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Pneumatic Division
Wadsworth, Ohio
www.parker.com/pneumatics

3MA/4MA Series

Non-Lube NFPA Air Cylinders

Contents

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Rod Bearing and Piston
Manufactured from tough, impact-resistant, bearing-grade materials, the composite rod bearing and piston provide excellent wear resistance. Other advantages include noise reduction without the need for bumpers and lower friction than other materials. Aluminum piston with wear band is available for bumper piston seals and other options.

Piston Seals
Carboxylated nitrile rounded-lip piston seals combine low friction with leak-free service and long service life. Optional bumper piston seals provide additional noise reduction and smooth end-of-stroke deceleration.

Piston Assembly
High strength steel fastener (composite piston) or piston rod thread (aluminum piston) connects the piston to the rod and is secured in place with anaerobic adhesive.

Ports
NPTF ports are standard.

Endcap Fasteners
Zinc plated steel endcap fasteners for tough environments. Stainless steel is available as an option.

Rod Seal
Carboxylated nitrile rounded-lip rod seal combines low friction with leak-free service and long service life.

Magnetic Piston Ring
Included as a standard feature for use with a variety of sensors.

Cylinder Body
Extruded aluminum profile cylinder body offers integrated sensor grooves to minimize sensor installation time, maximize sensor protection and eliminate the need for brackets. Grooves readily accept both Global and Mini-Global Sensors. Anodized and bright-dipped for corrosion resistance, maximum seal life and lower friction.

Adjustable Cushions
Included as a standard feature.

Rod Wiper
Outboard urethane rod wiper protects the cylinder by removing external debris and adherents from the piston rod during the entire stroke.

Heads and Caps
High-pressure die cast aluminum heads and caps are designed with the most flexible mounting platform. TEF mount is standard. Anodized for corrosion resistance.

Piston Rod
Standard case-hardened (50-64 Rc), hard chrome plated and polished carbon steel piston rod for reliable performance, long rod seal life and low friction. Grades of stainless steel are available as options.

For a complete list of 3MA options, please see pages B6 and B16.

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B

How to Order 3MA Series Cylinders for 1-1/2" to 5" Bore

3MA cylinders can be specified by model number by using the table below.

2.00	C		J	3MA		U			1	4		A	C	6.000

Bore Size
1.50
2.00
2.50
3.25
4.00
5.00

Cushion Head End

C	Standard (cushioned head end)
Blank	Non-cushioned head end

Double Rod Cylinder
Specify "K" only if double rod cylinder is required.

Mounting Style
Specify mounting style code (see table on following page).

Series
3MA

Piston Type

Blank	Standard (lipseals and magnetic ring)
1	Lipseals, no magnetic ring
2	Lipseals, no magnetic ring (aluminum piston)
3	Lipseals and magnetic ring (aluminum piston)
4	Bumper seals, no magnetic ring
6	Bumper seals and magnetic ring
B	Lipseals, 1/4" thick bumpers both ends[1]
H	Lipseals, 1/4" thick bumper head end[1]
C	Lipseals, 1/4" thick bumper cap end[1]
D	Lipseals and magnetic ring, 1/4" thick bumpers both ends[1]
F	Lipseals and magnetic ring, 1/4" thick bumper head end[1]
R	Lipseals and magnetic ring, 1/4" thick bumper cap end[1]

Ports
Standard (NPTF)

Seals

Blank	Standard (nitrile seals)
E	Fluorocarbon rod wiper and rod seal only[2]

Special Modification
Specify "S" only for special modification other than rod end, and then describe modification in item notes.

Piston Rod Number
Standard (rod code number 1)[3]

Piston Rod Thread Style

4	Small male
8	Intermediate male
9	Short female
55	For use with Split Coupler[4]
3	Special (and specify all dimensions required)

Rod Material Code

Blank	Standard
Y	17-4 PH stainless steel
J	303 stainless steel
S	316 stainless steel

Piston Rod Thread Type

A	Standard (UNF Unified Thread)
W	BSF British Fine
M	Metric (see page B106)

Cushion Cap End

C	Standard (cushioned cap end)
Blank	Non-cushioned cap end

Stroke Length
Specify stroke length required in inches.

[1] Addition of 1/4" bumper results in a 1/4" stroke loss per bumper, per end. For example, a 6" stroke cylinder with 1/4" bumpers at both ends (option B) has an effective stroke of 5-1/2".

[2] Used for external chemical compatibility applications, not high temperature.

[3] Review Piston Rod Selection Chart on page B136 to determine proper piston rod diameter. (Note: 3MA has only one rod diameter per bore size, so proper piston rod diameter from chart result may lead to bore size change). For oversize rod within the same bore size, please see 4MA section.

[4] For additional information regarding this style, refer to page B105. If non-standard Rod Material Code is required with this option, please place an "S" for special in Special Modification field and specify rod material in the item notes.

How to order 3MA Series cylinders with sensors:

Sensors must be ordered separately and are not mounted to the cylinder prior to shipment.

1. Cylinder model number must have a Piston Type with a magnetic ring ((blank), 3, 6, D, F or R).
2. Please refer to pages B113-B120 for sensor part numbers and specifications. Global, Mini-Global, NAMUR and Weld Immune Sensors will fit the 3MA Series.
3. Style DD mounts and tie rod versions with Global Sensors will require tie rod bracket P8S-TMA0X. Please refer to page B117 for more information.

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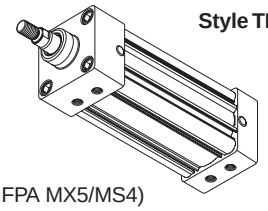
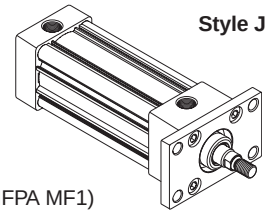
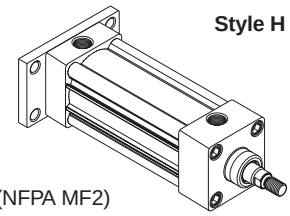
3MA Series Mounting Styles for 1-1/2" to 5" Bore

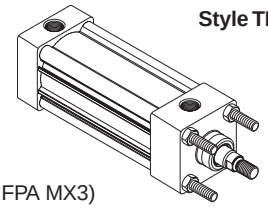
Mounting Code	NFPA Mounting	Description	Available Bore Sizes 3MA
TEF	MX5/MS4	Sleeve Nut with Side Tap (standard mount)	1-1/2 - 5
T	MX0	No Mount (same construction as TEF)	1-1/2 - 5
TE	MX5	Sleeve Nut (same construction as TEF)	1-1/2 - 5
F	MS4	Side Tap (same construction as TEF)	1-1/2 - 5
J	MF1	Head Rectangular Flange	1-1/2 - 5
H	MF2	Cap Rectangular Flange	1-1/2 - 5
TB	MX3	Tie Rods Extended Head End	1-1/2 - 5
TC	MX2	Tie Rods Extended Cap End	1-1/2 - 5
TD	MX1	Tie Rods Extended Both Ends	1-1/2 - 5
C	MS2	Side Lug	1-1/2 - 5
CB	MS1	Side End Angle	1-1/2 - 5
G	MS7	Side End Lug	1-1/2 - 4
NB	N/A	Base Bar	1-1/2 - 4
BB	MP1	Cap Fixed Clevis	1-1/2 - 5
BC	MP2	Cap Detachable Clevis	1-1/2 - 5
BE	MP4	Cap Detachable Eye	1-1/2 - 4
DD	MT4	Intermediate Trunnion	1-1/2 - 5
KTEF*	MDX5/MDS4	Double Rod End, TEF Mount	1-1/2 - 5

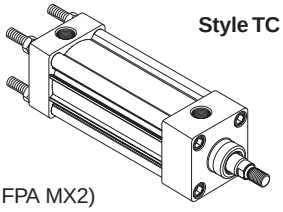
*Double rod end cylinders can be ordered with head mountings, i.e. KJ (see page B19).

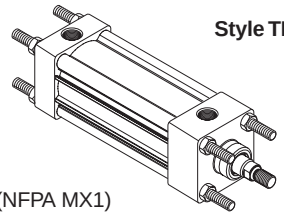
Standard Mount
Style TEF

(NFPA MX5/MS4)

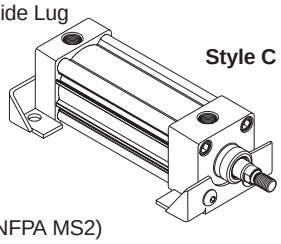
Head Rectangular Flange
Style J

(NFPA MF1)

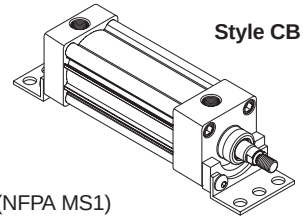
Cap Rectangular Flange
Style H

(NFPA MF2)

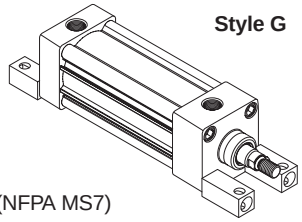
Tie Rods Ext. Head End
Style TB

(NFPA MX3)

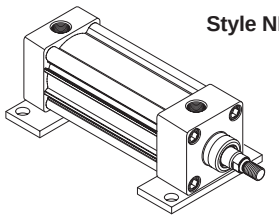
Tie Rods Ext. Cap End
Style TC

(NFPA MX2)

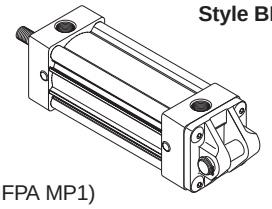
Tie Rods Ext. Both Ends
Style TD

(NFPA MX1)

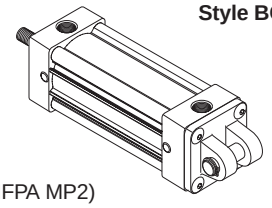
Side Lug
Style C

(NFPA MS2)

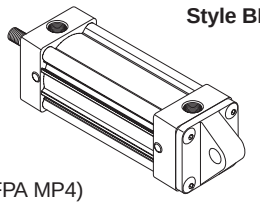
Side End Angle
Style CB

(NFPA MS1)

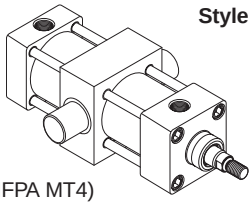
Side End Lug
Style G

(NFPA MS7)

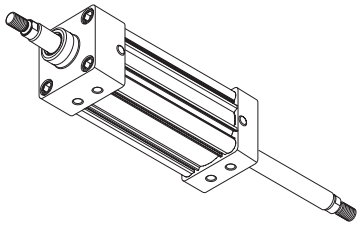
Base Bar Mount
Style NB


Cap Fixed Clevis
Style BB

(NFPA MP1)

Cap Detachable Clevis
Style BC

(NFPA MP2)

Cap Detachable Eye
Style BE

(NFPA MP4)

Intermediate Trunnion
Style DD

(NFPA MT4)

Double Rod End
Style KTEF

(NFPA MDX0)

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B

General Specifications

- NFPA interchangeable
- Bore sizes – 1-1/2", 2", 2-1/2", 3-1/4", 4" and 5"
- Strokes – available in any practical stroke length
- Rod diameters – 5/8" and 1"
- Rod end styles – 4 standard, specials available
- Single rod end or double rod ends
- Cushions – standard and adjustable at both ends, optional non-cushioned
- Operating pressure – 250 PSIG (17 Bar) maximum air service
- Media – dry, filtered air
- Temperature range – -10°F to +165°F (-23°C to +74°C)
- Mounting styles – 18 standard styles
- One porting style – NPTF
- RoHS compliant

For material options, including seals and piston rods, please see Material Specifications on next page.

Cylinder Weights – 3MA Cylinders

Bore (inch)	Rod (inch)	No Mount Single Rod 3MA	
		Base Wt. (lbs.)	Per Inch (lbs.)
1-1/2	5/8	1.57	0.20
2	5/8	2.13	0.21
2-1/2	5/8	2.87	0.23
3-1/4	1	5.73	0.42
4	1	7.51	0.49
5	1	10.99	0.61

Mounting Weight Adders

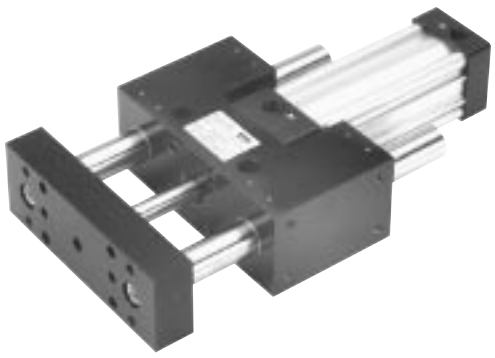
Bore (inch)	Weight (lbs) by Mounting Style						
	J, H	BB	CB, G	DD	BE	C	BC
1-1/2	0.51	0.15	0.36	1.70	0.23	0.15	0.20
2	0.76	0.26	065	2.38	0.32	0.15	0.29
2-1/2	1.13	0.38	1.05	3.00	0.42	0.15	0.41
3-1/4	2.76	0.98	1.38	5.35	1.26	0.35	1.06
4	4.05	1.35	2.20	6.75	1.62	0.35	1.49
5	6.46	1.20	4.29	8.77	N/A	0.57	2.41

Standard Cushion Position

Mounting Code	Position
All 3MA mounts	2

Standard Port Sizes

Bore	NPTF
1-1/2	3/8
2	3/8
2-1/2	3/8
3-1/4	1/2
4	1/2
5	1/2



For a guided version of the 3MA Series, please see the HB Series in Section F.

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Material Specifications – Standard Temperatures and Applications

Head and cap ..... Black anodized aluminum alloy

Head and cap screws ..... Zinc plated steel alloy

Cylinder body ..... Clear anodized aluminum alloy

Piston rod ..... Case-hardened, chrome plated carbon steel

Rod seal ..... Carboxylated nitrile (Nitroxile)

Rod wiper ..... Molythane

Rod bearing ..... Composite

Needle valve inserts ..... Composite

Piston ..... Composite (standard)
Aluminum alloy (optional)

Piston seals ..... Carboxylated nitrile (Nitroxile)

Piston bearing ..... Composite (for standard piston)
MolyGard™
(for aluminum piston)

Magnetic ring ..... Plastic-bound magnetic material

Piston fastener ..... Zinc plated steel alloy
(for composite piston)
Piston rod for aluminum piston

O-rings ..... Nitrile

End seals ..... Nitrile

Cushion seals ..... Urethane

Cushion needle valves ..... Composite

Tie-rods/studs ..... Blackened carbon steel
(some mounts)

Tie-rod nuts ..... Steel alloy, SAE J995 Grade 8
(some mounts)

Other Standard Options – Material and Part Changes

Cylinder seal options	Fluorocarbon rod wiper and rod seal for external chemical compatibility
	Other seal options available, please consult factory
Bumper piston seal options	Carboxylated nitrile (Nitroxile) for standard temperatures
Piston rod material options	Case-hardened, chrome plated carbon steel (standard)
	17-4 PH stainless steel, chrome plated
	303 stainless steel, chrome plated
	316 stainless steel, chrome plated
	(for stainless steel without chrome plating, please consult factory)
1/4" thick bumpers option	Urethane

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Piston
Manufactured from tough, impact-resistant, bearing-grade materials, the composite piston provides excellent wear resistance. Other advantages include noise reduction without the need for bumpers and lower friction than other materials. Aluminum piston with wear band (shown) is available for bumper piston seals, hydraulic service and other options.

Piston Assembly
High strength steel fastener or piston rod thread connects the piston to the rod and is secured in place with anaerobic adhesive.

Ports
NPTF ports are standard. Other port styles available.

Piston Seals
Carboxylated nitrile rounded-lip piston seals combine low friction with leak-free service and long service life. Optional bumper piston seals provide additional noise reduction and smooth end-of-stroke deceleration.

Endcap Fasteners
Zinc plated steel endcap fasteners for tough environments. Stainless steel is available as an option.

Rod Seal
Carboxylated nitrile rounded-lip rod seal combines low friction with leak-free service and long service life.

Rod Wiper
Outboard urethane rod wiper protects the cylinder by removing external debris and adherents from the piston rod during the entire stroke.

Magnetic Piston Ring
Included as a standard feature for use with a variety of sensors.

Cylinder Body
Extruded aluminum profile cylinder body offers integrated sensor grooves to minimize sensor installation time, maximize sensor protection and eliminate the need for brackets. Grooves readily accept both Global and Mini-Global Sensors. Anodized and bright-dipped for corrosion resistance, maximum seal life and lower friction.

Adjustable Cushions Available

Heads and Caps
High-strength aluminum heads and caps are designed with the most flexible mounting platform. TEF mount is standard. Using our proprietary extrusion, we can offer customization of the endcaps for unique designs, including extra ports, duplex, tandem and many special mountings. Anodized for corrosion resistance.

Piston Rod
Standard case-hardened (50-64 Rc), hard chrome plated and polished carbon steel piston rod for reliable performance, long rod seal life and low friction. Grades of stainless steel are available as options.

Rod Gland/Bearing
Threaded bronze rod gland is externally removable, without cylinder disassembly, for easy maintenance. Machined flats permit the use of common tools for removal and installation. Options include HI LOAD design for side load conditions and metallic wiper design for extremely tough rod contaminant/adherent applications.

For a complete list of 4MA options, please see pages B12 and B16.

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B

How to Order 4MA Series Cylinders for 1-1/2" to 5" Bore

4MA cylinders can be specified by model number by using the table below.

2.00			J	4MA		U			1	4		A		6.000

Bore Size
- 1.50[1]
- 2.00
- 2.50
- 3.25
- 4.00
- 5.00

Double Rod Cylinder
Specify "K" only if double rod cylinder is required.

Series
- **4MA** Air service
- **4ML** Hydraulic service[2]

Ports
- **U** NPTF
- **R** BSPP
- **B** BSPT
- **T** SAE

Piston Rod Number
Specify rod code number for required diameter.[8, 2]

Stroke Length
Specify stroke length required in inches.[11]

Mounting Style
Specify mounting style code (see table on following page).

Cushion Cap End
- **Blank** Non-cushioned cap end
- **C** Cushioned cap end (not available for 4ML)

Cushion Head End
- **Blank** Non-cushioned head end
- **C** Cushioned head end (n/a for 1.50" bore with 1" rod or 4ML)

Seals
- **Blank** Standard (nitrile seals)
- **V** Fluorocarbon seals[4]
- **E** Fluorocarbon rod wiper and rod seal only[5]
- **4** Low temperature seals[4]
- **M** Metallic rod wiper, nitrile seals[6]

Piston Rod Thread Type
- **A** Standard (UNF Unified Thread)
- **W** BSF British Fine
- **M** Metric (see page B106)

Piston Type[2]
- **Blank** Standard (lipseals and magnetic ring)
- **1** Lipseals, no magnetic ring
- **2** Lipseals, no magnetic ring (aluminum piston)
- **3** Lipseals and magnetic ring (aluminum piston) (standard for 4ML)
- **4** Bumper seals, no magnetic ring
- **6** Bumper seals and magnetic ring
- **B** Lipseals, 1/4" thick bumpers both ends[3]
- **H** Lipseals, 1/4" thick bumper head end[3]
- **C** Lipseals, 1/4" thick bumper cap end[3]
- **D** Lipseals and magnetic ring, 1/4" thick bumpers both ends[3]
- **F** Lipseals and magnetic ring, 1/4" thick bumper head end[3]
- **R** Lipseals and magnetic ring, 1/4" thick bumper cap end[3]

Special Modification
Specify "S" only for special modification other than rod end, and then describe modification in item notes. (Includes 4MA with Linear Position Sensor Option)[7]

Rod Material and Gland Code
- **Blank** Standard rod and gland
- **H** Standard rod and HI LOAD gland
- **Y** 17-4 PH stainless steel rod and standard gland
- **Z** 17-4 PH stainless steel rod and HI LOAD gland
- **J** 303 stainless steel rod and standard gland[10]
- **K** 303 stainless steel rod and HI LOAD gland[10]
- **S** 316 stainless steel rod and standard gland[10]
- **T** 316 stainless steel rod and HI LOAD gland[10]

Piston Rod Thread Style
- **4** Small male
- **8** Intermediate male
- **9** Short female
- **55** For use with Split Coupler[9]
- **3** Special (and specify all dimensions required)

1 Not available with Linear Position Sensor Option (LPSO).

2 Piston Types (blank), 1, 4 and 6 not available for 4ML. Piston Types (blank) and 1 not available for oversize rod numbers 2 and 3. Seals option V only available with Piston Types 2 and 4. Seals option 4 only available with Piston Types 2 and 3.

3 Addition of 1/4" bumper results in a 1/4" stroke loss per bumper, per end. For example, a 6" stroke cylinder with 1/4" bumpers at both ends (option B) has an effective stroke of 5-1/2".

4 Reed and solid-state sensors only available with standard seals or options E and M. See footnote 2.

5 Used for external chemical compatibility applications, not high temperature.

6 If fluorocarbon seals are required with this option, please place an "S" for special in the Special Modification field and specify the "fluorocarbon seals and metallic rod wiper" in the item notes.

7 For Linear Position Sensor Option (LPSO), please include the following information for the Special Modification item notes:
- a. Sensor part number (see pages B100-B104)
- b. Sensor position
- c. Port position (if other than position 1)
- d. Length of stop tubing, gross stroke and net stroke (if required)

Also, Piston Type option (blank), 3, 6, D, F or R is required.

8 Review Piston Rod Selection Chart on page B136 to determine proper piston rod diameter.

9 For additional information regarding this style, refer to page B105. If non-standard Rod Material and Gland Code is required with this option, please place an "S" for special in Special Modification field and specify Rod Material and Gland Code in the item notes.

10 Not available for 4ML.

11 If a stop tube is required, specify gross stroke (net stroke + stop tube) in the model number, then place an "S" for special in the Special Modification field and specify the stop tube length in the item notes. Not available with Piston Types (blank) and 1.

How to order 4MA/4ML Series cylinders with sensors:

Sensors must be ordered separately and are not mounted to the cylinder prior to shipment.

1. Cylinder model number must have a Piston Type with a magnetic ring ((blank), 3, 6, D, F or R).
2. Please refer to pages B113-B120 for sensor part numbers and specifications. Global, Mini-Global, NAMUR and Weld Immune Sensors will fit the 4MA/4ML Series.
3. Style DD mounts and tie rod versions with Global Sensors will require tie rod bracket P8S-TMA0X. Please refer to page B117 for more information.

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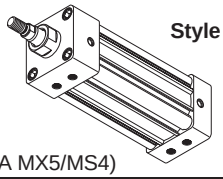
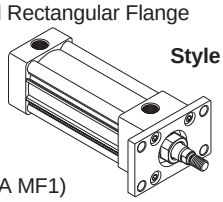
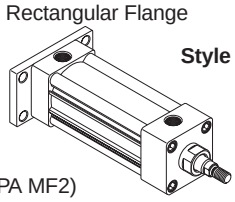
4MA Series Mounting Styles for 1-1/2" to 5" Bore

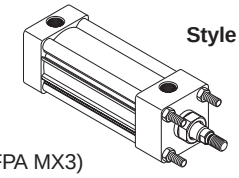
Mounting Code	NFPA Mounting Style	Description	Available Bore Sizes		
			4MA/4ML	4MA/4ML-LPSO w/o Stop Tube	4MA/4ML-LPSO w/Stop Tube
TEF	MX5/MS4	Sleeve Nut with Side Tap (standard mount)	1-1/2 - 5*	2 - 5	2 - 5
T	MX0	No Mount (same construction as TEF)	1-1/2 - 5	2 - 5	2 - 5
TE	MX5	Sleeve Nut (same construction as TEF)	1-1/2 - 5	2 - 5	2 - 5
F	MS4	Side Tap (same construction as TEF)	1-1/2 - 5*	2 - 5	2 - 5
J	MF1	Head Rectangular Flange	1-1/2 - 5	2 - 5**	2 - 5
H	MF2	Cap Rectangular Flange	1-1/2 - 5	2 - 5**	2 - 5**
TB	MX3	Tie Rods Extended Head End	1-1/2 - 5	-	2 - 5
TC	MX2	Tie Rods Extended Cap End	1-1/2 - 5	-	-
TD	MX1	Tie Rods Extended Both Ends	1-1/2 - 5	-	-
C	MS2	Side Lug	1-1/2 - 5	2 - 5	2 - 5
CB	MS1	Side End Angle	1-1/2 - 5	2 - 5	2 - 5
G	MS7	Side End Lug	1-1/2 - 4*	2 - 4	2 - 4
NB	N/A	Base Bar	1-1/2 - 4*	2 - 4	2 - 4
BB	MP1	Cap Fixed Clevis	1-1/2 - 5	2 - 5**	2 - 5**
BC	MP2	Cap Detachable Clevis	1-1/2 - 5	2 - 5**	2 - 5**
BE	MP4	Cap Detachable Eye	1-1/2 - 5	2 - 5**	2 - 5**
D	MT1	Head Trunnion	1-1/2 - 5*	2 - 5	2 - 5
DB	MT2	Cap Trunnion	1-1/2 - 5	2 - 5**	2 - 5**
DD	MT4	Intermediate Trunnion	1-1/2 - 5	-	-
KTEF***	MDX5/MDS4	Double Rod End, TEF Mount	1-1/2 - 5	2 - 5	2 - 5

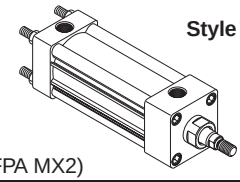
* Mounts TEF, F, G, NB and D not available for 1-1/2" bore with 1" rod.
** May interfere with mounting. Please provide clearance for Linear Position Sensor overhang (see page B99).

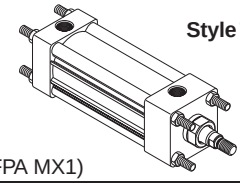
Standard Mount
Style TEF

(NFPA MX5/MS4)

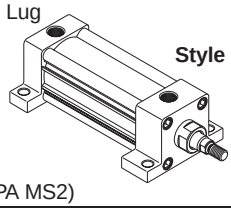
Head Rectangular Flange
Style J

(NFPA MF1)

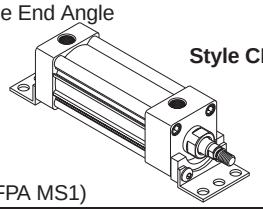
Cap Rectangular Flange
Style H

(NFPA MF2)

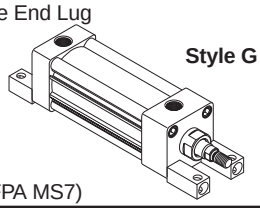
Tie Rods Ext. Head End
Style TB

(NFPA MX3)

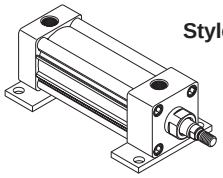
Tie Rods Ext. Cap End
Style TC

(NFPA MX2)

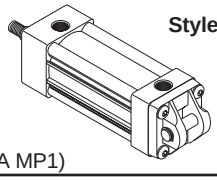
Tie Rods Ext. Both Ends
Style TD

(NFPA MX1)

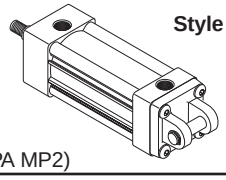
Side Lug
Style C

(NFPA MS2)

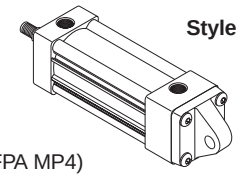
Side End Angle
Style CB

(NFPA MS1)

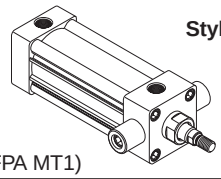
Side End Lug
Style G

(NFPA MS7)

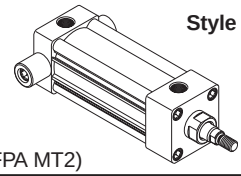
Base Bar Mount
Style NB

(NFPA MP1)

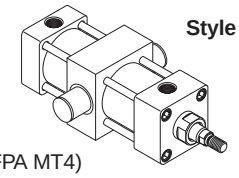
Cap Fixed Clevis
Style BB

(NFPA MP1)

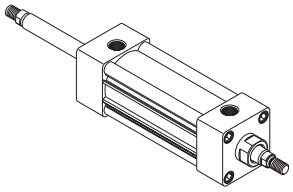
Cap Detachable Clevis
Style BC

(NFPA MP2)

Cap Detachable Eye
Style BE

(NFPA MP4)

Head Trunnion
Style D

(NFPA MT1)

Cap Trunnion
Style DB

(NFPA MT2)

Intermediate Trunnion
Style DD

(NFPA MT4)

Double Rod End
Style KTEF

(NFPA MDX0)

***Double rod end cylinders can be ordered with head mountings, i.e. KJ (see page B21).

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B

General Specifications

- NFPA interchangeable
- Bore sizes – 1-1/2", 2", 2-1/2", 3-1/4", 4" and 5"
- Strokes – available in any practical stroke length
- Rod diameters – 5/8", 1" and 1-3/8"
- Rod end styles – 4 standard, specials available
- Single rod end or double rod ends
- Cushions – optional and adjustable at either end or both ends (n/a for 4ML Hydraulic Version)
- Operating pressure – 4MA = 250 PSIG (17 Bar) maximum air service
  4ML = 400 PSIG (27 Bar) maximum hydraulic service
- Media 4MA = dry, filtered air
  4ML = filtered hydraulic oil
- Temperature range –
  -10°F to +165°F (-23°C to +74°C) with standard seals
  -10°F to +250°F (-23°C to +121°C) with fluorocarbon seals option
  -50°F to +150°F (-46°C to +66°C) with low temperature seals option
- Mounting styles – 20 standard styles
- RoHS compliant

For material options, including seals, piston rods and glands, please see Material Specifications on next page.

Cylinder Weights – 4MA/4ML Cylinders

Bore (inch)	Rod (inch)	No Mount Single Rod 4MA/4ML		No Mount Double Rod	
		Base Wt. (lbs.)	Per Inch (lbs.)	Base Wt. (lbs.)	Per Inch (lbs.)
1-1/2	0.625	1.73	0.20	2.16	0.28
2	0.625	2.40	0.21	3.05	0.30
	1.00	2.99	0.35	4.34	0.58
2-1/2	0.625	3.25	0.23	3.96	0.31
	1.00	4.06	0.37	5.74	0.60
3-1/4	1.00	6.45	0.42	7.65	0.64
	1.375	7.93	0.62	11.46	1.05
4	1.00	8.80	0.49	10.32	0.71
	1.375	10.29	0.69	14.37	1.12
5	1.00	13.20	0.61	15.84	0.84
	1.375	14.72	0.81	18.89	1.24

Mounting Weight Adders

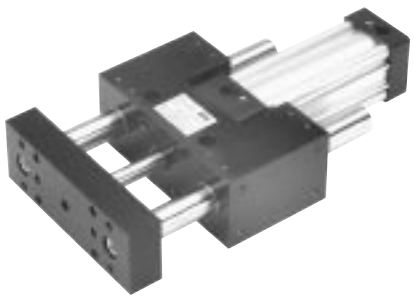
Bore (inch)	Weight (lbs) by Mounting Style							
	J, H	D, DB	BB	CB, G	DD	BE	C	BC
1-1/2	0.51	0.50	0.15	0.36	1.70	0.23	0.15	0.20
2	0.76	0.50	0.26	065	2.38	0.32	0.15	0.29
2-1/2	1.13	0.50	0.38	1.05	3.00	0.42	0.15	0.41
3-1/4	2.76	0.50	0.98	1.38	5.35	1.26	0.35	1.06
4	4.05	0.50	1.35	2.20	6.75	1.62	0.35	1.49
5	6.46	0.50	1.20	4.29	8.77	1.26	0.57	2.41

Standard Cushion Position

Mounting Code	Position
All except D, DB, DD	2
D, DB, DD	3

Standard Port Sizes

Bore	NPTF	BSPT	BSPP	SAE
1-1/2	3/8	Rc3/8	G3/8	6
2	3/8	Rc3/8	G3/8	6
2-1/2	3/8	Rc3/8	G3/8	6
3-1/4	1/2	Rc1/2	G1/2	10
4	1/2	Rc1/2	G1/2	10
5	1/2	Rc1/2	G1/2	10



For a guided version of the 4MA or 4ML Series, please see the HB Series in Section F.

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Material Specifications – Standard Temperatures and Applications

Head and cap	Black anodized aluminum alloy
Head and cap screws	Zinc plated steel alloy
Cylinder body	Clear anodized aluminum alloy
Piston rod	Case-hardened, chrome plated carbon steel
Rod seal	Carboxylated nitrile (Nitroxile)
Rod wiper	Molythane
Rod bearing (gland)	Bronze alloy
Piston	Composite (standard) Aluminum alloy (optional)
Piston seals	Carboxylated nitrile (Nitroxile)
Piston bearing	Composite (for standard piston) MolyGard™ (for aluminum piston)
Magnetic ring	Plastic-bound magnetic material
Piston fastener	Zinc plated steel alloy (for composite piston) Piston rod for aluminum piston
O-rings	Nitrile
End seals	Nitrile
Cushion seals	Urethane
Cushion needle valves	Stainless steel
Tie-rods/studs	Blackened carbon steel (some mounts)
Tie-rod nuts	Steel alloy, SAE J995 Grade 8 (some mounts)

4MA Options – Material and Part Changes

High temperatures (-10°F to +250°F)	All seals and wiper are fluorocarbon Aluminum piston only (without magnetic ring)
Low temperatures (-50°F to +150°F)	Rod seal, piston seals, o-rings and end seals are low temperature-rated nitrile Aluminum piston only

4ML Hydraulic Version – Material and Part Changes

Hydraulic service (general)	Aluminum piston only (all temperatures) Cushions and bumper piston seals not available
Hydraulic service (std temp)	Polyurethane TS-2000 rod seal and nitrile piston seals (for hydraulic use)
Hydraulic service (high temp)	Fluorocarbon TS-2000 rod seal; wiper and all seals are fluorocarbon (for hydraulic use)

Other Standard Options – Material and Part Changes

Cylinder seal options	Fluorocarbon for high temperatures or chemical compatibility Other seal options available, please consult factory
Bumper piston seal options (4MA only, n/a for 4ML)	Carboxylated nitrile (Nitroxile) for standard temperatures Fluorocarbon for high temperatures or chemical compatibility
1/4" thick bumpers option	Urethane
Piston rod material options	Case-hardened, chrome plated carbon steel (standard) 17-4 PH stainless steel, chrome plated 303 stainless steel, chrome plated (n/a for 4ML) 316 stainless steel, chrome plated (n/a for 4ML) (for stainless steel without chrome plating, please consult factory)
HI LOAD gland option	Composite bearing pressed into bronze alloy gland
Metallic rod scraper option	Dual high strength bronze wipers with PTFE (5/8" rod only) or fluorocarbon energizer

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B

How to Select a 3MA or 4MA Cylinder

Parker cylinders are available based on air or hydraulic operating pressure. The many styles, sizes and optional features available assure that your application requirements are precisely met. 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.

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 (4MA with aluminum piston only) 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. See Application Engineering section for recommendations.
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 4MA or 4ML cylinder with high temperature seals.

General Options and Modifications

3MA
- Non-Cushioned (adjustable cushions standard)
- Non-Magnetic piston (magnetic ring standard)
- Piston Bumper Seals
- Piston Bumpers (1/4" thick)
- Port Relocation (cushions will follow)
- Double Rod End
- Rod End Modifications
- Rod Materials (grades of stainless steel)
- Fluorocarbon Rod Wiper and Rod Seal only
- Mixed Mountings
- Round Tube and Tie Rod Construction
- Stainless Steel Fasteners/Tie Rods
- Par-Check unit for smooth hydraulic control
- Air Cylinder/Valve Combination (ACVB)
- Adjustable Point Sensors (order separately)
- Rod lock version (see 3MAJ)

4MA
- Adjustable Cushions
- Non-Magnetic Piston (magnetic ring standard)
- Piston Bumper Seals
- Piston Bumpers (1/4" thick)
- Port and Adjustable Cushion Relocation
- Port Thread Styles
- Multiple Ports

4MA (continued)
- Special Heads, Caps, Pistons and Mounts
- Double Rod End
- Oversize Rod Diameters
- Rod End Modifications
- Rod Materials (grades of stainless steel)
- Fluorocarbon Rod Wiper and Rod Seal only
- Fluorocarbon Seals (all cylinder seals)
- Metallic Rod Wiper
- HI LOAD Gland Assembly
- Stop Tube
- Mixed Mountings
- Round Tube and Tie Rod Construction
- Stainless Steel Fasteners/Tie Rods
- Shock Absorber on Cap End
- NuCushion Bumpers
- LECTROFLUOR® Coating
- Par-Check unit for smooth hydraulic control
- Air Cylinder/Valve Combination (ACVB)
- Adjustable Point Sensors (order separately)
- Continuous Linear Position Sensing (LPSO)
- High Temperature Service (to +250°F)
- Low Temperature Service (to -50°F)
- Hydraulic Service (4ML) (400 PSIG)
- Rod lock version (see 4MAJ)

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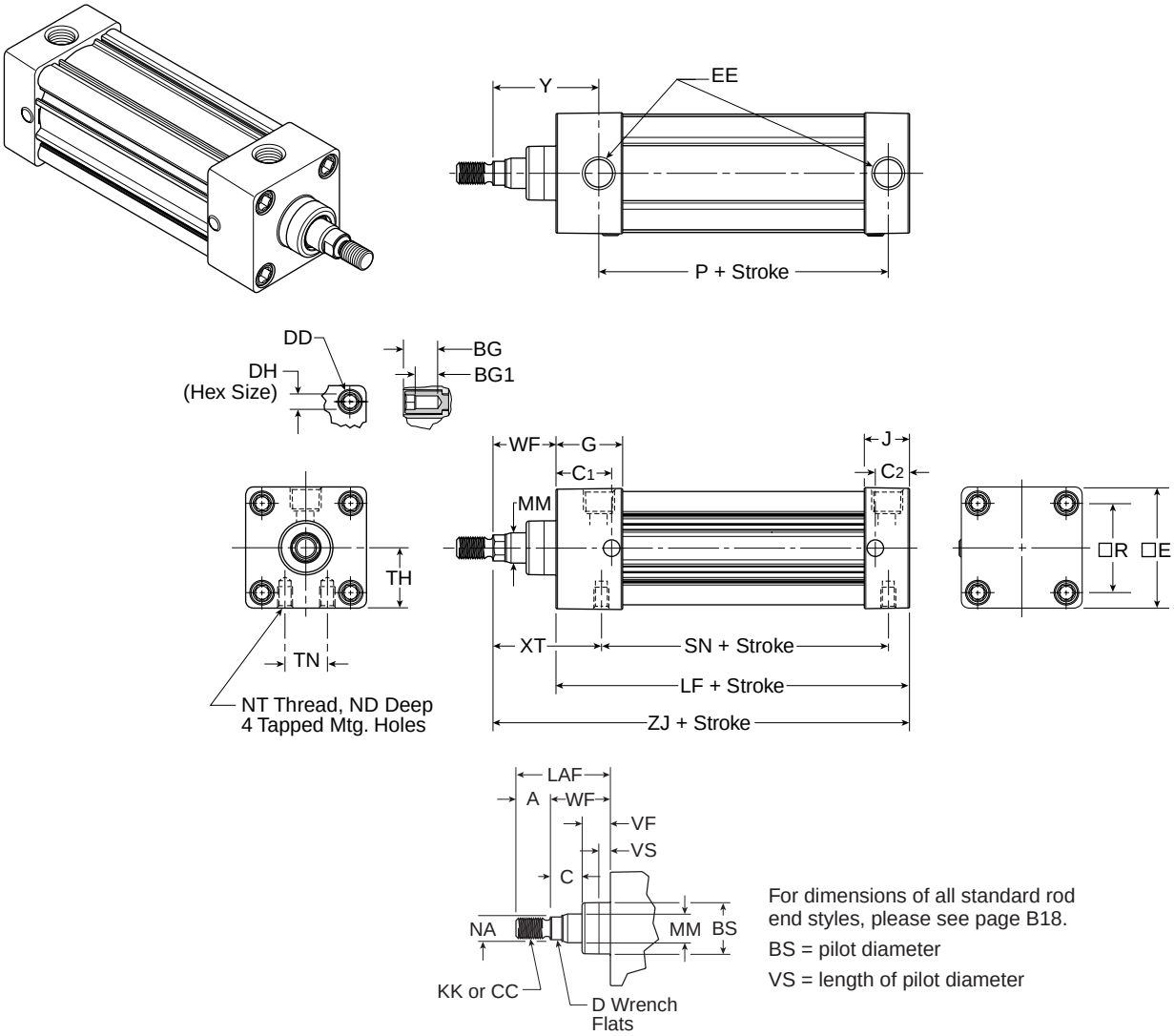
3MA Single Rod Dimensioned Drawings for 1-1/2" to 5" Bore Size (Styles TEF, T, TE and F)



For dimensions of all standard rod end styles, please see page B18.

BS = pilot diameter

VS = length of pilot diameter

3MA Cylinder Dimensions – Styles TEF, T, TE and F

Bore Size	Rod No.	Rod Dia. MM	Thread		A	AA	BG	BG1	+.000 -.004 BS	C	C1	C2	D	DD	DH	E	EE (NPTF)	G
			Style 8 CC	Style 4 & 9 KK														
1-1/2	1	5/8	1/2-20	7/16-20	0.750	2.020	0.562	0.374	1.124	0.385	1.000	0.500	1/2	1/4-28	1/4	2.000	3/8	1.438
2	1	5/8	1/2-20	7/16-20	0.750	2.600	0.562	0.362	1.124	0.385	1.148	0.711	1/2	5/16-24	5/16	2.500	3/8	1.375
2-1/2	1	5/8	1/2-20	7/16-20	0.750	3.100	0.562	0.362	1.124	0.385	1.117	0.711	1/2	5/16-24	5/16	3.000	3/8	1.344
3-1/4	1	1	7/8-14	3/4-16	1.125	3.900	0.700	0.500	1.499	0.510	1.350	0.881	7/8	3/8-24	3/8	3.750	1/2	1.594
4	1	1	7/8-14	3/4-16	1.125	4.700	0.700	0.500	1.499	0.510	1.350	0.881	7/8	3/8-24	3/8	4.500	1/2	1.594
5	1	1	7/8-14	3/4-16	1.125	5.800	0.781	0.531	1.499	0.510	1.350	0.975	7/8	1/2-20	1/2	5.500	1/2	1.594

Bore Size	Rod No.	Rod Dia. MM	J	LAF	NA	ND	NT	R	+.005 -.005 TH	TN	VF	VS	WF	XT	Y	Add Stroke			
																LF	P	SN	ZJ
1-1/2	1	5/8	0.938	1.750	0.563	0.375	1/4-20	1.430	0.993	0.625	0.615	-	1.000	1.938	1.875	3.625	2.313	2.250	4.625
2	1	5/8	0.938	1.750	0.563	0.438	5/16-18	1.840	1.243	0.875	0.615	0.250	1.000	1.938	1.875	3.625	2.313	2.250	4.625
2-1/2	1	5/8	0.938	1.750	0.563	0.625	3/8-16	2.190	1.493	1.250	0.615	0.250	1.000	1.938	1.938	3.750	2.375	2.375	4.750
3-1/4	1	1	1.125	2.500	0.938	0.750	1/2-13	2.760	1.868	1.500	0.865	0.250	1.375	2.438	2.438	4.250	2.625	2.625	5.625
4	1	1	1.125	2.500	0.938	0.750	1/2-13	3.320	2.243	2.063	0.865	0.250	1.375	2.438	2.438	4.250	2.625	2.625	5.625
5	1	1	1.219	2.500	0.938	0.938	5/8-11	4.100	2.743	2.688	0.865	0.250	1.375	2.438	2.438	4.500	2.875	2.875	5.875

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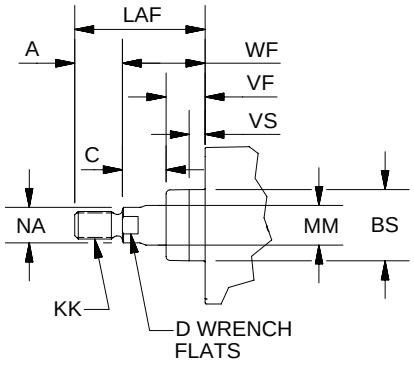
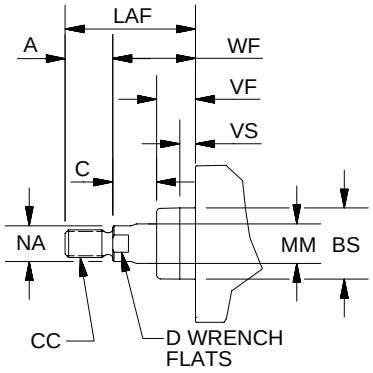
B

3MA Rod End Dimensions – 1-1/2" to 5" Bore Size

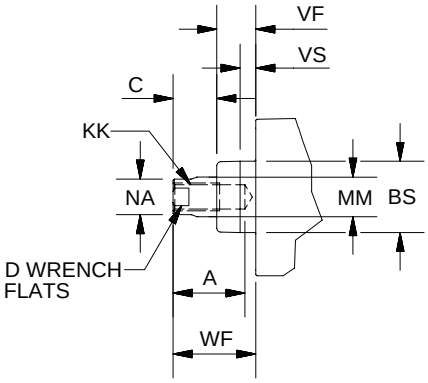
Thread Style 4
(NFPA Style SM)
Small Male



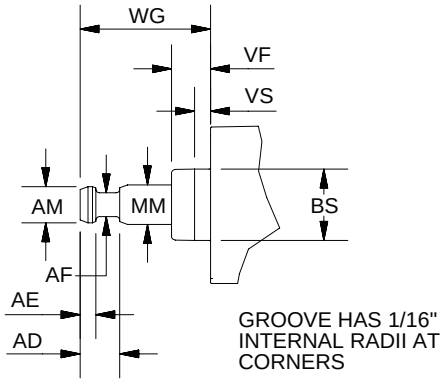
Thread Style 8
(NFPA Style IM)
Intermediate Male



Thread Style 9
(NFPA Style SF)
Short Female



Thread Style 55
For use with Split Coupler
(see page B105 for more information)



Applies to all rod ends:
BS = pilot diameter
VS = length of pilot diameter

Rod End Dimensions

Bore Size	Rod No.	Rod Dia. MM	Thread Style 8 CC	Thread Style 4 & 9 KK	A	AD	AE	AF	AM	+.000 -.004 BS	C	D	LAF	NA	VF	VS	WF	WG
1-1/2	1	5/8	1/2-20	7/16-20	0.750	0.625	0.250	0.375	0.570	1.124	0.385	1/2	1.750	0.563	0.615	-	1.000	1.750
2	1	5/8	1/2-20	7/16-20	0.750	0.625	0.250	0.375	0.570	1.124	0.385	1/2	1.750	0.563	0.615	0.250	1.000	1.750
2-1/2	1	5/8	1/2-20	7/16-20	0.750	0.625	0.250	0.375	0.570	1.124	0.385	1/2	1.750	0.563	0.615	0.250	1.000	1.750
3-1/4	1	1	7/8-14	3/4-16	1.125	0.938	0.375	0.688	0.950	1.499	0.510	7/8	2.500	0.938	0.865	0.250	1.375	2.375
4	1	1	7/8-14	3/4-16	1.125	0.938	0.375	0.688	0.950	1.499	0.510	7/8	2.500	0.938	0.865	0.250	1.375	2.375
5	1	1	7/8-14	3/4-16	1.125	0.938	0.375	0.688	0.950	1.499	0.510	7/8	2.500	0.938	0.865	0.250	1.375	2.375

Thread Style 3 - "Special Thread"

Special threads, rod extensions, rod eyes, blanks, etc. are also available.
To order, specify "Style 3" and give desired dimensions for KK or CC, A and W or WF.
If otherwise special, please supply dimensioned sketch.

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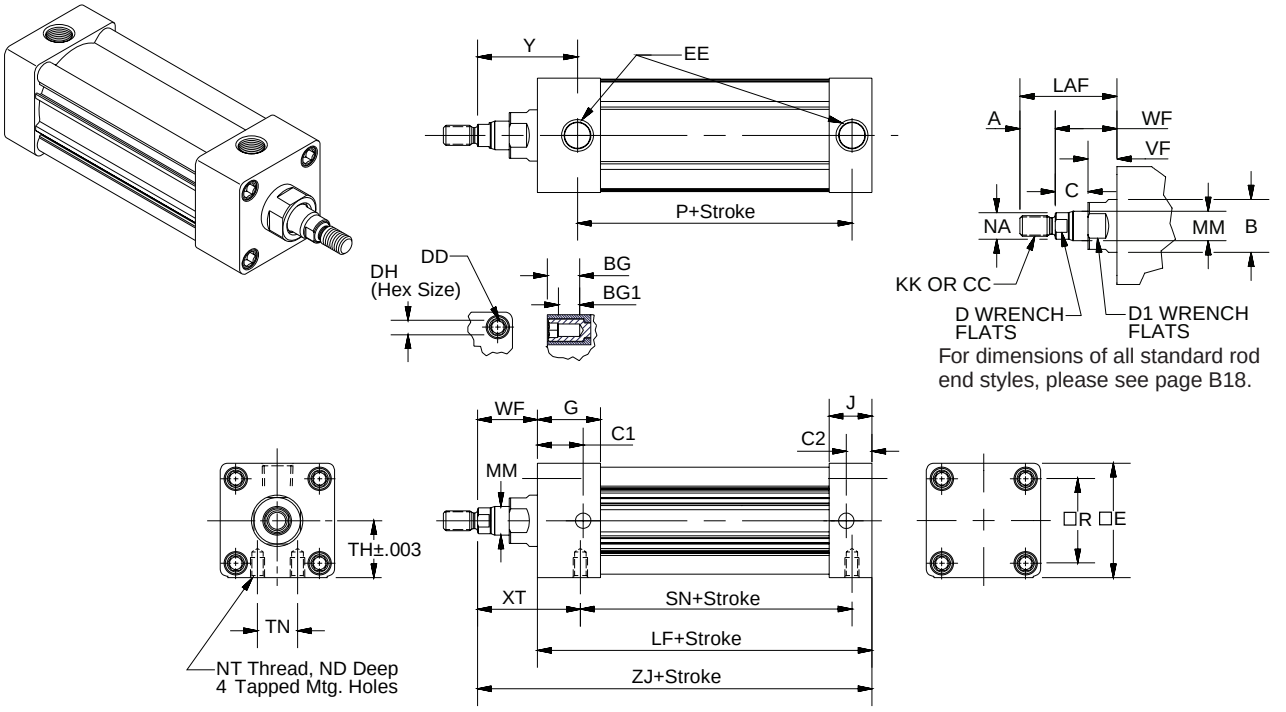
4MA Single Rod Dimensioned Drawings for 1-1/2" to 5" Bore Size (Styles TEF, T, TE and F)



For dimensions of all standard rod end styles, please see page B18.

1-1/2" bore with 1" rod is TE mount, F mount not available

1-1/2" bore with 1" rod cannot have a cushion at head end

4MA Cylinder Dimensions – Styles TEF, T, TE and F

Bore Size	Rod No.	Rod Dia. MM	Thread Style 8 CC	Thread Style 4 & 9 KK	A	AA	+.000 -.002 B	BG	BG1	C	C1	C2	D	D1	DD	DH	E	EE (NPTF)	G
1-1/2	1	5/8	1/2-20	7/16-20	0.750	2.020	1.124	0.562	0.374	0.385	1.000	0.500	1/2	1	1/4-28	1/4	2.000	3/8	1.438
	2	1	7/8-14	3/4-16	1.125	2.020	1.499	0.562	0.374	0.510	–	0.500	7/8	1-3/8	1/4-28	1/4	2.000	3/8	1.438
2	1	5/8	1/2-20	7/16-20	0.750	2.600	1.124	0.562	0.362	0.385	1.000	0.562	1/2	1	5/16-24	5/16	2.500	3/8	1.375
	3	1	7/8-14	3/4-16	1.125	2.600	1.499	0.562	0.362	0.510	1.000	0.562	7/8	1-3/8	5/16-24	5/16	2.500	3/8	1.375
2-1/2	1	5/8	1/2-20	7/16-20	0.750	3.100	1.124	0.562	0.362	0.385	1.000	0.594	1/2	1	5/16-24	5/16	3.000	3/8	1.344
	3	1	7/8-14	3/4-16	1.125	3.100	1.499	0.562	0.362	0.510	1.000	0.594	7/8	1-3/8	5/16-24	5/16	3.000	3/8	1.344
3-1/4	1	1	7/8-14	3/4-16	1.125	3.900	1.499	0.700	0.500	0.510	1.188	0.719	7/8	1-3/8	3/8-24	3/8	3.750	1/2	1.594
	3	1-3/8	1-1/4-12	1-14	1.625	3.900	1.999	0.700	0.500	0.635	1.188	0.719	1-1/8	1-7/8	3/8-24	3/8	3.750	1/2	1.594
4	1	1	7/8-14	3/4-16	1.125	4.700	1.499	0.700	0.500	0.510	1.188	0.719	7/8	1-3/8	3/8-24	3/8	4.500	1/2	1.594
	3	1-3/8	1-1/4-12	1-14	1.625	4.700	1.999	0.700	0.500	0.635	1.188	0.719	1-1/8	1-7/8	3/8-24	3/8	4.500	1/2	1.594
5	1	1	7/8-14	3/4-16	1.125	5.800	1.499	0.781	0.531	0.510	1.188	0.813	7/8	1-3/8	1/2-20	1/2	5.500	1/2	1.594
	3	1-3/8	1-1/4-12	1-14	1.625	5.800	1.999	0.781	0.531	0.635	1.188	0.813	1-1/8	1-7/8	1/2-20	1/2	5.500	1/2	1.594

Bore Size	Rod No.	Rod Dia. MM	J	LAF	NA	ND	NT	R	+.003 -.003 TH	TN	VF	WF	XT	Y	Add Stroke LF	Add Stroke P	Add Stroke SN	Add Stroke ZJ
1-1/2	1	5/8	0.938	1.750	0.563	0.375	1/4-20	1.430	0.993	0.625	0.615	1.000	1.938	1.875	3.625	2.313	2.250	4.625
	2	1	0.938	2.500	0.938	-	-	1.430	0.993	-	0.865	1.375	-	2.250	3.625	2.313	-	5.000
2	1	5/8	0.937	1.750	0.563	0.438	5/16-18	1.840	1.243	0.875	0.615	1.000	1.938	1.875	3.625	2.313	2.250	4.625
	3	1	0.937	2.500	0.938	0.375	5/16-18	1.840	1.243	0.875	0.865	1.375	2.313	2.250	3.625	2.313	2.250	5.000
2-1/2	1	5/8	0.938	1.750	0.563	0.625	3/8-16	2.190	1.493	1.250	0.615	1.000	1.938	1.938	3.750	2.375	2.375	4.750
	3	1	0.938	2.500	0.938	0.625	3/8-16	2.190	1.493	1.250	0.865	1.375	2.313	2.313	3.750	2.375	2.375	5.125
3-1/4	1	1	1.125	2.500	0.938	0.750	1/2-13	2.760	1.868	1.500	0.865	1.375	2.438	2.438	4.250	2.625	2.625	5.625
	3	1 3/8	1.125	3.250	1.313	0.750	1/2-13	2.760	1.868	1.500	0.990	1.625	2.688	2.688	4.250	2.625	2.625	5.875
4	1	1	1.125	2.500	0.938	0.750	1/2-13	3.320	2.243	2.063	0.865	1.375	2.438	2.438	4.250	2.625	2.625	5.625
	3	1-3/8	1.125	3.250	1.313	0.750	1/2-13	3.320	2.243	2.063	0.990	1.625	2.688	2.688	4.250	2.625	2.625	5.875
5	1	1	1.219	2.500	0.938	0.938	5/8-11	4.100	2.743	2.688	0.865	1.375	2.438	2.438	4.500	2.875	2.875	5.875
	3	1-3/8	1.219	3.250	1.313	0.938	5/8-11	4.100	2.743	2.688	0.990	1.625	2.688	2.688	4.500	2.875	2.875	6.125

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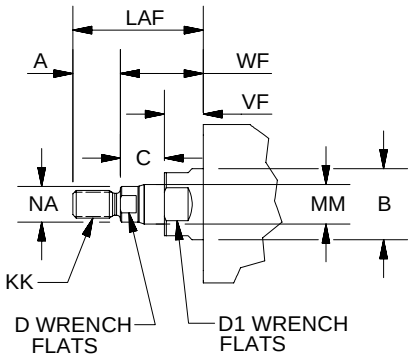
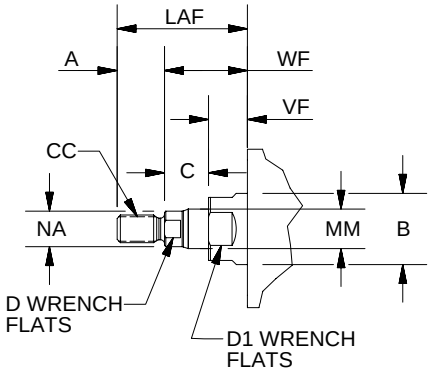
B

4MA Rod End Dimensions – 1-1/2" to 5" Bore Size

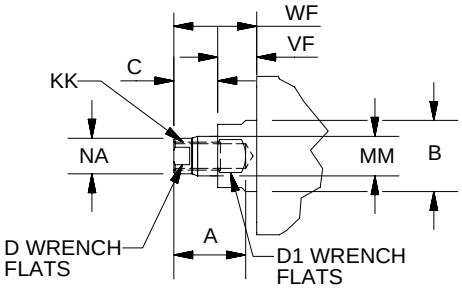
Thread Style 4
(NFPA Style SM)
Small Male



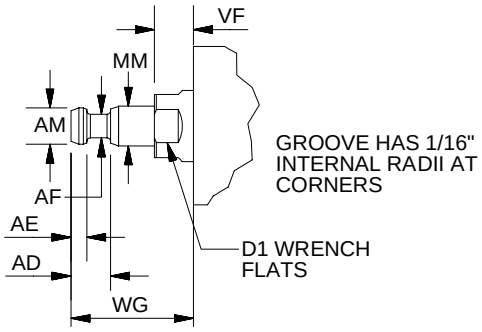
Thread Style 8
(NFPA Style IM)
Intermediate Male



Thread Style 9
(NFPA Style SF)
Short Female



Thread Style 55
For use with Split Coupler
(see page B103 for more information)



Rod End Dimensions

Bore Size	Rod No.	Rod Dia. MM	Thread Style 8 CC	Thread Style 4 & 9 KK	A	AD	AE	AF	AM	+.000 -.002 B	C	D	D1	LAF	NA	VF	WF	WG
1-1/2	1	5/8	1/2-20	7/16-20	0.750	0.625	0.250	0.375	0.570	1.124	0.385	1/2	1	1.750	0.563	0.615	1.000	1.750
	2	1	7/8-14	3/4-16	1.125	0.938	0.375	0.688	0.950	1.499	0.510	7/8	1-3/8	2.500	0.938	0.865	1.375	2.375
2	1	5/8	1/2-20	7/16-20	0.750	0.625	0.250	0.375	0.570	1.124	0.385	1/2	1	1.750	0.563	0.615	1.000	1.750
	3	1	7/8-14	3/4-16	1.125	0.938	0.375	0.688	0.950	1.499	0.510	7/8	1-3/8	2.500	0.938	0.865	1.375	2.375
2-1/2	1	5/8	1/2-20	7/16-20	0.750	0.625	0.250	0.375	0.570	1.124	0.385	1/2	1	1.750	0.563	0.615	1.000	1.750
	3	1	7/8-14	3/4-16	1.125	0.938	0.375	0.688	0.950	1.499	0.510	7/8	1-3/8	2.500	0.938	0.865	1.375	2.375
3-1/4	1	1	7/8-14	3/4-16	1.125	0.938	0.375	0.688	0.950	1.499	0.510	7/8	1-3/8	2.500	0.938	0.865	1.375	2.375
	3	1-3/8	1-1/4 - 12	1-14	1.625	1.063	0.375	0.875	1.320	1.999	0.635	1-1/8	1-7/8	3.250	1.313	0.990	1.625	2.750
4	1	1	7/8-14	3/4-16	1.125	0.938	0.375	0.688	0.950	1.499	0.510	7/8	1-3/8	2.500	0.938	0.865	1.375	2.375
	3	1-3/8	1-1/4 - 12	1-14	1.625	1.063	0.375	0.875	1.320	1.999	0.635	1-1/8	1-7/8	3.250	1.313	0.990	1.625	2.750
5	1	1	7/8-14	3/4-16	1.125	0.938	0.375	0.688	0.950	1.499	0.510	7/8	1-3/8	2.500	0.938	0.865	1.375	2.375
	3	1-3/8	1-1/4 - 12	1-14	1.625	1.063	0.375	0.875	1.320	1.999	0.635	1-1/8	1-7/8	3.250	1.313	0.990	1.625	2.750

Thread Style 3 - "Special Thread"

Special threads, rod extensions, rod eyes, blanks, etc. are also available.
To order, specify "Style 3" and give desired dimensions for KK or CC, A and W or WF.
If otherwise special, please supply dimensioned sketch.

