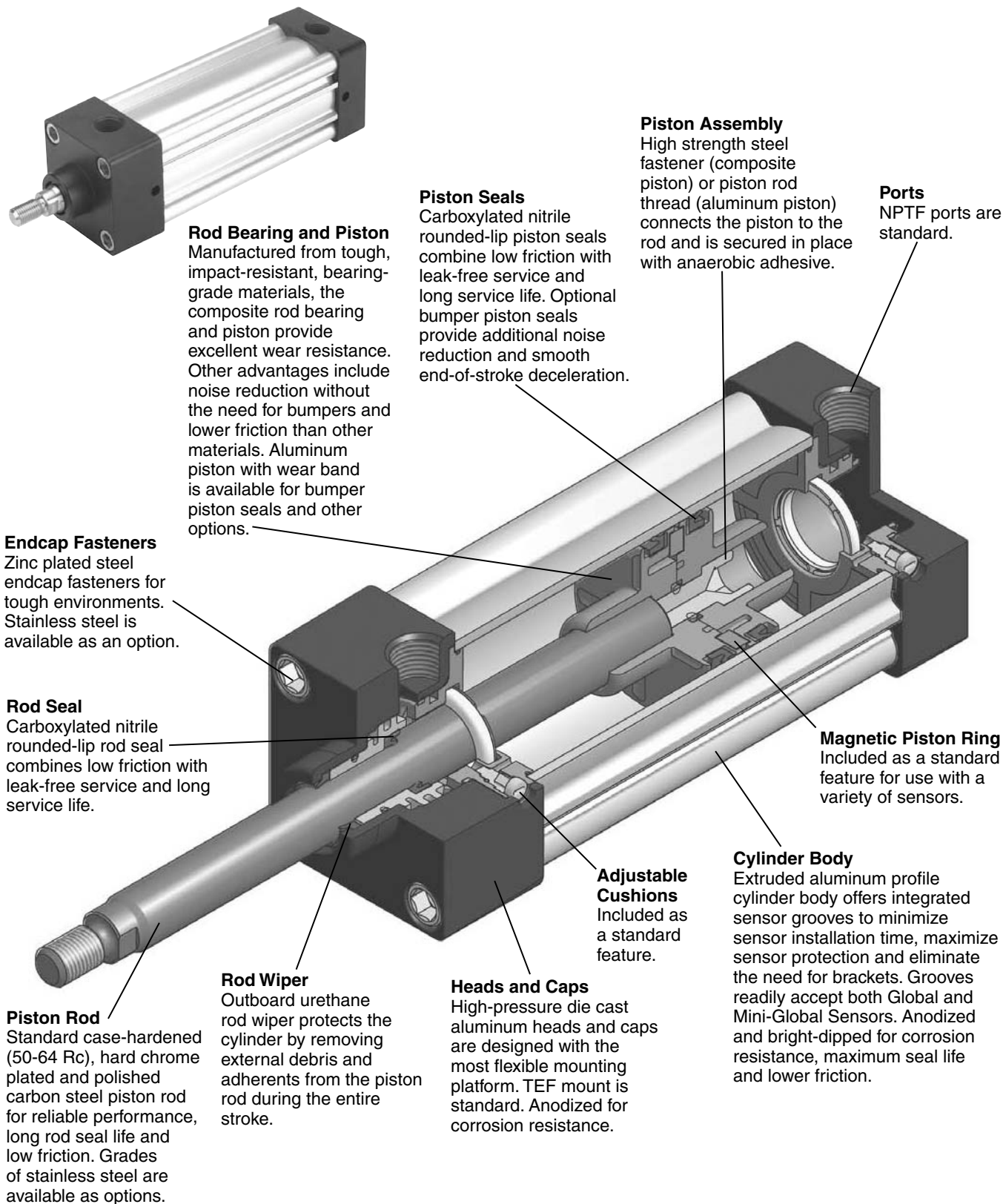


Section F



F

Features	F3	Accessories	F65-F69
3MA Model Code for 1-1/2" to 5" Bore	F4	Sensors	F70-F77
3MA Mounting Styles.....	F5	Cordsets	F78
Specifications	F6-F7	Technical Information.....	F79-F81
How to Select a 3MA Cylinder.....	F8	Mounting Information.....	F82-F85
3MA Dimensions – 1-1/2" to 5" Bore	F9-F18	Technical Data	F86-F95
3MA Dimensions – 1-1/8" Bore	F19-F31	Maintenance Section	F96-F100
3MAJ Rod Lock Cylinders	F32-F61		
Options	F62		



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.

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 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.

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.

Adjustable Cushions
Included as a standard feature.

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.

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.



For a complete list of 3MA options, please see pages E4 and E8.

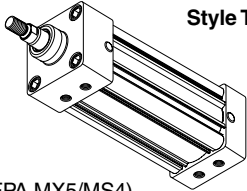
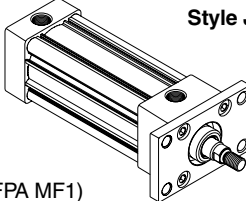
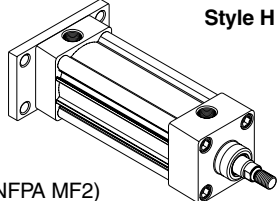
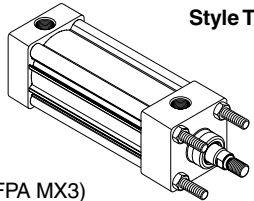
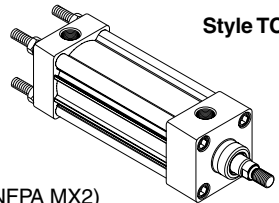
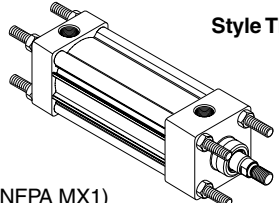
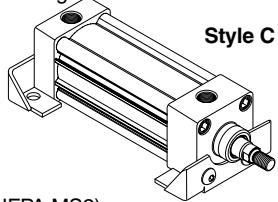
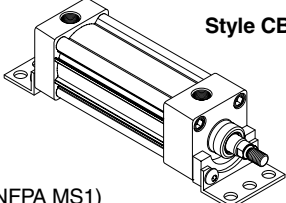
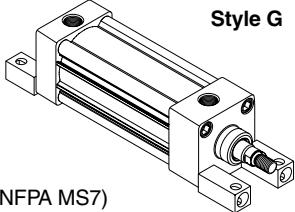
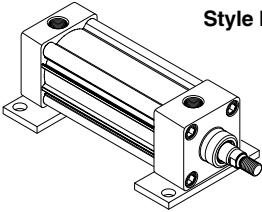
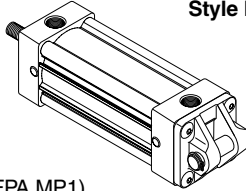
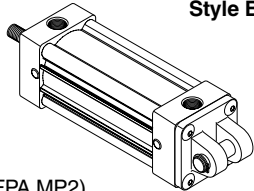
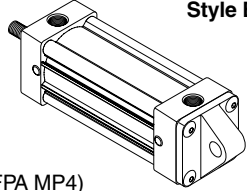
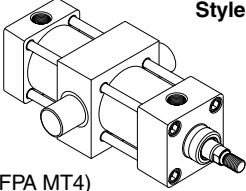
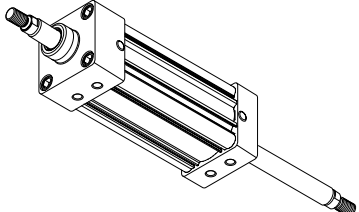
3MA Mounting Styles for 1-1/2" to 5" Bore

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 E11).



<p>Standard Mount</p>  <p>Style TEF</p> <p>(NFPA MX5/MS4)</p>	<p>Head Rectangular Flange</p>  <p>Style J</p> <p>(NFPA MF1)</p>	<p>Cap Rectangular Flange</p>  <p>Style H</p> <p>(NFPA MF2)</p>	<p>Tie Rods Ext. Head End</p>  <p>Style TB</p> <p>(NFPA MX3)</p>
<p>Tie Rods Ext. Cap End</p>  <p>Style TC</p> <p>(NFPA MX2)</p>	<p>Tie Rods Ext. Both Ends</p>  <p>Style TD</p> <p>(NFPA MX1)</p>	<p>Side Lug</p>  <p>Style C</p> <p>(NFPA MS2)</p>	<p>Side End Angle</p>  <p>Style CB</p> <p>(NFPA MS1)</p>
<p>Side End Lug</p>  <p>Style G</p> <p>(NFPA MS7)</p>	<p>Base Bar Mount</p>  <p>Style NB</p>	<p>Cap Fixed Clevis</p>  <p>Style BB</p> <p>(NFPA MP1)</p>	<p>Cap Detachable Clevis</p>  <p>Style BC</p> <p>(NFPA MP2)</p>
<p>Cap Detachable Eye</p>  <p>Style BE</p> <p>(NFPA MP4)</p>	<p>Intermediate Trunnion</p>  <p>Style DD</p> <p>(NFPA MT4)</p>	<p>Double Rod End</p>  <p>Style KTEF</p> <p>(NFPA MDX0)</p>	

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

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

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	0.65	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

F

Material Specifications – Standard Temperatures and Applications

Head and cap.....	Black anodized aluminum alloy	Piston fastener	Zinc plated steel alloy (for composite piston)
Head and cap screws	Zinc plated steel alloy	Piston rod for aluminum piston	
Cylinder body	Clear anodized aluminum alloy	O-rings.....	Nitrile
Piston rod	Case-hardened, chrome plated carbon steel	End seals	Nitrile
Rod seal	Carboxylated nitrile (Nitroxile)	Cushion seals.....	Urethane
Rod wiper	Molythane	Cushion needle valves	Composite
Rod bearing.....	Composite	Tie-rods/studs	Blackened carbon steel (some mounts)
Needle valve inserts.....	Composite	Tie-rod nuts	Steel alloy, SAE J995 Grade 8 (some mounts)
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		

F**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

How to Select a 3MA

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.

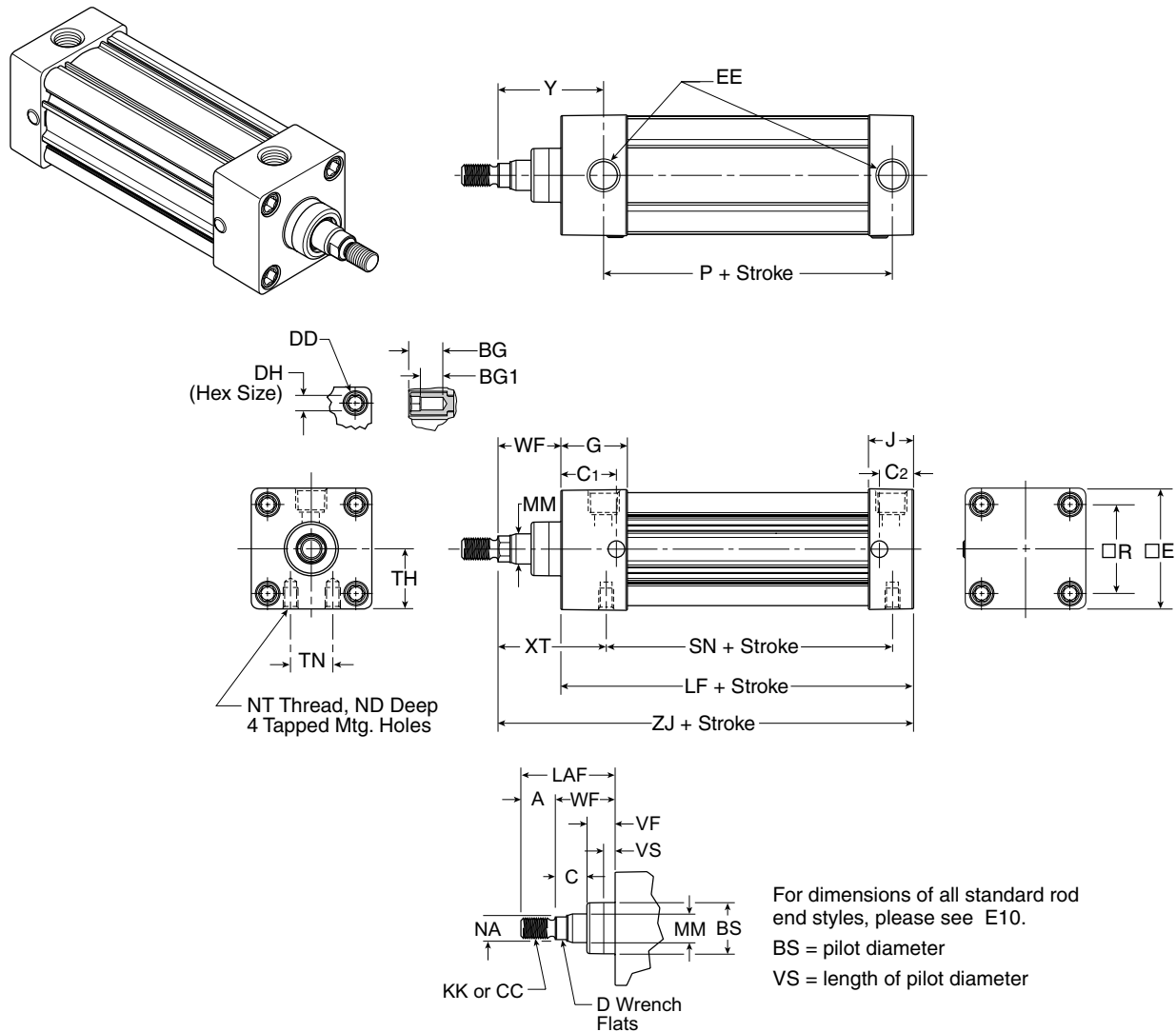
General Options and Modifications

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)

F

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 E10.
BS = pilot diameter
VS = length of pilot diameter

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

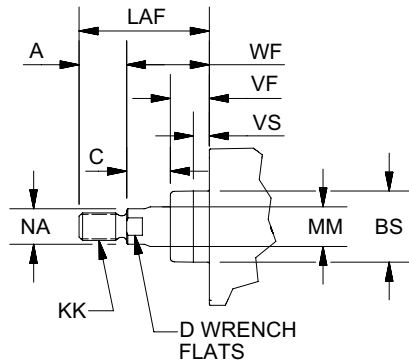
Bore Size	Rod No.	Rod Dia. MM	Thread		A	AA	BG	BG1	+0.000 -0.004 BS	C	C1	C2	D	DD	DH	E	EE (NPTF)	G
			Style 8 CC	Style 4 & 9 KK														
1-1/2	1	5/8	1/2-20	7/16-20	0.750	2.020	0.562	0.374	1.124	0.385	1.000	0.500	1/2	1/4-28	1/4	2.000	3/8	1.438
2	1	5/8	1/2-20	7/16-20	0.750	2.600	0.562	0.362	1.124	0.385	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	+0.005 -0.005 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

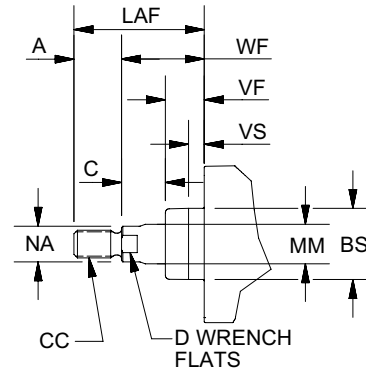


3MA Rod End Dimensions – 1-1/2" to 5" Bore Size

Thread Style 4
(NFPA Style SM)
Small Male

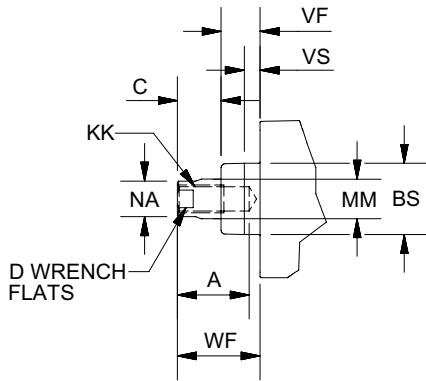


Thread Style 8
(NFPA Style IM)
Intermediate Male

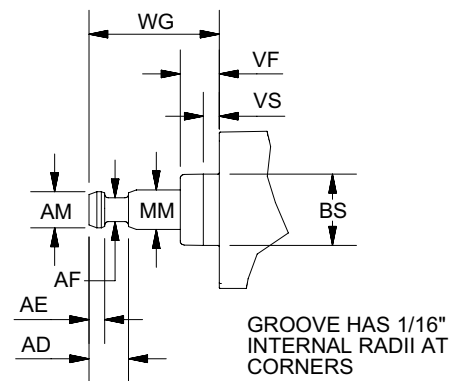


F

Thread Style 9
(NFPA Style SF)
Short Female



Thread Style 55
For use with Split Coupler
(see page E62 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		A	AD	AE	AF	AM	+.000 -.004 BS	C	D	LAF	NA	VF	VS	WF	WG
			Style 8 CC	Style 4 & 9 KK														
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.



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

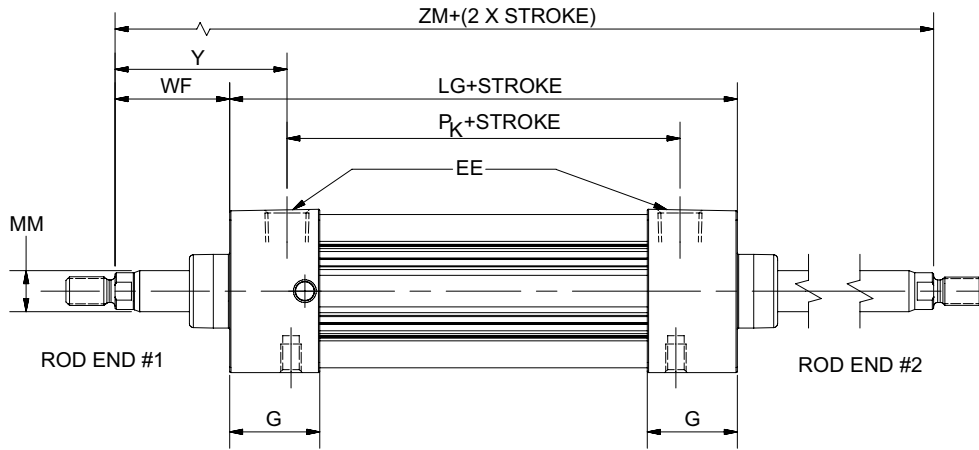
**Air Cylinders
3MA Series**

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



Cylinder Dimensions – K-type

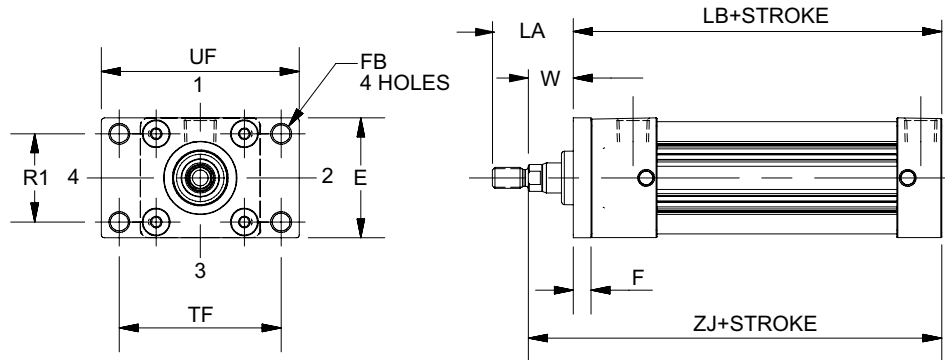
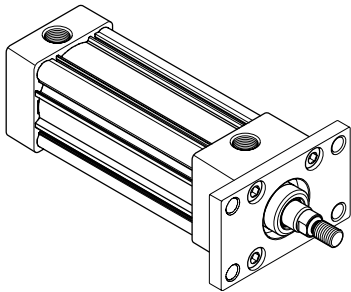
Bore Size	Rod No.	Rod Dia. MM	EE (NPTF)	G	WF	Y	Add Stroke								Add 2X Stroke ZM
							LG	PK	SAK	XAK	SSK	SNK	SEK	XEK	
1-1/2	1	5/8	3/8	1.438	1.000	1.875	4.125	2.375	6.125	6.125	3.375	2.250	6.375	6.250	6.125
	2	1	3/8	1.438	1.375	2.250	4.125	2.375	6.500	6.500	3.375	-	-	-	5.760
2	1	5/8	3/8	1.438	1.000	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



Head Rectangular Flange

Style J

(NFPA MF1)



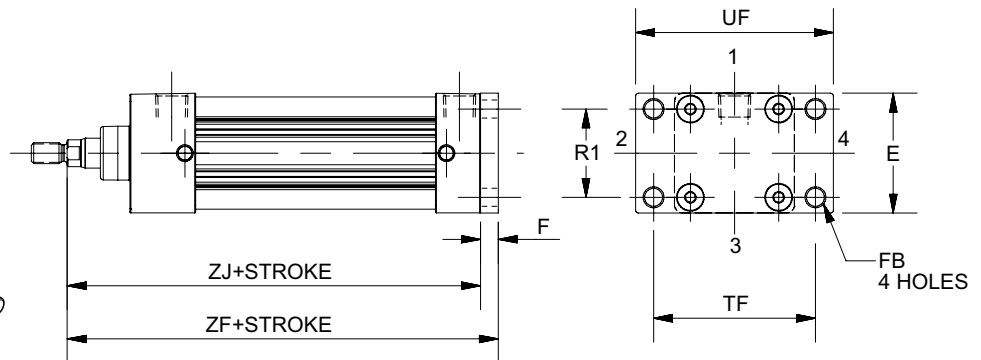
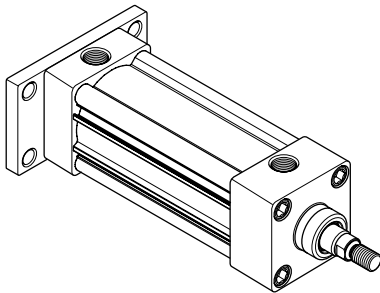
Note: Style J has a W dimension instead of WF and a LA dimension instead of LAF because of the flange installation. Please use dimensions W and LA regarding rod ends only for Style J. For reference, $WF = W + F$ and $LA = W + A$.

F

Cap Rectangular Flange

Style H

(NFPA MF2)

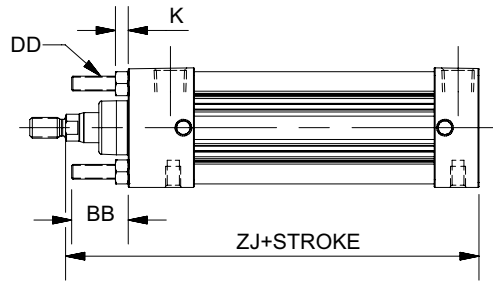
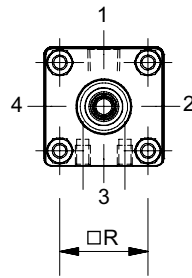
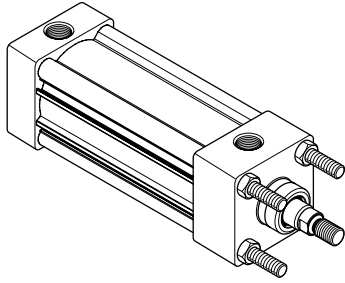


Cylinder Dimensions – Styles J and H

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

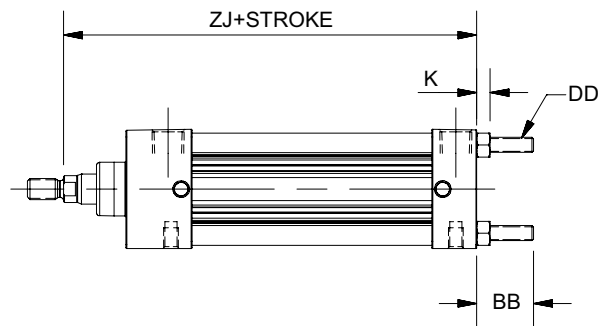
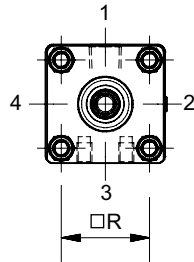
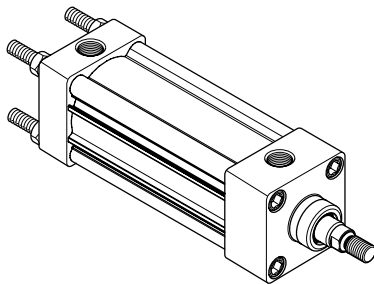
Tie Rods Ext. Head End

Style TB
(NFPA MX3)



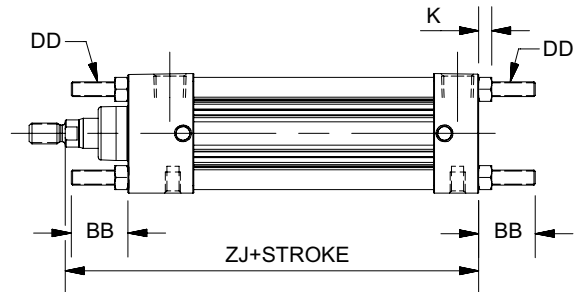
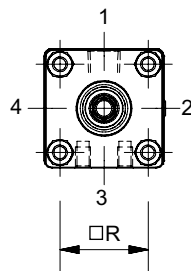
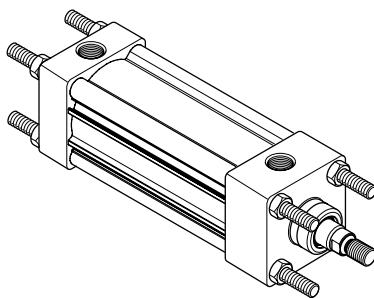
Tie Rods Ext. Cap End

Style TC
(NFPA MX2)



Tie Rods Ext. Both Ends

Style TD
(NFPA MX1)



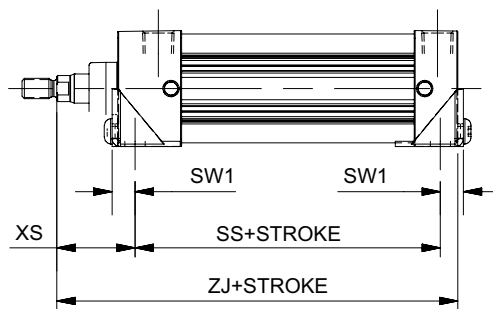
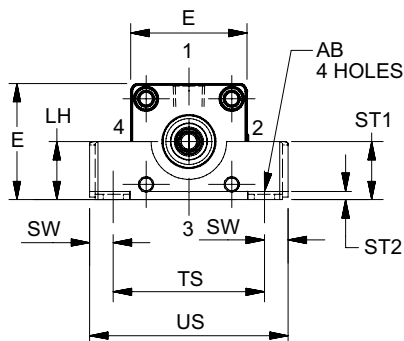
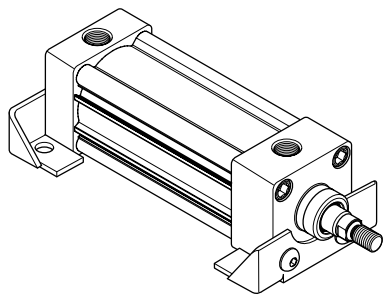
Cylinder Dimensions – Styles TB, TC and TD

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



Side Lug

Style C for 3MA
(NFPA MS2)



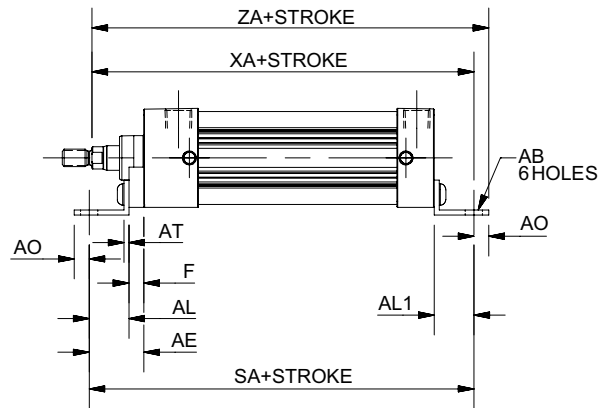
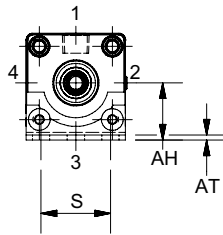
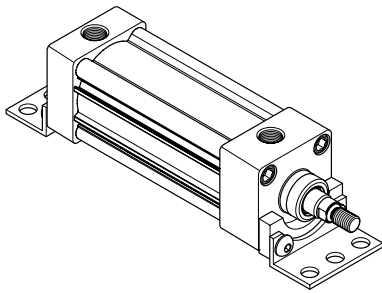
Cylinder Dimensions – Style C

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



Side End Angle*

Style CB
(NFA 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

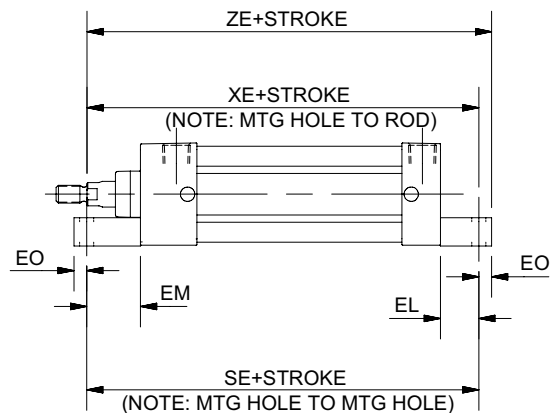
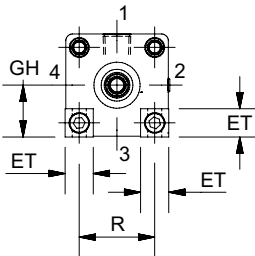
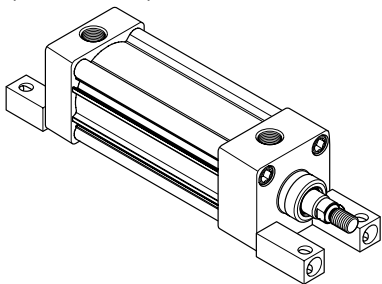
Cylinder Dimensions – Style CB

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
(NFA MS7)

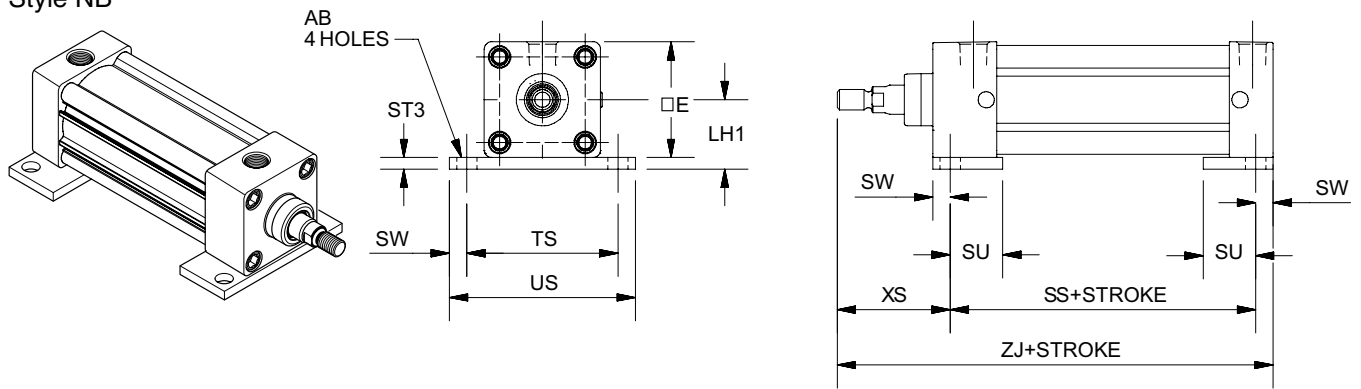


Cylinder Dimensions – Style G

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



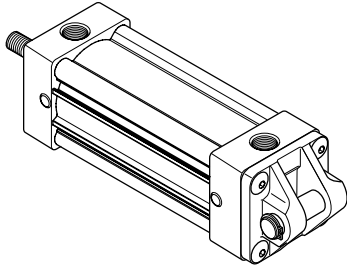
Base Bar Mount
Style NB



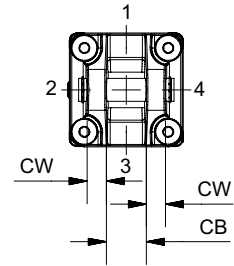
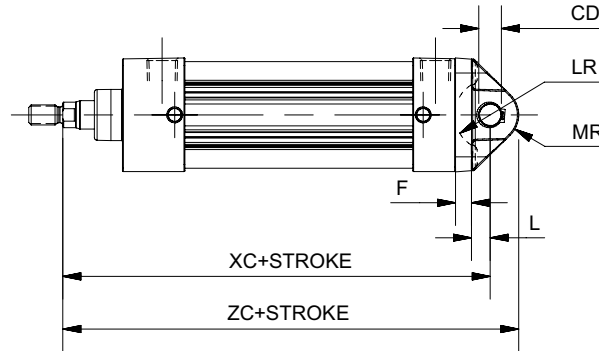
Cylinder Dimensions – Style NB

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

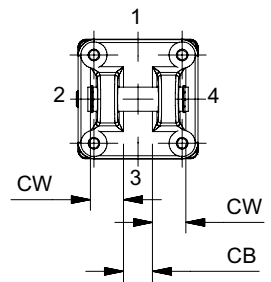
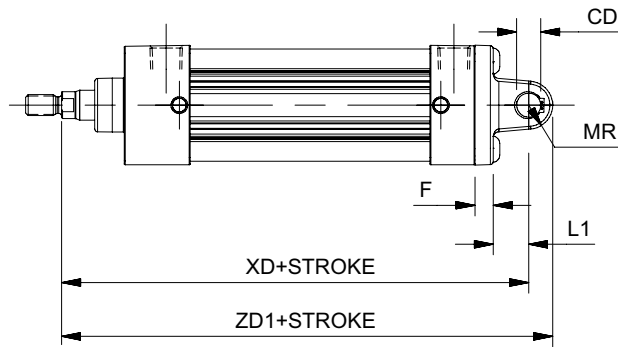
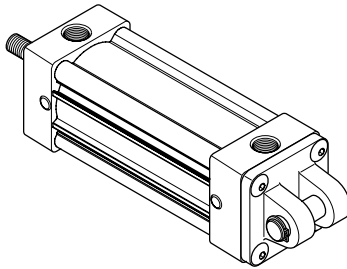
Cap Fixed Clevis
Style BB
(NFPA MP1)



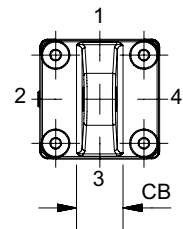
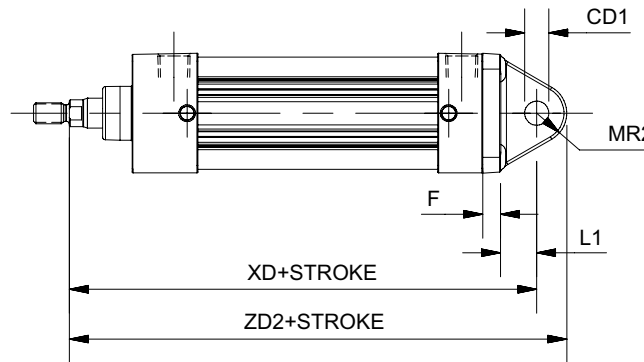
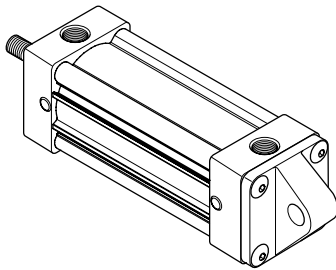
Note: For maximum swivel angle of BB mount with rear mounting plate, see Cylinder Accessories on page E65.



