



Section C – Tie Rod Design Pneumatic Cylinders

NFPA Cylinders

Econo-Ram II™ Series

- NFPA Interchangeable
- 9 Bore Sizes: 1-1/4" through 8"
- Lightweight Aluminum Construction
- Mounting styles: 17 standard

Econo-Ram II™ Clean Plus

- Withstands Caustic Washdown
- USDA and FDA Compliant Coating
- Ideal for Corrosive Environments
- 150 PSI Air Service

Econo-Ram II™ Series with Linear Positioning Feedback

- Precise Position Feedback
- Non-Contact Sensing
- Analog or Digital Outputs
- Bore Sizes 2" - 8"
- Mounting Styles: 11 Standard

2MNR Series

- Multi-Rod Non-Rotating Design
- N.F.P.A. Interchangeable
- Bore Sizes: 1-1/8 to 4"
- Mounting Styles: 9 N.F.P.A. Standard Mounts Plus 1 Base Bar Style
- Cushions: optional at either end or both ends of stroke

PA-2/PN Series

- Heavy Duty Steel Construction
- 13 Bore Sizes: 1" through 14"
- Mounting styles: 18 Standard
- PA-2 used for Lubed Air, PN used for Non-Lube Air

NC9 Series

- Steel Construction
- 10 Bore Sizes: 1-1/2" through 12"
- Mounting Styles: 10 Standard
- Built to Automotive and Foundry Standards

ACVB Series

- Cylinder/Valve Combination
- Two Different Manifold Sizes/Three Different Valve Sizes
- Utilizes B Series Valves
- Field Adaptable to Standard NFPA Cylinders

ISO/VDMA Cylinders

P1D Series

- ISO 6431 Pneumatic Cylinder
- New Flexible Design With 3 Major Versions (Standard, Clean, and Removable Gland)
- Standard Version – Low Cost, High Quality Design
- Clean Version – Convex Shape for Optimum Hygiene
- Removable Gland Version – Replacement of Rod Seals/Bearings Without Disassembly
- Rod Lock Option Available

ME/MERL/MERM Series

- ISO 6431 Pneumatic Cylinder
- New Dual Seal Rod Sealing System
- Removable Gland – Replacement of Rod Seals/Bearings Without Disassembly
- Rod Lock Option Available (MPRL Series)



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Econo-Ram II™ Non-Lube Air Cylinder...

Premium Quality at an Affordable Cost—

Econo-Ram II™ air cylinders combine light-weight aluminum construction with proven reliability. They are specifically designed to meet the present demand for more efficient, inexpensive, linear force and motion actuators.

Econo-Ram II air cylinders are rated for non-lube service. Each cylinder is thoroughly inspected against stringent dimensional and performance specifications to ensure the highest quality. In addition to this, we offer the Econo-Ram II cylinders at an affordable cost, which helps you stretch your tight design budget without sacrificing quality or performance. To support this, all Econo-Ram II cylinders come standard with a 5-year warranty at no extra charge.

Econo-Ram II cylinders are available from strategically located distributors and warehouses to ensure quick delivery. This provides a savings in downtime, delivery time and shipping costs. For your cylinder requirements, specify the Econo-Ram II cylinder.



WARNING

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

This document and other information from the Company, its subsidiaries and authorized distributors provide product and/or system options for further investigation by users having expertise. It is important that you analyze all aspects of your application, including consequences of any failure and review the information concerning the product or system in the current product catalog. Due to the variety of operating conditions and applications for these products or systems, the user, through its own analysis and testing, is solely responsible for making the final selection of the products and systems and assuring that all performance, safety and warning requirements of the application are met.

The products described herein, including without limitation, product features, specifications, designs, availability and pricing, are subject to change by the Company and its related companies at any time without notice.

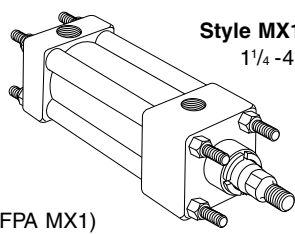
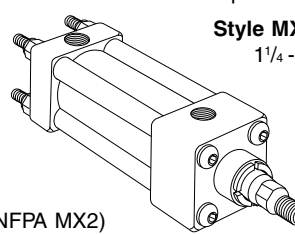
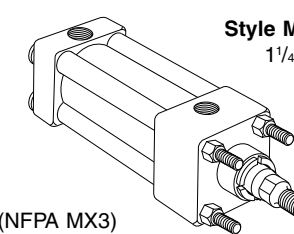
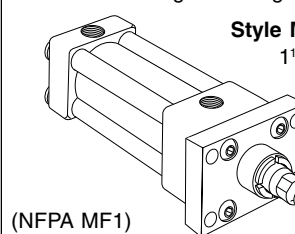
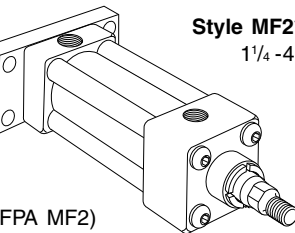
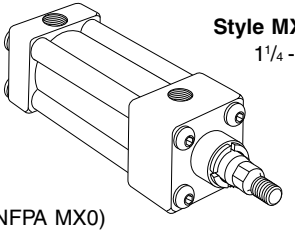
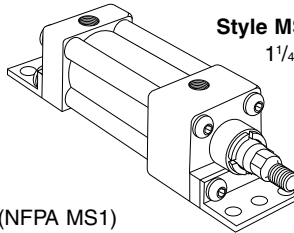
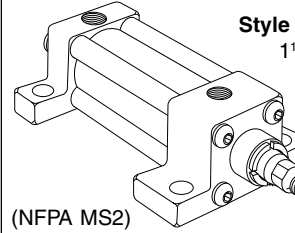
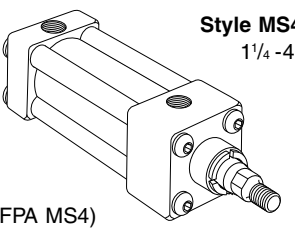
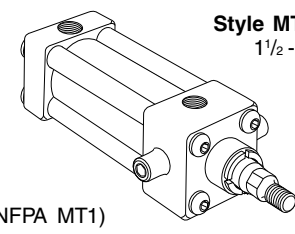
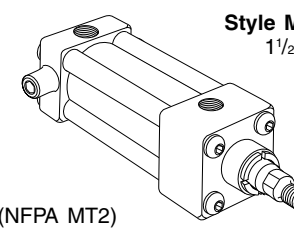
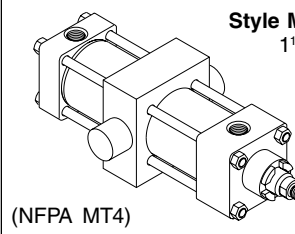
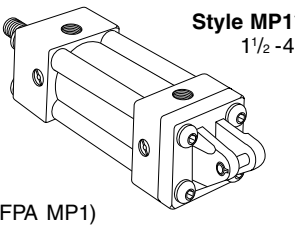
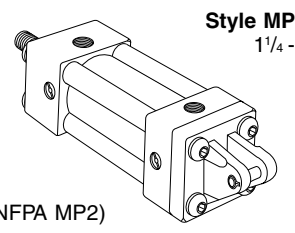
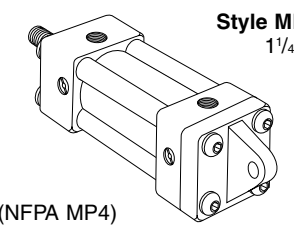
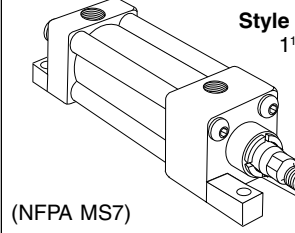
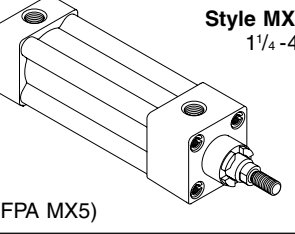
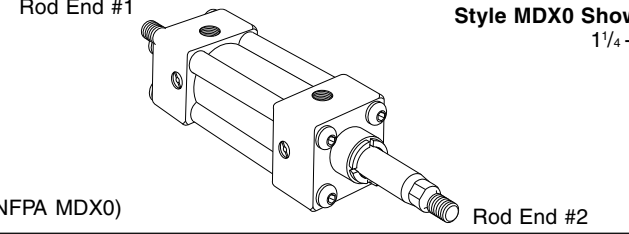
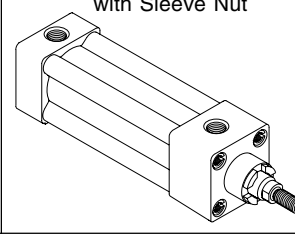
Standard Specifications — 1-1/4" to 4" Bores

- N.F.P.A. Interchangeable*
- Bore sizes – 1-1/4", 1-1/2", 2", 2-1/2", 3-1/4" and 4"
- Rod Diameters – 1/2", 5/8", 1", and 1-3/8"
- Rod Ends – three standard, specials to order
- Cushions – optional at either end or both ends of stroke
- Strokes – available in any practical stroke length
- 250 psi Air Service
- Optional 250 psi Hydraulic Service (non-cushioned only)

- Standard Fluid – Dry Filtered Air
- Standard Temperature – -10°F to +165°F
- Fluorocarbon Seals for high temperature service – -10°F to +250°F (optional)
- Single rod end or double rod end
- Mounting styles – 18 standard
- Optional Bumper Seal for noise dampening available on 1-1/2" – 4" bore sizes

*1-1/4" Bore size is not recognized by the NFPA as a standard.

Available Mounting Styles — 1-1/4" to 4" Bores

<p>Tie Rods Extended Both Ends</p>  <p>Style MX1 1 1/4" - 4"</p> <p>(NFPA MX1)</p>	<p>Tie Rods Extended Cap End</p>  <p>Style MX2 1 1/4" - 4"</p> <p>(NFPA MX2)</p>	<p>Tie Rods Extended Head End</p>  <p>Style MX3 1 1/4" - 4"</p> <p>(NFPA MX3)</p>	<p>Head Rectangular Flange</p>  <p>Style MF1* 1 1/4" - 4"</p> <p>(NFPA MF1)</p>
<p>Cap Rectangular Flange</p>  <p>Style MF2* 1 1/4" - 4"</p> <p>(NFPA MF2)</p>	<p>No Mount</p>  <p>Style MX0 1 1/4" - 4"</p> <p>(NFPA MX0)</p>	<p>Side End Angle</p>  <p>Style MS1* 1 1/4" - 4"</p> <p>(NFPA MS1)</p>	<p>Side Lug</p>  <p>Style MS2 1 1/2" - 4"</p> <p>(NFPA MS2)</p>
<p>Side Tap</p>  <p>Style MS4 1 1/4" - 4"</p> <p>(NFPA MS4)</p>	<p>Head Trunnion</p>  <p>Style MT1 1 1/2" - 4"</p> <p>(NFPA MT1)</p>	<p>Cap Trunnion</p>  <p>Style MT2 1 1/2" - 4"</p> <p>(NFPA MT2)</p>	<p>Intermediate Trunnion</p>  <p>Style MT4* 1 1/4" - 4"</p> <p>(NFPA MT4)</p>
<p>Cap Fixed Clevis</p>  <p>Style MP1* 1 1/2" - 4"</p> <p>(NFPA MP1)</p>	<p>Cap Detachable Clevis</p>  <p>Style MP2* 1 1/4" - 4"</p> <p>(NFPA MP2)</p>	<p>Cap Detachable Eye</p>  <p>Style MP4* 1 1/4" - 4"</p> <p>(NFPA MP4)</p>	<p>Side End Lug</p>  <p>Style MS7 1 1/4" - 4"</p> <p>(NFPA MS7)</p>
<p>Sleeve Nut</p>  <p>Style MX5 1 1/4" - 4"</p> <p>(NFPA MX5)</p>	<p>Double Rod End</p>  <p>Style MDX0 Shown 1 1/4" - 4"</p> <p>(NFPA MDX0)</p> <p>Rod End #1 Rod End #2</p>		<p>Combination Side Tap with Sleeve Nut</p> 

*Indicates Bolt on Mounting Design 1 1/2" - 4" Bores

▲Tie Rod Design

Econo-Ram II™ – 1 1/4" through 4" Bore, Lightweight, Non-Lube Pneumatic Cylinder

Premium Quality and Economy in one

Lightweight construction, solid Non-Lube design, and proven reliability make the Econo-Ram II Cylinder the high performance, long lasting, economical choice for your air cylinder applications.

Extruded Aluminum Body
Lightweight cylinder body is a unique design that provides strength and eliminates areas of contamination.

Heads and Caps are Precision, Lightweight Aluminum blocks that are anodized for maximum corrosion resistance.

Piston Rod Lipseal/Wiper combination is completely self compensating for zero leakage at all pressures. Keeps pressure in, contamination out.

Rod Gland
Threaded bronze gland is externally removable, without cylinder disassembly, for easy maintenance.



Check Seal Cushions

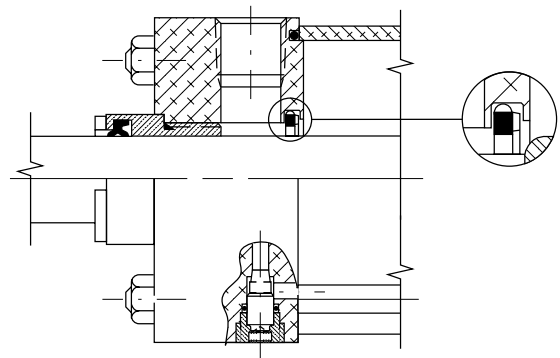
For Increased Productivity and Maximum Performance

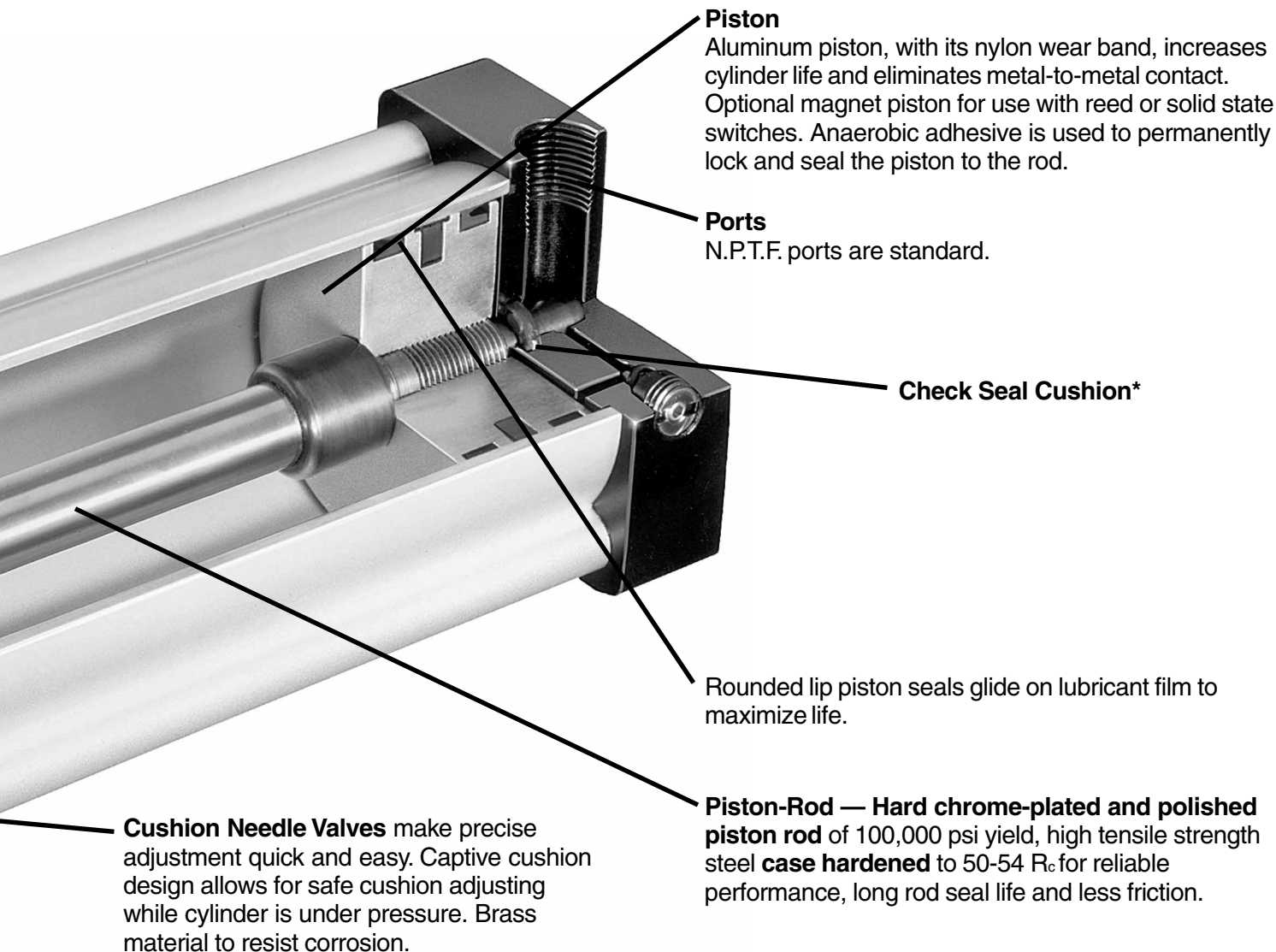
The check seal cushion is new and different from ordinary cushion designs. It combines the sealing capabilities of a lipseal for efficient capture of air to effectively cushion and to provide check valve action for quick stroke reversal.

The design also provides "floating cushions" to assure cushion repeatability and long life. At the start of the stroke in each direction, the check valve design allows full flow to piston face with a minimum pressure drop for a maximum power stroke.

Additional benefits of the new check seal cushions are increased productivity and top performance for faster cycle time, minimum wear, easy adjustment and low pressure drop.

The basic cushion design is optional and available on either the head end, cap end or both ends without change in envelope or mounting dimensions. A captive cushion adjusting needle is supplied for easy, precise adjustment on all bore sizes.





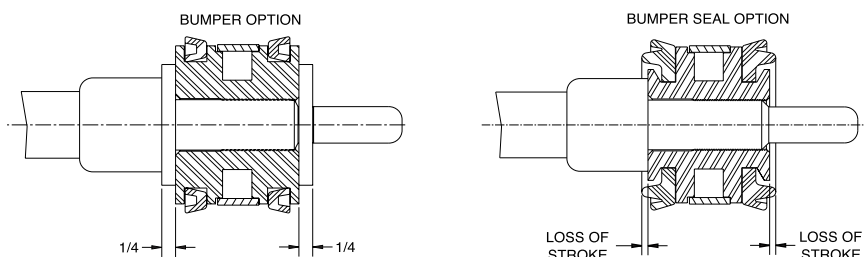
Schrader Bellows provides the ultimate in design flexibility by offering two styles of impact dampening bumpers for the Econo-Ram II cylinder line in bore sizes ranging from 1-1/2" - 4".

Conventional bumpers can be provided on one or both sides of the piston with a 1/4" stroke loss per bumper. This style of bumper is ideal for applications subjected to high speeds where cycle time may discourage the use of cushions.

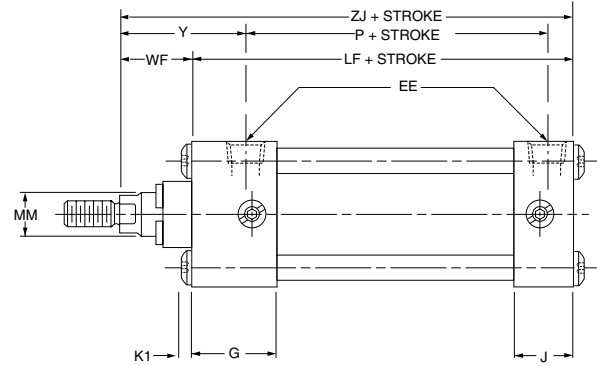
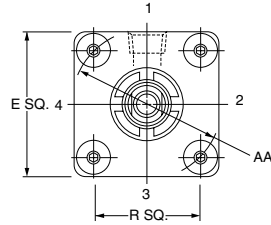
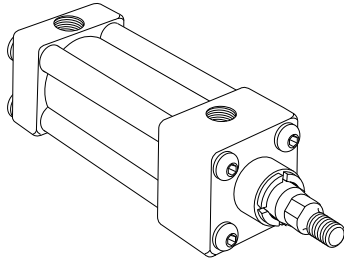
Impact dampening bumper seals can be combined with cushions to provide the ideal solution for applications that

experience high speed cycling and heavier loads. The bumper seal option combines the features of a low friction, round lip seal and impact resistant bumpers to provide smooth end of stroke deceleration. With system pressures above 80 PSI, the bumper seal option offers minimal stroke loss.

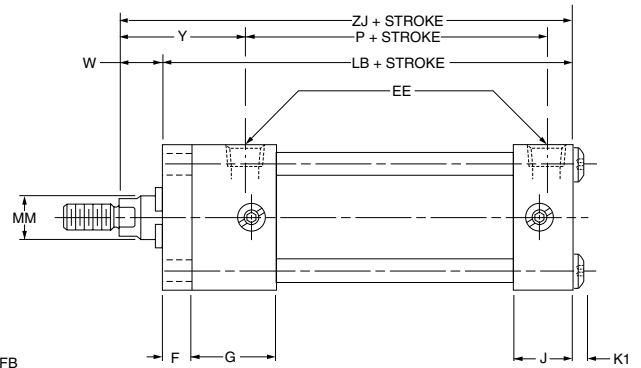
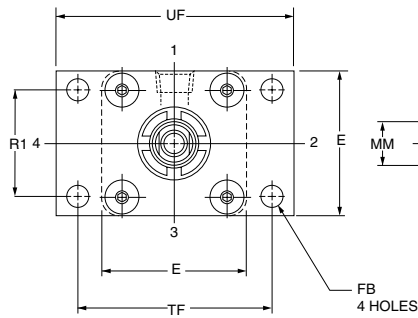
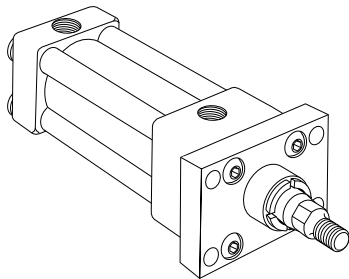
For additional information regarding the bumper seal option, refer to "Bumper Seal Options" page. For instructions on how to order these options, refer to "How To Order" page.



No Mount Basic
Style MX0
(NFPA MX0)

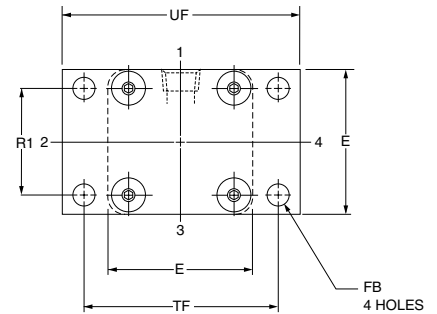
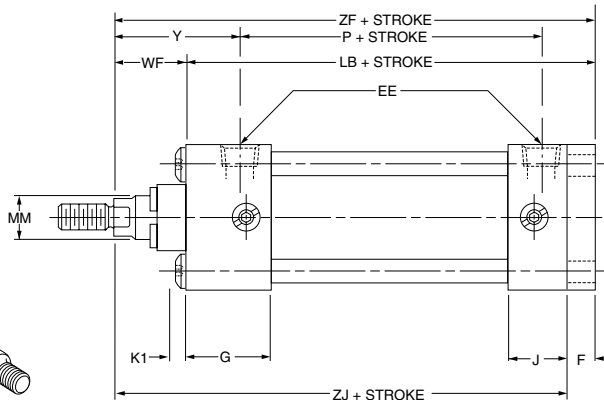
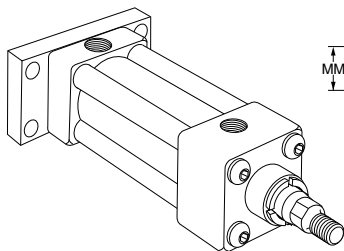


Head Rectangular Flange
Style MF1*
(NFPA MF1)



*Note: 1-1/4" bore flange has rounded corners.

