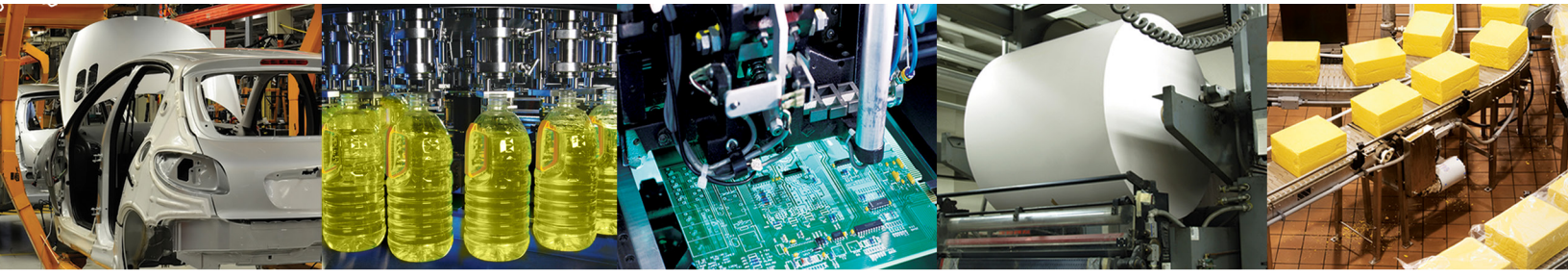
A Series

Aluminum NFPA Interchangeable Cylinder Line



AVENTICS

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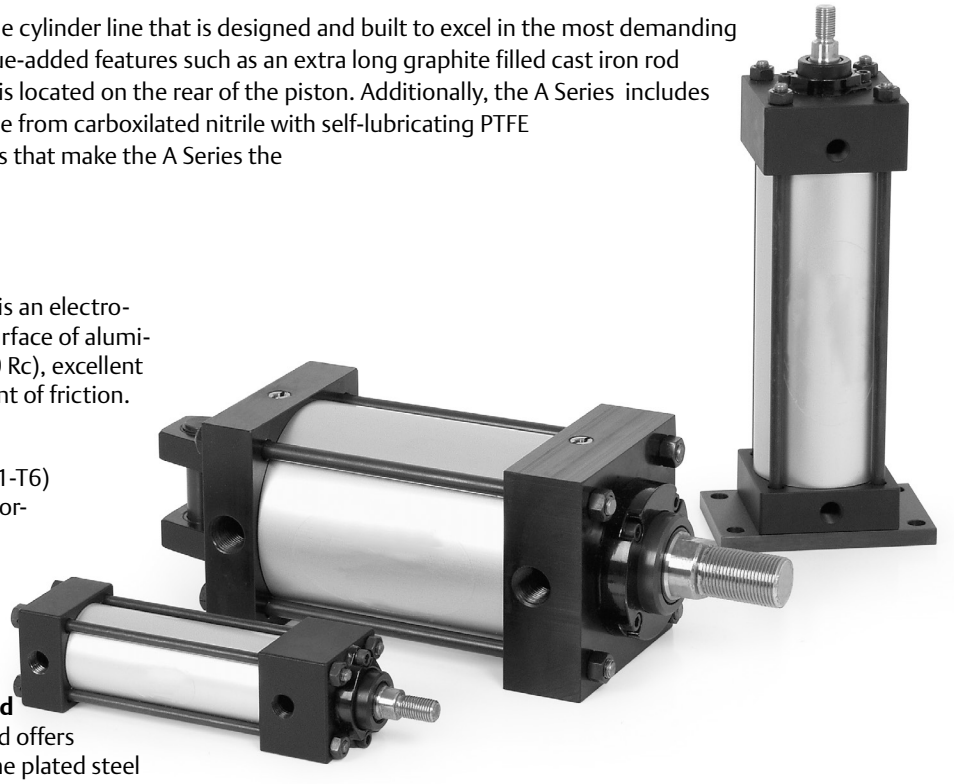
Large Bore A Series

The **A Series** is an aluminum NFPA Interchangeable cylinder line that is designed and built to excel in the most demanding applications. The A Series encompasses many value-added features such as an extra long graphite filled cast iron rod bushing and a standard oversized wear band that is located on the rear of the piston. Additionally, the A Series includes the well-proven "T" piston seal configuration made from carboxilated nitrile with self-lubricating PTFE compound. These are just a sample of the features that make the A Series the superior NFPA Interchangeable air cylinder line.



Tube
The **tube** is hard coat anodized. The hard coating is an electro-chemical process, which produces a very dense surface of aluminum oxide. This surface has extreme hardness (60 Rc), excellent wear and corrosion resistance, and a low coefficient of friction.

End Caps
The **end caps** are accurately machined from (6061-T6) solid aluminum bar stock. They are anodized for corrosion resistance. Additionally, a recess on the piston-mating surface (at both ends) enables the air to work on a larger piston area for effortless breakaway.

Rod Bushing
The A Series includes a graphite filled, cast iron **rod bushing** that is extra long in length. Graphite filled offers the best bearing surface when using a hard chrome plated steel piston rod. Cast iron provides maximum resistance against wear. The added length adds superior alignment and support of the piston rod as well as provides maximum load bearing support.

Rod Seal
The carboxilated nitrile with PTFE compound **rod seal** is self-lubricating and durable. The rounded lip design ensures proper sealing and long life.

Rod Wiper
The standard **rod wiper** construction is a highly durable polyurethane.

Piston Rod
High strength steel (100,000 psi minimum yield) **piston rod** has a ground, polished, and chrome plated surface. This surface provides maximum life for both the rod bushing and the seals.

Bushing Retainer
The **bushing retainer** allows cartridge removal (cylinder repair) without complete disassembly.

Tie Rods
The **tie rods** are 100,000 psi minimum yield steel for maximum holding power. The threads are roll formed for superior strength and engagement.

Piston Seal
The **piston seal** is a carboxilated nitrile with PTFE compound making it self-lubricating. The "T" with back-up ring construction prevents rolling and seals at all pressures.

Wear Band
The **wear band** is a stable, lubricating strip located on the piston. We separated the load bearing points by locating the wear band at the rear of the piston. This maximizes column strength at full extension.

Piston
The solid aluminum alloy **piston** is strong and durable.

Cushion Seal
The floating **cushion seal** design enables rapid stroke reversal by providing instantaneous full flow to the piston. Each cushion has a flush, retained adjustment needle.

Tube End Seal
The **tube end seals** are compression type and reusable.

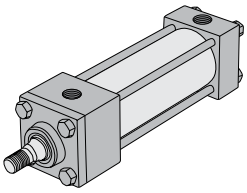
Ports
Our enhanced **port** design enables the cylinder to work more efficiently. Through the use of precise machining depths and tool shape, we are able to smooth the flow path into and out of the cylinder.

Standard Specifications:
- Meets NFPA specifications
- Bore sizes from 1-1/2" through 6"
- Piston rod diameters from 5/8" to 1-3/4"
- Maximum pressure rating is 250 psi air
- Standard temperature -10°F to 165°F (-23°C to 74°C)
- NPTF ports
- Flexible port and cushion location
- Multitude of mounting options

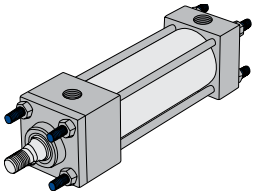
Standard A Series Mounts

Centerline Mounts

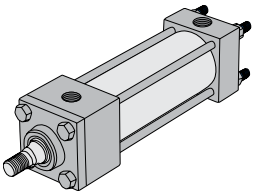
X0 Mount
Basic No Mount



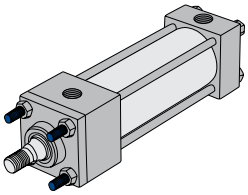
X1 Mount
Extended Tie Rods – Both Ends



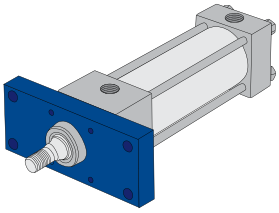
X2 Mount
Extended Tie Rods – Cap End



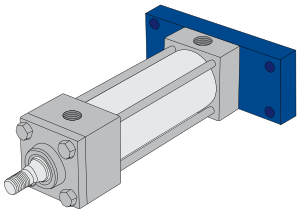
X3 Mount
Extended Tie Rods – Head End



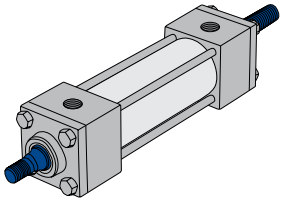
F1 Mount
Head Rectangular Flange



F2 Mount
Cap Rectangular Flange

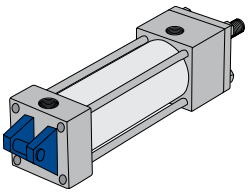


DA Mount
Double Rod End

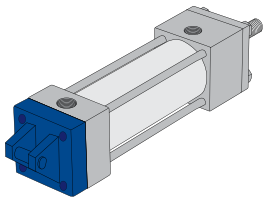


Pivot Mounts

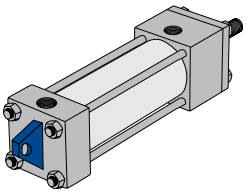
P1 Mount
Fixed Clevis



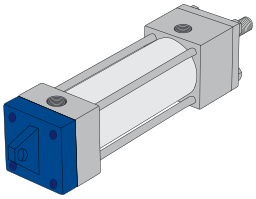
P2 Mount
Detachable Clevis



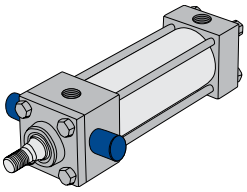
P3 Mount
Fixed Eye



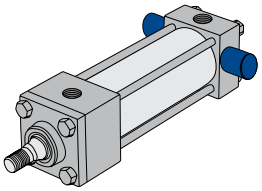
P4 Mount
Detachable Eye



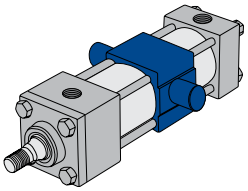
T1 Mount
Head Trunnion



T2 Mount
Cap Trunnion

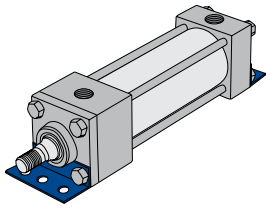


T4 Mount
Intermediate Trunnion

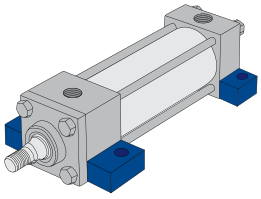


Foot Mounts

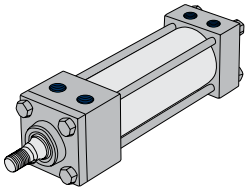
S1 Mount
Angle Mount



S2 Mount
Side Lugs



S4 Mount
Bottom Tapped



*For a complete offering a dimensional drawings by mounting type, see the comprehensive A Series catalog PDF via the following path: www.Emerson.com

How to Order

Leave blank unless using MU or BK option.

P1 A L - 04 A 1 D - C AA 0 04 0

Mount
F1 = Front Flange
F2 = Rear Flange
P1 = Fixed Clevis
P2 = Detachable Clevis
P3 = Fixed Eye
P4 = Detachable Eye
S1 = Angle Mount
S2 = Side Lug Mount
S4 = Bottom Tap
SE = Bottom Tap Sleeve Nut
SN = Sleeve Nut
T1 = Head Trunnion (Fixed Steel Ears)
T6 = Head Trunnion (Removable Aluminum Head)
T2 = Cap Trunnion (Fixed Steel Ears)
T7 = Cap Trunnion (Removable Aluminum Head)
T4* = Mid Trunnion
X0 = Basic No Mount
X1 = Extended Tie Rods Both Ends
X2 = Extended Tie Rod Cap
X3 = Extended Tie Rod Head
*Specify "XI" length.

