

# Norgren Pneumatic Actuator Products

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# Norgren Pneumatic Actuators



### Section 1 – NFPA Aluminum & Steel Actuators

Fluids: Filtered compressed air to 250 psi (17 bar)  
 Operating Pressure: 250 psi (17 bar)  
 Operating Temperature:  
 Series EA -20°F to 200°F (-29°C to 107°C)  
 with Viton Seals -20°F to 400°F (-29°C to 204°C)  
 Bore Sizes: 1-1/2", 2", 2-1/2", 3-1/4", 4", 5", 6", 7", 8", 10", 12"



### Section 2 – Series SS Stainless Steel Actuators

Fluids: Filtered compressed air to 250 PSI  
 Petroleum based hydraulic fluid to 400 PSI  
 Lubrication: None required  
 Operating Pressure:  
 250 psig air (17.2 bar)  
 400 psig hydraulic (27.6 bar)  
 Operating Temperatures:  
 Series SS: -40° to 200°F (-40° to 93°C)  
 Series D: -20° to 250°F (-29° to 204°C)  
 with Viton Seals: -20° to 400°F (-29° to 204°C)  
 Bore Sizes: 1.125" (29mm), 1.50" (38mm), 2.0" (51mm), 2.50" (64mm), 3.25" (83mm), 4.0" (102mm), 5.0" (127mm), 6.0" (152mm), 8.0" (203mm)



### Section 3– Series N Non-Rotating Actuators

Fluids: Filtered compressed air to 250 psi  
 (For hydraulic service consult factory.)  
 Operating Pressure: 250 psig (17.2 bar)  
 Operating Temperatures: -20° to 200°F (-29° to 93°C)  
 Bore Sizes: 1.125" (29mm), 1.50" (38mm), 2.0" (51mm), 2.50" (64mm), 3.25" (83mm), 4.0" (102mm)



### Section 4 – 8000 & 8000/M ISO VDMA Actuators

Fluids: Compressed air, filtered, lubricated and non-lubricated  
 Operating Pressure: 1 to 16 bar (14.5 to 232 psig)  
 Operating Temperature: -20° to 80°C max (-4° to 176°F max)  
 (Consult Technical Services for use below 2°C (35°F))  
 Bore Sizes: 32, 40, 50, 63, 80, 100, 125, 160, 200, 250, 320 mm  
 Note: Corrosion Resistant available.



### Section 5 – Tiny Tim Actuators

Fluids: Filtered compressed air to 150 psi (10 bar)  
 Operating Pressure: 150 psi (10 bar)  
 Operating Temperature:  
 -20° to 225°F (-30° to 110°C) with Standard Seals  
 -40° to 200°F (-40° to 90°C) with Buna N Seals  
 -40° to 350°F (-40° to 175°C) with Viton Seals  
 Bore Sizes: 3/4", 1", 1-1/8"



# Norgren Pneumatic Actuators



## Section 6 – Roundline Stainless Steel Body Actuators

Fluids: Filtered, lubricated or non-lubricated, compressed air  
 Maximum Operating Pressure: 250 psig (17.2 bar)  
 Temperature Range:  
     Standard Nitrile Seals: -20° to 200°F (-29° to 93°C)  
     Viton Seals: -20° to 400°F (-29° to 205°C)  
 Bore Sizes: .438" (11mm), .563" (14mm), .75" (19mm), 1.063" (27mm),  
 1.25" (32mm), 1.50" (40mm), 2.0" (50mm), 2.50" (63)



## Section 7– Mini Roundline Pneumatic Cylinder

Fluids: Compressed air filtered, lubricated or non-lubricated  
 Operating Pressure: 50.75 to 101.5 psig (3.5 to 7 bar)  
 Operating Temperature: 32°F to 140°F (0°C to 60°C)  
 Bore Sizes: ø 2.5 mm & 4 mm



## Section 8 – Series 90000 Compact Actuators

Fluids: Compressed air, filtered, lubricated or non-lubricated  
 Operating Pressure: 14.5 to 145 PSI (1 to 10 bar)  
 Operating Temperature: 23°\* to 176°F (-5°\* to 80 °C)  
 \* Consult Technical Service for use below 35°F (2° C)  
 Bore Sizes: 0.50"(12mm), 0.625" (16mm), 0.75" (20mm), 1.0" (25mm),  
 1.25" (32mm), 1.50" (40mm), 2.0" (50mm) 2.50" (63mm),  
 3.125" (80mm), 4.0" (100mm)



## Section 9 – Compact Interchangeable Pneumatic Actuator

Fluids: Compressed air filtered, lubricated or non-lubricated  
 Operating Pressure: 14.5 to 145 psig (1 to 10 bar)  
 Operating Temperature: -25°F to 250°F (-32°C to 121°C)  
 Bore Sizes: 0.5" (12mm), 0.63" (16mm), 0.79 (20mm), 0.98 (25mm), 1.26"  
 (32mm), 1.57" (40mm), 1.97" (50mm), 2.48" (63mm), 3.15"  
 (80mm), 3.94" (100mm), 4.92" (125mm), 5.51" (140mm),  
 6.3" (160mm).



## Section 10 – Lintra Series 46000 Rodless Actuators

Fluids: Compressed air filtered to 50µ and lubricated  
 Operating Pressure  
     16 mm: 22 to 150 psig (1.5 to 10 bar)  
     20 mm to 80 mm: 15 to 150 psig (1 to 10 bar)  
 Operating Temperatures  
     -22° to 180°F\* (-30°C to 80°C)  
     \*With dewpoint of supply air less than ambient air temperature.  
 Bore Sizes: 0.63" (16mm), 0.79 (20mm), 0.98 (25mm), 1.26" (32mm),  
 1.57" (40mm), 1.97" (50mm), 2.48" (63mm), 3.15" (80mm)

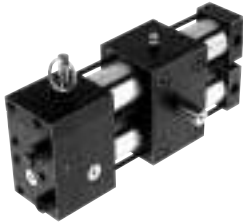


# Norgren Pneumatic Actuators



## Section 11 – Lintra-Lite Series A440000 Rodless Actuators

Fluids: Compressed air, filtered to 50 $\mu$  and lubricated  
 Operating Pressure: 15 to 118 psig ( 1 to 8 bar)  
 Operating Temperatures: -22° to 180°F\* (-30° to 80°C)  
 \*With dewpoint of supply air less than ambient air temperature at cylinder, consult our Technical Service for use below 36°F (2°C)  
 Bore Sizes: 1.0" (25mm), 1.25" (32mm), 1.50" (40mm)



## Section 12 – Rack and Pinion Rotary Actuators

Fluids: Filtered compressed air to 150 psi (10 bar)  
 Operating Pressure: 150 psi (10 bar)  
 Operating Temperature:  
 -20° to 200°F (-29° to 93°C) with Standard Nitrile Seals  
 -20° to 400°F (-29° to 204°C) with Viton® Seals  
 -20° to 250°F (-29° to 121°C) with Low Friction Seals  
 Bore Sizes: 0.50" (12mm), 0.75" (20mm), 1.125" (29mm), 1.50" (38mm), 2.00" (50mm), 2.50" (64mm)



## Section 13 – Mini Pneumatic Rotary Actuators

Fluids: Compressed air filtered, lubricated or non-lubricated  
 Operating Pressure: 14.5 to 101.5 psig ( 1 to 7 bar)  
 Operating Temperatures: 32°F to 140°F\* (5°C to 60°C)  
 \*With dewpoint of supply air less than ambient air temperature at cylinder, consult our Technical Service for use below 36°F (2°C)  
 Size Range:  $\varnothing$  0.47" to 0.87" (12 mm to 22 mm)



## Section 14 – Rotary Vane Actuators

Fluids: Lubricated or non-lubricated, filtered, compressed air  
 Operating Pressure:  
 M/60280, M/60281: 44 to 102 psig (3 to 7 bar)  
 M/60282, C/60283: 29 to 102 psig (2 to 7 bar)  
 C/60284, C/60084/TI: 29 to 145 psig (2 to 10 bar)  
 Operating Temperature: 40° to 140°F (5° to 60°C)



## Section 15 – Pneumatic Grippers

Fluids: Compressed air filtered, lubricated or non-lubricated  
 Operating Pressure  
 29 to 101.5 psig (2 to 7 bar) - See individual components for pressures  
 Operating Temperatures  
 32°F to 140°F\* (0°C to 60°C)  
 \*With dewpoint of supply air less than ambient air temperature.

# NFPA Aluminum & Steel Cylinders

**Series "A" Aluminum (1-1/2" to 8") & Series "J" Steel (1-1/2" to 12") Bore Cylinder Features**

Series "A" and "J" Technical Features . . . . . ACT-1-2, ACT-1-6

**Series "EA" Aluminum (1-1/2" to 8") & Series "EJ" Steel (1-1/2" to 12") Bore Cylinder Features**

Series "EA" and "EJ" Impact Dampening Seals . . . . . ACT-1-4, ACT-1-8, ACT-1-12

Series "EA" and "EJ" Technical Features . . . . . ACT-1-5, ACT-1-9

Decel Cushioned Cylinder . . . . . ACT-1-10

General Technical Information . . . . . ACT-1-13

Code	NFPA	Bore Sizes	Description	
01	MS4	1-1/2" - 12"	Side Tapped	ACT-1-18
03	MF1	1-1/2" - 6"	Head Rectangular Flange	ACT-1-22
03	ME3	7" - 12"	Head Square Flange	ACT-1-24
04	ME4	7" - 12"	Cap Square Flange	ACT-1-24
04	MF2	1-1/2" - 6"	Cap Rectangular Flange	ACT-1-26
05	MX0	1-1/2" - 12"	Basic	ACT-1-28
06	MX1	1-1/2" - 12"	4 Tie Rods Both Ends	ACT-1-32
6C	MX2	1-1/2" - 12"	Cap Tie Rods	ACT-1-32
6R	MX3	1-1/2" - 12"	Head Tie Rods	ACT-1-32
6B	MX4	1-1/2" - 12"	2 Tie Rods Both Ends	ACT-1-32
7R	MT1	1-1/2" - 8"	Removable Head Trunnion (A & EA Only)	ACT-1-36
07	MT1	1-1/2" - 12"	Head Trunnion (J & EJ Only)	ACT-1-36
8R	MT2	1-1/2" - 8"	Removable Cap Trunnion	ACT-1-40
08	MT2	1-1/2" - 12"	Cap Trunnion	ACT-1-40
09	MS2	1-1/2" - 12"	Side Lugs	ACT-1-44
10	MT4	1-1/2" - 12"	Intermediate Center Trunnion	ACT-1-48
11	MS1	1-1/2" - 12"	Side End Angles	ACT-1-52
12	MP1	1-1/2" - 12"	Cap Fixed Clevis	ACT-1-56
15	MS7	1-1/2" - 8"	Side End Lugs	ACT-1-60
16	N/A	1-1/2" - 6"	Sleeve Nut Construction Universal	ACT-1-62
20	MF5	1-1/2" - 6"	Head Square Flange	ACT-1-64
21	MF6	1-1/2" - 6"	Cap Square Flange	ACT-1-66
22	MP2	1-1/2" - 8"	Detachable Cap Clevis	ACT-1-68
32	MP3	1-1/2" - 12"	Cap Fixed Eye	ACT-1-70
42	MP4	1-1/2" - 8"	Detachable Cap Eye	ACT-1-74
52	N/A	1-1/2" - 8"	Spherical Bearing	ACT-1-76
60	N/A	1-1/2" - 6"	Base Bar (A & EA)	ACT-1-78

Series DA & EDA (Aluminum) and DJ & EDJ (Steel) Double Rod End Cylinders . . . . . ACT-1-80

Series A & EA (1-1/2" to 8") and Series J & EJ (1-1/2" to 12") Cylinder Accessories . . . . . ACT-1-84

Series A & EA and J & EJ Optional Features & Custom Cylinders . . . . . ACT-1-86

Stroke Signal Valve/Pneumatic Valve . . . . . ACT-1-88

Reed & Solid State Switch Information . . . . . ACT-1-90

Flow Controls . . . . . ACT-1-92

Rod Alignment Coupler . . . . . ACT-1-94

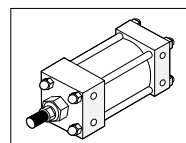
Air-Oil Tank . . . . . ACT-1-94

Series A & EA and J & EJ Standard and Special Options . . . . . ACT-1-95

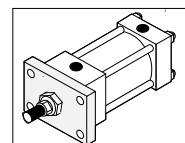
Series A & EA (1-1/2" - 8") and Series J & EJ (1-1/2" - 12") Order Information . . . . . ACT-1-96

Seal Replacement Kits for Series A, EA, J & EJ . . . . . ACT-1-97

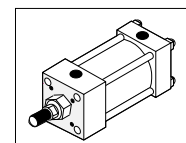
NFPA - National Fluid Power Association



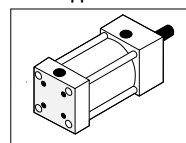
Page ACT-1-18  
Cylinder with 01 (MS4) Side Tapped



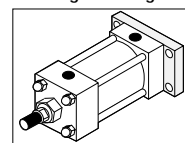
Page ACT-1-22  
Cylinder with 03 (MF1) Head Rectangular Flange



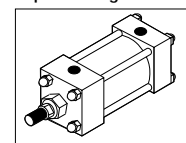
Page ACT-1-24  
Cylinder with 03 (ME3) Head Square Flange



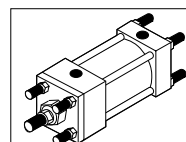
Page ACT-1-24  
Cylinder with 04 (ME4) Cap Square Flange



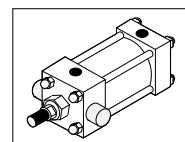
Page ACT-1-26  
Cylinder with 04 (MF2) Cap Rectangular Flange



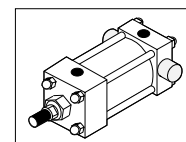
Page ACT-1-28  
Cylinder with 05 (MX0) Basic



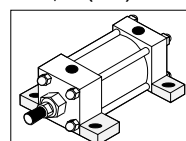
Page ACT-1-32  
Cylinder with 06 (MX1) Tie Rod-4, 6C (MX2) Cap, 6R (MX3) Head, 6B (MX4) Tie Rod-2



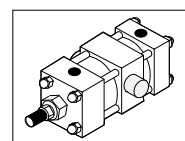
Page ACT-1-36  
Cylinder with 07 (MT1) Head Trunnion



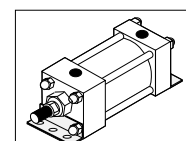
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Cylinder with 08 (MT2) Cap Trunnion



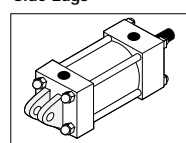
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Cylinder with 09 (MS2) Side Lugs



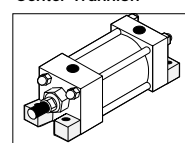
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Cylinder with 10 (MT4) Intermediate Center Trunnion



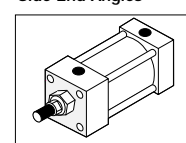
Page ACT-1-52  
Cylinder with 11 (MS1) Side End Angles



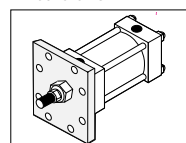
Page ACT-1-56  
Cylinder with 12 (MP1) Cap Fixed Clevis



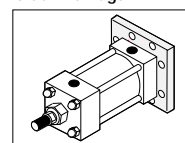
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Cylinder with 15 (MS7) Side End Lugs



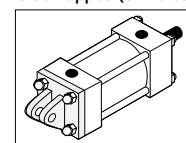
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Cylinder with 16 Sleeve Nut Construction Side Tapped (Universal)



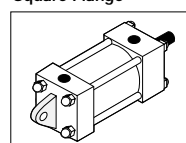
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Cylinder with 20 (MF5) Head Square Flange



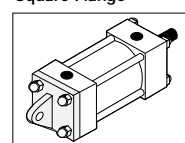
Page ACT-1-66  
Cylinder with 21 (MF6) Cap Square Flange



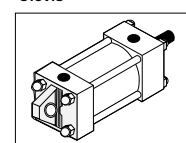
Page ACT-1-68  
Cylinder with 22 (MP2) Detachable Clevis



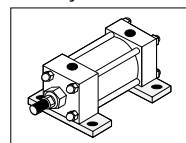
Page ACT-1-70  
Cylinder with 32 (MP3) Cap Fixed Eye



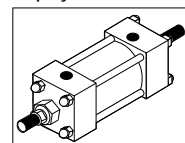
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Cylinder with 42 (MP4) Detachable Cap Eye



Page ACT-1-76  
Cylinder with 52 Spherical Bearing



Page ACT-1-78  
Cylinder with 60 Base Bar (A & EA Only)



Page ACT-1-80  
Double Rod End Cylinders



### Series A Cylinders are constructed with the finest materials for each component!

**1 Piston Rod:** Hard chrome plated high-tensile steel, ground and polished.

**2 Rod Bearing:** External removable threaded steel bearing housing (black oxide finish), with an oil-impregnated sintered iron rod bearing.

**3 Rod Seal:** Nitrile lip-type seal is pressure energized and wear compensating for durability and long life.

**4 Head/Cap:** Precision machined from alloy aluminum, then anodized for corrosion resistance (black finish).

**5 Ultra Cushion® Seals:** Advanced design features a unique, one-piece, compound seal of nitrile\* captured within a precision machined groove. Linear and radial "float" of the cushion seals eliminates misalignment. Ultra Cushions provide exceptionally fast "out of cushion" stroke reversal. (Head and Cap Cushions are optional.)

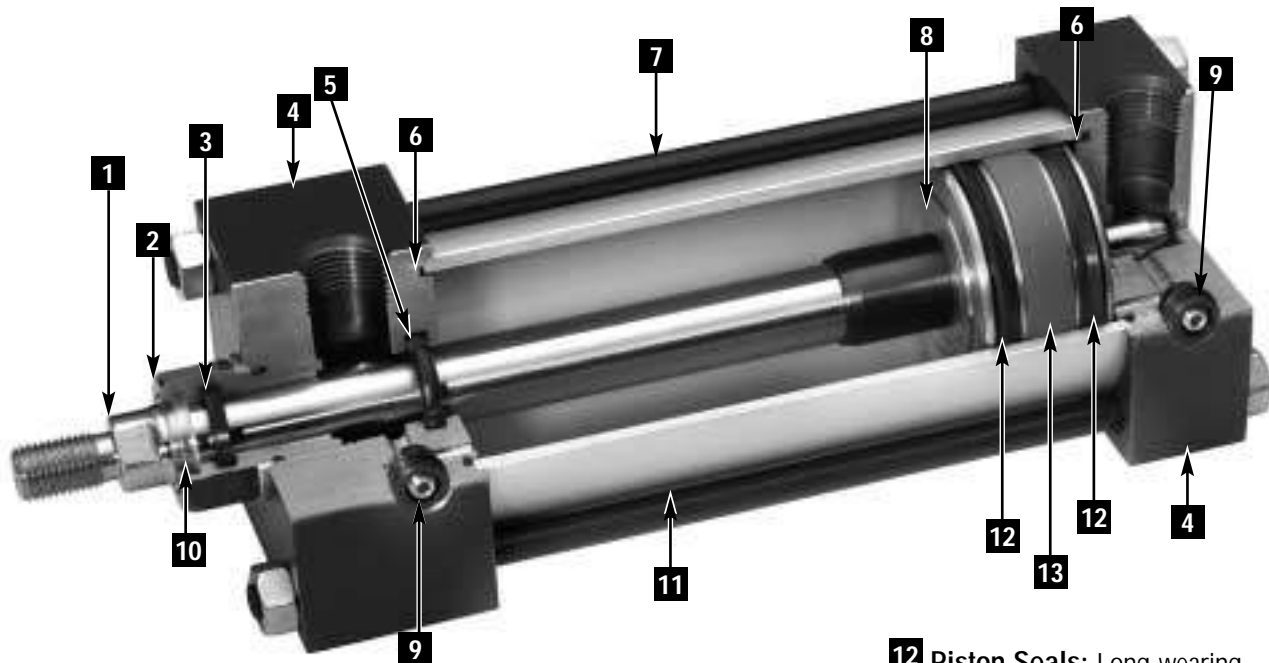
\*Nitrile seals on the 5/8" & 1" rod diameter. For rod sizes 1-3/8" and larger, urethane seals are standard.

**6 O-Ring Tube Seal:** Buna is standard. (Viton is optional.)

**7 Tie Rods:** High-strength steel maintains uniform compression on tube end seals.

**8 Piston:** Machined solid aluminum alloy, light-weight for low inertia, yet strong. Threaded piston is installed with high strength threadlocker adhesive then staked to the piston rod.

**9 Adjustable Captive Cushion Needle:** A one-piece, precision threaded brass cushion adjustment screw with a threaded steel capture ring. It provides safe and precise cushion adjustment.



**10 Wiper Seal:** Lip-type urethane wiper seal keeps contaminants from getting into cylinder by aggressively wiping foreign materials from the piston rod, enhancing the rod seal life.

**11 Cylinder Tube:** High-strength aluminum alloy ideally suited for air service. The tube is clear anodized on the O.D. and hard anodic coated on the I.D., resulting in a smooth, file hard (60RC), corrosion and score resistant surface finish.

**12 Piston Seals:** Long-wearing nitrile seals.

**13 Wear Ring:** Reinforced Teflon® compounded with polyphenylene sulfide provides supreme wear and excellent bearing support.

#### Application Information

Series A NFPA interchangeable aluminum air cylinders are offered with a variety of accessories, standard and optional equipment to meet your application needs.

The addition of a Teflon® wear ring to the outer perimeter of the piston permits us to guarantee its operation against failure due to lack of lubrication for ONE FULL YEAR, regardless of cycles! See page ACT-1-98 for complete warranty.

Standard non-cushioned Series A cylinders are recommended for applications that require full bottoming of the piston and where the noise emitted by the metal-to-metal impact between the piston and cylinder end caps is tolerable. We recommend that optional non-adjustable cushions be added for piston speeds (moving light tools) ranging from 15 to 30 in/sec. For speeds exceeding 30 in/sec, the cylinders should be equipped with adjustable air cushions.



## Series EA Ecology Cylinders are constructed with the finest materials for each component!

**1 Ultra Cushion® Seals:** Advanced design features a unique, one-piece, compound seal of nitrile\* captured within a precision machined groove. Linear and radial "float" of the cushion seals eliminates misalignment. Ultra Cushions provide exceptionally fast "out of cushion" stroke reversal. (Head and Cap Cushions are optional.)

\*Nitrile seals on the 5/8" & 1" rod diameter.  
For rod sizes 1-3/8" and larger, urethane seals are standard.

**2 Impact Dampening Piston Seals:** Our impact dampening piston seals, in conjunction with our advanced cushion design, decelerate and reduce end-of-stroke noise.

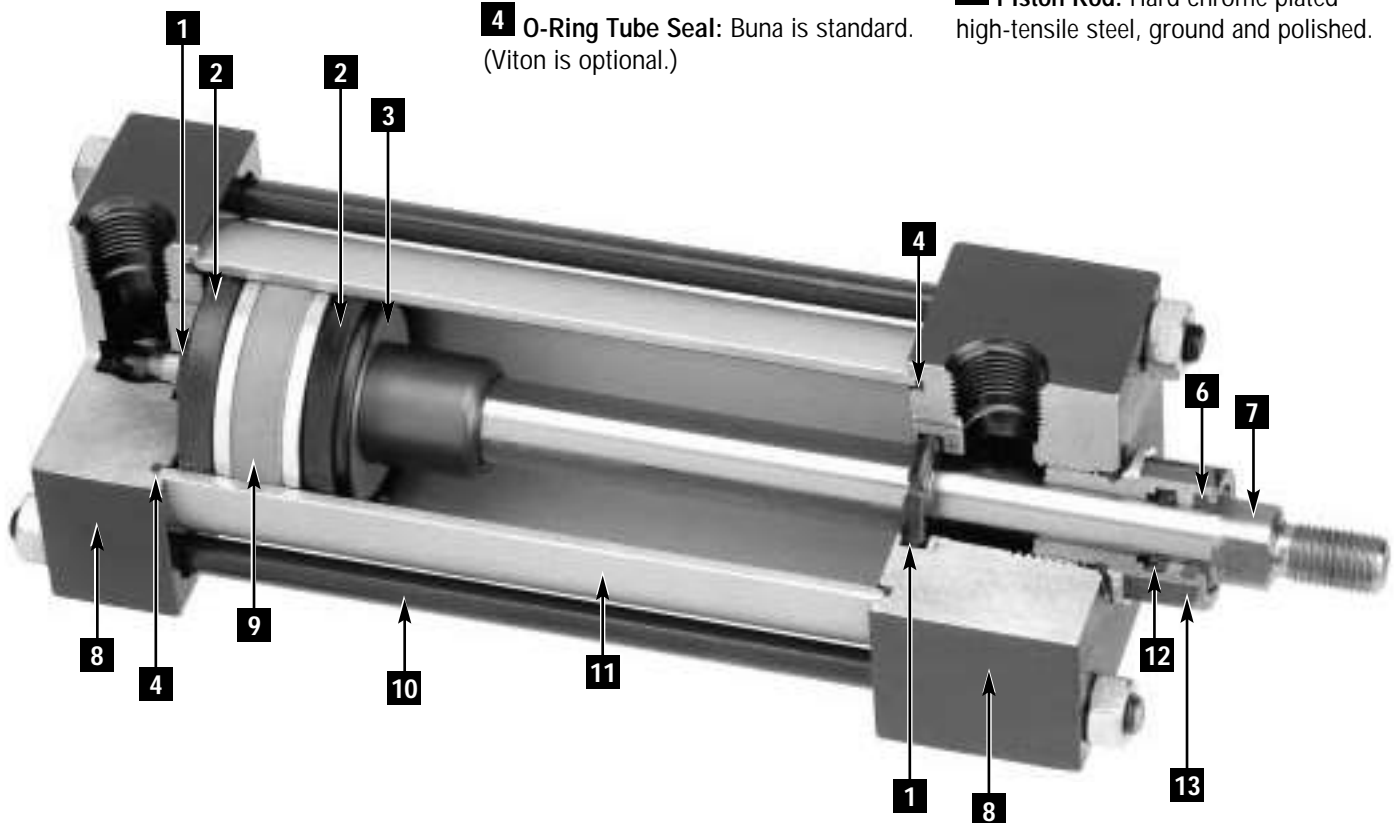
**3 Piston:** Machined solid aluminum alloy, light-weight for low inertia, yet strong. Threaded piston is installed with high strength threadlocker adhesive then staked to the piston rod.

**4 O-Ring Tube Seal:** Buna is standard. (Viton is optional.)

**5 Adjustable Captive Cushion Needle (not shown):** Fine thread allows for safe and precision adjustment of cushion. (See page 2.)

**6 Wiper Seal:** Lip-type urethane wiper seal keeps contaminants from getting into cylinder by aggressively wiping foreign materials from the piston rod, enhancing the rod seal life.

**7 Piston Rod:** Hard chrome plated high-tensile steel, ground and polished.



**8 Head/Cap:** Precision machined from alloy aluminum, then anodized for corrosion resistance (black finish).

**9 Wear Ring:** Reinforced Teflon® compounded with polyphenylene sulfide provides supreme wear and excellent bearing support.

**10 Tie Rods:** High-strength steel maintains uniform compression on tube end seals.

**11 Cylinder Tube:** High-strength aluminum alloy ideally suited for air service. The tube is clear anodized on the O.D. and hard anodic coated on the I.D., resulting in a smooth, file hard (60RC), corrosion and score resistant surface finish.

**12 Rod Seal:** Nitrile lip-type seal is pressure energized and wear compensating for durability and long life.

**13 Rod Bearing:** External removable steel bearing housing (black oxide finish), with an oil-impregnated sintered iron rod bearing.



# Norgren Ecology Cylinders offer these advantages:

## 1 Norgren Guarantees Non-lubricated Operation for a Full Year!

The piston rod is self-lubricated by the oil-impregnated rod bearing during operation. Lubrication between piston and cylinder barrel is derived from the polishing qualities of the reinforced Teflon® wear ring.

The low friction surfaces extend the life of the seals beyond normal expectations, permitting Norgren to unconditionally guarantee non-lubricated operation for one full year. See page ACT-1-98 for complete warranty.

Series EA cylinders are NFPA interchangeable and are available in many different mounting styles.

## 2 Operates Quietly to Meet OSHA Specifications.

Series EA cylinders provide substantial reductions in impact noise, which reduces overall machine noise and helps meet government regulations.

The summary of sound decibels chart illustrates the operating sound levels.

The impact dampening qualities of the Piston Seals are guaranteed for ONE FULL YEAR!

### Summary of Sound Levels in Decibels

PSI Air Sound Pressure Level+	Cylinder Model				
	A133B3 5" x 6"	EA155B3 5" x 6"	A1133A3 2" x 6"	EA1155A3 2" x 6"	
95 PSI+	End++	108	73	110	74
	Side++	112	84	110	81
50 PSI+	End++	108	73	113	74
	Side++	113	85	110	81

+ Peak sound pressure is given in decibels (dB) re: 2 x 10<sup>-5</sup> N/m<sup>2</sup>.

++End position of mike was 3' on centerline from end of cylinder; side position of mike was 3' perpendicular to centerline abeam of end of cylinder.

Note: At 5 feet, cylinder sound levels would be less by 9 dB from side figure and 13 dB from end figure. The total noise emitted will depend on the structure to which the cylinder is attached. If it is mounted on a thin flat plate of considerable area, the noise will be increased by a sounding board effect.

## 3 Energy Absorption Capacity of the Impact Dampening Seals

The impact-dampening Piston Seals in the Series EA cylinder allow for guaranteed, repeatable cushioning. The compressive qualities of the piston seals are predictable. The degree of seal compression at various supply pressures is documented. (See Energy Absorption Chart.) This allows you to compute the exact cylinder size required by knowing the weight (pounds) you are stopping at a given speed.

Series EA cylinders have a impact dampening piston seal that accomplishes 80% of the actual load stopping. The air cushion accounts for only 20%. (A conventional air cushioning cylinder depends 100% on the compressibility of air to do the stopping.) The EA seal absorbs high impact loads allowing the effect of the air cushion to be reduced by using a larger air cushion bleed orifice. As a result the piston can move at a faster speed for a longer period of time before the EA seal does the final stopping. See illustration at top of ACT-1-5 for cushion operation.

### Energy Absorption Capacity of the Impact Dampening Seals

\*Usable Pounds Stoppable at the Following Piston Speeds

This chart features the energy absorption capacity of the impact dampening piston seals with **Non-Adjustable** cushions. For higher loads and velocities please refer to the Decel-Air™ Cushion Option on ACT-1-10.

In/Sec	Cylinder Bore								
	1 1/2	2	2 1/2	3 1/4	4	5	6	7	8
6	155.6	275.5	499.8	969.3	1505.4	2603.2	4159.8	5794.2	8067.6
12	38.4	68.1	123.4	239.7	372.6	644.8	1030.2	1435.8	2000.4
18	16.7	29.7	53.7	104.6	162.8	282.1	450.6	628.7	876.8
24	9.2	16.3	29.4	57.3	89.4	155.2	247.8	346.2	483.6
30	5.6	10.0	18.1	35.4	55.4	96.4	153.9	215.4	301.6
36	3.7	6.7	11.9	23.5	37.0	64.5	102.9	144.4	202.7
42	2.6	4.6	8.2	16.3	25.8	45.3	72.2	101.6	143.1
48	1.8	3.2	5.8	11.7	18.6	32.8	52.2	73.8	104.4
54	1.3	2.4	4.2	8.5	13.6	24.2	38.5	54.7	77.9
60	1.0	1.8	3.0	6.2	10.1	18.1	28.7	41.1	58.9

\*The weight of the cylinder piston has been deducted from the figures shown above.

Note: The use of Viton® Seals limits the absorption of the impact dampening seals by 50%.

### Energy absorption capacity of the impact dampening piston seals with an adjustable cushion.

In/Sec	Cylinder Bore								
	1 1/2	2	2 1/2	3 1/4	4	5	6	7	8
6	279	495	899	1,744	2,709	4,685	7,486	10,429	14,520
12	68	122	221	430	699	1,159	1,854	2,583	3,800
18	30	53	95	187	291	507	810	1,130	1,576
24	16	29	52	102	160	279	444	622	869
30	10	18	32	63	99	172	275	387	541
36	6.7	12	21.6	42	66	116	183	259	363
42	4.7	8.3	14.7	29	46	81	129	181	257
48	3.4	5.7	10.4	21	33	59	93	131	187
54	2.3	4.3	7.6	15.3	24	43	68	97	138
60	1.8	3.2	5.4	11	18	33	52	74	106

### Effect of Impact Dampening Seals on Total Stroke of Cylinders

PSI	Cylinder Bore								
	1 1/2	2	2 1/2	3 1/4	4	5	6	7	8
0	.14	.15	.17	.19	.22	.25	.28	.32	.32
20	.10	.10	.12	.14	.16	.18	.20	.22	.22
40	.07	.07	.08	.09	.10	.12	.13	.14	.14
60	.04	.04	.05	.05	.06	.07	.07	.08	.08
80	.02	.02	.02	.02	.03	.03	.03	.04	.04
100	0	0	0	0	0	0	0	0	0

Note: These figures are for new cylinders. The impact dampening seals will take some compression set during operation of the cylinder and the stroke loss will decrease. Also, the pressure at zero stroke loss will decrease to about 80 psi.

At pressures above those of zero stroke loss, a slight clicking sound may be produced during impact.

To determine the stroke loss for either the head or cap end, divide the value shown by 2.





### Cushion Function



As the cushion spear enters the cushion cavity, the exhaust port becomes sealed off creating an air brake. This provides the initial deceleration in piston speed. The oversized air cushion bleed orifice permits the cushion pressure to exhaust with minimal restriction. This allows the piston to move quickly and smoothly through the cushion length.



As the piston continues its travel to the point of impact with the end caps, the compressive qualities of the EJ seal provide the final decelerating force. This action compresses the EJ seal and absorbs the remaining kinetic shock vibration and noise created by the impact.



On the reverse stroke the EJ seal releases its compressive energy to propel the piston away from the end caps, producing an immediate breakaway.

### Operating Temperatures:

Series EA -20°F to 200°F  
 (-29°C to 107°C)  
 with Viton Seals -20°F to 400°F  
 (-29°C to 204°C)

### Operating Pressure:

250 PSIG Air (17 Bar)  
 EA Cylinders cannot be used in hydraulic applications.  
 Bore Sizes: 1-1/2", 2", 2-1/2", 3-1/4", 4", 5", 6", 7", 8"

### Supply:

Filtered compressed air to 250 PSI

### Lubrication:

None required  
 Norgren Air Cylinders are rated for "no lube added" service. All internal components are lubricated at time of assembly with a Teflon® based grease.

### Materials:

Head and End Caps: black anodized 6061-T6 aluminum  
 Tube: 6063-T832 aluminum, clear anodized O.D., hardcoat anodized I.D.  
 Rod: hard chrome plated steel  
 Piston: machined high-strength aluminum alloy  
 Rod Bearing: oil impregnated sintered iron  
 Seals: nitrile rod seal, urethane rod wiper, nitrile piston seals, nitrile tube end seals  
 Tie Rods: high-tensile strength steel

### Side Loading:

Cylinders are specifically designed to push and pull. Side loading (misalignment) of the piston rod should be avoided to ensure maximum operating performance and life.

Care should be taken during installation to properly align the load to be moved with the center line of the cylinder.

The use of a rod alignment coupler (see page ACT-1-94) is strongly recommended whenever possible.

### Air Cylinder Selection:

The proper application and selection of an air cylinder requires full consideration of the following: the fluid medium, operating pressures, mounting style, length of stroke, type of rod connection to the load, thrust or mounting tension on the rod, mounting attitude, speed of the stroke and how the load motion will be stopped.

The data that follows provides the necessary information in the evaluation of

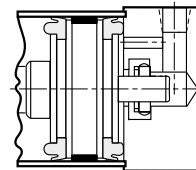
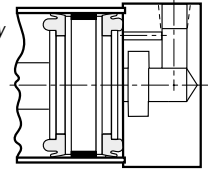
an average application and will help you in selecting the proper cylinder model and size for your particular application.

**Note:** 1-1/2", 2", 2-1/2", 3-1/4", 4" and 5" bore cylinders with 1/2" to 2" strokes will be furnished with a short head cushion sleeve and short cap cushion spear. Only available on 5/8" and 1" rods.

The above specification applies to Series EA cylinders with standard non-adjustable or optional adjustable cushions.

### Series EA Fixed Cushions

*Piston and rod assembly for 1-1/2" thru 5" bore cylinders with less than 1/2" stroke, and 6" thru 8" bore cylinders with less than 2" stroke.*



*Piston and rod assembly for 1-1/2" thru 5" bore cylinders with 1/2" to 2" stroke.*

### Ultra Cushion®

### A Major Design and Performance Breakthrough in Air Cylinder Cushioning Systems!

Norgren's advanced cushion design features a unique, one-piece, nitrile compound seal that is captured within a precision machined groove. This allows both linear and radial "float" of the cushion seal which virtually eliminates problems associated with misalignment. Integral flow paths molded in the periphery of the seal provide exceptionally fast "out of cushion" stroke reversal without the use of ball checks.

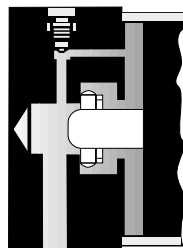


Figure 1

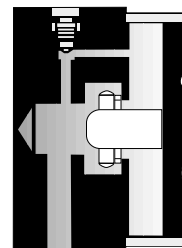
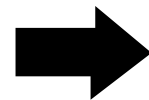


Figure 2 shows spear exiting cushion seal.





## Series J Cylinders are constructed with the finest materials for each component!

**1 Piston Rod:** Hard chrome plated high-tensile steel, ground and polished.

**2 Rod Bearing:** External removable threaded steel bearing housing (black oxide finish), with an oil-impregnated sintered iron rod bearing.

**3 Rod Seal:** Nitrile lip-type seal is pressure energized and wear compensating for durability and long life.

**4 Head/Cap:** Precision machined from steel, then black oxide finished 1-1/2" to 2-1/2" bores. Painted black finish on 3-1/4" to 12" bores.

**5 Ultra Cushion® Seals:** Advanced design features a unique, one-piece, compound seal of nitrile\* captured within a precision machined groove. Linear and radial "float" of the cushion seals eliminates misalignment. Ultra Cushions provide exceptionally fast "out of cushion" stroke reversal. (Head and Cap Cushions are optional.)

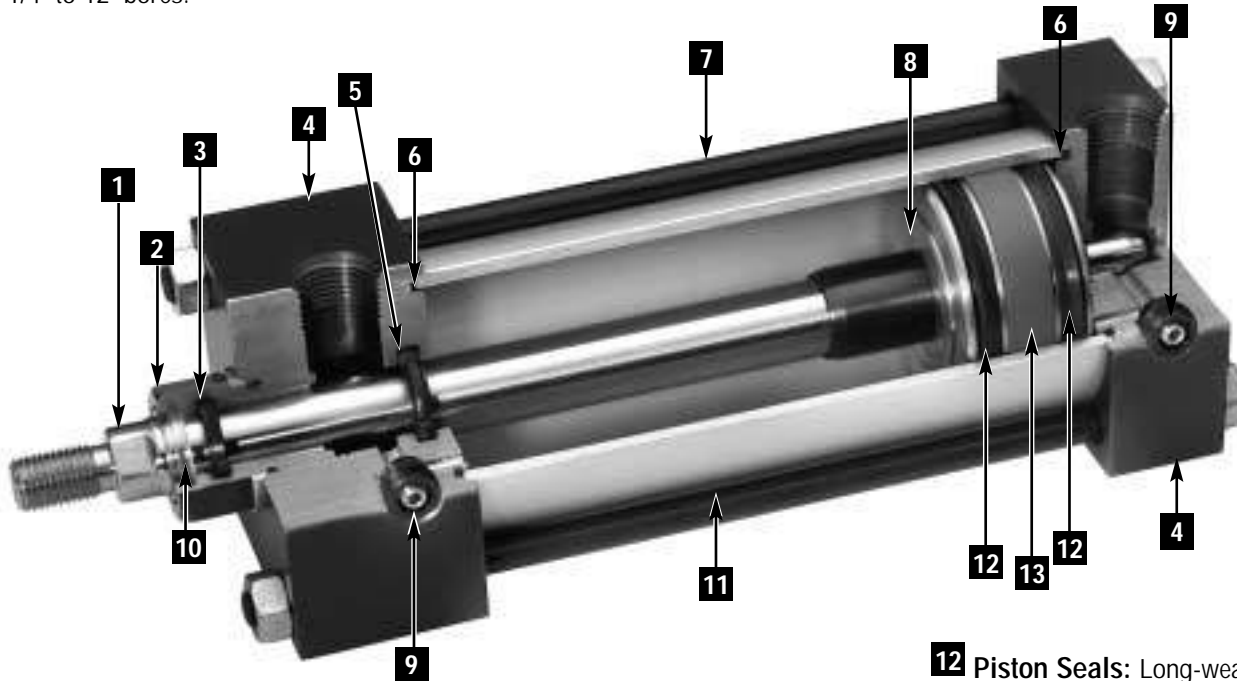
\*Nitrile seals on the 5/8" & 1" rod diameter. For rod sizes 1-3/8" and larger, urethane seals are standard.

**6 O-Ring Tube Seal:** Buna is standard. (Viton is optional.)

**7 Tie Rods:** High-strength steel maintains uniform compression on tube end seals.

**8 Piston:** Machined solid steel, for high strength. Threaded piston is installed with high strength threadlocker adhesive then staked to the piston rod.

**9 Adjustable Captive Cushion Needle:** A one-piece, precision threaded brass cushion adjustment screw with a threaded steel capture ring. It provides safe and precise cushion adjustment.



**10 Wiper Seal:** Lip-type urethane wiper seal keeps contaminants from getting into cylinder by aggressively wiping foreign materials from the piston rod, enhancing the rod seal life.

**11 Cylinder Tube:** High-strength aluminum alloy 1-1/2", 2", 2-1/2" bore anodized on the O.D. and hard coat I.D. Steel cylinder tube hard chrome plated I.D. 3-1/4" to 12" bore.

**12 Piston Seals:** Long-wearing nitrile seals.

**13 Wear Ring:** Reinforced Teflon® compounded with polyphenylene sulfide provides supreme wear and excellent bearing support.

### Application Information

Series J NFPA interchangeable steel air cylinders are offered with a variety of accessories, standard and optional equipment to meet your application needs.

The addition of a Teflon® wear ring to the outer perimeter of the piston permits us to guarantee its operation against failure due to lack of lubrication for ONE FULL YEAR, regardless of cycles! See page ACT-1-98 for complete warranty.

Standard non-cushioned Series J cylinders are recommended for applications that require full bottoming of the piston and where the noise emitted by the metal-to-metal impact between the piston and cylinder end caps is tolerable. We recommend that optional non-adjustable cushions be added for piston speeds (moving light tools) ranging from 15 to 30 in/sec. For speeds exceeding 30 in/sec, the cylinders should be equipped with adjustable air cushions.



## Series EJ Ecology Cylinders are constructed with the finest materials for each component!

**1 Ultra Cushion® Seals:** Advanced design features a unique, one-piece, compound seal of nitrile\* captured within a precision machined groove. Linear and radial "float" of the cushion seals eliminates misalignment. Ultra Cushions provide exceptionally fast "out of cushion" stroke reversal. (Head and Cap Cushions are optional.)

\*Nitrile seals on the 5/8" & 1" rod diameter.  
For rod sizes 1-3/8" and larger, urethane seals are standard.

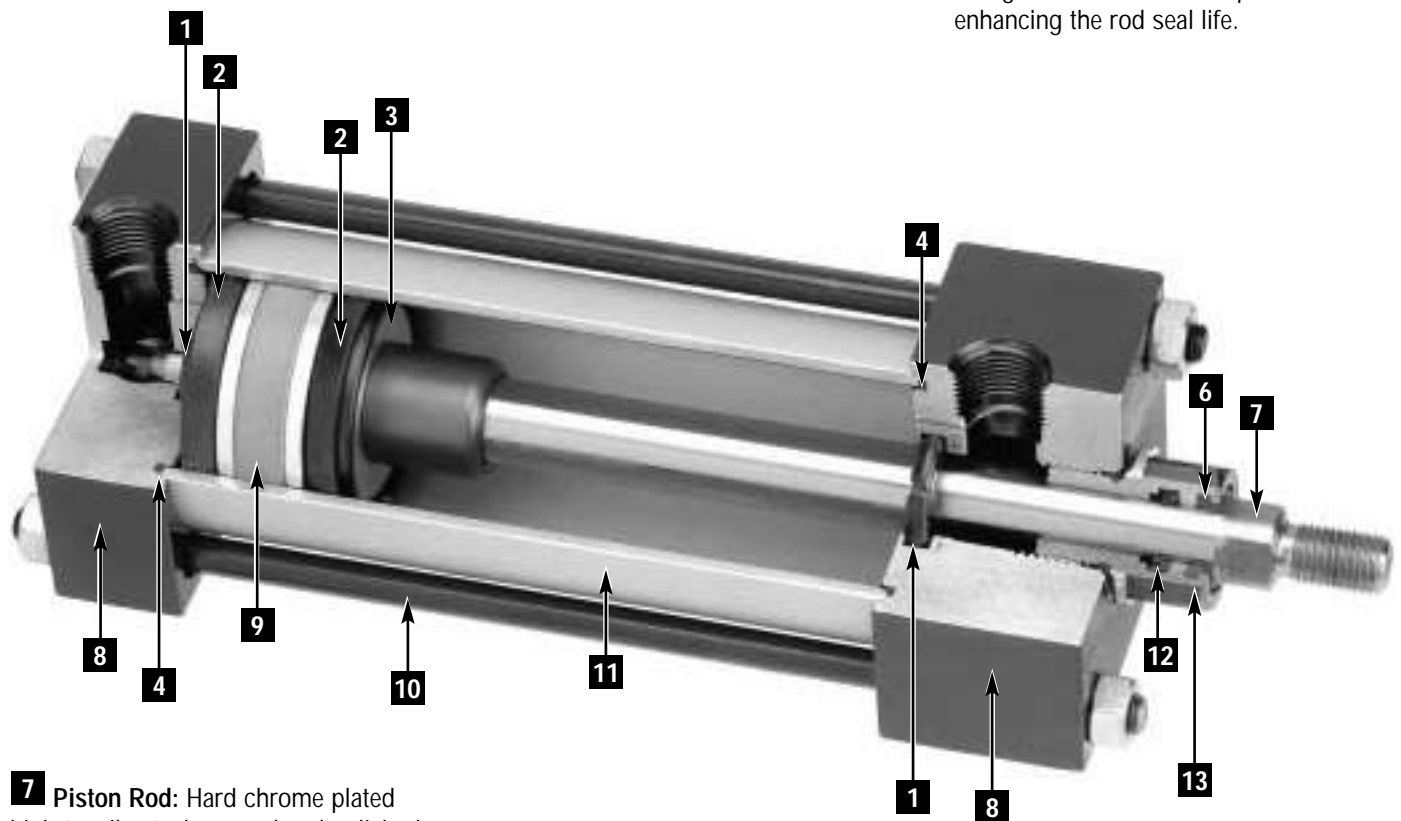
**2 Impact Dampening Piston Seals:** Our impact dampening piston seals, in conjunction with our advanced cushion design, decelerate and reduce end-of-stroke noise.

**3 Piston:** Machined solid steel, for high strength. Threaded piston is installed with high strength threadlocker adhesive then staked to the piston rod.

**4 O-Ring Tube Seal:** Buna is standard. (Viton is optional.)

**5 Adjustable Captive Cushion Needle (not shown):** Fine thread allows for safe and precision adjustment of cushion. (See page ACT-1-6.)

**6 Wiper Seal:** Lip-type urethane wiper seal keeps contaminants from getting into cylinder by aggressively wiping foreign materials from the piston rod, enhancing the rod seal life.



**7 Piston Rod:** Hard chrome plated high-tensile steel, ground and polished.

**8 Head/Cap:** Precision machined from steel, then black oxide finished 1-1/2" to 2-1/2" bores. Painted black finish 3-1/4" to 12" bores.

**9 Wear Ring:** Reinforced Teflon® compounded with polyphenylene sulfide provides supreme wear and excellent bearing support.

**10 Tie Rods:** High-strength steel maintains uniform compression on tube end seals.

**11 Cylinder Tube:** High-strength aluminum alloy 1-1/2", 2", 2-1/2" bore anodized on the O.D. and hard coat I.D. Steel cylinder tube hard chrome plated I.D. 3-1/4" to 12" bore.

**12 Rod Seal:** Nitrile lip-type seal is pressure energized and wear compensating for durability and long life.

**13 Rod Bearing:** External removable steel bearing housing (black oxide finish), with an oil-impregnated sintered iron rod bearing.



# Norgren Ecology Cylinders offer these advantages:

## 1 Norgren Guarantees Non-lubricated Operation for a Full Year!

The piston rod is self-lubricated by the oil-impregnated rod bearing during operation. Lubrication between piston and cylinder barrel is derived from the polishing qualities of the reinforced Teflon® wear ring.

The low friction surfaces extend the life of the seals beyond normal expectations, permitting Norgren to unconditionally guarantee non-lubricated operation for one full year.

See page ACT-1-98 for complete warranty.

Series EJ cylinders are NFPA interchangeable and are available in many different mounting styles.

## 2 Operates Quietly to Meet OSHA Specifications.

Series EJ cylinders provide substantial reductions in impact noise, which reduces overall machine noise and helps meet government regulations.

The summary of sound decibels chart illustrates the operating sound levels.

The impact dampening qualities of the Piston Seals are guaranteed for ONE FULL YEAR!

### Summary of Sound Levels in Decibels

PSI Air Sound Pressure Level+		Cylinder Model			
		J133B3 5" x 6"	EJ155B3 5" x 6"	J1133A3 2" x 6"	EJ1155A3 2" x 6"
95 PSI+	End++	108	73	110	74
	Side++	112	84	110	81
50 PSI+	End++	108	73	113	74
	Side++	113	85	110	81

+ Peak sound pressure is given in decibels (dB) re: 2 x 10<sup>5</sup> N/m<sup>2</sup>.

++End position of mike was 3' on centerline from end of cylinder; side position of mike was 3' perpendicular to centerline abeam of end of cylinder.

Note: At 5 feet, cylinder sound levels would be less by 9 dB from side figure and 13 dB from end figure. The total noise emitted will depend on the structure to which the cylinder is attached. If it is mounted on a thin flat plate of considerable area, the noise will be increased by a sounding board effect.

## 3 Energy Absorption Capacity of the Impact Dampening Seals

The impact-dampening

Piston Seals in the Series EJ cylinder allow for guaranteed, repeatable cushioning. The compressive qualities of the piston seals are predictable. The degree of seal compression at various supply pressures is documented. (See Energy Absorption Chart.) This allows you to compute the exact cylinder size required by knowing the weight (pounds) you are stopping at a given speed.

Series EJ cylinders have a impact dampening piston seal that accomplishes 80% of the actual load stopping. The air cushion accounts for only 20%. (A conventional air cushioning cylinder depends 100% on the compressibility of air to do the stopping.) The EJ seal absorbs high impact loads allowing the effect of the air cushion to be reduced by using a larger air cushion bleed orifice. As a result the piston can move at a faster speed for a longer period of time before the EJ seal does the final stopping. See illustration at top of ACT-1-9 for cushion operation.

### Energy Absorption Capacity of the Impact Dampening Seals

\*Usable Pounds Stoppable at the Following Piston Speeds

This chart features the energy absorption capacity of the impact dampening piston seals with a **Non-Adjustable** cushions. For higher loads and velocities please refer to the Decel- Air Cushion option on ACT-1-10.

In/Sec	Cylinder Bore										
	1 1/2	2	2 1/2	3 1/4	4	5	6	7	8	10	12
6	155.6	275.5	499.8	969.3	1505.4	2603.2	4159.8	5794.2	8067.6	12,242	20,139
12	38.4	68.1	123.4	239.7	372.6	644.8	1030.2	1435.8	2000.4	3026	4971
18	16.7	29.7	53.7	104.6	162.8	282.1	450.6	628.7	876.8	1319.3	2162.1
24	9.2	16.3	29.4	57.3	89.4	155.2	247.8	346.2	483.6	722	1179
30	5.6	10.0	18.1	35.4	55.4	96.4	153.9	215.4	301.6	445.5	724
36	3.7	6.7	11.9	23.5	37.0	64.5	102.9	144.4	202.7	295.3	476.8
42	2.6	4.6	8.2	16.3	25.8	45.3	72.2	101.6	143.1	204.8	327.7
48	1.8	3.2	5.8	11.7	18.6	32.8	52.2	73.8	104.4	146	231
54	1.3	2.4	4.2	8.5	13.6	24.2	38.5	54.7	77.9	105.7	164.7
60	1.0	1.8	3.0	6.2	10.1	18.1	28.7	41.1	58.9	76.9	117.2

\*The weight of the cylinder piston has been deducted from the figures shown above.

Note: The use of Viton® Seals limits the absorption of the impact dampening seals by 50%.

### Energy absorption capacity of the impact dampening piston seals with an adjustable cushion.

In/Sec	Cylinder Bore										
	1 1/2	2	2 1/2	3 1/4	4	5	6	7	8	10	12
6	279	495	899	1,744	2,709	4,685	7,486	10,429	4,520	22,035	36,250
12	68	122	221	430	699	1,159	1,854	2,583	3,800	5,446	8,947
18	30	53	95	187	291	507	810	1,130	1,576	2,374	3,891
24	16	29	52	102	160	279	444	622	869	1,299	1,414
30	10	18	32	63	99	172	275	387	541	801	1,303
36	6.7	12	21.6	42	66	116	183	259	363	531	856
42	4.7	8.3	14.7	29	46	81	129	181	257	367	588
48	3.4	5.7	10.4	21	33	59	93	131	187	262	415
54	2.3	4.3	7.6	15.3	24	43	68	97	138	189	295
60	1.8	3.2	5.4	11	18	33	52	74	106	138	211

### Effect of Impact Dampening Seals on Total Stroke of Cylinders

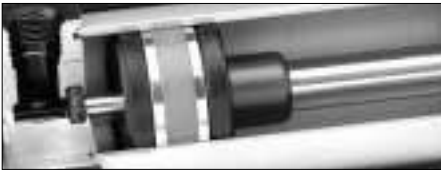
PSI	Cylinder Bore										
	1 1/2	2	2 1/2	3 1/4	4	5	6	7	8	10	12
0	.14	.15	.17	.19	.22	.25	.28	.32	.32	.36	.40
20	.10	.10	.12	.14	.16	.18	.20	.22	.22	.24	.26
40	.07	.07	.08	.09	.10	.12	.13	.14	.14	.15	.16
60	.04	.04	.05	.05	.06	.07	.07	.08	.08	.09	.10
80	.02	.02	.02	.02	.03	.03	.03	.04	.04	.04	.04
100	0	0	0	0	0	0	0	0	0	0	0

Note: These figures are for new cylinders. The impact dampening seals will take some compression set during operation of the cylinder and the stroke loss will decrease. Also, the pressure at zero stroke loss will decrease to about 80 psi. At pressures above those of zero stroke loss, a slight clicking sound may be produced during impact.

To determine the stroke loss for either the head or cap end, divide the value shown by 2.



### Cushion Function



As the cushion spear enters the cushion cavity, the exhaust port becomes sealed off creating an air brake. This provides the initial deceleration in piston speed. The oversized air cushion bleed orifice permits the cushion pressure to exhaust with minimal restriction. This allows the piston to move quickly and smoothly through the cushion length.



As the piston continues its travel to the point of impact with the end caps, the compressive qualities of the EJ seal provide the final decelerating force. This action compresses the EJ seal and absorbs the remaining kinetic shock vibration and noise created by the impact.



On the reverse stroke the EJ seal releases its compressive energy to propel the piston away from the end caps, producing an immediate breakaway.

### Operating Temperatures:

Series J -20°F to 200°F  
 (-29°C to 107°C)  
 with Viton Seals -20°F to 400°F  
 (-29°C to 204°C)

### Operating Pressure:

250 PSIG Air (17.2 Bar)  
 400 PSIG Hydraulic (27.6 Bar)  
 Bore Sizes: 1-1/2", 2", 2-1/2", 3-1/4",  
 4", 5", 6", 7", 8", 10", 12"

### Supply:

Filtered compressed air to 250 PSI Petroleum based hydraulic fluid to 400 PSI

### Lubrication:

None required  
 Norgren Air Cylinders are rated for "no lube added" service. All internal components are lubricated at time of assembly with a Teflon® based grease.

### Materials:

Head and End Caps: precision machined steel  
 Tube: 6063-T832 aluminum, clear anodized O.D., hard coat anodized I.D.  
 Rod: hard chrome plated steel  
 Piston: machined high-strength aluminum alloy  
 Rod Bearing: oil impregnated sintered iron  
 Seals: nitrile rod seal, urethane rod wiper, nitrile piston seals, nitrile tube end seals  
 Tie Rods: high-tensile strength steel

### Side Loading:

Cylinders are specifically designed to push and pull. Side loading (misalignment) of the piston rod should be avoided to ensure maximum operating performance and life.

Care should be taken during installation to properly align the load to be moved with the center line of the cylinder.

The use of a rod alignment coupler (see page ACT-1-94) is strongly recommended whenever possible.

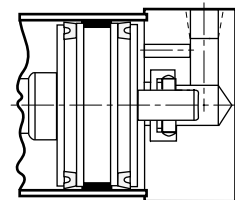
### Air Cylinder Selection:

The proper application and selection of an air cylinder requires full consideration of the following: the fluid medium, operating pressures, mounting style, length of stroke, type of rod connection to the load, thrust or mounting tension on the rod, mounting attitude, speed of the stroke and how the load motion will be stopped.

an average application and will help you in selecting the proper cylinder model and size for your particular application.

**Note:** 1-1/2", 2", 2-1/2", 3-1/4", 4" and 5" bore cylinders with 1/2" to 2" strokes will be furnished with a short head cushion sleeve and short cap cushion spear. Only available on 5/8" and 1" rods.

### Series J Fixed Cushions



*Piston and rod assembly for 1-1/2" thru 5" bore cylinders with 1/2" to 2" stroke.*

The data that follows provides the necessary information in the evaluation of

The above specification applies to Series J cylinders with optional non-adjustable or adjustable cushions.

### Ultra Cushion®

### A Major Design and Performance Breakthrough in Air Cylinder Cushioning Systems!

Norgren's advanced cushion design features a unique, one-piece, nitrile compound seal that is captured within a precision machined groove. This allows both linear and radial "float" of the cushion seal which virtually eliminates problems associated with misalignment. Integral flow paths molded in the periphery of the seal provide exceptionally fast "out of cushion" stroke reversal without the use of ball checks.

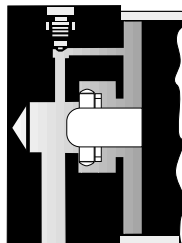


Figure 1

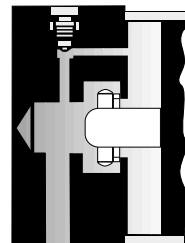
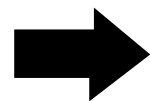


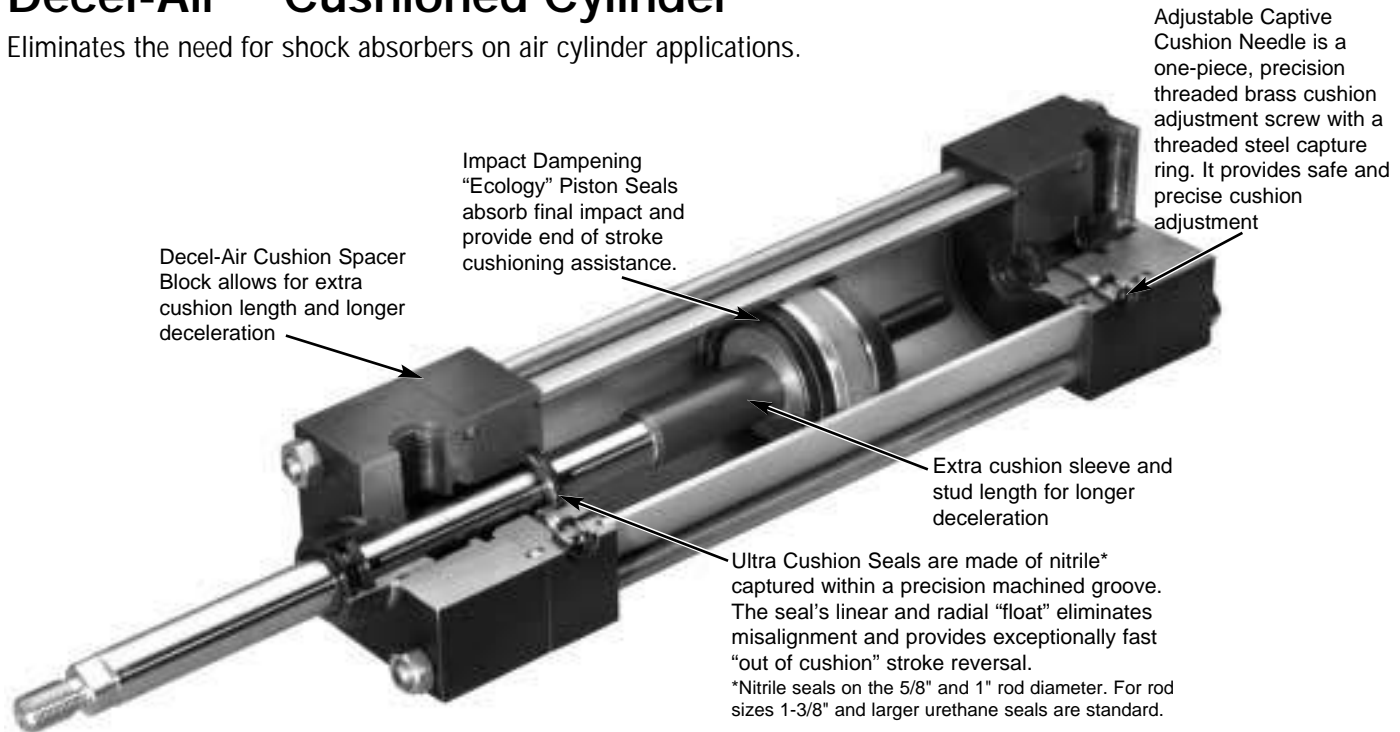
Figure 2 shows spear exiting cushion seal.





# Decel-Air™ Cushioned Cylinder

Eliminates the need for shock absorbers on air cylinder applications.



## Explanation of Decel-Air Cushion:

Norgren's Decel Cushioned cylinder was designed for applications where high velocity, low mass, material transfer or machine function is required, and where the kinetic energy to be absorbed during cushioning exceeds the parameters of our standard Series EA or EJ air cylinders equipped with non-adjustable or adjustable cushions. Decel cushions employ longer-than-standard air cushions to assist our Impact Dampening Piston Seal.

## Why does our Decel-Air Cushion work?

The extra cushion length of the Decel cushioned cylinder provides an additional deceleration capability to slow the cylinder's moving mass to a point where the positive cushioning effect of our Impact Dampening Piston Seals can perform the final cushioning.

## Norgren's Decel-Air Cushioned Cylinders Versus Cylinder Mounted Shock Absorbers

The first extensive evaluation of pneumatic cylinder cushion performance was undertaken by the Mechanical Engineering Department of The Ohio State University. The test was conducted on 2-1/2" bore, 12" stroke. The OSU tests found the Decel Cushioned cylinders absorbed almost three times as much kinetic energy with a lower level of peak cushion as a standard Ecology seal configured cylinder.

Because air is compressible and is exhausted out of the cylinder each cycle, the internal heat buildup is minimized. The **"Maximum Inch Pounds Per Hour"** rating which is essential in determining the effectiveness of shock absorber performance is **not needed** to judge Decel cushion performance.

The test indicated that Norgren Decel-Air Cushioned cylinders could prove to be superior to a hydraulic shock absorber assisted cylinder for high cycle, high velocity applications with light to moderate loading (precisely the area where most severe cylinder applications exist). The cycle rates and the cushioning times of the Decel-Air Cushioned cylinders and the hydraulic shock absorber assisted cylinders were comparable.\*

Decel-Air Cushioned cylinders are also less costly than shock absorber mounted cylinders and are self-contained units.

\*For comparative evaluation, a well-known hydraulic shock absorber was chosen. The OSU tests showed a smooth shock-absorbing operation was achieved at very low velocities using the shock absorbers, but at comparable Decel Cushion cylinder velocities, a high mechanical impact took place on the shock absorber mounted cylinder.

## Potential Decel-Air Cushion Applications

1. Conveyors & Material Handling Equipment
2. Transfer Machines & Shuttle Tables
3. Packaging Machinery
4. Foundry Equipment
5. Automatic Gate Opening & Closing



- The Decel Cushioned cylinder increases the kinetic energy absorption capability by increasing the effective cushion spear length in the cylinder.
- The Decel Cushioned cylinder increases the standard cushion spear length by 100%, allowing an increase in kinetic energy absorption capability by two times.

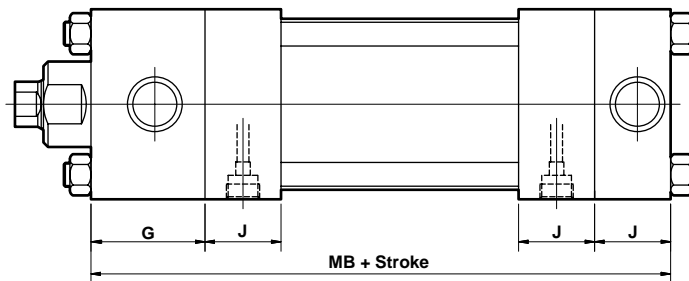
**Decel Cushioned Cylinder  
 Fully Cushioned Load Stopping Capacity in Pounds\***

In/ Sec	Cylinder Bore										
	1-1/2	2	2-1/2	3-1/4	4	5	6	7	8	10	12
6	558	990	1.798	3.488	5.418	9.370	14.972	20.040	20.858	44.070	72.500
12	136	244	442	860	1.338	2.318	3.708	5.166	7.600	10.892	17.894
18	60	106	190	374	582	1.014	1.620	2.260	3.152	4.748	7.782
24	32	58	104	204	320	558	888	1.244	1.738	2.598	2.828
30	20	36	64	126	198	344	550	774	1.082	1.602	2.606
36	13.4	24	43	84	132	232	366	518	726	1.062	1.712
42	9.4	16.6	29	58	92	162	258	362	514	734	1.176
48	6.8	11.4	20.8	42	66	118	186	262	374	524	830
54	4.6	8.6	10.8	30	48	86	136	194	276	378	590

Piston Rod Dia. Weights*	
5/8"	- .30 lb. + 0.09 lb./in. stroke
1"	- .90 lb. + 0.22 lb./in. stroke
1-3/8"	- 2.2 lb. + 0.42 lb./in. stroke
1-3/4"	- 4.0 lb. + 0.68 lb./in. stroke
2"	- 5.5 lb. + 0.90 lb./in. stroke
2-1/2"	- 10.1 lb. + 1.40 lb./in. stroke

Double Weight for double rod end cylinders

\*Include piston rod wight in total load to be stopped.



**NOTE:**

- All dimensions not shown are per STD NFPA dimensions
- For cylinders with (1) Decel Cushion AOL dimension will be "MB"- "J".

Decel Cushioned cylinder envelope dimensions are not NFPA dimensionally interchangeable over the stroke length.

**NOTE:** See page ACT-1-8 for "Effect of Impact Dampening Seals on Total Stroke of Cylinders," and page ACT-1-19 for Rod End Dimensions.

**Basic Envelope Dimensions**

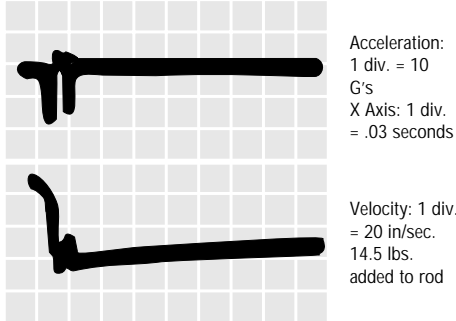
Cyl. Bore	G	J	Add Stroke MB
1-1/2	1-1/2	1	5-5/8
2	1-1/2	1	5-5/8
2-1/2	1-1/2	1	5-3/4
3-1/4	1-3/4	1-1/4	6-3/4
4	1-3/4	1-1/4	6-3/4
5	1-3/4	1-1/4	7
6	2	1-1/2	8
7	2	1-1/2	8-1/8
8	2	1-1/2	8-1/8



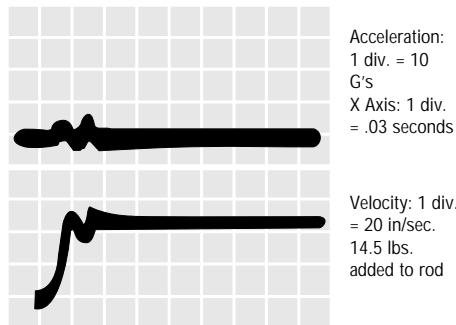
# Tests by the Milwaukee School of Engineering confirm Ecology Cylinder Cushions are more efficient, faster acting and bounce less!

## NORGREN ECOLOGY CYLINDERS with Non-Adjustable Cushions

**2" Bore Rod End Cushion Test**  
 Average deceleration force = 15 G's  
 Time consumed during cushioning = 0.030 sec.  
 Number of bounces: 1 Pneumatic – 1 Metallic

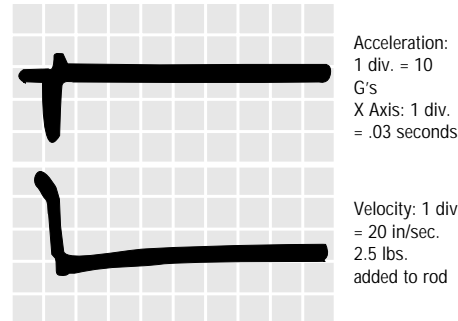


**2" Bore Cap End Cushion Test**  
 Average deceleration force = 17.5 G's  
 Time consumed during cushioning = 0.025 sec.  
 Number of bounces: 1 Pneumatic – 1 Metallic

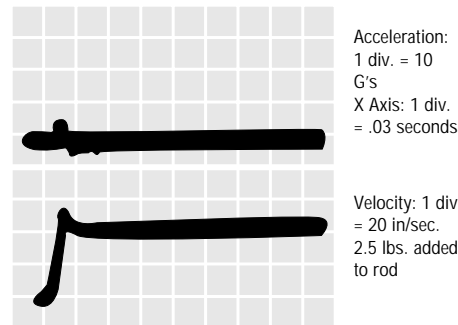


## NORGREN ECOLOGY CYLINDERS with Adjustable Cushions

**2" Bore Rod End Cushion Test**  
 Average deceleration force = 20 G's  
 Time consumed during cushioning = 0.015 sec.  
 Number of bounces: 1/2 Pneumatic – 0 Metallic

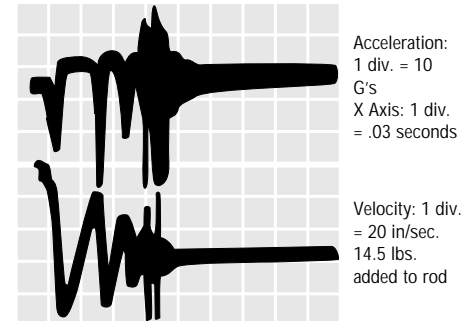


**2" Bore Cap End Cushion Test**  
 Average deceleration force = 10 G's  
 Time consumed during cushioning = 0.020 sec.  
 Number of bounces: 1/2 Pneumatic – 0 Metallic

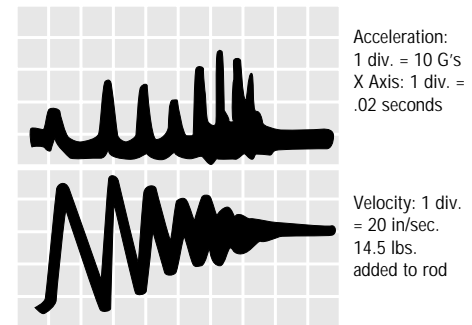


## COMPETITIVE CYLINDERS with Adjustable Cushions

**2" Bore Rod End Cushion Test**  
 Average deceleration force = 78 G's  
 Time consumed during cushioning = 0.120 sec.  
 Number of bounces: 2 Pneumatic – 4 Metallic



**2" Bore Cap End Cushion Test**  
 Average deceleration force = 60 G's  
 Time consumed during cushioning = 0.120 sec.  
 Number of bounces: 3 Pneumatic – 4 Metallic



## 2" Bore Cylinder Tests Results

Figures shown are average and not the result of each individual test. Piston velocity was regulated at 45 in/sec.

Cylinders with Cushions	Weight attached to Piston Rod (lbs)	Cushion Efficiency (G's* Created)	Cushioning Time (Ms)	Bounce Cycles During Cushioning
Norgren Ecology Adjustable	8.5	14.50	25.00	1.00
Norgren Ecology Non-Adjustable	8.5	17.50	26.25	1.75
Competitor A Adjustable	8.5	48.00	107.50	7.25
Competitor B Adjustable	8.5	32.75	102.50	6.50
Competitor C Adjustable	8.5	50.50	81.25	9.25

\*Measured in G's of deceleration force created. All cylinders tested were NFPA types, front flange mounting, 6" stroke with standard diameter piston rods.

## 4" Bore Cylinder Tests Results

Figures shown are average and not the result of each individual test. Piston velocity was regulated at 25 in/sec.

Cylinders with Cushions	Weight attached to Piston Rod (lbs)	Cushion Efficiency (G's* Created)	Cushioning Time (Ms)	Bounce Cycles During Cushioning
Norgren Ecology Adjustable	54	5.25	40.00	3.25
Norgren Ecology Non-Adjustable	54	12.00	28.75	2.75
Competitor A Adjustable	54	11.50	92.50	6.75
Competitor B Adjustable	54	8.00	77.50	5.25
Competitor C Adjustable	54	6.50	67.50	6.25

\*Measured in G's of deceleration force created. All cylinders tested were NFPA types, front flange mounting, 6" stroke with standard diameter piston rods.





### Cylinder Force and Volume Charts

Extend Forces in pounds (newtons)

Bore	Piston Area	PSI (bar)							Volume Cu Ft (cm <sup>3</sup> ) Displacement Per Inch
		40 (3)	60 (4)	80 (6)	100 (7)	150 (10)	200 (14)		
1 1/2"	1.77 (11.40)	71 (315)	106 (472)	142 (629)	177 (786)	266 (1179)	353 (1570)	.00102 (29)	
2"	3.14 (20.27)	126 (559)	189 (839)	251 (1119)	314 (1398)	471 (2097)	628 (2793)	.00182 (52)	
2 1/2"	4.91 (31.67)	196 (874)	295 (1311)	393 (1748)	491 (2185)	737 (3277)	982 (4368)	.00284 (80)	
3 1/4"	8.30 (53.32)	332 (1477)	498 (2215)	664 (2953)	830 (3692)	1245 (5538)	1659 (7379)	.00480 (136)	
4"	12.57 (81.07)	503 (2237)	754 (3355)	1005 (4473)	1257 (5592)	1886 (8388)	2513 (11178)	.00727 (206)	
5"	19.64 (126.71)	785 (3491)	1178 (5240)	1571 (6988)	1964 (8736)	2946 (13104)	3928 (17472)	.01137 (322)	
6"	28.27 (182.39)	1130 (5026)	1696 (7544)	2262 (10061)	2827 (12574)	4240 (18860)	5654 (25149)	.01636 (463)	
7"	38.49 (247.91)	1540 (6831)	2309 (10242)	3079 (13658)	3849 (17074)	5774 (25613)	7698 (34148)	.02227 (631)	
8"	50.26 (324.26)	2010 (8940)	3015 (13411)	4020 (17881)	5026 (22356)	7539 (33533)	10052 (44711)	.02909 (829)	
10"	78.54 (506.74)	3141 (13974)	4712 (20961)	6283 (27948)	7854 (34935)	11781 (52402)	15700 (69834)	.04545 (1282)	
12"	113.10 (729.72)	4524 (20123)	6786 (30184)	9048 (40246)	11310 (50307)	16965 (75460)	22620 (100614)	.06545 (1852)	

### Deduct these Forces for Retract Strokes

Rod	Rod Area	PSI (bar)							Volume Cu Ft (cm <sup>3</sup> ) Displacement Per Inch
		40 (3)	60 (4)	80 (6)	100 (7)	150 (10)	200 (14)		
5/8"	.307 (1.98)	12 (53)	18 (80)	25 (111)	31 (138)	46 (205)	61 (271)	.00018 (5)	
1"	.785 (5.06)	31 (138)	47 (209)	63 (280)	78 (351)	118 (525)	157 (698)	.00045 (13)	
1 3/8"	1.485 (9.58)	59 (262)	89 (396)	119 (529)	149 (663)	222 (997)	297 (1321)	.00086 (24)	
1 3/4"	2.404 (15.51)	96 (423)	144 (641)	192 (854)	240 (1068)	360 (1601)	480 (2135)	.00139 (39)	
2"	3.142 (20.16)	126 (559)	189 (839)	251 (1118)	314 (1398)	471 (2096)	628 (2795)	.00182 (52)	
2 1/2"	4.909 (31.67)	196 (873)	295 (1310)	393 (1747)	491 (2184)	736 (3275)	981 (4367)	.00284 (80)	

### Bore Size Selection:

Use the following formulas in the selection of the proper bore size:

- Extended force in pounds =  
 Bore area (in<sup>2</sup>) times  
 pressure to cap in psig.
- Retract force in pounds =  
 Bore area *minus* rod area (in<sup>2</sup>)  
 times pressure to head in psig.

### Bore Areas

Cylinder Bore	Area (sq. in.)
1-1/2"	1.77
2"	3.14
2-1/2"	4.91
3-1/4"	8.30
4"	12.57
5"	19.64
6"	28.27
7"	38.49
8"	50.26
10"	78.54
12"	113.10

### NOTE:

A & EA Bore Sizes (1-1/2" – 8")  
 J & EJ Bore Sizes (1-1/2" – 12")

### Rod Areas

Rod Diameter	Area (sq. in.)
5/8"	.31
1"	.78
1-3/8"	1.49
1-3/4"	2.41
2"	3.14
2-1/2"	4.91

### NOTE:

A & EA Rod Dia. (5/8" – 1-3/4")  
 J & EJ Rod Dia. (5/8" – 2-1/2")



### Piston Rod Diameter Selection:

Applications requiring long extend (push) strokes may require oversize piston rod diameters to prevent buckling. To determine the correct rod diameter for your application follow these simple steps:

1. Select the thrust from the **Cylinder Force and Volume Chart** (page ACT-1-13) that is required for your application.  
 Thrust = Piston Surface Area x Operating Pressure
2. From the **Cylinder Mounting Diagram Chart** (page ACT-1-15) select the mounting style being used.
3. With the piston rod fully extended, calculate the value of **L** (in inches). Multiply cylinder stroke by appropriate stroke factor located in **Cylinder Mounting Diagram Chart** to obtain effective length **L**.

4. Locate the value of **L** (in inches) from the **Determining Adequate Rod Diameter Chart**.

5. **Selecting Stop Tubes:** Stop tubes enhance the transverse load carrying capability of a long stroke cylinder by increasing the distance between the piston and rod bearing at full extension (Refer to page ACT-1-87). When the value of **L** (calculated from the **Adequate Rod Diameter Chart**) is less than 40", a stop tube is **not** required. However, if **L** is 40" or more, 1" of stop tube is recommended for every 10" (or fraction thereof) over 40".

6. **Recommended Mounting Styles for Maximum Stroke and Thrust Load:**

- Multiply cylinder stroke by appropriate stroke factor to obtain effective length **L**.
- If cylinder has extra rod extension, add this extension to the stroke length before obtaining effective length.

### Determining Adequate Rod Diameter Chart

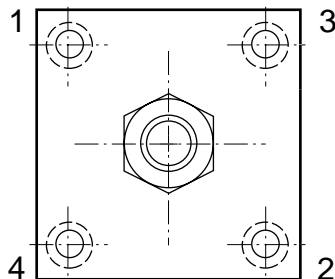
Extended Force (lbs)	Maximum effective length "L" recommended for rod diameters					
	5/8"	1"	1-3/8"	1-3/4"	2"	2-1/2"
50	95	-	-	-	-	-
100	65	170	-	-	-	-
150	50	135	260	-	-	-
200	43	115	220	-	-	-
300	34	93	180	300	-	-
500	25	70	135	250	-	-
750	20	56	110	185	250	-
1000	17	48	94	160	220	-
1500	13	38	80	130	170	260
2000	11	33	64	110	140	225
3000	9	26	51	90	115	180
4000	7	22	44	75	100	155
5000	-	20	39	66	88	140
6000	-	18	35	60	79	125
8000	-	15	30	52	68	110
10000	-	12	26	46	60	95
12500	-	10	22	41	52	86
15000	-	-	19	37	48	79
20000	-	-	14	29	41	68

**Note:** In some cases it may be necessary to use a larger bore cylinder than is required for force in order to obtain an adequate rod diameter.

### Tie Rod Tightening:

In order to reduce the possibility of cylinder binding or damage, tighten to quarter unit increments of the final torque value in the following order: #1, #2, #3, #4.

Then torque fully to the recommended foot pounds in the same order.



### Recommended Torques for Tightening Tie Rods

Cylinder Bore	Standard Steel Tie Rods	Stainless Steel Tie Rods
1-1/2"	6.6 ft. lbs.	3.75 ft. lbs.
2"	11 ft. lbs.	7.5 ft. lbs.
2-1/2"	13 ft. lbs.	7.5 ft. lbs.
3-1/4"	20 ft. lbs.	13-14 ft. lbs.
4"	24 ft. lbs.	13-14 ft. lbs.
5"	40 ft. lbs.	33 ft. lbs.
6"	48 ft. lbs.	33 ft. lbs.
7" & 8"	100 ft. lbs.	65 ft. lbs.
10"	150 ft. lbs.	75 ft. lbs.
12"	175 ft. lbs.	87.5 ft. lbs.



### Cylinder Mounting Diagram Chart

Cylinder Mounting	Rod End Connection	Example	Stroke Factor
Side Tapped, Head or Cap Flange, Tie Rod, Center or Side Lug	Fixed and Rigidly Guided		.50
Side Tapped, Head or Cap Flange, Tie Rod, Center or Side Lug	Pivoted and Rigidly Guided		.70
Side Tapped, Head or Cap Flange, Tie Rod, Center or Side Lug	Supported but not Rigidly Guided		2.00
Side Tapped, Head or Cap Flange, Tie Rod, Center or Side Lug	None		5.00
Head Trunnion	Pivoted and Rigidly Guided		1.00
Center Trunnion	Pivoted and Rigidly Guided		1.50
Cap Trunnion or Clevis	Pivoted and Rigidly Guided		2.00

#### Tie Rod Supports:

For long strokes, tie rod supports are provided. These supports are of the same envelope dimensions as the cylinder end caps.

**NOTE:** See chart for number of tie rod supports required.

#### Number of Tie Rod Supports Required

Cylinder Bore	Cylinder Stroke (in)				
	60	75	95	115	135
1-1/2"	1	1	2	2	3
2"	-	1	1	2	2
2-1/2"	-	-	1	1	1
3-1/4"	-	-	-	1	1
4"	-	-	-	-	1
5" and over	-	-	-	-	-



**Series A & EA, NFPA Aluminum Air Cylinders (ø1-1/2 to 8"), Technical Information**  
**Series J & EJ, NFPA Steel Air Cylinders (ø1-1/2 to 12"), Technical Information**

All Dimensions in Inches (mm)  
 All Weights in Pounds (Kilograms)

**Series A & EA Cylinder Weights**  
 In pounds (kilograms)

Bore Inch (mm)	Mounting Code												Add Per Inch of Stroke
	Rod Inch (mm)	01, 05, 16	03	04	06	7R, 8R, 09, 60	11	12	15	20, 21, 22, 32	10, 42, 52		
1 1/2" (38.10)	5/8" (15.88)	1.9 (.86)	2.6 (1.18)	2.7 (.23)	2.1 (.95)	2.5 (1.13)	2.3 (1.04)	2.8 (1.27)	2.5 (1.13)	3.0 (1.36)	2.8 (1.27)	0.18 (.08)	
2" (50.80)	5/8" (15.88)	2.8 (1.27)	3.9 (.77)	4.0 (1.81)	3.1 (1.41)	3.5 (1.59)	3.3 (1.50)	4.0 (1.81)	3.8 (1.72)	4.2 (1.91)	3.9 (1.77)	0.21 (.10)	
	1" (25.40)	3.4 (1.54)	4.4 (2.00)	4.6 (2.09)	3.7 (1.68)	4.1 (1.86)	3.9 (1.77)	4.6 (2.09)	4.4 (2.00)	4.8 (2.18)	4.5 (2.04)	0.35 (.16)	
2 1/2" (63.50)	5/8" (15.88)	3.9 (1.77)	5.3 (2.40)	5.5 (2.49)	4.1 (1.86)	4.6 (2.09)	4.4 (2.00)	5.3 (2.40)	5.3 (2.40)	5.5 (2.49)	5.3 (2.40)	0.23 (.10)	
	1" (25.40)	4.5 (2.04)	5.9 (2.68)	6.1 (2.77)	4.7 (2.13)	5.2 (2.36)	5.1 (2.31)	5.9 (2.68)	6.0 (2.72)	6.1 (2.77)	5.9 (2.68)	0.38 (.17)	
3 1/4" (82.55)	1" (25.40)	7.3 (3.31)	10.8 (4.90)	11.1 (5.03)	7.7 (3.49)	8.9 (4.04)	8.2 (3.72)	11.1 (5.03)	9.7 (4.40)	11.8 (5.35)	11.4 (5.17)	0.42 (.19)	
	1 3/8" (34.93)	8.2 (3.72)	11.5 (5.22)	12.1 (5.49)	8.7 (3.95)	9.9 (4.50)	9.2 (4.17)	12.1 (5.49)	10.7 (4.85)	12.8 (5.80)	12.4 (5.62)	0.63 (.29)	
4" (101.60)	1" (25.40)	9.8 (4.45)	14.8 (6.71)	15.1 (6.85)	10.2 (4.63)	11.5 (5.22)	10.9 (4.94)	14.8 (6.71)	13.3 (6.03)	15.5 (7.03)	15.2 (6.89)	0.45 (.20)	
	1 3/8" (34.93)	10.8 (4.90)	15.5 (7.03)	16.1 (7.30)	11.2 (5.08)	12.5 (5.67)	11.9 (5.40)	15.8 (7.17)	14.3 (6.49)	16.5 (7.48)	16.2 (7.35)	0.66 (.30)	
5" (127.00)	1" (25.40)	15.1 (6.85)	22.7 (10.30)	23.1 (10.48)	16.1 (7.30)	18.7 (8.48)	17.6 (7.98)	22.2 (10.07)	20.8 (9.43)	22.8 (10.34)	22.5 (10.21)	0.51 (.23)	
	1 3/8" (34.93)	16.2 (7.35)	23.5 (10.66)	24.1 (10.93)	17.2 (7.80)	19.7 (8.94)	18.6 (8.44)	23.2 (10.52)	21.9 (9.93)	23.9 (10.84)	23.5 (10.70)	0.73 (.33)	
6" (152.40)	1 3/8" (34.93)	23.5 (16.19)	35.6 (16.15)	36.3 (16.47)	24.5 (11.11)	27.3 (12.38)	26.6 (12.07)	35.7 (16.66)	32.1 (14.56)	37.0 (16.78)	36.3 (16.47)	0.77 (.35)	
	1 3/4" (44.45)	24.8 (11.27)	36.9 (16.77)	37.6 (17.09)	25.8 (11.73)	28.3 (12.86)	27.9 (12.68)	37.0 (16.82)	33.4 (15.18)	38.3 (17.41)	37.6 (17.09)	1.03 (.47)	
7" (177.80)	1 3/8" (34.93)	32.1 (14.56)	32.1 (14.56)	32.1 (14.56)	33.4 (15.15)	33.5 (15.20)	36.8 (16.69)	35.2 (15.97)	32.1 (14.56)	48.9 (22.18)	48.2 (21.86)	1.00 (.45)	
	1 3/4" (44.45)	33.4 (15.18)	33.4 (15.18)	33.4 (15.18)	34.7 (15.77)	34.8 (15.82)	38.1 (17.32)	36.5 (16.59)	33.4 (15.18)	50.2 (22.82)	49.5 (22.50)	1.26 (.57)	
8" (203.20)	1 3/8" (34.93)	40.0 (18.14)	40.0 (18.14)	40.0 (18.14)	41.3 (18.73)	41.4 (18.78)	45.7 (20.73)	43.0 (19.50)	40.0 (18.14)	60.5 (27.44)	59.7 (27.08)	1.06 (.48)	
	1 3/4" (44.45)	47.3 (21.50)	41.3 (18.77)	41.3 (18.77)	42.6 (19.36)	42.7 (19.41)	47.0 (21.36)	44.3 (20.14)	41.3 (18.77)	61.8 (28.09)	61.0 (27.73)	1.32 (.60)	

**Series J & EJ Cylinder Weights**  
 In pounds (kilograms)

Bore Inch (mm)	Mounting Code												Add Per Inch of Stroke
	Rod Inch (mm)	01, 05, 16	03	04	06	07, 08, 09	11	12	15	20, 21, 22, 32	10, 42, 52		
1 1/2" (38.10)	5/8" (15.88)	3.1 (1.42)	3.7 (1.67)	3.7 (1.67)	3.2 (1.48)	3.8 (1.73)	4.9 (2.24)	3.9 (1.76)	3.1 (1.42)	4.1 (1.87)	4.9 (2.24)	.18 (.08)	
2" (50.80)	5/8" (15.88)	5.0 (2.27)	5.9 (2.67)	5.9 (2.67)	5.2 (2.35)	5.7 (2.58)	7.6 (3.46)	5.8 (2.61)	5.0 (2.27)	6.2 (2.82)	7.6 (3.46)	.28 (.13)	
	1" (25.40)	5.1 (2.33)	6.0 (2.73)	6.0 (2.73)	5.3 (2.42)	5.8 (2.64)	7.8 (3.52)	5.9 (2.67)	5.1 (2.33)	6.4 (2.89)	7.8 (3.52)	.42 (.19)	
2 1/2" (63.50)	5/8" (15.88)	7.2 (3.26)	8.1 (3.68)	8.1 (3.68)	7.4 (3.35)	7.9 (3.57)	10.3 (4.68)	7.9 (3.60)	7.2 (3.26)	9.3 (4.20)	10.3 (4.68)	.40 (.18)	
	1" (25.40)	7.3 (3.32)	8.3 (3.75)	8.3 (3.75)	7.5 (3.41)	8.0 (3.64)	10.5 (4.74)	8.1 (3.66)	7.3 (3.32)	9.4 (4.26)	10.5 (4.74)	.54 (.25)	
3 1/4" (82.55)	1" (25.40)	11.1 (5.02)	14.3 (6.50)	14.3 (6.50)	11.4 (5.16)	11.7 (5.30)	16.8 (7.63)	12.6 (5.70)	11.1 (5.02)	16.0 (7.26)	16.8 (7.63)	.72 (.33)	
	1 3/8" (34.93)	11.3 (5.11)	14.5 (6.59)	14.5 (6.59)	11.6 (5.25)	11.9 (5.39)	17.0 (7.72)	12.8 (5.79)	11.3 (5.11)	16.2 (7.35)	17.0 (7.72)	.92 (.42)	
4" (101.60)	1" (25.40)	20.3 (9.22)	24.9 (11.29)	24.9 (11.29)	20.6 (9.36)	20.8 (9.45)	27.4 (12.43)	21.8 (9.90)	20.3 (9.22)	26.9 (12.20)	27.4 (12.43)	.81 (.37)	
	1 3/8" (34.93)	20.5 (9.31)	25.1 (11.38)	25.1 (11.38)	20.8 (9.45)	21.0 (9.54)	27.6 (12.52)	22.0 (9.99)	20.5 (9.31)	27.1 (12.29)	27.6 (12.52)	1.1 (.50)	
5" (127.00)	1" (25.40)	34.6 (15.72)	40.4 (18.33)	40.4 (18.33)	35.2 (15.97)	38.0 (17.25)	43.2 (19.60)	36.3 (16.49)	34.6 (15.72)	43.2 (19.60)	43.2 (19.60)	.98 (.45)	
	1 3/8" (34.93)	34.8 (15.81)	40.6 (18.42)	40.5 (18.42)	35.4 (16.06)	38.2 (17.34)	43.4 (19.69)	36.5 (16.58)	34.8 (15.81)	43.4 (19.69)	43.4 (19.69)	1.18 (.54)	
6" (152.40)	1 3/8" (34.93)	53.1 (24.09)	63.9 (29.02)	63.9 (29.02)	54.3 (24.66)	56.4 (25.59)	65.3 (29.65)	57.1 (25.93)	53.1 (24.09)	68.1 (30.91)	65.3 (29.65)	1.68 (.76)	
	1 3/4" (44.45)	53.3 (24.21)	64.2 (31.41)	64.2 (31.41)	54.6 (24.78)	56.7 (25.72)	65.6 (29.77)	57.4 (26.05)	53.3 (24.21)	68.1 (30.93)	65.6 (29.77)	1.94 (.88)	
7" (177.80)	1 3/8" (34.93)	73.0 (33.14)	73.0 (33.14)	73.0 (33.14)	74.0 (33.60)	76.5 (34.73)	96.0 (43.58)	85.0 (38.59)	73.0 (33.14)	—	96.0 (43.58)	1.75 (.80)	
	1 3/4" (44.45)	73.3 (33.26)	73.3 (33.26)	73.3 (33.26)	74.3 (33.71)	76.8 (34.85)	96.3 (43.70)	85.3 (38.71)	73.3 (33.26)	—	96.3 (43.70)	2.01 (.91)	
8" (203.20)	1 3/8" (34.93)	92.3 (41.88)	92.3 (41.88)	92.3 (41.88)	93.6 (42.50)	95.8 (43.47)	120.0 (54.48)	97.8 (44.41)	92.3 (41.88)	—	120.0 (54.48)	2.18 (.99)	
	1 3/4" (44.45)	92.5 (42.00)	92.5 (42.00)	92.5 (42.00)	93.9 (42.62)	96.0 (43.59)	120.3 (54.60)	98.1 (44.52)	92.5 (42.00)	—	120.3 (54.60)	2.44 (1.11)	
10" (254.00)	1 3/4" (44.45)	179.9 (81.66)	179.9 (81.66)	179.9 (81.66)	181.6 (82.46)	184.3 (83.65)	228.0 (103.51)	186.1 (84.50)	179.9 (81.66)	—	228.0 (103.51)	3.43 (1.56)	
	2" (50.80)	180.0 (81.72)	180.1 (81.76)	180.1 (81.76)	181.8 (82.55)	184.5 (83.74)	228.2 (103.61)	186.3 (84.59)	180.1 (81.76)	—	228.2 (103.61)	3.64 (1.65)	
12" (304.80)	2" (50.80)	288.0 (130.75)	288.0 (130.75)	288.0 (130.75)	289.0 (131.21)	293.0 (133.02)	380.0 (172.52)	297.0 (134.84)	288.0 (130.75)	—	380.0 (172.52)	4.12 (1.87)	
	2 1/2" (63.50)	288.5 (130.98)	288.5 (130.98)	288.5 (130.98)	289.5 (131.43)	293.5 (133.25)	380.5 (172.75)	297.5 (135.20)	288.5 (130.98)	—	380.5 (172.75)	4.62 (2.10)	



## Breakaway Pressures

An average of 5 pounds (psig) is necessary to breakaway non-cushioned Series J air cylinders when mounted horizontally with no load on the piston rod. Double rod end cylinders require an average of 7 pounds (psig).

An average of 6 pounds (psig) is required to breakaway single rod and Series A & J and Series EA & EJ air cylinders equipped with optional non-adjustable air cushions. Double rod end cylinders require an average of 8 pounds (psig).

These figures are for non-cushioned cylinders with strokes of 6 inches or less with factory lubrication. Consult the factory if your application requires a lower breakaway pressure or a guaranteed minimum breakaway.

Series A & J cylinders with 3-1/4" thru 12" diameter pistons are counterbored to provide a larger area for the pressure to act upon.

Listed are the average breakaway pressures in PSI for all Series J & EJ Cylinders. If your application requires a lower breakaway pressure than indicated for a particular bore size, consult the factory.

## Breakaway Pressures in PSI

Bore	Series A		Low Friction Seals (LF)	
	Extend	Retract	Extend	Retract
1 1/2", 2", 2 1/2"	5	6	3	4
3 1/4", 4"	4	5	2	3
5", 6", 7", 8"	3	4	1	2

Bore	Series J		Low Friction Seals (LF)	
	Extend	Retract	Extend	Retract
1 1/2", 2", 2 1/2"	5	6	3	4
3 1/4", 4"	4	5	2	3
5", 6", 7", 8"	3	4	1	2
10"	3	4	1	2
12"	3	4	1	2

Note: Breakaway pressures were established with the cylinders mounted horizontally and no load on the piston rod.

- NFPA (MS4) 01 Side Tapped Mount for 1-1/2" to 6" bore sizes.
- Series A & J Cylinders rated to 250 PSI air, 400 PSI hydraulic (non-shock). Series EA & EJ Cylinders rated to 250 PSI air only.
- Designed for non-lube service.
- Switches available on all bore sizes. (See pages ACT-1-90 & 91 for ordering information.)



### Cylinder Order Information

**01** - - - -

A	Series A Cylinder
EA	Series EA Cylinder
J	Series J Cylinder
EJ	Series EJ Cylinder

Mounting Options	
01	Side Tapped (MS4)
03	Head Rectangular Flange (MF1)
03	Head Square (ME3)-7" to 12" Bores
04	Cap Rectangular Flange (MF2)
04	Cap Square (ME4)-7" to 12" Bores
05	Basic Cylinder No Mounting (MX0)
06	Both Ends (4) Tie Rods Ext. (MX1)
6B	Both Ends (2) Tie Rods Ext. (MX4)
6C	Cap Tie Rods Ext. (MX2)
6R	Head Tie Rods Ext. (MX3)
7R	Removable Head Trunion (MT1) - A & EA
07	Head Trunion (MT1) - J & EJ
8R	Cap Trunion (MT2) - A & EA
08	Cap Trunion (MT2) (- J & EJ)
09	Side Lugs (MS2)
10	Center Trunion (MT4)
11	Side End Angles (MS1)
12	Cap Fixed Clevis (MP1)
15	Side End Lugs (MS7)
16	Sleeve Nut Construction (Universal)
20	Head Square Flange (MF5)
21	Cap Square Flange (MF6)
22	Detachable Cap Clevis (MP2)
32	Cap Fixed Eye (MP3)
42	Detachable Cap Eye (MP4)
52	Spherical Bearing
60	Base Bar (Not NFPA - A & EA Only)

Cushion in Head	
3	None
5 <sup>1</sup>	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

<sup>1</sup>Standard with EA & EJ

Cushion in Cap	
3	None
5 <sup>1</sup>	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

<sup>1</sup>Standard with EA & EJ

Bore and Stroke (write out)

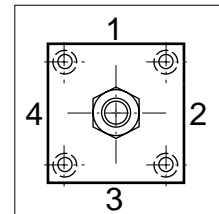
Additional Options - order alphabetically - More on page ACT-1-95	
HR	Case Hardened (45 Rc)
L(- -)	Port Location position 1 standard: L(Head Cap) (specify position 1 thru 4 for head and/or cap)
MS	Metal Rod Scraper
N(- -)	Cushion Adjust Screw Location position 2 standard: N(Head Cap) (specify position 1 thru 4 for head and/or cap)
P(-)*	Non-Standard Port Sizes: [specify port size for P(-H) head only, P(-C) cap only, or P(-) both head & cap]
PS	Magnetic Piston - includes aluminum tube option for J & EJ - Std. for Alum
RS	Rod Stud Type 1 (5/8" - 1 3/4" øRod) Type 2 (5/8" & 1" øRod)
RX	Rod Extensions (specify length of additional rod extension)
SC	Single Acting Spring Extend (Cap End)-See page ACT-1-86
SR	Single Acting Spring Retract (Rod End)-See page ACT-1-86
SS	303 Stainless Steel (Hard Chrome Plated)
ST(-C)	Stop Tube (Cap End) (specify stop tube length)
ST(-R)	Stop Tube (Rod End) (specify stop tube length)
T	Special Rod Threads (specify rod thread)
TK	Thrust Key
TX	Thread Extensions (specify length of thread extension)
V	Viton® Seals

\*1 1/2", 2", 2 1/2" bore cylinders have 3/8" NPT Standard, 1/2" NPT oversize.  
 3 1/4", 4", 5" bore cylinders have 1/2" NPT Standard, 3/4" NPT oversize.  
 This will add 1/8" to the overall cylinder length.

Piston Rod Threads Type	
1	Small Male (Solid)
2	Intermediate Thread Male (Solid)
3	Female
6	Full Thread Male (Solid)
7	Plain Rod End

Piston Rod Diameters		
A**	5/8"	Standard on 1 1/2", 2", 2 1/2"
B**	1"	Standard on 3 1/4", 4", 5" Oversized on 1 1/2", 2", 2 1/2"
C**	1 3/8"	Standard on 6", 7", 8" Oversized on 3 1/4", 4", 5"
D**	1 3/4"	Standard on 10" Oversized on 6", 7", 8"
E	2"	Standard on 12" Oversized on 10"
F	2 1/2"	Oversized on 10", 12"

\*\* A & EA uses A-D only.



**Port and Cushion Adjustment**

**Positions** (As viewed from rod end:

Port standard position 1, Cushion Adjustment standard position 2.)

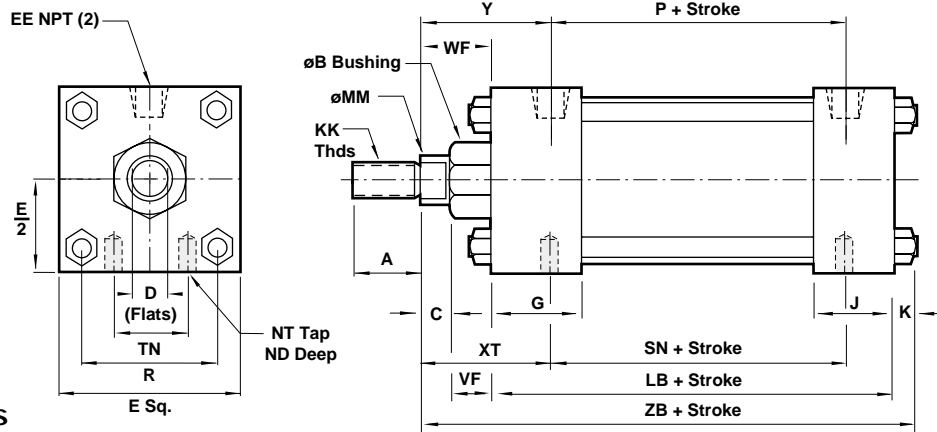
NOTE: A Port and a Cushion Adjustment cannot be in the same position.

See page ACT-1-96 for complete instructions on how to order cylinders.

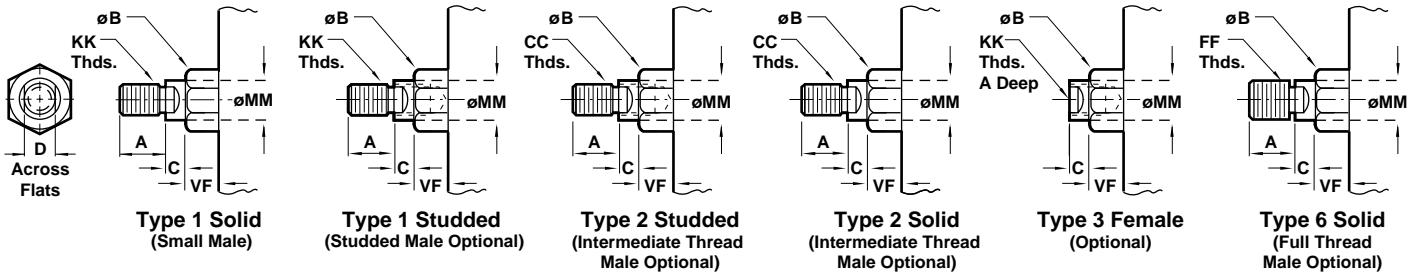
Series A & EA, NFPA Aluminum Air Cylinders with 01 (MS4) Side Tapped  
 Series J & EJ, NFPA Steel Air Cylinders with 01 (MS4) Side Tapped



All Dimensions in Inches (mm)



Standard & Optional Rod Ends



Dimension	1 1/2" Bore (38.10)	2" Bore (50.80)	2 1/2" Bore (63.50)	3 1/4" Bore (82.55)	4" Bore (101.60)	5" Bore (127.00)	6" Bore (152.40)
ø Rod	Std. 5/8" (15.88)	5/8" (15.88)	5/8" (15.88)	1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)
	O.S. 1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/4" (44.45)
A	Std. .750 (19.05)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)
	O.S. 1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)
B	Std. 1.124 (28.55)	1.124 (28.55)	1.124 (28.55)	1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)
	O.S. 1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)	1.999 (50.78)	1.999 (50.78)	2.374 (60.30)
C	Std. .375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)
	O.S. .500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)
CC	Std. 1/2 - 20	1/2 - 20	1/2 - 20	7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12
	O.S. 7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12	1 1/4 - 12	1 1/4 - 12	1 1/2 - 12
D	Std. .500 (12.70)	.500 (12.70)	.500 (12.70)	.813 (20.64)	.813 (20.64)	.813 (20.64)	1.125 (28.58)
	O.S. .813 (20.64)	.813 (20.64)	.813 (20.64)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)
E	2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)	5.500 (139.70)	6.500 (165.10)
EE	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)
FF	Std. 5/8 - 18	5/8 - 18	5/8 - 18	1 - 14	1 - 14	1 - 14	1 3/8 - 12
	O.S. 1 - 14	1 - 14	1 - 14	1 3/8 - 12	1 3/8 - 12	1 3/8 - 12	1 3/4 - 12
G	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)	2.000 (50.80)
J	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)
K	.250 (6.35)	.313 (7.94)	.313 (7.94)	.375 (9.53)	.375 (9.53)	.438 (11.11)	.438 (11.11)
KK	Std. 7/16 - 20	7/16 - 20	7/16 - 20	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14
	O.S. 3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14	1 - 14	1 1/4 - 12
LB	3.625 (92.08)	3.625 (92.08)	3.750 (95.25)	4.250 (107.95)	4.250 (107.95)	4.500 (114.30)	5.000 (127.00)
MM	Std. .625 (15.88)	.625 (15.88)	.625 (15.88)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)
	O.S. 1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.750 (44.45)
ND	.375 (9.53)	.375 (9.53)	.500 (12.70)	.750 (19.05)	.750 (19.05)	.938 (23.81)	1.125 (28.58)
NT	1/4 - 20	5/16 - 18	3/8 - 16	1/2 - 13	1/2 - 13	5/8 - 11	3/4 - 10
P	2.340 (59.44)	2.340 (59.44)	2.470 (62.74)	2.690 (68.33)	2.690 (68.33)	2.940 (74.68)	3.125 (79.38)
R	1.428 (36.27)	1.838 (46.68)	2.192 (55.67)	2.758 (70.05)	3.323 (84.40)	4.101 (104.16)	4.879 (123.92)
SN	2.250 (57.15)	2.250 (57.15)	2.375 (60.33)	2.625 (66.68)	2.625 (66.68)	2.875 (73.03)	3.125 (79.38)
TN	.625 (15.88)	.875 (22.23)	1.250 (31.75)	1.500 (38.10)	2.063 (52.37)	2.688 (68.28)	3.250 (82.55)
VF	Std. .625 (15.88)	.625 (15.88)	.625 (15.88)	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)
	O.S. .875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)
WF	Std. 1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)
	O.S. 1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	1.875 (47.63)
XT	Std. 1.938 (49.21)	1.938 (49.21)	1.938 (49.21)	2.438 (61.91)	2.438 (61.91)	2.438 (61.91)	2.813 (71.44)
	O.S. 2.313 (58.74)	2.313 (58.74)	2.313 (58.74)	2.688 (68.26)	2.688 (68.26)	2.688 (68.26)	3.063 (77.79)
Y	Std. 1.840 (46.74)	1.840 (46.74)	1.840 (46.74)	2.380 (60.45)	2.380 (60.45)	2.380 (60.45)	2.813 (71.44)
	O.S. 2.220 (56.39)	2.220 (56.39)	2.220 (56.39)	2.630 (66.80)	2.630 (66.80)	2.630 (66.80)	3.063 (77.79)
ZB	Std. 4.875 (123.83)	4.938 (125.41)	5.063 (128.59)	6.000 (152.40)	6.000 (152.40)	6.313 (160.34)	7.063 (179.39)
	O.S. 5.250 (133.35)	5.313 (134.94)	5.438 (138.11)	6.250 (158.75)	6.250 (158.75)	6.563 (166.69)	7.313 (185.74)

**Cylinder with 01 (MS4) Sided Tapped**

- NFPA (MS4) 01 Side Tapped Mount for 7" to 12" bore sizes.
- Series A & J Cylinders rated to 250 PSI air, 400 PSI hydraulic (non-shock). Series EA & EJ Cylinders rated to 250 PSI air only.
- Designed for non-lube service.
- Switches available on all bore sizes. (See pages ACT-1-90 & 91 for ordering information.)



**Cylinder Order Information**

**01** - - - - -

Bore and Stroke (write out)

A	Series A Cylinder
EA	Series EA Cylinder
J	Series J Cylinder
EJ	Series EJ Cylinder

Mounting Options	
01	Side Tapped (MS4)
03	Head Rectangular Flange (MF1)
03	Head Square (ME3)-7" to 12" Bores
04	Cap Rectangular Flange (MF2)
04	Cap Square (ME4)-7" to 12" Bores
05	Basic Cylinder No Mounting (MX0)
06	Both Ends (4) Tie Rods Ext. (MX1)
6B	Both Ends (2) Tie Rods Ext. (MX4)
6C	Cap Tie Rods Ext. (MX2)
6R	Head Tie Rods Ext. (MX3)
7R	Removable Head Trunion (MT1) - A & EA
07	Head Trunion (MT1) - J & EJ
8R	Cap Trunion (MT2) - A & EA
08	Cap Trunion (MT2) - J & EJ
09	Side Lugs (MS2)
10	Center Trunion (MT4)
11	Side End Angles (MS1)
12	Cap Fixed Clevis (MP1)
15	Side End Lugs (MS7)
16	Sleeve Nut Construction (Universal)
20	Head Square Flange (MF5)
21	Cap Square Flange (MF6)
22	Detachable Cap Clevis (MP2)
32	Cap Fixed Eye (MP3)
42	Detachable Cap Eye (MP4)
52	Spherical Bearing
60	Base Bar (Not NFPA - A & EA Only)

Cushion in Head	
3	None
5'	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

<sup>1</sup>Standard with EA & EJ

Cushion in Cap	
3	None
5'	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

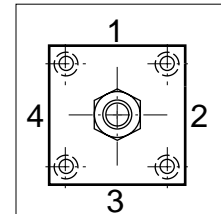
<sup>1</sup>Standard with EA & EJ

Additional Options - order alphabetically - More on page ACT-1-95	
HR	Case Hardened (45 Rc)
L(- -)	Port Location position 1 standard: L(Head Cap) (specify position 1 thru 4 for head and/or cap)
MS	Metal Rod Scraper
N(- -)	Cushion Adjust Screw Location position 2 standard: N(Head Cap) (specify position 1 thru 4 for head and/or cap)
P(-)*	Non-Standard Port Sizes: [specify port size for P(-H) head only, P(-C) cap only, or P(-) both head & cap]
PS	Magnetic Piston - includes aluminum tube option for J & EJ - Std. for Alum
RS	Rod Stud Type 1 (5/8" - 1 3/4" øRod) Type 2 (5/8" & 1" øRod)
RX	Rod Extensions (specify length of additional rod extension)
SC	Single Acting Spring Extend (Cap End)-See page ACT-1-86
SR	Single Acting Spring Retract (Rod End)-See page ACT-1-86
SS	303 Stainless Steel (Hard Chrome Plated)
ST(-C)	Stop Tube (Cap End) (specify stop tube length)
ST(-R)	Stop Tube (Rod End) (specify stop tube length)
T	Special Rod Threads (specify rod thread)
TK	Thrust Key
TX	Thread Extensions (specify length of thread extension)
V	Viton® Seals

\*1 1/2", 2", 2 1/2" bore cylinders have 3/8" NPT Standard, 1/2" NPT oversize.  
 3 1/4", 4", 5" bore cylinders have 1/2" NPT Standard, 3/4" NPT oversize.  
 This will add 1/8" to the overall cylinder length.

Piston Rod Threads Type	
1	Small Male (Solid)
2	Intermediate Thread Male (Solid)
3	Female
6	Full Thread Male (Solid)
7	Plain Rod End

Piston Rod Diameters		
A**	5/8"	Standard on 1 1/2", 2", 2 1/2"
B**	1"	Standard on 3 1/4", 4", 5" Oversized on 1 1/2", 2", 2 1/2"
C**	1 3/8"	Standard on 6", 7", 8" Oversized on 3 1/4", 4", 5"
D**	1 3/4"	Standard on 10" Oversized on 6", 7", 8"
E	2"	Standard on 12" Oversized on 10"
F	2 1/2"	Oversized on 10", 12"



**Port and Cushion Adjustment**

**Positions** (As viewed from rod end:

Port standard position 1, Cushion

Adjustment standard position 2.)

NOTE: A Port and a Cushion Adjustment cannot be in the same position.

\*\* A & EA uses A-D only.

See page ACT-1-96 for complete instructions on how to order cylinders.

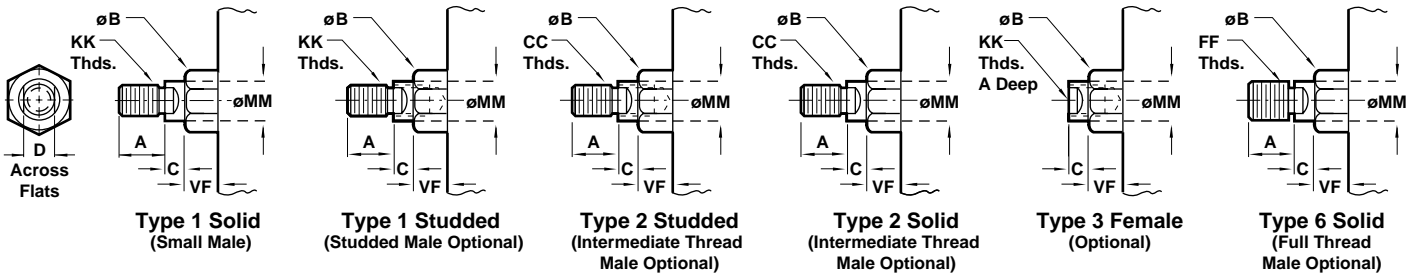


Series A & EA, NFPA Aluminum Air Cylinders with 01 (MS4) Side Tapped  
 Series J & EJ, NFPA Steel Air Cylinders with 01 (MS4) Side Tapped



All Dimensions in Inches (mm)

Standard & Optional Rod Ends



Dimension		7" Bore (177.80)	8" Bore (203.20)	10" Bore (254.00)	12" Bore (304.80)
Ø Rod	Std.	1 3/8" (34.93)	1 3/8" (34.93)	1 3/4" (44.45)	2" (50.80)
	O.S.	1 3/4" (44.45)	1 3/4" (44.45)	2" (50.80)	2 1/2" (63.50)
A	Std.	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)	2.250 (57.15)
	O.S.	2.000 (50.80)	2.000 (50.80)	2.250 (57.15)	3.000 (76.20)
B <sub>+0.002</sub>	Std.	1.999 (50.78)	1.999 (50.78)	2.374 (60.30)	2.624 (66.65)
	O.S.	2.374 (60.30)	2.374 (60.30)	2.624 (66.65)	3.124 (79.35)
C	Std.	.625 (15.88)	.625 (15.88)	.750 (19.05)	.875 (22.23)
	O.S.	.750 (19.05)	.750 (19.05)	.875 (22.23)	1.000 (25.40)
CC	Std.	1 1/4 - 12	1 1/4 - 12	1 1/2 - 12	1 3/4 - 12
	O.S.	1 1/2 - 12	1 1/2 - 12	1 3/4 - 12	2 1/4 - 12
D	Std.	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)	1.688 (42.86)
	O.S.	1.500 (38.10)	1.500 (38.10)	1.688 (42.86)	2.063 (52.39)
E		7.500 (190.50)	8.500 (215.90)	10.625 (269.88)	12.750 (323.85)
EE		.750 (19.05)	.750 (19.05)	1.000 (25.40)	1.000 (25.40)
FF	Std.	1 3/8 - 12	1 3/8 - 12	1 3/4 - 12	2 - 12
	O.S.	1 3/4 - 12	1 3/4 - 12	2 - 12	2 1/2 - 12
G		2.000 (50.80)	2.000 (50.80)	2.250 (57.15)	2.250 (57.15)
J		1.500 (38.10)	1.500 (38.10)	2.000 (50.80)	2.000 (50.80)
K		.563 (14.29)	.563 (14.29)	.688 (17.46)	.688 (17.46)
KK	Std.	1 - 14	1 - 14	1 1/4 - 12	1 1/2 - 12
	O.S.	1 1/4 - 12	1 1/4 - 12	1 1/2 - 12	1 7/8 - 12
LB		5.125 (130.18)	5.125 (130.18)	6.375 (161.93)	6.875 (174.63)
MM	Std.	1.375 (34.93)	1.375 (34.93)	1.750 (44.45)	2.000 (50.80)
	O.S.	1.750 (44.45)	1.750 (44.45)	2.000 (50.80)	2.500 (63.50)
ND		1.125 (28.58)	1.125 (28.58)	1.500 (38.10)	1.500 (38.10)
NT		3/4 - 10	3/4 - 10	1 - 8	1 - 8
P		3.250 (82.55)	3.250 (82.55)	4.125 (104.78)	4.625 (117.48)
R		5.730 (145.54)	6.442 (163.63)	7.969 (202.41)	9.406 (238.92)
SN		3.250 (82.55)	3.250 (82.55)	4.125 (104.78)	4.625 (117.48)
TN		3.500 (88.90)	4.500 (114.30)	5.500 (139.70)	7.250 (184.15)
VF	Std.	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)	1.125 (28.58)
	O.S.	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.250 (31.75)
WF	Std.	1.625 (41.28)	1.625 (41.28)	1.875 (47.63)	2.000 (50.80)
	O.S.	1.875 (47.63)	1.875 (47.63)	2.000 (50.80)	2.250 (57.15)
XT	Std.	2.813 (71.44)	2.813 (71.44)	3.125 (79.38)	3.250 (82.55)
	O.S.	3.063 (77.79)	3.063 (77.79)	3.250 (82.55)	3.500 (88.90)
Y	Std.	2.813 (71.44)	2.813 (71.44)	3.125 (79.38)	3.250 (82.55)
	O.S.	3.063 (77.79)	3.063 (77.79)	3.250 (82.55)	3.500 (88.90)
ZB	Std.	7.313 (185.74)	7.313 (185.74)	8.938 (227.01)	9.563 (242.89)
	O.S.	7.563 (192.10)	7.563 (192.10)	9.063 (230.19)	9.813 (249.24)

**Cylinder with 03 (MF1) Head Rectangular Flange**

- NFPA (MF1) 03 Head Rectangular Flange Mount for 1-1/2" to 6" bore sizes.
- Series A & J Cylinders rated to 250 PSI air, 400 PSI hydraulic (non-shock). Series EA & EJ Cylinders rated to 250 PSI air only.
- Designed for non-lube service.
- Switches available on all bore sizes. (See pages ACT-1-90 & 91 for ordering information.)



**Cylinder Order Information**

**03** - - - -

A	Series A Cylinder
EA	Series EA Cylinder
J	Series J Cylinder
EJ	Series EJ Cylinder

Mounting Options	
01	Side Tapped (MS4)
<b>03</b>	<b>Head Rectangular Flange (MF1)</b>
03	Head Square (ME3)- 7" to 12" Bores
04	Cap Rectangular Flange (MF2)
04	Cap Square (ME4)- 7" to 12" Bores
05	Basic Cylinder No Mounting (MX0)
06	Both Ends (4) Tie Rods Ext. (MX1)
6B	Both Ends (2) Tie Rods Ext. (MX4)
6C	Cap Tie Rods Ext. (MX2)
6R	Head Tie Rods Ext. (MX3)
7R	Removable Head Trunion (MT1) - A & EA
07	Head Trunion (MT1) - J & EJ
8R	Cap Trunion (MT2) - A & EA
08	Cap Trunion (MT2(- J & EJ
09	Side Lugs (MS2)
10	Center Trunion (MT4)
11	Side End Angles (MS1)
12	Cap Fixed Clevis (MP1)
15	Side End Lugs (MS7)
16	Sleeve Nut Construction (Universal)
20	Head Square Flange (MF5)
21	Cap Square Flange (MF6)
22	Detachable Cap Clevis (MP2)
32	Cap Fixed Eye (MP3)
42	Detachable Cap Eye (MP4)
52	Spherical Bearing
60	Base Bar (Not NFPA - A & EA Only)

Cushion in Head	
3	None
5 <sup>†</sup>	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

<sup>†</sup>Standard with EA & EJ

Cushion in Cap	
3	None
5 <sup>†</sup>	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

<sup>†</sup>Standard with EA & EJ

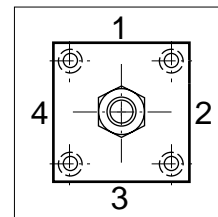
Bore and Stroke (write out)

Additional Options – order alphabetically – More on page ACT-1-95	
HR	Case Hardened (45 Rc)
L(- -)	Port Location position 1 standard: L(Head Cap) (specify position 1 thru 4 for head and/or cap)
MS	Metal Rod Scraper
N(- -)	Cushion Adjust Screw Location position 2 standard: N(Head Cap) (specify position 1 thru 4 for head and/or cap)
P(-)*	Non-Standard Port Sizes: [specify port size for P(-H) head only, P(-C) cap only, or P(-) both head & cap]
PS	Magnetic Piston – includes aluminum tube option for J & EJ - Std. for Alum
RS	Rod Stud Type 1 (5/8" – 1 3/4" øRod) Type 2 (5/8" & 1" øRod)
RX	Rod Extensions (specify length of additional rod extension)
SC	Single Acting Spring Extend (Cap End)–See page ACT-1-86
SR	Single Acting Spring Retract (Rod End)–See page ACT-1-86
SS	303 Stainless Steel (Hard Chrome Plated)
ST(-C)	Stop Tube (Cap End) (specify stop tube length)
ST(-R)	Stop Tube (Rod End) (specify stop tube length)
T	Special Rod Threads (specify rod thread)
TX	Thread Extensions (specify length of thread extension)
V	Viton® Seals

\*1 1/2", 2", 2 1/2" bore cylinders have 3/8" NPT Standard, 1/2" NPT oversize.  
 3 1/4", 4", 5" bore cylinders have 1/2" NPT Standard, 3/4" NPT oversize.  
 This will add 1/8" to the overall cylinder length.

Piston Rod Threads Type	
1	Small Male (Solid)
2	Intermediate Thread Male (Solid)
3	Female
6	Full Thread Male (Solid)
7	Plain Rod End

Piston Rod Diameters		
A**	5/8"	Standard on 1 1/2", 2", 2 1/2" Standard on 3 1/4", 4", 5"
B**	1"	Oversized on 1 1/2", 2", 2 1/2" Standard on 6", 7", 8"
C**	1 3/8"	Oversized on 3 1/4", 4", 5" Standard on 10"
D**	1 3/4"	Oversized on 6", 7", 8" Standard on 12"
E	2"	Oversized on 10"
F	2 1/2"	Oversized on 10", 12"



**Port and Cushion Adjustment**

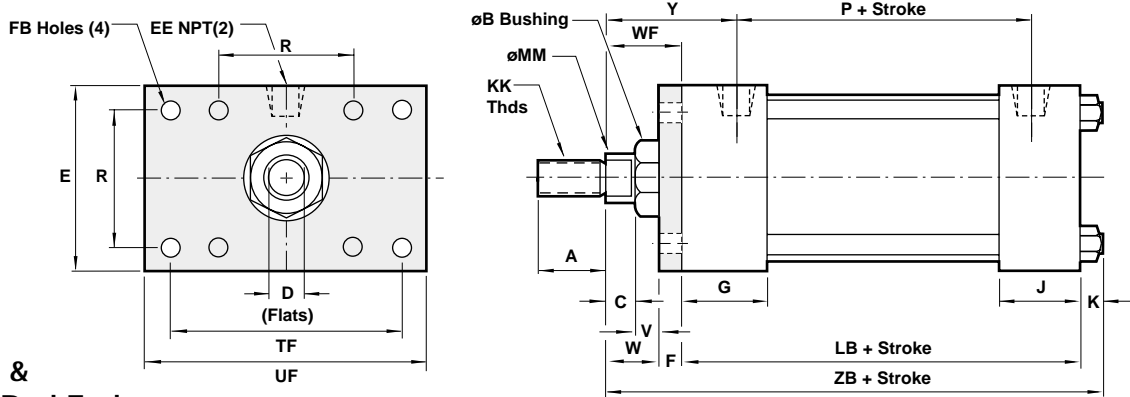
**Positions** (As viewed from rod end: Port standard position 1, Cushion Adjustment standard position 2.)  
 NOTE: A Port and a Cushion Adjustment cannot be in the same position.

\*\* A & EA uses A-D only.

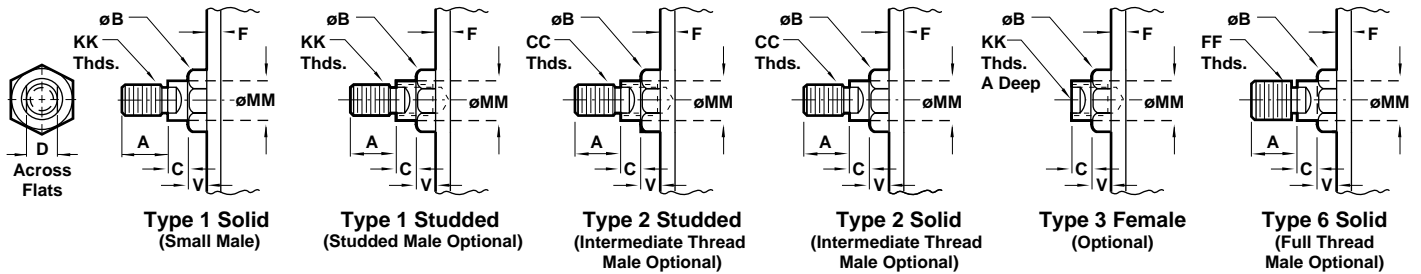
See page ACT-1-96 for complete instructions on how to order cylinders.

Series A & EA, NFPA Aluminum Air Cylinders with 03 (MF1) Head Rectangular Flange  
 Series J & EJ, NFPA Steel Air Cylinders with 03 (MF1) Head Rectangular Flange

All Dimensions in Inches (mm)



Standard & Optional Rod Ends



Dimension	1 1/2" Bore (38.10)	2" Bore (50.80)	2 1/2" Bore (63.50)	3 1/4" Bore (82.55)	4" Bore (101.60)	5" Bore (127.00)	6" Bore (152.40)
ø Rod	Std. 5/8" (15.88)	5/8" (15.88)	5/8" (15.88)	1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)
	O.S. 1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/4" (44.45)
A	Std. .750 (19.05)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)
	O.S. 1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)
B +.000 -.002	Std. 1.124 (28.55)	1.124 (28.55)	1.124 (28.55)	1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)
	O.S. 1.499 (38.08)	1.499 (38.08)	1.499 (50.78)	1.999 (50.78)	1.999 (50.78)	1.999 (50.78)	2.374 (60.30)
C	Std. .375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)
	O.S. .500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)
CC	Std. 1/2 - 20	1/2 - 20	1/2 - 20	7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12
	O.S. 7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12	1 1/4 - 12	1 1/4 - 12	1 1/2 - 12
D	Std. .500 (12.70)	.500 (12.70)	.500 (12.70)	.813 (20.64)	.813 (20.64)	.813 (20.64)	1.125 (28.58)
	O.S. .813 (20.64)	.813 (20.64)	.813 (20.64)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)
E	2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)	5.500 (139.70)	6.500 (165.10)
E	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)
F	.375 (9.53)	.375 (9.53)	.375 (9.53)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)
FB	.313 (7.94)	.375 (9.53)	.375 (9.53)	.438 (11.11)	.438 (11.11)	.563 (14.29)	.563 (14.29)
FF	Std. 5/8 - 18	5/8 - 18	5/8 - 18	1 - 14	1 - 14	1 - 14	1 3/8 - 12
	O.S. 1 - 14	1 - 14	1 - 14	1 3/8 - 12	1 3/8 - 12	1 3/8 - 12	1 3/4 - 12
G	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)	2.000 (50.80)
J	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)
K	.250 (6.35)	.313 (7.94)	.313 (7.94)	.375 (9.53)	.375 (9.53)	.438 (11.11)	.438 (11.11)
KK	Std. 7/16 - 20	7/16 - 20	7/16 - 20	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14
	O.S. 3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14	1 - 14	1 1/4 - 12
LB	3.625 (92.08)	3.625 (92.08)	3.750 (95.25)	4.250 (107.95)	4.250 (107.95)	4.500 (114.30)	5.000 (127.00)
MM	Std. .625 (15.88)	.625 (15.88)	.625 (15.88)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)
	O.S. 1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.750 (44.45)
P	2.340 (59.44)	2.340 (59.44)	2.470 (62.74)	2.690 (68.33)	2.690 (68.33)	2.940 (74.68)	3.125 (79.38)
R	1.428 (36.27)	1.838 (46.68)	2.192 (55.67)	2.758 (70.05)	3.323 (84.40)	4.101 (104.16)	4.879 (123.92)
TF	2.750 (69.85)	3.375 (85.73)	3.875 (98.43)	4.688 (119.06)	5.438 (138.11)	6.625 (168.28)	7.625 (193.68)
UF	3.375 (85.73)	4.125 (104.78)	4.625 (117.48)	5.500 (139.70)	6.250 (158.75)	7.625 (193.68)	8.625 (219.08)
V	Std. .250 (6.35)	.250 (6.35)	.250 (6.35)	.250 (6.35)	.250 (6.35)	.250 (6.35)	.250 (6.35)
	O.S. .500 (12.70)	.500 (12.70)	.500 (12.70)	.375 (9.53)	.375 (9.53)	.375 (9.53)	.375 (9.53)
W	Std. .625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)	.750 (19.05)	.750 (19.05)	.875 (22.23)
	O.S. 1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)
WF	Std. 1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.27)
	O.S. 1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.27)	1.625 (41.27)	1.625 (41.27)	1.875 (47.63)
Y	Std. 1.840 (46.74)	1.840 (46.74)	1.840 (46.74)	2.380 (60.45)	2.380 (60.45)	2.380 (60.45)	2.813 (71.44)
	O.S. 2.220 (56.39)	2.220 (56.39)	2.220 (56.39)	2.630 (66.80)	2.630 (66.80)	2.688 (68.00)	3.063 (77.79)
ZB	Std. 4.875 (123.83)	4.938 (125.41)	5.063 (128.59)	6.000 (152.40)	6.000 (152.40)	6.630 (160.34)	7.063 (179.39)
	O.S. 5.250 (133.35)	5.313 (134.94)	5.438 (138.11)	6.250 (158.75)	6.250 (158.75)	6.563 (166.69)	7.313 (185.74)



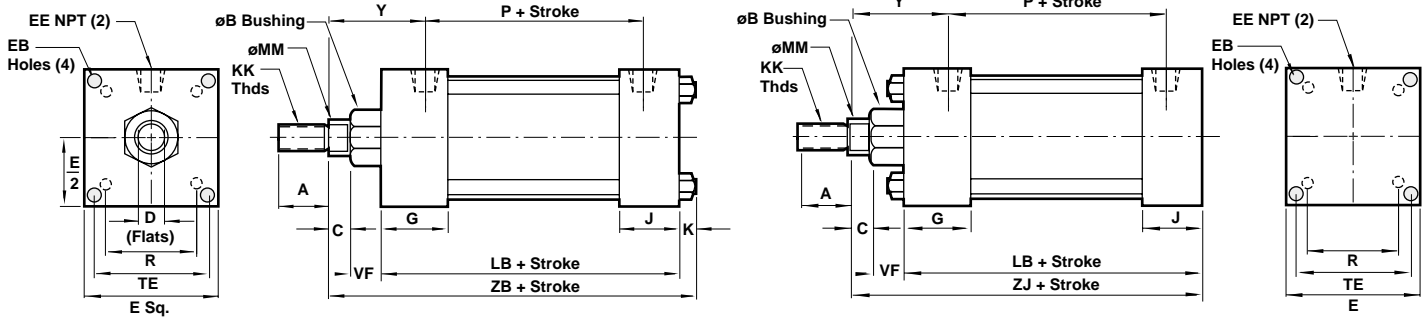
**Series A & EA Cylinder with 03 (ME3) Head Square & 04 (ME4) Cap Square**  
**Series J & EJ NFPA Cylinder with 03 (ME3) Head Square & 04 (ME4) Cap Square**



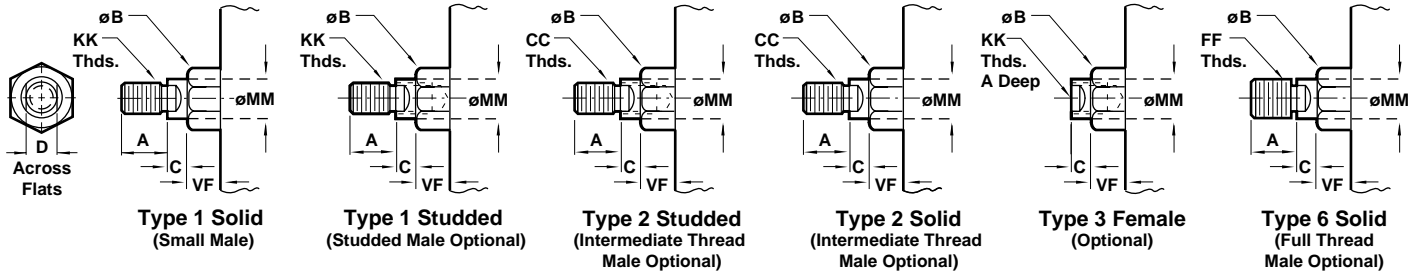
All Dimensions in Inches (mm)

**03 (ME3)**

**04 (ME4)**



**Standard & Optional Rod Ends**



Dimension	03 (ME3) Head Square				04 (ME4) Cap Square				
	7" Bore (177.80)	8" Bore (203.20)	10" Bore (254.00)	12" Bore (304.80)	7" Bore (177.80)	8" Bore (203.20)	10" Bore (254.00)	12" Bore (304.80)	
ø Rod	Std.	1 3/8" (34.93)	1 3/8" (34.93)	1 3/4" (44.45)	2" (50.80)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/4" (44.45)	2" (50.80)
	O.S.	1 3/4" (44.45)	1 3/4" (44.45)	2" (50.80)	2 1/2" (63.50)	1 3/4" (44.45)	1 3/4" (44.45)	2" (50.80)	2 1/2" (63.50)
A	Std.	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)	2.250 (57.15)	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)	2.250 (57.15)
	O.S.	2.000 (50.80)	2.000 (50.80)	2.250 (57.15)	3.000 (76.20)	2.000 (50.80)	2.000 (50.80)	2.250 (57.15)	3.000 (76.20)
B <sup>+0.000</sup> -0.002	Std.	1.999 Std(50.78)	1.999 (50.78)	2.374 (60.30)	2.624 (66.65)	1.999 (50.78)	1.999 (50.78)	2.374 (60.30)	2.624 (66.65)
	O.S.	2.374 (60.30)	2.374 (60.30)	2.624 (66.65)	3.124 (79.35)	2.374 (60.30)	2.374 (60.30)	2.624 (66.65)	3.124 (79.35)
C	Std.	.625 (15.88)	.625 (15.88)	.750 (19.05)	.875 (22.23)	.625 (15.88)	.625 (15.88)	.750 (19.05)	.875 (22.23)
	O.S.	.750 (19.05)	.750 (19.05)	.875 (22.23)	1.000 (25.40)	.750 (19.05)	.750 (19.05)	.875 (22.23)	1.000 (25.40)
CC	Std.	1 1/4 - 12	1 1/4 - 12	1 1/2 - 12	1 3/4 - 12	1 1/4 - 12	1 1/4 - 12	1 1/2 - 12	1 3/4 - 12
	O.S.	1 1/2 - 12	1 1/2 - 12	1 3/4 - 12	2 1/4 - 12	1 1/2 - 12	1 1/2 - 12	1 3/4 - 12	2 1/4 - 12
D	Std.	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)	1.688 (42.86)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)	1.688 (42.86)
	O.S.	1.500 (38.10)	1.500 (38.10)	1.688 (42.86)	2.063 (52.39)	1.500 (38.10)	1.500 (38.10)	1.688 (42.86)	2.063 (52.39)
E		7.500 (190.50)	8.500 (215.90)	10.625 (269.88)	12.750 (323.85)	7.500 (190.50)	8.500 (215.90)	10.625 (269.88)	12.750 (323.85)
EB		.563 (14.29)	.688 (17.46)	.813 (20.64)	.813 (20.64)	.563 (14.29)	.688 (17.46)	.813 (20.64)	.813 (20.64)
EE		.750 (19.05)	.750 (19.05)	1.000 (25.40)	1.000 (25.40)	.750 (19.05)	.750 (19.05)	1.000 (25.40)	1.000 (25.40)
FF	Std.	1 3/8 - 12	1 3/8 - 12	1 3/4 - 12	2 - 12	1 3/8 - 12	1 3/8 - 12	1 3/4 - 12	2 - 12
	O.S.	1 3/4 - 12	1 3/4 - 12	2 - 12	2 1/2 - 12	1 3/4 - 12	1 3/4 - 12	2 - 12	2 1/2 - 12
G		2.000 (50.80)	2.000 (50.80)	2.250 (57.15)	2.250 (57.15)	2.000 (50.80)	2.000 (50.80)	2.250 (57.15)	2.250 (57.15)
J		1.500 (38.10)	1.500 (38.10)	2.000 (50.80)	2.000 (50.80)	1.500 (38.10)	1.500 (38.10)	2.000 (50.80)	2.000 (50.80)
K		.563 (14.29)	.563 (14.29)	.688 (17.46)	.688 (17.46)	.563 (14.29)	.563 (14.29)	.688 (17.46)	.688 (17.46)
KK	Std.	1 - 14	1 - 14	1 1/4 - 12	1 1/2 - 12	1 - 14	1 - 14	1 1/4 - 12	1 1/2 - 12
	O.S.	1 1/4 - 12	1 1/4 - 12	1 1/2 - 12	1 7/8 - 12	1 1/4 - 12	1 1/4 - 12	1 1/2 - 12	1 7/8 - 12
LB		5.125 (130.18)	5.125 (130.18)	6.375 (161.93)	6.875 (174.63)	5.125 (130.18)	5.125 (130.18)	6.375 (161.93)	6.875 (174.63)
MM	Std.	1.375 (34.93)	1.375 (34.93)	1.750 (44.45)	2.000 (50.80)	1.375 (34.93)	1.375 (34.93)	1.750 (44.45)	2.000 (50.80)
	O.S.	1.750 (44.45)	1.750 (44.45)	2.000 (50.80)	2.500 (63.50)	1.750 (44.45)	1.750 (44.45)	2.000 (50.80)	2.500 (63.50)
P		3.250 (82.55)	3.250 (82.55)	4.125 (104.78)	4.625 (117.48)	3.250 (82.55)	3.250 (82.55)	4.125 (104.78)	4.625 (117.48)
R		5.730 (145.54)	6.442 (163.63)	7.969 (202.41)	9.406 (238.92)	5.730 (145.54)	6.442 (163.63)	7.969 (202.41)	9.406 (238.92)
TE		6.750 (171.45)	7.570 (192.27)	9.406 (238.92)	11.109 (282.18)	6.750 (171.45)	7.570 (192.27)	9.406 (238.92)	11.109 (282.18)
VF	Std.	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)	1.125 (28.58)	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)	1.125 (28.58)
	O.S.	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.250 (31.75)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.250 (31.75)
WF	Std.	1.625 (41.28)	1.625 (41.28)	1.875 (47.63)	2.000 (50.80)	1.625 (41.28)	1.625 (41.28)	1.875 (47.63)	2.000 (50.80)
	O.S.	1.875 (47.63)	1.875 (47.63)	2.000 (50.80)	2.250 (57.15)	1.875 (47.63)	1.875 (47.63)	2.000 (50.80)	2.250 (57.15)
Y	Std.	2.813 (71.44)	2.813 (71.44)	3.125 (79.38)	3.250 (82.55)	2.813 (71.44)	2.813 (71.44)	3.125 (79.38)	3.250 (82.55)
	O.S.	3.063 (77.79)	3.063 (77.79)	3.250 (82.55)	3.500 (88.90)	3.063 (77.79)	3.063 (77.79)	3.250 (82.55)	3.500 (88.90)
ZB	Std.	7.313 (185.74)	7.313 (185.74)	8.938 (227.01)	9.563 (242.89)	-	-	-	-
	O.S.	7.563 (192.09)	7.563 (192.09)	9.063 (230.19)	9.813 (249.24)	-	-	-	-
ZJ	Std.	-	-	-	-	6.750 (171.45)	6.750 (171.45)	8.250 (209.55)	8.875 (225.43)
	O.S.	-	-	-	-	7.000 (177.80)	7.000 (177.80)	8.375 (212.73)	9.125 (231.78)

**Cylinder with 04 (MF2) Cap Rectangular Flange**

- NFPA (MF2) 04 Cap Rectangular Flange Mount for 1-1/2" to 6" bore sizes.
- Series A & J Cylinders rated to 250 PSI air, 400 PSI hydraulic (non-shock). Series EA & EJ Cylinders rated to 250 PSI air only.
- Designed for non-lube service.
- Switches available on all bore sizes. (See pages ACT-1-90 & 91 for ordering information.)



**Cylinder Order Information**

**04** - - - - -

A	Series A Cylinder
EA	Series EA Cylinder
J	Series J Cylinder
EJ	Series EJ Cylinder

Mounting Options	
01	Side Tapped (MS4)
03	Head Rectangular Flange (MF1)
03	Head Square (ME3) - 7" to 12" Bores
<b>04</b>	<b>Cap Rectangular Flange (MF2)</b>
04	Cap Square (ME4) - 7" to 12" Bores
05	Basic Cylinder No Mounting (MX0)
06	Both Ends (4) Tie Rods Ext. (MX1)
6B	Both Ends (2) Tie Rods Ext. (MX4)
6C	Cap Tie Rods Ext. (MX2)
6R	Head Tie Rods Ext. (MX3)
7R	Removable Head Trunion (MT1) - A & EA
07	Head Trunion (MT1) - J & EJ
8R	Cap Trunion (MT2) - A & EA
08	Cap Trunion (MT2) (- J & EJ
09	Side Lugs (MS2)
10	Center Trunion (MT4)
11	Side End Angles (MS1)
12	Cap Fixed Clevis (MP1)
15	Side End Lugs (MS7)
16	Sleeve Nut Construction (Universal)
20	Head Square Flange (MF5)
21	Cap Square Flange (MF6)
22	Detachable Cap Clevis (MP2)
32	Cap Fixed Eye (MP3)
42	Detachable Cap Eye (MP4)
52	Spherical Bearing
60	Base Bar (Not NFPA - A & EA Only)

Cushion in Head	
3	None
5 <sup>1</sup>	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

Cushion in Cap	
3	None
5 <sup>1</sup>	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

<sup>1</sup>Standard with EA & EJ

<sup>1</sup>Standard with EA & EJ

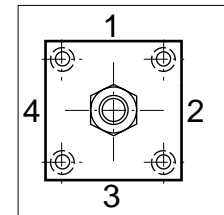
Bore and Stroke (write out )

Additional Options - order alphabetically - More on page ACT-1-95	
HR	Case Hardened (45 Rc)
L(- -)	Port Location position 1 standard: L(Head Cap) (specify position 1 thru 4 for head and/or cap)
MS	Metal Rod Scraper
N(- -)	Cushion Adjust Screw Location position 2 standard: N(Head Cap) (specify position 1 thru 4 for head and/or cap)
P(-)*	Non-Standard Port Sizes: [specify port size for P(-H) head only, P(-C) cap only, or P(-) both head & cap]
PS	Magnetic Piston - includes aluminum tube option for J & EJ - Std. for Alum
RS	Rod Stud Type 1 (5/8" - 1 3/4" øRod) Type 2 (5/8" & 1" øRod)
RX	Rod Extensions (specify length of additional rod extension)
SC	Single Acting Spring Extend (Cap End) - See page ACT-1-86
SR	Single Acting Spring Retract (Rod End) - See page ACT-1-86
SS	303 Stainless Steel (Hard Chrome Plated)
ST(-C)	Stop Tube (Cap End) (specify stop tube length)
ST(-R)	Stop Tube (Rod End) (specify stop tube length)
T	Special Rod Threads (specify rod thread)
TX	Thread Extensions (specify length of thread extension)
V	Viton® Seals

\*1 1/2", 2", 2 1/2" bore cylinders have 3/8" NPT Standard, 1/2" NPT oversize.  
 3 1/4", 4", 5" bore cylinders have 1/2" NPT Standard, 3/4" NPT oversize.  
 This will add 1/8" to the overall cylinder length.

Piston Rod Threads Type	
1	Small Male (Solid)
2	Intermediate Thread Male (Solid)
3	Female
6	Full Thread Male (Solid)
7	Plain Rod End

Piston Rod Diameters		
A**	5/8"	Standard on 1 1/2", 2", 2 1/2"
B**	1"	Standard on 3 1/4", 4", 5" Oversized on 1 1/2", 2", 2 1/2"
C**	1 3/8"	Standard on 6", 7", 8" Oversized on 3 1/4", 4", 5"
D**	1 3/4"	Standard on 10" Oversized on 6", 7", 8"
E	2"	Standard on 12" Oversized on 10"
F	2 1/2"	Oversized on 10", 12"



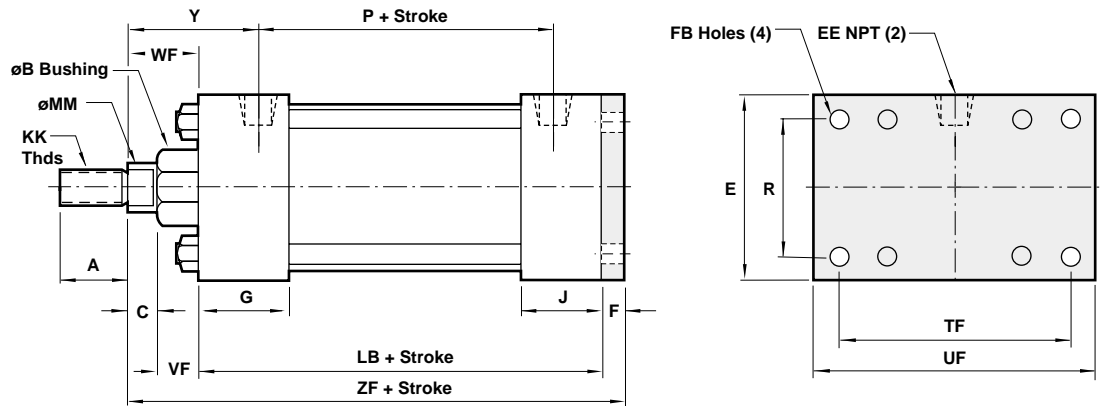
**Port and Cushion Adjustment Positions** (As viewed from rod end: Port standard position 1, Cushion Adjustment standard position 2.)  
 NOTE: A Port and a Cushion Adjustment cannot be in the same position.

See page ACT-1-96 for complete instructions on how to order cylinders.

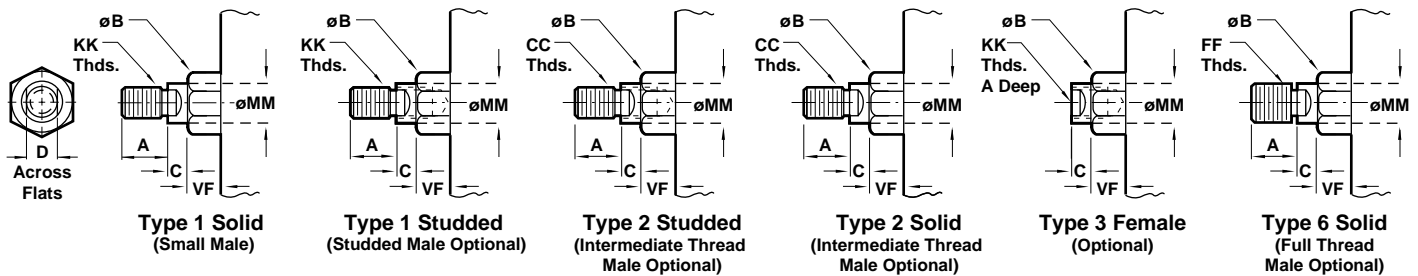
**Series A & EA, NFPA Aluminum Air Cylinders with 04 (MF2) Cap Rectangular Flange**  
**Series J & EJ, NFPA Steel Air Cylinders with 04 (MF2) Cap Rectangular Flange**



All Dimensions in Inches (mm)



**Standard & Optional Rod Ends**



Dimension		1 1/2" Bore (38.10)	2" Bore (50.80)	2 1/2" Bore (63.50)	3 1/4" Bore (82.55)	4" Bore (101.60)	5" Bore (127.00)	6" Bore (152.40)
ø Rod	Std.	5/8" (15.88)	5/8" (15.88)	5/8" (15.88)	1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)
	O.S.	1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/4" (44.45)
A	Std.	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)
	O.S.	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)
B +.000 -.002	Std.	1.124 (28.55)	1.124 (28.55)	1.124 (28.55)	1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)
	O.S.	1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)	1.999 (50.78)	1.999 (50.78)	2.374 (60.30)
C	Std.	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)
	O.S.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)
CC	Std.	1/2 - 20	1/2 - 20	1/2 - 20	7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12
	O.S.	7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12	1 1/4 - 12	1 1/4 - 12	1 1/2 - 12
D	Std.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.813 (20.64)	.813 (20.64)	.813 (20.64)	1.125 (28.58)
	O.S.	.813 (20.64)	.813 (20.64)	.813 (20.64)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)
E		2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)	5.500 (139.70)	6.500 (165.10)
EE		.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)
F		.375 (9.53)	.375 (9.53)	.375 (9.53)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)
FB	Std.	.313 (7.94)	.375 (9.53)	.375 (9.53)	.438 (11.11)	.438 (11.11)	.563 (14.29)	.563 (14.29)
	O.S.							
FF	Std.	5/8 - 18	5/8 - 18	5/8 - 18	1 - 14	1 - 14	1 - 14	1 3/8 - 12
	O.S.	1 - 14	1 - 14	1 - 14	1 3/8 - 12	1 3/8 - 12	1 3/8 - 12	1 3/4 - 12
G		1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)	2.000 (50.80)
J		1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)
K		.250 (6.35)	.313 (7.94)	.313 (7.94)	.375 (9.53)	.375 (9.53)	.438 (11.11)	.438 (11.11)
KK	Std.	7/16 - 20	7/16 - 20	7/16 - 20	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14
	O.S.	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14	1 - 14	1 1/4 - 12
LB		3.625 (92.08)	3.625 (92.08)	3.750 (95.25)	4.250 (107.95)	4.250 (107.95)	4.500 (114.30)	5.000 (127.00)
MM	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)
	O.S.	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.750 (44.45)
P		2.340 (59.44)	2.340 (59.44)	2.470 (62.74)	2.690 (68.33)	2.690 (68.33)	2.940 (74.68)	3.125 (79.38)
R		1.428 (36.27)	1.838 (46.68)	2.192 (55.67)	2.758 (70.05)	3.323 (84.40)	4.101 (104.16)	4.879 (123.93)
TF		2.750 (69.85)	3.375 (85.73)	3.875 (98.43)	4.687 (119.05)	5.438 (138.11)	6.625 (168.28)	7.625 (193.68)
UF		3.375 (85.73)	4.125 (104.78)	4.625 (117.48)	5.500 (139.70)	6.250 (158.75)	7.625 (193.68)	8.625 (219.08)
VF	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)
	O.S.	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)
WF	Std.	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.27)
	O.S.	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.27)	1.625 (41.27)	1.625 (41.27)	1.875 (47.63)
Y	Std.	1.840 (46.74)	1.840 (46.74)	1.840 (46.74)	2.380 (60.45)	2.380 (60.45)	2.380 (60.45)	2.813 (71.44)
	O.S.	2.220 (56.39)	2.220 (56.39)	2.220 (56.39)	2.630 (66.80)	2.630 (66.80)	2.630 (66.80)	3.063 (77.79)
ZF	Std.	5.000 (127.00)	5.000 (127.00)	5.125 (130.18)	6.250 (158.75)	6.250 (158.75)	6.500 (165.10)	7.375 (187.33)
	O.S.	5.375 (136.53)	5.375 (136.53)	5.500 (139.70)	6.500 (165.10)	6.500 (165.10)	6.750 (171.45)	7.625 (193.68)

**Cylinder with 05 (MX0) Basic**

- NFPA (MX0) 05 Basic Mount, for 1-1/2" to 6" bore sizes.
- Series A & J Cylinders rated to 250 PSI air, 400 PSI hydraulic (non-shock). Series EA & EJ Cylinders rated to 250 PSI air only.
- Designed for non-lube service.
- Switches available on all bore sizes. (See pages ACT-1-90 & 91 for ordering information.)



**Cylinder Order Information**

**05** - - - - -

A	Series A Cylinder
EA	Series EA Cylinder
J	Series J Cylinder
EJ	Series EJ Cylinder

Mounting Options	
01	Side Tapped (MS4)
03	Head Rectangular Flange (MF1)
03	Head Square (ME3)- 7" to 12" Bores
04	Cap Rectangular Flange (MF2)
04	Cap Square (ME4)- 7" to 12" Bores
<b>05</b>	<b>Basic Cylinder No Mounting (MX0)</b>
06	Both Ends (4) Tie Rods Ext. (MX1)
6B	Both Ends (2) Tie Rods Ext. (MX4)
6C	Cap Tie Rods Ext. (MX2)
6R	Head Tie Rods Ext. (MX3)
7R	Removable Head Trunnion (MT1) - A & EA
07	Head Trunnion (MT1) - J & EJ
8R	Cap Trunnion (MT2) - A & EA
08	Cap Trunnion (MT2) - J & EJ
09	Side Lugs (MS2)
10	Center Trunnion (MT4)
11	Side End Angles (MS1)
12	Cap Fixed Clevis (MP1)
15	Side End Lugs (MS7)
16	Sleeve Nut Construction (Universal)
20	Head Square Flange (MF5)
21	Cap Square Flange (MF6)
22	Detachable Cap Clevis (MP2)
32	Cap Fixed Eye (MP3)
42	Detachable Cap Eye (MP4)
52	Spherical Bearing
60	Base Bar (Not NFPA - A & EA Only)

Cushion in Head	
3	None
5 <sup>1</sup>	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

<sup>1</sup>Standard with EA & EJ

Cushion in Cap	
3	None
5 <sup>1</sup>	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

<sup>1</sup>Standard with EA & EJ

Bore and Stroke (write out)

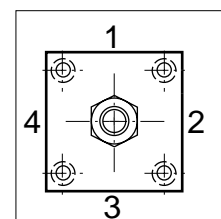
Additional Options – order alphabetically – More on page ACT-1-95	
HR	Case Hardened (45 Rc)
L(- -)	Port Location position 1 standard: L(Head Cap) (specify position 1 thru 4 for head and/or cap)
MS	Metal Rod Scraper
N(- -)	Cushion Adjust Screw Location position 2 standard: N(Head Cap) (specify position 1 thru 4 for head and/or cap)
P(-)*	Non-Standard Port Sizes: [specify port size for P(-H) head only, P(-C) cap only, or P(-) both head & cap]
PS	Magnetic Piston – includes aluminum tube option for J & EJ - Std. for Alum
RS	Rod Stud Type 1 (5/8" – 1 3/4" øRod) Type 2 (5/8" & 1" øRod)
RX	Rod Extensions (specify length of additional rod extension)
SC	Single Acting Spring Extend (Cap End)–See page ACT-1-86
SR	Single Acting Spring Retract (Rod End)–See page ACT-1-86
SS	303 Stainless Steel (Hard Chrome Plated)
ST(-C)	Stop Tube (Cap End) (specify stop tube length)
ST(-R)	Stop Tube (Rod End) (specify stop tube length)
T	Special Rod Threads (specify rod thread)
TX	Thread Extensions (specify length of thread extension)
V	Viton® Seals

\*1 1/2", 2", 2 1/2" bore cylinders have 3/8" NPT Standard, 1/2" NPT oversize.  
 3 1/4", 4", 5" bore cylinders have 1/2" NPT Standard, 3/4" NPT oversize.  
 This will add 1/8" to the overall cylinder length.

Piston Rod Threads Type	
1	Small Male (Solid)
2	Intermediate Thread Male (Solid)
3	Female
6	Full Thread Male (Solid)
7	Plain Rod End

Piston Rod Diameters		
A**	5/8"	Standard on 1 1/2", 2", 2 1/2"
B**	1"	Standard on 3 1/4", 4", 5" Oversized on 1 1/2", 2", 2 1/2"
C**	1 3/8"	Standard on 6", 7", 8" Oversized on 3 1/4", 4", 5"
D**	1 3/4"	Standard on 10" Oversized on 6", 7", 8"
E	2"	Standard on 12" Oversized on 10"
F	2 1/2"	Oversized on 10", 12"

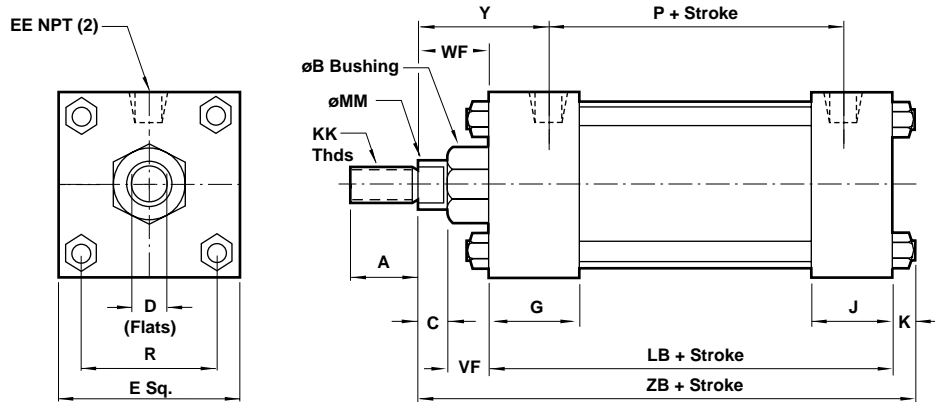
\*\* A & EA uses A-D only.



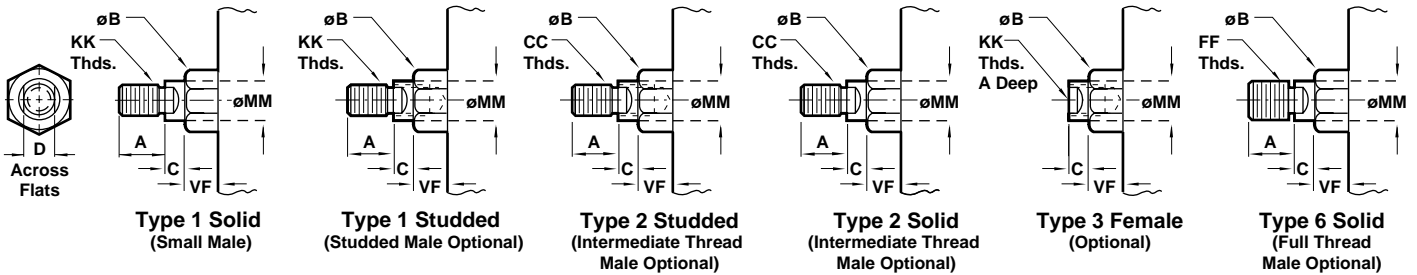
**Port and Cushion Adjustment Positions** (As viewed from rod end: Port standard position 1, Cushion Adjustment standard position 2.)  
 NOTE: A Port and a Cushion Adjustment cannot be in the same position.

See page ACT-1-96 for complete instructions on how to order cylinders.





Standard & Optional Rod Ends



Dimension	1 1/2" Bore (38.10)	2" Bore (50.80)	2 1/2" Bore (63.50)	3 1/4" Bore (82.55)	4" Bore (101.60)	5" Bore (127.00)	6" Bore (152.40)
ø Rod	Std. 5/8" (15.88)	5/8" (15.88)	5/8" (15.88)	1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)
	O.S. 1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/4" (44.45)
A	Std. .750 (19.05)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)
	O.S. 1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)
B +.000 -.002	Std. 1.124 (28.55)	1.124 (28.55)	1.124 (28.55)	1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)
	O.S. 1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)	1.999 (50.78)	1.999 (50.78)	2.374 (60.30)
C	Std. .375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)
	O.S. .500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)
CC	Std. 1/2 - 20	1/2 - 20	1/2 - 20	7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12
	O.S. 7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12	1 1/4 - 12	1 1/4 - 12	1 1/2 - 12
D	Std. .500 (12.70)	.500 (12.70)	.500 (12.70)	.813 (20.64)	.813 (20.64)	.813 (20.64)	1.125 (28.58)
	O.S. .813 (20.64)	.813 (20.64)	.813 (20.64)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)
E	2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)	5.500 (139.70)	6.500 (165.10)
EE	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)
FF	Std. 5/8 - 18	5/8 - 18	5/8 - 18	1 - 14	1 - 14	1 - 14	1 3/8 - 12
	O.S. 1 - 14	1 - 14	1 - 14	1 3/8 - 12	1 3/8 - 12	1 3/8 - 12	1 3/4 - 12
G	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)	2.000 (50.80)
J	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)
K	.250 (6.35)	.313 (7.94)	.313 (7.94)	.375 (9.53)	.375 (9.53)	.438 (11.11)	.438 (11.11)
KK	Std. 7/16 - 20	7/16 - 20	7/16 - 20	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14
	O.S. 3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14	1 - 14	1 1/4 - 12
LB	3.625 (92.08)	3.625 (92.08)	3.750 (95.25)	4.250 (107.95)	4.250 (107.95)	4.500 (114.30)	5.000 (127.00)
MM	Std. .625 (15.88)	.625 (15.88)	.625 (15.88)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)
	O.S. 1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.750 (44.45)
P	2.340 (59.44)	2.340 (59.44)	2.470 (62.74)	2.690 (68.33)	2.690 (68.33)	2.940 (74.68)	3.125 (79.38)
R	1.428 (36.27)	1.838 (46.68)	2.192 (55.67)	2.758 (70.05)	3.323 (84.40)	4.101 (104.16)	4.879 (123.92)
VF	Std. .625 (15.88)	.625 (15.88)	.625 (15.88)	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)
	O.S. .875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)
WF	Std. 1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)
	O.S. 1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	1.875 (47.63)
Y	Std. 1.840 (46.74)	1.840 (46.74)	1.840 (46.74)	2.380 (60.45)	2.380 (60.45)	2.380 (60.45)	2.813 (71.44)
	O.S. 2.220 (56.39)	2.220 (56.39)	2.220 (56.39)	2.630 (66.80)	2.630 (66.80)	2.630 (66.80)	3.063 (77.79)
ZB	Std. 4.875 (123.83)	4.938 (125.41)	5.063 (128.59)	6.000 (152.40)	6.000 (152.40)	6.313 (160.34)	7.063 (179.39)
	O.S. 5.250 (133.35)	5.313 (134.94)	5.438 (138.11)	6.250 (158.75)	6.250 (158.75)	6.563 (166.69)	7.313 (185.74)

Cylinder with 05 (MX0) Basic

- NFPA (MX0) 05 Basic Mount, for 7" to 12" bore sizes.
- Series A & J Cylinders rated to 250 PSI air, 400 PSI hydraulic (non-shock). Series EA & EJ Cylinders rated to 250 PSI air only.
- Designed for non-lube service.
- Switches available on all bore sizes. (See pages ACT-1-90 & 91 for ordering information.)



Cylinder Order Information

05 -

A	Series A Cylinder
EA	Series EA Cylinder
J	Series J Cylinder
EJ	Series EJ Cylinder

Mounting Options	
01	Side Tapped (MS4)
03	Head Rectangular Flange (MF1)
03	Head Square (ME3)- 7" to 12" Bores
04	Cap Rectangular Flange (MF2)
04	Cap Square (ME4)- 7" to 12" Bores
05	<b>Basic Cylinder No Mounting (MX0)</b>
06	Both Ends (4) Tie Rods Ext. (MX1)
6B	Both Ends (2) Tie Rods Ext. (MX4)
6C	Cap Tie Rods Ext. (MX2)
6R	Head Tie Rods Ext. (MX3)
7R	Removable Head Trunion (MT1) - A & EA
07	Head Trunion (MT1) - J & EJ
8R	Cap Trunion (MT2) - A & EA
08	Cap Trunion (MT2) - J & EJ
09	Side Lugs (MS2)
10	Center Trunion (MT4)
11	Side End Angles (MS1)
12	Cap Fixed Clevis (MP1)
15	Side End Lugs (MS7)
16	Sleeve Nut Construction (Universal)
20	Head Square Flange (MF5)
21	Cap Square Flange (MF6)
22	Detachable Cap Clevis (MP2)
32	Cap Fixed Eye (MP3)
42	Detachable Cap Eye (MP4)
52	Spherical Bearing
60	Base Bar (Not NFPA - A & EA Only)

Cushion in Head	
3	None
5 <sup>1</sup>	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

<sup>1</sup>Standard with EA & EJ

Cushion in Cap	
3	None
5 <sup>1</sup>	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

<sup>1</sup>Standard with EA & EJ

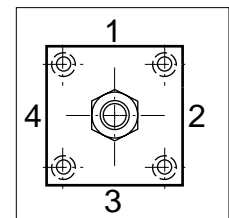
Bore and Stroke (write out)

Additional Options – order alphabetically – More on page ACT-1-95	
HR	Case Hardened (45 Rc)
L(- -)	Port Location position 1 standard: L(Head Cap) (specify position 1 thru 4 for head and/or cap)
MS	Metal Rod Scraper
N(- -)	Cushion Adjust Screw Location position 2 standard: N(Head Cap) (specify position 1 thru 4 for head and/or cap)
P(-)*	Non-Standard Port Sizes: [specify port size for P(-H) head only, P(-C) cap only, or P(-) both head & cap]
PS	Magnetic Piston – includes aluminum tube option for J & EJ - Std. for Alum
RS	Rod Stud Type 1 (5/8" – 1 3/4" øRod) Type 2 (5/8" & 1" øRod)
RX	Rod Extensions (specify length of additional rod extension)
SC	Single Acting Spring Extend (Cap End)–See page ACT-1-86
SR	Single Acting Spring Retract (Rod End)–See page ACT-1-86
SS	303 Stainless Steel (Hard Chrome Plated)
ST(-C)	Stop Tube (Cap End) (specify stop tube length)
ST(-R)	Stop Tube (Rod End) (specify stop tube length)
T	Special Rod Threads (specify rod thread)
TX	Thread Extensions (specify length of thread extension)
V	Viton® Seals

\*1 1/2", 2", 2 1/2" bore cylinders have 3/8" NPT Standard, 1/2" NPT oversize.  
 3 1/4", 4", 5" bore cylinders have 1/2" NPT Standard, 3/4" NPT oversize.  
 This will add 1/8" to the overall cylinder length.

Piston Rod Threads Type	
1	Small Male (Solid)
2	Intermediate Thread Male (Solid)
3	Female
6	Full Thread Male (Solid)
7	Plain Rod End

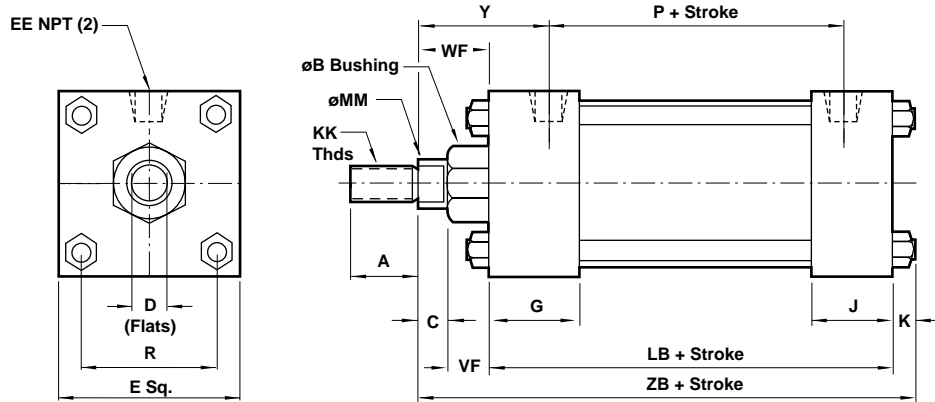
Piston Rod Diameters		
A**	5/8"	Standard on 1 1/2", 2", 2 1/2"
B**	1"	Standard on 3 1/4", 4", 5" Oversized on 1 1/2", 2", 2 1/2"
C**	1 3/8"	Standard on 6", 7", 8" Oversized on 3 1/4", 4", 5"
D**	1 3/4"	Standard on 10" Oversized on 6", 7", 8"
E	2"	Standard on 12" Oversized on 10"
F	2 1/2"	Oversized on 10", 12"



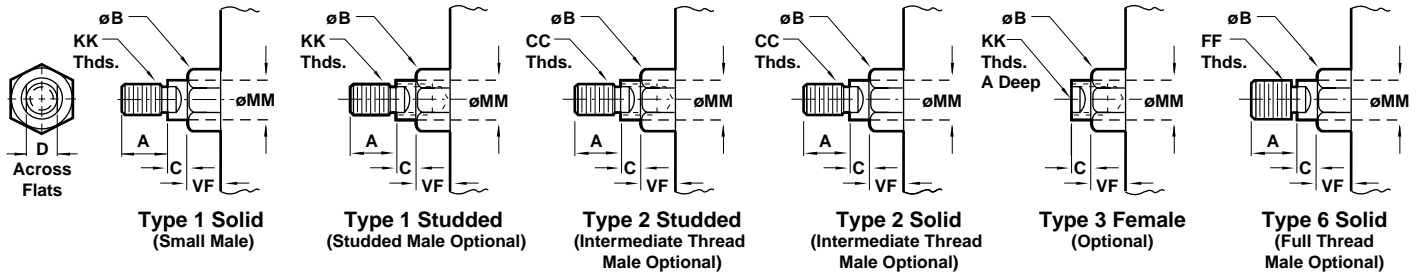
**Port and Cushion Adjustment Positions** (As viewed from rod end: Port standard position 1, Cushion Adjustment standard position 2.)  
 NOTE: A Port and a Cushion Adjustment cannot be in the same position.

\*\* A & EA uses A-D only.

See page ACT-1-96 for complete instructions on how to order cylinders.



Standard & Optional Rod Ends



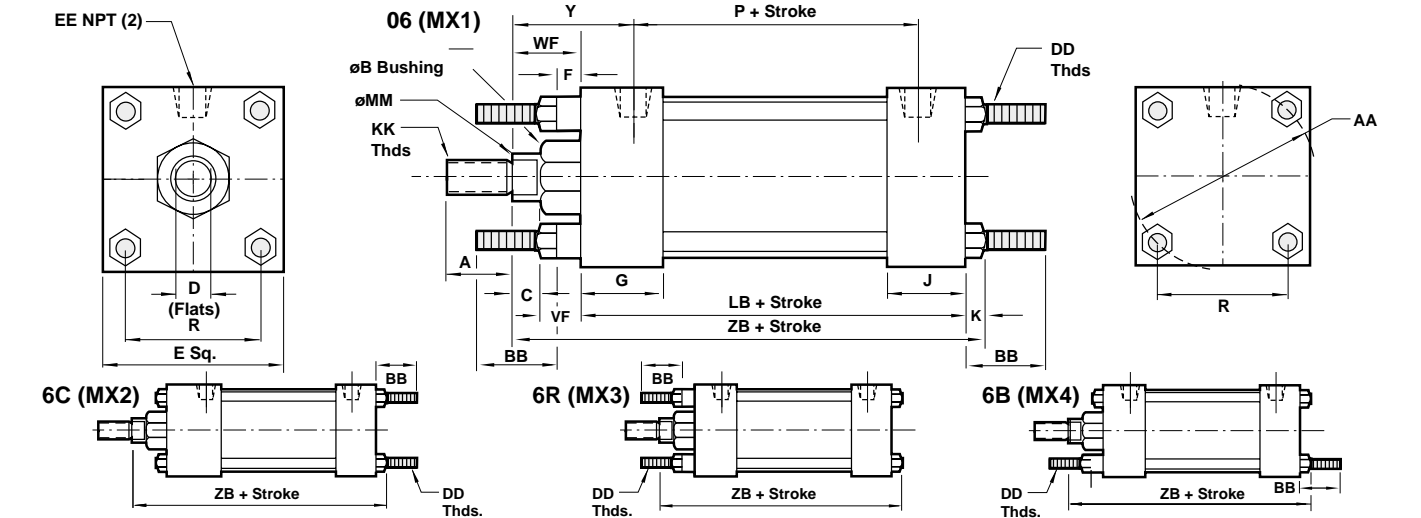
Dimension		7" Bore (177.80)	8" Bore (203.20)	10" Bore (254.00)	12" Bore (304.80)
ø Rod	Std.	1 3/8" (34.93)	1 3/8" (34.93)	1 3/4" (44.45)	2" (50.80)
	O.S.	1 3/4" (44.45)	1 3/4" (44.45)	2" (50.80)	2 1/2" (63.50)
A	Std.	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)	2.250 (57.15)
	O.S.	2.000 (50.80)	2.000 (50.80)	2.250 (57.15)	3.000 (76.20)
B	Std.	1.999 (50.78)	1.999 (50.78)	2.374 (60.30)	2.624 (66.65)
	O.S.	2.374 (60.30)	2.374 (60.30)	2.624 (66.65)	3.124 (79.35)
C	Std.	.625 (15.88)	.625 (15.88)	.750 (19.05)	.875 (22.23)
	O.S.	.750 (19.05)	.750 (19.05)	.875 (22.23)	1.000 (25.40)
CC	Std.	1 1/4 - 12	1 1/4 - 12	1 1/2 - 12	1 3/4 - 12
	O.S.	1 1/2 - 12	1 1/2 - 12	1 3/4 - 12	2 1/4 - 12
D	Std.	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)	1.688 (42.86)
	O.S.	1.500 (38.10)	1.500 (38.10)	1.688 (42.86)	2.063 (52.39)
E		7.500 (190.50)	8.500 (215.90)	10.625 (269.88)	12.750 (323.85)
EE		.750 (19.05)	.750 (19.05)	1.000 (25.40)	1.000 (25.40)
FF	Std.	1 3/8 - 12	1 3/8 - 12	1 3/4 - 12	2 - 12
	O.S.	1 3/4 - 12	1 3/4 - 12	2 - 12	2 1/2 - 12
G		2.000 (50.80)	2.000 (50.80)	2.250 (57.15)	2.250 (57.15)
J		1.500 (38.10)	1.500 (38.10)	2.000 (50.80)	2.000 (50.80)
K		.563 (14.29)	.563 (14.29)	.688 (17.46)	.688 (17.46)
KK	Std.	1 - 14	1 - 14	1 1/4 - 12	1 1/2 - 12
	O.S.	1 1/4 - 12	1 1/4 - 12	1 1/2 - 12	1 7/8 - 12
LB		5.125 (130.18)	5.125 (130.18)	6.375 (161.93)	6.875 (174.63)
MM	Std.	1.375 (34.93)	1.375 (34.93)	1.750 (44.45)	2.000 (50.80)
	O.S.	1.750 (44.45)	1.750 (44.45)	2.000 (50.80)	2.500 (63.50)
P		3.250 (82.55)	3.250 (82.55)	4.125 (104.78)	4.625 (117.48)
R		5.730 (145.54)	6.442 (163.63)	7.969 (202.41)	9.406 (238.92)
VF	Std.	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)	1.125 (28.58)
	O.S.	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.250 (31.75)
WF	Std.	1.625 (41.28)	1.625 (41.28)	1.875 (47.63)	2.000 (50.80)
	O.S.	1.875 (47.63)	1.875 (47.63)	2.000 (50.80)	2.250 (57.15)
Y	Std.	2.813 (71.44)	2.813 (71.44)	3.125 (79.38)	3.250 (82.55)
	O.S.	3.063 (77.79)	3.063 (77.79)	3.250 (82.55)	3.500 (88.90)
ZB	Std.	7.313 (185.74)	7.313 (185.74)	8.938 (227.01)	9.563 (242.89)
	O.S.	7.563 (192.09)	7.563 (192.09)	9.063 (230.19)	9.813 (249.24)



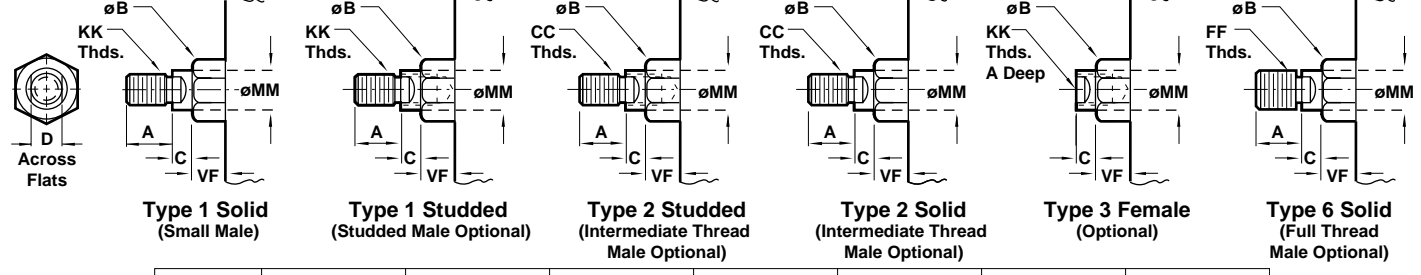
Series A & EA, NFPA Aluminum Air Cylinders Combinations with Extended Tie Rods  
 Series J & EJ, NFPA Steel Air Cylinders Combinations with Extended Tie Rods



All Dimensions in Inches (mm)



Standard & Optional Rod Ends



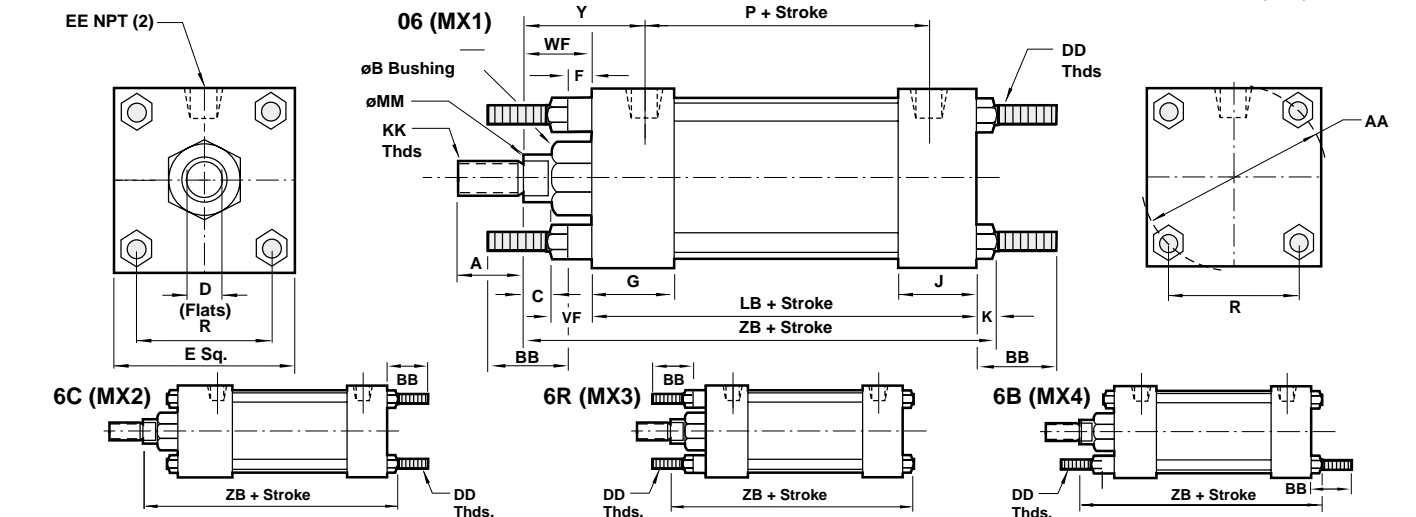
Dimension	1 1/2" Bore (38.10)	2" Bore (50.80)	2 1/2" Bore (63.50)	3 1/4" Bore (82.55)	4" Bore (101.60)	5" Bore (127.00)	6" Bore (152.40)
ø Rod	Std. 5/8" (15.88)	5/8" (15.88)	5/8" (15.88)	1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)
	O.S. 1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/4" (44.45)
A	Std. .750 (19.05)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)
	O.S. 1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)
AA	2.020 (51.31)	2.600 (66.04)	3.100 (78.74)	3.900 (99.06)	4.700 (119.38)	5.800 (147.32)	6.900 (175.26)
B <sup>+0.000</sup> -0.002	Std. 1.124 (28.55)	1.124 (28.55)	1.124 (28.55)	1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)
	O.S. 1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)	1.999 (50.78)	1.999 (50.78)	2.374 (60.30)
BB	1.000 (25.40)	1.125 (28.58)	1.125 (28.58)	1.375 (34.93)	1.375 (34.93)	1.813 (46.04)	1.813 (46.04)
C	Std. .375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)
	O.S. .500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)
CC	Std. 1/2 - 20	1/2 - 20	1/2 - 20	7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12
	O.S. 7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12	1 1/4 - 12	1 1/4 - 12	1 1/2 - 12
D	Std. .500 (12.70)	.500 (12.70)	.500 (12.70)	.813 (20.64)	.813 (20.64)	.813 (20.64)	1.125 (28.58)
	O.S. .813 (20.64)	.813 (20.64)	.813 (20.64)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)
DD	1/4 - 28	5/16 - 24	5/16 - 24	3/8 - 24	3/8 - 24	1/2 - 20	1/2 - 20
E	2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)	5.500 (139.70)	6.500 (165.10)
EE	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)
F	.375 (9.53)	.375 (9.53)	.375 (9.53)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)
FF	Std. 5/8 - 18	5/8 - 18	5/8 - 18	1 - 14	1 - 14	1 - 14	1 3/8 - 12
	O.S. 1 - 14	1 - 14	1 - 14	1 3/8 - 12	1 3/8 - 12	1 3/8 - 12	1 3/4 - 12
G	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)	2.000 (50.80)
J	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)
K	.250 (6.35)	.313 (7.94)	.313 (7.94)	.375 (9.53)	.375 (9.53)	.438 (11.11)	.438 (11.11)
KK	Std. 7/16 - 20	7/16 - 20	7/16 - 20	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14
	O.S. 3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14	1 - 14	1 1/4 - 12
LB	3.625 (92.08)	3.625 (92.08)	3.750 (95.25)	4.250 (107.95)	4.250 (107.95)	4.500 (114.30)	5.000 (127.00)
MM	Std. .625 (15.88)	.625 (15.88)	.625 (15.88)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)
	O.S. 1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.750 (44.45)
P	2.340 (59.44)	2.340 (59.44)	2.470 (62.74)	2.690 (68.33)	2.690 (68.33)	2.940 (74.68)	3.125 (79.38)
R	1.428 (36.27)	1.838 (46.68)	2.192 (55.67)	2.758 (70.05)	3.323 (84.40)	4.101 (104.16)	4.879 (123.92)
VF	Std. .625 (15.88)	.625 (15.88)	.625 (15.88)	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)
	O.S. .875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)
WF	Std. 1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)
	O.S. 1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	1.875 (47.63)
Y	Std. 1.840 (46.74)	1.840 (46.74)	1.840 (46.74)	2.380 (60.45)	2.380 (60.45)	2.380 (60.45)	2.813 (71.44)
	O.S. 2.220 (56.39)	2.220 (56.39)	2.220 (56.39)	2.630 (66.80)	2.630 (66.80)	2.630 (66.80)	3.063 (77.79)
ZB	Std. 4.875 (123.83)	4.938 (125.41)	5.063 (128.59)	6.000 (152.40)	6.000 (152.40)	6.313 (160.34)	7.063 (179.39)
	O.S. 5.250 (133.35)	5.313 (134.94)	5.438 (138.11)	6.250 (158.75)	6.250 (158.75)	6.563 (166.69)	7.313 (185.74)



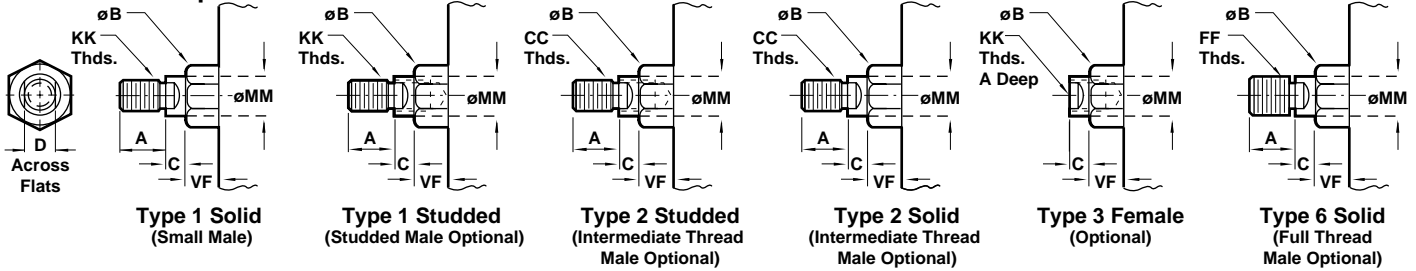
**Series A & EA, NFPA Aluminum Air Cylinder Combinations with Extended Tie Rods**  
**Series J & EJ, NFPA Steel Air Cylinder Combinations with Extended Tie Rods**



All Dimensions in Inches (mm)



**Standard & Optional Rod Ends**



Dimension		7" Bore (177.80)	8" Bore (203.20)	10" Bore (254.00)	12" Bore (304.80)
ø Rod	Std.	1 3/8" (34.93)	1 3/8" (34.93)	1 3/4" (44.45)	2" (50.80)
	O.S.	1 3/4" (44.45)	1 3/4" (44.45)	2" (50.80)	2 1/2" (63.50)
A	Std.	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)	2.250 (57.15)
	O.S.	2.000 (50.80)	2.000 (50.80)	2.250 (57.15)	3.000 (76.20)
AA		8.100 (205.74)	9.100 (231.14)	11.313 (287.34)	13.313 (338.14)
B <sup>+0.000</sup> <sub>-0.002</sub>	Std.	1.999 (50.78)	1.999 (50.78)	2.374 (60.30)	2.624 (66.65)
	O.S.	2.374 (60.30)	2.374 (60.30)	2.624 (66.65)	3.124 (79.35)
BB		2.313 (58.74)	2.313 (58.74)	2.688 (68.26)	2.688 (68.26)
C	Std.	.625 (15.88)	.625 (15.88)	.750 (19.05)	.875 (22.23)
	O.S.	.625 (15.88)	.750 (19.05)	.875 (22.23)	1.000 (25.40)
CC	Std.	1 1/4 - 12	1 1/4 - 12	1 1/2 - 12	1 3/4 - 12
	O.S.	1 1/2 - 12	1 1/2 - 12	1 3/4 - 12	2 1/4 - 12
D	Std.	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)	1.688 (42.86)
	O.S.	1.500 (38.10)	1.500 (38.10)	1.688 (42.86)	2.063 (52.39)
DD		5/8 - 18	5/8 - 18	3/4 - 16	3/4 - 16
E		7.500 (190.50)	8.500 (215.90)	10.625 (269.88)	12.750 (323.85)
EE		.750 (19.05)	.750 (19.05)	1.000 (25.40)	1.000 (25.40)
F		.750 (19.05)	.750 (19.05)	—	—
FF	Std.	1 3/8 - 12	1 3/8 - 12	1 3/4 - 12	2 - 12
	O.S.	1 3/4 - 12	1 3/4 - 12	2 - 12	2 1/2 - 12
G		2.000 (50.80)	2.000 (50.80)	2.250 (57.15)	2.250 (57.15)
J		1.500 (38.10)	1.500 (38.10)	2.000 (50.80)	2.000 (50.80)
K		.563 (14.29)	.563 (14.29)	.688 (17.46)	.688 (17.46)
KK	Std.	1 - 14	1 - 14	1 1/4 - 12	1 1/2 - 12
	O.S.	1 1/4 - 12	1 1/4 - 12	1 1/2 - 12	1 7/8 - 12
LB		5.125 (130.18)	5.125 (130.18)	6.375 (161.93)	6.875 (174.63)
MM	Std.	1.375 (34.93)	1.375 (34.93)	1.750 (44.45)	2.000 (50.80)
	O.S.	1.750 (44.45)	1.750 (44.45)	2.000 (50.80)	2.500 (63.50)
P		3.250 (82.55)	3.250 (82.55)	4.125 (104.78)	4.625 (117.48)
R		5.730 (145.54)	6.442 (163.63)	7.969 (202.41)	9.406 (238.92)
VF	Std.	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)	1.125 (28.58)
	O.S.	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.250 (31.75)
WF	Std.	1.625 (41.28)	1.625 (41.28)	1.875 (47.63)	2.000 (50.80)
	O.S.	1.875 (47.63)	1.875 (47.63)	2.000 (50.80)	2.250 (57.15)
Y	Std.	2.813 (71.44)	2.813 (71.44)	3.125 (79.38)	3.250 (82.55)
	O.S.	3.063 (77.79)	3.063 (77.79)	3.250 (82.55)	3.500 (88.90)
ZB	Std.	7.313 (185.74)	7.313 (185.74)	8.938 (227.01)	9.563 (242.89)
	O.S.	7.563 (192.09)	7.563 (192.09)	9.063 (230.19)	9.813 (249.24)

**Cylinder with 07 (MT1) Head Trunnion**

- NFPA (MT1) 07 Head Trunnion Mount for 1-1/2" to 6" bore sizes.
- Series A & J Cylinders rated to 250 PSI air, 400 PSI hydraulic (non-shock). Series EA & EJ Cylinders rated to 250 PSI air only.
- Designed for non-lube service.
- Switches available on all bore sizes. (See page ACT-1-90 & 91 for ordering information.)
- Head Trunnions are removable.



**Cylinder Order Information**

**07** -  
**7R**

A	Series A Cylinder
EA	Series EA Cylinder
J	Series J Cylinder
EJ	Series EJ Cylinder

Mounting Options	
01	Side Tapped (MS4)
03	Head Rectangular Flange (MF1)
03	Head Square (ME3)-7" to 12" Bores
04	Cap Rectangular Flange (MF2)
04	Cap Square (ME4)-7" to 12" Bores
05	Basic Cylinder No Mounting (MX0)
06	Both Ends (4) Tie Rods Ext. (MX1)
6B	Both Ends (2) Tie Rods Ext. (MX4)
6C	Cap Tie Rods Ext. (MX2)
6R	Head Tie Rods Ext. (MX3)
<b>7R</b>	<b>Removable Head Trunion (MT1) - A &amp; EA</b>
<b>07</b>	<b>Head Trunnion (MT1) - J &amp; EJ</b>
8R	Cap Trunion (MT2) - A & EA
08	Cap Trunnion (MT2) - J & EJ
09	Side Lugs (MS2)
10	Center Trunnion (MT4)
11	Side End Angles (MS1)
12	Cap Fixed Clevis (MP1)
15	Side End Lugs (MS7)
16	Sleeve Nut Construction (Universal)
20	Head Square Flange (MF5)
21	Cap Square Flange (MF6)
22	Detachable Cap Clevis (MP2)
32	Cap Fixed Eye (MP3)
42	Detachable Cap Eye (MP4)
52	Spherical Bearing
60	Base Bar (Not NFPA - A & EA Only)

Cushion in Head	
3	None
5 <sup>1</sup>	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

<sup>1</sup>Standard with EA & EJ

Cushion in Cap	
3	None
5 <sup>1</sup>	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

<sup>1</sup>Standard with EA & EJ

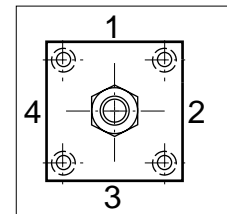
Bore and Stroke (write out)

Additional Options – order alphabetically – More on page ACT-1-95	
HR	Case Hardened (45 Rc)
L(- -)	Port Location position 1 standard: L(Head Cap) (specify position 1 thru 4 for head and/or cap)
MS	Metal Rod Scraper
N(- -)	Cushion Adjust Screw Location position 2 standard: N(Head Cap) (specify position 1 thru 4 for head and/or cap)
P(-)*	Non-Standard Port Sizes: [specify port size for P(-H) head only, P(-C) cap only, or P(-) both head & cap]
PS	Magnetic Piston – includes aluminum tube option for J & EJ - Std. for Alum
RS	Rod Stud Type 1 (5/8" – 1 3/4" øRod) Type 2 (5/8" & 1" øRod)
RX	Rod Extensions (specify length of additional rod extension)
SC	Single Acting Spring Extend (Cap End)–See page ACT-1-86
SR	Single Acting Spring Retract (Rod End)–See page ACT-1-86
SS	303 Stainless Steel (Hard Chrome Plated)
ST(-C)	Stop Tube (Cap End) (specify stop tube length)
ST(-R)	Stop Tube (Rod End) (specify stop tube length)
T	Special Rod Threads (specify rod thread)
TX	Thread Extensions (specify length of thread extension)
V	Viton® Seals

\*1 1/2", 2", 2 1/2" bore cylinders have 3/8" NPT Standard, 1/2" NPT oversize.  
 3 1/4", 4", 5" bore cylinders have 1/2" NPT Standard, 3/4" NPT oversize.  
 This will add 1/8" to the overall cylinder length.

Piston Rod Threads Type	
1	Small Male (Solid)
2	Intermediate Thread Male (Solid)
3	Female
6	Full Thread Male (Solid)
7	Plain Rod End

Piston Rod Diameters		
A**	5/8"	Standard on 1 1/2", 2", 2 1/2"
B**	1"	Standard on 3 1/4", 4", 5" Oversized on 1 1/2", 2", 2 1/2"
C**	1 3/8"	Standard on 6", 7", 8" Oversized on 3 1/4", 4", 5"
D**	1 3/4"	Standard on 10" Oversized on 6", 7", 8"
E	2"	Standard on 12" Oversized on 10"
F	2 1/2"	Oversized on 10", 12"



**Port and Cushion Adjustment Positions** (As viewed from rod end:  
 Port standard position 1, Cushion Adjustment standard position 2.)  
 NOTES: A Port and a Cushion Adjustment cannot be in the same position.  
 Port or cushion cannot be located in position 2 or 4 on the head end.

\*\* A & EA uses A-D only.

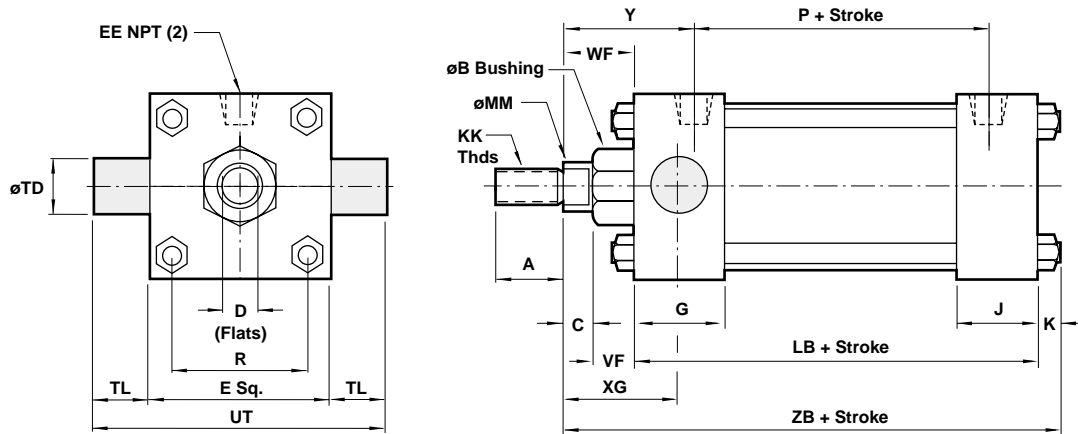
See page ACT-1-96 for complete instructions on how to order cylinders.



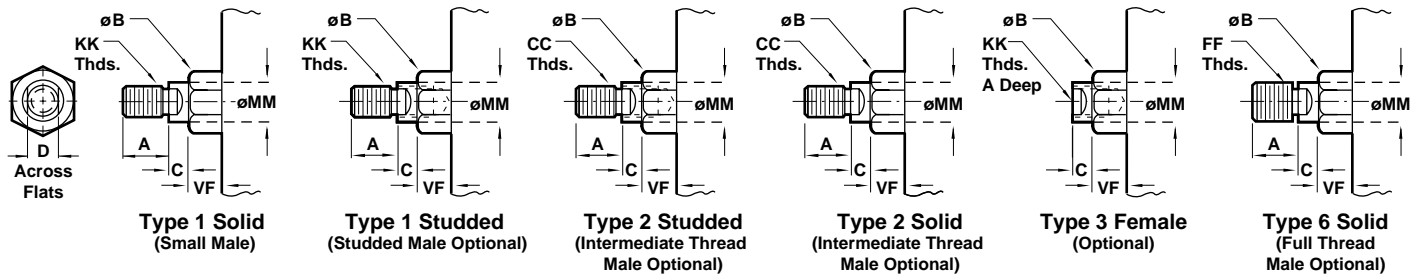
**Series A & EA, NFPA Aluminum Air Cylinders with 7R (MT1) Head Trunnion**  
**Series J & EJ, NFPA Steel Air Cylinders with 07 (MT1) Head Trunnion**



All Dimensions in Inches (mm)



**Standard & Optional Rod Ends**



Dimension	1 1/2" Bore (38.10)	2" Bore (50.80)	2 1/2" Bore (63.50)	3 1/4" Bore (82.55)	4" Bore (101.60)	5" Bore (127.00)	6" Bore (152.40)
ø Rod	Std. 5/8" (15.88)	5/8" (15.88)	5/8" (15.88)	1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)
	O.S. 1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/4" (44.45)
A	Std. .750 (19.05)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)
	O.S. 1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)
B <sup>+.000</sup> -0.002	Std. 1.124 (28.55)	1.124 (28.55)	1.124 (28.55)	1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)
	O.S. 1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)	1.999 (50.78)	1.999 (50.78)	2.374 (60.30)
C	Std. .375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)
	O.S. .500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)
CC	Std. 1/2 - 20	1/2 - 20	1/2 - 20	7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12
	O.S. 7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12	1 1/4 - 12	1 1/4 - 12	1 1/2 - 12
D	Std. .500 (12.70)	.500 (12.70)	.500 (12.70)	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.125 (28.58)
	O.S. .875 (22.23)	.875 (22.23)	.875 (22.23)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)
E	2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)	5.500 (139.70)	6.500 (165.10)
EE	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)
FF	Std. 5/8 - 18	5/8 - 18	5/8 - 18	1 - 14	1 - 14	1 - 14	1 3/8 - 12
	O.S. 1 - 14	1 - 14	1 - 14	1 3/8 - 12	1 3/8 - 12	1 3/8 - 12	1 3/4 - 12
G	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)	2.000 (50.80)
J	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)
K	.250 (6.35)	.313 (7.94)	.313 (7.94)	.375 (9.53)	.375 (9.53)	.438 (11.11)	.438 (11.11)
KK	Std. 7/16 - 20	7/16 - 20	7/16 - 20	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14
	O.S. 3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14	1 - 14	1 1/4 - 12
LB	3.625 (92.08)	3.625 (92.08)	3.750 (95.25)	4.250 (107.95)	4.250 (107.95)	4.500 (114.30)	5.000 (127.00)
MM	Std. .625 (15.88)	.625 (15.88)	.625 (15.88)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)
	O.S. 1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.750 (44.45)
P	2.340 (59.44)	2.340 (59.44)	2.470 (62.74)	2.690 (68.33)	2.690 (68.33)	2.940 (74.68)	3.125 (79.38)
R	1.428 (36.27)	1.838 (46.68)	2.192 (55.67)	2.758 (70.05)	3.323 (84.40)	4.101 (104.16)	4.879 (123.92)
TD <sup>+.000</sup> -.001	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)
TL	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)
UT	4.000 (101.60)	4.500 (114.30)	5.000 (127.00)	5.750 (146.05)	6.500 (165.10)	7.500 (190.50)	9.250 (234.95)
VF	Std. .625 (15.88)	.625 (15.88)	.625 (15.88)	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)
	O.S. .875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)
WF	Std. 1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)
	O.S. 1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	1.875 (47.63)
XG	Std. 1.750 (44.45)	1.750 (44.45)	1.750 (44.45)	2.250 (57.15)	2.250 (57.15)	2.250 (57.15)	2.625 (66.68)
	O.S. 2.125 (53.98)	2.125 (53.98)	2.125 (53.98)	2.500 (63.50)	2.500 (63.50)	2.500 (63.50)	2.875 (73.03)
Y	Std. 1.840 (46.74)	1.840 (46.74)	1.840 (46.74)	2.380 (60.45)	2.380 (60.45)	2.380 (60.45)	2.813 (71.44)
	O.S. 2.220 (56.39)	2.220 (56.39)	2.220 (56.39)	2.630 (66.80)	2.630 (66.80)	2.630 (66.80)	3.063 (77.79)
ZB	Std. 4.875 (123.83)	4.938 (125.41)	5.063 (128.59)	6.000 (152.40)	6.000 (152.40)	6.313 (160.34)	7.063 (179.39)
	O.S. 5.250 (133.35)	5.313 (134.94)	5.438 (138.11)	6.250 (158.75)	6.250 (158.75)	6.563 (166.69)	7.313 (185.74)

**Cylinder with 07 (MT1) Head Trunnion**

- NFPA (MT1) 7R & 07 Head Trunnion Mount for 7" to 12" bore sizes.
- Series A & J Cylinders rated to 250 PSI air, 400 PSI hydraulic (non-shock).  
 Series EA & EJ Cylinders rated to 250 PSI air only.
- Designed for non-lube service.
- Switches available on all bore sizes.  
 (See pages ACT-1-90 & 91 for ordering information.)
- Head Trunnions are removable.



**Cylinder Order Information**

07 - - - - -

7R

A	Series A Cylinder
EA	Series EA Cylinder
J	Series J Cylinder
EJ	Series EJ Cylinder

Bore and Stroke (write out)

Additional Options – order alphabetically – More on page ACT-1-95	
HR	Case Hardened (45 Rc)
L(- -)	Port Location position 1 standard: L(Head Cap) (specify position 1 thru 4 for head and/or cap)
MS	Metal Rod Scraper
N(- -)	Cushion Adjust Screw Location position 2 standard: N(Head Cap) (specify position 1 thru 4 for head and/or cap)
P(-)*	Non-Standard Port Sizes: [specify port size for P(-H) head only, P(-C) cap only, or P(-) both head & cap]
PS	Magnetic Piston – includes aluminum tube option for J & EJ - Std. for Alum
RS	Rod Stud Type 1 (5/8" – 1 3/4" øRod) Type 2 (5/8" & 1" øRod)
RX	Rod Extensions (specify length of additional rod extension)
SC	Single Acting Spring Extend (Cap End)–See page ACT-1-86
SR	Single Acting Spring Retract (Rod End)–See page ACT-1-86
SS	303 Stainless Steel (Hard Chrome Plated)
ST(-C)	Stop Tube (Cap End) (specify stop tube length)
ST(-R)	Stop Tube (Rod End) (specify stop tube length)
T	Special Rod Threads (specify rod thread)
TX	Thread Extensions (specify length of thread extension)
V	Viton® Seals

Mounting Options	
01	Side Tapped (MS4)
03	Head Rectangular Flange (MF1)
03	Head Square (ME3)–7" to 12" Bores
04	Cap Rectangular Flange (MF2)
04	Cap Square (ME4)–7" to 12" Bores
05	Basic Cylinder No Mounting (MX0)
06	Both Ends (4) Tie Rods Ext. (MX1)
6B	Both Ends (2) Tie Rods Ext. (MX4)
6C	Cap Tie Rods Ext. (MX2)
6R	Head Tie Rods Ext. (MX3)
<b>7R</b>	<b>Removable Head Trunnion (MT1) - A &amp; EA</b>
<b>07</b>	<b>Head Trunnion (MT1) - J &amp; EJ</b>
8R	Cap Trunnion (MT2) - A & EA
08	Cap Trunnion (MT2) - J & EJ
09	Side Lugs (MS2)
10	Center Trunnion (MT4)
11	Side End Angles (MS1)
12	Cap Fixed Clevis (MP1)
15	Side End Lugs (MS7)
16	Sleeve Nut Construction (Universal)
20	Head Square Flange (MF5)
21	Cap Square Flange (MF6)
22	Detachable Cap Clevis (MP2)
32	Cap Fixed Eye (MP3)
42	Detachable Cap Eye (MP4)
52	Spherical Bearing
60	Base Bar (Not NFPA - A & EA Only)

Cushion in Head	
3	None
5 <sup>1</sup>	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion
<sup>1</sup> Standard with EA & EJ	

Cushion in Cap	
3	None
5 <sup>1</sup>	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion
<sup>1</sup> Standard with EA & EJ	

Piston Rod Threads Type	
1	Small Male (Solid)
2	Intermediate Thread Male (Solid)
3	Female
6	Full Thread Male (Solid)
7	Plain Rod End

Piston Rod Diameters	
A**	5/8" Standard on 1 1/2", 2", 2 1/2"
B**	1" Standard on 3 1/4", 4", 5" Oversized on 1 1/2", 2", 2 1/2"
C**	1 3/8" Standard on 6", 7", 8" Oversized on 3 1/4", 4", 5"
D**	1 3/4" Standard on 10" Oversized on 6", 7", 8"
E	2" Standard on 12" Oversized on 10"
F	2 1/2" Oversized on 10", 12"

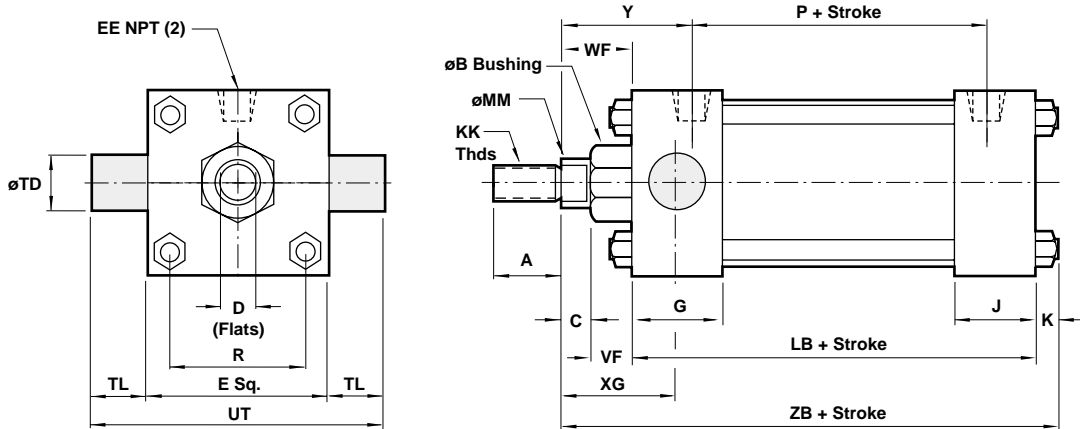
**Port and Cushion Adjustment Positions** (As viewed from rod end:  
 Port standard position 1, Cushion Adjustment standard position 2.)  
 NOTES: A Port and a Cushion Adjustment cannot be in the same position.  
 Port or cushion cannot be located in position 2 or 4 on the head end.

See page ACT-1-96 for complete instructions on how to order cylinders.

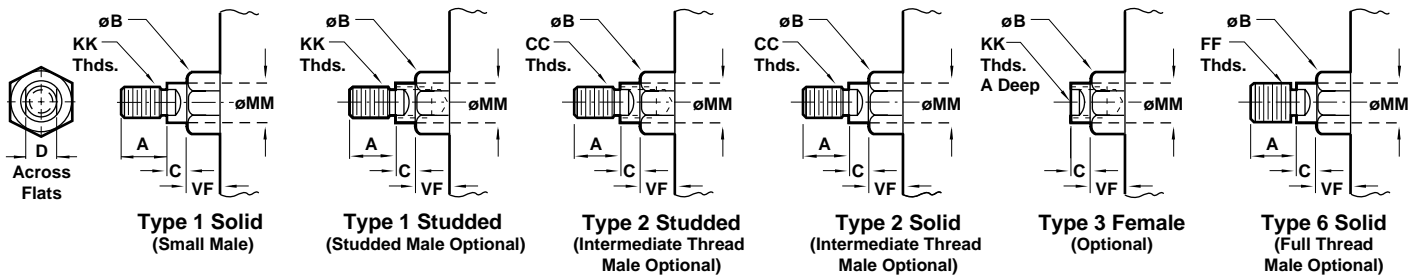
**Series A & EA, NFPA Aluminum Air Cylinder with 7R (MT1) Head Trunnion**  
**Series J & EJ, NFPA Steel Air Cylinder with 07 (MT1) Head Trunnion**



All Dimensions in Inches (mm)



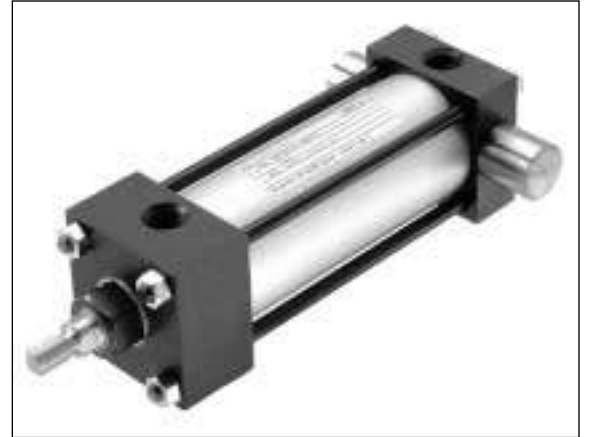
**Standard & Optional Rod Ends**



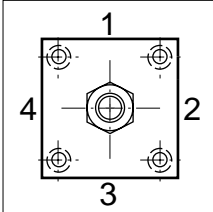
Dimension		7" Bore (177.80)		8" Bore (203.20)		10" Bore (254.00)		12" Bore (304.80)	
ø Rod	Std.	1 3/8"	(34.93)	1 3/8"	(34.93)	1 3/4"	(44.45)	2"	(50.80)
	O.S.	1 3/4"	(44.45)	1 3/4"	(44.45)	2"	(50.80)	2 1/2"	(63.50)
A	Std.	1.625	(41.28)	1.625	(41.28)	2.000	(50.80)	2.250	(57.15)
	O.S.	2.000	(50.80)	2.000	(50.80)	2.250	(57.15)	3.000	(76.20)
B <sup>+0.000</sup> -0.002	Std.	1.999	(50.78)	1.999	(50.78)	2.374	(60.30)	2.624	(66.65)
	O.S.	2.374	(60.30)	2.374	(60.30)	2.624	(66.65)	3.124	(79.35)
C	Std.	.625	(15.88)	.625	(15.88)	.750	(19.05)	.875	(22.23)
	O.S.	.750	(19.05)	.750	(19.05)	.875	(22.23)	1.000	(25.40)
CC	Std.	1 1/4 - 12		1 1/4 - 12		1 1/2 - 12		1 3/4 - 12	
	O.S.	1 1/2 - 12		1 1/2 - 12		1 3/4 - 12		2 1/4 - 12	
D	Std.	1.125	(28.58)	1.125	(28.58)	1.500	(38.10)	1.688	(42.86)
	O.S.	1.500	(38.10)	1.500	(38.10)	1.688	(42.86)	2.063	(52.39)
E		7.500	(190.50)	8.500	(215.90)	10.625	(269.88)	12.750	(323.85)
EE		.750	(19.05)	.75	(19.05)	1.000	(25.40)	1.000	(25.40)
FF	Std.	1 3/8 - 12		1 3/8 - 12		1 3/4 - 12		2 - 12	
	O.S.	1 3/4 - 12		1 3/4 - 12		2 - 12		2 1/2 - 12	
G		2.000	(50.80)	2.000	(50.80)	2.250	(57.15)	2.250	(57.15)
J		1.500	(38.10)	1.500	(38.10)	2.000	(50.80)	2.000	(50.80)
K		.563	(14.29)	.563	(14.29)	.688	(17.46)	.688	(17.46)
KK	Std.	1 - 14		1 - 14		1 1/4 - 12		1 1/2 - 12	
	O.S.	1 1/4 - 12		1 1/4 - 12		1 1/2 - 12		1 7/8 - 12	
LB		5.125	(130.18)	5.125	(130.18)	6.375	(161.93)	6.875	(174.63)
MM	Std.	1.375	(34.93)	1.375	(34.93)	1.750	(44.45)	2.000	(50.80)
	O.S.	1.750	(44.45)	1.750	(44.45)	2.000	(50.80)	2.500	(63.50)
P		3.250	(82.55)	3.250	(82.55)	4.125	(104.78)	4.625	(117.48)
R		5.730	(145.54)	6.435	(163.44)	7.969	(202.41)	9.406	(238.92)
TD <sup>+0.000</sup> -0.001		1.375	(34.93)	1.375	(34.93)	1.750	(44.45)	1.750	(44.45)
TL		1.375	(34.93)	1.375	(34.93)	1.750	(44.45)	1.750	(44.45)
UT		10.250	(260.35)	11.250	(285.75)	14.125	(358.78)	16.250	(412.75)
VF	Std.	1.000	(25.40)	1.000	(25.40)	1.125	(28.58)	1.125	(28.58)
	O.S.	1.125	(28.58)	1.125	(28.58)	1.125	(28.58)	1.250	(31.75)
WF	Std.	1.625	(41.28)	1.625	(41.28)	1.875	(47.63)	2.000	(50.80)
	O.S.	1.875	(47.63)	1.875	(47.63)	2.000	(50.80)	2.250	(57.15)
XG	Std.	2.625	(66.68)	2.625	(66.68)	3.000	(76.20)	3.125	(79.38)
	O.S.	2.875	(73.03)	2.875	(73.03)	3.125	(79.38)	3.375	(85.73)
Y	Std.	2.813	(71.44)	2.813	(71.44)	3.125	(79.38)	3.250	(82.55)
	O.S.	3.063	(77.79)	3.063	(77.79)	3.250	(82.55)	3.500	(88.90)
ZB	Std.	7.313	(185.74)	7.313	(185.74)	8.938	(227.01)	9.563	(242.89)
	O.S.	7.563	(192.09)	7.563	(192.09)	9.063	(230.19)	9.813	(249.24)

**Cylinder with 08 (MT2) Cap Trunnion**

- NFPA (MT2) 8R & 08 Cap Trunnion Mount for 1-1/2" to 6" bore sizes.
- Series A & J Cylinders rated to 250 PSI air, 400 PSI hydraulic (non-shock). Series EA & EJ Cylinders rated to 250 PSI air only.
- Designed for non-lube service.
- Switches available on all bore sizes. (See pages ACT-1-90 & 91 for ordering information.)
- Cap Trunnions are removable.



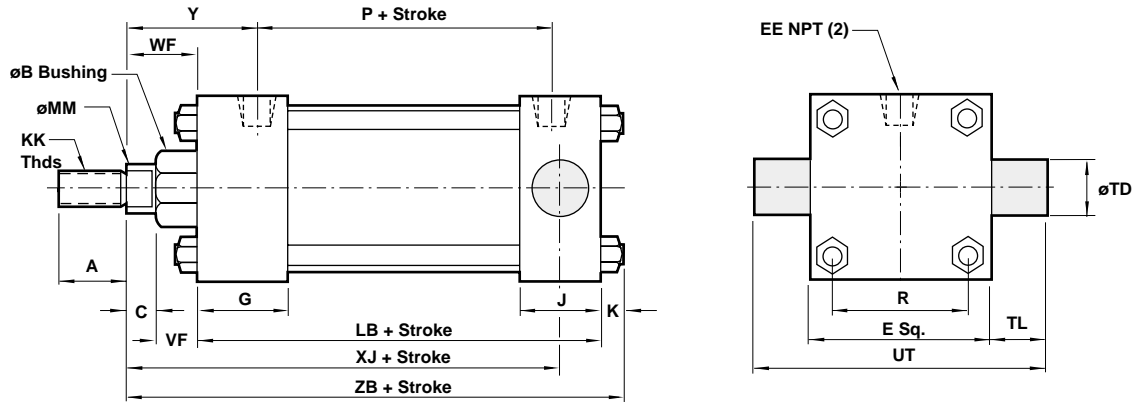
**Cylinder Order Information**

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<p><b>See page ACT-1-96 for complete instructions on how to order cylinders.</b></p>																																																																																																
<p><b>Port and Cushion Adjustment Positions</b> (As viewed from rod end: Port standard position 1, Cushion Adjustment standard position 2.)          NOTEA: A Port and a Cushion Adjustment cannot be in the same position.          Port or cushion cannot be located in position 2 or 4 on the cap end.</p>																																																																																																
<p>** A &amp; EA uses A-D only.</p>																																																																																																

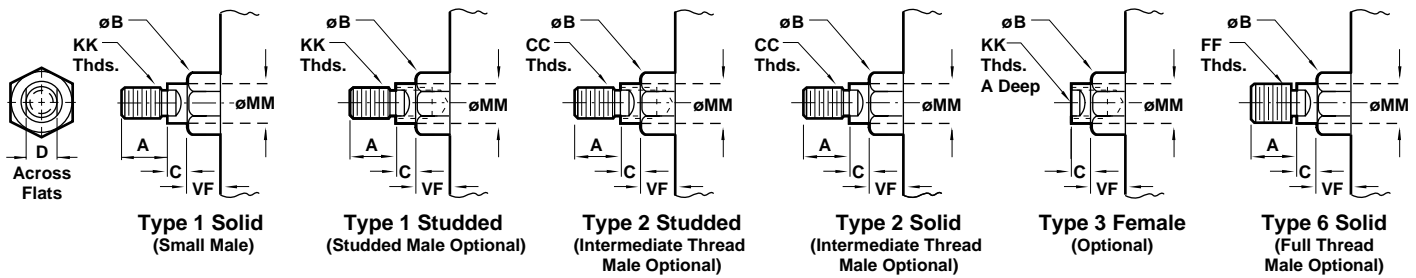
**Series A & EA, NFPA Aluminum Air Cylinders with 8R (MT2) Cap Trunnion**  
**Series J & EJ, NFPA Steel Air Cylinders with 08 (MT2) Cap Trunnion**



All Dimensions in Inches (mm)



**Standard & Optional Rod Ends**



Dimension	1 1/2" Bore (38.10)	2" Bore (50.80)	2 1/2" Bore (63.50)	3 1/4" Bore (82.55)	4" Bore (101.60)	5" Bore (127.00)	6" Bore (152.40)
ø Rod	Std. 5/8" (15.88)	5/8" (15.88)	5/8" (15.88)	1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)
	O.S. 1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/4" (44.45)
A	Std. .750 (19.05)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)
	O.S. 1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)
B +.000 -.002	Std. 1.124 (28.55)	1.124 (28.55)	1.124 (28.55)	1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)
	O.S. 1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)	1.999 (50.78)	1.999 (50.78)	2.374 (60.30)
C	Std. .375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)
	O.S. .500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)
CC	Std. 1/2 - 20	1/2 - 20	1/2 - 20	7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12
	O.S. 7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12	1 1/4 - 12	1 1/4 - 12	1 1/2 - 12
D	Std. .500 (12.70)	.500 (12.70)	.500 (12.70)	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.125 (28.58)
	O.S. .875 (22.23)	.875 (22.23)	.875 (22.23)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)
E	2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)	5.500 (139.70)	6.500 (165.10)
EE	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)
FF	Std. 5/8 - 18	5/8 - 18	5/8 - 18	1 - 14	1 - 14	1 - 14	1 3/8 - 12
	O.S. 1 - 14	1 - 14	1 - 14	1 3/8 - 12	1 3/8 - 12	1 3/8 - 12	1 3/4 - 12
G	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)	2.000 (50.80)
J	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)
K	.250 (6.35)	.313 (7.94)	.313 (7.94)	.375 (9.53)	.375 (9.53)	.438 (11.11)	.438 (11.11)
KK	Std. 7/16 - 20	7/16 - 20	7/16 - 20	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14
	O.S. 3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14	1 - 14	1 1/4 - 12
LB	3.625 (92.08)	3.625 (92.08)	3.750 (95.25)	4.250 (107.95)	4.250 (107.95)	4.500 (114.30)	5.000 (127.00)
MM	Std. .625 (15.88)	.625 (15.88)	.625 (15.88)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)
	O.S. 1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.750 (44.45)
P	2.340 (59.44)	2.340 (59.44)	2.470 (62.74)	2.690 (68.33)	2.690 (68.33)	2.940 (74.68)	3.125 (79.38)
R	1.428 (36.27)	1.838 (46.68)	2.192 (55.67)	2.758 (70.05)	3.323 (84.40)	4.101 (104.16)	4.879 (123.92)
TD +.000 -.001	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)
TL	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)
UT	4.000 (101.60)	4.500 (114.30)	5.000 (127.00)	5.750 (146.05)	6.500 (165.10)	7.500 (190.50)	9.250 (234.95)
VF	Std. .625 (15.88)	.625 (15.88)	.625 (15.88)	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)
	O.S. .875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)
WF	Std. 1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)
	O.S. 1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	1.875 (47.63)
XJ	Std. 4.125 (104.78)	4.125 (104.78)	4.250 (107.95)	5.000 (127.00)	5.000 (127.00)	5.250 (133.35)	5.875 (149.23)
	O.S. 4.500 (114.30)	4.500 (114.30)	4.625 (117.48)	5.250 (133.35)	5.250 (133.35)	5.500 (139.70)	6.125 (155.58)
Y	Std. 1.840 (46.74)	1.840 (46.74)	1.840 (46.74)	2.380 (60.45)	2.380 (60.45)	2.380 (60.45)	2.813 (71.44)
	O.S. 2.220 (56.39)	2.220 (56.39)	2.220 (56.39)	2.630 (66.80)	2.630 (66.80)	2.630 (66.80)	3.063 (77.79)
ZB	Std. 4.875 (123.83)	4.938 (125.41)	5.063 (128.59)	6.000 (152.40)	6.000 (152.40)	6.313 (160.34)	7.063 (179.39)
	O.S. 5.250 (133.35)	5.313 (134.94)	5.438 (138.11)	6.250 (158.75)	6.250 (158.75)	6.563 (166.69)	7.313 (185.74)

Cylinder with 08 (MT2) Cap Trunnion

- NFPA (MT2) 8R & 08 Cap Trunnion Mount for 7" to 12" bore sizes.
- Series A & J Cylinders rated to 250 PSI air, 400 PSI hydraulic (non-shock). Series EA & EJ Cylinders rated to 250 PSI air only.
- Designed for non-lube service.
- Switches available on all bore sizes. (See pages ACT-1-90 & 91 for ordering information.)
- Cap Trunnions are removable.



Cylinder Order Information

08 -  
8R

A	Series A Cylinder
EA	Series EA Cylinder
J	Series J Cylinder
EJ	Series EJ Cylinder

Mounting Options	
01	Side Tapped (MS4)
03	Head Rectangular Flange (MF1)
03	Head Square (ME3)-7" to 12" Bores
04	Cap Rectangular Flange (MF2)
04	Cap Square (ME4)-7" to 12" Bores
05	Basic Cylinder No Mounting (MX0)
06	Both Ends (4) Tie Rods Ext. (MX1)
6B	Both Ends (2) Tie Rods Ext. (MX4)
6C	Cap Tie Rods Ext. (MX2)
6R	Head Tie Rods Ext. (MX3)
7R	Removable Head Trunnion (MT1) - A & EA
07	Head Trunnion (MT1) - J & EJ
<b>8R</b>	<b>Removable Cap Trunnion (MT2) - A &amp; EA</b>
<b>08</b>	<b>Cap Trunnion (MT2) - J &amp; EJ</b>
09	Side Lugs (MS2)
10	Center Trunnion (MT4)
11	Side End Angles (MS1)
12	Cap Fixed Clevis (MP1)
15	Side End Lugs (MS7)
16	Sleeve Nut Construction (Universal)
20	Head Square Flange (MF5)
21	Cap Square Flange (MF6)
22	Detachable Cap Clevis (MP2)
32	Cap Fixed Eye (MP3)
42	Detachable Cap Eye (MP4)
52	Spherical Bearing
60	Base Bar (Not NFPA - A & EA Only)

Cushion in Head	
3	None
5 <sup>1</sup>	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

<sup>1</sup>Standard with EA & EJ

Cushion in Cap	
3	None
5 <sup>1</sup>	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

<sup>1</sup>Standard with EA & EJ

See page ACT-1-96 for complete instructions on how to order cylinders.

Bore and Stroke (write out)

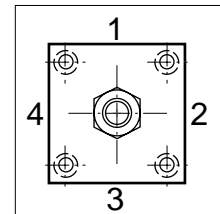
Additional Options – order alphabetically – More on page ACT-1-95	
HR	Case Hardened (45 Rc)
L(-)	Port Location position 1 standard: L(Head Cap) (specify position 1 thru 4 for head and/or cap)
MS	Metal Rod Scraper
N(-)	Cushion Adjust Screw Location position 2 standard: N(Head Cap) (specify position 1 thru 4 for head and/or cap)
P(-)*	Non-Standard Port Sizes: [specify port size for P(-H) head only, P(-C) cap only, or P(-) both head & cap]
PS	Magnetic Piston – includes aluminum tube option for J & EJ - Std. for Alum
RS	Rod Stud Type 1 (5/8" – 1 3/4" øRod) Type 2 (5/8" & 1" øRod)
RX	Rod Extensions (specify length of additional rod extension)
SC	Single Acting Spring Extend (Cap End)–See page ACT-1-86
SR	Single Acting Spring Retract (Rod End)–See page ACT-1-86
SS	303 Stainless Steel (Hard Chrome Plated)
ST(-C)	Stop Tube (Cap End) (specify stop tube length)
ST(-R)	Stop Tube (Rod End) (specify stop tube length)
T	Special Rod Threads (specify rod thread)
TX	Thread Extensions (specify length of thread extension)
V	Viton® Seals

\*1 1/2", 2", 2 1/2" bore cylinders have 3/8" NPT Standard, 1/2" NPT oversize.  
 3 1/4", 4", 5" bore cylinders have 1/2" NPT Standard, 3/4" NPT oversize.  
 This will add 1/8" to the overall cylinder length.

Piston Rod Threads Type	
1	Small Male (Solid)
2	Intermediate Thread Male (Solid)
3	Female
6	Full Thread Male (Solid)
7	Plain Rod End

Piston Rod Diameters		
A**	5/8"	Standard on 1 1/2", 2", 2 1/2"
B**	1"	Standard on 3 1/4", 4", 5" Oversized on 1 1/2", 2", 2 1/2"
C**	1 3/8"	Standard on 6", 7", 8" Oversized on 3 1/4", 4", 5"
D**	1 3/4"	Standard on 10" Oversized on 6", 7", 8"
E	2"	Standard on 12" Oversized on 10"
F	2 1/2"	Oversized on 10", 12"

\*\* A & EA uses A-D only.



Port and Cushion Adjustment

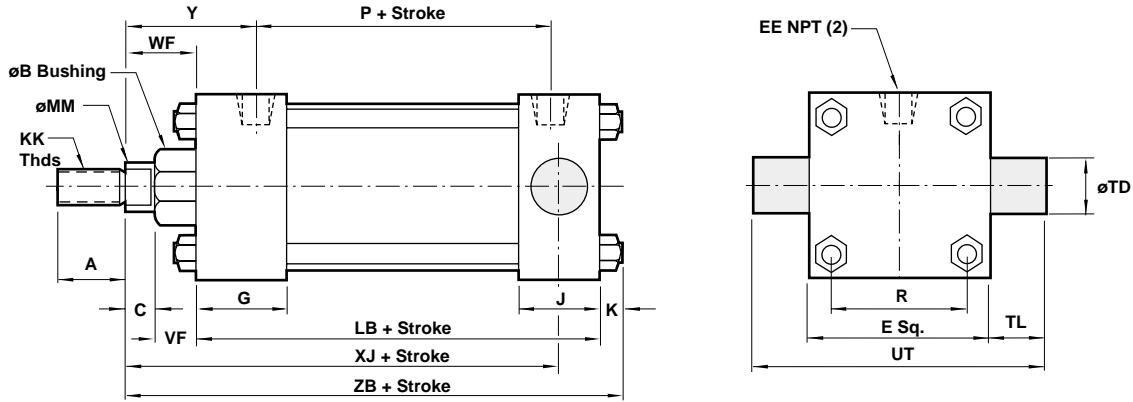
Positions (As viewed from rod end: Port standard position 1, Cushion Adjustment standard position 2.)

NOTES: A Port and a Cushion Adjustment cannot be in the same position. Port or cushion cannot be located in position 2 or 4 on the cap end.

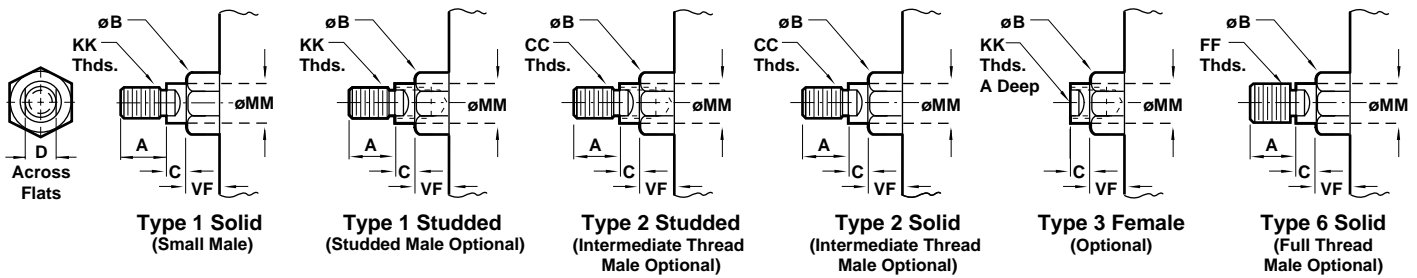
**Series A & EA, NFPA Aluminum Air Cylinders with 8R (MT2) Cap Trunnion**  
**Series J & EJ, NFPA Steel Air Cylinders with 08 (MT2) Cap Trunnion**



All Dimensions in Inches (mm)



**Standard & Optional Rod Ends**



Dimension		7" Bore (177.80)	8" Bore (203.20)	10" Bore (254.00)	12" Bore (304.80)
ø Rod	Std.	1 3/8" (34.93)	1 3/8" (34.93)	1 3/4" (44.45)	2" (50.80)
	O.S.	1 3/4" (44.45)	1 3/4" (44.45)	2" (50.80)	2 1/2" (63.50)
A	Std.	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)	2.250 (57.15)
	O.S.	2.000 (50.80)	2.000 (50.80)	2.250 (57.15)	3.000 (76.20)
B +.000 -.002	Std.	1.999 (50.78)	1.999 (50.78)	2.374 (60.30)	2.624 (66.65)
	O.S.	2.374 (60.30)	2.374 (60.30)	2.624 (66.65)	3.124 (79.35)
C	Std.	.625 (15.88)	.625 (15.88)	.750 (19.05)	.875 (22.23)
	O.S.	.750 (19.05)	.750 (19.05)	.875 (22.23)	1.000 (25.40)
CC	Std.	1 1/4 - 12	1 1/4 - 12	1 1/2 - 12	1 3/4 - 12
	O.S.	1 1/2 - 12	1 1/2 - 12	1 3/4 - 12	2 1/4 - 12
D	Std.	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)	1.688 (42.86)
	O.S.	1.500 (38.10)	1.500 (38.10)	1.688 (42.86)	2.063 (52.39)
E		7.500 (190.50)	8.500 (215.90)	10.625 (269.88)	12.750 (323.85)
EE		.750 (19.05)	.750 (19.05)	1.000 (25.40)	1.000 (25.40)
FF	Std.	1 3/8 - 12	1 3/8 - 12	1 3/4 - 12	2 - 12
	O.S.	1 3/4 - 12	1 3/4 - 12	2 - 12	2 1/2 - 12
G		2.000 (50.80)	2.000 (50.80)	2.250 (57.15)	2.250 (57.15)
J		1.500 (38.10)	1.500 (38.10)	2.000 (50.80)	2.000 (50.80)
K		.563 (14.29)	.563 (14.29)	.688 (17.46)	.688 (17.46)
KK	Std.	1 - 14	1 - 14	1 1/4 - 12	1 1/2 - 12
	O.S.	1 1/4 - 12	1 1/4 - 12	1 1/2 - 12	1 7/8 - 12
LB		5.125 (130.18)	5.125 (130.18)	6.375 (161.93)	6.875 (174.63)
MM	Std.	1.375 (34.93)	1.375 (34.93)	1.750 (44.45)	2.000 (50.80)
	O.S.	1.750 (44.45)	1.750 (44.45)	2.000 (50.80)	2.500 (63.50)
P		3.250 (82.55)	3.250 (82.55)	4.125 (104.78)	4.625 (117.48)
R		5.730 (145.54)	6.435 (163.44)	7.969 (202.41)	9.406 (238.92)
TD +.000 -.001		1.375 (34.93)	1.375 (34.93)	1.750 (44.45)	1.750 (44.45)
TL		1.375 (34.93)	1.375 (34.93)	1.750 (44.45)	1.750 (44.45)
UT		10.250 (260.35)	11.250 (285.75)	14.125 (358.78)	16.250 (412.75)
VF	Std.	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)	1.125 (28.58)
	O.S.	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.250 (31.75)
WF	Std.	1.625 (41.28)	1.625 (41.28)	1.875 (47.63)	2.000 (50.80)
	O.S.	1.875 (47.63)	1.875 (47.63)	2.000 (50.80)	2.250 (57.15)
XJ	Std.	6.000 (152.40)	6.000 (152.40)	7.250 (184.15)	7.875 (200.03)
	O.S.	6.250 (158.75)	6.250 (158.75)	7.375 (187.33)	8.125 (206.38)
Y	Std.	2.813 (71.44)	2.813 (71.44)	3.125 (79.38)	3.250 (82.55)
	O.S.	3.063 (77.79)	3.063 (77.79)	3.250 (82.55)	3.500 (88.90)
ZB	Std.	7.313 (185.74)	7.313 (185.74)	8.938 (227.01)	9.563 (242.89)
	O.S.	7.563 (192.09)	7.563 (192.09)	9.063 (230.19)	9.813 (249.24)

**Cylinder with 09 (MS2) Side Lug**

- NFPA (MS2) 09 Side Lug Mount for 1-1/2" to 6" bore sizes.
- Series A & J Cylinders rated to 250 PSI air, 400 PSI hydraulic (non-shock). Series EA & EJ Cylinders rated to 250 PSI air only.
- Designed for non-lube service.
- Switches available on all bore sizes. (See pages ACT-1-90 & 91 for ordering information.)



**Cylinder Order Information**

**09** - - - - -

A	Series A Cylinder
EA	Series EA Cylinder
J	Series J Cylinder
EJ	Series EJ Cylinder

Mounting Options	
01	Side Tapped (MS4)
03	Head Rectangular Flange (MF1)
03	Head Square (ME3)-7" to 12" Bores
04	Cap Rectangular Flange (MF2)
04	Cap Square (ME4)-7" to 12" Bores
05	Basic Cylinder No Mounting (MX0)
06	Both Ends (4) Tie Rods Ext. (MX1)
6B	Both Ends (2) Tie Rods Ext. (MX4)
6C	Cap Tie Rods Ext. (MX2)
6R	Head Tie Rods Ext. (MX3)
7R	Removable Head Trunion (MT1) - A & EA
07	Head Trunion (MT1) - J & EJ
8R	Cap Trunion (MT2) - A & EA
08	Cap Trunion (MT2) - J & EJ
<b>09</b>	<b>Side Lugs (MS2)</b>
10	Center Trunion (MT4)
11	Side End Angles (MS1)
12	Cap Fixed Clevis (MP1)
15	Side End Lugs (MS7)
16	Sleeve Nut Construction (Universal)
20	Head Square Flange (MF5)
21	Cap Square Flange (MF6)
22	Detachable Cap Clevis (MP2)
32	Cap Fixed Eye (MP3)
42	Detachable Cap Eye (MP4)
52	Spherical Bearing
60	Base Bar (Not NFPA - A & EA Only)

Cushion in Head	
3	None
5 <sup>1</sup>	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

<sup>1</sup>Standard with EA & EJ

Cushion in Cap	
3	None
5 <sup>1</sup>	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

<sup>1</sup>Standard with EA & EJ

**See page ACT-1-96 for complete instructions on how to order cylinders.**

Bore and Stroke (write out)

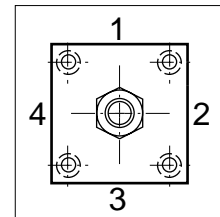
Additional Options – order alphabetically – More on page ACT-1-95	
HR	Case Hardened (45 Rc)
L(- -)	Port Location position 1 standard: L(Head Cap) (specify position 1 thru 4 for head and/or cap)
MS	Metal Rod Scraper
N(- -)	Cushion Adjust Screw Location position 2 standard: N(Head Cap) (specify position 1 thru 4 for head and/or cap)
P(-)*	Non-Standard Port Sizes: [specify port size for P(-H) head only, P(-C) cap only, or P(-) both head & cap]
PS	Magnetic Piston – includes aluminum tube option for J & EJ - Std. for Alum
RS	Rod Stud Type 1 (5/8" – 1 3/4" øRod) Type 2 (5/8" & 1" øRod)
RX	Rod Extensions (specify length of additional rod extension)
SC	Single Acting Spring Extend (Cap End)–See page ACT-1-86
SR	Single Acting Spring Retract (Rod End)–See page ACT-1-86
SS	303 Stainless Steel (Hard Chrome Plated)
ST(-C)	Stop Tube (Cap End) (specify stop tube length)
ST(-R)	Stop Tube (Rod End) (specify stop tube length)
T	Special Rod Threads (specify rod thread)
TK	Thrust Key
TX	Thread Extensions (specify length of thread extension)
V	Viton® Seals

\*1 1/2", 2", 2 1/2" bore cylinders have 3/8" NPT Standard, 1/2" NPT oversize.  
 3 1/4", 4", 5" bore cylinders have 1/2" NPT Standard, 3/4" NPT oversize.  
 This will add 1/8" to the overall cylinder length.

Piston Rod Threads Type	
1	Small Male (Solid)
2	Intermediate Thread Male (Solid)
3	Female
6	Full Thread Male (Solid)
7	Plain Rod End

Piston Rod Diameters		
A**	5/8"	Standard on 1 1/2", 2", 2 1/2"
B**	1"	Standard on 3 1/4", 4", 5" Oversized on 1 1/2", 2", 2 1/2"
C**	1 3/8"	Standard on 6", 7", 8" Oversized on 3 1/4", 4", 5"
D**	1 3/4"	Standard on 10" Oversized on 6", 7", 8"
E	2"	Standard on 12" Oversized on 10"
F	2 1/2"	Oversized on 10", 12"

\*\* A & EA uses A-D only.



**Port and Cushion Adjustment**

**Positions** (As viewed from rod end:

Port standard position 1, Cushion Adjustment standard position 2.)

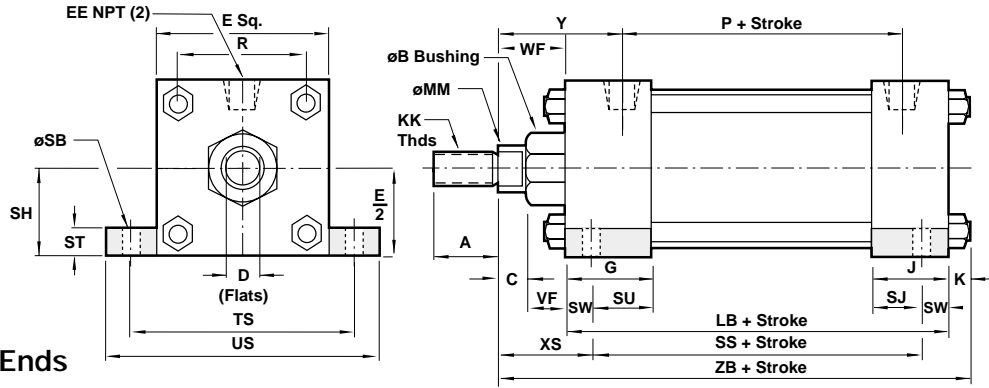
NOTE: A Port and a Cushion Adjustment cannot be in the same position.



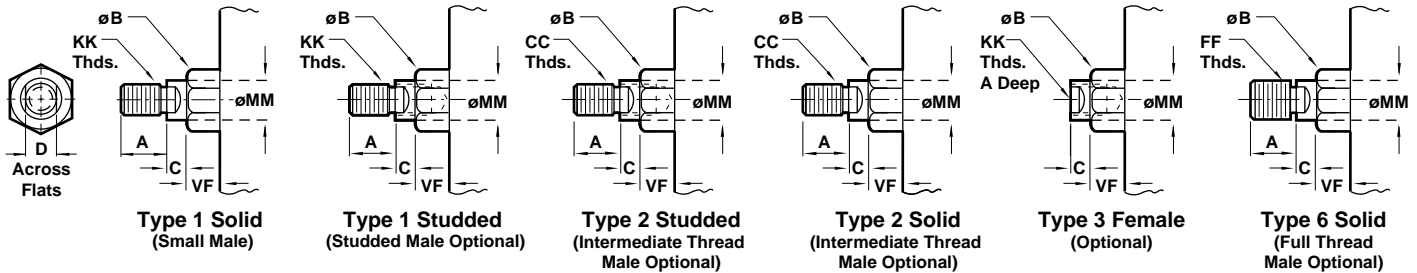
**Series A & EA, NFPA Aluminum Air Cylinders with 09 (MS2) Side Lugs**  
**Series J & EJ, NFPA Steel Air Cylinders with 09 (MS2) Side Lugs**



All Dimensions in Inches (mm)



**Standard & Optional Rod Ends**



Dimension	1 1/2" Bore (38.10)	2" Bore (50.80)	2 1/2" Bore (63.50)	3 1/4" Bore (82.55)	4" Bore (101.60)	5" Bore (127.00)	6" Bore (152.40)
ø Rod	Std. 5/8" (15.88)	5/8" (15.88)	5/8" (15.88)	1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)
	O.S. 1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/4" (44.45)
A	Std. .750 (19.05)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)
	O.S. 1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)
B	Std. 1.124 (28.55)	1.124 (28.55)	1.124 (28.55)	1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)
	O.S. 1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)	1.999 (50.78)	1.999 (50.78)	2.374 (60.30)
C	Std. .375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)
	O.S. .500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)
CC	Std. 1/2 - 20	1/2 - 20	1/2 - 20	7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12
	O.S. 7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12	1 1/4 - 12	1 1/4 - 12	1 1/2 - 12
D	Std. .500 (12.70)	.500 (12.70)	.500 (12.70)	.813 (20.64)	.813 (20.64)	.813 (20.64)	1.125 (28.58)
	O.S. .813 (20.64)	.813 (20.64)	.813 (20.64)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)
E	2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)	5.500 (139.70)	6.500 (165.10)
EE	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)
FF	Std. 5/8 - 18	5/8 - 18	5/8 - 18	1 - 14	1 - 14	1 - 14	1 3/8 - 12
	O.S. 1 - 14	1 - 14	1 - 14	1 3/8 - 12	1 3/8 - 12	1 3/8 - 12	1 3/4 - 12
G	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)	2.000 (50.80)
J	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)
K	.250 (6.35)	.313 (7.94)	.313 (7.94)	.375 (9.53)	.375 (9.53)	.438 (11.11)	.438 (11.11)
KK	Std. 7/16 - 20	7/16 - 20	7/16 - 20	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14
	O.S. 3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14	1 - 14	1 1/4 - 12
LB	3.625 (92.08)	3.625 (92.08)	3.750 (95.25)	4.250 (107.95)	4.250 (107.95)	4.500 (114.30)	5.000 (127.00)
MM	Std. .625 (15.88)	.625 (15.88)	.625 (15.88)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)
	O.S. 1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.750 (44.45)
P	2.340 (59.44)	2.340 (59.44)	2.470 (62.74)	2.690 (68.33)	2.690 (68.33)	2.940 (74.68)	3.125 (79.38)
R	1.428 (36.27)	1.838 (46.68)	2.192 (55.67)	2.758 (70.05)	3.323 (84.40)	4.101 (104.16)	4.879 (123.92)
SB	.438 (11.11)	.438 (11.11)	.438 (11.11)	.563 (14.29)	.563 (14.29)	.813 (20.64)	.813 (20.64)
SH	1.000 (25.40)	1.250 (31.75)	1.500 (38.10)	1.875 (47.63)	2.250 (57.15)	2.750 (69.85)	3.250 (82.55)
SJ	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)	.750 (19.05)	.813 (20.64)	.813 (20.64)
SS	2.875 (73.03)	2.875 (73.03)	3.000 (76.20)	3.250 (82.55)	3.250 (82.55)	3.125 (79.38)	3.625 (92.08)
ST	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)	1.000 (25.40)	1.000 (25.40)
SU	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.250 (31.75)	1.250 (31.75)	1.063 (26.99)	1.313 (33.34)
SW	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.688 (17.46)	.688 (17.46)
TS	2.750 (69.85)	3.250 (82.55)	3.750 (95.25)	4.750 (120.65)	5.500 (139.70)	6.875 (174.63)	7.875 (200.03)
US	3.500 (88.90)	4.000 (101.60)	4.500 (114.30)	5.750 (146.05)	6.500 (165.10)	8.250 (209.55)	9.250 (234.95)
VF	Std. .625 (15.88)	.625 (15.88)	.625 (15.88)	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)
	O.S. .875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)
WF	Std. 1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)
	O.S. 1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	1.875 (47.63)
XS	Std. 1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.875 (47.63)	1.875 (47.63)	2.062 (52.37)	2.313 (58.74)
	O.S. 1.750 (44.45)	1.750 (44.45)	1.750 (44.45)	2.125 (53.98)	2.125 (53.98)	2.313 (58.74)	2.562 (65.07)
Y	Std. 1.840 (46.74)	1.840 (46.74)	1.840 (46.74)	2.380 (60.45)	2.380 (60.45)	2.380 (60.45)	2.813 (71.44)
	O.S. 2.220 (56.39)	2.220 (56.39)	2.220 (56.39)	2.630 (66.80)	2.630 (66.80)	2.630 (66.80)	3.063 (77.79)
ZB	Std. 4.875 (123.83)	4.938 (125.41)	5.063 (128.59)	6.000 (152.40)	6.000 (152.40)	6.313 (160.34)	7.063 (179.39)
	O.S. 5.250 (133.35)	5.313 (134.94)	5.438 (138.11)	6.250 (158.75)	6.250 (158.75)	6.563 (166.69)	7.313 (185.74)

**Cylinder with 09 (MS2) Side Lug**

- NFPA (MS2) 09 Side Lug Mount for 7" to 12" bore sizes.
- Series A & J Cylinders rated to 250 PSI air, 400 PSI hydraulic (non-shock). Series EA & EJ Cylinders rated to 250 PSI air only.
- Designed for non-lube service.
- Switches available on all bore sizes. (See pages ACT-1-90 & 91 for ordering information.)



**Cylinder Order Information**

**09** - - - - -

A	Series A Cylinder
EA	Series EA Cylinder
J	Series J Cylinder
EJ	Series EJ Cylinder

Bore and Stroke (write out)

Mounting Options	
01	Side Tapped (MS4)
03	Head Rectangular Flange (MF1)
03	Head Square (ME3)-7" to 12" Bores
04	Cap Rectangular Flange (MF2)
04	Cap Square (ME4)-7" to 12" Bores
05	Basic Cylinder No Mounting (MX0)
06	Both Ends (4) Tie Rods Ext. (MX1)
6B	Both Ends (2) Tie Rods Ext. (MX4)
6C	Cap Tie Rods Ext. (MX2)
6R	Head Tie Rods Ext. (MX3)
7R	Removable Head Trunion (MT1) - A & EA
07	Head Trunion (MT1) - J & EJ
8R	Cap Trunion (MT2) - A & EA
08	Cap Trunion (MT2) - J & EJ
<b>09</b>	<b>Side Lugs (MS2)</b>
10	Center Trunion (MT4)
11	Side End Angles (MS1)
12	Cap Fixed Clevis (MP1)
15	Side End Lugs (MS7)
16	Sleeve Nut Construction (Universal)
20	Head Square Flange (MF5)
21	Cap Square Flange (MF6)
22	Detachable Cap Clevis (MP2)
32	Cap Fixed Eye (MP3)
42	Detachable Cap Eye (MP4)
52	Spherical Bearing
60	Base Bar (Not NFPA - A & EA Only)

Cushion in Head	
3	None
5 <sup>1</sup>	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

<sup>1</sup>Standard with EA & EJ

Cushion in Cap	
3	None
5 <sup>1</sup>	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

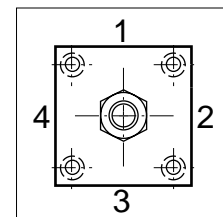
<sup>1</sup>Standard with EA & EJ

Additional Options – order alphabetically – More on page ACT-1-95	
HR	Case Hardened (45 Rc)
L(- -)	Port Location position 1 standard: L(Head Cap) (specify position 1 thru 4 for head and/or cap)
MS	Metal Rod Scraper
N(- -)	Cushion Adjust Screw Location position 2 standard: N(Head Cap) (specify position 1 thru 4 for head and/or cap)
P(-)*	Non-Standard Port Sizes: [specify port size for P(-H) head only, P(-C) cap only, or P(-) both head & cap]
PS	Magnetic Piston – includes aluminum tube option for J & EJ - Std. for Alum
RS	Rod Stud Type 1 (5/8" – 1 3/4" øRod) Type 2 (5/8" & 1" øRod)
RX	Rod Extensions (specify length of additional rod extension)
SC	Single Acting Spring Extend (Cap End)–See page ACT-1-86
SR	Single Acting Spring Retract (Rod End)–See page ACT-1-86
SS	303 Stainless Steel (Hard Chrome Plated)
ST(-C)	Stop Tube (Cap End) (specify stop tube length)
ST(-R)	Stop Tube (Rod End) (specify stop tube length)
T	Special Rod Threads (specify rod thread)
TK	Thrust Key
TX	Thread Extensions (specify length of thread extension)
V	Viton® Seals

\*1 1/2", 2", 2 1/2" bore cylinders have 3/8" NPT Standard, 1/2" NPT oversize.  
 3 1/4", 4", 5" bore cylinders have 1/2" NPT Standard, 3/4" NPT oversize.  
 This will add 1/8" to the overall cylinder length.

Piston Rod Threads Type	
1	Small Male (Solid)
2	Intermediate Thread Male (Solid)
3	Female
6	Full Thread Male (Solid)
7	Plain Rod End

Piston Rod Diameters		
A**	5/8"	Standard on 1 1/2", 2", 2 1/2"
B**	1"	Standard on 3 1/4", 4", 5" Oversized on 1 1/2", 2", 2 1/2"
C**	1 3/8"	Standard on 6", 7", 8" Oversized on 3 1/4", 4", 5"
D**	1 3/4"	Standard on 10" Oversized on 6", 7", 8"
E	2"	Standard on 12" Oversized on 10"
F	2 1/2"	Oversized on 10", 12"



**Port and Cushion Adjustment**

**Positions** (As viewed from rod end: Port standard position 1, Cushion Adjustment standard position 2.)

NOTE: A Port and a Cushion Adjustment cannot be in the same position.

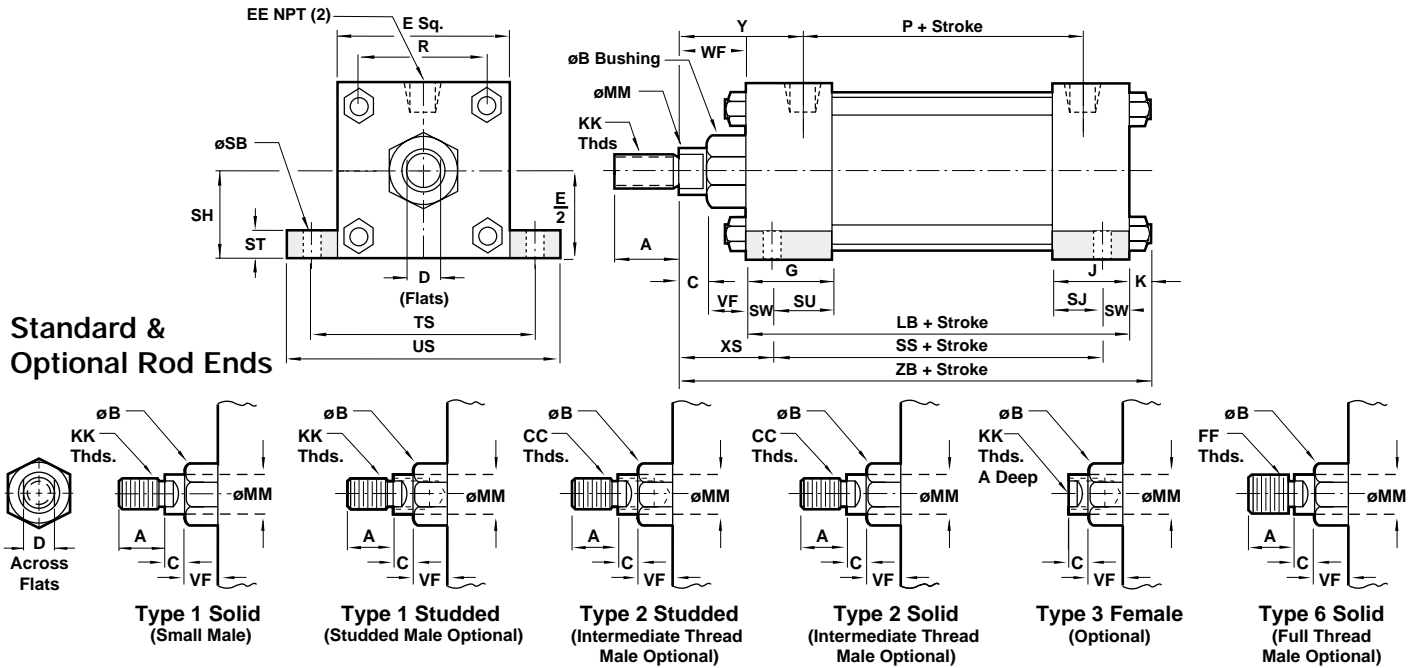
\*\* A & EA uses A-D only.

**See page ACT-1-96 for complete instructions on how to order cylinders.**

Series A & EA, NFPA Aluminum Air Cylinders with 09 (MS2) Side Lugs  
 Series J & EJ, NFPA Steel Air Cylinders with 09 (MS2) Side Lugs



All Dimensions in Inches (mm)



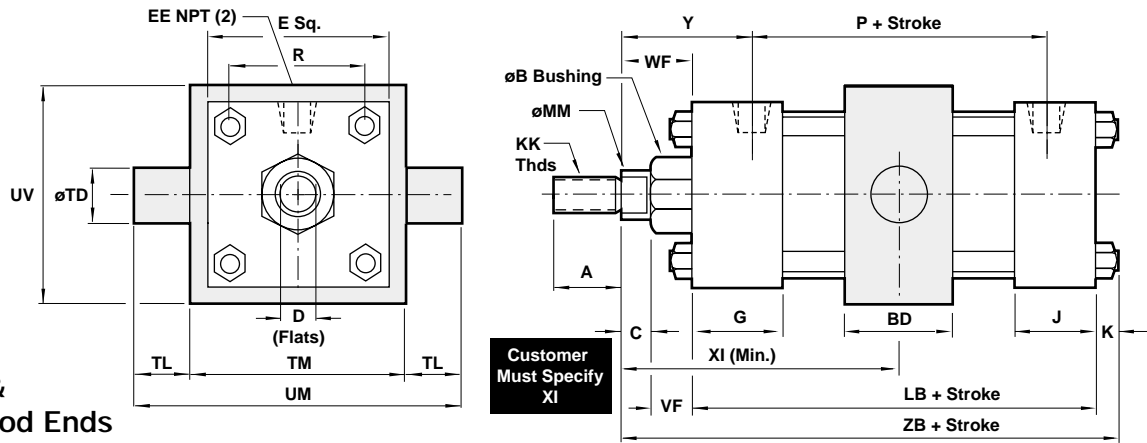
Dimension		7" Bore (177.80)		8" Bore (203.20)		10" Bore (254.00)		12" Bore (304.80)	
ø Rod	Std.	1 3/8"	(34.93)	1 3/8"	(34.93)	1 3/4"	(44.45)	2"	(50.80)
	O.S.	1 3/4"	(44.45)	1 3/4"	(44.45)	2"	(50.80)	2 1/2"	(63.50)
A	Std.	1.625	(41.28)	1.625	(41.28)	2.000	(50.80)	2.250	(57.15)
	O.S.	2.000	(50.80)	2.000	(50.80)	2.250	(57.15)	3.000	(76.20)
B <sup>+0.001</sup> -0.002	Std.	1.999	(50.78)	1.999	(50.78)	2.374	(60.30)	2.624	(66.65)
	O.S.	2.374	(60.30)	2.374	(60.30)	2.624	(66.65)	3.124	(79.35)
C	Std.	.625	(15.88)	.625	(15.88)	.750	(19.05)	.875	(22.23)
	O.S.	.750	(19.05)	.750	(19.05)	.875	(22.23)	1.000	(25.40)
CC	Std.	1 1/4 - 12		1 1/4 - 12		1 1/2 - 12		1 3/4 - 12	
	O.S.	1 1/2 - 12		1 1/2 - 12		1 3/4 - 12		2 1/4 - 12	
D	Std.	1.125	(28.58)	1.125	(28.58)	1.500	(38.10)	1.688	(42.86)
	O.S.	1.500	(38.10)	1.500	(38.10)	1.688	(42.86)	2.063	(52.39)
E		7.500	(190.50)	8.500	(215.90)	10.625	(269.88)	12.750	(323.85)
EE		.750	(19.05)	.750	(19.05)	1.000	(25.40)	1.000	(25.40)
FF	Std.	1 3/8 - 12		1 3/8 - 12		1 3/4 - 12		2 - 12	
	O.S.	1 3/4 - 12		1 3/4 - 12		2 - 12		2 1/2 - 12	
G		2.000	(50.80)	2.000	(50.80)	2.250	(57.15)	2.250	(57.15)
J		1.500	(38.10)	1.500	(38.10)	2.000	(50.80)	2.000	(50.80)
K		.563	(14.29)	.563	(14.29)	.688	(17.46)	.688	(17.46)
KK	Std.	1 - 14		1 - 14		1 1/4 - 12		1 1/2 - 12	
	O.S.	1 1/4 - 12		1 1/4 - 12		1 1/2 - 12		1 7/8 - 12	
LB		5.125	(130.18)	5.125	(130.18)	6.375	(161.93)	6.875	(174.63)
MM	Std.	1.375	(34.93)	1.375	(34.93)	1.750	(44.45)	2.000	(50.80)
	O.S.	1.750	(44.45)	1.750	(44.45)	2.000	(50.80)	2.500	(63.50)
P		3.250	(82.55)	3.250	(82.55)	4.125	(104.78)	4.625	(117.48)
R		5.730	(145.54)	6.442	(163.63)	7.969	(202.41)	9.406	(238.92)
SB		.813	(20.64)	.813	(20.64)	1.063	(26.99)	1.063	(26.99)
SH		3.750	(95.25)	4.250	(107.95)	5.313	(134.94)	6.375	(161.93)
SJ		.813	(20.64)	.813	(20.64)	2.000	(50.80)	2.000	(50.80)
SS		3.750	(95.25)	3.750	(95.25)	4.625	(117.48)	5.125	(130.18)
ST		1.000	(25.40)	1.000	(25.40)	1.250	(31.75)	1.250	(31.75)
SU		1.563	(39.69)	1.563	(39.69)	2.000	(50.80)	2.000	(50.80)
SW		.688	(17.46)	.688	(17.46)	.875	(22.23)	.875	(22.23)
TS		8.875	(225.43)	9.875	(250.83)	12.375	(314.33)	14.500	(368.30)
US		10.250	(260.35)	11.250	(285.75)	14.125	(358.78)	16.250	(412.75)
VF	Std.	1.000	(25.40)	1.000	(25.40)	1.125	(28.58)	1.125	(28.58)
	O.S.	1.125	(28.58)	1.125	(28.58)	1.125	(28.58)	1.250	(31.75)
WF	Std.	1.625	(41.28)	1.625	(41.28)	1.875	(47.63)	2.000	(50.80)
	O.S.	1.875	(47.63)	1.875	(47.63)	2.000	(50.80)	2.250	(57.15)
XS	Std.	2.313	(58.74)	2.313	(58.74)	2.750	(69.85)	2.875	(73.03)
	O.S.	2.563	(65.09)	2.563	(65.09)	2.875	(73.03)	3.125	(79.38)
Y	Std.	2.813	(71.44)	2.813	(71.44)	3.125	(79.38)	3.250	(82.55)
	O.S.	3.063	(77.79)	3.063	(77.79)	3.250	(82.55)	3.500	(88.90)
ZB	Std.	7.313	(185.74)	7.313	(185.74)	8.938	(227.01)	9.563	(242.89)
	O.S.	7.563	(192.09)	7.563	(192.09)	9.063	(230.19)	9.813	(249.24)



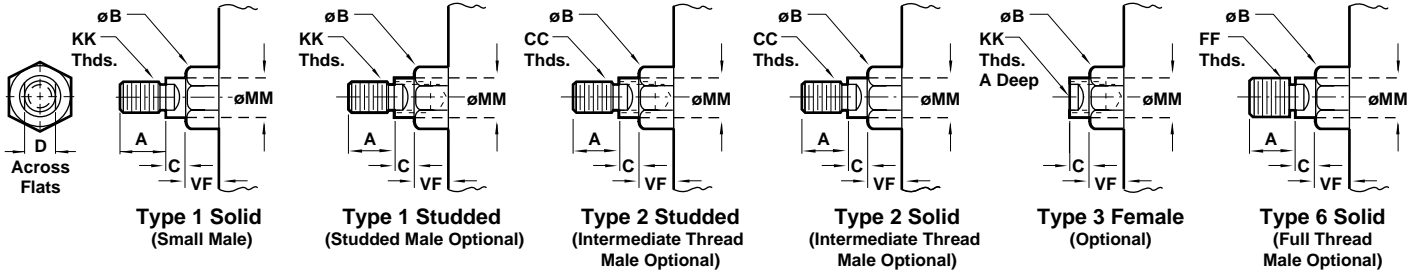
Series A & EA, NFPA Aluminum Air Cylinder 10 (MT4) with Center Trunnion  
 Series J & EJ, NFPA Steel Air Cylinder 10 (MT4) with Center Trunnion



All Dimensions in Inches (mm)



Standard & Optional Rod Ends



Dimension	1 1/2" Bore (38.10)	2" Bore (50.80)	2 1/2" Bore (63.50)	3 1/4" Bore (82.55)	4" Bore (101.60)	5" Bore (127.00)	6" Bore (152.40)
ø Rod	Std. 5/8" (15.88)	5/8" (15.88)	5/8" (15.88)	1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)
	O.S. 1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/4" (44.45)
A	Std. .750 (19.05)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)
	O.S. 1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)
B +.000 -.002	Std. 1.124 (28.55)	1.124 (28.55)	1.124 (28.55)	1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)
	O.S. 1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)	1.999 (50.78)	1.999 (50.78)	2.374 (60.30)
BD	1.250 (31.75)	1.500 (38.10)	1.500 (38.10)	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)	2.500 (63.50)
C	Std. .375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)
	O.S. .500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)
CC	Std. 1/2 - 20	1/2 - 20	1/2 - 20	7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12
	O.S. 7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12	1 1/4 - 12	1 1/4 - 12	1 1/2 - 12
D	Std. .500 (12.70)	.500 (12.70)	.500 (12.70)	.813 (20.64)	.813 (20.64)	.813 (20.64)	1.125 (28.58)
	O.S. .813 (20.64)	.813 (20.64)	.813 (20.64)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)
E	2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)	5.500 (139.70)	6.500 (165.10)
EE	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)
FF	Std. 5/8 - 18	5/8 - 18	5/8 - 18	1 - 14	1 - 14	1 - 14	1 3/8 - 12
	O.S. 1 - 14	1 - 14	1 - 14	1 3/8 - 12	1 3/8 - 12	1 3/8 - 12	1 3/4 - 12
G	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)	2.000 (50.80)
J	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)
K	.250 (6.35)	.313 (7.94)	.313 (7.94)	.375 (9.53)	.375 (9.53)	.438 (11.11)	.438 (11.11)
KK	Std. 7/16 - 20	7/16 - 20	7/16 - 20	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14
	O.S. 3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14	1 - 14	1 1/4 - 12
LB	3.625 (92.08)	3.625 (92.08)	3.750 (95.25)	4.250 (107.95)	4.250 (107.95)	4.500 (114.30)	5.000 (127.00)
MM	Std. .625 (15.88)	.625 (15.88)	.625 (15.88)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)
	O.S. 1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.750 (44.45)
P	2.340 (59.44)	2.340 (59.44)	2.470 (62.74)	2.690 (68.33)	2.690 (68.33)	2.940 (74.68)	3.125 (79.38)
R	1.428 (36.27)	1.838 (46.68)	2.192 (55.67)	2.758 (70.05)	3.323 (84.83)	4.101 (104.16)	4.879 (123.92)
TD +.000 -.001	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)
TL	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)
TM	2.500 (63.50)	3.000 (76.20)	3.500 (88.90)	4.500 (114.30)	5.250 (133.35)	6.250 (158.75)	7.625 (193.68)
UM	4.500 (114.30)	5.000 (127.00)	5.500 (139.70)	6.500 (165.10)	7.250 (184.15)	8.250 (209.55)	10.375 (263.53)
UV	2.500 (63.50)	3.000 (76.20)	3.500 (88.90)	4.250 (107.95)	5.000 (127.00)	6.000 (152.40)	7.000 (177.80)
VF	Std. .625 (15.88)	.625 (15.88)	.625 (15.88)	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)
	O.S. .875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)
WF	Std. 1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)
	O.S. 1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	1.875 (47.63)
XI min.	Std. 3.125 (79.38)	3.250 (82.55)	3.250 (82.55)	4.125 (104.78)	4.125 (104.78)	4.125 (104.78)	4.625 (117.48)
	O.S. 3.500 (88.90)	3.625 (92.08)	3.625 (92.08)	4.375 (111.13)	4.375 (111.13)	4.375 (111.13)	4.875 (123.83)
Y	Std. 1.840 (46.74)	1.840 (46.74)	1.840 (46.74)	2.380 (60.45)	2.380 (60.45)	2.380 (60.45)	2.813 (71.46)
	O.S. 2.220 (56.39)	2.220 (56.39)	2.220 (56.39)	2.630 (66.80)	2.630 (66.80)	2.630 (66.80)	3.063 (77.79)
ZB	Std. 4.875 (123.83)	4.938 (125.41)	5.063 (128.59)	6.000 (152.40)	6.000 (152.40)	6.313 (160.34)	7.063 (179.39)
	O.S. 5.250 (133.35)	5.313 (134.94)	5.438 (138.11)	6.250 (158.75)	6.250 (158.75)	6.563 (166.69)	7.313 (185.74)

**Cylinder with 10 (MT4) Center Trunnion**

- NFPA(MT4) 10 Center Trunnion Mount for 7" to 12" bore sizes.
- Series A & J Cylinders rated to 250 PSI air, 400 PSI hydraulic (non-shock). Series EA & EJ Cylinders rated to 250 PSI air only.
- Designed for non-lube service.
- Switches available on all bore sizes. (See page ACT-1-90 & 91 for ordering information.)