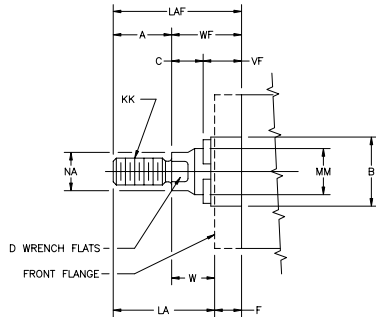
Cap Rectangular Flange
Style MF2*
(NFPA MF2)



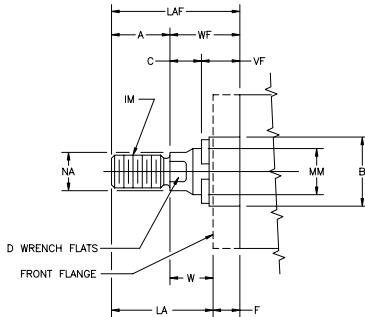
*Note: 1-1/4" bore flange has rounded corners.

Rod End Dimensions—Basic Cylinder

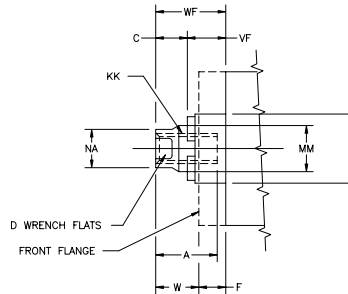
Thread Style 2
 (NFPA Style SM)
 Small Male



Thread Style 4
 (NFPA Style IM)
 Intermediate Male



Thread Style 3
 (NFPA Style SF)
 Short Female



**“Special Thread”
 Style 0**

Special thread, extension, rod eye, blank, etc., are also available.

To order, specify “Style 0” and give desired dimensions for CC or KK, A and W or WF.

If otherwise special, furnish dimensioned sketch.

Table 1—Envelope and Mounting Dimensions

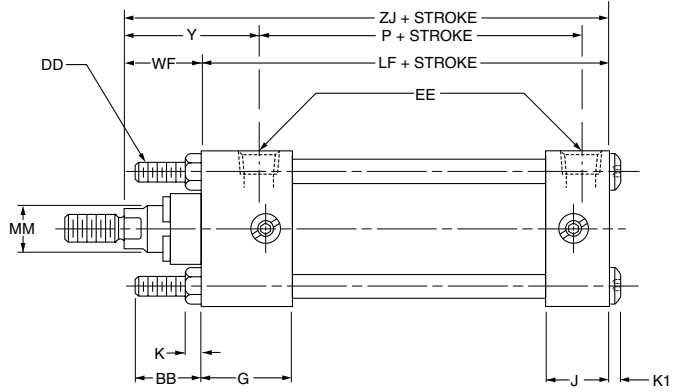
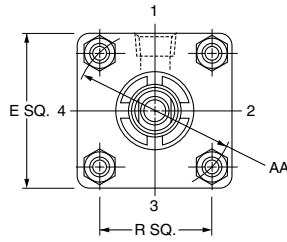
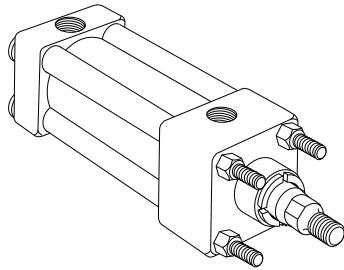
Bore	AA	E	EE (NPTF)	F	FB	G	J	K1	R	R1	TF	UF	Add Stroke		
													LB	LF	P
1 1/4	1.81	1 53/64	1/4	25/64	1/4	15/16	13/16	1/8	1.28	1.26	2 33/64	3 5/32	3 45/64	3 5/16	2 3/16
1 1/2	2.02	2	3/8	3/8	5/16	17/16	15/16	1/8	1.43	1.43	2 3/4	3 3/8	4	3 5/8	2 5/16
2	2.6	2 1/2	3/8	3/8	3/8	17/16	15/16	5/32	1.84	1.84	3 3/8	4 1/8	4	3 5/8	2 5/16
2 1/2	3.1	3	3/8	3/8	3/8	17/16	15/16	5/32	2.19	2.19	3 7/8	4 5/8	4 1/8	3 3/4	2 3/8
3 1/4	3.9	3 3/4	1/2	5/8	7/16	1 11/16	1 3/16	3/16	2.76	2.76	4 11/16	5 1/2	4 7/8	4 1/4	2 5/8
4	4.7	4 1/2	1/2	5/8	7/16	1 11/16	1 3/16	3/16	3.32	3.32	5 7/16	6 1/4	4 7/8	4 1/4	2 5/8

Table 2—Rod Dimensions

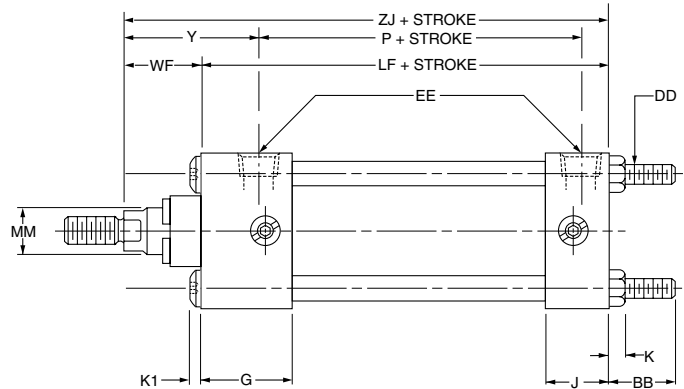
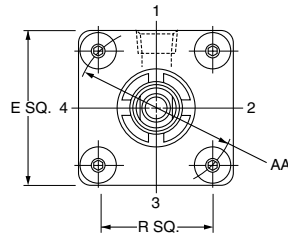
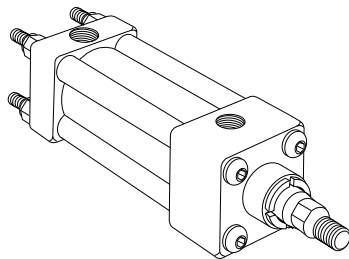
Bore Size	Rod Dia. MM	Thread		A	+.000 -.002 B	C	D	LA	NA	VF	W	WF	Y	Add Stroke	
		Style 4 CC	Style 2 & 3 KK											ZF	ZJ
1 1/4	1/2	7/16-20	5/16-24	5/8	.999	3/8	3/8	1 15/64	7/16	5/8	39/64	1	1 3/4	4 45/64	4 5/16
1 1/2	5/8	1/2-20	7/16-20	3/4	1.124	3/8	1/2	1 3/8	9/16	5/8	5/8	1	1 7/8	5	4 5/8
	1*	7/8-14	3/4-16	1 1/8	1.499	5/8	7/8	2 1/8	15/16	3/4	1	1 3/8	2 1/4	5 3/8	5
2	5/8	1/2-20	7/16-20	3/4	1.124	3/8	1/2	1 3/8	9/16	5/8	5/8	1	1 7/8	5	4 5/8
	1	7/8-14	3/4-16	1 1/8	1.499	5/8	7/8	2 1/8	15/16	3/4	1	1 3/8	2 1/4	5 3/8	5
2 1/2	5/8	1/2-20	7/16-20	3/4	1.124	3/8	1/2	1 3/8	9/16	5/8	5/8	1	1 15/16	5 1/8	4 3/4
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3 1/4	1	7/8-14	3/4-16	1 1/8	1.499	5/8	7/8	1 7/8	15/16	3/4	3/4	1 3/8	2 7/16	6 1/4	5 5/8
	1 3/8	1 1/4-12	1-14	1 5/8	1.999	7/8	1 1/8	2 5/8	15/16	3/4	1	1 5/8	2 11/16	6 1/2	5 7/8
4	1	7/8-14	3/4-16	1 1/8	1.499	5/8	7/8	1 7/8	15/16	3/4	3/4	1 3/8	2 7/16	6 1/4	5 5/8
	1 3/8	1 1/4-12	1-14	1 5/8	1.999	7/8	1 1/8	2 5/8	15/16	3/4	1	1 5/8	2 11/16	6 1/2	5 7/8

*Cushion not available head end.

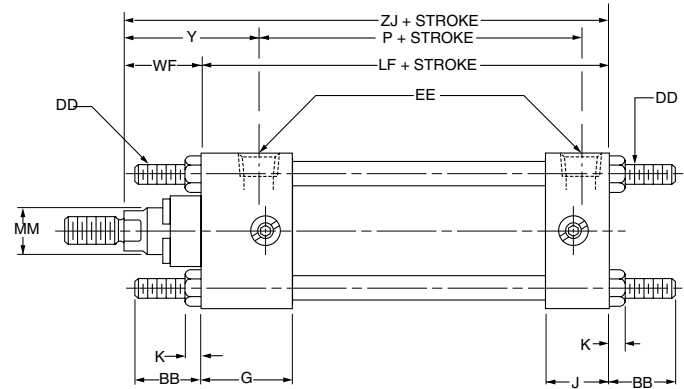
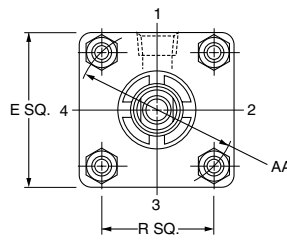
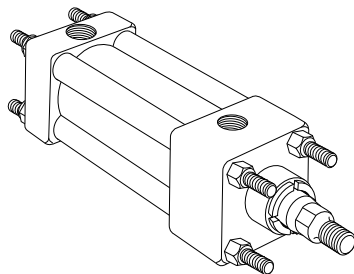
Tie Rods Extended Head End Mount
Style MX3
(NFPA MX3)



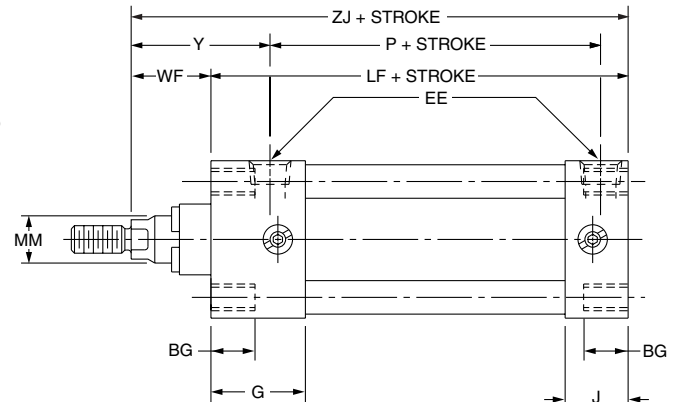
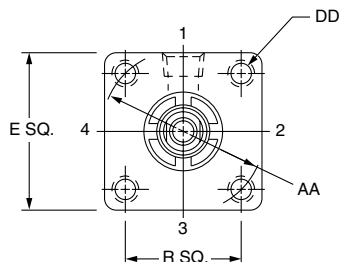
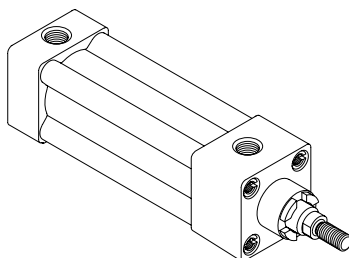
Tie Rods Extended Cap End Mount
Style MX2
(NFPA MX2)



Tie Rods Extended Both Ends Mount
Style MX1
(NFPA MX1)

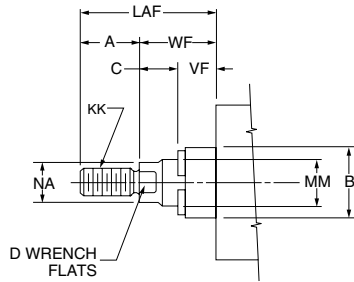


Sleeve Nut Mount
Style MX5
(NFPA MX5)

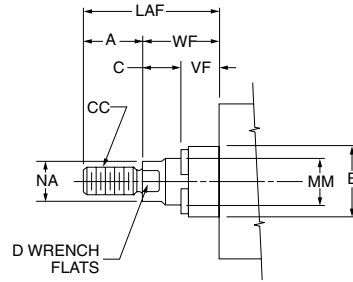


Rod End Dimensions—Basic Cylinder

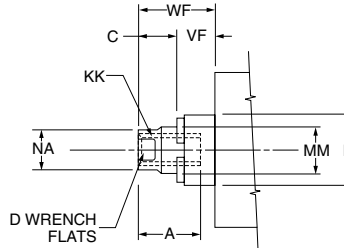
Thread Style 2
(NFPA Style SM)
Small Male



Thread Style 4
(NFPA Style IM)
Intermediate Male



Thread Style 3
(NFPA Style SF)
Short Female



**“Special Thread”
Style 0**

Special thread, extension, rod eye, blank, etc., are also available.

To order, specify “Style 0” and give desired dimensions for CC or KK, A and W or WF.

If otherwise special, furnish dimensioned sketch.

Table 1—Envelope and Mounting Dimensions

Bore	AA	BB	BG	DD	E	EE (NPTF)	G	J	K	K1	R	Add Stroke	
												LF	P
1 1/4	1.81	1	.45	1/4-28	1 ⁵³ /64	1/4	15 ¹⁶ /16	13 ¹⁶ /16	7 ³² /32	1/8	1.28	3 ⁵ /16	2 ³ /16
1 1/2	2.02	1	.45	1/4-28	2	3/8	1 ⁷ /16	15 ¹⁶ /16	1/4	1/8	1.43	3 ⁵ /8	2 ⁵ /16
2	2.6	1 1/8	.48	5/16-24	2 1/2	3/8	1 ⁷ /16	15 ¹⁶ /16	5/16	5/32	1.84	3 ⁵ /8	2 ⁵ /16
2 1/2	3.1	1 1/8	.48	5/16-24	3	3/8	1 ⁷ /16	15 ¹⁶ /16	5/16	5/32	2.19	3 ³ /4	2 ³ /8
3 1/4	3.9	1 3/8	.50	3/8-24	3 3/4	1/2	1 ¹¹ /16	1 ³ /16	3/8	3/16	2.76	4 ¹ /4	2 ⁵ /8
4	4.7	1 3/8	.50	3/8-24	4 1/2	1/2	1 ¹¹ /16	1 ³ /16	3/8	3/16	3.32	4 ¹ /4	2 ⁵ /8

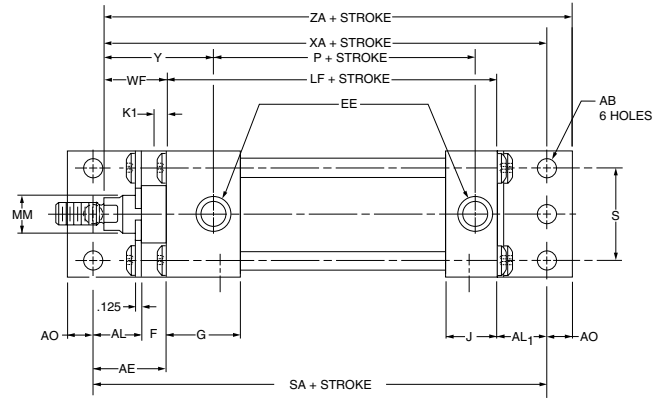
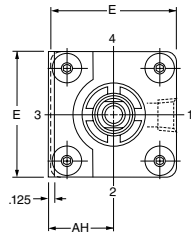
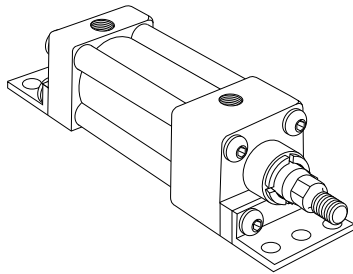
Table 2—Rod Dimensions

Bore Size	Rod Dia. MM	Thread		A	+.000 -.002 B	C	D	LAF	NA	VF	W	WF	Y	Add Stroke ZJ
		Style 4 CC	Style 2 & 3 KK											
1 1/4	1/2	7/16-20	5/16-24	5/8	.999	3/8	3/8	1 5/8	7/16	5/8	39/64	1	1 3/4	4 5/16
1 1/2	5/8	1/2-20	7/16-20	3/4	1.124	3/8	1/2	1 3/4	9/16	5/8	5/8	1	1 7/8	4 5/8
	1*	7/8-14	3/4-16	1 1/8	1.499	5/8	7/8	2 1/2	15/16	3/4	1	1 3/8	2 1/4	5
2	5/8	1/2-20	7/16-20	3/4	1.124	3/8	1/2	1 3/4	9/16	5/8	5/8	1	1 7/8	4 5/8
	1	7/8-14	3/4-16	1 1/8	1.499	5/8	7/8	2 1/2	15/16	3/4	1	1 3/8	2 1/4	5
2 1/2	5/8	1/2-20	7/16-20	3/4	1.124	3/8	1/2	1 3/4	9/16	5/8	5/8	1	1 15/16	4 3/4
	1	7/8-14	3/4-16	1 1/8	1.499	5/8	7/8	2 1/2	15/16	3/4	1	1 3/8	2 5/16	5 1/8
3 1/4	1	7/8-14	3/4-16	1 1/8	1.499	5/8	7/8	2 1/2	15/16	3/4	3/4	1 3/8	2 7/16	5 5/8
	1 3/8	1 1/4-12	1-14	1 5/8	1.999	7/8	1 1/8	3 1/4	15/16	3/4	1	1 5/8	2 11/16	5 7/8
4	1	7/8-14	3/4-16	1 1/8	1.499	5/8	7/8	2 1/2	15/16	3/4	3/4	1 3/8	2 7/16	5 5/8
	1 3/8	1 1/4-12	1-14	1 5/8	1.999	7/8	1 1/8	3 1/4	15/16	3/4	1	1 5/8	2 11/16	5 7/8

*Cushion not available head end.

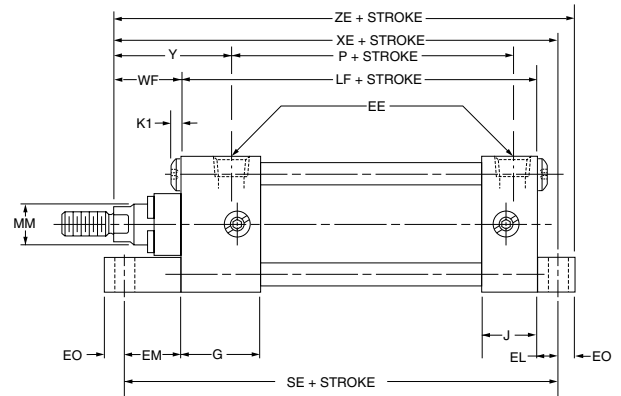
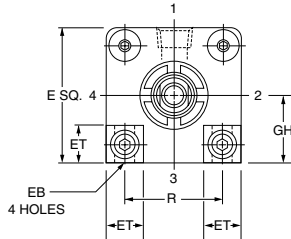
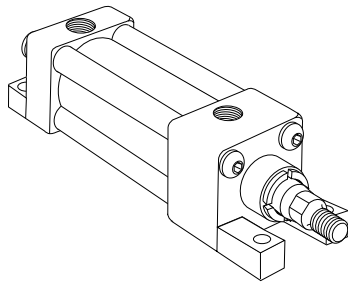
**Table 3—
Envelope
and
Mounting
Dimensions**

Side End Angle Mount
Style MS1*
(NFFPA MS1)

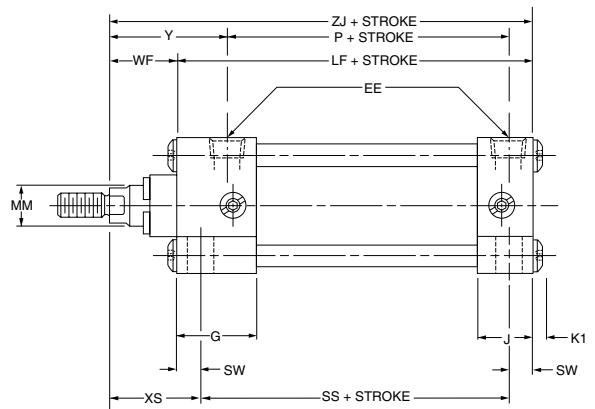
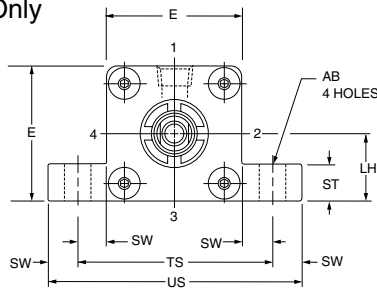
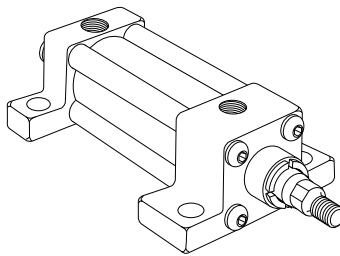


*Maximum recommended pressure of 150 PSI.

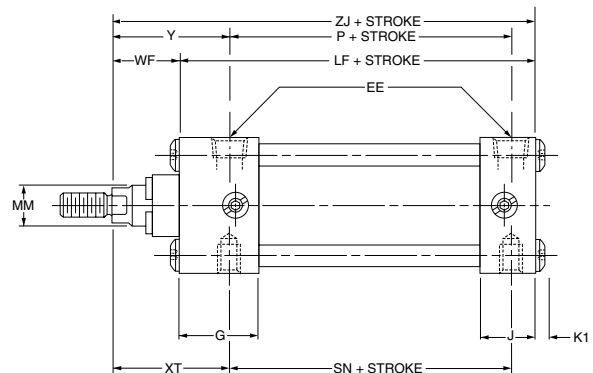
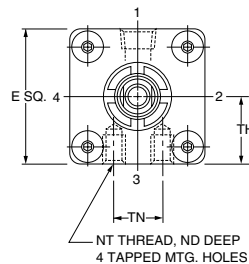
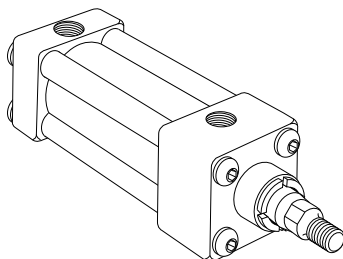
Side End Lug Mount
Style MS7
(NFFPA MS7)



Side Lug Mount
Style MS2
(NFFPA MS2) 1-1/2" - 4" Bore Only



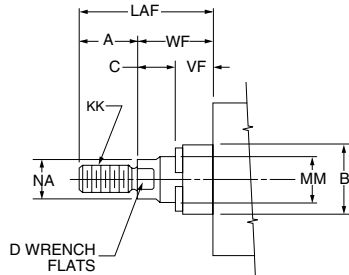
Side Tap Mount*
Style MS4
(NFFPA MS4)



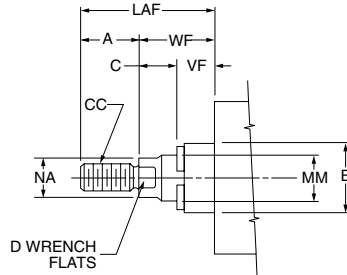
*Not available in 1-1/2" bore, 1" rod.