Cap Detachable Clevis
Style BC
(NFPA MP2)



Cap Detachable Eye*
Style BE
(NFPA MP4)

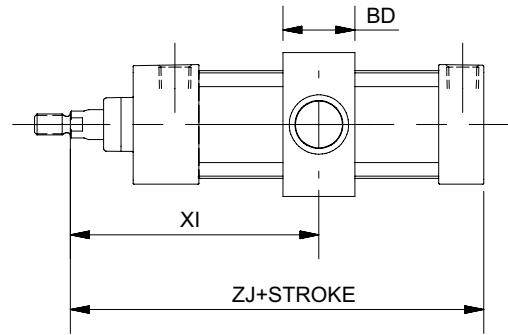
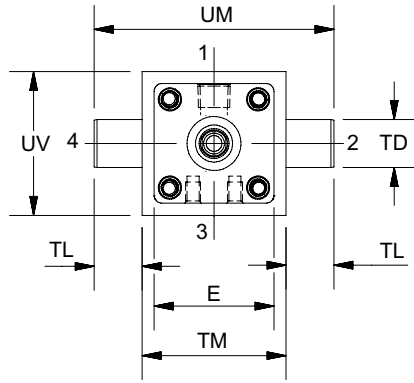
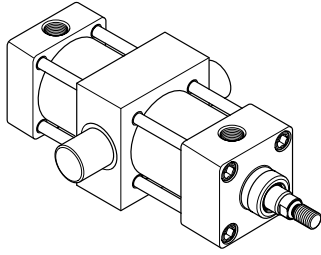


*Not available for 5" bore 3MA, please specify 4MA

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

Intermediate Trunnion
Style DD
(NFA MT4)



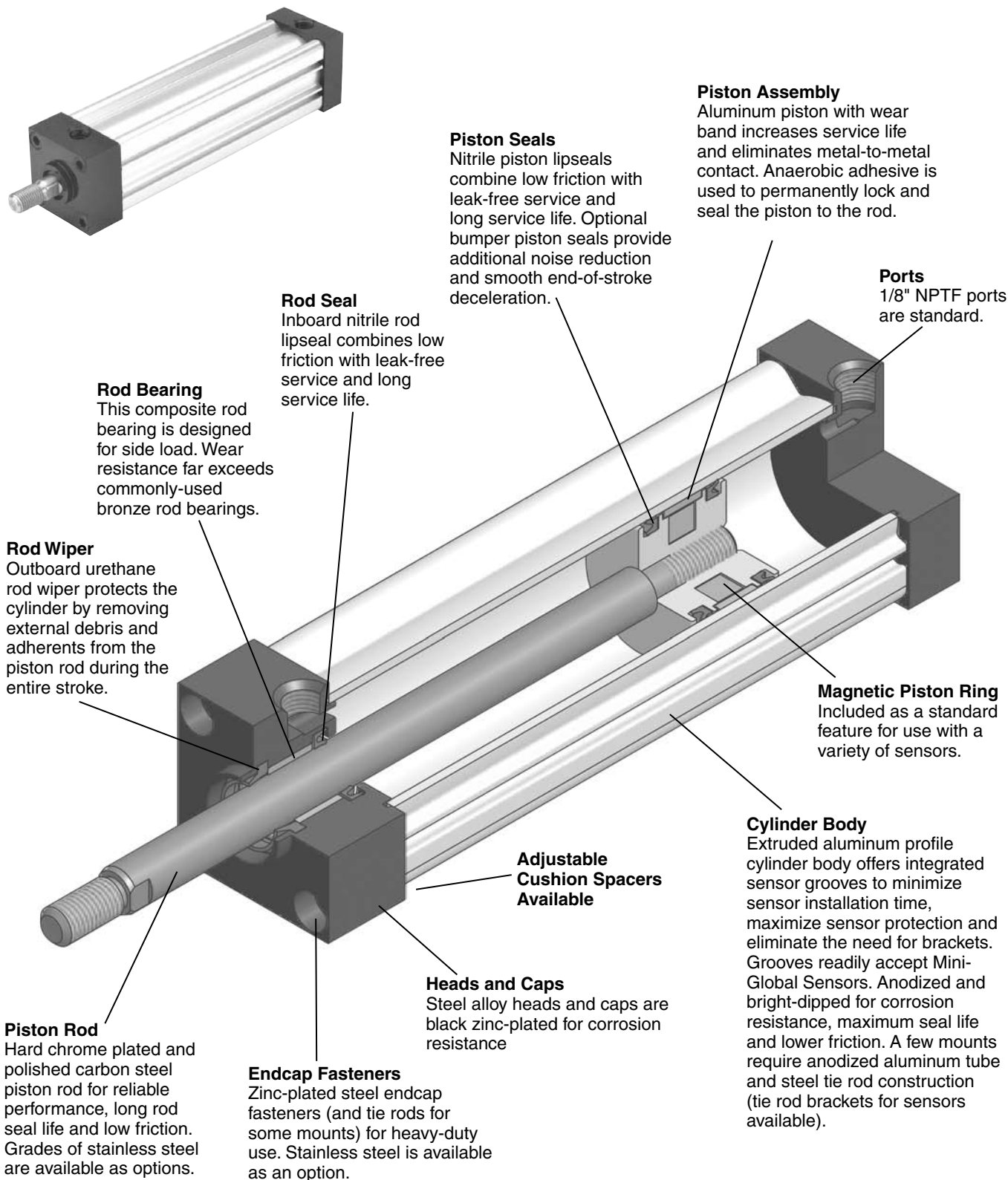
F

Cylinder Dimensions – Styles DD

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	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





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.

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.

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.

Heads and Caps

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

Adjustable Cushion Spacers Available

Ports

1/8" NPTF ports are standard.

Magnetic Piston Ring

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

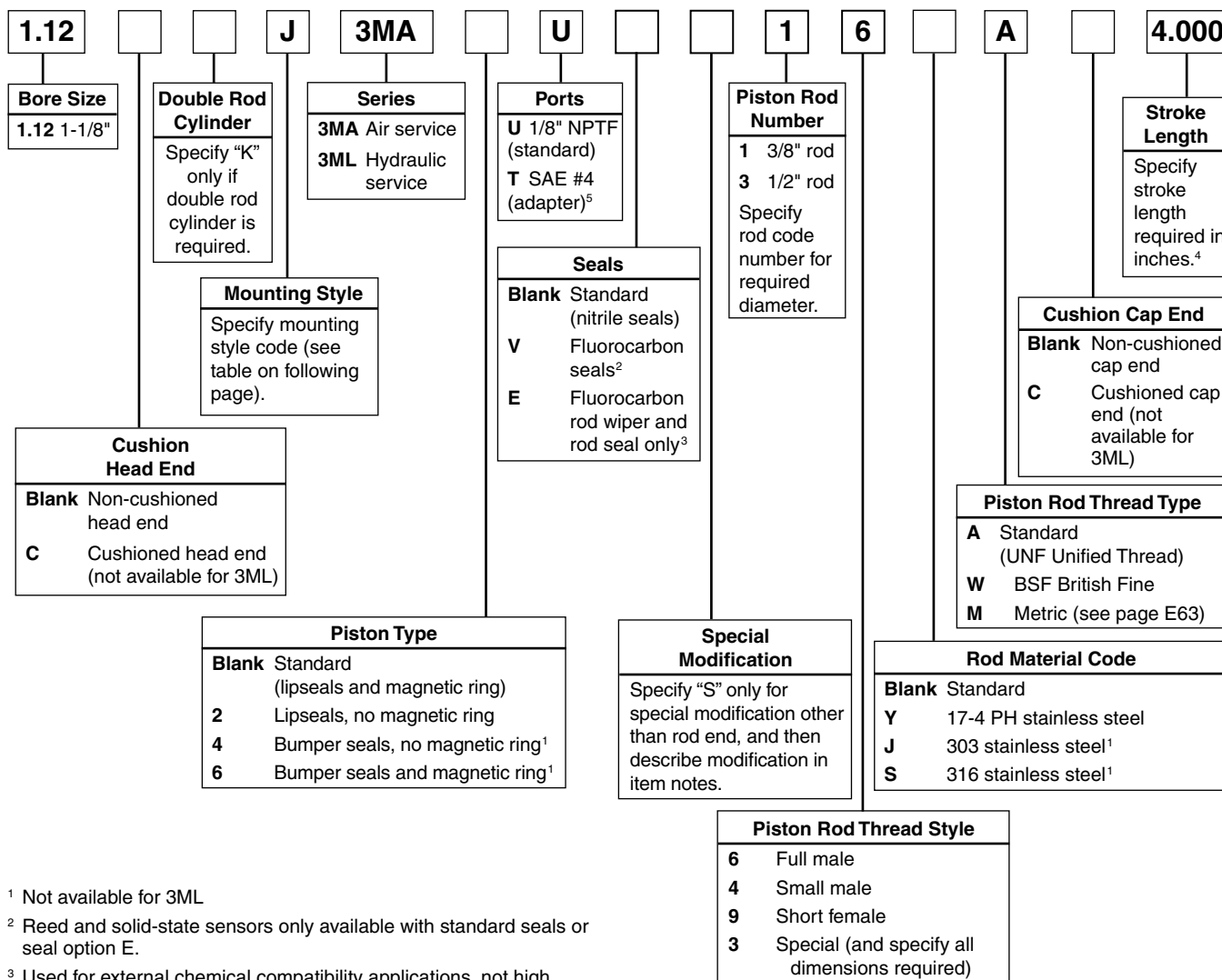
Cylinder Body

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).



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

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



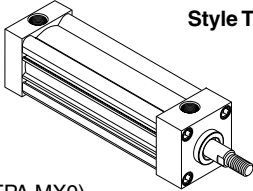
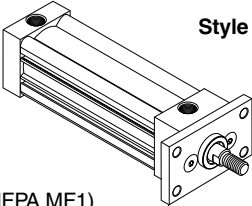
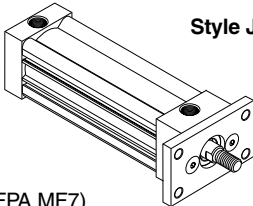
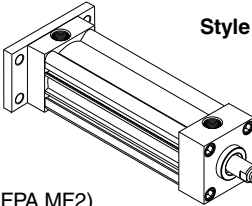
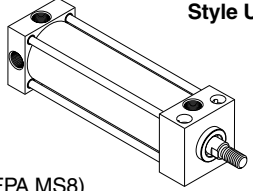
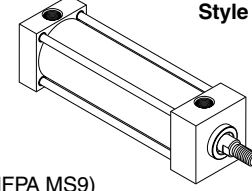
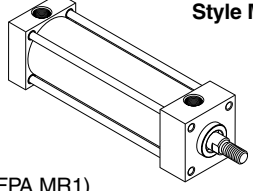
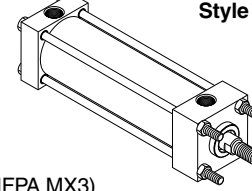
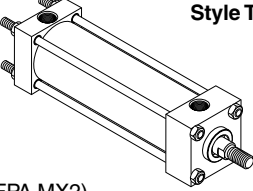
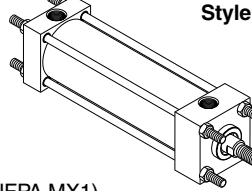
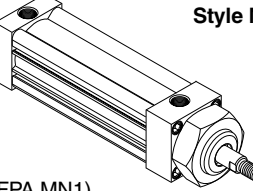
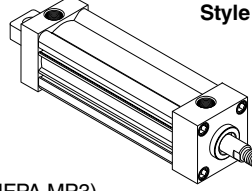
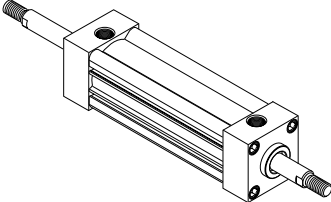
¹ Not available for 3ML
² Reed and solid-state sensors only available with standard seals or seal option E.
³ Used for external chemical compatibility applications, not high temperature.
⁴ If a stop tube is required, specify gross stroke (net stroke + stop tube) in the model number, then place an "S" 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 E74 for more information.



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

<p>No Mount Basic</p>  <p>Style T</p> <p>(NFPA MX0)</p>	<p>Head Rectangular Flange</p>  <p>Style J</p> <p>(NFPA MF1)</p>	<p>Head Rect. Flange (no pilot)</p>  <p>Style J7</p> <p>(NFPA MF7)</p>	<p>Cap Rectangular Flange</p>  <p>Style H</p> <p>(NFPA MF2)</p>	
<p>Side Thru Hole</p>  <p>Style US</p> <p>(NFPA MS8)</p>	<p>Side Tap</p>  <p>Style F</p> <p>(NFPA MS9)</p>	<p>Head Tap</p>  <p>Style MR</p> <p>(NFPA MR1)</p>	<p>Tie Rods Ext. Head End</p>  <p>Style TB</p> <p>(NFPA MX3)</p>	
<p>Tie Rods Ext. Cap End</p>  <p>Style TC</p> <p>(NFPA MX2)</p>	<p>Tie Rods Ext. Both Ends</p>  <p>Style TD</p> <p>(NFPA MX1)</p>	<p>Threaded Nose</p>  <p>Style NS</p> <p>(NFPA MN1)</p>	<p>Cap Pivot Eye</p>  <p>Style BE</p> <p>(NFPA MP3)</p>	
<p>Double Rod End</p>  <p>Style KT</p> <p>(NFPA MDX0)</p> <p>Double rod end cylinders can be ordered with head mountings, i.e. KJ (see page E25).</p>				



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.

3MA General Specifications for 1-1/8" Bore

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.

F

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 sealsNitrile
Cylinder bodyClear anodized aluminum alloy	Cushion spacerBlack zinc plated steel alloy
Piston rodChrome plated carbon steel	Cushion seals.....Urethane
Rod sealNitrile	Cushion needle valves..Stainless steel
Rod wiperMolythane	Tie-rodsBlackened carbon steel (some mounts)
Rod bearing.....Composite	Tie-rod nuts Black oxidized steel alloy (some mounts)
PistonAluminum alloy	Cylinder accessories.... Black zinc plated steel alloy
Piston seals.....Nitrile	
Piston bearingMolyGard™	
Magnetic ring.....Plastic-bound magnetic material	
Piston fastenerPiston 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)
Bumper piston seal options (3MA only, n/a for 3ML)	Carboxylated nitrile (Nitroxile) for standard temperatures Fluorocarbon for high temperatures and chemical compatibility		Case-hardened, chrome plated carbon steel



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.

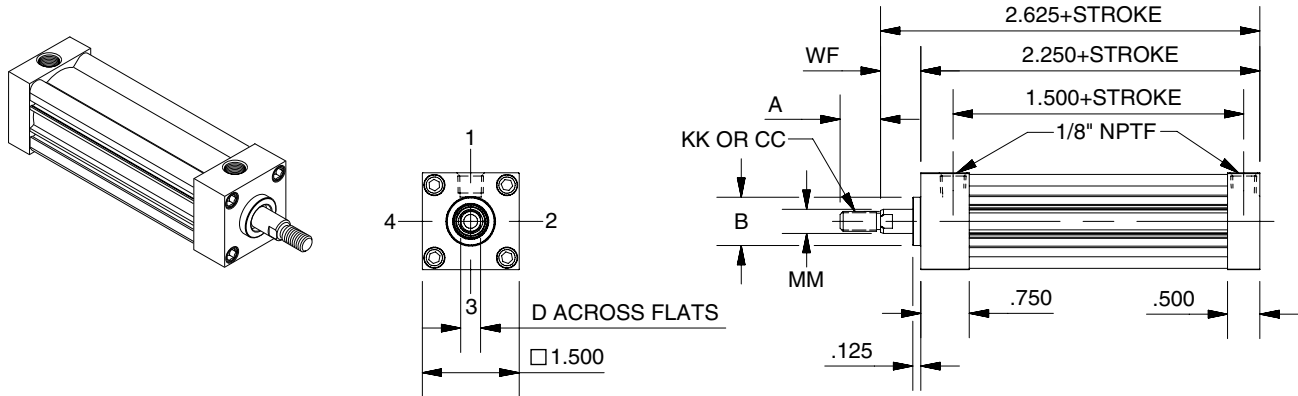
General Options and Modifications:

- 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)

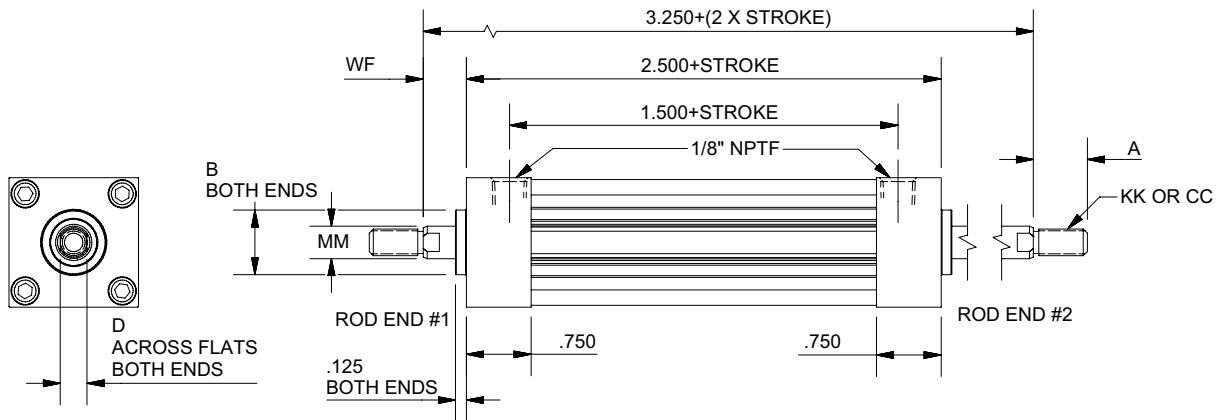
F

Single Rod, Double Rod and Cushioned Cylinder Dimensions

Single Rod – T Mount Dimensions

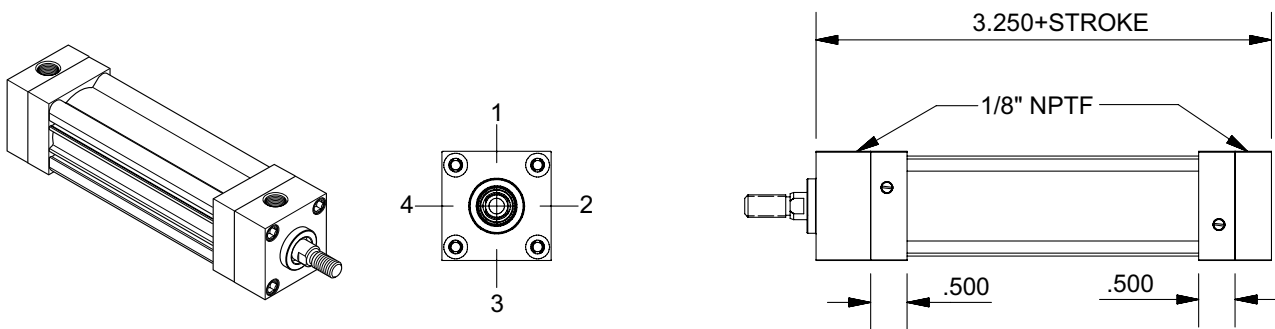


Double Rod – KT Mount Dimensions



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



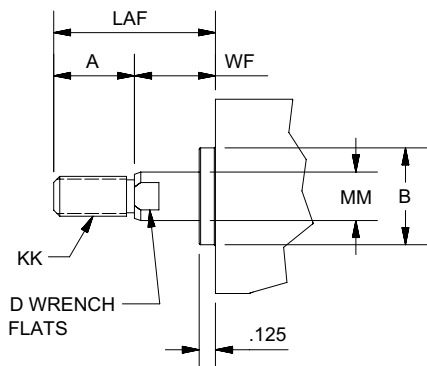
Rod End Dimensions

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

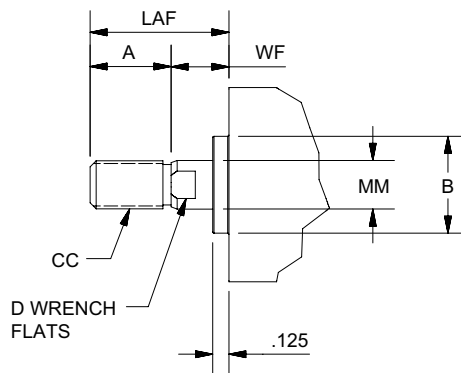
Note: Adjustable cushions will add 0.50" to each end. Cushions at both ends will add a total of 1.00" to the base cylinder length. Single rod configuration shown above. Available with single rod and double rod cylinders.

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

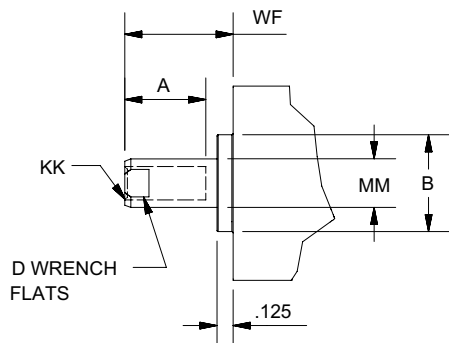
Thread Style 4
Small Male



Thread Style 6
Full Male



Thread Style 9
Short Female



Rod End Dimensions

Bore Size	Rod No.	Rod Dia. MM	Thread			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

Thread Style 3 - "Special Thread"

Special threads, rod extensions, rod eyes, blanks, etc. are also available.

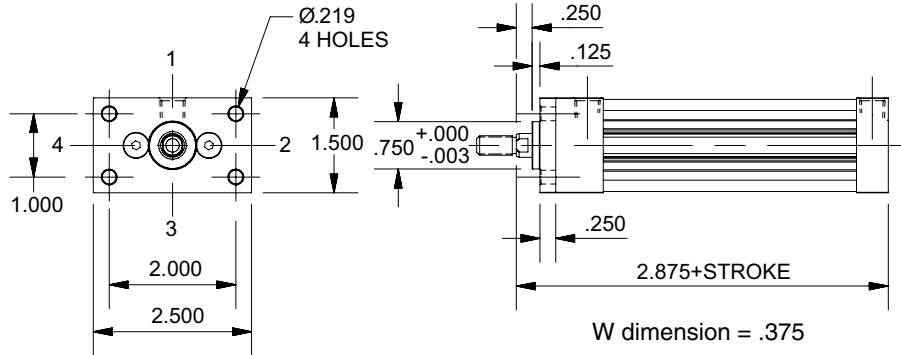
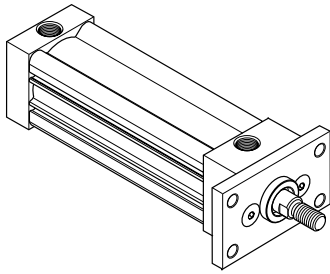
To order, specify "Style 3" and give desired dimensions for KK or CC, A and W or WF.

If otherwise special, please supply dimensioned sketch.



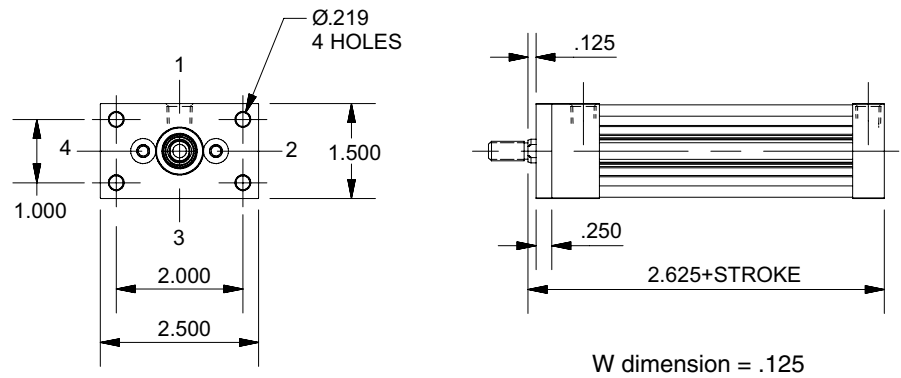
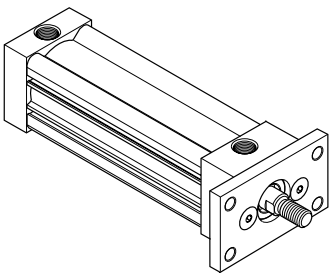
Head Rectangular Flange

Style J
(NFPA MF1)



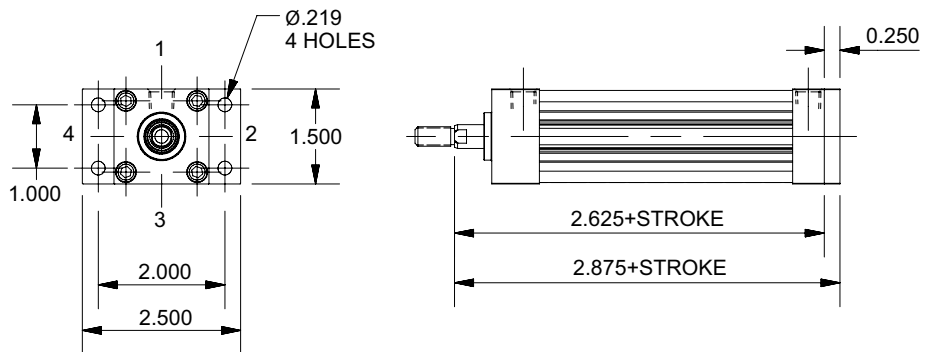
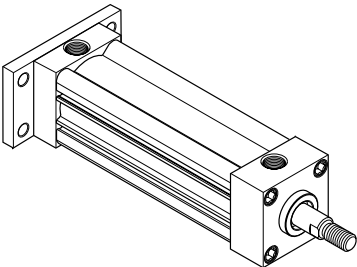
Head Rectangular Flange (no pilot)

Style J7
(NFPA MF7)



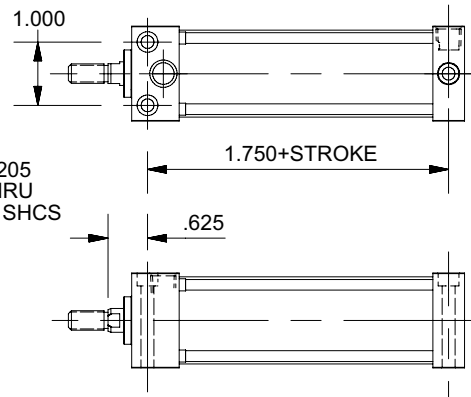
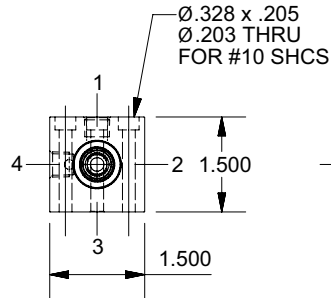
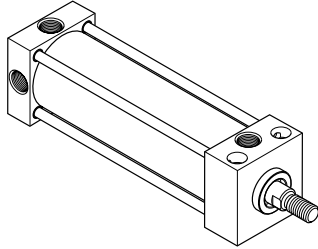
Cap Rectangular Flange

Style H
(NFPA MF2)



Side Thru Hole

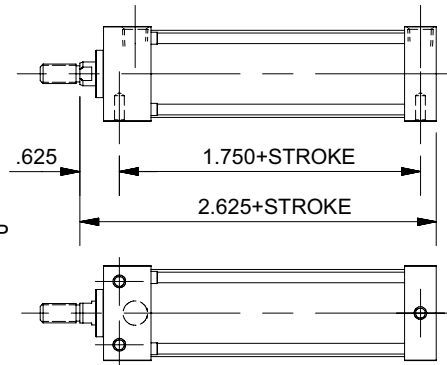
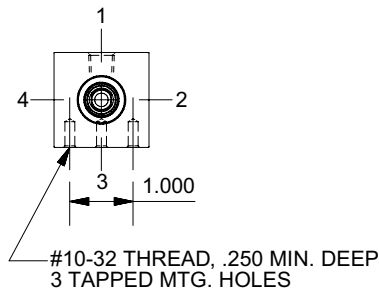
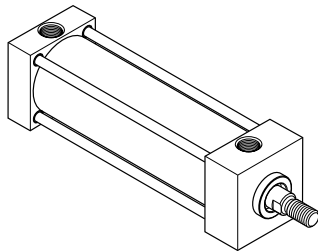
Style US
(NFPA MS8)



F

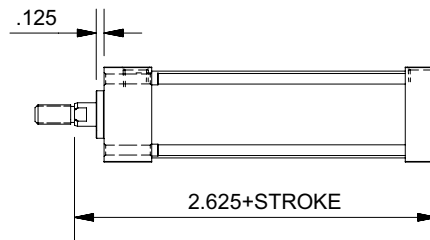
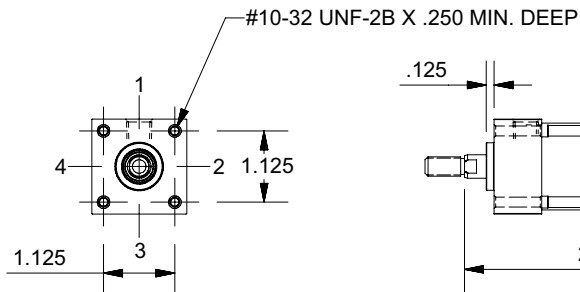
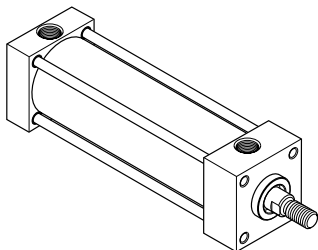
Side Tap

Style F
(NFPA MS9)



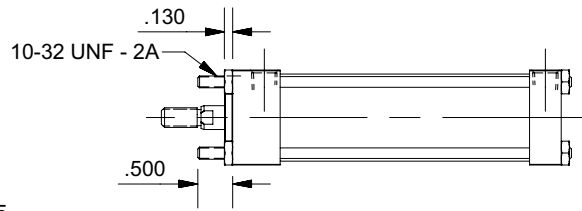
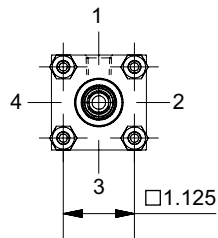
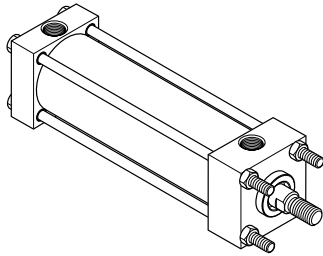
Head Tap

Style MR
(NFPA MR1)



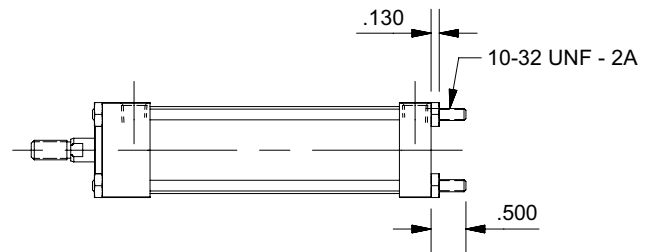
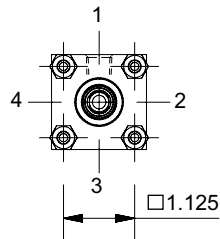
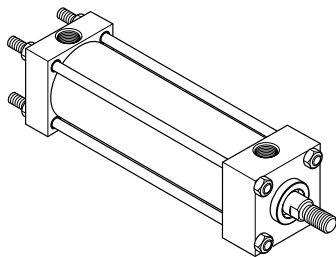
Tie Rods Ext. Head End

Style TB
(NFPA MX3)



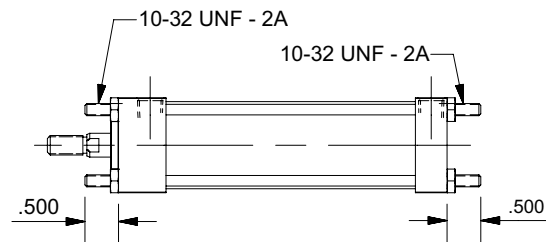
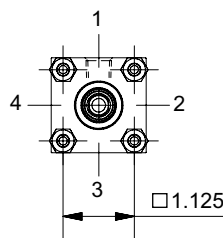
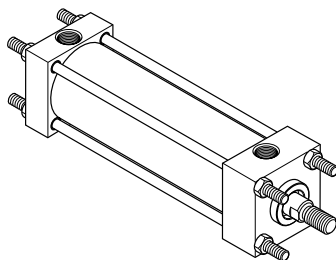
Tie Rods Ext. Cap End

Style TC
(NFPA MX2)



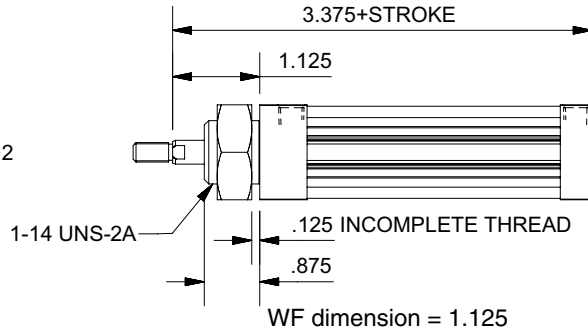
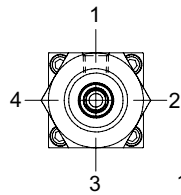
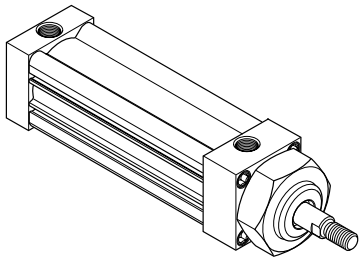
Tie Rods Ext. Both Ends

Style TD
(NFPA MX1)



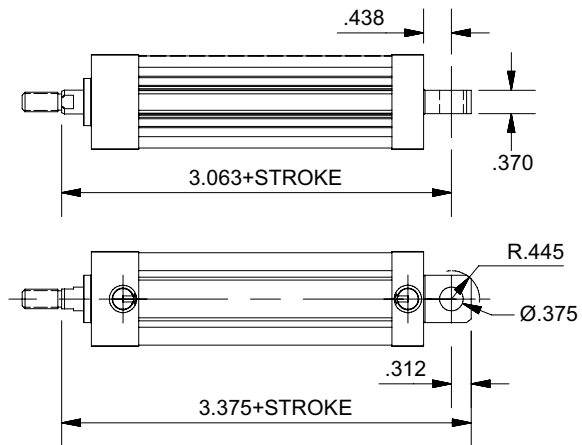
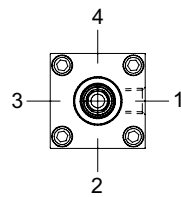
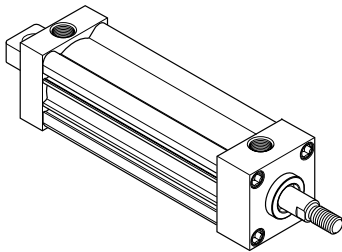
Threaded Nose

Style NS
(NFPA MN1)



Cap Pivot Eye

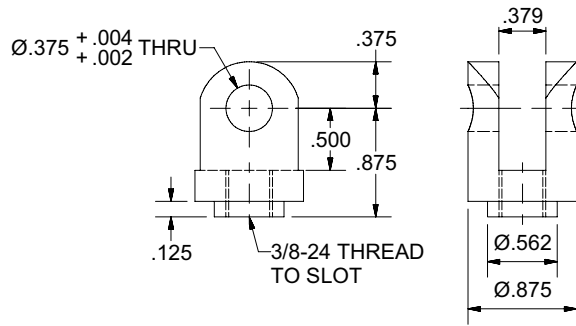
Style BE
(NFPA MP3)