**Cylinder Order Information**

**10** - - - - -

A	Series A Cylinder
EA	Series EA Cylinder
J	Series J Cylinder
EJ	Series EJ Cylinder

Mounting Options	
01	Side Tapped (MS4)
03	Head Rectangular Flange (MF1)
03	Head Square (ME3)– 7" to 12" Bores
04	Cap Rectangular Flange (MF2)
04	Cap Square (ME4)– 7" to 12" Bores
05	Basic Cylinder No Mounting (MX0)
06	Both Ends (4) Tie Rods Ext. (MX1)
6B	Both Ends (2) Tie Rods Ext. (MX4)
6C	Cap Tie Rods Ext. (MX2)
6R	Head Tie Rods Ext. (MX3)
7R	Removable Head Trunnion (MT1) - A & EA
07	Head Trunnion (MT1) - J & EJ
8R	Cap Trunnion (MT2) - A & EA
08	Cap Trunnion (MT2) - J & EJ
09	Side Lugs (MS2)
<b>10</b>	<b>Center Trunnion (MT4)</b>
11	Side End Angles (MS1)
12	Cap Fixed Clevis (MP1)
15	Side End Lugs (MS7)
16	Sleeve Nut Construction (Universal)
20	Head Square Flange (MF5)
21	Cap Square Flange (MF6)
22	Detachable Cap Clevis (MP2)
32	Cap Fixed Eye (MP3)
42	Detachable Cap Eye (MP4)
52	Spherical Bearing
60	Base Bar (Not NFPA - A & EA Only)

Cushion in Head	
3	None
5'	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

\*Standard with EA & EJ

Cushion in Cap	
3	None
5'	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

\*Standard with EA & EJ

Bore and Stroke (write out)	
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Additional Options – order alphabetically – More on page ACT-1-95	
HR	Case Hardened (45 Rc)
L(- -)	Port Location position 1 standard: L(Head Cap) (specify position 1 thru 4 for head and/or cap)
MS	Metal Rod Scraper
N(- -)	Cushion Adjust Screw Location position 2 standard: N(Head Cap) (specify position 1 thru 4 for head and/or cap)
P(-)*	Non-Standard Port Sizes: [specify port size for P(-H) head only, P(-C) cap only, or P(-) both head & cap]
PS	Magnetic Piston – includes aluminum tube option for J & EJ - Std. for Alum
RS	Rod Stud Type 1 (5/8" – 1 3/4" øRod) Type 2 (5/8" & 1" øRod)
RX	Rod Extensions (specify length of additional rod extension)
SC	Single Acting Spring Extend (Cap End)–See page ACT-1-86
SR	Single Acting Spring Retract (Rod End)–See page ACT-1-86
SS	303 Stainless Steel (Hard Chrome Plated)
ST(-C)	Stop Tube (Cap End) (specify stop tube length)
ST(-R)	Stop Tube (Rod End) (specify stop tube length)
T	Special Rod Threads (specify rod thread)
TX	Thread Extensions (specify length of thread extension)
V	Viton® Seals

\*1 1/2", 2", 2 1/2" bore cylinders have 3/8" NPT Standard, 1/2" NPT oversize.  
 3 1/4", 4", 5" bore cylinders have 1/2" NPT Standard, 3/4" NPT oversize.  
 This will add 1/8" to the overall cylinder length.

Piston Rod Threads Type	
1	Small Male (Solid)
2	Intermediate Thread Male (Solid)
3	Female
6	Full Thread Male (Solid)
7	Plain Rod End

Piston Rod Diameters		
A**	5/8"	Standard on 1 1/2", 2", 2 1/2"
B**	1"	Standard on 3 1/4", 4", 5" Oversized on 1 1/2", 2", 2 1/2"
C**	1 3/8"	Standard on 6", 7", 8" Oversized on 3 1/4", 4", 5"
D**	1 3/4"	Standard on 10" Oversized on 6", 7", 8"
E	2"	Standard on 12" Oversized on 10"
F	2 1/2"	Oversized on 10", 12"

1			
4	⊕	2	
	⊕		3

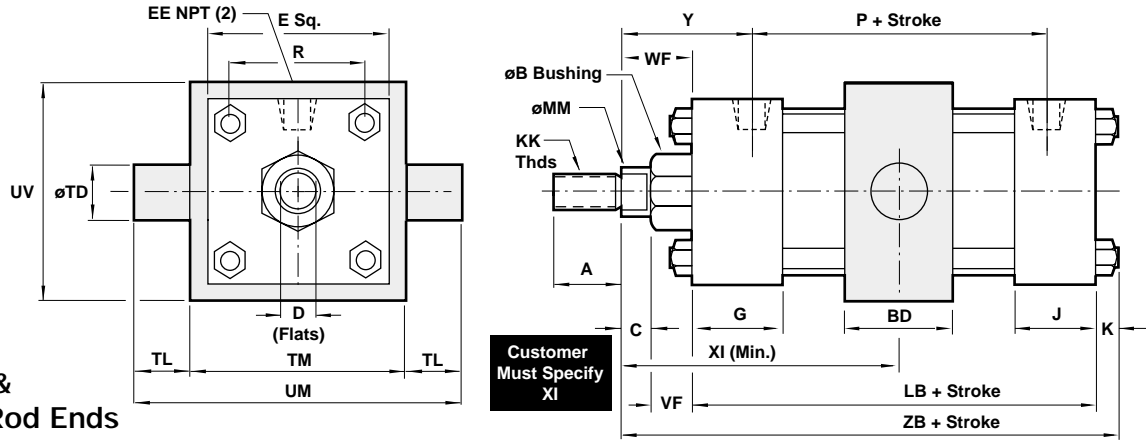
**Port and Cushion Adjustment Positions** (As viewed from rod end:  
 Port standard position 1, Cushion Adjustment standard position 2.)  
 NOTE: A Port and a Cushion Adjustment cannot be in the same position.

**See page ACT-1-96 for complete instructions on how to order cylinders.**

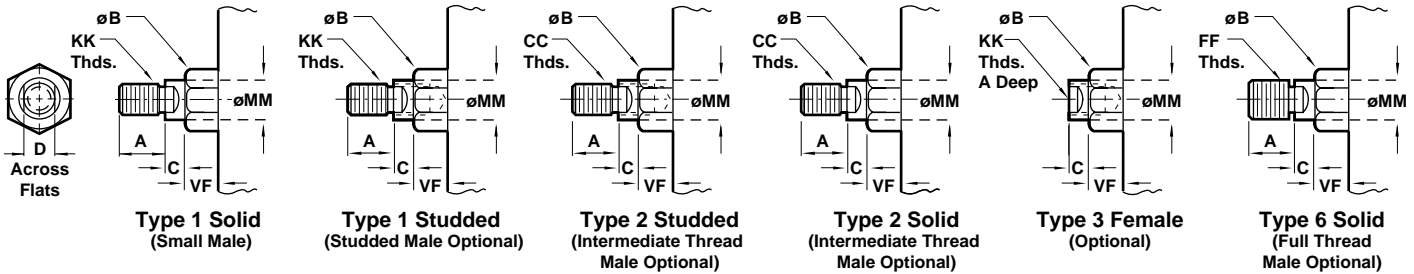
**Series A & EA, NFPA Aluminum Air Cylinders with 10 (MT4) with Center Trunnion**  
**Series J & EJ, NFPA Steel Air Cylinders with 10 (MT4) with Center Trunnion**



All Dimensions in Inches (mm)



**Standard & Optional Rod Ends**



Dimension		7" Bore (177.80)	8" Bore (203.20)	10" Bore (254.00)	12" Bore (304.80)
ø Rod	Std.	1 3/8" (34.93)	1 3/8" (34.93)	1 3/4" (44.45)	2" (50.80)
	O.S.	1 3/4" (44.45)	1 3/4" (44.45)	2" (50.80)	2 1/2" (63.50)
A	Std.	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)	2.250 (57.15)
	O.S.	2.000 (50.80)	2.000 (50.80)	2.250 (57.15)	3.000 (76.20)
B +.000 -.002	Std.	1.999 (50.78)	1.999 (50.78)	2.374 (60.30)	2.624 (66.65)
	O.S.	2.374 (60.30)	2.374 (60.30)	2.624 (66.65)	3.124 (79.35)
BD		2.500 (63.50)	2.500 (63.50)	3.000 (76.20)	3.000 (76.20)
C	Std.	.625 (15.88)	.625 (15.88)	.750 (19.05)	.875 (22.23)
	O.S.	.750 (19.05)	.750 (19.05)	.875 (22.23)	1.000 (25.40)
CC	Std.	1 1/4 - 12	1 1/4 - 12	1 1/2 - 12	1 3/4 - 12
	O.S.	1 1/2 - 12	1 1/2 - 12	1 3/4 - 12	2 1/4 - 12
D	Std.	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)	1.688 (42.86)
	O.S.	1.500 (38.10)	1.500 (38.10)	1.688 (42.86)	2.063 (52.39)
E		7.500 (190.50)	8.500 (215.90)	10.625 (269.88)	12.750 (323.85)
EE		.750 (19.05)	.750 (19.05)	1.000 (25.40)	1.000 (25.40)
FF	Std.	1 3/8 - 12	1 3/8 - 12	1 3/4 - 12	2 - 12
	O.S.	1 3/4 - 12	1 3/4 - 12	2 - 12	2 1/2 - 12
G		2.000 (50.80)	2.000 (50.80)	2.250 (57.15)	2.250 (57.15)
J		1.500 (38.10)	1.500 (38.10)	2.000 (50.80)	2.000 (50.80)
K		.563 (14.29)	.563 (14.29)	.688 (17.46)	.688 (17.46)
KK	Std.	1 - 14	1 - 14	1 1/4 - 12	1 1/2 - 12
	O.S.	1 1/4 - 12	1 1/4 - 12	1 1/2 - 12	1 7/8 - 12
LB		5.125 (130.18)	5.125 (130.18)	6.375 (161.93)	6.375 (174.63)
MM	Std.	1.375 (34.93)	1.375 (34.93)	1.750 (44.45)	2.000 (50.80)
	O.S.	1.750 (44.45)	1.750 (44.45)	2.000 (50.80)	2.500 (63.50)
P		3.250 (82.55)	3.250 (82.55)	4.125 (104.78)	4.625 (117.48)
R		5.730 (145.54)	6.435 (163.44)	7.969 (202.41)	9.406 (238.92)
TD +.000 -.001	Std.	1.375 (34.93)	1.375 (34.93)	1.750 (44.45)	1.750 (44.45)
	O.S.	1.375 (34.93)	1.375 (34.93)	1.750 (44.45)	1.750 (44.45)
TL		1.375 (34.93)	1.375 (34.93)	1.750 (44.45)	1.750 (44.45)
TM		8.750 (222.25)	9.750 (247.65)	12.000 (304.80)	14.000 (355.60)
UM		11.500 (292.10)	12.500 (317.50)	15.500 (393.70)	17.500 (444.50)
UV		8.500 (215.90)	9.500 (241.30)	11.750 (298.45)	13.750 (349.25)
VF	Std.	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)	1.125 (28.58)
	O.S.	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.250 (31.75)
WF	Std.	1.625 (41.28)	1.625 (41.28)	1.875 (47.63)	2.000 (50.80)
	O.S.	1.875 (47.63)	1.875 (47.63)	2.000 (50.80)	2.250 (57.15)
XI min.	Std.	4.875 (123.83)	4.875 (123.83)	5.625 (142.88)	5.750 (146.05)
	O.S.	5.125 (130.18)	5.125 (130.18)	5.750 (146.05)	6.000 (152.40)
Y	Std.	2.813 (71.46)	2.813 (71.46)	3.125 (79.38)	3.250 (82.55)
	O.S.	3.063 (77.79)	3.063 (77.79)	3.250 (82.55)	3.500 (88.90)
ZB	Std.	7.313 (185.74)	7.313 (185.74)	8.938 (227.01)	9.563 (242.89)
	O.S.	7.563 (192.10)	7.563 (192.10)	9.063 (230.19)	9.813 (249.24)

**Cylinder with 11 (MS1) Side End Angles**

- NFPA (MS1) 11 Side End Angle Mount for 1-1/2" to 6" bore sizes.
- Series A & J Cylinders rated to 250 PSI air, 400 PSI hydraulic (non-shock). Series EA & EJ Cylinders rated to 250 PSI air only.
- Designed for non-lube service.
- Switches available on all bore sizes. (See page ACT-1-90 & 91 for ordering information.)



**Cylinder Order Information**

**11** - - - -

A	Series A Cylinder
EA	Series EA Cylinder
J	Series J Cylinder
EJ	Series EJ Cylinder

Mounting Options	
01	Side Tapped (MS4)
03	Head Rectangular Flange (MF1)
03	Head Square (ME3)-7" to 12" Bores
04	Cap Rectangular Flange (MF2)
04	Cap Square (ME4)-7" to 12" Bores
05	Basic Cylinder No Mounting (MX0)
06	Both Ends (4) Tie Rods Ext. (MX1)
6B	Both Ends (2) Tie Rods Ext. (MX4)
6C	Cap Tie Rods Ext. (MX2)
6R	Head Tie Rods Ext. (MX3)
7R	Removable Head Trunion (MT1) - A & EA
07	Head Trunion (MT1) - J & EJ
8R	Cap Trunion (MT2) - A & EA
08	Cap Trunion (MT2) - J & EJ
09	Side Lugs (MS2)
10	Center Trunion (MT4)
<b>11</b>	<b>Side End Angles (MS1)</b>
12	Cap Fixed Clevis (MP1)
15	Side End Lugs (MS7)
16	Sleeve Nut Construction (Universal)
20	Head Square Flange (MF5)
21	Cap Square Flange (MF6)
22	Detachable Cap Clevis (MP2)
32	Cap Fixed Eye (MP3)
42	Detachable Cap Eye (MP4)
52	Spherical Bearing
60	Base Bar (Not NFPA - A & EA Only)

Cushion in Head	
3	None
5 <sup>1</sup>	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

<sup>1</sup>Standard with EA & EJ

Cushion in Cap	
3	None
5 <sup>1</sup>	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

<sup>1</sup>Standard with EA & EJ

Bore and Stroke (write out)

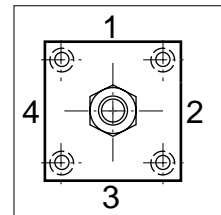
Additional Options – order alphabetically – More on page ACT-1-95	
HR	Case Hardened (45 Rc)
L(- -)	Port Location position 1 standard: L(Head Cap) (specify position 1 thru 4 for head and/or cap)
MS	Metal Rod Scraper
N(- -)	Cushion Adjust Screw Location position 2 standard: N(Head Cap) (specify position 1 thru 4 for head and/or cap)
P(-)*	Non-Standard Port Sizes: [specify port size for P(-H) head only, P(-C) cap only, or P(-) both head & cap]
PS	Magnetic Piston – includes aluminum tube option for J & EJ - Std. for Alum
RS	Rod Stud Type 1 (5/8" – 1 3/4" øRod) Type 2 (5/8" & 1" øRod)
RX	Rod Extensions (specify length of additional rod extension)
SC	Single Acting Spring Extend (Cap End)–See page ACT-1-86
SR	Single Acting Spring Retract (Rod End)–See page ACT-1-86
SS	303 Stainless Steel (Hard Chrome Plated)
ST(-C)	Stop Tube (Cap End) (specify stop tube length)
ST(-R)	Stop Tube (Rod End) (specify stop tube length)
T	Special Rod Threads (specify rod thread)
TX	Thread Extensions (specify length of thread extension)
V	Viton® Seals

\*1 1/2", 2", 2 1/2" bore cylinders have 3/8" NPT Standard, 1/2" NPT oversize.  
 3 1/4", 4", 5" bore cylinders have 1/2" NPT Standard, 3/4" NPT oversize.  
 This will add 1/8" to the overall cylinder length.

Piston Rod Threads Type	
1	Small Male (Solid)
2	Intermediate Thread Male (Solid)
3	Female
6	Full Thread Male (Solid)
7	Plain Rod End

Piston Rod Diameters		
A**	5/8"	Standard on 1 1/2", 2", 2 1/2"
B**	1"	Standard on 3 1/4", 4", 5" Oversized on 1 1/2", 2", 2 1/2"
C**	1 3/8"	Standard on 6", 7", 8" Oversized on 3 1/4", 4", 5"
D**	1 3/4"	Standard on 10" Oversized on 6", 7", 8"
E	2"	Standard on 12" Oversized on 10"
F	2 1/2"	Oversized on 10", 12"

\*\* A & EA uses A-D only.



**Port and Cushion Adjustment**

**Positions** (As viewed from rod end:

Port standard position 1, Cushion Adjustment standard position 2.)

NOTE: A Port and a Cushion Adjustment cannot be in the same position.

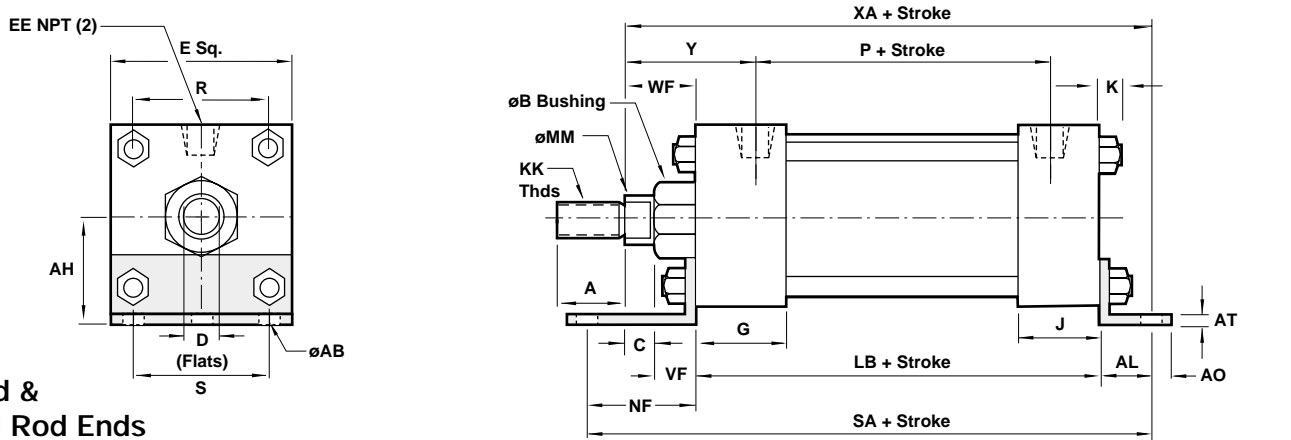
**See page ACT-1-96 for complete instructions on how to order cylinders.**



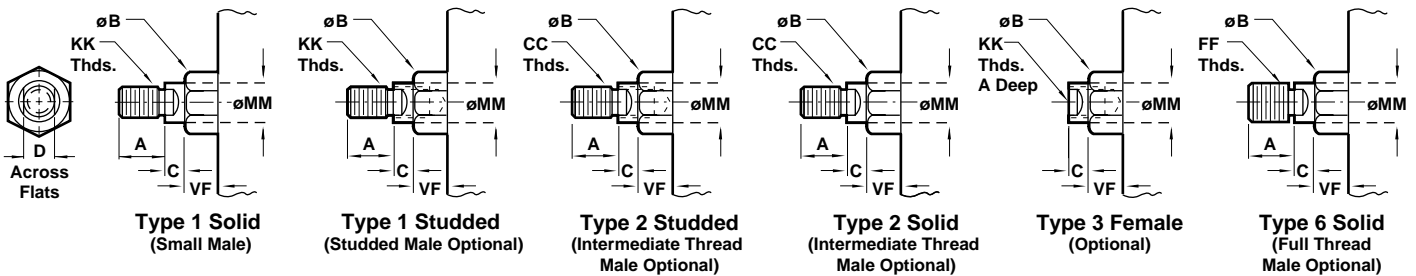
Series A & EA, NFPA Aluminum Air Cylinders with 11 (MS1) Side End Angles  
 Series J & EJ, NFPA Steel Air Cylinders with 11 (MS1) Side End Angles



All Dimensions in Inches (mm)



Standard & Optional Rod Ends



Dimension	1 1/2" Bore (38.10)	2" Bore (50.80)	2 1/2" Bore (63.50)	3 1/4" Bore (82.55)	4" Bore (101.60)	5" Bore (127.00)	6" Bore (152.40)
ø Rod	Std. 5/8" (15.88)	5/8" (15.88)	5/8" (15.88)	1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)
	O.S. 1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/4" (44.45)
A	Std. .750 (19.05)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)
	O.S. 1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)
AB	.438 (11.11)	.438 (11.11)	.438 (11.11)	.563 (14.29)	.563 (14.29)	.688 (17.46)	.813 (20.64)
AH	1.188 (30.16)	1.438 (36.51)	1.625 (41.28)	1.938 (49.21)	2.250 (57.15)	2.750 (69.85)	3.250 (82.55)
AL	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.250 (31.75)	1.375 (34.93)	1.375 (34.93)
AO	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)
AT	.125 (3.18)	.125 (3.18)	.125 (3.18)	.125 (3.18)	.125 (3.18)	.187 (4.75)	.187 (4.75)
B <sup>+0.000</sup> <sub>-0.002</sub>	Std. 1.124 (28.55)	1.124 (28.55)	1.124 (28.55)	1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)
	O.S. 1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)	1.999 (50.78)	1.999 (50.78)	2.374 (60.30)
C	Std. .375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)
	O.S. 5.000 (127.00)	5.000 (127.00)	5.000 (127.00)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)
CC	Std. 1/2 - 20	1/2 - 20	1/2 - 20	7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12
	O.S. 7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12	1 1/4 - 12	1 1/4 - 12	1 1/2 - 12
D	Std. .500 (12.70)	.500 (12.70)	.500 (12.70)	.813 (20.64)	.813 (20.64)	.813 (20.64)	1.125 (28.58)
	O.S. .813 (20.64)	.813 (20.64)	.813 (20.64)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)
E	2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)	5.500 (139.70)	6.500 (165.10)
EE	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)
FF	Std. 5/8 - 18	5/8 - 18	5/8 - 18	1 - 14	1 - 14	1 - 14	1 3/8 - 12
	O.S. 1 - 14	1 - 14	1 - 14	1 3/8 - 12	1 3/8 - 12	1 3/8 - 12	1 3/4 - 12
G	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)	2.000 (50.80)
J	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)
K	.250 (6.35)	.313 (7.94)	.313 (7.94)	.375 (9.53)	.375 (9.53)	.438 (11.11)	.438 (11.11)
KK	Std. 7/16 - 20	7/16 - 20	7/16 - 20	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14
	O.S. 3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14	1 - 14	1 1/4 - 12
LB	3.625 (92.08)	3.625 (92.08)	3.750 (95.25)	4.250 (107.95)	4.250 (107.95)	4.500 (114.30)	5.000 (127.00)
MM	Std. .625 (15.88)	.625 (15.88)	.625 (15.88)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)
	O.S. 1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.750 (44.45)
NF	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.875 (47.63)	1.875 (47.63)	2.000 (50.80)	2.125 (53.98)
P	2.340 (59.44)	2.340 (59.44)	2.470 (62.74)	2.690 (68.33)	2.690 (68.33)	2.940 (74.68)	3.125 (79.38)
R	1.428 (36.27)	1.838 (46.68)	2.192 (55.67)	2.758 (70.05)	3.323 (84.40)	4.101 (104.16)	4.879 (123.92)
S	1.250 (31.75)	1.750 (44.45)	2.250 (57.15)	2.750 (69.85)	3.500 (88.90)	4.250 (107.95)	5.250 (133.35)
SA	6.000 (152.40)	6.000 (152.40)	6.125 (155.58)	7.375 (187.33)	7.375 (187.33)	7.875 (200.03)	8.500 (215.90)
VF	Std. .625 (15.88)	.625 (15.88)	.625 (15.88)	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)
	O.S. .875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)
WF	Std. 1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)
	O.S. 1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	1.875 (47.63)
XA	Std. 5.625 (142.88)	5.625 (142.88)	5.750 (146.05)	6.875 (174.63)	6.875 (174.63)	7.250 (184.15)	8.000 (203.20)
	O.S. 6.000 (152.40)	6.000 (152.40)	6.125 (155.58)	7.125 (180.98)	7.125 (180.98)	7.500 (190.50)	8.250 (209.55)
Y	Std. 1.840 (46.74)	1.840 (46.74)	1.840 (46.74)	2.380 (60.45)	2.380 (60.45)	2.380 (60.45)	2.813 (71.44)
	O.S. 2.220 (56.39)	2.220 (56.39)	2.220 (56.39)	2.630 (66.80)	2.630 (66.80)	2.630 (66.80)	3.063 (77.79)

Cylinder with 11 (MS1) Side End Angles

- NFPA (MS1) 11 Side End Angle Mount for 7" to 12" bore sizes.
- Series A & J Cylinders rated to 250 PSI air, 400 PSI hydraulic (non-shock). Series EA & EJ Cylinders rated to 250 PSI air only.
- Designed for non-lube service.
- Switches available on all bore sizes. (See page ACT-1-90 & 91 for ordering information.)



Cylinder Order Information

11 - - - - -

A	Series A Cylinder
EA	Series EA Cylinder
J	Series J Cylinder
EJ	Series EJ Cylinder

Mounting Options	
01	Side Tapped (MS4)
03	Head Rectangular Flange (MF1)
03	Head Square (ME3)- 7" to 12" Bores
04	Cap Rectangular Flange (MF2)
04	Cap Square (ME4)- 7" to 12" Bores
05	Basic Cylinder No Mounting (MX0)
06	Both Ends (4) Tie Rods Ext. (MX1)
6B	Both Ends (2) Tie Rods Ext. (MX4)
6C	Cap Tie Rods Ext. (MX2)
6R	Head Tie Rods Ext. (MX3)
7R	Removable Head Trunion (MT1) - A & EA
07	Head Trunion (MT1) - J & EJ
8R	Cap Trunion (MT2) - A & EA
08	Cap Trunion (MT2) - J & EJ
09	Side Lugs (MS2)
10	Center Trunion (MT4)
11	Side End Angles (MS1)
12	Cap Fixed Clevis (MP1)
15	Side End Lugs (MS7)
16	Sleeve Nut Construction (Universal)
20	Head Square Flange (MF5)
21	Cap Square Flange (MF6)
22	Detachable Cap Clevis (MP2)
32	Cap Fixed Eye (MP3)
42	Detachable Cap Eye (MP4)
52	Spherical Bearing
60	Base Bar (Not NFPA - A & EA Only)

Cushion in Head	
3	None
5 <sup>1</sup>	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

<sup>1</sup>Standard with EA & EJ

Cushion in Cap	
3	None
5 <sup>1</sup>	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

<sup>1</sup>Standard with EA & EJ

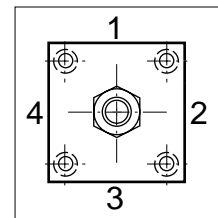
Bore and Stroke (write out)

Additional Options – order alphabetically – More on page ACT-1-95	
HR	Case Hardened (45 Rc)
L(- -)	Port Location position 1 standard: L(Head Cap) (specify position 1 thru 4 for head and/or cap)
MS	Metal Rod Scraper
N(- -)	Cushion Adjust Screw Location position 2 standard: N(Head Cap) (specify position 1 thru 4 for head and/or cap)
P(-)*	Non-Standard Port Sizes: [specify port size for P(-H) head only, P(-C) cap only, or P(-) both head & cap]
PS	Magnetic Piston – includes aluminum tube option for J & EJ - Std. for Alum
RS	Rod Stud Type 1 (5/8" – 1 3/4" øRod) Type 2 (5/8" & 1" øRod)
RX	Rod Extensions (specify length of additional rod extension)
SC	Single Acting Spring Extend (Cap End)–See page ACT-1-86
SR	Single Acting Spring Retract (Rod End)–See page ACT-1-86
SS	303 Stainless Steel (Hard Chrome Plated)
ST(-C)	Stop Tube (Cap End) (specify stop tube length)
ST(-R)	Stop Tube (Rod End) (specify stop tube length)
T	Special Rod Threads (specify rod thread)
TX	Thread Extensions (specify length of thread extension)
V	Viton® Seals

\*1 1/2", 2", 2 1/2" bore cylinders have 3/8" NPT Standard, 1/2" NPT oversize.  
 3 1/4", 4", 5" bore cylinders have 1/2" NPT Standard, 3/4" NPT oversize.  
 This will add 1/8" to the overall cylinder length.

Piston Rod Threads Type	
1	Small Male (Solid)
2	Intermediate Thread Male (Solid)
3	Female
6	Full Thread Male (Solid)
7	Plain Rod End

Piston Rod Diameters		
A**	5/8"	Standard on 1 1/2", 2", 2 1/2"
B**	1"	Standard on 3 1/4", 4", 5" Oversized on 1 1/2", 2", 2 1/2"
C**	1 3/8"	Standard on 6", 7", 8" Oversized on 3 1/4", 4", 5"
D**	1 3/4"	Standard on 10" Oversized on 6", 7", 8"
E	2"	Standard on 12" Oversized on 10"
F	2 1/2"	Oversized on 10", 12"



Port and Cushion Adjustment

Positions (As viewed from rod end: Port standard position 1, Cushion Adjustment standard position 2.)

NOTE: A Port and a Cushion Adjustment cannot be in the same position.

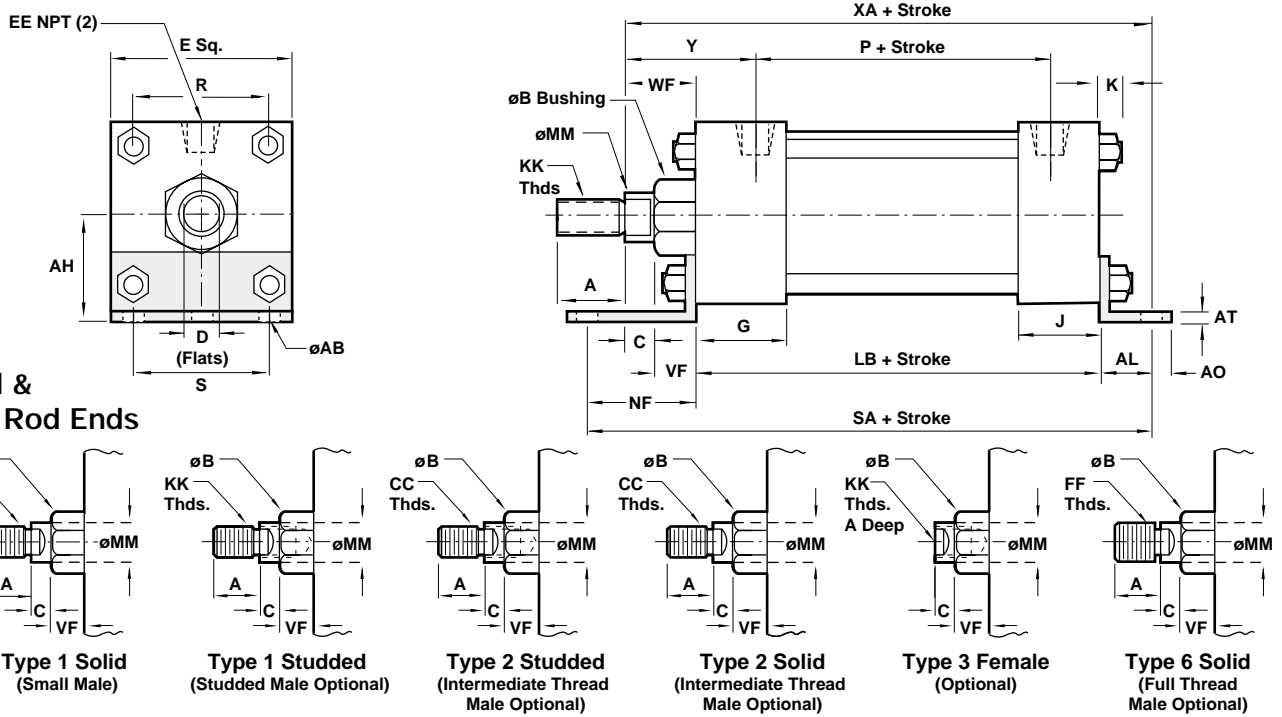
\*\* A & EA uses A-D only.

See page ACT-1-96 for complete instructions on how to order cylinders.

Series A & EA, NFPA Aluminum Air Cylinder with 11 (MS1) Side End Angles  
 Series J & EJ, NFPA Steel Air Cylinder with 11 (MS1) Side End Angles



All Dimensions in Inches (mm)



Dimension		7" Bore (177.80)		8" Bore (203.20)		10" Bore (254.00)		12" Bore (304.80)	
ø Rod	Std.	1 3/8"	(34.93)	1 3/8"	(34.93)	1 3/4"	(44.45)	2"	(50.80)
	O.S.	1 3/4"	(44.45)	1 3/4"	(44.45)	2"	(50.80)	2 1/2"	(63.50)
A	Std.	1.625	(41.28)	1.625	(41.28)	2.000	(50.80)	2.250	(57.15)
	O.S.	2.000	(50.80)	2.000	(50.80)	2.250	(57.15)	3.000	(76.20)
AB		.813	(20.64)	.813	(20.64)	1.063	(26.99)	1.063	(26.99)
AH		3.750	(95.25)	4.250	(107.95)	5.313	(134.94)	6.375	(161.93)
AL		1.813	(46.04)	1.813	(46.04)	2.125	(53.98)	2.125	(53.98)
AO		.688	(17.46)	.688	(17.46)	.875	(22.23)	.875	(22.23)
AT		.250	(6.35)	.250	(6.35)	.250	(6.35)	.250	(6.35)
B	Std.	1.999	(50.78)	1.999	(50.78)	2.374	(60.30)	2.624	(66.65)
	O.S.	2.374	(60.30)	2.374	(60.30)	2.624	(66.65)	3.124	(79.35)
C	Std.	.625	(15.88)	.625	(15.88)	.750	(19.05)	.875	(22.23)
	O.S.	.750	(19.05)	.750	(19.05)	.875	(22.23)	1.000	(25.40)
CC	Std.	1 1/4 - 12		1 1/4 - 12		1 1/2 - 12		1 3/4 - 12	
	O.S.	1 1/2 - 12		1 1/2 - 12		1 3/4 - 12		2 1/4 - 12	
D	Std.	1.125	(28.58)	1.125	(28.58)	1.500	(38.10)	1.688	(42.86)
	O.S.	1.500	(38.10)	1.500	(38.10)	1.688	(42.86)	2.063	(52.39)
E		7.500	(190.50)	8.500	(215.90)	10.625	(269.88)	12.750	(323.85)
EE		.750	(19.05)	.750	(19.05)	1.000	(25.40)	1.000	(25.40)
FF	Std.	1 3/8 - 12		1 3/8 - 12		1 3/4 - 12		2 - 12	
	O.S.	1 3/4 - 12		1 3/4 - 12		2 - 12		2 1/2 - 12	
G		2.000	(50.80)	2.000	(50.80)	2.250	(57.15)	2.250	(57.15)
J		1.500	(38.10)	1.500	(38.10)	2.000	(50.80)	2.500	(50.80)
K		.563	(14.29)	.563	(14.29)	.688	(17.46)	.688	(17.46)
KK	Std.	1 - 14		1 - 14		1 1/4 - 12		1 1/2 - 12	
	O.S.	1 1/4 - 12		1 1/4 - 12		1 1/2 - 12		1 7/8 - 12	
LB		5.125	(130.18)	5.125	(130.18)	6.375	(161.93)	6.875	(174.63)
MM	Std.	1.375	(34.93)	1.375	(34.93)	1.750	(44.45)	2.000	(50.80)
	O.S.	1.750	(44.45)	1.750	(44.45)	2.000	(50.80)	2.500	(63.50)
NF		1.813	(46.04)	1.813	(46.04)	1.813	(46.04)	1.813	(46.04)
P		3.250	(82.55)	3.250	(82.55)	4.125	(104.78)	4.625	(117.48)
R		5.730	(145.54)	6.442	(163.63)	7.969	(202.41)	9.406	(238.92)
S		6.125	(155.58)	7.125	(180.98)	8.875	(225.43)	11.000	(279.40)
SA		8.750	(222.25)	8.750	(222.25)	10.625	(269.53)	11.125	(282.58)
VF	Std.	1.000	(25.40)	1.000	(25.40)	1.125	(28.58)	1.125	(28.58)
	O.S.	1.125	(28.58)	1.125	(28.58)	1.125	(28.58)	1.250	(31.75)
WF	Std.	1.625	(41.28)	1.625	(41.28)	1.875	(47.63)	2.000	(50.80)
	O.S.	1.875	(47.63)	1.875	(47.63)	2.000	(50.80)	2.250	(57.15)
XA	Std.	8.562	(217.47)	8.562	(217.47)	10.375	(263.53)	11.000	(279.40)
	O.S.	8.813	(223.84)	8.813	(223.84)	10.500	(266.70)	11.250	(285.75)
Y	Std.	2.813	(71.44)	2.813	(71.44)	3.125	(79.38)	3.250	(82.55)
	O.S.	3.063	(77.79)	3.063	(77.79)	3.250	(82.55)	3.500	(88.90)

**Cylinder with 12 (MP1) Cap Fixed Clevis**

- NFPA (MP1) 12 Cap Fixed Clevis Mount for 1-1/2" to 6" steel bore sizes.
- Series A & J Cylinders rated to 250 PSI air, 400 PSI hydraulic (non-shock). Series EA & EJ Cylinders rated to 250 PSI air only.
- Designed for non-lube service.
- Switches available on all bore sizes. (See pages ACT-1-90 & 91 for ordering information.)



**Cylinder Order Information**

**12** - - - -

A	Series A Cylinder
EA	Series EA Cylinder
J	Series J Cylinder
EJ	Series EJ Cylinder

Mounting Options	
01	Side Tapped (MS4)
03	Head Rectangular Flange (MF1)
03	Head Square (ME3)- 7" to 12" Bores
04	Cap Rectangular Flange (MF2)
04	Cap Square (ME4)- 7" to 12" Bores
05	Basic Cylinder No Mounting (MX0)
06	Both Ends (4) Tie Rods Ext. (MX1)
6B	Both Ends (2) Tie Rods Ext. (MX4)
6C	Cap Tie Rods Ext. (MX2)
6R	Head Tie Rods Ext. (MX3)
7R	Removable Head Trunion (MT1) - A & EA
07	Head Trunion (MT1) - J & EJ
8R	Cap Trunion (MT2) - A & EA
08	Cap Trunion (MT2) - J & EJ
09	Side Lugs (MS2)
10	Center Trunion (MT4)
11	Side End Angles (MS1)
<b>12</b>	<b>Cap Fixed Clevis (MP1)</b>
15	Side End Lugs (MS7)
16	Sleeve Nut Construction (Universal)
20	Head Square Flange (MF5)
21	Cap Square Flange (MF6)
22	Detachable Cap Clevis (MP2)
32	Cap Fixed Eye (MP3)
42	Detachable Cap Eye (MP4)
52	Spherical Bearing
60	Base Bar (Not NFPA - A & EA Only)

Cushion in Head	
3	None
5 <sup>1</sup>	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

<sup>1</sup>Standard with EA & EJ

Cushion in Cap	
3	None
5 <sup>1</sup>	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

<sup>1</sup>Standard with EA & EJ

Bore and Stroke (write out )

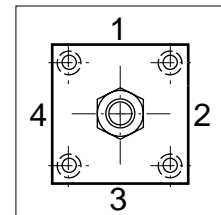
Additional Options – order alphabetically – More on page ACT-1-95	
HR	Case Hardened (45 Rc)
L(- -)	Port Location position 1 standard: L(Head Cap) (specify position 1 thru 4 for head and/or cap)
MS	Metal Rod Scraper
N(- -)	Cushion Adjust Screw Location position 2 standard: N(Head Cap) (specify position 1 thru 4 for head and/or cap)
P(-)*	Non-Standard Port Sizes: [specify port size for P(-H) head only, P(-C) cap only, or P(-) both head & cap]
PS	Magnetic Piston – includes aluminum tube option for J & EJ - Std. for Alum
RS	Rod Stud Type 1 (5/8" – 1 3/4" øRod) Type 2 (5/8" & 1" øRod)
RX	Rod Extensions (specify length of additional rod extension)
SC	Single Acting Spring Extend (Cap End)-See page ACT-1-86
SR	Single Acting Spring Retract (Rod End)-See page ACT-1-86
SS	303 Stainless Steel (Hard Chrome Plated)
ST(-C)	Stop Tube (Cap End) (specify stop tube length)
ST(-R)	Stop Tube (Rod End) (specify stop tube length)
T	Special Rod Threads (specify rod thread)
TX	Thread Extensions (specify length of thread extension)
V	Viton® Seals

\*1 1/2", 2", 2 1/2" bore cylinders have 3/8" NPT Standard, 1/2" NPT oversize.  
 3 1/4", 4", 5" bore cylinders have 1/2" NPT Standard, 3/4" NPT oversize.  
 This will add 1/8" to the overall cylinder length.

Piston Rod Threads Type	
1	Small Male (Solid)
2	Intermediate Thread Male (Solid)
3	Female
6	Full Thread Male (Solid)
7	Plain Rod End

Piston Rod Diameters		
A**	5/8"	Standard on 1 1/2", 2", 2 1/2"
B**	1"	Standard on 3 1/4", 4", 5" Oversized on 1 1/2", 2", 2 1/2"
C**	1 3/8"	Standard on 6", 7", 8" Oversized on 3 1/4", 4", 5"
D**	1 3/4"	Standard on 10" Oversized on 6", 7", 8"
E	2"	Standard on 12" Oversized on 10"
F	2 1/2"	Oversized on 10", 12"

\*\* A & EA uses A-D only.



**Port and Cushion Adjustment**

**Positions** (As viewed from rod end: Port standard position 1, Cushion Adjustment standard position 2.)

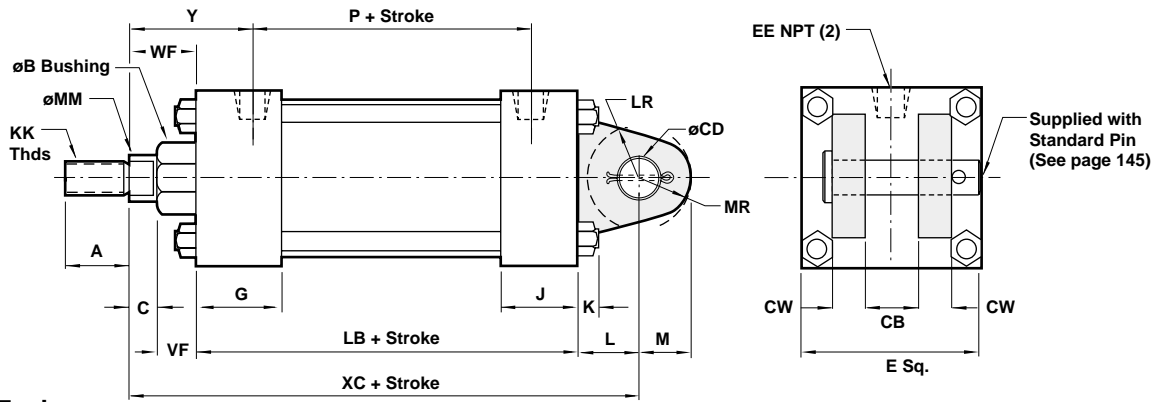
NOTE: A Port and a Cushion Adjustment cannot be in the same position.

**See page ACT-1-96 for complete instructions on how to order cylinders.**

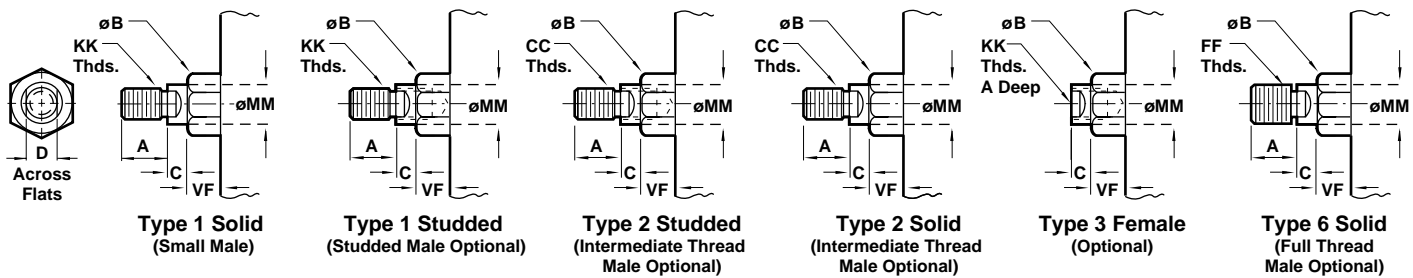
**Series A & EA, NFPA Aluminum Air Cylinder with 12 (MP1) Cap Fixed Clevis**  
**Series J & EJ, NFPA Steel Air Cylinder with 12 (MP1) Cap Fixed Clevis**



All Dimensions in Inches (mm)



**Standard & Optional Rod Ends**



Dimension	1 1/2" Bore (38.10)	2" Bore (50.80)	2 1/2" Bore (63.50)	3 1/4" Bore (82.55)	4" Bore (101.60)	5" Bore (127.00)	6" Bore (152.40)
ø Rod	Std. 5/8" (15.88)	5/8" (15.88)	5/8" (15.88)	1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)
	O.S. 1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/4" (44.45)
A	Std. .750 (19.05)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)
	O.S. 1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)
B +.000 -.002	Std. 1.124 (28.55)	1.124 (28.55)	1.124 (28.55)	1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)
	O.S. 1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)	1.999 (50.78)	1.999 (50.78)	2.374 (60.30)
C	Std. .375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)
	O.S. .500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)
CB	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)
CC	Std. 1/2 - 20	1/2 - 20	1/2 - 20	7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12
	O.S. 7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12	1 1/4 - 12	1 1/4 - 12	1 1/2 - 12
CD	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.000 (25.40)
CW	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)
D	Std. .500 (12.70)	.500 (12.70)	.500 (12.70)	.813 (20.64)	.813 (20.64)	.813 (20.64)	1.125 (28.58)
	O.S. .813 (20.64)	.813 (20.64)	.813 (20.64)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)
E	2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)	5.500 (139.70)	6.500 (165.10)
EE	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)
FF	Std. 5/8 - 18	5/8 - 18	5/8 - 18	1 - 14	1 - 14	1 - 14	1 3/8 - 12
	O.S. 1 - 14	1 - 14	1 - 14	1 3/8 - 12	1 3/8 - 12	1 3/8 - 12	1 3/4 - 12
G	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)	2.000 (50.80)
J	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)
K	.250 (6.35)	.313 (7.94)	.313 (7.94)	.375 (9.53)	.375 (9.53)	.438 (11.11)	.438 (11.11)
KK	Std. 7/16 - 20	7/16 - 20	7/16 - 20	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14
	O.S. 3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14	1 - 14	1 1/4 - 12
L	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)
LB	3.625 (92.08)	3.625 (92.08)	3.750 (95.25)	4.250 (107.95)	4.250 (107.95)	4.500 (114.30)	5.000 (127.00)
LR	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)
M	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.000 (25.40)
MM	Std. .625 (15.88)	.625 (15.88)	.625 (15.88)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)
	O.S. 1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.750 (44.45)
MR	.625 (15.88)	.625 (15.88)	.625 (15.88)	.938 (23.81)	.938 (23.81)	.938 (23.81)	1.188 (30.16)
P	2.340 (59.44)	2.340 (59.44)	2.470 (62.74)	2.690 (68.33)	2.690 (68.33)	2.940 (74.68)	3.125 (79.38)
VF	Std. .625 (15.88)	.625 (15.88)	.625 (15.88)	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)
	O.S. .875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)
WF	Std. 1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)
	O.S. 1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	1.875 (47.63)
XC	Std. 5.375 (136.53)	5.375 (136.53)	5.500 (139.70)	6.875 (174.63)	6.875 (174.63)	7.125 (180.98)	8.125 (206.38)
	O.S. 5.750 (146.05)	5.750 (146.05)	5.875 (149.23)	7.125 (180.98)	7.125 (180.98)	7.375 (187.33)	8.375 (212.73)
Y	Std. 1.840 (46.74)	1.840 (46.74)	1.840 (46.74)	2.380 (60.45)	2.380 (60.45)	2.380 (60.45)	2.813 (71.44)
	O.S. 2.220 (56.39)	2.220 (56.39)	2.220 (56.39)	2.630 (66.80)	2.630 (66.80)	2.630 (66.80)	3.063 (77.79)

**Cylinder with 12 (MP1) Cap Fixed Clevis**

- NFPA (MP1) 12 Cap Fixed Clevis Mount for 7" to 12" steel bore sizes.
- Series A & J Cylinders rated to 250 PSI air, 400 PSI hydraulic (non-shock). Series EA & EJ Cylinders rated to 250 PSI air only.
- Designed for non-lube service.
- Switches available on all bore sizes. (See pages ACT-1-90 & 91 for ordering information.)



**Cylinder Order Information**

**12** - - - - -

A	Series A Cylinder
EA	Series EA Cylinder
J	Series J Cylinder
EJ	Series EJ Cylinder

Bore and Stroke (write out)

Mounting Options	
01	Side Tapped (MS4)
03	Head Rectangular Flange (MF1)
03	Head Square (ME3)- 7" to 12" Bores
04	Cap Rectangular Flange (MF2)
04	Cap Square (ME4)- 7" to 12" Bores
05	Basic Cylinder No Mounting (MX0)
06	Both Ends (4) Tie Rods Ext. (MX1)
6B	Both Ends (2) Tie Rods Ext. (MX4)
6C	Cap Tie Rods Ext. (MX2)
6R	Head Tie Rods Ext. (MX3)
7R	Removable Head Trunion (MT1) - A & EA
07	Head Trunion (MT1) - J & EJ
8R	Cap Trunion (MT2) - A & EA
08	Cap Trunion (MT2) - J & EJ
09	Side Lugs (MS2)
10	Center Trunion (MT4)
11	Side End Angles (MS1)
<b>12</b>	<b>Cap Fixed Clevis (MP1)</b>
15	Side End Lugs (MS7)
16	Sleeve Nut Construction (Universal)
20	Head Square Flange (MF5)
21	Cap Square Flange (MF6)
22	Detachable Cap Clevis (MP2)
32	Cap Fixed Eye (MP3)
42	Detachable Cap Eye (MP4)
52	Spherical Bearing
60	Base Bar (Not NFPA - A & EA Only)

Cushion in Head	
3	None
5 <sup>1</sup>	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

<sup>1</sup>Standard with EA & EJ

Cushion in Cap	
3	None
5 <sup>1</sup>	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

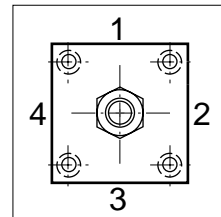
<sup>1</sup>Standard with EA & EJ

Additional Options – order alphabetically – More on page ACT-1-95	
HR	Case Hardened (45 Rc)
L(- -)	Port Location position 1 standard: L(Head Cap) (specify position 1 thru 4 for head and/or cap)
MS	Metal Rod Scraper
N(- -)	Cushion Adjust Screw Location position 2 standard: N(Head Cap) (specify position 1 thru 4 for head and/or cap)
P(-)*	Non-Standard Port Sizes: [specify port size for P(-H) head only, P(-C) cap only, or P(-) both head & cap]
PS	Magnetic Piston – includes aluminum tube option for J & EJ - Std. for Alum
RS	Rod Stud Type 1 (5/8" – 1 3/4" øRod) Type 2 (5/8" & 1" øRod)
RX	Rod Extensions (specify length of additional rod extension)
SC	Single Acting Spring Extend (Cap End)–See page ACT-1-86
SR	Single Acting Spring Retract (Rod End)–See page ACT-1-86
SS	303 Stainless Steel (Hard Chrome Plated)
ST(-C)	Stop Tube (Cap End) (specify stop tube length)
ST(-R)	Stop Tube (Rod End) (specify stop tube length)
T	Special Rod Threads (specify rod thread)
TX	Thread Extensions (specify length of thread extension)
V	Viton® Seals

\*1 1/2", 2", 2 1/2" bore cylinders have 3/8" NPT Standard, 1/2" NPT oversize.  
 3 1/4", 4", 5" bore cylinders have 1/2" NPT Standard, 3/4" NPT oversize.  
 This will add 1/8" to the overall cylinder length.

Piston Rod Threads Type	
1	Small Male (Solid)
2	Intermediate Thread Male (Solid)
3	Female
6	Full Thread Male (Solid)
7	Plain Rod End

Piston Rod Diameters	
A**	5/8" Standard on 1 1/2", 2", 2 1/2"
B**	1" Standard on 3 1/4", 4", 5" Oversized on 1 1/2", 2", 2 1/2"
C**	1 3/8" Standard on 6", 7", 8" Oversized on 3 1/4", 4", 5"
D**	1 3/4" Standard on 10" Oversized on 6", 7", 8"
E	2" Standard on 12" Oversized on 10"
F	2 1/2" Oversized on 10", 12"



**Port and Cushion Adjustment**

**Positions** (As viewed from rod end: Port standard position 1, Cushion Adjustment standard position 2.)

NOTE: A Port and a Cushion Adjustment cannot be in the same position.

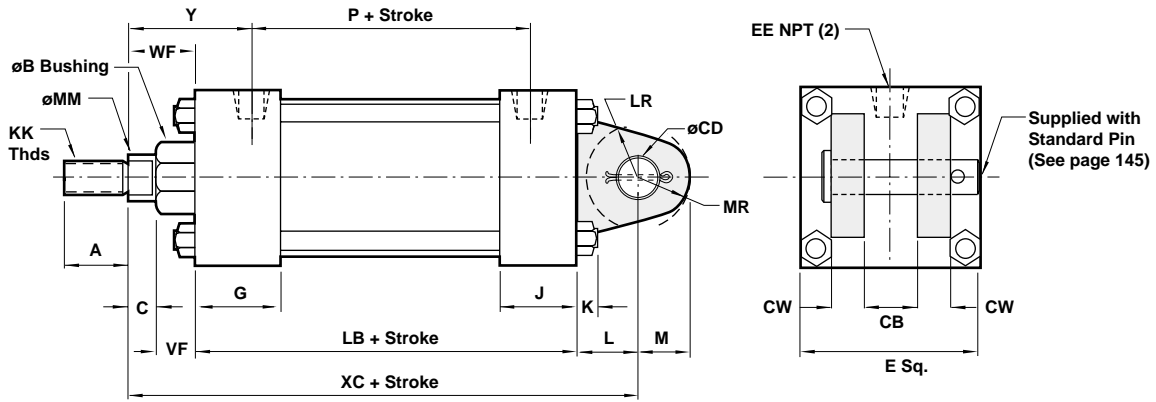
\*\* A & EA uses A-D only.

**See page ACT-1-96 for complete instructions on how to order cylinders.**

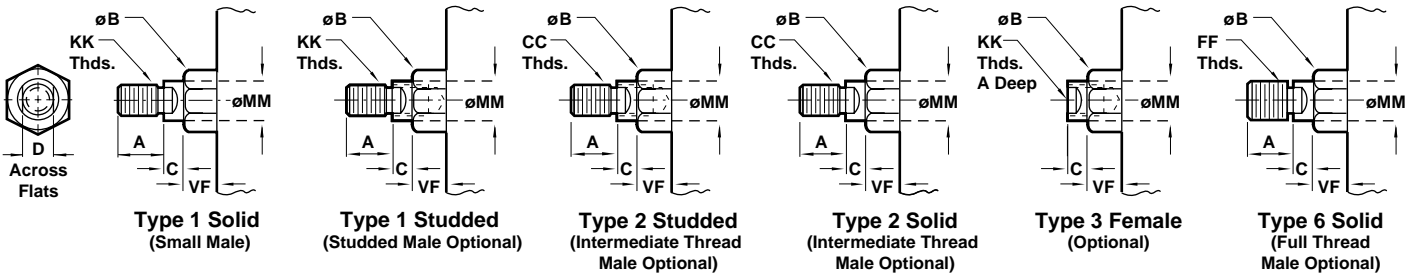
**Series A & EA, NFPA Aluminum Air Cylinder with 12 (MP1) Cap Fixed Clevis**  
**Series J & EJ, NFPA Steel Air Cylinder with 12 (MP1) Cap Fixed Clevis**



All Dimensions in Inches (mm)



**Standard & Optional Rod Ends**



Dimension		7" Bore (177.80)		8" Bore (203.20)		10" Bore (254.00)		12" Bore (304.80)	
ø Rod	Std.	1 3/8"	(34.93)	1 3/8"	(34.93)	1 3/4"	(44.45)	2"	(50.80)
	O.S.	1 3/4"	(44.45)	1 3/4"	(44.45)	2"	(50.80)	2 1/2"	(63.50)
A	Std.	1.625	(41.28)	1.625	(41.28)	2.000	(50.80)	2.250	(57.15)
	O.S.	2.000	(50.80)	2.000	(50.80)	2.250	(57.15)	3.000	(76.20)
B +.000 -.002	Std.	1.999	(50.78)	1.999	(50.78)	2.374	(60.30)	2.624	(66.65)
	O.S.	2.374	(60.30)	2.374	(60.30)	2.624	(66.65)	3.124	(79.35)
C	Std.	.625	(15.88)	.625	(15.88)	.750	(19.05)	.875	(22.23)
	O.S.	.750	(19.05)	.750	(19.05)	.875	(22.23)	1.000	(25.40)
CB	Std.	1.500	(38.10)	1.500	(38.10)	2.000	(50.80)	2.500	(63.50)
	O.S.	1.500	(38.10)	1.500	(38.10)	2.000	(50.80)	2.500	(63.50)
CC	Std.	1 1/4 - 12		1 1/4 - 12		1 1/2 - 12		1 3/4 - 12	
	O.S.	1 1/2 - 12		1 1/2 - 12		1 3/4 - 12		2 1/4 - 12	
CD	Std.	1.000	(25.40)	1.000	(25.40)	1.375	(34.93)	1.750	(44.45)
	O.S.	.750	(19.05)	.750	(19.05)	1.000	(25.40)	1.250	(31.75)
D	Std.	1.125	(28.58)	1.125	(28.58)	1.500	(38.10)	1.688	(42.86)
	O.S.	1.500	(38.10)	1.500	(38.10)	1.688	(42.86)	2.063	(52.39)
E	Std.	7.500	(190.50)	8.500	(215.90)	10.625	(269.88)	12.750	(323.85)
	O.S.	.750	(19.05)	.750	(19.05)	1.000	(25.40)	1.000	(25.40)
FF	Std.	1 3/8 - 12		1 3/8 - 12		1 3/4 - 12		2 - 12	
	O.S.	1 3/4 - 12		1 3/4 - 12		2 - 12		2 1/2 - 12	
G	Std.	2.000	(50.80)	2.000	(50.80)	2.250	(57.15)	2.250	(57.15)
	O.S.	1.500	(38.10)	1.500	(38.10)	2.000	(50.80)	2.000	(50.80)
K	Std.	.563	(14.29)	.563	(14.29)	.688	(17.46)	.688	(17.46)
	O.S.	.563	(14.29)	.563	(14.29)	.688	(17.46)	.688	(17.46)
KK	Std.	1 - 14		1 - 14		1 1/4 - 12		1 1/2 - 12	
	O.S.	1 1/4 - 12		1 1/4 - 12		1 1/2 - 12		1 7/8 - 12	
L	Std.	1.500	(38.10)	1.500	(38.10)	2.125	(53.98)	2.250	(57.15)
	O.S.	1.500	(38.10)	1.500	(38.10)	2.125	(53.98)	2.250	(57.15)
LB	Std.	5.125	(130.18)	5.125	(130.18)	6.375	(161.93)	6.875	(174.63)
	O.S.	5.125	(130.18)	5.125	(130.18)	6.375	(161.93)	6.875	(174.63)
LR	Std.	1.500	(38.10)	1.500	(38.10)	1.875	(47.63)	2.125	(53.98)
	O.S.	1.500	(38.10)	1.500	(38.10)	1.875	(47.63)	2.125	(53.98)
M	Std.	1.000	(25.40)	1.000	(25.40)	1.375	(34.93)	1.750	(44.45)
	O.S.	1.000	(25.40)	1.000	(25.40)	1.375	(34.93)	1.750	(44.45)
MM	Std.	1.375	(34.93)	1.375	(34.93)	1.750	(44.45)	2.000	(50.80)
	O.S.	1.750	(44.45)	1.750	(44.45)	2.000	(50.80)	2.500	(63.50)
MR	Std.	1.188	(30.16)	1.188	(30.16)	1.625	(41.28)	2.125	(53.98)
	O.S.	1.188	(30.16)	1.188	(30.16)	1.625	(41.28)	2.125	(53.98)
P	Std.	3.250	(82.55)	3.250	(82.55)	4.125	(104.78)	4.625	(117.48)
	O.S.	1.000	(25.40)	1.000	(25.40)	1.125	(28.58)	1.125	(28.58)
VF	Std.	1.125	(28.58)	1.125	(28.58)	1.125	(28.58)	1.250	(31.75)
	O.S.	1.125	(28.58)	1.125	(28.58)	1.125	(28.58)	1.250	(31.75)
WF	Std.	1.625	(41.28)	1.625	(41.28)	1.875	(47.63)	2.000	(50.80)
	O.S.	1.875	(47.63)	1.875	(47.63)	2.000	(50.80)	2.250	(57.15)
XC	Std.	8.250	(209.55)	8.250	(209.55)	10.375	(263.53)	11.125	(282.58)
	O.S.	8.500	(215.90)	8.500	(215.90)	10.500	(266.70)	11.375	(288.93)
Y	Std.	2.813	(71.44)	2.813	(71.44)	3.125	(79.38)	3.250	(82.55)
	O.S.	3.063	(77.79)	3.063	(77.79)	3.250	(82.55)	3.500	(88.90)

**Cylinder with 15 (MS7) Side End Lugs**

- NFPA (MS7) 15 End Lug Mount for 1-1/2" to 8" bore sizes.
- Series A & J Cylinders rated to 250 PSI air, 400 PSI hydraulic (non-shock). Series EA & EJ Cylinders rated to 250 PSI air only.
- Designed for non-lube service.
- Switches available on all bore sizes. (See pages ACT-1-90 & 91 for ordering information.)



**Cylinder Order Information**

**15** - - - -

A	Series A Cylinder
EA	Series EA Cylinder
J	Series J Cylinder
EJ	Series EJ Cylinder

Mounting Options	
01	Side Tapped (MS4)
03	Head Rectangular Flange (MF1)
03	Head Square (ME3)- 7" to 12" Bores
04	Cap Rectangular Flange (MF2)
04	Cap Square (ME4)- 7" to 12" Bores
05	Basic Cylinder No Mounting (MX0)
06	Both Ends (4) Tie Rods Ext. (MX1)
6B	Both Ends (2) Tie Rods Ext. (MX4)
6C	Cap Tie Rods Ext. (MX2)
6R	Head Tie Rods Ext. (MX3)
7R	Removable Head Trunion (MT1) - A & EA
07	Head Trunion (MT1) - J & EJ
8R	Cap Trunion (MT2) - A & EA
08	Cap Trunion (MT2) - J & EJ
09	Side Lugs (MS2)
10	Center Trunion (MT4)
11	Side End Angles (MS1)
12	Cap Fixed Clevis (MP1)
<b>15</b>	<b>Side End Lugs (MS7)</b>
16	Sleeve Nut Construction (Universal)
20	Head Square Flange (MF5)
21	Cap Square Flange (MF6)
22	Detachable Cap Clevis (MP2)
32	Cap Fixed Eye (MP3)
42	Detachable Cap Eye (MP4)
52	Spherical Bearing
60	Base Bar (Not NFPA - A & EA Only)

Cushion in Head	
3	None
5 <sup>1</sup>	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

<sup>1</sup>Standard with EA & EJ

Cushion in Cap	
3	None
5 <sup>1</sup>	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

<sup>1</sup>Standard with EA & EJ

**See page ACT-1-96 for complete instructions on how to order cylinders.**

Bore and Stroke (write out)

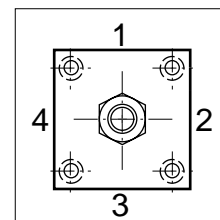
Additional Options – order alphabetically – More on page ACT-1-95	
HR	Case Hardened (45 Rc)
L(- -)	Port Location position 1 standard: L(Head Cap) (specify position 1 thru 4 for head and/or cap)
MS	Metal Rod Scraper
N(- -)	Cushion Adjust Screw Location position 2 standard: N(Head Cap) (specify position 1 thru 4 for head and/or cap)
P(-)*	Non-Standard Port Sizes: [specify port size for P(-H) head only, P(-C) cap only, or P(-) both head & cap]
PS	Magnetic Piston – includes aluminum tube option for J & EJ - Std. for Alum
RS	Rod Stud Type 1 (5/8" – 1 3/4" øRod) Type 2 (5/8" & 1" øRod)
RX	Rod Extensions (specify length of additional rod extension)
SC	Single Acting Spring Extend (Cap End)–See page ACT-1-86
SR	Single Acting Spring Retract (Rod End)–See page ACT-1-86
SS	303 Stainless Steel (Hard Chrome Plated)
ST(-C)	Stop Tube (Cap End) (specify stop tube length)
ST(-R)	Stop Tube (Rod End) (specify stop tube length)
T	Special Rod Threads (specify rod thread)
TK	Thrust Key
TX	Thread Extensions (specify length of thread extension)
V	Viton® Seals

\*1 1/2", 2", 2 1/2" bore cylinders have 3/8" NPT Standard, 1/2" NPT oversize.  
 3 1/4", 4", 5" bore cylinders have 1/2" NPT Standard, 3/4" NPT oversize.  
 This will add 1/8" to the overall cylinder length.

Piston Rod Threads Type	
1	Small Male (Solid)
2	Intermediate Thread Male (Solid)
3	Female
6	Full Thread Male (Solid)
7	Plain Rod End

Piston Rod Diameters		
A**	5/8"	Standard on 1 1/2", 2", 2 1/2"
B**	1"	Standard on 3 1/4", 4", 5" Oversized on 1 1/2", 2", 2 1/2"
C**	1 3/8"	Standard on 6", 7", 8" Oversized on 3 1/4", 4", 5"
D**	1 3/4"	Standard on 10" Oversized on 6", 7", 8"
E	2"	Standard on 12" Oversized on 10"
F	2 1/2"	Oversized on 10", 12"

\*\* A & EA uses A-D only.



**Port and Cushion Adjustment**

**Positions** (As viewed from rod end: Port standard position 1, Cushion Adjustment standard position 2.)

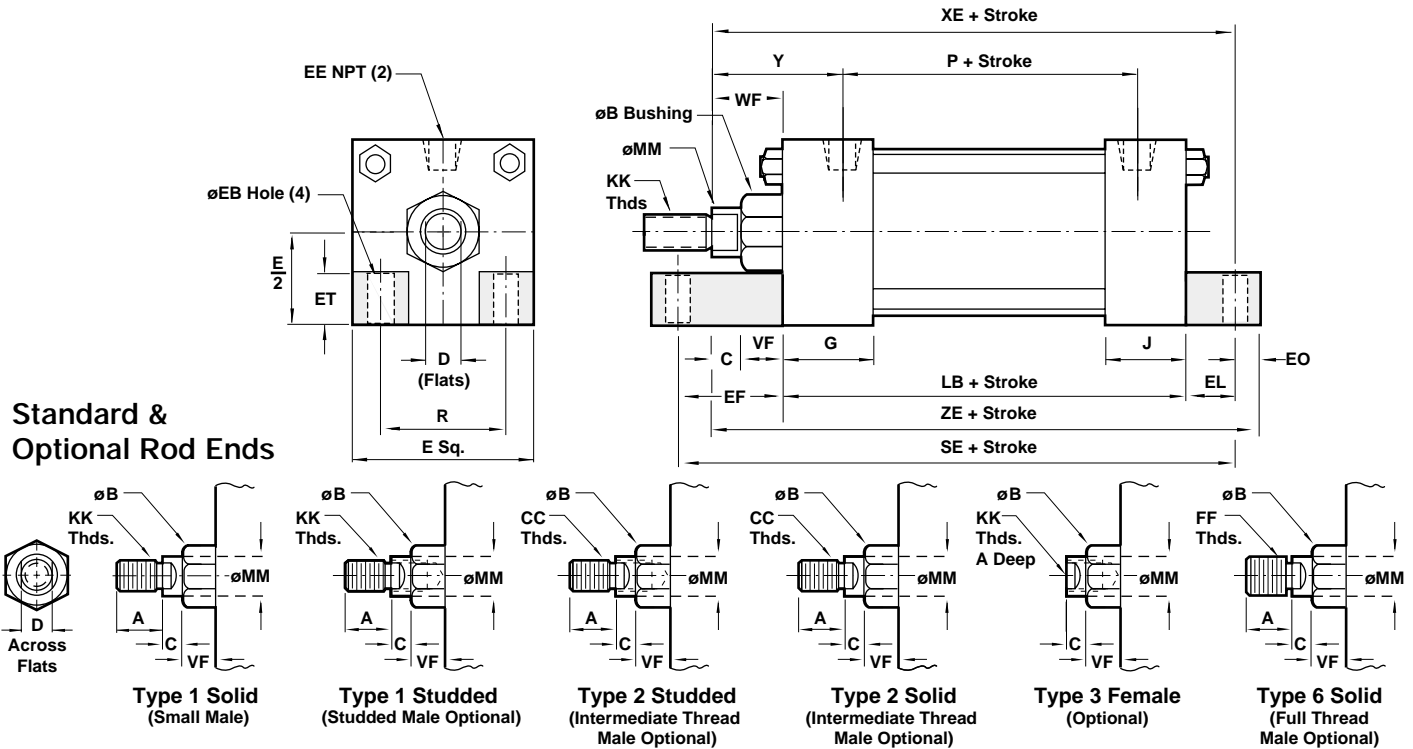
NOTE: A Port and a Cushion Adjustment cannot be in the same position.



**Series A & EA, NFPA Aluminum Air Cylinder with 15 (MS7) Side End Lugs**  
**Series J & EJ, NFPA Steel Air Cylinder with 15 (MS7) Side End Lugs**



All Dimensions in Inches (mm)



**Standard & Optional Rod Ends**

Dimension		1 1/2" Bore (38.10)	2" Bore (50.80)	2 1/2" Bore (63.50)	3 1/4" Bore (82.55)	4" Bore (101.60)	5" Bore (127.00)	6" Bore (152.40)	7" Bore (177.80)	8" Bore (203.20)
ø Rod	Std.	5/8" (15.88)	5/8" (15.88)	5/8" (15.88)	1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/8" (34.93)
	O.S.	1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/4" (44.45)	1 3/4" (44.45)	1 3/4" (44.45)
A	Std.	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)
	O.S.	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)
B <sup>+0.000</sup> -0.002	Std.	1.124 (28.55)	1.124 (28.55)	1.124 (28.55)	1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)	1.999 (50.78)	1.999 (50.78)
	O.S.	1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)	1.999 (50.78)	1.999 (50.78)	2.374 (60.30)	2.374 (60.30)	2.374 (60.30)
C	Std.	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)
	O.S.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)	.750 (19.05)	.750 (19.05)
CC	Std.	1/2 - 20	1/2 - 20	1/2 - 20	7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12	1 1/4 - 12	1 1/4 - 12
	O.S.	7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12	1 1/4 - 12	1 1/4 - 12	1 1/2 - 12	1 1/2 - 12	1 1/2 - 12
D	Std.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.813 (20.64)	.813 (20.64)	.813 (20.64)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)
	O.S.	.813 (20.64)	.813 (20.64)	.813 (20.64)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)
E		2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)	5.500 (139.70)	6.500 (165.10)	7.500 (190.50)	8.500 (215.90)
EB		.313 (7.94)	.375 (9.53)	.375 (9.53)	.438 (11.11)	.438 (11.11)	.563 (14.29)	.563 (14.29)	.688 (17.46)	.688 (17.46)
EE		.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)	.750 (19.05)
EF		1.125 (28.58)	1.313 (33.34)	1.438 (36.51)	1.500 (38.10)	1.625 (41.28)	1.688 (42.88)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)
EL		.750 (19.05)	.938 (23.81)	1.063 (26.99)	.875 (22.23)	1.000 (25.40)	1.063 (26.99)	1.000 (25.40)	1.125 (28.58)	1.125 (28.58)
EO		.250 (6.35)	.313 (7.94)	.313 (7.94)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)
ET		.500 (12.70)	.750 (19.05)	.750 (19.05)	1.000 (25.40)	1.250 (31.75)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	2.063 (52.39)
FF	Std.	5/8 - 18	5/8 - 18	5/8 - 18	1 - 14	1 - 14	1 - 14	1 3/8 - 12	1 3/8 - 12	1 3/8 - 12
	O.S.	1 - 14	1 - 14	1 - 14	1 3/8 - 12	1 3/8 - 12	1 3/8 - 12	1 3/4 - 12	1 3/4 - 12	1 3/4 - 12
G		1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)
J		1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)
KK	Std.	7/16 - 20	7/16 - 20	7/16 - 20	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14	1 - 14
	O.S.	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14	1 - 14	1 1/4 - 12	1 1/4 - 12	1 1/4 - 12
LB		3.625 (92.08)	3.625 (92.08)	3.750 (95.25)	4.250 (107.95)	4.250 (107.95)	4.500 (114.30)	5.000 (127.00)	5.125 (130.18)	5.125 (130.18)
MM	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)
	O.S.	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)
P		2.340 (59.44)	2.340 (59.44)	2.470 (62.74)	2.690 (68.33)	2.690 (68.33)	2.940 (74.68)	3.125 (79.38)	3.250 (82.55)	3.250 (82.55)
R		1.428 (36.27)	1.838 (46.68)	2.192 (55.67)	2.758 (70.05)	3.323 (84.40)	4.101 (104.16)	4.879 (123.92)	5.730 (145.54)	6.442 (163.63)
SE		5.500 (139.70)	5.875 (149.23)	6.250 (158.75)	6.625 (168.28)	6.875 (174.63)	7.250 (184.15)	7.750 (196.85)	7.375 (187.33)	7.375 (187.33)
VF	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)
	O.S.	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)
WF	Std.	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)
	O.S.	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	1.875 (47.63)	1.875 (47.63)	1.875 (47.63)
XE	Std.	5.375 (136.53)	5.563 (141.29)	5.813 (147.64)	6.500 (165.10)	6.625 (168.28)	6.938 (176.21)	7.625 (193.68)	7.875 (200.03)	7.875 (200.03)
	O.S.	5.750 (146.05)	5.938 (150.81)	6.188 (157.16)	6.750 (171.45)	6.875 (174.63)	7.188 (182.56)	7.875 (200.03)	8.125 (206.38)	8.125 (206.38)
Y	Std.	1.840 (46.74)	1.840 (46.74)	1.840 (46.74)	2.380 (60.45)	2.380 (60.45)	2.380 (60.45)	2.813 (61.91)	2.813 (71.44)	2.813 (71.44)
	O.S.	2.220 (56.39)	2.220 (56.39)	2.220 (56.39)	2.630 (66.80)	2.630 (66.80)	2.630 (66.80)	3.063 (77.79)	3.063 (77.79)	3.063 (77.79)
ZE	Std.	5.625 (142.88)	5.875 (149.23)	6.125 (155.58)	6.875 (174.63)	7.000 (177.80)	7.438 (188.91)	8.125 (206.38)	8.500 (215.90)	8.500 (215.90)
	O.S.	6.000 (152.40)	6.250 (158.75)	6.500 (165.10)	7.125 (180.98)	7.250 (184.15)	7.688 (195.26)	8.375 (212.73)	8.750 (222.25)	8.750 (222.25)

**Cylinder 16 Sleeve Nut Construction Side Tapped (Universal)**

- **16 Sleeve Nut Constuction Side Tapped (Universal Mount) for 1-1/2" to 6" bore sizes.**
- **Series A & J Cylinders rated to 250 PSI air, 400 PSI hydraulic (non-shock). Series EA & EJ Cylinders rated to 250 PSI air only.**
- **Designed for non-lube service.**
- **Switches available on all bore sizes. (See pages ACT-1-90 & 91 for ordering information.)**



**Cylinder Order Information**

**16** - - - - -

A	Series A Cylinder
EA	Series EA Cylinder
J	Series J Cylinder
EJ	Series EJ Cylinder

Mounting Options	
01	Side Tapped (MS4)
03	Head Rectangular Flange (MF1)
03	Head Square (ME3)– 7" to 12" Bores
04	Cap Rectangular Flange (MF2)
04	Cap Square (ME4)– 7" to 12" Bores
05	Basic Cylinder No Mounting (MX0)
06	Both Ends (4) Tie Rods Ext. (MX1)
6B	Both Ends (2) Tie Rods Ext. (MX4)
6C	Cap Tie Rods Ext. (MX2)
6R	Head Tie Rods Ext. (MX3)
7R	Removable Head Trunion (MT1) - A & EA
07	Head Trunion (MT1) - J & EJ
8R	Cap Trunion (MT2) - A & EA
08	Cap Trunion (MT2) - J & EJ
09	Side Lugs (MS2)
10	Center Trunion (MT4)
11	Side End Angles (MS1)
12	Cap Fixed Clevis (MP1)
15	Side End Lugs (MS7)
<b>16</b>	<b>Sleeve Nut Construction (Universal)</b>
20	Head Square Flange (MF5)
21	Cap Square Flange (MF6)
22	Detachable Cap Clevis (MP2)
32	Cap Fixed Eye (MP3)
42	Detachable Cap Eye (MP4)
52	Spherical Bearing
60	Base Bar (Not NFPA - A & EA Only)

Cushion in Head	
3	None
5 <sup>1</sup>	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

<sup>1</sup>Standard with EA & EJ

Cushion in Cap	
3	None
5 <sup>1</sup>	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

<sup>1</sup>Standard with EA & EJ

Bore and Stroke (write out)

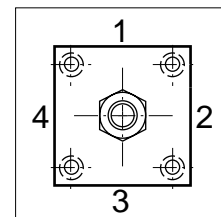
Additional Options – order alphabetically – More on page ACT-1-95	
HR	Case Hardened (45 Rc)
L(- -)	Port Location position 1 standard: L(Head Cap) (specify position 1 thru 4 for head and/or cap)
MS	Metal Rod Scraper
N(- -)	Cushion Adjust Screw Location position 2 standard: N(Head Cap) (specify position 1 thru 4 for head and/or cap)
P(-)*	Non-Standard Port Sizes: [specify port size for P(-H) head only, P(-C) cap only, or P(-) both head & cap]
PS	Magnetic Piston – includes aluminum tube option for J & EJ - Std. for Alum
RS	Rod Stud Type 1 (5/8" – 1 3/4" øRod) Type 2 (5/8" & 1" øRod)
RX	Rod Extensions (specify length of additional rod extension)
SC	Single Acting Spring Extend (Cap End)–See page ACT-1-86
SR	Single Acting Spring Retract (Rod End)–See page ACT-1-86
SS	303 Stainless Steel (Hard Chrome Plated)
ST(-C)	Stop Tube (Cap End) (specify stop tube length)
ST(-R)	Stop Tube (Rod End) (specify stop tube length)
T	Special Rod Threads (specify rod thread)
TX	Thread Extensions (specify length of thread extension)
V	Viton® Seals

\*1 1/2", 2", 2 1/2" bore cylinders have 3/8" NPT Standard, 1/2" NPT oversize.  
 3 1/4", 4", 5" bore cylinders have 1/2" NPT Standard, 3/4" NPT oversize.  
 This will add 1/8" to the overall cylinder length.

Piston Rod Threads Type	
1	Small Male (Solid)
2	Intermediate Thread Male (Solid)
3	Female
6	Full Thread Male (Solid)
7	Plain Rod End

Piston Rod Diameters		
A**	5/8"	Standard on 1 1/2", 2", 2 1/2"
B**	1"	Standard on 3 1/4", 4", 5" Oversized on 1 1/2", 2", 2 1/2"
C**	1 3/8"	Standard on 6", 7", 8" Oversized on 3 1/4", 4", 5"
D**	1 3/4"	Standard on 10" Oversized on 6", 7", 8"
E	2"	Standard on 12" Oversized on 10"
F	2 1/2"	Oversized on 10", 12"

\*\* A & EA uses A-D only.



**Port and Cushion Adjustment**

**Positions** (As viewed from rod end: Port standard position 1, Cushion Adjustment standard position 2.)

NOTE: A Port and a Cushion Adjustment cannot be in the same position.

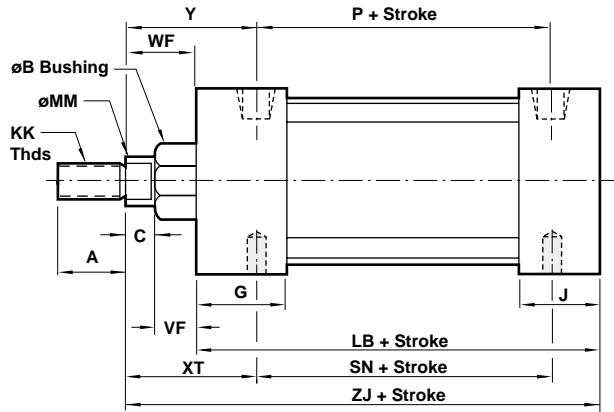
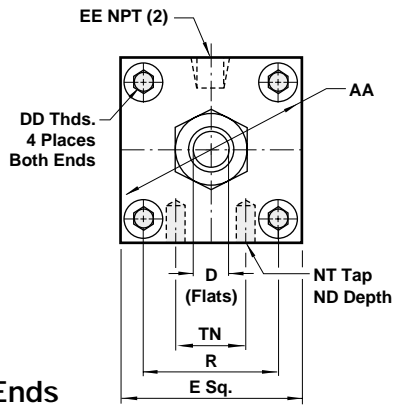
**See page ACT-1-96 for complete instructions on how to order cylinders.**

**Series A & EA Cylinder with 16 Sleeve Nut Construction Side Tapped (Universal)**  
**Series J & EJ Cylinder with 16 Sleeve Nut Construction Side Tapped (Universal)**

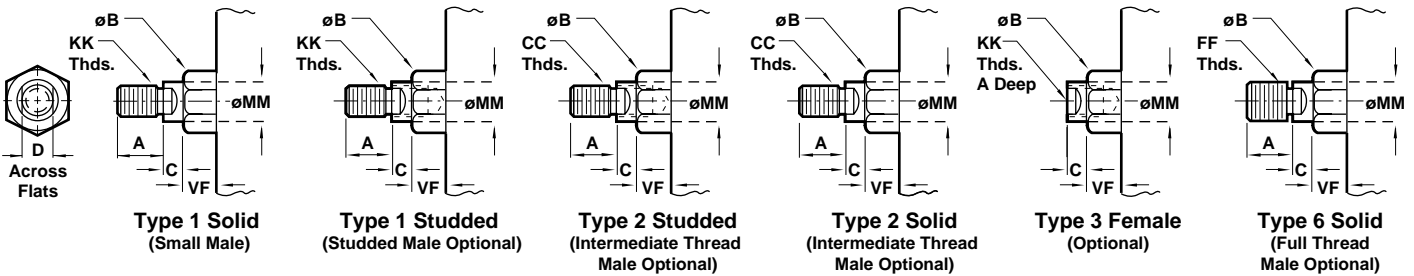


All Dimensions in Inches (mm)

**16 Sleeve Nut Construction**  
**Basic Cylinder Side Tapped (Universal)**



**Standard & Optional Rod Ends**



Dimension	1 1/2" Bore (38.10)	2" Bore (50.80)	2 1/2" Bore (63.50)	3 1/4" Bore (82.55)	4" Bore (101.60)	5" Bore (127.00)	6" Bore (152.40)
ø Rod	Std. 5/8" (15.88)	5/8" (15.88)	5/8" (15.88)	1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)
	O.S. 1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/4" (44.45)
A	Std. .750 (19.05)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)
	O.S. 1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)
AA	2.020 (51.31)	2.600 (66.04)	3.100 (78.74)	3.900 (99.06)	4.700 (119.38)	5.800 (147.32)	6.900 (175.26)
B <sup>+0.000</sup> <sub>-0.002</sub>	Std. 1.124 (28.55)	1.124 (28.55)	1.124 (28.55)	1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)
	O.S. 1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)	1.999 (50.78)	1.999 (50.78)	2.374 (60.30)
C	Std. .375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)
	O.S. .500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)
CC	Std. 1/2 - 20	1/2 - 20	1/2 - 20	7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12
	O.S. 7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12	1 1/4 - 12	1 1/4 - 12	1 1/2 - 12
D	Std. .500 (12.70)	.500 (12.70)	.500 (12.70)	.813 (20.64)	.813 (20.64)	.813 (20.64)	1.125 (28.58)
	O.S. .813 (20.64)	.813 (20.64)	.813 (20.64)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)
DD	1/4 - 28	5/16 - 24	5/16 - 24	3/8 - 24	3/8 - 24	1/2 - 20	1/2 - 20
E	2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)	5.500 (139.70)	6.500 (165.10)
EE	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)
FF	Std. 5/8 - 18	5/8 - 18	5/8 - 18	1 - 14	1 - 14	1 - 14	1 3/8 - 12
	O.S. 1 - 14	1 - 14	1 - 14	1 3/8 - 12	1 3/8 - 12	1 3/8 - 12	1 3/4 - 12
G	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)	2.000 (50.80)
J	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)
KK	Std. 7/16 - 20	7/16 - 20	7/16 - 20	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14
	O.S. 3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14	1 - 14	1 1/4 - 12
LB	3.625 (92.08)	3.625 (92.08)	3.750 (95.25)	4.250 (107.95)	4.250 (107.95)	4.500 (114.30)	5.000 (127.00)
MM	Std. .625 (15.88)	.625 (15.88)	.625 (15.88)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)
	O.S. 1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.750 (44.45)
NT	1/4 - 20	5/16 - 18	3/8 - 16	1/2 - 13	1/2 - 13	5/8 - 11	3/4 - 10
ND	.375 (9.53)	.375 (9.53)	.500 (12.70)	.750 (19.05)	.750 (19.05)	.938 (23.81)	1.125 (28.58)
P	2.340 (59.44)	2.340 (59.44)	2.470 (62.74)	2.690 (68.33)	2.690 (68.33)	2.940 (74.68)	3.125 (79.38)
R	1.428 (36.27)	1.838 (46.68)	2.192 (55.67)	2.758 (70.05)	3.323 (84.40)	4.101 (104.16)	4.879 (123.92)
SN	2.250 (57.15)	2.250 (57.15)	2.375 (60.33)	2.625 (66.68)	2.625 (66.68)	2.875 (73.03)	3.125 (79.38)
TN	.625 (15.88)	.875 (22.23)	1.250 (31.75)	1.500 (38.10)	2.063 (52.39)	2.688 (68.26)	3.250 (82.55)
VF	Std. .625 (15.88)	.625 (15.88)	.625 (15.88)	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)
	O.S. .875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)
WF	Std. 1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)
	O.S. 1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	1.875 (47.63)
XT	Std. 1.938 (49.21)	1.938 (49.21)	1.938 (49.21)	2.438 (61.91)	2.438 (61.91)	2.438 (61.91)	2.813 (71.44)
	O.S. 2.313 (58.74)	2.313 (58.74)	2.313 (58.74)	2.688 (68.26)	2.688 (68.26)	2.688 (68.26)	3.063 (77.79)
Y	Std. 1.840 (46.74)	1.840 (46.74)	1.840 (46.74)	2.380 (60.45)	2.380 (60.45)	2.380 (60.45)	2.813 (71.44)
	O.S. 2.220 (56.39)	2.220 (56.39)	2.220 (56.39)	2.630 (66.80)	2.630 (66.80)	2.630 (66.80)	3.063 (77.79)
ZJ	Std. 4.625 (117.48)	4.625 (117.48)	4.750 (120.65)	5.625 (142.88)	5.625 (142.88)	5.625 (142.88)	6.625 (168.28)
	O.S. 5.000 (127.00)	5.000 (127.00)	5.125 (130.18)	5.875 (149.23)	5.875 (149.23)	5.875 (149.23)	6.875 (174.63)

**Cylinder with 20 (MF5) Head Square Flange**

- NFPA (MF5) 20 Head Square Flange Mount for 1-1/2" to 6" bore sizes.
- Series A & J Cylinders rated to 250 PSI air, 400 PSI hydraulic (non-shock). Series EA & EJ Cylinders rated to 250 PSI air only.
- Designed for non-lube service.
- Switches available on all bore sizes. (See pages ACT-1-90 & 91 for ordering information.)



**Cylinder Order Information**

**20** - - - -

A	Series A Cylinder
EA	Series EA Cylinder
J	Series J Cylinder
EJ	Series EJ Cylinder

Mounting Options	
01	Side Tapped (MS4)
03	Head Rectangular Flange (MF1)
03	Head Square (ME3)-7" to 12" Bores
04	Cap Rectangular Flange (MF2)
04	Cap Square (ME4)-7" to 12" Bores
05	Basic Cylinder No Mounting (MX0)
06	Both Ends (4) Tie Rods Ext. (MX1)
6B	Both Ends (2) Tie Rods Ext. (MX4)
6C	Cap Tie Rods Ext. (MX2)
6R	Head Tie Rods Ext. (MX3)
7R	Removable Head Trunion (MT1) - A & EA
07	Head Trunion (MT1) - J & EJ
8R	Cap Trunion (MT2) - A & EA
08	Cap Trunion (MT2) - J & EJ
09	Side Lugs (MS2)
10	Center Trunion (MT4)
11	Side End Angles (MS1)
12	Cap Fixed Clevis (MP1)
15	Side End Lugs (MS7)
16	Sleeve Nut Construction (Universal)
<b>20</b>	<b>Head Square Flange (MF5)</b>
21	Cap Square Flange (MF6)
22	Detachable Cap Clevis (MP2)
32	Cap Fixed Eye (MP3)
42	Detachable Cap Eye (MP4)
52	Spherical Bearing
60	Base Bar (Not NFPA - A & EA Only)

Cushion in Head	
3	None
5 <sup>1</sup>	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

<sup>1</sup>Standard with EA & EJ

Cushion in Cap	
3	None
5 <sup>1</sup>	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

<sup>1</sup>Standard with EA & EJ

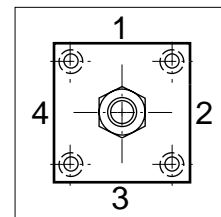
Bore and Stroke (write out)

Additional Options – order alphabetically – More on page ACT-1-95	
HR	Case Hardened (45 Rc)
L(- -)	Port Location position 1 standard: L(Head Cap) (specify position 1 thru 4 for head and/or cap)
MS	Metal Rod Scraper
N(- -)	Cushion Adjust Screw Location position 2 standard: N(Head Cap) (specify position 1 thru 4 for head and/or cap)
P(-)*	Non-Standard Port Sizes: [specify port size for P(-H) head only, P(-C) cap only, or P(-) both head & cap]
PS	Magnetic Piston – includes aluminum tube option for J & EJ - Std. for Alum
RS	Rod Stud Type 1 (5/8" – 1 3/4" øRod) Type 2 (5/8" & 1" øRod)
RX	Rod Extensions (specify length of additional rod extension)
SC	Single Acting Spring Extend (Cap End)–See page ACT-1-86
SR	Single Acting Spring Retract (Rod End)–See page ACT-1-86
SS	303 Stainless Steel (Hard Chrome Plated)
ST(-C)	Stop Tube (Cap End) (specify stop tube length)
ST(-R)	Stop Tube (Rod End) (specify stop tube length)
T	Special Rod Threads (specify rod thread)
TX	Thread Extensions (specify length of thread extension)
V	Viton® Seals

\*1 1/2", 2", 2 1/2" bore cylinders have 3/8" NPT Standard, 1/2" NPT oversize.  
 3 1/4", 4", 5" bore cylinders have 1/2" NPT Standard, 3/4" NPT oversize.  
 This will add 1/8" to the overall cylinder length.

Piston Rod Threads Type	
1	Small Male (Solid)
2	Intermediate Thread Male (Solid)
3	Female
6	Full Thread Male (Solid)
7	Plain Rod End

Piston Rod Diameters		
A**	5/8"	Standard on 1 1/2", 2", 2 1/2"
B**	1"	Standard on 3 1/4", 4", 5" Oversized on 1 1/2", 2", 2 1/2"
C**	1 3/8"	Standard on 6", 7", 8" Oversized on 3 1/4", 4", 5"
D**	1 3/4"	Standard on 10" Oversized on 6", 7", 8"
E	2"	Standard on 12" Oversized on 10"
F	2 1/2"	Oversized on 10", 12"



**Port and Cushion Adjustment**

**Positions** (As viewed from rod end: Port standard position 1, Cushion Adjustment standard position 2.)

NOTE: A Port and a Cushion Adjustment cannot be in the same position.

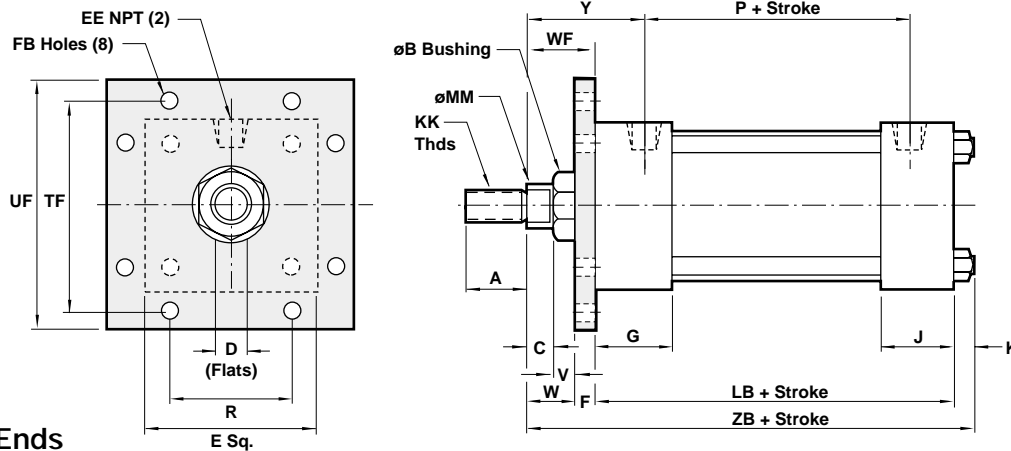
\*\* A & EA uses A-D only.

**See page ACT-1-96 for complete instructions on how to order cylinders.**

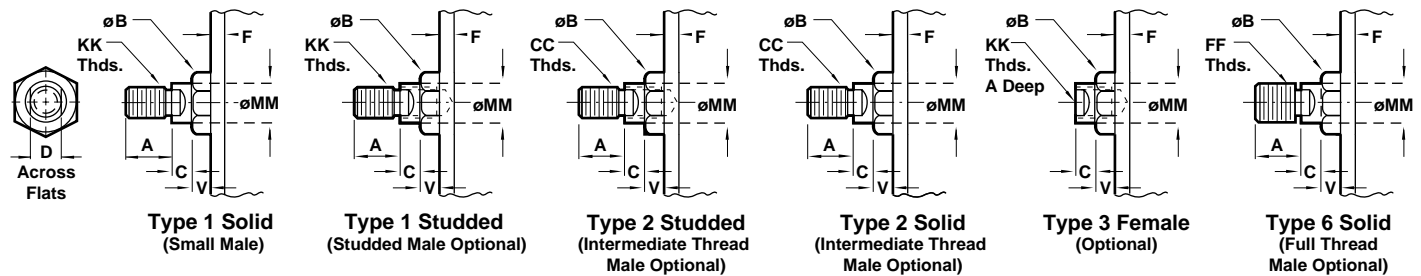
**Series A & EA, NFPA Aluminum Air Cylinders with 20 (MF5) Head Square Flange**  
**Series J & EJ, NFPA Steel Air Cylinder with 20 (MF5) Head Square Flange**



All Dimensions in Inches (mm)



**Standard & Optional Rod Ends**



Dimension		1 1/2" Bore (38.10)	2" Bore (50.80)	2 1/2" Bore (63.50)	3 1/4" Bore (82.55)	4" Bore (101.60)	5" Bore (127.00)	6" Bore (152.40)
ø Rod	Std.	5/8" (15.88)	5/8" (15.88)	5/8" (15.88)	1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)
	O.S.	1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/4" (44.45)
A	Std.	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)
	O.S.	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)
B +.000 -.002	Std.	1.124 (28.55)	1.124 (28.55)	1.124 (28.55)	1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)
	O.S.	1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)	1.999 (50.78)	1.999 (50.78)	2.374 (60.30)
C	Std.	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)
	O.S.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)
CC	Std.	1/2 - 20	1/2 - 20	1/2 - 20	7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12
	O.S.	7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12	1 1/4 - 12	1 1/4 - 12	1 1/2 - 12
D	Std.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.813 (20.64)	.813 (20.64)	.813 (20.64)	1.125 (28.58)
	O.S.	.813 (20.64)	.813 (20.64)	.813 (20.64)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)
E		2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)	5.500 (139.70)	6.500 (165.10)
EE		.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)
F		.375 (9.53)	.375 (9.53)	.375 (9.53)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)
FB		.313 (7.94)	.375 (9.53)	.375 (9.53)	.438 (11.11)	.438 (11.11)	.563 (14.29)	.563 (14.29)
FF	Std.	5/8 - 18	5/8 - 18	5/8 - 18	1 - 14	1 - 14	1 - 14	1 3/8 - 12
	O.S.	1 - 14	1 - 14	1 - 14	1 3/8 - 12	1 3/8 - 12	1 3/8 - 12	1 3/4 - 12
G		1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)	2.000 (50.80)
J		1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)
K		.250 (6.35)	.313 (7.94)	.313 (7.94)	.375 (9.53)	.375 (9.53)	.438 (11.11)	.438 (11.11)
KK	Std.	7/16 - 20	7/16 - 20	7/16 - 20	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14
	O.S.	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14	1 - 14	1 1/4 - 12
LB		3.625 (92.08)	3.625 (92.08)	3.750 (95.25)	4.250 (107.95)	4.250 (107.95)	4.500 (114.30)	5.000 (127.00)
MM	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)
	O.S.	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.750 (44.45)
P		2.340 (59.44)	2.340 (59.44)	2.470 (62.74)	2.690 (68.33)	2.690 (68.33)	2.940 (74.68)	3.125 (79.38)
R		1.428 (36.27)	1.838 (46.68)	2.192 (55.67)	2.758 (70.05)	3.323 (84.40)	4.101 (104.16)	4.879 (123.92)
TF		2.750 (69.85)	3.375 (85.73)	3.875 (98.43)	4.688 (119.06)	5.438 (138.11)	6.625 (168.28)	7.625 (193.68)
UF		3.375 (85.73)	4.125 (104.78)	4.625 (117.48)	5.500 (139.70)	6.250 (158.75)	7.625 (193.68)	8.625 (219.08)
V	Std.	.250 (6.35)	.250 (6.35)	.250 (6.35)	.375 (9.53)	.375 (9.53)	.375 (9.53)	.375 (9.53)
	O.S.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)	.750 (19.05)	.875 (22.23)
W	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)	.750 (19.05)	.750 (19.05)	.875 (22.23)
	O.S.	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)
WF	Std.	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.92)	1.375 (34.92)	1.375 (34.92)	1.625 (41.27)
	O.S.	1.375 (34.92)	1.375 (34.92)	1.375 (34.92)	1.625 (41.27)	1.625 (41.27)	1.625 (41.27)	1.875 (47.63)
Y	Std.	1.840 (46.74)	1.840 (46.74)	1.840 (46.74)	2.380 (60.45)	2.380 (60.45)	2.380 (60.45)	2.813 (71.44)
	O.S.	2.220 (56.39)	2.220 (56.39)	2.220 (56.39)	2.630 (66.80)	2.630 (66.80)	2.630 (66.80)	3.063 (77.79)
ZB	Std.	4.875 (123.83)	4.938 (125.41)	5.063 (128.59)	6.000 (152.40)	6.000 (152.40)	6.313 (160.34)	7.063 (179.39)
	O.S.	5.250 (133.35)	5.313 (134.94)	5.438 (138.11)	6.250 (158.75)	6.250 (158.75)	6.563 (166.69)	7.313 (185.74)

**Cylinder with 21 (MF6) Cap Square Flange**

- NFPA (MF6) 21 Cap Square Flange Mount for 1-1/2" to 6" bore sizes.
- Series A & J Cylinders rated to 250 PSI air, 400 PSI hydraulic (non-shock). Series EA & EJ Cylinders rated to 250 PSI air only.
- Designed for non-lube service.
- Switches available on all bore sizes. (See pages ACT-1-90 & 91 for ordering information.)



**Cylinder Order Information**

**21** - - - - -

A	Series A Cylinder
EA	Series EA Cylinder
J	Series J Cylinder
EJ	Series EJ Cylinder

Mounting Options	
01	Side Tapped (MS4)
03	Head Rectangular Flange (MF1)
03	Head Square (ME3)- 7" to 12" Bores
04	Cap Rectangular Flange (MF2)
04	Cap Square (ME4)- 7" to 12" Bores
05	Basic Cylinder No Mounting (MX0)
06	Both Ends (4) Tie Rods Ext. (MX1)
6B	Both Ends (2) Tie Rods Ext. (MX4)
6C	Cap Tie Rods Ext. (MX2)
6R	Head Tie Rods Ext. (MX3)
7R	Removable Head Trunnion (MT1) - A & EA
07	Head Trunnion (MT1) - J & EJ
8R	Cap Trunnion (MT2) - A & EA
08	Cap Trunnion (MT2) - J & EJ
09	Side Lugs (MS2)
10	Center Trunnion (MT4)
11	Side End Angles (MS1)
12	Cap Fixed Clevis (MP1)
15	Side End Lugs (MS7)
16	Sleeve Nut Construction (Universal)
20	Head Square Flange (MF5)
<b>21</b>	<b>Cap Square Flange (MF6)</b>
22	Detachable Cap Clevis (MP2)
32	Cap Fixed Eye (MP3)
42	Detachable Cap Eye (MP4)
52	Spherical Bearing
60	Base Bar (Not NFPA - A & EA Only)

Cushion in Head	
3	None
5 <sup>1</sup>	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

<sup>1</sup>Standard with EA & EJ

Cushion in Cap	
3	None
5 <sup>1</sup>	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

<sup>1</sup>Standard with EA & EJ

**See page ACT-1-96 for complete instructions on how to order cylinders.**

Bore and Stroke (write out)

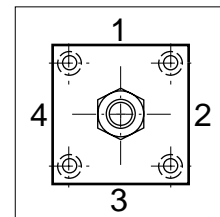
Additional Options – order alphabetically – More on page ACT-1-95	
HR	Case Hardened (45 Rc)
L(- -)	Port Location position 1 standard: L(Head Cap) (specify position 1 thru 4 for head and/or cap)
MS	Metal Rod Scraper
N(- -)	Cushion Adjust Screw Location position 2 standard: N(Head Cap) (specify position 1 thru 4 for head and/or cap)
P(-)*	Non-Standard Port Sizes: [specify port size for P(-H) head only, P(-C) cap only, or P(-) both head & cap]
PS	Magnetic Piston – includes aluminum tube option for J & EJ - Std. for Alum
RS	Rod Stud Type 1 (5/8" – 1 3/4" øRod) Type 2 (5/8" & 1" øRod)
RX	Rod Extensions (specify length of additional rod extension)
SC	Single Acting Spring Extend (Cap End)–See page ACT-1-86
SR	Single Acting Spring Retract (Rod End)–See page ACT-1-86
SS	303 Stainless Steel (Hard Chrome Plated)
ST(-C)	Stop Tube (Cap End) (specify stop tube length)
ST(-R)	Stop Tube (Rod End) (specify stop tube length)
T	Special Rod Threads (specify rod thread)
TX	Thread Extensions (specify length of thread extension)
V	Viton® Seals

\*1 1/2", 2", 2 1/2" bore cylinders have 3/8" NPT Standard, 1/2" NPT oversize.  
 3 1/4", 4", 5" bore cylinders have 1/2" NPT Standard, 3/4" NPT oversize.  
 This will add 1/8" to the overall cylinder length.

Piston Rod Threads Type	
1	Small Male (Solid)
2	Intermediate Thread Male (Solid)
3	Female
6	Full Thread Male (Solid)
7	Plain Rod End

Piston Rod Diameters		
A**	5/8"	Standard on 1 1/2", 2", 2 1/2"
B**	1"	Standard on 3 1/4", 4", 5" Oversized on 1 1/2", 2", 2 1/2"
C**	1 3/8"	Standard on 6", 7", 8" Oversized on 3 1/4", 4", 5"
D**	1 3/4"	Standard on 10" Oversized on 6", 7", 8"
E	2"	Standard on 12" Oversized on 10"
F	2 1/2"	Oversized on 10", 12"

\*\* A & EA uses A-D only.



**Port and Cushion Adjustment**

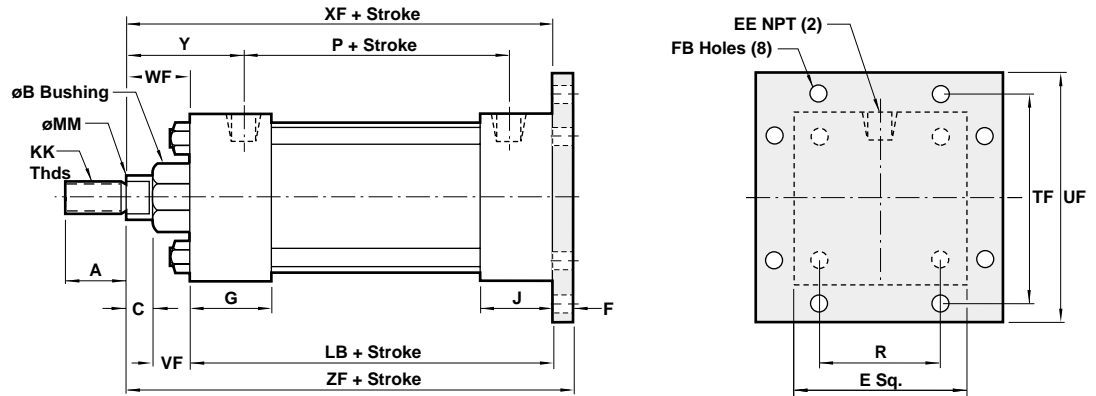
**Positions** (As viewed from rod end: Port standard position 1, Cushion Adjustment standard position 2.)

NOTE: A Port and a Cushion Adjustment cannot be in the same position.

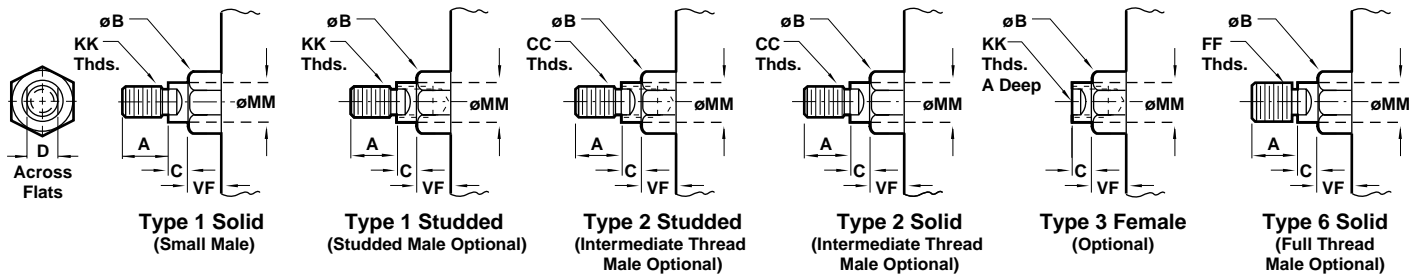
**Series A & EA, NFPA Aluminum Air Cylinder with 21 (MF6) Cap Square Flange**  
**Series J & EJ, NFPA Steel Air Cylinder with 21 (MF6) Cap Square Flange**



All Dimensions in Inches (mm)



**Standard & Optional Rod Ends**



Dimension		1 1/2" Bore (38.10)	2" Bore (50.80)	2 1/2" Bore (63.50)	3 1/4" Bore (82.55)	4" Bore (101.60)	5" Bore (127.00)	6" Bore (152.40)
ø Rod	Std.	5/8" (15.88)	5/8" (15.88)	5/8" (15.88)	1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)
	O.S.	1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/4" (44.45)
A	Std.	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)
	O.S.	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)
B +.000 -.002	Std.	1.124 (28.55)	1.124 (28.55)	1.124 (28.55)	1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)
	O.S.	1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)	1.999 (50.78)	1.999 (50.78)	2.374 (60.30)
C	Std.	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)
	O.S.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)
CC	Std.	1/2 - 20	1/2 - 20	1/2 - 20	7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12
	O.S.	7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12	1 1/4 - 12	1 1/4 - 12	1 1/2 - 12
D	Std.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.813 (20.64)	.813 (20.64)	.813 (20.64)	1.125 (28.58)
	O.S.	.813 (20.64)	.813 (20.64)	.813 (20.64)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)
E		2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)	5.500 (139.70)	6.500 (165.10)
EE		.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)
F		.375 (9.53)	.375 (9.53)	.375 (9.53)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)
FB		.313 (7.94)	.375 (9.53)	.375 (9.53)	.438 (11.11)	.438 (11.11)	.563 (14.29)	.563 (14.29)
FF	Std.	5/8 - 18	5/8 - 18	5/8 - 18	1 - 14	1 - 14	1 - 14	1 3/8 - 12
	O.S.	1 - 14	1 - 14	1 - 14	1 3/8 - 12	1 3/8 - 12	1 3/8 - 12	1 3/4 - 12
G		1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)	2.000 (50.80)
J		1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)
K		.250 (6.35)	.313 (7.94)	.313 (7.94)	.375 (9.53)	.375 (9.53)	.438 (11.11)	.438 (11.11)
KK	Std.	7/16 - 20	7/16 - 20	7/16 - 20	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14
	O.S.	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14	1 - 14	1 1/4 - 12
LB	Std.	3.625 (92.08)	3.625 (92.08)	3.750 (95.25)	4.250 (107.95)	4.250 (107.95)	4.500 (114.30)	5.000 (127.00)
	O.S.	.625 (15.88)	.625 (15.88)	.625 (15.88)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)
MM	Std.	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.750 (44.45)
	O.S.	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.750 (44.45)
P		2.340 (59.44)	2.340 (59.44)	2.470 (62.74)	2.690 (68.33)	2.690 (68.33)	2.940 (74.68)	3.125 (79.38)
R		1.428 (36.27)	1.838 (46.68)	2.192 (55.67)	2.758 (70.05)	3.323 (84.40)	4.101 (104.16)	4.879 (123.92)
TF		2.750 (69.85)	3.375 (85.73)	3.875 (98.43)	4.688 (119.06)	5.438 (138.11)	6.625 (168.28)	7.625 (193.68)
UF		3.375 (85.73)	4.125 (104.78)	4.625 (117.48)	5.500 (139.70)	6.250 (158.75)	7.625 (193.68)	8.625 (219.08)
VF	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)
	O.S.	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)
WF	Std.	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.92)	1.375 (34.92)	1.375 (34.92)	1.625 (41.27)
	O.S.	1.375 (34.92)	1.375 (34.92)	1.375 (34.92)	1.625 (41.27)	1.625 (41.27)	1.625 (41.27)	1.875 (47.63)
XF	Std.	4.625 (117.48)	4.625 (117.48)	4.750 (120.65)	5.625 (142.88)	5.625 (142.88)	5.875 (149.23)	6.625 (168.27)
	O.S.	5.000 (127.00)	5.000 (127.00)	5.125 (130.18)	5.875 (149.23)	5.875 (149.23)	6.125 (155.58)	6.875 (174.63)
Y	Std.	1.840 (46.74)	1.840 (46.74)	1.840 (46.74)	2.380 (60.45)	2.380 (60.45)	2.380 (60.45)	2.813 (71.44)
	O.S.	2.220 (56.39)	2.220 (56.39)	2.220 (56.39)	2.630 (66.80)	2.630 (66.80)	2.630 (66.80)	3.063 (77.79)
ZF	Std.	5.000 (127.00)	5.000 (127.00)	5.125 (130.18)	6.250 (158.75)	6.250 (158.75)	6.500 (165.10)	7.375 (187.33)
	O.S.	5.375 (136.53)	5.375 (136.53)	5.500 (139.70)	6.500 (165.10)	6.500 (165.10)	6.750 (171.45)	7.625 (193.68)

**Cylinder with 22 (MP2) Detachable Cap Clevis**



- NFPA (MP2) 22 Detachable Cap Clevis Mount for 1-1/2" to 8" bore sizes.
- Series A & J Cylinders rated to 250 PSI air, 400 PSI hydraulic (non-shock). Series EA & EJ Cylinders rated to 250 PSI air only.
- Designed for non-lube service.
- Switches available on all bore sizes. (See pages ACT-1-90 & 91 for ordering information.)

**Cylinder Order Information**

**22** - - - -

A	Series A Cylinder
EA	Series EA Cylinder
J	Series J Cylinder
EJ	Series EJ Cylinder

Mounting Options	
01	Side Tapped (MS4)
03	Head Rectangular Flange (MF1)
03	Head Square (ME3)-7" to 12" Bores
04	Cap Rectangular Flange (MF2)
04	Cap Square (ME4)-7" to 12" Bores
05	Basic Cylinder No Mounting (MX0)
06	Both Ends (4) Tie Rods Ext. (MX1)
6B	Both Ends (2) Tie Rods Ext. (MX4)
6C	Cap Tie Rods Ext. (MX2)
6R	Head Tie Rods Ext. (MX3)
7R	Removable Head Trunnion (MT1) - A & EA
07	Head Trunnion (MT1) - J & EJ
8R	Cap Trunnion (MT2) - A & EA
08	Cap Trunnion (MT2) - J & EJ
09	Side Lugs (MS2)
10	Center Trunnion (MT4)
11	Side End Angles (MS1)
12	Cap Fixed Clevis (MP1)
15	Side End Lugs (MS7)
16	Sleeve Nut Construction (Universal)
20	Head Square Flange (MF5)
21	Cap Square Flange (MF6)
22	<b>Detachable Cap Clevis (MP2)</b>
32	Cap Fixed Eye (MP3)
42	Detachable Cap Eye (MP4)
52	Spherical Bearing
60	Base Bar (Not NFPA - A & EA Only)

Cushion in Head	
3	None
5 <sup>1</sup>	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

<sup>1</sup>Standard with EA & EJ

Cushion in Cap	
3	None
5 <sup>1</sup>	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

<sup>1</sup>Standard with EA & EJ

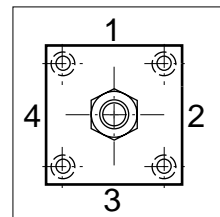
Bore and Stroke (write out)

Additional Options – order alphabetically – More on page ACT-1-95	
HR	Case Hardened (45 Rc)
L(- -)	Port Location position 1 standard: L(Head Cap) (specify position 1 thru 4 for head and/or cap)
MS	Metal Rod Scraper
N(- -)	Cushion Adjust Screw Location position 2 standard: N(Head Cap) (specify position 1 thru 4 for head and/or cap)
P(-)*	Non-Standard Port Sizes: [specify port size for P(-H) head only, P(-C) cap only, or P(-) both head & cap]
PS	Magnetic Piston – includes aluminum tube option for J & EJ - Std. for Alum
RS	Rod Stud Type 1 (5/8" – 1 3/4" øRod) Type 2 (5/8" & 1" øRod)
RX	Rod Extensions (specify length of additional rod extension)
SC	Single Acting Spring Extend (Cap End)–See page ACT-1-86
SR	Single Acting Spring Retract (Rod End)–See page ACT-1-86
SS	303 Stainless Steel (Hard Chrome Plated)
ST(-C)	Stop Tube (Cap End) (specify stop tube length)
ST(-R)	Stop Tube (Rod End) (specify stop tube length)
T	Special Rod Threads (specify rod thread)
TX	Thread Extensions (specify length of thread extension)
V	Viton® Seals

\*1 1/2", 2", 2 1/2" bore cylinders have 3/8" NPT Standard, 1/2" NPT oversize.  
 3 1/4", 4", 5" bore cylinders have 1/2" NPT Standard, 3/4" NPT oversize.  
 This will add 1/8" to the overall cylinder length.

Piston Rod Threads Type	
1	Small Male (Solid)
2	Intermediate Thread Male (Solid)
3	Female
6	Full Thread Male (Solid)
7	Plain Rod End

Piston Rod Diameters		
A**	5/8"	Standard on 1 1/2", 2", 2 1/2"
B**	1"	Standard on 3 1/4", 4", 5" Oversized on 1 1/2", 2", 2 1/2"
C**	1 3/8"	Standard on 6", 7", 8" Oversized on 3 1/4", 4", 5"
D**	1 3/4"	Standard on 10" Oversized on 6", 7", 8"
E	2"	Standard on 12" Oversized on 10"
F	2 1/2"	Oversized on 10", 12"



**Port and Cushion Adjustment**

**Positions** (As viewed from rod end:  
 Port standard position 1, Cushion Adjustment standard position 2.)

NOTE: A Port and a Cushion Adjustment cannot be in the same position.

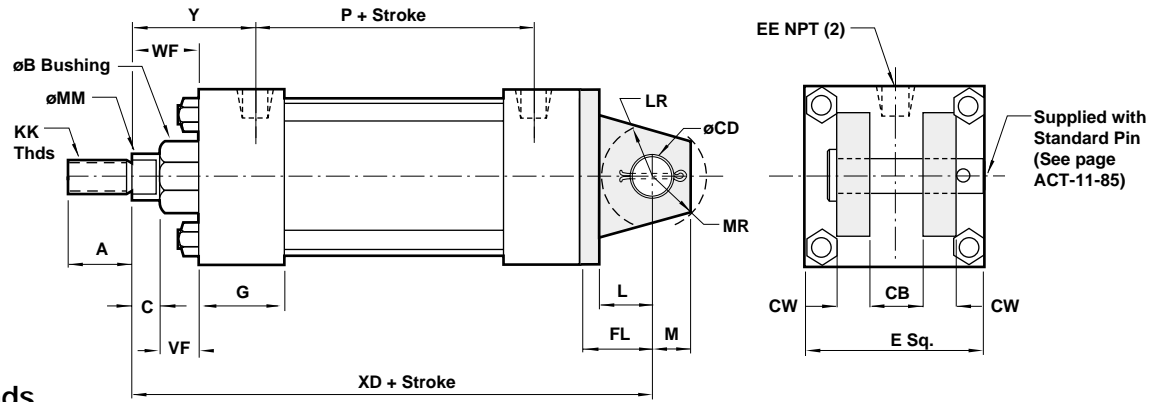
See page ACT-1-96 for complete instructions on how to order cylinders.



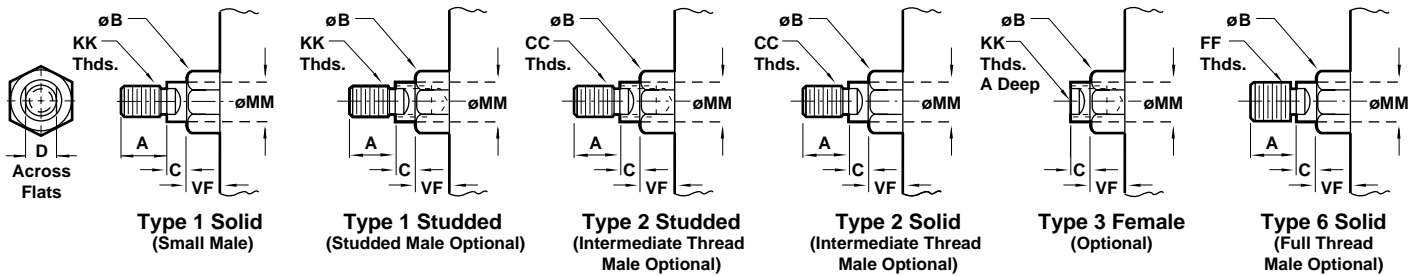
Series A & EA, NFPA Aluminum Air Cylinder with 22 (MP2) Detachable Cap Clevis  
 Series J & EJ, NFPA Steel Air Cylinder with 22 (MP2) Detachable Cap Clevis



All Dimensions in Inches (mm)



Standard & Optional Rod Ends



Dimension	1 1/2" Bore (38.10)	2" Bore (50.80)	2 1/2" Bore (63.50)	3 1/4" Bore (82.55)	4" Bore (101.60)	5" Bore (127.00)	6" Bore (152.40)	7" Bore (177.80)	8" Bore (203.20)
ø Rod	Std. 5/8" (15.88)	5/8" (15.88)	5/8" (15.88)	1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/8" (34.93)
	O.S. 1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/4" (44.45)	1 3/4" (44.45)	1 3/4" (44.45)
A	Std. .750 (19.05)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)
	O.S. 1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)
B	Std. 1.124 (28.55)	1.124 (28.55)	1.124 (28.55)	1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)	1.999 (50.78)	1.999 (50.78)
	O.S. 1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)	1.999 (50.78)	1.999 (50.78)	2.374 (60.30)	2.374 (60.30)	2.374 (60.30)
C	Std. .375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)
	O.S. .500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)	.750 (19.05)	.750 (19.05)
CB	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)
CC	Std. 1/2 - 20	1/2 - 20	1/2 - 20	7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12	1 1/4 - 12	1 1/4 - 12
	O.S. 7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12	1 1/4 - 12	1 1/4 - 12	1 1/2 - 12	1 1/2 - 12	1 1/2 - 12
CD	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)
CW	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)	.750 (19.05)	.750 (19.05)
D	Std. .500 (12.70)	.500 (12.70)	.500 (12.70)	.813 (20.64)	.813 (20.64)	.813 (20.64)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)
	O.S. .813 (20.64)	.813 (20.64)	.813 (20.64)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)
E	2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)	5.500 (139.70)	6.500 (165.10)	7.500 (190.50)	8.500 (215.90)
EE	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)	.750 (19.05)
FF	Std. 5/8 - 18	5/8 - 18	5/8 - 18	1 - 14	1 - 14	1 - 14	1 3/8 - 12	1 3/8 - 12	1 3/8 - 12
	O.S. 1 - 14	1 - 14	1 - 14	1 3/8 - 12	1 3/8 - 12	1 3/8 - 12	1 3/4 - 12	1 3/4 - 12	1 3/4 - 12
FL	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.875 (47.63)	1.875 (47.63)	1.875 (47.63)	2.250 (57.15)	2.250 (57.15)	2.250 (57.15)
G	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)
J	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)
K	.250 (6.35)	.313 (7.94)	.313 (7.94)	.375 (9.53)	.375 (9.53)	.438 (11.11)	.438 (11.11)	.563 (14.29)	.563 (14.29)
KK	Std. 7/16 - 20	7/16 - 20	7/16 - 20	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14	1 - 14
	O.S. 3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14	1 - 14	1 1/4 - 12	1 1/4 - 12	1 1/4 - 12
L	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)
LB	3.625 (92.08)	3.625 (92.08)	3.750 (95.25)	4.250 (107.95)	4.250 (107.95)	4.500 (114.30)	5.000 (127.00)	5.125 (130.18)	5.125 (130.18)
LR	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)
M	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)
MM	Std. .625 (15.88)	.625 (15.88)	.625 (15.88)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)
	O.S. 1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)
MR	.625 (15.88)	.625 (15.88)	.625 (15.88)	.938 (23.81)	.938 (23.81)	.938 (23.81)	1.188 (30.16)	1.188 (30.16)	1.188 (30.16)
P	2.340 (59.44)	2.340 (59.44)	2.470 (62.74)	2.690 (68.33)	2.690 (68.33)	2.940 (74.68)	3.125 (79.38)	3.250 (82.55)	3.250 (82.55)
VF	Std. .625 (15.88)	.625 (15.88)	.625 (15.88)	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)
	O.S. .875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)
WF	Std. 1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)
	O.S. 1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	1.875 (47.62)	1.875 (47.62)	1.875 (47.62)
XD	Std. 5.750 (146.05)	5.750 (146.05)	5.875 (149.23)	7.500 (190.50)	7.500 (190.50)	7.750 (196.85)	8.875 (225.43)	9.000 (228.60)	9.000 (228.60)
	O.S. 6.125 (155.58)	6.125 (155.58)	6.250 (158.75)	7.750 (196.85)	7.750 (196.85)	8.000 (203.20)	9.125 (231.78)	9.250 (234.95)	9.250 (234.95)
Y	Std. 1.840 (46.74)	1.840 (46.74)	1.840 (46.74)	2.380 (60.45)	2.380 (60.45)	2.380 (60.45)	2.813 (71.44)	2.813 (71.44)	2.813 (71.44)
	O.S. 2.220 (56.39)	2.220 (56.39)	2.220 (56.39)	2.630 (66.80)	2.630 (66.80)	2.630 (66.80)	3.063 (77.79)	3.063 (77.79)	3.063 (77.79)

**Cylinder with 32 (MP3) Cap Fixed Eye**

- NFPA (MP3) 32 Cap Fixed Eye for 1-1/2" to 6" bore sizes.
- Series A & J Cylinders rated to 250 PSI air, 400 PSI hydraulic (non-shock). Series EA & EJ Cylinders rated to 250 PSI air only.
- Designed for non-lube service.
- Switches available on all bore sizes. (See pages ACT-1-90 & 91 for ordering information.)



**Cylinder Order Information**

**32** - - - - -

A	Series A Cylinder
EA	Series EA Cylinder
J	Series J Cylinder
EJ	Series EJ Cylinder

Mounting Options	
01	Side Tapped (MS4)
03	Head Rectangular Flange (MF1)
03	Head Square (ME3)-7" to 12" Bores
04	Cap Rectangular Flange (MF2)
04	Cap Square (ME4)-7" to 12" Bores
05	Basic Cylinder No Mounting (MX0)
06	Both Ends (4) Tie Rods Ext. (MX1)
6B	Both Ends (2) Tie Rods Ext. (MX4)
6C	Cap Tie Rods Ext. (MX2)
6R	Head Tie Rods Ext. (MX3)
7R	Removable Head Trunnion (MT1) - A & EA
07	Head Trunnion (MT1) - J & EJ
8R	Cap Trunnion (MT2) - A & EA
08	Cap Trunnion (MT2) - J & EJ
09	Side Lugs (MS2)
10	Center Trunnion (MT4)
11	Side End Angles (MS1)
12	Cap Fixed Clevis (MP1)
15	Side End Lugs (MS7)
16	Sleeve Nut Construction (Universal)
20	Head Square Flange (MF5)
21	Cap Square Flange (MF6)
22	Detachable Cap Clevis (MP2)
<b>32</b>	<b>Cap Fixed Eye (MP3)</b>
42	Detachable Cap Eye (MP4)
52	Spherical Bearing
60	Base Bar (Not NFPA - A & EA Only)

Cushion in Head	
3	None
5 <sup>1</sup>	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

<sup>1</sup>Standard with EA & EJ

Cushion in Cap	
3	None
5 <sup>1</sup>	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

<sup>1</sup>Standard with EA & EJ

**See page ACT-1-96 for complete instructions on how to order cylinders.**

Bore and Stroke (write out)

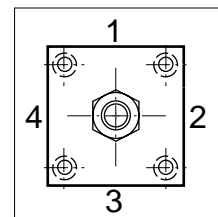
Additional Options – order alphabetically – More on page ACT-1-95	
HR	Case Hardened (45 Rc)
L(- -)	Port Location position 1 standard: L(Head Cap) (specify position 1 thru 4 for head and/or cap)
MS	Metal Rod Scraper
N(- -)	Cushion Adjust Screw Location position 2 standard: N(Head Cap) (specify position 1 thru 4 for head and/or cap)
P(-)*	Non-Standard Port Sizes: [specify port size for P(-H) head only, P(-C) cap only, or P(-) both head & cap]
PS	Magnetic Piston – includes aluminum tube option for J & EJ - Std. for Alum
RS	Rod Stud Type 1 (5/8" – 1 3/4" øRod) Type 2 (5/8" & 1" øRod)
RX	Rod Extensions (specify length of additional rod extension)
SC	Single Acting Spring Extend (Cap End)–See page ACT-1-86
SR	Single Acting Spring Retract (Rod End)–See page ACT-1-86
SS	303 Stainless Steel (Hard Chrome Plated)
ST(-C)	Stop Tube (Cap End) (specify stop tube length)
ST(-R)	Stop Tube (Rod End) (specify stop tube length)
T	Special Rod Threads (specify rod thread)
TX	Thread Extensions (specify length of thread extension)
V	Viton® Seals

\*1 1/2", 2", 2 1/2" bore cylinders have 3/8" NPT Standard, 1/2" NPT oversize.  
 3 1/4", 4", 5" bore cylinders have 1/2" NPT Standard, 3/4" NPT oversize.  
 This will add 1/8" to the overall cylinder length.

Piston Rod Threads Type	
1	Small Male (Solid)
2	Intermediate Thread Male (Solid)
3	Female
6	Full Thread Male (Solid)
7	Plain Rod End

Piston Rod Diameters	
A**	5/8" Standard on 1 1/2", 2", 2 1/2"
B**	1" Standard on 3 1/4", 4", 5" Oversized on 1 1/2", 2", 2 1/2"
C**	1 3/8" Standard on 6", 7", 8" Oversized on 3 1/4", 4", 5"
D**	1 3/4" Standard on 10" Oversized on 6", 7", 8"
E	2" Standard on 12" Oversized on 10"
F	2 1/2" Oversized on 10", 12"

\*\* A & EA uses A-D only.



**Port and Cushion Adjustment**

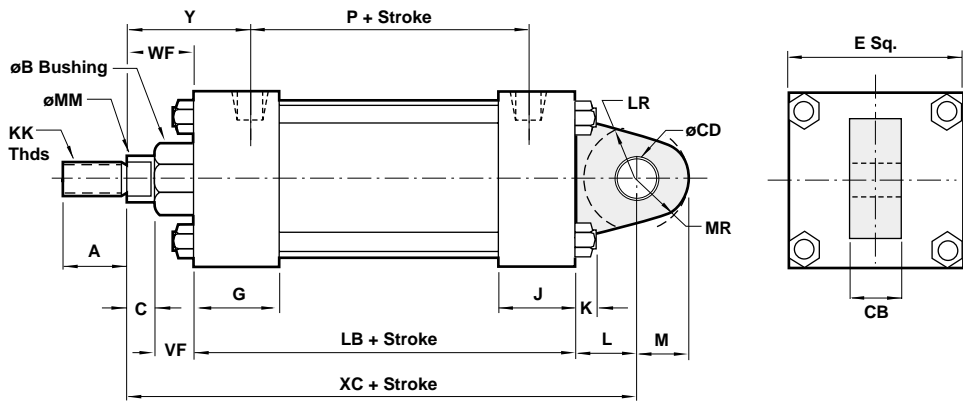
**Positions** (As viewed from rod end: Port standard position 1, Cushion Adjustment standard position 2.)

NOTE: A Port and a Cushion Adjustment cannot be in the same position.

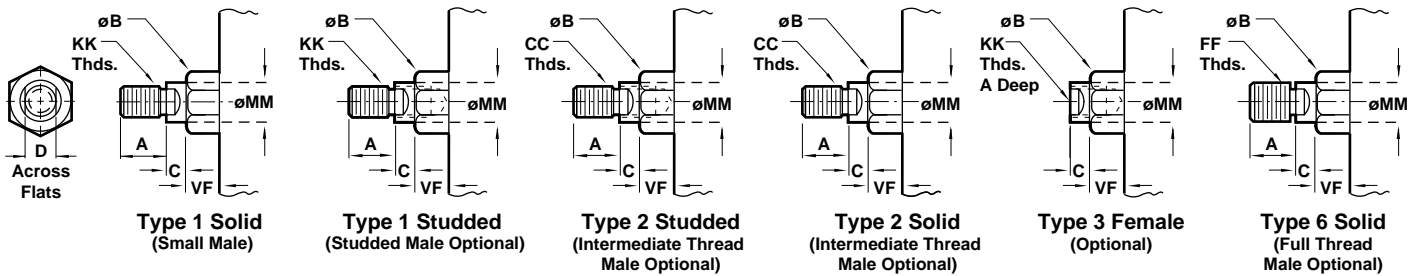
**Series A & EA, NFPA Aluminum Air Cylinder with 32 (MP3) Cap Fixed Eye**  
**Series J & EJ, NFPA Steel Air Cylinder with 32 (MP3) Cap Fixed Eye**



All Dimensions in Inches (mm)



**Standard & Optional Rod Ends**



Dimension		1 1/2" Bore (38.10)	2" Bore (50.80)	2 1/2" Bore (63.50)	3 1/4" Bore (82.55)	4" Bore (101.60)	5" Bore (127.00)	6" Bore (152.40)
ø Rod	Std.	5/8" (15.88)	5/8" (15.88)	5/8" (15.88)	1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)
	O.S.	1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/4" (44.45)
A	Std.	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)
	O.S.	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)
B <sup>+0.000</sup> -0.002	Std.	1.124 (28.55)	1.124 (28.55)	1.124 (28.55)	1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)
	O.S.	1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)	1.999 (50.78)	1.999 (50.78)	2.374 (60.30)
C	Std.	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)
	O.S.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)
CB		.750 (19.05)	.750 (19.05)	.750 (19.05)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)
CC	Std.	1/2 - 20	1/2 - 20	1/2 - 20	7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12
	O.S.	7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12	1 1/4 - 12	1 1/4 - 12	1 1/2 - 12
CD	Std.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.000 (25.40)
	O.S.	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)
D	Std.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.813 (20.64)	.813 (20.64)	.813 (20.64)	1.125 (28.58)
	O.S.	.813 (20.64)	.813 (20.64)	.813 (20.64)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)
E		2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)	5.500 (139.70)	6.500 (165.10)
EE		.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)
FF	Std.	5/8 - 18	5/8 - 18	5/8 - 18	1 - 14	1 - 14	1 - 14	1 3/8 - 12
	O.S.	1 - 14	1 - 14	1 - 14	1 3/8 - 12	1 3/8 - 12	1 3/8 - 12	1 3/4 - 12
G		1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)	2.000 (50.80)
J		1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)
K		.250 (6.35)	.313 (7.94)	.313 (7.94)	.375 (9.53)	.375 (9.53)	.438 (11.11)	.438 (11.11)
KK	Std.	7/16 - 20	7/16 - 20	7/16 - 20	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14
	O.S.	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14	1 - 14	1 1/4 - 12
L		.750 (19.05)	.750 (19.05)	.750 (19.05)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)
LB		3.625 (92.08)	3.625 (92.08)	3.750 (95.25)	4.250 (107.95)	4.250 (107.95)	4.500 (114.30)	5.000 (127.00)
LR		.750 (19.05)	.750 (19.05)	.750 (19.05)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)
M		.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.000 (25.40)
MM	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)
	O.S.	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.750 (44.45)
MR		.625 (15.88)	.625 (15.88)	.625 (15.88)	.938 (23.81)	.938 (23.81)	.938 (23.81)	1.188 (30.16)
P		2.340 (59.44)	2.340 (59.44)	2.470 (62.74)	2.690 (68.33)	2.690 (68.33)	2.940 (74.68)	3.125 (79.38)
VF	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)
	O.S.	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)
WF	Std.	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)
	O.S.	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	1.875 (47.63)
XC	Std.	5.375 (136.53)	5.375 (136.53)	5.500 (139.70)	6.875 (174.63)	6.875 (174.63)	7.125 (180.98)	8.125 (206.38)
	O.S.	5.750 (146.05)	5.750 (146.05)	5.875 (149.23)	7.125 (180.98)	7.125 (180.98)	7.375 (187.33)	8.375 (212.73)
Y	Std.	1.840 (46.74)	1.840 (46.74)	1.840 (46.74)	2.380 (60.45)	2.380 (60.45)	2.380 (60.45)	2.813 (71.44)
	O.S.	2.220 (56.39)	2.220 (56.39)	2.220 (56.39)	2.630 (66.80)	2.630 (66.80)	2.630 (66.80)	3.063 (77.79)

**Cylinder with 32 (MP3) Cap Fixed Eye**

- **NFPA (MP3) 32 Cap Fixed Eye** for 7" to 12" bore sizes.
- **Series A & J Cylinders** rated to 250 PSI air, 400 PSI hydraulic (non-shock).  
**Series EA & EJ Cylinders** rated to 250 PSI air only.
- **Designed for non-lube service.**
- **Switches available on all bore sizes.**  
 (See pages ACT-1-90 & 91 for ordering information.)



**Cylinder Order Information**

**32** - - - -

A	Series A Cylinder
EA	Series EA Cylinder
J	Series J Cylinder
EJ	Series EJ Cylinder

Mounting Options	
01	Side Tapped (MS4)
03	Head Rectangular Flange (MF1)
03	Head Square (ME3)-7" to 12" Bores
04	Cap Rectangular Flange (MF2)
04	Cap Square (ME4)-7" to 12" Bores
05	Basic Cylinder No Mounting (MX0)
06	Both Ends (4) Tie Rods Ext. (MX1)
6B	Both Ends (2) Tie Rods Ext. (MX4)
6C	Cap Tie Rods Ext. (MX2)
6R	Head Tie Rods Ext. (MX3)
7R	Removable Head Trunnion (MT1) - A & EA
07	Head Trunnion (MT1) - J & EJ
8R	Cap Trunnion (MT2) - A & EA
08	Cap Trunnion (MT2) - J & EJ
09	Side Lugs (MS2)
10	Center Trunnion (MT4)
11	Side End Angles (MS1)
12	Cap Fixed Clevis (MP1)
15	Side End Lugs (MS7)
16	Sleeve Nut Construction (Universal)
20	Head Square Flange (MF5)
21	Cap Square Flange (MF6)
22	Detachable Cap Clevis (MP2)
<b>32</b>	<b>Cap Fixed Eye (MP3)</b>
42	Detachable Cap Eye (MP4)
52	Spherical Bearing
60	Base Bar (Not NFPA - A & EA Only)

Cushion in Head	
3	None
5 <sup>1</sup>	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

<sup>1</sup>Standard with EA & EJ

Cushion in Cap	
3	None
5 <sup>1</sup>	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

<sup>1</sup>Standard with EA & EJ

Bore and Stroke (write out)

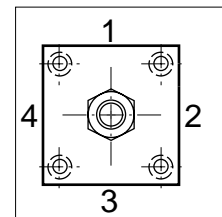
Additional Options – order alphabetically – More on page ACT-1-95	
HR	Case Hardened (45 Rc)
L(- -)	Port Location position 1 standard: L(Head Cap) (specify position 1 thru 4 for head and/or cap)
MS	Metal Rod Scraper
N(- -)	Cushion Adjust Screw Location position 2 standard: N(Head Cap) (specify position 1 thru 4 for head and/or cap)
P(-)*	Non-Standard Port Sizes: [specify port size for P(-H) head only, P(-C) cap only, or P(-) both head & cap]
PS	Magnetic Piston – includes aluminum tube option for J & EJ - Std. for Alum
RS	Rod Stud Type 1 (5/8" – 1 3/4" øRod) Type 2 (5/8" & 1" øRod)
RX	Rod Extensions (specify length of additional rod extension)
SC	Single Acting Spring Extend (Cap End)–See page ACT-1-86
SR	Single Acting Spring Retract (Rod End)–See page ACT-1-86
SS	303 Stainless Steel (Hard Chrome Plated)
ST(-C)	Stop Tube (Cap End) (specify stop tube length)
ST(-R)	Stop Tube (Rod End) (specify stop tube length)
T	Special Rod Threads (specify rod thread)
TX	Thread Extensions (specify length of thread extension)
V	Viton® Seals

\*1 1/2", 2", 2 1/2" bore cylinders have 3/8" NPT Standard, 1/2" NPT oversize.  
 3 1/4", 4", 5" bore cylinders have 1/2" NPT Standard, 3/4" NPT oversize.  
 This will add 1/8" to the overall cylinder length.

Piston Rod Threads Type	
1	Small Male (Solid)
2	Intermediate Thread Male (Solid)
3	Female
6	Full Thread Male (Solid)
7	Plain Rod End

Piston Rod Diameters		
A**	5/8"	Standard on 1 1/2", 2", 2 1/2"
B**	1"	Standard on 3 1/4", 4", 5" Oversized on 1 1/2", 2", 2 1/2"
C**	1 3/8"	Standard on 6", 7", 8" Oversized on 3 1/4", 4", 5"
D**	1 3/4"	Standard on 10" Oversized on 6", 7", 8"
E	2"	Standard on 12" Oversized on 10"
F	2 1/2"	Oversized on 10", 12"

\*\* A & EA uses A-D only.



**Port and Cushion Adjustment**

**Positions** (As viewed from rod end: Port standard position 1, Cushion Adjustment standard position 2.)

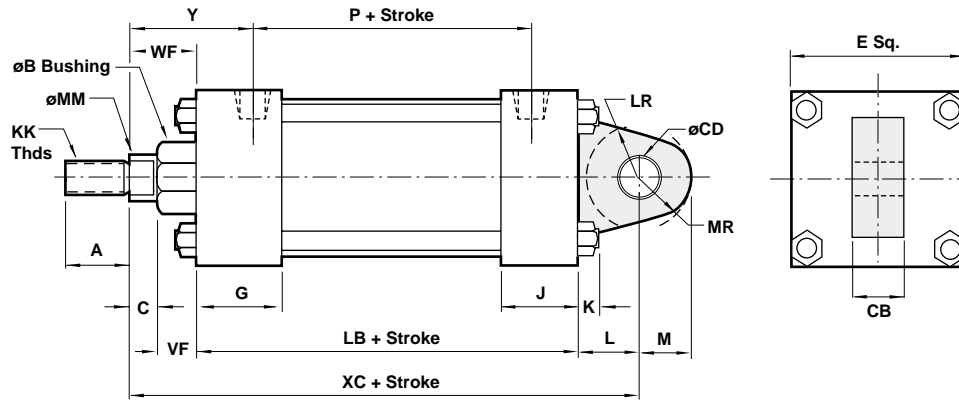
NOTE: A Port and a Cushion Adjustment cannot be in the same position.

**See page ACT-1-96 for complete instructions on how to order cylinders.**

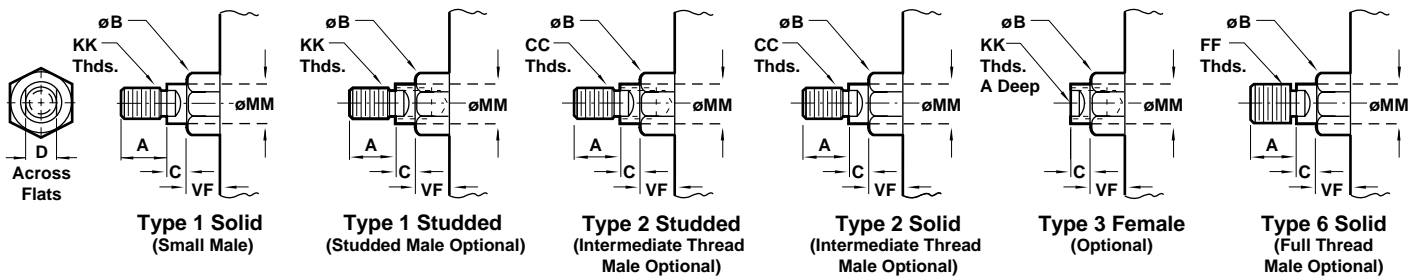
**Series A & EA, NFPA Aluminum Air Cylinder with 32 (MP3) Cap Fixed Eye**  
**Series J & EJ, NFPA Steel Air Cylinder with 32 (MP3) Cap Fixed Eye**



All Dimensions in Inches (mm)



**Standard & Optional Rod Ends**



Dimension		7" Bore (177.80)		8" Bore (203.20)		10" Bore (254.00)		12" Bore (304.80)	
ø Rod	Std.	1 3/8"	(34.93)	1 3/8"	(34.93)	1 3/4"	(44.45)	2"	(50.80)
	O.S.	1 3/4"	(44.45)	1 3/4"	(44.45)	2"	(50.80)	2 1/2"	(63.50)
A	Std.	1.625	(41.28)	1.625	(41.28)	2.000	(50.80)	2.250	(57.15)
	O.S.	2.000	(50.80)	2.000	(50.80)	2.250	(57.15)	3.000	(76.20)
B +.000 -.002	Std.	1.999	(50.78)	1.999	(50.78)	2.374	(60.30)	2.724	(69.65)
	O.S.	2.374	(60.30)	2.374	(60.30)	2.624	(66.65)	3.124	(79.35)
C	Std.	.625	(15.88)	.625	(15.88)	.750	(19.05)	.875	(22.23)
	O.S.	.750	(19.05)	.750	(19.05)	.875	(22.23)	1.000	(25.40)
CB		1.500	(38.10)	1.500	(38.10)	2.000	(50.80)	2.500	(63.50)
CC	Std.	1 1/4 - 12		1 1/4 - 12		1 1/2 - 12		1 3/4 - 12	
	O.S.	1 1/2 - 12		1 1/2 - 12		1 3/4 - 12		2 1/4 - 12	
CD		1.000	(25.40)	1.000	(25.40)	1.375	(34.93)	1.750	(44.45)
D	Std.	1.125	(28.58)	1.125	(28.58)	1.500	(38.10)	1.688	(42.86)
	O.S.	1.500	(38.10)	1.500	(38.10)	1.688	(42.86)	2.063	(52.39)
E		7.500	(190.50)	8.500	(215.90)	10.625	(269.88)	12.750	(323.85)
EE		.750	(19.05)	.750	(19.05)	1.000	(25.40)	1.000	(25.40)
FF	Std.	1 3/8 - 12		1 3/8 - 12		1 3/4 - 12		2 - 12	
	O.S.	1 3/4 - 12		1 3/4 - 12		2 - 12		2 1/2 - 12	
G		2.000	(50.80)	2.000	(50.80)	2.250	(57.15)	2.250	(57.15)
J		1.500	(38.10)	1.500	(38.10)	2.000	(50.80)	2.000	(50.80)
K		.563	(14.29)	.563	(14.29)	.688	(17.46)	.688	(17.46)
KK	Std.	1 - 14		1 - 14		1 1/4 - 12		1 1/2 - 12	
	O.S.	1 1/4 - 12		1 1/4 - 12		1 1/2 - 12		1 7/8 - 12	
L		1.500	(38.10)	1.500	(38.10)	2.125	(53.98)	2.250	(57.15)
LB		5.125	(130.18)	5.125	(130.18)	6.375	(161.93)	6.875	(174.63)
LR		1.500	(38.10)	1.500	(38.10)	1.875	(47.63)	2.125	(53.98)
M		1.000	(25.40)	1.000	(25.40)	1.375	(34.93)	1.750	(44.45)
MM	Std.	1.375	(34.93)	1.375	(34.93)	1.750	(44.45)	2.000	(50.80)
	O.S.	1.750	(44.45)	1.750	(44.45)	2.000	(50.80)	2.500	(63.50)
MR		1.188	(30.16)	1.188	(30.16)	1.625	(41.28)	2.125	(53.98)
P		3.250	(82.55)	3.250	(82.55)	4.125	(104.78)	4.625	(117.48)
VF	Std.	1.000	(25.40)	1.000	(25.40)	1.125	(28.58)	1.125	(28.58)
	O.S.	1.125	(28.58)	1.125	(28.58)	1.125	(28.58)	1.250	(31.75)
WF	Std.	1.625	(41.28)	1.625	(41.28)	1.875	(47.63)	2.000	(50.80)
	O.S.	1.875	(47.63)	1.875	(47.63)	2.000	(50.80)	2.250	(57.15)
XC	Std.	8.250	(209.55)	8.250	(209.55)	10.375	(263.53)	11.125	(282.58)
	O.S.	8.500	(215.90)	8.500	(215.90)	10.500	(266.70)	11.375	(288.93)
Y	Std.	2.813	(71.44)	2.813	(71.44)	3.125	(79.38)	3.250	(82.55)
	O.S.	3.063	(77.79)	3.063	(77.79)	3.250	(82.55)	3.500	(88.90)

**Cylinder with 42 (MP4) Detachable Cap Eye**



- NFPA (MP4) 42 Detachable Cap Eye Mount for 1-1/2" to 8" bore sizes.
- Series A & J Cylinders rated to 250 PSI air, 400 PSI hydraulic (non-shock). Series EA & EJ Cylinders rated to 250 PSI air only.
- Designed for non-lube service.
- Switches available on all bore sizes. (See pages ACT-1-90 & 91 for ordering information.)

**Cylinder Order Information**

**42** - - - -

A	Series A Cylinder
EA	Series EA Cylinder
J	Series J Cylinder
EJ	Series EJ Cylinder

Mounting Options	
01	Side Tapped (MS4)
03	Head Rectangular Flange (MF1)
03	Head Square (ME3)-7" to 12" Bores
04	Cap Rectangular Flange (MF2)
04	Cap Square (ME4)-7" to 12" Bores
05	Basic Cylinder No Mounting (MX0)
06	Both Ends (4) Tie Rods Ext. (MX1)
6B	Both Ends (2) Tie Rods Ext. (MX4)
6C	Cap Tie Rods Ext. (MX2)
6R	Head Tie Rods Ext. (MX3)
7R	Removable Head Trunnion (MT1) - A & EA
07	Head Trunnion (MT1) - J & EJ
8R	Cap Trunnion (MT2) - A & EA
08	Cap Trunnion (MT2) - J & EJ
09	Side Lugs (MS2)
10	Center Trunnion (MT4)
11	Side End Angles (MS1)
12	Cap Fixed Clevis (MP1)
15	Side End Lugs (MS7)
16	Sleeve Nut Construction (Universal)
20	Head Square Flange (MF5)
21	Cap Square Flange (MF6)
22	Detachable Cap Clevis (MP2)
32	Cap Fixed Eye (MP3)
<b>42</b>	<b>Detachable Cap Eye (MP4)</b>
52	Spherical Bearing
60	Base Bar (Not NFPA - A & EA Only)

Cushion in Head	
3	None
5 <sup>1</sup>	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

<sup>1</sup>Standard with EA & EJ

Cushion in Cap	
3	None
5 <sup>1</sup>	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

<sup>1</sup>Standard with EA & EJ

**See page ACT-1-96 for complete instructions on how to order cylinders.**

Bore and Stroke (write out)

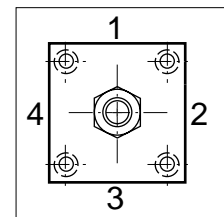
Additional Options – order alphabetically – More on page ACT-1-95	
HR	Case Hardened (45 Rc)
L(- -)	Port Location position 1 standard: L(Head Cap) (specify position 1 thru 4 for head and/or cap)
MS	Metal Rod Scraper
N(- -)	Cushion Adjust Screw Location position 2 standard: N(Head Cap) (specify position 1 thru 4 for head and/or cap)
P(-)*	Non-Standard Port Sizes: [specify port size for P(-H) head only, P(-C) cap only, or P(-) both head & cap]
PS	Magnetic Piston – includes aluminum tube option for J & EJ - Std. for Alum
RS	Rod Stud Type 1 (5/8" – 1 3/4" øRod) Type 2 (5/8" & 1" øRod)
RX	Rod Extensions (specify length of additional rod extension)
SC	Single Acting Spring Extend (Cap End)–See page ACT-1-86
SR	Single Acting Spring Retract (Rod End)–See page ACT-1-86
SS	303 Stainless Steel (Hard Chrome Plated)
ST(-C)	Stop Tube (Cap End) (specify stop tube length)
ST(-R)	Stop Tube (Rod End) (specify stop tube length)
T	Special Rod Threads (specify rod thread)
TX	Thread Extensions (specify length of thread extension)
V	Viton® Seals

\*1 1/2", 2", 2 1/2" bore cylinders have 3/8" NPT Standard, 1/2" NPT oversize.  
 3 1/4", 4", 5" bore cylinders have 1/2" NPT Standard, 3/4" NPT oversize.  
 This will add 1/8" to the overall cylinder length.

Piston Rod Threads Type	
1	Small Male (Solid)
2	Intermediate Thread Male (Solid)
3	Female
6	Full Thread Male (Solid)
7	Plain Rod End

Piston Rod Diameters		
A**	5/8"	Standard on 1 1/2", 2", 2 1/2"
B**	1"	Standard on 3 1/4", 4", 5" Oversized on 1 1/2", 2", 2 1/2"
C**	1 3/8"	Standard on 6", 7", 8" Oversized on 3 1/4", 4", 5"
D**	1 3/4"	Standard on 10" Oversized on 6", 7", 8"
E	2"	Standard on 12" Oversized on 10"
F	2 1/2"	Oversized on 10", 12"

\*\* A & EA uses A-D only.

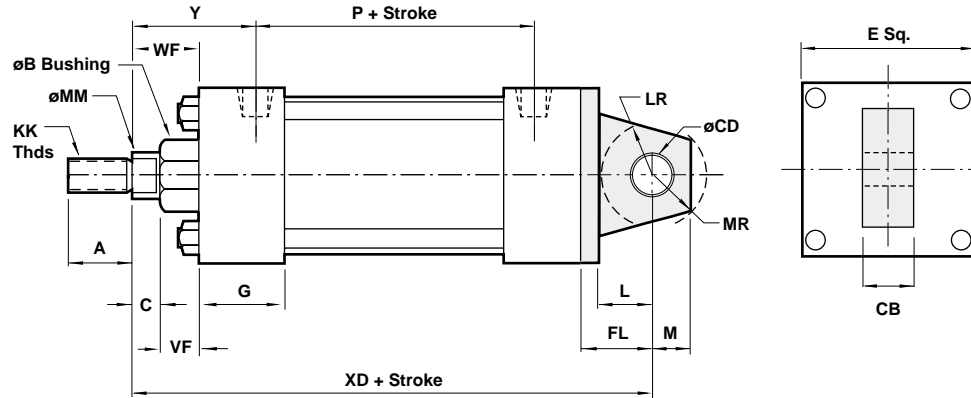


**Port and Cushion Adjustment Positions** (As viewed from rod end: Port standard position 1, Cushion Adjustment standard position 2.)  
 NOTE: A Port and a Cushion Adjustment cannot be in the same position.

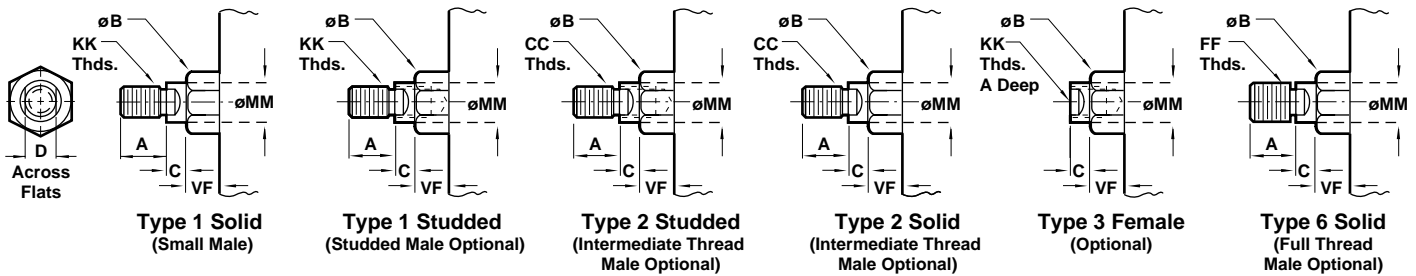
Series A & EA, NFPA Aluminum Air Cylinder with 42 (MP4) Detachable Cap Eye  
 Series J & EJ, NFPA Steel Air Cylinder with 42 (MP4) Detachable Cap Eye



All Dimensions in Inches (mm)



Standard & Optional Rod Ends



Dimension	1 1/2" Bore (38.10)	2" Bore (50.80)	2 1/2" Bore (63.50)	3 1/4" Bore (82.55)	4" Bore (101.60)	5" Bore (127.00)	6" Bore (152.40)	7" Bore (177.80)	8" Bore (203.20)
ø Rod	Std. 5/8" (15.88)	5/8" (15.88)	5/8" (15.88)	1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/8" (34.93)
	O.S. 1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/4" (44.45)	1 3/4" (44.45)	1 3/4" (44.45)
A	Std. .750 (19.05)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)
	O.S. 1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)
B +.000 -.002	Std. 1.124 (28.55)	1.124 (28.55)	1.124 (28.55)	1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)	1.999 (50.78)	1.999 (50.78)
	O.S. 1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)	1.999 (50.78)	1.999 (50.78)	2.374 (60.30)	2.374 (60.30)	2.374 (60.30)
C	Std. .375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)
	O.S. .500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)	.750 (19.05)	.750 (19.05)
CB	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)
CC	Std. 1/2 - 20	1/2 - 20	1/2 - 20	7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12	1 1/4 - 12	1 1/4 - 12
	O.S. 7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12	1 1/4 - 12	1 1/4 - 12	1 1/2 - 12	1 1/2 - 12	1 1/2 - 12
CD	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)
D	Std. .500 (12.70)	.500 (12.70)	.500 (12.70)	.813 (20.64)	.813 (20.64)	.813 (20.64)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)
	O.S. .813 (20.64)	.813 (20.64)	.813 (20.64)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)
E	2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)	5.500 (139.70)	6.500 (165.10)	7.500 (190.50)	8.500 (215.90)
EE	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)	.750 (19.05)
FF	Std. 5/8 - 18	5/8 - 18	5/8 - 18	1 - 14	1 - 14	1 - 14	1 3/8 - 12	1 3/8 - 12	1 3/8 - 12
	O.S. 1 - 14	1 - 14	1 - 14	1 3/8 - 12	1 3/8 - 12	1 3/8 - 12	1 3/4 - 12	1 3/4 - 12	1 3/4 - 12
FL	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.875 (47.63)	1.875 (47.63)	1.875 (47.63)	2.250 (57.15)	2.250 (57.15)	2.250 (57.15)
G	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)
J	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)
K	.250 (6.35)	.313 (7.94)	.313 (7.94)	.375 (9.53)	.375 (9.53)	.438 (11.11)	.438 (11.11)	.563 (14.29)	.563 (14.29)
KK	Std. 7/16 - 20	7/16 - 20	7/16 - 20	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14	1 - 14
	O.S. 3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14	1 - 14	1 1/4 - 12	1 1/4 - 12	1 1/4 - 12
L	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)
LB	3.625 (92.08)	3.625 (92.08)	3.750 (95.25)	4.250 (107.95)	4.250 (107.95)	4.500 (114.30)	5.000 (127.00)	5.125 (130.18)	5.125 (130.18)
LR	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)
M	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)
MM	Std. .625 (15.88)	.625 (15.88)	.625 (15.88)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)
	O.S. 1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)
MR	.625 (15.88)	.625 (15.88)	.625 (15.88)	.938 (23.81)	.938 (23.81)	.938 (23.81)	1.188 (30.16)	1.188 (30.16)	1.188 (30.16)
P	2.340 (59.44)	2.340 (59.44)	2.470 (62.74)	2.690 (68.33)	2.690 (68.33)	2.940 (74.68)	3.125 (79.38)	3.250 (82.55)	3.250 (82.55)
VF	Std. .625 (15.88)	.625 (15.88)	.625 (15.88)	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)
	O.S. .875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)
WF	Std. 1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)
	O.S. 1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	1.875 (47.62)	1.875 (47.62)	1.875 (47.62)
XD	Std. 5.750 (146.05)	5.750 (146.05)	5.875 (149.23)	7.500 (190.50)	7.500 (190.50)	7.750 (196.85)	8.875 (225.43)	9.000 (228.60)	9.000 (228.60)
	O.S. 6.125 (155.58)	6.125 (155.58)	6.250 (158.75)	7.750 (196.85)	7.750 (196.85)	8.000 (203.20)	9.125 (231.78)	9.250 (234.95)	9.250 (234.95)
Y	Std. 1.840 (46.74)	1.840 (46.74)	1.840 (46.74)	2.380 (60.45)	2.380 (60.45)	2.380 (60.45)	2.813 (71.44)	2.813 (71.44)	2.813 (71.44)
	O.S. 2.220 (56.39)	2.220 (56.39)	2.220 (56.39)	2.630 (66.80)	2.630 (66.80)	2.630 (66.80)	3.063 (77.79)	3.063 (77.79)	3.063 (77.79)

Cylinder with 52 (Not NFPA) Spherical Bearing

- 52 (Not NFPA) Spherical Bearing Mount for 1-1/2" to 8" bore sizes.
- Series A & J Cylinders rated to 250 PSI air, 400 PSI hydraulic (non-shock). Series EA & EJ Cylinders rated to 250 PSI air only.
- Designed for non-lube service.
- Switches available on all bore sizes. (See pages ACT-1-90 & 91 for ordering information.)



Cylinder Order Information

52 - - - -

A	Series A Cylinder
EA	Series EA Cylinder
J	Series J Cylinder
EJ	Series EJ Cylinder

Mounting Options	
01	Side Tapped (MS4)
03	Head Rectangular Flange (MF1)
03	Head Square (ME3)–7" to 12" Bores
04	Cap Rectangular Flange (MF2)
04	Cap Square (ME4)–7" to 12" Bores
05	Basic Cylinder No Mounting (MX0)
06	Both Ends (4) Tie Rods Ext. (MX1)
6B	Both Ends (2) Tie Rods Ext. (MX4)
6C	Cap Tie Rods Ext. (MX2)
6R	Head Tie Rods Ext. (MX3)
7R	Removable Head Trunnion (MT1) - A & EA
07	Head Trunnion (MT1) - J & EJ
8R	Cap Trunnion (MT2) - A & EA
08	Cap Trunnion (MT2) - J & EJ
09	Side Lugs (MS2)
10	Center Trunnion (MT4)
11	Side End Angles (MS1)
12	Cap Fixed Clevis (MP1)
15	Side End Lugs (MS7)
16	Sleeve Nut Construction (Universal)
20	Head Square Flange (MF5)
21	Cap Square Flange (MF6)
22	Detachable Cap Clevis (MP2)
32	Cap Fixed Eye (MP3)
42	Detachable Cap Eye (MP4)
52	Spherical Bearing
60	Base Bar (Not NFPA - A & EA Only)

Cushion in Head	
3	None
5'	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

<sup>1</sup>Standard with EA & EJ

Cushion in Cap	
3	None
5'	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

<sup>1</sup>Standard with EA & EJ

Bore and Stroke (write out)

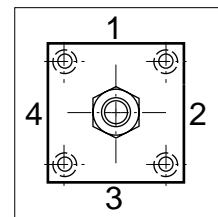
Additional Options – order alphabetically – More on page ACT-1-95	
HR	Case Hardened (45 Rc)
L(-)	Port Location position 1 standard: L(Head Cap) (specify position 1 thru 4 for head and/or cap)
MS	Metal Rod Scraper
N(-)	Cushion Adjust Screw Location position 2 standard: N(Head Cap) (specify position 1 thru 4 for head and/or cap)
P(-)*	Non-Standard Port Sizes: [specify port size for P(-H) head only, P(-C) cap only, or P(-) both head & cap]
PS	Magnetic Piston – includes aluminum tube option for J & EJ - Std. for Alum
RS	Rod Stud Type 1 (5/8" – 1 3/4" øRod) Type 2 (5/8" & 1" øRod)
RX	Rod Extensions (specify length of additional rod extension)
SC	Single Acting Spring Extend (Cap End)–See page ACT-1-86
SR	Single Acting Spring Retract (Rod End)–See page ACT-1-86
SS	303 Stainless Steel (Hard Chrome Plated)
ST(-C)	Stop Tube (Cap End) (specify stop tube length)
ST(-R)	Stop Tube (Rod End) (specify stop tube length)
T	Special Rod Threads (specify rod thread)
TX	Thread Extensions (specify length of thread extension)
V	Viton® Seals

\*1 1/2", 2", 2 1/2" bore cylinders have 3/8" NPT Standard, 1/2" NPT oversize.  
 3 1/4", 4", 5" bore cylinders have 1/2" NPT Standard, 3/4" NPT oversize.  
 This will add 1/8" to the overall cylinder length.

Piston Rod Threads Type	
1	Small Male (Solid)
2	Intermediate Thread Male (Solid)
3	Female
6	Full Thread Male (Solid)
7	Plain Rod End

Piston Rod Diameters		
A**	5/8"	Standard on 1 1/2", 2", 2 1/2"
B**	1"	Standard on 3 1/4", 4", 5" Oversized on 1 1/2", 2", 2 1/2"
C**	1 3/8"	Standard on 6", 7", 8" Oversized on 3 1/4", 4", 5"
D**	1 3/4"	Standard on 10" Oversized on 6", 7", 8"
E	2"	Standard on 12" Oversized on 10"
F	2 1/2"	Oversized on 10", 12"

\*\* A & EA uses A-D only.



Port and Cushion Adjustment

Positions (As viewed from rod end: Port standard position 1, Cushion Adjustment standard position 2.)

NOTE: A Port and a Cushion Adjustment cannot be in the same position.

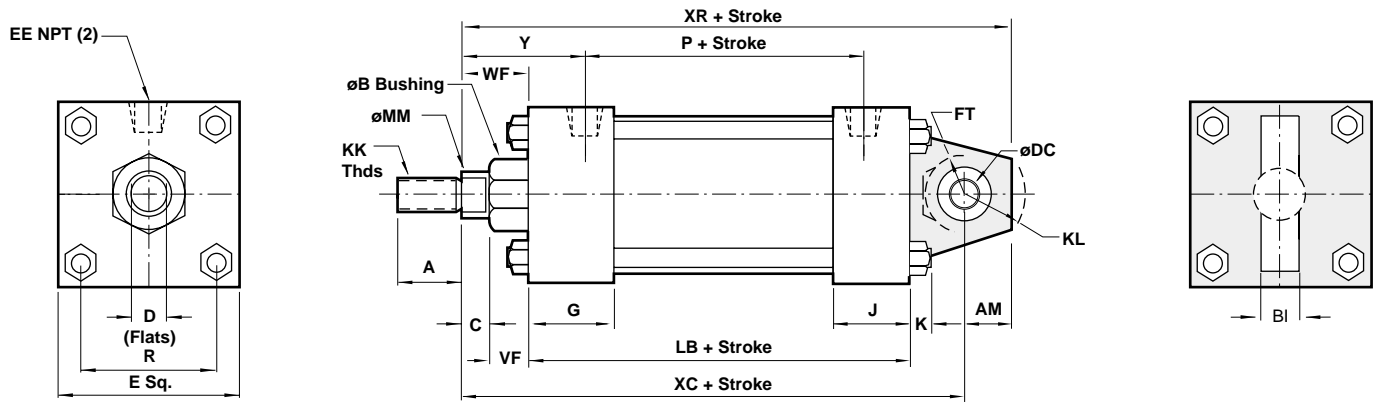
See page ACT-1-96 for complete instructions on how to order cylinders.



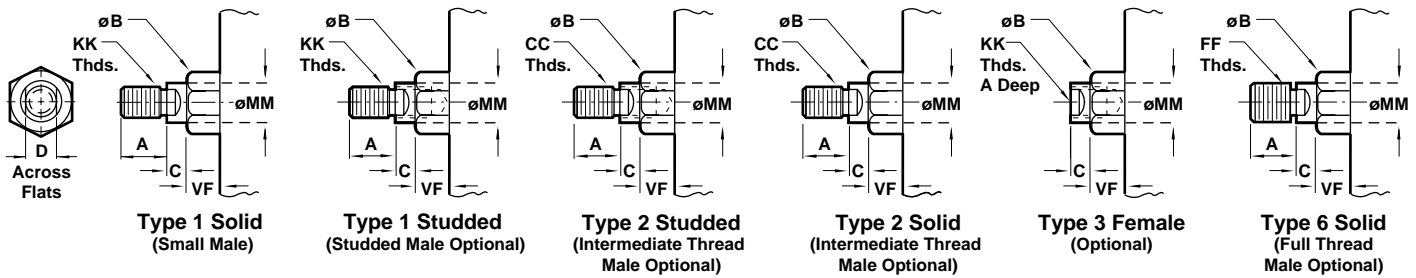
**Series A & EA, NFPA Aluminum Air Cylinder with 52 (Not NFPA) Spherical Bearing**  
**Series J & EJ, NFPA Steel Air Cylinder with 52 (Not NFPA) Spherical Bearing**



All Dimensions in Inches (mm)



**Standard & Optional Rod Ends**



Dimension	1 1/2" Bore (38.10)	2" Bore (50.80)	2 1/2" Bore (63.50)	3 1/4" Bore (82.55)	4" Bore (101.60)	5" Bore (127.00)	6" Bore (152.40)	7" Bore (177.80)	8" Bore (203.20)
ø Rod	Std. 5/8" (15.88)	5/8" (15.88)	5/8" (15.88)	1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/8" (34.93)
	O.S. 1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/4" (44.45)	1 3/4" (44.45)	1 3/4" (44.45)
A	Std. .750 (19.05)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)
	O.S. 1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)
AM	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)
B <sup>+0.000</sup> <sub>-0.002</sub>	Std. 1.124 (28.55)	1.124 (28.55)	1.124 (28.55)	1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)	1.999 (50.78)	1.999 (50.78)
	O.S. 1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)	1.999 (50.78)	1.999 (50.78)	2.374 (60.30)	2.374 (60.30)	2.374 (60.30)
BI	.438 (11.11)	.438 (11.11)	.438 (11.11)	.656 (16.67)	.656 (16.67)	.656 (16.67)	.875 (22.23)	.875 (22.23)	.875 (22.23)
C	Std. .375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)
	O.S. .500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)	.750 (19.05)	.750 (19.05)
CC	Std. 1/2 - 20	1/2 - 20	1/2 - 20	7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12	1 1/4 - 12	1 1/4 - 12
	O.S. 7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12	1 1/4 - 12	1 1/4 - 12	1 1/2 - 12	1 1/2 - 12	1 1/2 - 12
D <sup>+0.000</sup> <sub>-0.001</sub>	Std. .500 (12.70)	.500 (12.70)	.500 (12.70)	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)
	O.S. .875 (22.23)	.875 (22.23)	.875 (22.23)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)
DC	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)
E	2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)	5.500 (139.70)	6.500 (165.10)	7.500 (190.50)	8.500 (215.90)
EE	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)	.750 (19.05)
FF	Std. 5/8 - 18	5/8 - 18	5/8 - 18	1 - 14	1 - 14	1 - 14	1 3/8 - 12	1 3/8 - 12	1 3/8 - 12
	O.S. 1 - 14	1 - 14	1 - 14	1 3/8 - 12	1 3/8 - 12	1 3/8 - 12	1 3/4 - 12	1 3/4 - 12	1 3/4 - 12
FT	.625 (15.88)	.625 (15.88)	.625 (15.88)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)
G	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)
J	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)
K	.250 (6.35)	.313 (7.94)	.313 (7.94)	.375 (9.53)	.375 (9.53)	.438 (11.11)	.438 (11.11)	.563 (14.29)	.563 (14.29)
KK	Std. 7/16 - 20	7/16 - 20	7/16 - 20	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14	1 - 14
	O.S. 3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14	1 - 14	1 1/4 - 12	1 1/4 - 12	1 1/4 - 12
KL	.969 (24.61)	.969 (24.61)	.969 (24.61)	1.406 (35.71)	1.406 (35.71)	1.406 (35.71)	1.719 (43.66)	1.719 (43.66)	1.719 (43.66)
LB	3.625 (92.08)	3.625 (92.08)	3.750 (95.25)	4.250 (107.95)	4.250 (107.95)	4.500 (114.30)	5.000 (127.00)	5.125 (130.18)	5.125 (130.18)
MM	Std. .625 (15.88)	.625 (15.88)	.625 (15.88)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)
	O.S. 1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)
P	2.340 (59.44)	2.340 (59.44)	2.470 (62.74)	2.690 (68.33)	2.690 (68.33)	2.940 (74.68)	3.125 (79.38)	3.250 (82.55)	3.250 (82.55)
R	1.428 (36.27)	1.838 (46.68)	2.192 (55.67)	2.758 (70.05)	3.323 (84.40)	4.101 (104.16)	4.879 (123.92)	5.730 (145.54)	6.435 (163.44)
VF	Std. .625 (15.88)	.625 (15.88)	.625 (15.88)	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)
	O.S. .875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)
WF	Std. 1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)
	O.S. 1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	1.875 (47.62)	1.875 (47.62)	1.875 (47.62)
XC	Std. 5.375 (136.53)	5.375 (136.53)	5.500 (139.70)	6.875 (174.63)	6.875 (174.63)	7.125 (180.98)	8.125 (206.38)	8.250 (209.55)	8.250 (209.55)
	O.S. 5.750 (146.05)	5.750 (146.05)	5.875 (149.23)	7.125 (180.98)	7.125 (180.98)	7.375 (187.33)	8.375 (212.73)	8.500 (215.90)	8.500 (215.90)
XR	Std. 6.125 (155.58)	6.125 (155.58)	6.250 (158.75)	7.875 (200.03)	7.875 (200.03)	8.125 (206.38)	9.375 (238.13)	9.500 (241.30)	9.500 (241.30)
	O.S. 6.500 (165.10)	6.500 (165.10)	6.625 (168.28)	8.125 (206.38)	8.125 (206.38)	8.375 (212.73)	9.625 (244.48)	9.750 (247.65)	9.750 (247.65)
Y	Std. 1.840 (46.74)	1.840 (46.74)	1.840 (46.74)	2.380 (60.45)	2.380 (60.45)	2.380 (60.45)	2.813 (71.44)	2.813 (71.44)	2.813 (71.44)
	O.S. 2.220 (56.39)	2.220 (56.39)	2.220 (56.39)	2.630 (66.80)	2.630 (66.80)	2.630 (66.80)	3.063 (77.79)	3.063 (77.79)	3.063 (77.79)

**Cylinder with 60 (Not NFPA) Base Bar**

- 60 Base (Not NFPA) Bar Mount for 1-1/2" to 6" bore sizes.
- Series A Cylinders rated to 250 PSI air, 400 PSI hydraulic (non-shock). Series EA Cylinders rated to 250 PSI air only.
- Designed for non-lube service.
- Switches available on all bore sizes. (See pages ACT-1-90 & 91 for ordering information.)


**Cylinder Order Information**
**60** - - - - -

A	Series A Cylinder
EA	Series EA Cylinder

Bore and Stroke (write out)

Mounting Options	
01	Side Tapped (MS4)
03	Head Rectangular Flange (MF1)
03	Head Square (ME3) – 7" & 8" Bores
04	Cap Rectangular Flange (MF2)
04	Cap Square (ME4) – 7" & 8" Bores
05	Basic Cylinder No Mounting (MX0)
06	Both Ends (4) Tie Rods Ext. (MX1)
6B	Both Ends (2) Tie Rods Ext. (MX4)
6C	Cap Tie Rods Ext. (MX2)
6R	Head Tie Rods Ext. (MX3)
7R	Head Trunnion (MT1)
8R	Cap Trunnion (MT2)
09	Side Lugs (MS2)
10	Center Trunnion (MT4)
11	Side End Angles (MS1)
12	Cap Fixed Clevis (MP1)
15	Side End Lugs (MS7)
16	Sleeve Nut Construction (Universal)
20	Head Square Flange (MF5)
21	Cap Square Flange (MF6)
22	Detachable Cap Clevis (MP2)
32	Cap Fixed Eye (MP3)
42	Detachable Cap Eye (MP4)
52	Spherical Bearing
<b>60</b>	<b>Base Bar (Not NFPA)</b>

Cushion in Head	
3	None
5 <sup>1</sup>	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

<sup>1</sup>Standard with EA

Cushion in Cap	
3	None
5 <sup>1</sup>	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

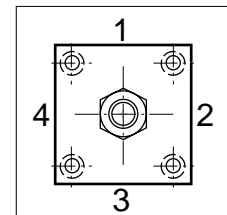
<sup>1</sup>Standard with EA

Additional Options – order alphabetically – More on page ACT-1-95.	
HR	Case Hardened (45 Rc)
L(- -)	Port Location position 1 standard: L(Head Cap) (specify position 1 thru 4 for head and/or cap)
MS	Metal Rod Scraper
N(- -)	Cushion Adjust Screw Location position 2 standard: N(Head Cap) (specify position 1 thru 4 for head and/or cap)
P(-)*	Non-Standard Port Sizes: [specify port size for P(-H) head only, P(-C) cap only, or P(-) both head & cap]
PS	Magnetic Piston
RS	Rod Stud Type 1 (5/8" – 1 3/4" øRod) Type 2 (5/8" & 1" øRod)
RX	Rod Extensions (specify length of additional rod extension)
SC	Single Acting Spring Extend (Cap End)–See page ACT-1-86
SR	Single Acting Spring Retract (Rod End)–See page ACT-1-86
SS	303 Stainless Steel (Hard Chrome Plated)
ST(-C)	Stop Tube (Cap End) (specify stop tube length)
ST(-R)	Stop Tube (Rod End) (specify stop tube length)
T	Special Rod Threads (specify rod thread)
TX	Thread Extensions (specify length of thread extension)
V	Viton® Seals

\*1 1/2", 2", 2 1/2" bore cylinders have 3/8" NPT Standard, 1/2" NPT oversize.  
3 1/4", 4", 5" bore cylinders have 1/2" NPT Standard, 3/4" NPT oversize.  
This will add 1/8" to the overall cylinder length.

Piston Rod Threads Type	
1	Small Male (Solid)
2	Intermediate Thread Male (Solid)
3	Female
6	Full Thread Male (Solid)
7	Plain Rod End

Piston Rod Diameters		
A	5/8"	Standard on 1 1/2", 2", 2 1/2"
B	1"	Standard on 3 1/4", 4", 5" Oversized on 1 1/2", 2", 2 1/2"
C	1 3/8"	Standard on 6", 7", 8" Oversized on 3 1/4", 4", 5"
D	1 3/4"	Oversized on 6", 7", 8"


**Port and Cushion Adjustment**

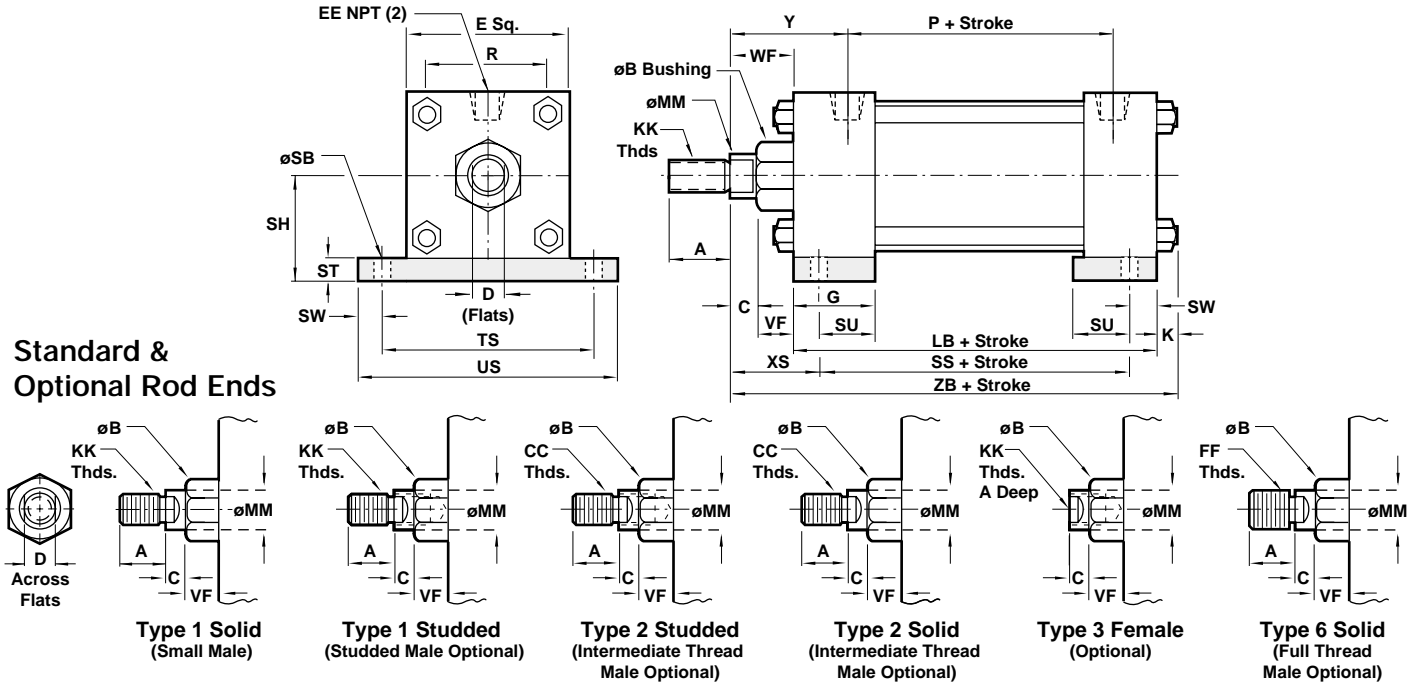
**Positions** (As viewed from rod end:  
Port standard position 1, Cushion Adjustment standard position 2.)

NOTE: A Port and a Cushion Adjustment cannot be in the same position.

See page ACT-1-96 for complete instructions on how to order cylinders.

# Series A, NFPA Aluminum Air Cylinders with 60 (Not NFPA) Base Bar

All Dimensions in Inches (mm)



Dimension		1 1/2" Bore (38.10)	2" Bore (50.80)	2 1/2" Bore (63.50)	3 1/4" Bore (82.55)	4" Bore (101.60)	5" Bore (127.00)	6" Bore (152.40)
ø Rod	Std.	5/8" (15.88)	5/8" (15.88)	5/8" (15.88)	1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)
	O.S.	1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/4" (44.45)
A	Std.	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)
	O.S.	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)
B	Std.	1.124 (28.55)	1.124 (28.55)	1.124 (28.55)	1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)
	O.S.	1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)	1.999 (50.78)	1.999 (50.78)	2.374 (60.30)
C	Std.	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)
	O.S.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)
CC	Std.	1/2 - 20	1/2 - 20	1/2 - 20	7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12
	O.S.	7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12	1 1/4 - 12	1 1/4 - 12	1 1/2 - 12
D	Std.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.125 (28.58)
	O.S.	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)
E		2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)	5.500 (139.70)	6.500 (165.10)
EE		.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)
FF	Std.	5/8 - 18	5/8 - 18	5/8 - 18	1 - 14	1 - 14	1 - 14	1 3/8 - 12
	O.S.	1 - 14	1 - 14	1 - 14	1 3/8 - 12	1 3/8 - 12	1 3/8 - 12	1 3/4 - 12
G		1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)	2.000 (50.80)
J		1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)
K		.250 (6.35)	.313 (7.94)	.313 (7.94)	.375 (9.53)	.375 (9.53)	.438 (11.11)	.438 (11.11)
KK	Std.	7/16 - 20	7/16 - 20	7/16 - 20	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14
	O.S.	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14	1 - 14	1 1/4 - 12
LB		3.625 (92.08)	3.625 (92.08)	3.750 (95.25)	4.250 (107.95)	4.250 (107.95)	4.500 (114.30)	5.000 (127.00)
MM	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)
	O.S.	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.750 (44.45)
P		2.340 (59.44)	2.340 (59.44)	2.470 (62.74)	2.690 (68.33)	2.690 (68.33)	2.940 (74.68)	3.125 (79.38)
R		1.428 (36.27)	1.838 (46.68)	2.192 (55.67)	2.758 (70.05)	3.323 (84.40)	4.101 (104.16)	4.879 (123.92)
SB		.438 (11.11)	.438 (11.11)	.438 (11.11)	.563 (14.29)	.563 (14.29)	.813 (20.64)	.813 (20.64)
SH		1.250 (31.75)	1.500 (38.10)	1.875 (47.63)	2.375 (60.33)	2.750 (69.85)	3.500 (88.90)	4.000 (101.60)
SS		2.875 (73.03)	2.875 (73.03)	3.000 (76.20)	3.250 (82.55)	3.250 (82.55)	3.125 (79.38)	3.625 (92.08)
ST		.250 (6.35)	.250 (6.35)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)
SU		1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.250 (31.75)	1.250 (31.75)	1.063 (26.99)	1.313 (33.34)
SW		.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.688 (17.44)	.688 (17.44)
TS		2.750 (69.85)	3.250 (82.55)	3.750 (95.25)	4.750 (120.65)	5.500 (139.70)	6.875 (174.63)	7.875 (200.03)
US		3.500 (88.90)	4.000 (101.60)	4.500 (114.30)	5.750 (146.05)	6.500 (165.10)	8.250 (209.55)	9.250 (234.95)
VF	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)
	O.S.	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)
WF	Std.	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)
	O.S.	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	1.875 (47.63)
XS	Std.	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.875 (47.63)	1.875 (47.63)	2.063 (52.39)	2.313 (58.74)
	O.S.	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)	2.125 (53.98)	2.125 (53.98)	2.313 (58.74)	2.563 (65.09)
Y	Std.	1.840 (46.74)	1.840 (46.74)	1.840 (46.74)	2.380 (60.45)	2.380 (60.45)	2.380 (60.45)	2.813 (71.44)
	O.S.	2.220 (56.39)	2.220 (56.39)	2.220 (56.39)	2.630 (66.80)	2.630 (66.80)	2.630 (66.80)	3.063 (77.79)
ZB	Std.	4.875 (123.83)	4.938 (125.41)	5.063 (128.59)	6.000 (152.40)	6.000 (152.40)	6.313 (160.34)	7.063 (179.39)
	O.S.	5.250 (133.35)	5.313 (134.94)	5.438 (138.11)	6.250 (158.75)	6.250 (158.75)	6.563 (166.69)	7.313 (185.74)

Double Rod End Cylinder with 05 (MX0) Basic

- NFPA (MX0) 05 Basic with Double Rod End Cylinder for 1-1/2" to 6" bore sizes.
- Series DA & EDA Cylinders rated to 250 PSI air, 400 PSI hydraulic (non-shock). Series EDA Cylinders rated to 250 PSI air only.
- Designed for non-lube service.
- Switches available on all bore sizes. (See pages ACT-1-90 & 91 for ordering information.)



Cylinder Order Information

05 - - - -

Bore and Stroke (write out)

DA	Series DA Double Rod End Cylinder
EDA	Series EDA Double Rod End Cylinder
DJ	Series DJ Double Rod End Cylinder
EDJ	Series EDJ Double Rod End Cylinder

Mounting Options	
01	Side Tapped (MS4)
03	Head Rectangular Flange (MF1)
03	Head Square (ME3) - 7" & 8" Bores
05	<b>Basic Cylinder No Mounting (MX0)</b>
06	Both Ends (4) Tie Rods Ext. (MX1)
6B	Both Ends (2) Tie Rods Ext. (MX4)
6R	Head Tie Rods Ext. (MX3)
7R	Head Trunnion (MT1)
09	Side Lugs (MS2)
10	Center Trunnion (MT4)
11	Side End Angles (MS1)
15	Side End Lugs (MS7)
16	Sleeve Nut Construction (Universal)
20	Head Square Flange (MF5)
60	Base Bar (Not NFPA) - A & EA Only

Additional Options - order alphabetically - More on page ACT-1-95.	
HR	Case Hardened (45 Rc)
L(-)	Port Location position 1 standard: L(Head Cap) (specify position 1 thru 4 for head and/or cap)
MS	Metal Rod Scraper
N(-)	Cushion Adjust Screw Location position 2 standard: N(Head Cap) (specify position 1 thru 4 for head and/or cap)
P(-)*	Non-Standard Port Sizes: [specify port size for P(-H) head only, P(-C) cap only, or P(-) both head & cap]
PS	Magnetic Piston
RS	Rod Stud Type 1 (5/8" - 1 3/4" øRod) Type 2 (5/8" & 1" øRod)
RX	Rod Extensions (specify length of additional rod extension)
SC	Single Acting Spring Extend (Cap End)-See page ACT-1-86
SR	Single Acting Spring Retract (Rod End)-See page ACT-1-86
SS	303 Stainless Steel (Hard Chrome Plated)
ST(-C)	Stop Tube (Cap End) (specify stop tube length)
ST(-R)	Stop Tube (Rod End) (specify stop tube length)
T	Special Rod Threads (specify rod thread)
TX	Thread Extensions (specify length of thread extension)
V	Viton® Seals

\*1 1/2", 2", 2 1/2" bore cylinders have 3/8" NPT Standard, 1/2" NPT oversize.  
 3 1/4", 4", 5" bore cylinders have 1/2" NPT Standard, 3/4" NPT oversize.  
 This will add 1/8" to the overall cylinder length.

Cushion in Head	
3	None
5'	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

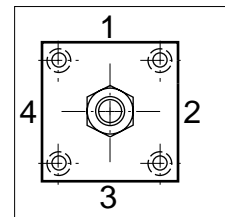
<sup>1</sup>Standard with EDA & EDJ

Piston Rod Threads Type	
1	Small Male (Solid)
2	Intermediate Thread Male (Solid)
3	Female
6	Full Thread Male (Solid)
7	Plain Rod End

Cushion in Cap	
3	None
5'	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

<sup>1</sup>Standard with EDA & EDJ

Piston Rod Diameters		
A**	5/8"	Standard on 1 1/2", 2", 2 1/2"
B**	1"	Standard on 3 1/4", 4", 5" Oversized on 1 1/2", 2", 2 1/2"
C**	1 3/8"	Standard on 6", 7", 8" Oversized on 3 1/4", 4", 5"
D**	1 3/4"	Oversized on 6", 7", 8"
E	2"	Standard on 12" Oversized on 10"
F	2 1/2"	Oversized on 10", 12"



**Port and Cushion Adjustment Positions** (As viewed from rod end: Port standard position 1, Cushion Adjustment standard position 2.)  
 NOTE: A Port and a Cushion Adjustment cannot be in the same position.

NOTE: Double Rod End cylinders have a (Head Rod End) and the opposite end cap is considered the (Cap Rod End).

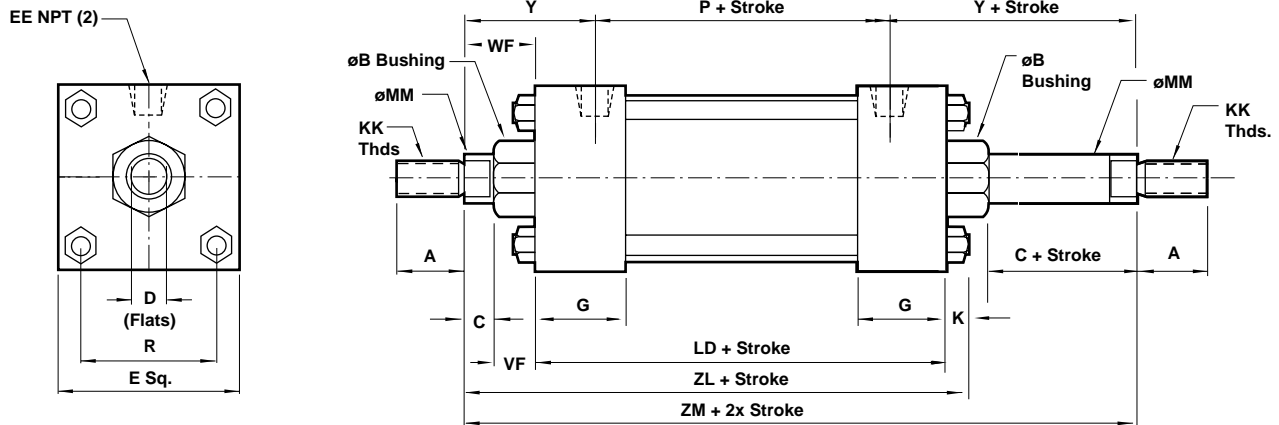
See page ACT-1-96 for complete instructions on how to order cylinders.

\*\* A & EA uses A-D only.

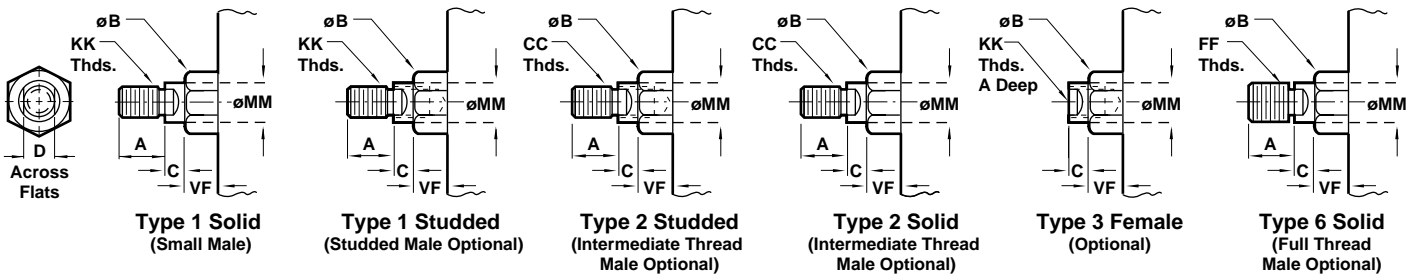
Series DA & EDA, NFPA Aluminum Double Rod End Air Cylinder with 05 (MX0) Basic  
 Series DJ & EDJ, NFPA Steel Double Rod End Air Cylinder with 05 (MX0) Basic



All Dimensions in Inches (mm)



Standard & Optional Rod Ends



Dimension	1 1/2" Bore (38.10)	2" Bore (50.80)	2 1/2" Bore (63.50)	3 1/4" Bore (82.55)	4" Bore (101.60)	5" Bore (127.00)	6" Bore (152.40)
ø Rod	Std. 5/8" (15.88)	5/8" (15.88)	5/8" (15.88)	1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)
	O.S. 1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/4" (44.45)
A	Std. .750 (19.05)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)
	O.S. 1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)
B <sup>+0.000</sup> <sub>-0.002</sub>	Std. 1.124 (28.55)	1.124 (28.55)	1.124 (28.55)	1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)
	O.S. 1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)	1.999 (50.78)	1.999 (50.78)	2.374 (60.30)
C	Std. .375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)
	O.S. .500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)
CC	Std. 1/2 - 20	1/2 - 20	1/2 - 20	7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12
	O.S. 7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12	1 1/4 - 12	1 1/4 - 12	1 1/2 - 12
D	Std. .500 (12.70)	.500 (12.70)	.500 (12.70)	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.125 (28.58)
	O.S. .875 (22.23)	.875 (22.23)	.875 (22.23)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)
E	2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)	5.500 (139.70)	6.500 (165.10)
EE	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)
FF	Std. 5/8 - 18	5/8 - 18	5/8 - 18	1 - 14	1 - 14	1 - 14	1 3/8 - 12
	O.S. 1 - 14	1 - 14	1 - 14	1 3/8 - 12	1 3/8 - 12	1 3/8 - 12	1 3/4 - 12
G	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)	2.000 (50.80)
K	.250 (6.35)	.313 (7.94)	.313 (7.94)	.375 (9.53)	.375 (9.53)	.438 (11.11)	.438 (11.11)
KK	Std. 7/16 - 20	7/16 - 20	7/16 - 20	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14
	O.S. 3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14	1 - 14	1 1/4 - 12
LD	4.125 (92.08)	4.125 (92.08)	4.250 (95.25)	4.750 (107.95)	4.750 (107.95)	5.000 (127.00)	5.500 (139.70)
MM	Std. .625 (15.88)	.625 (15.88)	.625 (15.88)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)
	O.S. 1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.750 (44.45)
P	2.340 (59.44)	2.340 (59.44)	2.470 (62.74)	2.690 (68.33)	2.690 (68.33)	2.940 (74.68)	3.125 (79.38)
R	1.428 (36.27)	1.838 (46.68)	2.192 (55.67)	2.758 (70.05)	3.323 (84.40)	4.101 (104.16)	4.879 (123.92)
VF	Std. .625 (15.88)	.625 (15.88)	.625 (15.88)	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)
	O.S. .875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)
WF	Std. 1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)
	O.S. 1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	1.875 (47.63)
Y	Std. 1.840 (46.74)	1.840 (46.74)	1.840 (46.74)	2.380 (60.45)	2.380 (60.45)	2.380 (60.45)	2.813 (71.44)
	O.S. 2.220 (56.39)	2.220 (56.39)	2.220 (56.39)	2.630 (66.80)	2.630 (66.80)	2.630 (66.80)	3.063 (77.79)
ZL	Std. 5.375 (136.53)	5.438 (138.11)	5.563 (141.29)	6.500 (165.10)	6.500 (165.10)	6.813 (174.04)	7.563 (192.09)
	O.S. 5.750 (146.05)	5.813 (147.64)	5.938 (150.81)	6.750 (171.45)	6.750 (171.45)	7.063 (178.47)	7.813 (198.44)
ZM	Std. 6.125 (155.58)	6.125 (155.58)	6.250 (158.75)	7.500 (190.50)	7.500 (190.50)	7.500 (190.50)	8.750 (222.25)
	O.S. 6.875 (174.63)	6.875 (174.63)	7.000 (177.80)	8.000 (203.20)	8.000 (203.20)	8.000 (203.20)	9.250 (234.95)

Double Rod End Cylinder with 05 (MX0) Basic

- NFPA (MX0) 05 Basic with Double Rod End Cylinder available in 7" thru 12" bore sizes.
- Series DJ & EDJ Cylinders rated to 250 PSI air, 400 PSI hydraulic (non-shock). Series EDJ Cylinders rated to 250 PSI air only.
- Designed for non-lube service.
- Switches available on all bore sizes. (See pages ACT-1-90 & 91 for ordering information.)



Cylinder Order Information

05 - - - - -

DA	Series DA Double Rod End Cylinder
EDA	Series EDA Double Rod End Cylinder
DJ	Series DJ Double Rod End Cylinder
EDJ	Series EDJ Double Rod End Cylinder

Mounting Options	
01	Side Tapped (MS4)
03	Head Rectangular Flange (MF1)
03	Head Square (ME3) – 7" to 12" Bores
05	Basic Cylinder No Mounting (MX0)
06	Both Ends (4) Tie Rods Ext. (MX1)
6B	Both Ends (2) Tie Rods Ext. (MX4)
6R	Head Tie Rods Ext. (MX3)
07	Head Trunnion (MT1)
09	Side Lugs (MS2)
10	Center Trunnion (MT4)
11	Side End Angles (MS1)
15	Side End Lugs (MS7)
16	Sleeve Nut Construction (Universal)
20	Head Square Flange (MF5)
60	Base Bar (Not NPFA - A & EA Only)

Cushion in Head	
3	None
5 <sup>1</sup>	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

<sup>1</sup>Standard with EDA & EDJ

Cushion in Cap	
3	None
5 <sup>1</sup>	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion

<sup>1</sup>Standard with EDA & EDJ

NOTE: Double Rod End cylinders have a (Head Rod End) and the opposite end cap is considered the (Cap Rod End).  
 See page ACT-1-96 for complete instructions on how to order cylinders.

Bore and Stroke (write out)

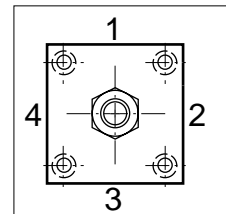
Additional Options – order alphabetically – More on page ACT-1-95	
HR	Case Hardened (45 Rc)
L(- -)	Port Location position 1 standard: L(Head Cap) (specify position 1 thru 4 for head and/or cap)
MS	Metal Rod Scraper
N(- -)	Cushion Adjust Screw Location position 2 standard: N(Head Cap) (specify position 1 thru 4 for head and/or cap)
P(-)*	Non-Standard Port Sizes: [specify port size for P(-H) head only, P(-C) cap only, or P(-) both head & cap]
PS	Magnetic Piston – includes aluminum tube option
RS	Rod Stud Type 1 (5/8" – 1 3/4" øRod) Type 2 (5/8" & 1" øRod)
RX	Rod Extensions (specify length of additional rod extension)
SC	Single Acting Spring Extend (Cap End) – See page ACT-1-86
SR	Single Acting Spring Retract (Rod End) – See page ACT-1-86
SS	303 Stainless Steel (Hard Chrome Plated)
ST(-C)	Stop Tube (Cap End) (specify stop tube length)
ST(-R)	Stop Tube (Rod End) (specify stop tube length)
T	Special Rod Threads (specify rod thread)
TX	Thread Extensions (specify length of thread extension)
V	Viton® Seals

\*1 1/2", 2", 2 1/2" bore cylinders have 3/8" NPT Standard, 1/2" NPT oversize.  
 3 1/4", 4", 5" bore cylinders have 1/2" NPT Standard, 3/4" NPT oversize.  
 This will add 1/8" to the overall cylinder length.

Piston Rod Threads Type	
1	Small Male (Solid)
2	Intermediate Thread Male (Solid)
3	Female
6	Full Thread Male (Solid)
7	Plain Rod End

Piston Rod Diameters	
A**	5/8" Standard on 1 1/2", 2", 2 1/2"
B**	1" Standard on 3 1/4", 4", 5" Oversized on 1 1/2", 2", 2 1/2"
C**	1 3/8" Standard on 6", 7", 8" Oversized on 3 1/4", 4", 5"
D**	1 3/4" Standard on 10" Oversized on 6", 7", 8"
E	2" Standard on 12" Oversized on 10"
F	2 1/2" Oversized on 10", 12"

\*\* A & EA uses A-D only.

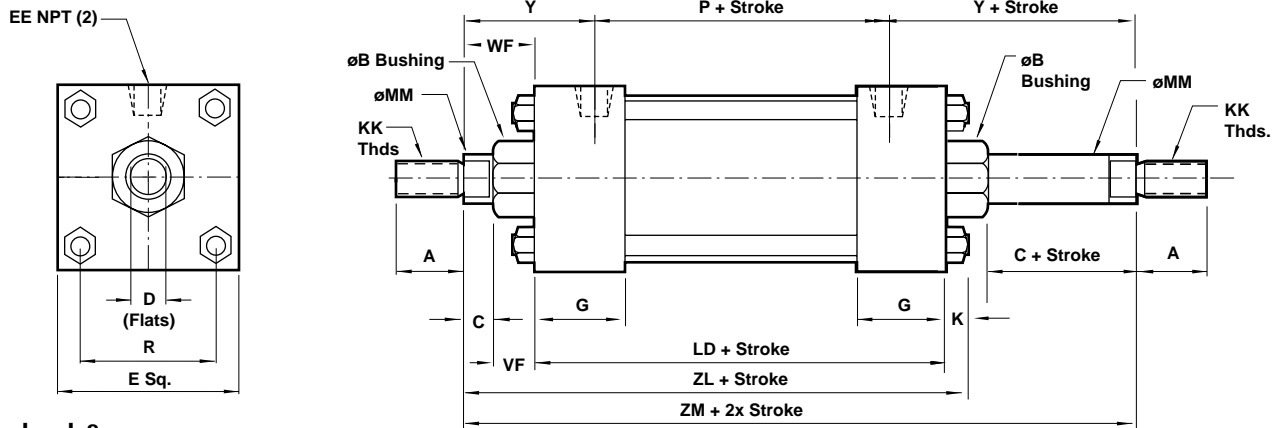


Port and Cushion Adjustment Positions (As viewed from rod end: Port standard position 1, Cushion Adjustment standard position 2.)  
 NOTE: A Port and a Cushion Adjustment cannot be in the same position.

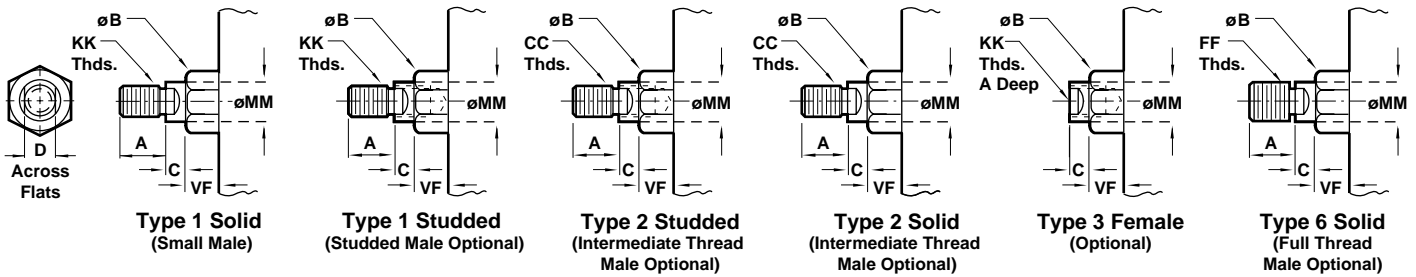
Series DA & EDA, NFGA Aluminum Double Rod End Air Cylinder with 05 (MX0) Basic  
 Series DJ & EDJ, NFGA Steel Double Rod End Air Cylinder with 05 (MX0) Basic



All Dimensions in Inches (mm)



Standard & Optional Rod Ends



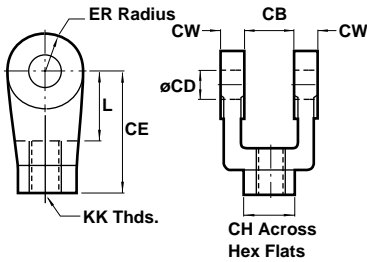
Dimension		7" Bore (177.80)	8" Bore (203.20)	10" Bore (254.00)	12" Bore (304.80)
ø Rod	Std.	1 3/8" (34.93)	1 3/8" (34.93)	1 3/4" (44.45)	2" (50.80)
	O.S.	1 3/4" (44.45)	1 3/4" (44.45)	2" (50.80)	2 1/2" (63.50)
A	Std.	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)	2.250 (57.15)
	O.S.	2.000 (50.80)	2.000 (50.80)	2.250 (57.15)	3.000 (76.20)
B +.000 -.002	Std.	1.999 (50.78)	1.999 (50.78)	2.374 (60.30)	2.624 (66.65)
	O.S.	2.374 (60.30)	2.374 (60.30)	2.624 (66.65)	3.124 (79.35)
C	Std.	.625 (15.88)	.625 (15.88)	.750 (19.05)	.875 (22.23)
	O.S.	.750 (19.05)	.750 (19.05)	.875 (22.23)	1.000 (25.40)
CC	Std.	1 1/4 - 12	1 1/4 - 12	1 1/2 - 12	1 3/4 - 12
	O.S.	1 1/2 - 12	1 1/2 - 12	1 3/4 - 12	2 1/4 - 12
D	Std.	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)	1.688 (42.86)
	O.S.	1.500 (38.10)	1.500 (38.10)	1.688 (42.86)	2.063 (52.39)
E		7.500 (190.50)	8.500 (215.90)	10.625 (269.88)	12.750 (323.85)
EE		.750 (19.05)	.750 (19.05)	1.000 (25.40)	1.000 (25.40)
FF	Std.	1 3/8 - 12	1 3/8 - 12	1 3/4 - 12	2 - 12
	O.S.	1 3/4 - 12	1 3/4 - 12	2 - 12	2 1/2 - 12
G		2.000 (50.80)	2.000 (50.80)	2.250 (57.15)	2.250 (57.15)
K		.563 (14.29)	.563 (14.29)	.688 (17.46)	.688 (17.46)
KK	Std.	1 - 14	1 - 14	1 1/4 - 12	1 1/2 - 12
	O.S.	1 1/4 - 12	1 1/4 - 12	1 1/2 - 12	1 7/8 - 12
LD		5.625 (142.88)	5.625 (142.88)	6.625 (168.28)	7.125 (180.98)
MM	Std.	1.375 (34.93)	1.375 (34.93)	1.750 (44.45)	2.000 (50.80)
	O.S.	1.750 (44.45)	1.750 (44.45)	2.000 (50.80)	2.500 (63.50)
P		3.250 (82.55)	3.250 (82.55)	4.125 (104.78)	4.625 (117.48)
R		5.730 (145.54)	6.442 (163.63)	7.969 (202.41)	9.406 (238.92)
VF	Std.	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)	1.125 (28.58)
	O.S.	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.250 (31.75)
WF	Std.	1.625 (41.28)	1.625 (41.28)	1.875 (47.63)	2.000 (50.80)
	O.S.	1.875 (47.63)	1.875 (47.63)	2.000 (50.80)	2.250 (57.15)
Y	Std.	2.813 (71.44)	2.813 (71.44)	3.125 (79.38)	3.250 (82.55)
	O.S.	3.063 (77.79)	3.063 (77.79)	3.250 (82.55)	3.500 (88.90)
ZL	Std.	7.813 (198.44)	7.813 (198.44)	10.375 (263.53)	11.125 (282.58)
	O.S.	8.125 (206.38)	8.125 (206.38)	10.625 (269.88)	11.625 (295.28)
ZM	Std.	8.875 (225.43)	8.875 (225.43)	9.250 (234.95)	9.675 (246.83)
	O.S.	9.375 (238.13)	9.375 (238.13)	9.375 (238.13)	10.375 (263.53)



# Series A & EA, NFPA Aluminum Air Cylinders (ø1-1/2" to 8") Accessories Series J & EJ, NFPA Steel Air Cylinders (ø1-1/2" to 12") Accessories

All Dimensions in Inches (mm)

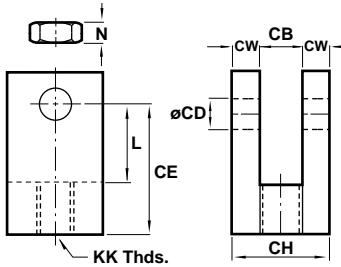
## NFPA Rod Clevis



Rod Clevis	Rod Clevis Assy.	KK	CB	CD	CE	CH	CW	ER	L
49028	49028A	7/16 - 20	.750 (19.05)	.500 (12.70)	1.500 (38.10)	1.000 (25.40)	.500 (12.70)	.500 (12.70)	.750 (19.05)
49029	49029A	1/2 - 20	.750 (19.05)	.500 (12.70)	1.500 (38.10)	1.000 (25.40)	.500 (12.70)	.500 (12.70)	.750 (19.05)
49097	49097A	5/8 - 18	.750 (19.05)	.500 (12.70)	1.500 (38.10)	1.000 (25.40)	.500 (12.70)	.500 (12.70)	.750 (19.05)
49030	49030A	3/4 - 16	1.250 (31.75)	.750 (19.05)	2.375 (60.33)	1.250 (31.75)	.625 (15.88)	.750 (19.05)	1.250 (31.75)
49098	49098A	7/8 - 14	1.250 (31.75)	.750 (19.05)	2.375 (60.33)	1.250 (31.75)	.625 (15.88)	.750 (19.05)	1.250 (31.75)
49032	49032A	1 - 14	1.500 (38.10)	1.000 (25.40)	3.125 (79.38)	1.500 (38.10)	.750 (19.05)	1.000 (25.40)	1.500 (38.10)
49033	49033A	1 1/4 - 12	2.000 (50.80)	1.375 (34.93)	4.125 (104.78)	2.000 (50.80)	1.000 (25.40)	1.375 (34.93)	2.125 (53.98)
49099	49099A	1 3/8 - 12	2.000 (50.80)	1.375 (34.93)	4.125 (104.78)	2.000 (50.80)	1.000 (25.40)	1.000 (25.40)	2.125 (53.98)
49034	49034A	1 1/2 - 12	2.500 (63.50)	1.750 (44.45)	4.500 (114.30)	2.375 (60.33)	1.250 (31.75)	1.750 (44.45)	2.250 (57.15)
49100	49100A	1 3/4 - 12	2.500 (63.50)	1.750 (44.45)	4.500 (114.30)	2.375 (60.33)	1.250 (31.75)	1.750 (44.45)	2.250 (57.15)
49036	49036A	1 7/8 - 12	2.500 (63.50)	2.000 (50.80)	5.500 (139.70)	2.937 (74.60)	1.250 (31.75)	2.000 (50.80)	2.500 (63.50)
49101	49101A	2 - 12	2.500 (63.50)	2.000 (50.80)	5.500 (139.70)	2.937 (74.60)	1.250 (31.75)	2.000 (50.80)	2.500 (63.50)
49102	49102A	2 1/4 - 12	3.000 (76.20)	2.500 (63.50)	6.500 (165.10)	3.500 (88.90)	1.500 (38.10)	2.750 (69.85)	3.000 (76.20)
49103	49103A	2 1/2 - 12	3.000 (76.20)	3.000 (76.20)	6.750 (171.45)	3.875 (98.45)	1.500 (38.10)	2.750 (69.85)	3.250 (82.55)

Note: Rod Clevis Assembly 49102A and 49103A are supplied with NFPA Pin. All others are with Standard Pin

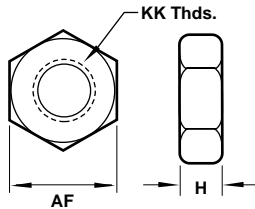
## Small Rod Clevis & Jam Nut



Rod Clevis	Rod Clevis Assy.	KK	CB	CD	CE	CH	CW	L	N
49218	49218A	1/2 - 20	.500 (12.70)	.500 (12.70)	1.375 (34.93)	1.000 (25.40)	.250 (6.35)	.750 (19.05)	.375 (9.53)
49219	49219A	3/4 - 16	.750 (19.05)	.750 (19.05)	1.750 (44.45)	1.500 (38.10)	.375 (9.53)	1.000 (25.40)	.500 (12.70)

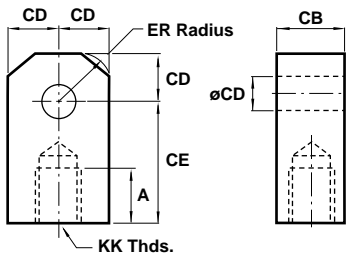
Note: Rod Clevis Assembly is supplied with Jam Nut and Standard Pin.

## Rod Jam Nut



KK	52025	52026	52027	52010	52029	52030	52085
KK	7/16 - 20	1/2 - 20	5/8 - 18	3/4 - 16	7/8 - 14	1 - 14	1 1/4 - 12
AF	.688 (17.46)	.750 (19.05)	.938 (23.81)	1.125 (28.58)	1.313 (33.34)	1.500 (38.10)	1.875 (47.63)
H	.250 (6.35)	.313 (7.94)	.375 (9.53)	.422 (10.72)	.484 (12.30)	.547 (13.89)	.719 (18.26)
KK	52092	52068	52082	52070	52093	52083	52075
KK	1 3/8 - 12	1 1/2 - 12	1 3/4 - 12	1 7/8 - 12	2 - 12	2 1/4 - 12	2 1/2 - 12
AF	2.063 (53.39)	2.250 (57.15)	2.625 (66.68)	2.938 (74.61)	3.125 (79.38)	3.500 (88.90)	3.875 (98.43)
H	.781 (19.84)	.844 (21.43)	.969 (24.61)	1.031 (26.19)	1.094 (27.78)	1.203 (30.56)	1.453 (36.91)

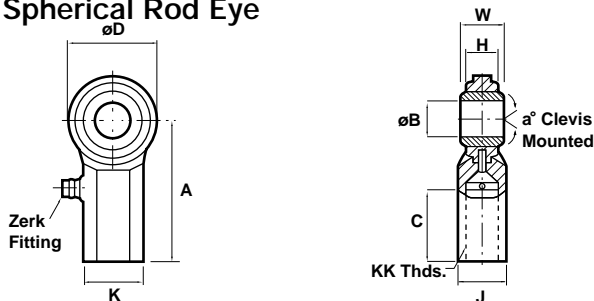
## NFPA Rod Eye



Rod Eye	Rod Eye Assy.	KK	A	CB	CD	CE	ER
49015	49015A	7/16 - 20	.750 (19.05)	.750 (19.05)	.500 (12.70)	1.500 (38.10)	.563 (14.29)
49014	49014A	1/2 - 20	.750 (19.05)	.750 (19.05)	.500 (12.70)	1.500 (38.10)	.563 (14.29)
49091	49091A	5/8 - 18	.750 (19.05)	1.250 (31.75)	.750 (19.05)	2.063 (52.39)	.500 (12.70)
49013	49013A	3/4 - 16	1.125 (28.58)	1.250 (31.75)	.750 (19.05)	2.063 (52.39)	.938 (23.81)
49092	49092A	7/8 - 14	1.125 (28.58)	1.250 (31.75)	.750 (19.05)	2.063 (52.39)	.750 (19.05)
49011	49011A	1 - 14	1.625 (41.28)	1.500 (38.10)	1.000 (25.40)	2.813 (71.44)	1.125 (28.58)
49010	49010A	1 1/4 - 12	2.000 (50.80)	2.000 (50.80)	1.375 (34.93)	3.438 (87.31)	1.563 (39.69)
49093	49093A	1 3/8 - 12	1.625 (41.28)	2.000 (50.80)	1.375 (34.93)	3.438 (87.31)	1.375 (34.93)
49009	49009A	1 1/2 - 12	2.250 (57.15)	2.500 (63.50)	1.750 (44.45)	4.000 (101.60)	2.500 (63.50)
49094	49094A	1 3/4 - 12	2.250 (57.15)	2.500 (63.50)	1.750 (44.45)	4.000 (101.60)	2.500 (63.50)
49007	49007A	1 7/8 - 12	3.000 (76.20)	2.500 (63.50)	2.000 (50.80)	5.000 (127.00)	2.875 (73.00)
49095	49095A	2 - 12	2.250 (57.15)	2.500 (63.50)	2.000 (50.80)	5.000 (127.00)	2.875 (73.00)
49062	49062A	2 1/4 - 12	3.000 (76.20)	3.000 (76.20)	2.500 (63.50)	5.813 (147.64)	3.250 (82.55)
49096	49096A	2 1/2 - 12	3.000 (76.20)	3.000 (76.20)	3.000 (76.20)	6.125 (155.58)	3.250 (82.55)

Note: Rod Eye Assembly 49062A and 49096A are supplied with NFPA Pin. All others are supplied with Standard Pin

## Spherical Rod Eye



Spherical Rod Eye	49220	49221	49222
Spherical Rod Eye Assy.	49220A	49221A	49222A
Bore	1 1/2, 2 & 2 1/2	3 1/4, 4 & 5	6 & 8
KK	UNF-2B	1/2 - 20	3/4 - 16
a°	Misalignment Angle	12	14
A	± .015	2.125 (53.98)	2.875 (73.03)
B	+ .0025 / -.0005	.500 (12.70)	.750 (19.05)
C	+ .062 / -.031	1.063 (26.99)	1.563 (39.69)
D	± .010	1.313 (33.34)	1.750 (44.45)
H	Reference	.453 (11.49)	.593 (15.06)
J	± .010	.750 (19.05)	1.000 (25.40)
K	± .010	.875 (22.23)	1.125 (28.58)
W	+ .000 / -.005	.625 (15.88)	.875 (22.23)

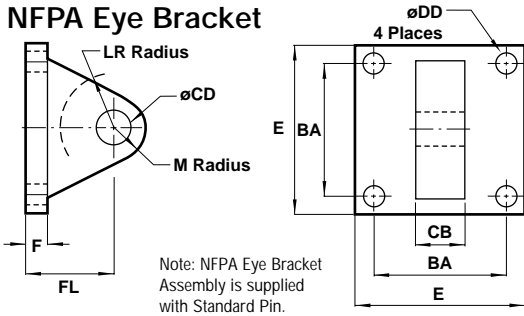


**Series A & EA, NFPA Aluminum Air Cylinders (ø1-1/2" to 8") Accessories**  
**Series J & EJ, NFPA Steel Air Cylinders (ø1-1/2" to 12") Accessories**



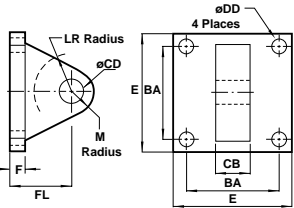
All Dimensions in Inches (mm)

**NFPA Eye Bracket**



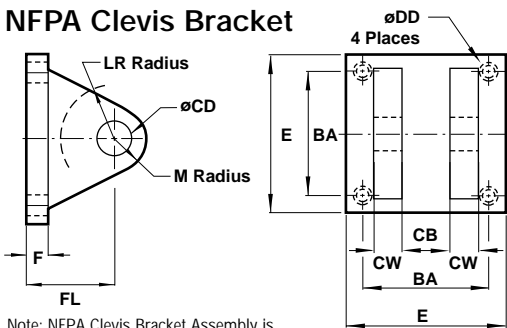
NFPA Eye Bracket	49021	49020	49019	49016	49017	49018
Eye Bracket Assembly	49021A	49020A	49019A	49016A	49017A	49018A
BA	1.625 (41.28)	2.563 (65.08)	3.250 (82.55)	3.813 (96.84)	4.937 (125.40)	5.750 (146.05)
CB	.750 (19.05)	1.250 (31.75)	1.500 (38.10)	2.000 (50.80)	2.500 (63.50)	2.500 (63.50)
CD	.500 (12.70)	.750 (19.05)	1.000 (25.40)	1.375 (34.93)	1.750 (44.45)	2.000 (50.80)
DD	.406 (10.32)	.531 (13.49)	.656 (16.67)	.656 (16.67)	.906 (23.02)	1.026 (26.06)
E	2.500 (63.50)	3.500 (88.90)	4.500 (114.30)	5.000 (127.00)	6.500 (165.10)	7.500 (190.50)
F	.375 (9.53)	.625 (15.88)	.750 (19.05)	.875 (22.23)	.875 (22.23)	1.000 (25.40)
FL	1.125 (28.58)	1.875 (47.63)	2.250 (57.15)	3.000 (76.20)	3.125 (79.38)	3.500 (88.90)
LR	.750 (19.05)	1.250 (31.75)	1.500 (38.10)	2.125 (53.98)	2.250 (57.15)	2.500 (63.50)
M	.500 (12.70)	.750 (19.05)	1.000 (25.40)	1.375 (34.93)	1.750 (44.45)	2.000 (50.80)

**Norgren Eye Bracket**



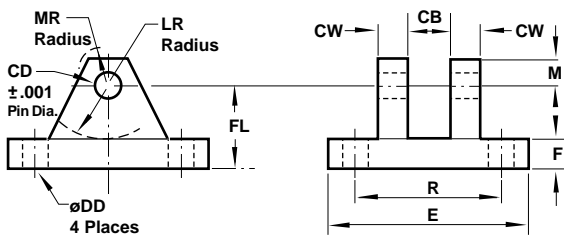
Norgren Eye Bracket	49240	49241	49242	49243	49244	49019	49016	49017	49018
Eye Bracket Assembly	49240A	49241A	49242A	49243A	49244A	49019A	49016A	49017A	49018A
BA	1.438 (36.51)	1.844 (46.83)	2.188 (55.56)	2.938 (74.61)	3.563 (90.49)	3.250 (82.55)	3.813 (96.84)	4.950 (125.73)	5.730 (145.54)
CB	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)	2.000 (50.80)	2.500 (63.50)	2.500 (63.50)
CD	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)	1.000 (25.40)	1.375 (34.93)	1.750 (44.45)	2.000 (50.80)
DD	.281 (7.14)	.344 (8.73)	.344 (8.73)	.469 (11.91)	.469 (11.91)	.656 (16.67)	.656 (16.67)	.906 (23.01)	1.062 (26.98)
E	2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)	4.500 (114.30)	5.000 (127.00)	6.500 (165.10)	7.500 (190.50)
F	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.875 (22.23)	.875 (22.23)	1.000 (25.40)
FL	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.750 (44.45)	1.750 (44.45)	2.250 (57.15)	3.000 (76.20)	3.125 (79.38)	3.500 (88.90)
LR	.563 (14.29)	.563 (14.29)	.563 (14.29)	1.000 (25.40)	1.000 (25.40)	1.500 (38.10)	2.125 (53.98)	2.250 (57.15)	2.500 (63.50)
M	.625 (15.88)	.625 (15.88)	.625 (15.88)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.375 (34.93)	1.750 (44.45)	2.000 (50.80)

**NFPA Clevis Bracket**



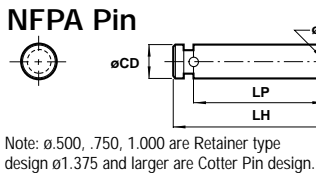
NFPA Clevis Bracket	49250	49251	49252
Clevis Bracket Assembly	49250A	49251A	49252A
BA	1.625 (41.28)	2.563 (65.09)	3.250 (82.55)
CB	.750 (19.05)	1.250 (31.75)	1.500 (38.10)
CD	.500 (12.70)	.750 (19.05)	1.000 (25.40)
CW	.500 (12.70)	.625 (15.88)	.750 (19.05)
DD	3/8 - 24	1/2 - 20	5/8 - 18
E	2.500 (63.50)	3.500 (88.90)	4.500 (114.30)
F	.375 (9.53)	.625 (15.88)	.750 (19.05)
FL	1.125 (28.58)	1.875 (47.63)	2.250 (57.15)
LR	.750 (19.05)	1.250 (31.75)	1.500 (38.10)
M	.500 (12.70)	.813 (20.64)	1.000 (25.40)

**Norgren Clevis Bracket**



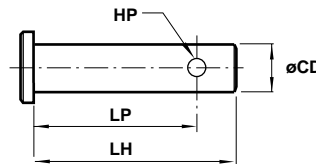
Norgren Clevis Bracket	49022	49023	49024	49027	49025	49026
Clevis Bracket Assembly	49022A	49023A	49024A	49027A	49025A	49026A
CB	.750 (19.05)	1.250 (31.75)	1.500 (38.10)	2.000 (50.80)	2.500 (63.50)	2.500 (63.50)
CD	.500 (12.70)	.750 (19.05)	1.000 (25.40)	1.375 (34.93)	1.750 (44.45)	2.000 (50.80)
CW	.500 (12.70)	.625 (15.88)	.750 (19.05)	1.000 (25.40)	1.250 (31.75)	1.500 (38.10)
DD	.406 (10.32)	.531 (13.49)	.656 (16.67)	.656 (16.67)	.906 (23.02)	1.026 (26.06)
E	3.500 (88.90)	5.000 (127.00)	6.500 (165.10)	8.000 (203.20)	10.000 (254.00)	12.000 (304.80)
F	.500 (12.70)	.625 (15.88)	.750 (19.05)	.875 (22.23)	.875 (22.23)	1.000 (25.40)
FL	1.500 (38.10)	1.875 (47.63)	2.250 (57.15)	3.000 (76.20)	3.625 (92.08)	4.520 (114.94)
LR	.750 (19.05)	1.188 (30.16)	1.500 (38.10)	2.000 (50.80)	2.750 (69.85)	3.188 (80.96)
M	.500 (12.70)	.750 (19.05)	1.000 (25.40)	1.375 (34.93)	1.750 (44.45)	2.250 (57.15)
MR	.625 (15.88)	.906 (23.02)	1.250 (28.58)	1.656 (42.07)	2.219 (56.36)	2.781 (70.64)
R	2.547 (64.69)	3.828 (97.23)	4.953 (125.81)	5.734 (145.65)	7.500 (190.50)	9.938 (252.41)

**NFPA Pin**



NFPA Pin	49006-R	49005-R	49004-R	49003	49002	49001	49000	49126	49127
CD	.500 (12.70)	.750 (19.05)	1.000 (12.70)	1.375 (34.93)	1.750 (44.45)	2.000 (50.80)	2.000 (50.80)	2.500 (63.50)	3.000 (76.20)
LH	2.219 (56.30)	3.125 (79.38)	3.750 (95.25)	4.750 (120.65)	5.812 (147.62)	5.812 (147.62)	6.312 (160.33)	6.875 (174.60)	6.875 (174.60)
LP	1.875 (47.63)	2.750 (69.85)	3.250 (82.55)	4.250 (107.95)	5.250 (133.35)	5.281 (134.14)	5.770 (146.56)	6.312 (160.33)	6.344 (161.14)
D	-	-	-	.173 (4.39)	.173 (4.39)	.204 (5.18)	.204 (5.18)	.219 (5.56)	.250 (6.35)

**Standard Pin**



Std. Pin	49207*	49208*	49206	49205	49204	49203	49202	49201
CD	.500 (12.70)	.750 (19.05)	.500 (12.70)	.750 (19.05)	1.000 (25.40)	1.375 (34.93)	1.750 (44.45)	2.000 (50.80)
HP	.156 (3.97)	.156 (3.97)	.156 (3.97)	.156 (3.97)	.203 (5.16)	.250 (6.35)	.250 (6.35)	.250 (6.35)
LH	1.421 (36.09)	2.000 (50.80)	2.250 (57.15)	3.000 (76.20)	3.500 (88.90)	5.000 (127.00)	6.000 (152.40)	6.000 (152.40)
LP	1.266 (32.16)	1.843 (46.83)	2.093 (53.16)	2.843 (72.22)	3.297 (83.74)	4.500 (114.30)	5.500 (139.70)	5.500 (139.70)

\*For small rod clevis only, see page ACT-1-84.

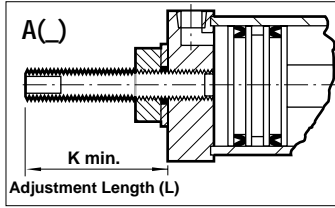


# Series A & EA Aluminum Optional Features & Custom Cylinders Series J & EJ Steel Optional Features & Custom Cylinders

All Dimensions in Inches (mm)

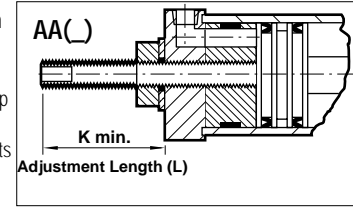
## Adjustable Stroke

Provides variable reduction of the retract stroke and serves as a positive stop for the cylinder piston. Consists of a threaded stud located in the cap end of the cylinder. Milled wrench flats on the end of the adjustment stud allow for simple yet precise positioning to accommodate varying retract stroke requirements.  
TO ORDER: Enter option code **A(L)**.  
Specify adjustable stroke length.



## Adjustable Stroke with Piston

Provides variable reduction of the retract stroke and serves as a positive stop for the cylinder piston. Consists of an adjustable stop piston attached to a threaded stud located in the cap end of the cylinder. Milled wrench flats on the end of the adjustment stud allow for simple yet precise positioning of the stop piston to accommodate varying retract stroke requirements.  
TO ORDER: Enter option code **AA(L)**. Specify adjustable stroke length.

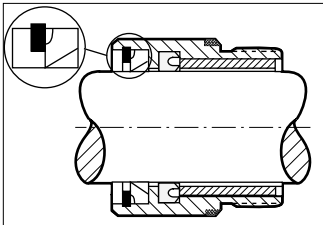


## Maximum Adjustable Stroke Length

Bore	1 1/2" (38.10)	2" (50.80)	2 1/2" (63.50)	3 1/4" (82.55)	4" (101.60)	5" (127.00)	6" (152.40)	7" (177.80)	8" (203.20)
K min.	1 (25.40)	1 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)	1.625 (41.28)	2 (50.80)	2 (50.80)
A (L max.)	5 (127.00)	5 (127.00)	8 (203.20)	8 (203.20)	8 (203.20)	9 (228.60)	9 (228.60)	12 (304.80)	12 (304.80)
AA (L max.)	10 (254.00)	10 (254.00)	16 (406.40)	16 (406.40)	16 (406.40)	18 (457.20)	18 (457.20)	20 (508.00)	20 (508.00)

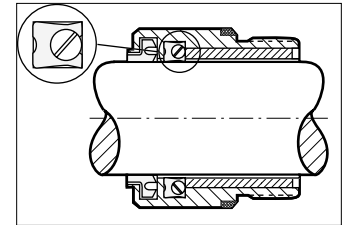
## Metallic Rod Scraper

Aggressively scrapes the exposed portion of the piston rod free of weld spatter, paint spray, abrasive powders or many other foreign materials that could damage the rod seal.  
TO ORDER: Enter option code **MS**.



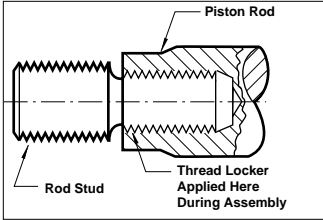
## Piston Rod Seal O-Ring Loaded (A & J Only)

Pre-loaded lip seal has a very low leakage at low pressure. Excellent for low pressure hydraulic applications. TO ORDER, enter: Option code **H** – Rod seal only. Option code **PP** – Rod and piston seals.



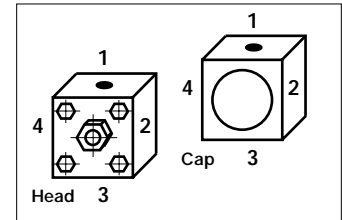
## Piston Rod Stud

Reduces the chance for piston rod failure. The rod stud can be installed with different thread locker. TO ORDER, enter: Option code **BL** – removable adhesive sealant. Option code **RS** – high strength thread locker adhesive.  
NOTE: Type 2 studded rod shown.



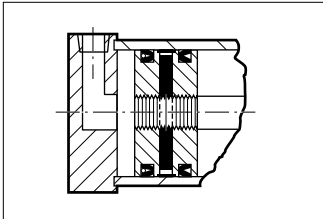
## Cushion Adjust Screw Optional Locations

Option code **N(L)**  
Specify optional location.  
Example: **N(4 2)** cushion location 4 Head end, standard position 2 Cap end.  
When using option code **N**, head and cap locations must be specified 1, 2, 3, or 4.



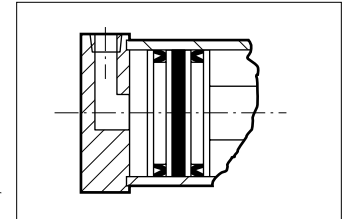
## Pinned Piston to Rod

Norgren will supply a full size piston rod to piston joint, in addition to pinning the piston to the rod, for severe applications. If under normal operating conditions, the pinned piston and rod become detached, Norgren will replace the piston and rod assembly free of charge.  
TO ORDER: Enter option code **PN**.



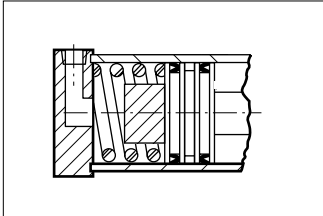
## Magnetic Piston (No Wear Ring)

When position sensing of the cylinder rod is required, a "magnetic piston" must be specified. A magnetic band is placed at the center of the piston which creates a magnetic field to actuate Norgren's reed, solid state or hall effect switch.  
NOTE: We cannot guarantee the operation of other manufacturers' switches.  
TO ORDER: Enter option code **PS**.



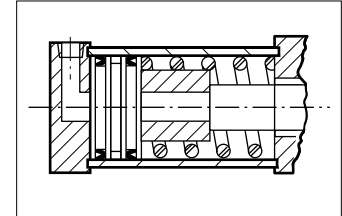
## Single Acting Spring Extend

Available on Cap End of Cylinder for 1 1/2", 2", and 2 1/2" bore sizes, 12" maximum stroke.  
NOTE: Standard spring extend cylinder has 12 lbs. force pre-load, 30 lbs. force compressed. For other spring forces, bore sizes or longer strokes, consult factory.  
TO ORDER: Enter option code **SC**.



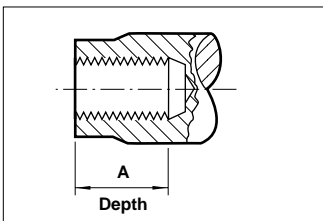
## Single Acting Spring Retract

Available on Rod End of Cylinder for 1 1/2", 2", and 2 1/2" bore sizes, 12" maximum stroke.  
NOTE: Standard spring retract cylinder has 12 lbs. force pre-load, 30 lbs. force compressed. For other spring forces, bore sizes or longer strokes, consult factory.  
TO ORDER: Enter option code **SR**.  
Note: Standard on A & J. Consult factory for EA & EJ.



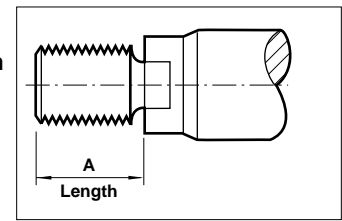
## Additional Female Thread Depth

Piston rod thread depth can be ordered over standard.  
TO ORDER: Enter option code **TF(L)** and specify additional "A" depth.



## Additional Male Thread Length

Piston rod thread extension can be ordered over standard.  
TO ORDER: Enter option code **TX(L)** and specify additional "A" length.



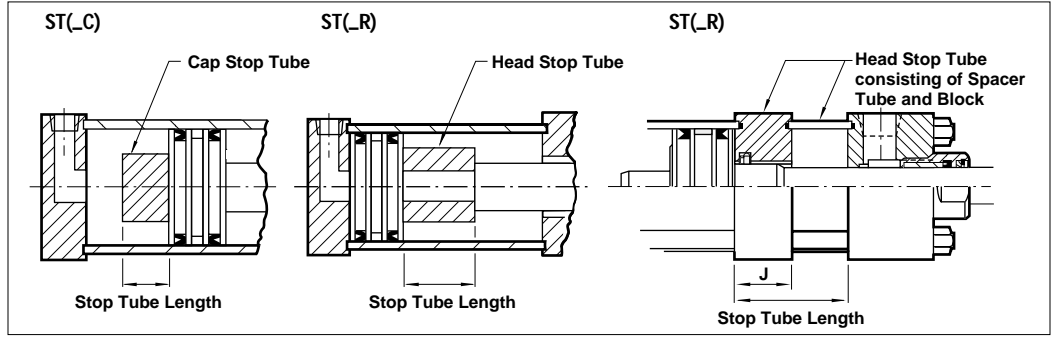


**Stop Tube**

Enhances the transverse load carrying capability of a long stroke cylinder by increasing the distance between the piston and rod bearing at full extension when placed on head end. Ideal for those applications requiring longer strokes or where additional rod stability is desired.

TO ORDER: Enter option code **ST(C)** Cap End or **ST(R)** Rod End. Specify stop tube length.

**NOTE:** **ST(R)** Alternate design: the stop tube rod end design changes when the stop tube exceeds **J** lengths in the chart.



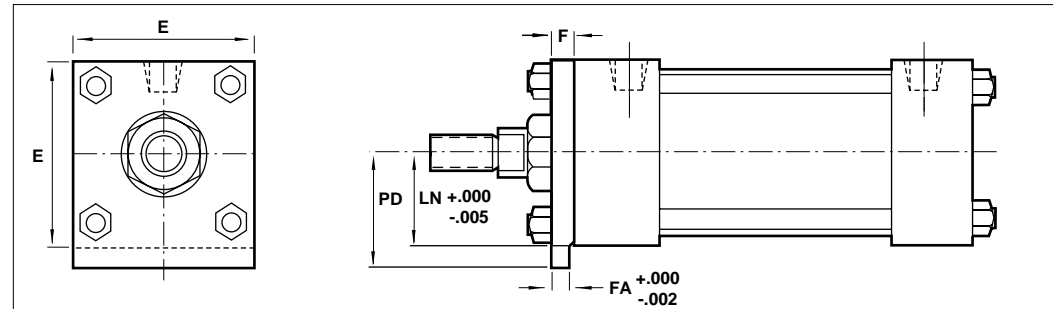
<b>Bore</b>	1 1/2" (38.10)	2" (50.80)	2 1/2" (63.50)	3 1/4" (82.55)	4" (101.60)	5" (127.00)	6" (152.40)	7" (177.80)	8" (203.20)
<b>J</b>	1 (25.40)	1 (25.40)	1 (25.40)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)

**Norgren's Standard Thrust Key Plate**

Thrust key plates eliminate the use of fitted bolts or dowel pins on side mountings. They prevent movement of the cylinder under shock loading, which might otherwise occur due to normal clearance between mounting holes and bolt diameters.

Option code **TK** available on 01(MS4), 09(MS2) and 15(MS7) mounts.

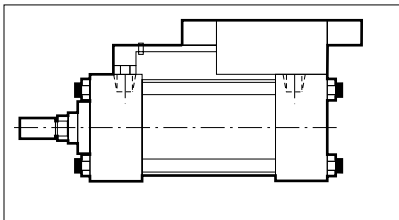
**NOTE:** Other manufacturers' thrust key plates can vary. Consult factory for information.



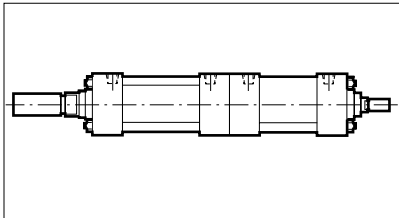
<b>Bore</b>	1 1/2" (38.10)	2" (50.80)	2 1/2" (63.50)	3 1/4" (82.55)	4" (101.60)	5" (127.00)	6" (152.40)
<b>E</b>	2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)	5.500 (139.70)	6.500 (165.10)
<b>F</b>	.375 (9.53)	.375 (9.53)	.375 (9.53)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)
<b>FA</b>	.313 (7.94)	.313 (7.94)	.313 (7.94)	.563 (14.29)	.563 (14.29)	.563 (14.29)	.688 (17.46)
<b>LN</b>	1.000 (25.40)	1.250 (31.75)	1.500 (38.10)	1.875 (47.63)	2.250 (57.15)	2.750 (69.85)	3.250 (82.55)
<b>PD</b>	1.188 (30.18)	1.438 (36.53)	1.688 (42.88)	2.188 (57.58)	2.563 (65.10)	3.063 (77.80)	3.625 (92.08)

**NOTE:** Care should be taken in machining the keyway slot for a tight fit. Only one keyway should be used per cylinder.

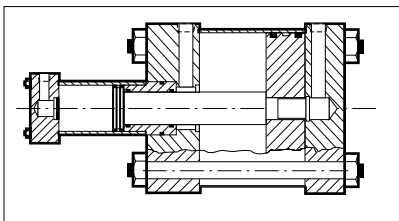
**Valve In Head**



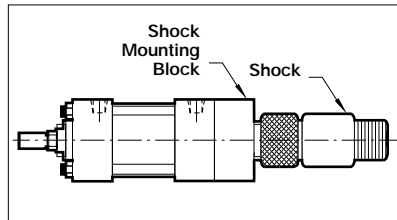
**Multi-Position Back-to-Back**



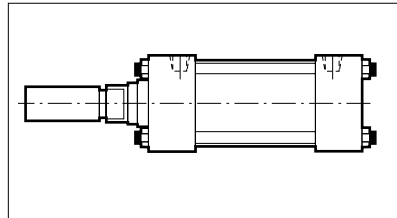
**Air to Air Booster/Pump**



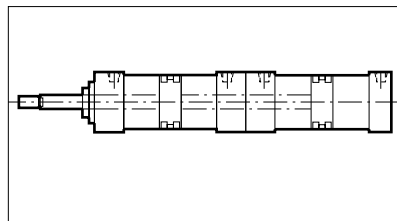
**Integral Shock Absorber**



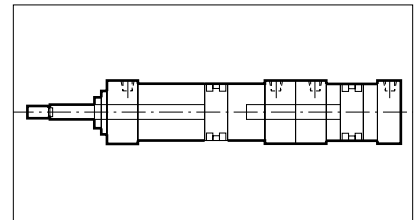
**Oversize Piston Rod**



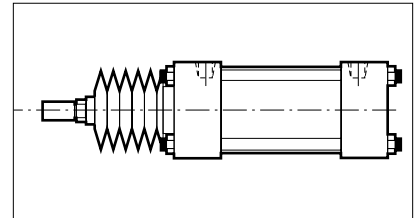
**Force Multiplication Tandem**



**Multi-Position Duplex**



**Protective Rod Boot**



**Other Custom Cylinders:**

Norgren designs and manufactures literally hundreds of specialty cylinders. We welcome the opportunity to provide you with a customized cylinder that meets the specific requirements of your application. For more information on how to order custom cylinders consult factory.

### Stroke Signal Valve

Stroke Signal Valves emit a positive pneumatic signal to indicate the position of the piston at each end of the cylinder stroke. It can be used to energize other air or electrical mechanisms in a control circuit.

The design involves a three-way normally closed poppet valve that uses the same pressure that drives the cylinder piston to provide a pneumatic signal.

Stroke Signal Valves are positioned on either or both ends of the cylinder according to your specifications. Each cylinder bore has minimum stroke limitations (See page ACT-1-89.) The standard Signal Valve begins to give a pneumatic signal when the cylinder piston is within 1/8" of the end of the stroke. For signal distances less than 1/8", consult factory.

### Pneumatic Valve

Pneumatic valves incorporate a single-pole, double-throw electric conversion switch with a Stroke Signal Valve. (Optional double-pole, double-throw switches are available.)

The electric conversion switch screws directly into the outlet port of the Stroke Signal Valve, enabling the Pneumatic Valve to convert air pulses into electrical signals without the need of complicated electro-pneumatic circuitry.

### How to Order Stroke Signal Valves

Add suffix SV ( ) after cylinder model number.  
 Indicate in ( ) Stroke Signal Valve location: list head position first, cap position last.  
 Valve position on head and/or cap should be indicated by position number 1, 2, 3 or 4.  
 Example: J333A1-SV(02) – Bore x Stroke = Stroke Signal Valve mounted on cap end only, position 2.

### How to Order Pneumatic Valves

Add suffix EV after cylinder model number.  
 Example: J333A1-EV(42S)\*\* – Bore x Stroke = Pneumatic Valve mounted on head end, position 4 and cap end, position 2, with single-pole – Double-throw.

\*\* S = Single-pole – Double-throw switch  
 D = Double-pole – Double-throw switch

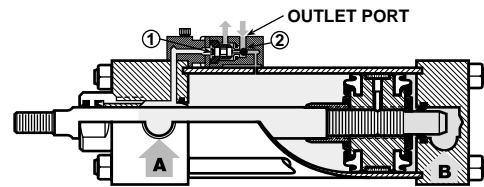
### Pneumatic & Pneumatic Valves Shown



### How the Valve Works

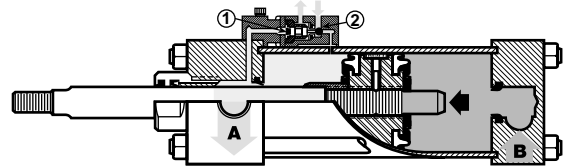
■ SUPPLY PRESSURE  
 □ EXHAUST PRESSURE

#### Start of the Stroke



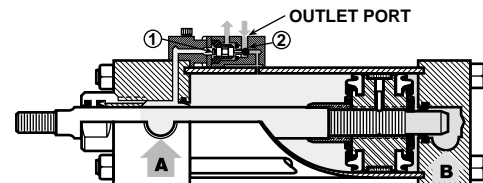
At the start of the stroke, the stroke signal valve is closed because areas (1) and (2) are equally pressurized (A), with area (1) being several times greater than area (2). Outlet port is vented to atmosphere.

#### Mid-Stroke



The same condition exists at mid-stroke with the exception that a greater pressure (B) has been applied to drive the piston.

#### End of the Stroke<sup>1</sup>

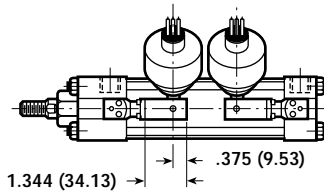
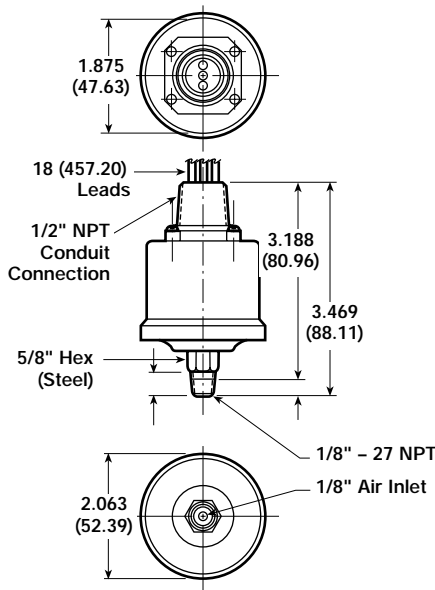


At the end of the stroke the piston seal has passed the inboard air hole (3), supplying full pressure against area (2) When air has exhausted through (A) the valve stem shifts and pressure is supplied to the outlet port of the signal valve.

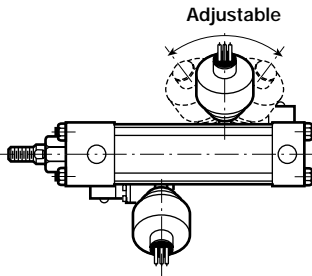
<sup>1</sup> 1/8" from bottoming.



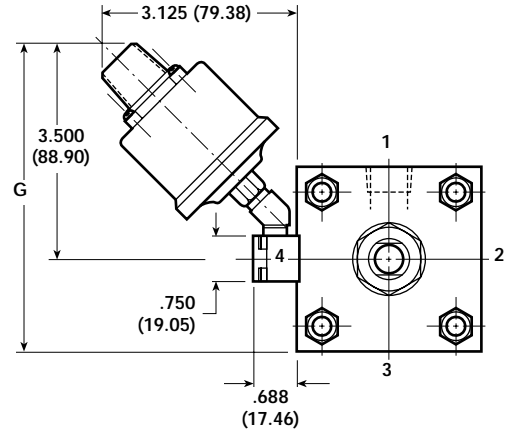
### Dimensions and Mountings: Pneumatic Valve



Two Valves Mounted on the Same Side (Type F)



One or Two Valves Mounted on Different Sides (Type E)



Stroke signal valves cannot be mounted on same side as port location or cushion adjustment location.

### Minimum Stroke

Minimum Stroke	Cylinder Bore									
	1 1/2"	2"	2 1/2"	3 1/4"	4"	5"	6"	7"	8"	
Type E	.813 (20.64)	.813 (20.64)	.688 (17.46)	.688 (17.46)	.688 (17.48)	.438 (11.11)	.438 (11.11)	.688 (17.46)	.688 (17.46)	
Type F	2.750 (69.85)	2.750 (69.85)	2.625 (66.68)	2.625 (66.68)	2.625 (66.68)	2.375 (60.33)	2.375 (60.33)	3.000 (76.20)	3.000 (76.20)	
G	4.500 (114.30)	4.750 (120.65)	5.000 (127.00)	5.375 (136.53)	5.750 (146.05)	6.250 (158.75)	6.750 (171.45)	7.250 (184.15)	7.750 (196.85)	

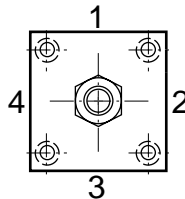
### Mounting Specifications

Position 4 Standard on Mounting Styles 1, 3, 4, 5, 6, 9, 11, 12, 15, 16, 20, 21, 22, 32, 42, 52 & 60.

Position 3 Standard on Mounting Styles 7\*, 8\* & 10.

\*SV or EV cannot be specified with cushion (adjustable) on same end (head or cap).

Stroke signal valves cannot be mounted on same side as port location or cushion adjustment location.



### Design Features

Electrical Ratings:

- 10 amp 110-220 v-ac
- 10 amp 28 v-dc

Pressure Ratings: Actuation – 30 psig

Modes of Operation:

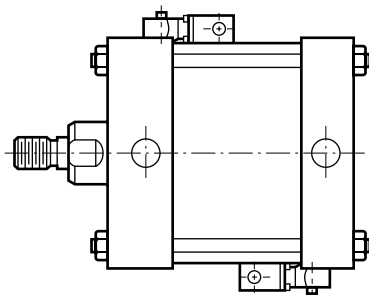
- Single-pole – Double-throw
- Double-pole – Double-throw

Single-pole – Double-throw is standard.  
 (For Double-pole – Double-throw specify DP-DT.)

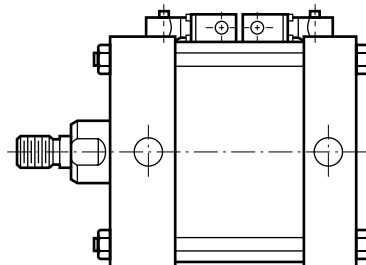
Lead Lengths: 18" standard  
 Maximum Pressure: 250 psi  
 Ambient Temperature Rating:  
 -40°F to 250°F  
 (-40°C to 121°C)

3 Wire Switch:

- Black = Common
- Red = N.O. Contact
- Green = N.C. Contact



**Type E**  
 One or Two Stroke Signal Valves Mounted on Opposite Sides



**Type F**  
 Two Stroke Signal Valves Mounted on the Same Side

**Switches for 1-1/2" to 2-1/2" Cylinders**

- Magnetically operated, non-contact sensing system.
- Consists of a magnet in the piston, and a sensing switch clamped on the cylinder tie rod.
- One or more switches may be mounted to provide an indication of piston position or to control or initiate any sequence function.
- Adjustable mounting brackets allow for switches to be securely positioned anywhere along the range of piston travel.
- LED indicator light facilitates installation and troubleshooting.
- Mounting brackets standard with switches.

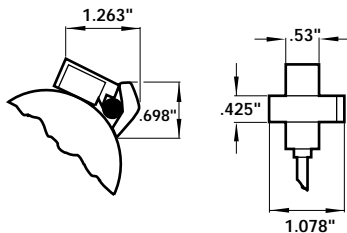

**Specifications**

\*Metal Oxide Varistor Surge Suppression. NOTE: All CS8 Series Switches are supplied with 9 foot leads.

Switch Model	CS8-2-04 Reed	CS8-2-31 Solid State	CS8-2-32 Solid State
Bore Sizes	1 1/2" thru 2 1/2"	1 1/2" thru 2 1/2"	1 1/2" thru 2 1/2"
Switch Type	Reed Switch *MOV & Light	Solid State & Light, Sourcing PNP	Solid State & Light, Sinking NPN
Function	SPST Normally Open	Normally Open	Normally Open
Switching Voltage	5-120 VDC/VAC 50/60 Hz	6-24 VDC	6-24 VDC
Switching Current	.5 Amp Max .005 Amp Min	.5 Amp Max	.5 Amp Max
Switching Power	10 VA	12 Watts Max	12 Watts Max
Max Voltage Drop	3.5 Volts	.5 Volts	.5 Volts
Magnetic Sensitivity	85 Gauss	85 Gauss	85 Gauss
Enclosure Classification	NEMA 6 & CSA Approved	NEMA 6 & CSA Approved	NEMA 6 & CSA Approved
Temperature Range	-22°F to +176°F	-22°F to +176°F	-22°F to +176°F
Wiring Diagrams			

**Switch & Mounting Bracket Dimensions**

CS8-2 Series

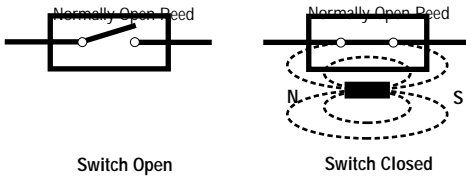

**NOTE:**

1-1/2" to 2-1/2" bore steel cylinder is supplied with an aluminum tube as standard. If a 3-1/4" to 12" bore steel cylinder requires switches, the aluminum tube and magnetic piston options must be selected.



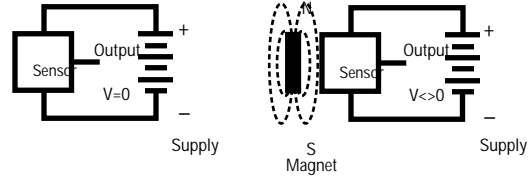
### Reed Switch Working Principle

Reed switch sensors contain hermetically sealed reed elements (mechanical contacts) which are open in their normal state. When a magnetic field moves within proximity of the switch, magnetism is induced into the leads and forces the contacts to close.



### Solid State/Magneto-resistive Working Principle

The solid state (no moving parts) magneto-resistive sensor responds to a parallel magnetic pole by providing a digital signal to the output control circuit. This technique enables the sensing of weak magnetic fields, with no limit to the maximum strength of the magnetic field. Norgren solid state switches are similar to the Hall effect switch.



### Application Recommendations and Precautions

To provide maximum reliability.

1. Always stay within the specifications and power rating limitations of the unit installed.
2. Primary and control circuit wiring should not be mixed in the same conduit. Motors will produce high pulses that will be introduced into the control wiring if the wiring is carried in the same conduit.
3. Never connect the switch without a load present. The switch will be destroyed.
4. Some electrical loads may be capacitive. Capacitive loading may occur due to distributed capacity in cable runs over 25 feet. Use switch Model CS7-24 whenever capacitive loading may occur.

In order to obtain optimum performance and long life, magnetically operated limit switches should not be subjected to: (1) strong magnetic fields, (2) extreme temperature, and (3) excessive ferrous filing or chip buildup.

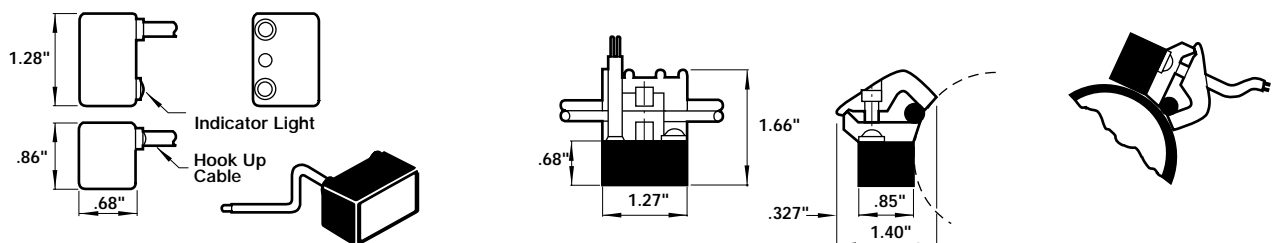
Improper wiring may damage or destroy the switch. The wiring diagram, along with the listed power ratings, must be carefully observed before connecting power to the switch.

Lower power switches are designed for signaling electronic circuits. Do not use on relay loads or with incandescent bulbs. Resistive loads only.

CS7-04 Reed	CS7-24 Reed	CS7-31 Solid State	CS7-32 Solid State
2" thru 8"	2" thru 8"	2" thru 8"	2" thru 8"
Reed Switch *MOV & Light	Reed Switch *MOV & Light, 3 Wire	Solid State & Light, Sourcing PNP	Solid State & Light, Sinking NPN
Normally Open	Normally Open	Normally Open	Normally Open
5-240 VDC/VAC 50/60 Hz	24-240 VAC 50/60 Hz	6-24 VDC	6-24 VDC
1 Amp Max	4 Amp Max 50 Amp Inrush	1 Amp Max	1 Amp Max
30 Watts Max	100 Watts Max	24 Watts Max	24 Watts Max
3 Volts	N/A	.5 Volts	.5 Volts
85 Gauss Parallel	85 Gauss Parallel	85 Gauss Parallel	85 Gauss Parallel
NEMA 6 & CSA Approved -22°F to +176°F	NEMA 6 & CSA Approved -22°F to +176°F	NEMA 6 & CSA Approved -22°F to +176°F	NEMA 6 & CSA Approved -22°F to +176°F

NOTE: For 8" bore add 9 to part number. Example: CS7-9-04. For 10" and 12" bore, consult the factory.

### CS7 Series



**Right Angle (Banjo) Flow Controls**

- 360° rotation of the banjo body around the bolt allows for ideal positioning of tubing.
- Low profile and reduced physical size provide space saving installations, while internal configuration provides the flow capacity of much bulkier designs.
- Tapered adjustment needles with large adjustment ranges provide linear flows and greater precision.
- Knurled adjustment knobs (w/screw driver slot) and lock nuts on 12 VA0 and 10 TA0 series provide finger tip adjustment. Tamper resistance on the 10 K51 is provided by a slotted adjustment screw covered by a protective plastic cap.
- Direct mounting of flow controls on pneumatic actuators minimizes the adjustment problems encountered due to the compressibility of air in long tubing runs between the actuator and control valving. Additionally, direct mounted flow controls end the confusion over which actuator in a circuit is being controlled.
- Metallic components are limited to nickel plated all brass construction, eliminating the potential problems encountered with products constructed of dissimilar metals.
- Adjustment needles and banjo bodies are retained, preventing accidental loss of the needle or lock nut.


**Operation**

Flow Controls are checked adjustable controls of the meter out type. Compressed air passes freely into the push-in fitting portion of the flow control, flowing past the check seal and entering the connected component. In reverse flow conditions, air passes back into the flow control and energizes the check seal. Air must now flow through the metered passage controlled by the tapered adjustment needle of the flow control, and finally exits through the push-in fitting end.

**Specifications**

Fluid: Compressed air. *For other types of compressed gases, please consult factory.*

Working Pressure: 0 to 150 psig (0 to 10 bar)

Temperature Range: 0° to 175°F (-20° to 80°C)

**Materials of Construction**

Banjo bolt, collet, adjustment knob and lock nut: Nickel plated brass

Tapered adjusting needle: Brass

Banjo Body 10 TA0 and 12 VA0 XXXX: Thermoplastic  
10 K51 XXXX: Nickel plated brass

O-rings and check-seal: Silicone free Nitrile

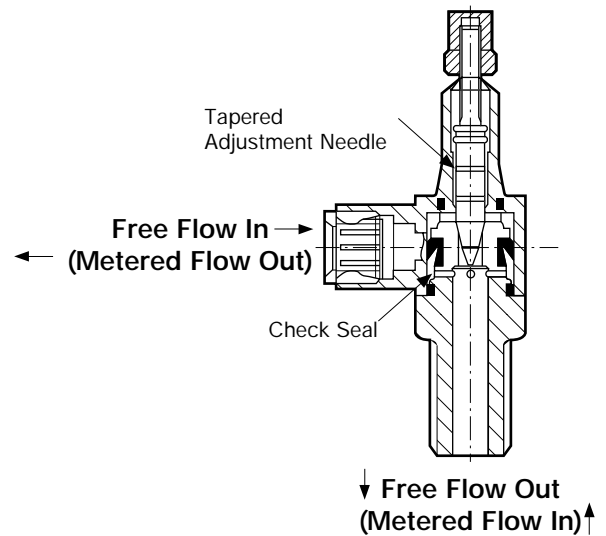
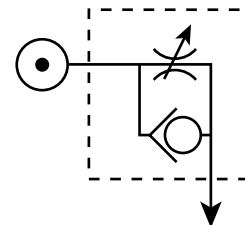
Sealing washer: Thermoplastic (ISO G and 10-32 UNF)

Tubing: Nylon 11 or 12, 95 durometer polyurethane.

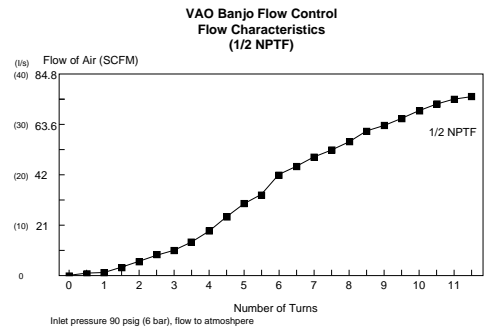
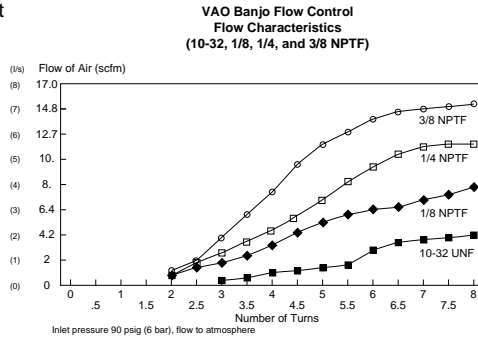
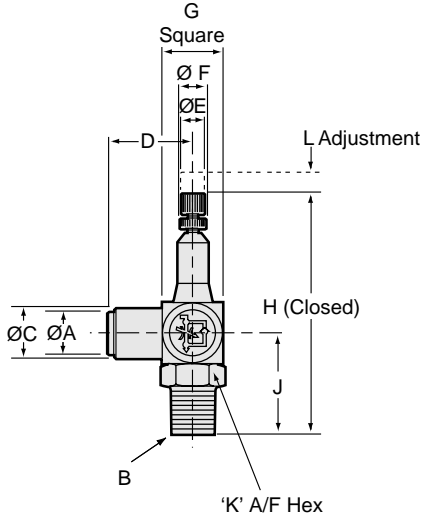
Thread Sealant: Thread sealant is applied to the full circumference of tapered male threads.

**Options**

Special versions of the flow controls are available, including meter-out and bi-directional control configurations. *Please consult factory with specific quantities and requirements.*

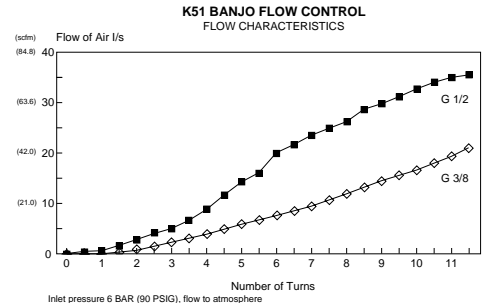
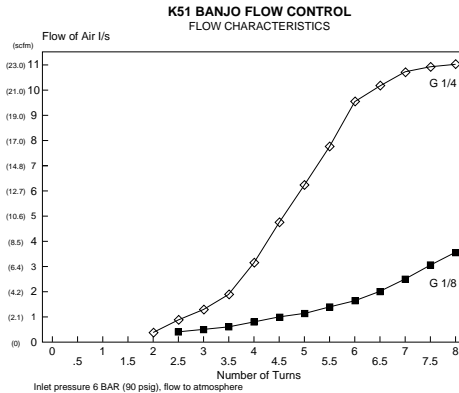
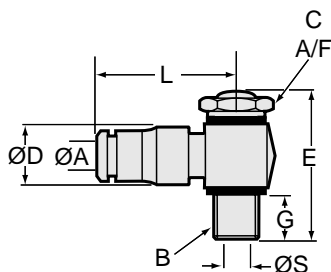

**Pneumatic Symbol**






A Tube O.D.	B NPTF or UNF Thread	Part Number	C	D	E	F	G	J	H	K A/F	L ADJ
5/32"	10-32 UNF	12 VAO 0210	0.31 (7.87)	0.37 (9.40)	1.04 (26.41)	0.16 (4.06)	0.74 (18.80)	0.10 (2.54)	-	-	-
	1/8	12 VAO 0218	0.30 (7.62)	0.45 (11.43)	0.87 (22.10)	0.31 (7.87)	0.35 (8.89)	0.63 (16.00)	2.09 (53.09)	0.89 (22.61)	9/16"
1/4"	1/8	12 VAO 0418	0.43 (10.93)	0.51 (12.95)	0.91 (23.11)	0.31 (7.87)	0.35 (8.89)	0.63 (16.00)	2.09 (53.09)	0.89 (22.61)	9/16"
	1/4	12 VAO 0428	0.43 (10.93)	0.53 (13.46)	1.00 (25.4)	0.39 (9.90)	0.43 (10.93)	0.79 (20.07)	2.64 (67.06)	1.16 (29.46)	11/16"
3/8"	1/4	12 VAO 0628	0.57 (14.48)	0.77 (19.56)	0.24 (6.10)	0.39 (9.90)	0.43 (10.93)	0.79 (20.07)	2.64 (67.06)	1.16 (29.46)	11/16"
	3/8	12 VAO 0638	0.57 (14.48)	0.77 (19.56)	1.28 (32.51)	0.47 (11.94)	0.51 (12.95)	0.87 (22.09)	3.07 (77.97)	1.30 (33.02)	3/4"
1/2"	1/2	12 VAO 0748	0.71 (18.03)	0.91 (23.11)	1.50 (38.10)	0.63 (16.00)	0.71 (18.03)	1.06 (26.92)	3.66 (92.97)	1.65 (41.91)	7/8"

K51 Series



A Tube O.D.	B ISO G or Metric Thread	Part Number	C A/F	D	E	G	L	S
4"	M5 X .8	10 K51 0405	0.31 (7.87)	0.37 (9.40)	1.04 (26.41)	0.16 (4.06)	0.74 (18.80)	0.10 (2.54)
	1/8	10 K51 0418	0.55 (13.97)	0.43 (10.92)	1.34 (34.03)	0.26 (6.60)	0.81 (20.57)	0.20 (5.08)
5"	M5 X .8	10 K51 0505	0.31 (7.87)	0.43 (10.92)	1.04 (26.41)	0.16 (4.06)	0.80 (20.32)	0.10 (2.54)
	1/8	10 K51 0518	0.55 (13.97)	0.45 (11.43)	1.34 (34.04)	0.26 (6.60)	0.85 (21.59)	0.20 (5.08)
6"	M5 X .8	10 K51 0605	0.31 (7.87)	0.49 (12.45)	1.04 (26.41)	0.16 (4.06)	0.87 (22.10)	0.10 (2.54)
	1/8	10 K51 0618	0.55 (13.97)	0.49 (12.45)	1.34 (34.04)	0.26 (6.60)	0.93 (23.62)	0.20 (5.08)
8"	1/4	10 K51 0628	0.67 (17.01)	0.51 (12.95)	1.44 (36.57)	0.28 (7.11)	0.95 (24.13)	0.33 (8.38)
	3/8	10 K51 0828	0.67 (17.01)	0.55 (13.97)	1.44 (36.57)	0.28 (7.11)	0.97 (24.64)	0.33 (8.38)
10"	3/8	10 K51 0838	0.87 (22.10)	0.65 (16.51)	2.03 (51.56)	0.43 (10.92)	1.05 (26.67)	0.39 (9.90)
	1/2	10 K51 1038	0.87 (22.10)	0.67 (17.01)	2.03 (51.56)	0.43 (10.92)	1.23 (31.24)	0.39 (9.90)
12"	1/2	10 K51 1248	1.06 (26.92)	0.69 (17.53)	2.26 (57.40)	0.39 (9.91)	1.50 (38.10)	-

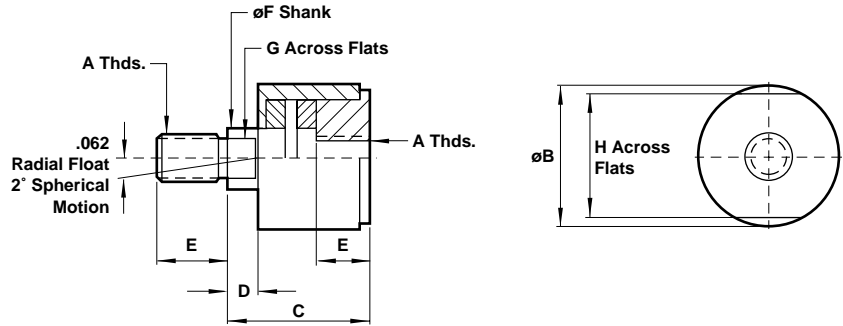


# Series A, NFPA Aluminum Air Cylinders (ø1-1/2" to 8"), Cylinder Features

All Dimensions in Inches (mm)

## Rod Alignment Coupler

The Rod Alignment Coupler allows 1/16" of radial float and 2° of spherical movement. This prevents cylinder binding due to misalignment thus extending bearing and seal life, and permits greater tolerance between the centerline of the cylinder and mating part for simplified installation.