Rod End Dimensions—Basic Cylinder

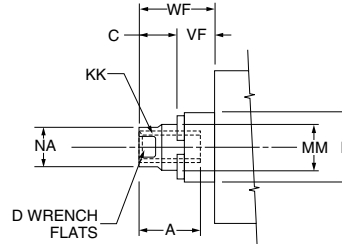
Thread Style 2
(NFWA Style SM)
Small Male



Thread Style 4
(NFWA Style IM)
Intermediate Male



Thread Style 3
(NFWA Style SF)
Short Female



**“Special Thread”
Style 0**

Special thread, extension, rod eye, blank, etc., are also available.

To order, specify “Style 0” and give desired dimensions for CC or KK, A and W or WF.

If otherwise special, furnish dimensioned sketch.

Table 1—Envelope and Mounting Dimensions

Bore	AB	AE	AH	AL	AL1	AO	E	EE (NPTF)	EB	EL	EM	EO	ET	F	G	GH ±.003	J	K1	LH ±.003	NT	R	S	ST	SW	TH ±.003	TN	TS	US	Add Stroke					
																													LF	P	SA	SE	SN	SS
1 1/4	.276"	—	1 17/64	15/16	15/16	9/32	1 53/64	1/4	9/32	3/4	1 1/8	1/4	9/16	—	15/16	.908	13/16	1/8	▲	1/4-20†	1.28	1 17/64	▲	▲	.908	—	▲	▲	3 5/16	2 3/16	5 3/16	5 3/16	1 15/16	▲
1 1/2	7/16	1 3/8	1 3/16	1	1	3/8	2	3/8	9/32	3/4	1 1/8	1/4	9/16	3/8	17/16	.993	15/16	1/8	.993	1/4-20	1.43	1 1/4	1/2	3/8	.993	5/8	2 3/4	3 1/2	3 5/8	2 5/16	6	5 1/2	2 1/4	2 7/8
2	7/16	1 3/8	1 7/16	1	1	3/8	2 1/2	3/8	11/32	15/16	1 5/16	5/16	11/16	3/8	17/16	1.243	15/16	5/32	1.243	5/16-18	1.84	1 3/4	1/2	3/8	1.243	7/8	3 1/4	4	3 5/8	2 5/16	6	5 7/8	2 1/4	2 7/8
2 1/2	7/16	1 3/8	1 5/8	1	1	3/8	3	3/8	11/32	1 1/16	1 7/16	5/16	13/16	3/8	17/16	1.493	15/16	5/32	1.493	3/8-16	2.19	2 1/4	1/2	3/8	1.493	1 1/4	3 3/4	4 1/2	3 3/4	2 3/8	6 1/8	6 1/4	2 3/8	3
3 1/4	9/16	1 7/8	1 15/16	1 1/4	1 1/4	1/2	3 3/4	1/2	13/32	7/8	1 1/2	3/8	1	5/8	1 11/16	1.868	1 3/16	3/16	1.868	1/2-13	2.76	2 3/4	3/4	1/2	1.868	1 1/2	4 3/4	5 3/4	4 1/4	2 5/8	7 3/8	6 5/8	2 5/8	3 1/4
4	9/16	—	2 1/4	1 7/8	1 1/4	1/2	4 1/2	1/2	13/32	1	1 5/8	3/8	1 3/16	—	1 11/16	2.243	1 3/16	3/16	2.243	1/2-13	3.32	3 1/2	3/4	1/2	2.243	2 1/16	5 1/2	6 1/2	4 1/4	2 5/8	7 3/8	6 7/8	2 5/8	3 1/4

* Mounting style MS1 for 1 1/4" bore only is furnished with four mounting holes (two each end). Center holes omitted.

▲ Mounting style MS2 is not available in 1 1/4" bore.

† Mounting style MS4 for 1 1/4" bore only is furnished with two mounting holes (one each end).

Table 2—Rod Dimensions

Bore Size	Rod Dia. MM	Thread		A	+.000 -.002 B	C	D	LAF	NA	VF	W	WF	Y	ND	XS	XT	Add Stroke				
		Style 4 CC	Style 2 & 3 KK														XA	XE	ZA	ZE	ZJ
1 1/4	1/2	7/16-20	5/16-24	5/8	.999	3/8	3/8	1 5/8	7/16	5/8	39/64	1	1 3/4	1/4	▲	1 15/16	5 1/4	5 1/16	5 17/32	5 5/16	4 5/16
1 1/2	5/8	1/2-20	7/16-20	3/4	1.124	3/8	1/2	1 3/4	9/16	5/8	5/8	1	1 7/8	3/8	1 3/8	1 15/16	5 5/8	5 3/8	6	5 5/8	4 5/8
	1*	7/8-14	3/4-16	1 1/8	1.499	5/8	7/8	2 1/2	15/16	3/4	1	1 3/8	2 1/4	—	1 3/4	—	6	—	6 3/8	—	5
2	5/8	1/2-20	7/16-20	3/4	1.124	3/8	1/2	1 3/4	9/16	5/8	5/8	1	1 7/8	7/16	1 3/8	1 15/16	5 5/8	5 9/16	6	5 7/8	4 5/8
	1	7/8-14	3/4-16	1 1/8	1.499	5/8	7/8	2 1/2	15/16	3/4	1	1 3/8	2 1/4	7/16	1 3/4	2 5/16	6	5 15/16	6 3/8	6 1/4	5
2 1/2	5/8	1/2-20	7/16-20	3/4	1.124	3/8	1/2	1 3/4	9/16	5/8	5/8	1	1 15/16	5/8	1 3/8	1 15/16	5 3/4	5 13/16	6 1/8	6 1/8	4 3/4
	1	7/8-14	3/4-16	1 1/8	1.499	5/8	7/8	2 1/2	15/16	3/4	1	1 3/8	2 5/16	5/8	1 3/4	2 5/16	6 1/8	6 9/16	6 1/2	6 1/2	5 1/8
3 1/4	1	7/8-14	3/4-16	1 1/8	1.499	5/8	7/8	2 1/2	15/16	3/4	3/4	1 3/8	2 7/16	3/4	1 7/8	2 7/16	6 7/8	6 1/2	7 3/8	6 7/8	5 5/8
	1 3/8	1 1/4-12	1-14	1 5/8	1.999	7/8	1 1/8	3 1/4	15/16	3/4	1	1 5/8	2 11/16	3/4	2 1/8	2 11/16	7 1/8	6 3/4	7 5/8	7 1/8	5 7/8
4	1	7/8-14	3/4-16	1 1/8	1.499	5/8	7/8	2 1/2	15/16	3/4	3/4	1 3/8	2 7/16	3/4	1 7/8	2 7/16	6 7/8	6 5/8	7 3/8	7	5 5/8
	1 3/8	1 1/4-12	1-14	1 5/8	1.999	7/8	1 1/8	3 1/4	15/16	3/4	1	1 5/8	2 11/16	3/4	2 1/8	2 11/16	7 1/8	6 7/8	7 5/8	7 1/4	5 7/8

* Cushion not available head end.

▲ Mounting style MS2 is not available in 1 1/4" bore.

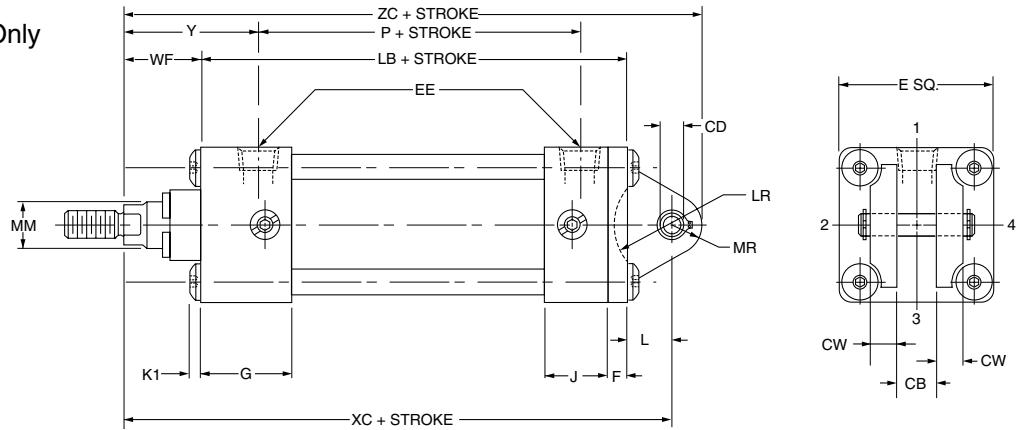
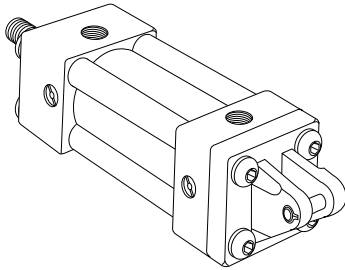
**Table 3—
Envelope and Mounting Dimensions**

Bore Size	Rod Dia. MM	Style 4 CC	Style 2 & 3 KK	A	+.000 -.002 B	C	D	LAF	NA	VF	W	WF	Y	ND	XS	XT	Add Stroke				
																	XA	XE	ZA	ZE	ZJ
1 1/4	1/2	7/16-20	5/16-24	5/8	.999	3/8	3/8	1 5/8	7/16	5/8	39/64	1	1 3/4	1/4	▲	1 15/16	5 1/4	5 1/16	5 17/32	5 5/16	4 5/16
1 1/2	5/8	1/2-20	7/16-20	3/4	1.124	3/8	1/2	1 3/4	9/16	5/8	5/8	1	1 7/8	3/8	1 3/8	1 15/16	5 5/8	5 3/8	6	5 5/8	4 5/8
	1*	7/8-14	3/4-16	1 1/8	1.499	5/8	7/8	2 1/2	15/16	3/4	1	1 3/8	2 1/4	—	1 3/4	—	6	—	6 3/8	—	5
2	5/8	1/2-20	7/16-20	3/4	1.124	3/8	1/2	1 3/4	9/16	5/8	5/8	1	1 7/8	7/16	1 3/8	1 15/16	5 5/8	5 9/16	6	5 7/8	4 5/8
	1	7/8-14	3/4-16	1 1/8	1.499	5/8	7/8	2 1/2	15/16	3/4	1	1 3/8	2 1/4	7/16	1 3/4	2 5/16	6	5 15/16	6 3/8	6 1/4	5
2 1/2	5/8	1/2-20	7/16-20	3/4	1.124	3/8	1/2	1 3/4	9/16	5/8	5/8	1	1 15/16	5/8	1 3/8	1 15/16	5 3/4	5 13/16	6 1/8	6 1/8	4 3/4
	1	7/8-14	3/4-16	1 1/8	1.499	5/8	7/8	2 1/2	15/16	3/4	1	1 3/8	2 5/16	5/8	1 3/4	2 5/16	6 1/8	6 9/16	6 1/2	6 1/2	5 1/8
3 1/4	1	7/8-14	3/4-16	1 1/8	1.499	5/8	7/8	2 1/2	15/16	3/4	3/4	1 3/8	2 7/16	3/4	1 7/8	2 7/16	6 7/8	6 1/2	7 3/8	6 7/8	5 5/8
	1 3/8	1 1/4-12	1-14	1 5/8	1.999	7/8	1 1/8	3 1/4	15/16	3/4	1	1 5/8	2 11/16	3/4	2 1/8	2 11/16	7 1/8	6 3/4	7 5/8	7 1/8	5 7/8
4	1	7/8-14	3/4-16	1 1/8	1.499	5/8	7/8	2 1/2	15/16	3/4	3/4	1 3/8	2 7/16	3/4	1 7/8	2 7/16	6 7/8	6 5/8	7 3/8	7	5 5/8
	1 3/8	1 1/4-12	1-14	1 5/8	1.999	7/8	1 1/8	3 1/4	15/16	3/4	1	1 5/8	2 11/16	3/4	2 1/8	2 11/16	7 1/8	6 7/8	7 5/8	7 1/4	5 7/8

Cap Fixed Clevis Mount

Style MP1

(NFPA MP1) 1-1/2" – 4" Bore Only

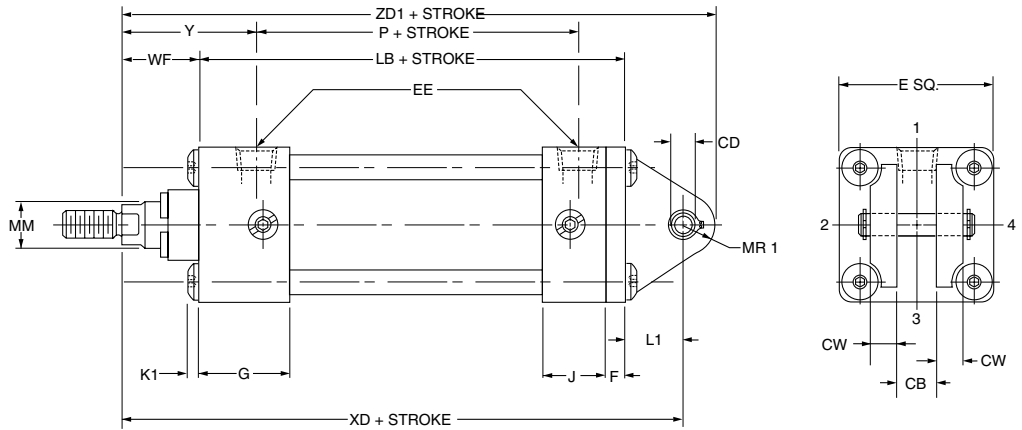
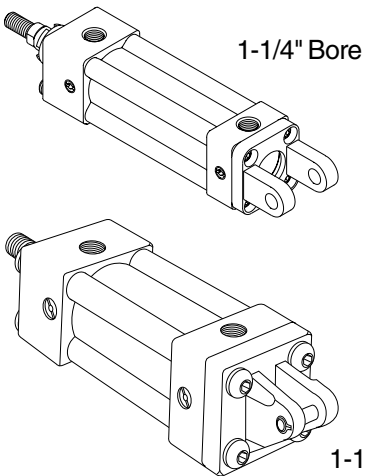


For maximum swivel angle with rear mounting plate for MP1 mounting, see Econo-Ram II cylinder accessories on page 37.

Cap Detachable Clevis Mount

Style MP2

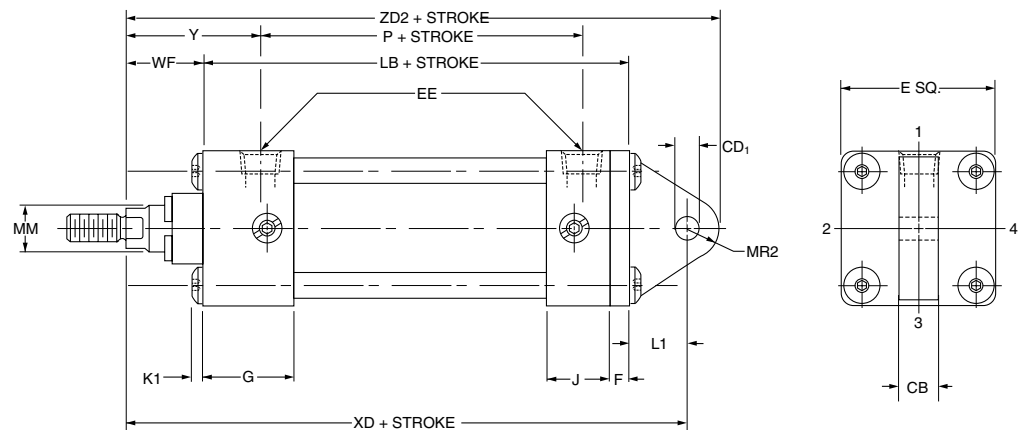
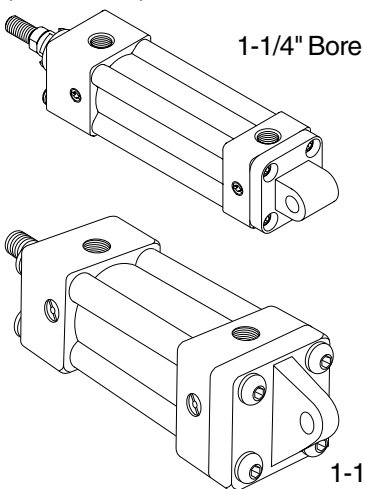
(NFPA MP2)



Cap Detachable Eye Mount

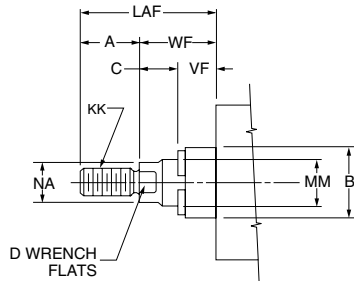
Style MP4

(NFPA MP4)

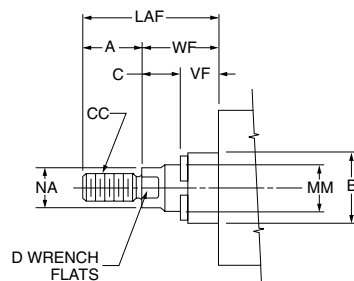


Rod End Dimensions—Basic Cylinder

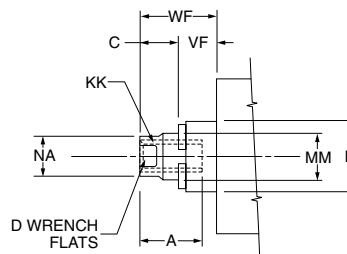
Thread Style 2
 (NFPA Style SM)
 Small Male



Thread Style 4
 (NFPA Style IM)
 Intermediate Male



Thread Style 3
 (NFPA Style SF)
 Short Female



**“Special Thread”
 Style 0**

Special thread, extension, rod eye, blank, etc., are also available.

To order, specify “Style 0” and give desired dimensions for CC or KK, A and W or WF.

If otherwise special, furnish dimensioned sketch.

Table 1—Envelope and Mounting Dimensions

Bore	CB	CD +.000 -.002	CD1 +.004	CW	E	EE (NPTF)	F	G	J	K1	L	L1	LR	MR	MR1	MR2	Add Stroke	
																	LB	P
1 1/4	1 1/64	.393	.392	3/8	1 53/64	1/4	25/64	15/16	13/16	1/8	▲	15/32	▲	▲	25/64	25/64	3 45/64	2 3/16
1 1/2	3/4	.501	.500	1/2	2	3/8	3/8	17/16	15/16	1/8	3/8	3/4	3/4	5/8	1/2	5/8	4	2 5/16
2	3/4	.501	.500	1/2	2 1/2	3/8	3/8	17/16	15/16	5/32	3/8	3/4	3/4	5/8	1/2	5/8	4	2 5/16
2 1/2	3/4	.501	.500	1/2	3	3/8	3/8	17/16	15/16	5/32	3/8	3/4	3/4	5/8	1/2	11/16	4 1/8	2 3/8
3 1/4	1 1/4	.751	.750	5/8	3 3/4	1/2	5/8	1 11/16	1 3/16	3/16	5/8	1 1/4	1	15/16	3/4	7/8	4 7/8	2 5/8
4	1 1/4	.751	.750	5/8	4 1/2	1/2	5/8	1 11/16	1 3/16	3/16	5/8	1 1/4	1	15/16	3/4	7/8	4 7/8	2 5/8

▲ Mounting style MP1 is not available in 1 1/4" bore.

Table 2—Rod Dimensions

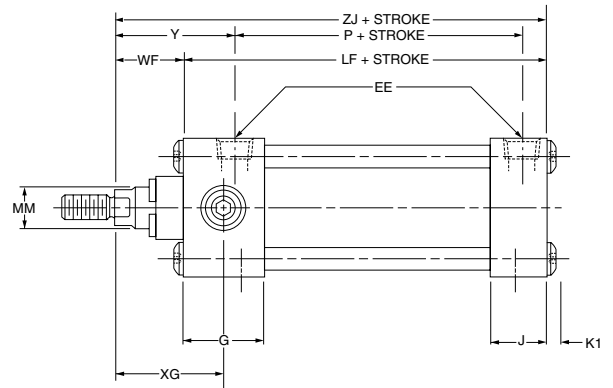
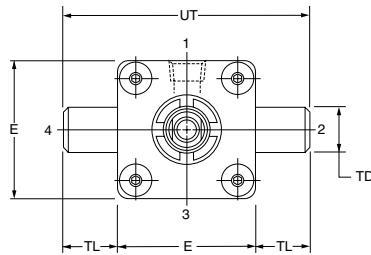
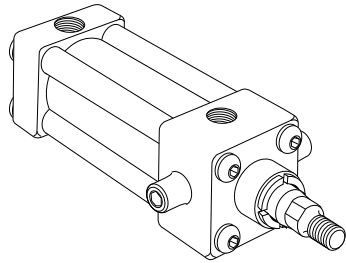
Bore Size	Rod Dia. MM	Thread		A	+.000 -.002 B	C	D	LAF	NA	VF	W	WF	Y	Add Stroke				
		Style 4 CC	Style 2 & 3 KK											XC	XD	ZC	ZD1	ZD2
1 1/4	1/2	7/16-20	5/16-24	5/8	.999	3/8	3/8	1 5/8	7/16	5/8	39/64	1	1 3/4	▲	5 3/16	▲	5 37/64	5 37/64
1 1/2	5/8	1/2-20	7/16-20	3/4	1.124	3/8	1/2	1 3/4	9/16	5/8	5/8	1	1 7/8	5 3/8	5 3/4	6	6 1/4	6 3/8
	1*	7/8-14	3/4-16	1 1/8	1.499	5/8	7/8	2 1/2	15/16	3/4	1	1 3/8	2 1/4	5 3/4	6 1/8	6 3/8	6 5/8	6 3/4
2	5/8	1/2-20	7/16-20	3/4	1.124	3/8	1/2	1 3/4	9/16	5/8	5/8	1	1 7/8	5 3/8	5 3/4	6	6 1/4	6 3/8
	1	7/8-14	3/4-16	1 1/8	1.499	5/8	7/8	2 1/2	15/16	3/4	1	1 3/8	2 1/4	5 3/4	6 1/8	6 3/8	6 5/8	6 3/4
2 1/2	5/8	1/2-20	7/16-20	3/4	1.124	3/8	1/2	1 3/4	9/16	5/8	5/8	1	1 15/16	5 1/2	5 7/8	6 1/8	6 3/8	6 9/16
	1	7/8-14	3/4-16	1 1/8	1.499	5/8	7/8	2 1/2	15/16	3/4	1	1 3/8	2 5/16	5 7/8	6 1/4	6 1/2	6 3/4	6 5/16
3 1/4	1	7/8-14	3/4-16	1 1/8	1.499	5/8	7/8	2 1/2	15/16	3/4	3/4	1 3/8	2 7/16	6 7/8	7 1/2	7 13/16	8 1/4	8 3/8
	1 3/8	1 1/4-12	1-14	1 5/8	1.999	7/8	1 1/8	3 1/4	1 5/16	3/4	1	1 5/8	2 11/16	7 1/8	7 3/4	8 1/16	8 1/2	8 5/8
4	1	7/8-14	3/4-16	1 1/8	1.499	5/8	7/8	2 1/2	15/16	3/4	3/4	1 3/8	2 7/16	6 7/8	7 1/2	7 13/16	8 1/4	8 3/8
	1 3/8	1 1/4-12	1-14	1 5/8	1.999	7/8	1 1/8	3 1/4	1 5/16	3/4	1	1 5/8	2 11/16	7 1/8	7 3/4	8 1/16	8 1/2	8 5/8

* Cushion not available head end.