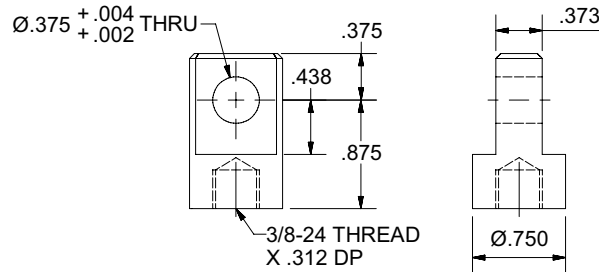
Cylinder Accessories

Note: Pivot Pin Assembly must be ordered separately

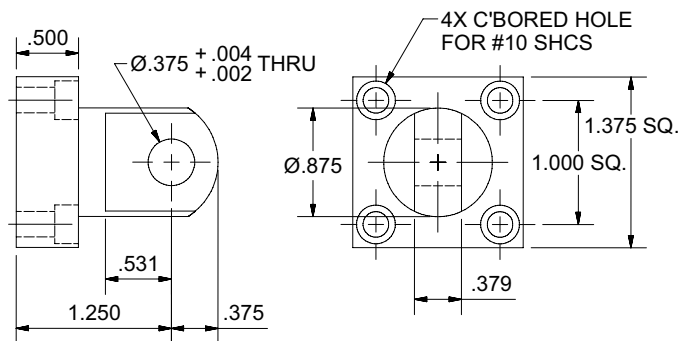
Rod Clevis P/N 1458030038



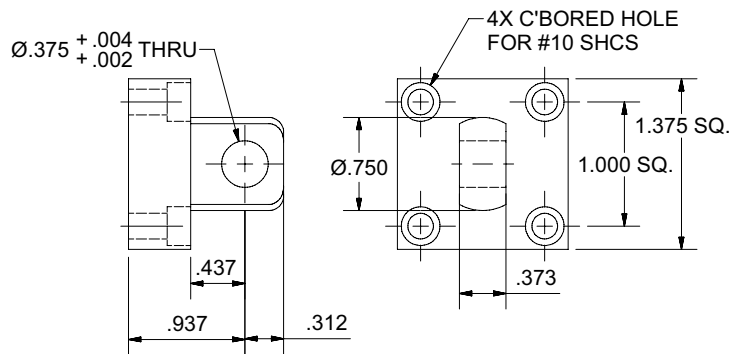
Rod Eye P/N 1458040038



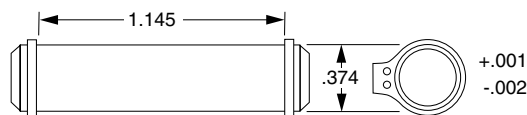
Clevis Bracket P/N 1458050038



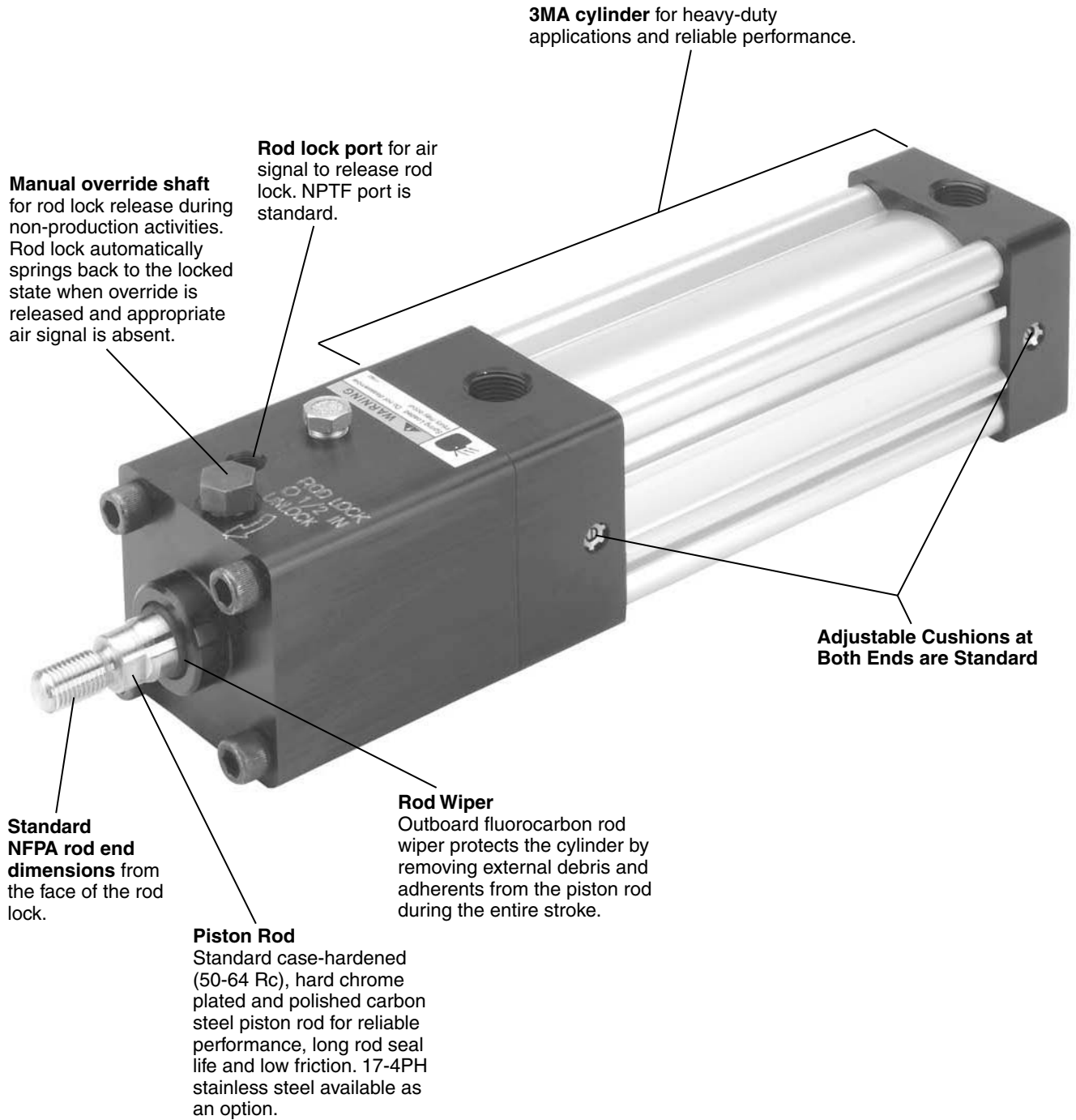
Eye Bracket P/N 1458060038



Pivot Pin Assembly P/N 0856640038



F



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.

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

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

Adjustable Cushions at Both Ends are Standard

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

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

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.

3MAJ Series Cylinders

NFPA Non-Lube Pneumatic Cylinder with Manual Override Rod Lock

Rod lock versions of the 3MA Series and 3MAJ Series 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 Series Cylinders:

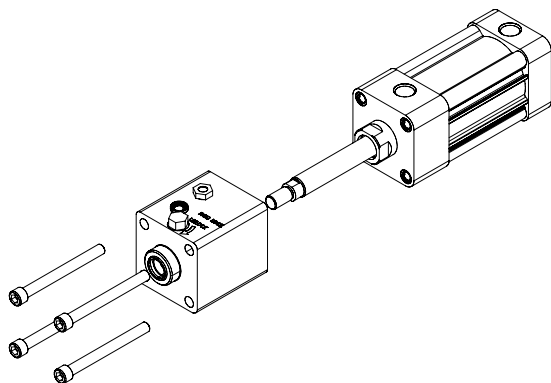
Bolt-On Modularity – As a true cylinder accessory, the rod lock may be removed without affecting the base cylinder (1-1/2" to 5" bores). The same, great cylinder remains intact, allowing the rod lock to bolt-on with minimal length change. This modularity can be extremely important for special installations 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.

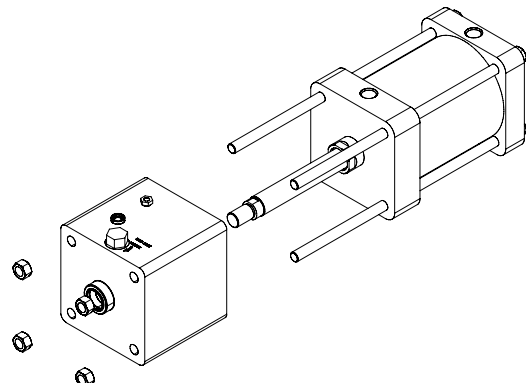
Functionality – With a holding force corresponding to 100 PSI on the cap end for nearly every bore size, the rod lock can be used for a variety of holding applications. The manual override shaft allows occasional release of the piston rod and automatically returns the rod lock back to the locked state 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 Series with the rod lock option, just change the product series to 3MAJ (the "J" is required for the rod lock option). See model code on page E34 for additional information.

1-1/2" to 5" Bores



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



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

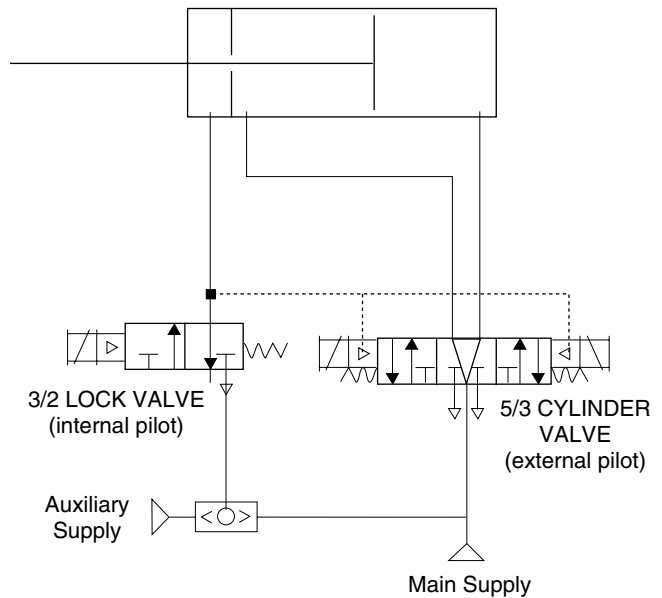
NOTE: Exhaust air from the rod lock can be piped away when there are demands for a contaminant-free environment.

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 rod lock will operate in both directions, engaging with the same holding force.
- The 3MAJ 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 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

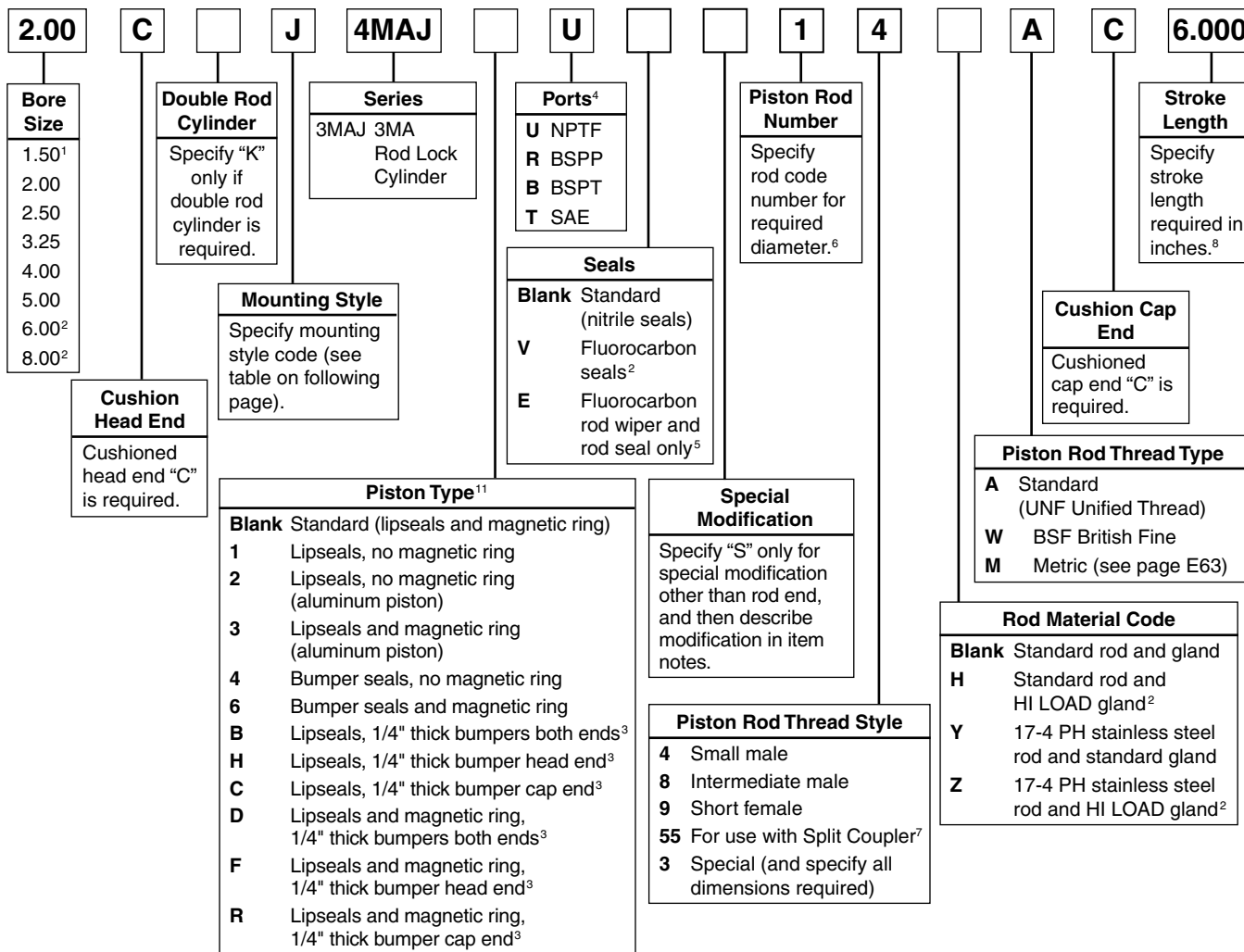
Bore Size	Rod No.	Rod Dia. MM	Air Chamber Volume (in ³)	Engagement Time (seconds)	Rated Holding Force (lbs)	Minimum Torque to Override (ft-lbs to hex shaft)
1-1/2	1	5/8	0.25	0.030	180	2
2	1	5/8	0.71	0.040	314	5
	3	1	0.68	0.040	250	5
2-1/2	1	5/8	1.26	0.045	491	7
	3	1	1.49	0.050	491	7
3-1/4	1	1	3.20	0.070	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 cylinder.

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

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

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



¹ Not available with 1" rod diameter (rod number 2) for 1-1/2" bore.
² Not available for 3MAJ.
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 Used for external chemical compatibility applications, not high temperature.
⁶ Review Piston Rod Selection Chart on page B136 to determine proper piston rod diameter.
⁷ 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.
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. Not available with Piston Types (blank) and 1 for 1-1/2" - 5" bore cylinders. Stop tube not available for 3MAJ

How to order 3MAJ 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 E70-E77 for sensor part numbers and specifications. Global, NAMUR and Weld Immune Sensors will fit the 3MAJ 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 E74 for more information.

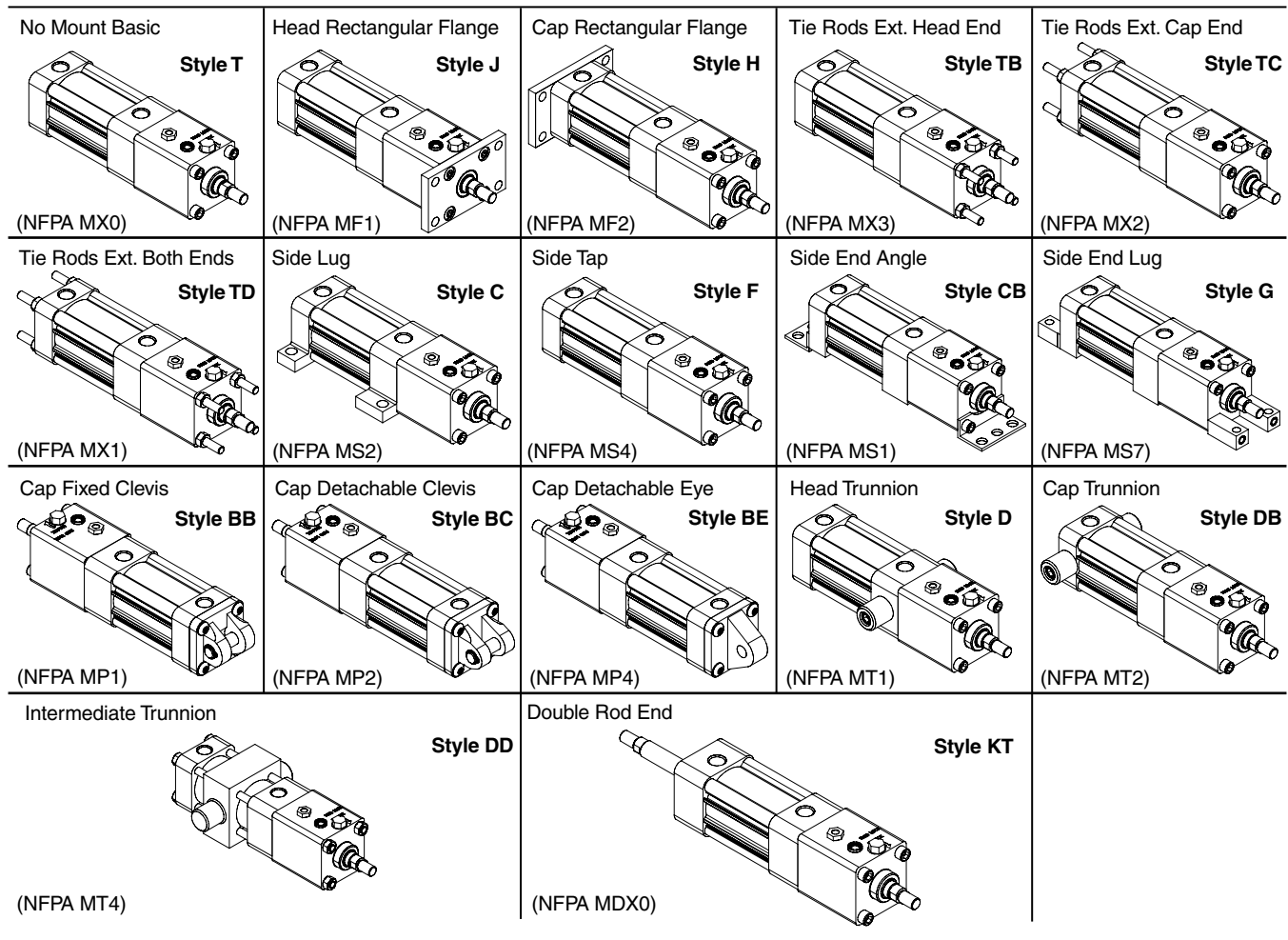
3MAJ Series Mounting Styles

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



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 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 60.

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

Cylinder Weights

Bore (inch)	Rod (inch)	No Mount Single Rod		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

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	0.65	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

Material Specifications – Standard Temperatures and Applications

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

- Piston rod Case-hardened,
(other materials chrome plated carbon steel
not available) (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 oxidized steel alloy



How to Select a 3MAJ 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:

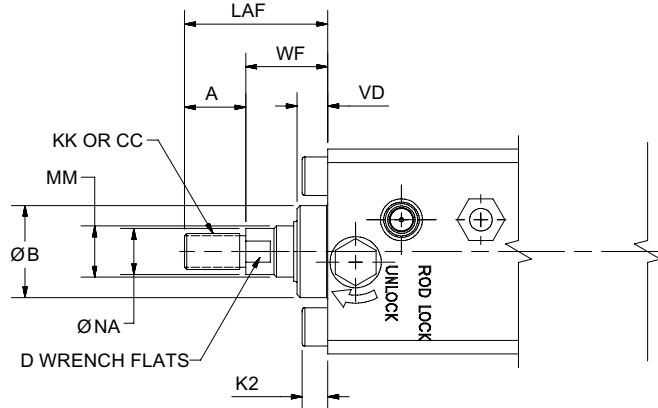
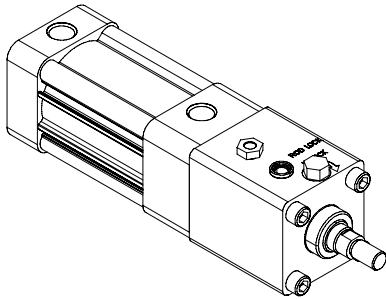
- Step 1 - **Determine the correct cylinder bore size** necessary to achieve required force using the available operating pressure.
- Step 2 - **Determine the series cylinder to use**, based on operating pressure.
- Step 3 - **Turn to the appropriate cylinder selection section.** Select the mounting 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 (Please refer to 3MA section regarding 3MAJ option availability beyond model code)	<ul style="list-style-type: none"> - 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 <ul style="list-style-type: none"> - 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

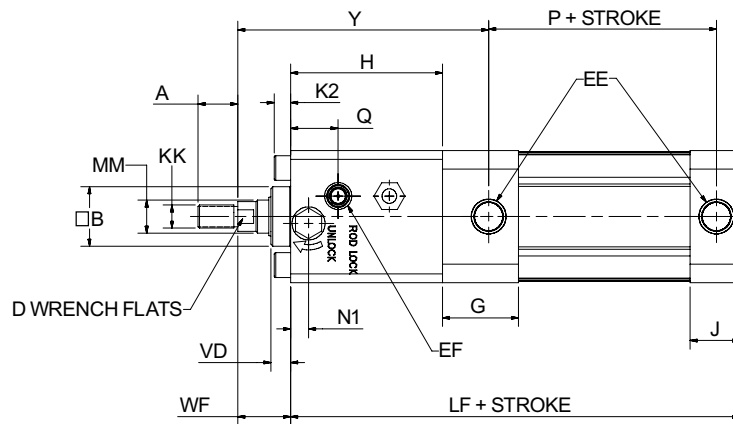
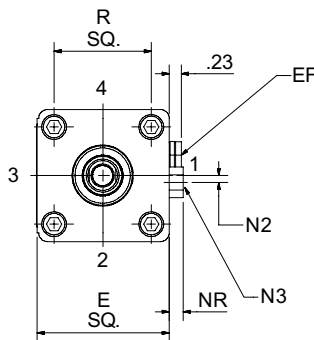


3MAJ Series Single Rod Dimensions – 1-1/2" to 5" Bore Size

No Mount Basic
Style T
(NFPA MX0)



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



Cylinder Dimensions – Style T

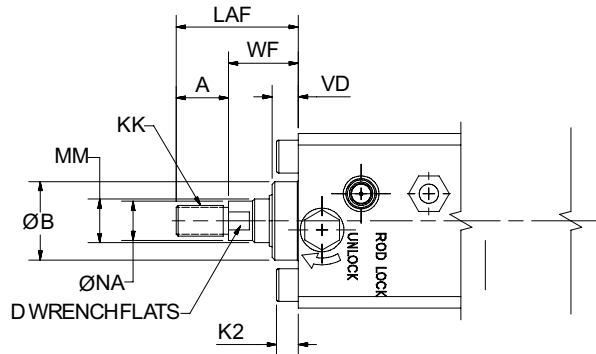
Bore Size	Rod No.	Rod Dia. MM	Thread		A	AA	+.000 -.002 B	D	E	EE (NPTF)	EF (NPTF)	G	H	J
			Style 8 CC	Style 4 & 9 KK										
1-1/2	1	5/8	1/2-20	7/16-20	0.750	2.020	1.124	1/2	2.000	3/8	1/8	1.438	2.625	0.938
	3	1	7/8-14	3/4-16	1.125	2.600	1.499	7/8	2.500	3/8	1/8	1.375	3.875	0.937
2-1/2	1	5/8	1/2-20	7/16-20	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	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
	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

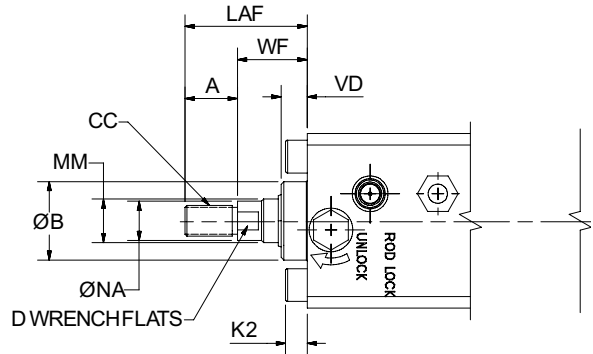


Rod End Dimensions – 1-1/2" to 5" Bore Size

Thread Style 4
(NFFPA Style SM)
Small Male

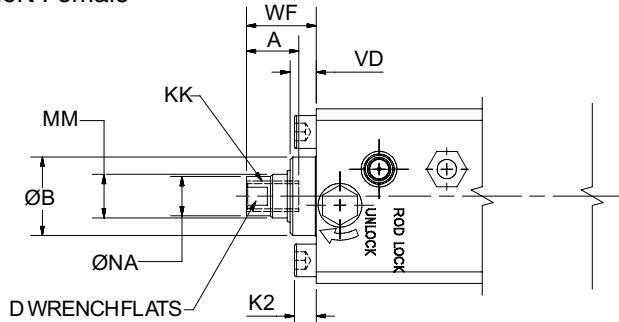


Thread Style 8
(NFFPA Style IM)
Intermediate Male

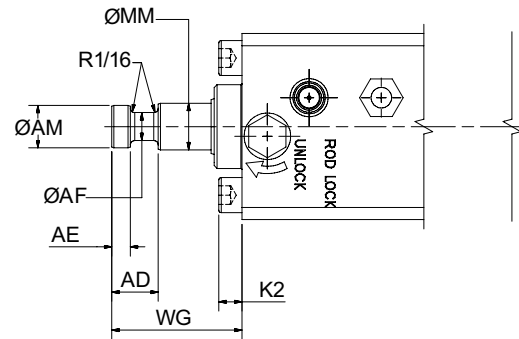


F

Thread Style 9
(NFFPA 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		A	AD	AE	AF	AM	+0.000 -0.002 B	D	K2	LAF	NA	VD	WF	WG
			Style 8 CC	Style 4 & 9 KK													
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	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
2	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
	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
2-1/2	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
	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
3-1/4	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
	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
4	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
	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
5	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.

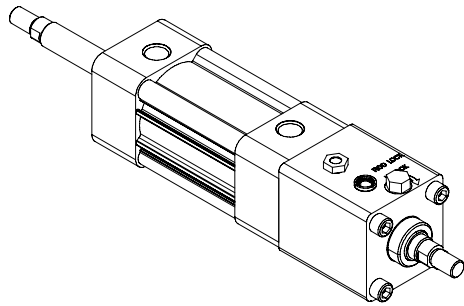


To determine dimensions for a double rod end cylinder, first refer to the desired single rod end mounting style cylinder shown in this catalog section. After selecting the necessary dimensions from that drawing, return to this page and supplement the single rod end dimensions with those shown in the drawings and dimension table below. Note that double rod end cylinders have a head dimension

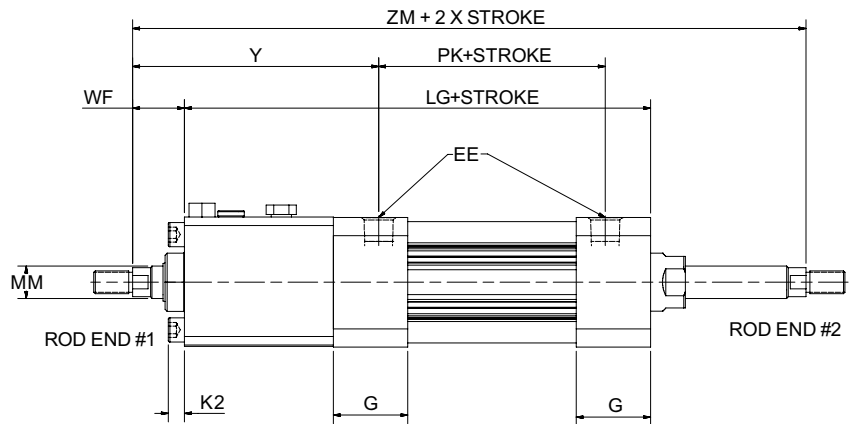
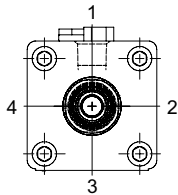
(G) at both ends, and that LG replaces LF, PK replaces P, etc. The double rod end dimensions differ from, or are in addition to, those for single rod cylinders.

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



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



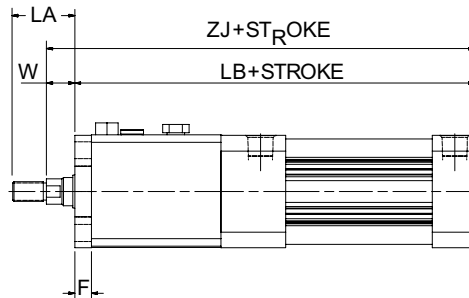
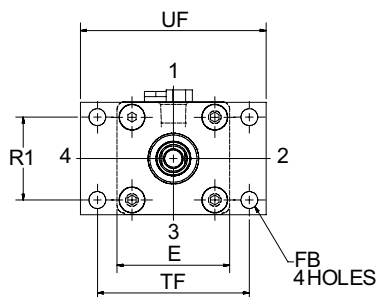
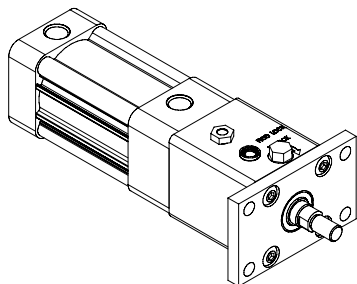
Cylinder Dimensions – Style KT

Bore Size	Rod No.	Rod Dia. MM	EE (NPTF)	G	K2	WF	Y	Add Stroke								Add 2X Stroke ZM
								LG	PK	SA _k	XA _k	SS _k	SN _k	SE _k	XE _k	
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



Head Rectangular Flange

Style J
(NFPA MF1)

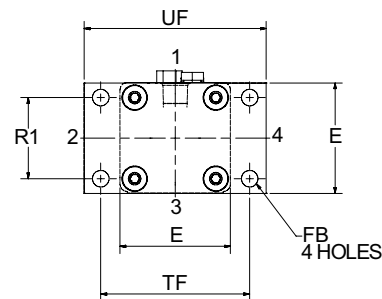
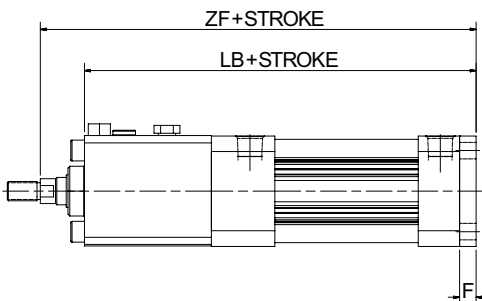
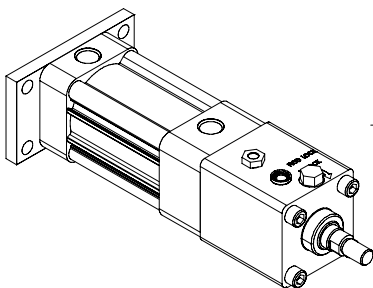


Note: Style J has a W dimension instead of WF and a LA dimension instead of LAF because of the flange installation. Please use dimensions W and LA regarding rod ends only for Style J. For reference, $WF = W + F$ and $LA = W + A$.