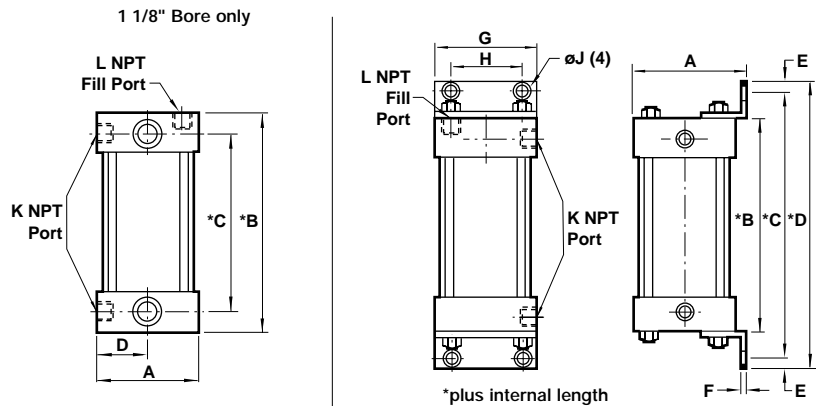


## Rod Alignment Coupler Dimensions

	CC-1-07	CC-1-08	CC-1-10	CC-1-12	CC-1-14	CC-1-16	CC-1-20	CC-1-24	CC-1-28
A	7/16 - 20	1/2 - 20	5/8 - 18	3/4 - 16	7/8 - 14	1 - 14	1 1/4 - 12	1 1/2 - 12	1 3/4 - 12
B	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.750 (44.45)	1.750 (44.45)	2.500 (63.50)	2.500 (63.50)	3.250 (82.50)	3.250 (82.50)
C	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)	2.312 (58.72)	2.312 (58.72)	2.937 (74.60)	2.937 (74.60)	4.375 (111.13)	4.375 (111.13)
D	.500 (12.70)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.812 (20.62)	.812 (20.62)
E	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	2.250 (57.15)	2.250 (57.15)
F	.625 (28.58)	.625 (28.58)	.625 (28.58)	.969 (24.61)	.969 (24.61)	1.375 (34.93)	1.375 (34.93)	1.750 (44.45)	1.750 (44.45)
G	.500 (12.70)	.500 (12.70)	.500 (12.70)	.812 (20.62)	.812 (20.62)	1.156 (29.36)	1.156 (29.36)	1.500 (38.10)	1.500 (38.10)
H	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)	1.500 (38.10)	2.250 (57.15)	2.250 (57.15)	3.000 (76.20)	3.000 (76.20)
Max Pull (lbs.)	10,000	14,000	19,000	34,000	39,000	64,000	78,000	134,000	134,000

## Air-Oil Tank

Available in 5 practical bore sizes: 1 1/8", 2", 3 1/4", 5", and 8", the Air-Oil Tank includes a translucent fiberglass tube which permits viewing of the tank oil level from any position, internal baffles that reduce foaming and aeration of the system oil resulting in maximum cylinder control, and standard angle mounting brackets (except 1 1/8" bore) easily removed for convenient fluid port positioning.



## How to Figure Length of Volume

The following equations are given to help you in selecting the right air/oil tank volume for your particular application.

**Volume of Cylinder:** • Cap End Cylinder Bore Area x Stroke = Volume

• Head End Cylinder Bore Area - (Piston Rod Area\*) x Stroke = Volume \*Reference Page ACT-1-13 for Areas.

**Length of Tank = Volume of Cylinder x 1.3\*\*** (See chart below.) \*\*30% minimum recommended reserve working volume.

Tank Bore Area

**Final Length of Volume of Tank = Working length of tank + 2" minimum safety factor to prevent aeration of oil.**

Note: Length must be at least 3".

## Air-Oil Tank Dimensions

Bore	1-1/8"	2"	3-1/4"	5"	8"
	AOT-225	AOT-04	AOT-065	AOT-10	AOT-16
A	1.500 (38.10)	2.687 (68.25)	4.000 (101.60)	5.625 (142.88)	8.625 (219.08)
B	1.250 (31.75)	2.000 (50.80)	2.500 (63.50)	2.500 (63.50)	3.000 (76.20)
C	.750 (19.05)	4.000 (101.60)	5.000 (127.00)	5.000 (127.00)	6.625 (168.28)
D	.750 (19.05)	4.750 (120.65)	6.000 (152.40)	6.000 (152.40)	8.000 (203.20)
E	-	.375 (9.53)	.500 (12.70)	.500 (12.70)	.687 (17.45)
F	-	.125 (3.18)	.187 (4.75)	.187 (4.75)	.250 (6.35)
G	-	2.500 (63.50)	3.750 (95.25)	5.500 (139.70)	8.500 (215.90)
H	-	1.750 (44.45)	2.750 (69.85)	4.250 (107.95)	7.125 (180.98)
øJ	-	.437 (11.10)	.562 (14.27)	.562 (14.27)	.812 (20.62)
K	.125 (3.18)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.750 (19.05)
L	.125 (3.18)	.250 (6.35)	.375 (9.53)	.375 (9.53)	.500 (12.70)

Note: Maximum operating pressure 250 PSI.

## Air-Oil Tank Volumes (cubic inches)

Bore	1-1/8"	2"	3-1/4"	5"	8"
Area	.995 sq."	3.14 sq."	8.30 sq."	19.64 sq."	50.26 sq."
6"	5.9	18.6	49.8	117.8	301.5
8"	7.9	25.1	66.4	157.1	402.0
10"	9.9	31.4	83.0	196.4	502.6
12"	11.9	37.6	99.6	235.6	603.1
14"	13.9	43.9	116.2	274.9	703.6
16"	15.9	50.2	132.8	314.2	804.1
18"	17.9	56.5	149.4	353.5	904.5
20"	19.9	62.8	166.0	392.8	1005.2

**How to Order:** Specify air-oil tank part number and internal length.

**Example:** 2" bore with 6" internal length = AOT-04 x 6

**Series A & EA, NFPA Aluminum Air Cylinders (ø1-1/2" to 8"), Standard & Special Options**  
**Series J & EJ, NFPA Steel Air Cylinders (ø1-1/2" to 12"), Standard & Special Options**



All Dimensions in Inches (mm)

Option Code	Description
A(-)	Stroke Adjustment Single Piston (specify adjustment length) – see page ACT-1-86
AA(-)	Stroke Adjustment Double Piston (specify adjustment length) – see page ACT-1-86
AN	Acorn Tie Rod Nuts (Stainless Steel)
AP	Air/Oil Piston (Piston supplied with O-ring hooded U-cup on cap end for air/oil operation)
BL	Removable Piston Rod Stud (installed with removable adhesive sealant)
EN	Electroless Nickel Plated Cylinder
EV(- _)	Pneumatic Stroke Signal Valve(s): EV(Head Cap) (specify position) – see pages ACT-1-88 & 89
FG	Black Fiberglass Cylinder Tube
H	Piston Rod Seals O-ring loaded U-cups – see page ACT-1-86 (A & J Only)
HR	Case Hardened Piston Rod
L(- _)	Non-Standard Port Location position 1 standard: L(Head Cap) (specify position 1 thru 4 for head and/or cap)
LF	Low Friction Cylinder (Nitrile compounded with Teflon® rod and piston seals) (Not available with Ecology series)
MS	Metal Scraper – see page ACT-1-86
N(- _)	Cushion Adjust Screw Location position 2 standard: N(Head Cap) (specify position 1 thru 4 for head and/or cap)
NW	No Wearstrip in Cylinder
P(-)	Non-Standard Port Sizes – [specify port size for P(-H) head only, P(-C) cap only, or P(-) both head & cap]
PP	Seals in Cylinder O-ring loaded U-cups (rod and piston seals) – see page ACT-1-86 (A & J Only)
PN	Pinned Piston and Rod Assembly – see page ACT-1-86
PS	Magnetic Piston Modification (no wearstrip) – see page ACT-1-86
RS	Studded Male Piston Rod End
RX(-)	Piston Rod Extension Over Standard (specify additional "C" length)
S	303/304 Stainless Steel Tie Rods & Nuts
SB	Stainless Steel Rod Bushing Nut
SC <sup>†</sup>	Single Acting Spring Extend Cap End of Cylinder – see page ACT-1-86
SL	Steel Cylinder Tubing
SR <sup>†</sup>	Single Acting Spring Retract Rod End of Cylinder – see page ACT-1-86
SS	303 Stainless Steel Piston Rod
ST(-C)	Stop Tube on Cap End (C) of Cylinder: ST(stop tube length C) – see page ACT-1-87
ST(-R)	Stop Tube on Rod End (R) of Cylinder: ST(stop tube length R) – see page ACT-1-87
SV(- _)	Stroke Signal Valve(s): SV(Head Cap) – see pages ACT-1-88 & 89
T(-)	Non-Standard Piston Rod Thread (specify thread)
TF(-)	Piston Rod Thread Depth Over Standard (Female) (specify additional "A" length) – see page ACT-1-86
TX(-)	Piston Rod Thread Extension Over Standard (Male) (specify additional "A" length) – see page ACT-1-86
V	Viton® Seals in Cylinder
XI(-)	Type #10 Trunion Set Dimension (MT4 Model Only) (customer must specify length)

<sup>†</sup>Standard available for 1 1/2", 2", 2 1/2" bores, 12" max stroke. (Stroke length doubles – 24" max); 12 lbs. force preload, 30 lbs. force compressed. Cushions not available on spring end. For other spring forces, bore sizes or longer strokes, consult factory.

**Consult Factory for These Options:**

Option Code	Description
AS	Airsaver Stroke Adjustment
BB	Cylinders Mounted Back to Back
BP	British Standard Pipe Cylinder Ports (Parallel) (BSPP)
BT	British Standard Pipe Cylinder Ports (Tapered) (BSPT)
CT	Close Tolerance on Cylinder Stroke
EX	Ecology Piston Seal on Rod End of Cylinder
LA	Low Friction Cylinder (Pak-Lap™ style seals)
NI	Nituff® Coated Cylinder
NS	No Silicone Used in Cylinder Assembly
NT	Nicotef® Coated Cylinder
OE	Zero Stroke/Pneumatic Stroke Signal Valve(s)
OV	Zero Stroke/Stroke Signal Valve(s)
PB	Piston Seal O-ring loaded deep U-cup shape
RB	Rod Boot over Piston Rod
SA	SAE Cylinder Ports (Straight Thread)
SM	Stroke Signal Valve (Mounting Only)
TE	Nituff® Coated Cylinder Tubing
TK	Thrust Key Plate Mounting – see page ACT-1-87 [01 (MS4), 09 (MS2), and 15 (MS7)]
VM	Valve Mounting Only
XE	Ecology Piston Seal on Cap End of Cylinder



Cylinder Order Information

**EJ 01 - 7 7 - A 1 - HR-L(1 4)-MS-P(1/4)-V - 2" X 6"**

A	Series A Cylinder
DA	Series A Double Rod End Cylinder
EA	Series EA Cylinder
EDA	Series EA Double Rod End Cylinder
J	Series J Cylinder
DJ	Series J Double Rod End Cylinder
EJ	Series EJ Cylinder
EDJ	Series EJ Double Rod End Cylinder

Bore and Stroke (write out)

Mounting Options	
01	Side Tapped (MS4)
03	Head Rectangular Flange (MF1)
03	Head Square (ME3) – 7" & 8" Bores
04	Cap Rectangular Flange (MF2)
04	Cap Square (ME4) – 7" & 8" Bores
05	Basic Cylinder No Mounting (MX0)
06	Both Ends (4) Tie Rods Ext. (MX1)
6B	Both Ends (2) Tie Rods Ext. (MX4)
6C	Cap Tie Rods Ext. (MX2)
6R	Head Tie Rods Ext. (MX3)
7R	Removable Head Trunnion (MT1) - A & EA
07	Head Trunnion (MT1) - J & EJ
8R	Removable Cap Trunnion (MT2) - A & EA
08	Cap Trunnion (MT2) - J & EJ
09	Side Lugs (MS2)
10	Center Trunnion (MT4)
11	Side End Angles (MS1)
12	Cap Fixed Clevis (MP1)
15	Side End Lugs (MS7)
16	Sleeve Nut Construction (Universal)
20	Head Square Flange (MF5)
21	Cap Square Flange (MF6)
22	Detachable Cap Clevis (MP2)
32	Cap Fixed Eye (MP3)
42	Detachable Cap Eye (MP4)
52	Spherical Bearing
60	Base Bar (Not NFPA A & EA Only)

Additional Options – order alphabetically – More on page ACT-1-95	
HR	Case Hardened (45 Rc)
L(-)	Port Location position 1 standard: L(Head Cap) (specify position 1 thru 4 for head and/or cap)
MS	Metal Rod Scraper
N(-)	Cushion Adjust Screw Location position 2 standard: N(Head Cap) (specify position 1 thru 4 for head and/or cap)
P(-)*	Non-Standard Port Sizes: [specify port size for P(-H) head only, P(-C) cap only, or P(-) both head & cap]
PS	Magnetic Piston – includes aluminum tube option - J & EJ
RS	Rod Stud Type 1 (5/8" – 1 3/4" øRod) Type 2 (5/8" & 1" øRod)
RX	Rod Extensions (specify length of additional rod extension)
SC	Single Acting Spring Extend (Cap End)–See page ACT-1-95
SR	Single Acting Spring Retract (Rod End)–See page ACT-1-95
SS	303 Stainless Steel (Hard Chrome Plated)
ST(-C)	Stop Tube (Cap End) (specify stop tube length)
ST(-R)	Stop Tube (Rod End) (specify stop tube length)
T	Special Rod Threads (specify rod thread)
TX	Thread Extensions (specify length of thread extension)
V	Viton® Seals

\*1 1/2", 2", 2 1/2" bore cylinders have 3/8" NPT Standard, 1/2" NPT oversize.  
 3 1/4", 4", 5" bore cylinders have 1/2" NPT Standard, 3/4" NPT oversize.  
 This will add 1/8" to the overall cylinder length.

Piston Rod Threads Type	
1	Small Male (Solid)
2	Intermediate Thread Male (Solid)
3	Female
6	Full Thread Male (Solid)
7	Plain Rod End

Piston Rod Diameters		
A**	5/8"	Standard on 1 1/2", 2", 2 1/2"
B**	1"	Standard on 3 1/4", 4", 5" Oversized on 1 1/2", 2", 2 1/2"
C**	1 3/8"	Standard on 6", 7", 8" Oversized on 3 1/4", 4", 5"
D**	1 3/4"	Standard on 10" Oversized on 6", 7", 8"
E	2"	Standard on 12" Oversized on 10"
F	2 1/2"	Oversized on 10", 12"

\*\* A & EA uses A-D only.

Cushion in Head	
3	None
5'	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion
*Standard with EA & EJ	

Cushion in Cap	
3	None
5'	Non-Adjustable Cushion
7	Adjustable Cushion (Position 2)
9	Decel Cushion
*Standard with EA & EJ	

**EXAMPLE:** Series EJ Cylinder – MS4 side tapped mount – Adjustable cushion in head (Position 2) – Adjustable cushion in cap (Position 2) – 5/8" piston rod diameter – Small male (solid) piston rod thread – Case hardened rod – Head port location at 1 – Cap port location at 4 – Metal rod scraper option – 1/4" special port size – Viton seals option – 2" X 6" bore and stroke.

**IMPORTANT:** Write out bore and stroke completely as shown in example.

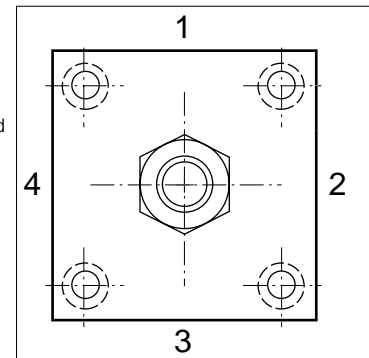
**Reed & Solid State Switches**

Available on all bore sizes – order separately.  
 See pages ACT-1-90 & ACT-1-91 for specifications.

**NOTE:** Consult factory when using competitive position sensing devices.

**Port and Cushion Adjustment Positions**

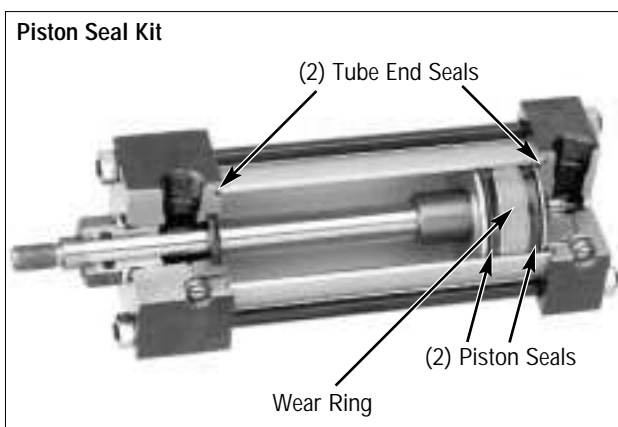
(As viewed from rod end:  
 Port standard position 1,  
 Cushion Adjustment standard position 2.)  
 NOTE: A Port and a Cushion Adjustment cannot be in the same position.





**Piston Seal Kits** (Includes: 2 piston seals, 1 wear ring and 2 tube end seals.)

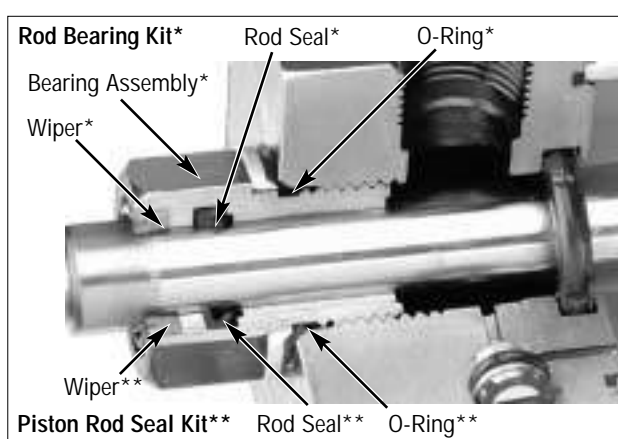
Bore Inches (mm)	Series A & J		Series EA & EJ	
	Buna N	Viton	Buna N	Viton
1-1/2" (38.10)	AJK-153	VAJK-153	EJK-153	VEJK-153
2" (50.80)	AJK-203	VAJK-203	EJK-203	VEJK-203
2-1/2" (63.50)	AJK-253	VAJK-253	EJK-253	VEJK-253
3-1/4" (82.55)	AJK-323	VAJK-323	EJK-323	VEJK-323
4" (101.80)	AJK-403	VAJK-403	EJK-403	VEJK-403
5" (127.00)	AJK-503	VAJK-503	EJK-503	VEJK-503
6" (152.40)	AJK-603	VAJK-603	EJK-603	VEJK-603
7" (177.80)	AJK-703	VAJK-703	EJK-703	Consult Factory
8" (203.20)	AJK-803	VAJK-803	EJK-803	Consult Factory
10" (254.00)	AJK-1003	VAJK-1003	EJK-1003	Consult Factory
12" (304.80)	AJK-1203	VAJK-1203	EJK-1203	Consult Factory



**Rod Bearing Kits for Series A, EA, J & EJ**

(Includes: Bearing Assembly, Rod Seal, Wiper & O-Ring.)

Rod Diameter	5/8" (15.88)	1" (25.40)	1-3/8" (34.93)	1-3/4" (44.45)	2" (50.80)	2-1/2" (63.50)
Buna N	RBK-15	RBK-25	RBK-35	RBK-45	RBK-55	RBK-65
Viton	VRBK-15	VRBK-25	VRBK-35	VRBK-45	VRBK-55	VRBK-65



**Piston Rod Seal Kits for Series A, EA, J & EJ**

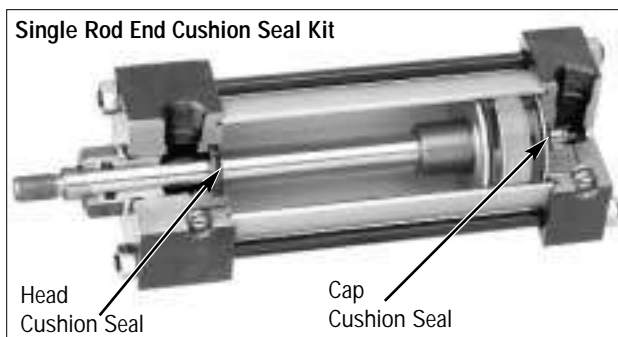
(Includes: Rod Seal, Wiper & O-Ring.)

Rod Diameter	5/8" (15.88)	1" (25.40)	1-3/8" (34.93)	1-3/4" (44.45)	2" (50.80)	2-1/2" (63.50)
Buna N	SWK-15	SWK-25	SWK-35	SWK-45	SWK-55	SWK-65
Viton	VSWK-15	VSWK-25	VSWK-35	VSWK-45	VSWK-55	VSWK-65



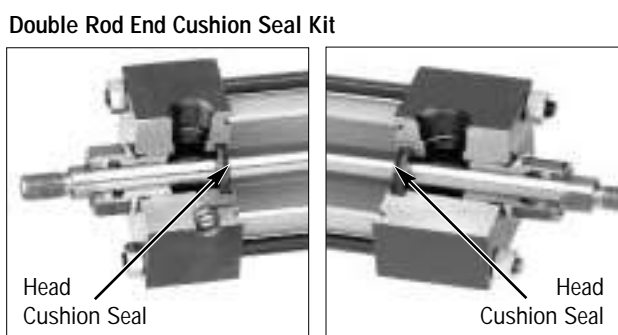
**Cushion Seal Kits for Series A, EA, J & EJ** (Single Rod End includes: 1 head and 1 cap cushion seal.)

Rod	Bore	1-1/2" (38.10)	2" (50.80)	2-1/2" (63.50)	3-1/4 - 5" (82.55 - 127.00)	6" - 8" (152.40 - 203.20)	10" - 12" (254.00 - 304.80)
5/8"	Buna N	CSK-15-13	CSK-15-13	VCSK-15-13			
	Viton	VCSK-15-13	VCSK-15-13	VCSK-15-13			
1"	Buna N	CSK-25-43	CSK-25-13	CSK-25-13	CSK-25-23		
	Viton	VCSK-25-43	VCSK-25-13	VCSK-25-13	VCSK-25-23		
1-3/8"	Buna N		CSK-35-53	CSK-35-13	CSK-35-23	CSK-35-33	
	Viton		VCSK-35-53	VCSK-35-13	VCSK-35-23	VCSK-35-33	
1-3/4"	Buna N			CSK-45-13	CSK-45-23	CSK-45-33	CSK-65-23
	Viton			VCSK-45-13	VCSK-45-23	VCSK-45-33	VCSK-65-23
2"	Buna N				CSK-55-23	CSK-55-33	CSK-55-33
	Viton				VCSK-55-23	VCSK-55-33	VCSK-55-33
2-1/2"	Buna N				CSK-65-23	CSK-65-33	CSK-65-53
	Viton				VCSK-65-23	VCSK-65-33	VCSK-65-53



**Cushion Seal Kits for Series A, EA, J & EJ** (Double Rod End includes: 2 head cushion seals.)

Rod	Bore	1-1/2" (38.10)	2" (50.80)	2-1/2" (63.50)	3-1/4 - 5" (82.55 - 127.00)	6" - 8" (152.40 - 203.20)	10" - 12" (254.00 - 304.80)
5/8"	Buna N	CSK-15-23	CSK-15-23	CSK-15-23			
	Viton	VCSK-15-23	VCSK-15-23	VCSK-15-23			
1"	Buna N	CSK-25-63	CSK-25-53	CSK-25-53	CSK-25-53		
	Viton	VCSK-25-63	VCSK-25-53	VCSK-25-53	VCSK-25-53		
1-3/8"	Buna N		CSK-35-63	CSK-35-43	CSK-35-43	CSK-35-43	
	Viton		VCSK-35-63	VCSK-35-43	VCSK-35-43	VCSK-35-43	
1-3/4"	Buna N			CSK-45-43	CSK-45-43	CSK-45-43	CSK-45-43
	Viton			VCSK-45-43	VCSK-45-43	VCSK-45-43	VCSK-45-43
2"	Buna N				CSK-55-43	CSK-55-43	CSK-55-43
	Viton				VCSK-55-43	VCSK-55-43	VCSK-55-43
2-1/2"	Buna N				CSK-65-43	CSK-65-43	CSK-65-43
	Viton				VCSK-65-43	VCSK-65-43	VCSK-65-43



NOTE: When ordering repair kits for Series A, EA, J and EJ cylinders, please specify the type of kit, the cylinder model number, and the cylinder bore. This will ensure that you receive the proper repair kit(s).

# Series SS Stainless Steel Cylinders

**Series SS 1-1/2" thru 8" Cylinder Features** .....ACT-2-2  
 Ultra Cushion & Soft Touch Bumper Seal .....ACT-2-3  
 Technical Information .....ACT-2-4  
 Cylinder with 01 (MX0) Basic .....ACT-2-6  
 Cylinder with 02 (MS4) Bottom Tap .....ACT-2-8  
 Cylinder with 04 (MF1) Front Flange .....ACT-2-10  
 Cylinder with 05 (MF2) Rear Flange .....ACT-2-12  
 Cylinder with 06 (MP1) Cap Fixed Clevis .....ACT-2-14  
 8" Cylinder with 10 (ME3) Head Square & 11 (ME4) Cap Square ....ACT-2-16  
 Cylinder with 15 (MT1) Head Trunnion .....ACT-2-18  
 Cylinder with 16 (MT2) Cap Trunnion .....ACT-2-20  
 Double Rod End Cylinder with 01 (MX0) Basic .....ACT-2-22  
 1-1/2" thru 8" Cylinder Accessories .....ACT-2-24  
 Optional Features & Custom Cylinders .....ACT-2-25  
 1-1/2" thru 8" Order Information .....ACT-2-26  
**Series SS 1-1/8" Cylinder Features** .....ACT-2-27  
 1-1/8" Cylinder with 01 (MX0) Basic, 03 (MS8) Bolt Thru,  
 04 (MF7) Front Flange, 05 (MF2) Rear Flange .....ACT-2-28  
 1-1/8" Cylinder with 17 (MP3) Fixed Eye, 22 (MS9) Side Tap,  
 30 (MR1) Head Face .....ACT-2-30  
 1-1/8" Double Rod End Cylinder with 01 (MX0) Basic .....ACT-2-30  
 1-1/8" Cylinder Accessories & Optional Features .....ACT-2-32  
 1-1/8" Order Information .....ACT-2-33  
**Switch Information** .....ACT-2-34



**ACT-2-6 –**  
Cylinder with  
01 (MX0)  
Basic



**ACT-2-8 –**  
Cylinder with  
02 (MS4)  
Bottom Tap



**ACT-2-10 –**  
Cylinder with  
04 (MF1)  
Front Flange



**ACT-2-12 –**  
Cylinder with  
05 (MF2)  
Rear Flange



**ACT-2-14 –**  
Cylinder with  
06 (MP1)  
Cap Fixed Clevis



**ACT-2-16 –**  
8" Cylinder with  
10 (ME3)  
Head Square



**ACT-2-16 –**  
8" Cylinder with  
11 (ME4)  
Cap Square



**ACT-2-18 –**  
Cylinder with  
15 (MT1)  
Head Trunnion



**ACT-2-20 –**  
Cylinder with  
16 (MT2)  
Cap Trunnion



**ACT-2-22 –**  
Double Rod End  
Cylinder with  
01 (MX0) Basic



**ACT-2-28 –**  
1-1/8" Cylinder  
with 01 (MX0)  
Basic



**ACT-2-28 –**  
1-1/8" Cylinder  
with 03 (MS8)  
Bolt Thru



**ACT-2-28 –**  
1-1/8" Cylinder  
with 04 (MF7)  
Front Flange



**ACT-2-28 –**  
1-1/8" Cylinder  
with 05 (MF2)  
Rear Flange



**ACT-2-30 –**  
1-1/8" Cylinder  
with 17 (MP3)  
Fixed Eye



**ACT-2-30 –**  
1-1/8" Cylinder  
with 22 (MS9)  
Side Tap



**ACT-2-30 –**  
1-1/8" Cylinder  
with 30 (MR1)  
Head Face



**ACT-2-30 –**  
1-1/8" Double Rod  
End Cylinder with  
01 (MX0) Basic



# The finest materials for each component!

**1 Piston Seals:** Lip-type nitrile seals are pressure energized and wear compensating. Their excellent lubrication retention characteristics lower seal friction and ensure long life.

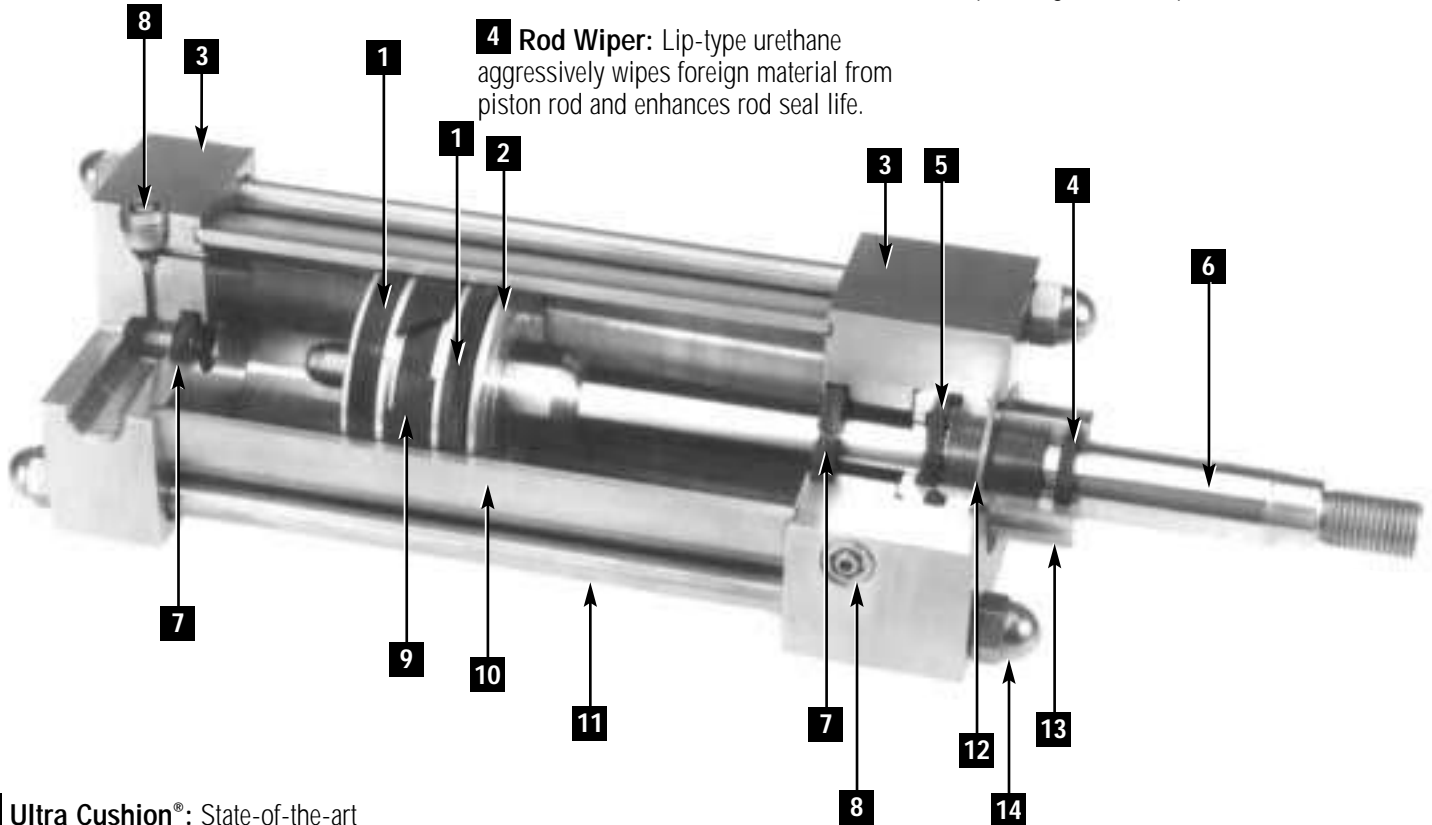
**2 Piston:** Solid aluminum alloy, light-weight for low inertia, yet strong.

**3 Head/Cap:** Precision machined from solid corrosion-resistant 304 stainless steel bar.

**4 Rod Wiper:** Lip-type urethane aggressively wipes foreign material from piston rod and enhances rod seal life.

**5 Rod Seals:** Rounded lip-type urethane is pressure energized and wear compensating.

**6 Piston Rod:** 303 stainless steel, 40,000 PSI minimum yield, hard chrome plated, ground and polished.



**7 Ultra Cushion®:** State-of-the-art design features a unique, one-piece, nitrile compound seal, captured within a precision machined groove. Linear and radial “float” of cushion seal eliminates misalignment. Ultra Cushions provide exceptionally fast “out of cushion” stroke reversal. (Head and Cap Cushions are optional.)

**8 Adjustable Captive Cushion Needle**  
Allows for safe and precise adjustment under pressure.

**9 Wear Strip:** Teflon® and graphite composition for minimum friction, maximum wear and side load resistance. (Magnetic band under wear strip optional.)

**10 Tube:** Corrosion-resistant 304 stainless steel.

**11 Tie Rods:** High-strength 303 stainless steel maintains compression on tube end seals.

**12 Retainer:** Stainless steel snap ring securely retains bushing in head.

**13 Rod Bearings:** Machined from 304 stainless steel, with a Teflon® composite wear band insert that eliminates metal-to-metal contact.

**14 Acorn Nut:** Tie rod threads are covered by stainless steel acorn nuts which eliminate another bacteria hiding place.

## Series D

Series D cylinders are designed for extremely smooth stroke performance on applications requiring very slow extension and/or retraction speeds. They are identical to the Series SS in design, function and dimensions, but have “ELF” carboxylated nitrile piston seals, rod seals, and rod wipers.

“ELF” carboxylated nitrile is a blend of Teflon® and other low friction additives that are molded into the substrate of the base seal material. Incorporating this compound in the dynamic seals of the cylinder results in diminished friction, lower breakaway and superior stroke performance.

### Features:

- Extra smooth performance throughout the entire stroke of the cylinder.
- Available in standard SS series bore sizes.
- NFPA interchangeable.
- Cylinders rated to 250 PSI air.



# Ultra Cushion®

## A Major Design and Performance Breakthrough in Air Cylinder Cushioning Systems!

Norgren's state-of-the-art cushion design features a unique, one-piece, nitrile compound seal that is captured within a precision machined groove. This allows both linear and radial "float" of the cushion seal which virtually eliminates problems associated with misalignment. Integral flow paths molded in the periphery of the seal provide exceptionally fast "out of cushion" stroke reversal without the use of ball checks.

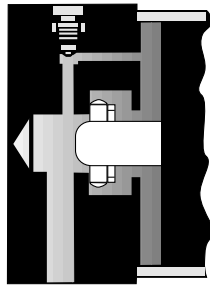


Figure 1

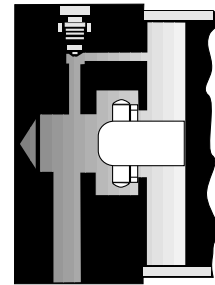


Figure 2 shows spear exiting cushion seal.

# Soft Touch Bumper Seal

The solution for noise pollution!

**Norgren's Low Friction Soft Touch Bumper Seal, in conjunction with our state-of-the-art cushion design, decelerates and reduces end-of-stroke noise.**

**Figure 1:** Cylinder deceleration starts when the cushion spear enters the cushion seal, creating a chamber of compressed air metered by an optional Adjustable Cushion Needle or Fixed Cushion (orifice).

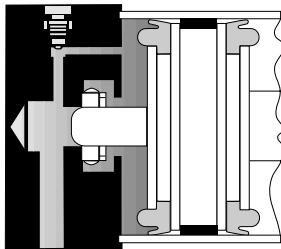


Figure 1

**Figure 2:** The final inertia load is absorbed by the Bumper, providing that final end-of-stroke "Soft Touch".

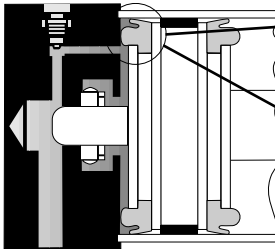
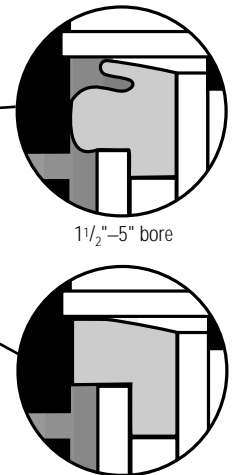


Figure 2



1 1/2" - 5" bore

Note: 1 1/8" bore configuration.

Operating PSI will control the reduction of total cylinder stroke. The chart shows the approximate average (new cylinder) stroke reductions in inches based on PSI.

Stroke length will vary based on PSI.

Not recommended for applications that require 100% repeatable stroke increment.

Available on 1-1/8" thru 5" bores.  
(Not available in 1-1/2" bore with 1" diameter rod.)

Can be incorporated into cylinders with no cushions, fixed cushions or adjustable cushions.

Bore	0 PSI	20 PSI	40 PSI	60 PSI	80 PSI	100 PSI
1 1/8"	.12	.08	.06	.03	.02	0
1 1/2"	.12	.04	.03	.02	.01	0
2"	.12	.10	.06	.03	.02	0
2 1/2"	.16	.10	.08	.04	.02	0
3 1/4"	.18	.10	.08	.04	.02	0
4"	.20	.14	.10	.06	.02	0
5"	.22	.14	.10	.06	.02	0

See ACT-2-26 for complete instructions on how to order cylinders.





# Series SS Actuators

All Dimensions in Inches (mm)

## Operating Temperatures:

Series SS -40°F to 200°F  
 (-40°C to 93°C)  
 Series D -20°F to 250°F  
 (-29°C to 121°C)  
 with Viton Seals -20°F to 400°F  
 (-29°C to 204°C)

## Operating Pressure:

250 PSIG Air (17.2 Bar)  
 400 PSIG Hydraulic (27.6 Bar)  
 Bore Sizes: 1-1/8", 1-1/2", 2", 2-1/2", 3-1/4",  
 4", 5", 6", 8"

## Supply:

Filtered compressed air to 250 PSI  
 Petroleum based hydraulic fluid to 400 PSI

## Lubrication:

None required  
 Norgren Air Cylinders are rated for "no lube added" service. All internal components are lubricated at time of assembly with a Teflon® based grease.

## Materials:

Head and End Caps: 304 stainless steel  
 Tube: 304 stainless steel  
 Piston Rod: hard chrome plated 303 stainless steel  
 Piston: 2011-T451 aluminum with Teflon® composite wearband  
 Rod Bearings: 304 stainless steel with Teflon® composite wearband  
 Seals: urethane rod seal and wiper, nitrile piston seals  
 Tie Rods: 303 stainless steel

## Side Loading:

Cylinders are specifically designed to push and pull. Side loading of the piston rod should be avoided to ensure maximum operating performance and life.

Care should be taken during installation to properly align the load to be moved with the center line of the cylinder. The use of a rod alignment coupler (see ACT-2-24) is strongly recommended whenever possible.

## Cylinder Weights

In pounds (kilograms)

Bore	Rod	Mounting Code					Add Per Inch of Stroke
		01, 02, 03, 10, 11, 22 & 30	04 & 05	*06 & 17	15 & 16		
1 1/8" (28.58)	3/8" (9.53)	1.1 (.49)	1.5 (.68)	1.3 (.58)	-	.13 (.05)	
	1/2" (12.70)	1.2 (.54)	1.6 (.72)	1.4 (.63)	-	.15 (.06)	
1 1/2" (38.10)	5/8" (15.88)	3.3 (1.49)	4.0 (1.81)	3.8 (1.72)	3.8 (1.72)	.3 (.13)	
	1" (25.40)	4.1 (1.85)	4.8 (2.17)	4.6 (2.08)	4.6 (2.08)	.4 (.18)	
2" (50.80)	5/8" (15.88)	5.9 (2.67)	7.0 (3.17)	6.4 (2.90)	6.4 (2.90)	.5 (.22)	
	1" (25.40)	6.3 (2.85)	7.4 (3.35)	6.8 (2.94)	6.8 (3.08)	.6 (.27)	
2 1/2" (63.50)	5/8" (15.88)	8.0 (3.62)	9.5 (4.30)	8.7 (3.94)	8.5 (3.85)	.6 (.27)	
	1" (25.40)	8.5 (3.85)	10.0 (4.53)	9.2 (4.17)	9.0 (4.08)	.7 (.31)	
3 1/4" (82.55)	1" (25.40)	15.0 (6.80)	18.7 (8.48)	16.0 (7.25)	15.5 (7.03)	.8 (.36)	
	1 3/8" (34.93)	15.5 (7.03)	19.2 (8.70)	16.5 (7.48)	16.0 (7.25)	1.0 (.45)	
4" (101.60)	1" (25.40)	23.0 (10.43)	28.0 (12.70)	27.0 (12.24)	23.5 (10.65)	1.0 (.45)	
	1 3/8" (34.93)	23.5 (10.65)	28.5 (12.92)	27.5 (12.47)	24.0 (10.88)	1.2 (.54)	
5" (127.00)	1" (25.40)	34.5 (15.64)	42.0 (19.05)	41.0 (18.59)	35.0 (15.87)	1.1 (.49)	
	1 3/8" (34.93)	35.0 (15.87)	42.5 (19.27)	41.5 (18.82)	35.5 (16.10)	1.3 (.58)	
6" (152.40)	1 3/8" (34.93)	60.0 (27.21)	71.9 (32.61)	69.0 (31.29)	61.2 (27.76)	1.5 (.68)	
	1 3/4" (44.45)	62.0 (28.12)	73.9 (33.52)	71.0 (32.20)	63.2 (28.66)	1.7 (.77)	
8" (203.20)	1 3/8" (34.93)	79.0 (35.83)	-	88.0 (39.91)	80.2 (36.37)	2.0 (.90)	
	1 3/4" (44.45)	82.0 (37.19)	-	91.0 (41.27)	83.2 (37.73)	2.3 (1.04)	

\*Weight includes pivot pin

## Breakaway Pressures in PSI

Listed are the average breakaway pressures in PSI for all Series SS and Series D cylinder bore sizes.

If your application requires a lower breakaway pressure than indicated for a particular bore size, consult the factory.

Bore	SS Series		D Series	
	Extend	Retract	Extend	Retract
1 1/8"	6	7	3	4
1 1/2", 2", 2 1/2"	5	6	3	4
3 1/4", 4"	4	5	2	3
5", 6", 8"	3	4	1	2

Note: Breakaway pressures were established with the cylinders mounted horizontally and no load on the piston rod.



### Piston Rod Diameter Selection:

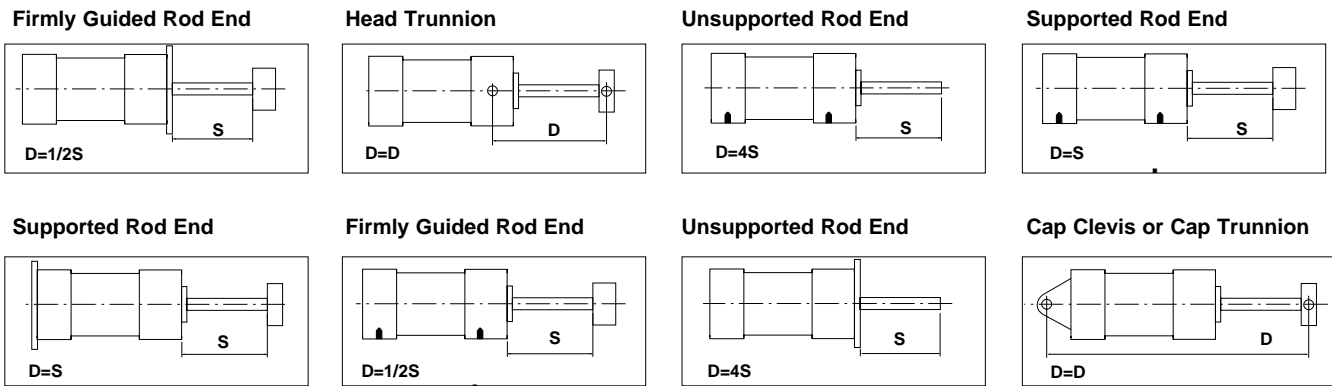
Applications requiring long extend (push) strokes may require oversize piston rod diameters to prevent buckling. To determine the correct rod diameter for your application follow these simple steps:

1. Select the thrust from the **Cylinder Force and Volume Chart** that is required for your application.  
Thrust = Piston Surface Area x Operating Pressure
2. From the **Cylinder Mounting Diagrams** select the mounting style being used.
3. With the piston rod fully extended, calculate the value of **D** (in inches) using the formula shown or the cylinder mounting diagram selected in step #2.
4. Locate the value of **D** (in inches) at the bottom of the **Selection Chart**. Enter the chart at this point and move vertically upward until intersecting with the horizontal line representing the required thrust which was selected in step #1. The band within which these lines intersect represents the minimum recommended piston rod diameter.

### Stop Tube Selection:

Stop tubes enhance the transverse load carrying capability of a long stroke cylinder by increasing the distance between the piston and rod bearing at full extension. When the value of **D** (calculated from the piston rod diameter selection instructions above) is less than 40", a stop tube is **not** required. However, if **D** is 40" or more, 1" of stop tube is recommended for every 10" (or fraction thereof) over 40".

### Cylinder Mounting Diagrams



### Cylinder Force and Volume Charts

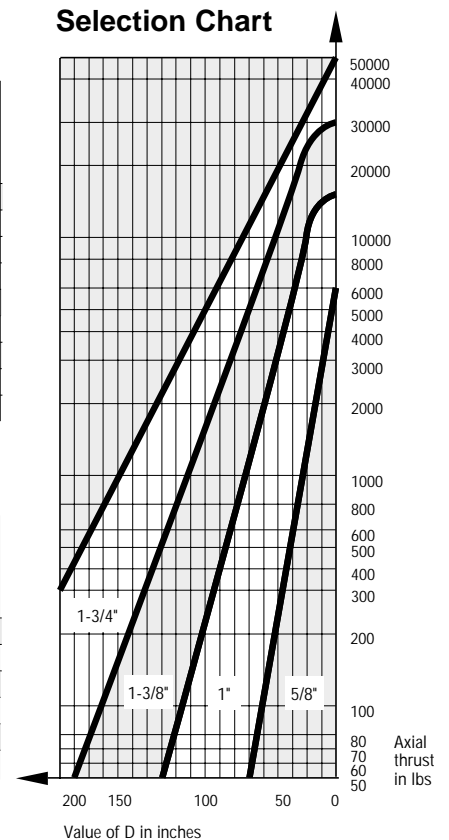
Extend Forces in pounds (newtons)

Bore	Piston Area	PSI (bar)						Volume Cu Ft (cm <sup>3</sup> ) Displacement Per Inch
		40 (3)	60 (4)	80 (6)	100 (7)	150 (10)	200 (14)	
1 1/8"	.99 (6.41)	40 (177)	60 (265)	80 (354)	99 (442)	149 (664)	200 (890)	.00057 (16)
1 1/2"	1.77 (11.40)	71 (315)	106 (472)	142 (629)	177 (786)	266 (1179)	353 (1570)	.00102 (29)
2"	3.14 (20.27)	126 (559)	189 (839)	251 (1119)	314 (1398)	471 (2097)	628 (2793)	.00182 (52)
2 1/2"	4.91 (31.67)	196 (874)	295 (1311)	393 (1748)	491 (2185)	737 (3277)	982 (4368)	.00284 (80)
3 1/4"	8.30 (53.32)	332 (1477)	498 (2215)	664 (2953)	830 (3692)	1245 (5538)	1659 (7379)	.00480 (136)
4"	12.57 (81.07)	503 (2237)	754 (3355)	1005 (4473)	1257 (5592)	1886 (8388)	2513 (11178)	.00727 (206)
5"	19.64 (126.71)	785 (3491)	1178 (5240)	1571 (6988)	1964 (8736)	2946 (13104)	3928 (17472)	.01137 (322)
6"	28.27 (182.39)	1130 (5026)	1696 (7544)	2262 (10061)	2827 (12574)	4240 (18860)	5654 (25149)	.01837 (520)
8"	50.26 (324.26)	2010 (8940)	3015 (13411)	4020 (17881)	5026 (22356)	7539 (33533)	10052 (44711)	.02227 (631)

Deduct these Forces for Retract Strokes

Rod	Rod Area	PSI (bar)						Volume Cu Ft (cm <sup>3</sup> ) Displacement Per Inch
		40 (3)	60 (4)	80 (6)	100 (7)	150 (10)	200 (14)	
3/8"	.112 (.72)	5 (20)	7 (30)	9 (40)	11 (50)	17 (75)	22 (100)	.00007 (2)
1/2"	.196 (1.26)	8 (35)	12 (52)	16 (70)	20 (87)	30 (131)	39 (174)	.00011 (3)
5/8"	.307 (1.98)	12 (53)	18 (80)	25 (111)	31 (138)	46 (205)	61 (271)	.00018 (5)
1"	.785 (5.06)	31 (138)	47 (209)	63 (280)	70 (351)	118 (525)	157 (698)	.00045 (13)
1 3/8"	1.485 (9.58)	59 (262)	89 (396)	119 (529)	149 (663)	222 (997)	297 (1321)	.00086 (24)
1 3/4"	2.404 (15.51)	95 (423)	144 (641)	192 (854)	240 (1068)	360 (1601)	480 (2135)	.00139 (39)

### Selection Chart



- **NFPA (MX0) 01 Basic Mount** available in 1-1/2" thru 8" bore sizes.
- **Precision machined 300 Series stainless steel components.**
- **Cylinders rated to 250 PSI air, 400 PSI hydraulic (non-shock).**
- **Designed for non-lube service.**
- **Switches available on all bore sizes.**  
(See pages ACT-2-34/35 for ordering information.)



### Cylinder Order Information

S	Series SS
D	Series D

Bore	Single Rod End
1 1/2"	C
2"	D
2 1/2"	E
3 1/4"	F
4"	G
5"	L
6"	J
8"	M

Full Inches in Strokes	
00	0" Stroke
01	1" Stroke
02	2" Stroke
03	3" Stroke
04	4" Stroke
05	5" Stroke
06	6" Stroke
...	...
99	99" Stroke
xx	Special

Fractional Increments of Stroke			
A	0"	J	1/2"
B	1/16"	K	9/16"
C	1/8"	M	5/8"
D	3/16"	N	11/16"
E	1/4"	P	3/4"
F	5/16"	R	13/16"
G	3/8"	S	7/8"
H	7/16"	T	15/16"
X	Special		

Rod Size & Style	
Standard	Oversized
A Male KK	H Male KK
B Male CC*	J Male CC
C Full Dia. Thd.	K Full Dia. Thd.
D Female XX	M Female XX
E Studded	N Studded
X Special	

Optional Seals	
No Option	A
Viton Seals	1
Air/Oil Seal	3
Metallic Rod Scraper	5
Soft Touch	6
Special	X

Cushions				
Needle Position	1	2'	3	4
No Cushions	A			
Head Only	B	C	D	E
Cap Only	G	H	J	K
Head and Cap	N	M	P	R
Fixed	U			
Special	X			

Ports				
Position	1'	2	3	4
Standard	A	B	C	D
Oversized*	E	G	H	J
Special	X			

Mounting Options			
01	Basic (MX0)	10	Head Square (ME3)*
02	Bottom Tap (MS4)	11	Cap Square (ME4)*
04	Front Flange (MF1)	15	Head Trunnion (MT1)
05	Rear Flange (MF2)	16	Cap Trunnion (MT2)
06	Cap Fixed Clevis (MP1)	XX	Special

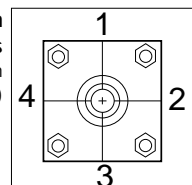
No Options	00
Magnetic Piston Only**	90
Special <sup>a</sup>	98

\*\*See ACT-2-34/35.  
<sup>a</sup>For any cylinder modifications not listed use "98" and please specify.

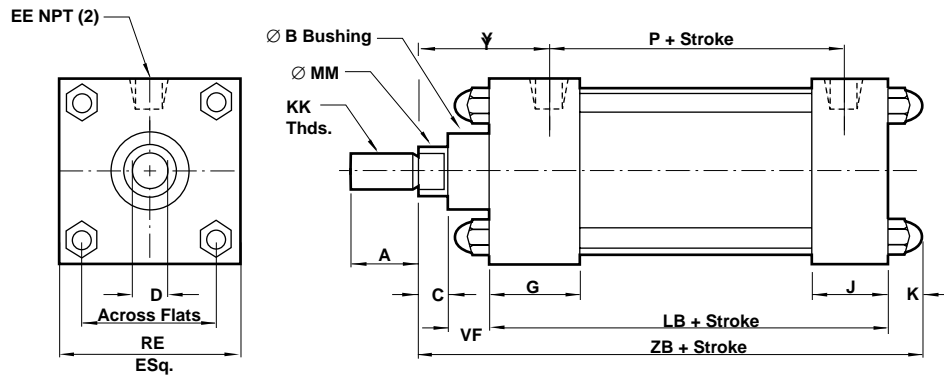
<sup>1</sup>Standard position  
<sup>\*</sup>NFPA

\*On 1 1/2", 2" & 2 1/2" Bore Sizes with 5/8" Rod, CC = 7/16 - 20 (NFPA)

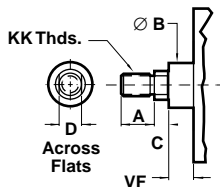
**Port and Cushion Needle Positions**  
(As viewed from rod end)



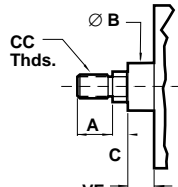
See ACT-2-26 for complete instructions on how to order cylinders.



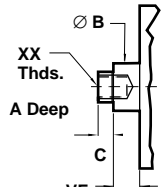
## Standard & Optional Rod Ends



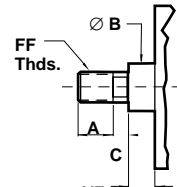
**Style #1**  
(Small Male)



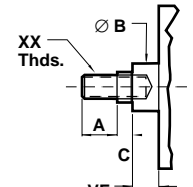
**Style #2**  
(Optional Male)



**Style #3**  
(Small Female)



**Style #4**  
(Optional Full Diameter Threads)



**Style #5**  
(Optional Studded)

Dimension		1 1/2" Bore (38.10)	2" Bore (50.80)	2 1/2" Bore (63.50)	3 1/4" Bore (82.55)	4" Bore (101.60)	5" Bore (127.00)	6" Bore (152.40)	8" Bore (203.20)
∅ Rod (MM)	Std.	5/8" (15.88)	5/8" (15.88)	5/8" (15.88)	1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)	1 3/8" (34.93)
	O.S.	1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/4" (44.45)	1 3/4" (44.45)
A	Std.	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)
	O.S.	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)	2.000 (50.80)
B	Std.	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	2.000 (50.80)	2.000 (50.80)
	O.S.	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)	2.375 (60.33)	2.375 (60.33)
C	Std.	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)
	O.S.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)	.750 (19.05)
CC	Std.	7/16 - 20	7/16 - 20	7/16 - 20	7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12	1 1/4 - 12
	O.S.	7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12	1 1/4 - 12	1 1/4 - 12	1 1/2 - 12	1 1/2 - 12
D	Std.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.812 (20.62)	.812 (20.62)	.812 (20.62)	1.125 (28.58)	1.125 (28.58)
	O.S.	.812 (20.62)	.812 (20.62)	.812 (20.62)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)	1.500 (38.10)
E		2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)	5.500 (139.70)	6.500 (165.10)	8.500 (215.90)
EE	Std.	.250 (6.35)	.250 (6.35)	.250 (6.35)	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)
	O.S.	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)
FF	Std.	5/8 - 18	5/8 - 18	5/8 - 18	1 - 14	1 - 14	1 - 14	1 3/8 - 12	1 3/8 - 12
	O.S.	1 - 14	1 - 14	1 - 14	1 3/8 - 12	1 3/8 - 12	1 3/8 - 12	1 3/4 - 12	1 3/4 - 12
G		1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)	2.000 (50.80)	2.000 (50.80)
J		1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)
K		.469 (11.91)	.531 (13.49)	.531 (13.49)	.625 (15.88)	.625 (15.88)	.830 (21.08)	.830 (21.08)	1.000 (25.40)
KK	Std.	1/2 - 20	1/2 - 20	1/2 - 20	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14
	O.S.	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14	1 - 14	1 1/4 - 12	1 1/4 - 12
LB		3.625 (92.08)	3.625 (92.08)	3.750 (95.25)	4.250 (107.95)	4.250 (107.95)	4.500 (114.30)	5.000 (127.00)	5.125 (130.18)
P		2.125 (53.98)	2.125 (53.98)	2.250 (57.15)	2.625 (66.68)	2.625 (66.68)	2.875 (73.03)	3.000 (76.20)	3.125 (79.38)
RE		1.430 (36.32)	1.840 (46.74)	2.190 (55.63)	2.760 (70.10)	3.320 (84.33)	4.100 (104.14)	4.880 (123.95)	6.435 (163.45)
VF	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)
	O.S.	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)	1.125 (28.58)
XX	Std.	7/16 - 20	7/16 - 20	7/16 - 20	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14
	O.S.	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14	1 - 14	1 1/4 - 12	1 1/4 - 12
Y	Std.	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)	2.437 (61.90)	2.437 (61.90)	2.437 (61.90)	2.875 (73.03)	2.875 (73.03)
	O.S.	2.375 (60.33)	2.375 (60.33)	2.375 (60.33)	2.687 (68.25)	2.687 (68.25)	2.687 (68.25)	3.125 (79.38)	3.125 (79.38)
ZB	Std.	5.094 (129.39)	5.156 (130.96)	5.281 (134.14)	6.250 (158.75)	6.250 (158.75)	6.705 (170.31)	7.455 (189.36)	7.750 (196.85)
	O.S.	5.469 (138.91)	5.531 (140.49)	5.656 (143.66)	6.500 (165.10)	6.500 (165.10)	6.955 (176.66)	7.705 (195.71)	8.000 (203.20)

- **NFPA (MS4) 02 Bottom Tap Mount** available in 1-1/2" thru 8" bore sizes.
- **Precision machined 300 Series stainless steel components.**
- **Cylinders rated to 250 PSI air, 400 PSI hydraulic (non-shock).**
- **Designed for non-lube service.**
- **Switches available on all bore sizes.**  
(See pages ACT-2-34/35 for ordering information.)



### Cylinder Order Information

S Series SS  
D Series D

Bore	Single Rod End
1 1/2"	C
2"	D
2 1/2"	E
3 1/4"	F
4"	G
5"	L
6"	J
8"	M

Full Inches in Strokes	
00	0" Stroke
01	1" Stroke
02	2" Stroke
03	3" Stroke
04	4" Stroke
05	5" Stroke
06	6" Stroke
...	...
99	99" Stroke
xx	Special

Fractional Increments of Stroke			
A	0"	J	1/2"
B	1/16"	K	9/16"
C	1/8"	M	5/8"
D	3/16"	N	11/16"
E	1/4"	P	3/4"
F	5/16"	R	13/16"
G	3/8"	S	7/8"
H	7/16"	T	15/16"
X	Special		

Rod Size & Style	
Standard	Oversized
A   Male KK	H   Male KK
B   Male CC*	J   Male CC
C   Full Dia. Thd.	K   Full Dia. Thd.
D   Female XX	M   Female XX
E   Studded	N   Studded
X   Special	

\*On 1 1/2", 2" & 2 1/2" Bore Sizes with 5/8" Rod, CC = 7/16 - 20 (NFPA)

No Options	00
Magnetic Piston Only**	90
Special <sup>†</sup>	98

\*\*See ACT-2-34/35.  
<sup>†</sup>For any cylinder modifications not listed use "98" and please specify.

Optional Seals	
No Option	A
Viton Seals	1
Air/Oil Seal	3
Metallic Rod Scraper	5
Soft Touch	6
Special	X

Cushions				
Needle Position	1	2'	3	4
No Cushions	A			
Head Only	B	C	D	E
Cap Only	G	H	J	K
Head and Cap	N	M	P	R
Fixed	U			
Special	X			

<sup>†</sup>Standard position

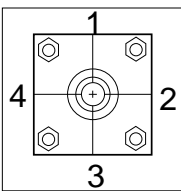
Ports				
Position	1'	2	3	4
Standard	A	B	C	D
Oversized*	E	G	H	J
Special	X			

<sup>†</sup>Standard position  
\*NFPA

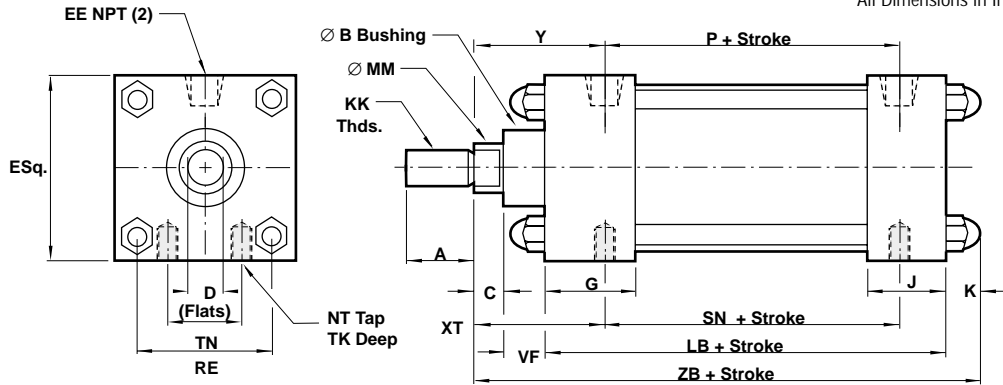
Mounting Options		
01 Basic (MX0)	10	Head Square (ME3)*
02 <b>Bottom Tap (MS4)</b>	11	Cap Square (ME4)*
04 Front Flange (MF1)	15	Head Trunnion (MT1)
05 Rear Flange (MF2)	16	Cap Trunnion (MT2)
06 Cap Fixed Clevis (MP1)	XX	Special

\*8" Bores Only

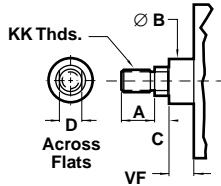
**Port and Cushion Needle Positions**  
(As viewed from rod end)



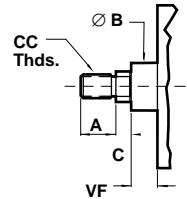
See ACT-2-26 for complete instructions on how to order cylinders.



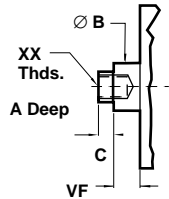
**Standard & Optional Rod Ends**



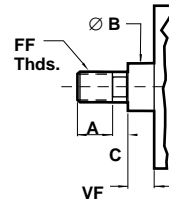
**Style #1**  
(Small Male)



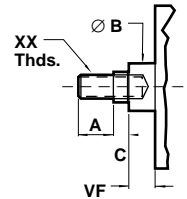
**Style #2**  
(Optional Male)



**Style #3**  
(Small Female)



**Style #4**  
(Optional Full Diameter Threads)



**Style #5**  
(Optional Studded)

Dimension		1 1/2" Bore (38.10)	2" Bore (50.80)	2 1/2" Bore (63.50)	3 1/4" Bore (82.55)	4" Bore (101.60)	5" Bore (127.00)	6" Bore (152.40)	8" Bore (203.20)
ø Rod (MM)	Std.	5/8" (15.88)	5/8" (15.88)	5/8" (15.88)	1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)	1 3/8" (34.93)
	O.S.	1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/4" (44.45)	1 3/4" (44.45)
A	Std.	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)
	O.S.	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)	2.000 (50.80)
B	Std.	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	2.000 (50.80)	2.000 (50.80)
	O.S.	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)	2.375 (60.33)	2.375 (60.33)
C	Std.	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)
	O.S.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)	.750 (19.05)
CC	Std.	7/16 - 20	7/16 - 20	7/16 - 20	7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12	1 1/4 - 12
	O.S.	7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12	1 1/4 - 12	1 1/4 - 12	1 1/2 - 12	1 1/2 - 12
D	Std.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.812 (20.62)	.812 (20.62)	.812 (20.62)	1.125 (28.58)	1.125 (28.58)
	O.S.	.812 (20.62)	.812 (20.62)	.812 (20.62)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)	1.500 (38.10)
E		2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)	5.500 (139.70)	6.500 (165.10)	8.500 (215.90)
EE	Std.	.250 (6.35)	.250 (6.35)	.250 (6.35)	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)
	O.S.	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)
FF	Std.	5/8 - 18	5/8 - 18	5/8 - 18	1 - 14	1 - 14	1 - 14	1 3/8 - 12	1 3/8 - 12
	O.S.	1 - 14	1 - 14	1 - 14	1 3/8 - 12	1 3/8 - 12	1 3/8 - 12	1 3/4 - 12	1 3/4 - 12
G		1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)	2.000 (50.80)	2.000 (50.80)
J		1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)
K		.469 (11.91)	.531 (13.49)	.531 (13.49)	.625 (15.88)	.625 (15.88)	.830 (21.08)	.830 (21.08)	1.000 (25.40)
KK	Std.	1/2 - 20	1/2 - 20	1/2 - 20	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14
	O.S.	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14	1 - 14	1 1/4 - 12	1 1/4 - 12
LB		3.625 (92.08)	3.625 (92.08)	3.750 (95.25)	4.250 (107.95)	4.250 (107.95)	4.500 (114.30)	5.000 (127.00)	5.125 (130.18)
NT		1/4 - 20	5/16 - 18	3/8 - 16	1/2 - 13	1/2 - 13	5/8 - 11	3/4 - 10	3/4 - 10
P		2.125 (53.98)	2.125 (53.98)	2.250 (57.15)	2.625 (66.68)	2.625 (66.68)	2.875 (73.03)	3.000 (76.20)	3.125 (79.38)
RE		1.430 (36.32)	1.840 (46.74)	2.190 (55.63)	2.760 (70.10)	3.320 (84.33)	4.100 (104.14)	4.880 (123.95)	6.435 (163.45)
SN		2.250 (57.15)	2.250 (57.15)	2.375 (60.33)	2.625 (66.68)	2.625 (66.68)	2.875 (73.03)	3.125 (79.38)	3.250 (82.55)
TK		.375 (9.53)	.500 (12.70)	.625 (15.88)	.750 (19.05)	.750 (19.05)	1.000 (25.40)	1.125 (28.58)	1.125 (28.58)
TN		.625 (15.88)	.875 (22.23)	1.250 (31.75)	1.500 (38.10)	2.062 (52.37)	2.687 (68.25)	3.250 (82.55)	4.500 (114.30)
VF	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)
	O.S.	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)	1.125 (28.58)
XT	Std.	1.937 (49.20)	1.937 (49.20)	1.937 (49.20)	2.437 (61.90)	2.437 (61.90)	2.437 (61.90)	2.812 (71.42)	2.812 (71.42)
	O.S.	2.312 (58.72)	2.312 (58.72)	2.312 (58.72)	2.687 (68.25)	2.687 (68.25)	2.687 (68.25)	3.062 (77.77)	3.062 (77.77)
XX	Std.	7/16 - 20	7/16 - 20	7/16 - 20	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14
	O.S.	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14	1 - 14	1 1/4 - 12	1 1/4 - 12
Y	Std.	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)	2.437 (61.90)	2.437 (61.90)	2.437 (61.90)	2.875 (73.03)	2.875 (73.03)
	O.S.	2.375 (60.33)	2.375 (60.33)	2.375 (60.33)	2.687 (68.25)	2.687 (68.25)	2.687 (68.25)	3.125 (79.38)	3.125 (79.38)
ZB	Std.	5.094 (129.39)	5.156 (130.96)	5.281 (134.14)	6.250 (158.75)	6.250 (158.75)	6.705 (170.31)	7.455 (189.36)	7.750 (196.85)
	O.S.	5.469 (138.91)	5.531 (140.49)	5.656 (143.66)	6.500 (165.10)	6.500 (165.10)	6.955 (176.66)	7.705 (195.71)	8.000 (203.20)

- NFPA (MF1) 04 Front Flange Mount available in 1-1/2" thru 6" bore sizes.
- Precision machined 300 Series stainless steel components.
- Cylinders rated to 250 PSI air, 400 PSI hydraulic (non-shock).
- Designed for non-lube service.
- Switches available on all bore sizes. (See pages ACT-2-34/35 for ordering information.)



### Cylinder Order Information

1	2	3	4	5	6	7	8	9	10	11	12	13
---	---	---	---	---	---	---	---	---	----	----	----	----

S	Series SS
D	Series D

Bore	Single Rod End
1 1/2"	C
2"	D
2 1/2"	E
3 1/4"	F
4"	G
5"	L
6"	J
8"	*

\*See ACT-2-16/17 for ME3 mount

Full Inches in Strokes	Stroke
00	0" Stroke
01	1" Stroke
02	2" Stroke
03	3" Stroke
04	4" Stroke
05	5" Stroke
06	6" Stroke
...	...
99	99" Stroke
xx	Special

Fractional Increments of Stroke			
A	0"	J	1/2"
B	1/16"	K	9/16"
C	1/8"	M	5/8"
D	3/16"	N	11/16"
E	1/4"	P	3/4"
F	5/16"	R	13/16"
G	3/8"	S	7/8"
H	7/16"	T	15/16"
X	Special		

Rod Size & Style	
Standard	Oversized
A Male KK	H Male KK
B Male CC*	J Male CC
C Full Dia. Thd.	K Full Dia. Thd.
D Female XX	M Female XX
E Studded	N Studded
X Special	

\*On 1 1/2", 2" & 2 1/2" Bore Sizes with 5/8" Rod, CC = 7/16 - 20 (NFPA)

No Options		00
Magnetic Piston Only**		90
Special <sup>a</sup>		98

\*\*See ACT-2-34/35.  
<sup>a</sup>For any cylinder modifications not listed use "98" and please specify.

Optional Seals	
No Option	A
Viton Seals	1
Air/Oil Seal	3
Metallic Rod Scraper	5
Soft Touch	6
Special	X

Cushions				
Needle Position	1	2'	3	4
No Cushions	A			
Head Only	B	C	D	E
Cap Only	G	H	J	K
Head and Cap	N	M	P	R
Fixed	U			
Special	X			

<sup>1</sup>Standard position

Ports				
Position	1'	2	3	4
Standard	A	B	C	D
Oversized*	E	G	H	J
Special	X			

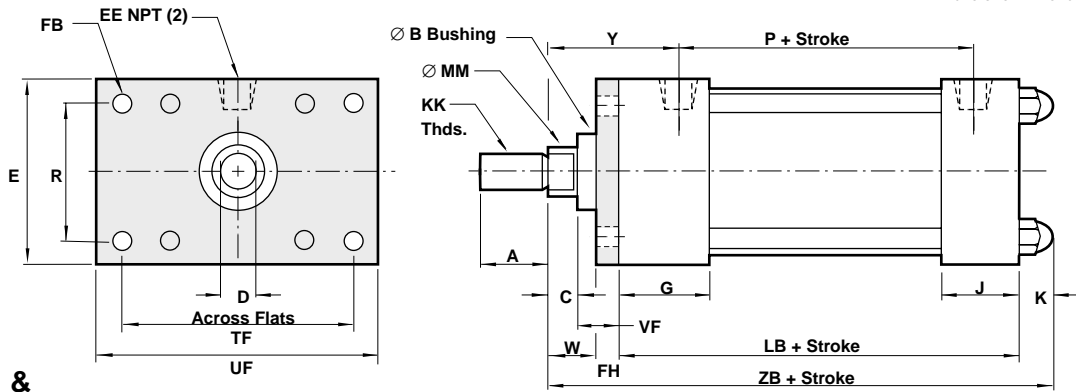
<sup>1</sup>Standard position  
<sup>\*</sup>NFPA

Mounting Options		
01	Basic (MX0)	10
02	Bottom Tap (MS4)	11
04	<b>Front Flange (MF1)</b>	15
05	Rear Flange (MF2)	16
06	Cap Fixed Clevis (MP1)	XX
	Head Square (ME3)*	
	Cap Square (ME4)*	
	Head Trunnion (MT1)	
	Cap Trunnion (MT2)	
	Special	

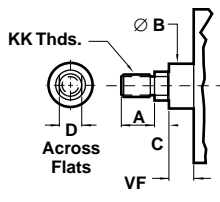
\*8" Bores Only

**Port and Cushion Needle Positions**  
(As viewed from rod end)

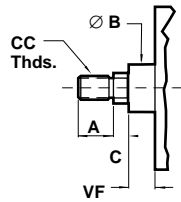
See ACT-2-26 for complete instructions on how to order cylinders.



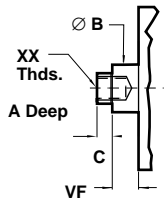
## Standard & Optional Rod Ends



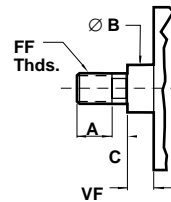
**Style #1**  
(Small Male)



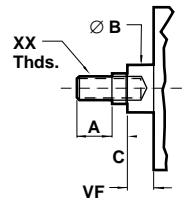
**Style #2**  
(Optional Male)



**Style #3**  
(Small Female)



**Style #4**  
(Optional Full Diameter Threads)



**Style #5**  
(Optional Studded)

Dimension		1 1/2" Bore (38.10)	2" Bore (50.80)	2 1/2" Bore (63.50)	3 1/4" Bore (82.55)	4" Bore (101.60)	5" Bore (127.00)	6" Bore (152.40)
ø Rod (MM)	Std.	5/8" (15.88)	5/8" (15.88)	5/8" (15.88)	1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)
	O.S.	1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/4" (44.45)
A	Std.	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)
	O.S.	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)
B	Std.	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	2.000 (50.80)
	O.S.	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)	2.375 (60.33)
C	Std.	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)
	O.S.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)
CC	Std.	7/16 - 20	7/16 - 20	7/16 - 20	7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12
	O.S.	7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12	1 1/4 - 12	1 1/4 - 12	1 1/2 - 12
D	Std.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.812 (20.62)	.812 (20.62)	.812 (20.62)	1.125 (28.58)
	O.S.	.812 (20.62)	.812 (20.62)	.812 (20.62)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)
E		2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)	5.500 (139.70)	6.500 (165.10)
EE	Std.	.250 (6.35)	.250 (6.35)	.250 (6.35)	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)
	O.S.	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)
FB		.312 (7.92)	.375 (9.53)	.375 (9.53)	.437 (11.10)	.437 (11.10)	.562 (14.27)	.562 (14.27)
FF	Std.	5/8 - 18	5/8 - 18	5/8 - 18	1 - 14	1 - 14	1 - 14	1 3/8 - 12
	O.S.	1 - 14	1 - 14	1 - 14	1 3/8 - 12	1 3/8 - 12	1 3/8 - 12	1 3/4 - 12
FH		.375 (9.53)	.375 (9.53)	.375 (9.53)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)
G		1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)	2.000 (50.80)
J		1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)	1.500 (38.10)
K		.469 (11.91)	.531 (13.49)	.531 (13.49)	.625 (15.88)	.625 (15.88)	.830 (21.08)	.830 (21.08)
KK	Std.	1/2 - 20	1/2 - 20	1/2 - 20	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14
	O.S.	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14	1 - 14	1 1/4 - 12
LB		3.625 (92.08)	3.625 (92.08)	3.750 (95.25)	4.250 (107.95)	4.250 (107.95)	4.500 (114.30)	5.000 (127.00)
P		2.125 (53.98)	2.125 (53.98)	2.250 (57.15)	2.625 (66.68)	2.625 (66.68)	2.875 (73.03)	3.000 (76.20)
R		1.430 (36.32)	1.840 (46.74)	2.190 (55.63)	2.760 (70.10)	3.320 (84.33)	4.100 (104.14)	4.880 (123.95)
TF		2.750 (69.85)	3.375 (85.73)	3.875 (98.43)	4.687 (119.08)	5.437 (138.10)	6.625 (168.28)	7.625 (193.68)
UF		3.375 (85.73)	4.125 (104.78)	4.625 (117.48)	5.500 (139.70)	6.250 (158.75)	7.625 (193.68)	8.625 (219.08)
VF	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)
	O.S.	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)
W	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)	.750 (19.05)	.750 (19.05)	.875 (22.23)
	O.S.	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)
XX	Std.	7/16 - 20	7/16 - 20	7/16 - 20	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14
	O.S.	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14	1 - 14	1 1/4 - 12
Y	Std.	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)	2.437 (61.90)	2.437 (61.90)	2.437 (61.90)	2.875 (73.03)
	O.S.	2.375 (60.33)	2.375 (60.33)	2.375 (60.33)	2.687 (68.25)	2.687 (68.25)	2.687 (68.25)	3.125 (79.38)
ZB	Std.	5.094 (129.39)	5.156 (130.96)	5.281 (134.14)	6.250 (158.75)	6.250 (158.75)	6.705 (170.31)	7.455 (189.36)
	O.S.	5.469 (138.91)	5.531 (140.49)	5.656 (143.66)	6.500 (165.10)	6.500 (165.10)	6.955 (176.66)	7.705 (195.71)



- **NFPA (MF2) 05 Rear Flange Mount** available in 1-1/2" thru 6" bore sizes.
- **Precision machined 300 Series stainless steel components.**
- **Cylinders rated to 250 PSI air, 400 PSI hydraulic (non-shock).**
- **Designed for non-lube service.**
- **Switches available on all bore sizes.**  
(See pages ACT-2-34/35 for ordering information.)



### Cylinder Order Information

■	■	■	■	■	-	■	0	5	-	■	■	■	■	■
1	2	3	4	5	6	7	8	9	10	11	12	13		

S	Series SS
D	Series D

Bore	Single Rod End
1 1/2"	C
2"	D
2 1/2"	E
3 1/4"	F
4"	G
5"	L
6"	J
8"	*

\*See ACT-2-16/17 for ME3 mount

Full Inches in Strokes	
00	0" Stroke
01	1" Stroke
02	2" Stroke
03	3" Stroke
04	4" Stroke
05	5" Stroke
06	6" Stroke
...	...
99	99" Stroke
xx	Special

Fractional Increments of Stroke			
A	0"	J	1/2"
B	1/16"	K	9/16"
C	1/8"	M	5/8"
D	3/16"	N	11/16"
E	1/4"	P	3/4"
F	5/16"	R	13/16"
G	3/8"	S	7/8"
H	7/16"	T	15/16"
X	Special		

Rod Size & Style			
Standard		Oversized	
A	Male KK	H	Male KK
B	Male CC*	J	Male CC
C	Full Dia. Thd.	K	Full Dia. Thd.
D	Female XX	M	Female XX
E	Studded	N	Studded
X	Special		

\*On 1 1/2", 2" & 2 1/2" Bore Sizes with 5/8" Rod, CC = 7/16 - 20 (NFPA)

No Options		00
Magnetic Piston Only**		90
Special <sup>a</sup>		98

\*\*See ACT-2-34/35.  
<sup>a</sup>For any cylinder modifications not listed use "98" and please specify.

Optional Seals	
No Option	A
Viton Seals	1
Air/Oil Seal	3
Metallic Rod Scraper	5
Soft Touch	6
Special	X

Cushions				
Needle Position	1	2'	3	4
No Cushions	A			
Head Only	B	C	D	E
Cap Only	G	H	J	K
Head and Cap	N	M	P	R
Fixed	U			
Special	X			

'Standard position

Ports				
Position	1'	2	3	4
Standard	A	B	C	D
Oversized*	E	G	H	J
Special	X			

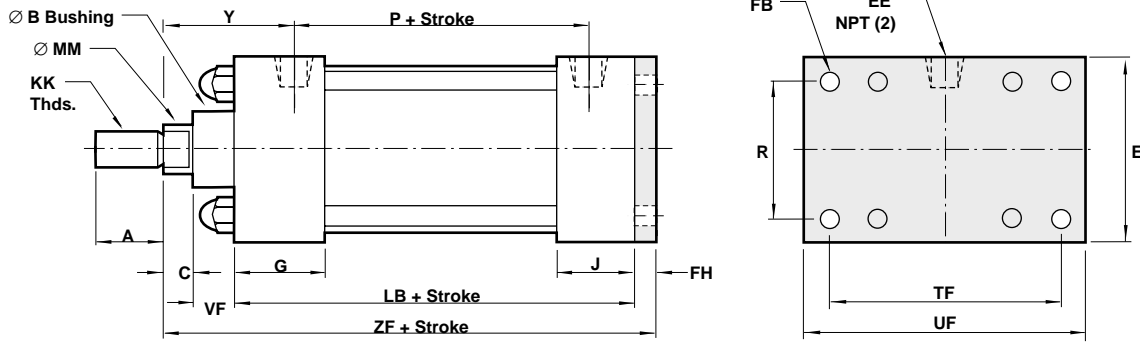
'Standard position  
\*NFPA

Mounting Options		
01	Basic (MX0)	10
02	Bottom Tap (MS4)	11
04	Front Flange (MF1)	15
05	Rear Flange (MF2)	16
06	Cap Fixed Clevis (MP1)	XX
	Head Square (ME3)*	
	Cap Square (ME4)*	
	Head Trunnion (MT1)	
	Cap Trunnion (MT2)	
	Special	

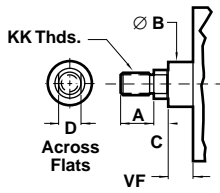
\*8" Bores Only

**Port and Cushion Needle Positions**  
(As viewed from rod end)

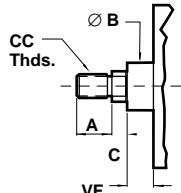
See ACT-2-26 for complete instructions on how to order cylinders.



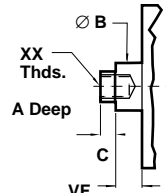
Standard & Optional Rod Ends



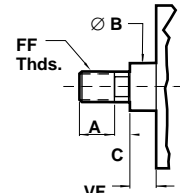
Style #1  
(Small Male)



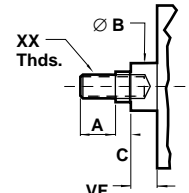
Style #2  
(Optional Male)



Style #3  
(Small Female)



Style #4  
(Optional Full Diameter Threads)



Style #5  
(Optional Studded)

Dimension		1 1/2" Bore (38.10)	2" Bore (50.80)	2 1/2" Bore (63.50)	3 1/4" Bore (82.55)	4" Bore (101.60)	5" Bore (127.00)	6" Bore (152.40)
ø Rod (MM)	Std.	5/8" (15.88)	5/8" (15.88)	5/8" (15.88)	1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)
	O.S.	1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/4" (44.45)
A	Std.	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)
	O.S.	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)
B	Std.	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	2.000 (50.80)
	O.S.	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)	2.375 (60.33)
C	Std.	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)
	O.S.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)
CC	Std.	7/16 - 20	7/16 - 20	7/16 - 20	7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12
	O.S.	7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12	1 1/4 - 12	1 1/4 - 12	1 1/2 - 12
D	Std.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.812 (20.62)	.812 (20.62)	.812 (20.62)	1.125 (28.58)
	O.S.	.812 (20.62)	.812 (20.62)	.812 (20.62)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)
E		2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)	5.500 (139.70)	6.500 (165.10)
EE	Std.	.250 (6.35)	.250 (6.35)	.250 (6.35)	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)
	O.S.	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)
FB		.312 (7.92)	.375 (9.53)	.375 (9.53)	.437 (11.10)	.437 (11.10)	.562 (14.27)	.562 (14.27)
FF	Std.	5/8 - 18	5/8 - 18	5/8 - 18	1 - 14	1 - 14	1 - 14	1 3/8 - 12
	O.S.	1 - 14	1 - 14	1 - 14	1 3/8 - 12	1 3/8 - 12	1 3/8 - 12	1 3/4 - 12
FH		.375 (9.53)	.375 (9.53)	.375 (9.53)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)
G		1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)	2.000 (50.80)
J		1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)	1.500 (38.10)
KK	Std.	1/2 - 20	1/2 - 20	1/2 - 20	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14
	O.S.	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14	1 - 14	1 1/4 - 12
LB		3.625 (92.08)	3.625 (92.08)	3.750 (95.25)	4.250 (107.95)	4.250 (107.95)	4.500 (114.30)	5.000 (127.00)
P		2.125 (53.98)	2.125 (53.98)	2.250 (57.15)	2.625 (66.68)	2.625 (66.68)	2.875 (73.03)	3.000 (76.20)
R		1.430 (36.32)	1.840 (46.74)	2.190 (55.63)	2.760 (70.10)	3.320 (84.33)	4.100 (104.14)	4.880 (123.95)
TF		2.750 (69.85)	3.375 (85.73)	3.875 (98.43)	4.687 (119.08)	5.437 (138.10)	6.625 (168.28)	7.625 (193.68)
UF		3.375 (85.73)	4.125 (104.78)	4.625 (117.48)	5.500 (139.70)	6.250 (158.75)	7.625 (193.68)	8.625 (219.08)
VF	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)
	O.S.	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)
XX	Std.	7/16 - 20	7/16 - 20	7/16 - 20	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14
	O.S.	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14	1 - 14	1 1/4 - 12
Y	Std.	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)	2.437 (61.90)	2.437 (61.90)	2.437 (61.90)	2.875 (73.03)
	O.S.	2.375 (60.33)	2.375 (60.33)	2.375 (60.33)	2.687 (68.25)	2.687 (68.25)	2.687 (68.25)	3.125 (79.38)
ZF	Std.	5.000 (127.00)	5.000 (127.00)	5.125 (130.18)	6.250 (158.75)	6.250 (158.75)	6.500 (165.10)	7.375 (187.33)
	O.S.	5.375 (136.53)	5.375 (136.53)	5.500 (139.70)	6.500 (165.10)	6.500 (165.10)	6.750 (171.45)	7.625 (193.68)

- **NFPA (MP1) 06 Cap Fixed Clevis Mount** available in 1-1/2" thru 8" bore sizes.
- **Precision machined 300 Series stainless steel components.**
- **Cylinders rated to 250 PSI air, 400 PSI hydraulic (non-shock).**
- **Designed for non-lube service.**
- **Switches available on all bore sizes.**  
(See pages ACT-2-34/35 for ordering information.)



### Cylinder Order Information

S	Series SS
D	Series D

Bore	Single Rod End
1 1/2"	C
2"	D
2 1/2"	E
3 1/4"	F
4"	G
5"	L
6"	J
8"	M

Full Inches in Strokes	
00	0" Stroke
01	1" Stroke
02	2" Stroke
03	3" Stroke
04	4" Stroke
05	5" Stroke
06	6" Stroke
...	...
99	99" Stroke
xx	Special

Fractional Increments of Stroke			
A	0"	J	1/2"
B	1/16"	K	9/16"
C	1/8"	M	5/8"
D	3/16"	N	11/16"
E	1/4"	P	3/4"
F	5/16"	R	13/16"
G	3/8"	S	7/8"
H	7/16"	T	15/16"
X	Special		

Rod Size & Style			
Standard		Oversized	
A	Male KK	H	Male KK
B	Male CC*	J	Male CC
C	Full Dia. Thd.	K	Full Dia. Thd.
D	Female XX	M	Female XX
E	Studded	N	Studded
X	Special		

\*On 1 1/2", 2" & 2 1/2" Bore Sizes with 5/8" Rod, CC = 7/16 - 20 (NFPA)

No Options		00
Magnetic Piston Only**		90
Special <sup>Δ</sup>		98

\*\*See ACT-24/35.  
<sup>Δ</sup>For any cylinder modifications not listed use "98" and please specify.

Optional Seals	
No Option	A
Viton Seals	1
Air/Oil Seal	3
Metallic Rod Scraper	5
Soft Touch	6
Special	X

Cushions				
Needle Position	1	2'	3	4
No Cushions	A			
Head Only	B	C	D	E
Cap Only	G	H	J	K
Head and Cap	N	M	P	R
Fixed	U			
Special	X			

<sup>1</sup>Standard position

Ports				
Position	1'	2	3	4
Standard	A	B	C	D
Oversized*	E	G	H	J
Special	X			

<sup>1</sup>Standard position  
\*NFPA

Mounting Options			
01	Basic (MX0)	10	Head Square (ME3)*
02	Bottom Tap (MS4)	11	Cap Square (ME4)*
04	Front Flange (MF1)	15	Head Trunnion (MT1)
05	Rear Flange (MF2)	16	Cap Trunnion (MT2)
<b>06</b>	<b>Cap Fixed Clevis (MP1)</b>	<b>XX</b>	<b>Special</b>

\*8" Bores Only

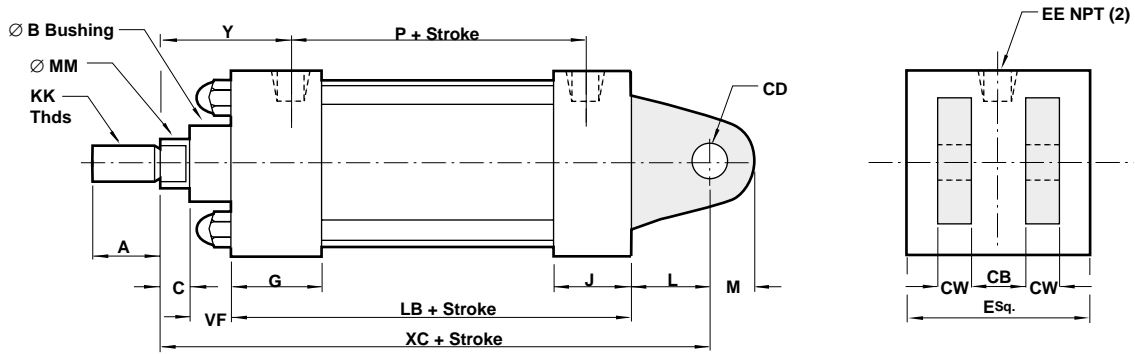
1	2
4	3

Port and Cushion Needle Positions  
(As viewed from rod end)

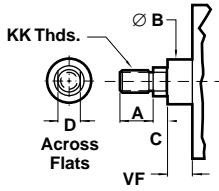
See ACT-2-26 for complete instructions on how to order cylinders.

# Series SS Actuators

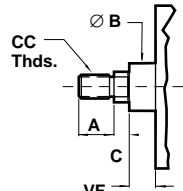
All Dimensions in Inches (mm)



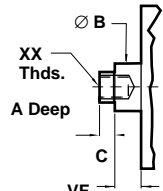
## Standard & Optional Rod Ends



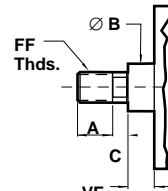
**Style #1**  
(Small Male)



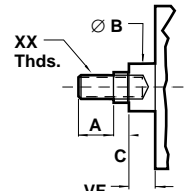
**Style #2**  
(Optional Male)



**Style #3**  
(Small Female)



**Style #4**  
(Optional Full Diameter Threads)



**Style #5**  
(Optional Studded)

Dimension		1 1/2" Bore (38.10)	2" Bore (50.80)	2 1/2" Bore (63.50)	3 1/4" Bore (82.55)	4" Bore (101.60)	5" Bore (127.00)	6" Bore (152.40)	8" Bore (203.20)
ø Rod	Std.	5/8" (15.88)	5/8" (15.88)	5/8" (15.88)	1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)	1 3/8" (34.93)
	O.S.	1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/4" (44.45)	1 3/4" (44.45)
A	Std.	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)
	O.S.	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)	2.000 (50.80)
B	Std.	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	2.000 (50.80)	2.000 (50.80)
	O.S.	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)	2.375 (60.33)	2.375 (60.33)
C	Std.	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)
	O.S.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)	.750 (19.05)
CB		.750 (19.05)	.750 (19.05)	.750 (19.05)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)	1.500 (38.10)
CC	Std.	7/16 - 20	7/16 - 20	7/16 - 20	7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12	1 1/4 - 12
	O.S.	7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12	1 1/4 - 12	1 1/4 - 12	1 1/2 - 12	1 1/2 - 12
CD		.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.000 (25.40)	1.000 (25.40)
CW		.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)	.750 (19.05)
D	Std.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.812 (20.62)	.812 (20.62)	.812 (20.62)	1.125 (28.58)	1.125 (28.58)
	O.S.	.812 (20.62)	.812 (20.62)	.812 (20.62)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)	1.500 (38.10)
E		2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)	5.500 (139.70)	6.500 (165.10)	8.500 (215.90)
EE	Std.	.250 (6.35)	.250 (6.35)	.250 (6.35)	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)
	O.S.	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)
FF	Std.	5/8 - 18	5/8 - 18	5/8 - 18	1 - 14	1 - 14	1 - 14	1 3/8 - 12	1 3/8 - 12
	O.S.	1 - 14	1 - 14	1 - 14	1 3/8 - 12	1 3/8 - 12	1 3/8 - 12	1 3/4 - 12	1 3/4 - 12
G		1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)	2.000 (50.80)	2.000 (50.80)
J		1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)
KK	Std.	1/2 - 20	1/2 - 20	1/2 - 20	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14
	O.S.	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14	1 - 14	1 1/4 - 12	1 1/4 - 12
L		.750 (19.05)	.750 (19.05)	.750 (19.05)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)	1.500 (38.10)
LB		3.625 (92.08)	3.625 (92.08)	3.750 (95.25)	4.250 (107.95)	4.250 (107.95)	4.500 (114.30)	5.000 (127.00)	5.125 (130.18)
M		.625 (15.88)	.625 (15.88)	.625 (15.88)	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)
P		2.125 (53.98)	2.125 (53.98)	2.250 (57.15)	2.625 (66.68)	2.625 (66.68)	2.875 (73.03)	3.000 (76.20)	3.125 (79.38)
VF	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)
	O.S.	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)	1.125 (28.58)
XC	Std.	5.375 (136.53)	5.375 (136.53)	5.500 (139.70)	6.875 (174.63)	6.875 (174.63)	7.125 (180.98)	8.125 (206.38)	8.250 (209.55)
	O.S.	5.750 (146.05)	5.750 (146.05)	5.875 (149.23)	7.125 (180.98)	7.125 (180.98)	7.375 (187.33)	8.375 (212.73)	8.500 (215.90)
XX	Std.	7/16 - 20	7/16 - 20	7/16 - 20	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14
	O.S.	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14	1 - 14	1 1/4 - 12	1 1/4 - 12
Y	Std.	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)	2.437 (61.90)	2.437 (61.90)	2.437 (61.90)	2.875 (73.03)	2.875 (73.03)
	O.S.	2.375 (60.33)	2.375 (60.33)	2.375 (60.33)	2.687 (68.25)	2.687 (68.25)	2.687 (68.25)	3.125 (79.38)	3.125 (79.38)

## Actuator with 10 (ME3) Head Square and Actuator with 11 (ME4) Cap Square

- **NFPA (ME3) 10 Head Square Mount and NFPA (ME4) 11 Cap Square Mount available in 8" bore size only.**
- **Precision machined 300 Series stainless steel components.**
- **Cylinders rated to 250 PSI air, 400 PSI hydraulic (non-shock).**
- **Designed for non-lube service.**
- **Switches available on all bore sizes.**  
(See pages ACT-2-34/35 for ordering information.)



### Cylinder Order Information

S	Series SS
D	Series D

Bore	Single Rod End
8"	M

Full Inches in Strokes	
00	0" Stroke
01	1" Stroke
02	2" Stroke
03	3" Stroke
04	4" Stroke
05	5" Stroke
06	6" Stroke
...	...
99	99" Stroke
xx	Special

Fractional Increments of Stroke			
A	0"	J	1/2"
B	1/16"	K	9/16"
C	1/8"	M	5/8"
D	3/16"	N	11/16"
E	1/4"	P	3/4"
F	5/16"	R	13/16"
G	3/8"	S	7/8"
H	7/16"	T	15/16"
X	Special		

Rod Size & Style			
Standard		Oversized	
A	Male KK	H	Male KK
B	Male CC*	J	Male CC
C	Full Dia. Thd.	K	Full Dia. Thd.
D	Female XX	M	Female XX
E	Studded	N	Studded
X	Special		

No Options	00
Magnetic Piston Only**	90
Special <sup>a</sup>	98

\*\*See ACT-2-34/35.  
<sup>a</sup>For any cylinder modifications not listed use "98" and please specify.

Optional Seals				
No Option	A			
Viton Seals	1			
Air/Oil Seal	3			
Metallic Rod Scraper	5			
Soft Touch	6			
Special	X			

Cushions				
Needle Position	1	2 <sup>1</sup>	3	4
No Cushions	A			
Head Only	B	C	D	E
Cap Only	G	H	J	K
Head and Cap	N	M	P	R
Fixed	U			
Special	X			

<sup>1</sup>Standard position

Ports				
Position	1 <sup>1</sup>	2	3	4
Standard	A	B	C	D
Oversized*	E	G	H	J
Special	X			

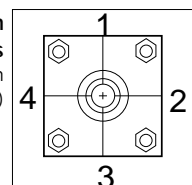
<sup>1</sup>Standard position  
\*NFPA

Mounting Options			
01	Basic (MX0)	10	Head Square (ME3)*
02	Bottom Tap (MS4)	11	Cap Square (ME4)*
04	Front Flange (MF1)	15	Head Trunnion (MT1)
05	Rear Flange (MF2)	16	Cap Trunnion (MT2)
06	Cap Fixed Clevis (MP1)	XX	Special

\*8" Bores Only

\*On 1 1/2", 2" & 2 1/2" Bore Sizes with 5/8" Rod, CC = 7/16 - 20 (NFPA)

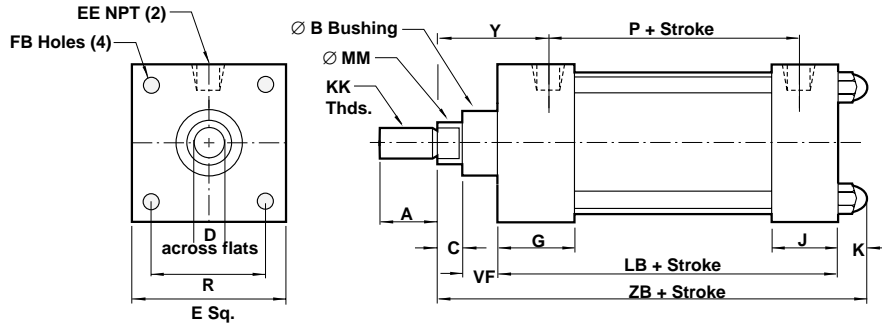
**Port and Cushion Needle Positions**  
(As viewed from rod end)



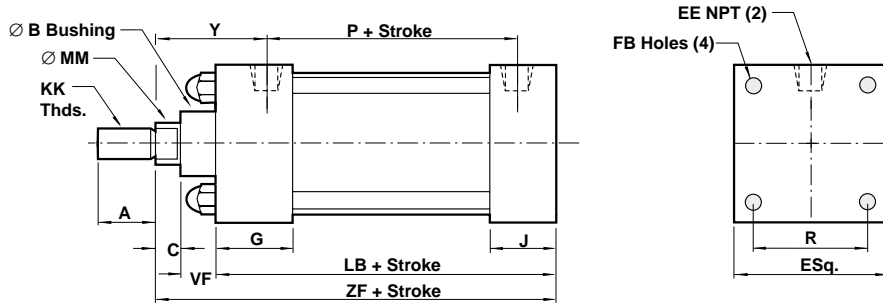
See ACT-2-26 for complete instructions on how to order cylinders.



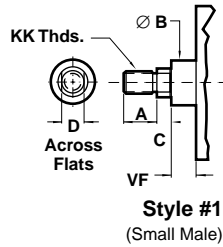
10 (ME3)



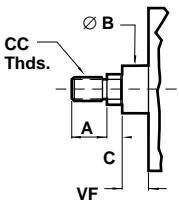
11 (ME4)



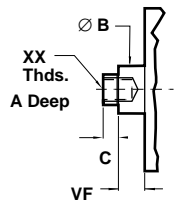
Standard & Optional Rod Ends



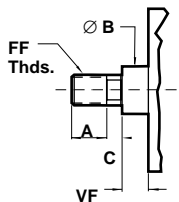
Style #1  
(Small Male)



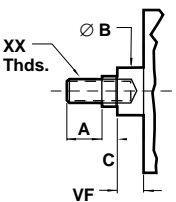
Style #2  
(Optional Male)



Style #3  
(Small Female)



Style #4  
(Optional Full Diameter Threads)



Style #5  
(Optional Studded)

Dimension	10 (ME3) Head Square		11 (ME4) Cap Square	
	8" Bore (203.20)			
Ø Rod (MM)	Std.	1 3/8" (34.93)	1 3/8" (34.93)	1 3/8" (34.93)
	O.S.	1 3/4" (44.45)	1 3/4" (44.45)	1 3/4" (44.45)
A	Std.	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)
	O.S.	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)
B	Std.	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)
	O.S.	2.375 (60.33)	2.375 (60.33)	2.375 (60.33)
C	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)
	O.S.	.750 (19.05)	.750 (19.05)	.750 (19.05)
CC	Std.	1 1/4 - 12	1 1/4 - 12	1 1/4 - 12
	O.S.	1 1/2 - 12	1 1/2 - 12	1 1/2 - 12
D	Std.	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)
	O.S.	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)
E		8.500 (215.90)	8.500 (215.90)	8.500 (215.90)
EE	Std.	.500 (12.70)	.500 (12.70)	.500 (12.70)
	O.S.	.750 (19.05)	.750 (19.05)	.750 (19.05)
FB		.687 (17.45)	.687 (17.45)	.687 (17.45)
FF	Std.	1 3/8 - 12	1 3/8 - 12	1 3/8 - 12
	O.S.	1 3/4 - 12	1 3/4 - 12	1 3/4 - 12
G		2.000 (50.80)	2.000 (50.80)	2.000 (50.80)
J		1.750 (44.45)	1.750 (44.45)	1.750 (44.45)
K		1.000 (25.40)	1.000 (25.40)	1.000 (25.40)
KK	Std.	1 - 14	1 - 14	1 - 14
	O.S.	1 1/4 - 12	1 1/4 - 12	1 1/4 - 12
LB		5.125 (130.18)	5.125 (130.18)	5.125 (130.18)
P		3.125 (79.38)	3.125 (79.38)	3.125 (79.38)
R		7.570 (192.28)	7.570 (192.28)	7.570 (192.28)
VF	Std.	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)
	O.S.	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)
XX	Std.	1 - 14	1 - 14	1 - 14
	O.S.	1 1/4 - 12	1 1/4 - 12	1 1/4 - 12
Y	Std.	2.875 (73.03)	2.875 (73.03)	2.875 (73.03)
	O.S.	3.125 (79.38)	3.125 (79.38)	3.125 (79.38)
ZB	Std.	7.750 (196.85)	-	-
	O.S.	8.000 (203.30)	-	-
ZF	Std.	-	6.750 (171.45)	6.750 (171.45)
	O.S.	-	7.000 (177.80)	7.000 (177.80)

- **NFPA (MT1) 15 Head Trunnion Mount** available in 1-1/2" thru 8" bore sizes.
- **Precision machined 300 Series stainless steel components.**
- **Cylinders rated to 250 PSI air, 400 PSI hydraulic (non-shock).**
- **Designed for non-lube service.**
- **Switches available on all bore sizes.**  
(See pages ACT-2-34/35 for ordering information.)



### Cylinder Order Information

1	2	3	4	5	6	7	8	9	10	11	12	13
---	---	---	---	---	---	---	---	---	----	----	----	----

S	Series SS
D	Series D

Bore	Single Rod End
1 1/2"	C
2"	D
2 1/2"	E
3 1/4"	F
4"	G
5"	L
6"	J
8"	M

Full Inches in Strokes	
00	0" Stroke
01	1" Stroke
02	2" Stroke
03	3" Stroke
04	4" Stroke
05	5" Stroke
06	6" Stroke
...	...
99	99" Stroke
xx	Special

Fractional Increments of Stroke			
A	0"	J	1/2"
B	1/16"	K	9/16"
C	1/8"	M	5/8"
D	3/16"	N	11/16"
E	1/4"	P	3/4"
F	5/16"	R	13/16"
G	3/8"	S	7/8"
H	7/16"	T	15/16"
X	Special		

Rod Size & Style			
Standard		Oversized	
A	Male KK	H	Male KK
B	Male CC*	J	Male CC
C	Full Dia. Thd.	K	Full Dia. Thd.
D	Female XX	M	Female XX
E	Studded	N	Studded
X	Special		

\*On 1 1/2", 2" & 2 1/2" Bore Sizes with 5/8" Rod, CC = 7/16 - 20 (NFPA)

No Options		00
Magnetic Piston Only**		90
Special <sup>†</sup>		98

\*\*See ACT-2-34/35.  
<sup>†</sup>For any cylinder modifications not listed use "98" and please specify.

Optional Seals	
No Option	A
Viton Seals	1
Air/Oil Seal	3
Metallic Rod Scraper	5
Soft Touch	6
Special	X

Cushions				
Needle Position	1	2	3'	4
No Cushions	A			
Head Only	B	N/A	D	N/A
Cap Only	G	H	J	K
Head and Cap	N	N/A	P	N/A
Fixed	U			
Special	X			

<sup>†</sup>Standard position

Ports				
Position	1'	2	3	4
Standard	A	B	C	D
Oversized*	E	G	H	J
Special	X			

<sup>†</sup>Standard position  
\*NFPA

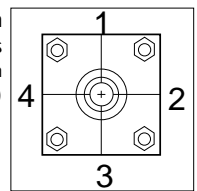
  

Mounting Options			
01	Basic (MX0)	10	Head Square (ME3)*
02	Bottom Tap (MS4)	11	Cap Square (ME4)*
04	Front Flange (MF1)	15	<b>Head Trunnion (MT1)</b>
05	Rear Flange (MF2)	16	Cap Trunnion (MT2)
06	Cap Fixed Clevis (MP1)	XX	Special

\*8" Bores Only

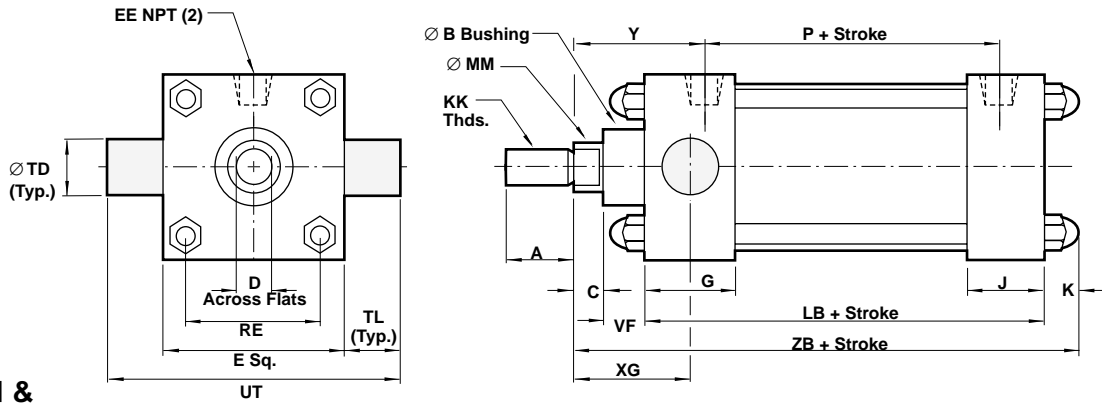
Port and Cushion Needle Positions	
(As viewed from rod end)	
1	2
4	3



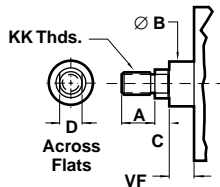
See ACT-2-26 for complete instructions on how to order cylinders.

# Series SS Actuators

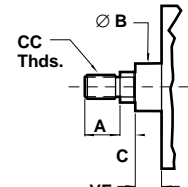
All Dimensions in Inches (mm)



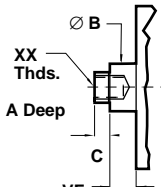
## Standard & Optional Rod Ends



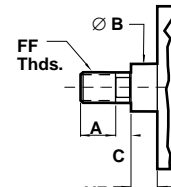
**Style #1**  
(Small Male)



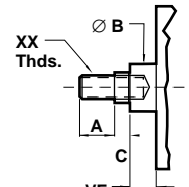
**Style #2**  
(Optional Male)



**Style #3**  
(Small Female)



**Style #4**  
(Optional Full Diameter Threads)



**Style #5**  
(Optional Studded)

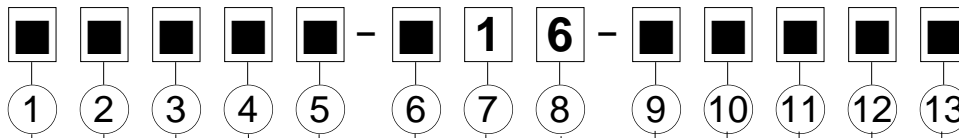
Dimension		1 1/2" Bore (38.10)	2" Bore (50.80)	2 1/2" Bore (63.50)	3 1/4" Bore (82.55)	4" Bore (101.60)	5" Bore (127.00)	6" Bore (152.40)	8" Bore (203.20)
$\varnothing$ Rod (MM)	Std.	5/8" (15.88)	5/8" (15.88)	5/8" (15.88)	1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)	1 3/8" (34.93)
	O.S.	1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/4" (44.45)	1 3/4" (44.45)
A	Std.	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)
	O.S.	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)	2.000 (50.80)
B	Std.	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	2.000 (50.80)	2.000 (50.80)
	O.S.	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)	2.375 (60.33)	2.375 (60.33)
C	Std.	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)
	O.S.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)	.750 (19.05)
CC	Std.	7/16 - 20	7/16 - 20	7/16 - 20	7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12	1 1/4 - 12
	O.S.	7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12	1 1/4 - 12	1 1/4 - 12	1 1/2 - 12	1 1/2 - 12
D	Std.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.812 (20.62)	.812 (20.62)	.812 (20.62)	1.125 (28.58)	1.125 (28.58)
	O.S.	.812 (20.62)	.812 (20.62)	.812 (20.62)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)	1.500 (38.10)
E		2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)	5.500 (139.70)	6.500 (165.10)	8.500 (215.90)
EE	Std.	.250 (6.35)	.250 (6.35)	.250 (6.35)	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)
	O.S.	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)
FF	Std.	5/8 - 18	5/8 - 18	5/8 - 18	1 - 14	1 - 14	1 - 14	1 3/8 - 12	1 3/8 - 12
	O.S.	1 - 14	1 - 14	1 - 14	1 3/8 - 12	1 3/8 - 12	1 3/8 - 12	1 3/4 - 12	1 3/4 - 12
G		1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)	2.000 (50.80)	2.000 (50.80)
J		1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)
K		.469 (11.91)	.531 (13.49)	.531 (13.49)	.625 (15.88)	.625 (15.88)	.830 (21.08)	.830 (21.08)	1.000 (25.40)
KK	Std.	1/2 - 20	1/2 - 20	1/2 - 20	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14
	O.S.	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14	1 - 14	1 1/4 - 12	1 1/4 - 12
LB		3.625 (92.08)	3.625 (92.08)	3.750 (95.25)	4.250 (107.95)	4.250 (107.95)	4.500 (114.30)	5.000 (127.00)	5.125 (130.18)
P		2.125 (53.98)	2.125 (53.98)	2.250 (57.15)	2.625 (66.68)	2.625 (66.68)	2.875 (73.03)	3.000 (76.20)	3.125 (79.38)
RE		1.430 (36.32)	1.840 (46.74)	2.190 (55.63)	2.760 (70.10)	3.320 (84.33)	4.100 (104.14)	4.880 (123.95)	6.435 (163.45)
TD		1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)
TL		1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)
UT		4.000 (101.60)	4.500 (114.30)	5.000 (127.00)	5.750 (146.05)	6.500 (165.10)	7.500 (190.50)	9.250 (234.95)	11.250 (285.75)
VF	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)
	O.S.	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)	1.125 (28.58)
XG	Std.	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)	2.250 (57.15)	2.250 (57.15)	2.250 (57.15)	2.625 (66.68)	2.625 (66.68)
	O.S.	2.125 (53.98)	2.125 (53.98)	2.125 (53.98)	2.500 (63.50)	2.500 (63.50)	2.500 (63.50)	2.875 (73.03)	2.875 (73.03)
XX	Std.	7/16 - 20	7/16 - 20	7/16 - 20	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14
	O.S.	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14	1 - 14	1 1/4 - 12	1 1/4 - 12
Y	Std.	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)	2.437 (61.90)	2.437 (61.90)	2.437 (61.90)	2.875 (73.03)	2.875 (73.03)
	O.S.	2.375 (60.33)	2.375 (60.33)	2.375 (60.33)	2.687 (68.25)	2.687 (68.25)	2.687 (68.25)	3.125 (79.38)	3.125 (79.38)
ZB	Std.	5.094 (129.39)	5.156 (130.96)	5.281 (134.14)	6.250 (158.75)	6.250 (158.75)	6.705 (170.31)	7.455 (189.36)	7.750 (196.85)
	O.S.	5.469 (138.91)	5.531 (140.49)	5.656 (143.66)	6.500 (165.10)	6.500 (165.10)	6.955 (176.66)	7.705 (195.71)	8.000 (203.20)



- **NFPA (MT2) 16 Cap Trunnion Mount** available in 1-1/2" thru 8" bore sizes.
- **Precision machined 300 Series stainless steel components.**
- **Cylinders rated to 250 PSI air, 400 PSI hydraulic (non-shock).**
- **Designed for non-lube service.**
- **Switches available on all bore sizes.**  
(See pages ACT-2-34/35 for ordering information.)



### Cylinder Order Information



S	Series SS
D	Series D

Bore	Single Rod End
1 1/2"	C
2"	D
2 1/2"	E
3 1/4"	F
4"	G
5"	L
6"	J
8"	M

Full Inches in Strokes	
00	0" Stroke
01	1" Stroke
02	2" Stroke
03	3" Stroke
04	4" Stroke
05	5" Stroke
06	6" Stroke
...	...
99	99" Stroke
xx	Special

Fractional Increments of Stroke			
A	0"	J	1/2"
B	1/16"	K	9/16"
C	1/8"	M	5/8"
D	3/16"	N	11/16"
E	1/4"	P	3/4"
F	5/16"	R	13/16"
G	3/8"	S	7/8"
H	7/16"	T	15/16"
X	Special		

Rod Size & Style			
Standard		Oversized	
A	Male KK	H	Male KK
B	Male CC*	J	Male CC
C	Full Dia. Thd.	K	Full Dia. Thd.
D	Female XX	M	Female XX
E	Studded	N	Studded
X	Special		

\*On 1 1/2", 2" & 2 1/2" Bore Sizes with 5/8" Rod, CC = 7/16 - 20 (NFPA)

No Options	00
Magnetic Piston Only**	90
Special*	98

\*\*See ACT-2-34/35.

^For any cylinder modifications not listed use "98" and please specify.

Optional Seals	
No Option	A
Viton Seals	1
Air/Oil Seal	3
Metallic Rod Scraper	5
Soft Touch	6
Special	X

Cushions				
Needle Position	1	2	3 <sup>1</sup>	4
No Cushions	A			
Head Only	B	C	D	E
Cap Only	G	N/A	J	N/A
Head and Cap	N	N/A	P	N/A
Fixed	U			
Special	X			

<sup>1</sup>Standard position

Ports				
Position	1 <sup>1</sup>	2	3	4
Standard	A	B	C	D
Oversized*	E	G	H	J
Special	X			

<sup>1</sup>Standard position

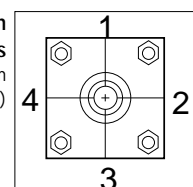
\*NFPA

Mounting Options			
01	Basic (MX0)	10	Head Square (ME3)*
02	Bottom Tap (MS4)	11	Cap Square (ME4)*
04	Front Flange (MF1)	15	Head Trunnion (MT1)
05	Rear Flange (MF2)	16	Cap Trunnion (MT2)
06	Cap Fixed Clevis (MP1)	XX	Special

\*8" Bores Only

#### Port and Cushion Needle Positions

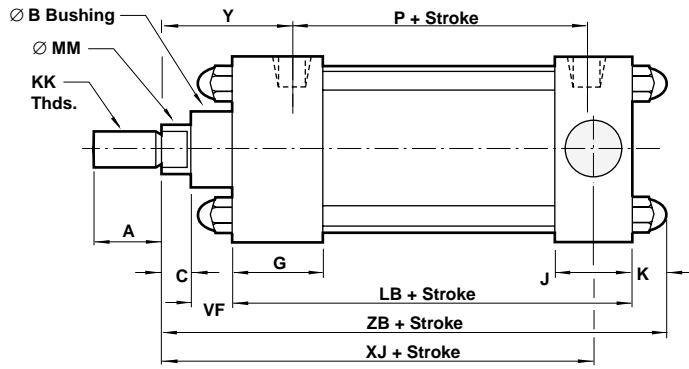
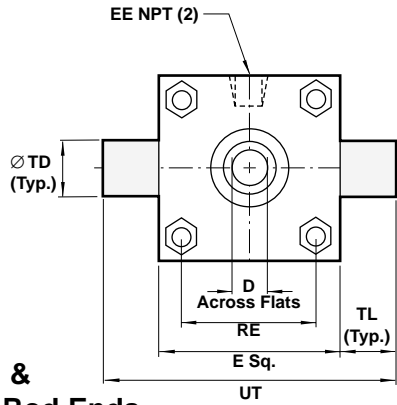
(As viewed from rod end)



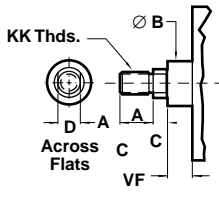
See ACT-2-26 for complete instructions on how to order cylinders.

# Series SS Actuators

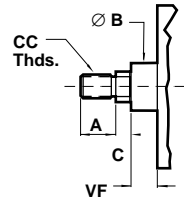
All Dimensions in Inches (mm)



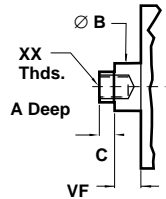
## Standard & Optional Rod Ends



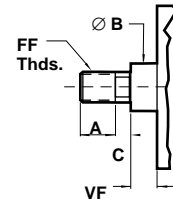
**Style #1**  
(Small Male)



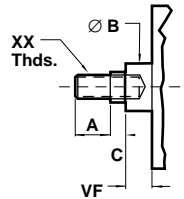
**Style #2**  
(Optional Male)



**Style #3**  
(Small Female)



**Style #4**  
(Optional Full Diameter Threads)



**Style #5**  
(Optional Studded)

Dimension		1 1/2" Bore (38.10)	2" Bore (50.80)	2 1/2" Bore (63.50)	3 1/4" Bore (82.55)	4" Bore (101.60)	5" Bore (127.00)	6" Bore (152.40)	8" Bore (203.20)
Ø Rod (MM)	Std.	5/8" (15.88)	5/8" (15.88)	5/8" (15.88)	1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)	1 3/8" (34.93)
	O.S.	1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/4" (44.45)	1 3/4" (44.45)
A	Std.	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)
	O.S.	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)	2.000 (50.80)
B	Std.	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	2.000 (50.80)	2.000 (50.80)
	O.S.	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)	2.375 (60.33)	2.375 (60.33)
C	Std.	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)
	O.S.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)	.750 (19.05)
CC	Std.	7/16 - 20	7/16 - 20	7/16 - 20	7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12	1 1/4 - 12
	O.S.	7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12	1 1/4 - 12	1 1/4 - 12	1 1/2 - 12	1 1/2 - 12
D	Std.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.812 (20.62)	.812 (20.62)	.812 (20.62)	1.125 (28.58)	1.125 (28.58)
	O.S.	.812 (20.62)	.812 (20.62)	.812 (20.62)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)	1.500 (38.10)
E		2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)	5.500 (139.70)	6.500 (165.10)	8.500 (215.90)
EE	Std.	.250 (6.35)	.250 (6.35)	.250 (6.35)	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)
	O.S.	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)
FF	Std.	5/8 - 18	5/8 - 18	5/8 - 18	1 - 14	1 - 14	1 - 14	1 3/8 - 12	1 3/8 - 12
	O.S.	1 - 14	1 - 14	1 - 14	1 3/8 - 12	1 3/8 - 12	1 3/8 - 12	1 3/4 - 12	1 3/4 - 12
G		1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)	2.000 (50.80)	2.000 (50.80)
J		1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)	1.500 (38.10)
K		.469 (11.91)	.531 (13.49)	.531 (13.49)	.625 (15.88)	.625 (15.88)	.830 (21.08)	.830 (21.08)	1.000 (25.40)
KK	Std.	1/2 - 20	1/2 - 20	1/2 - 20	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14
	O.S.	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14	1 - 14	1 1/4 - 12	1 1/4 - 12
LB		3.625 (92.08)	3.625 (92.08)	3.750 (95.25)	4.250 (107.95)	4.250 (107.95)	4.500 (114.30)	5.000 (127.00)	5.125 (130.18)
P		2.125 (53.98)	2.125 (53.98)	2.250 (57.15)	2.625 (66.68)	2.625 (66.68)	2.875 (73.03)	3.000 (76.20)	3.125 (79.38)
RE		1.430 (36.32)	1.840 (46.74)	2.190 (55.63)	2.760 (70.10)	3.320 (84.33)	4.100 (104.14)	4.880 (123.95)	6.435 (163.45)
TD		1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)
TL		1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)
UT		4.000 (101.60)	4.500 (114.30)	5.000 (127.00)	5.750 (146.05)	6.500 (165.10)	7.500 (190.50)	9.250 (234.95)	11.250 (285.75)
VF	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (22.23)	1.000 (22.23)
	O.S.	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)	1.125 (28.58)
XJ	Std.	4.125 (104.78)	4.125 (104.78)	4.250 (107.95)	5.000 (127.00)	5.000 (127.00)	5.250 (133.35)	5.875 (149.23)	6.000 (152.40)
	O.S.	4.500 (114.30)	4.500 (114.30)	4.625 (117.48)	5.250 (133.35)	5.250 (133.35)	5.500 (139.70)	6.125 (155.58)	6.250 (158.75)
XX	Std.	7/16 - 20	7/16 - 20	7/16 - 20	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14
	O.S.	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14	1 - 14	1 1/4 - 12	1 1/4 - 12
Y	Std.	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)	2.437 (61.90)	2.437 (61.90)	2.437 (61.90)	2.875 (73.03)	2.875 (73.03)
	O.S.	2.375 (60.33)	2.375 (60.33)	2.375 (60.33)	2.687 (68.25)	2.687 (68.25)	2.687 (68.25)	3.125 (79.38)	3.125 (79.38)
ZB	Std.	5.094 (129.39)	5.156 (130.96)	5.281 (134.14)	6.250 (158.75)	6.250 (158.75)	6.705 (170.31)	7.455 (189.36)	7.750 (196.85)
	O.S.	5.469 (138.91)	5.531 (140.49)	5.656 (143.66)	6.500 (165.10)	6.500 (165.10)	6.955 (176.66)	7.705 (195.71)	8.000 (203.20)

- **NFPA (MX0) 01 Basic Double Rod End Cylinder** available in 1-1/2" thru 8" bore size.
- **Precision machined 300 Series stainless steel components.**
- **Cylinders rated to 250 PSI air, 400 PSI hydraulic (non-shock).**
- **Designed for non-lube service.**
- **Switches available on all bore sizes.**  
(See pages ACT-2-34/35 for ordering information.)



### Cylinder Order Information

	■	■	■	■	■	-	■	0	1	-	■	■	■	■	
	1	2	3	4	5		6	7	8		9	10	11	12	13

S	Series SS
D	Series D

Bore	Double Rod End
1 1/2"	Q
2"	R
2 1/2"	S
3 1/4"	T
4"	U
5"	Y
6"	W
8"	Z

Full Inches in Strokes	
00	0" Stroke
01	1" Stroke
02	2" Stroke
03	3" Stroke
04	4" Stroke
05	5" Stroke
06	6" Stroke
...	...
99	99" Stroke
xx	Special

Fractional Increments of Stroke			
A	0"	J	1/2"
B	1/16"	K	9/16"
C	1/8"	M	5/8"
D	3/16"	N	11/16"
E	1/4"	P	3/4"
F	5/16"	R	13/16"
G	3/8"	S	7/8"
H	7/16"	T	15/16"
X	Special		

Rod Size & Style	
Standard	Oversized
A Male KK	H Male KK
B Male CC*	J Male CC
C Full Dia. Thd.	K Full Dia. Thd.
D Female XX	M Female XX
E Studded	N Studded
X Special	

No Options	00
Magnetic Piston Only**	90
Special <sup>1</sup>	98

\*\*See ACT-2-34/35.  
<sup>1</sup>For any cylinder modifications not listed use "98" and please specify.

Optional Seals	
No Option	A
Viton Seals	1
Air/Oil Seal	3
Metallic Rod Scraper	5
Soft Touch	6
Special	X

Cushions				
Needle Position	1	2 <sup>1</sup>	3	4
No Cushions	A			
Head Only	B	C	D	E
Cap Only	G	H	J	K
Head and Cap	N	M	P	R
Fixed	U			
Special	X			

<sup>1</sup>Standard position

Ports				
Position	1 <sup>1</sup>	2	3	4
Standard	A	B	C	D
Oversized*	E	G	H	J
Special	X			

<sup>1</sup>Standard position  
<sup>\*</sup>NFPA

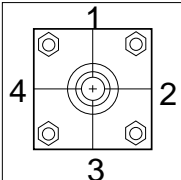
  

Mounting Options		
01 Basic (MX0)	10	Head Square (ME3)*
02 Bottom Tap (MS4)	15	Head Trunnion (MT1)
04 Front Flange (MF1)	XX	Special

\*8" Bores Only

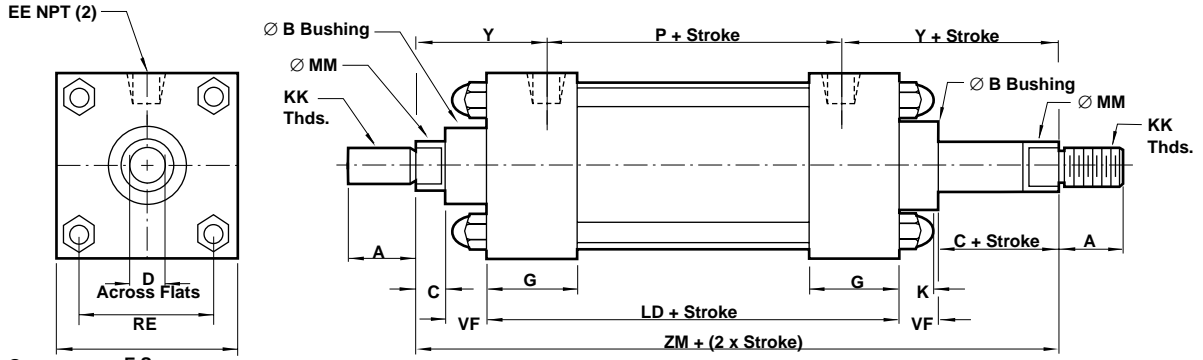
**Port and Cushion Needle Positions**  
(As viewed from rod end)



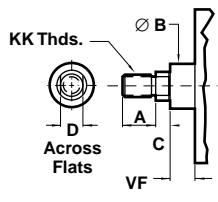
See ACT-2-26 for complete instructions on how to order cylinders.

# Series SS Actuators

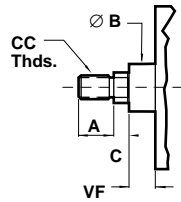
All Dimensions in Inches (mm)



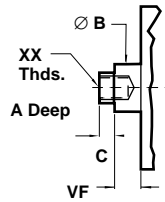
## Standard & Optional Rod Ends



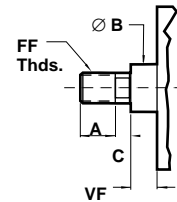
**Style #1**  
(Small Male)



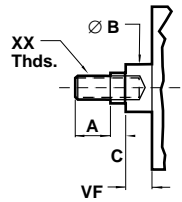
**Style #2**  
(Optional Male)



**Style #3**  
(Small Female)



**Style #4**  
(Optional Full Diameter Threads)



**Style #5**  
(Optional Studded)

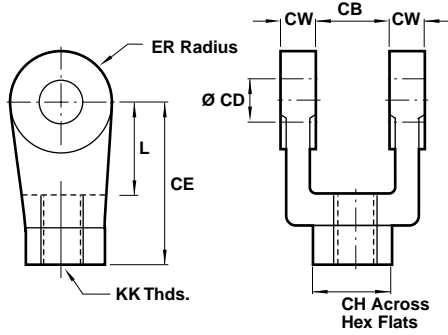
Dimension		1 1/2" Bore (38.10)	2" Bore (50.80)	2 1/2" Bore (63.50)	3 1/4" Bore (82.55)	4" Bore (101.60)	5" Bore (127.00)	6" Bore (152.40)	8" Bore (203.20)
ø Rod (mm)	Std.	5/8" (15.88)	5/8" (15.88)	5/8" (15.88)	1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)	1 3/8" (34.93)
	O.S.	1" (25.40)	1" (25.40)	1" (25.40)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/8" (34.93)	1 3/4" (44.45)	1 3/4" (44.45)
A	Std.	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)
	O.S.	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)	2.000 (50.80)
B	Std.	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	2.000 (50.80)	2.000 (50.80)
	O.S.	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)	2.375 (60.33)	2.375 (60.33)
C	Std.	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)
	O.S.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)	.750 (19.05)
CC	Std.	7/16 - 20	7/16 - 20	7/16 - 20	7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12	1 1/4 - 12
	O.S.	7/8 - 14	7/8 - 14	7/8 - 14	1 1/4 - 12	1 1/4 - 12	1 1/4 - 12	1 1/2 - 12	1 1/2 - 12
D	Std.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.812 (20.62)	.812 (20.62)	.812 (20.62)	1.125 (28.58)	1.125 (28.58)
	O.S.	.812 (20.62)	.812 (20.62)	.812 (20.62)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)	1.500 (38.10)
E		2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)	5.500 (139.70)	6.500 (165.10)	8.500 (215.90)
EE	Std.	.250 (6.35)	.250 (6.35)	.250 (6.35)	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)
	O.S.	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)
FF	Std.	5/8 - 18	5/8 - 18	5/8 - 18	1 - 14	1 - 14	1 - 14	1 3/8 - 12	1 3/8 - 12
	O.S.	1 - 14	1 - 14	1 - 14	1 3/8 - 12	1 3/8 - 12	1 3/8 - 12	1 3/4 - 12	1 3/4 - 12
G		1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)	2.000 (50.80)	2.000 (50.80)
K		.469 (11.91)	.531 (13.49)	.531 (13.49)	.625 (15.88)	.625 (15.88)	.830 (21.08)	.830 (21.08)	1.000 (25.40)
KK	Std.	1/2 - 20	1/2 - 20	1/2 - 20	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14
	O.S.	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14	1 - 14	1 1/4 - 12	1 1/4 - 12
LD		4.125 (104.78)	4.125 (104.78)	4.250 (107.95)	4.750 (120.65)	4.750 (120.65)	5.000 (127.00)	5.500 (139.70)	5.500 (139.70)
P		2.125 (53.98)	2.125 (53.98)	2.250 (57.15)	2.625 (66.68)	2.625 (66.68)	2.875 (73.03)	3.000 (76.20)	3.125 (79.38)
RE		1.430 (36.32)	1.840 (46.74)	2.190 (55.63)	2.760 (70.10)	3.320 (84.33)	4.100 (104.14)	4.880 (123.95)	6.435 (163.45)
VF	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (22.23)	1.000 (22.23)
	O.S.	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)	1.125 (28.58)
XX	Std.	7/16 - 20	7/16 - 20	7/16 - 20	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14
	O.S.	3/4 - 16	3/4 - 16	3/4 - 16	1 - 14	1 - 14	1 - 14	1 1/4 - 12	1 1/4 - 12
Y	Std.	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)	2.437 (61.90)	2.437 (61.90)	2.437 (61.90)	2.875 (73.03)	2.875 (73.03)
	O.S.	2.375 (60.33)	2.375 (60.33)	2.375 (60.33)	2.687 (68.25)	2.687 (68.25)	2.687 (68.25)	3.125 (79.38)	3.125 (79.38)
ZM	Std.	6.125 (155.58)	6.125 (155.58)	6.250 (158.75)	7.500 (190.50)	7.500 (190.50)	7.750 (196.85)	8.750 (222.25)	8.750 (222.25)
	O.S.	6.875 (174.63)	6.875 (174.63)	7.000 (177.80)	8.000 (203.20)	8.000 (203.20)	8.250 (209.55)	9.250 (234.95)	9.250 (234.95)



# Series SS Actuators

All Dimensions in Inches (mm)

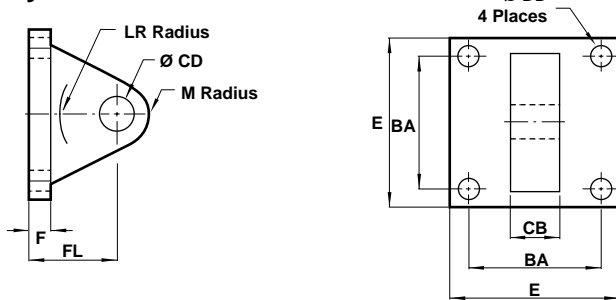
## Rod Clevis 303 Stainless Steel



## Rod Clevis Dimensions

	S-92-03		S-92-065		S-92-12		S-92-16	
CB	.750	(19.05)	1.250	(31.75)	1.500	(38.10)	2.000	(50.80)
CD	.500	(12.70)	.750	(19.05)	1.000	(25.40)	1.375	(34.93)
CE	1.500	(38.10)	2.375	(60.33)	3.125	(79.38)	4.125	(104.78)
CH	1.000	(25.40)	1.250	(31.75)	1.500	(38.10)	2.000	(50.80)
CW	.500	(12.70)	.625	(15.88)	.750	(19.05)	1.000	(25.40)
ER	.500	(12.70)	.750	(19.05)	1.000	(25.40)	1.375	(34.93)
KK	1/2-20		3/4-16		1-14		1 1/4-12	
L	.750	(19.05)	1.250	(31.75)	1.500	(38.10)	2.125	(53.98)

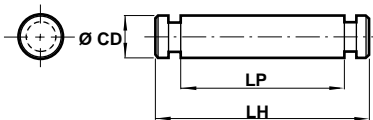
## Eye Bracket 304 Stainless Steel



## NFPA Eye Bracket Dimensions

	S-89-03A		S-89-065A		S-89-12A	
BA	1.625	(41.28)	2.562	(65.07)	3.250	(82.55)
CB	.750	(19.05)	1.250	(31.75)	1.500	(38.10)
CD	.500	(12.70)	.750	(19.05)	1.000	(25.40)
DD	.406	(10.31)	.531	(13.49)	.656	(16.66)
E	2.500	(63.50)	3.500	(88.90)	4.500	(114.30)
F	.375	(9.53)	.625	(15.88)	.750	(19.05)
FL	1.125	(28.58)	1.875	(47.63)	2.250	(57.15)
LR	.750	(19.05)	1.250	(31.75)	1.500	(38.10)
M	.500	(12.70)	.750	(19.05)	1.000	(25.40)

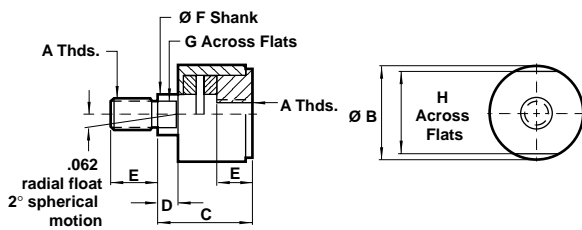
## NFPA Pin 303 Stainless Steel



## NFPA Pin Dimensions

	S-96-03A		S-96-065A		S-96-12A		S-96-16A	
CD	.500	(12.70)	.750	(19.05)	1.000	(25.40)	1.375	(34.93)
LH	2.219	(56.36)	3.125	(79.38)	3.750	(95.25)	5.625	(144.88)
LP	1.875	(47.63)	2.750	(69.85)	3.250	(82.55)	4.375	(111.13)

## Rod Alignment Coupler



## NFPA Rod Alignment Coupler Dimensions

	SC-107	SC-1-08	SC-1-12	SC-1-16
A	7/16-20	1/2 - 20	3/4 - 16	1-14
B	1.250(31.75)	1.250(31.75)	1.750(44.45)	2.500(63.50)
C	2.000(50.80)	2.000(50.80)	2.3125(58.72)	2.937(74.60)
D	.500(12.70)	.500(12.70)	.500(12.70)	.500(12.70)
E	.750 (19.05)	.750 (19.05)	1.125(28.58)	1.625(41.28)
F	.625(15.88)	.625(15.88)	.969(24.61)	1.375(34.93)
G	.563(12.70)	.563(12.70)	.812(20.62)	1.156(29.36)
H	1.125(28.58)	1.125(28.58)	1.500(38.10)	2.250(57.15)
Maximum Pull (lbs)	2.250	3.150	7.750	12.250

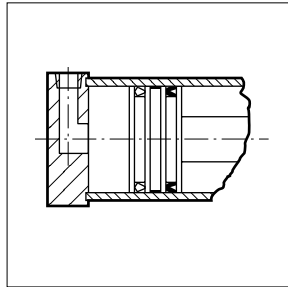
Made of 303 Stainless Steel, the Rod Alignment Coupler allows 1/16" of radial float and 2° of spherical movement. This prevents cylinder binding due to misalignment thus extending bearing and seal life, and permits greater tolerance between the center line of the cylinder and mating part for simplified installation.



## Optional Features

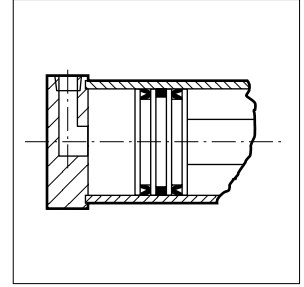
### Air/Oil Piston Seal

Prevents leakage past the seal in air/oil applications. This added protection is accomplished by using one loaded lip-type piston seal. TO ORDER: enter 3 in position 11 of the model number.



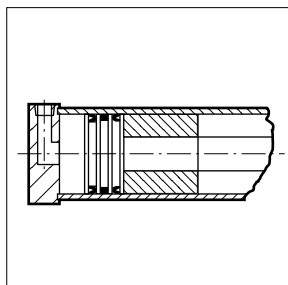
### 303 Stainless Steel Piston

When internal corrosion is a concern, specify the 303 Stainless Steel Piston.



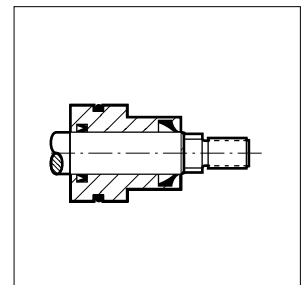
### Stop Tube

Provides increased stability to long stroke cylinders. TO ORDER: Indicate full working stroke in positions 3, 4 & 5 of the model number. Enter 98 in positions 12 & 13 of the model number and specify: 98 = \_\_\_\_\_ inches of stop tube.



### Metallic Rod Scraper

Aggressively scrapes foreign materials from the exposed portion of the piston rod during retract, thereby protecting the rod seal. TO ORDER: enter 5 in position 11 of the model number.

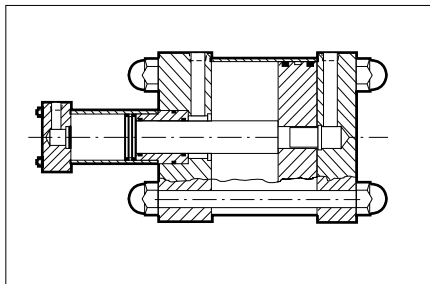


Optional features should be specified at the time of cylinder order. Enter 98 in positions 12 & 13 of the model number and specify: Example 98 = 303 stainless steel piston.

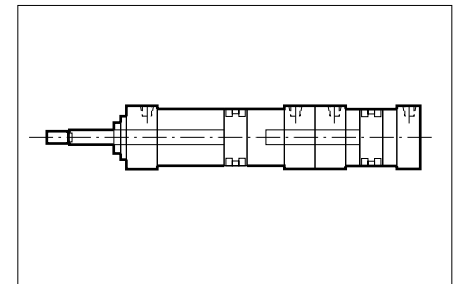
## Custom Cylinders

- Extra long cushions.
- Extremely low breakaway.
- High temperature.
- Stop tube.
- Spring extend/retract.
- Non-rotating rod.
- Oversized piston rods.

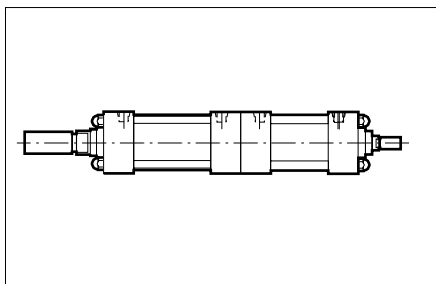
### Air-to-Air Booster/Pump



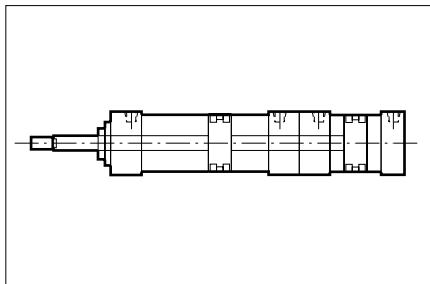
### Multi-Position Duplex



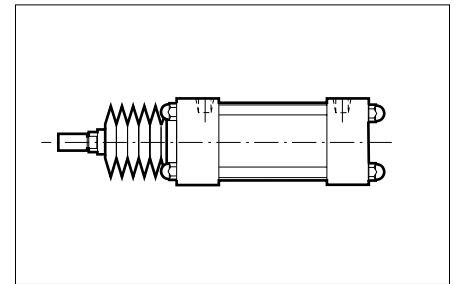
### Multi-Position Back-to-Back



### Force Multiplication Tandem



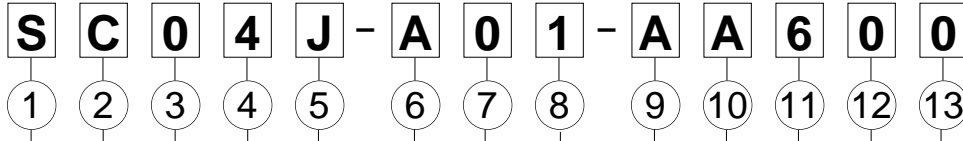
### Protective Rod Boot



Norgren designs and manufactures literally hundreds of specialty cylinders. We welcome the opportunity to provide you with a customized cylinder that meets the specific requirements of your application. For more information on how to order custom cylinders consult factory.



Cylinder Order Information for 1-1/2" to 8"



S	Series SS
D	Series D

Single Rod End	Bore	Double Rod End
C	1 1/2"	Q
D	2"	R
E	2 1/2"	S
F	3 1/4"	T
G	4"	U
L	5"	Y
J	6"	W
M	8"	Z

Full Inches in Strokes	
00	0" Stroke
01	1" Stroke
02	2" Stroke
03	3" Stroke
04	4" Stroke
05	5" Stroke
06	6" Stroke
...	...
99	99" Stroke
XX	Special

Fractional Increments of Stroke			
A	0"	J	1/2"
B	1/16"	K	9/16"
C	1/8"	M	5/8"
D	3/16"	N	11/16"
E	1/4"	P	3/4"
F	5/16"	R	13/16"
G	3/8"	S	7/8"
H	7/16"	T	15/16"
X	Special		

Rod Size & Style			
Standard		Oversized	
A	Male KK	H	Male KK
B	Male CC*	J	Male CC
C	Full Dia. Thd.	K	Full Dia. Thd.
D	Female XX	M	Female XX
E	Studded	N	Studded
X	Special		

\*On 1 1/2", 2" & 2 1/2" Bore Sizes with 5/8" Rod, CC = 7/16 - 20 (NFPA)

No Options	00
Magnetic Piston Only**	90
Special <sup>^</sup>	98

\*\*See ACT-2-34/35.

<sup>^</sup>For any cylinder modifications not listed use "98" and please specify.

Optional Seals	
No Option	A
Viton Seals	1
Air/Oil Seal	3
Metallic Rod Scraper	5
Soft Touch	6
Special	X

Cushions				
Needle Position	1	2'	3	4
No Cushions	A			
Head Only	B	C	D	E
Cap Only	G	H	J	K
Head and Cap	N	M	P	R
Fixed	U			
Special	X			

'Standard position

Ports				
Position	1'	2	3	4
Standard	A	B	C	D
Oversized*	E	G	H	J
Special	X			

'Standard position

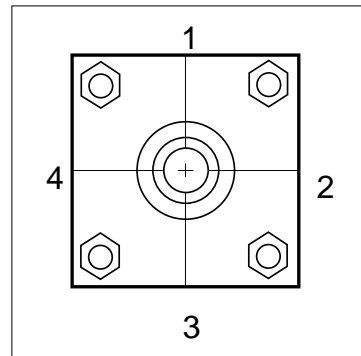
\*NFPA

Mounting Options			
01	Basic (MX0)	10	Head Square (ME3)*
02	Bottom Tap (MS4)	11	Cap Square (ME4)*
04	Front Flange (MF1)	15	Head Trunnion (MT1)
05	Rear Flange (MF2)	16	Cap Trunnion (MT2)
06	Cap Fixed Clevis (MP1)	XX	Special

\*8" Bores only

Port and Cushion Needle Positions

(As viewed from rod end)



**EXAMPLE:** Series SS – 1 1/2" bore – 4 1/2" stroke – standard rod end – MX0 Basic mount – standard ports at position #1 – no cushions – Soft Touch Bumper Seal – no options.

**IMPORTANT:** When using X, XX, or 98 in a model number, please be specific!  
X = (Description).

Reed & Hall Effect Switches

Available on all bore sizes – order separately. See ACT-2-34/35 for specifications.

**NOTE:** Consult factory when using competitive position sensing devices.



# Superior operating performance in a 1-1/8" bore size!

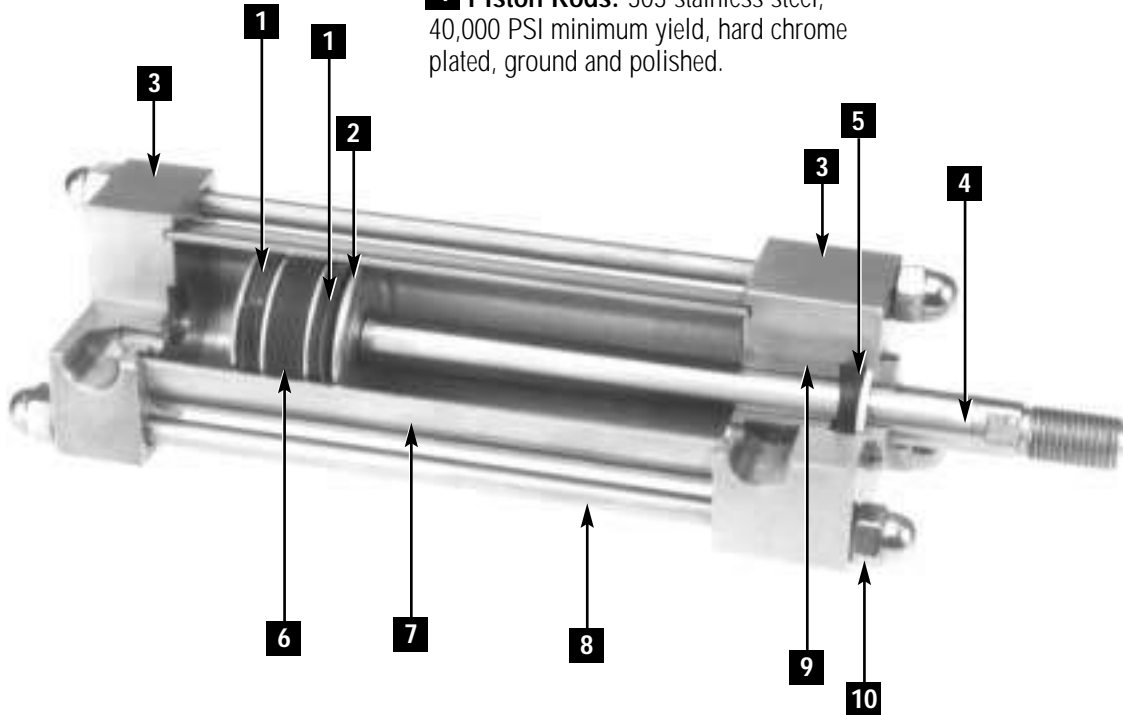
**1 Piston Seals:** Lip-type nitrile seals are pressure energized and wear compensating. Their excellent lubrication retention characteristics lower seal friction and ensure long life.

**2 Piston:** Solid aluminum alloy, light-weight for low inertia, yet strong.

**3 Head/Cap:** Precision machined from solid corrosion-resistant 304 stainless steel bar.

**5 Bearing Seal:** Teflon® rod wiper provides positive wiping action and low friction. Lip-type nitrile seal is pressure energized and wear compensating for long life.

**4 Piston Rods:** 303 stainless steel, 40,000 PSI minimum yield, hard chrome plated, ground and polished.



**6 Wear Strip:** Teflon® and graphite composition for minimum friction, maximum wear and side load resistance. (Magnetic band under wear strip optional.)

**7 Tube:** Corrosion-resistant 304 stainless steel.

**8 Tie Rods:** High-strength 303 stainless steel maintains compression on tube and seals.

**9 Rod Bearing:** Incorporates a sintered bronze rod bearing which is pressed into the cylinder head.

**10 Acorn Nut:** Tie rod threads are covered by stainless steel acorn nuts which eliminate another bacteria hiding place.

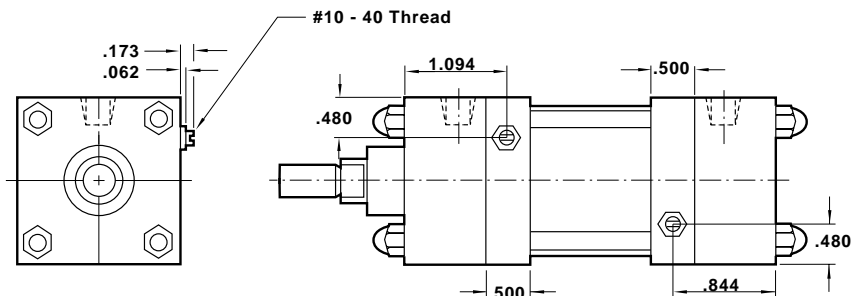
## Optional Features

Norgren's state-of-the-art Ultra Cushion® design and Soft Touch Bumper Seal are also available on our 1 1/8" bore. (See ACT-2-3.)

Cushions permit the trapping of cylinder exhaust volume prior to the completion of full rod extension or retraction. This volume is then metered through a finely tapered needle to deliver smooth, adjustable deceleration of the cylinder load.

Note: Cushion block increases stroke related dimensions by .500 per end.

Cushions are not available on 1 1/8" bore with 1/2" diameter rod.



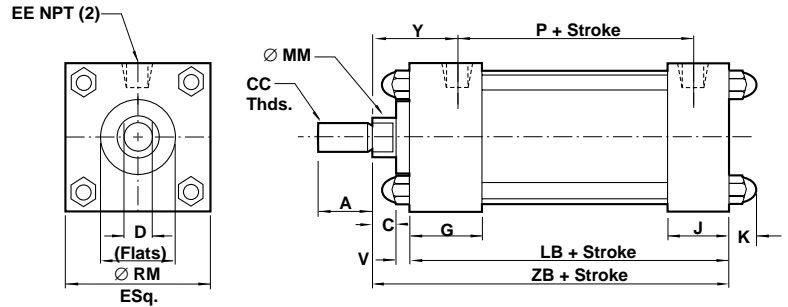




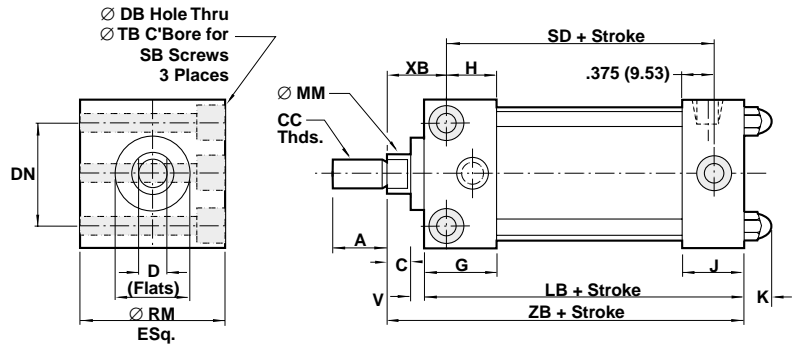
# Series SS Actuators

- Cylinder with 01 (MX0) Basic
- Cylinder with 03 (MS8) Bolt Thru
- Cylinder with 04 (MF7) Front Flange
- Cylinder with 05 (MF2) Rear Flange

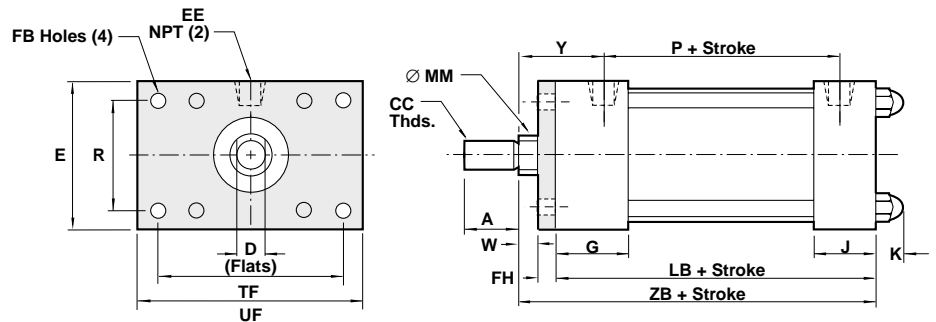
## 1-1/8" Cylinder with 01 (MX0) Basic



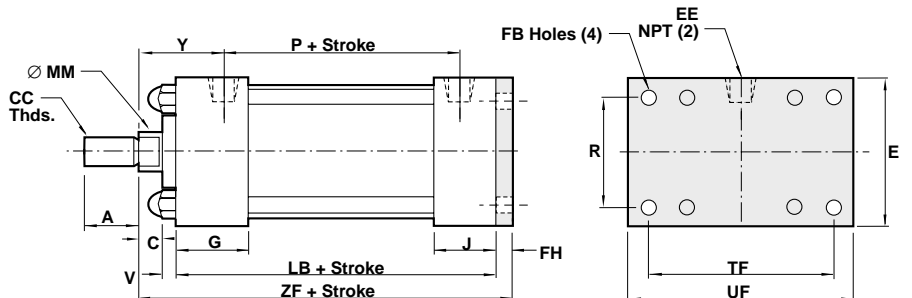
## 1-1/8" Cylinder with 03 (MS8) Bolt Thru



## 1-1/8" Cylinder with 04 (MF7) Front Flange



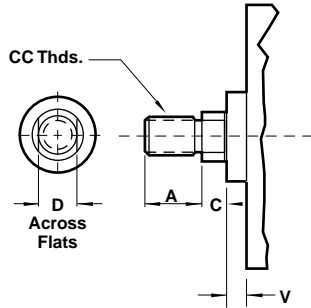
## 1-1/8" Cylinder with 05 (MF2) Rear Flange



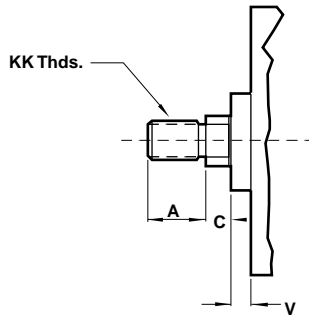
See ACT-2-33 for complete instructions on how to order cylinders.



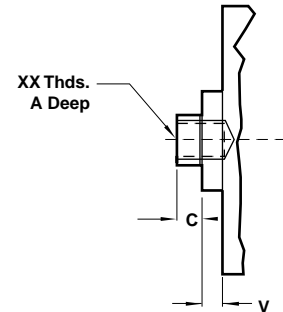
**Standard & Optional Rod Ends**



**Style #1**  
(Standard Male)



**Style #2**  
(Optional Male)



**Style #3**  
(Optional Female)

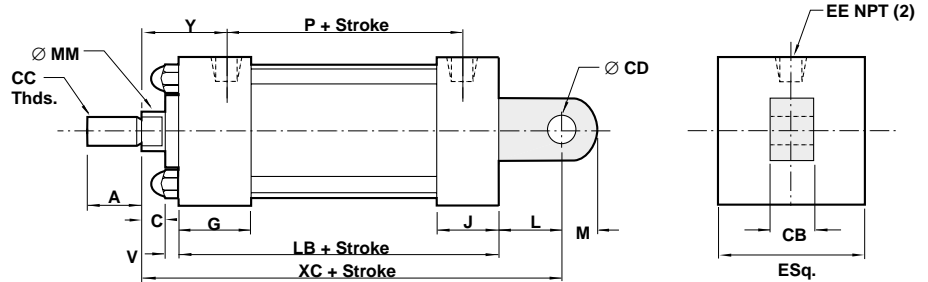
Dimension		Cylinder with 01 (MX0) Basic	Cylinder with 03 (MS8) Bolt Thru	Cylinder with 04 (MF7) Front Flange	Cylinder with 05 (MF2) Rear Flange
ø Rod	Std.	3/8" (9.53)	3/8" (9.53)	3/8" (9.53)	3/8" (9.53)
	O.S.	1/2" (12.70)	1/2" (12.70)	1/2" (12.70)	1/2" (12.70)
A	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	.625 (15.88)
	O.S.	.750 (19.05)	.750 (19.05)	.750 (19.05)	.750 (19.05)
C		.250 (6.35)	.250 (6.35)	.250 (6.35)	.250 (6.35)
CC	Std.	3/8 - 24	3/8 - 24	3/8 - 24	3/8 - 24
	O.S.	1/2 - 20	1/2 - 20	1/2 - 20	1/2 - 20
D	Std.	.312 (7.92)	.312 (7.92)	.312 (7.92)	.312 (7.92)
	O.S.	.437 (11.10)	.437 (11.10)	.437 (11.10)	.437 (11.10)
DB		-	.203 (5.16)	-	-
DN		-	1.000 (25.40)	-	-
E		1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)
EE		.125 (3.18)	.125 (3.18)	.125 (3.18)	.125 (3.18)
FB		-	-	.219 (5.56)	.219 (5.56)
FH		-	-	.250 (6.35)	.250 (6.35)
G		.875 (22.23)	.875 (22.23)	.875 (22.23)	.875 (22.23)
H		-	.625 (15.88)	-	-
J		.625 (15.88)	.625 (15.88)	.625 (15.88)	.625 (15.88)
K		.400 (10.16)	.400 (10.16)	.400 (10.16)	-
KK	Std.	5/16 - 24	5/16 - 24	5/16 - 24	5/16 - 24
	O.S.	7/16 - 20	7/16 - 20	7/16 - 20	7/16 - 20
LB		2.250 (57.15)	2.250 (57.15)	2.250 (57.15)	2.250 (57.15)
MM	Std.	.370 (9.40)	.370 (9.40)	.370 (9.40)	.370 (9.40)
	O.S.	.495 (12.57)	.495 (12.57)	.495 (12.57)	.495 (12.57)
P		1.375 (34.93)	-	1.375 (34.93)	1.375 (34.93)
R		-	-	1.000 (25.40)	1.000 (25.40)
RM	Std.	.750 (19.05)	.750 (19.05)	-	-
	O.S.	1.000 (25.40)	1.000 (25.40)	-	-
SB	Std.	-	#10	-	-
	O.S.	-	#10	-	-
SD		-	1.750 (44.45)	-	-
TB		-	.328 (8.33)	-	-
TF		-	-	2.000 (50.80)	2.000 (50.80)
UF		-	-	2.500 (63.50)	2.500 (63.50)
V		.125 (3.18)	.125 (3.18)	.125 (3.18)	.125 (3.18)
W		-	-	.125 (3.18)	-
XB		-	.625 (15.88)	-	-
XX	Std.	1/4 - 28	1/4 - 28	1/4 - 28	1/4 - 28
	O.S.	3/8 - 24	3/8 - 24	3/8 - 24	3/8 - 24
Y		.938 (23.82)	-	.938 (23.82)	.938 (23.82)
ZB		2.625 (66.68)	2.625 (66.68)	2.625 (66.68)	-
ZF		-	-	-	2.875 (73.03)



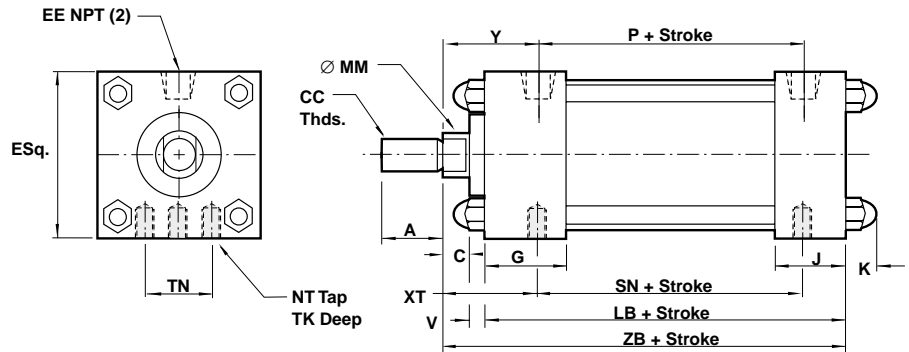
# Series SS Actuators

- Cylinder with 17 (MP3) Fixed Eye
- Cylinder with 22 (MS9) Side Tap
- Cylinder with 30 (MR1) Head Face
- Double Rod End Cylinder with 01 (MX0) Basic

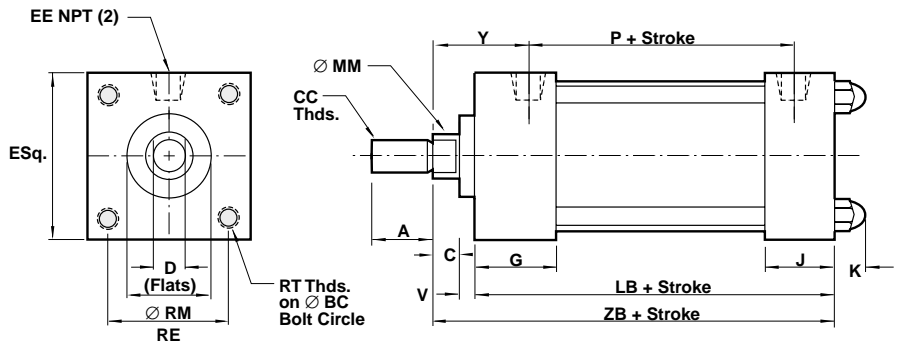
## 1-1/8" Cylinder with 17 (MP3) Fixed Eye



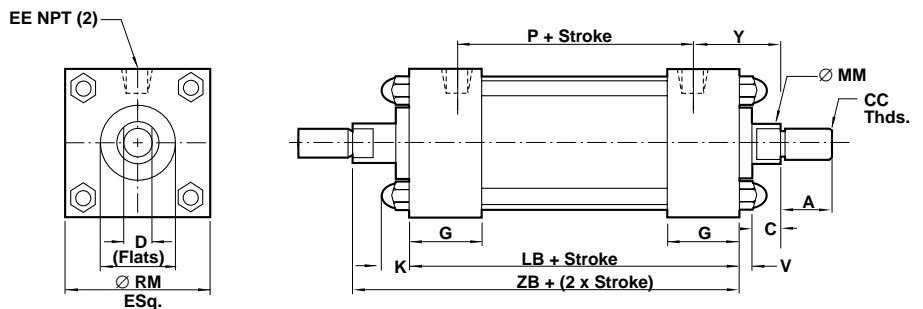
## 1-1/8" Cylinder with 22 (MS9) Side Tap



## 1-1/8" Cylinder with 30 (MR1) Head Face



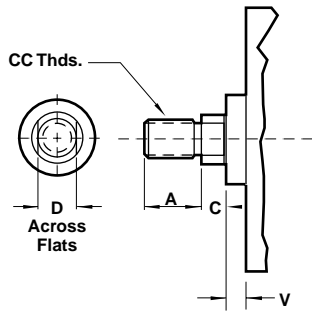
## 1-1/8" Double Rod End Cylinder with 01 (MX0) Basic



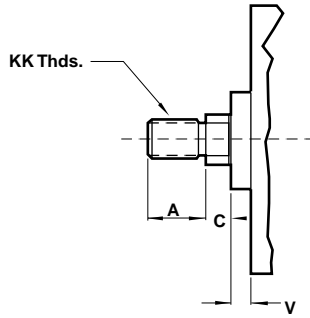
See ACT-2-33 for complete instructions on how to order cylinders.



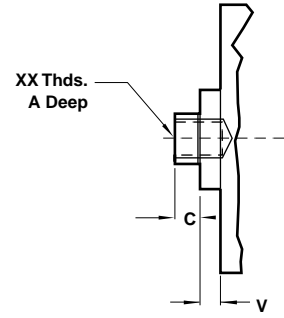
**Standard & Optional Rod Ends**



**Style #1**  
(Standard Male)



**Style #2**  
(Optional Male)



**Style #3**  
(Optional Female)

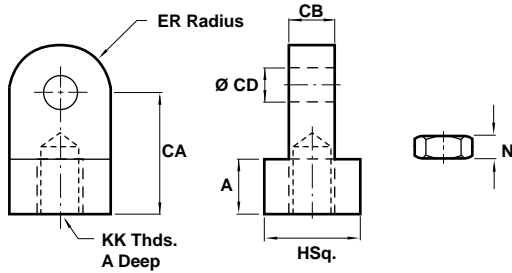
Dimension		Cylinder with 17 (MP3) Fixed Eye		Cylinder with 22 (MS9) Side Tap		Cylinder with 30 (MR1) Head Face		Double Rod End Cylinder with 01 (MX0)	
ø Rod	Std.	3/8"	(9.53)	3/8"	(9.53)	3/8"	(9.53)	3/8"	(9.53)
	O.S.	1/2"	(12.70)	1/2"	(12.70)	1/2"	(12.70)	1/2"	(12.70)
A	Std.	.625	(15.88)	.625	(15.88)	.625	(15.88)	.625	(15.88)
	O.S.	.750	(19.05)	.750	(19.05)	.750	(19.05)	.750	(19.05)
BC		-		-		1.593	(40.46)	-	
C		.250	(6.35)	.250	(6.35)	.250	(6.35)	.250	(6.35)
CB		.375 (9.53)		-		-		-	
CC	Std.	3/8 - 24		3/8 - 24		3/8 - 24		3/8 - 24	
	O.S.	1/2 - 20		1/2 - 20		1/2 - 20		1/2 - 20	
CD		.375	(9.53)	-		-		-	
D	Std.	.312	(7.92)	.312	(7.92)	.312	(7.92)	.312	(7.92)
	O.S.	.437	(11.10)	.437	(11.10)	.437	(11.10)	.437	(11.10)
E		1.500	(38.10)	1.500	(38.10)	1.500	(38.10)	1.500	(38.10)
EE		.125	(3.18)	.125	(3.18)	.125	(3.18)	.125	(3.18)
G		.875	(22.23)	.875	(22.23)	.875	(22.23)	.875	(22.23)
J		.625	(15.88)	.625	(15.88)	.625	(15.88)	.625	(15.88)
K		-		.400	(10.16)	.400	(10.16)	.400	(10.16)
KK	Std.	5/16 - 24		5/16 - 24		5/16 - 24		5/16 - 24	
	O.S.	7/16 - 20		7/16 - 20		7/16 - 20		7/16 - 20	
L		.437	(11.10)	-		-		-	
LB		2.250	(57.15)	2.250	(57.15)	2.250	(57.15)	2.250	(57.15)
M		.375	(9.53)	-		-		-	
MM	Std.	.370	(9.40)	.370	(9.40)	.370	(9.40)	.370	(9.40)
	O.S.	.495	(12.57)	.495	(12.57)	.495	(12.57)	.495	(12.57)
NT		-		10 - 32		-		-	
P		1.375	(34.93)	1.375	(34.93)	1.375	(34.93)	1.375	(34.93)
RE		-		-		1.125	(28.58)	-	
RM	Std.	-		-		.750	(19.05)	.750	(19.05)
	O.S.	-		-		1.000	(25.40)	1.000	(25.40)
RT		-		-		10 - 32		-	
SN		-		1.750	(44.45)	-		-	
TK		-		.250	(6.35)	-		-	
TN		-		1.000	(25.40)	-		-	
V		.125	(3.18)	.125	(3.18)	.125	(3.18)	.125	(3.18)
XC		3.062	(77.77)	-		-		-	
XT		-		.625	(15.88)	-		-	
XX	Std.	1/4 - 28		1/4 - 28		1/4 - 28		1/4 - 28	
	O.S.	3/8 - 24		3/8 - 24		3/8 - 24		3/8 - 24	
Y		.938	(23.83)	.938	(23.83)	.938	(23.83)	.938	(23.83)
ZB		-		2.625	(66.68)	2.625	(66.68)	3.250	(82.55)



# Series SS Actuators

All Dimensions in Inches (mm)

## Rod Eye 303 Stainless Steel

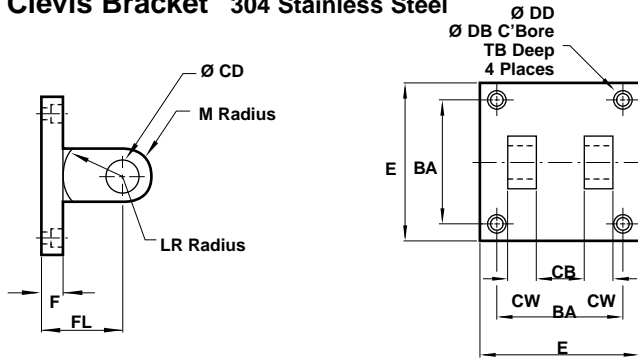


## Rod Eye Dimensions

	S-97-225*	S-97-225A*
A	.437 (11.10)	.437 (11.10)
CA	.875 (22.23)	.875 (22.23)
CB	.375 (9.53)	.375 (9.53)
CD	.375 (9.53)	.375 (9.53)
ER	.375 (9.53)	.375 (9.53)
H	.750 (19.05)	.750 (19.05)
KK	3/8-24	1/2-20
N	.219 (5.56)	.312 (7.92)

\*Includes Jam Nut

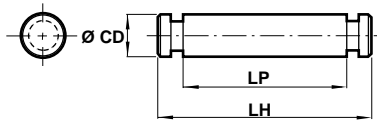
## Clevis Bracket 304 Stainless Steel



## Clevis Bracket Dimensions

	S-91-225
BA	1.125 (28.58)
CB	.375 (9.53)
CD	.375 (9.53)
CW	.250 (6.35)
DB	.328 (8.33)
DD	.203 (5.16)
E	.500 (12.70)
F	.500 (12.70)
FL	1.125 (28.58)
LR	.625 (15.88)
M	.375 (9.53)
TB	.312 (7.92)

## Pivot Pin 303 Stainless Steel

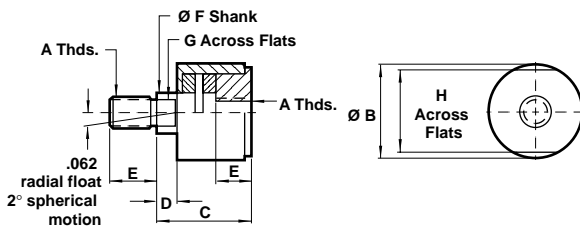


## Pivot Pin Dimensions

	S-96-225A**
CD	.375 (9.53)
LH	1.250 (31.75)
LP	1.032 (26.21)

\*\*Use with S-91-225, S-97-225

## Rod Alignment Coupler



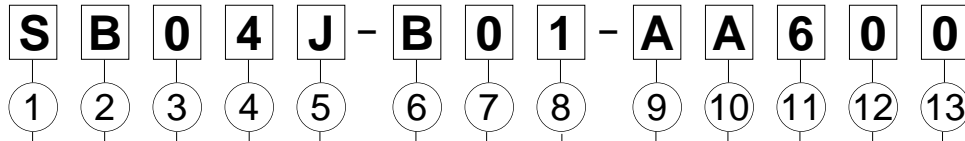
## NFPA Rod Alignment Coupler Dimensions

	SC-1-06
A	3/8 - 24
B	.875 (22.23)
C	1.250 (31.75)
D	.250 (6.35)
E	.625 (15.88)
F	.375 (9.53)
G	.312 (7.92)
H	.750 (19.05)
Maximum Pull (lbs.)	1,375

Made of 303 Stainless Steel, the Rod Alignment Coupler allows 1/16" of radial float and 2° of spherical movement. This prevents cylinder binding due to misalignment thus extending bearing and seal life, and permits greater tolerance between the center line of the cylinder and mating part for simplified installation.



Cylinder Order Information for 1-1/8"



S	Series SS
D	Series D

Single Rod End	Bore	Double Rod End
B	1 1/8"	P

Full Inches in Strokes	
00	0" Stroke
01	1" Stroke
02	2" Stroke
03	3" Stroke
04	4" Stroke
05	5" Stroke
06	6" Stroke
...	...
99	99" Stroke
XX	Special

Fractional Increments of Stroke			
A	0"	J	1/2"
B	1/16"	K	9/16"
C	1/8"	M	5/8"
D	3/16"	N	11/16"
E	1/4"	P	3/4"
F	5/16"	R	13/16"
G	3/8"	S	7/8"
H	7/16"	T	15/16"
X	Special		

Rod Size & Style			
Standard		Oversized	
A	Male KK	H	Male KK
B	Male CC*	J	Male CC
D	Female XX	M	Female XX
X	Special		

\*Standard Rod End 1 1/8" Bore (3/8 - 24)

No Options	00
Magnetic Piston Only**	90
Special <sup>1</sup>	98

\*\*See ACT-2-34/35.

<sup>1</sup>For any cylinder modifications not listed use "98" and please specify.

Optional Seals	
No Option	A
Viton Seals	1
Air/Oil Seal	3
Metallic Rod Scraper	5
Soft Touch	6
Special	X

Cushions				
Needle Position	1	2'	3	4
No Cushions	A			
Head Only	B	C	D	E
Cap Only	G	H	J	K
Head and Cap	N	M	P	R
Fixed	U			
Special	X			

<sup>1</sup>Standard position

Note: Cushions are not available on 1 1/8" bore with 1/2" diameter rod.

Ports				
Position	1'	2	3	4
Standard	A	B	C	D
Special	X			

<sup>1</sup>Standard position

Mounting Options			
01	Basic (MX0)	17	Fixed Eye (MP3)
03	Bolt Thru (MS8)	22	Side Tap (MS9)
04	Front Flange (MF7)	30	Head Face (MR1)
05	Rear Flange (MF2)	XX	Special

**EXAMPLE:** Series SS – 1 1/8" bore – 4 1/2" stroke – standard rod end – MX0 Basic mount – standard ports at position #1 – no cushions – Soft Touch Bumper Seal – no options.

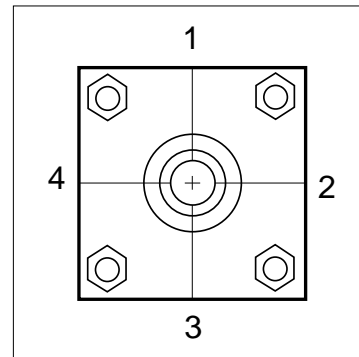
**IMPORTANT:** When using X, XX, or 98 in a model number, please be specific! X = (Description).

**Reed & Hall Effect Switches**

Available on all bore sizes – order separately. See ACT-2-34/35 for specifications.

**NOTE:** Consult factory when using **competitive** position sensing devices.

**Port and Cushion Needle Positions**  
(As viewed from rod end)



- Magnetically operated, non-contact sensing system.
- Consists of a magnet in the piston, and a sensing switch clamped on the cylinder tie rod.
- One or more switches may be mounted to provide an indication of piston position.
- Switches are provided with vinyl molded cable.
- Adjustable mounting brackets allow for switches to be securely positioned anywhere along the range of piston travel.
- Indicator light facilitates installation and troubleshooting.
- Several switches may be mounted to control or initiate any sequence function.
- Mounting brackets standard with switches.

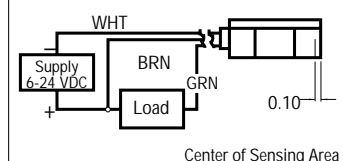
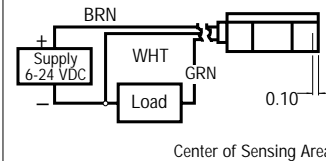
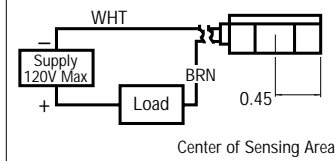


### Specifications

\*Metal Oxide Varistor Surge Suppression. NOTE: All CS7 and CS8 Series Switches are supplied with 9 foot leads.

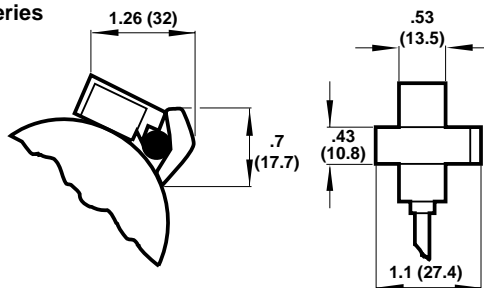
Switch Model	CS8-2-04 Reed	CS8-2-31 Hall	CS8-2-32 Hall
Bore Sizes	1 1/8" thru 2 1/2"	1 1/8" thru 2 1/2"	1 1/8" thru 2 1/2"
Switch Type	Reed Switch *MOV & Light	Hall Effect & Light, Sourcing PNP	Hall Effect & Light, Sinking NPN
Function	SPST Normally Open	Normally Open	Normally Open
Switching Voltage	5-120 VDC/VAC 50/60 Hz	6-24 VDC	6-24 VDC
Switching Current	.5 Amp Max .005 Amp Min	.5 Amp Max	.5 Amp Max
Switching Power	10 VA	12 Watts Max	12 Watts Max
Max Voltage Drop	3.5 Volts	.5 Volts	.5 Volts
Magnetic Sensitivity	85 Gauss	85 Gauss	85 Gauss
Enclosure Classification	NEMA 6 & CSA Approved	NEMA 6 & CSA Approved	NEMA 6 & CSA Approved
Temperature Range	-22°F to +176°F	-22°F to +176°F	-22°F to +176°F

### Wiring Diagrams



### Switch & Mounting Bracket Dimensions

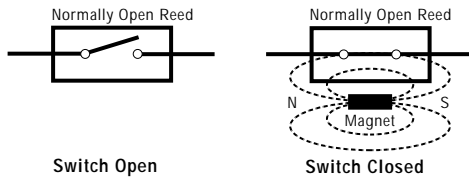
#### CS8-2 Series





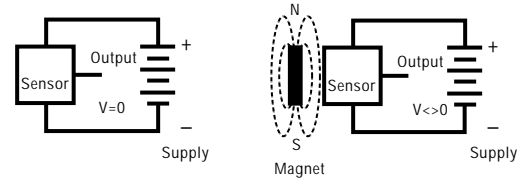
### Reed Switch Working Principle

Reed switch sensors contain hermetically sealed reed elements (mechanical contacts) which are open in their normal state. When a magnetic field moves within proximity of the switch, magnetism is induced into the leads and forces the contacts to close.



### Hall Effect/Magneto-resistive Working Principle

The solid state (no moving parts) magneto-resistive sensor responds to a north or south magnetic pole by providing a digital signal to the output control circuit. This technique enables the sensing of weak magnetic fields, with no limit to the maximum strength of the magnetic field.



### Application Recommendations and Precautions

To provide maximum reliability.

1. Always stay within the specifications and power rating limitations of the unit installed.
2. Primary and control circuit wiring should not be mixed in the same conduit. Motors will produce high pulses that will be introduced into the control wiring if the wiring is carried in the same conduit.
3. Never connect the switch without a load present. The switch will be destroyed.
4. Some electrical loads may be capacitive. Capacitive loading may occur due to distributed capacity in cable runs over 25 feet. Use switch Model CS7-24 whenever capacitive loading may occur.

In order to obtain optimum performance and long life, magnetically operated limit switches should not be subjected to: (1) strong magnetic fields, (2) extreme temperature, and (3) excessive ferrous filing or chip buildup.

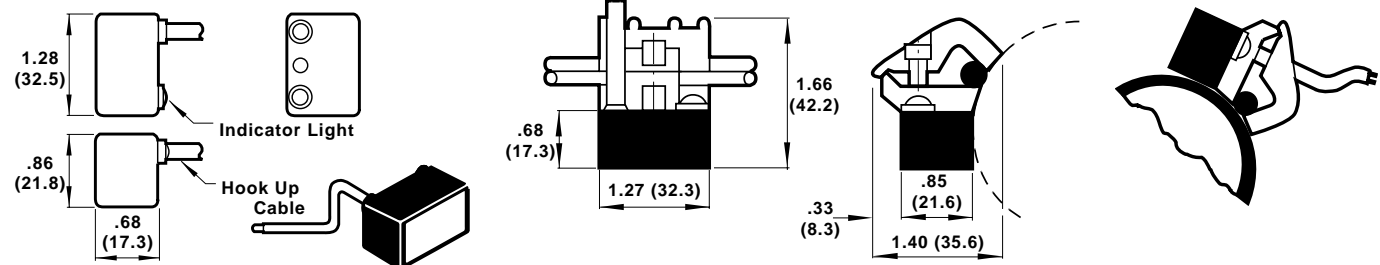
Improper wiring may damage or destroy the switch. The wiring diagram, along with the listed power ratings, must be carefully observed before connecting power to the switch.

Lower power switches are designed for signaling electronic circuits. Do not use on relay loads or with incandescent bulbs. Resistive loads only.

CS7-04 Reed	CS7-24 Reed	CS7-31 Hall	CS7-32 Hall
2" thru 8"	2" thru 8"	2" thru 8"	2" thru 8"
Reed Switch *MOV & Light	Reed Switch *MOV & Light, 3 Wire	Hall Effect & Light, Sourcing PNP	Hall Effect & Light, Sinking NPN
Normally Open	Normally Open	Normally Open	Normally Open
5-240 VDC/VAC 50/60 Hz	24-240 VAC 50/60 Hz	6-24 VDC	6-24 VDC
1 Amp Max	4 Amp Max 50 Amp Inrush	1 Amp Max	1 Amp Max
30 Watts Max	100 Watts Max	24 Watts Max	24 Watts Max
3 Volts	N/A	.5 Volts	.5 Volts
85 Gauss Parallel	85 Gauss Parallel	85 Gauss Parallel	85 Gauss Parallel
NEMA 6 & CSA Approved	NEMA 6 & CSA Approved	NEMA 6 & CSA Approved	NEMA 6 & CSA Approved
-22°F to +176°F	-22°F to +176°F	-22°F to +176°F	-22°F to +176°F

\*Note: for 8" bore add 9 to part number. Example: CS7-9-04

### CS7 Series







# Series N Non-Rotating Cylinders

Series N and Series Q Features.....ACT-3-2  
 Technical Information .....ACT-3-3  
 Basic Cylinder 01 (MX0) .....ACT-3-4  
 Cylinder with 20 (Not NFPA) Base Bar .....ACT-3-6  
 Cylinder with 02 (MS4) Bottom Tap.....ACT-3-8  
 Cylinder with 04 (MF1) Front Flange .....ACT-3-10  
 Cylinder with 05 (MF2) Rear Flange .....ACT-3-12  
 Cylinder with 07 (MP2) Detachable Clevis.....ACT-3-14  
 Cylinder with 18 (MP4) Detachable Eye .....ACT-3-16  
 Double Rod End Cylinder.....ACT-3-18  
 Double Rod End Cylinder with 20 (Not NFPA) Base Bar .....ACT-3-20  
 Double Rod End Cylinder with 02 (MS4) Bottom Tap .....ACT-3-22  
 Double Rod End Cylinder with 04 (MF1) Front Flange.....ACT-3-24  
 Cylinder Tooling Plates/Accessories .....ACT-3-26  
 Switch Information .....ACT-3-28  
 Series N Order Information .....ACT-3-30  
 Cylinder Weights and Seal Kits .....ACT-3-31



ACT-3-4 –  
01 (MX0) Basic Cylinder



ACT-3-6 –  
Cylinder with  
20 (Not NFPA) Base Bar



ACT-3-8 –  
Cylinder with  
02 (MS4) Bottom Tap



ACT-3-10 –  
Cylinder with  
04 (MF1) Front Flange



ACT-3-12 –  
Cylinder with  
05 (MF2) Rear Flange



ACT-3-14 –  
Cylinder with  
07 (MP2) Detachable Clevis



ACT-3-16 –  
Cylinder with  
18 (MP4) Detachable Eye



ACT-3-18 –  
Double Rod End Cylinder



ACT-3-20 –  
Double Rod End Cylinder  
with 20 (Not NFPA) Base Bar



ACT-3-22 –  
Double Rod End Cylinder  
with 02 (MS4) Bottom Tap



ACT-3-24 –  
Double Rod End Cylinder  
with 04 (MF1) Front Flange



ACT-3-24 –  
Double Rod End Cylinder  
with 05 (MF2) Rear Flange



# The finest materials for each component!

**1 Piston Seals:** Lip-type carboxylated nitrile incorporating Teflon® and other non-lube additives as integral parts of the compound. Extremely smooth stroke performance and “no lube added” operation results from reduced friction.

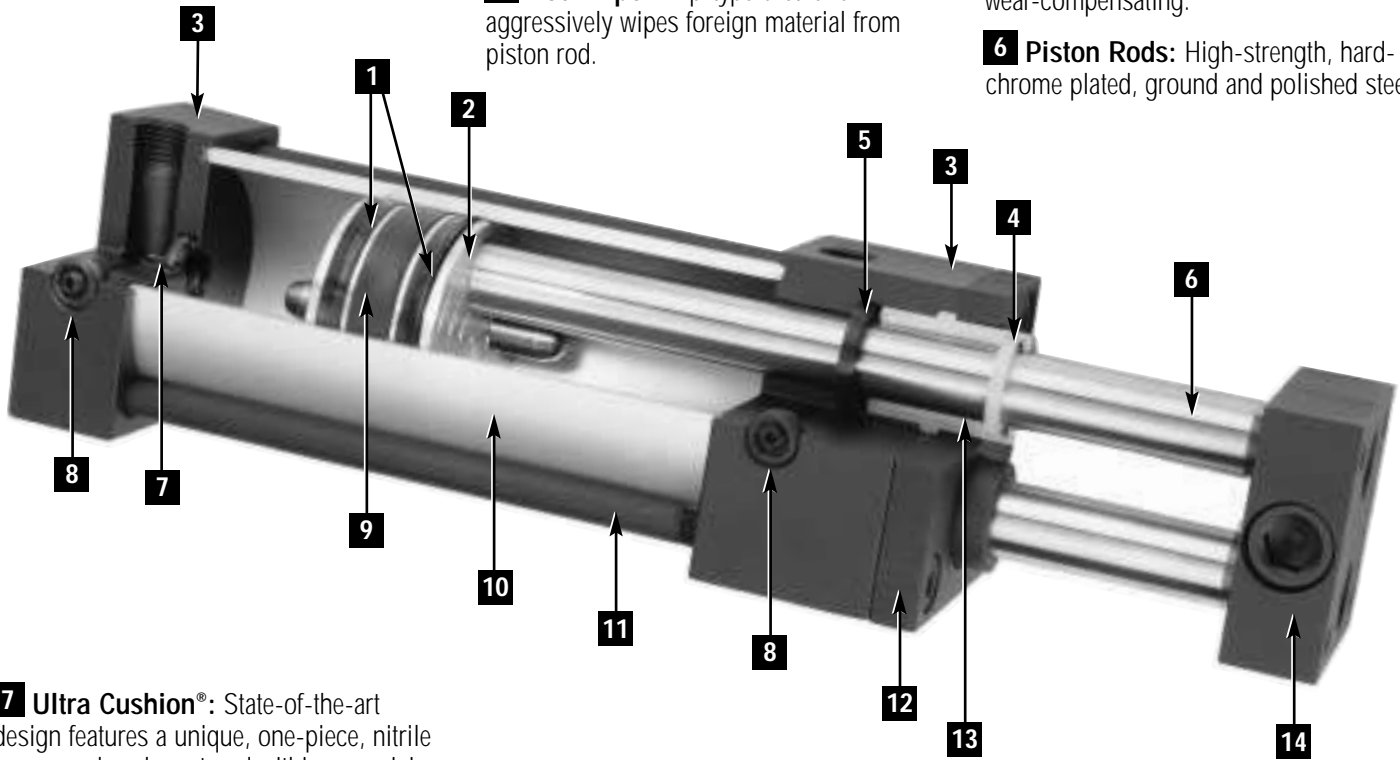
**2 Piston:** Solid aluminum alloy, light-weight for low inertia, yet strong.

**3 Head/Cap:** Precision machined from (6061-T6) solid aluminum bar, anodized for corrosion resistance.

**4 Rod Wiper:** Lip-type urethane aggressively wipes foreign material from piston rod.

**5 Rod Seals:** Rounded lip-type carboxylated nitrile incorporating Teflon® and other non-lube additives as integral parts of the compound. Extremely smooth stroke performance and “no lube added” operation results from reduced friction. Rod Seal is pressure-energized and wear-compensating.

**6 Piston Rods:** High-strength, hard-chrome plated, ground and polished steel.



**7 Ultra Cushion®:** State-of-the-art design features a unique, one-piece, nitrile compound seal, captured within a precision machined groove. Linear and radial “float” of cushion seal eliminates misalignment. Ultra Cushions provide exceptionally fast “out of cushion” stroke reversal. (Head and Cap Cushions are optional.)

**8 Adjustable Captive Cushion Needle**

**9 Wear Strip:** Teflon® and graphite composition for minimum friction, maximum wear and side load resistance. (Magnetic band under wear strip optional.)

**10 Tube:** 6063-T832 aluminum alloy ideally suited for air service. Tube is clear anodized on the O.D. and “hard anodic coated” on the I.D. resulting in a smooth, file-hard (60RC), corrosion-resistant and score-resistant surface finish.

**11 Tie Rods:** High-strength steel maintains compression on tube end seals.

**12 Retainer:** High-strength steel is used to retain rod bearings.

**13 Rod Bearings:** Machined from durable, close-grained cast iron, then completely coated with Teflon® to insure permanent lubrication and corrosion resistance.

**14 Tooling Plate:** Machined from solid steel and notched for secure attachment. Modular and pilot adaptor plates are available to add to the tooling plate mounting. (Use of modular and pilot adapter plates adds to overall length.)

## Series Q

Series Q cylinders are designed for corrosive environments. They are identical to the Series N in design, function, and dimensions, but have electroless nickel plating and stainless steel components to create significant resistance to corrosion.

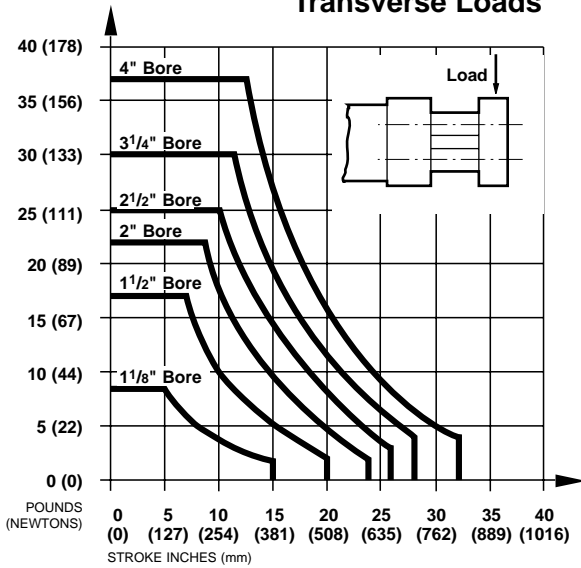
### Features:

Head, cap, tube, bushings, front plate, mounts, tooling plate, tie rod nuts, and screws are plated with electroless nickel to a minimum thickness of .0005".

Piston rod, tie rods, and cushion needles are made from 300 series stainless steel.



**Transverse Loads**

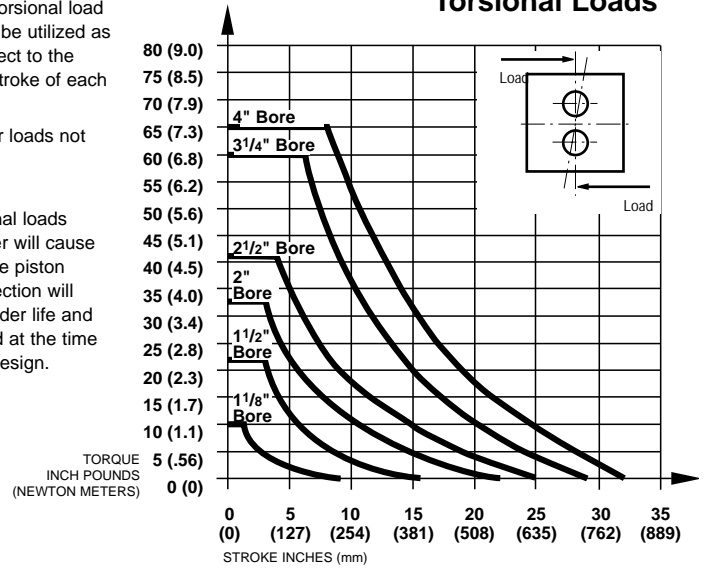


The transverse and torsional load graphs shown are to be utilized as a guideline with respect to the maximum load and stroke of each bore size.

NOTE: For strokes or loads not listed consult factory.

Transverse or torsional loads placed on the cylinder will cause some deflection of the piston rods. Excessive deflection will adversely affect cylinder life and should be considered at the time of initial application design.

**Torsional Loads**



**Theoretical Extend and Retract Forces in pounds (newtons)**

Bore	Movement	Effective Piston Area In <sup>2</sup> (cm <sup>2</sup> )	PSI (bar)								Cu Ft (cm <sup>3</sup> ) Displacement Per In of Stroke
			20 (1)	40 (3)	50 (3)	60 (4)	80 (6)	100 (7)	125 (9)	150 (10)	
1-1/8"	Extend	.99 (6.41)	20 (88)	40 (177)	50 (221)	60 (265)	80 (354)	99 (442)	124 (553)	149 (664)	.00058 (16)
	Retract	.84 (5.43)	17 (75)	34 (150)	42 (187)	50 (225)	67 (299)	84 (374)	105 (468)	126 (561)	.00049 (14)
1-1/2"	Extend	1.77 (11.40)	35 (157)	71 (315)	88 (393)	106 (472)	141 (629)	177 (786)	221 (983)	265 (1179)	.00102 (29)
	Retract	1.55 (9.97)	31 (138)	62 (275)	77 (344)	93 (413)	124 (550)	155 (688)	193 (860)	232 (1032)	.00089 (25)
2"	Extend	3.14 (20.27)	63 (280)	126 (559)	157 (699)	189 (839)	251 (1119)	314 (1398)	393 (1748)	471 (2097)	.00182 (52)
	Retract	2.53 (16.31)	51 (225)	101 (450)	126 (562)	152 (675)	202 (900)	253 (1125)	316 (1406)	379 (1687)	.00146 (41)
2-1/2"	Extend	4.91 (31.67)	98 (437)	196 (874)	245 (1092)	295 (1311)	393 (1748)	491 (2185)	614 (2731)	736 (3277)	.00284 (80)
	Retract	4.30 (27.71)	86 (382)	172 (765)	215 (956)	258 (1147)	344 (1529)	430 (1911)	537 (2389)	644 (2867)	.00249 (71)
3-1/4"	Extend	8.30 (53.32)	166 (738)	332 (1477)	415 (1846)	498 (2215)	664 (2953)	830 (3692)	1037 (4615)	1244 (5538)	.00480 (136)
	Retract	7.51 (48.45)	150 (668)	300 (1337)	376 (1671)	451 (2005)	601 (2674)	751 (3342)	939 (4177)	1127 (5013)	.00435 (123)
4"	Extend	12.57 (81.07)	251 (1118)	503 (2237)	628 (2796)	754 (3355)	1005 (4473)	1257 (5592)	1571 (6990)	1885 (8388)	.00727 (206)
	Retract	11.78 (76.01)	236 (1049)	471 (2097)	589 (2621)	707 (3146)	943 (4194)	1178 (5243)	1473 (6553)	1767 (7864)	.00682 (193)
<b>Extend Double Rod Forces</b>											
1-1/8"	Standard	.88 (5.69)	18 (79)	35 (157)	44 (196)	53 (235)	71 (314)	88 (392)	110 (491)	132 (589)	.00051 (14)
	Oversize	.80 (5.15)	16 (71)	32 (142)	40 (178)	48 (213)	64 (284)	80 (355)	100 (444)	120 (533)	.00047 (13)
1-1/2"	Standard	1.46 (9.42)	29 (130)	58 (260)	73 (325)	88 (390)	117 (520)	146 (650)	183 (812)	219 (975)	.00084 (24)
	Oversize	.98 (6.34)	20 (87)	39 (175)	49 (218)	59 (262)	79 (350)	98 (437)	123 (546)	147 (655)	.00057 (16)
2"	Standard	2.84 (18.29)	57 (252)	113 (505)	142 (631)	170 (757)	227 (1009)	284 (1262)	354 (1577)	425 (1892)	.00164 (46)
	Oversize	2.36 (15.21)	47 (210)	94 (420)	118 (524)	141 (629)	189 (839)	236 (1049)	295 (1311)	354 (1573)	.00137 (39)
2-1/2"	Standard	4.60 (29.69)	92 (410)	184 (819)	230 (1024)	276 (1229)	368 (1638)	460 (2048)	575 (2560)	690 (3072)	.00266 (75)
	Oversize	4.12 (26.61)	82 (367)	165 (734)	206 (918)	247 (1101)	330 (1468)	412 (1835)	516 (2294)	619 (2753)	.00239 (68)
3-1/4"	Standard	7.51 (48.46)	150 (668)	300 (1337)	376 (1671)	451 (2005)	601 (2674)	751 (3342)	939 (4178)	1127 (5014)	.00435 (123)
	Oversize	6.81 (43.94)	136 (606)	272 (1212)	341 (1515)	409 (1819)	545 (2425)	681 (3031)	851 (3789)	1022 (4546)	.00394 (112)
4"	Standard	11.78 (76.01)	236 (1049)	471 (2097)	589 (2621)	707 (3146)	942 (4194)	1178 (5243)	1473 (6553)	1767 (7864)	.00682 (193)
	Oversize	11.08 (71.49)	222 (986)	443 (1972)	554 (2466)	665 (2959)	886 (3945)	1108 (4931)	1385 (6164)	1662 (7397)	.00641 (181)

**Operating Temperatures:**

-20°F to 200°F  
(-29°C to 93°C)

**Operating Pressure:**

250 psig (17.2 bar)

**1-1/8" Bore pressure rating**

150 psi

**Bore Sizes:** 1-1/8", 1-1/2", 2", 2-1/2", 3-1/4", 4"

**Supply:**

Filtered compressed air to 250 psi  
(for hydraulic service consult factory.)

**Materials:**

Head and end caps - anodized 6061-T6 aluminum  
Tube: 6063-T832 aluminum, clear anodized O.D., hard coat anodized I.D.

Piston Rod: C1141 hard chrome plated steel

Piston: 2011-T451 aluminum

Rod Bearings: G2 Durabar cast iron, teflon coated

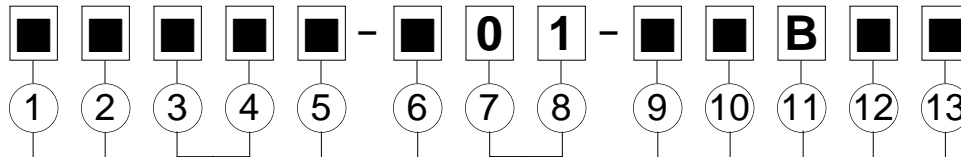
Seals: carboxylated nitrile

Tie Rods: 12L14 steel

- Basic Cylinders available in 1-1/8" thru 4" bore sizes.
- Cylinders rated to 250 PSI air.  
(For hydraulic service consult factory)
- Designed for non-lube service.
- Low breakaway seal design.
- Position sensing switches available on all bore sizes.  
(See ACT-3-28/29 for ordering information.)



### Cylinder Order Information



N	Series N
Q	Series Q Electroless Nickel

Single Rod End	Bore	Double Rod End*
B	1 1/8"	P
C	1 1/2"	Q
D	2"	R
E	2 1/2"	S
F	3 1/4"	T
G	4"	U

\* Double Rod End has two Piston Rods on one end and one Piston Rod on opposite end.

Full Inches in Strokes	
00	0" Stroke
01	1" Stroke
02	2" Stroke
03	3" Stroke
04	4" Stroke
05	5" Stroke
06	6" Stroke
...	...
30	30" Stroke
xx	Special

Fractional Increments of Stroke			
A	0"	J	1/2"
B	1/16"	K	9/16"
C	1/8"	M	5/8"
D	3/16"	N	11/16"
E	1/4"	P	3/4"
F	5/16"	R	13/16"
G	3/8"	S	7/8"
H	7/16"	T	15/16"
X	Special		

Rod Axis	
E	Horizontal Rod Axis
N	Vertical Rod Axis
A	No Tooling Plate - Horizontal Rod
B	No Tooling Plate - Vertical Rod
C	Blank Rod End - Horizontal Rod*
D	Blank Rod End - Vertical Rod*
X	Special

\* Does not include tooling plate

Options	
O	No Options
M	Metal Rod Scraper
P	Air/Oil Piston
R	Double Rod W/OS Cap Rod
S	Stainless Piston Rods
V	Viton Seals
X	Special

Magnetic Option	
O	No Magnet
M	Magnetic Piston

B	Design Level
---	--------------

Cushions <sup>1</sup>				
Needle Position	1	2**	3	4
No Cushions	A			
Head Only	B	C	D	E
Cap Only	G	H	J	K
Head and Cap	N	M	P	R
Special	X			

<sup>1</sup>Cushions not available on 1 1/8" Bore.

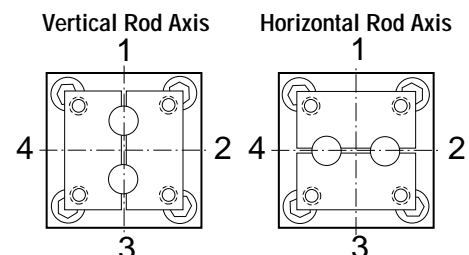
\*\*Standard position

Ports				
Position	1**	2	3	4
Standard	A	B	C	D
Special	X			

\*\*Standard position

Mounting Options			
01	No Mounts (MX0)	07	Det. Clevis (MP2)
02	Bottom Tap (MS4)	18	Det. Eye (MP4)
04	Front Flange (MF1)	20	Base Bar
05	Rear Flange (MF2)	XX	Special

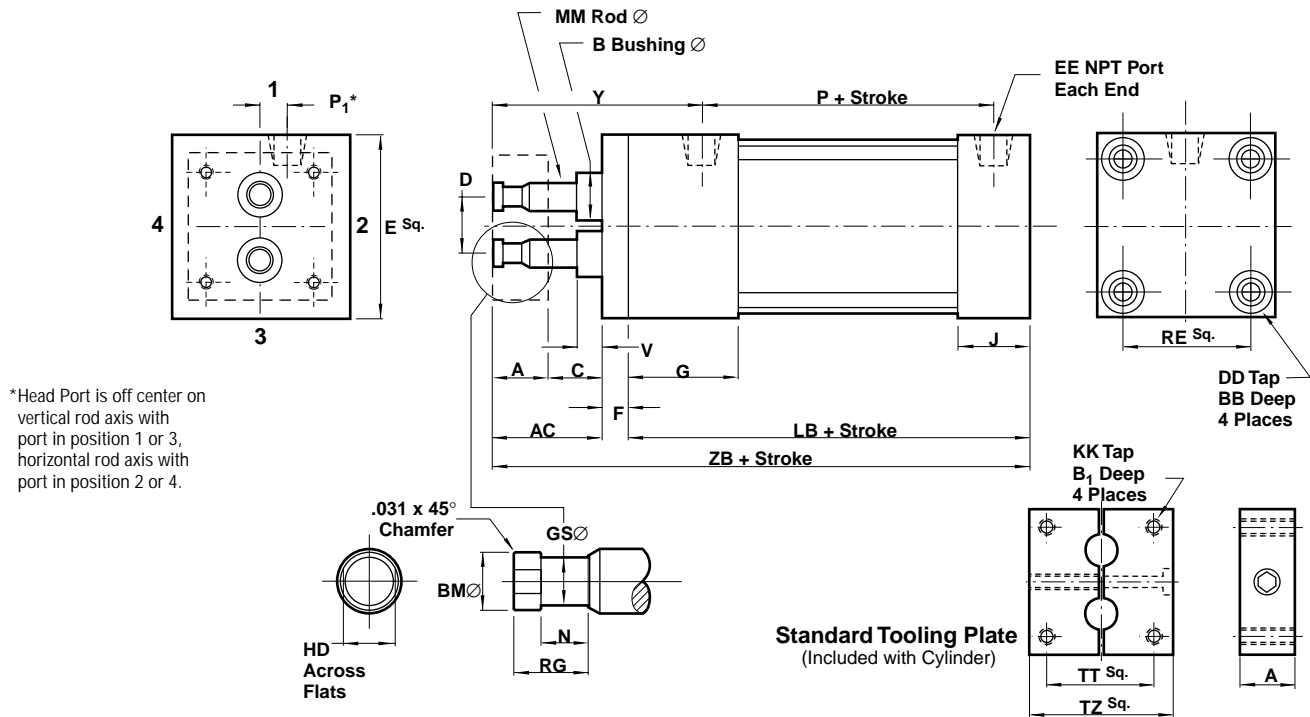
Switch, Port, and Cushion Needle Positions  
(As viewed from twin rod end)



See ACT-3-30 for complete instructions on how to order cylinders.

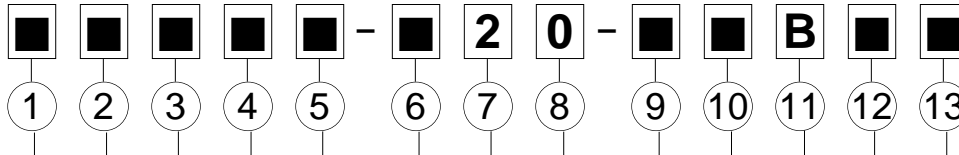
# Series N Actuators

All Dimensions in Inches (mm)



Dimension	1-1/8" Bore (28.58)	1-1/2" Bore (38.10)	2" Bore (50.80)	2-1/2" Bore (63.50)	3-1/4" Bore (82.55)	4" Bore (101.60)
A	.625 (15.88)	.625 (15.88)	.750 (19.05)	.750 (19.05)	1.250 (31.75)	1.250 (31.75)
AC	1.250 (31.75)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)
B	N/A	.590 (14.99)	.900 (22.86)	.900 (22.86)	1.498 (38.05)	1.498 (38.05)
B <sub>1</sub>	.500 (12.70)	Thru	Thru	Thru	Thru	Thru
BB	.188 (4.78)	.312 (7.92)	.312 (7.92)	.312 (7.92)	.437 (11.10)	.437 (11.10)
BM	.270 (6.86)	.330 (8.38)	.550 (13.97)	.550 (13.97)	.900 (22.86)	.900 (22.86)
C	.625 (15.88)	.875 (22.23)	.750 (19.05)	1.000 (25.40)	.500 (12.70)	.500 (12.70)
D	.627 (15.93)	.750 (19.05)	1.052 (26.72)	1.398 (35.51)	2.000 (50.80)	2.360 (59.94)
DD	10 – 32	1/4 – 28	5/16 – 24	5/16 – 24	3/8 – 24	3/8 – 24
E	1.500 (38.10)	2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)
EE	1/8	1/4	1/4	1/4	3/8	3/8
F	.250 (6.35)	.375 (9.53)	.375 (9.53)	.375 (9.53)	.625 (15.88)	.625 (15.88)
G	1.000 (25.4)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)
GS	.190 (4.83)	.250 (6.35)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)
HD	.250 (6.35)	.312 (7.92)	.500 (12.70)	.500 (12.70)	.812 (20.62)	.812 (20.62)
J	.625 (15.88)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.250 (31.75)
KK	6 – 32	10 – 32	1/4 – 28	5/16 – 24	3/8 – 24	3/8 – 24
LB	2.250 (57.15)	3.625 (92.08)	3.625 (92.08)	3.750 (95.25)	4.250 (107.95)	4.250 (107.95)
MM	.312 (7.92)	.375 (9.53)	.625 (15.88)	.625 (15.88)	1.000 (25.40)	1.000 (25.40)
N	.400 (10.16)	.400 (10.16)	.526 (13.36)	.526 (13.36)	.784 (19.81)	.784 (19.81)
P	1.469 (37.31)	2.125 (53.98)	2.125 (53.98)	2.250 (57.15)	2.625 (66.68)	2.625 (66.68)
P <sub>1</sub>	.241 (6.12)	.303 (7.70)	.480 (12.19)	.635 (16.13)	.845 (21.46)	.875 (22.23)
RE	1.125 (28.58)	1.428 (36.27)	1.840 (46.74)	2.192 (55.68)	2.758 (70.05)	3.323 (84.40)
RG	.580 (14.73)	.580 (14.73)	.705 (17.91)	.705 (17.91)	1.205 (30.61)	1.205 (30.61)
TT	.750 (19.05)	1.125 (28.58)	1.430 (36.32)	1.840 (46.74)	1.790 (45.47)	3.440 (87.38)
TZ	1.250 (31.75)	1.500 (38.10)	2.000 (50.80)	2.500 (63.50)	3.250 (82.55)	4.000 (101.60)
V	N/A	.250 (6.35)	.250 (6.35)	.250 (6.35)	.250 (6.35)	.250 (6.35)
Y	2.031 (51.59)	2.875 (73.03)	2.875 (73.03)	3.125 (79.38)	3.437 (87.30)	3.437 (87.30)
ZB	3.750 (95.25)	5.500 (139.70)	5.500 (139.70)	5.875 (149.23)	6.625 (168.28)	6.625 (168.28)

- (Not NFPA) 20 Base Bar Mounts available in 1-1/8" thru 4" bore sizes.
- Cylinders rated to 250 PSI air. (For hydraulic service consult factory)
- Designed for non-lube service.
- New low breakaway design.
- Switches available on all bore sizes. (See ACT-3-28/29 for ordering information.)


**Cylinder Order Information**


N	Series N
Q	Series Q Electroless Nickel

Single Rod End	Bore	Double Rod End*
B	1 1/8"	P
C	1 1/2"	Q
D	2"	R
E	2 1/2"	S
F	3 1/4"	T
G	4"	U

\*Double Rod End has two Piston Rods on one end and one Piston Rod on opposite end.

Full Inches in Strokes	
00	0" Stroke
01	1" Stroke
02	2" Stroke
03	3" Stroke
04	4" Stroke
05	5" Stroke
06	6" Stroke
...	...
30	30" Stroke
xx	Special

Fractional Increments of Stroke			
A	0"	J	1/2"
B	1/16"	K	9/16"
C	1/8"	M	5/8"
D	3/16"	N	11/16"
E	1/4"	P	3/4"
F	5/16"	R	13/16"
G	3/8"	S	7/8"
H	7/16"	T	15/16"
X	Special		

Rod Axis	
E	Horizontal Rod Axis
N	Vertical Rod Axis
A	No Tooling Plate - Horizontal Rod
B	No Tooling Plate - Vertical Rod
C	Blank Rod End - Horizontal Rod*
D	Blank Rod End - Vertical Rod*
X	Special

\* Does not include tooling plate

Options	
O	No Options
M	Metal Rod Scraper
P	Air/Oil Piston
R	Double Rod W/OS Cap Rod
S	Stainless Piston Rods
V	Viton Seals
X	Special

Magnetic Option	
O	No Magnet
M	Magnetic Piston

B	Design Level
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Cushions <sup>1</sup>				
Needle Position	1	2**	3	4
No Cushions	A			
Head Only	B	C	D	E
Cap Only	G	H	J	K
Head and Cap	N	M	P	R
Special	X			

<sup>1</sup>Cushions not available on 1 1/8" Bore.

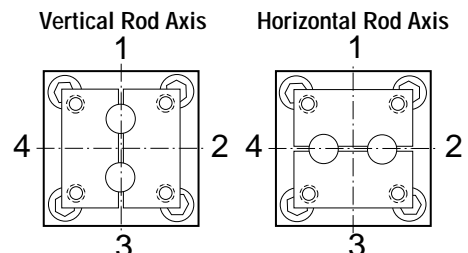
\*\*Standard position

Ports				
Position	1**	2	3	4
Standard	A	B	C	D
Special	X			

\*\*Standard position

Mounting Options			
01	No Mounts (MX0)	07	Det. Clevis (MP2)
02	Bottom Tap (MS4)	18	Det. Eye (MP4)
04	Front Flange (MF1)	20	Base Bar
05	Rear Flange (MF2)	XX	Special

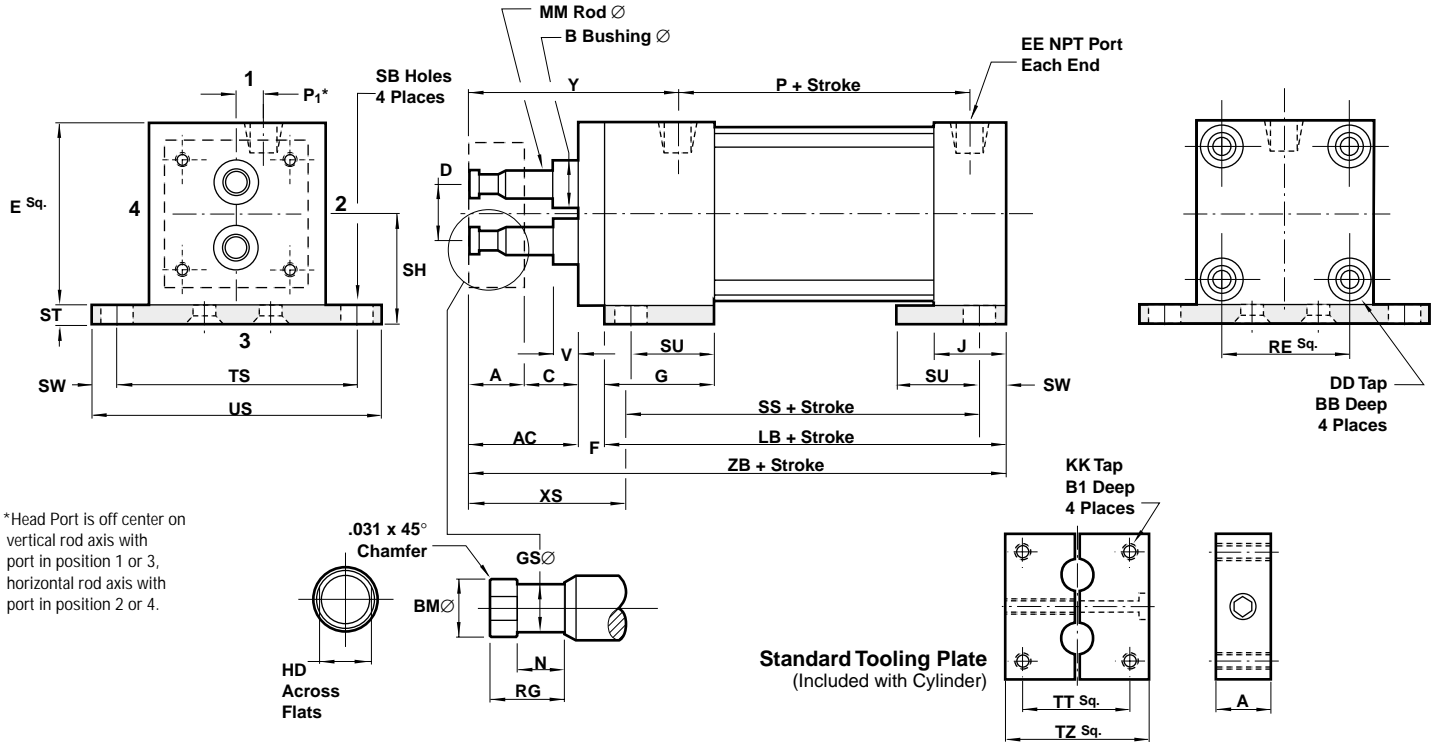
Switch, Port, and Cushion Needle Positions (As viewed from twin rod end)



See ACT-3-30 for complete instructions on how to order cylinders.

# Series N Actuators

All Dimensions in Inches (mm)



\*Head Port is off center on vertical rod axis with port in position 1 or 3, horizontal rod axis with port in position 2 or 4.

Standard Tooling Plate (Included with Cylinder)

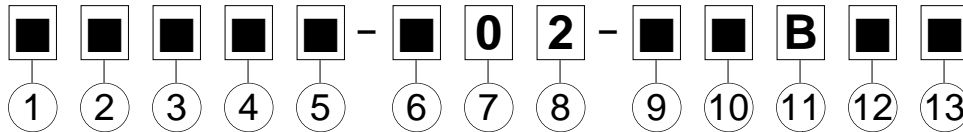
Dimension	1-1/8" Bore (28.58)	1-1/2" Bore (38.10)	2" Bore (50.80)	2-1/2" Bore (63.50)	3-1/4" Bore (82.55)	4" Bore (101.60)
A	.625 (15.88)	.625 (15.88)	.750 (19.05)	.750 (19.05)	1.250 (31.75)	1.250 (31.75)
AC	1.250 (31.75)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)
B	N/A	.590 (14.99)	.900 (22.86)	.900 (22.86)	1.498 (38.05)	1.498 (38.05)
B <sub>1</sub>	.500 (12.70)	Thru	Thru	Thru	Thru	Thru
BB	.188 (4.78)	.312 (7.92)	.312 (7.92)	.312 (7.92)	.437 (11.10)	.437 (11.10)
BM	.270 (6.86)	.330 (8.38)	.550 (13.97)	.550 (13.97)	.900 (22.86)	.900 (22.86)
C	.625 (15.88)	.875 (22.23)	.750 (19.05)	1.000 (25.40)	.500 (12.70)	.500 (12.70)
D	.627 (15.93)	.750 (19.05)	1.052 (26.72)	1.398 (35.51)	2.000 (50.80)	2.360 (59.94)
DD	10 - 32	1/4 - 28	5/16 - 24	5/16 - 24	3/8 - 24	3/8 - 24
E	1.500 (38.10)	2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)
EE	1/8	1/4	1/4	1/4	3/8	3/8
F	.250 (6.35)	.375 (9.53)	.375 (9.53)	.375 (9.53)	.625 (15.88)	.625 (15.88)
G	1.000 (25.40)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)
GS	.190 (4.83)	.250 (6.35)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)
HD	.250 (6.35)	.312 (7.92)	.500 (12.70)	.500 (12.70)	.812 (20.62)	.812 (20.62)
J	.625 (15.88)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.250 (31.75)
KK	6 - 32	10 - 32	1/4 - 28	5/16 - 24	3/8 - 24	3/8 - 24
LB	2.250 (57.15)	3.625 (92.08)	3.625 (92.08)	3.750 (95.25)	4.250 (107.95)	4.250 (107.95)
MM	.312 (7.92)	.375 (9.53)	.625 (15.88)	.625 (15.88)	1.000 (25.40)	1.000 (25.40)
N	.400 (10.16)	.400 (10.16)	.526 (13.36)	.526 (13.36)	.784 (19.81)	.784 (19.81)
P	1.469 (37.31)	2.125 (53.98)	2.125 (53.98)	2.250 (57.15)	2.625 (66.68)	2.625 (66.68)
P <sub>1</sub>	.241 (6.12)	.303 (7.70)	.480 (12.19)	.635 (16.13)	.845 (21.46)	.875 (22.23)
RE	1.125 (28.58)	1.428 (36.27)	1.840 (46.74)	2.192 (55.68)	2.758 (70.05)	3.323 (84.40)
RG	.580 (14.73)	.580 (14.73)	.705 (17.91)	.705 (17.91)	1.205 (30.61)	1.205 (30.61)
SB	.203 (5.16)	.437 (11.10)	.437 (11.10)	.437 (11.10)	.563 (14.30)	.563 (14.30)
SH	1.000 (25.40)	1.250 (31.75)	1.500 (38.10)	1.875 (47.63)	2.375 (60.33)	2.750 (69.85)
SS	1.750 (44.45)	2.875 (73.03)	2.875 (73.03)	3.000 (76.20)	3.250 (82.55)	3.250 (82.55)
ST	.250 (6.35)	.250 (6.35)	.250 (6.35)	.375 (9.53)	.500 (12.70)	.500 (12.70)
SU	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.250 (31.75)	1.250 (31.75)
SW	.250 (6.35)	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)
TS	1.875 (47.63)	2.750 (69.85)	3.250 (82.55)	3.750 (95.25)	4.750 (120.65)	5.500 (139.70)
TT	.750 (19.05)	1.125 (28.58)	1.430 (36.32)	1.840 (46.74)	1.790 (45.47)	3.440 (87.38)
TZ	1.250 (31.75)	1.500 (38.10)	2.000 (50.80)	2.500 (63.50)	3.250 (82.55)	4.000 (101.60)
US	2.375 (60.33)	3.500 (88.90)	4.000 (101.60)	4.500 (114.30)	5.750 (146.05)	6.500 (165.10)
V	N/A	.250 (6.35)	.250 (6.35)	.250 (6.35)	.250 (6.35)	.250 (6.35)
XS	1.750 (44.45)	2.250 (57.15)	2.250 (57.15)	2.500 (63.50)	2.875 (73.03)	2.875 (73.03)
Y	2.031 (51.59)	2.875 (73.03)	2.875 (73.03)	3.125 (79.38)	3.437 (87.30)	3.437 (87.30)
ZB	3.750 (95.25)	5.500 (139.70)	5.500 (139.70)	5.875 (149.23)	6.625 (168.28)	6.625 (168.28)



- **NFPA (MS4) 02 Bottom Tap Mounts available in 1-1/8" thru 4" bore sizes.**
- **Cylinders rated to 250 PSI air.**  
(For hydraulic service consult factory)
- **Designed for non-lube service.**
- **New low breakaway design.**
- **Switches available on all bore sizes.**  
(See ACT-3-28/29 for ordering information.)



### Cylinder Order Information



N	Series N
Q	Series Q Electroless Nickel

Single Rod End	Bore	Double Rod End*
B	1 1/8"	P
C	1 1/2"	Q
D	2"	R
E	2 1/2"	S
F	3 1/4"	T
G	4"	U

\*Double Rod End has two Piston Rods on one end and one Piston Rod on opposite end.

Full Inches in Strokes	
00	0" Stroke
01	1" Stroke
02	2" Stroke
03	3" Stroke
04	4" Stroke
05	5" Stroke
06	6" Stroke
...	...
30	30" Stroke
xx	Special

Fractional Increments of Stroke			
A	0"	J	1/2"
B	1/16"	K	9/16"
C	1/8"	M	5/8"
D	3/16"	N	11/16"
E	1/4"	P	3/4"
F	5/16"	R	13/16"
G	3/8"	S	7/8"
H	7/16"	T	15/16"
X	Special		

Rod Axis	
E	Horizontal Rod Axis
N	Vertical Rod Axis
A	No Tooling Plate - Horizontal Rod
B	No Tooling Plate - Vertical Rod
C	Blank Rod End - Horizontal Rod*
D	Blank Rod End - Vertical Rod*
X	Special

\* Does not include tooling plate

Options	
O	No Options
M	Metal Rod Scraper
P	Air/Oil Piston
R	Double Rod W/OS Cap Rod
S	Stainless Piston Rods
V	Viton Seals
X	Special

Magnetic Option	
O	No Magnet
M	Magnetic Piston

B	Design Level
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Cushions <sup>1</sup>				
Needle Position	1	2**	3	4
No Cushions	A			
Head Only	B	C	D	E
Cap Only	G	H	J	K
Head and Cap	N	M	P	R
Special	X			

<sup>1</sup>Cushions not available on 1 1/8" Bore.

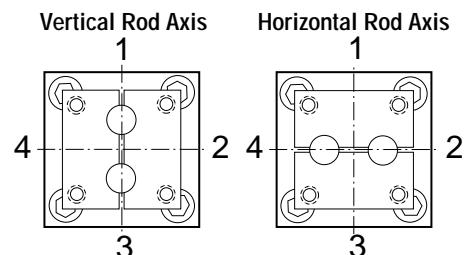
\*\*Standard position

Ports				
Position	1**	2	3	4
Standard	A	B	C	D
Special	X			

\*\*Standard position

Mounting Options			
01	No Mounts (MX0)	07	Det. Clevis (MP2)
02	<b>Bottom Tap (MS4)</b>	18	Det. Eye (MP4)
04	Front Flange (MF1)	20	Base Bar
05	Rear Flange (MF2)	XX	Special

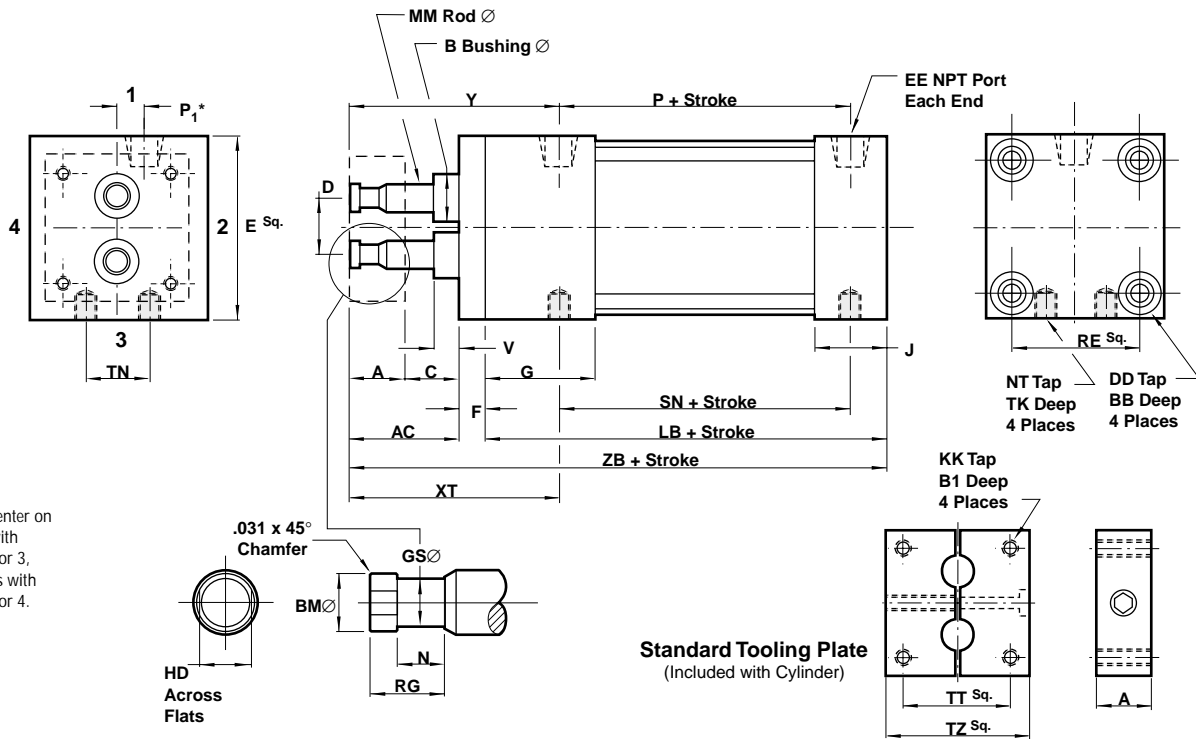
Switch, Port, and Cushion Needle Positions  
(As viewed from twin rod end)



See ACT-3-30 for complete instructions on how to order cylinders.

# Series N Actuators

All Dimensions in Inches (mm)



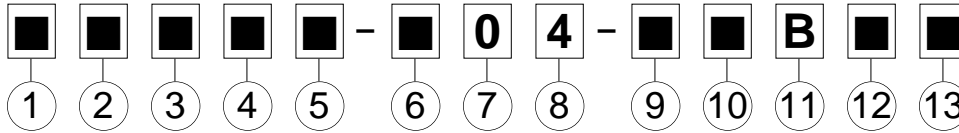
\*Head Port is off center on vertical rod axis with port in position 1 or 3, horizontal rod axis with port in position 2 or 4.

Dimension	1-1/8" Bore (28.58)		1-1/2" Bore (38.10)		2" Bore (50.80)		2-1/2" Bore (63.50)		3-1/4" Bore (82.55)		4" Bore (101.60)	
A	.625	(15.88)	.625	(15.88)	.750	(19.05)	.750	(19.05)	1.250	(31.75)	1.250	(31.75)
AC	1.250	(31.75)	1.500	(38.10)	1.500	(38.10)	1.750	(44.45)	1.750	(44.45)	1.750	(44.45)
B	N/A		.590	(14.99)	.900	(22.86)	.900	(22.86)	1.498	(38.05)	1.498	(38.05)
B <sub>1</sub>	.500	(12.70)	Thru		Thru		Thru		Thru		Thru	
BB	.188	(4.78)	.312	(7.92)	.312	(7.92)	.312	(7.92)	.437	(11.10)	.437	(11.10)
BM	.270	(6.86)	.330	(8.38)	.550	(13.97)	.550	(13.97)	.900	(22.86)	.900	(22.86)
C	.625	(15.88)	.875	(22.23)	.750	(19.05)	1.000	(25.40)	.500	(12.70)	.500	(12.70)
D	.627	(15.93)	.750	(19.05)	1.052	(26.72)	1.398	(35.51)	2.000	(50.80)	2.360	(59.94)
DD	10 - 32		1/4 - 28		5/16 - 24		5/16 - 24		3/8 - 24		3/8 - 24	
E	1.500	(38.10)	2.000	(50.80)	2.500	(63.50)	3.000	(76.20)	3.750	(95.25)	4.500	(114.30)
EE	1/8		1/4		1/4		1/4		3/8		3/8	
F	.250	(6.35)	.375	(9.53)	.375	(9.53)	.375	(9.53)	.625	(15.88)	.625	(15.88)
G	1.000	(25.4)	1.500	(38.10)	1.500	(38.10)	1.500	(38.10)	1.750	(44.45)	1.750	(44.45)
GS	.190	(4.83)	.250	(6.35)	.500	(12.70)	.500	(12.70)	.750	(19.05)	.750	(19.05)
HD	.250	(6.35)	.312	(7.92)	.500	(12.70)	.500	(12.70)	.812	(20.62)	.812	(20.62)
J	.625	(15.88)	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.250	(31.75)	1.250	(31.75)
KK	6 - 32		10 - 32		1/4 - 28		5/16 - 24		3/8 - 24		3/8 - 24	
LB	2.250	(57.15)	3.625	(92.08)	3.625	(92.08)	3.750	(95.25)	4.250	(107.95)	4.250	(107.95)
MM	.312	(7.92)	.375	(9.53)	.625	(15.88)	.625	(15.88)	1.000	(25.40)	1.000	(25.40)
N	.400	(10.16)	.400	(10.16)	.526	(13.36)	.526	(13.36)	.784	(19.81)	.784	(19.81)
NT	10 - 32		1/4 - 20		5/16 - 18		3/8 - 16		1/2 - 13		1/2 - 13	
P	1.469	(37.31)	2.125	(53.98)	2.125	(53.98)	2.250	(57.15)	2.625	(66.68)	2.625	(66.68)
P <sub>1</sub>	.241	(6.12)	.303	(7.70)	.480	(12.19)	.635	(16.13)	.845	(21.46)	.875	(22.23)
RE	1.125	(28.58)	1.428	(36.27)	1.840	(46.74)	2.192	(55.68)	2.758	(70.05)	3.323	(84.40)
RG	.580	(14.73)	.580	(14.73)	.705	(17.91)	.705	(17.91)	1.205	(30.61)	1.205	(30.61)
SN	1.500	(38.10)	2.250	(57.15)	2.250	(57.15)	2.375	(60.33)	2.625	(66.68)	2.625	(66.68)
TK	.250	(6.35)	.375	(9.53)	.375	(9.53)	.625	(15.88)	.625	(15.88)	.750	(19.05)
TN	.500	(12.70)	.625	(15.88)	.875	(22.23)	1.250	(31.75)	1.500	(38.10)	2.063	(52.40)
TT	.750	(19.05)	1.125	(28.58)	1.430	(36.32)	1.840	(46.74)	1.790	(45.47)	3.440	(87.38)
TZ	1.250	(31.75)	1.500	(38.10)	2.000	(50.80)	2.500	(63.50)	3.250	(82.55)	4.000	(101.60)
V	N/A		.250	(6.35)	.250	(6.35)	.250	(6.35)	.250	(6.35)	.250	(6.35)
XT	2.000	(50.80)	2.812	(71.42)	2.812	(71.42)	3.063	(77.80)	3.437	(87.30)	3.437	(87.30)
Y	2.031	(51.59)	2.875	(73.03)	2.875	(73.03)	3.125	(79.38)	3.437	(87.30)	3.437	(87.30)
ZB	3.750	(95.25)	5.500	(139.70)	5.500	(139.70)	5.875	(149.23)	6.625	(168.28)	6.625	(168.28)

- **NFPA (MF1) 04 Front Flange Mounts available in 1-1/8" thru 4" bore sizes.**
- **Cylinders rated to 250 PSI air.**  
(For hydraulic service consult factory)
- **Designed for non-lube service.**
- **New low breakaway design.**
- **Switches available on all bore sizes.**  
(See ACT-3-28/29 for ordering information.)



### Cylinder Order Information



N	Series N
Q	Series Q Electroless Nickel

Single Rod End	Bore	Double Rod End*
B	1 1/8"	P
C	1 1/2"	Q
D	2"	R
E	2 1/2"	S
F	3 1/4"	T
G	4"	U

\* Double Rod End has two Piston Rods on one end and one Piston Rod on opposite end.

Full Inches in Strokes	
00	0" Stroke
01	1" Stroke
02	2" Stroke
03	3" Stroke
04	4" Stroke
05	5" Stroke
06	6" Stroke
...	...
30	30" Stroke
xx	Special

Fractional Increments of Stroke			
A	0"	J	1/2"
B	1/16"	K	9/16"
C	1/8"	M	5/8"
D	3/16"	N	11/16"
E	1/4"	P	3/4"
F	5/16"	R	13/16"
G	3/8"	S	7/8"
H	7/16"	T	15/16"
X	Special		

Rod Axis	
E	Horizontal Rod Axis
N	Vertical Rod Axis
A	No Tooling Plate - Horizontal Rod
B	No Tooling Plate - Vertical Rod
C	Blank Rod End - Horizontal Rod*
D	Blank Rod End - Vertical Rod*
X	Special

\* Does not include tooling plate

Options	
O	No Options
M	Metal Rod Scraper
P	Air/Oil Piston
R	Double Rod W/OS Cap Rod
S	Stainless Piston Rods
V	Viton Seals
X	Special

Magnetic Option	
O	No Magnet
M	Magnetic Piston

B	Design Level

Cushions <sup>1</sup>				
Needle Position	1	2**	3	4
No Cushions	A			
Head Only	B	C	D	E
Cap Only	G	H	J	K
Head and Cap	N	M	P	R
Special	X			

<sup>1</sup>Cushions not available on 1 1/8" Bore.

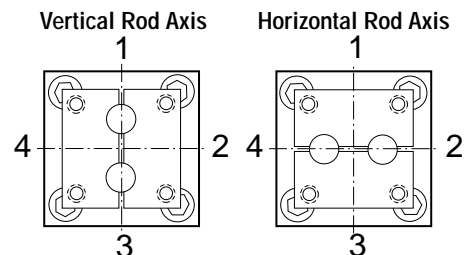
\*\*Standard position

Ports				
Position	1**	2	3	4
Standard	A	B	C	D
Special	X			

\*\*Standard position

Mounting Options			
01	No Mounts (MX0)	07	Det. Clevis (MP2)
02	Bottom Tap (MS4)	18	Det. Eye (MP4)
04	<b>Front Flange (MF1)</b>	20	Base Bar
05	Rear Flange (MF2)	XX	Special

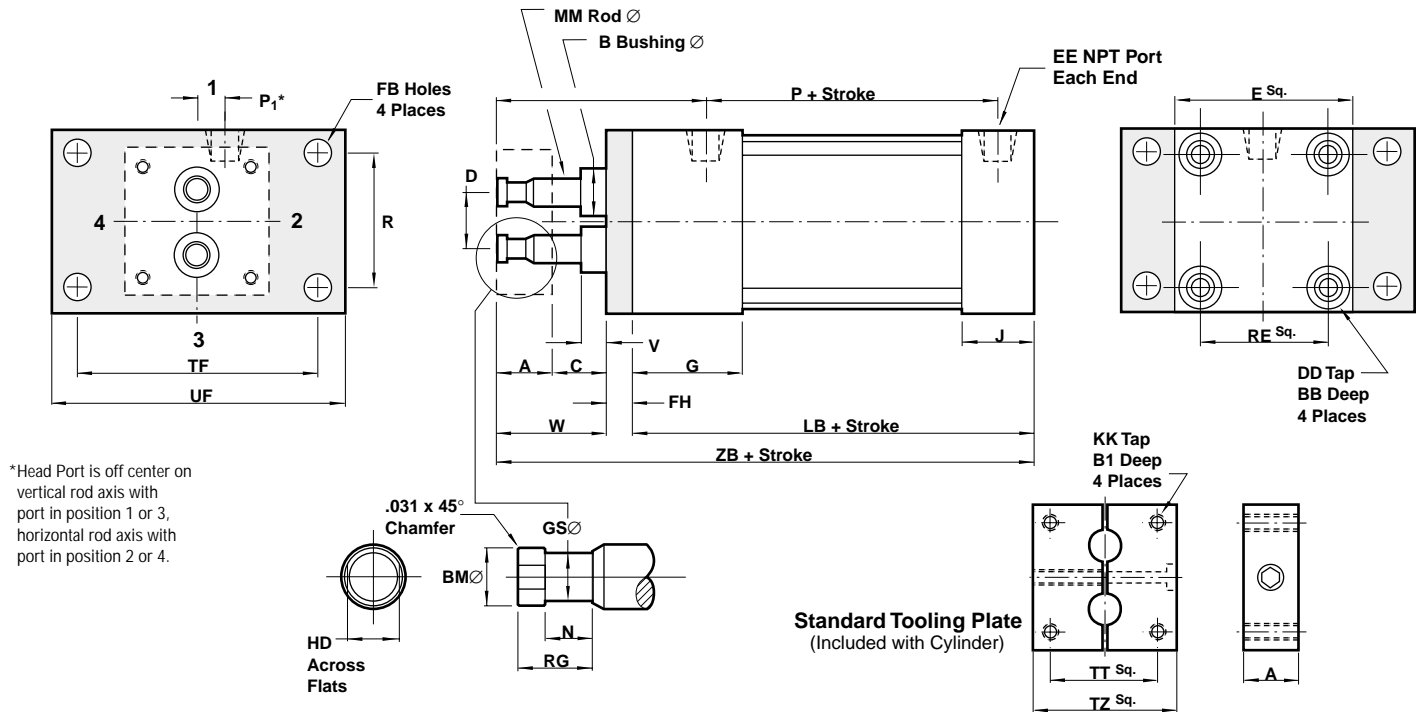
Switch, Port, and Cushion Needle Positions  
(As viewed from twin rod end)



See ACT-3-30 for complete instructions on how to order cylinders.

# Series N Actuators

All Dimensions in Inches (mm)

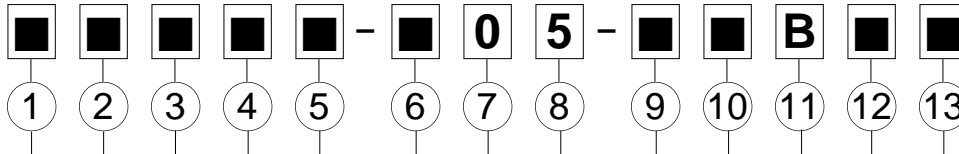


Dimension	1-1/8" Bore (28.58)	1-1/2" Bore (38.10)	2" Bore (50.80)	2-1/2" Bore (63.50)	3-1/4" Bore (82.55)	4" Bore (101.60)
A	.625 (15.88)	.625 (15.88)	.750 (19.05)	.750 (19.05)	1.250 (31.75)	1.250 (31.75)
B	N/A	.590 (14.99)	.900 (22.86)	.900 (22.86)	1.498 (38.05)	1.498 (38.05)
B <sub>1</sub>	.500 (12.70)	Thru	Thru	Thru	Thru	Thru
BB	.188 (4.78)	.312 (7.92)	.312 (7.92)	.312 (7.92)	.437 (11.10)	.437 (11.10)
BM	.270 (6.86)	.330 (8.38)	.550 (13.97)	.550 (13.97)	.900 (22.86)	.900 (22.86)
C	.625 (15.88)	.875 (22.23)	.750 (19.05)	1.000 (25.40)	.500 (12.70)	.500 (12.70)
D	.627 (15.93)	.750 (19.05)	1.052 (26.72)	1.398 (35.51)	2.000 (50.80)	2.360 (59.94)
DD	10 - 32	1/4 - 28	5/16 - 24	5/16 - 24	3/8 - 24	3/8 - 24
E	1.500 (38.10)	2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)
EE	1/8	1/4	1/4	1/4	3/8	3/8
FB	.219 (5.56)	.312 (7.92)	.375 (9.53)	.375 (9.53)	.437 (11.10)	.437 (11.10)
FH	.250 (6.35)	.375 (9.53)	.375 (9.53)	.375 (9.53)	.625 (15.88)	.625 (15.88)
G	1.000 (25.4)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)
GS	.190 (4.83)	.250 (6.35)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)
HD	.250 (6.35)	.312 (7.92)	.500 (12.70)	.500 (12.70)	.812 (20.62)	.812 (20.62)
J	.625 (15.88)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.250 (31.75)
KK	6 - 32	10 - 32	1/4 - 28	5/16 - 24	3/8 - 24	3/8 - 24
LB	2.250 (57.15)	3.625 (92.08)	3.625 (92.08)	3.750 (95.25)	4.250 (107.95)	4.250 (107.95)
MM	.312 (7.92)	.375 (9.53)	.625 (15.88)	.625 (15.88)	1.000 (25.40)	1.000 (25.40)
N	.400 (10.16)	.400 (10.16)	.526 (13.36)	.526 (13.36)	.784 (19.81)	.784 (19.81)
P	1.469 (37.31)	2.125 (53.98)	2.125 (53.98)	2.250 (57.15)	2.625 (66.68)	2.625 (66.68)
P <sub>1</sub>	.241 (6.12)	.303 (7.70)	.480 (12.19)	.635 (16.13)	.845 (21.46)	.875 (22.23)
R	1.000 (25.40)	1.430 (36.32)	1.840 (46.74)	2.190 (55.63)	2.760 (70.10)	3.320 (84.33)
RE	1.125 (28.58)	1.428 (36.27)	1.840 (46.74)	2.192 (55.68)	2.758 (70.05)	3.323 (84.40)
RG	.580 (14.73)	.580 (14.73)	.705 (17.91)	.705 (17.91)	1.205 (30.61)	1.205 (30.61)
TF	2.000 (50.80)	2.750 (69.85)	3.375 (85.73)	3.875 (98.43)	4.688 (119.08)	5.437 (138.10)
TT	.750 (19.05)	1.125 (28.58)	1.430 (36.32)	1.840 (46.74)	1.790 (45.47)	3.440 (87.38)
TZ	1.250 (31.75)	1.500 (38.10)	2.000 (50.80)	2.500 (63.50)	3.250 (82.55)	4.000 (101.60)
UF	2.500 (63.50)	3.750 (95.25)	4.125 (104.78)	4.625 (117.48)	5.500 (139.70)	6.250 (158.75)
V	N/A	.250 (6.35)	.250 (6.35)	.250 (6.35)	.250 (6.35)	.250 (6.35)
W	1.250 (31.75)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)
Y	2.031 (51.59)	2.875 (73.03)	2.875 (73.03)	3.125 (79.38)	3.437 (87.30)	3.437 (87.30)
ZB	3.750 (95.25)	5.500 (139.70)	5.500 (139.70)	5.875 (149.23)	6.625 (168.28)	6.625 (168.28)

- NFPA (MF2) 05 Rear Flange Mounts available in 1-1/8" thru 4" bore sizes.
- Cylinders rated to 250 PSI air.  
(For hydraulic service consult factory)
- Designed for non-lube service.
- New low breakaway design.
- Switches available on all bore sizes.  
(See ACT-3-28/29 for ordering information.)



### Cylinder Order Information



N	Series N
Q	Series Q Electroless Nickel

Single Rod End	Bore	Double Rod End*
B	1 1/8"	P
C	1 1/2"	Q
D	2"	R
E	2 1/2"	S
F	3 1/4"	T
G	4"	U

\* Double Rod End has two Piston Rods on one end and one Piston Rod on opposite end.

Full Inches in Strokes	
00	0" Stroke
01	1" Stroke
02	2" Stroke
03	3" Stroke
04	4" Stroke
05	5" Stroke
06	6" Stroke
...	...
30	30" Stroke
xx	Special

Fractional Increments of Stroke			
A	0"	J	1/2"
B	1/16"	K	9/16"
C	1/8"	M	5/8"
D	3/16"	N	11/16"
E	1/4"	P	3/4"
F	5/16"	R	13/16"
G	3/8"	S	7/8"
H	7/16"	T	15/16"
X	Special		

Rod Axis	
E	Horizontal Rod Axis
N	Vertical Rod Axis
A	No Tooling Plate - Horizontal Rod
B	No Tooling Plate - Vertical Rod
C	Blank Rod End - Horizontal Rod*
D	Blank Rod End - Vertical Rod*
X	Special

\* Does not include tooling plate

Options	
O	No Options
M	Metal Rod Scraper
P	Air/Oil Piston
R	Double Rod W/OS Cap Rod
S	Stainless Piston Rods
V	Viton Seals
X	Special

Magnetic Option	
O	No Magnet
M	Magnetic Piston

B	Design Level
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Cushions <sup>1</sup>				
Needle Position	1	2**	3	4
No Cushions	A			
Head Only	B	C	D	E
Cap Only	G	H	J	K
Head and Cap	N	M	P	R
Special	X			

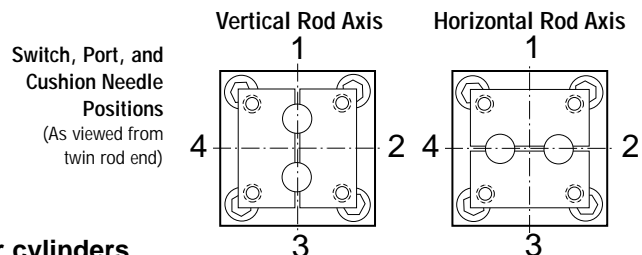
<sup>1</sup>Cushions not available on 1 1/8" Bore.

\*\*Standard position

Ports				
Position	1**	2	3	4
Standard	A	B	C	D
Special	X			

\*\*Standard position

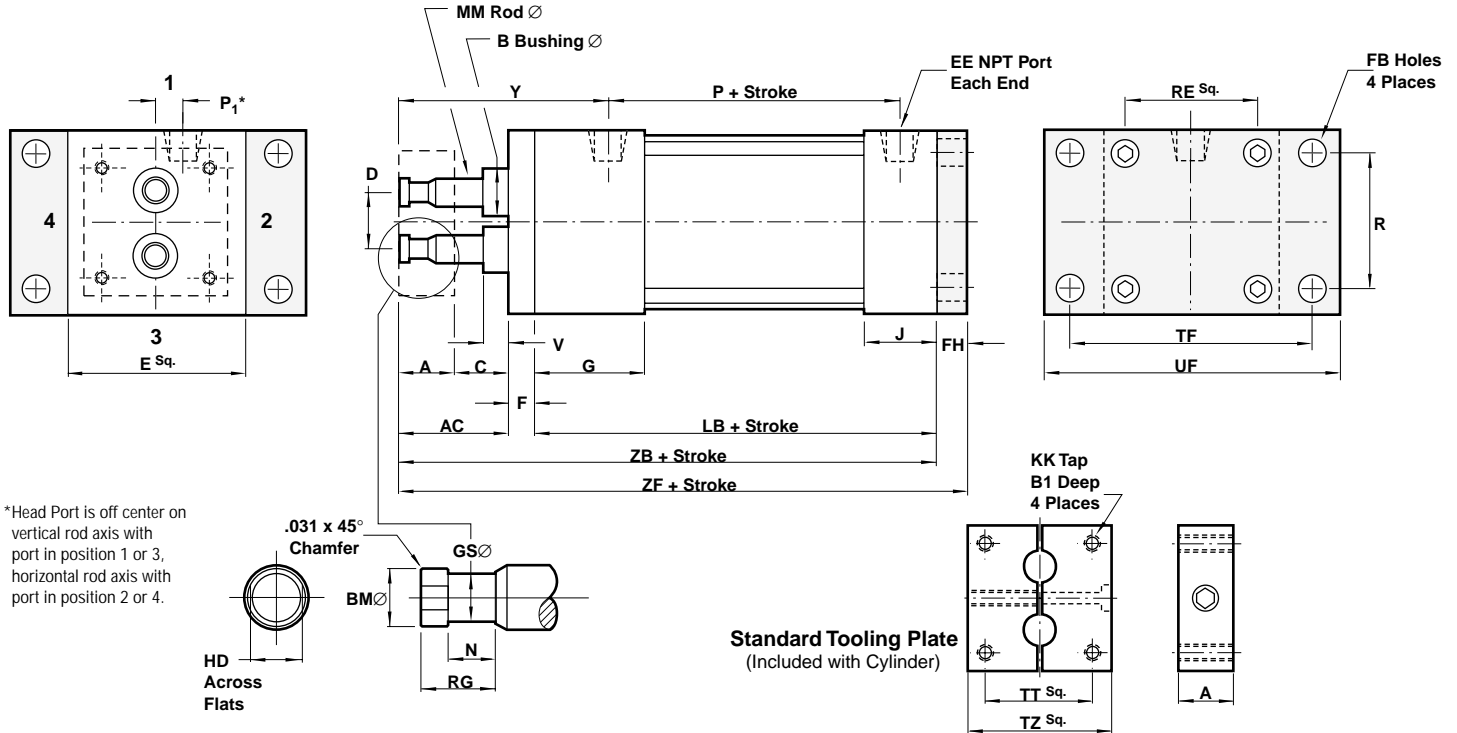
Mounting Options			
01	No Mounts (MX0)	07	Det. Clevis (MP2)
02	Bottom Tap (MS4)	18	Det. Eye (MP4)
04	Front Flange (MF1)	20	Base Bar
05	Rear Flange (MF2)	XX	Special



See ACT-3-30 for complete instructions on how to order cylinders.

# Series N Actuators

All Dimensions in Inches (mm)

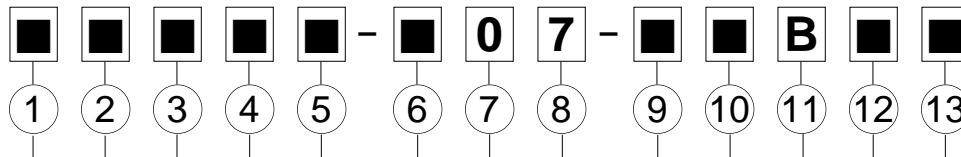


Dimension	1-1/8" Bore (28.58)	1-1/2" Bore (38.10)	2" Bore (50.80)	2-1/2" Bore (63.50)	3-1/4" Bore (82.55)	4" Bore (101.60)
A	.625 (15.88)	.625 (15.88)	.750 (19.05)	.750 (19.05)	1.250 (31.75)	1.250 (31.75)
AC	1.250 (31.75)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)
B	N/A	.590 (14.99)	.900 (22.86)	.900 (22.86)	1.498 (38.05)	1.498 (38.05)
B <sub>1</sub>	.500 (12.70)	Thru	Thru	Thru	Thru	Thru
BM	.270 (6.86)	.330 (8.38)	.550 (13.97)	.550 (13.97)	.900 (22.86)	.900 (22.86)
C	.625 (15.88)	.875 (22.23)	.750 (19.05)	1.000 (25.40)	.500 (12.70)	.500 (12.70)
D	.627 (15.93)	.750 (19.05)	1.052 (26.72)	1.398 (35.51)	2.000 (50.80)	2.360 (59.94)
E	1.500 (38.10)	2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)
EE	1/8	1/4	1/4	1/4	3/8	3/8
F	.250 (6.35)	.375 (9.53)	.375 (9.53)	.375 (9.53)	.625 (15.88)	.625 (15.88)
FB	.219 (5.56)	.312 (7.92)	.375 (9.53)	.375 (9.53)	.437 (11.10)	.437 (11.10)
FH	.250 (6.35)	.375 (9.53)	.375 (9.53)	.375 (9.53)	.625 (15.88)	.625 (15.88)
G	1.000 (25.4)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)
GS	.190 (4.83)	.250 (6.35)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)
HD	.250 (6.35)	.312 (7.92)	.500 (12.70)	.500 (12.70)	.812 (20.62)	.812 (20.62)
J	.625 (15.88)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.250 (31.75)
KK	6 - 32	10 - 32	1/4 - 28	5/16 - 24	3/8 - 24	3/8 - 24
LB	2.250 (57.15)	3.625 (92.08)	3.625 (92.08)	3.750 (95.25)	4.250 (107.95)	4.250 (107.95)
MM	.312 (7.92)	.375 (9.53)	.625 (15.88)	.625 (15.88)	1.000 (25.40)	1.000 (25.40)
N	.400 (10.16)	.400 (10.16)	.526 (13.36)	.526 (13.36)	.784 (19.81)	.784 (19.81)
P	1.469 (37.31)	2.125 (53.98)	2.125 (53.98)	2.250 (57.15)	2.625 (66.68)	2.625 (66.68)
P <sub>1</sub>	.241 (6.12)	.303 (7.70)	.480 (12.19)	.635 (16.13)	.845 (21.46)	.875 (22.23)
R	1.000 (25.40)	1.430 (36.32)	1.840 (46.74)	2.190 (55.63)	2.760 (70.10)	3.320 (84.33)
RE	1.125 (28.58)	1.428 (36.27)	1.840 (46.74)	2.192 (55.68)	2.758 (70.05)	3.323 (84.40)
RG	.580 (14.73)	.580 (14.73)	.705 (17.91)	.705 (17.91)	1.205 (30.61)	1.205 (30.61)
TF	2.000 (50.80)	2.750 (69.85)	3.375 (85.73)	3.875 (98.43)	4.688 (119.08)	5.437 (138.10)
TT	.750 (19.05)	1.125 (28.58)	1.430 (36.32)	1.840 (46.74)	1.790 (45.47)	3.440 (87.38)
TZ	1.250 (31.75)	1.500 (38.10)	2.000 (50.80)	2.500 (63.50)	3.250 (82.55)	4.000 (101.60)
UF	2.500 (63.50)	3.750 (95.25)	4.125 (104.78)	4.625 (117.48)	5.500 (139.70)	6.250 (158.75)
V	N/A	.250 (6.35)	.250 (6.35)	.250 (6.35)	.250 (6.35)	.250 (6.35)
Y	2.031 (51.59)	2.875 (73.03)	2.875 (73.03)	3.125 (79.38)	3.437 (87.30)	3.437 (87.30)
ZB	3.750 (95.25)	5.500 (139.70)	5.500 (139.70)	5.875 (149.23)	6.625 (168.28)	6.625 (168.28)
ZF	4.000 (101.60)	5.875 (149.23)	5.875 (149.23)	6.250 (158.75)	7.250 (184.15)	7.250 (184.15)

- NFPA (MP2) 07 Detachable Clevis Mounts available in 1-1/8" thru 4" bore sizes.
- Cylinders rated to 250 PSI air.  
(For hydraulic service consult factory)
- Designed for non-lube service.
- New low breakaway design.
- Switches available on all bore sizes.  
(See ACT-3-28/29 for ordering information.)



### Cylinder Order Information



N	Series N
Q	Series Q Electroless Nickel

Single Rod End	Bore	Double Rod End*
B	1 1/8"	P
C	1 1/2"	Q
D	2"	R
E	2 1/2"	S
F	3 1/4"	T
G	4"	U

\* Double Rod End has two Piston Rods on one end and one Piston Rod on opposite end.

Full Inches in Strokes	
00	0" Stroke
01	1" Stroke
02	2" Stroke
03	3" Stroke
04	4" Stroke
05	5" Stroke
06	6" Stroke
...	...
30	30" Stroke
xx	Special

Fractional Increments of Stroke			
A	0"	J	1/2"
B	1/16"	K	9/16"
C	1/8"	M	5/8"
D	3/16"	N	11/16"
E	1/4"	P	3/4"
F	5/16"	R	13/16"
G	3/8"	S	7/8"
H	7/16"	T	15/16"
X	Special		

Rod Axis	
E	Horizontal Rod Axis
N	Vertical Rod Axis
A	No Tooling Plate - Horizontal Rod
B	No Tooling Plate - Vertical Rod
C	Blank Rod End - Horizontal Rod*
D	Blank Rod End - Vertical Rod*
X	Special

\* Does not include tooling plate

Options	
O	No Options
M	Metal Rod Scraper
P	Air/Oil Piston
R	Double Rod W/OS Cap Rod
S	Stainless Piston Rods
V	Viton Seals
X	Special

Magnetic Option	
O	No Magnet
M	Magnetic Piston

B	Design Level
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Cushions <sup>1</sup>				
Needle Position	1	2**	3	4
No Cushions	A			
Head Only	B	C	D	E
Cap Only	G	H	J	K
Head and Cap	N	M	P	R
Special	X			

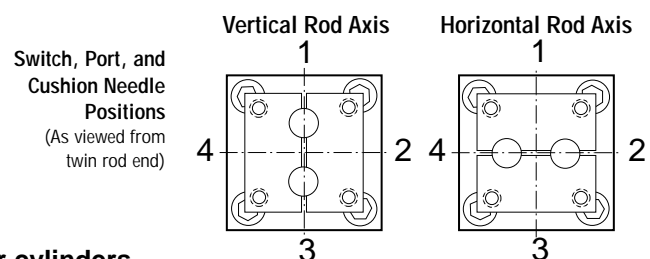
<sup>1</sup>Cushions not available on 1 1/8" Bore.

\*\*Standard position

Ports				
Position	1**	2	3	4
Standard	A	B	C	D
Special	X			

\*\*Standard position

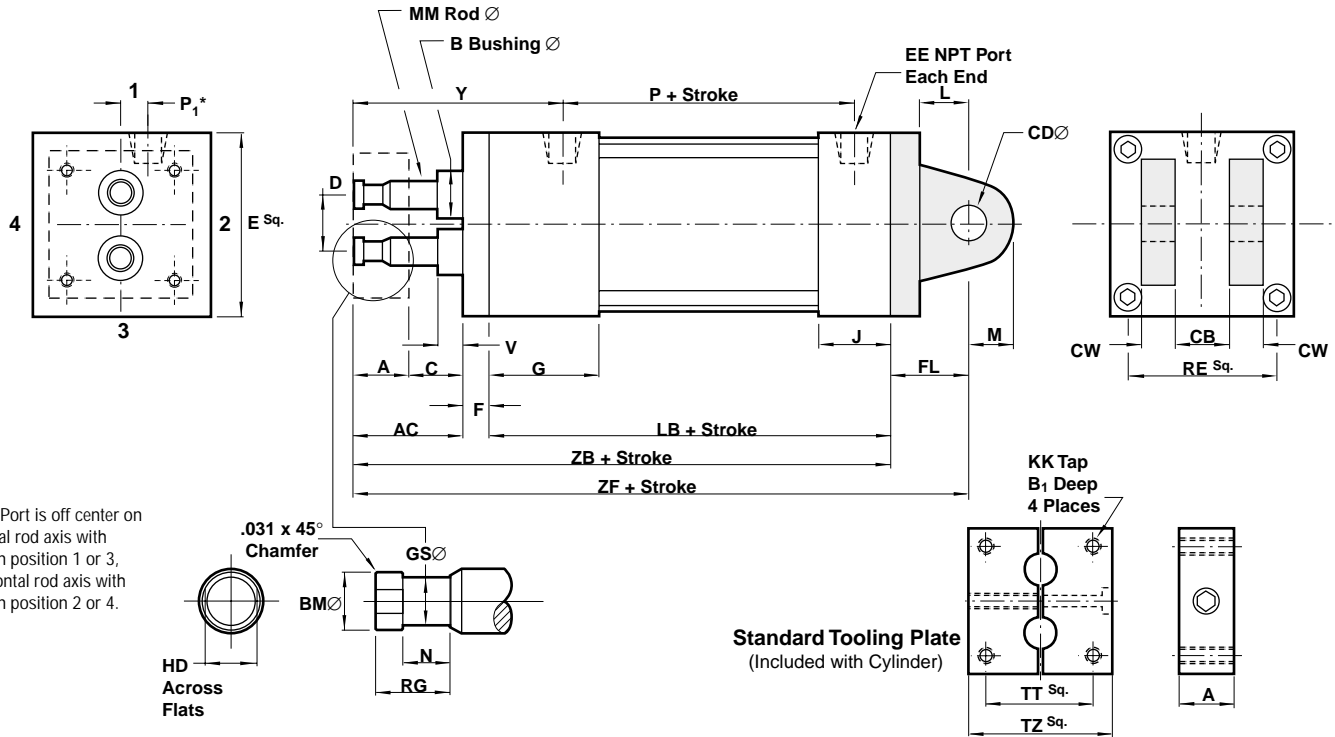
Mounting Options			
01	No Mounts (MX0)	07	Det. Clevis (MP2)
02	Bottom Tap (MS4)	18	Det. Eye (MP4)
04	Front Flange (MF1)	20	Base Bar
05	Rear Flange (MF2)	XX	Special



See ACT-3-30 for complete instructions on how to order cylinders.

# Series N Actuators

All Dimensions in Inches (mm)



\*Head Port is off center on vertical rod axis with port in position 1 or 3, horizontal rod axis with port in position 2 or 4.

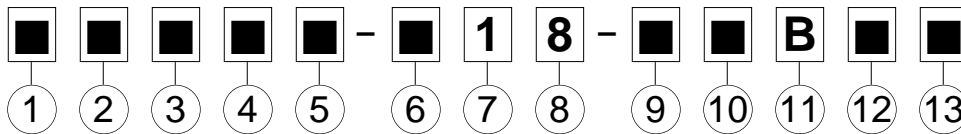
Dimension	1-1/8" Bore (28.58)	1-1/2" Bore (38.10)	2" Bore (50.80)	2-1/2" Bore (63.50)	3-1/4" Bore (82.55)	4" Bore (101.60)
A	.625 (15.88)	.625 (15.88)	.750 (19.05)	.750 (19.05)	1.250 (31.75)	1.250 (31.75)
AC	1.250 (31.75)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)
B	N/A	.590 (14.99)	.900 (22.86)	.900 (22.86)	1.498 (38.05)	1.498 (38.05)
B <sub>1</sub>	.500 (12.70)	Thru	Thru	Thru	Thru	Thru
BM	.270 (6.86)	.330 (8.38)	.550 (13.97)	.550 (13.97)	.900 (22.86)	.900 (22.86)
C	.625 (15.88)	.875 (22.23)	.750 (19.05)	1.000 (25.40)	.500 (12.70)	.500 (12.70)
CB	.375 (9.53)	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.250 (31.75)	1.250 (31.75)
CD	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)
CW	.250 (6.35)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)
D	.627 (15.93)	.750 (19.05)	1.052 (26.72)	1.398 (35.51)	2.000 (50.80)	2.360 (59.94)
E	1.500 (38.10)	2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)
EE	1/8	1/4	1/4	1/4	3/8	3/8
F	.250 (6.35)	.375 (9.53)	.375 (9.53)	.375 (9.53)	.625 (15.88)	.625 (15.88)
FL	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.875 (47.63)	1.875 (47.63)
G	1.000 (25.4)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)
GS	.190 (4.83)	.250 (6.35)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)
HD	.250 (6.35)	.312 (7.92)	.500 (12.70)	.500 (12.70)	.812 (20.62)	.812 (20.62)
J	.625 (15.88)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.250 (31.75)
KK	6 - 32	10 - 32	1/4 - 28	5/16 - 24	3/8 - 24	3/8 - 24
L	.625 (15.88)	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.250 (31.75)	1.250 (31.75)
LB	2.250 (57.15)	3.625 (92.08)	3.625 (92.08)	3.750 (95.25)	4.250 (107.95)	4.250 (107.95)
M	.375 (9.53)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.875 (22.23)	.875 (22.23)
MM	.312 (7.92)	.375 (9.53)	.625 (15.88)	.625 (15.88)	1.000 (25.40)	1.000 (25.40)
N	.400 (10.16)	.400 (10.16)	.526 (13.36)	.526 (13.36)	.784 (19.81)	.784 (19.81)
P	1.469 (37.31)	2.125 (53.98)	2.125 (53.98)	2.250 (57.15)	2.625 (66.68)	2.625 (66.68)
P <sub>1</sub>	.241 (6.12)	.303 (7.70)	.480 (12.19)	.635 (16.13)	.845 (21.46)	.875 (22.23)
RE	1.125 (28.58)	1.428 (36.27)	1.840 (46.74)	2.192 (55.68)	2.758 (70.05)	3.323 (84.40)
RG	.580 (14.73)	.580 (14.73)	.705 (17.91)	.705 (17.91)	1.205 (30.61)	1.205 (30.61)
TT	.750 (19.05)	1.125 (28.58)	1.430 (36.32)	1.840 (46.74)	1.790 (45.47)	3.440 (87.38)
TZ	1.250 (31.75)	1.500 (38.10)	2.000 (50.80)	2.500 (63.50)	3.250 (82.55)	4.000 (101.60)
V	N/A	.250 (6.35)	.250 (6.35)	.250 (6.35)	.250 (6.35)	.250 (6.35)
XD	4.875 (123.83)	6.625 (168.28)	6.625 (168.28)	7.000 (177.80)	8.375 (212.73)	8.375 (212.73)
Y	2.031 (51.59)	2.875 (73.03)	2.875 (73.03)	3.125 (79.38)	3.437 (87.30)	3.437 (87.30)
ZB	3.750 (95.25)	5.500 (139.70)	5.500 (139.70)	5.875 (149.23)	6.625 (168.28)	6.625 (168.28)



- **NFPA (MP4) 18 Detachable Eye Mounts available in 1-1/8" thru 4" bore sizes.**
- **Cylinders rated to 250 PSI air.**  
(For hydraulic service consult factory)
- **Designed for non-lube service.**
- **New low breakaway design.**
- **Switches available on all bore sizes.**  
(See ACT-3-28/29 for ordering information.)



### Cylinder Order Information



N	Series N
Q	Series Q Electroless Nickel

Single Rod End	Bore	Double Rod End*
B	1 1/8"	P
C	1 1/2"	Q
D	2"	R
E	2 1/2"	S
F	3 1/4"	T
G	4"	U

\*Double Rod End has two Piston Rods on one end and one Piston Rod on opposite end.

Full Inches in Strokes	
00	0" Stroke
01	1" Stroke
02	2" Stroke
03	3" Stroke
04	4" Stroke
05	5" Stroke
06	6" Stroke
...	...
30	30" Stroke
xx	Special

Fractional Increments of Stroke			
A	0"	J	1/2"
B	1/16"	K	9/16"
C	1/8"	M	5/8"
D	3/16"	N	11/16"
E	1/4"	P	3/4"
F	5/16"	R	13/16"
G	3/8"	S	7/8"
H	7/16"	T	15/16"
X	Special		

Rod Axis	
E	Horizontal Rod Axis
N	Vertical Rod Axis
A	No Tooling Plate - Horizontal Rod
B	No Tooling Plate - Vertical Rod
C	Blank Rod End - Horizontal Rod*
D	Blank Rod End - Vertical Rod*
X	Special

\* Does not include tooling plate

Options	
O	No Options
M	Metal Rod Scraper
P	Air/Oil Piston
R	Double Rod W/OS Cap Rod
S	Stainless Piston Rods
V	Viton Seals
X	Special

Magnetic Option	
O	No Magnet
M	Magnetic Piston

B	Design Level
---	--------------

Cushions <sup>1</sup>				
Needle Position	1	2**	3	4
No Cushions	A			
Head Only	B	C	D	E
Cap Only	G	H	J	K
Head and Cap	N	M	P	R
Special	X			

<sup>1</sup>Cushions not available on 1 1/8" Bore.