▲ Mounting style MP1 is not available in 1 1/4" bore.

Head Trunnion Mount*

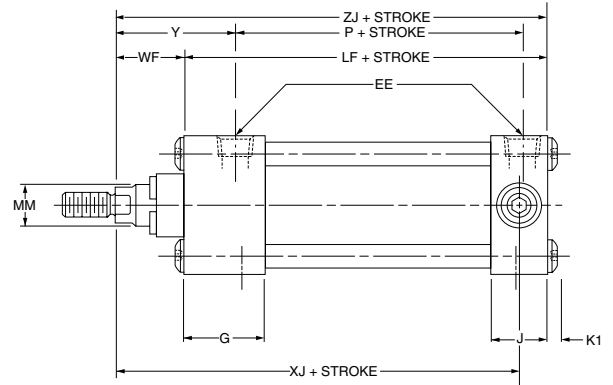
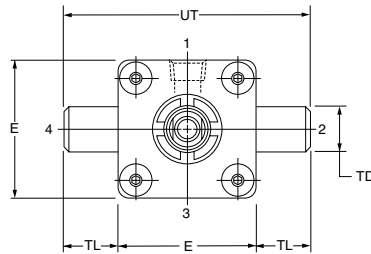
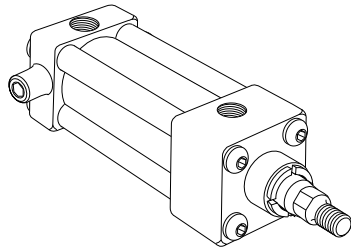
Style MT1
(NFPA MT1)



*Not available in 1-1/4" or 1-1/2" bore with 1" rod.

Cap Trunnion Mount*

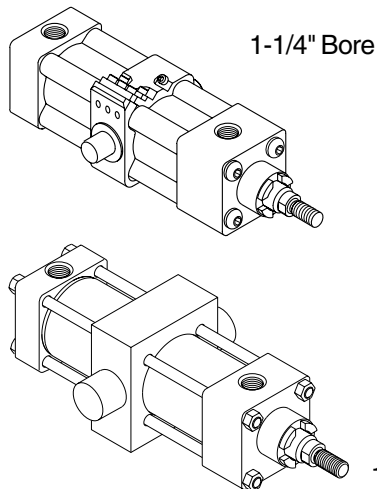
Style MT2
(NFPA MT2)



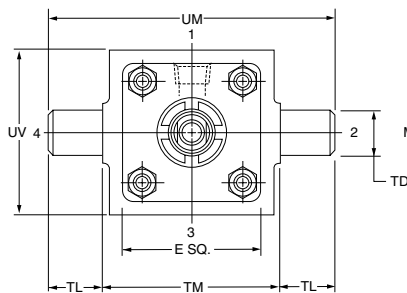
*Not available in 1-1/4" bore.

Intermediate Trunnion Mount

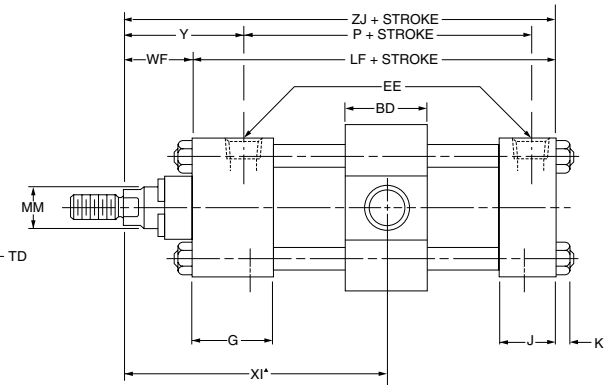
Style MT4
(NFPA MT4)



1-1/4" Bore



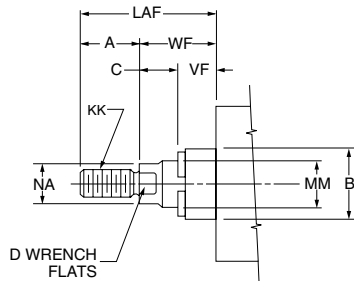
1-1/2 - 4" Bore



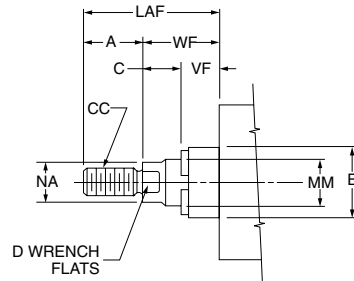
▲ Dimension "XI" to be specified by customer.

Rod End Dimensions—Basic Cylinder

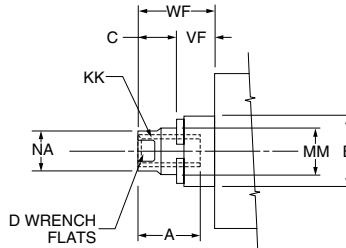
Thread Style 2
(NFPA Style SM)
Small Male



Thread Style 4
(NFPA Style IM)
Intermediate Male



Thread Style 3
(NFPA Style SF)
Short Female



**“Special Thread”
Style 0**

Special thread, extension, rod eye, blank, etc., are also available.

To order, specify “Style 0 and give desired dimensions for CC or KK, A and W or WF.

If otherwise special, furnish dimensioned sketch.

Table 1—Envelope and Mounting Dimensions

Bore	BD	E	EE (NPTF)	G	J	K	K1	+000 TD -001	TL	TM	UM	UT	UV	Add Stroke		Style MT4 Minimum Stroke
														LF	P	
1 1/4	.98	1.83	1/4	15/16	13/16	—	1/8	.471	15/32	131/32	229/32	■	29/16	35/16	23/16	0
1 1/2	1 1/4	2	3/8	17/16	15/16	1/4	1/8	1.000	1	2 1/2	4 1/2	4	2 1/2	35/8	25/16	0
2	1 1/2	2 1/2	3/8	17/16	15/16	5/16	5/32	1.000	1	3	5	4 1/2	3	35/8	25/16	1/4
2 1/2	1 1/2	3	3/8	17/16	15/16	5/16	5/32	1.000	1	3 1/2	5 1/2	5	3 1/2	33/4	23/8	1/8
3 1/4	2	3 3/4	1/2	11 1/16	13/16	3/8	3/16	1.000	1	4 1/2	6 1/2	5 3/4	4 1/4	4 1/4	25/8	5/8
4	2	4 1/2	1/2	11 1/16	13/16	3/8	3/16	1.000	1	5 1/4	7 1/4	6 1/2	5	4 1/4	25/8	5/8

■ Mounting styles MT1 and MT2 are not available in 1 1/4" bore.

Table 2—Rod Dimensions

Bore Size	Rod Dia. MM	Thread		A	+000 -002 B	C	D	LAF	NA	VF	W	WF	Y	XG	▲ Min. XI	Add Stroke	
		Style 4 CC	Style 2 & 3 KK													XJ	ZJ
1 1/4	1/2	7/16-20	5/16-24	5/8	.999	3/8	3/8	15/8	7/16	5/8	39/64	1	13/4	■	27/8	■	45/16
1 1/2	5/8	1/2-20	7/16-20	3/4	1.124	3/8	1/2	13/4	9/16	5/8	5/8	1	17/8	13/4	31/8	41/8	45/8
	1*	7/8-14	3/4-16	1 1/8	1.499	5/8	7/8	2 1/2	15/16	3/4	1	13/8	2 1/4	—	3 1/2	4 1/2	5
2	5/8	1/2-20	7/16-20	3/4	1.124	3/8	1/2	13/4	9/16	5/8	5/8	1	17/8	13/4	3 1/4	4 1/8	45/8
	1	7/8-14	3/4-16	1 1/8	1.499	5/8	7/8	2 1/2	15/16	3/4	1	13/8	2 1/4	2 1/8	35/8	4 1/2	5
2 1/2	5/8	1/2-20	7/16-20	3/4	1.124	3/8	1/2	13/4	9/16	5/8	5/8	1	115/16	13/4	3 1/4	4 1/4	43/4
	1	7/8-14	3/4-16	1 1/8	1.499	5/8	7/8	2 1/2	15/16	3/4	1	13/8	25/16	2 1/8	35/8	45/8	5 1/8
3 1/4	1	7/8-14	3/4-16	1 1/8	1.499	5/8	7/8	2 1/2	15/16	3/4	3/4	13/8	27/16	2 1/4	4 1/8	5	55/8
	13/8	1 1/4-12	1-14	15/8	1.999	7/8	1 1/8	3 1/4	15/16	3/4	1	15/8	211/16	2 1/2	43/8	5 1/4	57/8
4	1	7/8-14	3/4-16	1 1/8	1.499	5/8	7/8	2 1/2	15/16	3/4	3/4	13/8	27/16	2 1/4	4 1/8	5	55/8
	13/8	1 1/4-12	1-14	15/8	1.999	7/8	1 1/8	3 1/4	15/16	3/4	1	15/8	211/16	2 1/2	43/8	5 1/4	57/8

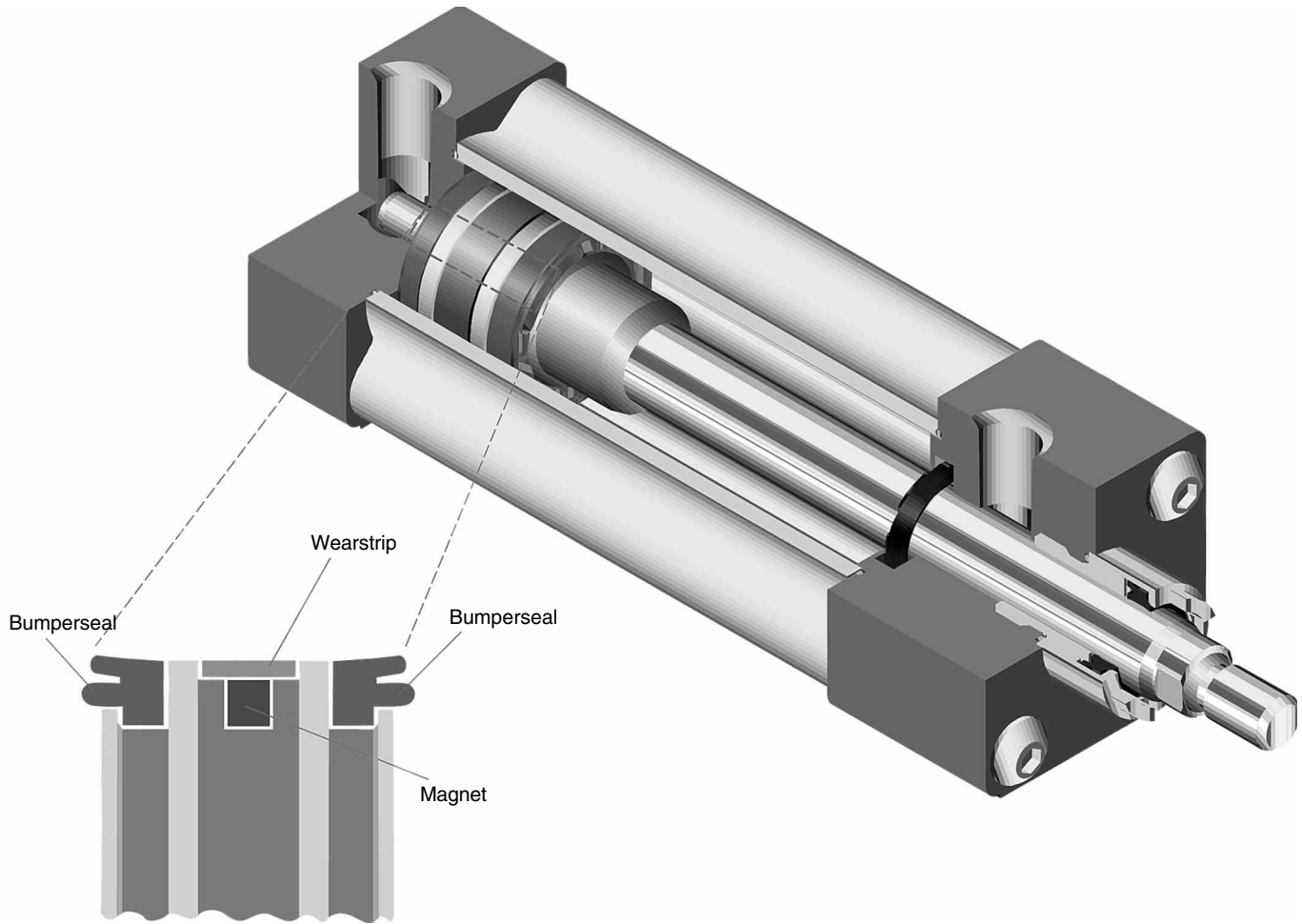
* Cushion not available head end.

▲ Dimension “XI” to be specified by customer.

■ Mounting styles MT1 and MT2 are not available in 1 1/4" bore.

Impact dampening Bumper Seals are now optional on all Econo-Ram II air cylinders from 1.50" to 4.00" bore. The Bumper Seal piston combines the features of low-friction, round lipseals and impact-dampening bumpers to provide reduced noise and smoother end-of-

stroke deceleration. At pressure greater than 80 psi, the compressible Buna Nitrile Bumper Seal has minimal effect on stroke loss. When specified, Bumper Seals will be supplied on both ends of the piston, eliminating the need to specify head end or cap end only.



Specifying the Bumper Seal piston feature on Econo-Ram II Series cylinders provides many benefits, such as:

Advantage	Benefit
Reduced noise upon piston impact	Quieter operating environment
Minimal loss of stroke (or added piston thickness)	Space-efficient design for applying cylinders in tight spaces
Smoother end-of-stroke deceleration when used in combination with cushions	Efficient cushioning increases cylinder and machine life
Rounded sealing lip is rated for non-lube service	Long seal life without the need for external lubrication

Summary of Accelerometer Test Results

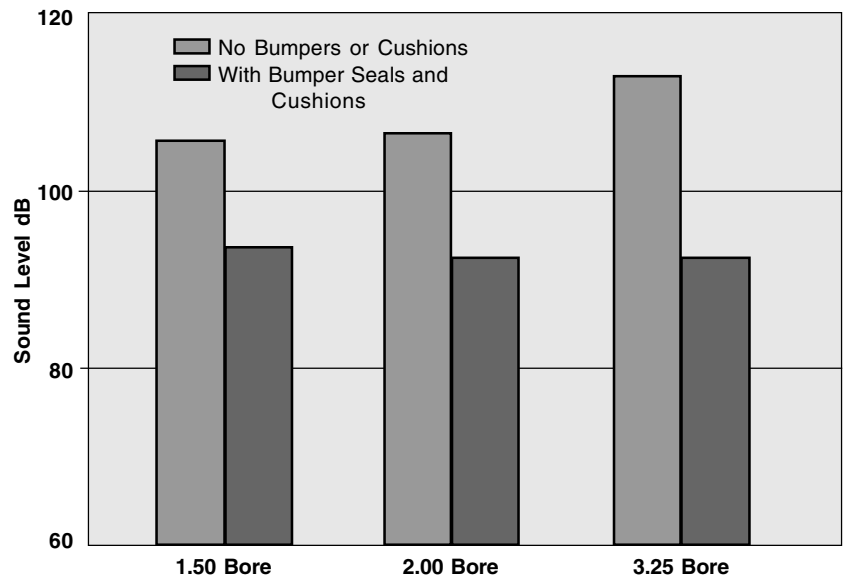
Bore Size	Piston Type	Cushioning Efficiency (Maximum G's of deceleration force created)	Cushioning Time (ms)
1.50"	Standard Piston	13.4	22
	Bumper Seal Piston	5.1	22
2.00"	Standard Piston	12.6	33
	Bumper Seal Piston	7.8	26
2.50"	Standard Piston	12.2	36
	Bumper Seal Piston	5.2	24

Bumper Seals Reduce Noise

The special profile of the Bumper Seal prevents the piston from banging into the end cap at the end of stroke. Independent testing shows that the Bumper Seal, when combined with cushions, will absorb the final piston inertia and reduce the stroke noise by as much as 20 dB. The Sound Level Comparison graph illustrates the noise-reducing effects of the Bumper Seal piston when combined with cushions.

Impact noise was recorded at a distance of 3 feet from the front of the cylinder, inside a semi-anechoic chamber. Cylinders were operating at 95 psi.

Sound Level Comparison



Bumper Seals have Minimum Effect on Stroke Length

The accompanying chart depicts typical amounts of overall stroke loss incurred at various system pressures. The amount of stroke loss may vary slightly due to design tolerances of: seal size, variance in seal durometer, and compression set associated with cylinder wear. To determine the stroke loss at either end of the cylinder, divide the values by two.

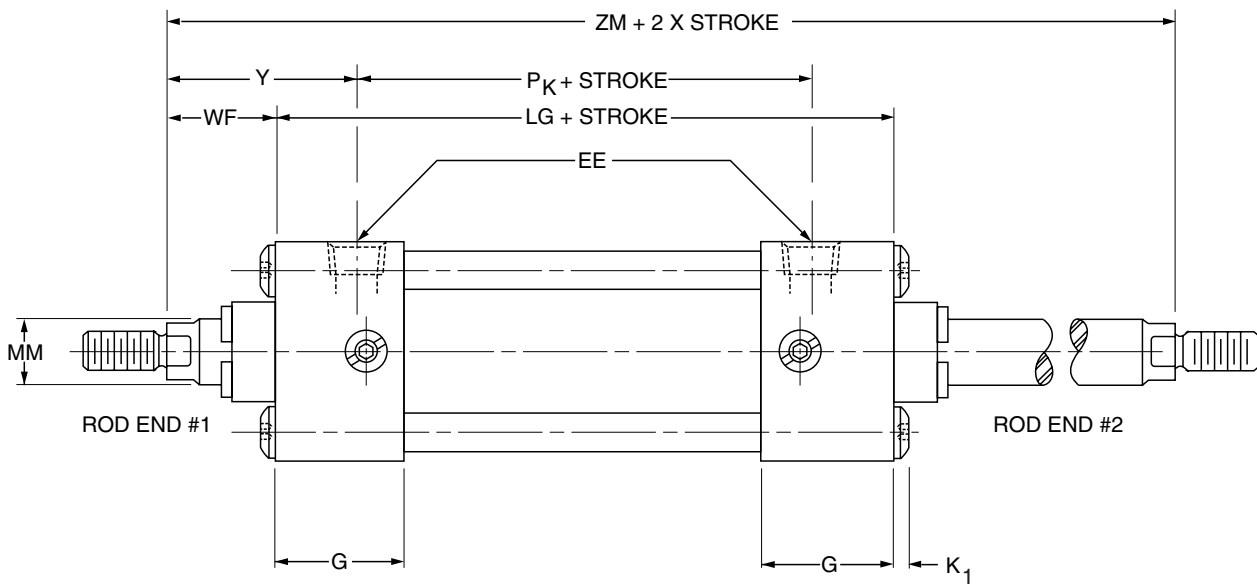
Pressure (PSI)	Typical Overall Loss by Bore Size (in.)				
	1.50"	2.00"	2.50"	3.25"	4.00"
0	.16"	.13"	.19"	.22"	.22"
20	.12"	.11"	.12"	.18"	.18"
40	.10"	.08"	.09"	.12"	.12"
60	.08"	.07"	.07"	.09"	.09"
80	.06"	.05"	.05"	.06"	.06"
100	.05"	.03"	.02"	.04"	.04"

How to Use Double Rod Cylinder Dimensioned Drawings

To determine dimensions for a double rod cylinder, first refer to the desired single rod mounting style cylinder shown on preceding pages of this catalog. After selecting necessary dimensions from that drawing, return to this page and supplement the single rod dimensions with those shown on the drawing and dimension table below. Note that double rod cylinders have a head (Dim. G) at both ends and that dimension LG replaces LF and P_K replaces P,

etc. The double rod dimensions differ from, or are in addition to those for single rod cylinders shown on preceding pages. Provide the necessary information to completely dimension a double rod cylinder.

On a double rod cylinder where the two rod ends are different, be sure to clearly state which rod end is to be assembled at which end.



All dimensions are in inches and apply to standard rod sizes only. For alternate rod sizes, determine all envelope dimensions (within LD dim.) as described above and then use appropriate rod end dimensions for proper rod size from single rod cylinder.

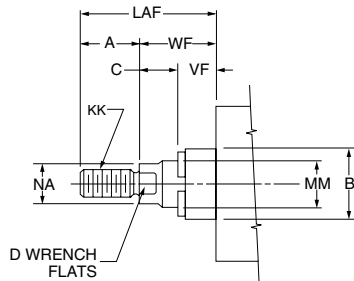
Mounting Styles for Single Rod Models	Mounting Styles for Corresponding Double Rod Models
MX3	MDX3
MF1	MDF1
MS2*	MDS2*
MT1*	MDT1*
MT4	MDT4
MS7	MDS7
MX0	MDX0
MX1	KDM1
MS4	KDMS4

Bore	Rod Dia.	Add Stroke								Add 2x Stroke
	MM	LG	P _K	SA _K	XA _K	SS _K	SN _K	SE _K	XE _K	ZM
1 1/4	1/2	3 ¹³ / ₁₆	2 ⁵ / ₁₆	5 ¹¹ / ₁₆	5 ³ / ₄	*	1 ¹⁵ / ₁₆	6 ¹ / ₁₆	5 ¹⁵ / ₁₆	5 ¹³ / ₁₆
1 1/2	5/8	4 ¹ / ₈	2 ³ / ₈	6 ¹ / ₈	6 ¹ / ₈	3 ³ / ₈	2 ¹ / ₄	6 ³ / ₈	6 ¹ / ₄	6 ¹ / ₈
2	5/8	4 ¹ / ₈	2 ³ / ₈	6 ¹ / ₈	6 ¹ / ₈	3 ³ / ₈	2 ¹ / ₄	6 ³ / ₄	6 ⁷ / ₁₆	6 ¹ / ₈
2 1/2	5/8	4 ¹ / ₄	2 ³ / ₈	6 ¹ / ₄	6 ¹ / ₄	3 ¹ / ₂	2 ³ / ₈	7 ¹ / ₈	6 ¹¹ / ₁₆	6 ¹ / ₄
3 1/4	1	4 ³ / ₄	2 ⁵ / ₈	7 ¹ / ₄	7 ³ / ₈	3 ³ / ₄	2 ⁵ / ₈	7 ³ / ₄	7 ⁵ / ₈	7 ¹ / ₂
4	1	4 ³ / ₄	2 ⁵ / ₈	7 ¹ / ₄	7 ³ / ₈	3 ³ / ₄	2 ⁵ / ₈	8	7 ³ / ₄	7 ¹ / ₂
Replaces Dimension		LF	P	SA	XA	SS	SN	SE	XE	—
On Single Rod Mounting Styles		All Mtg. Styles		MS1		MS2	MS4	MS7		All Mtg. Styles

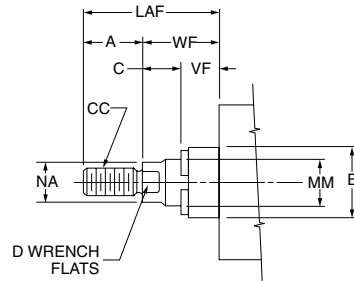
*Mounting styles MS2 and MT1 are not available in 1 1/4" bore.