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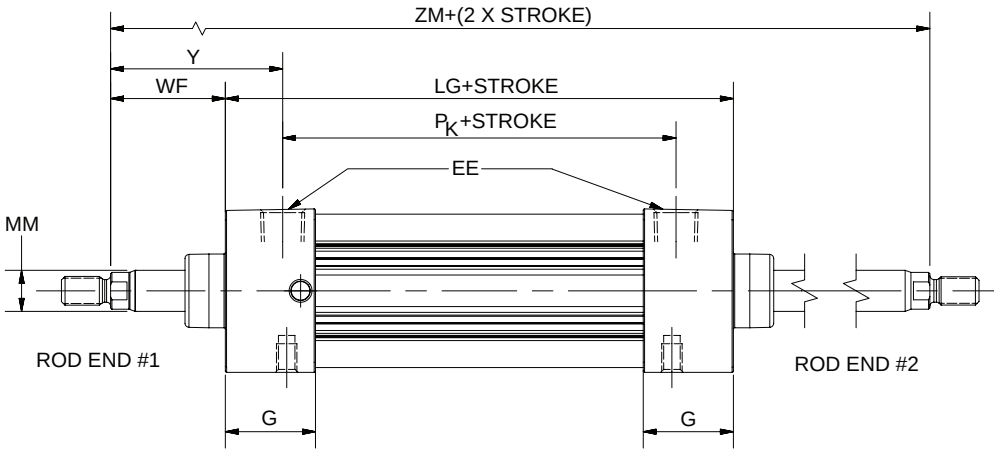
To determine dimensions for a double rod end cylinder, first refer to the desired single rod end mounting style cylinder shown in this catalog section. After selecting the necessary dimensions from that drawing, return to this page and supplement the single rod end dimensions with those shown in the drawings and dimension table below. Note that double rod end cylinders have a head dimension (G) at both ends, and that LG replaces LF, P_K replaces P, etc. The double rod end dimensions differ from, or are in addition to, those for single rod cylinders.

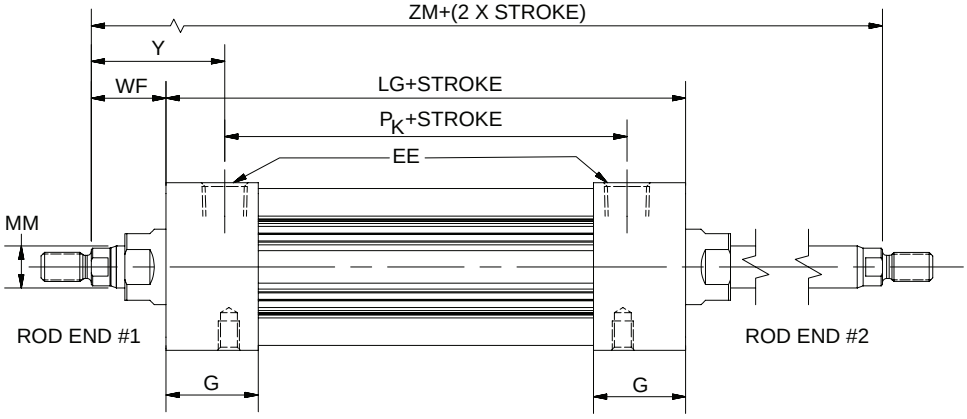
When a double rod end cylinder has two different rod ends, please clearly state which rod end is to be available at which head end.

3MA K-type for 1-1/2" to 5" Bore



Mounting Styles for Single Rod Models	Corresponding Mounting Styles for Double Rod Models
C	KC
CB	KCB
D	KD
DD	KDD
F	KF
G	KG
J	KJ
NB	KNB
T	KT
TB	KTB
TD	KTD
TE	KTE
TEF	KTEF

4MA K-type for 1-1/2" to 5" Bore



Cylinder Dimensions – K-type

Bore Size	Rod No.	Rod Dia. MM	EE (NPTF)	G	WF	Y	Add Stroke								Add 2X Stroke
							LG	PK	SAK	XAK	SSK	SNK	SEK	XEK	ZM
1-1/2	1	5/8	3/8	1.438	1.000	1.875	4.125	2.375	6.125	6.125	3.375	2.250	6.375	6.250	6.125
	2	1	3/8	1.438	1.375	2.250	4.125	2.375	6.500	6.500	3.375	–	–	–	5.760
2	1	5/8	3/8	1.438	1.000	1.875	4.125	2.375	6.125	6.125	3.375	2.250	6.750	6.438	6.125
	3	1	3/8	1.438	1.375	2.250	4.125	2.375	6.125	6.500	3.375	2.250	6.750	6.813	6.875
2-1/2	1	5/8	3/8	1.438	1.000	1.938	4.250	2.375	6.250	6.250	3.500	2.375	7.125	6.688	6.250
	3	1	3/8	1.438	1.375	2.313	4.250	2.375	6.250	6.625	3.500	2.375	7.125	7.063	7.000
3-1/4	1	1	1/2	1.688	1.375	2.438	4.750	2.625	7.250	7.375	3.750	2.625	7.750	7.625	7.500
	3	1-3/8	1/2	1.688	1.625	2.688	4.750	2.625	7.250	7.625	3.750	2.625	7.750	7.875	8.000
4	1	1	1/2	1.688	1.375	2.438	4.750	2.625	7.250	7.375	3.750	2.625	8.000	7.750	7.500
	3	1-3/8	1/2	1.688	1.625	2.688	4.750	2.625	7.250	7.625	3.750	2.625	8.000	8.000	8.000
5	1	1	1/2	1.660	1.375	2.438	4.938	2.813	7.688	7.688	3.563	2.813	–	–	7.688
	3	1-3/8	1/2	1.660	1.625	2.688	4.938	2.813	7.688	7.938	3.563	2.813	–	–	8.188
Replaces Dimension							LF	P	SA	XA	SS	SN	SE	XE	–
On Single Rod Mounting Styles							All Styles		CB		C	TEF, F	G		All

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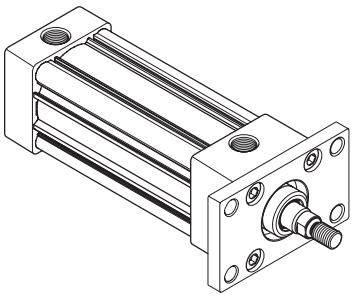
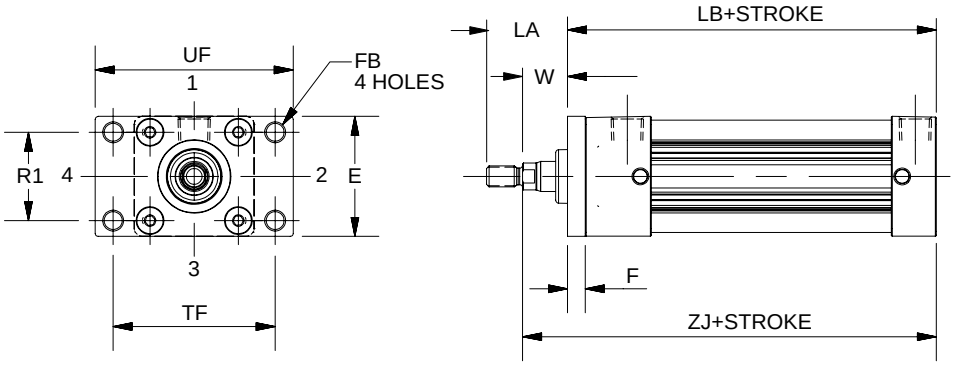
B

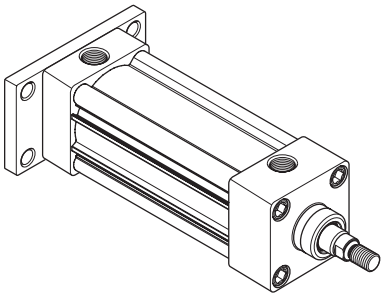
Head Rectangular Flange
Style J
(NFPA MF1)

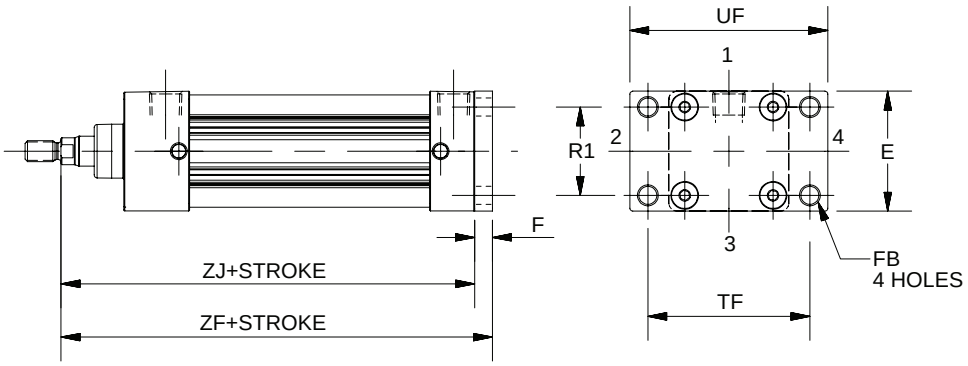




Note: Style J has a W dimension instead of WF and a LA dimension instead of LAF because of the flange installation. Please use dimensions W and LA regarding rod ends only for Style J.
For reference, WF = W + F and LA = W + A.

Cap Rectangular Flange
Style H
(NFPA MF2)





Cylinder Dimensions – Styles J and H

Bore Size	Rod No.	Rod Dia. MM	A	E	F	FB	LA	R1	TF	UF	W	Add Stroke		
												LB	ZF	ZJ
1-1/2	1	5/8	0.750	2.000	0.375	0.313	1.375	1.430	2.750	3.375	0.625	4.000	5.000	4.625
	2	1	1.125	2.000	0.375	0.313	2.125	1.430	2.750	3.375	1.000	4.000	5.375	5.000
2	1	5/8	0.750	2.500	0.375	0.375	1.375	1.840	3.375	4.125	0.625	4.000	5.000	4.625
	3	1	1.125	2.500	0.375	0.375	2.125	1.840	3.375	4.125	1.000	4.000	5.375	5.000
2-1/2	1	5/8	0.750	3.000	0.375	0.375	1.375	2.190	3.875	4.625	0.625	4.125	5.125	4.750
	3	1	1.125	3.000	0.375	0.375	2.125	2.190	3.875	4.625	1.000	4.125	5.500	5.125
3-1/4	1	1	1.125	3.750	0.625	0.438	1.875	2.760	4.688	5.500	0.750	4.875	6.250	5.625
	3	1-3/8	1.625	3.750	0.625	0.438	2.625	2.760	4.688	5.500	1.000	4.875	6.500	5.875
4	1	1	1.125	4.500	0.625	0.438	1.875	3.320	5.438	6.250	0.750	4.875	6.250	5.625
	3	1-3/8	1.625	4.500	0.625	0.438	2.625	3.320	5.438	6.250	1.000	4.875	6.500	5.875
5	1	1	1.125	5.500	0.625	0.563	1.875	4.100	6.625	7.625	0.750	5.125	6.500	5.875
	3	1-3/8	1.625	5.500	0.625	0.563	2.625	4.100	6.625	7.625	1.000	5.125	6.750	6.125

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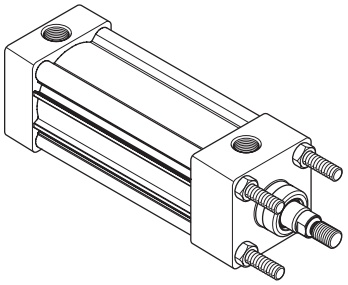
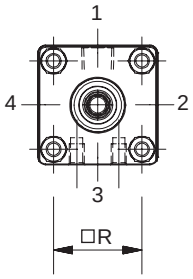
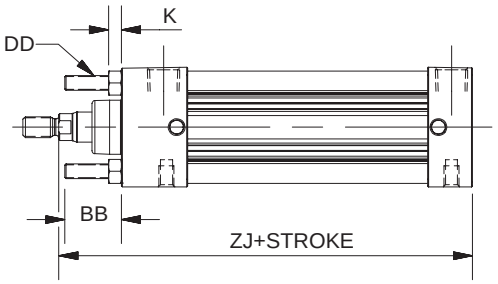
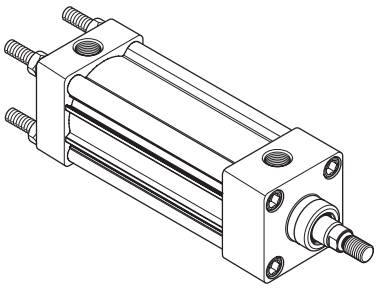
Tie Rods Ext. Head End
Style TB
(NFPA MX3)

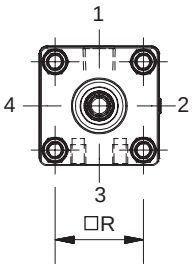


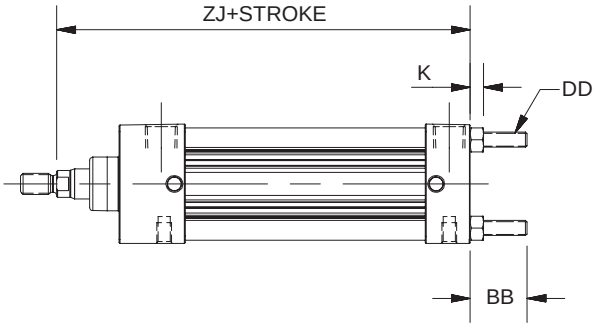




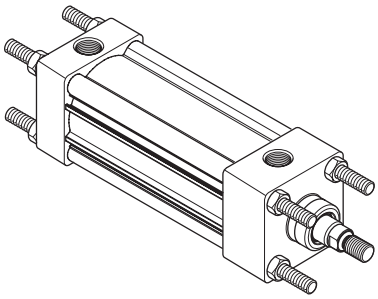
Tie Rods Ext. Cap End
Style TC
(NFPA MX2)

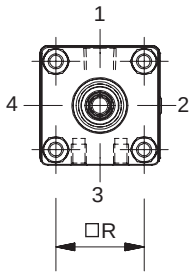


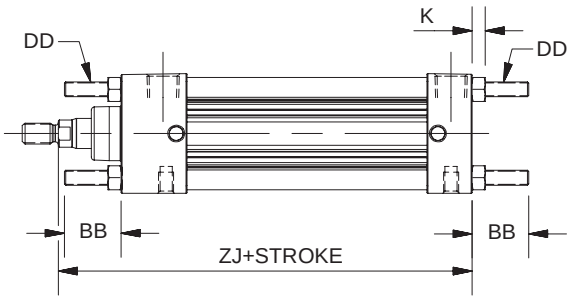




Tie Rods Ext. Both Ends
Style TD
(NFPA MX1)







Cylinder Dimensions – Styles TB, TC and TD

Bore Size	Rod No.	Rod Dia. MM	BB	DD	E	K	R	Add Stroke ZJ
1-1/2	1	5/8	1.000	1/4-28	2.000	0.250	1.430	4.625
	2	1	1.000	1/4-28	2.000	0.250	1.430	5.000
2	1	5/8	1.125	5/16-24	2.500	0.313	1.840	4.625
	3	1	1.125	5/16-24	2.500	0.313	1.840	5.000
2-1/2	1	5/8	1.125	5/16-24	3.000	0.313	2.190	4.750
	3	1	1.125	5/16-24	3.000	0.313	2.190	5.125
3-1/4	3	1	1.125	5/16-24	3.000	0.313	2.190	5.125
	3	1-3/8	1.375	3/8-24	3.750	0.375	2.760	5.875
4	1	1	1.375	3/8-24	4.500	0.375	3.320	5.625
	3	1-3/8	1.375	3/8-24	4.500	0.375	3.320	5.875
5	1	1	1.813	1/2-20	5.500	0.438	4.100	5.875
	3	1-3/8	1.813	1/2-20	5.500	0.438	4.100	6.125

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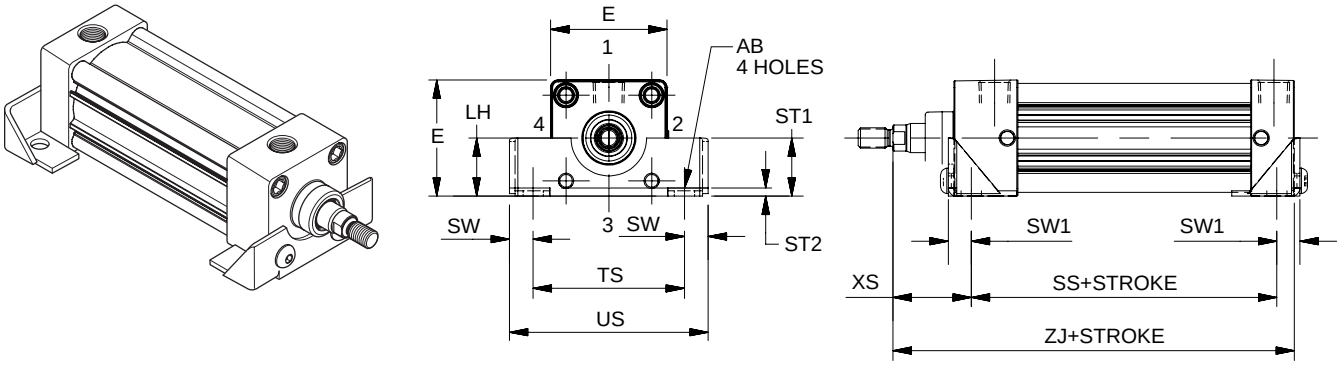
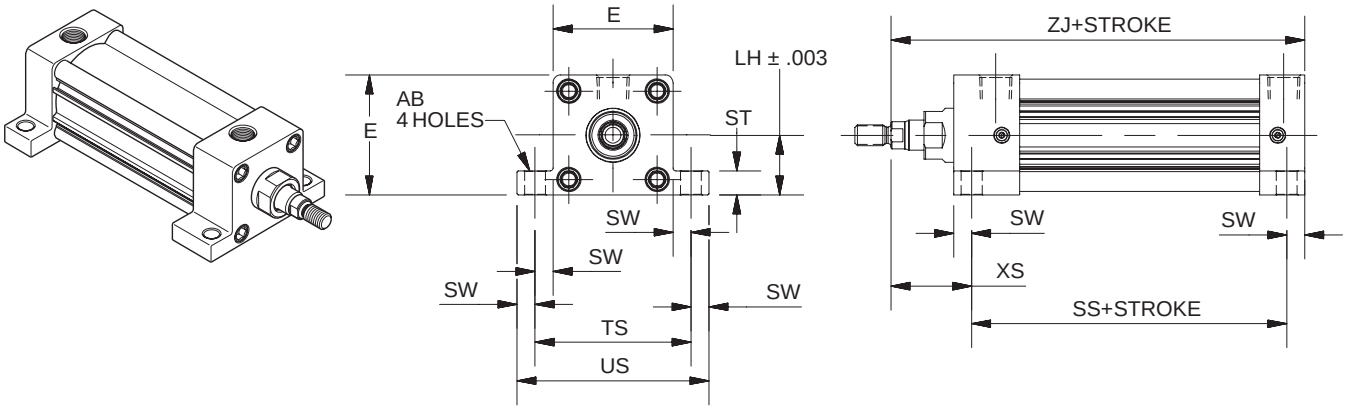
Side Lug
Style C for 3MA
(NFPA MS2)



Side Lug
Style C for 4MA/4ML
(NFPA MS2)



Cylinder Dimensions – Style C

Bore Size	Rod No.	Rod Dia. MM	AB	E	LH	ST	ST1	ST2	SW	SW1	TS	US	XS	Add Stroke	
														SS	ZJ
1-1/2	1	5/8	0.438	2.000	0.993	0.500	1.000	0.120	0.375	0.495	2.750	3.500	1.375	2.875	4.625
	2	1	0.438	2.000	0.993	0.500	1.000	0.120	0.375	0.495	2.750	3.500	1.750	2.875	5.000
2	1	5/8	0.438	2.500	1.243	0.500	1.250	0.120	0.375	0.495	3.250	4.000	1.375	2.875	4.625
	3	1	0.438	2.500	1.243	0.500	1.250	0.120	0.375	0.495	3.250	4.000	1.750	2.875	5.000
2-1/2	1	5/8	0.438	3.000	1.493	0.500	1.343	0.120	0.375	0.495	3.750	4.500	1.375	3.000	4.750
	3	1	0.438	3.000	1.493	0.500	1.343	0.120	0.375	0.495	3.750	4.500	1.750	3.000	5.125
3-1/4	1	1	0.563	3.750	1.868	0.750	1.500	0.188	0.500	0.688	4.750	5.750	1.875	3.250	5.625
	3	1-3/8	0.563	3.750	1.868	0.750	1.500	0.188	0.500	0.688	4.750	5.750	2.125	3.250	5.875
4	1	1	0.563	4.500	2.243	0.750	1.500	0.188	0.500	0.688	5.500	6.500	1.875	3.250	5.625
	3	1-3/8	0.563	4.500	2.243	0.750	1.500	0.188	0.500	0.688	5.500	6.500	2.125	3.250	5.875
5	1	1	0.813	5.500	2.743	1.000	1.500	0.250	0.688	0.938	6.875	8.250	2.063	3.125	5.875
	3	1-3/8	0.813	5.500	2.743	1.000	1.500	0.250	0.688	0.938	6.875	8.250	2.313	3.125	6.125

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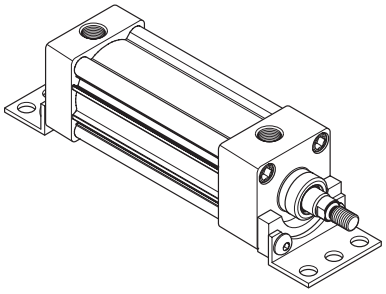
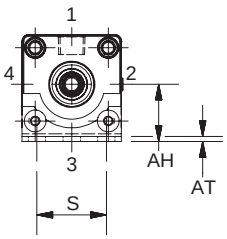
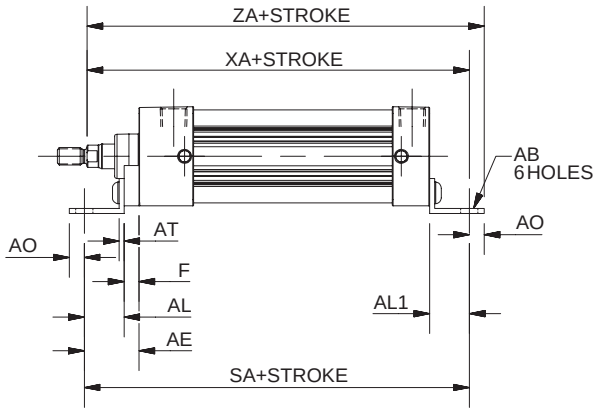
Side End Angle*
Style CB
(NFPA MS1)







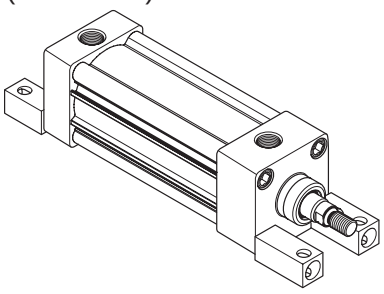
NOTE: DIM "S" IS FOR THE HOLES IN THE MOUNT
(NOT THE SCREW TO SCREW DIM)

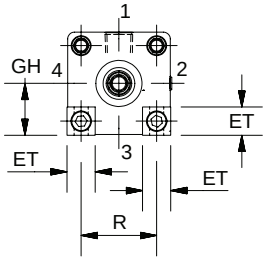
*Maximum recommended pressure for this mount is 150 PSIG

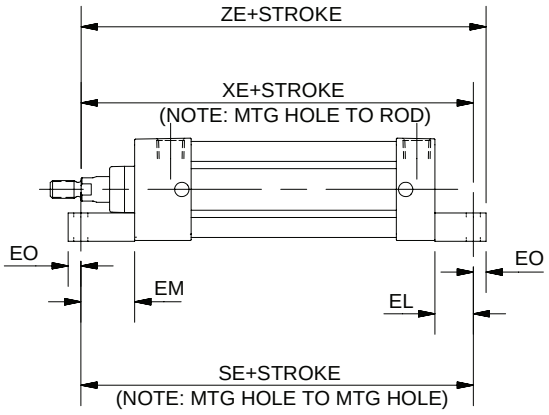
Cylinder Dimensions – Style CB

Bore Size	Rod No.	Rod Dia. MM	AB	AE	AH	AL	AL1	AO	AT	E	F	S	Add Stroke SA	XA	ZA
1-1/2	1	5/8	0.438	1.375	1.188	1.000	1.000	0.375	0.125	2.000	0.375	1.250	6.000	5.625	6.000
	2	1	0.438	1.375	1.188	1.000	1.000	0.375	0.125	2.000	0.375	1.250	6.000	6.000	6.375
2	1	5/8	0.438	1.375	1.438	1.000	1.000	0.375	0.125	2.500	0.375	1.750	6.000	5.625	6.000
	3	1	0.438	1.375	1.438	1.000	1.000	0.375	0.125	2.500	0.375	1.750	6.000	6.000	6.375
2-1/2	1	5/8	0.438	1.375	1.625	1.000	1.000	0.375	0.125	3.000	0.375	2.250	6.125	5.750	6.125
	3	1	0.438	1.375	1.625	1.000	1.000	0.375	0.125	3.000	0.375	2.250	6.125	6.125	6.500
3-1/4	1	1	0.563	1.875	1.938	1.250	1.250	0.500	0.125	3.750	0.625	2.750	7.375	6.875	7.375
	3	1-3/8	0.563	1.875	1.938	1.250	1.250	0.500	0.125	3.750	0.625	2.750	7.375	7.125	7.625
4	1	1	0.563	-	2.250	1.875	1.250	0.500	0.125	4.500	-	3.500	7.375	6.875	7.375
	3	1-3/8	0.563	-	2.250	1.875	1.250	0.500	0.125	4.500	-	3.500	7.375	7.125	7.625
5	1	1	0.688	2.000	2.750	1.375	-	0.625	0.188	5.500	0.625	4.250	7.875	7.250	7.875
	3	1-3/8	0.688	2.000	2.750	1.375	-	0.625	0.188	5.500	0.625	4.250	7.875	7.500	8.125

Side End Lug
Style G
(NFPA MS7)







Cylinder Dimensions – Style G

Bore Size	Rod No.	Rod Dia. MM	E	EB	EL	EM	EO	ET	GH	R	Add Stroke SE	XE	ZE
1-1/2	1	5/8	2.000	0.281	0.750	1.125	0.250	0.563	0.993	1.430	5.500	5.375	5.625
	2	1	-	-	-	-	-	-	-	-	-	-	-
2	1	5/8	2.500	0.344	0.938	1.313	0.313	0.688	1.243	1.840	5.875	5.563	5.875
	3	1	2.500	0.344	0.938	1.313	0.313	0.688	1.243	1.840	5.875	5.938	6.250
2-1/2	1	5/8	3.000	0.344	1.063	1.438	0.313	0.813	1.493	2.190	6.250	5.813	6.125
	3	1	3.000	0.344	1.063	1.438	0.313	0.813	1.493	2.190	6.250	6.188	6.500
3-1/4	1	1	3.750	0.406	0.875	1.500	0.375	1.000	1.868	2.760	6.625	6.500	6.875
	3	1-3/8	3.750	0.406	0.875	1.500	0.375	1.000	1.868	2.760	6.625	6.750	7.125
4	1	1	4.500	0.406	1.000	1.625	0.375	1.188	2.243	3.320	6.875	6.625	7.000
	3	1-3/8	4.500	0.406	1.000	1.625	0.375	1.188	2.243	3.320	6.875	6.875	7.250

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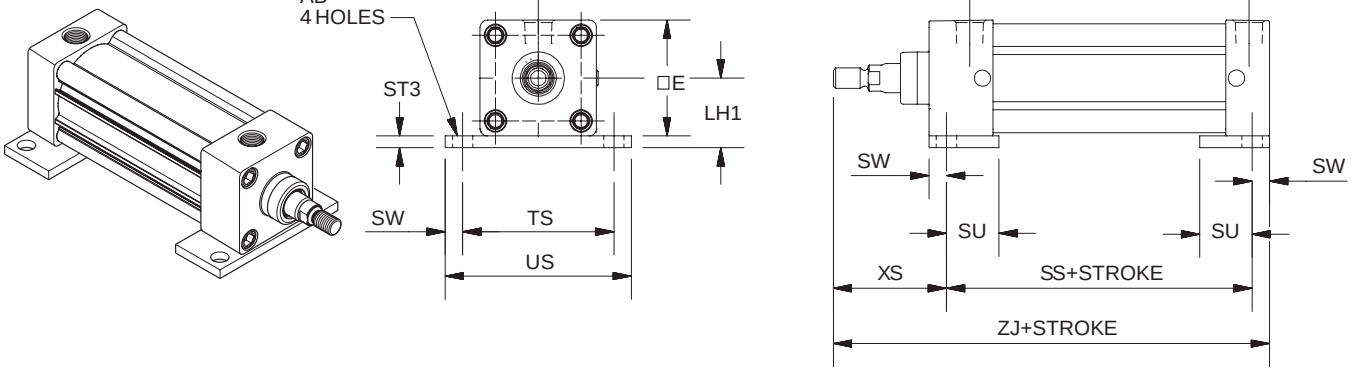
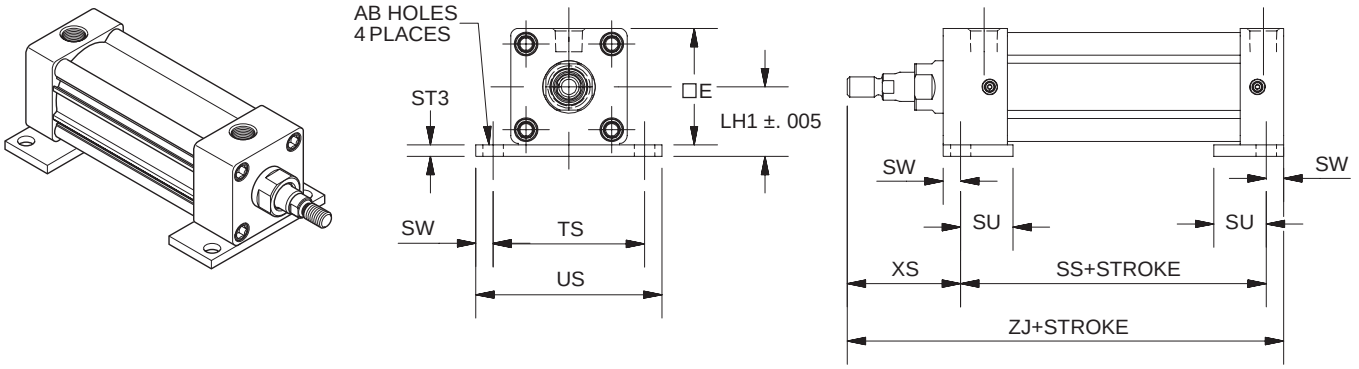
B

Base Bar Mount
Style NB for 3MA



Base Bar Mount
Style NB for 4MA



Note: Fasteners for NB base bar mount have been applied with removable threadlocking compound and torqued to bottom of endcaps.

Cylinder Dimensions – Style NB

Bore Size	Rod No.	Rod Dia. MM	AB	E	LH1	ST3	SU	SW	TS	US	XS	Add Stroke	
												SS	ZJ
1-1/2	1	5/8	0.438	2.000	1.243	0.250	1.125	0.375	2.750	3.500	1.375	2.875	4.625
	2	1	-	-	-	-	-	-	-	-	-	-	-
2	1	5/8	0.438	2.500	1.493	0.250	1.125	0.375	3.250	4.000	1.375	2.875	4.625
	3	1	0.438	2.500	1.493	0.250	1.125	0.375	3.250	4.000	1.750	2.875	5.000
2-1/2	1	5/8	0.438	3.000	1.868	0.375	1.125	0.375	3.750	4.500	1.375	3.000	4.750
	3	1	0.438	3.000	1.868	0.375	1.125	0.375	3.750	4.500	1.750	3.000	5.125
3-1/4	1	1	0.563	3.750	2.368	0.500	1.250	0.500	4.750	5.750	1.875	3.250	5.625
	3	1-3/8	0.563	3.750	2.368	0.500	1.250	0.500	4.750	5.750	2.125	3.250	5.875
4	1	1	0.563	4.500	2.743	0.500	1.250	0.500	5.500	6.500	1.875	3.250	5.625
	3	1-3/8	0.563	4.500	2.743	0.500	1.250	0.500	5.500	6.500	2.125	3.250	5.875

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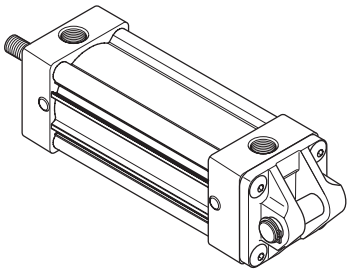
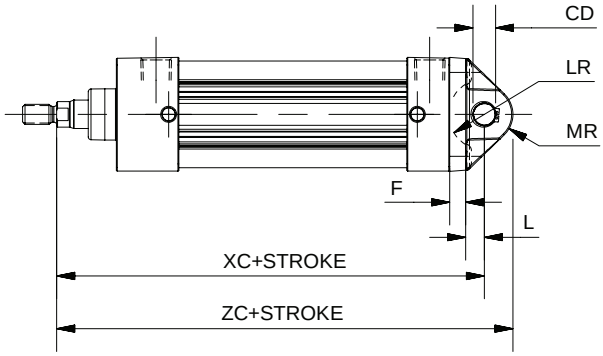
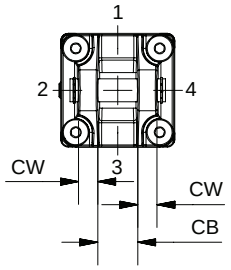
Cap Fixed Clevis
Style BB
(NFPA MP1)

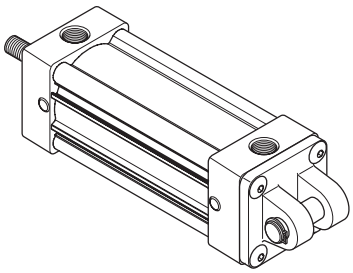


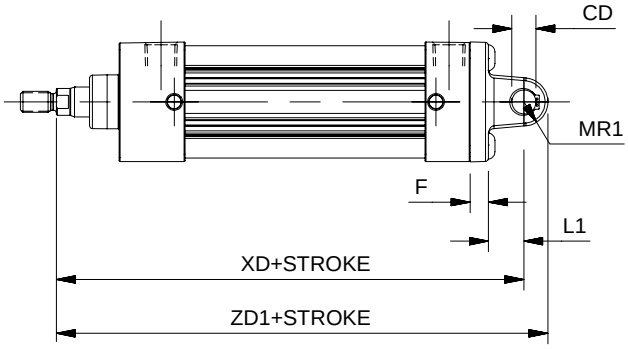
Note: For maximum swivel angle of BB mount with rear mounting plate, see Cylinder Accessories on page B108.

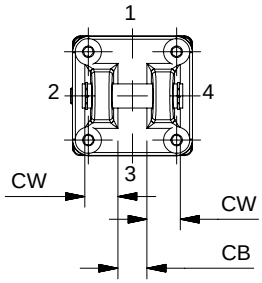




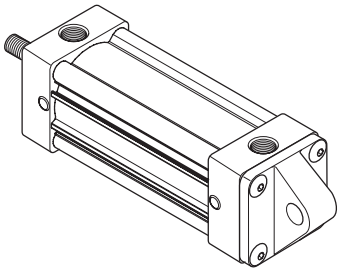
Cap Detachable Clevis
Style BC
(NFPA MP2)

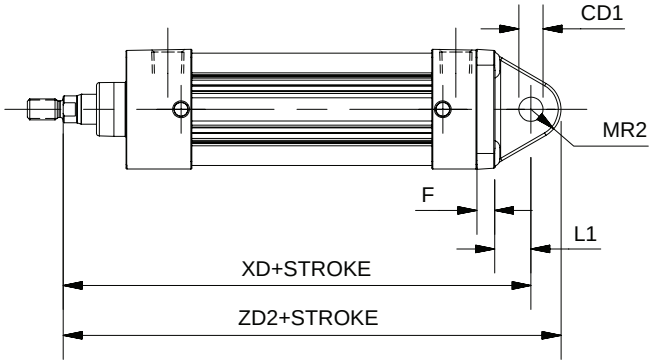


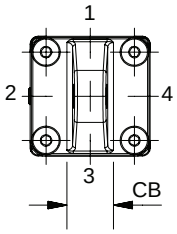




Cap Detachable Eye*
Style BE
(NFPA MP4)







*Not available for 5" bore 3MA, please specify 4MA

Cylinder Dimensions – Styles BB, BC and BE

Bore Size	Rod No.	Rod Dia. MM	CB	+.000 -.002 CD	+.002 +.004 CD1	CW	E	F	L	LR	L1	MR	MR1	MR2	Add Stroke XC	XD	ZC	ZD1	ZD2
1-1/2	1	5/8	0.750	0.501	0.500	0.500	2.000	0.375	0.375	0.750	0.750	0.625	0.500	0.625	5.375	5.750	6.000	6.250	6.375
	2	1	0.750	0.501	0.500	0.500	2.000	0.375	0.375	0.750	0.750	0.625	0.500	0.625	5.750	6.125	6.375	6.625	6.750
2	1	5/8	0.750	0.501	0.500	0.500	2.500	0.375	0.375	0.750	0.750	0.625	0.500	0.625	5.375	5.750	6.000	6.250	6.375
	3	1	0.750	0.501	0.500	0.500	2.500	0.375	0.375	0.750	0.750	0.625	0.500	0.625	5.750	6.125	6.375	6.625	6.750
2-1/2	1	5/8	0.750	0.501	0.500	0.500	3.000	0.375	0.375	0.750	0.750	0.625	0.500	0.688	5.500	5.875	6.125	6.375	6.563
	3	1	0.750	0.501	0.500	0.500	3.000	0.375	0.375	0.750	0.750	0.625	0.500	0.688	5.875	6.250	6.500	6.750	6.313
3-1/4	1	1	1.250	0.751	0.750	0.625	3.750	0.625	0.625	1.000	1.250	0.938	0.750	0.875	6.875	7.500	7.813	8.250	8.375
	3	1-3/8	1.250	0.751	0.750	0.625	3.750	0.625	0.625	1.000	1.250	0.938	0.750	0.875	7.125	7.750	8.063	8.500	8.625
4	1	1	1.250	0.751	0.750	0.625	4.500	0.625	0.625	1.000	1.250	0.938	0.750	0.875	6.875	7.500	7.813	8.250	8.375
	3	1-3/8	1.250	0.751	0.750	0.625	4.500	0.625	0.625	1.000	1.250	0.938	0.750	0.875	7.125	7.750	8.063	8.500	8.625
5	1	1	1.250	0.751	0.750	0.625	5.500	0.625	0.625	1.000	1.250	0.938	0.750	0.875	7.125	7.750	8.063	8.500	8.625
	3	1-3/8	1.250	0.751	0.750	0.625	5.500	0.625	0.625	1.000	1.250	0.938	0.750	0.875	7.375	8.000	8.313	8.750	8.875

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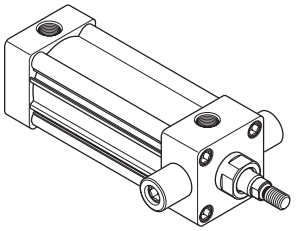
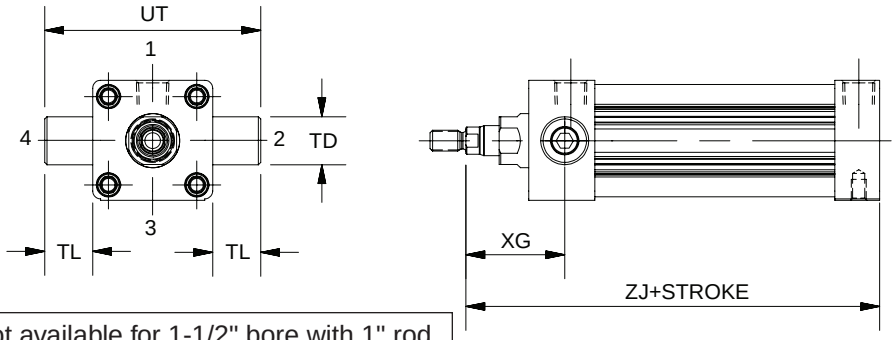
B

Head Trunnion*

Style D (only for 4MA/4ML)
(NFPA MT1)

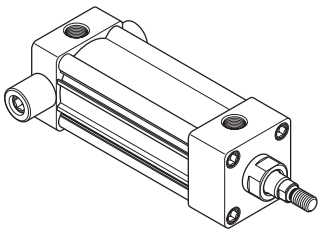


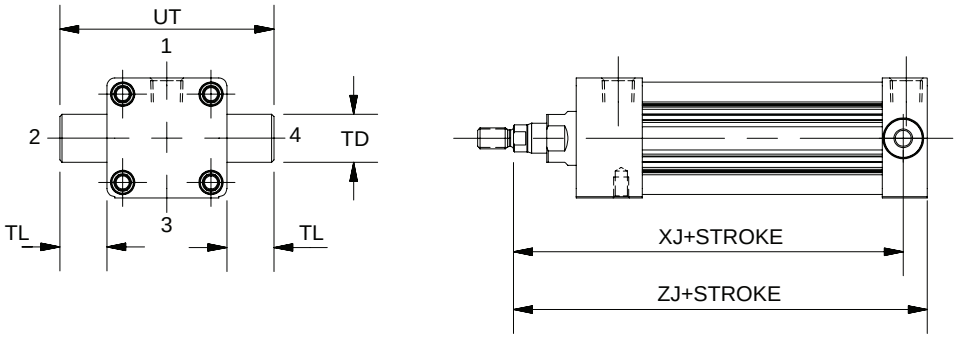


*Not available for 1-1/2" bore with 1" rod

Cap Trunnion

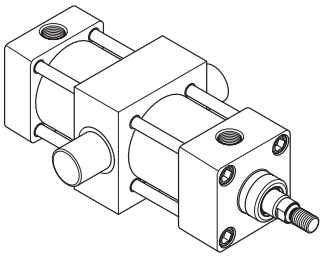
Style DB (only for 4MA/4ML)
(NFPA MT2)

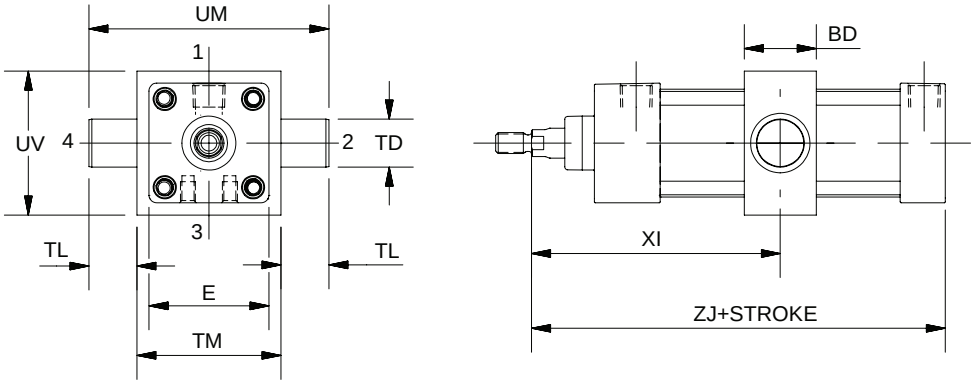




Intermediate Trunnion

Style DD
(NFPA MT4)





Cylinder Dimensions – Styles D, DB and D

Note: Tie rod nuts for Style DD have a slot instead of internal hex.

Bore Size	Rod No.	Rod Dia. MM	E	BD	+.000 -.001 TD	TL	TM	UM	UT	UV	XG	Min. XI	Add Stroke XJ	Add Stroke ZJ
1-1/2	1	5/8	2.000	1.250	1.000	1.000	2.500	4.500	4.000	2.500	1.750	3.125	4.125	4.625
	2	1	2.000	1.250	1.000	1.000	2.500	4.500	4.000	2.500	-	3.500	4.250	5.000
2	1	5/8	2.500	1.500	1.000	1.000	3.000	5.000	4.500	3.000	1.750	3.250	4.125	4.625
	3	1	2.500	1.500	1.000	1.000	3.000	5.000	4.500	3.000	2.125	3.625	4.500	5.000
2-1/2	1	5/8	3.000	1.500	1.000	1.000	3.500	5.500	5.000	3.500	1.750	3.250	4.250	4.750
	3	1	3.000	1.500	1.000	1.000	3.500	5.500	5.000	3.500	2.125	3.625	4.625	5.125
3-1/4	1	1	3.750	2.000	1.000	1.000	4.500	6.500	5.750	4.250	2.250	4.125	5.000	5.625
	3	1-3/8	3.750	2.000	1.000	1.000	4.500	6.500	5.750	4.250	2.500	4.375	5.250	5.875
4	1	1	4.500	2.000	1.000	1.000	5.250	7.250	6.500	5.000	2.250	4.125	5.000	5.625
	3	1-3/8	4.500	2.000	1.000	1.000	5.250	7.250	6.500	5.000	2.500	4.375	5.250	5.875
5	1	1	5.500	2.000	1.000	1.000	6.250	8.250	7.500	6.000	2.250	4.063	5.250	5.875
	3	1-3/8	5.500	2.000	1.000	1.000	6.250	8.250	7.500	6.000	2.500	4.313	5.500	6.125

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Piston Seals (hidden)
Carboxylated nitrile rounded-lip piston seals combine low friction with leak-free service and long service life.

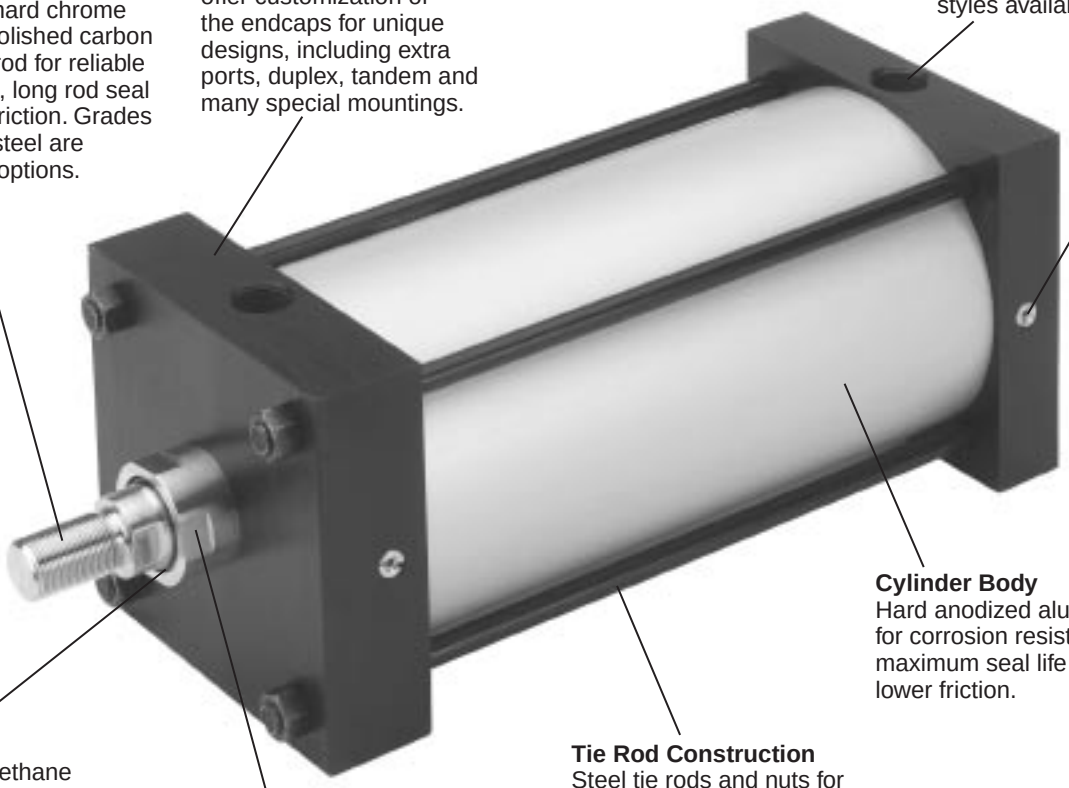
Piston Assembly (hidden)
Aluminum piston with wear band increases service life and eliminates metal-to-metal contact. Optional magnetic piston ring for use with a variety of sensors. Anaerobic adhesive is used to permanently lock and seal the piston to the rod.

Heads and Caps
High-strength aluminum heads and caps are anodized for corrosion resistance. We can offer customization of the endcaps for unique designs, including extra ports, duplex, tandem and many special mountings.

Piston Rod
Standard case-hardened (50-64 Rc), hard chrome plated and polished carbon steel piston rod for reliable performance, long rod seal life and low friction. Grades of stainless steel are available as options.

Ports
NPTF ports are standard. Other port styles available.

Adjustable Cushions Available



Cylinder Body
Hard anodized aluminum for corrosion resistance, maximum seal life and lower friction.

Rod Wiper
Outboard urethane rod wiper protects the cylinder by removing external debris and adherents from the piston rod during the entire stroke.

Rod Gland/Bearing
Threaded bronze rod gland is externally removable, without cylinder disassembly, for easy maintenance. Machined flats permit the use of common tools for removal and installation. Options include HI LOAD design for side load conditions and metallic wiper design for extremely tough rod contaminant/adherent applications.

Rod Seal (hidden)
Carboxylated nitrile rounded-lip rod seal combines low friction with leak-free service and long service life.

Tie Rod Construction
Steel tie rods and nuts for heavy-duty use. Stainless steel is available as an option.

For a complete list of 4MA options, please see pages B30 and B34.

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B

How to Order 4MA Series Cylinders for 6" and 8" Bore

4MA cylinders can be specified by model number by using the table below.

6.00			J	4MA		U			1	4		A		12.000

Bore Size
6.00
8.00

Double Rod Cylinder
Specify "K" only if double rod cylinder is required.

Mounting Style
Specify mounting style code (see table on following page).

Series
4MA Air service
4ML Hydraulic service

Ports
U NPTF
R BSPP
B BSPT
T SAE

Piston Rod Number
Specify rod code number for required diameter.[5]

Stroke Length
Specify stroke length required in inches.[8]

Cushion Cap End
Blank Non-cushioned cap end
C Cushioned cap end (not available for 4ML)

Cushion Head End
Blank Non-cushioned head end
C Cushioned head end (not available for 4ML)

Seals
Blank Standard (nitrile seals)
V Fluorocarbon seals[1]
E Fluorocarbon rod wiper and rod seal only[2]
4 Low temperature seals[1]
M Metallic rod wiper, nitrile seals[3]

Piston Rod Thread Type
A Standard (UNF Unified Thread)
W BSF British Fine
M Metric (see page B106)

Piston Type
Blank Standard (lipseals, no magnetic ring)
3 Lipseals and magnetic ring

Special Modification
Specify "S" only for special modification other than rod end, and then describe modification in item notes. (Includes 4MA with Linear Position Sensor Option)[4]

Rod Material and Gland Code
Blank Standard rod and gland
H Standard rod and HI LOAD gland
Y 17-4 PH stainless steel rod and standard gland
Z 17-4 PH stainless steel rod and HI LOAD gland
J 303 stainless steel rod and standard gland[7]
K 303 stainless steel rod and HI LOAD gland[7]
S 316 stainless steel rod and standard gland[7]
T 316 stainless steel rod and HI LOAD gland[7]

Piston Rod Thread Style
4 Small male
8 Intermediate male
9 Short female
55 For use with Split Coupler[6]
3 Special (and specify all dimensions required)

[1] Reed and solid-state sensors only available with standard seals or options E and M.

[2] Used for external chemical compatibility applications, not high temperature.

[3] If fluorocarbon seals are required with this option, please place an "S" for special in the Special Modification field and specify the "fluorocarbon seals and metallic rod wiper" in the item notes.

[4] For Linear Position Sensor Option (LPSO), please include the following information for the Special Modification item notes:

a. Sensor part number (see pages B100-B104)

b. Sensor position

c. Port position (if other than position 1)

d. Length of stop tubing, gross stroke and net stroke (if required)

Also, Piston Type 3 is required.

[5] Review Piston Rod Selection Chart on page B136 to determine proper piston rod diameter.

[6] For additional information regarding this style, refer to page B105. If non-standard Rod Material and Gland Code is required with this option, please place an "S" for special in Special Modification field and specify Rod Material and Gland Code in the item notes.

[7] Not available for 4ML.

[8] If a stop tube is required, specify gross stroke (net stroke + stop tube) in the model number, then place an "S" for special in the Special Modification field and specify the stop tube length in the item notes.

How to order 6"-8" Bore 4MA/4ML Series cylinders with sensors:

Sensors must be ordered separately and are not mounted to the cylinder prior to shipment.

1. Cylinder model number must have Piston Type 3.
2. Please refer to pages B111-B118 for sensor part numbers and specifications. Global, NAMUR and Weld Immune Sensors will fit the 6"-8" Bore 4MA/4ML Series.
3. Tie rod bracket P8S-TMA0X will be required for Global Sensors. Please refer to page B117 for more information.

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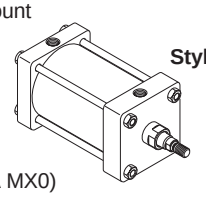
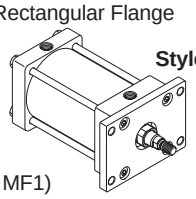
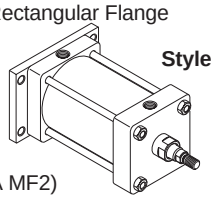
4MA Series Mounting Styles – 6" and 8" Bore

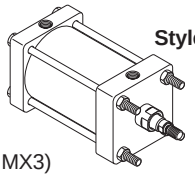
Mounting Code	NFPA Mounting Style	Description	Available Bore Sizes		
			4MA/4ML	4MA/4ML-LPSO w/o Stop Tube	4MA/4ML-LPSO w/Stop Tube
T	MX0	No Mount	6 - 8	6 - 8	6 - 8
J	MF1	Head Rectangular Flange	6	6*	6
H	MF2	Cap Rectangular Flange	6	6*	6*
TB	MX3	Tie Rods Extended Head End	6 - 8	-	6 - 8
TC	MX2	Tie Rods Extended Cap End	6 - 8	-	-
TD	MX1	Tie Rods Extended Both Ends	6 - 8	-	-
TE	MX5	Sleeve Nut	6 - 8	6 - 8	6 - 8
TEF	MX5/MS4	Sleeve Nut with Side Tap	6 - 8	6 - 8	6 - 8
C	MS2	Side Lug	6 - 8	6 - 8	6 - 8
F	MS4	Side Tap	6 - 8	6 - 8	6 - 8
CB	MS1	Side End Angle	6 - 8	6 - 8	6 - 8
BB	MP1	Cap Fixed Clevis	6 - 8	6 - 8*	6 - 8*
BC	MP2	Cap Detachable Clevis	6 - 8	6 - 8*	6 - 8*
BE	MP4	Cap Detachable Eye	6	6*	6*
D	MT1	Head Trunnion	6 - 8	6 - 8	6 - 8
DB	MT2	Cap Trunnion	6 - 8	6 - 8*	6 - 8*
DD	MT4	Intermediate Trunnion	6 - 8	-	-
JB	ME3	Head Square	8	-	8
HB	ME4	Cap Square	8	-	-
KT**	MDX0	Double Rod End, No Mount	6 - 8	6 - 8	6 - 8

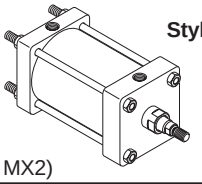
* May interfere with mounting. Please provide clearance for Linear Position Sensor overhang (see page B99).
** Double rod end cylinders can be ordered with head mountings, i.e. KJ (see page B35).

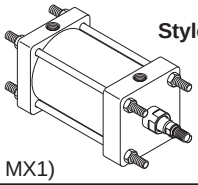
No Mount
Style T

(NFPA MX0)

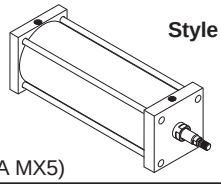
Head Rectangular Flange
Style J

(NFPA MF1)

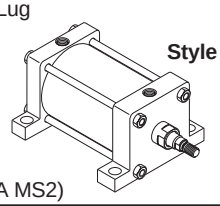
Cap Rectangular Flange
Style H

(NFPA MF2)

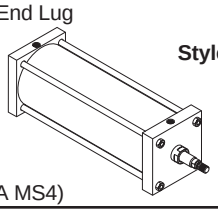
Tie Rods Ext. Head End
Style TB

(NFPA MX3)

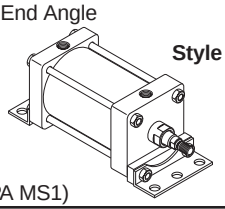
Tie Rods Ext. Cap End
Style TC

(NFPA MX2)

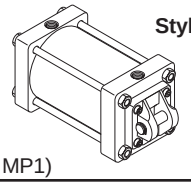
Tie Rods Ext. Both Ends
Style TD

(NFPA MX1)

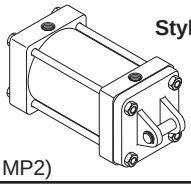
Sleeve Nut
Style TE

(NFPA MX5)

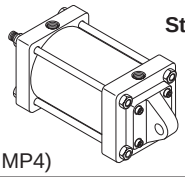
Side Lug
Style C

(NFPA MS2)

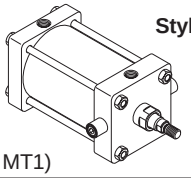
Side End Lug
Style F

(NFPA MS4)

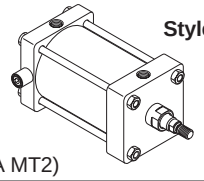
Side End Angle
Style CB

(NFPA MS1)

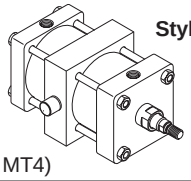
Cap Fixed Clevis
Style BB

(NFPA MP1)

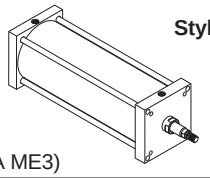
Cap Detachable Clevis
Style BC

(NFPA MP2)

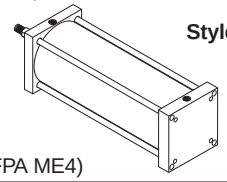
Cap Detachable Eye
Style BE

(NFPA MP4)

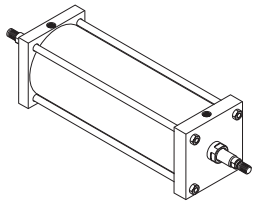
Head Trunnion
Style D

(NFPA MT1)

Cap Trunnion
Style DB

(NFPA MT2)

Intermediate Trunnion
Style DD

(NFPA MT4)

Head Square
Style JB

(NFPA ME3)

Cap Square
Style HB

(NFPA ME4)

Double Rod End
Style KT

(NFPA MDX0)

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B

General Specifications

- NFPA interchangeable
- Bore sizes – 6" and 8"
- Strokes – available in any practical stroke length
- Rod diameters – 1-3/8" and 1-3/4"
- Rod end styles – 4 standard, specials available
- Single rod end or double rod ends
- Cushions – optional and adjustable at either end or both ends
  (n/a for 4ML Hydraulic Version)
- Operating pressure –
  4MA = 250 PSIG (17 Bar) maximum air service
  4ML = 400 PSIG (27 Bar) maximum hydraulic service
- Media – 4MA = dry, filtered air
  4ML = filtered hydraulic oil
- Temperature range –
  -10°F to +165°F (-23°C to +74°C) with standard seals
  -10°F to +250°F (-23°C to +121°C) with fluorocarbon seals option
  -50°F to +150°F (-46°C to +66°C) with low temperature seals option
- Mounting styles – 20 standard styles
- RoHS compliant

For material options, including seals, piston rods and glands, please see Material Specifications on next page.