F

Cap Rectangular Flange

Style H
(NFPA MF2)

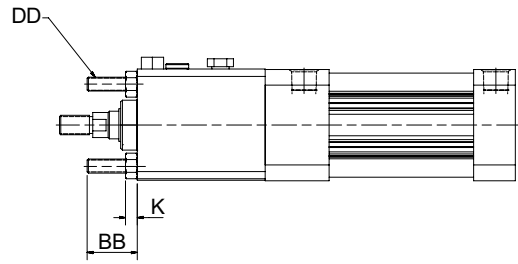
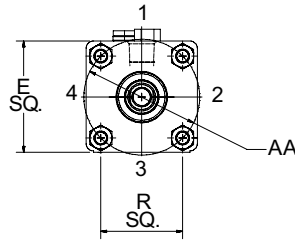
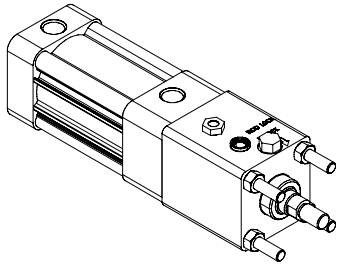


Cylinder Dimensions – Styles J and H

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

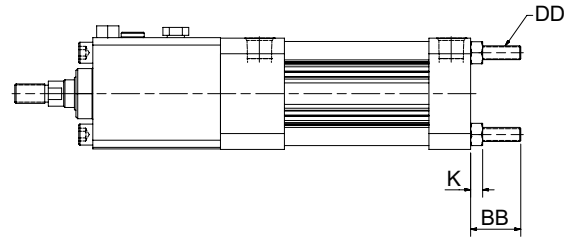
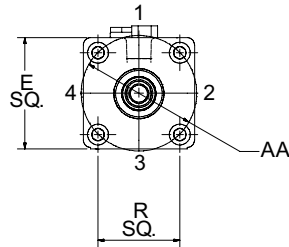
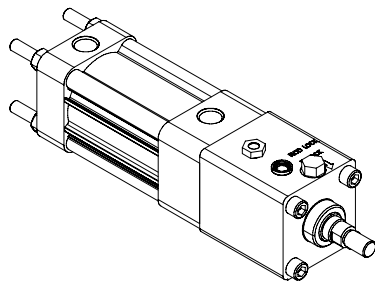
Tie Rods Extended Head End Mount

Style TB
(NFPA MX3)



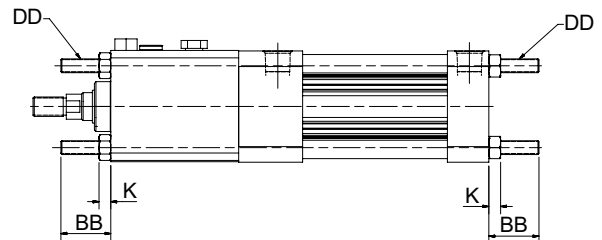
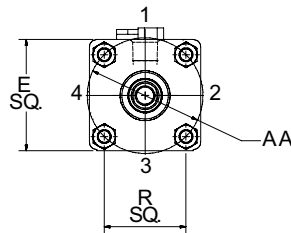
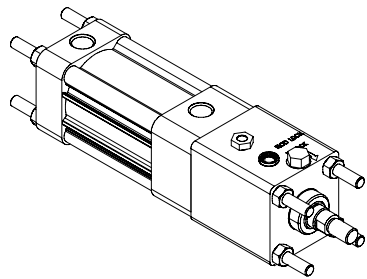
Tie Rods Extended Cap End Mount

Style TC
(NFPA MX2)



Tie Rods Extended Both Ends Mount

Style TD
(NFPA MX1)



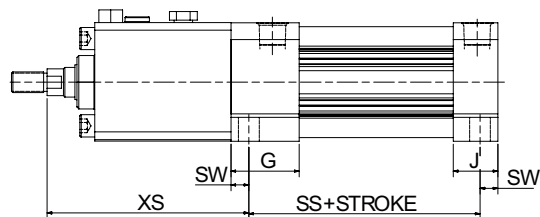
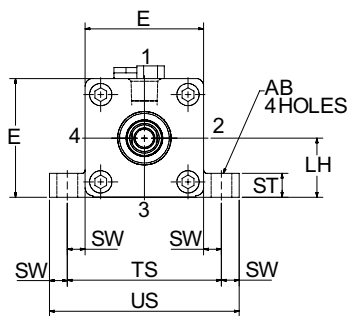
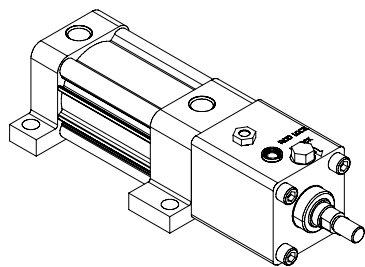
Cylinder Dimensions – Styles TB, TC and TD

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



Side Lug Mount

Style C (only 4MAJ)
(NFPA MS2)



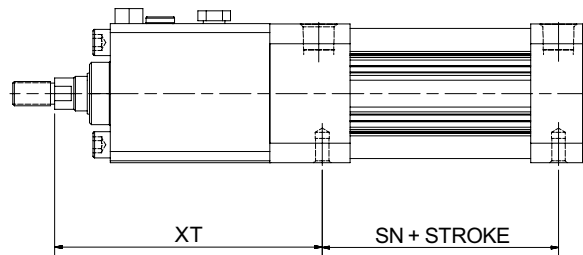
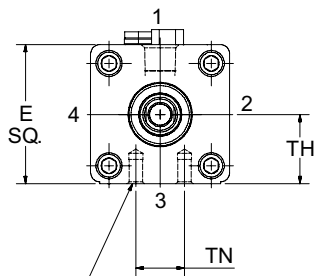
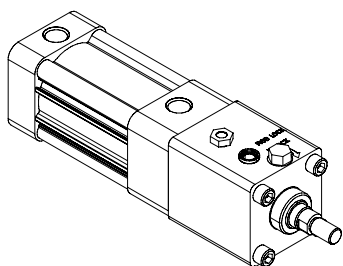
Cylinder Dimensions – Style C

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

F

Side Tap Mount

Style F
(NFPA MS4)



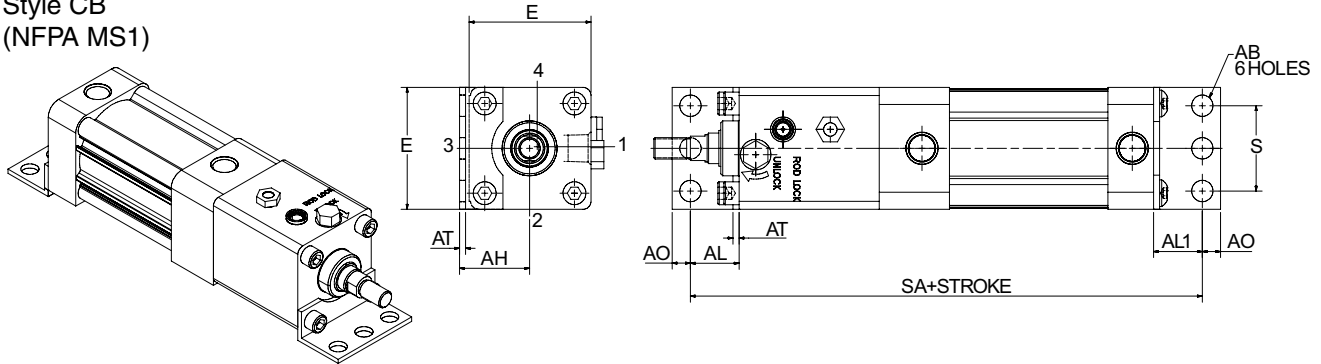
NT THREAD, ND DEEP
4 TAPPED MTG. HOLES

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

Side End Angle Mount

Style CB
(NFPA MS1)



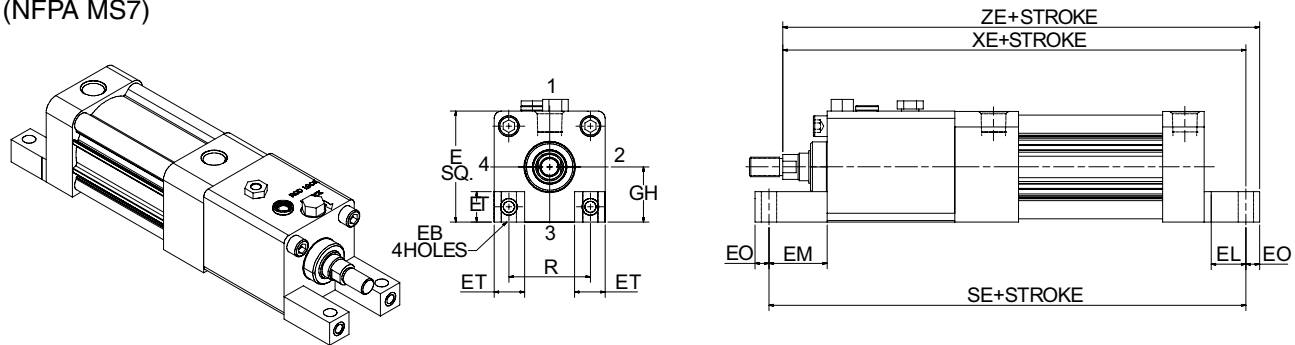
Cylinder Dimensions – Style CB

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

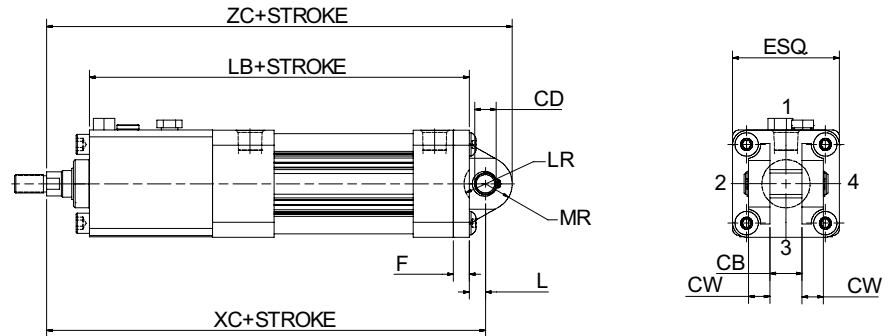
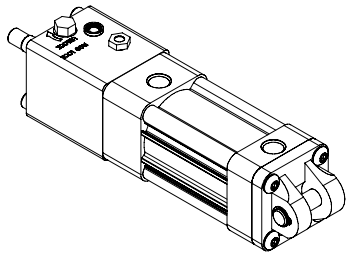
Bore Size	Rod No.	Rod Dia. MM	E	EB	EL	EM	EO	ET	+/- .003 GH	R	Add Stroke		
											SE	XE	ZE
1-1/2	1	5/8	2.000	0.281	0.750	1.125	0.250	0.563	0.993	1.430	8.125	8.000	8.250
2	1	5/8	2.500	0.344	0.938	1.313	0.313	0.688	1.243	1.840	8.750	8.438	8.750
	3	1	2.500	0.344	0.938	1.313	0.313	0.688	1.243	1.840	9.750	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



Cap Fixed Clevis Mount

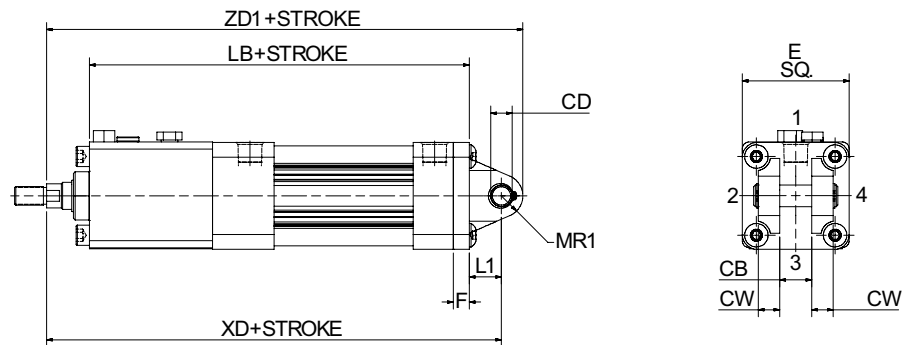
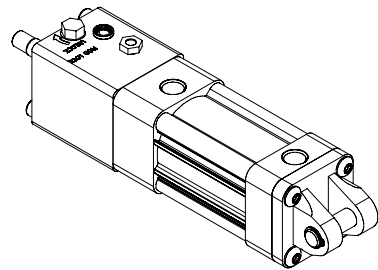
Style BB
(NFPA MP1)

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



Cap Detachable Clevis Mount

Style BC
(NFPA MP2)

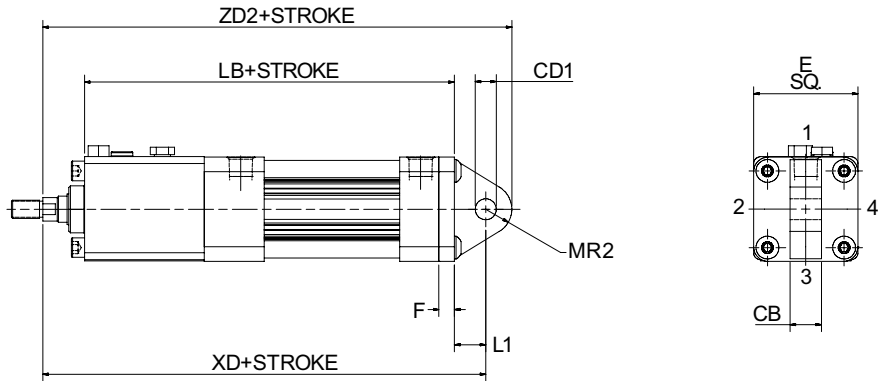
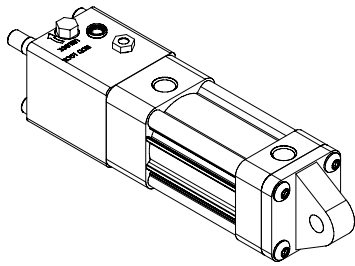


Cylinder Dimensions – Styles BB and BC

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

Cap Detachable Eye Mount*

Style BE
(NFPA MP4)



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



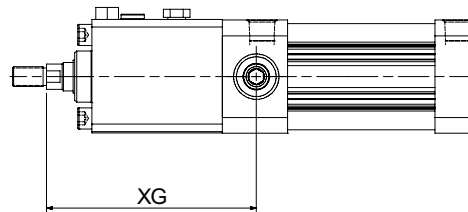
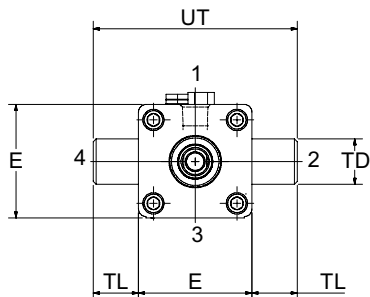
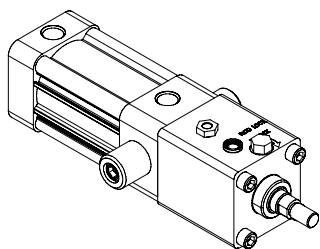
Cylinder Dimensions – Style BE

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



Head Trunnion Mount

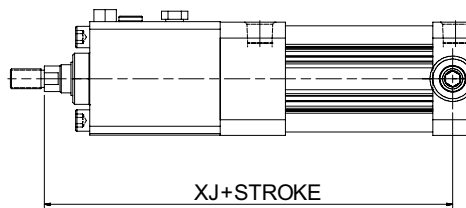
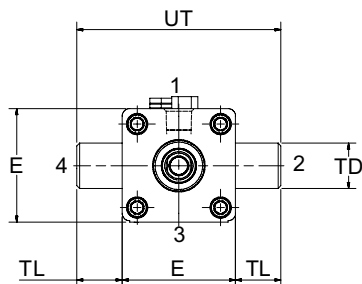
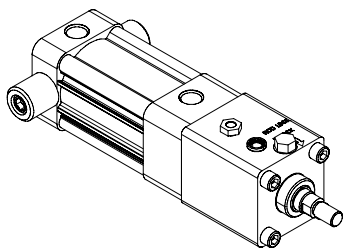
Style D (only 4MAJ)
(NFPA MT1)



F

Cap Trunnion Mount

Style DB (only 4MAJ)
(NFPA MT2)



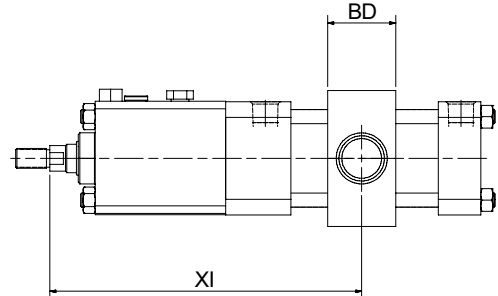
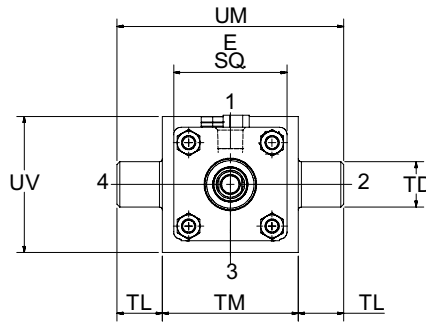
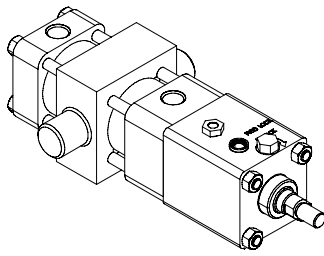
Cylinder Dimensions – Styles D and DB

Bore Size	Rod No.	Rod Dia. MM	E	+0.000 -0.001 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

Intermediate Trunnion Mount

Style DD

(NFPA MT4)



Cylinder Dimensions – Style DD

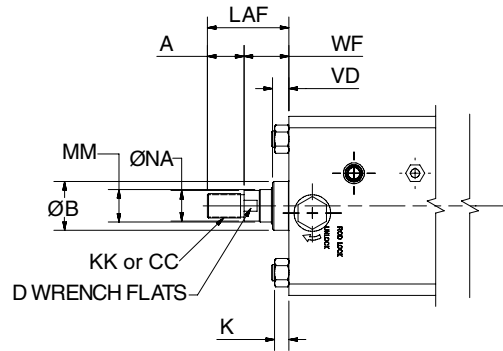
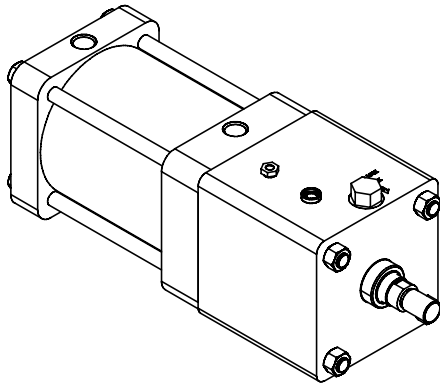
Bore Size	Rod No.	Rod Dia. MM	E	BD	+0.000 -0.001 TD	TL	TM	UM	UV	Min. XI	Min. Stroke
1-1/2	1	5/8	2.000	1.250	1.000	1.000	2.500	4.500	2.500	9.000	3.250
2	1	5/8	2.500	1.500	1.000	1.000	3.000	5.000	3.000	9.937	4.000
	3	1	2.500	1.500	1.000	1.000	3.000	5.000	3.000	11.312	4.000
2-1/2	1	5/8	3.000	1.500	1.000	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.

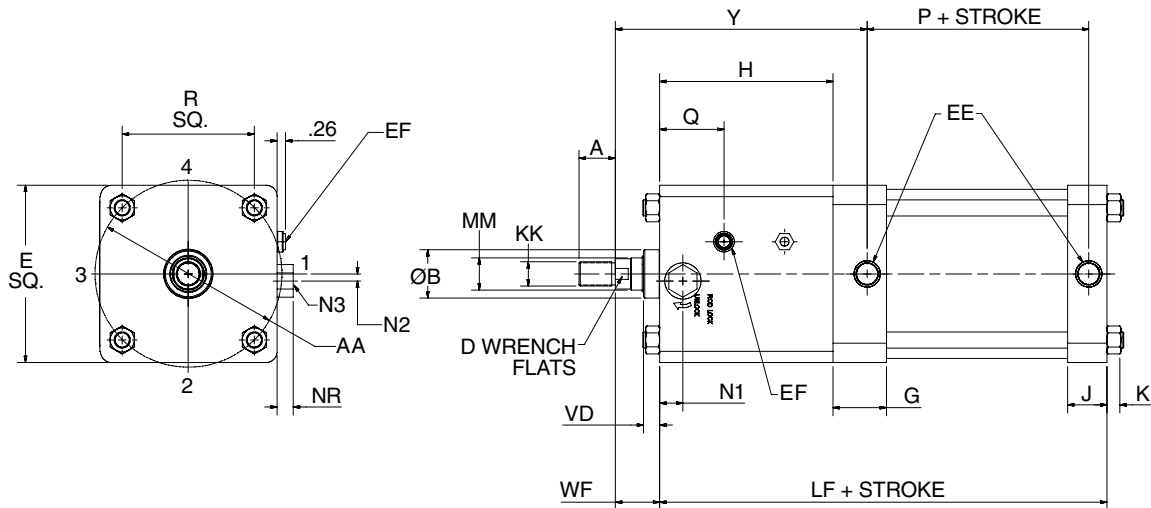
Note: Style DD requires Minimum Stroke per table.



No Mount
Style T
(NFPA MX0)



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



Cylinder Dimensions – Style T

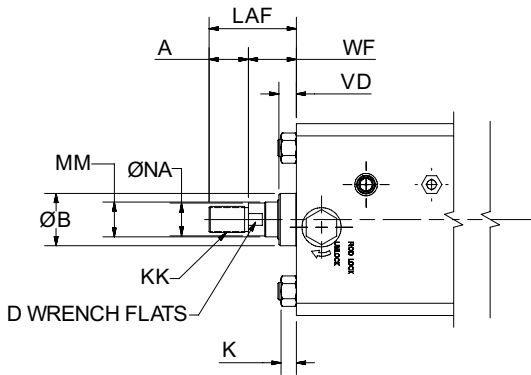
Bore Size	Rod No.	Rod Dia. MM	Thread		A	AA	+0.000 -0.002 B	D	E	EE (NPTF)	EF (NPTF)	G	H	J
			Style 8 CC	Style 4 & 9 KK										
6	1	1-3/8	1-1/4 - 12	1-14	1.625	6.900	1.999	1-1/8	6.500	3/4	1/4	1.910	6.375	1.410
	3	1-3/4	1-1/2 - 12	1-1/4 - 12	2.000	6.900	2.374	1-1/2	6.500	3/4	1/4	1.910	6.875	1.410
8	1	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

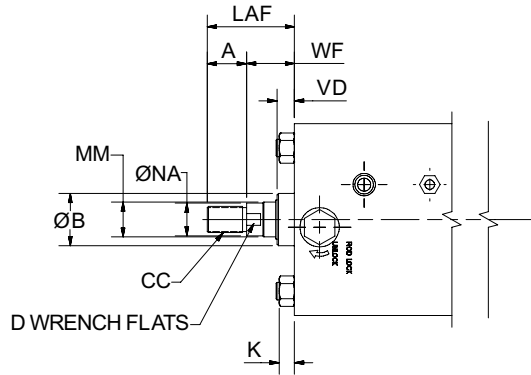


Rod End Dimensions – 6" to 8" Bore Sizes

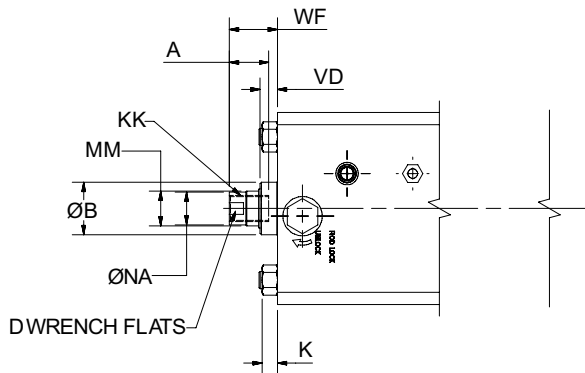
Thread Style 4
(NFPA Style SM)
Small Male



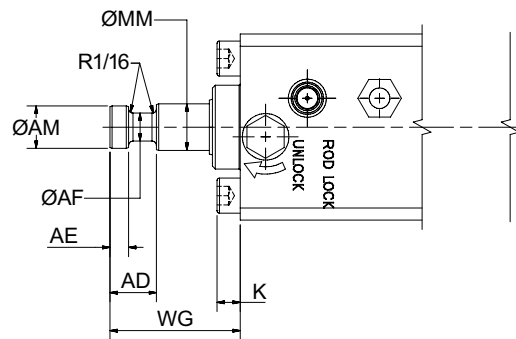
Thread Style 8
(NFPA Style IM)
Intermediate Male



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		A	AD	AE	AF	AM	+0.000 -0.002 B	D	K	LAF	NA	VD	WF	WG
			Style 8 CC	Style 4 & 9 KK													
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.

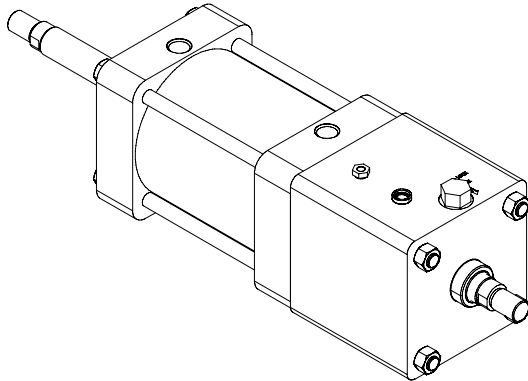


To determine dimensions for a double rod end cylinder, first refer to the desired single rod end mounting style cylinder shown in this catalog section. After selecting the necessary dimensions from that drawing, return to this page and supplement the single rod end dimensions with those shown in the drawings and dimension table below. Note that double rod end cylinders have a head dimension

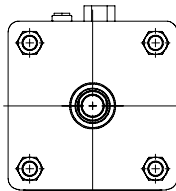
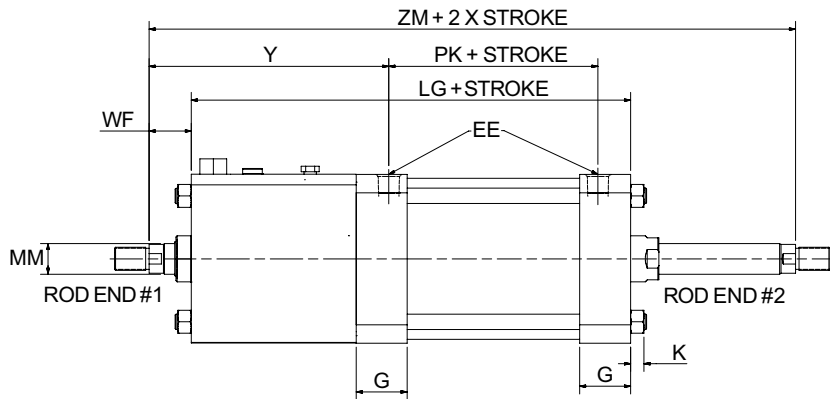
(G) at both ends, and that LG replaces LF, P_k replaces P, etc. The double rod end dimensions differ from, or are in addition to, those for single rod cylinders.

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.

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

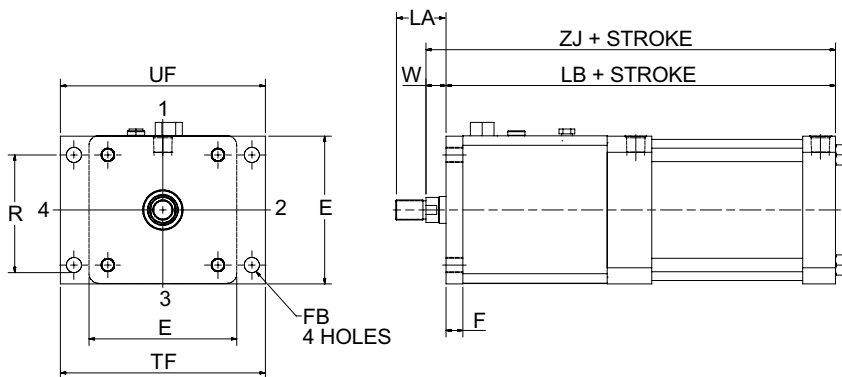
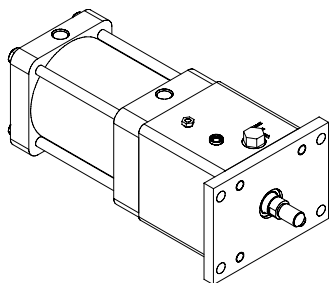


Cylinder Dimensions – Style KT

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	
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 Single Rod Mounting Styles								LF	P	SA	XA	SS	SN	–
								All Styles		CB		C	F	All

Head Rectangular Flange Mount

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

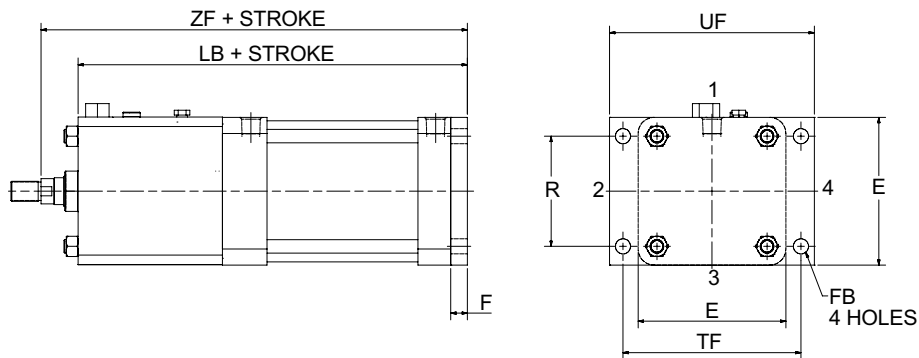
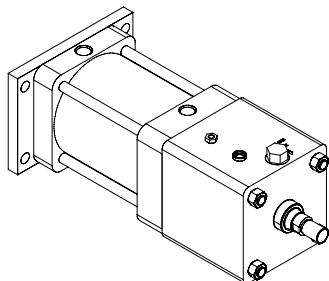


Note: Style J has a W dimension instead of WF and a LA dimension instead of LAF because of the flange installation. Please use dimensions W and LA regarding rod ends only for Style J. For reference, $WF = W + F$ and $LA = W + A$.



Cap Rectangular Flange Mount

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



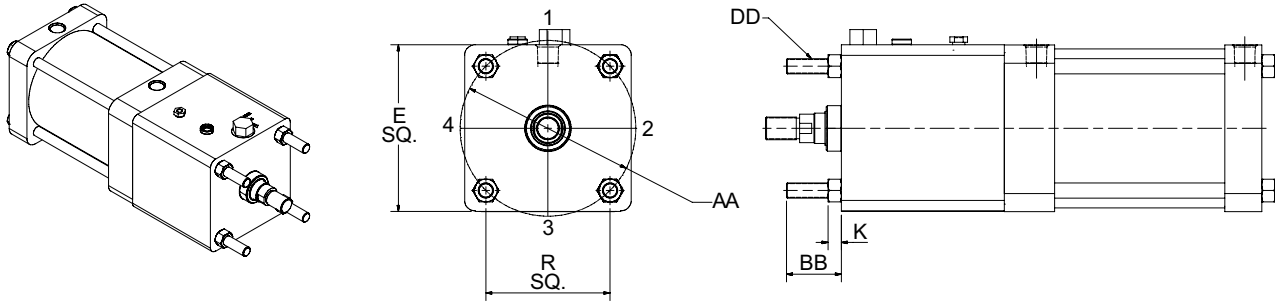
Cylinder Dimensions – Styles J and H

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



Tie Rods Extended Head End Mount

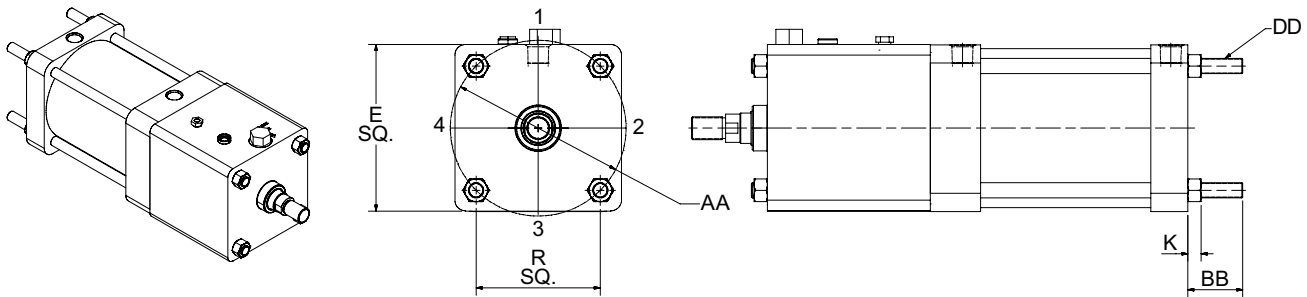
Style TB
(NFPA MX3)



Tie Rods Extended Cap End Mount

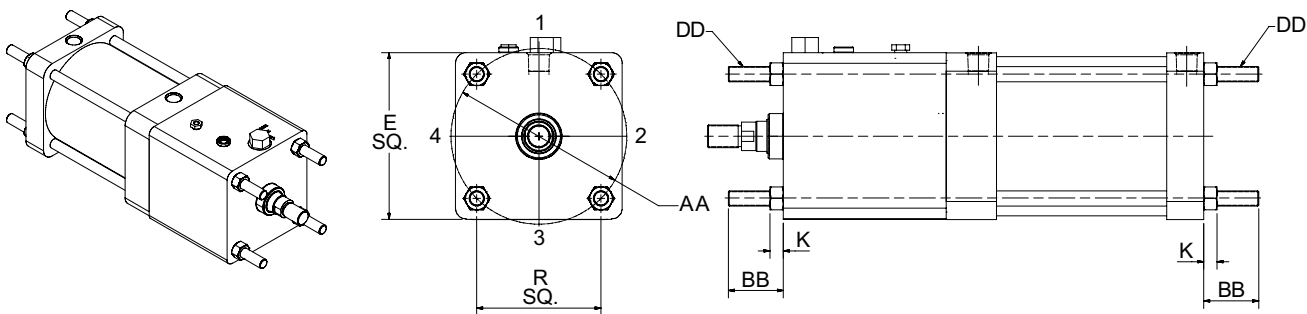
Style TC
(NFPA MX2)

F



Tie Rods Extended Both Ends Mount

Style TD
(NFPA MX1)

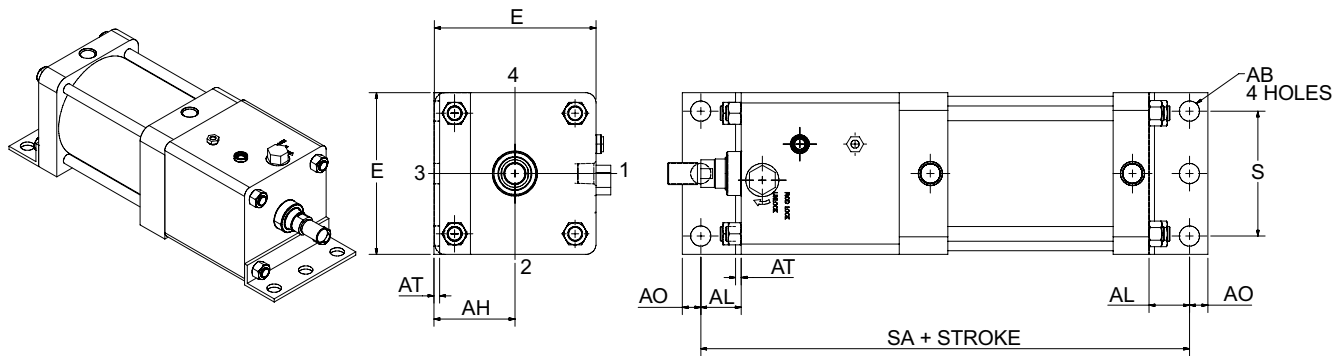


Cylinder Dimensions – Styles TB, TC and TD

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

Side End Angle Mount

Style CB
(NFPA MS1)



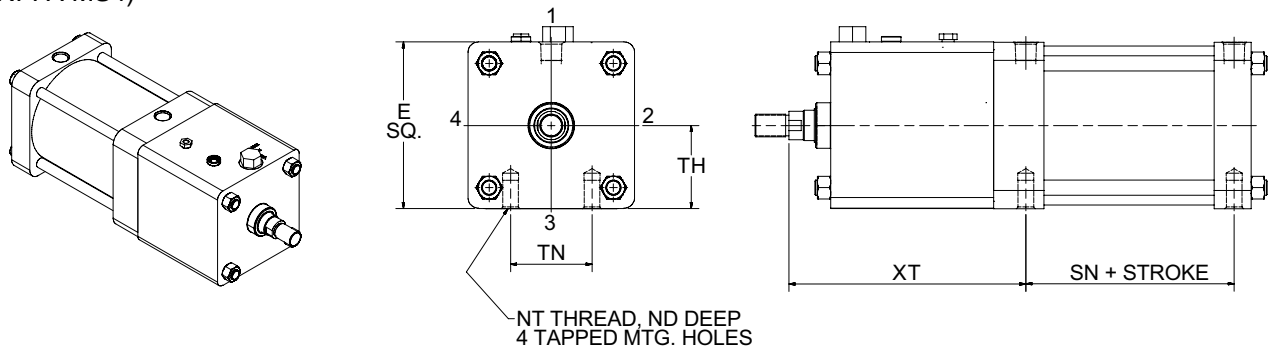
Cylinder Dimensions – Style CB

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)

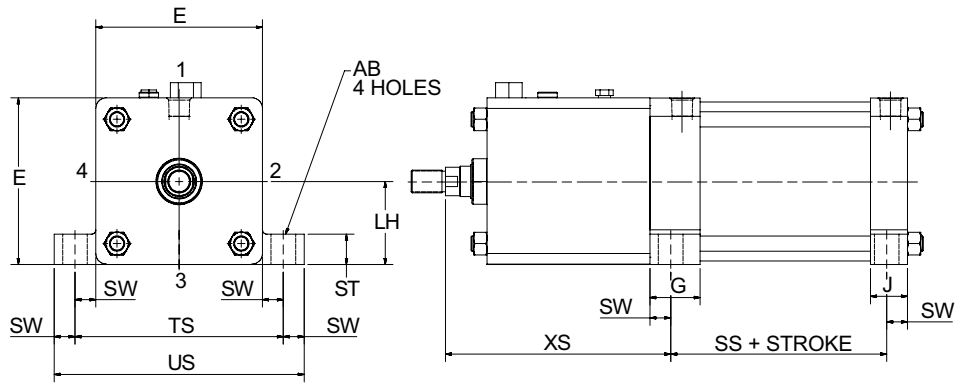
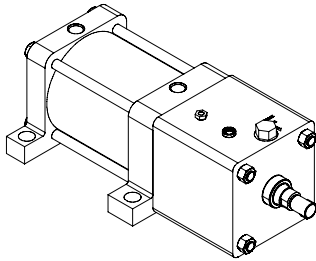


Cylinder Dimensions – Style F

Bore Size	Rod No.	Rod Dia. MM	E	ND	NT	+/-0.003 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