Type
A = A Series NFPA Interchangeable

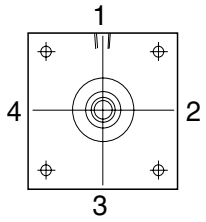
Bore
K = 1-1/2" R = 4"
L = 2" T = 5"
M = 2-1/2" U = 6"
P = 3-1/4"

Full Inches of Stroke
00 = 0" Stroke
01 = 1" Stroke
02 = 2" Stroke
03 = 3" Stroke
99 = 99" Stroke
Note: Consult factory for strokes greater than 99".

Fractional Inches of Stroke
A = 0" I = 1/2"
B = 1/16" J = 9/16"
C = 1/8" K = 5/8"
D = 3/16" L = 11/16"
E = 1/4" M = 3/4"
F = 5/16" N = 13/16"
G = 3/8" O = 7/8"
H = 7/16" P = 15/16"

Rod Code
1= Style #1 Standard Rod Diameter
2 = Style #2 Standard Rod Diameter
3 = Style #3 Standard Rod Diameter
4 = Special Standard Rod Diameter (must specify threads)
5 = Special Oversize Rod Diameter (must specify threads)
6 = Style #1 Oversize Rod Diameter
7 = Style #2 Oversize Rod Diameter
8 = Style #3 Oversize Rod Diameter
U = Male Coupling Rod End Standard Rod Diameter
V = Male Coupling Rod End Oversized Rod Diameter

Cylinder Orientation



Ports are normally located in position 1.
Cushions are normally located in position 2.

Fractional Inches of Stroke
A = 0" I = 1/2"
B = 1/16" J = 9/16"
C = 1/8" K = 5/8"
D = 3/16" L = 11/16"
E = 1/4" M = 3/4"
F = 5/16" N = 13/16"
G = 3/8" O = 7/8"
H = 7/16" P = 15/16"

Full Inches of Stroke
00 = 0" Stroke
01 = 1" Stroke
02 = 2" Stroke
03 = 3" Stroke

Magnet
0 = No Magnet
2 = Reed Magnet

Options
AA = No Options
BA** = Bumpers Both Ends
BC** = Bumper Cap Only
BH** = Bumper Head
BK = Back to Back Cylinder
CT = Composite Tube
DA = Double Rod End
EB = Silencer Bumpers
GA = High Temperature Rod Boot
KA* = Stroke Adjuster
LB = Low Breakaway Seals
LP = Profile Tubing (1-1/2" to 3-1/4" Bores)
MA = Metallic Rod Scraper
MU = Multiposition Cylinder
NA = Nickel Plated Cylinder, Stainless Steel Rod and Tie Rods
PA = Polypak Rod Seal
RB = Rod Boot
RA* = Save Air Stroke Adjuster
SA = Stainless Steel Piston Rod
SS = Stainless Piston Rod and Tie Rod
ST = Stainless Tie Rods
TD = Tandem Cylinder
VA = FKM Seals
YA = NuLock Rod Brake
YE = NuLock Rod Brake Ready
1A* = Rod Extension
2A* = Thread Extension
12* = Rod and Thread Extension
3A = Studded Rod End
4A* = Stop Tube
4D* = Double Piston Stop Tube
* Specify length.
**Bumpers add .062" to OAL (per bumper).
Consult factory for information regarding combination options and options not listed.

Cushions

Position	1	2	3	4	Fixed
No Cushion	A	A	A	A	A
Head and Cap	B	C	D	E	Y
Head Only	F	G	H	J	W
Cap Only	K	L	M	N	V

Ports

Position	1/8"	1/4"	3/8"	1/2"	3/4"
1	B	C	D	E	F
2	H	I	J	K	L
3	N	O	P	Q	R
4	T	U	V	W	X

Z = Special Ports (must specify ports/size(s) and location(s))
Consult factory for additional details

Rod End Styles, Diameters and Threads

Diameter	Style #1 Standard Male	Style #2 Optional Male	Style #3 Optional Female
0.625	7/16-20	1/2-20	7/16-20
1.000	3/4-16	7/8-14	3/4-16
1.375	1-14	1 1/4-12	1-14
1.750	1 1/4-12	1 1/2-12	1 1/4-12

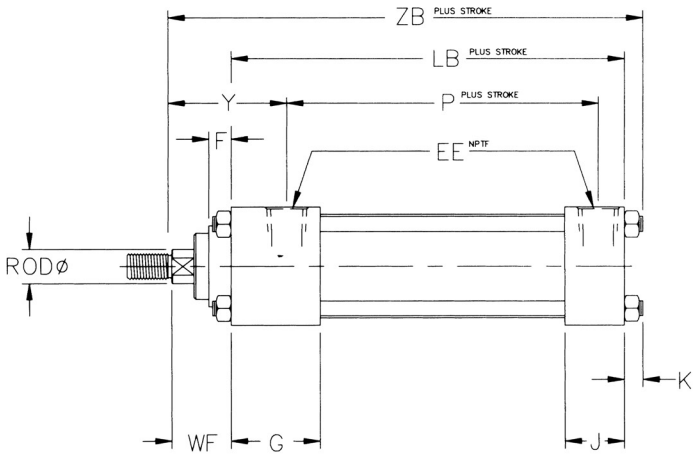
Rod Diameters by Bore Size

Bore	Standard Dia.	Oversized Dia.
1-1/2"	0.625	1.000
2"	0.625	1.000
2-1/2"	0.625	1.000
3-1/4"	1.000	1.375
4"	1.000	1.375
5"	1.000	1.375
6"	1.375	1.750

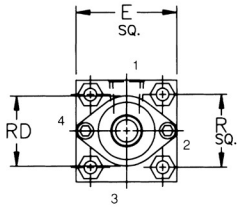
The above information is for information purposes only and not all combinations are available.

Dimensions: Inches

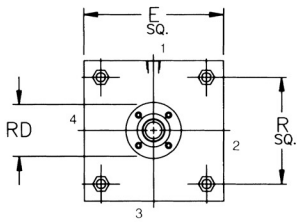
Basic No Mount Cylinder



Mount Code X0 NFPA MX0



1-1/2" Through 2-1/2"



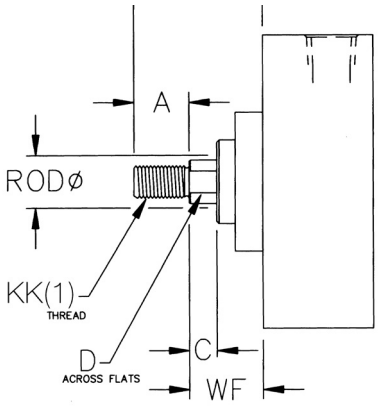
3-1/4" Through 6"

Bore	Rod	E	EE	F	G	J	K	LB	P	R	RD	WF	Y	ZB
1-1/2"	0.625	2.000	0.375	0.375	1.500	1.000	0.250	3.625	2.250	1.430	1.375	1.000	1.938	4.875
	1.000	2.000	0.375	0.375	1.500	1.000	0.250	3.625	2.103	1.430	2.000*	1.375	2.460	5.250
2"	0.625	2.500	0.375	0.375	1.500	1.000	0.313	3.625	2.250	1.840	1.375	1.000	1.938	4.938
	1.000	2.500	0.375	0.375	1.500	1.000	0.313	3.625	2.250	1.840	2.500*	1.375	2.313	5.313
2-1/2"	0.625	3.000	0.375	0.375	1.500	1.000	0.313	3.750	2.375	2.190	1.375	1.000	1.938	5.062
	1.000	3.000	0.375	0.375	1.500	1.000	0.313	3.750	2.375	2.190	3.000*	1.375	2.313	5.438
3-1/4"	1.000	3.750	0.500	0.625	1.750	1.250	0.375	4.250	2.625	2.760	2.706	1.375	2.438	6.000
	1.375	3.750	0.500	0.625	1.750	1.250	0.375	4.250	2.625	2.760	3.125	1.625	2.688	6.250
4"	1.000	4.500	0.500	0.625	1.750	1.250	0.375	4.250	2.625	3.320	2.706	1.375	2.438	6.000
	1.375	4.500	0.500	0.625	1.750	1.250	0.375	4.250	2.625	3.320	3.125	1.625	2.688	6.250
5"	1.000	5.500	0.500	0.625	1.750	1.250	0.500	4.500	2.875	4.100	2.706	1.375	2.438	6.375
	1.375	5.500	0.500	0.625	1.750	1.250	0.500	4.500	2.875	4.100	3.125	1.625	2.688	6.625
6"	1.375	6.500	0.750	0.625	2.000	1.500	0.500	5.000	3.125	4.880	3.125	1.625	2.813	7.125
	1.750	6.500	0.750	0.750	2.000	1.500	0.500	5.000	3.125	4.880	3.788	1.875	3.063	7.375

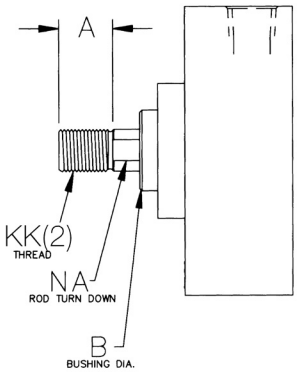
* Uses a full-face bushing retainer.

Dimensions: Inches

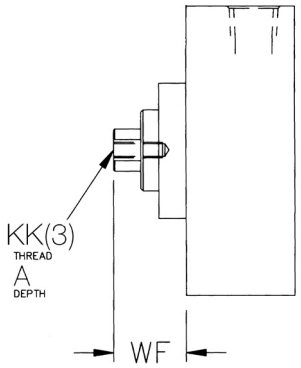
Standard and Optional Rod Ends



Style #1 (Standard Male)



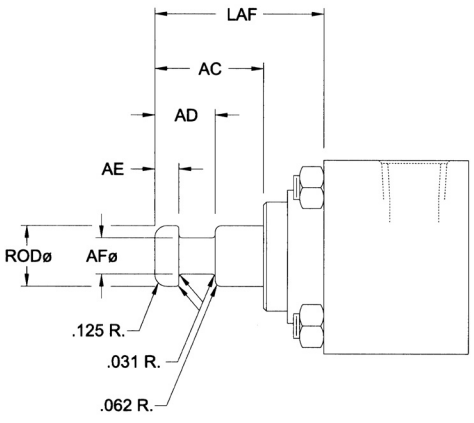
Style #2 (Optional Male)



Style #3 (Optional Female)

Bore	Rod	KK(1)	KK(2)	KK(3)	A	B	C	D	NA	LAF	WF
1-1/2"	0.625	7/16-20	1/2-20	7/16-20	0.750	1.125	0.375	0.500	0.585	1.750	1.000
	1.000	3/4-16	7/8-14	3/4-16	1.125	1.500	0.500	0.813	0.960	2.500	1.375
2"	0.625	7/16-20	1/2-20	7/16-20	0.750	1.125	0.375	0.500	0.585	1.750	1.000
	1.000	3/4-16	7/8-14	3/4-16	1.125	1.500	0.500	0.813	0.960	2.500	1.375
2-1/2"	0.625	7/16-20	1/2-20	7/16-20	0.750	1.125	0.375	0.500	0.585	1.750	1.000
	1.000	3/4-16	7/8-14	3/4-16	1.125	1.500	0.500	0.813	0.960	2.500	1.375
3-1/4"	1.000	3/4-16	7/8-14	3/4-16	1.125	1.500	0.500	0.813	0.960	2.500	1.375
	1.375	1-14	1 1/4-12	1-14	1.625	2.000	0.625	1.125	1.313	3.250	1.625
4"	1.000	3/4-16	7/8-14	3/4-16	1.125	1.500	0.500	0.813	0.960	2.500	1.375
	1.375	1-14	1 1/4-12	1-14	1.625	2.000	0.625	1.125	1.313	3.250	1.625
5"	1.000	3/4-16	7/8-14	3/4-16	1.125	1.500	0.500	0.813	0.960	2.500	1.375
	1.375	1-14	1 1/4-12	1-14	1.625	2.000	0.625	1.125	1.313	3.250	1.625
6"	1.375	1-14	1 1/4-12	1-14	1.625	2.000	0.625	1.125	1.313	3.250	1.625
	1.750	1 1/4-12	1 1/2-12	1 1/4-12	2.000	2.375	0.750	1.500	1.688	3.875	1.875