Cylinder Weights – 4MA/4ML Cylinders

Bore (inch)	Rod (inch)	No Mount Single Rod 4MA/4ML		No Mount Double Rod	
		Base Wt. (lbs.)	Per Inch (lbs.)	Base Wt. (lbs.)	Per Inch (lbs.)
6	1.375	20.50	0.87	25.65	1.30
	1.75	22.61	1.13	30.41	1.82
8	1.375	35.50	1.25	41.15	1.68
	1.75	37.63	1.51	45.90	2.20

Mounting Weight Adders

Bore (inch)	Weight (lbs) by Mounting Style							
	J, H	D, DB	BB	CB	DD	BE	C	BC
6	10.74	1.22	2.91	5.88	15.52	2.91	0.69	11.38
8	N/A	1.22	2.91	7.84	25.01	N/A	0.67	17.31

Standard Cushion Position

Mounting Code	Position
All except D, DB, DD	2
D, DB, DD	3

Standard Port Sizes

Bore	NPTF	BSPT	BSPP	SAE
6	3/4	Rc3/4	G3/4	12
8	3/4	Rc3/4	G3/4	12

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Material Specifications – Standard Temperatures and Applications

Head and cap	Black anodized aluminum alloy
Cylinder body	Clear hard-coat anodized aluminum alloy
Piston rod	Case-hardened, chrome plated carbon steel
Rod seal	Carboxylated nitrile (Nitroxile)
Rod wiper	Molythane
Rod bearing (gland)	Bronze alloy
Piston	Aluminum alloy
Piston seals	Carboxylated nitrile (Nitroxile)
Piston bearing	MolyGard™
Magnetic ring	Plastic-bound magnetic material
Piston fastener	Piston rod for aluminum piston
O-rings	Nitrile
End seals	Nitrile
Cushion seals	Urethane
Cushion needle valves	Brass cushion needle valves
Tie-rods	Blackened carbon steel
Tie-rod nuts	Steel alloy, SAE J995 Grade 8

4MA Options – Material and Part Changes

High temperatures (-10°F to +250°F)	All seals and wiper are fluorocarbon Aluminum piston only (without magnetic ring)	Low temperatures (-50°F to +150°F)	Rod seal, piston seals, o-rings and end seals are low temperature-rated nitrile

4ML Hydraulic Version – Material and Part Changes

Hydraulic service (general)	Cushions not available	Hydraulic service (high temp)	Fluorocarbon TS-2000 rod seal; wiper and all seals are fluorocarbon (for hydraulic use)
Hydraulic service (std temp)	Polyurethane TS-2000 rod seal and nitrile piston seals (for hydraulic use)		

Other Standard Options – Material and Part Changes

Cylinder seal options	Fluorocarbon for high temperatures or chemical compatibility Other seal options available, please consult factory	HI LOAD gland option Metallic rod scraper option	Composite bearing pressed into bronze alloy gland Dual high strength bronze wipers with fluorocarbon energizer
Piston rod material options	Case-hardened, chrome plated carbon steel (standard) 17-4 PH stainless steel, chrome plated 303 stainless steel, chrome plated (n/a for 4ML) 316 stainless steel, chrome plated (n/a for 4ML) (for stainless steel without chrome plating, please consult factory)		

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B

How to Select a 6" - 8" Bore 4MA Cylinder

Parker cylinders are available based on air or hydraulic operating pressure. The many styles, sizes and optional features available assure that your application requirements are precisely met. 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.

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. See Application Engineering section for recommendations.
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 4MA cylinder with high temperature seals.

General Options and Modifications:

- Adjustable Cushions
- Magnetic Piston
- Port and Adjustable Cushion Relocation
- Port Thread Styles
- Multiple Ports
- Special Heads, Caps, Pistons and Mounts
- Double Rod End
- Oversize Rod Diameters
- Rod End Modifications
- Rod Materials (grades of stainless steel)
- Stainless Steel Tie Rods and Nuts
- Fluorocarbon Rod Wiper and Rod Seal only
- Fluorocarbon Seals (all cylinder seals)
- Metallic Rod Wiper
- HI LOAD Gland Assembly
- Stop Tube
- Mixed Mountings
- Shock Absorber on Cap End
- Air Cylinder/Valve Combination (ACVB)
- Adjustable Point Sensors (order separately)
- Continuous Linear Position Sensing (LPSO)
- High Temperature Service (to +250°F)
- Low Temperature Service (to -50°F)
- Hydraulic Service (4ML) (400 PSIG)
- Rod lock version (see 4MAJ)

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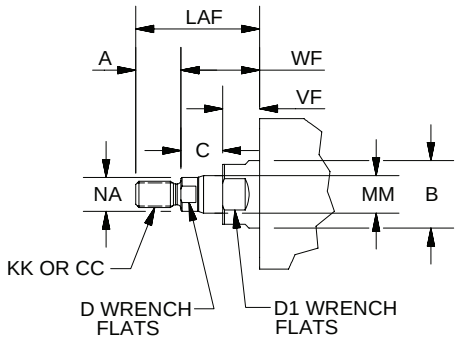
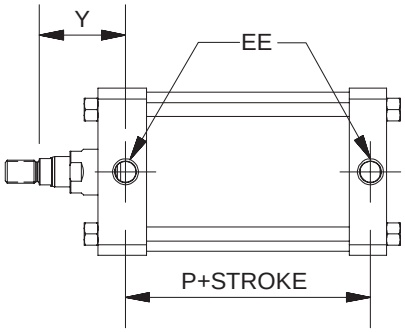
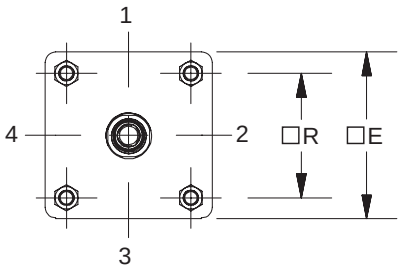
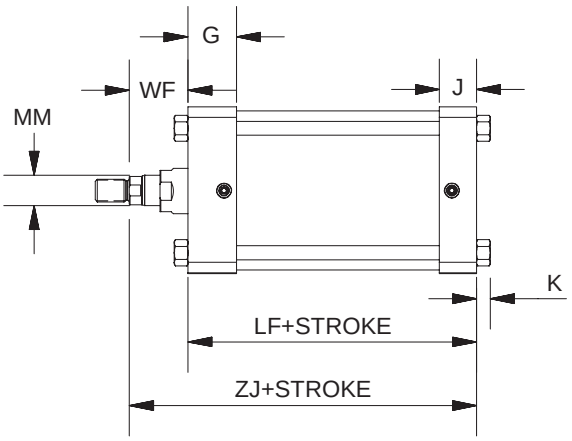
4MA Series Single Rod Dimensions – 6" and 8" Bore





For dimensions of all standard rod end styles, please see page B36.





Cylinder Dimensions – Style T

Bore Size	Rod No.	Rod Dia. MM	Thread		A	AA	+.000 -.002 B	C	D	D1	E	EE (NPTF)	G
			Style 8 CC	Style 4 & 9 KK									
6	1	1-3/8	1-1/4 - 12	1-14	1.625	6.900	1.999	0.635	1-1/8	1-7/8	6.500	3/4	1.910
	3	1-3/4	1-1/2 - 12	1-1/4 - 12	2.000	6.900	2.374	0.760	1-1/2	2-3/16	6.500	3/4	1.910
8	1	1-3/8	1-1/4 - 12	1-14	1.625	9.100	1.999	0.635	1-1/8	1-7/8	8.500	3/4	1.810
	3	1-3/4	1-1/2 - 12	1-1/4 - 12	2.000	9.100	2.374	0.760	1-1/2	2-3/16	8.500	3/4	1.810

Bore Size	Rod No.	Rod Dia. MM	J	K	LAF	NA	R	VF	WF	Y	Add Stroke		
											LF	P	ZJ
6	1	1-3/8	1.410	0.438	3.250	1.313	4.880	0.990	1.625	2.813	5.000	3.125	6.625
	3	1-3/4	1.410	0.438	3.875	1.688	4.880	1.115	1.875	3.063	5.000	3.125	6.875
8	1	1-3/8	1.440	0.563	3.250	1.313	6.440	0.990	1.625	2.750	5.125	3.250	6.750
	3	1-3/4	1.440	0.563	3.875	1.688	6.440	1.115	1.875	3.000	5.125	3.250	7.000

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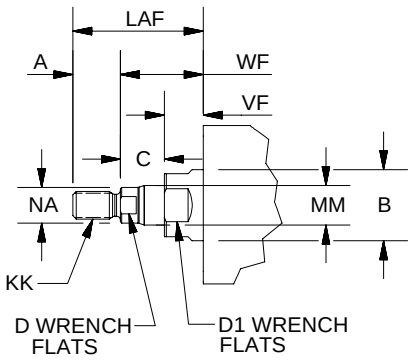
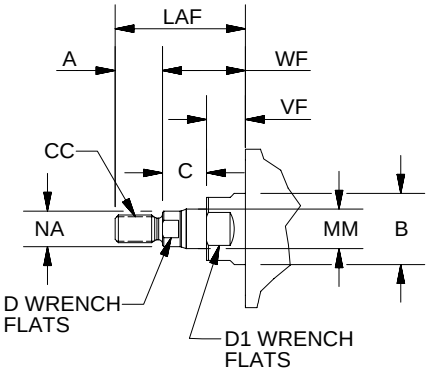
B

4MA Rod End Dimensions – 6" and 8" Bore Sizes

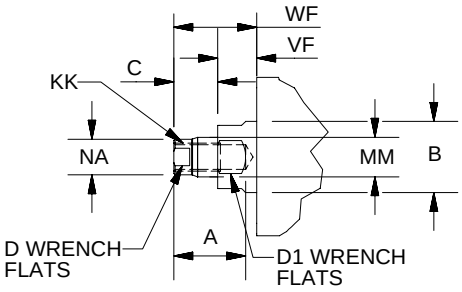
Thread Style 4
(NFPA Style SM)
Small Male



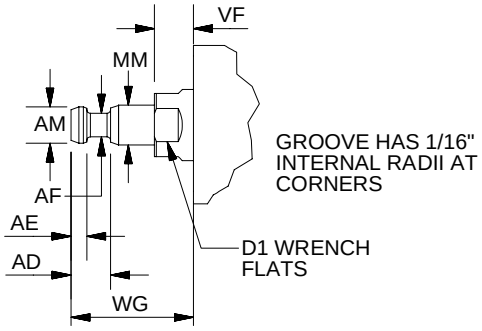
Thread Style 8
(NFPA Style IM)
Intermediate Male



Thread Style 9
(NFPA Style SF)
Short Female



Thread Style 55
For use with Split Coupler
(see page B103 for more information)



Rod End Dimensions

Bore Size	Rod No.	Rod Dia. MM	Thread Style 8 CC	Thread Style 4 & 9 KK	A	AD	AE	AF	AM	+.000 -.002 B	C	D	D1	LAF	NA	VF	WF	WG
6	1	1-3/8	1-1/4 - 12	1-14	1.625	1.063	0.375	0.875	1.320	1.999	0.635	1-1/8	1-7/8	3.250	1.313	0.990	1.625	2.750
	3	1-3/4	1-1/2 - 12	1-1/4 - 12	2.000	1.313	0.500	1.125	1.700	2.374	0.760	1-1/2	2-3/16	3.875	1.688	1.115	1.875	3.125
8	1	1-3/8	1-1/4 - 12	1-14	1.625	1.063	0.375	0.875	1.320	1.999	0.635	1-1/8	1-7/8	3.250	1.313	0.990	1.625	2.750
	3	1-3/4	1-1/2 - 12	1-1/4 - 12	2.000	1.313	0.500	1.125	1.700	2.374	0.760	1-1/2	2-3/16	3.875	1.688	1.115	1.875	3.125

Thread Style 3 - "Special Thread"

Special threads, rod extensions, rod eyes, blanks, etc. are also available.
To order, specify "Style 3" and give desired dimensions for KK or CC, A and W or WF.
If otherwise special, please supply dimensioned sketch.

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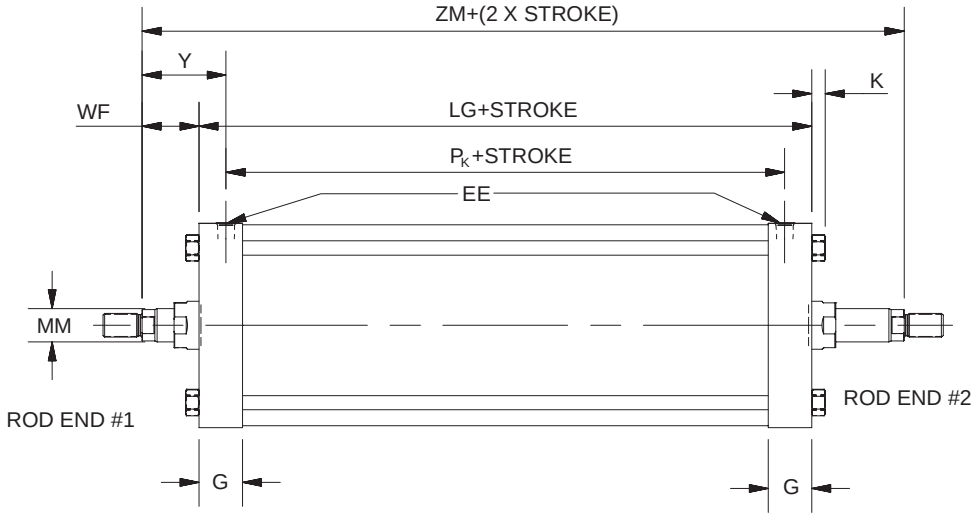
To determine dimensions for a double rod end cylinder, first refer to the desired single rod end mounting style cylinder shown in this catalog section. After selecting the necessary dimensions from that drawing, return to this page and supplement the single rod end dimensions with those shown in the drawings and dimension table below.
Note that double rod end cylinders have a head dimension (G) at both ends, and that LG replaces LF, P_K replaces P, etc. The double rod end dimensions differ from, or are in addition to, those for single rod cylinders.

When a double rod end cylinder has two different rod ends, please clearly state which rod end is to be available at which head end.

4MA Series K-type Drawing – 6" and 8" Bore



Mounting Styles for Single Rod Models	Corresponding Mounting Styles for Double Rod Models
C	KC
CB	KCB
D	KD
DD	KDD
F	KF
J	KJ
T	KT
TB	KTB
TD	KTD
TE	KTE
TEF	KTEF

Cylinder Dimensions – Style KT

Bore Size	Rod No.	Rod Dia. MM	EE (NPTF)	G	K	WF	Y	Add Stroke						Add 2X Stroke
								LG	P_K	SA_K	XAK	SS_K	SN_K	ZM
6	1	1-3/8	3/4	1.910	0.438	1.625	2.813	5.500	3.125	8.250	8.500	4.125	3.125	8.750
	3	1-3/4	3/4	1.910	0.438	1.875	3.063	5.500	3.125	8.250	8.750	4.125	3.125	9.250
8	1	1-3/8	3/4	1.810	0.563	1.625	2.750	5.500	3.250	9.125	8.938	4.125	3.125	8.750
	3	1-3/4	3/4	1.810	0.563	1.875	3.000	5.500	3.250	9.125	9.188	4.125	3.125	9.250
Replaces Dimension								LF	P	SA	XA	SS	SN	–
On Single Rod Mounting Styles								All Styles		CB		C	F, TEF	All

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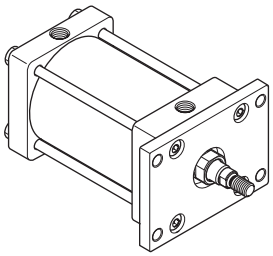
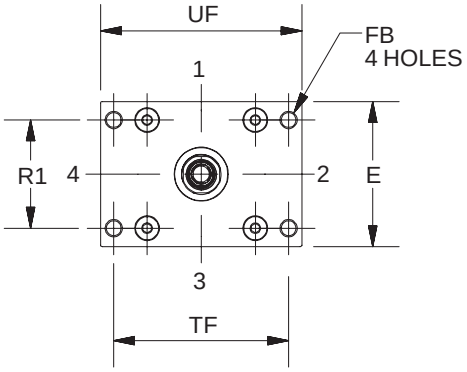
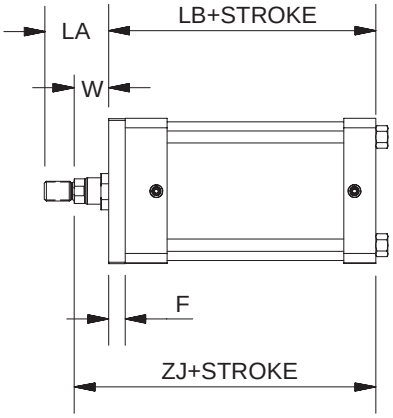
B

Head Rectangular Flange
Style J
(NFPA MF1)
(only 6" Bore)

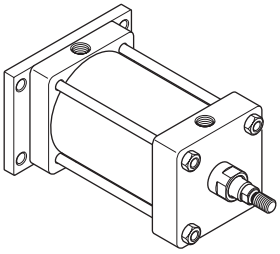


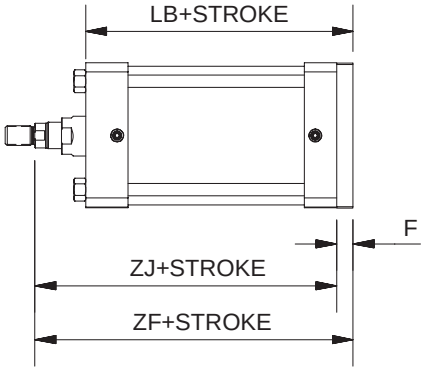


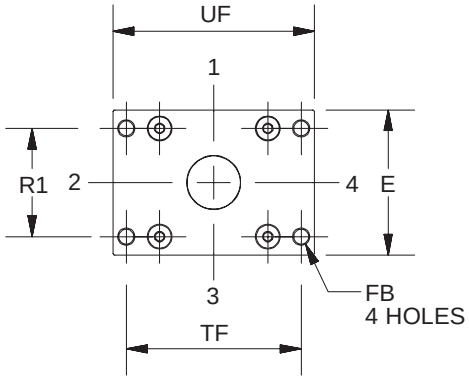


Note: Style J has a W dimension instead of WF and a LA dimension instead of LAF because of the flange installation. Please use dimensions W and LA regarding rod ends only for Style J.
For reference, WF = W + F and LA = W + A.

Cap Rectangular Flange
Style H
(NFPA MF2)
(only 6" Bore)







Cylinder Dimensions – Styles J and H

Bore Size	Rod No.	Rod Dia. MM	A	E	F	FB	LA	R1	TF	UF	W	Add Stroke		
												LB	ZF	ZJ
6	1	1-3/8	1.625	6.500	0.750	0.563	2.500	4.880	7.625	8.625	0.875	5.750	7.375	6.625
	3	1-3/4	2.000	6.500	0.750	0.563	3.125	4.880	7.625	8.625	1.125	5.750	7.625	6.875

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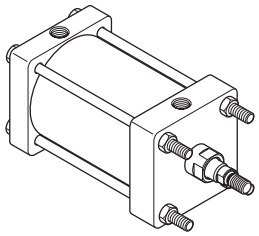
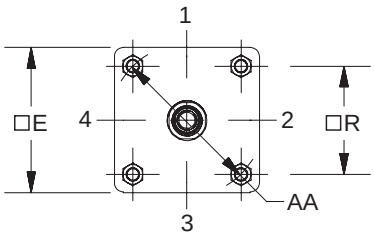
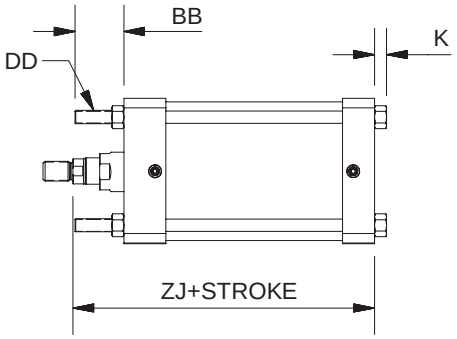
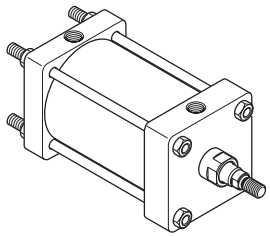
Tie Rods Ext. Head End
Style TB
(NFPA MX3)

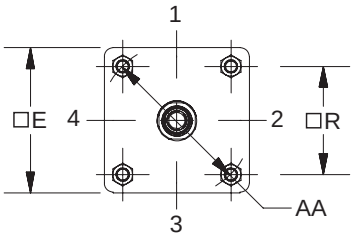


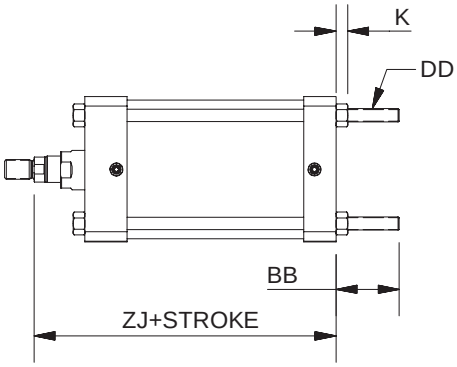




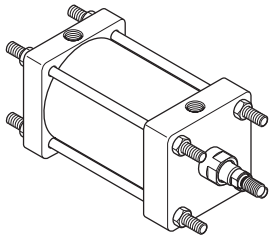
Tie Rods Ext. Cap End
Style TC
(NFPA MX2)

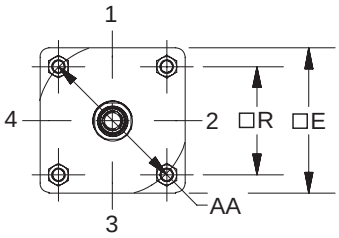


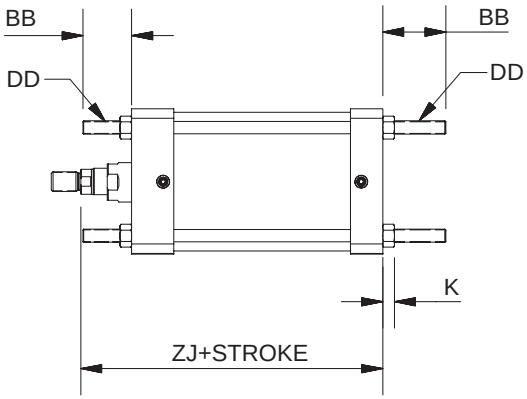




Tie Rods Ext. Both Ends
Style TD
(NFPA MX1)







Cylinder Dimensions – Styles TB, TC and TD

Bore Size	Rod No.	Rod Dia. MM	AA	BB	DD	E	K	R	Add Stroke ZJ
6	1	1-3/8	6.900	1.813	1/2-20	6.500	0.438	4.880	6.625
	3	1-3/4	6.900	1.813	1/2-20	6.500	0.438	4.880	6.875
8	1	1-3/8	9.100	2.313	5/8-18	8.500	0.563	6.440	6.750
	3	1-3/4	9.100	2.313	5/8-18	8.500	0.563	6.440	7.000

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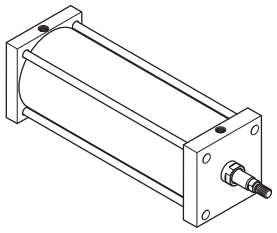
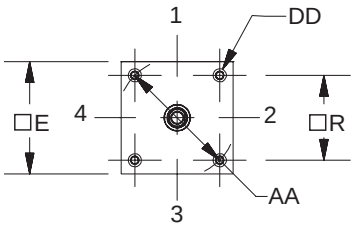
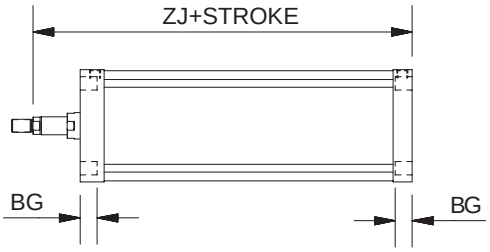
B

Sleeve Nut
Style TE
(NFPA MX5)







Cylinder Dimensions – Style TE

Bore Size	Rod No.	Rod Dia. MM	AA	BG	DD	E	R	Add Stroke ZJ
6	1	1-3/8	6.900	0.500	1/2-20	6.500	4.880	6.625
	3	1-3/4	6.900	0.500	1/2-20	6.500	4.880	6.875
8	1	1-3/8	9.100	0.620	5/8-18	8.500	6.440	6.750
	3	1-3/4	9.100	0.620	5/8-18	8.500	6.440	7.000

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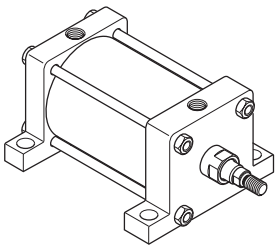
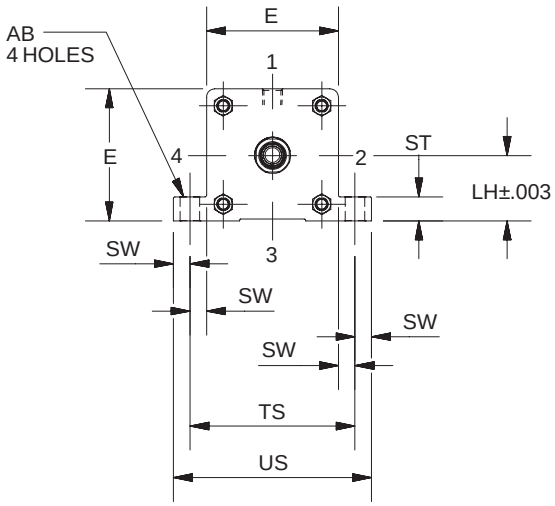
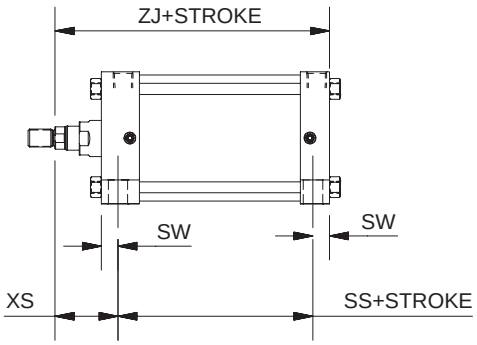
Side Lug
Style C
(NFPA MS2)



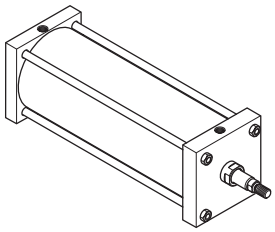


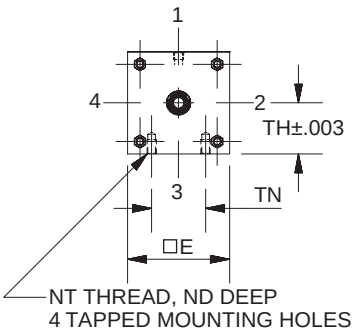


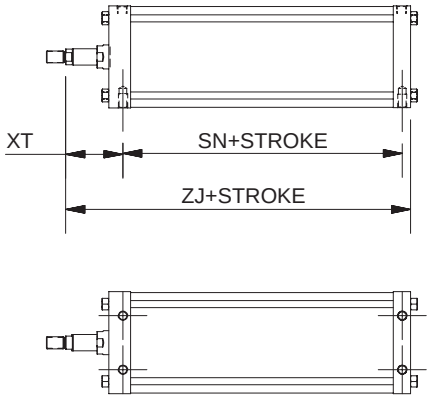
Cylinder Dimensions – Style C

Bore Size	Rod No.	Rod Dia. MM	AB	E	+/-.003 LH	ST	SW	TS	US	XS	Add Stroke	
											SS	ZJ
6	1	1-3/8	0.813	6.500	3.243	1.000	0.688	7.875	9.250	2.313	3.625	6.625
	3	1-3/4	0.813	6.500	3.243	1.000	0.688	7.875	9.250	2.563	3.625	6.875
8	1	1-3/8	0.813	8.500	4.243	1.000	0.688	9.875	11.250	2.313	3.750	6.750
	3	1-3/4	0.813	8.500	4.243	1.000	0.688	9.875	11.250	2.563	3.750	7.000

Side End Lug
Style F
(NFPA MS4)







Cylinder Dimensions – Style F

Bore Size	Rod No.	Rod Dia. MM	E	ND	NT	+/-.003 TH	TN	XT	Add Stroke	
									SN	ZJ
6	1	1-3/8	6.500	1.125	3/4-10	3.243	3.250	2.813	3.125	6.625
	3	1-3/4	6.500	1.125	3/4-10	3.243	3.250	3.063	3.125	6.875
8	1	1-3/8	8.500	1.125	3/4-10	4.243	4.500	2.813	3.250	6.750
	3	1-3/4	8.500	1.125	3/4-10	4.243	4.500	3.063	3.250	7.000

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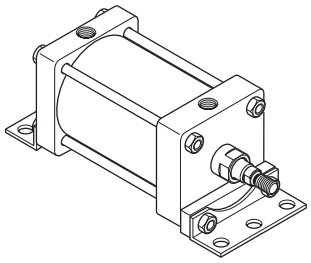
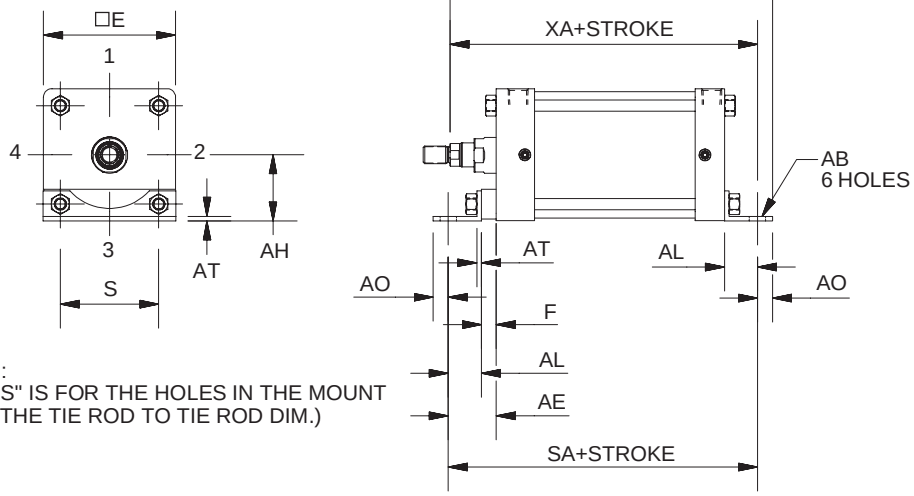
B

Side End Angle*
Style CB
(NFPA MS1)





NOTE:
DIM. "S" IS FOR THE HOLES IN THE MOUNT
(NOT THE TIE ROD TO TIE ROD DIM.)

*Maximum recommended pressure for this mount is 150 PSIG

Cylinder Dimensions – Style CB

Bore Size	Rod No.	Rod Dia. MM	AB	AE	AH	AL	AO	AT	E	F	S	Add Stroke		
												SA	XA	ZA
6	1	1-3/8	0.813	2.125	3.250	1.375	0.625	0.188	6.500	0.750	5.250	8.500	8.000	8.625
	3	1-3/4	0.813	2.125	3.250	1.375	0.625	0.188	6.500	0.750	5.250	8.500	8.250	8.875
8	1	1-3/8	0.813	1.813	4.250	1.813	0.688	0.250	8.500	–	7.125	8.750	8.563	9.250
	3	1-3/4	0.813	1.813	4.250	1.813	0.688	0.250	8.500	–	7.125	8.750	8.813	9.500

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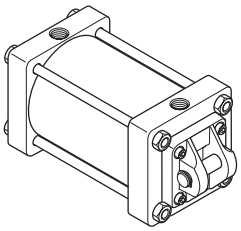
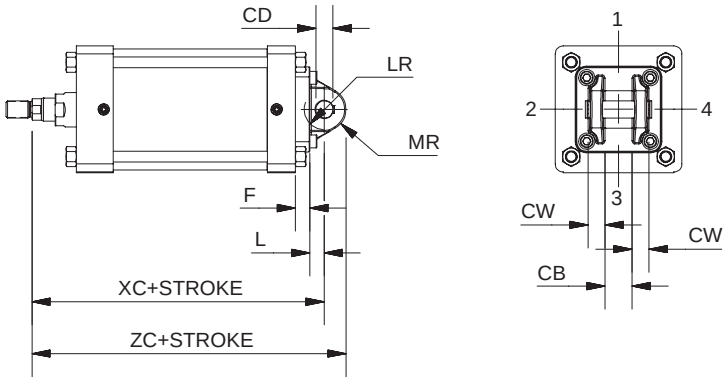
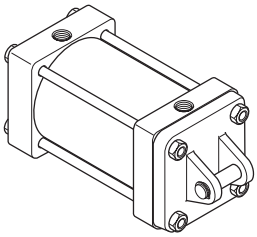
Cap Fixed Clevis
Style BB
(NFPA MP1)

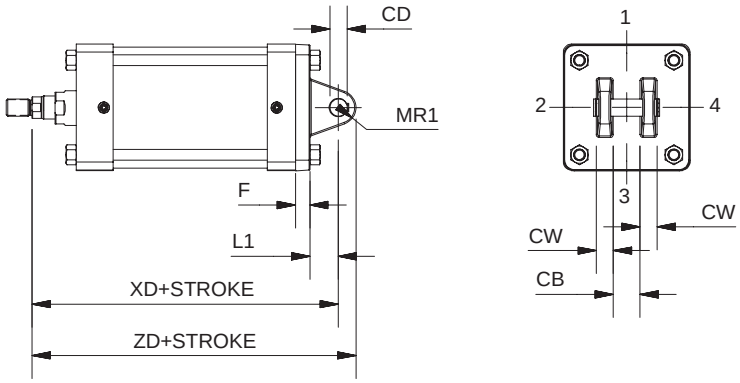


Note: For maximum swivel angle of BB mount with rear mounting plate, see Cylinder Accessories on page B108.



Cap Detachable Clevis
Style BC
(NFPA MP2)

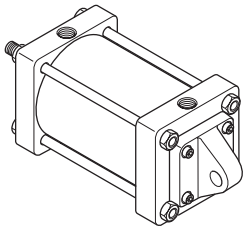


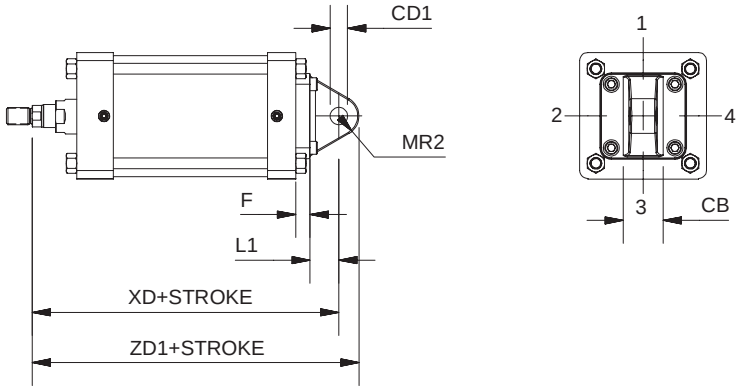


Cylinder Dimensions – Styles BB and BC

Bore Size	Rod No.	Rod Dia. MM	CB	+.000 -.002 CD	CW	E	F	L	LR	L1	MR	MR1	Add Stroke XC	XD	ZC	ZD
6	1	1- 3/8	1.500	1.001	0.750	6.500	0.750	0.750	1.250	1.500	1.125	1.000	8.125	8.875	9.250	9.875
	3	1-3/4	1.500	1.001	0.750	6.500	0.750	0.750	1.250	1.500	1.125	1.000	8.375	9.125	9.500	10.125
8	1	1-3/8	1.500	1.001	0.750	8.500	0.750	0.750	1.250	1.500	1.125	1.000	8.250	9.000	9.375	10.000
	3	1-3/4	1.500	1.001	0.750	8.500	0.750	0.750	1.250	1.500	1.125	1.000	8.500	9.250	9.625	10.250

Cap Detachable Eye
Style BE
(NFPA MP4)





Cylinder Dimensions – Style BE

Bore Size	Rod No.	Rod Dia. MM	CB	+.002 +.004 CD1	E	F	L1	MR2	Add Stroke XD	ZD1
6	1	1-3/8	1.500	1.000	6.500	0.750	1.500	1.125	8.875	10.000
	3	1-3/4	1.500	1.000	6.500	0.750	1.500	1.125	9.125	10.250

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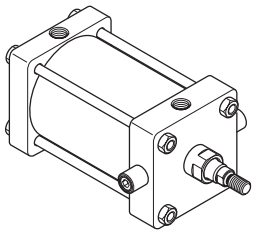
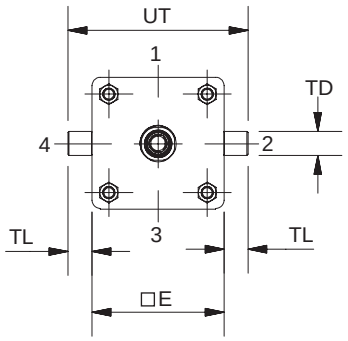
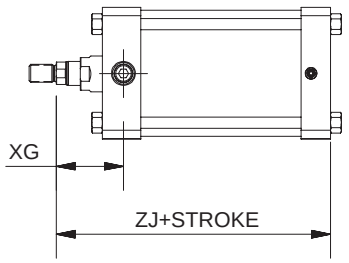
B

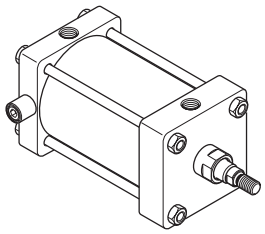
Head Trunnion
Style D
(NFPA MT1)

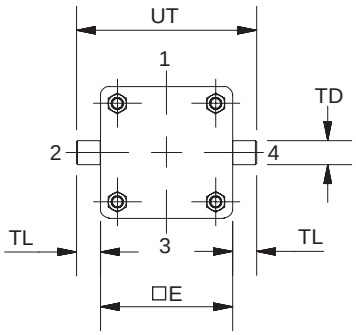


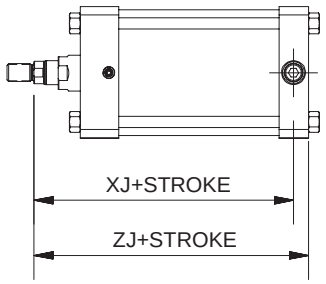




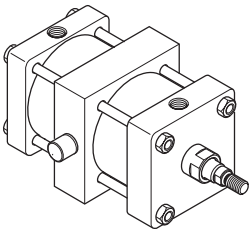
Cap Trunnion
Style DB
(NFPA MT2)

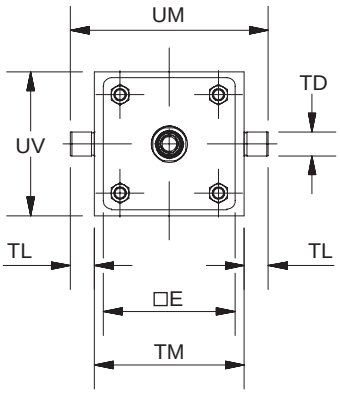


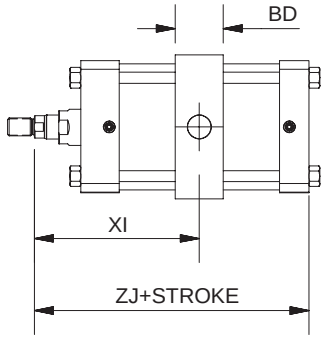




Intermediate Trunnion
Style DD
(NFPA MT4)







Cylinder Dimensions – Style D, DB and DD

Bore Size	Rod No.	Rod Dia. MM	E	BD	+.000 -.001 TD	TL	TM	UM	UT	UV	XG	Min. XI	Add Stroke	
													XJ	ZJ
6	1	1-3/8	6.500	2.500	1.375	1.375	7.625	10.375	9.250	7.000	2.625	4.813	5.875	6.625
	3	1-3/4	6.500	2.500	1.375	1.375	7.625	10.375	9.250	7.000	2.875	5.063	6.125	6.875
8	1	1-3/8	8.500	2.500	1.375	1.375	9.750	12.500	11.250	9.500	2.625	4.750	6.000	6.750
	3	1-3/4	8.500	2.500	1.375	1.375	9.750	12.500	11.250	9.500	2.875	5.000	6.250	7.000

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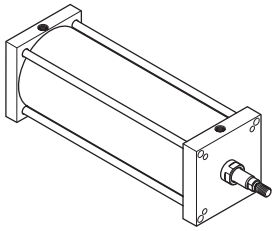
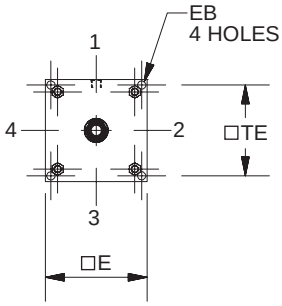
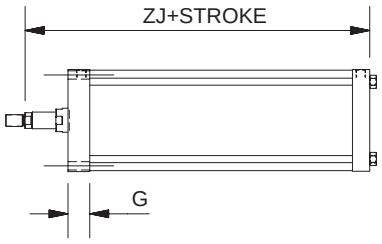
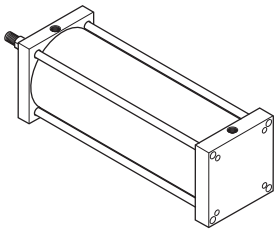
Head Square
Style JB
(NFPA ME3)
(only 8" Bore)

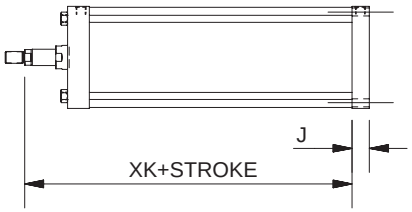


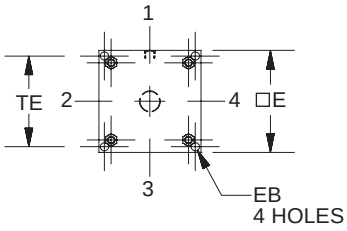




Cap Square
Style HB
(NFPA ME4)
(only 8" Bore)







Cylinder Dimensions – Styles JB and HB

Bore Size	Rod No.	Rod Dia. MM	E	EB	G	J	TE	Add Stroke	
								XK	ZJ
8	1	1-3/8	8.500	0.688	1.810	1.440	7.570	5.313	6.750
	3	1-3/4	8.500	0.688	1.810	1.440	7.570	5.563	7.000

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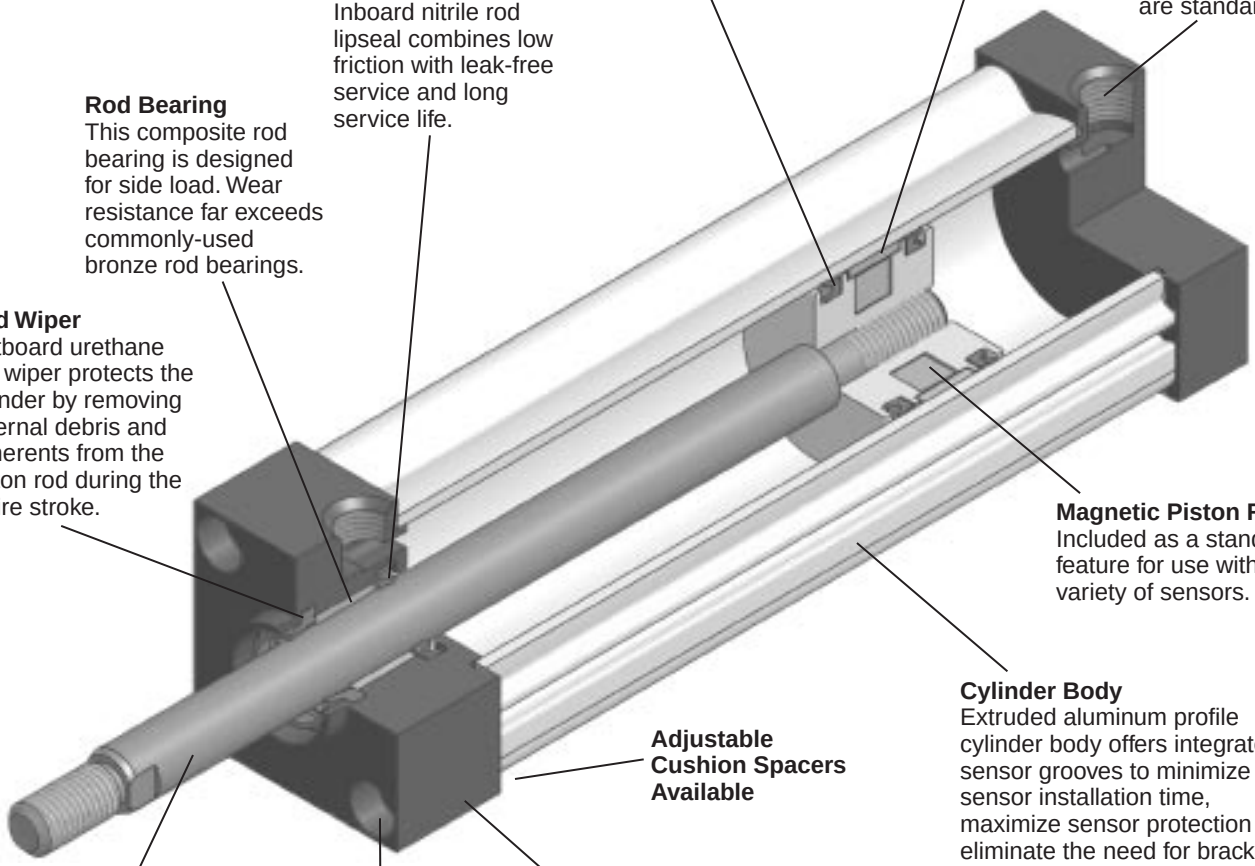

Piston Assembly
Aluminum piston with wear band increases service life and eliminates metal-to-metal contact. Anaerobic adhesive is used to permanently lock and seal the piston to the rod.

Piston Seals
Nitrile piston lipseals combine low friction with leak-free service and long service life. Optional bumper piston seals provide additional noise reduction and smooth end-of-stroke deceleration.

Ports
1/8" NPTF ports are standard.

Rod Seal
Inboard nitrile rod lipseal combines low friction with leak-free service and long service life.

Rod Bearing
This composite rod bearing is designed for side load. Wear resistance far exceeds commonly-used bronze rod bearings.

Rod Wiper
Outboard urethane rod wiper protects the cylinder by removing external debris and adherents from the piston rod during the entire stroke.

Magnetic Piston Ring
Included as a standard feature for use with a variety of sensors.

Cylinder Body
Extruded aluminum profile cylinder body offers integrated sensor grooves to minimize sensor installation time, maximize sensor protection and eliminate the need for brackets. Grooves readily accept Mini-Global Sensors. Anodized and bright-dipped for corrosion resistance, maximum seal life and lower friction. A few mounts require anodized aluminum tube and steel tie rod construction (tie rod brackets for sensors available).

Adjustable Cushion Spacers Available

Heads and Caps
Steel alloy heads and caps are black zinc-plated for corrosion resistance

Piston Rod
Hard chrome plated and polished carbon steel piston rod for reliable performance, long rod seal life and low friction. Grades of stainless steel are available as options.

Endcap Fasteners
Zinc-plated steel endcap fasteners (and tie rods for some mounts) for heavy-duty use. Stainless steel is available as an option.

For a complete list of 3MA options, please see pages B48 and B52.

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B

How to Order 3MA Series Cylinders for 1-1/8" Bore

3MA cylinders can be specified by model number by using the table below.

1.12			J	3MA		U			1	6		A		4.000

Bore Size
1.12 1-1/8"

Double Rod Cylinder
Specify "K" only if double rod cylinder is required.

Mounting Style
Specify mounting style code (see table on following page).

Series
3MA Air service
3ML Hydraulic service

Ports
U 1/8" NPTF (standard)
T SAE #4 (adapter)[5]

Seals
Blank Standard (nitrile seals)
V Fluorocarbon seals[2]
E Fluorocarbon rod wiper and rod seal only[3]

Piston Rod Number
1 3/8" rod
3 1/2" rod
Specify rod code number for required diameter.

Stroke Length
Specify stroke length required in inches.[4]

Cushion Cap End
Blank Non-cushioned cap end
C Cushioned cap end (not available for 3ML)

Cushion Head End
Blank Non-cushioned head end
C Cushioned head end (not available for 3ML)

Piston Rod Thread Type
A Standard (UNF Unified Thread)
W BSF British Fine
M Metric (see page B106)

Piston Type
Blank Standard (lipseals and magnetic ring)
2 Lipseals, no magnetic ring
4 Bumper seals, no magnetic ring[1]
6 Bumper seals and magnetic ring[1]

Special Modification
Specify "S" only for special modification other than rod end, and then describe modification in item notes.

Rod Material Code
Blank Standard
Y 17-4 PH stainless steel
J 303 stainless steel[1]
S 316 stainless steel[1]

Piston Rod Thread Style
6 Full male
4 Small male
9 Short female
3 Special (and specify all dimensions required)

[1] Not available for 3ML

[2] Reed and solid-state sensors only available with standard seals or seal option E.

[3] Used for external chemical compatibility applications, not high temperature.

[4] If a stop tube is required, specify gross stroke (net stroke + stop tube) in the model number, then place an "S" for special in the Special Modification field and specify the stop tube length in the item notes.

[5] Not available with US mount. Adapter height is approximately 0.83" when installed. Adapter body extends 0.15" from cap face. Use of mountings at cap end may be affected by this port type.

How to order 1-1/8" Bore 3MA/3ML Series cylinders with sensors:

Sensors must be ordered separately and are not mounted to the cylinder prior to shipment.

1. Cylinder model number must have Piston Type (blank) or 6.
2. Please refer to pages B115-B120 for sensor part numbers and specifications. Mini-Global, NAMUR and Weld Immune Sensors will fit the 1-1/8" Bore 3MA/3ML Series (Global Sensors not available).
3. Tie rod bracket P8S-TMA0Z will be required for Mini-Global Sensors with Mounting Styles US, F, MR, TB, TC, TD or other tie rod versions.
   Please refer to page B119 for more information.

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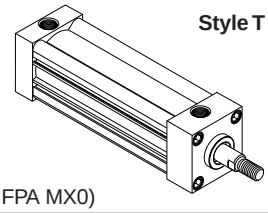
3MA Series Mounting Styles for 1-1/8" Bore

No Mount Basic

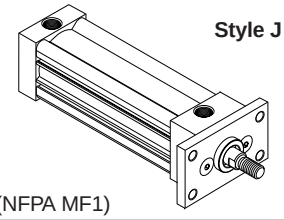
Style T



(NFPA MX0)

Head Rectangular Flange

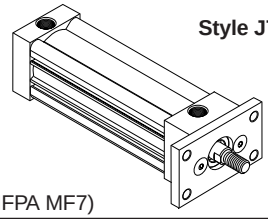
Style J



(NFPA MF1)

Head Rect. Flange (no pilot)

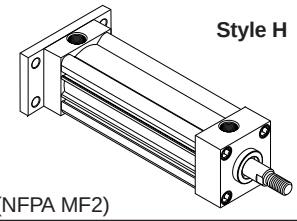
Style J7



(NFPA MF7)

Cap Rectangular Flange

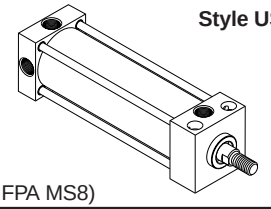
Style H



(NFPA MF2)

Side Thru Hole

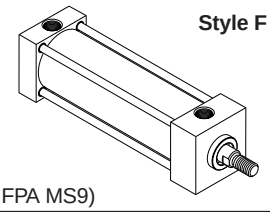
Style US



(NFPA MS8)

Side Tap

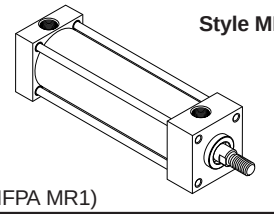
Style F



(NFPA MS9)

Head Tap

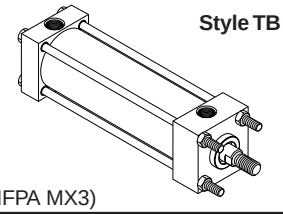
Style MR



(NFPA MR1)

Tie Rods Ext. Head End

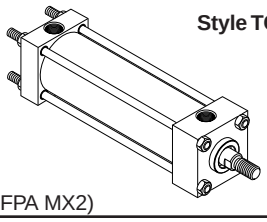
Style TB



(NFPA MX3)

Tie Rods Ext. Cap End

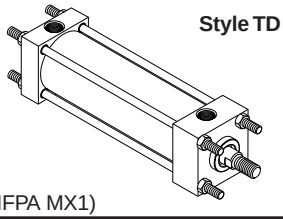
Style TC



(NFPA MX2)

Tie Rods Ext. Both Ends

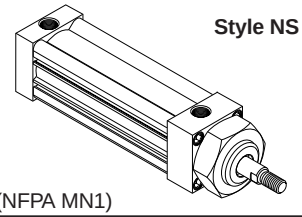
Style TD



(NFPA MX1)

Threaded Nose

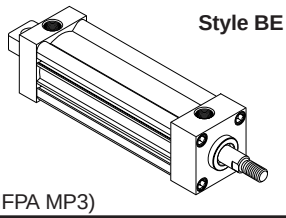
Style NS



(NFPA MN1)

Cap Pivot Eye

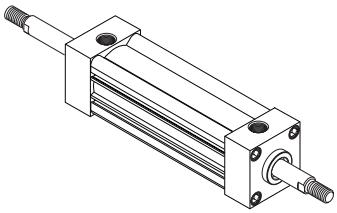
Style BE



(NFPA MP3)

Double Rod End

Style KT



(NFPA MDX0)

Double rod end cylinders can be ordered with head mountings, i.e. KJ (see page B51).

Note: Styles US, F, MR, TB, TC and TD are tie rod construction only, profile body not available. If Mini-Global sensors are required, please order one tie rod bracket (P8S-TMA0Z) for each sensor.

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B

General Specifications

- NFPA interchangeable – NFPA/T3.6.11 R1-1998 (R2004)
- Strokes – available in any practical stroke length
- Rod diameters – 3/8" and 1/2"
- Rod end styles – 3 standard, specials available
- Single rod end or double rod ends
- Cushions – optional and adjustable at either end or both ends (n/a for 3ML Hydraulic Version)
- Operating pressure –
  3MA = 250 PSIG (17 Bar) max. air service
  3ML = 1,100 PSIG (76 Bar) max. hydraulic service
- Media – 3MA = dry, filtered air
  3ML = filtered hydraulic oil
- Temperature range –
  -10°F to +165°F (-23°C to +74°C) with standard seals
  -10°F to +250°F (-23°C to +121°C) with fluorocarbon seals option
  -50°F to +150°F (-46°C to +66°C) with low temperature seals (consult factory)
- Mounting styles – 13 standard styles

For material options, including seals and piston rods, please see Material Specifications on next page.

Cylinder Weights – 1-1/8" Bore

3MA/3ML Cylinders

Bore (inch)	Rod (inch)	No Mount Single Rod 3MA	
		Base Wt. (lbs.)	Per Inch (lbs.)
1-1/8	3/8	1.26	0.10
	1/2		0.13

Standard Cushion Position

Mounting Code	Position
All mounts	2

Standard Port Size

Bore	NPTF
1-1/8	1/8

Recommended Maximum Extend Stroke Length

Rod (inch)	Pressure (PSIG)			
	100	200	500	1100
3/8	26"	18"	12"	9"
1/2	46"	32"	21"	15"

Please consult Actuator Division for longer stroke lengths.

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Material Specifications – Standard Temperatures and Applications

Head and cap	Black zinc plated steel alloy	O-rings	Nitrile
Head and cap screws	Zinc plated steel alloy	End seals	Nitrile
Cylinder body	Clear anodized aluminum alloy	Cushion spacer	Black zinc plated steel alloy
Piston rod	Chrome plated carbon steel	Cushion seals	Urethane
Rod seal	Nitrile	Cushion needle valves	Stainless steel
Rod wiper	Molythane	Tie-rods (some mounts)	Blackened carbon steel
Rod bearing	Composite	Tie-rod nuts (some mounts)	Black oxided steel alloy
Piston	Aluminum alloy	Cylinder accessories	Black zinc plated steel alloy
Piston seals	Nitrile		
Piston bearing	MolyGard™		
Magnetic ring	Plastic-bound magnetic material		
Piston fastener	Piston rod for aluminum piston		

3MA Options – Material and Part Changes

High temperatures (-10°F to +250°F)	All seals and wiper are fluorocarbon Aluminum piston only (without magnetic ring)	Low temperatures (-50°F to +150°F)	Rod seal, piston seals, o-rings and end seals are low temperature-rated nitrile (consult factory)

3ML Hydraulic Version – Material and Part Changes

Hydraulic service (general)	Cushions and bumper piston seals not available	Hydraulic service (high temp)	All seals and wiper are fluorocarbon (for hydraulic use)
Hydraulic service (std temp)	Nitrile rod seal and piston seals (for hydraulic use)		

Other Standard Options – Material and Part Changes

Cylinder seal options	Fluorocarbon for high temperatures or chemical compatibility Other seal options available, please consult factory	Piston rod material options	Chrome plated carbon steel (standard) 17-4 PH stainless steel 303 stainless steel (n/a for 3ML) 316 stainless steel (n/a for 3ML) (for stainless steel with chrome plating, please consult factory) Case-hardened, chrome plated carbon steel
Bumper piston seal options (3MA only, n/a for 3ML)	Carboxylated nitrile (Nitroxile) for standard temperatures Fluorocarbon for high temperatures and chemical compatibility		

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How to Select a 1-1/8" Bore 3MA Cylinder

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

Step 1 - **Verify that the 1-1/8" bore size is** appropriate 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.

- 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.

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. See Application Engineering section for recommendations.
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 3MA or 3ML cylinder with high temperature seals.

General Options and Modifications:

- Adjustable Cushions (Cushion Spacers)
- Non-Magnetic Piston (magnetic ring standard)
- Piston Bumper Seals
- Port and Adjustable Cushion Relocation
- Port Thread Styles
- Multiple Ports
- Special Heads, Caps, Pistons and Mounts
- Double Rod End
- Oversize Rod Diameters
- Rod End Modifications
- Rod Materials (grades of stainless steel)
- Fluorocarbon Rod Wiper and Rod Seal only
- Fluorocarbon Seals (all cylinder seals)
- Stop Tube
- Mixed Mountings
- Round Tube and Tie Rod Construction
- Stainless Steel Fasteners/Tie Rods
- Shock Absorber on Cap End
- LECTROFLUOR® Coating
- Adjustable Point Sensors (order separately)
- High Temperature Service (to +250°F)
- Hydraulic Service (3ML) (1,100 PSIG)

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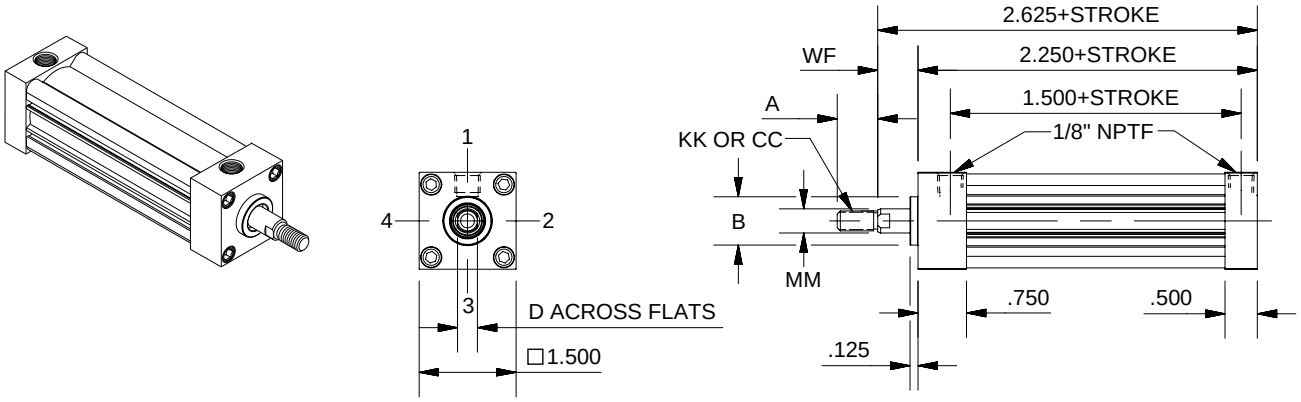
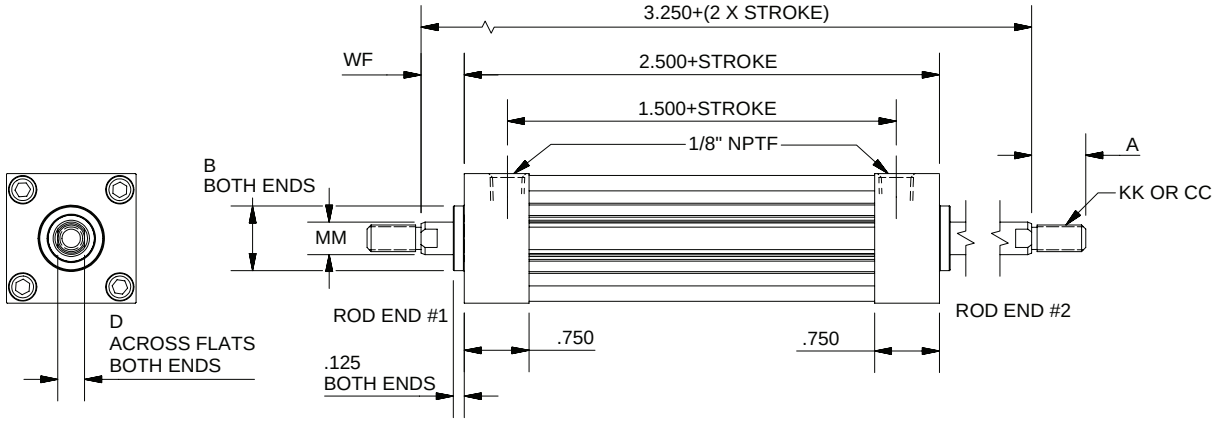
Single Rod, Double Rod and Cushioned Cylinder Dimensions

Single Rod – T Mount Dimensions

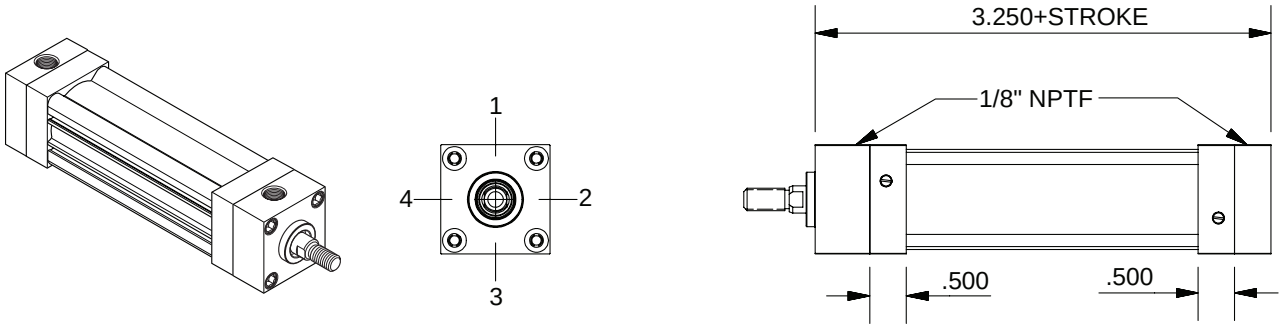


Double Rod – KT Mount Dimensions



Single rod end mounts T, J, J7, TB, TD and NS can become double rod end mounts KT, KJ, KJ7, KTB, KTD and KNS. Please use the appropriate dimensions from head face of the single rod end mount drawings with KT drawing above for double rod end cylinder dimensions.