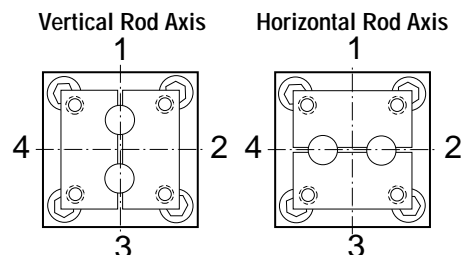
\*\*Standard position

Ports				
Position	1**	2	3	4
Standard	A	B	C	D
Special	X			

\*\*Standard position

Mounting Options			
01	No Mounts (MX0)	07	Det. Clevis (MP2)
02	Bottom Tap (MS4)	18	Det. Eye (MP4)
04	Front Flange (MF1)	20	Base Bar
05	Rear Flange (MF2)	XX	Special

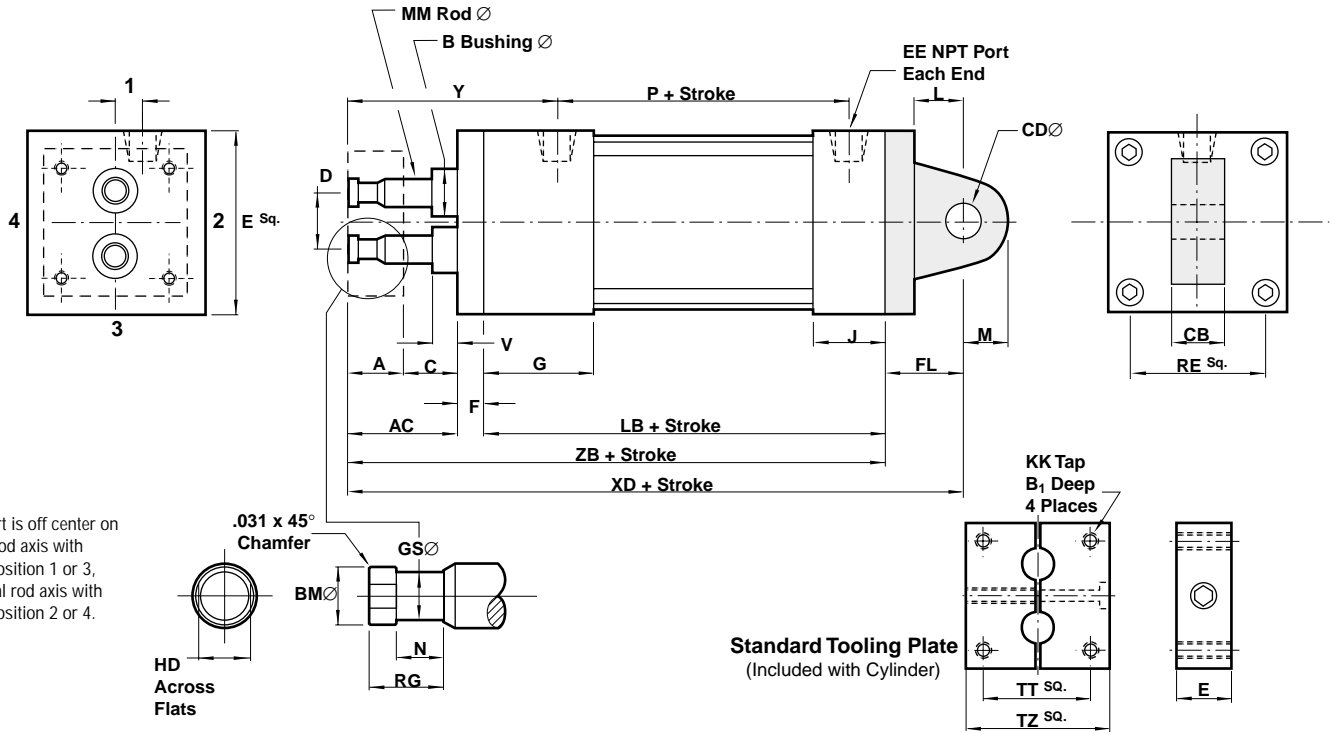
Switch, Port, and Cushion Needle Positions  
(As viewed from twin rod end)



See ACT-3-30 for complete instructions on how to order cylinders.

# Series N Actuators

All Dimensions in Inches (mm)

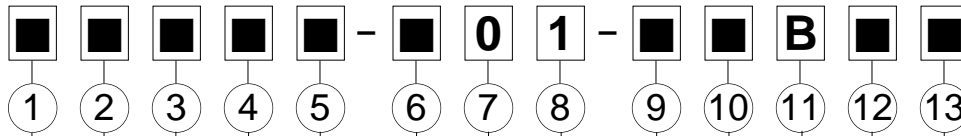


Dimension	1-1/8" Bore (28.58)	1-1/2" Bore (38.10)	2" Bore (50.80)	2-1/2" Bore (63.50)	3-1/4" Bore (82.55)	4" Bore (101.60)
A	.625 (15.88)	.625 (15.88)	.750 (19.05)	.750 (19.05)	1.250 (31.75)	1.250 (31.75)
AC	1.250 (31.75)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)
B	N/A	.590 (14.99)	.900 (22.86)	.900 (22.86)	1.498 (38.05)	1.498 (38.05)
B <sub>1</sub>	.500 (12.70)	Thru	Thru	Thru	Thru	Thru
BM	.270 (6.86)	.330 (8.38)	.550 (13.97)	.550 (13.97)	.900 (22.86)	.900 (22.86)
C	.625 (15.88)	.875 (22.23)	.750 (19.05)	1.000 (25.40)	.500 (12.70)	.500 (12.70)
CB	.375 (9.53)	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.250 (31.75)	1.250 (31.75)
CD	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)
D	.627 (15.93)	.750 (19.05)	1.052 (26.72)	1.398 (35.51)	2.000 (50.80)	2.360 (59.94)
E	1.500 (38.10)	2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)
EE	1/8	1/4	1/4	1/4	3/8	3/8
F	.250 (6.35)	.375 (9.53)	.375 (9.53)	.375 (9.53)	.625 (15.88)	.625 (15.88)
FL	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.875 (47.63)	1.875 (47.63)
G	1.000 (25.4)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)
GS	.190 (4.83)	.250 (6.35)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)
HD	.250 (6.35)	.312 (7.92)	.500 (12.70)	.500 (12.70)	.812 (20.62)	.812 (20.62)
J	.625 (15.88)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.250 (31.75)
KK	6 - 32	10 - 32	1/4 - 28	5/16 - 24	3/8 - 24	3/8 - 24
L	.625 (15.88)	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.250 (31.75)	1.250 (31.75)
LB	2.250 (57.15)	3.625 (92.08)	3.625 (92.08)	3.750 (95.25)	4.250 (107.95)	4.250 (107.95)
M	.375 (9.53)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.875 (22.23)	.875 (22.23)
MM	.312 (7.92)	.375 (9.53)	.625 (15.88)	.625 (15.88)	1.000 (25.40)	1.000 (25.40)
N	.400 (10.16)	.400 (10.16)	.526 (13.36)	.526 (13.36)	.784 (19.81)	.784 (19.81)
P	1.469 (37.31)	2.125 (53.98)	2.125 (53.98)	2.250 (57.15)	2.625 (66.68)	2.625 (66.68)
P <sub>1</sub>	.241 (6.12)	.303 (7.70)	.480 (12.19)	.635 (16.13)	.845 (21.46)	.875 (22.23)
RE	1.125 (28.58)	1.428 (36.27)	1.840 (46.74)	2.192 (55.68)	2.758 (70.05)	3.323 (84.40)
RG	.580 (14.73)	.580 (14.73)	.705 (17.91)	.705 (17.91)	1.205 (30.61)	1.205 (30.61)
TT	.750 (19.05)	1.125 (28.58)	1.430 (36.32)	1.840 (46.74)	1.790 (45.47)	3.440 (87.38)
TZ	1.250 (31.75)	1.500 (38.10)	2.000 (50.80)	2.500 (63.50)	3.250 (82.55)	4.000 (101.60)
V	N/A	.250 (6.35)	.250 (6.35)	.250 (6.35)	.250 (6.35)	.250 (6.35)
XD	4.875 (123.83)	6.625 (168.28)	6.625 (168.28)	7.000 (177.80)	8.375 (212.73)	8.375 (212.73)
Y	2.031 (51.59)	2.875 (73.03)	2.875 (73.03)	3.125 (79.38)	3.437 (87.30)	3.437 (87.30)
ZB	3.750 (95.25)	5.500 (139.70)	5.500 (139.70)	5.875 (149.23)	6.625 (168.28)	6.625 (168.28)

- Double Rod End Cylinders available in 1-1/8" thru 4" bore sizes.
- Cylinders rated to 250 PSI air.  
(For hydraulic service consult factory)
- Designed for non-lube service.
- New low breakaway design.
- Switches available on all bore sizes.  
(See ACT-3-28/29 for ordering information.)



### Cylinder Order Information



N	Series N
Q	Series Q Electroless Nickel

Single Rod End	Bore	Double Rod End*
B	1 1/8"	P
C	1 1/2"	Q
D	2"	R
E	2 1/2"	S
F	3 1/4"	T
G	4"	U

\*Double Rod End has two Piston Rods on one end and one Piston Rod on opposite end.

Full Inches in Strokes	
00	0" Stroke
01	1" Stroke
02	2" Stroke
03	3" Stroke
04	4" Stroke
05	5" Stroke
06	6" Stroke
...	...
30	30" Stroke
xx	Special

Fractional Increments of Stroke			
A	0"	J	1/2"
B	1/16"	K	9/16"
C	1/8"	M	5/8"
D	3/16"	N	11/16"
E	1/4"	P	3/4"
F	5/16"	R	13/16"
G	3/8"	S	7/8"
H	7/16"	T	15/16"
X	Special		

Rod Axis	
E	Horizontal Rod Axis
N	Vertical Rod Axis
A	No Tooling Plate - Horizontal Rod
B	No Tooling Plate - Vertical Rod
C	Blank Rod End - Horizontal Rod*
D	Blank Rod End - Vertical Rod*
X	Special

\* Does not include tooling plate

Note: 1 1/8" diameter not NFPA

Options	
O	No Options
M	Metal Rod Scraper
P	Air/Oil Piston
R	Double Rod W/OS Cap Rod
S	Stainless Piston Rods
V	Viton Seals
X	Special

Magnetic Option	
O	No Magnet
M	Magnetic Piston

B	Design Level
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Cushions <sup>†</sup>				
Needle Position	1	2**	3	4
No Cushions	A			
Head Only	B	C	D	E
Cap Only	G	H	J	K
Head and Cap	N	M	P	R
Special	X			

<sup>†</sup>Cushions not available on 1 1/8" Bore.

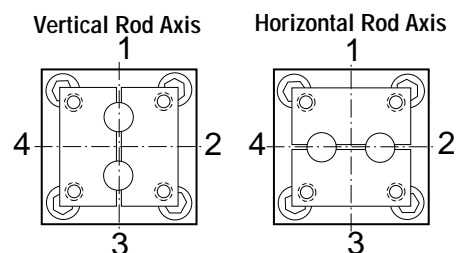
\*\*Standard position

Ports				
Position	1**	2	3	4
Standard	A	B	C	D
Special	X			

\*\*Standard position

Mounting Options			
01	No Mounts (MX0)	20	Base Bar
02	Bottom Tap (MS4)	XX	Special
04	Front Flange (MF1)		
05	Rear Flange (MF2)		

Switch, Port, and Cushion Needle Positions  
(As viewed from twin rod end)



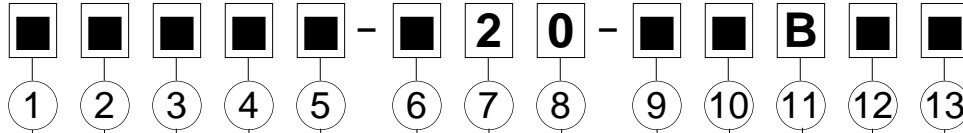
See ACT-3-30 for complete instructions on how to order cylinders.



- (Not NFPA) 20 Base Bar Mounts available in 1-1/8" thru 4" bore sizes.
- Cylinders rated to 250 PSI air. (For hydraulic service consult factory)
- Designed for non-lube service.
- New low breakaway design.
- Switches available on all bore sizes (See ACT-3-28/29 for ordering information.)



### Cylinder Order Information



N	Series N
Q	Series Q Electroless Nickel

Single Rod End	Bore	Double Rod End*
B	1 1/8"	P
C	1 1/2"	Q
D	2"	R
E	2 1/2"	S
F	3 1/4"	T
G	4"	U

\* Double Rod End has two Piston Rods on one end and one Piston Rod on opposite end.

Full Inches in Strokes	
00	0" Stroke
01	1" Stroke
02	2" Stroke
03	3" Stroke
04	4" Stroke
05	5" Stroke
06	6" Stroke
...	...
30	30" Stroke
xx	Special

Fractional Increments of Stroke			
A	0"	J	1/2"
B	1/16"	K	9/16"
C	1/8"	M	5/8"
D	3/16"	N	11/16"
E	1/4"	P	3/4"
F	5/16"	R	13/16"
G	3/8"	S	7/8"
H	7/16"	T	15/16"
X	Special		

Rod Axis	
E	Horizontal Rod Axis
N	Vertical Rod Axis
A	No Tooling Plate - Horizontal Rod
B	No Tooling Plate - Vertical Rod
C	Blank Rod End - Horizontal Rod*
D	Blank Rod End - Vertical Rod*
X	Special

\* Does not include tooling plate

Options	
O	No Options
M	Metal Rod Scraper
P	Air/Oil Piston
R	Double Rod W/OS Cap Rod
S	Stainless Piston Rods
V	Viton Seals
X	Special

Magnetic Option	
O	No Magnet
M	Magnetic Piston

B	Design Level
---	--------------

Cushions <sup>1</sup>				
Needle Position	1	2**	3	4
No Cushions	A			
Head Only	B	C	D	E
Cap Only	G	H	J	K
Head and Cap	N	M	P	R
Special	X			

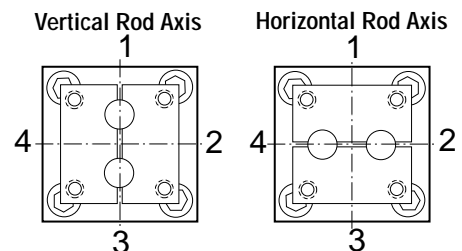
<sup>1</sup>Cushions not available on 1 1/8" Bore.

\*\*Standard position

Ports				
Position	1**	2	3	4
Standard	A	B	C	D
Special	X			

\*\*Standard position

Mounting Options			
01	No Mounts (MX0)	20	Base Bar
02	Bottom Tap (MS4)	XX	Special
04	Front Flange (MF1)		
05	Rear Flange (MF2)		



Note: 1 1/8" diameter not NFPA

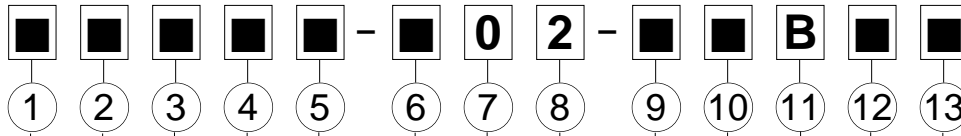
**ACT-3-30 for complete instructions on how to order cylinders.**



- NFPA (MF1) 02 Bottom Tap Mounts available in 1-1/8" thru 4" bore sizes.
- Cylinders rated to 250 PSI air.  
(For hydraulic service consult factory)
- Designed for non-lube service.
- New low breakaway design.
- Switches available on all bore sizes.  
(See ACT-3-28/29 for ordering information.)



### Cylinder Order Information



N	Series N
Q	Series Q Electroless Nickel

Single Rod End	Bore	Double Rod End*
B	1 1/8"	P
C	1 1/2"	Q
D	2"	R
E	2 1/2"	S
F	3 1/4"	T
G	4"	U

\* Double Rod End has two Piston Rods on one end and one Piston Rod on opposite end.

Full Inches in Strokes	
00	0" Stroke
01	1" Stroke
02	2" Stroke
03	3" Stroke
04	4" Stroke
05	5" Stroke
06	6" Stroke
...	...
30	30" Stroke
xx	Special

Fractional Increments of Stroke			
A	0"	J	1/2"
B	1/16"	K	9/16"
C	1/8"	M	5/8"
D	3/16"	N	11/16"
E	1/4"	P	3/4"
F	5/16"	R	13/16"
G	3/8"	S	7/8"
H	7/16"	T	15/16"
X	Special		

Rod Axis	
E	Horizontal Rod Axis
N	Vertical Rod Axis
A	No Tooling Plate - Horizontal Rod
B	No Tooling Plate - Vertical Rod
C	Blank Rod End - Horizontal Rod*
D	Blank Rod End - Vertical Rod*
X	Special

\* Does not include tooling plate

Options	
O	No Options
M	Metal Rod Scraper
P	Air/Oil Piston
R	Double Rod W/OS Cap Rod
S	Stainless Piston Rods
V	Viton Seals
X	Special

Magnetic Option	
O	No Magnet
M	Magnetic Piston

B	Design Level
---	--------------

Cushions <sup>1</sup>				
Needle Position	1	2**	3	4
No Cushions	A			
Head Only	B	C	D	E
Cap Only	G	H	J	K
Head and Cap	N	M	P	R
Special	X			

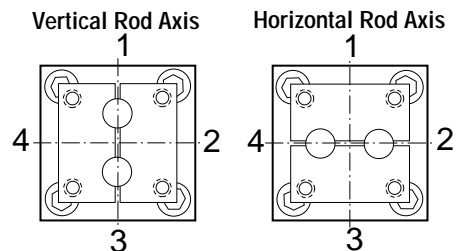
<sup>1</sup>Cushions not available on 1 1/8" Bore.  
\*\*Standard position

Ports				
Position	1**	2	3	4
Standard	A	B	C	D
Special	X			

\*\*Standard position

Mounting Options			
01	No Mounts (MX0)	07	Det. Clevis (MP2)
02	Bottom Tap (MS4)	18	Det. Eye (MP4)
04	Front Flange (MF1)	20	Base Bar
05	Rear Flange (MF2)	XX	Special

Switch, Port, and Cushion Needle Positions  
(As viewed from twin rod end)



Note: 1 1/8" diameter not NFPA

See ACT-3-30 for complete instructions on how to order cylinders.

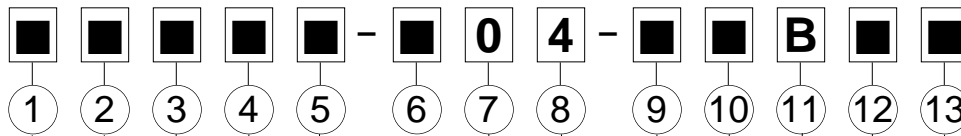




- NFPA (MF1) 04 Front Flange Mounts available in 1-1/8" thru 4" bore sizes.
- Cylinders rated to 250 PSI air. (For hydraulic service consult factory)
- Designed for non-lube service.
- New low breakaway design.
- Switches available on all bore sizes. (See ACT-3-28/29 for ordering information.)



### Cylinder Order Information



N	Series N
Q	Series Q Electroless Nickel

Single Rod End	Bore	Double Rod End*
B	1 1/8"	P
C	1 1/2"	Q
D	2"	R
E	2 1/2"	S
F	3 1/4"	T
G	4"	U

\* Double Rod End has two Piston Rods on one end and one Piston Rod on opposite end.

Full Inches in Strokes	
00	0" Stroke
01	1" Stroke
02	2" Stroke
03	3" Stroke
04	4" Stroke
05	5" Stroke
06	6" Stroke
...	...
30	30" Stroke
xx	Special

Fractional Increments of Stroke			
A	0"	J	1/2"
B	1/16"	K	9/16"
C	1/8"	M	5/8"
D	3/16"	N	11/16"
E	1/4"	P	3/4"
F	5/16"	R	13/16"
G	3/8"	S	7/8"
H	7/16"	T	15/16"
X	Special		

Rod Axis	
E	Horizontal Rod Axis
N	Vertical Rod Axis
A	No Tooling Plate - Horizontal Rod
B	No Tooling Plate - Vertical Rod
C	Blank Rod End - Horizontal Rod*
D	Blank Rod End - Vertical Rod*
X	Special

\* Does not include tooling plate

Options	
O	No Options
M	Metal Rod Scraper
P	Air/Oil Piston
R	Double Rod W/Os Cap Rod
S	Stainless Piston Rods
V	Viton Seals
X	Special

Magnetic Option	
O	No Magnet
M	Magnetic Piston

B	Design Level
---	--------------

Cushions <sup>1</sup>				
Needle Position	1	2**	3	4
No Cushions	A			
Head Only	B	C	D	E
Cap Only	G	H	J	K
Head and Cap	N	M	P	R
Special	X			

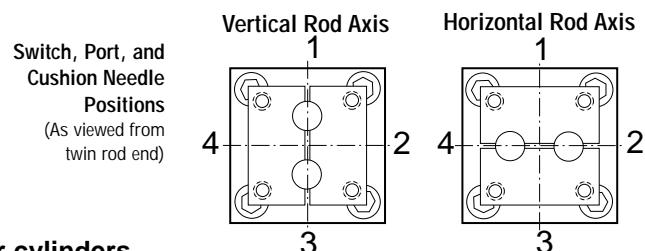
<sup>1</sup>Cushions not available on 1/8" Bore.

\*\*Standard position

Ports				
Position	1**	2	3	4
Standard	A	B	C	D
Special	X			

\*\*Standard position

Mounting Options			
01	No Mounts (MX0)	07	Det. Clevis (MP2)
02	Bottom Tap (MS4)	18	Det. Eye (MP4)
04	Front Flange (MF1)	20	Base Bar
05	Rear Flange (MF2)	XX	Special

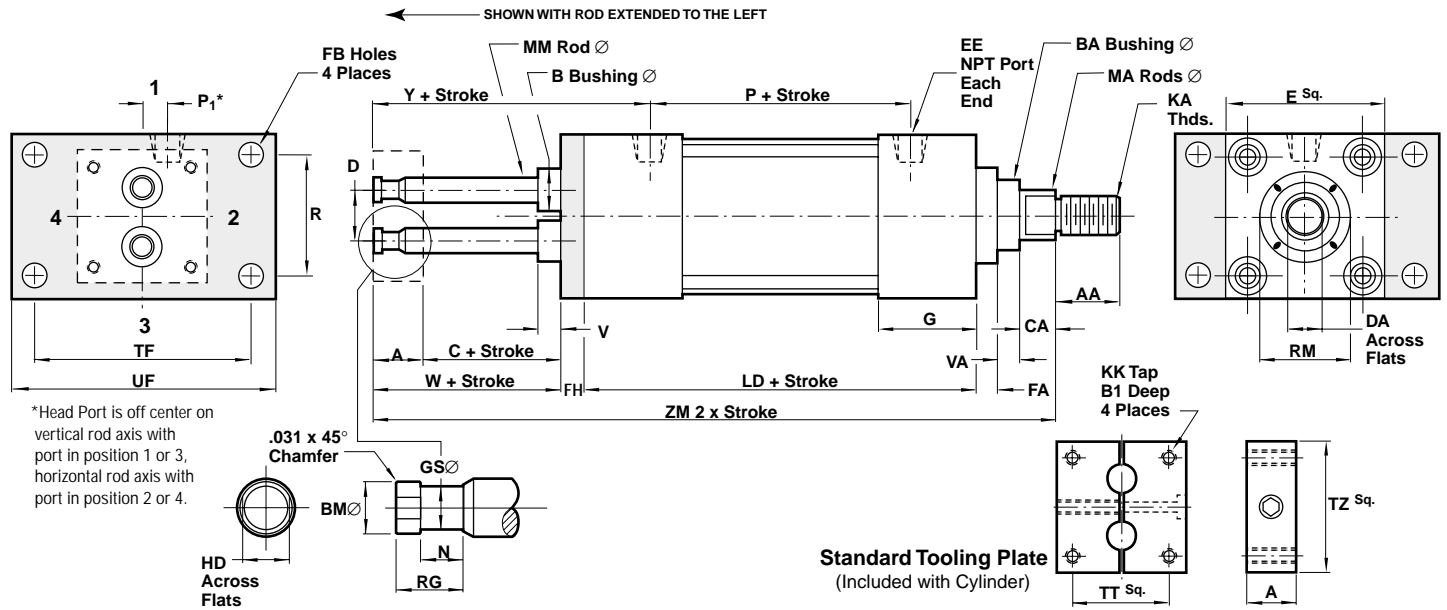


Note: 1/8" diameter not NFPA

See ACT-3-30 for complete instructions on how to order cylinders.

# Series N Actuators

All Dimensions in Inches (mm)



\*Head Port is off center on vertical rod axis with port in position 1 or 3, horizontal rod axis with port in position 2 or 4.

Standard Tooling Plate  
(Included with Cylinder)

Dimension	1-1/8" Bore (28.58)	1-1/2" Bore (38.10)	2" Bore (50.80)	2-1/2" Bore (63.50)	3 1/4" Bore (82.55)	4" Bore (101.60)
A	.625 (15.88)	.625 (15.88)	.750 (19.05)	.750 (19.05)	1.250 (31.75)	1.250 (31.75)
AA	Standard .625 (15.88) Oversize .750 (19.05)	.750 (19.05) 1.125 (28.58)	.750 (19.05) 1.125 (28.58)	.750 (19.05) 1.125 (28.58)	1.125 (28.58) 1.625 (41.28)	1.125 (28.58) 1.625 (41.28)
B	N/A	.590 (14.99)	.900 (22.86)	.900 (22.86)	1.498 (38.05)	1.498 (38.05)
B <sub>1</sub>	.500 (12.70)	Thru	Thru	Thru	Thru	Thru
BA	Standard N/A Oversize N/A	1.125 (28.58) 1.400 (35.56)	1.125 (28.58) 1.500 (38.10)	1.125 (28.58) 1.500 (38.10)	1.500 (38.10) 2.000 (50.80)	1.500 (38.10) 2.000 (50.80)
BM	.270 (6.86)	.330 (8.38)	.550 (13.97)	.550 (13.97)	.900 (22.86)	.900 (22.86)
C	.625 (15.88)	.875 (22.23)	.750 (19.05)	1.000 (25.40)	.500 (12.70)	.500 (12.70)
CA	Standard .250 (6.35) Oversize .250 (6.35)	.375 (9.53) .500 (12.70)	.375 (9.53) .500 (12.70)	.375 (9.53) .500 (12.70)	.500 (12.70) .625 (15.88)	.500 (12.70) .625 (15.88)
D	.627 (15.93)	.750 (19.05)	1.052 (26.72)	1.398 (35.51)	2.000 (50.80)	2.360 (59.94)
DA	Standard .312 (7.92) Oversize .437 (11.10)	.500 (12.70) .812 (20.62)	.500 (12.70) .812 (20.62)	.500 (12.70) .812 (20.62)	.812 (20.62) 1.125 (28.58)	.812 (20.62) 1.125 (28.58)
E	1.500 (38.10)	2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)
EE	1/8	1/4	1/4	1/4	3/8	3/8
FA	.125 (3.18)	.375 (9.53)	.375 (9.53)	.375 (9.53)	.625 (15.88)	.625 (15.88)
FB	.219 (5.56)	.312 (7.92)	.375 (9.53)	.375 (9.53)	.437 (11.10)	.437 (11.10)
FH	.250 (6.35)	.375 (9.53)	.375 (9.53)	.375 (9.53)	.625 (15.88)	.625 (15.88)
G	1.000 (25.4)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)
GS	.190 (4.83)	.250 (6.35)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)
HD	.250 (6.35)	.312 (7.92)	.500 (12.70)	.500 (12.70)	.812 (20.62)	.812 (20.62)
KA	Standard 3/8 - 24 Oversize 1/2 - 20	1/2 - 20 3/4 - 16	1/2 - 20 3/4 - 16	1/2 - 20 3/4 - 16	3/4 - 16 1 - 14	3/4 - 16 1 - 14
KK	6 - 32	10 - 32	1/4 - 28	5/16 - 24	3/8 - 24	3/8 - 24
LD	2.875 (73.03)	4.125 (104.78)	4.125 (104.78)	4.250 (107.95)	4.750 (120.65)	4.750 (120.65)
MA	Standard .375 (9.53) Oversize .500 (12.70)	.625 (15.88) 1.000 (25.40)	.625 (15.88) 1.000 (25.40)	.625 (15.88) 1.000 (25.40)	1.000 (25.40) 1.375 (34.93)	1.000 (25.40) 1.375 (34.93)
MM	.312 (7.92)	.375 (9.53)	.625 (15.88)	.625 (15.88)	1.000 (25.40)	1.000 (25.40)
N	.400 (10.16)	.400 (10.16)	.526 (13.36)	.526 (13.36)	.784 (19.81)	.784 (19.81)
P	1.844 (46.84)	2.125 (53.98)	2.125 (53.98)	2.250 (57.15)	2.625 (66.68)	2.625 (66.68)
P <sub>1</sub>	.241 (6.12)	.303 (7.70)	.480 (12.19)	.635 (16.13)	.845 (21.46)	.875 (22.23)
R	1.000 (25.40)	1.430 (36.32)	1.840 (46.74)	2.190 (55.63)	2.760 (70.10)	3.320 (84.33)
RG	.580 (14.73)	.580 (14.73)	.705 (17.91)	.705 (17.91)	1.205 (30.61)	1.205 (30.61)
RM	Standard .750 (19.05) Oversize 1.000 (25.40)	2.000sq (50.80) 2.000sq (50.80)	2.000 (50.80) 2.500sq (63.50)	2.000 (50.80) 3.000sq (76.20)	2.625 (66.68) 3.375 (85.73)	2.625 (66.68) 3.375 (85.73)
TF	2.000 (50.80)	2.750 (69.85)	3.375 (85.73)	3.875 (98.43)	4.688 (119.08)	5.437 (138.10)
TT	.750 (19.05)	1.125 (28.58)	1.430 (36.32)	1.840 (46.74)	1.790 (45.47)	3.440 (87.38)
TZ	1.250 (31.75)	1.500 (38.10)	2.000 (50.80)	2.500 (63.50)	3.250 (82.55)	4.000 (101.60)
UF	2.500 (63.50)	3.750 (95.25)	4.125 (104.78)	4.625 (117.48)	5.500 (139.70)	6.250 (158.75)
V	N/A	.250 (6.35)	.250 (6.35)	.250 (6.35)	.250 (6.35)	.250 (6.35)
VA	Standard N/A Oversize N/A	.250 (6.35) .500 (12.70)	.250 (6.35) .500 (12.70)	.250 (6.35) .500 (12.70)	.250 (6.35) .375 (9.53)	.250 (6.35) .375 (9.53)
W	1.250 (31.75)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)
Y	2.031 (51.59)	2.875 (73.03)	2.875 (73.03)	3.125 (81.66)	3.437 (87.30)	3.437 (87.30)
ZM	4.625 (117.48)	7.000 (177.80)	7.000 (177.80)	7.375 (187.33)	8.500 (215.90)	8.500 (215.90)

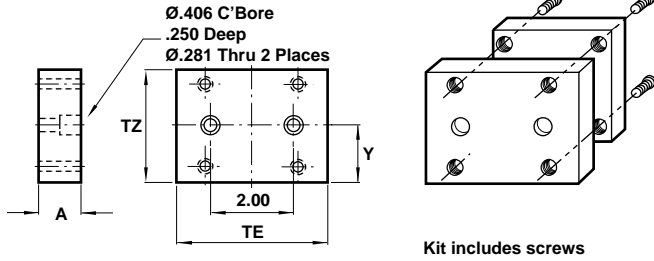
<sup>1</sup>Note: 1 1/8" bore overall body is 3/8" longer than our standard Series "C" Double Rod End Cylinder.



# Series N Actuators

All Dimensions in Inches (mm)

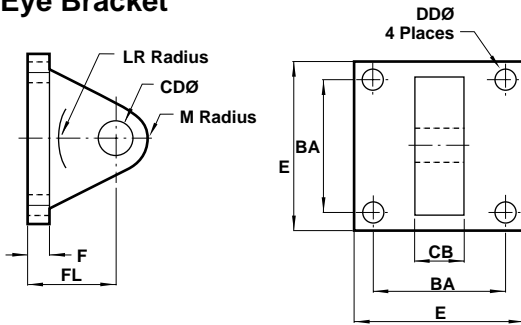
## Modular Adaptor Plate



## Modular Adaptor Plate Dimensions

Bore	1-1/8"	1-1/2"	2"	2-1/2"
	NB-172-225K	NB-172-03K	NB-172-04K	NB-172-05K
A	.625 (15.88)	.625 (15.88)	.625 (15.88)	.625 (15.88)
TE	3.000 (76.20)	3.000 (76.20)	3.000 (76.20)	3.000 (76.20)
TZ	1.250 (31.75)	1.500 (38.10)	2.000 (50.80)	2.500 (63.50)
Y	.625 (15.88)	.750 (19.05)	1.000 (25.40)	1.250 (31.75)

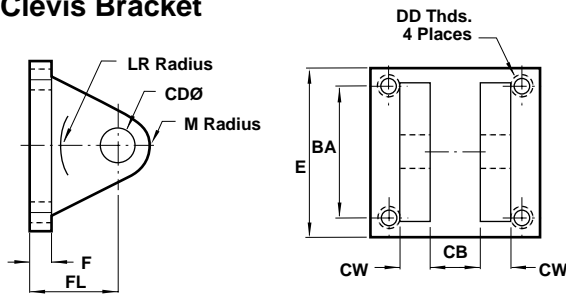
## Eye Bracket



## NFPA Eye Bracket Dimensions

	C-89-03A	C-89-065A	C-89-12A
BA	1.625 (41.28)	2.562 (65.07)	3.250 (82.55)
CB	.750 (19.05)	1.250 (31.75)	1.500 (38.10)
CD	.500 (12.70)	.750 (19.05)	1.000 (25.40)
DD	.406 (10.31)	.531 (13.49)	.656 (16.66)
E	2.500 (63.50)	3.500 (88.90)	4.500 (114.30)
F	.375 (9.53)	.625 (15.88)	.750 (19.05)
FL	1.125 (28.58)	1.875 (47.63)	2.250 (57.15)
LR	.750 (19.05)	1.250 (31.75)	1.500 (38.10)
M	.500 (12.70)	.750 (19.05)	1.000 (25.40)

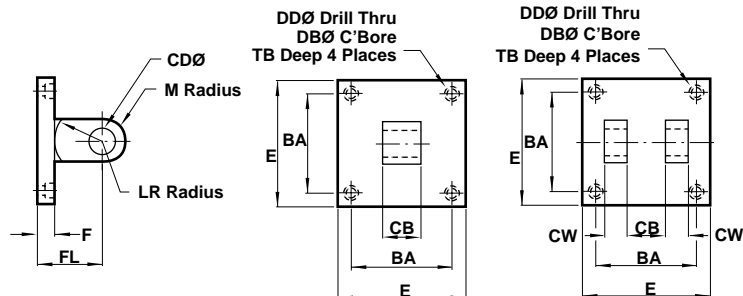
## Clevis Bracket



## NFPA Clevis Bracket Dimensions

	C-91-03A	C-91-065A	C-91-12A
BA	1.625 (41.28)	2.562 (65.07)	3.250 (82.55)
CB	.750 (19.05)	1.250 (31.75)	1.500 (38.10)
CD	.500 (12.70)	.750 (19.05)	1.000 (25.40)
CW	.500 (12.70)	.625 (15.88)	.750 (19.05)
DD	3/8-24	1/2-20	5/8-18
E	2.500 (63.50)	3.500 (88.90)	4.500 (114.30)
F	.375 (9.53)	.625 (15.88)	.750 (19.05)
FL	1.125 (28.58)	1.875 (47.63)	2.250 (57.15)
LR	.750 (19.05)	1.250 (31.75)	1.500 (38.10)
M	.500 (12.70)	.812 (20.62)	1.000 (25.40)

## 1-1/8" Bore Eye & Clevis Bracket



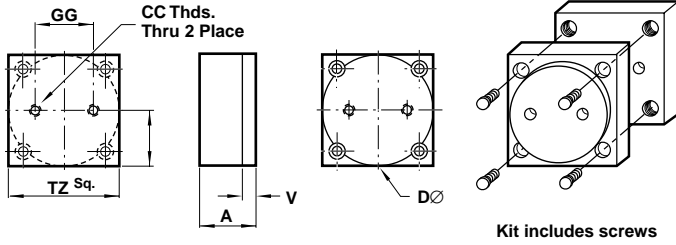
## 1-1/8" Bore Eye & Clevis Bracket Dimensions

	W-89-225K Eye	W-91-225K Clevis
BA	1.125 (28.58)	1.150 (29.21)
CB	.375 (9.53)	.375 (9.53)
CD	.375 (9.53)	.375 (9.53)
CW	-	.250 (6.35)
DB	.328 (8.33)	.328 (8.33)
DD	.203 (5.16)	.203 (5.16)
E	1.500 (38.10)	1.500 (38.10)
F	.500 (12.70)	.500 (12.70)
FL	1.125 (28.58)	1.125 (28.58)
LR	.625 (15.88)	.625 (15.88)
M	.375 (9.53)	.375 (9.53)
TB	.312 (7.92)	.312 (7.92)

Note: 1-1/8" bore eye and clevis brackets include standard pivot pin and mounting screws.



**Pilot Adaptor Plate**

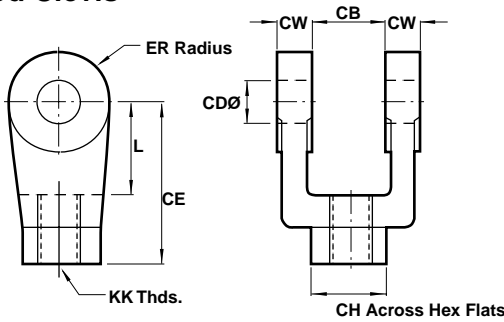


Kit includes screws

**Pilot Adaptor Plate Dimensions**

Bore	1-1/8"	1-1/2"	2"	2-1/2"	3/4"	4"
	NB-171-225K	NB-171-03K	NB-171-04K	NB-171-05K	NB-171-065K	NB-171-08K
A	.625 (15.88)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.875 (22.23)	.875 (22.23)
CC	1/4-20	5/16-18	5/16-18	3/8-16	1/2-13	1/2-13
D	1.260 (32.00)	1.575 (40.01)	1.969 (50.01)	2.480 (62.99)	3.150 (80.01)	3.937 (99.99)
GG	.750 (19.05)	.860 (21.84)	1.180 (29.97)	1.500 (38.10)	1.970 (50.04)	2.760 (70.10)
TZ	1.250 (31.75)	1.500 (38.10)	2.000 (50.80)	2.500 (63.50)	3.250 (82.55)	4.000 (101.60)
V	.160 (4.06)	.160 (4.06)	.200 (5.08)	.200 (5.08)	.200 (5.08)	.200 (5.08)
Y	.625 (15.88)	.750 (19.05)	1.000 (25.40)	1.250 (31.75)	1.625 (41.28)	2.000 (50.80)

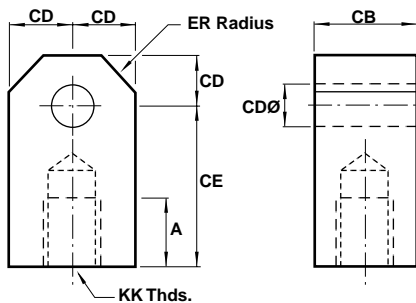
**Rod Clevis**



**Rod Clevis Dimensions**

	C-92-03	C-92-065	C-92-12
CB	.750 (19.05)	1.250 (31.75)	1.500 (38.10)
CD	.500 (12.70)	.750 (19.05)	1.000 (25.40)
CE	1.500 (38.10)	2.375 (60.33)	3.125 (79.38)
CH	1.000 (25.40)	1.250 (31.75)	1.500 (38.10)
CW	.500 (12.70)	.625 (15.88)	.750 (19.05)
ER	.500 (12.70)	.750 (19.05)	1.000 (25.40)
KK	1/2-20	3/4-16	1-14
L	.750 (19.05)	1.250 (31.75)	1.500 (38.10)

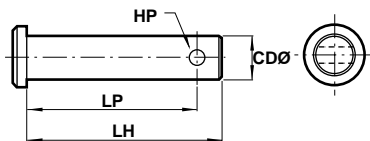
**Rod Eye**



**Rod Eye Dimensions**

	C-97-03	C-97-065	C-97-12
CB	.750 (19.05)	1.250 (31.75)	1.500 (38.10)
CD	.500 (12.70)	.750 (19.05)	1.000 (25.40)
CE	1.500 (38.10)	2.062 (52.37)	2.812 (71.42)
ER	.562 (14.27)	.937 (23.80)	1.125 (28.58)
KK	1/2-20	3/4-16	1-14

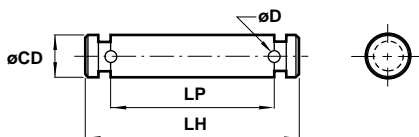
**Standard Pin**



**Standard Pin Dimensions**

	C-96-225	C-96-03	C-96-065	C-96-12
CD	.375 (9.53)	.500 (12.70)	.750 (19.05)	1.000 (25.40)
HP	.156 (3.96)	.156 (3.96)	.156 (3.96)	.203 (5.18)
LH	1.250 (31.75)	2.250 (57.15)	3.000 (76.20)	3.500 (88.90)
LP	1.032 (26.21)	2.093 (53.16)	2.843 (72.21)	3.297 (83.74)

**NFPA Pin**



**NFPA Pin Dimensions**

	C-96-03A	C-96-065A	C-96-12A
CD	.500 (12.70)	.750 (19.05)	1.000 (25.40)
LH	2.219 (56.36)	3.125 (79.38)	3.750 (95.25)
LP	1.875 (47.63)	2.750 (69.85)	3.250 (82.55)

- Magnetically operated, non-contact sensing system.
- Consists of a magnet in the piston, and a sensing switch clamped to the tie rod holding it against the cylinder tube.
- One or more switches may be mounted to provide an indication of piston position.
- Switches are provided with vinyl molded cable.
- Adjustable mounting brackets allow for switches to be securely positioned anywhere along the range of piston travel.
- Indicator light facilitates installation and troubleshooting.
- Several switches may be mounted to control or initiate any sequence function.
- Mounting brackets standard with switches.

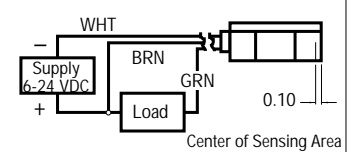
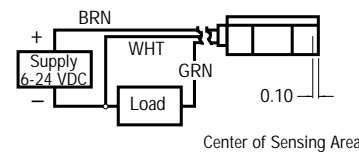
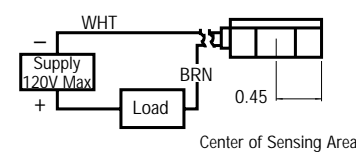


### Specifications

\*Metal Oxide Varistor Surge Suppression. NOTE: All CS7 and CS8 Series Switches are supplied with 9 foot leads.

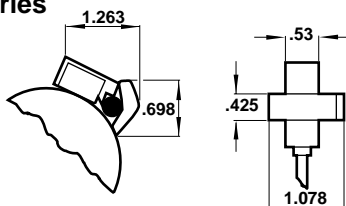
Switch Model	CS8-2-04 Reed	CS8-2-31 Hall	CS8-2-32 Hall
Bore Sizes	1 1/8" thru 2 1/2"	1 1/8" thru 2 1/2"	1 1/8" thru 2 1/2"
Switch Type	Reed Switch *MOV & Light	Hall Effect & Light, Sourcing PNP	Hall Effect & Light, Sinking NPN
Function	SPST Normally Open	Normally Open	Normally Open
Switching Voltage	5-120 VDC/VAC 50/60 Hz	6-24 VDC	6-24 VDC
Switching Current	.5 Amp Max .005 Amp Min	.5 Amp Max	.5 Amp Max
Switching Power	10 VA	12 Watts Max	12 Watts Max
Max Voltage Drop	3.5 Volts	.5 Volts	.5 Volts
Magnetic Sensitivity	85 Gauss	85 Gauss	85 Gauss
Enclosure Classification	NEMA 6 & CSA Approved	NEMA 6 & CSA Approved	NEMA 6 & CSA Approved
Temperature Range	-22°F to +176°F	-22°F to +176°F	-22°F to +176°F

### Wiring Diagrams

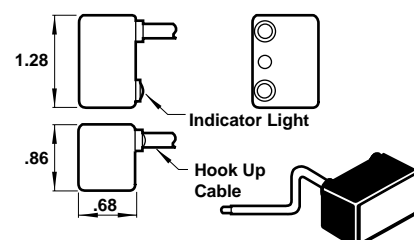


### Switch & Mounting Bracket Dimensions

#### CS8-2 Series



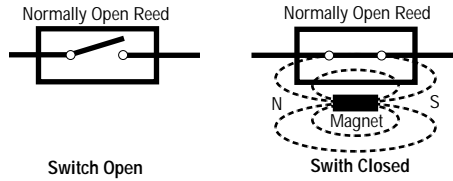
#### CS7 Series





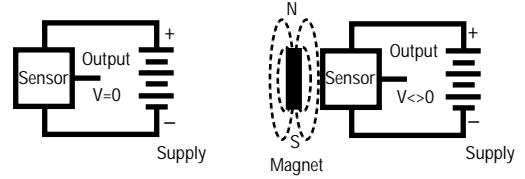
## Reed Switch Working Principle

Reed switch sensors contain hermetically sealed reed elements (mechanical contacts) which are open in their normal state. When a magnetic field moves within proximity of the switch, magnetism is induced into the leads and forces the contacts to close.



## Hall Effect/Magnetostrictive Working Principle

The solid state (no moving parts) magnetostrictive sensor responds to a north or south magnetic pole by providing a digital signal to the output control circuit. This technique enables the sensing of weak magnetic fields, with no limit to the maximum strength of the magnetic field.



## Application Recommendations and Precautions

To provide maximum reliability.

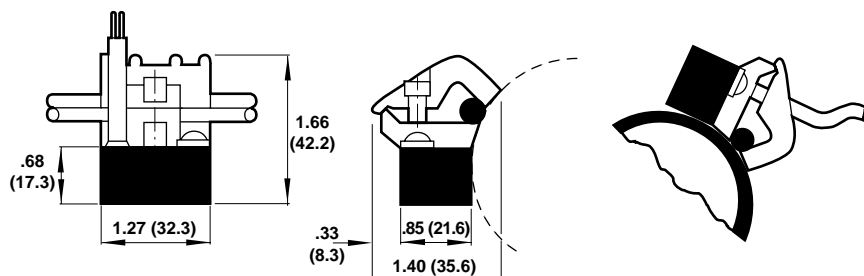
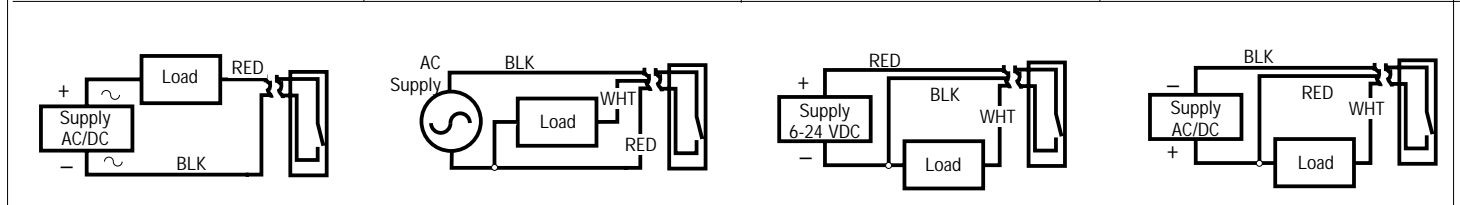
1. Always stay within the specifications and power rating limitations of the unit installed.
2. Primary and control circuit wiring should not be mixed in the same conduit. Motors will produce high pulses that will be introduced into the control wiring if the wiring is carried in the same conduit.
3. Never connect the switch without a load present. The switch will be destroyed.
4. Some electrical loads may be capacitive. Capacitive loading may occur due to distributed capacity in cable runs over 25 feet. Use switch Model CS7-24 whenever capacitive loading may occur.

In order to obtain optimum performance and long life, magnetically operated limit switches should not be subjected to: (1) strong magnetic fields, (2) extreme temperature, and (3) excessive ferrous filing or chip buildup.

Improper wiring may damage or destroy the switch. The wiring diagram, along with the listed power ratings, must be carefully observed before connecting power to the switch.

Lower power switches are designed for signaling electronic circuits. Do not use on relay loads or with incandescent bulbs. Resistive loads only.

CS7-04 Reed	CS7-24 Reed	CS7-31 Hall	CS7-32 Hall
2" thru 4"	2" thru 4"	2" thru 4"	2" thru 4"
Reed Switch *MOV & Light	Reed Switch *MOV & Light, 3 Wire	Hall Effect & Light, Sourcing PNP	Hall Effect & Light, Sinking NPN
Normally Open	Normally Open	Normally Open	Normally Open
5-240 VDC/VAC 50/60 Hz	24-240 VAC 50/60 Hz	6-24 VDC	6-24 VDC
1 Amp Max	4 Amp Max 50 Amp Inrush	1 Amp Max	1 Amp Max
30 Watts Max	100 Watts Max	24 Watts Max	24 Watts Max
3 Volts	N/A	.5 Volts	.5 Volts
85 Gauss Parallel	85 Gauss Parallel	85 Gauss Parallel	85 Gauss Parallel
NEMA 6 & CSA Approved	NEMA 6 & CSA Approved	NEMA 6 & CSA Approved	NEMA 6 & CSA Approved
-22°F to +176°F	-22°F to +176°F	-22°F to +176°F	-22°F to +176°F

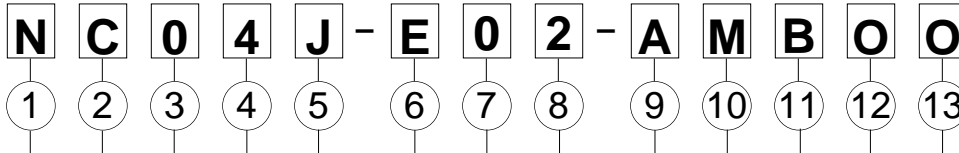




# Series N Actuators

All Dimensions in Inches (mm)

## Cylinder Order Information



N	Series N
Q	Series Q Electroless Nickel

Single Rod End	Bore	Double Rod End*
B	1 1/8"	P
C	1 1/2"	Q
D	2"	R
E	2 1/2"	S
F	3 1/4"	T
G	4"	U

\*Double Rod End has two Piston Rods on one end and one Piston Rod on opposite end.

Full Inches in Strokes	
00	0" Stroke
01	1" Stroke
02	2" Stroke
03	3" Stroke
04	4" Stroke
05	5" Stroke
06	6" Stroke
...	...
30	30" Stroke
xx	Special

Fractional Increments of Stroke			
A	0"	J	1/2"
B	1/16"	K	9/16"
C	1/8"	M	5/8"
D	3/16"	N	11/16"
E	1/4"	P	3/4"
F	5/16"	R	13/16"
G	3/8"	S	7/8"
H	7/16"	T	15/16"
X	Special		

Rod Axis	
E	Horizontal Rod Axis
N	Vertical Rod Axis
A	No Tooling Plate - Horizontal Rod
B	No Tooling Plate - Vertical Rod
C	Blank Rod End - Horizontal Rod*
D	Blank Rod End - Vertical Rod*
X	Special

\* Does not include tooling plate

Note: 1 1/8" diameter not NFPA

Options	
O	No Options
M	Metal Rod Scraper
P	Air/Oil Piston
R	Double Rod W/OS Cap Rod
S	Stainless Piston Rods
V	Viton Seals
X	Special

Magnetic Option	
O	No Magnet
M	Magnetic Piston

B	Design Level
---	--------------

Cushions <sup>1</sup>				
Needle Position	1	2**	3	4
No Cushions	A			
Head Only	B	C	D	E
Cap Only	G	H	J	K
Head and Cap	N	M	P	R
Special	X			

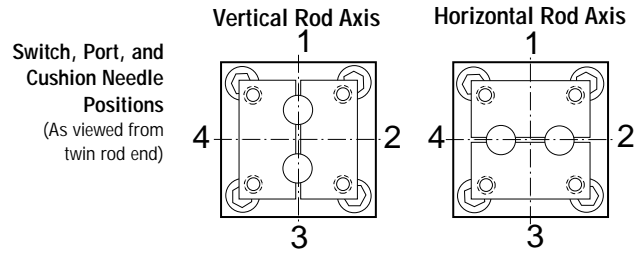
<sup>1</sup>Cushions not available on 1 1/8" Bore.

\*\*Standard position

Ports				
Position	1**	2	3	4
Standard	A	B	C	D
Special	X			

\*\*Standard position

Mounting Options			
01	No Mounts (MX0)	07	Det. Clevis (MP2)
02	Bottom Tap (MS4)	18	Det. Eye (MP4)
04	Front Flange (MF1)	20	Base Bar
05	Rear Flange (MF2)	XX	Special



**EXAMPLE:** Series "N" – 1 1/2" bore – 4 1/2" stroke – horizontal rod axis – standard tooling plate – MS4 Mount – standard ports at position #1 – standard cushion head and cap at position #2 – no options.

**IMPORTANT:** When using X, XX, or 98 in a model number, please be specific!  
X = (Description).

**Switch, Port, and Cushion Needle Positions**  
(As viewed from twin rod end)

### Reed & Hall Effect Switches

Available on all bore sizes – order separately. See pages 28 and 29 for specifications.

**NOTE:** Consult factory when using **competitive** position sensing devices.

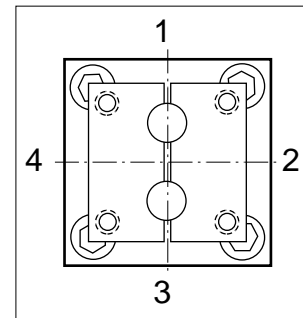
### Proximity Switches

Available on 1 1/2" thru 4" bores only. See page 30 for specifications.

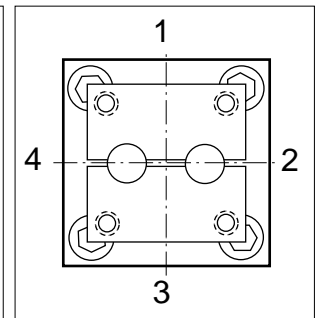
To indicate switch mounting location, use "98" and specify end cap designations and the desired switch location.

**NOTE:** Proximity switch position must be 90° from rod axis.

### Vertical Rod Axis



### Horizontal Rod Axis

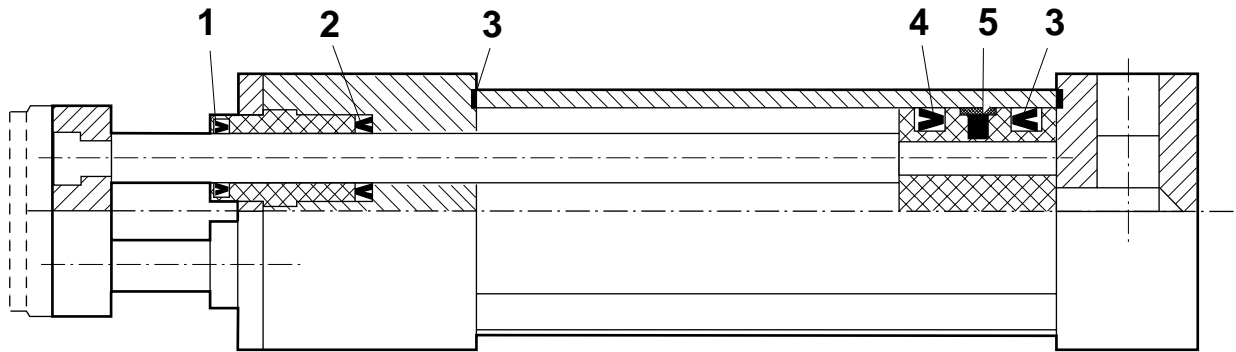




**Cylinder Weights**

Bore		Mounting Code					Add Per Inch of Stroke	Standard Tooling Plate	Pilot Adaptor Plate	Modular Adaptor Plate
		01-02	04	05	07-18	20				
1-1/8"	Single Rod End	1 lb	1 lb 2 ozs	1 lb 4 ozs	1 lb 6 ozs	1 lb 3 ozs	2 ozs	4 ozs	1.2 ozs	3.4 ozs
	Standard Double Rod End	1 lb 3 ozs	1 lb 5 ozs	1 lb 7 ozs	1 lb 9 ozs	1 lb 6 ozs	2.5 ozs			
	OverSize Double Rod End	1 lb 4 ozs	1 lb 6 ozs	1 lb 8 ozs	1 lb 10 ozs	1 lb 7 ozs	2.8 ozs			
1-1/2"	Single Rod End	2 lbs 4 ozs	2 lbs 10 ozs	2 lbs 15 ozs	2 lbs 14 ozs	2 lbs 8 ozs	4 ozs	6 ozs	1.8 ozs	4.1 ozs
	Standard Double Rod End	2 lbs 10 ozs	3 lbs	3 lbs 5 ozs	3 lbs 4 ozs	2 lbs 8 ozs	5.4 ozs			
	OverSize Double Rod End	3 lbs 4 ozs	3 lbs 10 ozs	3 lbs 15 ozs	3 lbs 14 ozs	3 lbs 14 ozs	7.6 ozs			
2"	Single Rod End	4 lbs 3 ozs	4 lbs 12 ozs	5 lbs 4 ozs	5 lbs 4 ozs	4 lbs 8 ozs	4 ozs	12 ozs	3.3 ozs	5.8 ozs
	Standard Double Rod End	4 lbs 9 ozs	5 lbs 2 ozs	5 lbs 10 ozs	5 lbs 10 ozs	4 lbs 14 ozs	5.4 ozs			
	OverSize Double Rod End	5 lbs 3 ozs	5 lbs 12 ozs	6 lbs 4 ozs	6 lbs 4 ozs	5 lbs 8 ozs	7.6 ozs			
2-1/2"	Single Rod End	4 lbs 4 ozs	4 lbs 15 ozs	5 lbs 12 ozs	5 lbs 7 ozs	4 lbs 13 ozs	6 ozs	1 lb 3 ozs	5.2 ozs	7.0 ozs
	Standard Double Rod End	4 lbs 10 ozs	5 lbs 5 ozs	6 lbs 2 ozs	5 lbs 13 ozs	5 lbs 3 ozs	7.4 ozs			
	OverSize Double Rod End	5 lbs 4 ozs	5 lbs 15 ozs	6 lbs 12 ozs	6 lbs 7 ozs	5 lbs 13 ozs	9.6 ozs			
3-1/4"	Single Rod End	12 lbs 5 ozs	13 lbs 10 ozs	15 lbs 12 ozs	15 lbs 3 ozs	13 lbs 5 ozs	11 ozs	3 lbs 6 ozs	11.4 ozs	N/A
	Standard Double Rod End	13 lbs 9 ozs	14 lbs 14 ozs	17 lbs	16 lbs 7 ozs	14 lbs 9 ozs	14.6 ozs			
	OverSize Double Rod End	14 lbs 10 ozs	15 lbs 15 ozs	18 lbs 1 oz	17 lbs 8 ozs	15 lbs 5 ozs	17.7 ozs			
4"	Single Rod End	16 lbs 10 ozs	17 lbs 13 ozs	21 lbs 1 oz	20 lbs 8 ozs	17 lbs 12 ozs	12 ozs	5 lbs 6 ozs	19.4 ozs	N/A
	Standard Double Rod End	17 lbs 14 ozs	19 lbs 1 oz	22 lbs 5 ozs	21 lbs 12 ozs	19 lbs	15.6 ozs			
	OverSize Double Rod End	18 lbs 15 ozs	20 lbs 2 ozs	23 lbs 6 ozs	22 lbs 13 ozs	20 lbs 1 oz	1 lb 2.7 ozs			

**Single Rod End Cylinder**



**Single Rod End Seal Kits**

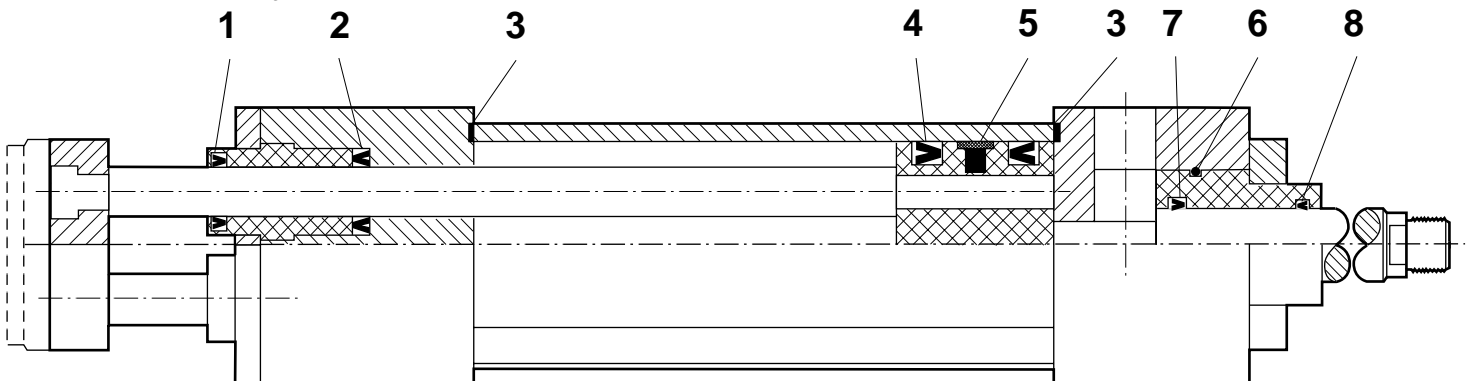
Bore	Number	Seal Kit Consists of:		
		Item	Description	Quantity
1 1/8"	NBSK-225	1	Rod wiper	2
1 1/2"	NBSK-03	2	Rod seal	2
2"	NBSK-04	3	Tube seal	2
2 1/2"	NBSK-05	4	Piston seal	2*
3 1/4"	NBSK-065	5	Wear band	1
4"	NBSK-08			

\*One bidirectional piston seal for the 1 1/8" bore

**Double Rod End Seal Kits**

Bore	Number	Seal Kit Consists of:		
		Item	Description	Quantity
1 1/8"	NBSK-225D	1	Rod wiper	2
1 1/2"	NBSK-03D	2	Rod seal	2
2"	NBSK-04D	3	Tube seal	2
2 1/2"	NBSK-05D	4	Piston seal	2
3 1/4"	NBSK-065D	5	Wear band	1
4"	NBSK-08D	6	Bushing Seal	1
		7	Rod seal	1
		8	Rod wiper	1

**Double Rod End Cylinder**



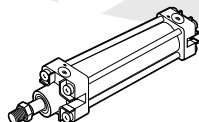




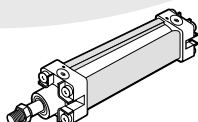
Lightweight Cylinders to ISO Standard 6431 and VDMA 24562

Series 8000, 8000/M, P/8000, P/8000/M and PV/8000/M Pneumatic Cylinders

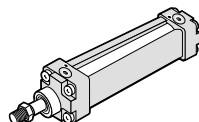
Technical Features: 8000 and 8000/M ..... ACT-4-2  
 Technical Features: P/8000 and P/8000/M Profile, PV/8000/M Corrosive Resistant ..... ACT-4-3  
 Cylinder Model Code ..... ACT-4-4  
 Theoretical Forces, Technical Features, Materials, Surface Treatments ..... ACT-4-5  
 Important Information about ISO/VDMA Cylinders ..... ACT-4-6  
 How to Order Numbering System  
     8000, 8000/M Basic Cylinder ..... ACT-4-6  
     P/8000, P/8000/M Profile Cylinder, PV/8000/M Corrosive Resistant Cylinder ..... ACT-4-7  
 Basic Dimensions 8000, 8000/M, P/8000, P/8000/M and PV/8000/M ..... ACT-4-8  
 8000J, 8000/JM, P/8000/JM and PV/8000/JM Double Ended Piston Rod ..... ACT-4-9  
 8000/N1, P/8000/N1 and 8000/N2, P/8000/N2 Non-rotating Piston Rod ..... ACT-4-9  
 8000/IT, P/8000/IT and 8000/MT, P/8000/MT Four-position Cylinders ..... ACT-4-9  
 8000/G, P/8000/G and 8000/MG, P/8000/MG with Piston Rod Bellows ..... ACT-4-10  
 8000/L2, P/8000/L2 and 8000/L4, P/8000/L4 with Locking Units ..... ACT-4-10  
**8000, 8000/M, P/8000, P/8000/M and PV/8000 Mountings**  
 8000/35 Front or Rear Stud, Style A & 8000/22 Rear Flange, Style B ..... ACT-4-11  
 8000/22 Front Flange, Style G & 8000/21 Foot, Style C ..... ACT-4-11  
 8000/25 Piston Rod Clevis, Style F & 8000/26 Front Hinge, Style M ..... ACT-4-12  
 M/P199 Hinge Bracket for Piston Rod Clevis, Style SS ..... ACT-4-12  
 8000/23 Rear Clevis, Style D & 8000/24 Rear Hinge, Style L ..... ACT-4-13  
 M/P19 or M/P40 Hinge Bracket for Rear Clevis, Style SW ..... ACT-4-13  
 8000/42 Rear Clevis, Style D2 & 8000/43 Universal Rear Hinge, Style UL ..... ACT-4-14  
 M/P Hinge Bracket for Rear Clevis, Style US ..... ACT-4-14  
 8000/27 Rear Eye, Style R & 8000/33 Universal Rear Eye, Style UR ..... ACT-4-15  
 8000/28 Central Trunnion, Style H & 8000/40 Adjustable Intermediate Trunnion, Style UH ..... ACT-4-16  
 PQA/8000/40 Style UH for P/8000 ..... ACT-4-16  
 8000/34 Head Detachable Trunnion, Style FH & 8000/34 Cap Detachable Trunnion, Style FH ..... ACT-4-17  
 8000/41 Swivel Bearing, Style S ..... ACT-4-17  
 8000/38 Piston Rod Swivel, Style AK & 8000/32 Universal Piston Rod Eye, Style UF ..... ACT-4-18  
 QA/8000/51 Guide Blocks (with sintered bronze bearings) ..... ACT-4-19  
 QA/8000/61 Guide Blocks (with roller bearings) ..... ACT-4-20  
 Load Capacity ..... ACT-4-21  
 Mounting Kits ..... ACT-4-22  
**Switches** ..... ACT-4-24  
**Switch Brackets** ..... ACT-4-26  
**Seal Replacement Kits** ..... ACT-4-27



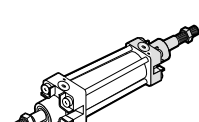
ACT-5-8 –  
8000 Basic Cylinder



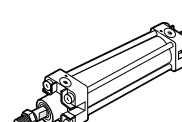
ACT-5-8 –  
P/8000 Profile Cylinder



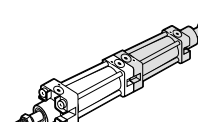
ACT-5-8 –  
PV/8000 Corrosive  
Resistant Cylinder



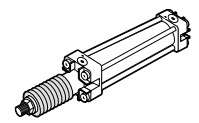
ACT-5-9 –  
Cylinder with Double  
Ended Piston Rod



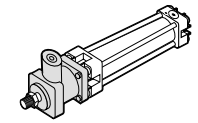
ACT-5-9 –  
Cylinder with  
Non-Rotating Piston Rod



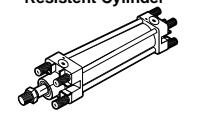
ACT-5-9 –  
Four-position Cylinders



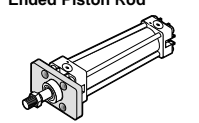
ACT-5-10 –  
Cylinder with  
Piston Rod Bellows



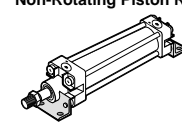
ACT-5-10 –  
Cylinder with  
Locking Units



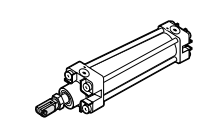
ACT-5-11 –  
Cylinder with Front or  
Rear Stud, Style A



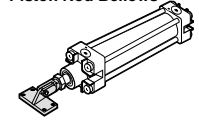
ACT-5-11 –  
Cylinder with Front or  
Rear Flange, Style B or G



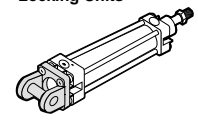
ACT-5-11 –  
Cylinder with Foot, Style C



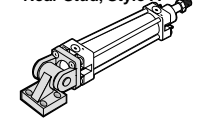
ACT-5-12 –  
Cylinder with Piston Rod  
Clevis, Style F



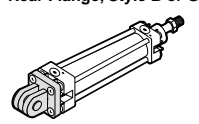
ACT-5-12 –  
Cylinder with  
Front Hinge, Style M



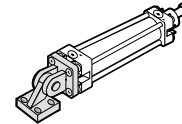
ACT-5-13 –  
Cylinder with Rear Clevis,  
Style D



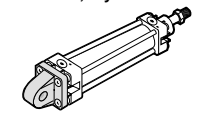
ACT-5-13 –  
Cylinder with Rear Hinge,  
Style L



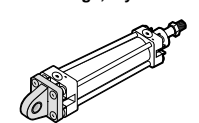
ACT-5-14 –  
Cylinder with Rear Clevis,  
Style D2



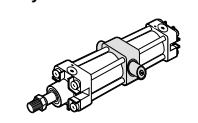
ACT-5-14 –  
Cylinder with Universal  
Rear Hinge, Style UL



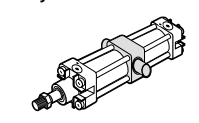
ACT-5-15 –  
Cylinder with  
Rear Eye, Style R



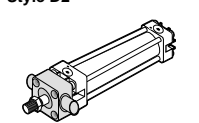
ACT-5-15 –  
Cylinder with Universal  
Rear Eye, Style UR



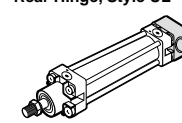
ACT-5-16 –  
Cylinder with Central  
Trunnion, Style H



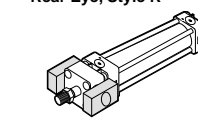
ACT-5-16 –  
Adjustable Intermediate  
Trunnion, Style UH



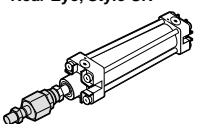
ACT-5-17 –  
Head Detachable  
Trunnion, Style FH



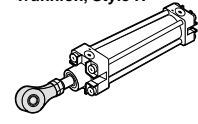
ACT-5-17 –  
Cap Detachable  
Trunnion, Style FH



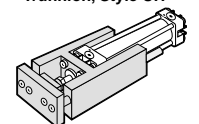
ACT-5-17 –  
Cylinder with Swivel  
Bearing, Style S



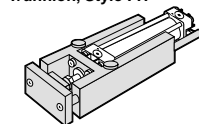
ACT-5-18 –  
Cylinder with Piston Rod  
Swivel, Style AK



ACT-5-18 –  
Cylinder with Universal  
Piston Rod Eye, Style UF



ACT-5-19 –  
Cylinder with Guide  
Blocks



ACT-5-20 –  
Cylinder with Guide Blocks



## ISO/VDMA – Pneumatic Cylinders contain the finest materials for each component!

The complete selection from  $\varnothing 32$  to  $\varnothing 320$  mm, corresponds to ISO 6431, NFE 49-003-1 and VDMA 24562.

High performance ISO/VDMA cylinders are rugged, reliable and ideal for the demands of today.

- ISO/VDMA cylinders are known worldwide as the metric standard for pneumatic cylinders.
- Numerous standard variants for specialized applications.
- Comprehensive range of standard mounts.
- Non-contact position sensing option.
- Suitable for lubricated and non-lubricated air supplies.

Norgren ISO/VDMA Cylinders are available in three models to meet a wide range of applications: • Basic • Profile • Corrosion Resistant

### Basic Cylinder Series 8000

**1** Tie Rod Nuts: Heavy duty steel (zinc plated) sleeve nuts.

**2** Cushioning: Heavy duty cushioning with fine adjustment is standard.

**3** Piston Rod: High performance, high-strength, ground and polished 303 stainless steel, hard-chrome plated for excellent protection against wear.

**4** Cushion Sleeves: Smooth operating polyamide cushion sleeves.

**5** Tube: Precision aluminum tube ideally suited for air service. Anodized corrosion resistant surface.

**6** Rod Seal Wiper: The combination seal/wiper design is molded from tough abrasion resistant materials for long life and ease of maintenance.

**7** Bearing: Heavy duty long wearing nylon rod bearing.



Basic Cylinder Series 8000  
 $\varnothing 32$  to  $\varnothing 320$  mm

The standard cylinder for all applications. Robust, technically advanced, superior in function and efficiency. All sizes are available with or without a magnetic piston.

#### Technical Data

**Medium:** Compressed air, filtered, lubricated and non-lubricated

**Operation:** Double acting

8000 Adjustable cushioning  
8000/M Magnetic piston, adjustable cushioning

**Operating Pressure:**

1 to 16 bar (14.5 to 232 PSIG)  
1 to 10 bar (14.5 to 145 PSIG) for  $\varnothing 250$  mm and  $\varnothing 320$  mm

**Operating Temperature:**

-20°C to +80°C max (-4°F to +176°F max)  
[Consult Technical Services for use below +2°C (35°F)]

**Cylinder Diameters:** 32, 40, 50, 63, 80, 100, 125, 160, 200, 250, 320 mm

**Strokes Lengths:** Non-standard strokes (10 mm to 3000 mm) available

**Materials:**

Anodized aluminum tube

Pressure diecast aluminum end covers:

$\varnothing 32$  to  $\varnothing 160$  mm (gravity cast aluminum  $\varnothing 200$  to  $\varnothing 320$  mm)

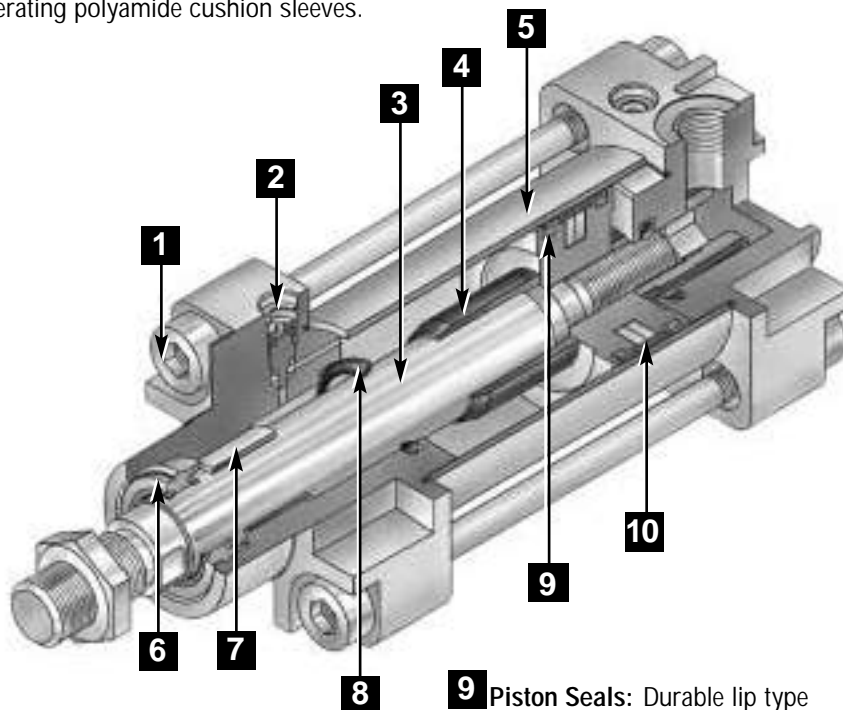
Chrome plated stainless steel piston rod

Polyurethane piston rod seals:  $\varnothing 32$  to  $\varnothing 100$  mm (nitrile rubber  $\varnothing 125$  to  $\varnothing 320$  mm)

Polyurethane piston seals:  $\varnothing 32$  to  $\varnothing 100$  mm (nitrile rubber  $\varnothing 125$  to  $\varnothing 320$  mm)

Nitrile rubber O-rings

Tie Rod: High strength steel



**8** Cushion Seal: One piece, nitrile compound seal. Linear and radial *float* of cushion seal eliminates misalignment. Designed to provide exceptionally fast *out of cushion* stroke reversal.

**9** Piston Seals: Durable lip type seals are pressure energized and wear compensating.

**10** Piston: Wear band is standard. Optional magnetic piston for non-contact sensing.



## Profile Cylinder Series P/8000



**Profile Cylinder Series P/8000**  
 ø32 to ø125 mm  
 With the same advantages of the basic cylinder, but a specially shaped profile aluminum tube with enclosed tie rods to provide high rigidity and a clean look. The Profile Series is available with or without a magnetic piston.

### Technical Data

**Medium:** Compressed air, filtered, lubricated and non-lubricated

**Operation:** Double acting

P/8000 Adjustable cushioning  
 P/8000/M Magnetic piston, adjustable cushioning

**Operating Pressure:** 1 to 16 bar (14.5 to 232 PSIG)

**Operating Temperature:** -20°C to +80°C max (-4°F to +176°F max)

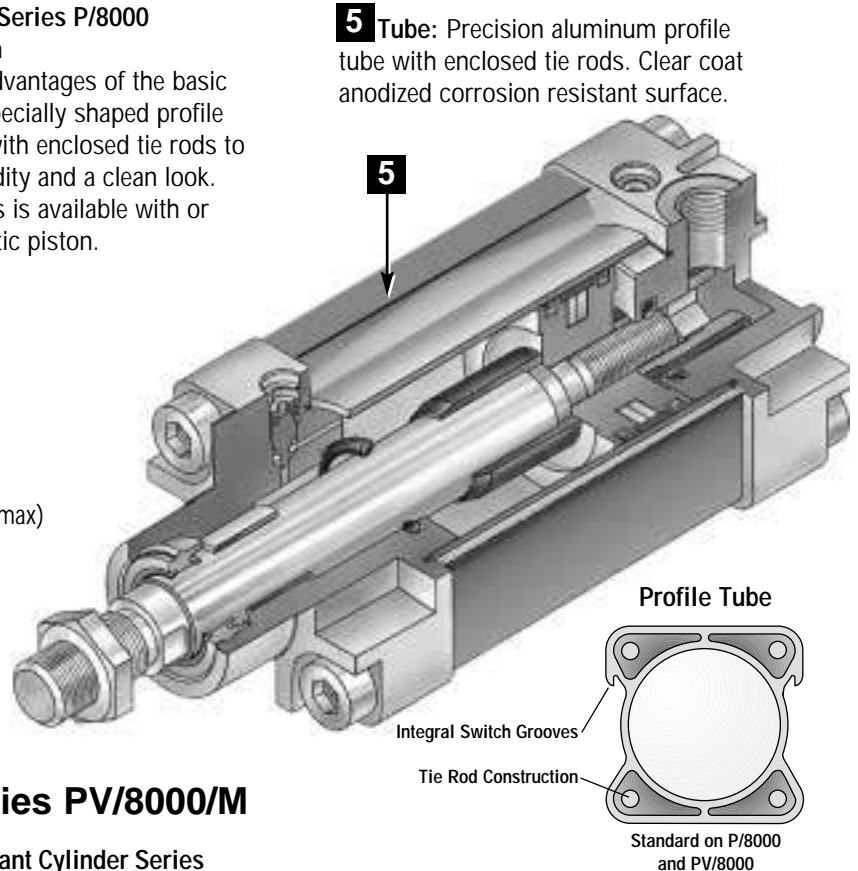
[Consult Technical Services for use below +2°C (+35°F)]

**Cylinder Diameters:** 32, 40, 50, 63, 80, 100, 125 mm

**Strokes Lengths:** Non-standard strokes (10 mm to 3000 mm) available

**Materials:**

Anodized aluminum profile tube



## Corrosion Resistant Cylinder Series PV/8000/M



**Corrosion Resistant Cylinder Series PV/8000**  
 ø32 to ø100 mm  
 A perfect blend of design and function, incorporating cleanline profile tube and end caps. Corrosion resistant and stainless steel materials make this cylinder ideal for the chemical, pharmaceutical and food industries. Magnetic piston is standard.

### Technical Data

**Medium:** Compressed air, filtered, lubricated and non-lubricated

**Operation:** PV/8000/M

Double acting with magnetic piston and adjustable cushioning (corrosion resistant construction)

**Operating Pressure:** 1 to 16 bar (14.5 to 232 PSIG)

**Operating Temperature:** -20°C to +80°C max (-4°F to +176°F max)

[Consult Technical Services for use below +2°C (+35°F)]

**Cylinder Diameters:** 32, 40, 50, 63, 80, 100 mm

**Strokes Lengths:** Non-standard strokes (10 mm to 3000 mm) available

**Materials:**

Anodized aluminum profile tube

Black anodized solid aluminum end covers

Chrome plated stainless steel piston rod

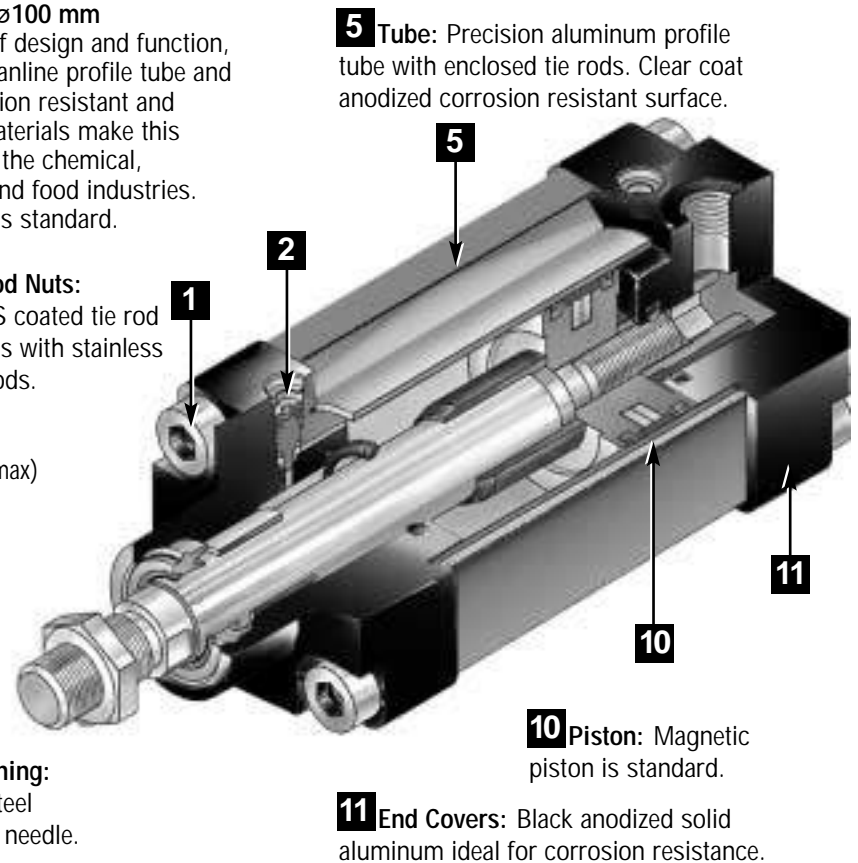
303 Series

316 Series stainless steel tie rods

303 Series cushion needle

**1 Tie Rod Nuts:**  
 Delta-MCS coated tie rod sleeve nuts with stainless steel tie rods.

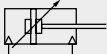
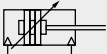
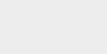
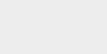
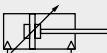
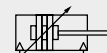
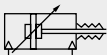
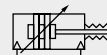
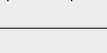
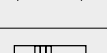

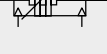

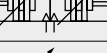
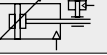
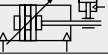










**2 Cushioning:**  
 Stainless steel cushioning needle.





# 8000, 8000/M, P/8000, P/8000/M and PV/8000/M Pneumatic Cylinders

## Cylinder Model Code (Reference)

Symbol	Model Non-magnetic piston	Symbol	Model Magnetic piston	Description
	NA/8000		NA/8000/M	303 Stainless steel chromium plated piston rod series 303 SS tie rods
	DA/8000		DA/8000/M	Standard cylinder with hard chromium plated stainless steel piston rod (Austenitic)
	PDA/8000		PDA/8000/M	
	CA/8000		CA/8000/M	Cylinder with hard chromium plated steel piston rod
	PCA/8000		PCA/8000/M	
	RA/8000		RA/8000/M	Cylinder with non-chrome plated stainless steel piston rod (Martensitic)
	PRA/8000		PRA/8000/M	
	SA/8000		SA/8000/M	Cylinder with non-chrome plated stainless steel piston rod (Austenitic)
PSA/8000	PSA/8000/M			
	DA/8000/W1		DA/8000/W2	Cylinder with special wiper/seal for applications with arizona sand, cement, plaster (stucco), hoar-frost or ice (ø32 mm to ø125 mm)
	PDA/8000/W1		PDA/8000/W2	
	DA/8000/X1		PRA/8000/X2	Low friction cylinders (ø32 mm to ø200 mm) Medium: Compressed air, filtered and non-lubricated recommended
	PDA/8000/X1			
	TDA/8000		TPDA/8000/M	Cylinder with heat resistant seal 150°C max (302°F max)
			TPVA/8000/M	
	DA/8000/IU, PDA/8000/IU		DA/8000/MU	Cylinder with extended piston rod
			PDA/8000/MU	
	DA/8000/W5		PVA/8000/MU	
	PDA/8000/W5		DA/8000/W6	Cylinder with extended piston rod and special wiper/seal for applications with arizona sand, cement, plaster (stucco), hoar-frost or ice (ø32 mm to ø125 mm)
	DA/8000/G		PDA/8000/W6	
	PDA/8000/G		PVA/8000/W6	
	DA/8000/W		DA/8000/MG	Cylinder with piston rod bellows
	PDA/8000/W		PDA/8000/MG	
	DA/8000/X3		DA/8000/MW	Cylinder without cushioning
	PDA/8000/X3		PDA/8000/MW	
			DA/8000/X4	Low friction cylinders without cushioning (ø32 mm to ø200 mm) Medium: Compressed air, filtered and non-lubricated recommended
			PDA/8000/X4	
			HDA/8000/M	Cylinder with hydraulic (ø32 mm to ø100 mm)
			HPDA/8000/M	
	DA/8000/J		HPVA/8000/M	
	PDA/8000/J		DA/8000/JM	Cylinder with double ended piston rod
	DA/8000/W3		PDA/8000/JM	
	PDA/8000/W3		PVA/8000/JM	
	DA/8000/IT		DA/8000/W4	Cylinder with double ended piston rod and special wiper/seal for applications with arizona sand, cement, plaster (stucco), hoar-frost or ice (ø32 mm to ø125 mm)
	PDA/8000/IT		PDA/8000/W4	
	RA/8000/N1		PVA/8000/W4	
	PRA/8000/N1		DA/8000/MT	Four position cylinders, ø32 mm to ø200 mm
	DA/8000/L2		PDA/8000/MT	
	PDA/8000/L2		PVA/8000/MT	
			RA/8000/N2	Cylinder with non-rotating piston rod, ø32 mm to ø100 mm
			PRA/8000/N2	
			DA/8000/L4	Cylinders with locking unit (PASSIVE). Locking is achieved by spring force on removal of the signal to the unit, ø32 mm to ø125 mm
			PDA/8000/L4	

For combinations of cylinder variants consult Technical Service.



**Theoretical Forces | Cushioning | Air Consumption**

ø Cylinder	Theoretical forces at 6 bar (lbs. at 87 PSI)		Cushion length Inch (mm)	Initial cushion volume Inches <sup>3</sup> (cm <sup>3</sup> )	Air consumption – Liters/cm of stroke (cubic inches/inch)			
	Extend lbs. Force (Newtons)	Retract lbs. Force (Newtons)			Extend Inch <sup>3</sup>	(Liters)	Retract Inch <sup>3</sup>	(Liters)
32	108 (482)	93 (414)	.75 (19)	.75 (12.3)	8.7 (0.056)	7.5 (0.048)		
40	169 (754)	142 (633)	.87 (22)	1.26 (20.7)	13.7 (0.088)	11.5 (0.074)		
50	265 (1178)	222 (990)	.94 (24)	2.20 (36)	21.3 (0.137)	17.7 (0.114)		
63	420 (1870)	378 (1680)	.94 (24)	3.90 (64)	33.9 (0.218)	30.3 (0.195)		
80	678 (3016)	612 (2722)	1.06 (27)	7.08 (116)	54.4 (0.35)	49.8 (0.32)		
100	1059 (4710)	993 (4416)	1.34 (34)	14.76 (242)	85.5 (0.55)	79.3 (0.51)		
125	1656 (7363)	1547 (6882)	1.61 (41)	27.51 (451)	133.7 (0.86)	122.9 (0.79)		
160	2713 (12064)	2543 (11310)	1.77 (45)	49.78 (816)	219.3 (1.41)	205.3 (1.32)		
200	4236 (18840)	4068 (18090)	1.77 (45)	80.76 (1324)	342.1 (2.20)	326.6 (2.10)		
250	6619 (29436)	6349 (28236)	2.36 (60)	176.9 (2900)	534.0 (3.44)	513.2 (3.30)		
320	10846 (48228)	10634 (47292)	2.56 (65)	317.2 (5200)	875.6 (5.63)	841.4 (5.41)		

**Spring Forces for Cylinder with Locking Unit • Stroke and Torque for Non-Rotating Piston Rod Cylinders**

ø	Locking Unit	Spring forces lbs. Force (Newtons)	ø	Non-Rotating Piston Rod Cylinder	Stroke max. Inches (mm)	Torque max. Inch lbs. (Nm)
32	8032/L2, P/8032/L2 and 8032/L4, P/8032/L4	135 (600)	32	8032/N1, P/8032/N1 and 8032/N2, P/8032/N2	11.8 (300)	4.4 (0.5)
40	8040/L2, P/8040/L2 and 8040/L4, P/8040/L4	225 (1000)	40	8040/N1, P/8040/N1 and 8040/N2, P/8040/N2	15.7 (400)	8.9 (1.0)
50	8050/L2, P/8050/L2 and 8050/L4, P/8050/L4	337 (1500)	50	8050/N1, P/8050/N1 and 8050/N2, P/8050/N2	19.7 (500)	13.3 (1.5)
63	8063/L2, P/8063/L2 and 8063/L4, P/8063/L4	495 (2200)	63	8063/N1, P/8063/N1 and 8063/N2, P/8063/N2	19.7 (500)	13.3 (1.5)
80	8080/L2, P/8080/L2 and 8080/L4, P/8080/L4	1124 (5000)	80	8080/N1, P/8080/N1 and 8080/N2, P/8080/N2	23.6 (600)	22.1 (2.5)
100	8100/L2, P/8100/L2 and 8100/L4, P/8100/L4	1124 (5000)	100	8100/N1, P/8100/N1 and 8100/N2, P/8100/N2	23.6 (600)	22.1 (2.5)
125	8125/L2, P/8125/L2 and 8125/L4, P/8125/L4	1574 (7000)				

**Materials and Surface Treatment of Mountings**

	Standard	Corrosion Resistant Construction
Style A	Zinc plated steel	
Style AK	Zinc plated steel	
Styles B, G	Clear anodized aluminum	Clear anodized aluminum. Screws: A2
Style C	Painted steel (zinc plated steel 32 to 63 mm bore)	
Style D	Diecast aluminum mounting, stainless steel (Martensitic) bolt	Black corrosion protected diecast aluminum mounting, certified for most food industries. Bolt: X 10 Cr Ni S 18 9 (1.4305, AISI 303). Circlip: stainless steel (Martensitic). Screws: A2
Style D2	Painted cast iron, stainless steel (Martensitic) bolt	
Style F	Zinc plated steel	Nickel plated steel mounting. Circlip: X 10 Cr Ni S 18 9 (1.4305, AISI 303). Bolt: X 10 Cr Ni S 18 9 (1.4305, AISI 303).
Style FH	Painted cast iron	
Style L	Diecast aluminum mounting, stainless steel (Martensitic) bolt	Black corrosion protected diecast aluminum mounting, certified for most food industries. Bolt: X 10 Cr Ni S 18 9 (1.4305, AISI 303). Circlip: stainless steel (Martensitic). Screws: A2
Style M	Zinc plated steel clevis mounting, diecast aluminum hinge	
Style R	Diecast aluminum	Black corrosion protected diecast aluminum mounting, certified for most food industries. Screws: A2
Style S	Zinc plated steel, sintered bronze bearing bushing	
Style SS	Painted cast iron	
Style SW	Diecast aluminum	Black corrosion protected diecast aluminum mounting, certified for most food industries.
Style UF	Zinc plated steel, mounting hardened steel ball and roller-bearing elements	Nickel plated steel mounting. Inner ring: stainless steel (Austenitic). Outer ring: nickel plated hardened steel.
Style UH, H	Clear anodized aluminum	
Style UL	Painted cast iron clevis mounting, stainless steel (Martensitic) bolt, diecast aluminum hinge, hardened steel ball and roller-bearing elements	
Style UR	Painted diecast aluminum mounting, hardened steel ball and roller-bearing elements	Black corrosion protected diecast aluminum mounting, certified for most food industries. Inner ring: stainless steel (Austenitic). Outer ring: nickel plated hardened steel.
Style US	Diecast aluminum (125 mm bore painted cast iron) mounting, hardened steel ball and roller-bearing elements	



Important information to know when ordering ISO/VDMA Cylinders:

- ISO 6431 standard defines that cylinders with their mountings attached are interchangeable.
ISO 6431/VDMA 24562 further defines that cylinders are interchangeable with or without mountings.

The original Norgren RM/8000 Cylinder was designed to meet the ISO 6431 standard. The redesigned DA/8000 Cylinder was designed to meet the ISO 6431 and the VDMA 24562 standard.

The Norgren ISO/VDMA Cylinder is produced worldwide, so the piston rod ordering code may vary slightly from country to country. For example, in the USA, the top of the line chrome plated 303 stainless steel piston rod currently is standard in all ISO/VDMA Cylinders.

Alternative letter codes are used on Norgren ISO/VDMA Cylinders from other countries, such as:

- C /8000 = chrome plated steel
R /8000 = 400 series stainless steel (Martensitic) non-chrome plated
S /8000 = 300 series stainless steel (Austenitic) non-chrome plated
N /8000 = 300 series SS (Austenitic) hard chromium plated piston rod and 300 series SS tie rods non-chrome plated

ISO/VDMA Cylinders are unique: after selecting bore, stroke and type of cylinder, the desired mounting kit is chosen. These kits come complete with required mounting hardware. (ACT-4- 22/23)

ISO/VDMA basic cylinder Series 8000 and the Profile Series P/8000 can be ordered with or without a magnetic piston. The Corrosive Resistant Cylinder PV/8000 is supplied with a magnetic piston as standard.

EXAMPLES:

- DA/8000 Basic Cylinder
DA/8000/M Basic Cylinder, magnetic piston
PDA/8000 Profile Cylinder
PDA/8000/M Profile Cylinder, magnetic piston
PVA/8000/M Corrosive Resistant Cylinder, magnetic piston

A magnetic piston is required for cylinders that will utilize reed and solid state switches. See ACT-4-24/26 for a complete list of switches and mounting brackets.

ISO 6431/VDMA 24562 Basic Cylinder Series 8000

Model Codes

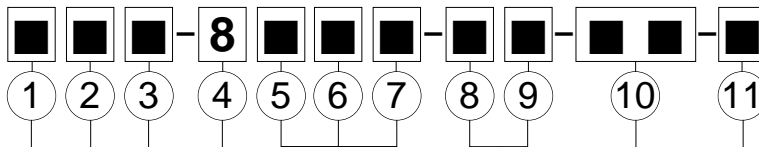


Table with 2 columns: Special Optional, and rows for Standard (blank), Hydraulic (ø32mm to ø100mm), and Temperature.

Table with 2 columns: Piston Rod Material, and rows for Chrome plated stainless steel and Stainless steel non-chrome plated (options N1 and N2).

Table with 2 columns: Port Threads, and rows for ISO G and NPT.

Series 8000

Table with 2 columns: Bore Size (Diameters), and rows for diameters from 032 to 320mm.

Option IU or MU
Enter \_\_\_/8 \_\_\_/IU or MU/\_\_\_/\_\_\_
the additional piston rod length (ACT-4-9)
Mounting style H or UH
Enter \_\_\_/8 \_\_\_/\_\_\_/\_\_\_/H,XV
the XV distance (ACT-4-16)

Table with 2 columns: Stroke (mm), and row for 3000 maximum.

Ordering Examples Cylinders

To order a basic ø80 mm bore magnetic piston cylinder with a 50 mm stroke specify: DA/8080/M/50.

Mountings

To order a front flange mounting style G for ø80 mm bore cylinder specify: QA/8080/22. (ACT-4-11)

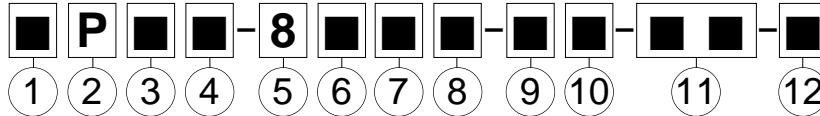
Options table with columns for Non-magnetic Piston and Magnetic Piston, listing various options like W1, X1, IU, W5, G, W, X3, J, W3, IT, N1, L2 and their corresponding magnetic piston options M, W2, X2, MU, W6, MG, MW, X4, JM, W4, MT, N2, L4.

\*Requires piston rod material R



ISO 6431/VDMA 24562 Profile Cylinder Series P/8000

Model Codes



Special Optional	
	Standard (blank)
H	Hydraulic (ø32mm to ø100mm)
T	Temperature

Profile Cylinder	
P	Profile

Piston Rod Material	
D	Chrome plated stainless steel
R	Stainless steel non-chrome plated (options N1 and N2)

Port Threads	
A	ISO G
C	NPT

Series 8000	
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Bore Size (Diameters)	
032	32mm
040	40mm
050	50mm
063	63mm
080	80mm
100	100mm
125	125mm

Option IU or MU  
Enter \_\_\_/8 \_\_\_/IU or MU/\_\_\_/\_\_\_ the additional piston rod length (ACT-4-9)

Mounting style H or UH  
Enter \_\_\_/8 \_\_\_/\_\_\_/\_\_\_/H,XV the XV distance (ACT-4-16)

Stroke (mm)	
3000 maximum	

Options		
Non-magnetic Piston		Magnetic Piston
	Standard cylinder	M
W1	Special wiper/seal	W2
X1	Low friction	X2
IU	Additional piston rod length	MU
W5	Additional piston rod, special wiper/seal	W6
G	Piston rod boot/bellows (gaiter)	MG
W	Without cushioning	MW
X3	Without cushioning, low friction	X4
J	Double ended piston rod	JM
W3	Double ended piston rod, special wiper/seal	W4
IT	Four position cylinder	MT
N1	*Non-rotating piston rod (ø32mm to ø100mm)	N2
L2	Passive locking unit	L4

\*Requires piston rod material R

Ordering Examples

Cylinders

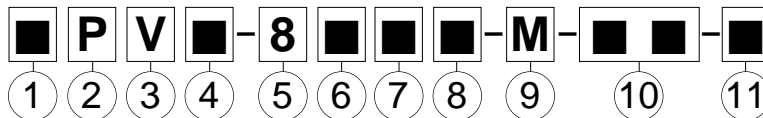
To order a Profile ø100 mm bore magnetic piston cylinder with a 63 mm stroke specify: **PDA/8100/M/63.**

Mountings

To order a cap detachable trunnion mounting style FH for ø100 mm bore cylinder specify: **QA/8100/34.** (ACT-4-17)

ISO 6431/VDMA 24562 Corrosive Resistant Cylinder Series PV/8000

Model Codes



Special Optional	
	Standard (blank)
H	Hydraulic
T	Temperature

Corrosive Resistant Cylinder	
PV	Profile tube, chrome plated 300 series stainless steel piston rod and tie rods, black anodized solid aluminum end caps, Delta-MCS coated tie rod nuts.

Port Threads	
A	ISO G
C	NPT

Series 8000	
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Bore Size (Diameters)	
032	32mm
040	40mm
050	50mm
063	63mm
080	80mm
100	100mm

Option MU  
Enter \_\_\_/8 \_\_\_/MU/\_\_\_/\_\_\_ the additional piston rod length

Stroke (mm)	
3000 maximum	

Options include Magnetic Piston	
M	Standard cylinder
W2	Special wiper/seal
MU	Additional piston rod length
W6	Additional piston rod, special wiper/seal
JM	Double ended piston rod
W4	Double ended piston rod, special wiper/seal
MT	Four position cylinder

Ordering Examples

Cylinders

To order a ø50 mm bore Corrosive Resistant Cylinder with magnetic piston and a 100 mm stroke specify: **PVA/8050/M/100.**

Mountings

To order a rear hinge mounting style L for ø40 mm bore cylinder specify: **PVQA/8040/24.** (ACT-4-13)



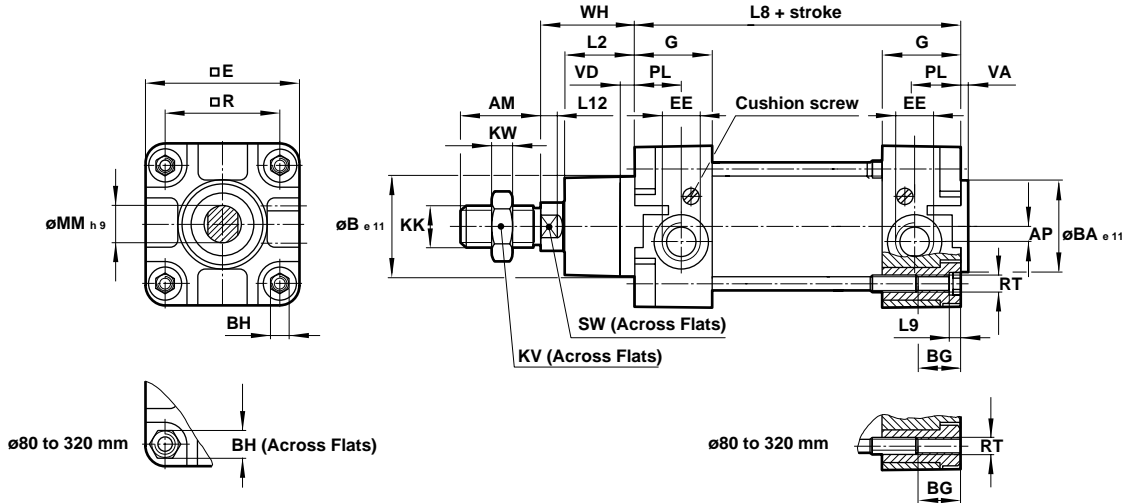


# 8000, 8000/M, P/8000, P/8000/M and PV/8000/M Pneumatic Cylinders

All Dimensions in Inches (mm)

## Basic Dimensions

### Series 8000, 8000/M, P/8000, P/8000/M and PV/8000/M Pneumatic Cylinders

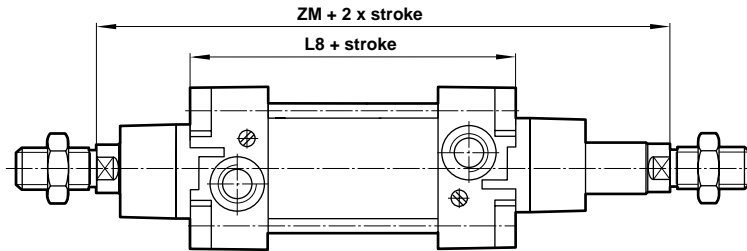


$\phi$	AM	AP	$\phi B_{e11}$	$\phi BA_{e11}$	BG	BH	$\square E$	EE	G	KK	KV	KW	L2	L8	L9
32	0.87 (22)	0.14 (3.5)	1.18 (30)	1.18 (30)	0.71 (18)	0.24 (6)	1.85 (47)	G 1/8 (1/8"NPT)	1.08 (27.5)	M10x1.25	0.67 (17)	0.20 (5)	0.79 (20)	3.70 (94)	0.16 (4)
40	0.94 (24)	0.18 (4.5)	1.38 (35)	1.38 (35)	0.71 (18)	0.24 (6)	2.09 (53)	G 1/4 (1/4"NPT)	1.26 (32)	M12x1.25	0.75 (19)	0.24 (6)	0.87 (22)	4.13 (105)	0.16 (4)
50	1.26 (32)	0.24 (6)	1.57 (40)	1.57 (40)	0.71 (18)	0.31 (8)	2.56 (65)	G 1/4 (1/4"NPT)	1.22 (31)	M16x1.5	0.94 (24)	0.31 (8)	1.06 (27)	4.17 (106)	0.20 (5)
63	1.26 (32)	0.39 (10)	1.77 (45)	1.77 (45)	0.69 (17.5)	0.31 (8)	2.95 (75)	G 3/8 (3/8"NPT)	1.30 (33)	M16x1.5	0.94 (24)	0.31 (8)	1.14 (29)	4.76 (121)	0.20 (5)
80	1.57 (40)	0.33 (8.5)	1.77 (45)	1.77 (45)	0.85 (21.5)	0.75 (19)	3.74 (95)	G 3/8 (3/8"NPT)	1.30 (33)	M20x1.5	1.18 (30)	0.39 (10)	1.30 (33)	5.04 (128)	-
100	1.57 (40)	0.35 (9)	2.17 (55)	2.17 (55)	0.85 (21.5)	0.75 (19)	4.53 (115)	G 1/2 (1/2"NPT)	1.46 (37)	M20x1.5	1.18 (30)	0.39 (10)	1.42 (36)	5.43 (138)	-
125	2.13 (54)	0.39 (10)	2.36 (60)	2.36 (60)	1.26 (32)	0.94 (24)	5.51 (140)	G 1/2 (1/2"NPT)	1.81 (46)	M27x2	1.61 (41)	0.53 (13.5)	1.77 (45)	6.30 (160)	-
160	2.83 (72)	0.71 (18)	2.56 (65)	2.56 (65)	1.12 (28.5)	1.26 (32)	7.22 (183.5)	G 3/4 (3/4"NPT)	1.97 (50)	M36x2	2.17 (55)	0.71 (18)	2.28 (58)	7.09 (180)	-
200	2.83 (72)	0.71 (18)	2.95 (75)	2.95 (75)	1.12 (28.5)	1.26 (32)	8.82 (224)	G 3/4 (3/4"NPT)	1.97 (50)	M36x2	2.17 (55)	0.71 (18)	2.64 (67)	7.09 (180)	-
250	3.31 (84)	0.89 (22.5)	3.54 (90)	3.54 (90)	1.38 (35)	1.42 (36)	11.02 (280)	G 1 (1"NPT)	2.28 (58)	M42x2	2.56 (65)	0.83 (21)	3.15 (80)	7.87 (200)	-
320	3.78 (96)	0.89 (22.5)	4.33 (110)	4.33 (110)	1.18 (30)	1.81 (46)	13.78 (350)	G 1 (1"NPT)	2.36 (60)	M48x2	2.95 (75)	0.94 (24)	3.54 (90)	8.66 (220)	-
										<b>8000</b>					
										Weight at zero stroke					
										lbs (kg)					
											<b>P/8000</b>				
											Weight at zero stroke				
											lbs (kg)				
												<b>PV/8000</b>			
												Weight at zero stroke			
												lbs (kg)			
$\phi$	L12	$\phi MM_{h9}$	PL	$\square R$	RT	SW	VA	VD	WH						
32	0.24 (6)	0.47 (12)	0.51 (13)	1.26 (32.5)	M 6	0.39 (10)	0.12 (3)	0.24 (6)	1.02 (26)	1.12 (0.51)	0.13 (0.06)	1.12 (0.51)	0.13 (0.06)	1.41 (0.64)	0.13 (0.06)
40	0.26 (6.5)	0.63 (16)	0.59 (15)	1.50 (38)	M 6	0.51 (13)	0.14 (3.5)	0.24 (6)	1.18 (30)	1.76 (0.80)	0.18 (0.08)	1.76 (0.80)	0.18 (0.08)	2.09 (0.95)	0.18 (0.08)
50	0.31 (8)	0.79 (20)	0.73 (18.5)	1.83 (46.5)	M 8	0.67 (17)	0.14 (3.5)	0.24 (6)	1.46 (37)	2.93 (1.33)	0.26 (0.12)	2.93 (1.33)	0.26 (0.12)	3.33 (1.51)	0.26 (0.12)
63	0.31 (8)	0.79 (20)	0.75 (19)	2.22 (56.5)	M 8	0.67 (17)	0.16 (4)	0.24 (6)	1.46 (37)	3.97 (1.80)	0.29 (0.13)	3.97 (1.80)	0.29 (0.13)	4.63 (2.10)	0.29 (0.13)
80	0.39 (10)	0.98 (25)	0.75 (19)	2.83 (72)	M 10	0.87 (22)	0.16 (4)	0.24 (6)	1.81 (46)	7.17 (3.25)	0.44 (0.20)	7.17 (3.25)	0.44 (0.20)	8.27 (3.75)	0.44 (0.20)
100	0.39 (10)	0.98 (25)	0.71 (18)	3.50 (89)	M 10	0.87 (22)	0.16 (4)	0.24 (6)	2.01 (51)	10.61 (4.81)	0.51 (0.23)	10.61 (4.81)	0.51 (0.23)	12.37 (5.61)	0.51 (0.23)
125	0.51 (13)	1.26 (32)	0.79 (20)	4.33 (110)	M 12	1.06 (27)	0.24 (6)	0.61 (15.5)	2.56 (65)	17.64 (8.00)	0.73 (0.33)	17.64 (8.00)	0.73 (0.33)	-	-
160	0.63 (16)	1.57 (40)	0.83 (21)	5.51 (140)	M 16	1.42 (36)	0.16 (4)	0.59 (15)	3.15 (80)	32.85 (14.9)	1.21 (0.55)	-	-	-	-
200	0.63 (16)	1.57 (40)	0.83 (21)	6.89 (175)	M 16	1.42 (36)	0.20 (5)	0.59 (15)	3.74 (95)	47.85 (21.7)	1.32 (0.60)	-	-	-	-
250	0.79 (20)	1.97 (50)	1.14 (29)	8.66 (220)	M 20	1.61 (41)	0.28 (7)	0.51 (13)	4.13 (105)	71.88 (32.6)	2.03 (0.92)	-	-	-	-
320	0.94 (24)	2.48 (63)	1.18 (30)	10.63 (270)	M 24	2.17 (55)	0.28 (7)	0.51 (13)	4.72 (120)	131.86 (59.8)	3.22 (1.46)	-	-	-	-



8000J, P/8000J, 8000/JM, P/8000/JM and PV/8000/JM – Cylinders with Double Ended Piston Rod

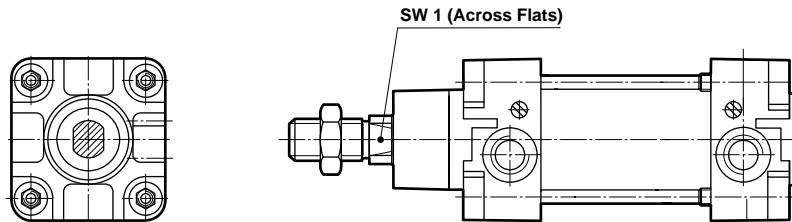
Cylinder Ø	ZM	L8
32	5.75 (146)	3.70 (94)
40	6.50 (165)	4.13 (105)
50	7.09 (180)	4.17 (106)
63	7.68 (195)	4.76 (121)
80	8.66 (220)	5.04 (128)
100	9.45 (240)	5.43 (138)
125	11.42 (290)	6.30 (160)
160	13.39 (340)	7.09 (180)
200	14.57 (370)	7.09 (180)



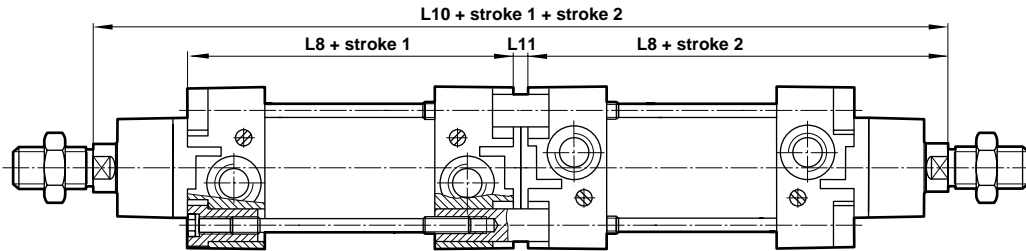
8000/N1, P/8000/N1 and 8000/N2, P/8000/N2 – Cylinders with Non-rotating Piston Rod

Cylinder Ø	SW 1
32	0.39 (10)
40	0.51 (13)
50	0.63 (16)
63	0.63 (16)
80	0.83 (21)
100	0.83 (21)

See ACT-4-5 for maximum stroke, length and torque



8000/IT, P/8000/IT and 8000/MT, P/8000/MT – Four-position Cylinders



Cylinder Ø	L8	L10	L11
32	3.70 (94)	9.72 (247)	0.28 (7)
40	4.13 (105)	10.94 (278)	0.31 (8)
50	4.17 (106)	11.57 (294)	0.31 (8)
63	4.76 (121)	12.80 (325)	0.35 (9)
80	5.04 (128)	14.06 (357)	0.35 (9)
100	5.43 (138)	15.24 (387)	0.35 (9)
125	6.30 (160)	18.19 (462)	0.47 (12)
160	7.09 (180)	20.87 (530)	0.39 (10)
200	7.09 (180)	22.05 (560)	0.39 (10)

Four Position Cylinders are ordered as a complete unit

Examples:

Non-Magnetic Cylinders

8000/IT/Stroke #1/Stroke #2

P/8000/IT/Stroke #1/Stroke #2

Magnetic Cylinders

8000/MT/Stroke #1/Stroke #2

P/8000/MT/Stroke #1/Stroke #2

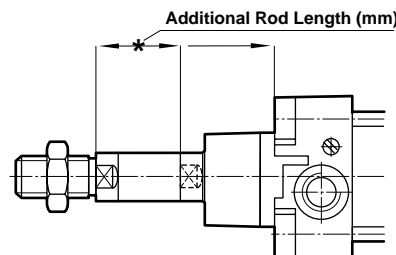
Four Position Unit with ø80 mm, Stroke #1 = 200 mm, Stroke #2 = 160 mm, magnetic piston, complete with foot mounting, and reed switches.

4 Position Cylinder	DA/8080/MT/200/160	Qty 1
Foot Mounting	QA/8080/21	Qty 1 Pair
Reed Switch	QM/34/2	Qty 4
Switch Clamps	QM/27/2/1	Qty 4

8000/IU, P/8000/IU and 8000/MU, P/8000/MU – Additional Piston Rod Length

Order Example:

DA/8000/MU/100/50  
 Additional Rod Length (mm)  
 Stroke

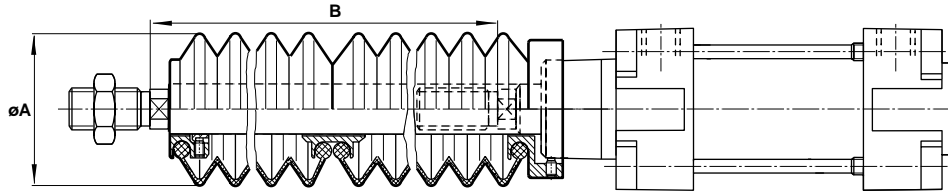




# 8000, 8000/M, P/8000 and P/8000/M Pneumatic Cylinder Variations

All Dimensions in inches (mm)

## 8000/G, P/8000/G and 8000/MG, P/8000/MG – Cylinder with Piston Rod Bellows

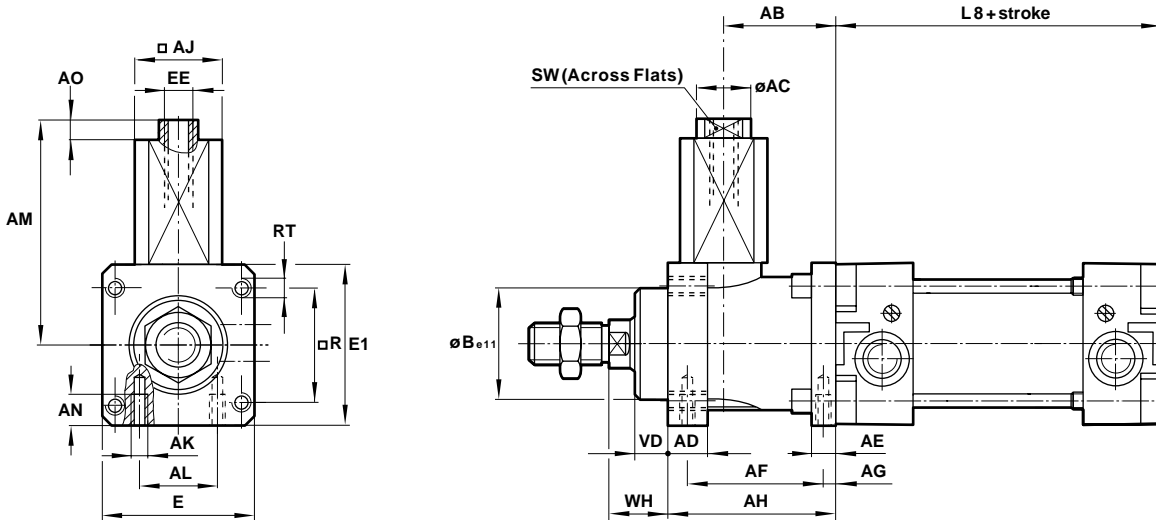


Cylinder Ø	ØA	Maximum stroke per bellows	Piston rod extension B	
			first bellows	additional bellows
32	1.57 (40)	2.36 (60)	1.18 (30)	0.98 (25)
40	2.48 (63)	5.71 (145)	1.97 (50)	1.26 (32)
50	2.48 (63)	5.71 (145)	1.57 (40)	1.26 (32)
63	2.48 (63)	5.71 (145)	1.57 (40)	1.26 (32)
80	3.15 (80)	9.84 (250)	1.97 (50)	1.77 (45)
100	3.15 (80)	9.84 (250)	1.97 (50)	1.77 (45)
125	3.15 (80)	9.84 (250)	1.97 (50)	1.77 (45)
160	4.57 (116)	13.78 (350)	2.76 (70)	2.36 (60)
200	4.57 (116)	13.78 (350)	2.76 (70)	2.36 (60)
250	4.57 (116)	13.78 (350)	2.76 (70)	2.36 (60)
320	5.63 (143)	19.69 (500)	4.33 (110)	3.94 (100)

**Example:** To determine B dimension for a cylinder Ø40 mm x 325 mm stroke

- Step 1** Calculate the number of bellows that will be required. To do this, divide 325 mm (cylinder stroke length) by 145 mm (the maximum stroke per bellows) = 2.242 rounded up to 3. A total of three rod bellows will be required.
- Step 2** B dimension (additional piston rod extension required) with three rod bellows = 50 mm (first rod bellows) + 32 mm + 32 mm (two remaining rod bellows): 50 + 32 + 32 = 114. B dimension = 114 mm.

## 8000/L2, P/8000/L2 and 8000/L4, P/8000/L4 – Cylinder with Passive Locking Unit



**Separate Locking Cartridge for Locking Unit**

Cylinder Ø	Model	*Locking Forces
32	QA/8032/63	135 (600)
40	QA/8040/63	225 (1000)
50	QA/8050/63	337 (1500)
63	QA/8063/63	495 (2200)
80	QA/8100/63	1124 (5000)
100	QA/8100/63	1124 (5000)
125	QA/8125/63	1574 (7000)

Cylinder Ø	AB	ØAC	AD	AE	AF	AG	AH	□AJ	AK	AL	AM	AN
32	1.26 (32)	0.39 (10)	0.47 (12)	0.31 (8)	1.57 (40)	0.17 (4.2)	1.89 (48)	0.89 (22.5)	M 5	0.63 (16)	2.78 (70.5)	0.31 (8)
40	1.40 (35.5)	0.39 (10)	0.47 (12)	0.39 (10)	1.81 (46)	0.18 (4.5)	2.17 (55)	1.08 (27.5)	M 5	0.83 (21)	2.93 (74.5)	0.39 (10)
50	1.93 (49)	0.59 (15)	0.63 (16)	0.59 (15)	2.13 (54)	0.43 (11.5)	2.76 (70)	1.28 (32.5)	M 6	0.94 (24)	3.60 (91.5)	0.47 (12)
63	1.93 (49)	0.59 (15)	0.59 (15)	0.59 (15)	2.17 (55)	0.30 (7.5)	2.76 (70)	1.61 (41)	M 8	1.26 (32)	4.27 (108.5)	0.47 (12)
80	2.44 (62)	0.75 (19)	0.63 (16)	0.63 (16)	2.76 (70)	0.39 (10)	3.54 (90)	2.15 (54.5)	M 8	1.73 (44)	5.57 (141.5)	0.63 (16)
100	2.56 (65)	0.75 (19)	0.71 (18)	0.63 (16)	2.76 (70)	0.39 (10)	3.62 (92)	2.15 (54.5)	M 8	2.36 (60)	5.57 (141.5)	0.63 (16)
125	3.35 (85)	0.75 (19)	1.06 (27)	0.98 (25)	3.74 (95)	0.43 (11)	4.80 (122)	2.56 (65)	M 10	2.95 (75)	5.98 (152)	0.79 (20)

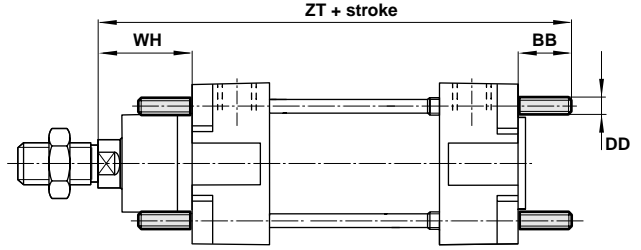
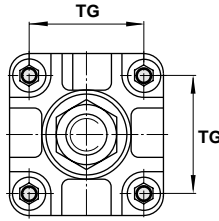
Cylinder Ø	AO	ØB e11	E	E1	EE	L8	□R	RT	SW	VD	WH	Forces*
32	0.16 (4)	1.18 (30)	1.89 (48)	1.97 (50)	M 5	3.70 (94)	1.28 (32.5)	M 6	0.31 (8)	0.39 (10)	0.63 (16)	135 (600)
40	0.16 (4)	1.38 (35)	2.20 (56)	2.28 (58)	M 5	4.13 (105)	1.50 (38)	M 6	0.31 (8)	0.39 (10)	0.71 (18)	225 (1000)
50	0.16 (4)	1.57 (40)	2.68 (68)	2.76 (70)	G 1/8	4.17 (106)	1.83 (46.5)	M 8	0.51 (13)	0.47 (12)	0.87 (22)	337 (1500)
63	0.16 (4)	1.77 (45)	3.23 (82)	3.35 (85)	G 1/8	4.76 (121)	2.22 (56.5)	M 8	0.51 (13)	0.47 (12)	0.79 (20)	495 (2200)
80	0.16 (4)	1.77 (45)	3.94 (100)	4.13 (105)	G 1/8	5.04 (128)	2.83 (72)	M 10	0.67 (17)	0.79 (20)	1.30 (33)	1124 (5000)
100	0.16 (4)	2.17 (55)	4.72 (120)	5.12 (130)	G 1/8	5.43 (138)	3.50 (89)	M 10	0.67 (17)	0.91 (23)	1.50 (38)	1124 (5000)
125	0.16 (4)	2.36 (60)	5.51 (140)	5.91 (150)	G 1/8	6.30 (160)	4.33 (110)	M 12	0.67 (17)	1.26 (32)	2.56 (65)	1574 (7000)

\*All Forces in Inch Lbs. (Newtons)



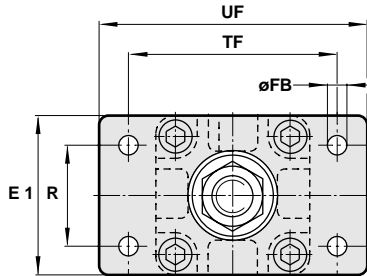
**8000/35 – Front or Rear Stud Mounting Style A**  
(Corresponds to DIN ISO 6431, Style MX1)

Cylinder Ø	8000, P/8000
32	QM/8032/35
40	QM/8032/35
50	QM/8050/35
63	QM/8050/35
80	QM/8080/35
100	QM/8080/35
125	QM/8125/35
160	QM/8160/35
200	QM/8160/35
250	QM/8250/35
320	QM/8320/35

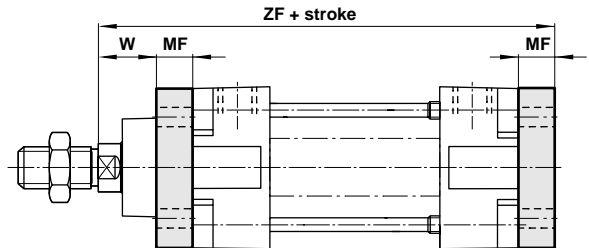


**8000/22 – Front Flange Mounting Style G**  
(Corresponds to DIN ISO 6431 and VDMA 24562 Part 2, Style MF1)

Cylinder Ø	8000, P/8000	PV/8000
32	QA/8032/22	PVQA/8032/22
40	QA/8040/22	PVQA/8040/22
50	QA/8050/22	PVQA/8050/22
63	QA/8063/22	PVQA/8063/22
80	QA/8080/22	PVQA/8080/22
100	QA/8100/22	PVQA/8100/22
125	QM/8125/22	
160	QM/8160/22	
200	QM/8200/22	
250	QM/8250/22	
320	QM/8320/22	

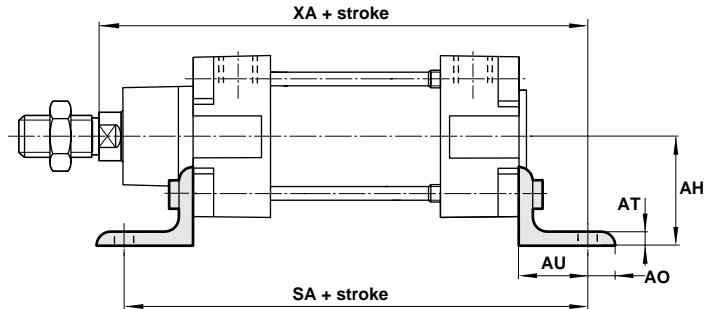
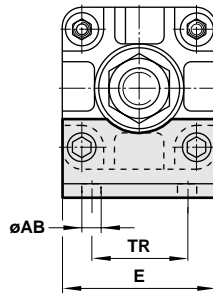


**8000/22 – Rear Flange Mounting Style B**  
(Corresponds to DIN ISO 6431 and VDMA 24562 Part 2, Style MF2)



**8000/21 – Foot Mounting Style C**  
(Corresponds to DIN ISO 6431 and VDMA 24562 Part 2, Style MS1)

Cylinder Ø	8000, P/8000
32	QA/8032/21
40	QA/8040/21
50	QA/8050/21
63	QA/8063/21
80	QA/8080/21
100	QA/8100/21
125	QM/8125/21
160	QM/8160/21
200	QM/8200/21
250	QM/8250/21
320	QM/8320/21



Cylinder Ø	ØAB	AH	AO	AT	AU	BB	DD	E	E1	ØFB	MF	R	SA
32	0.28 (7)	1.26 (32)	0.31 (8)	0.16 (4)	0.94 (24)	0.67 (17)	M 6	1.89 (48)	1.97 (50)	0.28 (7)	0.39 (10)	1.26 (32)	5.59 (142)
40	0.35 (9)	1.42 (36)	0.35 (9)	0.16 (4)	1.10 (28)	0.67 (17)	M 6	2.09 (53)	2.17 (55)	0.35 (9)	0.39 (10)	1.42 (36)	6.34 (161)
50	0.35 (9)	1.77 (45)	0.39 (10)	0.20 (5)	1.26 (32)	0.91 (23)	M 8	2.52 (64)	2.56 (65)	0.35 (9)	0.47 (12)	1.77 (45)	6.69 (170)
63	0.35 (9)	1.97 (50)	0.47 (12)	0.20 (5)	1.26 (32)	0.91 (23)	M 8	2.91 (74)	2.95 (75)	0.35 (9)	0.47 (12)	1.97 (50)	7.28 (185)
80	0.47 (12)	2.48 (63)	0.75 (19)	0.20 (5)	1.61 (41)	1.10 (28)	M 10	3.86 (98)	3.94 (100)	0.47 (12)	0.63 (16)	2.48 (63)	8.27 (210)
100	0.55 (14)	2.80 (71)	0.75 (19)	0.20 (5)	1.61 (41)	1.10 (28)	M 10	4.53 (115)	4.72 (120)	0.55 (14)	0.63 (16)	2.95 (75)	8.66 (220)
125	0.63 (16)	3.54 (90)	0.79 (20)	0.35 (9)	1.77 (45)	1.34 (34)	M 12	5.51 (140)	5.51 (140)	0.63 (16)	0.79 (20)	3.54 (90)	9.84 (250)
160	0.71 (18)	4.53 (115)	0.79 (20)	0.31 (8)	2.36 (60)	1.65 (42)	M 16	7.09 (180)	7.09 (180)	0.71 (18)	0.79 (20)	4.53 (115)	11.81 (300)
200	0.87 (22)	5.31 (135)	1.18 (30)	0.35 (9)	2.76 (70)	1.65 (42)	M 16	8.66 (220)	8.66 (220)	0.87 (22)	0.98 (25)	5.31 (135)	12.60 (320)
250	1.02 (26)	6.50 (165)	1.38 (35)	0.39 (10)	2.95 (75)	1.97 (50)	M 20	11.02 (280)	11.02 (280)	1.02 (26)	0.98 (25)	6.50 (165)	13.78 (350)
320	1.30 (33)	7.87 (200)	1.77 (45)	0.63 (16)	3.35 (85)	2.36 (60)	M 24	13.78 (350)	13.78 (350)	1.30 (33)	1.18 (30)	7.87 (200)	15.35 (390)

Cylinder Ø	TF	TG	TR	UF	W	WH	XA	ZF	ZT	Style A*	Style B, G*	Style C*
32	2.52 (64)	1.28 (32.5)	1.26 (32)	3.15 (80)	0.63 (16)	1.02 (26)	5.67 (144)	5.12 (130)	5.39 (137)	0.04 (0.02)	0.55 (0.25)	0.33 (0.15)
40	2.83 (72)	1.50 (38)	1.42 (36)	3.54 (90)	0.79 (20)	1.18 (30)	6.42 (163)	5.71 (145)	5.98 (152)	0.04 (0.02)	0.77 (0.35)	0.40 (0.18)
50	3.54 (90)	1.83 (46.5)	1.77 (45)	4.33 (110)	0.98 (25)	1.46 (37)	6.89 (175)	6.10 (155)	6.54 (166)	0.11 (0.05)	1.54 (0.70)	0.66 (0.30)
63	3.94 (100)	2.22 (56.5)	1.97 (50)	4.92 (125)	0.98 (25)	1.46 (37)	7.48 (190)	6.69 (170)	7.13 (181)	0.11 (0.05)	1.76 (0.80)	0.86 (0.39)
80	4.96 (126)	2.83 (72)	2.48 (63)	6.06 (154)	1.18 (30)	1.81 (46)	8.46 (215)	7.48 (190)	7.95 (202)	0.18 (0.08)	2.98 (1.35)	1.76 (0.80)
100	5.91 (150)	3.50 (89)	2.95 (75)	7.32 (186)	1.38 (35)	2.01 (51)	9.06 (230)	8.07 (205)	8.54 (217)	0.18 (0.08)	4.85 (2.20)	2.09 (0.95)
125	7.09 (180)	4.33 (110)	3.54 (90)	8.82 (224)	1.77 (45)	2.56 (65)	10.63 (270)	9.65 (245)	10.20 (259)	0.31 (0.14)	3.75 (1.70)	5.29 (2.40)
160	9.06 (230)	5.51 (140)	4.53 (115)	11.02 (280)	2.36 (60)	3.15 (80)	12.60 (320)	11.02 (280)	11.89 (302)	0.68 (0.31)	6.84 (3.10)	7.72 (3.50)
200	10.63 (270)	6.89 (175)	5.31 (135)	12.60 (320)	2.76 (70)	3.74 (95)	13.58 (345)	11.81 (300)	12.48 (317)	0.68 (0.31)	10.14 (4.60)	11.58 (5.25)
250	12.99 (330)	8.66 (220)	6.50 (165)	15.55 (395)	3.15 (80)	4.13 (105)	14.96 (380)	12.99 (330)	13.98 (355)	2.03 (0.92)	16.32 (7.40)	20.95 (9.50)
320	15.75 (400)	10.63 (270)	7.87 (200)	18.70 (475)	3.54 (90)	4.72 (120)	16.73 (425)	14.57 (370)	15.75 (400)	3.22 (1.46)	29.99 (13.6)	48.51 (22.0)

\*All Weights in Pounds (Kilograms)

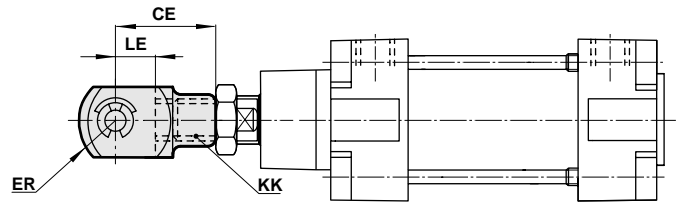
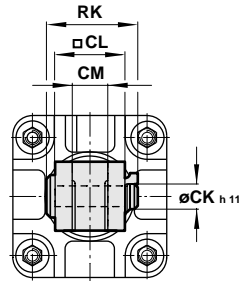


# 8000, 8000/M, P/8000, P/8000/M and PV/8000/M Pneumatic Cylinder Mounts

All Dimensions in Inches (mm)

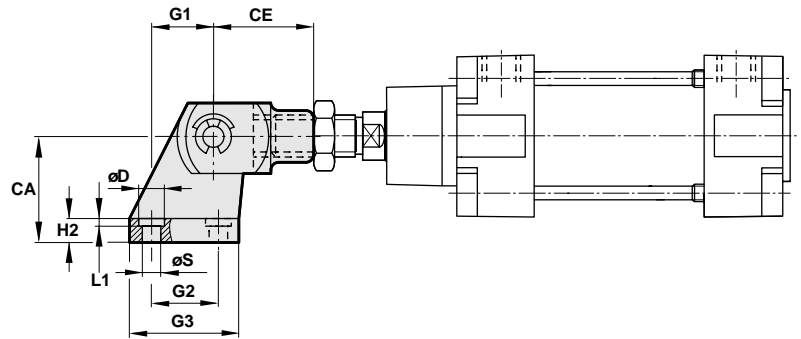
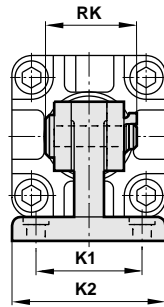
## 8000/25 – Piston Rod Clevis Mounting Style F (Corresponds to DIN ISO 8140)

Cylinder Ø	8000, P/8000	PV/8000
32	QM/8025/25	PVQM/8032/25
40	QM/8040/25	PVQM/8040/25
50	QM/8050/25	PVQM/8050/25
63	QM/8050/25	PVQM/8050/25
80	QM/8080/25	PVQM/8080/25
100	QM/8080/25	PVQM/8080/25
125	QM/8125/25	
160	QM/8160/25	
200	QM/8160/25	
250	QM/8250/25	
320	QM/8320/25	



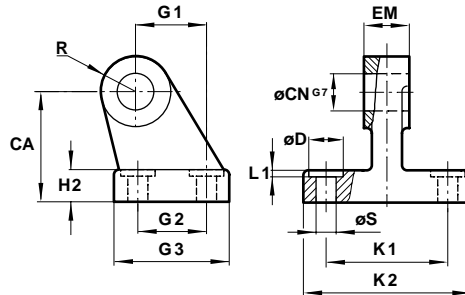
## 8000/26 – Front Hinge Mounting Style M

Cylinder Ø	8000, P/8000
32	QM/8032/26
40	QM/8040/26
50	QM/8050/26
63	QM/8063/26
80	QM/8080/26
100	QM/8100/26
125	QM/8125/26
160	QM/8160/26
200	QM/8200/26



## M/P199 . . – Hinge Bracket Style SS (For Piston Rod Clevis Mounting Style F)

Cylinder Ø	8000, P/8000
32	M/P19931
40	M/P19932
50	M/P19933
63	M/P19934
80	M/P19935
100	M/P19936
125	M/P19937
160	M/P19938
200	M/P19939



Cylinder Ø	CA	CE	øCK h11	CL	CM	øCN G7	øD	EM	ER	G1	G2	G3
32	1.26 (32)	1.57 (40)	0.39 (10)	0.79 (20)	0.39 (10)	0.39 (10)	0.43 (11)	0.39 (10)	0.63 (16)	0.83 (21)	0.71 (18)	1.22 (31)
40	1.42 (36)	1.89 (48)	0.47 (12)	0.94 (24)	0.47 (12)	0.47 (12)	0.43 (11)	0.47 (12)	0.75 (19)	0.94 (24)	0.87 (22)	1.38 (35)
50	1.77 (45)	2.52 (64)	0.63 (16)	1.26 (32)	0.63 (16)	0.63 (16)	0.59 (15)	0.63 (16)	0.98 (25)	1.30 (33)	1.18 (30)	1.77 (45)
63	1.97 (50)	2.52 (64)	0.63 (16)	1.26 (32)	0.63 (16)	0.63 (16)	0.59 (15)	0.63 (16)	0.98 (25)	1.46 (37)	1.38 (35)	1.97 (50)
80	2.48 (63)	3.15 (80)	0.79 (20)	1.57 (40)	0.79 (20)	0.79 (20)	0.71 (18)	0.79 (20)	1.26 (32)	1.85 (47)	1.57 (40)	2.36 (60)
100	2.80 (71)	3.15 (80)	0.79 (20)	1.57 (40)	0.79 (20)	0.79 (20)	0.71 (18)	0.79 (20)	1.26 (32)	2.17 (55)	1.97 (50)	2.76 (70)
125	3.54 (90)	4.33 (110)	1.18 (30)	2.17 (55)	1.18 (30)	1.18 (30)	0.79 (20)	1.18 (30)	1.77 (45)	2.76 (70)	2.36 (60)	3.54 (90)
160	4.53 (115)	5.67 (144)	1.38 (35)	2.76 (70)	1.38 (35)	1.38 (35)	0.79 (20)	1.38 (35)	2.24 (57)	3.82 (97)	3.46 (88)	4.96 (126)
200	5.31 (135)	5.67 (144)	1.38 (35)	2.76 (70)	1.38 (35)	1.38 (35)	0.94 (24)	1.38 (35)	2.24 (57)	4.13 (105)	3.54 (90)	5.12 (130)
250	—	6.61 (168)	1.57 (40)	3.35 (85)	1.57 (40)	—	—	—	2.68 (68)	—	—	—
320	—	7.56 (192)	1.97 (50)	3.78 (96)	1.97 (50)	—	—	—	3.35 (85)	—	—	—

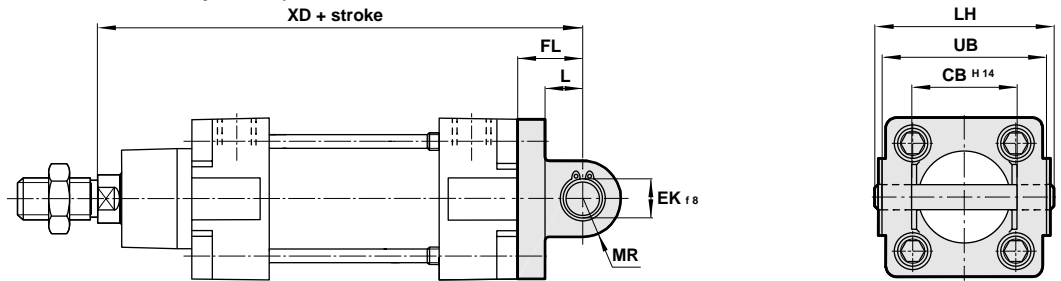
Cylinder Ø	H2	KK	K1	K2	L1	LE	R	RK	øS	Style F*	Style M*	Style SS*
32	0.31 (8)	M10x1.25	1.50 (38)	2.01 (51)	0.06 (1.6)	0.79 (20)	0.39 (10)	1.10 (28)	0.26 (6.6)	0.20 (0.09)	0.53 (0.24)	0.33 (0.15)
40	0.39 (10)	M12x1.25	1.61 (41)	2.13 (54)	0.06 (1.6)	0.94 (24)	0.43 (11)	1.26 (32)	0.26 (6.6)	0.29 (0.13)	0.73 (0.33)	0.44 (0.20)
50	0.47 (12)	M16x1.5	1.97 (50)	2.56 (65)	0.06 (1.6)	1.26 (32)	0.51 (13)	1.63 (41.5)	0.35 (9)	0.73 (0.33)	1.79 (0.81)	1.06 (0.48)
63	0.47 (12)	M16x1.5	2.05 (52)	2.64 (67)	0.06 (1.6)	1.26 (32)	0.59 (15)	1.63 (41.5)	0.35 (9)	0.73 (0.33)	1.83 (0.83)	1.10 (0.50)
80	0.55 (14)	M20x1.5	2.60 (66)	3.39 (86)	0.10 (2.5)	1.57 (40)	0.59 (15)	1.97 (50)	0.43 (11)	1.48 (0.67)	3.13 (1.42)	1.65 (0.75)
100	0.59 (15)	M20x1.5	2.99 (76)	3.78 (96)	0.10 (2.5)	1.57 (40)	0.75 (19)	1.97 (50)	0.43 (11)	1.48 (0.67)	4.12 (1.87)	2.65 (1.20)
125	0.79 (20)	M27x2	3.70 (94)	4.88 (124)	0.13 (3.2)	2.13 (54)	0.87 (22)	2.44 (62)	0.55 (14)	2.98 (1.35)	8.49 (3.85)	5.51 (2.50)
160	0.98 (25)	M36x2	4.65 (118)	6.14 (156)	0.16 (4)	2.83 (72)	1.22 (31)	3.74 (95)	0.55 (14)	6.62 (3.00)	19.85 (9.00)	13.23 (6.00)
200	1.18 (30)	M36x2	4.80 (122)	6.38 (162)	0.16 (4)	2.83 (72)	1.22 (31)	3.74 (95)	0.71 (18)	6.62 (3.00)	23.37 (10.60)	16.76 (7.60)
250	—	M42x2	—	—	—	3.31 (84)	—	4.17 (106)	—	14.11 (6.40)	—	—
320	—	M48x2	—	—	—	3.78 (96)	—	4.76 (121)	—	19.18 (8.70)	—	—

\*All Weights in Pounds (Kilograms)



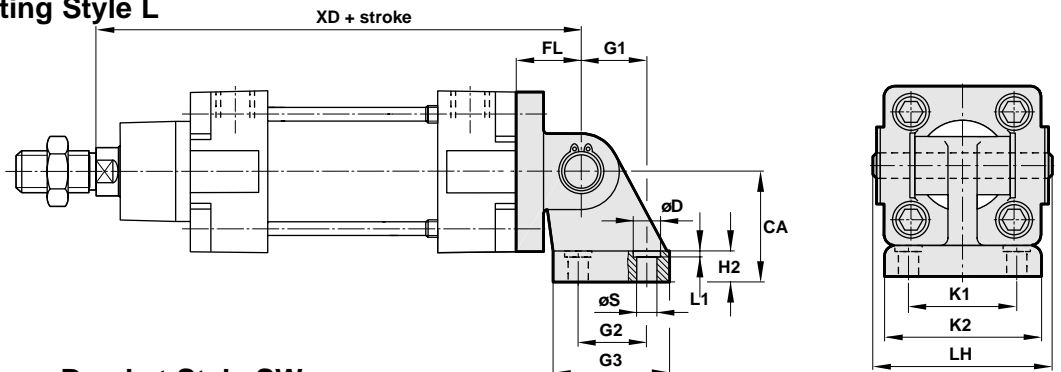
**8000/23 – Rear Clevis Mounting Style D**  
(Corresponds to DIN ISO 6431 and VDMA 24562 Part 2, Style MP2)

Cylinder Ø	8000, P/8000	PV/8000
32	QA/8032/23	PVQA/8032/23
40	QA/8040/23	PVQA/8040/23
50	QA/8050/23	PVQA/8050/23
63	QA/8063/23	PVQA/8063/23
80	QA/8080/23	PVQA/8080/23
100	QA/8100/23	PVQA/8100/23
125	QM/8125/23	
160	QM/8160/23	
200	QM/8200/23	
250	QM/8250/23	
320	QM/8320/23	



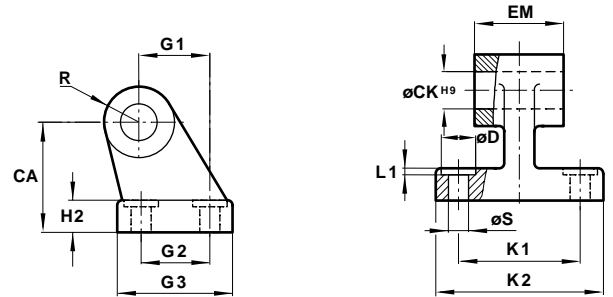
**8000/24 – Rear Hinge Mounting Style L**  
(Corresponds to VDMA 24562 Part 2)

Cylinder Ø	8000, P/8000	PV/8000
32	QA/8032/24	PVQA/8032/24
40	QA/8040/24	PVQA/8040/24
50	QA/8050/24	PVQA/8050/24
63	QA/8063/24	PVQA/8063/24
80	QA/8080/24	PVQA/8080/24
100	QA/8100/24	PVQA/8100/24
125	QM/8125/24	
160	QM/8160/24	
200	QM/8200/24	
250	QM/8250/24	
320	QM/8320/24	



**M/P19 . . . or M/P40 . . . – Hinge Bracket Style SW**  
(For Rear Clevis Mounting Style D)  
(Corresponds to VDMA 24562, Part 2)

Cylinder Ø	8000, P/8000	PV/8000
32	M/P19493	M/P40459
40	M/P19494	M/P40460
50	M/P19495	M/P40461
63	M/P19496	M/P40462
80	M/P19497	M/P40463
100	M/P19498	M/P40464
125	M/P19499	
160	M/P19679	
160	M/P19683	
160	M/P19446	
200	M/P19447	



Cylinder Ø	CA	CB H14	øCK H9	øD	ΔEK 18	EM	FL	G1	G2	G3	H2	K1
32	1.26 (32)	1.02 (26)	0.39 (10)	0.43 (11)	0.39 (10)	1.02 (26)	0.87 (22)	0.83 (21)	0.71 (18)	1.22 (31)	0.31 (8)	1.50 (38)
40	1.42 (36)	1.10 (28)	0.47 (12)	0.43 (11)	0.47 (12)	1.10 (28)	0.98 (25)	0.94 (24)	0.87 (22)	1.38 (35)	0.39 (10)	1.61 (41)
50	1.77 (45)	1.26 (32)	0.47 (12)	0.59 (15)	0.47 (12)	1.26 (32)	1.06 (27)	1.30 (33)	1.18 (30)	1.77 (45)	0.47 (12)	1.97 (50)
63	1.97 (50)	1.57 (40)	0.63 (16)	0.59 (15)	0.63 (16)	1.57 (40)	1.26 (32)	1.46 (37)	1.38 (35)	1.97 (50)	0.47 (12)	2.05 (52)
80	2.48 (63)	1.97 (50)	0.63 (16)	0.71 (18)	0.63 (16)	1.97 (50)	1.42 (36)	1.85 (47)	1.57 (40)	2.36 (60)	0.55 (14)	2.60 (66)
100	2.80 (71)	2.36 (60)	0.79 (20)	0.71 (18)	0.79 (20)	2.36 (60)	1.61 (41)	2.17 (55)	1.97 (50)	2.76 (70)	0.59 (15)	3.00 (76)
125	3.54 (90)	2.76 (70)	0.98 (25)	0.79 (20)	0.98 (25)	2.76 (70)	1.97 (50)	2.76 (70)	2.36 (60)	3.54 (90)	0.79 (20)	3.70 (94)
160	4.53 (115)	3.54 (90)	1.18 (30)	0.79 (20)	1.18 (30)	3.54 (90)	2.17 (55)	3.82 (97)	3.46 (88)	4.96 (126)	0.98 (25)	4.65 (118)
200	5.31 (135)	3.54 (90)	1.18 (30)	0.94 (24)	1.18 (30)	3.54 (90)	2.36 (60)	4.13 (105)	3.54 (90)	5.12 (130)	1.18 (30)	4.80 (122)
250	6.50 (165)	4.33 (110)	1.57 (40)	1.30 (33)	1.57 (40)	4.33 (110)	2.76 (70)	5.04 (128)	4.33 (110)	6.30 (160)	1.38 (35)	5.91 (150)
320	7.87 (200)	4.72 (120)	1.77 (45)	1.57 (40)	1.77 (45)	4.72 (120)	3.15 (80)	5.91 (150)	4.80 (122)	7.32 (186)	1.57 (40)	6.69 (170)

Cylinder Ø	K2	L	L1	LH	MR	R	øS	UB	XD	Style D*	Style L*	Style SW*
32	2.01 (51)	0.51 (13)	0.06 (1.6)	2.05 (52)	0.35 (9)	0.39 (10)	0.26 (6.6)	1.77 (45)	5.59 (142)	0.24 (0.11)	0.35 (0.16)	0.11 (0.05)
40	2.13 (54)	0.63 (16)	0.06 (1.6)	2.36 (60)	0.47 (12)	0.43 (11)	0.26 (6.6)	2.05 (52)	6.30 (160)	0.35 (0.16)	0.51 (0.23)	0.15 (0.07)
50	2.56 (65)	0.67 (17)	0.06 (1.6)	2.68 (68)	0.47 (12)	0.51 (13)	0.35 (9)	2.36 (60)	6.69 (170)	0.49 (0.22)	0.79 (0.36)	0.31 (0.14)
63	2.64 (67)	0.87 (22)	0.06 (1.6)	3.11 (79)	0.59 (15)	0.59 (15)	0.35 (9)	2.76 (70)	7.48 (190)	0.75 (0.34)	1.15 (0.52)	0.40 (0.18)
80	3.39 (86)	0.87 (22)	0.10 (2.5)	3.90 (99)	0.59 (15)	0.59 (15)	0.43 (11)	3.54 (90)	8.27 (210)	1.19 (0.54)	1.81 (0.82)	0.62 (0.28)
100	3.78 (96)	1.06 (27)	0.10 (2.5)	4.69 (119)	0.79 (20)	0.75 (19)	0.43 (11)	4.33 (110)	9.06 (230)	1.98 (0.90)	2.91 (1.32)	0.93 (0.42)
125	4.88 (124)	1.22 (31)	0.13 (3.2)	5.47 (139)	0.98 (25)	0.87 (22)	0.55 (14)	5.12 (130)	10.83 (275)	5.95 (2.70)	11.91 (5.40)	5.95 (2.70)
160	6.14 (156)	1.40 (35.5)	0.16 (4)	7.13 (181)	1.18 (30)	1.22 (31)	0.55 (14)	6.69 (170)	12.40 (315)	9.48 (4.30)	23.37 (10.6)	13.89 (6.30)
200	6.38 (162)	1.41 (36)	0.16 (4)	7.13 (181)	1.18 (30)	1.22 (31)	0.71 (18)	6.69 (170)	13.19 (335)	13.45 (6.10)	31.09 (14.1)	17.64 (8.00)
250	7.87 (200)	1.77 (45)	0.08 (2)	8.60 (218)	1.57 (40)	1.57 (40)	0.87 (22)	7.87 (200)	14.76 (375)	41.90 (19.0)	71.44 (32.4)	29.55 (13.4)
320	9.21 (234)	1.97 (50)	0.08 (2)	9.37 (238)	1.77 (45)	1.77 (45)	1.02 (26)	8.66 (220)	16.54 (420)	67.25 (30.5)	115.76 (52.5)	48.51 (22.0)

\*All Weights in Pounds (Kilograms)



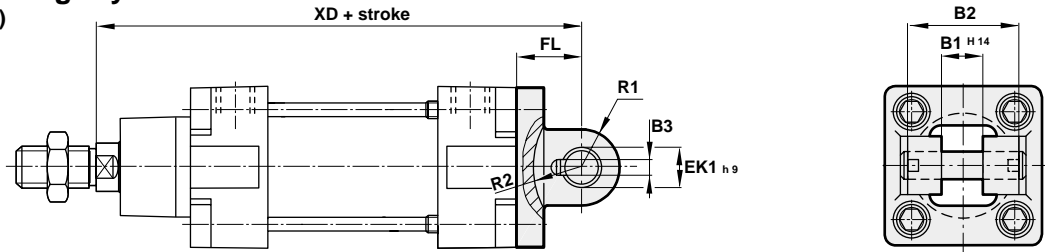
# 8000, 8000/M, P/8000 and P/8000/M Pneumatic Cylinder Mounts

All Dimensions in Inches (mm)

## 8000/42 – Rear Clevis Mounting Style D2

(Corresponds to VDMA 24562 Part 2)

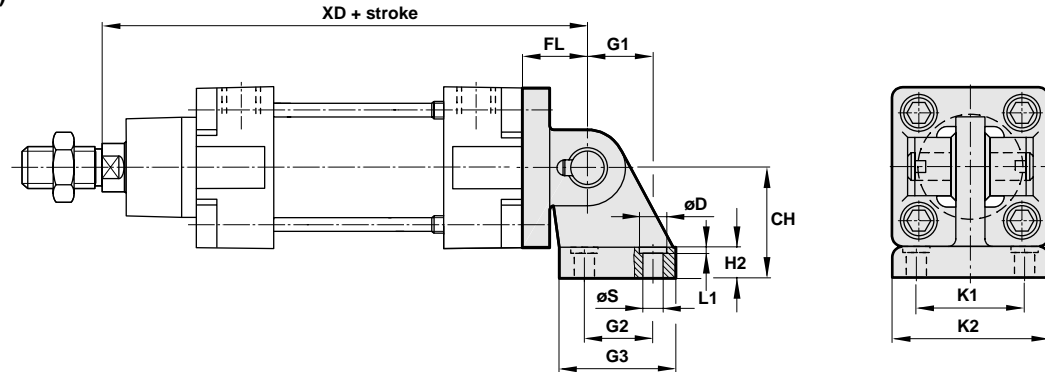
Cylinder Ø	8000, P/8000
32	QA/8032/42
40	QA/8040/42
50	QA/8050/42
63	QA/8063/42
80	QA/8080/42
100	QA/8100/42
125	QA/8125/42
160	QA/8160/42
200	QA/8200/42



## 8000/43 – Universal Rear Hinge Mounting Style UL

(Corresponds to VDMA 24562 Part 2)

Cylinder Ø	8000, P/8000
32	QA/8032/43
40	QA/8040/43
50	QA/8050/43
63	QA/8063/43
80	QA/8080/43
100	QA/8100/43
125	QA/8125/43
160	QA/8160/43
200	QA/8200/43

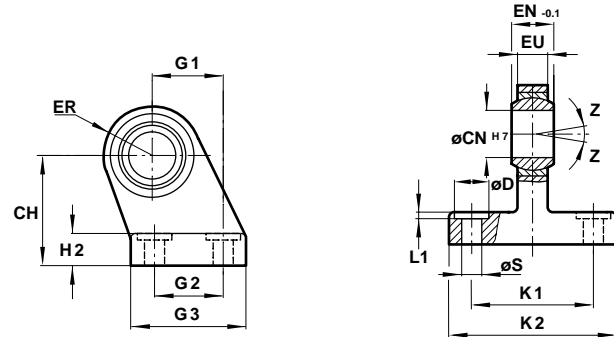


## M/P . . . . – Hinge Bracket Style US

(For Rear Clevis Mounting Style D2)

(Corresponds to VDMA 24562 Part 2)

Cylinder Ø	8000, P/8000
32	M/P40310
40	M/P40311
50	M/P40312
63	M/P40313
80	M/P40314
100	M/P40315
125	M/P71355
160	M/P71356
200	M/P71357



Cylinder Ø	B1 H14	B2	B3	CH	ØCN H7	ØD	ØEKH9	EN -0.1	ER	EU	FL	G 1	G 2
32	0.55 (14)	1.34 (34)	0.13 (3.3)	1.26 (32)	0.39 (10)	0.43 (11)	0.39 (10)	0.55 (14)	0.63 (16)	0.41 (10.5)	0.87 (22)	0.83 (21)	0.71 (18)
40	0.63 (16)	1.57 (40)	0.17 (4.3)	1.42 (36)	0.47 (12)	0.43 (11)	0.47 (12)	0.63 (16)	0.75 (19)	0.47 (12)	0.98 (25)	0.94 (24)	0.87 (22)
50	0.83 (21)	1.77 (45)	0.17 (4.3)	1.77 (45)	0.63 (16)	0.59 (15)	0.63 (16)	0.83 (21)	0.83 (21)	0.59 (15)	1.06 (27)	1.30 (33)	1.18 (30)
63	0.83 (21)	2.01 (51)	0.17 (4.3)	1.97 (50)	0.63 (16)	0.59 (15)	0.63 (16)	0.83 (21)	0.94 (24)	0.59 (15)	1.26 (32)	1.46 (37)	1.38 (35)
80	0.98 (25)	2.56 (65)	0.17 (4.3)	2.48 (63)	0.79 (20)	0.71 (18)	0.79 (20)	0.98 (25)	1.10 (28)	0.71 (18)	1.42 (36)	1.85 (47)	1.57 (40)
100	0.98 (25)	2.95 (75)	0.17 (4.3)	2.80 (71)	0.79 (20)	0.71 (18)	0.79 (20)	0.98 (25)	1.18 (30)	0.71 (18)	1.61 (41)	2.17 (55)	1.97 (50)
125	1.46 (37)	3.82 (97)	0.25 (6.3)	3.54 (90)	1.18 (30)	0.79 (20)	1.18 (30)	1.46 (37)	1.57 (40)	0.98 (25)	1.97 (50)	2.76 (70)	2.36 (60)
160	1.69 (43)	4.80 (122)	0.25 (6.3)	4.53 (115)	1.38 (35)	0.79 (20)	1.38 (35)	1.69 (43)	1.73 (44)	1.10 (28)	2.17 (55)	3.82 (97)	3.46 (88)
200	1.69 (43)	4.80 (122)	0.25 (6.3)	5.31 (135)	1.38 (35)	0.94 (24)	1.38 (35)	1.69 (43)	1.89 (48)	1.10 (28)	2.36 (60)	4.13 (105)	3.54 (90)

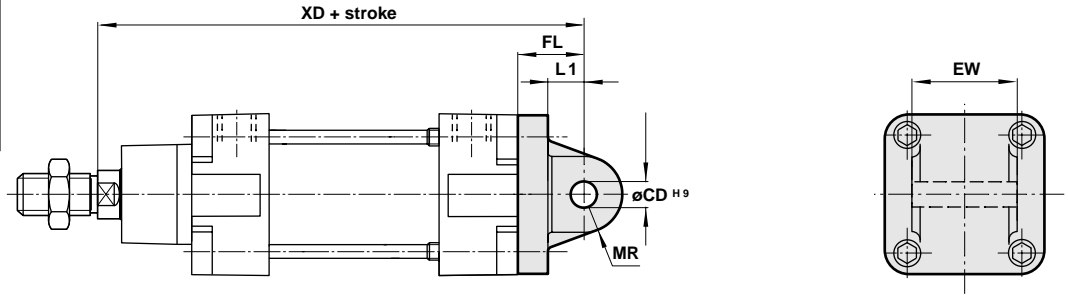
Cylinder Ø	G 3	H 2	K1	K 2	L1	R1	R2	ØS	XD	Style D2*	Style UL*	Style US*
32	1.22 (31)	0.31 (8)	1.50 (38)	2.01 (51)	0.06 (1.6)	0.43 (11)	0.67 (17)	0.26 (6.6)	5.59 (142)	0.44 (0.20)	0.86 (0.39)	0.42 (0.19)
40	1.38 (35)	0.39 (10)	1.61 (41)	2.13 (54)	0.06 (1.6)	0.47 (12)	0.79 (20)	0.26 (6.6)	6.30 (160)	0.51 (0.23)	1.04 (0.47)	0.53 (0.24)
50	1.77 (45)	0.47 (12)	1.97 (50)	2.56 (65)	0.06 (1.6)	0.57 (14.5)	0.87 (22)	0.35 (9)	6.69 (170)	0.79 (0.36)	1.80 (0.82)	1.01 (0.46)
63	1.97 (50)	0.47 (12)	2.05 (52)	2.64 (67)	0.06 (1.6)	0.71 (18)	0.98 (25)	0.35 (9)	7.48 (190)	1.21 (0.55)	2.51 (1.14)	1.30 (0.59)
80	2.36 (60)	0.55 (14)	2.60 (66)	3.39 (86)	0.10 (2.5)	0.87 (22)	1.18 (30)	0.43 (11)	8.27 (210)	1.98 (0.90)	4.26 (1.93)	2.27 (1.03)
100	2.76 (70)	0.59 (15)	2.99 (76)	3.78 (96)	0.10 (2.5)	0.87 (22)	1.26 (32)	0.43 (11)	9.06 (230)	3.20 (1.45)	6.28 (2.85)	3.09 (1.40)
125	3.54 (90)	0.79 (20)	3.70 (94)	4.88 (124)	0.13 (3.2)	1.18 (30)	1.65 (42)	0.55 (14)	10.83 (275)	5.95 (2.70)	12.79 (5.80)	6.84 (3.10)
160	4.96 (126)	0.98 (25)	4.65 (118)	6.14 (156)	0.16 (4)	1.42 (36)	1.81 (46)	0.55 (14)	12.40 (315)	9.48 (4.30)	23.59 (10.70)	14.11 (6.40)
200	5.12 (130)	1.18 (30)	4.80 (122)	6.38 (162)	0.16 (4)	1.50 (38)	1.93 (49)	0.71 (18)	13.19 (335)	13.45 (6.10)	33.52 (15.20)	20.07 (9.10)

\*All Weights in Pounds (Kilograms)



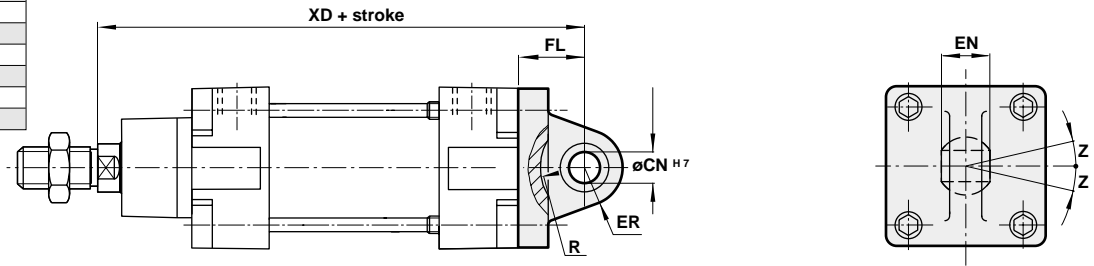
**8000/27 – Rear Eye Mounting Style R**  
(Corresponds to DIN ISO 6431 and VDMA 24562 Part 2, Style MP4)

Cylinder Ø	8000, P/8000	PV8000
32	QA/8032/27	PVQA/8032/27
40	QA/8040/27	PVQA/8040/27
50	QA/8050/27	PVQA/8050/27
63	QA/8063/27	PVQA/8063/27
80	QA/8080/27	PVQA/8080/27
100	QA/8100/27	PVQA/8100/27
125	QM/8125/27	
160	QM/8160/27	
200	QM/8200/27	



**8000/33 – Universal Rear Eye Mounting Style UR**  
(Corresponds to VDMA 24562 Part 2)

Cylinder Ø	8000, P/8000	PV/8000
32	QA/8032/33	PVQA/8032/33
40	QA/8040/33	PVQA/8040/33
50	QA/8050/33	PVQA/8050/33
63	QA/8063/33	PVQA/8063/33
80	QA/8080/33	PVQA/8080/33
100	QA/8100/33	PVQA/8100/33
125	QM/8125/33	
160	QM/8160/33	
200	QM/8200/33	



Cylinder Ø	ØCD H9	ØCN H7	EN	ER	EW	FL	L1	MR	R	XD	Z	Style R*	Style UR*
32	0.39 (10)	0.39 (10)	0.55 (14)	0.63 (16)	1.02 (25.8)	0.87 (22)	0.51 (13)	0.35 (9)	0.57 (14.5)	5.59 (142)	13°	0.20 (0.09)	0.37 (0.17)
40	0.47 (12)	0.47 (12)	0.63 (16)	0.75 (19)	1.09 (27.8)	0.98 (25)	0.63 (16)	0.47 (12)	0.71 (18)	6.30 (160)	13°	0.24 (0.11)	0.55 (0.25)
50	0.47 (12)	0.63 (16)	0.83 (21)	0.83 (21)	1.25 (31.7)	1.06 (27)	0.67 (17)	0.47 (12)	0.75 (19)	6.69 (170)	13°	0.37 (0.17)	0.88 (0.40)
63	0.63 (16)	0.63 (16)	0.83 (21)	0.94 (24)	1.56 (39.7)	1.26 (32)	0.87 (22)	0.59 (15)	0.94 (24)	7.48 (190)	15°	0.53 (0.24)	1.21 (0.55)
80	0.63 (16)	0.79 (20)	0.98 (25)	1.10 (28)	1.96 (49.7)	1.42 (36)	0.87 (22)	0.59 (15)	0.94 (24)	8.27 (210)	15°	0.82 (0.37)	1.98 (0.90)
100	0.79 (20)	0.79 (20)	0.98 (25)	1.18 (30)	2.35 (59.7)	1.61 (41)	1.06 (27)	0.79 (20)	1.14 (29)	9.06 (230)	15°	1.30 (0.59)	3.31 (1.50)
125	0.98 (25)	1.18 (30)	1.46 (37)	1.57 (40)	2.74 (69.7)	1.97 (50)	1.30 (33)	0.98 (25)	1.42 (36)	10.83 (275)	15°	7.06 (3.20)	5.95 (2.70)
160	1.18 (30)	1.38 (35)	1.69 (43)	1.73 (44)	3.53 (89.7)	2.17 (55)	1.40 (35.5)	1.18 (30)	1.61 (41)	12.40 (315)	16°	13.45 (6.10)	10.14 (4.60)
200	1.18 (30)	1.38 (35)	1.69 (43)	1.89 (48)	3.53 (89.7)	2.36 (60)	1.46 (37)	1.18 (30)	1.65 (42)	13.19 (335)	16°	14.99 (6.80)	16.10 (7.30)

\*All Weights in Pounds (Kilograms)





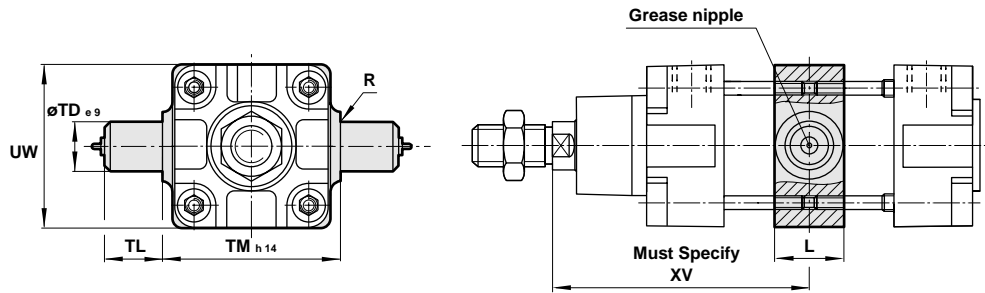
# 8000, 8000/M, P/8000 and P/8000/M Pneumatic Cylinder Mounts

All Dimensions in Inches (mm)

## 8000/28 – Central Trunnion Mounting Style H for 8000 (Fixed Location)

(Corresponds to DIN ISO 6431 and VDMA 24562 Part 2, Style MT4)

Cylinder Ø	8000
32	QA/8032/28
40	QA/8040/28
50	QA/8050/28
63	QA/8063/28
80	QA/8080/28
100	QA/8100/28
125	QM/8125/28
160	QM/8160/28
200	QM/8200/28
250	QM/8250/28
320	QM/8320/28

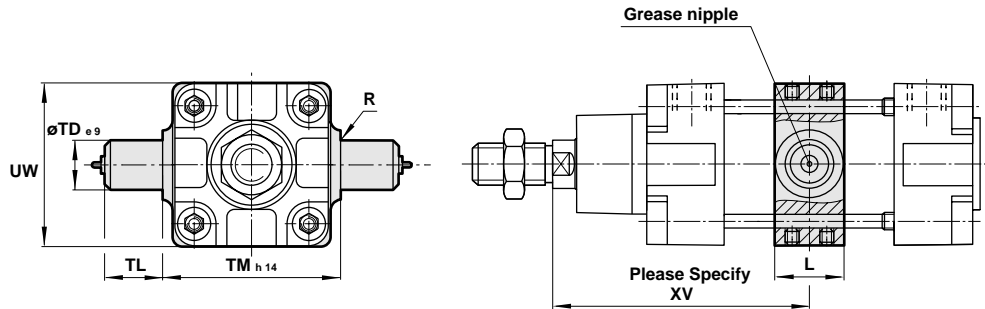


**NOTE: Style H** is non-adjustable and permanently fixed into position per the customer's required XV, therefore dimension XV must be specified. Grease nipple supplied as standard on cylinders ø125 mm to ø320 mm bore.

## 8000/40 – Adjustable Intermediate Trunnion Mounting Style UH for 8000

(Corresponds to DIN ISO 6431 and VDMA 24562 Part 2, Style MT4)

Cylinder Ø	8000
32	QA/8032/40
40	QA/8040/40
50	QA/8050/40
63	QA/8063/40
80	QA/8080/40
100	QA/8100/40
125	QA/8125/40
160	QA/8160/40
200	QA/8200/40

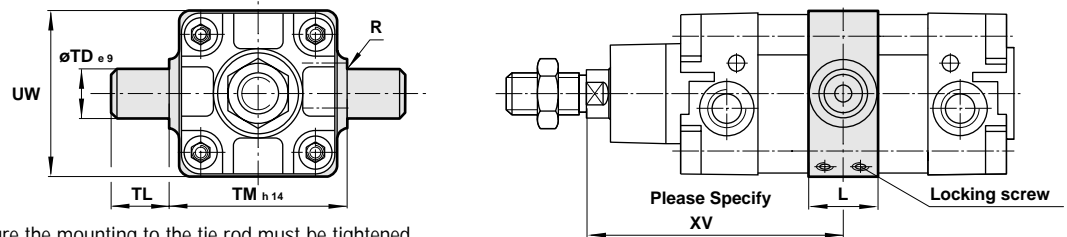


**NOTE: Style UH:** Locking screws which secure the mounting to the tie rod must be tightened to the torque figures shown in the table below. For maximum energy input, consult Technical Services. Grease nipple supplied as standard on cylinders ø125 mm to ø200 mm bore. Unless otherwise specified, units will be supplied with adjustable trunnion centered between end covers.

## PQA/8000/40 – Adjustable Intermediate Trunnion Mounting Style UH for P/8000

(Corresponds to DIN ISO 6431 and VDMA 24562 Part 2, Style MT4)

Cylinder Ø	P/8000
32	PQA/8032/40
40	PQA/8040/40
50	PQA/8050/40
63	PQA/8063/40
80	PQA/8080/40
100	PQA/8100/40
125	PQA/8125/40



**NOTE: Style UH:** Locking screws which secure the mounting to the tie rod must be tightened to the torque figures shown in the table below. For maximum energy input, consult Technical Services.

Cylinder Ø	L	R	ØTD e9	TL	TM h14	UW	XV min.	XV max.	Torque Nm (n lbs)	Style H*	Style UH*	Style UH (P)*
32	0.79 (20)	0.04 (1)	0.47 (12)	0.47 (12)	1.97 (50)	1.97 (50)	2.50 (63.5)	3.25 (82.5)	4.4 (6)	0.35 (0.16)	0.35 (0.16)	0.35 (0.16)
40	0.94 (24)	0.06 (1.6)	0.63 (16)	0.63 (16)	2.48 (63)	2.28 (58)	2.91 (74)	3.58 (91)	4.4 (6)	0.77 (0.35)	0.77 (0.35)	0.77 (0.35)
50	1.10 (28)	0.06 (1.6)	0.63 (16)	0.63 (16)	2.95 (75)	2.76 (70)	3.23 (82)	3.86 (98)	7.4 (10)	1.43 (0.65)	1.43 (0.65)	1.43 (0.65)
63	1.10 (28)	0.06 (1.6)	0.79 (20)	0.79 (20)	3.54 (90)	3.15 (80)	3.31 (84)	4.37 (111)	7.4 (10)	1.87 (0.85)	1.87 (0.85)	1.87 (0.85)
80	1.10 (28)	0.06 (1.6)	0.79 (20)	0.79 (20)	4.33 (110)	3.94 (100)	3.66 (93)	5.00 (127)	11.1 (15)	2.65 (1.20)	2.65 (1.20)	2.65 (1.20)
100	1.50 (38)	0.08 (2)	0.98 (25)	0.98 (25)	5.20 (132)	4.96 (126)	4.21 (107)	5.24 (133)	11.1 (15)	5.07 (2.30)	5.07 (2.30)	5.07 (2.30)
125	1.97 (50)	0.08 (2)	0.98 (25)	0.98 (25)	6.30 (160)	5.98 (152)	5.35 (136)	6.06 (154)	18.4 (25)	7.28 (3.30)	7.28 (3.30)	7.28 (3.30)
160	1.97 (50)	0.10 (2.5)	1.26 (32)	1.26 (32)	7.87 (200)	7.56 (192)	6.10 (155)	7.28 (185)	29.5 (40)	11.69 (5.30)	11.69 (5.30)	—
200	1.97 (50)	0.10 (2.5)	1.26 (32)	1.26 (32)	9.84 (250)	9.45 (240)	6.69 (170)	7.87 (200)	29.5 (40)	20.73 (9.40)	20.73 (9.40)	—
250	2.36 (60)	0.13 (3.2)	1.57 (40)	1.57 (40)	12.60 (320)	12.52 (318)	7.60 (193)	8.54 (217)	—	39.69 (18.00)	—	—
320	2.76 (70)	0.13 (3.2)	1.97 (50)	1.97 (50)	15.75 (400)	15.75 (400)	8.46 (215)	9.65 (245)	—	66.15 (30.0)	—	—

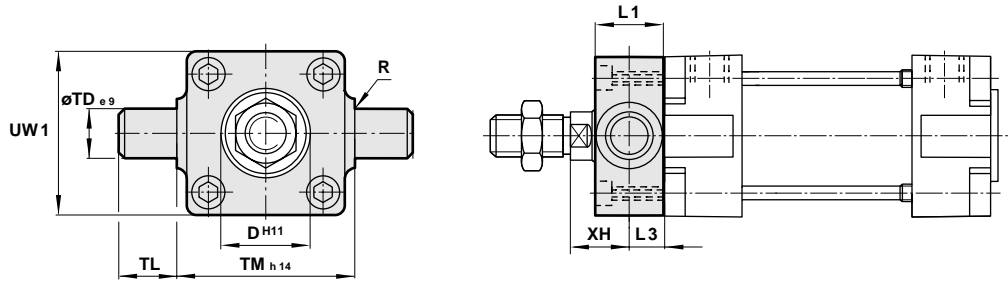
\*All Weights in Pounds (Kilograms)



**8000/34 – Head Detachable Trunnion Mounting Style FH**

(Corresponds to VDMA 24562 Part 2, Style MT 5/6)

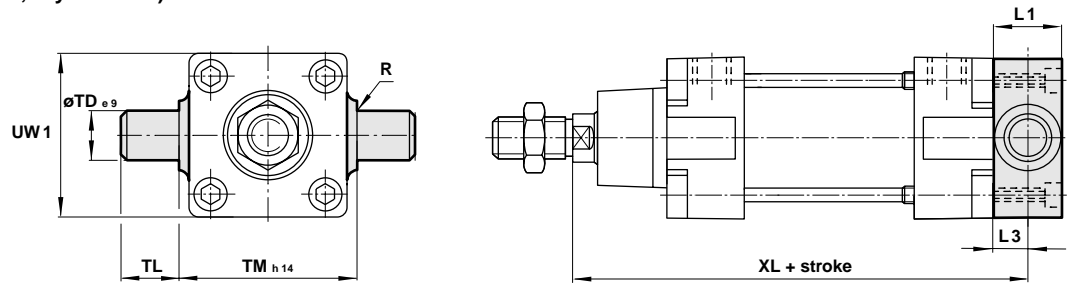
Cylinder Ø	8000, P/8000
32	QA/8032/34
40	QA/8040/34
50	QA/8050/34
63	QA/8063/34
80	QA/8080/34
100	QA/8100/34
125	QA/8125/34



**8000/34 – Cap Detachable Trunnion Mounting Style FH**

(Corresponds to VDMA 24562 Part 2, Style MT 5/6)

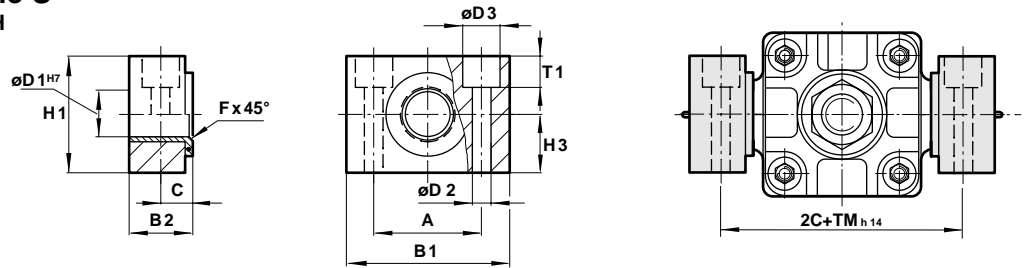
Cylinder Ø	8000, P/8000
32	QA/8032/34
40	QA/8040/34
50	QA/8050/34
63	QA/8063/34
80	QA/8080/34
100	QA/8100/34
125	QA/8125/34



**8000/41 – Swivel Bearing Style S**

For Trunnion Mountings Style H, FH, UH

Cylinder Ø	8000, P/8000
32	QA/8032/41
40	QA/8040/41
50	QA/8040/41
63	QA/8063/41
80	QA/8063/41
100	QA/8100/41
125	QA/8100/41
160	QA/8160/41
200	QA/8160/41



Kit contains 2 bearings

Cylinder Ø	A	B1	B2	C	ØD H11	ØD1 H7	ØD2	ØD3	F x 45°	H1	H3	L1
32	1.26 (32)	1.81 (46)	0.71 (18)	0.41 (10.5)	1.18 (30)	0.47 (12)	0.26 (6.6)	0.43 (11)	0.04 (1)	1.18 (30)	0.59 (15)	0.63 (16)
40	1.42 (36)	2.17 (55)	0.83 (21)	0.47 (12)	1.38 (35)	0.63 (16)	0.35 (9)	0.59 (15)	0.06 (1.6)	1.42 (36)	0.71 (18)	0.79 (20)
50	1.42 (36)	2.17 (55)	0.83 (21)	0.47 (12)	1.57 (40)	0.63 (16)	0.35 (9)	0.59 (15)	0.06 (1.6)	1.42 (36)	0.71 (18)	0.94 (24)
63	1.65 (42)	2.56 (65)	0.91 (23)	0.51 (13)	1.77 (45)	0.79 (20)	0.43 (11)	0.71 (18)	0.06 (1.6)	1.57 (40)	0.79 (20)	0.94 (24)
80	1.65 (42)	2.56 (65)	0.91 (23)	0.51 (13)	1.77 (45)	0.79 (20)	0.43 (11)	0.71 (18)	0.06 (1.6)	1.57 (40)	0.79 (20)	1.10 (28)
100	1.97 (50)	2.95 (75)	1.12 (28.5)	0.63 (16)	2.17 (55)	0.98 (25)	0.55 (14)	0.79 (20)	0.08 (2)	1.97 (50)	0.98 (25)	1.50 (38)
125	1.97 (50)	2.95 (75)	1.12 (28.5)	0.63 (16)	2.36 (60)	0.98 (25)	0.55 (14)	0.79 (20)	0.08 (2)	1.97 (50)	0.98 (25)	1.97 (50)
160	2.36 (60)	3.62 (92)	1.54 (39)	0.85 (21.5)	—	1.26 (32)	0.71 (18)	1.02 (26)	0.10 (2.5)	2.36 (60)	1.18 (30)	—
200	2.36 (60)	3.62 (92)	1.54 (39)	0.85 (21.5)	—	1.26 (32)	0.71 (18)	1.02 (26)	0.10 (2.5)	2.36 (60)	1.18 (30)	—
250	—	—	—	—	—	—	—	—	—	—	—	—
320	—	—	—	—	—	—	—	—	—	—	—	—

Cylinder Ø	L3	R	ØTD e9	TL	TM h14	T1	UW 1	XH	XL	Style FH*	Style S*
32	0.31 (8)	0.04 (1)	0.47 (12)	0.47 (12)	1.97 (50)	0.31 (6.8)	1.97 (50)	0.71 (18)	5.04 (128)	0.44 (0.20)	0.24 (0.11)
40	0.39 (10)	0.06 (1.6)	0.63 (16)	0.63 (16)	2.48 (63)	0.35 (9)	2.17 (55)	0.79 (20)	5.71 (145)	0.84 (0.38)	0.35 (0.16)
50	0.47 (12)	0.06 (1.6)	0.63 (16)	0.63 (16)	2.95 (75)	0.35 (9)	2.56 (65)	0.98 (25)	6.10 (155)	1.32 (0.60)	0.35 (0.16)
63	0.47 (12)	0.06 (1.6)	0.79 (20)	0.79 (20)	3.54 (90)	0.43 (11)	2.95 (75)	0.98 (25)	6.69 (170)	2.43 (1.10)	0.51 (0.23)
80	0.55 (14)	0.06 (1.6)	0.79 (20)	0.79 (20)	4.33 (110)	0.43 (11)	3.94 (100)	1.26 (32)	7.40 (188)	4.19 (1.90)	0.51 (0.23)
100	0.75 (19)	0.08 (2)	0.98 (25)	0.98 (25)	5.20 (132)	0.51 (13)	4.72 (120)	1.26 (32)	8.19 (208)	7.72 (3.50)	0.93 (0.42)
125	0.98 (25)	0.08 (2)	0.98 (25)	0.98 (25)	6.30 (160)	0.51 (13)	5.71 (145)	1.57 (40)	9.84 (250)	14.33 (6.50)	0.93 (0.42)
160	—	0.10 (2.5)	1.26 (32)	1.26 (32)	7.87 (200)	0.61 (15.5)	—	—	—	—	1.85 (0.84)
200	—	0.10 (2.5)	1.26 (32)	1.26 (32)	9.84 (250)	0.61 (15.5)	—	—	—	—	1.85 (0.84)
250	—	0.13 (3.2)	1.57 (40)	1.57 (40)	12.60 (320)	—	—	—	—	—	—
320	—	0.13 (3.2)	1.97 (50)	1.97 (50)	15.75 (400)	—	—	—	—	—	—

\*All Weights in Pounds (Kilograms)

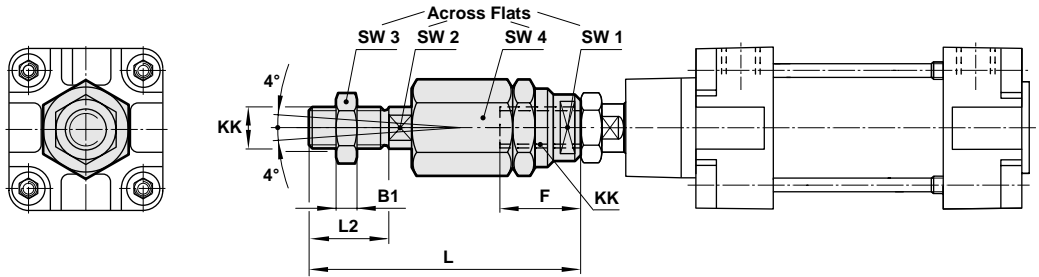


# 8000, 8000/M, P/8000, P/8000/M and PV/8000/M Pneumatic Cylinder Mounts

All Dimensions in Inches (mm)

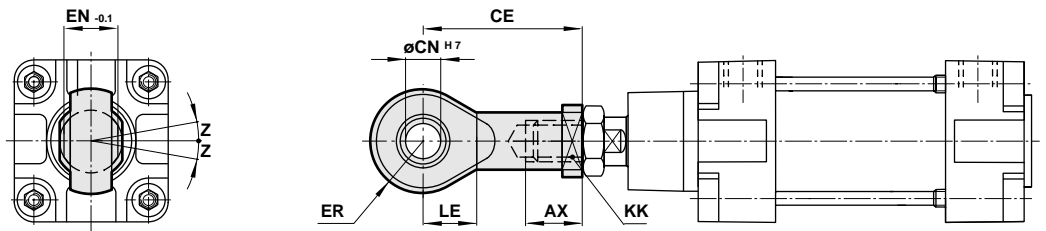
## 8000/38 – Piston Rod Swivel Mounting Style AK

Cylinder Ø	8000, P/8000
32	QM/8025/38
40	QM/8040/38
50	QM/8050/38
63	QM/8050/38
80	QM/8080/38
100	QM/8080/38
125	QM/8125/38
160	QM/8160/38
200	QM/8160/38



## 8000/32 – Universal Piston Rod Eye Mounting Style UF (Corresponds to DIN ISO 8139)

Cylinder Ø	8000, P/8000	PV/8000
32	QM/8025/32	PVQM/8032/32
40	QM/8040/32	PVQM/8040/32
50	QM/8050/32	PVQM/8050/32
63	QM/8050/32	PVQM/8050/32
80	QM/8080/32	PVQM/8080/32
100	QM/8080/32	PVQM/8080/32
125	QM/8125/32	
160	QM/8160/32	
200	QM/8160/32	
250	QM/8250/32	
320	QM/8200/32	



Cylinder Ø	AX	B1	CE	ØCN H7	EN -0.1	ER	F	KK	L
32	0.79 (20)	0.20 (5)	1.69 (43)	0.39 (10)	0.55 (14)	0.55 (14)	1.02 (26)	M 10 x 1.25	2.87 (73)
40	0.87 (22)	0.24 (6)	1.97 (50)	0.47 (12)	0.63 (16)	0.63 (16)	1.02 (26)	M 12 x 1.25	3.03 (77)
50	1.10 (28)	0.31 (8)	2.52 (64)	0.63 (16)	0.83 (21)	0.83 (21)	1.34 (34)	M 16 x 1.5	4.17 (106)
63	1.10 (28)	0.31 (8)	2.52 (64)	0.63 (16)	0.83 (21)	0.83 (21)	1.34 (34)	M 16 x 1.5	4.17 (106)
80	1.30 (33)	0.39 (10)	3.03 (77)	0.79 (20)	0.98 (25)	0.98 (25)	1.65 (42)	M 20 x 1.5	4.80 (122)
100	1.30 (33)	0.39 (10)	3.03 (77)	0.79 (20)	0.98 (25)	0.98 (25)	1.65 (42)	M 20 x 1.5	4.80 (122)
125	2.01 (51)	0.53 (13.5)	4.33 (110)	1.18 (30)	1.46 (37)	1.38 (35)	1.57 (40)	M 27 x 2	5.79 (147)
160	2.20 (56)	0.71 (18)	4.92 (125)	1.38 (35)	1.69 (43)	1.57 (40)	3.07 (78)	M 36 x 2	9.88 (251)
200	2.20 (56)	0.71 (18)	4.92 (125)	1.38 (35)	1.69 (43)	1.57 (40)	3.07 (78)	M 36 x 2	9.88 (251)
250	2.36 (60)	—	5.59 (142)	1.57 (40)	1.93 (49)	1.77 (45)	—	M 42 x 2	—
320	2.56 (65)	—	6.30 (160)	1.97 (50)	2.36 (60)	2.28 (58)	—	M 48 x 2	—

Cylinder Ø	L2	LE	SW 1	SW 2	SW 3	SW 4	Z	Style AK*	Style F*
32	0.79 (20)	0.59 (15)	0.75 (19)	0.47 (12)	0.67 (17)	1.18 (30)	13°	0.44 (0.20)	0.20 (0.09)
40	0.94 (24)	0.67 (17)	0.75 (19)	0.47 (12)	0.75 (19)	1.18 (30)	13°	0.44 (0.20)	0.29 (0.13)
50	1.26 (32)	0.87 (22)	1.18 (30)	0.75 (19)	0.94 (24)	1.65 (42)	15°	1.43 (0.65)	0.73 (0.33)
63	1.26 (32)	0.87 (22)	1.18 (30)	0.75 (19)	0.94 (24)	1.65 (42)	15°	1.43 (0.65)	0.73 (0.33)
80	1.57 (40)	1.02 (26)	1.18 (30)	0.75 (19)	1.18 (30)	1.65 (42)	15°	1.59 (0.72)	1.48 (0.67)
100	1.57 (40)	1.02 (26)	1.18 (30)	0.75 (19)	1.18 (30)	1.65 (42)	15°	1.59 (0.72)	1.48 (0.67)
125	2.13 (54)	1.42 (36)	1.57 (40)	0.94 (24)	1.61 (41)	2.17 (55)	15°	3.75 (1.70)	2.98 (1.35)
160	2.83 (72)	1.61 (41)	1.97 (50)	1.42 (36)	2.17 (55)	2.95 (75)	16°	11.91 (5.40)	6.62 (3.00)
200	2.83 (72)	1.61 (41)	1.97 (50)	1.42 (36)	2.17 (55)	2.95 (75)	16°	11.91 (5.40)	6.62 (3.00)
250	—	1.81 (46)	—	—	—	—	17°	—	14.11 (6.40)
320	—	2.32 (59)	—	—	—	—	12°	—	19.18 (8.70)

\*All Weights in Pounds (Kilograms)



## QA/8000/51 – Guide Blocks (with sintered bronze bearings)

Guide Blocks provide accurate guidance for unsupported loads.  
Guide rods run through bearings which are protected by wiper rings.

- Guide Block, Nut and Mounting Plate: anodized aluminum
- Slide Bearings: sintered bronze
- Guide Rods: stainless steel
- Wiper Rings: nitrile

Cylinder Ø	8000, P/8000
32	QA/8032/51/*
40	QA/8040/51/*
50	QA/8050/51/*
63	QA/8063/51/*
80	QA/8080/51/*
100	QA/8100/51/*

\*Insert standard stroke length (50, 100, 160, 200, 250, 320, 400, or 500) in mm. Consult Technical Services for stroke lengths above 500 mm.

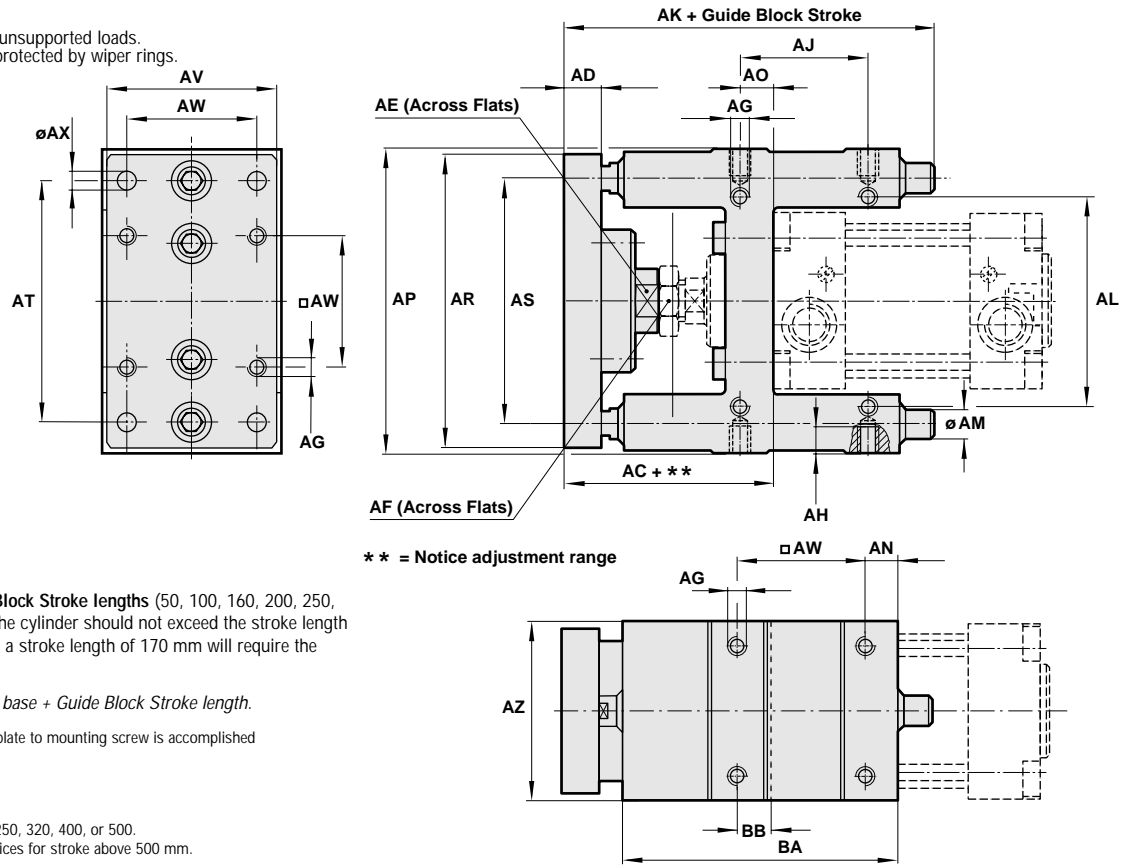
Guide Blocks are available in **Eight Guide Block Stroke lengths** (50, 100, 160, 200, 250, 320, 400 or 500 mm). The stroke length of the cylinder should not exceed the stroke length of the Guide Block. **Example:** A cylinder with a stroke length of 170 mm will require the Guide Block Stroke length of 200 mm.

Total (AK Dimension) = AK base + Guide Block Stroke length.

\*\*Mounting Adjustment from the face of the guide plate to mounting screw is accomplished at the piston rod connection. (Dimension AC)

\*Insert Guide Block Stroke length required.

**Example:** QA/8032/51/  
50, 100, 160, 200, 250, 320, 400, or 500.  
Consult Technical Services for stroke above 500 mm.



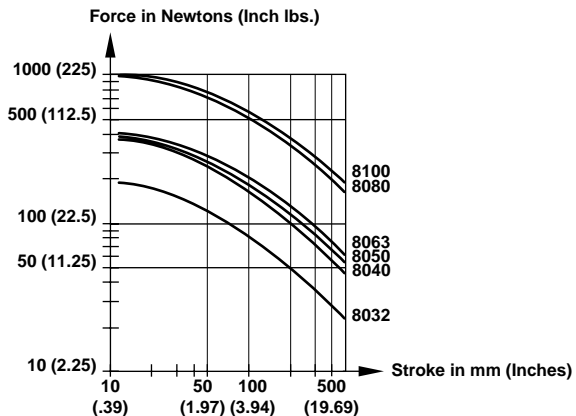
Cylinder Ø	AC + **	AD	AE	AF	AG	AH	AJ	AK	AL	ØAM	AN	AO
32	69 + 2	0.47 (12)	0.59 (15)	0.67 (17)	M 6	0.39 (10)	1.28 (32.5)	4.33 (110)	2.28 (58)	0.39 (10)	0.24 (6)	0.35 (9)
40	74 + 2	0.47 (12)	0.59 (15)	0.75 (19)	M 6	0.39 (10)	1.50 (38)	4.80 (122)	2.52 (64)	0.47 (12)	0.24 (6)	0.43 (11)
50	91.5 + 4	0.59 (15)	0.87 (22)	0.94 (24)	M 8	0.47 (12)	1.83 (46.5)	5.31 (135)	3.15 (80)	0.47 (12)	0.24 (6)	0.75 (19)
63	92 + 4	0.59 (15)	0.87 (22)	0.94 (24)	M 8	0.47 (12)	2.22 (56.5)	6.02 (153)	3.74 (95)	0.47 (12)	0.28 (7)	0.59 (15)
80	106 + 6	0.59 (15)	1.06 (27)	1.18 (30)	M 10	0.59 (15)	1.97 (50)	7.09 (180)	5.12 (130)	0.63 (16)	0.35 (9)	0.55 (14)
100	111 + 6	0.59 (15)	1.06 (27)	1.18 (30)	M 10	0.59 (15)	2.76 (70)	7.83 (199)	5.91 (150)	0.63 (16)	0.35 (9)	0.75 (19)
Cylinder Ø	AP	AR	AS	AT	AV	AW	ØAX	AZ	BA	BB	at 0 mm <sup>1</sup>	per 100 mm <sup>1</sup>
32	3.94 (100)	3.54 (90)	2.91 (74)	3.07 (78)	1.77 (45)	1.28 (32.5)	0.26 (6.6)	1.89 (48)	2.99 (76)	0.35 (9)	2.21 (1.00)	0.13 (0.06)
40	4.17 (106)	3.94 (100)	3.15 (80)	3.31 (84)	1.97 (50)	1.50 (38)	0.26 (6.6)	2.20 (56)	3.35 (85)	0.43 (11)	2.65 (1.20)	0.20 (0.09)
50	4.92 (125)	4.72 (120)	3.86 (96)	3.94 (100)	2.36 (60)	1.83 (46.5)	0.35 (9)	2.60 (66)	3.90 (99)	0.75 (19)	3.97 (1.80)	0.20 (0.09)
63	5.20 (132)	4.92 (125)	4.09 (104)	4.13 (105)	2.76 (70)	2.22 (56.5)	0.35 (9)	2.99 (76)	4.49 (114)	0.59 (15)	4.85 (2.20)	0.20 (0.09)
80	6.50 (165)	6.10 (155)	5.12 (130)	5.12 (130)	3.54 (90)	2.83 (72)	0.43 (11)	3.86 (98)	5.30 (134.5)	0.98 (25)	9.04 (4.10)	0.35 (0.16)
100	7.28 (185)	6.89 (175)	5.91 (150)	5.91 (150)	4.33 (110)	3.50 (89)	0.43 (11)	4.65 (118)	6.04 (153.5)	1.12 (28.5)	12.79 (5.80)	0.35 (0.16)

<sup>1</sup>All Weights in Pounds (Kilograms)

\*\*Notice adjustment range

Note: Supplied complete with mounting screws for cylinder

### Maximum load for QA/8000/51



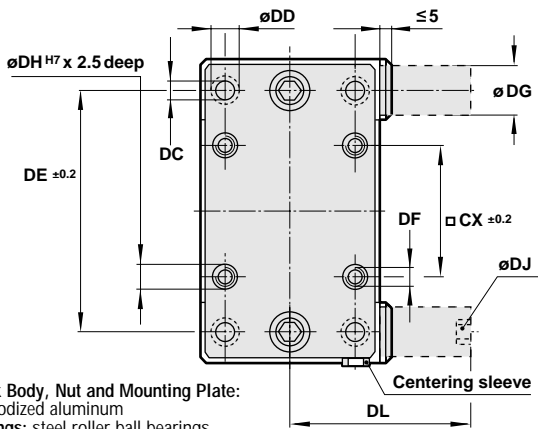


# 8000, 8000/M, P/8000 and P/8000/M Pneumatic Cylinder Guide Blocks

All Dimensions in Inches (mm)

## QA/8000/61 – Guide Blocks (with roller bearings)

Guide Block with roller bearings allows high axial loads to be applied. Guide rods run through roller bearings which are protected by wiper rings. They can be supplied with optional locking units.



Guide Block Body, Nut and Mounting Plate: black anodized aluminum  
 Slide Bearings: steel roller ball bearings  
 Guide Rods: steel inductive hardened  
 Wiper Rings: nitrile

\*\* = Notice adjustment range

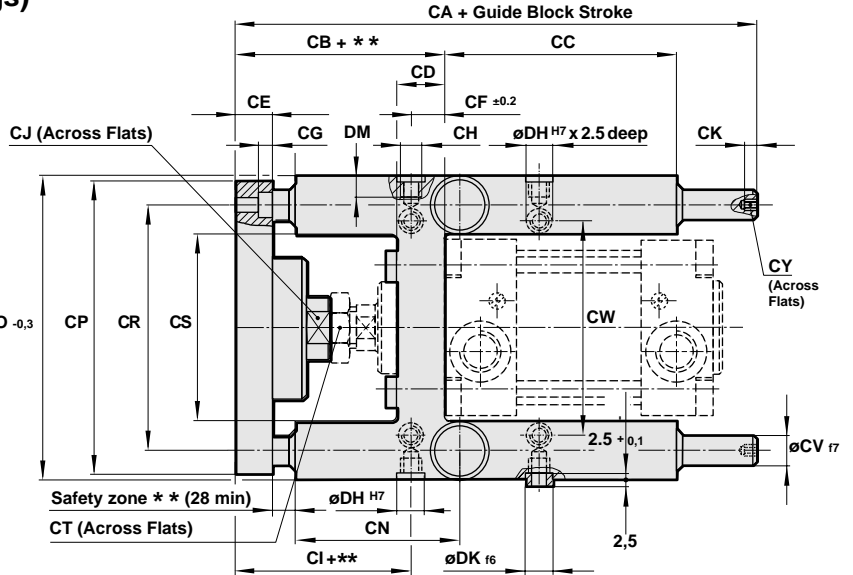
Cylinder Ø	8000, P/8000
32	QA/8032/61/*
40	QA/8040/61/*
50	QA/8050/61/*
63	QA/8063/61/*
80	QA/8080/61/*
100	QA/8100/61/*

\*Insert standard stroke length (50, 100, 160, 200, 250, 320, 400, or 500) in mm. Consult Technical Services for stroke lengths above 500 mm.

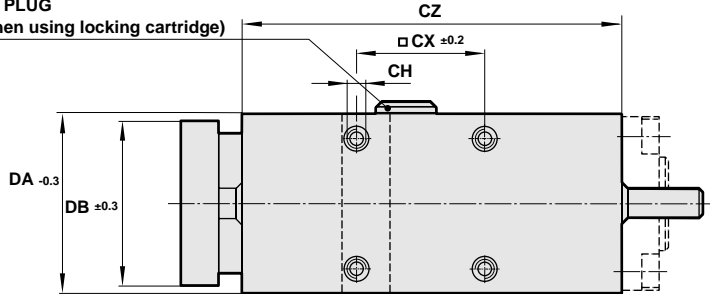
## Separate Locking Cartridge for Guide Block Unit

Cylinder Ø	Model	Forces*
32	QA/8032/63	135 (600)
40	QA/8040/63	225 (1000)
50	QA/8050/63	337 (1500)
63	QA/8050/63	337 (1500)
80	QA/8080/63	674 (3000)
100	QA/8080/63	674 (3000)

\*Locking forces per cartridge in Inch lbs (Newton)



BLANKING PLUG (remove when using locking cartridge)



Guide Blocks are available in **Eight** Guide Block Stroke lengths (50, 100, 160, 200, 250, 320, 400 or 500 mm). The stroke length of the cylinder should not exceed the stroke length of the Guide Block. **Example:** A cylinder with stroke length of 170 mm will require the Guide Block Stroke length of 200 mm.

Total (CA Dimension) = CA base + Guide Block Stroke length.

\*\*Mounting Adjustment from the face of the guide plate to mounting screw is accomplished at the piston rod connection. (Dimensions CB & CI)

\*Insert Guide Block Stroke length required.

Example: QA/8032/61/\*

50, 100, 160, 200, 250, 320, 400, or 500. Consult Technical Services for stroke above 500 mm.

Cylinder Ø	CA	CB + **	CC	CD	CE	CF ±0.2	CG	CH	CI + **	CJ	CK	CN
32	6.97 (177)	3.94+.197 (100+5)	2.56 (65)	1.06 (27)	0.47 (12)	0.17 (4.3)	0.26 (6.5)	M6	3.33+.197 (84.5+5)	0.51 (13)	0.20 (5)	2.40 (61)
40	7.56 (192)	4.37+.197 (111+5)	2.72 (69)	1.26 (32)	0.47 (12)	0.43 (11)	0.26 (6.5)	M6	3.46+.197 (88+5)	0.59 (15)	0.24 (6)	2.64 (67)
50	9.33 (237)	5.04+.394 (128+10)	2.56 (65)	1.54 (39)	0.59 (15)	0.78 (19.8)	0.35 (9)	M8	3.70+.394 (94+10)	0.87 (22)	0.24 (6)	2.97 (75.5)
63	9.33 (237)	5.04+.394 (128+10)	3.82 (97)	1.54 (39)	0.59 (15)	0.60 (15.3)	0.35 (9)	M8	3.88+.394 (98.5+10)	0.87 (22)	0.24 (6)	3.15 (80)
80	11.02 (280)	5.94+.394 (151+10)	4.41 (112)	1.93 (49)	0.79 (20)	0.83 (21)	0.43 (11)	M10	4.49+.394 (114+10)	1.06 (27)	0.28 (7)	3.62 (92)
100	11.02 (280)	6.14+.394 (156+10)	4.41 (112)	2.13 (54)	0.79 (20)	0.96 (24.5)	0.43 (11)	M10	4.55+.394 (115.5+10)	1.06 (27)	0.28 (7)	3.66 (93)

Cylinder Ø	CO -0.3	CP	CR	CS	CT	øCV 17	CW	□CX ±0.2	CY	CZ	DA -0.3	DB ±0.3
32	3.82 (97)	3.54 (90)	2.91 (74)	1.99 (50.5)	0.67 (17)	0.47 (12)	2.40 (61)	1.28 (32.5)	0.20 (5)	4.92 (125)	1.97 (50)	1.77 (45)
40	4.53 (115)	4.33 (110)	3.43 (87)	2.30 (58.5)	0.75 (19)	0.63 (16)	2.72 (69)	1.50 (38)	0.24 (6)	5.51 (140)	2.28 (58)	2.13 (54)
50	5.39 (137)	5.12 (130)	4.09 (104)	2.78 (70.5)	0.94 (24)	0.79 (20)	3.35 (85)	1.83 (46.5)	0.24 (6)	5.91 (150)	2.76 (70)	2.48 (63)
63	5.98 (152)	5.71 (145)	3.02 (119)	3.37 (85.5)	0.94 (24)	0.79 (20)	3.94 (100)	2.22 (56.5)	0.24 (6)	7.17 (182)	3.35 (85)	3.15 (80)
80	7.44 (189)	7.09 (180)	5.83 (148)	4.15 (105.5)	1.18 (30)	0.98 (25)	5.12 (130)	2.83 (72)	0.31 (8)	8.46 (215)	4.13 (105)	3.94 (100)
100	8.39 (213)	7.87 (200)	6.77 (172)	5.14 (130.5)	1.18 (30)	0.98 (25)	5.91 (150)	3.50 (89)	0.31 (8)	8.66 (220)	5.12 (130)	4.72 (120)

Cylinder Ø	øDC	øDD	DE ±0.2	DF	øDG	øDH H7	øDJ	øDK f6	DL	DM	at 0 mm <sup>1</sup>	per 100 mm <sup>1</sup>
32	0.26 (6.6)	0.43 (11)	3.07 (78)	M 6	0.79 (20)	0.35 (9)	M 5	0.35 (9)	1.77 (45)	0.55 (14)	2.65 (1.20)	0.40 (0.18)
40	0.26 (6.6)	0.43 (11)	3.31 (84)	M 6	0.94 (24)	0.35 (9)	G 1/8	0.35 (9)	2.44 (62)	0.55 (14)	4.85 (2.20)	0.71 (0.32)
50	0.35 (9)	0.59 (15)	3.94 (100)	M 8	1.18 (30)	0.43 (11)	G 1/8	0.43 (11)	2.95 (75)	0.63 (16)	7.90 (3.60)	1.08 (0.49)
63	0.35 (9)	0.59 (15)	4.13 (105)	M 8	1.18 (30)	0.43 (11)	G 1/8	0.43 (11)	2.95 (75)	0.63 (16)	10.14 (4.60)	1.08 (0.49)
80	0.43 (11)	0.71 (18)	5.12 (130)	M 10	1.50 (38)	0.51 (13)	G 1/8	0.51 (13)	4.61 (117)	0.79 (20)	19.18 (8.70)	1.70 (0.77)
100	0.43 (11)	0.71 (18)	5.91 (150)	M 10	1.50 (38)	0.51 (13)	G 1/8	0.51 (13)	4.61 (117)	0.79 (20)	24.26 (11.0)	1.70 (0.77)

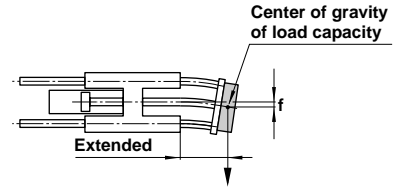
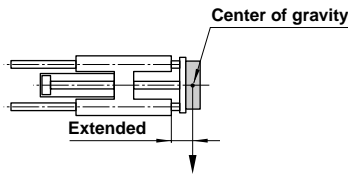
\*\*Notice adjustment range

<sup>1</sup>All Weights in Pounds (Kilograms)

Note: Supplied complete with mounting screws for cylinders and two centering sleeves.



### Maximum load for QA/8000/61



Maximum load capacity is dependent on the stroke extension of a horizontally installed guide unit. In the case of short stroke operation, the load capacity figures taken from the diagram must be multiplied by the correction factor (diagram 2). In the curves of load capacity (diagram 1), the short stroke corrections have already been taken into account for an stroke extension > 60 mm.

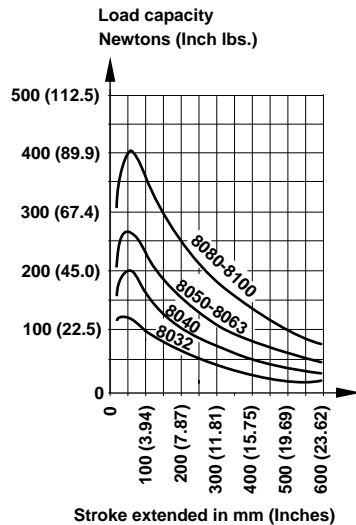
The total deflection of guide rods will be determined by the addition of the amount of deflection due to own weight (diagram 3) plus the amount of deflection due to load capacity (diagram 4).

### Loading Values

### Deflection Values

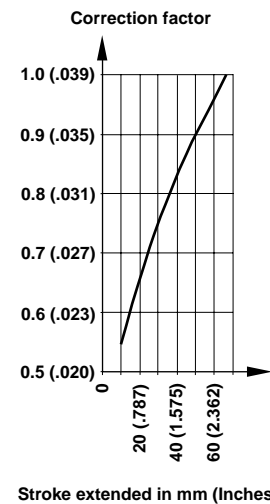
#### Maximum Load Capacity Depending on Stroke Extension

Diagram 1



#### Correction Factor

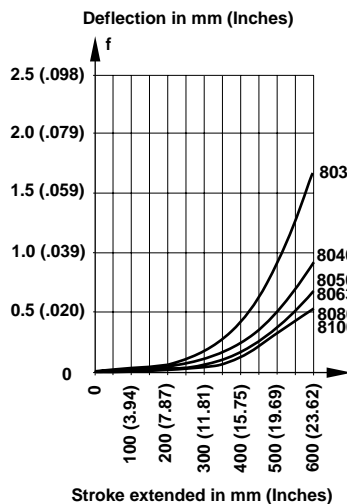
Diagram 2



Reduction of load capacity for short-stroke operation

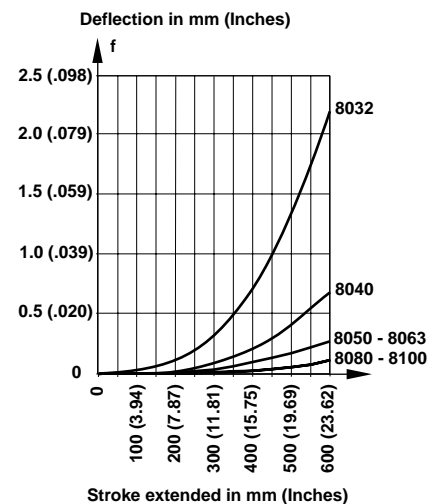
#### Deflection Caused by Own Weight

Diagram 3



#### Deflection Caused by a Load of 10 N

Diagram 4




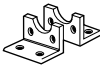





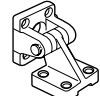




In the case of shock load applications, the figures given in the diagrams above must be reduced by a factor of 2.



# 8000, 8000/M, P/8000, P/8000/M and PV/8000/M Pneumatic Cylinder Mounts

## Mountings









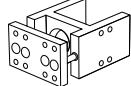
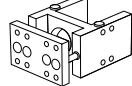
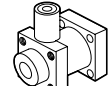
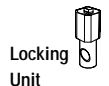
Cylinder Ø	Series	Style A	Style AK	Style B, G	Style C	Style D	Style D2
		 ACT-4-11	 ACT-4-18	 ACT-4-11	 ACT-4-11	 ACT-4-13	 ACT-4-14
32	8000 P/8000 PV/8000	QM/8032/35 QM/8032/35 —	QM/8025/38 QM/8025/38 —	QA/8032/22 QA/8032/22 PVQA/8032/22	QA/8032/21 QA/8032/21 —	QA/8032/23 QA/8032/23 PVQA/8032/23	QA/8032/42 QA/8032/42 —
40	8000 P/8000 PV/8000	QM/8032/35 QM/8032/35 —	QM/8040/38 QM/8040/38 —	QA/8040/22 QA/8040/22 PVQA/8040/22	QA/8040/21 QA/8040/21 —	QA/8040/23 QA/8040/23 PVQA/8040/23	QA/8040/42 QA/8040/42 —
50	8000 P/8000 PV/8000	QM/8050/35 QM/8050/35 —	QM/8050/38 QM/8050/38 —	QA/8050/22 QA/8050/22 PVQA/8050/22	QA/8050/21 QA/8050/21 —	QA/8050/23 QA/8050/23 PVQA/8050/23	QA/8050/42 QA/8050/42 —
63	8000 P/8000 PV/8000	QM/8050/35 QM/8050/35 —	QM/8050/38 QM/8050/38 —	QA/8063/22 QA/8063/22 PVQA/8063/22	QA/8063/21 QA/8063/21 —	QA/8063/23 QA/8063/23 PVQA/8063/23	QA/8063/42 QA/8063/42 —
80	8000 P/8000 PV/8000	QM/8080/35 QM/8080/35 —	QM/8080/38 QM/8080/38 —	QA/8080/22 QA/8080/22 PVQA/8080/22	QA/8080/21 QA/8080/21 —	QA/8080/23 QA/8080/23 PVQA/8080/23	QA/8080/42 QA/8080/42 —
100	8000 P/8000 PV/8000	QM/8080/35 QM/8080/35 —	QM/8080/38 QM/8080/38 —	QA/8100/22 QA/8100/22 PVQA/8100/22	QA/8100/21 QA/8100/21 —	QA/8100/23 QA/8100/23 PVQA/8100/23	QA/8100/42 QA/8100/42 —
125	8000 P/8000	QM/8125/35 QM/8125/35	QM/8125/38 QM/8125/38	QM/8125/22 QM/8125/22	QM/8125/21 QM/8125/21	QM/8125/23 QM/8125/23	QA/8125/42 QA/8125/42
160	8000	QM/8160/35	QM/8160/38	QM/8160/22	QM/8160/21	QM/8160/23	QA/8160/42
200	8000	QM/8160/35	QM/8160/38	QM/8200/22	QM/8200/21	QM/8200/23	QA/8200/42
250	8000	QM/8250/35	—	QM/8250/22	QM/8250/21	QM/8250/23	—
320	8000	QM/8320/35	—	QM/8320/22	QM/8320/21	QM/8320/23	—
Cylinder Ø	Series	Style F	Style FH	Style H	Style L	Style M	Style R
		 ACT-4-12	 ACT-4-17	 ACT-4-16	 ACT-4-13	 ACT-4-12	 ACT-4-15
32	8000 P/8000 PV/8000	QM/8025/25 QM/8025/25 PVQM/8032/25	QA/8032/34 QA/8032/34 —	QA/8032/28 — —	QA/8032/24 QA/8032/24 PVQA/8032/24	QM/8032/26 QM/8032/26 —	QA/8032/27 QA/8032/27 PVQA/8032/27
40	8000 P/8000 PV/8000	QM/8040/25 QM/8040/25 PVQM/8040/25	QA/8040/34 QA/8040/34 —	QA/8040/28 — —	QA/8040/24 QA/8040/24 PVQA/8040/24	QM/8040/26 QM/8040/26 —	QA/8040/27 QA/8040/27 PVQA/8040/27
50	8000 P/8000 PV/8000	QM/8050/25 QM/8050/25 PVQM/8050/25	QA/8050/34 QA/8050/34 —	QA/8050/28 — —	QA/8050/24 QA/8050/24 PVQA/8050/24	QM/8050/26 QM/8050/26 —	QA/8050/27 QA/8050/27 PVQA/8050/27
63	8000 P/8000 PV/8000	QM/8050/25 QM/8050/25 PVQM/8050/25	QA/8063/34 QA/8063/34 —	QA/8063/28 — —	QA/8063/24 QA/8063/24 PVQA/8063/24	QM/8063/26 QM/8063/26 —	QA/8063/27 QA/8063/27 PVQA/8063/27
80	8000 P/8000 PV/8000	QM/8080/25 QM/8080/25 PVQM/8080/25	QA/8080/34 QA/8080/34 —	QA/8080/28 — —	QA/8080/24 QA/8080/24 PVQA/8080/24	QM/8080/26 QM/8080/26 —	QA/8080/27 QA/8080/27 PVQA/8080/27
100	8000 P/8000 PV/8000	QM/8080/25 QM/8080/25 PVQM/8080/25	QA/8100/34 QA/8100/34 —	QA/8100/28 — —	QA/8100/24 QA/8100/24 PVQA/8100/24	QM/8100/26 QM/8100/26 —	QA/8100/27 QA/8100/27 PVQA/8100/27
125	8000 P/8000	QM/8125/25 QM/8125/25	QA/8125/34 QA/8125/34	QM/8125/28 —	QM/8125/24 QM/8125/24	QM/8125/26 QM/8125/26	QM/8125/27 QM/8125/27
160	8000	QM/8160/25	—	QM/8160/28	QM/8160/24	QM/8160/26	QM/8160/27
200	8000	QM/8160/25	—	QM/8200/28	QM/8200/24	QM/8200/26	QM/8200/27
250	8000	QM/8250/25	—	QM/8250/28	QM/8250/24	—	—
320	8000	QM/8320/25	—	QM/8320/28	QM/8320/24	—	—

## How to Order Mounting Kits

ISO/VDMA Cylinders are unique: after selecting bore, stroke and type of cylinder, the desired mounting kit is chosen. These kits come complete with required mounting hardware.



Mountings

Cylinder Ø	Series	Style S	Style SS	Style SW	Style UF	Style UH	Style UL
		 ACT-4-17	 ACT-4-12	 ACT-4-13	 ACT-4-18	 ACT-4-16	 ACT-4-14
32	8000 P/8000 PV/8000	QA/8032/41 QA/8032/41 —	M/P19931 M/P19931 —	M/P19493 M/P19493 M/P40459	QM/8025/32 QM/8025/32 PVQM/8032/32	QA/8032/40 PQA/8032/40 —	QA/8032/43 QA/8032/43 —
40	8000 P/8000 PV/8000	QA/8040/41 QA/8040/41 —	M/P19932 M/P19932 —	M/P19494 M/P19494 M/P40460	QM/8040/32 QM/8040/32 PVQM/8040/32	QA/8040/40 PQA/8040/40 —	QA/8040/43 QA/8040/43 —
50	8000 P/8000 PV/8000	QA/8040/41 QA/8040/41 —	M/P19933 M/P19933 —	M/P19495 M/P19495 M/P40461	QM/8050/32 QM/8050/32 PVQM/8050/32	QA/8050/40 PQA/8050/40 —	QA/8050/43 QA/8050/43 —
63	8000 P/8000 PV/8000	QA/8063/41 QA/8063/41 —	M/P19934 M/P19934 —	M/P19496 M/P19496 M/P40462	QM/8050/32 QM/8050/32 PVQM/8050/32	QA/8063/40 PQA/8063/40 —	QA/8063/43 QA/8063/43 —
80	8000 P/8000 PV/8000	QA/8063/41 QA/8063/41 —	M/P19935 M/P19935 —	M/P19497 M/P19497 M/P40463	QM/8080/32 QM/8080/32 PVQM/8080/32	QA/8080/40 PQA/8080/40 —	QA/8080/43 QA/8080/43 —
100	8000 P/8000 PV/8000	QA/8100/41 QA/8100/41 —	M/P19936 M/P19936 —	M/P19498 M/P19498 M/P40464	QM/8080/32 QM/8080/32 PVQM/8080/32	QA/8100/40 PQA/8100/40 —	QA/8100/43 QA/8100/43 —
125	8000 P/8000	QA/8100/41 QA/8100/41	M/P19937 M/P19937	M/P19499 M/P19499	QM/8125/32 QM/8125/32	QA/8125/40 —	QA/8125/43 QA/8125/43
160	8000	QA/8160/41	M/P19938	M/P19679	QM/8160/32	QA/8160/40	QA/8160/43
200	8000	QA/8160/41	M/P19939	M/P19683	QM/8160/32	QA/8200/40	QA/8200/43
250	8000	—	—	M/P19446	QM/8250/32	—	—
320	8000	—	—	M/P19447	QM/8320/32	—	—
Cylinder Ø	Series	Style UR	Style US	Guide Blocks	Guide Blocks	Locking Unit	Locking Cartridge
		 ACT-4-15	 ACT-4-14	 ACT-4-19	 ACT-4-20	 ACT-4-10	 ACT-4-10
32	8000 P/8000 PV/8000	QA/8032/33 QA/8032/33 PVQA/8032/33	M/P40310 M/P40310 —	QA/8032/51/* QA/8032/51/* —	QA/8032/61/* QA/8032/61/* —	QA/8032/59 QA/8032/59 —	QA/8032/63 QA/8032/63 —
40	8000 P/8000 PV/8000	QA/8040/33 QA/8040/33 PVQA/8040/33	M/P40311 M/P40311 —	QA/8040/51/* QA/8040/51/* —	QA/8040/61/* QA/8040/61/* —	QA/8040/59 QA/8040/59 —	QA/8040/63 QA/8040/63 —
50	8000 P/8000 PV/8000	QA/8050/33 QA/8050/33 PVQA/8050/33	M/P40312 M/P40312 —	QA/8050/51/* QA/8050/51/* —	QA/8050/61/* QA/8050/61/* —	QA/8050/59 QA/8050/59 —	QA/8050/63 QA/8050/63 —
63	8000 P/8000 PV/8000	QA/8063/33 QA/8063/33 PVQA/8063/33	M/P40313 M/P40313 —	QA/8063/51/* QA/8063/51/* —	QA/8063/61/* QA/8063/61/* —	QA/8063/59 QA/8063/59 —	QA/8063/63 QA/8063/63 —
80	8000 P/8000 PV/8000	QA/8080/33 QA/8080/33 PVQA/8080/33	M/P40314 M/P40314 —	QA/8080/51/* QA/8080/51/* —	QA/8080/61/* QA/8080/61/* —	QA/8080/59 QA/8080/59 —	QA/8080/63 QA/8080/63 —
100	8000 P/8000 PV/8000	QA/8100/33 QA/8100/33 PVQA/8100/33	M/P40315 M/P40315 —	QA/8100/51/* QA/8100/51/* —	QA/8100/61/* QA/8100/61/* —	QA/8100/59 QA/8100/59 —	QA/8100/63 QA/8100/63 —
125	8000 P/8000	QM/8125/33 QM/8125/33	M/P71355 M/P71355	— —	— —	QA/8125/59 QA/8125/59	QA/8125/63 QA/8125/63
160	8000	QM/8160/33	M/P71356	—	—	•	•
200	8000	QM/8200/33	M/P71357	—	—	•	•
250	8000	—	—	—	—	—	—
320	8000	—	—	—	—	—	—

\*Insert standard stroke length (50, 100, 160, 200, 250, 320, 400, or 500) in mm. Consult Technical Services for strokes lengths above 500 mm.





# 8000/M, P/8000/M and PV/8000/M Pneumatic Cylinder Switches

All Dimensions in Inches (mm)  
All Weights in Pounds (Kilograms)

## Switches

Model							
Reed	QM/33	QM/34	QM/34/P	QM/31	QM/32	QM/32/P	—
Solid State	—	QM/134	QM/134/P	—	QM/132	QM/132/P	—
Pneumatic	—	—	—	—	—	—	QM/140
Series 8000	ø32 – ø200	ø32 – ø200	ø32 – ø200	ø32 – ø320	ø32 – ø320	ø32 – ø320	ø32 – ø100
Series P/8000	ø32 – ø125	ø32 – ø125	ø32 – ø125	—	—	—	—
Series PV/8000	ø32 – ø100	ø32 – ø100	ø32 – ø100	—	—	—	—

Model Reed	Voltage		Current Max.	Temperature °C (°F)	LED	Features	Cable Length	Cable Type	Plug-in Cable Straight**	
	V a.c.	V d.c.							90°	
QM/31/*	10 to 240	10 to 240	2 A	-20° to 80° (-4° to 176°)	—	—	2, 5, 10 m (6.5', 16.5', 33')	PVC 2 x 0.75	—	—
TQM/31/*	10 to 240	10 to 240	2 A	-20° to 150° (-4° to 302°)	—	High Temperature	5 m (16.5')	Silicone 2x0.75	—	—
QM/31/C/*	10 to 110	10 to 175	0.25 A	-20° to 80° (-4° to 176°)	—	Changeover	5 m (16.5')	PVC 3 x 0.5	—	—
QM/32/*	10 to 240	10 to 240	1 A	-20° to 80° (-4° to 176°)	●	—	2, 5, 10 m (6.5', 16.5', 33')	PVC 2 x 0.75	—	—
QM/32/P	10 to 240	10 to 240	1 A	-20° to 80° (-4° to 176°)	●	—	5 m (16.5')	PVC 3 x 0.34	M/P34692/5	—
QM/33/*	10 to 240	10 to 240	1.5 A	-20° to 80° (-4° to 176°)	—	—	2, 5, 10 m (6.5', 16.5', 33')	PVC 2 x 0.34	—	—
TQM/33/*	10 to 30	10 to 30	1.5 A	-20° to 150° (-4° to 302°)	—	High Temperature	5 m (16.5')	Silicone 2x0.34	—	—
QM/33/C/*	10 to 110	10 to 175	0.25 A	-20° to 80° (-4° to 176°)	—	Changeover	5 m (16.5')	PVC 2 x 0.34	—	—
QM/34/*	—	10 to 30	1 A	-20° to 80° (-4° to 176°)	●	Output: Positive	2, 5, 10 m (6.5', 16.5', 33')	PVC 3 x 0.34	—	—
QM/34/P	—	10 to 30	1 A	-20° to 80° (-4° to 176°)	●	Output: Positive	5 m (16.5')	PVC 3 x 0.25	M/P34614/5	M/P34615/5
QM/34/S/*	10 to 240	10 to 240	0.5 A	-20° to 80° (-4° to 176°)	●	—	2, 5, 10 m (6.5', 16.5', 33')	PVC 2 x 0.34	—	—
QM/34/N/*	—	10 to 30	1 A	-20° to 80° (-4° to 176°)	●	Output: Negative	2, 5 m (6.5', 16.5')	PVC 3 x 0.34	—	—
<b>Solid State</b>										
QM/132/*	—	10 to 30	0.2 A	-20° to 80° (-4° to 176°)	●	PNP	2, 5, 10 m (6.5', 16.5', 33')	PVC 3 x 0.35	—	—
QM/132/P	—	10 to 30	0.2 A	-20° to 80° (-4° to 176°)	●	PNP	5 m (16.5')	PVC 3 x 0.34	M/P34692/5	—
QM/132/E/*	—	10 to 30	0.2 A	-20° to 80° (-4° to 176°)	●	Pulse stretcher	5 m (16.5')	PVC 3 x 0.35	—	—
QM/134/*	—	10 to 30	0.2 A	-20° to 80° (-4° to 176°)	●	PNP	2, 5 m (6.5', 16.5')	PVC 3 x 0.34	—	—
QM/134/P	—	10 to 30	0.2 A	-20° to 80° (-4° to 176°)	●	PNP	5 m (16.5')	PVC 3 x 0.25	M/P34614/5	M/P34615/5
QM/134/E/*	—	10 to 30	0.2 A	-20° to 80° (-4° to 176°)	●	Pulse stretcher	5 m (16.5')	PVC 3 x 0.34	—	—
QM/134/N/*	—	10 to 30	0.2 A	-20° to 80° (-4° to 176°)	●	NPN	2, 5 m (6.5', 16.5')	PVC 3 x 0.34	—	—
QM/134/N/P	—	10 to 30	0.2 A	-20° to 80° (-4° to 176°)	●	NPN	5 m (16.5')	PVC 3 x 0.25	M/P34614/5	M/P34615/5
QM/134/X/*	—	8.2	2.2/1 mA	-25° to 75° (-13° to 167°)	●	NAMUR	5 m (16.5')	PVC 2 x 0.34	—	—

\*Insert cable length

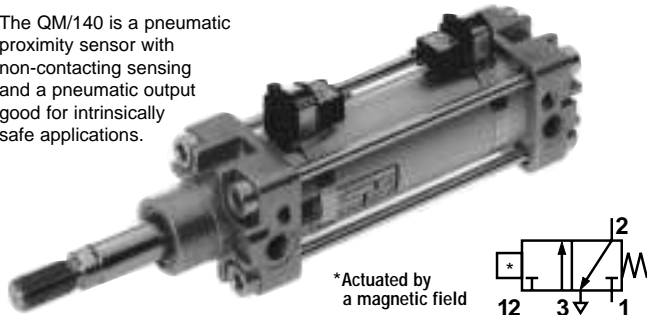
Full information on switches (technical data, polyurethane cable, dimensions, etc.) please refer to ACT-4-25.

\*\* Not included with switch

## QM/140 Switch

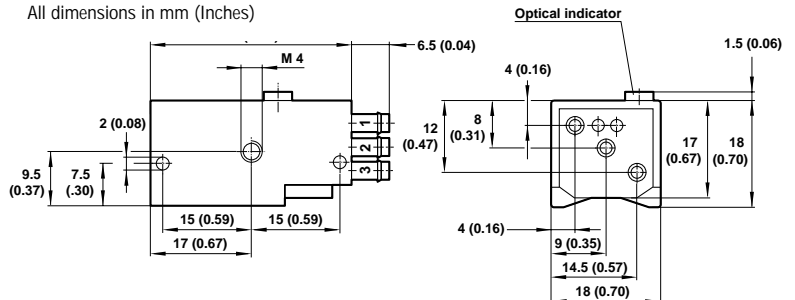
Pneumatic	Operating Pressure	Flow Rate	Orifice Size	Temperature	Active Spot	Connections
QM/140	2 to 6 bar (29 to 87 PSI)	40 l/min (12.2 ft <sup>3</sup> /min)	2 mm (.078 inches)	+60°C (+140°F)	●	For 3 mm (.118 Inches) I/D tubing

The QM/140 is a pneumatic proximity sensor with non-contacting sensing and a pneumatic output good for intrinsically safe applications.



## Basic Dimensions

All dimensions in mm (Inches)



## Ordering Examples

**Cylinders:** To order a basic 80 mm bore magnetic piston cylinder with a 50 mm stroke specify: **DA/8080/M/50**.

**Mountings:** To order a front flange mounting style G for 80 mm bore cylinder specify: **QA/8080/22**.

**Switches:** To order a reed switch with LED and 2 m cable length specify: **QM/34/2**.

**Brackets for switches (ACT-4-26):**

To order a bracket for magnetically operated switches QM/34, 80 mm bore cylinder specify: **QM/27/2/1**.



Switch Schematics

Symbol	Switches (without LED)	Symbol	Switches (with LED)	Description
brown blue	QM/31/* TQM/31/*			Reed Switch (normally open) High temperature +150°C (+302°F), silicone cable 2 x 0.75 (.03") 2, 5 or 10 m length (6.5'; 16.5' or 33').
black blue brown	QM/31/C/*			Changeover, PVC cable 3 x 0.5 (.02") 5 m (16.5') length, switching voltage 10 to 110 V a.c./175 V d.c., switching current 250 mA, switching power 5W/ 5 VA, response time 0.7 ms, contact resistance 100 mW, vibration resistance 20 g (during 11 ms).
			QM/32/*	Reed Switch (normally open)
			QM/32/P	Plug-in connector, connector cable – see ACT-4-24.
brown blue	QM/33/* TQM/33/*			Reed Switch (normally open) High temperature +150°C (+302°F), silicone cable 2 x 0.34 (.01") switching voltage 10 to 30 V a.c./10 to 30 V d.c.
black blue brown	QM/33/C/*			Changeover, PVC cable 3 X 0.34 (.01") 5 m (16.5') length, switching voltage 10 to 110 V a.c./175 V d.c., switching current 250 mA, switching power 5 W/ 5 VA, response time 0.7 ms, contact resistance 100 mW, vibration resistance 20 g (during 11 ms).
			QM/34/*	Reed Switch (normally open)
			QM/34/P	Plug-in connector, connector cable – see ACT-4-24.
			QM/34/N/* QM/34/N*/PU	Negative output, PVC cable 3 x 0.34 (.01") 2 or 5 m (6.5' or 16.5') length. Very flexible polyurethane cable 3 x 0.34 (.01") 2 m (6.5') length.
			QM/34/S/*	PVC cable 2 x 0.34 (.01") 2, 5 or 10 m (6.5'; 16.5' or 33') length, switching voltage 10 to 240 V a.c./d.c., switching current 500 mA, switching power 50 W/ 50 VA, response time 2 ms.
			QM/34/S*/PU	Very flexible polyurethane cable 2 x 0.5 (.02") 2 m (6.5') length.
			QM/132/* QM/132/E/*	Solid State Pulse stretcher 50 to 60 mm (1.97" to 2.36") length, PVC cable 3 x 0.5 (.02") 5 m (16.5') length.
			QM/132*/PU	Very flexible polyurethane cable 3 x 0.34 (.01") 5 m (16.5') length.
			QM/132/P	Plug-in connector, connector cable – see ACT-4-24.
			QM/134/* QM/134/E/*	Solid State Pulse stretcher PVC cable 3 x 0.34 (.01") 5 m (16.5') length, response time 30 ms.
			QM/134*/PU	Very flexible polyurethane cable 3 x 0.34 (.01") 5 m (16.5') length.
			QM/134/P	Plug-in connector, connector cable – see ACT-4-24.
			QM/134/N QM/134/N/PU	Solid State Very flexible polyurethane cable 3 x 0.34 (.01") 5 m (16.5') length.
			QM/134/N/P	Plug-in connector, connector cable – see ACT-4-24.
			QM/134/X/*	NAMUR conforms to DIN 19234, PVC cable 2 x 0.34 (.01") 5 m (16.4') length, (cover blue), switching voltage 8.2 V d.c., switching current active ≥ 2.2 mA / passive E 1 mA, response time 0.15 ms, operating frequency 5 kHz, LED yellow, operating temperature -25°C to +75°C (-13°F to +167°F), protection rating IP 67 (DIN 40050).

\*Insert cable length



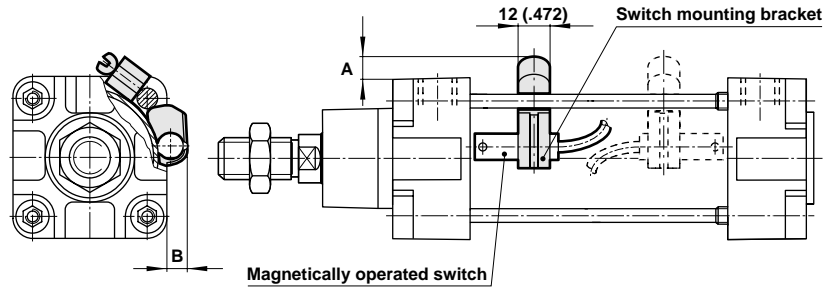
# 8000/M, P/8000/M and PV/8000/M Pneumatic Cylinder Switches

All Dimensions in mm (Inches)  
All Weights in Pounds (Kilograms)

## Series 8000 Bracket

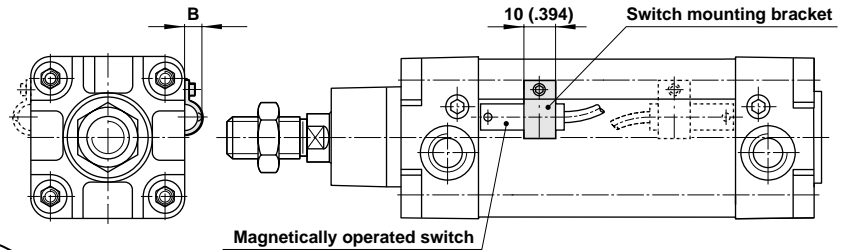
Switches: QM/33, QM/34 and QM/134 (ø8 mm)

Ø	Switch Bracket	A	B	Weight
32	QM/27/2/1	0.35 (9)	0.28 (7)	0.02 (0.010)
40	QM/27/2/1	0.31 (8)	0.31 (8)	0.02 (0.010)
50	QM/27/2/1	0.28 (7)	0.20 (5)	0.02 (0.010)
63	QM/27/2/1	0.28 (7)	0.28 (7)	0.02 (0.010)
80	QM/27/2/1	0.28 (7)	0.16 (4)	0.02 (0.010)
100	QM/27/2/1	0.08 (2)	0.08 (2)	0.02 (0.010)
125	QM/27/2/1	-0.16 (-4)	-0.12 (-3)	0.02 (0.010)
160	QM/27/2/1	-0.39 (-10)	-0.35 (-9)	0.02 (0.010)
200	QM/27/2/1	-0.67 (-17)	-0.55 (-14)	0.02 (0.010)



## Series P/8000 & PV/8000 Bracket

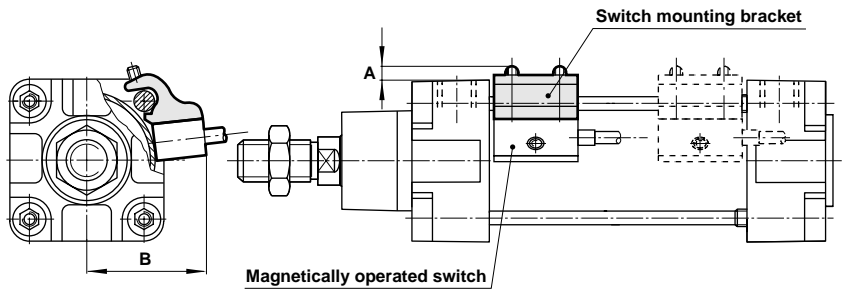
Ø	Switch Bracket	B	Weight
32	QM/33/P32/22	0.22 (5.5)	0.007 (0.003)
40	QM/33/P32/22	0.26 (6.5)	0.007 (0.003)
50	QM/33/P32/22	0.22 (5.5)	0.007 (0.003)
63	QM/33/P32/22	0.26 (6.5)	0.007 (0.003)
80	QM/33/P32/22	0.14 (3.5)	0.007 (0.003)
100	QM/33/P32/22	0.06 (1.5)	0.007 (0.003)
125	QM/33/P32/22	0.08 (2)	0.007 (0.003)



## Series 8000 Bracket

Switches: QM/31, QM/32 and QM/132

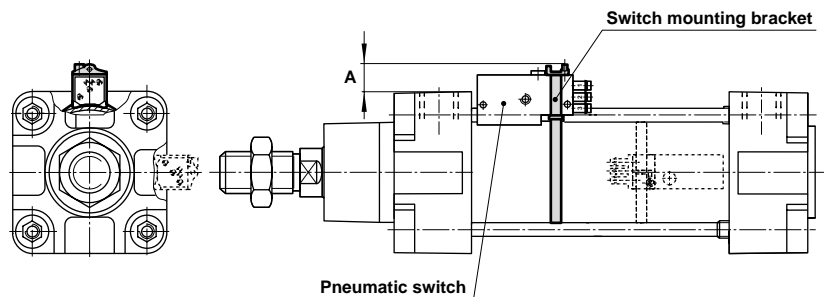
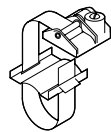
Ø	Switch Bracket	A	B	Weight
32	QM/31/032/22	0.18 (4.5)	1.50 (38)	0.06 (0.026)
40	QM/31/032/22	0.22 (5.5)	1.69 (43)	0.06 (0.026)
50	QM/31/032/22	0.18 (4.5)	1.89 (48)	0.06 (0.026)
63	QM/31/032/22	0.18 (4.5)	2.09 (53)	0.06 (0.026)
80	QM/31/080/22	0.06 (1.5)	2.40 (61)	0.06 (0.028)
100	QM/31/080/22	0.02 (0.5)	2.68 (68)	0.06 (0.028)
125	QM/31/080/22	-0.04 (-1)	3.11 (79)	0.06 (0.028)
160	QM/31/160/22	0	3.60 (91.5)	0.05 (0.023)
200	QM/31/160/22	-0.16 (-4)	4.17 (106)	0.05 (0.023)
250	QM/31/250/22	-0.12 (-3)	5.43 (138)	0.09 (0.041)
320	QM/31/320/22	-0.83 (-21)	6.06 (154)	0.18 (0.080)



## Series 8000 Bracket with Holding Strap

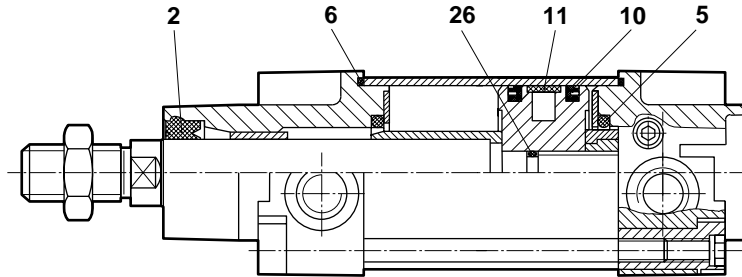
Switch: QM/140

Ø	Switch Bracket	A	Weight
32	QM/140/010/22	1.24 (31.5)	0.04 (0.020)
40	QM/140/010/22	1.20 (30.5)	0.04 (0.020)
50	QM/140/010/22	1.24 (31.5)	0.04 (0.020)
63	QM/140/010/22	1.16 (29.5)	0.04 (0.020)
80	QM/140/010/22	1.20 (30.5)	0.04 (0.020)
100	QM/140/010/22	1.18 (30)	0.04 (0.020)





**Spares: Replacement Piston Rod  
Cylinder Seal Kits**



Cylinder Ø	Model (Standard)	Item	Cylinder Seal Kit		Comprising			
			Description	Quantity				
32			DA/8032, DA/8032/M		2	QA/8032/00	Piston rod seal	1
40	DA/8040, DA/8040/M		QA/8040/00		5		Cushion seal	2
50	DA/8050, DA/8050/M		QA/8050/00		6		Sealing ring	2
63	DA/8063, DA/8063/M		QA/8063/00		10		Piston seal	2
80	DA/8080, DA/8080/M		QA/8080/00		11		Wear ring	1
100	DA/8100, DA/8100/M		QA/8100/00		26		O-ring (ø32 mm to ø100 mm)	1
125	DA/8125, DA/8125/M		QA/8125/00					
160	DA/8160, DA/8160/M		QA/8160/00					
200	DA/8200, DA/8200/M		QA/8200/00					
250	DA/8250, DA/8250/M		QA/8250/00					
320	DA/8320, DA/8320/M		QA/8320/00					

Note: Please specify the cylinder model number when ordering cylinder seal kits and replacement piston rods.

# Tiny Tim

## Series T, VT, ET, and TA, TAV, and TAE NFPA Air Actuators

<b>Series T &amp; VT Features</b> .....	ACT-5-2
<b>Series ET Features</b> .....	ACT-5-3
<b>Series T &amp; VT Specifications</b> .....	ACT-5-4
<b>Series ET Specifications</b> .....	ACT-5-5
<b>Series T, VT, and ET Dimensions</b> .....	ACT-5-6
<b>T, VT, and ET Accessories</b> .....	ACT-5-9
<b>Switches</b> .....	ACT-5-10
<b>T, VT, and ET Ordering Information</b> .....	ACT-5-12
<b>Tiny Tim NFPA Features</b> .....	ACT-5-13
<b>Series NFPA Specifications</b> .....	ACT-5-14
<b>NFPA Dimensions</b> .....	ACT-5-15
<b>NFPA Accessories</b> .....	ACT-5-18
<b>NFPA Ordering Information</b> .....	ACT-5-20

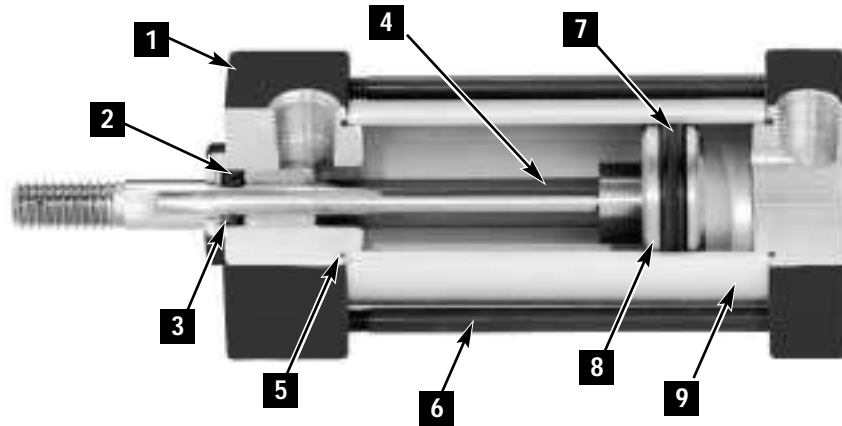




## Series T & VT Tiny Tim Air Cylinders

### Series T

Series T uses Quad Ring Buna-Ring piston seal.



**1** Heads and Caps: Corrosion resistant alloy or black oxidized steel.

**2** Rod Bushing: Oil-filled, sintered iron bushing.

**3** Rod Seal: Replaceable block-vee Buna-N rod seal (Viton® optional).

**4** Piston Rod: Hard chrome plated high tensile steel piston rod.

**5** Seals: O-ring type seals.

**6** Tie Rods: High yield strength tie rods.

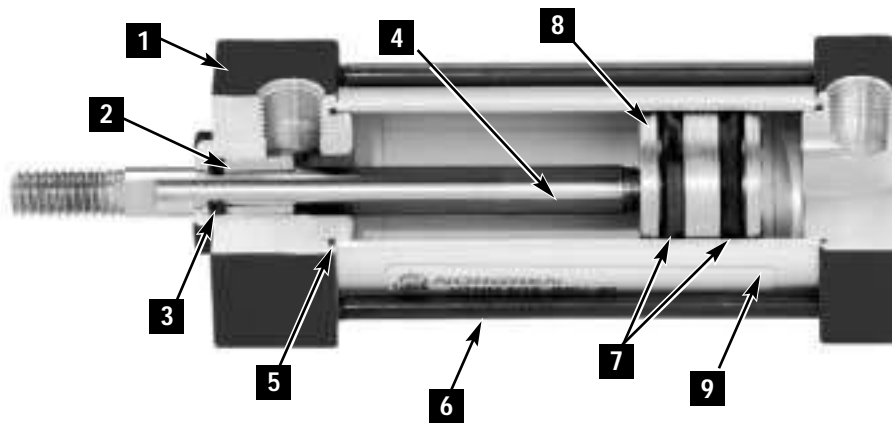
**7** Piston Seal: Replaceable quad ring Buna-N (Viton® optional).

**8** Piston: Machined alloy.

**9** Tubing: Hard anodized I.D. aluminum tubing.

### Series VT

Series VT uses Block-Vee Buna-N piston seal. This increases envelope dimension by 3/8" but provides lower breakaway pressure. (See ACT-5-4 for specifications)



**1** Heads and Caps: Corrosion resistant alloy or black oxidized steel.

**2** Rod Bushing: Oil-filled, sintered iron bushing.

**3** Rod Seal: Replaceable block-vee Buna-N rod seal (Viton® optional).

**4** Piston Rod: Hard chrome plated high tensile steel piston rod.

**5** Seals: O-ring type seals.

**6** Tie Rods: High yield strength tie rods.

**7** Piston Seal: Replaceable Block-Vee Buna-N (Viton® optional).

**8** Piston: Machined alloy.

**9** Tubing: Hard anodized I.D. aluminum tubing.



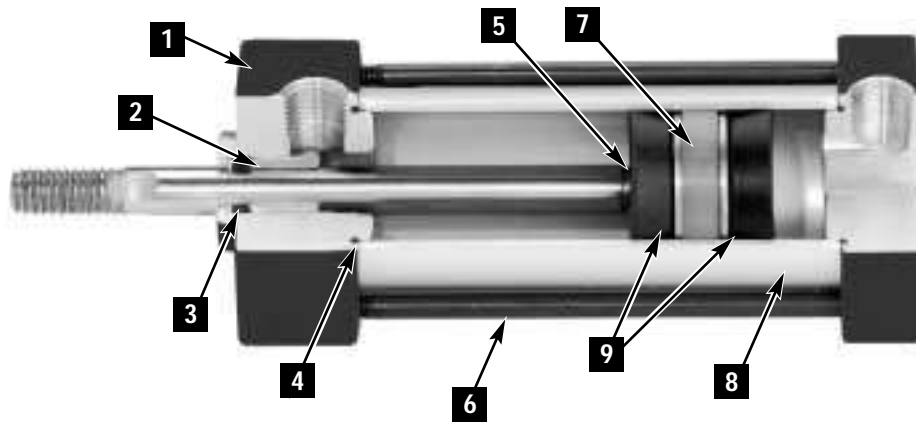
# Series ET Tiny Tim Air Cylinders

## Series ET

Series ET actuators achieve their cushion effect through the normal compression of the Buna-N “shock-absorber” seals at the completion of the cylinder stroke. This compressive action absorbs the cylinder’s kinetic energy and reduces the shock created by the piston striking the end caps.

The measurable cushion effect of the “shock-absorber” seals provides a predictable pounds stoppable/piston speed ratio (Chart 1, ACT-5-5), allowing you to determine the exact weight that can be stopped at a given piston speed.

Series ET actuators also help meet OSHA’s noise and clean air standards (Chart 3, ACT-5-5). They are guaranteed to operate without lubrication for one year regardless of cycles. Non-lubricated operation is achieved by the combined efforts of an oil-impregnated sintered iron piston rod busing that lubricates the rod during normal operation, and through the use of a reinforced Teflon wear ring on the center perimeter of the piston. This ring reduces friction between the piston and the cylinder tube.



**1** Heads and Caps: Corrosion resistant alloy or black oxidized steel.

**2** Bushing: Oil-filled rod bushing.

**3** Rod Seal: Replaceable block-vee Buna-N rod seal (Viton® optional).

**4** Seals: O-ring type seals.

**5** Piston: Machined alloy.

**6** Tie Rods: High yield strength tie rods.

**7** Wear Ring: Teflon® reinforced wear ring.

**8** Tubing: Hard anodized I.D. aluminum tubing.

**9** Impact Dampening Seals: Impact dampening seals specifically designed piston incorporated energy absorbing seals to dissipate the forces generated during impact without increasing envelope dimensions. Not available for cylinders with oversize rods. Not recommended for applications that require 100% repeatable stroke increments, or for applications that exceed the pounds stoppable capacities shown on ACT-5-5 at the various recommended piston speeds.

- 3/4" and 1-1/8" bore
- Single and double rod end styles
- Rated 150 psi air
- -20° to 200°F (-29° to 107°C) operating temperatures
- Viton seals optional for higher temperatures



#### Differences between Series T and Series VT air actuators

Series T contains a Quad Ring Buna-N piston seal. The VT Series utilizes a dual Block-Vee Buna-N piston seal design.

The Block-Vee seals increase the envelope dimensions of the Series VT cylinders by 3/8". All other features of the Series T and VT are the same.

Series VT cylinders have a slightly lower breakaway pressure (psig) than the Series T Tiny Tim air cylinders. See "Minimum Breakaway Pressures (PSIG)" chart.

#### Technical Information

Medium: Compressed air, filtered, lubricated or non-lubricated

Operation: Single or double acting

Operating Pressure: 150 PSI (10 bar)

Operating Temperature: -20° to 200°F (-29° to 107°C)

Cylinder Diameters: 3/4", 1-1/8"

#### Minimum Breakaway Pressures (PSIG) Non-cushioned cylinders, mounted horizontally with no load on the piston rod.

Cylinder Bore (inches)	Model	PSIG
3/4"	Series T	12
	Series VT-ET	8
1-1/8"	Series T	7
	Series VT-ET	5

The proper selection and application of a fluid power actuator requires consideration of the following: Operation pressure, the fluid medium, mounting style, length of stroke, type of piston rod connection to the load, thrust or mounting tension loading on the rod, mounting attitude, speed of the stroke and how the load in motion will be stopped.

#### Bore Size Selection

The following formulae and charts may be used in the proper selection of the actuator bore size.

- Extended force in pounds = bore area in sq. inches x pressure to cap in psig.
- Retract force in pounds = (bore area – rod area) in sq. inches x pressure to head in psig.

Bore Areas Chart A		Bore Areas Chart B	
Cylinder Bore (in.)	Area (Sq. in.)	Rod Dia. (in.)	Area (Sq. in.)
3/4"	.44	5/16"	.076
1-1/8"	.99	3/8"	.11

**Note:** Allow for friction and attached mechanism when selecting cylinder bore size. Also, consider the weight of the piston and rod assembly if the cylinder is not mounted with the rod in a horizontal plane.





- 3/4" and 1-1/8" bore
- Single and double rod end styles
- Rated 150 psi air
- -20° to 200°F (-29° to 107°C) operating temperatures
- Viton seals optional for higher temperatures

**Chart 1**  
**Energy Absorption of Impact Dampening “Shock-Absorber” Seals**

Cylinder Bore	Inch-Pounds of Kinetic Energy Absorbable	*Pounds Stoppable at Following Speeds				
		12 in/sec	24 in/sec	36 in/sec	48 in/sec	60 in/sec
3/4"	1.5	8	2	0.8	0.41	0.23
1-1/8"	3	16	4	1.8	1	.59

\* Pounds must include weight of piston and rod assembly.

**Chart 2**  
**Effect of Impact Dampening Seals on Total Stroke of Cylinder**

Cylinder Bore	Reduction in inches of total stroke at following psi pressures					
	0	20	40	60	80	100
3/4"	.11	.08	.05	.03	.01	0
1-1/8"	.12	.09	.06	.04	.02	0

**NOTE:** The above figures are for new cylinders. The impact dampening seals will take some compression set during operation of the cylinder and the stroke loss will decrease. Also, the pressure at zero stroke loss will decrease to about 80 psi. At pressures above those of zero stroke loss, a slight clicking sound will be produced during impact.

**Chart 3**  
**Summary of Sound Levels in Decibels**

Cylinder Model	With 95 psi Air Peak Sound Pressure Level +		With 50 psi Air Peak Sound Pressure Level +	
	End+ +	Side+ +	End+ +	Side+ +
	TF — 3/4" x 1-1/8"	99	107	100
ETF — 3/4" x 1-1/8"	84	86	87	87

+ Peak sound pressure is given in decibels (dB) re: 2 x 10<sup>-5</sup> N/m<sup>2</sup>.

++ End position of mike was located 3 ft. on centerline from end of cylinder; side position of mike was located 3 ft. perpendicular to centerline abeam of end of cylinder.

The total noise emitted will depend on the structure to which the cylinder is attached. If it is mounted on a thin flat plate of considerable area, the noise will be increased by a sounding board effect.

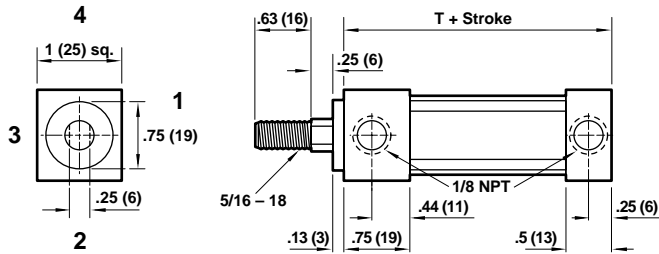


# Tiny Tim Series Actuators

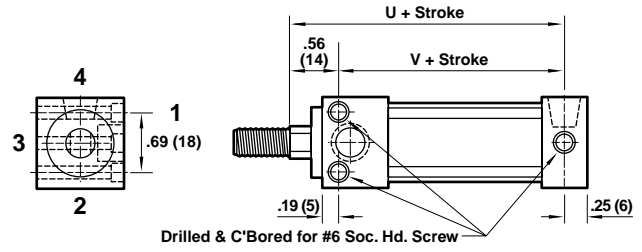
All Dimensions in Inches (mm)

## Series T, ET, VT (3/4" Bore, 5/16" Rod)

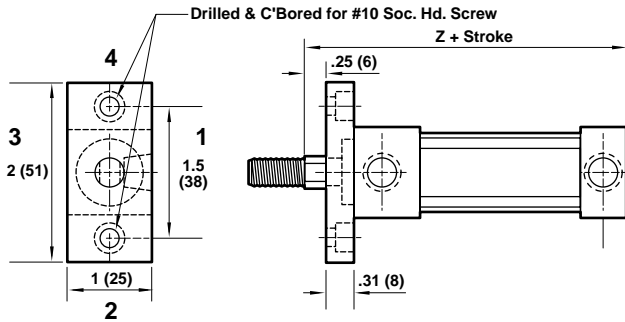
### Standard Cylinder (TNM, VTNM, ETNM)



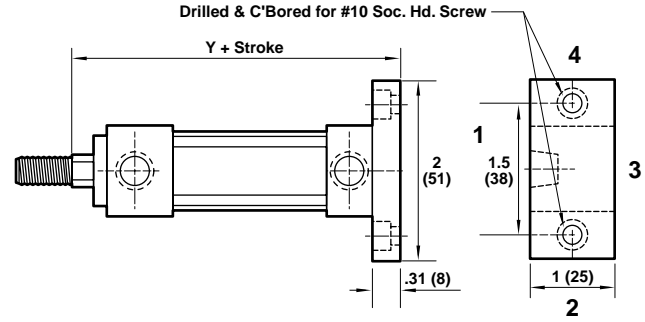
### Flush Mount – TF, VTF, ETF



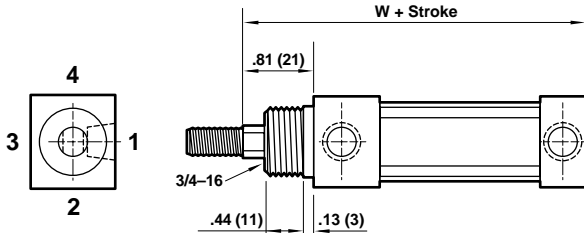
### Front Flange Mount – TFR, VTFR, ETFR



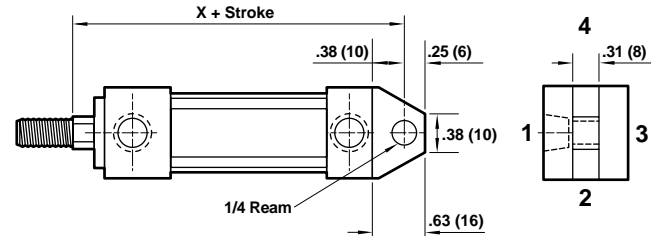
### Rear Flange Mount – TFC, VTFC, ETFC



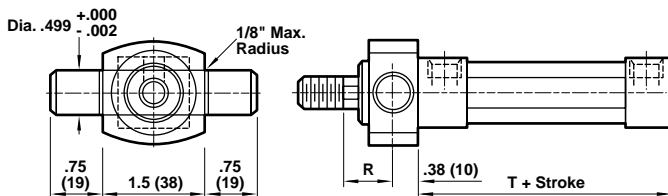
### Nose Mount – TSR, VTSR, ETSR



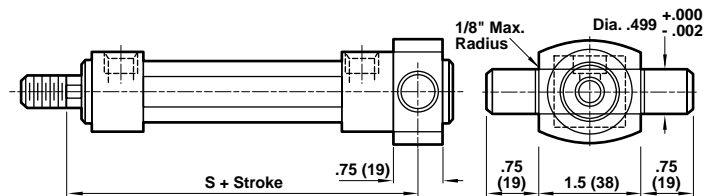
### Clevis Mount – TC, VTC, ETC



### Head Trunnion Mount\* – THT, VTHT, ETHT



### Back Trunnion Mount\* – TBT, VTBT, ETBT



\*Configured as special at factory

Series T: Quad Ring Seals  
Series VT: Block-Vee Seals  
Series ET: Ecology Seals

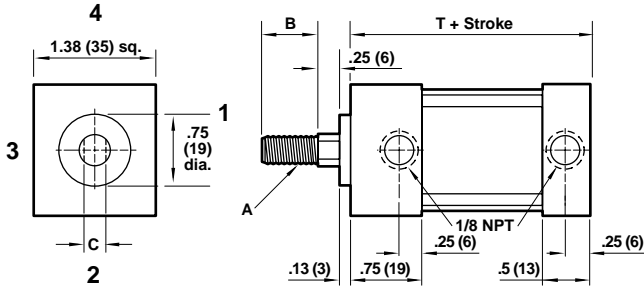
	Series T	Series ET & VT
R	.44 (11)	.44 (11)
S	2.81 (71)	3.19 (81)
T	1.81 (46)	2.19 (56)
U	1.94 (49)	2.31 (59)
V	1.38 (35)	1.75 (45)
W	2.63 (67)	3 (76)
X	2.56 (65)	2.94 (75)
Y	2.5 (64)	2.88 (73)
Z	2.38 (60)	2.75 (70)

NOTE: For spring return cylinders add an additional stroke length to dimensions.

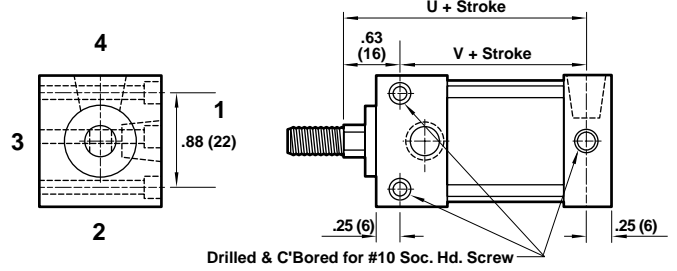


## Series T, ET, VT (1-1/8" Bore, 5/16" and 3/8" Rods)

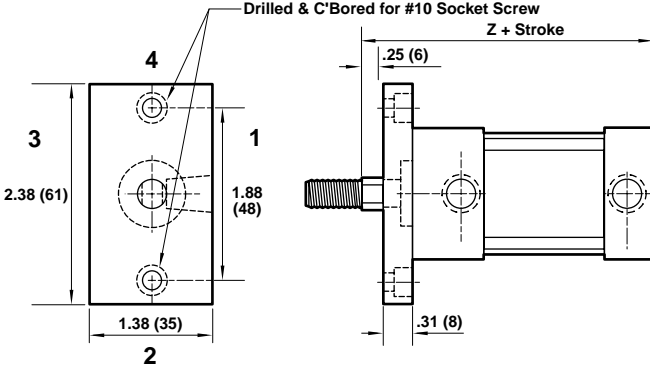
### Standard Cylinder (TNM, VTNM, ETNM)



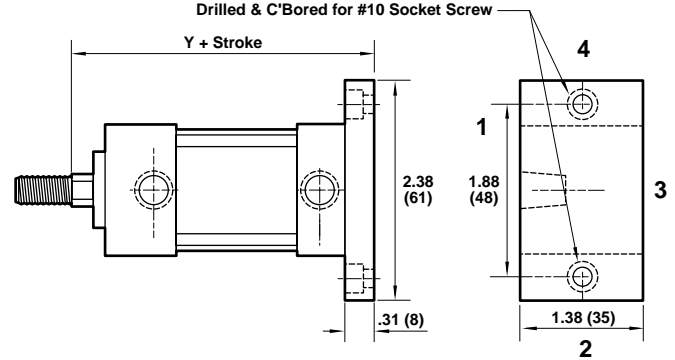
### Flush Mount – TF, VTF, ETF



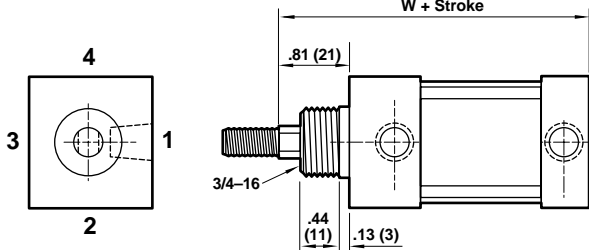
### Front Flange Mount – TFR, VTFR, ETFR



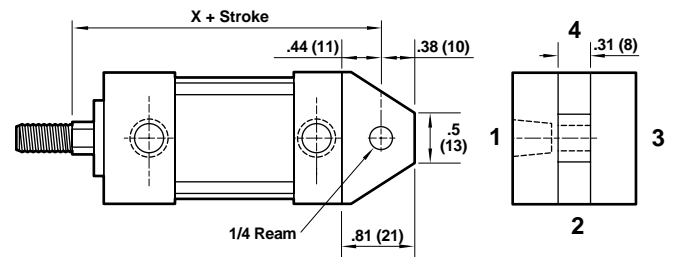
### Rear Flange Mount – TFC, VTFC, ETFC



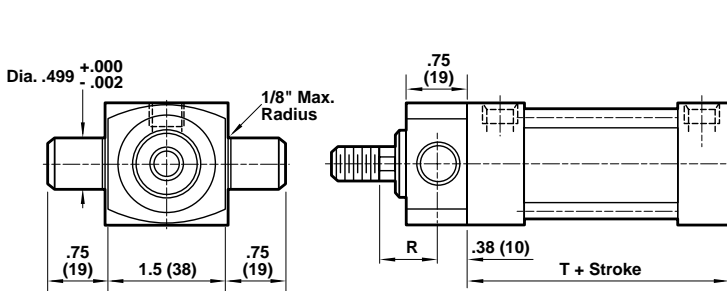
### Nose Mount – TSR, VTSR, ETSR



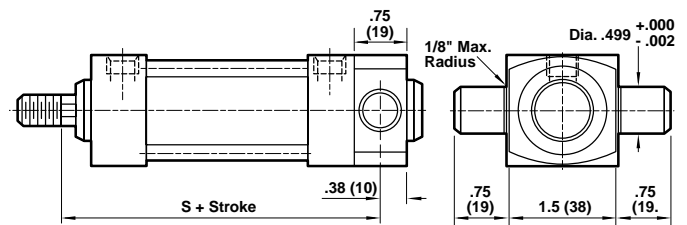
### Clevis Mount – TC, VTC, ETC



### Head Trunnion Mount\* – THT, VTHT, ETHT



### Back Trunnion Mount \*- TBT, VTBT, ETBT



\*Configured as special at factory

	Piston Rod	
	5/16 Diameter	3/8* Diameter
A	5/16-18	3/8-24
B	.63 (16)	.75 (19)
C	.25 (6)	.31 (8)

\* 3/8" dia. piston rod will be furnished as an option only if specified.

	Series T	Series ET, VT
R	.44 (11)	.44 (11)
S	2.81 (71)	3.19 (81)
T	1.81 (46)	2.19 (56)
U	1.94 (49)	2.31 (59)
V	1.31 (33)	1.69 (43)
W	2.63 (67)	3 (76)
X	2.63 (67)	3 (76)
Y	2.5 (64)	2.88 (73)
Z	2.38 (60)	2.75 (70)

**NOTE:** Series T, ET & VT 1-1/8" Bore Cylinders are available with adjustable cushions. Increase dimensions T through Z by 9/16" for one cushion and by 1-1/8" for both ends cushioned. (See "Ordering Procedure" for details.) For spring return cylinders add an additional stroke length to above dimensions.