Male Coupling Rod End



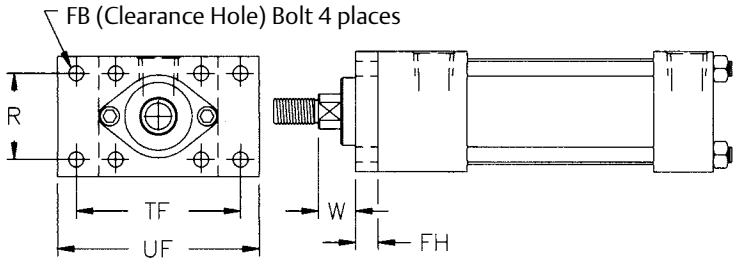
U = Male Coupling Rod End Standard Rod Diameter
V = Male Coupling Rod End Oversized Rod Diameter

Dimensions: Inches

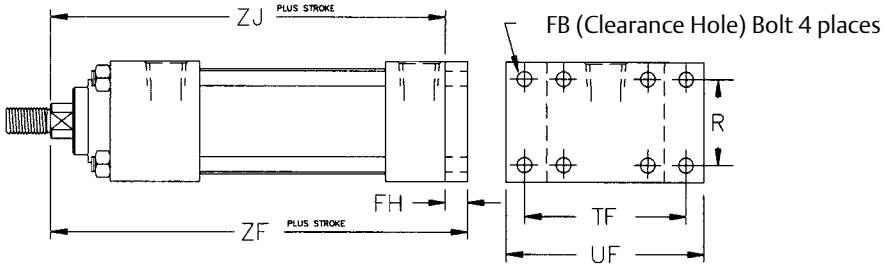
Bore	Rod	AC	AD	AE	AF	LAF
1-1/2", 2", 2-1/2"	5/8"	1.125	0.625	0.250	0.375	1.750
	1"	1.625	0.938	0.375	0.688	2.500
3-1/4", 4", 5"	1"	1.500	0.938	0.375	0.688	2.375
	1 3/8"	1.750	1.062	0.375	0.875	2.750
6"	1 3/8"	1.750	1.062	0.375	0.875	2.750
	1 3/4"	2.000	1.313	0.500	1.125	3.125

Dimensions: Inches

Flange Mounts



Mount Code F1 NFPA MF1



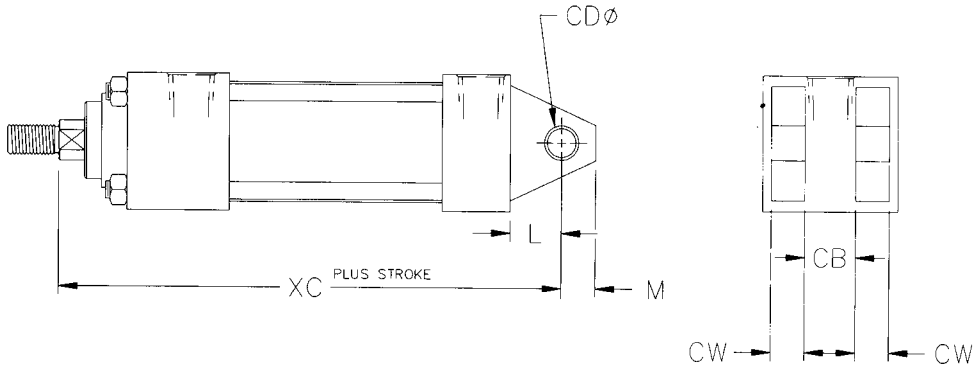
Mount Code F2 NFPA MF2

NOTE: This drawing represents 1-1/2" through 2-1/2" bore rod bushing retainer configuration.

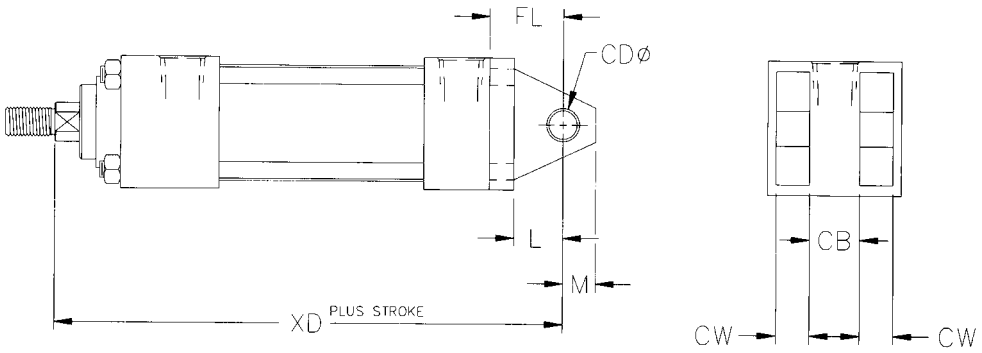
Bore	Rod	FB	FH	R	TF	UF	W	ZJ	ZF
1-1/2"	0.625	0.313	0.375	1.430	2.750	3.375	0.625	4.625	5.000
	1.000	0.313	0.375	1.430	2.750	3.375	1.000	5.000	5.375
2"	0.625	0.375	0.375	1.840	3.375	4.125	0.625	4.625	5.000
	1.000	0.375	0.375	1.840	3.375	4.125	1.000	5.000	5.375
2-1/2"	0.625	0.375	0.375	2.190	3.875	4.625	0.625	4.750	5.125
	1.000	0.375	0.375	2.190	3.875	4.625	1.000	5.125	5.500
3-1/4"	1.000	0.438	0.625	2.760	4.688	5.500	0.750	5.625	6.250
	1.375	0.438	0.625	2.760	4.688	5.500	1.000	5.875	6.500
4"	1.000	0.438	0.625	3.320	5.438	6.250	0.750	5.625	6.250
	1.375	0.438	0.625	3.320	5.438	6.250	1.000	5.875	6.500
5"	1.000	0.563	0.625	4.100	6.625	7.625	0.750	5.875	6.500
	1.375	0.563	0.625	4.100	6.625	7.625	1.000	6.125	6.750
6"	1.375	0.563	0.750	4.880	7.625	8.625	0.875	6.625	7.375
	1.750	0.563	0.750	4.880	7.625	8.625	1.125	6.875	7.625

Dimensions: Inches

Clevis Mounts



Mount Code P1 NFPA MP1

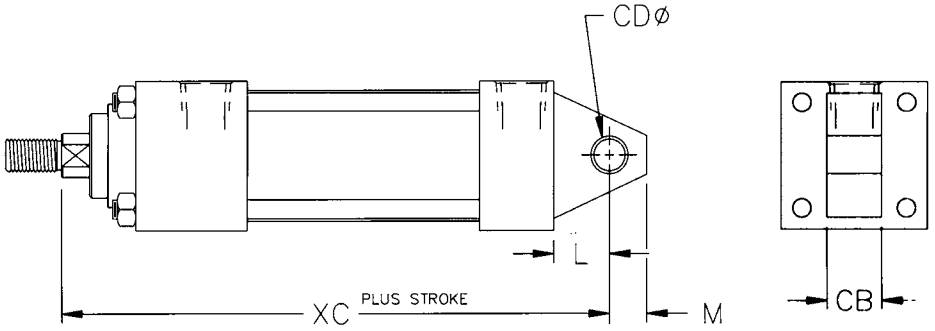


Mount Code P2 NFPA MP2

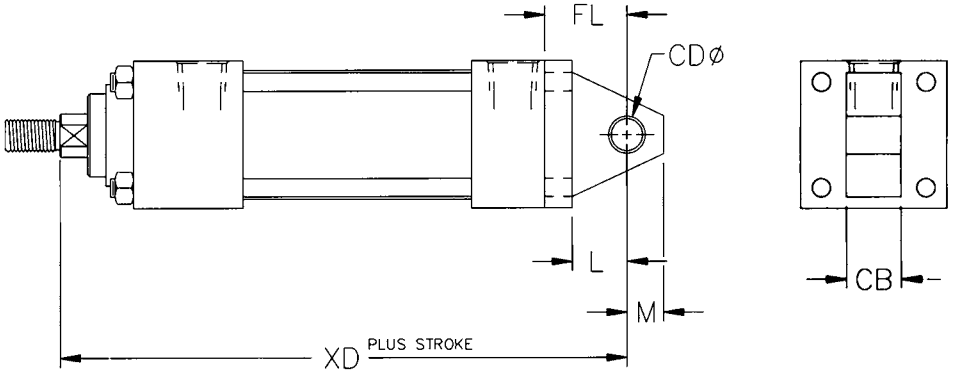
Bore	Rod	CB	CD	CW	FL	L	M	XC	XD
1-1/2"	0.625	0.750	0.500	0.500	1.125	0.750	0.500	5.375	5.750
	1.000	0.750	0.500	0.500	1.125	0.750	0.500	5.750	6.125
2"	0.625	0.750	0.500	0.500	1.125	0.750	0.500	5.375	5.750
	1.000	0.750	0.500	0.500	1.125	0.750	0.500	5.750	6.125
2-1/2"	0.625	0.750	0.500	0.500	1.125	0.750	0.500	5.500	5.875
	1.000	0.750	0.500	0.500	1.125	0.750	0.500	5.875	6.250
3-1/4"	1.000	1.250	0.750	0.625	1.875	1.250	0.750	6.875	7.500
	1.375	1.250	0.750	0.625	1.875	1.250	0.750	7.125	7.750
4"	1.000	1.250	0.750	0.625	1.875	1.250	0.750	6.875	7.500
	1.375	1.250	0.750	0.625	1.875	1.250	0.750	7.125	7.750
5"	1.000	1.250	0.750	0.625	1.875	1.250	0.750	7.125	7.750
	1.375	1.250	0.750	0.625	1.875	1.250	0.750	7.375	8.000
6"	1.375	1.500	1.000	0.750	2.250	1.500	1.000	8.125	8.875
	1.750	1.500	1.000	0.750	2.250	1.500	1.000	8.375	9.125