**Side Lug Mount
Style C
(NFPA MS2)**

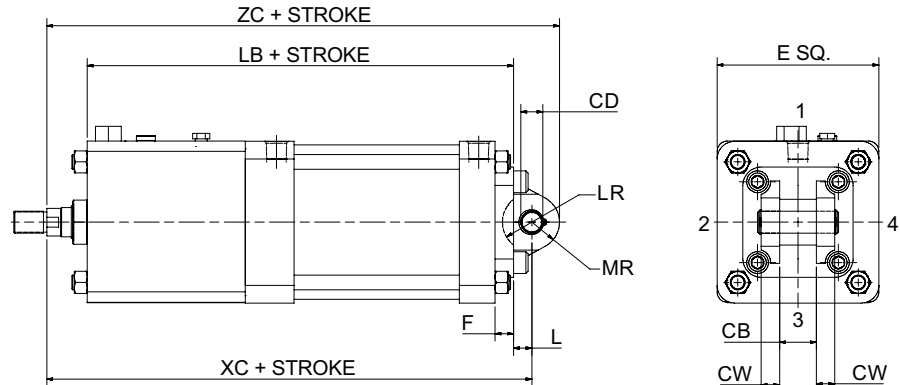
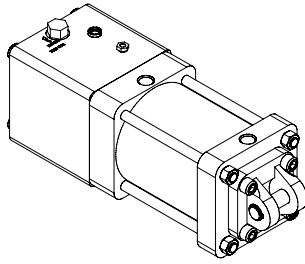


Cylinder Dimensions – Style C

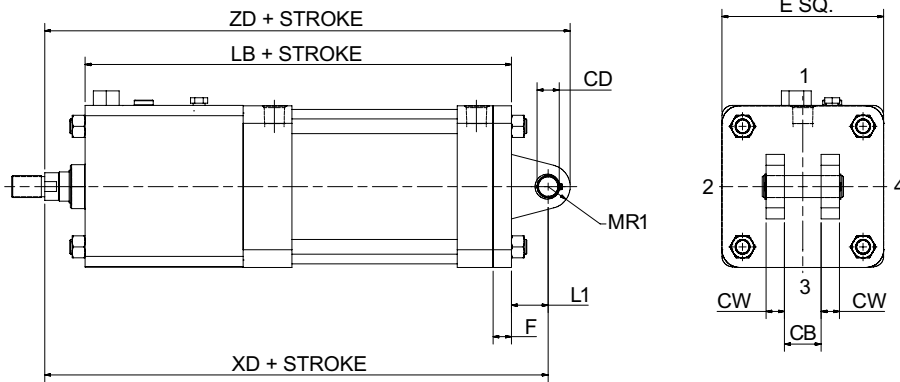
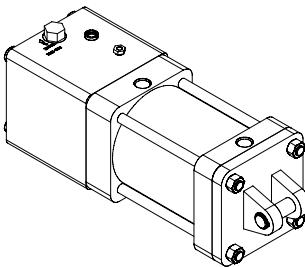
Bore Size	Rod No.	Rod Dia. MM	AB	E	G	J	+/- .003 LH	ST	SW	TS	US	XS	Add Stroke SS
6	1	1-3/8	0.813	6.500	1.910	1.410	3.243	1.000	0.688	7.875	9.250	8.688	3.625
	3	1-3/4	0.813	6.500	1.910	1.410	3.243	1.000	0.688	7.875	9.250	9.438	3.625
8	1	1-3/8	0.813	8.500	1.810	1.440	4.243	1.000	0.688	9.875	11.250	8.938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

Cap Fixed Clevis
Style BB
(NFA MP1)

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



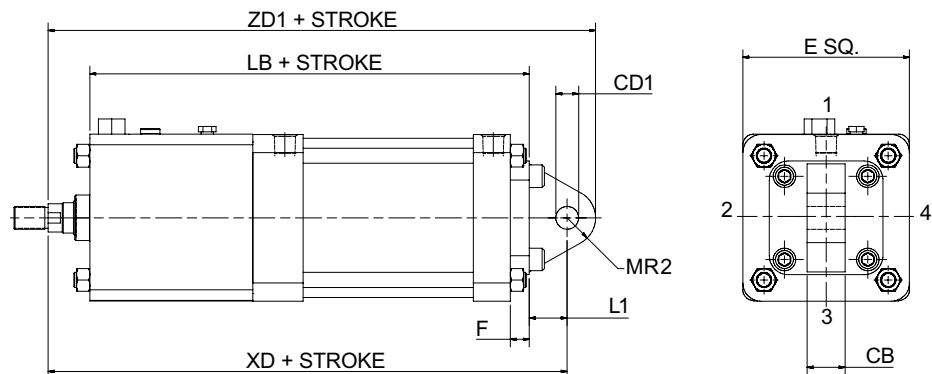
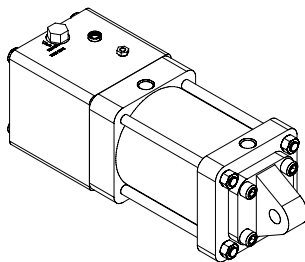
Cap Detachable Clevis
Style BC
(NFA MP2)



Cylinder Dimensions – Styles BB and BC

Bore Size	Rod No.	Rod Dia. MM	CB	+0.000 -.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
(NFA MP4)
(only 6" Bore)



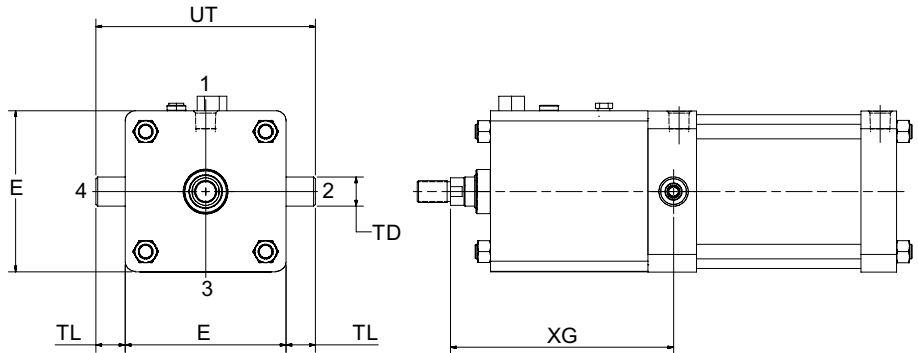
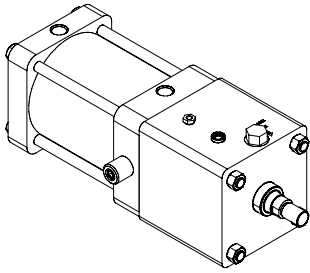
Cylinder Dimensions – Style BE

Bore Size	Rod No.	Rod Dia. MM	CB	+0.002 +0.004 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



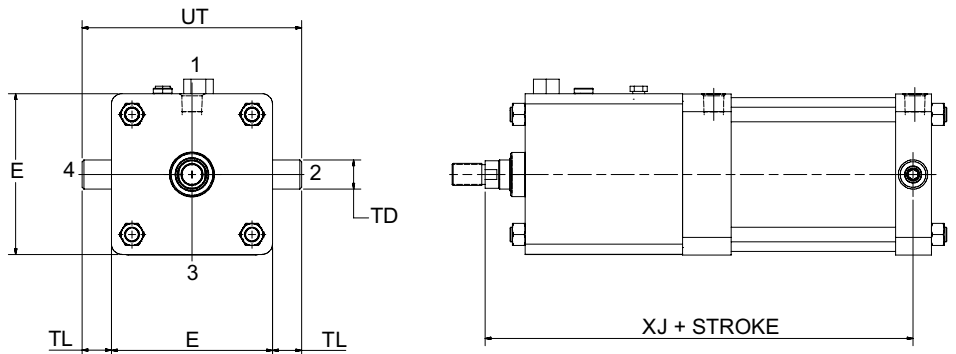
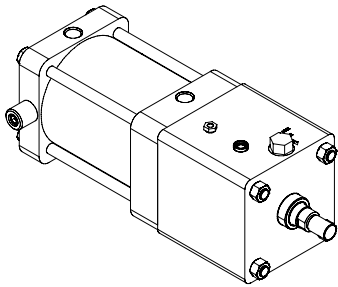
Head Trunnion Mount

Style D
(NFA MT1)



Cap Trunnion Mount

Style DB
(NFA MT2)



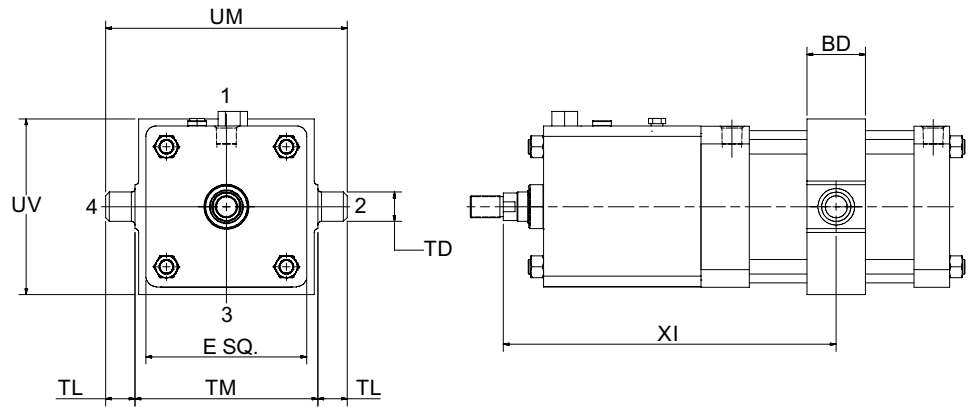
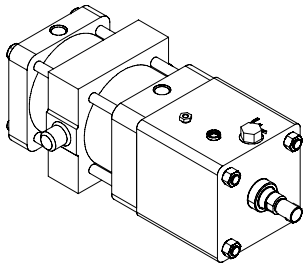
Cylinder Dimensions – Styles D and DB

Bore Size	Rod No.	Rod Dia. MM	E	+0.000 -0.001 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

Intermediate Trunnion Mount

Style DD

(NFPA MT4)



Cylinder Dimensions – Style DD

Bore Size	Rod No.	Rod Dia. MM	E	BD	+0.000 -0.001 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.

Parker “Style 55” Piston Rod End

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

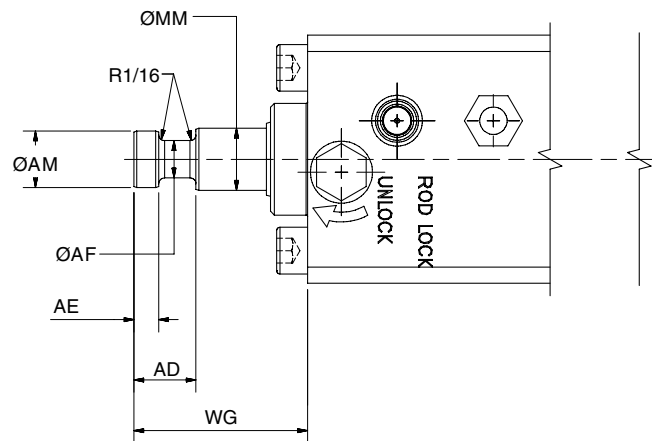
- Simplifies alignment
- Reduces assembly time
- Allows full rated pneumatic pressure in push and pull directions
- Available in 5/8" through 1-3/4" piston rod diameters

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.



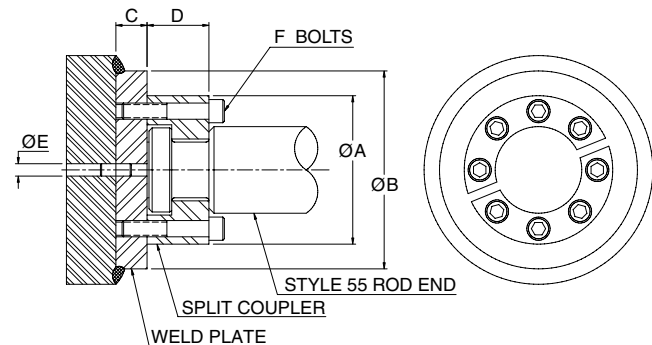
Example: Style 55 Rod End shown on 4MAJ Series cylinder

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 or 3MAJ 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.

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.

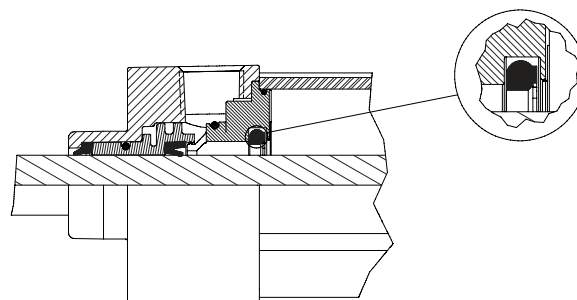
Check Seal Cushions For Increased Productivity and Maximum Performance

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.

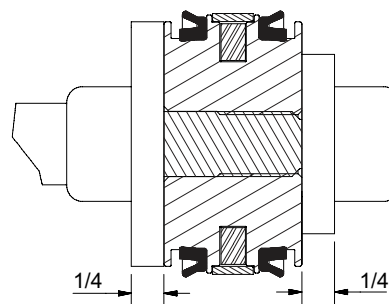


Bumpers

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.

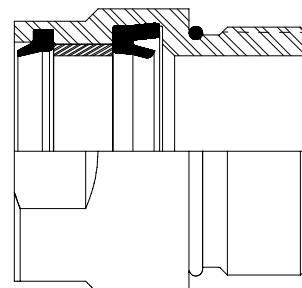
Available in 1-1/2" - 4" bore sizes for 3MA and 3MAJ Series cylinders.

Bumper Option



HI LOAD Gland Assembly

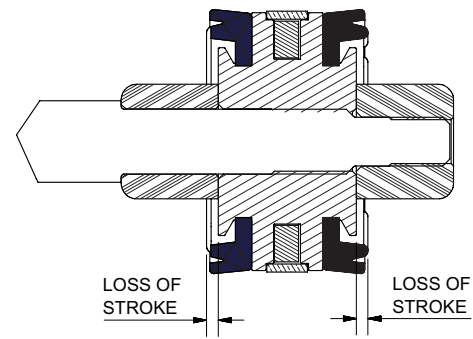
Applications with inherent side load require a slide package for maximum service life. In some cases, there may be limitations to the size or expense of these additional components. One possible solution may be the use of the optional HI LOAD gland assembly that incorporates a high strength composite 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.



Bumper Seal Option

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



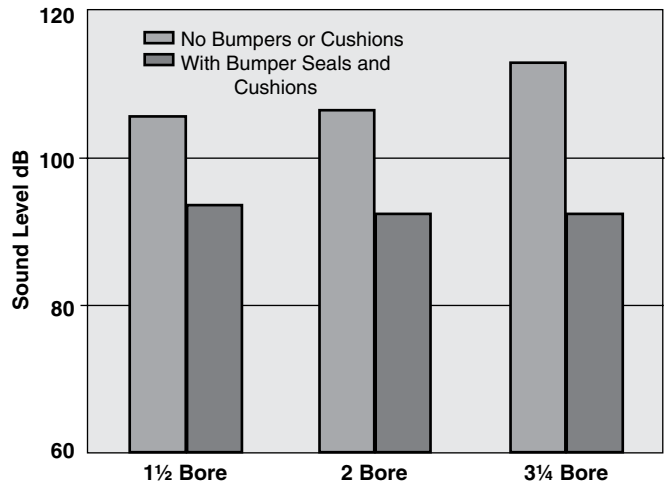
Summary of Accelerometer Test Results

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

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

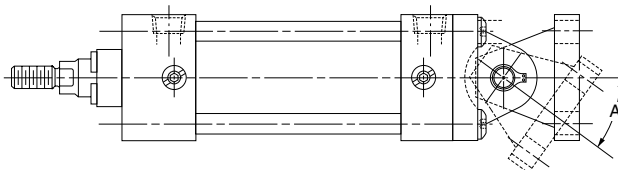
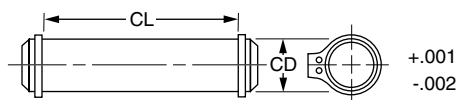
Rod end accessories can be selected by cylinder rod end thread size from Table A & B below. Mating parts for rod end accessories are listed just to the right of the knuckle or clevis selected. Mounting plates for style MP1 & MP4 cylinder mounts are selected by bore size from Table C.

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 E31.



Pivot Pin



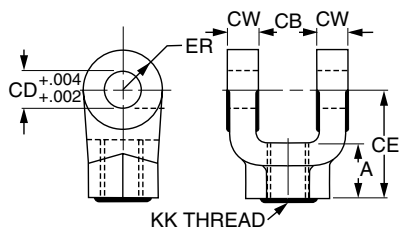
Symbol	0856640044	0856640050	0856640075	0856640100	0856640138	0856640175
CD	7/16	1/2	3/4	1	1-3/8	1-3/4
CL	1-5/16	1-7/8	2-5/8	3-1/8	4-1/8	5-3/16
Shear Cap. (lbs)	6600	8600	19300	34300	65000	105200

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

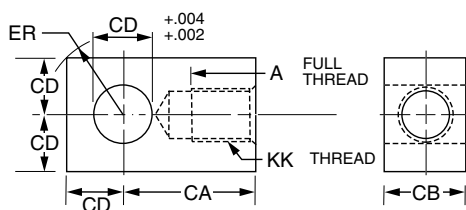
Note: Pivot Pin must be ordered separately for single lug pivot mounting.

Female Rod Clevis



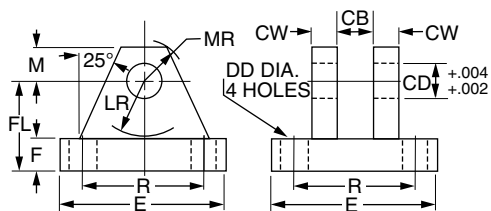
Symbol	1458030044	1458030050	1458030075	1458030088	1458030100	1458030125	1458030150
A	3/4	3/4	1-1/8	1-5/8	1-5/8	2	2-1/4
CB	3/4	3/4	1-1/4	1-1/2	1-1/2	2	2-1/2
CD	1/2	1/2	3/4	1	1	1-3/8	1-3/4
C E	1-1/2	1-1/2	2-1/8	2-15/16	2-15/16	3-3/4	4-1/2
CW	1/2	1/2	5/8	3/4	3/4	1	1-1/4
ER	1/2	1/2	3/4	1	1	1-3/8	1-3/4
KK	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



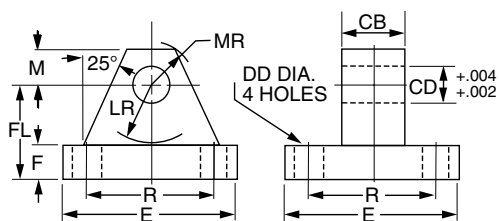
Symbol	1458040044	1458040050	1458040075	1458040088	1458040100	1458040125	1458040150
A	3/4	3/4	1-1/8	1-1/8	1-5/8	2	2-1/4
CA	1-1/2	1-1/2	2-1/16	2-3/8	2-13/16	3-7/16	4
CB	3/4	3/4	1-1/4	1-1/2	1-1/2	2	2-1/2
CD	1/2	1/2	3/4	1	1	1-3/8	1-3/4
ER	23/32	23/32	1-1/16	1-7/16	1-7/16	1-31/32	2-1/2
KK	7/16-20	1/2-20	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

Linear Alignment Couplers are available in 11 standard thread sizes...

Cost Saving Features and Benefits Include...

- Maximum reliability for trouble-free operation, long life and lower operating costs
- Increased cylinder life by reducing wear on piston and rod bearings
- Simplifying cylinder installation and reducing assembly costs
- Increase rod bearing and rod seal life for lower maintenance costs

Alignment Coupler

See Table 1 for Part Numbers and Dimensions

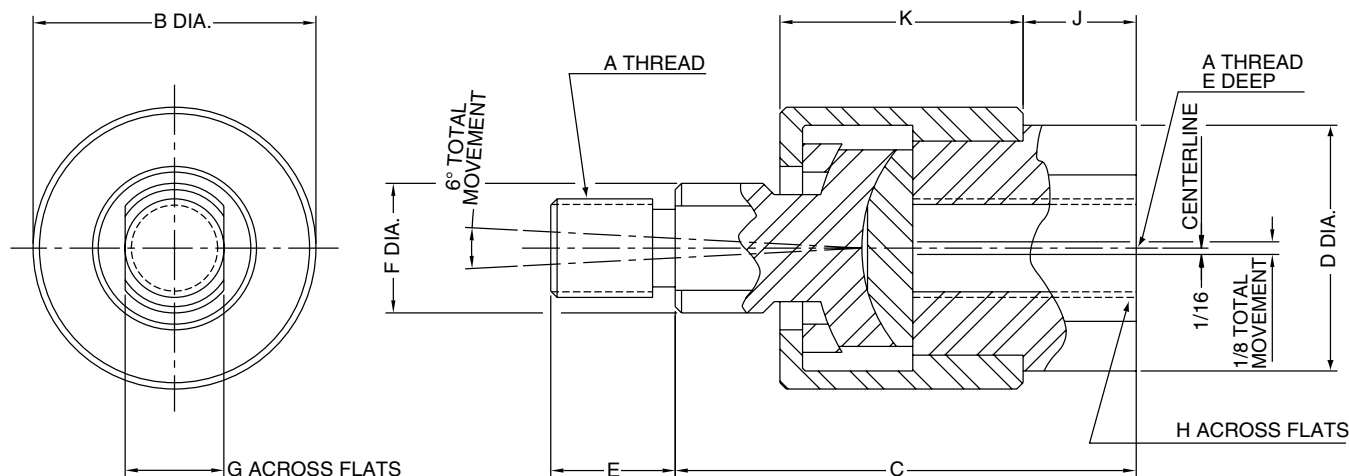


Table 1 — Part Numbers and Dimensions

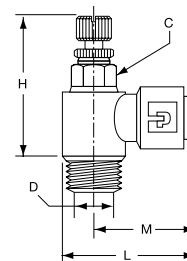
Part No.	A	B	C	D	E	F	G	H	J	K	Max. Pull Load (lbs.)	Approx. Weight (lbs.)
1347570031	5/16-24	1-1/8	1-3/4	15/16	1/2	1/2	3/8	3/4	3/8	15/16	1200	0.35
1347570038	3/8-24	1-1/8	1-3/4	15/16	1/2	1/2	3/8	3/4	3/8	15/16	2425	0.35
1347570044	7/16-20	1-3/8	2	1-1/8	3/4	5/8	1/2	7/8	3/8	13/32	3250	0.55
1347570050	1/2-20	1-3/8	2	1-1/8	3/4	5/8	1/2	7/8	3/8	13/32	4450	0.55
1347570063	5/8-18	1-3/8	2	1-1/8	3/4	5/8	1/2	7/8	3/8	13/32	6800	0.55
1347570075	3/4-16	2	2-5/16	1-5/8	1-1/8	1-5/16	3/4	1-5/16	7/16	19/32	9050	1.4
1347570088	7/8-14	2	2-5/16	1-5/8	1-1/8	1-5/16	3/4	1-5/16	7/16	19/32	14450	1.4
1347570100	1-14	3-1/8	3	2-3/8	1-5/8	1-7/16	1-1/4	1-7/8	3/4	1-25/32	19425	4.8
1347570125	1-1/4-12	3-1/8	3	2-3/8	1-5/8	1-7/16	1-1/4	1-7/8	3/4	1-25/32	30500	4.8
1337390125	1-1/4-12	3-1/2	4	2	2	1-1/2	1-1/4	1-11/16	3/4	2-1/2	30500	6.9
1337390150	1-1/2-12	4	4-3/8	2-1/4	2-1/4	1-3/4	1-1/2	1-15/16	7/8	2-3/4	45750	9.8
1337390175	1-3/4-12	4	4-3/8	2-1/4	2-1/4	1-3/4	1-1/2	1-15/16	7/8	2-3/4	58350	9.8

How to Order Linear Alignment Couplers

When ordering a cylinder with a threaded male rod end, specify the coupler of equal thread size by part number as listed in Table 1, i.e.; Piston Rod “KK” or “CC” dimension is 3/4” - 16”, specify coupler part number 1347570075.

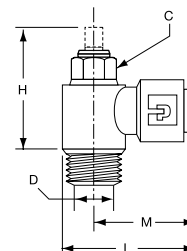
Miniature Exhaust Flow Control

Part Number	Tube Size	Thread Size	C Hex mm	H Closed	H Open	L	M	Flow Dia. D
0876300100	5/32	10-32	6	0.925	1.023	0.846	0.669	0.080
0876300200	5/32	1/8	7	1.000	1.083	0.935	0.708	0.100
0876300300	1/4	10-32	6	0.925	1.023	0.885	0.708	0.080
0876300400	1/4	1/8	7	1.000	1.083	0.957	0.730	0.100
0876300500	1/4	1/4	8	1.083	1.180	1.013	0.748	0.160



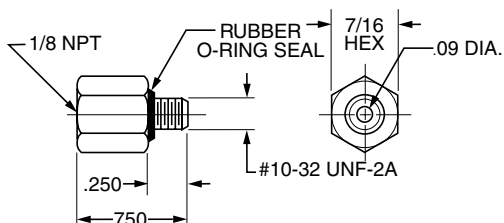
Knobless Miniature Exhaust Flow Control

Part Number	Tube Size	Thread Size	C Hex mm	H Closed	H Open	L	M	Flow Dia. D
0876310100	5/32	10-32	6	0.650	0.787	0.846	0.669	0.080
0876310200	1/4	1/8	7	0.708	0.860	0.956	0.730	0.100
0876310300	1/4	1/4	8	0.826	0.964	1.013	0.748	0.160

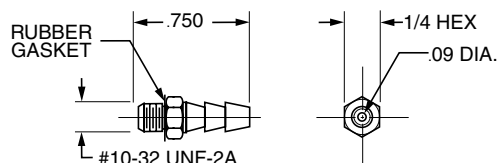


F

#10-32 to 1/8-27 Port Adapter
P.N. 1442840000



1/4" O.D. Hose Barbed Fittings
P.N. L06998 0000 (Pkg. of 10)



Blocking valves are designed for precise, repeatable stopping of moving cylinders or to maintain the position of a cylinder in the event of an air pilot signal loss. Blockers are used for positioning and jogging purposes.

A blocking valve has a spring loaded poppet which normally prevents flow through the valve in both directions. When an air pilot control signal (see pilot pressure chart below for required pilot signal pressure) is applied to the top of the valve, the poppet opens and allows the valve to flow in both directions like a standard fitting. When the pilot signal is removed, the poppet springs shut and prevents air from entering or leaving cylinder, thus stopping cylinder travel.

Blocking valves are designed to be installed directly into actuator ports (up to 5" bore cylinders).

Specifications

Operating Pressure: 0 to 145 PSI (0 to 10 Bar)

Temperature Range: 5°F to 140°F (-15°C to 60°C)

Maximum Operating Frequency: 10 Hz

Life Expectancy: 10 million cycles @ 90 PSIG, 68°F, dry filtered air and 1 Hz operating frequency

Materials: Zinc alloy body; brass mounting screw and threads

Pilot Pressure (PSI)

Operating Pressure	Cylinder Port Size							
	1/8"		1/4"		3/8"		1/2"	
	Pilot	Depilot	Pilot	Depilot	Pilot	Depilot	Pilot	Depilot
30	34	22	34	22	36	21	45	26
60	40	26	40	26	40	25	50	31
90	45	31	45	31	45	30	54	35
115	50	35	50	35	50	34	59	41

Model Selection

With Instant Tube Fittings

Cylinder Port	Tube Size (OD)	Pilot Tube (OD)	Part Number	Flow (Cv)	Wt. (oz)
1/8"	1/4"	5/32"	PWBA3468	0.78	5.1
1/4"	1/4"	5/32"	PWBA3469	1.02	5.3
3/8"	3/8"	5/32"	PWBA3493	1.67	6.3
1/2"	1/2"	5/32"	PWBA3412	2.12	17.5

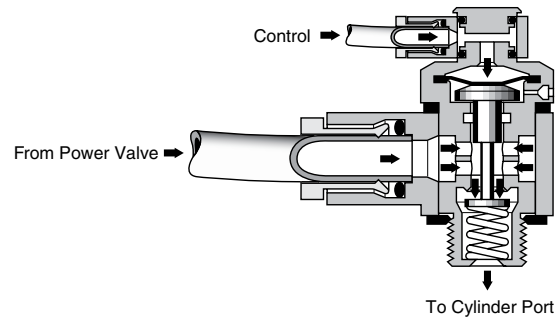
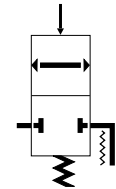
With NPT Threaded Connections & Tube Pilot Port

Cylinder Port	Female Port	Pilot Port	Part Number	Flow (Cv)	Wt. (oz)
1/8"	1/8"	5/32"*	PWBA3888	0.78	6.2
1/4"	1/4"	5/32"*	PWBA3899	1.02	6.2
3/8"	3/8"	10-32	PWBA3833	1.67	6.7
1/2"	1/2"	10-32	PWBA3822	2.12	16.8

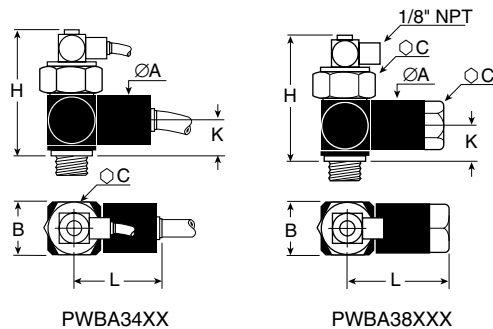
With NPT Threaded Connections & Pilot Port

Cylinder Port	Female Port	Pilot Port	Part Number	Flow (Cv)	Wt. (oz)
1/8"	1/8"	1/8"	PWBA38887	0.78	6.2
1/4"	1/4"	1/8"	PWBA38997	1.02	6.2
3/8"	3/8"	1/8"	PWBA38337	1.67	6.7
1/2"	1/2"	1/8"	PWBA38227	2.12	16.8

*Instant tube connection



Dimensions



Cyl. Port Size	A Dia.	B	C Hex	H	K	L	L1
1/8"	22 (0.90)	21 (0.86)	15/16"	59 (2.41)	19.5 (0.80)	39 (1.59)	43.5 (1.78)
1/4"	22 (0.90)	21 (0.86)	15/16"	53 (2.16)	13.5 (0.55)	39 (1.59)	43.5 (1.78)
3/8"	27 (1.10)	28 (1.14)	15/16"	53 (2.16)	14 (0.57)	50 (2.04)	55.5 (2.27)
1/2"	31 (1.27)	33 (1.35)	1-1/4"	66 (2.69)	24 (0.98)	66 (2.69)	63 (2.57)

Dimensions in mm (inch)

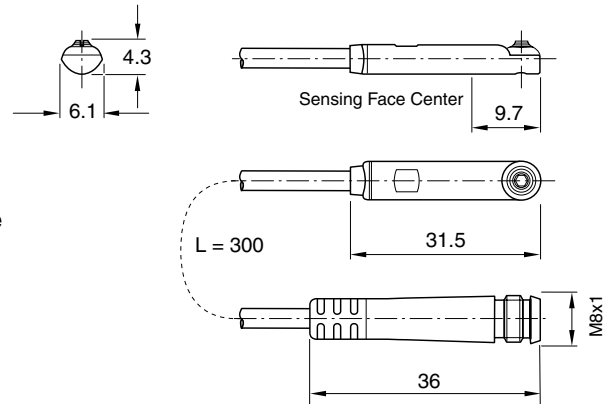
Global Drop-In Solid State Sensors  



Wiring	PNP Sensor	NPN Sensor	PNP Sensor ATEX Certified
3m Flying Leads	P8S-GPFLX	P8S-GNFLX	P8S-GPFLX/EX
10m Flying Leads	P8S-GPFTX	P8S-GNFTX	N/A
0.3m Lead with 8mm Connector	P8S-GPSHX	P8S-GNSHX	
0.3m Lead with 12mm Connector	P8S-GPMHX	P8S-GNMHX	
1m Lead with 8mm Connector	P8S-GPSCX	P8S-GNSCX	

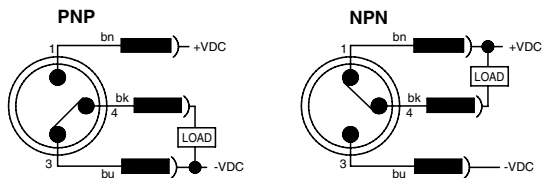
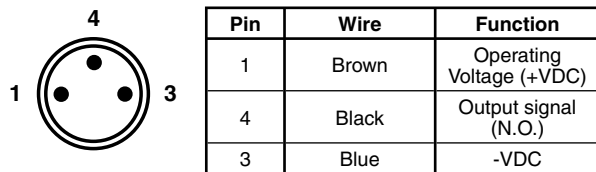
Specifications

Type Electronic
 Output Function Normally Open
 Sensor Output PNP/NPN
 Operating Voltage 10 - 30VDC
 Continuous Current 100 mA max.
 Response Sensitivity 28 Gauss min.
 Switching Frequency 5 KHz
 Power Consumption 10 mA max.
 Voltage Drop 2.5 VDC max.
 Ripple 10% of Operating Voltage
 Hysteresis 1.5 mm max.
 Repeatability 0.1 mm max.
 EMC EN 60 947-5-2
 Short-circuit Protection Yes
 Power-up Pulse Suppression Yes
 Reverse Polarity Protection Yes
 Enclosure Rating IP 68
 Shock and Vibration Stress 30g, 11 ms, 10 to 55 Hz, 1 mm
 Operating Temperature Range -25°C to +75°C (-13°F to 167°F)
 Housing Material PA 12, Black
 Connector Cable PVC
 Connector PUR cable w/8 or 12 mm connector

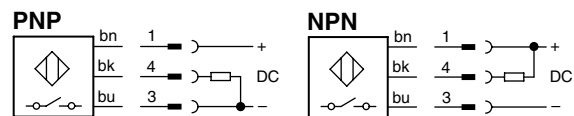


SOLID STATE SENSOR – WIRING CONNECTION

Flying Lead or 8 mm Connector (shown)



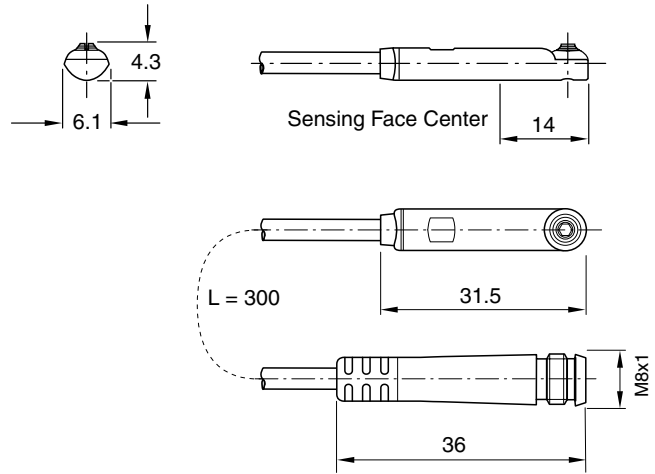
12 mm Connector



Global Drop-In Reed Sensors



Wiring	Reed Sensor
3m Flying Leads	P8S-GRFLX
10m Flying Leads	P8S-GRFTX
0.3m Lead with 8mm Connector	P8S-GRSHX
0.3m Lead with 12mm Connector	P8S-GRMHX
1m Lead with 8mm Connector	P8S-GRSCX



Specifications

Type	2-Wire Reed
Output Function	Normally Open
Operating Voltage	10 - 120 VAC* 10 - 30 VDC
Switching Power	6 W/VA
Continuous Current	100 mA max.
Response Sensitivity	30 Gauss min.
Switching Frequency	400 Hz
Voltage Drop	2.5 V max.
Ripple	10% of Operating Voltage
Hysteresis	1.5 mm max.
Repeatability	0.2 mm max.
EMC	EN 60 947-5-2
Reverse Polarity Protection	Yes
Enclosure Rating	IP 68
Shock and Vibration Stress	30g, 11 ms, 10 to 55 Hz, 1 mm
Operating Temperature Range	-25°C to +75°C (-13°F to 167°F)
Housing Material	PA 12, Black
Connector Cable	PVC
Connector	PUR cable with 8 or 12 mm connector

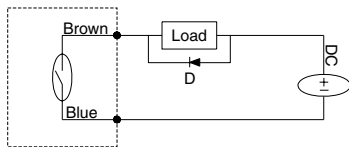
*8mm connector rated for 50 VAC max.