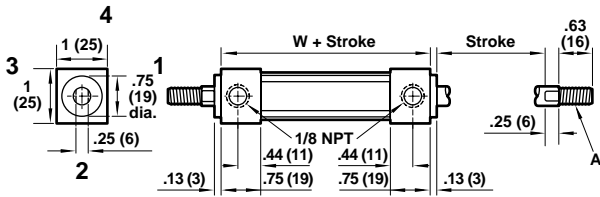
# Tiny Tim Series Actuators

All Dimensions in Inches (mm)

## Series DT, EDT, VDT (Double Rod End)

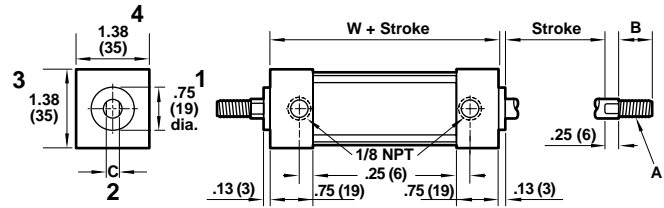
### 3/4 Bore

#### Standard Cylinder (DTNM, VDTNM, EDTNM)

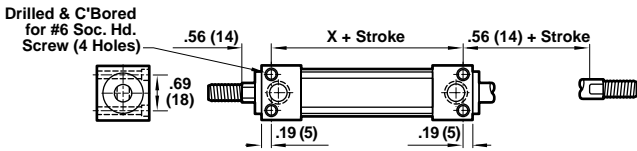


### 1-1/8 Bore

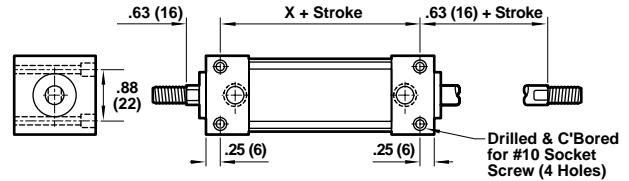
#### Standard Cylinder (DTNM, VDTNM, EDTNM)



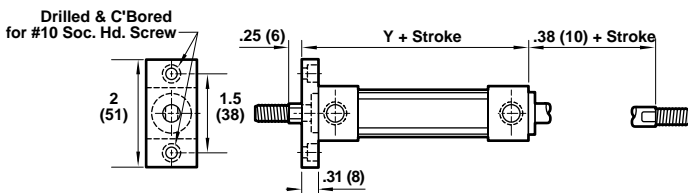
#### Flush Mount – DTF, VDTF, EDTF



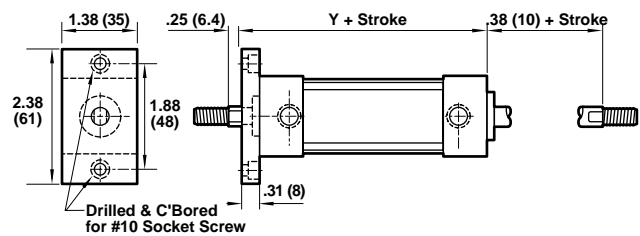
#### Flush Mount – DTF, VDTF, EDTF



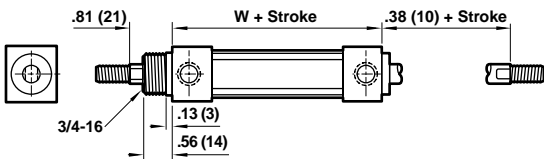
#### Front Flange – DTFR, VDTFR, EDTFR



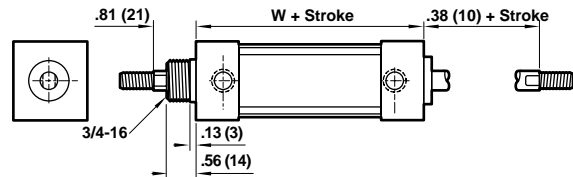
#### Front Flange – DTFR, VDTFR, EDTFR



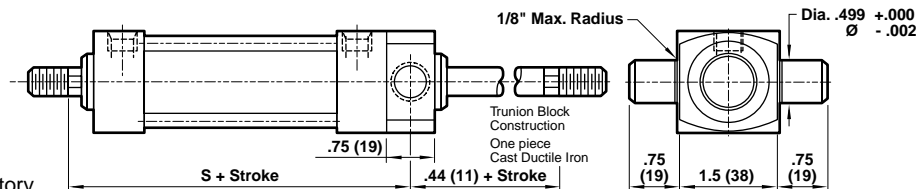
#### Nose Mount – DTSR, VDTSR, EDTSR



#### Nose Mount – DTSR, VDTSR, EDTSR



#### Trunnion Mount \*- DTHT, VDHT, EDHT



\*Configured as special at factory

	Piston Rod	
	5/16 Diameter	3/8* Diameter
A	5/16-18	3/8-24
B	.63 (16)	.75 (19)
C	.25 (6)	.31 (8)

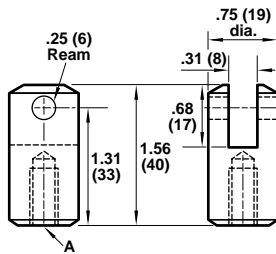
\* 3/8" dia. piston rod will be furnished as an option only if specified.

	3/4" Bore		1-1/8" Bore	
	DT	VDT & EDT	DT	VDT & EDT
S	2.81 (71)	3.19 (81)	2.81 (71)	3.19 (81)
W	2.06 (52)	2.44 (62)	2.06 (52)	2.44 (62)
X	1.69 (43)	2.06 (52)	1.56 (40)	1.94 (49)
Y	2.38 (60)	2.75 (70)	2.38 (60)	2.75 (70)

**NOTE:** Series DT, VDT & EDT 1-1/8" bore cylinders are available with adjustable cushions. Increase dimensions S through Y by 9/16" for one cushion and by 1-1/8" for both ends cushioned.

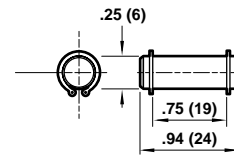


### Rod Clevis (includes pin)



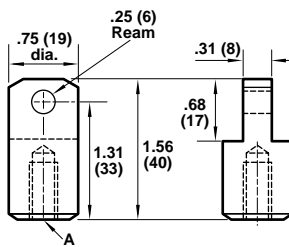
Part Number	Thread
40035	5/16-18
40036	3/8-24

### Pin



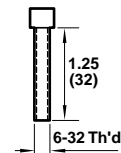
Part Number – 49085  
(includes snap rings)

### Rod Eye



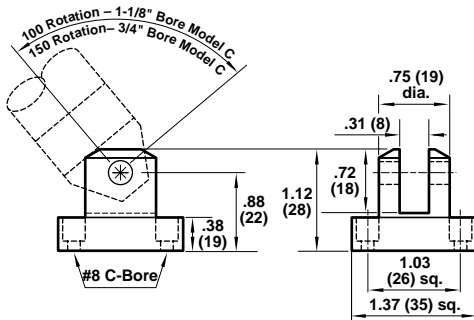
Part Number	Thread
40042	5/16-18
40043	3/8-24

### Mounting Screw



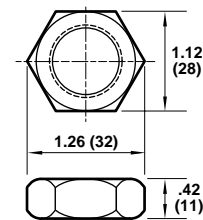
Part Number – 51043  
Used on model TF, VTF, and ETF 3/4" bore actuators

### Clevis Bracket (includes pin)



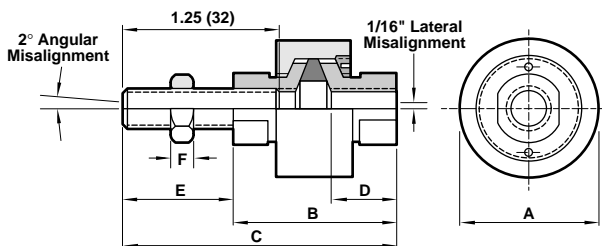
Part Number – 40038

### Mounting Nut



Part Number – 52010  
Used on model TSR, VTSR, ETSR actuators

### Rod Aligners (includes jam nut)



Rod Aligners				
PN	RA-25	RA-31C	RA-32	RA-38
Thread	1/4-28	5/16-18	5/16-24	3/8-24
A	1 (25)	1 (25.4)	1 (25)	1 (25)
B	1.38 (35)	1.38 (35)	1.38 (35)	1.38 (35)
C	2.13 (54)	2.13 (54)	2.13 (54)	2.13 (54)
D	.5 (13)	.5 (13)	.5 (13)	.5 (13)
E	.75 (19)	.75 (19)	.75 (19)	.75 (19)
F	.16 (4)	.19 (5)	.19 (5)	.22 (6)



# Tiny Tim Series Actuators

All Dimensions in Inches (mm)

## Reed Switches

PS01-B and PS04-B are compact and low profile switches when mounted on the cylinder tie rods. Each switch has a plug allowing electrical disconnection without removing or changing the adjustment of the switch on the cylinder.

Reed switches are constructed of two overlapping ferromagnetic reeds (nickel-iron) which are hermetically sealed in a glass tube with the ends aligned and a small gap between them.

When an external magnetic force is applied, the reeds assume opposite polarity and the ends of the reeds are mutually attracted and contact, completing the circuit.

Due to the light weight and small gap, very fast action is obtained. They will close in 2 ms and release in 0.1 ms. Caution should be observed when using reed switches in sensitive circuits since they can introduce noise into the circuit due to bounce and vibration occurring from the mechanical closing of the reeds.

Reed switches require a magnetic material (located in the piston) with a polarity that is axial in orientation to actuate the switch.

**Note:** Cylinders modified for use with a reed switch will have a magnetic strip on the piston in place of the Teflon® wear strip.

## Technical Information

Working Temperature	Min. -20°F (°C) Max. 175°F (°C)
Operating Time	On 2 ms Off .1 ms
Repeatability	.015 inch
Vibration resistance	50 to 1000 Hz
Shock resistance	50g
Minimum magnetic field to actuate	85 gauss (axial)
Maximum switch current	see chart
Voltage range	see chart
Maximum switch power	30W

**Note:** A piston modified for a reed switch will not work with a hall effect switch.

## Reed Switch Quick Reference Chart

Switch Part Number	Type	Max. VA (Watt)	Max. Switch Current Resistance	Voltage Range AC-DC	Light	Hysteresis	Varistor	Plug-In	Wire Length
PS01-B	S.P./S.T. N.O.	*50	*1 Amp	5-250	Yes	.03	Yes	Yes	114"
PS04-B	S.P./S.T. N.O.	*50	*3 Amp	0-250	No	.03	No	Yes	114"

\*For inductive loads use 70% of the ratings.

## PS01-B Switch & Bracket For Tiny Tim Cylinders

Part #	Fits
PS01-B7T	3/4" Bore
PS01-B11T	1-1/8" Bore

## PS04-B Switch & Bracket For Tiny Tim Cylinders

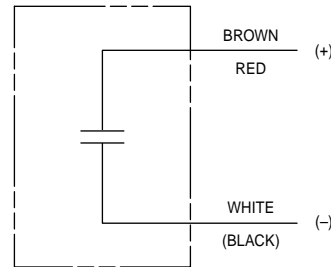
Part #	Fits
PS04-B7T	3/4" Bore
PS04-B11T	1-1/8" Bore

### How to Order

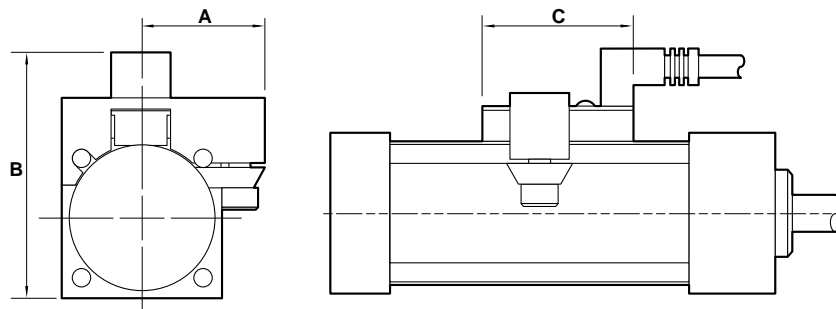
ETF-2 PS01-B 7T (22) 3/4 x 5  
 — Switch Positions  
 — Switch and Bracket Assy.  
 — Quantity

### How to Order

ETF-PS-3/4 x 5  
 — Piston modification only (no switch)



PS01-B, PS04-B



Series	Bore	A	B	C
T	.75 (19)	.94 (24)	1.77 (45)	1.94 (49)
VT	1.13 (29)	1.06 (27)	2.56 (65)	
ET				

**NOTE:** PS Option add 1/2" to overall length of cylinder.

Series	Min. Stroke	Min. Stroke (2) Switches Same Side
T	.75 (19)	2 (51)
VT & ET	.56 (14)	1.63 (41)



## Hall Effect Switches

Hall effect switches are a non-mechanical switch (no moving parts), which take the supply current and place it within a magnetic field, generating a voltage output. Hall effect switches are continually on, operating at a low voltage level (low ground), until the internal magnetic field is disturbed by the switch actuating magnetic. The built-in amplifier then boosts the output signal to a usable level. Since there are no moving parts, hall effect switches can operate in sensitive areas without sending interference or noise into the circuit. Hall effect switches require a magnetic material (located on the piston) with a polarity that is longitudinal in orientation to actuate the switch.

**Note:** A piston modified for a hall effect switch will not work with a reed switch.

## Technical Information

Working Temperature	Min. 23°F (°C) Max. 257°F (°C)
Operating Time	On 2 ms Off .1 ms
Repeatability	.001 inch
Vibration resistance	5 to 1000 Hz
Shock resistance	30g @ 11 ms
Minimum magnetic field to actuate	85 gauss (longitudinal)

### How to Order

ETF-2 HS2-7T (22) 3/4 x 5  
 ——— Switch Positions  
 ——— Switch and Bracket Assy.  
 ——— Quantity

### How to Order

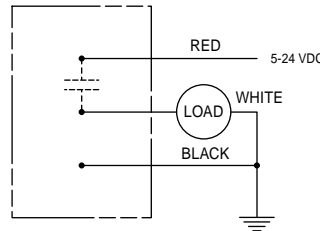
ETF-HS-3/4 x 5  
 ——— Piston modification only  
 (no switch)

## Hall Effect Switch Quick Reference Chart

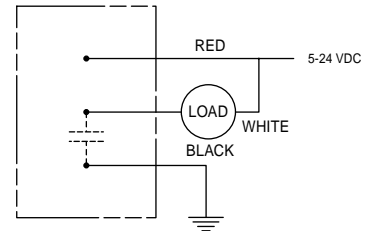
Switch Part Number	Type	Max. VA (Watt)	Max. Switch Current Resistance	Voltage Range DC	Light	Diode	Plug-In	Wire Length
HS1	N.O. Sourcing (PNP)	30	*1 Amp	5-24	No	Yes	No	108"
HS2	N.O. Sourcing (PNP)	30	*1 Amp	5-24	Yes	Yes	No	108"
HS3	Sinking (NPN)	30	*1 Amp	5-24	No	Yes	No	108"

\*For inductive loads use 70% of the ratings.

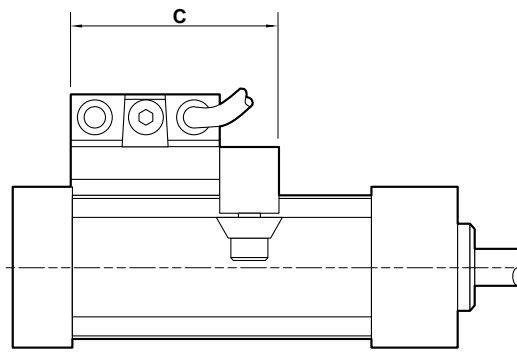
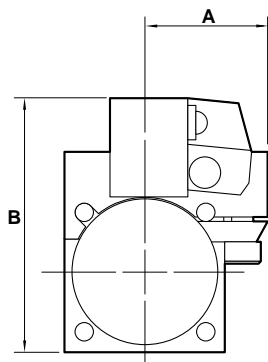
HS1 Switch & Bracket		HS2 Switch & Bracket		HS3 Switch & Bracket	
Part #	Fits	Part #	Fits	Part #	Fits
HS1-7T	3/4" Bore	HS2-7T	3/4" Bore	HS3-7T	3/4" Bore
HS1-11T	1-1/8" Bore	HS2-11T	1-1/8" Bore	HS3-11T	1-1/8" Bore



HS1, HS2-SOURCING (PNP)



HS3-SINKING (NPN)



Series	Bore	A	B	C
T	.75 (19)	.94 (24)	1.81 (46)	1.78 (45)
VT	1.13 (29)	1.06 (27)	2.19 (56)	
ET				

**NOTE:** PS Option add 1/2" to overall length of cylinder.

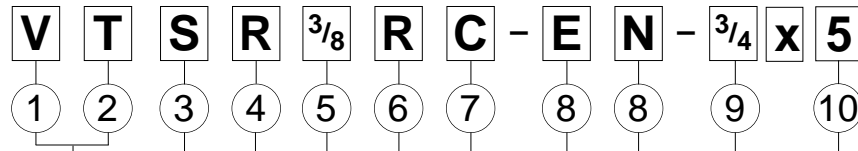
Series	Min. Stroke	Min. Stroke (2) Switches Same Side
T	.75 (19)	2.5 (64)
VT & ET	.56 (14)	2.44 (62)



# Tiny Tim Series Actuators

All Dimensions in Inches (mm)

## T, VT, and ET Product Ordering Information



### Single Rod End Models

- T = Quad ring piston seal, block – vee rod seal
- VT = Block-vee piston and rod seals
- ET = Impact dampening piston seals and block-vee rod seal

### Double Rod End Models

- DT = Quad ring piston, block – vee rod seal
- VDT = Block-vee piston and rod seals
- EDT = Impact dampening piston seals and block-vee rod seal

### Mounting Styles

- F = Flush mount
- C = CLevis mount
- SR = Nose mount
- FC = Rear flange mount
- FR = Front flange mount
- HT = Head trunnion mount
- BT = Back trunnion mount

### Rod Diameter

Specify 5/16" or 3/8"

### Single Acting Cylinders (3/4" and 1-1/8" bore cylinders)

- SR = Spring on rod end (spring retracts rod).
- SC = Spring on cap end (spring extends rod).
- Notes: Cylinder requires a stop tube equivalent to the stroke length.
- Cushions not available on spring end of cylinder.
- Standard spring forces for SR and SC = 3.5 lbs relaxed, 11.5 lbs compressed

### Cushions

- R = Rod end cushion
- C = Cap end cushion
- RC = Both ends cushioned
- Notes: Available on 1-1/8" bore cylinders only.
- 1/4" effective cushion length.
- Add 9/16" to overall length of cylinder for each cushion.
- Cushion not available on spring end of a single acting cylinder.

### Options

- A = T and VT stroke adjustment. (Specify length of adjustment)
- AA = ET stroke adjustment (specify length of adjustment) Note: This option adds 1/2" to overall cylinder length.
- EN = Electroless nickel plating (includes option S).
- \*†EV = Pneumatic valve (specify position 1, 2, 3, or 4)
- \*L = Port location other than standard. (Specify location)
- PR = Plain rod, no thread
- RX = Rod extension over standard. (Specify length)
- S = Stainless steel tie rods and nuts.
- SS = Chrome-plated stainless steel piston rod.
- \*†SV = Stroke signal valve. (specify position 1, 2, 3, or 4)
- TX = Rod thread extension over standard (specify length)
- V = Viton® seals. -20° to 350°F temperature range.

**Bore** (Specify 3/4" or 1-1/8")

**Stroke (inches)**

\* Designate head position first, and cap position last

† Not available on 3/4" and 1-1/8" bore Series T





# NFPA interchangeable Tiny Tim Air Actuators

## Series TA, TAV, TAE

**1 Heads and Caps:** Corrosion resistant alloy

**2 Rod Bushing:** Oil-filled, sintered iron bushing.

**3 Rod Seal:** Carboxylated Nitrile Block-vee for maximum life and efficiency.

**4 Piston and Rod Assembly:** Full diameter thread into the piston, secured with red Loctite® to resist shock and vibration.

**5 Tie Rods:** Pre-stressed to maintain rigidity. Tie rod nuts are recessed into the head or caps for compactness and clean appearance.

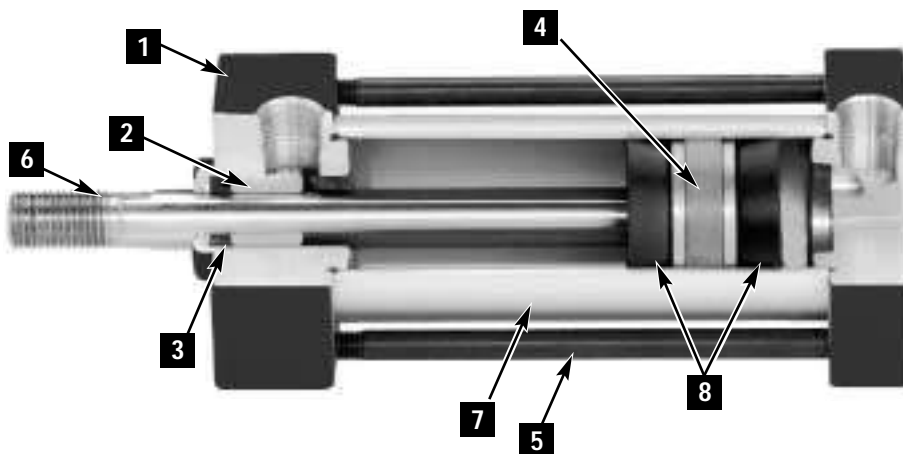
**6 Piston Rod:** Hard chrome plated steel. Milled wrench flats and full diameter thread for maximum rod strength. 303 hard chrome plated stainless steel available at extra cost.

**7 Tube:** Hard anodized aluminum tube with micro-inch finish for low breakaway and long seal life.

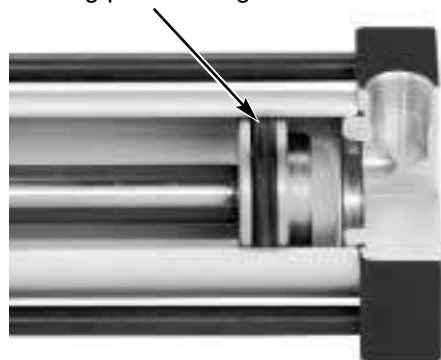
**8 Impact Dampening Seals:** Impact dampening seals specifically designed piston incorporated energy absorbing seals to dissipate the forces generated during impact without increasing envelope dimensions. Not available for cylinders with oversize rods. Not recommended for applications that require 100% repeatable stroke increments, or for applications that exceed the pounds stoppable capacities shown on ACT-5-14 at the various recommended piston speeds.

## Series TAE

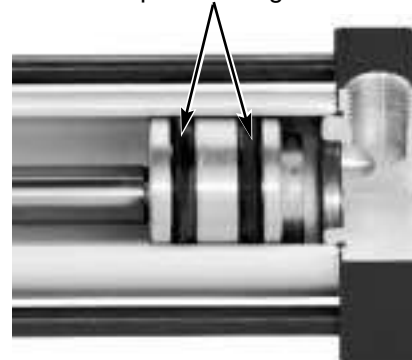
Series TAE features impact dampening piston design.



Series TA  
Quad Ring piston design



Series TAV  
Block-V piston design



- 3/4", 1", and 1-1/8" bore
- Single and double rod end styles
- Rated 150 psi air
- -20° to 200°F (-29° to 107°C) operating temperatures
- Viton seals optional for higher temperatures
- Designed to conform with NFPA (T3.6.11) 1972, and interchange with Tom Thumb's Series A and AV mounting dimensions.



**Minimum Breakaway Pressures (PSIG)**  
Non-cushioned cylinders, mounted horizontally with no load on the piston rod.

Cylinder Bore (inches)	Model	PSIG
3/4"	Series TA	12 (DTA-15)
	Series TAE-TAV	8 (DTAE, DTAV-11)
1", 1-1/8"	Series TA	7 (DTA-11)
	Series TAE-TAV	5 (DTAE, DTAV-9)

#### Temperatures

Buna N Seals: -20° to 200°F (-29° to 107°C)  
Viton Seals: -40° to 350°F (-40° to 175°C)

#### Technical Information

Medium:

Compressed air, filtered, lubricated or non-lubricated

Operation:

Double acting

Operating Pressure:

150 PSI (10 bar)

Operating Temperature:

-20° to 200°F (-29° to 107°C)

Cylinder Diameters:

Nominal Inch:

3/4", 1-1/8"

#### Effective Piston Areas

To determine approximate force/lb multiply area by applicable pressure

Bore	Head End*	Cap End
3/4"	.393 sq. in.	.442 sq. in.
1"	.917 sq. in.	.994 sq. in.
1-1/8"	.884 sq. in.	.994 sq. in.

\* With standard rods

#### Energy Absorption Capacity of Impact Dampening Seals

Size	In./Lbs of Kinetic Energy Absorbable	Pounds* Stoppable at Following Speeds					
		6 in/sec	12 in/sec	24 in/sec	36 in/sec	48 in/sec	60 in/sec
3/4"	1.5	32.4	8.0	2.0	.8	.41	.23
1"	3	79.2	16	4	1.8	1	.59
1-1/8"							

\*Pounds must include piston and rod assembly weight

# Series TA NFPA Interchangeable Tiny Tim Actuators

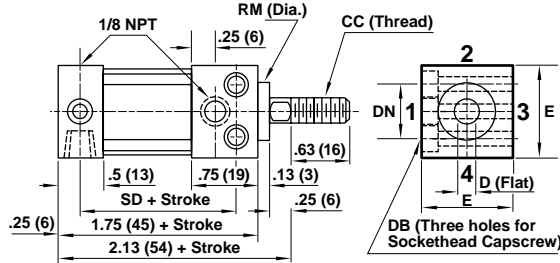


All Dimensions in Inches (mm)

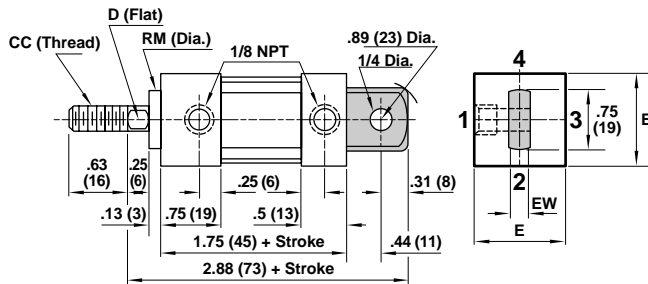
Bore	3/4	1*	1-1/8
BC	1.06 (27)	1.41 (36)	1.59 (40)
CC	1/4-28	5/16-24	3/8-24
D	.22 (6)	.25 (6)	.31 (8)
DB	8-32	10-32	10-32
DN	.63 (16)	.88 (22)	1 (25)
E	1 (25)	1.38 (35)	1.5 (38)
EW	.25 (6)	.38 (10)	.38 (10)
KM	5/8-18	3/4-16	3/4-16
N	.75 (19)	1 (25)	1.13 (29)
NT	8-32 x 3/16 DP	10-32 x 1/4 DP	10-32 x 1/4 DP
R	.5 (13)	.88 (22)	1 (25)
RM	.63 (16)	.75 (19)	.75 (19)
RM <sub>1</sub>	.69 (18)	.81 (21)	.81 (21)
RT	8-32 x 1/4 DP	8-32 x 1/4 DP	10-32 x 1/4 DP
SD	1.31 (33)	1.25 (32)	1.25 (32)
SN	1.31 (33)	1.25 (32)	1.25 (32)
TF	1.5 (38)	1.88 (48)	2 (51)
TN	.63 (16)	.88 (22)	1 (25)
UF	2 (51)	2.38 (60)	2.5 (64)

\* Piston Dia. of 1" cylinders is 1-1/8" diameter.

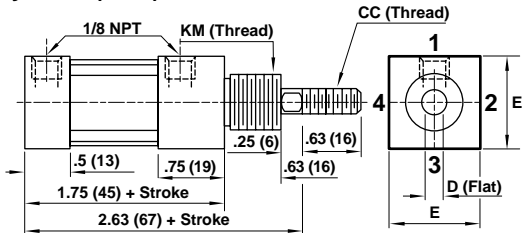
## Style 2 – (MS8) Side Through Holes (not available w/oversized rod)



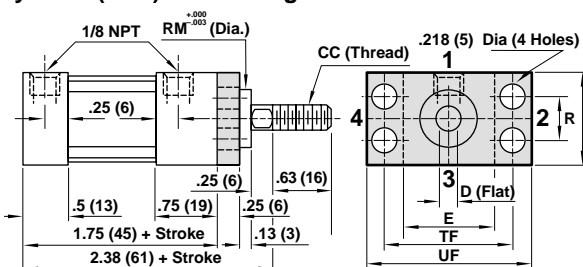
## Style 4 – (MP3) Cap Eye



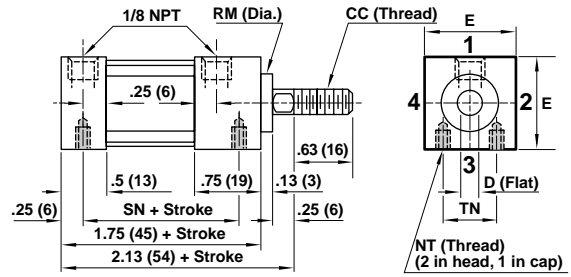
## Style 6 – (MN1) Threaded Nose



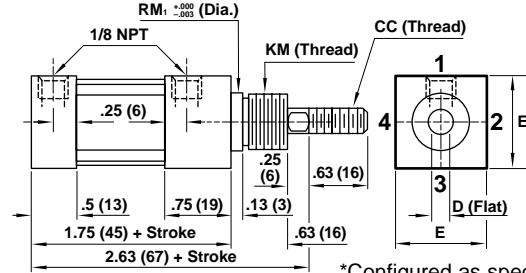
## Style 8 – (MF1) Head Flange



## Style 1 – (MS9) Side Tapped

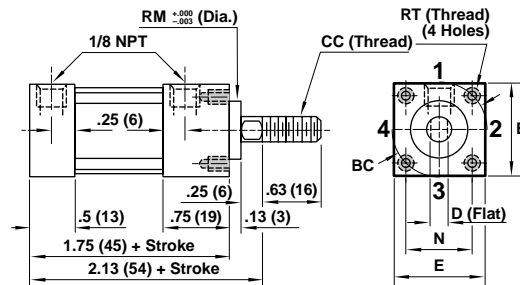


## Style 3 – (MNR1) Threaded Male Rabbet\*

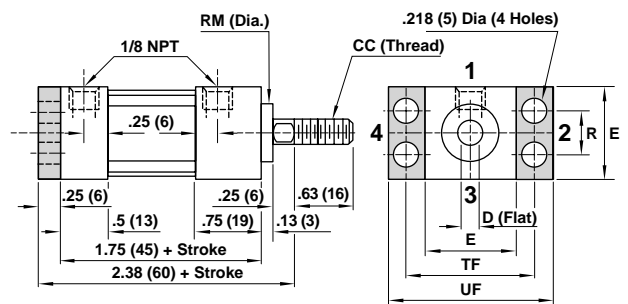


\*Configured as special at factory

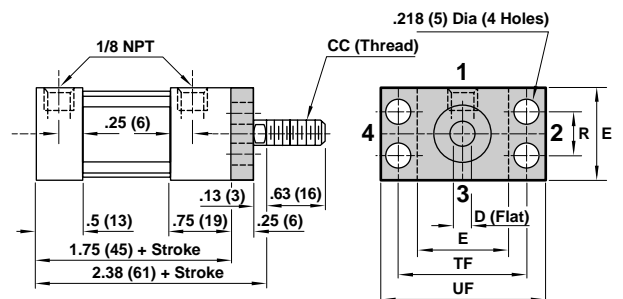
## Style 5 – (MR1) Head Male Rabbet



## Style 7 – (MF2) Cap Rectangular Flange



## Style 9 – (MF7) Head Flange (No pilot)





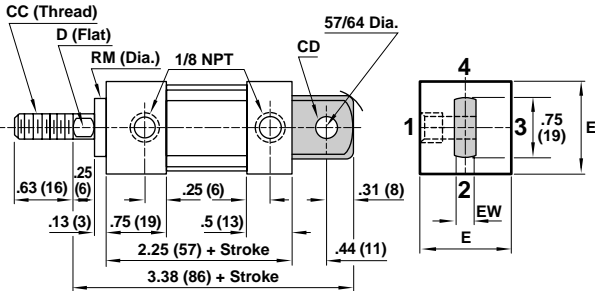
# Series TAE & TAV NFPA Interchangeable Tiny Tim Actuators

All Dimensions in Inches (mm)

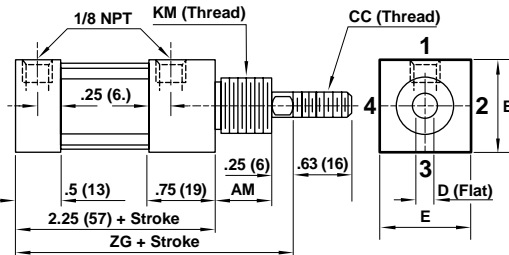
Bore	3/4	1*	1-1/8
AM	.63 (16)	.63 (16)	.88 (22)
BC	1.06 (27)	1.41 (36)	1.59 (40)
CC	1/4-28	5/16-24	3/8-24
CD	.25 (6)	.38 (10)	.38 (10)
D	.22 (6)	.25 (6)	.31 (8)
DB	8-32	10-32	10-32
DN	.63 (16)	.88 (22)	1 (25)
E	1 (25)	1.38 (35)	1.5 (38)
EW	.25 (6)	.38 (10)	.38 (10)
KM	5/8-18	3/4-16	1-14
N	.75 (19)	1 (25)	1.13 (29)
NT	8-32 x 3/16 DP	10-32 x 1/4 DP	10-32 x 1/4 DP
R	.5 (13)	.88 (22)	1 (25)
RM	.63 (16)	.75 (19)	.75 (19)
RM <sub>1</sub>	.69 (18)	.81 (21)	1.06 (27)
RT	8-32 x 1/4 DP	8-32 x 1/4 DP	10-32 x 1/4 DP
SD	1.81 (46)	1.75 (45)	1.75 (45)
SN	1.81 (46)	1.75 (45)	1.75 (45)
TF	1.5 (38)	1.88 (48)	2 (51)
TN	.63 (16)	.88 (22)	1 (25)
UF	2 (51)	2.38 (60)	2.5 (64)
ZG	3.13 (79)	3.13 (79)	3.38 (86)

\* Piston Dia. of 1" cylinders is 1-1/8" diameter.

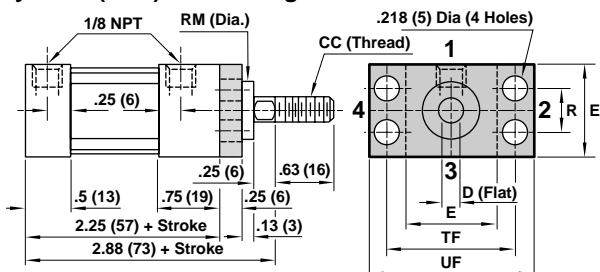
## Style 4 – (MP3) Cap Eye



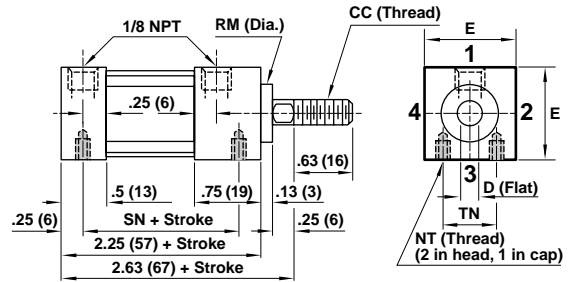
## Style 6 – (MN1) Threaded Nose



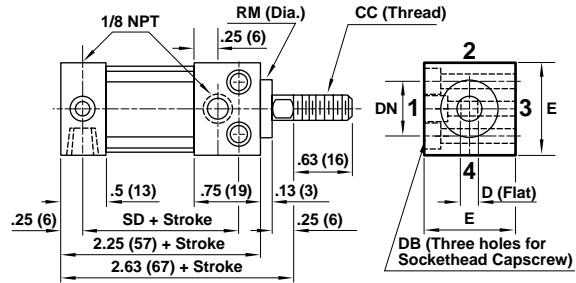
## Style 8 – (MF1) Head Flange



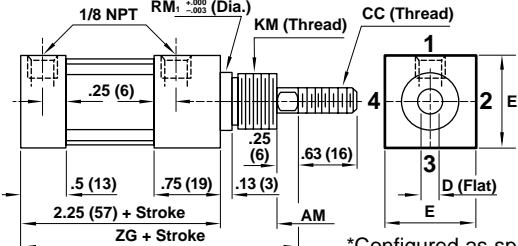
## Style 1 – (MS9) Side Tapped



## Style 2 – (MS8) Side Through Holes (not available w/oversized rod)

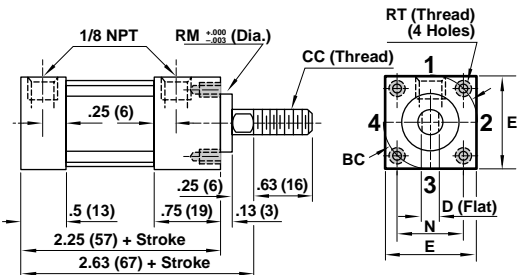


## Style 3 – (MNR1) Threaded Male Rabbit\*

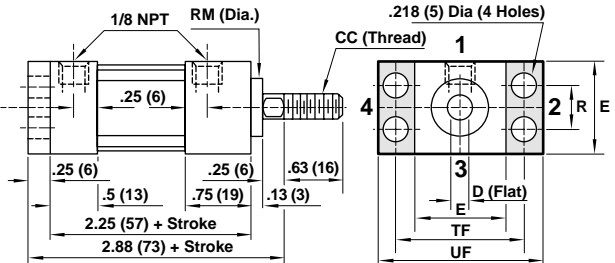


\*Configured as special at factory

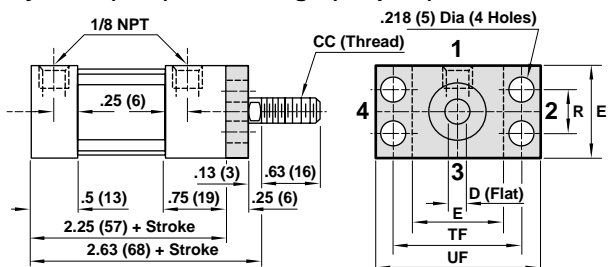
## Style 5 – (MR1) Head Male Rabbit



## Style 7 – (MF2) Cap Rectangular Flange



## Style 9 – (MF7) Head Flange (No pilot)



# Tiny Tim Series NFPA Interchangeable Actuators

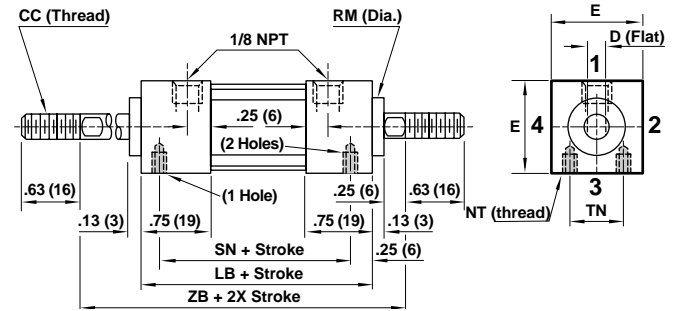
All Dimensions in Inches (mm)



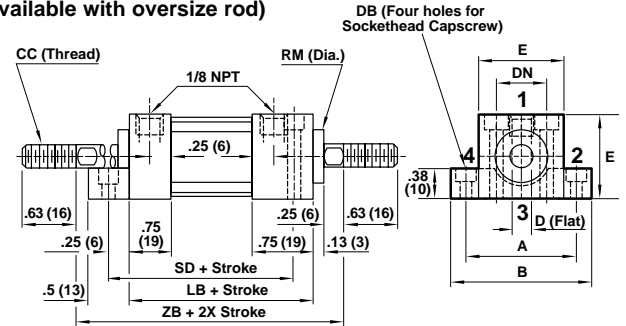
Bore	3/4		1*		1-1/8	
	DTA	DTAE-DTAV	DTA	DTAE-DTAV	DTA	DTAE-DTAV
A	1.38 (35)		1.75 (45)		1.88 (48)	
AM	.63 (16)		.63 (16)		.63 (16)	.88 (23)
B	1.75 (45)		2.13 (54)		2.25 (57)	
BC	1.06 (27)		1.41 (36)		1.59 (40)	
CC	1/4-28		5/16-24		3/8-24	
D	.22 (6)		.25 (6)		.31 (8)	
DB	8-32		10-32		10-32	
DN	.63 (16)		.88 (22)		1 (25)	
E	1 (25)		1.38 (35)		1.5 (38)	
KM	5/8-18		3/4-16		3/4-16	1-14
LB	2 (51)	2.5 (64)	2 (51)	2.5 (64)	2 (51)	2.5 (64)
N	.75 (19)		1 (25)		1.13 (29)	
NT	8-32 x 3/16 DP		10-32 x 1/4 DP		10-32 x 1/4 DP	
R	.5 (13)		.88 (22)		1 (25)	
RM	.63 (16)		.75 (19)		.75 (19)	
RM <sub>1</sub>	.69 (18)		.81 (21)		.81 (21)	1.06 (27)
RT	8-32 x 1/4 DP		8-32 x 1/4 DP		10-32 x 1/4 DP	
SD	2.06 (52)	2.56 (65)	2 (51)	2.5 (64)	2 (51)	2.5 (64)
SN	1.56 (40)	2.06 (52)	1.5 (38)	2 (51)	1.5 (38)	2 (51)
TF	1.5 (38)		1.88 (48)		2 (51)	
TN	.63 (16)		.88 (22)		1 (25)	
UF	2 (51)		2.38 (60)		2.5 (64)	
ZB	2.75 (70)	3.25 (83)	2.75 (70)	3.25 (83)	2.75 (70)	3.25 (83)
ZR	3.25 (83)	3.75 (95)	3.25 (83)	3.75 (95)	3.25 (83)	3.75 (95)
ZT	3 (76)	3.5 (89)	3 (76)	3.5 (89)	3 (76)	3.5 (89)

\* Piston Dia. of 1" cylinders is 1-1/8" diameter.

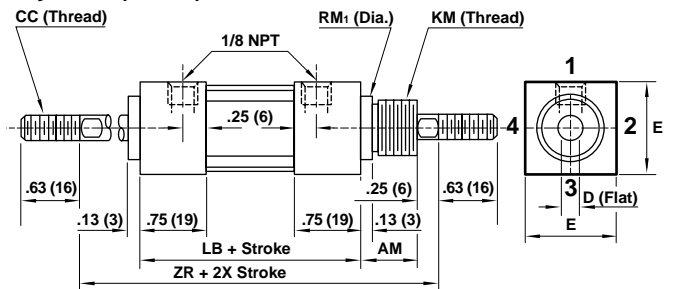
## Style 1 – (MS9) Side Tapped



## Style 2 – (MS8) Side Through Holes (Not available with oversize rod)

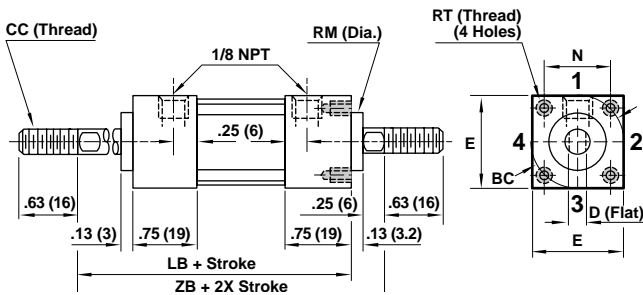


## Style 3 – (MNR1) Threaded Male Rabbet\*

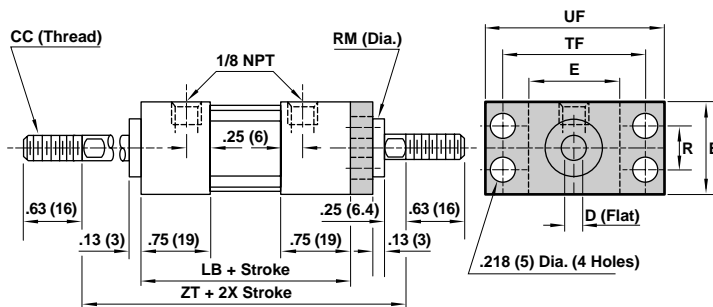


\*Configured as special at factory

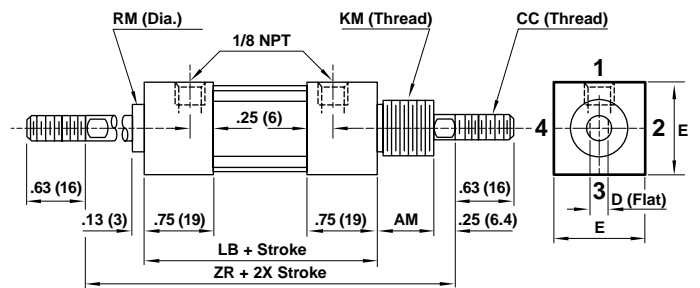
## Style 5 – (MR1) Head Male Rabbet



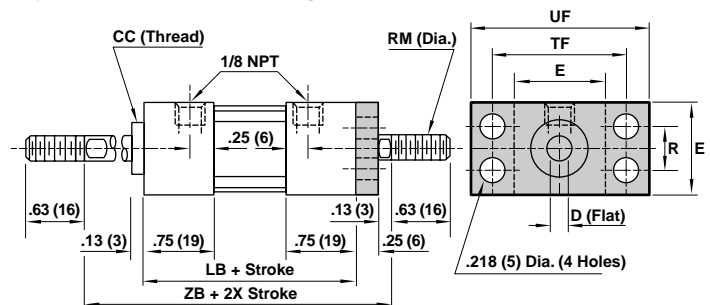
## Style 8 – (MF1) Head Flange



## Style 6 – (MN1) Threaded Nose



## Style 9 – (MF7) Head Flange (No pilot)

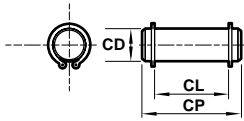




# Tiny Tim Series NFPA Interchangeable Actuators

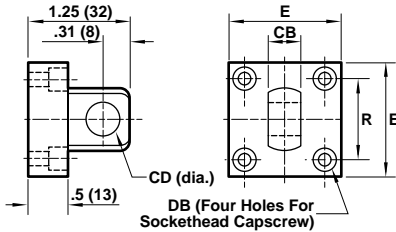
All Dimensions in Inches (mm)

## Pivot Pin



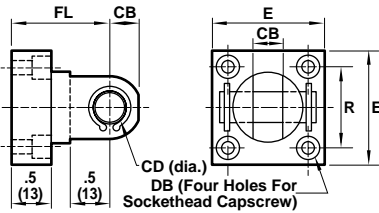
Cyl. Bore	Cyl. Series	Part No.	CD	CL	CP
3/4	All	49085	.25 (6)	.75 (19)	.94 (24)
1, 1-1/8	TA	49086	.25 (6)	.88 (22)	1.06 (27)
1, 1-1/8	TAV-TAE	49087	.38 (10)	.88 (22)	1.06 (27)

## Eye Bracket



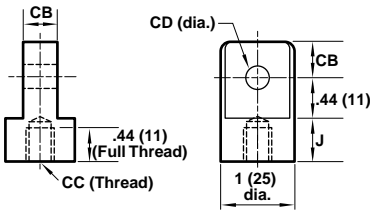
Cyl. Bore	Cyl. Series	Part No.	CD	CB	DB	E	R
3/4	TA, TAV-TAE	49069	.25 (6)	.25 (6)	6-32	1 (25)	.75 (19)
1 &	TA	49070	.25 (6)	.38 (10)	10-32	1.38 (35)	1 (25)
1-1/8	TAV-TAE	49071	.38 (10)	.38 (10)	10-32	1.38 (35)	1 (25)

## Clevis Bracket (includes pin)



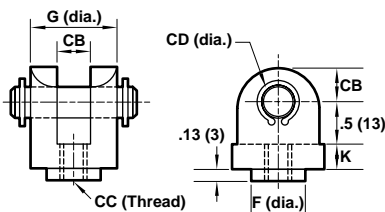
Cyl. Bore	Cyl. Series	Part No.	E	R	FL	CB	CD	DB
3/4	TA, TAV-TAE	49072	1 (25)	.75 (19)	1.19 (30)	.25 (6)	.25 (6)	6-32
1 &	TA	49073	1.38 (35)	1 (25)	1.25 (32)	.38 (10)	.25 (6)	10-32
1-1/8	TAV-TAE	49074	1.38 (35)	1 (25)	1.25 (32)	.38 (10)	.38 (10)	10-32

## Rod Eye



Cyl. Bore	Cyl. Series	Part No.	CC	CD	CB	I	J
3/4	TA, TAV-TAE	49075	1/4-28	.25 (6)	.25 (6)	.5 (13)	.31 (8)
1	TA	49076	5/16-24	.25 (6)	.38 (10)	.75 (19)	.44 (11)
	TAV-TAE	49077	5/16-24	.38 (10)	.38 (10)	.75 (19)	.44 (11)
1-1/8	TA	49078	3/8-24	.25 (6)	.38 (10)	.75 (19)	.44 (11)
	TAV-TAE	49079	3/8-24	.38 (10)	.38 (10)	.75 (19)	.44 (11)

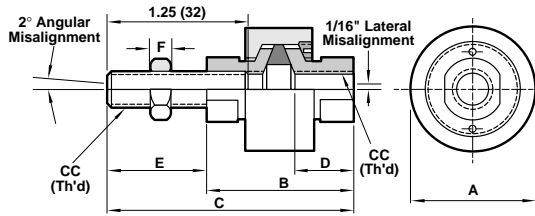
## Rod Clevis (includes pin)



Cyl. Bore	Cyl. Series	Part No.	CB	CD	F	G	K	CC
3/4	TA, TAV-TAE	49080	.25 (6)	.25 (6)	.44 (11)	.75 (19)	.19 (5)	1/4-28
1	TA	49081	.38 (10)	.25 (6)	.56 (14)	.88 (22)	.25 (6)	5/16-24
	TAV-TAE	49082	.38 (10)	.38 (10)	.56 (14)	.88 (22)	.25 (6)	5/16-24
1-1/8	TA	49083	.38 (10)	.25 (6)	.56 (14)	.88 (22)	.25 (6)	3/8-24
	TAV-TAE	49084	.38 (10)	.38 (10)	.56 (14)	.88 (22)	.25 (6)	3/8-24

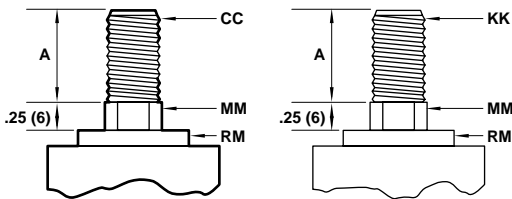


## Rod Aligners (includes jam nut)



Model	A	B	C	D	E	F	CC
RA-25	1 (25)	1.38 (35)	2.13 (54)	.5 (13)	.75 (19)	.16 (4)	1/4-28
RA-32	1 (25)	1.38 (35)	2.13 (54)	.5 (13)	.75 (19)	.19 (5)	5/16-24
RA-38	1 (25)	1.38 (35)	2.13 (54)	.5 (13)	.75 (19)	.19 (5)	3/8-24
RA-44	1.5 (38)	1.78 (45)	3 (76)	.69 (18)	1.22 (31)	.22 (6)	7/16-20
RA-50	1.5 (38)	1.78 (45)	3 (76)	.69 (18)	1.22 (31)	.25 (6)	1/2-20

## Oversize Rods – Optional Rod End Styles



Bore	Rod Size	MM	CC (Style A)	A	KK (Style B)	D	RM
3/4"	1	.25 (6)	1/4-28	.63 (16)	10-32	.22 (6)	.63 (16)
	2	.31 (8)	5/16-24	.63 (16)	1/4-28	.25 (6)	.63 (16)
1"	2	.31 (8)	5/16-24	.63 (16)	1/4-28	.25 (6)	.75 (19)
	4	.5 (13)	1/2-20	.75 (19)	7/16-20	.44 (11)	.75 (19)*
1-1/8"	3	.38 (10)	3/8-24	.63 (16)	5/16-24	.31 (8)	.75 (19)*
	4	.5 (13)	1/2-20	.75 (19)	7/16-20	.44 (11)	.75 (19)*

**Note:** Oversize rods are not available in Style 2, sizes 3/4" and 1" due to interference with the rod gland. See ACT-5-20 for cylinders equipped with modified rods or other optional equipment.

\* RM (Dia.) on Series TAV and DTAV 1" & 1-1/8" Sizes in Mounting Styles 5 and 8 is 1".

## Optional Equipment

### High temperature seals

Available for all seals and bore sizes when normal service requires the cylinder to operate at ambient temperatures ranging above 200° to 350°F ( 93° to 177°C). Specify Viton.

### Single Acting, Spring Return Actuators

Available for all Series and bore sizes. Add two times working stroke to envelope dimensions shown on ACT-5-16/17

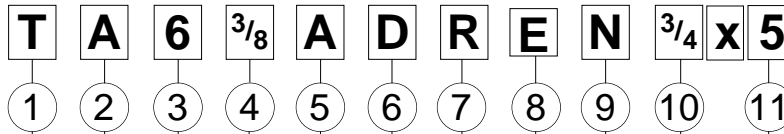
### Adjustable Cushions

Insert type adjustable cushions are available when required. Add 1/2" to cylinder length per cushioned end.

**Note:** Not available with 1/2" diameter rods.



### NFPA Product Ordering Information



**Series**

Standard Single Rod End Models  
 TA = Quad ring piston seal, Block-V rod seal  
 TAV - Block-V piston and rod seals  
 TAE = Impact dampening piston seals, Block-V rod seal  
 Standard Double Rod End Models  
 DTA = Quad ring piston seal, Block-V rod seals  
 DTAV - Block-V piston and rod seals  
 DTAE = Impact dampening piston seals, Block-V rod seal

**Mounting Styles**

- 1 = Side Tapped
- 2 = Side through holes
- 4 = Cap eye
- 5 = Head male rabbet
- 6 = Threaded nose
- 7 = Cap rectangular flange
- 8 = Head flange
- 9 = Head flange (no pilot)

**Rod Diameter (Specify on all models)**

- 1/4"
- 5/16"
- 3/8"
- 1/2"

**Note:** 1/2" diameter rods are not available on Series TAE

**Rod End Thread Style**

(Specify "A" or "B" on all models)

Rod Size	Thd A	Thd B
1/4 ø	1/4-28	10-32
5/16 ø	5/16-24	1/4-28
3/8 ø	3/8-24	5/16-24
1/2 ø	1/2-20	7/16-20

**Adjustable Cushions\***

- DR = Rod end only
- DC = Cap end only
- D = Both ends

\* Add 1/2" per cushioned end.

**Stroke**

**Bore**

- 3/4"
- 1"
- 1-1/8"

**Options**

- RX = Rod extension (specify length)
- TX = Rod thread extension (specify length)
- T = Special Rod thread (specify length)
- PR = Plain rod end
- PS = Magnetic piston\*\*
- L = Port location other than standard (specify location)
- ST = Stop tube. (specify length and location)
- A = Stroke adjust (specify length of adjustment)
- AA = Stroke adjustment (double piston design)
- V = Viton seals
- SS = Piston Rod (chrome plated stainless steel)
- EN = Electroless nickel plating (includes option S)
- S = Stainless steel tie rods & nuts

**Single Acting Actuators**

- SR = Spring on Rod End
- SC = Spring on Cap End

\*\* PS option adds 1/2" to overall length.



# Round Line Stainless Steel Body Air Actuator

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**ACT-6-6 – Single Acting Spring Return – Nose Mount**



**ACT-6-7 – Single Acting Spring Return – Pivot Mount**



**ACT-6-8 – Single Acting Spring Return – Front Block Mount**



**ACT-6-9 – Single Acting Non-rotating – Nose Mount**



**ACT-6-10 – Single Acting Non-rotating – Pivot Mount**



**ACT-6-11 – Reverse Acting Spring Extend – Nose Mount**



**ACT-6-12 – Reverse Acting Spring Extend – Pivot Mount**



**ACT-6-13 – Double Acting – Nose Mount**



**ACT-6-14 – Double Acting – Pivot Mount**



**ACT-6-15 – Double Acting – Double End Mount**



**ACT-6-16 – Double Acting – Front Block Mount**



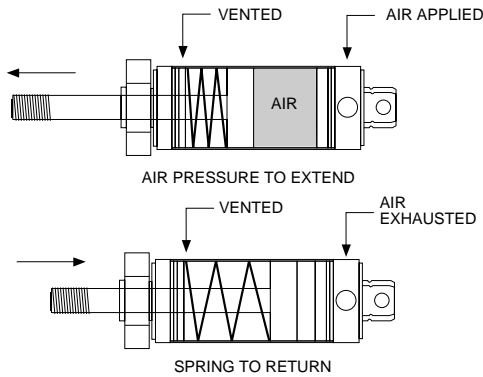
**ACT-6-17 – Double Acting Double Rod End – Double End Mount**



**ACT-6-20 – Position Sensing Systems**



# Operating Variations

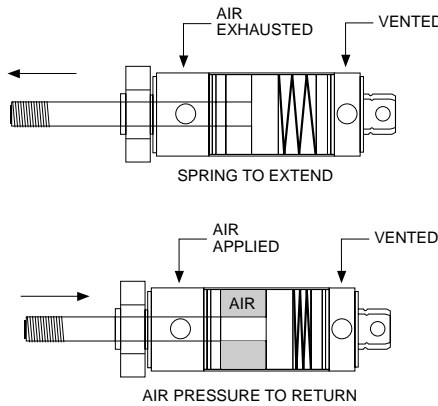


## Single Acting Spring Return Cylinders

Air introduced into the cylinder at the port furthest away from the rod actuates the cylinder extending the piston rod. A spring returns the piston to its original retracted position when pressure is removed from the cylinder.

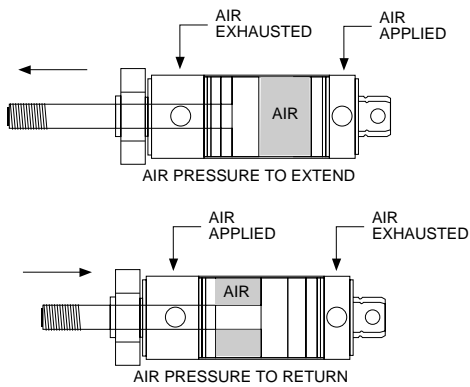
## Single Acting Non-Rotating Cylinders

Identical in operation to a Single Acting Spring Return Cylinder, Non-Rotating Cylinders incorporate a hexagonal shaped piston rod and bearing to prevent the rod from turning.



## Single Acting Spring Extend Cylinders

Air introduced into the cylinder at the port closest to the rod actuates the cylinder – retracting the piston rod. A spring returns the piston to its original extended position when pressure is removed from the cylinder.



## Double Acting Cylinders

Air pressure is used to both extend and retract the piston rod. Pressure applied to one end port of the cylinder moves the piston in the opposite direction as the air is exhausted from the other cylinder end.



## Specifications

### Operating Specifications

Fluids: Filtered, lubricated or non-lubricated, compressed air  
 Maximum Operating Pressure: 250 psig (17.2 bar)  
 Temperature Range\*:

Standard Nitrile Seals: -20° to 200°F (-29° to 93°C)  
 Viton Seals: -20° to 400°F (-29° to 205°C)

Lubrication: All Series S stainless steel body air cylinders are pre-lubricated at the time of assembly with a Teflon®-based grease. Cylinder life will be enhanced with the use of a properly maintained Lubricator. In the absence of a lubricator, it is recommended that a non-detergent, mineral-based oil be directly introduced into the cylinder periodically.

Side Loading: Cylinders are specifically designed to push and pull. Side loading of the piston rod should be avoided to ensure maximum operating performance and life. Care should be taken during installation to properly align the load to be moved with the centerline of the cylinder.

\*With dew point of supply air less than air temperature below 35°F (2°C)

### Materials of Construction

Cylinder Body: Type 304 Stainless Steel  
 Head Cap: Aluminum Alloy  
 Piston Rod: Type 303 Stainless Steel  
 Rod Bearing: Oil Impregnated Sintered Bronze  
 Piston: 2011-T3 Aluminum Alloy  
 Rod & Piston Seals: Nitrile  
 Pivot Bracket, Rod Clevis, Foot Bracket, Mounting Nut: Zinc Plated Carbon Steel

### Mounting Dimensions

All dimensions contained within this catalog are sufficiently accurate for general use. However, the manufacturer assumes no responsibility for errors or omissions. Certified prints are available upon request at a nominal charge.

### Port Sizes

Bore	7/16"	9/16"	3/4"	1-1/16"	1-1/4"	1-1/2"	2"	2-1/2"
Port Size	10-32	10-32	1/8" N.P.T.	1/8" N.P.T.	1/8" N.P.T.	1/8" N.P.T.	1/4" N.P.T.	1/4" N.P.T.

Bore Size	Rod Diameter (Hex <sup>†</sup> )	Force Factor (Area)	
		Extend	Retract
7/16"	3/16"	.15	.12
9/16"	3/16"	.25	.22
3/4"	1/4"	.44	.39
1-1/16"	*5/16"	.89	.61
1-1/4"	7/16"	1.23	1.08
1-1/2"	7/16"	1.77	1.62
2"	*5/8"	3.14	2.84
2-1/2"	*5/8"	4.91	4.61

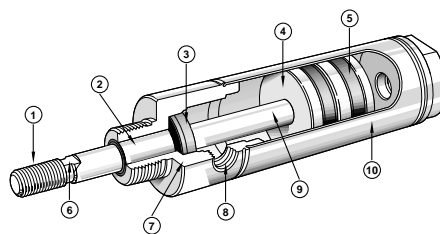
### Cylinder Output Formula

$$\text{Cylinder Output Force} = \text{Force Factor (Area)} \times \text{Air Line Pressure (psi)}$$

<sup>†</sup>Non-Rotating Cylinders have hex-shaped piston rods.

\*Non-Rotating 1-1/16" bore size uses a 3/8" hex piston rod.  
 2" and 2-1/2" bore not available

Bore Size	Spring Return Models		Spring Extend Models	
	With Piston Rod Retracted	With Piston Rod Extended	With Piston Rod Extended	With Piston Rod Retracted
7/16"	2	1	2	1
9/16"	4	2	4	2
3/4"	6	3	6	3
1-1/16"	6	3	6	3
1-1/4"	15	7.5	15	7.5
1-1/2"	12	6	12	6
2"	30	15	30	15



### Quality Cylinder Components for Dependable Service

- 1. Rod Threads** Roll-formed for superior strength and resistance to wear or breakage.
- 2. Bearing** Oil impregnated sintered bronze provides exceptional rod support, smooth rod movement and optimum cycle life
- 3. Rod Seal** Lip-type nitrile, pressure energized and wear compensating.
- 4. Piston** Solid aluminum alloy 2011-T3 is strong yet lightweight for low inertia. The piston is spin riveted to roll-formed piston rod threads for maximum strength.
- 5. Piston Seals** Lip-type nitrile seals are pressure energized and wear compensating. Excellent lubrication retention characteristics reduce seal friction, ensuring long life.
- 6. Wrench Flats** Broached wrench flats are standard on most models.
- 7. Head/Cap** Precision machined from 2011-T3 solid aluminum alloy for strength and durability. "V" grooves in the face of the head and cap provide maximum air flow for fast response.
- 8. Pressure Ports** Full, unrestricted porting for maximum air flow.
- 9. Piston Rod** The Type 303 stainless steel is hard chrome plated, ground and polished for extended rod seal life.
- 10. Cylinder Body** Type 304 stainless steel with a drawn and polished internal diameter ensures smooth performance and outstanding cycle life. The body is secured to the head and cap using double rolled-in construction.  
**Springs** (Not shown.) The springs used on single acting cylinders are manufactured from music wire and designed for literally millions of trouble-free cycles.



# Competitive Cross-Reference Guide

□ = manufacturer's stroke length designation

Bore	Cylinder Model	Mounting Style	Roundline Model No.	Manufacturer					
				Bimba Model No.	Clippard Model No.	American Model No.	Humphrey Model No.	Parker Model No.	
7/16"	Single Acting — Spring Return	Nose	RLA□□□-SAN-AA00	01□	↑	437SNS-□	↑	.44NSR□	
	Single Acting — Spring Return	Pivot	RLA□□□-SAP-AA00	01□-P		437SVS-□		.44PSR□	
	Single Acting — Spring Return	Front Block	RLA□□□-SAB-AA00	BF-01□		437SBFS-□		.44BFNSR□	
	Single Acting Non-Rotating	Nose	RLA□□□-NRN-AA00	01□-NR	↓	437SNHS-□	↓	.44NRSR□	
	Single Acting Non-Rotating	Pivot	RLA□□□-NRP-AA00	01□-NRP		437RVHS-□		.44NRPSR□	
	Reverse Acting — Spring Extend	Nose	RLA□□□-RAN-AA00	01□-R	N/A	437RNS-□	N/A	.44RSR□	
	Reverse Acting — Spring Extend	Pivot	RLA□□□-RAP-AA00	01□-RP	↓	437RVS-□	↓	.44RPSR□	
	Double Acting	Nose	RLA□□□-DAN-AA00	01□-D		437DNS-□		.44DSR□	
	Double Acting	Pivot	RLA□□□-DAP-AA00	01□-DP		437DVS-□		.44DPSR□	
	Double Acting	Double End	RLA□□□-DAD-AA00	01□-DX		437DVS-□-2		.44DXPSR□	
	Double Acting	Front Block	RLA□□□-DAB-AA00	BF-01□-D		437DBFS-□		.44BFDSR□	
	Double Acting Double Rod End	Double End	RLA□□□-DRD-AA00	01□-DXDE		437DES-□		.44DXSR□	
	9/16"	Single Acting — Spring Return	Nose	RLB□□□-SAN-AA00	02□	↑	562SNS-□	↑	.56NSR□
		Single Acting — Spring Return	Pivot	RLB□□□-SAP-AA00	02□-P		562SVS-□		.56PSR□
Single Acting Non-Rotating		Nose	RLB□□□-NRN-AA00	02□-NR	562SNHS-□		.56NRSR□		
Single Acting Non-Rotating		Pivot	RLB□□□-NRP-AA00	02□-NRP	562SVHS-□	.56NRPSR□			
Reverse Acting — Spring Extend		Nose	RLB□□□-RAN-AA00	02□-R	N/A	562RNS-□	N/A	.56RSR□	
Reverse Acting — Spring Extend		Pivot	RLB□□□-RAP-AA00	02□-RP	↓	562RVS-□	↓	.56RPSR□	
Double Acting		Nose	RLB□□□-DAN-AA00	02□-D		562DNS-□		.56DSR□	
Double Acting		Pivot	RLB□□□-DAP-AA00	02□-DXP		562DVS-□		.56DXPSR□	
Double Acting		Double End	RLB□□□-DAD-AA00	02□-DXP		562DVS-□-2		.56DXPSR□	
Double Acting		Front Block	RLB□□□-DAB-AA00	BF-01□-D		562DBFS-□		.56BFDSR□	
Double Acting Double Rod End		Double End	RLB□□□-DRD-AA00	02□-DXDE		562DES-□		.56DXSR□	
3/4"		Single Acting — Spring Return	Nose	RLC□□□-SAN-AA00	04□	SSR-12-□	750SNS-□	7-S-□	.75NSR□
		Single Acting — Spring Return	Pivot	RLC□□□-SAP-AA00	04□-P	USR-12-□	750SVS-□	7-SP-□	.75PSR□
		Single Acting — Spring Return	Front Block	RLC□□□-SAB-AA00	BF-04□	FSR-12-□	750SBFS-□	7-BFS-□	.75BFNSR□
	Single Acting Non-Rotating	Nose	RLC□□□-NRN-AA00	04□-NR	SSN-12-□	750SNHS-□	7-SH-□	.75NRSR□	
	Single Acting Non-Rotating	Pivot	RLC□□□-NRP-AA00	04□-NRP	USN-12-□	750SVHS-□	7-SHP-□	.75NRPSR□	
	Reverse Acting — Spring Extend	Nose	RLC□□□-RAN-AA00	04□-R	SRR-12-□	750RNS-□	7-SR-□	.75RSR□	
	Reverse Acting — Spring Extend	Pivot	RLC□□□-RAP-AA00	04□-RP	URR-12-□	750RVS-□	7-SRP-□	.75RPSR□	
	Double Acting	Nose	RLC□□□-DAN-AA00	04□-D	SDR-12-□	750DNS-□	7-D-□	.75DSR□	
	Double Acting	Pivot	RLC□□□-DAP-AA00	04□-DP	UDR-12-□	750DVS-□	7-DP-□	.75DPSR□	
	Double Acting	Double End	RLC□□□-DAD-AA00	04□-DX	UDR-12-□	750DVS-□-2	7-DP-□	.75DXPSR□	
	Double Acting	Front Block	RLC□□□-DAB-AA00	BF-04□-D	FDR-12-□	750BFS-□	7-BFD-□	.75BFDSR□	
	Double Acting Double Rod End	Double End	RLC□□□-DRD-AA00	04□-DXDE	SDD-12-□	750DES-□	7-D2EY-□	.75KDXXSR□	
	1-1/16"	Single Acting — Spring Return	Nose	RLD□□□-SAN-AA00	09□	SSR-17-□	1062SNS-□	6-S-□	1.06NSR□
		Single Acting — Spring Return	Pivot	RLD□□□-SAP-AA00	09□-P	USR-17-□	1062SVS-□	6-SP-□	1.06PSR□
Single Acting — Spring Return		Front Block	RLD□□□-SAB-AA00	BF-09□	FSR-17-□	1062SBFS-□	6-BFS-□	1.06BFNSR□	
Single Acting Non-Rotating		Nose	RLD□□□-NRN-AA00	09□-NR	SSN-17-□	1062SNHS-□	6-SH-□	1.06NRSR□	
Single Acting Non-Rotating		Pivot	RLD□□□-NRP-AA00	09□-NRP	USN-17-□	1062SVHS-□	6-SHP-□	1.06NRPSR□	
Reverse Acting — Spring Extend		Nose	RLD□□□-RAN-AA00	09□-R	SRR-17-□	1062RNS-□	6-SR-□	1.06RSR□	
Reverse Acting — Spring Extend		Pivot	RLD□□□-RAP-AA00	09□-RP	URR-17-□	1062RVS-□	6-SRP-□	1.06RPSR□	

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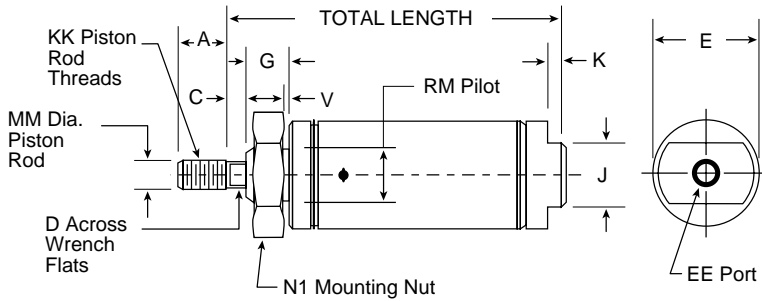


# Competitive Cross-Reference Guide (Continued)

□ = manufacturer's stroke length designation

Bore	Cylinder Model	Mounting Style	Round Line Model No.	Manufacturer				
				Bimba Model No.	Clippard Model No.	American Model No.	Humphrey Model No.	Parker Model No.
1-1/16"	Double Acting	Nose	RLD□□□-DAN-AA00	09□-D	SDR-17-□	1062DNS-□	6-D-□	1.06DSR□
	Double Acting	Pivot	RLD□□□-DAP-AA00	09□-DP	UDR-17-□	1062DVS-□	6-DP-□	1.06DPSR□
	Double Acting	Double End	RLD□□□-DAD-AA00	09□-DX	UDR-17-□	1062DVS-□-2	6-DP-□	1.06DXPSR□
	Double Acting	Front Block	RLD□□□-DAB-AA00	BF-09□-D	FDR-17-□	1062DBFS-□	6-BFD-□	1.06BFDSR□
	Double Acting Double Rod End	Double End	RLD□□□-DRD-AA00	09□-DXDE	SDD-17-□	1062DES-□	6-D2EY-□	1.06KDXSR□
1-1/4"	Single Acting — Spring Return	Nose	RLE□□□-SAN-AA00	12□	SSR-20-□	1250SNS-□	25-S-□	1.25NSR□
	Single Acting — Spring Return	Pivot	RLE□□□-SAP-AA00	12□-P	USR-20-□	1250SVS-□	25-SP-□	1.25PSR□
	Single Acting Non-Rotating	Nose	RLE□□□-NRN-AA00	12□-NR	SSN-20-□	1250SNHS-□	25-SH-□	1.25NRSR□
	Single Acting Non-Rotating	Pivot	RLE□□□-NRP-AA00	12□-NRP	USN-20-□	1250SVHS-□	25-SHP-□	1.25NRPSR□
	Reverse Acting — Spring Extend	Nose	RLE□□□-RAN-AA00	12□-R	SRR-20-□	1250RNS-□	25-SR-□	1.25RSR□
1-1/2"	Reverse Acting — Spring Extend	Pivot	RLE□□□-RAP-AA00	12□-RP	URR-20-□	1250RVS-□	25-SRP-□	1.25RPSR□
	Double Acting	Nose	RLE□□□-DAN-AA00	12□-D	SDR-20-□	1250DNS-□	25-D-□	1.25DSR□
	Double Acting	Pivot	RLE□□□-DAP-AA00	12□-DP	UDR-20-□	1250DVS-□	25-DP-□	1.25DXPSR□
	Double Acting	Double End	RLE□□□-DAD-AA00	12□-DP	UDR-20-□	1250DVS-□-2	25-DP-□	1.25DXPSR□
	Double Acting Double Rod End	Double End	RLE□□□-DRD-AA00	12□-DXDE	SDD-20-□	1250DES-□	25-D2EY-□	1.25KDXSR□
1-1/2"	Single Acting — Spring Return	Nose	RLF□□□-SAN-AA00	17□	SSR-24-□	1500SNS-□	5-S-□	1.50NSR□
	Single Acting — Spring Return	Pivot	RLF□□□-SAP-AA00	17□-P	CSR-24-□	1500SVS-□	5-SP-□	1.50PSR□
	Single Acting — Spring Return	Front Block	RLF□□□-SAB-AA00	BF-17□	N/A	1500SBFS-□	5-BFS-□	1.50BFNSR□
	Single Acting Non-Rotating	Nose	RLF□□□-NRN-AA00	17□-NR	SSN-24-□	1500SNHS-□	5-SH-□	1.50NRSR□
	Single Acting Non-Rotating	Pivot	RLF□□□-NRP-AA00	17□-NRP	CSN-24-□	1500SVHS-□	5-SHP-□	1.50NRPSR□
1-1/2"	Reverse Acting — Spring Extend	Nose	RLF□□□-RAN-AA00	17□-R	SRR-24-□	1500RNS-□	5-SR-□	1.50RSR□
	Reverse Acting — Spring Extend	Pivot	RLF□□□-RAP-AA00	17□-RP	CRR-24-□	1500RVS-□	5-SRP-□	1.50RPSR□
	Double Acting	Nose	RLF□□□-DAN-AA00	17□-D	SDR-24-□	1500DNS-□	5-D-□	1.50DSR□
	Double Acting	Pivot	RLF□□□-DAP-AA00	17□-DP	CDR-24-□	1500DVS-□	5-DP-□	1.50DPSR□
	Double Acting	Double End	RLF□□□-DAD-AA00	17□-DX	EDR-24-□	1500DVS-□-2	5-DP-□	1.50DXSR□
2"	Double Acting	Front Block	RLF□□□-DAB-AA00	BF-17□-D	N/A	1500DBFS-□	5-BFD-□	1.50BDSR□
	Double Acting Double Rod End	Double End	RLF□□□-DRD-AA00	17□-DXDE	SDD-24-□	1500DES-□	5-D2EY-□	1.50KDXSR□
	Single Acting — Spring Return	Nose	RLG□□□-SAN-AA00	31□	N/A	↑	4-S-□	2.00NSR□
	Single Acting — Spring Return	Pivot	RLG□□□-SAP-AA00	31□-XP	N/A		4-SP-□	2.00PSR□
	2"	Reverse Acting — Spring Extend	Nose	RLG□□□-RAN-AA00	31□-R	↓	N/A	4-SR-□
Reverse Acting — Spring Extend		Pivot	RLG□□□-RAP-AA00	31□-RP	4-SRP-□			2.00RPSR□
2-1/2"	Double Acting	Nose	RLG□□□-DAN-AA00	31□-D	SDR-32-□	↓	4-D-□	2.00DSR□
	Double Acting	Pivot	RLG□□□-DAP-AA00	31□-DXP	UDR-32-□		4-DP-□	2.00XPSR□
	Double Acting	Double End	RLG□□□-DAD-AA00	31□-DXP	UDR-32-□		4-DP-□	2.00DXPSR□
	Double Acting Double Rod End	Double End	RLG□□□-DRD-AA00	31□-DXDE	N/A	2000DES-□	4-D2EY-□	2.00KDXSR□
	2-1/2"	Double Acting	Nose	RLH□□□-DAN-AA00	50□-D	N/A	↓	3-D-□
Double Acting		Pivot	RLH□□□-DAP-AA00	50□-DXP	UDR-40-□	3-DP-□		
Double Acting		Double End	RLH□□□-DAD-AA00	50□-DXP	UDR-40-□	3-DP-□		
Double Acting Double Rod End		Double End	RLH□□□-DRD-AA00	50□-DXDE	N/A	3-D2EY-□		

- Standard stroke length cylinders are available from shelf stock.
- Custom stroke lengths manufactured in minimal time.



Bore Size	Dimensions — All Dimensions in Inches												
	A	C	D	E	EE	G	J	K	KK	MM	N1	RM	V
7/16"	0.50	NA	NA	0.50	10-32	0.31	0.38	0.19	10-32	0.18	3/8-24	.369/.373	0.05
9/16"	0.50	NA	NA	0.62	10-32	0.38	0.50	0.19	10-32	0.18	7/16-20	.434/.437	0.06
3/4"	0.50	NA	NA	0.81	1/8 NPT	0.44	0.62	0.19	1/4-28	0.25	1/2-20	.494/.498	0.08
1-1/16"	0.50	NA	NA	1.12	1/8 NPT	0.50	0.88	0.19	5/16-24	0.31	5/8-18	.621/.624	0.07
1-1/4"	0.75	0.25	0.38	1.34	1/8 NPT	0.63	0.88	0.25	7/16-20	0.43	3/4-16	.746/.749	0.09
1-1/2"	0.75	0.25	0.38	1.56	1/8 NPT	0.63	0.88	0.25	7/16-20	0.43	3/4-16	.746/.749	0.09
2"	0.88	0.38	0.50	2.08	1/4 NPT	0.81	1.25	0.31	1/2-20	0.62	1-1/4-12	1.372/1.375	0.12

Bore Size	Total Length – Standard Strokes							Total length for stroke longer than 4" standard
	1/2	1	1-1/2	2	2-1/2	3	4	
7/16"	2.25	3.19	4.12	5.07	6.01	6.95	8.83	1.31 + (.94 per 1/2" of stroke)
9/16"	2.66	3.15	4.27	4.77	5.90	6.39	8.01	1.53 + (1.62 per 1" of stroke)
3/4"	2.69	3.19	4.38	4.88	–	6.57	8.26	1.50 + (1.69 per 1" of stroke)
1-1/16"	3.00	3.50	4.56	5.06	–	6.62	8.18	1.94 + (1.56 per 1" of stroke)
1-1/4"	3.97	4.47	–	6.28	–	8.09	9.90	2.66 + (1.81 per 1" of stroke)
1-1/2"	3.63	4.13	–	5.82	–	7.51	9.20	2.44 + (1.69 per 1" of stroke)
2"	4.91	5.41	–	7.41	–	8.66	11.59	Consult Factory

**Maximum Stroke Lengths**  
7/16" – 1-1/2" Bore – 15"  
2" Bore – Consult Factory

### Ordering Information — Standard Stroke Lengths

Stock bore sizes and strokes are shown below. Contact the factory for custom stroke lengths. For Options and Accessories see ACT-6-18/19. See ACT-6-21 for complete Product Numbering System.

### Stock Stroke Lengths (in)

Bore Sizes	Standard Stroke Lengths
7/16, 9/16	1/2, 1, 1-1/2, 2, 2-1/2, 3, or 4
3/4, 1-1/16	1, 2, 3, 4, 5, or 6
1-1/4, 1-1/2, 2	1, 2, 3, 4, 5, or 6

**Product Numbering System: R L ■ ■ ■ ■ - S A N - A A 0 0**

1 2 3 4 5 6 7 8 9 10 11 12 13

Series	
Bore Size	
A	7/16"
B	9/16"
C	3/4"
D	1-1/16"
E	1-1/4"
F	1-1/2"
G	2"

Full Inches of Stroke			
00	0" Stroke	03	3" Stroke
01	1" Stroke	04	4" Stroke
02	2" Stroke		

Fractional Increments of Stroke*	
A	0"
J	1/2"

Model <sup>(4)Double End Mount Only</sup>	
SA	Single Acting Spring Return
RA	Reverse Acting Spring Extend
NR	Non-Rotating Rod
DA	Double Acting
DR	Double Acting Double Rod End <sup>4</sup>

Options	
00	No Options
90	Standard Magnetic Piston Only <sup>1</sup>

<sup>1</sup>Magnetic pistons will change overall cylinder length. See table on ACT-6-20.

Special Designation	
A	Standard
X	Special

Options <sup>(2)Bumpers on air side only with spring version</sup>	
A	No Options
B	Viton Seals
C	Bumpers (Head & Cap) <sup>2</sup>
D	Viton seals and bumpers
X	Special

Mounting Style <sup>(3)Includes Mounting Nut</sup>	
N	Nose Mount <sup>3</sup>
P	Pivot Mount
D	Double End Mount <sup>3</sup>
B	Front Block Mount

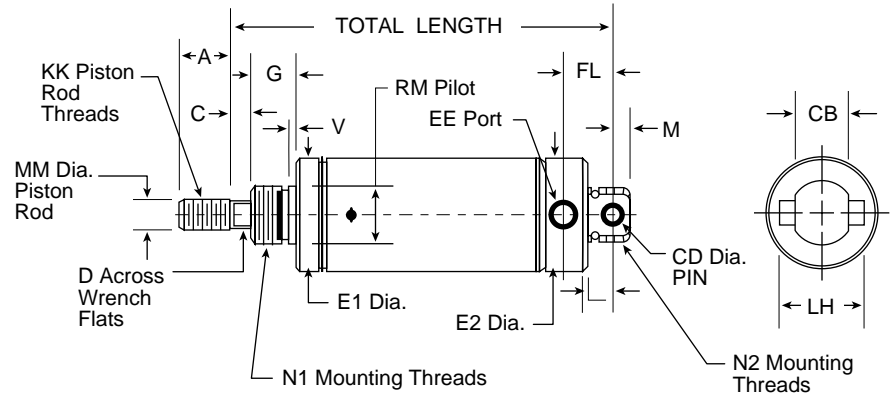
\* See ACT-6-22 for stroke increments.

# Round Line Actuators



## Single Acting Spring Return — Pivot Mount

- Standard stroke length cylinders are available from shelf stock.
- Custom stroke lengths manufactured in minimal time.



### Dimensions — All Dimensions in Inches

Bore	A	CB	C	CD	D	E1	E2	EE	FL	G	KK	L	LH	M	MM	N1	N2	V	RM
7/16"	0.50	0.31	NA	0.156	NA	0.50	0.74	10-32	0.44	0.31	10-32	0.25	0.50	0.25	0.18	3/8-24	7/16-20	0.05	.369/.373
9/16"	0.50	0.31	NA	0.156	NA	0.62	0.62	10-32	0.38	0.38	10-32	0.25	0.50	0.19	0.18	7/16-20	7/16-20	0.06	.434/.437
3/4"	0.50	0.38	NA	0.250	NA	0.81	0.86	1/8 NPT	0.62	0.44	1/4-28	0.34	0.75	0.28	0.25	1/2-20	5/8-18	0.08	.494/.498
1-1/16"	0.50	0.38	0.12	0.250	.25	1.12	1.12	1/8 NPT	0.62	0.50	5/16-24	0.34	0.75	0.28	0.31	5/8-18	5/8-18	0.07	.621/.624
1-1/4"	0.75	0.50	0.25	0.250	.38	1.34	1.34	1/8 NPT	0.78	0.63	7/16-20	0.41	0.88	0.40	0.43	3/4-16	3/4-16	0.09	.746/.749
1-1/2"	0.75	0.62	0.25	0.375	.38	1.56	1.56	1/8 NPT	0.81	0.63	7/16-20	0.50	1.00	0.38	0.43	3/4-16	NA	0.09	.746/.749
2"	0.88	0.75	0.38	0.375	.50	2.08	2.08	1/4 NPT	1.03	0.81	1/2-20	0.56	1.63	0.44	0.62	1-1/4-12	1-1/4-12	0.12	1.372/1.375

Bore Size	Total Length – Standard Strokes							Total length for stroke longer than 4" standard
	1/2	1	1-1/2	2	2-1/2	3	4	
7/16"	2.69	3.63	4.57	5.51	–	7.39	9.27	1.75 + (.94 per 1/2" of stroke)
9/16"	2.93	3.43	4.55	5.05	–	6.67	8.29	1.81 + (1.62 per 1" of stroke)
3/4"	3.47	3.97	5.16	5.66	–	7.35	9.04	2.28 + (1.69 per 1" of stroke)
1-1/16"	3.72	4.22	5.28	5.78	–	7.34	8.90	2.66 + (1.56 per 1" of stroke)
1-1/4"	–	5.19	–	7.00	–	8.81	10.62	3.38 + (1.81 per 1" of stroke)
1-1/2"	4.31	4.81	–	6.50	–	8.19	9.88	3.12 + (1.69 per 1" of stroke)
2"	–	6.34	–	8.34	–	9.59	12.53	Consult Factory

**Maximum Stroke Lengths**  
 7/16" – 1-1/2" Bore – 15"  
 2" Bore – Consult Factory

### Ordering Information — Standard Stroke Lengths

Stock bore sizes and strokes are shown below. Contact the factory for custom stroke lengths. For Options and Accessories see ACT-6-18/19. See ACT-6-21 for complete Product Numbering System.

### Stock Stroke Lengths (in)

Bore Sizes	Standard Stroke Lengths
7/16	1/2, 1
3/4, 1-1/16, 1-1/4	1, 2, or 3
1-1/2, 2	

**Product Numbering System:** R L [ ] [ ] [ ] [ ] - S A P - A A 0 0

1 2 3 4 5 6 7 8 9 10 11 12 13

Series	
A	7/16"
B	9/16"
C	3/4"
D	1-1/16"

Full Inches of Stroke	
00	0" Stroke
01	1" Stroke
02	2" Stroke
03	3" Stroke
04	4" Stroke

Fractional Increments of Stroke*	
A	0"
J	1/2"

Options	
00	No Options
90	Standard Magnetic Piston Only <sup>1</sup>

<sup>1</sup>Magnetic pistons will change overall cylinder length. See table on ACT-6-20.

Special Designation	
A	Standard
X	Special

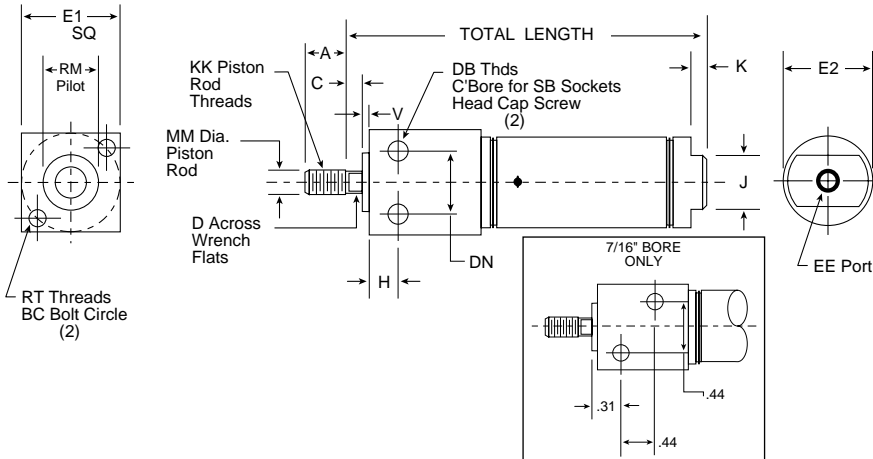
Options (2Bumpers on air side only with spring version)	
A	No Options
B	Viton Seals
C	Bumpers (Head & Cap) <sup>2</sup>
D	Viton seals and bumpers
X	Special

Mounting Style (3Includes Mounting Nut)	
N	Nose Mount <sup>3</sup>
P	Pivot Mount
D	Double End Mount <sup>3</sup>
B	Front Block Mount

Model (4Double End Mount Only)	
SA	Single Acting Spring Return
RA	Reverse Acting Spring Extend
NR	Non-Rotating Rod
DA	Double Acting
DR	Double Acting Double Rod End <sup>4</sup>

\* See ACT-6-22 for stroke increments.

- Standard stroke length cylinders are available from shelf stock.
- Custom stroke lengths manufactured in minimal time.



### Dimensions — All Dimensions in Inches

Bore	A	BC	C	D	DB	DN	E1	E2	EE	H	J	K	KK	MM	RM	RT	SB	V
7/16"	0.50	0.75	NA	NA	8-32	NA	0.75	0.50	10-32	NA	0.38	0.19	10-32	0.18	.437	8-32	NA	0.06
3/4"	0.75	1.00	0.25	0.22	1/4-20	0.62	1.00	0.81	1/8 NPT	0.38	0.62	0.19	1/4-28	0.25	.625	10-32	#10	0.09
1-1/16"	0.75	1.25	0.38	0.25	1/4-20	0.81	1.25	1.12	1/8 NPT	0.62	0.88	0.19	5/16-24	0.31	.750	10-32	#10	0.09
1-1/2"	1.25	1.75	0.25	0.38	5/16-18	1.12	1.75	1.56	1/4 NPT	0.88	0.88	0.25	7/16-20	0.43	1.00	1/4-20	1/4	0.13

Bore Size	Total Length – Standard Strokes							Total length for stroke longer than 4" standard
	1/2	1	1-1/2	2	2-1/2	3	4	
7/16"	2.88	3.82	4.76	5.70	–	7.58	9.46	1.94 + (.94 per 1/2" of stroke)
3/4"	3.85	4.35	–	6.04	–	7.73	9.42	2.66 + (1.69 per 1" of stroke)
1-1/16"	–	5.19	–	7.00	–	8.81	10.62	3.38 + (1.81 per 1" of stroke)
1-1/2"	–	5.69	–	7.69	–	9.69	11.69	3.69 + (2.00 per 1" of stroke)

### Ordering Information — Standard Stroke Lengths

Stock bore sizes and strokes are shown below. Contact the factory for custom stroke lengths. For Options and Accessories see ACT-6-18/19. See ACT-6-21 for complete Product Numbering System.

**Maximum Stroke Lengths**  
 7/16" – 1-1/2" Bore – 15"  
 2" Bore – Consult Factory

**Series** 1 2 3 4 5 6 - **7** **8** **9** - **10** **11** **12** **13**

**Bore Size**

A	7/16"
C	3/4"
D	1-1/16"
F	1-1/2"

**Full Inches of Stroke**

00	0" Stroke	03	3" Stroke
01	1" Stroke	04	4" Stroke
02	2" Stroke		

**Fractional Increments of Stroke\***

A	0"	J	1/2"
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**Options**

00	No Options
90	Standard Magnetic Piston Only <sup>1</sup>

<sup>1</sup>Magnetic pistons will change overall cylinder length. See table on ACT-6-20.

**Special Designation**

A	Standard
X	Special

**Options** (<sup>2</sup>Bumpers on air side only with spring version)

A	No Options
B	Viton Seals
C	Bumpers (Head & Cap) <sup>2</sup>
D	Viton seals and bumpers
X	Special

**Model** (<sup>4</sup>Double End Mount Only)

SA	Single Acting Spring Return
RA	Reverse Acting Spring Extend
NR	Non-Rotating Rod
DA	Double Acting
DR	Double Acting Double Rod End <sup>4</sup>

**Mounting Style** (<sup>3</sup>Includes Mounting Nut)

N	Nose Mount <sup>3</sup>
P	Pivot Mount
D	Double End Mount <sup>3</sup>
B	Front Block Mount

\* See ACT-6-22 for stroke increments.



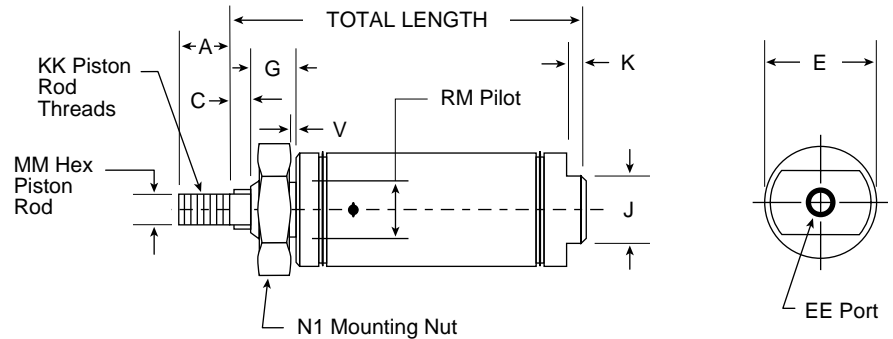
# Round Line Actuators



## Single Acting Non-Rotating — Nose Mount



- Standard stroke length cylinders are available from shelf stock.
- Custom stroke lengths manufactured in minimal time.



**Dimensions — All Dimensions in Inches**

Bore	A	C	E	EE	G	J	K	KK	MM	N1	RM	V
7/16"	0.50	0.25	0.50	10-32	0.31	0.38	0.19	10-32	0.18	3/8-24	.369/.373	0.05
9/16"	0.50	0.25	0.62	10-32	0.38	0.50	0.19	10-32	0.18	7/16-20	.434/.437	0.06
3/4"	0.50	0.25	0.81	1/8 NPT	0.44	0.62	0.19	1/4-28	0.25	1/2-20	.494/.498	0.08
1-1/16"	0.50	0.25	1.12	1/8 NPT	0.50	0.88	0.19	5/16-24	0.38	5/8-18	.621/.624	0.07
1-1/4"	0.88	0.25	1.34	1/8 NPT	0.63	0.88	0.25	7/16-20	0.43	3/4-16	.746/.749	0.09
1-1/2"	0.88	0.25	1.56	1/8 NPT	0.63	0.88	0.25	7/16-20	0.43	3/4-16	.746/.749	0.09

Bore Size	Total Length – Standard Strokes							Total length for stroke longer than 4" standard
	1/2	1	1-1/2	2	2-1/2	3	4	
7/16"	2.50	3.44	4.38	5.32	–	7.20	9.08	1.56 + (.94 per 1/2" of stroke)
9/16"	2.90	3.40	4.52	5.02	–	6.64	8.26	1.78 + (1.62 per 1" of stroke)
3/4"	2.94	3.44	4.63	5.13	–	6.82	8.51	1.75 + (1.69 per 1" of stroke)
1-1/16"	3.25	3.75	4.81	5.31	–	6.87	8.43	2.19 + (1.56 per 1" of stroke)
1-1/4"	–	4.47	–	6.28	–	8.09	9.90	2.66 + (1.81 per 1" of stroke)
1-1/2"	3.63	4.13	–	5.82	–	7.51	9.20	2.44 + (1.69 per 1" of stroke)

### Ordering Information — Standard Stroke Lengths

Stock bore sizes and strokes are shown below. Contact the factory for custom stroke lengths. For Options and Accessories see ACT-6-18/19. See ACT-6-21 for complete Product Numbering System.

**Maximum Stroke Lengths**  
7/16" – 1-1/2" Bore – 15"

R L ■ ■ ■ ■ - N R N - A A 0 0

1 2 3 4 5 6 7 8 9 10 11 12 13

Series			
Bore Size			
A	7/16"	E	1-1/4"
B	9/16"	F	1-1/2"
C	3/4"		
D	1-1/16"		

Full Inches of Stroke			
00	0" Stroke	03	3" Stroke
01	1" Stroke	04	4" Stroke
02	2" Stroke		

Fractional Increments of Stroke*			
A	0"	J	1/2"

Model <sup>(4)Double End Mount Only</sup>	
SA	Single Acting Spring Return
RA	Reverse Acting Spring Extend
NR	<b>Non-Rotating Rod</b>
DA	Double Acting
DR	Double Acting Double Rod End <sup>4</sup>

Options	
00	No Options
90	Standard Magnetic Piston Only <sup>1</sup>

<sup>1</sup>Magnetic pistons will change overall cylinder length. See table on ACT-6-20.

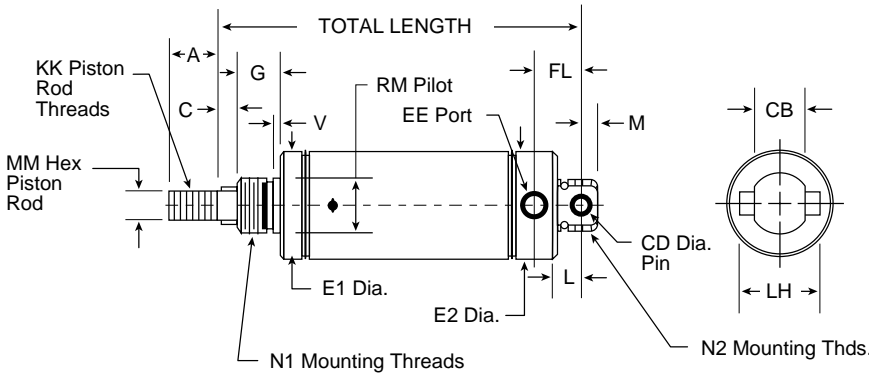
Special Designation	
A	Standard
X	Special

Options <sup>(2)Bumpers on air side only with spring version</sup>	
A	No Options
B	Viton Seals
C	Bumpers (Head & Cap) <sup>2</sup>
D	Viton seals and bumpers
X	Special

Mounting Style <sup>(3)Includes Mounting Nut</sup>	
N	<b>Nose Mount<sup>3</sup></b>
P	Pivot Mount
D	Double End Mount <sup>3</sup>
B	Front Block Mount

\* See ACT-6-22 for stroke increments.

- Standard stroke length cylinders are available from shelf stock.
- Custom stroke lengths manufactured in minimal time.



### Dimensions — All Dimensions in Inches

Bore	A	C	CB	CD	E1	E2	EE	FL	G	KK	L	LH	M	MM	N1	N2	RM	V
7/16"	0.50	0.25	0.31	0.156	0.50	0.74	10-32	0.44	0.31	10-32	0.25	0.50	0.25	0.19	3/8-24	7/16-20	.369/.373	0.05
9/16"	0.50	0.25	0.31	0.156	0.62	0.62	10-32	0.38	0.38	10-32	0.25	NA	0.19	0.19	7/16-20	7/16-20	.434/.437	0.06
3/4"	0.50	0.25	0.38	0.250	0.81	0.86	1/8 NPT	0.62	0.44	1/4-28	0.34	0.75	0.28	0.25	1/2-20	5/8-18	.494/.498	0.08
1-1/16"	0.50	0.25	0.38	0.250	1.12	1.12	1/8 NPT	0.62	0.50	5/16-24	0.34	0.75	0.28	0.38	5/8-18	5/8-18	.621/.624	0.07
1-1/4"	0.88	0.25	0.50	0.250	1.34	1.34	1/8 NPT	0.78	0.63	7/16-20	0.41	0.88	0.40	0.43	3/4-16	3/4-16	.746/.749	0.09
1-1/2"	0.88	0.38	0.62	0.375	1.56	1.56	1/8 NPT	0.81	0.63	7/16-20	0.50	1.00	0.37	0.43	3/4-16	NA	.746/.749	0.09

Bore Size	Total Length – Standard Strokes							Total length for stroke longer than 4" standard
	1/2	1	1-1/2	2	2-1/2	3	4	
7/16"	3.19	4.13	5.07	6.01	–	7.89	9.77	2.25 + (.94 per 1/2" of stroke)
9/16"	3.18	3.68	4.8	5.30	–	6.92	8.54	2.06 + (1.62 per 1" of stroke)
3/4"	3.72	4.22	5.41	5.91	–	7.60	9.29	2.53 + (1.69 per 1" of stroke)
1-1/16"	3.84	4.34	5.40	5.90	–	7.46	9.02	2.78 + (1.56 per 1" of stroke)
1-1/4"	–	5.19	–	7.00	–	8.81	10.62	3.38 + (1.81 per 1" of stroke)
1-1/2"	–	4.94	–	6.63	–	8.32	10.01	3.25 + (1.69 per 1" of stroke)

### Ordering Information — Standard Stroke Lengths

Stock bore sizes and strokes are shown below. Contact the factory for custom stroke lengths. For Options and Accessories see ACT-6-18/19. See ACT-6-21 for complete Product Numbering System.

**Maximum Stroke Lengths**  
7/16" – 1-1/2" Bore – 15"

Series: **R L** (1 2) **■ ■ ■ ■** (3 4 5 6) **- NR P** (7 8 9) **- AA 00** (10 11 12 13)

Bore Size			
A	7/16"	E	1-1/4"
B	9/16"	F	1-1/2"
C	3/4"		
D	1-1/16"		

Full Inches of Stroke			
00	0" Stroke	03	3" Stroke
01	1" Stroke	04	4" Stroke
02	2" Stroke		

Fractional Increments of Stroke*	
A	0"
J	1/2"

Model <sup>(4)Double End Mount Only</sup>	
SA	Single Acting Spring Return
RA	Reverse Acting Spring Extend
NR	<b>Non-Rotating Rod</b>
DA	Double Acting
DR	Double Acting Double Rod End <sup>4</sup>

Options	
00	No Options
90	Standard Magnetic Piston Only <sup>1</sup>

<sup>1</sup>Magnetic pistons will change overall cylinder length. See table on ACT-6-20.

Special Designation	
A	Standard
X	Special

Options <sup>(2)Bumpers on air side only with spring version</sup>	
A	No Options
B	Viton Seals
C	Bumpers (Head & Cap) <sup>2</sup>
D	Viton seals and bumpers
X	Special

Mounting Style <sup>(3)Includes Mounting Nut</sup>	
N	Nose Mount <sup>3</sup>
P	<b>Pivot Mount</b>
D	Double End Mount <sup>3</sup>
B	Front Block Mount

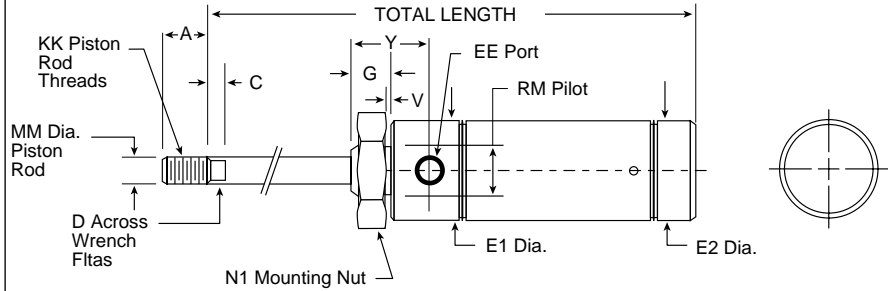
\* See ACT-6-22 for stroke increments.

# Round Line Actuators



## Reverse Acting Spring Extend — Nose Mount

- Standard stroke length cylinders are available from shelf stock.
- Custom stroke lengths manufactured in minimal time.



### Dimensions — All Dimensions in Inches

Bore	A	C	D	E1	E2	EE	G	KK	MM	N1	RM	V	Y
7/16"	0.50	NA	NA	0.74	0.50	10-32	0.38	10-32	0.19	7/16-20	.434/.437	0.05	0.72
9/16"	0.50	NA	NA	0.62	0.62	10-32	0.38	10-32	0.19	7/16-20	.434/.437	0.06	0.75
3/4"	0.50	NA	NA	0.86	0.81	1/8 NPT	0.50	1/4-28	0.25	5/8-18	.621/.624	0.09	0.97
1-1/16"	0.50	0.12	0.25	1.12	1.12	1/8 NPT	0.50	5/16-24	0.31	5/8-18	.621/.624	0.09	1.06
1-1/4"	0.75	0.25	0.38	1.34	1.34	1/8 NPT	0.63	7/16-20	0.44	3/4-16	.746/.749	0.09	1.37
1-1/2"	1.25	0.25	0.38	1.56	1.56	1/8 NPT	0.63	7/16-20	0.44	3/4-16	.746/.749	0.09	1.25
2"	0.88	0.38	0.50	2.08	2.08	1/4 NPT	0.81	1/2-20	0.62	1-1/4-12	1.372/1.375	0.12	1.46

Bore Size	Total Length – Standard Strokes							Total length for stroke longer than 4" standard
	1/2	1	1-1/2	2	2-1/2	3	4	
7/16"	3.38	4.82	6.26	7.70	–	10.58	–	1.94 + (1.44 per 1/2" of stroke)
9/16"	3.62	4.62	6.24	7.24	–	9.86	–	2.00 + (2.62 per 1" of stroke)
3/4"	4.00	5.00	–	7.69	–	10.38	13.07	2.31 + (2.69 per 1" of stroke)
1-1/16"	4.43	5.43	7.24	8.24	–	11.05	13.86	2.62 + (2.81 per 1" of stroke)
1-1/4"	–	6.28	–	9.09	–	11.90	14.71	3.47 + (2.81 per 1" of stroke)
1-1/2"	–	6.19	–	9.19	–	12.19	15.19	3.19 + (3.00 per 1" of stroke)
2"	–	7.11	–	10.11	–	12.34	16.34	Consult Factory

### Ordering Information — Standard Stroke Lengths

Stock bore sizes and strokes are shown below. Contact the factory for custom stroke lengths. For Options and Accessories see ACT-6-18/19. See ACT-6-21 for complete Product Numbering System.

**Maximum Stroke Lengths**  
7/16" – 1-1/2" Bore – 15"  
2" Bore - Consult Factory

**Product Numbering System:** R L [ ] [ ] [ ] [ ] - R A N - A A 0 0

1 2 3 4 5 6 7 8 9 10 11 12 13

Series	
A	7/16"
B	9/16"
C	3/4"
D	1-1/16"

Bore Size		E	
A	7/16"	E	1-1/4"
B	9/16"	F	1-1/2"
C	3/4"	G	2"
D	1-1/16"		

Full Inches of Stroke			
00	0" Stroke	03	3" Stroke
01	1" Stroke	04	4" Stroke
02	2" Stroke		

Fractional Increments of Stroke*	
A	0"
J	1/2"

Model	
SA	Single Acting Spring Return
<b>RA</b>	<b>Reverse Acting Spring Extend</b>
NR	Non-Rotating Rod
DA	Double Acting
DR	Double Acting Double Rod End <sup>4</sup>

Options	
00	No Options
90	Standard Magnetic Piston Only <sup>1</sup>

<sup>1</sup>Magnetic pistons will change overall cylinder length. See table on ACT-6-20.

Special Designation	
A	Standard
X	Special

Options	
A	No Options
B	Viton Seals
C	Bumpers (Head & Cap) <sup>2</sup>
D	Viton seals and bumpers
X	Special

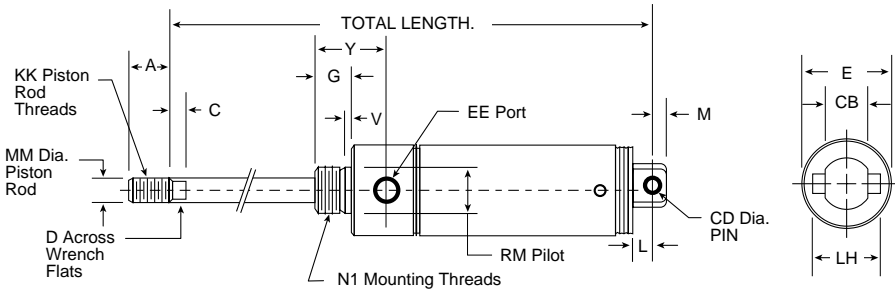
<sup>2</sup>Bumpers on air side only with spring version

Mounting Style	
<b>N</b>	<b>Nose Mount<sup>3</sup></b>
P	Pivot Mount
D	Double End Mount <sup>3</sup>
B	Front Block Mount

<sup>3</sup>Includes Mounting Nut

\* See ACT-6-22 for stroke increments.

- Standard stroke length cylinders are available from shelf stock.
- Custom stroke lengths manufactured in minimal time.



### Dimensions — All Dimensions in Inches

Bore	A	C	CB	CD	EE	E	G	KK	L	LH	MM	M	N1	RM	V	Y
7/16"	0.50	NA	0.31	0.156	10-32	0.74	0.38	10-32	0.25	0.50	0.19	0.25	7/16-20	.434/.437	0.05	0.72
9/16"	0.50	NA	0.31	0.156	10-32	0.62	0.38	10-32	0.25	0.50	0.19	0.19	7/16-20	.434/.437	0.06	0.75
3/4"	0.50	NA	0.38	0.250	1/8 NPT	0.86	0.50	1/4-28	0.34	0.75	0.25	0.28	5/8-18	.621/.624	0.09	0.97
1-1/16"	0.50	0.12	0.38	0.250	1/8 NPT	1.12	0.50	5/16-24	0.34	0.75	0.31	0.28	5/8-18	.621/.624	0.09	1.06
1-1/4"	0.75	0.25	0.50	0.250	1/8 NPT	1.34	0.63	7/16-20	0.34	0.88	0.44	0.38	3/4-16	.746/.749	0.09	1.37
1-1/2"	1.25	0.25	0.62	0.375	1/8 NPT	1.56	0.63	7/16-20	0.50	1.00	0.44	0.38	3/4-16	.746/.749	0.09	1.25
2"	0.88	0.38	0.75	0.375	1/4 NPT	2.08	0.81	1/2-20	0.56	1.63	0.62	0.44	1-1/4-12	1.372/1.375	0.12	1.46

Bore Size	Total Length – Standard Strokes							Total length for stroke longer than 4" standard
	1/2	1	1-1/2	2	2-1/2	3	4	
7/16"	3.82	5.26	6.70	8.14	–	11.02	–	2.38 + (1.44 per 1/2" of stroke)
9/16"	3.90	4.90	6.52	7.52	–	10.14	–	2.28 + (2.62 per 1" of stroke)
3/4"	4.13	5.13	–	7.82	–	10.51	13.20	2.44 + (2.69 per 1" of stroke)
1-1/16"	4.59	5.59	–	8.40	–	11.21	14.02	2.78 + (2.81 per 1" of stroke)
1-1/4"	–	6.59	–	9.40	–	12.21	15.02	3.78 + (2.81 per 1" of stroke)
1-1/2"	–	6.88	–	9.88	–	12.88	15.88	3.88 + (3.00 per 1" of stroke)
2"	–	8.05	–	11.05	–	13.28	17.28	Consult Factory

### Ordering Information — Standard Stroke Lengths

Stock bore sizes and strokes are shown below. Contact the factory for custom stroke lengths. For Options and Accessories see ACT-6-18/19. See ACT-6-21 for complete Product Numbering System.

**Maximum Stroke Lengths**  
 7/16" – 1-1/2" Bore – 15"  
 2" Bore - Consult Factory

**Product Numbering System: R L ■ ■ ■ ■ - R A P - A A 0 0**

1 2 3 4 5 6 7 8 9 10 11 12 13

Series	
A	7/16"
B	9/16"
C	3/4"
D	1-1/16"

Full Inches of Stroke	
00	0" Stroke
01	1" Stroke
02	2" Stroke
03	3" Stroke
04	4" Stroke

Fractional Increments of Stroke*	
A	0"
J	1/2"

Model <sup>(4)Double End Mount Only</sup>	
SA	Single Acting Spring Return
RA	Reverse Acting Spring Extend
NR	Non-Rotating Rod
DA	Double Acting
DR	Double Acting Double Rod End <sup>4</sup>

Options	
00	No Options
90	Standard Magnetic Piston Only <sup>1</sup>

<sup>1</sup>Magnetic pistons will change overall cylinder length. See table on ACT-6-20.

Special Designation	
A	Standard
X	Special

Options <sup>(2)Bumpers on air side only with spring version</sup>	
A	No Options
B	Viton Seals
C	Bumpers (Head & Cap) <sup>2</sup>
D	Viton seals and bumpers
X	Special

Mounting Style <sup>(3)Includes Mounting Nut</sup>	
N	Nose Mount <sup>3</sup>
P	Pivot Mount
D	Double End Mount <sup>3</sup>
B	Front Block Mount

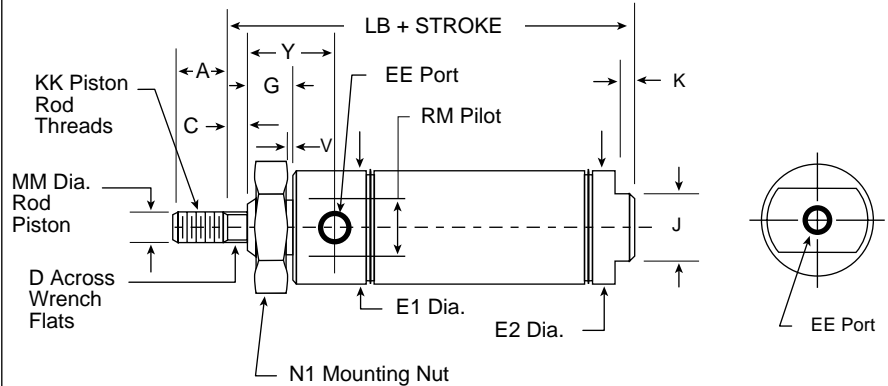
\* See ACT-6-22 for stroke increments.

# Round Line Actuators



## Double Acting — Nose Mount

- Standard stroke length cylinders are available from shelf stock.
- Custom stroke lengths manufactured in minimal time.



### Dimensions — All Dimensions in Inches

Bore	A	C	D	EE	E1	E2	G	J	K	KK	LB	MM	N1	RM	Y	V
7/16"	0.50	NA	NA	10-32	0.74	0.50	0.38	0.38	0.19	10-32	2.12	0.18	7/16-20	.434/.437	0.72	0.05
9/16"	0.50	NA	NA	10-32	0.62	0.62	0.38	0.50	0.19	10-32	2.28	0.18	7/16-20	.434/.437	0.75	0.06
3/4"	0.50	NA	NA	1/8 NPT	0.86	0.81	0.50	0.62	0.19	1/4-28	2.97	0.25	5/8-18	.621/.624	0.97	0.09
1-1/16"	0.50	NA	NA	1/8 NPT	1.12	1.12	0.50	0.88	0.19	5/16-24	3.12	0.31	5/8-18	.621/.624	1.06	0.09
1-1/4"	0.75	0.25	0.38	1/8 NPT	1.34	1.34	0.63	0.88	0.25	7/16-20	4.00	0.43	3/4-16	.746/.749	1.37	0.09
1-1/2"	0.75	0.25	0.38	1/8 NPT	1.56	1.56	0.63	0.88	0.25	7/16-20	3.69	0.43	3/4-16	.746/.749	1.25	0.09
2"	0.88	0.38	0.50	1/4 NPT	2.08	2.08	0.81	1.25	0.31	1/2-20	4.69	0.62	1-1/4-12	1.372/1.375	1.46	0.12
2-1/2"	0.88	0.38	0.50	1/4 NPT	2.62	2.62	0.81	1.75	0.31	1/2-20	4.69	0.62	1-3/8-12	1.497/1.500	1.46	0.12

### Ordering Information — Standard Stroke Lengths

Stock bore sizes and strokes are shown below. Contact the factory for custom stroke lengths. For Options and Accessories see ACT-6-18/19. See ACT-6-21 for complete Product Numbering System.

### Stock Stroke Lengths (in)

Bore Sizes	Standard Stroke Lengths
7/16, 9/16	1/2, 1, 1-1/2, or 2
3/4	1, 2, 3, 4, 5, or 6
1-1/16	1, 1-1/2, 2, 3, 4, 5, or 6
1-1/4, 1-1/2, 2, 2-1/2	1, 2, 3, 4, 5, or 6

### Maximum Stroke Lengths

7/16" – 2-1/2" Bore – 36"

**Product Numbering System:** R L ■ ■ ■ ■ - D A N - A A 0 0

1 2 3 4 5 6 7 8 9 10 11 12 13

Bore Size		Full Inches of Stroke		Fractional Increments of Stroke*	
A	7/16"	00	0" Stroke	A	0"
B	9/16"	01	1" Stroke	J	1/2"
C	3/4"	02	2" Stroke		
D	1-1/16"	03	3" Stroke		
E	1-1/4"	04	4" Stroke		
F	1-1/2"				
G	2"				
H	2-1/2"				

Options	
00	No Options
90	Standard Magnetic Piston Only <sup>1</sup>

<sup>1</sup>Magnetic pistons will change overall cylinder length. See table on ACT-6-20.

Special Designation	
A	Standard
X	Special

Options	
A	No Options
B	Viton Seals
C	Bumpers (Head & Cap) <sup>2</sup>
D	Viton seals and bumpers
X	Special

<sup>2</sup>Bumpers on air side only with spring version

Mounting Style	
N	Nose Mount <sup>3</sup>
P	Pivot Mount
D	Double End Mount <sup>3</sup>
B	Front Block Mount

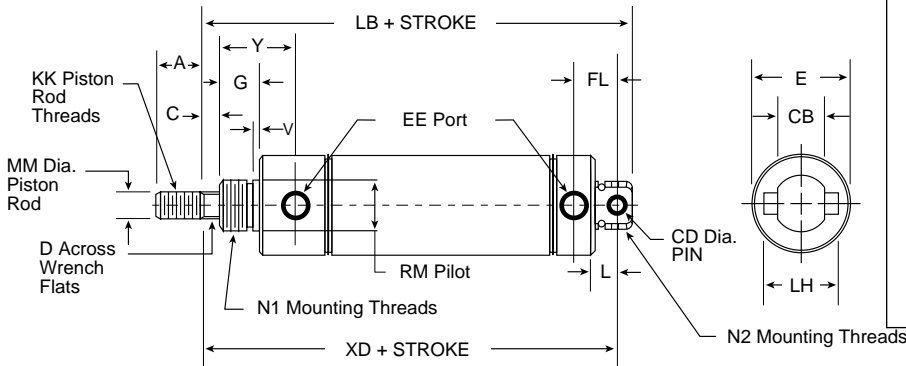
<sup>3</sup>Includes Mounting Nut

Model	
SA	Single Acting Spring Return
RA	Reverse Acting Spring Extend
NR	Non-Rotating Rod
DA	Double Acting
DR	Double Acting Double Rod End <sup>4</sup>

<sup>4</sup>Double End Mount Only

\* See ACT-6-22 for stroke increments.

- Standard stroke length cylinders are available from shelf stock.
- Custom stroke lengths manufactured in minimal time.



**Dimensions — All Dimensions in Inches**

Bore	A	C	CB	CD	D	E	EE	FL	G	KK	L	LB	LH	MM	N1	N2	RM	V	XD	Y
7/16"	0.50	NA	0.31	0.156	NA	0.74	10-32	0.44	0.38	10-32	0.25	2.81	0.50	0.18	7/16-20	7/16-20	.434/.437	0.05	2.56	0.72
9/16"	0.50	NA	0.31	0.156	NA	0.62	10-32	0.38	0.38	10-32	0.25	2.75	0.50	0.18	7/16-20	7/16-20	.434/.437	0.06	2.56	0.75
3/4"	0.50	NA	0.38	0.250	NA	0.86	1/8 NPT	0.62	0.50	1/4-28	0.34	4.03	0.75	0.25	5/8-18	5/8-18	.621/.624	0.09	3.75	0.97
1-1/16"	0.50	0.12	0.38	0.250	0.25	1.12	1/8 NPT	0.62	0.50	5/16-24	0.34	4.12	0.75	0.31	5/8-18	5/8-18	.621/.624	0.09	3.84	1.07
1-1/4"	0.75	0.25	0.50	0.250	0.38	1.34	1/8 NPT	0.78	0.63	7/16-20	0.41	5.12	0.88	0.43	3/4-16	3/4-16	.746/.749	0.09	4.72	1.37
1-1/2"	0.75	0.25	0.62	0.375	0.38	1.56	1/8 NPT	0.81	0.63	7/16-20	0.50	4.76	1.00	0.43	3/4-16	NA	.746/.749	0.09	4.38	1.25
2"	0.88	0.38	0.75	0.375	0.50	2.08	1/4 NPT	1.03	0.81	1/2-20	0.56	6.06	1.63	0.62	1 1/4-12	1-1/4-12	1.372/1.375	0.12	5.62	1.46
2-1/2"	0.88	0.38	0.75	0.375	0.50	2.62	1/4 NPT	1.03	0.81	1/2-20	0.56	6.06	1.63	0.62	1 3/8-12	1-3/8-12	1.497/1.500	0.12	5.62	1.46

**Ordering Information — Standard Stroke Lengths**

Stock bore sizes and strokes are shown below. Contact the factory for custom stroke lengths. For Options and Accessories see ACT-6-18/19. See ACT-6-21 for complete Product Numbering System.

**Stock Stroke Lengths (in)**

Bore Sizes	Standard Stroke Lengths
7/16, 9/16	1/2, 1, 1-1/2, or 2
3/4, 1-1/16, 1-1/4,	1, 2, 3, 4, 5, or 6
1-1/2, 2, 2-1/2	

**Maximum Stroke Lengths**  
7/16" – 2-1/2" Bore – 36"

**Series**

**Bore Size**

A	7/16"	E	1-1/4"
B	9/16"	F	1-1/2"
C	3/4"	G	2"
D	1-1/16"	H	2-1/2"

**Full Inches of Stroke**

00	0" Stroke	03	3" Stroke
01	1" Stroke	04	4" Stroke
02	2" Stroke		

**Fractional Increments of Stroke\***

A	0"	J	1/2"
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**Model** <sup>(4)Double End Mount Only</sup>

SA	Single Acting Spring Return
RA	Reverse Acting Spring Extend
NR	Non-Rotating Rod
DA	<b>Double Acting</b>
DR	Double Acting Double Rod End <sup>4</sup>

**Options**

00	No Options
90	Standard Magnetic Piston Only <sup>1</sup>

<sup>1</sup>Magnetic pistons will change overall cylinder length. See table on ACT-6-20.

**Special Designation**

A	Standard
X	Special

**Options** <sup>(2)Bumpers on air side only with spring version</sup>

A	No Options
B	Viton Seals
C	Bumpers (Head & Cap) <sup>2</sup>
D	Viton seals and bumpers
E	Ecology piston seals (3/4-2-1/2 bores only)**
X	Special

**Mounting Style** <sup>(3)Includes Mounting Nut</sup>

N	Nose Mount <sup>3</sup>
P	<b>Pivot Mount</b>
D	Double End Mount <sup>3</sup>
B	Front Block Mount

**Series** R L ■ ■ ■ ■ - D A P - A A 0 0

1 2 3 4 5 6 7 8 9 10 11 12 13

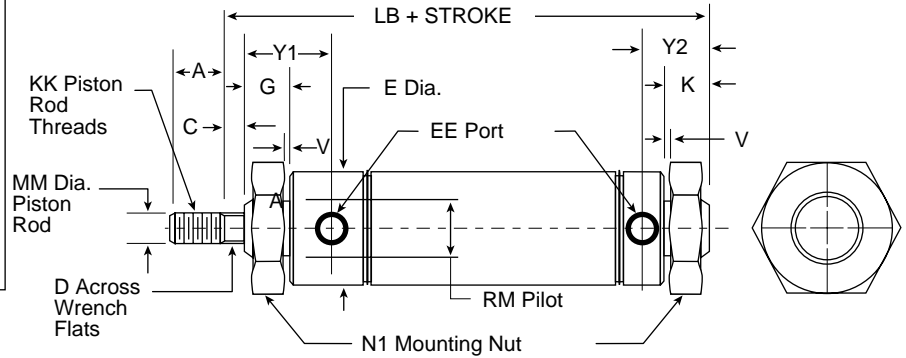
\* See ACT-6-22 for stroke increments.  
\*\* See ACT-6-21 for complete information on the Ecology seal.

# Round Line Actuators



## Double Acting — Double End Mount

- Standard stroke length cylinders are available from shelf stock.
- Custom stroke lengths manufactured in minimal time.



Dimensions — All Dimensions in Inches															
Bore	A	C	D	E	EE	G	K	KK	LB	MM	N1	RM	V	Y1	Y2
7/16"	0.50	NA	NA	0.74	10-32	0.38	0.50	10-32	2.81	0.18	7/16-20	.434/.437	0.05	0.73	0.69
9/16"	0.50	NA	NA	0.62	10-32	0.38	0.44	10-32	2.75	0.18	7/16-20	.434/.437	0.06	0.75	0.57
3/4"	0.50	NA	NA	0.86	1/8 NPT	0.50	0.62	1/4-28	4.03	0.25	5/8-18	.621/.624	0.09	0.97	0.90
1-1/16"	0.50	0.12	0.25	1.12	1/8 NPT	0.50	0.62	5/16-24	4.12	0.31	5/8-18	.624/.624	0.09	1.07	0.90
1-1/4"	0.75	0.25	0.38	1.34	1/8 NPT	0.63	0.81	7/16-20	5.12	0.43	3/4-16	.746/.749	0.09	1.37	1.18
1-1/2"	0.75	0.25	0.38	1.56	1/8 NPT	0.63	0.62	7/16-20	4.50	0.43	3/4-16	.746/.749	0.09	1.25	0.94
2"	0.88	0.38	0.50	2.08	1/4 NPT	0.81	1.00	1/2-20	6.06	0.62	1-1/4-12	1.372/1.375	0.12	1.46	1.47
2-1/2"	0.88	0.38	0.50	2.62	1/4 NPT	0.81	1.00	1/2-20	6.06	0.62	1-3/8-12	1.497/1.500	0.12	1.46	1.47

### Ordering Information — Standard Stroke Lengths

Stock bore sizes and strokes are shown below. Contact the factory for custom stroke lengths. For Options and Accessories see ACT-6-18/19. See ACT-6-21 for complete Product Numbering System.

### Stock Stroke Lengths (in)

Bore Sizes  
3/4, 1-1/16, 1-1/4, 1-1/2, 2, 2-1/2

Standard Stroke Lengths  
1, 2, 3, 4, 5, or 6

### Maximum Stroke Lengths

7/16" – 2-1/2" Bore – 36"

**Series**

**Bore Size**

A	7/16"	E	1-1/4"
B	9/16"	F	1-1/2"
C	3/4"	G	2"
D	1-1/16"	H	2-1/2"

**Full Inches of Stroke**

00	0" Stroke	03	3" Stroke
01	1" Stroke	04	4" Stroke
02	2" Stroke		

**Fractional Increments of Stroke\***

A	0"	J	1/2"
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**Model** <sup>(4)Double End Mount Only</sup>

SA	Single Acting Spring Return
RA	Reverse Acting Spring Extend
NR	Non-Rotating Rod
<b>DA</b>	<b>Double Acting</b>
DR	Double Acting Double Rod End <sup>4</sup>

**Options**

<b>00</b>	<b>No Options</b>
90	Standard Magnetic Piston Only <sup>1</sup>

<sup>1</sup>Magnetic pistons will change overall cylinder length. See table on ACT-6-20.

**Special Designation**

<b>A</b>	<b>Standard</b>
X	Special

**Options** <sup>(2)Bumpers on air side only with spring version</sup>

<b>A</b>	<b>No Options</b>
B	Viton Seals
C	Bumpers (Head & Cap) <sup>2</sup>
D	Viton seals and bumpers
E	Ecology piston seals (3/4-2-1/2 bores only)**
X	Special

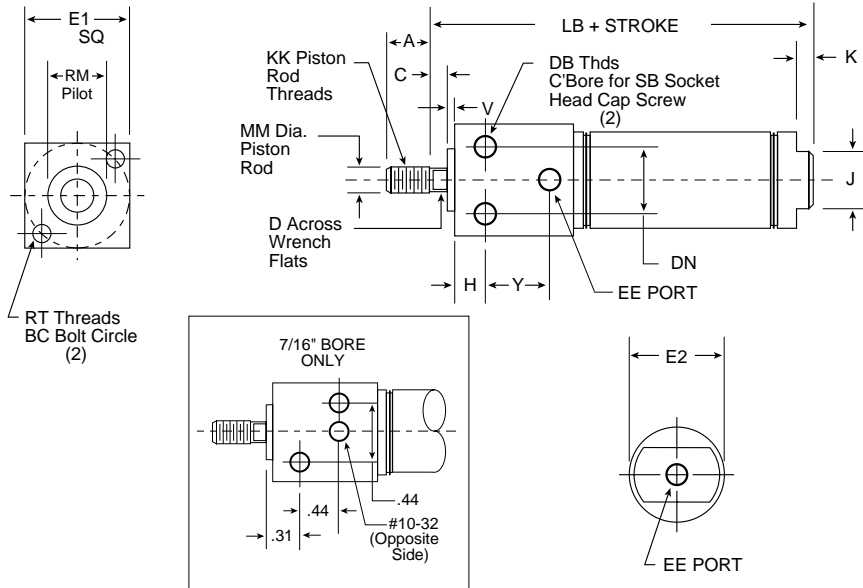
**Mounting Style** <sup>(3)Includes Mounting Nut</sup>

N	Nose Mount <sup>3</sup>
P	Pivot Mount
<b>D</b>	<b>Double End Mount<sup>3</sup></b>
B	Front Block Mount

\* See ACT-6-22 for stroke increments.  
\*\* See ACT-6-21 for complete information on the Ecology seal.



- Standard stroke length cylinders are available from shelf stock.
- Custom stroke lengths manufactured in minimal time.



**Dimensions — All Dimensions in Inches**

Bore	A	BC	C	D	DB	DN	EE	E1	E2	H	J	K	KK	LB	MM	RM	RT	SB	V	Y
7/16"	0.50	0.75	NA	NA	8-32	NA	NA	0.75	0.50	NA	0.38	0.19	10-32	2.12	0.18	0.437	8-32	NA	0.06	NA
3/4"	0.75	1.00	0.25	0.22	1/4-20	0.62	1/8 NPT	1.00	0.81	0.38	0.62	0.19	1/4-28	3.22	0.25	0.625	10-32	#10	0.09	0.50
1-1/16"	0.75	1.25	0.38	0.25	1/4-20	0.81	1/8 NPT	1.25	1.12	0.62	0.88	0.19	5/16-24	3.75	0.31	0.750	10-32	#10	0.09	0.54
1-1/2"	1.25	1.75	0.25	0.38	5/16-18	1.12	1/4 NPT	1.75	1.56	0.88	0.88	0.25	7/16-20	4.19	0.43	1.000	1/4-20	1/4	0.13	0.65

**Ordering Information — Standard Stroke Lengths**

Stock bore sizes and strokes are shown below. Contact the factory for custom stroke lengths. For Options and Accessories see ACT-6-18/19. See ACT-6-21 for complete Product Numbering System.

**Maximum Stroke Lengths**  
7/16" – 1-1/2" Bore – 36"

<b>R</b>	<b>L</b>	■	■	■	■	-	<b>D</b>	<b>A</b>	<b>B</b>	-	<b>A</b>	<b>A</b>	<b>0</b>	<b>0</b>																																																
1	2	3	4	5	6		7	8	9		10	11	12	13																																																
Series						Bore Size			Full Inches of Stroke			Options																																																		
Series						<table border="1"> <tr><td>A</td><td>7/16"</td></tr> <tr><td>C</td><td>3/4"</td></tr> <tr><td>D</td><td>1-1/16"</td></tr> <tr><td>F</td><td>1-1/2"</td></tr> </table>			A	7/16"	C	3/4"	D	1-1/16"	F	1-1/2"	<table border="1"> <tr><td>00</td><td>0" Stroke</td><td>03</td><td>3" Stroke</td></tr> <tr><td>01</td><td>1" Stroke</td><td>04</td><td>4" Stroke</td></tr> <tr><td>02</td><td>2" Stroke</td><td></td><td></td></tr> </table>			00	0" Stroke	03	3" Stroke	01	1" Stroke	04	4" Stroke	02	2" Stroke			<table border="1"> <tr><td colspan="4">Options</td></tr> <tr><td>00</td><td colspan="3">No Options</td></tr> <tr><td>90</td><td colspan="3">Standard Magnetic Piston Only<sup>1</sup></td></tr> <tr><td colspan="4"><sup>1</sup>Magnetic pistons will change overall cylinder length. See table on ACT-6-20.</td></tr> <tr><td colspan="4">Special Designation</td></tr> <tr><td>A</td><td colspan="3">Standard</td></tr> <tr><td>X</td><td colspan="3">Special</td></tr> </table>			Options				00	No Options			90	Standard Magnetic Piston Only <sup>1</sup>			<sup>1</sup> Magnetic pistons will change overall cylinder length. See table on ACT-6-20.				Special Designation				A	Standard			X	Special		
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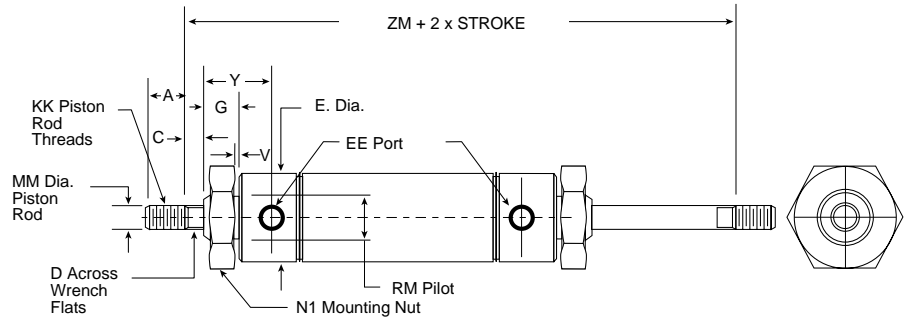


# Round Line Actuators



## Double Acting Double Rod End — Double End Mount

- Standard stroke length cylinders are available from shelf stock.
- Custom stroke lengths manufactured in minimal time.



**Dimensions — All Dimensions in Inches**

Bore	A	C	D	E	EE	G	KK	MM	N1	RM	V	Y	ZM
7/16"	0.50	NA	NA	0.74	10-32	0.38	10-32	0.19	7/16-20	.434/.437	0.05	0.72	2.81
9/16"	0.50	NA	NA	0.62	10-32	0.38	10-32	0.19	7/16-20	.434/.437	0.06	0.75	2.94
3/4"	0.50	NA	NA	0.86	1/8 NPT	0.50	1/4-28	0.25	5/8-18	.621/.624	0.09	0.97	4.00
1-1/16"	0.50	0.12	0.25	1.12	1/8 NPT	0.50	5/16-24	0.31	5/8-18	.621/.624	0.09	1.06	4.00
1-1/4"	0.75	0.25	0.38	1.34	1/8 NPT	0.63	7/16-20	0.43	3/4-16	.746/.749	0.09	1.37	5.56
1-1/2"	0.75	0.25	0.38	1.56	1/8 NPT	0.63	7/16-20	0.43	3/4-16	.746/.749	0.09	1.25	5.12
2"	0.88	0.38	0.50	2.08	1/4 NPT	0.81	1/2-20	0.62	1-1/4-12	1.372/1.375	0.12	1.46	6.56
2-1/2"	0.88	0.38	0.50	2.62	1/4 NPT	0.81	1/2-20	0.62	1-3/8-12	1.497/1.500	0.12	1.46	6.56

### Ordering Information — Standard Stroke Lengths

Stock bore sizes and strokes are shown below. Contact the factory for custom stroke lengths. For Options and Accessories see ACT-6-18/19. See ACT-6-21 for complete Product Numbering System.

**Product Numbering System:** R L ■ ■ ■ ■ - D R D - A A 0 0

1 2 3 4 5 6 7 8 9 10 11 12 13

Series	
A	7/16"
B	9/16"
C	3/4"
D	1-1/16"
E	1-1/4"
F	1-1/2"
G	2"
H	2-1/2"

Full Inches of Stroke			
00	0" Stroke	03	3" Stroke
01	1" Stroke	04	4" Stroke
02	2" Stroke		

Fractional Increments of Stroke*			
A	0"	J	1/2"

Model <sup>(4)Double End Mount Only</sup>	
SA	Single Acting Spring Return
RA	Reverse Acting Spring Extend
NR	Non-Rotating Rod
DA	Double Acting
DR	Double Acting Double Rod End <sup>4</sup>

Options	
00	No Options
90	Standard Magnetic Piston Only <sup>1</sup>

<sup>1</sup>Magnetic pistons will change overall cylinder length. See table on ACT-6-20.

Special Designation	
A	Standard
X	Special

Options <sup>(2)Bumpers on air side only with spring version</sup>	
A	No Options
B	Viton Seals
C	Bumpers (Head & Cap) <sup>2</sup>
D	Viton seals and bumpers
X	Special

Mounting Style <sup>(3)Includes Mounting Nut</sup>	
N	Nose Mount <sup>3</sup>
P	Pivot Mount
D	Double End Mount <sup>3</sup>
B	Front Block Mount

\* See ACT-6-22 for stroke increments.



# Round Line Actuators

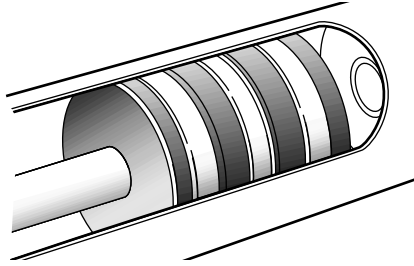
## Options

The following options can be requested at the time of cylinder order. Position 10 of the Product Numbering System (ACT-6-21) pertains to these options

### Noise Dampening Bumpers

Nitrile bumpers are installed in each end of the cylinder preventing metal-to-metal contact to provide extremely quiet cylinder operation.

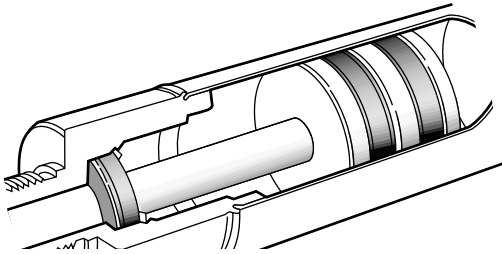
Note: Overall cylinder length increases by .125 per bumper.



To Order: Enter "C" in the 10th position of the Product Number

### Viton Rod & Piston Seals

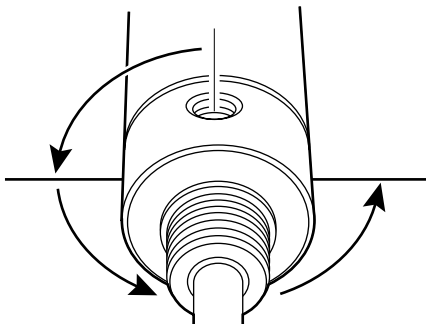
For higher temperature applications use Viton Seals (-20° to 400°F).



To Order: Enter "B" in the 10th position of the Product Number

### Ports Rotated 90°

Viewing cylinder from the rod end, specify port relocation in 90° increments moving counterclockwise from the standard port location.



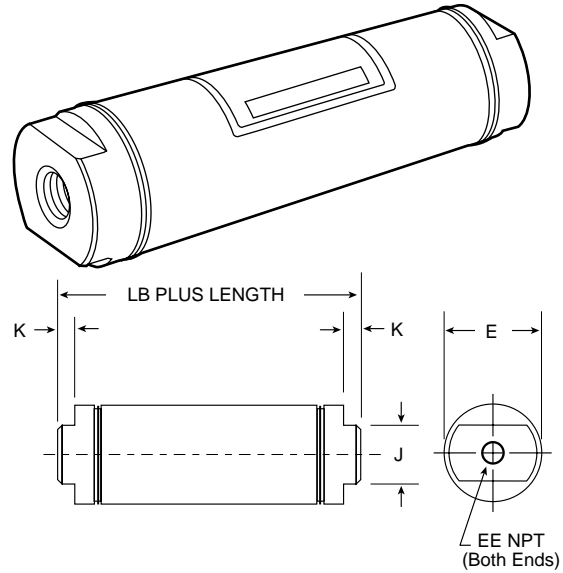
To Order: Enter "X" in the 11th position of the Product Number and specify new port location at 90°, 180°, or 270° from origin.

## Accessories

The following accessories are ordered separately from the cylinder, use the order number included with the product description.

### Air Reservoir

Air Reservoirs are made of the same high-quality stainless steel as the Series RL Cylinders.



Dimensions — All Dimensions in Inches						
Bore	E	EE	J	K	LB	Standard Internal Lengths
3/4"	0.813	1/8"	0.625	0.187	1.938	1" increments thru 4"
1-1/16"	1.125	1/8"	0.875	0.187	2.375	1" increments thru 8"
1-1/2"	1.562	1/8"	0.875	0.250	2.250	1" increments thru 16"
2"	2.080	1/4"	1.250	0.312	2.875	1" increments thru 16"
2-1/2"	2.610	1/4"	1.750	0.312	2.875	1" increments thru 24"

### How to Order

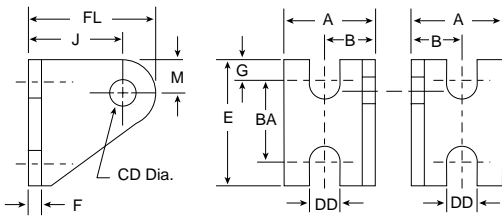
Example:  
1-1/16" bore air reservoir with a 3" internal length would be ordered as follows: **AR-1 1/16 x 3**

Flow Controls		
Part No	Tube Size	Port Size
12 VAO 0210	5/32" O.D.	X10-32UNF
12 VAO 0218	5/32" O.D.	1/8" N.P.T.
12 VAO 0418	1/4" O.D.	1/8" N.P.T.
12 VAO 0428	1/4" O.D.	1/4" N.P.T.
12 VAO 0628	3/8" O.D.	1/4" N.P.T.



- All accessories are clear zinc plated carbon steel

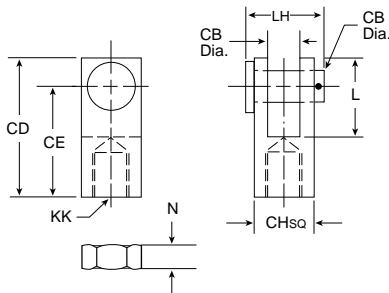
**Pivot Bracket**



**Dimensions — All Dimensions in Inches**

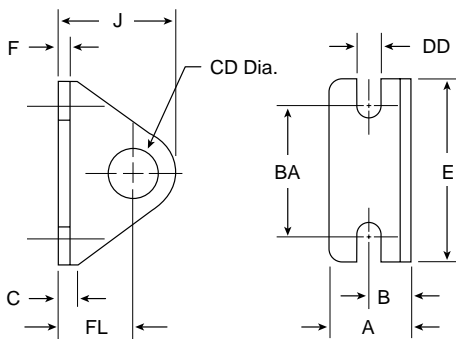
Bore	Part Number	A	B	BA	CD	DD	E	F	FL	G	J	M
7/16", 9/16"	PB-1	0.50	0.28	0.50	0.156	0.19	0.75	0.06	0.77	0.12	0.56	0.20
3/4", 1-1/16", 1-1/4"	PB-2	0.81	0.44	0.75	0.250	0.27	1.12	0.12	1.19	0.19	0.88	0.31
1-1/2"	PB-3	1.00	0.62	1.00	0.375	0.27	1.50	0.12	1.75	0.25	1.38	0.38
2", 2-1/2"	PB-4	1.125	0.68	1.00	0.375	0.26	1.50	0.25	1.75	0.25	1.38	0.38

**Rod Clevis  
(Includes Pin & Jam Nut)**



Bore	Part Number	CB	CD	CE	CH	KK	L	LH	N
7/16", 9/16"	RC-1	0.19	0.94	0.75	0.38	10-32	0.56	0.66	0.12
3/4"	RC-2	0.25	1.19	0.94	0.50	1/4-28	0.68	0.85	0.16
1-1/16"	RC-3	0.25	1.19	0.94	0.50	5/16-24	0.69	0.85	0.19
1-1/4", 1-1/2"	RC-4	0.38	1.69	1.31	0.75	7/16-20	0.94	1.12	0.25
2", 2-1/2"	RC-5	0.38	1.69	1.31	0.75	1/2-20	0.94	1.12	0.31

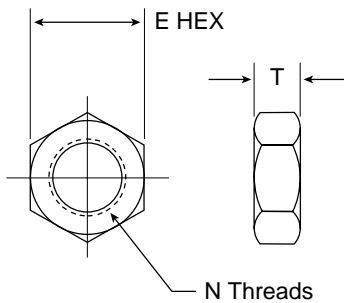
**Foot Bracket**



Bore	Part Number	A	B	BA	C	CD	DD	E	F	FL	J
7/16" (S)	FB-1	0.62	0.31	1.00	0.12	0.38	0.19	1.38	0.07	0.56	0.88
7/16" (D), 9/16" (S/D)	FB-2	0.69	0.38	1.00	0.12	0.44	0.19	1.38	0.09	0.56	0.83
3/4" (S)	FB-3	0.75	0.44	1.25	0.19	0.50	0.19	1.62	0.10	0.69	1.09
3/4" (D), 1-1/16" (S/D)	FB-4	1.00	0.56	1.50	0.25	0.62	0.27	1.88	0.12	0.81	1.38
1-1/4" (S/D), 1-1/2" (S/D)	FB-5	1.50	0.75	1.88	0.62	0.75	0.28	2.50	0.12	1.00	1.75
2" (S/D)	FB-6	1.62	1.00	2.25	0.62	1.38	0.34	3.12	0.25	1.50	2.50
2-1/2" (S/D)	FB-7	1.62	1.00	2.88	0.75	1.50	0.34	3.75	0.25	1.75	3.00

S = Single Acting Models    D = Double Acting Models    S/D = Single & Double Acting Models

**Mounting Nut**



**Single Acting Spring Return Models**

Bore	Part Number	N	E	T
7/16"	MN-1	3/8-24	0.56	0.22
9/16"	MN-2	7/16-20	0.69	0.25
3/4"	MN-3	1/2-20	0.75	0.31
1-1/16"	MN-4	5/8-18	0.94	0.38
1-1/4", 1-1/2"	MN-5	3/4-16	1.12	0.42
2"	MN-6	1-1/4-12	1.88	0.50

**Single Acting Spring Extend & Double Acting Models**

Bore	Part Number	N	E	T
7/16", 9/16"	MN-2	7/16-20	0.69	0.25
3/4", 1-1/16"	MN-4	5/8-18	0.94	0.38
1-1/4", 1-1/2"	MN-5	3/4-16	1.12	0.42
2"	MN-6	1-1/4-12	1.88	0.50
2-1/2"	MN-7	1-3/8-12	2.00	0.50

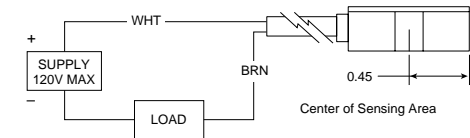
- Attach to Series S Cylinders with an adjustable band
- Switches can be positioned anywhere along the range of piston travel.
- LED indicator light facilitates installation and trouble shooting.
- Several switches can be mounted to a cylinder to control or initiate any sequence function.
- All switches are supplied with 9-ft leads and brackets.



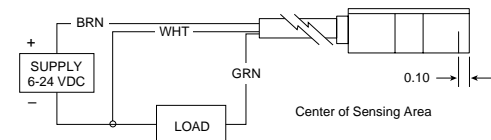
	Specifications & Order Number		
Model Number	CS8-04	CS8-31	CS8-32
Switch Type	Reed Switch *MOV & Light	Hall Effect & Light, Sourcing	Hall Effect & Light, Sinking
Function	SPST Normally Open	Normally Open	Normally Open
Switching Voltage	5-120 VDC/VAC 50/60 Hz	6-24 VDC	6-24 VDC
Switching Current	0.5 Amp Max. 0.005 Amp Min.	0.5 Amp Max.	0.5 Amp Max.
Switching Power	10 VA	12 Watts Max.	12 Watts Max.
Max. Voltage Drop	3.5 Volts	0.5 Volts	0.5 Volts
Magnetic Sensitivity	85 Gauss	85 Gauss	85 Gauss
Enclosure Classification	NEMA 6	NEMA 6	NEMA 6
Temperature Range	-22°F to + 176°F	-22°F to + 176°F	-22°F to + 176°F

\* Metal Oxide Varistor Surge Suppression

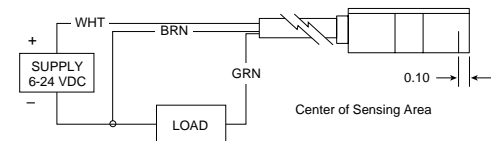
### Wiring Diagram



CS8-04



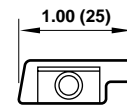
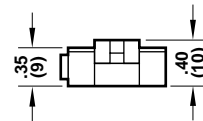
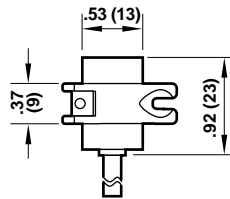
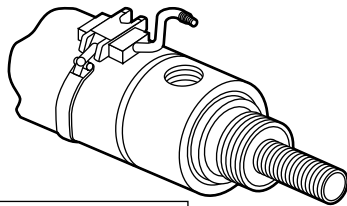
CS8-31 (Source)



CS8-32 (Sink)

Bore Size	9/16	3/4	1-1/16	1-1/4	1-1/2	2	2-1/2
Change in overall cylinder length when specifying a magnetic piston	+0.25	+0.31	+0.41	-0.09	+0.43	+0.47	+0.72

### CS8 Series Switch & Mounting Strap Dimensions — In inches



To order Mounting Strap only, reference P/N 1A940-01

### CS8 Reed & Hall Effect Application Recommendations and Precautions

All Switches have been carefully engineered and tested, but since they may be installed in virtually an unlimited number of applications under a great variety of plant conditions, they should be installed as outlined to provide maximum reliability.

1. Always stay within the specifications and power rating limitations of the unit installed.
2. Primary and control circuit wiring should not be mixed in the same conduit. Motors will produce high pulses that will be introduced into the control wiring if the wiring is carried in the same conduit.
3. Never connect the switch without a load present. The switch will be destroyed.

In order to obtain optimum performance and long life, magnetically operated limit switches should not be subjected to: (1) strong magnetic fields, (2) extreme temperature and (3) excessive ferrous filing or chip buildup.

Improper wiring may damage or destroy the switch. Therefore, the wiring diagram along with the listed power ratings, should be carefully observed before connecting power to the switch.

Lower power switches are designed for signalling electronic circuits. Do not use on relay loads or with incandescent bulbs. Resistive loads only.



**Roundline Ecology Piston Seal Option (E)**

The Ecology (Impact Dampening) Piston Seal option is available on 3/4 to 2-1/2 inch bore size Roundline cylinders in DAP and DAD configurations. This option includes non-adjustable air cushions on both the extend and retract stroke of the cylinder. By including the Ecology Piston Seal option, cylinders can be specified based on weights of load being carried and speed of load. This is shown in the top table below.

**Energy Absorption Capacity of the Impact Dampening Piston Seal**

This chart represents the energy absorption capacity of the Impact Dampening piston seals with standard Non-Adjustable air cushions. The values given are usable pounds stoppable at stated piston speeds.

In/Sec	Cylinder Bore					
	3/4	1-1/16	1-1/4	1-1/2	2	2-1/2
6	36.6	62.3	74.5	115.5	258.9	421.1
12	5.6	15.6	18.6	28.9	64.7	105.3
18	2.5	6.9	8.3	12.8	28.8	46.8
24	1.4	3.9	4.7	7.2	16.2	26.3
30	0.9	2.5	3.0	4.6	10.4	16.8
36	0.6	1.7	2.1	3.2	7.2	11.7
42	0.5	1.3	1.5	2.4	5.3	8.6
48	0.3	1.0	1.2	1.8	4.0	6.6
54	0.3	0.8	0.9	1.4	3.2	5.2
60	0.2	0.6	0.7	1.2	2.6	4.2

The figures below represent total stroke loss (both ends) for the pressure indicated for new cylinders. The impact dampening seals will take some compression set during operation of the cylinder and the stroke loss will decrease. To determine stroke loss for either the head or cap, divide the value shown by 2

PSI	Cylinder Bore					
	3/4	1-1/16	1-1/4	1-1/2	2	2-1/2
0	.11	.12	.12	.14	.15	.17
20	.08	.09	.09	.10	.10	.12
40	.05	.06	.06	.07	.07	.08
60	.03	.04	.04	.04	.04	.05
80	.01	.02	.02	.02	.02	.02
100	0	0	0	0	0	0



The face of the Impact Dampening (Ecology) Piston Seal extends beyond the face of the machined aluminum piston. This allows for energy absorption when the Impact Dampening Piston Seal contacts the head or cap and compresses. In conjunction with the non-adjustable air cushions, the load is effectively stopped with minimal shock or vibration.

For complete "how to order" instructions on the Ecology Piston Seal Options, see ACT-6-22.

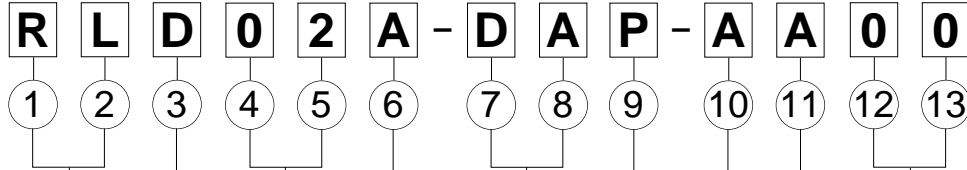


# Round Line Actuators

**EXAMPLE:** Stainless Steel Body Air Cylinder – 1-1/16" Bore – 2" Stroke – Double Acting – Pivot Mount – No Options

**IMPORTANT:** When using "X" in the model number, please be specific!  
X=DESCRIBE IN DETAIL

## Cylinder Order Information



Series

Bore Size	
A	7/16"
B	9/16"
C	3/4"
D	1-1/16"
E	1-1/4"
F	1-1/2"
G	2"
H	2-1/2"
X	Special

Options	
00	No Options
90	Standard Magnetic Piston Only <sup>1</sup>

<sup>1</sup>Magnetic pistons will change overall cylinder length. See table on preceding page.

Special Designation	
A	Standard
X	Special

Options	
A	No Options
B	Viton Seals
C	Bumpers (Head & Cap) <sup>2</sup>
D	Viton Seals and Bumpers
E	Ecology Piston Seals <sup>3</sup>
X	Special

<sup>2</sup>Bumpers on air side only with spring version  
<sup>3</sup>DAD and DAP models only

Mounting Style	
N	Nose Mount <sup>4</sup>
P	Pivot Mount
D	Double End Mount <sup>4</sup>
B	Front Block Mount

<sup>4</sup>Includes Mounting Nut

Full Inches of Stroke			
00	0" Stroke	13	13" Stroke
01	1" Stroke	14	14" Stroke
02	2" Stroke	15	15" Stroke
03	3" Stroke	16	16" Stroke
04	4" Stroke	17	17" Stroke
05	5" Stroke	18	18" Stroke
06	6" Stroke	19	19" Stroke
07	7" Stroke	20	20" Stroke
08	8" Stroke	21	21" Stroke
09	9" Stroke	22	22" Stroke
10	10" Stroke	23	23" Stroke
11	11" Stroke	24	24" Stroke
12	12" Stroke	XX	Special

Fractional Inches of Stroke			
A	0"	G	3/8"
B	1/16"	H	7/16"
C	1/8"	J	1/2"
D	3/16"	K	9/16"
E	1/4"	M	5/8"
F	5/16"	N	11/16"
		P	3/4"
		R	13/16"
		S	7/8"
		T	15/16"
		X	Special

Model	
SA	Single Acting Spring Return
RA	Reverse Acting Spring Extend
NR	Non-Rotating Rod
DA	Double Acting
DR	Double Acting Double Rod End <sup>5</sup>

<sup>5</sup>Double End Mount Only

# Norgren Mini Roundline Pneumatic Cylinder

Mini Roundline Cylinders .....ACT-7-2



**Miniature Roundline cylinders**  
Single acting, Ø 2.5 & 4 mm

**Ideal for very light load applications such as function testing mobile phones and keyboards**

**Low friction characteristics mean high speeds**

**No fittings required - all types feature one integral push on barbed connector**

**Long service life and corrosion resistant materials mean low cost of ownership**



#### **Technical data**

Medium:

Compressed air, filtered, lubricated or non-lubricated

Operating pressure:

50.75 to 101.5 psig (3.5 to 7 bar)

Operating temperature:

32°F to 140°F (0°C to 60°C)

\* Air supply must be dry enough to avoid ice formation at temperatures below 35°F (2°C)

Cylinder diameters:

2.5 and 4mm

Strokes:

5, 10 mm - Ø 2.5 mm

5, 10, 15, 20 mm - Ø 4 mm

#### **Materials**

Barrel: stainless steel

End caps: aluminum alloy

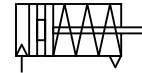
Piston rod: stainless steel

Elastomers: nitrile

#### **Ordering information**

To order a basic 2.5mm diameter cylinder, sprung in with a 10mm stroke quote:

**RM/59102/C/10**







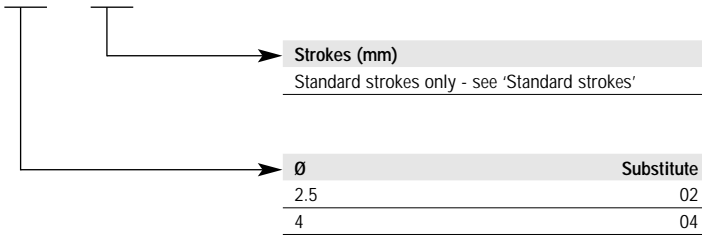
**Theoretical forces ● Air consumption ● Weight of cylinders**

Ø mm	Theoretical forces lb (N) at 87 psig (6 bar)		Air consumption in <sup>3</sup> /cm (l/cm) at 6 bar		Weight lb (kg) by stroke length			
	Outstroke	F1	Instroke	Outstroke	5 mm	10 mm	15 mm	20 mm
2.5	0.65 (2.9)	0.15 (0.7)	0.06 (0.001)	0.06 (0.001)	0.004 (0.002)	0.004 (0.002)	-	-
4	1.70 (7.6)	0.26 (1.2)	0.18 (0.003)	0.18 (0.003)	0.006 (0.003)	0.008 (0.004)	0.010 (0.005)	0.012(0.006)

F1 = Return force

**Options selector**

**RM/591★★/C/★★**

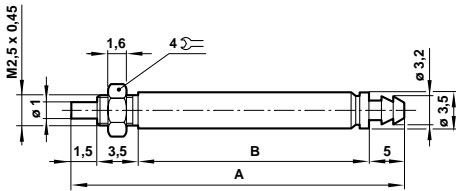


**Standard strokes**

Cylinder Ø mm	Strokes (mm)			
	5	10	15	20
2.5	●	●		
4	●	●	●	●

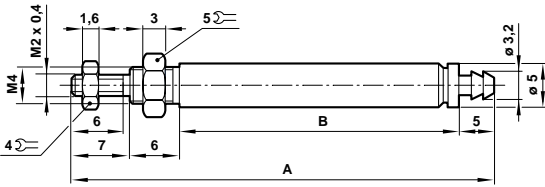
**Basic dimensions**

RM/59102/C



	Ø	A	B
RM/59102/C/5	2.5	1.04 (26.5)	0.65 (16.5)
RM/59102/C/10	2.5	1.40 (35.5)	1.00 (25.5)
RM/59104/C/5	4	1.46 (37)	0.75 (19)
RM/59104/C/10	4	1.81 (46)	1.10 (28)
RM/59104/C/15	4	2.17 (55)	1.46 (37)
RM/59104/C/20	4	2.52 (64)	1.81 (46)

RM/59104/C



Note: push-on connector is suitable for 5/32 Inch O/D, 0.106 Inch I/D (4mm O/D, 2.5 mm I/D) polyurethane tubing

# Series 90000 Compact Actuators

## Single and Double Acting 1/2" to 4" bore sizes

<b>Series 92000 Double Acting Compact Cylinder Features</b> .....	ACT-8-2
Technical Information .....	ACT-8-3
Type /M Basic .....	ACT-8-4
Rear Flange Mount 'B', Front Flange Mount 'G' and Foot Mount 'C' .....	ACT-8-6
Piston Rod Clevis Mount 'F', Back to Back Mounting Kit, How to Order Mounts .....	ACT-8-7
Type /JM Double Ended Piston Rod .....	ACT-8-8
Type /N2 Internal Non-rotating Piston Rod .....	ACT-8-9
Type /N4 External Non-rotating Guidance .....	ACT-8-10
How to Order Double Acting Compact Cylinders .....	ACT-8-11
Spares Kits .....	ACT-8-11
<b>Series 91000 and Series 93000 Single Acting Compact Cylinder Features</b> .....	ACT-8-12
Technical Information .....	ACT-8-13
Type /M Basic Single Acting Spring Return and Spring Extend .....	ACT-8-14
Rear Flange Mount 'B', Front Flange Mount 'G' and Foot Mount 'C' .....	ACT-8-16
Piston Rod Clevis Mount 'F', Back to Back Mounting Kit, How to Order Mounts .....	ACT-8-17
Type /N2 Spring Return and Spring Extend Non-rotating Piston Rods .....	ACT-8-18
How to Order Single Acting Compact Cylinders .....	ACT-8-19
Spares Kits .....	ACT-8-19
<b>M/40 Magnetically Operated Reed Switches</b> .....	ACT-8-20
<b>M/41, M/42 Magnetically Operated Solid State Switches</b> .....	ACT-8-22



**ACT-8-4 – Basic Double Acting  
– 92000/M**



**ACT-8-8 – Double Acting with Double  
Ended Piston Rod – 92000/JM**



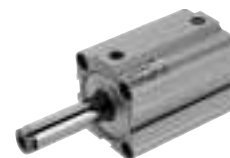
**ACT-8-9 – Double Acting with Internal  
Non-rotating Piston Rod – 92000/N2**



**ACT-8-10 – Double Acting with External  
Non-rotating Guidance – 92000/N4**



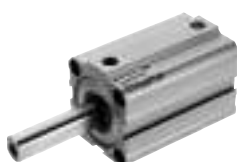
**ACT-8-14 – Basic Single Acting  
Spring Return – 91000/M**



**ACT-8-14 – Basic Single Acting  
Spring Extend – 93000/M**



**ACT-8-18 – Single Acting Spring Return  
with Non-rotating Piston Rod – 91000/N2**



**ACT-8-18 – Single Acting Spring Extend  
with Non-rotating Piston Rod – 93000/N2**



# The finest materials for each Series 92000 component!

## 1 Rod Seal Wiper:

Polyurethane pressure energized and wear-compensating.

## 2 Rod Bearing:

Short Stroke version with integrated bearing made of anodized aluminum. Long Stroke version incorporates a heavy duty polyamide bearing.

## 3 Piston Rod:

303 stainless steel, ground and polished, hard chrome plated for excellent protection against wear and corrosion.

## 4 Tube Body:

6063 extruded aluminum alloy, ideally suited for air service, clear coat anodized corrosion resistant surface.

## 5 Piston:

Specially formulated polyacetal on the smaller bore sizes and solid aluminum on the larger bore sizes for added strength and longevity.

## 6 Head/Cap:

Anodized aluminum for corrosion resistance.

## 7 Extrusion:

Complete with integral slots for low profile position sensing switches.

## 8 Piston Magnet:

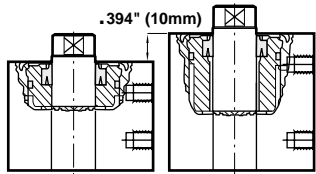
All cylinders are supplied with a specially molded piston magnet; switches can be added later.

## 9 Piston Seal:

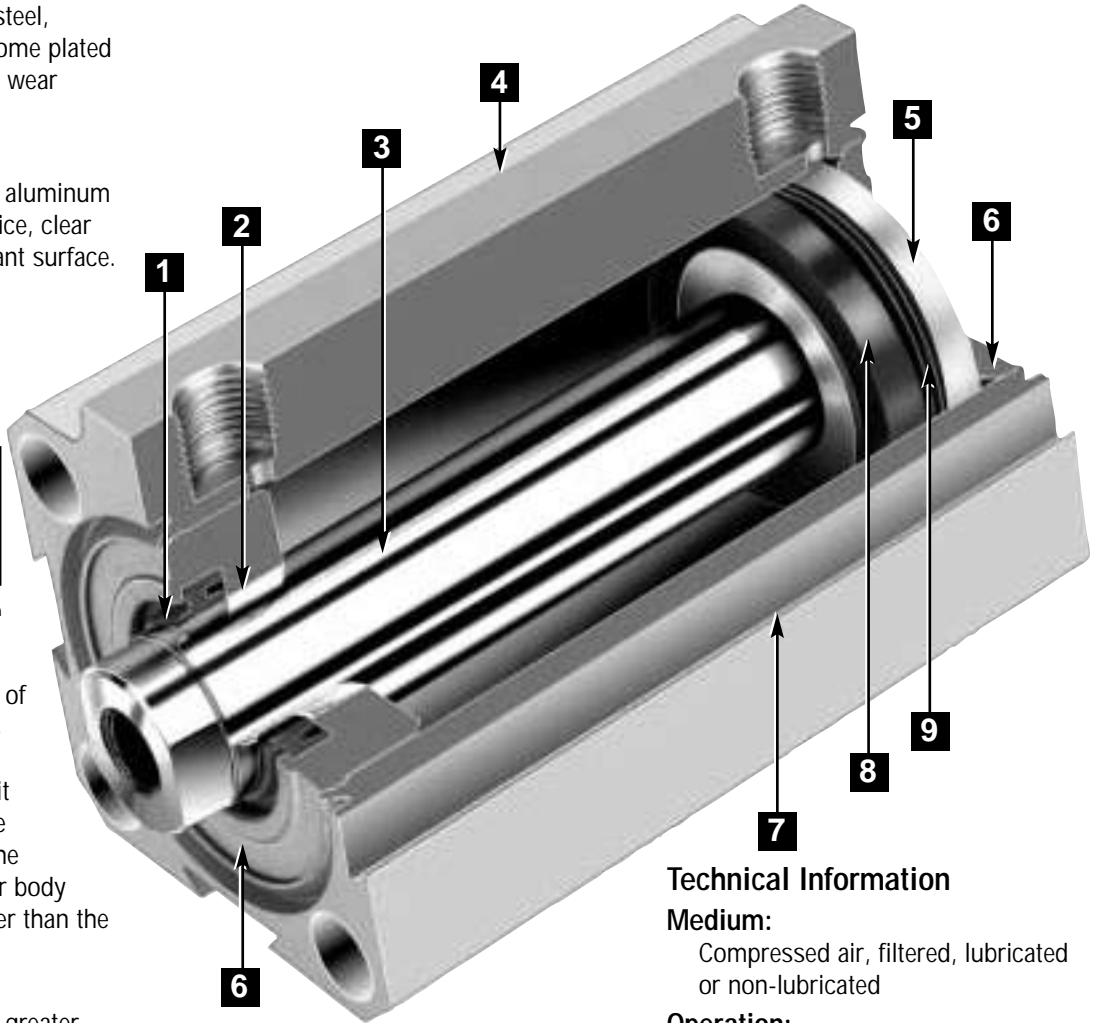
Z-Seal is a pressure energized bidirectional seal compounded with nitrile rubber for excellent wear.

## 10 Prelubricated:

All cylinders are prelubricated for dry air service.



Short Stroke Version Long Stroke Version



### Short Stroke Version:

Designed for stroke lengths of 2" (50mm) and shorter, this cylinder incorporates an integrated bearing to make it as compact as possible. The integrated bushing makes the overall length of the cylinder body exactly .394" (10mm) shorter than the Long Stroke version.

### Long Stroke Version:

Designed for stroke lengths greater than 2" (50mm), cylinder incorporates a longer bearing housing with a heavy duty Polyamide rod bearing for increased stability. The housing increases the overall length of the cylinder body .394" (10mm) longer than the Short Stroke version.

### Non-rotating Piston Rod Version:

/N2/ cylinder has a special non-rotating bearing housing. As a result, the cylinder overall body length is .394" (10mm) longer.

### Non-rotating Guidance Version:

/N4/ cylinder utilizes the Short Stroke version and Long Stroke version cylinders depending on stroke length.

### High Temperature Version:

Available on bore sizes 1 1/4" to 4" (32 to 100mm) double acting cylinders. Pistons are made from brass or solid aluminum and seals are changed to fluorocarbon for temperatures up to 302°F (150°C). High temperature reed switch TM/40 is available for position sensing.

### Technical Information

#### Medium:

Compressed air, filtered, lubricated or non-lubricated

#### Operation:

Double acting with magnetic piston

#### Operating Pressure:

14.5 to 145 PSI (1 to 10 bar)

#### Operating Temperature:

23°\* to 176°F (-5°\* to 80°C)

\*Consult Technical Service for use below 35°F (2°C)

#### Cylinder Diameters:

Nominal Inch:

1/2", 5/8", 3/4", 1", 1 1/4", 1 1/2", 2", 2 1/2", 3 1/8", 4", 12, 16, 20, 25, 32, 40, 50, 63, 80, 100mm



Cylinder Variations

Symbol	Model (magnetic piston)	Description
	DC/92000/JM inch cylinder DM/92000/JM metric cylinder	Double ended piston rod See ACT-8-8 for dimensional and stroke length information Ø 5/8", 3/4", 1", 1 1/4", 1 1/2", 2", 2 1/2", 3 1/8", 4" (Ø 16, 20, 25, 32, 40, 50, 63, 80, 100 mm)
	RC/92000/N2 inch cylinder RM/92000/N2 metric cylinder	Internal non-rotating piston rod See ACT-8-9 for dimensional and stroke length information Ø 5/8", 3/4", 1", 1 1/4", 1 1/2", 2", 2 1/2", 3 1/8", 4" (Ø 16, 20, 25, 32, 40, 50, 63, 80, 100 mm)
	DC/92000/N4 inch cylinder DM/92000/N4 metric cylinder	External non-rotating guidance See ACT-8-10 for dimensional and stroke length information Ø 5/8", 3/4", 1", 1 1/4", 1 1/2", 2", 2 1/2", 3 1/8", 4" (Ø 16, 20, 25, 32, 40, 50, 63, 80, 100 mm)

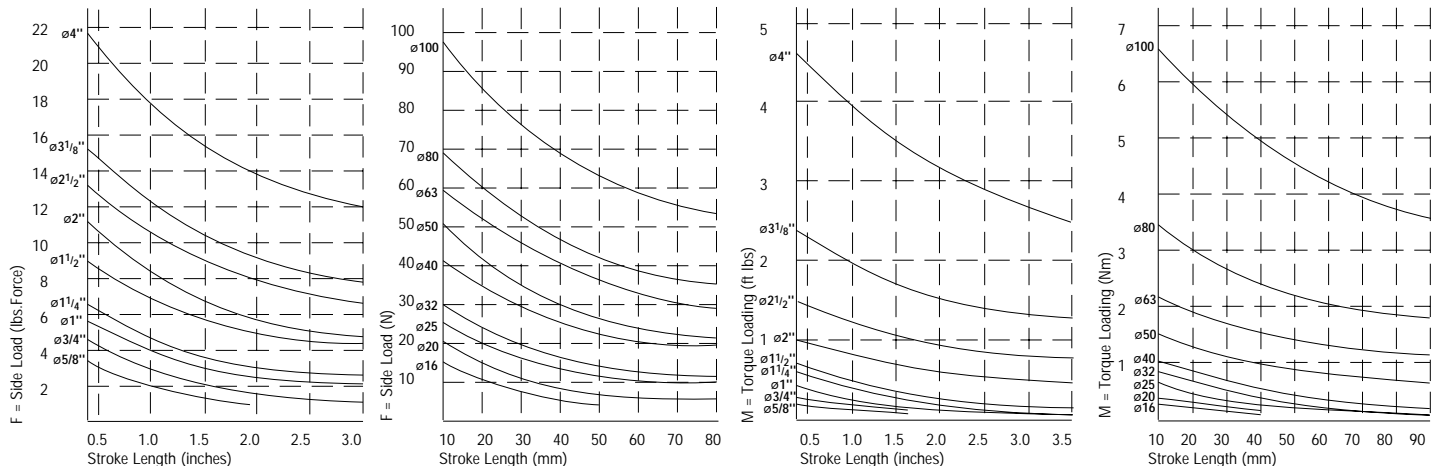
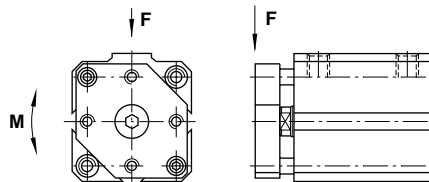
Theoretical Forces • Air Consumption • Torque for /N2 Cylinders

Ø Bore Nominal Inch	Ø Bore mm	DC/92000/M inch, DM/92000/M metric Theoretical forces at 87 PSI (6 bar)				DC/92000/M inch, DM/92000/M metric Air consumption cubic inches/inch of stroke (Liters/cm of stroke)				Non-rotating piston rod permissible torque RC/92000/N2 inch, RM/92000/N2 metric Torque at 87 PSI (6 bar)	
		Extend lbs. Force	Newtons	Retract lbs. Force	Newtons	Extend Inch <sup>3</sup>	Liters	Retract Inch <sup>3</sup>	Liters	Model	Max Torque Inch lbs. Nm
1/2"	(12)	15.3	(68)	11.5	(51)	1.240	(0.008)	1.085	(0.007)	-	-
5/8"	(16)	27.2	(121)	20.2	(90)	2.170	(0.014)	1.705	(0.011)	RC/92016/N2, RM/92016/N2	1.33 (0.15)
3/4"	(20)	42.3	(188)	31.7	(141)	3.410	(0.022)	2.635	(0.017)	RC/92020/N2, RM/92020/N2	2.21 (0.25)
1"	(25)	66.3	(295)	51.0	(227)	5.425	(0.035)	4.185	(0.027)	RC/92025/N2, RM/92025/N2	3.54 (0.40)
1 1/4"	(32)	108.6	(483)	81.4	(362)	8.680	(0.056)	6.510	(0.042)	RC/92032/N2, RM/92032/N2	6.64 (0.75)
1 1/2"	(40)	169.5	(754)	142.3	(633)	13.640	(0.088)	11.470	(0.074)	RC/92040/N2, RM/92040/N2	6.64 (0.75)
2"	(50)	264.8	(1178)	222.6	(990)	21.390	(0.138)	17.980	(0.116)	RC/92050/N2, RM/92050/N2	13.28 (1.50)
2 1/2"	(63)	420.4	(1870)	378.1	(1682)	33.790	(0.218)	30.380	(0.196)	RC/92063/N2, RM/92063/N2	13.28 (1.50)
3 1/8"	(80)	678.0	(3016)	611.7	(2721)	54.560	(0.352)	49.290	(0.318)	RC/92080/N2, RM/92080/N2	22.13 (2.50)
4"	(100)	1059.3	(4712)	993.2	(4418)	85.250	(0.550)	79.825	(0.515)	RC/92100/N2, RM/92100/N2	22.13 (2.50)

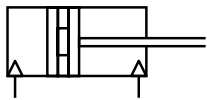
Weights of Cylinders and Mountings

Ø Bore Nominal Inch	Ø Bore mm	DC/92000/M inch DM/92000/M metric Weight at zero stroke		DC/92000/N4 inch DM/92000/N4 metric Weight at zero stroke		Style 'B', 'G'		Style 'C'		Style 'F'		Nut		Stud or Adaptor			
		lbs	kg	lbs	kg	lbs	kg	lbs	kg	lbs	kg	lbs	kg	lbs	kg		
1/2"	(12)	0.132	(0.060)	0.088	(0.040)	-	-	0.044	(0.020)	0.044	(0.020)	0.022	(0.010)	0.002	(0.001)	0.002	(0.001)
5/8"	(16)	0.176	(0.080)	0.088	(0.040)	0.243	(0.110)	0.110	(0.050)	0.044	(0.020)	0.022	(0.010)	0.002	(0.001)	0.004	(0.002)
3/4"	(20)	0.220	(0.100)	0.132	(0.060)	0.287	(0.130)	0.154	(0.070)	0.044	(0.020)	0.022	(0.010)	0.002	(0.001)	0.007	(0.003)
1"	(25)	0.331	(0.150)	0.154	(0.070)	0.375	(0.170)	0.220	(0.100)	0.088	(0.040)	0.022	(0.010)	0.004	(0.002)	0.011	(0.005)
1 1/4"	(32)	0.551	(0.250)	0.265	(0.120)	0.617	(0.280)	0.287	(0.130)	0.132	(0.060)	0.088	(0.040)	0.007	(0.003)	0.022	(0.010)
1 1/2"	(40)	0.838	(0.380)	0.331	(0.150)	0.970	(0.440)	0.331	(0.150)	0.331	(0.150)	0.220	(0.100)	0.044	(0.020)	0.007	(0.003)
2"	(50)	0.992	(0.450)	0.397	(0.180)	1.102	(0.500)	0.441	(0.200)	0.375	(0.170)	0.243	(0.110)	0.088	(0.040)	-	-
2 1/2"	(63)	1.808	(0.820)	0.573	(0.260)	1.984	(0.900)	0.661	(0.300)	0.728	(0.330)	0.287	(0.130)	0.198	(0.090)	-	-
3 1/8"	(80)	2.646	(1.200)	0.728	(0.330)	2.976	(1.350)	0.772	(0.350)	0.904	(0.410)	0.397	(0.180)	0.485	(0.220)	-	-
4"	(100)	4.034	(1.830)	0.926	(0.420)	4.850	(2.200)	1.323	(0.600)	1.587	(0.720)	1.058	(0.480)	0.485	(0.220)	-	-

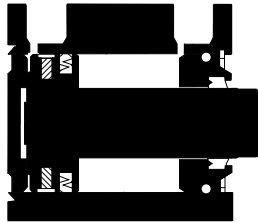
External Non-rotating Guidance  
DC/92000/N4 inch, DM/92000/N4 metric  
Permissible Load and Torque



- Very compact – approximately one third the basic length of a corresponding conventional cylinder
- Entirely manufactured from corrosion resistant materials
- Standard magnetic piston provides a wide range of control options
- $\varnothing$  1/2" to 4" ( $\varnothing$  12 to 100 mm)



Magnetic piston


**Ordering Information**

To order a basic 3 1/8" bore cylinder with a 2 inch stroke and magnetic piston, specify: DC/92080/M/2.0

To order a basic 63 mm bore cylinder with a 100 mm stroke and magnetic piston, specify: DM/92063/M/100

To order mounting accessories, refer to appropriate cylinder mounting table on pages 6 and 7.

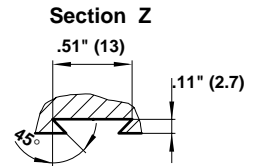
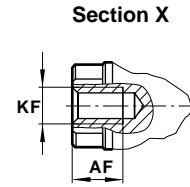
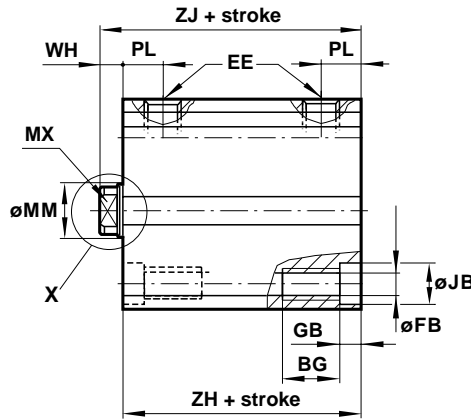
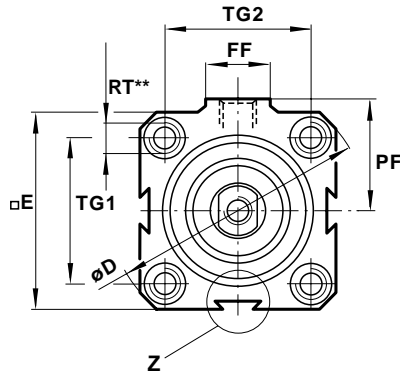
Order magnetically operated switches M/40, M/41 and M/42 separately. See pages ACT-8-20/23.

**Non-Standard Options**

- Hollow piston rod for blow-off or vacuum
- Additional mountings
- Force multiplication tandems
- Multi-position duplex
- Integrated control valve

**Cylinder Order Information**

■	■	■	-	9	2	■	■	■	-	■	M	-	*																																						
1	2	3		4	5	6	7	8		9	10		11																																						
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>T</td><td>High Temperature</td></tr> </table>			T	High Temperature	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td colspan="2">Piston Rod Material</td></tr> <tr><td>D</td><td>Chrome Plated Stainless Steel</td></tr> <tr><td>R</td><td>Stainless Steel (N2/ only)</td></tr> </table>			Piston Rod Material		D	Chrome Plated Stainless Steel	R	Stainless Steel (N2/ only)	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td colspan="2">Inch Cylinder</td></tr> <tr><td>C</td><td>NPT ports, inch threads, stroke in inches</td></tr> <tr><td colspan="2">Metric Cylinder</td></tr> <tr><td>M</td><td>ISO G ports, metric threads, stroke in mm</td></tr> </table>			Inch Cylinder		C	NPT ports, inch threads, stroke in inches	Metric Cylinder		M	ISO G ports, metric threads, stroke in mm	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>9</td><td>Series 90000</td></tr> </table>			9	Series 90000	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td colspan="2">Stroke Length</td></tr> <tr><td colspan="2">In Inches for inch cylinder</td></tr> <tr><td colspan="2">In (mm) for metric cylinder</td></tr> </table>			Stroke Length		In Inches for inch cylinder		In (mm) for metric cylinder		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td colspan="2">Cylinder Options</td></tr> <tr><td>M</td><td>Magnetic Piston</td></tr> <tr><td>JM</td><td>Double ended piston rod with magnetic piston</td></tr> <tr><td>N2</td><td>Internal non-rotating piston rod with magnetic piston</td></tr> <tr><td>N4</td><td>External non-rotating guidance with magnetic piston</td></tr> </table>			Cylinder Options		M	Magnetic Piston	JM	Double ended piston rod with magnetic piston	N2	Internal non-rotating piston rod with magnetic piston	N4	External non-rotating guidance with magnetic piston
T	High Temperature																																																		
Piston Rod Material																																																			
D	Chrome Plated Stainless Steel																																																		
R	Stainless Steel (N2/ only)																																																		
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Cylinder Version																																																			
2	Double Acting																																																		
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="4">Piston Diameters Nominal Inch (mm)</th> </tr> </thead> <tbody> <tr> <td>012</td> <td><math>\varnothing</math> 1/2"</td> <td>12 mm</td> <td>040 <math>\varnothing</math> 1 1/2" 40 mm</td> </tr> <tr> <td>016</td> <td><math>\varnothing</math> 5/8"</td> <td>16 mm</td> <td>050 <math>\varnothing</math> 2" 50 mm</td> </tr> <tr> <td>020</td> <td><math>\varnothing</math> 3/4"</td> <td>20 mm</td> <td>063 <math>\varnothing</math> 2 1/2" 63 mm</td> </tr> <tr> <td>025</td> <td><math>\varnothing</math> 1"</td> <td>25 mm</td> <td>080 <math>\varnothing</math> 3 1/8" 80 mm</td> </tr> <tr> <td>032</td> <td><math>\varnothing</math> 1 1/4"</td> <td>32 mm</td> <td>100 <math>\varnothing</math> 4" 100 mm</td> </tr> </tbody> </table>													Piston Diameters Nominal Inch (mm)				012	$\varnothing$ 1/2"	12 mm	040 $\varnothing$ 1 1/2" 40 mm	016	$\varnothing$ 5/8"	16 mm	050 $\varnothing$ 2" 50 mm	020	$\varnothing$ 3/4"	20 mm	063 $\varnothing$ 2 1/2" 63 mm	025	$\varnothing$ 1"	25 mm	080 $\varnothing$ 3 1/8" 80 mm	032	$\varnothing$ 1 1/4"	32 mm	100 $\varnothing$ 4" 100 mm															
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- \*\* Only the 4 front holes are tapped on stroke lengths of less than:
- ø 1" and 1 1/4" (ø 25 and 32 mm) .197" (5 mm)
  - ø 1 1/2" and 2 1/2" (ø 40 and 63 mm) .591" (15 mm) .../N2 .197" (5 mm)
  - ø 2" and 3" (ø 50 and 80 mm) .394" (10 mm)
  - ø 4" (ø 100 mm) .984" (25 mm) .../N2 .591" (15 mm)



NOTE: ø 1/2" to 3/4" (ø 12 to 20 mm) have only two side dovetails.

ø Bore	inch (mm) 1/2" (12)	inch (mm) 5/8" (16)	inch (mm) 3/4" (20)	inch (mm) 1" (25)	inch (mm) 1 1/4" (32)	inch (mm) 1 1/2" (40)	inch (mm) 2" (50)	inch (mm) 2 1/2" (63)	inch (mm) 3 1/8" (80)	inch (mm) 4" (100)
Inch Cylinder	DC/92012/M	DC/92016/M	DC/92020/M	DC/92025/M	DC/92032/M	DC/92040/M	DC/92050/M	DC/92063/M	DC/92080/M	DC/92100/M
Metric Cylinder	DM/92012/M	DM/92016/M	DM/92020/M	DM/92025/M	DM/92032/M	DM/92040/M	DM/92050/M	DM/92063/M	DM/92080/M	DM/92100/M
AF	.24 (6)	.28 (7)	.31 (8)	.35 (9)	.47 (12)	.47 (12)	.55 (14)	.63 (16)	.87 (22)	.87 (22)
BG	.35 (9)	.35 (9)	.35 (9)	.47 (12)	.47 (12)	.63 (16)	.63 (16)	.79 (20)	.79 (20)	.98 (25)
ø D	1.28 (32.5)	1.44 (36.5)	1.63 (41.5)	1.89 (48)	2.28 (58)	2.81 (71.5)	3.19 (81)	4.09 (104)	4.72 (120)	5.85 (148.5)
□ E	.98 (25)	1.10 (28)	1.26 (32)	1.46 (37)	1.77 (45)	2.17 (55)	2.48 (63)	3.15 (80)	3.70 (94)	4.59 (116.5)
EE	10-32 (M 5)	10-32 (M 5)	10-32 (M 5)	10-32 (M 5)	1/8NPT (G 1/8)	1/8NPT (G 1/8)	1/8NPT (G 1/8)	1/4NPT (G 1/4)	1/4NPT (G 1/4)	1/4NPT (G 1/4)
ø FB	.13 (3.3)	.13 (3.3)	.13 (3.3)	.17 (4.2)	.17 (4.2)	.27 (6.8)	.27 (6.8)	.33 (8.5)	.33 (8.5)	.40 (10.2)
FF	.39 (10)	.39 (10)	.39 (10)	.39 (10)	.71 (18)	.71 (18)	.71 (18)	.87 (22)	.87 (22)	.87 (22)
GB	.14 (3.5)	.14 (3.5)	.14 (3.5)	.18 (4.5)	.18 (4.5)	.26 (6.5)	.26 (6.5)	.33 (8.5)	.33 (8.5)	.41 (10.5)
ø JB	.24 (6)	.24 (6)	.24 (6)	.30 (7.5)	.30 (7.5)	.41 (10.5)	.41 (10.5)	.53 (13.5)	.53 (13.5)	.65 (16.5)
KF	4-40 (M 3)	8-32 (M 4)	10-32 (M 5)	1/4-28 (M 6)	5/16-24 (M 8)	5/16-24 (M 8)	3/8-24 (M 10)	7/16-20 (M 12)	1/2-20 (M 16)	1/2-20 (M 16)
ø MM	.24 (6)	.31 (8)	.39 (10)	.47 (12)	.63 (16)	.63 (16)	.79 (20)	.79 (20)	.98 (25)	.98 (25)
MX	.19 (5)	.25 (6)	.31 (8)	.38 (10)	.50 (13)	.50 (13)	.66 (17)	.66 (17)	.81 (22)	.81 (22)
PF	.59 (15)	.67 (17)	.77 (19.5)	.87 (22)	1.08 (27.5)	1.24 (31.5)	1.46 (37)	1.89 (48)	2.24 (57)	2.64 (67)
PL	.28 (7)	.30 (7.5)	.30 (7.5)	.31 (8)	.35 (9)	.39 (10)	.41 (10.5)	.51 (13)	.57 (14.5)	.63 (16)
RT	8-32 (M 4)	8-32 (M 4)	8-32 (M 4)	10-32 (M 5)	10-32 (M 5)	5/16-24 (M 8)	5/16-24 (M 8)	3/8-24 (M 10)	3/8-24 (M 10)	7/16-20 (M 12)
TG 1	.67 (17)	.79 (20)	.91 (23)	1.06 (27)	1.30 (33)	1.61 (41)	1.89 (48)	2.40 (61)	2.87 (73)	3.56 (90.5)
TG 2	.51 (13)	.79 (20)	.91 (23)	1.06 (27)	1.30 (33)	1.61 (41)	1.89 (48)	2.40 (61)	2.87 (73)	3.56 (90.5)
WH	.18 (4.5)	.22 (5.5)	.24 (6)	.26 (6.5)	.26 (6.5)	.26 (6.5)	.31 (8)	.31 (8)	.35 (9)	.39 (10)
ZH	.94 (24)	.96 (24.5)	1.02 (26)	1.12 (28.5)	1.14 (29)	1.24 (31.5)	1.38 (35)	1.67 (42.5)	1.85 (47)	1.90 (48.5)
ZH Long Stroke	-	1.36 (34.5)	1.42 (36)	1.52 (38.5)	1.54 (39)	1.63 (41.5)	1.77 (45)	2.07 (52.5)	2.24 (57)	2.30 (58.5)
ZJ	1.12 (28.5)	1.18 (30)	1.26 (32)	1.38 (35)	1.40 (35.5)	1.50 (38)	1.69 (43)	1.99 (50.5)	2.20 (56)	2.30 (58.5)
ZJ Long Stroke	-	1.57 (40)	1.65 (42)	1.77 (45)	1.79 (45.5)	1.89 (48)	2.09 (53)	2.38 (60.5)	2.60 (66)	2.70 (68.5)

Long Stroke versions, >2" (>50mm), incorporate a longer rod bearing. This increases the overall body by .394" (10mm). Explanation on ACT-8-2.

### Maximum Stroke for 92000/M Double Acting Cylinders

DC/92000/M inch cylinder

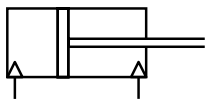
Nominal Diameter

Maximum Stroke

DM/92000/M metric cylinder

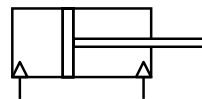
Diameter

Maximum Stroke



- ø 1/2"
- ø 5/8", 3/4", 1"
- ø 1 1/4", 1 1/2"
- ø 2", 2 1/2", 3 1/8", 4"

- 2"
- 8"
- 10"
- 12"



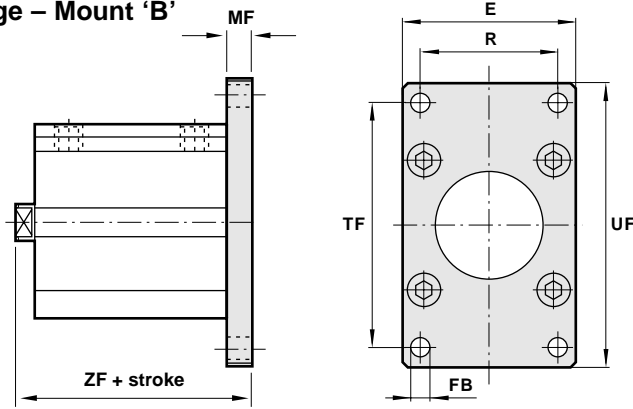
- ø 12 mm
- ø 16, 20, 25 mm
- ø 32, 40 mm
- ø 50, 63, 80, 100 mm

- 50 mm
- 200 mm
- 250 mm
- 300 mm

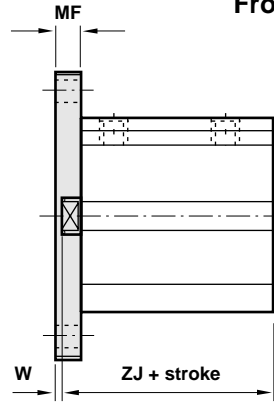


# Series 90000 Compact Actuators

## Rear Flange – Mount ‘B’



## Front Flange – Mount ‘G’



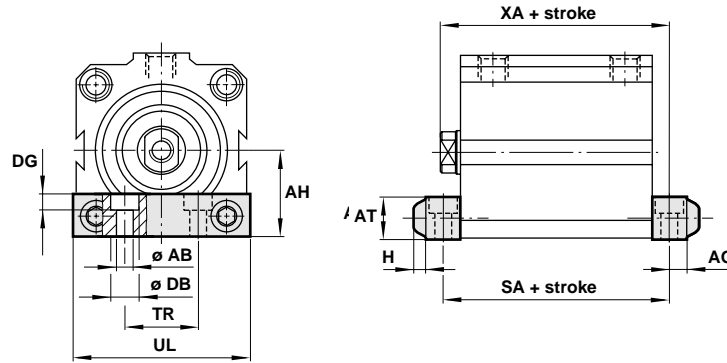
∅ Bore	inch (mm)		inch (mm)		inch (mm)		inch (mm)		inch (mm)		inch (mm)	
	1/2" (12)	5/8" (16)	3/4" (20)	1" (25)	1 1/4" (32)	1 1/2" (40)	2" (50)	2 1/2" (63)	3 1/8" (80)	4" (100)		
Inch Cylinder	QC/90012/22	QC/90016/22	QC/90020/22	QC/90025/22	QC/90032/22	QC/90040/22	QC/90050/22	QC/90063/22	QC/90080/22	QC/90100/22		
Metric Cylinder	QM/90012/22	QM/90016/22	QM/90020/22	QM/90025/22	QM/90032/22	QM/90040/22	QM/90050/22	QM/90063/22	QM/90080/22	QM/90100/22		
E	.98 (26)	1.18 (30)	1.30 (33)	1.50 (38)	1.81 (46)	2.24 (57)	2.52 (64)	3.19 (81)	3.74 (95)	4.65 (118)		
∅ FB	.14 (3.5)	.14 (3.5)	.14 (3.5)	.18 (4.5)	.18 (4.5)	.26 (6.5)	.26 (6.5)	.33 (8.5)	.33 (8.5)	.43 (11)		
MF	.20 (5)	.20 (5)	.20 (5)	.26 (6.5)	.26 (6.5)	.37 (9.5)	.37 (9.5)	.49 (12.5)	.49 (12.5)	.49 (12.5)		
R	.71 (18)	.87 (22)	.98 (25)	1.10 (28)	1.42 (36)	1.69 (43)	1.97 (50)	2.48 (63)	3.03 (77)	3.86 (98)		
TF	1.50 (38)	1.65 (42)	1.89 (48)	2.13 (54)	2.60 (66)	3.07 (78)	3.54 (90)	4.33 (110)	5.04 (128)	6.14 (156)		
UF	1.81 (46)	1.97 (50)	2.20 (56)	2.52 (64)	2.99 (76)	3.62 (92)	4.09 (104)	5.04 (128)	5.75 (146)	6.93 (176)		
W	-.02 (-0.5)	.02 (0.5)	.04 (1)	0 (0)	0 (0)	-.12 (-3)	-.04 (-1)	-.18 (-4.5)	-.14 (-3.5)	-.10 (-2.5)		
ZF	1.32 (33.5)	1.38 (35)	1.46 (37)	1.63 (41.5)	1.65 (42)	1.87 (47.5)	2.07 (52.5)	2.50 (63.5)	2.70 (68.5)	2.81 (71.5)		
ZF Long Stroke*	-	1.77 (45)	1.85 (47)	2.03 (51.5)	2.05 (52)	2.26 (57.5)	2.46 (62.5)	2.89 (73.5)	3.09 (78.5)	3.21 (81.5)		
ZJ	1.12 (28.5)	1.18 (30)	1.26 (32)	1.38 (35)	1.40 (35.5)	1.50 (38)	1.69 (43)	1.99 (50.5)	2.20 (56)	2.30 (58.5)		

NOTE: Dimension 'W' negative figures indicate that the piston rod is below the mounting face.

\*For non-rotating rod cylinders RC/92000/N2 and RM/92000/N2, use long stroke dimensions.

Long Stroke versions, >2" (>50mm), incorporate a longer rod bearing. This increases the overall body by .394" (10mm). Explanation on ACT-8-2.

## Foot Mount – Style ‘C’



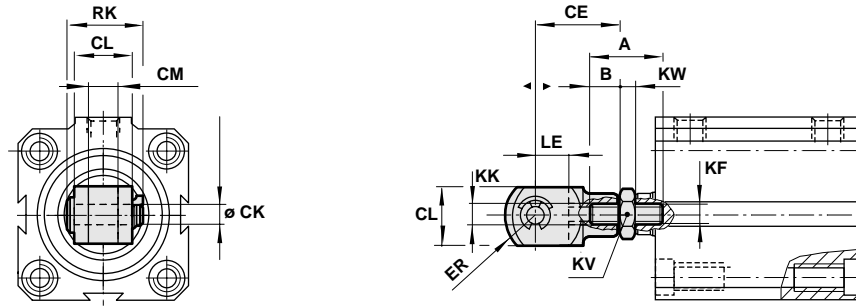
∅ Bore	inch (mm)		inch (mm)		inch (mm)		inch (mm)		inch (mm)		inch (mm)	
	1/2" (12)	5/8" (16)	3/4" (20)	1" (25)	1 1/4" (32)	1 1/2" (40)	2" (50)	2 1/2" (63)	3 1/8" (80)	4" (100)		
Inch Cylinder	QC/90012/21	QC/90016/21	QC/90020/21	QC/90025/21	QC/90032/21	QC/90040/21	QC/90050/21	QC/90063/21	QC/90080/21	QC/90100/21		
Metric Cylinder	QM/90012/21	QM/90016/21	QM/90020/21	QM/90025/21	QM/90032/21	QM/90040/21	QM/90050/21	QM/90063/21	QM/90080/21	QM/90100/21		
∅ AB	.13 (3.4)	.13 (3.4)	.13 (3.4)	.17 (4.3)	.17 (4.3)	.25 (6.4)	.25 (6.4)	.33 (8.4)	.33 (8.4)	.41 (10.5)		
AH	.53 (13.5)	.59 (15)	.65 (16.5)	.79 (20)	.91 (23)	1.12 (28.5)	1.26 (32)	1.63 (41.5)	1.93 (49)	2.34 (59.5)		
AO	.16 (4)	.16 (4)	.16 (4)	.20 (5)	.20 (5)	.26 (6.5)	.26 (6.5)	.31 (8)	.31 (8)	.37 (9.5)		
AT	.37 (9.5)	.37 (9.5)	.37 (9.5)	.49 (12.5)	.49 (12.5)	.63 (16)	.63 (16)	.87 (22)	1.00 (25.5)	1.12 (28.5)		
∅ DB	.24 (6)	.24 (6)	.24 (6)	.30 (7.5)	.30 (7.5)	.41 (10.5)	.41 (10.5)	.53 (13.5)	.53 (13.5)	.65 (16.5)		
DG	.14 (3.5)	.14 (3.5)	.14 (3.5)	.18 (4.5)	.18 (4.5)	.26 (6.5)	.26 (6.5)	.33 (8.5)	.33 (8.5)	.41 (10.5)		
H	.08 (2)	.08 (2)	.08 (2)	.12 (3)	.12 (3)	.18 (4.5)	.18 (4.5)	.22 (5.5)	.22 (5.5)	.26 (6.5)		
SA	1.26 (32)	1.28 (32.5)	1.34 (34)	1.50 (38)	1.52 (38.5)	1.75 (44.5)	1.87 (47.5)	2.30 (58.5)	2.46 (62.5)	2.66 (67.5)		
SA Long Stroke*	-	1.67 (42.5)	1.73 (44)	1.89 (48)	1.91 (48.5)	2.15 (54.5)	2.26 (57.5)	2.70 (68.5)	2.85 (72.5)	3.05 (77.5)		
TR	.98 (25)	1.26 (32)	1.38 (35)	1.61 (41)	.75 (19)	.83 (21)	1.06 (27)	1.34 (34)	1.73 (44)	2.20 (56)		
UL	1.30 (33)	1.57 (40)	1.69 (43)	2.01 (51)	1.81 (46)	2.20 (56)	2.52 (64)	3.19 (81)	3.74 (95)	4.65 (118)		
XA	1.28 (32.5)	1.34 (34)	1.42 (36)	1.55 (39.5)	1.57 (40)	1.75 (44.5)	1.93 (49)	2.30 (58.5)	2.52 (64)	2.68 (68)		
XA Long Stroke*	-	1.73 (44)	1.81 (46)	1.95 (49.5)	1.97 (50)	2.15 (54.5)	2.32 (59)	2.70 (68.5)	2.91 (74)	3.07 (78)		

\*For non-rotating rod cylinders RC/92000/N2 and RM/92000/N2, use long stroke dimensions.

Long Stroke versions, >2" (>50mm), incorporate a longer rod bearing. This increases the overall body by .394" (10mm). Explanation on ACT-8-2.



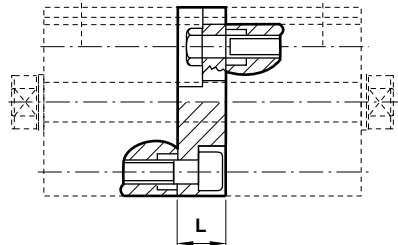
Piston Rod Clevis – Mount ‘F’



∅ Bore	inch (mm) 1/2" (12)	inch (mm) 5/8" (16)	inch (mm) 3/4" (20)	inch (mm) 1" (25)	inch (mm) 1 1/4" (32)	inch (mm) 1 1/2" (40)	inch (mm) 2" (50)	inch (mm) 2 1/2" (63)	inch (mm) 3 1/8" (80)	inch (mm) 4" (100)
Clevis	Inch RC-12	Inch RC-16	Inch RC-20	Inch RC-25	Inch RC-32	Inch RC-32	Inch RC-50	Inch RC-63	Inch RC-80	Inch RC-80
	Metric QM/57008/25	Metric QM/8010/25	Metric QM/92020/25	Metric QM/57016/25	Metric QM/57020/25	Metric QM/57020/25	Metric QM/57025/25	Metric QM/57040/25	Metric QM/57063/25	Metric QM/57063/25
Stud	Inch C-653-24-00J	Inch C-653-04-00M	Inch C-653-05-00P	Inch C-653-08-01A	Inch C-653-11-01A	Inch C-653-11-01A	Inch C-653-14-01E	Inch C-653-16-01P	Inch C-653-18-01J	Inch C-653-18-01J
	Metric M/P1710/18	Metric M/P1710/19	Metric M/P1710/20	Metric M/P1710/21	Metric M/P1710/22	Metric M/P1710/22	-	-	-	-
Nut	Inch C-76-36	Inch C-76-37	Inch C-76-225	Inch C-76-03A	Inch C-76-04A	Inch C-76-04A	Inch C-76-05A	Inch C-76-065A	Inch C-76-12A	Inch C-76-12A
	Metric M/P1500/111	Metric M/P1501/80	Metric M/P1501/109	Metric M/P1501/79	Metric M/P1501/60	Metric M/P1501/60	-	-	-	-
Adaptor	Metric -	Metric -	Metric -	Metric -	Metric -	Metric -	Metric M/P71470/1	Metric M/P71470/2	Metric M/P71470/3	Metric M/P71470/3
A	.50 (12)	.63 (16)	.75 (20)	1.00 (25)	1.00 (25)	1.00 (25)	1.25 (29)	1.50 (35)	1.75 (45)	1.75 (45)
B	-	-	-	-	-	-	.47 (12)	.59 (15)	.79 (20)	.79 (20)
CE	.63 (11)	.63 (16)	.75 (20)	.94 (20)	.94 (24)	.94 (24)	1.31 (26)	1.31 (40)	1.31 (56)	1.31 (56)
∅ CK	.19 (3)	.19 (4)	.19 (5)	.25 (5)	.25 (6)	.25 (6)	.38 (8)	.38 (10)	.38 (14)	.38 (14)
CL	.31 (6)	.31 (8)	.38 (10)	.50 (10)	.50 (12)	.50 (12)	.75 (14)	.75 (20)	.75 (27)	.75 (27)
CM	.16 (3)	.16 (4)	.20 (5)	.26 (5)	.26 (6)	.26 (6)	.38 (7)	.38 (10)	.38 (14)	.38 (14)
ER	- (4.5)	- (6.5)	- (8)	- (8)	- (9.5)	- (9.5)	- (11.5)	- (16)	- (21)	- (21)
KF	4-40 (M 3)	8-32 (M 4)	10-32 (M 5)	1/4-28 (M 6)	5/16-24 (M 8)	5/16-24 (M 8)	3/8-24 (M 10)	7/16-20 (M 12)	1/2-20 (M 16)	1/2-20 (M 16)
KK	4-40 (M 3)	8-32 (M 4)	10-32 (M 5)	1/4-28 (M 6)	5/16-24 (M 8)	5/16-24 (M 8)	3/8-24 (M10x1.25)	7/16-20 (M12x1.25)	1/2-20 (M16x1.5)	1/2-20 (M16x1.5)
KV (A/F)	.25 (6)	.31 (7)	.38 (8)	.44 (10)	.50 (13)	.50 (13)	.56 (12)	.69 (13)	.75 (17)	.75 (17)
KW	.09 (2)	.13 (2)	.13 (2.5)	.17 (3)	.19 (4)	.19 (4)	.22 (5)	.22 (5)	.31 (5)	.31 (5)
LE	.22 (5)	.22 (8)	.37 (10)	.44 (10)	.44 (12)	.44 (12)	.56 (12)	.56 (20)	.56 (28)	.56 (28)
RK	.50 (10)	.50 (11.5)	.66 (14.5)	.85 (14.5)	.85 (17.5)	.85 (17.5)	1.13 (20.5)	1.13 (29)	1.13 (36.5)	1.13 (36.5)

NOTE: Clevis includes Pin. To order a complete piston rod clevis mount: ∅ 1/2" to 4" or (∅ 12 to 40mm) = Clevis plus Stud and Nut. ∅ 50 to 100mm = Clevis plus Adaptor. Piston Rod Clevis will vary in design. Inch clevis and metric clevis are dimensionally different.

Back to Back Mounting Kit



∅ Bore	inch (mm) 1/2" (12)	inch (mm) 5/8" (16)	inch (mm) 3/4" (20)	inch (mm) 1" (25)	inch (mm) 1 1/4" (32)	inch (mm) 1 1/2" (40)	inch (mm) 2" (50)	inch (mm) 2 1/2" (63)	inch (mm) 3 1/8" (80)	inch (mm) 4" (100)
Inch	QC/92012/55	QC/92016/55	QC/92020/55	QC/92025/55	QC/92032/55	QC/92040/55	QC/92050/55	QC/92063/55	QC/92080/55	QC/92100/55
Metric	QM/92012/55	QM/92016/55	QM/92020/55	QM/92025/55	QM/92032/55	QM/92040/55	QM/92050/55	QM/92063/55	QM/92080/55	QM/92100/55
L	.39 (10)	.39 (10)	.39 (10)	.39 (10)	.39 (10)	.59 (15)	.59 (15)	.79 (20)	.79 (20)	1.00 (25)

Mounting Order Information

All Mountings are ordered separately and are normally mounted to the cylinder by the customer.

Flange Mount – Style ‘B’ and ‘G’ Mounting Kit

Inch Cylinder: QC/90 \_ \_ \_ /22  
Includes the flange and the inch mounting screws to mount the flange to the Inch version cylinder.

Metric Cylinder: QM/90 \_ \_ \_ /22  
Includes the flange and the metric mounting screws to mount the flange to the Metric version cylinder.

Foot Mount – Style ‘C’ Mounting Kit

Inch Cylinder: QC/90 \_ \_ \_ /21  
Includes the two foot mounts and the inch mounting screws to mount the feet to the Inch version cylinder.

Metric Cylinder: QM/90 \_ \_ \_ /21  
Includes two foot mounts and the metric mounting screws to mount the feet to the Metric version cylinder.

Piston Rod Clevis Mount – Style ‘F’ Mounting Kit

Inch Cylinder:  
Clevis RC- \_ \_ \_  
Stud C-653- \_ \_ \_ \_ \_  
Nut C-76- \_ \_ \_

To order a piston rod clevis mounting complete for Inch cylinders = Clevis plus Stud and Nut. (Clevis includes pivot pin.)

Metric Cylinder:

Clevis QM/ \_ \_ \_ \_ \_ /25  
Stud M/P1710/\_ \_  
Nut M/P1501/\_ \_ \_  
Adaptor M/P71470/\_

To order a piston rod clevis mounting complete for a Metric cylinder for: ∅ 12 to 40mm = Clevis plus Stud and Nut. ∅ 50 to 100mm = Clevis and Adaptor. (Clevis includes pivot pin.)

Back to Back Mounting Kit

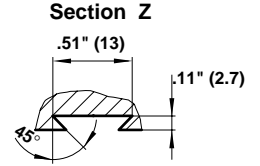
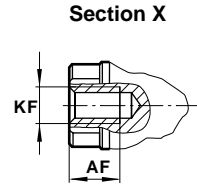
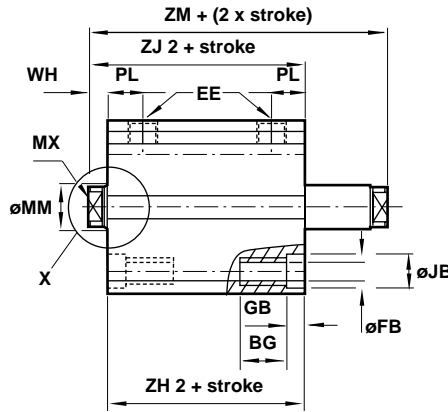
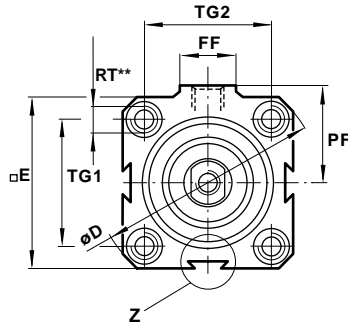
Inch cylinders: QC/ 92- \_ \_ \_ /55  
Includes the mounting plate and the inch mounting screws to mount the two Inch version cylinders back to back.

Metric cylinders: QM/ 92- \_ \_ \_ /55  
Includes the mounting plate and the metric mounting screws to mount the two Metric version cylinders back to back.





# Series 90000 Compact Actuators

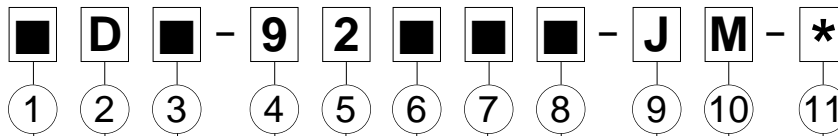


\*\* Only the 4 front holes are tapped on stroke lengths of less than:  
 ø 1" and 1 1/4" (ø 25 and 32 mm) .197" (5 mm)  
 ø 1 1/2" and 2 1/2" (ø 40 and 63 mm) .591" (15 mm) .../N2 .197" (5 mm)  
 ø 2" and 3" (ø 50 and 80 mm) .394" (10 mm)  
 ø 4" (ø 100 mm) .984" (25 mm) .../N2 .591" (15 mm)

NOTE: ø 5/8" and 3/4" (ø 16 and 20 mm) have only two side dovetails.

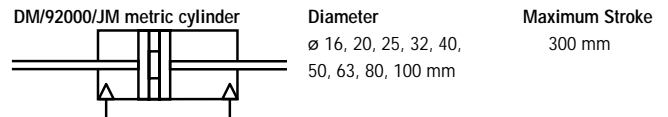
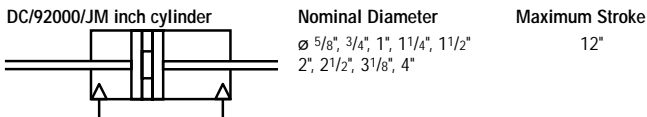
ø Bore	inch (mm) 5/8" (16)	inch (mm) 3/4" (20)	inch (mm) 1" (25)	inch (mm) 1 1/4" (32)	inch (mm) 1 1/2" (40)	inch (mm) 2" (50)	inch (mm) 2 1/2" (63)	inch (mm) 3 1/8" (80)	inch (mm) 4" (100)
Inch Cylinder	DC/92016/JM	DC/92020/JM	DC/92025/JM	DC/92032/JM	DC/92040/JM	DC/92050/JM	DC/92063/JM	DC/92080/JM	DC/92100/JM
Metric Cylinder	DM/92016/JM	DM/92020/JM	DM/92025/JM	DM/92032/JM	DM/92040/JM	DM/92050/JM	DM/92063/JM	DM/92080/JM	DM/92100/JM
AF	.28 (7)	.31 (8)	.35 (9)	.47 (12)	.47 (12)	.55 (14)	.63 (16)	.87 (22)	.87 (22)
BG	.35 (9)	.35 (9)	.47 (12)	.47 (12)	.63 (16)	.63 (16)	.79 (20)	.79 (20)	.98 (25)
ø D	1.44 (36.5)	1.63 (41.5)	1.89 (48)	2.28 (58)	2.81 (71.5)	3.19 (81)	4.09 (104)	4.72 (120)	5.85 (148.5)
□ E	1.10 (28)	1.26 (32)	1.46 (37)	1.77 (45)	2.17 (55)	2.48 (63)	3.15 (80)	3.70 (94)	4.59 (116.5)
EE	10-32 (M 5)	10-32 (M 5)	10-32 (M 5)	1/8NPT (G 1/8)	1/8NPT (G 1/8)	1/8NPT (G 1/8)	1/4NPT (G 1/4)	1/4NPT (G 1/4)	1/4NPT (G 1/4)
ø FB	.13 (3.3)	.13 (3.3)	.17 (4.2)	.17 (4.2)	.27 (6.8)	.27 (6.8)	.33 (8.5)	.33 (8.5)	.40 (10.2)
FF	.39 (10)	.39 (10)	.39 (10)	.71 (18)	.71 (18)	.71 (18)	.87 (22)	.87 (22)	.87 (22)
GB	.14 (3.5)	.14 (3.5)	.18 (4.5)	.18 (4.5)	.26 (6.5)	.26 (6.5)	.33 (8.5)	.33 (8.5)	.41 (10.5)
ø JB	.24 (6)	.24 (6)	.30 (7.5)	.30 (7.5)	.41 (10.5)	.41 (10.5)	.53 (13.5)	.53 (13.5)	.65 (16.5)
KF	8-32 (M 4)	10-32 (M 5)	1/4-28 (M 6)	5/16-24 (M 8)	5/16-24 (M 8)	3/8-24 (M 10)	7/16-20 (M 12)	1/2-20 (M 16)	1/2-20 (M 16)
ø MM	.31 (8)	.39 (10)	.47 (12)	.63 (16)	.63 (16)	.79 (20)	.79 (20)	.98 (25)	.98 (25)
MX	.24 (6)	.31 (8)	.39 (10)	.51 (13)	.51 (13)	.67 (17)	.67 (17)	.87 (22)	.87 (22)
PF	.67 (17)	.77 (19.5)	.87 (22)	1.08 (27.5)	1.24 (31.5)	1.46 (37)	1.89 (48)	2.24 (57)	2.64 (67)
PL	.30 (7.5)	.30 (7.5)	.31 (8)	.35 (9)	.39 (10)	.41 (10.5)	.51 (13)	.57 (14.5)	.63 (16)
RT	8-32 (M 4)	8-32 (M 4)	10-32 (M 5)	10-32 (M 5)	5/16-24 (M 8)	5/16-24 (M 8)	3/8-24 (M 10)	3/8-24 (M 10)	7/16-20 (M 12)
TG 1	.79 (20)	.91 (23)	1.06 (27)	1.30 (33)	1.61 (41)	1.89 (48)	2.40 (61)	2.87 (73)	3.56 (90.5)
TG 2	.79 (20)	.91 (23)	1.06 (27)	1.30 (33)	1.61 (41)	1.89 (48)	2.40 (61)	2.87 (73)	3.56 (90.5)
WH	.22 (5.5)	.24 (6)	.26 (6.5)	.26 (6.5)	.26 (6.5)	.31 (8)	.31 (8)	.35 (9)	.39 (10)
ZH 2	1.16 (29.5)	1.24 (31.5)	1.36 (34.5)	1.44 (36.5)	1.56 (39.5)	1.65 (42)	2.04 (52)	2.20 (56)	2.28 (58)
ZJ 2	1.37 (35)	1.48 (37.5)	1.61 (41)	1.69 (43)	1.81 (46)	1.97 (50)	2.36 (60)	2.56 (65)	2.68 (68)
ZM	1.61 (41)	1.73 (44)	1.89 (48)	1.97 (50)	2.09 (53)	2.32 (59)	2.72 (69)	2.91 (74)	3.07 (78)

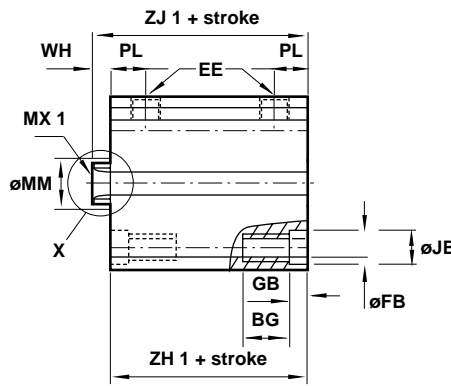
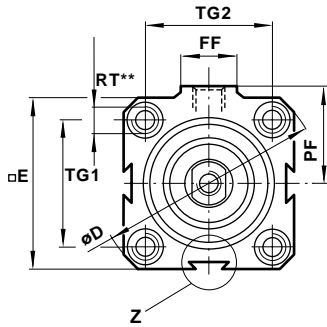
## Cylinder Order Information



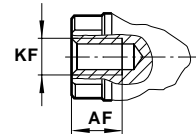
T High Temperature	Stroke Length In Inches for inch cylinder In (mm) for metric cylinder
D Piston Rod Material Chrome Plated Stainless Steel	Cylinder Options JM Double Ended Piston Rod with Magnetic Piston
Inch Cylinder C NPT ports, inch threads, stroke in inches	Piston Diameters Nominal Inch (mm)
Metric Cylinder M ISO G ports, metric threads, stroke in mm	012 N/A 040 ø 1 1/2" 40 mm
9 Series 90000	016 ø 5/8" 16 mm 050 ø 2" 50 mm
Cylinder Version 2 Double Acting	020 ø 3/4" 20 mm 063 ø 2 1/2" 63 mm
	025 ø 1" 25 mm 080 ø 3 1/8" 80 mm
	032 ø 1 1/4" 32 mm 100 ø 4" 100 mm

## Maximum Stroke for 92000/JM Double Ended Piston Rod Cylinders

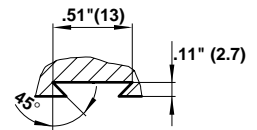




Section X



Section Z



\*\* Only the 4 front holes are tapped on stroke lengths of less than:  
 ø 1" and 1 1/4" (ø 25 and 32 mm) .197" (5 mm)  
 ø 1 1/2" and 2 1/2" (ø 40 and 63 mm) .197" (5 mm)  
 ø 2" and 3" (ø 50 and 80 mm) .394" (10 mm)  
 ø 4" (ø 100 mm) .591" (15 mm)



NOTE: ø 5/8" and 3/4" (ø 16 and 20 mm) have only two side dovetails.

ø Bore	inch (mm) 5/8" (16)	inch (mm) 3/4" (20)	inch (mm) 1" (25)	inch (mm) 1 1/4" (32)	inch (mm) 1 1/2" (40)	inch (mm) 2" (50)	inch (mm) 2 1/2" (63)	inch (mm) 3 1/8" (80)	inch (mm) 4" (100)
Inch Cylinder	RC/92016/N2	RC/92020/N2	RC/92025/N2	RC/92032/N2	RC/92040/N2	RC/92050/N2	RC/92063/N2	RC/92080/N2	RC/92100/N2
Metric Cylinder	RM/92016/N2	RM/92020/N2	RM/92025/N2	RM/92032/N2	RM/92040/N2	RM/92050/N2	RM/92063/N2	RM/92080/N2	RM/92100/N2
AF	.28 (7)	.31 (8)	.35 (9)	.47 (12)	.47 (12)	.55 (14)	.63 (16)	.87 (22)	.87 (22)
BG	.35 (9)	.35 (9)	.47 (12)	.47 (12)	.63 (16)	.63 (16)	.79 (20)	.79 (20)	.98 (25)
ø D	1.44 (36.5)	1.63 (41.5)	1.89 (48)	2.28 (58)	2.81 (71.5)	3.19 (81)	4.09 (104)	4.72 (120)	5.85 (148.5)
□ E	1.10 (28)	1.26 (32)	1.46 (37)	1.77 (45)	2.17 (55)	2.48 (63)	3.15 (80)	3.70 (94)	4.59 (116.5)
EE	10-32 (M 5)	10-32 (M 5)	10-32 (M 5)	1/8NPT (G 1/8)	1/8NPT (G 1/8)	1/8NPT (G 1/8)	1/4NPT (G 1/4)	1/4NPT (G 1/4)	1/4NPT (G 1/4)
ø FB	.13 (3.3)	.13 (3.3)	.17 (4.2)	.17 (4.2)	.27 (6.8)	.27 (6.8)	.33 (8.5)	.33 (8.5)	.40 (10.2)
FF	.39 (10)	.39 (10)	.39 (10)	.71 (18)	.71 (18)	.71 (18)	.87 (22)	.87 (22)	.87 (22)
GB	.14 (3.5)	.14 (3.5)	.18 (4.5)	.18 (4.5)	.26 (6.5)	.26 (6.5)	.33 (8.5)	.33 (8.5)	.41 (10.5)
ø JB	.24 (6)	.24 (6)	.30 (7.5)	.30 (7.5)	.41 (10.5)	.41 (10.5)	.53 (13.5)	.53 (13.5)	.65 (16.5)
KF	8-32 (M 4)	10-32 (M 5)	1/4-28 (M 6)	5/16-24 (M 8)	5/16-24 (M 8)	3/8-24 (M 10)	7/16-20 (M 12)	1/2-20 (M 16)	1/2-20 (M 16)
ø MM	.31 (8)	.39 (10)	.47 (12)	.63 (16)	.63 (16)	.79 (20)	.79 (20)	.98 (25)	.98 (25)
MX 1	.24 (6)	.31 (8)	.39 (10)	.51 (13)	.51 (13)	.63 (16)	.63 (16)	.83 (21)	.83 (21)
PF	.67 (17)	.77 (19.5)	.87 (22)	1.08 (27.5)	1.24 (31.5)	1.46 (37)	1.89 (48)	2.24 (57)	2.64 (67)
PL	.30 (7.5)	.30 (7.5)	.31 (8)	.35 (9)	.39 (10)	.41 (10.5)	.51 (13)	.57 (14.5)	.63 (16)
RT	8-32 (M 4)	8-32 (M 4)	10-32 (M 5)	10-32 (M 5)	5/16-24 (M 8)	5/16-24 (M 8)	3/8-24 (M 10)	3/8-24 (M 10)	7/16-20 (M 12)
TG 1	.79 (20)	.91 (23)	1.06 (27)	1.30 (33)	1.61 (41)	1.89 (48)	2.40 (61)	2.87 (73)	3.56 (90.5)
TG 2	.79 (20)	.91 (23)	1.06 (27)	1.30 (33)	1.61 (41)	1.89 (48)	2.40 (61)	2.87 (73)	3.56 (90.5)
WH	.22 (5.5)	.24 (6)	.26 (6.5)	.26 (6.5)	.26 (6.5)	.31 (8)	.31 (8)	.35 (9)	.39 (10)
ZH 1	1.36 (34.5)	1.42 (36)	1.52 (38.5)	1.54 (39)	1.63 (41.5)	1.77 (45)	2.07 (52.5)	2.24 (57)	2.30 (58.5)
ZJ 1	1.57 (40)	1.65 (42)	1.77 (45)	1.79 (45.5)	1.89 (48)	2.09 (53)	2.38 (60.5)	2.60 (66)	2.70 (68.5)

Cylinder Order Information

D ■ - 9 2 ■ ■ ■ - N 2 - \*

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11

Piston Rod Material

**D** Chrome Plated Stainless Steel

R Stainless Steel

Inch Cylinder

C NPT ports, inch threads, stroke in inches

Metric Cylinder

M ISO G ports, metric threads, stroke in mm

Stroke Length

In Inches for inch cylinder

In (mm) for metric cylinder

Cylinder Options

**N2** Internal Non-rotating Piston Rod with Magnetic Piston

9 Series 90000

Cylinder Version

2 Double Acting

Piston Diameters	Nominal Inch (mm)
012	N/A
016	ø 5/8" 16 mm
020	ø 3/4" 20 mm
025	ø 1" 25 mm
032	ø 1 1/4" 32 mm
040	ø 1 1/2" 40 mm
050	ø 2" 50 mm
063	ø 2 1/2" 63 mm
080	ø 3 1/8" 80 mm
100	ø 4" 100 mm

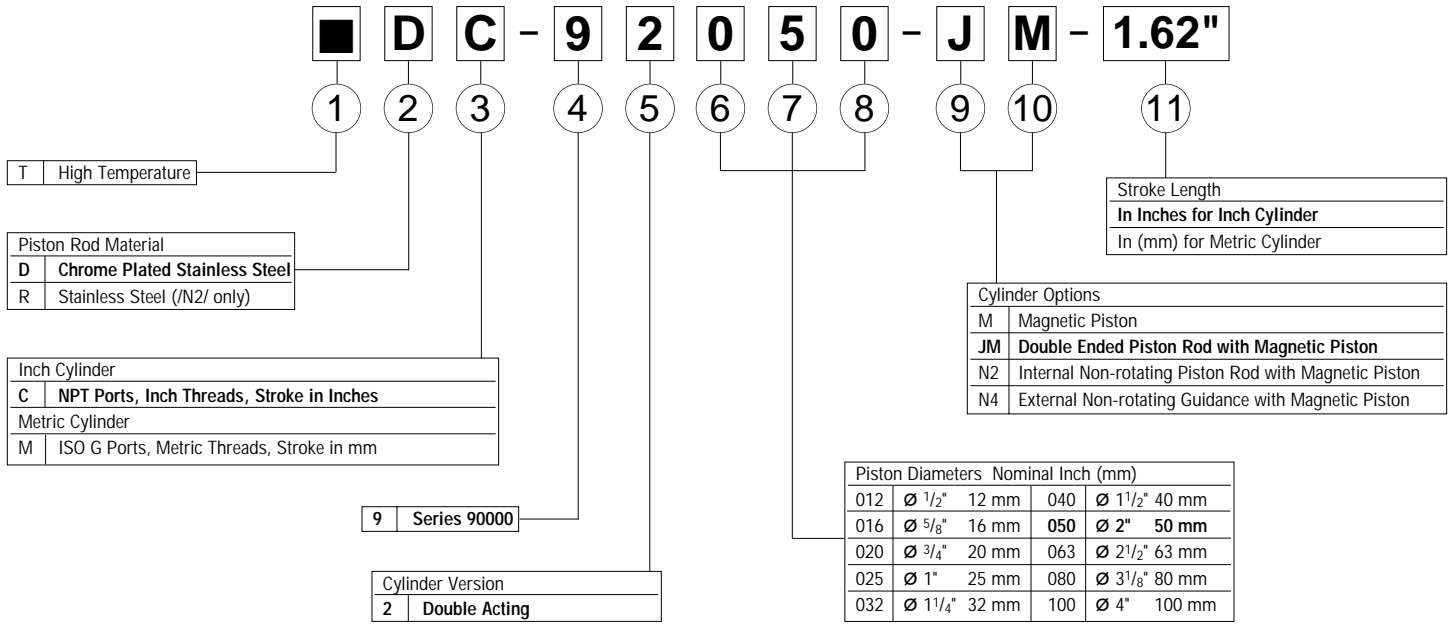
Maximum Stroke for 92000/N2 Internal Non-rotating Piston Rod

RC/92000/N2 inch cylinder	Nominal Diameter	Maximum Stroke	RM/92000/N2 metric cylinder	Diameter	Maximum Stroke
	ø 5/8", 3/4", 1"	8"		ø 16, 20, 25 mm	200 mm
	ø 1 1/4", 1 1/2"	10"		ø 32, 40 mm	250 mm
	ø 2", 2 1/2", 3 1/8", 4"	12"		ø 50, 63, 80, 100 mm	300 mm





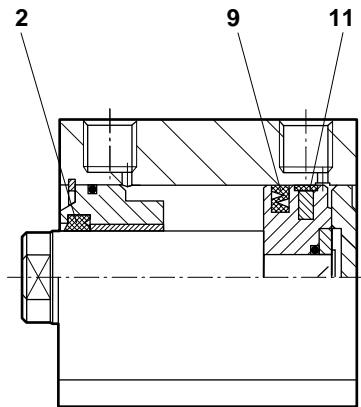
Cylinder Order Information



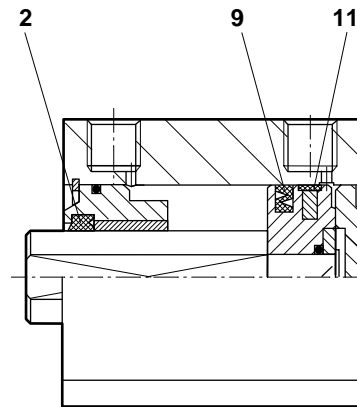
NOTE: 012 not available in /JM/, /N2/, /N4/.

EXAMPLE: Chrome plated stainless steel – inch threads – Series 90000 – double acting – 2" diameter – double ended piston rod with magnetic piston – 1.62 inch stroke length.

Spares Kits



DC/92000/M, DM/92000/M



RC/92000/N2, RM/92000/N2

Model	Spares kits ø 2" to 4" (ø 50 to 100 mm)	Consisting of Item	Description	Quantity
DC/92050/M, DM/92050/M, DC/92050/N4, DM/92050/N4, TDC/92050/M, TDM/92050/M	QM/92050/00, TQM/92050/00	2	Piston rod seal	1
RC/92050/N2, RM/92050/N2	QM/92050/N2/00	9	Piston seal	1
DC/92063/M, DM/92063/M, DC/92063/N4, DM/92063/N4, TDC/92063/M, TDM/92063/M	QM/92063/00, TQM/92063/00	11	Wear ring	1
RC/92063/N2, RM/92063/N2	QM/92063/N2/00		Grease	1
DC/92080/M, DM/92080/M, DC/92080/N4, DM/92080/N4, TDC/92080/M, TDM/92080/M	QM/92080/00, TQM/92080/00			
DC/92100/M, DM/92100/M, DC/92100/N4, DM/92100/N4, TDC/92100/M, TDM/92100/M	QM/92100/00, TQM/92100/00			

NOTE: Please specify the cylinder number when ordering spare parts. Spares are not available for Ø 1/2" to 1 1/2" (Ø 12 to 40 mm) models.



# The finest materials for each Series 91000 & 93000 component!

**1** Rod Seal Wiper:

Polyurethane pressure energized and wear-compensating.

**2** Rod Bearing:

Short Stroke version with integrated bearing made of anodized aluminum. Long Stroke version incorporates a heavy duty polyamide bearing.

**3** Piston Rod:

303 stainless steel, ground and polished, hard chrome plated for excellent protection against wear and corrosion.

**4** Tube Body:

6063 extruded aluminum alloy, ideally suited for air service, clear coat anodized corrosion resistant surface.

**5** Piston:

Specially formulated polyacetal on the smaller bore sizes and solid aluminum on the larger bore sizes for added strength and longevity.

**6** Head/Cap: Anodized aluminum for corrosion resistance.

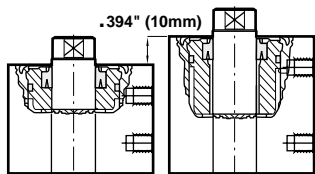
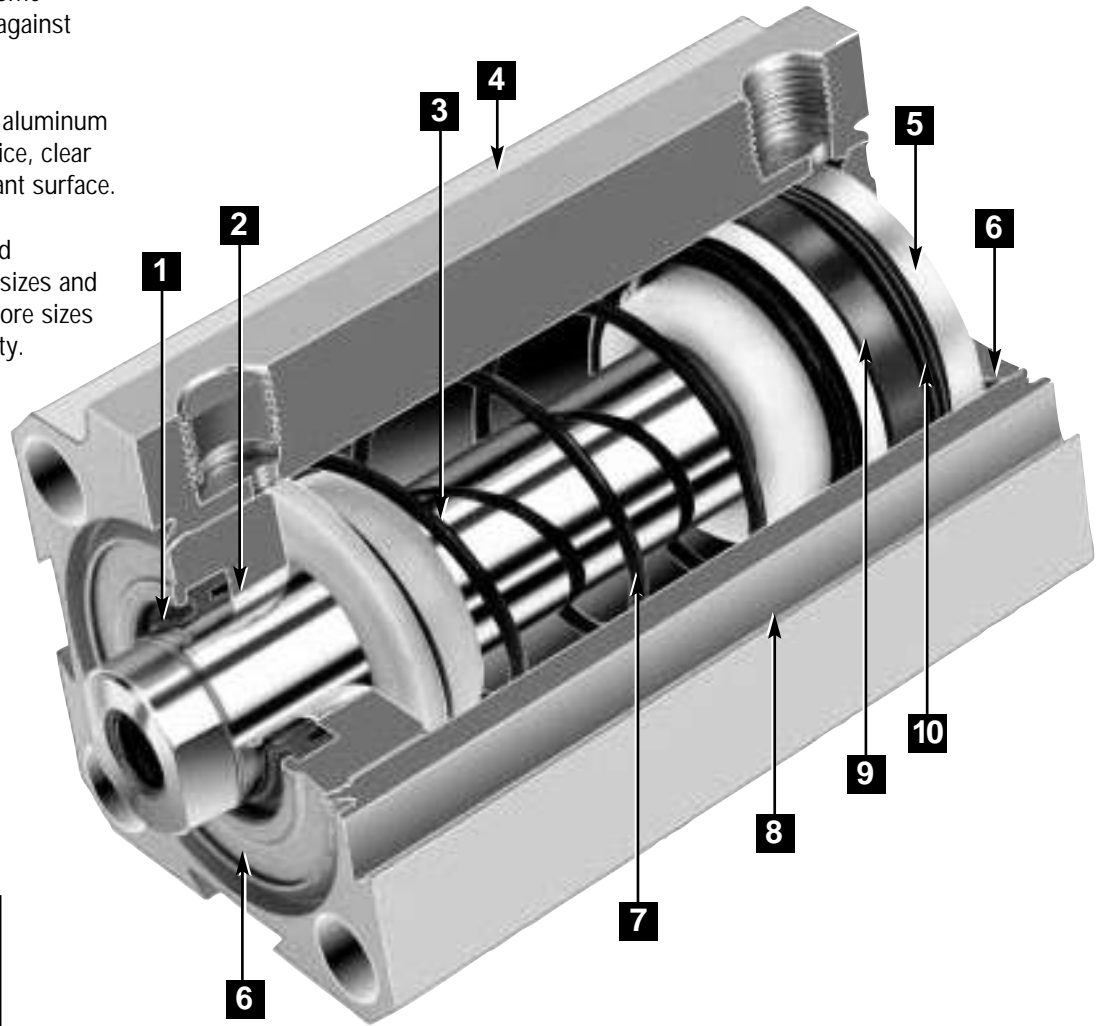
**7** Springs: Premium quality spring steel is used to create the force for single acting cylinders.

**8** Extrusion: Complete with integral slots for low profile position sensing switches.

**9** Piston Magnet: All cylinders are supplied with a specially molded piston magnet; switches can be added later.

**10** Piston Seal: Z-Seal is a pressure energized bidirectional seal compounded with nitrile rubber for excellent wear.

**11** Prelubricated: All cylinders are prelubricated for dry air service.



Short Stroke Version Long Stroke Version

### Short Stroke Version:

Designed for stroke lengths of 2" (50mm) and shorter, this cylinder incorporates an integrated bearing to make it as compact as possible. The integrated bushing makes the overall length of the cylinder body exactly .394" (10mm) shorter than the Long Stroke version.

### Long Stroke Version:

Designed for stroke lengths greater than 2" (50mm), cylinder incorporates a longer bearing housing with a heavy duty Polyamide rod bearing for increased stability. The housing increases the overall length of the cylinder body .394" (10mm) longer than the Short Stroke version.

### Non-rotating Piston Rod Version:

/N2/ cylinder has a special non-rotating bearing housing. As a result, the cylinder overall body length is .394" (10mm) longer.



**Medium:**

Compressed air, filtered, lubricated or non-lubricated

**Operation:**

91000/M Single acting, non-cushioned, magnetic, spring return  
 93000/M Single acting, non-cushioned, magnetic, spring extend

**Operating Pressure:**

29 to 145 PSI (2 to 10 bar)

**Operating Temperature:**

23°F\* to 176°F (-5°C\* to +80°C)  
 \*Consult Technical Service for use below +35°F (+2°C)

**Cylinder Diameters:**

Nominal Inch  
 1/2", 5/8", 3/4", 1", 1 1/4", 1 1/2", 2", 2 1/2"  
 12, 16, 20, 25, 32, 40, 50, 63 mm

**Torque for /N2 Cylinders**

Ø Bore Nominal Inch	Ø Bore mm	Non-rotating piston rod permissible torque RC/91000/N2, RC/93000/N2 inch cylinders, RM/91000/N2, RM/93000/N2 metric cylinders	
		Torque at 87 PSI (6 bar) Model	Max Torque Inch lbs. (Nm)
1/2"	(12)	-	-
5/8"	(16)	RC/91016/N2, RC/93016/N2, RM/91016/N2, RM/93016/N2	1.33 (0.15)
3/4"	(20)	RC/91020/N2, RC/93020/N2, RM/91020/N2, RM/93020/N2	2.21 (0.25)
1"	(25)	RC/91025/N2, RC/93025/N2, RM/91025/N2, RM/93025/N2	3.54 (0.40)
1 1/4"	(32)	RC/91032/N2, RC/93032/N2, RM/91032/N2, RM/93032/N2	6.64 (0.75)
1 1/2"	(40)	RC/91040/N2, RC/93040/N2, RM/91040/N2, RM/93040/N2	6.64 (0.75)
2"	(50)	RC/91050/N2, RC/93050/N2, RM/91050/N2, RM/93050/N2	13.28 (1.50)
2 1/2"	(63)	RC/91063/N2, RC/93063/N2, RM/91063/N2, RM/93063/N2	13.28 (1.50)

**Cylinder Variations**

Symbol	Model (magnetic piston)	Description	
	RC/91000/N2, RM/91000/N2	Non-rotating piston rod Ø 5/8", 3/4", 1", 1 1/4", 1 1/2", 2", 2 1/2" spring retract (Ø 16, 20, 25, 32, 40, 50, 63 mm) spring retract	See ACT-8-18 for dimensional and stroke length information.
	RC/93000/N2, RM/93000/N2	Non-rotating piston rod Ø 5/8", 3/4", 1", 1 1/4", 1 1/2", 2", 2 1/2" spring extend (Ø 16, 20, 25, 32, 40, 50, 63 mm) spring extend	See ACT-8-18 for dimensional and stroke length information.

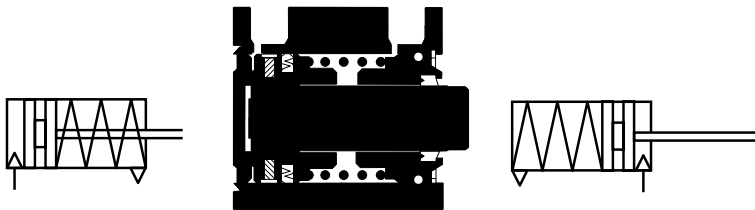
**Theoretical Forces • Air Consumption**

Ø Bore Nominal Inch	Ø Bore mm	DC/91000/M inch cylinder DM/91000/M metric cylinder Theoretical forces at 87 PSI (6 bar)		DC/93000/M inch cylinder DM/93000/M metric cylinder Theoretical forces at 87 PSI (6 bar)		DC/91000/M, DC/93000/M inch Air consumption DM/91000/M, DM/93000/M metric inches <sup>3</sup> /inch (Liters/cm)							
		Extend lbs Force	(N)	Return force of spring lbs Force	(N)	Retract lbs Force	(N)	Return force of spring lbs Force	(N)	Extend Inch <sup>3</sup>	Liters	Retract Inch <sup>3</sup>	Liters
1/2"	(12)	12.8	(57)	1.57	(7)	9.0	(40)	1.57	(7)	1.240	(0.008)	1.085	(0.007)
5/8"	(16)	23.2	(103)	2.81	(12.5)	16.2	(72)	2.81	(12.5)	2.170	(0.014)	1.705	(0.011)
3/4"	(20)	36.2	(161)	3.26	(14.5)	26.8	(119)	3.26	(14.5)	3.410	(0.022)	2.635	(0.017)
1"	(25)	59.3	(264)	4.50	(20)	44.3	(197)	4.50	(20)	5.425	(0.035)	4.185	(0.027)
1 1/4"	(32)	97.1	(432)	7.19	(32)	70.0	(311)	7.19	(32)	8.680	(0.056)	6.510	(0.042)
1 1/2"	(40)	154.4	(687)	9.89	(44)	127.3	(566)	9.89	(44)	13.640	(0.088)	11.470	(0.074)
2"	(50)	245.9	(1094)	12.70	(56.5)	203.7	(906)	12.70	(56.5)	21.390	(0.138)	17.980	(0.116)
2 1/2"	(63)	397.9	(1770)	16.75	(74.5)	355.6	(1582)	16.75	(74.5)	33.790	(0.218)	30.380	(0.196)

**Weights of Cylinders and Mountings**

Ø Bore Nominal Inch	Ø Bore mm	Weight at zero stroke lbs	kg	Weight per 1/4 inch 5mm lbs	kg										
						Style 'B', 'G' lbs	kg	Style 'C' lbs	kg	Style 'F' lbs	kg	Nut lbs	kg	Stud or Adaptor lbs	kg
1/2"	(12)	0.154	(0.070)	0.044	(0.020)	0.044	(0.020)	0.044	(0.020)	0.022	(0.010)	0.002	(0.001)	0.002	(0.001)
5/8"	(16)	0.198	(0.090)	0.044	(0.020)	0.044	(0.020)	0.044	(0.020)	0.022	(0.010)	0.002	(0.001)	0.004	(0.002)
3/4"	(20)	0.265	(0.120)	0.044	(0.020)	0.044	(0.020)	0.044	(0.020)	0.022	(0.010)	0.002	(0.001)	0.007	(0.003)
1"	(25)	0.375	(0.170)	0.066	(0.030)	0.088	(0.040)	0.088	(0.040)	0.022	(0.010)	0.004	(0.002)	0.011	(0.005)
1 1/4"	(32)	0.617	(0.280)	0.110	(0.050)	0.132	(0.060)	0.088	(0.040)	0.044	(0.020)	0.007	(0.003)	0.022	(0.010)
1 1/2"	(40)	0.970	(0.440)	0.132	(0.060)	0.331	(0.150)	0.220	(0.100)	0.044	(0.020)	0.007	(0.003)	0.022	(0.010)
2"	(50)	1.102	(0.500)	0.176	(0.080)	0.375	(0.170)	0.243	(0.110)	0.088	(0.040)	-	-	0.044	(0.020)
2 1/2"	(63)	1.984	(0.900)	0.243	(0.110)	0.728	(0.330)	0.287	(0.130)	0.198	(0.090)	-	-	0.077	(0.035)

- **Very compact – approximately one third the basic length of a corresponding conventional model**
- **Entirely manufactured from corrosion resistant materials**
- **Standard magnetic piston provides a wide range of control options**
- **∅ 1/2" to 2 1/2" (∅ 12 to 63 mm)**



Magnetic, spring return

Magnetic, spring extend

**Ordering Information**

To order a basic 2 1/2" bore cylinder, spring return with a 1 inch stroke and magnet piston, specify: DC/91063/M/1.0

To order a basic 16 mm bore cylinder, spring extend with a 5 mm stroke and magnet piston, specify: DM/93016/M/5

To order mounting accessories, refer to appropriate cylinder mounting table on pages ACT-8-16/17.

Order magnetically operated switches M/40, M/41 and M/42 separately. See pages ACT-8-20/23.

**Non-Standard Options**

- Hollow piston rod for blow-off or vacuum
- Additional mountings
- Force multiplication tandems
- Multi-position duplex
- Integrated control valve

**Cylinder Order Information**

D	■	-	9	■	■	■	■	-	■	M	-	*
1	2		3	4	5	6	7		8	9		10

<b>Piston Rod Material</b>	
D	Chrome Plated Stainless Steel
R	Stainless Steel (N2/ only)

<b>Inch Cylinder</b>	
C	NPT ports, inch threads, stroke in inches
<b>Metric Cylinder</b>	
M	ISO G ports, metric threads, stroke in mm

9	Series 90000
---	--------------

<b>Stroke Length</b>	
In Inches for inch cylinder	
In (mm) for metric cylinder	

<b>Cylinder Options</b>	
M	Magnetic Piston
N2	Internal non-rotating piston rod with magnetic piston

<b>Piston Diameters Nominal Inch (mm)</b>					
012	∅ 1/2"	12 mm	032	∅ 1 1/4"	32 mm
016	∅ 5/8"	16 mm	040	∅ 1 1/2"	40 mm
020	∅ 3/4"	20 mm	050	∅ 2"	50 mm
025	∅ 1"	25 mm	063	∅ 2 1/2"	63 mm

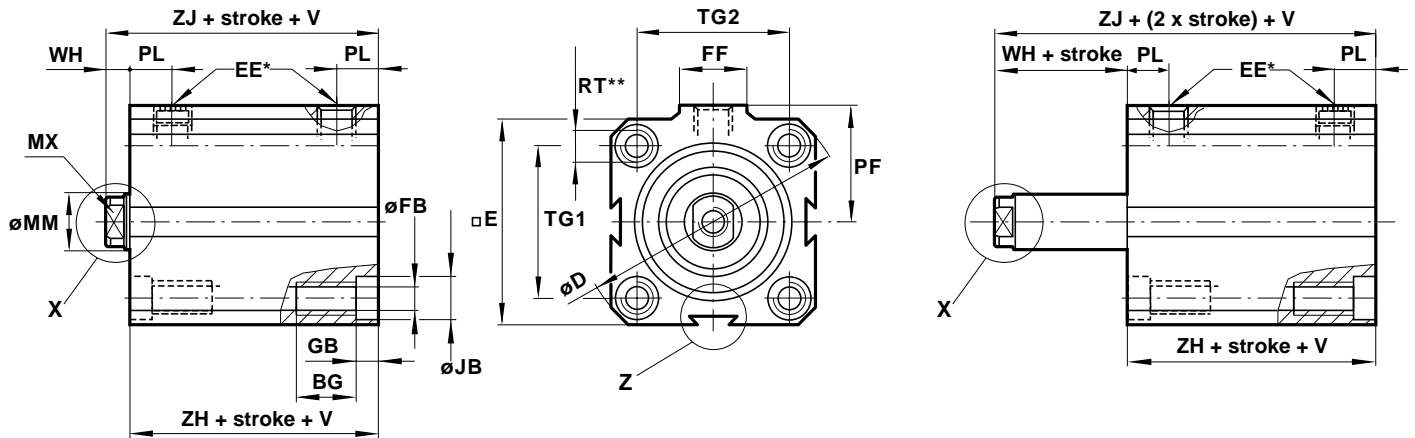
  

<b>Cylinder Version</b>	
1	Single Acting Spring Return
3	Single Acting Spring Extend



DC/91000/M, DM/91000/M

DC/93000/M, DM/93000/M

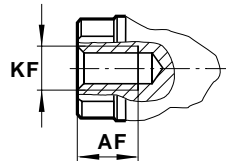
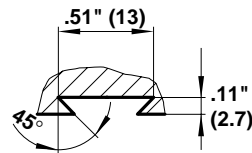


Section Z

Section X



NOTE: Ø 1/2" to 3/4" (Ø 12 to 20 mm) have only two side dovetails.

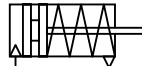


\* Port thread with inserted filter, do not obstruct  
 \*\* Only the 4 front holes are tapped on stroke lengths of less than:  
 Ø 1" and 1 1/4" (Ø 25 and 32 mm) .197" (5 mm)  
 Ø 1 1/2" and 2 1/2" (Ø 40 and 63 mm) .591" (15 mm) .../N2 .197" (5 mm)  
 Ø 2" (Ø 50 mm) .394" (10 mm)

Ø Bore	Inch (mm) 1/2" (12)	Inch (mm) 5/8" (16)	Inch (mm) 3/4" (20)	Inch (mm) 1" (25)	Inch (mm) 1 1/4" (32)	Inch (mm) 1 1/2" (40)	Inch (mm) 2" (50)	Inch (mm) 2 1/2" (63)
Inch Cylinder	DC/91012/M	DC/91016/M	DC/91020/M	DC/91025/M	DC/91032/M	DC/91040/M	DC/91050/M	DC/91063/M
Metric Cylinder	DM/91012/M	DM/91016/M	DM/91020/M	DM/91025/M	DM/91032/M	DM/91040/M	DM/91050/M	DM/91063/M
Inch Cylinder	DC/93012/M	DC/93016/M	DC/93020/M	DC/93025/M	DC/93032/M	DC/93040/M	DC/93050/M	DC/93063/M
Metric Cylinder	DM/93012/M	DM/93016/M	DM/93020/M	DM/93025/M	DM/93032/M	DM/93040/M	DM/93050/M	DM/93063/M
AF	.24 (6)	.28 (7)	.31 (8)	.35 (9)	.47 (12)	.47 (12)	.55 (14)	.63 (16)
BG	.35 (9)	.35 (9)	.35 (9)	.47 (12)	.47 (12)	.63 (16)	.63 (16)	.79 (20)
Ø D	1.28 (32.5)	1.44 (36.5)	1.63 (41.5)	1.89 (48)	2.28 (58)	2.81 (71.5)	3.19 (81)	4.09 (104)
□ E	.98 (25)	1.10 (28)	1.26 (32)	1.46 (37)	1.77 (45)	2.17 (55)	2.48 (63)	3.15 (80)
EE	10-32 (M 5)	10-32 (M 5)	10-32 (M 5)	10-32 (M 5)	1/8NPT (G 1/8)	1/8NPT (G 1/8)	1/8NPT (G 1/8)	1/4NPT (G 1/4)
Ø FB	.13 (3.3)	.13 (3.3)	.13 (3.3)	.17 (4.2)	.17 (4.2)	.27 (6.8)	.27 (6.8)	.33 (8.5)
FF	.39 (10)	.39 (10)	.39 (10)	.39 (10)	.71 (18)	.71 (18)	.71 (18)	.87 (22)
GB	.14 (3.5)	.14 (3.5)	.14 (3.5)	.18 (4.5)	.18 (4.5)	.26 (6.5)	.26 (6.5)	.33 (8.5)
Ø JB	.24 (6)	.24 (6)	.24 (6)	.30 (7.5)	.30 (7.5)	.41 (10.5)	.41 (10.5)	.41 (13.5)
KF	4-40 (M 3)	8-32 (M 4)	10-32 (M 5)	1/4-28 (M 6)	5/16-24 (M 8)	5/16-24 (M 8)	3/8-24 (M 10)	7/16-20 (M 12)
Ø MM	.24 (6)	.31 (8)	.39 (10)	.47 (12)	.63 (16)	.63 (16)	.79 (20)	.79 (20)
MX	.20 (5)	.24 (6)	.31 (8)	.39 (10)	.51 (13)	.51 (13)	.67 (17)	.67 (17)
PF	.59 (15)	.67 (17)	.77 (19.5)	.87 (22)	1.08 (27.5)	1.24 (31.5)	1.46 (37)	1.89 (48)
PL	.28 (7)	.30 (7.5)	.30 (7.5)	.31 (8)	.35 (9)	.39 (10)	.41 (10.5)	.51 (13)
RT	8-32 (M 4)	8-32 (M 4)	8-32 (M 4)	10-32 (M 5)	10-32 (M 5)	5/16-24 (M 8)	5/16-24 (M 8)	3/8-24 (M 10)
TG 1	.67 (17)	.79 (20)	.91 (23)	1.06 (27)	1.30 (33)	1.61 (41)	1.89 (48)	2.40 (61)
TG 2	.51 (13)	.79 (20)	.91 (23)	1.06 (27)	1.30 (33)	1.61 (41)	1.89 (48)	2.40 (61)
V strokes 0 - 1" (25)	.55 (14)	.59 (15)	.67 (17)	.71 (18)	.75 (19)	.79 (20)	1.18 (30)	1.18 (30)
strokes > 1" (25)	-	-	1.34 (34)	1.42 (36)	1.50 (38)	1.57 (40)	2.36 (60)	2.36 (60)
WH	.18 (4.5)	.22 (5.5)	.24 (6)	.26 (6.5)	.26 (6.5)	.26 (6.5)	.31 (8)	.31 (8)
ZH	.94 (24)	.96 (24.5)	1.02 (26)	1.12 (28.5)	1.14 (29)	1.24 (31.5)	1.38 (35)	1.67 (42.5)
ZJ	1.12 (28.5)	1.18 (30)	1.26 (32)	1.38 (35)	1.40 (35.5)	1.50 (38)	1.69 (43)	1.99 (50.5)

Maximum Stroke for 91000/M & 93000/M Single Acting Cylinders

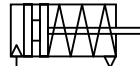
DC/91000/M spring return inch cylinder



Nominal Diameter  
 Ø 1/2", 5/8"  
 Ø 3/4", 1", 1 1/4", 1 1/2", 2", 2 1/2"

Maximum Stroke  
 3/8"  
 2"

DM/91000/M spring return metric cylinder



Diameter  
 Ø 12, 16 mm  
 Ø 20, 25, 32, 40, 50, 63 mm

Maximum Stroke  
 10 mm  
 50 mm

DC/93000/M spring extend inch cylinder



DM/93000/M spring extend metric cylinder







# Series 90000 Compact Actuators

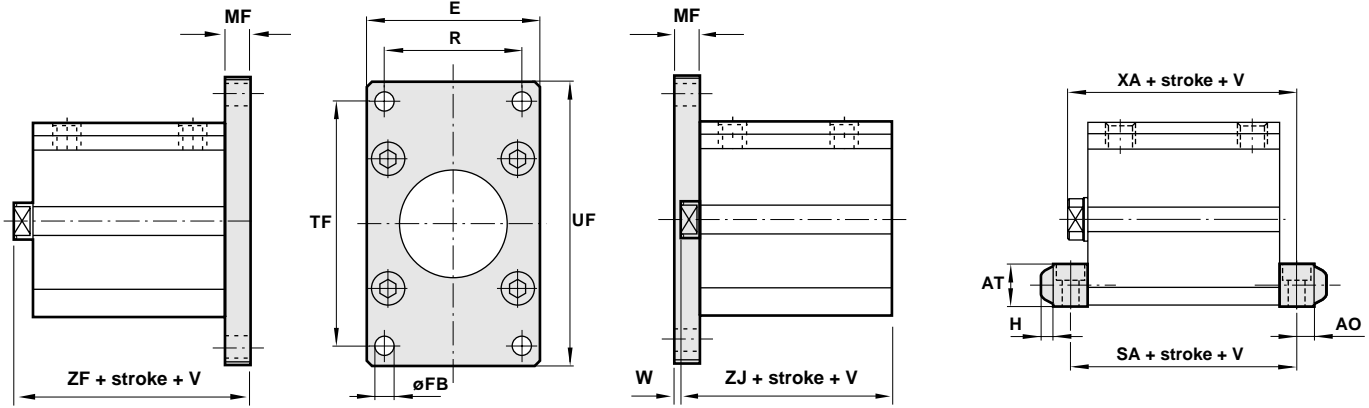
DC/91000/M, DM/91000/M, RC/91000/N2, RM/91000/N2

Rear Flange Mount 'B'

Front Flange Mount 'G'

DC/93000/M, DM/93000/M

RC/93000/N2, RM/93000/N2

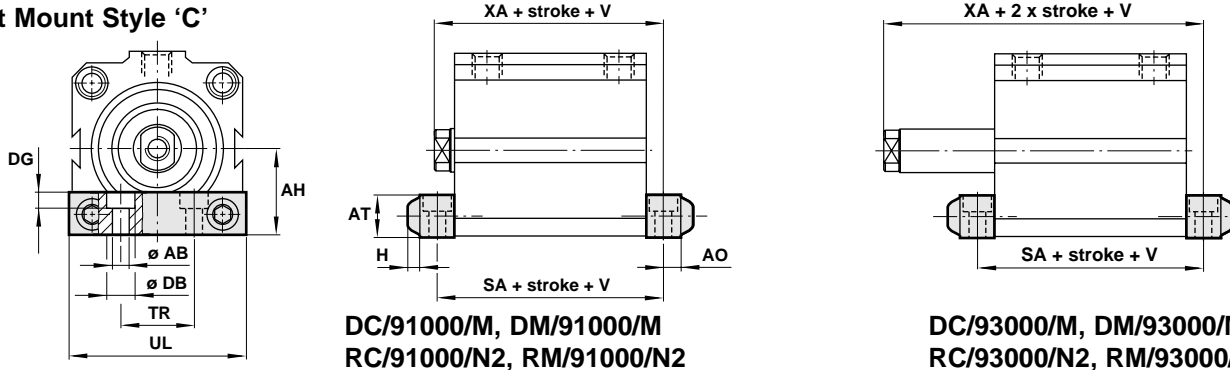


Ø Bore	Inch (mm) 1/2" (12)	Inch (mm) 5/8" (16)	Inch (mm) 3/4" (20)	Inch (mm) 1" (25)	Inch (mm) 1 1/4" (32)	Inch (mm) 1 1/2" (40)	Inch (mm) 2" (50)	Inch (mm) 2 1/2" (63)
Inch Cylinder	QC/90012/22	QC/90016/22	QC/90020/22	QC/90025/22	QC/90032/22	QC/90040/22	QC/90050/22	QC/90063/22
Metric Cylinder	QM/90012/22	QM/90016/22	QM/90020/22	QM/90025/22	QM/90032/22	QM/90040/22	QM/90050/22	QM/90063/22
E	1.02 (26)	1.18 (30)	1.30 (33)	1.50 (38)	1.81 (46)	2.24 (57)	2.52 (64)	3.19 (81)
Ø FB	.14 (3.5)	.14 (3.5)	.14 (3.5)	.18 (4.5)	.18 (4.5)	.26 (6.5)	.26 (6.5)	.33 (8.5)
MF	.20 (5)	.20 (5)	.20 (5)	.26 (6.5)	.26 (6.5)	.37 (9.5)	.37 (9.5)	.49 (12.5)
R	.71 (18)	.87 (22)	.98 (25)	1.10 (28)	1.42 (36)	1.69 (43)	1.97 (50)	2.48 (63)
TF	1.50 (38)	1.65 (42)	1.89 (48)	2.13 (54)	2.60 (66)	3.07 (78)	3.54 (90)	4.33 (110)
UF	1.81 (46)	1.97 (50)	2.20 (56)	2.52 (64)	2.99 (76)	3.62 (92)	4.09 (104)	5.04 (128)
V strokes 0 - 1" (25)	.55 (14)	.59 (15)	.67 (17)	.71 (18)	.75 (19)	.79 (20)	1.18 (30)	1.18 (30)
strokes > 1" (25)	-	-	1.34 (34)	1.42 (36)	1.50 (38)	1.57 (40)	2.36 (60)	2.36 (60)
W	-.02 (-0.5)	.02 (0.5)	.04 (1)	0 (0)	0 (0)	-.12 (-3)	-.04 (-1)	-.18 (-4.5)
ZF	1.32 (33.5)	1.38 (35)	1.46 (37)	1.63 (41.5)	1.77 (45)	1.87 (47.5)	2.07 (52.5)	2.50 (63.5)
ZF*	1.71 (43.5)	1.77 (45)	1.85 (47)	2.03 (51.5)	2.17 (55)	2.26 (57.5)	2.46 (62.5)	2.89 (73.5)
ZJ	1.12 (28.5)	1.18 (30)	1.26 (32)	1.38 (35)	1.40 (35.5)	1.50 (38)	1.69 (43)	1.99 (50.5)

NOTE: Dimension 'W' negative figures indicate that the piston rod is below the mounting face.

\*Non-rotating rod cylinders RC/91000/N2, RM/91000/N2, RC/93000/N2 and RM/93000/N2 incorporate a longer rod bearing. This increases the overall body by .394" (10mm). See ACT-8-12.

## Foot Mount Style 'C'



DC/91000/M, DM/91000/M  
RC/91000/N2, RM/91000/N2

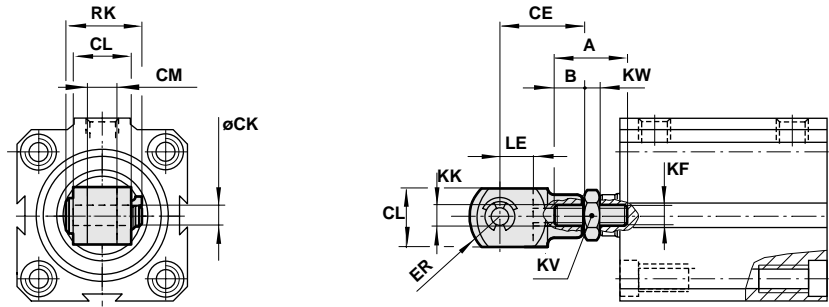
DC/93000/M, DM/93000/M  
RC/93000/N2, RM/93000/N2

Ø Bore	Inch (mm) 1/2" (12)	Inch (mm) 5/8" (16)	Inch (mm) 3/4" (20)	Inch (mm) 1" (25)	Inch (mm) 1 1/4" (32)	Inch (mm) 1 1/2" (40)	Inch (mm) 2" (50)	Inch (mm) 2 1/2" (63)
Inch Cylinder	QC/90012/21	QC/90016/21	QC/90020/21	QC/90025/21	QC/90032/21	QC/90040/21	QC/90050/21	QC/90063/21
Metric Cylinder	QM/90012/21	QM/90016/21	QM/90020/21	QM/90025/21	QM/90032/21	QM/90040/21	QM/90050/21	QM/90063/21
Ø AB	.13 (3.4)	.13 (3.4)	.13 (3.4)	.17 (4.3)	.17 (4.3)	.25 (6.4)	.25 (6.4)	.33 (8.4)
AH	.53 (13.5)	.59 (15)	.65 (16.5)	.79 (20)	.94 (24)	1.12 (28.5)	1.26 (32)	1.63 (41.5)
AO	.16 (4)	.16 (4)	.16 (4)	.20 (5)	.20 (5)	.26 (6.5)	.26 (6.5)	.31 (8)
AT	.37 (9.5)	.37 (9.5)	.37 (9.5)	.49 (12.5)	.49 (12.5)	.63 (16)	.63 (16)	.87 (22)
Ø DB	.24 (6)	.24 (6)	.24 (6)	.30 (7.5)	.30 (7.5)	.41 (10.5)	.41 (10.5)	.53 (13.5)
DG	.14 (3.5)	.14 (3.5)	.14 (3.5)	.18 (4.5)	.18 (4.5)	.26 (6.5)	.26 (6.5)	.33 (8.5)
H	.08 (2)	.08 (2)	.08 (2)	.12 (3)	.12 (3)	.18 (4.5)	.18 (4.5)	.22 (5.5)
SA	1.26 (32)	1.28 (32.5)	1.34 (34)	1.52 (38.5)	1.54 (39)	1.75 (44.5)	1.89 (48)	2.30 (58.5)
SA*	1.65 (42)	1.67 (42.5)	1.73 (44)	1.91 (48.5)	1.93 (49)	2.15 (54.5)	2.28 (58)	2.70 (68.5)
TR	.98 (25)	1.26 (32)	1.38 (35)	1.61 (41)	.75 (19)	.83 (21)	1.06 (27)	1.34 (34)
UL	1.30 (33)	1.57 (40)	1.69 (43)	2.01 (51)	1.81 (46)	2.20 (56)	2.52 (64)	3.19 (81)
XA	1.28 (32.5)	1.34 (34)	1.42 (36)	1.57 (40)	1.59 (40.5)	1.75 (44.5)	1.95 (49.5)	2.30 (58.5)
XA*	1.67 (42.5)	1.73 (44)	1.81 (46)	1.97 (50)	1.99 (50.5)	2.15 (54.5)	2.34 (59.5)	2.70 (68.5)

\*Non-rotating rod cylinders RC/91000/N2, RM/91000/N2, RC/93000/N2 and RM/93000/N2 incorporate a longer rod bearing. This increases the overall body by .394" (10mm). See ACT-8-12.



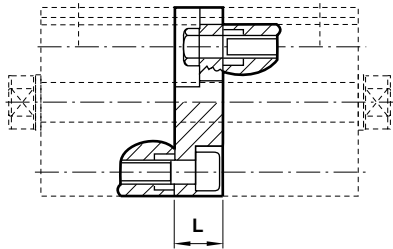
Piston Rod Clevis Mount 'F'



∅ Bore	inch (mm) 1/2" (12)	inch (mm) 5/8" (16)	inch (mm) 3/4" (20)	inch (mm) 1" (25)	inch (mm) 1 1/4" (32)	inch (mm) 1 1/2" (40)	inch (mm) 2" (50)	inch (mm) 2 1/2" (63)
Clevis Inch Metric	RC-12 QM/57008/25	RC-16 QM/8010/25	RC-20 QM/92020/25	RC-25 QM/57016/25	RC-32 QM/57020/25	RC-32 QM/57020/25	RC-50 QM/57025/25	RC-63 QM/57040/25
Stud Inch Metric	C-653-24-00J M/P1710/18	C-653-04-00M M/P1710/19	C-653-05-00P M/P1710/20	C-653-08-01A M/P1710/21	C-653-11-01A M/P1710/22	C-653-11-01A M/P1710/22	C-653-14-01E -	C-653-16-01P -
Nut Inch Metric	C-76-36 M/P1500/111	C-76-37 M/P1501/80	C-76-225 M/P1501/109	C-76-03A M/P1501/79	C-76-04A M/P1501/60	C-76-04A M/P1501/60	C-76-05A -	C-76-065A -
Adaptor Metric	-	-	-	-	-	-	M/P71470/1	M/P71470/2
A	.50 (12)	.63 (16)	.75 (20)	1.00 (25)	1.00 (25)	1.00 (25)	1.25 (29)	1.50 (35)
B	-	-	-	-	-	-	.47 (12)	.59 (15)
CE	.63 (11)	.63 (16)	.75 (20)	.94 (20)	.94 (24)	.94 (24)	1.31 (26)	1.31 (40)
∅ CK	.19 (3)	.19 (4)	.19 (5)	.25 (5)	.25 (6)	.25 (6)	.38 (8)	.38 (10)
□ CL	.31 (6)	.31 (8)	.38 (10)	.50 (10)	.50 (12)	.50 (12)	.75 (14)	.75 (20)
CM	.16 (3)	.16 (4)	.20 (5)	.26 (5)	.26 (6)	.26 (6)	.38 (7)	.38 (10)
ER	- (4.5)	- (6.5)	- (8)	- (8)	- (9.5)	- (9.5)	- (11.5)	- (16)
KF	4-40 (M 3)	8-32 (M 4)	10-32 (M 5)	1/4-28 (M 6)	5/16-24 (M 8)	5/16-24 (M 8)	3/8-24 (M 10)	7/16-20 (M 12)
KK	4-40 (M 3)	8-32 (M 4)	10-32 (M 5)	1/4-28 (M 6)	5/16-24 (M 8)	5/16-24 (M 8)	3/8-24 (M 10 x 1.25)	7/16-20 (M 12 x 1.25)
KV (A/F)	.25 (6)	.31 (7)	.38 (8)	.44 (10)	.50 (13)	.50 (13)	.56 (12)	.69 (13)
KW	.09 (2)	.13 (2)	.13 (2.5)	.17 (3)	.19 (4)	.19 (4)	.22 (5)	.22 (5)
LE	.22 (5)	.22 (5)	.37 (10)	.44 (10)	.44 (12)	.44 (12)	.56 (12)	.56 (20)
RK	.50 (10)	.50 (10)	.66 (14.5)	.85 (14.5)	.85 (17.5)	.85 (17.5)	1.13 (20.5)	1.13 (29)

NOTE: Clevis Includes Pin. To order a complete piston rod clevis mount: ∅ 1/2" to 2-1/2" (∅ 12 to 40mm) = Clevis plus Stud and Nut. ∅ 50 and 63mm = Clevis plus Adaptor. Piston Rod Clevis will vary in design. Inch clevis and metric clevis are dimensionally different.

Back to Back Mounting Kit



∅ Bore	inch (mm) 1/2" (12)	inch (mm) 5/8" (16)	inch (mm) 3/4" (20)	inch (mm) 1" (25)	inch (mm) 1 1/4" (32)	inch (mm) 1 1/2" (40)	inch (mm) 2" (50)	inch (mm) 2 1/2" (63)
Inch	QC/92012/55	QC/92016/55	QC/92020/55	QC/92025/55	QC/92032/55	QC/92040/55	QC/92050/55	QC/92063/55
Metric	QM/92012/55	QM/92016/55	QM/92020/55	QM/92025/55	QM/92032/55	QM/92040/55	QM/92050/55	QM/92063/55
L	.39 (10)	.39 (10)	.39 (10)	.39 (10)	.39 (10)	.59 (15)	.59 (15)	.79 (20)

Mounting Order Information

All Mountings are ordered separately and are normally mounted to the cylinder by the customer.