Dimensions: Inches

Eye Mounts



Mount Code P3 NFPA MP3

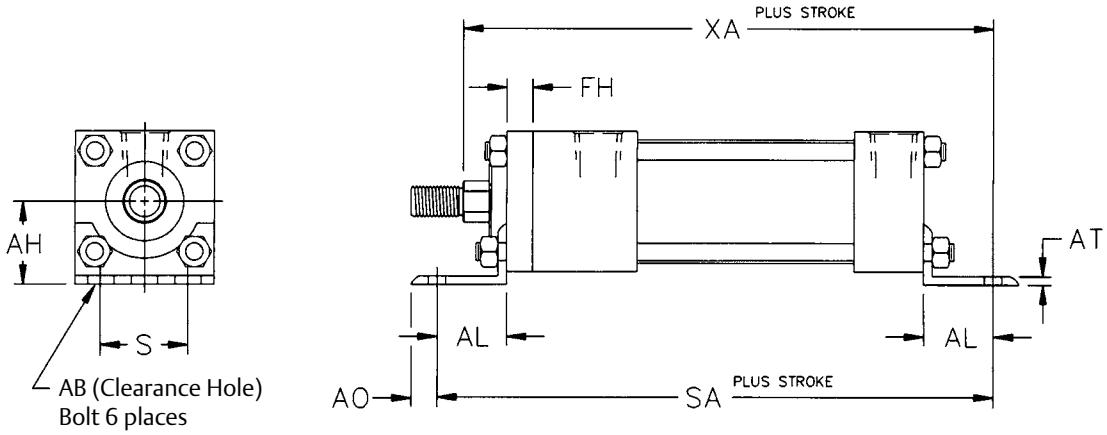


Mount Code P4 NFPA MP4

Bore	Rod	CB	CD	FL	L	M	XC	XD
1-1/2"	0.625	0.750	0.500	1.125	0.750	0.500	5.375	5.750
	1.000	0.750	0.500	1.125	0.750	0.500	5.750	6.125
2"	0.625	0.750	0.500	1.125	0.750	0.500	5.375	5.750
	1.000	0.750	0.500	1.125	0.750	0.500	5.750	6.125
2-1/2"	0.625	0.750	0.500	1.125	0.750	0.500	5.500	5.875
	1.000	0.750	0.500	1.125	0.750	0.500	5.875	6.250
3-1/4"	1.000	1.250	0.750	1.875	1.250	0.750	6.875	7.500
	1.375	1.250	0.750	1.875	1.250	0.750	7.125	7.750
4"	1.000	1.250	0.750	1.875	1.250	0.750	6.875	7.500
	1.375	1.250	0.750	1.875	1.250	0.750	7.125	7.750
5"	1.000	1.250	0.750	1.875	1.250	0.750	7.125	7.750
	1.375	1.250	0.750	1.875	1.250	0.750	7.375	8.000
6"	1.375	1.500	1.000	2.250	1.500	1.000	8.125	8.875
	1.750	1.500	1.000	2.250	1.500	1.000	8.375	9.125

Dimensions: Inches

Angle Mount

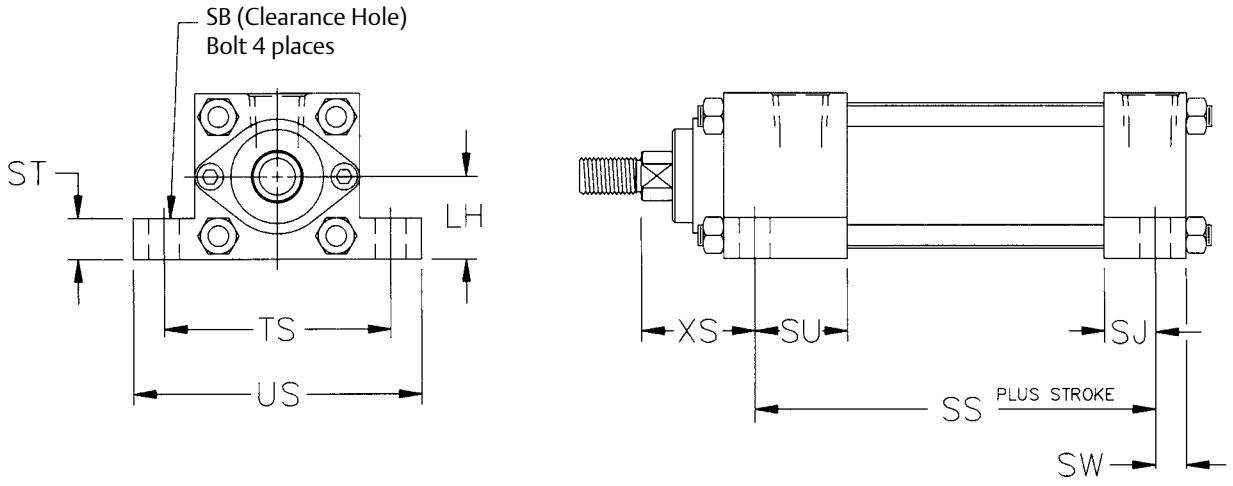


Mount Code S1 NFPA MS1

Bore	Rod	AB	AH	AL	AO	AT	FH	S	SA	XA
1-1/2"	0.625	0.375	1.188	1.000	0.375	0.125	0.375	1.250	6.000	5.625
	1.000	0.375	1.188	1.000	0.375	0.125	0.375	1.250	6.000	6.000
2"	0.625	0.375	1.438	1.000	0.375	0.125	0.375	1.750	6.000	5.625
	1.000	0.375	1.438	1.000	0.375	0.125	0.375	1.750	6.000	6.000
2-1/2"	0.625	0.375	1.625	1.000	0.375	0.125	0.375	2.250	6.125	5.750
	1.000	0.375	1.625	1.000	0.375	0.125	0.375	2.250	6.125	6.125
3-1/4"	1.000	0.500	1.938	1.250	0.500	0.125	0.625	2.750	7.375	6.875
	1.375	0.500	1.938	1.250	0.500	0.125	0.625	2.750	7.375	7.125
4"	1.000	0.500	2.250	1.250	0.500	0.125	0.625	3.500	7.375	6.875
	1.375	0.500	2.250	1.250	0.500	0.125	0.625	3.500	7.375	7.125
5"	1.000	0.625	2.750	1.375	0.625	0.188	0.625	4.250	7.875	7.250
	1.375	0.625	2.750	1.375	0.625	0.188	0.625	4.250	7.875	7.500
6"	1.375	0.750	3.250	1.375	0.625	0.188	0.750	5.250	8.500	8.000
	1.750	0.750	3.250	1.375	0.625	0.188	0.750	5.250	8.500	8.250

Dimensions: Inches

Side Lug Mount

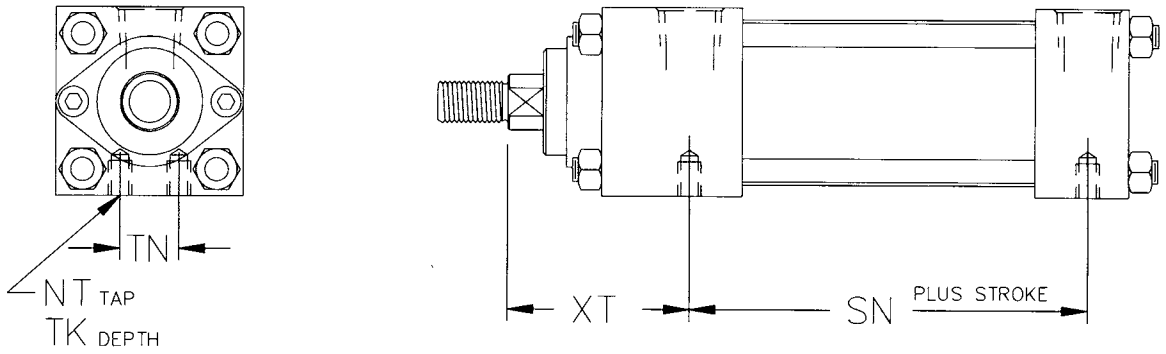


Mount Code S2 NFPA MS2

Bore	Rod	LH	SB	SJ	SS	ST	SU	SW	TS	US	XS
1-1/2"	0.625	1.000	0.375	0.625	2.875	0.500	1.125	0.375	2.750	3.500	1.375
	1.000	1.000	0.375	0.625	2.875	0.500	1.125	0.375	2.750	3.500	1.750
2"	0.625	1.250	0.375	0.625	2.875	0.500	1.125	0.375	3.250	4.000	1.375
	1.000	1.250	0.375	0.625	2.875	0.500	1.125	0.375	3.250	4.000	1.750
2-1/2"	0.625	1.500	0.375	0.625	3.000	0.500	1.125	0.375	3.750	4.500	1.375
	1.000	1.500	0.375	0.625	3.000	0.500	1.125	0.375	3.750	4.500	1.750
3-1/4"	1.000	1.875	0.500	0.750	3.250	0.750	1.250	0.500	4.750	5.750	1.875
	1.375	1.875	0.500	0.750	3.250	0.750	1.250	0.500	4.750	5.750	2.125
4"	1.000	2.250	0.500	0.750	3.250	0.750	1.250	0.500	5.500	6.500	1.875
	1.375	2.250	0.500	0.750	3.250	0.750	1.250	0.500	5.500	6.500	2.125
5"	1.000	2.750	0.750	0.563	3.125	1.000	1.063	0.688	6.875	8.250	2.063
	1.375	2.750	0.750	0.563	3.125	1.000	1.063	0.688	6.875	8.250	2.313
6"	1.375	3.250	0.750	0.813	3.625	1.000	1.313	0.688	7.875	9.250	2.313
	1.750	3.250	0.750	0.813	3.625	1.000	1.313	0.688	7.875	9.250	2.563

Dimensions: Inches

Bottom Tap Mount

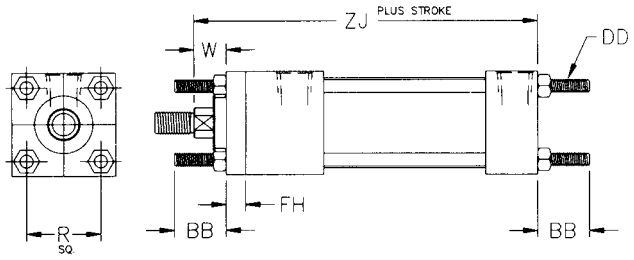


Mount Code S4 NFPA MS4

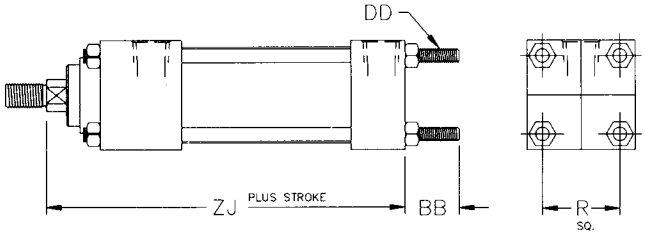
Bore	Rod	NT	TK	TN	SN	XT
1-1/2"	0.625	1/4-20	0.375	0.625	2.250	1.938
	1.000	1/4-20	0.313	0.625	2.250	2.313
2"	0.625	5/16-18	0.500	0.875	2.250	1.938
	1.000	5/16-18	0.500	0.875	2.250	2.313
2-1/2"	0.625	3/8-16	0.625	1.250	2.375	1.938
	1.000	3/8-16	0.625	1.250	2.375	2.313
3-1/4"	1.000	1/2-13	0.750	1.500	2.625	2.438
	1.375	1/2-13	0.750	1.500	2.625	2.688
4"	1.000	1/2-13	0.750	2.063	2.625	2.438
	1.375	1/2-13	0.750	2.063	2.625	2.688
5"	1.000	5/8-11	1.000	2.688	2.875	2.438
	1.375	5/8-11	1.000	2.688	2.875	2.688
6"	1.375	3/4-10	1.125	3.250	3.125	2.813
	1.750	3/4-10	1.125	3.250	3.125	3.063

Dimensions: Inches

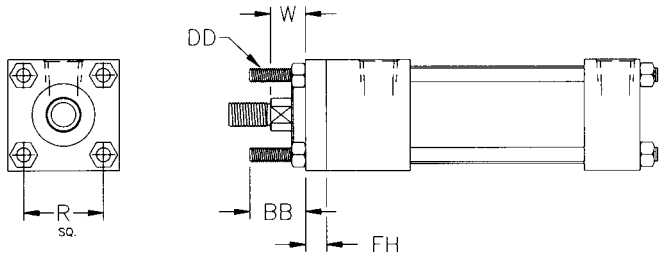
Extended Tie Rod Mounts



Mount Code X1 NFPA MX1



Mount Code X2 NFPA MX2

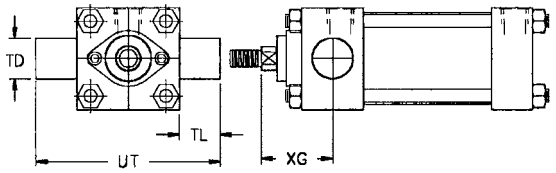


Mount Code X3 NFPA MX3

Bore	Rod	BB	DD	FH	R	W	ZJ
1-1/2"	0.625	1.000	1/4-28	0.375	1.430	0.625	4.625
	1.000	1.000	1/4-28	0.375	1.430	1.000	5.000
2"	0.625	1.125	5/16-24	0.375	1.840	0.625	4.625
	1.000	1.125	5/16-24	0.375	1.840	1.000	5.000
2-1/2"	0.625	1.125	5/16-24	0.375	2.190	0.625	4.750
	1.000	1.125	5/16-24	0.375	2.190	1.000	5.125
3-1/4"	1.000	1.375	3/8-24	0.625	2.760	0.750	5.625
	1.375	1.375	3/8-24	0.625	2.760	1.000	5.875
4"	1.000	1.375	3/8-24	0.625	3.320	0.750	5.625
	1.375	1.375	3/8-24	0.625	3.320	1.000	5.875
5"	1.000	1.813	1/2-20	0.625	4.100	0.750	5.875
	1.375	1.813	1/2-20	0.625	4.100	1.000	6.125
6"	1.375	1.813	1/2-20	0.750	4.880	0.875	6.625
	1.750	1.813	1/2-20	0.750	4.880	1.125	6.875