Cushioned Cylinder Dimensions



Rod End Dimensions

Bore Size	Rod No.	Rod Dia. MM	Thread			A	-0.001 -0.003 B	D	LAF	WF
			Style 6 CC	Style 4 KK	Style 9 KK					
1-1/8	1	3/8	3/8-24	5/16-24	1/4-28	0.625	0.750	5/16	1.000	0.375
	3	1/2	1/2-20	7/16-20	3/8-24	0.750	0.750	7/16	1.125	0.375

Note: Adjustable cushions will add 0.50" to each end. Cushions at both ends will add a total of 1.00" to the base cylinder length. Single rod configuration shown above. Available with single rod and double rod cylinders.

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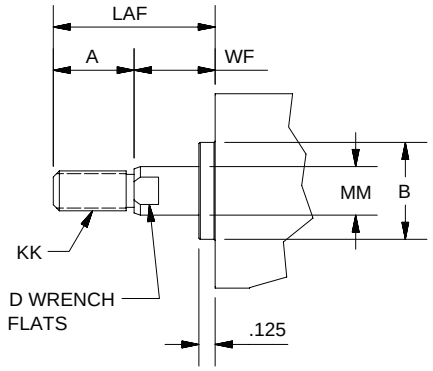
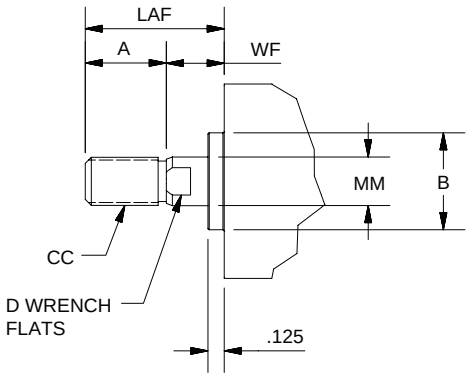
3MA Series Rod End Dimensions – 1-1/8" Bore

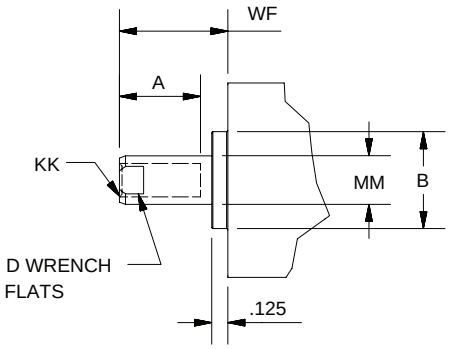
Thread Style 4
Small Male



Thread Style 6
Full Male



Thread Style 9
Short Female



Rod End Dimensions

Bore Size	Rod No.	Rod Dia. MM	Thread Style 6 CC	Thread Style 4 KK	Thread Style 9 KK	A	-0.001 -0.003 B	D	LAF	WF
1-1/8	1	3/8	3/8-24	5/16-24	1/4-28	0.625	0.750	5/16	1.000	0.375
	3	1/2	1/2-20	7/16-20	3/8-24	0.750	0.750	7/16	1.125	0.375

Thread Style 3 - "Special Thread"

Special threads, rod extensions, rod eyes, blanks, etc. are also available.
To order, specify "Style 3" and give desired dimensions for KK or CC, A and W or WF.
If otherwise special, please supply dimensioned sketch.

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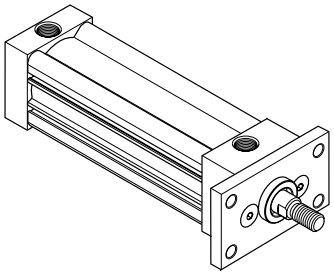
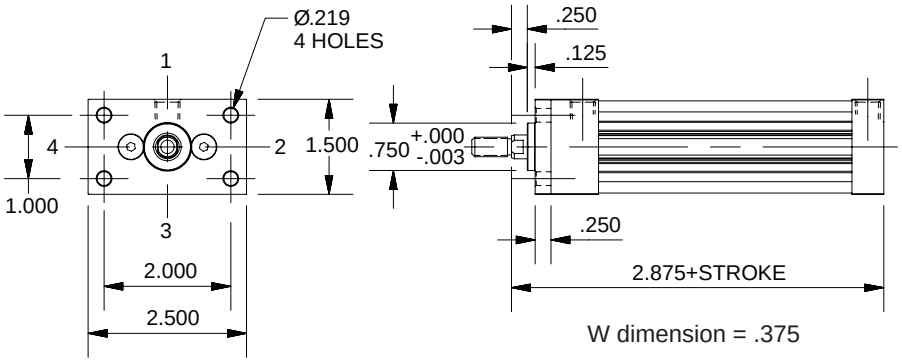
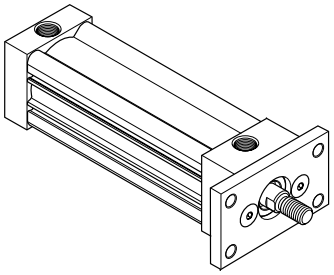
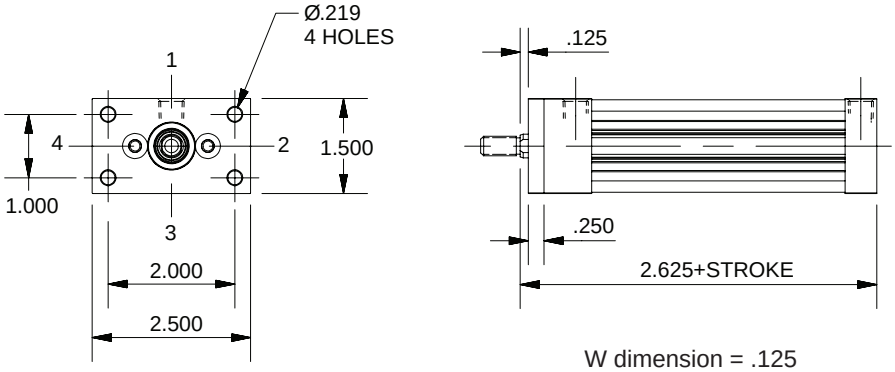
Head Rectangular Flange
Style J
(NFPA MF1)



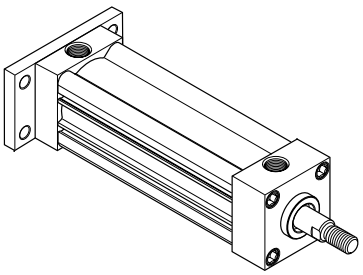


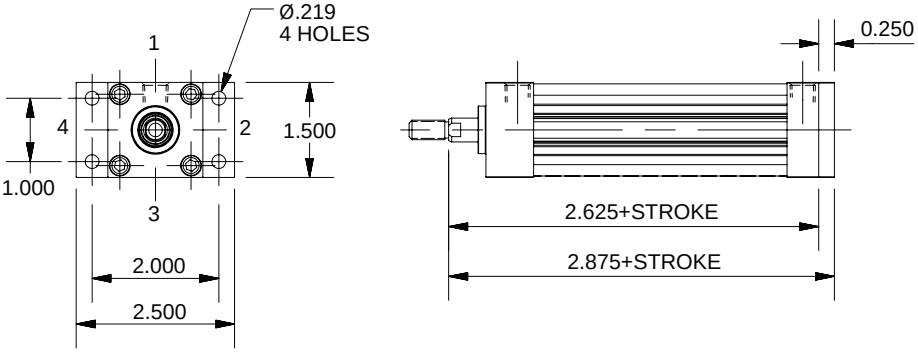
Head Rectangular Flange (no pilot)
Style J7
(NFPA MF7)





Cap Rectangular Flange
Style H
(NFPA MF2)





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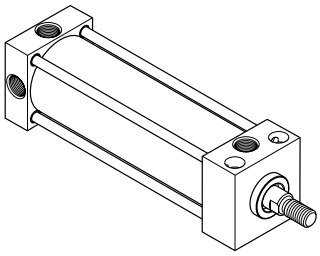
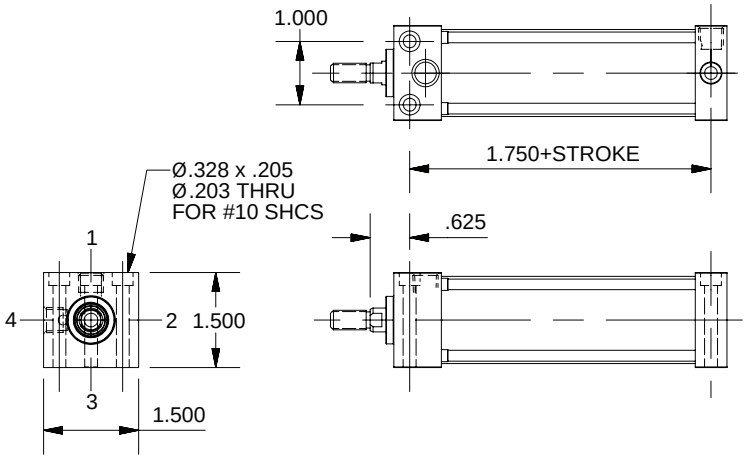
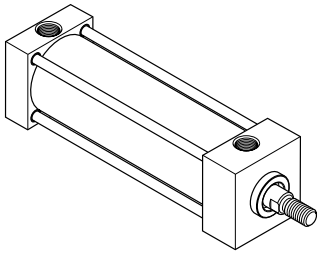
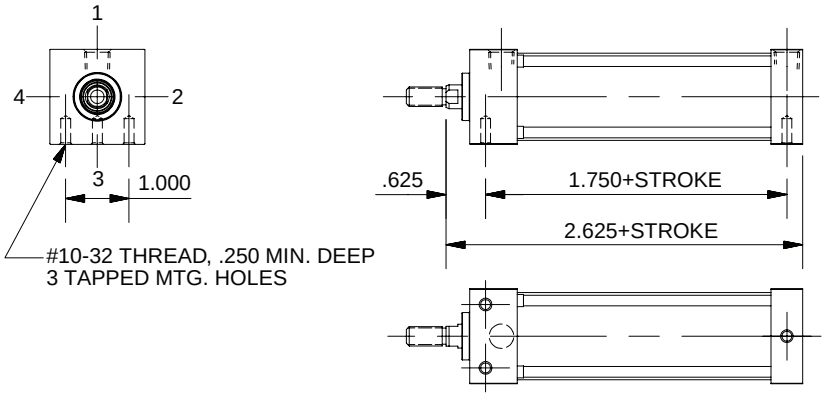
Side Thru Hole
Style US
(NFPA MS8)



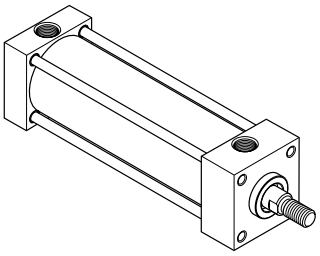


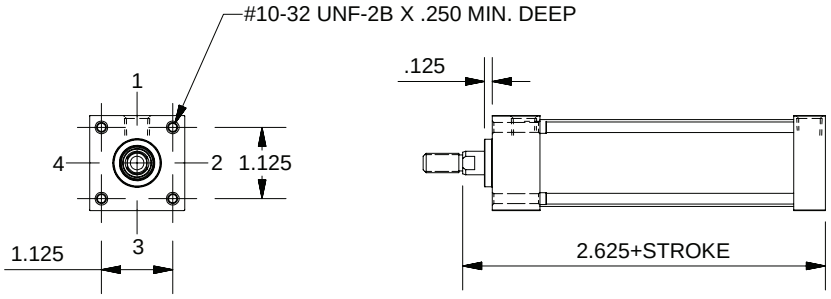
Side Tap
Style F
(NFPA MS9)





Head Tap
Style MR
(NFPA MR1)





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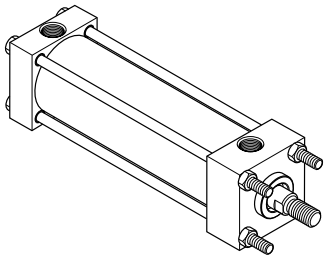
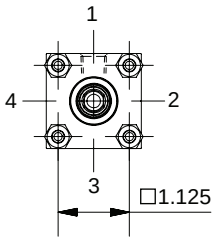
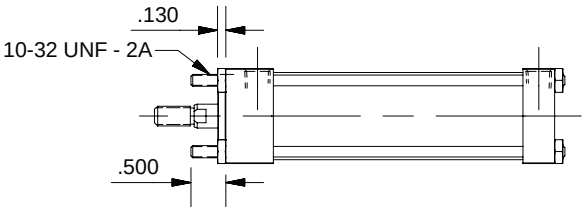
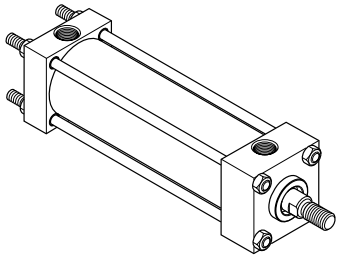
Tie Rods Ext. Head End
Style TB
(NFPA MX3)

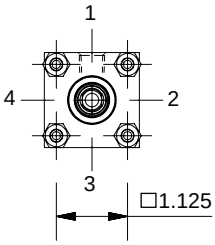


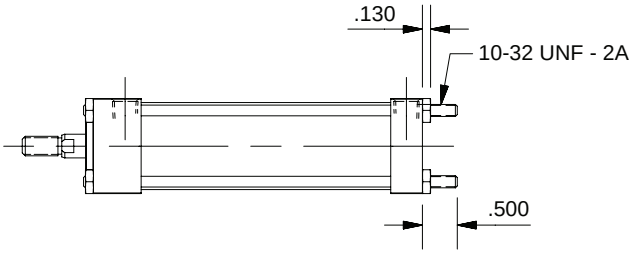




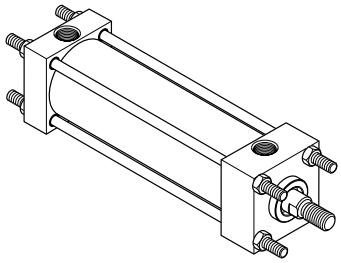
Tie Rods Ext. Cap End
Style TC
(NFPA MX2)

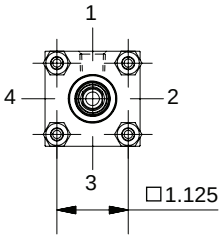


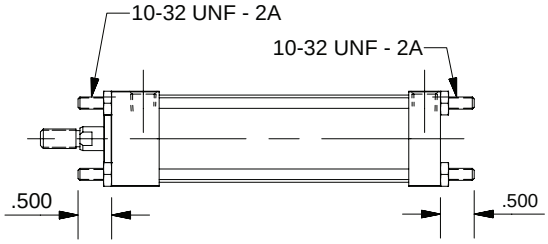




Tie Rods Ext. Both Ends
Style TD
(NFPA MX1)







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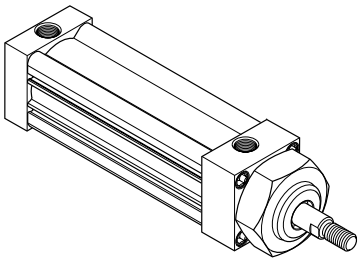
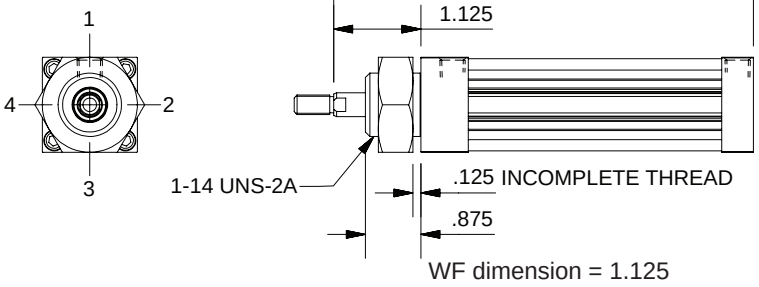
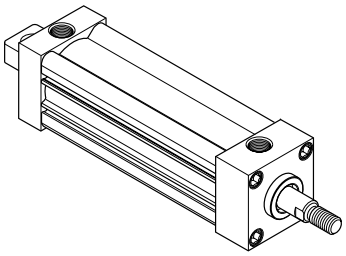
B

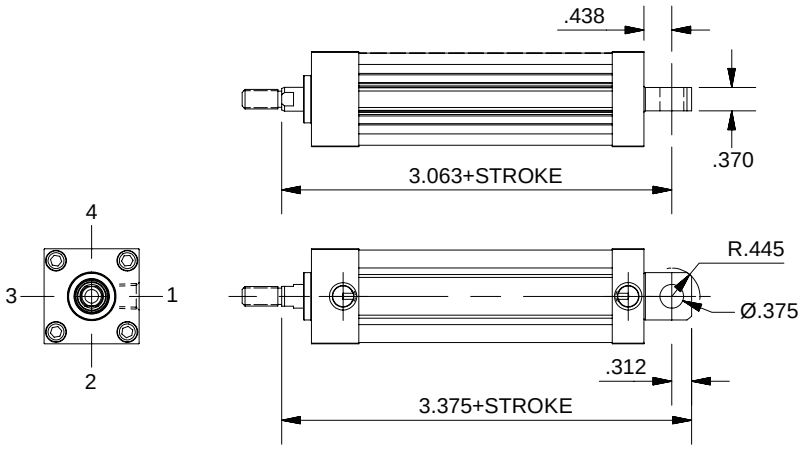
Threaded Nose
Style NS
(NFPA MN1)





Cap Pivot Eye
Style BE
(NFPA MP3)





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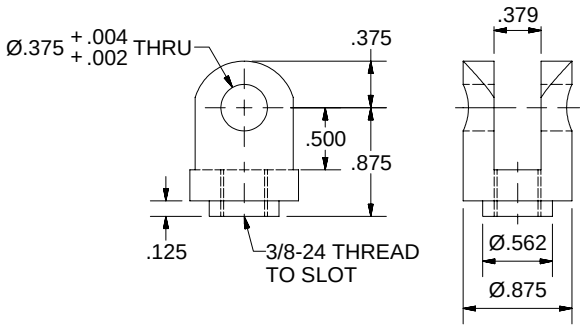
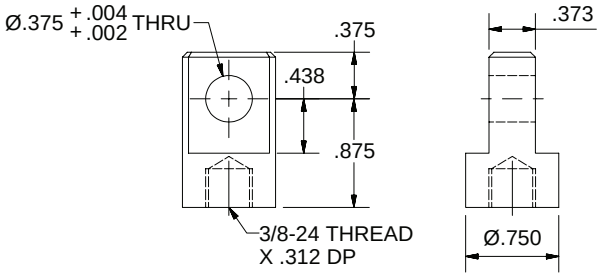
Cylinder Accessories

Note: Pivot Pin Assembly must be ordered separately

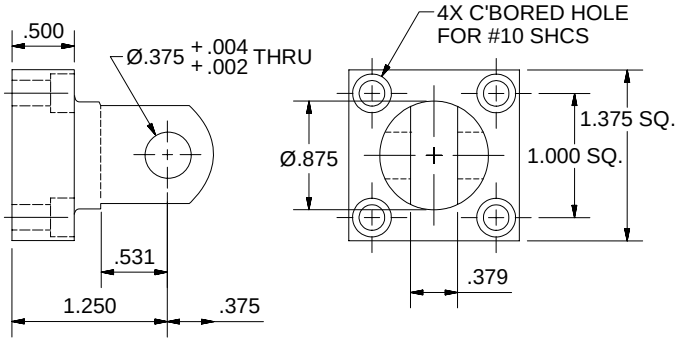
Rod Clevis P/N 1458030038



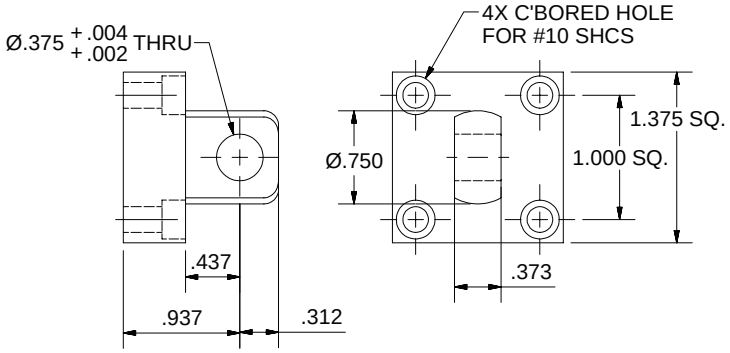
Rod Eye P/N 1458040038



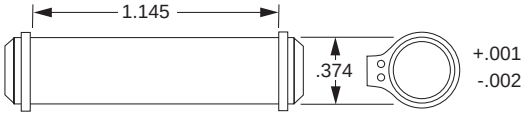
Clevis Bracket P/N 1458050038



Eye Bracket P/N 1458060038



Pivot Pin Assembly P/N 0856640038



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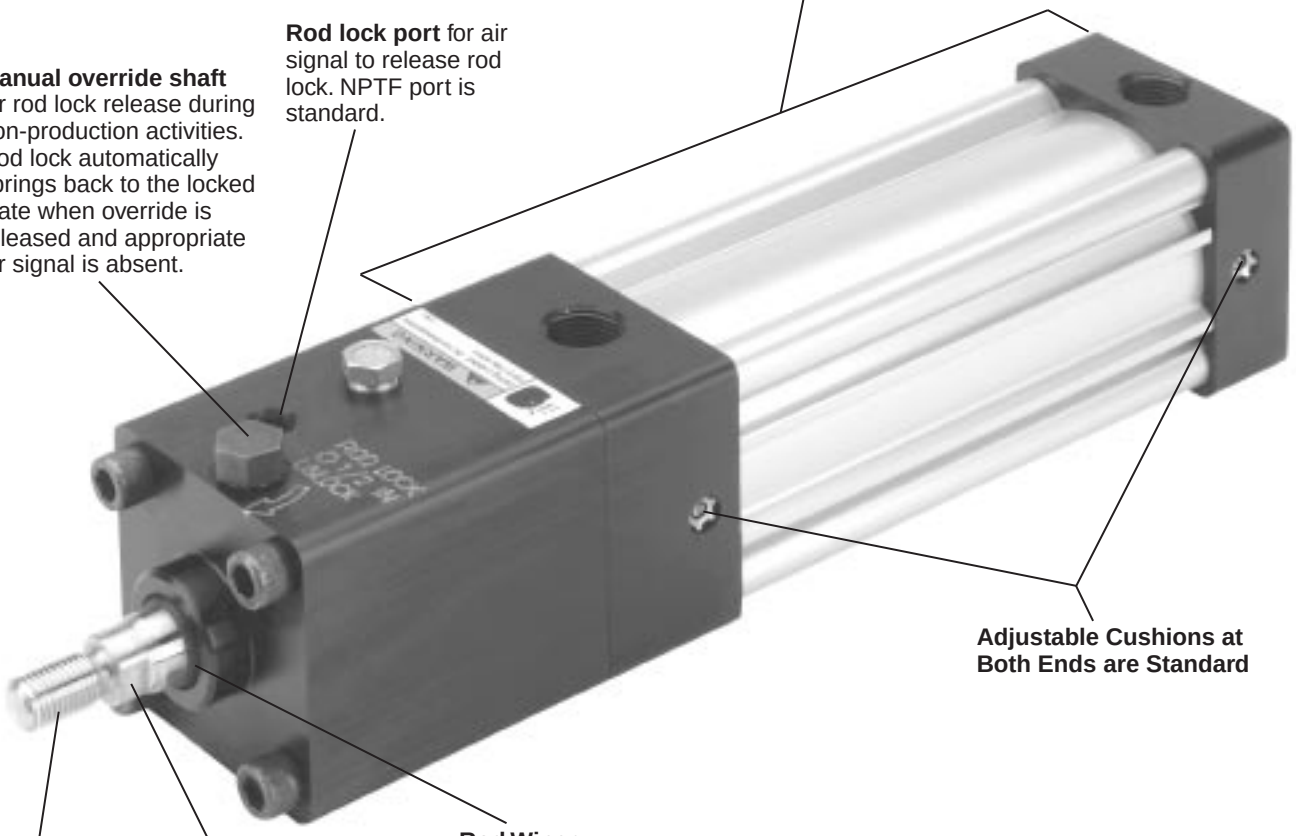

3MA or 4MA cylinder for heavy-duty applications and reliable performance.

Rod lock port for air signal to release rod lock. NPTF port is standard.

Manual override shaft for rod lock release during non-production activities. Rod lock automatically springs back to the locked state when override is released and appropriate air signal is absent.

Adjustable Cushions at Both Ends are Standard

Rod Wiper
Outboard fluorocarbon rod wiper protects the cylinder by removing external debris and adherents from the piston rod during the entire stroke.

Standard NFPA rod end dimensions from the face of the rod lock.

Piston Rod
Standard case-hardened (50-64 Rc), hard chrome plated and polished carbon steel piston rod for reliable performance, long rod seal life and low friction. 17-4PH stainless steel available as an option.

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3MAJ and 4MAJ Series Cylinders

NFPA Non-Lube Pneumatic Cylinder with Manual Override Rod Lock

Rod lock versions of the 3MA Series (the 3MAJ) and 4MA Series (the 4MAJ) are available. These rod lock version provides precise load holding with virtually zero backlash and features high accuracy for demanding applications. The rod lock is a spring-activated type with air pressure release and clamps the piston rod to lock it into position. In the absence of an appropriate air signal, full holding force is applied to the piston rod. When a 60 PSI (or greater) air signal is present, the locking device is released. All rod locks include a manual override shaft to free the rod lock without air pressure during non-production activities.

Some key benefits of the 3MAJ and 4MAJ Series Cylinders:

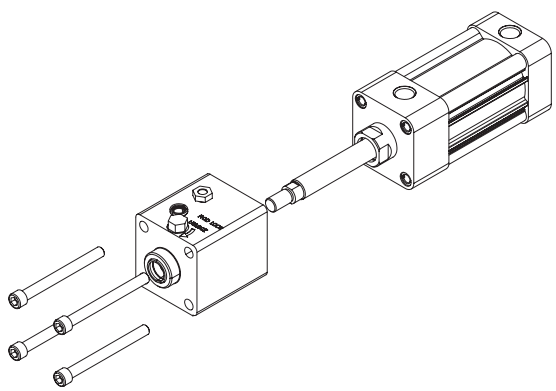
Bolt-On Modularity – As a true cylinder accessory, the rod lock may be removed without affecting the base cylinder (1-1/2" to 5" bores). The same, great cylinder remains intact, allowing the rod lock to bolt-on with minimal length change. This modularity can be extremely important for special installations or while servicing the cylinder. Rod locks for 6" - 8" bores and all Style DD mounts (NFPA MT4) are fastened to the base cylinder using the base cylinder's tie rods. See drawings below.

Aesthetics – we have designed our rod locks with the same anodized aluminum extrusion used for the cylinder endcaps, resulting in a virtually seamless assembly. In addition, we focused every effort to create the shortest overall package, minimizing the need for customers to accommodate significantly longer cylinder lengths.

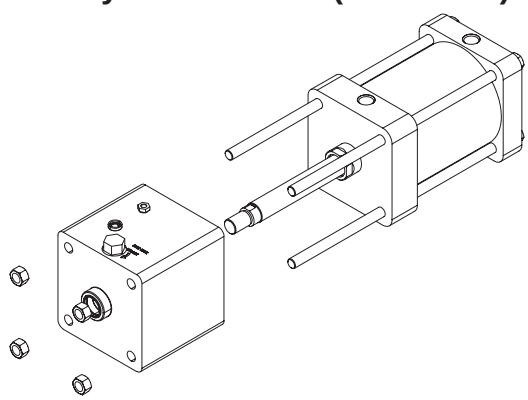
Functionality – With a holding force corresponding to 100 PSI on the cap end for nearly every bore size, the rod lock can be used for a variety of holding applications. The manual override shaft allows occasional release of the piston rod and automatically returns the rod lock back to the locked state when it is released and the appropriate air signal is absent. The front pilot diameter meets NFPA specifications and facilitates proper installation of the cylinder to customer equipment or cylinder accessories.

Ease of Order Entry – To order the 3MA or 4MA Series with the rod lock option, just change the product series to 3MAJ or 4MAJ (the "J" is required for the rod lock option). See model code on page B64 for additional information.

1-1/2" to 5" Bores



6" to 8" Bores and all Style DD Mounts (NFPA MT4)



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3MAJ and 4MAJ Series Cylinders

NFPA Non-Lube Pneumatic Cylinder with Manual Override Rod Lock

Connection

The signal air for the locking device can be obtained directly from a main air supply, or from the air supply serving the valve that controls the cylinder itself. For controlled ON/OFF operation of the locking device, a separate quick-venting valve is used.

The piston rod should not be moving when the locking device is activated. The locking device is not intended to brake a movement in repeated sequences.

NOTE: The 3MAJ and 4MAJ is not intended for use in water service applications, or in environments that have high humidity levels and/or splashing fluids present.

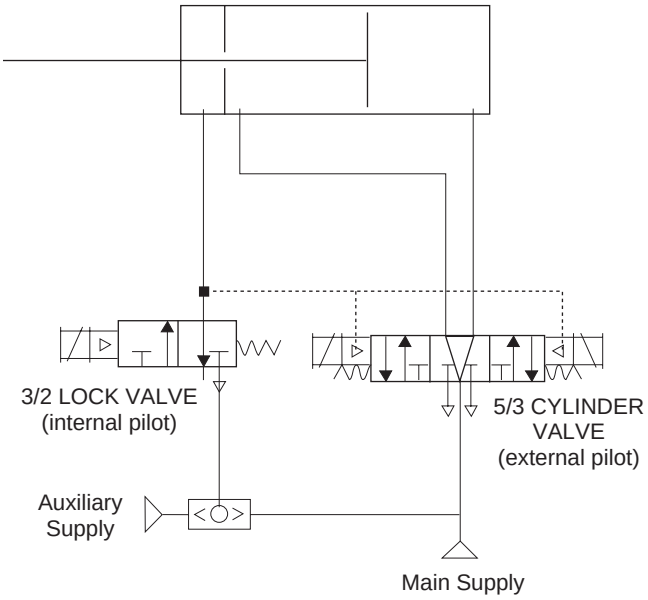
NOTE: Exhaust air from the rod lock can be piped away when there are demands for a contaminant-free environment.

Operation at pressures lower than 60 PSI may lead to inadvertent engagement of the rod lock device.

Other Cylinder and Rod Lock Features:

- The 3MAJ and 4MAJ rod lock will operate in both directions, engaging with the same holding force.
- The 3MAJ and 4MAJ can be mounted in any position.
- Piston rod rotation is not allowed when the rod lock is engaged (not intended for torsional braking).
- Rod lock is suitable for infrequent dynamic braking (emergency stops). Since the 3MAJ and 4MAJ rod lock is designed for static applications, repeated dynamic stops will cause rod and/or bearing wear and reduce holding forces.
- The rated holding force corresponds to static load conditions. If the rated value is exceeded, slipping and other problems may occur.
- If personal safety is required, an unrelated, redundant safety system is recommended.

Sample Pneumatic Circuit



1. Lock valve must be maintained energized during cylinder motion, otherwise rod lock is engaged and cylinder valve shifts to mid position.
2. Cylinder valve must be maintained energized during extend or retract. Also keep energized at end of stroke until change of direction is desired.
3. Mid position of 5/3 Cylinder valve may be pressurized outlets if the combination of pressure load on the cylinder and inertia effects of the attached load do not exceed the holding force rating of the rod lock device, including allowance for wear.
4. Do not use cylinder lines for any logic functions – pressure levels vary too much.

Basic Rod Lock Specifications

Bore Size	Rod No.	Rod Dia. MM	Air Chamber Volume (in^3)	Engagement Time (seconds)	Rated Holding Force (lbs)	Minimum Torque to Override (ft-lbs to hex shaft)
1-1/2	1	5/8	0.25	0.030	180	2
2	1	5/8	0.71	0.040	314	5
	3	1	0.68	0.040	250	5
2-1/2	1	5/8	1.26	0.045	491	7
	3	1	1.49	0.050	491	7
3-1/4	1	1	3.20	0.070	830	17
	3	1-3/8	2.11	0.060	830	17
4	1	1	6.73	0.100	1,256	45
	3	1-3/8	4.78	0.100	1,256	45
5	1	1	11.50	0.150	1,963	72
	3	1-3/8	9.50	0.130	1,963	72
6	1	1-3/8	14.08	0.175	2,830	135
	3	1-3/4	12.75	0.165	2,830	135
8	1	1-3/8	22.66	0.265	5,026	160
	3	1-3/4	23.21	0.265	5,026	160

Note: This specification data applies only to the rod lock part of the 3MAJ and 4MAJ cylinder.

For cylinder volume and performance, please use cylinder dimensions and application criteria.

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How to Order 3MAJ/4MAJ Series Cylinders for 1-1/2" to 8" Bore

3MAJ/4MAJ cylinders can be specified by model number by using the table below.

2.00	C		J	4MAJ		U			1	4		A	C	6.000

Bore Size

1.50[1]
2.00
2.50
3.25
4.00
5.00
6.00[2]
8.00[2]

Cushion Head End

Cushioned head end "C" is required.

Double Rod Cylinder

Specify "K" only if double rod cylinder is required.

Mounting Style

Specify mounting style code (see table on following page).

Series

4MAJ	4MA Rod Lock Cylinder
3MAJ	3MA Rod Lock Cylinder

Ports[4]

U	NPTF
R	BSPP
B	BSPT
T	SAE

Seals

Blank	Standard (nitrile seals)
V	Fluorocarbon seals[2,5]
E	Fluorocarbon rod wiper and rod seal only[6]

Piston Type[11]

Blank	Standard (lipseals and magnetic ring)
1	Lipseals, no magnetic ring
2	Lipseals, no magnetic ring (aluminum piston)
3	Lipseals and magnetic ring (aluminum piston)
4	Bumper seals, no magnetic ring
6	Bumper seals and magnetic ring
B	Lipseals, 1/4" thick bumpers both ends[3]
H	Lipseals, 1/4" thick bumper head end[3]
C	Lipseals, 1/4" thick bumper cap end[3]
D	Lipseals and magnetic ring, 1/4" thick bumpers both ends[3]
F	Lipseals and magnetic ring, 1/4" thick bumper head end[3]
R	Lipseals and magnetic ring, 1/4" thick bumper cap end[3]

Special Modification

Specify "S" only for special modification other than rod end, and then describe modification in item notes. (Includes 4MAJ with Linear Position Sensor Option)[7]

Piston Rod Number

Specify rod code number for required diameter.[8]

Piston Rod Thread Style

4	Small male
8	Intermediate male
9	Short female
55	For use with Split Coupler[9]
3	Special (and specify all dimensions required)

Rod Material Code

Blank	Standard rod and gland
H	Standard rod and HI LOAD gland[2]
Y	17-4 PH stainless steel rod and standard gland
Z	17-4 PH stainless steel rod and HI LOAD gland[2]

Piston Rod Thread Type

A	Standard (UNF Unified Thread)
W	BSF British Fine
M	Metric (see page B106)

Cushion Cap End

Cushioned cap end "C" is required.

Stroke Length

Specify stroke length required in inches.[10]

[1] Not available with 1" rod diameter (rod number 2) for 1-1/2" bore. Not available with Linear Position Sensor Option (LPSO).

[2] Not available for 3MAJ, please specify 4MAJ.

[3] Addition of 1/4" bumper results in a 1/4" stroke loss per bumper, per end. For example, a 6" stroke cylinder with 1/4" bumpers at both ends (option B) has an effective stroke of 5-1/2".

[4] Port thread styles only for base cylinder. Rod lock port is always NPTF. If a different rod lock port thread style is required, place an "S" for special in the Special Modification field and indicate the desired rod lock port thread style in the item notes. NPTF cylinder ports are must be ordered for 3MAJ.

[5] Fluorocarbon seals for 4MAJ are only for external chemical compatibility applications, not high temperature.

[6] Used for external chemical compatibility applications, not high temperature.

[7] For Linear Position Sensor Option (LPSO), please include the following information for the Special Modification item notes:
a. Sensor part number (see pages B100-B104)
b. Sensor position
c. Port position (if other than position 1)
d. Length of stop tubing, gross stroke and net stroke (if required)

LPSO not available for 3MAJ, please specify 4MAJ. Cylinder dimensions will approximate dimensions for 4MAJ. Piston Type option (blank), 3, 6, D, F or R is required. Please consult the Actuator Division for additional information.

[8] Review Piston Rod Selection Chart on page B136 to determine proper piston rod diameter.

[9] For additional information regarding this style, refer to page B105. If non-standard Rod Material and Gland Code is required with this option, please place an "S" for special in Special Modification field and specify Rod Material and Gland Code in the item notes.

[10] If a stop tube is required, specify gross stroke (net stroke + stop tube) in the model number, then place an "S" for special in the Special Modification field and specify the stop tube length in the item notes. Not available with Piston Types (blank) and 1 for 1-1/2" - 5" bore cylinders. Stop tube not available for 3MAJ, please specify 4MAJ.

[11] 6"-8" bore 4MAJ can accept only Piston Types (blank) and 3. The (blank) piston for 6"-8" bores is aluminum, lipseals, no magnetic ring. Composite pistons not available with oversize rod number 3.

How to order 3MAJ/4MAJ Series cylinders with sensors:

Sensors must be ordered separately and are not mounted to the cylinder prior to shipment.

1. Cylinder model number must have a Piston Type with a magnetic ring ((blank, thru 5" bore) 3, 6, D, F or R).
2. Please refer to pages B113-B120 for sensor part numbers and specifications. Global, NAMUR and Weld Immune Sensors will fit the 3MAJ/4MAJ Series.
3. Style DD mounts, 6"-8" Bore and other tie rod versions with Global Sensors will require tie rod bracket P8S-TMA0X. Please refer to page B117 for more information.

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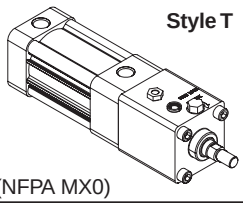
3MAJ/4MAJ Series Mounting Styles

Mounting Code	NFPA Mounting Style	Description	Available Bore Sizes		
			4MAJ/3MAJ*	4MAJ-LPSO w/o Stop Tube	4MAJ-LPSO w/Stop Tube
T	MX0	No Mount	1-1/2 - 8	2 - 8	2 - 8
J	MF1	Head Rectangular Flange	1-1/2 - 6	2 - 6**	2 - 6
H	MF2	Cap Rectangular Flange	1-1/2 - 6	2 - 6**	2 - 6**
TB	MX3	Tie Rods Extended Head End	1-1/2 - 8	–	2 - 8
TC	MX2	Tie Rods Extended Cap End	1-1/2 - 8	–	–
TD	MX1	Tie Rods Extended Both Ends	1-1/2 - 8	–	–
C	MS2	Side Lug	1-1/2 - 8	2 - 8	2 - 8
F	MS4	Side Tap	1-1/2 - 8	2 - 8	2 - 8
CB	MS1	Side End Angle	1-1/2 - 8	2 - 8	2 - 8
G	MS7	Side End Lug	1-1/2 - 4	2 - 4	2 - 4
BB	MP1	Cap Fixed Clevis	1-1/2 - 8	2 - 8**	2 - 8**
BC	MP2	Cap Detachable Clevis	1-1/2 - 8	2 - 8**	2 - 8**
BE	MP4	Cap Detachable Eye	1-1/2 - 6	2 - 6**	2 - 6**
D	MT1	Head Trunnion	1-1/2 - 8	2 - 8	2 - 8
DB	MT2	Cap Trunnion	1-1/2 - 8	2 - 8**	2 - 8**
DD	MT4	Intermediate Trunnion	1-1/2 - 8	–	–
KT	MDX0	Double Rod End, No Mount	1-1/2 - 8	2 - 8	2 - 8

* 3MAJ utilizes base 3MA cylinder and is available in 1-1/2" to 5" bore sizes. Mounting style codes C, D and DB not available for 3MAJ

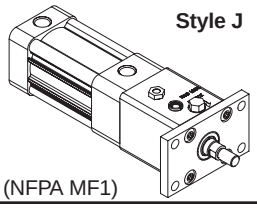
** May interfere with mounting. Please provide clearance for Linear Position Sensor overhang (see page B99).

No Mount Basic **Style T**



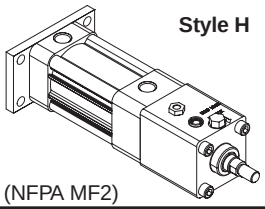
(NFPA MX0)

Head Rectangular Flange **Style J**



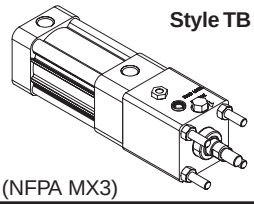
(NFPA MF1)

Cap Rectangular Flange **Style H**



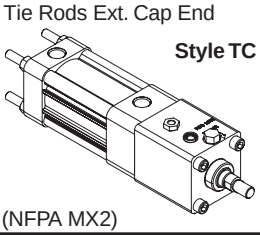
(NFPA MF2)

Tie Rods Ext. Head End **Style TB**



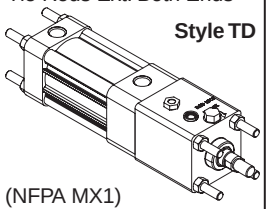
(NFPA MX3)

Tie Rods Ext. Cap End **Style TC**



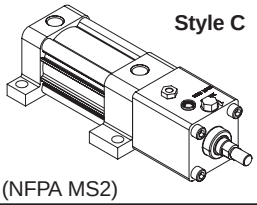
(NFPA MX2)

Tie Rods Ext. Both Ends **Style TD**



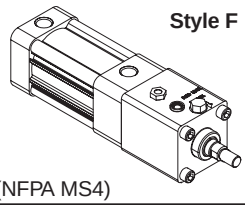
(NFPA MX1)

Side Lug **Style C**



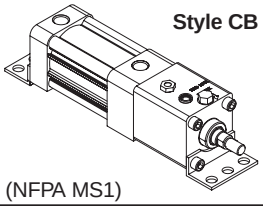
(NFPA MS2)

Side Tap **Style F**



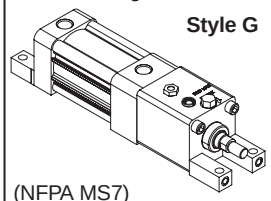
(NFPA MS4)

Side End Angle **Style CB**



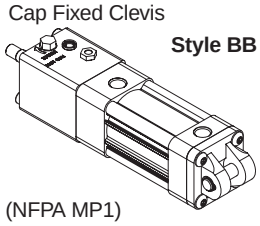
(NFPA MS1)

Side End Lug **Style G**



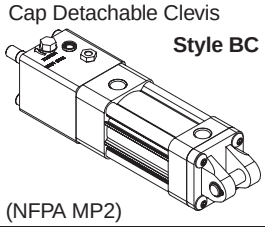
(NFPA MS7)

Cap Fixed Clevis **Style BB**



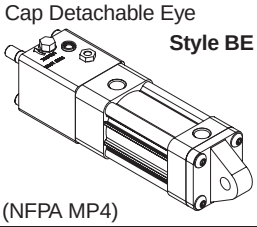
(NFPA MP1)

Cap Detachable Clevis **Style BC**



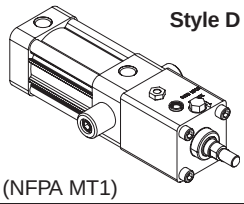
(NFPA MP2)

Cap Detachable Eye **Style BE**



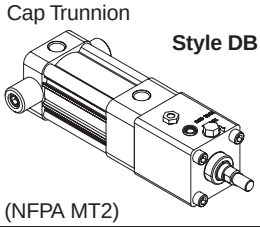
(NFPA MP4)

Head Trunnion **Style D**



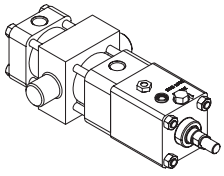
(NFPA MT1)

Cap Trunnion **Style DB**



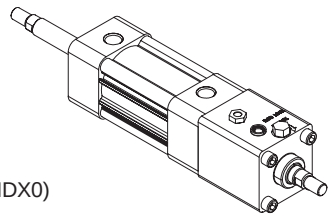
(NFPA MT2)

Intermediate Trunnion **Style DD**



(NFPA MT4)

Double Rod End **Style KT**



(NFPA MDX0)

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General Specifications

- NFPA interchangeable*
- Bore sizes – 1-1/2", 2", 2-1/2", 3-1/4", 4", 5", 6" and 8"
- Strokes – available in any practical stroke length
- Rod diameters – 5/8", 1", 1-3/8" and 1-3/4"
- Rod end styles – 4 standard, specials available
- Single rod end or double rod ends
- Cushions – required and adjustable at both ends
- Operating pressure –

  100 PSIG (6.9 Bar)** maximum air service, except for 2" bore with 1" rod (rated at 80 PSIG)

  60 PSIG (4.1 Bar) minimum air pressure to release rod lock
- Media – dry, filtered air
- Temperature range – -10°F to +165°F
  (-23°C to +74°C)
- Mounting styles – 18 standard styles

* NFPA standards do not specify rod lock cylinder dimensions. The base 3MA or 4MA cylinder and mounting accessories subscribe to NFPA standards.

** The pressure ratings are for these devices as stated. However, the rated holding forces of the rod locks are as stated on page 62.

For material options, including seals and piston rods, please see Material Specifications on next page.

Cylinder Weights – 3MAJ and 4MAJ

Bore (inch)	Rod (inch)	No Mount Single Rod 3MAJ and 4MAJ		No Mount Double Rod	
		Base Wt. (lbs.)	Per Inch (lbs.)	Base Wt. (lbs.)	Per Inch (lbs.)
1-1/2	0.625	4.23	0.20	4.66	0.28
2	0.625	5.90	0.21	6.55	0.30
	1.00	6.49	0.35	7.84	0.58
2-1/2	0.625	7.75	0.23	8.46	0.31
	1.00	8.56	0.37	10.24	0.60
3-1/4	1.00	13.95	0.42	15.15	0.64
	1.375	15.93	0.62	19.46	1.05
4	1.00	20.80	0.49	22.32	0.71
	1.375	22.29	0.69	26.37	1.12
5	1.00	31.20	0.61	33.84	0.84
	1.375	32.72	0.81	36.89	1.24
6	1.375	55.50	0.87	60.63	1.30
	1.75	57.61	1.13	65.41	1.82
8	1.375	94.50	1.25	100.15	1.68
	1.75	96.63	1.51	104.90	2.20

Standard Cushion Position

Mounting Code	Position
All except D, DB, DD	2
D, DB, DD (4MAJ only)	3

Standard Cylinder Port Sizes***

Bore	NPTF / BSPT	BSPP	SAE
1-1/2	3/8	G3/8	6
2	3/8	G3/8	6
2-1/2	3/8	G3/8	6
3-1/4	1/2	G1/2	10
4	1/2	G1/2	10
5	1/2	G1/2	10
6	3/4	G3/4	12
8	3/4	G3/4	12

Port thread styles for base cylinder only. Rod lock port is always NPTF. If a different rod lock port thread style is required, place an "S" for special in the Special Modification field and indicate the desired rod lock port thread style in the item notes. Standard rod lock port sizes are detailed in cylinder dimension tables.

***3MAJ only available with NPTF ports.

Mounting Weight Adders

Bore (inch)	Weight (lbs) by Mounting Style							
	J, H	D, DB	BB	CB, G	DD	BE	C	BC
1-1/2	0.51	0.50	0.15	0.36	1.70	0.23	0.15	0.20
2	0.76	0.50	0.26	065	2.38	0.32	0.15	0.29
2-1/2	1.13	0.50	0.38	1.05	3.00	0.42	0.15	0.41
3-1/4	2.76	0.50	0.98	1.38	5.35	1.26	0.35	1.06
4	4.05	0.50	1.35	2.20	6.75	1.62	0.35	1.49
5	6.46	0.50	1.20	4.29	8.77	1.26	0.57	2.41
6	10.74	1.22	2.91	5.88	15.52	2.91	0.69	11.38
8	N/A	1.22	2.91	7.84	25.01	N/A	0.67	17.31

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Material Specifications – Standard Temperatures and Applications

Same as 3MA for 3MAJ, and 4MA for 4MAJ, with the following additions/changes:

Piston rod ..... (other materials not available)	Case-hardened, chrome plated carbon steel (standard).
	17-4 PH stainless steel, chrome plated.
Rod lock housing	Black anodized aluminum alloy
Rod lock wiper	Fluorocarbon
Manual override shaft ..	416 stainless steel
Rod lock screws	Black oxided steel alloy

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B

How to Select a 3MAJ and 4MAJ Cylinder

Parker cylinders are available based on air operating pressure. The many styles, sizes and optional features available assure that your application requirements are precisely met. 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.

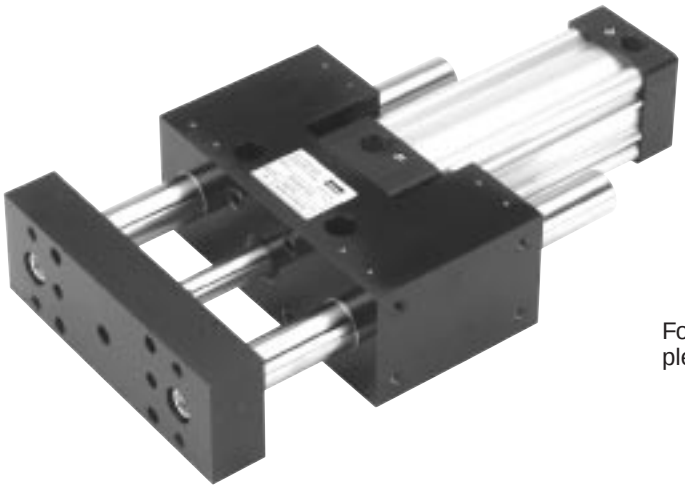
Step 2 - **Determine the series cylinder to use**, based on operating pressure.

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.

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. Mandatory cushions can be used to reduce shock during deceleration, check that peak pressures will be within tolerable limits.	
Long Push Stroke	Check whether stop tube (4MAJ with aluminum piston only) 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. See Piston Rod Selection Chart or Application Engineering section for recommendations.	
Long Horizontal Stroke	Determine if standard size piston rod is strong enough to accommodate intended load.	
Options and Modifications (4MAJ only, please refer to 3MA section regarding 3MAJ option availability beyond model code)	- Piston Bumper Seals (1-1/2" through 5") - Piston Bumpers (1-1/2" through 4") - Port and Cushion Adjust Relocation - Port Thread Styles - Multiple Ports - Adjustable Sensors - Linear Position Sensing Option (LPSO) - Double Rod End	- Rod End Modifications - Stop Tube - Mixed Mountings - Shock Absorber on Cap End - Round Tube and Tie Rod Construction - LECTROFLUOR® Coating - Air Cylinder/Valve Combination (ACVB) - Par-Check for smooth hydraulic control



For a guided version of the 4MAJ Series, please see the HB Series in Section F.

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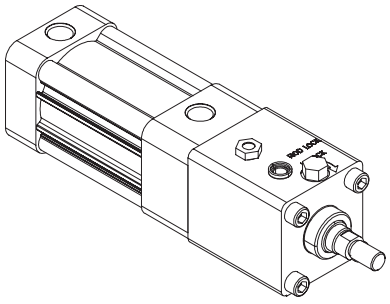
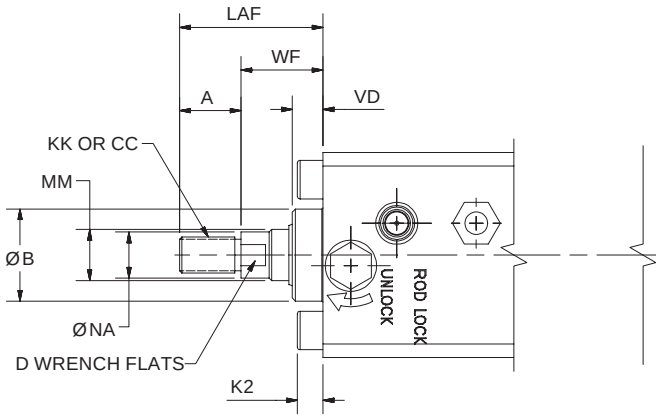
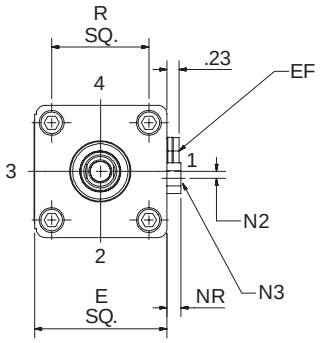
3MAJ/4MAJ Series Single Rod Dimensions – 1-1/2" to 5" Bore Size

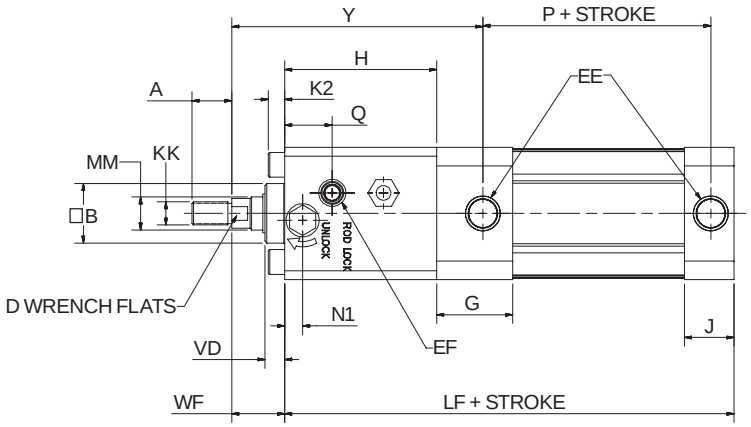
No Mount Basic
Style T
(NFPA MX0)





For dimensions of all standard rod end styles, please see page B70.





Cylinder Dimensions – Style T

Bore Size	Rod No.	Rod Dia. MM	Thread Style 8 CC	Thread Style 4 & 9 KK	A	AA	+.000 -.002 B	D	E	EE (NPTF)	EF (NPTF)	G	H	J
1-1/2	1	5/8	1/2-20	7/16-20	0.750	2.020	1.124	1/2	2.000	3/8	1/8	1.438	2.625	0.938
2	1	5/8	1/2-20	7/16-20	0.750	2.600	1.124	1/2	2.500	3/8	1/8	1.375	2.875	0.937
	3	1	7/8-14	3/4-16	1.125	2.600	1.499	7/8	2.500	3/8	1/8	1.375	3.875	0.937
2-1/2	1	5/8	1/2-20	7/16-20	0.750	3.100	1.124	1/2	3.000	3/8	1/8	1.344	2.875	0.938
	3	1	7/8-14	3/4-16	1.125	3.100	1.499	7/8	3.000	3/8	1/8	1.344	4.000	0.938
3-1/4	1	1	7/8-14	3/4-16	1.125	3.900	1.499	7/8	3.750	1/2	1/4	1.594	4.500	1.125
	3	1-3/8	1-1/4 - 12	1-14	1.625	3.900	1.999	1-1/8	3.750	1/2	1/4	1.594	4.875	1.125
4	1	1	7/8-14	3/4-16	1.125	4.700	1.499	7/8	4.500	1/2	1/4	1.594	4.875	1.125
	3	1-3/8	1-1/4 - 12	1-14	1.625	4.700	1.999	1-1/8	4.500	1/2	1/4	1.594	5.125	1.125
5	1	1	7/8-14	3/4-16	1.125	5.800	1.499	7/8	5.500	1/2	1/4	1.594	5.375	1.219
	3	1-3/8	1-1/4 - 12	1-14	1.625	5.800	1.999	1-1/8	5.500	1/2	1/4	1.594	5.750	1.219

Bore Size	Rod No.	Rod Dia. MM	K2	LAF	N1	N2	Hex N3	NA	NR	Q	R	VD	WF	Y	Add Stroke LF	Add Stroke P
1-1/2	1	5/8	0.250	1.750	0.220	0.140	5/16	0.563	0.190	0.715	1.430	0.375	1.000	4.500	6.250	2.313
2	1	5/8	0.313	1.750	0.340	0.130	1/2	0.563	0.265	0.895	1.840	0.375	1.000	4.750	6.500	2.313
	3	1	0.313	2.500	0.338	0.146	1/2	0.938	0.275	1.065	1.840	0.500	1.375	6.125	7.500	2.313
2-1/2	1	5/8	0.313	1.750	0.346	0.150	1/2	0.563	0.265	0.755	2.190	0.500	1.000	4.813	6.625	2.375
	3	1	0.313	2.500	0.346	0.148	1/2	0.938	0.265	1.120	2.190	0.500	1.375	6.313	7.750	2.375
3-1/4	1	1	0.375	2.500	0.631	0.180	5/8	0.938	0.340	1.510	2.760	0.500	1.375	6.938	8.750	2.625
	3	1-3/8	0.375	3.250	0.813	0.247	5/8	1.313	0.350	1.645	2.760	0.625	1.625	7.563	9.125	2.625
4	1	1	0.375	2.500	0.625	0.240	7/8	0.938	0.500	1.725	3.320	0.500	1.375	7.313	9.125	2.625
	3	1-3/8	0.375	3.250	0.771	0.276	7/8	1.313	0.490	1.679	3.320	0.750	1.625	7.813	9.375	2.625
5	1	1	0.500	2.500	0.720	0.220	7/8	0.938	0.500	1.995	4.100	0.500	1.375	7.813	9.875	2.875
	3	1-3/8	0.500	3.250	0.720	0.220	7/8	1.313	0.490	2.330	4.100	0.750	1.625	8.438	10.250	2.875

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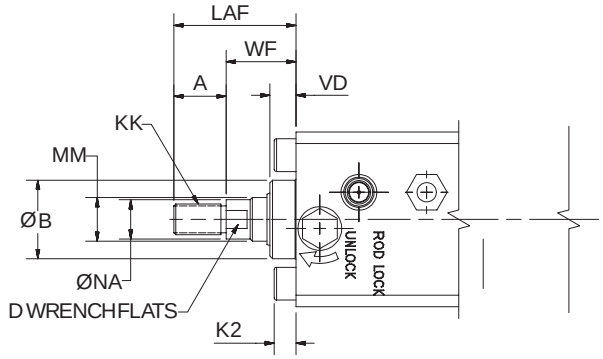
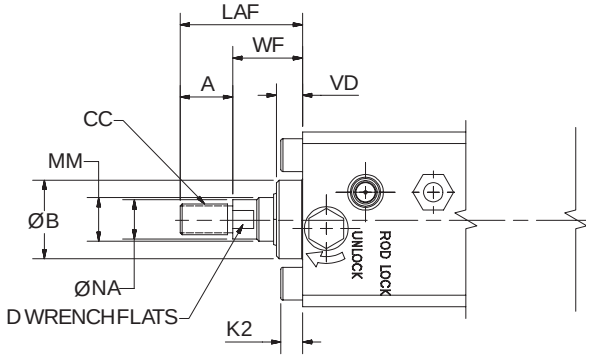
B

Rod End Dimensions – 1-1/2" to 5" Bore Size

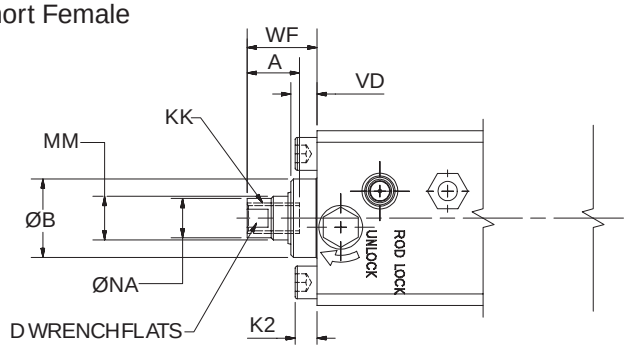
Thread Style 4
(NFPA Style SM)
Small Male



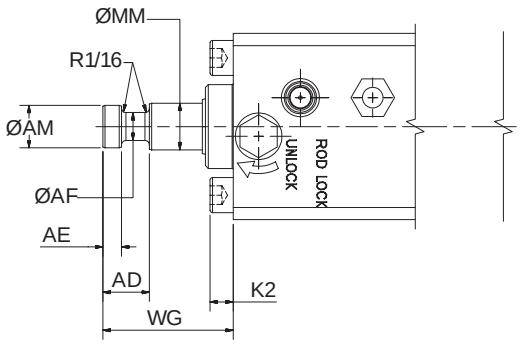
Thread Style 8
(NFPA Style IM)
Intermediate Male



Thread Style 9
(NFPA Style SF)
Short Female



Thread Style 55
For use with Split Coupler
(see page B105 for more information)



Rod End Dimensions

Bore Size	Rod No.	Rod Dia. MM	Thread Style 8 CC	Thread Style 4 & 9 KK	A	AD	AE	AF	AM	+.000 -.002 B	D	K2	LAF	NA	VD	WF	WG
1-1/2	1	5/8	1/2-20	7/16-20	0.750	0.625	0.250	0.375	0.570	1.124	1/2	0.250	1.750	0.563	0.375	1.000	1.750
2	1	5/8	1/2-20	7/16-20	0.750	0.625	0.250	0.375	0.570	1.124	1/2	0.313	1.750	0.563	0.375	1.000	1.750
	3	1	7/8-14	3/4-16	1.125	0.938	0.375	0.688	0.950	1.499	7/8	0.313	2.500	0.938	0.500	1.375	2.375
2-1/2	1	5/8	1/2-20	7/16-20	0.750	0.625	0.250	0.375	0.570	1.124	1/2	0.313	1.750	0.563	0.500	1.000	1.750
	3	1	7/8-14	3/4-16	1.125	0.938	0.375	0.688	0.950	1.499	7/8	0.313	2.500	0.938	0.500	1.375	2.375
3-1/4	1	1	7/8-14	3/4-16	1.125	0.938	0.375	0.688	0.950	1.499	7/8	0.375	2.500	0.938	0.500	1.375	2.375
	3	1-3/8	1-1/4 - 12	1-14	1.625	1.063	0.375	0.875	1.320	1.999	1-1/8	0.375	3.250	1.313	0.625	1.625	2.750
4	1	1	7/8-14	3/4-16	1.125	0.938	0.375	0.688	0.950	1.499	7/8	0.375	2.500	0.938	0.500	1.375	2.375
	3	1-3/8	1-1/4 - 12	1-14	1.625	1.063	0.375	0.875	1.320	1.999	1-1/8	0.375	3.250	1.313	0.750	1.625	2.750
5	1	1	7/8-14	3/4-16	1.125	0.938	0.375	0.688	0.950	1.499	7/8	0.500	2.500	0.938	0.500	1.375	2.375
	3	1-3/8	1-1/4 - 12	1-14	1.625	1.063	0.375	0.875	1.320	1.999	1-1/8	0.500	3.250	1.313	0.750	1.625	2.750

Thread Style 3 - "Special Thread"

Special threads, rod extensions, rod eyes, blanks, etc. are also available.
To order, specify "Style 3" and give desired dimensions for KK or CC, A and W or WF.
If otherwise special, please supply dimensioned sketch.