Flange Mount – Style 'B' and 'G' Mounting Kit

Inch Cylinder: QC/90 \_ \_ \_ /22  
Includes the flange and the inch mounting screws to mount the flange to the Inch version cylinder.

Metric Cylinder: QM/90 \_ \_ \_ /22  
Includes the flange and the metric mounting screws to mount the flange to the Metric version cylinder.

Foot Mount – Style 'C' Mounting Kit

Inch Cylinder: QC/90 \_ \_ \_ /21  
Includes the two foot mounts and the inch mounting screws to mount the feet to the Inch version cylinder.

Metric Cylinder: QM/90 \_ \_ \_ /21  
Includes two foot mounts and the metric mounting screws to mount the feet to the Metric version cylinder.

Piston Rod Clevis Mount – Style 'F' Mounting Kit

Inch Cylinder:  
Clevis RC- \_ \_  
Stud C-653- \_ \_ \_ \_ \_  
Nut C-76- \_ \_ \_

To order a piston rod clevis mounting complete for Inch cylinders = Clevis plus Stud and Nut. (Clevis includes pivot pin.)

Metric Cylinder:

Clevis QM/ \_ \_ \_ \_ \_ /25  
Stud M/P1710/\_ \_  
Nut M/P1501/\_ \_ \_  
Adaptor M/P71470/\_

To order a piston rod clevis mounting complete for a Metric cylinder for: ∅ 12 to 40mm = Clevis plus Stud and Nut. ∅ 50 and 63mm = Clevis and Adaptor. (Clevis includes pivot pin.)

Back to Back Mounting Kit

Inch cylinders: QC/ 92\_ \_ \_ /55  
Includes the mounting plate and the inch mounting screws to mount the two Inch version cylinders back to back.

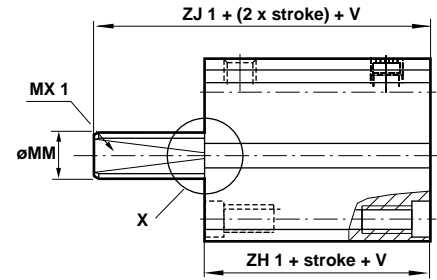
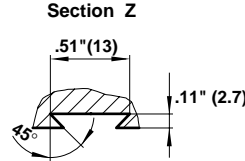
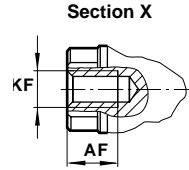
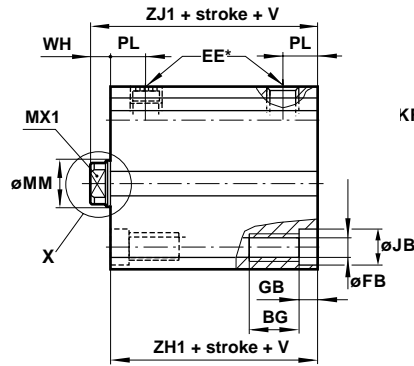
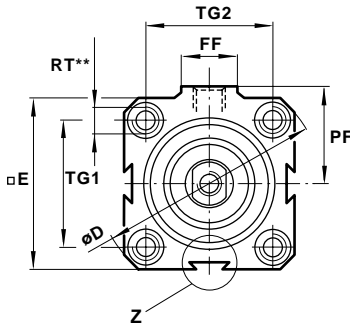
Metric cylinders: QM/ 92\_ \_ \_ /55  
Includes the mounting plate and the metric mounting screws to mount the two Metric version cylinders back to back.



# Series 90000 Compact Actuators

## DC/91000/N2, DM/91000/N2

## DC/93000/N2, DM/93000/N2

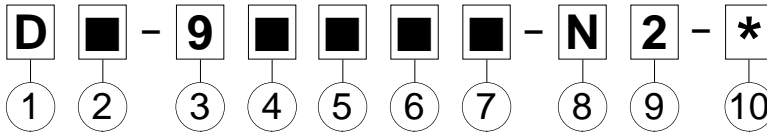


NOTE:  $\varnothing 5/8"$  and  $3/4"$  ( $\varnothing 16$  and  $20$  mm) have only two side dovetails

\* Port thread with inserted filter, do not obstruct  
 \*\* Only the 4 front holes are tapped on stroke lengths of less than:  
 $\varnothing 1"$ ,  $1 1/4"$ ,  $1 1/2"$  and  $2 1/2"$  ( $\varnothing 25$ ,  $32$ ,  $40$  and  $63$  mm) .197" (5 mm)  
 $\varnothing 2"$  ( $\varnothing 50$  mm) .394" (10 mm)

Ø Bore	inch (mm) 5/8" (16)	inch (mm) 3/4" (20)	inch (mm) 1" (25)	inch (mm) 1 1/4" (32)	inch (mm) 1 1/2" (40)	inch (mm) 2" (50)	inch (mm) 2 1/2" (63)
Inch Cylinder	RC/91016/N2	RC/91020/N2	RC/91025/N2	RC/91030/N2	RC/91040/N2	RC/91050/N2	RC/91063/N2
Metric Cylinder	RM/91016/N2	RM/91020/N2	RM/91025/N2	RM/91030/N2	RM/91040/N2	RM/91050/N2	RM/91063/N2
Inch Cylinder	RC/93016/N2	RC/93020/N2	RC/93025/N2	RC/93030/N2	RC/93040/N2	RC/93050/N2	RC/93063/N2
Metric Cylinder	RM/93016/N2	RM/93020/N2	RM/93025/N2	RM/93030/N2	RM/93040/N2	RM/93050/N2	RM/93063/N2
AF	.28 (7)	.31 (8)	.35 (9)	.47 (12)	.47 (12)	.55 (14)	.63 (16)
BG	.35 (9)	.35 (9)	.47 (12)	.47 (12)	.63 (16)	.63 (16)	.79 (20)
Ø D	1.44 (36.5)	1.63 (41.5)	1.89 (48)	2.28 (58)	2.81 (71.5)	3.19 (81)	4.09 (104)
□ E	1.10 (28)	1.26 (32)	1.46 (37)	1.77 (45)	2.17 (55)	2.48 (63)	3.15 (80)
EE	10-32 (M 5)	10-32 (M 5)	10-32 (M 5)	1/8NPT (G 1/8)	1/8NPT (G 1/8)	1/8NPT (G 1/8)	1/4NPT (G 1/4)
Ø FB	.13 (3.3)	.13 (3.3)	.17 (4.2)	.17 (4.2)	.27 (6.8)	.27 (6.8)	.33 (8.5)
FF	.39 (10)	.39 (10)	.39 (10)	.71 (18)	.71 (18)	.71 (18)	.87 (22)
GB	.14 (3.5)	.14 (3.5)	.18 (4.5)	.18 (4.5)	.26 (6.5)	.26 (6.5)	.33 (8.5)
Ø JB	.24 (6)	.24 (6)	.30 (7.5)	.30 (7.5)	.41 (10.5)	.41 (10.5)	.41 (13.5)
KF	8-32 (M 4)	10-32 (M 5)	1/4-28 (M 6)	5/16-24 (M 8)	5/16-24 (M 8)	3/8-24 (M 10)	7/16-20 (M 12)
Ø MM	.31 (8)	.39 (10)	.47 (12)	.63 (16)	.63 (16)	.79 (20)	.79 (20)
MX 1	.24 (6)	.31 (8)	.39 (10)	.51 (13)	.51 (13)	.63 (16)	.63 (16)
PF	.67 (17)	.77 (19.5)	.87 (22)	1.08 (27.5)	1.24 (31.5)	1.46 (37)	1.89 (48)
PL	.30 (7.5)	.30 (7.5)	.31 (8)	.35 (9)	.39 (10)	.41 (10.5)	.51 (13)
RT	8-32 (M 4)	8-32 (M 4)	10-32 (M 5)	10-32 (M 5)	5/16-24 (M 8)	5/16-24 (M 8)	3/8-24 (M 10)
TG 1	.79 (20)	.91 (23)	1.06 (27)	1.30 (33)	1.61 (41)	1.89 (48)	2.40 (61)
TG 2	.79 (20)	.91 (23)	1.06 (27)	1.30 (33)	1.61 (41)	1.89 (48)	2.40 (61)
V strokes 0 to 1" (25)	.59 (15)	.67 (17)	.71 (18)	.75 (19)	.79 (20)	1.18 (30)	1.18 (30)
strokes > 1" (25)	-	1.34 (34)	1.42 (36)	1.50 (38)	1.57 (40)	2.36 (60)	2.36 (60)
WH	.22 (5.5)	.24 (6)	.26 (6.5)	.26 (6.5)	.26 (6.5)	.31 (8)	.31 (8)
ZH 1	1.36 (34.5)	1.42 (36)	1.52 (38.5)	1.54 (39)	1.63 (41.5)	1.77 (45)	2.07 (52.5)
ZJ 1	1.57 (40)	1.65 (42)	1.77 (45)	1.79 (45.5)	1.89 (48)	2.09 (53)	2.38 (60.5)

### Cylinder Order Information



Piston Rod Material	
D	Hand Chrome Plated Stainless Steel
R	Stainless Steel

Inch Cylinder	
C	NPT Ports, Inch Threads, Stroke in Inches
Metric Cylinder	
M	ISO G Ports, Metric Threads, Stroke in mm

9 Series 90000

Cylinder Version	
1	Single Acting Spring Return
3	Single Acting Spring Extend

Stroke Length	
In Inches for Inch Cylinders	
In (mm) for Metric Cylinders	

Cylinder Options	
N2	Internal Non-rotating Piston Rod with Magnetic Piston

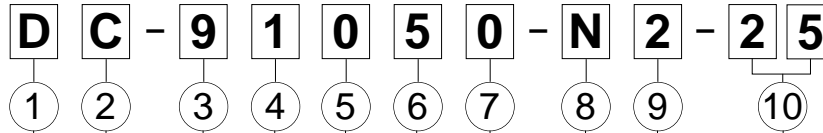
Piston Diameters Nominal Inch (mm)			
012	N/A	032	$\varnothing 1 1/4"$ 32 mm
016	$\varnothing 5/8"$ 16 mm	040	$\varnothing 1 1/2"$ 40 mm
020	$\varnothing 3/4"$ 20 mm	050	$\varnothing 2"$ 50 mm
025	$\varnothing 1"$ 25 mm	063	$\varnothing 2 1/2"$ 63 mm

### Maximum Stroke for 91000/N2 & 93000/N2 Single Acting Non-rotating Piston Rods

DC/91000/N2 spring return inch cylinder	Nominal Diameter	Maximum Stroke	DM/91000/N2 spring return metric cylinder	Diameter	Maximum Stroke
	$\varnothing 5/8"$ $\varnothing 3/4"$ , 1", 1 1/4", 1 1/2", 2", 2 1/2"	3/8" 2"		$\varnothing 16$ mm $\varnothing 20, 25, 32, 40, 50, 63$ mm	10 mm 50 mm



Cylinder Order Information



Piston Rod Material	
D	Chrome Plated Stainless
R	Stainless Steel

Inch Cylinder	
C	NPT Ports, Inch Threads, Stroke in Inches
Metric Cylinder	
M	ISO (Imperial) Metric Ports, Metric Threads, Stroke in mm

9 Series 90000

Cylinder Version	
1	Single Acting Spring Return
3	Single Acting Spring Extend

Stroke Length	
In Inches for Inch Cylinder	
In (mm) for Metric Cylinder	

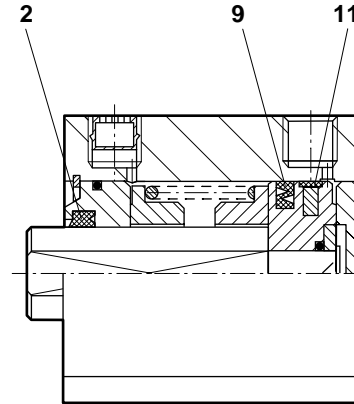
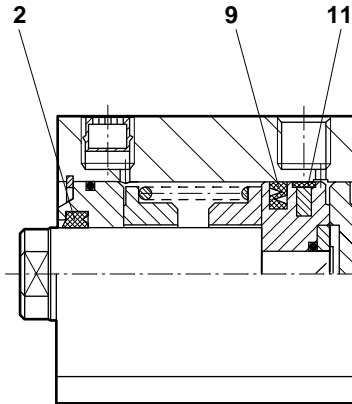
Cylinder Options	
M	Magnetic Piston
N2	Internal Non-rotating Piston Rod with Magnetic Piston

Piston Diameters Nominal Inch (mm)			
012	Ø 1/2" 12 mm	032	Ø 1 1/4" 32 mm
016	Ø 5/8" 16 mm	040	Ø 1 1/2" 40 mm
020	Ø 3/4" 20 mm	050	Ø 2" 50 mm
025	Ø 1" 25 mm	063	Ø 2 1/2" 63 mm

NOTE: Ø12 not available in /N2/

**EXAMPLE:** Stainless steel – metric threads – Series 90000 – single acting – spring return – 50 mm diameter – internal non-rotating piston rod with magnetic piston – 25 mm stroke length.

Spares Kits



DC/91000/M, DM/91000/M, DC/93000/M, DM/93000/M

RC/91000/N2, RM/91000/N2, RC/93000/N2, RM/93000/N2

Model	Spares kits Ø 2" & 2 1/2" (Ø 50 & 63 mm)	Comprising		
		Item	Description	Quantity
DC/91050/M, DM/91050/M, DC/93050/M, DM/93050/M	QM/92050/00	2	Piston rod seal	1
RC/91050/N2, RM/91050/N2, RC/93050/N2, RM/93050/N2	QM/92050/N2/00	9	Piston seal	1
DC/91063/M, DM/91063/M, DC/93063/M, DM/93063/M	QM/92063/00	11	Wear ring	1
RC/91063/N2, RM/91063/N2, RC/93063/N2, RM/93063/N2	QM/92063/N2/00		Grease	1

Note: Please specify the cylinder number when ordering spare parts. Spares are not available for Ø 1/2" to 1-1/2" (Ø 12 to 40 mm) models.

- Compact, low profile reed switches
- M/40, M/40/P, and TM/40 feature LED indicators
- Simple, reliable switching for fast response times
- TM/40 high temperature model
- M/40/P features a plug-in cable connection

### Specifications

#### Form:

M/40 M/40/P – Normally open with LED  
M/40/C – Normally open/normally closed  
TM/40 – Normally open

#### Switching Voltage:

M/40, TM/40 – 240 VAC or 170 VDC maximum  
M/40/C – 10 - 110 VAC or 10 - 175 VDC maximum  
M/40/P – 60 VAC and 75 VDC maximum

#### Switching Current:

M/40, M/40/P – 180 mA (temperature dependent), see ACT-8-21.  
M/40/C – 250 mA  
TM/40 – 180 mA

#### Contact Rating:

M/40, TM/40, M/40/P – 10 VA  
M/40/C – 5 VA

#### Response Time:

M/40, M/40/C, M/40/P – 1.8 ms  
TM/40 – 1.0 ms

#### Operating Temperature:

-4° to 176°F (-20° to 80°C)  
TM/40 – 32° to 302°F (0° to 150°C)

#### Protection Rating:

I.P.66

#### Vibration Resistance:

M/40, TM/40, M/40/P – 10 to 2000Hz 0.08 lbs. (35g)  
(Resonant Frequency = 3 kHz)  
M/40/C – 10 to 2000Hz 0.07 lbs. (30g)  
(Resonant Frequency = 13 kHz)

#### Cable Length:

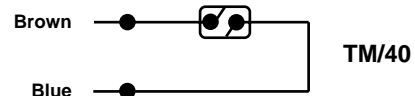
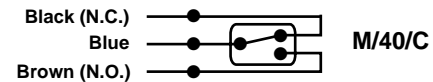
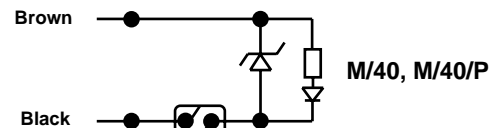
M/40 – 6.5' (2m), 16.25' (5m) of P.V.C. covered two core cable  
M/40/C – 6.5' (2m) of P.V.C. covered three core cable  
TM/40 – 6.5' (2m) of silicon rubber covered two core cable  
M/40/P – 16.25' (5m) of P.V.C. or Polyurethane covered three core cable with plug-in connection

### Materials

M/40, M/40/C, M/40/P – Nylon 66 body  
TM/40 – 30% Glass filled Nylon 66 body

**NOTE:** When used to switch inductive loads such as solenoids, relays etc., arcing can occur across the switch contacts depending on the current and voltage involved. This arcing can be eliminated on d.c. loads by connecting a suitably rated diode across the load or switch.

On a.c. loads, arcing is more difficult to eliminate, but the contact life can be greatly extended by reducing the peak voltages by connecting a suitable non-linear resistor (V.D.R.) across the load or switch.



### Alternative Models

M/41 Solid state model with hardwired cable – see ACT-8-22

M/42 Solid state model with hardwired cable – see ACT-8-22

M/42/P Solid state model with plug-in cable – see page ACT-8-22



## General Information

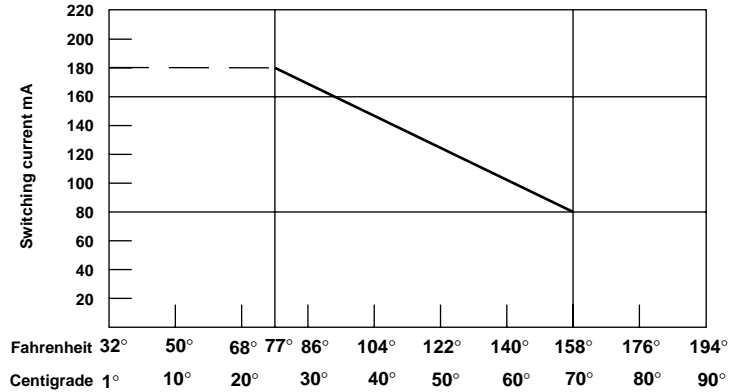
Model	Switch type	Cable length
M/40	LED, Normally open, hardwired	6.5' (2), 16.25' (5)
M/40/C	Normally open/Normally closed - changeover, hardwired	6.5' (2)
TM/40	Normally open, high temperature, hardwired	6.5' (2)
M/40/P	Normally open with LED, plug-in cable	16.25' (5)

**NOTE:** Switches are ordered separately.

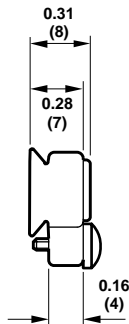
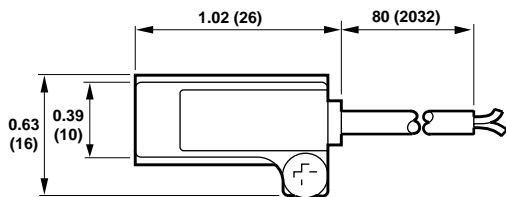
### Effect of High Temperatures – M/40 and M/40/P with LED

When using a Reed Switch that incorporates an LED, the maximum switching current should be reduced in direct proportion to the rise in temperature above 77°F (25°C).

At maximum temperature of 158°F (70°C) the maximum switching current must be derated to 80mA.



### M/40, M/40/C, TM/40 Magnetically Operated Switches, with hardwired cable



Switches are mounted in the integral slot of the extruded tube.

Polarity:

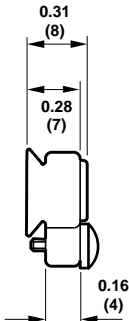
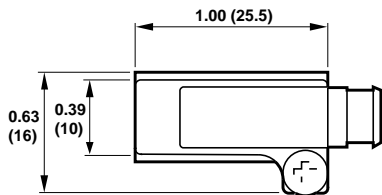
- Brown +
- Blue -

Polarity is important on the M/40.

Normally open/normally closed:

- Brown common
- Black normally closed
- Blue normally open

### M/40/P Magnetically Operated Switches, with plug-in cable\*



Switches are mounted in the integral slot of the extruded tube.

Polarity:

- Brown +
- Black -

Polarity is important.

Cable No.	Connector type	Outer cover
M/P34595/5	Straight	Polyurethane
M/P34596/5	Angled 90°	Polyurethane
M/P34614/5	Straight	P.V.C.
M/P34615/5	Angled 90°	P.V.C.

\*Cable must be ordered separately.

- Compact, low profile solid state switches
- LED indicator is standard
- Simple, reliable switching with fast response times
- Particularly suited for use where high levels of vibration are present
- M/42/P features a plug-in cable connection
- CE – Marking



### Specifications

#### Form:

M/41 – Solid state with LED (NPN, sinking, grounded emitter output)

M/42, M/42/P – Solid state with LED (PNP, sourcing, open collector output)

#### Switching Voltage:

10V to 30 VDC only

M/42/P – 10V to 30 VDC only

#### Switching Current:

M/41, M/42, M/42/P – 200 mA

#### Response Time:

0.5 ms

#### Operating Temperature:

-4° to 158°F (-20° to 70°C)

#### Protection Rating:

I.P.66

#### Cable Length:

M/41, M/42 – 6.5' (2m) of P.V.C. covered three core cable

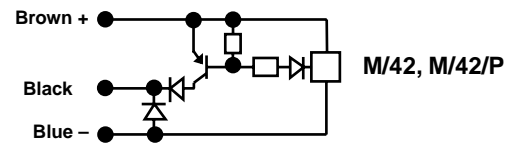
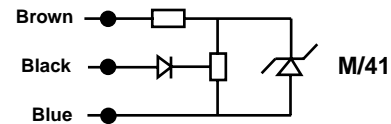
M/42/P – 16.25' (5m) of P.V.C. or Polyurethane covered three core cable with plug-in connection

#### Switch Protection:

Diode protection must be used with inductive loads

### Materials

Nylon 66 body



### Alternative Models

M/40 Hardwired cable model – see ACT-8-20

M/40/C Normally open/normally closed model with integral cable – see ACT-8-20

M/40/P Plug-in cable model – see ACT-8-20

TM/40 High temperature model – see ACT-8-20

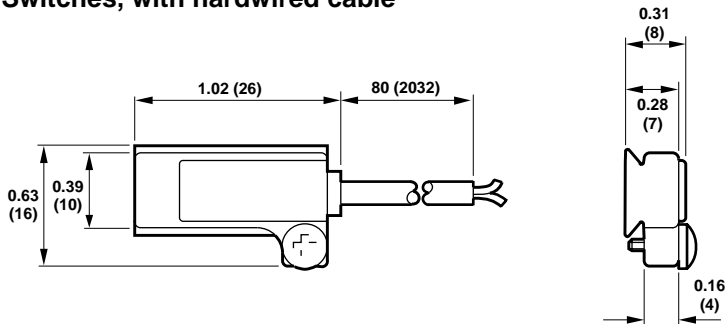


General Information

Model	Switch type	Cable length
M/41	Solid State with LED, sinking, NPN, hardwired cable	6.5' (2)
M/42	Solid State with LED, sourcing, PNP, hardwired cable	6.5' (2)
M/42/P	Solid State with LED, sourcing, PNP, plug-in cable	16.25' (5)

NOTE: Switches are ordered separately.

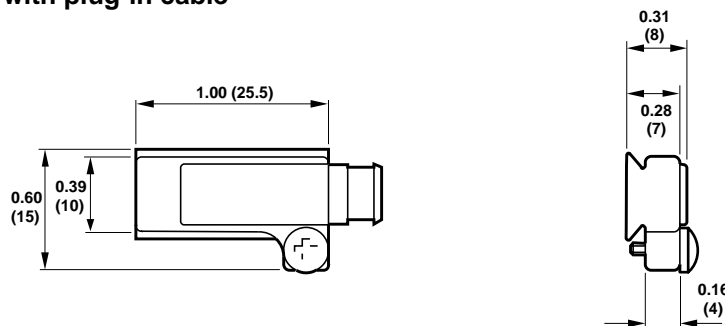
M/41, M/42 Magnetically Operated Switches, with hardwired cable



Switches are mounted in the integral slot of the extruded tube.

Polarity:  
 Brown +  
 Blue -  
 Black Output  
 Polarity is important.

M/42/P Magnetically Operated Switches, with plug-in cable\*



Switches are mounted in the integral slot of the extruded tube.

Polarity:  
 Brown +  
 Blue -  
 Black Output  
 Polarity is important.

\*Cable must be ordered separately.

Cable No.	Connector type	Outer cover
M/P34595/5	Straight	Polyurethane
M/P34596/5	Angled 90°	Polyurethane
M/P34614/5	Straight	P.V.C.
M/P34615/5	Angled 90°	P.V.C.



# Norgren Compact Interchangeable Pneumatic Actuator

Single Acting Actuator .....ACT-9-1  
Double Acting Actuator.....ACT-9-8



**Single Acting Compact  
Interchangeable Pneumatic Actuator**



**Double Acting Compact  
Interchangeable Pneumatic Actuator**

**Light weight**

**Compact design, which is considerably shorter than ISO/VDMA or NFPA equivalent.**

**Low friction characteristics for high speed operation**

**Hard anodized body for corrosion protection and longer life**

**Duralon<sup>®</sup> rod bearing for reduced wear**

**Chrome plated stainless steel piston rods**


**Technical data**

Medium:

Compressed air, filtered, lubricated or non-lubricated

Operation:

DM/95000 BSP parallel ports, single acting, non-cushioned, metric ports, spring return

DM/96000 BSP parallel ports, single acting, non-cushioned, metric ports, spring extend

DC/95000 NPT ports, single acting, non-cushioned, metric ports, spring return

DC/96000 NPT ports, single acting, non-cushioned, metric ports, spring extend

Operating pressure:

14,5 to 145 psig (1 to 10 bar)

Operating temperature:

-25°F to +250°F (-32°C to +121°C)

Consult our Technical Service for use below 35°F (+2°C)

Cylinder diameters:

12, 16, 20, 25, 32, 40, 50 mm

Strokes:

5 mm                    Ø 12 to 40 mm

10 mm                  Ø 12 to 50 mm

20 mm                  Ø 50 mm

See table on page N 1.4.099.02

Non-standard strokes available on request

**Materials**

Barrel: hard anodized aluminum

End caps: hard anodized aluminum alloy

Piston rod: stainless steel, hard chrome plated

Elastomers: Buna N

**Ordering information**

To order a basic 25 mm bore cylinder, spring return, with a 10 mm stroke, female thread, BSP parallel ports, metric thread, quote: **DM/95025/X/10**.

To order a basic 40 mm bore cylinder, spring extend, with a 5 mm stroke, female thread, NPT ports, inch thread, quote: **DC/96040/X/5**.

Mountings are included. See Options selector table on page ACT-9-8.

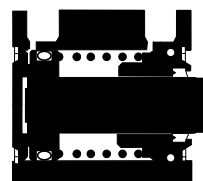
**Accessories**

see page

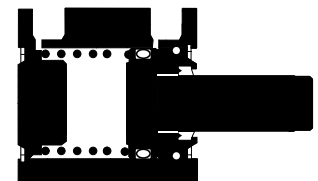
Piston rod clevis mounting                    ACT-9-8

Piston rod eye mounting                        ACT-9-8

Spring return



Spring extend





### Cylinder variants

Symbol	Model	Description
	D*/95000/X	Standard cylinders, single acting, spring return, female rod thread, rod end
	D*/95000	Standard cylinders, single acting, spring return, male rod thread, rod end
	TD*/95000	Heat resistant (Viton®) seals, +400°F (+204°C) max., metric ports
	D*/96000/X	Standard cylinders, single acting, spring extend, female rod thread, rod end
	D*/96000	Standard cylinders, single acting, spring extend, male rod thread, rod end
	TD*/96000	Heat resistant (Viton®) seals, +400°F (+204°C) max., metric ports

### Options selector

★ D ★ / 9 ★ 0 ★ ★ / ★ / ★ / ★

Temperature	Substitute
High temperature (Viton® seals)	T
Ports	Substitute
NPT Ports (inch threads, stroke in mm)	C
BSP parallel (metric ports and threads, stroke in mm)	M
Operation	Substitute
Spring return	5
Spring extend	6
Cylinder diameters (mm)	Substitute
12	012
16	016
20	020
25	025
32	032
40	040
50	050

Mounting	Substitute
Without	None
Foot	C
Flange rod end	G
Flange cap end	B
ISO Flange rod end	IG
ISO Flange cap end	IB
Rear clevis	D
Tapped holes - both ends	A

Stroke (mm)
10 mm max. (Ø 12 to 40 mm)
20 mm max. (Ø 50 mm)

Variants (non-magnetic piston)	Substitute
Standard, female rod thread, rod end	X
Male rod thread, rod end	None

For combinations of alternative cylinders consult our Technical Service.

### Strokes (mm)

Ø	5	10	20
12	●	●	-
16	●	●	-
20	●	●	-
25	●	●	-
32	●	●	-
40	●	●	-
50	-	●	●



Theoretical forces • Air consumption

Ø	D*/95000 Theoretical forces lb (N) at 87 psi (6 bar)		D*/96000 Theoretical forces lb (N) at 87 psi (6 bar)		Air consumption in <sup>3</sup> /in. stroke (l/cm stroke) at 87 psi (6 bar)			
	Outstroke	F1	Instroke	F1	Outstroke	Instroke		
12	11.7 (52)	1.58 (7)	8.9 (40)	1.58 (7)	1.24 (0.008)	0.93 (0.006)		
16	23.7 (105)	2.81 (12.5)	15.4 (61)	2.81 (12.5)	2.17 (0.014)	1.71 (0.011)		
20	39.1 (174)	3.26 (14.5)	26.0 (116)	3.26 (14.5)	3.41 (0.022)	2.64 (0.017)		
25	61.5 (274)	4.50 (20)	44.7 (199)	4.50 (20)	5.43 (0.035)	4.19 (0.027)		
32	103.5 (460)	7.20 (32)	75.2 (335)	7.20 (32)	8.68 (0.056)	6.51 (0.042)		
40	162.9 (725)	9.90 (44)	136.1 (605)	9.90 (44)	13.64 (0.088)	11.47 (0.074)		
50	252.4 (1123)	12.71 (56.5)	204.0 (907)	12.71 (56.5)	21.39 (0.138)	17.98 (0.116)		

F1 = Return force of spring lb (N)

Cylinder weights

Ø	Stroke (mm)			Additional weight for male thread
	5	10	20	
12	0.19 (0.09)	0.23 (0.11)	- (-)	0.004 (0.002)
16	0.24 (0.11)	0.28 (0.13)	- (-)	0.007 (0.003)
20	0.30 (0.14)	0.34 (0.16)	- (-)	0.015 (0.007)
25	0.44 (0.20)	0.51 (0.23)	- (-)	0.04 (0.017)
32	0.73 (0.33)	0.84 (0.38)	- (-)	0.09 (0.040)
40	1.10 (0.50)	1.23 (0.56)	- (-)	0.09 (0.040)
50	- (-)	1.46 (0.66)	1.82 (0.82)	0.18 (0.080)

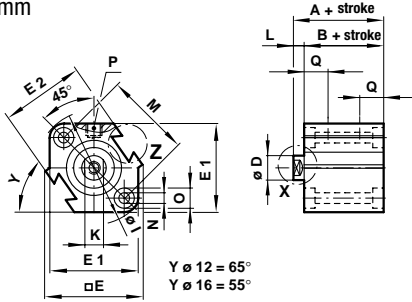
Weights in lb (kg)

Please note: estimated weights for single rod models

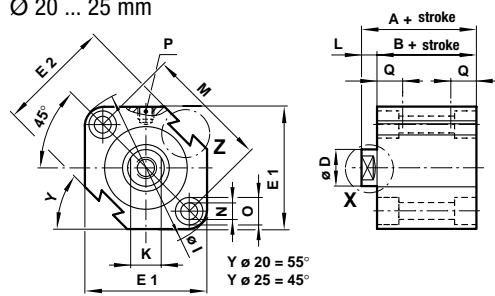


Basic dimensions –D\*/95000/X, D\*/96000/X

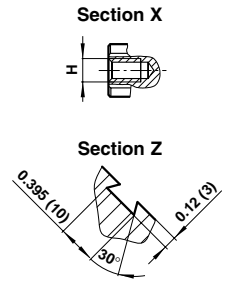
Ø 12 ... 16 mm



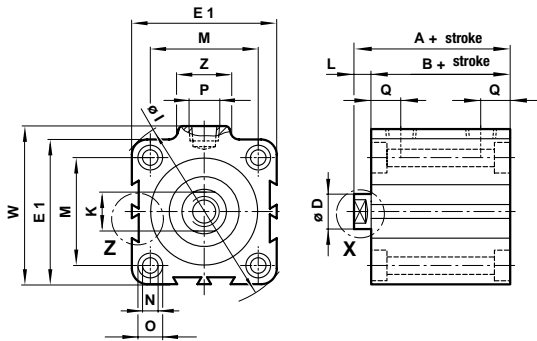
Ø 20 ... 25 mm



Ø 12 ... 25 mm



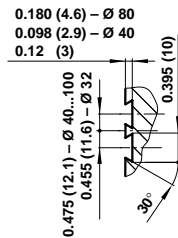
Ø 32 ... 50 mm



Section X

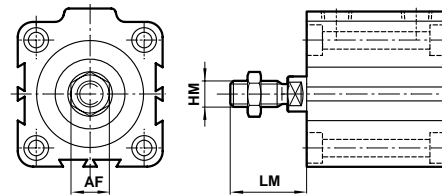


Section Z



Cylinder with rod end male thread  
D\*/95000, D\*/96000

Ø 12 ... 50 mm



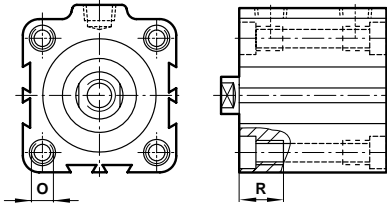
Ø	Stroke range	A	AF	B	Ø D	E	E1	E2		
12	5 ... 10	0.81 (20.5)	0.34 (8)	0.67 (17.0)	0.236 (6)	1.09 (27.7)	0.98 (25)	0.90 (23)		
16	5 ... 10	0.87 (22.0)	0.34 (10)	0.73 (18.5)	0.315 (8)	1.25 (31.7)	1.14 (29)	1.07 (27.2)		
20	5 ... 10	0.94 (24.0)	0.38 (13)	0.77 (19.5)	0.394 (10)	- (-)	1.42 (36)	1.23 (31.2)		
25	5 ... 10	1.08 (27.5)	0.43 (17)	0.86 (22.5)	0.472 (12)	- (-)	1.57 (40)	1.45 (36.9)		
32	5 ... 10	1.18 (30.0)	0.50 (22)	0.91 (23.0)	0.630 (16)	- (-)	1.75 (44.5)	- (-)		
40	5 ... 10	1.44 (36.5)	0.56 (22)	1.16 (29.5)	0.630 (16)	- (-)	2.05 (52)	- (-)		
50	10 ... 20	1.52 (38.5)	0.75 (27)	1.20 (30.5)	0.787 (20)	- (-)	2.51 (63.7)	- (-)		
Ø	Stroke range	H	HM	Ø I	K	L	LM	M	Ø N	
12	5 ... 10	#8-32 x 0.21 (M3 x 0.5-5 deep)	#8-32 x 0.31 (M5 x 0.8-9 deep)	1.24 (31.5)	0.20 (5)	0.14 (3.5)	0.45 (14)	0.87 (22)	0.14 (3.5)	
16	5 ... 10	#8-32 x 0.21 (M4 x 0.7-5 deep)	#8-32 x 0.31 (M6 x 1.0-10 deep)	1.46 (37.1)	0.24 (6)	0.14 (3.5)	0.45 (15.5)	1.10 (28)	0.14 (3.5)	
20	5 ... 10	#10-32 x 0.28 (M5 x 0.8-7 deep)	#10-32 x 0.31 (M8 x 1.25-12 deep)	1.85 (47)	0.31 (8)	0.18 (4.5)	0.49 (18.5)	1.42 (36)	0.22 (5.5)	
25	5 ... 10	1/4-28 x 0.39 (M6 x 1.0-10 deep)	1/4-28 x 0.37 (M10 x 1.25-15 deep)	2.02 (51.3)	0.39 (10)	0.20 (5)	0.57 (22.5)	1.57 (40)	0.22 (5.5)	
32	5 ... 10	5/16-24 x 0.50 (M8 x 1.25-12 deep)	5/16-24 x 0.50 (M14 x 1.5-20.5 deep)	2.32 (58.9)	0.55 (14)	0.28 (7)	0.78 (28.5)	1.34 (34)	0.22 (5.5)	
40	5 ... 10	3/8-24 x 0.50 (M8 x 1.25-12 deep)	3/8-24 x 0.63 (M14 x 1.5-20.5 deep)	2.72 (69)	0.55 (14)	0.28 (7)	0.91 (28.5)	1.57 (40)	0.22 (5.5)	
50	10 ... 20	1/2-20 x 0.50 (M10 x 1.5-12 deep)	1/2-20 x 0.77 (M18 x 1.5-26 deep)	3.34 (84.9)	0.67 (17)	0.31 (8)	1.08 (33.5)	1.97 (50)	0.26 (6.6)	
Ø	Stroke range	Ø O	P	Q	W	Z	lb (kg) at 0 mm		lb (kg) per 5 mm	
12	5 ... 10	0.26 x 0.14 (6.5 x 3.5 deep)	M5 x 0.8	0.28 (7.0)	- (-)	- (-)	0.15 (0.07)	0.04 (0.02)		
16	5 ... 10	0.26 x 0.14 (6.5 x 3.5 deep)	M5 x 0.8	0.31 (7.8)	- (-)	- (-)	0.20 (0.09)	0.04 (0.02)		
20	5 ... 10	0.35 x 0.28 (9.0 x 7.0 deep)	M5 x 0.8	0.32 (8.1)	- (-)	- (-)	0.26 (0.12)	0.04 (0.02)		
25	5 ... 10	0.35 x 0.28 (9.0 x 7.0 deep)	M5 x 0.8	0.33 (8.4)	- (-)	- (-)	0.37 (0.17)	0.07 (0.03)		
32	5 ... 10	0.35 x 0.28 (9.0 x 7.0 deep)	M5 x 0.8	0.34 (8.7)	1.94 (49.3)	0.84 (21.4)	0.62 (0.28)	0.11 (0.05)		
40	5 ... 10	0.35 x 0.28 (9.0 x 7.0 deep)	1/8	0.36 (9.2)	2.24 (57.0)	0.84 (21.4)	0.97 (0.44)	0.13 (0.06)		
50	10 ... 20	0.43 x 0.31 (11.0 x 8.0 deep)	1/4	0.41 (10.5)	2.78 (70.6)	1.04 (26.5)	1.10 (0.50)	0.18 (0.08)		

Dimensions in inches (mm)



Mountings

Tapped hole mounting both ends – A



Ø	O	R
12	#8-32 (M4 x 0.7)	0.43 (11)
16	#8-32 (M4 x 0.7)	0.43 (11)
16	1/4-20 (M6 x 1.0)	0.67 (17)
25	1/4-20 (M6 x 1.0)	0.67 (17)
32	1/4-20 (M6 x 1.0)	0.67 (17)
40	1/4-20 (M6 x 1.0)	0.75 (19)
50	5/16-18 (M8 x 1.25)	0.75 (19)

Dimensions in inches (mm)

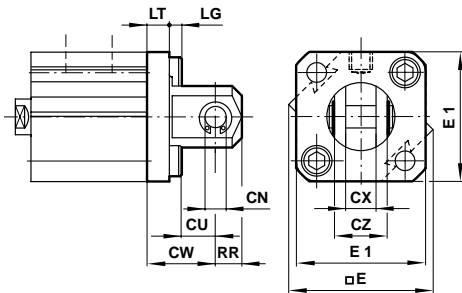
Note: Inch threads for 'C' port code.

Metric threads for 'M' port codes.

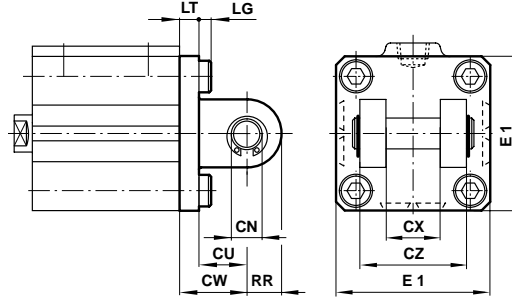
Metric for foot, flange, or clevis mount.

Rear clevis mounting – D

Ø 12 ... 25 mm



Ø 32 ... 50 mm



Ø	CN	CW	CU	CX	CZ	LT	LG	RR	E1	□ E	lb (kg)
12	0.187 (5)	0.55 (14)	0.28 (7)	0.21 (5.3)	0.39 (10)	0.2 (5)	0.11 (2.8)	0.24 (6.0)	0.98 (25)	1.09 (27.7)	0.05 (0.02)
16	0.187 (5)	0.59 (15)	0.39 (10)	0.27 (6.8)	0.47 (12)	0.2 (5)	0.11 (2.8)	0.24 (6.0)	1.14 (29)	1.25 (31.7)	0.05 (0.02)
20	0.312 (8)	0.71 (18)	0.47 (12)	0.33 (8.3)	0.63 (16)	0.2 (5)	0.16 (4.0)	0.35 (9.0)	1.42 (36)	– (–)	0.10 (0.05)
25	0.375 (10)	0.79 (20)	0.55 (14)	0.41 (10.3)	0.79 (20)	0.2 (5)	0.16 (4.0)	0.39 (10)	1.57 (40)	– (–)	0.15 (0.07)
32	0.375 (10)	0.79 (20)	0.55 (14)	0.72 (18.3)	1.42 (36)	0.24 (6)	0.16 (4.0)	0.39 (10)	1.75 (44.5)	– (–)	0.20 (0.09)
40	0.375 (10)	0.87 (22)	0.55 (14)	0.72 (18.3)	1.42 (36)	0.31 (8)	0.16 (4.0)	0.39 (10)	2.05 (52)	– (–)	0.29 (0.13)
50	0.5 (14)	1.1 (28)	0.79 (20)	0.88 (22.3)	1.73 (44)	0.31 (8)	0.2 (5.0)	0.55 (14)	2.51 (63.7)	– (–)	0.46 (0.22)

Dimensions in inches (mm)

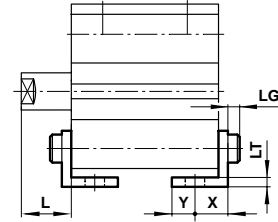
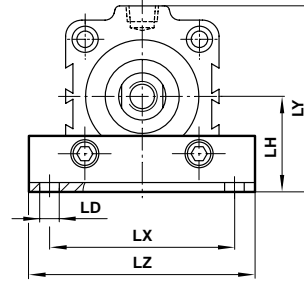
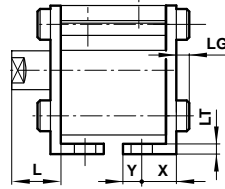
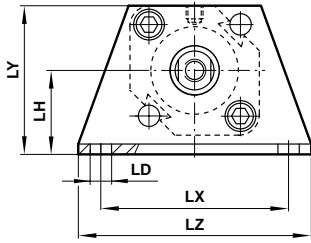
For basic cylinder dimensions, see page N 1.4.099.04



**Foot mounting – C**

Ø 12 ... 25 mm

Ø 32 ... 50 mm



Ø	LD	LH	LX	LY	LZ	L	LT	X	Y	LG	lb (kg)
12	0.18 (4.5)	0.67 (17)	1.39 (34)	1.16 (29.5)	1.73 (44)	0.53 (13.5)	0.08 (2)	0.31 (8)	0.18 (4.5)	0.11 (2.8)	0.04 (0.02)
16	0.18 (4.5)	0.75 (19)	1.50 (38)	1.32 (33.5)	1.89 (48)	0.53 (13.5)	0.08 (2)	0.31 (8)	0.20 (5)	0.11 (2.8)	0.04 (0.02)
20	0.26 (6.5)	0.94 (24)	1.89 (48)	1.65 (42)	2.44 (62)	0.57 (14.5)	0.13 (3.2)	0.36 (9.2)	0.23 (5.8)	0.16 (4)	0.04 (0.02)
25	0.26 (6.5)	1.02 (26)	2.05 (52)	1.81 (46)	2.60 (66)	0.59 (15)	0.13 (3.2)	0.42 (10.7)	0.23 (5.8)	0.16 (4)	0.09 (0.04)
32	0.26 (6.5)	1.18 (30)	2.24 (57)	2.24 (57)	2.80 (71)	0.67 (17)	0.13 (3.2)	0.44 (11.2)	0.23 (5.8)	0.16 (4)	0.09 (0.04)
40	0.26 (6.5)	1.30 (33)	2.52 (64)	2.52 (64)	3.07 (78)	0.67 (17)	0.13 (3.2)	0.44 (11.2)	0.28 (7)	0.16 (4)	0.22 (0.10)
50	0.35 (9)	1.54 (39)	3.11 (79)	3.07 (78)	3.74 (95)	0.71 (18)	0.13 (3.2)	0.58 (14.7)	0.31 (8)	0.20 (5)	0.24 (0.11)

Dimensions in inches (mm)

For basic cylinder dimensions, see page N 1.4.099.04

**Flange rod end mounting – G**

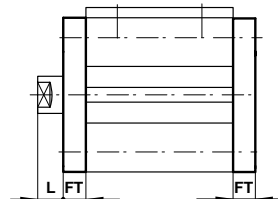
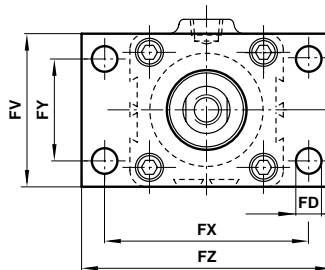
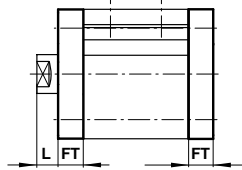
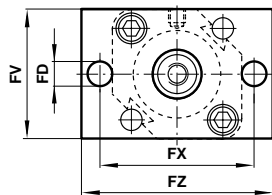
**Flange cap end mounting – B**

**ISO Flange rod end mounting – IG**

**ISO Flange cap end mounting – IB**

Ø 12 ... 25 mm

Ø 32 ... 50 mm



**ISO**

**Non-ISO**

Ø	FT	L	FD	FY	FX	FV	FZ	FD	FY	FX	FV	FZ	lb (kg)
12	0.22 (5.5)	0.31 (8.0)	0.22 (5.5)	- (-)	1.57 (40)	0.98 (25)	1.97 (50)	0.18 (4.5)	- (-)	1.77 (45)	0.98 (25)	2.17 (55)	0.04 (0.02)
16	0.22 (5.5)	0.31 (8.0)	0.22 (5.5)	- (-)	1.57 (40)	1.18 (30)	1.97 (50)	0.18 (4.5)	- (-)	1.77 (45)	1.18 (30)	2.17 (55)	0.04 (0.02)
20	0.31 (8)	0.26 (6.5)	0.26 (6.6)	- (-)	1.97 (50)	1.54 (39)	2.44 (62)	0.26 (6.5)	- (-)	1.89 (48)	1.54 (39)	2.36 (60)	0.04 (0.02)
25	0.31 (8)	0.28 (7.0)	0.26 (6.6)	- (-)	1.97 (50)	1.65 (42)	2.44 (62)	0.26 (6.5)	- (-)	2.05 (52)	1.65 (42)	2.52 (64)	0.09 (0.04)
32	0.31 (8)	0.35 (9.0)	0.28 (7)	1.26 (32)	2.52 (64)	1.89 (48)	2.99 (76)	0.22 (5.5)	1.34 (34)	2.2 (56)	1.89 (48)	2.56 (65)	0.13 (0.06)
40	0.31 (8)	0.35 (9.0)	0.35 (9)	1.42 (36)	2.83 (72)	2.13 (54)	3.47 (88)	0.22 (5.5)	1.57 (40)	2.44 (62)	2.13 (54)	2.83 (72)	0.33 (0.15)
50	0.35 (9)	0.35 (9.0)	0.35 (9)	1.77 (45)	3.54 (90)	2.64 (67)	4.17 (106)	0.26 (6.5)	1.97 (50)	2.99 (76)	2.64 (67)	3.5 (89)	0.37 (0.16)

Dimensions in inches (mm)

For basic cylinder dimensions, see page N 1.4.099.04



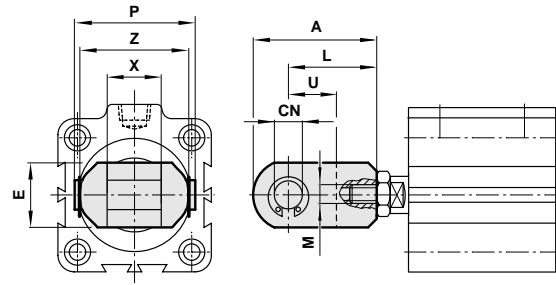
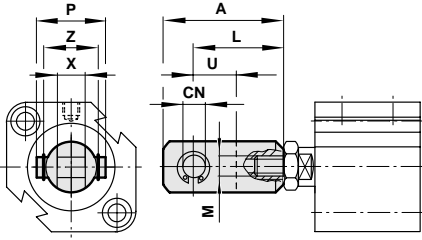
# Series 95000 Compact Actuators

## Accessories

### Piston rod clevis

Ø 12 ... 25 mm

Ø 32 ... 50 mm



Ø	Model	CN	M	L	U	X	Z	P	E	A	lb (kg)	
Inch	Inch											
	Metric											
12	QC/99012/25	QM/99012/25	0.187 (5)	#8-32 (M5 x 0.8 deep)	0.63 (16)	0.27 (7)	0.21 (5.3)	0.39 (10)	0.55 (14)	0.39 (10)	0.85 (21.5)	0.02 (0.01)
16	QC/99016/25	QM/99016/25	0.187 (5)	#8-32 (M6 x 1.0 deep)	0.83 (21)	0.39 (10)	0.26 (6.6)	0.47 (12)	0.63 (16)	0.47 (12)	1.10 (28)	0.02 (0.01)
20	QC/99020/25	QM/99020/25	0.312 (8)	#10-32 (M8 x 1.25 deep)	0.98 (25)	0.45 (11.5)	0.33 (8.3)	0.63 (16)	0.83 (21)	0.63 (16)	1.34 (34)	0.02 (0.01)
25	QC/99025/25	QM/99025/25	0.375 (10)	1/4-28 (M10 x 1.25 deep)	1.18 (30)	0.55 (14)	0.41 (10.3)	0.78 (20)	0.98 (25)	0.78 (20)	1.61 (41)	0.02 (0.01)
32	QC/99032/25	QM/99032/25	0.375 (10)	5/16-24 (M14 x 1.5 deep)	1.18 (30)	0.55 (14)	0.72 (18.4)	1.44 (36.6)	1.61 (41)	0.87 (22)	1.65 (42)	0.04 (0.02)
40	QC/99040/25	QM/99032/25	0.375 (10)	3/8-24 (M14 x 1.5 deep)	1.18 (30)	0.55 (14)	0.72 (18.4)	1.44 (36.6)	1.61 (41)	0.87 (22)	1.65 (42)	0.04 (0.02)
50	QC/99050/25	QM/99050/25	0.500 (14)	1/2-20 (M18 x 1.5 deep)	1.57 (40)	0.79 (20)	0.88 (22.4)	1.75 (44.5)	1.97 (50)	1.10 (28)	2.20 (56)	0.09 (0.04)

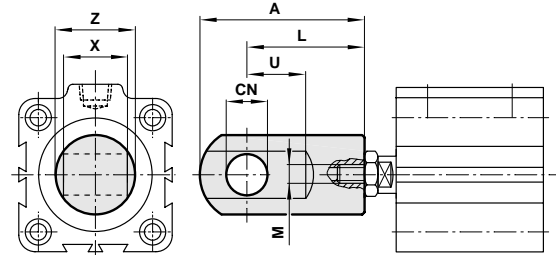
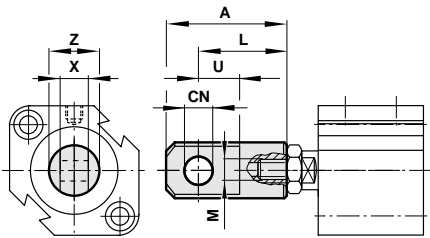
Dimensions in inches (mm) For basic cylinder dimensions, see page N 1.4.099.04

**Ordering information** To order a basic 25 mm bore cylinder, spring return, with a 10 mm stroke, BSP parallel ports quote: **DM/95025/10** plus piston rod clevis mounting: **QM/99025/25**

### Piston rod eye

Ø 12 ... 25 mm

Ø 32 ... 50 mm



Ø	Model	CN	M	L	U	X	Z	A	lb (kg)
Inch	Inch								
	Metric								
12	QC/99012/32	QM/99012/32	0.187 (5)	#8-32 (M5 x 0.8 deep)	0.63 (16)	0.27 (7)	0.18 (4.7)	0.38 (9.7)	0.05 (0.02)
16	QC/99016/32	QM/99016/32	0.187 (5)	#8-32 (M6 x 1.0 deep)	0.98 (25)	0.55 (14)	0.24 (6.2)	0.44 (11.2)	0.05 (0.02)
20	QC/99020/32	QM/99020/32	0.312 (8)	#10-32 (M8 x 1.25 deep)	0.98 (25)	0.45 (11.5)	0.3 (7.7)	0.63 (16)	0.10 (0.05)
25	QC/99025/32	QM/99025/32	0.375 (10)	1/4-28 (M10 x 1.25 deep)	1.18 (30)	0.55 (14)	0.38 (9.7)	0.75 (19)	0.15 (0.07)
32	QC/99032/32	QM/99032/32	0.375 (10)	5/16-24 (M14 x 1.5 deep)	1.18 (30)	0.55 (14)	0.69 (17.5)	0.87 (22)	0.20 (0.09)
40	QC/99040/32	QM/99032/32	0.375 (10)	3/8-24 (M14 x 1.5 deep)	1.18 (30)	0.55 (14)	0.69 (17.5)	0.87 (22)	0.29 (0.13)
50	QC/99050/32	QM/99050/32	0.500 (14)	1/2-20 (M18 x 1.5 deep)	1.57 (40)	0.79 (20)	0.85 (21.5)	1.06 (27)	0.73 (0.33)

Dimensions in inches (mm) For basic cylinder dimensions, see page N 1.4.099.04

**Ordering information** To order a basic 25 mm bore cylinder, spring return, with a 10 mm stroke, BSP parallel ports, quote: **DM/95025/10** plus piston rod eye mounting: **QM/99025/32**

### Spares

Cylinder	Spares kit
D*95012, D*96012	QM/99012/00
D*95016, D*96016	QM/99016/00
D*95020, D*96020	QM/99020/00
D*95025, D*96025	QM/99025/00
D*95032, D*96032	QM/99032/00
D*95040, D*96040	QM/99040/00
D*95050, D*96050	QM/99050/00





### Light weight

**Compact design, which is considerably shorter than ISO/VDMA or NFPA equivalent.**

**Low friction characteristics for high speed operation**

**Duralon<sup>®</sup> rod bearing for reduced wear**

**Chrome plated stainless steel piston rods**

### Ordering information

To order a basic 25 mm bore cylinder with a magnetic piston and 10 mm stroke, female rod thread, BSP parallel ports, quote: **DM/99025/MX/10.**

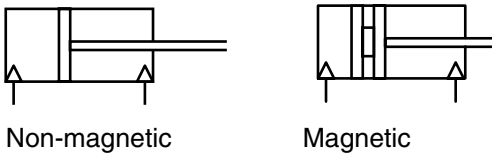
To order a basic 40 mm bore cylinder with a magnetic piston and 5 mm stroke, female rod thread, NPT ports, quote: **DC/99040/MX/5.**

Mountings are included for cylinders up to Ø 100 mm. See Model codes table on page ACT-9-9.

Magnetically operated switches need to be ordered separately.

### Accessories

Switches See page ACT-9-10.



### Technical data

Medium:

Compressed air, filtered, lubricated or non-lubricated

Operation:

DM/99000 BSP parallel ports, double acting, non-cushioned, metric threads

DC/99000 NPT ports, double acting, non-cushioned, inch threads

Operating pressure:

14.5 to 145 psig (1 to 10 bar)

Operating temperature:

-25°F to +250°F (-32°C to +121°C)

Consult our Technical Service for use below 35°F (+2°C)

Cylinder diameters:

12, 16, 20, 25, 32, 40, 50, 63, 80, 100, 125, 140, 160 mm

Strokes:

See table on page ACT-9-9

Non-standard strokes available on request

### Materials

Barrel: hard anodized aluminum

End caps: hard anodized aluminum alloy

Piston rod: stainless steel, hard chrome plated

Elastomers: Buna N

### Alternative cylinders

See page ACT-9-9.



# Series 99000 Compact Actuators

## Cylinder variants

Symbol	Model Non-magnetic piston	Symbol	Model Magnetic piston	Description	Catalogue page
	D*/99000/X		D*/99000/MX	Standard female thread	ACT-9-11/12
	D*/99000/		D*/99000/M	Male rod thread, single rod	ACT-9-11/12
	D*/99000/EX		D*/99000/MEX	Boss, rod end female thread	ACT-9-22
	D*/99000/FX		D*/99000/MFX	Boss, cap end female thread	ACT-9-22
	TD*/99000/X		D*/99000/JMX	High temperature (Viton seals)	ACT-9-11
	D*/99000/JX		D*/99000/JM	Double ended piston rod, female thread	ACT-9-13/14
	D*/99000/J		D*/99000/N2X	Double ended piston rod, male thread	ACT-9-13/14
	D*/99000/N1X		D*/99000/N4	Non-rotating piston rod, female thread (Ø 12 to 100 mm)	ACT-9-15/16
	D*/99000/N3		D*/99000/N6X	Cylinder with guided toolplate	ACT-9-19
	D*/99000/N5X		D*/99000/BMX	Non-rotating double ended piston rod, female thread	ACT-9-17/18
	D*/99000/BX		D*/99000/MSX	Cylinder with bumpers both ends, female thread (standard on Ø 125, 140 & 160)	ACT-9-11/12
	D*/99000/SX		D*/99000/MSX	Adjustable stroke, single rod, female thread	On request

For combinations of alternative cylinders consult our Technical Service.

## Options selector

★ D ★ / 99 ★ ★ ★ / ★ / ★ / ★

Temperature	Substitute
High temperature (Viton® seals)	T

Ports	Substitute
NPT Ports (inch threads, stroke in mm)	C
BSP parallel ports (metric ports & threads, stroke in mm)	M

Cylinder diameters (mm)	Substitute
12	012
16	016
20	020
25	025
32	032
40	040
50	050
63	063
80	080
100	100
125	125
140	140
160	160

Mounting	Substitute
Without	None
Foot	C
Flange rod end	G
Flange cap end	B
ISO Flange rod end	IG
ISO Flange cap end	IB
Rear clevis	D
Tapped holes - both ends	A

Stroke (mm)
300 max. (see table below)

Variants (non-magnetic piston)	Substitute
Standard, female rod thread	X
Male rod thread, single rod	None
Double ended piston rod, female rod thread	JX
Double ended piston rod, male thread, both ends	J
Non-rotating piston rod, female rod thread	N1X
Cylinder with guided toolplate	N3
Double ended piston rod, non-rotating, female rod thread	N5X
Boss, rod end, female rod thread	EX
Boss, cap end, female rod thread	FX
Bumpers on both ends, female rod thread (Ø 12 ... 100 mm)	BX
Adjustable stroke, retract, single rod, female rod thread	SX

Variants (magnetic piston)	Substitute
Standard, female rod thread	MX
Male rod thread, single rod	M
Double ended piston rod, male thread, both ends	JM
Double ended piston rod, female rod thread	JMX
Non-rotating piston rod, female rod thread	N2X
Cylinder with guided toolplate	N4
Double ended piston rod, non-rotating, female rod thread	N6X
Boss, rod end, female rod thread	MEX
Boss, cap end, female rod thread	MFX
Bumpers on both ends, female rod thread (Ø 12 ... 100 mm)	MBX
Adjustable stroke, retract, single rod, female rod thread	MSX

## Strokes

Ø	5	10	15	20	25	30	35	40	45	50	75	100	125	150	175	200	250	300
12	●	●	●	●	●	●	-	-	-	●	●	●	-	-	-	-	-	-
16	●	●	●	●	●	●	-	-	-	●	●	●	-	-	-	-	-	-
20	●	●	●	●	●	●	●	●	●	●	●	●	-	-	-	-	-	-
25	●	●	●	●	●	●	●	●	●	●	●	●	-	-	-	-	-	-
32	●	●	●	●	●	●	●	●	●	●	●	●	●	●	-	-	-	-
40	●	●	●	●	●	●	●	●	●	●	●	●	●	●	-	-	-	-
50	-	●	●	●	●	●	●	●	●	●	●	●	●	●	-	-	-	-
63	-	●	●	●	●	●	●	●	●	●	●	●	●	●	-	-	-	-
80	-	●	●	●	●	●	●	●	●	●	●	●	●	●	-	-	-	-
100	-	●	●	●	●	●	●	●	●	●	●	●	●	●	-	-	-	-
125	-	●	-	●	-	●	-	●	-	●	●	●	●	●	●	●	●	●
140	-	●	-	●	-	●	-	●	-	●	●	●	●	●	●	●	●	●
160	-	●	-	●	-	●	-	●	-	●	●	●	●	●	●	●	●	●

For combinations of alternative cylinders consult our Technical Service.



### Theoretical forces • Air consumption

Ø	Theoretical forces lb (N) at 87 psi (6 bar)				Air consumption in <sup>3</sup> /in. stroke (l/cm stroke) at 87 psi (6 bar)			
	Outstroke		Instroke		Outstroke		Instroke	
12	14.8	(65.8)	11.3	(50.3)	1.24	(0.008)	1.09	(0.007)
16	27.0	(120.1)	20.1	(89.0)	2.17	(0.014)	1.71	(0.011)
20	42.6	(189.5)	32.2	(143.2)	3.41	(0.022)	2.64	(0.017)
25	66.1	(294.0)	51.3	(228.2)	5.43	(0.035)	4.19	(0.027)
32	108.8	(484.0)	81.8	(363.9)	8.68	(0.056)	6.51	(0.042)
40	169.7	(754.9)	142.7	(634.8)	13.64	(0.088)	11.47	(0.074)
50	264.5	(1176.6)	222.7	(990.6)	21.39	(0.138)	17.98	(0.116)
63	420.2	(1869.1)	378.5	(1683.7)	33.79	(0.218)	30.38	(0.196)
80	677.7	(3014.6)	611.6	(2720.5)	54.56	(0.35)	49.29	(0.32)
100	1058.8	(4709.8)	964.0	(4288.1)	85.25	(0.55)	79.83	(0.52)
125	1654.7	(7360.5)	1517.3	(6749.3)	133.30	(0.86)	122.45	(0.79)
140	2075.8	(9233.6)	1938.4	(8622.4)	167.40	(1.08)	156.55	(1.01)
160	2711.8	(12062.7)	2542.1	(11307.8)	218.55	(1.41)	204.60	(1.32)

### Cylinder weights

Ø	Stroke (mm)		30	50	75	100	125	150	Additional weight for male thread	Additional weight for magnetic piston
	5	10								
12	0.088 (0.04)	0.104 (0.05)	0.165 (0.08)	0.240 (0.11)	0.309 (0.14)	0.378 (0.17)	- (-)	- (-)	0.002 (0.004)	0.012 (0.03)
16	0.135 (0.06)	0.159 (0.07)	0.256 (0.12)	0.353 (0.16)	0.450 (0.20)	0.546 (0.25)	- (-)	- (-)	0.003 (0.007)	0.017 (0.04)
20	0.201 (0.09)	0.247 (0.11)	0.426 (0.19)	0.559 (0.25)	0.684 (0.31)	0.826 (0.38)	- (-)	- (-)	0.007 (0.015)	0.025 (0.05)
25	0.260 (0.12)	0.306 (0.14)	0.494 (0.22)	0.631 (0.29)	0.899 (0.41)	1.070 (0.48)	- (-)	- (-)	0.017 (0.040)	0.029 (0.06)
32	0.346 (0.16)	0.397 (0.18)	0.595 (0.27)	0.746 (0.34)	1.150 (0.52)	1.400 (0.64)	1.810 (0.82)	2.060 (0.94)	0.040 (0.090)	0.039 (0.09)
40	0.600 (0.27)	0.648 (0.29)	0.842 (0.38)	0.986 (0.45)	1.370 (0.62)	1.620 (0.73)	2.370 (1.08)	2.670 (1.21)	0.040 (0.090)	0.054 (0.12)
50	- (-)	0.884 (0.40)	1.210 (0.55)	1.460 (0.66)	2.110 (0.96)	2.430 (1.10)	4.070 (1.85)	4.550 (2.07)	0.080 (0.180)	0.080 (0.18)
63	- (-)	1.430 (0.65)	1.780 (0.81)	2.040 (0.93)	2.770 (1.26)	3.230 (1.46)	4.940 (2.24)	5.510 (2.50)	0.080 (0.180)	0.102 (0.24)
80	- (-)	3.180 (1.44)	3.980 (1.80)	4.570 (2.08)	6.240 (2.83)	7.270 (3.30)	7.700 (3.49)	8.520 (3.87)	0.160 (0.350)	0.143 (0.31)
100	- (-)	4.870 (2.21)	5.800 (2.63)	6.490 (2.95)	8.380 (3.80)	9.520 (4.32)	11.100 (5.04)	12.180 (5.53)	0.270 (0.600)	0.282 (0.62)
125	- (-)	12.08 (5.48)	13.23 (6.00)	14.37 (6.52)	15.81 (7.17)	17.22 (7.81)	18.65 (8.46)	20.08 (9.11)	0.31 (0.680)	- (-)
140	- (-)	14.31 (6.49)	15.61 (7.08)	16.93 (7.68)	18.56 (8.42)	20.22 (9.17)	21.85 (9.91)	23.50 (10.66)	0.31 (0.680)	- (-)
160	- (-)	19.75 (8.96)	21.32 (9.67)	22.91 (10.39)	24.89 (11.29)	26.87 (12.19)	28.86 (13.09)	30.84 (13.99)	0.48 (1.060)	- (-)

Weights in lb (kg)

Please note: estimated weights for single rod models

### Switches



Model		
Reed	QM/348/RSU/2,75	QM/348/RSU/CP
	QM/348/LSU/2,75	QM/348/LSU/CP
Solid state	QM/348/EAP/2,75	QM/348/EAP/CP
	QM/348/EAN/2,75	QM/348/EAN/CP

### Female cordsets



Model	Length
M/P73326/1	1 m
M/P73326/2	2 m
M/P73326/5	5 m

Note: Quick disconnect styles are supplied with 6 inch pigtail with male connector. Order female cordsets separately.

Model	Voltage	Current	Temperature	LED	Features	Cable/plug length	Cable type
Reed	V a.c.	max.	°F °C				
QM/348/RSU/2,75	0 ... 120	500 mA	-4° ... +176° (-20° ... +80°)	-	-	9 ft. (2.75 m)	26-3 PVC
QM/348/LSU/2,75	5 ... 120	30 mA	-4° ... +176° (-20° ... +80°)	●	-	9 ft. (2.75 m)	26-3 PVC
QM/348/EAP/2,75	-	200 mA	-4° ... +176° (-20° ... +80°)	●	PNP	9 ft. (2.75 m)	26-3 PVC
QM/348/EAN/2,75	-	200 mA	-4° ... +176° (-20° ... +80°)	●	NPN	9 ft. (2.75 m)	26-3 PVC

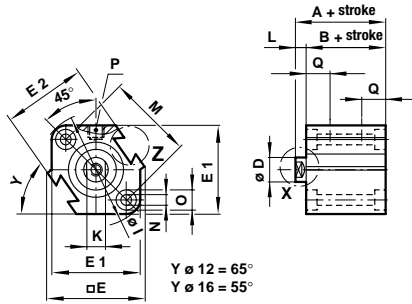
Full information on switches (technical data, cable materials, dimensions etc.) please refer to relevant catalogue pages



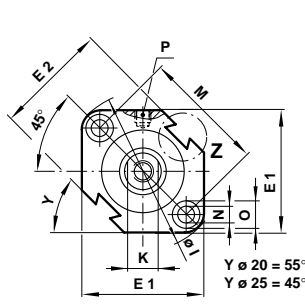
# Series 99000 Compact Actuators

## Basic dimensions – DM/99000/X (Non-magnetic)

Ø 12 ... 16 mm

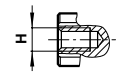


Ø 20 ... 25 mm

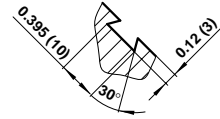


Ø 12 ... 25 mm

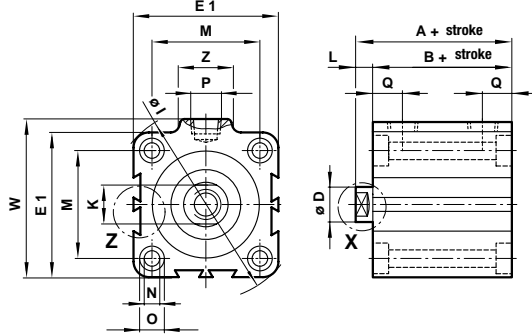
Section X



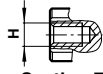
Section Z



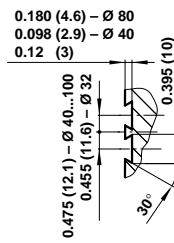
Ø 32 ... 160 mm



Section X

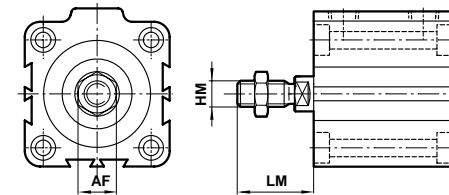


Section Z



## Cylinder with rod end male thread D\*/99000 ...

Ø 12 ... 160 mm



Ø	Stroke range	A	AF	B	Ø D	E	E1	E2
12	5 ... 10	0.81 (20.5)	0.34 (8)	0.67 (17)	0.236 (6)	1.09 (27.7)	0.98 (25)	0.90 (23)
16	5 ... 10	0.87 (22)	0.34 (10)	0.73 (18.5)	0.315 (8)	1.25 (31.7)	1.14 (29)	1.07 (27.2)
20	5 ... 10	0.94 (24)	0.38 (13)	0.77 (19.5)	0.394 (10)	- (-)	1.42 (36)	1.23 (31.2)
25	5 ... 10	1.08 (27.5)	0.43 (17)	0.86 (22.5)	0.472 (12)	- (-)	1.57 (40)	1.45 (36.9)
32	5.10 ... 50	1.18 (30)	0.50 (22)	0.91 (23)	0.603 (16)	- (-)	1.75 (44.5)	- (-)
40	5 ... 10	1.44 (36.5)	0.56 (22)	1.16 (29.5)	0.603 (16)	- (-)	2.05 (52)	- (-)
50	10 ... 20	1.52 (38.5)	0.75 (27)	1.20 (30.5)	0.787 (20)	- (-)	2.51 (63.7)	- (-)
63	10 ... 50	1.73 (44)	0.75 (27)	1.42 (36)	0.787 (20)	- (-)	3.02 (76.7)	- (-)
80	10 ... 50	2.11 (53.5)	0.93 (32)	1.71 (43.5)	0.984 (25)	- (-)	3.85 (97.8)	- (-)
100	10 ... 50	2.56 (65)	1.13 (46)	2.09 (53)	1.181 (30)	- (-)	4.54 (115.3)	- (-)
125	10 ... 300	3.90 (99)	1.13 (46)	3.27 (83)	1.417 (36)	- (-)	5.59 (142)	- (-)
140	10 ... 300	3.90 (99)	1.13 (46)	3.27 (83)	1.417 (36)	- (-)	6.22 (158)	- (-)
160	10 ... 300	4.25 (108)	1.35 (55)	3.58 (91)	1.575 (40)	- (-)	7.01 (178)	- (-)

Ø	Stroke range	H	HM	Ø I	K	L	LM	M
12	5 ... 10	#8-32 x 0.21 (M3 x 0.5-5 deep)	#8-32 x 0.31 (M5 x 0.8-9 deep)	1.24 (31.5)	0.20 (5)	0.14 (3.5)	0.45 (14)	0.87 (22)
16	5 ... 10	#8-32 x 0.21 (M4 x 0.7-5 deep)	#8-32 x 0.31 (M6 x 1.0-10 deep)	1.46 (37.1)	0.24 (6)	0.14 (3.5)	0.45 (15.5)	1.10 (28)
20	5 ... 10	#10-32 x 0.28 (M5 x 0.8-7 deep)	#10-32 x 0.31 (M8 x 1.25-12 deep)	1.85 (47)	0.31 (8)	0.18 (4.5)	0.49 (18.5)	1.42 (36)
25	5 ... 10	1/4-28 x 0.39 (M6 x 1.0-10 deep)	1/4-28 x 0.37 (M10 x 1.25-15 deep)	2.02 (51.3)	0.39 (10)	0.20 (5)	0.57 (22.5)	1.57 (40)
32	5.10 ... 50	5/16-24 x 0.50 (M8 x 1.25-12 deep)	5/16-24 x 0.50 (M14 x 1.5-20.5 deep)	2.32 (58.9)	0.55 (14)	0.28 (7)	0.78 (28.5)	1.34 (34)
40	5 ... 10	3/8-24 x 0.50 (M8 x 1.25-12 deep)	3/8-24 x 0.63 (M14 x 1.5-20.5 deep)	2.72 (69)	0.55 (14)	0.28 (7)	0.91 (28.5)	1.57 (40)
50	10 ... 20	1/2-20 x 0.50 (M10 x 1.5-12 deep)	1/2-20 x 0.77 (M18 x 1.5-26 deep)	3.34 (84.9)	0.67 (17)	0.31 (8)	1.08 (33.5)	1.97 (50)
63	10 ... 50	1/2-20 x 0.50 (M10 x 1.5-12 deep)	1/2-20 x 0.77 (M18 x 1.5-26 deep)	4.01 (101.8)	0.67 (17)	0.31 (8)	1.08 (33.5)	2.36 (60)
80	10 ... 50	5/8-18 x 0.88 (M16 x 2.0-22 deep)	5/8-18 x 1.00 (M22 x 1.5-32.5 deep)	5.11 (129.8)	0.87 (22)	0.39 (10)	1.40 (43.5)	3.03 (77)
100	10 ... 50	3/4-16 x 0.88 (M20 x 2.5-22 deep)	3/4-16 x 1.12 (M26 x 1.5-32.5 deep)	6.06 (153.9)	1.06 (27)	0.47 (12)	1.59 (43.5)	3.70 (94)
125	10 ... 300	3/4-16 x 1.06 (M22 x 2.5-27 deep)	3/4-16 x 1.12 (M30 x 1.5-42 deep)	7.48 (190)	1.26 (32)	0.63 (16)	1.75 (58)	4.49 (114)
140	10 ... 300	3/4-16 x 1.06 (M22 x 2.5-27 deep)	3/4-16 x 1.12 (M30 x 1.5-42 deep)	8.27 (210)	1.26 (32)	0.63 (16)	1.75 (58)	5.04 (128)
160	10 ... 300	3/4-16 x 1.06 (M24 x 3.0-27 deep)	3/4-16 x 1.12 (M36 x 1.5-47 deep)	9.37 (238)	1.42 (36)	0.67 (17)	1.79 (64)	5.67 (144)

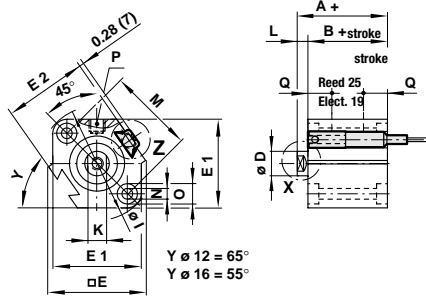
Ø	Stroke range	Ø N	Ø O	P*	Q	W	Z
12	5 ... 10	0.14 (3.5)	0.26 x 0.14 (6.5 x 3.5 deep)	M5 x 0.8	0.28 (7)	- (-)	- (-)
16	5 ... 10	0.14 (3.5)	0.26 x 0.14 (6.5 x 3.5 deep)	M5 x 0.8	0.31 (7.8)	- (-)	- (-)
20	5 ... 10	0.22 (5.5)	0.35 x 0.28 (9.0 x 7.0 deep)	M5 x 0.8	0.32 (8.1)	- (-)	- (-)
25	5 ... 10	0.22 (5.5)	0.35 x 0.28 (9.0 x 7.0 deep)	M5 x 0.8	0.33 (8.4)	- (-)	- (-)
32	5.10 ... 50	0.22 (5.5)	0.35 x 0.28 (9.0 x 7.0 deep)	M5 x 0.8	0.34 (8.7)	1.94 (49.3)	0.84 (21.4)
40	5 ... 10	0.22 (5.5)	0.35 x 0.28 (9.0 x 7.0 deep)	1/8"	0.36 (9.2)	2.24 (57)	0.84 (21.4)
50	10 ... 20	0.26 (6.5)	0.43 x 0.31 (11.0 x 8.0 deep)	1/4"	0.41 (10.5)	2.78 (70.6)	1.04 (26.5)
63	10 ... 50	0.35 (9)	0.55 x 0.41 (14.0 x 10.5 deep)	1/4"	0.45 (11.5)	3.29 (83.6)	1.04 (26.5)
80	10 ... 50	0.43 (11)	0.69 x 0.53 (17.5 x 13.5 deep)	3/8"	0.55 (14)	4.09 (104)	1.18 (30)
100	10 ... 50	0.43 (11)	0.69 x 0.53 (17.5 x 13.5 deep)	3/8"	0.71 (18)	4.8 (121.9)	1.18 (30)
125	10 ... 300	0.50 (12.7)	0.83 x 0.72 (21.2 x 18.4 deep)	3/8"	0.96 (24.5)	6.02 (153)	1.53 (39)
140	10 ... 300	0.50 (12.7)	0.83 x 0.72 (21.2 x 18.4 deep)	3/8"	0.96 (24.5)	6.61 (168)	1.53 (39)
160	10 ... 300	0.57 (14.5)	0.95 x 0.83 (24.2 x 21.2 deep)	3/8"	1.08 (27.5)	7.4 (188)	1.53 (39)

Dimensions in inches (mm) \* Port sizes: DM/99000/... = G (BSP parallel ports), DC/99000/... = NPT (NPT ports). Note: M5 x 0.8 port will accept #10-32 male thread fittings.

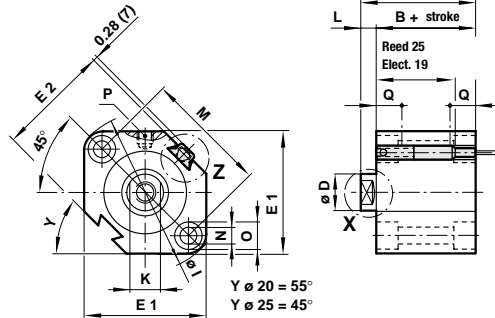


Basic dimensions – DM/99000/MX (Magnetic)

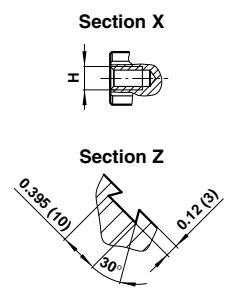
Ø 12 ... 16 mm



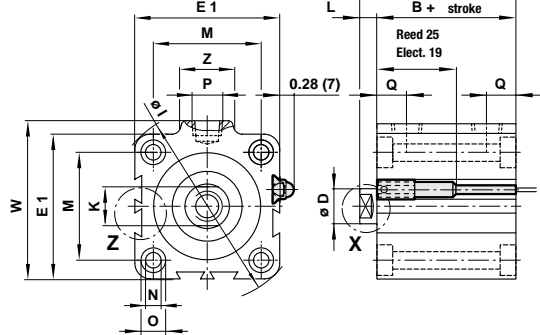
Ø 20 ... 25 mm



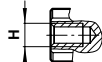
Ø 12 ... 25 mm



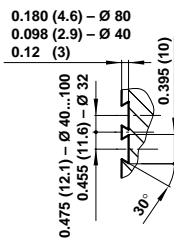
Ø 32 ... 160 mm



Section X



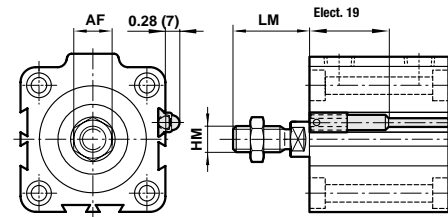
Section Z



Cylinder with rod end male thread

D\*/99000/M

Ø 12 ... 160 mm



Ø	Stroke range	A	AF	B	Ø D	E	E1	E2
12	5 ... 30	1.24 (31.5)	0.34 (8)	1.10 (28)	0.236 (6)	1.09 (27.7)	0.98 (25)	0.90 (23)
16	5 ... 30	1.34 (34)	0.34 (10)	1.20 (30.5)	0.315 (8)	1.25 (31.7)	1.14 (29)	1.07 (27.2)
20	5 ... 50	1.42 (36)	0.38 (13)	1.24 (31.5)	0.394 (10)	- (-)	1.42 (36)	1.23 (31.2)
25	5 ... 50	1.48 (37.5)	0.43 (17)	1.28 (32.5)	0.472 (12)	- (-)	1.57 (40)	1.45 (36.9)
32	5 ... 50	1.57 (40)	0.50 (22)	1.30 (33)	0.630 (16)	- (-)	1.75 (44.5)	- (-)
40	5 ... 50	1.83 (46.5)	0.56 (22)	1.56 (39.5)	0.630 (16)	- (-)	2.05 (52)	- (-)
50	10 ... 50	1.91 (48.5)	0.75 (27)	1.59 (40.5)	0.787 (20)	- (-)	2.51 (63.7)	- (-)
63	10 ... 50	2.13 (54)	0.75 (27)	1.81 (46)	0.787 (20)	- (-)	3.02 (76.7)	- (-)
80	10 ... 50	2.50 (63.5)	0.93 (32)	2.11 (53.5)	0.984 (25)	- (-)	3.85 (97.8)	- (-)
100	10 ... 50	2.95 (75)	1.13 (46)	2.48 (63)	1.181 (30)	- (-)	4.54 (115.3)	- (-)
125	10 ... 300	3.90 (99)	1.13 (46)	3.27 (83)	1.417 (36)	- (-)	5.59 (142)	- (-)
140	10 ... 300	3.90 (99)	1.13 (46)	3.27 (83)	1.417 (36)	- (-)	6.22 (158)	- (-)
160	10 ... 300	4.25 (108)	1.35 (55)	3.58 (91)	1.575 (40)	- (-)	7.01 (178)	- (-)

Ø	Stroke range	H	HM	Ø I	K	L	LM	M
12	5 ... 30	#8-32 x 0.21 (M3 x 0.5-5 deep)	#8-32 x 0.31 (M5 x 0.8-9 deep)	1.24 (31.5)	0.20 (5)	0.14 (3.5)	0.45 (14)	0.87 (22)
16	5 ... 30	#8-32 x 0.21 (M4 x 0.7-5 deep)	#8-32 x 0.31 (M6 x 1.0-10 deep)	1.46 (37.1)	0.24 (6)	0.14 (3.5)	0.45 (15.5)	1.10 (28)
20	5 ... 50	#10-32 x 0.28 (M5 x 0.8-7 deep)	#10-32 x 0.31 (M8 x 1.25-12 deep)	1.85 (47)	0.31 (8)	0.18 (4.5)	0.49 (18.5)	1.42 (36)
25	5 ... 50	1/4-28 x 0.39 (M6 x 1.0-10 deep)	1/4-28 x 0.37 (M10 x 1.25-15 deep)	2.02 (51.3)	0.39 (10)	0.20 (5)	0.57 (22.5)	1.57 (40)
32	5 ... 50	5/16-24 x 0.50 (M8 x 1.25-12 deep)	5/16-24 x 0.50 (M14 x 1.5-20.5 deep)	2.32 (58.9)	0.55 (14)	0.28 (7)	0.78 (28.5)	1.34 (34)
40	5 ... 50	3/8-24 x 0.50 (M8 x 1.25-12 deep)	3/8-24 x 0.63 (M14 x 1.5-20.5 deep)	2.72 (69)	0.55 (14)	0.28 (7)	0.91 (28.5)	1.57 (40)
50	10 ... 50	1/2-20 x 0.50 (M10 x 1.5-12 deep)	1/2-20 x 0.77 (M18 x 1.5-26 deep)	3.34 (84.9)	0.67 (17)	0.31 (8)	1.08 (33.5)	1.97 (50)
63	10 ... 50	1/2-20 x 0.50 (M10 x 1.5-12 deep)	1/2-20 x .77 (M18 x 1.5-26 deep)	4.01 (101.8)	0.67 (17)	0.31 (8)	1.08 (33.5)	2.36 (60)
80	10 ... 50	5/8-18 x 0.88 (M16 x 2.0-22 deep)	5/8-18 x 1.00 (M22 x 1.5-32.5 deep)	5.11 (129.8)	0.87 (22)	0.39 (10)	1.40 (43.5)	3.03 (77)
100	10 ... 50	3/4-16 x 0.88 (M20 x 2.5-22 deep)	3/4-16 x 1.12 (M26 x 1.5-32.5 deep)	6.06 (153.9)	1.06 (27)	0.47 (12)	1.59 (43.5)	3.70 (94)
125	10 ... 300	3/4-16 x 1.06 (M22 x 2.5-27 deep)	3/4-16 x 1.12 (M30 x 1.5-42 deep)	7.48 (190)	1.26 (32)	0.63 (16)	1.75 (58)	4.49 (114)
140	10 ... 300	3/4-16 x 1.06 (M22 x 2.5-27 deep)	3/4-16 x 1.12 (M30 x 1.5-42 deep)	8.27 (210)	1.26 (32)	0.63 (16)	1.75 (58)	5.04 (128)
160	10 ... 300	3/4-16 x 1.06 (M24 x 3.0-27 deep)	3/4-16 x 1.12 (M36 x 1.5-47 deep)	9.37 (238)	1.42 (36)	0.67 (17)	1.79 (64)	5.67 (144)

Ø	Stroke range	Ø N	Ø O	P*	Q	W	Z
12	5 ... 30	0.14 (3.5)	0.26 x 0.14 (6.5 x 3.5 deep)	M5 x 0.8	0.28 (7)	- (-)	- (-)
16	5 ... 30	0.14 (3.5)	0.26 x 0.14 (6.5 x 3.5 deep)	M5 x 0.8	0.31 (7.8)	- (-)	- (-)
20	5 ... 50	0.22 (5.5)	0.35 x 0.28 (9.0 x 7.0 deep)	M5 x 0.8	0.32 (8.1)	- (-)	- (-)
25	5 ... 50	0.22 (5.5)	0.35 x 0.28 (9.0 x 7.0 deep)	M5 x 0.8	0.33 (8.4)	- (-)	- (-)
32	5 ... 50	0.22 (5.5)	0.35 x 0.28 (9.0 x 7.0 deep)	1/8*	0.34 (8.7)	1.94 (49.3)	0.84 (21.4)
40	5 ... 50	0.22 (5.5)	0.35 x 0.28 (9.0 x 7.0 deep)	1/8*	0.36 (9.2)	2.24 (57)	0.84 (21.4)
50	10 ... 50	0.26 (6.6)	0.43 x 0.31 (11.0 x 8.0 deep)	1/4*	0.41 (10.5)	2.78 (70.6)	1.04 (26.5)
63	10 ... 50	0.35 (9)	0.55 x 0.41 (14.0 x 10.5 deep)	1/4*	0.45 (11.5)	3.29 (83.6)	1.04 (26.5)
80	10 ... 50	0.43 (11)	0.69 x 0.53 (17.5 x 13.5 deep)	3/8*	0.55 (14.0)	4.09 (104)	1.18 (30)
100	10 ... 50	0.43 (11)	0.69 x 0.53 (17.5 x 13.5 deep)	3/8*	0.71 (18)	4.80 (121.9)	1.18 (30)
125	10 ... 300	0.50 (12.7)	0.83 x 0.72 (21.2 x 18.4 deep)	3/8*	0.96 (24.5)	6.02 (153)	1.53 (39)
140	10 ... 300	0.50 (12.7)	0.83 x 0.72 (21.2 x 18.4 deep)	3/8*	0.96 (24.5)	6.61 (168)	1.53 (39)
160	10 ... 300	0.57 (14.5)	0.95 x 0.83 (24.2 x 21.2 deep)	3/8*	1.08 (27.5)	7.40 (188)	1.53 (39)

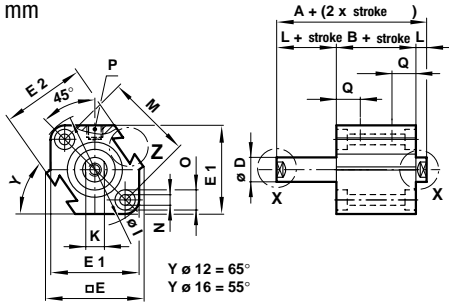
Dimensions in inches (mm) \* Port sizes: DM/99000/... = G (BSP parallel ports), DC/99000/... = NPT (NPT ports). Note: M5 x 0.8 port will accept #10-32 male thread fittings.



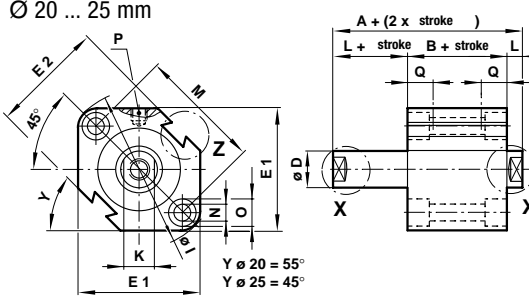
# Series 99000 Compact Actuators

## Double ended piston rod – DM/99000/JX (Non-magnetic)

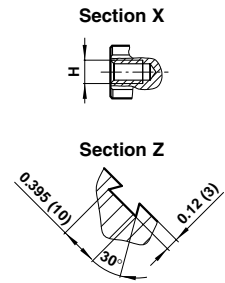
Ø 12 ... 16 mm



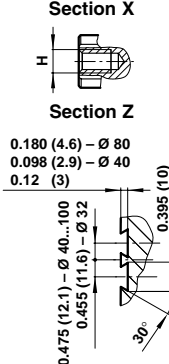
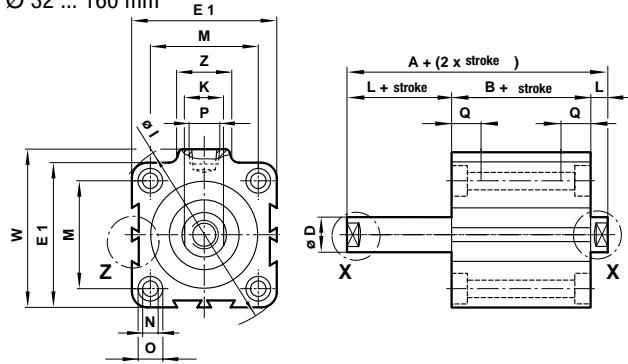
Ø 20 ... 25 mm



Ø 12 ... 25 mm

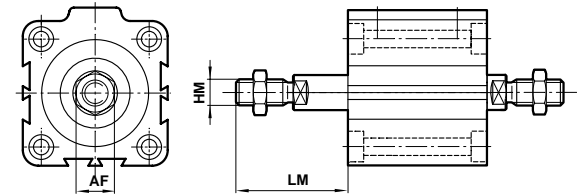


Ø 32 ... 160 mm



## Cylinders with rod end male thread D\*/99000/J

Ø 12 ... 160 mm



Ø	Stroke range	A	AF	B	Ø D	E	E1	E2
12	5 ... 30	1.27 (32.2)	0.34 (8)	0.99 (25.2)	0.236 (6)	1.09 (27.7)	0.98 (25)	0.90 (23)
16	5 ... 30	1.30 (33.0)	0.34 (10)	1.02 (26.0)	0.315 (8)	1.25 (31.7)	1.14 (29)	1.07 (27.2)
20	5 ... 50	1.38 (35.0)	0.38 (13)	1.02 (26.0)	0.394 (10)	- (-)	1.42 (36)	1.23 (31.2)
25	5 ... 50	1.54 (39.0)	0.43 (17)	1.14 (29.0)	0.472 (12)	- (-)	1.57 (40)	1.45 (36.9)
32	5.10 ... 50	1.75 (44.5)	0.50 (22)	1.20 (30.5)	0.630 (16)	- (-)	1.75 (44.5)	- (-)
40	5 ... 50	2.13 (54.0)	0.56 (22)	1.57 (40.0)	0.630 (16)	- (-)	2.05 (52)	- (-)
50	10 ... 50	2.22 (56.5)	0.75 (27)	1.59 (40.5)	0.787 (20)	- (-)	2.51 (63.7)	- (-)
63	10 ... 50	2.28 (58.0)	0.75 (27)	1.65 (42.0)	0.787 (20)	- (-)	3.02 (76.7)	- (-)
80	10 ... 50	2.80 (71.0)	0.93 (32)	2.01 (51.0)	0.984 (25)	- (-)	3.85 (97.8)	- (-)
100	10 ... 50	3.33 (84.5)	1.13 (46)	2.38 (60.5)	1.181 (30)	- (-)	4.54 (115.3)	- (-)
125	10 ... 300	4.53 (115)	1.13 (46)	3.27 (83.0)	1.417 (36)	- (-)	5.59 (142)	- (-)
140	10 ... 300	4.53 (115)	1.13 (46)	3.27 (83.0)	1.417 (36)	- (-)	6.22 (158)	- (-)
160	10 ... 300	4.92 (125)	1.35 (55)	3.58 (91.0)	1.575 (40)	- (-)	7.01 (178)	- (-)
Ø	Stroke range	H	HM	Ø I	K	L	LM	M
12	5 ... 30	#8-32 x 0.21 deep (M3 x 0.5-5)	#8-32 x 0.31 (M5 x 0.8-9)	1.24 (31.5)	0.20 (5)	0.14 (3.5)	0.45 (14)	0.87 (22)
16	5 ... 30	#8-32 x 0.21 deep (M4 x 0.7-5)	#8-32 x 0.31 (M6 x 1.0-10)	1.46 (37.1)	0.24 (6)	0.14 (3.5)	0.45 (15.5)	1.10 (28)
20	5 ... 50	#10-32 x 0.28 deep (M5 x 0.8-7)	#10-32 x 0.31 (M8 x 1.25-12)	1.85 (47)	0.31 (8)	0.18 (4.5)	0.49 (18.5)	1.42 (36)
25	5 ... 50	1/4-28 x 0.39 deep (M6 x 1.0-10)	1/4-28 x 0.37 (M10 x 1.25-15)	2.02 (51.3)	0.39 (10)	0.20 (5)	0.57 (22.5)	1.57 (40)
32	5.10 ... 50	5/16-24 x 0.50 deep (M8 x 1.25-12)	5/16-24 x 0.50 (M14 x 1.5-20.5)	2.32 (58.9)	0.55 (14)	0.28 (7)	0.78 (28.5)	1.34 (34)
40	5 ... 50	3/8-24 x 0.50 deep (M8 x 1.25-12)	3/8-24 x 0.63 (M14 x 1.5-20.5)	2.72 (69)	0.55 (14)	0.28 (7)	0.91 (28.5)	1.57 (40)
50	10 ... 50	1/2-20 x 0.50 deep (M10 x 1.5-12)	1/2-20 x 0.77 (M18 x 1.5-26)	3.34 (84.9)	0.67 (17)	0.31 (8)	1.08 (33.5)	1.97 (50)
63	10 ... 50	1/2-20 x 0.50 deep (M10 x 1.5-12)	1/2-20 x .77 (M18 x 1.5-26)	4.01 (101.8)	0.67 (17)	0.31 (8)	1.08 (33.5)	2.36 (60)
80	10 ... 50	5/8-18 x 0.88 deep (M16 x 2.0-22)	5/8-18 x 1.00 (M22 x 1.5-32.5)	5.11 (129.8)	0.87 (22)	0.39 (10)	1.40 (43.5)	3.03 (77)
100	10 ... 50	3/4-16 x 0.88 deep (M20 x 2.5-22)	3/4-16 x 1.12 (M26 x 1.5-32.5)	6.06 (153.9)	1.06 (27)	0.47 (12)	1.59 (43.5)	3.70 (94)
125	10 ... 300	3/4-16 x 1.06 deep (M22 x 2.5-27)	3/4-16 x 1.12 (M30 x 1.5-42)	7.48 (190)	1.26 (32)	0.63 (16)	1.75 (58)	4.49 (114)
140	10 ... 300	3/4-16 x 1.06 deep (M22 x 2.5-27)	3/4-16 x 1.12 (M30 x 1.5-42)	8.27 (210)	1.26 (32)	0.63 (16)	1.75 (58)	5.04 (128)
160	10 ... 300	3/4-16 x 1.06 deep (M24 x 3.0-27)	3/4-16 x 1.12 (M36 x 1.5-47)	9.37 (238)	1.42 (36)	0.67 (17)	1.79 (64)	5.67 (144)
Ø	Stroke range	Ø N	Ø O	P*	Q	W	Z	
12	5 ... 30	0.14 (3.5)	0.26 x 0.14 (6.5 x 3.5 deep)	M5 x 0.8	0.28 (7.0)	- (-)	- (-)	
16	5 ... 30	0.14 (3.5)	0.26 x 0.14 (6.5 x 3.5 deep)	M5 x 0.8	0.31 (7.8)	- (-)	- (-)	
20	5 ... 50	0.22 (5.5)	0.35 x 0.28 (9.0 x 7.0 deep)	M5 x 0.8	0.32 (8.1)	- (-)	- (-)	
25	5 ... 50	0.22 (5.5)	0.35 x 0.28 (9.0 x 7.0 deep)	M5 x 0.8	0.33 (8.4)	- (-)	- (-)	
32	5.10 ... 50	0.22 (5.5)	0.35 x 0.28 (9.0 x 7.0 deep)	1/8*	0.34 (8.7)	1.94 (49.3)	0.84 (21.4)	
40	5 ... 50	0.22 (5.5)	0.35 x 0.28 (9.0 x 7.0 deep)	1/8*	0.36 (9.2)	2.24 (57.0)	0.84 (21.4)	
50	10 ... 50	0.26 (6.6)	0.43 x 0.31 (11.0 x 8.0 deep)	1/4*	0.41 (10.5)	2.78 (70.6)	1.04 (26.5)	
63	10 ... 50	0.35 (9)	0.55 x 0.41 (14.0 x 10.5 deep)	1/4*	0.45 (11.5)	3.29 (83.6)	1.04 (26.5)	
80	10 ... 50	0.43 (11)	0.69 x 0.53 (17.5 x 13.5 deep)	3/8*	0.55 (14.0)	4.09 (104)	1.18 (30.0)	
100	10 ... 50	0.43 (11)	0.69 x 0.53 (17.5 x 13.5 deep)	3/8*	0.71 (18.0)	4.80 (121.9)	1.18 (30.0)	
125	10 ... 300	0.50 (12.7)	0.83 x 0.72 (21.2 x 18.4 deep)	3/8*	0.96 (24.5)	6.02 (153)	1.53 (39.0)	
140	10 ... 300	0.50 (12.7)	0.83 x 0.72 (21.2 x 18.4 deep)	3/8*	0.96 (24.5)	6.61 (168)	1.53 (39.0)	
160	10 ... 300	0.57 (14.5)	0.95 x 0.83 (24.2 x 21.2 deep)	3/8*	1.08 (27.5)	7.40 (188)	1.53 (39.0)	

Dimensions in inches (mm)

\* Port sizes: DM/99000/... = G (BSP parallel ports), DC/99000/... = NPT (NPT ports). Note: M5 x 0.8 port will accept #10-32 male thread fittings.

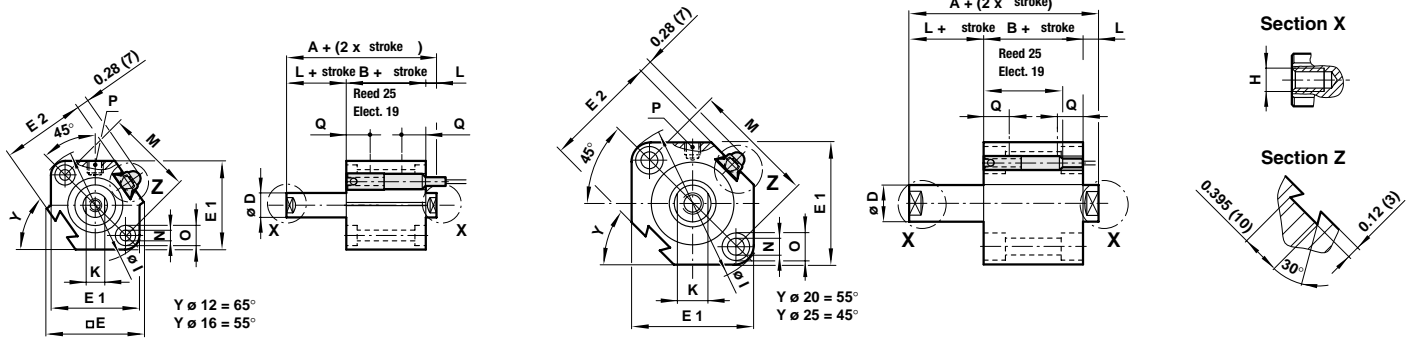


Double ended piston rod – DM/99000/JMX (Magnetic)

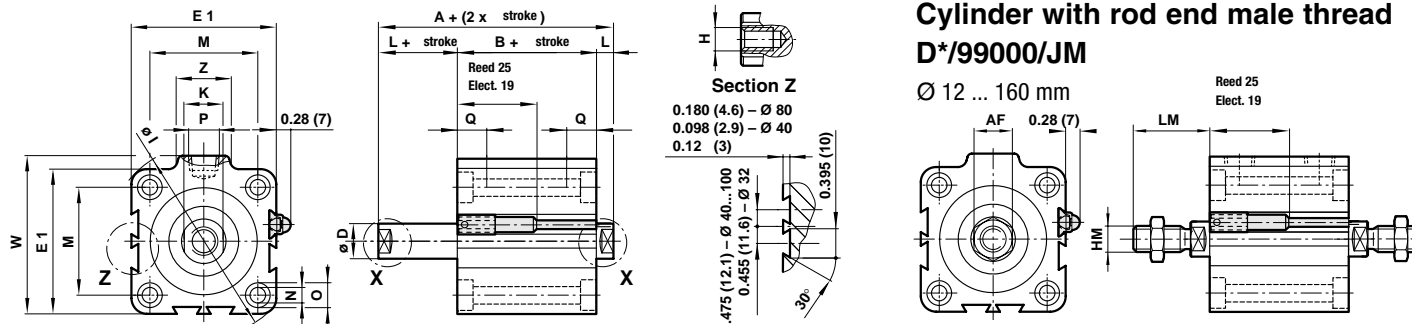
Ø 12 ... 16 mm

Ø 20 ... 25 mm

Ø 12 ... 25 mm

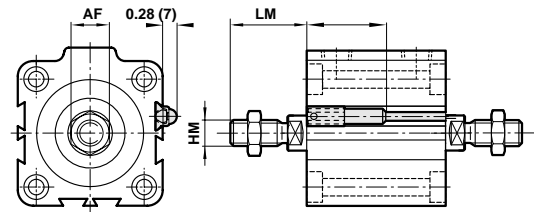


Ø 32 ... 160 mm



Cylinder with rod end male thread  
D\*/99000/JM

Ø 12 ... 160 mm



Ø	Stroke range	A	AF	B	Ø D	E	E1	E2
12	5 ... 30	1.55 (39.4)	0.34 (8)	1.28 (32.4)	0.236 (6)	1.09 (27.7)	0.98 (25)	0.90 (23)
16	5 ... 30	1.69 (43.0)	0.34 (10)	1.42 (36.0)	0.315 (8)	1.25 (31.7)	1.14 (29)	1.07 (27.2)
20	5 ... 50	1.85 (47.0)	0.38 (13)	1.50 (38.0)	0.394 (10)	- (-)	1.42 (36)	1.23 (31.2)
25	5 ... 50	1.93 (49.0)	0.43 (17)	1.54 (39)	0.472 (12)	- (-)	1.57 (40)	1.45 (36.9)
32	5 ... 50	2.15 (54.5)	0.50 (22)	1.59 (40.5)	0.630 (16)	- (-)	1.75 (44.5)	- (-)
40	5 ... 50	2.52 (64.0)	0.56 (22)	1.97 (50.0)	0.630 (16)	- (-)	2.05 (52)	- (-)
50	10 ... 50	2.62 (66.5)	0.75 (27)	1.99 (50.5)	0.787 (20)	- (-)	2.51 (63.7)	- (-)
63	10 ... 50	2.68 (68.0)	0.75 (27)	2.05 (52.0)	0.787 (20)	- (-)	3.02 (76.7)	- (-)
80	10 ... 50	3.19 (81.0)	0.93 (32)	2.40 (61.0)	0.984 (25)	- (-)	3.85 (97.8)	- (-)
100	10 ... 50	3.72 (94.5)	1.13 (46)	2.78 (70.5)	1.181 (30)	- (-)	4.54 (115.3)	- (-)
125	10 ... 300	4.53 (115)	1.13 (46)	3.27 (83.0)	1.417 (36)	- (-)	5.59 (142)	- (-)
140	10 ... 300	4.53 (115)	1.13 (46)	3.27 (83.0)	1.417 (36)	- (-)	6.22 (158)	- (-)
160	10 ... 300	4.92 (125)	1.35 (55)	3.58 (91.0)	1.575 (40)	- (-)	7.01 (178)	- (-)
Ø	Stroke range	H	HM	Ø I	K	L	LM	M
12	5 ... 30	#8-32 x .21 (M3 x 0.5-5 deep)	#8-32 x 0.31 (M5 x 0.8-9 deep)	1.24 (31.5)	0.20 (5)	0.14 (3.5)	0.45 (14)	0.87 (22)
16	5 ... 30	#8-32 x .21 (M4 x 0.7-5 deep)	#8-32 x 0.31 (M6 x 1.0-10 deep)	1.46 (37.1)	0.24 (6)	0.14 (3.5)	0.45 (15.5)	1.10 (28)
20	5 ... 50	#10-32 x .28 (M5 x 0.8-7 deep)	#10-32 x 0.31 (M8 x 1.25-12 deep)	1.85 (47)	0.31 (8)	0.18 (4.5)	0.49 (18.5)	1.42 (36)
25	5 ... 50	1/4-28 x .39 (M6 x 1.0-10 deep)	1/4-28 x 0.37 (M10 x 1.25-15 deep)	2.02 (51.3)	0.39 (10)	0.20 (5)	0.57 (22.5)	1.57 (40)
32	5 ... 50	5/16-24 x .50 (M8 x 1.25-12 deep)	5/16-24 x 0.50 (M14 x 1.5-20.5 deep)	2.32 (58.9)	0.55 (14)	0.28 (7)	0.78 (28.5)	1.34 (34)
40	5 ... 50	3/8-24 x .50 (M8 x 1.25-12 deep)	3/8-24 x 0.63 (M14 x 1.5-20.5 deep)	2.72 (69)	0.55 (14)	0.28 (7)	0.91 (28.5)	1.57 (40)
50	10 ... 50	1/2-20 x .50 (M10 x 1.5-12 deep)	1/2-20 x 0.77 (M18 x 1.5-26 deep)	3.34 (84.9)	0.67 (17)	0.31 (8)	1.08 (33.5)	1.97 (50)
63	10 ... 50	1/2-20 x .50 (M10 x 1.5-12 deep)	1/2-20 x .77 (M18 x 1.5-26 deep)	4.01 (101.8)	0.67 (17)	0.31 (8)	1.08 (33.5)	2.36 (60)
80	10 ... 50	5/8-18 x .88 (M16 x 2.0-22 deep)	5/8-18 x 1.00 (M22 x 1.5-32.5 deep)	5.11 (129.8)	0.87 (22)	0.39 (10)	1.40 (43.5)	3.03 (77)
100	10 ... 50	3/4-16 x .88 (M20 x 2.5-27 deep)	3/4-16 x 1.12 (M26 x 1.5-32.5 deep)	6.06 (153.9)	1.06 (27)	0.47 (12)	1.59 (43.5)	3.70 (94)
125	10 ... 300	3/4-16 x 1.06 (M22 x 2.5-27 deep)	3/4-16 x 1.12 (M30 x 1.5-42 deep)	7.48 (190)	1.26 (32)	0.63 (16)	1.75 (58)	4.49 (114)
140	10 ... 300	3/4-16 x 1.06 (M22 x 2.5-27 deep)	3/4-16 x 1.12 (M30 x 1.5-42 deep)	8.27 (210)	1.26 (32)	0.63 (16)	1.75 (58)	5.04 (128)
160	10 ... 300	3/4-16 x 1.06 (M24 x 3.0-27 deep)	3/4-16 x 1.12 (M36 x 1.5-47 deep)	9.37 (238)	1.42 (36)	0.67 (17)	1.79 (64)	5.67 (144)
Ø	Stroke range	Ø N	Ø O	P*	Q	W	Z	
12	5 ... 30	0.14 (3.5)	0.26 x 0.14 (6.5 x 3.5 deep)	M5 x 0.8	0.28 (7.0)	- (-)	- (-)	
16	5 ... 30	0.14 (3.5)	0.26 x 0.14 (6.5 x 3.5 deep)	M5 x 0.8	0.31 (7.8)	- (-)	- (-)	
20	5 ... 50	0.22 (5.5)	0.35 x 0.28 (9.0 x 7.0 deep)	M5 x 0.8	0.32 (8.1)	- (-)	- (-)	
25	5 ... 50	0.22 (5.5)	0.35 x 0.28 (9.0 x 7.0 deep)	M5 x 0.8	0.33 (8.4)	- (-)	- (-)	
32	5 ... 50	0.22 (5.5)	0.35 x 0.28 (9.0 x 7.0 deep)	1/8*	0.34 (8.7)	1.94 (49.3)	0.84 (21.4)	
40	5 ... 50	0.22 (5.5)	0.35 x 0.28 (9.0 x 7.0 deep)	1/8*	0.36 (9.2)	2.24 (57.0)	0.84 (21.4)	
50	10 ... 50	0.26 (6.6)	0.43 x 0.31 (11.0 x 8.0 deep)	1/4*	0.41 (10.5)	2.78 (70.6)	1.04 (26.5)	
63	10 ... 50	0.35 (9)	0.55 x 0.41 (14.0 x 10.5 deep)	1/4*	0.45 (11.5)	3.29 (83.6)	1.04 (26.5)	
80	10 ... 50	0.43 (11)	0.69 x 0.53 (17.5 x 13.5 deep)	3/8*	0.55 (14.0)	4.09 (104)	1.18 (30.0)	
100	10 ... 50	0.43 (11)	0.69 x 0.53 (17.5 x 13.5 deep)	3/8*	0.71 (18.0)	4.80 (121.9)	1.18 (30.0)	
125	10 ... 300	0.50 (12.7)	0.83 x 0.72 (21.2 x 18.4 deep)	3/8*	0.96 (24.5)	6.02 (153)	1.53 (39.0)	
140	10 ... 300	0.50 (12.7)	0.83 x 0.72 (21.2 x 18.4 deep)	3/8*	0.96 (24.5)	6.61 (168)	1.53 (39.0)	
160	10 ... 300	0.57 (14.5)	0.95 x 0.83 (24.2 x 21.2 deep)	3/8*	1.08 (27.5)	7.40 (188)	1.53 (39.0)	

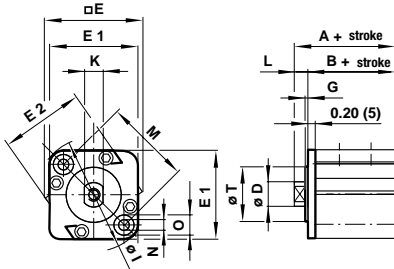
Dimensions in inches (mm) \* Port sizes: DM/99000/... = G (BSP parallel ports), DC/99000/... = NPT (NPT ports). Note: M5 x 0.8 port will accept #10-32 male thread fittings.



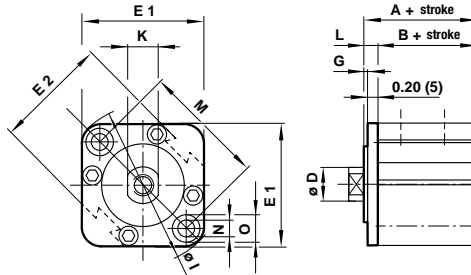
# Series 99000 Compact Actuators

## Cylinders with non-rotating piston rod – DM/99000/N1X (Non-magnetic)

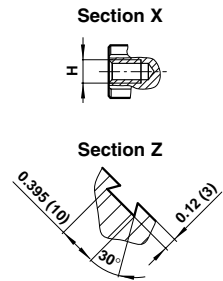
Ø 12 ... 16 mm



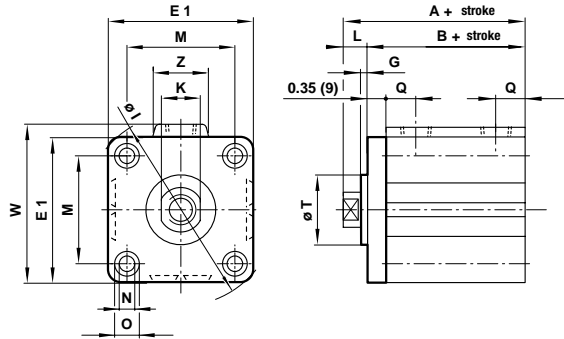
Ø 20 ... 25 mm



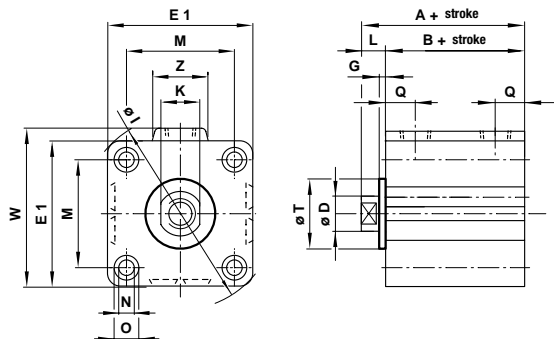
Ø 12 ... 25 mm



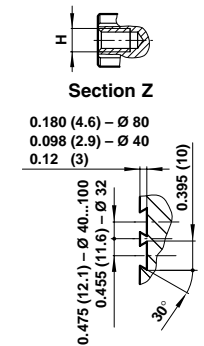
Ø 32 mm



Ø 40 ... 100 mm



Section X



**WARNING:** This cylinder has a non-rotating rod. To prevent internal damage hold rod by flats ONLY WHEN FULLY RETRACTED while installing or removing attachments. DO NOT SCRATCH OR DENT SHAFT.

Ø	Stroke range	A	AF	B	Ø D	E	E1	E2	G
12	5 ... 30	1.00 (25.5)	0.34 (8)	0.87 (22.0)	0.236 (6)	1.09 (27.7)	0.98 (25)	0.90 (23)	0.059 (1.5)
16	5 ... 30	1.06 (27.0)	0.34 (10)	0.93 (23.5)	0.315 (8)	1.25 (31.7)	1.14 (29)	1.07 (27.2)	0.059 (1.5)
20	5 ... 50	1.26 (32.0)	0.38 (13)	1.08 (27.5)	0.394 (10)	- (-)	1.42 (36)	1.23 (31.2)	0.079 (2.0)
25	5 ... 50	1.40 (35.5)	0.43 (17)	1.20 (30.5)	0.472 (12)	- (-)	1.57 (40)	1.45 (36.9)	0.079 (2.0)
32	5.10 ... 50	1.54 (39.0)	0.50 (22)	1.26 (32.0)	0.630 (16)	- (-)	1.75 (44.5)	- (-)	0.079 (2.0)
40	5 ... 50	1.44 (36.5)	0.56 (22)	1.16 (29.5)	0.630 (16)	- (-)	2.05 (52)	- (-)	0.079 (2.0)
50	10 ... 50	1.52 (38.5)	0.75 (27)	1.20 (30.5)	0.787 (20)	- (-)	2.51 (63.7)	- (-)	0.079 (2.0)
63	10 ... 50	1.73 (44.0)	0.75 (27)	1.42 (36.0)	0.787 (20)	- (-)	3.02 (76.7)	- (-)	0.079 (2.0)
80	10 ... 50	2.11 (53.5)	0.93 (32)	1.71 (43.5)	0.984 (25)	- (-)	3.85 (97.8)	- (-)	0.079 (2.0)
100	10 ... 50	2.56 (65.0)	1.13 (46)	2.09 (53.0)	1.181 (30)	- (-)	4.54 (115.3)	- (-)	0.079 (2.0)

Ø	Stroke range	H	HM	Ø I	K	L	LM	M	Ø N
12	5 ... 30	#8-32 x 0.21 (M3 x 0.5-5 deep)	#8-32 x 0.31 (M5 x 0.8-9 deep)	1.24 (31.5)	0.20 (5.2)	0.14 (3.5)	0.45 (14)	0.87 (22)	0.14 (3.5)
16	5 ... 30	#8-32 x 0.21 (M4 x 0.7-5 deep)	#8-32 x 0.31 (M6 x 1.0-10 deep)	1.46 (37.1)	0.24 (6)	0.14 (3.5)	0.45 (15.5)	1.10 (28)	0.14 (3.5)
20	5 ... 50	#10-32 x 0.28 (M5 x 0.8-7 deep)	#10-32 x 0.31 (M8 x 1.25-12 deep)	1.85 (47)	0.31 (8)	0.18 (4.5)	0.49 (18.5)	1.42 (36)	0.22 (5.5)
25	5 ... 50	1/4-28 x 0.39 (M6 x 1.0-10 deep)	1/4-28 x 0.37 (M10 x 1.25-15 deep)	2.02 (51.3)	0.39 (10)	0.20 (5)	0.57 (22.5)	1.57 (40)	0.22 (5.5)
32	5.10 ... 50	5/16-24 x 0.50 (M8 x 1.25-12 deep)	5/16-24 x 0.50 (M14 x 1.5-20.5 deep)	2.32 (58.9)	0.55 (14)	0.28 (7)	0.78 (28.5)	1.34 (34)	0.22 (5.5)
40	5 ... 50	3/8-24 x 0.50 (M8 x 1.25-12 deep)	3/8-24 x 0.63 (M14 x 1.5-20.5 deep)	2.72 (69)	0.55 (14)	0.28 (7)	0.91 (28.5)	1.57 (40)	0.22 (5.5)
50	10 ... 50	1/2-20 x 0.50 (M10 x 1.5-12 deep)	1/2-20 x 0.77 (M18 x 1.5-26 deep)	3.34 (84.9)	0.71 (18)	0.31 (8)	1.08 (33.5)	1.97 (50)	0.26 (6.6)
63	10 ... 50	1/2-20 x 0.50 (M10 x 1.5-12 deep)	1/2-20 x .77 (M18 x 1.5-26 deep)	4.01 (101.8)	0.71 (18)	0.31 (8)	1.08 (33.5)	2.36 (60)	0.35 (9)
80	10 ... 50	5/8-18 x 0.88 (M16 x 2.0-22 deep)	5/8-18 x 1.00 (M22 x 1.5-32.5 deep)	5.11 (129.8)	0.87 (22)	0.39 (10)	1.40 (43.5)	3.03 (77)	0.43 (11)
100	10 ... 50	3/4-16 x 0.88 (M20 x 2.5-22 deep)	3/4-16 x 1.12 (M26 x 1.5-32.5 deep)	6.06 (153.9)	1.06 (27)	0.47 (12)	1.59 (43.5)	3.7 (94)	0.43 (11)

Ø	Stroke range	Ø O	P*	Q	Ø T	W	Z
12	5 ... 30	0.26 x 0.14 (6.5 x 3.5)	M5 x 0.8	0.28 (7.0)	0.591 ±0.002 (15 ±0.043)	- (-)	- (-)
16	5 ... 30	0.26 x 0.14 (6.5 x 3.5)	M5 x 0.8	0.31 (7.8)	0.787 ±0.002 (20 ±0.052)	- (-)	- (-)
20	5 ... 50	0.35 x 0.28 (9.0 x 7.0)	M5 x 0.8	0.32 (8.1)	0.512 ±0.002 (13 ±0.043)	- (-)	- (-)
25	5 ... 50	0.35 x 0.28 (9.0 x 7.0)	M5 x 0.8	0.33 (8.4)	0.591 ±0.002 (15 ±0.043)	- (-)	- (-)
32	5.10 ... 50	0.35 x 0.28 (9.0 x 7.0)	M5 x 0.8	0.34 (8.7)	0.827 ±0.002 (21 ±0.062)	1.94 (49.3)	0.84 (21.4)
40	5 ... 50	0.35 x 0.28 (9.0 x 7.0)	1/8*	0.36 (9.2)	1.102 ±0.002 (28 ±0.062)	2.24 (57.0)	0.84 (21.4)
50	10 ... 50	0.43 x 0.31 (11.0 x 8.0)	1/4*	0.41 (10.5)	1.378 ±0.002 (35 ±0.062)	2.78 (70.6)	1.04 (26.5)
63	10 ... 50	0.55 x 0.41 (14.0 x 10.5)	1/4*	0.45 (11.5)	1.378 ±0.002 (35 ±0.062)	3.29 (83.6)	1.04 (26.5)
80	10 ... 50	0.69 x 0.53 (17.5 x 13.5)	3/8*	0.55 (14.0)	1.693 ±0.002 (43 ±0.062)	4.09 (104)	1.18 (30.0)
100	10 ... 50	0.69 x 0.53 (17.5 x 13.5)	3/8*	0.71 (18.0)	2.323 ±0.003 (59 ±0.074)	4.8 (121.9)	1.18 (30.0)

Dimensions in inches (mm) \* Port sizes: DM/99000/... = G (BSP parallel ports), DC/99000/... = NPT (NPT ports). Note: M5 x 0.8 port will accept #10-32 male thread fittings.

### Non-rotation accuracy

Deflection of the mounting plate B (°) at instroke position without load

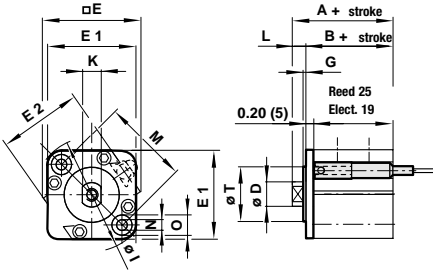
Ø	12	16	20	25	32	40	50	63	80	100
	±2°	±1°	±1°	±1°	±0.8°	±0.8°	±0.8°	±0.8°	±0.8°	±0.8°



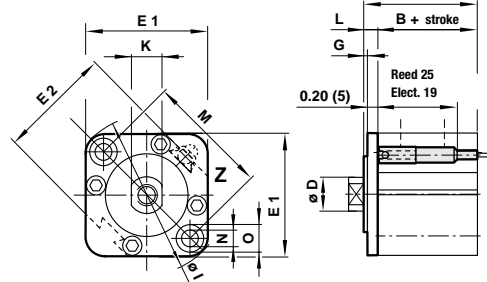


Cylinders with non-rotating piston rod – DM/99000/N2X (Magnetic)

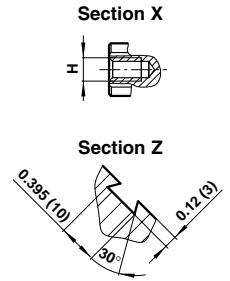
Ø 12 ... 16 mm



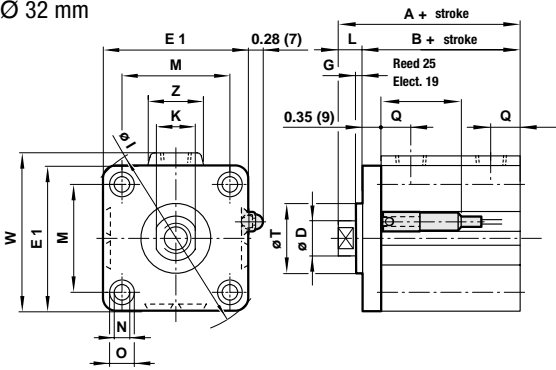
Ø 20 ... 25 mm



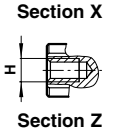
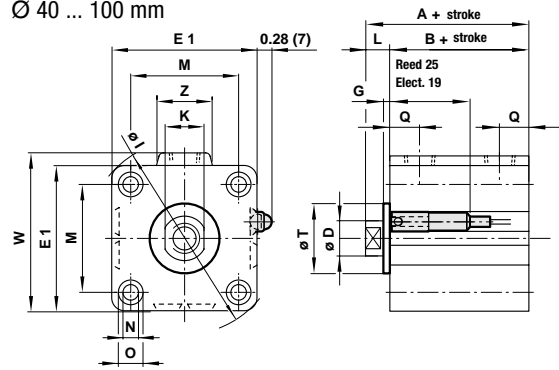
Ø 12 ... 25 mm



Ø 32 mm



Ø 40 ... 100 mm



**WARNING:** This cylinder has a non-rotating rod. To prevent internal damage hold rod by flats ONLY WHEN FULLY RETRACTED while installing or removing attachments. DO NOT SCRATCH OR DENT SHAFT.

Ø	Stroke range	A	AF	B	Ø D	E	E1	E2	G
12	5 ... 30	1.44 (36.5)	0.34 (8)	1.30 (33.0)	0.236 (6)	1.09 (27.7)	0.98 (25)	0.90 (23)	0.059 (1.5)
16	5 ... 30	1.54 (39.0)	0.34 (10)	1.40 (35.5)	0.315 (8)	1.25 (31.7)	1.14 (29)	1.07 (27.2)	0.059 (1.5)
20	5 ... 50	1.73 (44.0)	0.38 (13)	1.56 (39.5)	0.394 (10)	- (-)	1.42 (36)	1.23 (31.2)	0.079 (2.0)
25	5 ... 50	1.79 (45.5)	0.43 (17)	1.59 (40.5)	0.472 (12)	- (-)	1.57 (40)	1.45 (36.9)	0.079 (2.0)
32	5.10 ... 50	1.93 (49.0)	0.50 (22)	1.65 (42.0)	0.630 (16)	- (-)	1.75 (44.5)	- (-)	0.079 (2.0)
40	5 ... 50	1.83 (46.5)	0.56 (22)	1.56 (39.5)	0.630 (16)	- (-)	2.05 (52)	- (-)	0.079 (2.0)
50	10 ... 50	1.91 (48.5)	0.75 (27)	1.59 (40.5)	0.787 (20)	- (-)	2.51 (63.7)	- (-)	0.079 (2.0)
63	10 ... 50	2.13 (54.0)	0.75 (27)	1.81 (46.0)	0.787 (20)	- (-)	3.02 (76.7)	- (-)	0.079 (2.0)
80	10 ... 50	2.50 (63.5)	0.93 (32)	2.11 (53.5)	0.984 (25)	- (-)	3.85 (97.8)	- (-)	0.079 (2.0)
100	10 ... 50	2.95 (75.0)	1.13 (46)	2.48 (63.0)	1.181 (30)	- (-)	4.54 (115.3)	- (-)	0.079 (2.0)

Ø	Stroke range	H	HM	Ø I	K	L	LM	M	Ø N
12	5 ... 30	#8-32 x 0.21 (M3 x 0.5-5 deep)	#8-32 x 0.31 (M5 x 0.8-9 deep)	1.24 (31.5)	0.20 (5.2)	0.14 (3.5)	0.45 (14)	0.87 (22)	0.14 (3.5)
16	5 ... 30	#8-32 x 0.21 (M4 x 0.7-5 deep)	#8-32 x 0.31 (M6 x 1.0-10 deep)	1.46 (37.1)	0.24 (6)	0.14 (3.5)	0.45 (15.5)	1.10 (28)	0.14 (3.5)
20	5 ... 50	#10-32 x 0.28 (M5 x 0.8-7 deep)	#10-32 x 0.31 (M8 x 1.25-12 deep)	1.85 (47)	0.31 (8)	0.18 (4.5)	0.49 (18.5)	1.42 (36)	0.22 (5.5)
25	5 ... 50	1/4-28 x 0.39 (M6 x 1.0-10 deep)	1/4-28 x 0.37 (M10 x 1.25-15 deep)	2.02 (51.3)	0.39 (10)	0.20 (5)	0.57 (22.5)	1.57 (40)	0.22 (5.5)
32	5.10 ... 50	5/16-24 x 0.50 (M8 x 1.25-12 deep)	5/16-24 x 0.50 (M14 x 1.5-20.5 deep)	2.32 (58.9)	0.55 (14)	0.28 (7)	0.78 (28.5)	1.34 (34)	0.22 (5.5)
40	5 ... 50	3/8-24 x 0.50 (M8 x 1.25-12 deep)	3/8-24 x 0.63 (M14 x 1.5-20.5 deep)	2.72 (69)	0.55 (14)	0.28 (7)	0.91 (28.5)	1.57 (40)	0.22 (5.5)
50	10 ... 50	1/2-20 x 0.50 (M10 x 1.5-12 deep)	1/2-20 x 0.77 (M18 x 1.5-26 deep)	3.34 (84.9)	0.71 (18)	0.31 (8)	1.08 (33.5)	1.97 (50)	0.26 (6.6)
63	10 ... 50	1/2-20 x 0.50 (M10 x 1.5-12 deep)	1/2-20 x 0.77 (M18 x 1.5-26 deep)	4.01 (101.8)	0.71 (18)	0.31 (8)	1.08 (33.5)	2.36 (60)	0.35 (9)
80	10 ... 50	5/8-18 x 0.88 (M16 x 2.0-22 deep)	5/8-18 x 1.00 (M22 x 1.5-32.5 deep)	5.11 (129.8)	0.87 (22)	0.39 (10)	1.40 (43.5)	3.03 (77)	0.43 (11)
100	10 ... 50	3/4-16 x 0.88 (M20 x 2.5-22 deep)	3/4-16 x 1.12 (M26 x 1.5-32.5 deep)	6.06 (153.9)	1.06 (27)	0.47 (12)	1.59 (43.5)	3.7 (94)	0.43 (11)

Ø	Stroke range	Ø O	P*	Q	Ø T	W	Z
12	5 ... 30	0.26 x 0.14 (6.5 x 3.5)	M5 x 0.8	0.28 (7.0)	0.591 ±0.002 (15 ±0.043)	- (-)	- (-)
16	5 ... 30	0.26 x 0.14 (6.5 x 3.5)	M5 x 0.8	0.31 (7.8)	0.787 ±0.002 (20 ±0.052)	- (-)	- (-)
20	5 ... 50	0.35 x 0.28 (9.0 x 7.0)	M5 x 0.8	0.32 (8.1)	0.512 ±0.002 (13 ±0.043)	- (-)	- (-)
25	5 ... 50	0.35 x 0.28 (9.0 x 7.0)	M5 x 0.8	0.33 (8.4)	0.591 ±0.002 (15 ±0.043)	- (-)	- (-)
32	5.10 ... 50	0.35 x 0.28 (9.0 x 7.0)	M5 x 0.8	0.34 (8.7)	0.827 ±0.002 (21 ±0.062)	1.94 (49.3)	0.84 (21.4)
40	5 ... 50	0.35 x 0.28 (9.0 x 7.0)	1/8*	0.36 (9.2)	1.102 ±0.002 (28 ±0.062)	2.24 (57.0)	0.84 (21.4)
50	10 ... 50	0.43 x 0.31 (11.0 x 8.0)	1/4*	0.41 (10.5)	1.378 ±0.002 (35 ±0.062)	2.78 (70.6)	1.04 (26.5)
63	10 ... 50	0.55 x 0.41 (14.0 x 10.5)	1/4*	0.45 (11.5)	1.378 ±0.002 (35 ±0.062)	3.29 (83.6)	1.04 (26.5)
80	10 ... 50	0.69 x 0.53 (17.5 x 13.5)	3/8*	0.55 (14.0)	1.693 ±0.002 (43 ±0.062)	4.09 (104)	1.18 (30.0)
100	10 ... 50	0.69 x 0.53 (17.5 x 13.5)	3/8*	0.71 (18.0)	2.323 ±0.003 (59 ±0.074)	4.8 (121.9)	1.18 (30.0)

Dimensions in inches (mm) \* Port sizes: DM/99000/... = G (BSP parallel ports), DC/99000/... = NPT (NPT ports). Note: M5 x 0.8 port will accept #10-32 male thread fittings.

**Non-rotation accuracy**

Deflection of the mounting plate B (°) at instroke position without load

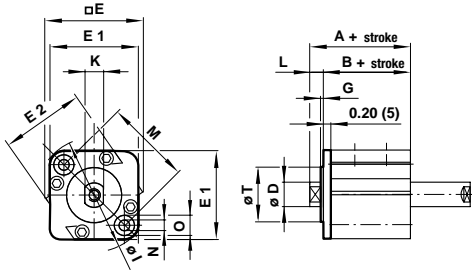
Ø	12	16	20	25	32	40	50	63	80	100
	±2°	±1°	±1°	±1°	±0.8°	±0.8°	±0.8°	±0.8°	±0.8°	±0.8°



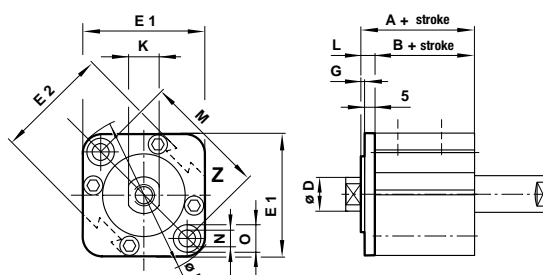
# Series 99000 Compact Actuators

## Cylinders with non-rotating piston rod – DM/99000/N5X (Non-magnetic)

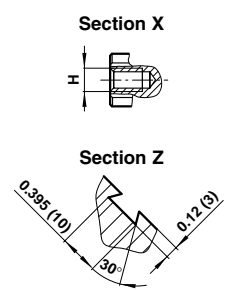
Ø 12 ... 16 mm



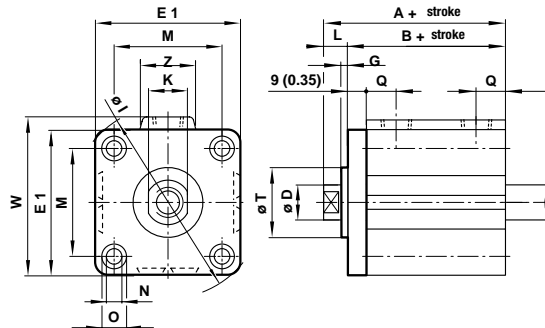
Ø 20 ... 25 mm



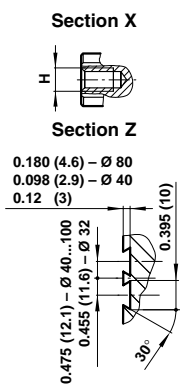
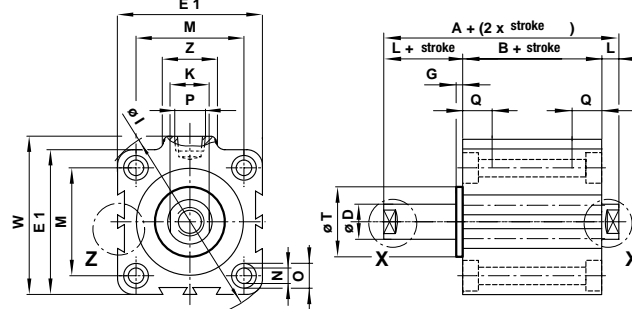
Ø 12 ... 25 mm



Ø 32 mm



Ø 40 ... 100 mm



**WARNING:** This cylinder has a non-rotating rod. To prevent internal damage hold rod by flats **ONLY** WHEN FULLY RETRACTED while installing or removing attachments. DO NOT SCRATCH OR DENT SHAFT.

Ø	Stroke range	A	AF	B	Ø D	E	E1	E2	G
12	5 ... 30	1.46 (37.2)	0.34 (8)	1.19 (30.2)	0.236 (6)	1.09 (27.7)	0.98 (25)	0.90 (23)	0.059 (1.5)
16	5 ... 30	1.50 (38.0)	0.34 (10)	1.22 (31.0)	0.315 (8)	1.25 (31.7)	1.14 (29)	1.07 (27.2)	0.059 (1.5)
20	5 ... 50	1.69 (43.0)	0.38 (13)	1.34 (34.0)	0.394 (10)	- (-)	1.42 (36)	1.23 (31.2)	0.079 (2.0)
25	5 ... 50	1.85 (47.0)	0.43 (17)	1.46 (37.0)	0.472 (12)	- (-)	1.57 (40)	1.45 (36.9)	0.079 (2.0)
32	5.10 ... 50	2.11 (53.5)	0.50 (22)	1.56 (39.5)	0.630 (16)	- (-)	1.75 (44.5)	- (-)	0.079 (2.0)
40	5 ... 50	2.13 (54.0)	0.56 (22)	1.57 (40.0)	0.630 (16)	- (-)	2.05 (52)	- (-)	0.079 (2.0)
50	10 ... 50	2.22 (56.5)	0.75 (27)	1.59 (40.5)	0.787 (20)	- (-)	2.51 (63.7)	- (-)	0.079 (2.0)
63	10 ... 50	2.28 (58.0)	0.75 (27)	1.65 (42.0)	0.787 (20)	- (-)	3.02 (76.7)	- (-)	0.079 (2.0)
80	10 ... 50	2.80 (71.0)	0.93 (32)	2.01 (51.0)	0.984 (25)	- (-)	3.85 (97.8)	- (-)	0.079 (2.0)
100	10 ... 50	3.33 (84.5)	1.13 (46)	2.38 (60.5)	1.181 (30)	- (-)	4.54 (115.3)	- (-)	0.079 (2.0)

Ø	Stroke range	H	HM	Ø I	K	L	LM	M	Ø N
12	5 ... 30	#8-32 x 0.21 (M3 x 0.5-5 deep)	#8-32 x 0.31 (M5 x 0.8-9 deep)	1.24 (31.5)	0.20 (5.2)	0.14 (3.5)	0.45 (14)	0.87 (22)	0.14 (3.5)
16	5 ... 30	#8-32 x 0.21 (M4 x 0.7-5 deep)	#8-32 x 0.31 (M6 x 1.0-10 deep)	1.46 (37.1)	0.24 (6)	0.14 (3.5)	0.45 (15.5)	1.10 (28)	0.14 (3.5)
20	5 ... 50	#10-32 x 0.28 (M5 x 0.8-7 deep)	#10-32 x 0.31 (M8 x 1.25-12 deep)	1.85 (47)	0.31 (8)	0.18 (4.5)	0.49 (18.5)	1.42 (36)	0.22 (5.5)
25	5 ... 50	1/4-28 x 0.39 (M6 x 1.0-10 deep)	1/4-28 x 0.37 (M10 x 1.25-15 deep)	2.02 (51.3)	0.39 (10)	0.20 (5)	0.57 (22.5)	1.57 (40)	0.22 (5.5)
32	5.10 ... 50	5/16-24 x 0.50 (M8 x 1.25-12 deep)	5/16-24 x 0.50 (M14 x 1.5-20.5 deep)	2.32 (58.9)	0.55 (14)	0.28 (7)	0.78 (28.5)	1.34 (34)	0.22 (5.5)
40	5 ... 50	3/8-24 x 0.50 (M8 x 1.25-12 deep)	3/8-24 x 0.63 (M14 x 1.5-20.5 deep)	2.72 (69)	0.55 (14)	0.28 (7)	0.91 (28.5)	1.57 (40)	0.22 (5.5)
50	10 ... 50	1/2-20 x 0.50 (M10 x 1.5-12 deep)	1/2-20 x 0.77 (M18 x 1.5-26 deep)	3.34 (84.9)	0.71 (18)	0.31 (8)	1.08 (33.5)	1.97 (50)	0.26 (6.6)
63	10 ... 50	1/2-20 x 0.50 (M10 x 1.5-12 deep)	1/2-20 x 0.77 (M18 x 1.5-26 deep)	4.01 (101.8)	0.71 (18)	0.31 (8)	1.08 (33.5)	2.36 (60)	0.35 (9)
80	10 ... 50	5/8-18 x 0.88 (M16 x 2.0-22 deep)	5/8-18 x 1.00 (M22 x 1.5-32.5 deep)	5.11 (129.8)	0.87 (22)	0.39 (10)	1.40 (43.5)	3.03 (77)	0.43 (11)
100	10 ... 50	3/4-16 x 0.88 (M20 x 2.5-22 deep)	3/4-16 x 1.12 (M26 x 1.5-32.5 deep)	6.06 (153.9)	1.06 (27)	0.47 (12)	1.59 (43.5)	3.7 (94)	0.43 (11)

Ø	Stroke range	Ø 0	P*	Q	Ø T	W	Z
12	5 ... 30	0.26 x 0.14 (6.5 x 3.5)	M5 x 0.8	0.28 (7.0)	0.591 ±0.002 (15 ±0.043)	- (-)	- (-)
16	5 ... 30	0.26 x 0.14 (6.5 x 3.5)	M5 x 0.8	0.31 (7.8)	0.787 ±0.002 (20 ±0.052)	- (-)	- (-)
20	5 ... 50	0.35 x 0.28 (9.0 x 7.0)	M5 x 0.8	0.32 (8.1)	0.512 ±0.002 (13 ±0.043)	- (-)	- (-)
25	5 ... 50	0.35 x 0.28 (9.0 x 7.0)	M5 x 0.8	0.33 (8.4)	0.591 ±0.002 (15 ±0.043)	- (-)	- (-)
32	5.10 ... 50	0.35 x 0.28 (9.0 x 7.0)	M5 x 0.8	0.34 (8.7)	0.827 ±0.002 (21 ±0.062)	1.94 (49.3)	0.84 (21.4)
40	5 ... 50	0.35 x 0.28 (9.0 x 7.0)	1/8*	0.36 (9.2)	1.102 ±0.002 (28 ±0.062)	2.24 (57.0)	0.84 (21.4)
50	10 ... 50	0.43 x 0.31 (11.0 x 8.0)	1/4*	0.41 (10.5)	1.378 ±0.002 (35 ±0.062)	2.78 (70.6)	1.04 (26.5)
63	10 ... 50	0.55 x 0.41 (14.0 x 10.5)	1/4*	0.45 (11.5)	1.378 ±0.002 (35 ±0.062)	3.29 (83.6)	1.04 (26.5)
80	10 ... 50	0.69 x 0.53 (17.5 x 13.5)	3/8*	0.55 (14.0)	1.693 ±0.002 (43 ±0.062)	4.09 (104)	1.18 (30.0)
100	10 ... 50	0.69 x 0.53 (17.5 x 13.5)	3/8*	0.71 (18.0)	2.323 ±0.003 (59 ±0.074)	4.8 (121.9)	1.18 (30.0)

Dimensions in inches (mm) \* Port sizes: DM/99000/... = G (BSP parallel ports), DC/99000/... = NPT (NPT ports). Note: M5 x 0.8 port will accept #10-32 male thread fittings.

### Non-rotation accuracy

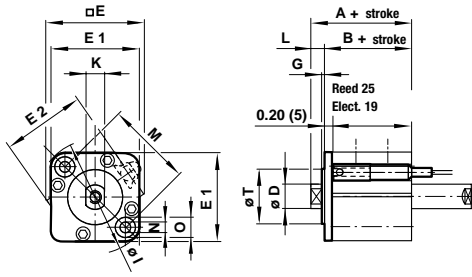
Deflection of the mounting plate B (°) at instroke position without load

Ø	12	16	20	25	32	40	50	63	80	100
	±2°	±1°	±1°	±1°	±0.8°	±0.8°	±0.8°	±0.8°	±0.8°	±0.8°

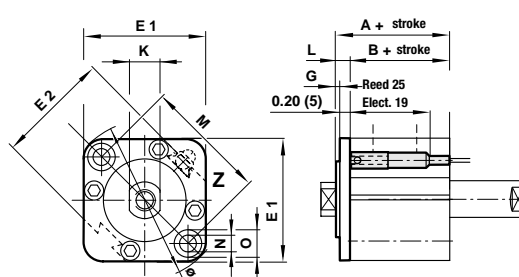


Cylinders with non-rotating piston rod – DM/99000/N6X (Magnetic)

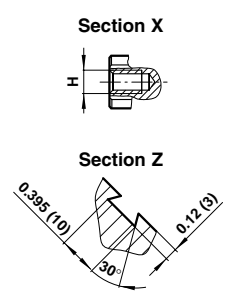
Ø 12 ... 16 mm



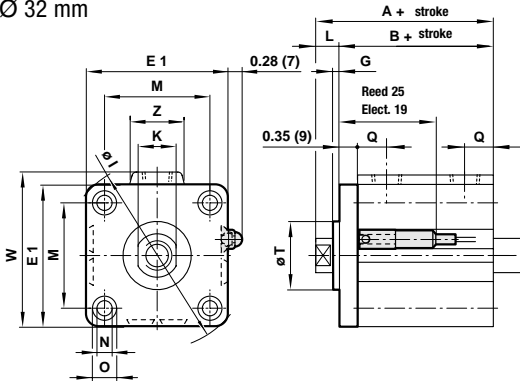
Ø 20 ... 25 mm



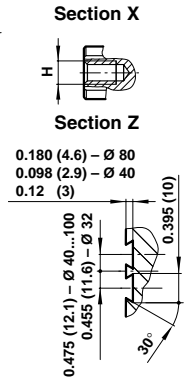
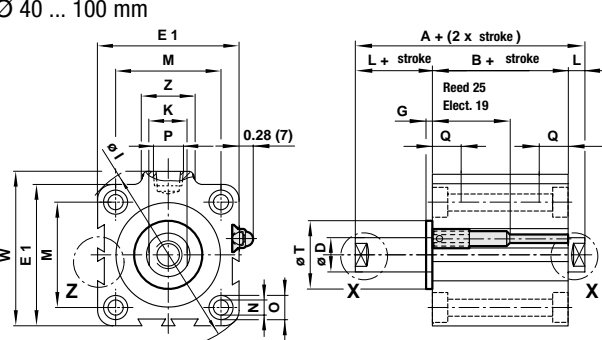
Ø 12 ... 25 mm



Ø 32 mm



Ø 40 ... 100 mm



**WARNING:** This cylinder has a non-rotating rod. To prevent internal damage hold rod by flats ONLY WHEN FULLY RETRACTED while installing or removing attachments. DO NOT SCRATCH OR DENT SHAFT.

Ø	Stroke range	A	AF	B	Ø D	□ E	E1	E2	G
12	5 ... 30	1.75 (44.4)	0.34 (8)	1.47 (37.4)	0.236 (6)	1.09 (27.7)	0.98 (25)	0.90 (23)	0.059 (1.5)
16	5 ... 30	1.89 (48.0)	0.34 (10)	1.61 (41.0)	0.315 (8)	1.25 (31.7)	1.14 (29)	1.07 (27.2)	0.059 (1.5)
20	5 ... 50	2.17 (55.0)	0.38 (13)	1.81 (46.0)	0.394 (10)	- (-)	1.42 (36)	1.23 (31.2)	0.079 (2.0)
25	5 ... 50	2.24 (57.0)	0.43 (17)	1.85 (47.0)	0.472 (12)	- (-)	1.57 (40)	1.45 (36.9)	0.079 (2.0)
32	5.10 ... 50	2.50 (63.5)	0.50 (22)	1.95 (49.5)	0.630 (16)	- (-)	1.75 (44.5)	- (-)	0.079 (2.0)
40	5 ... 50	2.52 (64.0)	0.56 (22)	1.97 (50.0)	0.630 (16)	- (-)	2.05 (52)	- (-)	0.079 (2.0)
50	10 ... 50	2.62 (66.5)	0.75 (27)	1.99 (50.5)	0.787 (20)	- (-)	2.51 (63.7)	- (-)	0.079 (2.0)
63	10 ... 50	2.68 (68.0)	0.75 (27)	2.05 (52.0)	0.787 (20)	- (-)	3.02 (76.7)	- (-)	0.079 (2.0)
80	10 ... 50	3.19 (81.0)	0.93 (32)	2.40 (61.0)	0.984 (25)	- (-)	3.85 (97.8)	- (-)	0.079 (2.0)
100	10 ... 50	3.72 (94.5)	1.13 (46)	2.78 (70.5)	1.181 (30)	- (-)	4.54 (115.3)	- (-)	0.079 (2.0)
Ø	Stroke range	H	HM	Ø I	K	L	LM	M	Ø N
12	5 ... 30	#8-32 x 0.21 (M3 x 0.5-5 deep)	#8-32 x 0.31 (M5 x 0.8-9 deep)	1.24 (31.5)	0.20 (5.2)	0.14 (3.5)	0.45 (14)	0.87 (22)	0.14 (3.5)
16	5 ... 30	#8-32 x 0.21 (M4 x 0.7-5 deep)	#8-32 x 0.31 (M6 x 1.0-10 deep)	1.46 (37.1)	0.24 (6)	0.14 (3.5)	0.45 (15.5)	1.10 (28)	0.14 (3.5)
20	5 ... 50	#10-32 x 0.28 (M5 x 0.8-7 deep)	#10-32 x 0.31 (M8 x 1.25-12 deep)	1.85 (47)	0.31 (8)	0.18 (4.5)	0.49 (18.5)	1.42 (36)	0.22 (5.5)
25	5 ... 50	1/4-28 x 0.39 (M6 x 1.0-10 deep)	1/4-28 x 0.37 (M10 x 1.25-15 deep)	2.02 (51.3)	0.39 (10)	0.20 (5)	0.57 (22.5)	1.57 (40)	0.22 (5.5)
32	5.10 ... 50	5/16-24 x 0.50 (M8 x 1.25-12 deep)	5/16-24 x 0.50 (M14 x 1.5-20.5 deep)	2.32 (58.9)	0.55 (14)	0.28 (7)	0.78 (28.5)	1.34 (34)	0.22 (5.5)
40	5 ... 50	3/8-24 x 0.50 (M8 x 1.25-12 deep)	3/8-24 x 0.63 (M14 x 1.5-20.5 deep)	2.72 (69)	0.55 (14)	0.28 (7)	0.91 (28.5)	1.57 (40)	0.22 (5.5)
50	10 ... 50	1/2-20 x 0.50 (M10 x 1.5-12 deep)	1/2-20 x 0.77 (M18 x 1.5-26 deep)	3.34 (84.9)	0.71 (18)	0.31 (8)	1.08 (33.5)	1.97 (50)	0.26 (6.6)
63	10 ... 50	1/2-20 x 0.50 (M10 x 1.5-12 deep)	1/2-20 x .77 (M18 x 1.5-26 deep)	4.01 (101.8)	0.71 (18)	0.31 (8)	1.08 (33.5)	2.36 (60)	0.35 (9)
80	10 ... 50	5/8-18 x 0.88 (M16 x 2.0-22 deep)	5/8-18 x 1.00 (M22 x 1.5-32.5 deep)	5.11 (129.8)	0.87 (22)	0.39 (10)	1.40 (43.5)	3.03 (77)	0.43 (11)
100	10 ... 50	3/4-16 x 0.88 (M20 x 2.5-22 deep)	3/4-16 x 1.12 (M26 x 1.5-32.5 deep)	6.06 (153.9)	1.06 (27)	0.47 (12)	1.59 (43.5)	3.7 (94)	0.43 (11)
Ø	Stroke range	Ø O	P*	Q	Ø T	W	Z		
12	5 ... 30	0.26 x 0.14 (6.5 x 3.5)	M5 x 0.8	0.28 (7.0)	0.591 ±0.002 (15 ±0.043)	- (-)	- (-)		
16	5 ... 30	0.26 x 0.14 (6.5 x 3.5)	M5 x 0.8	0.31 (7.8)	0.787 ±0.002 (20 ±0.052)	- (-)	- (-)		
20	5 ... 50	0.35 x 0.28 (9.0 x 7.0)	M5 x 0.8	0.32 (8.1)	0.512 ±0.002 (13 ±0.043)	- (-)	- (-)		
25	5 ... 50	0.35 x 0.28 (9.0 x 7.0)	M5 x 0.8	0.33 (8.4)	0.591 ±0.002 (15 ±0.043)	- (-)	- (-)		
32	5.10 ... 50	0.35 x 0.28 (9.0 x 7.0)	M5 x 0.8	0.34 (8.7)	0.827 ±0.002 (21 ±0.062)	1.94 (49.3)	0.84 (21.4)		
40	5 ... 50	0.35 x 0.28 (9.0 x 7.0)	1/8*	0.36 (9.2)	1.102 ±0.002 (28 ±0.062)	2.24 (57.0)	0.84 (21.4)		
50	10 ... 50	0.43 x 0.31 (11.0 x 8.0)	1/4*	0.41 (10.5)	1.378 ±0.002 (35 ±0.062)	2.78 (70.6)	1.04 (26.5)		
63	10 ... 50	0.55 x 0.41 (14.0 x 10.5)	1/4*	0.45 (11.5)	1.378 ±0.002 (35 ±0.062)	3.29 (83.6)	1.04 (26.5)		
80	10 ... 50	0.69 x 0.53 (17.5 x 13.5)	3/8*	0.55 (14.0)	1.693 ±0.002 (43 ±0.062)	4.09 (104)	1.18 (30.0)		
100	10 ... 50	0.69 x 0.53 (17.5 x 13.5)	3/8*	0.71 (18.0)	2.323 ±0.003 (59 ±0.074)	4.8 (121.9)	1.18 (30.0)		

Dimensions in inches (mm) \* Port sizes: DM/99000/... = G (BSP parallel ports), DC/99000/... = NPT (NPT ports). Note: M5 x 0.8 port will accept #10-32 male thread fittings.

**Non-rotation accuracy**

Deflection of the mounting plate B (°) at instroke position without load

Ø	12	16	20	25	32	40	50	63	80	100
	±2°	±1°	±1°	±1°	±0.8°	±0.8°	±0.8°	±0.8°	±0.8°	±0.8°

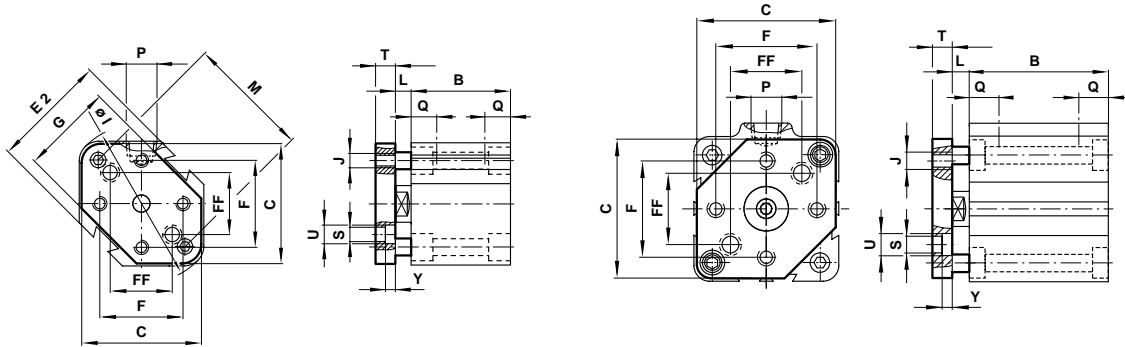


# Series 99000 Compact Actuators

## Guided toolplate – DM/99000/N3 (Non-magnetic)

Ø 12 ... 25 mm

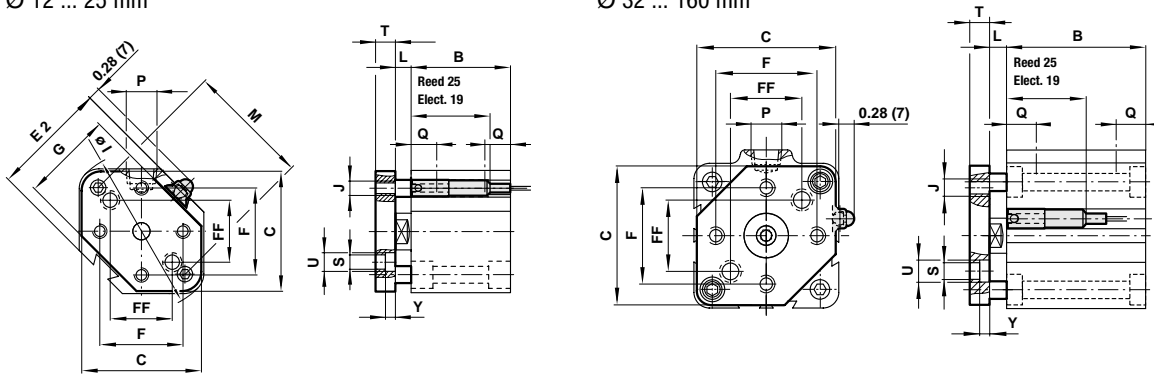
Ø 32 ... 160 mm



## Guided toolplate – DM/99000/N4 (Magnetic)

Ø 12 ... 25 mm

Ø 32 ... 160 mm



Ø	Stroke range	C	E1	E2	F	FF	G	Ø I	J	L	M	
12	5 ... 100	0.94 (24)	0.98 (25)	0.90 (23)	0.63 (16)	- (-)	0.82 (20.8)	1.24 (31.5)	6-32 (M3 x 0.5)	0.14 (3.5)	0.87 (22)	
16	5 ... 100	1.10 (28)	1.14 (29)	1.07 (27.2)	0.81 (20)	0.44 (11)	0.98 (25)	1.46 (37.1)	6-32 (M4 x 0.7)	0.14 (3.5)	1.10 (28)	
20	5 ... 100	1.38 (35)	1.42 (36)	1.23 (31.2)	1.06 (27)	0.57 (14.5)	1.00 (25.4)	1.85 (47)	8-32 (M6 x 1.0)	0.18 (4.5)	1.42 (36)	
25	5 ... 100	1.54 (40)	1.57 (40)	1.45 (36.9)	1.13 (28.5)	0.66 (16.6)	1.18 (30)	2.02 (51.3)	8-32 (M6 x 1.0)	0.20 (5)	1.57 (40)	
32	5 ... 150	1.71 (43.4)	1.75 (44.5)	- (-)	1.19 (30)	0.84 (21.2)	1.44 (36.7)	2.32 (58.9)	10-24 (M5 x 0.8)	0.28 (7)	1.34 (34)	
40	5 ... 150	2.00 (50.5)	2.05 (52)	- (-)	1.38 (35)	0.97 (24.7)	1.78 (45.1)	2.72 (69)	1/4-20 (M6 x 1.0)	0.28 (7)	1.57 (40)	
50	5 ... 150	2.47 (62.7)	2.51 (63.7)	- (-)	1.75 (45.5)	1.24 (32.2)	2.25 (57.1)	3.34 (84.9)	5/16-18 (M8 x 1.25)	0.31 (8)	1.97 (50)	
63	5 ... 150	2.98 (75.7)	3.02 (76.7)	- (-)	2.00 (50.5)	1.41 (35.7)	2.69 (68.3)	4.01 (101.8)	7/16-14 (M10 x 1.5)	0.31 (8)	2.36 (60)	
80	5 ... 150	3.81 (96.9)	3.85 (97.8)	- (-)	2.75 (70)	1.95 (49.5)	3.50 (88.9)	5.11 (129.8)	1/2-13 (M12 x 1.75)	0.39 (10)	3.03 (77)	
100	5 ... 150	4.50 (114.4)	4.54 (115.3)	- (-)	3.25 (82.5)	2.30 (58.3)	4.45 (112.9)	6.06 (153.9)	1/2-13 (M12 x 1.75)	0.47 (12)	3.70 (94)	
125	5 ... 300	5.55 (141)	5.59 (142)	- (-)	3.74 (95)	2.65 (67.2)	5.30 (134.7)	7.48 (190)	*	(M14 x 2.0)	0.63 (16)	4.49 (114)
140	5 ... 300	6.18 (157)	6.22 (158)	- (-)	4.00 (101.5)	2.83 (71.8)	6.08 (154.5)	8.27 (210)	*	(M14 x 2.0)	0.63 (16)	5.04 (128)
160	5 ... 300	6.91 (175.5)	7.01 (178)	- (-)	4.74 (120.5)	3.35 (85.2)	6.85 (174.1)	9.37 (238)	*	(M16 x 2.0)	0.67 (17)	5.67 (144)

Ø	Stroke range	N	O	P	Q	S	T	U	W	Y	Z
12	5 ... 100	- (-)	- (-)	M5 x 0.8	0.28 (7)	- (-)	0.24 (6.1)	- (-)	- (-)	- (-)	- (-)
16	5 ... 100	- (-)	0.26 x 14 (6.5 x 3.5 deep)	M5 x 0.8	0.31 (7.8)	0.14 (3.3)	0.24 (6.1)	- (-)	- (-)	- (-)	- (-)
20	5 ... 100	- (-)	0.35 x 0.28 (9.0 x 7.0 deep)	M5 x 0.8	0.32 (8.1)	0.17 (4.2)	0.27 (6.9)	0.28 (7)	- (-)	0.06 (1.5)	- (-)
25	5 ... 100	- (-)	0.35 x 0.28 (9.0 x 7.0 deep)	M5 x 0.8	0.33 (8.4)	0.17 (4.2)	0.33 (8.3)	- (-)	- (-)	- (-)	- (-)
32	5 ... 150	0.22 (5.5)	0.35 x 0.28 (9.0 x 7.0 deep)	1/8*‡	0.34 (8.7)	0.20 (5.2)	0.33 (8.3)	- (-)	1.94 (49.3)	- (-)	0.84 (21.4)
40	5 ... 150	0.22 (5.5)	0.35 x 0.28 (9.0 x 7.0 deep)	1/8*	0.36 (9.2)	0.26 (6.1)	0.33 (8.3)	- (-)	2.24 (57)	- (-)	0.84 (21.4)
50	5 ... 150	0.26 (6.6)	0.43 x 0.31 (11.0 x 8.0 deep)	1/4*	0.41 (10.5)	0.33 (8.2)	0.48 (12.1)	0.49 (13.5)	2.78 (70.6)	0.10 (2.5)	1.04 (26.5)
63	5 ... 150	0.35 (9)	0.55 x 0.41 (14.0 x 10.5 deep)	1/4*	0.45 (11.5)	0.45 (11.5)	0.49 (12.5)	0.68 (16.5)	3.29 (83.6)	0.18 (3.3)	1.04 (26.5)
80	5 ... 150	0.43 (11)	0.69 x 0.53 (17.5 x 13.5 deep)	3/8*	0.55 (14)	0.52 (12.3)	0.55 (14)	0.77 (18.5)	4.09 (104)	0.18 (3.8)	1.18 (30)
100	5 ... 150	0.43 (11)	0.69 x 0.53 (17.5 x 13.5 deep)	3/8*	0.71 (18)	0.52 (12.3)	0.55 (14)	0.77 (18.5)	4.80 (121.9)	0.13 (3.2)	1.18 (30)
125	5 ... 300	0.50 (12.7)	0.83 x 0.72 (21.2 x 18.4 deep)	3/8*	0.96 (24.5)	* (14.3)	0.83 (21)	- (-)	6.02 (153)	- (-)	1.53 (39)
140	5 ... 300	0.50 (12.7)	0.83 x 0.72 (21.2 x 18.4 deep)	3/8*	0.96 (24.5)	* (14.3)	0.83 (21)	- (-)	6.61 (168)	- (-)	1.53 (39)
160	5 ... 300	0.57 (14.5)	0.95 x 0.83 (24.2 x 21.2 deep)	3/8*	1.08 (27.5)	* (16.7)	0.83 (21)	- (-)	7.40 (188)	- (-)	1.53 (39)

Dimensions in inches (mm)

\* Port sizes: DM/99000/... = G (BSP parallel ports), DC/99000/... = NPT (NPT ports). Note: M5 x 0.8 port will accept #10-32 male thread fittings.

‡ Note: On 32 bore, 5 mm stroke, non-magnetic model only, port thread is M5 x 0.8 which will accept #10-32 male thread fittings.

Please see next page for 'B' and 'Q' dimensions.



Ø	Q									
	Stroke (mm)		50	75	100	125, 150	175 ... 300			
	5 ... 45	5 ... 100								
12	0.28 (7)	- (-)	0.35 (9)	0.35 (9)	0.35 (9)	- (-)	- (-)	- (-)	- (-)	- (-)
16	0.31 (8)	- (-)	0.40 (10)	0.40 (10)	0.40 (10)	- (-)	- (-)	- (-)	- (-)	- (-)
20	0.32 (8)	- (-)	0.32 (8)	0.48 (12)	0.48 (12)	- (-)	- (-)	- (-)	- (-)	- (-)
25	0.33 (8.5)	- (-)	0.33 (8.5)	0.50 (12.5)	0.50 (12.5)	- (-)	- (-)	- (-)	- (-)	- (-)
32	- (-)	0.34 (9)	- (-)	- (-)	- (-)	- (-)	0.50 (12.5)	- (-)	- (-)	- (-)
40	- (-)	0.36 (9)	- (-)	- (-)	- (-)	- (-)	0.50 (12.5)	- (-)	- (-)	- (-)
50	- (-)	0.41 (10.5)	- (-)	- (-)	- (-)	- (-)	0.52 (13)	- (-)	- (-)	- (-)
63	- (-)	0.45 (11.5)	- (-)	- (-)	- (-)	- (-)	0.73 (18.5)	- (-)	- (-)	- (-)
80	- (-)	0.55 (14)	- (-)	- (-)	- (-)	- (-)	0.55 (14)	- (-)	- (-)	- (-)
100	- (-)	0.71 (18)	- (-)	- (-)	- (-)	- (-)	0.71 (18)	- (-)	- (-)	- (-)
125	- (-)	0.96 (24.5)	- (-)	- (-)	- (-)	- (-)	0.96 (24.5)	0.96 (24.5)	0.96 (24.5)	0.96 (24.5)
140	- (-)	0.96 (24.5)	- (-)	- (-)	- (-)	- (-)	0.96 (24.5)	0.96 (24.5)	0.96 (24.5)	0.96 (24.5)
160	- (-)	1.08 (27.5)	- (-)	- (-)	- (-)	- (-)	1.08 (27.5)	1.08 (27.5)	1.08 (27.5)	1.08 (27.5)

Non-magnetic piston

Ø	B														
	Stroke (mm)		15	20	25	30	35	40	45	50	75	100	125	150	
	5	10													
12	1.30 (33)	1.50 (38)	1.69 (43)	1.89 (48)	2.07 (53)	2.28 (58)	- (-)	- (-)	- (-)	3.30 (84)	4.28 (109)	5.27 (134)	- (-)	- (-)	
16	1.40 (35.5)	1.59 (40.5)	1.79 (45.5)	1.99 (50.5)	2.19 (55.5)	2.38 (60.5)	- (-)	- (-)	- (-)	3.39 (86)	4.38 (111)	5.36 (136)	- (-)	- (-)	
20	1.44 (36.5)	1.63 (41.5)	1.83 (46.5)	2.03 (51.5)	2.22 (56.5)	2.42 (61.5)	- (-)	- (-)	- (-)	3.21 (81.5)	4.59 (116.5)	5.57 (141.5)	- (-)	- (-)	
25	1.48 (37.5)	1.67 (42.5)	1.87 (47.5)	2.07 (52.5)	2.26 (57.5)	2.46 (62.5)	- (-)	- (-)	- (-)	3.25 (82.5)	4.82 (122.5)	5.81 (147.5)	- (-)	- (-)	
32	1.10 (28)	1.30 (33)	1.50 (38)	1.69 (43)	1.89 (48)	2.09 (53)	2.28 (58)	2.48 (63)	2.68 (68)	2.87 (73)	4.25 (108)	5.24 (133)	6.80 (173)	7.79 (198)	
40	1.36 (34.5)	1.56 (39.5)	1.75 (44.5)	1.95 (49.5)	2.15 (54.5)	2.34 (59.5)	2.54 (64.5)	2.74 (69.5)	2.93 (74.5)	3.13 (79.5)	4.51 (114.5)	5.49 (139.5)	7.11 (180.5)	8.09 (205.5)	
50	- (-)	1.59 (40.5)	1.79 (45.5)	1.99 (50.5)	2.19 (55.5)	2.38 (60.5)	2.58 (65.5)	2.78 (70.5)	2.97 (75.5)	3.17 (80.5)	4.55 (115.5)	5.53 (140.5)	7.26 (184.5)	8.24 (209.5)	
63	- (-)	1.81 (46)	2.01 (51)	2.20 (56)	2.40 (61)	2.60 (66)	2.80 (71)	2.99 (76)	3.19 (81)	3.39 (86)	4.76 (121)	5.75 (146)	7.46 (189.5)	8.49 (214.5)	
80	- (-)	2.11 (53.5)	2.30 (58.5)	2.50 (63.5)	2.70 (68.5)	2.89 (73.5)	3.09 (78.5)	3.29 (83.5)	3.48 (88.5)	3.68 (93.5)	5.06 (128.5)	6.04 (153.5)	7.66 (194.5)	8.64 (219.5)	
100	- (-)	2.48 (63)	2.68 (68)	2.87 (73)	3.07 (78)	3.27 (83)	3.46 (88)	3.66 (93)	3.86 (98)	4.06 (103)	5.43 (138)	6.42 (163)	7.94 (202)	8.93 (227)	
125	- (-)	3.66 (93)	- (-)	4.06 (103)	- (-)	4.45 (113)	- (-)	4.84 (123)	- (-)	5.24 (133)	6.22 (158)	7.20 (183)	8.19 (208)	9.17 (233)	
140	- (-)	3.66 (93)	- (-)	4.06 (103)	- (-)	4.45 (113)	- (-)	4.84 (123)	- (-)	5.24 (133)	6.22 (158)	7.20 (183)	8.19 (208)	9.17 (233)	
160	- (-)	3.98 (101)	- (-)	4.37 (111)	- (-)	4.76 (121)	- (-)	5.16 (131)	- (-)	5.55 (141)	6.54 (166)	7.52 (191)	8.50 (216)	9.49 (241)	

Magnetic piston

Ø	B														
	Stroke (mm)		15	20	25	30	35	40	45	50	75	100	125	150	
	5	10													
12	1.30 (33)	1.50 (38)	1.69 (43)	1.89 (48)	2.07 (53)	2.28 (58)	- (-)	- (-)	- (-)	3.30 (84)	4.28 (109)	5.27 (134)	- (-)	- (-)	
16	1.40 (35.5)	1.59 (40.5)	1.79 (45.5)	1.99 (50.5)	2.19 (55.5)	2.38 (60.5)	- (-)	- (-)	- (-)	3.39 (86)	4.38 (111)	5.36 (136)	- (-)	- (-)	
20	1.44 (36.5)	1.63 (41.5)	1.83 (46.5)	2.03 (51.5)	2.22 (56.5)	2.42 (61.5)	- (-)	- (-)	- (-)	3.21 (81.5)	4.59 (116.5)	5.57 (141.5)	- (-)	- (-)	
25	1.48 (37.5)	1.67 (42.5)	1.87 (47.5)	2.07 (52.5)	2.26 (57.5)	2.46 (62.5)	- (-)	- (-)	- (-)	3.25 (82.5)	4.82 (122.5)	5.81 (147.5)	- (-)	- (-)	
32	1.50 (38)	1.69 (43)	1.89 (48)	2.09 (53)	2.28 (58)	2.48 (63)	2.68 (68)	2.87 (73)	3.07 (78)	3.27 (83)	4.25 (108)	5.24 (133)	6.80 (173)	7.79 (198)	
40	1.75 (44.5)	1.95 (49.5)	2.15 (54.5)	2.34 (59.5)	2.54 (64.5)	2.74 (69.5)	2.93 (74.5)	3.13 (79.5)	3.33 (84.5)	3.52 (89.5)	4.51 (114.5)	5.49 (139.5)	7.11 (180.5)	8.09 (205.5)	
50	- (-)	1.99 (50.5)	2.19 (55.5)	2.38 (60.5)	2.58 (65.5)	2.78 (70.5)	2.97 (75.5)	3.17 (80.5)	3.37 (85.5)	3.56 (90.5)	4.55 (115.5)	5.53 (140.5)	7.26 (184.5)	8.24 (209.5)	
63	- (-)	2.20 (56)	2.40 (61)	2.60 (66)	2.80 (71)	2.99 (76)	3.19 (81)	3.39 (86)	3.58 (91)	3.78 (96)	4.76 (121)	5.75 (146)	7.46 (189.5)	8.49 (214.5)	
80	- (-)	2.50 (63.5)	2.70 (68.5)	2.89 (73.5)	3.09 (78.5)	3.29 (83.5)	3.48 (88.5)	3.68 (93.5)	3.88 (98.5)	4.07 (103.5)	5.06 (128.5)	6.04 (153.5)	7.66 (194.5)	8.64 (219.5)	
100	- (-)	2.87 (73)	3.07 (78)	3.27 (83)	3.46 (88)	3.66 (93)	3.86 (98)	4.06 (103)	4.25 (108)	4.45 (113)	5.43 (138)	6.42 (163)	7.94 (201.5)	8.93 (226.5)	
125	- (-)	3.66 (93)	- (-)	4.06 (103)	- (-)	4.45 (113)	- (-)	4.84 (123)	- (-)	5.24 (133)	6.22 (158)	7.20 (183)	8.19 (208)	9.17 (233)	
140	- (-)	3.66 (93)	- (-)	4.06 (103)	- (-)	4.45 (113)	- (-)	4.84 (123)	- (-)	5.24 (133)	6.22 (158)	7.20 (183)	8.19 (208)	9.17 (233)	
160	- (-)	3.98 (101)	- (-)	4.37 (111)	- (-)	4.76 (121)	- (-)	5.16 (131)	- (-)	5.55 (141)	6.54 (166)	7.52 (191)	8.50 (216)	9.49 (241)	

Dimensions in inches (mm)



# Series 99000 Compact Actuators

## Maximum allowable load at toolplate

Ø	Stroke (mm)																	
	5		10		15		20		25		30		35		40		45	
12	7.8	(3.54)	6.0	(2.72)	3.0	(1.36)	2.5	(1.14)	2.1	(0.95)	1.90	(0.86)	-	(-)	-	(-)	-	(-)
16	11.0	(4.99)	9.0	(4.09)	4.7	(2.13)	4.1	(1.86)	3.4	(1.54)	2.90	(1.32)	-	(-)	-	(-)	-	(-)
20	17.0	(7.72)	16.0	(7.26)	11.0	(4.99)	9.0	(4.09)	7.0	(3.18)	6.20	(2.81)	5.7	(2.59)	5.2	(2.36)	5.0	(2.27)
25	18.0	(8.17)	16.5	(7.49)	12.0	(5.45)	10.5	(4.77)	9.0	(4.09)	7.50	(3.41)	6.0	(2.72)	5.5	(2.50)	5.2	(2.36)
32	24.0	(10.90)	20.0	(9.08)	15.5	(7.04)	13.5	(6.13)	11.0	(4.99)	10.0	(4.54)	8.0	(3.63)	7.5	(3.41)	7.2	(3.27)
40	26.0	(11.80)	22.0	(9.99)	17.0	(7.72)	14.2	(6.45)	11.7	(5.31)	10.6	(4.81)	8.6	(3.90)	8.1	(3.68)	7.8	(3.54)
50	-	(-)	34.5	(15.66)	31.0	(14.07)	28.0	(12.71)	25.0	(11.35)	23.0	(10.44)	22.0	(9.99)	19.0	(8.63)	16.0	(7.26)
63	-	(-)	56.0	(25.42)	50.0	(22.70)	46.5	(21.11)	38.0	(17.25)	33.0	(14.98)	29.0	(13.17)	23.0	(10.44)	19.5	(8.85)
80	-	(-)	85.0	(38.59)	78.9	(35.82)	73.0	(33.14)	68.0	(30.87)	63.0	(28.60)	59.0	(26.79)	45.0	(20.43)	37.0	(16.80)
100	-	(-)	92.5	(42.00)	85	(38.59)	79.0	(35.87)	74.0	(33.60)	69.0	(31.33)	65.0	(29.51)	49.0	(22.25)	39.0	(17.71)
125	-	(-)	99.0	(44.95)	-	(-)	85.0	(38.59)	-	(-)	75.0	(34.05)	-	(-)	53.0	(24.06)	-	(-)
140	-	(-)	107.0	(48.58)	-	(-)	93.0	(42.22)	-	(-)	81.0	(36.77)	-	(-)	57.0	(25.88)	-	(-)
160	-	(-)	168.0	(76.27)	-	(-)	146.0	(66.28)	-	(-)	127.0	(57.66)	-	(-)	93.0	(42.22)	-	(-)

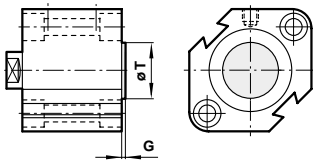
  

Ø	Stroke (mm)																	
	50		75		100		125		150		175		200		250		300	
12	1.1	(0.50)	0.9	(0.41)	0.7	(0.32)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)
16	1.7	(0.77)	1.4	(0.64)	0.9	(0.41)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)
20	4.6	(2.09)	2.7	(1.23)	1.7	(0.77)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)
25	4.8	(2.18)	2.9	(1.32)	1.9	(0.86)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)
32	6.7	(3.04)	5.4	(2.45)	4.2	(1.91)	1.6	(0.73)	0.9	(0.41)	-	(-)	-	(-)	-	(-)	-	(-)
40	7.1	(3.22)	5.8	(2.63)	4.6	(2.90)	1.9	(0.86)	1.2	(0.54)	-	(-)	-	(-)	-	(-)	-	(-)
50	13.0	(5.90)	10.6	(4.81)	9.1	(4.13)	3.0	(1.36)	2.3	(1.04)	-	(-)	-	(-)	-	(-)	-	(-)
63	18.5	(8.40)	14.6	(6.63)	12.1	(5.49)	4.5	(2.04)	3.1	(1.41)	-	(-)	-	(-)	-	(-)	-	(-)
80	33.0	(14.98)	26.6	(12.08)	22.6	(10.26)	8.4	(3.81)	5.8	(2.63)	-	(-)	-	(-)	-	(-)	-	(-)
100	35.0	(15.89)	29.0	(13.17)	24.6	(11.17)	9.1	(4.13)	6.3	(2.86)	-	(-)	-	(-)	-	(-)	-	(-)
125	37.0	(16.80)	31.0	(14.07)	26.0	(11.80)	12.0	(5.45)	9.5	(4.31)	7.3	(3.31)	5.5	(2.50)	3.7	(1.68)	2.7	(1.23)
140	44.0	(19.98)	42.0	(19.07)	35.0	(15.89)	16.0	(7.26)	13.0	(5.90)	9.5	(4.31)	7.6	(3.45)	5.8	(2.63)	4.5	(2.04)
160	72.0	(32.69)	69.0	(31.33)	57.0	(25.89)	26.0	(11.80)	21.0	(9.53)	15.3	(6.95)	12.2	(5.54)	11.3	(5.13)	10.1	(4.59)

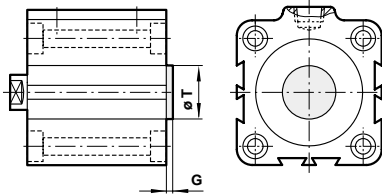
Figures in lbs (kg)

### Boss, cap end – DM/99000/FX

Ø 12 ... 25 mm

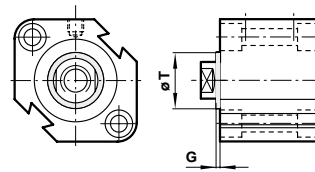


Ø 32 ... 160 mm

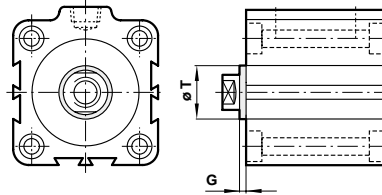


### Boss, rod end – DM/99000/EX

Ø 12 ... 25 mm



Ø 32 ... 160 mm



Ø	Ø T	G
12	0.591 ±0.002 (15 ±0.043)	0.059 (1.5)
16	0.787 ±0.002 (20 ±0.052)	0.059 (1.5)
20	0.512 ±0.002 (13 ±0.043)	0.079 (2.0)
25	0.591 ±0.002 (15 ±0.043)	0.079 (2.0)
32	0.827 ±0.002 (21 ±0.062)	0.079 (2.0)
40	1.102 ±0.002 (28 ±0.062)	0.079 (2.0)
50	1.378 ±0.002 (35 ±0.062)	0.079 (2.0)
63	1.378 ±0.002 (35 ±0.062)	0.079 (2.0)
80	1.693 ±0.002 (43 ±0.062)	0.079 (2.0)
100	2.323 ±0.003 (59 ±0.074)	0.079 (2.0)

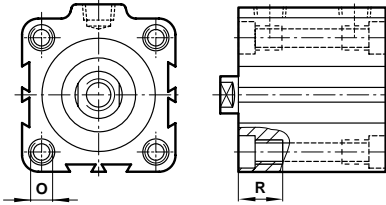
Dimensions in inches (mm)



Mountings

Tapped hole mounting both ends – A

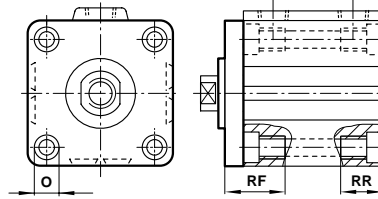
For single and double ended piston rod



Ø	O	R
12	#8-32 (M4 x 0.7)	0.43 (11)
16	#8-32 (M4 x 0.7)	0.43 (11)
16	1/4-20 (M6 x 1.0)	0.67 (17)
25	1/4-20 (M6 x 1.0)	0.67 (17)
32	1/4-20 (M6 x 1.0)	0.67 (17)
40	1/4-20 (M6 x 1.0)	0.75 (19)
50	5/16-18 (M8 x 1.25)	0.75 (19)
63	7/16-14 (M10 x 1.5)	0.87 (22)
80	1/2-13 (M12 x 1.75)	1.13 (29)
100	1/2-13 (M12 x 1.75)	1.13 (29)
125	– (M14 x 2.0)	– (45)
140	– (M14 x 2.0)	– (45)
160	– (M16 x 2.0)	– (50)

Dimensions in inches (mm)  
 Note: Inch threads for 'C' port code.  
 Metric threads for 'M' port codes.  
 Metric for foot, flange, or clevis mount.

For cylinders with non-rotating piston rod

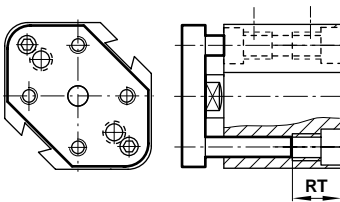


Ø	O	Places front	RF	Places rear	RR
12	#8-32 (M4 x 0.7)	2	0.63 (16)	2	0.43 (11)
16	#8-32 (M4 x 0.7)	2	0.63 (16)	2	0.43 (11)
16	1/4-20 (M6 x 1.0)	2	0.98 (25)	2	0.67 (17)
25	1/4-20 (M6 x 1.0)	2	0.98 (25)	2	0.67 (17)
32	1/4-20 (M6 x 1.0)	2	1.02 (26)	4	0.67 (17)
40	1/4-20 (M6 x 1.0)	4	0.75 (19)	4	0.75 (19)
50	5/16-18 (M8 x 1.25)	4	0.75 (19)	4	0.75 (19)
63	7/16-14 (M10 x 1.5)	4	0.87 (22)	4	0.87 (22)
80	1/2-13 (M12 x 1.75)	4	1.13 (29)	4	1.13 (29)
100	1/2-13 (M12 x 1.75)	4	1.13 (29)	4	1.13 (29)

Dimensions in inches (mm)  
 Note: Inch threads for 'C' port code.  
 Metric threads for 'M' port codes.  
 Metric for foot, flange, or clevis mount.

For cylinders with toolplate

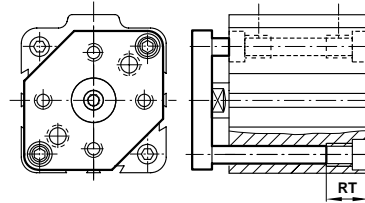
Ø 12 .... 25 mm



Ø	OT	RT
12	#8-32 (M4 x 0.7)	0.38 (9.7)
16	#8-32 (M4 x 0.7)	0.51 (13)
20	1/4-20 (M6 x 1.0)	0.53 (13.5)
25	1/4-20 (M6 x 1.0)	0.59 (15)
32	1/4-20 (M6 x 1.0)	0.67 (17)
40	1/4-20 (M6 x 1.0)	0.75 (19)
50	5/16-18 (M8 x 1.25)	0.75 (19)
63	7/16-14 (M10 x 1.5)	0.87 (22)
80	1/2-13 (M12 x 1.75)	1.13 (29)
100	1/2-13 (M12 x 1.75)	1.13 (29)
125	– (M14 x 2.0)	– (40)
140	– (M14 x 2.0)	– (40)
160	– (M16 x 2.0)	– (45.2)

Dimensions in inches (mm)  
 Note: Inch threads for 'C' port code.  
 Metric threads for 'M' port codes.  
 Metric for foot, flange, or clevis mount.

Ø 32 .... 100 mm



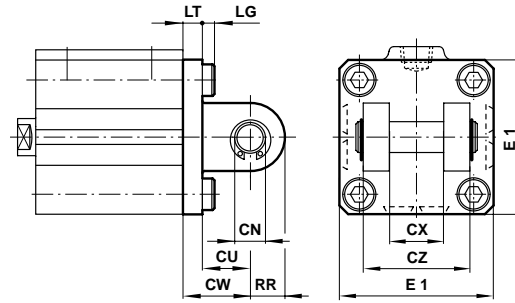
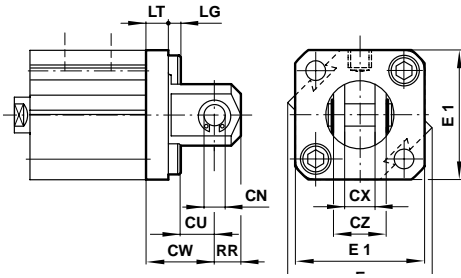


# Series 99000 Compact Actuators

## Rear clevis mounting – D

Ø 12 ... 25 mm

Ø 32 ... 100 mm



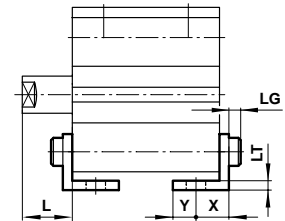
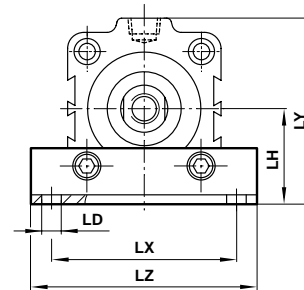
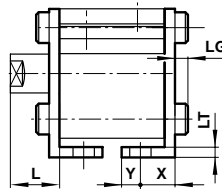
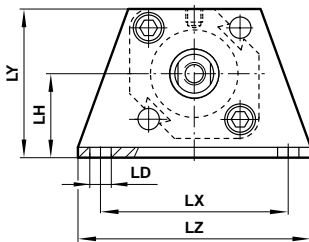
Ø	CN	CW	CU	CX	CZ	LT	LG	RR	E1	□ E	lb (kg)
12	0.187 (5)	0.55 (14)	0.28 (7)	0.21 (5.3)	0.39 (10)	0.2 (5)	0.11 (2.8)	0.24 (6.0)	0.98 (25)	1.09 (27.7)	0.05 (0.02)
16	0.187 (5)	0.59 (15)	0.39 (10)	0.27 (6.8)	0.47 (12)	0.2 (5)	0.11 (2.8)	0.24 (6.0)	1.14 (29)	1.25 (31.7)	0.05 (0.02)
20	0.312 (8)	0.71 (18)	0.47 (12)	0.33 (8.3)	0.63 (16)	0.2 (5)	0.16 (4.0)	0.35 (9.0)	1.42 (36)	– (–)	0.10 (0.05)
25	0.375 (10)	0.79 (20)	0.55 (14)	0.41 (10.3)	0.79 (20)	0.2 (5)	0.16 (4.0)	0.39 (10)	1.57 (40)	– (–)	0.15 (0.07)
32	0.375 (10)	0.79 (20)	0.55 (14)	0.72 (18.3)	1.42 (36)	0.24 (6)	0.16 (4.0)	0.39 (10)	1.75 (44.5)	– (–)	0.20 (0.09)
40	0.375 (10)	0.87 (22)	0.55 (14)	0.72 (18.3)	1.42 (36)	0.31 (8)	0.16 (4.0)	0.39 (10)	2.05 (52)	– (–)	0.29 (0.13)
50	0.5 (14)	1.1 (28)	0.79 (20)	0.88 (22.3)	1.73 (44)	0.31 (8)	0.2 (5.0)	0.55 (14)	2.51 (63.7)	– (–)	0.46 (0.22)
63	0.5 (14)	1.18 (30)	0.79 (20)	0.88 (22.3)	1.73 (44)	0.39 (10)	0.24 (6.0)	0.55 (14)	3.02 (76.7)	– (–)	0.75 (0.34)
80	0.75 (18)	1.5 (38)	1.07 (27)	1.11 (28.3)	2.2 (56)	0.43 (11)	0.28 (7.0)	0.71 (18)	3.85 (97.8)	– (–)	1.19 (0.54)
100	0.875 (22)	1.77 (45)	1.22 (31)	1.27 (32.3)	2.52 (64)	0.55 (14)	0.28 (7.0)	0.87 (22)	4.54 (115.3)	– (–)	1.98 (0.90)

Dimensions in inches (mm)

## Foot mounting – C

Ø 12 ... 25 mm

Ø 32 ... 100 mm



Ø	LD	LH	LX	LY	LZ	L	LT	X	Y	LG	lb (kg)
12	0.18 (4.5)	0.67 (17)	1.39 (34)	1.16 (29.5)	1.73 (44)	0.53 (13.5)	0.08 (2)	0.31 (8)	0.18 (4.5)	0.11 (2.8)	0.04 (0.02)
16	0.18 (4.5)	0.75 (19)	1.50 (38)	1.32 (33.5)	1.89 (48)	0.53 (13.5)	0.08 (2)	0.31 (8)	0.20 (5)	0.11 (2.8)	0.04 (0.02)
20	0.26 (6.5)	0.94 (24)	1.89 (48)	1.65 (42)	2.44 (62)	0.57 (14.5)	0.13 (3.2)	0.36 (9.2)	0.23 (5.8)	0.16 (4)	0.04 (0.02)
25	0.26 (6.5)	1.02 (26)	2.05 (52)	1.81 (46)	2.60 (66)	0.59 (15)	0.13 (3.2)	0.42 (10.7)	0.23 (5.8)	0.16 (4)	0.09 (0.04)
32	0.26 (6.5)	1.18 (30)	2.24 (57)	2.24 (57)	2.80 (71)	0.67 (17)	0.13 (3.2)	0.44 (11.2)	0.23 (5.8)	0.16 (4)	0.09 (0.04)
40	0.26 (6.5)	1.30 (33)	2.52 (64)	2.52 (64)	3.07 (78)	0.67 (17)	0.13 (3.2)	0.44 (11.2)	0.28 (7)	0.16 (4)	0.22 (0.10)
50	0.35 (9)	1.54 (39)	3.11 (79)	3.07 (78)	3.74 (95)	0.71 (18)	0.13 (3.2)	0.58 (14.7)	0.31 (8)	0.20 (5)	0.24 (0.11)
63	0.43 (11)	1.81 (46)	3.74 (95)	3.6 (91.5)	4.45 (113)	0.71 (18)	0.13 (3.2)	0.64 (16.2)	0.35 (9)	0.24 (6)	0.29 (0.13)
80	0.51 (13)	2.32 (59)	4.65 (118)	4.49 (114)	5.51 (140)	0.79 (20)	0.18 (4.5)	0.77 (19.5)	0.43 (11)	0.28 (7)	0.40 (0.18)
100	0.51 (13)	2.80 (71)	5.39 (137)	5.35 (136)	6.38 (162)	0.87 (22)	0.24 (6)	0.91 (23)	0.49 (12.5)	0.28 (7)	1.06 (0.47)

Dimensions in inches (mm)

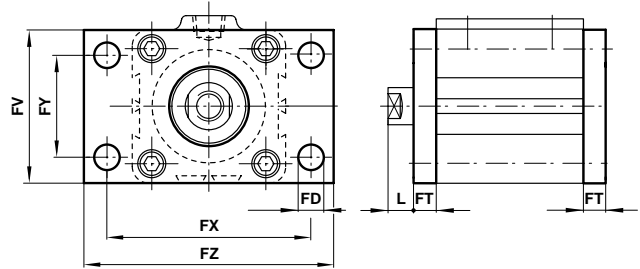
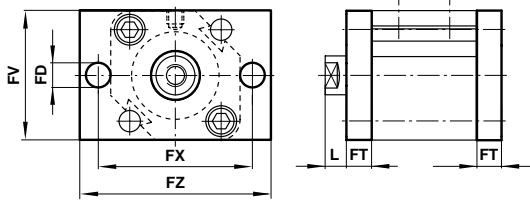




Flange rod end mounting – G  
 Flange cap end mounting – B  
 ISO Flange rod end mounting – IG  
 ISO Flange cap end mounting – IB

Ø 12 ... 25 mm

Ø 32 ... 100 mm



ISO

Non-ISO

Ø	FT	L	FD	FY	FX	FV	FZ	FD	FY	FX	FV	FZ	lb (kg)
12	0.22 (5.5)	0.31 (8)	0.22 (5.5)	- (-)	1.57 (40)	0.98 (25)	1.97 (50)	0.18 (4.5)	- (-)	1.77 (45)	0.98 (25)	2.17 (55)	0.04 (0.02)
16	0.22 (5.5)	0.31 (8)	0.22 (5.5)	- (-)	1.57 (40)	1.18 (30)	1.97 (50)	0.18 (4.5)	- (-)	1.77 (45)	1.18 (30)	2.17 (55)	0.04 (0.02)
20	0.31 (8)	0.26 (6.5)	0.26 (6.5)	- (-)	1.97 (50)	1.54 (39)	2.44 (62)	0.26 (6.5)	- (-)	1.89 (48)	1.54 (39)	2.36 (60)	0.04 (0.02)
25	0.31 (8)	0.28 (7)	0.26 (6.5)	- (-)	1.97 (50)	1.65 (42)	2.44 (62)	0.26 (6.5)	- (-)	2.05 (52)	1.65 (42)	2.52 (64)	0.09 (0.04)
32	0.31 (8)	0.35 (9)	0.28 (7)	1.26 (32)	2.52 (64)	1.89 (48)	2.99 (76)	0.22 (5.5)	1.34 (34)	2.2 (56)	1.89 (48)	2.56 (65)	0.13 (0.06)
40	0.31 (8)	0.35 (9)	0.35 (9)	1.42 (36)	2.83 (72)	2.13 (54)	3.47 (88)	0.22 (5.5)	1.57 (40)	2.44 (62)	2.13 (54)	2.83 (72)	0.33 (0.15)
50	0.35 (9)	0.35 (9)	0.35 (9)	1.77 (45)	3.54 (90)	2.64 (67)	4.17 (106)	0.26 (6.5)	1.97 (50)	2.99 (76)	2.64 (67)	3.5 (89)	0.37 (0.16)
63	0.35 (9)	0.35 (9)	0.35 (9)	1.97 (50)	3.94 (100)	3.15 (80)	4.57 (116)	0.35 (9)	2.36 (60)	3.62 (92)	3.15 (80)	4.25 (108)	0.73 (0.32)
80	0.43 (11)	0.35 (9)	0.47 (12)	2.48 (63)	4.96 (126)	3.9 (99)	5.91 (150)	0.43 (11)	3.03 (77)	4.57 (116)	3.9 (99)	5.28 (134)	0.90 (0.40)
100	0.43 (11)	0.43 (11)	0.55 (14)	2.95 (75)	5.91 (150)	4.61 (117)	7.01 (178)	0.43 (11)	3.7 (94)	5.35 (136)	4.61 (117)	6.06 (154)	1.58 (0.70)

Dimensions in inches (mm)



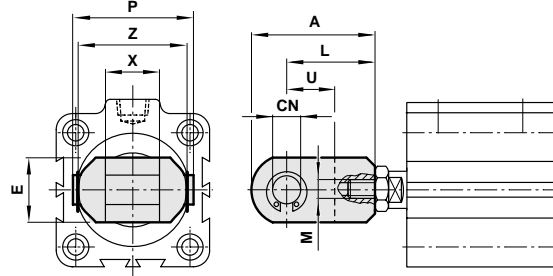
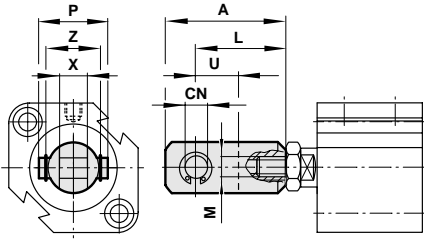
# Series 99000 Compact Actuators

## Accessories

### Piston rod clevis

Ø 12 ... 25 mm

Ø 32 ... 100 mm



Ø	Model	Metric	CN	M	L	U	X	Z	P	E	A	lb (kg)	
12	QC/99012/25	QM/99012/25	0.187 (5)	#8-32 (M5 x 0.8 deep)	0.63 (16)	0.27 (7)	0.21 (5.3)	0.39 (10)	0.55 (14)	0.39 (10)	0.85 (21.5)	0.02	(0.01)
16	QC/99016/25	QM/99016/25	0.187 (5)	#8-32 (M6 x 1.0 deep)	0.83 (21)	0.39 (10)	0.26 (6.6)	0.47 (12)	0.63 (16)	0.47 (12)	1.10 (28)	0.02	(0.01)
20	QC/99020/25	QM/99020/25	0.312 (8)	#10-32 (M8 x 1.25 deep)	0.98 (25)	0.45 (11.5)	0.33 (8.3)	0.63 (16)	0.83 (21)	0.63 (16)	1.34 (34)	0.02	(0.01)
25	QC/99025/25	QM/99025/25	0.375 (10)	1/4-28 (M10 x 1.25 deep)	1.18 (30)	0.55 (14)	0.41 (10.3)	0.78 (20)	0.98 (25)	0.78 (20)	1.61 (41)	0.02	(0.01)
32	QC/99032/25	QM/99032/25	0.375 (10)	5/16-24 (M14 x 1.5 deep)	1.18 (30)	0.55 (14)	0.72 (18.4)	1.44 (36.6)	1.61 (41)	0.87 (22)	1.65 (42)	0.04	(0.02)
40	QC/99040/25	QM/99032/25	0.375 (10)	3/8-24 (M14 x 1.5 deep)	1.18 (30)	0.55 (14)	0.72 (18.4)	1.44 (36.6)	1.61 (41)	0.87 (22)	1.65 (42)	0.04	(0.02)
50	QC/99050/25	QM/99050/25	0.500 (14)	1/2-20 (M18 x 1.5 deep)	1.57 (40)	0.79 (20)	0.88 (22.4)	1.75 (44.5)	1.97 (50)	1.10 (28)	2.20 (56)	0.09	(0.04)
63	QC/99050/25	QM/99050/25	0.500 (14)	1/2-20 (M18 x 1.5 deep)	1.57 (40)	0.79 (20)	0.88 (22.4)	1.75 (44.5)	1.97 (50)	1.10 (28)	2.20 (56)	0.20	(0.09)
80	QC/99080/25	QM/99080/25	0.750 (18)	5/8-18 (M22 x 1.5 deep)	1.97 (50)	1.06 (27)	1.12 (28.4)	2.19 (55.6)	2.46 (62.5)	1.50 (38)	2.80 (71)	0.48	(0.22)
100	QC/99100/25	QM/99100/25	0.875 (22)	3/4-16 (M26 x 1.5 deep)	2.17 (55)	1.22 (31)	1.28 (32.4)	2.50 (63.5)	2.78 (70.6)	1.73 (44)	3.11 (79)	0.48	(0.22)

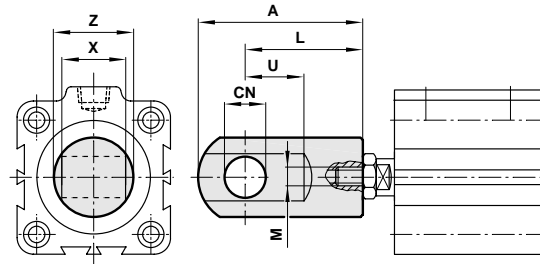
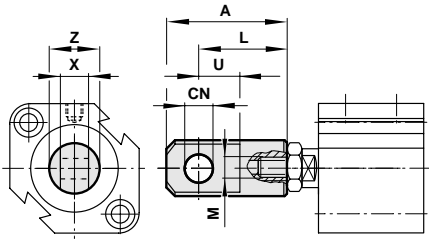
Dimensions in inches (mm)

**Ordering information** To order a basic 25 mm bore cylinder with a 10 mm stroke, quote: **DM/99025/10** plus piston rod clevis mounting: **QM/99025/25**

### Piston rod eye

Ø 12 ... 25 mm

Ø 32 ... 100 mm



Ø	Model	Metric	CN	M	L	U	X	Z	A	lb (kg)	
12	QC/99012/32	QM/99012/32	0.187 (5)	#8-32 (M5 x 0.8 deep)	0.63 (16)	0.27 (7)	0.18 (4.7)	0.38 (9.7)	0.85 (21)	0.05	(0.02)
16	QC/99016/32	QM/99016/32	0.187 (5)	#8-32 (M6 x 1.0 deep)	0.98 (25)	0.55 (14)	0.24 (6.2)	0.44 (11.2)	1.26 (32)	0.05	(0.02)
20	QC/99020/32	QM/99020/32	0.312 (8)	#10-32 (M8 x 1.25 deep)	0.98 (25)	0.45 (11.5)	0.3 (7.7)	0.63 (16)	1.34 (34)	0.10	(0.05)
25	QC/99025/32	QM/99025/32	0.375 (10)	1/4-28 (M10 x 1.25 deep)	1.18 (30)	0.55 (14)	0.38 (9.7)	0.75 (19)	1.61 (41)	0.15	(0.07)
32	QC/99032/32	QM/99032/32	0.375 (10)	5/16-24 (M14 x 1.5 deep)	1.18 (30)	0.55 (14)	0.69 (17.5)	0.87 (22)	1.65 (42)	0.20	(0.09)
40	QC/99040/32	QM/99032/32	0.375 (10)	3/8-24 (M14 x 1.5 deep)	1.18 (30)	0.55 (14)	0.69 (17.5)	0.87 (22)	1.65 (42)	0.29	(0.13)
50	QC/99050/32	QM/99050/32	0.500 (14)	1/2-20 (M18 x 1.5 deep)	1.57 (40)	0.79 (20)	0.85 (21.5)	1.06 (27)	2.2 (56)	0.73	(0.33)
63	QC/99050/32	QM/99050/32	0.500 (14)	1/2-20 (M18 x 1.5 deep)	1.57 (40)	0.79 (20)	0.85 (21.5)	1.06 (27)	2.2 (56)	0.73	(0.33)
80	QC/99080/32	QM/99080/32	0.750 (18)	5/8-18 (M22 x 1.5 deep)	1.97 (50)	1.06 (27)	1.08 (27.5)	1.50 (38)	2.8 (71)	1.52	(0.67)
100	QC/99100/32	QM/99100/32	0.875 (22)	3/4-16 (M26 x 1.5 deep)	2.17 (55)	1.22 (31)	1.24 (31.5)	1.75 (44.5)	3.11 (79)	1.52	(0.67)

Dimensions in inches (mm)

**Ordering information** To order a basic 25 mm bore cylinder with a 10 mm stroke, quote: **DM/99025/10** plus piston rod eye mounting: **QM/99025/32**



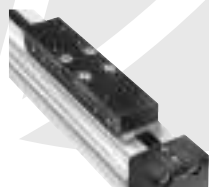
## Spares

Cylinder	Spares kit
D*/99012	QM/99012/00
D*/99016	QM/99016/00
D*/99020	QM/99020/00
D*/99025	QM/99025/00
D*/99032	QM/99032/00
D*/99040	QM/99040/00
D*/99050	QM/99050/00
D*/99063	QM/99063/00
D*/99080	QM/99080/00
D*/99100	QM/99100/00
D*/99125	QM/99125/00
D*/99160	QM/99160/00

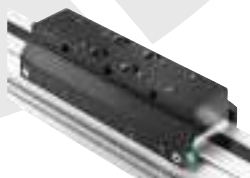
# Lintra Rodless Cylinder

## Series 46000B, 46100B, and 46200B

Proven Applications.....ACT-10-2  
 Features.....ACT-10-4  
 Specifications .....ACT-10-5  
 Series 46000B Internally Guided Carriage.....ACT-10-6  
 Series 46100B Externally Guided Carriage.....ACT-10-8  
 Series 46200B Roller Guided Carriage.....ACT-10-10  
 Series 46000B/L3 Active Holding Brake .....ACT-10-12  
 Series 46000B/L4 Passive Holding Brake.....ACT-10-14  
 Series 46000B Right Angle Mounting System .....ACT-10-16  
 Series 46000B Without Top Cover.....ACT-10-18  
 Side Mounting Plate with Secondary Carriage .....ACT-10-19  
 Foot Mounts .....ACT-10-20  
 Center Support Mounts .....ACT-10-21  
 Carriage Mounting Plate .....ACT-10-22  
 Swinging Bridge .....ACT-10-23  
 Sensing Switches for 16 to 80 mm Bore Cylinders .....ACT-10-24  
 Technical Data .....ACT-10-26  
 Spare Parts and Kits .....ACT-10-27



**ACT-10-6 – Internally Guided Carriage**



**ACT-10-8 – Externally Guided Carriage**



**ACT-10-10 – Roller Guided Carriage**



**ACT-10-12 – Active Holding Brake System**



**ACT-10-14 – Passive Holding Brake System**



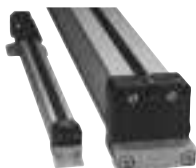
**ACT-10-16 – Right Angle Holding System**



**ACT-10-18 – Carriage Without Top Cover**



**ACT-10-19 – Side Mounting Plate w/Secondary Carriage**



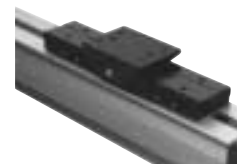
**ACT-10-20 – Foot Mount Style "C"**



**ACT-10-21 – Center Support Style "V"**



**ACT-10-22 – Carriage Mounting Plate Style "UV"**



**ACT-10-23 – Swinging Bridge Mounting Style "S"**

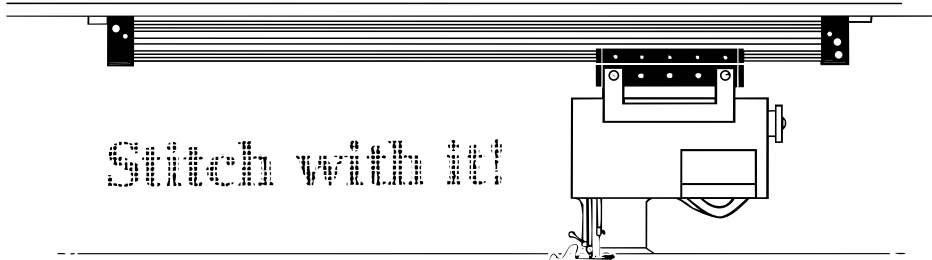


**ACT-10-24 – Switches for 16 mm to 80 mm actuators**



## Proven Applications

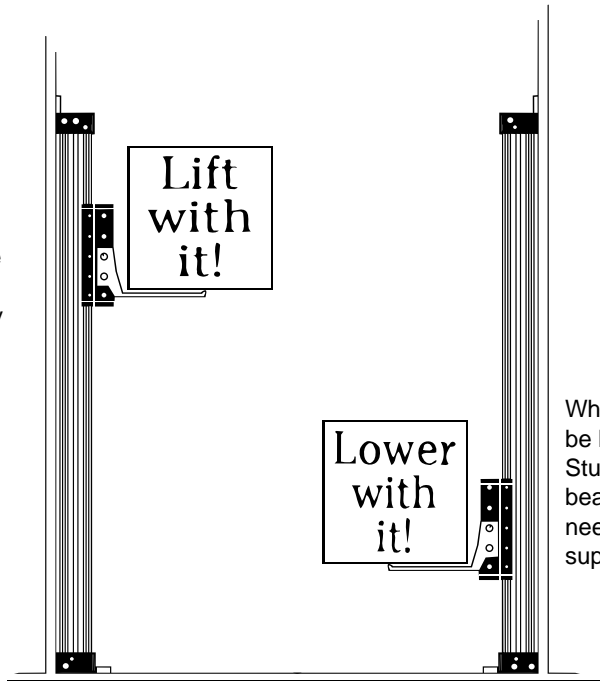
Start something with Lintra. When your application requires movement, especially linear movement, think Lintra. Consider the many possibilities available when you choose Lintra. Shown here are some proven Lintra applications, discover your own.



Stitch with it!

A manufacturer of custom drapery glides his sewing machines down the length of his stitching stations attached to Lintra cylinders. The result is a smooth, even line delivered with precision.

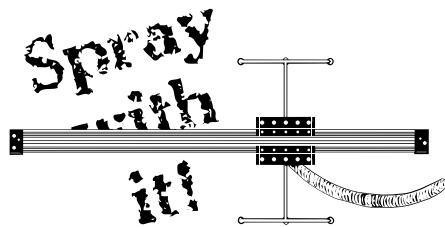
Attach a shelf to the carriage of a vertical Lintra cylinder and you have a lift ready for action. With stroke lengths up to 28 feet (see p. 5), a two-story lift or a two-foot lift can be ready made for your operations.



Lift with it!

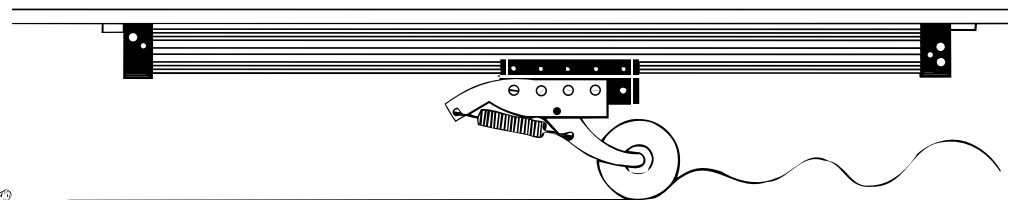
Lower with it!

What goes up...can readily be brought back down. Sturdy Lintra Cylinders bear the load without the need for external guides or supports.



Spray with it!

Mount a paint spray nozzle onto a Lintra carriage and you have an inexpensive automated paint sprayer with excellent repeatability. Lintra doesn't get tired.

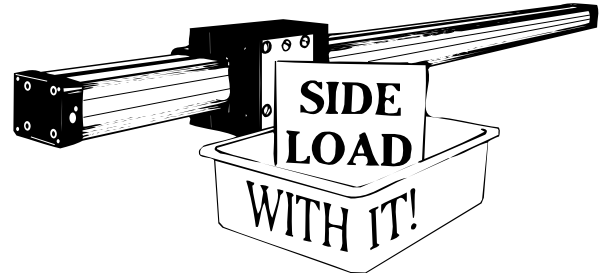
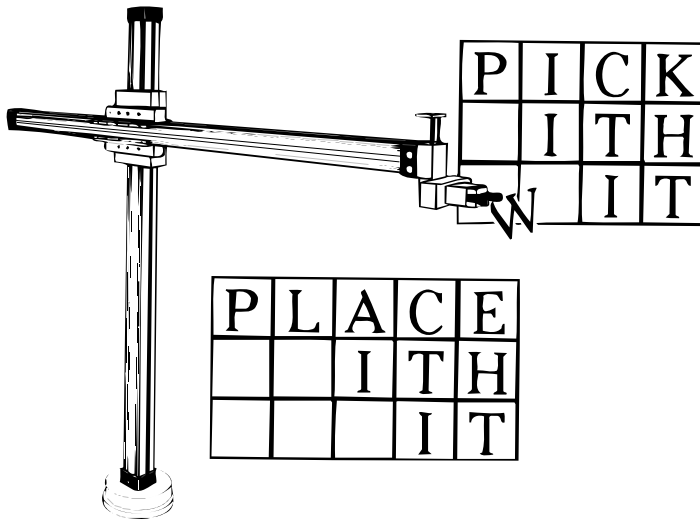


Silk screening, attaching side molding to automobile bodies, any job where there is a need for even pressure to be applied in a straight line is a job for Lintra

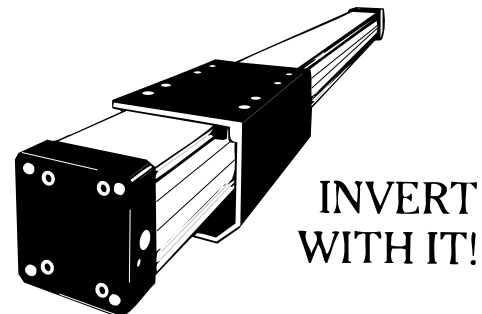
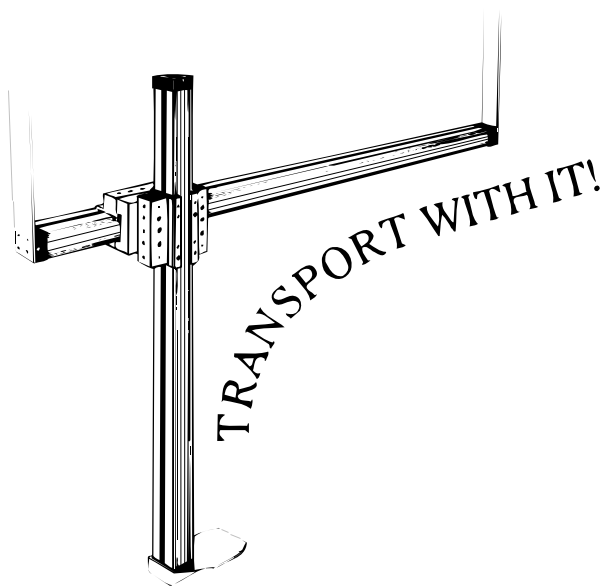


**Proven Applications**

Create new solutions to manufacturing challenges with the simple, durable design of Lintra Cylinders. Your local NORGREN Lintra Distributor is ready today with helpful application ideas. Lintra - Use it!

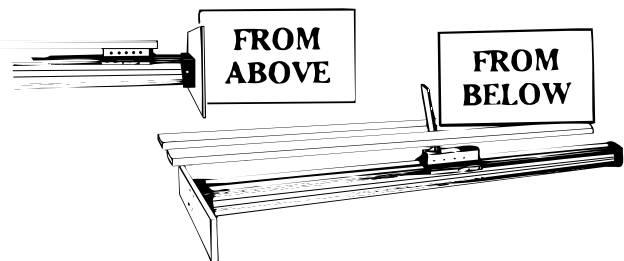


Fit a Lintra cylinder with a secondary carriage and side mounting plate. Now, not only do you have a new mounting configuration, but a 50% increase in the loading capability of the cylinder is realized. The side loading plate really takes advantage of LINTRA's integral guided carriage.



The Carriage Bracket Accessory transfers power from the top carriage to a guided mounting plate on the opposite side of the cylinder. This allows hanging loads to be transported by the cylinder or the cylinder to be inverted in dirty environments, sheltering the seal strips from contaminants.

**TRANSFER WITH IT!**



Conveyor lines are moving in the right direction when Lintra cylinders are used to perform transfers along the system. Cylinders secured above conveyors or below roller conveyors provide reliable transfers for the system.

The "Walking Beam" can straddle two areas and provide a transporting bridge to link the two. A horizontal cylinder fitted with a Right Angle Mounting System carries the load from one point to the other while the second cylinder raises and lowers the load.

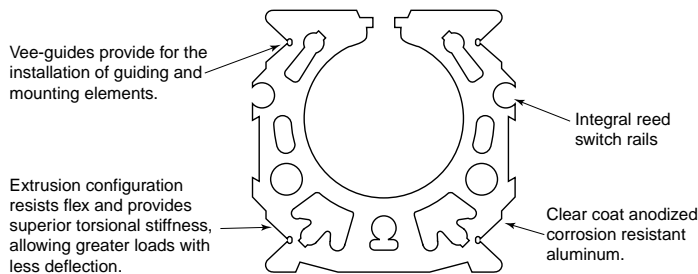


## Features

- Lintra rodless cylinders require less space for installation since the stroke of the cylinder is contained within the length of the cylinder itself.
- Non-rotating load carrying capability without additional expensive guide rods and bearings
- Rodless design means there is no rod that can buckle or kink.
- Equal forces can be applied to each stroke direction.
- All stroke lengths are custom made to customer requirements.
- Extreme stroke lengths are available up to 28 ft. (see ACT-10-5).
- Lintra features a wide range of bore sizes:
  - 16 mm bore — 0.63"
  - 20 mm bore — 0.79"
  - 25 mm bore — 0.98"
  - 32 mm bore — 1.26"
  - 40 mm bore — 1.57"
  - 50 mm bore — 1.97"
  - 63 mm bore — 2.48"
  - 80 mm bore — 3.15"

- Magnetic piston standard
- Integral switch rail on both sides of the extrusion.
- Components are made of anodized, corrosion resistant aluminum.
- Cushion adjustment standard at both ends of the cylinder.
- Stroke velocities up to 98 ft/sec (30 m/s) are available. Contact factory.
- The Lintra is designed for easy maintenance.
- Lintra cylinders can withstand heavy loads and inertial moments.
- Polyurethane seals provide long life.
- For increased load carrying capabilities and mounting versatility a variety of options and accessories are available.

The Extruded Tube of the Lintra Series 46000B Cylinder



For **corrosion resistance** put a "V" in front of the actuator part number. i.e. **VC/46032/M...**

- High corrosion and acid resistance
- Suitable for food, chemical, pharmaceutical and offshore oil industry applications.

**Notes:** For ISO porting with the corrosion resistance option contact factory.  
Corrosion resistance is available for 20 thru 80 mm only.

### Materials:

- End covers: Aluminum (HCR<sup>®</sup> coated\*)
  - Carriage: Aluminum (HCR<sup>®</sup> coated\*)
  - Yoke: Moulded plastic – Ø 20 mm, Aluminum (HCR<sup>®</sup> coated\*) – Ø 25 to 80 mm
  - Barrel: Extruded aluminum alloy (HCR<sup>®</sup> coated\*)
  - Sealing strip & piston seals: Polyurethane
  - Cover strip: Polyamide
  - Seals: Nitrile rubber
- \*HCR<sup>®</sup>: High Technology Synergistic Coating

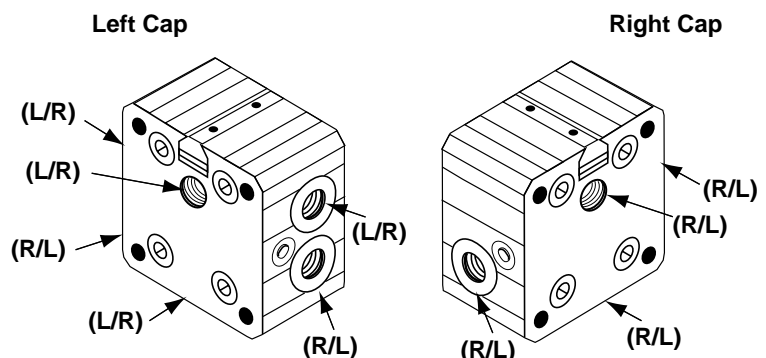
## Lintra<sup>®</sup> 46000 Series Multiple Port Endcaps

Multiple Ported left and right endcaps available in bore sizes 25mm - 63mm, endcaps are ported with NPT or Metric ISO G threads.

**(L/R)** - indicates air applied to this port will move the carriage from Left to Right.

**(R/L)** - indicates air applied to this port will move the carriage from Right to Left.

To specify Multiple Port endcaps place **/MC/** in the fourth position instead of **/M/**.





**Operating Specifications**

Operating Temperature

-22° to 180°F\* (-30°C to 80°C)

\*With dewpoint of supply air less than ambient air temperature.

Operating Pressure

16 mm: 22 to 150 psig (1.5 to 10 bar)

20 mm to 80 mm: 15 to 150 psig (1 to 10 bar)

Bore Sizes:	Area (sq. in.)
16 mm bore — 0.63"	.31
20 mm bore — 0.79"	.49
25 mm bore — 0.98"	.75
32 mm bore — 1.26"	1.25
40 mm bore — 1.57"	1.94
50 mm bore — 1.97"	3.05
63 mm bore — 2.48"	4.83
80 mm bore — 3.15"	7.79

Stroke lengths:

16 mm to 40 mm bore - to 28 ft. (8500 mm)

50 mm and 63 mm bore - to 23 ft. (7000)

80 mm bore - to 18 ft. (5500 mm)

Supply Fluid: Compressed air filtered to

50-microns and lubricated.

Cushion Lengths:

16 mm bore — 12 mm (0.48")

20 mm bore — 26 mm (1.02")

25 mm bore — 26 mm (1.02")

32 mm bore — 35 mm (1.38")

40 mm bore — 50 mm (1.97")

50 mm bore — 60 mm (2.36")

63 mm bore — 70 mm (2.76")

80 mm bore — 75 mm (2.95")

Magnetic Non-Contact Sensing Switches: ACT-10-24/25

**Materials of Construction**

Tube and Carriage: Anodized aluminum

End Caps: 16 mm - molded plastic end caps and yoke.

20 mm - anodized aluminum end covers, molded plastic yoke.

25 to 80 mm - anodized aluminum end caps and yoke.

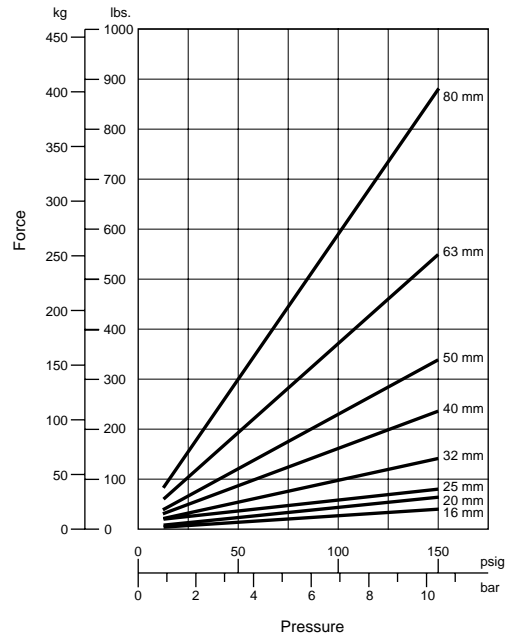
Seal Strips and Piston Seals: Polyurethane

Cover Strips: Polyamide

Guide Rails: UHMW Polymer

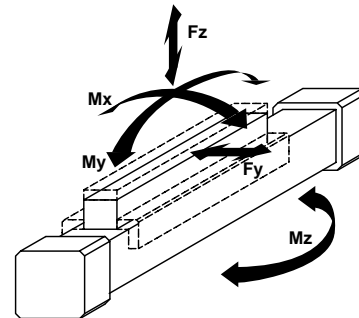
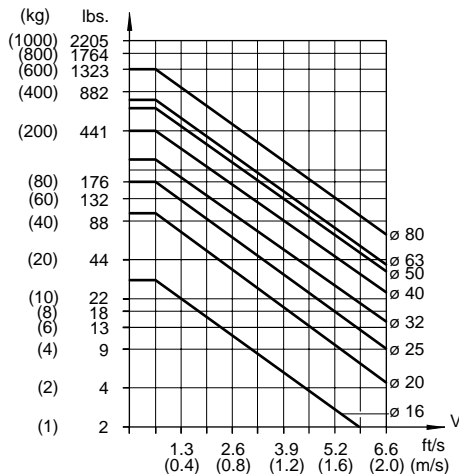
Seals: Nitrile rubber or Polyurethane

THRUST – Based on 75% of Maximum Thrust



**Cushioning Performance**

The dynamic energy of a Lintra cylinder is caused by direct or partial external loads which must be absorbed by pneumatic cushioning. The cushioning ability depends to a large extent on the pneumatic circuit (e. g. counter pressure, pre-exhaust). The values given in the diagram were tested with an operation pressure of 87 psig (6 bar) using a 5/2 control valve. When installed horizontally, depending upon the speed, dynamic energy can be absorbed by the cylinder. Whenever the values given in the diagram are exceeded, the transported mass must be cushioned by additional shock absorbers. These have to be located at the center of gravity of the mass.



**Loading values for Lintra cylinders**

The values given in the table below show the single forces in the directions Fy and Fz and the maximum moments Mx, My and Mz. All values are applicable only for speeds of max. 0.66 ft/s (0.2 m/s). A requirement for using these values is a constant movement (no jerking) of the mass over the whole stroke length of the cylinder. The reference point from which the moments for all cylinders should be calculated is the centerline of the piston.

**For speeds up to 6.6 ft.s (2 m/s) please use our calculation program PNEUCALC 2A. It is available upon request. PNEUCALC IIA is suitable for all PC's having MS-DOS 3.1 and higher.**

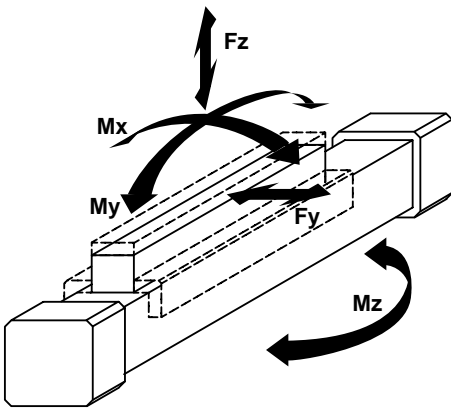
**Total loads**

When a Lintra cylinder has to take several loads and moments, an additional calculation is necessary using this formula:

$$\frac{M_x}{M_{x \max}} + \frac{M_y}{M_{y \max}} + \frac{M_z}{M_{z \max}} + \frac{F_y}{F_{y \max}} + \frac{F_z}{F_{z \max}} \leq 1$$



- Economical alternative for applications where limited external guiding is needed
- Ideal for light-duty installations, or in applications where external guides are required.
- Can be used to save money and space.
- Same rugged quality construction.
- Available with NPT or ISO G ports



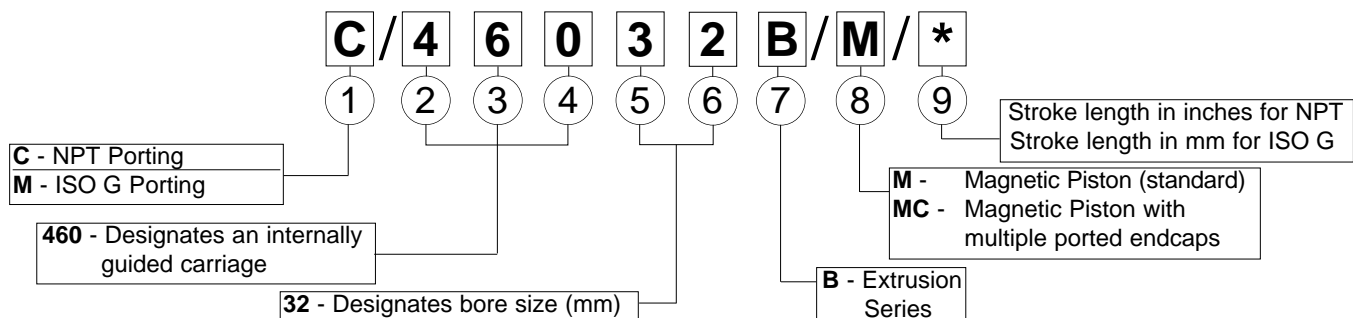
Load capabilities decrease inversely with piston velocities greater than 8 in./sec. Consult factory for additional load/velocity information. Moments are to be calculated with respect to the centerline of the cylinder. Values shown are for single axis moments. For multiple moment applications refer to ACT-10-5.

All Dimensions in Inches (mm)

Bore	16 mm	20 mm	25 mm	32 mm	40 mm	50 mm	63 mm	80 mm	
NPT Model	NA	C/46020B/M*	C/46025B/M*	C/46032B/M*	C/46040B/M*	C/46050B/M*	C/46063B/M*	C/46080B/M*	
ISO G Model	M/46016B/M*	C/46020B/M*	M/46025B/M*	M/46032B/M*	M/46040B/M*	M/46050B/M*	M/46063B/M*	M/46080B/M*	
Fy	Lbs Force N	9 (40)	20 (90)	25 (110)	34 (150)	68 (300)	90 (400)	144 (640)	176 (780)
Fz	Lbs Force N	27 (120)	63 (280)	79 (350)	104 (460)	203 (900)	270 (1200)	428 (1900)	518 (2300)
Mx	In Lbs Nm	2.7 (0.3)	8 (0.9)	12 (1.3)	22 (2.5)	51 (5.8)	87 (9.8)	159 (18)	239 (27)
My	In Lbs Nm	34 (3.8)	106 (12)	168 (19)	266 (30)	681 (77)	974 (110)	2124 (240)	3186 (360)
Mz	In Lbs Nm	9.7 (1.1)	32 (3.6)	50 (5.6)	76 (8.6)	195 (22)	283 (32)	620 (70)	885 (100)

\*Insert stroke length

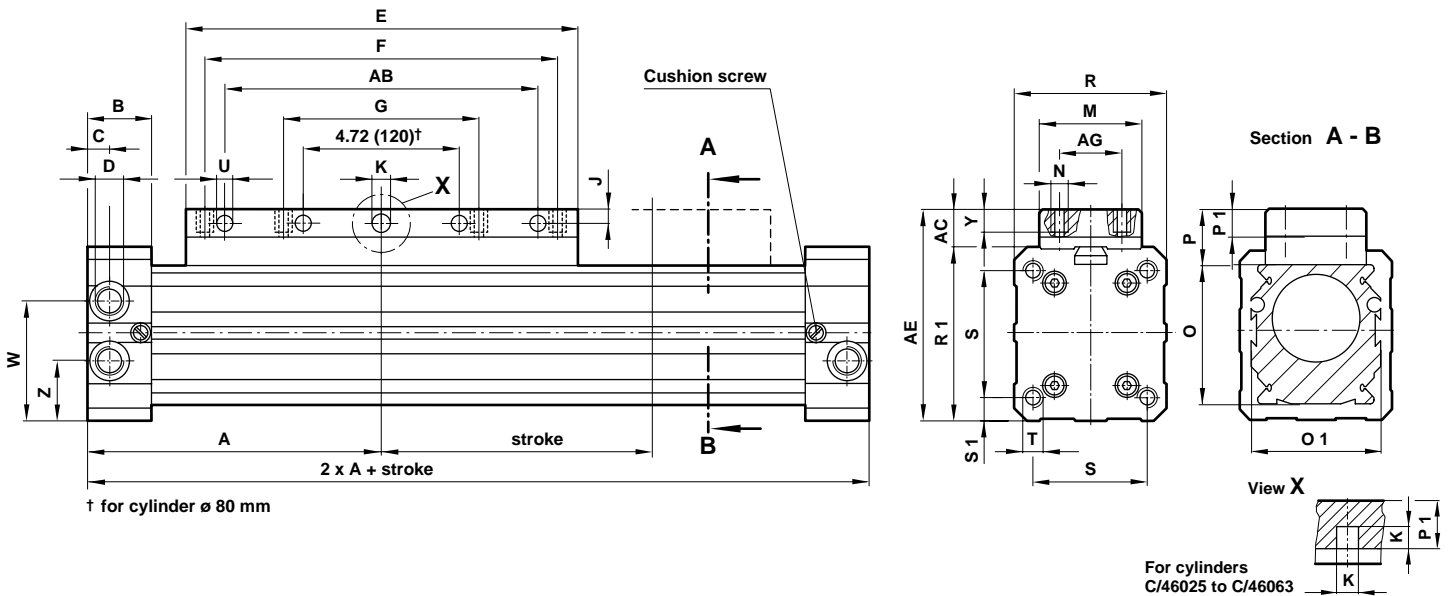
### Cylinder Order Information



C/46032B/M/40 is a cylinder with internally guided carriage, and NPT ports. It has a 32 mm bore (bore sizes are always designated in millimeters), magnetic piston, and a 40 inch stroke.



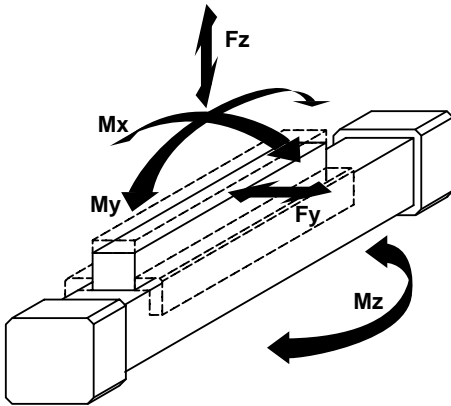
Basic Dimensions for Series 46000 Cylinders



Bore NPT Model ISO G Model	16 mm NA M/46016B/M/*	20 mm C/46020B/M/* M/46020B/M/*	25 mm C/46025B/M/* M/46025B/M/*	32 mm C/46032B/M/* M/46032B/M/*	40 mm C/46040B/M/* M/46040B/M/*	50 mm C/46050B/M/* M/46050B/M/*	63 mm C/46063B/M/* M/46063B/M/*	80 mm C/46080B/M/* M/46080B/M/*
A	2.46 (62.5)	3.35 (85)	3.94 (100)	4.72 (120)	5.91 (150)	7.09 (180)	8.46 (215)	10.24 (260)
AB	-	-	-	-	-	-	-	9.45 (240)
AC	0.33 (8.5)	0.55 (14)	0.47 (12)	0.63 (16)	0.59 (15)	0.79 (20)	0.79 (20)	0.94 (24)
AE	1.56 (39.5)	2.13 (54)	2.36 (60)	2.99 (76)	3.54 (90)	4.33 (110)	4.92 (125)	6.06 (154)
AG	0.31 (8)	0.71 (18)	0.79 (20)	0.98 (25)	0.98 (25)	0.98 (25)	0.98 (25)	0.98 (25)
B	0.69 (17.5)	0.91 (23)	0.91 (23)	1.06 (27)	1.18 (30)	1.38 (35)	1.57 (40)	1.77 (45)
C	0.31 (8)	0.31 (8)	0.57 (14.5)	0.41 (10.5)	0.45 (11.5)	0.55 (14)	0.55 (14)	0.67 (17)
D	M5	1/8NPT (G-1/8)	1/8NPT (G-1/8)	1/4NPT (G-1/4)	1/4NPT (G-1/4)	3/8NPT (G-3/8)	1/2NPT (G-1/2)	1/2NPT (G-1/2)
E	3.15 (80)	4.33 (110)	5.12 (130)	6.30 (160)	8.46 (215)	9.84 (250)	12.60 (320)	15.35 (390)
F	2.36 (60)	3.15 (80)	3.54 (90)	4.72 (120)	6.30 (160)	7.48 (190)	9.45 (240)	11.81 (300)
G	-	1.57 (40)	1.77 (45)	2.36 (60)	3.15 (80)	3.74 (95)	4.72 (120)	5.91 (150)
J	0.10 (2.5)	0.14 (3.5)	-	-	-	-	-	0.35 (9)
K	Ø .12 (3)	Ø .17 (4.2)	0.18 □ (4.5)	0.24 □ (6)	0.24 □ (6)	0.31 □ (8)	0.31 □ (8)	Ø .47 (12)
M	0.71 (18)	1.06 (27)	1.26 (32)	1.77 (45)	1.77 (45)	1.97 (50)	1.97 (50)	1.97 (50)
N	M3 - 4 deep	M5 - 12 deep	M5 - 7 deep	M5 - 8 deep	M6 - 8 deep	M8 - 11 deep	M8 - 11 deep	M10 - 15 deep
O	0.98 (25)	1.26 (32)	1.57 (40)	2.05 (52)	2.56 (65)	3.15 (80)	3.74 (95)	4.72 (120)
O1	1.02 (26)	1.26 (32)	1.61 (41)	2.05 (52)	2.56 (65)	3.15 (80)	3.74 (95)	4.72 (120)
P	0.47 (12)	0.73 (18.5)	0.63 (16)	0.79 (20)	0.79 (20)	0.98 (25)	0.98 (25)	1.14 (29)
P1	-	-	0.30 (7.5)	0.39 (10)	0.39 (10)	0.51 (13)	0.55 (14)	-
R	1.06 (27)	1.57 (40)	1.89 (48)	2.36 (60)	2.95 (75)	3.54 (90)	4.13 (105)	5.12 (130)
R1	1.22 (31)	1.57 (40)	1.89 (48)	2.36 (60)	2.95 (75)	3.54 (90)	4.13 (105)	5.12 (130)
S	0.63 (16)	1.26 (32)	1.46 (37)	1.85 (47)	2.28 (58)	2.76 (70)	3.31 (84)	3.94 (100)
S1	0.22 (5.5)	0.16 (4)	0.22 (5.5)	0.26 (6.5)	0.33 (8.5)	0.39 (10)	0.41 (10.5)	0.59 (15)
T	M3 - 5 deep	M5 - 12 deep	M5 - 13 deep	M6 - 15 deep	M8 - 20 deep	M8 - 25 deep	M10 - 25 deep	M12 - 25 deep
UØ	-	-	-	-	-	-	-	0.43 (11)
W	-	-	1.30 (33)	1.57 (40)	1.97 (50)	2.36 (60)	2.76 (70)	3.54 (90)
Y	0.16 (4)	0.47 (12)	0.28 (7)	0.31 (8)	0.31 (8)	0.43 (11)	0.43 (11)	0.59 (15)
Z	0.64 (16.3)	0.85 (21.5)	0.67 (17)	0.79 (20)	0.98 (25)	1.18 (30)	1.38 (35)	1.57 (40)

\*Insert stroke length

- The external guiding system provides greater resistance to axial and radial loads.
- Reduces the need for external bearings or supports.
- Large load carrying capability
- Operates within its own envelope
- Available with NPT or ISO G ports



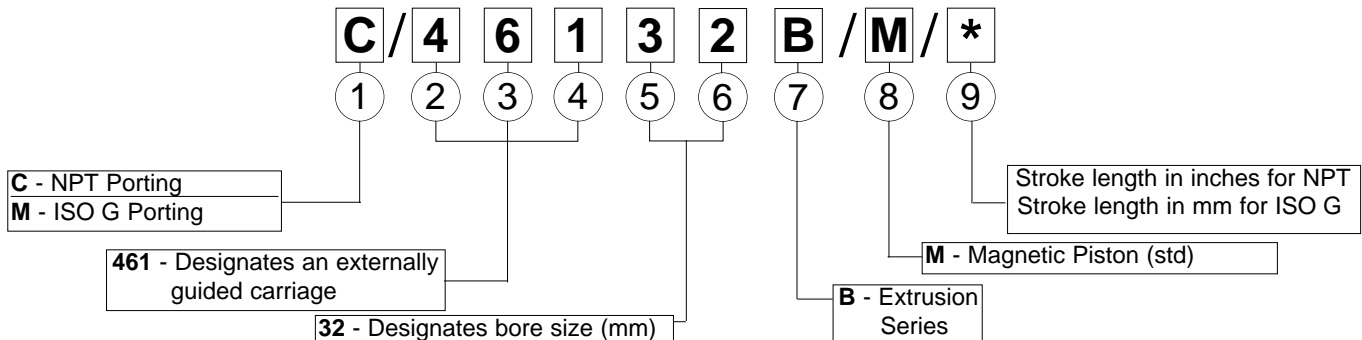
Load capabilities decrease inversely with piston velocities greater than 8 in./sec. Consult factory for additional load/velocity information. Moments are to be calculated with respect to the centerline of the cylinder. Values shown are for single axis moments. For multiple moment applications refer to ACT-10-5.

All Dimensions in Inches (mm)

Bore	16 mm	20 mm	25 mm	32 mm	40 mm	50 mm	63 mm	80 mm
NPT Model	NA	C/46120B/M*	C/46125B/M*	C/46132B/M*	C/46140B/M*	C/46150B/M*	C/46163B/M*	C/46180B/M*
ISO G Model	M/46116B/M*	M/46120B/M*	M/46125B/M*	M/46132B/M*	M/46140B/M*	M/46150B/M*	M/46163B/M*	M/46180B/M*
F <sub>y</sub> Lbs Force	45	106	133	176	338	450	720	878
N	(200)	(470)	(590)	(780)	(1500)	(2000)	(3200)	(3900)
F <sub>z</sub> Lbs Force	45	106	133	176	338	450	720	878
N	(200)	(470)	(590)	(780)	(1500)	(2000)	(3200)	(3900)
M <sub>x</sub> In Lbs	18	53	80	150	345	577	1066	1598
Nm	(2)	(6)	(9)	(17)	(39)	(65)	(120)	(180)
M <sub>y</sub> In Lbs	49	159	249	381	974	1421	3108	4618
Nm	(5.5)	(18)	(28)	(43)	(110)	(160)	(350)	(520)
M <sub>z</sub> In Lbs	49	159	249	381	974	1421	3108	4618
Nm	(5.5)	(18)	(28)	(43)	(110)	(160)	(350)	(520)

\*Insert stroke length

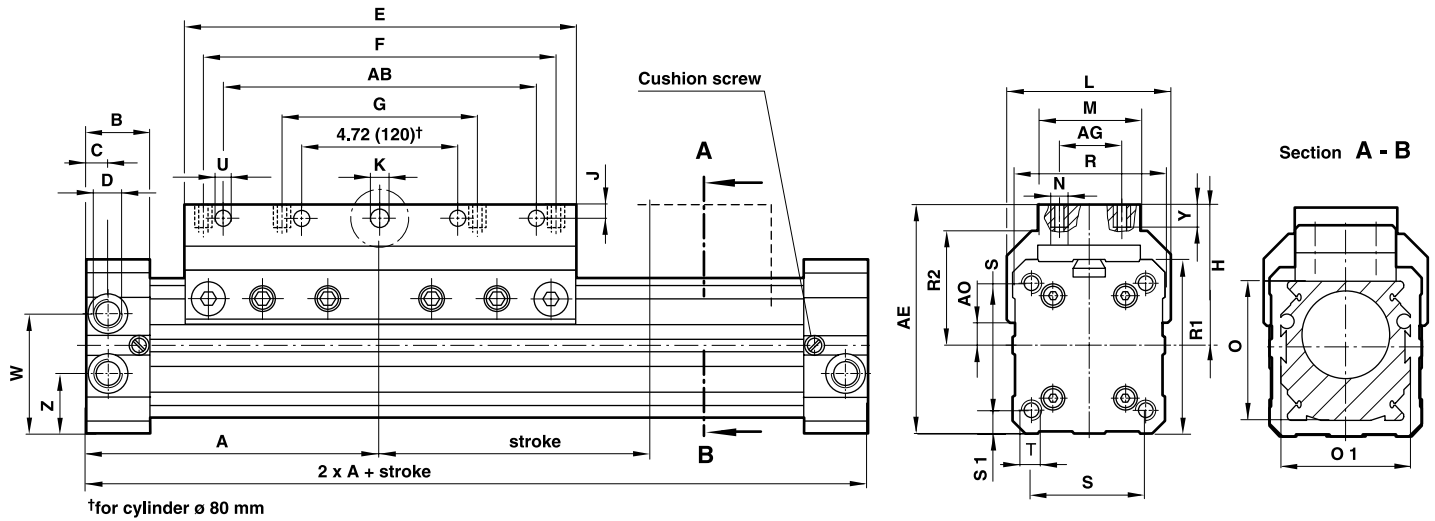
### Cylinder Order Information



C/46132/M/40 is a cylinder with externally guided carriage, and NPT ports. It has a 32 mm bore (bore sizes are always designated in millimeters), magnetic piston, and a 40 inch stroke.



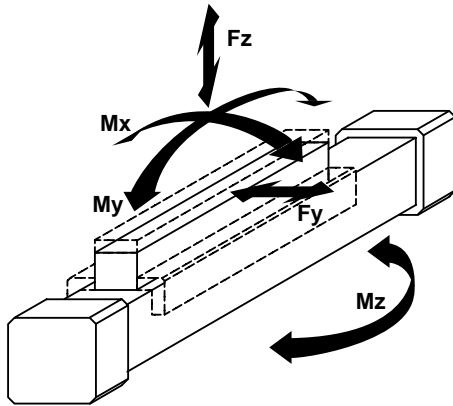
**Basic Dimensions for Series 46100 Cylinders**



Bore	16 mm	20 mm	25 mm	32 mm	40 mm	50 mm	63 mm	80 mm
NPT Model	NA	C/46120B/M*	C/46125B/M*	C/46132B/M*	C/46140B/M*	C/46150B/M*	C/46163B/M*	C/46180B/M*
ISO G Model	M/46116B/M*	M/46120B/M*	M/46125B/M*	M/46132B/M*	M/46140B/M*	M/46150B/M*	M/46163B/M*	M/46180B/M*
A	2.46 (62.5)	3.35 (85)	3.94 (100)	4.72 (120)	5.91 (150)	7.09 (180)	8.46 (215)	10.24 (260)
AB	—	2.36 (60)	2.76 (70)	3.54 (90)	4.72 (120)	6.30 (160)	7.48 (190)	9.45 (240)
AE	1.50 (38)	2.32 (59)	2.66 (67.5)	3.23 (82)	3.84 (97.5)	4.61 (117)	5.39 (137)	6.50 (165)
AG	0.31 (8)	0.71 (18)	0.79 (20)	0.98 (25)	0.98 (25)	0.98 (25)	0.98 (25)	0.98 (25)
AO	0.30 (7.5)	0.26 (6.5)	0.37 (9.5)	0.61 (15.5)	0.65 (16.5)	0.94 (24)	1.00 (25.5)	1.50 (38)
B	0.69 (17.5)	0.91 (23)	0.91 (23)	1.06 (27)	1.18 (30)	1.38 (35)	1.57 (40)	1.77 (45)
C	0.31 (8)	0.31 (8)	0.57 (14.5)	0.41 (10.5)	0.45 (11.5)	0.55 (14)	0.67 (17)	0.67 (17)
D	M5	1/8NPT (G-1/8)	1/8NPT (G-1/8)	1/4NPT (G-1/4)	1/4NPT (G-1/4)	3/8NPT (G-3/8)	1/2NPT (G-1/2)	1/2NPT (G-1/2)
E	3.15 (80)	4.33 (110)	5.12 (130)	6.30 (160)	8.46 (215)	9.84 (250)	12.60 (320)	15.35 (390)
F	2.36 (60)	3.15 (80)	3.54 (90)	4.72 (120)	6.30 (160)	7.48 (190)	9.45 (240)	11.81 (300)
G	—	1.57 (40)	1.77 (45)	2.36 (60)	3.15 (80)	3.74 (95)	4.72 (120)	5.91 (150)
H	0.89 (22.5)	1.54 (39)	1.71 (43.5)	2.05 (52)	2.36 (60)	2.84 (72)	3.33 (84.5)	3.94 (100)
J	—	0.30 (7.5)	0.20 (5)	0.20 (5)	0.20 (5)	0.26 (6.5)	0.30 (7.5)	0.39 (10)
K	—	∅ .22 (5.5)	∅ .22 (5.5)	∅ .22 (5.5)	∅ .26 (6.6)	∅ .35 (9)	∅ .35 (9)	∅ .47 (12)
L	1.22 (31)	1.65 (42)	2.05 (52)	2.52 (64)	3.11 (79)	3.62 (92)	4.33 (110)	5.12 (130)
M	0.71 (18)	1.06 (27)	1.26 (32)	1.77 (45)	1.77 (45)	1.97 (50)	1.97 (50)	1.97 (50)
N	M3 - 4 deep	M5 - 12 deep	M5 - 7 deep	M5 - 8 deep	M6 - 8 deep	M8 - 11 deep	M8 - 11 deep	M10 - 15 deep
O	0.98 (25)	1.26 (32)	1.57 (40)	2.05 (52)	2.56 (65)	3.15 (80)	3.74 (95)	4.72 (120)
O1	1.26 (32)	1.50 (38)	1.77 (45)	2.05 (52)	2.56 (65)	3.15 (80)	3.74 (95)	4.72 (120)
P1	—	—	0.30 (7.5)	0.39 (10)	0.39 (10)	0.51 (13)	0.55 (14)	—
R	1.06 (27)	1.57 (40)	1.89 (48)	2.36 (60)	2.95 (75)	3.54 (90)	4.13 (105)	5.12 (130)
R1	1.22 (31)	1.57 (40)	1.89 (48)	2.36 (60)	2.95 (75)	3.54 (90)	4.13 (105)	5.12 (130)
R2	0.73 (18.5)	0.94 (24)	1.34 (34)	1.67 (42.5)	1.95 (49.5)	2.30 (58.5)	2.68 (68)	3.19 (81)
S	0.63 (16)	1.26 (32)	1.46 (37)	1.85 (47)	2.28 (58)	2.76 (70)	3.31 (84)	3.94 (100)
S1	0.22 (5.5)	0.16 (4.0)	0.22 (5.5)	0.26 (6.5)	0.33 (8.5)	0.39 (10)	0.41 (10.5)	0.59 (15)
T	M3 - 5 deep	M5 - 12 deep	M5 - 13 deep	M6 - 15 deep	M8 - 20 deep	M8 - 25 deep	M10 - 25 deep	M12 - 25 deep
U∅	—	0.22 (5.5)	0.22 (5.5)	0.22 (5.5)	0.26 (6.6)	0.35 (9)	0.35 (9)	0.43 (11)
W	—	—	1.30 (33)	1.57 (40)	1.97 (50)	2.36 (60)	2.76 (70)	3.54 (90)
Y	0.20 (5)	0.47 (12)	0.47 (12)	0.47 (12)	0.47 (12)	0.67 (17)	0.79 (20)	0.98 (25)
Z	0.64 (16.3)	0.85 (21.5)	0.67 (17)	0.79 (20)	0.98 (25)	1.18 (30)	1.38 (35)	1.57 (40)

\*Insert stroke length

- Reduces the need for additional external guiding.
- Reduced friction
- Increased load carrying capability
- Smoother operation
- Large mounting surface
- Available with NPT or ISO G ports



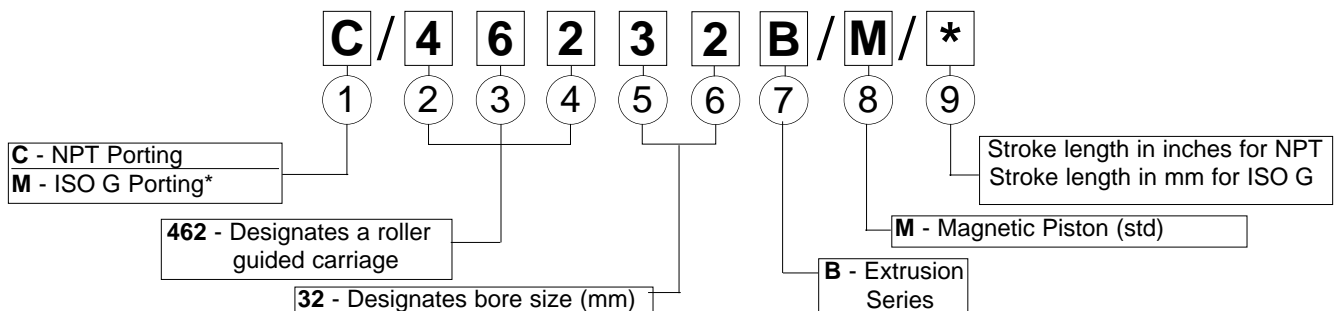
Load capabilities decrease inversely with piston velocities greater than 8 in./sec. Consult factory for additional load/velocity information. Moments are to be calculated with respect to the centerline of the cylinder. Values shown are for single axis moments. For multiple moment applications refer to ACT-10-5.

All Dimensions in Inches (mm)

Bore	16 mm	20 mm	25 mm	32 mm	40 mm	50 mm	63 mm	80 mm
NPT Model	NA	C/46220B/M*	C/46225B/M*	C/46232B/M*	C/46240B/M*	C/46250B/M*	C/46263B/M*	C/46280B/M*
ISO G Model	M/46216B/M*	M/46220B/M*	M/46225B/M*	M/46232B/M*	M/46240B/M*	M/46250B/M*	M/46263B/M*	M/46280B/M*
F <sub>y</sub>	Lbs Force	-	-	133	176	338	450	720
	N	-	-	(590)	(780)	(1500)	(2000)	(3200)
F <sub>z</sub>	Lbs Force	-	-	266	351	675	900	1440
	N	-	-	(1180)	(1560)	(3000)	(4000)	(6400)
M <sub>x</sub>	In Lbs	-	-	115	222	515	861	1598
	Nm	-	-	(13)	(25)	(58)	(97)	(180)
M <sub>y</sub>	In Lbs	-	-	373	568	1421	2131	4618
	Nm	-	-	(42)	(64)	(160)	(240)	(520)
M <sub>z</sub>	In Lbs	-	-	373	568	1421	2131	4618
	Nm	-	-	(42)	(64)	(160)	(240)	(520)

\*Insert stroke length

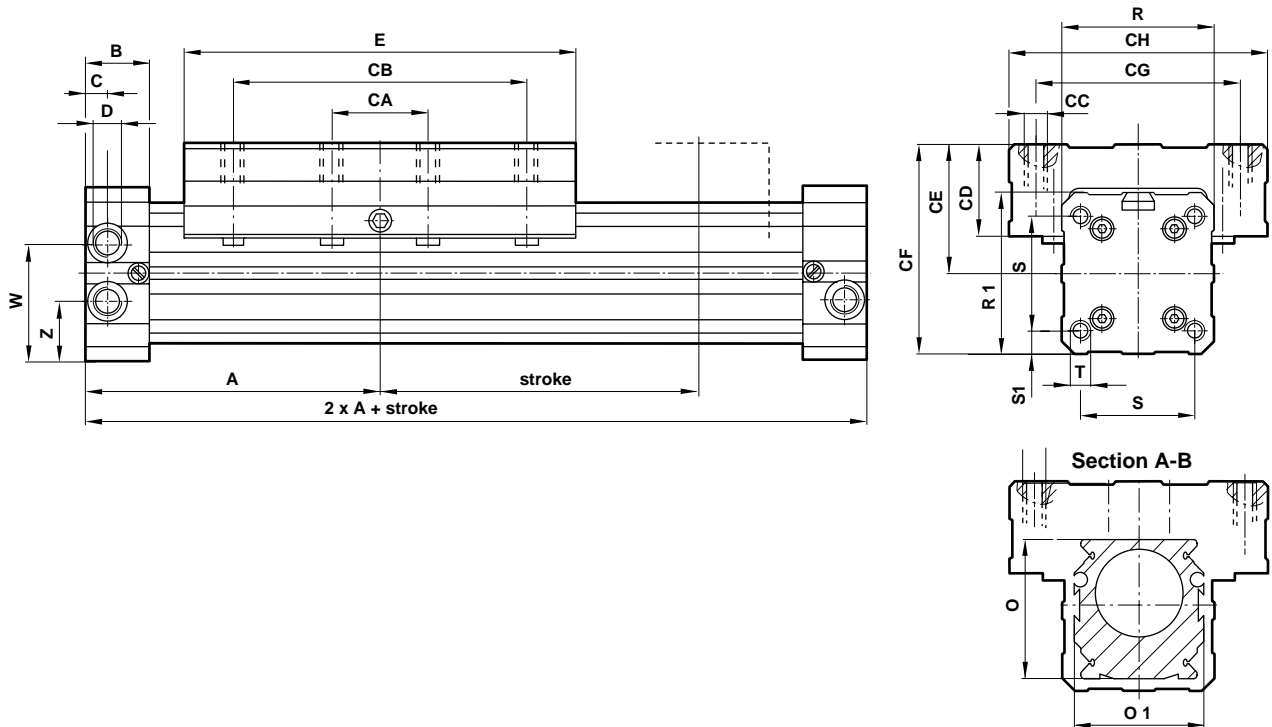
**Cylinder Order Information**



C/46232B/M/40 is a cylinder with a roller guided carriage, and NPT ports. It has a 32 mm bore (bore sizes are always designated in millimeters), magnetic piston, and a 40 inch stroke.



Basic Dimensions for Series 46200 Cylinders



Bore NPT Model ISO G Model	25 mm C/46225B/M/* M/46225B/M/*	32 mm C/46232B/M/* M/46232B/M/*	40 mm C/46240B/M/* M/46240B/M/*	50 mm C/46250B/M/* M/46250B/M/*	63 mm C/46263B/M/* M/46263B/M/*
A	3.94 (100)	4.72 (120)	5.91 (150)	7.09 (180)	8.46 (215)
B	0.91 (23)	1.06 (27)	1.18 (30)	1.38 (35)	1.57 (40)
C	0.57 (14.5)	0.41 (10.5)	0.45 (11.5)	0.55 (14)	0.55 (14)
CA	1.77 (45)	2.36 (60)	3.15 (80)	3.54 (90)	4.72 (120)
CB	3.54 (90)	4.72 (120)	5.91 (150)	7.09 (180)	9.45 (240)
CC	M 6 - 14 deep	M 8 - 16 deep	M 8 - 16 deep	M 10 - 20 deep	M 10 - 20 deep
CD	1.42 (36)	1.50 (38)	1.65 (42)	1.73 (44)	1.85 (47)
CE	1.65 (42)	1.97 (50)	2.26 (57.5)	2.64 (67)	2.93 (74.5)
CF	2.60 (66)	3.15 (80)	3.74 (95)	4.41 (112)	5.00 (127)
CG	2.36 (60)	2.95 (75)	3.62 (92)	3.94 (100)	4.33 (110)
CH	3.35 (85)	3.85 (98)	4.65 (118)	5.20 (132)	5.51 (140)
D	1/8 NPT(G-1/8)	1/4 NPT(G-1/4)	1/4 NPT(G-1/4)	3/8 NPT(G-3/8)	1/2 NPT (G-1/2)
E	5.12 (130)	6.30 (160)	8.46 (215)	9.84 (250)	12.6 (320)
O	1.57 (40)	2.05 (52)	2.56 (65)	3.15 (80)	3.74 (95)
O1	1.61 (41)	2.05 (52)	2.56 (65)	3.15 (80)	3.74 (95)
R	1.89 (48)	2.36 (60)	2.95 (75)	3.54 (90)	4.13 (105)
R1	1.89 (48)	2.36 (60)	2.95 (75)	3.54 (90)	4.13 (105)
S	1.46 (37)	1.85 (47)	2.28 (58)	2.76 (70)	3.31 (84)
S1	0.22 (5.5)	0.26 (6.5)	0.33 (8.5)	0.39 (10)	0.41 (10.5)
T	M5 - 13 deep	M6 - 15 deep	M8 - 20 deep	M8 - 25 deep	M10 - 25 deep
W	1.30 (33)	1.57 (40)	1.97 (50)	2.36 (60)	2.76 (70)
Z	0.67 (17)	0.79 (20)	0.98 (25)	1.18 (30)	1.38 (35)

- **Attaches to the carriage of the internally guided cylinder.**
- **Loads are guided by the integral guide strips at the sides of the bracket.**
- **With carriage stopped (air applied to brake unit), loads are held firmly in place by the brake.**



### Specifications

Pressure Range: 30 to 150 psig  
(2 to 10 bar)

Temperature Range: -22° to 180°F  
(-30° to 80°C)

Brake Material: Asbestos-Free Brake Pad

Wear Band: Stainless Steel

Body: Aluminum

### Technical Data

Brake Selection: Limited by load. No applied force or bending moment may exceed the "Externally Guided Carriage Load Carrying Capability" for that cylinder's bore size, shown in the table on ACT-10-8.

Brake Operation: Air pressure **applies** the brake.

**Note:** Brake pad and wear band surfaces must be kept clean and dry, and free of oil.

Cylinder Length: Limited by load. See deflection tables on ACT-10-21 for values on maximum unsupported span, load and resulting deflection.

### Cylinder/Brake Circuit

In the air circuit diagrammed at right, pressure is applied to both sides of the cylinder when the Valve 1 (4-Way/3-Position) is in normal, spring centered condition. When solenoid "A" is actuated the carriage will move toward endcap "A".

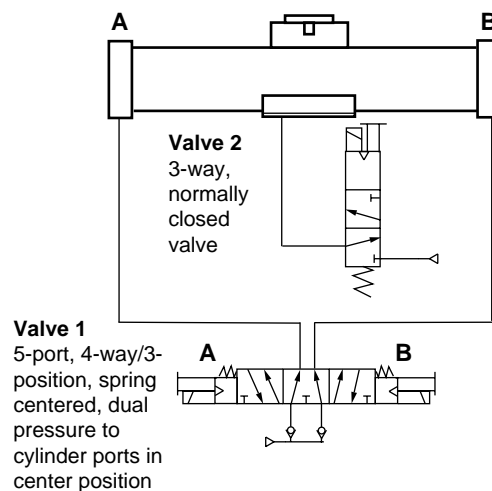
When the carriage reaches the desired location along the cylinder length, the signal to Valve 1 is removed and equal pressure is applied to both sides of the piston, stopping movement of the carriage. The directional control Valve 2 (3-Way, Normally Closed) controlling the brake is then actuated, pressurizing the brake, and causing the brake pad to contact the wear band, thus holding the carriage in place. With equal operating pressure on both sides of the piston, the brake will hold a load (horizontally or vertically) up to the maximum specified weights shown on ACT-10-13 in the **Holding Force of the Active Brake** table.

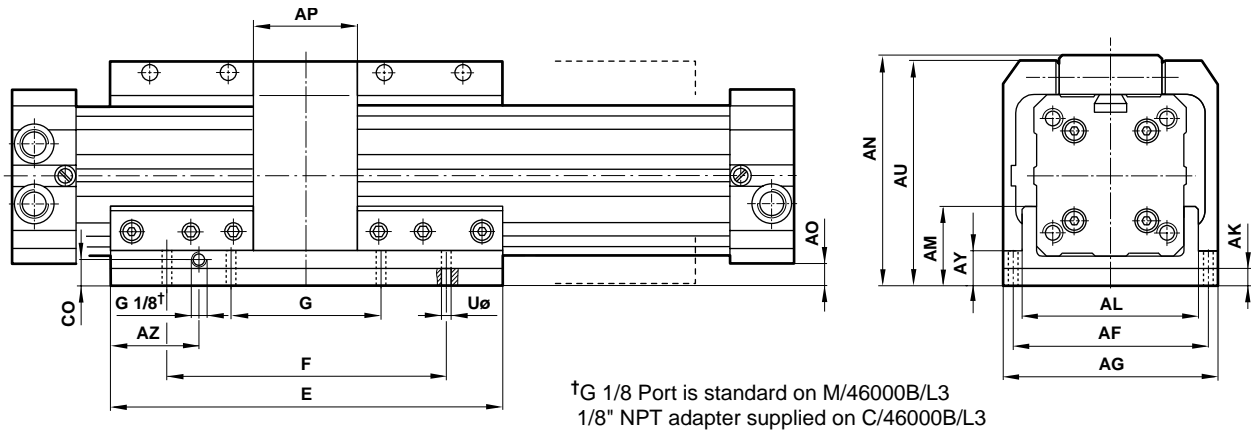
### Caution

**In order to avoid a runaway condition, the brake must be vented to atmosphere (releasing the brake), allowing the carriage to move freely, before any pressure change is made to the cylinder.**

A runaway condition may occur if pressure is applied to one side of the piston and exhausted from the other side before the brake is released.

**NOTE:** The Active Brake is a static brake, it is not designed to stop or slow moving loads.

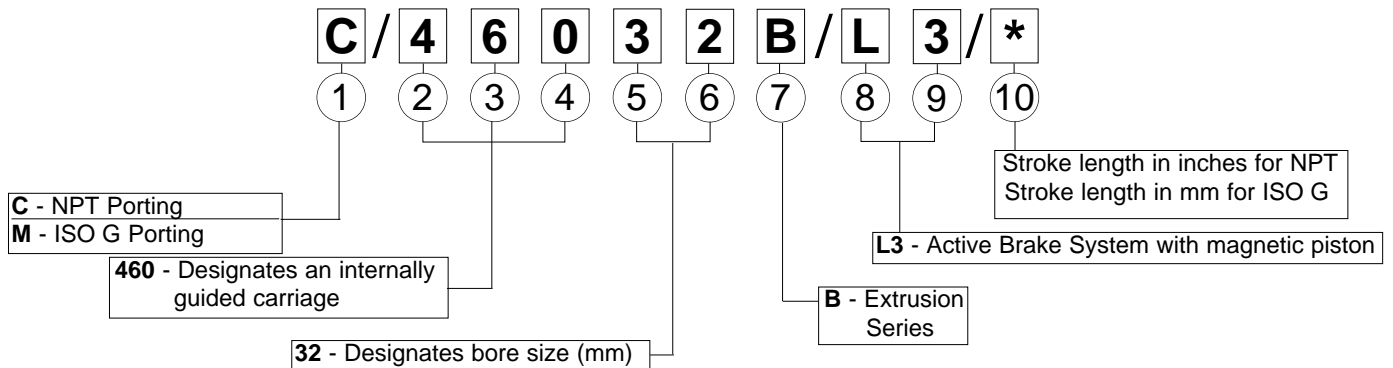




†G 1/8 Port is standard on M/46000B/L3  
1/8" NPT adapter supplied on C/46000B/L3

Bore NPT Model ISO G Model	25 mm C/46025B/L3/* M/46025B/L3/*	32 mm C/46032B/L3/* M/46032B/L3/*	40 mm C/46040B/L3/* M/46040B/L3/*	50 mm C/46050B/L3/* M/46050B/L3/*	63 mm C/46063B/L3/* M/46063B/L3/*
AF	2.44 (62)	3.07 (78)	3.70 (94)	4.41 (112)	5.20 (132)
AG	2.95 (75)	3.62 (92)	4.41 (112)	5.20 (132)	5.91 (150)
AK	0.48 (12)	0.48 (12)	0.48 (12)	0.48 (12)	0.48 (12)
AL	2.05 (52)	2.52 (64)	3.19 (81)	3.70 (94)	4.41 (112)
AM	1.12 (28.5)	1.14 (29)	1.36 (34.5)	1.40 (35.5)	1.67 (42.5)
AN	2.89 (73.5)	3.54 (90)	4.07 (103.5)	4.90 (124.5)	5.53 (140.5)
AO	0.53 (13.5)	0.55 (14)	0.53 (13.5)	0.57 (14.5)	0.61 (15.5)
AP	1.77 (45)	2.17 (55)	2.56 (65)	2.95 (75)	3.54 (90)
AU	2.87 (73)	3.52 (89.5)	4.06 (103)	4.88 (124)	5.51 (140)
AY	0.65 (16.5)	0.69 (17.5)	0.71 (18)	0.73 (18.5)	0.81 (20.5)
AZ	1.18 (30)	1.28 (32.5)	2.07 (52.5)	2.56 (65)	4.53 (115)
CO	0.63 (16)	0.71 (18)	0.71 (18)	0.94 (24)	0.94 (24)
E	5.12 (130)	6.30 (160)	8.46 (215)	9.84 (250)	12.60 (320)
F	3.54 (90)	4.72 (120)	6.30 (160)	7.48 (190)	9.45 (240)
G	—	2.36 (60)	3.15 (80)	3.74 (95)	4.72 (120)
UØ	0.26 (6.6)	0.35 (9)	0.35 (9)	0.43 (11)	0.51 (13)

### Cylinder Order Information



C/46032B/L3/40 is a cylinder with internally guided carriage, and NPT ports. It has a 32 mm bore (bore sizes are always designated in millimeters), and active brake system with magnetic piston, and 40 inch stroke.

### Holding force of the Active Brake at 87 psi (6 bar) with dry brake surface:

Cylinder Bore	25	32	40	50	63
Retention forces in lbs.	112.5	202.5	337.5	562.5	900.0
(N)	(500)	(900)	(1500)	(2500)	(4000)



- **Attaches to the carriage of the Internally guided cylinder.**
- **Loads are guided by the integral guide strips at the sides of the bracket.**
- **With carriage stopped, (with no air pressure applied to the brake unit) loads are held firmly in place by the brake.**



### Specifications

Pressure Range: 73 to 150 psig  
(5 to 10 bar)

Temperature Range: -22° to 180°F  
(-30° to 80°C)

Brake Material: Asbestos-Free Brake Pad  
Wear Band: Stainless Steel  
Body: Aluminum

### Technical Data

Brake Selection: Limited by load. No applied force or bending moment may exceed the "Externally Guided Carriage Load Carrying Capability" for that cylinder's bore size, shown in the table on ACT-10-8.

Brake Operation: Air pressure **releases** the brake.

**Note:** Brake pad and wear band surfaces must be kept clean and dry, and free of oil.

Cylinder Length: Limited by load. See deflection tables on ACT-10-21 for values on maximum unsupported span, load and resulting deflection.

### Cylinder/Brake Circuit

In the air circuit diagrammed at right, pressure is applied to both sides of the cylinder when the Valve 1 (4-Way/3-Position) is in normal, spring centered position. When solenoid "A" is actuated the carriage will move toward endcap "A".