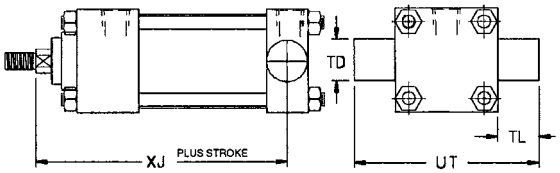
Dimensions: Inches

Trunnion Mounts



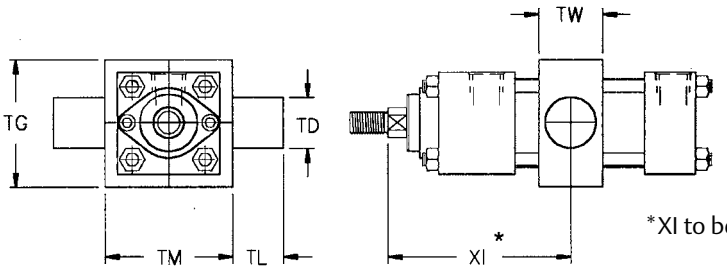
Mount Code T1 (Fixed Steel Trunnion Ears)
Mount Code T6 (Removable Aluminum Trunnion Head)

NFPA MT1



Mount Code T2 (Fixed Steel Trunnion Ears)
Mount Code T7 (Removable Aluminum Trunnion Head)

NFPA MT2



*XI to be specified by customer

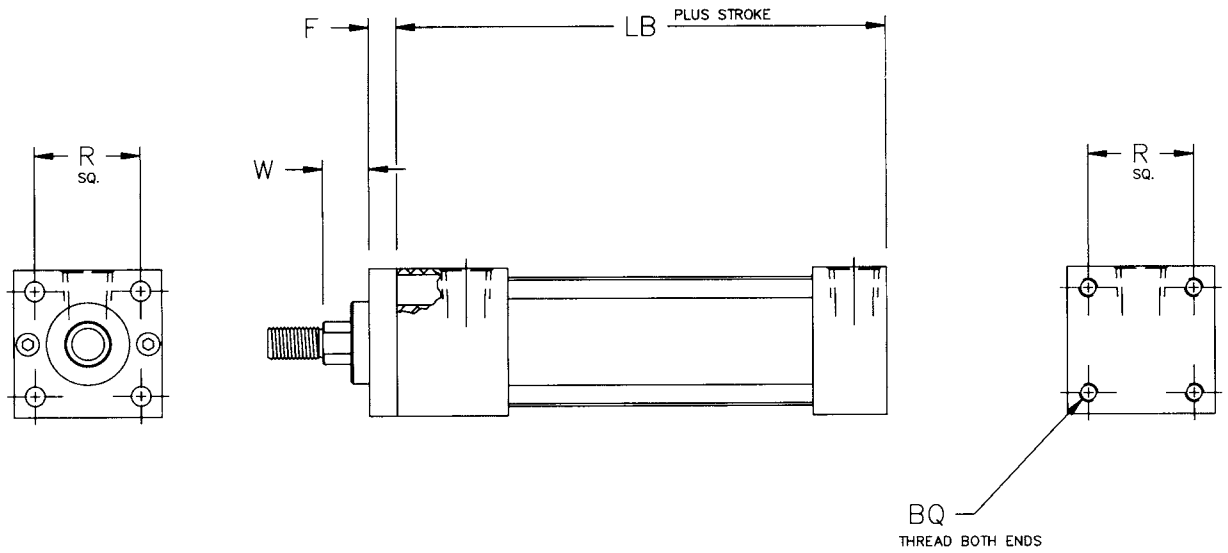
Mount Code T4

NFPA MT4

Bore	Rod	TD	TG	TL	TM	TW	UT	XG	XI (Min.)	XJ
1-1/2"	0.625	1.000	2.500	1.000	2.500	1.250	4.000	1.750	3.125	4.125
	1.000	1.000	2.500	1.000	2.500	1.250	4.000	2.125	3.500	4.500
2"	0.625	1.000	3.000	1.000	3.000	1.500	4.500	1.750	3.250	4.125
	1.000	1.000	3.000	1.000	3.000	1.500	4.500	2.125	3.625	4.500
2-1/2"	0.625	1.000	3.500	1.000	3.500	1.500	5.000	1.750	3.250	4.250
	1.000	1.000	3.500	1.000	3.500	1.500	5.000	2.125	3.625	4.625
3-1/4"	1.000	1.000	4.250	1.000	4.500	2.000	5.750	2.250	4.125	5.000
	1.375	1.000	4.250	1.000	4.500	2.000	5.750	2.500	4.375	5.250
4"	1.000	1.000	5.000	1.000	5.250	2.000	6.500	2.250	4.125	5.000
	1.375	1.000	5.000	1.000	5.250	2.000	6.500	2.500	4.375	5.250
5"	1.000	1.000	6.000	1.000	6.250	2.000	7.500	2.250	4.125	5.250
	1.375	1.000	6.000	1.000	6.250	2.000	7.500	2.500	4.375	5.500
6"	1.375	1.375	7.000	1.375	7.625	2.500	9.250	2.625	4.875	5.875
	1.750	1.375	7.000	1.375	7.625	2.500	9.250	2.875	5.125	6.125

Dimensions: Inches

Sleeve Nut Mount

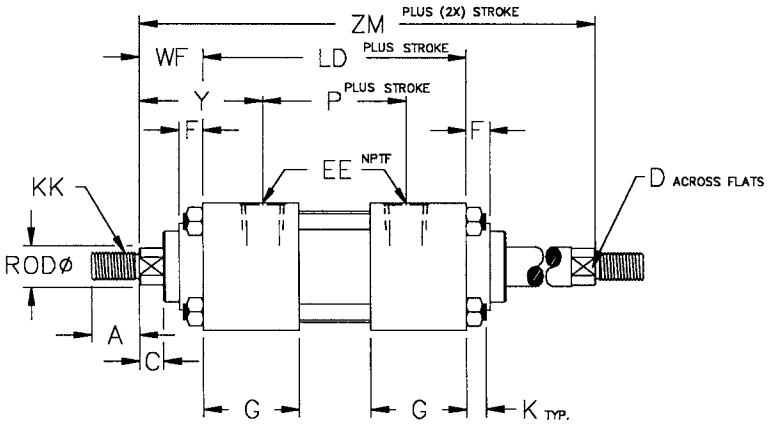


Mount Code SN

Bore	Rod	BQ	F	LB	R	W
1-1/2"	0.625	1/4-28	0.375	3.625	1.430	0.625
	1.000	1/4-28	0.375	3.625	1.430	1.000
2"	0.625	5/16-24	0.375	3.625	1.840	0.625
	1.000	5/16-24	0.375	3.625	1.840	1.000
2-1/2"	0.625	5/16-24	0.375	3.750	2.190	0.625
	1.000	5/16-24	0.625	3.750	2.190	1.000
3-1/4"	1.000	3/8-24	0.625	4.250	2.760	0.750
	1.375	3/8-24	0.625	4.250	2.760	1.000
4"	1.000	3/8-24	0.625	4.250	3.320	0.750
	1.375	3/8-24	0.625	4.250	3.320	1.000
5"	1.000	1/2-20	0.625	4.500	4.100	0.750
	1.375	1/2-20	0.625	4.500	4.100	1.000
6"	1.375	1/2-20	0.625	5.000	4.880	1.000
	1.750	1/2-20	0.750	5.000	4.880	1.125

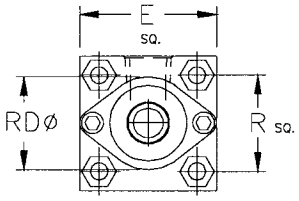
Dimensions: Inches

Double Rod End

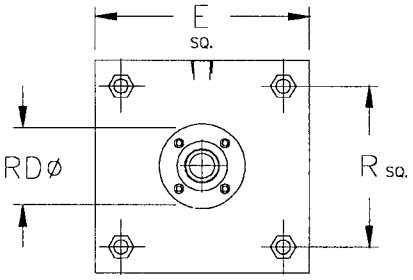


Order as "DA" Option

NFPA MDXO



1 1/2" Through 2 1/2"



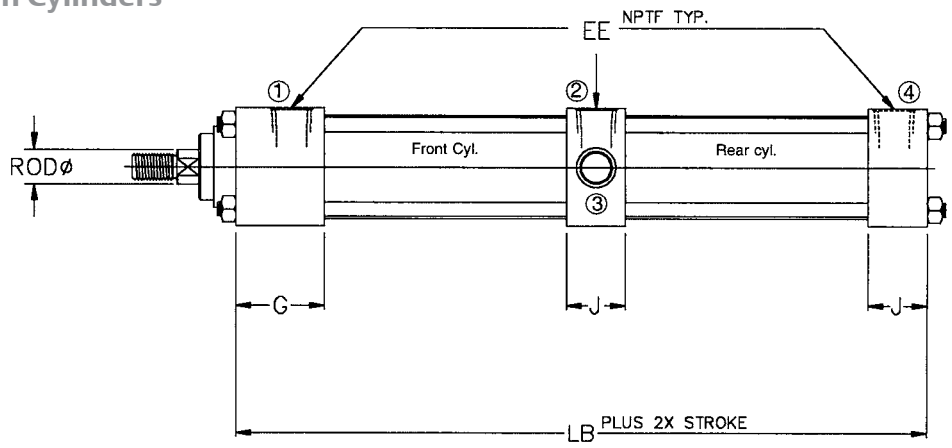
3 1/4" Through 6"

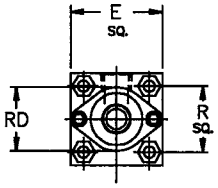
Bore	Rod	A	C	D	E	EE	F	G	K	KK	LD	P	R	SN	SS	RD	WF	Y	ZM
1-1/2"	0.625	0.750	0.375	0.500	2.000	0.375	0.375	1.500	0.250	7/16-20	4.125	2.250	1.430	2.250	3.375	1.375	1.000	1.938	6.125
	1.000	1.125	0.500	0.813	2.000	0.250	0.375	1.500	0.250	3/4-16	4.125	1.955	1.430	2.250	3.375	2.000*	1.375	2.460	6.875
2"	0.625	0.750	0.375	0.500	2.500	0.375	0.375	1.500	0.313	7/16-20	4.125	2.250	1.840	2.250	3.375	1.375	1.000	1.938	6.125
	1.000	1.125	0.500	0.813	2.500	0.375	0.375	1.500	0.313	3/4-16	4.125	2.250	1.840	2.250	3.375	2.500*	1.375	2.313	6.875
2-1/2"	0.625	0.750	0.375	0.500	3.000	0.375	0.375	1.500	0.313	7/16-20	4.250	2.375	2.190	2.375	3.500	1.375	1.000	1.938	6.250
	1.000	1.125	0.500	0.813	3.000	0.375	0.375	1.500	0.313	3/4-16	4.250	2.375	2.190	2.375	3.500	3.000*	1.375	2.313	7.000
3-1/4"	1.000	1.125	0.500	0.813	3.750	0.500	0.625	1.750	0.375	3/4-16	4.750	2.625	2.760	2.625	3.750	2.706	1.375	2.438	7.500
	1.375	1.625	0.625	1.125	3.750	0.500	0.625	1.750	0.375	1-14	4.750	2.625	2.760	2.625	3.750	3.125	1.625	2.688	8.000
4"	1.000	1.125	0.500	0.813	4.500	0.500	0.625	1.750	0.375	3/4-16	4.750	2.625	3.320	2.625	3.750	2.706	1.375	2.438	7.500
	1.375	1.625	0.625	1.125	4.500	0.500	0.625	1.750	0.375	1-14	4.750	2.625	3.320	2.625	3.750	3.125	1.625	2.688	8.000
5"	1.000	1.125	0.500	0.813	5.500	0.500	0.625	1.750	0.500	3/4-16	5.000	2.875	4.100	2.875	3.625	2.706	1.375	2.438	7.750
	1.375	1.625	0.625	1.125	5.500	0.500	0.625	1.750	0.500	1-14	5.000	2.875	4.100	2.875	3.625	3.125	1.625	2.688	8.250
6"	1.375	1.625	0.625	1.125	6.500	0.750	0.625	2.000	0.500	1-14	5.000	3.125	4.880	3.125	4.125	3.125	1.625	2.813	8.750
	1.750	2.000	0.750	1.500	6.500	0.750	0.750	2.000	0.500	1 1/4-12	5.000	3.125	4.880	3.125	4.125	3.788	1.875	3.063	9.250

*Uses a full-face bushing retainer.