REED SENSOR - WIRING CONNECTION																
Flying Lead or 8 mm Connector																
	<table border="1"> <thead> <tr> <th>Pin</th> <th>Wire</th> <th>Function</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Brown</td> <td>Operating Voltage (+V)</td> </tr> <tr> <td>4</td> <td>Black</td> <td>Not Used</td> </tr> <tr> <td>3</td> <td>Blue</td> <td>Output Signal (-V or Ground)</td> </tr> </tbody> </table>	Pin	Wire	Function	1	Brown	Operating Voltage (+V)	4	Black	Not Used	3	Blue	Output Signal (-V or Ground)			
Pin	Wire	Function														
1	Brown	Operating Voltage (+V)														
4	Black	Not Used														
3	Blue	Output Signal (-V or Ground)														
12 mm Connector																
<p>* Pin 2 not present.</p>	<table border="1"> <thead> <tr> <th>Pin</th> <th>Wire</th> <th>Function</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Brown</td> <td>Operating Voltage (+V)</td> </tr> <tr> <td>2*</td> <td>White</td> <td>Not Used</td> </tr> <tr> <td>3</td> <td>Blue</td> <td>Output Signal (-V or Ground)</td> </tr> <tr> <td>4</td> <td>Black</td> <td>Not Used</td> </tr> </tbody> </table>	Pin	Wire	Function	1	Brown	Operating Voltage (+V)	2*	White	Not Used	3	Blue	Output Signal (-V or Ground)	4	Black	Not Used
Pin	Wire	Function														
1	Brown	Operating Voltage (+V)														
2*	White	Not Used														
3	Blue	Output Signal (-V or Ground)														
4	Black	Not Used														



Circuit for Switching Contact Protection (For Inductive Loads, e.g. Solenoids, Relays)
(Required for proper operation 24V DC)

Put Diode parallel to loads following polarity as shown below.



D: Diode: select a Diode with the breakdown voltage and current rating according to the load.

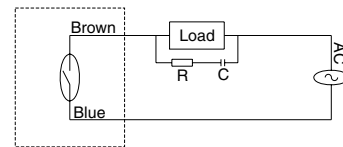
Typical Example—100 Volt, 1 Amp Diode
CR: Relay coil (under 0.5W coil rating)

(Recommended for longer life 120 VAC)

Put a resistor and capacitor in parallel with the load. Select the resistor and capacitor according to the load.

Typical Example:

CR: Relay coil (under 2W coil rating)
R: Resistor 1 KΩ - 5 KΩ, 1/4 W
C: Capacitor 0.1 μF, 600 V



Caution

- Use an ammeter to test reed sensor current. Testing devices such as incandescent light bulbs may subject the reed sensor to high in-rush loads.
- **NOTE:** When checking an unpowered reed sensor for continuity with a digital ohmmeter the resistance reading will change from infinity to a very large resistance (2 M ohm) when the sensor is activated. This is due to the presence of a diode in the reed sensor.
- Anti-magnetic shielding is recommended for reed sensors exposed to high external RF or magnetic fields.
- The magnetic field strength of the piston magnet is designed to operate with our sensors. Other manufacturers' sensors may not operate correctly in conjunction with these magnets.

- Use relay coils for reed sensor contact protection.
- The operation of some 120 VAC PLC's (especially some older Allen-Bradley PLC's) can overload the reed sensor. The sensor may fail to release after the piston magnet has passed. This problem may be corrected by the placement of a 700 to 1K OHM resistor between the sensor and the PLC input terminal. Consult the manufacturer of the PLC for appropriate circuit.
- Sensors with long wire leads (greater than 15 feet) can cause capacitance build-up and sticking will result. Attach a resistor in series with the reed sensor (the resistor should be installed as close as possible to the sensor). The resistor should be selected such that $R \text{ (ohms)} > E/0.3$.

Mini-Global Drop-In Solid State Sensors

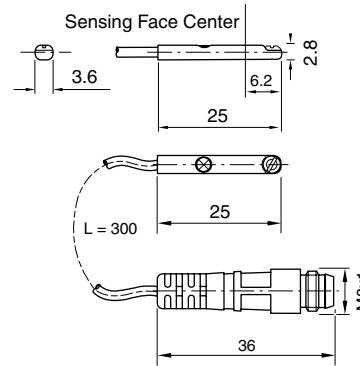


Wiring	PNP Sensor	NPN Sensor
3m Flying Leads	P8S-MPFLX	P8S-MNFLX
10m Flying Leads	P8S-MPFTX	P8S-MNFTX
0.3m Lead with 8mm Connector	P8S-MPSHX	P8S-MNSHX

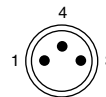
Solid State Sensor

SPECIFICATIONS

Type Electronic
 Output Function Normally Open
 Sensor Output PNP or NPN
 Operating Voltage 10 - 30VDC
 Continuous Current ≤ 70 mA
 Response Sensitivity ≤ 48 Gauss
 Switching Frequency 1000 Hz
 Power Consumption ≤ 8 mA without load
 Voltage Drop ≤ 2.5 VDC
 Ripple 10% of Operating Voltage
 Hysteresis ≤ 15 Gauss
 Repeatability ≤ ±0.1 mm
 EMC EN 60 947-5-2
 Short-circuit Protection Yes
 Power-up Pulse Suppression No
 Reverse Polarity Protection Yes
 Enclosure Rating IP 67
 Shock and Vibration Stress 30g, 11 ms, 10 to 55 Hz, 1 mm
 Operating Temperature Range -25°C to +75°C (-13°F to 167°F)
 Housing Material PA 12
 Connector Cable PUR 3 x 0.09mm²
 Connector PUR cable w/8mm connector

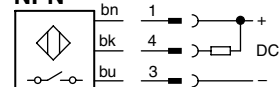


WIRING CONNECTION

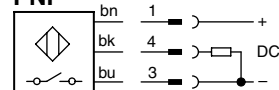


Pin	Wire	Function
1	Brown	+VDC
4	Black	NO
3	Blue	-VDC

NPN



PNP

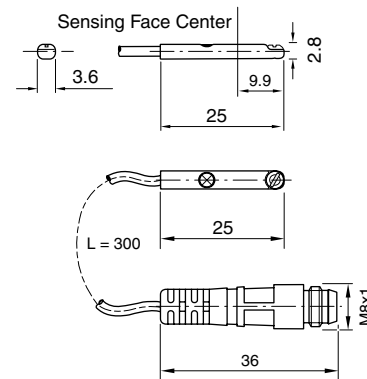


Mini-Global Drop-In Reed Sensors 

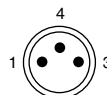
Wiring	Reed Sensor
3m Flying Leads	P8S-MRFLX
10m Flying Leads	P8S-MRFTX
0.3m Lead with 8mm Connector	P8S-MRSHX

Specifications

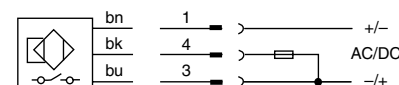
Type 3-Wire Reed
 Output Function Normally Open
 Operating Voltage 10 - 30 VAC, 10 - 30 VDC
 Switching Power 10 W/VA
 Continuous Current ≤ 500 mA max.
 Response Sensitivity ≤ 48 Gauss
 Switching Frequency 500 Hz
 Hysteresis ≤ 7 Gauss
 Repeatability ≤ 0.1 mm
 EMC EN 60 947-5-2 / EN 40 050
 Enclosure Rating IP 67
 Shock and Vibration Stress 30g, 11 ms, 10 to 55 Hz, 1 mm
 Operating Temperature Range -25°C to +75°C (-13°F to 167°F)
 Housing Material PA 12
 Connector Cable PUR 3 x 0.09 mm²
 Connector PUR cable w/8mm connector



WIRING CONNECTION



Pin	Wire	Function
1	Brown	Operating Voltage (+V)
4	Black	Output signal
3	Blue	Ground (-V)



Caution

- Use an ammeter to test reed sensor current. Testing devices such as incandescent light bulbs may subject the reed sensor to high in-rush loads.
- **NOTE:** When checking an unpowered reed sensor for continuity with a digital ohmmeter the resistance reading will change from infinity to a very large resistance (2 M ohm) when the sensor is activated. This is due to the presence of a diode in the reed sensor.
- Anti-magnetic shielding is recommended for reed sensors exposed to high external RF or magnetic fields.
- The magnetic field strength of the piston magnet is designed to operate with our sensors. Other manufacturers' sensors may not operate correctly in conjunction with these magnets.

- Use relay coils for reed sensor contact protection.
- The operation of some 120 VAC PLC's (especially some older Allen-Bradley PLC's) can overload the reed sensor. The sensor may fail to release after the piston magnet has passed. This problem may be corrected by the placement of a 700 to 1K OHM resistor between the sensor and the PLC input terminal. Consult the manufacturer of the PLC for appropriate circuit.
- Sensors with long wire leads (greater than 15 feet) can cause capacitance build-up and sticking will result. Attach a resistor in series with the reed sensor (the resistor should be installed as close as possible to the sensor). The resistor should be selected such that $R \text{ (ohms)} > E/0.3$.

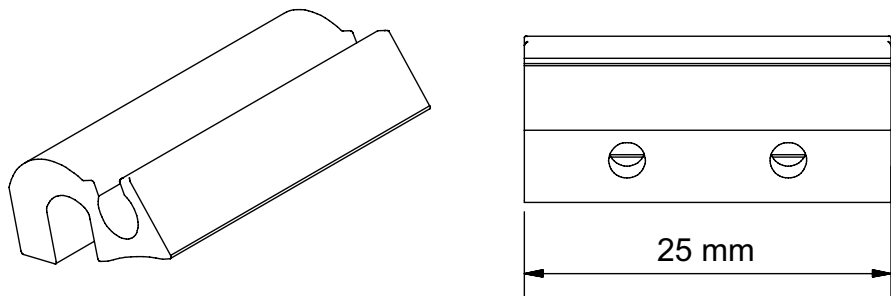
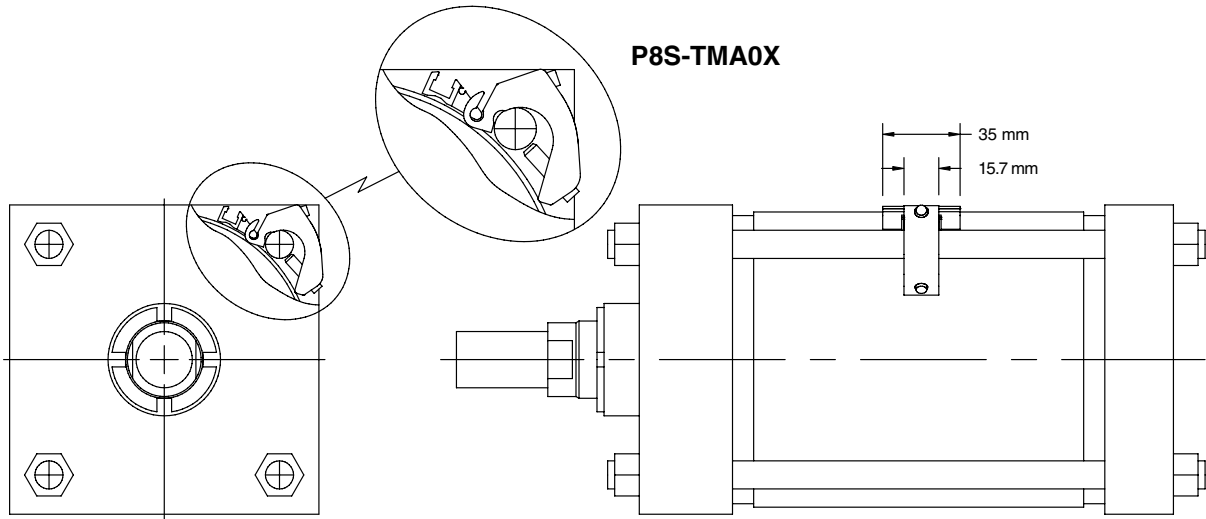


Tie Rod Bracket Assembly Part Number and Dimensions

Tie Rod Bracket Assembly is necessary for sensor installation on all tie rod construction cylinders. This includes all Style DD (NFPA MT4) mounts, some 1-1/8" bore mounts and all 6" and 8" bore cylinders. Sensors and bracket assemblies must be ordered separately.

Part number P8S-TMA0X fits 1-1/2" to 8" bores for Global Sensors
Part number P8S-TMA0Z fits 1-1/8" bore for Mini-Global Sensors

F



NAMUR Intrinsically Safe Sensors  

Part Number	Sensor Description
0897790001	Fits 1-1/8" to 4" bore (2m flying lead)
0897790002	Fits 1-1/8" to 4" bore (12mm connector)
0897790003	Fits 5" to 6" bore (2m flying lead)
0897790004	Fits 5" to 6" bore (12mm connector)
0897790005	Fits 8" bore (2m flying lead)
0897790006	Fits 8" bore (12mm connector)

Specifications

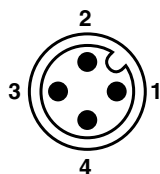
Electrical configuration NAMUR 2-Wire
 Output function NAMUR
 Supply voltage 5-25 VDC
 Response sensitivity ≤ 30 Gauss
 Switching frequency 5 kHz
 Switching output Control current dependent on switching
 Residual ripple ≤ 5% of Supply Voltage
 Power consumption, attenuated ≤ 2.5mA
 Power consumption, unattenuated ≤ 1mA
 Internal capacitance ≤ 15nF
 Internal inductance ≤ 25 μH
 Cable resistance ≤ 50 Ohm
 Hysteresis ≤ 1mm
 Repeatability ≤ 0.1mm
 EMC EN 60 947-5-6
 Short circuit protected Yes
 Reverse polarity protected Yes
 Enclosure rating IP67
 Shock/vibration stress 30 g, 11ms, 10-55 Hz, 1mm
 Operating temperature -25°C to +70°C (-13°F to +158°F)
 Housing material aluminum, plastic
 Connector cable PVC with Flying Leads (shown)
 Connector (option) M12 connector
 Classification TÜV 99 ATEX 1398 II 2G EEx ib IIC T6

Data for Connecting Power Supplies or other approved isolating amplifiers:

Short circuit current I_{Kmax} ≤ 30mA
 No load voltage ≤ 16VDC
 Power loss ≤ 75mW

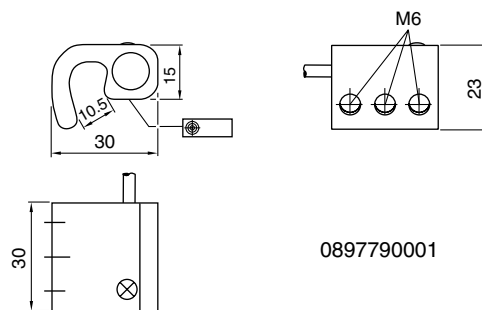
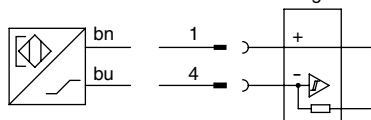
Note: Intrinsically safe NAMUR solutions must include a NAMUR Power Supply

Wiring Connection

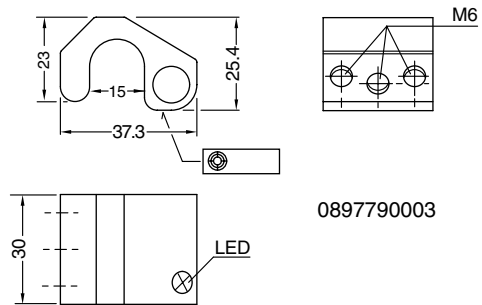


Pin	Wire	Function
1	Brown	Operating Voltage (+VDC)
4	Blue	-VDC
2		Not Used
3		Not Used

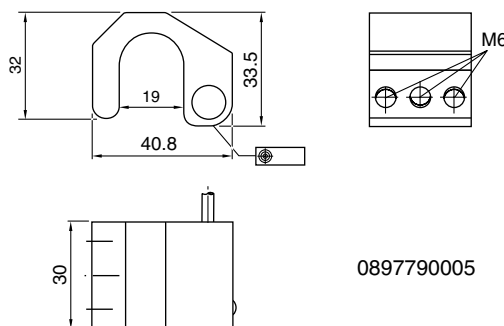
NAMUR Power Supply/
Isolating Unit



0897790001



0897790003



0897790005

NAMUR Sensor Power Supply



For All NAMUR Sensors

Part Number	Supply Voltage
0897810001	115VAC
0897810002	230VAC
0897810003	24VDC

- Reliable DC-decoupling between input, output and supply voltage in accordance with VDE 0100 Part 410
- 2-channel with one relay output SPDT respectively
- Intrinsically safe inputs complying with [EEx 1a] IIC
- Housing with snap fastening for support rail DIN 46277

Specifications

Supply voltage 115 VAC (p/n 0897810001)
 230 VAC (p/n 0897810002)
 24 VDC (p/n 0897810003)

Mains frequency 48-62 Hz

Switching frequency ≤ 20 Hz

Power consumption per channel Approximately 1.5 VA
 Approximately 0.7 W only for
 p/n 0897810003

Inputs 2 sensors

No load voltage 8.5 VDC

Short circuit current ≤ 6mA

Permissible external capacitance ... ≤ 567nF

Permissible external inductance ≤ 5 mH

Switching outputs 1 relay per input: SPDT

Switching voltage ≤ 250 VAC

Switching current ≤ 5 A

Switching output ≤ 100 VA

Permit PTB no. Ex-95.C.2003X

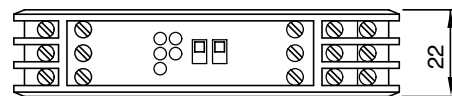
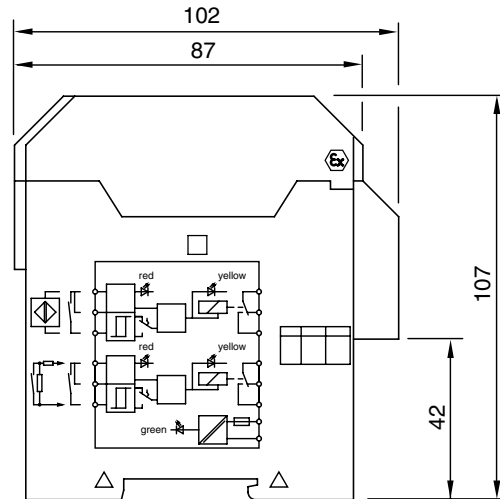
VDE protection class I

Enclosure rating IP20

Operating temperature -25°C to +60°C (-13°F to +140°F)

Approximate weight 250g (8.8 oz.)

Housing material Plastic



Cordset Specifications

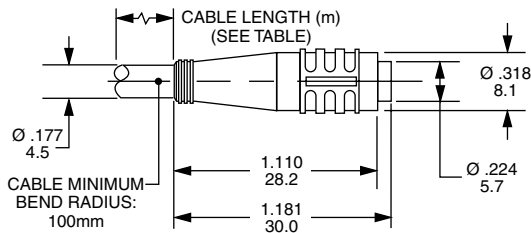
Air Cylinders 3MA Series

8mm Cordset with Female Quick Connect

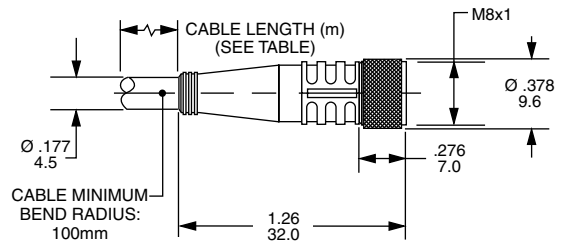
A female connector is available for all sensors with the male 8mm quick connect option. The male plug will accept a snap-on or threaded connector. Cordset part numbers are listed below:

Cable Length	Threaded Connector	Snap On Connector
5 meters	086620T005	086620S005
2 meters	086620T002	086620S002

Snap-On Straight Connector



Threaded Straight Connector



12mm Cordset with Female Quick Connect

M12 Straight Connector	
Cable Length	Part Number
5 meters	9126487205
2 meters	9126487202

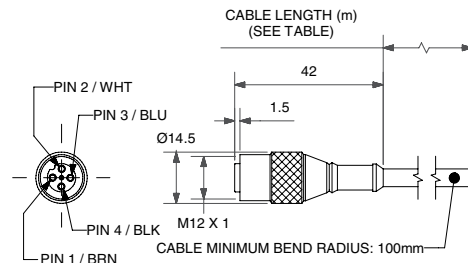
M12 Right Angle Connector	
Cable Length	Part Number
5 meters	9126487305
2 meters	9126487302

A female connector is available for all sensors with the male 12mm quick connect option. The cordsets are available with a right angle or straight connector. Cordset part numbers are listed above.

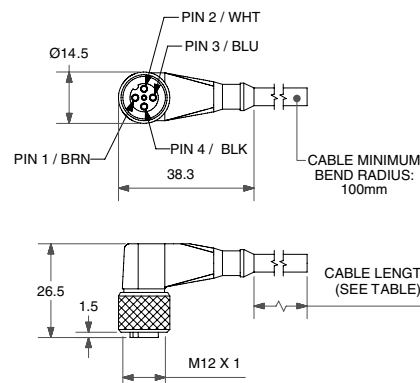
Cordset Specifications

- Connector Polyvinylchloride (PVC) body material, PVC contact carrier, spacing to VDE 0110 Group C, (250VAC / 300VDC)
- Contacts Gold Plated Copper Tin (CuSn), stamped from stock.
- Coupling Method Threaded nut: Chrome plated brass.
- Cord Construction PVC non-wicking, non-hygrosopic, 250VAC / 300VDC. Cable end is stripped.
- Conductors Extra high flex stranding with PVC insulation
- Temperature -13°F to 158°F (-25°C to 70°C)
- Protection NEMA 1, 3, 4, 6P and IEC 1P67
- Cable Length 6.56 ft (2m) or 16.4 ft (5m)

Straight Connector



Right Angle Connector



Operating Fluids and Temperature Range

Fluidpower cylinders are designed for use with pressurized air, hydraulic oil and fire resistant fluids, in some cases special seals are required.

Standard Seals (class 1)

Class 1 seals are what is normally provided in a cylinder unless otherwise specified. They are intended for use with fluids such as: air, nitrogen, mineral base hydraulic oil or MIL-H-5606 within the temperature range of -10°F (-23°C) to +165°F (+74°C). Generally they are nitrile except for piston rod seals in hydraulic cylinders. However the individual seals may be nitrile (Buna-N) enhanced polyurethane, polymyte, P.T.F.E. or filled P.T.F.E.

Water Base Fluid Seals (class 2)

Generally class 2 seals are intended for use with water base fluids within the temperature of -10°F (-23°C) to +165°F (+74°C) except for High Water Content Fluids (H.W.C.F.) in which case Class 6 seals should be used. Typical water base fluids are: Water, Water-Glycol, Water-in Emulsion, Houghto-Safe 27, 620, 5040, Mobil Pyrogard D, Shell Iru 905, Ucon Hydrolube J-4. These seals are nitrile. Lipseal will have polymyte or P.T.F.E. back-up washer when required. O-rings will have nitrile back-up washers when required.

Ethylene Propylene (E.P.R.) Seals (class 3)

Class 3 seals are intended for use with some Phosphate Ester Fluids between the temperatures of -10°F (-23°C) to +130°F (+54°C). Typical fluids compatible with E.P.R. seals are Skydrol 500 and 700. E.P.R. are Ethylene Propylene. Lipseals will have a P.T.F.E. back-up washer when required. O-rings will have EPB back-up washers when required. **Note:** E.P.R. seals are not compatible with mineral base hydraulic oil or greases. Even limited exposure to these fluids will cause severe swelling. P.T.F.E. back-up washer may not be suitable when used in a radiation environment.

Low Temperature Nitrile Seals (class 4)

Class 4 seals are intended for low temperature service with the same type of fluids as used with Class 1 seals within the temperature range of -50°F (-46°C) to +150°F (+66°C). Lipseals will have leather, polymyte or P.T.F.E. back-up washers when required. O-rings will have nitrile back-up washers when required.

Fluorocarbon Seals (class 5)

Class 5 seals are intended for elevated temperature service or for some Phosphate Ester Fluids such as Houghto-Safe 1010, 1055, 1120; Fyrquel 150, 220, 300, 350; Mobile Pyrogard 42, 43, 53, and 55. **Note:** In addition, class 5 seals can be used with fluids listed below under standard service. However, they are not compatible with Phosphate Ester Fluids such as Skydrols. Class 5 seals can operate with a temperature range of -10°F (-23°C) to +250°F (+121°C). Class 5 seals may be operated to +400°F (+204°C) with limited service life, but please consult the Actuator Division for possible cylinder material changes. For temperatures above +250°F (+120°C) the cylinder must be manufactured with non-studded piston rod and thread and a pinned piston to rod connection. Class 5 Lipseals will have P.T.F.E. back-up washers when required. O-rings will have fluorocarbon back-up when required.

Warning ⚠

The piston rod stud and the piston rod to piston threaded connections are secured with an anaerobic adhesive which is temperature sensitive. Cylinders specified with Class 5 seals are assembled with anaerobic adhesive having a maximum temperature rating of +250°F (+74°C). Cylinders specified with all other seal compounds are assembled with anaerobic adhesive having a maximum operating temperature rating +165°F (+74°C). These temperature limitations are necessary to prevent the 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 factory immediately and arrange for the piston to rod and the stud to piston rod connections to be properly re-assembled to withstand the higher temperature service.

Lipseal Pistons

Under most conditions lipseals provide the best all around service for pneumatic applications. Lipseals with a back-up washer are often used for hydraulic applications when virtually zero static leakage is required. Lipseals will function properly in these applications when used in conjunction with moderate hydraulic pressures.

Water Service

For pressures up to 400 PSIG, 4ML series cylinders can be modified to make them more suitable for use with water as the operating medium. Chrome plated 17-4 PH stainless steel piston rod is recommended to inhibit corrosion.

Warranty

Parker Hannifin will warrant cylinders modified for water or high water content fluid service to be free of defects in materials or workmanship, but cannot accept responsibility to premature failure due to excessive wear due to lack of lubricity or where failure is caused by corrosion, electrolysis or mineral deposits within the cylinder.

Non-Lubricated Air Cylinders

3MA air cylinders with Class 1 seals are recommended for non-lubricated air service. These cylinders are originally lubricated at the factory and, with the rounded lipseal design, typically do not require any additional lubrication for most applications. Please note that the use of air-line oil lubricators will wash away the original grease lubricant, so it must be continued until the cylinder is serviced with the appropriate grease lubricant.



Class No.	Typical Fluids	Temperature Range
1 (Standard) (Nitrile Polyurethane)	Air, Nitrogen, Hydraulic Oil, Mil-H-5606 Oil	-10°F (-23°C) to +165°F (+74°C)
2 Optional Water Base Fluid Seal	Water, Water-Glycol, H.W.C.F. — See Class 6 below. Water-in-Oil Emulsion Houghto-Safe, 271, 620, 5040 Mobil Pyrogard D, Shell Iru 905 Ucon Hydrolube J-4	-10°F (-23°C) to +165°F (+74°C)
3 Special (E.P.R.) (At extra cost)	Some Phosphate Ester Fluids Skydrol 500, 7000	-10°F (-23°C) to +130°F (+54°C)
Note: (E.P.R.) seals are not compatible with Hydraulic Oil		
4 Special (Nitrile) (At extra cost)	Low Temperature Air or Hydraulic Oil	-50°F (-46°C) to +150°F (+66°C)
5 Optional (At extra cost) (Fluorocarbon Seals)	High Temperature Houghto-Safe 1010, 1055, 1120 Fyrquel 150, 220, 300, 550 Mobil Pyrogard 42,43,53,55	See above paragraph on fluorocarbon seals for recommended temperature range.
Note: Fluorocarbon seals are not suitable for use with Skydrol fluid, but can be used with hydraulic oil if desired		

Fundamental Cylinders

Standard Double-Acting Cylinders

Power stroke is in both directions and is used in the majority of applications.

Single-Acting Cylinders

When thrust is needed in only one direction, a single-acting cylinder may be used. The inactive end is vented to atmosphere through a breather/filter for pneumatic applications, or vented to reservoir below the oil level in hydraulic application.

Double-Rod Cylinders

Used when equal displacement is needed on both sides of the piston, or when it is mechanically advantageous to couple a load to each end. The extra end can be used to mount cams for operating limit switches, etc.

Spring Return, Single-Acting Cylinders

Usually limited to very small, short stroke cylinders used for holding and clamping. The length needed to contain the return spring makes them undesirable when a long stroke is needed.

Ram Type, Single-Acting Cylinders

Containing only one fluid chamber, this type of cylinder is usually mounted vertically. The weight of the load retracts the cylinder. They are sometimes know as “displacement cylinders”, and are practical for long strokes.

Telescoping Cylinders

Available with up to 4 or 5 sleeves; collapsed length is shorter than standard cylinders. Available either single or double-acting, they are relatively expensive compared to standard cylinders.

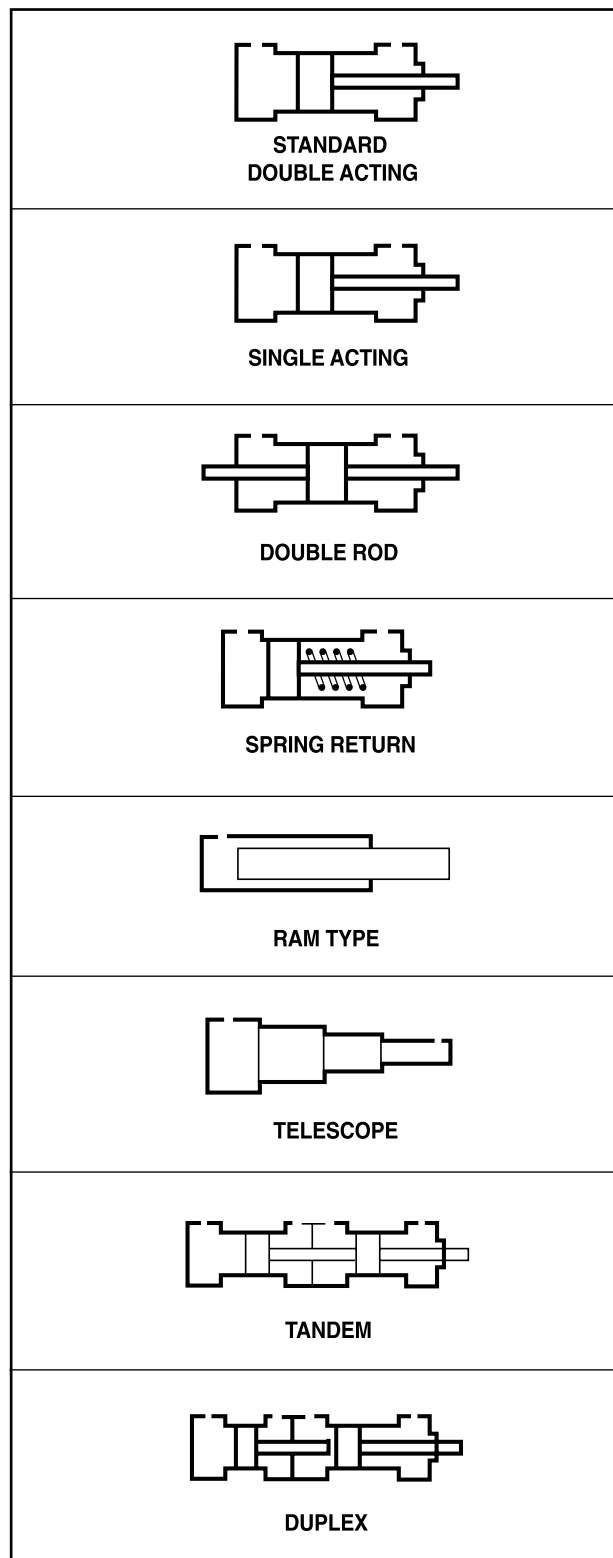
Tandem Cylinders

A tandem cylinder is made up of two cylinders mounted in line with pistons connected by a common piston rod and rod seals installed between the cylinders to permit double acting operation of each. Tandem cylinders allow increased output force when mounting width or height are restricted.

Duplex Cylinders

A duplex cylinder is made up of two cylinders mounted in line with pistons not connected and with rod seals installed between the cylinders to permit double acting operation of each. Cylinders may be mounted with piston rod to piston (as shown) or back to back and are generally used to provide three position operation.

Illustration B29



**Calculation of Cylinder Forces – Inch Based Product
 Theoretical Push and Pull Forces for Pneumatic Cylinders**

Push Force and Displacement

Cylinder Bore Size (inch)	Piston Area (in ²)	Cylinder Push Stroke Force in Pounds at Various Pressures (PSI)						Cu. Ft. Free Air at 80 lbs. Pressure, Required to Move Max. Load 1 Inch	Displacement Per Inch of Stroke (ft ³)
		25	50	65	80	100	250		
1-1/8	0.994	25	50	65	80	99	249	0.00371	0.0005751
1-1/2	1.767	44	88	115	142	177	443	0.00659	0.0010225
2	3.14	79	157	204	251	314	785	0.01171	0.0018171
2-1/2	4.91	123	245	319	393	491	1228	0.01830	0.0028414
3-1/4	8.30	208	415	540	664	830	2075	0.03093	0.0048032
4	12.57	314	628	817	1006	1257	3143	0.04685	0.0072743
5	19.64	491	982	1277	1571	1964	4910	0.07320	0.0113657
6	28.27	707	1414	1838	2262	2827	7068	0.10541	0.0163599
7	38.49	962	1924	2502	3079	3849	9623	0.14347	0.0222743
8	50.27	1257	2513	3268	4022	5027	12568	0.18740	0.0290914



Deductions for Pull Force and Displacement

Piston Rod Dia. (inch)	Piston Rod Area (in ²)	Piston Rod Diameter Force In Pounds At Various Pressures (PSI)						Cu. Ft. Free Air at 80 lbs. Pressure, Required to Move Max. Load 1 Inch	Displacement Per Inch of Stroke (ft ³)
		To determine Cylinder Pull Force or Displacement, deduct the following Force or Displacement corresponding to Rod Size, from selected Push Stroke Force or Displacement corresponding to Bore Size in table above.							
		25	50	65	80	100	250		
3/8	0.110	3	6	7	9	11	28	0.00041	0.0000636
1/2	0.196	5	10	13	16	20	49	0.00073	0.0001134
5/8	0.307	8	15	20	25	31	77	0.00114	0.0001776
1	0.785	20	39	51	65	79	196	0.00293	0.0004542
1-3/8	1.49	37	75	97	119	149	373	0.00554	0.0008622
1-3/4	2.41	60	121	157	193	241	603	0.00897	0.0013946

General Formula

The cylinder output forces are derived from the formula:

$$F = P \times A$$

Where F = Force in pounds.

P = Pressure at the cylinder in pounds per square inch, gauge.

A = Effective area of cylinder piston in square inches.