Rod End Dimensions—Basic Cylinder, Hydraulic Option (Series 2ML)

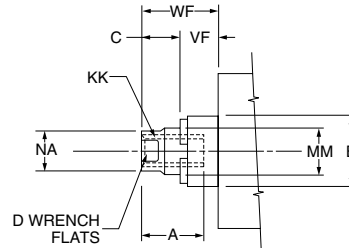
Thread Style 2
(NFPA Style SM)
Small Male



Thread Style 4
(NFPA Style IM)
Intermediate Male



Thread Style 3
(NFPA Style SF)
Short Female



**“Special Thread”
Style 0**

Special thread, extension, rod eye, blank, etc., are also available.

To order, specify “Style 0” and give desired dimensions for CC or KK, A and W or WF.

If otherwise special, furnish dimensioned sketch.

Gland Dimensions – Series FW4 Hydraulic Cylinders*

Bore Size	Rod Dia. MM	A	+0.000 -0.002 B	C	LAF	NA	VF	WF
1 1/2	5/8	3/4	1.124	5/16	1 3/4	9/16	11/16	1
	1	1 1/8	1.499	9/16	2 1/2	15/16	13/16	1 3/8
2	5/8	3/4	1.124	5/16	1 3/4	9/16	11/16	1
	1	1 1/8	1.499	9/16	2 1/2	15/16	13/16	1 3/8
2 1/2	5/8	3/4	1.124	5/16	1 3/4	9/16	11/16	1
	1	1 1/8	1.449	9/16	2 1/2	15/16	13/16	1 3/8
3 1/4	1	1 1/8	1.449	9/16	2 1/2	15/16	13/16	1 3/8
	1 3/8	1 5/8	1.999	11/16	3 1/4	15/16	15/16	1 5/8
4	1	1 1/8	1.449	9/16	2 1/2	15/16	13/16	1 3/8
	1 3/8	1 5/8	1.999	11/16	3 1/4	15/16	15/16	1 5/8
5	1	1 1/8	1.449	9/16	2 1/2	15/16	13/16	1 3/8
	1 3/8	1 5/8	1.999	11/16	3 1/4	15/16	15/16	1 5/8
6	1 3/8	1 5/8	1.999	11/16	3 1/4	15/16	15/16	1 5/8
	1 3/4	2	2.374	CONSULT FACTORY	3 7/8	1 11/16		1 7/8
8	1 3/8	1 5/8	1.999	11/16	3 1/4	15/16	15/16	1 5/8
	1 3/4	2	2.374	CONSULT FACTORY	3 7/8	1 11/16		1 7/8

*Not available in 1 1/4" bore.

Cylinder Weights – FW2, FW4 Cylinders

No Mount Single Rod FW2, FW4				No Mount Double Rod	
Bore In.	Rod In.	Base Lbs.	Per Inch Lbs.	Base Lbs.	Per Inch Lbs.
1.25	.500	1.32	.14	1.63	.19
1.50	.625	1.73	.20	2.16	.28
2.00	.625	2.40	.21	3.05	.30
2.00	1.00	2.99	.35	4.34	.58
2.50	.625	3.25	.23	3.96	.31
2.50	1.00	4.06	.37	5.74	.60
3.25	1.00	6.45	.42	7.65	.64
3.25	1.375	7.93	.62	11.46	1.05
4.00	1.00	8.80	.49	10.32	.71
4.00	1.375	10.29	.69	14.37	1.12
5.00	1.00	13.20	.61	15.84	.84
5.00	1.375	14.72	.81	18.89	1.24
6.00	1.375	20.50	.87	25.65	1.30
6.00	1.75	22.61	1.13	30.41	1.82
8.00	1.375	35.50	1.25	41.15	1.68
8.00	1.75	37.63	1.51	45.90	2.20

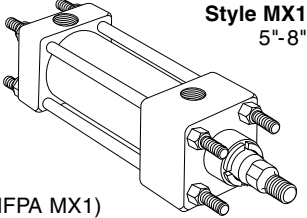
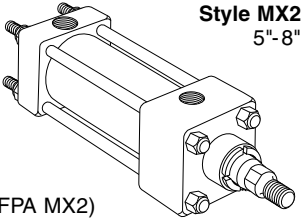
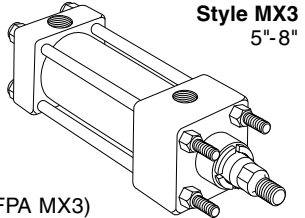
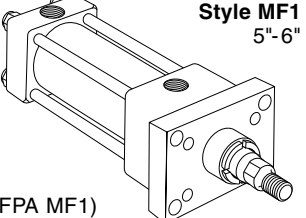
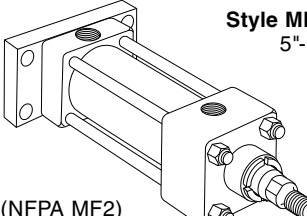
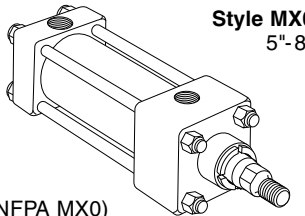
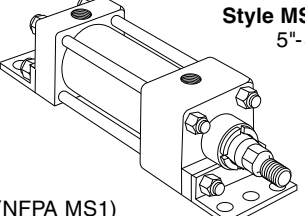
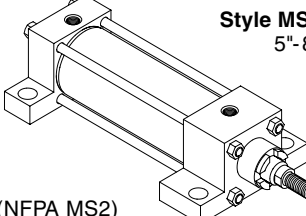
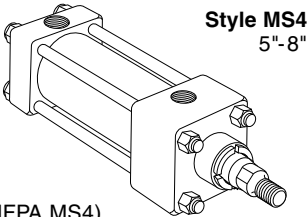
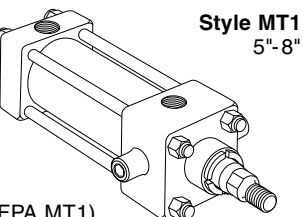
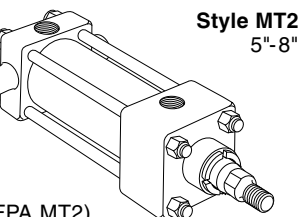
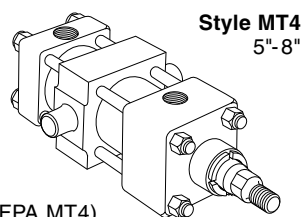
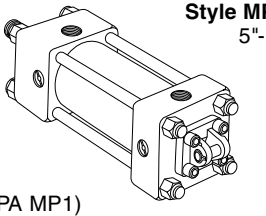
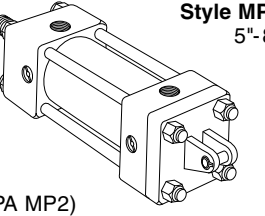
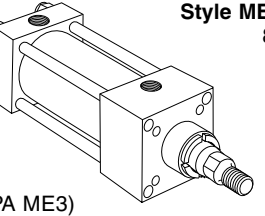
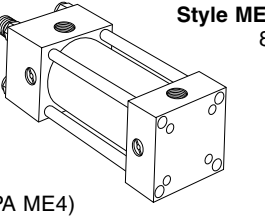
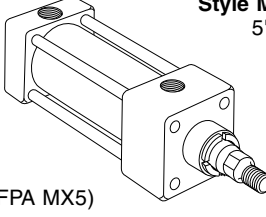
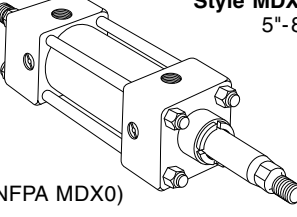
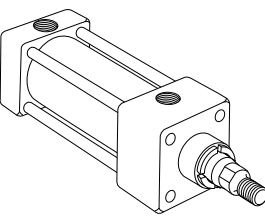
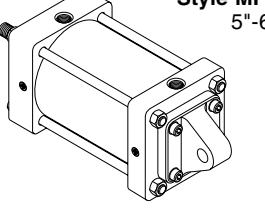
Mounting Weight Adders

Bore In.	MF1, MF2 Lbs.	MT1, MT2 Lbs.	MP1 Lbs.	MS1, MS7 Lbs.	MT4 Lbs.	MP4 Lbs.	MS2 Lbs.	MP2 Lbs.
1.25	.51	N/A	N/A	.26	.44	.42	N/A	.33
1.50	.51	.50	.15	.36	1.70	.23	.15	.20
2.00	.76	.50	.26	.65	2.38	.32	.15	.29
2.50	1.13	.50	.38	1.05	3.00	.42	.15	.41
3.25	2.76	.50	.98	1.38	5.35	1.26	.35	1.06
4.00	4.05	.50	1.35	2.20	6.75	1.62	.35	1.49
5.00	6.46	.50	1.20	4.29	8.77	N/A	.57	2.41
6.00	10.74	1.22	2.91	5.88	15.52	N/A	.69	11.38
8.00	N/A	1.22	2.91	7.84	25.01	N/A	.67	17.31

Standard Specifications — 5" to 8" Bores

- N.F.P.A. Interchangeable
- Bore sizes – 5", 6" and 8"
- Rod Diameters – 1", 1-3/8", and 1-3/4"
- Rod Ends – three standard, specials to order
- Cushions – optional at either end or both ends of stroke
- Strokes – available in any practical stroke length
- 250 psi Air Service
- 250 psi Hydraulic Service (non-cushioned only)
- Standard Fluid – Filtered Air
- Standard Temperature – -10°F to +165°F
- Fluorocarbon Seals for high temperature service – -10°F to +250°F (optional)
- Single rod end or double rod end
- Mounting styles – 19 standard

Available Mounting Styles — 5" to 8" Bores

<p>Tie Rods Extended Both Ends</p>  <p>Style MX1 5"-8"</p> <p>(NFA MX1)</p>	<p>Tie Rods Extended Cap End</p>  <p>Style MX2 5"-8"</p> <p>(NFA MX2)</p>	<p>Tie Rods Extended Head End</p>  <p>Style MX3 5"-8"</p> <p>(NFA MX3)</p>	<p>Head Rectangular Flange</p>  <p>Style MF1 5"-6"</p> <p>(NFA MF1)</p>
<p>Cap Rectangular Flange</p>  <p>Style MF2 5"-6"</p> <p>(NFA MF2)</p>	<p>No Mount</p>  <p>Style MX0 5"-8"</p> <p>(NFA MX0)</p>	<p>Side End Angle</p>  <p>Style MS1 5"-8"</p> <p>(NFA MS1)</p>	<p>Side Lug</p>  <p>Style MS2 5"-8"</p> <p>(NFA MS2)</p>
<p>Side Tap</p>  <p>Style MS4 5"-8"</p> <p>(NFA MS4)</p>	<p>Head Trunnion</p>  <p>Style MT1 5"-8"</p> <p>(NFA MT1)</p>	<p>Cap Trunnion</p>  <p>Style MT2 5"-8"</p> <p>(NFA MT2)</p>	<p>Intermediate Trunnion</p>  <p>Style MT4 5"-8"</p> <p>(NFA MT4)</p>
<p>Cap Fixed Clevis</p>  <p>Style MP1 5"-8"</p> <p>(NFA MP1)</p>	<p>Cap Detachable Clevis</p>  <p>Style MP2 5"-8"</p> <p>(NFA MP2)</p>	<p>Head Square</p>  <p>Style ME3 8"</p> <p>(NFA ME3)</p>	<p>Cap Square</p>  <p>Style ME4 8"</p> <p>(NFA ME4)</p>
<p>Sleeve Nut</p>  <p>Style MX5 5"-8"</p> <p>(NFA MX5)</p>	<p>Double Rod End</p>  <p>Style MDX0 5"-8"</p> <p>(NFA MDX0)</p>	<p>Combination Side Tap with Sleeve Nut</p>  <p>(NFA MX5)</p>	<p>Cap Detachable Eye</p>  <p>Style MP4 5"-6"</p> <p>(NFA MP4)</p>

Econo-Ram II™ - 5" through 8" Bore, Lightweight, Non-Lube Pneumatic Cylinder

Premium Quality and Economy in one

Lightweight construction, solid Non-Lube design, and proven reliability make the Econo-Ram II Cylinder the high-performance, long-lasting, economical choice for your air cylinder applications.

Piston

Aluminum Piston with nylon wear band increases cylinder life, eliminates metal-to-metal contact. Optional magnet piston for use with reed or solid state sensors. Anaerobic adhesive is used to permanently lock and seal the piston to the rod.

Hard Anodized Aluminum

Lightweight cylinder body: aluminum tube with steel tie rods.

Ports

N.P.T.F. ports are standard.

Heads and Caps are precision, light-weight aluminum blocks that are anodized for maximum corrosion resistance.

Piston Rod Lipseal/Wiper combination is completely self-compensating for zero leakage at all pressures. Keeps pressure in, contamination out. Pneumatic service.

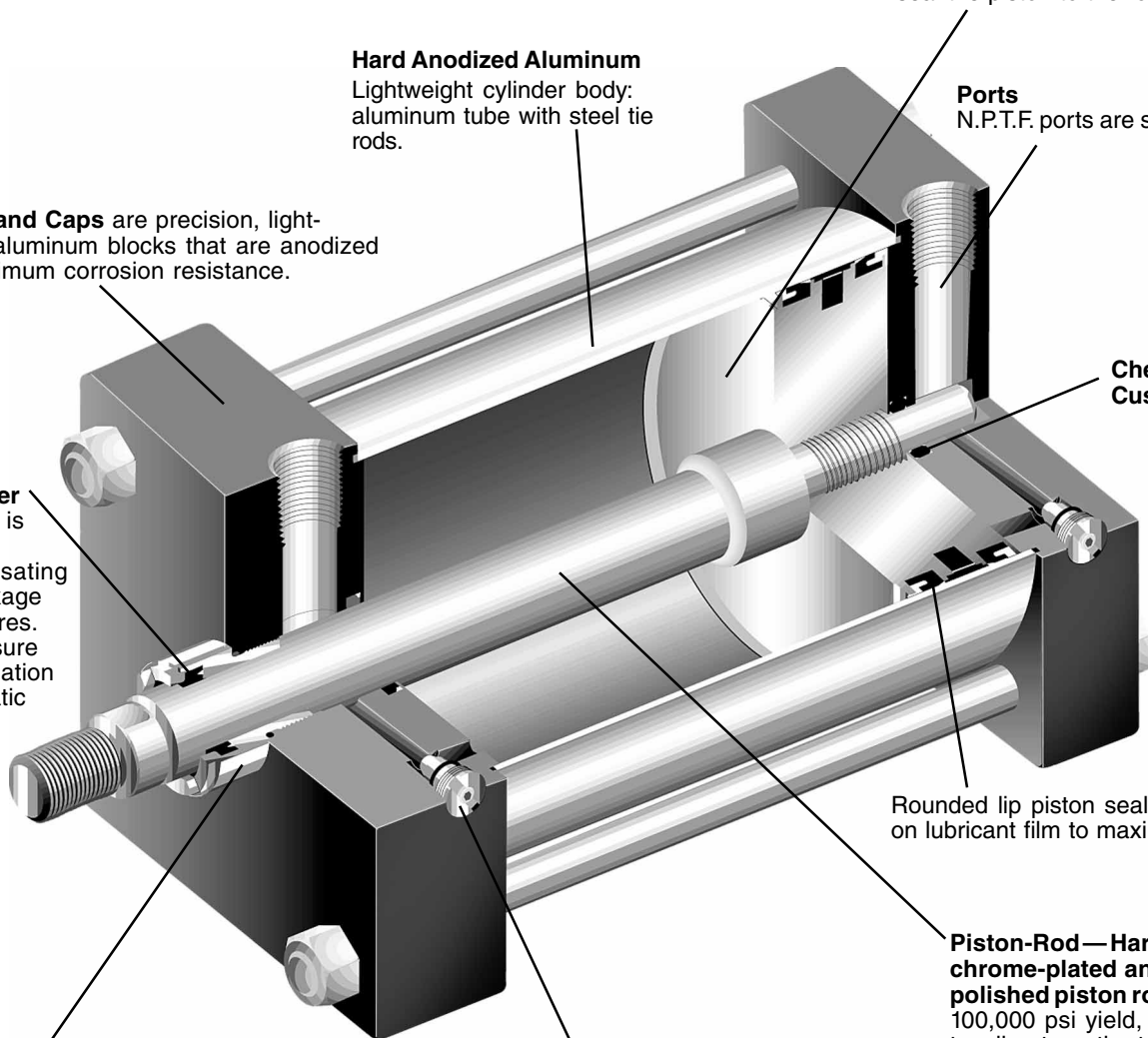
Check Seal Cushion

Rounded lip piston seals glide on lubricant film to maximize life.

Rod Gland
Threaded bronze gland is externally removable (without cylinder disassembly) for easy maintenance.

Cushion Needle Valves make precise adjustment quick and easy. Captive cushion design allows for safe cushion adjusting while cylinder is under pressure. Brass material to resist corrosion.

Piston-Rod — Hard chrome-plated and polished piston rod of 100,000 psi yield, high tensile strength steel case hardened to 50-54 Rc. for reliable performance, long rod seal life and less friction.



Econo-Ram II

2MNR

PA-2

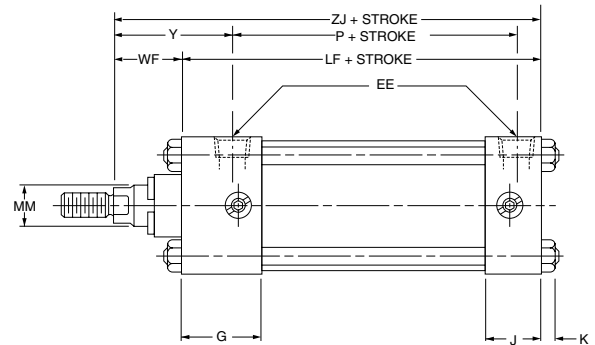
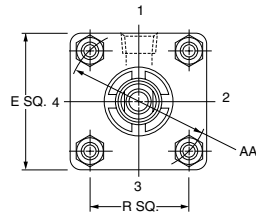
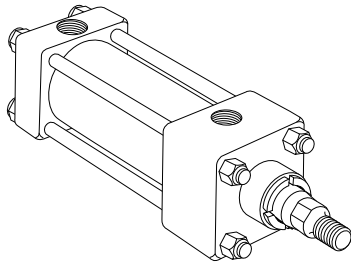
NC9

ACVB

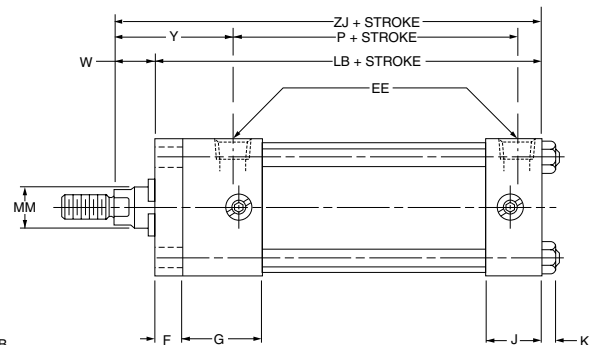
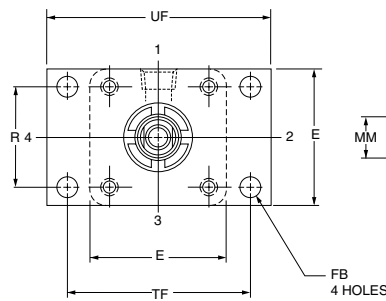
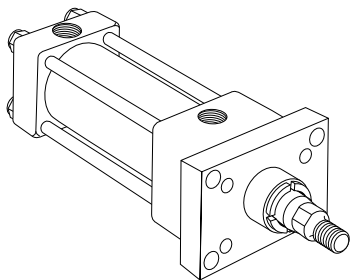
PTD

ME/MER(L/M)

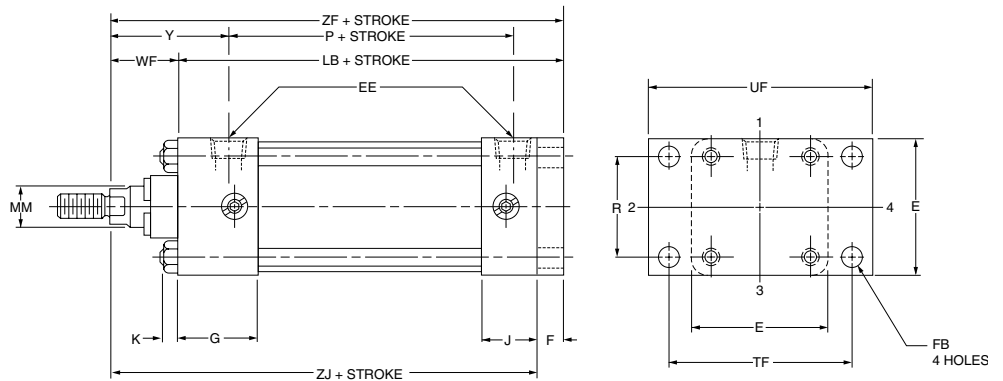
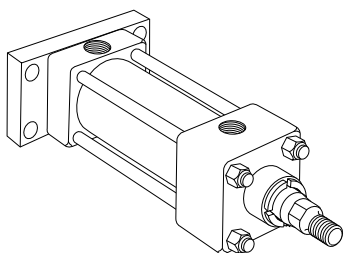
No Mount (5" and 8" Bore Sizes)
Style MX0
(NFFPA MX0)



Head Rectangular Flange Mount (5" and 6" Bore Sizes)
Style MF1
(NFFPA MF1)

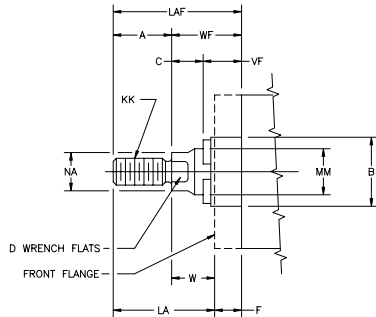


Cap Rectangular Flange Mount (5" and 6" Bore Sizes)
Style MF2
(NFFPA MF2)

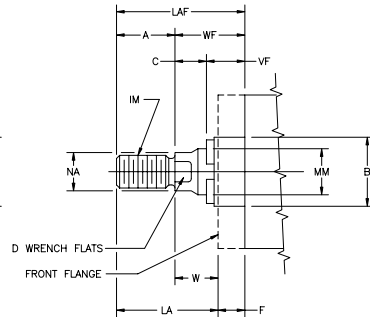


Rod End Dimensions—Basic Cylinder

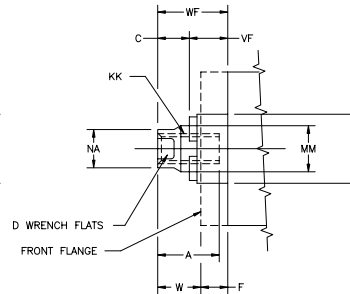
Thread Style 2
(NFFA Style SM)
Small Male



Thread Style 4
(NFFA Style IM)
Intermediate Male



Thread Style 3
(NFFA Style SF)
Short Female



**“Special Thread”
Style 0**

Special thread, extension, rod eye, blank, etc., are also available.

To order, specify “Style 0” and give desired dimensions for CC or KK, A and W or WF.

If otherwise special, furnish dimensioned sketch.