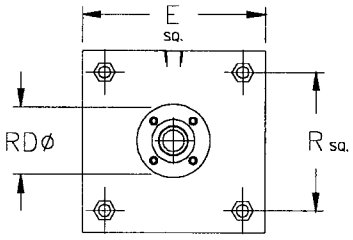
Dimensions: Inches

Tandem Cylinders





1-1/2" Through 2-1/2"



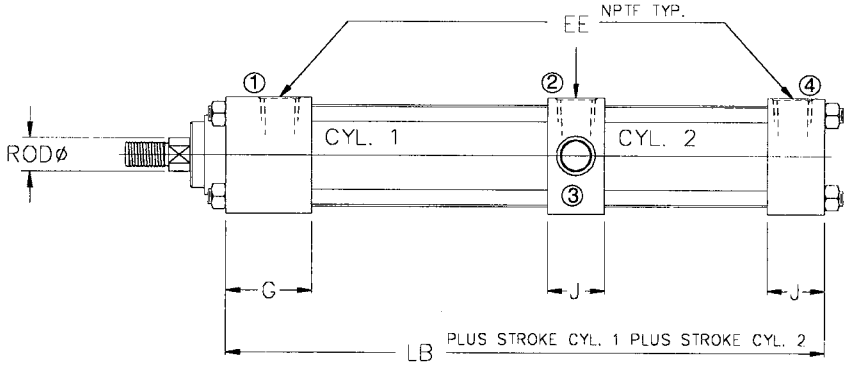
3-1/4" Through 6"

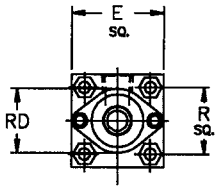
This configuration provides approximately twice the force of an equivalent basic double acting cylinder. Two pistons are attached to a common piston rod. Ports 2 and 4 are pressurized to roughly double the extend force. Ports 1 and 3 are pressurized to double the retract force.

Bore	Rod	E	EE	G	J	LB	R	RD
1-1/2"	0.625	2.000	3/8	1.500	1.000	5.750	1.430	1.375
	1.000	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2"	0.625	2.500	3/8	1.500	1.000	5.750	1.840	1.375
	1.000	2.500	3/8	1.500	1.000	5.750	1.840	2.000
2-1/2"	0.625	3.000	3/8	1.500	1.000	6.000	2.190	1.375
	1.000	3.000	3/8	1.500	1.000	6.000	2.190	3.000
3-1/4"	1.000	3.750	1/2	1.750	1.250	6.750	2.760	2.706
	1.375	3.750	1/2	1.750	1.250	6.750	2.760	3.125
4"	1.000	4.500	1/2	1.750	1.250	6.750	3.320	2.706
	1.375	4.500	1/2	1.750	1.250	6.750	3.320	3.125
5"	1.000	5.500	1/2	1.750	1.250	7.250	4.100	2.706
	1.375	5.500	1/2	1.750	1.250	7.250	4.100	3.125
6"	1.375	6.500	3/4	2.000	1.500	8.000	4.880	3.125
	1.750	6.500	3/4	2.000	1.500	8.000	4.880	3.788

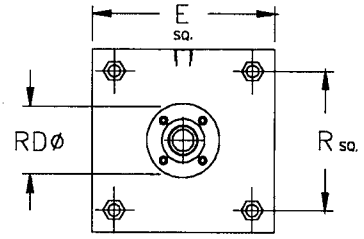
Dimensions: Inches

Multi-Position Cylinders





1-1/2" Through 2 1/2"



3-1/4" Through 6"

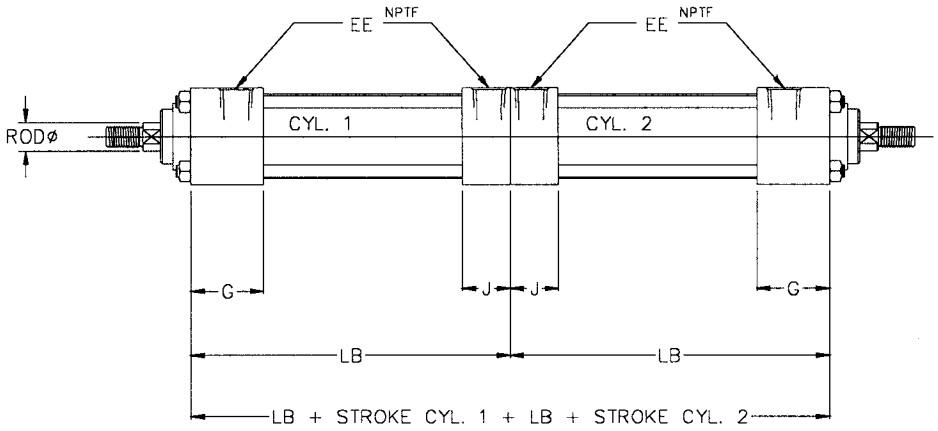
Multi-position cylinders look similar to tandem cylinders. However, in this cylinder the rear and front piston rods are separate. The stroke from full retract to the intermediate extend point is set by the stroke of cylinder #2. The total stroke from full retract to full extend is set by the stroke cylinder #1. Full extend or retract is achieved by pressurizing ports 2 or 1 respectively with ports 3 and 4 vented. An intermediate position is achieved by pressurizing port 4 with the other ports vented or by pressurizing both ports 1 and 4. With 1 and 4 pressurized, the rod is more positively held in the intermediate position.

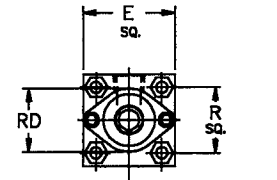
Bore	Rod	E	EE	G	J	LB	R	RD
1-1/2"	0.625	2.000	3/8	1.500	1.000	5.750	1.430	1.375*
	1.000	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2"	0.625	2.500	3/8	1.500	1.000	5.750	1.840	1.375
	1.000	2.500	3/8	1.500	1.000	5.750	1.840	2.000*
2-1/2"	0.625	3.000	3/8	1.500	1.000	6.000	2.190	1.375
	1.000	3.000	3/8	1.500	1.000	6.000	2.190	3.000*
3-1/4"	1.000	3.750	1/2	1.750	1.250	6.750	2.760	2.706
	1.375	3.750	1/2	1.750	1.250	6.750	2.760	3.125
4"	1.000	4.500	1/2	1.750	1.250	6.750	3.320	2.706
	1.375	4.500	1/2	1.750	1.250	6.750	3.320	3.125
5"	1.000	5.500	1/2	1.750	1.250	7.250	4.100	2.706
	1.375	5.500	1/2	1.750	1.250	7.250	4.100	3.125
6"	1.375	6.500	3/4	2.000	1.500	8.000	4.880	3.125
	1.750	6.500	3/4	2.000	1.500	8.000	4.880	3.788

*Uses a full-face bushing retainer.

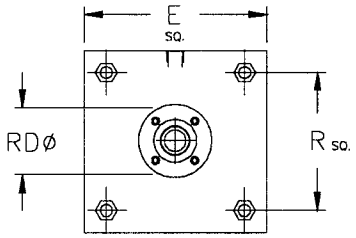
Dimensions: Inches

Back to Back Cylinders





1-1/2" Through 2 1/2"



3-1/4" Through 6"

This configuration is two cylinders mounted back to back. Each cylinder can be operated independently. The cylinders can have the same stroke or different strokes. This configuration enables you to have four combinations of rods extended or retracted.

Bore	Rod	E	EE	G	J	LB	R	RD
1-1/2"	0.625	2.000	3/8	1.500	1.000	3.625	1.430	1.375
	1.000	N/A	N/A	N/A	N/A	3.625	1.430	2.000*
2"	0.625	2.500	3/8	1.500	1.000	3.625	1.840	1.375
	1.000	2.500	3/8	1.500	1.000	3.625	1.840	2.500
2-1/2"	0.625	3.000	3/8	1.500	1.000	3.750	2.190	1.375
	1.000	3.000	3/8	1.500	1.000	3.750	2.190	3.000*
3-1/4"	1.000	3.750	1/2	1.750	1.250	4.250	2.760	2.706
	1.375	3.750	1/2	1.750	1.250	4.250	2.760	3.125
4"	1.000	4.500	1/2	1.750	1.250	4.250	3.320	2.706
	1.375	4.500	1/2	1.750	1.250	4.250	3.320	3.125
5"	1.000	5.500	1/2	1.750	1.250	4.500	4.100	2.706
	1.375	5.500	1/2	1.750	1.250	4.500	4.100	3.125
6"	1.375	6.500	3/4	2.000	1.500	5.000	4.880	3.125
	1.750	6.500	3/4	2.000	1.500	5.000	4.880	3.788

*Uses a full-face bushing retainer.

Air-Oil Tanks

The Aventics Air-Oil Tank offers a way to convert available (shop) air pressure into hydraulic pressure. Compressed air is applied directly to the oil that is in the air-oil tank. In turn, it is converted into hydraulic pressure. Note that the pressure is converted at a 1 to 1 ratio. For example, 90 psi air produces 90 psi hydraulic pressure.

All Aventics Air-Oil Tanks have a sight level gauge, which shows the oil level. They also contain two fluid flow baffles. The top baffle disperses the incoming air over the surface of the oil in an effort to inhibit agitation. The bottom baffle ensures a smooth flow pattern. This will minimize oil turbulence and eliminate swirling. Swirling could cause the oil to be blown from the tank into atmosphere.

Air-Oil Tanks are used to assist in making the piston rod travel smooth and effortless, in turn, preventing unwanted chatter. Air-Oil Tanks are commonly used in slow speed applications. Fluid velocity in or out of the tank through standard ports should be less than 6 feet per second. Again, this will prevent the oil from being blown from the tank into atmosphere. Since each tank is designed for a specific port size, note that increasing the port size in an effort to decrease the fluid velocity is not recommended. Instead, a tank with a larger port should be selected.