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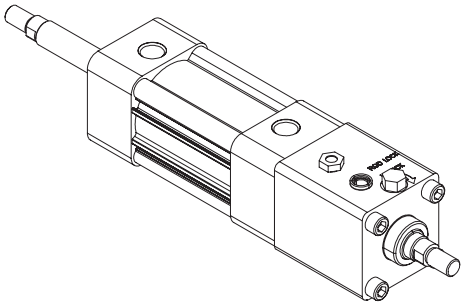
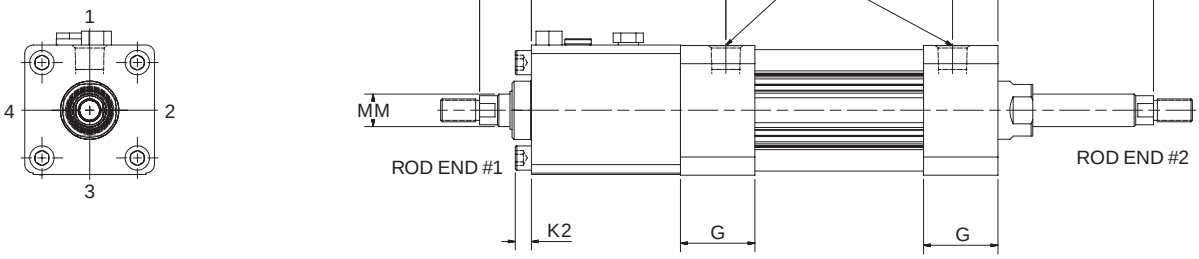
To determine dimensions for a double rod end cylinder, first refer to the desired single rod end mounting style cylinder shown in this catalog section. After selecting the necessary dimensions from that drawing, return to this page and supplement the single rod end dimensions with those shown in the drawings and dimension table below. Note that double rod end cylinders have a head dimension (G) at both ends, and that LG replaces LF, PK replaces P, etc. The double rod end dimensions differ from, or are in addition to, those for single rod cylinders.

When a double rod end cylinder has two different rod ends, please clearly state which rod end is to be available at which head end.

1-1/2" to 5" Bore Size K-type 3MAJ/4MAJ

Mounting Styles for Single Rod Models	Corresponding Mounting Styles for Double Rod Models
C	KC
CB	KCB
D	KD
DD	KDD
F	KF
G	KG
J	KJ
T	KT
TB	KTB
TD	KTD





Cylinder Dimensions – Style KT

Bore Size	Rod No.	Rod Dia. MM	EE (NPTF)	G	K2	WF	Y	Add Stroke								Add 2X Stroke
								LG	P_K	SA_K	XA_K	SS_K	SN_K	SE_K	XE_K	ZM
1-1/2	1	5/8	3/8	1.438	0.250	1.000	4.500	6.750	2.375	8.750	8.750	3.375	2.250	9.000	8.875	8.750
2	1	5/8	3/8	1.375	0.313	1.000	4.750	7.000	2.375	9.000	9.000	3.375	2.250	9.625	9.313	9.000
	3	1	3/8	1.375	0.313	1.375	6.125	8.000	2.375	10.000	10.375	3.375	2.250	10.625	10.688	10.750
2-1/2	1	5/8	3/8	1.344	0.313	1.000	4.813	7.125	2.375	9.125	9.125	3.500	2.375	10.000	9.563	9.125
	3	1	3/8	1.344	0.313	1.375	6.313	8.250	2.375	10.250	10.625	3.500	2.375	11.125	11.063	11.000
3-1/4	1	1	1/2	1.594	0.375	1.375	6.938	9.250	2.625	11.750	11.875	3.750	2.625	12.250	12.125	12.000
	3	1-3/8	1/2	1.594	0.375	1.625	7.563	9.625	2.625	12.125	12.500	3.750	2.625	12.625	12.750	12.875
4	1	1	1/2	1.594	0.375	1.375	7.313	9.625	2.625	12.125	12.250	3.750	2.625	12.875	12.625	12.375
	3	1-3/8	1/2	1.594	0.375	1.625	7.813	9.875	2.625	12.375	12.750	3.750	2.625	13.125	13.125	13.125
5	1	1	1/2	1.594	0.500	1.375	7.813	10.313	2.813	13.063	13.063	3.563	2.813	–	–	13.063
	3	1-3/8	1/2	1.594	0.500	1.625	8.438	10.688	2.813	13.438	13.688	3.563	2.813	–	–	13.938
Replaces Dimension								LF	P	SA	XA	SS	SN	SE	XE	–
On Single Rod Mounting Styles								All Styles		CB		C	F	G		All

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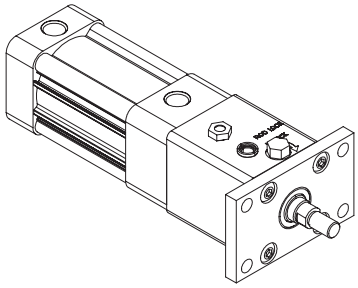
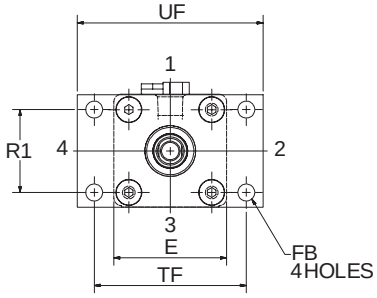
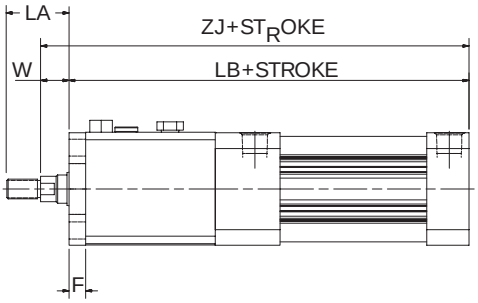
B

Head Rectangular Flange
Style J
(NFPA MF1)

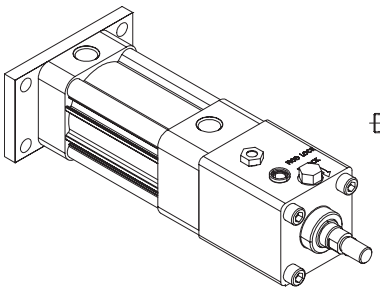


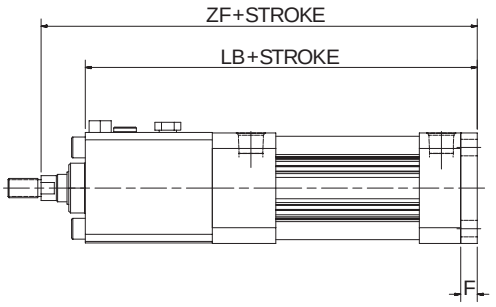


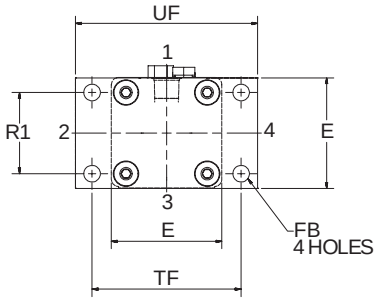


Note: Style J has a W dimension instead of WF and a LA dimension instead of LAF because of the flange installation. Please use dimensions W and LA regarding rod ends only for Style J.
For reference, WF = W + F and LA = W + A.

Cap Rectangular Flange
Style H
(NFPA MF2)







Cylinder Dimensions – Styles J and H

Bore Size	Rod No.	Rod Dia. MM	A	E	F	FB	LA	R1	TF	UF	W	Add Stroke		
												LB	ZF	ZJ
1-1/2	1	5/8	0.750	2.000	0.375	0.313	1.375	1.430	2.750	3.375	0.625	6.625	7.625	7.250
2	1	5/8	0.750	2.500	0.375	0.375	1.375	1.840	3.375	4.125	0.625	6.875	7.875	7.500
	3	1	1.125	2.500	0.375	0.375	2.125	1.840	3.375	4.125	1.000	7.875	9.250	8.875
2-1/2	1	5/8	0.750	3.000	0.375	0.375	1.375	2.190	3.875	4.625	0.625	7.000	8.000	7.625
	3	1	1.125	3.000	0.375	0.375	2.125	2.190	3.875	4.625	1.000	8.125	9.500	9.125
3-1/4	1	1	1.125	3.750	0.625	0.438	1.875	2.760	4.688	5.500	0.750	9.375	10.750	10.125
	3	1-3/8	1.625	3.750	0.625	0.438	2.625	2.760	4.688	5.500	1.000	9.750	11.375	10.750
4	1	1	1.125	4.500	0.625	0.438	1.875	3.320	5.438	6.250	0.750	9.750	11.125	10.500
	3	1-3/8	1.625	4.500	0.625	0.438	2.625	3.320	5.438	6.250	1.000	10.000	11.625	11.000
5	1	1	1.125	5.500	0.625	0.563	1.875	4.100	6.625	7.625	0.750	10.500	11.875	11.250
	3	1-3/8	1.625	5.500	0.625	0.563	2.625	4.100	6.625	7.625	1.000	10.875	12.500	11.875

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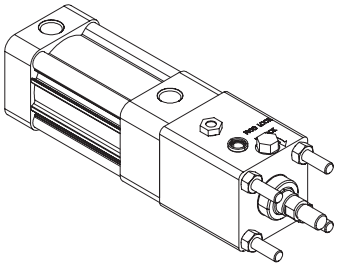
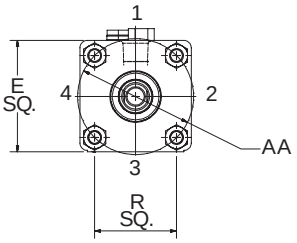
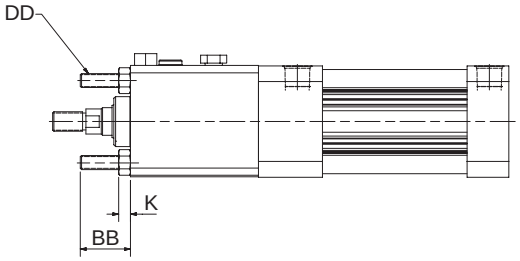
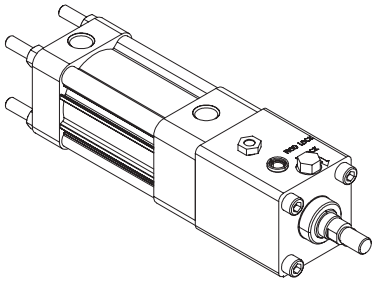
Tie Rods Extended Head End Mount
Style TB
(NFPA MX3)

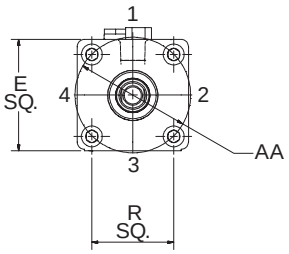


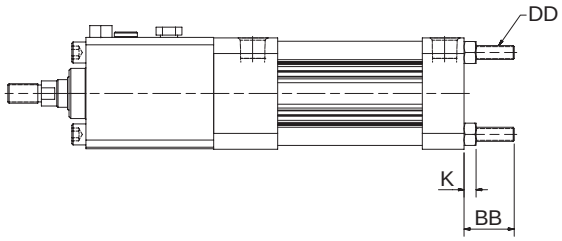




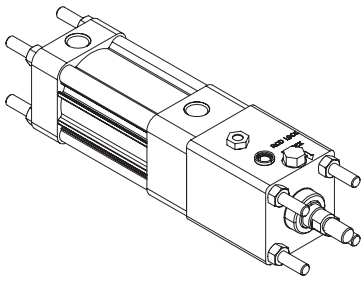
Tie Rods Extended Cap End Mount
Style TC
(NFPA MX2)

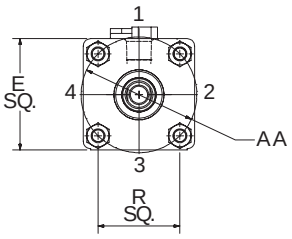


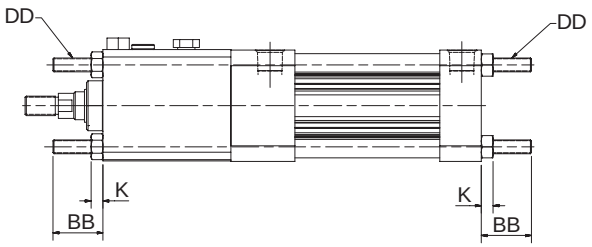




Tie Rods Extended Both Ends Mount
Style TD
(NFPA MX1)







Cylinder Dimensions – Styles TB, TC and TD

Bore Size	Rod No.	Rod Dia. MM	AA	BB	DD	E	K	R
1-1/2	1	5/8	2.020	1.000	1/4-28	2.000	0.250	1.430
2	1	5/8	2.600	1.125	5/16-24	2.500	0.313	1.840
	3	1	2.600	1.125	5/16-24	2.500	0.313	1.840
2-1/2	1	5/8	3.100	1.125	5/16-24	3.000	0.313	2.190
	3	1	3.100	1.125	5/16-24	3.000	0.313	2.190
3-1/4	1	1	3.900	1.375	3/8-24	3.750	0.375	2.760
	3	1-3/8	3.900	1.375	3/8-24	3.750	0.375	2.760
4	1	1	4.700	1.375	3/8-24	4.500	0.375	3.320
	3	1-3/8	4.700	1.375	3/8-24	4.500	0.375	3.320
5	1	1	5.800	1.813	1/2-20	5.500	0.438	4.100
	3	1-3/8	5.800	1.813	1/2-20	5.500	0.438	4.100

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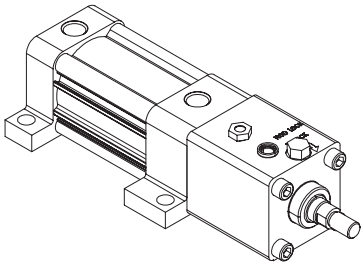
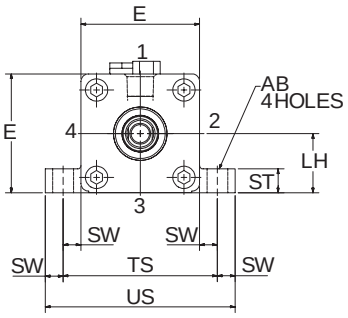
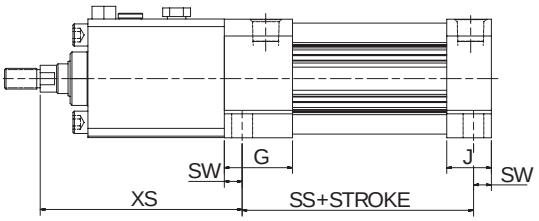
B

Side Lug Mount
Style C (only 4MAJ)
(NFPA MS2)



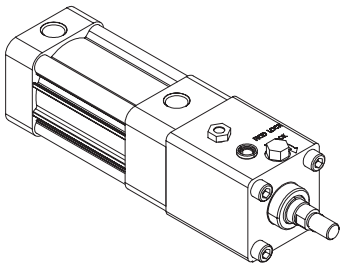


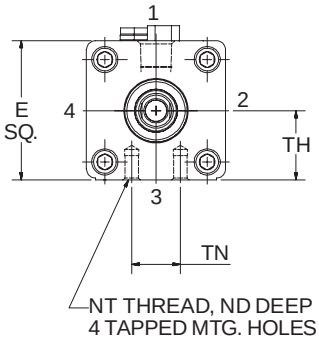


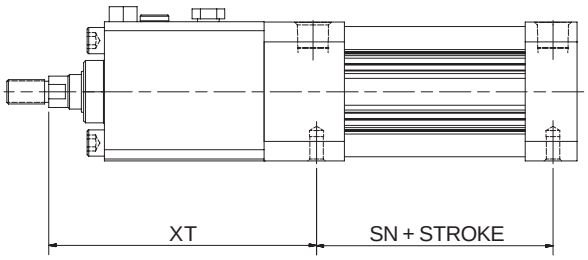
Cylinder Dimensions – Style C

Bore Size	Rod No.	Rod Dia. MM	AB	E	G	J	+/-.003 LH	ST	SW	TS	US	XS	Add Stroke SS
1-1/2	1	5/8	0.438	2.000	1.438	0.938	0.993	0.500	0.375	2.750	3.500	4.000	2.875
2	1	5/8	0.438	2.500	1.375	0.937	1.243	0.500	0.375	3.250	4.000	4.250	2.875
	3	1	0.438	2.500	1.375	0.937	1.243	0.500	0.375	3.250	4.000	5.625	2.875
2-1/2	1	5/8	0.438	3.000	1.344	0.938	1.493	0.500	0.375	3.750	4.500	4.250	3.000
	3	1	0.438	3.000	1.344	0.938	1.493	0.500	0.375	3.750	4.500	5.750	3.000
3-1/4	1	1	0.563	3.750	1.594	1.125	1.868	0.750	0.500	4.750	5.750	6.375	3.250
	3	1-3/8	0.563	3.750	1.594	1.125	1.868	0.750	0.500	4.750	5.750	7.000	3.250
4	1	1	0.563	4.500	1.594	1.125	2.243	0.750	0.500	5.500	6.500	6.750	3.250
	3	1-3/8	0.563	4.500	1.594	1.125	2.243	0.750	0.500	5.500	6.500	7.250	3.250
5	1	1	0.813	5.500	1.594	1.219	2.743	1.000	0.688	6.875	8.250	7.438	3.125
	3	1-3/8	0.813	5.500	1.594	1.219	2.743	1.000	0.688	6.875	8.250	8.063	3.125

Side Tap Mount
Style F
(NFPA MS4)







Cylinder Dimensions – Style F

Bore Size	Rod No.	Rod Dia. MM	E	ND	NT	+/-.003 TH	TN	XT	Add Stroke SN
1-1/2	1	5/8	2.000	0.375	1/4-20	0.993	0.625	4.563	2.250
2	1	5/8	2.500	0.438	5/16-18	1.243	0.875	4.813	2.250
	3	1	2.500	0.375	5/16-18	1.243	0.875	6.188	2.250
2-1/2	1	5/8	3.000	0.625	3/8-16	1.493	1.250	4.813	2.375
	3	1	3.000	0.625	3/8-16	1.493	1.250	6.313	2.375
3-1/4	1	1	3.750	0.750	1/2-13	1.868	1.500	6.938	2.625
	3	1-3/8	3.750	0.750	1/2-13	1.868	1.500	7.563	2.625
4	1	1	4.500	0.750	1/2-13	2.243	2.063	7.313	2.625
	3	1-3/8	4.500	0.750	1/2-13	2.243	2.063	7.813	2.625
5	1	1	5.500	0.938	5/8-11	2.743	2.688	7.813	2.875
	3	1-3/8	5.500	0.938	5/8-11	2.743	2.688	8.438	2.875

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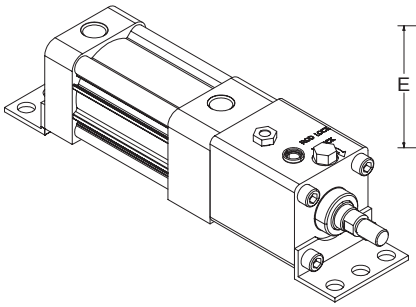
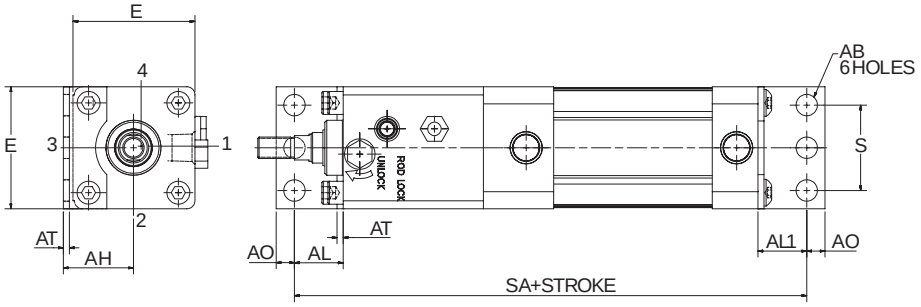
Side End Angle Mount
Style CB
(NFPA MS1)

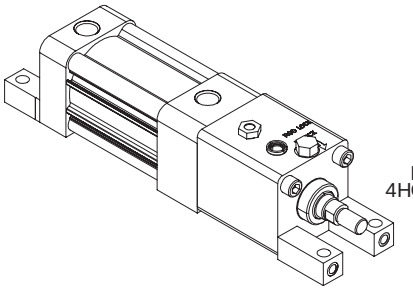


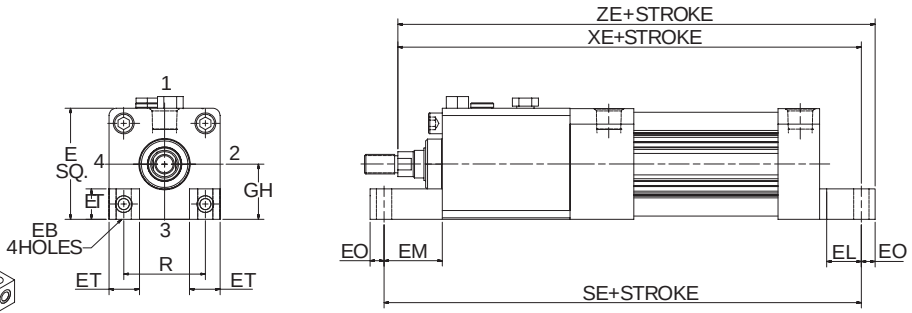


Cylinder Dimensions – Style CB

Bore Size	Rod No.	Rod Dia. MM	AB	AH	AL	AL1	AO	AT	E	S	Add Stroke SA
1-1/2	1	5/8	0.438	1.188	1.000	1.000	0.375	0.125	2.000	1.250	8.250
2	1	5/8	0.438	1.438	1.000	1.000	0.375	0.125	2.500	1.750	8.500
	3	1	0.438	1.438	1.000	1.000	0.375	0.125	2.500	1.750	9.500
2-1/2	1	5/8	0.438	1.625	1.000	1.000	0.375	0.125	3.000	2.250	8.625
	3	1	0.438	1.625	1.000	1.000	0.375	0.125	3.000	2.250	9.750
3-1/4	1	1	0.563	1.938	1.250	1.250	0.500	0.125	3.750	2.750	11.250
	3	1-3/8	0.563	1.938	1.250	1.250	0.500	0.125	3.750	2.750	11.625
4	1	1	0.563	2.250	1.875	1.250	0.500	0.125	4.500	3.500	12.250
	3	1-3/8	0.563	2.250	1.875	1.250	0.500	0.125	4.500	3.500	12.500
5	1	1	0.688	2.750	1.375	1.375	0.625	0.188	5.500	4.250	12.625
	3	1-3/8	0.688	2.750	1.375	1.375	0.625	0.188	5.500	4.250	13.000

Side End Lug Mount
Style G
(NFPA MS7)





Cylinder Dimensions – Style G

Bore Size	Rod No.	Rod Dia. MM	E	EB	EL	EM	EO	ET	+/-.003 GH	R	Add Stroke SE	Add Stroke XE	Add Stroke ZE
1-1/2	1	5/8	2.000	0.281	0.750	1.125	0.250	0.563	0.993	1.430	8.125	8.000	8.250
2	1	5/8	2.500	0.344	0.938	1.313	0.313	0.688	1.243	1.840	8.750	8.438	8.750
	3	1	2.500	0.344	0.938	1.313	0.313	0.688	1.243	1.840	9.750	9.813	10.125
2-1/2	1	5/8	3.000	0.344	1.063	1.438	0.313	0.813	1.493	2.190	9.125	8.688	9.000
	3	1	3.000	0.344	1.063	1.438	0.313	0.813	1.493	2.190	10.250	10.188	10.500
3-1/4	1	1	3.750	0.406	0.875	1.500	0.375	1.000	1.868	2.760	11.125	11.000	11.375
	3	1-3/8	3.750	0.406	0.875	1.500	0.375	1.000	1.868	2.760	11.500	11.625	12.000
4	1	1	4.500	0.406	1.000	1.625	0.375	1.188	2.243	3.320	11.750	11.500	11.875
	3	1-3/8	4.500	0.406	1.000	1.625	0.375	1.188	2.243	3.320	12.000	12.000	12.375

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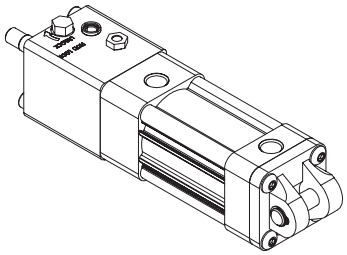
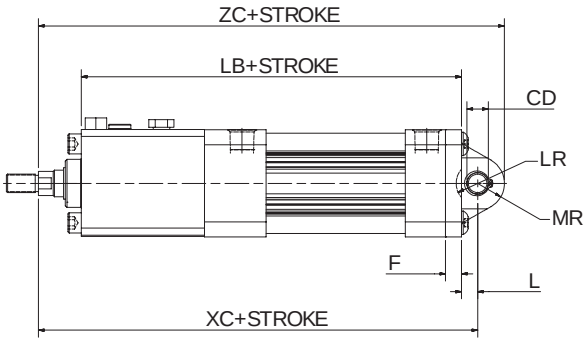
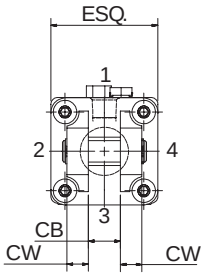
Cap Fixed Clevis Mount
Style BB
(NFPA MP1)

Note: For maximum swivel angle of BB mount with rear mounting plate, see Cylinder Accessories on page B110.

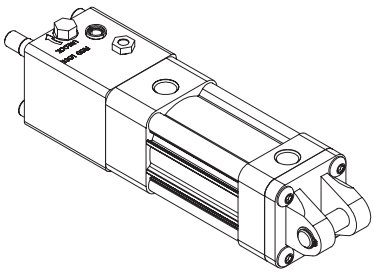
B

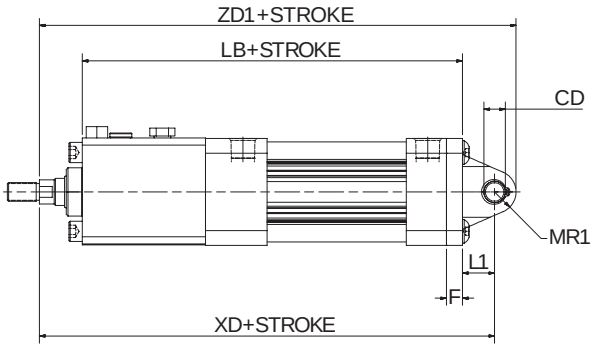


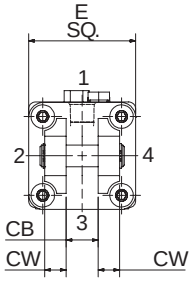




Cap Detachable Clevis Mount
Style BC
(NFPA MP2)







Cylinder Dimensions – Styles BB and BC

Bore Size	Rod No.	Rod Dia. MM	CB	+.000 -.002 CD	CW	E	F	L	L1	LR	MR	MR1	Add Stroke				
													LB	XC	XD	ZC	ZD1
1-1/2	1	5/8	0.750	0.501	0.500	2.000	0.375	0.375	0.750	0.750	0.625	0.500	6.625	8.000	8.375	8.625	8.875
2	1	5/8	0.750	0.501	0.500	2.500	0.375	0.375	0.750	0.750	0.625	0.500	6.875	8.250	8.625	8.875	9.125
	3	1	0.750	0.501	0.500	2.500	0.375	0.375	0.750	0.750	0.625	0.500	7.875	9.625	10.000	10.250	10.500
2-1/2	1	5/8	0.750	0.501	0.500	3.000	0.375	0.375	0.750	0.750	0.625	0.500	7.000	8.375	8.750	9.000	9.250
	3	1	0.750	0.501	0.500	3.000	0.375	0.375	0.750	0.750	0.625	0.500	8.125	9.875	10.250	10.500	10.750
3-1/4	1	1	1.250	0.751	0.625	3.750	0.625	0.625	1.250	1.000	0.938	0.750	9.375	11.375	12.000	12.313	12.750
	3	1-3/8	1.250	0.751	0.625	3.750	0.625	0.625	1.250	1.000	0.938	0.750	9.750	12.000	12.625	12.938	13.375
4	1	1	1.250	0.751	0.625	4.500	0.625	0.625	1.250	1.000	0.938	0.750	9.750	11.750	12.375	12.688	13.125
	3	1-3/8	1.250	0.751	0.625	4.500	0.625	0.625	1.250	1.000	0.938	0.750	10.000	12.250	12.875	13.188	13.625
5	1	1	1.250	0.751	0.625	5.500	0.625	0.625	1.250	1.000	0.938	0.750	10.500	12.500	13.125	13.438	13.875
	3	1-3/8	1.250	0.751	0.625	5.500	0.625	0.625	1.250	1.000	0.938	0.750	10.875	13.125	13.750	14.063	14.500

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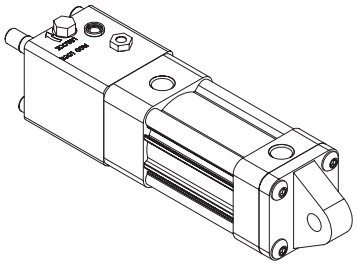
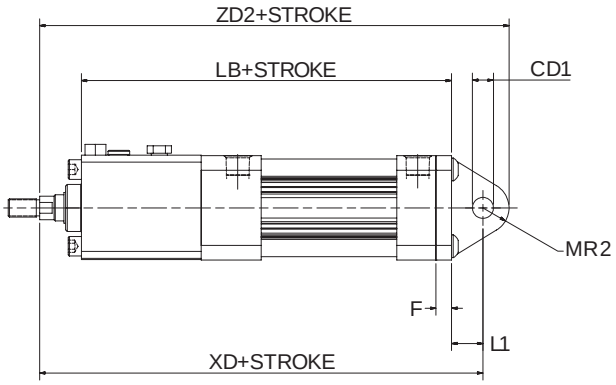
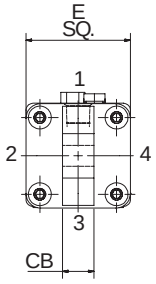
Cap Detachable Eye Mount*
Style BE
(NFPA MP4)







*Not available for 5" bore 3MAJ, please specify 4MAJ

Cylinder Dimensions – Style BE

Bore Size	Rod No.	Rod Dia. MM	CB	+.002 +.004 CD1	E	F	L1	MR2	Add Stroke		
									LB	XD	ZD2
1-1/2	1	5/8	0.750	0.500	2.000	0.375	0.750	0.625	6.625	8.375	9.000
2	1	5/8	0.750	0.500	2.500	0.375	0.750	0.625	6.875	8.625	9.250
	3	1	0.750	0.500	2.500	0.375	0.750	0.625	7.875	10.000	10.625
2-1/2	1	5/8	0.750	0.500	3.000	0.375	0.750	0.688	7.000	8.750	9.438
	3	1	0.750	0.500	3.000	0.375	0.750	0.688	8.125	10.250	10.313
3-1/4	1	1	1.250	0.750	3.750	0.625	1.250	0.875	9.375	12.000	12.875
	3	1-3/8	1.250	0.750	3.750	0.625	1.250	0.875	9.750	12.625	13.500
4	1	1	1.250	0.750	4.500	0.625	1.250	0.875	9.750	12.375	13.250
	3	1-3/8	1.250	0.750	4.500	0.625	1.250	0.875	10.000	12.875	13.750
5	1	1	1.250	0.750	5.500	0.625	1.250	0.875	10.500	13.125	14.000
	3	1-3/8	1.250	0.750	5.500	0.625	1.250	0.875	10.875	13.750	14.625

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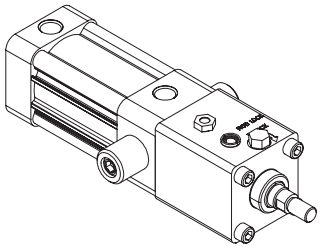
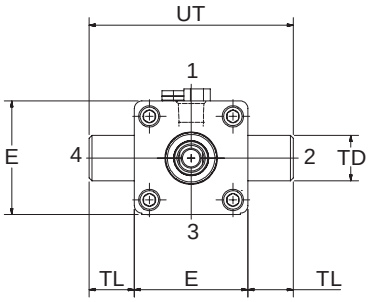
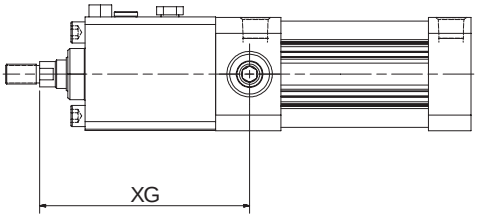
B

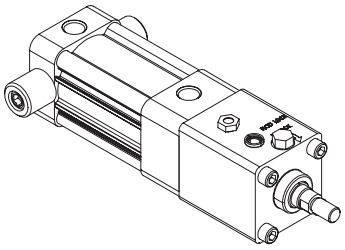
Head Trunnion Mount
Style D (only 4MAJ)
(NFPA MT1)

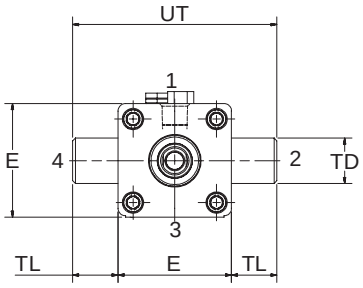


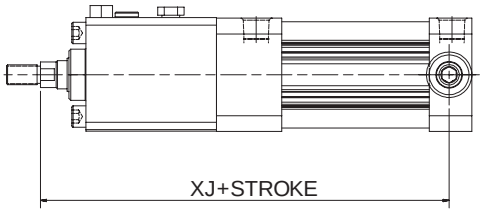




Cap Trunnion Mount
Style DB (only 4MAJ)
(NFPA MT2)







Cylinder Dimensions – Styles D and DB

Bore Size	Rod No.	Rod Dia. MM	E	+.000 -.001 TD	TL	UT	XG	XJ
1-1/2	1	5/8	2.000	1.000	1.000	4.000	4.375	6.750
2	1	5/8	2.500	1.000	1.000	4.500	4.625	7.000
	3	1	2.500	1.000	1.000	4.500	6.000	8.375
2-1/2	1	5/8	3.000	1.000	1.000	5.000	4.625	7.125
	3	1	3.000	1.000	1.000	5.000	6.125	8.625
3-1/4	1	1	3.750	1.000	1.000	5.750	6.750	9.500
	3	1-3/8	3.750	1.000	1.000	5.750	7.375	10.125
4	1	1	4.500	1.000	1.000	6.500	7.125	9.875
	3	1-3/8	4.500	1.000	1.000	6.500	7.625	10.375
5	1	1	5.500	1.000	1.000	7.500	7.625	10.625
	3	1-3/8	5.500	1.000	1.000	7.500	8.250	11.250

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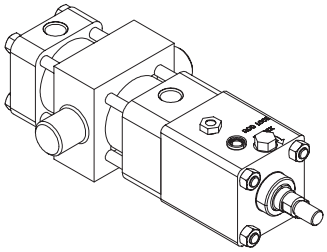
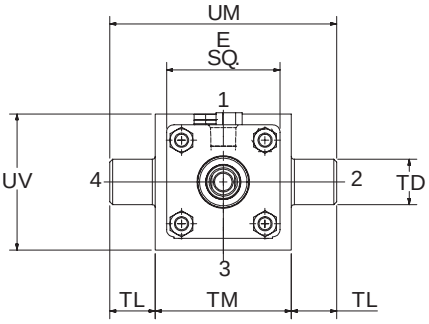
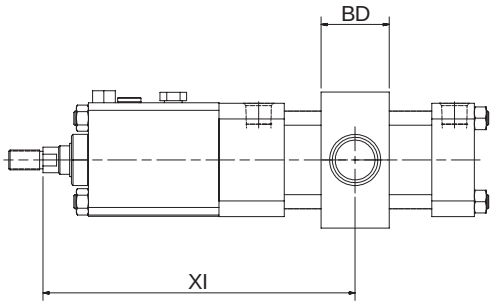
Intermediate Trunnion Mount
Style DD
(NFPA MT4)







Cylinder Dimensions – Style DD

Bore Size	Rod No.	Rod Dia. MM	E	BD	+.000 -.001 TD	TL	TM	UM	UV	Min. XI	Min. Stroke
1-1/2	1	5/8	2.000	1.250	1.000	1.000	2.500	4.500	2.500	9.000	3.250
2	1	5/8	2.500	1.500	1.000	1.000	3.000	5.000	3.000	9.937	4.000
	3	1	2.500	1.500	1.000	1.000	3.000	5.000	3.000	11.312	4.000
2-1/2	1	5/8	3.000	1.500	1.000	1.000	3.500	5.500	3.500	9.937	3.875
	3	1	3.000	1.500	1.000	1.000	3.500	5.500	3.500	11.437	3.875
3-1/4	1	1	3.750	2.000	1.000	1.000	4.500	6.500	4.250	12.500	4.375
	3	1-3/8	3.750	2.000	1.000	1.000	4.500	6.500	4.250	13.312	4.375
4	1	1	4.500	2.000	1.000	1.000	5.250	7.250	5.000	13.375	4.875
	3	1-3/8	4.500	2.000	1.000	1.000	5.250	7.250	5.000	13.875	4.875
5	1	1	5.500	2.000	1.000	1.000	6.250	8.250	6.000	14.500	5.125
	3	1-3/8	5.500	2.000	1.000	1.000	6.250	8.250	6.000	15.125	5.125

Note: Tie rod nuts for Style DD have a slot instead of external hex.
Note: Style DD requires Minimum Stroke per table.

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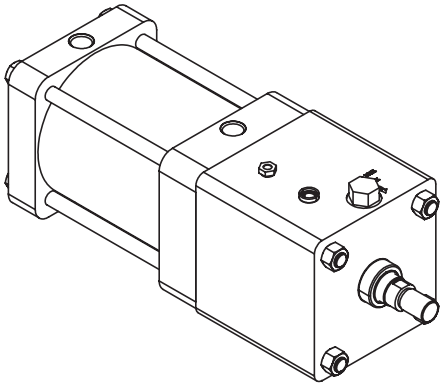
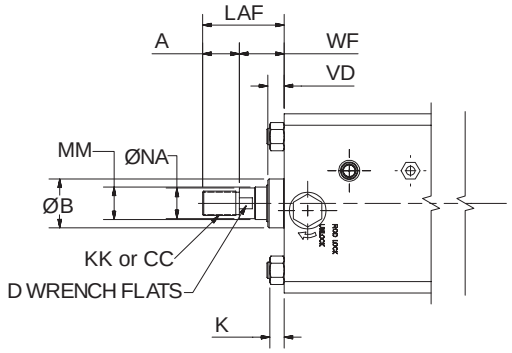
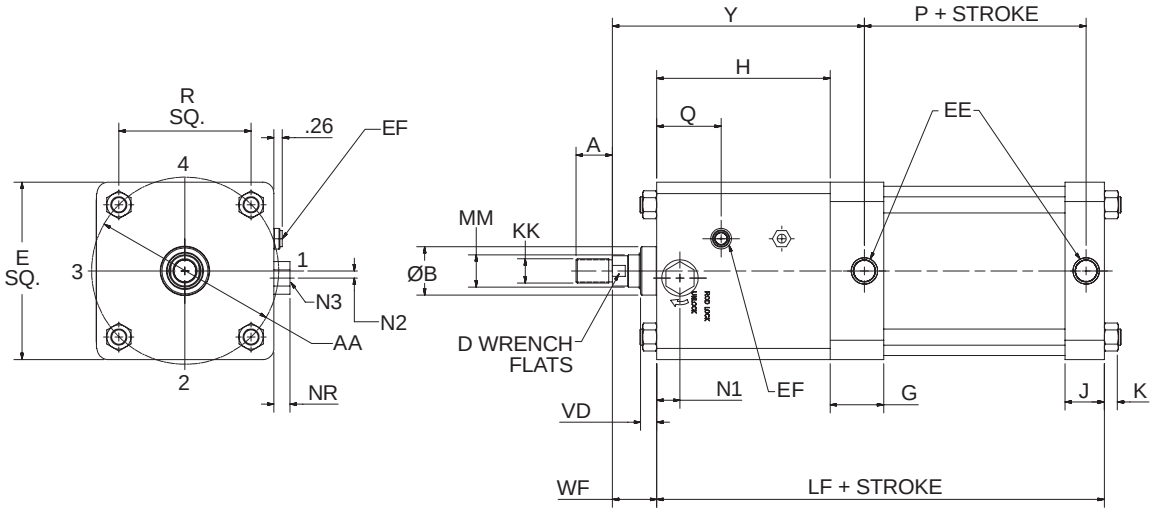
B

No Mount
Style T
(NFPA MX0)





For dimensions of all standard rod end styles, please see page B81.



Cylinder Dimensions – Style T

Bore Size	Rod No.	Rod Dia. MM	Thread		A	AA	+.000 -.002 B	D	E	EE (NPTF)	EF (NPTF)	G	H	J
			Style 8 CC	Style 4 & 9 KK										
6	1	1-3/8	1-1/4 - 12	1-14	1.625	6.900	1.999	1-1/8	6.500	3/4	1/4	1.910	6.375	1.410
	3	1-3/4	1-1/2 - 12	1-1/4 - 12	2.000	6.900	2.374	1-1/2	6.500	3/4	1/4	1.910	6.875	1.410
8	1	1-3/8	1-1/4 - 12	1-14	1.625	9.100	1.999	1-1/8	8.500	3/4	1/4	1.810	6.625	1.440
	3	1-3/4	1-1/2 - 12	1-1/4 - 12	2.000	9.100	2.374	1-1/2	8.500	3/4	1/4	1.810	7.125	1.440

Bore Size	Rod No.	Rod Dia. MM	K	LAF	N1	N2	Hex N3	NA	NR	Q	R	VD	WF	Y	Add Stroke	
															LF	P
6	1	1-3/8	0.438	3.250	1.165	0.177	1-5/16	1.313	0.750	2.705	4.880	0.755	1.625	9.188	11.375	3.125
	3	1-3/4	0.438	3.875	1.495	0.177	1-5/16	1.688	0.740	3.055	4.880	0.875	1.875	9.938	11.875	3.125
8	1	1-3/8	0.563	3.250	1.305	0.177	1-5/16	1.313	0.740	2.885	6.440	0.755	1.625	9.375	11.750	3.250
	3	1-3/4	0.563	3.875	1.570	0.177	1-5/16	1.688	0.740	3.145	6.440	0.875	1.875	10.125	12.250	3.250

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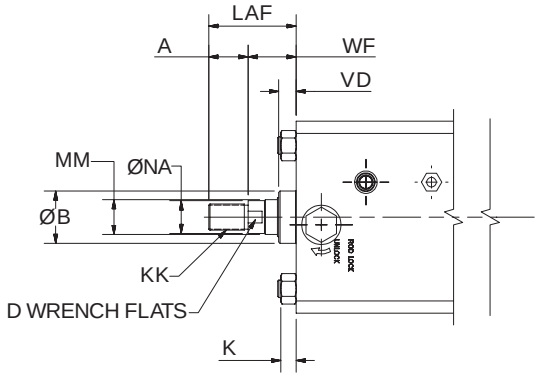
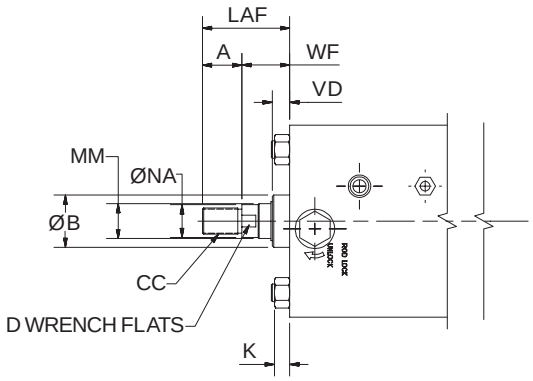
Rod End Dimensions – 6" to 8" Bore Sizes

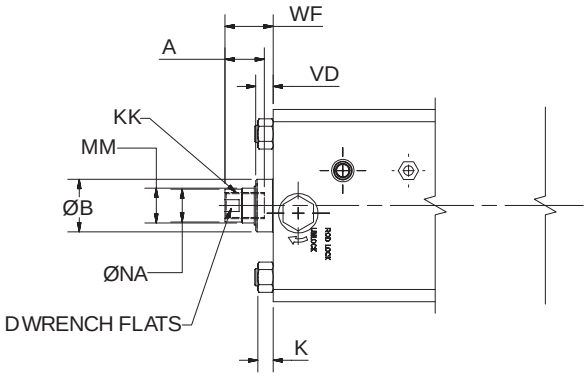
Thread Style 4
(NFPA Style SM)
Small Male



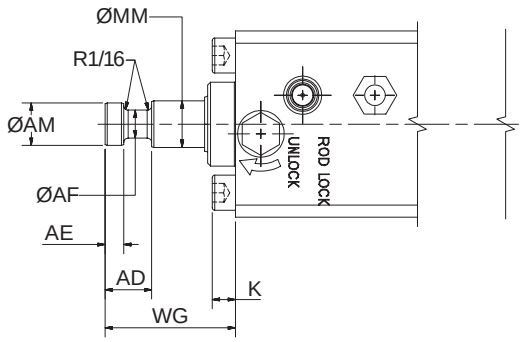
Thread Style 8
(NFPA Style IM)
Intermediate Male



Thread Style 9
(NFPA Style SF)
Short Female



Thread Style 55
For use with Split Coupler
(see page B105 for more information)



Rod End Dimensions

Bore Size	Rod No.	Rod Dia. MM	Thread Style 8 CC	Thread Style 4 & 9 KK	A	AD	AE	AF	AM	+.000 -.002 B	D	K	LAF	NA	VD	WF	WG
6	1	1-3/8	1-1/4 - 12	1-14	1.625	1.063	0.375	0.875	1.320	1.999	1-1/8	0.438	3.250	1.313	0.755	1.625	2.750
	3	1-3/4	1-1/2 - 12	1-1/4 - 12	2.000	1.313	0.500	1.125	1.700	2.374	1-1/2	0.438	3.875	1.688	0.875	1.875	3.125
8	1	1-3/8	1-1/4 - 12	1-14	1.625	1.063	0.375	0.875	1.320	1.999	1-1/8	0.563	3.250	1.313	0.755	1.625	2.750
	3	1-3/4	1-1/2 - 12	1-1/4 - 12	2.000	1.313	0.500	1.125	1.700	2.374	1-1/2	0.563	3.875	1.688	0.875	1.875	3.125

Thread Style 3 - "Special Thread"

Special threads, rod extensions, rod eyes, blanks, etc. are also available.
To order, specify "Style 3" and give desired dimensions for KK or CC, A and W or WF.
If otherwise special, please supply dimensioned sketch.

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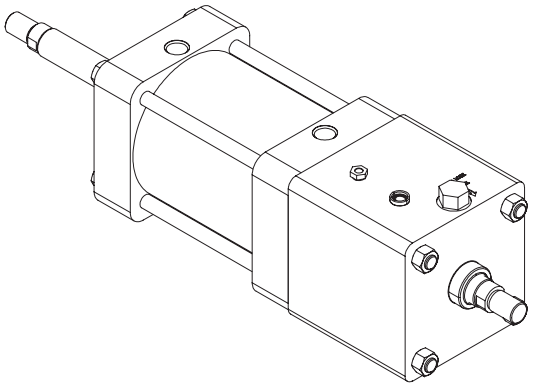
To determine dimensions for a double rod end cylinder, first refer to the desired single rod end mounting style cylinder shown in this catalog section. After selecting the necessary dimensions from that drawing, return to this page and supplement the single rod end dimensions with those shown in the drawings and dimension table below. Note that double rod end cylinders have a head dimension (G) at both ends, and that LG replaces LF, P_K replaces P, etc. The double rod end dimensions differ from, or are in addition to, those for single rod cylinders.

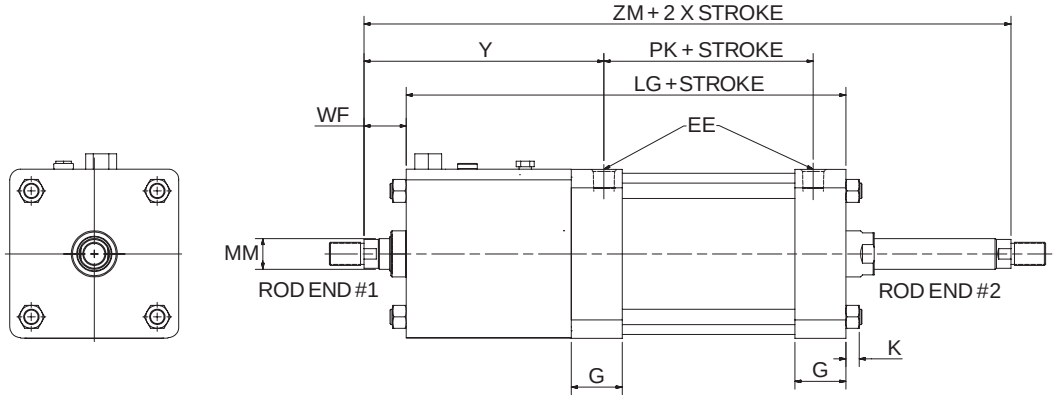
When a double rod end cylinder has two different rod ends, please clearly state which rod end is to be available at which head end.

B

K-type drawings

Mounting Styles for Single Rod Models	Corresponding Mounting Styles for Double Rod Models
C	KC
CB	KCB
D	KD
DD	KDD
F	KF
J	KJ
T	KT
TB	KTB
TD	KTD





Cylinder Dimensions – Style KT

Bore Size	Rod No.	Rod Dia. MM	EE (NPTF)	G	K	WF	Y	Add Stroke						Add 2X Stroke
								L_G	PK	SA_K	XA_K	SS_K	SN_K	ZM
6	1	1-3/8	3/4	1.910	0.438	1.625	9.188	11.875	3.125	14.625	14.875	4.125	3.125	15.125
	3	1-3/4	3/4	1.910	0.438	1.875	9.938	12.375	3.125	15.125	15.625	4.125	3.125	16.125
8	1	1-3/8	3/4	1.810	0.563	1.625	9.375	12.125	3.250	15.750	15.563	4.125	3.125	15.375
	3	1-3/4	3/4	1.810	0.563	1.875	10.125	12.625	3.250	16.250	16.313	4.125	3.125	16.375
Replaces Dimension On								LF	P	SA	XA	SS	SN	–
Single Rod Mounting Styles								All Styles		CB		C	F	All

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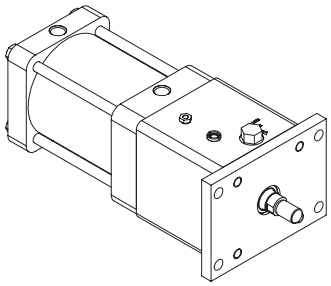
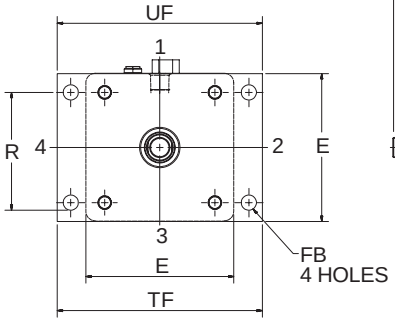
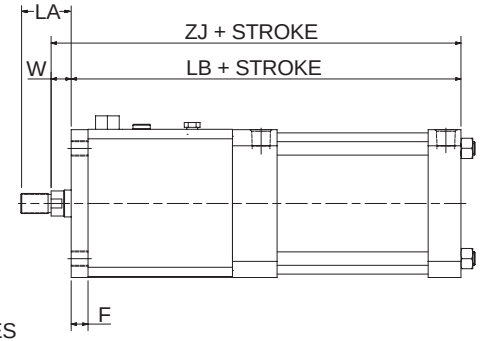
Head Rectangular Flange Mount

Style J
(NFPA MF1)
(only 6" Bore)



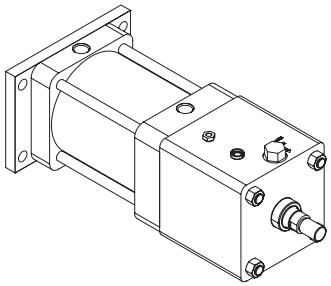


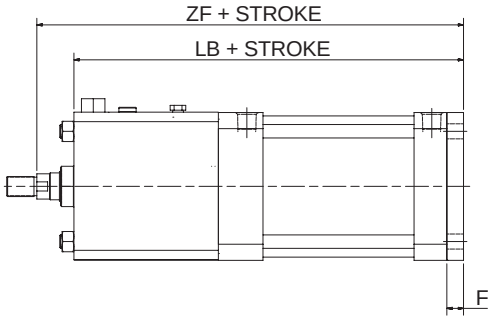


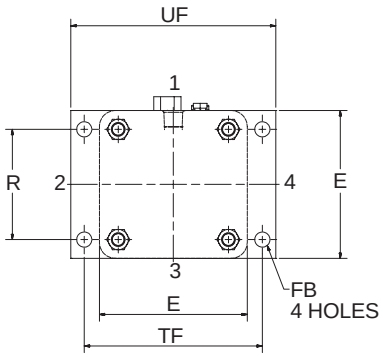
Note: Style J has a W dimension instead of WF and a LA dimension instead of LAF because of the flange installation. Please use dimensions W and LA regarding rod ends only for Style J.
For reference, WF = W + F and LA = W + A.