Table 1—Envelope and Mounting Dimensions

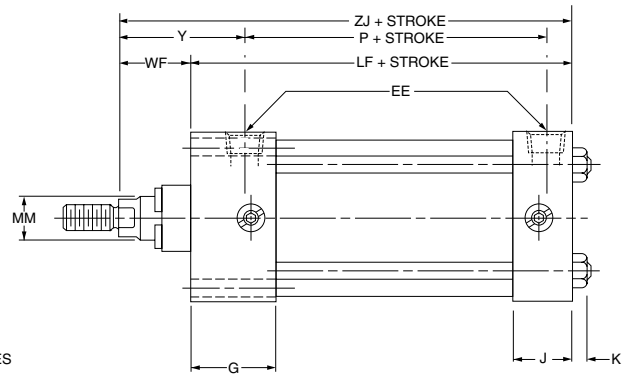
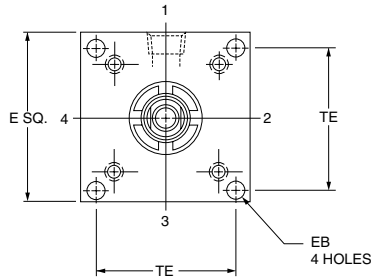
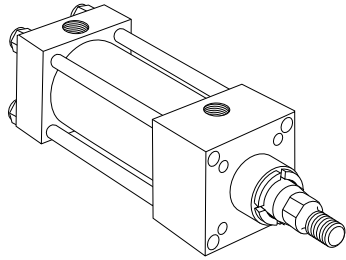
Bore	AA	E	EE (NPTF)	F	FB	G	J	K	R	TF	UF	Add Stroke		
												LB	LF	P
5	5.8	5 1/2	1/2	5/8	9/16	1.66	1.22	7/16	4.10	6 5/8	7 5/8	5 1/8	4 1/2	2 7/8
6	6.9	6 1/2	3/4	3/4	9/16	1.91	1.41	7/16	4.88	7 5/8	8 5/8	5 3/4	5	3 1/8
8	9.1	8 1/2	3/4	3/4	—	1.81	1.44	9/16	—	—	—	5 7/8	5 1/8	3 1/4

Table 2—Rod Dimensions

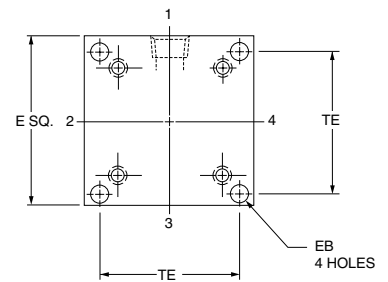
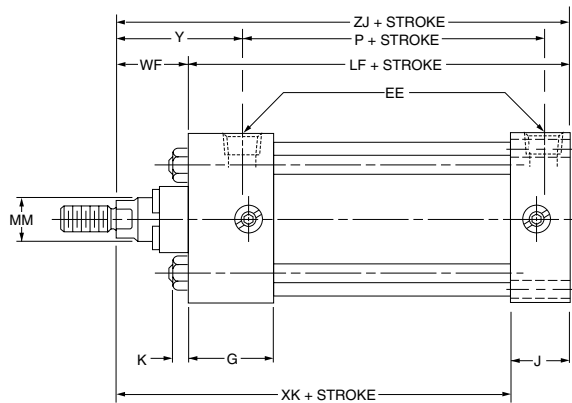
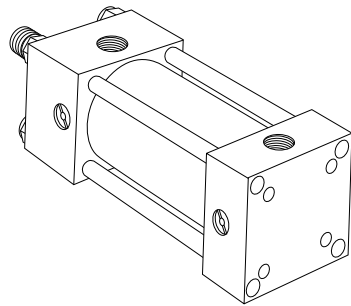
Bore Size	Rod Dia. MM	Thread		A	+.000 -.002 B	C	D	LA	NA	VF	W	WF	Y	Add Stroke	
		Style 4 CC	Style 2 & 3 KK											ZF	ZJ
5	1	7/8-14	3/4-16	1 1/8	1.499	5/8	7/8	1 7/8	15/16	3/4	3/4	1 3/8	2 7/16	6 1/2	5 7/8
	1 3/8	1 1/4-12	1-14	1 5/8	1.999	7/8	1 1/8	2 5/8	1 5/16	3/4	1	1 5/8	2 11/16	6 3/4	6 1/8
6	1 3/8	1 1/4-12	1-14	1 5/8	1.999	7/8	1 1/8	2 1/2	1 5/16	3/4	7/8	1 5/8	2 13/16	7 3/8	6 5/8
	1 3/4	1 1/2-12	1 1/4-12	2	2.374	13/16	1 1/2	3 1/8	1 11/16	1 1/16	1 1/8	1 7/8	3 1/16	7 5/8	6 7/8
8	1 3/8	1 1/4-12	1-14	1 5/8	1.999	7/8	1 1/8	2 1/2	1 5/16	3/4	7/8	1 5/8	2 3/4	—	6 3/4
	1 3/4	1 1/2-12	1 1/4-12	2	2.374	13/16	1 1/2	3 1/8	1 11/16	1 1/16	1 1/8	1 7/8	3	—	7

**Table 3—
Envelope and
Mounting
Dimensions**

Head Square Mount
Style ME3
(NFPA ME3)

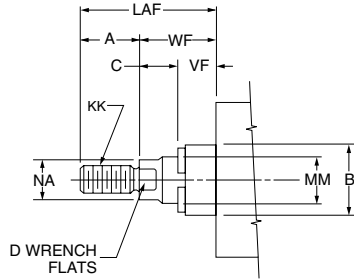


Cap Square Mount
Style ME4
(NFPA ME4)

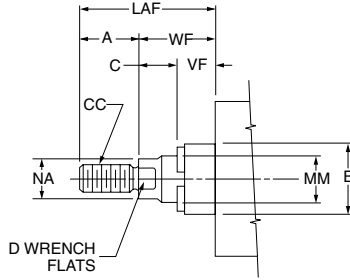


Rod End Dimensions—Basic Cylinder

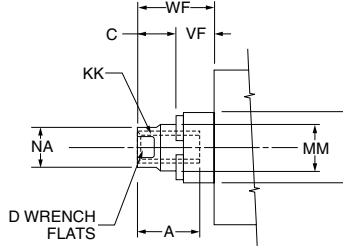
Thread Style 2
 (NFPA Style SM)
 Small Male



Thread Style 4
 (NFPA Style IM)
 Intermediate Male



Thread Style 3
 (NFPA Style SF)
 Short Female



**“Special Thread”
 Style 0**

Special thread, extension, rod eye, blank, etc., are also available.

To order, specify “Style 0” and give desired dimensions for CC or KK, A and W or WF.

If otherwise special, furnish dimensioned sketch.

Table 1—Envelope and Mounting Dimensions

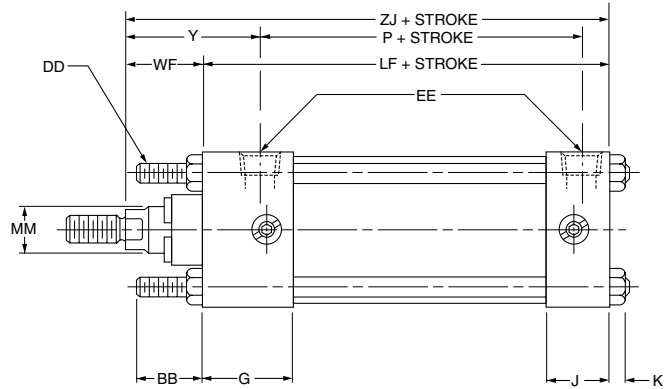
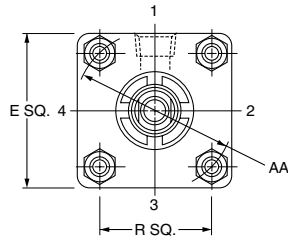
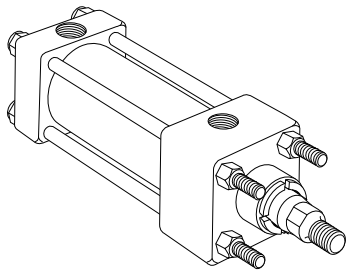
Bore	E	EB	EE (NPTF)	G	J	K	TE	Add Stroke	
								LF	P
8	8 ¹ / ₂	1 ¹ / ₁₆	³ / ₄	1.81	1.44	⁹ / ₁₆	7.57	5 ¹ / ₈	3 ¹ / ₄

Table 2—Rod Dimensions

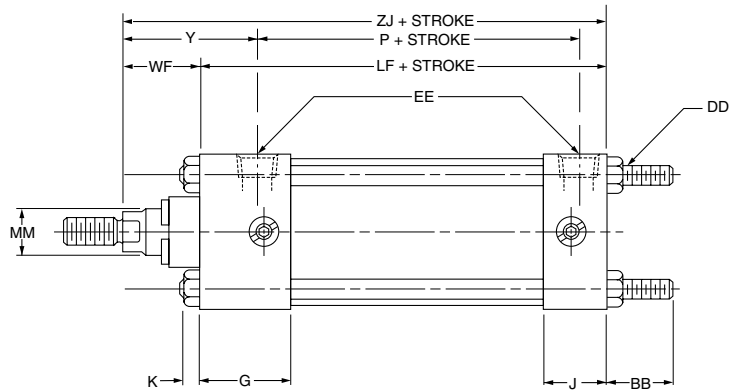
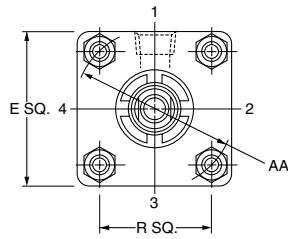
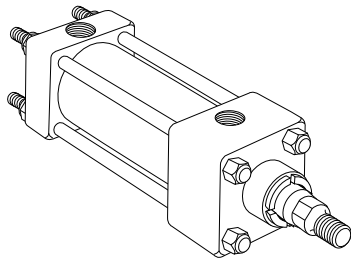
Bore Size	Rod Dia. MM	Thread		A	+.000 -.002 B	C	D	LAF	NA	VF	W	WF	Y	Add Stroke	
		Style 4 CC	Style 2 & 3 KK											XK	ZJ
8	1 ³ / ₈	1 ¹ / ₄ -12	1-14	1 ⁵ / ₈	1.999	⁷ / ₈	1 ¹ / ₈	3 ¹ / ₄	1 ⁵ / ₁₆	³ / ₄	⁷ / ₈	1 ⁵ / ₈	2 ³ / ₄	5 ⁵ / ₁₆	6 ³ / ₄
	1 ³ / ₄	1 ¹ / ₂ -12	1 ¹ / ₄ -12	2	2.374	¹³ / ₁₆	1 ¹ / ₂	3 ⁷ / ₈	1 ¹¹ / ₁₆	1 ¹ / ₁₆	1 ¹ / ₈	1 ⁷ / ₈	3	5 ⁹ / ₁₆	7

**Table 3—
 Envelope
 and Mounting
 Dimensions**

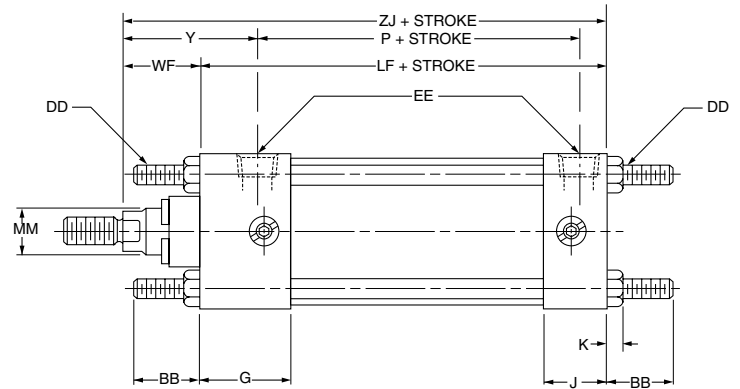
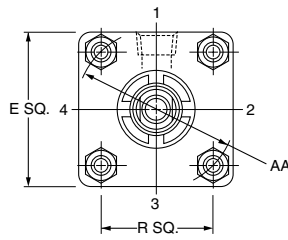
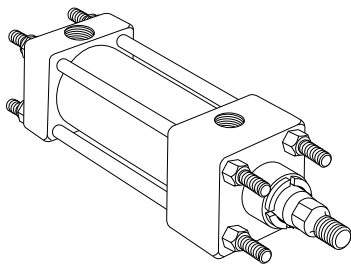
Tie Rods Extended Head End Mount
Style MX3
(NFPA MX3)



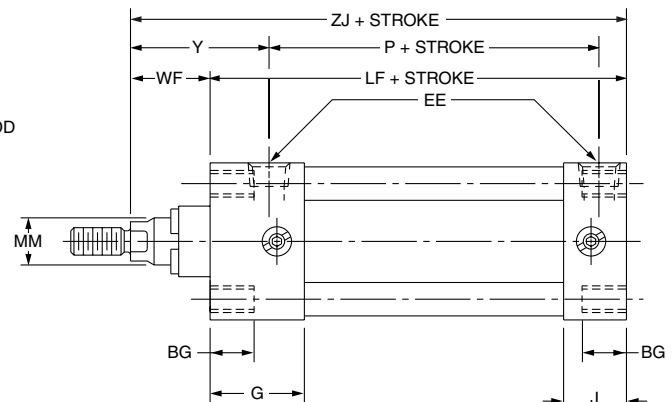
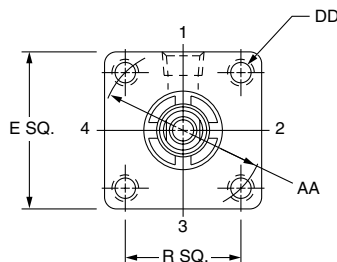
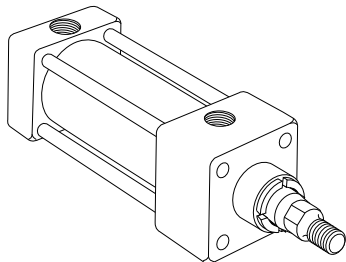
Tie Rods Extended Cap End Mount
Style MX2
(NFPA MX2)



Tie Rods Extended Both Ends Mount
Style MX1
(NFPA MX1)

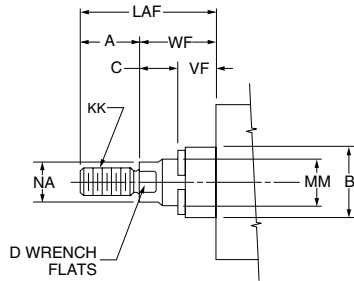


Sleeve Nut Mount
Style MX5
(NFPA MX5)

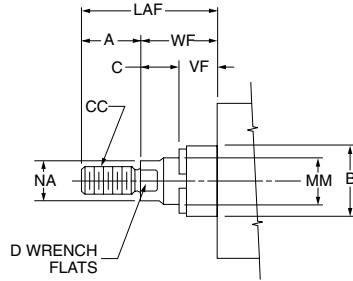


Rod End Dimensions—Basic Cylinder

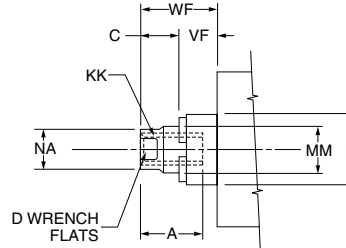
Thread Style 2
(NFPA Style SM)
Small Male



Thread Style 4
(NFPA Style IM)
Intermediate Male



Thread Style 3
(NFPA Style SF)
Short Female



**“Special Thread”
Style 0**

Special thread, extension, rod eye, blank, etc., are also available.

To order, specify “Style 0” and give desired dimensions for CC or KK, A and W or WF.

If otherwise special, furnish dimensioned sketch.

Table 1—Envelope and Mounting Dimensions

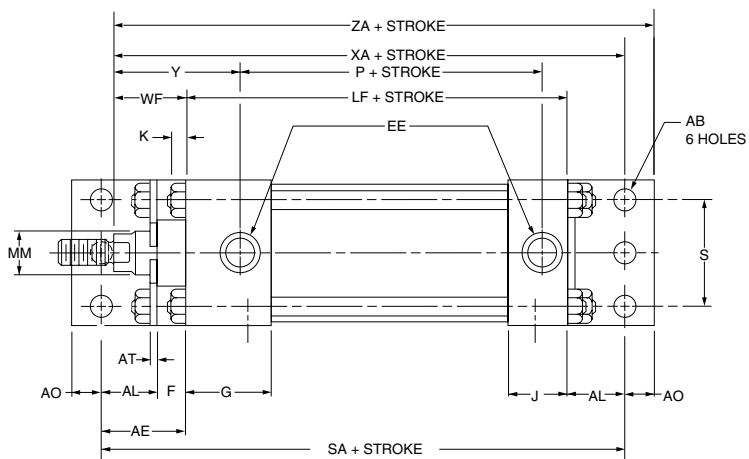
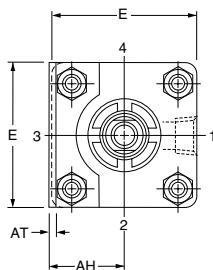
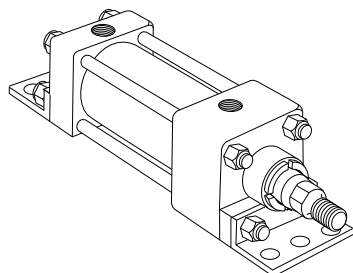
Bore	AA	BB	BG	DD	E	EE (NPTF)	G	J	K	R	Add Stroke	
											LF	P
5	5.8	1 ¹³ / ₁₆	.50	1 ¹ / ₂ – 20	5 ¹ / ₂	1 ¹ / ₂	1.66	1.22	7 ⁷ / ₁₆	4.10	4 ¹ / ₂	2 ⁷ / ₈
6	6.9	1 ¹³ / ₁₆	.50	1 ¹ / ₂ – 20	6 ¹ / ₂	3 ³ / ₄	1.91	1.41	7 ⁷ / ₁₆	4.88	5	3 ¹ / ₈
8	9.1	2 ⁵ / ₁₆	.62	5 ⁵ / ₈ – 18	8 ¹ / ₂	3 ³ / ₄	1.81	1.44	9 ⁹ / ₁₆	6.44	5 ¹ / ₈	3 ¹ / ₄

Table 2—Rod Dimensions

Bore Size	Rod Dia. MM	Thread		A	+.000 -.002 B	C	D	LAF	NA	VF	W	WF	Y	Add Stroke ZJ
		Style 4 CC	Style 2 & 3 KK											
5	1	7 ⁷ / ₈ -14	3 ³ / ₄ -16	1 ¹ / ₈	1.499	5 ⁵ / ₈	7 ⁷ / ₈	2 ¹ / ₂	15 ¹⁵ / ₁₆	3 ³ / ₄	3 ³ / ₄	13 ¹³ / ₈	2 ⁷ / ₁₆	5 ⁷ / ₈
	13 ¹³ / ₈	1 ¹ / ₄ -12	1-14	1 ⁵ / ₈	1.999	7 ⁷ / ₈	1 ¹ / ₈	3 ³ / ₄	15 ¹⁵ / ₁₆	3 ³ / ₄	1	15 ¹⁵ / ₈	2 ¹¹ / ₁₆	6 ¹ / ₈
6	13 ¹³ / ₈	1 ¹ / ₄ -12	1-14	1 ⁵ / ₈	1.999	7 ⁷ / ₈	1 ¹ / ₈	3 ³ / ₄	15 ¹⁵ / ₁₆	3 ³ / ₄	7 ⁷ / ₈	15 ¹⁵ / ₈	2 ¹³ / ₁₆	6 ⁵ / ₈
	13 ¹³ / ₄	1 ¹ / ₂ -12	1 ¹ / ₄ -12	2	2.374	13 ¹³ / ₁₆	1 ¹ / ₂	3 ⁷ / ₈	11 ¹¹ / ₁₆	1 ¹ / ₁₆	1 ¹ / ₈	17 ¹⁷ / ₈	3 ¹ / ₁₆	6 ⁷ / ₈
8	13 ¹³ / ₈	1 ¹ / ₄ -12	1-14	1 ⁵ / ₈	1.999	7 ⁷ / ₈	1 ¹ / ₈	3 ³ / ₄	15 ¹⁵ / ₁₆	3 ³ / ₄	7 ⁷ / ₈	15 ¹⁵ / ₈	2 ³ / ₄	6 ³ / ₄
	13 ¹³ / ₄	1 ¹ / ₂ -12	1 ¹ / ₄ -12	2	2.374	13 ¹³ / ₁₆	1 ¹ / ₂	3 ⁷ / ₈	11 ¹¹ / ₁₆	1 ¹ / ₁₆	1 ¹ / ₈	17 ¹⁷ / ₈	3	7

Table 3—Envelope and Mounting Dimensions

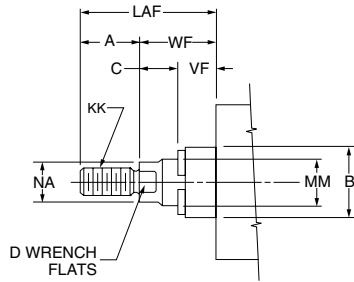
Side End Angle Mount
Style MS1*
(NFPA MS1)



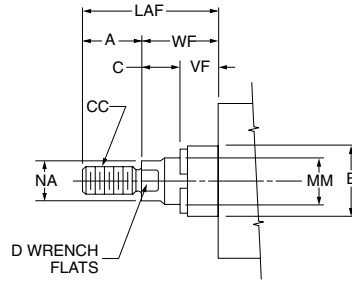
*Maximum recommended pressure of 150 PSI.

Rod End Dimensions—Basic Cylinder

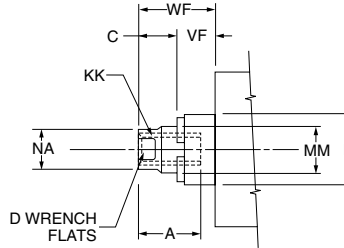
Thread Style 2
 (NFPA Style SM)
 Small Male



Thread Style 4
 (NFPA Style IM)
 Intermediate Male



Thread Style 3
 (NFPA Style SF)
 Short Female



**“Special Thread”
 Style 0**

Special thread, extension, rod eye, blank, etc., are also available.

To order, specify “Style 0” and give desired dimensions for CC or KK, A and W or WF.

If otherwise special, furnish dimensioned sketch.