Bore	Stroke (in) 4 Volume (in^3)	Stroke (in) 8 Volume (in^3)	Stroke (in) 12 Volume (in^3)	Stroke (in) 16 Volume (in^3)	Stroke (in) 20 Volume (in^3)	Stroke (in) 24 Volume (in^3)
2"	12.6	25.1	37.7	50.3	62.8	75.4
2-1/2"	19.6	39.3	58.9	78.5	98.2	117.8
3-1/4"	33.2	66.4	99.5	132.7	165.9	199.1
4"	50.3	100.5	150.8	201.1	251.3	301.6
5"	78.5	157.1	235.6	314.2	392.7	471.2
6"	113.1	226.2	339.3	452.4	565.5	678.6
8"	201.1	402.1	603.2	804.2	1005.3	1206.4

How to Order

F1 T L - 04 A 0 D - A AA 0

Mount
E3* = Head Square
E4* = Cap Square
F1 = Front Flange
F2 = Rear Flange
S1 = Angle Mount
S2 = Side Lug Mount
S4 = Bottom Tap
X0 = Basic No Mount
X1 = Extended Tie Rod Both Ends
X2 = Extended Tie Rod Cap
X3 = Extended Tie Rod Head
*Only Available for 8" Bore

Type
T = Air-Oil Tank

Bore
K = 1-1/2"
L = 2"
M = 2-1/2"
P = 3-1/4"
R = 4"
T = 5"
U = 6"
W = 8"

Full Inches of Stroke
00 = 0" Stroke
01 = 1" Stroke
02 = 2" Stroke
03 = 3" Stroke
99 = 99" Stroke
Note: Consult factory for strokes greater than 99".

Magnet
0 = No Magnet

Options
AA = No Options
VA = FKM Seals
VC = Volume Chamber

Cushions
A = No Cushions

Ports

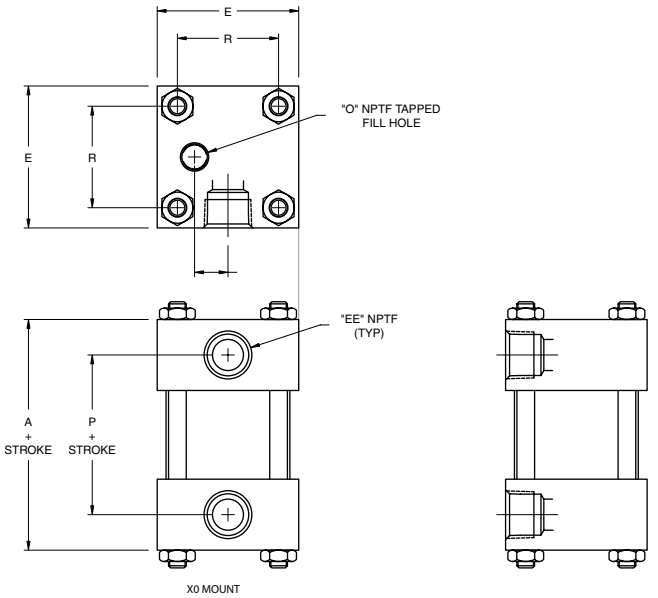
Position	1/8"	1/4"	3/8"	1/2"	3/4"
1	B	C	D	E	F
2	H	I	J	K	L
3	N	O	P	Q	R
4	T	U	V	W	X

Rod Code
0 = No Rod

Fractional Inches of Stroke
A = 0"
B = 1/16"
C = 1/8"
D = 3/16"
E = 1/4"
F = 5/16"
G = 3/8"
H = 7/16"
A = 1/2"
B = 9/16"
C = 5/8"
A = 11/16"
B = 3/4"
C = 13/16"
B = 7/8"
C = 15/16"

Dimensions: Inches

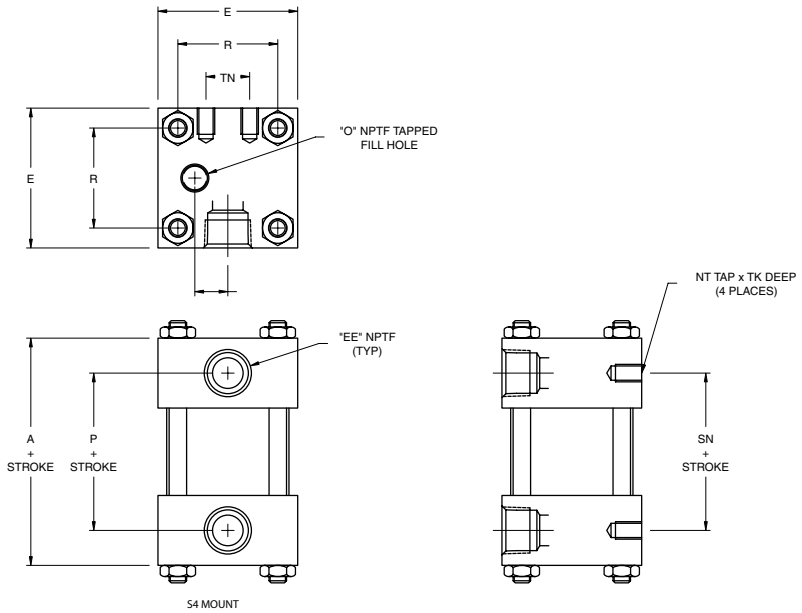
X0 Mount



X0 MOUNT

Bore	A	E	EE	M	O	P	R
2"	2.00	2.50	3/8	0.56	1/4	1.12	1.84
2-1/2"	2.00	3.00	3/8	0.69	1/4	1.12	2.19
3-1/4"	2.50	3.75	1/2	0.88	3/8	1.38	2.76
4"	2.50	4.50	1/2	0.88	3/8	1.38	3.32
5"	2.50	5.50	1/2	1.31	3/8	1.38	4.10
6"	3.00	6.50	1/2	1.31	3/8	1.63	4.88
8"	3.00	8.50	3/4	2.25	1/2	1.63	6.44

S4 Mount

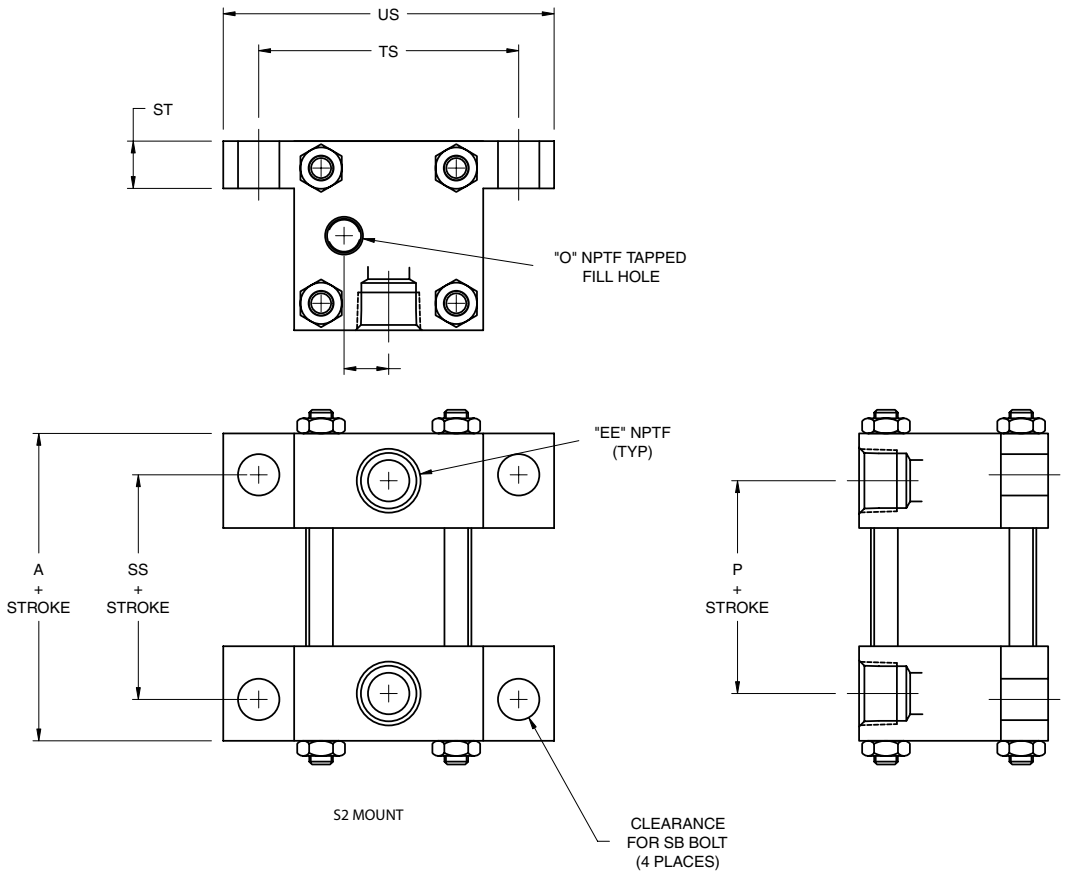


S4 MOUNT

Bore	A	E	EE	M	O	P	R	NT	SN	TK	TN
2"	2.00	2.50	3/8	0.56	1/4	1.12	1.84	5/16-18 UNC-2B	1.13	0.28	0.88
2-1/2"	2.00	3.00	3/8	0.69	1/4	1.12	2.19	3/8-16 UNC-2B	1.13	0.28	1.25
3-1/4"	2.50	3.75	1/2	0.88	3/8	1.38	2.76	1/2-13 UNC-2B	1.37	0.25	1.50
4"	2.50	4.50	1/2	0.88	3/8	1.38	3.32	1/2-13 UNC-2B	1.37	0.50	2.06
5"	2.50	5.50	1/2	1.31	3/8	1.38	4.10	5/8-11 UNC-2B	1.37	1.00	2.69
6"	3.00	6.50	1/2	1.31	3/8	1.63	4.88	3/4-10 UNC-2B	1.63	0.94	3.25
8"	3.00	8.50	3/4	2.25	1/2	1.63	6.44	3/4-10 UNC-2B	1.63	0.94	4.50