Cap Rectangular Flange Mount

Style H
(NFPA MF2)
(only 6" Bore)







Cylinder Dimensions – Styles J and H

Bore Size	Rod No.	Rod Dia. MM	A	E	F	FB	LA	R	TF	UF	W	Add Stroke		
												LB	ZF	ZJ
6	1	1-3/8	1.625	6.500	0.750	0.563	2.500	4.880	7.625	8.625	0.875	12.125	13.750	13.000
	3	1-3/4	2.000	6.500	0.750	0.563	3.125	4.880	7.625	8.625	1.125	12.625	14.500	13.750

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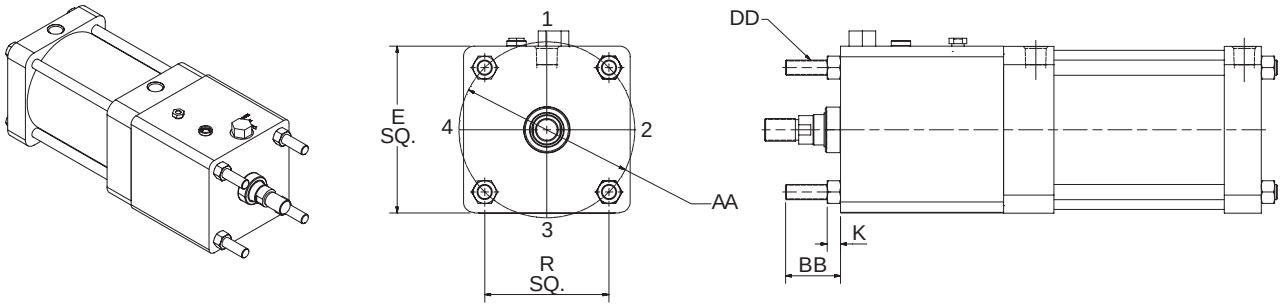
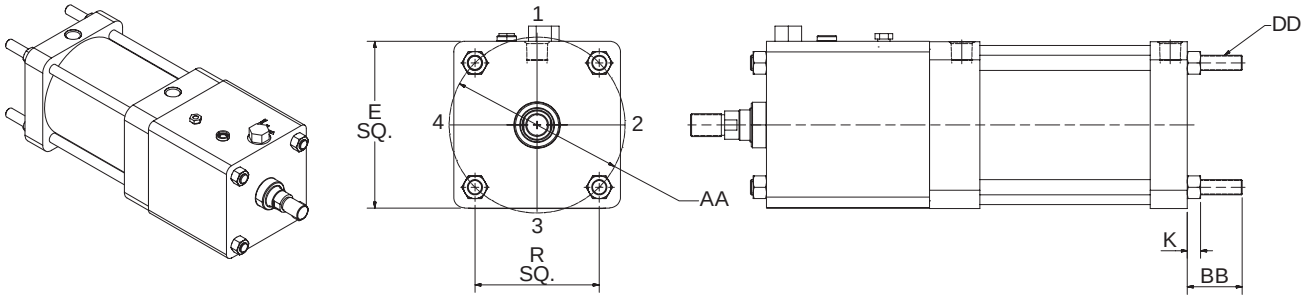
B

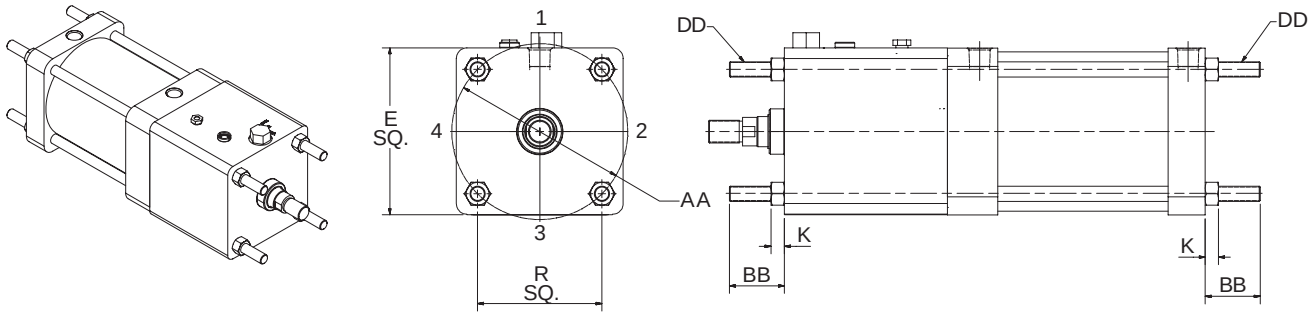
Tie Rods Extended Head End Mount
Style TB
(NFPA MX3)



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



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



Cylinder Dimensions – Styles TB, TC and TD

Bore Size	Rod No.	Rod Dia. MM	AA	BB	DD	E	K	R
6	1	1-3/8	6.900	1.813	1/2-20	6.500	0.438	4.880
	3	1-3/4	6.900	1.813	1/2-20	6.500	0.438	4.880
8	1	1-3/8	9.100	2.313	5/8-18	8.500	0.563	6.440
	3	1-3/4	9.100	2.313	5/8-18	8.500	0.563	6.440

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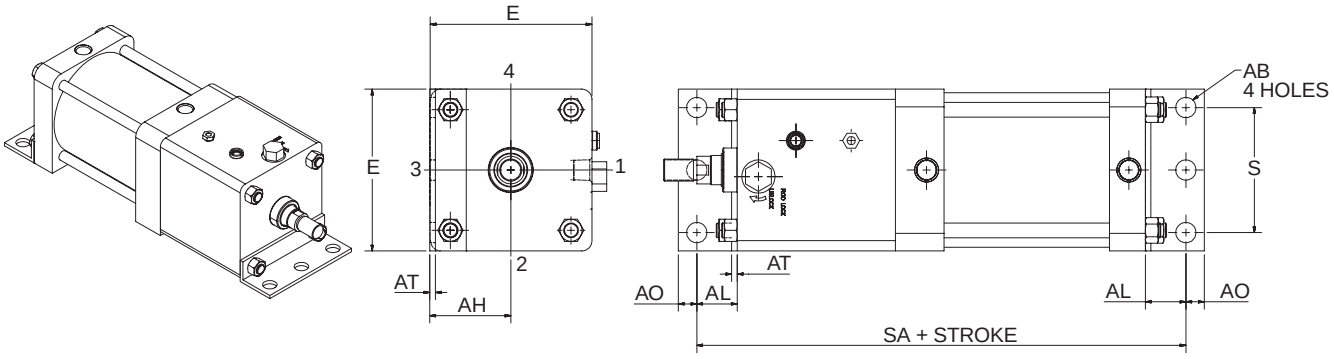
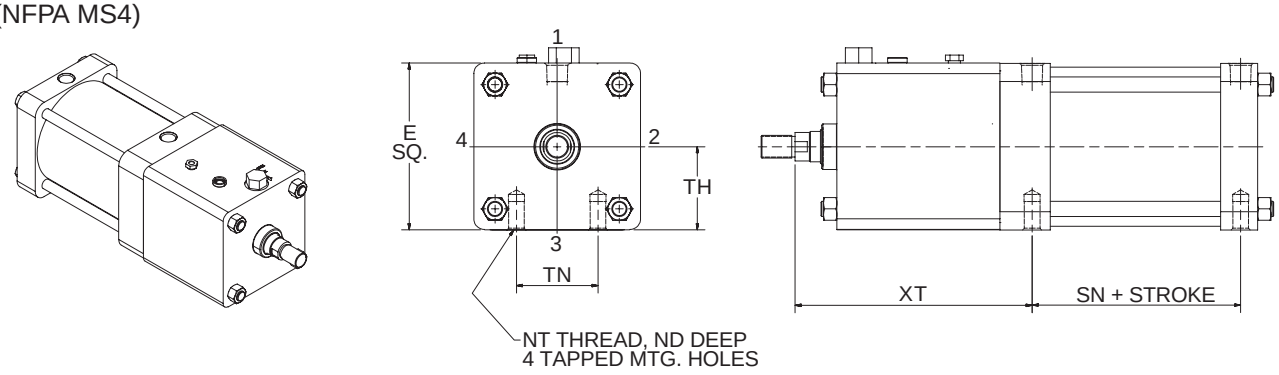
Side End Angle Mount
Style CB
(NFPA MS1)



Cylinder Dimensions – Style CB

Bore Size	Rod No.	Rod Dia. MM	AB	AH	AL	AO	AT	E	S	Add Stroke SA
6	1	1-3/8	0.813	3.250	1.375	0.625	0.188	6.500	5.250	14.125
	3	1-3/4	0.813	3.250	1.375	0.625	0.188	6.500	5.250	14.625
8	1	1-3/8	0.813	4.250	1.813	0.688	0.250	8.500	7.125	15.375
	3	1-3/4	0.813	4.250	1.813	0.688	0.250	8.500	7.125	15.875

Side Tap Mount
Style F
(NFPA MS4)



Cylinder Dimensions – Style F

Bore Size	Rod No.	Rod Dia. MM	E	ND	NT	+/-.003 TH	TN	XT	Add Stroke SN
6	1	1-3/8	6.500	1.125	3/4-10	3.243	3.250	9.188	3.125
	3	1-3/4	6.500	1.125	3/4-10	3.243	3.250	9.938	3.125
8	1	1-3/8	8.500	1.125	3/4-10	4.243	4.500	9.438	3.250
	3	1-3/4	8.500	1.125	3/4-10	4.243	4.500	10.188	3.250

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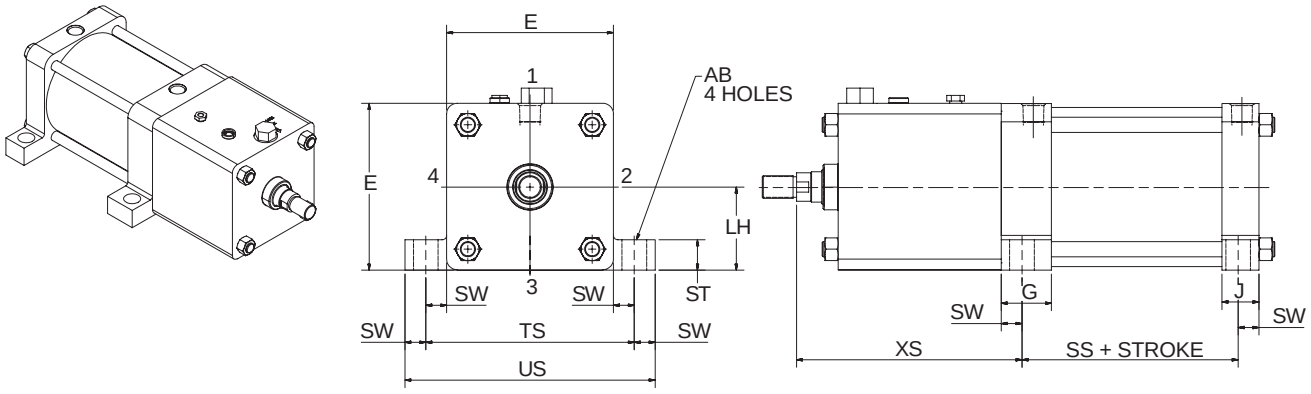
Side Lug Mount
Style C
(NFPA MS2)

B



Cylinder Dimensions – Style C

Bore Size	Rod No.	Rod Dia. MM	AB	E	G	J	+/-.003 LH	ST	SW	TS	US	XS	Add Stroke SS
6	1	1-3/8	0.813	6.500	1.910	1.410	3.243	1.000	0.688	7.875	9.250	8.688	3.625
	3	1-3/4	0.813	6.500	1.910	1.410	3.243	1.000	0.688	7.875	9.250	9.438	3.625
8	1	1-3/8	0.813	8.500	1.810	1.440	4.243	1.000	0.688	9.875	11.250	8.938	3.750
	3	1-3/4	0.813	8.500	1.810	1.440	4.243	1.000	0.688	9.875	11.250	9.688	3.750

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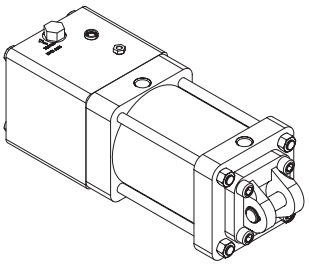
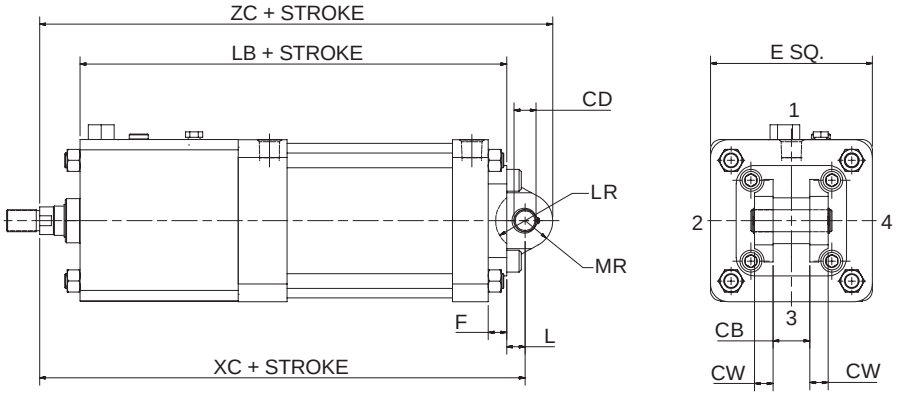
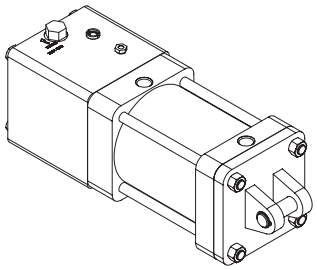
Cap Fixed Clevis
Style BB
(NFPA MP1)

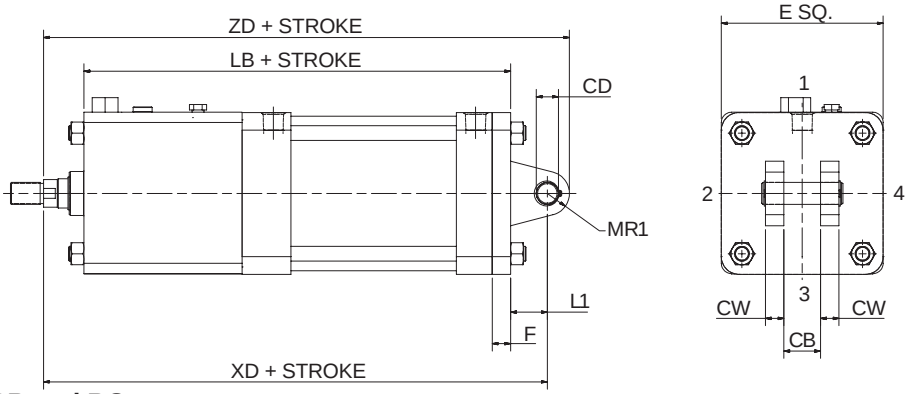
Note: For maximum swivel angle of BB mount with rear mounting plate, see Cylinder Accessories on page B110.





Cap Detachable Clevis
Style BC
(NFPA MP2)

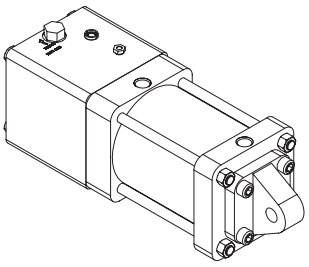


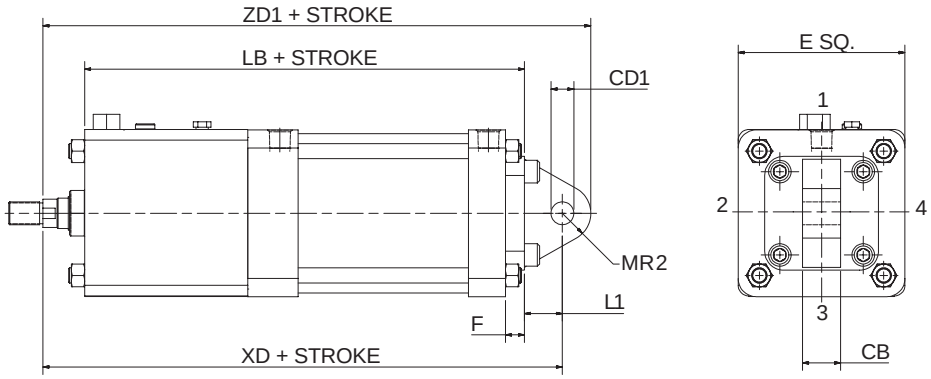


Cylinder Dimensions – Styles BB and BC

Bore Size	Rod No.	Rod Dia. MM	CB	+.000 -.002 CD	CW	E	F	L	L1	LR	MR	MR1	Add Stroke LB	XC	XD	ZC	ZD
6	1	1-3/8	1.500	1.001	0.750	6.500	0.750	0.750	1.500	1.250	1.125	1.000	12.125	14.500	15.250	15.625	16.250
	3	1-3/4	1.500	1.001	0.750	6.500	0.750	0.750	1.500	1.250	1.125	1.000	12.625	15.250	16.000	16.375	17.000
8	1	1-3/8	1.500	1.001	0.750	8.500	0.750	0.750	1.500	1.250	1.125	1.000	12.500	14.875	15.625	16.000	16.625
	3	1-3/4	1.500	1.001	0.750	8.500	0.750	0.750	1.500	1.250	1.125	1.000	13.000	15.625	16.375	16.750	17.375

Cap Detachable Eye Mount
Style BE
(NFPA MP4)
(only 6" Bore)





Cylinder Dimensions – Style BE

Bore Size	Rod No.	Rod Dia. MM	CB	+.002 +.004 CD1	E	F	L1	MR2	Add Stroke LB	XD	ZD1
6	1	1-3/8	1.500	1.000	6.500	0.750	1.500	1.125	12.125	15.250	16.375
	3	1-3/4	1.500	1.000	6.500	0.750	1.500	1.125	12.625	16.000	17.125

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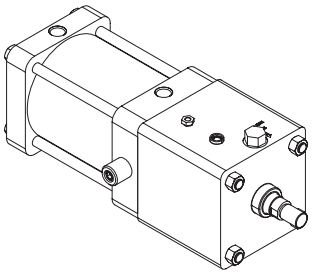
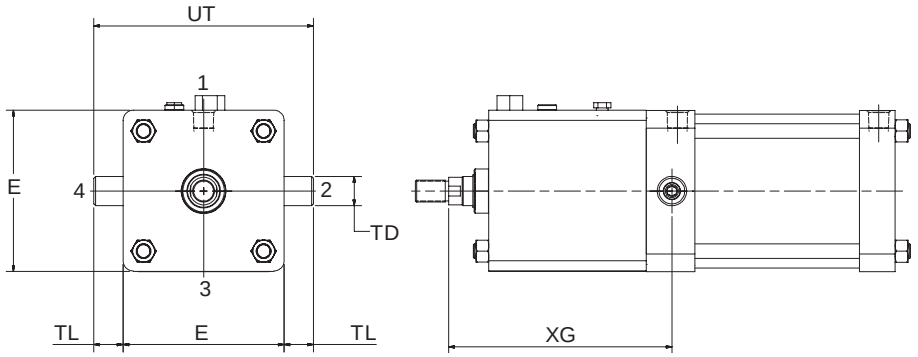
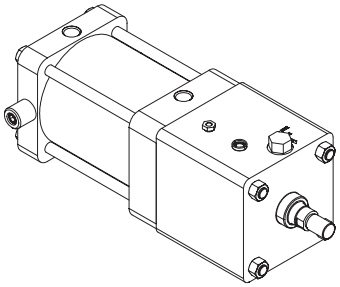
B

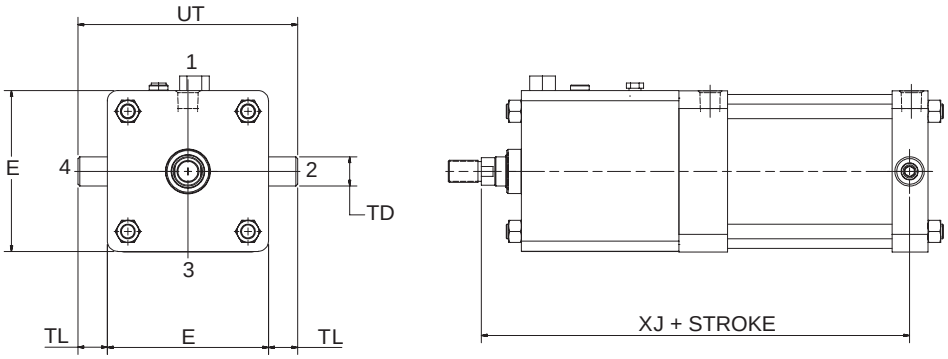
Head Trunnion Mount
Style D
(NFPA MT1)





Cap Trunnion Mount
Style DB
(NFPA MT2)





Cylinder Dimensions – Styles D and DB

Bore Size	Rod No.	Rod Dia. MM	E	+.000 -.001 TD	TL	UT	XG	XJ
6	1	1-3/8	6.500	1.375	1.375	9.250	9.000	12.250
	3	1-3/4	6.500	1.375	1.375	9.250	9.750	13.000
8	1	1-3/8	8.500	1.375	1.375	11.250	9.250	12.625
	3	1-3/4	8.500	1.375	1.375	11.250	10.000	13.375

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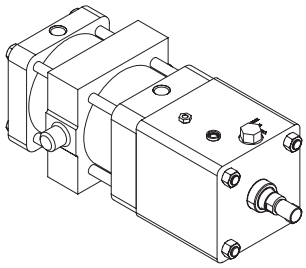
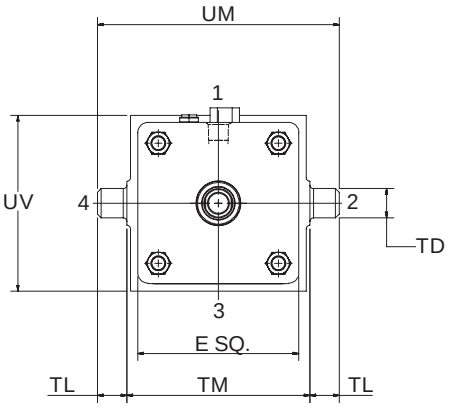
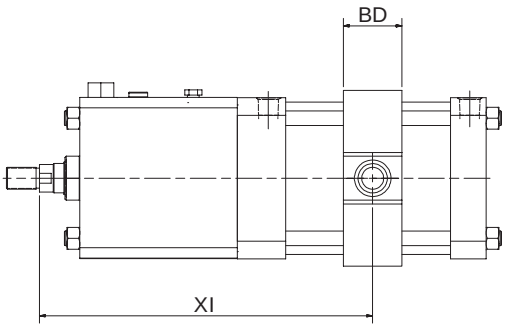
Intermediate Trunnion Mount
Style DD
(NFPA MT4)







Cylinder Dimensions – Style DD

Bore Size	Rod No.	Rod Dia. MM	E	BD	+.000 -.001 TD	TL	TM	UM	UV	Min. XI	Min. Stroke
6	1	1-3/8	6.500	2.500	1.375	1.375	7.625	10.375	7.000	16.750	6.125
	3	1-3/4	6.500	2.500	1.375	1.375	7.625	10.375	7.000	17.500	6.125
8	1	1-3/8	8.500	2.500	1.375	1.375	9.750	12.500	9.500	17.625	6.500
	3	1-3/4	8.500	2.500	1.375	1.375	9.750	12.500	9.500	18.375	6.500

Note: Style DD requires Minimum Stroke per table.

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B

How to Order ACVB Option fully assembled to 3MA or 4MA Cylinder

2.00			J	4MA		U		S	1	4		A		6.000

Bore Size
1.50
2.00
2.50
3.25
4.00
5.00

Double Rod Cylinder
Specify "K" only if double rod cylinder is required.

Mounting Style
Specify mounting style code per available 3MA or 4MA mount.

Series
3MA
4MA

Ports

U	NPTF

Piston Rod Number
See 3MA/4MA section for more details.

Stroke Length
Specify stroke length required in inches.

Cushion Cap End

Blank	Non-cushioned cap end
C	Cushioned cap end

Seals

Blank	Standard (nitrile seals)
E	Fluorocarbon rod wiper and rod seal only
M	Metallic rod wiper, nitrile seals*

Cushion Head End

Blank	Non-cushioned head end
C	Cushioned head end

Piston Rod Thread Type

A	Standard (UNF Unified Thread)
W	BSF British Fine
M	Metric (see page B106)

Piston Type

Blank	Standard (lipseals and magnetic ring)
1	Lipseals, no magnetic ring
2	Lipseals, no magnetic ring (aluminum piston)
3	Lipseals and magnetic ring (aluminum piston)
4	Bumper seals, no magnetic ring
6	Bumper seals and magnetic ring
B	Lipseals, 1/4" thick bumpers both ends
H	Lipseals, 1/4" thick bumper head end
C	Lipseals, 1/4" thick bumper cap end
D	Lipseals and magnetic ring, 1/4" thick bumpers both ends
F	Lipseals and magnetic ring, 1/4" thick bumper head end
R	Lipseals and magnetic ring, 1/4" thick bumper cap end

Special Modification
Specify "S" for ACVB options and any other special modification other than rod end. See examples below.

Piston Rod Thread Style

4	Small male
8	Intermediate male
9	Short female
55	For use with Split Coupler
3	Special (and specify all dimensions required)

Rod Material and Gland Code

Blank	Standard rod and gland
H	Standard rod and HI LOAD gland*
Y	17-4 PH stainless steel rod and standard gland
Z	17-4 PH stainless steel rod and HI LOAD gland*
J	303 stainless steel rod and standard gland
K	303 stainless steel rod and HI LOAD gland*
S	316 stainless steel rod and standard gland
T	316 stainless steel rod and HI LOAD gland*

*4MA only.

Example

2.00 CJ3MAUS14AC 6.000
S = ACVB Valve Combination
S = 3C2B54 Manifold Code
(See following page.)

Flow Control Option

Add "S = with SP37 Flow Controls" to item notes

Muffler Option

Add "S = with EM Mufflers" to item notes

For ACVB with the 2A Series, please use the 2A Series Model Code and specify the following in the item notes:

S = ACVB Valve Combination

S = (Manifold Code from following page)

ACVB Minimum Stroke Requirements**	
Bore	**3MA/4MA**
Compact Manifold	
1.50	0.500
2.00	0.500
2.50	0.438
Full Manifold	
1.50	5.813
2.00	5.813
2.50	5.750
3.25	5.500
4.00	5.500
5.00	5.250

**For desired strokes less than the minimum requirement, specify a stop tube for the cylinder assembly. Total stroke should be (desired net stroke) + (stop tube length to help exceed minimum stroke). Stop tube only available for 4MA with aluminum piston.

Example: 1.50" bore 4MA with 5.000" of desired net stroke:

Gross stroke = 5.813"

Stop tube = 0.813"

Net stroke = 5.000"

Note: place gross stroke in cylinder model number and specify stop tube length and net stroke in the item notes.

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ACVB Series Valve/Manifold Codes

Valve Series	
3	B3
5	B5
6	B6

Manifold Type / Location	
C	Compact Manifold / Cap End (For use with B3 valve only)
D	Compact Manifold / Head End (For use with B3 valve only)
F	Full Manifold / Cap End (For use with B3, B5 or B6 valves)
G	Full Manifold / Head End (For use with B3, B5 or B6 valves)

Operator Type / Function	
1	Single Solenoid / Air Return
2	Double Solenoid
3	Single Remote Pilot / Air Return
4	Double Remote Pilot

NOTE: Cylinders with single solenoid valves mounted at the CAP END will be NORMALLY RETRACTED. Cylinders with single solenoid valves mounted at the HEAD END will be NORMALLY EXTENDED.

Pilot / Source	
A	Internal / Port #1 (B5, B6 only)
B	Internal / Port #1 Vented (B3 only)
0	None / Remote

Voltage	
4	24 VDC
5	110 VAC
X	Remote Pilot

Connector / Valve Series Available	
(Connector can be rotated in 90° increments for Options A-H)	
0	None / B3, B5, B6 (Remote Pilot)
5	15mm 3-PIN DIN 43650C / B3, B5, B6 (Male Connector)
6	15mm 3-PIN DIN 43650C (rotated 180°) / B3, B5, B6 (Male Connector)
A	30mm Square 3-PIN ISO 4400 Form A / B5, B6 (Male Connector)
B	22mm Rectangular 3-PIN Type B Industrial / B5, B6 (Male Connector)
C	3-PIN Automotive Mini / B5, B6 (Female Connector)
D	5-PIN Automotive Mini / B5, B6 (Female Connector)
F	Hazardous Duty 1/2” Conduit 18" Leads / B5, B6
H	1/2" NPT Conduit 18” Leads / B5, B6

Customer orientation of connector at 45 degree increments possible on Options A through H on B5 and B6 valves.

Example: 6 F 2 A 5 5

6	F	2	A	5	5
B6 Valve	Cap Mounted Full Manifold	Double Solenoid	Internal Pilot (Port 1)	15mm 3-PIN Square Connector	110 VAC

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B

Compact Manifold

- Standard Fluid – Dry, filtered air.
- Standard Temperature – -5°F to 120°F (-15°C to 49°C).
- Maximum 145 PSI operating pressure.
- Fits 1-1/2" through 2-1/2" Bore 3MA and 4MA standard cylinders.
- Uses standard Parker fittings, tubing, and seals.
- Compact manifold accommodates B3 Series valve from Parker Pneumatic Division North America without field modification to cylinder.

Full Manifold

- Standard Fluid – Dry, filtered air.
- Standard Temperature – -5° F to 120° F (-15°C to 49°C).
- Maximum 145 PSI operating pressure.
- Fits 1-1/2" through 5” Bore 3MA and 4MA standard cylinders.
- Uses standard Parker fittings, tubing, and seals.
- Full manifold accommodates B3, B5 and B6 series Parker Pneumatic valves, without field modification to cylinder (B6 series shown).
- Bolt pattern conforms to NAMUR standard on B5 and B6 valves.
- Manifold and valve do not overhang beyond head or cap fasteners.

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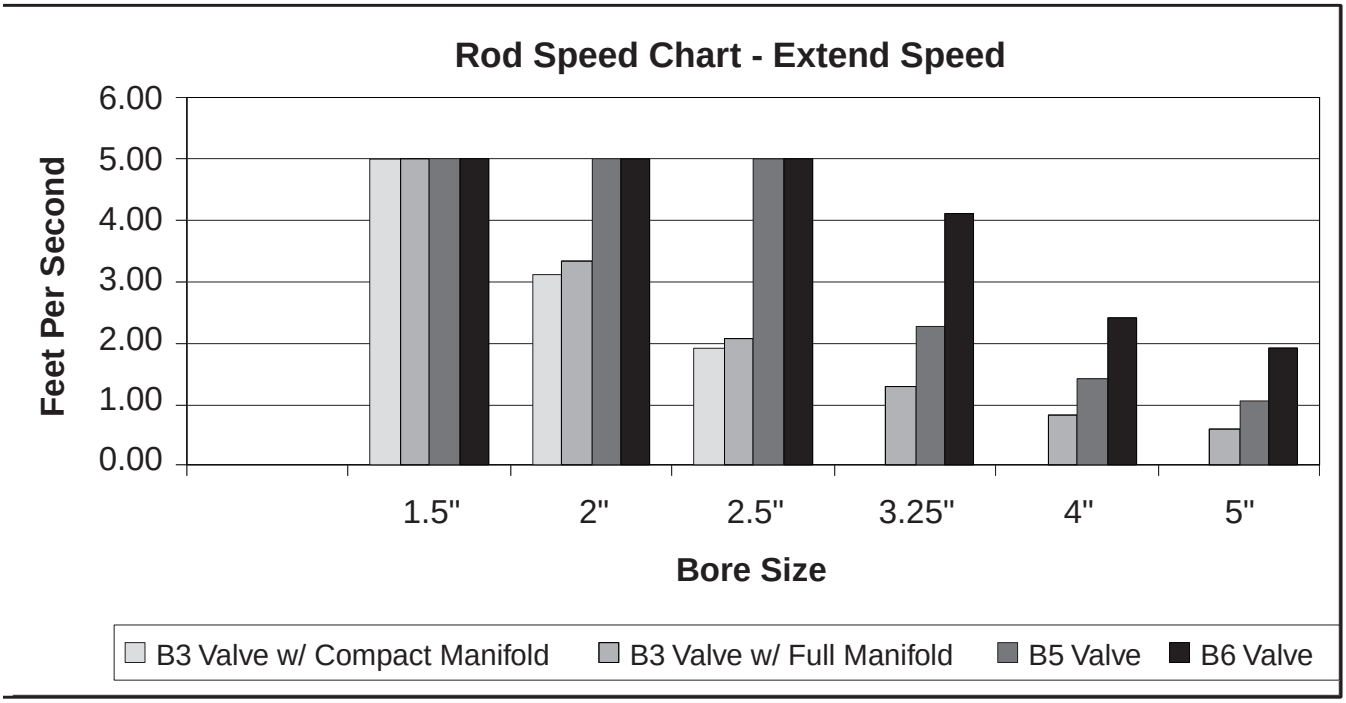

Steps to size a cylinder-valve system

Step 1. Gather the Application Parameters

Total load
Maximum velocity needed to move load in specified time*
Minimum pressure available

Step 2. Size Cylinder

Use equations in engineering section of Pneumatic Actuator Catalog to calculate minimum bore size

Step 3. Size Valve/Manifold

Use the Rod Speed Chart above
Choose valve/manifold system that will supply maximum velocity needed for bore size chosen above

Step 4. Choose the Appropriate Model Code**

Specify necessary valve and manifold
Choose type of control required
Choose type of connection and voltage required

* If maximum velocity is not easily calculated, divide the total stroke distance by the total stroke time and multiply by 2.

** See the ACVB Series Valve/Manifold Code page for more details.

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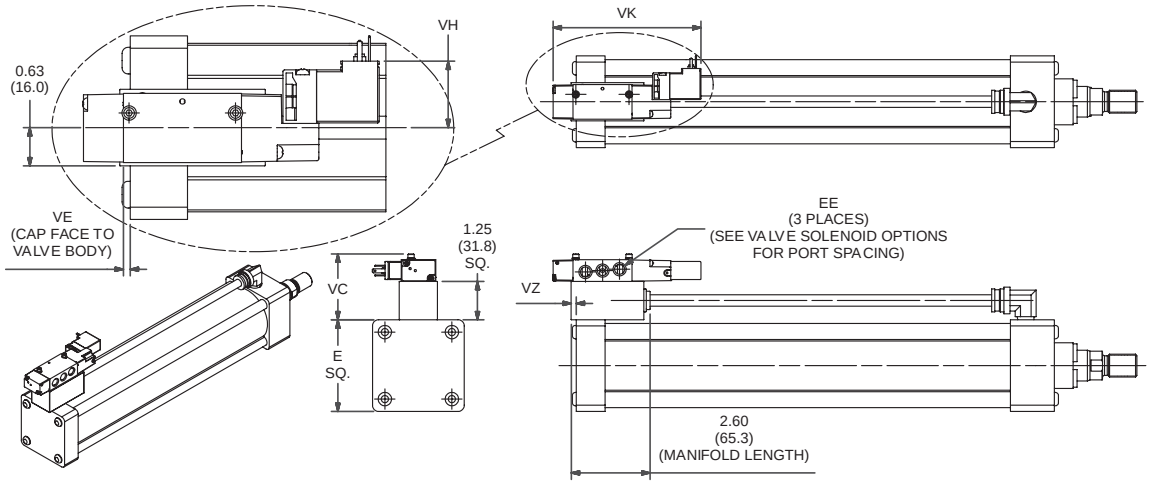
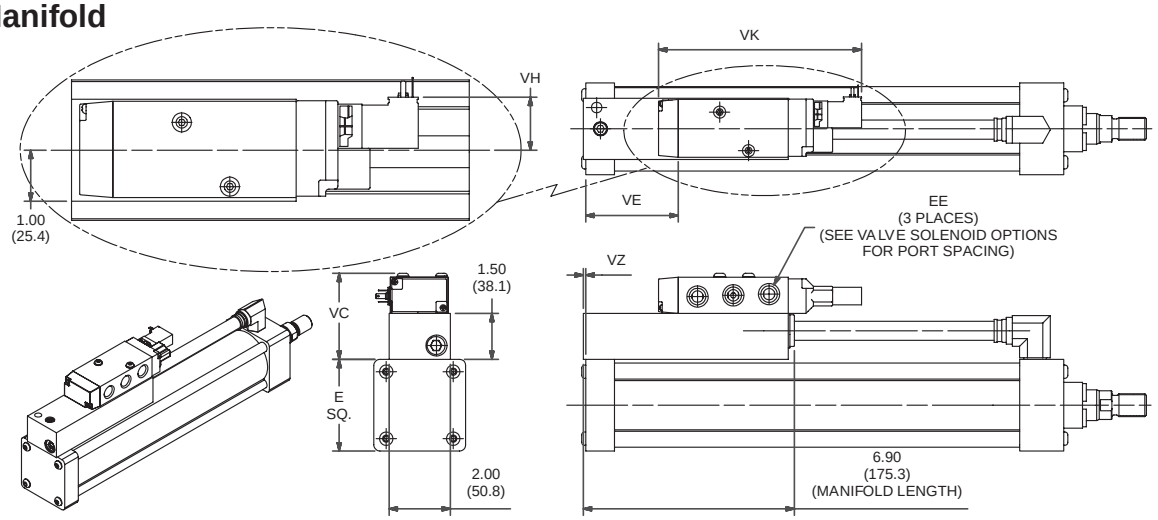
B

Compact Manifold



Full Manifold



Dimensions

Bore	E (SQ.)	Manifold	Valve	VE*	VZ** 3MA/4MA
1-1/2	2	Compact	B3	0.17 (4.3)	0.23 (5.8)
		Full	B3	3.78 (96.3)	0.23 (5.8)
			B5	3.48 (88.4)	0.13 (3.3)
			B6	2.97 (75.4)	0.13 (3.3)
2	2-1/2	Compact	B3	0.17 (4.3)	0.23 (5.8)
		Full	B3	3.78 (96.3)	0.13 (3.3)
			B5	3.36 (85.3)	0.13 (3.3)
			B6	2.97 (75.4)	0.13 (3.3)
2-1/2	3	Compact	B3	0.17 (4.3)	0.23 (5.8)
		Full	B3	3.78 (96.3)	0.13 (3.3)
			B5	3.36 (85.3)	0.13 (3.3)
			B6	2.97 (75.4)	0.13 (3.3)
3-1/4	3-3/4	Full	B3	3.90 (99.1)	0.00
			B5	3.48 (88.4)	0.00
			B6	3.10 (78.7)	0.00
4	4-1/2	Full	B3	3.90 (99.1)	0.00
			B5	3.48 (88.4)	0.00
			B6	3.10 (78.7)	0.00
5	5-1/2	Full	B3	3.90 (99.1)	0.00
			B5	3.48 (88.4)	0.00
			B6	3.10 (78.7)	0.00

Valve	EE (NPTF)	VH	VK	VC	
B3	1/8	1.09 (27.7)	4.67 (118.6)	Compact Manifold	2.12 (53.8)
				Full Manifold	2.37 (60.2)
B5	1/4	1.12 (28.4)	5.78 (146.8)	Full Manifold	2.81 (71.4)
B6	3/8	1.12 (28.4)	6.67 (169.4)	Full Manifold	2.81 (71.4)

* VE = Dimension from edge of endcap to edge of valve body.
** VZ = Dimension from edge of endcap to edge of manifold.

Note: Dimensions shown are for a single solenoid enclosure with Option 5. For other valve or enclosure option dimensions, see pages B96-B97.

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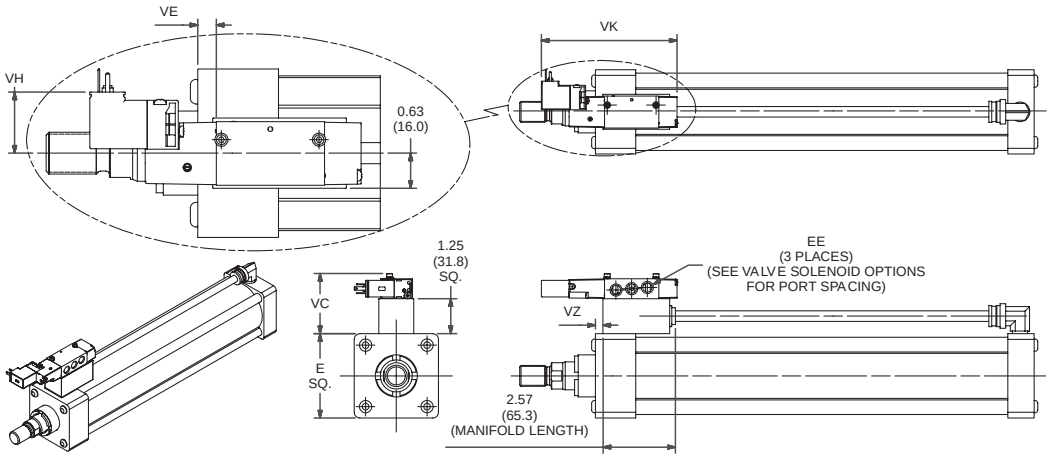
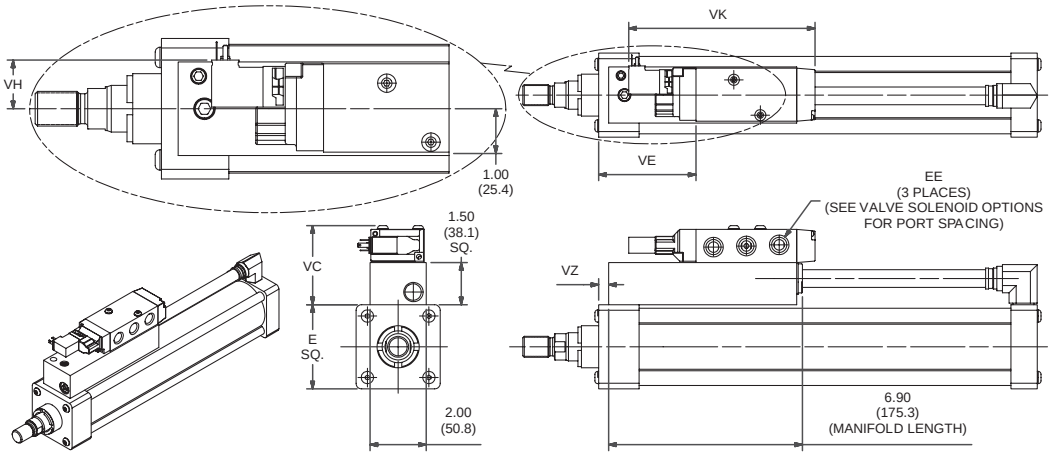
Compact Manifold



Full Manifold



Dimensions

Bore	E (SQ.)	Manifold	Valve	VE*	VZ**
				3MA/4MA	3MA/4MA
1-1/2	2	Compact	B3	0.26 (6.6)	0.20 (5.1)
		Full	B3	4.21 (106.9)	0.31 (7.9)
			B5	3.79 (96.3)	0.31 (7.9)
			B6	3.41 (86.6)	0.31 (7.9)
2	2-1/2	Compact	B3	0.26 (6.6)	0.20 (5.1)
		Full	B3	4.21 (106.9)	0.31 (7.9)
			B5	3.79 (96.3)	0.31 (7.9)
			B6	3.41 (86.6)	0.31 (7.9)
2-1/2	3	Compact	B3	0.33 (8.4)	0.27 (6.9)
		Full	B3	4.27 (108.5)	0.38 (9.6)
			B5	3.86 (98.0)	0.38 (9.6)
			B6	3.47 (88.1)	0.38 (9.6)
3-1/4	3-3/4	Full	B3	4.40 (111.8)	0.50 (12.7)
			B5	3.98 (101.1)	0.50 (12.7)
			B6	3.60 (91.4)	0.50 (12.7)
4	4-1/2	Full	B3	4.40 (111.8)	0.50 (12.7)
			B5	3.98 (101.1)	0.50 (12.7)
			B6	3.60 (91.4)	0.50 (12.7)
5	5-1/2	Full	B3	4.40 (111.8)	0.50 (12.7)
			B5	3.98 (101.1)	0.50 (12.7)
			B6	3.60 (91.4)	0.50 (12.7)

Valve	EE (NPTF)	VH	VK	VC	
B3	1/8	1.09 (27.7)	4.67 (118.6)	Compact Manifold	2.12 (53.8)
				Full Manifold	2.37 (60.2)
B5	1/4	1.12 (28.4)	5.78 (146.8)	Full Manifold	2.81 (71.4)
B6	3/8	1.12 (28.4)	6.67 (169.4)	Full Manifold	2.81 (71.4)

* VE = Dimension from edge of endcap to edge of valve body.
** VZ = Dimension from edge of endcap to edge of manifold.

Note: Single Solenoid with enclosure 5 shown. For other valve options, see pages B96-B97.

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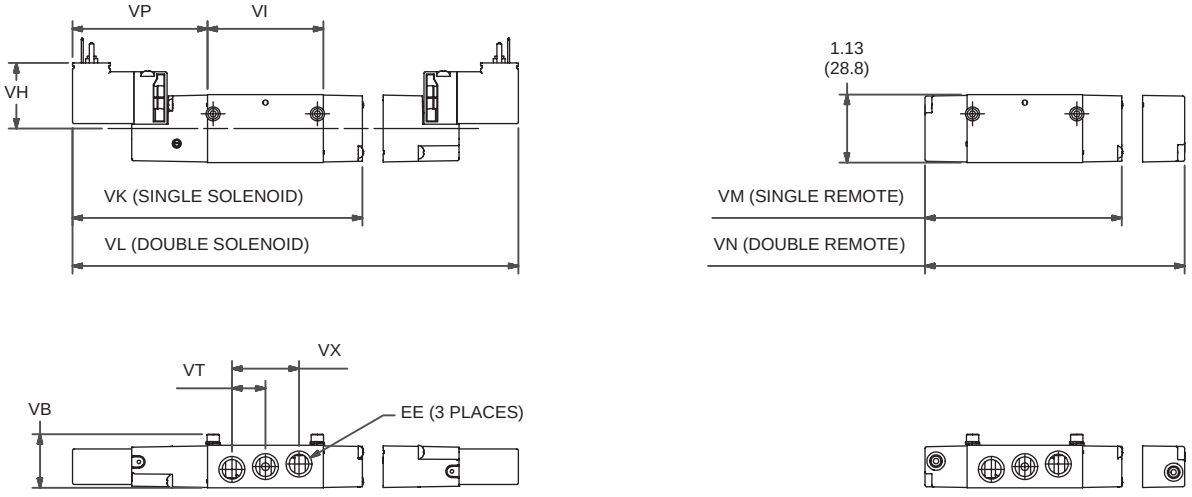
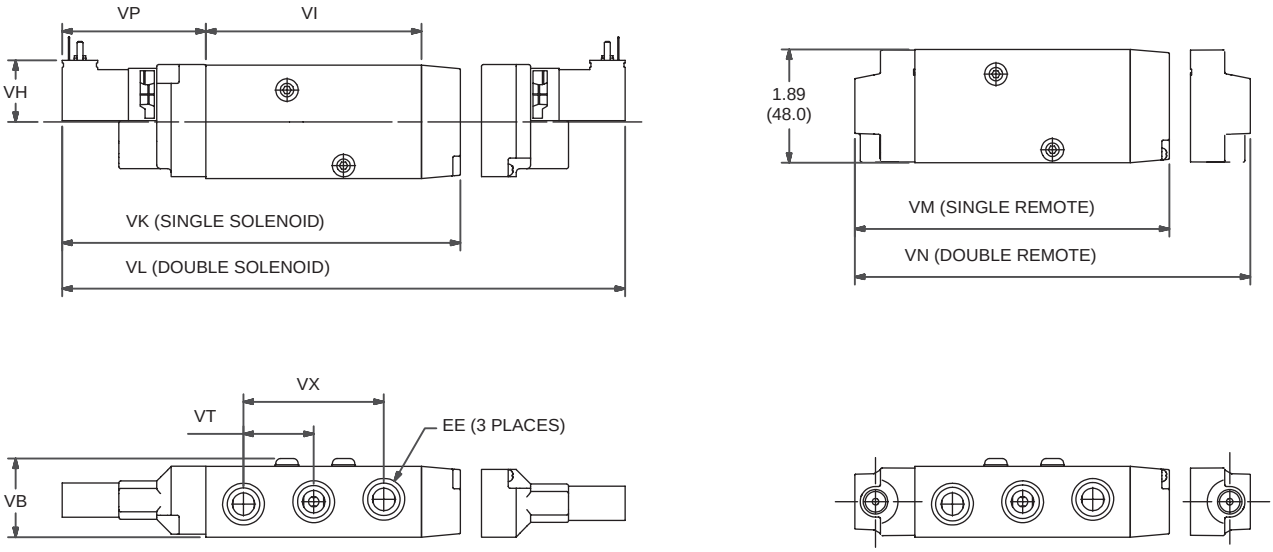
B

B3 Valve



B5 and B6 Valve



Dimensions

Valve	EE (NPTF)	VB	VH	VI	VK	VL	VM	VN	VP	VT	VX
B3	1/8	0.87 (22.1)	1.09 (27.7)	1.93 (49.0)	4.67 (118.6)	6.44 (163.6)	3.12 (79.2)	3.33 (84.6)	2.25 (57.2)	0.56 (14.2)	1.12 (28.4)
B5	1/4	1.31 (33.3)	1.12 (28.4)	2.70 (68.6)	5.78 (146.8)	7.51 (190.8)	4.37 (111.0)	4.70 (119.4)	2.40 (61.0)	0.88 (22.4)	1.75 (44.5)
B6	3/8	1.31 (33.3)	1.12 (28.4)	3.60 (91.5)	6.67 (169.4)	8.41 (213.6)	5.26 (133.6)	5.59 (142.0)	2.40 (61.0)	1.17 (29.7)	2.34 (59.4)

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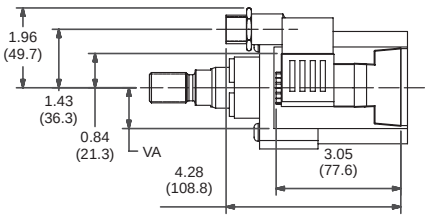
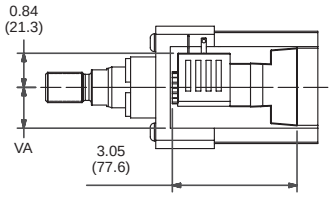
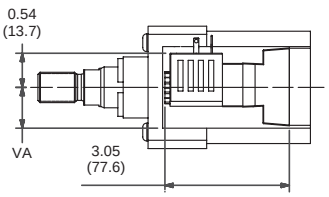
Optional Electrical Connections



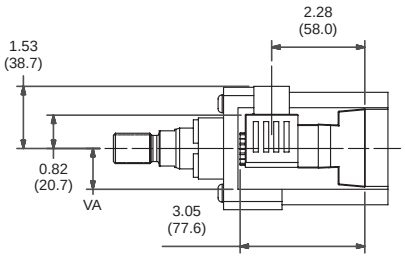
ENCLOSURE C, D



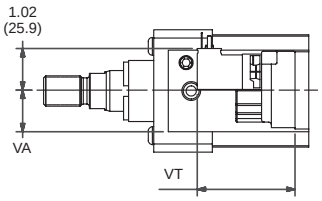
ENCLOSURE A



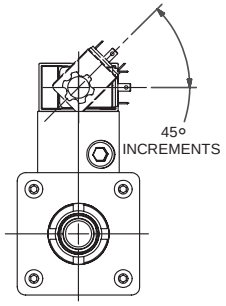
SOLENOID OPTION A, B, C, D, F, & H
CAN BE ROTATED IN 45° INCREMENTS AS SHOWN



ENCLOSURE 5



ENCLOSURE F, H
B5 AND B6 ONLY

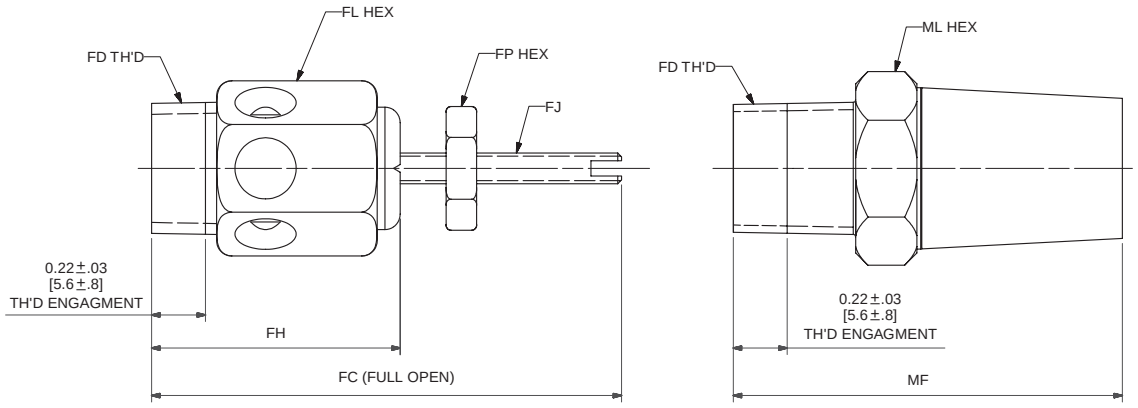


ENCLOSURE B

Optional Electrical Connections Dimensions

Valve	VA	VT
B3	0.63 (16.0)	2.25 (57.2)
B5	1.00 (25.4)	2.40 (61.0)
B6	1.00 (25.4)	2.40 (61.0)

Optional Flow Controls / Mufflers



Optional Flow Controls Dimensions

Valve	FC	FD	FJ	FH	FL	FP	MF	ML
B3	1.48 (37.6)	1/8	10-32	0.90 (22.9)	1/2	3/8	1.00 (25.4)	7/16
B5	1.92 (48.8)	1/4	1/4-28	1.17 (29.7)	9/16	7/16	1.32 (33.5)	9/16
B6	1.92 (48.8)	3/8	1/4-28	1.27 (32.3)	11/16	7/16	1.54 (39.1)	11/16

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B

Manifold Kits Without Valve

Bore Size	Compact Manifold	Full Manifold	
	1-1/2", 2", and 2-1/2"	1-1/2", 2" and 2-1/2"	3-1/4", 4", and 5"
Kit w/ Tubing	L078350000	L078380000	L078390000
Kit w/o Tubing	L078370000	L078400000	L078410000
Max. Stroke for Kit w/ Tubing*	34.5"	39.5"	39"
Tubing Part #	0880383836	0880386336	

Example:

Manifold Kits:

Without Tubing Include:

- Manifold
- Grease
- O-rings for all applicable valves
- All necessary fasteners
- All necessary fittings
- Assembly Instructions

With Tubing Include:

- All “without tubing” items
- 36" of appropriate tubing
  – 3/8" O.D. for compact manifold
  – 5/8" O.D. for full manifold
- See above table for maximum stroke lengths.

Valve:

To Order Valve:

- Consult latest revision of Parker Pneumatic Products Catalog (Catalog #0600P).
- Specify “T” code as port size/thread type on B3, B5 or B6 valve order.
- All valves supplied with flush, locking overrides (code ‘C’).
- Manifolds designed for 2 position valves only.

Example: B61TBCH4901A defines:

B6 ACVB Single Solenoid Valve, Flush Locking Override, with 1/2" NPT conduit, using 24VDC voltage with operator on 12 end.

Flow Controls & Mufflers:

- Order as separate line items.

Valve Size	Port Size (NPTF)	Flow Control Part #	Muffler Part #
B3	1/8	0881480001	0882410013
B5	1/4	0881480002	0882410025
B6	3/8	0881480003	0882410038

⚠ WARNING

The Prestomatic fittings on the manifold and cylinder end caps are to be used in conjunction with Parker Air Brake tubing PFT-6B and PFT-10B only. The use of other tubing may not be compatible with the Prestomatic fittings. This may lead to a tubing failure which could cause the cylinder piston rod to suddenly retract or extend at high speed.

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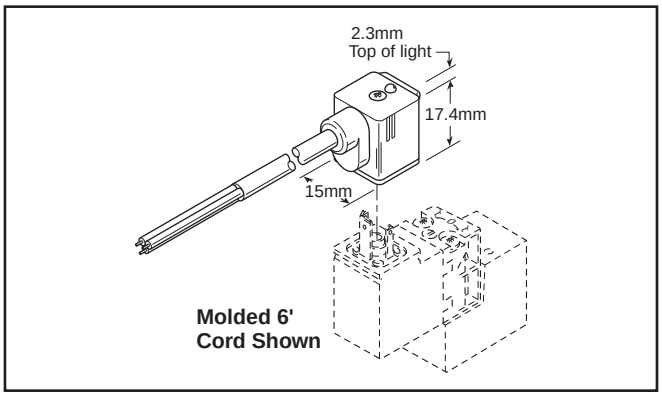
Female Electrical Connectors

15mm 3-Pin DIN 43650C
(Use with Enclosure "5")

Connector	Connector with 6' (2m) Cord	Description
PS2932BP	PS2932JBP	Unlighted
PS294679BP	PS2946J79BP*	Light – 24VAC or DC
PS294683BP	PS2946J83BP*	Light – 110/120VAC

*LED with surge suppression.

Note: Max Ø6.5mm cable size required for connector w/o 6' (2m) cord. IP65 rated when properly installed.

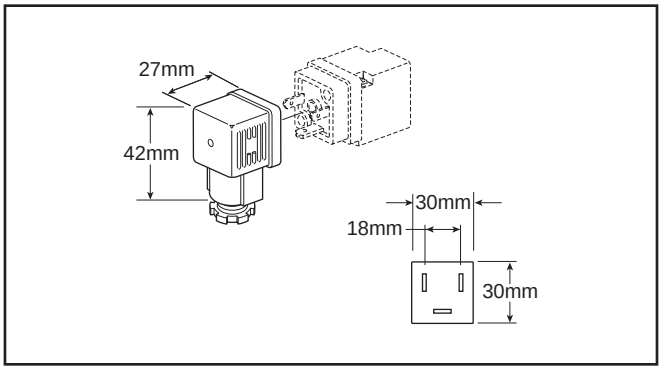


30mm Square 3-Pin – ISO 4400, DIN 43650A
(Use with Enclosure "A")

Connector	Connector with 6' (2m) Cord	Description
PS2028BP	PS2028JBP	Unlighted
PS203279BP	PS2032J79BP*	Light – 6-48V, 50/60Hz, 6-48VDC
PS203283BP	PS2032J83BP*	Light – 120V/60Hz

*LED with surge suppression.

Note: Max Ø6.5mm cable size required for connector w/o 6' (2m) cord. IP65 rated when properly installed.

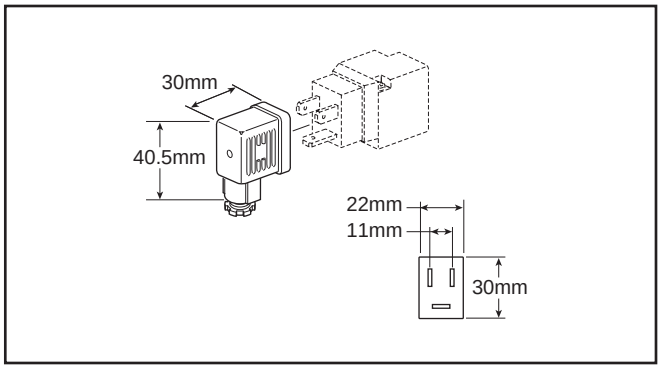


22mm Rectangular 3-Pin – Type B Industrial
(Use with Enclosure "B")

Connector	Connector with 6' (2m) Cord	Description
PS2429BP	PS2429JBP	Unlighted
PS243079BP	PS2430J79BP*	Light – 24V/60Hz, 24VDC
PS243083BP	PS2430J83BP*	Light – 120V/60Hz

*LED with surge suppression.

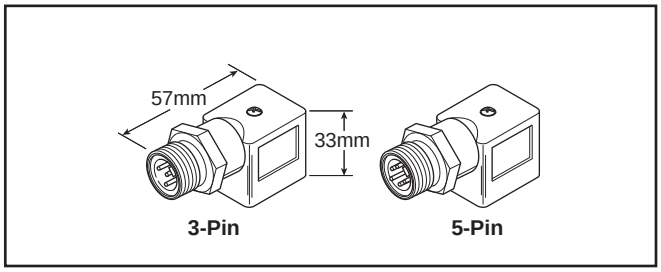
Note: Max Ø6.5mm cable size required for connector w/o 6' (2m) cord. IP65 rated when properly installed.



3-Pin / 5-Pin Male Automotive Connectors
(Use on 22mm Rectangular 3-Pin Solenoid)

3-Pin	5-Pin	Description
PS2893CP	PS2893DP	Unlighted
PS2893C##P	PS2893D83P	Lighted - Voltage

– '83' for 120VAC
'79' for 24VDC & 24VAC



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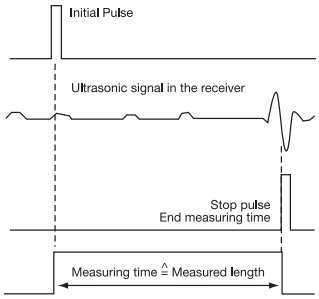
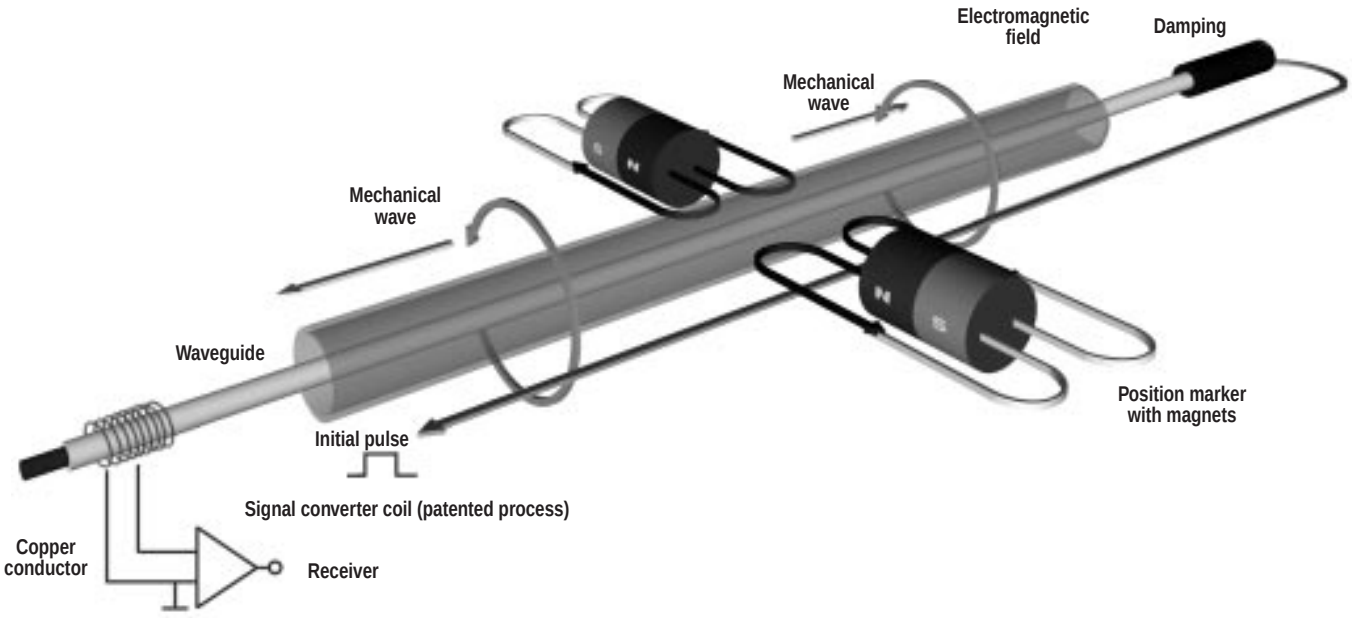
B

Linear Position Sensor for Continuous Position Feedback



Generation of the ultrasonic torsion pulse in a metallic conductor based on the principle of magnetostriction.



Principles of Operation

The measuring element (“waveguide”), consists of a special nickel-alloy tube.

A copper conductor is introduced through the length of this tube. The start of measurement is initiated by a short current pulse.

This current generates a circular magnetic field which rotates around the waveguide. A permanent magnet at the point of measurement is used as the marker element, whose lines of field run at right angles to the electromagnetic field. In the area on the waveguide where the two fields intersect, a magneto-strictive effect causes an elastic deformation of the waveguide, which propagates along the wave guide in both directions in the form of a mechanical wave.