Table 1—Envelope and Mounting Dimensions

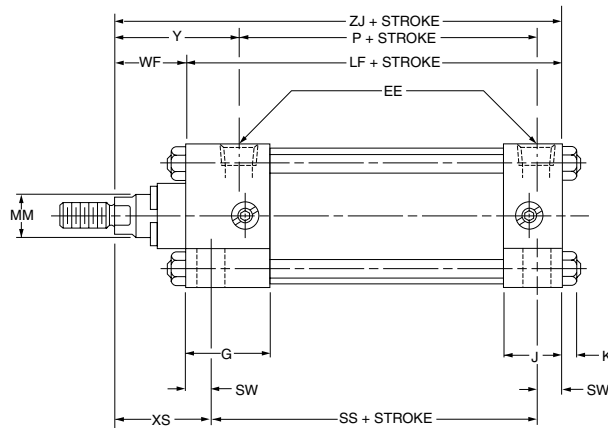
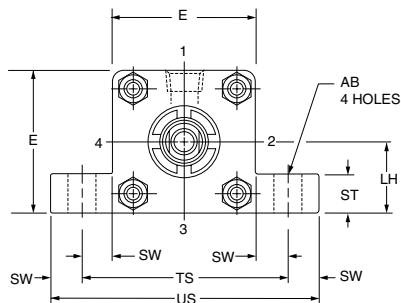
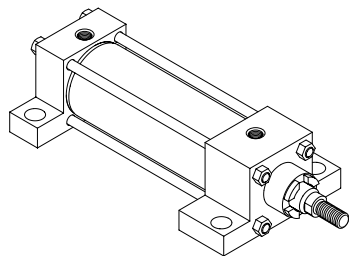
Bore	AB	AE	AH	AL	AO	AT	E	EE (NPTF)	F	G	J	K	R	S	Add Stroke		
															LF	P	SA
5	11/16	2	2 3/4	1 3/8	5/8	3/16	5 1/2	1/2	5/8	1.66	1.22	7/16	4.10	4 1/4	4 1/2	2 7/8	7 7/8
6	13/16	2 1/8	3 1/4	1 3/8	5/8	3/16	6 1/2	3/4	3/4	1.91	1.41	7/16	4.88	5 1/4	5	3 1/8	8 1/2
8	13/16	1 13/16	4 1/4	1 13/16	1 1/16	1/4	8 1/2	3/4	—	1.81	1.44	9/16	6.44	7 1/8	5 1/8	3 1/4	8 3/4

Table 2—Rod Dimensions

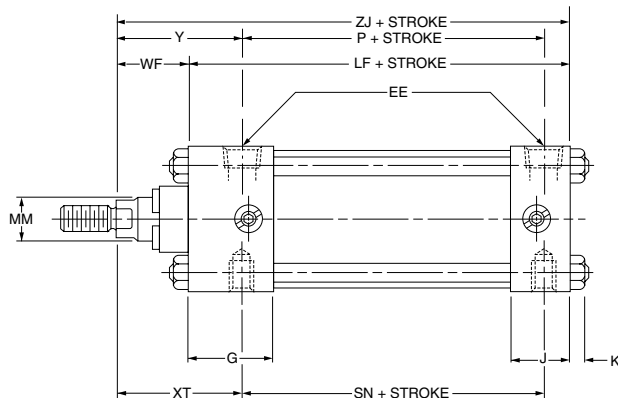
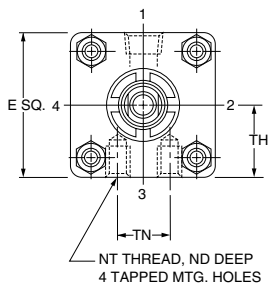
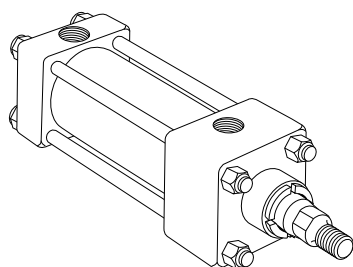
Bore Size	Rod Dia MM	Thread		A	+.000 -.002 B	C	D	LAF	NA	VF	W	WF	Y	Add Stroke	
		Style 4 CC	Style 2 & 3 KK											XA	ZA
5	1	7/8-14	3/4-16	1 1/8	1.499	5/8	7/8	2 1/2	15/16	3/4	3/4	1 3/8	2 7/16	7 1/4	7 7/8
	1 3/8	1 1/4-12	1-14	1 5/8	1.999	7/8	1 1/8	3 1/4	1 5/16	3/4	1	1 5/8	2 11/16	7 1/2	8 1/8
6	1 3/8	1 1/4-12	1-14	1 5/8	1.999	7/8	1 1/8	3 1/4	1 5/16	3/4	7/8	5/8	2 13/16	8	8 5/8
	1 3/4	1 1/2-12	1 1/4-12	2	2.374	13/16	1 1/2	3 7/8	1 11/16	1 1/16	1 1/8	1 7/8	3 1/16	8 1/4	8 7/8
8	1 3/8	1 1/4-12	1-14	1 5/8	1.999	7/8	1 1/8	3 1/4	1 5/16	3/4	7/8	1 5/8	2 3/4	8 9/16	9 1/4
	1 3/4	1 1/2-12	1 1/4-12	2	2.374	13/16	1 1/2	3 7/8	1 11/16	1 1/16	1 1/8	1 7/8	3	8 13/16	9 1/2

**Table 3—
 Envelope and
 Mounting Dimensions**

Side Lug Mount
Style MS2
(NFFPA MS2)

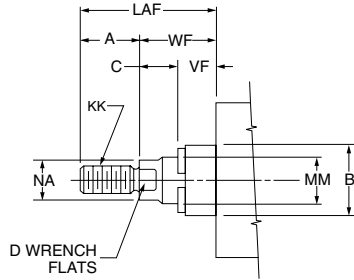


Side Tap Mount
Style MS4
(NFFPA MS4)

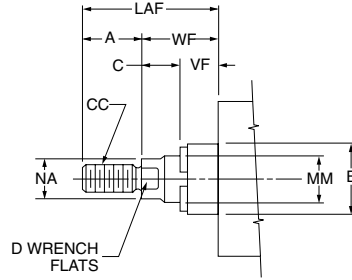


Rod End Dimensions—Basic Cylinder

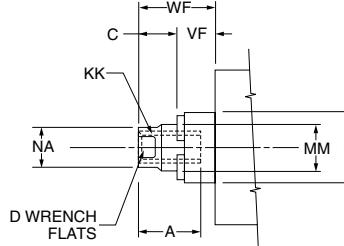
Thread Style 2
 (NFPA Style SM)
 Small Male



Thread Style 4
 (NFPA Style IM)
 Intermediate Male



Thread Style 3
 (NFPA Style SF)
 Short Female



**“Special Thread”
 Style 0**

Special thread, extension, rod eye, blank, etc., are also available.

To order, specify “Style 0” and give desired dimensions for CC or KK, A and W or WF.

If otherwise special, furnish dimensioned sketch.

Table 1—Envelope and Mounting Dimensions

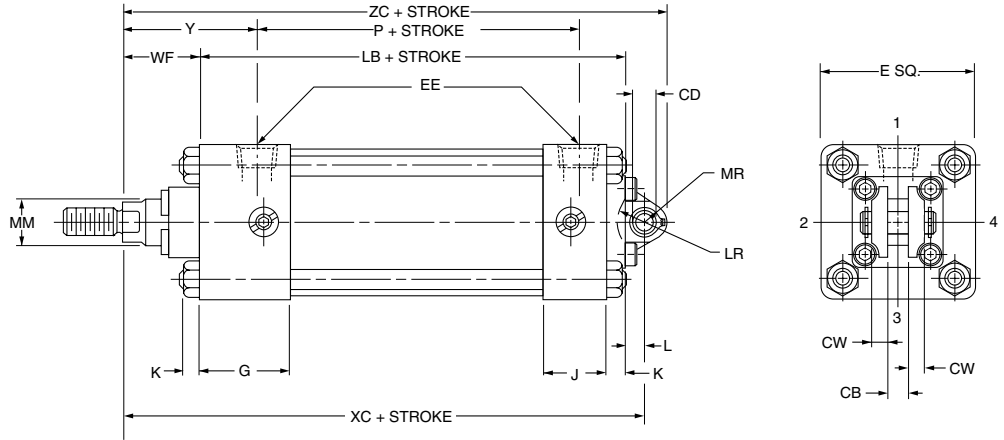
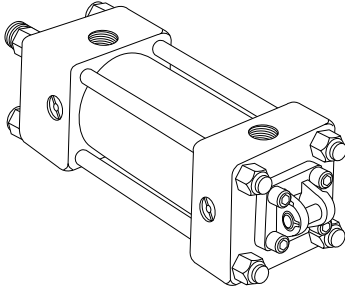
Bore	AB	E	EE (NPTF)	G	J	K	LH ±.003	NT	ST	SW	TH ±.003	TN	TS	US	Add Stroke			
															LF	P	SN	SS
5	13/16	5 1/2	1/2	1.66	1.22	7/16	2.743	5/8-11	1	11/16	2.743	2 11/16	6 7/8	8 1/4	4 1/2	2 7/8	2 7/8	3 1/8
6	13/16	6 1/2	3/4	1.91	1.41	7/16	3.243	3/4-10	1	11/16	3.243	3 1/4	7 7/8	9 1/4	5	3 1/8	3 1/8	3 5/8
8	13/16	8 1/2	3/4	1.81	1.44	9/16	4.243	3/4-10	1	11/16	4.243	4 1/2	9 7/8	11 1/4	5 1/8	3 1/4	3 1/4	3 3/4

Table 2—Rod Dimensions

Bore Size	Rod Dia. MM	Thread		A	+.000 -.002 B	C	D	LAF	NA	VF	W	WF	Y	ND	XS	XT	Add Stroke ZJ
		Style 4 CC	Style 2 & 3 KK														
5	1	7/8-14	3/4-16	1 1/8	1.499	5/8	7/8	2 1/2	1 5/16	3/4	3/4	1 3/8	2 7/16	1 5/16	2 1/16	2 7/16	5 7/8
	1 3/8	1 1/4-12	1-14	1 5/8	1.999	7/8	1 1/8	3 1/4	1 5/16	3/4	1	1 5/8	2 11/16	1 5/16	2 5/16	2 11/16	6 1/8
6	1 3/8	1 1/4-12	1-14	1 5/8	1.999	7/8	1 1/8	3 1/4	1 5/16	3/4	7/8	1 5/8	2 13/16	1 1/8	2 5/16	2 13/16	6 5/8
	1 3/4	1 1/2-12	1 1/4-12	2	2.374	1 3/16	1 1/2	3 7/8	1 11/16	1 1/16	1 1/8	1 7/8	3 1/16	1 1/8	2 9/16	3 1/16	6 7/8
8	1 3/8	1 1/4-12	1-14	1 5/8	1.999	7/8	1 1/8	3 1/4	1 5/16	3/4	7/8	1 5/8	2 3/4	1 1/8	2 5/16	2 13/16	6 3/4
	1 3/4	1 1/2-12	1 1/4-12	2	2.374	1 3/16	1 1/2	3 7/8	1 11/16	1 1/16	1 1/8	1 7/8	3	1 1/8	2 9/16	3 1/16	7

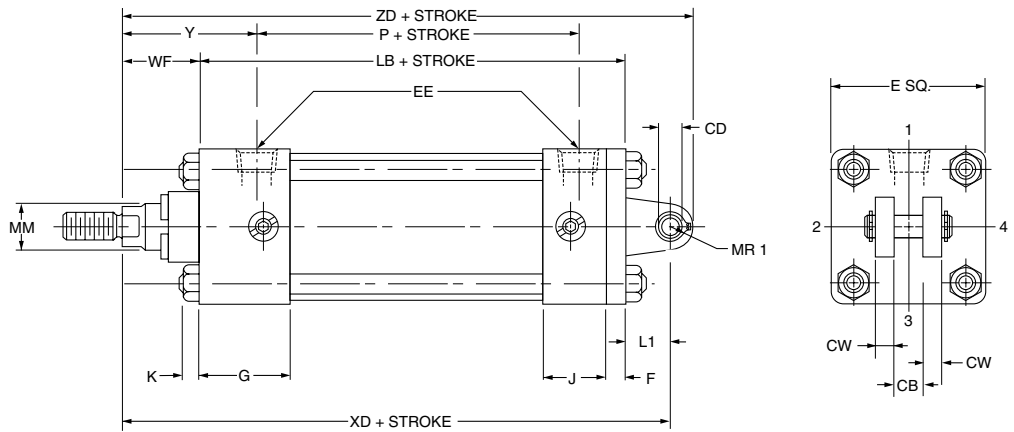
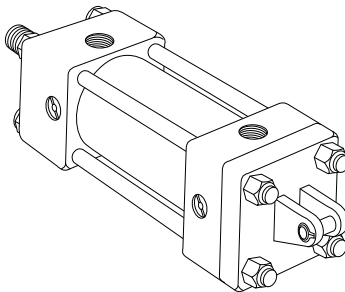
**Table 3—
 Envelope and
 Mounting Dimensions**

Cap Fixed Clevis
 Style MP1
 (NFA MP1)

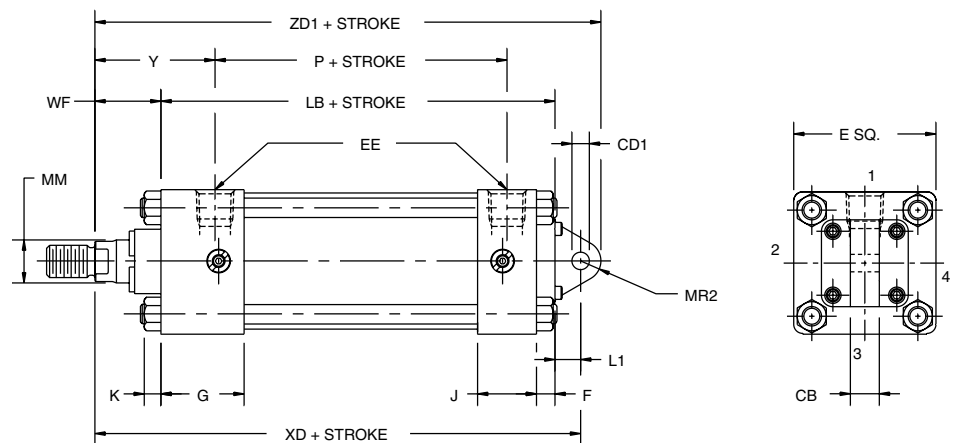
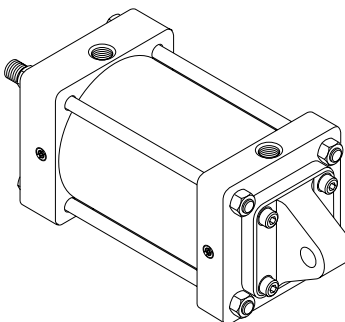


For maximum swivel angle with rear mounting plate for MP1 mounting, see Econo-Ram II cylinder accessories on page 37.

Cap Detachable Clevis
 Style MP2
 (NFA MP2)

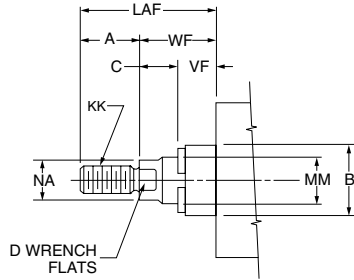


Cap Detachable Eye Mount
 Style MP4
 (NFA MP4) 5" & 6" Bore Only

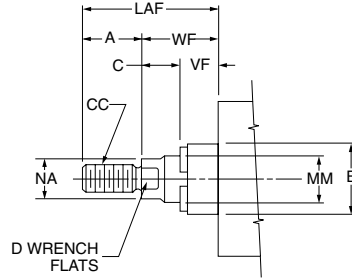


Rod End Dimensions—Basic Cylinder

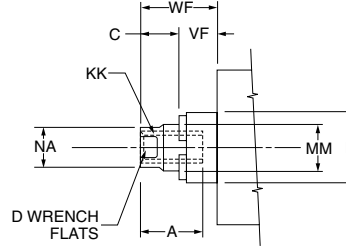
Thread Style 2
 (NFPA Style SM)
 Small Male



Thread Style 4
 (NFPA Style IM)
 Intermediate Male



Thread Style 3
 (NFPA Style SF)
 Short Female



**“Special Thread”
 Style 0**

Special thread, extension, rod eye, blank, etc., are also available.

To order, specify “Style 0” and give desired dimensions for CC or KK, A and W or WF.

If otherwise special, furnish dimensioned sketch.

Table 1—Envelope and Mounting Dimensions

Bore	CB	+0.000 CD▲ -0.002	+0.002 CD1▲ +0.004	CW	E	EE (NPTF)	F	G	J	K	L	L1	LR	MR	MR1	MR2	Add Stroke	
																	LB	P
5	1 1/4	.751	.750	5/8	5 1/2	1/2	5/8	1.66	1.22	7/16	5/8	1 1/4	1	15/16	3/4	7/8	5 1/8	2 7/8
6	1 1/2	1.001	1.00	3/4	6 1/2	3/4	3/4	1.91	1.41	7/16	3/4	1 1/2	1 1/4	1 1/8	1	1 1/8	5 3/4	3 1/8
8	1 1/2	1.001	—	3/4	8 1/2	3/4	3/4	1.81	1.44	9/16	3/4	1 1/2	1 1/4	1 1/8	1	—	5 7/8	3 1/4

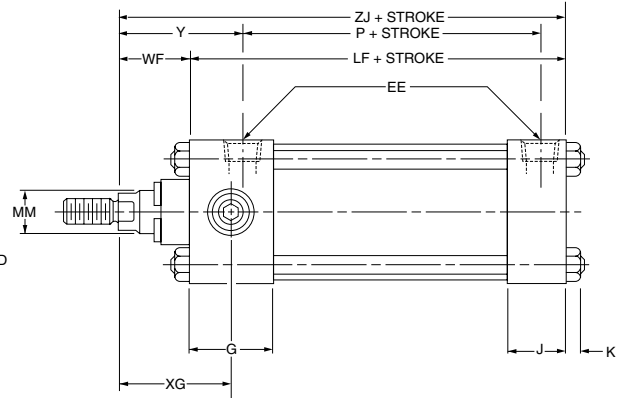
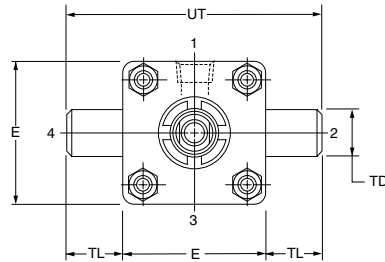
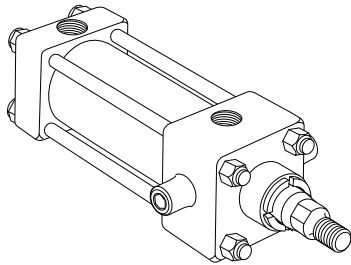
▲Dimension is pin diameter.

Table 2—Rod Dimensions

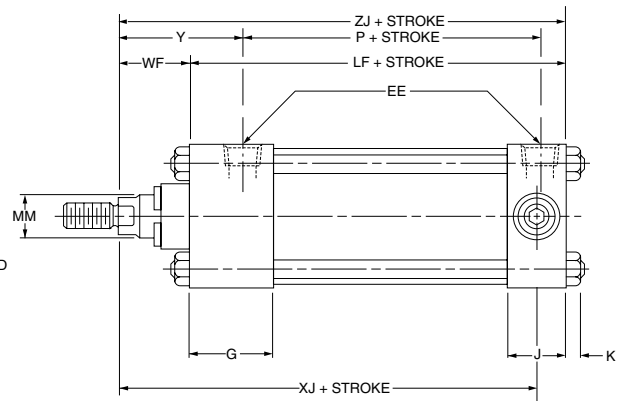
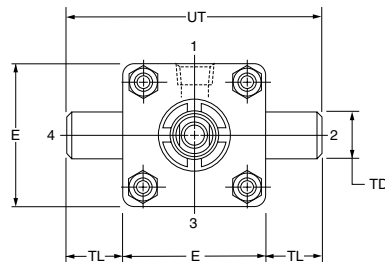
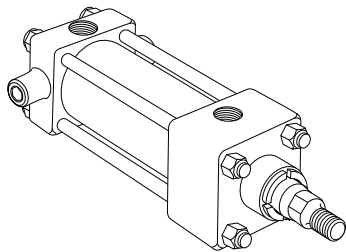
Bore Size	Rod Dia. MM	Thread		A	+0.000 -0.002 B	C	D	LAF	NA	VF	W	WF	Y	Add Stroke				
		Style 4 CC	Style 2 & 3 KK											XC	XD	ZC	ZD	ZD1
5	1	7/8-14	3/4-16	1 1/8	1.499	5/8	7/8	2 1/2	15/16	3/4	3/4	1 3/8	2 7/16	7 1/8	7 3/4	8 1/16	8 1/2	8 5/8
	1 3/8	1 1/4-12	1-14	1 5/8	1.999	7/8	1 1/8	3 1/4	1 5/16	3/4	1	1 5/8	2 11/16	7 3/8	8	8 5/16	8 3/4	—
6	1 3/8	1 1/4-12	1-14	1 5/8	1.999	7/8	1 1/8	3 1/4	1 5/16	3/4	7/8	1 5/8	2 13/16	8 1/8	8 7/8	9 1/4	9 7/8	10
	1 3/4	1 1/2-12	1 1/4-12	2	2.374	13/16	1 1/2	3 7/8	1 11/16	1 1/16	1 1/8	1 7/8	3 1/16	8 3/8	9 1/8	9 1/2	10 1/8	—
8	1 3/8	1 1/4-12	1-14	1 5/8	1.999	7/8	1 1/8	3 1/4	1 5/16	3/4	7/8	1 5/8	2 3/4	8 1/4	9	9 3/8	10	—
	1 3/4	1 1/2-12	1 1/4-12	2	2.374	13/16	1 1/2	3 7/8	1 11/16	1 1/16	1 1/8	1 7/8	3	8 1/2	9 1/4	9 5/8	10 1/4	—

**Table 3—
 Envelope and
 Mounting Dimensions**

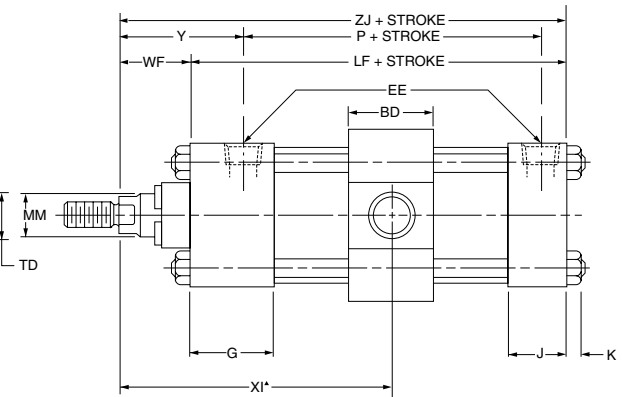
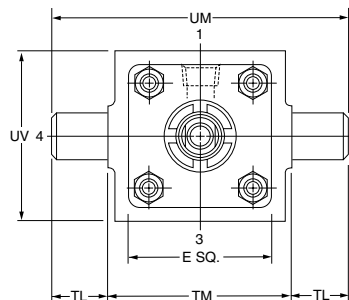
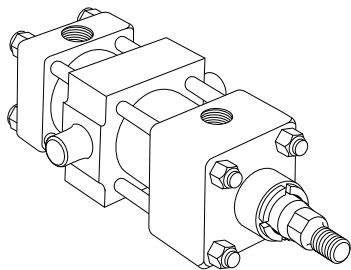
Head Trunnion Mount
Style MT1
(NFFPA MT1)



Cap Trunnion Mount
Style MT2
(NFFPA MT2)



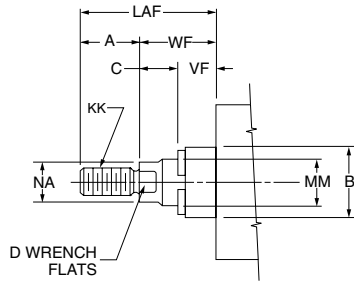
Intermediate Trunnion Mount
Style MT4
(NFFPA MT4)



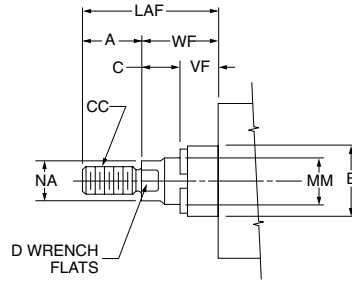
▲Dimension "XI" to be specified by customer.