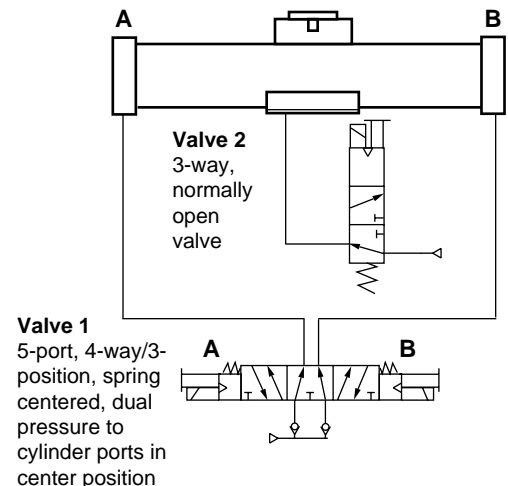
When the carriage reaches the desired location along the cylinder length, the signal to Valve 1 is removed and equal pressure is applied to both sides of the piston, stopping movement of the carriage. The directional control Valve 2 (3-Way, Normally Open) controlling the brake is then actuated, exhausting pressure and causing the brake pad to contact the wear band, thus holding the carriage in place. With equal operating pressure on both sides of the piston, the brake will hold a load (horizontally or vertically) up to the maximum specified weights shown on ACT-10-15 in the **Holding Force of the Passive Brake** table.

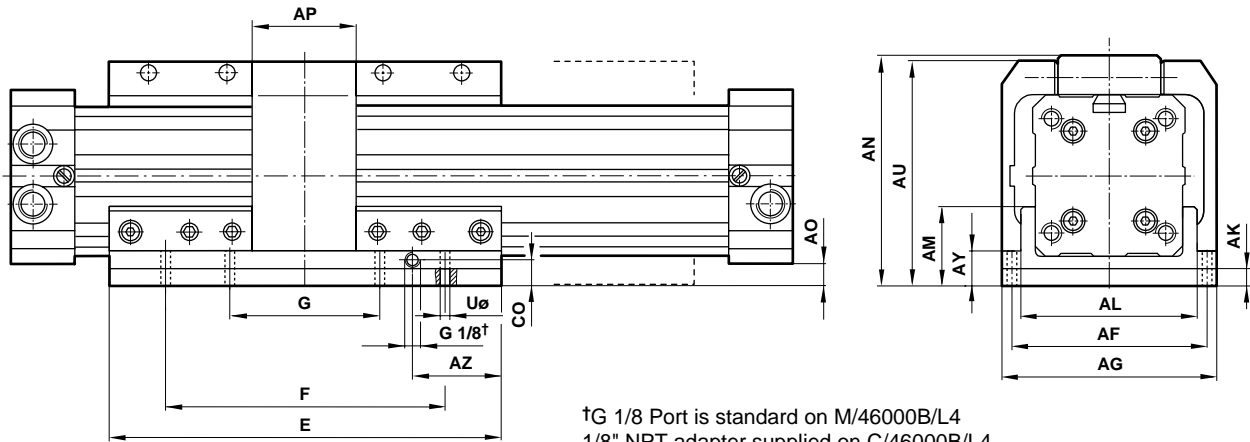
### Caution

**In order to avoid a runaway condition, the brake must be pressurized (releasing the brake), allowing the carriage to move freely, before any pressure change is made to the cylinder.**

A runaway condition may occur if pressure is applied to one side of the piston and exhausted from the other side before the brake is released.

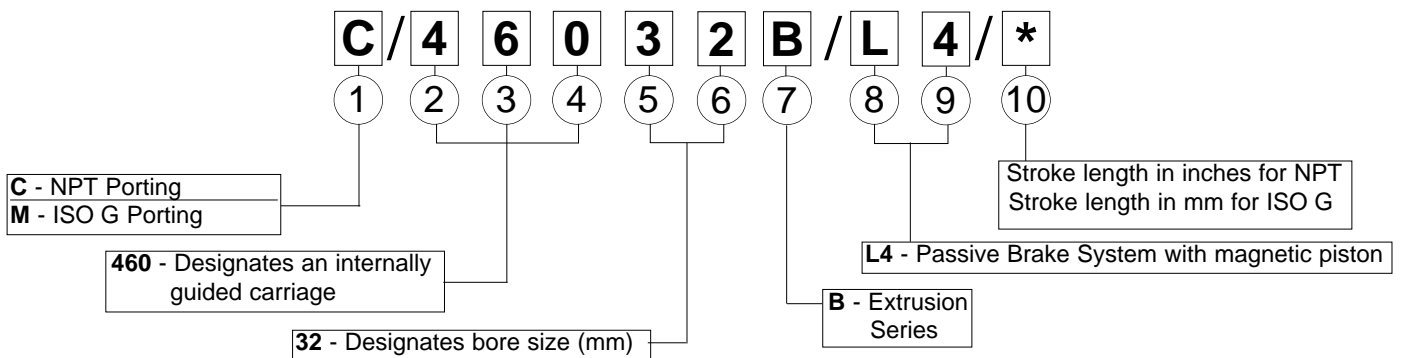
**NOTE:** The Passive Brake is a static brake, it is not designed to stop or slow moving loads.





Bore NPT Model ISO G Model	25 mm C/46025B/L4* M/46025B/L4*	32 mm C/46032B/L4* M/46032B/L4*	40 mm C/46040B/L4* M/46040B/L4*	50 mm C/46050B/L4* M/46050B/L4*	63 mm C/46063B/L4* M/46063B/L4*
AF	2.44 (62)	3.07 (78)	3.70 (94)	4.41 (112)	5.20 (132)
AG	2.95 (75)	3.62 (92)	4.41 (112)	5.20 (132)	5.91 (150)
AK	0.39 (10)	0.47 (12)	0.47 (12)	0.71 (18)	0.71 (18)
AL	2.05 (52)	2.52 (64)	3.19 (81)	3.31 (84)	4.41 (112)
AM	1.52 (38.5)	1.61 (41)	1.83 (46.5)	2.11 (53.5)	2.38 (60.5)
AN	3.29 (83.5)	4.02 (102)	4.55 (115.5)	5.61 (142.5)	6.24 (158.5)
AO	0.93 (23.5)	1.02 (26)	1.00 (25.5)	1.28 (32.5)	1.32 (33.5)
AP	1.77 (45)	2.17 (55)	2.56 (65)	2.95 (75)	3.54 (90)
AU	3.27 (83)	4.00 (101.5)	4.53 (115)	5.59 (142)	6.22 (158)
AY	1.04 (26.5)	1.16 (29.5)	1.18 (30)	1.44 (36.5)	1.52 (38.5)
AZ	1.18 (30)	1.28 (32.5)	2.07 (52.5)	2.56 (65)	4.53 (115)
CO	0.63 (16)	0.71 (18)	0.71 (18)	0.94 (24)	0.94 (24)
E	5.12 (130)	6.30 (160)	8.46 (215)	9.84 (250)	12.60 (320)
F	3.54 (90)	4.72 (120)	6.30 (160)	7.48 (190)	9.45 (240)
G	—	2.36 (60)	3.15 (80)	3.74 (95)	4.72 (120)
UØ	0.26 (6.6)	0.35 (9)	0.35 (9)	0.43 (11)	0.51 (13)

### Cylinder Order Information



C/46032B/L4/40 is a cylinder with internally guided carriage, and NPT ports. It has a 32 mm bore (bore sizes are always designated in millimeters), and passive brake system with magnetic piston, and 40 inch stroke

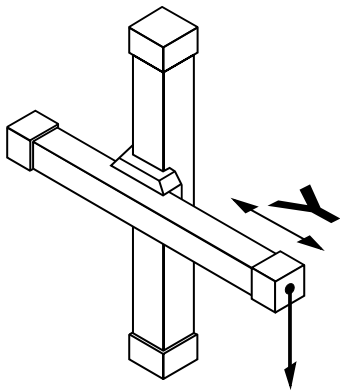
### Holding force of the Passive Brake at 0 psi on dry brake surface:

Cylinder Bore	25	32	40	50	63
Retention forces lbs.	49.5	84.4	141.8	225.0	371.3
(N)	(220)	(375)	(630)	(1000)	(1650)

- Provides economical, guided X-Y axis motion
- Lintra Series 46000 cylinders of like or different bore sizes may be combined using this Right Angle Mounting System.

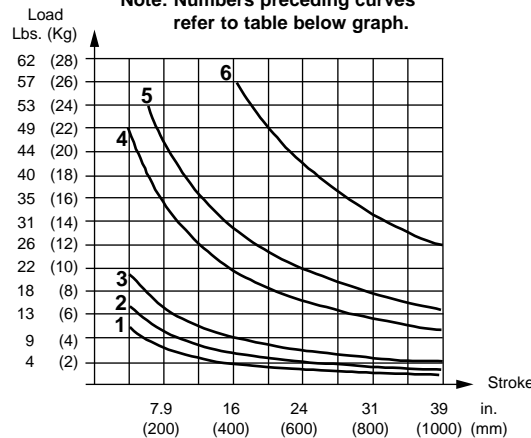


**Maximum load for Right Angle Mounting**



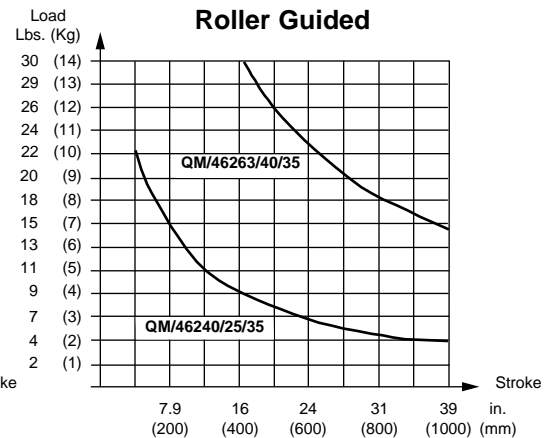
**Externally Guided**

Note: Numbers preceding curves refer to table below graph.



1	QM/46125/20/33
2	QM/46125/25/33, QM/46132/25/33, QM/46140/25/33
3	QM/46132/32/33, QM/46140/32/33, QM/46150/32/33
4	QM/46140/40/33, QM/46163/40/33
5	QM/46150/50/33
6	QM/46163/63/33

**Roller Guided**



**Ordering a Right Angle Mounting System**

All systems require two cylinders and one right angle adapter. Because the Right Angle System mounts directly to the yokes, cylinders do not come with carriages. Right angle adapters incorporate external guided or roller guided systems. When ordering choose from the cylinders and adapters listed on ACT-10-17. **You must order two cylinders and one adapter.** Unless otherwise requested, one cylinder will come with the Right Angle Bracket attached.

**Order example for a Right Angle Mounting System using same bore size cylinders**

2 cylinders

**QC\* / 460 32 / M / 40 / 33**

**QC\* / 460 32 / M / 40 / 33**

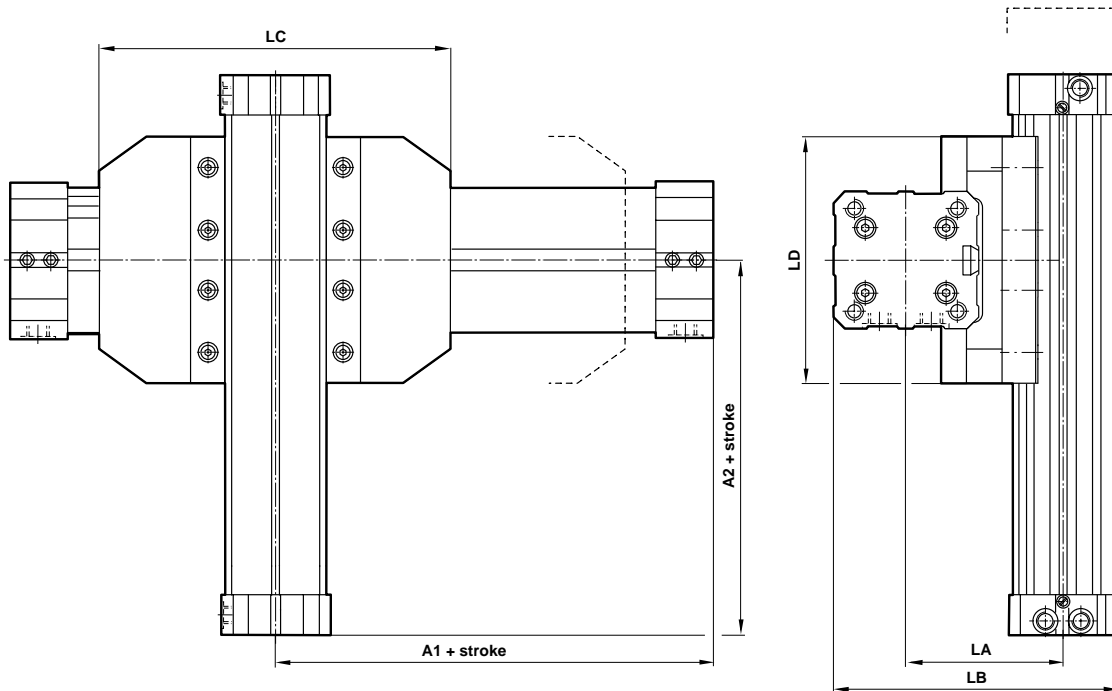
**+**

Right Angle Adapter

**QM / 46132 / 32 / 33**

The numbers above represent two cylinders with NPT ports (C), 32 mm bores, magnetic pistons (M) standard, and 40 inch strokes. The "Q" indicates that these cylinders are part of an assembly, and the "33" indicates that these cylinders are part of an externally guided right angle mounting system. When ordering a Right Angle Mounting System, two cylinders must be specified as separate line items.

The number above represents an Externally Guided Right Angle Adapter for 32 mm bore cylinders. This adapter must be ordered as a separate line item when ordering the Right Angle Mounting System. Refer to ACT-10-17 for cylinder and adapter numbers.



### Externally Guided Right Angle Mounting System (Same bore size cylinders)

Note: For ISO ports replace "C" with "M" in second position of the cylinder number and state stroke length in mm.

Bore	Model	Right Angle Adapter	A1	A2	LA	LB	LC	LD
25 mm	QC/46025/M*/33	QM/46125/25/33	3.9 (100)	3.9 (100)	2.7 (69)	4.6 (117)	5.1 (130)	5.1 (130)
25 mm	QC/46025/M*/33							
32 mm	QC/46032/M*/33	QM/46132/32/33	4.7 (120)	4.7 (120)	3.3 (84)	5.7 (144)	6.3 (160)	6.3 (160)
32 mm	QC/46032/M*/33							
40 mm	QC/46040/M*/33	QM/46140/40/33	5.9 (150)	5.9 (150)	3.8 (97)	6.8 (172)	8.5 (215)	8.5 (215)
40 mm	QC/46040/M*/33							
50 mm	QC/46050/M*/33	QM/46150/50/33	7.1 (180)	7.1 (180)	4.6 (116)	8.1 (206)	9.8 (250)	9.8 (250)
50 mm	QC/46050/M*/33							

\* Insert stroke length

### Reduction 1 (One cylinder one size smaller than the other cylinder)

Note: For ISO ports replace "C" with "M" in second position of the cylinder number and state stroke length in mm.

Bore	Model	Right Angle Adapter	A1	A2	LA	LB	LC	LD
25 mm	QC/46025/M*/33	QM/46125/20/33	3.9 (100)	3.4 (85)	2.4 (62)	4.2 (106)	5.1 (130)	4.3 (110)
20 mm	QC/46020/M*/33							
32 mm	QC/46032/M*/33	QM/46132/25/33	4.7 (120)	3.9 (100)	3.0 (77)	5.1 (131)	6.3 (160)	5.1 (130)
25 mm	QC/46025/M*/33							

\* Insert stroke length

### Reduction 2 (One cylinder two bore sizes smaller than the other cylinder)

Note: For ISO ports replace "C" with "M" in second position of the cylinder number and state stroke length in mm.

Bore	Model	Right Angle Adapter	A1	A2	LA	LB	LC	LD
40 mm	QC/46040/M*/33	QM/46140/25/33	5.9 (150)	3.9 (100)	3.0 (77)	5.5 (139)	8.5 (215)	5.1 (130)
25 mm	QC/46025/M*/33							
50 mm	QC/46050/M*/33	QM/46150/32/33	7.1 (180)	4.7 (120)	3.3 (84)	6.7 (169)	9.8 (250)	6.3 (160)
32 mm	QC/46032/M*/33							
63 mm	QC/46063/M*/33	QM/46163/40/33	8.5 (215)	5.9 (150)	4.3 (108)	7.8 (198)	12.6 (320)	8.5 (215)
40 mm	QC/46040/M*/33							

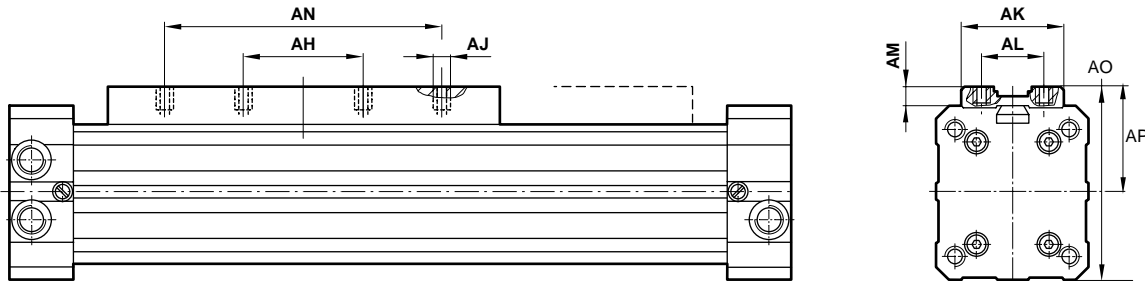
\* Insert stroke length

### Roller Guided Right Angle Mounting System Reduction 2 (One cylinder two bore sizes smaller than the other cylinder)

Note: For ISO ports replace "C" with "M" in second position of the cylinder number and state stroke length in mm.

Bore	Model	Right Angle Adapter	A1	A2	LA	LB	LC	LD
40 mm	QC/46240/M*/35	QM/46240/25/35	5.9 (150)	3.9 (100)	3.2 (80)	5.6 (142)	8.5 (215)	5.1 (130)
25 mm	QC/46225/M*/35							
63 mm	QC/46263/M*/35	QM/46263/40/35	8.5 (215)	5.9 (150)	4.3 (108)	7.8 (198)	12.6 (320)	8.5 (215)
40 mm	QC/46240/M*/35							

- Removing the top cover plate reduces overall mounting height creating useful space



All Dimensions in Inches (mm)

Bore NPT Model ISO G Model	25 mm QC/46025/M/* QM/46025/M/*	32 mm QC/46032/M/* QM/46032/M/*	40 mm QC/46040/M/* QM/46040/M/*	50 mm QC/46050/M/* QM/46050/M/*	63 mm QC/46063/M/* QM/46063/M/*	80 mm QC/46080/M/* QM/46080/M/*
AH	0.98 (25)	1.57 (40)	2.17 (55)	2.95 (75)	3.54 (90)	2.36 (60)
AJ	M5-.20 (5) deep	M6-.24 (6) deep	M6-.24 (6) deep	M6-.24 (6) deep	M6-.31 (8) deep	M6-.31 (8) deep
AK	1.06 (27)	1.42 (36)	1.42 (36)	1.61 (41)	1.61 (41)	1.61 (41)
AL	0.79 (20)	1.06 (27)	1.06 (27)	1.26 (32)	1.26 (32)	1.26 (32)
AM	0.18 (5)	0.24 (6)	0.20 (5)	0.28 (7)	0.24 (6)	0.28 (7)
AN	—	—	—	—	—	7.09 (180)
AO	2.09 (53)	2.60 (66)	3.15 (80)	3.82 (97)	4.37 (111)	5.39 (137)
AP	1.14 (29)	1.42 (36)	1.67 (42.5)	2.05 (52)	2.30 (58.5)	2.83 (72)

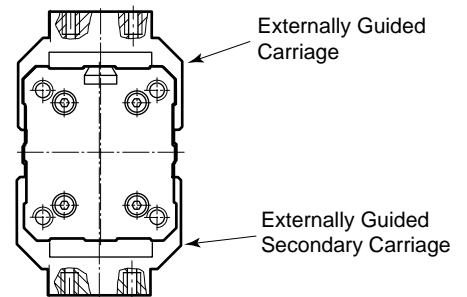
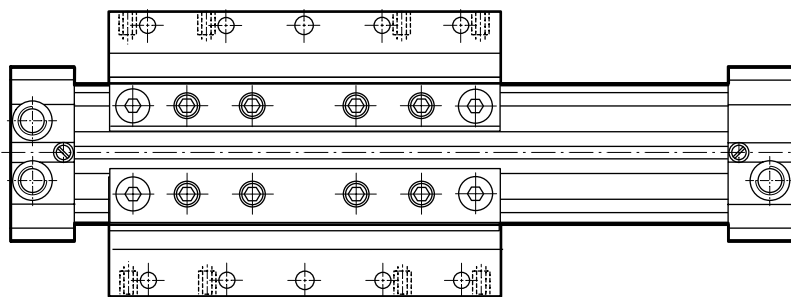
\*Insert stroke length

**NOTE:** If the internally guided cylinder is used without the top cover plate, any tooling plate mounted directly to the yoke must be at least as large as the cover plate area to insure proper preload on the wiper seals.

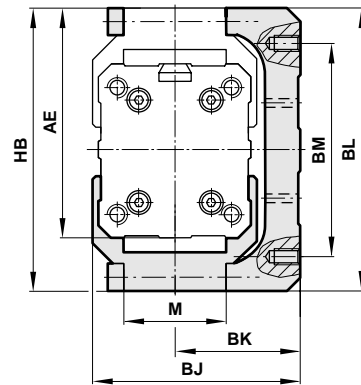
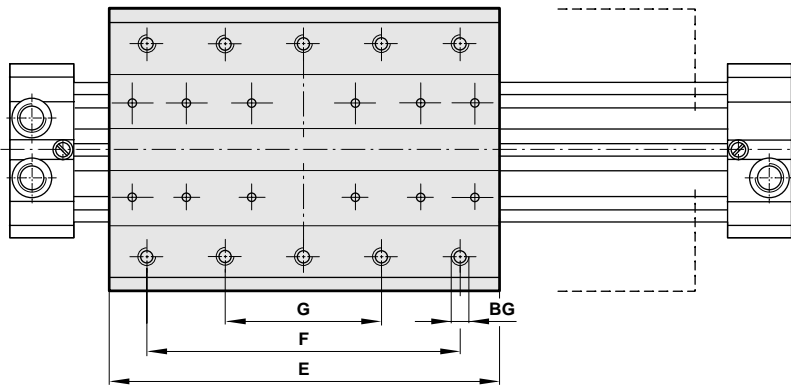
## Series 46000 Side Mounting Plate with Secondary Carriage



- Externally guided carriage cylinder is fitted with a secondary carriage and the side mounting plate is bolted to both the secondary and powered carriages.
- Provides a flat mounting surface that moves with the externally guided carriage along the side of the cylinder.
- Provides a 50% increase in the load capabilities of the cylinder.



NOTE: Side Mounting Plate must be used with an externally guided carriage and an externally guided secondary carriage.



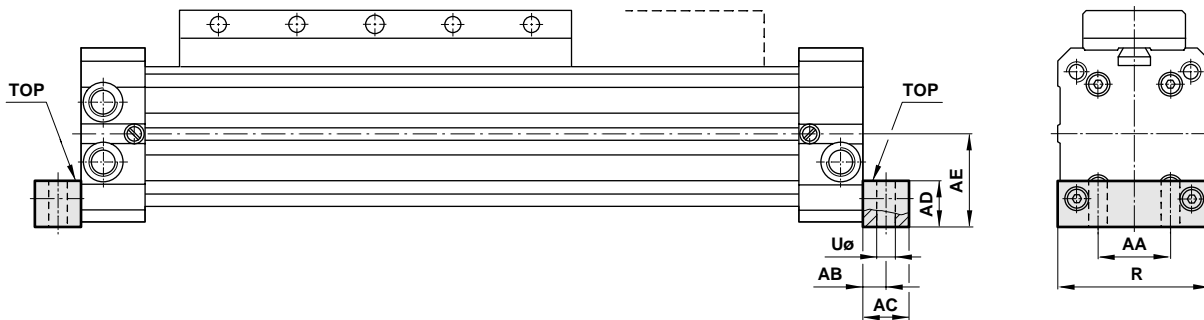
All Dimensions in Inches (mm)

Bore Side Mount Plate	20 mm QM/46120/36	25 mm QM/46125/36	32 mm QM/46132/36	40 mm QM/46140/36	50 mm QM/46150/36	63 mm QM/46163/36
Secondary Carriage	QM/46120/35	QM/46125/35	QM/46132/35	QM/46140/35	QM/46150/35	QM/46163/35
AE	2.32 (59)	2.66 (67.5)	3.23 (82)	3.84 (97.5)	4.61 (117)	5.39 (137)
BG	M5 - 10 deep	M5 - 10 deep	M5 - 12 deep	M6 - 12 deep	M6 - 15 deep	M8 - 20 deep
BJ	2.13 (54)	2.50 (63)	3.03 (77)	3.86 (98)	4.63 (117.5)	5.49 (139.5)
BK	1.30 (33)	1.46 (37)	1.77 (45)	2.30 (58.5)	2.81 (71.5)	3.33 (84.5)
BL	3.07 (78)	3.39 (86)	4.06 (103)	4.69 (119)	5.63 (143)	6.61 (168)
BM	2.17 (55)	2.56 (65)	3.15 (80)	3.54 (90)	4.72 (120)	5.51 (140)
E	4.33 (110)	5.12 (130)	6.30 (160)	8.46 (215)	9.84 (250)	12.60 (320)
F	3.15 (80)	3.54 (90)	4.72 (120)	6.30 (160)	7.48 (190)	9.45 (240)
G	1.57 (40)	1.77 (45)	2.36 (60)	3.15 (80)	3.74 (95)	4.72 (120)
HB	3.11 (79)	3.43 (87)	4.09 (104)	4.72 (120)	5.67 (144)	6.65 (169)
M	1.06 (27)	1.26 (32)	1.77 (45)	1.77 (45)	1.97 (50)	1.97 (50)

- A full line of foot mounting systems and accessories for Series 46000, 46100 and 46200 cylinders.
- Foot mounts are used to bolt cylinders firmly in place.



The Foot Mount, Style C bolts directly into the tapped holes in each end cap and provides two through holes at each end to facilitate foot mounting of the cylinder. Two socket head screws are supplied with each foot mount for mounting to the cylinder end cap.



NOTE: When mounted in conjunction with a support bracket the writing 'TOP' should be visible on the top side of the mount.

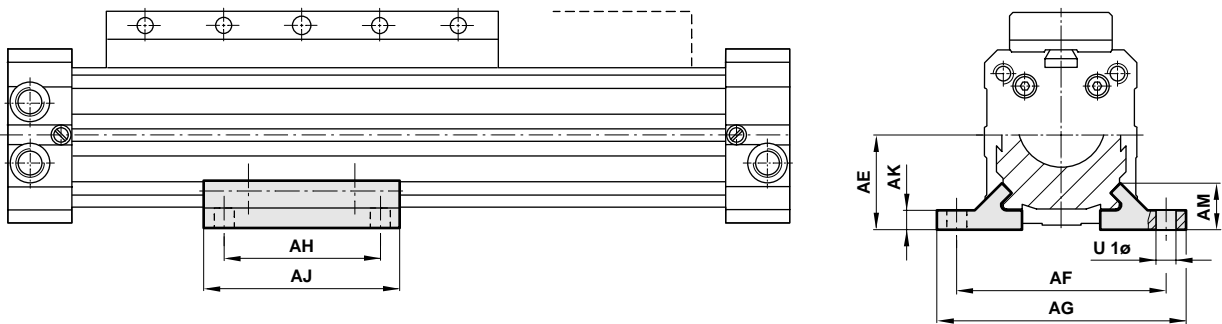
All Dimensions in Inches (mm)

Bore Part	16 mm QM/46016/21	20 mm QM/46020/21	25 mm QM/46025/21	32 mm QM/46032/21	40 mm QM/46040/21	50 mm QM/46050/21	63 mm QM/46063/21	80 mm QM/46080/21
AA	0.63 (16)	0.67 (17)	0.71 (18)	1.02 (26)	1.18 (30)	1.65 (42)	1.89 (48)	2.52 (64)
AB	0.39 (10)	0.20 (5)	0.28 (7)	0.43 (11)	0.43 (11)	0.47 (12)	0.51 (13)	0.49 (12.5)
AC	0.59 (15)	0.39 (10)	0.59 (15)	0.87 (22)	0.87 (22)	0.98 (25)	0.98 (25)	0.98 (25)
AD	0.12 (3)	0.39 (10)	0.53 (13.5)	0.65 (16.5)	0.77 (19.5)	0.94 (24)	1.08 (27.5)	1.38 (35)
AE	0.63 (16)	0.85 (21.5)	0.94 (24)	1.20 (30.5)	1.48 (37.5)	1.77 (45)	2.13 (54)	2.76 (70)
R	1.06 (27)	1.57 (40)	1.89 (48)	2.36 (60)	2.95 (75)	3.54 (90)	4.13 (105)	5.12 (130)
UØ	0.22 (5.5)	0.22 (5.5)	0.28 (7)	0.35 (9)	0.35 (9)	0.43 (11)	0.51 (13)	0.55 (14)

## Series 46000 Center Support Style 'V'



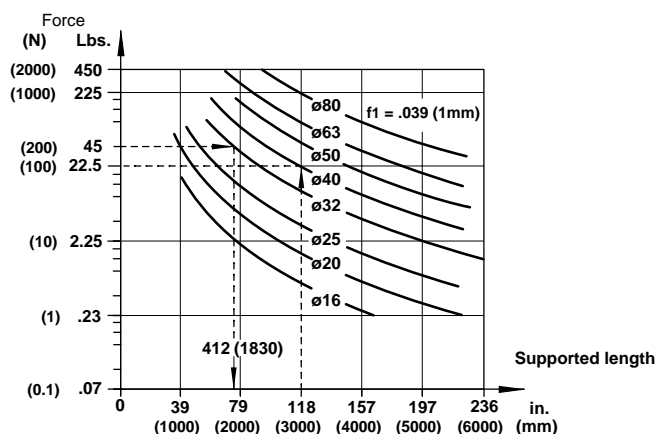
- The Center Support Style V is designed to mount in the bottom "V" grooves of the cylinder tube.
- Center mounts may be positioned anywhere along the length of the cylinder and provide intermediate support for longer stroke applications.
- The supports can be utilized in conjunction with foot mounts.



All Dimensions in Inches (mm)

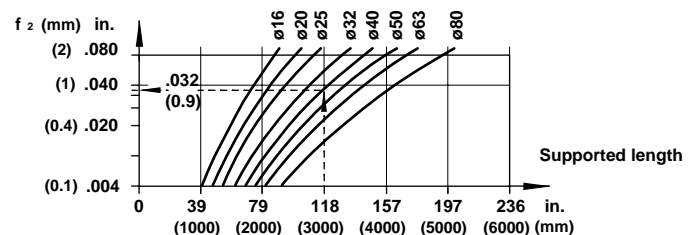
Bore Part	16 mm QM/46016/32	20 mm QM/46020/32	25 mm QM/46025/32	32 mm QM/46032/32	40 mm QM/46040/32	50 mm QM/46050/32	63 mm QM/46063/32	80 mm QM/46080/32
AE	0.63 (16)	0.85 (21.5)	0.94 (24)	1.20 (30.5)	1.48 (37.5)	1.77 (45)	2.13 (54)	2.76 (70)
AF	1.57 (40)	2.05 (52)	2.36 (60)	2.99 (76)	3.62 (92)	4.33 (110)	5.20 (132)	6.10 (155)
AG	1.97 (50)	2.44 (62)	2.83 (72)	3.62 (92)	4.25 (108)	5.04 (128)	6.06 (154)	7.09 (180)
AH	0.79 (20)	1.77 (45)	2.36 (60)	2.76 (70)	3.54 (90)	4.33 (110)	4.72 (120)	5.51 (140)
AJ	1.18 (30)	2.36 (60)	3.15 (80)	3.94 (100)	4.72 (120)	5.51 (140)	6.30 (160)	7.09 (180)
AK	0.14 (3.5)	0.18 (4.5)	0.22 (5.5)	0.26 (6.5)	0.30 (7.5)	0.30 (7.5)	0.35 (9)	0.47 (12)
AM	0.35 (9)	0.47 (12)	0.51 (13)	0.53 (13.5)	0.73 (18.5)	0.73 (18.5)	0.98 (25)	1.12 (28.5)
U1Ø	0.22 (5.5)	0.22 (5.5)	0.26 (6.6)	0.35 (9)	0.35 (9)	0.43 (11)	0.51 (13)	0.55 (14)

### Cylinder Deflection Due to External Force (.040" Deflection Chart)



Cylinder Ø 32 mm, stroke length 138 in. (3500 mm), external load 45 lbs. force (200N). Maximum distance between supports = 72 in. (1830 mm) (see diagram). Therefore an additional support is required.

### Deflection Due to Cylinder Weight



Cylinder Ø 40 mm, external force 40.5 lbs. force (180N), distance between supports 118 in. (3000 mm)  
Required: Total deflection

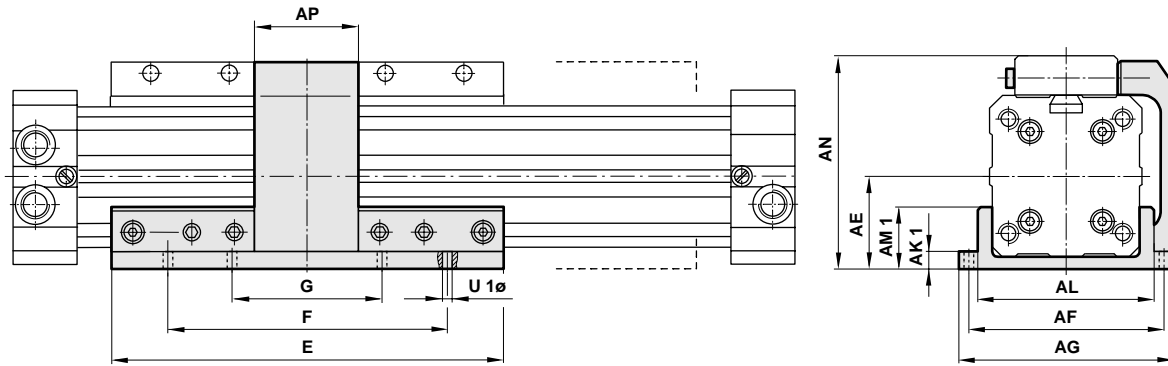
1. Deflection due to external force: See diagram → .03937 in./225 lb. force (1mm/100N) · 40.5 lbs. force (180N) **.07 in. (1.8 mm)**
  2. Deflection due to cylinder weight: See diagram → **+ .04 in. (0.9 mm)**
- Total deflection: **.11 in. (2.7 mm)**

Maximum permitted deflection ( $f_1 + f_2$ ) < **.039 in (1 mm)**  
**39 in. (1000 mm) stroke**

**CAUTION: A deflection of more than .080" (2 mm) is not recommended**



- Carriage Mounting Plates offer mounting versatility.
- Transfers the powered motion of the carriage to a guided mounting plate on the opposite side of the cylinder.
- Useful in applications with underhanging loads.
- Allows the load to be suspended without inverting the cylinder.
- In dirty environments the Carriage Mount allows the cylinder to be inverted to shelter the sealing strip from settling contaminants.



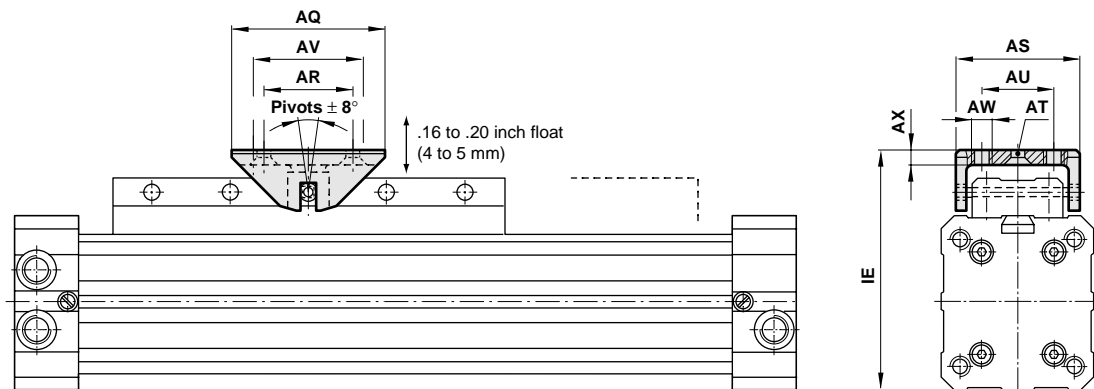
All Dimensions in Inches (mm)

Bore	16 mm	20 mm	25 mm	32 mm	40 mm	50 mm	63 mm	80 mm
Part	QM/46016/34	QM/46020/34	QM/46025/34	QM/46032/34	QM/46040/34	QM/46050/34	QM/46063/34	QM/46080/34
AE	0.63 (16)	0.85 (21.5)	1.04 (26.5)	1.30 (33)	1.59 (40.5)	1.93 (49)	2.26 (57.5)	2.76 (70)
AF	1.57 (40)	2.05 (52)	2.44 (62)	3.07 (78)	3.70 (94)	4.41 (112)	5.20 (132)	6.10 (155)
AG	1.97 (50)	2.44 (62)	2.95 (75)	3.62 (92)	4.41 (112)	5.20 (132)	5.91 (150)	7.09 (180)
AK1	0.14 (3.5)	0.22 (5.5)	0.22 (5.5)	0.25 (6.5)	0.30 (7.5)	0.31 (8)	0.39 (10)	0.39 (10)
AL	1.22 (31)	1.65 (42)	2.05 (52)	2.52 (64)	3.19 (81)	3.70 (94)	4.41 (112)	5.20 (132)
AM1	0.33 (8.5)	0.57 (14.5)	0.69 (17.5)	0.71 (18)	0.94 (24)	0.98 (25)	1.26 (32)	1.26 (32)
AN	1.59 (40.5)	2.20 (56)	2.46 (62.5)	3.11 (79)	3.66 (93)	4.49 (114)	5.12 (130)	6.26 (159)
AP	1.18 (30)	1.42 (36)	1.77 (45)	2.17 (55)	2.56 (65)	2.95 (75)	3.54 (90)	3.94 (100)
E	3.15 (80)	4.33 (110)	5.12 (130)	6.30 (160)	8.46 (215)	9.84 (250)	12.60 (320)	15.35 (390)
F	2.36 (60)	3.15 (80)	3.54 (90)	4.72 (120)	6.30 (160)	7.48 (190)	9.45 (240)	11.81 (300)
G	-	1.57 (40)	1.77 (45)	2.36 (60)	3.15 (80)	3.74 (95)	4.72 (120)	5.91 (150)
U1Ø	0.22 (5.5)	0.22 (5.5)	0.26 (6.6)	0.35 (9)	0.35 (9)	0.43 (11)	0.51 (13)	0.55 (14)

**Series 46000**  
**Swinging Bridge Mounting Style 'S'**



- Designed for use in applications requiring external guides.
- Mount pivots along the axis of the cylinder
- Provides flexible connection between the cylinder and the external guides
- Bridge floats .16 to .20 inch (4 to 5 mm)



All Dimensions in Inches (mm)

Bore Part	16 mm QM/46016/37	20 mm QM/46020/37	25 mm QM/46025/37	32 mm QM/46032/37	40 mm QM/46032/37	50 mm QM/46050/37	63 mm QM/46050/37	80 mm QM/46080/37
AQ	1.57 (40)	1.97 (50)	2.36 (60)	3.15 (80)	3.15 (80)	3.94 (100)	3.94 (100)	3.94 (100)
AR	-	1.38 (35)	1.57 (40)	1.97 (50)	1.97 (50)	2.36 (60)	2.36 (60)	2.36 (60)
AS	1.02 (26)	1.50 (38)	1.73 (44)	2.32 (59)	2.32 (59)	2.56 (65)	2.56 (65)	2.56 (65)
AT	-	DIN74-Bm 5	DIN74-Bm 5	DIN74-Bm 6	DIN74-Bm 6	DIN74-Bm 8	DIN74-Bm 8	DIN74-Bm 8
AU	0.47 (12)	0.79 (20)	0.79 (20)	1.18 (30)	1.18 (30)	1.57 (40)	1.57 (40)	1.57 (40)
AV	1.18 (30)	1.57 (40)	1.77 (45)	2.36 (60)	2.36 (60)	3.15 (80)	3.15 (80)	3.15 (80)
AW	M4	M5	M5	M6	M6	M8	M8	M8
AX	0.16 (4)	0.20 (5)	0.20 (5)	0.22 (5.5)	0.22 (5.5)	0.26 (6.5)	0.26 (6.5)	0.26 (6.5)
IE	1.89 + .16 (48 + 4)	2.58 + .20 (65.5 + 5)	2.76 + .20 (70 + 5)	3.48 + .20 (88.5 + 5)	4.04 + .20 (102.5 + 5)	4.88 + .20 (124 + 5)	5.47 + .20 (139 + 5)	6.63 + .20 (168.5 + 5)

- Suitable for all cylinder ranges with magnetic piston
- Very neat and compact design
- LED indicator on LSU models
- Simple, reliable switching, very fast response time
- Simple to install



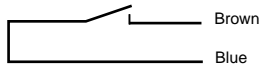
Switch P/N		M/50/LSU*V	M/50/LSU/5U	M/50/RAC/5V	TM/50/RAU/2S	M/50/LSU/CP**
Switch Type	Reed	X	X	X	X	X
	Solid State					
Voltage (V)	AC	10-240	10-240	10-240	10-240	10-60
	DC	10-170	10-170	10-170	10-170	10-75
LED		Yes	Yes	No	No	Yes
Switch Function		Normally Open	Normally Open	Changeover	Normally Open	Normally Open
Wiring Connection		2 wire	2 wire	3 wire	2 wire	2 wire
Switching Current		180mA	180mA	180mA	180mA	180mA
Switching Power		10W	10W	10W	10W	10W
Contact Resistance		150m Ohm	150m Ohm	150m Ohm	150m Ohm	150m Ohm
Switching Time		1.8 ms	1.8 ms	1.8 ms	1.8 ms	1.8 ms
Shock Resistance		50g (11ms)	50g (11ms)	50g (11ms)	50g (11ms)	50g (11ms)
Vibration Resistance		35g (@2000hz)	35g (@2000hz)	35g (@2000hz)	35g (@2000hz)	35g (@2000hz)
Operating Temperature		-20°C to 80°C -5°F to 175°F	-20°C to 80°C -5°F to 175°F	-20°C to 80°C -5°F to 175°F	-20°C to 150°C -5°F to 302°F	-20°C to 80°C -5°F to 175°F
Protection Rating		IP66 (DIN 40050)	IP66 (DIN 40050)	IP66 (DIN 40050)	IP66 (DIN 40050)	IP66 (DIN 40050)
Length of Switch		1.18 in (30mm)	1.18 in (30mm)	1.18 in (30mm)	1.18 in (30mm)	1.18 in (30mm)
Diameter of Switch		0.252 in (6.4mm)	0.252 in (6.4mm)	0.252 in (6.4mm)	0.252 in (6.4mm)	0.252 in (6.4mm)
Cable Material		PVC	Polyurethane	PVC	Silicone	PVC
Cable Length		* Insert 2 = 2 meters * Insert 5 = 5 meters * Insert 10 = 10 meters	5 meters	5 meters	2 meters	0.3 meters With M8 X 1 Cable Plug

\*\* Plug in cable with M8 X 1 connector (3 wire)

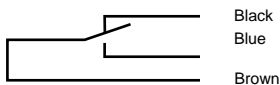
Model	Outer Cover	Cable Length
M/P73001/5	PVC 3 x 0.25	5 meter
M/P73002/5	PUR 3 x 0.25	5 meter

### Electrical Schematics

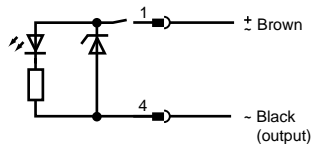
**TM/50/RAU/2S**  
normally open



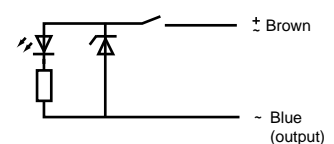
**M/50/RAC/5V**  
changeover



**M/50/LSU/CP**  
normally open



**M/50/LSU\*V**  
**M/50/LSU/5U**  
normally open



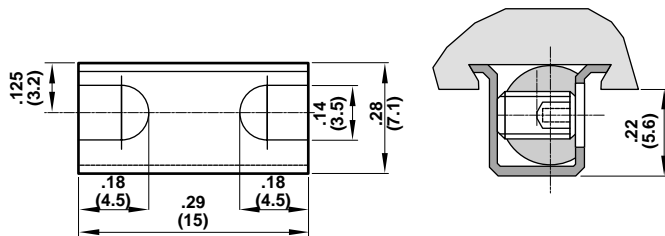
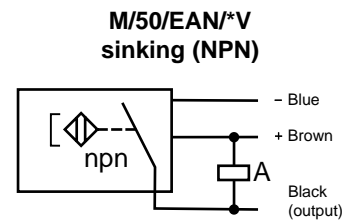
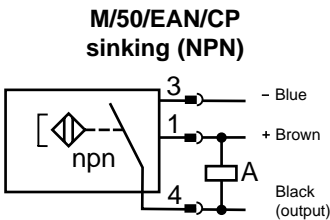
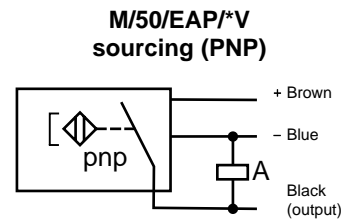
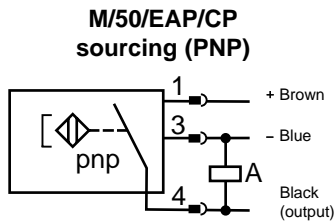


Switch P/N		M/50/EAP/*V	M/50/EAN/*V	M/50/EAP/CP**	M/50/EAN/CP**
Switch Type	Reed				
	Solid State	X	X	X	X
Voltage (V)	AC	-	-	-	-
	DC	10-30	10-30	10-30	10-30
LED		Yes	Yes	Yes	Yes
Switch Function		Sourcing (PNP)	Sinking (NPN)	Sourcing (PNP)	Sinking (NPN)
Wiring Connection		3 wire	3 wire	3 wire	3 wire
Switching Current		150mA	150mA	150mA	150mA
Switching Power		4.5W Max	4.5W Max	4.5W Max	4.5W Max
Contact Resistance		N/A	N/A	N/A	N/A
Switching Time		0.5ms	0.5ms	0.5ms	0.5ms
Shock Resistance		N/A	N/A	N/A	N/A
Vibration Resistance		N/A	N/A	N/A	N/A
Operating Temperature		-20°C to 80°C -5°F to 175°F	-20°C to 80°C -5°F to 175°F	-20°C to 80°C -5°F to 175°F	-20°C to 80°C -5°F to 175°F
Protection Rating		IP67 (DIN 40050)	IP67 (DIN 40050)	IP67 (DIN 40050)	IP67 (DIN 40050)
Length of Switch		1.18 in (30mm)	1.18 in (30mm)	1.18 in (30mm)	1.18 in (30mm)
Diameter of Switch		0.252 in (6.4mm)	0.252 in (6.4mm)	0.252 in (6.4mm)	0.252 in (6.4mm)
Cable Material		PVC	PVC	PVC	PVC
Cable Length		* Insert 2 = 2 meters * Insert 5 = 5 meters * Insert 10 = 10 meters	* Insert 2 = 2 meters * Insert 5 = 5 meters * Insert 10 = 10 meters	0.3 meters With M8 X 1 Cable Plug	0.3 meters With M8 X 1 Cable Plug

\*\* Plug in cable with M8 X 1 connector (3 wire)

Model	Outer Cover	Cable Length
M/P73001/5	PVC 3 x 0.25	5 meter
M/P73002/5	PUR 3 x 0.25	5 meter

## Electrical Schematics



## Switch Bracket

The M50 switch can be used on pre-Series B extrusion, 16 mm to 25 mm bore size Lintra cylinders by ordering bracket part number **M/P72486**. The M50 switch can be used on pre-series B extrusions, 32mm to 80mm bore size Lintra Cylinders by ordering bracket part number **QU/33/732/22**. These brackets adapt the M/50 (round) switch into the dovetail grooves on these older extrusions.



## M/50 Switch Groove Cover

Part number **M/K72725\*** is a red plastic switch groove cover that snaps in place along the length of the Lintra cylinder extrusion. It holds and protects M/50 switch cables when mounted to the cylinder.

\* Insert cylinder stroke length to order. For C (inch stroke) specify length in inches and for M (metric stroke) specify in mm.



Technical Data

Thrust, Cushion Lengths, Holding Forces

Bore	Thrust at 87 psi (6 bar) lbs. force (N)	Air Consumption at 87 psi (6 bar) cu ft./in stroke (l/cm)	Cushion Length in (mm)	Active Brake (L3) holding force* at 87 psig (6 bar) lb. force (N)	Passive Brake (L4) holding force* at 0 psig lb. force (N)
16	22.5 (100)	0.01 (0.014)	0.47 (12)	- -	- -
20	33.8 (150)	0.02 (0.022)	1.02 (26)	- -	- -
25	56.3 (250)	0.03 (0.035)	1.02 (26)	112.5 (500)	49.5 (220)
32	92.3 (410)	0.04 (0.056)	1.38 (35)	202.5 (900)	84.4 (375)
40	144.0 (640)	0.06 (0.088)	1.97 (50)	337.5 (1500)	141.8 (630)
50	225.0 (1000)	0.10 (0.137)	2.36 (60)	562.5 (2500)	225.0 (1000)
63	337.5 (1500)	0.16 (0.218)	2.76 (70)	900.0 (4000)	371.3 (1650)
80	540.0 (2400)	0.26 (0.350)	2.95 (75)		

\*Calculated for dry surface

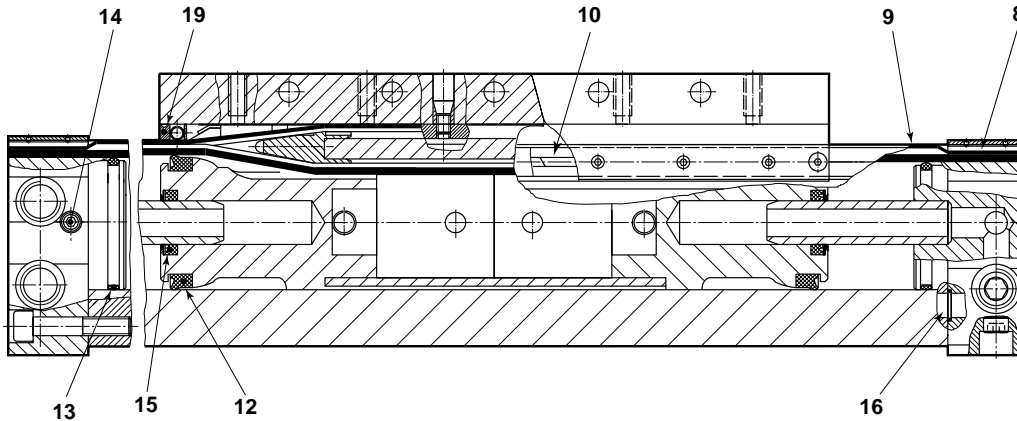
Weights of Cylinders lbs. (kg)

Model Bore	C/46000B Weight at 0 in. stroke	C/46100B Weight at 0 in. stroke	C/46200B Weight at 0 in. stroke	C/46000B/L3 Weight at 0 in. stroke	C/46000B/L4 Weight at 0 in. stroke	Weight per inch of Stroke
16	0.35 (0.16)	0.40 (0.18)				0.07 (0.03)
20	1.10 (0.50)	1.32 (0.60)				0.09 (0.04)
25	1.76 (0.80)	1.98 (0.90)	3.75 (1.7)	3.53 (1.6)	4.19 (1.9)	0.11 (0.05)
32	3.53 (1.60)	3.75 (1.70)	6.84 (3.1)	5.95 (2.7)	6.84 (3.1)	0.20 (0.09)
40	5.95 (2.70)	6.39 (2.90)	11.03 (5.0)	9.92 (4.5)	11.47 (5.2)	0.29 (0.13)
50	10.58 (4.80)	10.80 (4.90)	20.07 (9.1)	16.10 (7.3)	19.62 (8.9)	0.42 (0.19)
63	15.88 (7.20)	16.98 (7.70)	30.65 (13.9)	25.36 (11.5)	27.34 (12.4)	0.55 (0.25)
80	29.11 (13.20)	29.55 (13.40)				0.84 (0.38)

Weights of Mountings and Right Angle Adapters in lbs. (kg)

Bore	Foot Mount (ACT-10-20)	Swinging Bridge (ACT-10-23)	Carriage Mount Plate (ACT-10-22)	Center Mount (ACT-10-21)
16	0.02 (0.01)	0.04 (0.02)	0.22 (0.10)	0.02 (0.01)
20	0.07 (0.03)	0.22 (0.10)	0.44 (0.20)	0.07 (0.03)
25	0.02 (0.01)	0.44 (0.20)	0.66 (0.30)	0.09 (0.04)
32	0.22 (0.10)	0.66 (0.30)	0.88 (0.40)	0.15 (0.07)
40	0.44 (0.20)	0.66 (0.30)	1.76 (0.80)	0.44 (0.20)
50	0.66 (0.30)	1.10 (0.50)	2.65 (1.20)	0.44 (0.20)
63	0.88 (0.40)	1.10 (0.50)	4.41 (2.00)	0.66 (0.30)
80	0.88 (0.40)	1.10 (0.50)	6.39 (2.90)	0.88 (0.40)

Right Angle Adapter (ACT-10-17)			Right Angle Adapter (ACT-10-17)		
QM/46125/25/33	2.43 (1.1)		QM/46140/25/33	3.09 (1.4)	
QM/46132/32/33	3.31 (1.5)		QM/46150/32/33	3.97 (1.8)	
QM/46140/40/33	5.95 (2.7)		QM/46163/40/33	8.38 (3.8)	
QM/46150/50/33	7.94 (3.6)		QM/46240/25/35	5.51 (2.5)	
QM/46125/20/33	2.21 (1.0)		QM/46263/40/35	8.82 (4.0)	
QM/46125/25/33	2.87 (1.3)				



**Replacement Parts for C/46000B/M with NPT ports**

**Internally Guided - C/46000B/M**

Cylinder	Basic Seal kit Items 12 thru 16 and 20 Part No.	Spares Set Items 12 thru 20 Part No.	Spares Set with Seal & Cover Strip — Items 8, 9 & 12 thru 20 Part No.
C/46020B/M/*	QM/46020/00	QM/46020/88	QC/46020*/88
C/46025B/M/*	QM/46025/00	QM/46025/88	QC/46025*/88
C/46032B/M/*	QM/46032/00	QM/46032/88	QC/46032*/88
C/46040B/M/*	QM/46040/00	QM/46040/88	QC/46040*/88
C/46050B/M/*	QM/46050/00	QM/46050/88	QC/46050*/88
C/46063B/M/*	QM/46063/00	QM/46063/88	QC/46063*/88
C/46080B/M/*	QM/46080/00	QM/46080/88	QC/46080*/88

\*Overall stroke length in inches

**Externally Guided - C/46100B/M**

Cylinder	Basic Seal kit Items 12 thru 16 and 20 Part No.	Spares Set Items 10 thru 20 Part No.	Spares Set with Seal & Cover Strip — Items 8 thru 20 Part No.
C/46120B/M/*	QM/46020/00	QM/46120/88	QC/46120*/88
C/46125B/M/*	QM/46025/00	QM/46125/88	QC/46125*/88
C/46132B/M/*	QM/46032/00	QM/46132/88	QC/46132*/88
C/46140B/M/*	QM/46040/00	QM/46140/88	QC/46140*/88
C/46150B/M/*	QM/46050/00	QM/46150/88	QC/46150*/88
C/46163B/M/*	QM/46063/00	QM/46163/88	QC/46163*/88
C/46180B/M/*	QM/46080/00	QM/46180/88	QC/46180*/88

\*Overall stroke length in inches

**Roller Guided - C/46200B/M**

Cylinder	Basic Seal kit Items 12 thru 16 and 20 Part No.	Spares Set Items 12 thru 20 Part No.	Spares Set with Seal & Cover Strip — Items 8, 9 & 12 thru 20 Part No.
C/46225B/M/*	QM/46025/00	QM/46025/88	QC/46025*/88
C/46232B/M/*	QM/46032/00	QM/46032/88	QC/46032*/88
C/46240B/M/*	QM/46040/00	QM/46040/88	QC/46040*/88
C/46250B/M/*	QM/46050/00	QM/46050/88	QC/46050*/88
C/46263B/M/*	QM/46063/00	QM/46063/88	QC/46063*/88

\*Overall stroke length in inches



Replacement Parts for C/46000B/M, C/46100B/M, and C/46200B/M with NPT Ports

Carriage Assembly

Cylinder	Internally Guided Part No.	Externally Guided Part No.	With Roller Guide Part No.
16 mm	NA	NA	NA
20 mm	QM/46020/68	QM/46120/69	NA
25 mm	QM/46025/68	QM/46125/69	QM/46225/70
32mm	QM/46032/68	QM/46132/69	QM/46232/70
40 mm	QM/46040/68	QM/46140/69	QM/46240/70
50 mm	QM/46050/68	QM/46150/69	QM/46250/70
63 mm	QM/46063/68	QM/46163/69	QM/46263/70
80 mm	QM/46080/68	QM/46180/69	NA

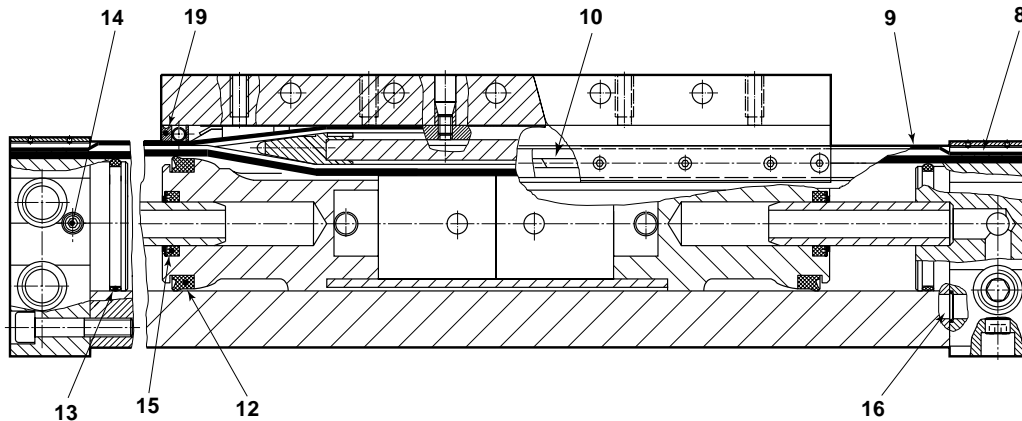
Item	Description
8	Seal strip (1)
9	Cover strip (1)
10	Guide bar (2)
12	Seal (2)
13	O-ring (1)
14	O-ring (1)
15	Seal (2)
16	O-ring (2)
19	Closer assy. (2)
20	Grease (1) tube

Cylinder	Right End Cap Part No.	Left End Cap Part No.	Tube Part No.	Piston Yoke Assembly Part No.
16 mm	NA	NA	NA	NA
20 mm	QC/46020/02	QC/46020/03	C/P41067/*	QM/46020/M/13
25 mm	QC/46025/02	QC/46025/03	C/P41066/*	QM/46025/M/13
32 mm	QC/46032/02	QC/46032/03	C/P41018/*	QM/46032/M/13
40 mm	QC/46040/02	QC/46040/03	C/P41017/*	QM/46040/M/13
50 mm	QC/46050/02	QC/46050/03	C/P41064/*	QM/46050/M/13
63 mm	QC/46063/02	QC/46063/03	C/P41065/*	QM/46063/M/13
80 mm	QC/46080/02	QC/46080/03	C/P41071/*	QM/46080/M/13

\*Overall stroke length in inches

Cylinder	Seal Strip (Item 8) Part No.	Cover Strip (Item 9) Part No.
16 mm	NA	NA
20 mm	C/P40262/*	C/P19567/2/*
25 mm	C/P40262/*	C/P19567/2/*
32 mm	C/P40344/*	C/P19587/2/*
40 mm	C/P40263/*	C/P19606/2/*
50 mm	C/P40626/*	C/P19644/2/*
63 mm	C/P40626/*	C/P19644/2/*
80 mm	C/P40715/*	C/P41076/*

\*Overall stroke length in inches



Item	Description
8	Seal strip (1)
9	Cover strip (1)
10	Guide bar (2)
12	Piston seal (2)
13	Endcap O-ring (2)
14	Cush. adj. O-ring (2)
15	Cushion seal (2)
16	Port o-ring (2)
19	Closer assembly (2)
20	Grease (1) tube

### Replacement Parts for M/46000B/M with Metric Ports

#### Internally Guided - M/46000B/M

Cylinder	Basic Seal kit Items 12 thru 16 and 20 Part No.	Spares Set Items 12 thru 20 Part No.	Spares Set with Seal & Cover Strip — Items 8, 9 & 12 thru 20 Part No.
M/46016B/M*	QM/46016/00	QM/46016/88	QM/46016/*/88
M/46020B/M*	QM/46020/00	QM/46020/88	QM/46020/*/88
M/46025B/M*	QM/46025/00	QM/46025/88	QM/46025/*/88
M/46032B/M*	QM/46032/00	QM/46032/88	QM/46032/*/88
M/46040B/M*	QM/46040/00	QM/46040/88	QM/46040/*/88
M/46050B/M*	QM/46050/00	QM/46050/88	QM/46050/*/88
M/46063B/M*	QM/46063/00	QM/46063/88	QM/46063/*/88
M/46080B/M*	QM/46080/00	QM/46080/88	QM/46080/*/88

Overall stroke length in millimeters

#### Externally Guided - M/46100B/M

Cylinder	Basic Seal kit Items 12 thru 16 and 20 Part No.	Spares Set Items 10 thru 20 Part No.	Spares Set with Seal & Cover Strip — Items 8 thru 20 Part No.
M/46116B/M*	QM/46016/00	QM/46116/88	QM/46116/*/88
M/46120B/M*	QM/46020/00	QM/46120/88	QM/46120/*/88
M/46125B/M*	QM/46025/00	QM/46125/88	QM/46125/*/88
M/46132B/M*	QM/46032/00	QM/46132/88	QM/46132/*/88
M/46140B/M*	QM/46040/00	QM/46140/88	QM/46140/*/88
M/46150B/M*	QM/46050/00	QM/46150/88	QM/46150/*/88
M/46163B/M*	QM/46063/00	QM/46163/88	QM/46163/*/88
M/46180B/M*	QM/46080/00	QM/46180/88	QM/46180/*/88

Overall stroke length in millimeters

#### Roller Guided - M/46200/M

Cylinder	Basic Seal kit Items 12 thru 16 and 20 Part No.	Spares Set Items 12 thru 20 Part No.	Spares Set with Seal & Cover Strip — Items 8, 9 & 12 thru 20 Part No.
M/46225B/M*	QM/46025/00	QM/46025/88	QM/46025/*/88
M/46232B/M*	QM/46032/00	QM/46032/88	QM/46032/*/88
M/46240B/M*	QM/46040/00	QM/46040/88	QM/46040/*/88
M/46250B/M*	QM/46050/00	QM/46050/88	QM/46050/*/88
M/46263B/M*	QM/46063/00	QM/46063/88	QM/46063/*/88

Overall stroke length in millimeters





**Replacement parts for M/46000B/M, M/46100B/M, and M/46200B/M with Metric Ports**

**Carriage Assembly**

Cylinder	Internally Guided Part No.	Externally Guided Part No.	With Roller Guide Part No.	Item	Description
16 mm	QM/46016/68	QM/46116/69	NA	8	Seal strip (1)
20 mm	QM/46020/68	QM/46120/69	NA	9	Cover strip (1)
25 mm	QM/46025/68	QM/46125/69	QM/46225/70	10	Guide bar (2)
32 mm	QM/46032/68	QM/46132/69	QM/46232/70	12	Seal (2)
40 mm	QM/46040/68	QM/46140/69	QM/46240/70	13	O-ring (1)
50 mm	QM/46050/68	QM/46150/69	QM/46250/70	14	O-ring (1)
63 mm	QM/46063/68	QM/46163/69	QM/46263/70	15	Seal (2)
80 mm	QM/46080/68	QM/46180/69	NA	16	O-ring (2)
				19	Closer assy. (2)
				20	Grease (1) tube

Cylinder	Right End Cap Part No.	Left End Cap Part No.	Tube Part No.	Piston Yoke Assembly Part No.
16 mm	QM/46016/02	QM/46016/03	M/P41097/*	QM/46016/M/13
20 mm	QM/46020/02	QM/46020/03	M/P41067/*	QM/46020/M/13
25 mm	QM/46025/02	QM/46025/03	M/P41067/*	QM/46025/M/13
32 mm	QM/46032/02	QM/46032/03	M/P41067/*	QM/46032/M/13
40 mm	QM/46040/02	QM/46040/03	M/P41067/*	QM/46040/M/13
50 mm	QM/46050/02	QM/46050/03	M/P41067/*	QM/46050/M/13
63 mm	QM/46063/02	QM/46063/03	M/P41067/*	QM/46063/M/13
80 mm	QM/46080/02	QM/46080/03	M/P41067/*	QM/46080/M/13

\*Overall stroke length in millimeters

Cylinder	Seal Strip (Item 8) Part No.	Cover Strip (Item 9) Part No.
16 mm	M/P40270/*	M/P41101/*
20 mm	M/P40262/*	M/P19567/2/*
25 mm	M/P40262/*	M/P19567/2/*
32 mm	M/P40344/*	M/P19587/2/*
40 mm	M/P40263/*	M/P19606/2/*
50 mm	M/P40626/*	M/P19644/2/*
63 mm	M/P40626/*	M/P19644/2/*
80 mm	M/P40715/*	M/P41076/2/*

\*Overall stroke length in millimeters

# Lintra-Lite Actuators

## Series A44000, Rodless Cylinders

### Double Acting

**LINTRA®-LITE Series A44000 Rodless Cylinders**

**Series A44000 Features** .....ACT-11-2

**Series A44000 Specifications** .....ACT-11-3

**Series A44000 Basic Cylinder** .....ACT-11-4

**Series A44000 Cylinder Mounting Styles** .....ACT-11-5

**Series A44000 How to Order** .....ACT-11-6

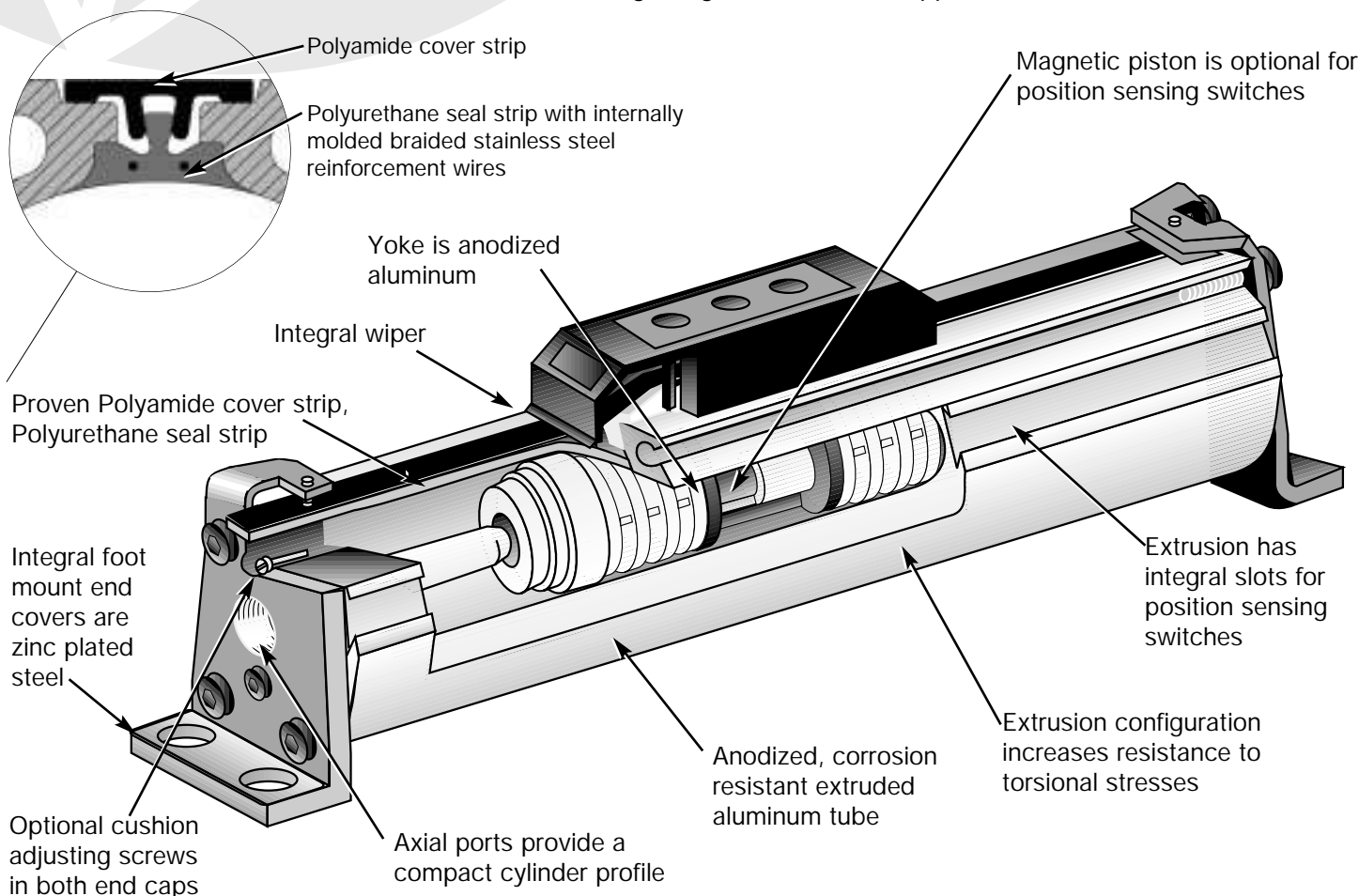
**Series A44000 Spare Kits** .....ACT-11-7

**M/40 Magnetically Operated Reed Switches**.....ACT-11-8

**M/41, M/42 Magnetically Operated Solid State Switches**.....ACT-11-10

Self-retaining Sealing System has one of the lowest leakage rates in the industry.

The LINTRA®-LITE rodless cylinder is a cost effective solution for application where light loading is required or where external guiding will be used to support the load.

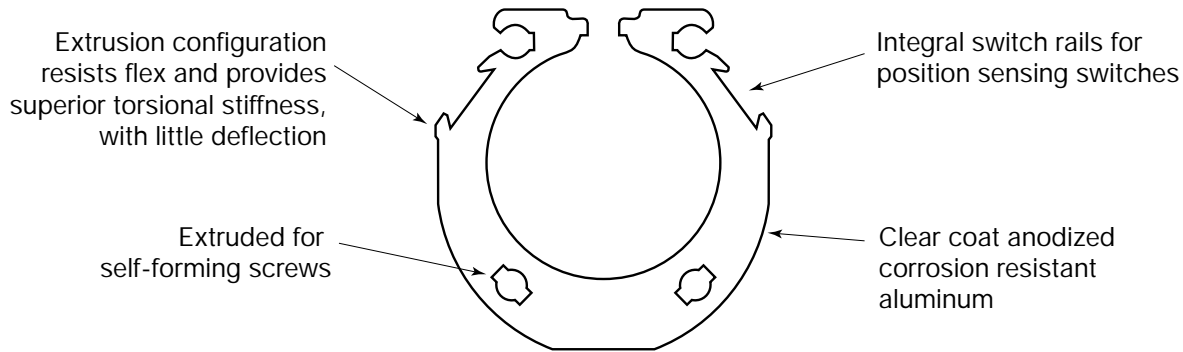




## Features

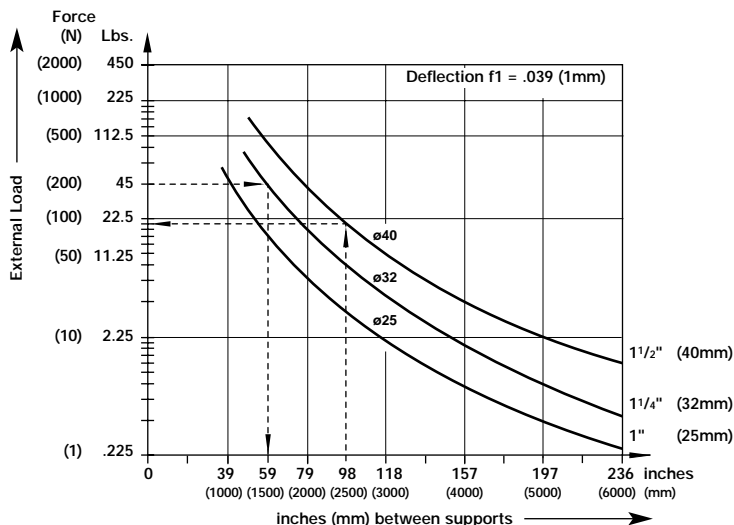
- LINTRA®-LITE rodless cylinders require less space for installation since the stroke of the cylinder is contained within the length of the cylinder itself.
- Non-rotating load carrying capability without additional guide rods and bearings.
- Rodless design means there is no rod that can buckle or kink.
- Equal forces can be applied to each stroke direction.
- All stroke lengths are custom made to customer requirements.
- Stroke lengths are available up to 236" (6000mm). For longer stroke lengths, consult factory.
- LINTRA®-LITE features a choice of bore sizes:
  - Ø 1" = 0.984" (Ø 25mm)
  - Ø 1 1/4" = 1.260" (Ø 32mm)
  - Ø 1 1/2" = 1.575" (Ø 40mm)
- Cushion adjustment optional at both ends of the cylinder.
- Magnetic piston optional.
- Integral switch rail on both sides of the extrusion.
- Main components are made of anodized, corrosion resistant aluminum, with zinc plated steel integral foot mount end covers.
- Velocities up to 4.9 ft/sec (1.5 m/s) are achievable.
- The LINTRA®-LITE is designed for easy maintenance.
- Polyurethane seals provide long life.

## The Extruded Tube of the LINTRA®-LITE Series A44000 Cylinder



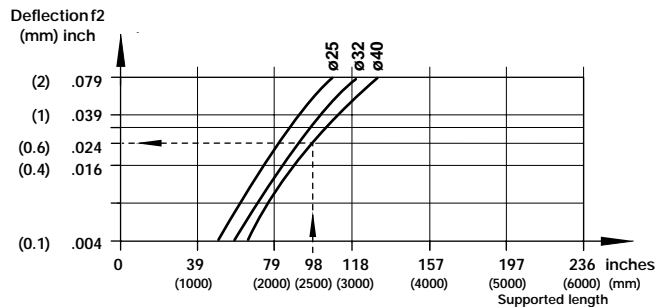
## Cylinder Deflection

### Deflection due to external load.



Cylinder Ø1 1/4" (32mm), stroke length 138" (3500mm), external load 45 lbs. (200 N). Maximum distance between supports = 59 inches (1500mm) (see diagram). Therefore additional support is required.

### Deflection due to cylinder weight.



Cylinder Ø 40mm, external force 25 lbs. force (120 N), distance between supports 98 inches (2500mm).  
Required: Total deflection

1. Deflection due to external force (f1): See diagram → .039" / 20.23 lbs. (1mm / 90 N) · 25 lbs. (120 N) = **.051" (1.3mm)**
  2. Deflection due to cylinder weight (f2): See diagram → **+.024" (0.6mm)**
- Total deflection: **.075" (1.9mm)**

### Maximum permitted deflection:

**f1 + f2 ≤ .039 inches (1mm) per 39.37 inches (1000mm) stroke.**  
**Result: .075 inches (1.9mm) are below the maximum permitted deflection of .098 inches (2.5mm).**



**Operating Specifications**

**Operating Temperature:**

-22° to 180°F\* (-30°C to 80°C)

\*With dewpoint of supply air less than ambient air temperature at cylinder, consult our Technical Service for use below +36°F (+2°C)

**Operating Pressure:**

15 to 116 psig (1 to 8 bar)

**Bore Sizes:**

- Ø 1" = 0.984" (Ø 25mm)
- Ø 1¼" = 1.260" (Ø 32mm)
- Ø 1½" = 1.575" (Ø 40mm)

**Stroke Lengths:**

236 inches (6000mm) max.

**Supply:**

Compressed air, filtered to 50-microns and lubricated.

**Cushion Lengths:**

- Ø 1" = 0.709" (Ø 25mm = 18mm)
- Ø 1¼" = 0.906" (Ø 32mm = 23mm)
- Ø 1½" = 1.378" (Ø 40mm = 35mm)

**Magnetic Sensing Switches:**

Refer to pp. 8 - 11

**Materials of Construction**

- Barrel: Anodized aluminum alloy
- End covers: Zinc plated steel/aluminum
- Yoke: Anodized aluminum alloy
- Cover and Pistons: Plastic
- Sealing strip: Polyurethane
- Cover strip: Polyamide
- Seals: Nitrile rubber and polyurethane

**Loading values for LINTRA®-LITE cylinders**

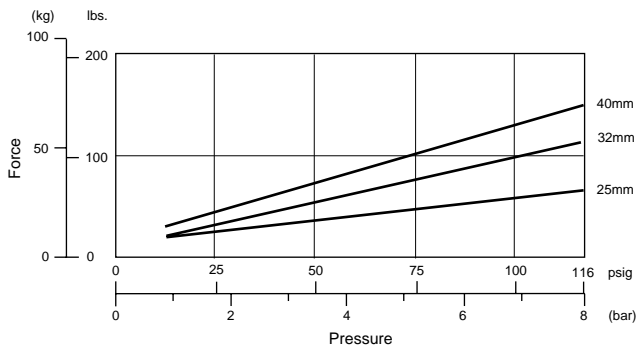
The values given in the table below show the forces in the directions Fy and Fz and the maximum moments Mx, My and Mz. All values are applicable for speeds up to .66 ft/s (0.2 m/s). A requirement for using these values is a smooth movement of the mass over the whole stroke length of the cylinder. The reference point from which the moments for all cylinders should be calculated is the center line of the piston.

**Total loads**

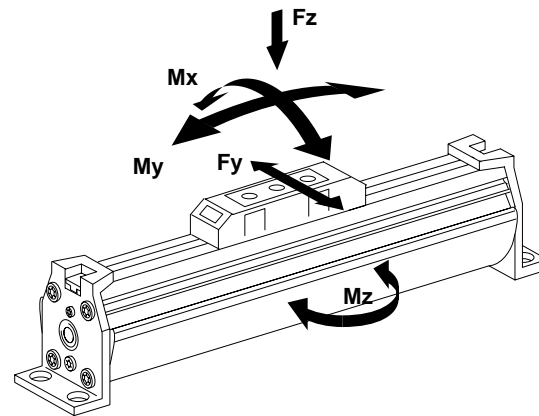
When a LINTRA®-LITE cylinder has to take several loads and moments, an additional calculation is necessary using the following formula:

$$\frac{Mx}{Mx \text{ max}} + \frac{My}{My \text{ max}} + \frac{Mz}{Mz \text{ max}} + \frac{Fy}{Fy \text{ max}} + \frac{Fz}{Fz \text{ max}} \leq 1$$

**Thrust – Based on 75% of Theoretical Thrust**



1 bar = 14.5 PSI  
 1 kg = 2.205 lbs.  
 1 m/s = 3.3 ft/s



**Thrust • Air Consumption • Cushion Length • Loading Values**

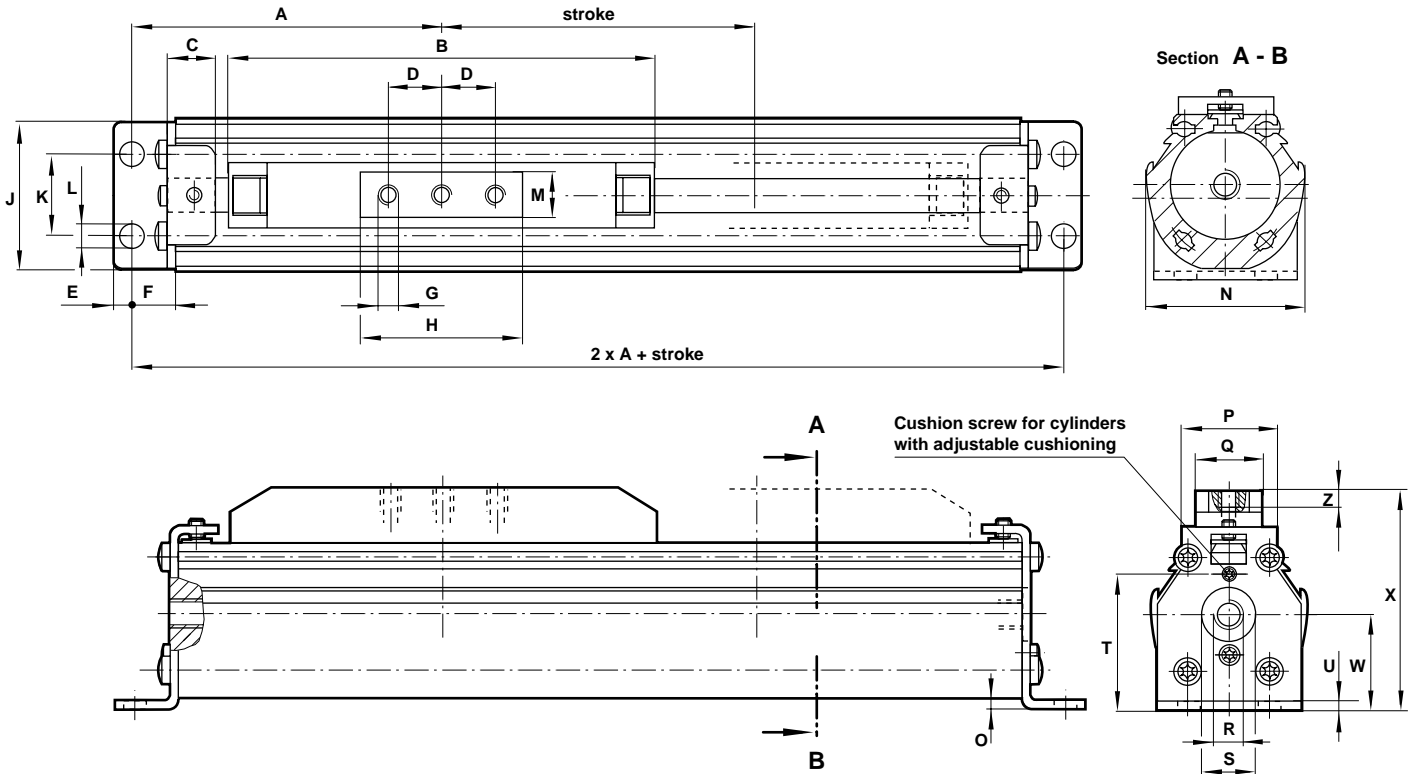
Cylinder Inch Ø mm	Theoretical forces at 6 bar lbs (N)	Air consumption per stroke at 6 bar cu.ft./in.(l/cm)	Cushion length		Loading values					
			Inch	(mm)	Fy lbs (N)	Fz lbs (N)	Mx in/lbs (Nm)	My in/lbs (Nm)	Mz in/lbs (Nm)	
1" 25	56 (250)	0.03 (0.035)	.709	(18)	20 (90)	63 (280)	9 (1)	115 (13)	35 (4)	
1¼" 32	92 (410)	0.04 (0.056)	.906	(23)	27 (120)	83 (370)	18 (2)	186 (21)	53 (6)	
1½" 40	143 (640)	0.06 (0.088)	1.378	(35)	54 (240)	162 (720)	36 (4)	496 (56)	142 (16)	

Loading values applicable to a speed of ≤ .66 ft/s (≤ 0.2 m/s). Maximum working life is normally reached below a speed of 3.3 ft/s (1 m/s).

- New compact, space-saving design
- Proven sealing system
- Integral switch mounting
- Bumper or adjustable cushioning
- Integral foot mount end covers are standard



Basic Dimensions  
 A44000 Standard Cylinders



Dimension	A	B	C	D	E	F	G	H	J	K	$\varnothing$ L
1" 25mm	3.03 (77)	3.94 (100)	.47 (12)	.49 (12.5)	.20 (5)	.47 (12)	M 5	1.57 (40)	1.42 (36)	.71 (18)	.28 (7)
1 1/4" 32mm	3.66 (93)	4.72 (120)	.71 (18)	.59 (15)	.28 (7)	.59 (15)	M 6	1.97 (50)	1.89 (48)	1.02 (26)	.35 (9)
1 1/2" 40mm	4.62 (117.5)	6.50 (165)	.71 (18)	.79 (20)	.28 (7)	.67 (17)	M 6	2.36 (60)	2.13 (54)	1.18 (30)	.35 (9)

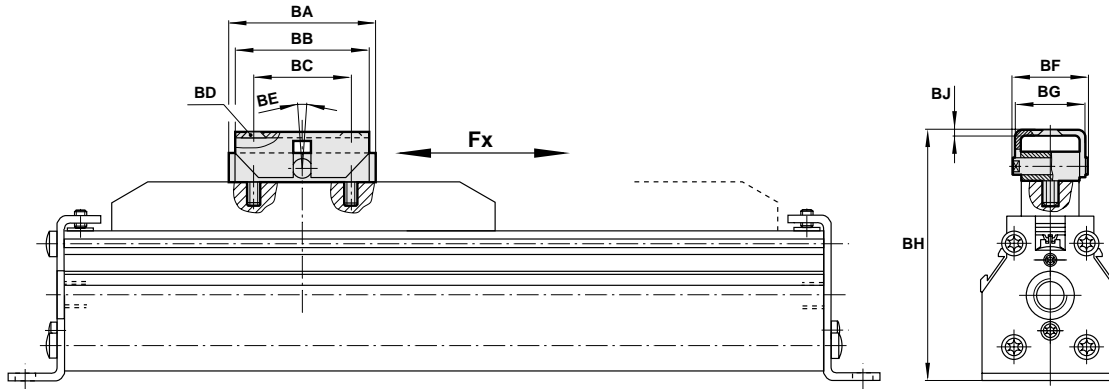
Dimension	M	N	O	P	Q	R*	$\varnothing$ S	T	U	W	X	Z max.	
1" 25mm	.71 (18)	1.57 (40)	.10 (2.5)	1.10 (28)	.87 (22)	NPT 1/8	G 1/8	.47 (12)	1.20 (30.5)	.08 (2)	.85 (21.5)	2.10 (53.5)	.28 (7)
1 1/4" 32mm	.79 (20)	1.95 (49.5)	.14 (3.5)	1.26 (32)	.94 (24)	NPT 1/8	G 1/8	.67 (17)	1.57 (40)	.12 (3)	1.12 (28.5)	2.76 (70)	.39 (10)
1 1/2" 40mm	.79 (20)	2.24 (57)	.14 (3.5)	1.42 (36)	.94 (24)	NPT 1/4	G 1/4	.79 (20)	1.95 (49.5)	.12 (3)	1.38 (35)	3.21 (81.5)	.39 (10)

\*Optional NPT or ISO G thread. NPT dimensions are in inches, ISO G dimensions are in mm.



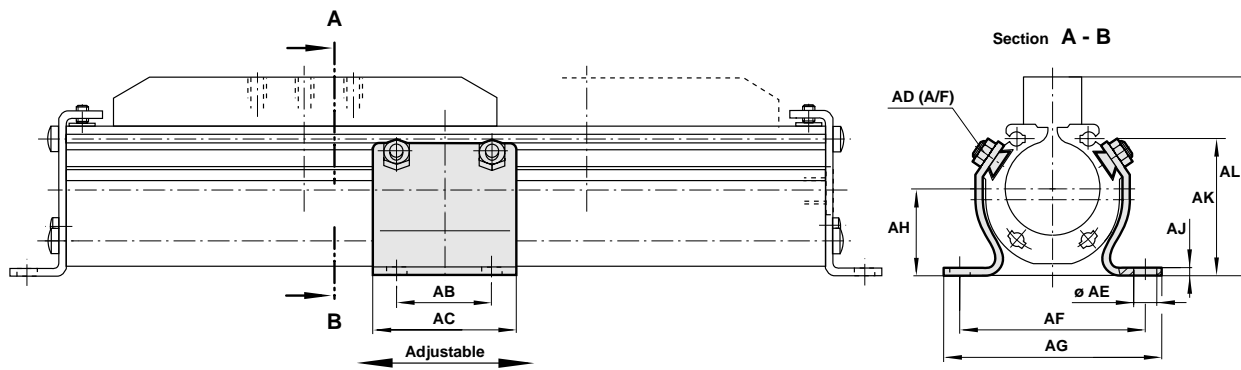
**MOUNTINGS**

**Q44000AAAAM337 — Swinging Bridge Mounting Style 'S'**



Dimension		BA	BB	BC	BD (DIN 74)	BE	BF	BG	BH	BJ
1"	25mm	1.57 (40)	1.57 (40)	1.10 (28)	BM 6	±.315 ±(8)	1.14 (29)	1.10 (28)	2.70+2 (68.5+5)	.08 (2)
1 1/4"	32mm	1.97 (50)	2.17 (55)	1.57 (40)	BM 6	±.315 ±(8)	1.22 (31)	1.18 (30)	3.44+2 (87.5+5)	.08 (2)
1 1/2"	40mm	2.36 (60)	2.17 (55)	1.57 (40)	BM 6	±.315 ±(8)	1.22 (31)	1.18 (30)	3.92+2 (99.5+5)	.08 (2)

**Q44000AAAAM332 — Center Support Mounting Style 'V'**



Dimension		AB	AC	AD (A/F)	∅ AE	AF	AG	AH	AJ	AK	AL
1"	25mm	.98 (25)	1.57 (40)	.39 (10)	.26 (6.6)	2.28 (58)	2.76 (70)	.85 (21.5)	.12 (3)	1.22 (31)	2.11 (53.5)
1 1/4"	32mm	1.18 (30)	1.97 (50)	.39 (10)	.35 (9)	2.76 (70)	3.27 (83)	1.12 (28.5)	.12 (3)	1.69 (43)	2.76 (70)
1 1/2"	40mm	1.57 (40)	2.36 (60)	.39 (10)	.35 (9)	3.11 (79)	3.62 (92)	1.37 (35)	.12 (3)	2.17 (55)	3.21 (81.5)



# Lintra-Lite Actuators

All Dimensions in Inches (mm)  
All Weights in Pounds (Kilograms)

## Model Codes for Inch (Metric)

**A440\*\*AA\*A\*\*\*\*\***

Cylinder Diameters Nominal Inch (mm)		Specify
ø 1"	(ø 25mm)	25
ø 1 1/4"	(ø 32mm)	32
ø 1 1/2"	(ø 40mm)	40

Variants	Specify
Bumper cushioning, non-magnetic piston	A
Bumper cushioning, magnetic piston	B
Adjustable cushioning, non-magnetic piston	C
Adjustable cushioning, magnetic piston	D

Porting	Specify
ISO G-thread (Specify stroke in mm)	A
NPT-Thread (Specify stroke in inches)	N

Fractional Increments of Stroke in Inch			
A = 0	E = 1/4	J = 1/2	P = 3/4
B = 1/16	F = 5/16	K = 9/16	R = 13/16
C = 1/8	G = 3/8	M = 5/8	S = 7/8
D = 3/16	H = 7/16	N = 11/16	T = 15/16
X = Special			
Specify Stroke Length in Inches (with NPT-thread port)			
236 Inches maximum			
Specify Stroke Length in mm (with ISO G-thread port)			
6000mm maximum			

**Bore Size Conversion:**


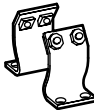
ø 25mm = .984" 1"  
 ø 32mm = 1.260" 1 1/4"  
 ø 40mm = 1.575" 1 1/2"

## Cylinder Weights

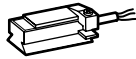
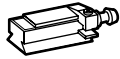
In pounds (kilograms)

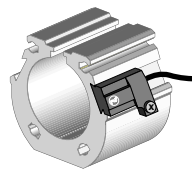
Cylinder Ø	Basic Cylinder Weight		Style 'S' Mounting Weight		Style 'V' Mounting Weight		Weight per Inch of Stroke	
	lbs.	Kg	lbs.	Kg	lbs.	Kg	per 100mm of Stroke	
1" (25mm)	1.1	0.5	0.33	0.15	0.15	0.07	0.08 lbs.	0.15 Kg
1 1/4" (32mm)	1.76	0.8	0.44	0.20	0.33	0.15	0.14 lbs.	0.25 Kg
1 1/2" (40mm)	2.87	1.3	0.55	0.25	0.55	0.25	0.19 lbs.	0.35 Kg

## Mountings

Cylinder Ø	Style 'S'	Style 'V'
	 Page 05	 Page 05
1" (25mm)	Q44025AAAAAM337	Q44025AAAAAM332
1 1/4" (32mm)	Q44032AAAAAM337	Q44032AAAAAM332
1 1/2" (40mm)	Q44040AAAAAM337	Q44040AAAAAM332

## Switches

Model		
Reed	M/40	M/40/P
Solid state	M/41, M/42	M/42/P



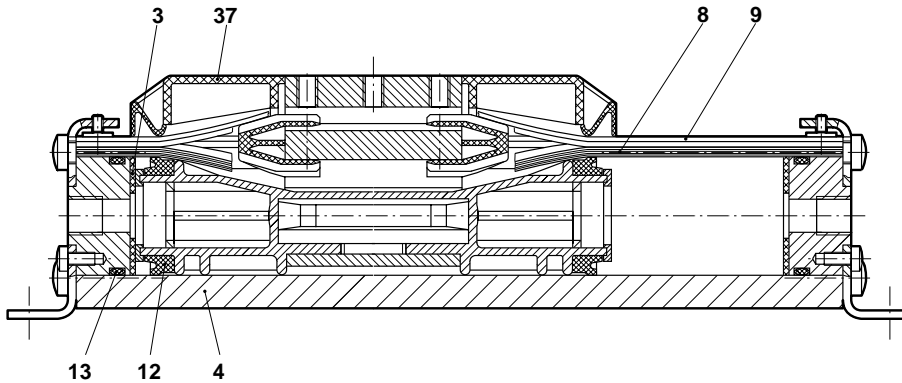
Model Reed	Solid state	Voltage		Current Max.	Temperature		LED	Features	Cable Length	Cable Type	Plug-in Cable		Page
		a.c.	d.c.		°F	°C					Straight	90°	
M/40/2	—	10 to 240	10 to 170	0.18 A	-4° to 176°	-20° to +80°	●	—	6.5' (2m)	PVC 2 x 0.25	—	—	ACT-11-8
M/40/C/2	—	10 to 110	10 to 175	0.25 A	-4° to 176°	-20° to +80°	—	Changeover	6.5' (2m)	PVC 3 x 0.25	—	—	ACT-11-8
M/40/P	—	10 to 60	10 to 75	0.18 A	-4° to 176°	-20° to +80°	●	—	16.25' (5m)	PVC 3 x 0.25	M/P34614/5	M/P34615/5	ACT-11-8
—	M/41/2	—	10 to 30	0.20 A	-4° to 158°	-20° to +70°	●	NPN	6.5' (2m)	PVC 3 x 0.25	—	—	ACT-11-10
—	M/42/2	—	10 to 30	0.20 A	-4° to 158°	-20° to +70°	●	PNP	6.5' (2m)	PVC 3 x 0.25	—	—	ACT-11-10
—	M/42/P	—	10 to 30	0.20 A	-4° to 158°	-20° to +70°	●	PNP	16.25' (5m)	PVC 3 x 0.25	M/P34614/5	M/P34615/5	ACT-11-10

Full information on switches (technical data, polyurethane cable, dimensions etc.) please refer to relevant catalog ACT-11-8 thru 11.

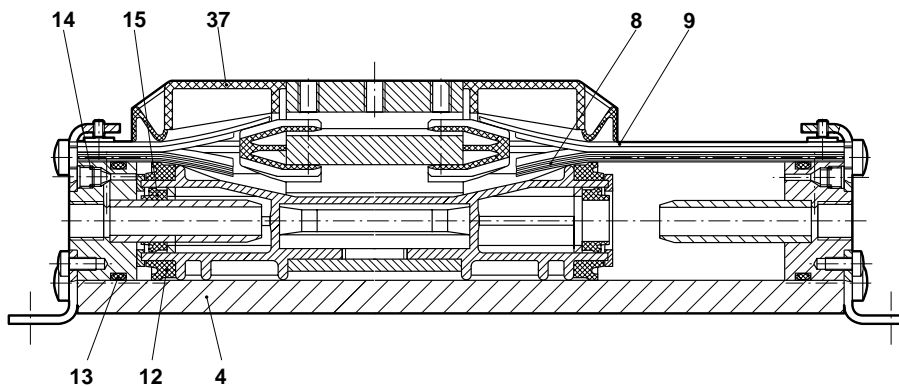


Spares

Cylinders with Bumper Cushioning



Cylinders with Adjustable Cushioning



Replacement Parts for A44000AA\*AN with NPT Port Thread and Stroke in inches

Cylinder Ø	Model	Spares kit includes:			Seal strip Item 8	Cover strip Item 9	Tube Item 4	
		Item	Description	Quantity				
1"	A44025AA*AN	Q44025AACANT788*	3	Bumper	2	C/P 41628/*	C/P 41631/*	C/P 41607/*
1 1/4"	A44032AA*AN	Q44032AACANT788*	8/9	Seal/cover strip	1/1	C/P 41629/*	C/P 41632/*	C/P 41613/*
1 1/2"	A44040AA*AN	Q44040AACANT788*	12/15	Piston/cushion seal	2/2	C/P 41630/*	C/P 41633/*	C/P 41602/*
	* Variants A, B, C or D	* Insert stroke length in inches.	13/14	O-Ring	2/2			
			37	Cover	1			
				Grease	2			

NOTE: Spares kits are common for all cylinder variants. Please specify the cylinder model number when ordering spare parts.

Replacement Parts for A44000AA\*AA with ISO-G Port Thread and Stroke in mm

Cylinder Ø	Model	Spares kit includes:			Seal strip Item 8	Cover strip Item 9	Tube Item 4	
		Item	Description	Quantity				
25mm	A44025AA*AA	Q44025AACAAAT788*	3	Bumper	2	M/P 41628/*	M/P 41631/*	M/P 41607/*
32mm	A44032AA*AA	Q44032AACAAAT788*	8/9	Seal/cover strip	1/1	M/P 41629/*	M/P 41632/*	M/P 41613/*
40mm	A44040AA*AA	Q44040AACAAAT788*	12/15	Piston/cushion seal	2/2	M/P 41630/*	M/P 41633/*	M/P 41602/*
	* Variants A, B, C or D	* Insert stroke length in mm.	13/14	O-Ring	2/2			
			37	Cover	1			
				Grease	2			

NOTE: Spares kits are common for all cylinder variants. Please specify the cylinder model number when ordering spare parts.

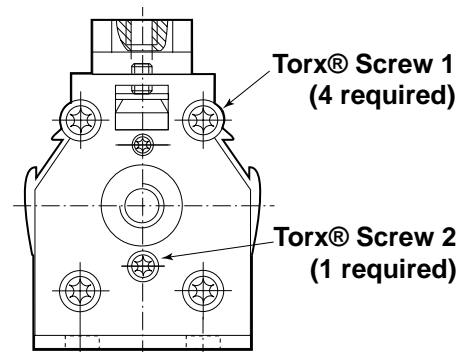
Torx® Screws

Tube Torque Torx® Screw 1 (4)

Cylinder Ø	Screw Size	Torque	Tool Size
1" (25mm)	M4x16	3-3.5 Nm	T-20
1 1/4" (32mm)	M5x20	6-7 Nm	T-25
1 1/2" (40mm)	M6x25	9-10 Nm	T-30

Cap to Mounting Plate Torx® Screw 2 (1)

Cylinder Ø	Screw Size	Torque	Tool Size
1" (25mm)	M3x8	.8-1 Nm	T-10
1 1/4" (32mm)	M3x8	.8-1 Nm	T-10
1 1/2" (40mm)	M4x10	3-3.5 Nm	T-20





- Compact, low profile reed switches.
- M/40, M/40/P, and TM/40 feature LED indicators.
- Simple, reliable switching for fast response times.
- TM/40 high temperature model.
- M/40/P features a plug-in cable connection.
- CE – Marking.



### Specifications

#### Form:

M/40 M/40/P – Normally open with LED  
M/40/C – Normally open/normally closed  
TM/40 – Normally open

#### Switching Voltage:

M/40, M/40/C, TM/40 – 110 VAC or 100 VDC maximum  
M/40/P – 60 VAC and 75 VDC maximum

#### Switching Current:

M/40, M/40/P – 180 mA (temperature dependent), ACT-11-9  
M/40/C, TM/40 – 250 mA

#### Contact Rating:

M/40, TM/40, M/40/P – 10 VA  
M/40/C – 5 VA

#### Response Time:

M/40, M/40/C, M/40/P – 0.6 ms  
TM/40 – 1.0 ms

#### Operating Temperature:

32° to 158°F (0° to 70°C)  
TM/40 – 32° to 248°F (0° to 120°C)

#### Protection Rating:

I.P.67

#### Vibration Resistance:

M/40, TM/40, M/40/P – 10 to 2000Hz 0.11 lbs. (50g)  
(Resonant Frequency = 3 kHz)  
M/40/C – 10 to 2000Hz 0.11 lbs. (50g)  
(Resonant Frequency = 13 kHz)

#### Cable Length:

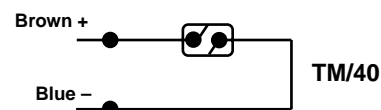
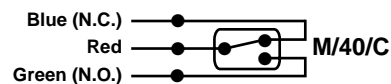
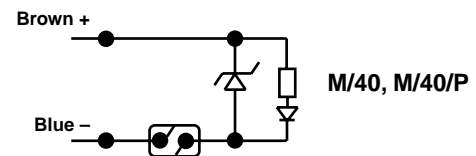
M/40 – 6.5' (2m), 16.25' (5m) of P.V.C. covered two core cable  
M/40/C – 6.5' (2m) of P.V.C. covered three core cable  
TM/40 – 6.5' (2m) of silicon rubber covered two core cable  
M/40/P – 16.25' (5m) of P.V.C. or Polyurethane covered three core cable with plug-in connection

### Materials

M/40, M/40/C, M/40/P – Nylon 66 body  
TM/40 – 30% Glass filled Nylon 66 body

**NOTE:** When used to switch inductive loads such as solenoids, relays etc., arcing can occur across the switch contacts depending on the current and voltage involved. This arcing can be eliminated on d.c. loads by connecting a suitably rated diode across the load or switch.

On a.c. loads, arcing is more difficult to eliminate, but the contact life can be greatly extended by reducing the peak voltages by connecting a suitable non-linear resistor (V.D.R.) across the load or switch.



### Alternative Models

- M/41 Solid state model with hardwired cable – see ACT-11-10
- M/42 Solid state model with hardwired cable – see ACT-11-10
- M/42/P Solid state model with plug-in cable – see ACT-11-10



**General Information**

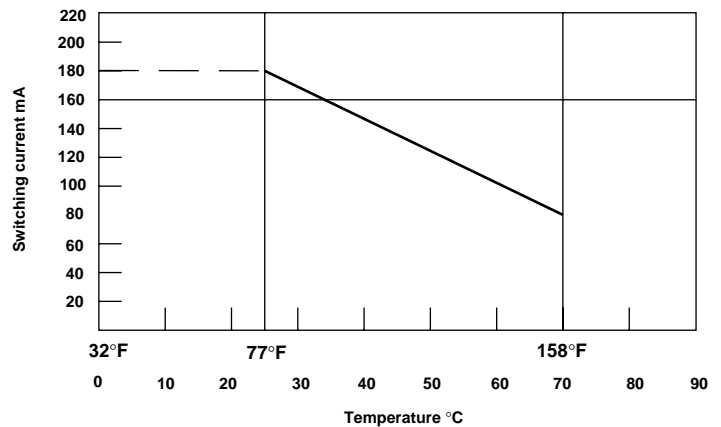
Model	Switch type	Cable length
M/40	LED, Normally open, hardwired	6.5' (2), 16.25' (5)
M/40/C	Normally open/Normally closed - changeover, hardwired	6.5' (2)
TM/40	Normally open, high temperature, hardwired	6.5' (2)
M/40/P	Normally open with LED, plug-in cable	16.25' (5)

NOTE: Switches are ordered separately.

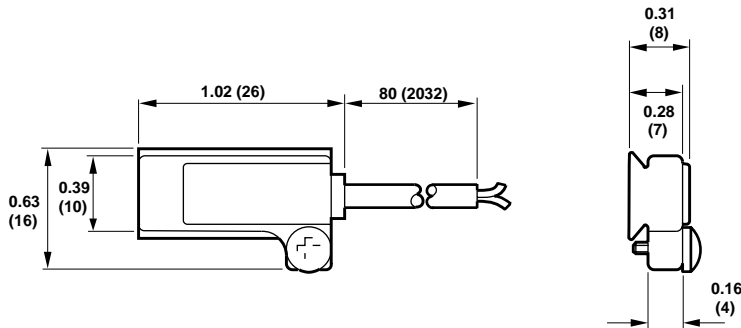
**Effect of High Temperatures – M/40 and M/40/P with LED**

When using a Reed Switch that incorporates an LED, the maximum switching current should be reduced in direct proportion to the rise in temperature above 77°F (25°C).

At maximum temperature of 158°F (70°C) the maximum switching current must be derated to 80mA.



**M/40, M/40/C, TM/40 Magnetically Operated Switches, with hardwired cable**

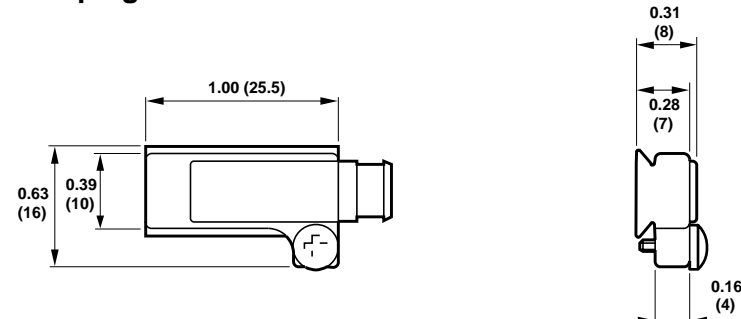


Switches are mounted in the integral slot of the extruded tube.

Polarity:  
Red +  
Blue -

Normally open/normally closed:  
Red common  
Blue normally closed  
Green normally open

**M/40/P Magnetically Operated Switches, with plug-in cable\***



Switches are mounted in the integral slot of the extruded tube.

Polarity:  
Brown +  
Blue -

Cable No.	Connector type	Outer cover
M/P34595/5	Straight	Polyurethane
M/P34596/5	Angled 90°	Polyurethane
M/P34614/5	Straight	P.V.C.
M/P34615/5	Angled 90°	P.V.C.

\*Cable must be ordered separately.

- Compact, low profile solid state switches.
- LED indicator is standard.
- Simple, reliable switching with fast response times.
- Particularly suited for use where high levels of vibration are present.
- M/42/P features a plug-in cable connection.
- CE - Marking.

### Specifications

#### Form:

M/41 – Solid state with LED (NPN, sinking, grounded emitter output)

M/42, M/42/P – Solid state with LED (PNP, sourcing, open collector output)

#### Switching Voltage:

10V to 28VDC only

M/42/P – 10V to 30VDC only

#### Switching Current:

M/41 – 20 mA

M/42, M/42/P – 300 mA

#### Response Time:

1.5  $\mu$ s

#### Operating Temperature:

32° to 158°F (0° to 70°C)

#### Protection Rating:

I.P.67

#### Vibration Resistance:

Immune to shock loads

#### Cable Length:

M/41, M/42 – 6.5' (2m) of P.V.C. covered three core cable

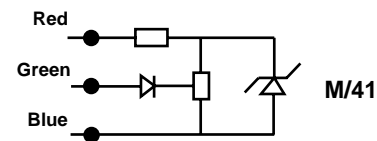
M/42/P – 16.25' (5m) of P.V.C. or Polyurethane covered three core cable with plug-in connection.

#### Switch Protection:

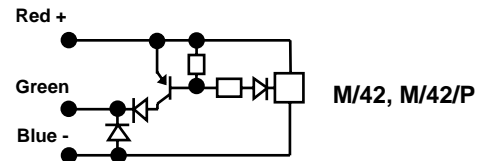
Diode protection must be used with inductive loads.

### Materials

Nylon 66 body.



M/41



M/42, M/42/P

### Alternative Models

M/40 Hardwired cable model – see ACT-11-8

M/40/C Normally open/normally closed model with integral cable – see ACT-11-8

M/40/P Plug-in cable model – see ACT-11-8

TM/40 High temperature model – see ACT-11-8

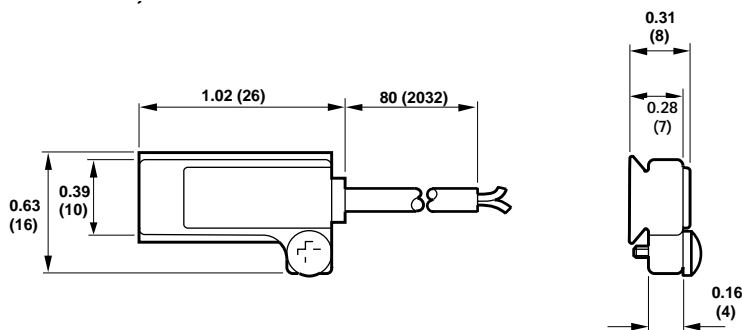


## General Information

Model	Switch type	Cable length
M/41	Solid State with LED, sinking, NPN, hardwired cable	6.5' (2)
M/42	Solid State with LED, sourcing, PNP, hardwired cable	6.5' (2)
M/42/P	Solid State with LED, sourcing, PNP, plug-in cable	16.25' (5)

NOTE: Switches are ordered separately.

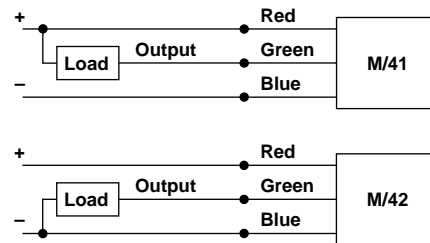
### M/41, M/42 Magnetically Operated Switches, with hardwired cable



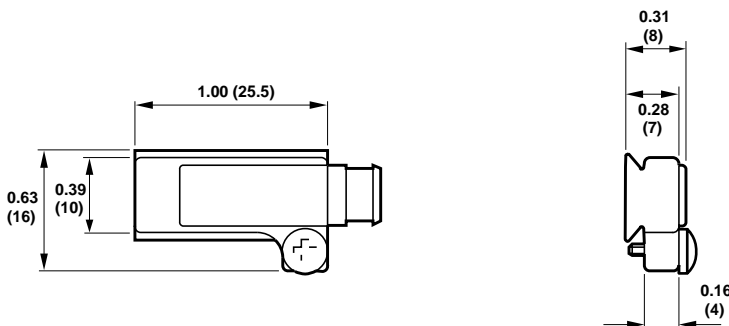
Switches are mounted in the integral slot of the extruded tube.

Polarity:

- Red +
- Blue -
- Green Output



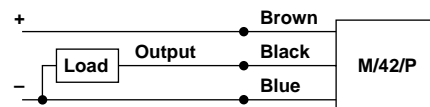
### M/42/P Magnetically Operated Switches, with plug-in cable\*



Switches are mounted in the integral slot of the extruded tube.

Polarity:

- Brown +
- Blue -
- Black Output



\*Cable must be ordered separately.

Cable No.	Connector type	Outer cover
M/P34595/5	Straight	Polyurethane
M/P34596/5	Angled 90°	Polyurethane
M/P34614/5	Straight	P.V.C.
M/P34615/5	Angled 90°	P.V.C.



# Rack and Pinion Rotary Actuators

## Mini Rotary Actuators

Mini Rack and Pinion Rotary Actuators 1/2" and 3/4" Bore Features.....ACT-12-2  
 Mini Rack and Pinion Rotary Actuators 1/2" and 3/4" Bore Technical Features .....ACT-12-3  
 Mini Rack and Pinion Rotary Actuators 1/2" and 3/4" Bore Special Options .....ACT-12-4  
 Single Rack and Pinion Mini Rotary Actuators 1/2" and 3/4" Bore .....ACT-12-6  
 Double Rack and Pinion Mini Rotary Actuators 1/2" and 3/4" Bore .....ACT-12-7  
 Integral Air/Oil Tandem Double Rack and Pinion Mini Rotary Actuators 3/4" Bore..ACT-12-8  
 Mini Rack and Pinion Rotary Actuators Order Information.....ACT-12-9

## Rotary Actuators

Rack and Pinion Rotary Actuators 1-1/8" to 2-1/2" Bore Features.....ACT-12-10  
 Rack and Pinion Rotary Actuators 1-1/8" to 2-1/2" Bore Technical Features .....ACT-12-11  
 Rack and Pinion Rotary Actuators 1-1/8" to 2-1/2" Bore Special Options .....ACT-12-12  
 Single Rack and Pinion Rotary Actuators 1-1/8" to 2-1/2" Bore .....ACT-12-14  
 Double Rack and Pinion Rotary Actuators 1-1/8" to 2-1/2" Bore .....ACT-12-16  
 Double Rack and Pinion Rotary Actuators 1-1/8" to 2-1/2"  
 Bore with Standard Air/Oil Tandem Option .....ACT-12-18  
 Double Rack and Pinion Rotary Actuators 1-1/8" to 2-1/2"  
 Bore with Integral Air/Oil Tandem Option.....ACT-12-18  
 Multiple (3) Position Rack and Pinion Rotary Actuators .....ACT-12-19  
 Multiple (4) Position Rack and Pinion Rotary Actuators .....ACT-12-19  
 Multiple (5) Position Rack and Pinion Rotary Actuators .....ACT-12-19  
 Rotary Actuators Order Information .....ACT-12-20

Switches.....ACT-12-21  
 Rotary Tables.....ACT-12-22  
 Calculating a Moment of Inertia .....ACT-12-26  
 Rotary Actuator Applications .....ACT-12-27



ACT-12-6 –  
Single Rack and Pinion  
Mini Rotary Actuator



ACT-12-7 –  
Double Rack and Pinion  
Mini Rotary Actuator



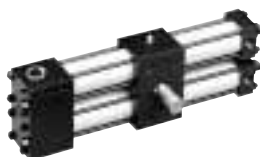
ACT-12-8 – Integral Air/Oil  
Tandem Double Rack and  
Pinion Mini Rotary Actuator



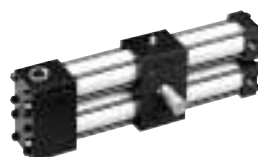
ACT-12-14 –  
Single Rack and Pinion  
Rotary Actuator



ACT-12-16 –  
Double Rack and Pinion  
Rotary Actuator



ACT-12-18 –  
Double Rack and Pinion Rotary  
Actuator with Standard Air/Oil  
Tandem Option



ACT-12-18 – Double Rack and  
Pinion Rotary Actuator with  
Integral Air/Oil Tandem Option



ACT-12-19 – Multiple (3, 4, and  
5) Position Rack and Pinion  
Rotary Actuator



# Rack & Pinion Rotary Actuators

All Dimensions in Inches (mm)

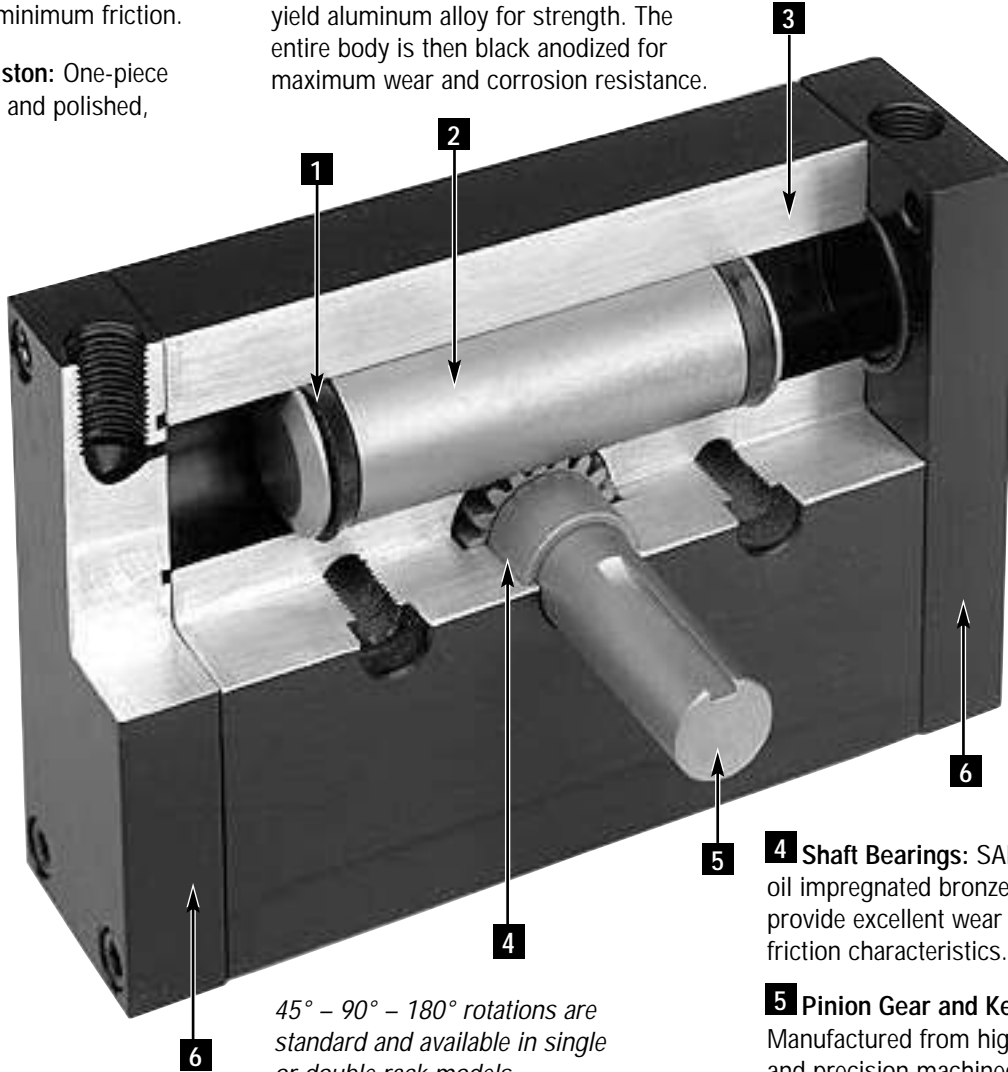
Mini Rotary Actuators are constructed with the finest materials for each component!

**1 Seals:** Lip type, pressure sensitive nitrile seals are wear compensating for long service life and minimum friction.

**2 Gear Rack and Piston:** One-piece construction, ground and polished, stress-proof steel.

**3 Actuator Body:** Precision machined from 6061-T6, 40,000 PSI minimum yield aluminum alloy for strength. The entire body is then black anodized for maximum wear and corrosion resistance.

Double Rack Shown



45° – 90° – 180° rotations are standard and available in single or double rack models.

**4 Shaft Bearings:** SAE 841 oil impregnated bronze bearings provide excellent wear and low friction characteristics.

**5 Pinion Gear and Keyed Output Shaft:** Manufactured from high strength steel and precision machined as one piece. The gear/shaft can be easily removed and reinserted to satisfy a variety of keyway orientation requirements.

**6 End Caps:** Machined from 6061-T6 solid aluminum bar that is anodized for corrosion resistance.

## Seal Kits

Bore	Standard Part No.	Low Friction Part No.	Viton® Part No.	Air/Oil Tandem Part No.
1/2" Single Rack	000SK	000TK	000VK	We recommend that Air/Oil Tandems are returned to the factory for repair.
1/2" Double Rack	050SK	050TK	050VK	
3/4" Single Rack	100SK	100TK	100VK	
3/4" Double Rack	150SK	150TK	150VK	

## Torque Output

Theoretical Torque Output in Inch-pounds (Newton-meters)

Bore Size	Series	PSI (bar)									Inch-pounds per PSI	(Newton-meters per Bar)
		40 (2.8)	60 (4.1)	80 (5.5)	90 (6.2)	100 (6.9)	125 (8.6)	150 (10.3)				
1/2" Single Rack	000	2.0 (.23)	2.9 (.33)	3.9 (.44)	4.4 (.50)	4.9 (.50)	6.1 (.69)	7.4 (.84)	.049	(.080)		
1/2" Double Rack	050	4.0 (.45)	5.8 (.66)	7.8 (.88)	8.8 (1.00)	9.8 (1.11)	12.2 (1.38)	14.8 (1.67)	.098	(.160)		
3/4" Single Rack	100	6.6 (.75)	9.9 (1.12)	13.3 (1.50)	14.9 (1.68)	16.5 (1.86)	20.7 (2.33)	24.8 (2.80)	.165	(.270)		
3/4" Double Rack	150	13.2 (1.49)	19.8 (2.24)	26.6 (3.0)	29.8 (3.37)	33.0 (3.73)	41.4 (4.68)	49.6 (5.60)	.330	(.540)		

NOTE: Deduct 10% from torque output for frictional loss. ø3/4" Air/Oil Tandem has the torque output of a Single Rack unit; deduct 20% for frictional loss.



**Operating Specifications**

**Operating Temperature:**

- 20°F to 200°F (-29°C to 93°C) with Standard Nitrile Seals
- 20°F to 400°F (-29°C to 204°C) with Viton® Seals
- 20°F to 250°F (-29°C to 121°C) with Low Friction Seals

**Operating Pressure:**

150 PSI (10 Bar)

**Supply:**

Filtered compressed air to 150 PSI (10 Bar)

**Angle of Rotation:**

- 45°, 90°, 180° Standard
- Other rotations available

**Rotational Tolerance:**

-0° + 1/2°

**Backlash Between Rack & Pinion:**

2 position units less than 1° of arc maximum

NOTE: For 0° backlash at each end of rotation, specify a double rack actuator with rotation adjustments.

**Lubrication:**

None required

Norgren Rotary Actuators are rated for “no lube added” service. All internal components are lubricated at the time of assembly with a Teflon® based grease.

Recommended fluid for air/oil tandem is petroleum based hydraulic oil, non-foaming, non-detergent ISO Viscosity grade of 46.

**Materials:**

End Caps: Black anodized 6061-T6 aluminum

Body: 6061-T6 aluminum alloy, entirely black anodized

Gear Rack: Ground and polished stress proof steel

Pinion Gear and Output Shaft: Manufactured as one piece from high strength steel.

Shaft Bearings: SAE 841 Bronze

Standard Seals: Nitrile

**Displacement • Load Bearing Capacity • Unit Weights**

Displacement in cubic inches (mm<sup>3</sup>); Load Bearing Capacity in pounds force (kilograms); Bearing Distance in inches (mm); Unit Weights in pounds (kilograms)

Bore Size	Displacement for Each Degree of Rotation		Axial Load Bearing Capacity		Radial Load Bearing Capacity		Distance Between Bearings		Basic Weight-180° Unit		Add for Double Output Shaft	
	Inch <sup>3</sup>	(mm <sup>3</sup> )	lbs	(Kg)	lbs	(Kg)	Inch	(mm)	lbs	(Kg)	lbs	(Kg)
1/2" Single Rack	.0009	(15)	10	(4.54)	25	(11.35)	.66	(17)	.172	(.08)	.031	(.01)
1/2" Double Rack	.0018	(30)	10	(4.54)	25	(11.35)	.66	(17)	1.563	(.71)	.031	(.01)
3/4" Single Rack	.0029	(48)	30	(13.62)	50	(22.70)	.75	(19)	1.344	(.61)	.063	(.03)
3/4" Double Rack	.0058	(95)	30	(13.62)	50	(22.70)	.75	(19)	2.063	(.94)	.063	(.03)

**Rotational Velocity**

Maximum rotational velocity of a rotary actuator is difficult to determine due to varying factors such as pressure, medium, flow and external loading. Excessive speeds in a given application can create inertia loads whose shock values could prove detrimental to the actuator. Use of external stops, cushions, or other deceleration devices will ensure maximum performance and actuator life. For calculating a moment of inertia, see page 26.





# Rack & Pinion Rotary Actuators

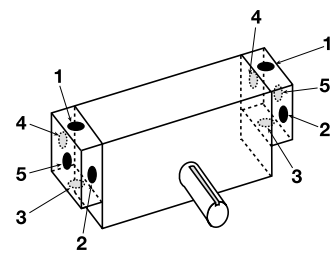
All Dimensions in Inches (mm)

## Optional Features:

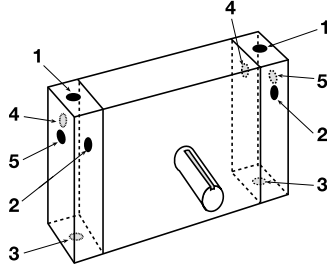
- Port Locations
- Rotation Adjustment
- Viton® Seals for High Temperature
- Integral Air/Oil Tandem (3/4" Bore)
- Low Friction Seals
- Electroless Nickel Plating
- Angle Bracket, Front and Rear Flange Mountings
- Noise Dampening Bumpers
- Double End Output Shaft

## Mini Rotary Actuator Port Locations

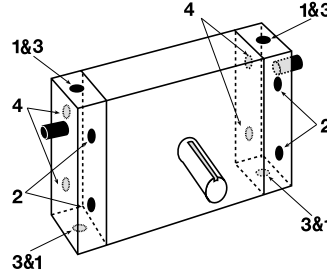
### Single Rack



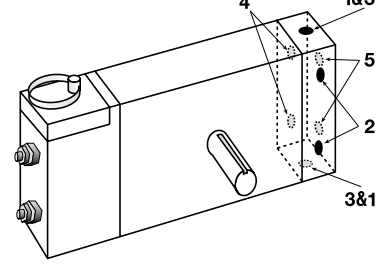
### Standard Double Rack with No Rotation Adjustment



### Double Rack with Rotation Adjustment



### Integral Double Rack



## Mini Rotary Integral Air/Oil Tandem (ø3/4" Bore)

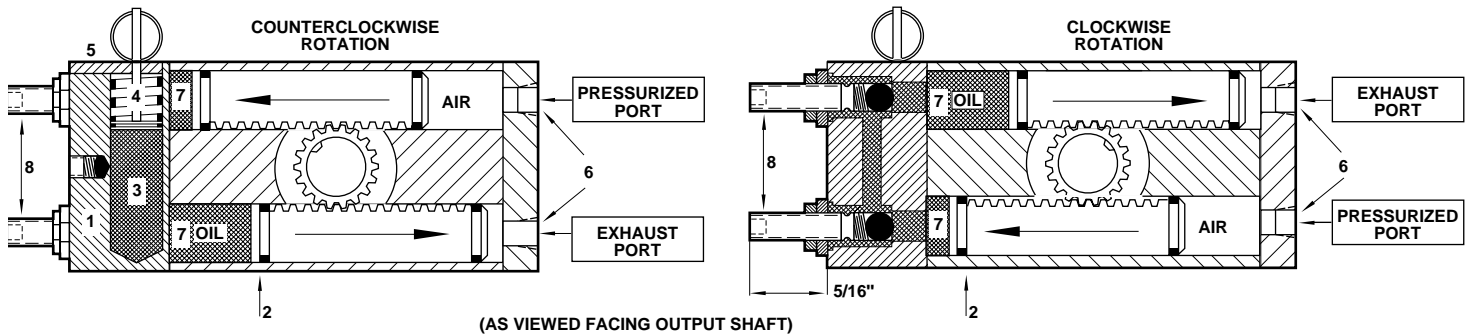
Norgren ø3/4" Bore Mini Rotary Actuator can be supplied with a unique, fully self-contained, air/oil tandem system. This option provides extremely smooth, fully adjustable speed control of the output shaft.

### Maximum Speed in degrees per second: (No Load Condition)

Bore Size	Operating Pressure in PSI (bar)					
	40 (2.8)	50 (3.4)	60 (4.1)	70 (4.8)	80 (5.5)	90 (6.2)
3/4"	296°	366°	386°	441°	480°	518°

Note: Theoretical Reservoir Pressure 20 PSI. Oil Temperature 95°F.

## Integral Air/Oil Tandem Operating Principle



The **1** closed loop oil system manifold including the oil reservoir, is attached to the **2** actuator body. This **3** oil reservoir allows for the oil fluctuations caused by variations in temperature. A **4** spring loaded plunger exerts a

constant pressure on the system oil, which keeps the system purged of air. The **5** ring attached to the plunger shaft will **pop up** when the system oil needs replenishment. When air pressure is applied to **6** either port, the gear racks

move in opposing directions. **7** System oil is displaced from one rack bore to the other by way of the integral **8** cartridge speed controls which meter the oil as it passes through the manifold to provide smooth and precise adjustment of the output shaft velocity.

## Low Friction Seals

Single and Double Rack Mini Rotary Actuators can be ordered with Low Friction Seals. Nitrile seals, specially compounded with Teflon®, offer extremely smooth low friction operation. TO ORDER: enter option code **1** or **2** in Rack/Rotary Type position **2**.

## Electroless Nickel Plating

For corrosive environments, all external components of the actuator are electroless nickel plated or manufactured from 303 stainless steel with the exception of the output shaft. Consult factory for stainless steel output shaft if required. TO ORDER electroless nickel: enter option code **E** in position **13**.

## High Temperature Viton® Seals

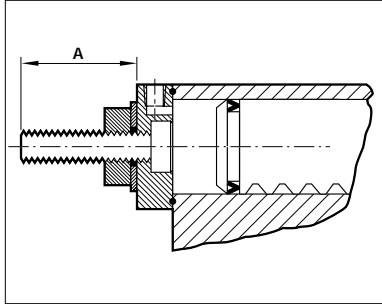
Viton® Seals are ideal for higher temperature applications -20°F to 400°F (-29°C to 204°C). TO ORDER Viton® seals: enter option code **V** in position **13**.



## Rotation Adjustment

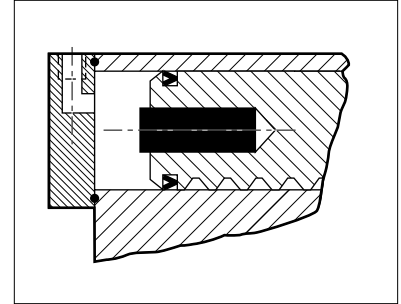
Located in the actuator end cap, each rotation adjustment provides up to 30° of angle reduction.

Bore	1/2"	3/4"
A	.563 (14.29)	.813 (20.64)



## Noise Dampening Bumpers

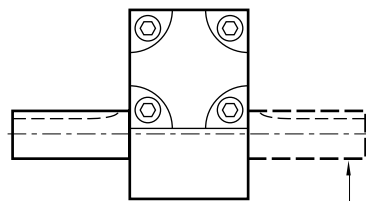
A urethane insert is placed in the gear rack preventing metal to metal contact and providing quiet operation.



## Double End Output Shaft

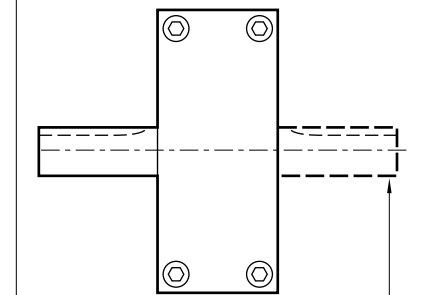
Single and Double Rack Mini Rotary Actuators can be ordered with optional double end keyway output shafts. TO ORDER: enter option code **B** in **Output Shaft** position 5.

Single Rack



Optional Double End Output Shaft

Double Rack



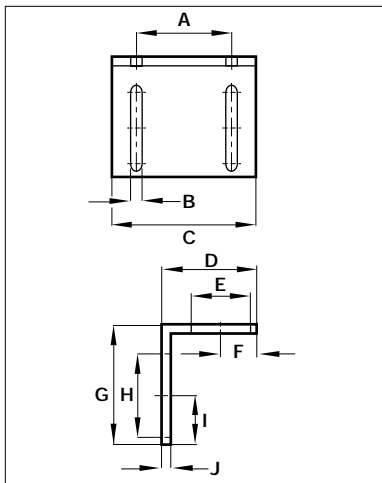
Optional Double End Output Shaft

## Angle Bracket R-920-100

The Angle Bracket can be used to mount any  $\varnothing 1/2"$  or  $\varnothing 3/4"$  Mini Rotary Actuator perpendicular to the axis of a Norgren Series N twin rod cylinder (Section 4). All brackets include mounting hardware.

TO ORDER: enter option code **5** in **Mounting** position 6.

NOTE: Mini Rotary Actuators come with standard 1/4" – 28 threads/counterbore for #10 socket head cap screw, machined in the body for direct mounting, if desired.

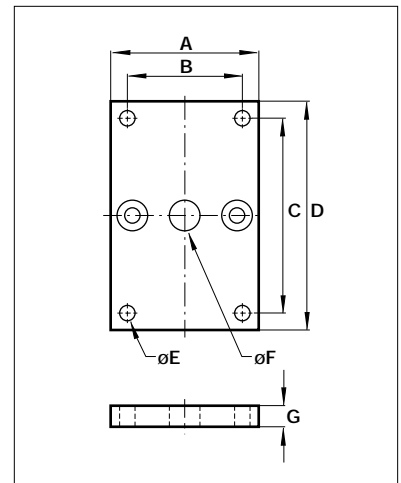


Bore	1/2"	3/4"
A	2.00 (51)	2.00 (51)
B	.25 (6)	.25 (6)
C	3.00 (76)	3.00 (76)
D	2.00 (51)	2.00 (51)
E	1.25 (32)	1.25 (32)
F	.75 (19)	.75 (19)
G	2.50 (64)	2.50 (64)
H	1.75 (44)	1.75 (44)
I	1.00 (25)	1.00 (25)
J	.25 (6)	.25 (6)

## Front and Rear Flange Mountings R-80-100

Flanges are universal and can be used on both  $\varnothing 1/2"$  and  $\varnothing 3/4"$  Mini Rotary Actuators. All flange mounts include mounting hardware. TO ORDER: enter option code **2** or **3** in **Mounting** position 6.

NOTE: Mini Rotary Actuators come with standard 1/4" – 28 threads/counterbore for #10 socket head cap screw, machined in the body for direct mounting, if desired.

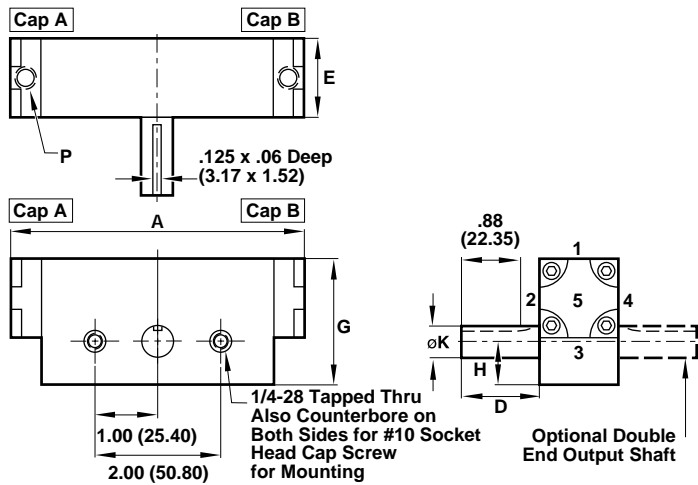


Bore	1/2"	3/4"
A	2.75 (70)	2.75 (70)
B	2.125 (54)	2.125 (54)
C	3.625 (92)	3.625 (92)
D	4.25 (108)	4.25 (108)
øE	.281 (7)	.281 (7)
øF	.281 (7)	.281 (7)
G	.375 (10)	.375 (10)

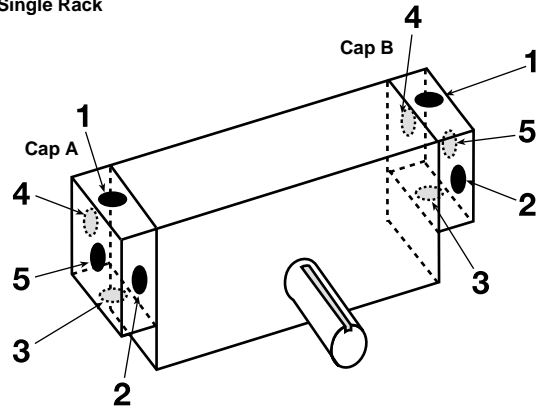
- Single Rack and Pinion Mini Rotary Actuators are very compact.
- Theoretical torque from 2.0 to 24.8 inch-pounds (.23 to 2.80 Newton-meters).
- Rotation angles 45°, 90°, and 180° standard.
- Nitrile Noise Dampening Bumpers optional.
- Viton® Seals optional for higher temperatures.
- Optional Low Friction Seals.
- Body Mount or optional Angle Bracket, Front and Rear Flange Mountings.



### Basic Dimensions Single Rack and Pinion Mini Rotary Actuator



Port Positions Single Rack



All Dimensions in Inches (mm)

Bore	A	D	E	G	H	øK	P
1/2" Single Rack and Pinion	3.50 (89)	1.06 (27)	1.00 (25)	1.50 (38)	.59 (15)	.375 (9.53)	10-32
3/4" Single Rack and Pinion	4.88 (124)	1.25 (32)	1.25 (32)	2.00 (51)	.69 (18)	.500 (12.70)	1/8 NPT

### Single Rack and Pinion Mini Rotary Actuator Order Information

Order Information Diagram showing 13 positions and various options:

- Bore:** 0 1/2", 1 3/4"
- Rack/Rotary Type:** 0 Single Rack Standard Seals, 1 Single Rack Low Friction Seals
- Multiple Position:** 0 N/A
- Rotation:** A 45°, B 90°, C 180°, X Special
- Output Shaft:** A Single End Keyway Standard, B Double End Keyway, X Special
- Mounting:** 1 Standard, 2 Front Flange, 3 Rear Flange, 5 Angle Bracket, X Special
- Port & Location:** A Port Position 1\*, B Port Position 2, C Port Position 3, D Port Position 4, F Port Position 5
- Cushions:** A N/A
- Flow Controls:** A N/A
- Bumper:** A No Bumpers, B End Cap A, C End Cap B, D All Caps
- Switches:** 0 N/A
- Options:** 0 No Option, E Electroless Nickel, V Viton® Seals, X Special (Specify)
- Rotation Adjustments:** 1 No Adjustment, 2 End Cap A, 3 End Cap B, 4 End Caps A & B, X Special

See ACT-12-9 for complete instructions on how to order Mini Rotary Actuators.

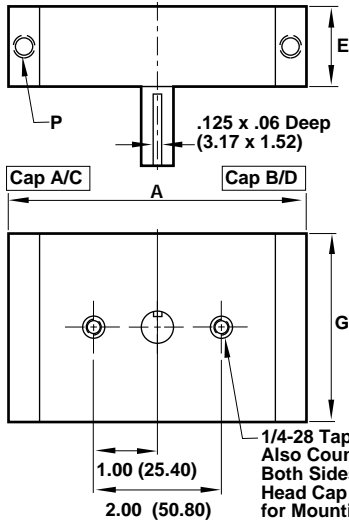
# Rack & Pinion Rotary Actuators



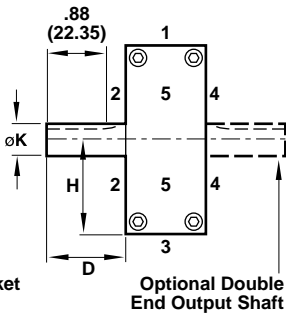
## Double Rack & Pinion Mini Rotary Actuator ( $\varnothing 1/2"$ & $3/4"$ Bores)



- Double Rack and Pinion Mini Rotary Actuators have double the theoretical torque of a Single Rack Rotary.
- Theoretical torque from 4.0 to 49.6 inch-pounds (.45 to 5.60 Newton-meters).
- Rotation angles 45°, 90°, and 180° standard.
- Nitrile Noise Dampening Bumpers optional.
- Viton® Seals optional for higher temperatures.
- Optional Low Friction Seals.
- Body Mount or optional Angle Bracket, Front and Rear Flange Mountings.

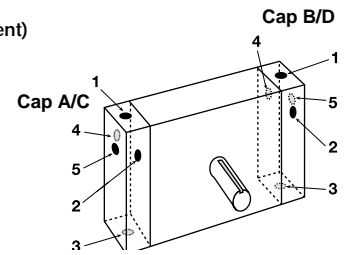


**Basic Dimensions  
Double Rack and Pinion  
Mini Rotary Actuator**

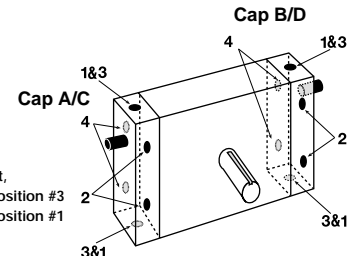


**Optional Double  
End Output Shaft**

**Port Positions for  
Double Rack  
(No Rotation Adjustment)**



**Port Positions for  
Double Rack with  
Rotation Adjustment**

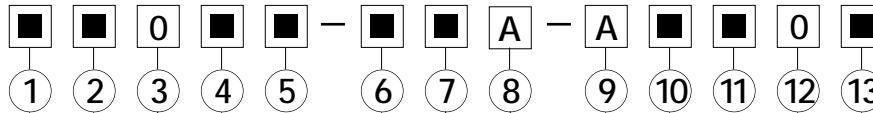


NOTE: With Rotation Adjustment,  
Port Position #1 includes Port Position #3  
Port Position #3 includes Port Position #1

All Dimensions in Inches (mm)

Bore	A	D	E	G	H	øK	P
1/2" Double Rack and Pinion	3.75 (95)	1.06 (27)	1.00 (25)	2.50 (64)	1.25 (32)	.375 (9.53)	1/8 NPT
3/4" Double Rack and Pinion	4.75 (121)	1.25 (32)	1.25 (32)	3.00 (76)	1.50 (38)	.500 (12.70)	1/8 NPT

### Double Rack and Pinion Mini Rotary Actuator Order Information



Bore	
0	1/2"
1	3/4"

Rack/Rotary Type	
2	Double Rack Low Friction Seals
5	Double Rack Standard Seals

Multiple Position	
0	N/A

Rotation	
A	45°
B	90°
C	180°
X	Special

Output Shaft	
A	Single End Keyway Standard
B	Double End Keyway
X	Special

Mounting	
1	Standard
2	Front Flange
3	Rear Flange
5	Angle Bracket
X	Special

Cushions	
A	N/A

Flow Controls	
A	N/A

Port & Location	
A	Port Position 1*
B	Port Position 2
C	Port Position 3
D	Port Position 4
F	Port Position 5

\*Standard Port Location  
NOTE: Port Position 5 is not available with Rotation Adjustment

Switches	
0	N/A

Options	
0	No Option
E	Electroless Nickel
V	Viton® Seals
X	Special (Specify)

Rotation Adjustments	
1	No Adjustment
2	End Cap A
3	End Cap B
4	End Caps A & B
5	End Caps B & D
X	Special

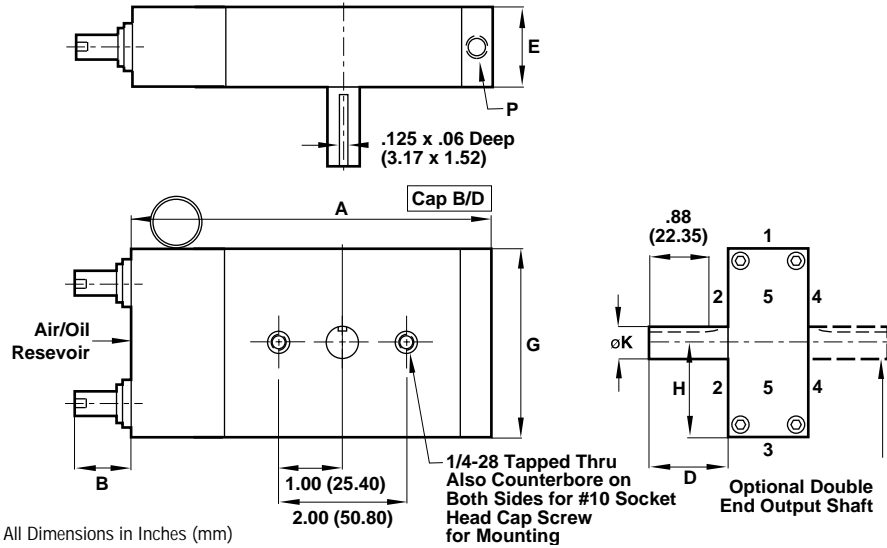
Bumper	
A	No Bumpers
B	End Cap A
C	End Cap B
D	All Caps

See ACT-12-9 for complete instructions on how to order Mini Rotary Actuators.

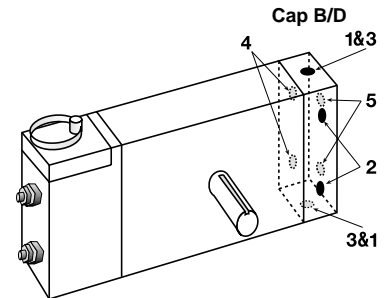
- Integral Air/Oil Tandem Double Rack and Pinion Mini Rotary Actuators have the same theoretical torque of Single Rack Rotaries.
- Theoretical torque from 2.0 to 24.8 inch-pounds (.23 to 2.80 Newton-meters).
- Rotation angles 45°, 90°, and 180° standard.
- Nitrile Noise Dampening Bumpers optional.
- Viton® Seals optional for higher temperatures.
- Body Mount or optional Angle Bracket, Front and Rear Flange Mountings.



## Basic Dimensions Double Rack and Pinion Mini Rotary Actuator with Integral Air-Oil Tandem



Standard Port Positions  
Integral Air/Oil Tandem  
Double Rack



NOTE: Port Position #1  
Includes Port Position #3

All Dimensions in Inches (mm)

Bore	A	B	D	E	G	H	øK	P
3/4" Double Rack with Air/Oil Tandem	5.75 (121)	.3125 (8)	1.25 (32)	1.25 (32)	3.00 (76)	1.50 (38)	.500 (12.70)	1/8 NPT

## Integral Air/Oil Tandem Double Rack and Pinion Mini Rotary Actuator Order Information

1 7 0 ■ ■ — ■ ■ A — A ■ ■ 0 ■

1 2 3 4 5 6 7 8 9 10 11 12 13

**Bore**

1	3/4"
---	------

**Rack/Rotary Type**

7	Double Rack Integral A/O Tandem Standard Seals
---	--

**Multiple Position**

0	N/A
---	-----

**Rotation**

A	45°
B	90°
C	180°
X	Special

**Output Shaft**

A	Single End Keyway Standard
B	Double End Keyway
X	Special

**Mounting**

1	Standard
2	Front Flange
3	Rear Flange
5	Angle Bracket
X	Special

**Cushions**

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

**Flow Controls**

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

NOTE: Flow Controls are standard on end caps A & C.

**Port & Location**

A	Port Position 1 and 3*
B	Port Position 2
D	Port Position 4
F	Port Position 5

\*Standard Port Locations are Positions 1 and 3.

**Bumper**

A	No Bumpers
B	End Cap A
C	End Cap B
D	All Caps

**Options**

0	No Option
E	Electroless Nickel
V	Viton® Seals
X	Special (Specify)

**Switches**

0	N/A
---	-----

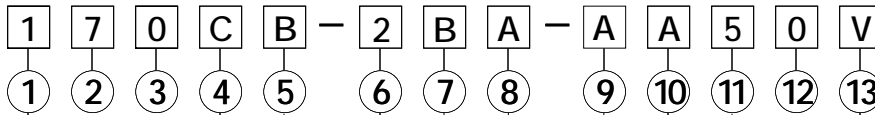
**Rotation Adjustments**

1	No Adjustment
2	N/A
3	End Cap B
4	N/A
5	End Caps B & D
X	Special

See ACT-12-9 for complete instructions on how to order Mini Rotary Actuators.



Mini Rotary Actuator Order Information



Bore	
0	1/2"
1	3/4"

Rack/Rotary Type	
0	Single Rack Standard Seals
1	Single Rack Low Friction Seals
2	Double Rack Low Friction Seals
5	Double Rack Standard Seals
7	Double Rack Integral A/O Tandem Standard Seals (ø 3/4" Bore only in mini rotary)

Multiple Position Actuator	
0	2 Position
X	Special

Rotation	
A	45°
B	90°
C	180°
X	Special

Output Shaft	
A	Single End Keyway Standard
B	Double End Keyway
X	Special

Mounting	
1	Standard
2	Front Flange
3	Rear Flange
5	Angle Bracket
X	Special

Cushions	
A	N/A

Flow Controls	
A	N/A

Port & Location	
A	Port Position 1*
B	Port Position 2
C	Port Position 3
D	Port Position 4
F	Port Position 5

\*Standard Port Location

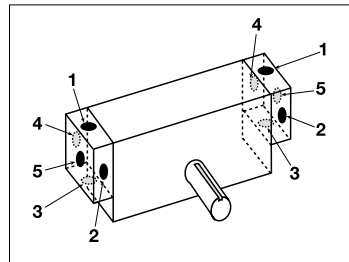
Switches	
0	N/A

Options	
0	No Option
E	Electroless Nickel
V	Viton® Seals
X	Special (Specify)

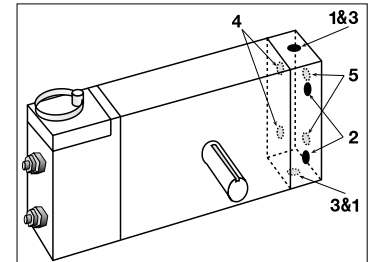
Rotation Adjustments	
1	No Adjustment
2	End Cap A
3	End Cap B
4	End Caps A & B
5	End Caps B & D
X	Special

Bumper	
A	No Bumpers
B	End Cap A
C	End Cap B
D	All Caps

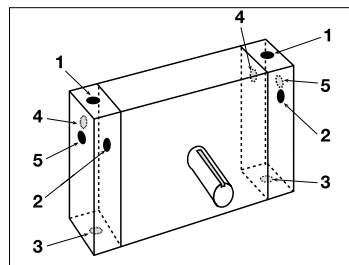
Port Positions Single Rack



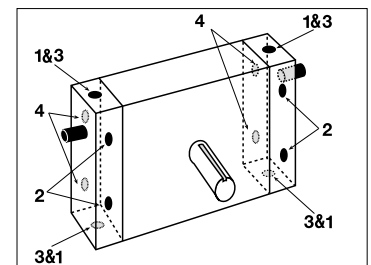
Port Positions Integral Double Rack



Port Positions Double Rack without Rotation Adjustment

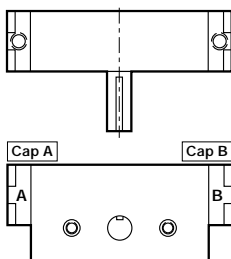


Port Positions Double Rack with Rotation Adjustment

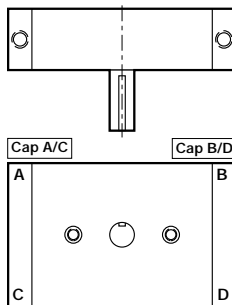


**EXAMPLE:** Mini Rotary Actuator 3/4" Bore – Double Rack Integral Air/Oil Tandem Mini Rotary Actuator – 2 Position – 180° Rotation – Double End Keyway Output Shaft – Front Flange Mounting – Port Position 2 – No Bumpers – Rotation Adjustment End Caps B & D – Viton® Seals.

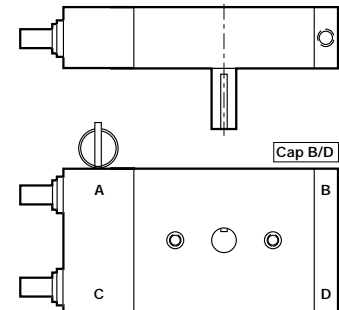
Single Rack



Double Rack



Integral Air/Oil Tandem Double Rack





## Rotary Actuators are constructed with the finest materials for each component!

**1 Floating Pistons:** Solid aluminum alloy, lightweight for low inertia, yet strong. Provide excellent wear characteristics against the hard coated tube I.D.

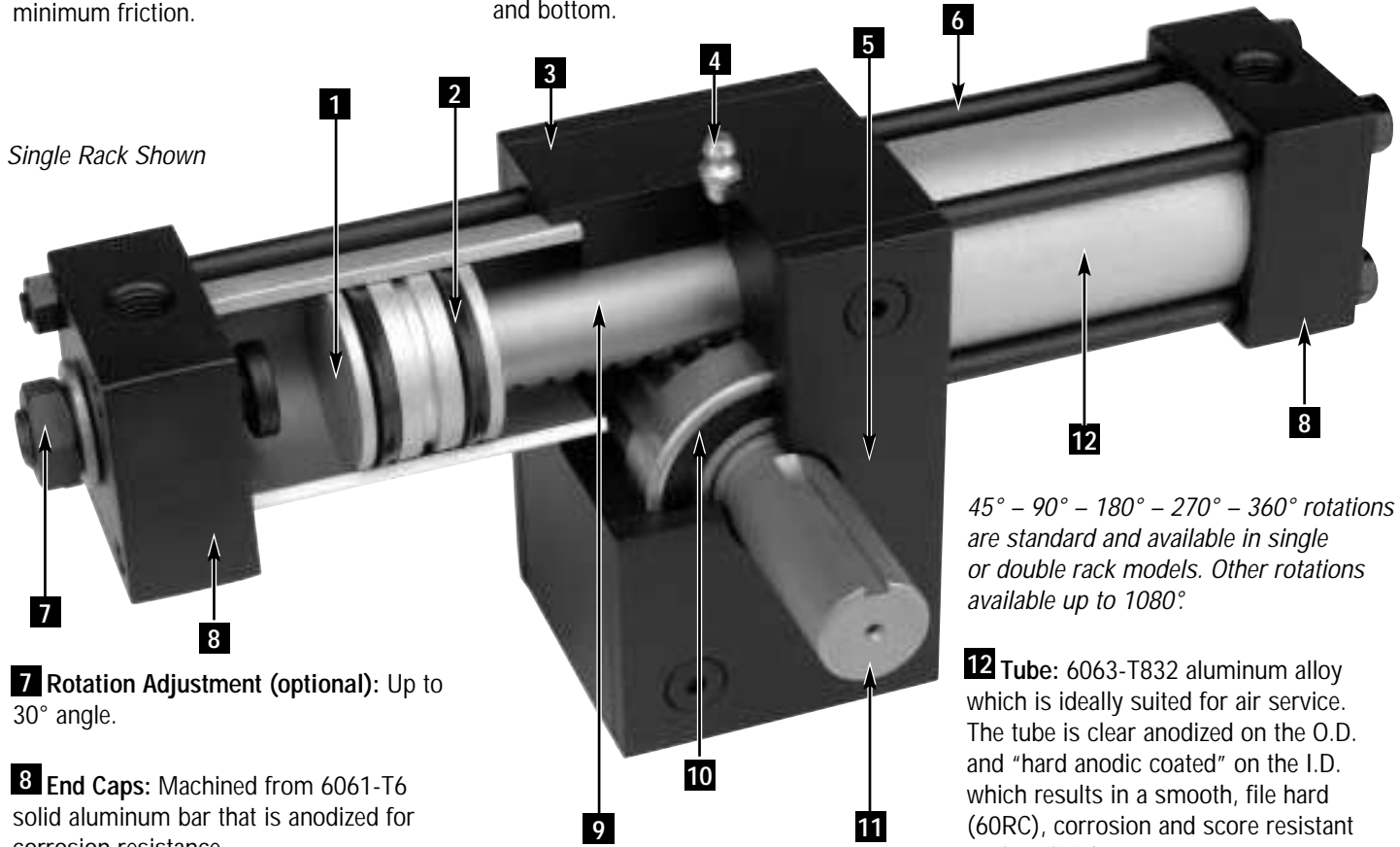
**2 Seals:** Lip type, pressure sensitive nitrile seals are wear compensating for long service life and minimum friction.

**3 Actuator Body:** Precision machined from 6061-T6, 40,000 PSI minimum yield aluminum alloy for strength. The entire body is then hard-anodized for maximum wear and corrosion resistance.

**4 Grease Fitting:** Easy access for additional lubrication. Single rack located on top; double located on top and bottom.

**5 Retainers:** Aluminum plates are located on the front and rear of the actuator body to ensure positive retention of the pinion/shaft/bearing assembly.

**6 Tie Rods:** Stress-proof steel to maintain compression on the tube end seals.



Single Rack Shown

**7 Rotation Adjustment (optional):** Up to 30° angle.

**8 End Caps:** Machined from 6061-T6 solid aluminum bar that is anodized for corrosion resistance.

**9 Rack:** Ground and polished stress-proof steel.

**10 Shaft Bearings:** Sealed, single row ball bearings provide exceptional shaft stability with a low coefficient of friction.

**11 Pinion and Output Shaft:** Manufactured from high strength steel for maximum strength and endurance. A keyed output shaft is standard with other shaft options available.

45° – 90° – 180° – 270° – 360° rotations are standard and available in single or double rack models. Other rotations available up to 1080°.

**12 Tube:** 6063-T832 aluminum alloy which is ideally suited for air service. The tube is clear anodized on the O.D. and “hard anodic coated” on the I.D. which results in a smooth, file hard (60RC), corrosion and score resistant surface finish.

**Options not shown:** Low Friction Seals, Cartridge Speed Controls, High Temperature Viton® Seals, Adjustable Cushions, Bumpers, Magnetic Piston for Position Sensing, Multi-Position Rotation Capabilities.

### Seal Kits

Bore	Standard Part No.	Low Friction Part No.	Viton® Part No.	Air/Oil Tandem Part No.
1 1/8" Single Rack	200SK	200TK	200VK	We recommend that Air/Oil Tandems are returned to the factory for repair.
1 1/8" Double Rack	250SK	250TK	250VK	
1 1/2" Single Rack	300SK	300TK	300VK	
1 1/2" Double Rack	350SK	350TK	350VK	
2" Single Rack	400SK	400TK	400VK	
2" Double Rack	450SK	450TK	450VK	
2 1/2" Single Rack	500SK	500TK	500VK	
2 1/2" Double Rack	550SK	550TK	550VK	

### Rotational Velocity

Maximum rotational velocity of a rotary actuator is difficult to determine due to varying factors such as pressure, medium, flow and external loading. Excessive speeds in a given application can create inertia loads whose shock values could prove detrimental to the actuator. Use of external stops, cushions, or other deceleration devices will ensure maximum performance and actuator life.



## Operating Specifications

### Operating Temperature:

- 20° to 200°F (-29°C to 93°C) with Standard Nitrile Seals
- 20° to 400°F (-29°C to 204°C) with Viton® Seals
- 20° to 250°F (-29°C to 121°C) with Low Friction Seals

### Operating Pressure:

- 150 PSI (10 Bar)
- 400 PSI (27.6 Bar) Hydraulic (non-shock)

### Supply:

- Filtered compressed air to 150 PSI
- Petroleum based hydraulic fluid to 400 PSI

### Angle of Rotation:

- 45°, 90°, 180°, 270°, 360° Standard
- Any rotation up to 1080° can be supplied

### Rotational Tolerance:

- 0° + 10°

### Backlash Between Rack & Pinion:

- 1 1/8" Bore 2 position units 1° of arc maximum
- 1 1/2" – 2 1/2" Bore 2 position units 30 minutes of arc maximum

### Lubrication:

None required  
 Norgren Rotary Actuators are rated for "no lube added" service. All internal components are lubricated at the time of assembly with a Teflon® based grease. Should additional lubrication become necessary between the radial surface of the rack gear and the rack/pinion mesh area due to severe operating conditions, a grease fitting is provided.

### Materials:

- End Caps: Black anodized 6061-T6 aluminum
- Body: 6061-T6 aluminum alloy, entirely hard coat anodized
- Gear Rack: Ground and polished stress-proof steel
- Pinion Gear and Output Shaft: Manufactured from high-strength steel.
- Shaft Bearings: Sealed, single row ball bearings
- Standard Seals: Nitrile
- Tube: 6063-T832 aluminum alloy
- Tie Rods: Stress-proof steel
- Floating Pistons: Solid aluminum alloy

## Displacement • Load Bearing Capacity • Unit Weights

Displacement in cubic inches (mm<sup>3</sup>); Load Bearing Capacity in pounds force (kilograms);  
 Bearing Distance in inches (mm); Unit Weights in pounds (kilograms)

Bore Size	Displacement for Each Degree of Rotation		Axial Load Bearing Capacity		Radial Load Bearing Capacity		Distance Between Bearings		Unit Weight 90°		Unit Weight 180°		Unit Weight 360°		Add for Double Output Shaft	
	Inch <sup>3</sup>	(mm <sup>3</sup> )	lbs	(Kg)	lbs	(Kg)	Inch	(mm)	lbs	(Kg)	lbs	(Kg)	lbs	(Kg)	lbs	(Kg)
1 1/8" Single Rack	.0108	(177)	100	(45)	200	(91)	1.38	(35)	3.5	(1.59)	3.75	(1.70)	4.25	(1.93)	.063	(.03)
1 1/8" Double Rack	.0216	(354)	100	(45)	200	(91)	1.38	(35)	6	(2.72)	7	(3.18)	8.5	(3.86)	.063	(.03)
1 1/2" Single Rack	.0270	(443)	225	(102)	450	(204)	1.56	(40)	6.75	(3.06)	7.5	(3.41)	9	(4.09)	.344	(.16)
1 1/2" Double Rack	.0540	(885)	225	(102)	450	(204)	1.56	(40)	10.5	(4.77)	12.75	(5.79)	17.25	(7.83)	.344	(.16)
2" Single Rack	.0760	(1254)	500	(227)	1000	(454)	2.28	(58)	18	(8.17)	19.5	(8.85)	21	(9.53)	.656	(.30)
2" Double Rack	.1520	(2491)	500	(227)	1000	(454)	2.28	(58)	22	(9.98)	24	(10.90)	27	(12.26)	.656	(.30)
2 1/2" Single Rack	.1200	(1966)	500	(227)	1000	(454)	2.28	(58)	18.5	(8.40)	20	(9.08)	22	(9.99)	.656	(.30)
2 1/2" Double Rack	.2400	(3933)	500	(227)	1000	(454)	2.28	(58)	22.5	(10.22)	24.5	(11.12)	27.5	(12.49)	.656	(.30)

## Torque Output

Theoretical Torque Output in Inch-pounds per PSI (Newton-meters per Bar)

Bore Size	PSI (Bar)														Inch-pounds per PSI	(Newton-meters per Bar)
	40 (2.8)	60 (4.1)	80 (5.5)	90 (6.2)	100 (6.9)	125 (8.6)	150 (10.3)	200 (13.8)	250 (17.2)	400 (27.6)						
1 1/8" Single Rack	25 (2.8)	37 (4.2)	50 (5.6)	56 (6.3)	62 (7.0)	78 (8.8)	93 (17.5)	124 (10.5)	156 (17.6)	249 (28.1)	311 (35.1)	498 (56.2)	.6	(.59)		
1 1/8" Double Rack	50 (5.6)	75 (8.4)	100 (11.3)	112 (12.7)	124 (14.1)	155 (17.6)	187 (21.1)	249 (28.1)	311 (35.1)	498 (56.2)	620 (70.0)	774 (87.5)	1.2	(1.97)		
1 1/2" Single Rack	62 (7.0)	93 (10.4)	124 (14.0)	139 (15.7)	155 (17.5)	194 (21.9)	232 (26.2)	310 (35.0)	387 (43.7)	620 (70.0)	774 (87.5)	1239 (140.0)	1.6	(2.62)		
1 1/2" Double Rack	124 (14.0)	186 (21.0)	248 (28.0)	279 (31.5)	310 (35.0)	387 (43.8)	465 (52.5)	620 (70.0)	774 (87.5)	1239 (140.0)	1758 (198.6)	2198 (248.3)	3.2	(5.24)		
2" Single Rack	175 (19.9)	264 (29.8)	352 (39.7)	396 (44.7)	440 (49.7)	550 (62.1)	660 (74.4)	879 (99.3)	1099 (124.1)	1758 (198.6)	2198 (248.3)	3517 (397.2)	4.4	(7.21)		
2" Double Rack	352 (39.7)	528 (59.6)	703 (79.5)	791 (89.4)	879 (99.3)	1099 (124.1)	1319 (149.0)	1758 (198.6)	2198 (248.3)	3517 (397.2)	4980 (561.6)	6200 (700.0)	8.8	(14.41)		
2 1/2" Single Rack	275 (31.0)	412 (46.6)	550 (62.1)	619 (69.9)	687 (77.7)	860 (97.1)	1031 (116.5)	1375 (155.3)	1719 (194.1)	2750 (310.6)	3437 (388.2)	5500 (621.2)	6.9	(11.30)		
2 1/2" Double Rack	550 (62.1)	825 (93.2)	1100 (124.2)	1237 (139.8)	1375 (155.3)	1719 (194.1)	2062 (232.9)	2750 (310.6)	3437 (388.2)	5500 (621.2)	7290 (820.8)	9240 (1048.8)	13.8	(22.60)		

NOTE: Air/Oil Tandem and Multiple Position Rotary Actuators utilize a double rack configuration; however, the torque output of a SINGLE RACK unit apply. Deduct 10% from torque output for frictional loss. Deduct 20% for frictional loss on all Air/Oil Tandem Rotary Actuators.





# Rack & Pinion Rotary Actuators

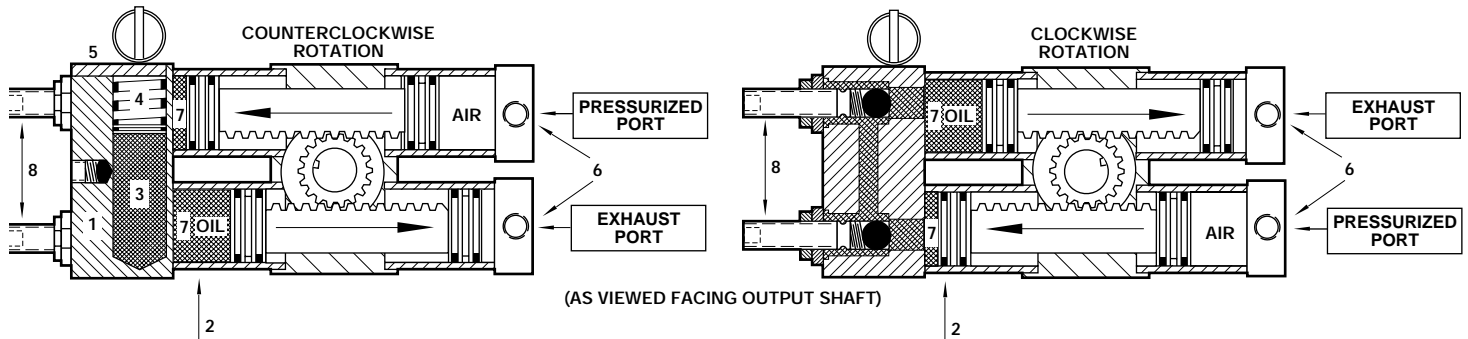
## Optional Features:

- Integral Air/Oil Tandem
- Rotation Adjustment
- Viton® Seals for High Temperature
- Cartridge Speed Control
- Low Friction Seals
- Electroless Nickel Plating
- Front, Rear & Bottom Mount Flanges
- Noise Dampening Bumpers
- Double End Output Shaft
- Switches
- Adjustable Cushion

## Integral Air/Oil Tandem

Norgren Rotary Actuators can be supplied with a unique, fully self-contained, air-oil tandem system. This option provides extremely smooth, fully adjustable speed control of the output shaft. . . the simplicity of compressed air with the smooth control of hydraulics!

## Integral Air/Oil Tandem Operating Principle



The **1** closed loop oil system manifold, including oil reservoir is attached with tie rods to the **2** actuator unit. This **3** oil reservoir allows for the oil fluctuations caused by variations in temperature. A **4** spring loaded plunger exerts a constant pressure on the

system oil, which keeps the system purged of air. The **5** ring attached to the plunger shaft will *pop up* when the system oil needs replenishment. When air pressure is applied to **6** either port, the gear racks move in opposing directions. **7** System oil is

displaced from one rack bore to the other by way of the integral **8** cartridge speed controls which meter the oil as it passes through the manifold to provide smooth and precise adjustment of the output shaft velocity.

## Maximum Speed in degrees per second: No Load Condition

Bore Size	Operating Pressure in PSI (bar)					
	40 (2.8)	50 (3.4)	60 (4.1)	70 (4.8)	80 (5.5)	90 (6.2)
1 1/8"	254°	284°	309°	353°	384°	415°
1 1/2"	242°	271°	302°	340°	365°	382°
2"	197°	222°	251°	282°	303°	315°
2 1/2"	152°	173°	199°	233°	240°	248°

NOTE: Theoretical Reservoir Pressure 20 PSI. Oil Temperature 95°F.

## Low Friction Seals

Single and Double Rack Rotary Actuators can be ordered with Low Friction Seals. Nitrile seals, specially compounded with Teflon®, offer extremely smooth low friction operation. TO ORDER: enter option code **1** or **2** in **Rack/Rotary Type** position **2**.

## Electroless Nickel Plating

All external components of the actuator are electroless nickel plated or manufactured from 303 stainless steel with the exception of the output shaft for corrosive environments. Consult factory for stainless steel output shaft if required. TO ORDER electroless nickel: enter option code **E** in **Rack/Rotary Type** position **13**.

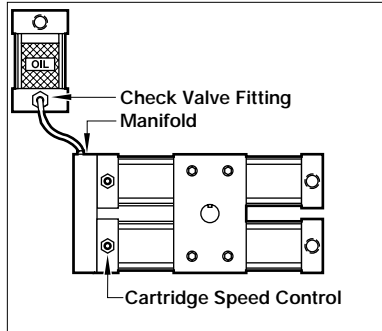
## High Temperature Viton® Seals

Viton® Seals are ideal for higher temperature applications -20°F to 400°F (-29°C to 204°C). TO ORDER Viton® seals: enter option code **V** in **Rack/Rotary Type** position **13**.



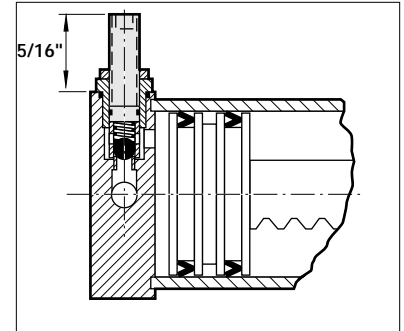
## Standard Air/Oil Tandem

Rotary unit is supplied with an Air/Oil Tank that requires a 20 PSI pressure header. TO ORDER: enter option code **6** in **Rack/Rotary Type** position **2**.



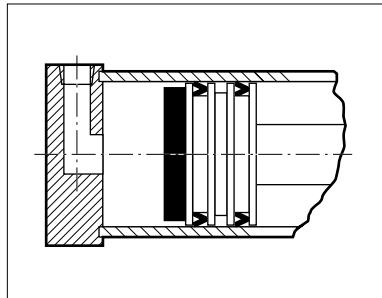
## Cartridge Speed Control

$\varnothing 1\frac{1}{2}$ " thru  $\varnothing 2\frac{1}{2}$ " Bores only.  
NOTE: Cartridge Speed Control & Cushion are *not* available on same end cap.



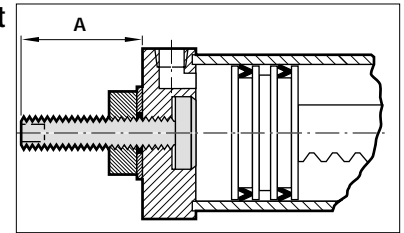
## Noise Dampening Bumper

Urethane bumpers attached to the actuator piston provides quiet operation by preventing metal to metal contact. NOTE: Each bumper adds  $\frac{1}{4}$ " to **A** dimension.



## Rotation Adjustment

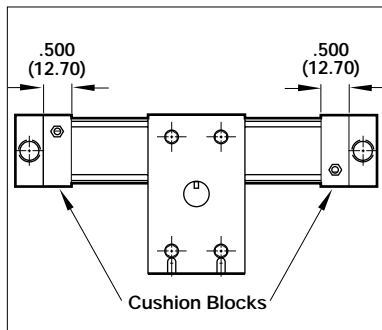
Located in the actuator end cap, each rotation adjustment provides up to 30° of angle reduction. NOTE: Cushion & Rotation Adjustment are *not* available on the same end cap.



Bore	1 $\frac{1}{8}$ "	1 $\frac{1}{2}$ "	2"	2 $\frac{1}{2}$ "
A	.687 (17.46)	.938 (23.81)	1.187 (30.16)	1.187 (30.16)

## Cushioning

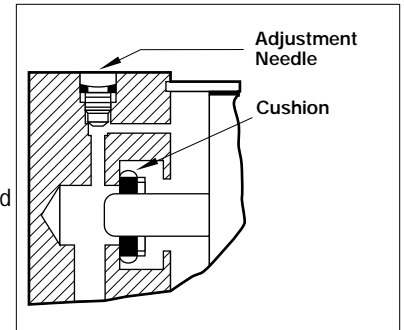
**The Cushioning Principle**  
Cushions permit the trapping of cylinder exhaust volume prior to the completion of full rotation. This volume is then metered through a finely tapered needle to deliver smooth, adjustable deceleration of the rotary actuator. NOTE: On 1 $\frac{1}{8}$ " bores, add  $\frac{1}{2}$ " to overall dimension for each cushion block.



Cushion Design 1 $\frac{1}{8}$ " Bore

## Adjustable Cushioning

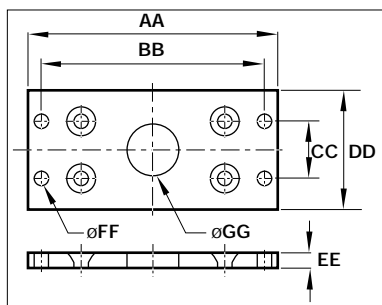
Flush, self locking adjustment needle allows fine cushion metering. Cushion design features a unique, one piece, nitrile compound seal captured within a groove machined to exacting tolerances. This allows linear and radial *float* of the cushion seal, virtually eliminating problems associated with misalignment. The design also provides exceptionally fast *out of cushion* rotation reversal.



Cushion Design 1 $\frac{1}{2}$ " or 2 $\frac{1}{2}$ " Bore

## Front and Rear Mounting Flanges

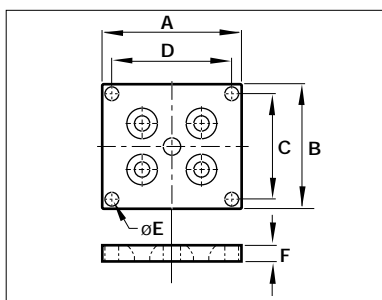
TO ORDER: enter option code **2** or **3** in **Rack/Rotary Type** position **6**.



Bore	1 $\frac{1}{8}$ "	1 $\frac{1}{2}$ "	2"	2 $\frac{1}{2}$ "
Series	200 - 250	300 - 350	400 - 450	500 - 550
Part	R-80-225K	R-80-03K	R-80-04K	R-80-04K
AA	4.812 (122)	5.875 (149)	8.625 (219)	8.625 (219)
BB	4.062 (103)	5.125 (130)	7.625 (194)	7.625 (194)
CC	1.500 (38)	1.500 (38)	2.000 (51)	2.000 (51)
DD	2.250 (57)	2.750 (70)	4.000 (102)	4.000 (102)
EE	.250 (6)	.375 (10)	.437 (11)	.437 (11)
$\varnothing$ FF	.343 (9)	.343 (9)	.531 (13)	.531 (13)
$\varnothing$ GG	.562 (14)	.937 (24)	1.312 (33)	1.312 (33)

## Bottom Mounting Flanges

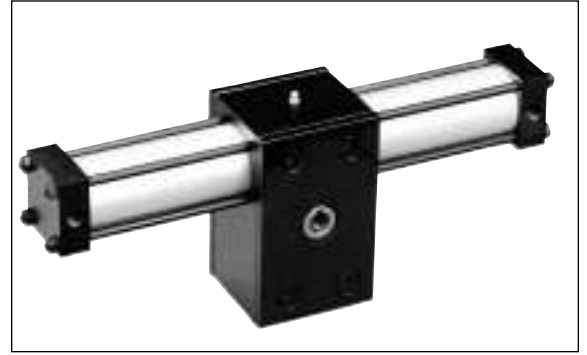
TO ORDER: enter option code **4** in **Rack/Rotary Type** position **6**.



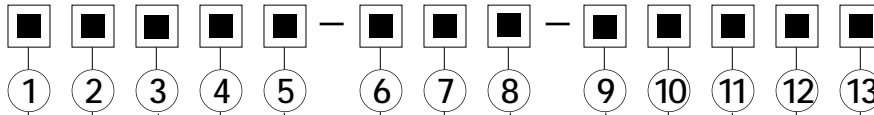
Bore	1 $\frac{1}{8}$ "	1 $\frac{1}{2}$ "	2"	2 $\frac{1}{2}$ "
Series	200 - 250	300 - 350	400 - 450	500 - 550
Part	R-942-225K	R-942-03K	R-942-04K	R-942-04K
A	4.250 (108)	5.000 (127)	5.000 (127)	5.000 (127)
B	2.250 (57)	3.000 (76)	4.000 (102)	4.000 (102)
C	1.625 (41)	2.375 (60)	3.375 (86)	3.375 (86)
D	3.625 (92)	4.375 (111)	4.375 (111)	4.375 (111)
$\varnothing$ E	.281 (7)	.406 (10)	.406 (10)	.406 (10)
F	.375 (10)	.437 (11)	.437 (11)	.437 (11)

## Single Rack & Pinion Rotary Actuator (ø1<sup>1</sup>/<sub>8</sub>" to 2<sup>1</sup>/<sub>2</sub>" Bores)

- Single Rack and Pinion Rotary Actuators are designed for non-lube added service.
- Theoretical torque from 25 to 2750 inch-pounds (2.82 to 310.63 Newton-meters).
- Rotation angles 45°, 90°, 180°, 270° and 360° standard.
- Urethane Noise Dampening Bumpers optional.
- Viton® Seals optional for higher temperatures.
- Body Mount or optional Bottom, Front and Rear Flange Mountings.



### Single Rack and Pinion Rotary Actuator Order Information



Bore	
2	1 <sup>1</sup> / <sub>8</sub> "
3	1 <sup>1</sup> / <sub>2</sub> "
4	2"
5	2 <sup>1</sup> / <sub>2</sub> "

Rack/Rotary Type	
0	Single Rack Standard Seals
1	Single Rack Low Friction Seals
X	Special

Multiple Position Actuator	
0	N/A

Rotation	
A	45°
B	90°
C	180°
D	270°
E	360°
X	Special

Output Shaft	
A	Single End Keyway Standard
B	Double End Keyway
C	Hollow Internal Keyway
D	Cross Keyway
E	Preloaded Keyway
X	Special

Mounting	
1	Standard
2	Front Flange
3	Rear Flange
4	Bottom Flange
X	Special

Port Size & Location					
Position	1	2	3	4	5
Standard	A	B*	C	D	F
Oversized	E	G	H	J	K
Special	X				

\*Standard Port Size and Location.

Options	
0	No Option
E	Electroless Nickel
P	Loaded Piston Seals
V	Viton® Seals
X	Special (Specify)

Magnetic Option	
0	No Magnet
M	Standard Magnetic Piston in Position A & B

NOTE: See ACT-12-21 for information on switches.

Rotation Adjustments	
1	No Adjustment
2	End Cap A
3	End Cap B
4	End Caps A & B
X	Special

NOTE: Standard rotation adjustments provide 30° of angle reduction.

Bumper	
A	No Bumpers
B	End Cap A
C	End Cap B
D	All Caps
X	Special

Flow Controls				
Needle Position	1	2	3	4
No Flow Controls	A			
End Cap A	B	C	D	E
End Cap B	G	H	J	K
End Caps A & B	M	N	P	R
Special	X			

NOTE: Flow Controls must be 90° to Port Location. Flow controls are Standard on all Air/ Oil Tandems. Standard Air/ Oil Tandem Flow Controls are in end caps A & C in position #2. Integral Air/ Oil Tandem Flow Controls are in position #5.

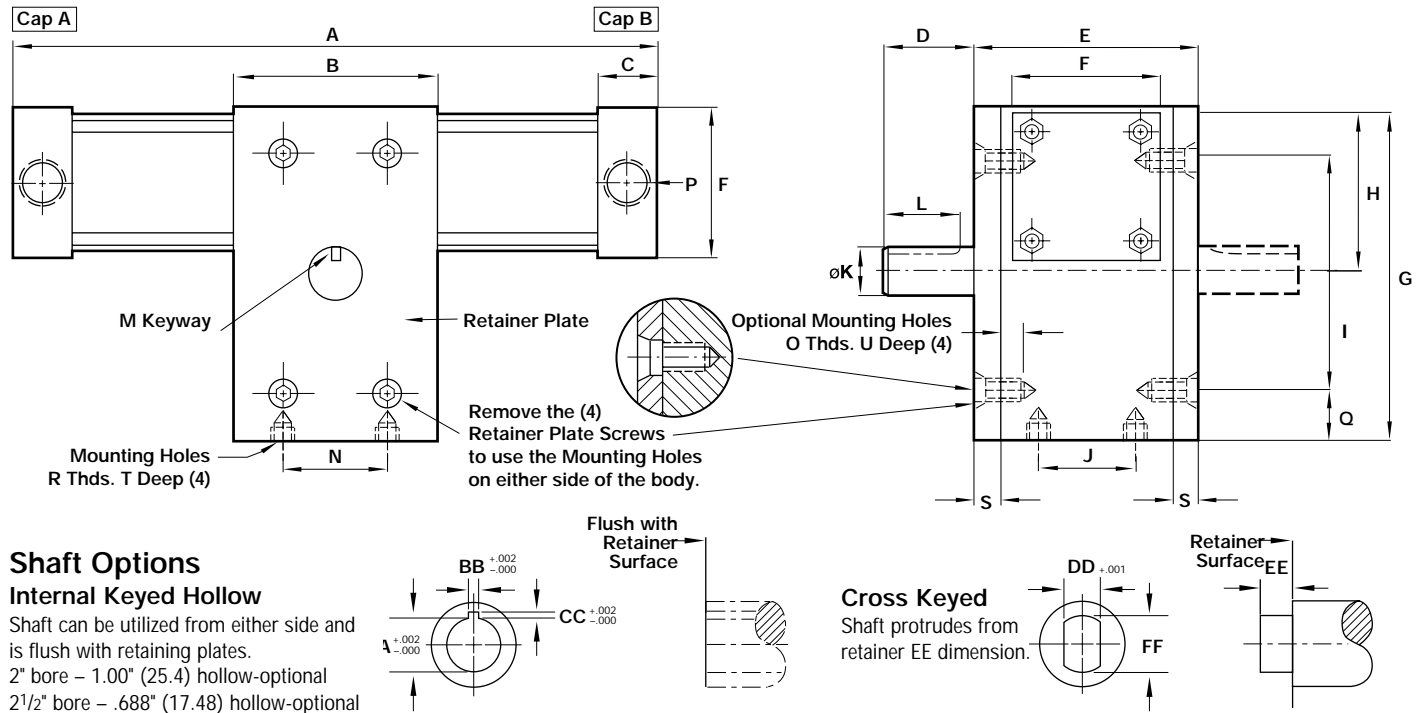
Cushions				
Needle Position	1	2	3	4
No Cushions	A			
End Cap A	B	C	D	E
End Cap B	G	H	J	K
End Caps A & B	N	M	P	R
Special	X			

NOTE: Cushions & Rotation Adjustment cannot be located in same end cap.

See ACT-12-20 for complete instructions on how to order Mini Rotary Actuators.



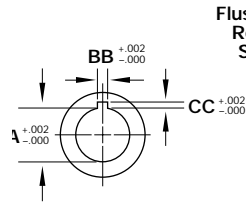
## Basic Dimensions Single Rack and Pinion Rotary Actuator



### Shaft Options

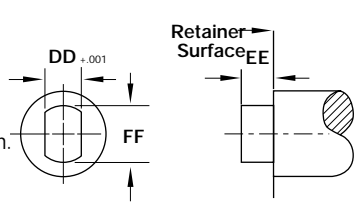
#### Internal Keyed Hollow

Shaft can be utilized from either side and is flush with retaining plates.  
 2" bore - 1.00" (25.4) hollow-optional  
 2 1/2" bore - .688" (17.48) hollow-optional



#### Cross Keyed

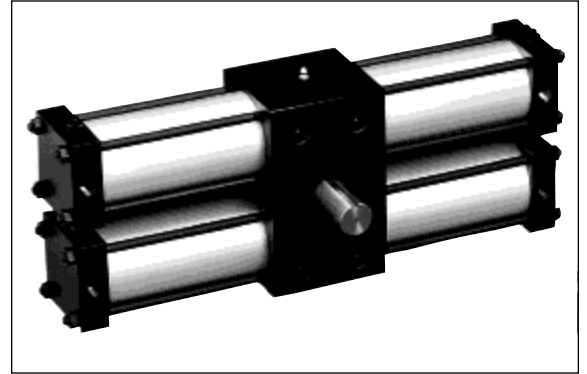
Shaft protrudes from retainer EE dimension.



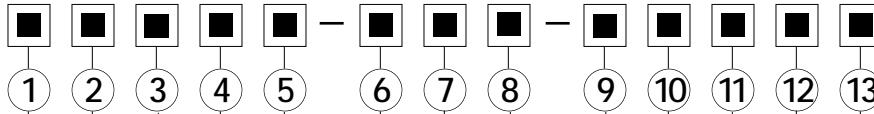
Dimension	Degree Rotation	1 1/8" Bore Single Rack		1 1/2" Bore Single Rack		2" Bore Single Rack		2 1/2" Bore Single Rack	
A	0°	4.500	(114)	6.500	(165)	7.750	(197)	8.000	(203)
	45°	5.590	(142)	8.025	(204)	10.195	(259)	10.445	(265)
	90°	6.571	(167)	9.397	(239)	12.395	(315)	12.645	(321)
	180°	8.533	(217)	12.142	(308)	16.796	(427)	17.046	(433)
	270°	10.495	(267)	14.887	(378)	21.197	(538)	21.447	(545)
	360°	12.457	(316)	17.632	(448)	25.598	(650)	25.848	(657)
	Add per °	.0218	(0.55)	.0305	(0.77)	.0489	(1.24)	.0489	(1.24)
AA		.312	(7.92)	.500	(12.70)	.688	(17.48)	1.000	(25.40)
B		2.250	(57)	2.750	(70)	4.000	(102)	4.000	(102)
BB		.093	(2.36)	.125	(3.18)	.187	(4.75)	.187	(4.75)
C		.625	(16)	1.000	(25)	1.000	(25)	1.000	(25)
CC		.047	(1.19)	.060	(1.52)	.093	(2.36)	.093	(2.36)
D		.875	(22)	1.750	(44)	2.031	(52)	2.031	(52)
DD		.234	(5.94)	.250	(6.35)	.500	(12.70)	.500	(12.70)
E		2.250	(57)	2.687	(68)	3.718	(94)	3.718	(94)
EE		.250	(6.35)	.250	(6.35)	.437	(11.10)	.437	(11.10)
F		1.500	(38)	2.000	(51)	2.500	(64)	3.000	(76)
FF		.500	(12.70)	.750	(19.15)	1.125	(28.58)	1.125	(28.58)
G		3.312	(84)	4.375	(111)	6.604	(168)	6.604	(168)
H		1.656	(42)	2.187	(56)	3.302	(84)	3.302	(84)
I		2.406	(61)	3.187	(81)	4.878	(124)	4.878	(124)
J		1.000	(25)	1.500	(38)	1.500	(38)	1.500	(38)
øK		.500	(12.70)	.875	(22.23)	1.125	(28.58)	1.125	(28.58)
L		.625	(16)	1.500	(38)	1.625	(67)	1.625	(67)
M		1/8 x 1/16		3/16 x 3/32		1/4 x 1/8		1/4 x 1/8	
N		1.500	(38)	1.500	(38)	2.000	(51)	2.000	(51)
O		1/4-20		1/4-20		7/16-14		7/16-14	
P		1/8 NPT		1/4 NPT		1/4 NPT		1/4 NPT	
Q		.453	(12)	.594	(15)	.863	(22)	.863	(22)
R		1/4-20		5/16-24		1/2-20		1/2-20	
S		.250	(6)	.250	(6)	.375	(10)	.375	(10)
T		.250	(6)	.313	(8)	.500	(13)	.500	(13)
U		.250	(6)	.438	(11)	.438	(11)	.438	(11)

## Double Rack & Pinion Rotary Actuator (ø1<sup>1</sup>/<sub>8</sub>" to 2<sup>1</sup>/<sub>2</sub>" Bores)

- Double Rack and Pinion Rotary Actuators are designed for non-lube added service.
- Theoretical torque from 50 to 5500 inch-pounds (5.65 to 621.25 Newton-meters).
- Rotation angles 45°, 90°, 180°, 270° and 360° standard.
- Urethane Noise Dampening Bumpers optional.
- Viton® Seals optional for higher temperatures.
- Body Mount or optional Bottom, Front and Rear Flange Mountings.



### Double Rack and Pinion Rotary Actuator Order Information



Bore	
2	1 <sup>1</sup> / <sub>8</sub> "
3	1 <sup>1</sup> / <sub>2</sub> "
4	2"
5	2 <sup>1</sup> / <sub>2</sub> "

Rack/Rotary Type	
2	Double Rack Low Friction Seals
5	Double Rack Standard Seals
6	Standard Air/Oil Tandem
7	Integral Air/Oil Tandem
X	Special

Multiple Position Actuator	
0	2 Position
3	3 Position
4	4 Position
5	5 Position
X	Special

Rotation	
A	45°
B	90°
C	180°
D	270°
E	360°
X	Special

Output Shaft	
A	Single End Keyway Standard
B	Double End Keyway
C	Hollow Internal Keyway
D	Cross Keyway
E	Preloaded Keyway
X	Special

Mounting	
1	Standard
2	Front Flange
3	Rear Flange
4	Bottom Flange
X	Special

Port Size & Location					
Position	1	2	3	4	5
Standard	A	B*	C	D	F
Oversized	E	G	H	J	K
Special	X				

\*Standard Port Size and Location.

Options	
0	No Option
E	Electroless Nickel
P	Loaded Piston Seals
V	Viton® Seals
X	Special (Specify)

Magnetic Option	
0	No Magnet
M	Standard Magnetic Piston in Position A & B Integral Air/Oil Tandems in Position B & D

NOTE: See page 21 for information on switches.

Rotation Adjustments	
1	No Adjustment
2	End Cap A
3	End Cap B
4	End Caps A & B
5	End Caps B & D
X	Special

NOTE: Standard rotation adjustments provide 30° of angle reduction.

Bumper	
A	No Bumpers
B	End Cap A
C	End Cap B
D	All Caps
X	Special

Flow Controls				
Needle Position	1	2	3	4
No Flow Controls	A			
End Cap A	B	C	D	E
End Cap B	G	H	J	K
End Caps A & B	M	N	P	R
Special	X			

NOTE: Flow Controls must be 90° to Port Location. Flow controls are Standard on all Air/ Oil Tandems. Standard Air/ Oil Tandem Flow Controls are in end caps A & C in position #2. Integral Air/ Oil Tandem Flow Controls are in position #5.

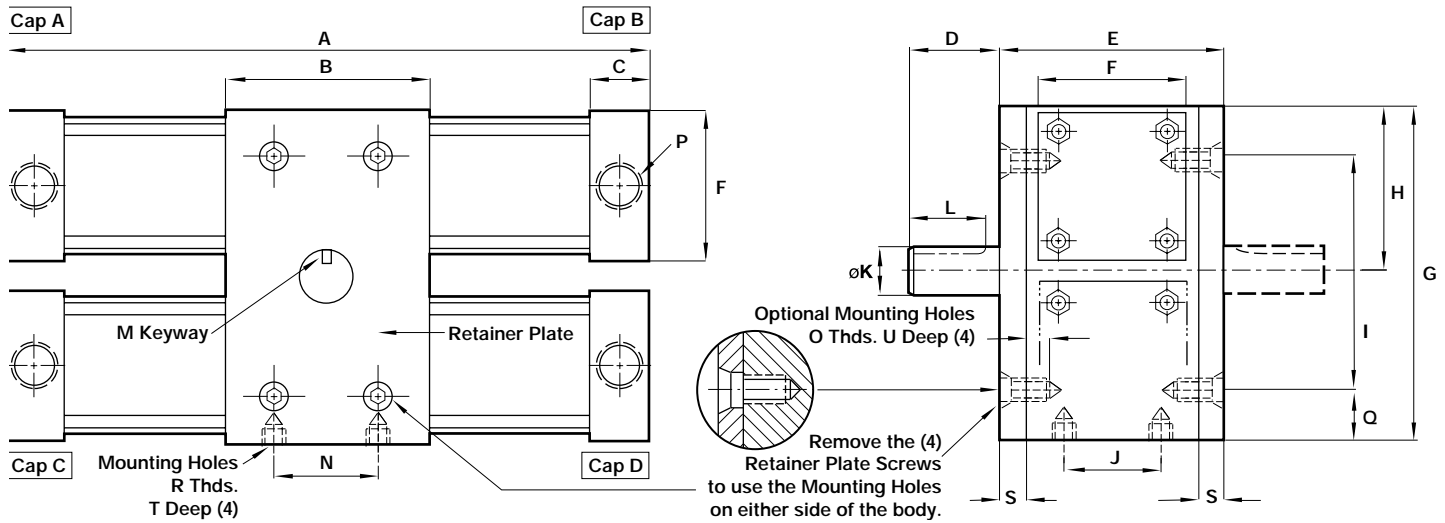
Cushions				
Needle Position	1	2	3	4
No Cushions	A			
End Cap A	B	C	D	E
End Cap B	G	H	J	K
End Caps A & B	N	M	P	R
Special	X			

NOTE: Cushions & Rotation Adjustment cannot be located in same end cap.

See ACT-12-20 for complete instructions on how to order Mini Rotary Actuators.



## Basic Dimensions Double Rack and Pinion Rotary Actuator



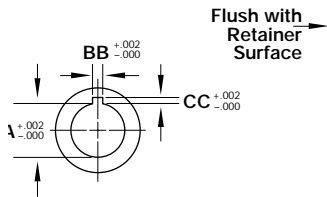
### Shaft Options

#### Internal Keyed Hollow

Shaft can be utilized from either side and is flush with retaining plates.

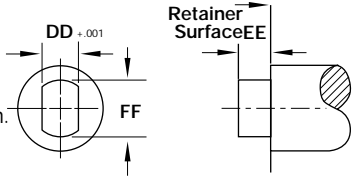
2" bore - 1.00" (25.4) hollow-optional

2 1/2" bore - .688" (17.48) hollow-optional



#### Cross Keyed

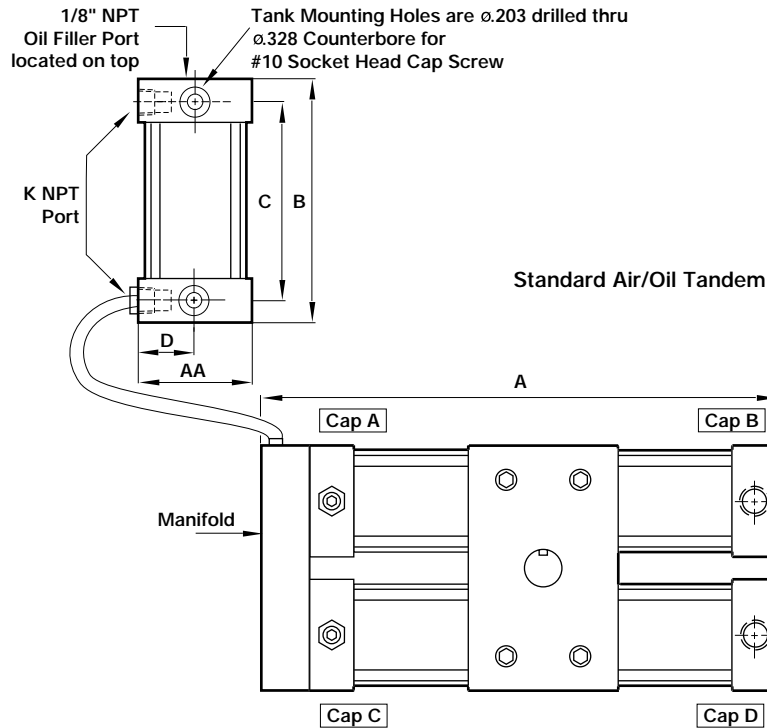
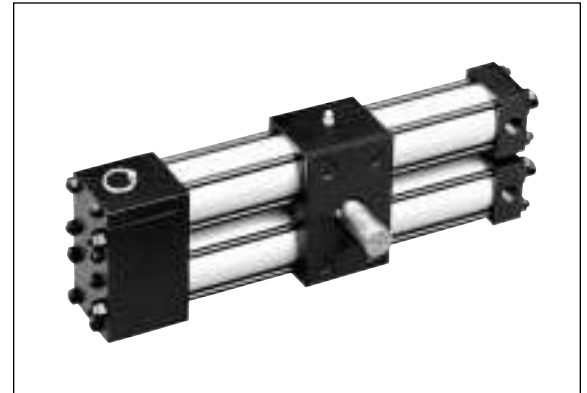
Shaft protrudes from retainer EE dimension.



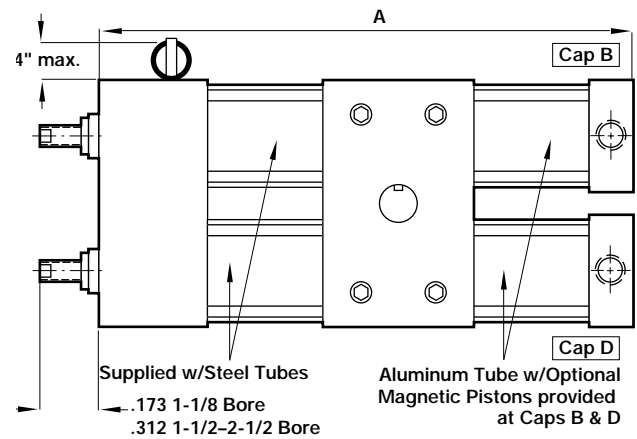
Dimension	Degree Rotation	1 1/8" Bore Double Rack		1 1/2" Bore Double Rack		2" Bore Double Rack		2 1/2" Bore Double Rack	
A	0°	4.500	(114)	6.500	(165)	7.750	(197)	8.000	(203)
	45°	5.590	(142)	8.025	(204)	10.195	(259)	10.445	(265)
	90°	6.571	(167)	9.397	(239)	12.395	(315)	12.645	(321)
	180°	8.533	(217)	12.142	(308)	16.796	(427)	17.046	(433)
	270°	10.495	(267)	14.887	(378)	21.197	(538)	21.447	(545)
	360°	12.457	(316)	17.632	(448)	25.598	(650)	25.848	(657)
	Add per °	.0218	(0.55)	.0305	(0.77)	.0489	(1.24)	.0489	(1.24)
AA		.312	(7.92)	.500	(12.70)	.688	(17.48)	1.000	(25.40)
B		2.250	(57)	2.750	(70)	4.000	(102)	4.000	(102)
BB		.093	(2.36)	.125	(3.18)	.187	(4.75)	.187	(4.75)
C		.625	(16)	1.000	(25)	1.000	(25)	1.000	(25)
CC		.047	(1.19)	.060	(1.52)	.093	(2.36)	.093	(2.36)
D		.875	(22)	1.750	(44)	2.031	(52)	2.031	(52)
DD		.234	(5.94)	.250	(6.35)	.500	(12.70)	.500	(12.70)
E		2.250	(57)	2.687	(68)	3.718	(94)	3.718	(94)
EE		.250	(6.35)	.250	(6.35)	.437	(11.10)	.437	(11.10)
F		1.500	(38)	2.000	(51)	2.500	(64)	3.000	(76)
FF		.500	(12.70)	.750	(19.15)	1.125	(28.58)	1.125	(28.58)
G		3.312	(84)	4.375	(111)	6.604	(168)	6.604	(168)
H		1.656	(42)	2.187	(56)	3.302	(84)	3.302	(84)
I		2.406	(61)	3.187	(81)	4.878	(124)	4.878	(124)
J		1.000	(25)	1.500	(38)	1.500	(38)	1.500	(38)
øK		.500	(12.70)	.875	(22.23)	1.125	(28.58)	1.125	(28.58)
L		.625	(16)	1.500	(38)	1.625	(67)	1.625	(67)
M		1/8 x 1/16		3/16 x 3/32		1/4 x 1/8		1/4 x 1/8	
N		1.500	(38)	1.500	(38)	2.000	(51)	2.000	(51)
O		1/4-20		1/4-20		7/16-14		7/16-14	
P		1/8 NPT		1/4 NPT		1/4 NPT		1/4 NPT	
Q		.453	(12)	.594	(15)	.863	(22)	.863	(22)
R		1/4-20		5/16-24		1/2-20		1/2-20	
S		.250	(6)	.250	(6)	.375	(10)	.375	(10)
T		.250	(6)	.313	(8)	.500	(13)	.500	(13)
U		.250	(6)	.438	(11)	.438	(11)	.438	(11)

Standard Air/Oil Tandem is supplied with an Air/Oil Tank.

- Air/Oil Tank should have 20 PSI pressure header.
- Integral Air/Oil Tank is fully self-contained.
- The simplicity of compressed air with the smooth control of hydraulics.
- Provides extremely smooth, fully adjustable speed control of the actuator output shaft.



Integral Air/Oil Tandem  
Refer to ACT-12-12 for Operating Principle.



## Length Dimensions for Air/Oil Tandems

Dimension	Degree Rotation	1 1/8" Standard	1 1/2" Standard	2" Standard	2 1/2" Standard
A	0°	5.125 (130)	7.500 (191)	8.750 (222)	9.000 (229)
	45°	6.215 (158)	9.025 (292)	11.195 (284)	11.445 (291)
	90°	7.196 (183)	10.397 (264)	13.395 (340)	13.645 (347)
	180°	9.158 (233)	13.142 (333)	17.796 (452)	18.046 (458)
	270°	11.121 (282)	15.887 (404)	22.197 (563)	22.447 (570)
	360°	13.082 (332)	18.632 (473)	26.598 (676)	26.848 (682)
Dimension	Degree Rotation	1 1/8" Integral	1 1/2" Integral	2" Integral	2 1/2" Integral
A	0°	6.125 (156)	8.000 (203)	9.500 (241)	10.000 (254)
	45°	7.215 (183)	9.525 (242)	11.945 (303)	12.445 (316)
	90°	8.196 (208)	10.897 (277)	14.145 (359)	14.645 (372)
	180°	10.158 (258)	13.642 (347)	18.546 (471)	19.046 (484)
	270°	12.120 (308)	16.387 (416)	22.947 (583)	23.447 (596)
	360°	14.082 (358)	19.132 (486)	27.348 (695)	27.848 (707)
	Add per °	.0218 (1)	.0305 (1)	.0489 (1)	.0489 (1)

## Dimensions for Air/Oil Tanks

Rotary Actuator Bore Size	Air/Oil Tank Model Number	Tank Bore Size	AA	B	C	D	K
1 1/8"	AOT-225X2	1 1/8"	1.500 (38)	3.125 (79)	2.750 (70)	.750 (19)	1/8" NPT
1 1/2"	AOT-225X3	1 1/8"	1.500 (38)	4.125 (105)	3.750 (95)	.750 (19)	1/8" NPT
2"	AOT-225X4	1 1/8"	1.500 (38)	5.125 (130)	4.750 (121)	.750 (19)	1/8" NPT
2 1/2"	AOT-225X5	1 1/8"	1.500 (38)	6.125 (156)	5.750 (146)	.750 (19)	1/8" NPT



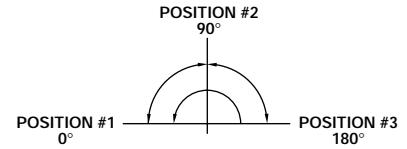
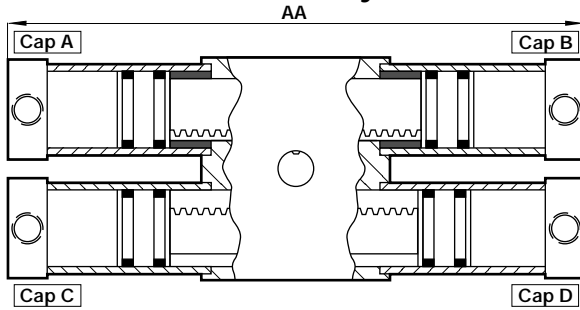
Multiple Position Rack and Pinion Rotary Actuators are capable of producing 3, 4, or 5 predetermined output shaft positions. Each intermediate stop position specified is mechanically locked and therefore not adjustable. Use of optional rotation

adjustments at the full clockwise and counterclockwise positions will provide up to 30° of angular reduction at each end.

The alternate pressurizing and exhausting

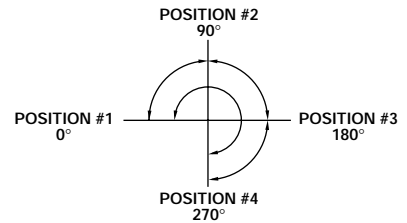
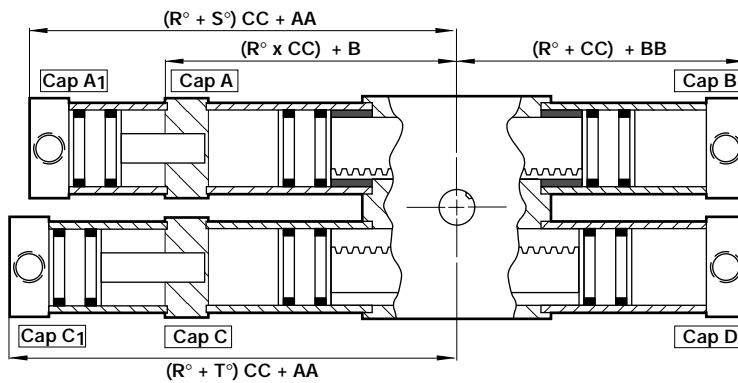
of various actuator ports will determine which output shaft position is obtained. This can be accomplished with the use of simple, directional control valving and allows output shaft positioning in virtually **ANY** desired sequence.

## 3 Position Rotary Actuator



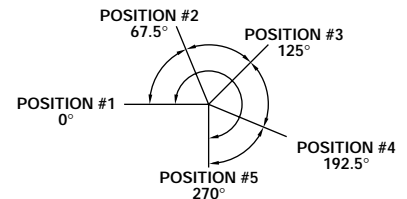
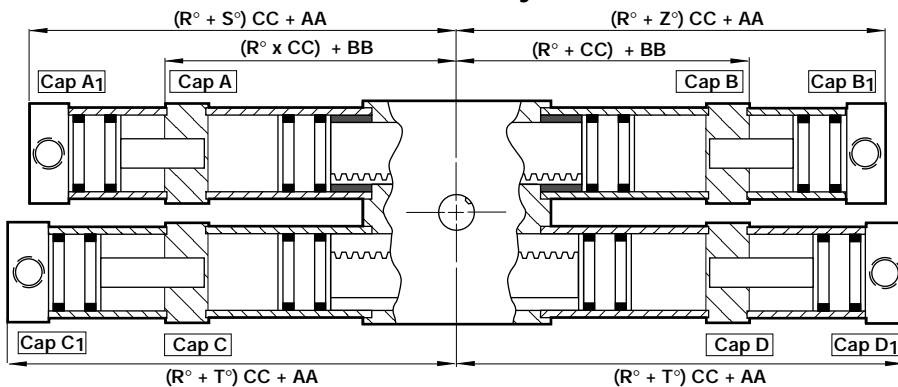
Output Shaft Position Number	Pressurize Port(s) in Cap(s)	Exhaust
1	C	All other ports
2	A & B	All other ports
3	D	All other ports

## 4 Position Rotary Actuator



Output Shaft Position Number	Pressurize Port(s) in Cap(s)	Exhaust
1	C	All other ports
2	A <sub>1</sub> & C <sub>1</sub>	All other ports
3	A & B	All other ports
4	D	All other ports

## 5 Position Rotary Actuator



Output Shaft Position Number	Pressurize Port(s) in Cap(s)	Exhaust
1	C	All other ports
2	A <sub>1</sub> & C <sub>1</sub>	All other ports
3	A & B	All other ports
4	B <sub>1</sub> & D <sub>1</sub>	All other ports
5	D	All other ports

### 4-Position Rotary Actuator

**R°** = Rotation of base unit in degrees (Positions 1 and 4)  
**S°** = Change in rotation of base unit (Position 2)  
**T°** = Change in rotation of base unit (Position 3)

### 5-Position Rotary Actuator Total

**R°** = Rotation of base unit in degrees  
**S°** = Change in rotation of base unit (Position 2)  
**T°** = Change in rotation of base unit (Position 3)  
**Z°** = Change in rotation of base unit (Position 4)

Dimension	1 1/8"	1 1/2"	2"	2 1/2"
AA	3.625 (92)	5.375 (54)	6.000 (152)	6.250 (159)
BB	2.250 (57)	3.250 (83)	3.875 (98)	4.000 (102)
CC	.011 (.28)	.015 (.38)	.024 (.61)	.024 (.61)

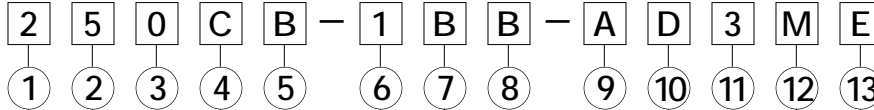
NOTE: The 3-position actuator dimensions are the same as a standard 2-position unit. Keyway in position shown is at midpoint of rotation.





# Rack & Pinion Rotary Actuators

## Rack and Pinion Rotary Actuator Order Information



Bore	
2	1 1/8"
3	1 1/2"
4	2"
5	2 1/2"

Rack/Rotary Type	
0	Single Rack Standard Seals
1	Single Rack Low Friction Seals
2	Double Rack Low Friction Seals
5	Double Rack Standard Seals
6	Standard Air/Oil Tandem
7	Integral Air/Oil Tandem
X	Special

Multiple Position Actuator	
0	2 Position
3	3 Position
4	4 Position
5	5 Position
X	Special

Rotation	
A	45°
B	90°
C	180°
D	270°
E	360°
X	Special

Output Shaft	
A	Single End Keyway Standard
B	Double End Keyway
C	Hollow Internal Keyway
D	Cross Keyway
E	Preloaded Keyway
X	Special

Mounting	
1	Standard
2	Front Flange
3	Rear Flange
4	Bottom Flange
X	Special

Port Location					
Position	1	2	3	4	5
Standard	A	B*	C	D	F
Oversized	E	G	H	J	K
Special	X				

\*Standard Port Size and Location.

Options	
0	No Option
E	Electroless Nickel
P	O-Ring Loaded Piston Seals
V	Viton® Seals
X	Special (Specify)

Magnetic Option	
0	No Magnet
M	Standard Magnetic Piston in Position A & B Integral Air/Oil Tandems in Position B & D

NOTE: See ACT-12-21 for information on switches.

Rotation Adjustments	
1	No Adjustment
2	End Cap A
3	End Cap B
4	End Caps A & B
5	End Caps B & D
X	Special

NOTE: Standard rotation adjustments provide 30° of angle reduction.

Bumper	
A	No Bumpers
B	End Cap A
C	End Cap B
D	All Caps
X	Special

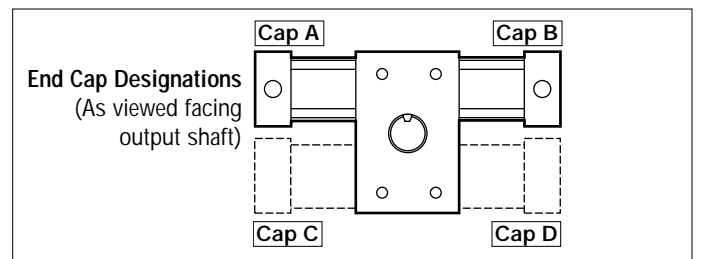
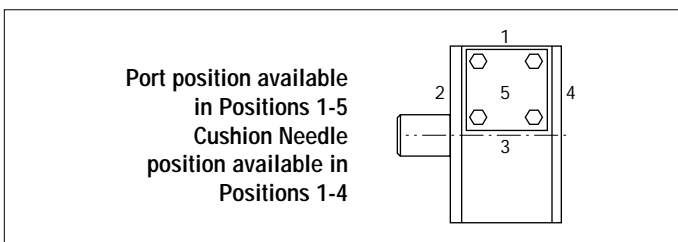
Flow Controls				
Needle Position	1	2	3	4
No Flow Controls	A			
End Cap A	B	C	D	E
End Cap B	G	H	J	K
End Caps A & B	M	N	P	R
Special	X			

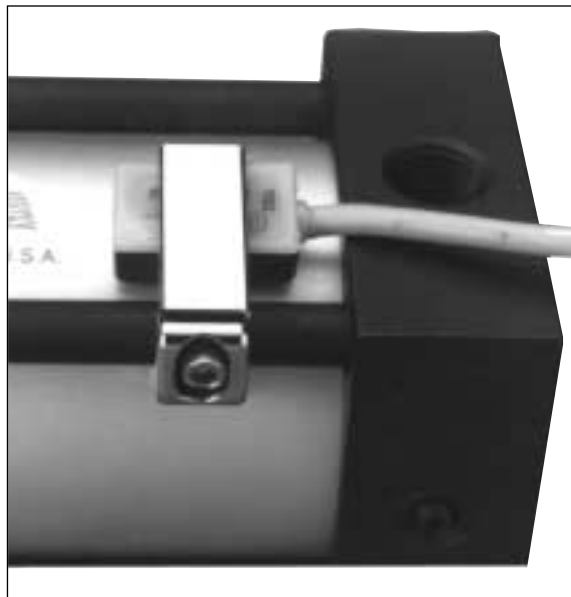
NOTE: Flow Controls must be 90° to Port Location. Flow controls are Standard on all Air/ Oil Tandems. Standard Air/ Oil Tandem Flow Controls are in end caps A & C in position #2. Integral Air/ Oil Tandem Flow Controls are in position #5.

Cushions				
Needle Position	1	2	3	4
No Cushions	A			
End Cap A	B	C	D	E
End Cap B	G	H	J	K
End Caps A & B	N	M	P	R
Special	X			

NOTE: Cushions & Rotation Adjustment cannot be located in same end cap.

**EXAMPLE:** 1 1/8" Bore – Double Rack with Standard Seals – 2 Position Rotary Actuator – 180° Rotation – Double End Keyway – Standard Mounting – Standard Port Located at Position 2 – Cushion Needle position available in Positions 1-4 – No Flow Controls – Bumpers on All Caps – End Cap B Rotation Adjustments – Standard Magnetic Piston Option – Electroless Nickel Plated.





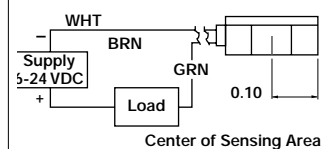
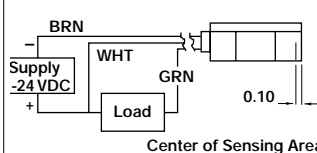
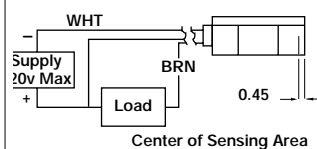
- Magnetically operated, non-contact sensing system.
- Consists of a magnet in the piston, and a sensing switch clamped on the actuator tie rod.
- One or more switches may be mounted to provide an indication of piston position or to control or initiate any sequence function.
- Adjustable mounting brackets are standard, and allow switches to be securely positioned anywhere along the range of piston travel.
- LED indicator light facilitates installation and troubleshooting.

## Specifications

\*Metal Oxide Varistor Surge Suppression. NOTE: All CS8 Series Switches are supplied with 9 foot leads.

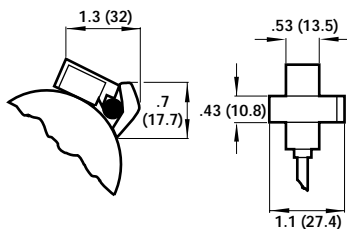
Switch Model	CS8-2-04 Reed	CS8-2-31 Solid State	CS8-2-32 Solid State
Bore Sizes	1 1/8" thru 2 1/2"	1 1/8" thru 2 1/2"	1 1/8" thru 2 1/2"
Switch Type	Reed Switch *MOV & Light	Solid State & Light, Sourcing PNP	Solid State & Light, Sinking NPN
Function	SPST Normally Open	Normally Open	Normally Open
Switching Voltage	5-120 VDC/VAC 50/60 Hz	6-24 VDC	6-24 VDC
Switching Current	.5 Amp Max .005 Amp Min	.5 Amp Max	.5 Amp Max
Switching Power	10 VA	12 Watts Max	12 Watts Max
Max Voltage Drop	3.5 Volts	.5 Volts	.5 Volts
Magnetic Sensitivity	85 Gauss	85 Gauss	85 Gauss
Enclosure Classification	NEMA 6 & CSA Approved	NEMA 6 & CSA Approved	NEMA 6 & CSA Approved
Temperature Range	-22°F to +176°F	-22°F to +176°F	-22°F to +176°F

## Wiring Diagrams



## Switch & Mounting Bracket Dimensions

### CS8-2 Series



All Dimensions in Inches (mm)

## Application Recommendations and Precautions

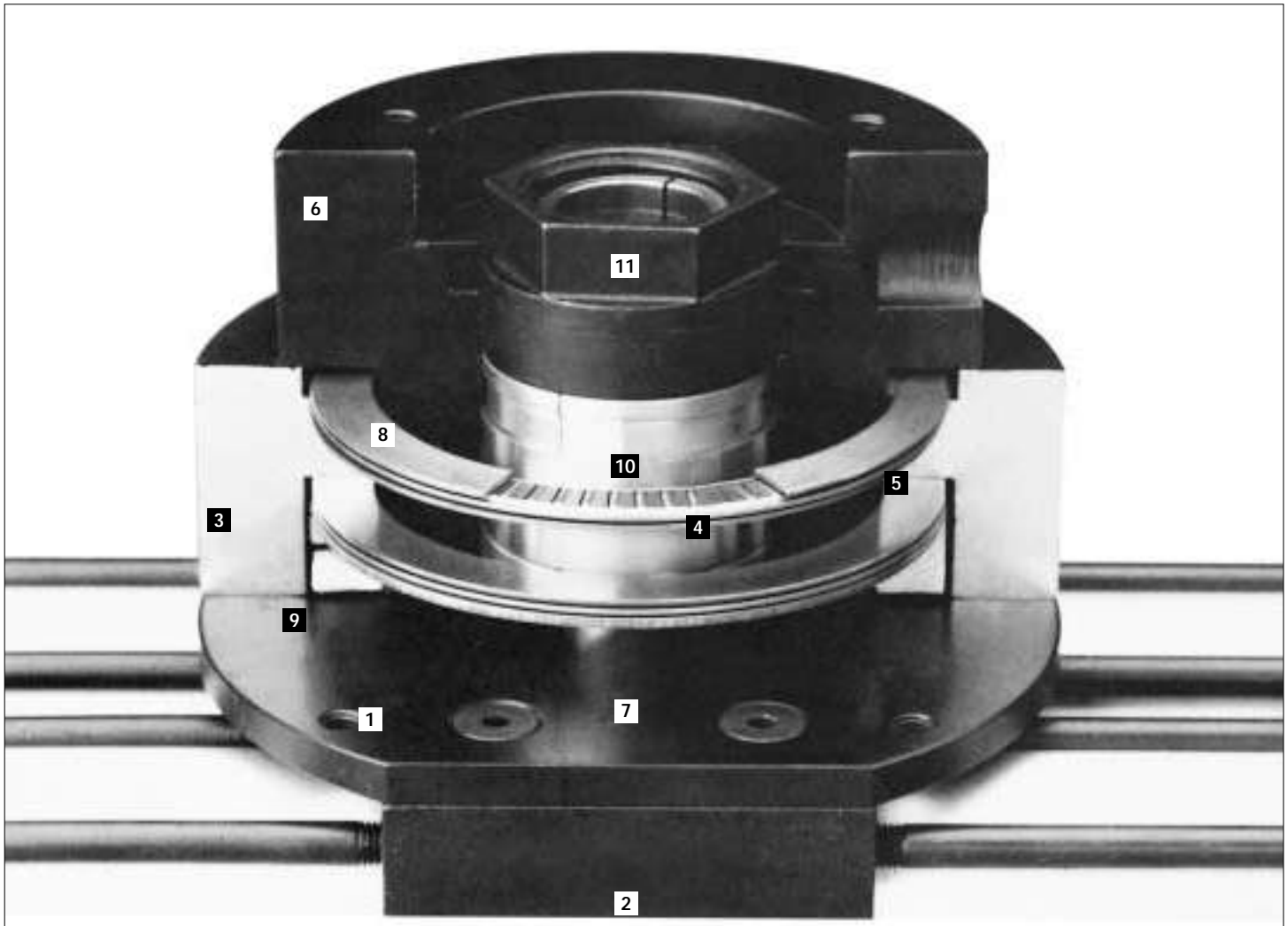
To provide maximum reliability:

1. Always stay within the specifications and power rating limitations of the unit installed.
2. Primary and control circuit wiring should not be mixed in the same conduit. Motors will produce high pulses that will be introduced into the control wiring if the wiring is carried in the same conduit.
3. Never connect the switch without a load present. The switch will be destroyed.
4. Some electrical loads may be capacitive. Capacitive loading may occur due to distributed capacity in cable runs over 25 feet. Use switch Model CS7-24 whenever capacitive loading may occur. Refer to NCA-60 catalog.

In order to obtain optimum performance and long life, magnetically operated limit switches should not be subjected to: (1) strong magnetic fields, (2) extreme temperature, and (3) excessive ferrous filing or chip buildup.

Improper wiring may damage or destroy the switch. The wiring diagram, along with the listed power ratings, must be carefully observed before connecting power to the switch.

Lower power switches are designed for signaling electronic circuits. Do not use on relay loads or with incandescent bulbs. Resistive loads only.



A **1 Rotary Table Flange** is attached to the body of a **2 Rotary Actuator** to create a mounting surface for the rotary table assembly. This assembly consists of a **3 Table Housing** machined from 6061-T6 aluminum alloy. This housing is specifically designed to incorporate two individual **4 Thrust Bearings**, each sandwiched between two steel **5 Surface Washers**. These bearings accept axial and radial loads that are applied to the rotary table assembly.

The **6 Hub**, also machined from 6061-T6 aluminum alloy, is centrally positioned

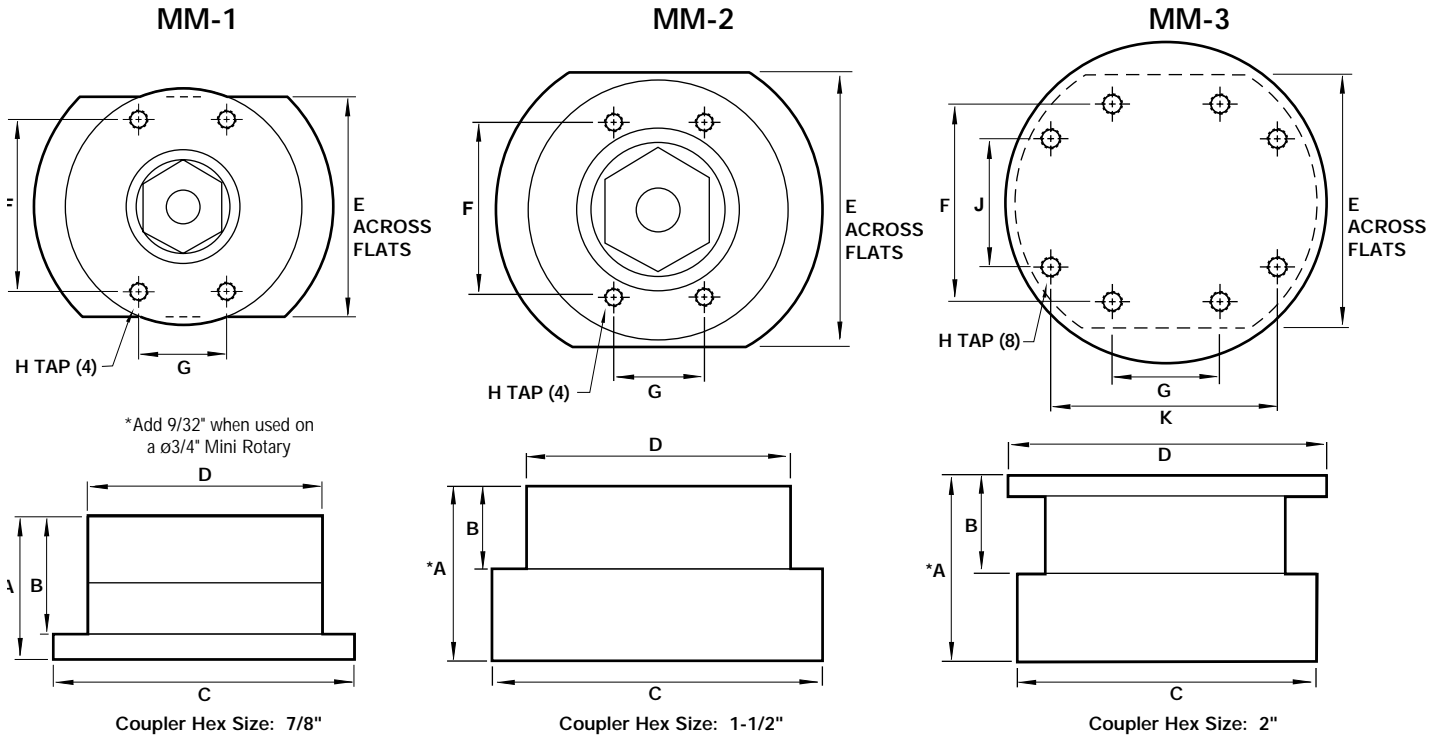
over the actuator **7 Output Shaft**.

A **8 Wear Band** located on the hub enhances load carrying capability. The **9 Slotted Locking Ring** retains the hub and thrust bearings to the table housing.

Attachment of the hub to the actuator output shaft is accomplished by a **10 Coupler**. The coupler is a simple, keyless design consisting of an inner collet-like element, an outer sleeve set and a **11 Hex Nut**. The inner and outer elements have matching opposing tapers. As the hex nut is tightened, the coupler

elements expand *and* contract radially, locking the hub to the output shaft. In this locked condition, the output shaft and hub act as a single unit, allowing the rotational forces (torque) of the output shaft to be directly transmitted to the hub.

The keyless design of the coupler allows infinite positioning of the tapered holes located in the hub. These holes enable either vertical or horizontal mounting of a **Series N Non-Rotating Rod Cylinder (Section 4)**.



### MM-1 Rotary Table

Use with  $\varnothing 3/4$ " or  $\varnothing 1 1/8$ " Bore Rotary Actuator. Accepts  $1 1/8$ " Bore **Series N (Section 4)**. With Rotary Table Plate **MM-80-03**, accepts  $1 1/2$ " Bore **Series N (Section 4)**.

NOTE: When interfacing with  $\varnothing 3/4$ " Bore Mini Rotary Actuator, a **Double Rack** model is recommended.

### MM-2 Rotary Table

Use with  $\varnothing 1 1/2$ " Bore Rotary Actuator. Accepts  $1 1/2$ " Bore **Series N (Section 4)**. With Rotary Table Plate **MM-80-04**, accepts 2" or  $2 1/2$ " Bore **Series N (Section 4)**.

### MM-3 Rotary Table

Use with  $\varnothing 2$ " or  $\varnothing 2 1/2$ " Bore Rotary Actuator. (Rotary Table Plate **MM-80-04**, comes standard). Accepts  $1 1/2$ " Bore **Series N (Section 4)** without Rotary Table Plate **MM-80-04**. Accepts 2" or  $2 1/2$ " Bore **Series N (Section 4)** with Rotary Table Plate **MM-80-04**.

### Rotary Table Dimensions

Rotary Table	A	B	C	D	E	F	G	H	J	K
MM-1	1.625 (41)	1.344 (34)	3.438 (87)	2.688 (68)	2.500 (64)	2.000 (51)	1.000 (25)	10 - 32	-	-
MM-2	2.807 (71)	1.328 (34)	5.125 (130)	4.125 (108)	4.355 (111)	2.750 (70)	1.428 (36)	1/4 - 28	-	-
MM-3	4.117 (105)	2.638 (67)	5.125 (130)	5.500 (140)	4.355 (111)	3.375 (86)	1.838 (47)	5/16 - 24	2.192 (56)	3.875 (98)

### Optional Rotary Table Plate

Larger than standard rear flange mounting patterns for the MM-1 and MM-2 Rotary Tables are available by the simple interface of the optional Rotary Table Plate.

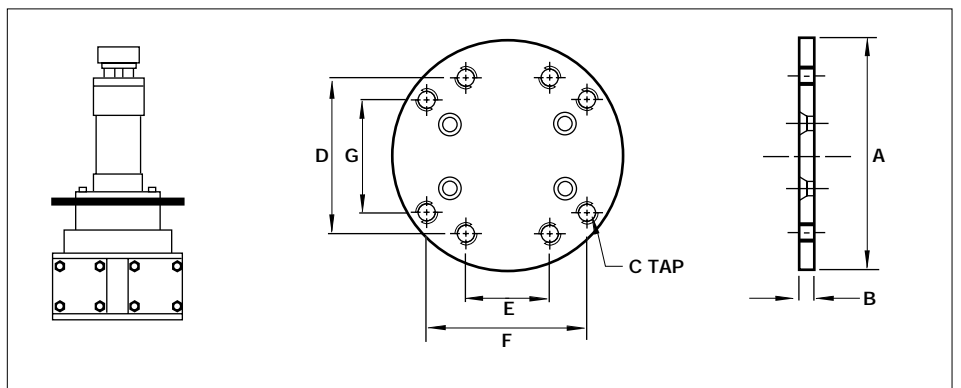
When using optional rotary table plate:

**MM-1** accepts Series N  $1 1/2$ " Bore

**MM-2** accepts Series N 2" or  $2 1/2$ " Bore

**MM-3** accepts Series N 2" or  $2 1/2$ " Bore

Refer to Section 4.



Rotary Table Plate Part #	Use with Rotary Table	A	B	C	D	E	F	G
MM-80-03	MM-1	4.000 (102)	.250 (6)	1/4 - 28	2.750 (70)	1.428 (36)	-	-
MM-80-04	MM-2	5.500 (140)	.375 (10)	5/16 - 24	3.375 (86)	1.838 (47)	3.875 (98)	2.192 (56)
MM-80-04	MM-3	5.500 (140)	.375 (10)	5/16 - 24	3.375 (86)	1.838 (47)	3.875 (98)	2.192 (56)

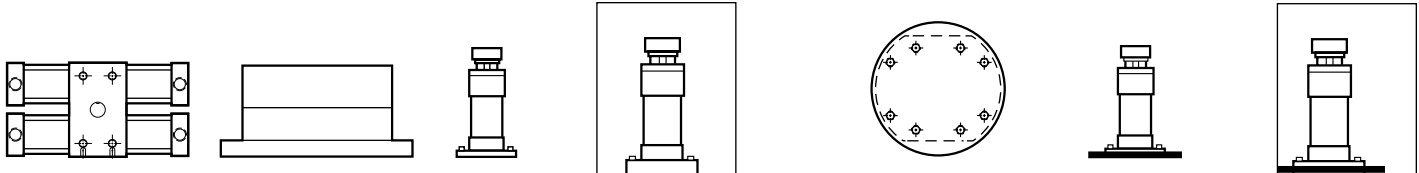


# Rack & Pinion Rotary Actuators

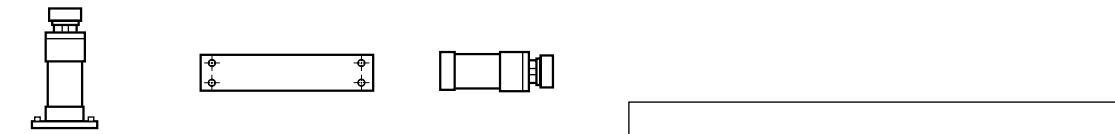
Norgren Motion Modules may be assembled in a number of single or multi-axis configurations to provide a wide range of linear and rotary movements. The selection guide shown

below is intended to graphically assist in the interface of appropriate MOTION MODULES and ACCESSORIES required to accomplish the specific configurations.


MOTION MODULES afford such total design flexibility that the selection guide has been limited to only the more basic MOTION MODULE assemblies.



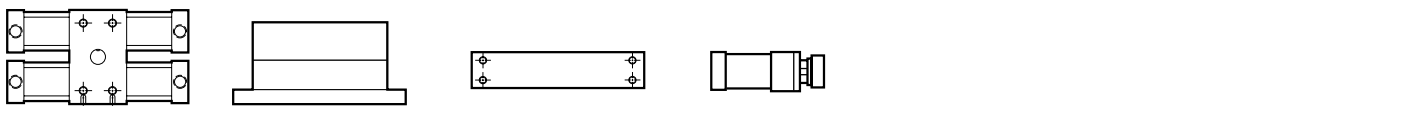
Rotary Actuator Bore Size		Rotary Table Part No.		Series N Bore Size		Rotary Table Plate Part No.		Series N Bore Size
*3/4" or 1 1/8"	+	MM-1	+	1 1/8"	=	OR + MM-80-03	+	1 1/2"
1 1/2"	+	MM-2	+	1 1/2"	=	OR + MM-80-04	+	2" or 2 1/2"
2" or 2 1/2"	+	**MM-3	+	1 1/2"	=	OR + MM-80-04	+	2" or 2 1/2"



Series N Bore Size		Cylinder Mounting Plate		Series N Bore Size
1 1/8"	+	MM-225-00A	+	1 1/8"
1 1/2"	+	MM-225-00A	+	1 1/8"
1 1/2"	+	MM-003-00A	+	1 1/2"
2"	+	MM-003-00A	+	1 1/2"
2"	+	MM-004-00A	+	2"
2 1/2"	+	MM-004-00A	+	2"
2 1/2"	+	MM-005-00A	+	2 1/2"



Series N Bore Size		Modular Adaptor Plate		Mini Rotary Actuator Bore Size		Angle Bracket		Mini Rotary Actuator Bore Size
1 1/8"	+	NB-172-225K	+	1/2" or 3/4"	=	OR + R-920-100	+	1/2" or 3/4"
1 1/2"	+	NB-172-03K	+	1/2" or 3/4"	=	OR + R-920-100	+	1/2" or 3/4"
2"	+	NB-172-04K	+	1/2" or 3/4"	=	OR + R-920-100	+	1/2" or 3/4"
2 1/2"	+	NB-172-05K	+	1/2" or 3/4"	=	OR + R-920-100	+	1/2" or 3/4"



Rotary Actuator		Rotary Table		Cylinder Mounting Plate		Series N Bore Size
*3/4" or 1 1/8"	+	MM-1	+	MM-225-00A	+	1 1/8"
1 1/2"	+	MM-2	+	MM-003-00A	+	1 1/2"
1 1/2"	+	MM-2	+	MM-004-00A	+	2"
1 1/2"	+	MM-2	+	MM-005-00A	+	2 1/2"
2"	+	MM-3	+	MM-003-00A	+	1 1/2"
2"	+	MM-3	+	MM-004-00A	+	2"
2"	+	MM-3	+	MM-005-00A	+	2 1/2"
2 1/2"	+	MM-3	+	MM-003-00A	+	1 1/2"
2 1/2"	+	MM-3	+	MM-004-00A	+	2"
2 1/2"	+	MM-3	+	MM-005-00A	+	2 1/2"

\*When interfacing MM-1 Rotary Table with 3/4" bore Mini Rotary Actuator, a double rack model is recommended.

\*\*Rotary Table MM-3 includes Rotary Table Plate No. MM-80-04. Remove Rotary Table MM-80-04 to use 1 1/2" Series N.



## Rotary Table Weights & Hex Nut Installation Torques

Rotary Table	Rotary Table Weight (Kilograms)		Hex Nut Installation Torque in Foot-Pounds (Newton-meters)	
MM-1	1.125	(0.511)	30 ft. lbs.	(40.66)
MM-2	5.5625	(2.525)	160 ft. lbs.	(216.87)
MM-3	7.875	(3.575)	240 ft. lbs.	(325.31)

NOTE: All Rotary Tables are supplied with a torque bar to simplify coupler installation.

## How to Order Rotary Tables

Order Rotary Table	When Interfacing with this size Rotary Actuator
MM-1	*3/4" or 1-1/8"
MM-2	1-1/2"
MM-3	2" or 2-1/2"

NOTE: \*When interfacing MM-1 Rotary Table with 3/4" Bore Mini Rotary Actuator, a **double rack** model is recommended.

## Consolidated Motion Module Torque Output and Force Data

### Rotary Table Model MM-1

Input Pressure PSI (bar)	Rotary Actuator Torque Output in Inch-pounds per PSI (Newton-meters per Bar)						Series N Extend & Retract Forces in Pounds (Newtons)					
	3/4" Bore		1-1/8" Bore		1-1/8" Bore		1-1/2" Bore		1-1/2" Bore		1-1/2" Bore	
	Single	Double	Single	Double	Extend	Retract	Extend	Retract	Extend	Retract	Extend	Retract
30 (2)	4.9 (8.03)	9.9 (16.21)	18.7 (30.62)	37.4 (61.25)	29.9 (132.00)	26.9 (119.65)	53.1 (236.19)	46.5 (206.83)	39.8 (177.03)	35.9 (159.68)	70.8 (314.92)	61.8 (274.89)
40 (3)	6.6 (10.80)	13.2 (21.62)	24.9 (40.78)	49.8 (81.56)	49.8 (221.51)	44.9 (199.72)	88.5 (393.65)	77.3 (343.83)	59.7 (265.55)	53.8 (239.30)	106.2 (472.38)	92.8 (412.77)
50 (3.5)	8.3 (13.59)	16.5 (27.02)	31.1 (50.93)	62.3 (102.04)	69.7 (310.03)	62.8 (279.33)	123.9 (551.11)	108.5 (482.61)	79.6 (354.06)	71.8 (319.37)	141.6 (629.84)	123.7 (550.22)
60 (4)	9.9 (16.21)	19.8 (32.43)	37.3 (61.09)	74.6 (122.18)	89.6 (398.54)	80.7 (358.95)	159.3 (708.57)	139.5 (620.50)	99.5 (442.48)	89.7 (398.99)	177.0 (787.30)	154.6 (687.60)
70 (5)	11.6 (18.99)	23.1 (37.83)	43.6 (71.41)	87.1 (142.66)	124.4 (553.33)	112.1 (498.62)	221.3 (984.34)	193.3 (859.80)	124.4 (553.33)	112.1 (498.62)	221.3 (984.34)	193.3 (859.80)
80 (6)	13.3 (21.78)	26.6 (43.57)	49.8 (81.56)	99.6 (163.12)	149.2 (663.64)	134.6 (598.70)	265.5 (1180.94)	231.9 (1031.49)	149.2 (663.64)	134.6 (598.70)	265.5 (1180.94)	231.9 (1031.49)
90 (6.2)	14.9 (24.40)	29.8 (48.80)	56.0 (91.72)	112.0 (183.44)								
100 (7)	16.5 (27.02)	33.0 (54.05)	62.2 (101.87)	124.4 (203.75)								
125 (8.6)	20.7 (33.90)	41.4 (67.81)	77.7 (127.26)	155.4 (254.52)								
150 (10)	24.8 (40.62)	49.6 (81.24)	93.3 (152.81)	186.6 (305.62)								

### Rotary Table Model MM-2

Input Pressure PSI (bar)	Rotary Actuator Torque Output in Inch-pounds per PSI (Newton-meters per Bar)				Series N Extend & Retract Forces in Pounds (Newtons)							
	1-1/2" Bore		1-1/2" Bore		2" Bore		2-1/2" Bore		2-1/2" Bore		2-1/2" Bore	
	Single	Double	Extend	Retract	Extend	Retract	Extend	Retract	Extend	Retract	Extend	Retract
30 (2)	46.5 (76.16)	93.0 (152.32)	53.1 (236.19)	46.5 (206.83)	94.2 (482.61)	82.5 (366.96)	147.3 (655.19)	129.0 (573.79)	125.6 (558.67)	109.9 (488.35)	196.4 (873.59)	171.8 (764.16)
40 (3)	62.0 (101.55)	124.0 (203.09)	70.8 (314.92)	61.8 (274.89)	125.6 (558.67)	109.9 (488.35)	196.4 (873.59)	171.8 (764.16)	157.0 (698.34)	137.4 (611.16)	245.5 (1091.98)	214.8 (955.30)
50 (3.5)	77.5 (126.93)	155.0 (253.87)	88.5 (393.65)	77.3 (343.83)	188.4 (838.35)	164.9 (733.47)	294.6 (1310.38)	257.8 (1146.69)	219.8 (977.67)	192.5 (856.24)	343.7 (1525.97)	301.0 (1338.85)
60 (4)	92.9 (152.16)	185.8 (304.31)	106.2 (472.38)	92.8 (412.77)	219.8 (977.67)	192.5 (856.24)	343.7 (1525.97)	301.0 (1338.85)	251.2 (1117.34)	219.8 (977.67)	392.8 (1747.17)	343.7 (1528.78)
70 (5)	108.5 (177.71)	217.0 (355.41)	123.9 (551.11)	108.5 (482.61)	251.2 (1117.34)	219.8 (977.67)	392.8 (1747.17)	343.7 (1528.78)	282.6 (1257.00)	247.5 (1100.88)	441.9 (1965.57)	387.0 (1721.38)
80 (6)	123.9 (202.93)	247.8 (405.86)	141.6 (629.84)	123.7 (550.22)	314.0 (1396.67)	274.8 (1222.31)	491.0 (2183.96)	429.6 (1910.86)	314.0 (1396.67)	274.8 (1222.31)	491.0 (2183.96)	429.6 (1910.86)
90 (6.2)	139.4 (228.31)	278.8 (456.63)	159.3 (708.57)	139.5 (620.50)	392.5 (1754.84)	343.5 (1527.89)	613.8 (2730.18)	537.0 (2388.58)	392.5 (1754.84)	343.5 (1527.89)	613.8 (2730.18)	537.0 (2388.58)
100 (7)	154.9 (253.70)	309.8 (507.40)	177.0 (787.30)	154.6 (687.60)	471.0 (2095.00)	412.2 (1833.10)	736.5 (3275.95)	644.4 (2866.29)	471.0 (2095.00)	412.2 (1833.10)	736.5 (3275.95)	644.4 (2866.29)
125 (8.6)	193.6 (317.08)	387.2 (634.17)	221.3 (984.34)	193.3 (859.80)								
150 (10)	232.3 (380.47)	464.6 (760.94)	265.5 (1180.94)	231.9 (1031.49)								

### Rotary Table Model MM-3

Input Pressure PSI (bar)	Rotary Actuator Torque Output in Inch-pounds per PSI (Newton-meters per Bar)				Series N Extend & Retract Forces in Pounds (Newtons)							
	2" Bore		2-1/2" Bore		2" Bore		2-1/2" Bore		2-1/2" Bore		2-1/2" Bore	
	Single	Double	Single	Double	Extend	Retract	Extend	Retract	Extend	Retract	Extend	Retract
30 (2)	131.9 (216.03)	263.8 (432.06)	206.3 (337.88)	412.6 (675.77)	94.2 (482.61)	82.5 (366.96)	147.3 (655.19)	129.0 (573.79)	125.6 (558.67)	109.9 (488.35)	196.4 (873.59)	171.8 (764.16)
40 (3)	175.8 (287.93)	351.6 (575.86)	275.0 (450.41)	550.0 (900.81)	125.6 (558.67)	109.9 (488.35)	196.4 (873.59)	171.8 (764.16)	157.0 (698.34)	137.4 (611.15)	245.5 (1091.98)	214.8 (955.30)
50 (3.5)	219.8 (360.00)	439.5 (719.83)	343.8 (563.09)	687.6 (1126.17)	188.4 (838.35)	164.9 (733.47)	294.6 (1310.38)	257.8 (1146.69)	219.8 (977.67)	192.5 (856.24)	343.7 (1525.97)	301.0 (1338.85)
60 (4)	263.8 (431.73)	527.6 (864.12)	412.4 (675.45)	824.8 (1350.89)	219.8 (977.67)	192.5 (856.24)	343.7 (1525.97)	301.0 (1338.85)	251.2 (1117.34)	219.8 (977.67)	392.8 (1747.17)	343.7 (1528.78)
70 (5)	307.7 (503.96)	615.3 (1007.76)	481.3 (708.29)	962.6 (1576.59)	251.2 (1117.34)	219.8 (977.67)	392.8 (1747.17)	343.7 (1528.78)	282.6 (1257.00)	247.5 (1100.88)	441.9 (1965.57)	387.0 (1721.38)
80 (6)	351.7 (576.03)	703.4 (1152.06)	549.9 (900.65)	1099.8 (1801.29)	314.0 (1396.67)	274.8 (1222.31)	491.0 (2183.96)	429.6 (1910.86)	314.0 (1396.67)	274.8 (1222.31)	491.0 (2183.96)	429.6 (1910.86)
90 (6.2)	395.6 (647.92)	791.2 (1259.86)	618.7 (1013.33)	1237.4 (2026.66)	392.5 (1754.84)	343.5 (1527.89)	613.8 (2730.18)	537.0 (2388.58)	392.5 (1754.84)	343.5 (1527.89)	613.8 (2730.18)	537.0 (2388.58)
100 (7)	439.6 (720.00)	879.2 (1439.99)	687.4 (1125.85)	1374.8 (2251.70)	471.0 (2095.00)	412.2 (1833.10)	736.5 (3275.95)	644.4 (2866.29)	471.0 (2095.00)	412.2 (1833.10)	736.5 (3275.95)	644.4 (2866.29)
125 (8.6)	549.5 (899.99)	1099.0 (1799.99)	859.3 (1407.40)	1718.6 (2814.79)								
150 (10)	659.4 (1079.99)	1318.8 (2159.98)	1031.1 (1688.78)	2062.2 (3377.56)								

NOTE: All Rotary Actuator torque outputs and Series N Cylinder forces listed above are theoretical. Deduct 10% from these torques and forces to allow for friction loss in actual application. Deduct 20% on all Air/Oil Tandem Rotary Actuators. Air/Oil Tandem and Multiple Position Rotary Actuators utilize a double rack configuration; however, the torque outputs of a single rack unit apply.



# Rack & Pinion Rotary Actuators

$$KE = \frac{J\omega^2}{2}$$

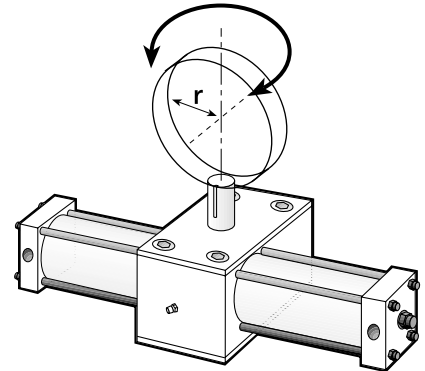
$$\omega = 0.035 \times \frac{\text{Angle traveled (degrees)}}{\text{Rotation time (seconds)}}$$

where:

- KE = Kinetic Energy (in-lb)
- J = Rotational mass moment of inertia (in-lb-sec<sup>2</sup>)  
(Dependent on physical size of object and weight)
- $\omega$  = Peak Velocity (rad/sec) (Assuming twice average velocity)
- W = Weight of load (lb)
- g = Acceleration due to gravity = 386.4 in/sec<sup>2</sup>
- r = Radius of gyration (in)
- l = length from point of rotation
- w = width

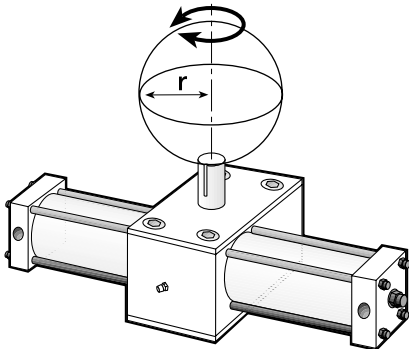
## Moments of Inertia

Maximum Kinetic Energy Rating for Model Based on Configuration (in.-lb.)		
Bore	Non-Cushioned	Cushioned
1 1/8"	0.5	5
1 1/2"	2.0	20
2"	4.0	40
2 1/2"	7.0	70



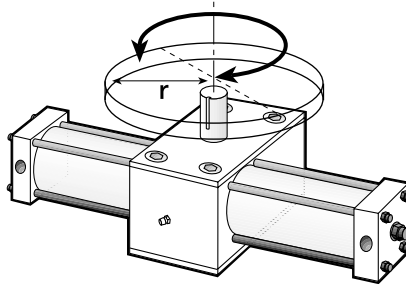
**Thin Disk**  
End mounted  
on center

$$J = \frac{W}{g} \times \frac{r^2}{4}$$



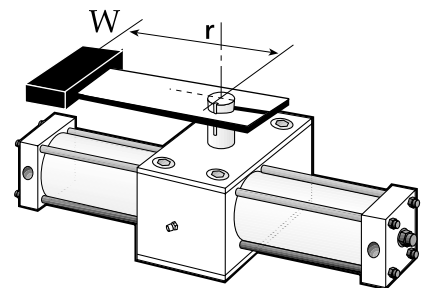
**Sphere**  
Mounted  
on center

$$J = \frac{W}{g} \times \frac{2r^2}{5}$$



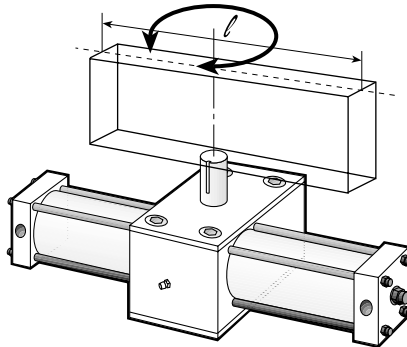
**Thin Disk**  
Mounted  
on center

$$J = \frac{W}{g} \times \frac{r^2}{2}$$



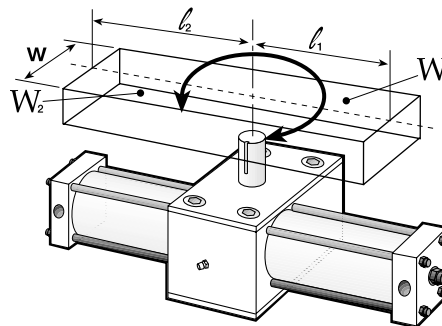
**Load off Center**  
(Torque)

$$J = \frac{W}{g} \times r^2$$



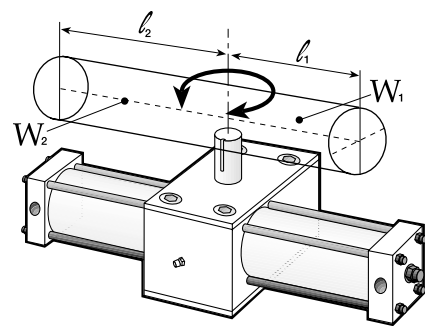
**Thin Rectangular Plate**  
Mounted  
on center

$$J = \frac{W}{g} \times \frac{l^2}{12}$$



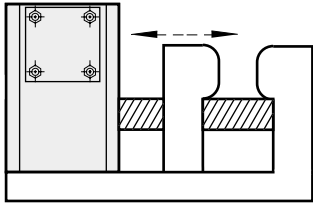
**Thin Rectangular Plate**

$$J = \frac{W_1}{g} \times \frac{4l_1^2 + w^2}{12} + \frac{W_2}{g} \times \frac{4l_2^2 + w^2}{12}$$

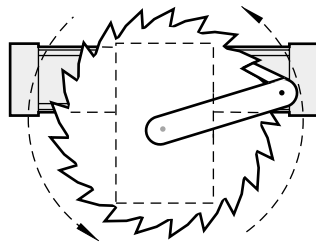


**Thin Rod**

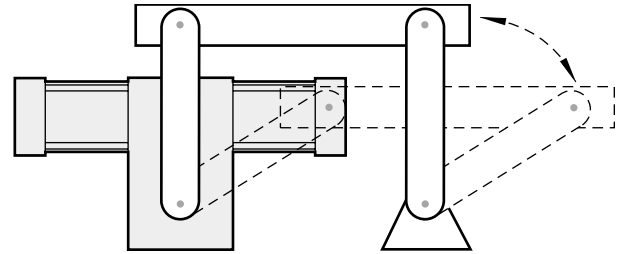
$$J = \frac{W_1}{g} \times \frac{l_1^2}{3} + \frac{W_2}{g} \times \frac{l_2^2}{3}$$



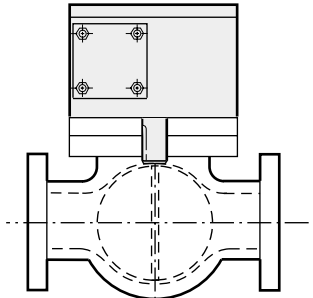
Screw Clamping



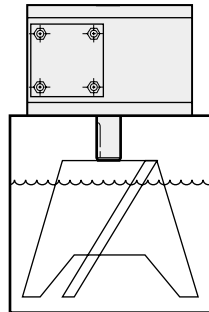
Rotation



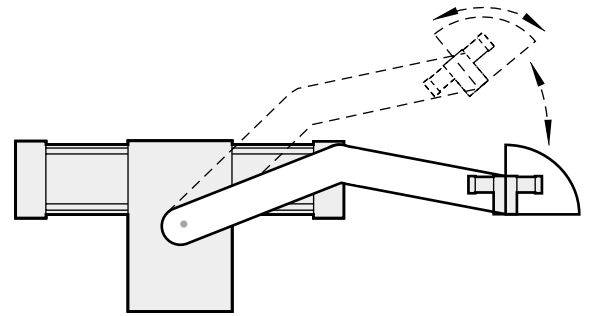
Automation Transfer



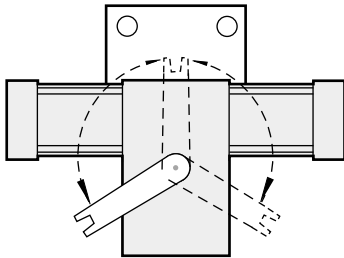
Valve Turning



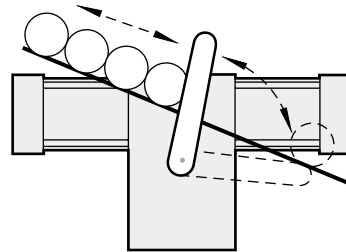
Mixer



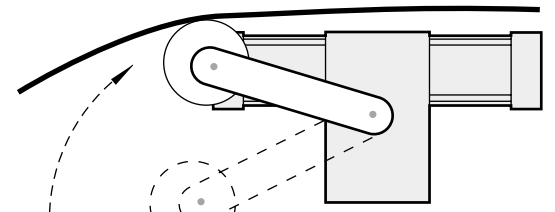
Material Handling



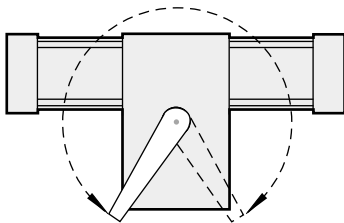
Load and Unload Machine



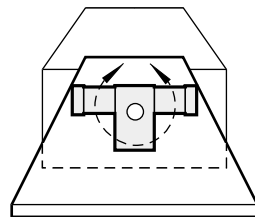
Intermittent Feed



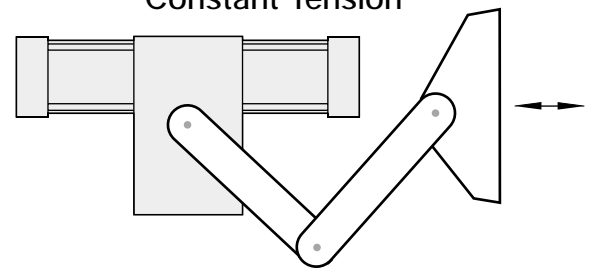
Constant Tension



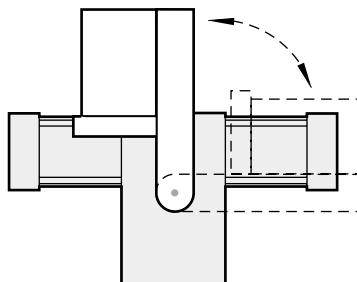
Turn or Oscillate



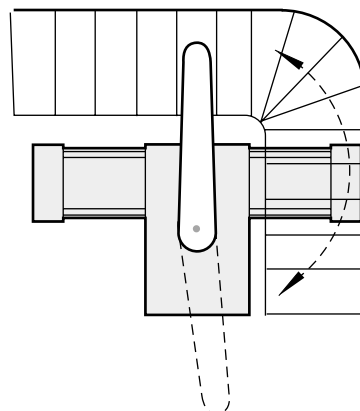
Turnover or Dumping



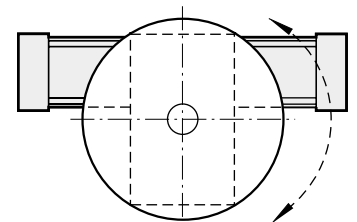
Toggle Push or Clamp



Lift or Rotate



Conveyor Turn or Stop



Index or Position





# Mini Pneumatic Rotary Actuators

**Mini rotary actuator, double acting,  
w/magnetic piston .....ACT-13-2**  
**Compact rotary actuator, double acting,  
w/magnetic piston .....ACT-13-5**



ACT-13-2 Mini rotary actuator, double acting, w/magnetic piston



ACT-13-5 Compact rotary actuator, double acting, w/magnetic piston

**Miniature rotary actuators, Double acting  
Magnetic piston, Ø 12 & 20 mm****Smooth operation with zero backlash****Lightweight****Compact envelope dimensions****Integral magnets for positional feedback****Technical data**

Medium:

Compressed air, filtered, lubricated or non-lubricated

Operating pressure:

14.5 to 101.5 psig (1 to 7 bar)

Operating temperature:

32°F to 140°F (5°C to 60°C)

Mounting:

Mounting holes in body

Rotation angle:

90°, 180°

Adjustable  $\pm 5^\circ$ **Materials**

Body: aluminum alloy

End covers: aluminum alloy

Shaft: carbon steel

External stop: carbon steel

External nuts: mild steel

External screws: chrome molybdenum steel

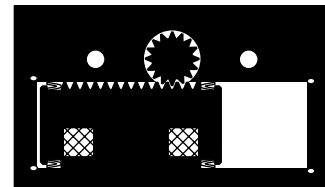
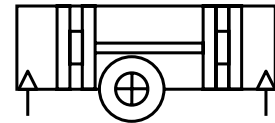
Elastomers: nitrile

**Barb fittings connections**M5 x 1/8" tube ID, straight barb: part number **29217X305****Ordering information**To order a rotary actuator with torque up to 2.0 in lbs (0.23 Nm) at 87 psig (6 bar) and a 180° rotation quote: **M/60215/M/180**To order a rotary actuator with torque up to 8.9 in lbs (1.0 Nm) at 87 psig (6 bar) and a 90° rotation quote: **M/60216/M/90****Accessories**

Switch M/345 or M/346

**See page**

ACT-13-4





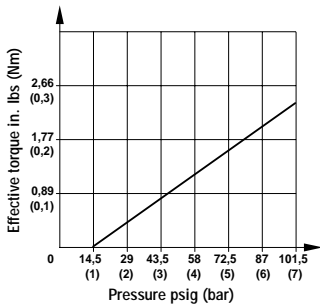
Standard models ● Theoretical torque ● Angle of rotation ● Permissible forces ● Air consumption

Model	Theoretical torque in. lbs (Nm) at 87 psig (6 bar)	Angle of rotation	Permissible forces lbs force (N)		Air consumption in <sup>3</sup> (cm <sup>3</sup> ) at 87 psig (6 bar)
			Axial	Radial	
M/60215/M/90	2.0 (0.23)	90°	0.3 (1.47)	0.7 (2.94)	0.10 (1.6)
M/60215/M/180	2.0 (0.23)	180°	0.3 (1.47)	0.7 (2.94)	0.18 (3.0)
M/60216/M/90	8.9 (1.0)	90°	0.4 (1.96)	1.1 (4.90)	0.37 (6.0)
M/60216/M/180	8.9 (1.0)	180°	0.4 (1.96)	1.1 (4.90)	0.73 (12.0)

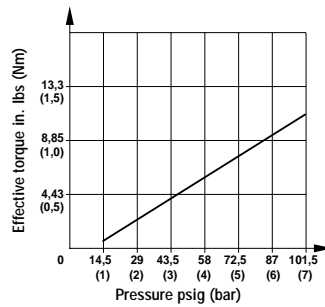
\* per cycle

Theoretical torque

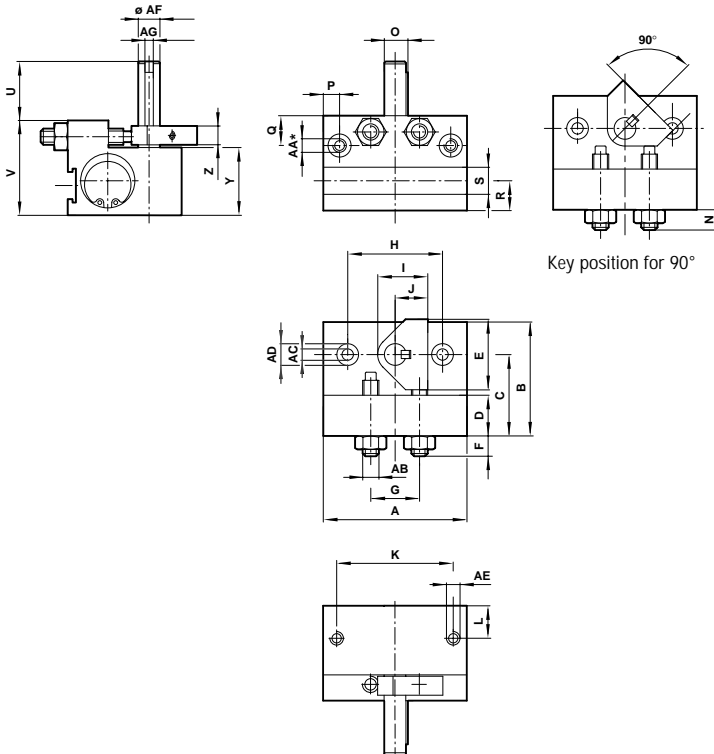
M/60215/M



M/60216/M



Basic dimensions



	Ø	A	B	C	D	E	F	G	H	I	J	K	L	N
M/60215/M/90	12	1.65 (42)	1.18 (30)	0.79 (20)	0.30 (7.5)	0.87 (22)	0.24 (6)	0.55 (14)	0.94 (24)	0.60 (15.3)	0.39 (10)	1.34 (34)	0.31 (8)	0.22 (5.5)
M/60215/M/180	12	2.17 (55)	1.18 (30)	0.79 (20)	0.30 (7.5)	0.87 (22)	0.24 (6)	0.55 (14)	0.94 (24)	0.60 (15.3)	0.39 (10)	1.34 (34)	0.31 (8)	0.22 (5.5)
M/60216/M/90	20	2.09 (53)	1.65 (42)	1.18 (30)	0.59 (15)	1.02 (26)	0.31 (8)	0.71 (18)	1.38 (35)	0.73 (18.5)	0.47 (12)	1.69 (43)	0.47 (12)	0.26 (6.5)
M/60216/M/180	20	2.83 (72)	1.65 (42)	1.18 (30)	0.59 (15)	1.02 (26)	0.31 (8)	0.71 (18)	1.38 (35)	0.73 (18.5)	0.47 (12)	1.69 (43)	0.47 (12)	0.26 (6.5)
	Ø	O	P	Q	R	S	U	V	Y	Z	AA	AB	AC	
M/60215/M/90	12	0.28 (7.2)	0.24 (6)	0.41 (10.5)	0.31 (8)	0.39 (10)	0.59 (15)	1.10 (28)	0.79 (20)	0.28 (7)	M5 X 0.8	M5 X 0.8	Ø 0.13 (Ø3.3)	
M/60215/M/180	12	0.28 (7.2)	0.24 (6)	0.31 (8)	0.31 (8)	0.39 (10)	0.59 (15)	1.10 (28)	0.79 (20)	0.28 (7)	M5 X 0.8	M5 X 0.8	Ø 0.13 (Ø3.3)	
M/60216/M/90	20	0.36 (9.2)	0.24 (6)	0.43 (11)	0.43 (11)	0.39 (10)	0.79 (20)	1.38 (35)	1 (25.5)	0.28 (7)	M5 X 0.8	M6 x 1	Ø 0.17 (Ø4.2)	
M/60216/M/180	20	0.36 (9.2)	0.24 (6)	0.43 (11)	0.43 (11)	0.39 (10)	0.79 (20)	1.38 (35)	1 (25.5)	0.28 (7)	M5 X 0.8	M6 x 1	Ø 0.17 (Ø4.2)	
	Ø	AD				AE		AF			AG		Ib (kg)	
M/60215/M/90	12	Ø 0.26 deep 0.14 (M4 X 0.7 deep 0.39 on rear face) Ø6.5 deep 3.5 (M4 X 0.7 deep 10 on rear face)				M4 X 0.7 deep 0.31 (8)		Ø 0.24 + 0.0004/- 0.002 (Ø6 + 0.01/- 0.03)			0.12 - 0.001 (3 - 0.025)		0.22 (0.11)	
M/60215/M/180	12	Ø 0.26 deep 0.14 (M4 X 0.7 deep 0.39 on rear face) Ø6.5 deep 3.5 (M4 X 0.7 deep 10 on rear face)				M4 X 0.7 deep 0.31 (8)		Ø 0.24 + 0.0004/- 0.002 (Ø6 + 0.01/- 0.03)			0.12 - 0.001 (3 - 0.025)		0.28 (0.14)	
M/60216/M/90	20	Ø 0.31 deep 0.14 (M4 X 0.7 deep 0.59 on rear face) Ø8 deep 3.5 (M5 X 0.8 deep 15 on rear face)				M5 X 0.8 deep 0.39 (10)		Ø 0.31 + 0.0004/- 0.002 (Ø8 + 0.01/- 0.03)			0.12 + 0.001 (3 + 0.03)		0.50 (0.25)	
M/60216/M/180	20	Ø 0.31 deep 0.14 (M4 X 0.7 deep 0.59 on rear face) Ø8 deep 3.5 (M5 X 0.8 deep 15 on rear face)				M5 X 0.8 deep 0.39 (10)		Ø 0.31 + 0.0004/- 0.002 (Ø8 + 0.01/- 0.03)			0.12 + 0.001 (3 + 0.03)		0.64 (0.32)	



### Switches

Model Reed	Two wire solid state	Three wire solid state	Voltage V d.c.	V a.c.	Current Max.	Temperature °C	LED	Features	Cable Length	Cable Type	Cable	
											Straight	90°
M/346/LAU/1PV	-	-	12 ... 100	12 ... 125	50mA	32° ... 140° (0° ... 60°)	•	-	4.92 ft. (1.5m)	PVC	•	
M/346/LAU/5PV	-	-	12 ... 100	12 ... 125	50mA	32° ... 140° (0° ... 60°)	•	-	16.40 ft. (5m)	PVC	•	
-	M/346/EAU/1APV	-	10 ... 28	-	70mA	32° ... 140° (0° ... 60°)	•	-	4.92 ft. (1.5m)	PVC		•
-	M/346/EAU/5APV	-	10 ... 28	-	70mA	32° ... 140° (0° ... 60°)	•	-	16.40 ft. (5m)	PVC		•
-	M/345/EAU/1PV	-	10 ... 28	-	40mA	32° ... 140° (0° ... 60°)	•	-	3.28 ft. (1m)	PVC	•	
-	M/345/EAU/3PV	-	10 ... 28	-	40mA	32° ... 140° (0° ... 60°)	•	-	9.84 ft. (3m)	PVC	•	
-	-	M/345/EAN/1PV	4.5 ... 28	-	100mA	32° ... 140° (0° ... 60°)	•	NPN	3.28 ft. (1m)	PVC	•	
-	-	M/345/EAN/3PV	4.5 ... 28	-	100mA	32° ... 140° (0° ... 60°)	•	NPN	9.84 ft. (3m)	PVC	•	

# M/60270/M

Compact rotary actuators, Double acting  
Magnetic piston, Ø 14 ... 22 mm



**High torque levels from a compact product**

**Minimal radial or thrust shudder means smooth operation**

**Adjustable angle of rotation**

**Integral magnets for positional feedback**

## Ordering information

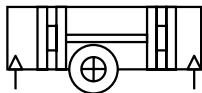
To order a compact rotary actuator with torque up to 23 in. lbs (2.6 Nm) at 87 psig (6 bar) and a 180° rotation quote: **M/60271/M/180**.