The propagation velocity of this wave in the waveguide is 2830 m/s, and is nearly insensitive to environmental effects (e.g., temperature, shock, contamination).

The component of the wave which reaches the far end of the waveguide is damped there, whereas the component which arrives at the signal converter is changed into an electrical signal by reversing the magnetostrictive effect. The wave travel time from its point of origin to the signal converter is directly proportional to the distance between the permanent magnet and the signal converter. A time measurement then allows the distance to be determined with extremely high accuracy.

Design

The transducers are made to the same safety and reliability standards for use in the harshest conditions:

- The electronics unit is compactly designed using SMD technology. The boards are protected in a space-saving, rugged aluminum extruded housing.
- The waveguide is protected in the extruded aluminum housing.

Quality

Each and every transducer undergoes a specially designed, computer-controlled testing procedure which includes 100% checking of all specified data.

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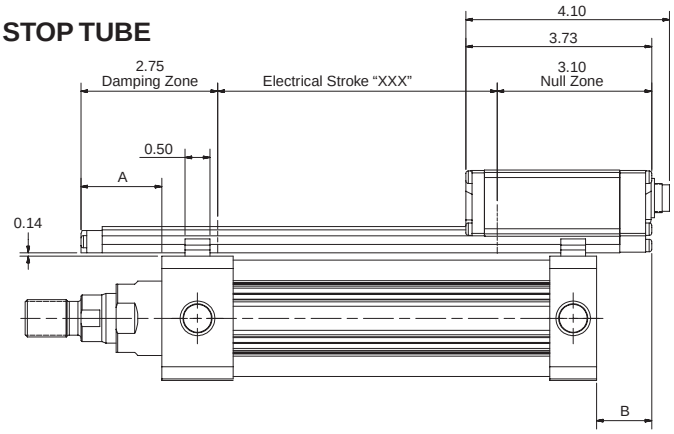
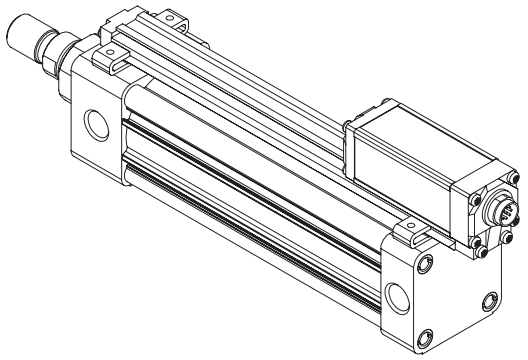
The drawings below show that the Linear Position Sensor is longer than the cylinder of the same stroke length. The sensor overhang on the head end of the cylinder, as indicated by dimension A, may be eliminated by adding stop tubing, which effectively increases the gross stroke of the cylinder. The recommended stop tube lengths are provided in the table below for each bore size. The examples show that the electrical stroke of the sensor will always match the **net** stroke of the cylinder.

As a result of the limited sensing range of the sensor, it will overhang at the cap end of the cylinder by the amount of dimension B.

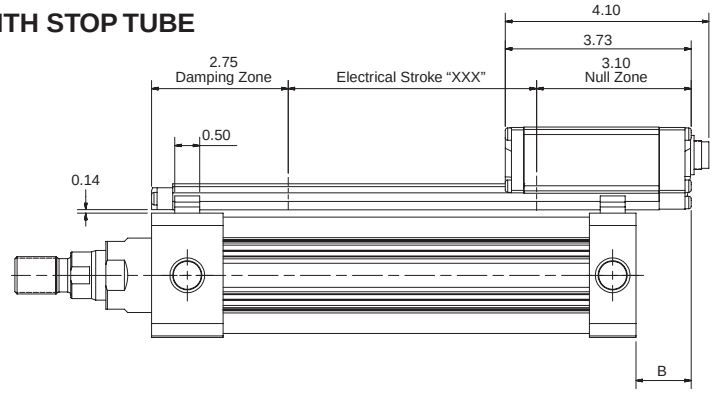
NO STOP TUBE

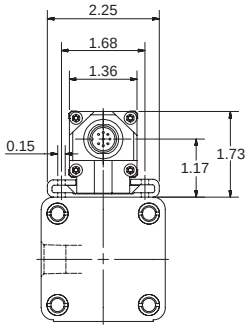




Example A: 12" Stroke cylinder without stop tube equals 12" Electrical Stroke for the Sensor.

WITH STOP TUBE





Example B: To eliminate sensor overhang on the head end of a 2.0" bore cylinder, add 1.0" of recommended stop tube length. The cylinder gross stroke becomes 13" and the net stroke remains 12". Specify a sensor with an electrical stroke of 12". Note that the electrical stroke equals cylinder **net** stroke length.

Example C: To eliminate sensor overhang on the head end of a 5.0" bore cylinder, add 0.625" of recommended stop tube length. The cylinder gross stroke becomes 12.625" and the net stroke remains 12". Specify a sensor with an electrical stroke of 12". Note that the electrical stroke equals cylinder **net** stroke length.

Bore	Rod Code	Rod Diameter	No Stop Tube		With Stop Tube		
			A	B	Stop Tube Length	A_1	B
2	1	5/8	0.95	1.3	1.0	0	1.3
	3	1					
2-1/2	1	5/8	0.90	1.25	1.0	0	1.25
	3	1					
3-1/4	1	1	0.64	1.0	0.75	0	1.0
	3	1-3/8					
4	1	1	0.63	0.99	0.75	0	0.99
	3	1-3/8					
5	1	1	0.55	0.79	0.625	0	0.79
	3	1-3/8					
6	1	1-3/8	0.47	0.46	0.50	0	0.45
	3	1-3/4					
8	1	1-3/8	0.28	0.44	0.375	0	0.44
	3	1-3/4					

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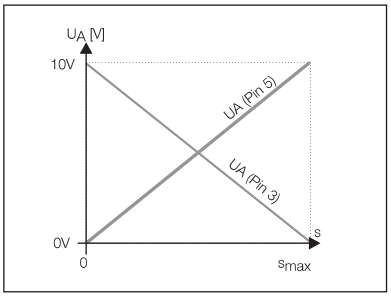
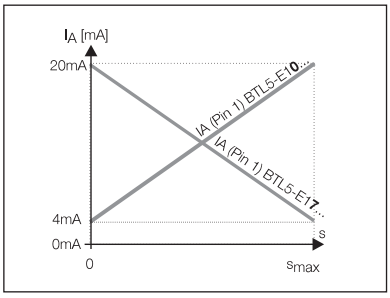
B

Output signal	analog	analog
Transducer interface	**A**	**E**
Input interface	analog	analog





Ordering code	BTL5-**A11**-M_ _ _ _-RSU022S32	BTL5-**E1**_-M_ _ _ _-RSU022S32
Output voltage	**0...10 V**	
Output current		**4...20 mA**
Load current	max. 10 mA	
max. ripple.	≤ 5 mV	
Load resistance		≤ 500 Ohm
System resolution	≤ **0.1 mV**	≤ **0.2 µA**

Hysteresis		≤ 4 µm
Repeatability		≤ 6 µm (hysteresis + resolution)
Output update rate		STANDARD = 1 ms ≤1400 mm
max. non-linearity		±100 µm to 500 mm stroke
		±0.02 % 501...3606 mm stroke
Temperature coefficient	Voltage output	[150 µV/°C + (5 ppm/°CxPxU/L)]xDT
	Current output	[0.6 µA/°C + (10 ppm/°CxPxI/L)]x DT
Shock loading		100 g/11 ms per IEC 68-2-27
Vibration		12 g, 10...2000 Hz per IEC 68-2-6
Traverse velocity of magnet		any
Operating voltage		24 V DC ± 20%
Current draw		≤150 mA
Polarity reversal protected		yes
Overvoltage protection		Transzorb protection diodes
Dielectric constant		500 V (Ground to housing)
Operating temperature		-40...185 °F (-40...85°C)
Storage temperature		-40...212 °F (-40...100°C)

S32 Pin assignments	Pin	Color	BTL5-**A11**...	BTL5-**E1**...BTL5-**E7**...
Output signals	1	YE	not used	4...20 mA 20...4 mA
	2	GY	signal GND	0 V output
	3	PK	10...0 V	10...0 V
	5	GN	0...10 V	0...10 V
Supply voltage	6	BU	GND	GND
	7	BN	+24 V DC	+24 V DC
	8	WH	(GND)	(GND)

Connect shield to housing.

Specifications subject to change.

Please enter code for output signal and nominal stroke in ordering code.

BTL transducers with analog outputs are available in the ranges of 0...10V, 4...20mA with rising or falling signal.

Ordering Sample:

BTL5-A11-M_ _ _ _-R-SU 022S32

Output signal
1 increasing and decreasing (for A)
0 increasing
7 decreasing (for E)

Standard stroke lengths (mm)

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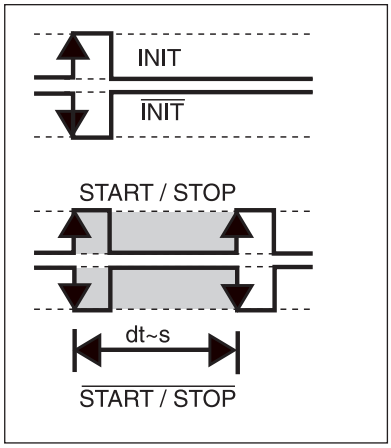
M Interface

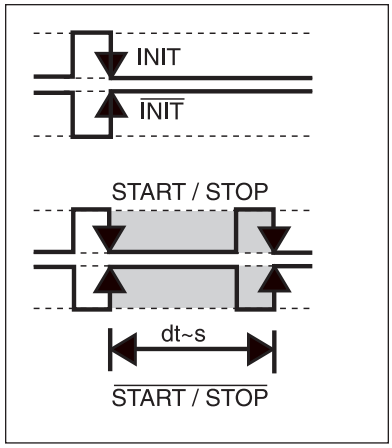
Differential **START/STOP** control-specific interface.

P Interface

Compatible with BTA processors and various OEM controls. Reliable signal transmission, even over cable lengths up to 500 m (1640ft.) between BTA and BTL, is assured by the especially noise-immune RS485 differential drivers and receivers. Noise signals are effectively suppressed.

Series	BTL5 Low Profile	BTL5 Low Profile
Transducer interface	pulse **M**	pulse **P**
User interface	pulse **M**	pulse **P**





Ordering code	BTL5-**M**1-M_ _ _ _-RSU022S32	BTL5-**P**1-M_ _ _ _-RSU022S32
System resolution	Process-dependent/control dependent	
Repeatability	Hysteresis + Resolution	
Resolution	≤ 2 µm	
Hysteresis	≤ 4 µm	
Standard sampling rate	STANDARD = 1 kHz ≤1400 mm	
max. non-linearity	±100 µm to 500 mm nominal stroke	
	±0.02 % 501...3750 mm nominal stroke	
Temperature coefficient of overall system	(6 µm + 5 ppm x L)/°C	
Traverse velocity of magnet	any	
Operating voltage	24 V DC ±20 % or ±15V DC ±2% (optional)	
Current draw	≤100 mA	
Operating temperature	–40...185 °F (-40...85°C)	
Storage temperature	–40...212 °F (-40...100°C)	

S32 Pin assignments		Pin	Color	BTL5-**M**1-M...	BTL5-**P**1-M...
Input/output signals	Input	1	YE	INIT	INIT
	Output	2	GY	START/STOP	START/STOP
	Input	3	PK	INIT	INIT
	Output	5	GN	START/STOP	START/STOP
Supply voltage		6	BU	GND	GND
		7	BN	+24 V DC	+24 V DC
		8	WH	(GND)	(GND)

Shield connected to housing

Specifications subject to change.

Please enter code for nominal stroke in ordering code.

Ordering Sample:

BTL5-P1-M_ _ _ _-R-SU 022S32

Output signal

Standard stroke lengths (mm)

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B

Sensor Ordering Code

BTL-5 - A 1 1 - M 0305 - R SU022 S32

Output Signal	
A	0...10V
E	4...20mA
M	Differential Start/Stop, leading edge active
P	Differential Start/Stop, trailing edge active

Nominal Stroke
Specify whole mm using 4 digits, i.e. 0305 = 305mm active electrical stroke*

* Electrical stroke = net cylinder stroke.

Connection Type	
S32	8-pin Quick Disconnect Metal Connector
KA05	Integral Axial Cable (specify cable length in whole meters using 2 digits, i.e. 05 = 5m)

Supply Voltage	
1	24 V ±20%

Housing Geometry	
R	Low Profile Extrusion

Output Signal (Analog only)	
1	V_{min} or V_{max} at Connector End, i.e. user selectable rising or falling*
0	I_{min} at Connector End (rising toward opposite end)**
7	I_{max} at Connector End (falling toward opposite end)**

* Available only with 0...10V output signal (A).

**Available only with 4...20mA output signal (E).

Please see page B12 or B30 to order 4MA cylinder configuration.

Standard Lengths

Electrical Stroke

inches	mm
2	0051
3	0077
4	0102
5	0127
6	0152
7	0178
8	0203
9	0230
10	0254
11	0280
12	0305
13	0330

inches	mm
15	0381
16	0407
18	0457
20	0508
22	0560
24	0610
26	0661
28	0711
30	0762
32	0813
36	0914
40	1016

inches	mm
42	1067
48	1220
50	1270
60	1524
70	1778
80	2032
90	2286
100	2540
110	2794
120	3048

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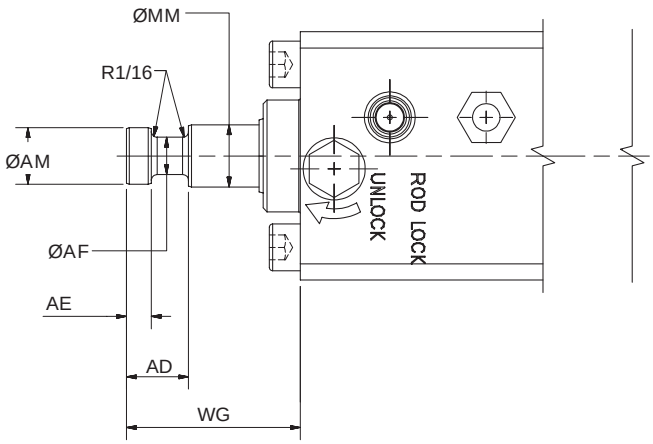
Parker "Style 55" Piston Rod End

Rod end flange coupling for Parker 3MA, 4MA, 4ML, 3MAJ and 4MAJ Series cylinders:

- Simplifies alignment
- Reduces assembly time
- Allows full rated pneumatic pressure in push and pull directions
- Available in 5/8" through 1-3/4" piston rod diameters



Example: Style 55 Rod End shown on 4MAJ Series cylinder

How To Order

Complete Model Number and place a "55" in the Piston Rod End designator position.

Example: 2.00 CJ4MAJU155C 6.000

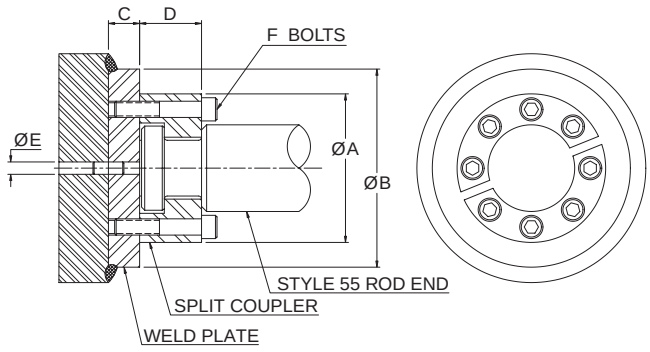
Consult factory for availability of mounting accessories and hardware.

Style 55 Rod End Dimensions

MM Rod Dia.	AD	AE	AF	AM	WG
5/8	5/8	1/4	3/8	.57	1-3/4
1	1-5/16	3/8	11/16	.95	2-3/8
1-3/8	1-1/16	3/8	7/8	1.32	2-3/4
1-3/4	1-5/16	1/2	1-1/8	1.70	3-1/8

See 3MA, 4MA or 3MAJ/4MAJ Series sections for more dimensions

Split Couplers and Weld Plates



⚠WARNING: Piston rod separation from the machine member can result in severe personal injury or even death to nearby personnel. The cylinder user must make sure the weld holding the weld plate to the machine is of sufficient quality and size to hold the intended load. The cylinder user must also make sure the bolts holding split coupler to the weld plate are of sufficient strength to hold the intended load and installed in such a way that they will not become loose during the machine's operation.

NOTE: Screws are not included with split coupler or weld plate.

Table 1 — Part Numbers and Dimensions

Rod Dia.	A	B	C	D	E	F	Bolt Size	Bolt Circle	Split Coupler Part No.	Weld Plate Part No.
0.625	1.50	2.00	0.50	0.56	0.250	4	#10-24 x .94 LG	1.125	1472340062	1481740062
1.00	2.00	2.50	0.50	0.88	0.250	6	.250-20 x 1.25 LG	1.500	1472340100	1481740100
1.375	2.50	3.00	0.63	1.00	0.250	6	.312-18 x 1.50 LG	2.000	1472340138	1481740138
1.75	3.00	4.00	0.63	1.25	0.250	8	.312-18 x 1.75 LG	2.375	1472340175	1481740175

Note: All dimensions without a tolerance are reference dimensions.

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B

Metric Rod Threads

Standard Metric Thread Sizes for Piston Rod Thread Type M

Rod Dia. MM	Styles 4 & 9 KK	Style 8* CC
3/8	M6 x 1.0	M8 x 1.25
1/2	M8 x 1.25	M12 x 1.25
5/8	M10 x 1.5	M12 x 1.5
1	M20 x 1.5	M22 x 1.5
1-3/8	M26 x 1.5	M30 x 2.0
1-3/4	M33 x 2.0	M39 x 2.0

*Style 6 for 1-1/8" bore 3MA
Note: All other rod end dimensions are standard per catalog.

Check Seal Cushions

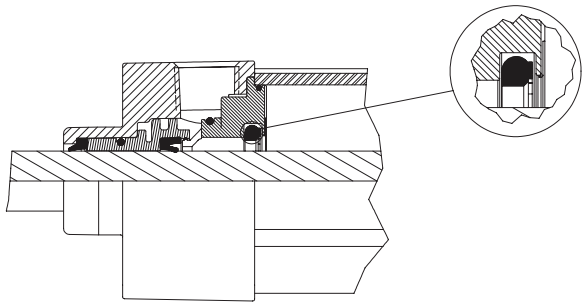
For Increased Productivity and Maximum Performance

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 available at both ends without change in envelope or mounting dimensions. A captive cushion adjusting needle is supplied for easy, precise adjustment on all bore sizes.

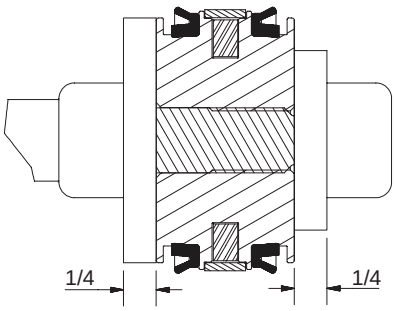


Bumpers

Impact dampening 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.

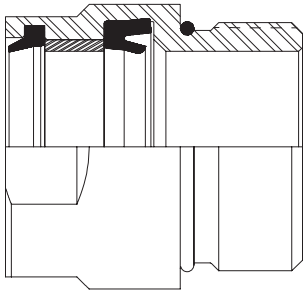
Available in 1-1/2" - 4" bore sizes for 3MA, 4MA, 4ML, 3MAJ and 4MAJ Series cylinders.

Bumper Option



HI LOAD Gland Assembly

Applications with inherent side load require a slide package for maximum service life. In some cases, there may be limitations to the size or expense of these additional components. One possible solution may be the use of the optional HI LOAD gland assembly that incorporates a high strength composite bearing for radial load conditions. Extensive testing showed an approximate 50% increase in service life for general applications. Please note that each application is unique and results may vary. Includes seal options for standard, high and low temperature applications with air (4MA) or hydraulic (4ML) service.



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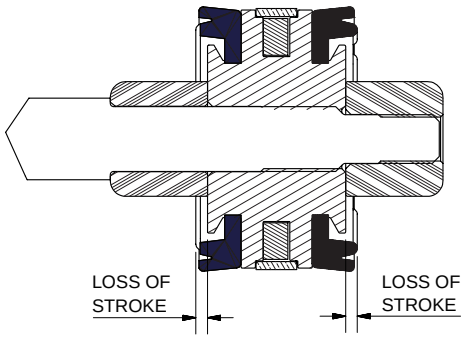
Bumper Seal Option

Impact dampening Bumper Seals are now optional on all 3MA, 4MA, 3MAJ and 4MAJ cylinders from 1-1/8" to 5" bore. The Bumper Seal piston combines the features of low-friction, rounded lipseals and impact-damping bumpers to provide reduced noise and smoother end-of-stroke deceleration. At pressure greater than 80 PSI, the compressible Buna Nitrile or Fluorocarbon 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.

Bumper Seal Option



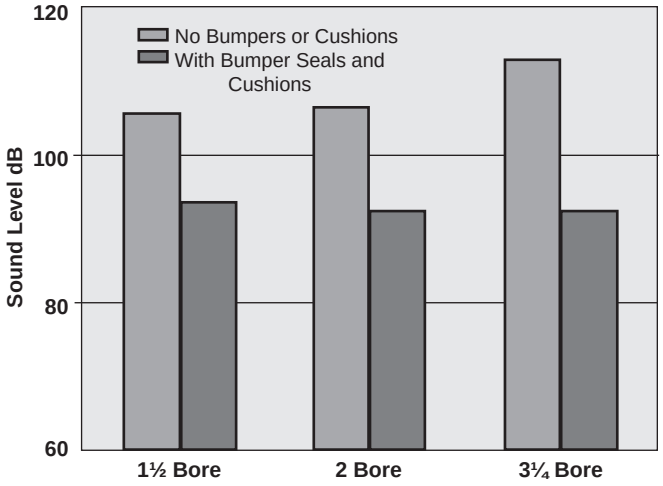
Summary of Accelerometer Test Results

Bore Size	Piston Type	Cushioning Efficiency (Maximum G's of Deceleration Force Created)	Cushioning Time (ms)
1-1/2"	Standard Piston	13.4	22
	Bumper Seal Piston	5.1	22
2"	Standard Piston	12.6	33
	Bumper Seal Piston	7.8	26
2-1/2"	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 noisily 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 of Stroke (inch) by Bore Size				
	1-1/2"	2"	2-1/2"	3-1/4"	4"
0	0.16	0.13	0.19	0.22	0.22
20	0.12	0.11	0.12	0.18	0.18
40	0.10	0.08	0.09	0.12	0.12
60	0.08	0.07	0.07	0.09	0.09
80	0.06	0.05	0.05	0.06	0.06
100	0.05	0.03	0.02	0.04	0.04

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B

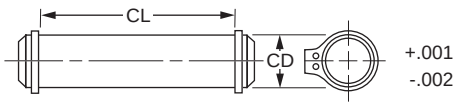
1-1/2" to 8" Bore Cylinder Accessories

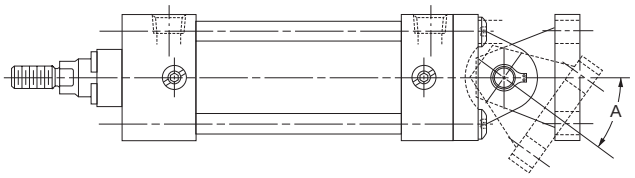
Rod end accessories can be selected by cylinder rod end thread size from Table A & B below.
Mating parts for rod end accessories are listed just to the right of the knuckle or clevis selected.
Mounting plates for style MP1 & MP4 cylinder mounts are selected by bore size from Table C.

Rod End Thread Size	TABLE A			TABLE B			TABLE C		
	Female Rod Clevis	Mating Parts		Knuckle	Mating Parts		Bore Size	Mounting Plates	
		Eye Bracket	Pivot Pin		Clevis Bracket	Pivot Pin		For Mtg. Style MP1 Cylinder	For Mtg. Style MP4 Cylinder
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	—

Note: For 1-1/8" bore 3MA cylinder accessories, please refer to page B59.

Pivot Pin





Symbol	0856640044	0856640050	0856640075	0856640100	0856640138	0856640175
CD	7/16	1/2	3/4	1	1-3/8	1-3/4
CL	1-5/16	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.

Maximum Pivot Angle for Rear Clevis Mounts (BB Mounts) and Accessories

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

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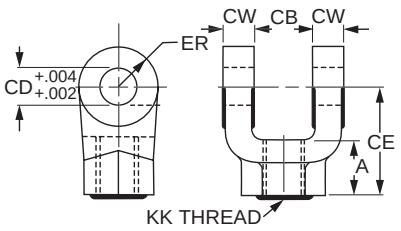
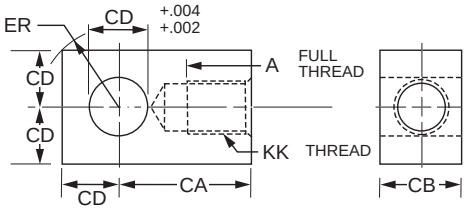
Female Rod Clevis



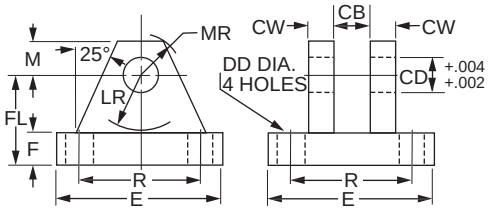
Symbol	1458030044	1458030050	1458030075	1458030088	1458030100	1458030125	1458030150
A	3/4	3/4	1-1/8	1-5/8	1-5/8	2	2-1/4
CB	3/4	3/4	1-1/4	1-1/2	1-1/2	2	2-1/2
CD	1/2	1/2	3/4	1	1	1-3/8	1-3/4
C E	1-1/2	1-1/2	2-1/8	2-15/16	2-15/16	3-3/4	4-1/2
CW	1/2	1/2	5/8	3/4	3/4	1	1-1/4
ER	1/2	1/2	3/4	1	1	1-3/8	1-3/4
KK	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)	4250	4900	11200	18800	19500	33500	45600

Rod Eye Knuckle



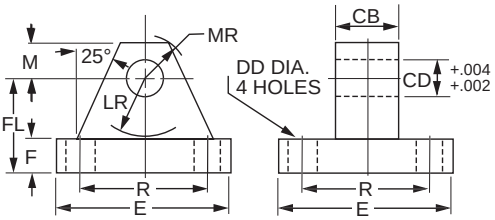
Symbol	1458040044	1458040050	1458040075	1458040088	1458040100	1458040125	1458040150
A	3/4	3/4	1-1/8	1-1/8	1-5/8	2	2-1/4
CA	1-1/2	1-1/2	2-1/16	2-3/8	2-13/16	3-7/16	4
CB	3/4	3/4	1-1/4	1-1/2	1-1/2	2	2-1/2
CD	1/2	1/2	3/4	1	1	1-3/8	1-3/4
ER	23/32	23/32	1-1/16	1-7/16	1-7/16	1-31/32	2-1/2
KK	7/16-20	1/2-20	3/4-16	7/8-14	1-14	1-1/4-12	1-1/2-12
Load Capacity (lbs)	5000	5700	12100	13000	21700	33500	45000

Clevis Bracket



Symbol	1458050044	1458050050	1458050075	1458050100	1458050138	1458050175
CB	15/32	3/4	1-1/4	1-1/2	2	2-1/2
CD	7/16	1/2	3/4	1	1-3/8	1-3/4
CW	3/8	1/2	5/8	3/4	1	1-1/4
DD	17/64	13/32	17/32	21/32	21/32	29/32
E	2-1/4	3-1/2	5	6-1/2	7-1/2	9-1/2
F	3/8	1/2	5/8	3/4	7/8	7/8
FL	1	1-1/2	1-7/8	2-1/4	3	3-5/8
LR	5/8	3/4	1-3/16	1-1/2	2	2-3/4
M	3/8	1/2	3/4	1	1-3/8	1-3/4
MR	1/2	5/8	29/32	1-1/4	1-21/32	2-7/32
R	1.75	2.55	3.82	4.95	5.73	7.50
Load Capacity (lbs)	3600	7300	14000	19200	36900	34000

Mounting Plate & Eye Bracket



Symbol	1458060031	1458060050	1458060075	1458060100	1458060138	1458060175
CB	15/16	3/4	1-1/4	1-1/2	2	2-1/2
CD	15/16	1/2	3/4	1	1-3/8	1-3/4
DD	17/64	13/32	17/32	21/32	21/32	29/32
E	2-1/4	2-1/2	3-1/2	4-1/2	5	6-1/2
F	3/8	3/8	5/8	7/8	7/8	1-1/8
FL	1	1-1/8	$1^{7}/_{8}$	2-3/8	3	3-3/8
LR	5/8	3/4	1-1/4	1-1/2	2-1/8	2-1/4
M	3/8	1/2	3/4	1	1-3/8	1-3/4
MR	1/2	9/16	7/8	1-1/4	1-5/8	2-1/8
R	1.75	1.63	2.55	3.25	3.82	4.95
Load Capacity (lbs)	1700	4100	10500	20400	21200	49480

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B

Mounting Kit Assembly

Perform the following steps when installing mounting kits onto 1-1/2" - 5" bore 3MA, 4MA and 4ML cylinders with the standard mount (TE or TEF).

1) Clean mating parts to remove oil, grease and dirt.
2) Fasteners should be clean, dry and burr free.
3) Brush mounting fastener threads thoroughly with anti-seize lubricant.
4) Follow the appropriate procedure below for the desired mounting.

Rear Pivot Mounting Kits – Style BB, BC and BE (Fig. 1)
Place pivot mount over end cap, lining up the four fastener holes in the end cap with the pivot mounting plate. Note that the pivot mount can be rotated allowing for different cylinder port locations. Secure mounting to cylinder cap (finger tight) using the four fasteners. Torque the fasteners to the specifications in the table below.

End Angle Mounting Kit – Style CB (Fig. 2)

The end angles bolt to the front and rear of the cylinder end caps. The spacer plate** provided is to be assembled at the rod end under the angle plate. Line up the two holes of the spacer plate and angle plate with the two fastener holes in the cylinder head. If 2 different length fasteners are in the kit, use the longer fasteners for the cylinder head end (rod end) mount. Secure (finger tight) using two fasteners. Repeat this assembly at the opposite end (less spacer). Place the assembly with the end angles down on a flat surface and torque the four fasteners to the specifications shown in the table below.

Flange Mounting Kits – Style J and H Single and Double Rod Cylinders (Fig. 3)
Place rectangular flange plate over appropriate end cap. Line up the four holes in the mounting plate with the four fastener holes in the cylinder end cap. Note that the rectangular mounting plate can be rotated to allow for different port locations. Secure the rectangular mounting plate to the end cap (finger tight) using the four fasteners. Then torque the four fasteners to the specifications shown in the table below.

Side End Lug Mounting Kits – Style G (Fig. 4)
Attach the two longer lugs with the fasteners provided in the kit to the cylinder head as shown. Attach the two shorter lugs to the cylinder cap in a similar fashion. Place the assembly with the lugs down on a flat surface and torque the four fasteners to the specifications shown in the table below.

Side Lug Mount – Style C (not shown)
Place one bracket over one cylinder endcap. Align the lower two fastener holes in the endcap with the thru holes in the bracket. Note that the bracket can be rotated allowing for different cylinder port locations. Secure the bracket to the endcap (finger tight) using two fasteners. Repeat for the other bracket and endcap. Place the assembly with the brackets down on a flat surface and torque the four fasteners on both brackets to specifications shown in the table below.

Fig. 1 - Pivot Mounting Kit

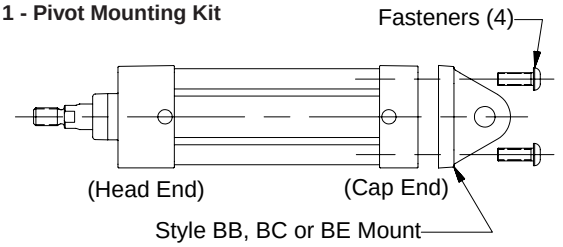


Fig. 2 - End Angle Mounting Kit

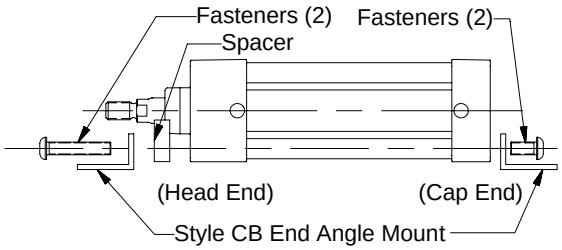


Fig. 3 - Flange Mounting Kit

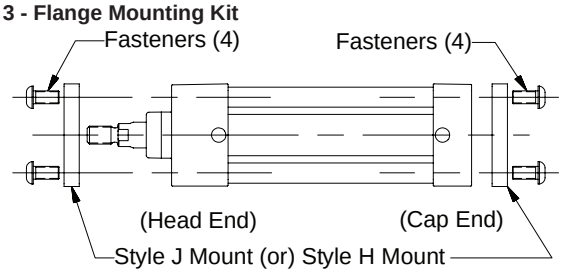
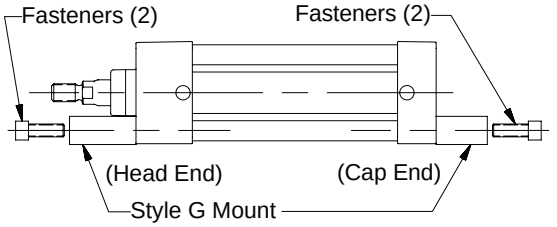


Fig. 4 - Side End Lug Mounting Kit - Style MS7



3MA and 4MA Mounting Kits										
Bore Size	J (MF1) Head Rectangular Flange	H (MF2) Cap Rectangular Flange	BB (MP1) Cap Fixed Clevis	BC (MP2) Cap Detachable Clevis	BE (MP4) Cap Detachable Eye	CB (MS1) Side End Angles	C (MS2) Side Lug (3MA only)	G (MS7) Side End Lug	Kit Fastener Torque Units	
	Kit Number	Kit Number	Kit Number	Kit Number	Kit Number	Kit Number	Kit Number	Kit Number	USA inch-lbs	Metric N-m
1-1/2	L079700150	L079700150	L079710150	L079730150	L079720150	L079740150	L079830150	L079750150	32 - 36	3.6 - 4.1
2	L079700200	L079700200	L079710200	L079730200	L079720200	L079740200	L079830200	L079750200	72 - 82	8 - 9
2-1/2	L079700250	L079700250	L079710250	L079730250	L079720250	L079740250	L079830250	L079750250	72 - 82	8 - 9
3-1/4	L079700325	L079700325	L079710325	L079730325	L079720325	L079740325	L079830325	L079750325	216 - 228	24 - 25.3
4	L079700400	L079700400	L079710400	L079730400	L079720400	L079740400	L079830400	L079750400	216 - 228	24 - 25.3
5	L079700500	L079700500	L079710500	L079730500	N/A	L079740500	L079830500	N/A	360 - 372	41 - 42

** Spacer plate not used for 4" bore or double rod cylinders

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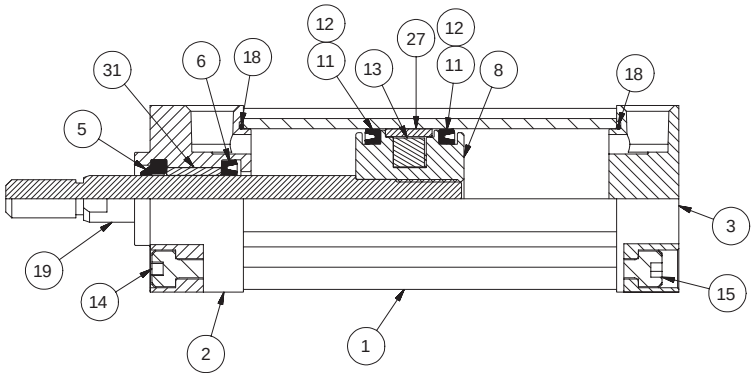
1-1/8" Bore 3MA/3ML Individual and Complete Cylinder Kits

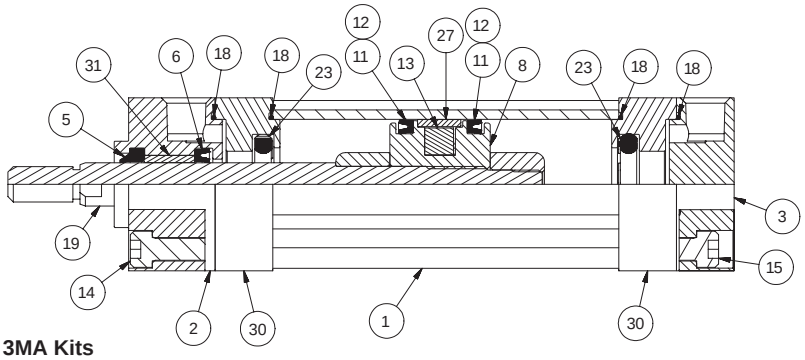
3MA kits – pneumatic service only
3ML kits – hydraulic service

Temperatures:
- Nitrile -10°F to +165°F (-23°C to +74°C)
- Fluorocarbon -10°F to +250°F (-23°C to +121°C)

Non-cushioned (3MA or 3ML)



Cushioned (3MA only)



Symbol Legend

Symbol	Description
1	Cylinder body
2	Head
3	Cap
5	Rod wiper
6	Rod seal
8	Piston
11	Piston seal (lipseal)
12	Piston seal (bumper seal option)
13	Magnetic ring
14	Head fastener
15	Cap fastener
18	O-ring - cylinder body to head & cap
19	Piston rod
23	Cushion check seal
24	Tie rod nut (Some mounts)
27	Wear band
28	Tie rod (Some mounts)
30	Cushion spacer
31	Rod bearing (1-1/2" bore)

Servicing the complete cylinder

The SK kit offers all parts to service an entire 3MA or 3ML cylinder with standard piston lipseals. Kits are available with Nitrile or Fluorocarbon seals. This kit is a combination of the rod wiper, rod seal, rod bearing and standard Piston Seal Kit.

1 tube of Lube-A-Cyl is also included with each kit.

3MA Kits

Rod Dia.	Rod No.	PK - Piston Seal Kit, Standard Lipseals Includes (2) each of symbol 11 & 18, and (1) of symbol 27		BK - Piston Seal Kit, Bumper Seals Includes (2) each of symbol 12 & 18, and (1) of symbol 27		Magnetic Ring Symbol 13 Only with Nitrile Seals	Endcap Fastener or Tie Rod Torque Units	
		Nitrile Seals Kit Number	Fluorocarbon Seals Kit Number	Nitrile Seals Kit Number	Fluorocarbon Seals Kit Number	Part Number	USA inch-lbs	Metric N-m
3/8	1	PK11003MA1	PK11003MA5	BK01123MA1	BK01123MA5	086513S112	32-36	3.6-4.1
1/2	3							

Rod Dia.	Rod No.	CH - Cushion Kit for either end Includes 1 each of symbol 18, 23 and cushion needle valve assembly (no symbol)		SK - Complete Cylinder Kit Includes 1 each of symbol 5, 6, 31 and Standard Piston Seal Kit		Endcap Fastener or Tie Rod Torque Units	
		Nitrile Seals Kit Number	Fluorocarbon Seals Kit Number	Nitrile Seals Kit Number	Fluorocarbon Seals Kit Number	USA inch-lbs	Metric N-m
3/8	1	CH11003MA1	CH11003MA5	SK11103MA1	SK11103MA5	32-36	3.6-4.1
1/2	3	CH11003MA1	CH11003MA5	SK11303MA1	SK11303MA5		

3ML Kits

Rod Dia.	Rod No.	PK - Piston Seal Kit, Standard Lipseals Includes (2) each of symbol 11 & 18, and (1) of symbol 27		Magnetic Ring Symbol 13 Only with Nitrile Seals	SK - Complete Cylinder Kit Includes 1 each of symbol 5, 6, 31 and Standard Piston Seal Kit		Endcap Fastener or Tie Rod Torque Units	
		Nitrile Seals Kit Number	Fluorocarbon Seals Kit Number	Part Number	Nitrile Seals Kit Number	Fluorocarbon Seals Kit Number	USA inch-lbs	Metric N-m
3/8	1	PK1123ML01	PK1123ML05	086513S112	SK11103ML1	SK11103ML5	32-36	3.6-4.1
1/2	3	PK1123ML01	PK1123ML05	086513S112	SK11303ML1	SK11303ML5		

Parker Hannifin Corporation
Pneumatic Division
Wadsworth, Ohio
www.parker.com/pneumatics

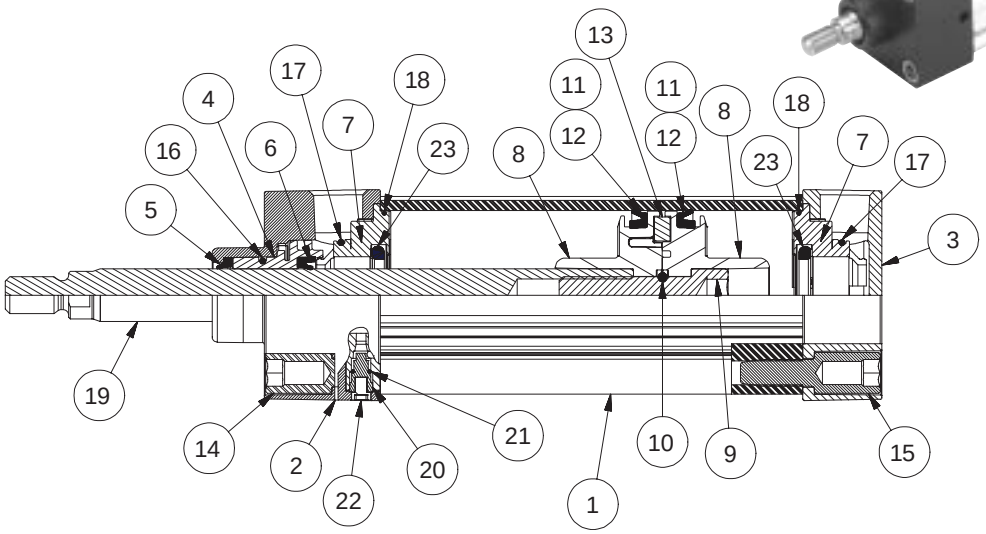
B

1-1/2" - 5" Bore 3MA Piston Seal Kits (Piston and cylinder body seals)

Pneumatic service only

Temperatures:

- Nitrile -10°F to +165°F (-23°C to +74°C)



Composite piston assembly shown above.

Aluminum piston options available.

The same piston lipseals fit both piston types.

Servicing the piston seals – see next page

Warning ⚠ The piston rod (or fastener) to piston threaded connection is secured with an anaerobic adhesive that is temperature sensitive. Cylinders are assembled with an anaerobic adhesive having a maximum operating temperature rating of +165°F (+74°C). This temperature limitation is necessary to prevent possible loosening of the threaded connections.

Note: the maximum temperature rating for the 1-1/2"-5" bore 3MA is +165°F (+74°C).

Every standard piston seal kit (PK) contains 2 of the following:

Symbol	Description
11	Piston seal (lipseal)
18	O-ring - cylinder body to head & cap

Every bumper piston seal kit (BK) contains 2 of the following:

Symbol	Description
12	Piston seal (bumper seat cushion)
18	O-ring - cylinder body to head & cap

1 tube of Lube-A-Cyl is also included with each PK or BK kit.

Bore Size	PK - Piston Seal Kit, Standard Lipseals Includes 2 each of symbol 11 & 18 Includes wear band (#27) for aluminum pistons and 4" and 5" composite pistons Nitrile Seals Kit Number	BK - Piston Seal Kit, Bumper Seals Includes 2 each of symbol 12 & 18 Nitrile Seals Kit Number	Magnetic Ring (not replaceable for composite piston, only for aluminum piston) Part Number	Torque Units Endcap Fastener or Tie Rod USA inch-lbs	Metric N-m
1-1/2	PK1503MA01	BK01503MA1	0865130151	32 - 36	3.6 - 4.1
2	PK2003MA01	BK02003MA1	0865130200	72 - 82	8 - 9
2-1/2	PK2503MA01	BK02503MA1	0865130250	72 - 82	8 - 9
3-1/4	PK3253MA01	BK03253MA1	0865130325	216 - 228	24 - 25.3
4	PK4003MA01	BK04003MA1	0865130400	216 - 228	24 - 25.3
5	PK5003MA01	BK05003MA1	0865130500	360 - 372	41 - 42

Parker Hannifin Corporation
Pneumatic Division
Wadsworth, Ohio
www.parker.com/pneumatics

Parker Lube-A-Cyl...

Is recommended for use in air cylinders during normal operation, and particularly when servicing and reassembling cylinders. It is a multi-purpose lubricant in grease form that provides lubrication without deteriorating effects on synthetic seals. It produces a thin film which will not blow out with exhaust air. It provides piston, rod and seal lubrication, and has excellent resistance to water and mechanical breakdown with temperature range of -10°F (-23°C) to +350°F (+177°C). Lube-A-Cyl is packaged in 1.5 oz. tubes, a sufficient quantity for average size air cylinder. One application should last for a period of 6 to 18 months depending upon service. Order by part number 0761630000.

Servicing the Piston Seals

Disassemble the cylinder completely, remove the old seals and clean all the parts. The cylinder bore and piston should then be examined for evidence of scoring. (The light scratch marks usually present on both cylinder bore and piston will generally have no detrimental effects on the performance of the cylinder.)

Apply Parker "Lube-A-Cyl" to O.D. of piston and all grooves. Install one piston Lipseal (sym. # 11 or 12) in the groove nearest the rod. The two "lips" of this seal should face toward the rod end of the piston. **Aluminum and 4" & 5" composite pistons only** – If required, install magnetic ring (sym. #13) in the bottom of the middle groove and then install wear band (sym. #27) in the top of the middle groove.

Coat the inside of the cylinder body with Parker "Lube-A-Cyl" and insert the piston – cap end first – into the cylinder body as shown in detail "2" below.

Next, turn the cylinder body on its side and push the piston and rod assembly through the barrel just far enough to expose the groove for the second Lipseal. (See detail "3" below.) For aluminum pistons, be careful not to move the piston too far so as to expose the wear strip (sym. #27). If the piston should move too far, push the piston and rod assembly completely through the cylinder body and again start the piston from the original end. Now install the second Lipseal (sym. # 11 or 12) in the exposed groove with the two "lips" facing away from the rod and pull the piston into the cylinder body.

The piston and rod are securely locked together with anaerobic adhesive. This threaded connection should only be disassembled or reassembled by factory trained personnel.

NOTE: An extreme pressure lubricant (such as molybdenum disulphate) should be used on the tie rod threads and bearing faces to reduce friction and tie rod twist.

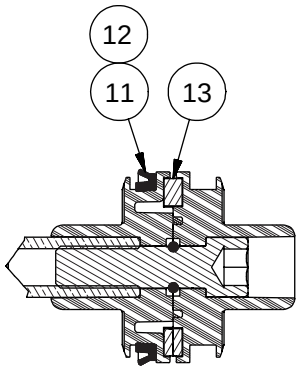
Assemble both cap and head, complete with cylinder body O-Rings (sym. # 18), to each end of the cylinder body. Install end cap fasteners and tighten to appropriate torque, using opposite corner to corner torquing sequence.

In case of a "DD" – center trunnion – mounted cylinder, care must be taken to prevent binding the cylinder body when repositioning the trunnion collar. The proper method of assembling this type of cylinder is as follows:

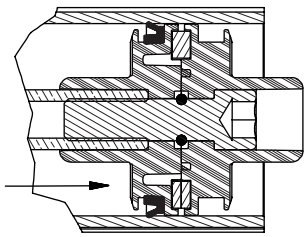
After all the piston seals have been installed on the piston and the piston is in the cylinder body, fit the cap with its O-ring (sym. # 18) in position onto the cylinder body. Then "stud" into the trunnion collar the four tie rods that connect the cap to the trunnion collar. Hand tighten the four tie rod nuts at the cap. Distances from the inner face of the cap to the finished face of the trunnion collar should the be made equal at all four tie rods when all four tie rod nuts are in contact with the cap.

When the assembly is ready for final torquing, it may be necessary to adjust the tie rods at the cap when torquing the tie rods at the head in order to position the trunnion collar in its final position.

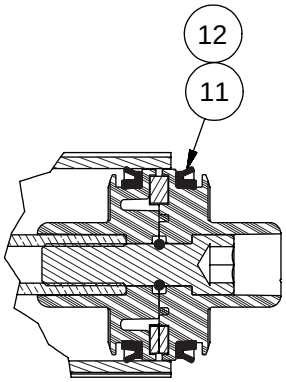
As a check, to be certain the trunnion mount will not interfere with cylinder operation, move the piston and rod assembly by hand to determine whether there is any tendency for the piston to bind at the spot where the trunnion collar is located. If any binding is noticeable, readjust the tie rods.



Detail "1"



Detail "2"



Detail "3"

Parker Hannifin Corporation
Pneumatic Division
Wadsworth, Ohio
www.parker.com/pneumatics

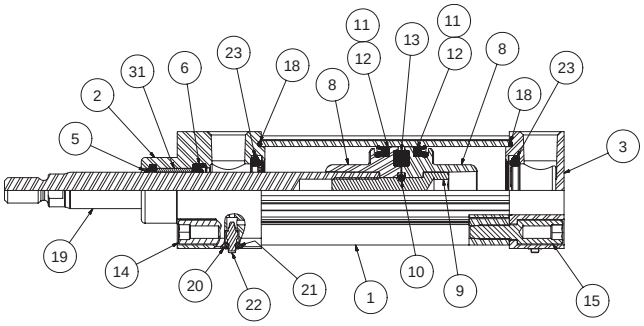
B

1-1/2"- 5" Bore 3MA Complete Cylinder Kits (All parts to service entire cylinder)

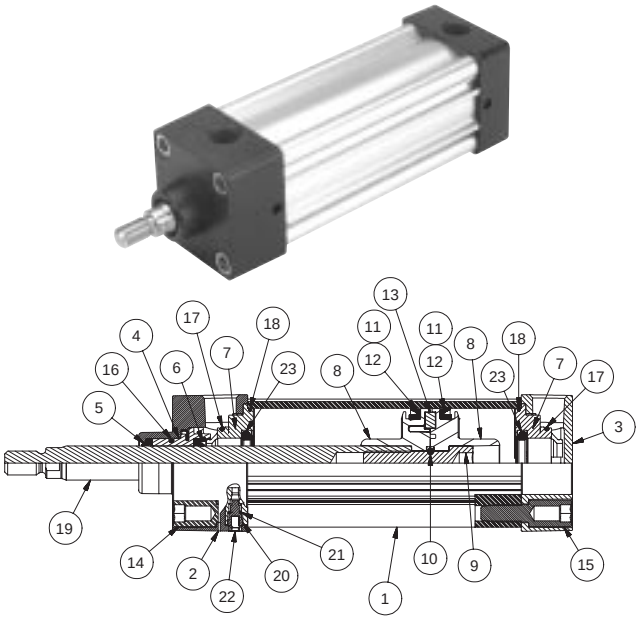
Pneumatic service only

Temperatures:

- Nitrile -10°F to +165°F (-23°C to +74°C)
- Fluorocarbon rod seals only (all other Nitrile) -10°F to +165°F (-23°C to +74°C)



1-1/2" Bore



2"-5" Bores

Servicing the complete cylinder

The SK kit offers all parts to service an entire 3MA cylinder with the standard piston lipseals. Kits are available with Nitrile seals or Fluorocarbon rod seals only (all other Nitrile).

This kit a combination of the rod wiper, rod seal, rod bearing, Standard Piston Seal Kit, two Cushion Kits and any other necessary seals. These kits can service cylinders with either the composite or aluminum piston (lipseal). Depending on cylinder configuration, some parts may not be used. Please refer to the pages or bulletins of these individual kits for service instructions.

Bore Size	Rod Dia.	Rod No.	SK - Complete Cylinder Kit Includes (1) each of symbol 5, 6, 31 (or 4); (1 Standard Piston Seal Kit and (2) Cushion Kits		Endcap Fastener or Tie Rod Torque Units	
			Nitrile Seals Kit Number	Fluorocarbon Rod Seals Only (all other Nitrile) Kit Number	USA inch-lbs	Metric N-m
1-1/2	5/8	1	SK15003MA1	SK15003MA5	32 - 36	3.6 - 4.1
2	5/8	1	SK20003MA1	SK20003MA5	72 - 82	8 - 9
2-1/2	5/8	1	SK25003MA1	SK25003MA5	72 - 82	8 - 9
3-1/4	1	1	SK32003MA1	SK32003MA5	216 - 228	24 - 25.3
4	1	1	SK40003MA1	SK40003MA5	216 - 228	24 - 25.3
5	1	1	SK50003MA1	SK50003MA5	360 - 372	41 - 42

Cushion Kits

Bore Size	Rod Dia.	Rod No.	CH - Cushion Kit for either end Includes 1 each of symbol 7, 17, 18, 20, 21, 22 & 23	Endcap Fastener or Tie Rod Torque Units	
			Nitrile Seals Kit Number	USA inch-lbs	Metric N-m
1-1/2	5/8	1	CH15003MA1	32 - 36	3.6 - 4.1
2	5/8	1	CH20003MA1	72 - 82	8 - 9
2-1/2	5/8	1	CH25003MA1	72 - 82	8 - 9
3-1/4	1	1	CH32003MA1	216 - 228	24 - 25.3
4	1	1	CH40003MA1	216 - 228	24 - 25.3
5	1	1	CH50003MA1	360 - 372	41 - 42

Symbol Legend

Symbol	Description
1	Cylinder body
2	Head
3	Cap
4	Rod bearing insert (2"-5" bores)
5	Rod wiper
6	Rod seal
7	Needle valve insert
8	Piston (composite or aluminum)
9	Piston fastener (only for composite piston)
10	O-ring - piston fastener to piston
11	Piston seal (lipseal)
12	Piston seal (bumper seal option)
13	Magnetic ring
14	Head fastener
15	Cap fastener
16	O-ring - rod bearing insert
17	O-ring - needle valve insert
18	O-ring - cylinder body to head & cap
19	Piston rod
20	Cushion needle valve
21	O-ring - cushion needle valve
22	Cushion knob
23	Cushion check seal
24	Tie rod nut (Style DD mounts)
27	Wear band (aluminum and 4" & 5" composite pistons)
28	Tie rod (Style DD mounts)
31	Rod bearing (1-1/2" bore)

1 tube of Lube-A-Cyl is also included with each SK or CH kit.

Parker Hannifin Corporation
Pneumatic Division
Wadsworth, Ohio
www.parker.com/pneumatics

4MA Gland Kits (Gland cartridges and rod seals)

Pneumatic service only

Temperatures:

- Nitrile -10°F to +165°F (-23°C to +74°C)
- Fluorocarbon -10°F to +250°F (-23°C to +121°C)

Servicing the rod gland (Cylinder disassembly is not required)

Air leakage around the piston rod at the gland area will normally indicate a need to replace the gland cartridge.

The Parker 4MA gland is a unique cartridge design. It is threaded into the cylinder head and all sizes are removable without disturbing the endcap fasteners.

To remove the old gland cartridge from the cylinder:

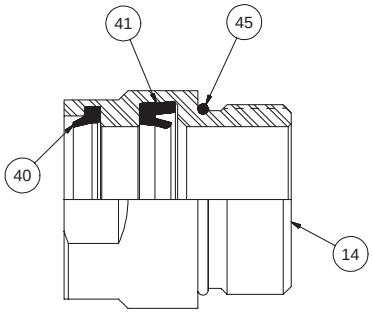
1. Inspect the piston rod to be sure it is free of burrs or other foreign material that would prevent sliding the gland off the rod.
2. Disconnect any attachments to the piston rod end thread.
3. Lubricate the rod with Lube-A-Cyl (included in kit).
4. Unscrew the gland cartridge from the head using the appropriate wrench (see D1 dimension in catalog).
5. Slide the gland cartridge off the piston rod.
6. Verify that the gland-to-head o-ring (#45) is also removed from the head.

To install the new gland cartridge onto the cylinder:

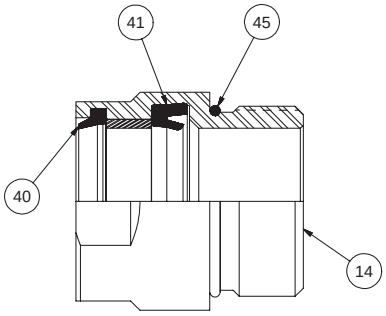
1. Re-inspect the surface of the piston rod for scratches, dents and other surface damage, and repair if necessary.
2. Clean and lubricate the surface of the piston rod with Lube-A-Cyl (included in kit).
3. Lubricate the rod wiper (#40), rod seal (#41), o-ring (#45) and the inside surfaces of the gland cartridge with Lube-A-Cyl.
4. Slide the gland cartridge onto the piston rod, align it with the threads in the head, and tighten (clockwise) until seated firmly against the head.
5. Torque the gland cartridge to the specifications shown below. Tools are available to assist this process (see below).

   Note: Make sure the gland cartridge is sufficiently tight. Failure to do so may result in loosening during operation.

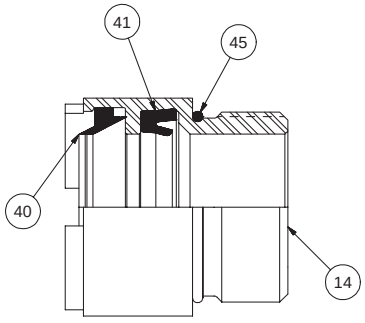
Rod Dia.	Standard & HI LOAD Gland	Metallic Rod Wiper Gland	
	Gland Wrench	Gland Wrench	Spanner Wrench
5/8	0695800000	0695900000	0116760000
1	0695810000	0695910000	0116760000
1-3/8	0695820000	0695920000	0117030000
1-3/4	0695830000	0695930000	0116770000



Standard Rod Gland



HI LOAD Rod Gland
(includes composite bearing)



Metallic Rod Wiper Gland

Every gland cartridge kit contains 1 each of the following:

Symbol	Description
14	Gland
40	Rod Wiper
41	Rod Seal
45	O-ring - Gland to head

Bore Size	Rod Dia.	Rod No.	Standard Rod Gland Cartridge Kit Includes 1 each of symbol 14, 40, 41 & 45		HI LOAD Rod Gland Cartridge Kit Includes 1 each of symbol 14, 40, 41 & 45		Metallic Rod Wiper Gland Cartridge Kit Includes 1 each of symbol 14, 40, 41 & 45		Gland to Head Torque Units	
			Nitrile Seals Kit Number	Fluorocarbon Seals Kit Number	Nitrile Seals Kit Number	Fluorocarbon Seals Kit Number	Nitrile & PUR Seals Kit Number	Fluorocarbon Seals Kit Number	USA Ft-Lbs	Metric N-m
1-1/2	5/8	1	RG04MA0061	RG04MA0065	RG04MAH061	RG04MAH065	RG04MAM061	RG04MAM065	40 - 45	54 - 61
	1	2	RG04MA0101	RG04MA0105	RG04MAH101	RG04MAH105	RG04MAM101	RG04MAM105	45 - 50	61 - 68
2	5/8	1	RG04MA0061	RG04MA0065	RG04MAH061	RG04MAH065	RG04MAM061	RG04MAM065	40 - 45	54 - 61
	1	3	RG04MA0101	RG04MA0105	RG04MAH101	RG04MAH105	RG04MAM101	RG04MAM105	45 - 50	61 - 68
2-1/2	5/8	1	RG04MA0061	RG04MA0065	RG04MAH061	RG04MAH065	RG04MAM061	RG04MAM065	40 - 45	54 - 61
	1	3	RG04MA0101	RG04MA0105	RG04MAH101	RG04MAH105	RG04MAM101	RG04MAM105	45 - 50	61 - 68
3-1/4	1	1	RG04MA0101	RG04MA0105	RG04MAH101	RG04MAH105	RG04MAM101	RG04MAM105	45 - 50	61 - 68
	1-3/8	3	RG04MA0131	RG04MA0135	RG04MAH131	RG04MAH135	RG04MAM131	RG04MAM135	75 - 80	102 - 108
4	1	1	RG04MA0101	RG04MA0105	RG04MAH101	RG04MAH105	RG04MAM101	RG04MAM105	45 - 50	61 - 68
	1-3/8	3	RG04MA0131	RG04MA0135	RG04MAH131	RG04MAH135	RG04MAM131	RG04MAM135	75 - 80	102 - 108
5	1	1	RG04MA0101	RG04MA0105	RG04MAH101	RG04MAH105	RG04MAM101	RG04MAM105	45 - 50	61 - 68
	1-3/8	3	RG04MA0131	RG04MA0135	RG04MAH131	RG04MAH135	RG04MAM131	RG04MAM135	75 - 80	102 - 108
6	1-3/8	1	RG04MA0131	RG04MA0135	RG04MAH131	RG04MAH135	RG04MAM131	RG04MAM135	75 - 80	102 - 108
	1-3/4	3	RG04MA0171	RG04MA0175	RG04MAH171	RG04MAH175	RG04MAM171	RG04MAM175	90 - 95	122- 129
8	1-3/8	1	RG04MA0131	RG04MA0135	RG04MAH131	RG04MAH135	RG04MAM131	RG04MAM135	75 - 80	102 - 108
	1-3/4	3	RG04MA0171	RG04MA0175	RG04MAH171	RG04MAH175	RG04MAM171	RG04MAM175	90 - 95	122- 129

Parker Hannifin Corporation
Pneumatic Division
Wadsworth, Ohio
www.parker.com/pneumatics

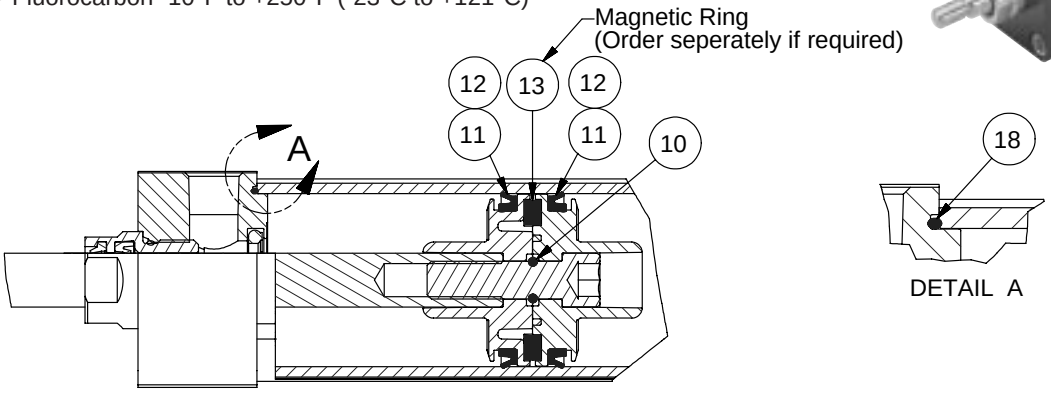
B

4MA Piston Seal Kits (Piston and cylinder body seals)

Pneumatic service only

Temperatures:

- Nitrile -10°F to +165°F (-23°C to +74°C)
- Fluorocarbon -10°F to +250°F (-23°C to +121°C)



Composite piston assembly shown above.