Rod End Dimensions—Basic Cylinder

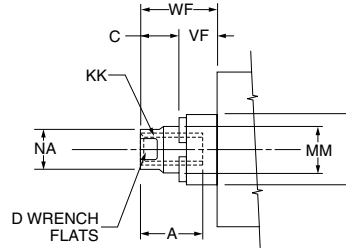
Thread Style 2
(NFFA Style SM)
Small Male



Thread Style 4
(NFFA Style IM)
Intermediate Male



Thread Style 3
(NFFA Style SF)
Short Female



**“Special Thread”
Style 0**

Special thread, extension, rod eye, blank, etc., are also available.

To order, specify “Style 0” and give desired dimensions for CC or KK, A and W or WF.

If otherwise special, furnish dimensioned sketch.

Table 1—Envelope and Mounting Dimensions

Bore	BD	E	EE (NPTF)	G	J	K	+.000 TD -.001	TL	TM	UM	UT	UV	Add Stroke		Style MT4 Minimum Stroke
													LF	P	
5	2	5 1/2	1/2	1.66	1.22	7/16	1.000	1	6 1/4	8 1/4	7 1/2	6	4 1/2	2 7/8	3/8
6	2 1/2	6 1/2	3/4	1.91	1.41	7/16	1.375	1 3/8	7 5/8	10 3/8	9 1/4	7	5	3 1/8	7/8
8	2 1/2	8 1/2	3/4	1.81	1.44	9/16	1.375	1 3/8	9 3/4	12 1/2	11 1/4	9 1/2	5 1/8	3 1/4	5/8

Table 2—Rod Dimensions

Bore Size	Rod Dia. MM	Thread		A	+.000 -.002 B	C	D	LAF	NA	VF	W	WF	Y	XG	▲ Min. XI	Add Stroke	
		Style 4 CC	Style 2 & 3 KK													XJ	ZJ
5	1	7/8-14	3/4-16	1 1/8	1.499	5/8	7/8	2 1/2	15/16	3/4	3/4	1 3/8	2 7/16	2 1/4	4 1/16	5 1/4	5 7/8
	1 3/8	1 1/4-12	1-14	1 5/8	1.999	7/8	1 1/8	3 1/4	15/16	3/4	1	1 5/8	2 11/16	2 1/2	4 5/16	5 1/2	6 1/8
6	1 3/8	1 1/4-12	1-14	1 5/8	1.999	7/8	1 1/8	3 1/4	15/16	3/4	7/8	1 5/8	2 13/16	2 5/8	4 13/16	5 7/8	6 5/8
	3/4	1 1/2-12	1 1/4-12	2	2.374	13/16	1 1/2	3 7/8	1 1/16	1 1/16	1 1/8	1 7/8	3 1/16	2 7/8	5 1/16	6 1/8	6 7/8
8	1 3/8	1 1/4-12	1-14	1 5/8	1.999	7/8	1 1/8	3 1/4	15/16	3/4	7/8	1 5/8	2 3/4	2 5/8	4 3/4	6	6 3/4
	1 3/4	1 1/2-12	1 1/4-12	2	2.374	13/16	1 1/2	3 7/8	1 1/16	1 1/16	1 1/8	1 7/8	3	2 7/8	5	6 1/4	7

▲Dimension “XI” to be specified by customer.

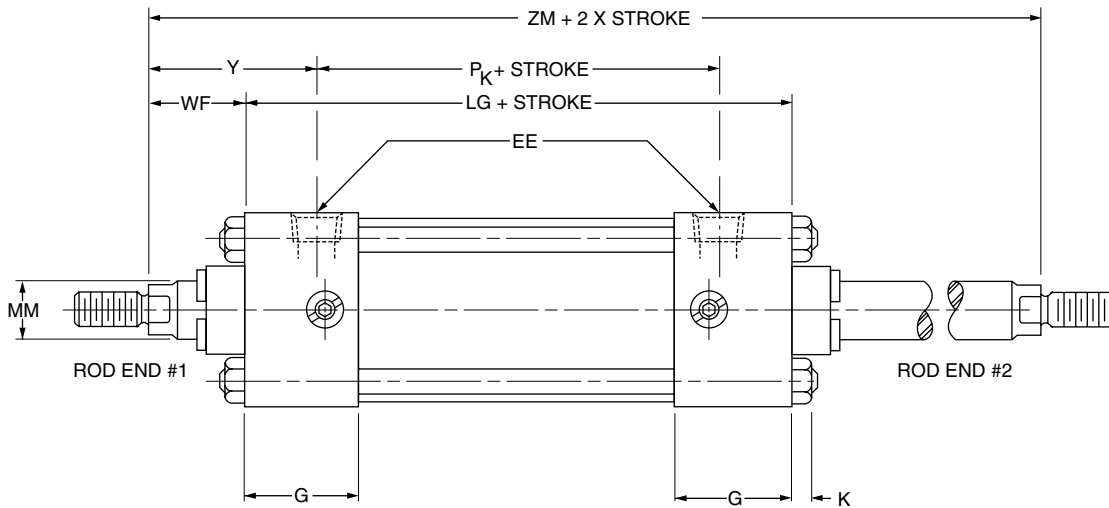
**Table 3—
Envelope and
Mounting Dimensions**

How to Use Double Rod Cylinder Dimensioned Drawings

To determine dimensions for a double rod cylinder, first refer to the desired single rod mounting style cylinder shown on preceding pages of this catalog. After selecting necessary dimensions from that drawing, return to this page and supplement the single rod dimensions with those shown on the drawing and dimension table below. Note that double rod cylinders have a head (Dim. G) at both ends and that dimension LG replaces LF and P_K

replaces P, etc. The double rod dimensions differ from, or are in addition to those for single rod cylinders shown on preceding pages. Provide the necessary information to completely dimension a double rod cylinder.

On a double rod cylinder where the two rod ends are different, be sure to clearly state which rod end is to be assembled and at which end.



Bore	Rod Dia.	Add Stroke						Add 2X Stroke
	MM	LG	P _K	SA _K	XA _K	SS _K	SN _K	ZM
5	1	4 ¹⁵ / ₁₆	2 ¹³ / ₁₆	7 ¹ / ₁₆	7 ¹ / ₁₆	3 ⁹ / ₁₆	2 ¹³ / ₁₆	7 ¹¹ / ₁₆
6	1 ³ / ₈	5 ¹ / ₂	3 ¹ / ₈	8 ¹ / ₄	8 ¹ / ₂	4 ¹ / ₈	3 ¹ / ₈	8 ³ / ₄
8	1 ³ / ₈	5 ¹ / ₂	3 ¹ / ₄	9 ¹ / ₈	8 ¹⁵ / ₁₆	4 ¹ / ₈	3 ¹ / ₈	8 ³ / ₄
REPLACES DIMENSION		LF	P	SA	XA	SS	SN	—
ON SINGLE ROD MOUNTING STYLES		ALL MTG STYLES		MS1		MS2	MS4	ALL MTG STYLES

All dimensions are in inches and apply to standard rod sizes only. For alternate rod sizes, determine all envelope dimensions (within LD dim.) as described above and then use appropriate rod end dimensions for proper rod size from single rod cylinder.

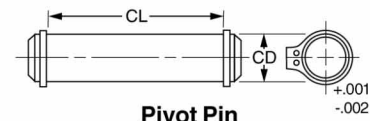
Cylinder Accessories

Rod end accessories can be selected by cylinder rod end thread size from Table A & B below. Mating parts for rod end accessories are listed just to the right of the knuckle or clevis selected. Mounting plates for style MP1 & MP4 cylinder mounts are selected by bore size from Table C.

Rod End Thread Size	TABLE A			TABLE B			TABLE C		
	Female Rod Clevis	Mating Parts		Knuckle	Mating Parts		Bore Size	Mounting Plate	
		Eye Bracket	Pivot Pin		Clevis Bracket	Pivot Pin		For Mtg. Style MP1 Cylinder	For Mtg. Style MP4 Cylinder
5/16-24	1458030031	1458060031	—	1458040031	1458050044	0856640044	1 1/4	32-27021	32-27020
7/16-20	1458030044	1458060050	0856640050	1458040044	1458050050	0856640050	1 1/2	1458060050	1458050050
1/2-20	1458030050	1458060050	0856640050	1458040050	1458050050	0856640050	2	1458060050	1458050050
3/4-16	1458030075	1458060075	0856640075	1458040075	1458050075	0856640075	2 1/2	1458060050	1458050050
7/8-14	1458030088	1458060100	0856640100	1458040088	1458050100	0856640100	3 1/4	1458060075	1458050075
1-14	1458030100	1458060100	0856640100	1458040100	1458050100	0856640100	4	1458060075	1458050075
1 1/4-12	1458030125	1458060138	0856640138	1458040125	1458050138	0856640138	5	1458060075	—
1 1/2-12	1458030150	1458060175	0856640175	1458040150	1458050175	0856640175	6	1458060100	—
							8	1458060100	—



Bore	1 1/4	1 1/2	2	2 1/2	3 1/4	4	5	6	8
Angle A	55	52	43	29	50	49	45	42	42

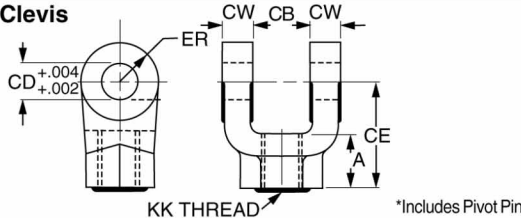


Pivot Pin

Symbol	0856640044	0856640050	0856640075	0856640100	0856640138	0856640175
CD	7/16	1/2	3/4	1	1 3/8	1 3/4
CL	1 9/16	1 7/8	2 5/8	3 1/8	4 1/8	5 3/16
Shear Cap. Lbs.	6600	8600	19300	34300	65000	105200

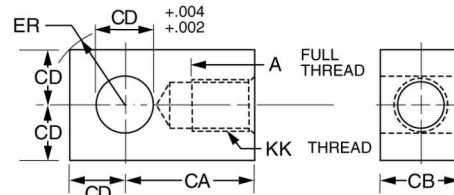
Note: Pivot Pin must be ordered separately for single lug pivot mounting.

Female Rod Clevis



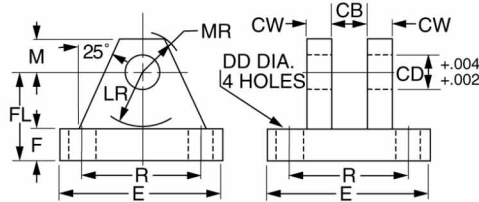
Symbol	1458030031*	1458030044	1458030050	1458030075	1458030088	1458030100	1458030125	1458030150
A	13/16	3/4	3/4	1 1/8	1 5/8	1 5/8	2	2 1/4
CB	1 1/32	3/4	3/4	1 1/4	1 1/2	1 1/2	2	2 1/2
CD	5/16	1/2	1/2	3/4	1	1	1 3/8	1 3/4
CE	2 1/4	1 1/2	1 1/2	2 1/8	2 15/16	2 15/16	3 3/4	4 1/2
CW	13/64	1/2	1/2	5/8	3/4	3/4	1	1 1/4
ER	19/64	1/2	1/2	3/4	1	1	1 3/8	1 3/4
KK	5/16-24	7/16-20	1/2-20	3/4-16	7/8-14	1-14	1 1/4-12	1 1/2-12
Load Capacity Lbs.	2600	4250	4900	11200	18800	19500	33500	45600

Rod Eye Knuckle



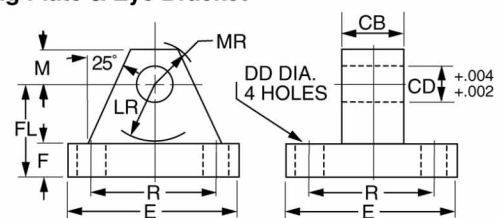
Symbol	1458040031	1458040044	1458040050	1458040075	1458040088	1458040100	1458040125	1458040150
A	3/4	3/4	3/4	1 1/8	1 1/8	1 5/8	2	2 1/4
CA	1 1/2	1 1/2	1 1/2	2 1/16	2 3/8	2 13/16	3 7/16	4
CB	7/16	3/4	3/4	1 1/4	1 1/2	1 1/2	2	2 1/2
CD	7/16	1/2	1/2	3/4	1	1	1 3/8	1 3/4
ER	19/32	23/32	23/32	1 1/16	1 1/16	1 7/16	1 3/32	2 1/2
KK	5/16-24	7/16-20	1/2-20	3/4-16	7/8-14	1-14	1 1/4-12	1 1/2-12
Load Capacity Lbs.	3300	5000	5700	12100	13000	21700	33500	45000

Clevis Bracket



Symbol	1458050044	32-27020	1458050050	1458050075	1458050100	1458050138	1458050175
CB	15/32	1 1/64	3/4	1 1/4	1 1/2	2	2 1/2
CD	7/16	.392	1/2	3/4	1	1 3/8	1 3/4
CW	3/8	3/8	1/2	5/8	3/4	1	1 1/4
DD	17/64	17/64	13/32	17/32	2 1/32	2 1/32	2 9/32
E	2 1/4	1 53/64	3 1/2	5	6 1/2	7 1/2	9 1/2
F	3/8	25/64	1/2	5/8	3/4	7/8	7/8
FL	1	55/64	1 1/2	1 7/8	2 1/4	3	3 5/8
LR	5/8	15/32	3/4	1 3/16	1 1/2	2	2 3/4
M	3/8	25/64	1/2	3/4	1	1 3/8	1 3/4
MR	1/2	25/64	5/8	2 9/32	1 1/4	1 21/32	2 7/32
R	1.75	1.28	2.55	3.82	4.95	5.73	7.50
Load Capacity Lbs.	3600	2025	7300	14000	19200	36900	34000

Mounting Plate & Eye Bracket



Symbol	1458060031	32-27020	1458060050	1458060075	1458060100	1458060138	1458060175
CB	5/16	1 1/64	3/4	1 1/4	1 1/2	2	2 1/2
CD	5/16	.392	1/2	3/4	1	1 3/8	1 3/4
DD	17/64	17/64	13/32	17/32	2 1/32	2 1/32	2 9/32
E	2 1/4	1 53/64	2 1/2	3 1/2	4 1/2	5	6 1/2
F	3/8	25/64	3/8	5/8	7/8	7/8	1 1/8
FL	1	55/64	1 1/8	1 7/8	2 3/8	3	3 3/8
LR	5/8	15/32	3/4	1 1/4	1 1/2	2 1/8	2 1/4
M	3/8	25/64	1/2	3/4	1	1 3/8	1 3/4
MR	1/2	25/64	9/16	7/8	1 1/4	1 5/8	2 1/8
R	1.75	1.28	1.63	2.55	3.25	3.82	4.95
Load Capacity Lbs.	1700	2880	4100	10500	20400	21200	49480

How to Select a Cylinder

Schrader Bellows cylinders are available based on air or hydraulic operating pressure. The many styles, sizes and optional features available assure that your application requirements are met precisely. To select a cylinder, follow these simple steps:

- Step 1 - **Determine the correct cylinder bore size** necessary to achieve required force using the available operating pressure.
- Step 2 - **Determine the series cylinder to use**, based on operating pressure.
- Step 3 - **Turn to the appropriate cylinder selection section.** Select the mounting style that fits your installation needs. Determine the bore and rod sizes available for the model you select. Then complete model selection.
 - Choose a rod end style and the desired rod end accessories.
 - Size the cylinder to meet your application requirements.
- Step 4 - **Consider the following conditions** which may require further modifications to the cylinder you have selected. See Table of Contents for location of additional information on each subject.

Application Condition	Check the Following
Quick Starts or Stops	Confirm that determined thrust is sufficient to accelerate or decelerate cylinder and load within prescribed distance. Optional cushions should be used to reduce shock during deceleration, check that peak pressures will be within tolerable limits.
Long Push Stroke	Check whether stop tube is required to prevent excessive bearing loads and wear.
High Column-loading Long Push Stroke	Determine if standard size piston rod is strong enough to accommodate intended load.
Long Horizontal Stroke	Determine if standard size piston rod is strong enough to accommodate intended load.
High Operating Temperatures	For temperatures between 165°F and 250°F use high temperature seals.
Options and Modifications	<ul style="list-style-type: none"> - Adjustable Cushions - Piston Bumper Seals (1-1/2" through 4") - Adjustable Sensors - Linear Position Sensing - Piston Bumpers (1-1/2" through 8") - Port and Cushion Adjust Relocation <ul style="list-style-type: none"> - Stop Tube - Mixed Mountings - Rod End Modifications - Double Rod End - Multiple Ports

Table C – Mounting Styles

MX0	No Mount	ME3*▲	Head Square	MT2▲	Cap Trunnion
MX1	Tie Rods Extended Both Ends	ME4*▲	Cap Square	MP1▲	Cap Fixed Clevis
MX2	Tie Rods Extended Cap End	MS1**	Side End Angle	MP2	Cap Detachable Clevis
MX3	Tie Rods Extended Head End	MS2▲	Side Lug	MT4†	Intermediate Trunnion
MX5	Sleeve Nut	MS4	Side Tap	MP4**	Cap Detachable Eye
MF1**	Head Rectangular Flange	MS7	Side End Lug		
MF2**	Cap Rectangular Flange	MT1▲	Head Trunnion		

* 8" bore only.

** Mounting styles can be ordered assembled to the cylinder or as a basic (MX0) no-mount cylinder with a bolt on mounting kit as a separate item (1-1/4 to 4" only).

† For cylinders with intermediate trunnion mounting (style MT4) specify distance between the piston rod end reference point and the centerline of the trunnion pin (dimension "X1").

▲ Not available on 1-1/4" Bore.

How to Order by Model Number...

**Econo-Ram II Series
 Pneumatic Cylinders**

Econo-Ram II Series air and hydraulic cylinders can be specified by model number by using the tables shown at right.

1. TYPE

Select the Model Number Code which identifies the single or double rod end air or hydraulic cylinder.

2. BORE & ROD DIAMETER

Select the Model Number Code which identifies the desired bore size and rod diameter combination.

3. MOUNTING & CUSHIONING

Select the Model Number Code which identifies the desired mounting style and cushioning option. **Cushions available only for air cylinders model FW2 & FX2.** Note: Mounting styles with asterisk (*) can be ordered assembled to the cylinder or as a basic (MX0) no-mount cylinder with a bolt on mounting kit as a separate item (1-1/4 - 4" Bores).

4. ROD END STYLE

Select the Model Number Code which identifies the desired rod end thread style.

5. SEAL TYPE

Complete the model number by selecting the type of seals desired. **Note:** Reed or solid state sensors available with standard seals only.

6. STROKE LENGTH

It is necessary to specify the stroke length desired following the Model Number. For example: FW2B108121 with 6" stroke. **Note:** Minimum stroke length applies to cylinders ordered with unassembled mounting kits. See mounting style dimensional tables for appropriate minimum stroke length.

THE FW2B108121 EXAMPLE WOULD IDENTIFY:

A single rod end air cylinder with 2" bore size, 5/8" diameter piston rod, cap fixed clevis mounting, with a small male rod end thread, Nitrile seals and a 6" stroke.

SPECIFYING THE DESIRED TRUNNION LOCATION: (Style MT4 Mounting)

For cylinders with intermediate trunnion mounting, specify the distance between the piston rod reference point and the center-line of the trunnion pin (Dimension "X1").

OPTIONAL MOUNTING ACCESSORIES

Specify separately by part number the desired optional mounting or rod end accessories.

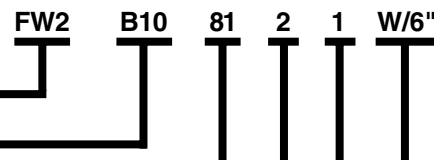
SPECIAL MODIFICATIONS

For special modifications other than piston rod end, use "S" in the 11th position of the model number and describe the special feature required.

Example: FW2B108121S with 6" stroke
 S = Ports to be in position #2

1	Model Number Code	
	Air	Hydraulic▲
Single Rod End	FW2	FW4
Double Rod End	FX2	FX4

Model Number Example



2		
Bore Size	Rod Dia.	Model Number Code
1 1/4"	1/2"	N50
1 1/2"	5/8"	A10
	1"	A11
2"	5/8"	B10
	1"	B11
2 1/2"	5/8"	C10
	1"	C11
3 1/4"	1"	D11
	1 3/8"	D12
4"	1"	E11
	1 3/8"	E12
5"	1"	F11
	1 3/8"	F12
6"	1 3/8"	G12
	1 3/4"	G13
8"	1 3/8"	J12
	1 3/4"	J13

3					
Mounting Style	NFPA Style	Non-Cush.	Cush. Head	Cush. Cap.	Cush. Both
Side End Angles (1-1/4" - 8")	MS1*	01	02	03	04
Side Lug (1-1/2" - 8") ▲	MS2	05	06	07	08
Side Tapped (1-1/4" - 8")	MS4	13	14	15	16
Eng Lug Mount (1-1/4" - 4")	MS7	17	18	19	20
Head Rectangular Flange (1-1/4" - 6")	MF1*	21	22	23	24
Cap Rectangular Flange (1-1/4" - 6")	MF2*	25	26	27	28
Head Square (8")	ME3	37	38	39	40
Cap Square (8")	ME4	41	42	43	44
Tie Rod Extended Both Ends (1-1/4"-8")	MX1	53	54	55	56
Tie Rod Extended Cap End (1-1/4" - 8")	MX2	57	58	59	60
Tie Rod Extended Head End (1-1/4" - 8")	MX3	61	62	63	64
Detachable Pivot Eye (1-1/4" - 4")	MP4*	65	66	67	68
Head Trunnion (1-1/2" - 8") ▲	MT1	69	70	71	72
Cap Trunnion (1-1/2" - 8") ▲	MT2	73	74	75	76
Intermediate Fixed Trunnion (1-1/4" - 8")	MT4	77	78	79	80
Cap Fixed Clevis (1-1/2" - 8") ▲	MP1*	81	82	83	84
Cap Detachable Clevis (1-1/4" - 8")	MP2*	85	86	87	88
No Mount (BASIC) (1-1/4" - 8")	MX0	93	94	95	96
Sleeve Nut Mount (1-1/4" - 8")	MX5	97	98	99	00
Side Tapped with Sleeve Nuts (1-1/4" - 8")	N/A	T1	T2	T3	T4

4	
Rod End Style	Model Code Number
Small Male	2
Short Female	3
Intermediate Male	4
Special - Specify	0

5		
Seal Type†	Model Code Number	
Nitrile Seals	No Bumpers	1
	Magnetic Piston	3
	Bumper-Piston Seal	4
	Magnetic Piston w/Bumper-Piston Seal	6
	Bumper Both Ends	B
	Bumper Head End	H
Viton Seals	Bumper Cap End	C
		2

6	
Specify Stroke Length	6"
NOTE: For cylinders ordered with unassembled mounting kits see minimum stroke length of the dimensional table of the corresponding mounting style.	

Note: Addition of Bumper (B, H, or C) results in a 1/4" stroke loss per Bumper. For example, a 6" stroke cylinder with Bumpers both ends has an effective stroke of 5-1/2"

†Bumpers not available in 1-1/4" Bore.

▲Not available in 1-1/4" Bore.

How to Order Schrader Bellows Econo-Ram II Cylinders with Sensors:

Sensors are not mounted to the cylinder prior to shipment. When ordering a cylinder to accommodate a sensor:

1. Derive a proper model number as shown in the table above.
2. Use 3 or 6 for Seal Type (step 5).
3. If using B, H, or C for Seal Type, then place an "S" in the Special Modification column of the model number and request a Magnetic Piston.
4. Order sensors as separate line items.

Example: For cylinder prepared for sensor only – FW2B108123 with 6" stroke



NOTES