To order a compact rotary actuator with torque up to 65.5 in. lbs (7.4 Nm) at 87 psig (6 bar) and a 90° rotation quote: **M/60273/M/90**

## Accessories

Switch M/345 or M/346

**See page**  
ACT-13-7



## Technical data

Medium:

Compressed air filtered, lubricated or non-lubricated

Operating pressure:

14.5 to 101.5 psig (1 to 7 bar)

Operating temperature:

32°F to 140°F (+ 0°C to + 60°C)

Mounting:

Mounting holes on three faces

Rotation angle:

90°, 180°

Adjustable ± see table on page ACT-13-6

## Materials

Body: aluminum alloy

End covers: aluminum alloy

Shaft: carbon steel

External shaft cover and screws: mild steel

External nuts: mild steel

External screws: chrome molybdenum steel

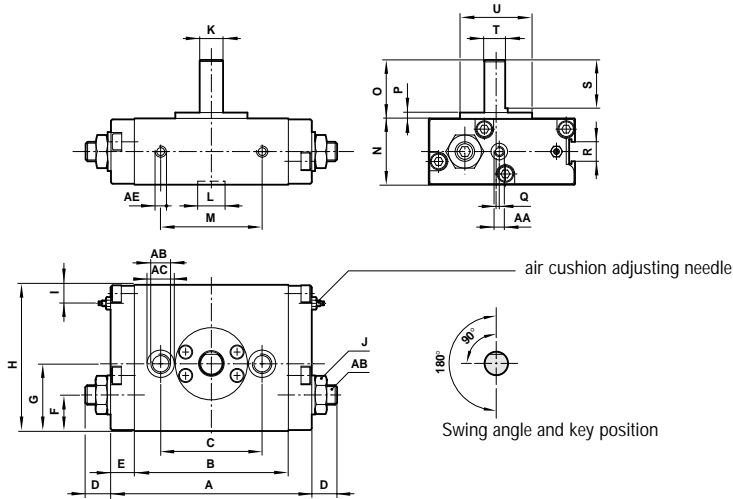
## Barb fittings connections

M5 x 1/8" tube ID, straight barb, part number **29217X305**



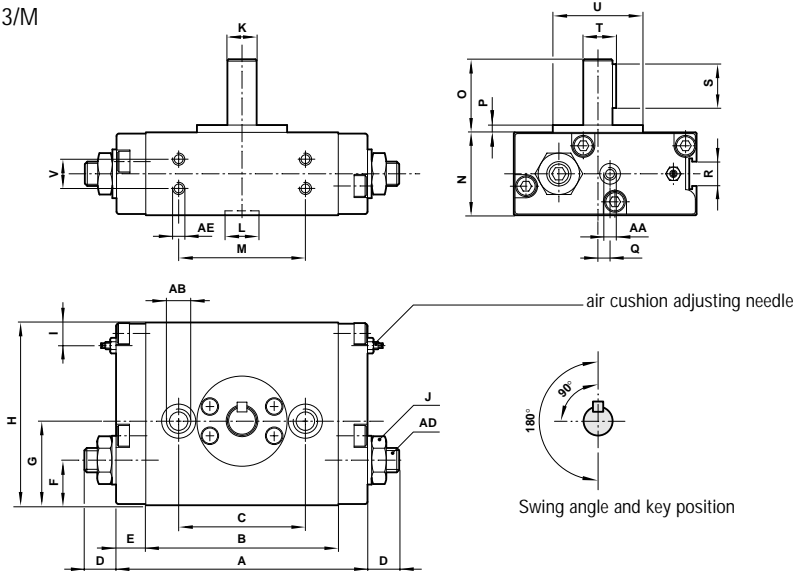
Basic dimensions

M/60270/M



M/60270/M*	Ø	A	B	C	D	E	F	G	H	I	J	K		L		
	14	3.46 (88)	2.68 (68)	1.89 (48)	0.43 (11)	0.39 (10)	0.67 (17)		2.36 (60)	0.31 (8)	0.39 A/F (10 A/F)	Ø 0.31h7 - 0.0006 (Ø8h7 - 0.015)		Ø 0.39 + 0.002 deep 0.06 (Ø10 + 0.05 deep 1.5)		
M/60270/M*	Ø	M	N	O	P	Q	R	S	T	U	AA	AB	AC	AD	AE	lb (kg)
	14	1.77 (45)	1.10 (28)	0.79 (20)	0.08 (2)	0.06 (1.5)	0.39 (10)	0.63 (16)	0.28 (7)	Ø1.02 - 0.002 (Ø26 - 0.05)	M5 X 0.8	M6 X 1	Ø 0.37 deep 0.22 (Ø9.5 deep 5.5)	M6 X 1	M5 X 0.8 deep 0.24 (M5 X 0.8 deep 6)	0.92 (0.46)

M/60271/M ... M/60273/M



M/60271/M/90	Ø	A	B	C	D	E	F	G	H	I	J										
M/60271/M/180	Ø	A	B	C	D	E	F	G	H	I	J										
M/60272/M/90	Ø	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
M/60272/M/180	Ø	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
M/60273/M/90	Ø	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
M/60273/M/180	Ø	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
M/60271/M/90	Ø	U	V	AA	AB	AC	AD	AE	lb		kg										
M/60271/M/180	Ø	U	V	AA	AB	AC	AD	AE	lb		kg										
M/60272/M/90	Ø	U	V	AA	AB	AC	AD	AE	lb		kg										
M/60272/M/180	Ø	U	V	AA	AB	AC	AD	AE	lb		kg										
M/60273/M/90	Ø	U	V	AA	AB	AC	AD	AE	lb		kg										
M/60273/M/180	Ø	U	V	AA	AB	AC	AD	AE	lb		kg										



Standard models ● Theoretical torque ● Angle of rotation ● Angle adjustment range ● Permissible forces ● Air consumption

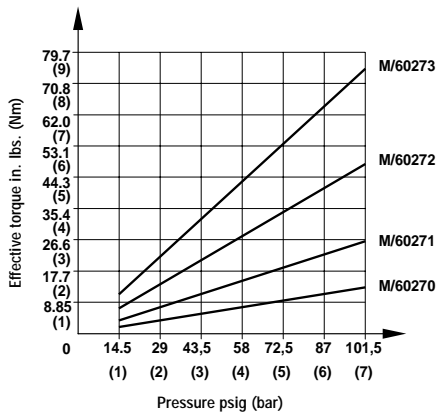
Model	Theoretical torque in. lb (Nm) at 6 bar	Angle of rotation	Angle adjustment range	Permissible forces lbs (N)		Air consumption in (cm <sup>3</sup> ) at 6 bar *
				Axial	Radial	
M/60270/M/90	13.3 (1.5)	90°	70° ... 95°	0.55 (2.45)	1.1 (4.90)	0.005 (0.09)
M/60270/M/180	13.3 (1.5)	180°	160° ... 185°	0.55 (2.45)	1.1 (4.90)	0.01 (0.18)
M/60271/M/90	23.0 (2.6)	90°	70° ... 95°	2.21 (9.81)	4.41 (19.6)	0.01 (0.17)
M/60271/M/180	23.0 (2.6)	180°	160° ... 185°	2.21 (9.81)	4.41 (19.6)	0.02 (0.33)
M/60272/M/90	40.7 (4.6)	90°	70° ... 95°	4.41 (19.6)	8.81 (39.2)	0.02 (0.27)
M/60272/M/180	40.7 (4.6)	180°	160° ... 185°	4.41 (19.6)	8.81 (39.2)	0.03 (0.55)
M/60273/M/90	65.5 (7.4)	90°	70° ... 95°	6.61 (29.4)	13.2 (58.8)	0.03 (0.44)
M/60273/M/180	65.5 (7.4)	180°	160° ... 185°	6.61 (29.4)	13.2 (58.8)	0.05 (0.89)

\* per cycle

Switches

Model Reed	Two wire solid state	Three wire solid state	Voltage V d.c.	V a.c.	Current Max.	Temperature °C	LED	Features	Cable Length	Cable Type	Cable Straight	Cable 90°
M/346/LAU/1PV	-	-	12 ... 100	12 ... 125	50mA	32° ... 140° (0° ... 60°)	•	-	4.92 ft. (1.5m)	PVC	•	
M/346/LAU/5PV	-	-	12 ... 100	12 ... 125	50mA	32° ... 140° (0° ... 60°)	•	-	16.40 ft. (5m)	PVC	•	
-	M/346/EAU/1APV	-	10 ... 28	-	70mA	32° ... 140° (0° ... 60°)	•	-	4.92 ft. (1.5m)	PVC		•
-	M/346/EAU/5APV	-	10 ... 28	-	70mA	32° ... 140° (0° ... 60°)	•	-	16.40 ft. (5m)	PVC		•
-	M/345/EAU/1PV	-	10 ... 28	-	40mA	32° ... 140° (0° ... 60°)	•	-	3.28 ft. (1m)	PVC	•	
-	M/345/EAU/3PV	-	10 ... 28	-	40mA	32° ... 140° (0° ... 60°)	•	-	9.84 ft. (3m)	PVC	•	
-	-	M/345/EAN/1PV	4.5 ... 28	-	100mA	32° ... 140° (0° ... 60°)	•	NPN	3.28 ft. (1m)	PVC	•	
-	-	M/345/EAN/3PV	4.5 ... 28	-	100mA	32° ... 140° (0° ... 60°)	•	NPN	9.84 ft. (3m)	PVC	•	

Theoretical torque





# Norgren Rotary Actuators

## Fixed and Variable Angle, Compressed Air Rotary Actuators

<b>Features and Products</b> .....	ACT-14-1
<b>Fixed Oscillating Angle Actuators</b> .....	ACT-14-2
<b>Variable Oscillating Angle Actuators</b> .....	ACT-14-6
<b>Standard Rotary Actuators</b> .....	ACT-14-10
<b>M/40, M/40/C, TM/40 and M/40/P Switches</b> .....	ACT-14-16
<b>M/41, M/42, M/42/P Switches</b> .....	ACT-14-18



**ACT-14-2 –  
Fixed Oscillating  
Angle Actuators**



**ACT-14-6 –  
Variable Oscillating  
Angle Actuators**



**ACT-14-10 –  
Standard Rotary Actuator**



**ACT-14-16 –  
M/40, M/40/C, TM/40,  
& M/40/P Switches**



**ACT-14-18 –  
M/41, M/42, M/42/P  
Switches**

- Suitable for torques from 0.5 to 144 in. lbs (0.058 to 16.27 Nm)
- Rotation angles from 90° to 270°
- Modern compact design

**Specifications**
**Medium:**

Lubricated or non-lubricated, filtered, compressed air

**Operation:**

Double acting rotary vane with buffer cushioning

M/60280/IE to C/60284/IE: single vane

C/60284/TI: double vane

**Operating Pressure:**

M/60280, M/60281: 44 to 102 psig (3 to 7 bar)

M/60282, C/60283: 29 to 102 psig (2 to 7 bar)

C/60284, C/60284/TI: 29 to 145 psig (2 to 10 bar)

**Operating Temperature:**

40° to 140° F (5° to 60°C)

**Porting:**

M5: M/60280, M/60281, M/60282

1/8 NPT: C/60283, C/60284, C/60284A/TI

**Rotation Angle:**

90°, 180°: M/60280 to C/60283

90°, 180°, 270°: C/60284

90°: C/60284/TI

**Rotation Angle Tolerance:**

0 to +4° M/60280 to C/60283

0 to +3° C/60284, C/60284A/TI

**Other Features:**

Drive-key is standard.

**Materials:**

Cast aluminium housing, steel shaft, sintered bronze shaft bearings, nitrile rubber seals.


**Ordering Information**

To order a Rotary Vane Actuator with torque up to 8 in. lbs. at 87 psig (0.9 Nm at 6 bar) and a 180° rotation, order:

M/60282A/180

To order a Rotary Vane Actuator with torque up to 80 in. lbs. at 87 psig (9 Nm at 6 bar) and a 90° rotation order:

C/60284A/TI/90

To order mounting brackets refer to appropriate actuator mounting table.

End position detection available on request.

Model	Max Theoretical Torque at 87 psig (6 bar) in. lbs. (Nm)	Permissible Axial Forces* lbs. Force (N)	Radial Force lbs. Force (N)	Permissible Rotation Energy** In. lbs (Nm)	Maximum Frequency*** (1/min)	Air Consumption cu. in. (cm <sup>3</sup> )			Wt. Wt lbs. (kg)	Wt. Styles B, G lbs. (kg)	Style C lbs. (kg)
						90°	180°	270°			
M/60280	1.15 (0.13)	0.22 (1.0)	2.21 (9.8)	0.03 (0.0003)	180 (at 180°)	0.03 (0.5)	0.06 (1.0)	—	0.09 (0.04)	0.02 (0.01)	0.04 (0.02)
M/60281	3.10 (0.35)	0.88 (3.9)	8.82 (39.2)	0.12 (0.001)	160 (at 180°)	0.15 (2.4)	0.16 (2.6)	—	0.15 (0.07)	0.04 (0.02)	0.09 (0.04)
M/60282	9.20 (1.04)	0.88 (3.9)	11.03 (49.0)	0.32 (0.003)	150 (at 180°)	0.31 (5.0)	0.52 (8.5)	—	0.31 (0.14)	0.07 (0.03)	0.11 (0.05)
C/60283	16.90 (1.91)	5.51 (24.5)	66.15 (294.0)	1.59 (0.015)	120 (at 180°)	0.73 (12.0)	—	—	0.79 (0.36)	0.11 (0.05)	0.20 (0.09)
C/60284	35.58 (4.02)	6.62 (29.4)	88.20 (392.0)	2.66 (0.025)	70 (at 170°)	2.26 (37.0)	—	2.62 (43.0)	1.04 (0.47)	0.22 (0.10)	0.44 (0.20)
C/60284A/TI	82.39 (9.31)	6.62 (29.4)	88.20 (392.0)	2.66 (0.025)	200 (at 90°)	2.07 (34.0)	—	—	1.06 (0.48)	0.22 (0.10)	0.44 (0.20)

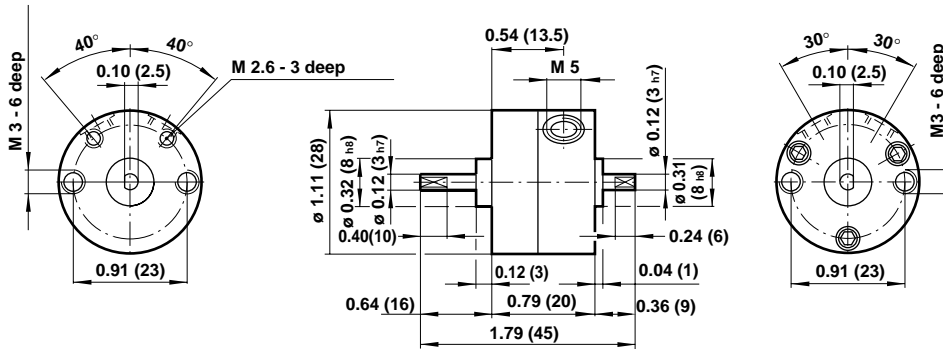
\* Permissible load on rotary vane shaft

\*\* Permissible rotational energy in psig (Nm) which may be applied to shaft. It can be calculated as follows: Permissible rotational energy  $\geq 1/2 I \omega^2$ , I = Angular moment,  $\omega$  = Mean angular velocity.

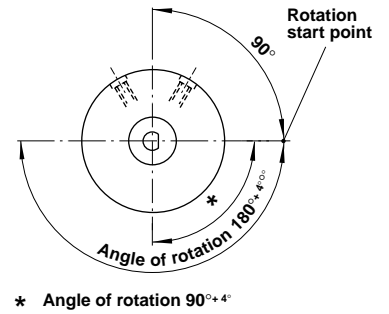
\*\*\* Maximum frequency at 73 psig (5 bar) pressure, no load.



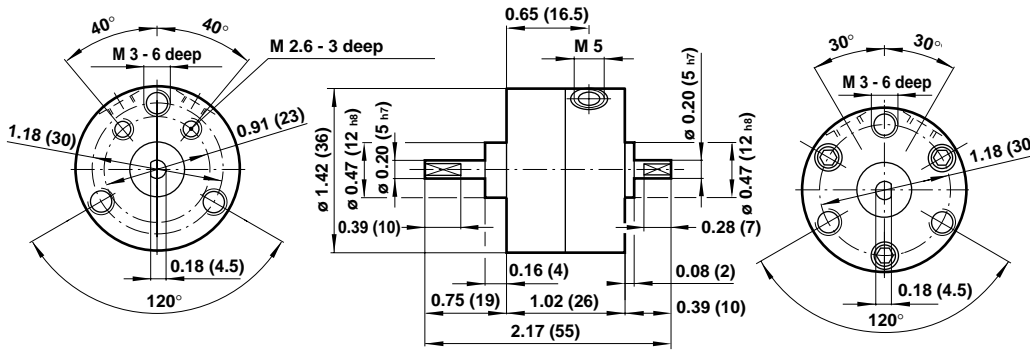
## Basic Dimensions for M/60280



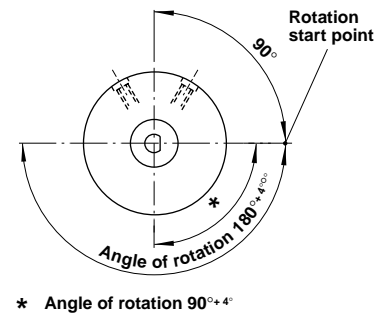
## Rotation Starting Point



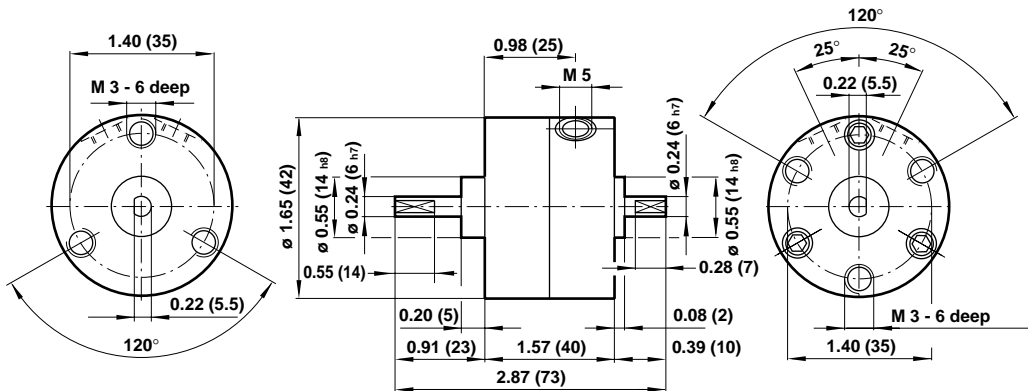
## Basic Dimensions for M/60281



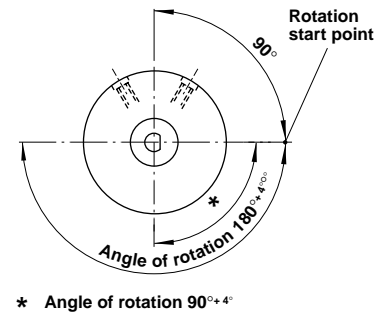
## Rotation Starting Point



## Basic Dimensions for M/60282



## Rotation Starting Point

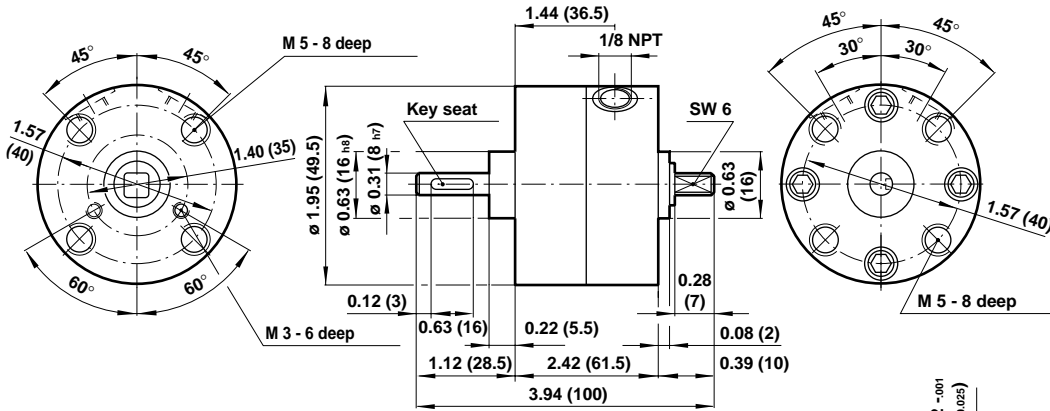




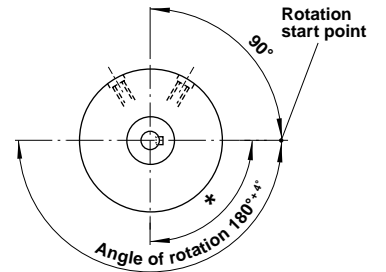
# Rotary Actuators

All Dimensions in Inches (mm)

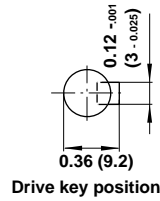
## Basic Dimensions for C/60283



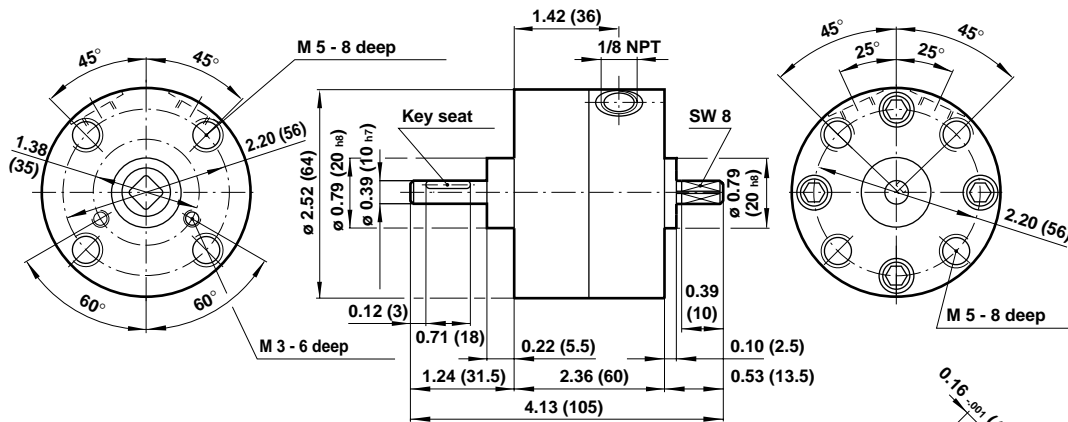
## Rotation Start Point



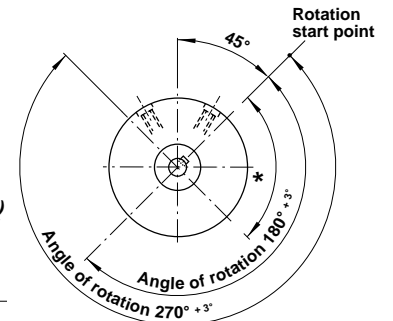
\* Angle of rotation 90° ± 4°



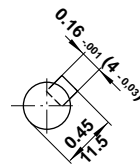
## Basic Dimensions for C/60284 and C/60284/TI



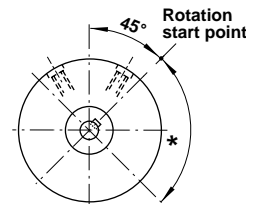
## Rotation Start Point C/60284



\* Angle of rotation 90° ± 3°



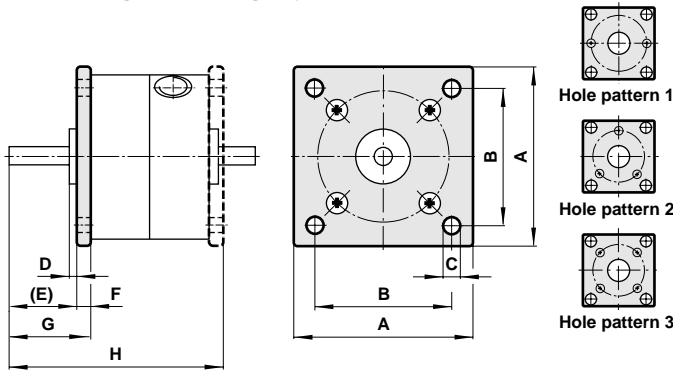
## C/60284/TI



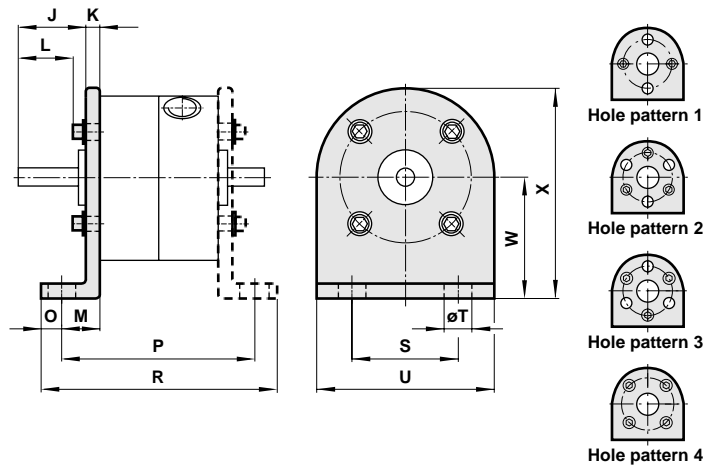
\* Angle of rotation 90° ± 4°



## Rear Flange Mounting Style B Front Flange Mounting Style G



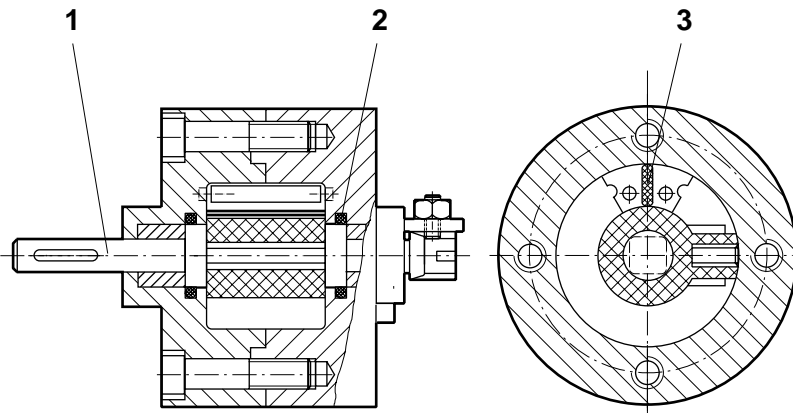
## Foot Mounting Style C



Model B,G Actuator	QM/60280A/22 60280	QM/60281A/22 60281	QM/60282A/22 60282	QM/60283A/22 60283	QM/60284A/22 60284	Model C Actuator	QM/60280A/21 60280	QM/60281A/21 60281	QM/60282A/21 60282	QM/60283A/21 60283	QM/60284A/21 60284
<b>A</b>	1.18 (30.0)	1.46 (37.0)	1.65 (42.0)	1.97 (50.0)	2.52 (64.0)	<b>J</b>	0.55 (14.0)	0.65 (16.5)	0.79 (20.0)	0.98 (25.0)	1.06 (27.0)
<b>B</b>	0.94 (24.0)	1.18 (30.0)	1.34 (34.0)	1.61 (41.0)	2.05 (52.0)	<b>K</b>	0.08 (2.0)	0.10 (2.5)	0.12 (3.0)	0.14 (3.5)	0.18 (4.5)
<b>ØC</b>	0.13 (3.4)	0.13 (3.4)	0.14 (3.5)	0.22 (5.5)	0.22 (5.5)	<b>L</b>	0.41 (10.5)	0.49 (12.5)	0.63 (16.0)	0.73 (18.5)	0.81 (20.5)
<b>D</b>	0.04 (1.0)	0.06 (1.5)	0.08 (2.0)	0.08 (2.0)	0.08 (2.0)	<b>M</b>	0.39 (10.0)	0.43 (11.0)	0.47 (12.0)	0.59 (15.0)	0.71 (18.0)
<b>E</b>	0.55 (14.0)	0.65 (16.5)	0.79 (20.0)	0.98 (25.0)	1.10 (28.0)	<b>O</b>	0.20 (5.0)	0.28 (7.0)	0.31 (8.0)	0.39 (10.0)	0.47 (12.0)
<b>F</b>	0.08 (2.0)	0.10 (2.5)	0.12 (3.0)	0.14 (3.5)	0.14 (3.5)	<b>P</b>	1.57 (40.0)	1.89 (48.0)	2.52 (64.0)	3.60 (91.5)	3.78 (96.0)
<b>G</b>	0.63 (16.0)	0.75 (19.0)	0.91 (23.0)	1.12 (28.5)	1.24 (31.5)	<b>R</b>	1.97 (50.0)	2.44 (62.0)	3.15 (80.0)	4.39 (111.5)	4.72 (120.0)
<b>H</b>	1.50 (38.0)	0.20 (5.0)	2.56 (65.0)	3.68 (93.5)	3.74 (95.0)	<b>S</b>	0.79 (20.0)	1.02 (26.0)	1.18 (30.0)	1.42 (36.0)	1.89 (48.0)
<b>Hole Pattern Rotation*</b>	1 180°	2 120°	2 120°	3 90°	3 90°	<b>ØT</b>	0.19 (4.8)	0.19 (4.8)	0.23 (5.8)	0.28 (7.0)	0.26 (6.5)
						<b>U</b>	1.18 (30.0)	1.42 (36.0)	1.65 (42.0)	1.93 (49.0)	2.60 (66.0)
						<b>W</b>	0.87 (22.0)	0.98 (25.0)	1.18 (30.0)	1.34 (34.0)	1.65 (42.0)
						<b>X</b>	1.46 (37.0)	1.69 (43.0)	2.01 (51.0)	2.30 (58.5)	2.95 (75.0)
						<b>Hole Pattern Rotation*</b>	1 90°	2 60°	3 60°	4 90°	4 90°

\*The mountings can be rotated through the angle shown

## Spares



Model	Spares kit	Model	Spares kit	Item	Kit Consists of Description	Quantity
M/60280	QM/60280A/00	C/60283	QM/60283A/00	1	Shaft with vane	1
M/60281	QM/60281A/00	C/60284	QM/60284A/00	2	O-ring	2
M/60282	QM/60282A/00	C/60284A/TI	QM/60284A/TI/00	3	Seal	1 (2)

( ) for .../TI

## Adjustable Oscillating Angle Mini Rotary Actuators

- Suitable for torques from 1.33 to 144 in. lbs (0.15 to 16.27 Nm)
- Angle of rotation infinitely adjustable between 30° to 270°
- Modern compact design

### Specifications

#### Medium:

Lubricated or non-lubricated, filtered, compressed air

#### Operation:

Double acting rotary vane with buffer cushioning and adjustable rotation angles

M/60281A/IE to C/60284A/IE: single vane

C/60284A/TE: double vane

#### Operating Pressure:

44 to 102 psig (3 to 7 bar) M/60281A/IE

29 to 102 psig (2 to 7 bar) M/60282A/IE

29 to 145 psig (2 to 10 bar) C/60283A/IE, C/60284A/IE, C/60284A/TE

#### Operating Temperature:

40° to 140°F (5° to 60°C)

#### Porting:

M5: M/60281A/IE, M/60282A/IE

1/8 NPT: C/60283A/IE, C/60284A/IE, C/60284A/TE

#### Rotation Angle:

180°: (30 to 180° adjustable) M/60281A/IE, M/60282A/IE, C/60283A/IE

270°: (30 to 270° adjustable) C/60284A/IE

90°: (30 to 90° adjustable) C/60284A/TE

#### Rotation Angle Tolerance (fine adjustment):

-9° to +3° range and maximum angle setting

±3° rotation reference point

#### Other Features:

Drive-key is standard.

#### Materials:

Cast aluminium housing, steel shaft, sintered bronze shaft bearings, nitrile rubber seals.



### Ordering Information

To order a Rotary Vane Actuator with torque up to 8 in. lbs. at 87 psig (0.9 Nm at 6 bar) and a 180° rotation quote: M/60282A/IE

To order a Rotary Vane Actuator with torque up to 80 in. lbs. at 87 psig. (9 Nm at 6 bar) and a 270° rotation quote: C/60284A/TE

To order mounting brackets refer to appropriate actuator mounting table.

End position detection available on request.

Model	Max. Theoretical Torque at 87 psig (6 bar) in. lbs. (Nm)	Permissible Axial Forces* lbs. Force (N)	Radial Force lbs. Force (N)	Permissible Rotation Energy** In. lbs (Nm)	Maximum Frequency*** (cycles per min)	Air Consumption cu. in. (cm <sup>3</sup> )Wt per cycle	Styles B,G lbs. (kg)	Wt. Style C lbs. (kg)	Wt. lbs. (kg)
M/60281A/IE	3.10 (0.35)	0.88 (3.9)	8.82 (39.2)	0.12 (.001)	160 (at 180°)	0.16 (2.6)	0.15 (0.07)	0.04 (0.02)	0.09 (0.04)
M/60282A/IE	9.20 (1.04)	0.88 (3.9)	11.03 (49.0)	0.21 (.002)	150 (at 180°)	0.52 (8.5)	0.37 (0.17)	0.07 (0.03)	0.11 (0.05)
C/60283A/IE	16.90 (1.91)	5.51 (24.5)	66.15 (294.0)	0.32 (.003)	120 (at 180°)	0.98 (16.0)	0.86 (0.39)	0.11 (0.05)	0.20 (0.09)
C/60284A/IE	35.58 (4.02)	6.62 (29.4)	88.20 (392.0)	0.74 (.007)	70 (at 270°)	2.62 (43.0)	1.12 (0.51)	0.22 (0.10)	0.44 (0.20)
C/60284A/TE	82.39 (9.31)	6.62 (29.4)	88.20 (392.0)	0.74 (.007)	200 (at 90°)	2.07 (34.0)	1.17 (0.53)	0.22 (0.10)	0.44 (0.20)

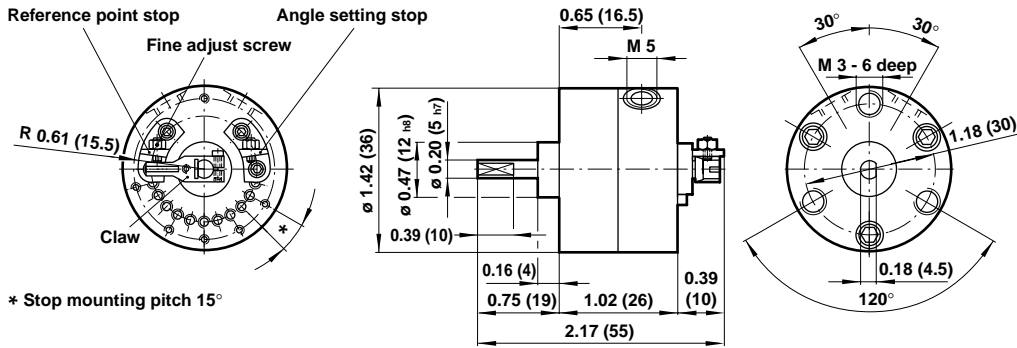
\* Permissible load on rotary vane shaft

\*\* Permissible rotational energy in psig (Nm) which may be applied to shaft. It can be calculated as follows: Permissible rotational energy  $\geq 1/2 I \omega^2$ , I = Angular moment,  $\omega$  = Mean angular velocity.

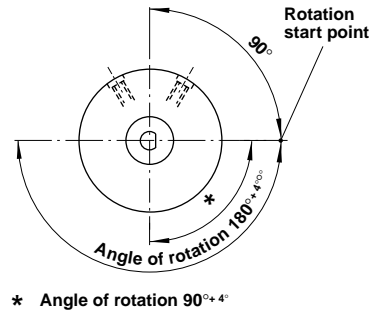
\*\*\* Maximum frequency at 73 psig (5 bar) pressure, no load.



## Basic Dimensions for M/60281A/IE (30° to 180°)



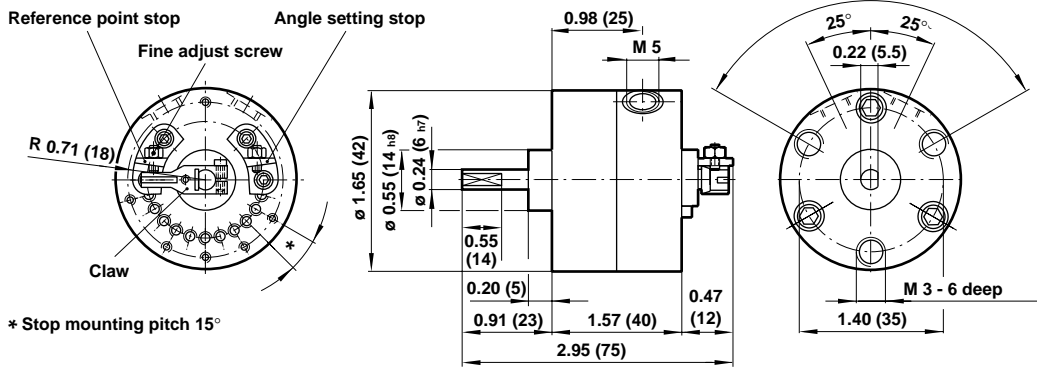
## Rotation Start Point



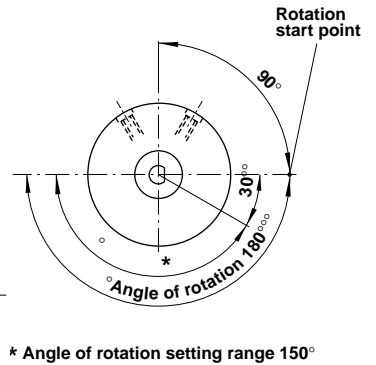
\* Stop mounting pitch 15°

\* Angle of rotation 90°<sup>±.4°</sup>

## Basic Dimensions for M/60282A/IE (30° to 180°)



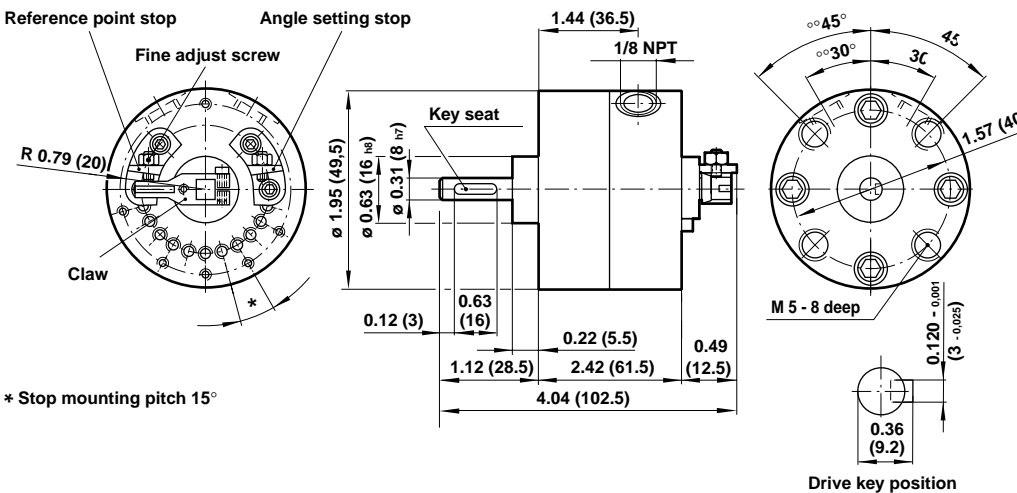
## Rotation Start Point



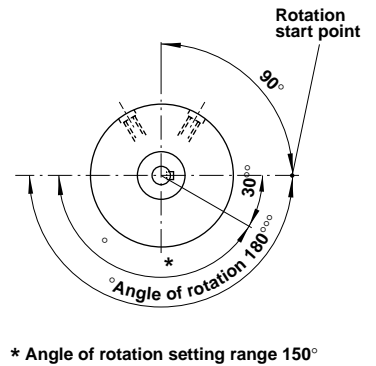
\* Stop mounting pitch 15°

\* Angle of rotation setting range 150°

## Basic Dimensions for C/60283A/IE (30° to 180°)



## Rotation Start Point



\* Stop mounting pitch 15°

\* Angle of rotation setting range 150°

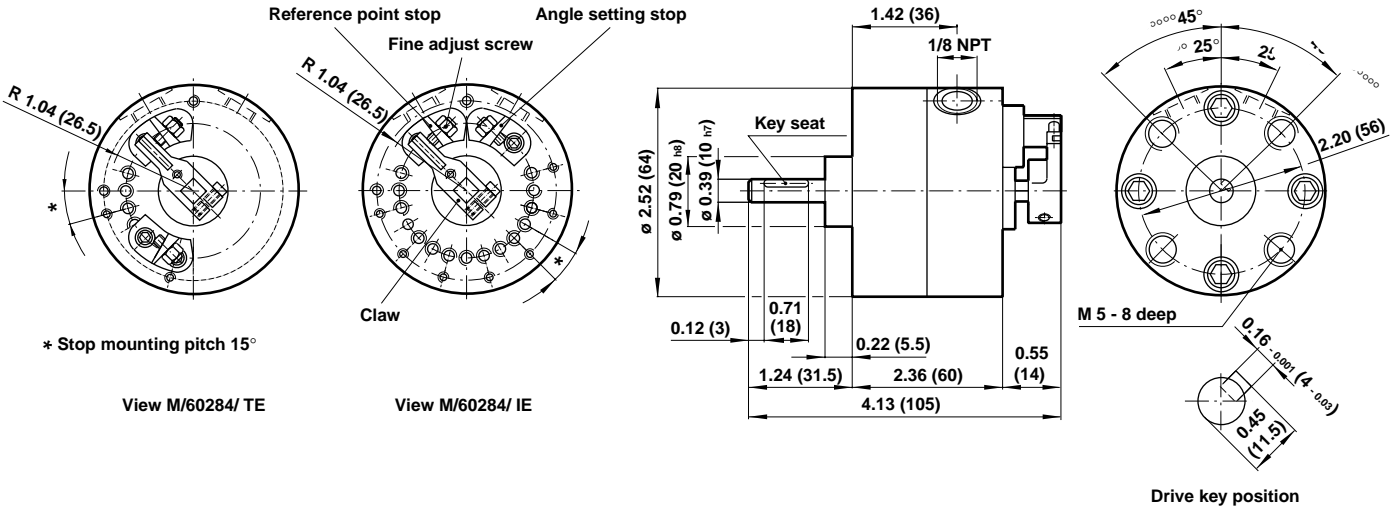
Drive key position



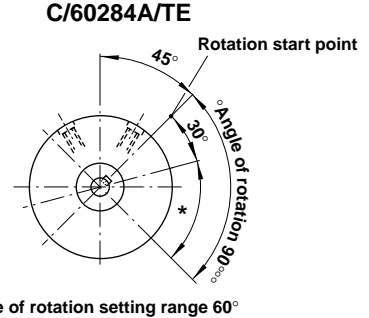
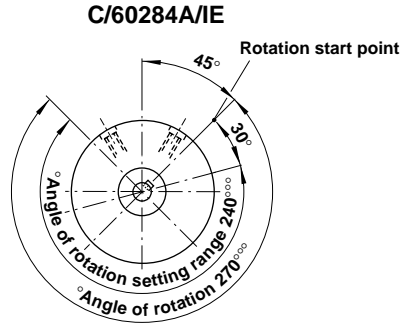
# Rotary Actuators

All Dimensions in Inches (mm)

## Basic Dimensions for C/60284A/IE (30° to 270°) and C/60284A/TE (30° to 90°)



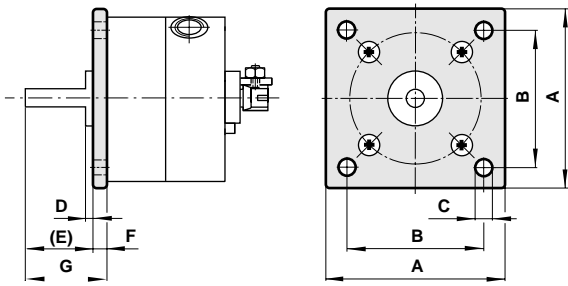
### Rotation Start Point







## Front Flange Mounting Style G

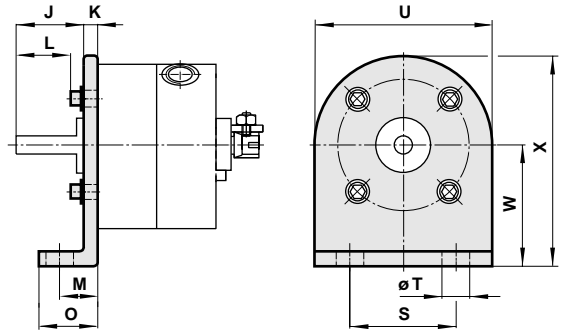


Hole pattern 2



Hole pattern 3

## Foot Mounting Style C



Hole pattern 2



Hole pattern 3

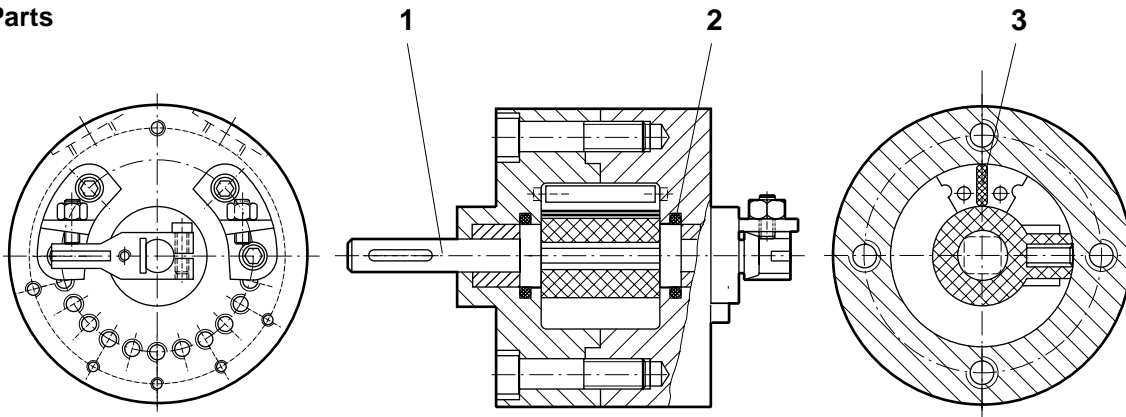


Hole pattern 4

Model G Actuator	QM/60281A/22 60281	QM/60282A/22 60282	QM/60283A/22 60283	QM/60284A/22 60284	Model C Actuator	QM/60281A/21 60281	QM/60282A/21 60282	QM/60283A/21 60283	QM/60283A/21 60284
A	1.46 (37.0)	1.65 (42.0)	1.97 (50.0)	2.52 (64.0)	J	0.65 (16.5)	0.79 (20.0)	0.98 (25.0)	1.06 (27.0)
B	1.18 (30.0)	1.34 (34.0)	1.61 (41.0)	2.05 (52.0)	K	0.10 (2.5)	0.12 (3.0)	0.14 (3.5)	0.18 (4.5)
ØC	0.13 (3.4)	0.14 (3.5)	0.22 (5.5)	0.22 (5.5)	L	0.49 (12.5)	0.63 (16.0)	0.73 (18.5)	0.81 (20.5)
D	0.06 (1.5)	0.08 (2.0)	0.08 (2.0)	0.08 (2.0)	M	0.43 (11.0)	0.47 (12.0)	0.59 (15.0)	0.71 (18.0)
E	0.65 (16.5)	0.79 (20.0)	0.98 (25.0)	1.10 (28.0)	O	0.71 (18.0)	0.79 (20.0)	0.98 (25.0)	1.18 (30.0)
F	0.10 (2.5)	0.12 (3.0)	0.14 (3.5)	0.14 (3.5)	S	1.02 (26.0)	1.18 (30.0)	1.42 (36.0)	1.89 (48.0)
G	0.75 (19.0)	0.91 (23.0)	1.12 (28.5)	1.24 (31.5)	ØT	0.19 (4.8)	0.23 (5.8)	0.28 (7.0)	0.26 (6.5)
Hole Pattern	2	2	3	3	U	1.42 (36.0)	1.65 (42.0)	1.93 (49.0)	2.60 (66.0)
Rotation*	120°	120°	90°	90°	W	0.98 (25.0)	1.18 (30.0)	1.34 (34.0)	1.65 (42.0)
					X	1.69 (43.0)	2.01 (51.0)	2.30 (58.5)	2.95 (75.0)
					Hole Pattern	2	3	4	4
					Rotation*	60°	60°	90°	90°

\*These mountings can be rotated through the angle shown

## Repair Parts



Model	Spares kit	Item	Kit Consists of Description	Quantity
M/60281A/IE	QM/60281A/00	1	Shaft with vane	1
M/60282A/IE	QM/60282A/00	2	O-ring	2
C/60283A/IE	QM/60283A/00	3	Seal	1 (2)
C/60284A/IE	QM/60284A/00			
C/60284A/TE	QM/60284A/TE/00			

( ) for .../TE

- Suitable for torques from 11 to 3562 in. lbs (1.23 to 402.46 Nm)
- Rotation angles from 90° to 270°
- High torque from compact units



### Specifications

#### Medium:

Lubricated or non-lubricated, filtered, compressed air

#### Operation:

Double acting rotary vane with buffer cushioning

C/60285 to C/60288 single vane

C/60285A/TI to C/60288A/TI double vane

#### Operating Pressure:

29 to 145 psig (2 to 10 bar)

#### Operating Temperature:

40° to 140° F (5° to 60°C)

#### Porting:

1/8 NPT: C/60285, C/60285A/TI

1/4 NPT: C/60286, C/60286A/TI

3/8 NPT: C/60287, C/60287A/TI

1/2 NPT: C/60288, C/60288A/TI

#### Rotation Angle:

90°, 180°, 270°: single vane

90°: double vane

#### Rotation Angle Tolerance:

0° to +3°

#### Other Features:

Drive-key is standard.

#### Materials:

Cast aluminum housing, steel shaft, sintered bronze shaft bearings, nitrile rubber seals.

### Ordering Information

To order a Rotary Vane Actuator with torque up to 150 in. lbs. at 87 psig (17 Nm at 6 bar) and a 90° rotation quote: C/60286/90

To order a Rotary Vane Actuator with torque up to 2133 in. lbs. at 87 psig (241 Nm at 6 bar) and a 90° rotation quote: C/60288A/TI/90

To order mounting brackets refer to appropriate actuator mounting table. Order magnetically operated switches separately.



## Technical Data for C/60285 to C/60288

Model	Max. Theoretical Torques at 87 psig (6 bar) in. lbs. (Nm)	Permissible forces*		Permissible rotation energy** ft. lbs. (Nm)	Maximum frequency*** (cycles per min)			Air consumption cu. in. (cm <sup>3</sup> ) per cycle			Weight			Wt. lbs. (kg)	
		axial lbs. force (N)	radial lbs. force (N)		90°	180°	270°	90°	180°	270°	90°	180°	270°	Style B, G	Style C
<b>C/60285</b>	51.15 (5.8)	9.9 (44)	132.3 (588)	0.43 (0.049)	180	90	60	3.11 (51)	3.11 (51)	3.72 (61)	1.81 (0.8)	1.74 (0.8)	1.61 (0.7)	0.44 (0.2)	0.57 (0.3)
<b>C/60285A/TI</b>	111.07 (12.6)				180	-	-	2.56 (42)	-	-	1.81 (0.8)	-	-		
<b>C/60286</b>	156.20 (17.7)	19.8 (88)	264.6 (1176)	1.99 (0.225)	120	80	50	8.91 (146)	8.91 (146)	10.92 (179)	4.41 (2.0)	4.19 (1.9)	3.75 (1.7)	1.12 (0.5)	2.51 (1.1)
<b>C/60286A/TI</b>	360.11 (40.7)				120	-	-	7.75 (127)	-	-	4.41 (2.0)	-	-		
<b>C/60287</b>	299.40 (33.8)	33.1 (147)	441 (1960)	9.54 (1.078)	90	60	40	14.88 (244)	17.26 (283)	21.47 (352)	8.16 (3.7)	8.16 (3.7)	8.16 (3.7)	-	2.73 (1.2)
<b>C/60287A/TI</b>	720.30 (81.4)				90	-	-	14.88 (244)	-	-	9.48 (4.3)	-	-		
<b>C/60288</b>	1070.05 (120.9)	110.3 (490)	1102.5 (4900)	34.7 (3.920)	65	45	30	45.99 (754)	53.01 (869)	63.20 (1036)	28.00 (12.7)	26.90 (12.2)	24.70 (11.2)	-	9.81 (4.5)
<b>C/60288A/TI</b>	2139.31 (241.7)				65	-	-	45.99 (754)	-	-	28.00 (12.7)	-	-		

\* Permissible load on rotary vane shaft

\*\*Permissible rotational energy in in. lbs. (Nm) which may be applied to shaft. It can be calculated as follows:  
Permissible rotational energy  $\geq 1/2 I \omega^2$ , I = Angular moment,  $\omega$  = Mean angular velocity

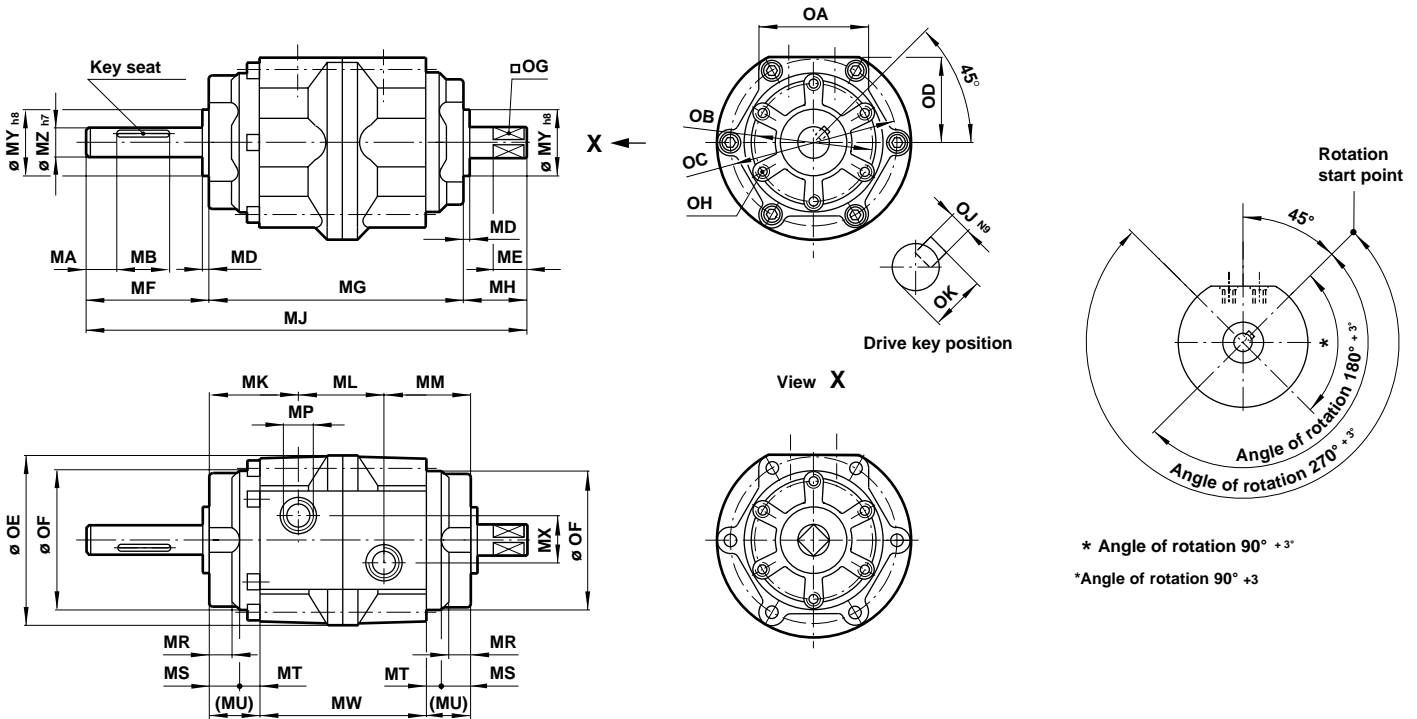
\*\*\*Maximum frequency at 73 psig (5 bar) pressure, no load.



# Rotary Actuators

All Dimensions in Inches (mm)

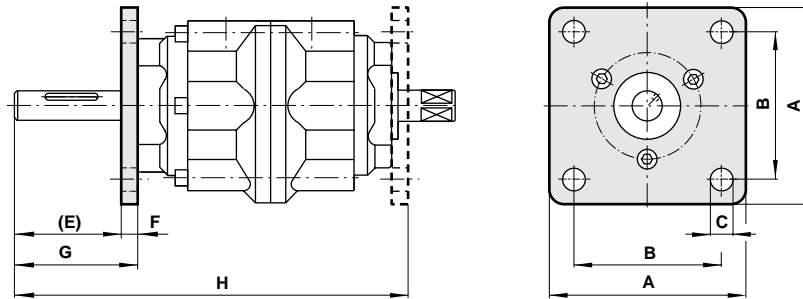
## Basic Dimensions for C/60285 to C/60288



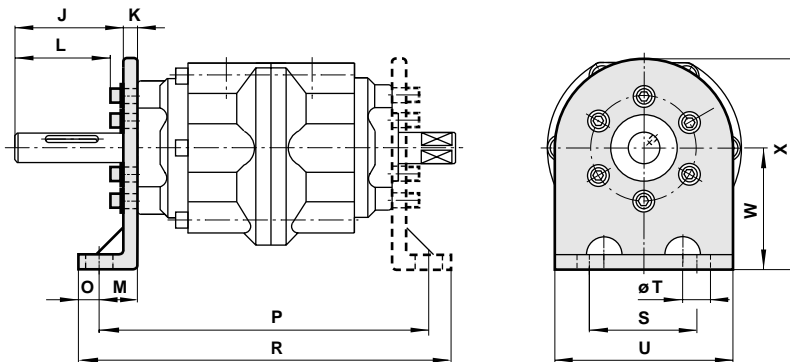
Model	MA	MB	MD	ME	MF	MG	MH	MJ	MK	ML
<b>60285</b>	0.20 (5.0)	0.79 (20.0)	0.10 (2.5)	0.51 (13.0)	1.56 (39.5)	2.20 (56.0)	0.77 (19.5)	5.71 (145.0)	1.14 (29.0)	1.10 (28.0)
<b>60286</b>	0.20 (5.0)	1.42 (36.0)	0.12 (3.0)	0.63 (16.0)	2.11 (53.5)	4.06 (103.0)	0.93 (23.5)	7.09 (180.0)	1.36 (34.5)	1.34 (34.0)
<b>60287</b>	0.20 (5.0)	1.57 (40.0)	0.14 (3.5)	0.87 (22.0)	2.56 (65.0)	4.92 (125.0)	1.18 (30.0)	8.66 (220.0)	1.63 (41.5)	1.65 (42.0)
<b>60288</b>	0.39 (10.0)	1.57 (40.0)	0.18 (4.5)	1.38 (35.0)	2.74 (69.5)	6.73 (171.0)	1.75 (44.5)	11.22 (285.0)	2.11 (53.5)	2.52 (64.0)
Model	MM	MP	MR	MS	MT	MU	MW	MX	ØMYH8	ØMZH7
<b>60285</b>	1.14 (29.0)	1/8 NPT	0.43 (11.0)	0.55 (14.0)	0.24 (6.0)	0.79 (20.0)	1.81 (46.0)	0.63 (16.0)	0.98 (25.0)	0.47 (12.0)
<b>60286</b>	1.36 (34.5)	1/4 NPT	0.41 (10.5)	0.61 (15.5)	0.31 (8.0)	0.93 (23.5)	2.09 (53.0)	0.94 (24.0)	1.18 (30.0)	0.67 (17.0)
<b>60287</b>	1.63 (41.5)	3/8 NPT	0.51 (13.0)	0.69 (17.5)	0.39 (10.0)	1.08 (27.5)	2.76 (70.0)	1.26 (32.0)	1.77 (45.0)	0.98 (25.0)
<b>60288</b>	2.11 (53.5)	1/2 NPT	0.57 (14.5)	0.83 (21.0)	0.45 (11.5)	1.28 (32.5)	4.17 (106.0)	1.73 (44.0)	2.76 (70.0)	1.57 (40.0)
Model	OA	Ø08	Ø0C	OD	ØOE	ØOF	OG-0.1	OH	OJN9	OK
<b>60285</b>	1.73 (44.0)	1.77 (45.0)	2.68 (68.0)	1.42 (36.0)	3.11 (79.0)	2.28 (58.0)	0.39 (10.0)	M6-9 deep	0.16 (4.0)	0.53 (13.5)
<b>60286</b>	2.40 (61.0)	2.76 (70.0)	3.82 (97.0)	2.01 (51.0)	4.33 (110.0)	3.37 (85.5)	0.51 (13.0)	M8-12 deep	0.20 (5.0)	0.75 (19.0)
<b>60287</b>	3.07 (78.0)	3.15 (80.0)	4.92 (125.0)	2.60 (66.0)	5.57 (141.5)	4.33 (110.0)	0.75 (19.0)	M10-15 deep	0.28 (7.0)	1.10 (28.0)
<b>60288</b>	4.33 (110.0)	4.72 (120.0)	6.81 (173.0)	3.54 (90.0)	7.72 (196.0)	5.98 (152.0)	1.26 (32.0)	M12-18 deep	0.47 (12.0)	1.69 (43.0)



## Rear Flange Mounting Style 'B' Front Flange Mounting Style 'G'



## Foot Mounting Style 'C'



Model B, G Actuator	QM/60285A/22 60285	QM/60286A/22 60286	Model C Actuator	QM/60285A/21 60285	QM/60286A/21 60286	QM/60287A/21 60287	QM/60288A/21 60288
<b>A</b>	3.15 (80.0)	4.33 (110.0)	<b>J</b>	1.38 (35.0)	1.71 (43.5)	2.09 (53.0)	2.15 (54.5)
<b>B</b>	2.52 (64.0)	3.46 (88.0)	<b>K</b>	0.18 (4.5)	0.39 (10.0)	0.47 (12.0)	0.59 (15.0)
<b>ØC</b>	0.28 (7.0)	0.35 (9.0)	<b>L</b>	1.08 (27.5)	1.32 (33.5)	1.59 (40.5)	1.56 (39.5)
<b>E</b>	1.38 (35.0)	1.87 (47.5)	<b>M</b>	6.00 (25.0)	1.10 (28.0)	1.26 (32.0)	1.38 (35.0)
<b>F</b>	0.18 (4.5)	0.24 (6.0)	<b>O</b>	0.39 (10.0)	0.47 (12.0)	0.51 (13.0)	0.59 (15.0)
<b>G</b>	1.56 (39.5)	2.11 (53.5)	<b>P</b>	5.35 (136.0)	6.26 (159.0)	7.44 (189.0)	9.49 (241.0)
<b>H</b>	5.12 (130.0)	6.40 (162.5)	<b>R</b>	6.14 (156.0)	7.20 (183.0)	8.46 (215.0)	10.67 (271.0)
<b>Rotation*</b>	60°	60°	<b>S</b>	2.17 (55.0)	3.15 (80.0)	3.94 (100.0)	5.51 (140.0)
			<b>ØT</b>	0.43 (11.0)	0.51 (13.0)	0.59 (15.0)	0.59 (15.0)
			<b>U</b>	2.95 (75.0)	4.33 (110.0)	5.51 (140.0)	7.87 (200.0)
			<b>W</b>	1.77 (45.0)	2.56 (65.0)	3.15 (80.0)	4.33 (110.0)
			<b>X</b>	3.25 (82.5)	4.53 (115.0)	5.31 (135.0)	7.28 (185.0)
			<b>Rotation*</b>	60°	60°	60°	60°

\*The mountings can be rotated through the angle shown.



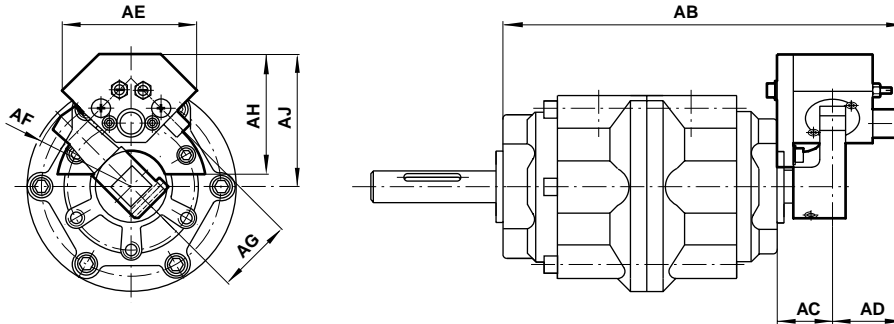
# Rotary Actuators

All Dimensions in Inches (mm)

## Technical Data for Hydro-Cushion

Model	Minimum operating pressure psig (bar)	Operating temperature F° (C°)	Load range cu. in. (kg x cm <sup>2</sup> )	Maximum absorption energy ft. lbs. (Nm)	Maximum absorption energy ft. lbs./min (Nm/min)	Absorbing angle	Maximum collision angular Velocity (°/s)	wt. lbs. (kg)
QM/60285A/60	44 (3)	40 to 120 F° (5 to 50 C°)	5.98 (98.1)	25.7 (2.9)	177.0 (20)	11°	850	0.53 (0.24)
QM/60286A/60	44 (3)	40 to 120 F° (5 to 50 C°)	17.9 (294.2)	86.7 (9.8)	628.4 (71)	11°	750	0.93 (0.42)
QM/60287A/60	44 (3)	40 to 120 F° (5 to 50 C°)	35.89 (588.4)	173.5 (19.6)	1212.5 (137)	11°	650	1.72 (0.78)

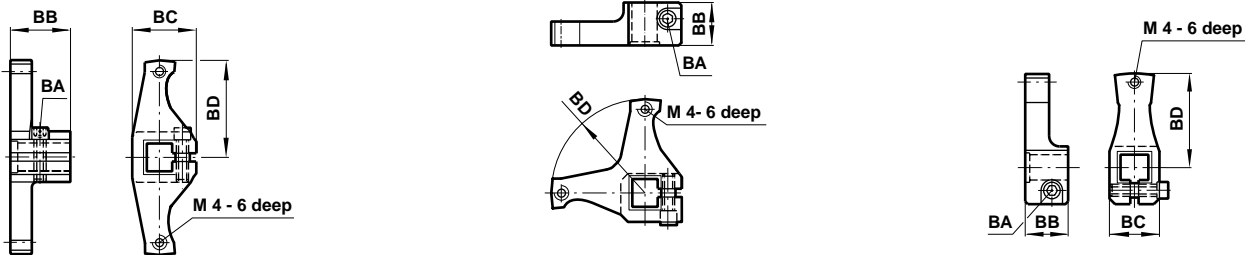
### Dimensional Information for Hydro-cushion kit



Model	AB	AC	AD	AE	AF	AG	AH	AJ
QM/60285A/60	5.37 (136.5)	0.81 (20.5)	1.18 (30.0)	2.20 (56.0)	1.50 (38.0)	1.34 (34.0)	1.97 (50.0)	2.13 (54.0)
QM/60286A/60	6.28 (159.5)	0.89 (22.5)	1.34 (34.0)	3.15 (80.0)	2.01 (51.0)	1.81 (46.0)	2.44 (62.0)	2.81 (71.5)
QM/60287A/60	7.38 (187.5)	1.00 (25.5)	1.46 (37.0)	3.74 (95.0)	2.68 (68.0)	2.44 (62.0)	3.43 (87.0)	3.74 (95.0)

### Claw

(for hydro-cushion, magnetic and non-magnetic sensing)

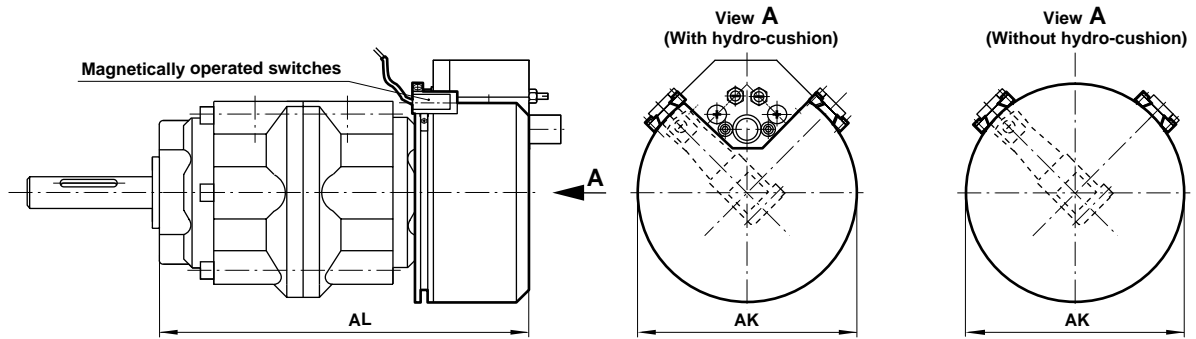


Model	Actuator	BA (A/F)	BB	BC	BD
M/P70088 (90°), M/P70089 (180°), M/P70090 (270°)	60285	0.16 (4)	0.71 (18)	0.91 (23)	1.50 (38)
M/P70091 (90°), M/P70092 (180°), M/P70093 (270°)	60286	0.20 (5)	0.79 (20)	1.10 (28)	2.01 (51)
M/P70094 (90°), M/P70095 (180°), M/P70096 (270°)	60287	0.24 (6)	0.93 (24)	1.57 (40)	2.68 (68)

**NOTE:** Hydro-cushion kits, switch mounting kits, and claws are all ordered separately. For reed switches see ACT-14-16 thru 19.



## Mounting kit for switches



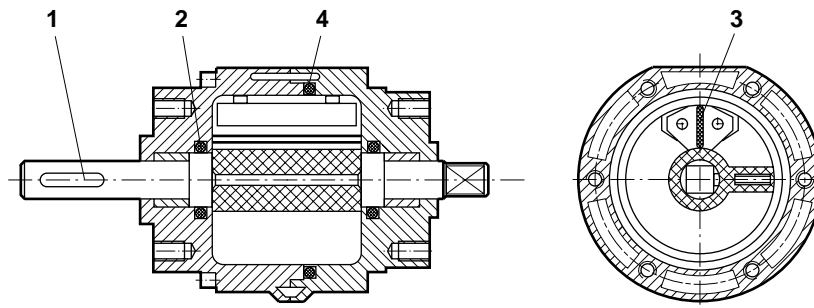
Mounting kit for two Switches (without hydro-cushion)	Mounting kit for two Switches (with hydro-cushion)	øAK	AL
QM/60285A/22/64	QM/60285A/23/64	3.35 (85)	4.84 (123)
QM/60286A/22/64	QM/60286A/23/64	4.37 (111)	5.63 (143)
QM/60287A/22/64	QM/60287A/23/64	5.71 (145)	6.65 (169)

Note: Order claws and magnetically operated switches separately

### Mounting Kit Components

Description	Quantity
Plastic Cover	1
Mounting Plate	1
Reed Switch Mounting Plate	2
Reed Switch Mounting Nuts	4
Reed Switch Mounting Screws	7
Mounting Plate Screws	3
Mounting Plate Washers	3
Magnet and Screw Assembly	1

### Repair Parts



Model	Spares kit	Model	Spares kit	Consisting of Item	Description	Quantity
C/60285	QM/60285A/00	C/60285A/TI	QM/60285A/TI/00	1	Shaft with rotary vane	1
C/60286	QM/60286A/00	C/60286A/TI	QM/60286A/TI/00	2	O-ring	2
C/60287	QM/60287A/00	C/60287A/TI	QM/60287A/TI/00	3	Seal	1(2)
C/60288	QM/60288A/00	C/60288A/TI	QM/60288A/TI/00	4	O-ring	1

- Compact, low profile solid state reed switches
- M/40 and M/40/P feature LED indicators
- Simple, reliable switching for fast response times
- TM/40 high temperature model
- M/40/P features a plug-in cable connection
- Reed switches are used on the Standard Actuator in conjunction with the switch mounting kit and claw. See ACT-14-14/15.

### Specifications

#### Form:

M/40 M/40/P - Normally open with LED  
M/40/C - Normally open/normally closed  
TM/40 - Normally open

#### Switching Voltage:

M/40, M/40/C, TM/40 - 110 V a.c. or 100 V d.c. maximum  
M/40/P - 60 V a.c. and 75 V d.c. maximum

#### Switching Current:

M/40, M/40/P - 180 mA (temperature dependent), see ACT-14-17.  
M/40/C, TM/40 - 250 mA

#### Contact Rating:

M/40, TM/40, M/40/P - 10 VA  
M/40/C - 5 VA

#### Response Time:

M/40, M/40/C, M/40/P - 0.6 ms  
TM/40 - 1.0 ms

#### Operating Temperature:

32° to 158°F ( 0° to 70°C)  
TM/40 - 32° to 248°F (0° to 120°C)

#### Protection Rating:

I.P.67

#### Vibration Resistance:

M/40, TM/40, M/40/P - 10 to 2000Hz 0.11 lbs. (50g) (Resonant Frequency = 3 kHz)  
M/40/C - 10 to 2000Hz 0.11 lbs. (50g) (Resonant Frequency = 13 kHz)

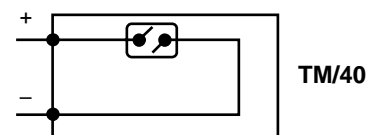
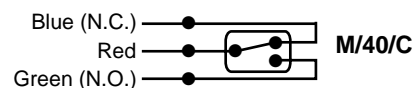
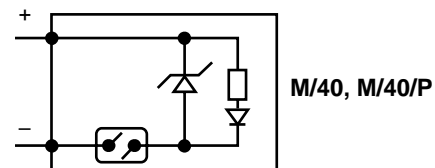
#### Cable Length:

M/40 - 79" (2m) of P.V.C. covered two core cable  
M/40/C - 79" (2m) of P.V.C. covered three core cable  
TM/40 - 79" (2m) of silicon rubber. covered two core cable  
M/40/P - 16' (5m) of P.V.C. or Polyurethane covered three core cable with plug-in connection

### Materials

M/40, M/40/C, M/40/P - Nylon 66 body  
TM/40 - 30% Glass filled Nylon 66 body

**NOTE:** When used to switch inductive loads such as solenoids, relays etc., arcing can occur across the switch contacts depending on the current and voltage involved. This arcing can be eliminated on d.c. loads by connecting a suitably rated diode across the load or switch.  
On a.c. loads arcing is more difficult to eliminate but the contact life can be greatly extended by reducing the peak voltages by connecting a suitable non-linear resistor (V.D.R.) across the load or switch.



### Alternative Models

- M/41 Solid state model with hardwired cable - see ACT-14-18
- M/42 Solid state model with hardwired cable - see ACT-14-18
- M/42/P Solid state model with plug-in cable - see ACT-14-18





## General Information

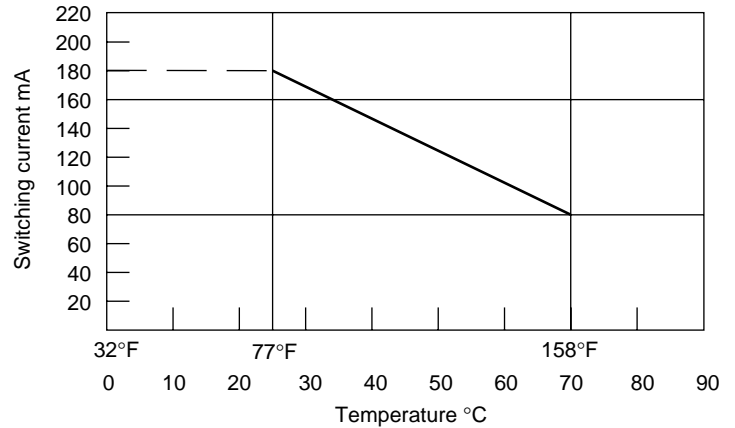
Model	Switch type	Cable length
M/40	LED, Normally open, hardwired	79" (2)
M/40/C	Normally open/Normally closed - changeover, hardwired	79" (2)
TM/40	Normally open, high temperature, hardwired	79" (2)
M/40/P	Normally open with LED, plug-in cable	16' (5)

**NOTE:** Switches are ordered separately

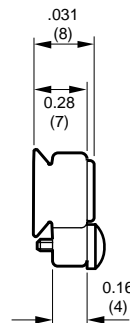
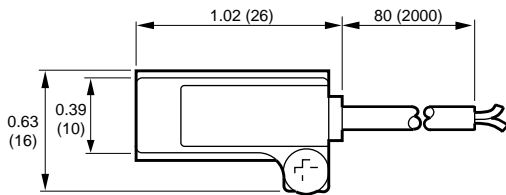
## Effect of High Temperatures - M/40 and M/40/P with LED

When using Reed Switches that incorporate LED's, the maximum switching current should be reduced in direct proportion to the rise in temperature above 77°F (25°C).

At maximum temperature of 158°F (70°C) the maximum switching current must be derated to 80mA.



## M/40, M/40/C, TM/40 Magnetically Operated Switches, with hardwired cable



Switches are attached to the actuator using the switch mounting kits on ACT-14-15.

**Polarity:**

Red +

Blue -

Polarity is important on the M/40

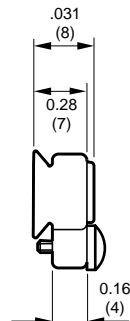
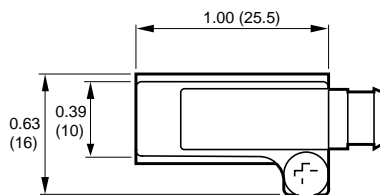
**Normally open/normally closed:**

Red common

Blue normally closed

Green normally open

## M/40/P Magnetically Operated Switches, with plug-in cable\*



Switches are attached to the actuator using the switch mounting kits on ACT-14-15.

**Polarity:**

Brown +

Blue -

Polarity is important.

\*Cable must be ordered separately

Cable No.	Connector type	Outer cover
<b>M/P34595A/5</b>	Straight	Polyurethane
<b>M/P34596A/5</b>	Angled 90°	Polyurethane
<b>M/P34614A/5</b>	Straight	P.V.C.
<b>M/P34615A/5</b>	Angled 90°	P.V.C.

- Compact, low profile solid state reed switches
- LED indicator is standard
- Simple, reliable switching with fast response times
- Particularly suited for use where high levels of vibration are present
- M/42/P features a plug-in cable connection
- Reed switches are used on the Standard Actuator in conjunction with the switch mounting kit and claw. See ACT-14-14/15.

**Specifications**
**Form:**

M/41 - Solid state with LED (NPN, sinking, grounded emitter output)

M/42, M/42/P - Solid state with LED (PNP, sourcing, open collector output)

**Switching Voltage:**

10V to 28V d.c. only

M/42/P - 10V to 30V d.c. only

**Switching Current:**

M/41 - 20 mA

M/42, M/42/P - 300 mA

**Response Time:**

1.5  $\mu$ s

**Operating Temperature:**

32° to 158°F (0° to 70°C)

**Protection Rating:**

I.P.67

**Vibration Resistance:**

Immune to shock loads

**Cable Length:**

M/41, M/42 - 79" (2m) of P.V.C. covered three core cable

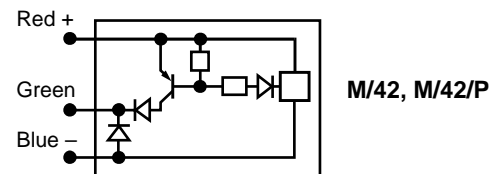
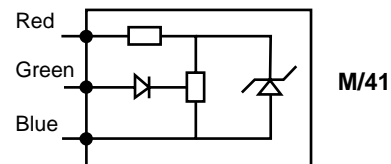
M/42/P - 16' (5m) of P.C.V. or Polyurethane covered three core cable with plug-in connection.

**Switch Protection:**

Diode protection must be used with inductive loads

**Materials**

Nylon 66 body.


**Alternative Models**

M/40 Hardwired cable model - see ACT-14-16

M/40/C Normally open/normally closed model with integral cable - see ACT-14-16

M/40/P Plug-in cable model - see ACT-14-16

TM/40 High temperature model - see ACT-14-16

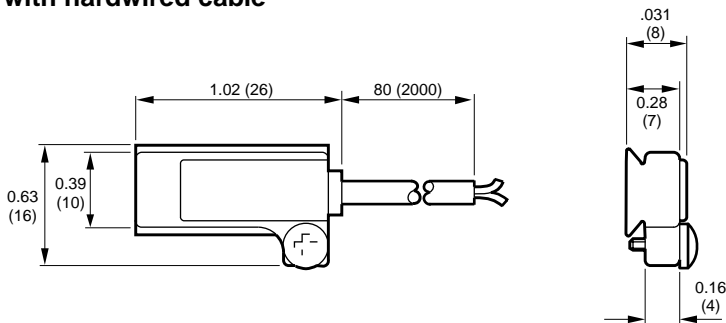


## General Information

Model	Switch type	Cable length
M/41	Solid State with LED. sinking, NPN, hardwired cable	79" (2)
M/42	Solid State with LED. sourcing, PNP, hardwired cable	79" (2)
M/42/P	Solid State with LED. sourcing, PNP, plug-in cable	16' (5)

**NOTE:** Switches are ordered separately

### M/41, M/42 Magnetically Operated Switches, with hardwired cable



Switches are attached to the actuator using the switch mounting kits on ACT-14-15.

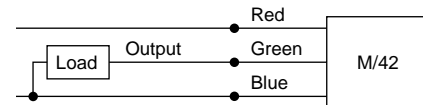
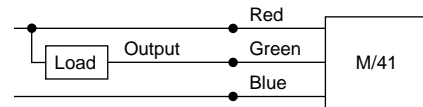
Polarity:

Red +

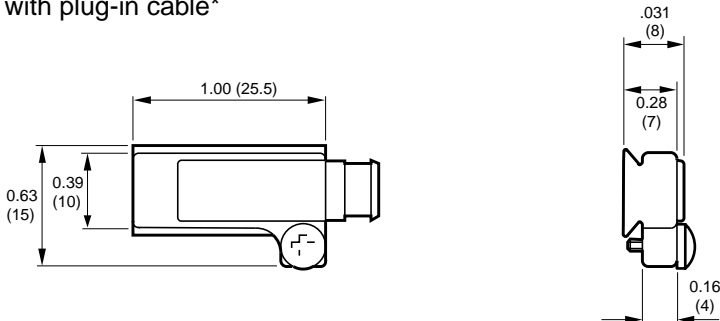
Blue -

Green Output

Polarity is important



### M/42/P Magnetically Operated Switches, with plug-in cable\*



Switches are attached to the actuator using the switch mounting kits on ACT-14-15.

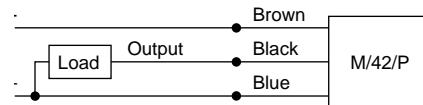
Polarity:

Brown +

Blue -

Black Output

Polarity is important



\*Cable must be ordered separately

Cable No.	Connector type	Outer cover
M/P34595A/5	Straight	Polyurethane
M/P34596A/5	Angled 90°	Polyurethane
M/P34614A/5	Straight	P.V.C.
M/P34615A/5	Angled 90°	P.V.C.



# Norgren Pneumatic Grippers

Single acting angular gripper .....ACT-15-2  
 Double acting angular gripper .....ACT-15-5  
 Double acting 180° angular gripper .....ACT-15-8  
 Single acting parallel gripper .....ACT-15-11  
 Double acting parallel gripper .....ACT-15-14  
 Single acting parallel gripper w/magnetic piston .....ACT-15-17  
 Double acting parallel gripper w/magnetic piston .....ACT-15-21  
 Three jaw, double acting w/magnetic piston .....ACT-15-29  
 Low profile, double acting w/magnetic piston .....ACT-15-26  
 Long stroke, double acting w/magnetic piston .....ACT-15-32



ACT-15-2 Single Acting Angular gripper  
ACT-15-5 Double Acting Angular Gripper



ACT-15-8 Double acting 180° Angular gripper



ACT-15-11 Single acting parallel gripper  
ACT-15-14 Double acting parallel gripper



ACT-15-17 Single acting parallel gripper w/magnetic piston  
ACT-15-21 Double acting parallel gripper w/magnetic piston



ACT-15-26 Low profile Double acting w/magnetic piston



ACT-15-29 Three jaw, double acting w/magnetic piston



ACT-15-32 Long stroke, double acting w/magnetic piston

**Smooth, accurate movement**

**Long, uninterrupted service life**

**Low weight**

**Compact size**

**Integral magnets for positional feedback**



#### Technical data

Medium:

Compressed air, filtered, lubricated or non-lubricated

Operation:

Single acting, angular, magnetic piston

Operating pressure:

29 to 101.5 psig (2 to 7 bar)

Ø 8 mm - 52.2 to 101.5 psig (3.6 to 7 bar)

Ø 10 mm - 43.5 to 101.5 psig (3 to 7 bar)

Operating temperature:

+32°F to +140°F (0°C to 60°C)

\* Air supply must be dry enough to avoid ice formation at temperatures below 35°F (2°C)

Mounting:

Mounting holes on three faces

Mechanical life:

~ 5 million cycles before maintenance may be necessary

Operating frequency:

180 cycles per minute maximum

Materials

Body: aluminum alloy

Fingers: carbon steel

Elastomers: nitrile

#### Barb fittings connections

M3 x 1/8" tube ID, straight barb, part number **29217X303**

M5 x 1/8" tube ID, straight barb, part number **29217X305**

#### Ordering information

To order a gripper with an effective closing grip force of up to 0.325 lb at 72.5 psig (1.4N at 5 bar) quote: **M/160306/M/11**

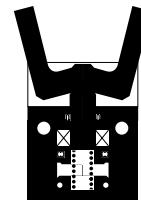
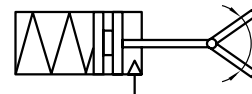
Order magnetically operated switches separately

#### Accessories

Switch M/344

#### See page

ACT-15-3





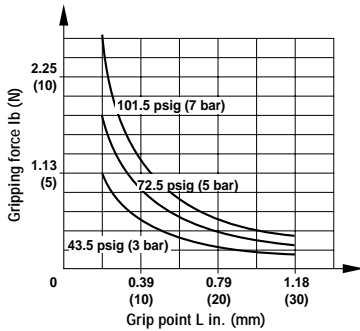
**Standard models ● Effective gripping force ● Air consumption**

Model	Effective gripping force lb (N) at 72.5 psig (5 bar)		Air consumption in <sup>3</sup> (cm <sup>3</sup> ) at 72.5 psig (5 bar)**
	Opening	Closing	
M/160305/M/11	0.135 (0.6)	0.225 (1)	0.0036 (0.06)
M/160306/M/11	0.225 (1)	0.315 (1.4)	0.006 (0.1)
M/160307/M/11	0.63 (2.8)	2.25 (10)	0.039 (0.65)
M/160308/M/11	1.35 (6)	4.05 (18)	0.078 (1.3)
M/160309/M/11	2.25 (10)	8.55 (38)	0.144 (2.4)

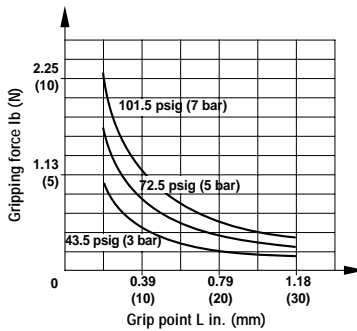
\*\*per cycle

**Theoretical closing gripping forces**

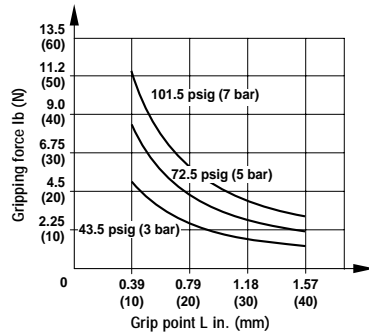
M/160305/M/11



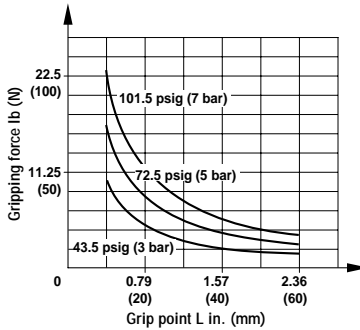
M/160306/M/11



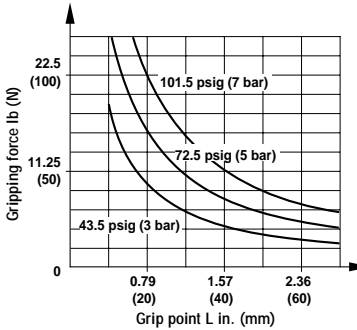
M/160307/M/11



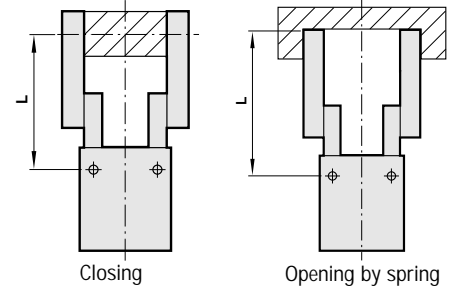
M/160308/M/11



M/160309/M/11



Workpiece grip point



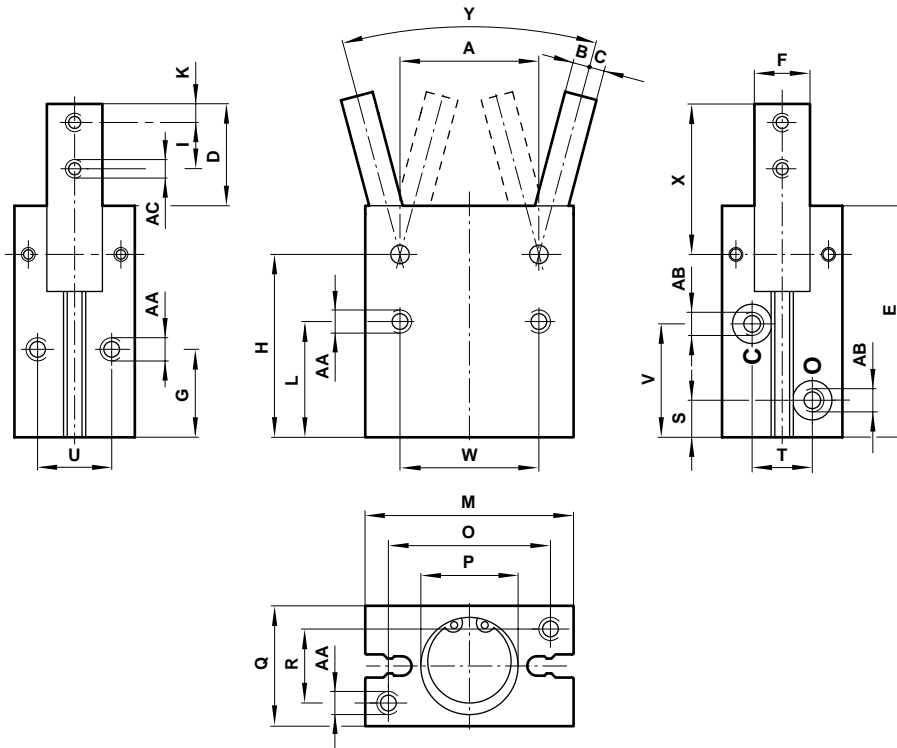
Effective closing gripping forces = Theoretical closing gripping force x 0.85

**Switches with LED indication**

Model	Voltage V d.c.	Current max.	Temperature °F °C	LED	Features	Cable length	Cable type	Straight cable connection	90° elbow cable connection
M/344/EAU/1APV	10 ... 28	20 mA	32° ... 140° (0° ... 60°)	•	-	3.28 ft. (1 m)	PVC	-	•
M/344/EAU/1PV	10 ... 28	20 mA	32° ... 140° (0° ... 60°)	•	-	3.28 ft. (1 m)	PVC	•	-
M/344/EAU/3APV	10 ... 28	20 mA	32° ... 140° (0° ... 60°)	•	-	9.84 ft. (3 m)	PVC	-	•
M/344/EAU/3PV	10 ... 28	20 mA	32° ... 140° (0° ... 60°)	•	-	9.84 ft. (3 m)	PVC	•	-
M/344/EAN/1APV	4.5 ... 28	50 mA	32° ... 140° (0° ... 60°)	•	NPN	3.28 ft. (1 m)	PVC	-	•
M/344/EAN/1PV	4.5 ... 28	50 mA	32° ... 140° (0° ... 60°)	•	NPN	3.28 ft. (1 m)	PVC	•	-
M/344/EAN/3APV	4.5 ... 28	50 mA	32° ... 140° (0° ... 60°)	•	NPN	9.84 ft. (3 m)	PVC	-	•
M/344/EAN/3PV	4.5 ... 28	50 mA	32° ... 140° (0° ... 60°)	•	NPN	9.84 ft. (3 m)	PVC	•	-



Dimensions



	Ø	A	B	C	D	E	F	G	H	I	K
M/160305/M/11	8	0.47 (12)	0.06 (1.5)	0.08 (2)	0.492 (12.5)	1.14 (29)	0.22 (5.5)	-0.001 (-0.03)	0.94 (24)	0.22 (5.5)	0.10 (2.5)
M/160306/M/11	10	0.55 (14)	0.06 (1.5)	0.10 (2.5)	0.571 (14.5)	1.42 (36)	0.28 (7)	-0.001 (-0.03)	1.18 (30)	0.24 (6)	0.12 (3)
M/160307/M/11	16	0.94 (24)	0.12 (3)	0.12 (3)	0.689 (17.5)	1.67 (42.5)	0.35 (9)	-0.001 (-0.03)	1.38 (35)	0.31 (8)	0.12 (3)
M/160308/M/11	20	1.18 (30)	0.14 (3.5)	0.14 (3.5)	0.866 (22)	1.97 (50)	0.47 (12)	-0.001 (-0.03)	1.56 (39.5)	0.39 (10)	0.16 (4)
M/160309/M/11	25	1.42 (36)	0.16 (4)	0.20 (5)	1.024 (26)	2.28 (58)	0.55 (14)	-0.001 (-0.03)	1.79 (45.5)	0.47 (12)	0.20 (5)
	Ø	L	M	O	P	Q	R	S	T	U	V
M/160305/M/11	8	0.73 (18.5)	0.79 (20)	0.59 (15)	Ø 0.35 + 0.002 deep 0.04 (Ø 9 +0.05 deep 1)	0.51 (13)	0.35 (9)	0.18 (4.5)	-	-	0.57 (14.5)
M/160306/M/11	10	0.79 (20)	0.91 (23)	0.67 (17)	Ø 0.43 + 0.002 deep 0.06 (Ø 11 +0.05 deep 1.5)	0.63 (16)	0.39 (10)	0.30 (7.5)	0.39 (10)	0.39 (10)	0.75 (19)
M/160307/M/11	16	0.89 (22.5)	1.34 (34)	1.02 (26)	Ø 0.67 + 0.002 deep 0.06 (Ø 12 +0.05 deep 1.5)	0.87 (22)	0.55 (14)	0.30 (7.5)	0.47 (12)	0.55 (14)	0.87 (22)
M/160308/M/11	20	0.98 (25)	1.77 (45)	1.38 (35)	Ø 0.83 + 0.002 deep 0.06 (Ø 21 +0.05 deep 1.5)	1.02 (26)	0.63 (16)	0.31 (8)	0.51 (13)	0.63 (16)	0.96 (24.5)
M/160309/M/11	25	1.12 (28.5)	2.05 (52)	1.57 (40)	Ø 1.02 + 0.002 deep 0.06 (Ø 26 +0.05 deep 1.5)	1.26 (32)	0.79 (20)	0.35 (9)	0.71 (18)	0.79 (20)	1.10 (28)
	Ø	W	X	Y	AA	AB	AC	lb	kg		
M/160305/M/11	8	0.59 (15)	0.69 (17.5)	30° -10°	(M2.5 x 0.45 deep 0.18 (base); M3 x 0.5 deep 0.14 (side); Ø 0.13 (front) (M2.5 x 0.45 deep 4.5 (base); M3 x 0.5 deep 3.5 (side); Ø 3.2 (front)	M3 x 0.5	M2.5 x 0.45	0.04	(0.02)		
M/160306/M/11	10	0.71 (18)	0.81 (20.5)	30° -10°	M3 x 0.5 deep 0.20 (M3 x 0.5 deep 5)	M3 x 0.5	M3 x 0.5	0.09	(0.04)		
M/160307/M/11	16	0.94 (24)	0.98 (25)	30° -10°	M4 x 0.7 deep 0.28 (M4 x 0.7 deep 7)	M5 x 0.8	M3 x 0.5	0.22	(0.10)		
M/160308/M/11	20	1.18 (30)	1.28 (32.5)	30° -10°	M5 x 0.8 deep 0.31 (M5 x 0.8 deep 8)	M5 x 0.8	M4 x 0.7	0.40	(0.18)		
M/160309/M/11	25	1.42 (36)	1.52 (38.5)	30° -10°	M6 x 1 deep 0.39 (M6 x 1 deep 10)	M5 x 0.8	M5 x 0.8	0.68	(0.31)		



# M/160300/M/12

Angular grippers, Double acting  
Magnetic piston, Ø 8 ... 25 mm



**Smooth, accurate movement**

**Long, uninterrupted service life**

**Low weight**

**Compact size**

**Integral magnets for positional feedback**

## Ordering information

To order a gripper with an effective closing grip force of up to 0.56 lb (2.5 N) at 72.5 psig (5 bar) quote: **M/160306/M/12**

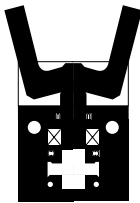
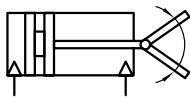
Order magnetically operated switches separately

## Accessories

Switch M/344

## See page

ACT-15-6



## Technical data

Medium:

Compressed air, filtered, lubricated or non-lubricated

Operation:

Double acting, angular, magnetic piston

Operating pressure:

14.5 to 101.5 psig (1 to 7 bar)

Ø 8 mm - 31.9 to 101.5 psig (2.2 to 7 bar)

Operating temperature:

32°F to 140°F (0°C to 60°C)

\* Air supply must be dry enough to avoid ice formation at temperatures below 35°F (2°C)

Mounting:

Mounting holes on three faces

Mechanical life:

~ 5 million cycles before maintenance may be necessary

Operating frequency:

180 cycles per minute maximum

Materials

Body: aluminum alloy

Fingers: carbon steel

Elastomers: nitrile

## Barb fittings connections

M3 x 1/8" tube ID, straight barb, part number **29217X303**

M5 x 1/8" tube ID, straight barb, part number **29217X305**



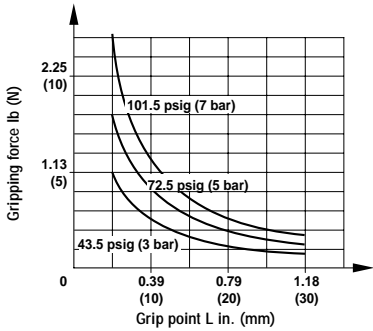
**Standard models ● Effective gripping force ● Air consumption**

Model	Effective gripping force lb (N) at 72.5 psig (5 bar)		Air consumption in <sup>3</sup> (cm <sup>3</sup> ) at 72.5 psig (5 bar)**
	Opening	Closing	
M/160305/M/12	0.59 (2.6)	0.36 (1.6)	0.01 (0.15)
M/160306/M/12	0.86 (3.8)	0.56 (2.5)	0.02 (0.3)
M/160307/M/12	3.83 (17)	2.88 (12.8)	0.09 (1.5)
M/160308/M/12	7.20 (32)	5.40 (24)	0.18 (3)
M/160309/M/12	13.95 (62)	10.80 (48)	0.33 (5.5)

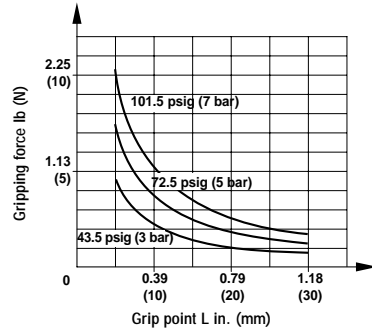
\*\*per cycle

**Theoretical closing gripping forces**

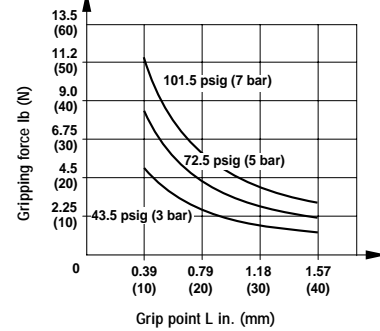
M/160305/M/12



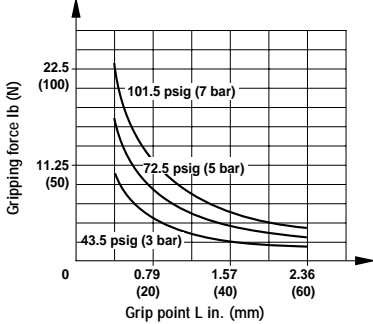
M/160306/M/12



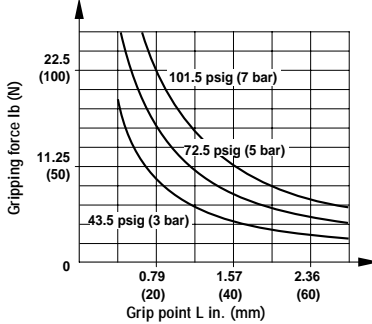
M/160307/M/12



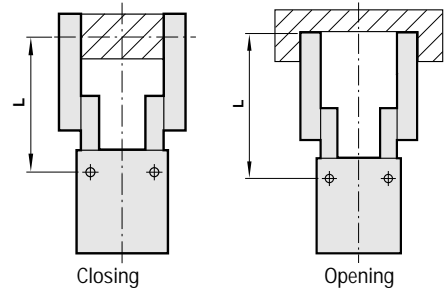
M/160308/M/12



M/160309/M/12



Workpiece grip point



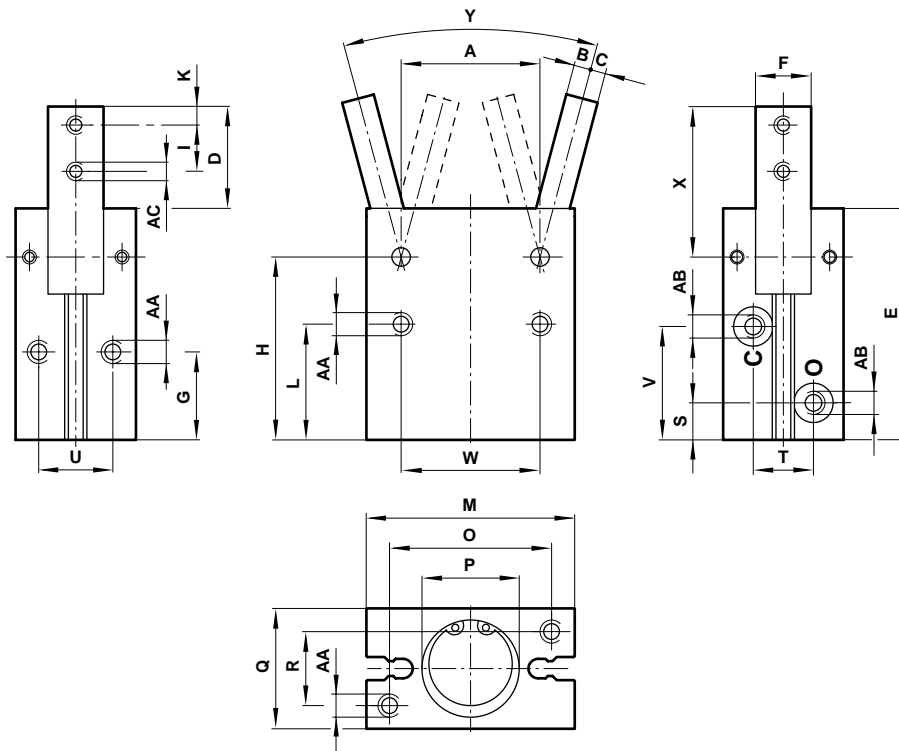
Effective closing gripping forces = Theoretical closing gripping force x 0.85

**Switches with LED indication**

Model	Voltage V d.c.	Current max.	Temperature °F °C	LED	Features	Cable length	Cable type	Straight cable connection	90° elbow cable connection
M/344/EAU/1APV	10 ... 28	20 mA	32° ... 140° (0° ... 60°)	•	-	3.28 ft. (1 m)	PVC	-	•
M/344/EAU/1PV	10 ... 28	20 mA	32° ... 140° (0° ... 60°)	•	-	3.28 ft. (1 m)	PVC	•	-
M/344/EAU/3APV	10 ... 28	20 mA	32° ... 140° (0° ... 60°)	•	-	9.84 ft. (3 m)	PVC	-	•
M/344/EAU/3PV	10 ... 28	20 mA	32° ... 140° (0° ... 60°)	•	-	9.84 ft. (3 m)	PVC	•	-
M/344/EAN/1APV	4.5 ... 28	50 mA	32° ... 140° (0° ... 60°)	•	NPN	3.28 ft. (1 m)	PVC	-	•
M/344/EAN/1PV	4.5 ... 28	50 mA	32° ... 140° (0° ... 60°)	•	NPN	3.28 ft. (1 m)	PVC	•	-
M/344/EAN/3APV	4.5 ... 28	50 mA	32° ... 140° (0° ... 60°)	•	NPN	9.84 ft. (3 m)	PVC	-	•
M/344/EAN/3PV	4.5 ... 28	50 mA	32° ... 140° (0° ... 60°)	•	NPN	9.84 ft. (3 m)	PVC	•	-



Dimensions



	Ø	A	B	C	D	E	F	G	H	I	K	
M/160305/M/12	8	0.47 (12)	0.06 (1.5)	0.08 (2)	0.49 (12.5)	1.14 (29)	0.22 -0.001 (5.5 -0.03)	0.51 (13)	0.94 (24)	0.22 (5.5)	0.10 (2.5)	
M/160306/M/12	10	0.55 (14)	0.06 (1.5)	0.10 (2.5)	0.57 (14.5)	1.42 (36)	0.28 -0.001 (7 -0.03)	0.63 (16)	1.18 (30)	0.24 (6)	0.12 (3)	
M/160307/M/12	16	0.94 (24)	0.12 (3)	0.12 (3)	0.69 (17.5)	1.67 (42.5)	0.35 -0.001 (9 -0.03)	0.71 (18)	1.38 (35)	0.31 (8)	0.12 (3)	
M/160308/M/12	20	1.18 (30)	0.14 (3.5)	0.14 (3.5)	0.87 (22)	1.97 (50)	0.47 -0.001 (12 -0.03)	0.75 (19)	1.56 (39.5)	0.39 (10)	0.16 (4)	
M/160309/M/12	25	1.42 (36)	0.16 (4)	0.20 (5)	1.02 (26)	2.28 (58)	0.55 -0.001 (14 -0.03)	0.85 (21.5)	1.79 (45.5)	0.47 (12)	0.20 (5)	
	Ø	L	M	O	P		Q	R	S	T	U	V
M/160305/M/12	8	0.73 (18.5)	0.79 (20)	0.59 (15)	Ø 0.35 +0.002 deep 0.04 (Ø 9 +0.05 deep 1)		0.51 (13)	0.35 (9)	0.18 (4.5)	- (-)	- (-)	0.57 (14.5)
M/160306/M/12	10	0.79 (20)	0.91 (23)	0.67 (17)	Ø 0.43 +0.002 deep 0.06 (Ø 11 +0.05 deep 1.5)		0.63 (16)	0.39 (10)	0.30 (7.5)	0.39 (10)	0.39 (10)	0.75 (19)
M/160307/M/12	16	0.89 (22.5)	1.34 (34)	1.02 (26)	Ø 0.67 +0.002 deep 0.06 (Ø 17 +0.05 deep 1.5)		0.87 (22)	0.55 (14)	0.30 (7.5)	0.47 (12)	0.55 (14)	0.87 (22)
M/160308/M/12	20	0.98 (25)	1.77 (45)	1.38 (35)	Ø 0.83 +0.002 deep 0.06 (Ø 21 +0.05 deep 1.5)		1.02 (26)	0.63 (16)	0.31 (8)	0.51 (13)	0.63 (16)	0.96 (24.5)
M/160309/M/12	25	1.12 (28.5)	2.05 (52)	1.57 (40)	Ø 1.02 +0.002 deep 0.06 (Ø 26 +0.05 deep 1.5)		1.26 (32)	0.79 (20)	0.35 (9)	0.71 (18)	0.79 (20)	1.10 (28)
	Ø	W	X	Y	AA				AB	AC	lb	kg
M/160305/M/12	8	0.59 (15)	0.69 (17.5)	30° -10°	M2.5 x 0.45 deep 0.18 (4.5) base; M3 x 0.5 deep 0.14 (3.5) side; Ø 0.13 (Ø 3.2) front				M3 x 0.5	M2.5 x 0.45	0.04	(0.02)
M/160306/M/12	10	0.71 (18)	0.81 (20.5)	30° -10°	M3 x 0.5 deep 0.20 (5)				M3 x 0.5	M3 x 0.5	0.09	(0.04)
M/160307/M/12	16	0.94 (24)	0.98 (25)	30° -10°	M4 x 0.7 deep 0.28 (7)				M5 x 0.8	M3 x 0.5	0.22	(0.1)
M/160308/M/12	20	1.18 (30)	1.28 (32.5)	30° -10°	M5 x 0.8 deep 0.31 (8)				M5 x 0.8	M4 x 0.7	0.40	(0.18)
M/160309/M/12	25	1.42 (36)	1.52 (38.5)	30° -10°	M6 x 1 deep 0.39 (10)				M5 x 0.8	M5 x 0.8	0.68	(0.31)

- Smooth, accurate movement**
- Long, uninterrupted service life**
- Low weight**
- Compact size**
- Integral magnets for positional feedback**

**Technical data**

- Medium:  
Compressed air, filtered, lubricated or non-lubricated
- Operating pressure:  
29 to 101.5 psig (2 to 7 bar)
- Operating temperature:  
32°F to 140°F (0°C to 60°C)  
\* Air supply must be dry enough to avoid ice formation at temperatures below 35°F (2°C)
- Mounting:  
Mounting holes on three surfaces
- Mechanical life:  
~ 3 million cycles before maintenance may be necessary
- Operating frequency:  
100 cycles per minute maximum

**Materials**

- Body: aluminum alloy
- Fingers: carbon steel
- Slide plate: carbon steel
- Elastomers: nitrile

**Barb fittings connections**

- M3 x 1/8" tube ID, straight barb, part number **29217X303**
- M5 x 1/8" tube ID, straight barb, part number **29217X305**

**Ordering information**

To order a gripper with an effective closing grip force of up to 12.36 lb (55N/L) at 72.5 psig (5 bar) quote: **M/160335/M/12**

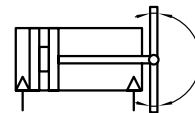
Order magnetically operated switches separately

**Accessories**

Switch M/344

**See page**

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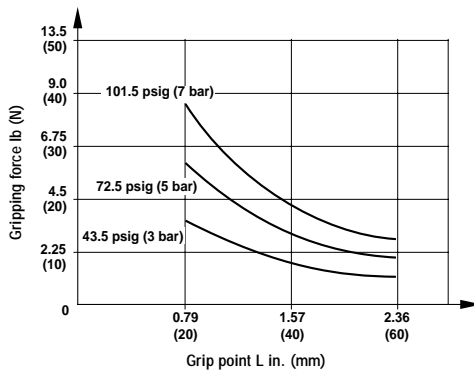
**Standard models ● Effective gripping force ● Air consumption**

Model	Effective gripping force lb (N) at 72.5 psig (5 bar)		Air consumption in <sup>3</sup> (cm <sup>3</sup> ) at 72.5 psig (5 bar)**
	Opening	Closing	
M/160335/M/12	14.4/L (64/L)	12.38/L (55/L)	0.21 (3.5)
M/160336/M/12	30.15/L (134/L)	25.43/L (113/L)	0.48 (8.0)

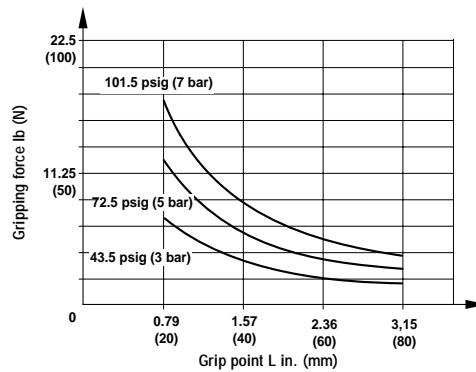
\*\*per cycle

**Theoretical closing gripping forces**

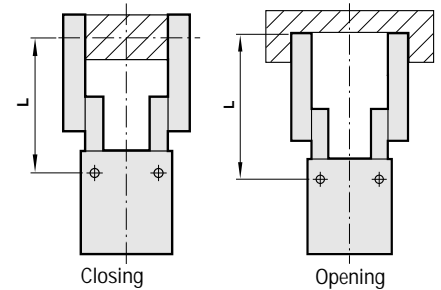
M/160335/M/12



M/160336/M/12



Workpiece grip point



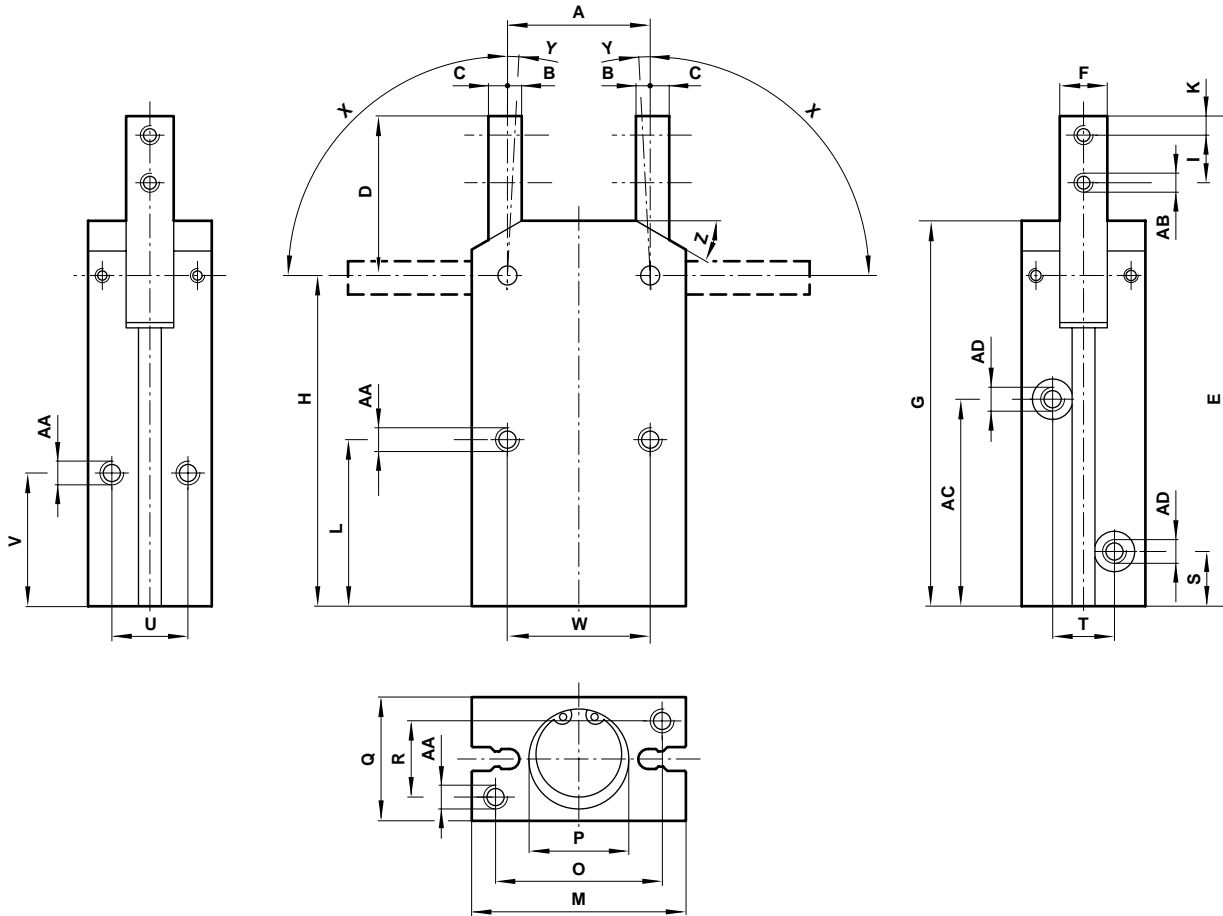
Effective closing gripping forces = Theoretical closing gripping force x 0.85

**Switches with LED indication**

Model	Voltage V d.c.	Current max.	Temperature °F °C	LED	Features	Cable length	Cable type	Straight cable connection	90° elbow cable connection
M/344/EAU/1APV	10 ... 28	20 mA	32° ... 140° (0° ... 60°)	•	-	3.28 ft. (1 m)	PVC	-	•
M/344/EAU/1PV	10 ... 28	20 mA	32° ... 140° (0° ... 60°)	•	-	3.28 ft. (1 m)	PVC	•	-
M/344/EAU/3APV	10 ... 28	20 mA	32° ... 140° (0° ... 60°)	•	-	9.84 ft. (3 m)	PVC	-	•
M/344/EAU/3PV	10 ... 28	20 mA	32° ... 140° (0° ... 60°)	•	-	9.84 ft. (3 m)	PVC	•	-
M/344/EAN/1APV	4.5 ... 28	50 mA	32° ... 140° (0° ... 60°)	•	NPN	3.28 ft. (1 m)	PVC	-	•
M/344/EAN/1PV	4.5 ... 28	50 mA	32° ... 140° (0° ... 60°)	•	NPN	3.28 ft. (1 m)	PVC	•	-
M/344/EAN/3APV	4.5 ... 28	50 mA	32° ... 140° (0° ... 60°)	•	NPN	9.84 ft. (3 m)	PVC	-	•
M/344/EAN/3PV	4.5 ... 28	50 mA	32° ... 140° (0° ... 60°)	•	NPN	9.84 ft. (3 m)	PVC	•	-



Basic dimensions



	Ø	A	B	C	D	E	F	G	H	I	K		
M/160335/M/12	16	0.94 (24)	0.12 (3)	0.10 (2.5)	1.12 (28.5)	3.44 (87.5)	0.31 -0.001 (8 -0.03)	2.72 (69)	2.32 (59)	0.31 (8)	0.16 (4)		
M/160336/M/12	20	1.18 (30)	0.16 (4)	0.12 (3)	1.32 (33.5)	4.06 (103)	0.39 -0.001 (10 -0.03)	3.19 (81)	2.74 (69.5)	0.39 (10)	0.16 (4)		
	Ø	L	M	O	P			Q	R	S	T	U	V
M/160335/M/12	16	1.18 (30)	1.34 (34)	1.02 (26)	Ø 0.67 + 0.002 deep 0.06 (Ø 17 + 0.05 deep 1.5)			0.87 (22)	0.55 (14)	0.41 (10.5)	0.47 (12)	0.55 (14)	0.98 (25)
M/160336/M/12	20	1.38 (35)	1.77 (45)	1.38 (35)	Ø 0.83 + 0.002 deep 0.06 (Ø 21 + 0.05 deep 1.5)			1.02 (26)	0.63 (16)	0.45 (11.5)	0.51 (13)	0.63 (16)	1.10 (28)
	Ø	W	X	Y	Z	AA	AB	AC	AD	lb (kg)			
M/160335/M/12	16	0.94 (24)	90°	3°	30°	M4 X 0.7 deep 0.28 (7)	M3 X 0.5	1.50 (38)	M5 X 0.8	0.33 (0.15)			
M/160336/M/12	20	1.18 (30)	90°	3°	30°	M5 X 0.8 deep 0.31 (8)	M4 X 0.7	1.71 (43.5)	M5 X 0.8	0.62 (0.28)			

# M/160340/M/11

Parallel grippers, Single acting  
Magnetic piston, Ø 10 ... 25 mm



**Ideal for general purpose gripping applications**

**Smooth, accurate movement**

**Long, uninterrupted service life**

**Low weight**

**Compact size**

**Integral magnets for positional feedback**

## Ordering information

To order a gripper with an effective closing grip force of up to 4.72 lb (21N) at 72.5 psig (5 bar) quote: **M/160344/M/11**

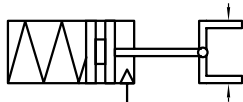
Order magnetically operated switches separately

## Accessories

Switch M/344

## See page

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## Technical data

Medium:

Compressed air, filtered, lubricated or non-lubricated

Operation:

Single acting, parallel, magnetic piston

Operating pressure:

36.25 to 101.5 psig (2.5 to 7 bar)

Ø 10 mm – 50.75 to 101.5 psig (3.5 to 7 bar)

Operating temperature:

32°F to 140°F (0°C to 60°C)

\* Air supply must be dry enough to avoid ice formation at temperatures below 35°F (2°C)

Mounting:

Mounting holes on three faces

Gripping repeatability:

+/- 0.0004 inches (+/- 0.01 mm)

Mechanical life:

~ 5 million cycles before maintenance may be necessary

Operating frequency:

200 cycles per minute maximum

## Materials

Body: aluminum alloy

Top plate: carbon steel

Fingers: carbon steel

External screws: carbon steel

Elastomers: nitrile

## Barb fittings connections

M3 x 1/8" tube ID, straight barb, part number **29217X303**

M5 x 1/8" tube ID, straight barb, part number **29217X305**

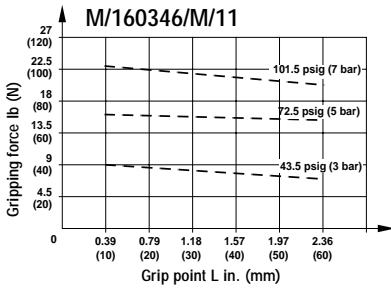
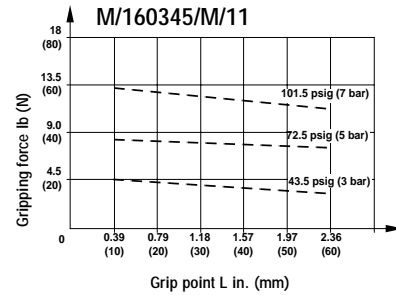
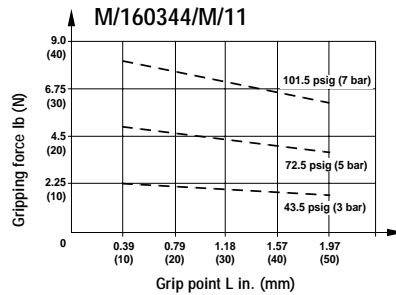
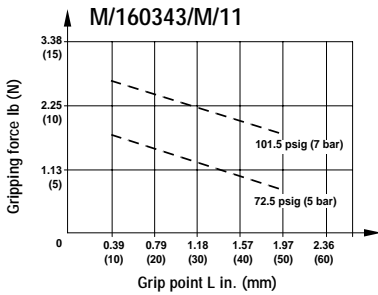


Standard models ● Effective gripping force ● Air consumption

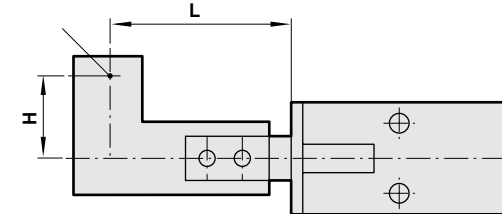
Model	Effective gripping force lb (N) at 72.5 psig (5 bar)		Air consumption in <sup>3</sup> (cm <sup>3</sup> ) at 72.5 psig (5 bar)**
	Opening	Closing	
M/160343/M/11	0.45 (2)	1.10 (4.9)	0.10 (0.1)
M/160344/M/11	0.88 (3.9)	4.73 (21)	0.65 (0.65)
M/160345/M/11	1.55 (6.9)	8.19 (36.4)	1.40 (1.4)
M/160346/M/11	3.08 (13.7)	12.15 (54)	2.80 (2.8)

\*\*per cycle

Theoretical closing gripping forces

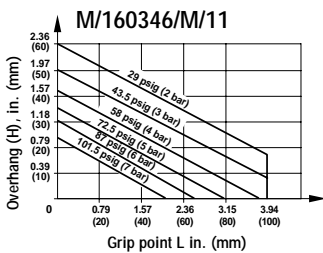
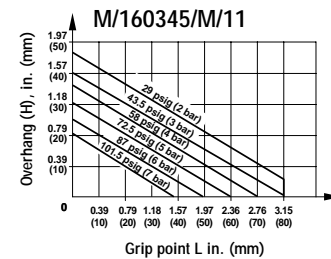
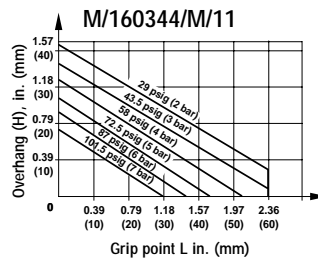
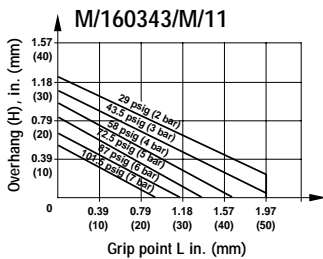


Workpiece grip point



Effective closing gripping forces = Theoretical closing gripping force x 0.85

Grip point limitation range



Criteria of workpiece weight

When chucking a workpiece, weight should be within the range between 1/10 and 1/20 of the above gripping force.

When chucking and then moving a workpiece, the workpiece may protrude or drop. Therefore, workpiece weight should be less than the above mentioned value. (Reference value is 1/30-1/50)

Weight depends on the operational condition, such as material and shape of workpiece or claw, speed and direction of moving workpiece (straight advance, rotation or swing, etc.)

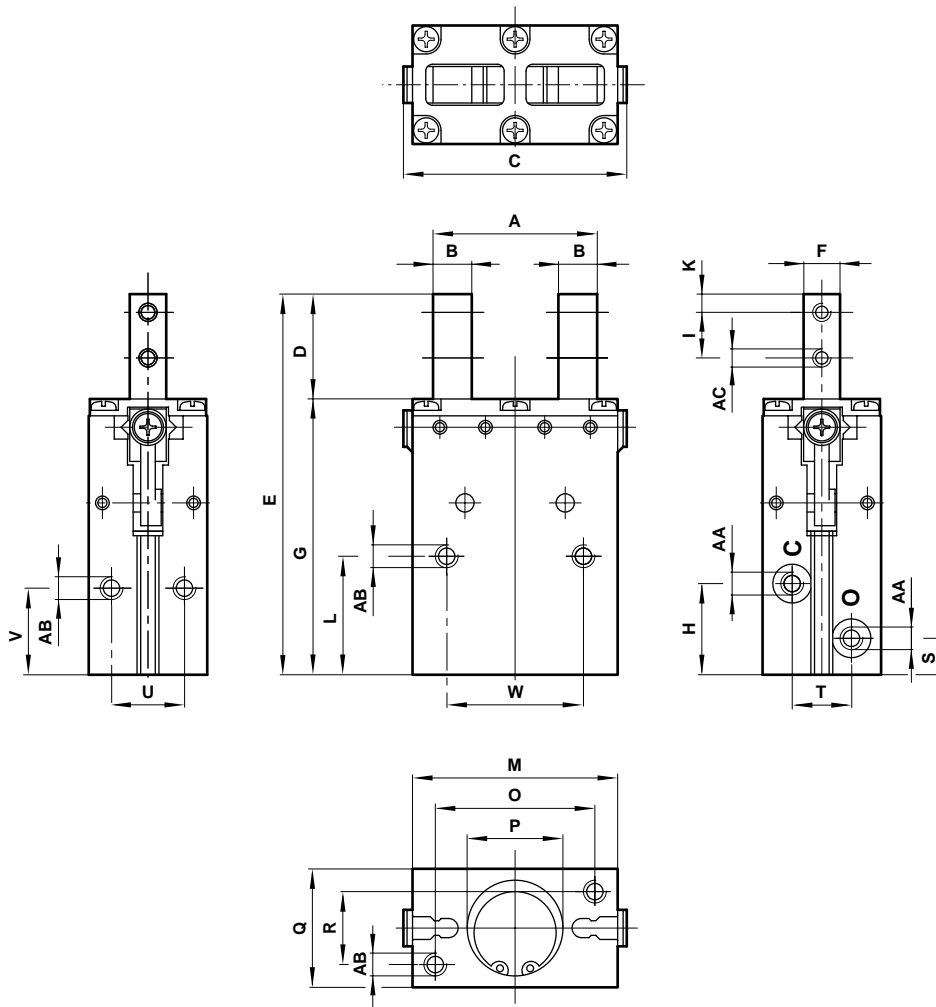
Switches with LED indication

Model	Voltage V d.c.	Current max.	Temperature °F °C	LED	Features	Cable length	Cable type	Straight cable connection	90° elbow cable connection
M/344/EAU/1APV	10 ... 28	20 mA	32° ... 140° (0° ... 60°)	•	-	3.28 ft. (1 m)	PVC	-	•
M/344/EAU/1PV	10 ... 28	20 mA	32° ... 140° (0° ... 60°)	•	-	3.28 ft. (1 m)	PVC	•	-
M/344/EAU/3APV	10 ... 28	20 mA	32° ... 140° (0° ... 60°)	•	-	9.84 ft. (3 m)	PVC	-	•
M/344/EAU/3PV	10 ... 28	20 mA	32° ... 140° (0° ... 60°)	•	-	9.84 ft. (3 m)	PVC	•	-
M/344/EAN/1APV	4.5 ... 28	50 mA	32° ... 140° (0° ... 60°)	•	NPN	3.28 ft. (1 m)	PVC	-	•
M/344/EAN/1PV	4.5 ... 28	50 mA	32° ... 140° (0° ... 60°)	•	NPN	3.28 ft. (1 m)	PVC	•	-
M/344/EAN/3APV	4.5 ... 28	50 mA	32° ... 140° (0° ... 60°)	•	NPN	9.84 ft. (3 m)	PVC	-	•
M/344/EAN/3PV	4.5 ... 28	50 mA	32° ... 140° (0° ... 60°)	•	NPN	9.84 ft. (3 m)	PVC	•	-





Dimensions



	Ø	A					B	C	D	E		
M/160343/M/11	10	0.67 + 0.06/-0.01 open, 0.55 ± 0.02 closed (17 + 1.6/-0.2 open, 13 ± 0.4 closed)					0.18 (4.5)	0.98 max. (25 max.)	0.65 (16.5)	2.34 (59.5)		
M/160344/M/11	16	1.02 + 0.09 open, 0.71 + 0.02/-0.01 closed (26 + 2.3 open, 18 + 0.6/-0.2 closed)					0.26 (6.5)	1.48 max. (37.5 max)	0.75 (19)	2.80 (71)		
M/160345/M/11	20	1.42 + 0.06/-0.04 open, 0.94 + 0.004/-0.04 closed (36 + 1.5/-0.9 open, 24 + 0.1/-0.9 closed)					0.33 (8.5)	1.93 max. (49 max)	0.91 (23)	3.29 (83.5)		
M/160346/M/11	25	1.65 + 0.04/-0.03 open, 1.10 ± 0.02 closed (42 + 1.0/-0.7 open, 28 ± 0.4 closed)					0.39 (10)	2.26 max. (57.5 max)	1.06 (27)	3.74 (95)		
	Ø	F	G	H	I	K	L	M	O	P		
M/160343/M/11	10	0.22 -0.001 (5.5 - 0.03)	1.69 (43)	0.59 (15)	0.24 (6)	0.12 (3)	0.79 (20)	0.91 (23)	0.67 (17)	Ø 0.43 + 0.002 deep 0.06 (Ø11 + 0.05 deep 1.5)		
M/160344/M/11	16	0.28 -0.001 (7 - 0.03)	2.05 (52)	0.69 (17.5)	0.31 (8)	0.12 (3)	0.91 (23)	1.34 (34)	1.02 (26)	Ø 0.67 + 0.002 deep 0.06 (Ø17 + 0.05 deep 1.5)		
M/160345/M/11	20	0.31 -0.001 (8 - 0.04)	2.38 (60.5)	0.79 (20)	0.39 (10)	0.16 (4)	1.02 (26)	1.77 (45)	1.38 (35)	Ø 0.83 + 0.002 deep 0.06 (Ø21 + 0.05 deep 1.5)		
M/160346/M/11	25	0.39 -0.001 (10 - 0.03)	2.68 (68)	0.91 (23)	0.47 (12)	0.20 (5)	1.18 (30)	2.05 (52)	1.57 (40)	Ø 1.02 + 0.002 deep 0.06 (Ø26 + 0.05 deep 1.5)		
	Ø	Q	R	S	T	U	V	W	AA	AB	AC	lb (kg)
M/160343/M/11	10	0.63 (16)	0.39 (10)	0.30 (7.5)	0.39 (10)	0.39 (10)	0.63 (16)	0.71 (18)	M3 X 0.5	M3 X 0.5 deep 0.12 (5)	M3 X 0.5	0.11 (0.05)
M/160344/M/11	16	0.87 (22)	0.55 (14)	0.30 (7.5)	0.47 (12)	0.55 (14)	0.71 (18)	0.94 (24)	M5 X 0.8	M4 X 0.7 deep 0.28 (7)	M3 X 0.5	0.26 (0.12)
M/160345/M/11	20	1.02 (26)	0.63 (16)	0.31 (8)	0.51 (13)	0.63 (16)	0.75 (19)	1.18 (30)	M5 X 0.8	M5 X 0.8 deep 0.31 (8)	M4 X 0.7	0.48 (0.22)
M/160346/M/11	25	1.26 (32)	0.79 (20)	0.35 (9)	0.71 (18)	0.79 (20)	0.87 (22)	1.42 (36)	M5 X 0.8	M6 X 1.0 deep 0.39 (10)	M5 X 0.8	0.82 (0.37)

**Ideal for general purpose gripping applications**

**Smooth, accurate movement**

**Long, uninterrupted service life**

**Low weight**

**Compact size**

**Integral magnets for positional feedback**



#### **Technical data**

Medium:

Compressed air, filtered, lubricated or non-lubricated

Operation:

Double acting, parallel, magnetic piston

Operating pressure:

14.5 to 101.5 psig (1 to 7 bar)

Ø 10 mm - 26.1 to 101.5 psig (1.8 to 7 bar)

Ø 16 mm - 17.4 to 101.5 psig (1.2 to 7 bar)

Operating temperature:

32°F to 140°F (0°C to 60°C)

\* Air supply must be dry enough to avoid ice formation at temperatures below 35°F (2°C)

Mounting:

Mounting holes on three faces

Gripping repeatability:

+/- 0.0004 inches (+/- 0.01 mm)

Mechanical life:

~ 5 million cycles before maintenance may be necessary

Materials

Body: aluminum alloy

Top plate: carbon steel

Fingers: carbon steel

External screws: carbon steel

Elastomers: nitrile

#### **Barb fittings connections**

M3 x 1/8" tube ID, straight barb, part number **29217X303**

M5 x 1/8" tube ID, straight barb, part number **29217X305**

#### **Ordering information**

To order a gripper with an effective closing grip force of up to 5.73 lb at 72.5 psig (25.5N at 5 bar) quote: **M/160344/M/12**

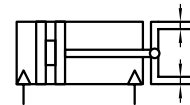
Order magnetically operated switches separately

#### **Accessories**

Switch M/344

#### **See Page**

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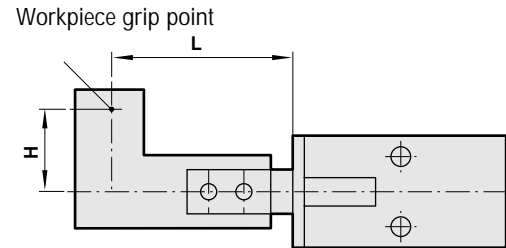
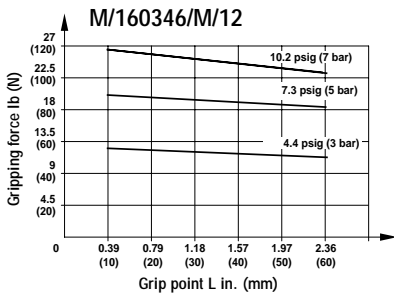
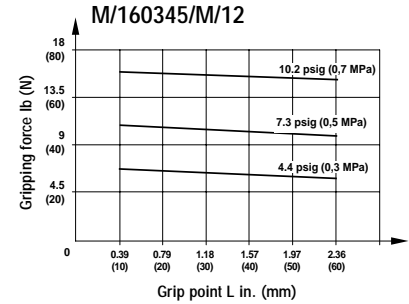
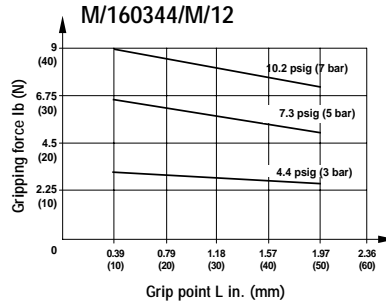
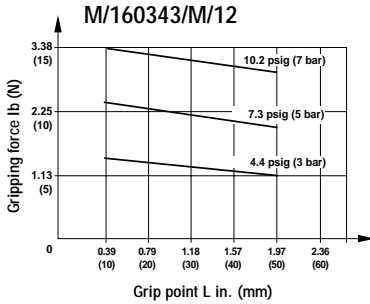


**Standard models ● Effective gripping force ● Air consumption**

Model	Effective gripping force lb (N) at 72.5 psig (5 bar)		Air consumption in <sup>3</sup> (cm <sup>3</sup> ) at 72.5 psig (5 bar)**
	Opening	Closing	
M/160343/M/12	3.29 (14.6)	2.12 (9.4)	0.02 (0.3)
M/160344/M/12	7.65 (34)	5.74 (25.5)	0.09 (1.5)
M/160345/M/12	13.70 (60.9)	10.28 (45.7)	0.20 (3.3)
M/160346/M/12	19.58 (87)	15.08 (67)	0.38 (6.4)

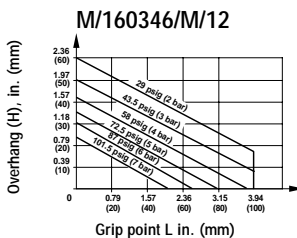
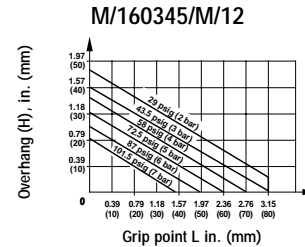
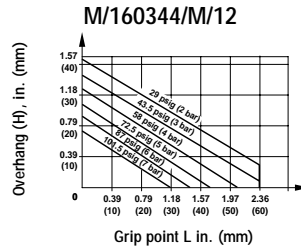
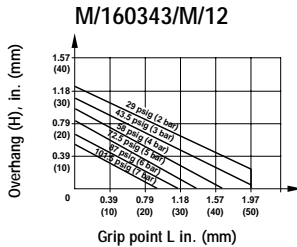
\*\*per cycle

**Theoretical closing gripping forces**



Effective closing gripping forces = Theoretical closing gripping force x 0.85

**Grip point limitation range**



**Criteria of workpiece weight**

When chucking a workpiece, weight should be within the range between 1/10 and 1/20 of the above gripping force.

When chucking and then moving a workpiece, the workpiece may protrude or drop. Therefore, workpiece weight should be less than the above mentioned value. (Reference value is 1/30-1/50)

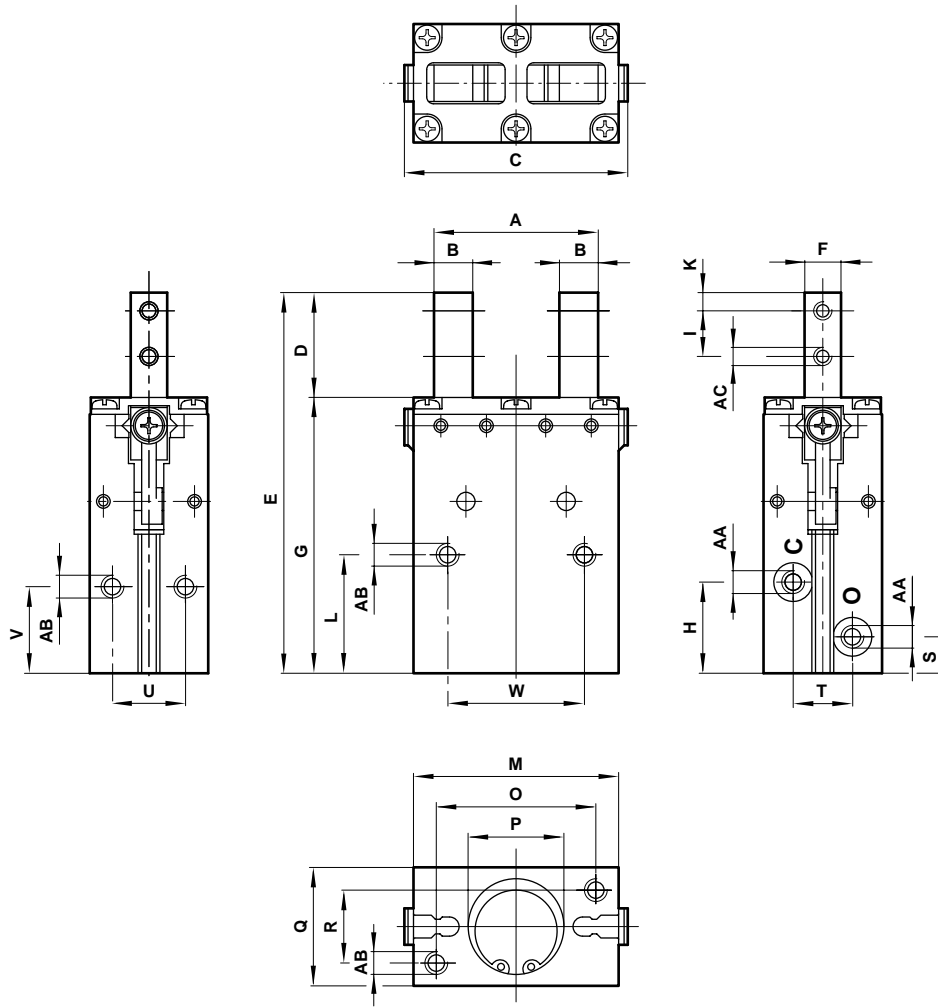
Weight depends on the operational condition, such as material and shape of workpiece or claw, speed and direction of moving workpiece (straight advance, rotation or swing, etc.)

**Switches with LED indication**

Model	Voltage V d.c.	Current max.	Temperature °F °C	LED	Features	Cable length	Cable type	Straight cable connection	90° elbow cable connection
M/344/EAU/1APV	10 ... 28	20 mA	32° ... 140° (0° ... 60°)	•	-	3.28 ft. (1 m)	PVC	-	•
M/344/EAU/1PV	10 ... 28	20 mA	32° ... 140° (0° ... 60°)	•	-	3.28 ft. (1 m)	PVC	•	-
M/344/EAU/3APV	10 ... 28	20 mA	32° ... 140° (0° ... 60°)	•	-	9.84 ft. (3 m)	PVC	-	•
M/344/EAU/3PV	10 ... 28	20 mA	32° ... 140° (0° ... 60°)	•	-	9.84 ft. (3 m)	PVC	•	-
M/344/EAN/1APV	4.5 ... 28	50 mA	32° ... 140° (0° ... 60°)	•	NPN	3.28 ft. (1 m)	PVC	-	•
M/344/EAN/1PV	4.5 ... 28	50 mA	32° ... 140° (0° ... 60°)	•	NPN	3.28 ft. (1 m)	PVC	•	-
M/344/EAN/3APV	4.5 ... 28	50 mA	32° ... 140° (0° ... 60°)	•	NPN	9.84 ft. (3 m)	PVC	-	•
M/344/EAN/3PV	4.5 ... 28	50 mA	32° ... 140° (0° ... 60°)	•	NPN	9.84 ft. (3 m)	PVC	•	-



Dimensions



	Ø	A				B	C	D	E			
M/160343/M/12	10	0.67 + 0.06/-0.01 open, 0.51 ± 0.016 closed (17 + 1.6 / -0.2 open, 13 ± 0.4 closed)				0.18 (4.5)	0.98 max (25 max)	0.65 (16.5)	2.34 (59.5)			
M/160344/M/12	16	1.02 + 0.09 open, 0.71 + 0.024/-0.008 closed (26 + 2.3 open, 18 + 0.6 / -0.2 closed)				0.26 (6.5)	1.48 max (37.5 max)	0.75 (19)	2.80 (71)			
M/160345/M/12	20	1.42 + 0.06/-0.04 open, 0.94 + 0.004/-0.035 closed (36 + 1.5 / -0.9 open, 24 + 0.1 / -0.9 closed)				0.33 (8.5)	1.93 max (49 max)	0.91 (23)	3.29 (83.5)			
M/160346/M/12	25	1.65 + 0.04/-0.03 open, 1.10 ± 0.016 closed (42 + 1.0 / -0.7 open, 28 ± 0.4 closed)				0.39 (10)	2.26 max (57.5 max)	1.06 (27)	3.74 (95)			
	Ø	F	G	H	I	K	L	M	O	P		
M/160343/M/12	10	0.22 - 0.001 (5.5 - 0.03)	1.69 (43)	0.59 (15)	0.24 (6)	0.12 (3)	0.79 (20)	0.91 (23)	0.67 (17)	Ø0.43 + 0.002 deep 0.06 (Ø11 + 0.05 deep 1.5)		
M/160344/M/12	16	0.28 - 0.001 (7 - 0.03)	2.05 (52)	0.69 (17.5)	0.31 (8)	0.12 (3)	0.91 (23)	1.34 (34)	1.02 (26)	Ø0.67 + 0.002 deep 0.06 (Ø17 + 0.05 deep 1.5)		
M/160345/M/12	20	0.31 - 0.002 (8 - 0.04)	2.38 (60.5)	0.79 (20)	0.39 (10)	0.16 (4)	1.02 (26)	1.77 (45)	1.38 (35)	Ø0.83 + 0.002 deep 0.06 (Ø21 + 0.05 deep 1.5)		
M/160346/M/12	25	0.39 - 0.001 (10 - 0.03)	2.68 (68)	0.91 (23)	0.47 (12)	0.20 (5)	1.18 (30)	2.05 (52)	1.57 (40)	Ø1.02 + 0.002 deep 0.06 (Ø26 + 0.05 deep 1.5)		
	Ø	Q	R	S	T	U	V	W	AA	AB	AC	lb (kg)
M/160343/M/12	10	0.63 (16)	0.39 (10)	0.30 (7.5)	0.39 (10)	0.39 (10)	0.63 (16)	0.71 (18)	M3 X 0.5	M3 X 0.5 deep 0.20 (5)	M3 x 0.5	0.11 (0.05)
M/160344/M/12	16	0.87 (22)	0.55 (14)	0.30 (7.5)	0.47 (12)	0.55 (14)	0.71 (18)	0.94 (24)	M5 X 0.8	M4 X 0.7 deep 0.28 (7)	M3 x 0.5	0.26 (0.12)
M/160345/M/12	20	1.02 (26)	0.63 (16)	0.31 (8)	0.51 (13)	0.63 (16)	0.75 (19)	1.18 (30)	M5 X 0.8	M5 X 0.8 deep 0.31 (8)	M4 x 0.7	0.48 (0.22)
M/160346/M/12	25	1.26 (32)	0.79 (20)	0.35 (9)	0.71 (18)	0.79 (20)	0.87 (22)	1.42 (36)	M5 X 0.8	M6 X 1.0 deep 0.39 (10)	M5 x 0.8	0.82 (0.37)

# M/160350/M/11

Parallel grippers - precision, Single acting  
Magnetic piston, Ø 8 ... 20 mm



**Ideal for applications demanding accuracy and precise repeatability**

**Smooth, accurate movement**

**Long, uninterrupted service life**

**Low weight**

**Compact size**

**Integral magnets for positional feedback**

## Ordering information

To order a gripper with an effective closing grip force of up to 4.49 lb at 72.5 psig (20N at 5 bar) quote: **M/160356/M/11**

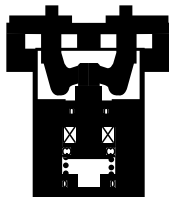
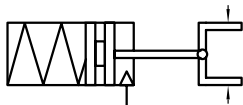
Order magnetically operated switches separately

## Accessories

Switch M/344

## See Page

ACT-15-18



## Technical data

Medium:

Compressed air, filtered, lubricated or non-lubricated

Operation:

Single acting, parallel, magnetic piston

Operating pressure:

101.5 psig (7 bar) maximum - see page ACT-15-18 for minimum operating pressures

Operating temperature:

32°F to 140°F (0°C to 60°C)

\* Air supply must be dry enough to avoid ice formation at temperatures below 2°C

Mounting:

Mounting holes on three faces

Gripping repeatability:

+/- 0.0004 inches (+/- 0.01 mm)

Accuracy to center:

+/- 0.003 inches (+/- 0.07 mm)

Mechanical life:

~ 5 million cycles before maintenance may be necessary

Operating frequency:

120 cycles per minute maximum

Materials

Body: aluminum alloy

Fingers: stainless steel

Guide rail: stainless steel

Elastomers: nitrile

## Barb fittings connections

M3 x 1/8" tube ID, straight barb, part number **29217X303**

M5 x 1/8" tube ID, straight barb, part number **29217X305**



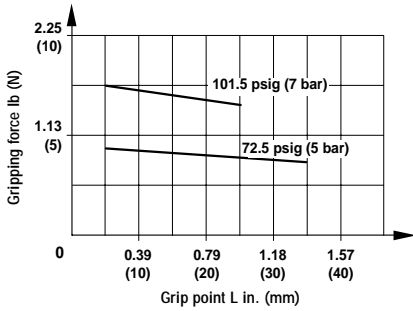
**Standard models ● Effective gripping force ● Air consumption**

Model	Effective gripping force lb (N) at 72.5 psig (5 bar)		Minimum operating pressure in psig (bar)	Air consumption in <sup>3</sup> (cm <sup>3</sup> ) at 72.5 psig (5 bar)**
	Opening	Closing		
M/160354/M/11	0.61 (2.7)	0.92 (4.1)	58.00 (4)	0.004 (0.06)
M/160355/M/11	0.54 (2.4)	1.53 (6.8)	50.75 (3.5)	0.010 (0.16)
M/160356/M/11	1.22 (5.4)	4.50 (20)	36.25 (2.5)	0.042 (0.7)
M/160357/M/11	1.64 (7.3)	7.65 (34)	36.25 (2.5)	0.096 (1.6)

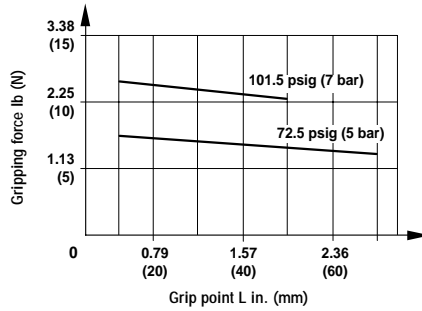
\*\*per cycle

**Theoretical closing gripping forces**

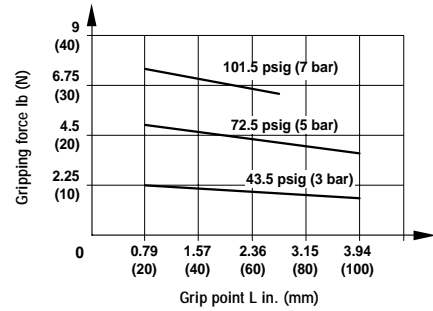
M/160354/M/11



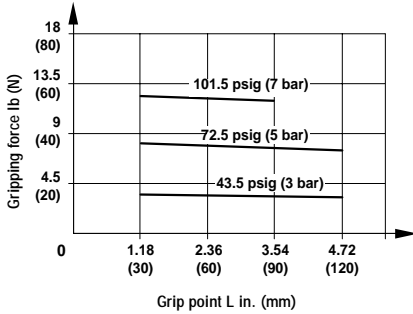
M/160355/M/11



M/160356/M/11



M/160357/M/11



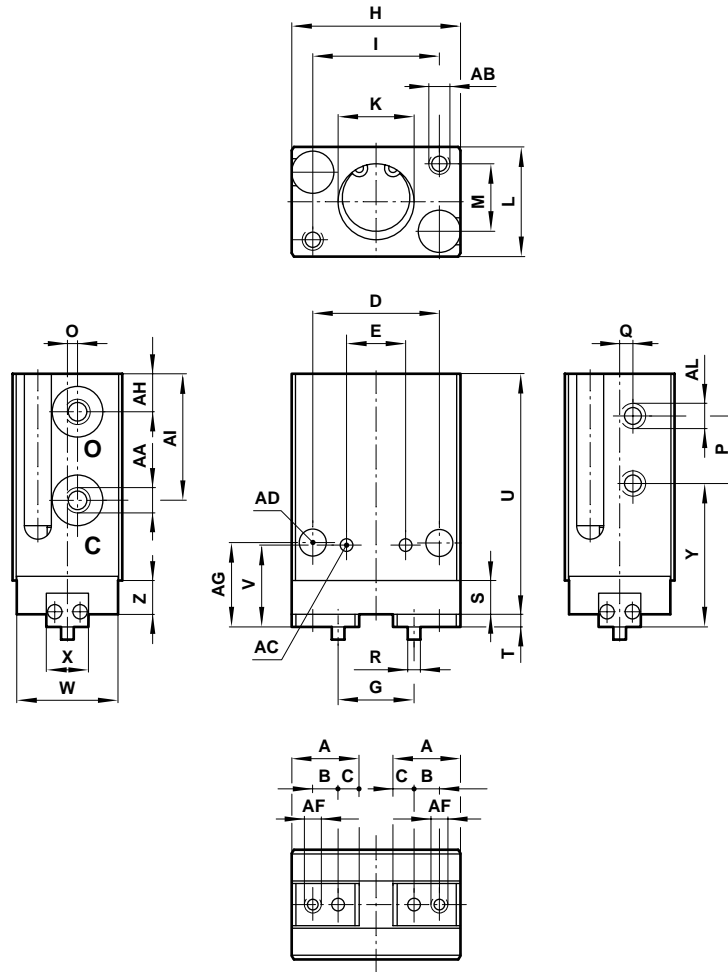
Effective closing gripping forces = Theoretical closing gripping force x 0.85

**Switches with LED indication**

Model	Voltage V d.c.	Current max.	Temperature °F °C	LED	Features	Cable length	Cable type	Straight cable connection	90° elbow cable connection
M/344/EAU/1APV	10 ... 28	20 mA	32° ... 140° (0° ... 60°)	•	-	3.28 ft. (1 m)	PVC	-	•
M/344/EAU/1PV	10 ... 28	20 mA	32° ... 140° (0° ... 60°)	•	-	3.28 ft. (1 m)	PVC	•	-
M/344/EAU/3APV	10 ... 28	20 mA	32° ... 140° (0° ... 60°)	•	-	9.84 ft. (3 m)	PVC	-	•
M/344/EAU/3PV	10 ... 28	20 mA	32° ... 140° (0° ... 60°)	•	-	9.84 ft. (3 m)	PVC	•	-
M/344/EAN/1APV	4.5 ... 28	50 mA	32° ... 140° (0° ... 60°)	•	NPN	3.28 ft. (1 m)	PVC	-	•
M/344/EAN/1PV	4.5 ... 28	50 mA	32° ... 140° (0° ... 60°)	•	NPN	3.28 ft. (1 m)	PVC	•	-
M/344/EAN/3APV	4.5 ... 28	50 mA	32° ... 140° (0° ... 60°)	•	NPN	9.84 ft. (3 m)	PVC	-	•
M/344/EAN/3PV	4.5 ... 28	50 mA	32° ... 140° (0° ... 60°)	•	NPN	9.84 ft. (3 m)	PVC	•	-



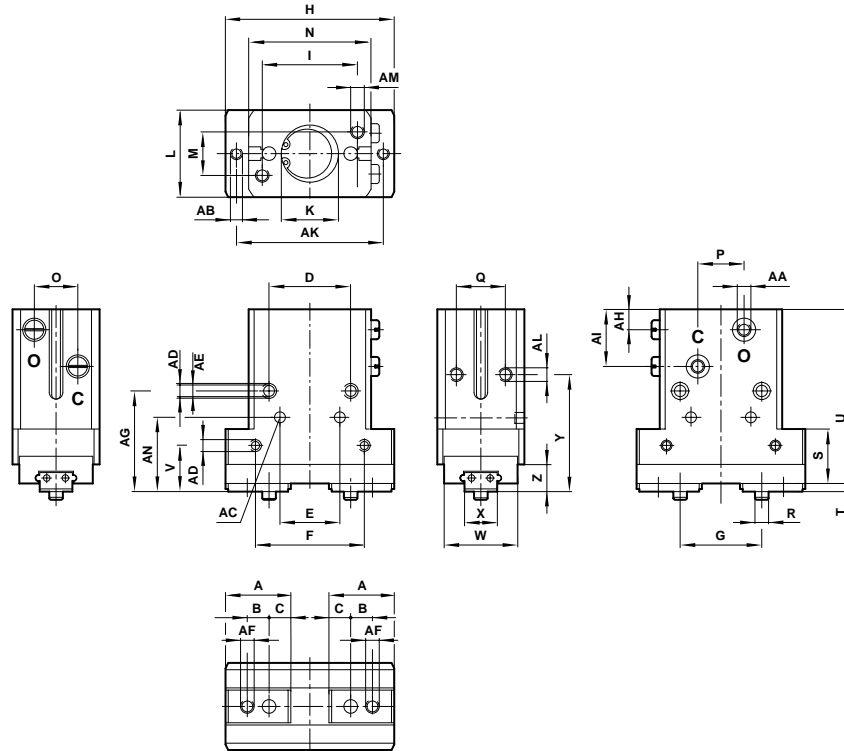
Dimensions



M/160354/M/11	Ø	A	B	C	D	E		G			H	I	
	8	0.31 (8)	0.12 (3.00)	0.10 (2.5)	0.59 (15)	0.28 ± 0.001 (7 ± 0.03)		0.35 + 0.06 open, 0.20 + 0.02 closed (9 + 1.5 open, 5 + 0.5 closed)			0.79 (20)	0.59 (15)	
M/160354/M/11	Ø	K			L		M	O	P	Q	R		S
	8	Ø 0.35 + 0.002 deep 0.04 (Ø 9 + 0.05 deep 1)			0.51 ± 0.002 (13 ± 0.05)		0.35 (9)	0.05 (1.2)	0.31 (8)	0.06 (1.5)	Ø 0.06 -0.001 (Ø 1.5 -0.03)		0.16 (4)
M/160354/M/11	Ø	T	U	V	W	X		Y	Z	AA	AB		
	8	0.06 (1.5)	1.12 (28.5)	0.38 (9.7)	0.47 (12)	0.2 ± 0.001 (5 ± 0.025)		0.67 (17)	0.16 (4)	M3 X 0.5	M2.5 X 0.45 deep 0.16 (4)		
M/160354/M/11	Ø	AC			AD	AF		AG	AH	AI	AL	Ib (kg)	
	8	Ø0.06 + 0.001 deep 0.04 (Ø1.5 + 0.02 deep 1)			Ø0.13 (Ø3.2)	M2 X 0.4 deep 0.14 (3.5)		0.39 (10)	0.18 (4.5)	0.59 (15)	M3 X 0.5 deep 0.12 (3)	0.04 (0.02)	



Dimensions



	Ø	A	B	C	D	E	F	G				H
M/160355/M/11	10	0.58 (14.7)	0.20 (5)	0.18 (4.5)	0.67 (17)	0.47 ± 0.001 (12 ± 0.03)	0.79 (20)	0.61 + 0.06 open. 0.35 + 0.02 closed (15.5 + 1.5 open. 9 + 0.5 closed)				1.42 (36)
M/160356/M/11	16	0.79 (20)	0.31 (8)	0.24 (6)	0.94 (24)	0.63 ± 0.001 (16 ± 0.03)	1.18 (30)	0.87 + 0.07 open. 0.47 + 0.05 closed (22 + 1.8 open. 12 + 1.3 closed)				1.97 (50)
M/160357/M/11	20	0.94 (24)	0.31 (8)	0.31 (8)	1.18 (30)	0.87 ± 0.001 (22 ± 0.03)	1.57 (40)	1.18 + 0.09/-0.02 open. 0.63 + 0.06 closed (30 + 2.4/-0.5 open. 16 + 1.4 closed)				2.44 (62)
	Ø	K			L	M	N	O	P	Q	R	
M/160355/M/11	10	Ø0.43 + 0.002 deep 0.06 (Ø11 + 0.05 deep 1.5)			0.79 ± 0.002 (20 ± 0.05)	0.39 (10)	0.91 (23)	0.35 (9)	0.28 (7)	0.47 (12)	Ø 0.12 - 0.001 (Ø3 - 0.03)	
M/160356/M/11	16	Ø0.67 + 0.002 deep 0.06 (Ø17 + 0.05 deep 1.5)			0.98 ± 0.002 (25 ± 0.05)	0.55 (14)	1.34 (34)	0.47 (12)	0.59 (15)	0.59 (15)	Ø 0.16 - 0.001 (Ø4 - 0.03)	
M/160357/M/11	20	Ø0.83 + 0.002 deep 0.06 (Ø21 + 0.05 deep 1.5)			1.26 ± 0.002 (32 ± 0.05)	0.63 (16)	1.77 (45)	0.63 (16)	0.67 (17)	0.67 (18)	Ø 0.20 - 0.001 (Ø5 - 0.03)	
	Ø	S	T	U	V	W	X	Y	Z	AA	AB	
M/160355/M/11	10	0.49 (12.5)	0.06 (1.5)	1.87 (47.5)	0.43 (11)	0.67 (17)	0.28 ± 0.001 (7 ± 0.025)	1.14 (29)	0.24 (6)	M3 X 0.5	M3 X 0.5 deep 0.18 (4.5)	
M/160356/M/11	16	0.59 (15)	0.08 (2)	2.13 (54)	0.55 (14)	0.79 (20)	0.35 ± 0.001 (9 ± 0.025)	1.42 (36)	0.31 (8)	M5 X 0.8	M4 X 0.7 deep 0.20 (5)	
M/160357/M/11	20	0.79 (20)	0.12 (3)	2.52 (64)	0.67 (17)	1.06 (27)	0.47 ± 0.001 (12 ± 0.025)	1.69 (43)	0.31 (8)	M5 X 0.8	M4 X 0.7 deep 0.28 (7)	
	Ø	AC		AD	AE	AF	AG	AH	AI	AK		
M/160355/M/11	10	Ø 0.10 + 0.001 deep 0.10 (Ø2.5 + 0.02 deep 2.5)		M4 X 0.7 deep 0.24 (6)	Ø0.13 (Ø3.4)	M3 X 0.5 deep 0.16 (4)	0.94 (24)	0.3 (7.5)	0.67 (17)	1.18 (30)		
M/160356/M/11	16	Ø 0.12 + 0.001 deep 0.12 (Ø3 + 0.02 deep 3)		M4 X 0.7 deep 0.24 (6)	Ø0.13 (Ø3.4)	M4 X 0.7 deep 0.20 (5)	1.22 (31)	0.3 (7.5)	0.75 (19)	1.65 (42)		
M/160357/M/11	20	Ø 0.16 + 0.001 deep 0.14 (Ø4 + 0.02 deep 3.5)		M5 X 0.8 deep 0.31 (8)	Ø0.17 (Ø4.2)	M5 X 0.8 deep 0.28 (7)	1.46 (37)	0.3 (7.5)	0.83 (21)	2.13 (54)		
	Ø	AL	AM	AN	AO	Lb (kg)						
M/160355/M/11	10	M3 X 0.5 deep 0.20 (5)	M3 X 0.5 deep 0.24 (6)	0.63 (16)	M3 X 0.5 deep 0.20 (5)	0.18 (0.08)						
M/160356/M/11	16	M4 X 0.7 deep 0.24 (6)	M4 X 0.7 deep 0.28 (7)	0.83 (21)	M3 X 0.5 deep 0.20 (5)	0.35 (0.16)						
M/160357/M/11	20	M5 X 0.8 deep 0.31 (8)	M5 X 0.8 deep 0.35 (9)	1.07 (27.3)	M4 X 0.7 deep 0.24 (6)	0.73 (0.33)						



# M/160350/M/12

Parallel grippers - precision, Double acting  
Magnetic piston, Ø 8 ... 50 mm



**Ideal for applications demanding accuracy and precise repeatability**

**Smooth, accurate movement**

**Long, uninterrupted service life**

**Low weight**

**Compact size**

**Integral magnets for positional feedback**

## Ordering information

To order a gripper with an effective closing grip force of up to 5.84 lb (26N) at 72.5 psig (5 bar) quote: **M/160356/M/12**

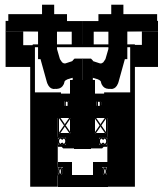
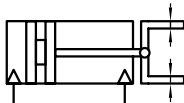
Order magnetically operated switches separately

## Accessories

Switch M/344

## See page

ACT-15-22



## Technical data

Medium:

Compressed air, filtered, lubricated or non-lubricated

Operation:

Double acting, parallel, magnetic piston

Operating pressure:

101.5 psig (7 bar) maximum – see page ACT-15-2 for minimum operating pressures

Operating temperature:

32°F to 140°F (0°C to 60°C)

\* Air supply must be dry enough to avoid ice formation at temperatures below 35°F (2°C)

Mounting:

Mounting holes on three faces

Gripping repeatability:

+/- 0.0004 inches (+/- 0.01 mm)

Accuracy to center:

+/- 0.003 inches (+/- 0.07 mm)

Mechanical life:

~ 5 million cycles before maintenance may be necessary

Operating frequency:

120 cycles per minute maximum

Materials

Body: aluminum alloy

Fingers: stainless steel

Guide rail: stainless steel

Elastomers: nitrile

## Barb fittings connections

M3 x 1/8" tube ID, straight barb, part number **29217X303**

M5 x 1/8" tube ID, straight barb, part number **29217X305**

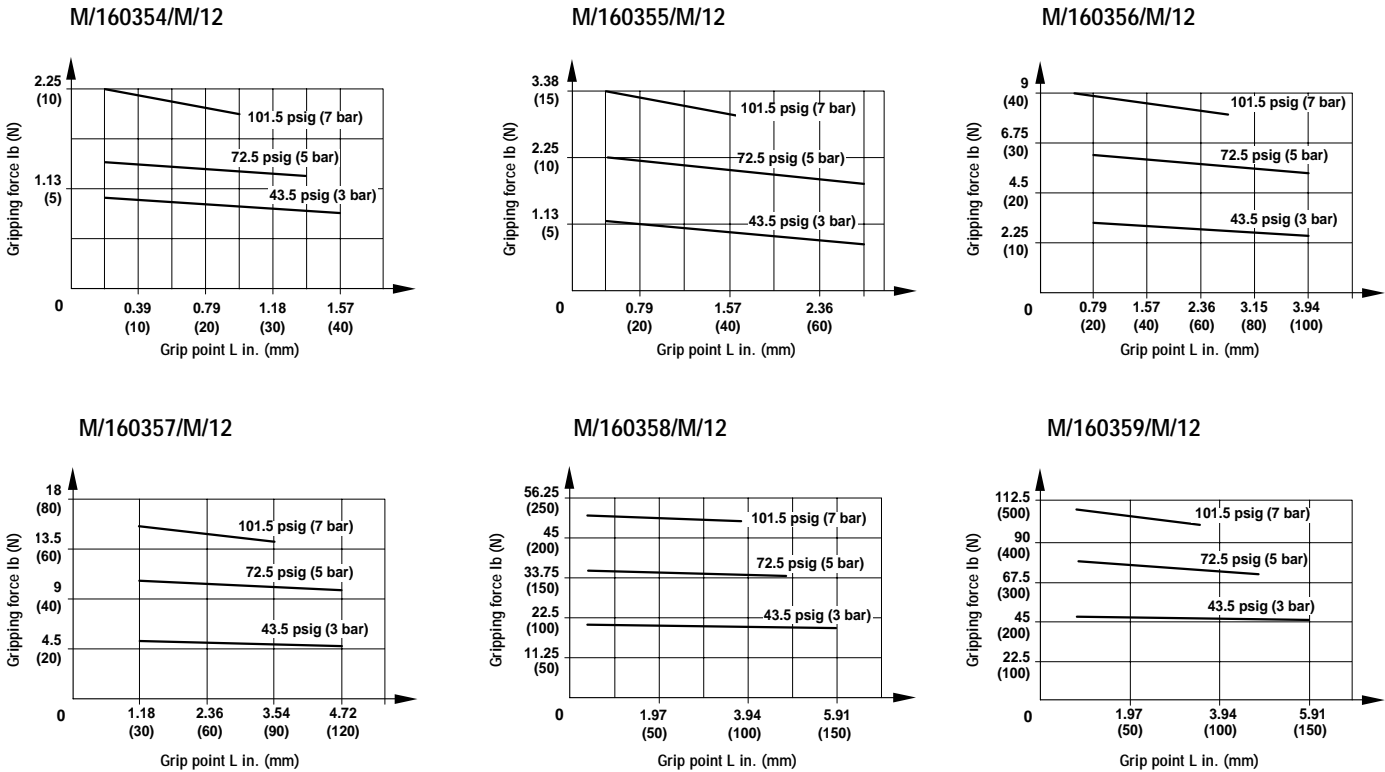


**Standard models ● Effective gripping force ● Air consumption**

Model	Effective gripping force lb (N) at 72.5 psig (5 bar) Opening	Effective gripping force lb (N) at 72.5 psig (5 bar) Closing	Minimum operating pressure in bar	Air consumption in <sup>3</sup> (cm <sup>3</sup> ) at 72.5 psig (5 bar)**
M/160354/M/12	2.23 (9.9)	1.31 (5.8)	31.9 (2.2)	0.009 (0.15)
M/160355/M/12	3.38 (15)	2.12 (9.4)	29 (2)	0.025 (0.41)
M/160356/M/12	8.78 (39)	5.85 (26)	17.4 (1.2)	0.096 (1.6)
M/160357/M/12	13.50 (60)	10.13 (45)	14.5 (1)	0.222 (3.7)
M/160358/M/12	39.60 (176)	35.33 (157)	14.5 (1)	0.984 (16.4)
M/160359/M/12	93.15 (414)	78.08 (347)	14.5 (1)	3.660 (61.0)

\*\*per cycle

**Theoretical closing gripping forces**



Effective closing gripping forces = Theoretical closing gripping force x 0.85

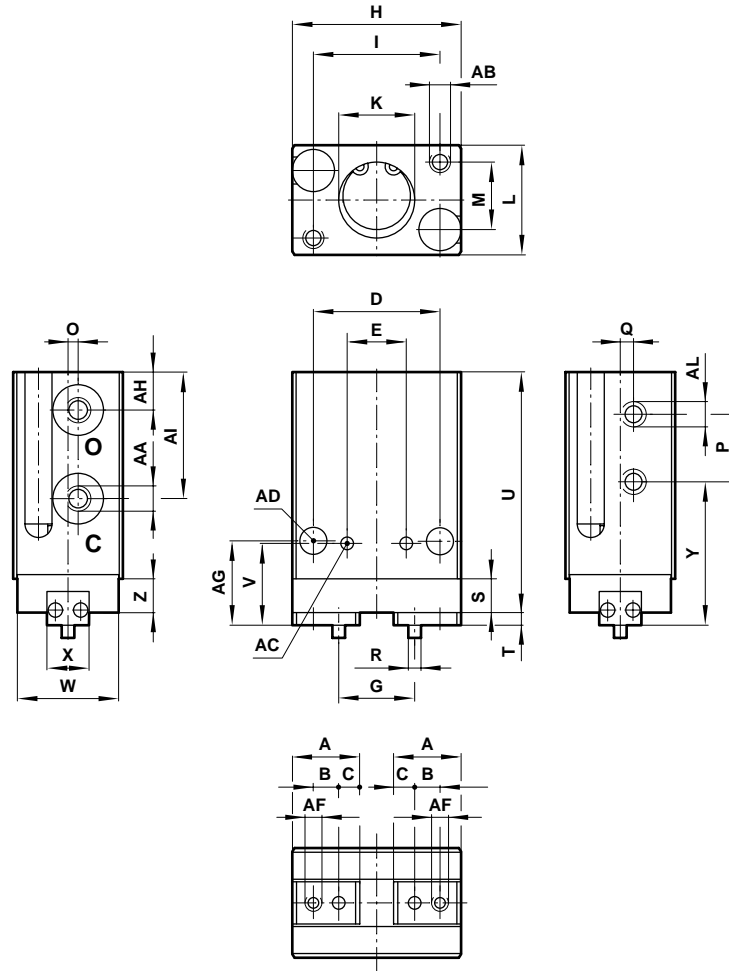
**Switches with LED indication**

Model	Voltage V d.c.	Current max.	Temperature °F °C	LED	Features	Cable length	Cable type	Straight cable connection	90° elbow cable connection
M/344/EAU/1APV	10 ... 28	20 mA	32° ... 140° (0° ... 60°)	•	-	3.28 ft. (1 m)	PVC	-	•
M/344/EAU/1PV	10 ... 28	20 mA	32° ... 140° (0° ... 60°)	•	-	3.28 ft. (1 m)	PVC	•	-
M/344/EAU/3APV	10 ... 28	20 mA	32° ... 140° (0° ... 60°)	•	-	9.84 ft. (3 m)	PVC	-	•
M/344/EAU/3PV	10 ... 28	20 mA	32° ... 140° (0° ... 60°)	•	-	9.84 ft. (3 m)	PVC	•	-
M/344/EAN/1APV	4.5 ... 28	50 mA	32° ... 140° (0° ... 60°)	•	NPN	3.28 ft. (1 m)	PVC	-	•
M/344/EAN/1PV	4.5 ... 28	50 mA	32° ... 140° (0° ... 60°)	•	NPN	3.28 ft. (1 m)	PVC	•	-
M/344/EAN/3APV	4.5 ... 28	50 mA	32° ... 140° (0° ... 60°)	•	NPN	9.84 ft. (3 m)	PVC	-	•
M/344/EAN/3PV	4.5 ... 28	50 mA	32° ... 140° (0° ... 60°)	•	NPN	9.84 ft. (3 m)	PVC	•	-



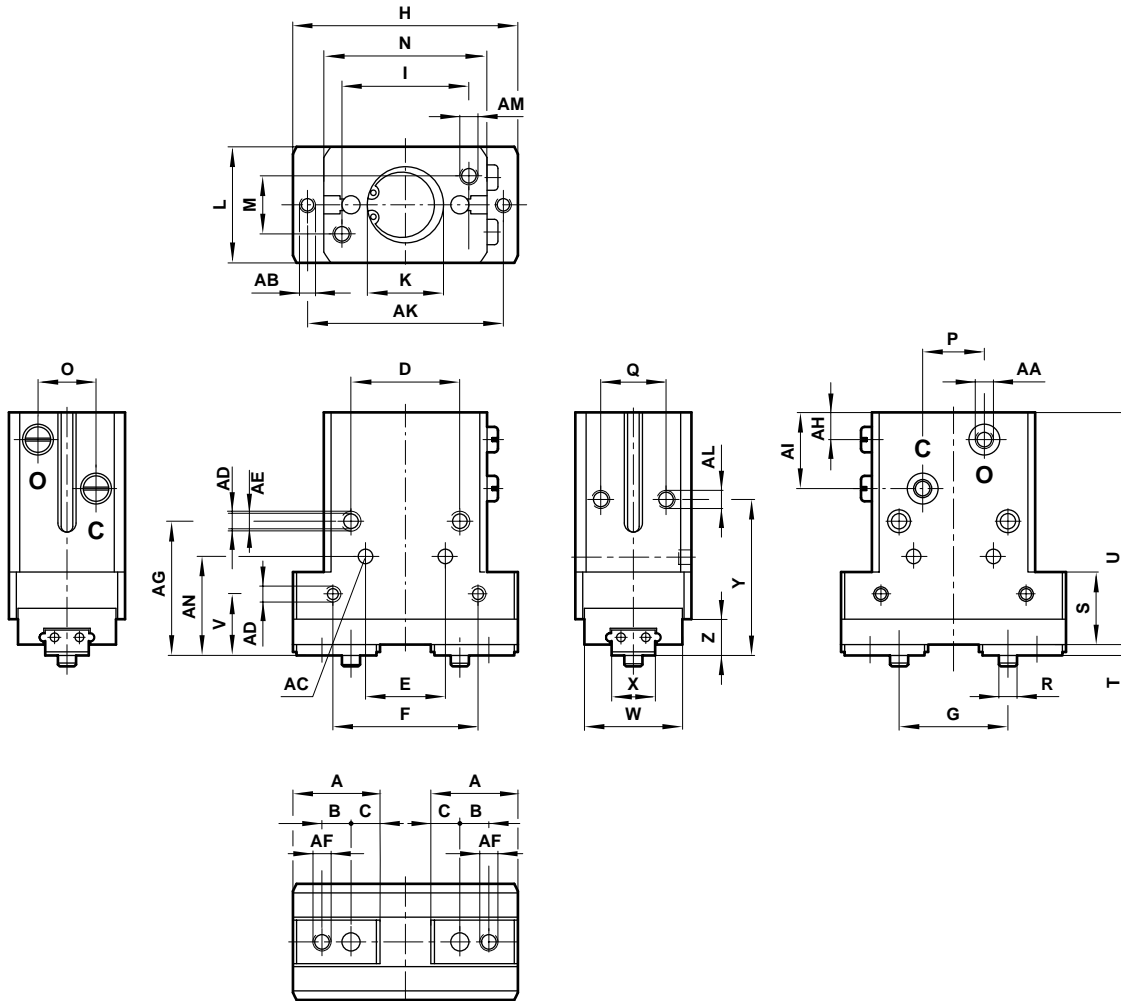
M/160354/M/12

Dimensions



M/160354/M/12	∅	A	B	C	D	E	G				H	I
M/160354/M/12	8	0.31 (8)	0.12 (3)	0.10 (2.5)	0.59 (15)	0.28 ±0.001 (7 ± 0.03)	0.35 + 0.06 open, 0.20 + 0.02 closed (9 + 1.5 open, 5 + 0.5 closed)				0.79 (20)	0.59 (15)
M/160354/M/12	∅	K				L	M	O	P	Q	R	S
M/160354/M/12	8	∅ 0.35 + 0.002 deep 0.04 (∅9 + 0.05 deep 1)				0.51 ±0.002 (13 ± 0.05)	0.35 (9)	0.05 (1.2)	0.31 (8)	0.06 (1.5)	∅ 0.06 - 0.001 (∅1.5 - 0.03)	0.16 (4)
M/160354/M/12	∅	T	U	V	W	X	Y	Z	AA	AB		
M/160354/M/12	8	0.06 (1.5)	1.12 (28.5)	0.38 (9.7)	0.47 (12)	0.20 ±0.001 (5 ± 0.025)	0.67 (17)	0.16 (4)	M3 X 0.5	M2.5 X 0.45 deep 0.16 (4)		
M/160354/M/12	∅	AC			AD	AF		AG	AH	AI	AL	lb (kg)
M/160354/M/12	8	∅ 0.06 + 0.001 deep 0.04 (∅1.5 + 0.02 deep 1)			∅ 0.13 (∅3.2)	M2 X 0.4 deep 0.14 (3.5)		0.39 (10)	0.18 (4.5)	0.59 (15)	M3 X 0.5 deep 0.12 (3)	0.04 (0.02)

Dimensions in inches (mm)

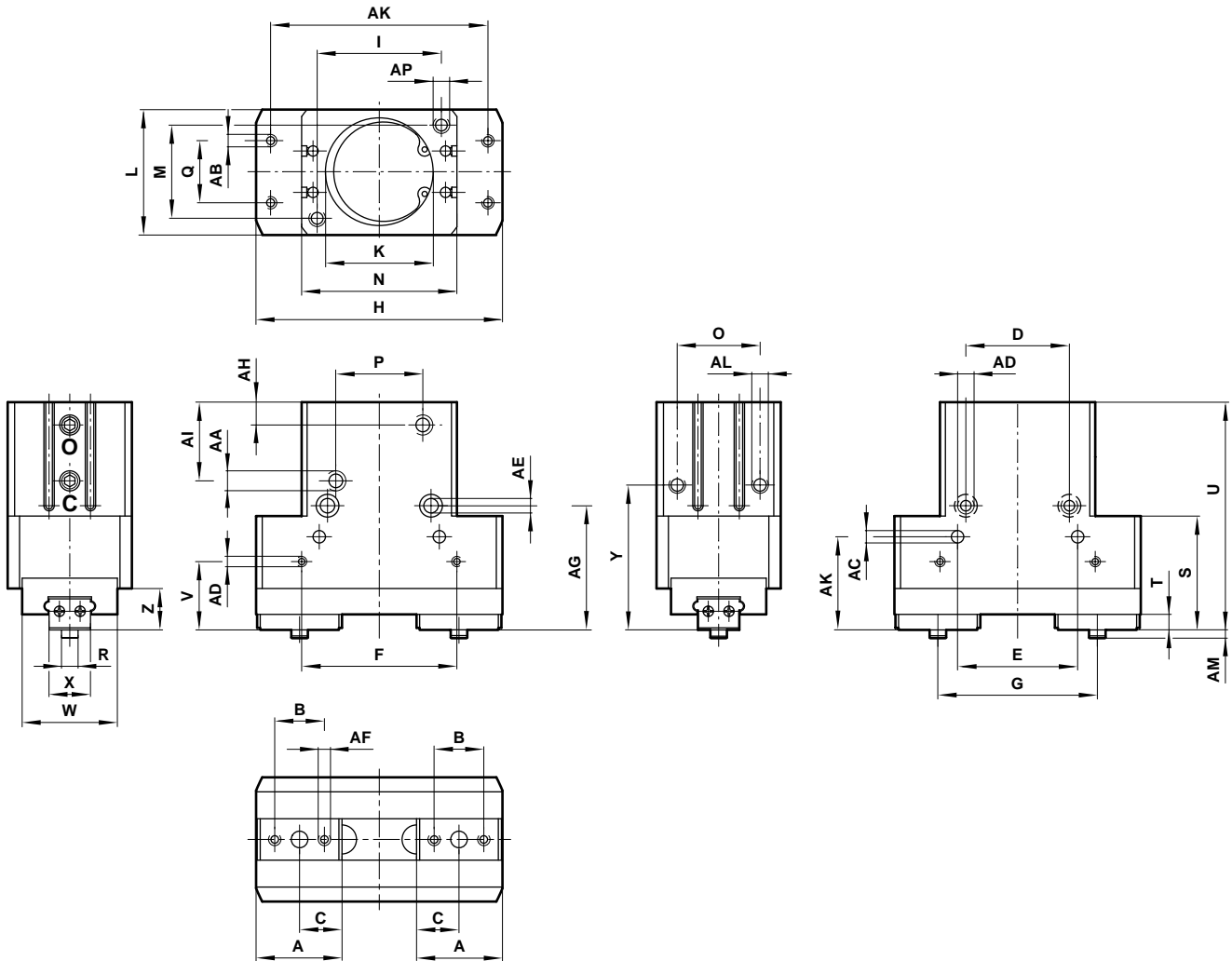


Ø	A	B	C	D	E	F	G					H
M/160355/M/12	10 0.58 (14.7)	0.20(5)	0.18 (4.5)	0.67 (17)	0.47 ± 0.001 (12 ± 0.03)	0.79 (20)	0.61 + 0.06 open, 0.35 + 0.02 closed (15.5 + 1.5 open, 9 + 0.5 closed)					1.42 (36)
M/160356/M/12	16 0.79 (20)	0.31 (8)	0.24 (6)	0.94 (24)	0.63 ± 0.001 (16 ± 0.03)	1.18 (30)	0.87 + 0.07 open, 0.47 + 0.05 closed (22 + 1.8 open, 12 + 1.3 closed)					1.97 (50)
M/160357/M/12	20 0.94 (24)	0.31 (8)	0.31 (8)	1.18 (30)	0.87 ± 0.001 (22 ± 0.03)	1.57 (40)	1.18 + 0.09/0.02 open, 0.63 + 0.06 closed (30 + 2.4/-0.5 open, 16 + 1.4 closed)					2.44 (62)
M/160358/M/12	32 1.22 (31)	0.55(14)	0.37 (9.5)	1.18 (30)	1.18 ± 0.001 (30 ± 0.03)	1.97 (50)	1.61 + 0.07 open, 0.75 + 0.05 closed (41 + 1.80 open, 19 + 1.30 closed)					3.35 (85)
Ø	I	K			L	M	N	O	P	Q	R	
M/160355/M/12	10 0.67 (17)	Ø 0.43 + 0.02 deep 0.06 (Ø11 + 0.05 deep 1.5)			0.79 ± 0.002 (20 ± 0.05)	0.39 (10)	0.91 (23)	0.35 (9)	0.28 (7)	0.47 (12)	Ø 0.12 - 0.001 (Ø 3 - 0.03)	
M/160356/M/12	16 1.02 (26)	Ø 0.67 + 0.02 deep 0.06 (Ø17 + 0.05 deep 1.5)			0.98 ± 0.002 (25 ± 0.05)	0.55 (14)	1.34 (34)	0.47 (12)	0.59 (15)	0.59 (15)	Ø 0.16 - 0.001 (Ø 4 - 0.03)	
M/160357/M/12	20 1.38 (35)	Ø 0.83 + 0.02 deep 0.06 (Ø21 + 0.05 deep 1.5)			1.26 ± 0.002 (32 ± 0.05)	0.63 (16)	1.77 (45)	0.63 (16)	0.67 (17)	0.71 (18)	Ø 0.20 - 0.001 (Ø 5 - 0.03)	
M/160358/M/12	32 1.57 (40)	Ø 1.34 + 0.02 deep 0.08 (Ø34 + 0.050 deep 2)			1.57 ± 0.002 (40 ± 0.05)	1.18 (30)	2.05 (52)	0.79 (20)	0.79 (20)	0.79 (20)	Ø 0.24 - 0.001 (Ø 6 - 0.03)	
Ø	S	T	U	V	W	X	Y	Z	AA	AB		
M/160355/M/12	10 0.49 (12.5)	0.06 (1.5)	1.87 (47.5)	0.43 (11)	0.67 (17)	0.28 ± 0.001 (7 ± 0.025)	1.14 (29)	0.24 (6)	M3 X 0.5	M3 X 0.5 deep 0.18 (4.5)		
M/160356/M/12	16 0.59 (15)	0.08 (2)	2.13 (54)	0.55 (14)	0.79 (20)	0.35 ± 0.001 (9 ± 0.025)	1.42 (36)	0.31 (8)	M5 X 0.8	M4 X 0.7 deep 0.20 (5)		
M/160357/M/12	20 0.79 (20)	0.12 (3)	2.52 (64)	0.67 (17)	1.06 (27)	0.47 ± 0.001 (12 ± 0.025)	1.69 (43)	0.31 (8)	M5 X 0.8	M4 X 0.7 deep 0.28 (7)		
M/160358/M/12	32 1.22 (31)	0.16 (4)	3.11 (79)	0.79 (20)	1.26 (32)	0.59 ± 0.001 (15 ± 0.025)	2.09 (53)	0.51 (13)	M5 x 0.8	M8 x 1 deep 0.35 (9)		
Ø	AC			AD		AE	AF	AG	AH	AI		
M/160355/M/12	Ø 0.10 + 0.001 deep 0.10 (Ø 2.5 + 0.02 deep 2.5)			M4 X 0.7 deep 0.24 (6)		Ø 0.13 (Ø 3.4)	M3 X 0.5 deep 0.16 (4)	0.94 (24)	0.30 (7.5)	0.67 (17)		
M/160356/M/12	Ø 0.12 + 0.001 deep 0.12 (Ø 3 + 0.02 deep 3)			M4 X 0.7 deep 0.24 (6)		Ø 0.13 (Ø 3.4)	M4 X 0.7 deep 0.20 (5)	1.22 (31)	0.30 (7.5)	0.75 (19)		
M/160357/M/12	Ø 0.16 + 0.001 deep 0.14 (Ø 4 + 0.02 deep 3.5)			M5 X 0.8 deep 0.31 (8)		Ø 0.17 (Ø 4.2)	M5 X 0.8 deep 0.28 (7)	1.46 (37)	0.30 (7.5)	0.83 (21)		
M/160358/M/12	Ø 0.2 + 0.001 deep 0.16 (Ø 5 + 0.03 deep 4)			M6 x 1 deep 0.35 (9)		Ø 0.2 (Ø 5.2)	M6 x 1 deep 0.35 (9)	1.81 (46)	0.35 (9)	1.12 (28.5)		
Ø	AK	AL	AM	AN	AO	lb (kg)						
M/160355/M/12	10 1.18 (30)	M3 X 0.5 deep 0.20 (5)	M3 X 0.5 deep 0.24 (6)	0.63 (16)	M3 X 0.5 deep 0.20 (5)	0.18 (0.08)						
M/160356/M/12	16 1.65 (42)	M4 X 0.7 deep 0.24 (6)	M4 X 0.7 deep 0.28 (7)	0.83 (21)	M3 X 0.5 deep 0.20 (5)	0.35 (0.16)						
M/160357/M/12	20 2.13 (54)	M5 X 0.8 deep 0.31 (8)	M5 X 0.8 deep 0.35 (9)	1.07 (27.3)	M4 X 0.7 deep 0.24 (6)	0.73 (0.33)						
M/160358/M/12	32 2.76 (70)	M6 x 1 deep 0.31 (8)	M6 x 1 deep 0.35 (9)	1.22 (31)	M5 x 0.8 deep 0.31 (8)	1.46 (0.66)						

Dimensions in inches (mm)



M/160359/M/12



	Ø	A	B	C	D	E	F	G					
M/160359/M/12	50	1.61 (41)	0.94 (24)	0.81 (20.5)	1.97 (50)	2.28 ± 0.001 (58 ± 0.03)	2.95 (75)	3.03 + 0.07/-0.01 open, 1.61 + 0.02 closed (77 + 1.8/-0.2 open, 41 + 0.4 closed)					
	Ø	H	I	K			L	M	N	O	P	Q	
M/160359/M/12	50	4.69 (119)	2.36 (60)	Ø 2.05 + 0.002 deep 0.12 (Ø52 + 0.05 deep 3)			2.36 ± 0.002 (60 ± 0.05)	1.77 (45)	2.95 (5)	1.57 (40)	1.65 (2)	1.18 (30)	
	Ø	R		S	T	U	V	W	X	Y	Z	AA	AB
M/160359/M/12	50	Ø 0.31 - 0.001 (Ø8 - 0.02)		2.17 (55)	0.30 (7.5)	4.33 (110)	1.30 (33)	1.81 (46)	0.79 - 0.001 (20 - 0.025)	2.76 (70)	0.79 (20)	Rc1/8	M6 X 1 deep 0.47 (12)
	Ø	AC			AD		AE		AF		AG	AH	AI
M/160359/M/12	50	Ø 0.24 + 0.001 deep 0.28 (Ø6 + 0.03 deep 7)			M8 X 1.25 deep 0.47 (12)		Ø 0.43 deep 0.26 (Ø11 deep 6.5)		M6 X 1 deep 0.47 (12)		2.36 (60)	0.43 (11)	1.50 (38)
	Ø	AK	AL		AM	AN	AO	AP		lb (kg)			
M/160359/M/12	50	4.13 (105)	M8 X 1.25 deep 0.47 (12)		0.16 (4)	1.77 (45)	M5 X 0.8 deep 0.32 (8)	M8 X 1.25 deep 0.59 (15)		4.08 (1.85)			

Dimensions in inches (mm)

**Ideal for applications where operating space  
is restricted**

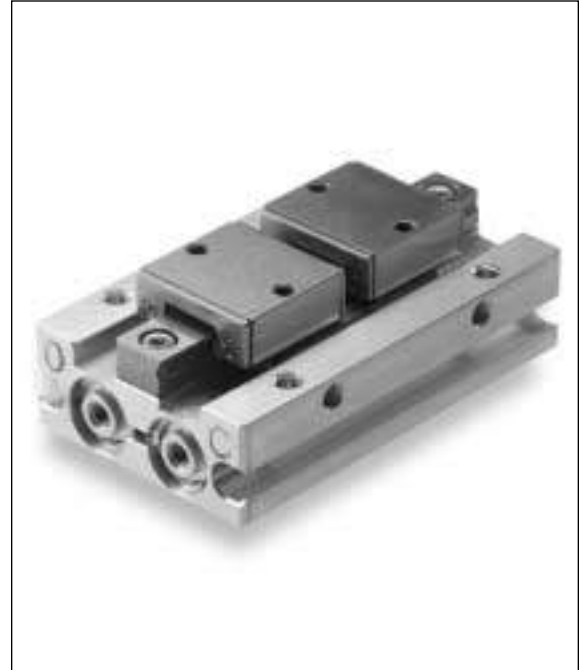
**Smooth, accurate movement**

**Long, uninterrupted service life**

**Low weight**

**Compact size**

**Integral magnets for positional feedback**



#### Technical data

Medium:

Compressed air, filtered, lubricated or non-lubricated

Operating pressure:

M/160364/M/12: 29 to 101.5 psig (2 to 7 bar)

M/160365/M/12: 21.75 to 101.5 psig (1.5 to 7 bar)

Operating temperature:

32°F to 140°F (0°C to 60°C)

\* Air supply must be dry enough to avoid ice formation at temperatures below 35°F (2°C)

Mounting:

Mounting holes on three faces

Gripping repeatability:

+/- 0.003 inches (+/- 0.07mm)

Accuracy to center:

+/- 0.004 inches (+/- 0.1mm)

Materials

Body: aluminum alloy

Fingers: carbon steel

Bearings: stainless steel

Elastomers: nitrile

#### Barb fittings connections

M3 x 1/8" tube ID, straight barb, part number **29217X303**

M5 x 1/8" tube ID, straight barb, part number **29217X305**

#### Ordering information

To order a gripper with an effective closing grip force of up to 3.75 lb at 72.5 psig (16.7N at 5 bar) quote: **M/160364/M/12**

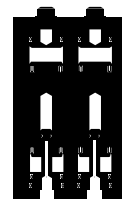
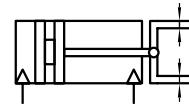
Order magnetically operated switches separately

#### Accessories

Switch M/344

#### See page

ACT-15-27



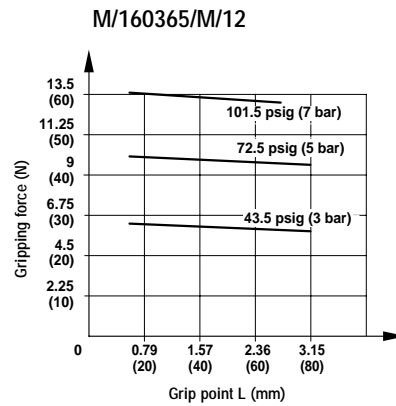
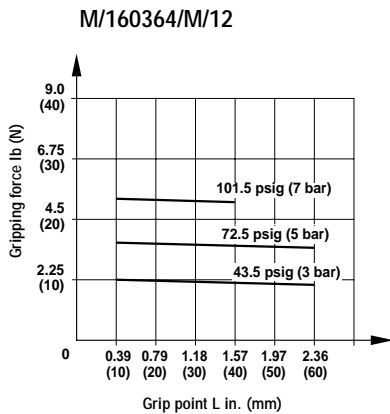


**Standard models ● Effective gripping force ● Air consumption**

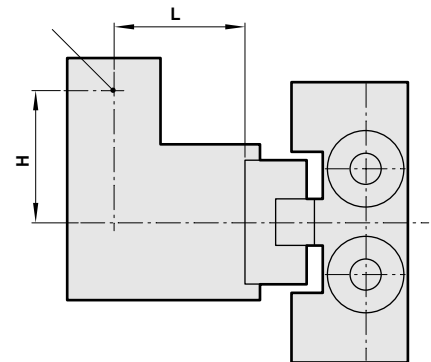
Model	Effective gripping force lb (N) at 72.5 psig (5 bar)		Air consumption in <sup>3</sup> (cm <sup>3</sup> ) at 72.5 psig (5 bar)**
	Opening	Closing	
M/160364/M/12	3.76 (16.7)	3.76 (16.7)	0.084 (1.4)
M/160365/M/12	9.90 (44)	9.90 (44)	0.258 (4.3)

\*\*per cycle

**Theoretical gripping forces**



Workpiece grip point

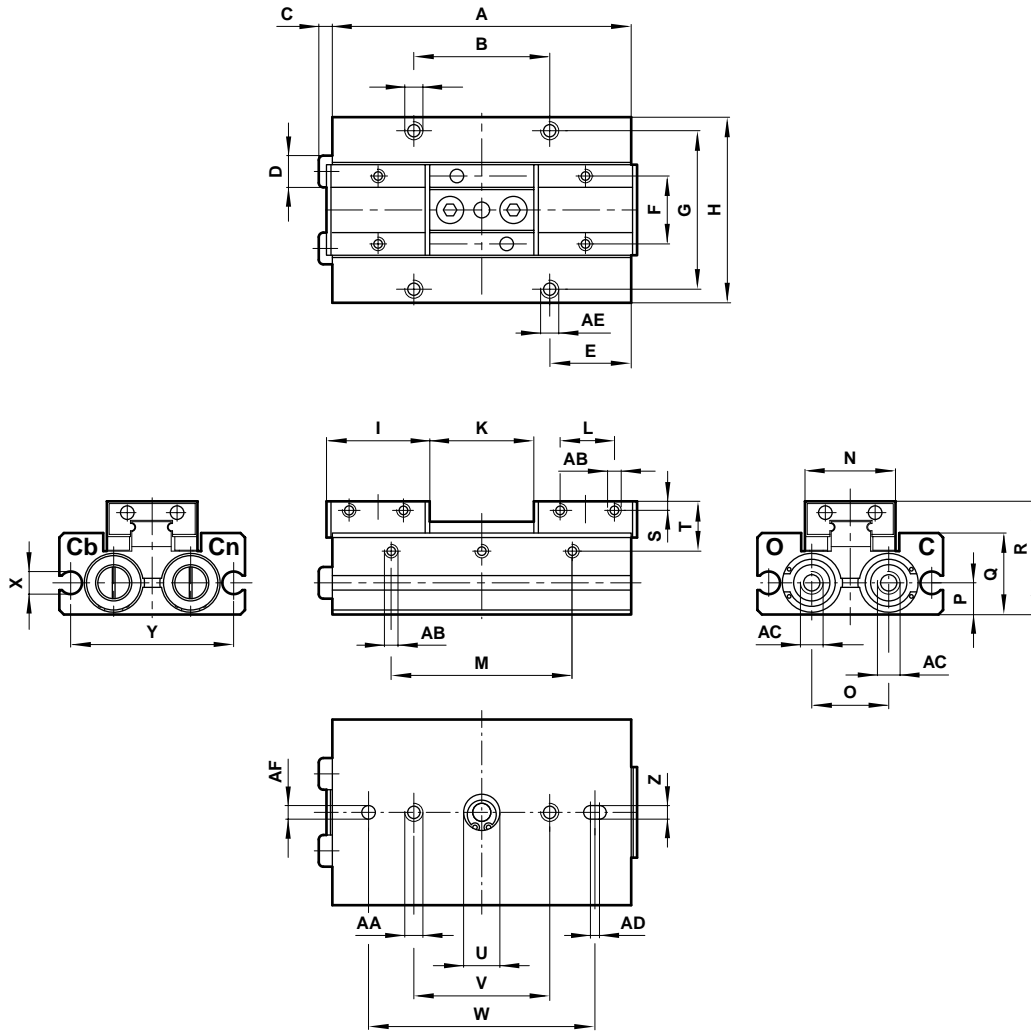


**Switches with LED indication**

Model	Voltage V d.c.	Current max.	Temperature °F °C	LED	Features	Cable length	Cable type	Straight cable connection	90° elbow cable connection
M/344/EAU/1APV	10 ... 28	20 mA	32° ... 140° (0° ... 60°)	•	-	3.28 ft. (1 m)	PVC	-	•
M/344/EAU/1PV	10 ... 28	20 mA	32° ... 140° (0° ... 60°)	•	-	3.28 ft. (1 m)	PVC	•	-
M/344/EAU/3APV	10 ... 28	20 mA	32° ... 140° (0° ... 60°)	•	-	9.84 ft. (3 m)	PVC	-	•
M/344/EAU/3PV	10 ... 28	20 mA	32° ... 140° (0° ... 60°)	•	-	9.84 ft. (3 m)	PVC	•	-
M/344/EAN/1APV	4.5 ... 28	50 mA	32° ... 140° (0° ... 60°)	•	NPN	3.28 ft. (1 m)	PVC	-	•
M/344/EAN/1PV	4.5 ... 28	50 mA	32° ... 140° (0° ... 60°)	•	NPN	3.28 ft. (1 m)	PVC	•	-
M/344/EAN/3APV	4.5 ... 28	50 mA	32° ... 140° (0° ... 60°)	•	NPN	9.84 ft. (3 m)	PVC	-	•
M/344/EAN/3PV	4.5 ... 28	50 mA	32° ... 140° (0° ... 60°)	•	NPN	9.84 ft. (3 m)	PVC	•	-



Dimensions



	Ø	A	B	C	D	E	F	G	H	I		
M/160364/M/12	8	2.05 (52)	1.26 (32)	0.10 (2.5)	Ø 0.20 (Ø 5)	0.32 (8.1)	0.51 (13)	1.02 (26)	1.26 (32)	0.64 (16.2)		
M/160365/M/12	12	2.60 (66)	1.18 (30)	0.12 (3)	Ø 0.28 (Ø 7)	0.45 (11.4)	0.59 (15)	1.38 (35)	1.61 (41)	0.90 (22.8)		
	Ø	K						L	M	N	O	P
M/160364/M/12	8	0.67 +0.07/-0.02 open, 0.04 +0.03/-0.04 closed (17 +1.7/-0.5 open, 1 +0.7/-1.0 closed)						0.39 (10)	0.94 (24)	0.67 (17)	0.47 (12)	0.20 (5)
M/160365/M/12	12	0.91 +0.07/-0.02 open, 0.04 +0.04/-0.04 closed (23 +1.9/-0.5 open, 1 +0.9/-1.0 closed)						0.47 (12)	1.57 (40)	0.79 (20)	0.67 (17)	0.28 (7)
	Ø	Q	R	S	T	U		V	W	X	Y	
M/160364/M/12	8	0.51 (13)	0.75 (19)	0.08 (2)	0.33 (8.5)	Ø 0.31 +0.002 deep 0.04 (Ø 8 + 0.05 deep 1)		0.94 (24)	1.57 (40)	Ø 0.20 (Ø 5)	1.06 (27)	
M/160365/M/12	12	0.71 (18)	0.98 (25)	0.08 (2)	0.43 (11)	Ø 0.31 +0.002 deep 0.04 (Ø 8 + 0.05 deep 1)		1.18 (30)	1.97 (50)	Ø 0.20 (Ø 5)	1.42 (36)	
	Ø	Z			AA	AB	AC	AD	AE		lb (kg)	
M/160364/M/12	8	0.10 +0.001 deep 0.10 (2.5 + 0.03 deep 2.5)			M3 X 0.5 deep 0.20 (5)	M2.5 X 0.45 deep 0.12 (3)	M3 X 0.5	0.08 (2)	M3 X 0.5 deep 0.20 (5)		0.20 (0.09)	
M/160365/M/12	12	0.12 +0.001 deep 0.12 (3 + 0.03 deep 3)			M4 X 0.7 deep 0.31 (8)	M3 X 0.5 deep 0.20 (5)	M5 X 0.8	0.08 (2)	M4 X 0.7 deep 0.24 (6)		0.44 (0.20)	

Dimensions in inches (mm)



# M/160380/M/12

Parallel grippers - three jaw, Double acting  
Magnetic piston, Ø 16 ... 20 mm



**Ideal for gripping spheres or components with circular faces**

**Smooth, accurate movement**

**Long, uninterrupted service life**

**Low weight**

**Compact size**

**Integral magnets for positional feedback**

## Ordering information

To order a gripper with an effective closing grip force of up to 4.49 lb (20N) at 72.5 psig (5 bar) quote: **M/160385/M/12**

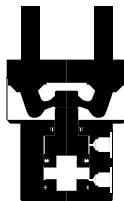
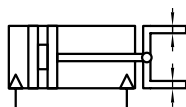
Order magnetically operated switches separately

## Accessories

Switch M/344

## See page

ACT-15-30



## Technical data

Medium:

Compressed air, filtered, lubricated or non-lubricated

Operation:

Double acting, three jaw parallel, magnetic piston

Operating pressure:

29 to 101.5 psig (2 to 7 bar)

21.75 to 101.5 psig (1.5 to 7 bar) M/160386/M/12

Operating temperature:

32°F to 140°F (+0°C to 60°C)

\* Air supply must be dry enough to avoid ice formation at temperatures below 35°F (2°C)

Mounting:

Mounting holes on base

Gripping repeatability:

+/- 0.004 inches (+/- 0.01 mm)

Mechanical life:

~ 5 million cycles before maintenance may be necessary

Operating frequency:

200 cycles per minute maximum

Materials

Body: aluminum alloy

Top plate: carbon steel

Fingers: carbon steel

External screws: carbon steel

Elastomers: nitrile

## Barb fittings connections

M3 x 1/8" tube ID, straight barb, part number **29217X303**

M5 x 1/8" tube ID, straight barb, part number **29217X305**

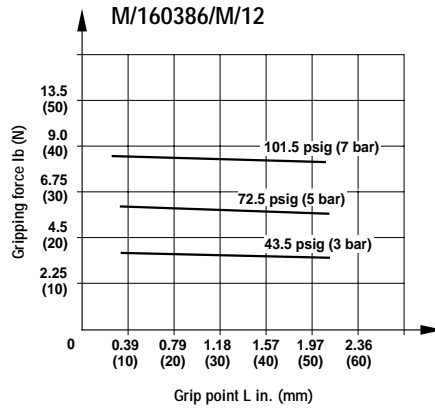
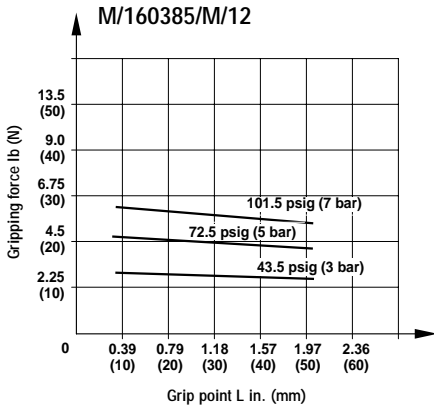


**Standard models ● Effective gripping force ● Air consumption**

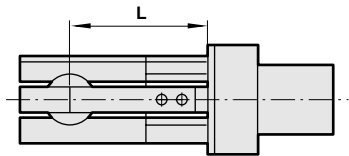
Model	Effective gripping force lb (N) at 72.5 psig (5 bar)		Air consumption in <sup>3</sup> (cm <sup>3</sup> ) at 72.5 psig (5 bar)**
	Opening	Closing	
M/160385/M/12	6.08 (27)	4.50 (20)	0.08 (1.4)
M/160386/M/12	8.10 (36)	6.08 (27)	0.20 (3.3)

\*\*per cycle

**Theoretical closing gripping forces**



Workpiece grip point



**Criteria of workpiece weight**

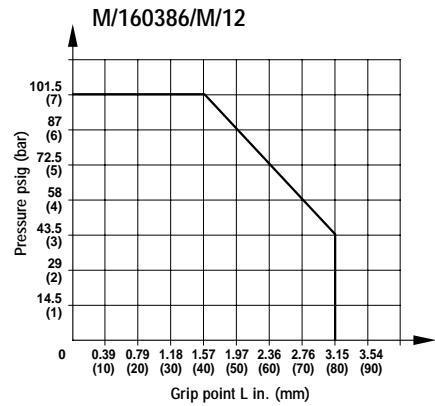
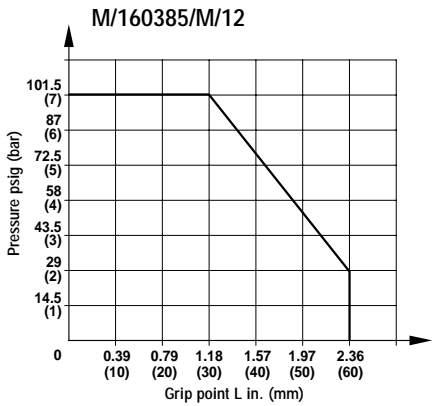
When chucking a workpiece, weight should be within the range between 1/10 and 1/20 of the above gripping force.

When chucking and then moving a workpiece, the workpiece may protrude or drop. Therefore, workpiece weight should be less than the above mentioned value.  
(Reference value is 1/30-1/50)

Weight depends on the operational condition, such as material and shape of workpiece or claw, speed and direction of moving workpiece (straight advance, rotation or swing, etc.)

Effective closing gripping forces = Theoretical closing gripping force x 0.85

**Grip point limitation range**

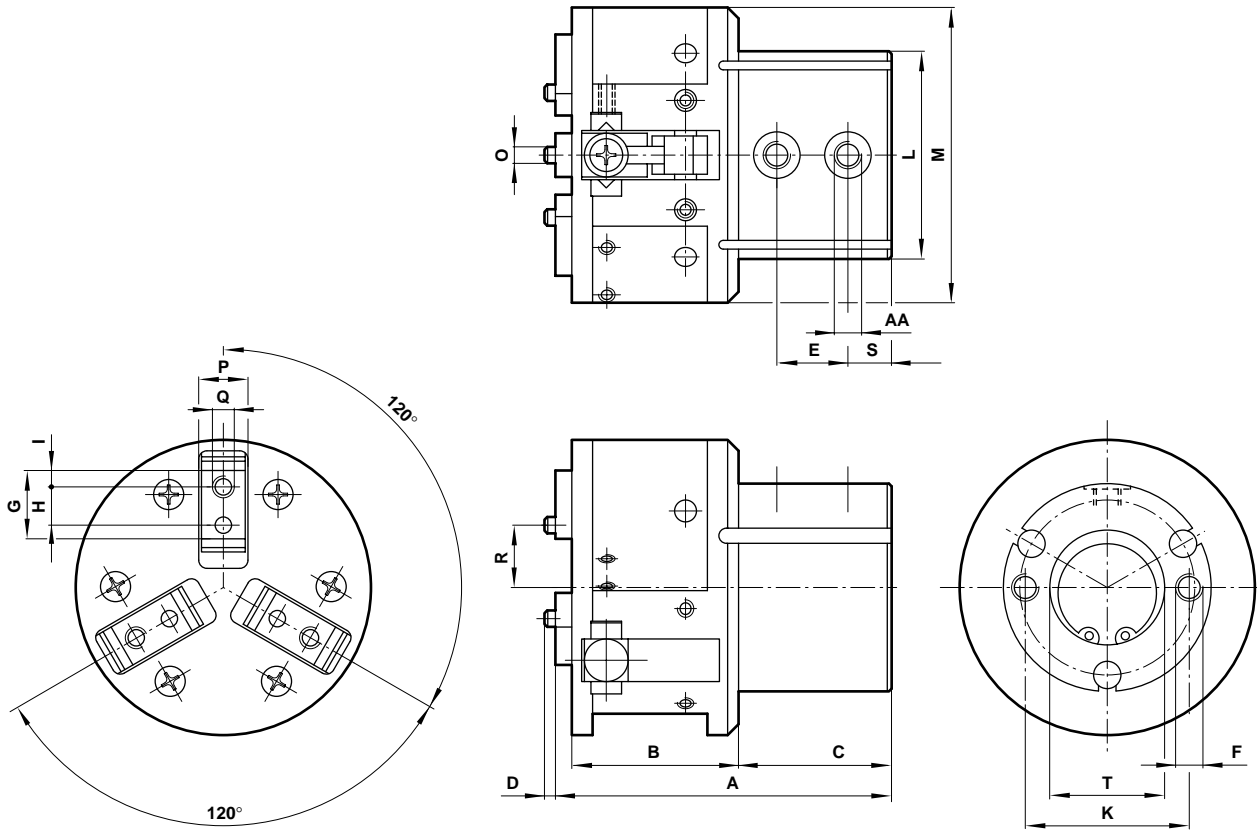


**Switches with LED indication**

Model	Voltage V d.c.	Current max.	Temperature °F °C	LED	Features	Cable length	Cable type	Straight cable connection	90° elbow cable connection
M/344/EAU/1APV	10 ... 28	20 mA	32° ... 140° (0° ... 60°)	•	-	3.28 ft. (1 m)	PVC	-	•
M/344/EAU/1PV	10 ... 28	20 mA	32° ... 140° (0° ... 60°)	•	-	3.28 ft. (1 m)	PVC	•	-
M/344/EAU/3APV	10 ... 28	20 mA	32° ... 140° (0° ... 60°)	•	-	9.84 ft. (3 m)	PVC	-	•
M/344/EAU/3PV	10 ... 28	20 mA	32° ... 140° (0° ... 60°)	•	-	9.84 ft. (3 m)	PVC	•	-
M/344/EAN/1APV	4.5 ... 28	50 mA	32° ... 140° (0° ... 60°)	•	NPN	3.28 ft. (1 m)	PVC	-	•
M/344/EAN/1PV	4.5 ... 28	50 mA	32° ... 140° (0° ... 60°)	•	NPN	3.28 ft. (1 m)	PVC	•	-
M/344/EAN/3APV	4.5 ... 28	50 mA	32° ... 140° (0° ... 60°)	•	NPN	9.84 ft. (3 m)	PVC	-	•
M/344/EAN/3PV	4.5 ... 28	50 mA	32° ... 140° (0° ... 60°)	•	NPN	9.84 ft. (3 m)	PVC	•	-



Dimensions



	Ø	A	B	C	D	E	F	G	H	I
M/160385/M/12	16	2.09 (53.0)	0.91 (23)	1.06 (27)	0.08 (2)	0.49 (12.5)	M4 X 0.7 deep 0.28 (7)	0.39 (10)	0.20 (5)	0.10 (2.5)
M/160386/M/12	20	2.42 (61.5)	1.20 (30.5)	1.10 (28)	0.08 (2)	0.51 (13.0)	M5 X 0.8 deep 0.31 (8)	0.49 (12.5)	0.28 (7)	0.12 (3)
	Ø	K	L	M	O		P		Q	
M/160385/M/12	16	0.94 (24)	Ø 1.26 (Ø 32)	Ø 1.65 (Ø 42)	Ø 0.12 -0.0002 (Ø3 - 0.005)		0.28 -0.0012 (7 - 0.03)		M3 X 0.5	
M/160386/M/12	20	1.18 (30)	Ø 50 (Ø 38)	Ø 2.13 (Ø 54)	Ø 0.12 -0.0002 (Ø3 - 0.005)		0.31 -0.0016 (8 - 0.04)		M4 X 0.7	
	Ø	R				S	T		AA	lb (kg)
M/160385/M/12	16	0.37 + 0.04/-0.02 open, 0.22 + 0.04/-0.02 closed (9.5 + 0.9/-0.4 open 5.5 + 0.9/-0.4 closed)				0.30 (7.5)	Ø 0.67 + 0.002 deep 0.059 (Ø17 + 0.05 deep 1.5)		M5 X 0.8	0.32 (0.16)
M/160386/M/12	20	0.51 + 0.06/-0.02 open, 0.28 + 0.05/-0.02 closed (13 + 1.6/-0.4 open 7 + 1.2/-0.4 closed)				0.31 (8)	Ø 0.83 + 0.002 deep 0.029 (Ø21 + 0.05 deep 1.5)		M5 X 0.8	0.56 (0.28)

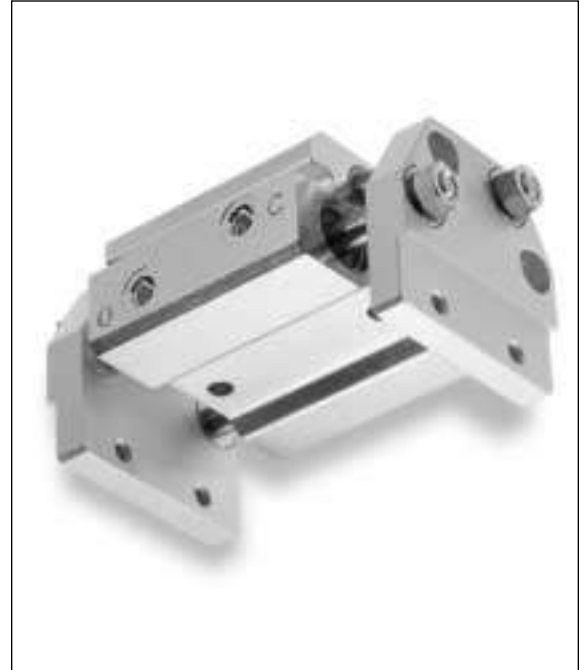
**Ideal for handling wide components**

**Smooth, accurate movement**

**Long, uninterrupted service life**

**Low weight**

**Compact size**



#### **Technical data**

Medium:

Compressed air, filtered, lubricated or non-lubricated

Operating pressure:

29 to 101.5 psig (2 to 7 bar)

Operating temperature:

32°F to 140°F (0°C to 60°C)

\* Air supply must be dry enough to avoid ice formation at temperatures below 35°F (+2°C)

Mounting:

Mounting holes on two faces

#### **Materials**

Body: aluminum alloy

Piston rods: stainless steel

External nuts: carbon steel

Elastomers: nitrile

#### **Barb fittings connections**

M3 x 1/8" tube ID, straight barb, part number **29217X303**

M5 x 1/8" tube ID, straight barb, part number **29217X305**

#### **Ordering information**

To order a gripper with an effective closing grip force of up to 12.36 lb (55 N) at 72.5 psig (5 bar) quote: **M/160395/M/12**

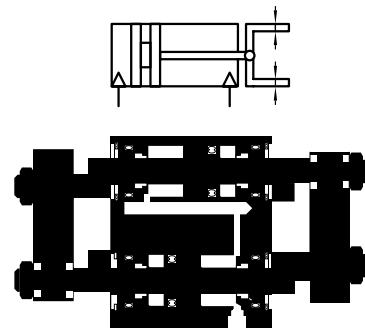
Order magnetically operated switches separately

#### **Accessories**

Switch M/344

**See page**

ACT-15-33



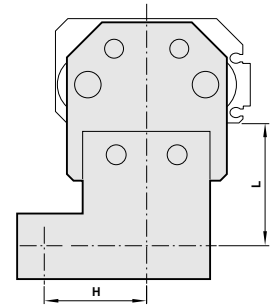
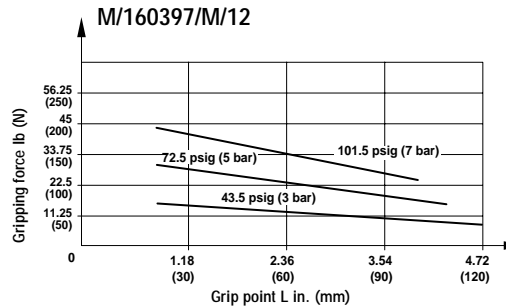
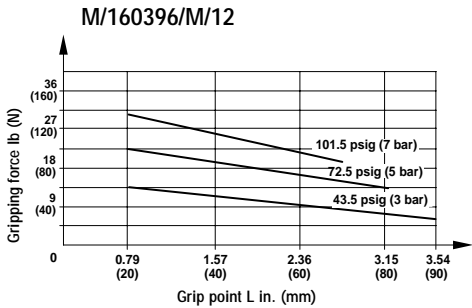
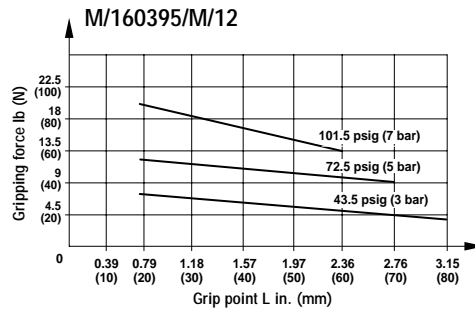
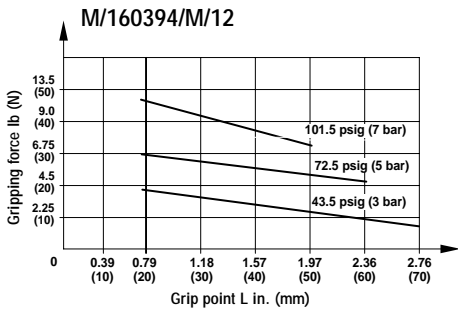


**Standard models ● Effective gripping force ● Air consumption**

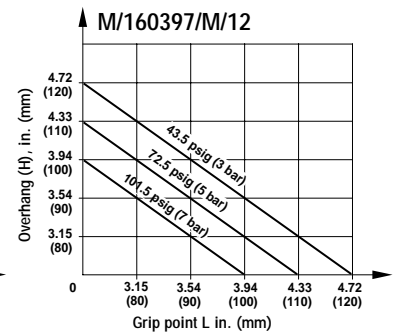
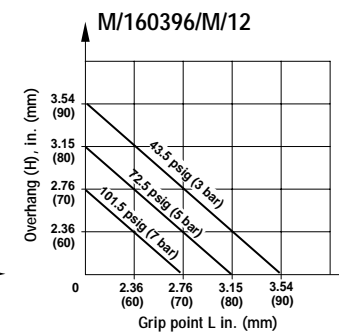
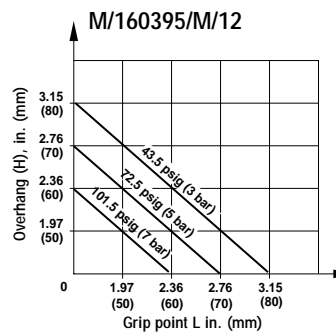
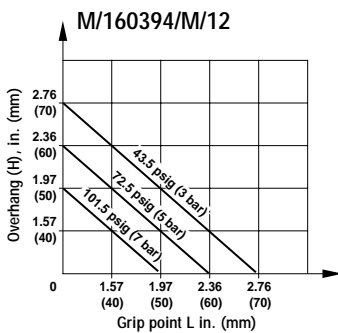
Model	Effective gripping force lb (N) at 72.5 psig (5 bar)		Air consumption in <sup>3</sup> (cm <sup>3</sup> ) at 72.5 psig (5 bar)**
	Opening	Closing	
M/160394/M/12	6.08 (27)	6.08 (27)	0.24 (4)
M/160395/M/12	12.36 (55)	12.36 (55)	0.57 (9.5)
M/160396/M/12	19.13 (85)	19.13 (85)	1.13 (18.8)
M/160397/M/12	30.38 (135)	30.38 (135)	2.28 (38)

\*\*per cycle

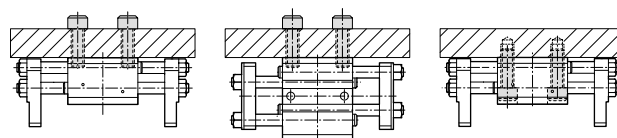
**Effective gripping forces**



**Grip point limitation range**



**Mounting examples**

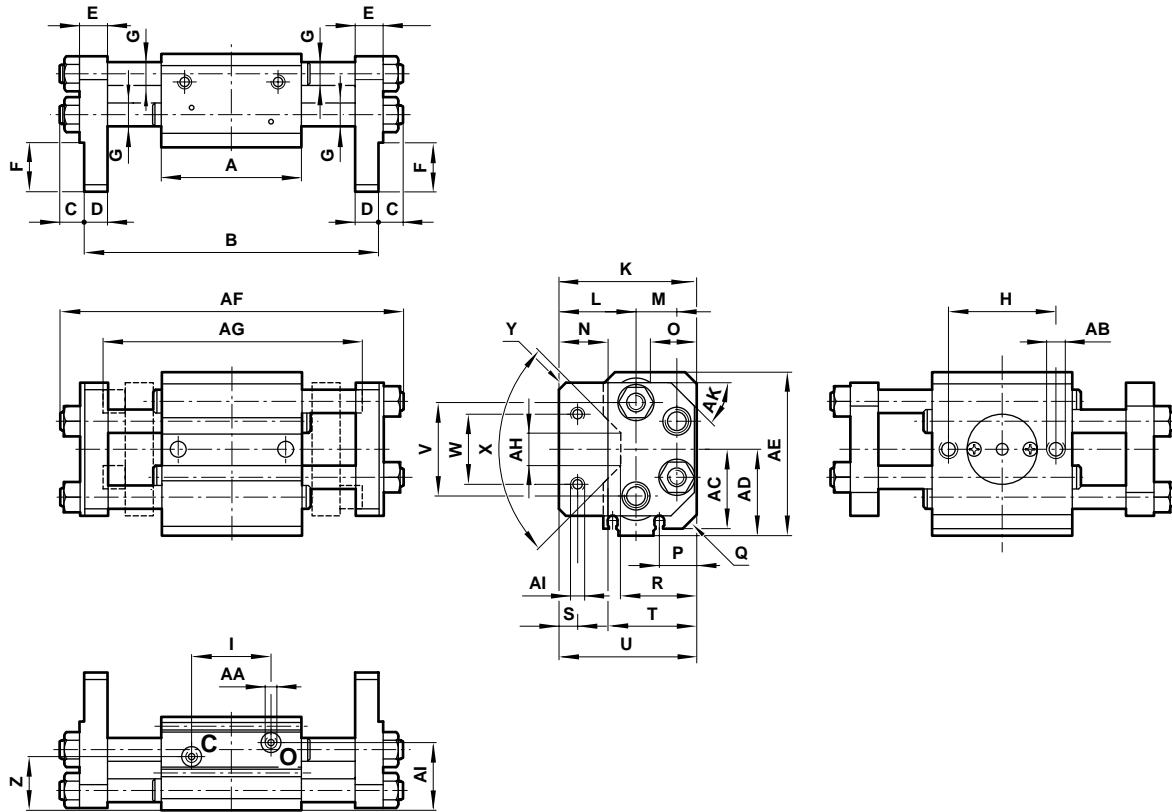


**Switches with LED indication**

Model	Voltage V d.c.	Current max.	Temperature		LED	Features	Cable length	Cable type	Straight cable connection	90° elbow cable connection
			°F	°C						
M/344/EAU/1APV	10 ... 28	20 mA	32° ... 140°	(0° ... 60°)	•	-	3.28 ft. (1 m)	PVC	-	•
M/344/EAU/1PV	10 ... 28	20 mA	32° ... 140°	(0° ... 60°)	•	-	3.28 ft. (1 m)	PVC	•	-
M/344/EAU/3APV	10 ... 28	20 mA	32° ... 140°	(0° ... 60°)	•	-	9.84 ft. (3 m)	PVC	-	•
M/344/EAU/3PV	10 ... 28	20 mA	32° ... 140°	(0° ... 60°)	•	-	9.84 ft. (3 m)	PVC	•	-
M/344/EAN/1APV	4.5 ... 28	50 mA	32° ... 140°	(0° ... 60°)	•	NPN	3.28 ft. (1 m)	PVC	-	•
M/344/EAN/1PV	4.5 ... 28	50 mA	32° ... 140°	(0° ... 60°)	•	NPN	3.28 ft. (1 m)	PVC	•	-
M/344/EAN/3APV	4.5 ... 28	50 mA	32° ... 140°	(0° ... 60°)	•	NPN	9.84 ft. (3 m)	PVC	-	•
M/344/EAN/3PV	4.5 ... 28	50 mA	32° ... 140°	(0° ... 60°)	•	NPN	9.84 ft. (3 m)	PVC	•	-



Dimensions



	Ø	A	C	D	E	F	G	H	I	K				
M/160394/M/12	12	1.73 (44)	0.26 (6.5)	0.24 (6)	0.31 (8)	0.47 (12)	Ø 0.24 (Ø 6)	1.34 (34)	0.83 (21)	1.52 (38.5)				
M/160395/M/12	16	1.97 (50)	0.31 (8)	0.31 (8)	0.39 (10)	0.53 (13.5)	Ø 0.31 (Ø 8)	1.50 (38)	1.10 (28)	1.71 (43.5)				
M/160396/M/12	20	2.36 (60)	0.41 (10.5)	0.39 (10)	0.47 (12)	0.83 (21)	Ø 0.39 (Ø 10)	1.81 (46)	1.34 (34)	2.28 (58)				
M/160397/M/12	25	2.60 (66)	0.43 (11)	0.47 (12)	0.55 (14)	1.02 (26)	Ø 0.39 & Ø 0.47 (Ø 10 & Ø 12)	2.05 (52)	1.54 (39)	2.66 (67.5)				
	Ø	L	M	O	P	Q	R	S	T	U	V			
M/160394/M/12	12	0.83 (21)	0.45 (11.5)	0.59 (15)	0.37 (9.5)	0.14 (3.5)	0.94 (24)	0.16 (4)	1.06 (27)	1.54 (39)	1.14 (29)			
M/160395/M/12	16	0.93 (23.5)	0.55 (14.0)	0.59 (15)	0.43 (11)	0.14 (3.5)	1.06 (27)	0.20 (5)	1.26 (32)	1.77 (45)	1.34 (34)			
M/160396/M/12	20	1.30 (33)	0.69 (17.5)	- (-)	0.63 (16)	0.39 (10)	1.28 (32.5)	0.31 (8)	1.57 (40)	2.32 (59)	1.57 (40)			
M/160397/M/12	25	1.61 (41)	0.73 (18.5)	- (-)	0.65 (16.5)	0.39 (10)	1.40 (35.5)	0.39 (10)	1.73 (44)	2.72 (69)	1.93 (49)			
	Ø	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AI	AK
M/160394/M/12	12	0.79 (20)	90°	0.04 (1)	0.63 (16)	M5 X 0.8	M5 X 0.8	0.89 (22.7)	1.06 (27)	1.97 (50)	3.90 (99)	2.99 (76)	M4 X 0.7	30°
M/160395/M/12	16	0.79 (20)	90°	0.04 (1)	0.77 (19.5)	M5 X 0.8	M6 X 1	1.08 (27.5)	1.28 (32.5)	2.36 (60)	4.84 (123)	3.66 (93)	M5 X 0.8	30°
M/160396/M/12	20	1.18 (30)	90°	0.12 (3)	0.91 (23)	M5 X 0.8	M8 X 1.25	1.34 (34)	1.46 (37)	2.76 (70)	5.79 (147)	4.41 (112)	M6 X 1	45°
M/160397/M/12	25	1.18 (30)	90°	0.12 (3)	0.98 (25)	M5 X 0.8	M10 X 1.5	1.59 (40.5)	1.73 (44)	3.31 (84)	6.65 (169)	4.88 (124)	M8 X 1.25	45°
	Ø	B									lb (kg)			
M/160394/M/12	12	3.32 + 0.055/-0.039 open, 2.36 + 0.039/-0.035 closed (84.4 + 1.4/-1.0 open, 60 + 1.0/-0.9 closed)									0.51 (0.23)			
M/160395/M/12	16	4.03 + 0.055/-0.039 open, 2.76 + 0.039/-0.071 closed (102.4 + 1.4/-1.0 open, 70 + 1.0/-1.8 closed)									0.88 (0.40)			
M/160396/M/12	20	4.90 + 0.059/-0.043 open, 3.31 + 0.043/-0.075 closed (124.4 + 1.5/-1.1 open, 84 + 1.1/-1.9 closed)									1.68 (0.76)			
M/160397/M/12	25	5.71 + 0.059/-0.043 open, 3.72 + 0.043/-0.075 closed (145 + 1.5/-1.1 open, 94.6 + 1.1/-1.9 closed)									2.43 (1.10)			

Dimensions in inches (mm)

# **Accessories, and Helpful Engineering Information**

<b>Contents</b>	
<b>Fittings and Accessories</b> .....	<b>VAL-16-2</b>
<b>Helpful Engineering Information</b> .....	<b>VAL-16-6</b>
<b>Conversion Tables</b> .....	<b>VAL-16-8</b>
<b>Warning/Warranty</b> .....	<b>VAL-16-9</b>



### Right Angle (Banjo) Flow Controls

**Operation:**

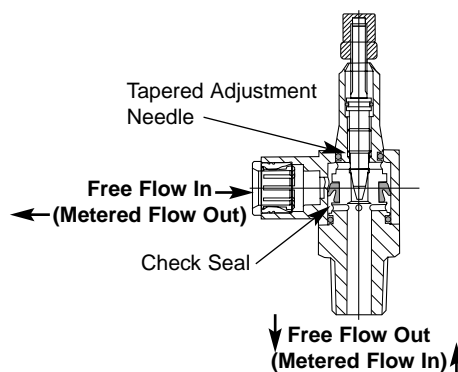
Flow Controls are meter out type. Compressed air passes freely into the push-in fitting portion of the flow control, flowing past the check seal and entering the connected component. In reverse flow conditions, air passes back into the flow control and energizes the check seal. Air must now flow through the metered passage controlled by the tapered adjustment needle of the flow control, and finally exits through the push-in fitting end.

**Specifications**

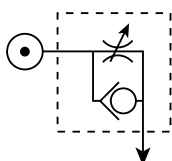
- Fluid: Compressed air.
- Working Pressure: 5 to 150 psig (.3 to 10 bar)
- Temperature Range: 0° to 175°F (-20° to 80°C)

**Materials of Construction:**

- Banjo bolt, body, collet: Nickel plated brass
- Tapered adjusting needle: Brass
- O-rings and check-seal: Silicone free Nitrile
- Sealing washer: Thermoplastic (10-32 UNF)
- Tubing: Nylon 11 or 12, 95 durometer polyurethane.
- Thread Sealant: Applied to the full circumference of tapered male threads.



Pneumatic Symbol



**VB0 Series**

Tube O.D.	NPT or UNF Thread	Screw Driver Slot Part Number	Knob
5/32"	10-32 UNF	12 VB0 0210	12 VA0 0210
	1/8	12 VB0 0218	12 VA0 0218
1/4"	1/8	12 VB0 0418	12 VA0 0418
	1/4	12 VB0 0428	12 VA0 0428
3/8"	1/4	12 VB0 0628	12 VA0 0628
	3/8	12 VB0 0638	12 VA0 0638
1/2"	3/8	12 VB0 0738	-
	1/2	12 VB0 0748	12 VA0 0748

NPT Female	NPT Male	Screw Driver Slot Part Number
1/8	1/8	12 VB0 1818
1/4	1/4	12 VB0 2828
3/8	3/8	12 VB0 3838
1/2	1/2	12 VB0 4848

For additional sizes, configurations, metric products, and technical specifications request catalog Fittings APC-101.





**Check Valves - T51, T52, T53**  
**In-line Push-in**  
**5/32" - 1/2" O.D. tube**

**Technical Data**

Fluid: Compressed air, nitrogen, inert and non-combustible gases compatible with materials of construction.

Operating Pressure:

26.8" Hg vacuum to 145 psi (-0.9 to 16 bar)

Operating Temperature:

0° to 175°F (-20° to 80°C)

\* Consult our Technical Service for use below 35°F (2°C)



O.D. Tube	Part Number
5/32"	T51Y0002
1/4"	T51Y0004
5/16"	T51Y0005
3/8"	T51Y0006
1/2"	T51Y0007

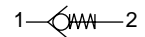
  

PIF x NPT Thread	Part Number
5/32" x 1/8"	T52A1802
1/4" x 1/8"	T52A1804
1/4" x 1/4"	T52A2804

Male to PIF	Part Number
1/8" x 5/32"	T53A1802
1/8" x 1/4"	T53A1804
1/4" x 1/4"	T53A2804

**ISO Symbol**



**Pressure Reducing Fitting - 124GB**  
**In-line Push-in**  
**5/32" - 1/2" O.D. tube**  
**1/8 - 1/2 NPTF pipe**

**Technical Data**

Fluid: Compressed air, nitrogen, inert and non-combustible gases compatible with materials of construction.

Operating Pressure:

Primary (inlet) pressure 0 to 150 psi (0 - 10 bar)

Maximum secondary (regulated) pressure 115 psi (8 bar)

Operating Temperature:

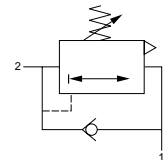
0° to 175°F (-20° to +80°C)

**Pressure Reducing Fitting:** It is often necessary to provide a secondary reduced pressure to an actuator to control its operating force. A pressure reducing fitting provides this function, and can be manually adjusted to the required pressure level.



Part Number	O/D Tube	NPTF Thread
12 4GB 0218	5/32	1/8
12 4GB 0418	1/4	1/8
12 4GB 0428	1/4	1/4
12 4GB 0528	5/16	1/4
12 4GB 0538	5/16	3/8
12 4GB 0638	3/8	3/8
12 4GB 0748	1/2	1/2

**ISO Symbol**



**Pilot Operated Check Valve - 124GA**  
**In-line Push-in**  
**1/4" - 1/2" O.D. tube**  
**1/8 - 1/2 NPTF pipe**

**Technical Data**

Fluid: Compressed air, nitrogen, inert and non-combustible gases compatible with materials of construction.

Operating Pressure:

15-150 psi (1 - 10 bar)

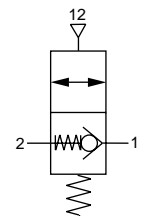
Operating Temperature:

0° to 175°F (-20° to +80°C)



Product Number	O.D. Tube	NPTF Thread	Max Tightening Torque
12 4GA 0418	1/4"	1/8	5 ft. lbs.
12 4GA 0428	1/4"	1/4	11 ft. lbs.
12 4GA 0638	3/8"	3/8	14 ft. lbs.
12 4GA 0748	1/2"	1/2	14 ft. lbs.

**ISO Symbol**



**Pilot Operated Check Valve:** A blocking fitting which allows air flow in both directions if a pilot pressure is applied to port 12. When pressure to the pilot port is removed flow occurs in one direction only due to an integral control valve. When used in pairs, blocking fittings can control an actuator to give controlled operation in the event of an electrical problem, air failure, or tube breakage.

For additional sizes, configurations, metric products, and technical specifications request catalog Fittings APC-101.



## Fittings and Accessories

### Pressure Sensor Fitting -124GD

In-line Push-in  
5/32" O.D. tube  
1/8 - 1/4 NPTF pipe

#### Technical Data

Fluid: Compressed air, nitrogen, inert and non-combustible gases compatible with materials of construction.

#### Operating Pressure:

Cylinder pressure (Pc) 145 psi (10 bar) max  
Sensor supply pressure 43 to 145 psi (3 - 10 bar)  
Sensor switch pressure 14.5 psi (1.0 bar) typical

#### Operating Temperature:

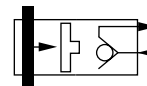
0° to 175°F (-20° to +80°C)

**Pneumatic Sensor Fittings:** Provides an air signal when a cylinder has reached the end of travel. Sensor fittings operate by detecting the drop in exhaust pressure at the end of a stroke. They effectively offer an all-pneumatic option to the electrical reed switch.



Product Number	Tube O/D	NPTF Thread
12 4GD 0218	5/32"	1/8
12 4GD 0228	5/32"	1/8

#### ISO Symbol



### Check Valves



Port Size NPT	Model
1/8	T55A1800
1/4	T55A2800
3/8	T55A3800
1/2	T55A4800
3/4	TC/523
1	TC/524



### Push-In Flow Controls

Port Size NPT	Model
1/8	T15Y0001
5/32	T15Y0002
1/4	T15Y0004
3/8	T15Y0006
1/2	T15Y0007

### Quick Exhaust Valves



Port Size NPT	Model
1/8	T70A 1800
1/4	T70A 2800
3/8	T70A 3800
1/2	T70A 4800



### In-line Flow Controls

Port Size NPT	Model
1/8	T1000A1800
1/4	T1000A2800
3/8	T1000A3800
1/2	T1000A4800

### Shuttle Valves



Port Size NPT	Model
1/8	T65A1800
1/4	T65A2800



Quietaire™ Pneumatic Silencers



Heavy-duty shell type

Port Size NPT	Part Number (male)	Part Number (female)
1/8	MB001A	MA001A
1/4	MB002A	MA002A
3/8	MB003A	MA003A
1/2	MB004A	MA004A
3/4	MB006A	MA006A
1	MB008A	MA008A



Standard-duty, sintered bronze

Port Size NPT	Part Number
10-32	MS000A
1/8	MS001A
1/4	MS002A
3/8	MS003A
1/2	MS004A
3/4	MS006A
1	MS008A



Standard-duty porous plastic

Port Size NPT	Part Number
10-32 UNF	M/S0
1/8	C/S1
1/4	C/S2
3/8	C/S3
1/2	C/S4
3/4	C/S6
1	C/S8



Breather vent sintered bronze

Port Size NPT	Part Number
1/8	MV001A
1/4	MV002A
3/8	MV003A
1/2	MV004A
3/4	MV006A
1	MV008A



Heavy duty speed control sintered bronze

Port Size NPT	Part Number
1/8	MM001A
1/4	MM002A
3/8	MM003A
1/2	MM004A



Standard-duty speed control porous plastic

Port Size NPT	Part Number
10-32 UNF	T20M0500
1/8	T20A1800
1/4	T20A2800
3/8	T20A3800
1/2	T20A4800

For additional sizes, configurations, metric products, and technical specifications request catalog Fittings APC-101.



## Determining Proper Air Valve Size

Most manufacturers catalogs give flow rating  $C_V$  for the valve, which was established using proposed National Fluid Power Association (NFPA) standard T3.21.3. The following tables and formulas will enable you to quickly size a valve properly. The traditional, often used, approach of using the valve size equivalent to the port in the cylinder can be very costly. Cylinder speed, not port size, should be the determining factor.

The following  $C_V$  calculations are based upon simplified formulas which yield results with acceptable accuracy under the following standard condition:

Air at a temperature of 68°F (20°C)

Absolute downstream or secondary pressure must be 53% of absolute inlet or primary pressure or greater. Below 53%, the air velocity may become sonic and the  $C_V$  formula does not apply. To calculate air flow to atmosphere, enter outlet pressure  $p_2$  as 53% of absolute  $p_2$ . Pressure drop  $\Delta P$  would be 47% of absolute inlet pressure. These valves have been calculated for a  $C_V = 1$  in Table 3.

### Nomenclature

- B Pressure drop factor
- C Compression factor
- $C_V$  Flow factor
- D Cylinder Diameter (IN)
- F Cylinder Area (SQ IN)
- L Cylinder Stroke (IN)
- $p_1$  Inlet or Primary Pressure (PSIG)
- $p_2$  Outlet or Secondary Pressure (PSIG)
- $\Delta P$  Pressure differential ( $p_1 - p_2$ ) (PSID)
- q Air flow at actual condition (CFM)
- Q Air flow of free air (SCFM)
- t Time to complete one cylinder stroke (SEC)
- T Absolute temperature at operating pressure (R°)
- Deg R = Deg F + 460

### Valve Sizing for Cylinder Actuation – (Method A)

$$C_V = \frac{\text{cylinder area (Sq In) (see Table 1) } F \times \text{cylinder stroke (IN) } L \times \text{Compression factor (see Table 2) } C}{\text{Pressure drop factor (See Table 2) } B \times \text{time to complete cylinder stroke (SEC) } t \times 29}$$

Example:

Cylinder size 4" Dia. x 10" stroke. Time to extend: 2 seconds. Inlet pressure 90 psig. Allowable pressure drop 5 psid. Determine  $C_V$ .

Solution: Table 1 F = 12.57 sq in  
 Table 2 C = 7.1  
 B = 21.6

$$C_V = \frac{12.57 \times 10 \times 7.1}{21.6 \times 2 \times 29} = .7$$

Select a valve that has a  $C_V$  factor of .7 or higher. In most cases a 1/4" valve would be sufficient.

It is considered good engineering practice to limit the pressure drop  $\Delta P$  to approximately 10% of primary pressure  $p_1$ . The smaller the allowable pressure drop, the larger the required valve will become.

After the minimum required  $C_V$  has been calculated, the proper size valve can be selected from the catalog.

Bore Size D (in)	Push Bore F (sq in)	Bore Size D (in)	Push Bore F (sq in)
3/4"	.44	4"	12.57
1"	.79	4-1/2"	15.90
1-1/8"	.99	5"	19.64
1-1/4"	1.23	6"	28.27
1-1/2"	1.77	7"	38.48
1-3/4"	2.41	8"	50.27
2"	3.14	10"	78.54
2-1/2"	4.91	12"	113.10
3-1/4"	8.30	14"	153.94

Table 1: Cylinder push bore area F for standard size cylinders

Inlet Pressure (psig)	Compression Factor C	Pressure Drop Factor B for various Pressure Drops $\Delta P$				
		2 psig	5 psid	10 psid	15 psid	20 psid
10	1.7	6.5				
20	2.4	7.8	11.8			
30	3.0	8.9	13.6	18.0		
40	3.7	9.9	15.3	20.5	23.6	
50	4.4	10.8	16.7	22.6	26.4	29.0
60	5.1	11.7	18.1	24.6	29.0	32.0
70	5.8	12.5	19.3	26.5	31.3	34.8
80	6.4	13.2	20.5	28.2	33.5	37.4
90	7.1	13.9	21.6	29.8	35.5	39.9
100	7.8	14.5	22.7	31.3	37.4	42.1
110	8.5	15.2	23.7	32.8	39.3	44.3
120	9.2	15.8	24.7	34.2	41.0	46.4
130	9.8	16.4	25.6	35.5	42.7	48.4
140	10.5	16.9	26.5	36.8	44.3	50.3
150	11.2	17.5	27.4	38.1	45.9	52.1
160	11.9	18.0	28.2	39.3	47.4	53.9
170	12.6	18.5	29.0	40.5	48.9	55.6
180	13.2	19.0	29.8	41.6	50.3	57.2
190	13.9	19.5	30.6	42.7	51.7	58.9
200	14.6	20.0	31.4	43.8	53.0	60.4
210	15.3	20.4	32.1	44.9	54.3	62.0
220	16.0	20.9	32.8	45.9	55.6	63.5
230	16.7	21.3	33.5	46.9	56.8	64.9
240	17.3	21.8	34.2	47.9	58.1	66.3
250	18.0	22.2	34.9	48.9	59.3	67.7

Table 2: Compression Factor C and pressure drop Factor B.



**Valve Sizing with  $C_v = 1$  Table (Method B)**

(For nomenclature see previous page)

This method can be used if the required air flow is known or has been calculated with the formulas as shown below:

$$1. \quad Q = .0273 \frac{D^2 L}{t} \times \frac{p_2 + 14.7}{14.7} \quad (\text{SCFM})$$

Conversion of CFM to SCFM

$$2. \quad Q = q \times \frac{p_2 + 14.7}{14.7} \times \frac{528}{T} \quad (\text{SCFM})$$

Flow factor  $C_v$  (standard conditions)

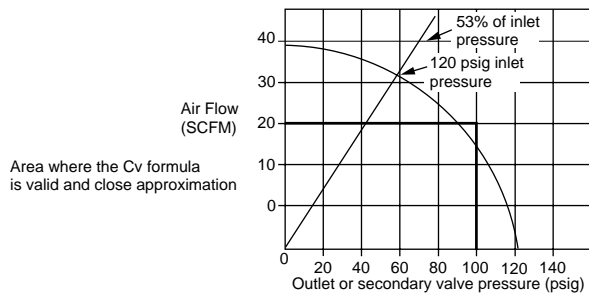
$$3. \quad C_v = \frac{1.024 \times Q}{\sqrt{\Delta P} \times (p_2 + 14.7)} \quad \text{Proposed NFPA Standard T3.21.3}$$

Maximum pressure drop  $\Delta p$  across the valve should be less than 10% of inlet pressure  $p_1$ .

Inlet Pressure (psig)	Air Flow Q (scfm) for various Pressure drops $\Delta P$ at $C_v = 1$					Air Flow Q (scfm) to atmosphere
	2 psid	5 psid	10 psid	15 psid	20 psid	
10	6.7					12.0
20	7.9	11.9				16.9
30	9.0	13.8	18.2			21.8
40	9.9	15.4	20.6	23.8		26.6
50	10.8	16.9	22.8	26.7	29.2	31.5
60	11.6	18.2	24.8	29.2	32.3	36.4
70	12.3	19.5	26.7	31.6	35.1	41.2
80	13.0	20.7	28.4	33.8	37.7	46.1
90	13.7	21.8	30.0	35.8	40.2	51.0
100	14.4	22.9	31.6	37.8	42.5	55.9
110	15.0	23.9	33.1	39.6	44.7	60.7
120	15.6	24.9	34.5	41.4	46.8	65.6
130	16.1	25.8	35.8	43.1	48.8	70.5
140	16.7	26.7	37.1	44.7	50.7	75.3
150	17.2	27.6	38.4	46.3	52.5	80.2
160	17.7	28.4	39.6	47.8	54.3	85.1
170	18.2	29.3	40.8	49.3	56.0	90.0
180	18.7	30.1	42.0	50.7	57.7	94.8
190	19.2	30.9	43.1	52.1	59.4	99.7
200	19.6	31.6	44.2	53.4	60.9	104.6
210	20.1	32.4	45.2	54.8	62.5	109.4
220	20.5	33.1	46.3	56.1	64.0	114.3
230	21.0	33.8	47.3	57.3	65.5	119.2
240	21.4	34.5	48.3	58.6	66.9	124.0
250	21.8	35.2	49.3	59.8	68.3	128.9

Table 3: Air Flow Q (scfm) for  $C_v = 1$

Flow Curves: How to read them



Example 1: Find air flow Q (scfm) if  $C_v$  is known.  
 $C_v$  (from valve catalog) = 1.8  
 Primary pressure  $p_1 = 90$  psig  
 Pressure drop across valve  $\Delta P = 5$  psid

Flow through valve from Table 3 for  $C_v = 1: 21.8$  scfm

$$Q = C_v \text{ of valve} \times \text{air flow at } C_v = 1 \text{ (scfm)}$$

$$Q = 1.8 \times 21.8 = 39.2 \text{ scfm}$$

Example 2: Find  $C_v$  if air flow Q (scfm) is given.  
 Primary pressure  $p_1 = 90$  psig  
 Pressure drop  $\Delta P = 10$  psid  
 Air flow - Q = 60 scfm

Flow through valve from Table 3 for  $C_v = 1: 30$  scfm

$$C_v = \frac{\text{Air flow Q (scfm)}}{\text{Air flow at } C_v = 1 \text{ (scfm)}}$$

$$C_v = \frac{60 \text{ scfm}}{30} = 2.0$$

A valve with a  $C_v$  of minimum 2 should be selected.

Example 3: Find  $C_v$  if air flow Q (scfm) to atmosphere is given (from catalog).  
 Primary pressure  $p_1 = 90$  psig  
 Air flow to atmosphere Q = 100 scfm

Flow to atmosphere through valve from Table 3 for  $C_v = 1: 51$  scfm

$$C_v = \frac{\text{Air flow to atmosphere Q (scfm)}}{\text{Air flow to atmosphere at } C_v = 1 \text{ (scfm)}}$$

$$C_v = \frac{100}{51} = 2.0$$

Flow given in catalog is equivalent to a valve with  $C_v = 2$ . This conversion is often necessary to size a valve properly since some manufacturers do not show the standard  $C_v$  to allow a comparison.

Example 4: Find  $C_v$  if cylinder size and stroke speed is known, using the formulas 1 and 3.

Primary pressure = 90 psig  
 Pressure drop across valve 5 psid  
 Cylinder size 4" dia. x 10" stroke  
 Time to complete stroke 2 sec.

$$Q = .0273 \frac{4^2 \times 10}{2} \times \frac{85 + 14.7}{14.7} = 14.81 \text{ scfm}$$

$$C_v = \frac{1.024 \times 14.81}{\sqrt{5} \times (85 + 14.7)} = .7$$



# Conversion Tables

## VOLUME

from/to	cm <sup>3</sup>	liter	in <sup>3</sup>	ft <sup>3</sup>	fl oz	pt.	qt.	gal
cm <sup>3</sup>	1	.001	0.06102	3.53 x 10 <sup>-5</sup>	.03381	.00211	0.106	2.64 x 10 <sup>-10</sup>
liter	1000	1	61.02	0.03532	33.81	2.113	10.057	.2642
in <sup>3</sup>	16.39	0.01639	1	5379 x 10 <sup>-4</sup>	.5541	.03463	0.01732	.00433
ft <sup>3</sup>	2.83 x 10 <sup>4</sup>	28.32	1728	1	957.5	59.84	29.92	7.481
fl oz	29.57	0.02957	1.805	0.00104	1	.06250	.03125	.00781
pt	473.2	0.4732	28.88	0.01671	16	1	0.500	0.1250
qt	946.4	0.9463	57.75	0.03342	32	2	1	0.2500
gal (US)	3785	3.785	231	0.1337	128	8	4	1

## PRESSURE

from/to	mm Hg	in Hg	in H <sub>2</sub> O	ft H <sub>2</sub> O	atm	lb/in <sup>2</sup>	kg/cm <sup>2</sup>
mm Hg	1	0.03937	0.5353	0.04460	.00132	0.01934	.00136
in Hg	25.40	1	13.60	1.133	.03342	0.4912	0.03453
in H <sub>2</sub> O	1.868	0.07355	1	0.08333	0.00246	0.03613	0.00254
ft H <sub>2</sub> O	22.42	0.8826	12	1	0.02950	0.4335	0.03048
atm	760	29392	406.8	33.9	1	14.70	1.033
lb/in <sup>2</sup>	51.71	2.036	27.67	2.307	0.06805	1	0.07031
kg/cm <sup>2</sup>	735.6	28.96	393.7	32.81	0.9678	14.22	1
bar	750.0	29.53	401.32	33.46	0.98592	14.504	1.01978

## Length

from/to	cm	m	km	in	ft.	mile
cm	1	0.01	1 x 10 <sup>-5</sup>	0.3937	0.03281	6.21 x 10 <sup>-6</sup>
m	100	1	0.001	39.37	3.281	6.21 x 10 <sup>-4</sup>
km	1 x 10 <sup>5</sup>	1000	1	3.94 x 10 <sup>4</sup>	3281	0.6214
in	2.540	0.02540	2.54 x 10 <sup>-5</sup>	1	0.08333	1.58 x 10 <sup>-5</sup>
ft	30.48	0.3048	3.05 x 10 <sup>-4</sup>	12	1	1.89 x 10 <sup>-4</sup>
mile	1.61 x 10 <sup>5</sup>	1609	1.609	6.34 x 10 <sup>4</sup>	5280	1

## ENERGY

from/to	BTU	Cal	Joule	Hp. hr.	Kw hr.
BTU	1	252.0	1055	3.93 x 10 <sup>-4</sup>	2.93 x 10 <sup>-4</sup>
Cal	0.397	1	4.186	1.56 x 10 <sup>-5</sup>	1.16 x 10 <sup>-5</sup>
joule	9.48 x 10 <sup>-4</sup>	0.2389	1	3.73 x 10 <sup>-7</sup>	2.78 x 10 <sup>-7</sup>
Hp hr	2545	6.41 x 10 <sup>5</sup>	2.68 x 10 <sup>6</sup>	1	0.7457
Kw hr	3413	8.60 x 10 <sup>5</sup>	3.60 x 10 <sup>6</sup>	1.341	1

## AREA

from/to	cm <sup>4</sup>	m <sup>2</sup>	km <sup>2</sup>	in <sup>2</sup>	ft <sup>2</sup>
cm <sup>2</sup>	1	0.0001	1 x 10 <sup>-10</sup>	0.1550	0.00108
m <sup>2</sup>	1 x 10 <sup>4</sup>	1	1 x 10 <sup>-5</sup>	1550	10.76
km <sup>2</sup>	1 x 10 <sup>10</sup>	1 x 10 <sup>5</sup>	1	1.55 x 10 <sup>9</sup>	1.08 x 10 <sup>7</sup>
in <sup>2</sup>	6.452	6.45 x 10 <sup>-4</sup>	6.45 x 10 <sup>-10</sup>	1	0.00694
ft <sup>2</sup>	929.00	0.09290	9.29 x 10 <sup>-8</sup>	144	1

## TEMPERATURE CONVERSION

°C = 5/9 (°F - 32)
°F = 9/5 (°C + 32)
°K = °C + 273.2
°R = °F + 459.7

## WEIGHT

from/to	gm	kg	oz	lb
gm	1	0.001	0.03527	0.00220
kg	1000	1	35.27	2.205
oz	28.35	0.02835	1	0.06250
lb	453.6	0.4536	16	1

## TEMPERATURE COMPARISON

-100°C to +300°C			
°C	°F	°C	°F
-100	-148	29	84.2
-90	-130	30	86.0
-80	-112	31	87.8
-70	-94	32	89.6
-60	-76	33	91.4
-50	-58	34	93.2
-40	-40	35	95.0
-35	-31	36	96.8
-30	-22	37	98.6
-25	-13	38	100.4
-20	-4	39	102.2
-15	5	40	104.0
-10	14	45	113
-5	23	50	122
0	32	55	131
1	33.8	60	140
2	35.6	65	149
3	37.4	70	158
4	39.2	75	167
5	41	80	176
6	42.8	85	185
7	44.6	90	194
8	46.4	95	203
9	48.2	100	212
10	50	110	230
11	51.8	120	248
12	53.6	130	266
13	55.4	140	284
14	57.2	150	302
15	59	160	320
16	60.8	170	338
17	62.6	180	356
18	64.4	190	374
19	66.2	200	392
20	68	210	410
21	69.8	220	428
22	71.6	230	446
23	73.4	240	464
24	75.2	250	482
25	77	260	500
26	78.8	270	518
27	80.6	280	531
28	82.4	290	554
		300	572



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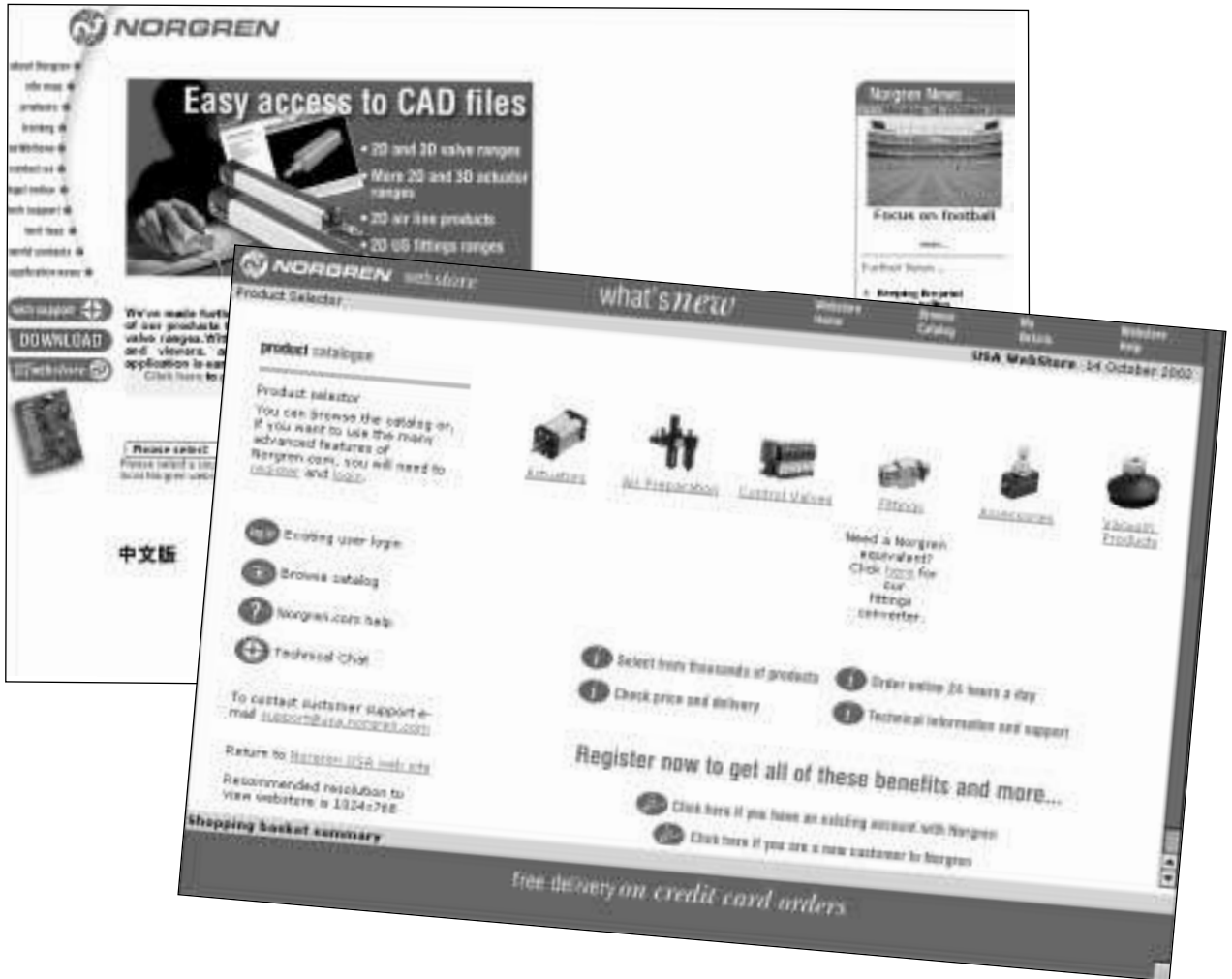
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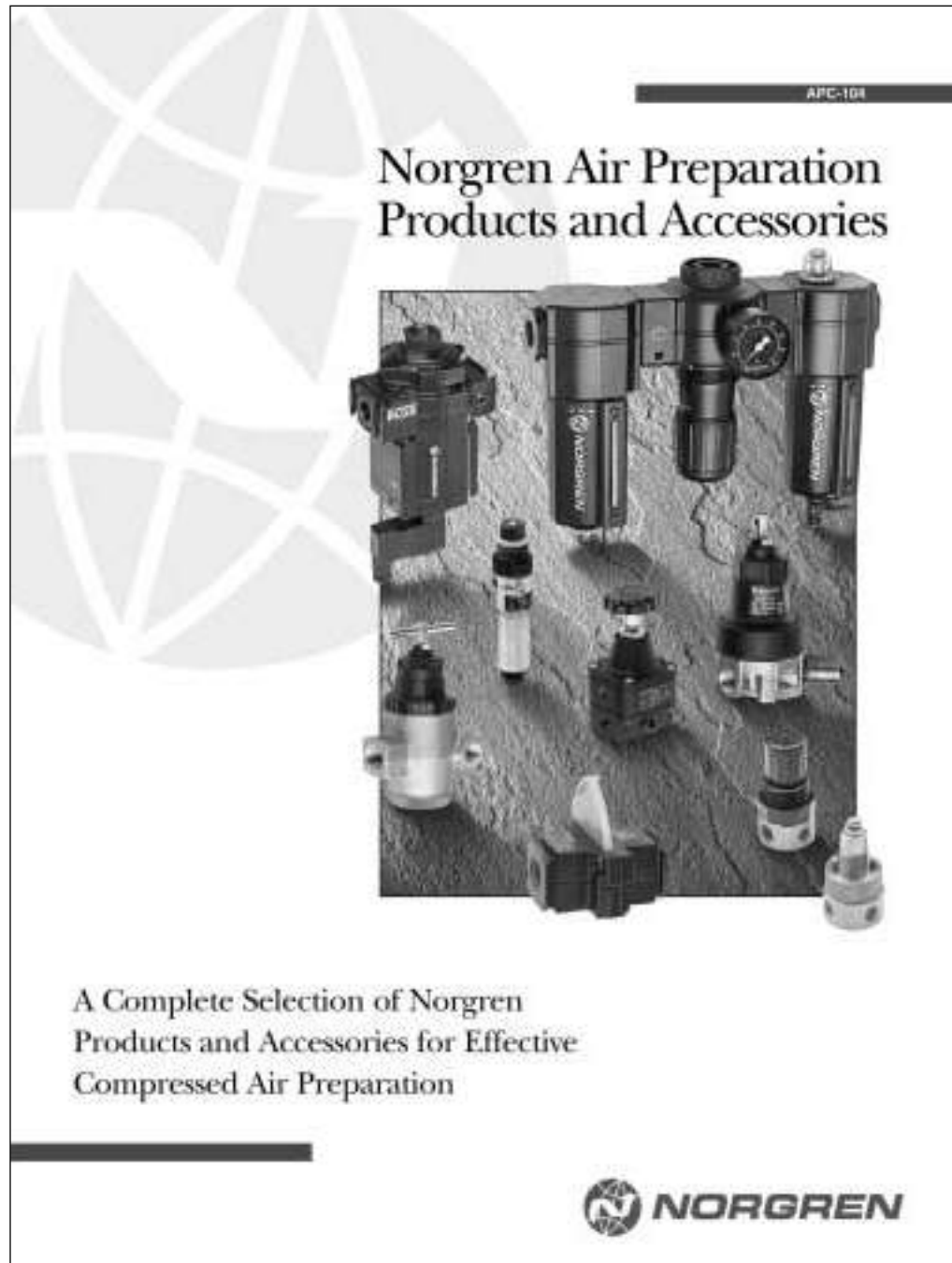


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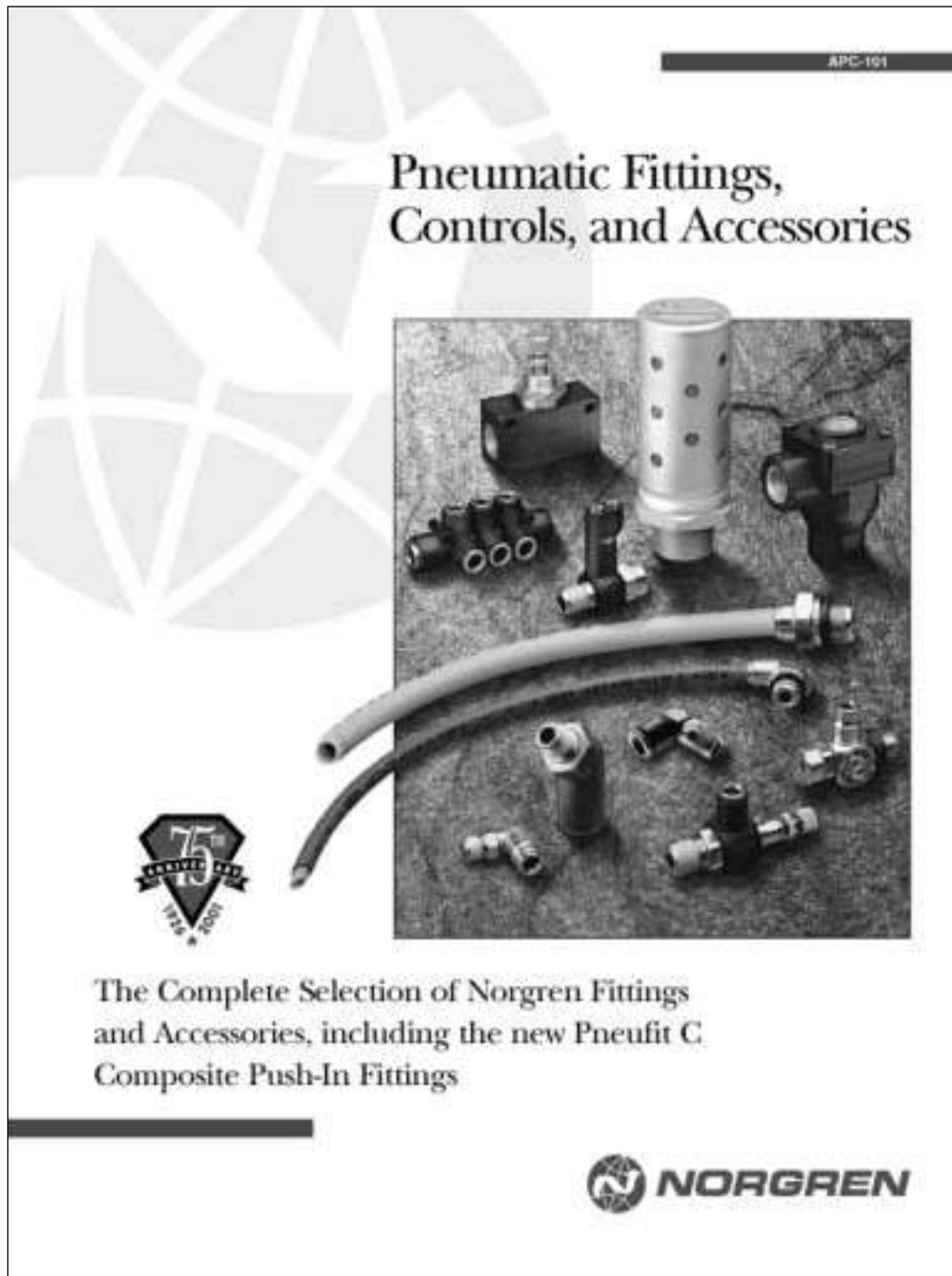


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## Notes

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