Free Air refers to normal atmospheric conditions of the air at sea level (14.7 PSI). Use above cu. ft. free air required data to compute CFM required from a compressor at 80 PSI. Cu. ft. of free air required at other pressures can be calculated using formula below.

$$V_1 = \frac{(P_2 + 14.7) V_2}{14.7}$$

Where V₁ = Free air consumption per inch of stroke (cubic feet).

V₂ = Cubic feet displaced per inch of stroke.

P₂ = Gauge pressure required to move maximum load.

Single rod type, fluid power cylinders are commonly available in 20 standard mounting styles ranging from head or cap end mounts to intermediate mounts. Many mounting styles are also available in double rod type cylinders. Refer to NFPA Std. B93.15-1981 or Parker air or hydraulic cylinder catalogs for detailed description.

Standard mounting styles for fluid power cylinders fall into three basic groups. The groups can be described as follows.

Group 1 – Straight line force transfer with fixed mounts which absorb force on cylinder centerline.

Group 3 – Straight line force transfer with fixed mounts which do not absorb force on cylinder centerline.

Group 2 – Pivot force transfer with pivot mounts which absorb force on cylinder centerline and permit cylinder to change alignment in one plane.

Cylinder mounting directly affects the maximum pressure at which the fluid power cylinder can be used, and proper selection of mounting style will have a bearing on cylinder operation and service life. Whether the cylinder is used in thrust or tension, its stroke length, piston rod diameter and the method of connection to load also must be considered when selecting a mounting style.

Many pneumatic cylinders are offered for use with air pressure up to 250 PSI. The industrial tie rod types, known as NFPA cylinders, with square heads and caps, plus mountings lend themselves to standardized mounts which are similar in appearance for air cylinders.

Straight Line Force Transfer (Group 1)

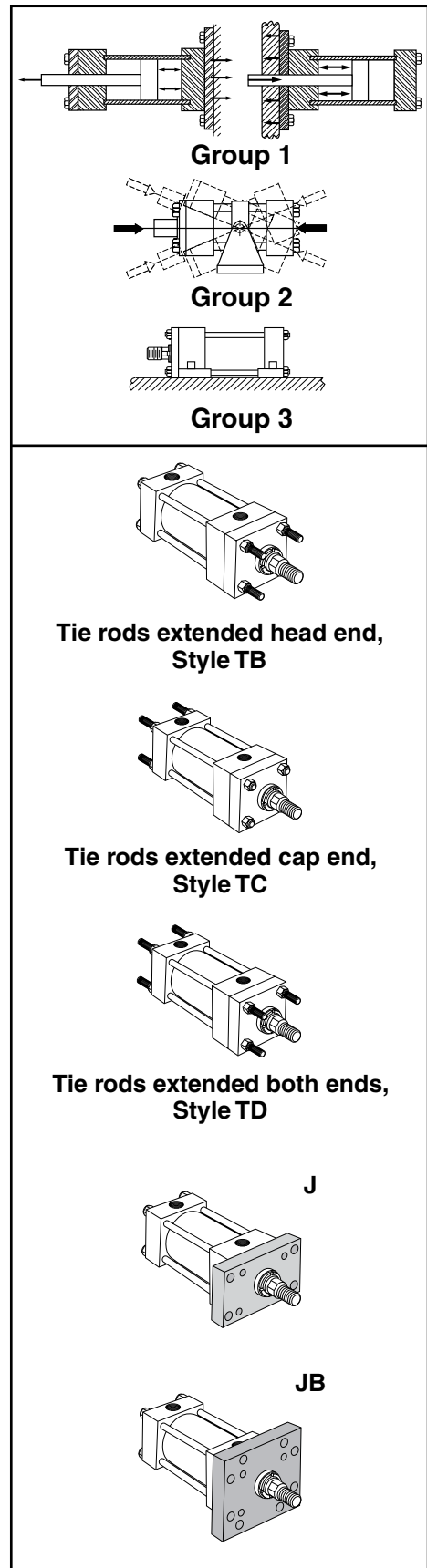
Cylinders with fixed mounts (Group 1) which absorb the force on centerline are considered the best for straight line force transfer. Tie rods extended, flange or centerline lug mounts are symmetrical and allow the thrust or tension forces of the piston rod to be distributed uniformly about the cylinder centerline. Mounting bolts are subjected to simple tension or simple shear without compound forces, and when properly installed damaging cylinder bearing sideloading is kept to a minimum.

Tie Rods Extended are considered to be of the centerline mount type. The cylinder tie rods are designed to withstand maximum rated internal pressure and can be extended and used to mount the cylinder at cap or head end. This often overlooked mounting will securely support the cylinder when bolted to the panel or machine member to which the cylinder is mounted. The torque value for the mounting nuts should be the same as the tie rod nut torque recommended by the cylinder manufacturer. Cylinders are available with tie rod extended both ends. In such applications one end is used for mounting and the opposite end to support the cylinder or to attach other machine components.

Tie rod mount cylinders may be used to provide thrust or tension forces at full rated pressures.

Tie rods extended head end (Style TB), cap end (Style TC) or extended both ends (Style TD) are readily available and fully dimensioned in Parker cylinder product catalogs.

Flange Mount cylinders are also considered to be centerline mount type and thus are among the best mounts for use on straight line force transfer applications. The machine designer has a choice of mounting styles at each end, such as head rectangular flange (Style J), head square flange (Style JB), cap rectangular flange (Style H), and cap square flange (Style HB). Selection of a flange mounting style depends, in part, upon whether the major force applied to the load will result in compression (push) or tension (pull) stresses of the cylinder piston rod. Cap end mounting styles are recommended for thrust loads (push), while head end mounting styles are recommended where the major load puts the piston rod in tension (pull).



F

Flange mounts are best used when end face is mounted against the machine support member. (Fig. 1) This is especially true where head rectangular flange type (Style J) is used with major load in tension. In this mode, the flange is not subjected to flexure or bending stresses, nor are the mounting bolts stressed to unusually high levels. The use of head rectangular flange (Style J) mount with major load in compression (see Fig. 2) is not recommended except on reduced pressure systems. The use of Style J mount in compression subjects the flange to bending and the mounting bolts to tension stresses, which could result in early fatigue failure. For applications where push forces require full rated system pressure, head square flange (Style JB) mounts are recommended.

Cap flange mounts are also best used when end face is mounted against the machine support member. The use of cap rectangular flange mount, Style H, is not recommended on applications where the major load is in tension (pull) except at reduced pressure.

For applications where pull forces involved require full rated system pressure, cap square flange, Style HB mounts are recommended.

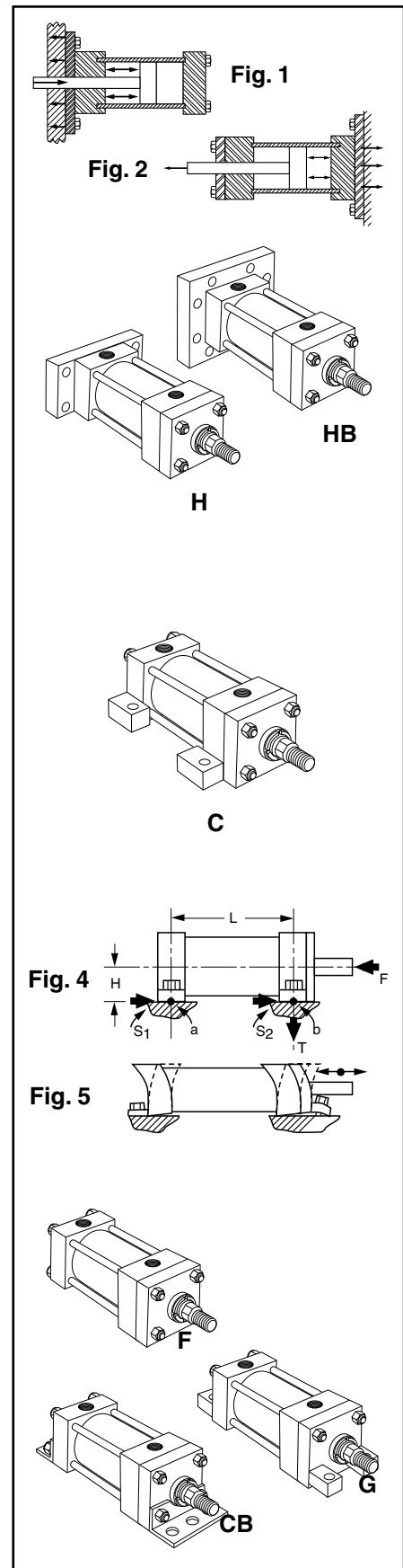
Straight Line Force Transfer (Group 3)

Side Mount cylinders are considered to be fixed mounts which do not absorb force on their centerline. Cylinders of this group have mounting lugs connected to the ends, and one style has side tapped holes for flush mounting. The plane of their mounting surfaces is not through the centerline of the cylinder, and for this reason side mounted cylinders produce a turning moment as the cylinder applies force to the load. (Fig. 4) This turning moment tends to rotate the cylinder about its mounting bolts. If the cylinder is not well secured to the machine member on which it is mounted or the load is not well-guided, this turning moment results in side load applied to rod gland and piston bearings. To avoid this problem, side mount cylinders should be specified with a stroke length at least equal to the bore size.

Shorter stroke, large bore cylinders tend to sway on their mountings when subjected to heavy loads, especially side end lug or side and angle mounts. (Fig. 5)

Side mount cylinders are available in several mounting styles, such as side lug (Style C), Side tapped (Style F or TEF), side end lug (Style G) and side end angle (Style CB). Of these, the side lug mount is the most popular and reliable, since the mounting lugs are part of the head and cap (4MA) or a structural steel bracket (3MA).

Side tapped mount is the choice when cylinders must be mounted side by side at minimum center-to-center distance. Another narrow side mount style is the side end lug mount which has lugs threaded to the tie rods. Thus the end lugs serve a dual function of holding the cylinder together and act as a means of mounting. This mounting style should be used only on medium- to light-duty applications, because the end lugs are subjected to compound stresses which could result in early failure.



Mounting Information

The side end angle mount is also a narrow mount type, but is the weakest of the side mount styles. Its use should be limited to a maximum pressure of 150 PSI and minimum stroke length of two times the bore size. For pressure rating of longer strokes, consult the cylinder manufacturer.

Consideration should also be given to design of the machine frame used to support cylinders non-centerline mount, since stronger members are often required to resist bending moments. (See Fig. 6)

Side mount cylinders depend wholly on the friction of their mounting surfaces in contact with the machine member to absorb the force produced. Thus the torque applied to the mounting bolts is an important consideration. Since the mounting bolts are the same diameter as the tie rods for a given cylinder, it is recommended that the torque applied to the mounting bolts be the same as the tie rod torque recommended by the cylinder manufacturer for the given bore size.

For heavy loads or high shock conditions, side mounted cylinders should be held in place to prevent shifting by keying or pinning. A shear key, consisting of a plate extending from side of cylinder, can be supplied on most cylinders. (Fig. 7) This method may be used where a keyway can be milled into a machine member. It serves to take up shear loads and also provides accurate alignment of the cylinder.

Side lug mounts are designed so as to allow dowel pins to be used to pin the cylinder to the machine member. Pins, when used, are installed on both sides of the cylinder but not at both ends. (See Fig. 8)

The use of a separate shear key is fairly common. It should be placed at the proper end of the cylinder to absorb the major load. (see Fig. 9)

Side mount cylinders should not be pinned or keyed at both ends. Changes in temperature and pressure under normal operating conditions cause the cylinder to increase (or decrease) in length from its installed length and therefore must be free to expand and contract. If pinned or keyed at both ends, the advantages of cylinder elasticity in absorbing high shock loads will be lost. (Fig. 10)

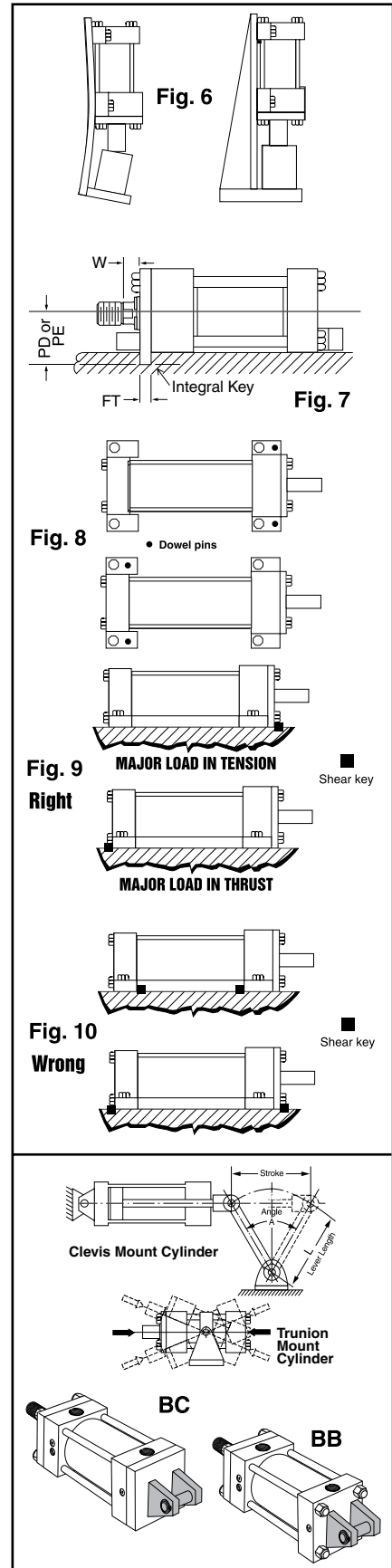
If high shock loads are the major consideration, the cylinder should be mounted and pins or shear key so located as to take full advantage of the cylinder's inherent elasticity. For major shock load in tension, locate key at rear face of head or pin the head in place. For major shock load in thrust, pin cap in place or locate key at front face of cap.

Pivot Force Transfer (Group 2)

Cylinders with pivot mounts which absorb force on centerline should be used on applications where the machine member to be moved travels in a curved path. There are two basic ways to mount a cylinder so that it will pivot during the work cycle: clevis or trunnion mounts, with variations of each. Pivot mount cylinders are available in cap fixed clevis (Style BB), cap detachable clevis (Style BC), cap spherical bearing (Style SB), head trunnion (Style D), cap trunnion (Style DB), and intermediate fixed trunnion (Style DD).

Pivot mount cylinders can be used on tension (pull) or thrust (push) applications at full rated pressure, except long stroke thrust cylinders are limited by piston rod column strength. See Piston Rod Selection Chart on page E89.

Clevis or single ear mounts are usually an integral part of the cylinder cap (though one style is detachable) and provide a single pivot point for mounting the cylinder. A pivot pin of proper length and of sufficient diameter to withstand the maximum shear load developed by the cylinder at rated operating pressure is included as a part of the clevis mount style. The fixed clevis mount, Style BB, is the most popular of the pivot force transfer types and is used on applications where the piston rod end travels in a curved path in one plane. It can be used vertically or horizontally or any angle in between. On long stroke push applications it may be necessary to use a larger diameter piston rod to prevent buckling or stop tube to minimize side loading due to "jackknife" action of cylinder in extended position. Fixed clevis mount cylinders will not function well if the curved path of piston rod travel is other than one plane. Such an application results in misalignment and causes the gland and piston bearing surfaces to be subjected to unnecessary side loading. For applications where the piston rod will travel in a path not more than 3° either side of the true plane motion, a cap spherical bearing mount is recommended. A spherical bearing rod eye should be used at rod end. Most spherical bearing mounts have limited pressure ratings. Consult cylinder manufacturer's product catalog.



Cap detachable clevis mounts are usually used for air service. Cap detachable clevis mounts are longer, centerline of pivot pin to shoulder of piston rod, than fixed clevis mount in any given bore size. They are most often specified to avoid port relocation charges. Application parameters are the same as described for fixed clevis mounting.

Trunnion mount cylinders are a second type of pivot mounts used on applications where the piston rod travels in a curved path in one plane. Three styles are available – head trunnion (Style D), cap trunnion (Style DB) and intermediate fixed trunnion (Style DD). Trunnion pins are designed for shear loads only and should not be subjected to bending stresses. Pillow blocks, rigidly mounted with bearings at least as long as the trunnion pins, should be used to minimize bending stresses. The support bearings should be mounted as close to the head, cap or intermediate trunnion shoulder faces as possible.

Cap end trunnion mounts are used on cylinder applications similar to fixed clevis mounts, and the same application data applies.

Head trunnion mount cylinders can usually be specified with smaller diameter piston rods than cylinders with pivot point at cap end or at an intermediate position. This is evident in data shown in piston rod selection chart on page E89. On head end trunnion mount, long stroke, cylinder applications consideration should be given to the overhanging weight at cap end of cylinder. To keep trunnion bearing loading within limits, stroke lengths should be not more than 5 times the bore size. If cylinder stroke is greater than 5 times the bore size and piston speed exceeds 35 ft/minute, consult factory.

Intermediate fixed trunnion mount is the best of the trunnion mount types. The trunnion can be located so as to balance the weight of the cylinder, or it can be located at any point between the head or cap to suit the application. It is of fixed design, and the location of the trunnion must be specified (X1 dimension) at time of order. The location cannot be easily changed once manufactured.

Thrust exerted by a pivot transfer cylinder working at an angle is proportional to the angle of the lever arm which it operates. In Fig. 12 that vector force, T, which is at right angle to the lever axis, is effective for turning the lever. The value of T varies with the acute angle A between cylinder centerline and lever axes. To calculate effective thrust T, multiply cylinder thrust by the power factor shown in table below.

Accessories

Rod clevises or rod knuckles are available for use with either fixed or pivot mount cylinders. Such accessories are usually specified with pivot mount cylinders and are used with pivot pin centerline in same axis as pivot pin centerline on cylinder. Pivot pins for accessories must be ordered separately.

Pin size of rod clevis or rod knuckle should be at least equal in diameter to the pin diameter of the cap fixed clevis pin for the cylinder bore size specified. Larger accessories are more costly and usually result in a mismatch of pin diameters, especially when used with oversize piston rods.

Removable Trunnion Pins

Removable trunnion pins are a convenience when machine structures or confined space prohibit the use of separate pillow blocks situated close to the cylinder sides.

Spherical Bearing Mount

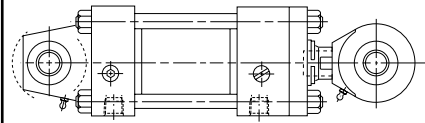
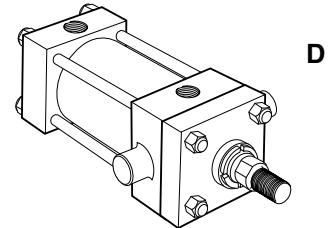
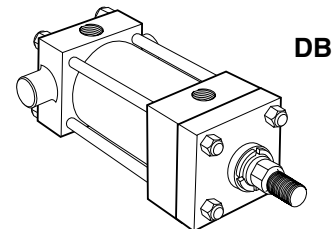


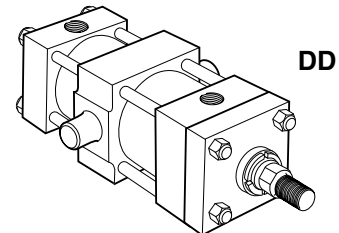
Fig. 11



D



DB



DD

Clevis Mount Cylinder

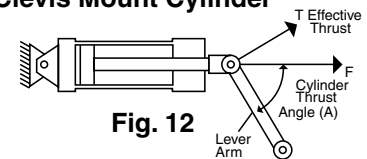


Fig. 12

Power Factor Table

Angle A Degrees	Pwr. Factor (SIN A)	Angle A Degrees	Pwr. Factor (SIN A)
5	0.087	50	0.766
10	0.174	55	0.819
15	0.259	60	0.867
20	0.342	65	0.906
25	0.423	70	0.940
30	0.500	75	0.966
35	0.573	80	0.985
40	0.643	85	0.996
45	0.707	90	1.000



Ports

Parker hydraulic and pneumatic cylinders can be supplied with S.A.E. straight O-ring ports or N.P.T.F. pipe thread ports. For the type of port recommended and port size, see respective product catalogs. If specified on your order, extra ports can be provided on the sides of heads or caps that are not occupied by mountings or cushion valve on all cylinders.

Standard port location is position 1 as shown on line drawings in product catalog and Figure 1 below. Cushion adjustment needle valves are at positions 2 and 4 (or 3), depending on mounting style. Heads or caps which do not have an integral mounting can be rotated and assembled with ports at 90° or 180° from standard position. Mounting styles on which head or cap can be rotated at no extra charge are shown in Table A below. To order, specify by position number. In such assemblies the cushion adjustment needle valves rotate accordingly, since their relationship with port position does not change.

Figure 1

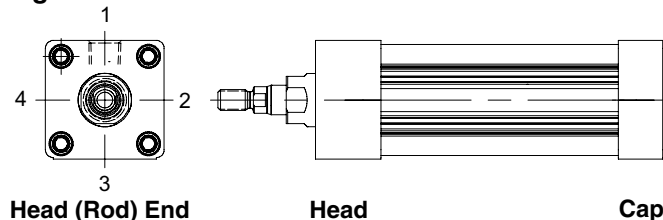


Table A

Mounting Style	Head End	Cap End
T, TB, TC, TD, H, HB, J, JB, DD	1, 2, 3 or 4	1, 2, 3 or 4
BB, DB	1, 2, 3 or 4	1 or 3
D	1 or 3	1, 2, 3 or 4
C, F	1	1

Straight Thread Ports

The S.A.E. straight thread O-ring port is recommended for hydraulic applications. Parker will furnish this port configuration at positions shown in Table A above. This port can also be provided at positions other than those shown in Table A at an extra charge. S.A.E. port size numbers are listed next to their N.P.T.F. pipe thread counterparts for each bore size in the General Specifications pages of the 4MA. Size number, tube O.D. and port thread size for S.A.E. ports are listed in Table C. S.A.E. ports are available at extra cost.

Table C

S.A.E. Straight Thread "O" Ring Ports

Size No.	Tube O.D. (In.)	Thread Size	Size No.	Tube O.D. (In.)	Thread Size
2	1/8"	5/16 - 24	12	3/4"	1-1/16 - 12
3	3/16"	3/8 - 24	—	—	—
4	1/4"	7/16 - 20	16	1"	1-5/16 - 12
5	5/16"	1/2 - 20	20	1-1/4"	1-5/8 - 12
6	3/8"	9/16 - 18	24	1-1/2"	1-7/8 - 12
8	1/2"	3/4 - 16	32	2"	2-1/2 - 12
10	5/8"	7/8 - 14	—	—	—

Note: For the pressure ratings of individual connectors, contact your connector supplier.

International Ports

Other port configurations to meet international requirements are available at extra cost. Parker cylinders can be supplied, on request, with British standard taper port (BSPT). Such port has a taper of 1 in 16 measured on the diameter (1/16" per inch). The thread form is Whitworth System, and size and number of threads per inch are as follows:

Table D

British Standard Pipe Threads

Nominal Pipe Size	No. Threads Per Inch	Pipe O.D.
1/8	28	.383
1/4	19	.518
3/8	19	.656
1/2	14	.825
3/4	14	1.041
1	11	1.309
1-1/4	11	1.650
1-1/2	11	1.882
2	11	2.347

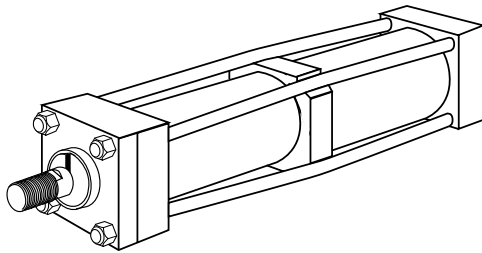
British standard parallel internal threads are designated as BSP and have the same thread form and number of threads per inch as the BSPT type and can be supplied, on request, at extra cost. Unless otherwise specified, the BSP or BSPT port size supplied will be the same nominal pipe size as the N.P.T.F. port for a given bore size cylinder.

Metric ports options G or Y can also be supplied to order at extra cost.

Stroke Data

Parker cylinders are available in any practical stroke length. The following information should prove helpful to you in selecting the proper stroke for your cylinder application.

Stroke Tolerances – Stroke length tolerances are required due to build-up of tolerances of piston, head, cap and cylinder body. Standard production stroke tolerances run +1/32" to -1/64" up to 20" stroke, +1/32" to -.020" for 21" to 60" stroke and +1/32" to -1/32" for greater than 60" stroke. For closer tolerances on stroke length, it is necessary to specify the required tolerance plus the operating pressure and temperature at which the cylinder will operate. Stroke tolerances smaller than .015" are not generally practical due to elasticity of cylinders. If machine design requires such close tolerances, use of a stroke adjuster (below) may achieve the desired result.



Tie Rod Supports

Rigidity of Envelope – The pre-stressed tie rod construction of Parker cylinders has advantages in rigidity within the limits of the cylinder tube to resist buckling. For long stroke cylinders within practical limits, Parker provides exclusive TIE ROD SUPPORTS (see table below) which move the tie rod centerlines radially outward (US patent number 3011844).

Standard tie rod supports are kept within the envelope dimensions of the head and cap, and generally do not interfere with mounting a long cylinder.

Number of Supports Required	Bore	Stroke (inches)												
		36	48	60	72	84	96	108	120	132	144	156	168	
1	—	1	1	1	2	Consult Factory								
1-1/2	—	—	1	1	1	2	2	2	3	3	3	4		
2	—	—	—	1	1	1	1	2	2	2	2	3		
2-1/2	—	—	—	—	—	1	1	1	1	1	2	2		
3-1/4	—	—	—	—	—	—	—	1	1	1	1	1		
4	—	—	—	—	—	—	—	—	—	1	1	1		

Note: 5" through 14" bore sizes — no supports required.

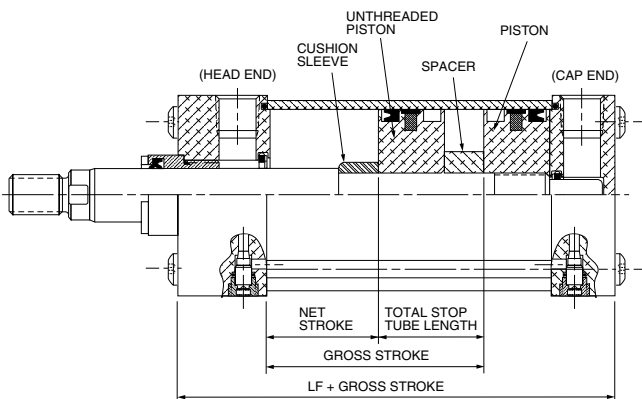
Stop Tubing

(only 4MA, 4ML, 4MAJ with aluminum piston)

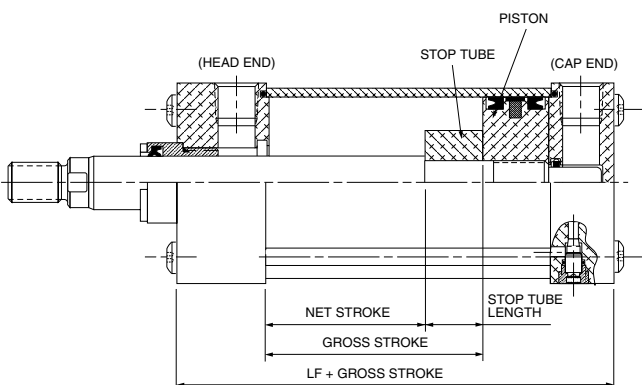
Long stroke cylinders, fixed or pivot mounted, tend to jack-knife or buckle on push load applications, resulting in high bearing loading at the rod gland or piston. Use of a stop tube to lengthen the distance between the gland and piston when cylinder rod is fully extended is recommended to reduce these bearing loads. The drawing below shows stop tube construction for fluid power cylinders. Refer to chart on next page to determine stop tube length.

When specifying cylinders with long stroke and stop tube, be sure to call out the net stroke and the length of the stop tube. Machine design can be continued without delay by laying in a cylinder equivalent in length to the NET STROKE PLUS STOP TUBE LENGTH, which is referred to as GROSS STROKE.

Refer to the next page to determine stop tube length.



Double piston design is supplied on air cylinders with cushion head end or both ends.



This design is supplied on cushioned cap or non-cushioned cylinders.

Cushion Selection

Cushions are required when cylinder piston rod speed exceeds 4" per second.

Mounting Classes

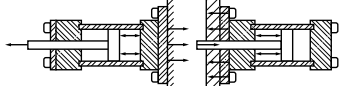
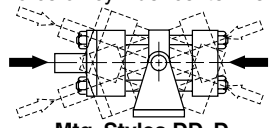
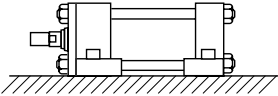
Standard mountings for fluid power cylinders fall into three basic groups. The groups can be summarized as follows:

Group 1 – Straight Line Force Transfer with fixed mounts which absorb force on cylinder centerline.

Group 2 – Pivot Force Transfer. Pivot mountings permit a cylinder to change its alignment in one plane.

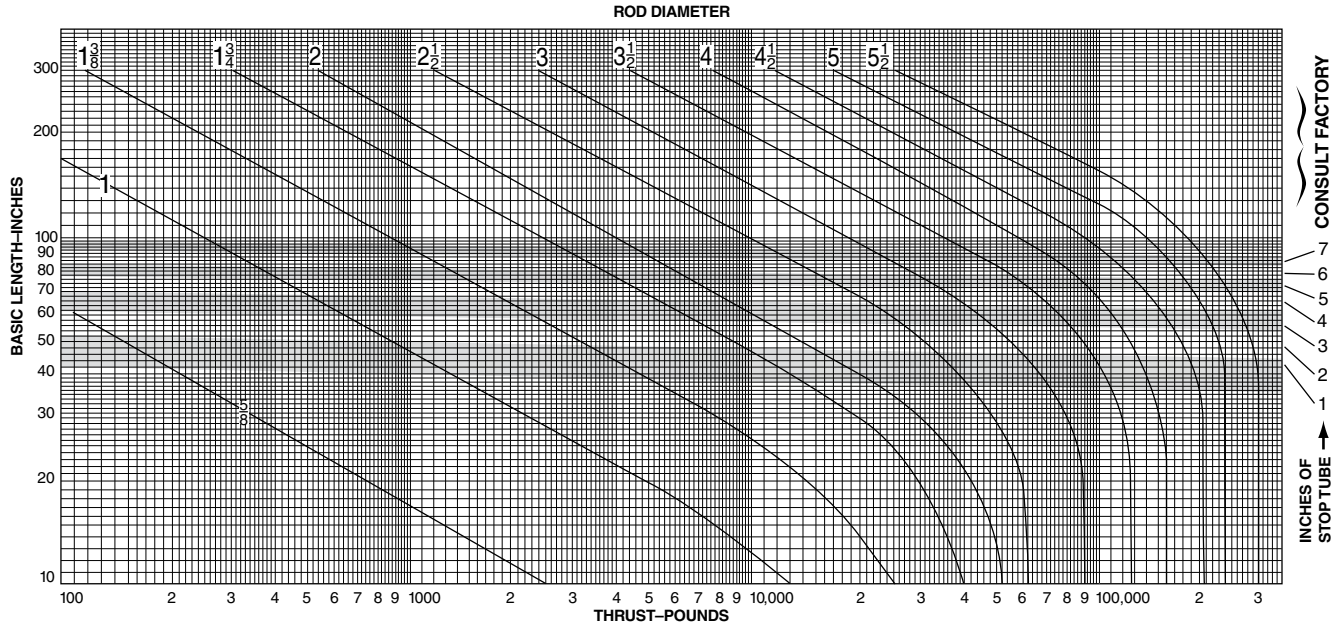
Group 3 – Straight Line Force Transfer with fixed mounts which do not absorb force on cylinder centerline.

Because a cylinder's mounting directly affects the maximum pressure at which the cylinder can be used, the charts below should be helpful in the selection of the proper mounting combination for your application. Stroke length, piston rod connection to load, extra piston rod length over standard, etc. should be considered for thrust loads. Alloy steel mounting bolts are recommended for all mounting styles, and thrust keys are recommended for Group 3.

	GROUP 1
	FIXED MOUNTS which absorb force on cylinder centerline.
	
HEAVY-DUTY SERVICE For Thrust Loads _____ For Tension Loads _____	Mtg. Styles TC Mtg. Styles TB
MEDIUM-DUTY SERVICE For Thrust Loads _____ For Tension Loads _____	Mtg. Styles H, HB Mtg. Styles J, JB
LIGHT-DUTY SERVICE For Thrust Loads _____ For Tension Loads _____	Mtg. Styles J, JB Mtg. Styles H, HB
	GROUP 2
	PIVOT MOUNTS which absorb force on cylinder centerline.
	
HEAVY-DUTY SERVICE For Thrust Loads _____ For Tension Loads _____	Mtg. Styles DD, D Mtg. Styles BB, BC, DD, D, DB
MEDIUM-DUTY SERVICE For Thrust Loads _____ For Tension Loads _____	Mtg. Styles BB, BC, BE Mtg. Styles BB, BC, BE
	GROUP 3
	FIXED MOUNTS which do not absorb force on the centerline.
	
HEAVY-DUTY SERVICE For Thrust Loads _____ For Tension Loads _____	Mtg. Styles C Mtg. Styles C
MEDIUM-DUTY SERVICE For Thrust Loads _____ For Tension Loads _____	Mtg. Styles F Mtg. Styles F
LIGHT-DUTY SERVICE For Thrust Loads _____ For Tension Loads _____	Mtg. Styles CB† Mtg. Styles CB†

† Mounting style CB recommended for maximum pressure of 150 PSI.

Piston Rod — Stroke Selection Chart



How to Use the Chart

The selection of a piston rod for thrust (push) conditions requires the following steps:

1. Determine the type of cylinder mounting style and rod end connection to be used. Then consult the chart below and find the "stroke factor" that corresponds to the conditions used.

2. Using this stroke factor, determine the "basic length" from the equation:

$$\text{Basic Length} = \frac{\text{Actual Stroke}}{\text{Stroke Factor}} \times \text{Stroke Factor}$$

The graph is prepared for standard rod extensions beyond the face of the gland retainers. For rod extensions greater than standard, add the increase to the stroke in arriving at the "basic length."

3. Find the load imposed for the thrust application by multiplying the full bore area of the cylinder by the system pressure.
4. Enter the graph along the values of "basic length" and "thrust" as found above and note the point of intersection:
 - A) The correct piston rod size is read from the diagonally curved line labeled "Rod Diameter" next above the point of intersection.
 - B) The required length of stop tube is read from the right of the graph by following the shaded band in which the point of intersection lies.

- C) If required length of stop tube is in the region labeled "consult factory," submit the following information for an individual analysis:

- 1) Cylinder mounting style.
- 2) Rod end connection and method of guiding load.
- 3) Bore, required stroke, length of rod extension (Dim. "LA or LAF") if greater than standard, and series of cylinder used.
- 4) Mounting position of cylinder. (Note: If at an angle or vertical, specify direction of piston rod.)
- 5) Operating pressure of cylinder if limited to less than standard pressure for cylinder selected.

Warning ⚠

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 end to fail. If these types of additional loads are expected to be imposed on the piston rods, their magnitude should be made known to our Engineering Department so they may be properly addressed. Additionally, cylinder users should always make sure that the piston rod is securely attached to the machine member.