Aluminum piston options available.

The same piston lipseals fit both piston types.

Servicing the piston seals – see next page

Warning – The piston rod (or fastener) to piston threaded connection is secured with an anaerobic adhesive that is temperature sensitive. Cylinders specified with all fluorocarbon seals are assembled with an anaerobic adhesive having a maximum operating temperature rating of +250°F (+121°C). Cylinders specified with other seal compounds are assembled with an anaerobic adhesive having a maximum operating temperature rating of +165°F (+74°C). These temperature limitations are necessary to prevent possible loosening of the threaded connections. Cylinders originally manufactured with Class 1 seals (Nitrile) that will be exposed to ambient temperatures above +165°F (+74°C) must be modified for higher temperature service. Contact the Wadsworth, OH facility immediately and arrange for the piston to rod connection to be properly re-assembled to withstand the higher temperature service and other cylinder changes.

Note: the maximum temperature rating for the composite piston is +165°F (+74°C).

Every standard piston seal kit (PK) contains 2 of the following:

Symbol	Description
11	Piston seal (lipseal)
18	O-ring - cylinder body to head & cap

Every bumper piston seal kit (BK) contains 2 of the following:

Symbol	Description
12	Piston seal (bumper seat cushion)
18	O-ring - cylinder body to head & cap

1 tube of Lube-A-Cyl is also included with each PK or BK kit.

Bore Size	PK - Piston Seal Kit, Standard Lipseals Includes 2 each of symbol 11 & 18		BK - Piston Seal Kit, Bumper Seals Includes 2 each of symbol 12 & 18		Magnetic Ring (not replaceable for composite piston)	Torque Units Endcap Fastener or Tie Rod	
	Includes wear band (#27) for aluminum pistons and 4" and 5" composite pistons						
	Nitrile Seals Kit Number	Fluorocarbon Seals Kit Number	Nitrile Seals Kit Number	Fluorocarbon Seals Kit Number	Only with Nitrile Seals Part Number	USA inch-lbs	Metric N-m
1-1/2	PK1504MA01	PK1504MA05	BK01504MA1	BK01504MA5	0865130151	32 - 36	3.6 - 4.1
2	PK2004MA01	PK2004MA05	BK02004MA1	BK02004MA5	0865130200	72 - 82	8 - 9
2-1/2	PK2504MA01	PK2504MA05	BK02504MA1	BK02504MA5	0865130250	72 - 82	8 - 9
3-1/4	PK3254MA01	PK3254MA05	BK03254MA1	BK03254MA5	0865130325	216 - 228	24 - 25.3
4	PK4004MA01	PK4004MA05	BK04004MA1	BK04004MA5	0865130400	216 - 228	24 - 25.3
5	PK5004MA01	PK5004MA05	BK05004MA1	BK05004MA5	0865130500	360 - 372	41 - 42
6	PK6004MA01	PK6004MA05	N/A	N/A	0865130600	420 - 432	48 - 49
8	PK8004MA01	PK8004MA05	N/A	N/A	0865130800	960 - 972	109 - 115

Parker Hannifin Corporation
Pneumatic Division
Wadsworth, Ohio
www.parker.com/pneumatics

Parker Lube-A-Cyl...

Is recommended for use in air cylinders during normal operation, and particularly when servicing and reassembling cylinders. It is a multi-purpose lubricant in grease form that provides lubrication without deteriorating effects on synthetic seals. It produces a thin film which will not blow out with exhaust air. It provides piston, rod and seal lubrication, and has excellent resistance to water and mechanical breakdown with temperature range of -10°F (-23°C) to +350°F (+177°C). Lube-A-Cyl is packaged in 1.5 oz. tubes, a sufficient quantity for average size air cylinder. One application should last for a period of 6 to 18 months depending upon service. Order by part number 0761630000.

Servicing the Piston Seals

Disassemble the cylinder completely, remove the old seals and clean all the parts. The cylinder bore and piston should then be examined for evidence of scoring. (The light scratch marks usually present on both cylinder bore and piston will generally have no detrimental effects on the performance of the cylinder.)

Apply Parker "Lube-A-Cyl" to O.D. of piston and all grooves. Install one piston Lipseal (sym. # 11 or 12) in the groove nearest the rod. The two "lips" of this seal should face toward the rod end of the piston. **Aluminum and 4" & 5" composite pistons only** – If required, install magnetic ring (sym. #13) in the bottom of the middle groove and then install wear band (sym. #27) in the top of the middle groove.

Coat the inside of the cylinder body with Parker "Lube-A-Cyl" and insert the piston – cap end first – into the cylinder body as shown in detail "2" below.

Next, turn the cylinder body on its side and push the piston and rod assembly through the barrel just far enough to expose the groove for the second Lipseal. (See detail "3" below.) For aluminum pistons, be careful not to move the piston too far so as to expose the wear strip (sym. #27). If the piston should move too far, push the piston and rod assembly completely through the cylinder body and again start the piston from the original end. Now install the second Lipseal (sym. # 11 or 12) in the exposed groove with the two "lips" facing away from the rod and pull the piston into the cylinder body.

The piston and rod are securely locked together with anaerobic adhesive. This threaded connection should only be disassembled or reassembled by factory trained personnel.

NOTE: An extreme pressure lubricant (such as molybdenum disulphate) should be used on the tie rod threads and bearing faces to reduce friction and tie rod twist.

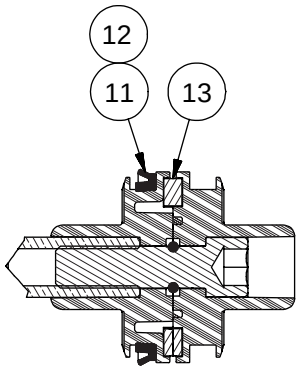
Assemble both cap and head, complete with cylinder body O-Rings (sym. # 18), to each end of the cylinder body. Install end cap fasteners and tighten to appropriate torque, using opposite corner to corner torquing sequence.

In case of a "DD" – center trunnion – mounted cylinder, care must be taken to prevent binding the cylinder body when repositioning the trunnion collar. The proper method of assembling this type of cylinder is as follows:

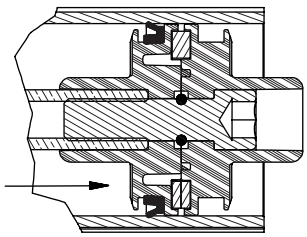
After all the piston seals have been installed on the piston and the piston is in the cylinder body, fit the cap with its O-ring (sym. # 18) in position onto the cylinder body. Then "stud" into the trunnion collar the four tie rods that connect the cap to the trunnion collar. Hand tighten the four tie rod nuts at the cap. Distances from the inner face of the cap to the finished face of the trunnion collar should the be made equal at all four tie rods when all four tie rod nuts are in contact with the cap.

When the assembly is ready for final torquing, it may be necessary to adjust the tie rods at the cap when torquing the tie rods at the head in order to position the trunnion collar in its final position.

As a check, to be certain the trunnion mount will not interfere with cylinder operation, move the piston and rod assembly by hand to determine whether there is any tendency for the piston to bind at the spot where the trunnion collar is located. If any binding is noticeable, readjust the tie rods.



Detail "1"



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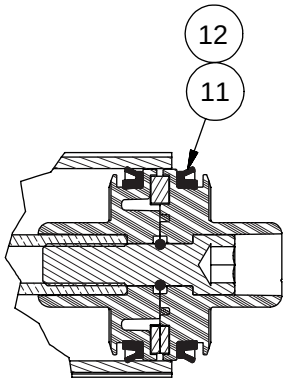


Detail "3"

Parker Hannifin Corporation
Pneumatic Division
Wadsworth, Ohio
www.parker.com/pneumatics

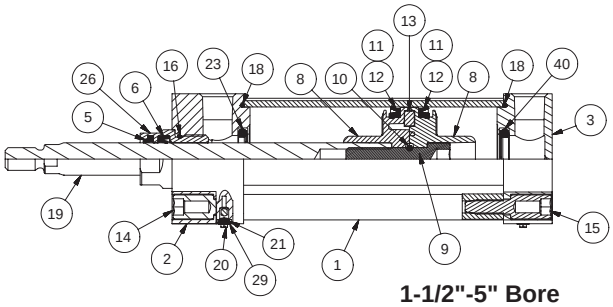
B

4MA Complete Cylinder Kits (All parts to service entire cylinder)

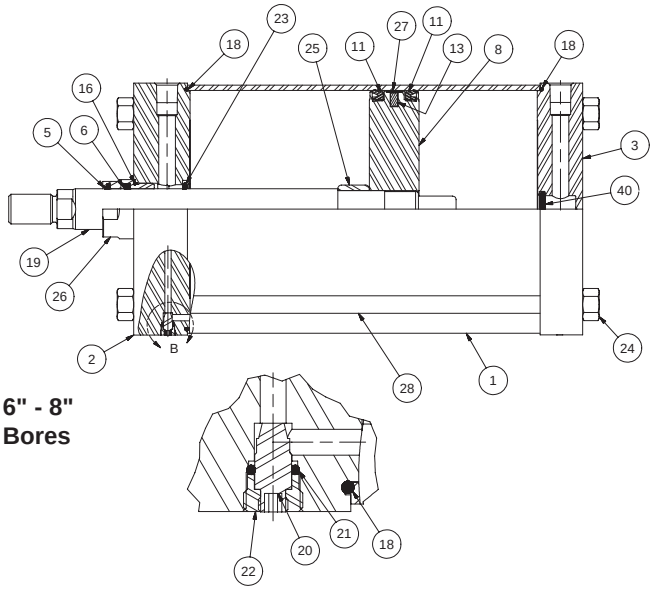
Pneumatic service only

Temperatures:

- Nitrile -10°F to +165°F (-23°C to +74°C)
- Fluorocarbon -10°F to +250°F (-23°C to +121°C)



1-1/2"-5" Bore



6" - 8" Bores

Symbol Legend

Symbol	Description
1	Cylinder body
2	Head
3	Cap
5	Rod wiper
6	Rod seal
8	Piston (composite or aluminum)
9	Piston fastener (only for composite piston)
10	O-ring - piston fastener to piston
11	Piston seal (lipseal)
12	Piston seal (Bumper seal option)
13	Magnetic ring
14	Head fastener
15	Cap fastener
16	O-ring - gland to head
18	O-ring - cylinder body to head & cap
19	Piston rod
20	Cushion needle valve
21	O-ring - cushion needle valve
22	Cushion needle valve retainer (6" & 8")
23	Cushion check seal - head
24	Tie rod nut (6" & 8" bore or Style DD mounts)
25	Head cushion sleeve
26	Gland
27	Wear band (aluminum and 4" & 5" composite pistons)
28	Tie rod (6" & 8" bore or Style DD mounts)
29	Retaining washer
40	Cushion check seal - cap

Servicing the complete cylinder

This kit offers all parts to service an entire 4MA cylinder with the standard rod gland and standard piston lipseals. Kits are available with Nitrile or Fluorocarbon seals.

This kit is a combination of the Standard Gland Kit, Standard Piston Seal Kit, Head Cushion Kit and Cap Cushion Kit. The kits can service cylinders with either the composite or aluminum piston (lipseal). Depending on cylinder configuration, some parts may not be used. Please refer to the pages or bulletins of these individual kits for service instructions.

1 tube of Lube-A-Cyl is also included with each SK kit.

Bore Size	Rod Dia.	Rod No.	SK - Complete Cylinder Kit Includes 1 each of Standard Rod Gland Kit, Standard Piston Seal Kit, Head Cushion Kit and Cap Cushion Kit		Gland to Head Torque Units		Endcap Fastener or Tie Rod Torque Units	
			Nitrile Seals Kit Number	Fluorocarbon Seals Kit Number	USA Ft-Lbs	Metric N-m	USA inch-lbs	Metric N-m
1-1/2	5/8	1	SK15104MA1	SK15104MA5	40 - 45	54 - 61	32 - 36	3.6 - 4.1
	1	2	SK15304MA1*	SK15304MA5*	45 - 50	61 - 68		
2	5/8	1	SK20104MA1	SK20104MA5	40 - 45	54 - 61	72 - 82	8 - 9
	1	3	SK20304MA1	SK20304MA5	45 - 50	61 - 68		
2-1/2	5/8	1	SK25104MA1	SK25104MA5	40 - 45	54 - 61	72 - 82	8 - 9
	1	3	SK25304MA1	SK25304MA5	45 - 50	61 - 68		
3-1/4	1	1	SK32104MA1	SK32104MA5	45 - 50	61 - 68	216 - 228	24 - 25.3
	1-3/8	3	SK32304MA1	SK32304MA5	75 - 80	102 - 108		
4	1	1	SK40104MA1	SK40104MA5	45 - 50	61 - 68	216 - 228	24 - 25.3
	1-3/8	3	SK40304MA1	SK40304MA5	75 - 80	102 - 108		
5	1	1	SK50104MA1	SK50104MA5	45 - 50	61 - 68	360 - 372	41 - 42
	1-3/8	3	SK50304MA1	SK50304MA5	75 - 80	102 - 108		
6	1-3/8	1	SK60104MA1	SK60104MA5	75 - 80	102 - 108	420 - 432	48 - 49
	1-3/4	3	SK60304MA1	SK60304MA5	90 - 95	122- 129		
8	1-3/8	1	SK80104MA1	SK80104MA5	75 - 80	102 - 108	960 - 972	109 - 115
	1-3/4	3	SK80304MA1	SK80304MA5	90 - 95	122- 129		

*Does not include Head Cushion Kit (not available)

Parker Hannifin Corporation
Pneumatic Division
Wadsworth, Ohio
www.parker.com/pneumatics

4ML Gland Kits (Gland cartridges and rod seals)

Hydraulic service (includes TS-2000 rod seal)

Temperatures:

- Nitrile/Polyurethane (PUR) -10°F to +165°F (-23°C to +74°C)
- Fluorocarbon -10°F to +250°F (-23°C to +121°C)

Servicing the rod gland (Cylinder disassembly is not required)

Fluid leakage around the piston rod at the gland area will normally indicate a need to replace the gland cartridge.

The Parker 4ML gland is a unique cartridge design. It is threaded into the cylinder head and all sizes are removable without disturbing the endcap fasteners.

To remove the old gland cartridge from the cylinder:

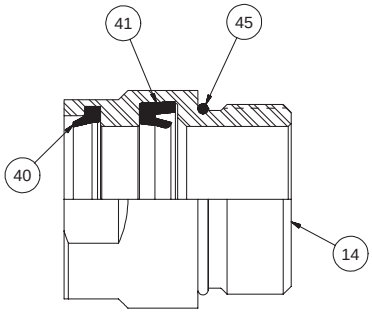
To remove the old gland cartridge from the cylinder:

1. Inspect the piston rod to be sure it is free of burrs or other foreign material that would prevent sliding the gland off the rod.
2. Disconnect any attachments to the piston rod end thread.
3. Lubricate the rod with clean light oil.
4. Unscrew the gland cartridge from the head using the appropriate wrench (see D1 dimension in catalog).
5. Slide the gland cartridge off the piston rod.
6. Verify that the gland-to-head o-ring (#45) is also removed from the head.

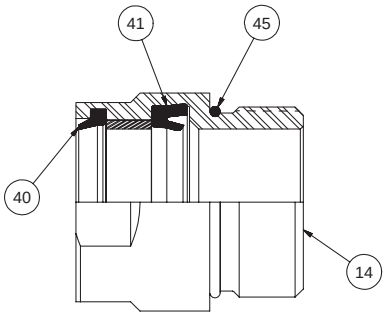
To install the new gland cartridge onto the cylinder:

1. Re-inspect the surface of the piston rod for scratches, dents and other surface damage, and repair if necessary.
2. Clean and lubricate the surface of the piston rod with clean light oil.
3. Lubricate the rod wiper (#40), rod seal (#41), o-ring (#45) and the inside surfaces of the gland cartridge with clean light oil.
4. Slide the gland cartridge onto the piston rod, align it with the threads in the head, and tighten (clockwise) until seated firmly against the head.
5. Torque the gland cartridge to the specifications shown below. Tools are available to assist this process (see below).

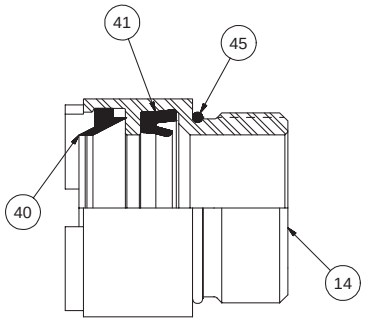
   Note: Make sure the gland cartridge is sufficiently tight. Failure to do so may result in loosening during operation.



Standard Rod Gland



HI LOAD Rod Gland
(includes composite bearing)



Metallic Rod Wiper Gland

Rod Dia.	Standard & HI LOAD Gland	Metallic Rod Wiper Gland	
	Gland Wrench	Gland Wrench	Spanner Wrench
5/8	0695800000	0695900000	0116760000
1	0695810000	0695910000	0116760000
1-3/8	0695820000	0695920000	0117030000
1-3/4	0695830000	0695930000	0116770000

Every gland cartridge kit contains 1 each of the following:

Symbol	Description
14	Gland
40	Rod Wiper
41	Rod Seal
45	O-ring - Gland to head

Bore Size	Rod Dia.	Rod No.	Standard Rod Gland Cartridge Kit Includes 1 each of symbol 14, 40, 41 & 45		HI LOAD Rod Gland Cartridge Kit Includes 1 each of symbol 14, 40, 41 & 45		Metallic Rod Wiper Gland Cartridge Kit Includes 1 each of symbol 14, 40, 41 & 45		Gland to Head Torque Units	
			Nitrile & PUR Seals Kit Number	Fluorocarbon Seals Kit Number	Nitrile & PUR Seals Kit Number	Fluorocarbon Seals Kit Number	Nitrile & PUR Seals Kit Number	Fluorocarbon Seals Kit Number	USA Ft-Lbs	Metric N-m
1-1/2	5/8	1	RG04ML0061	RG04ML0065	RG04MLH061	RG04MLH065	RG04MLM061	RG04MLM065	40 - 45	54 - 61
	1	2	RG04ML0101	RG04ML0105	RG04MLH101	RG04MLH105	RG04MLM101	RG04MLM105	45 - 50	61 - 68
2	5/8	1	RG04ML0061	RG04ML0065	RG04MLH061	RG04MLH065	RG04MLM061	RG04MLM065	40 - 45	54 - 61
	1	3	RG04ML0101	RG04ML0105	RG04MLH101	RG04MLH105	RG04MLM101	RG04MLM105	45 - 50	61 - 68
2-1/2	5/8	1	RG04ML0061	RG04ML0065	RG04MLH061	RG04MLH065	RG04MLM061	RG04MLM065	40 - 45	54 - 61
	1	3	RG04ML0101	RG04ML0105	RG04MLH101	RG04MLH105	RG04MLM101	RG04MLM105	45 - 50	61 - 68
3-1/4	1	1	RG04ML0101	RG04ML0105	RG04MLH101	RG04MLH105	RG04MLM101	RG04MLM105	45 - 50	61 - 68
	1-3/8	3	RG04ML0131	RG04ML0135	RG04MLH131	RG04MLH135	RG04MLM131	RG04MLM135	75 - 80	102 - 108
4	1	1	RG04ML0101	RG04ML0105	RG04MLH101	RG04MLH105	RG04MLM101	RG04MLM105	45 - 50	61 - 68
	1-3/8	3	RG04ML0131	RG04ML0135	RG04MLH131	RG04MLH135	RG04MLM131	RG04MLM135	75 - 80	102 - 108
5	1	1	RG04ML0101	RG04ML0105	RG04MLH101	RG04MLH105	RG04MLM101	RG04MLM105	45 - 50	61 - 68
	1-3/8	3	RG04ML0131	RG04ML0135	RG04MLH131	RG04MLH135	RG04MLM131	RG04MLM135	75 - 80	102 - 108
6	1-3/8	1	RG04ML0131	RG04ML0135	RG04MLH131	RG04MLH135	RG04MLM131	RG04MLM135	75 - 80	102 - 108
	1-3/4	3	RG04ML0171	RG04ML0175	RG04MLH171	RG04MLH175	RG04MLM171	RG04MLM175	90 - 95	122- 129
8	1-3/8	1	RG04ML0131	RG04ML0135	RG04MLH131	RG04MLH135	RG04MLM131	RG04MLM135	75 - 80	102 - 108
	1-3/4	3	RG04ML0171	RG04ML0175	RG04MLH171	RG04MLH175	RG04MLM171	RG04MLM175	90 - 95	122- 129

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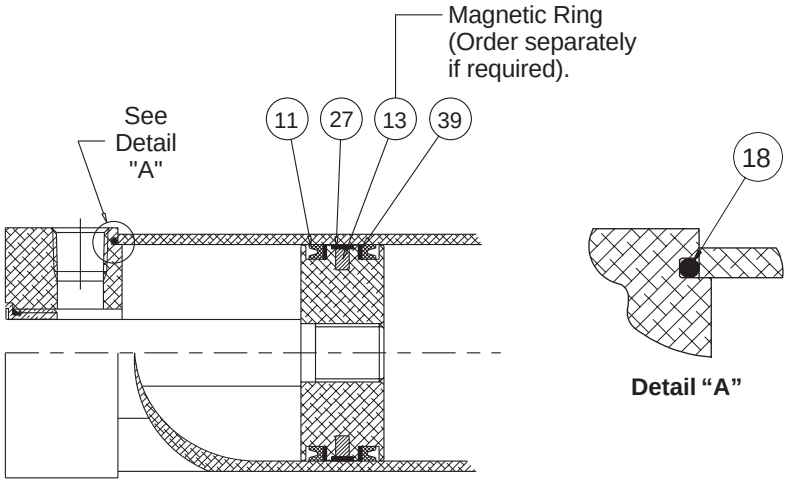
B

4ML Piston Seal Kits (Piston and cylinder body seals)

Hydraulic service

Temperatures:

- Nitrile -10°F to +165°F (-23°C to +74°C)
- Fluorocarbon -10°F to +250°F (-23°C to +121°C)



Detail "A"

Servicing the piston seals – see next page

Warning – The piston rod (or fastener) to piston threaded connection is secured with an anaerobic adhesive that is temperature sensitive. Cylinders specified with all fluorocarbon seals are assembled with an anaerobic adhesive having a maximum operating temperature rating of +250°F (+121°C). Cylinders specified with other seal compounds are assembled with an anaerobic adhesive having a maximum operating temperature rating of +165°F (+74°C). These temperature limitations are necessary to prevent possible loosening of the threaded connections. Cylinders originally manufactured with Class 1 seals (Nitrile) that will be exposed to ambient temperatures above +165°F (+74°C) must be modified for higher temperature service. Contact the Wadsworth, OH facility immediately and arrange for the piston to rod connection to be properly re-assembled to withstand the higher temperature service and other cylinder changes.

Every piston seal kit (PK) contains (2) of symbols 11, 18 and 39, and (1) of symbol 27

Symbol	Description
11	Piston seal (lipseal)
18	O-ring - cylinder body to head & cap
27	Wear band
39	Piston seal backup washer

Bore Size	PK - Piston Seal Kit, Standard Lipseals Includes 2 each of symbol 11, 39 & 18 Wear band (#27) for aluminum piston included		Magnetic Ring Symbol 13 Only with Nitrile Seals	Endcap Fastener or Tie Rod Torque Units	
	Nitrile Seals Kit Number	Fluorocarbon Seals Kit Number	Part Number	USA inch-lbs	Metric N-m
1-1/2	PK1504ML01	PK1504ML05	0865130151	32 - 36	3.6 - 4.1
2	PK2004ML01	PK2004ML05	0865130200	72 - 82	8 - 9
2-1/2	PK2504ML01	PK2504ML05	0865130250	72 - 82	8 - 9
3-1/4	PK3254ML01	PK3254ML05	0865130325	216 - 228	24 - 25.3
4	PK4004ML01	PK4004ML05	0865130400	216 - 228	24 - 25.3
5	PK5004ML01	PK5004ML05	0865130500	360 - 372	41 - 42
6	PK6004ML01	PK6004ML05	0865130600	420 - 432	48 - 49
8	PK8004ML01	PK8004ML05	0865130800	960 - 972	109 - 115

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Servicing the Piston Seals

Disassemble the cylinder completely, remove the old seals and clean all the parts. The cylinder bore and piston should then be examined for evidence of scoring. (The light scratch marks usually present on both cylinder bore and piston will generally have no detrimental effects on the performance of the cylinder.)

Apply clean light oil to O.D. of piston and all grooves. Install one piston Lipseal (sym. # 11) & one Back-Up Washer (sym. #39) in the groove nearest the rod. The two "lips" of the Lipseal (sym. #11) should face toward the rod end of the piston and the Back-Up Washer (sym. #39) should be installed in the same piston groove as shown. If required, install the magnetic ring (sym. # 13) in the bottom of the middle groove. (See detail "1" below) Next, install the wear strip (sym. # 27) in the top of the middle groove – (See detail "2" below).

Coat the inside of the cylinder body with clean light oil and insert the piston – cap end first – into the cylinder body as shown in detail "3" below.

Next, turn the cylinder body on its side and push the piston and rod assembly through the barrel just far enough to expose the piston groove for the second Lipseal. (See detail "4" below.) Be careful not to move the piston too far so as to expose the wear strip (sym. # 27). If the piston should move too far, push the piston and rod assembly completely through the cylinder body and again start the piston from the original end. Now install the second Lipseal (sym. # 11) & Back-Up Washer (sym. #39) in the exposed groove with the two "lips" of the Lipseal (sym. #11) facing away from the rod and the Back-Up Washer (sym. #39) positioned as shown. Then pull the piston into the cylinder body.

The piston and rod are securely locked together with anaerobic adhesive. This threaded connection should only be disassembled or reassembled by factory trained personnel.

NOTE: An extreme pressure lubricant (such as molybdenum disulphate) should be used on the tie rod threads and bearing faces to reduce friction and tie rod twist.

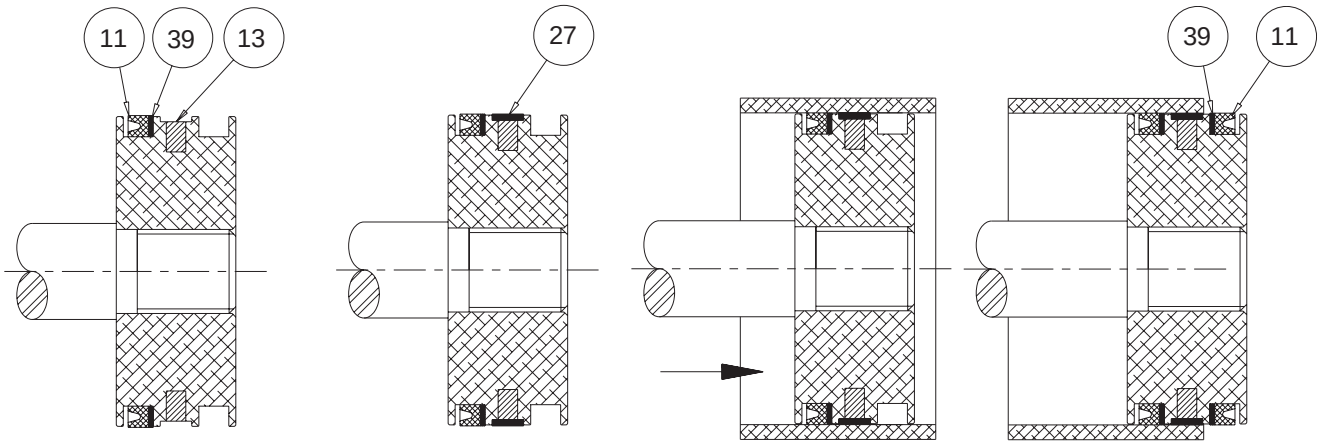
Assemble both cap and head, complete with cylinder body O-Rings (sym. # 18), to each end of the cylinder body. Install end cap fasteners and tighten to appropriate torque, using opposite corner to corner torquing sequence. After screws are torqued, firmly torque the rod gland against the head.

In case of a "DD" – center trunnion – mounted cylinder, care must be taken to prevent binding the cylinder body when repositioning the trunnion collar. The proper method of assembling this type of cylinder is as follows:

After all the piston seals have been installed on the piston and the piston is in the cylinder body, fit the cap with its O-ring (sym. # 18) in position onto the cylinder body. Then "stud" into the trunnion collar the four tie rods that connect the cap to the trunnion collar. Hand tighten the four tie rod nuts at the cap. Distances from the inner face of the cap to the finished face of the trunnion collar should the be made equal at all four tie rods when all four tie rod nuts are in contact with the cap.

When the assembly is ready for final torquing, it may be necessary to adjust the tie rods at the cap when torquing the tie rods at the head in order to position the trunnion collar in its final position.

As a check, to be certain the trunnion mount will not interfere with cylinder operation, move the piston and rod assembly by hand to determine whether there is any tendency for the piston to bind at the spot where the trunnion collar is located. If any binding is noticeable, readjust the tie rods.



Detail "1" **Detail "2"** **Detail "3"** **Detail "4"**

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B

4ML Complete Cylinder Kits (All parts to service entire cylinder)

Hydraulic service

Temperatures:

- Nitrile/Polyurethane (PUR) -10°F to +165°F (-23°C to +74°C)
- Fluorocarbon -10°F to +250°F (-23°C to +121°C)

Servicing the complete cylinder

This kit offers all parts to service an entire 4ML cylinder with the standard rod gland and standard piston lipseals. Kits are available with Nitrile/Polyurethane or Fluorocarbon seals.

This kit is a combination of the Standard Gland Kit and Standard Piston Seal Kit. Please refer to the pages or bulletins of these individual kits for service instructions.

Bore Size	Rod Dia.	Rod No.	SK - Complete Cylinder Kit Includes 1 each of Standard Rod Gland Kit and Piston Seal Kit		Gland to Head Torque Units		Endcap Fastener or Tie Rod Torque Units	
			Nitrile & PUR Seals Kit Number	Fluorocarbon Seals Kit Number	USA Ft-Lbs	Metric N-m	USA inch-lbs	Metric N-m
1-1/2	5/8	1	SK15104ML1	SK15104ML5	40 - 45	54 - 61	32 - 36	3.6 - 4.1
	1	2	SK15304ML1	SK15304ML5	45 - 50	61 - 68		
2	5/8	1	SK20104ML1	SK20104ML5	40 - 45	54 - 61	72 - 82	8 - 9
	1	3	SK20304ML1	SK20304ML5	45 - 50	61 - 68		
2-1/2	5/8	1	SK25104ML1	SK25104ML5	40 - 45	54 - 61	72 - 82	8 - 9
	1	3	SK25304ML1	SK25304ML5	45 - 50	61 - 68		
3-1/4	1	1	SK32104ML1	SK32104ML5	45 - 50	61 - 68	216 - 228	24 - 25.3
	1-3/8	3	SK32304ML1	SK32304ML5	75 - 80	102 - 108		
4	1	1	SK40104ML1	SK40104ML5	45 - 50	61 - 68	216 - 228	24 - 25.3
	1-3/8	3	SK40304ML1	SK40304ML5	75 - 80	102 - 108		
5	1	1	SK50104ML1	SK50104ML5	45 - 50	61 - 68	360 - 372	41 - 42
	1-3/8	3	SK50304ML1	SK50304ML5	75 - 80	102 - 108		
6	1-3/8	1	SK60104ML1	SK60104ML5	75 - 80	102 - 108	420 - 432	48 - 49
	1-3/4	3	SK60304ML1	SK60304ML5	90 - 95	122- 129		
8	1-3/8	1	SK80104ML1	SK80104ML5	75 - 80	102 - 108	960 - 972	109 - 115
	1-3/4	3	SK80304ML1	SK80304ML5	90 - 95	122- 129		

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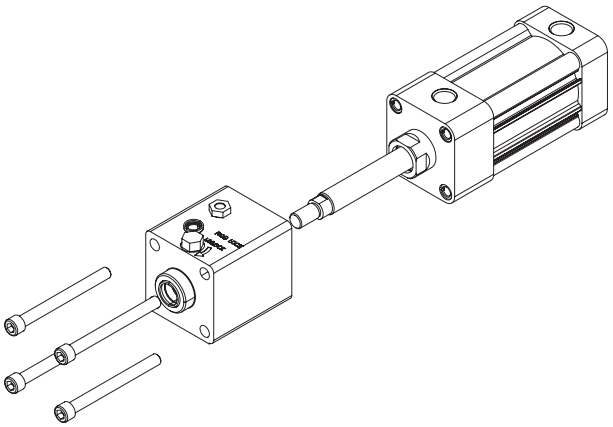
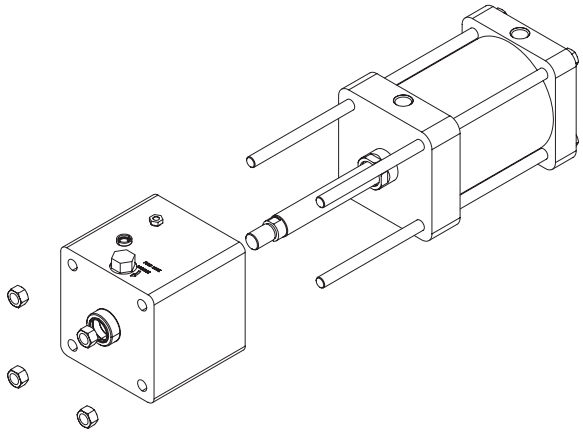
Rod Lock Removal and Re-assembly

1-1/2" to 5" Bores



6" to 8" Bores and all Style DD Mounts (NFPA MT4)



To remove the rod lock from the 3MAJ/4MAJ cylinder in order to service the base 3MAJ/4MAJ cylinder, please perform the following steps:

1. Remove the 3MAJ/4MAJ cylinder from the application to a serviceable area.
2. Using a corner-to-corner sequence, loosen the four SHCS fasteners (1-1/2" to 5" bores) or tie rod nuts (6" to 8" bores and all Style DD mounts (NFPA MT4) at the rod lock face and remove them from the rod lock. Please note that the tie rod nuts for 6" to 8" bores and all Style DD mounts are also used to assemble the base cylinder.
3. Apply a minimum of 60 PSI air pressure to the rod lock port, or apply the appropriate amount of torque to the manual override shaft, in order to release the rod lock from the piston rod.
4. Carefully slide the rod lock off the piston rod and away from the base cylinder. The rod lock is piloted and sealed to the gland OD, so some force may be required.
5. Particularly at larger bores, the rod lock can be heavy. Please remove the rod lock from the piston rod and follow all necessary safety precautions.

3MAJ/4MAJ Bore Size	SHCS Fastener Torque or Tie Rod Torque	
	inch-lbs	Nm
1-1/2	32-36	3.6-4.1
2	72-82	8-9
2-1/2	72-82	8-9
3-1/4	216-228	24-25.3
4	216-228	24-25.3
5	360-372	41-42
6	420-432	48-49
8	960-972	109-115

To re-assemble the rod lock to the base 3MAJ/4MAJ cylinder, please perform the following steps:

1. Remove all dirt and debris from the mating features of the rod lock, base cylinder, fasteners (or nuts) and threads.
2. Apply a minimum of 60 PSI air pressure to the rod lock port, or apply the appropriate amount of torque to the manual override shaft, in order to open the rod lock.
3. Carefully slide the rod lock onto the piston rod and toward the base cylinder. The rod lock is piloted and sealed to the gland OD, so some force may be required. Press the rod lock to the head face as close as possible, avoiding damage to the rod lock o-ring that seals the gland OD.
4. Using a corner-to-corner sequence, install and tighten, to approximately 75% of final torque specifications, the SHCS fasteners (1-1/2" to 5" bores) or tie rod nuts (6" to 8" bores and all Style DD mounts (NFPA MT4)) at the rod lock face. See torque specification table below.
5. Using a calibrated torque wrench, tighten the fasteners or nuts to the final torque specification using the same corner-to-corner sequence.
6. Remove the air pressure from the rod lock port or remove the torque from the manual override shaft to return the rod lock to the locked state.

The rod lock units are not field-repairable and must be returned to the Pneumatic Division for any repairs. Please contact the Wadsworth, Ohio facility for any assistance.

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Safety Guide for Selecting and Using Hydraulic, Pneumatic Cylinders and Their Accessories

WARNING: ⚠ FAILURE OF THE CYLINDER, ITS PARTS, ITS MOUNTING, ITS CONNECTIONS TO OTHER OBJECTS, OR ITS CONTROLS CAN RESULT IN:

- **Unanticipated or uncontrolled movement of the cylinder or objects connected to it.**
- **Falling of the cylinder or objects held up by it.**
- **Fluid escaping from the cylinder, potentially at high velocity.**

THESE EVENTS COULD CAUSE DEATH OR PERSONAL INJURY BY, FOR EXAMPLE, PERSONS FALLING FROM HIGH LOCATIONS, BEING CRUSHED OR STRUCK BY HEAVY OR FAST MOVING OBJECTS, BEING PUSHED INTO DANGEROUS EQUIPMENT OR SITUATIONS, OR SLIPPING ON ESCAPED FLUID.

Before selecting or using Parker (The Company) cylinders or related accessories, it is important that you read, understand and follow the following safety information. Training is advised before selecting and using The Company's products.

1.0 General Instructions

1.1 Scope – This safety guide provides instructions for selecting and using (including assembling, installing, and maintaining) cylinder products. This safety guide is a supplement to and is to be used with the specific Company publications for the specific cylinder products that are being considered for use.

1.2 Fail Safe – Cylinder products can and do fail without warning for many reasons. All systems and equipment should be designed in a fail-safe mode so that if the failure of a cylinder product occurs people and property won't be endangered.

1.3 Distribution – Provide a free copy of this safety guide to each person responsible for selecting or using cylinder products. Do not select or use The Company's cylinders without thoroughly reading and understanding this safety guide as well as the specific Company publications for the products considered or selected.

1.4 User Responsibility – Due to very wide variety of cylinder applications and cylinder operating conditions, The Company does not warrant that any particular cylinder is suitable for any specific application. This safety guide does not analyze all technical parameters that must be considered in selecting a product. The hydraulic and pneumatic cylinders outlined in this catalog are designed to The Company's design guidelines and do not necessarily meet the design guideline of other agencies such as American Bureau of Shipping, ASME Pressure Vessel Code etc. The user, through its own
analysis and testing, is solely responsible for:

- Making the final selection of the cylinders and related accessories.
- Determining if the cylinders are required to meet specific design requirements as required by the Agency(s) or industry standards covering the design of the user's equipment.
- Assuring that the user's requirements are met, OSHA requirements are met, and safety guidelines from the applicable agencies such as but not limited to ANSI are followed and that the use presents no health or safety hazards.
- Providing all appropriate health and safety warnings on the equipment on which the cylinders are used.

1.5 Additional Questions – Call the appropriate Company technical service department if you have any questions or require any additional information. See the Company publication for the product being considered or used, or call 1-800-CPARKER, or go to www.parker.com, for telephone numbers of the appropriate technical service department.

2.0 Cylinder and Accessories Selection

2.1 Seals – Part of the process of selecting a cylinder is the selection of seal compounds. Before making this selection, consult the "seal information page(s)" of the publication for the series of cylinders of interest.

The application of cylinders may allow fluids such as cutting fluids, wash down fluids etc. to come in contact with the external area of the cylinder. These fluids may attack the piston rod wiper and or the primary seal and must be taken into account when selecting and specifying seal compounds.

Dynamic seals will wear. The rate of wear will depend on many operating factors. Wear can be rapid if a cylinder is mis-aligned or if the cylinder has been improperly serviced. The user must take seal wear into consideration in the application of cylinders.

2.2 Piston Rods – Possible consequences of piston rod failure or separation of the piston rod from the piston include, but are not limited to are:

- Piston rod and or attached load thrown off at high speed.
- High velocity fluid discharge.
- Piston rod extending when pressure is applied in the piston retract mode.

Piston rods or machine members attached to the piston rod may move suddenly and without warning as a consequence of other conditions occurring to the machine such as, but not limited to:

- Unexpected detachment of the machine member from the piston rod.
- Failure of the pressurized fluid delivery system (hoses, fittings, valves, pumps, compressors) which maintain cylinder position.
- Catastrophic cylinder seal failure leading to sudden loss of pressurized fluid.
- Failure of the machine control system.

Follow the recommendations of the "Piston Rod Selection Chart and Data" in the publication for the series of cylinders of interest. The suggested piston rod diameter in these charts must be followed in order to avoid piston rod buckling.

Piston rods are not normally designed to absorb bending moments or loads which are perpendicular to the axis of piston rod motion. These additional loads can cause the piston rod to fail. If these types of additional loads are expected to be imposed on the piston rod, their magnitude should be made known to our engineering department.

The cylinder user should always make sure that the piston rod is securely attached to the machine member.

On occasion cylinders are ordered with double rods (a piston rod extended from both ends of the cylinder). In some cases a stop is threaded on to one of the piston rods and used as an external stroke adjuster. On occasions spacers are attached to the machine member connected to the piston rod and also used as a stroke adjuster. In both cases the stops will create a pinch point and the user should consider appropriate use of guards. If these external stops are not perpendicular to the mating contact surface, or if debris is trapped between the contact surfaces, a bending moment will be placed on the piston rod, which can lead to piston rod failure. An external stop will also negate the effect of cushioning and will subject the piston rod to impact loading. Those two (2) conditions can cause piston rod failure. Internal stroke adjusters are available with and without cushions. The use of external stroke adjusters should be reviewed with our engineering department.

The piston rod to piston and the stud to piston rod threaded connections are secured with an anaerobic adhesive. The strength of the adhesive decreases with increasing temperature. Cylinders which can be exposed to temperatures above +250°F (+121°C) are to be ordered with a non studded piston rod and a pinned piston to rod joint.

2.3 Cushions – Cushions should be considered for cylinder applications when the piston velocity is expected to be over 4 inches/second.

Cylinder cushions are normally designed to absorb the energy of a linear applied load. A rotating mass has considerably more energy than the same mass moving in a linear mode. Cushioning for a rotating mass application should be review by our engineering department.

2.4 Cylinder Mountings – Some cylinder mounting configurations may have certain limitations such as but not limited to minimum stroke for side or foot mounting cylinders or pressure de-ratings for certain mounts. Carefully review the catalog for these types of restrictions.

Always mount cylinders using the largest possible high tensile alloy steel socket head cap screws that can fit in the cylinder mounting holes and torque them to the manufacturer's recommendations for their size.

2.5 Port Fittings – Hydraulic cylinders applied with meter out or deceleration circuits are subject to intensified pressure at piston rod end.

The rod end pressure is approximately equal to:

$$\frac{\text{operating pressure x effective cap end area}}{\text{effective rod end piston area}}$$

Contact your connector supplier for the pressure rating of individual connectors.

3.0 Cylinder and Accessories Installation and Mounting

3.1 Installation

3.1.1 – Cleanliness is an important consideration, and cylinders are shipped with the ports plugged to protect them from contaminants entering the ports. These plugs should not be removed until the piping is to be installed. Before making the connection to the cylinder ports, piping should be thoroughly cleaned to remove all chips or burrs which might have resulted from threading or flaring operations.

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3.1.2 – Cylinders operating in an environment where air drying materials are present such as fast-drying chemicals, paint, or weld splatter, or other hazardous conditions such as excessive heat, should have shields installed to prevent damage to the piston rod and piston rod seals.

3.1.3 – Proper alignment of the cylinder piston rod and its mating component on the machine should be checked in both the extended and retracted positions. Improper alignment will result in excessive rod gland and/or cylinder bore wear. On fixed mounting cylinders attaching the piston rod while the rod is retracted will help in achieving proper alignment.

3.1.4 – Sometimes it may be necessary to rotate the piston rod in order to thread the piston rod into the machine member. This operation must always be done with zero pressure being applied to either side of the piston. Failure to follow this procedure may result in loosening the piston to rod-threaded connection. In some rare cases the turning of the piston rod may rotate a threaded piston rod gland and loosen it from the
cylinder head. Confirm that this condition is not occurring. If it does, re-tighten the piston rod gland firmly against the cylinder head.

For double rod cylinders it is also important that when attaching or detaching the piston rod from the machine member that the torque be applied to the piston rod end of the cylinder that is directly attaching to the machine member with the opposite end unrestrained. If the design of the machine is such that only the rod end of the cylinder opposite to where the rod attaches to the machine member can be rotated, consult the factory for further instructions.

3.2 Mounting Recommendations

3.2.1 – Always mount cylinders using the largest possible high tensile alloy steel socket head screws that can fit in the cylinder mounting holes and torque them to the manufacturer's recommendations for their size.

3.2.2 – Side-Mounted Cylinders – In addition to the mounting bolts, cylinders of this type should be equipped with thrust keys or dowel pins located so as to resist the major load.

3.2.3 – Tie Rod Mounting – Cylinders with tie rod mountings are recommended for applications where mounting space is limited. The standard tie rod extension is shown as BB in dimension tables. Longer or shorter extensions can be supplied. Nuts used for this mounting style should be torqued to the same value as the tie rods for that bore size.

3.2.4 – Flange Mount Cylinders – The controlled diameter of the rod gland extension on head end flange mount cylinders can be used as a pilot to locate the cylinders in relation to the machine. After alignment has been obtained, the flanges may be drilled for pins or dowels to prevent shifting.

3.2.5 – Trunnion Mountings – Cylinders require lubricated bearing blocks with minimum bearing clearances. Bearing blocks should be carefully aligned and rigidly mounted so the trunnions will not be subjected to bending moments. The rod end should also be pivoted with the pivot pin in line and parallel to axis of the trunnion pins.

3.2.6 – Clevis Mountings – Cylinders should be pivoted at both ends with centerline of pins parallel to each other. After cylinder is mounted, be sure to check to assure that the cylinder is free to swing through its working arc without interference from other machine parts.

4.0 Cylinder and Accessories Maintenance, Troubleshooting and Replacement

4.1 Storage – At times cylinders are delivered before a customer is ready to install them and must be stored for a period of time. When storage is required the following procedures are recommended.

4.1.1 – Store the cylinders in an indoor area which has a dry, clean and noncorrosive atmosphere. Take care to protect the cylinder from both internal corrosion and external damage.

4.1.2 – Whenever possible cylinders should be stored in a vertical position (piston rod up). This will minimize corrosion due to possible condensation which could occur inside the cylinder. This will also minimize seal damage.

4.1.3 – Port protector plugs should be left in the cylinder until the time of installation.

4.1.4 – If a cylinder is stored full of hydraulic fluid, expansion of the fluid due to temperature changes must be considered. Installing a check valve with free flow out of the cylinder is one method.

4.1.5 – When cylinders are mounted on equipment that is stored outside for extended periods, exposed unpainted surfaces, e.g. piston rod, must be coated with a rust-inhibiting compound to prevent corrosion.

4.2 Cylinder Trouble Shooting

4.2.1 – **External Leakage**

4.2.1.1 – Rod seal leakage can generally be traced to worn or damaged seals. Examine the piston rod for dents, gouges or score marks, and replace piston rod if surface is rough.

Rod seal leakage could also be traced to gland wear. If clearance is excessive, replace rod bushing and seal. Rod seal leakage can also be traced to seal deterioration. If seals are soft or gummy or brittle, check compatibility of seal material with lubricant used if air cylinder, or operating fluid if hydraulic cylinder. Replace with seal material, which is compatible with these fluids. If the seals are hard or have lost elasticity, it is usually due to exposure to temperatures in excess of 165°F. (+74°C). Shield the cylinder from the heat source to limit temperature to 350°F. (+177°C.) and replace with fluorocarbon seals.

4.2.1.2 – Cylinder body seal leak can generally be traced to loose tie rods. Torque the tie rods to manufacturer's recommendation for that bore size.

Excessive pressure can also result in cylinder body seal leak. Determine maximum pressure to rated limits. Replace seals and retorque tie rods as in paragraph above. Excessive pressure can also result in cylinder body seal leak. Determine if the pressure rating of the cylinder has been exceeded. If so, bring the operating pressure down to the rating of the cylinder and have the tie rods replaced.

Pinched or extruded cylinder body seal will also result in a leak. Replace cylinder body seal and retorque as in paragraph above.

Cylinder body seal leakage due to loss of radial squeeze which shows up in the form of flat spots or due to wear on the O.D. or I.D. – Either of these are symptoms of normal wear due to high cycle rate or length of service. Replace seals as per paragraph above.

4.2.2 – **Internal Leakage**

4.2.2.1 – Piston seal leak (by-pass) 1 to 3 cubic inches per minute leakage is considered normal for piston ring construction. Virtually no static leak with lipseal type seals on piston should be expected. Piston seal wear is a usual cause of piston seal leakage. Replace seals as required.

4.2.2.2 – With lipseal type piston seals excessive back pressure due to over-adjustment of speed control valves could be a direct cause of rapid seal wear. Contamination in a hydraulic system can result in a scored cylinder bore, resulting in rapid seal wear. In either case, replace piston seals as required.

4.2.2.3 – What appears to be piston seal leak, evidenced by the fact that the cylinder drifts, is not always traceable to the piston. To make sure, it is suggested that one side of the cylinder piston be pressurized and the fluid line at the opposite port be disconnected. Observe leakage. If none is evident, seek the cause of cylinder drift in other component parts in the circuit.

4.2.3 – **Cylinder Fails to Move the Load**

4.2.3.1 – Pneumatic or hydraulic pressure is too low. Check the pressure at the cylinder to make sure it is to circuit requirements.

4.2.3.2 – Piston Seal Leak – Operate the valve to cycle the cylinder and observe fluid flow at valve exhaust ports at end of cylinder stroke. Replace piston seals if flow is excessive.

4.2.3.3 – Cylinder is undersized for the load – Replace cylinder with one of a larger bore size.

4.3 Erratic or Chatter Operation

4.3.1 – Excessive friction at rod gland or piston bearing due to load misalignment – Correct cylinder-to-load alignment.

4.3.2 – Cylinder sized too close to load requirements – Reduce load or install larger cylinder.

4.3.3 – Erratic operation could be traced to the difference between static and kinetic friction. Install speed control valves to provide a back pressure to control the stroke.

4.4 Cylinder Modifications, Repairs, or Failed Component – Cylinders as shipped from the factory are not to be disassembled and or modified. If cylinders require modifications, these modifications must be done at company locations or by The Company's certified facilities. The Cylinder Division Engineering Department must be notified in the event of a mechanical fracture or permanent deformation of any cylinder component (excluding seals). This includes a broken piston rod, tie rod, mounting accessory or any other cylinder component. The notification should include all operation and application details. This information will be used to provide an engineered repair that will prevent recurrence of the failure.

It is allowed to disassemble cylinders for the purpose of replacing seals or seal assemblies. However, this work must be done by strictly following all the instructions provided with the seal kits.

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Offer of Sale

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1. Terms and Conditions of Sale: All descriptions, quotations, proposals, offers, acknowledgments, acceptances and sales of Seller's products are subject to and shall be governed exclusively by the terms and conditions stated herein. Buyer's acceptance of any offer to sell is limited to these terms and conditions. Any terms or conditions in addition to, or inconsistent with those stated herein, proposed by Buyer in any acceptance of an offer by Seller, are hereby objected to. No such additional, different or inconsistent terms and conditions shall become part of the contract between Buyer and Seller unless expressly accepted in writing by Seller. Seller's acceptance of any offer to purchase by Buyer is expressly conditional upon Buyer's assent to all the terms and conditions stated herein, including any terms in addition to, or inconsistent with those contained in Buyer's offer. Acceptance of Seller's products shall in all events constitute such assent.

2. Payment: Payment shall be made by Buyer net 30 days from the date of delivery of the items purchased hereunder. Amounts not timely paid shall bear interest at the maximum rate permitted by law for each month or portion thereof that the Buyer is late in making payment. Any claims by Buyer for omissions or shortages in a shipment shall be waived unless Seller receives notice thereof within 30 days after Buyer's receipt of the shipment.

3. Delivery: Unless otherwise provided on the face hereof, delivery shall be made F.O.B. Seller's plant. Regardless of the method of delivery, however, risk of loss shall pass to Buyer upon Seller's delivery to a carrier. Any delivery dates shown are approximate only and Seller shall have no liability for any delays in delivery.

4. Warranty: Seller warrants that the items sold hereunder shall be free from defects in material or workmanship for a period of 18 months from date of shipment from the Company. **THIS WARRANTY COMPRISES THE SOLE AND ENTIRE WARRANTY PERTAINING TO ITEMS PROVIDED HEREUNDER. SELLER MAKES NO OTHER WARRANTY, GUARANTEE, OR REPRESENTATION OF ANY KIND WHATSOEVER. ALL OTHER WARRANTIES, INCLUDING BUT NOT LIMITED TO, MERCHANTABILITY AND FITNESS FOR PURPOSE, WHETHER EXPRESS, IMPLIED, OR ARISING BY OPERATION OF LAW, TRADE USAGE, OR COURSE OF DEALING ARE HEREBY DISCLAIMED.**

NOTWITHSTANDING THE FOREGOING, THERE ARE NO WARRANTIES WHATSOEVER ON ITEMS BUILT OR ACQUIRED WHOLLY OR PARTIALLY, TO BUYER'S DESIGN OR SPECIFICATIONS.

5. Limitation of Remedy: SELLER'S LIABILITY ARISING FROM OR IN ANY WAY CONNECTED WITH THE ITEMS SOLD OR THIS CONTRACT SHALL BE LIMITED EXCLUSIVELY TO REPAIR OR REPLACEMENT OF THE ITEMS SOLD OR REFUND OF THE PURCHASE PRICE PAID BY BUYER, AT SELLER'S SOLE OPTION. IN NO EVENT SHALL SELLER BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES OF ANY KIND OR NATURE WHATSOEVER, INCLUDING BUT NOT LIMITED TO LOST PROFITS ARISING FROM OR IN ANY WAY CONNECTED WITH THIS AGREEMENT OR ITEMS SOLD HEREUNDER, WHETHER ALLEGED TO ARISE FROM BREACH OF CONTRACT, EXPRESS OR IMPLIED WARRANTY, OR IN TORT, INCLUDING WITHOUT LIMITATION, NEGLIGENCE, FAILURE TO WARN OR STRICT LIABILITY.

6. Changes, Reschedules and Cancellations: Buyer may request to modify the designs or specifications for the items sold hereunder as well as the quantities and delivery dates thereof, or may request to cancel all or part of this order, however, no such requested modification or cancellation shall become part of the contract between Buyer and Seller unless accepted by Seller in a written amendment to this Agreement. Acceptance of any such requested modification or cancellation shall be at Seller's discretion, and shall be upon such terms and conditions as Seller may require.

7. Special Tooling: A tooling charge may be imposed for any special tooling, including without limitations, dies, fixtures, molds and patterns, acquired to manufacture items sold pursuant to this contract. Such special tooling shall be and remain Seller's property notwithstanding payment of any charges by Buyer. In no event will Buyer acquire any interest in apparatus belonging to Seller which is utilized in the manufacture of the items sold hereunder, even if such apparatus has been specially converted or adapted for such manufacture and notwithstanding any charges paid by Buyer. Unless otherwise agreed, Seller shall have the right to alter, discard or otherwise dispose of any special tooling or other property in its sole discretion at any time.

8. Buyer's Property: Any designs, tools, patterns, materials, drawings, confidential information or equipment furnished by Buyer, or any other items which become Buyer's property, may be considered obsolete and may be destroyed by Seller after two (2) consecutive years have elapsed without Buyer placing an order for the items which are manufactured using such property. Seller shall not be responsible for any loss or damage to such property while it is in Seller's possession or control.

9. Taxes: Unless otherwise indicated on the face hereof, all prices and charges are exclusive of excise, sales, use, property, occupational or like taxes which may be imposed by any taxing authority upon the manufacture, sale or delivery of the items sold hereunder. If any such taxes must be paid by Seller or if Seller is liable for the collection of such tax, the amount thereof shall be in addition to the amounts for the items sold. Buyer agrees to pay all such taxes or to reimburse Seller therefore upon receipt of its invoice. If Buyer claims exemption from any sales, use or other tax imposed by any taxing authority, Buyer shall save Seller harmless from and against any such tax, together with any interest or penalties thereon which may be assessed if the items are held to be taxable.

10. Indemnity For Infringement of Intellectual Property Rights: Seller shall have no liability for infringement of any patents, trademarks, copyrights, trade dress, trade secrets or similar rights except as provided in this Part 10. Seller will defend and indemnify Buyer against allegations of infringement of U.S. patents, U.S. trademarks, copyrights, trade dress and trade secrets (hereinafter "Intellectual Property Rights"). Seller will defend at its expense and will pay the cost of any settlement or damages awarded in an action brought against Buyer based on an allegation that an item sold pursuant to this contract infringes the Intellectual Property Rights of a third party. Seller's obligation to defend and indemnify Buyer is contingent on Buyer notifying Seller within ten (10) days after Buyer becomes aware of such allegations of infringement, and Seller having sole control over the defense of any allegations or actions including all negotiations for settlement or compromise. If an item sold hereunder is subject to a claim that it infringes the Intellectual Property Rights of a third party, Seller may, at its sole expense and option, procure for Buyer the right to continue using said item, replace or modify said item so as to make it noninfringing, or offer to accept return of said item and return the purchase price less a reasonable allowance for depreciation. Notwithstanding the foregoing, Seller shall have no liability for claims of infringement based on information provided by Buyer, or directed to items delivered hereunder for which the designs are specified in whole or part by Buyer, or infringements resulting from the modification, combination or use in a system of any item sold hereunder. The foregoing provisions of this Part 10 shall constitute Seller's sole and exclusive liability and Buyer's sole and exclusive remedy for infringement of Intellectual Property Rights.

If a claim is based on information provided by Buyer or if the design for an item delivered hereunder is specified in whole or in part by Buyer, Buyer shall defend and indemnify Seller for all costs, expenses or judgements resulting from any claim that such item infringes any patent, trademark, copyright, trade dress, trade secret or any similar right.

11. Force Majeure: Seller does not assume the risk of and shall not be liable for delay or failure to perform any of Seller's obligations by reason of circumstances beyond the reasonable control of Seller (hereinafter "Events of Force Majeure"). Events of Force Majeure shall include without limitation, accidents, acts of God, strikes or labor disputes, acts, laws, rules or regulations of any government or government agency, fires, floods, delays or failures in delivery of carriers or suppliers, shortages of materials and any other cause beyond Seller's control.

12. Entire Agreement/Governing Law: The terms and conditions set forth herein, together with any amendments, modifications and any different terms or conditions expressly accepted by Seller in writing, shall constitute the entire Agreement concerning the items sold, and there are no oral or other representations or agreements which pertain thereto. This Agreement shall be governed in all respects by the law of the State of Ohio. No actions arising out of sale of the items sold hereunder or this Agreement may be brought by either party more than two (2) years after the cause of action accrues.

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