Recommended Mounting Styles for Maximum Stroke and Thrust Loads	Rod End Connection	Case	Stroke Factor
Groups 1 or 3 Long stroke cylinders for thrust loads should be mounted using a heavy-duty mounting style at one end, firmly fixed and aligned to take the principal force. Additional mounting should be specified at the opposite end, which should be used for alignment and support. An intermediate support may also be desirable for long stroke cylinders mounted horizontally. Machine mounting pads can be adjustable for support mountings to achieve proper alignment.	Fixed and Rigidly Guided	I	0.50
	Pivoted and Rigidly Guided	II	0.70
	Supported but not Rigidly Guided	III	2.00
Group 2 Style D — Trunnion on Head	Pivoted and Rigidly Guided	IV	1.00
Style DD — Intermediate Trunnion	Pivoted and Rigidly Guided	V	1.50
Style DB — Trunnion on Cap or Style BB — Clevis on Cap	Pivoted and Rigidly Guided	VI	2.00

Cushion ratings for **Air Cylinders Only** are described in **Table b-2** and **Graph b-1**. To determine whether a cylinder will adequately stop a load without damage to the cylinder, the weight of the load (including the weight of the piston and the piston rod from **Table b-1**) and the maximum speed of the piston rod must first be determined. Once these two factors are known, the **Kinetic Energy Graph** may be used. Enter the graph at its base for the value of weight determined, and project vertically to the required speed value. The point of intersection of these two lines will be the cushion rating number required for the application.

To determine the total load to be moved, the weight of the piston and rod must be included.

Total Weight = weight of the piston and non-stroke rod length (column 1) + weight of the rod per inch of stroke x the inches of stroke (Column 2) + the load to be moved.

Example: a 3-1/4" bore cylinder with a 1" rod diameter and 25" of stroke; external load to be moved is 85 lbs. Total load to be moved is then (3.3 lbs) + (0.223 lbs/inch X 25 inches) + (85 lbs) for a total of 93.9 lbs.

3MA Piston Rod Assembly Weight Table

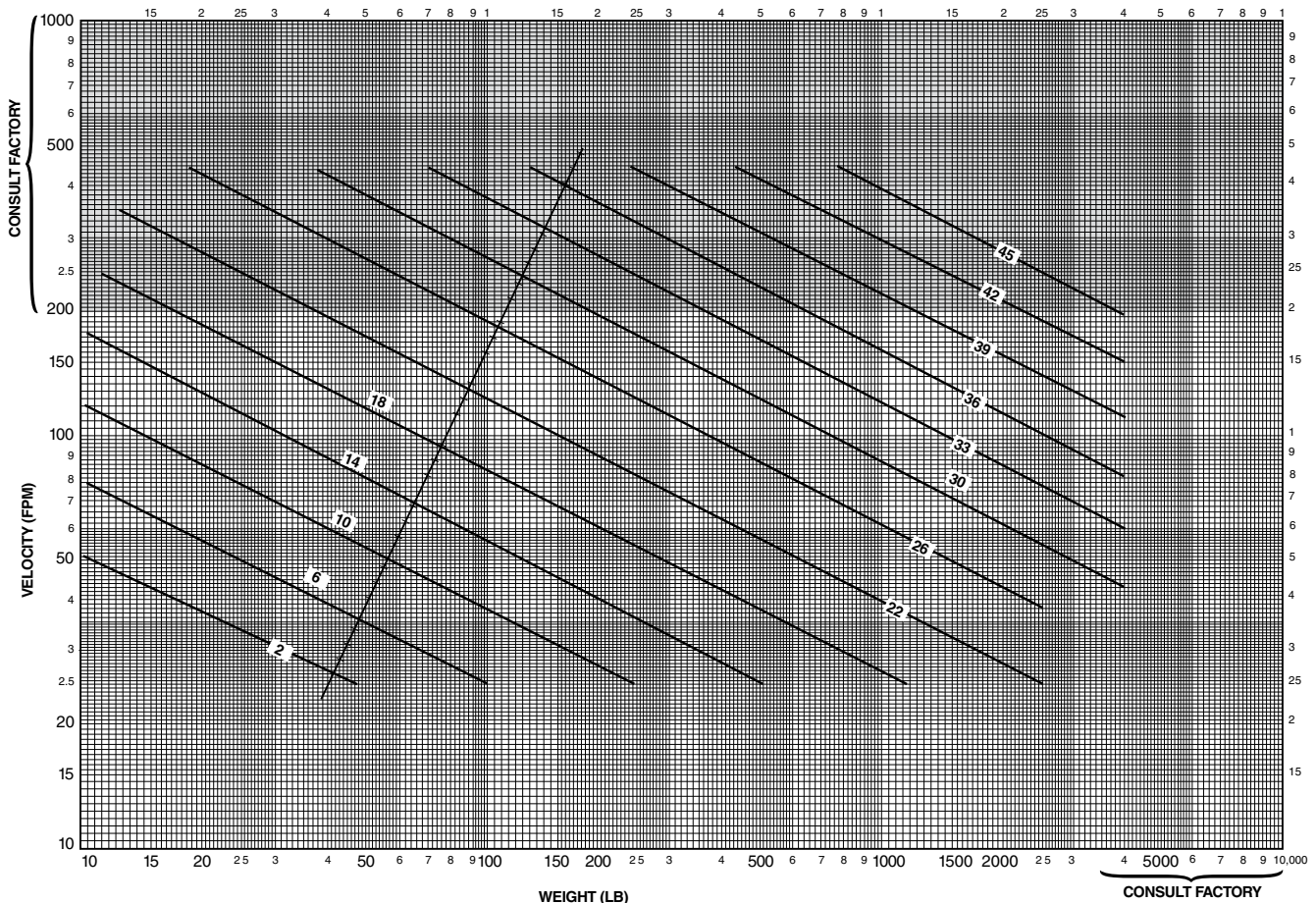
Table b-1

Bore	Rod Dia. MM	Column 1 Basic Weight for Piston and Non-Stroke Rod (lbs)	Column 2 Basic Weight for each 1" of Stroke (lbs)
1-1/2	5/8	1.1	0.087
	1	n/a	n/a
2	5/8	1.2	0.087
	1	2.1	0.223
2-1/2	5/8	1.5	0.087
	1	2.3	0.223
3-1/4	1	3.3	0.223
	1-3/8	4.9	0.421
4	1	3.8	0.223
	1-3/8	5.4	0.421
5	1	5.0	0.223
	1-3/8	6.5	0.421
6	1-3/8	8.3	0.421
	1-3/4	11.8	0.682
8	1-3/8	12.4	0.421
	1-3/4	15.0	0.682

Note: aluminum piston used for weight calculation

Kinetic Energy Graph – Air Cylinders

Graph b-1



Now refer to **Table b-2** and find the cushion ratings, using bore size and rod diameter of the cylinder selected. If a simple circuit is used, with no meter out or speed control, use the "Rating with No Back Pressure" column values. If a meter out or speed control is to be used, use the "Rating with Back Pressure" column values. If the cushion rating found in **Table b-2** below is **greater** than the number determined in **Graph b-1**, then the cylinder will stop the load adequately. If the cushion rating in **Table b-2** is **smaller** than the number found in **Graph b-1**, then a larger bore cylinder should be used. In those applications where back pressures exist in the exhaust lines, it is possible to exceed the cushion ratings shown in **Table b-2**. In these cases, consult the factory and advise the amount of back pressure.

Air Cylinder Cushion Ratings Table

Table b-2

3MA Cushion Ratings			
Bore	Rod Dia. MM	Rating with No Back Pressure	Rating with Back Pressure
1-1/2	5/8	8	14
2	5/8	12	18
2-1/2	5/8	14	20
3-1/4	1	18	24
4	1	20	27
5	1	23	28

In general, if the cushion rating number from the Kinetic Energy Graph is greater than the cushion rating for a particular bore and rod diameter, other and external means of decelerating the load will be necessary for proper cylinder application. Parker options include shock absorbers, Par-Check hydraulic resistance units and NuCushion bumpers.

Shock absorbers provide the greatest selection of decelerating products, and many can be incorporated into the cap end of cylinders for retract stroke deceleration. Additional product information can be found in Industrial Shock Absorbers Catalog AU08-1022-1/NA, and please contact the Wadsworth, OH facility for cylinder modification details.



Shock Absorber



**NuCushion Bumper
2-1/2" - 4" Bores**



**Inch Based Cylinders
Air Requirement Per Inch of Cylinder Stroke**

The amount of air required to operate a cylinder is determined from the volume of the cylinder and its cycle in strokes per minute. This may be determined by use of the following formulae which apply to a single-acting cylinder.

$$V = \frac{3.1416 L D^2}{4} \quad C = \frac{fV}{1728}$$

- Where: V = Cylinder volume, cu. in.
- L = Cylinder stroke length, in.
- D = Internal diameter of cylinder in.
- C = Air required, cfm
- f = Number of strokes per minute

The air requirements for a double-acting cylinder is almost double that of a single-acting cylinder, except for the volume of the piston rod.

The air flow requirements of a cylinder in terms of cfm should not be confused with compressor ratings which are given in terms of free air. If compressor capacity is involved in the consideration of cylinder air requirements it will be necessary to convert cfm values to free air values. This relationship varies for different gauge pressures.

Thrust (pounds) = operating pressure x area of cylinder bore.

Note: That on the "out" stroke the air pressure is working on the entire piston area but on the "in" stroke the air pressure works on the piston area less the rod area.

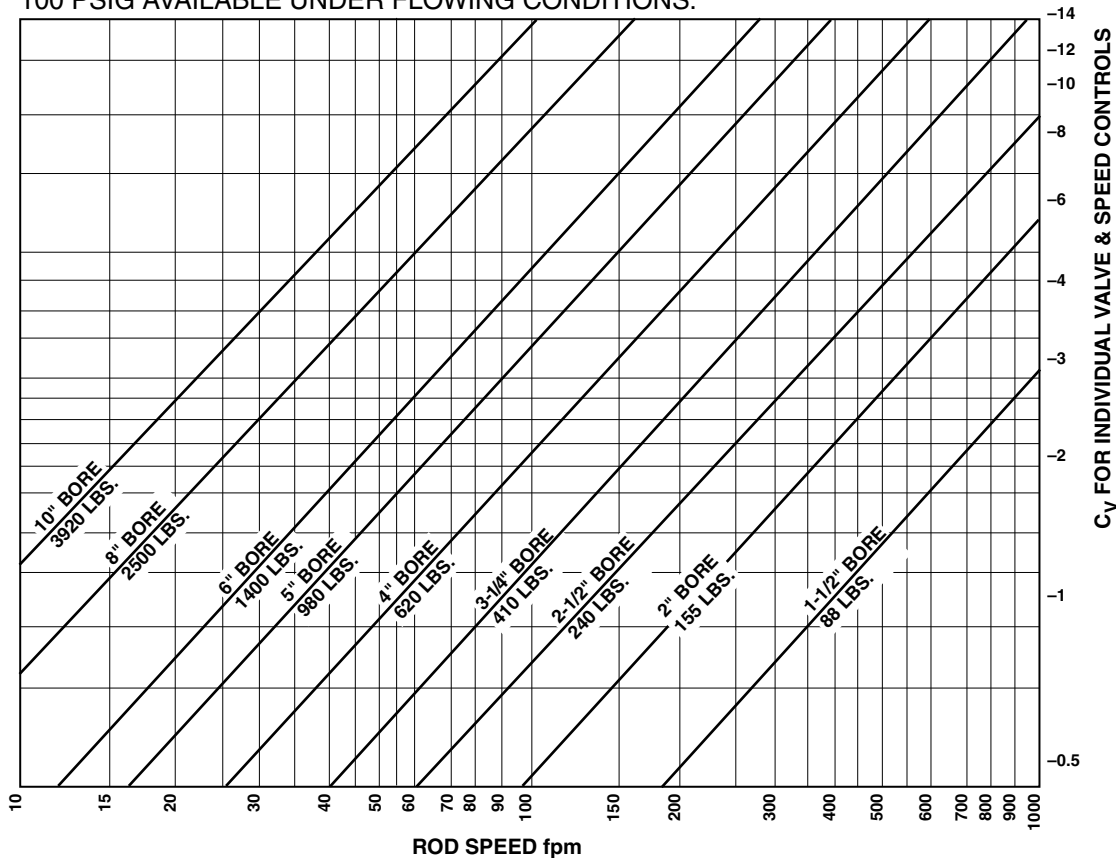
Graph b-2 and **b-3** offer a simple means to select pneumatic components for dynamic cylinder applications. It is only necessary to know the force required, the desired speed and the pressure which can be maintained at the inlet to the air preparation system. The graphs assume average conditions relative to air line sizes, system layout, friction, etc. At higher speeds, consider appropriate cushioning of cylinders.

The general procedure to follow when using these graphs is:

1. Select the appropriate graph depending upon the pressure which can be maintained to the system – **Graph b-2** for 100 PSIG and **Graph b-3** for 80 PSIG.
2. Determine appropriate cylinder bore. Values underneath the diagonal cylinder bore lines indicate the maximum recommended dynamic thrust developed while the cylinder is in motion. The data in the table at the bottom of each graph indicates available static force applications in which clamping force is a prime consideration in determining cylinder bore. Please reference table number b-3 and b-4 for approximate thrust developed at a given operating pressure.

Graph b-2

THIS GRAPH IS DETERMINED BY HAVING 100 PSIG AVAILABLE UNDER FLOWING CONDITIONS.



**Table b-3
Thrust Developed**

Bore Size	1-1/2"	2"	2-1/2"	3-1/4"	4"	5"	6"	8"
Dynamic Thrust (lbs.)	88	155	240	410	620	980	1400	500
Static Thrust (lbs.)	177	314	491	830	1250	1960	2820	5020

3. Read upward on appropriate rod speed line to intersection with diagonal cylinder bore line. Read right from intersection point to determine the required C_v of the valve and the speed controls. Both the valve and speed controls must have this C_v .

The following examples illustrate use of the graphs:

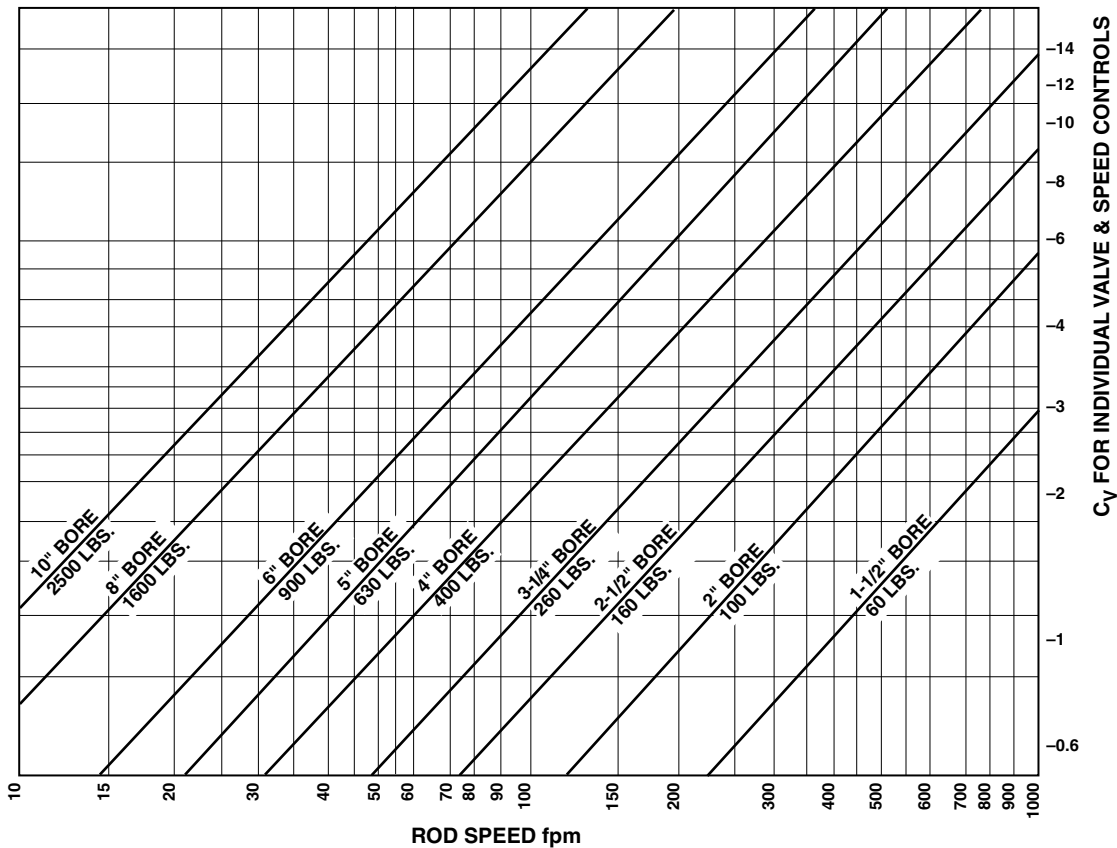
Example 1: Assume it is necessary to raise a 900-pound load 24 inches in two seconds. With 100 PSIG maintained at the inlet to the air preparation system, use **Graph b-2**. The 5-inch bore cylinder is capable of developing the required thrust while in motion. Since 24 inches in two seconds is equal to 60 fpm, read upward on the 60 fpm line to the intersection of the 5-inch bore diagonal line. Reading to the right indicates that the required valve and speed controls must each have a C_v of over 1.9.

Example 2: Assume similar conditions to Example 1 except that only 80-PSIG will be available under flowing conditions. Using **Graph b-3**, a 6-inch bore cylinder is indicated. Read upward on the 60 fpm line to the intersection point. Interpolation of the right-hand scale indicates a required valve and speed control C_v of over 2.8.

Example 3: Assume similar conditions to Example 1 except that the load is being moved in a horizontal plane with a coefficient of sliding friction of 0.2. Only a 180-pound thrust is now required (900 lb. x 0.2). Consult **Graph b-3**. The 2-1/2 inch bore cylinder will develop sufficient thrust, and at 60 fpm requires a valve and speed control C_v of about 0.5.

Graph b-3

THIS GRAPH IS DETERMINED BY HAVING 80 PSIG AVAILABLE UNDER FLOWING CONDITIONS.



**Table b-4
Thrust Developed**

Bore Size	1-1/2"	2"	2-1/2"	3-1/4"	4"	5"	6"	8"
Dynamic Thrust (lbs.)	60	100	160	260	400	630	900	1600
Static Thrust (lbs.)	141	251	393	663	1000	1570	2260	4010



Rod End Data

Rod end dimension symbols as shown comply with the National Fluid Power Association dimensional code. The following chart indicates the symbols used in this catalog.

Description	Symbol
Thread diameter and pitch	KK or CC
Length of thread	A
Length of rod extension from face of gland retainer to end of retracted rod	LA or LAF (Male Thread) W or WF (Female Thread)

Five rod ends for Parker cylinders are offered as shown on the dimension pages of this catalog. They are Parker styles 4, 6, 8, 9 and 55, and all five are optional without price penalty.

Warning 

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 end to fail. If these types of additional loads are expected to be imposed on the piston rods, their magnitude should be made known to our Application Engineering Department so they may be properly addressed. Additionally, cylinder users should always make sure that the piston rod is securely attached to the machine member.

On occasion cylinders are ordered with double rods. In some cases a stop is threaded onto one of the piston rods and used as an external stroke adjuster. This can cause a potential safety concern and can also lead to premature piston rod failure. The external stop will create a pinch point and the cylinder user should consider appropriate use of guards. If an external stop is not parallel to the final contact surface it will place a bending moment on the piston rod. An external stop will also negate the effect of a cushion and will subject the piston rod to an impact loading. These two (2) conditions can cause piston rod failure. The use of external stroke adjusters should be reviewed with our Application Engineering Department.

Piston Rod End Threads

Standard piston rod end thread lengths are shown as dimension "A" in Catalog dimension pages. Special rod end threads which are two times standard length can be supplied at a small extra cost. Available thread lengths are shown in the table below. To order, add suffix "2" to piston rod model number code and specify as Style #42 or Style #82.

Optional Piston Rod End Studs

Piston Rod Dia.	Rod End Thread Style #42		Rod End Thread Style #82	
	Thread Dia. & Pitch (KK)	Length (= 2 × A)	Thread Dia. & Pitch (CC)	Length (= 2 × A)
5/8	7/16-20	1-1/2	1/2-20	1-1/2
1	3/4-16	2-1/4	7/8-14	2-1/4
1-3/8	1-14	3-1/4	1-1/4 - 12	3-1/4
1-3/4	1-1/4 - 12	4	1-1/2 - 12	4

International Rod End Threads

Piston rod threads to meet international requirements are available at extra cost. Parker cylinders can be supplied with British standard fine (W) or metric (M). To order, specify in model number. For dimensions, consult factory.

Special Rod Ends

If a rod end configuration other than the standard styles is required, such special rod ends can be provided. The designation "Style 3" is assigned to such specials and is incorporated in the cylinder model number. To order, specify "Style 3" and give desired dimensions for KK; A; LA, LAF, W, or WF. If otherwise special, send a dimensioned sketch.

Special Assemblies from Standard Parts

Each dimensioned drawing in this catalog has position numbers shown on the end view to identify the four sides of the cylinder. These aid in communications and simplify the writing of specifications that cover changes in port positions, etc. Following are several suggested special assemblies that can be made up from standard parts.

- By calling out the position numbers for the desired locations for head and cap ports, many mounting styles can be assembled with ports located at 90° or 180° from standard. In such special assemblies, the cushion needle valves are also repositioned since their relation with the port position does not change.
- On mounting styles D, DB and DD, the cushion needle valves are provided only on the side position 3 on the head or cap which accommodates the mounting. The opposite head or cap can be rotated.
- Standard mountings in different combinations can be provided: for example Style J mounting on head end with Style C on the cap end. This would be made up from standard parts and would be designated Model (bore size) **JC-4MAU14A** (stroke).

Single-Acting Cylinders

Double-acting cylinders are supplied as standard. They can also be used as single-acting cylinders where air or hydraulic force is applied to only one side of the piston, with the load or other external forces acting to "return" the piston after pressure is exhausted.

Spring-Returned, Single-Acting Cylinders

(only 4MA, 4MAJ with aluminum piston) – Single-acting, spring-returned models can also be provided. Load conditions and friction factors must be considered in supplying the proper spring for the application. In addition, it is necessary that information be supplied as to which side of the piston the spring should act upon. Specify "Spring to return piston rod" or "Spring to advance piston rod."

On longer stroke spring-returned cylinders, it is recommended that tie rod extensions be specified on the cylinder end in which the spring is located so that the cap or head against which the spring is acting can be "backed-off" slowly until compression of the spring is relieved. In such cases it should also be specified that the tie rod nuts be welded to the tie rods at the opposite end of the cylinder to further insure safe disassembly.

Consult factory when ordering spring-returned cylinders.

Modifications

The following modifications can be supplied on most cylinders.

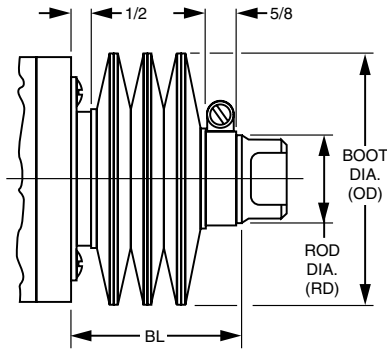
Metallic Rod Wiper Gland Assembly

When specified metallic rod wipers can be supplied instead of the standard wiper. Recommended in applications where contaminants tend to adhere to the extended piston rod and would damage the standard wiper. Installation of metallic rod wiper does not affect cylinder dimensions. It is available at extra cost and can be specified as part of the 4MA model code. Please contact the Wadsworth, OH facility for more information.

Rod End Boots

Most Parker cylinders have a hardened bearing surface on the standard piston rod to resist external damage, and are equipped with a high efficiency wiper to remove external dust and dirt. Exposed piston rods that are subjected to contaminants with air hardening properties, such as paint, should be protected. In such applications, the use of a collapsing cover should be considered. This is commonly referred to as a "boot". Calculate the longer rod end required to accommodate the collapsed length of the boot from the following data.

RD	1/2	5/8	1	1-3/8	1-3/4
OD	2-1/4	2-1/4	2-5/8	3	3-3/8
LF	.13	.13	.13	.13	.13



To determine extra length of piston rod required to accommodate boot, calculate:

$$BL = \text{Stroke} \times LF + 1-1/8"$$

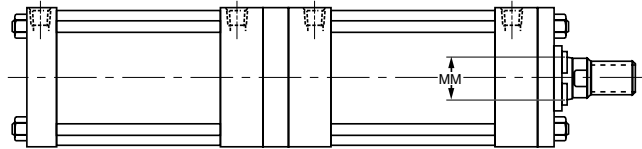
BL + std LAF (male rod end) or WF (female rod end) dimension = length of piston rod to extend beyond the head face.

Note: Please compare the Boot OD size to the standard E dimension per desired cylinder series and bore. This may be critical for foot mounted cylinders.

Rod Boots are available for many other cylinder series. Please contact the Wadsworth, OH facility for rod boot options.

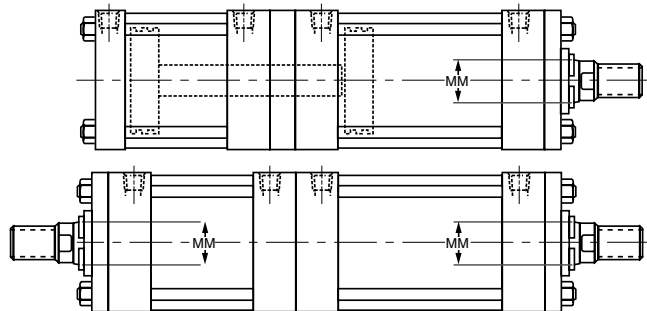
Tandem Cylinders

A tandem cylinder is made up of two cylinders mounted in line with pistons connected by a common piston rod and rod seals installed between the cylinders to permit double acting operation of each. Tandem cylinders allow increased output force when mounting width or height are restricted. Please contact the Wadsworth, OH facility for more information.



Duplex Cylinders

A duplex cylinder is made up of two cylinders mounted in line with pistons not connected and with rod seals installed between the cylinders to permit double acting operation of each. Cylinders may be mounted with piston rod to piston (as shown) or back to back and are generally used to provide three position operation. Please contact the Wadsworth, OH facility for more information.



Mounting Kit Assembly

Perform the following steps when installing mounting kits onto 1-1/2" - 5" bore 3MA 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

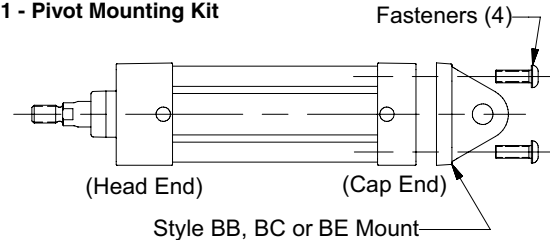


Fig. 2 - End Angle Mounting Kit

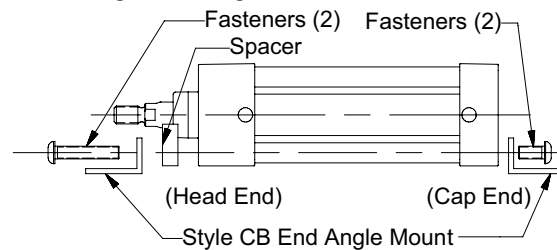


Fig. 3 - Flange Mounting Kit

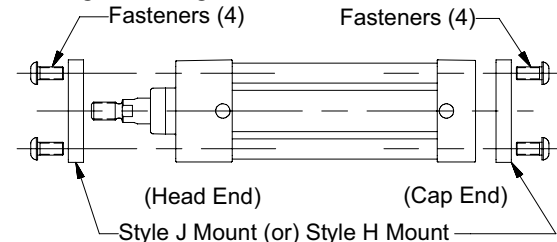
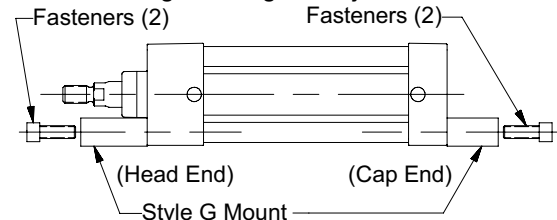


Fig. 4 - Side End Lug Mounting Kit - Style MS7



3MA Mounting Kits										
Bore Size	J (MF1)	H (MF2)	BB (MP1)	BC (MP2)	BE (MP4)	CB (MS1)	C (MS2)	G (MS7)	Kit Fastener Torque Units	
	Head Rectangular Flange	Cap Rectangular Flange	Cap Fixed Clevis	Cap Detachable Clevis	Cap Detachable Eye	Side End Angles	Side Lug (3MA only)	Side End Lug	USA inch-lbs	Metric N-m
	Kit Number	Kit Number	Kit Number	Kit Number	Kit Number	Kit Number	Kit Number	Kit Number		
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

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

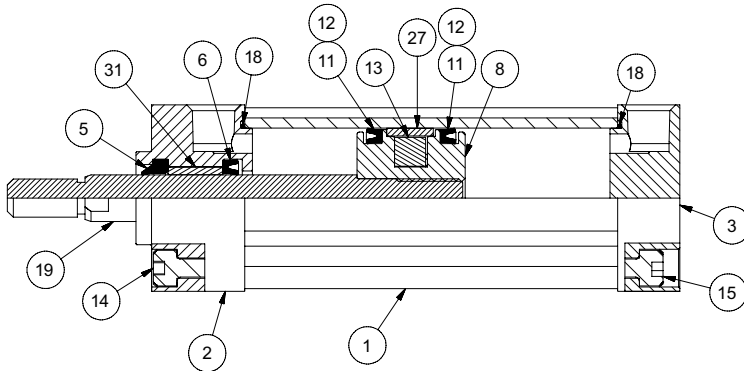
3MA kits – pneumatic service only

Temperatures:

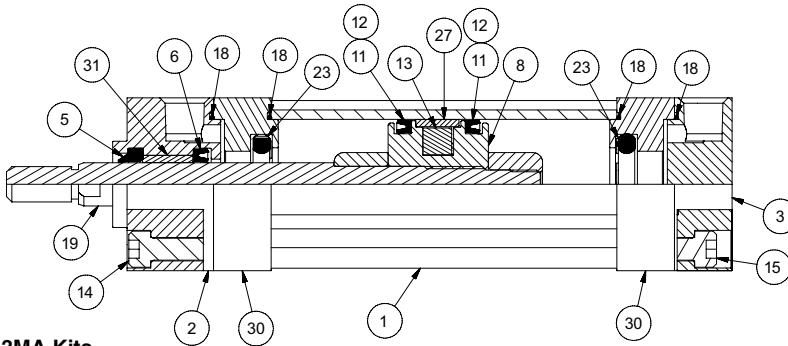
- Nitrile -10°F to +165°F (-23°C to +74°C)
- Fluorocarbon -10°F to +250°F (-23°C to +121°C)



Non-cushioned



Cushioned



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		

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 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.

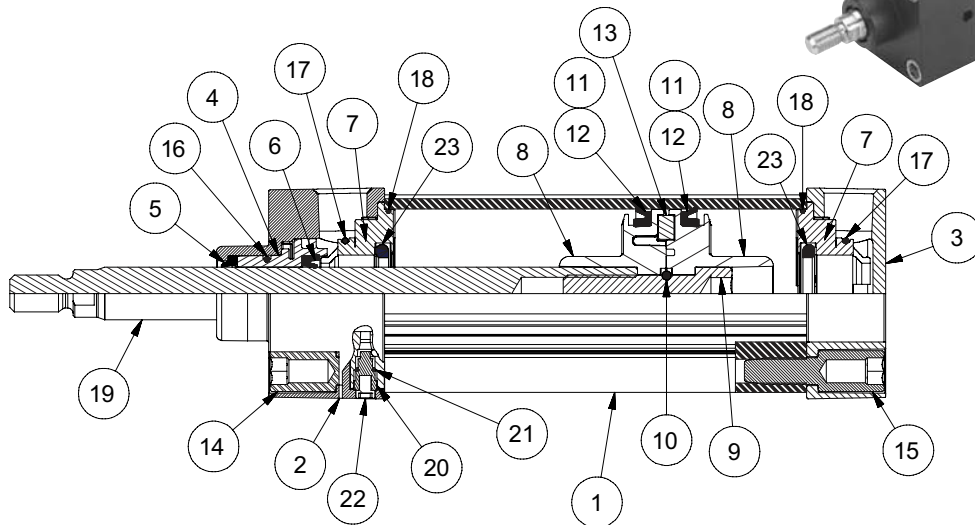
1 tube of Lube-A-Cyl is also included with each kit.

**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

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.

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).

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, only for aluminum piston)	Torque Units Endcap Fastener or Tie Rod	
	Includes wear band (#27) for aluminum pistons and 4" and 5" composite pistons			USA inch-lbs	Metric N-m
	Nitrile Seals Kit Number	Nitrile Seals Kit Number	Part Number		
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 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.

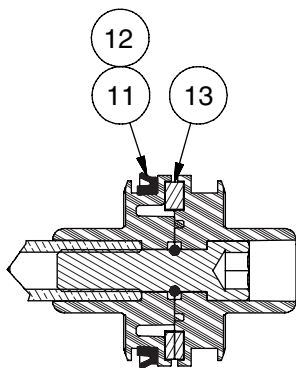
Assemble both cap and head, complete with cylinder body O-Rings (sym. # 18), to each end of the cylinder body. Install end cap fasteners and tighten to appropriate torque, using opposite corner to corner torquing sequence.

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:

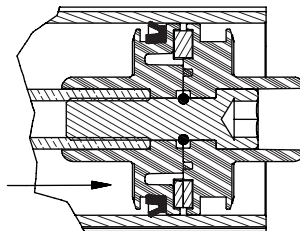
After all the piston seals have been installed on the piston and the piston is in the cylinder body, fit the cap with its O-ring (sym. # 18) in position onto the cylinder body. Then "stud" into the trunnion collar the four tie rods that connect the cap to the trunnion collar. Hand tighten the four tie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

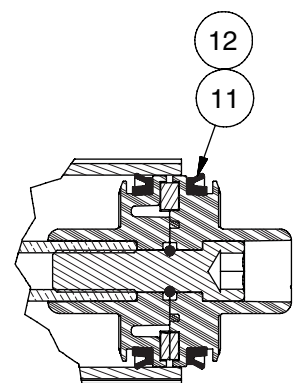
As a check, to be certain the trunnion mount will not interfere with cylinder operation, move the piston and rod assembly by hand to determine whether there is any tendency for the piston to bind at the spot where the trunnion collar is located. If any binding is noticeable, readjust the tie rods.



Detail "1"



Detail "2"



Detail "3"

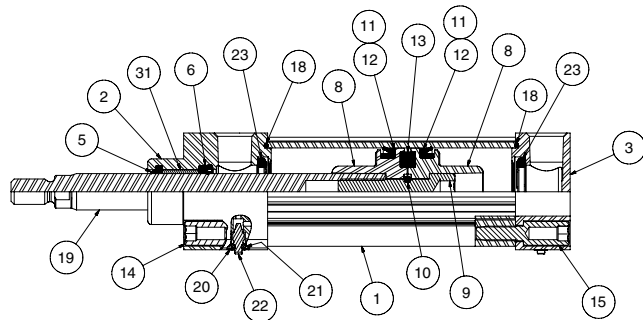


1-1/2"- 5" Bore 3MA Complete Cylinder Kits (All parts to service entire cylinder)

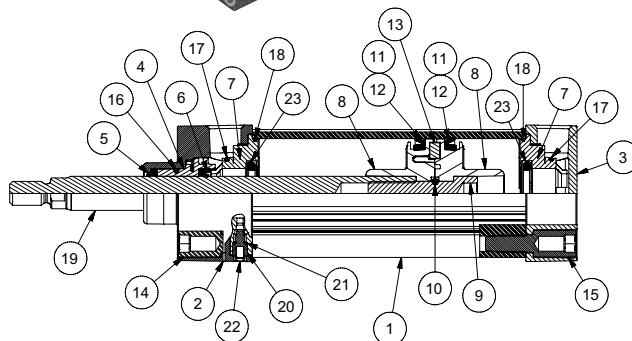
Pneumatic service only

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.

F