Dimensions: Inches

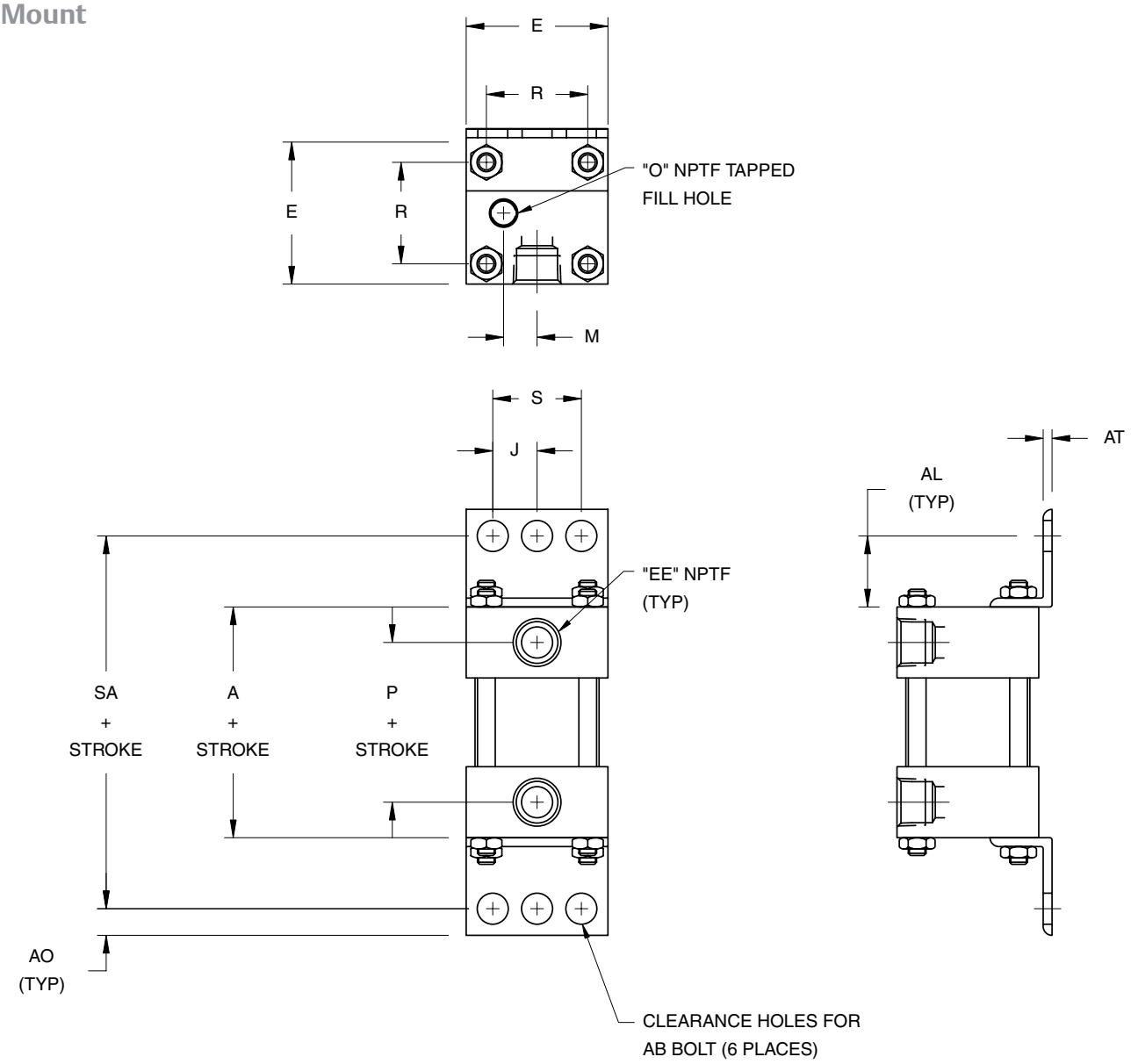
S2 Mount



Bore	A	EE	M	O	P	SB	SS	ST	TS	US
2"	2.00	3/8	0.56	1/4	1.12	3/8	1.13	0.50	3.25	4.00
2-1/2"	2.00	3/8	0.69	1/4	1.12	3/8	1.13	0.50	3.75	4.50
3-1/4"	2.50	1/2	0.88	3/8	1.38	1/2	1.44	0.75	4.75	5.75
4"	2.50	1/2	0.88	3/8	1.38	1/2	1.44	0.75	5.50	6.50
5"	2.50	1/2	1.31	3/8	1.38	3/4	1.44	1.00	6.88	8.25
6"	3.00	1/2	1.31	3/8	1.63	3/4	1.69	1.00	7.88	9.25
8"	3.00	3/4	2.25	1/2	1.63	3/4	1.69	1.00	9.88	11.25

Dimensions: Inches

S1 Mount



Bore	A	AO	AL	AT	J	E	EE	M	O	P	R	S	SA	AB
2"	2.00	0.38	1.00	0.13	0.88	2.50	3/8	0.56	1/4	1.12	1.84	1.75	4.00	3/8
2-1/2"	2.00	0.38	1.00	0.13	1.13	3.00	3/8	0.69	1/4	1.12	2.19	2.25	4.00	3/8
3-1/4"	2.50	0.50	1.25	0.13	1.38	3.75	1/2	0.88	3/8	1.38	2.76	2.75	5.00	1/2
4"	2.50	0.50	1.25	0.13	1.75	4.50	1/2	0.88	3/8	1.38	3.32	3.50	5.00	1/2
5"	2.50	0.63	1.38	0.19	2.13	5.50	1/2	1.31	3/8	1.38	4.10	4.25	5.25	5/8
6"	3.00	0.63	1.38	0.19	2.63	6.50	1/2	1.31	3/8	1.63	4.88	5.25	5.75	3/4
8"	3.00	0.69	1.81	0.25	3.56	8.50	3/4	2.25	1/2	1.63	6.44	7.13	6.63	3/4

Stop Tube Data

Step 1 - Determine which mount below corresponds to your application.

Step 2 - Determine the value of “L” from Table 1 below. Then find “L” dimension in Table 2 and read across to determine the required stop tube length.

Step 3 - Add the stop tube length to the original “L” value from Step 2. This is the corrected “L.” If the corrected “L” still falls within the same range as the original “L” then this is the required stop length. Otherwise, use this number in Table 2 to determine the second stop tube length.

Step 4 - Add the second stop length to the original “L.” If this value falls within the same range then the second stop tube length is the required length. Otherwise, repeat Step 4.

NOTE: Specify the effective stroke and the stop tube length when ordering.

Example:

Step 1: 10" bore cylinder, 1 3/4 diameter rod, P1 mount, 82 inch stroke
From catalog, XC = 10.375

From table 1, "L"=XC=(2xStroke)

Step 2: From Table 1, “L” = 10.375 + 164 = 174.375 inches
From Table 2, when “L” = 174.375, stop tube length = 14 inches

Step 3: Corrected “L” = 14 + 174.375 = 188.375 inches
From Table 2, when “L” = 188.375, stop tube length = 15 inches

Step 4: New corrected “L” = 15 + 174.375 = 189.375 inches
From Table 2, when “L” = 189.375, stop tube length = 15 inches

The stop tube length from Step 3 and 4 are the same, therefore, 15 inches is the required stop tube length.

Table 1

Mount Code	"L" (Inches)
S1*	4 x (WF + Stroke)
S2*	4 x (WF + Stroke)
S4*	4 x (WF + Stroke)
X3*	4 x (WF + Stroke)
X2*	4 x (WF + Stroke)
X1*	4 x (WF + Stroke)
T1	XG + Stroke
T2	XJ + (2 x Stroke)
T3	XI + Stroke

* “L” given is for an unsupported rod end. If rod end is supported with a guide less than 1" in width, divide “L” by 4. If rod end is supported with a guide greater than 1" in width, divide “L” by 8.

Table 2

"L" (Inches)	Stop Tube Length (Inches)
0-40	0
41-50	1
51-60	2
61-70	3
71-80	4
81-90	5
91-100	6
101-110	7
111-120	8
121-130	9
131-140	10
141-150	11
151-160	12
161-170	13
171-180	14
181-190	15
191-200	16
201-210	17
211-220	18
221-230	19
231-240	20
241-250	21
251-260	22
261-270	23
271-280	24
281-290	25
291-300	26
301-310	27

For P1 mount, “L” assumes that the rod extends and the cylinder pivots with the rod. Multiply “L” by four so the rod extends and the cylinder does not pivot with the rod.

Force Tables

The **extend force** is determined from Table 1 based on the operating pressure and cylinder bore size. Then determine the Retract Force by subtracting the "Retract Force Deduction" from the Extend Force. The "Retract Force Deduction" is found in Table 2 below corresponding to the piston rod diameter and operating pressure. These forces are theoretical based on areas with no friction allowance.

Table 1 Force Chart Extend

Bore	Piston Area	Pressure								Cubic Feet Displacement per Inch of Extended Stroke
		40	50	60	80	90	100	125	150	
1.50	1.77	71	88	106	141	159	177	221	265	.00102
2.00	3.14	126	157	188	251	283	314	393	471	.00182
2.50	4.91	196	245	295	393	442	491	614	736	.00284
3.25	8.30	332	415	498	664	747	830	1037	1244	.00480
4.00	12.57	503	628	754	1005	1131	1257	1571	1885	.00727
5.00	19.63	785	982	1178	1571	1767	1963	2454	2945	.01136
6.00	28.27	1131	1414	1696	2262	2545	2827	3534	4241	.01636

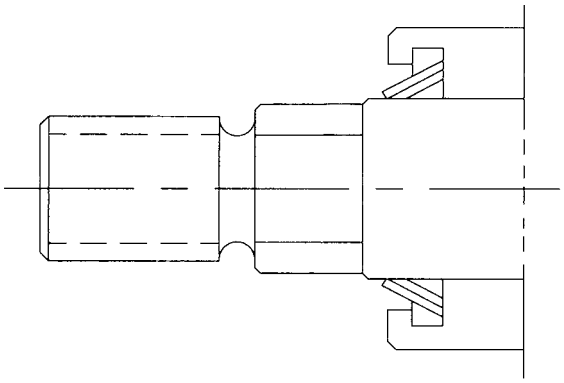
Table 2 Retract Force Deduction

Bore	Piston Area	Pressure								Cubic Feet Displacement per Inch of Extended Stroke
		40	50	60	80	90	100	125	150	
.625	.307	12	15	18	25	28	31	38	46	.00018
1.000	.785	31	39	47	63	71	79	98	118	.00045
1.375	1.485	59	74	89	119	134	148	186	223	.00086
1.750	2.405	96	120	144	192	216	241	301	361	.00139

Approximate Cylinder Weights (lbs)

Bore	1-1/2"		2"		2-1/2"		3-1/4"		4"		5"		6"	
Piston Rod Diameter	5/8"	1"	5/8"	1"	5/8"	1"	1"	1-38"	1"	1-38"	1"	1-38"	1-38"	1-34"
X0, S4	2.10	2.80	2.70	3.40	3.60	4.30	7.10	8.40	9.30	10.80	13.00	14.00	22.00	22.50
F1, F2, S2	2.70	3.50	3.70	4.40	5.00	5.70	10.30	12.00	14.00	15.40	20.00	21.00	32.00	34.00
P2, P4	3.20	4.00	4.10	5.00	5.50	6.40	11.50	13.10	15.50	16.40	20.10	21.80	35.00	36.00
T1, T2	2.60	3.30	3.10	3.90	4.00	4.80	7.50	8.90	9.90	11.30	13.70	15.00	23.00	25.00
P1, P3, X1, X2, X3, S1	2.30	3.00	2.80	3.50	3.70	4.50	7.50	9.00	9.90	11.30	13.30	15.00	23.00	25.00
Per Inch Of Stroke	0.24	0.40	0.30	0.40	0.30	0.44	0.50	0.70	0.60	0.80	0.60	0.80	0.90	1.14

Metallic Rod Scraper



A rod scraper may be necessary when the cylinder must endure paint overspray, weld splatter or flyash.

Order as “MA” Option

Electroless Nickel Protection

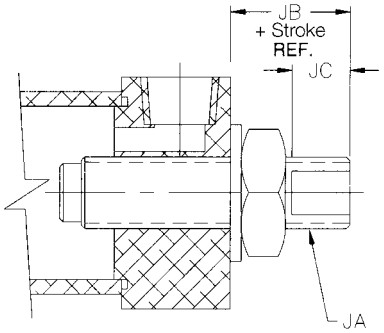
Electroless Nickel Plated NFPA Air Cylinder for Use in Corrosive Environments

1. Tie rods and tie rod nuts are 300 series stainless steel.
2. Piston rod is 303 stainless steel turned, ground, polished and hard chrome plated.
3. Tube, head, cap, bushing retainer and all mounts are protected from corrosion with .0005 thick electroless nickel plating.
4. The rod bushing is a cutting edge PolyLube™ composite bushing.
5. Reed, Hall and Prox switches are NEMA 6 or IP67 approved for corrosive and wash down environments.
6. Mounting accessories are available with electroless nickel plating.

For detailed information regarding the properties of PolyLube™, call 1-800-918-9261.

Order as “NA” Option

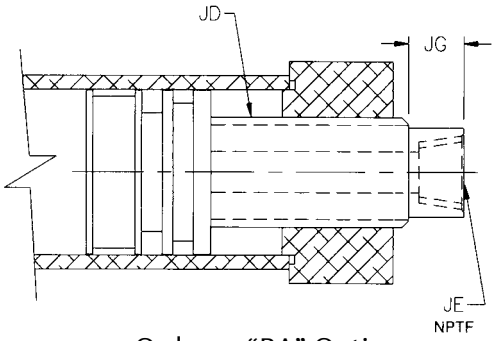
Adjustable Stroke Cylinder



Order as “KA” Option

Bore	JA	JB	JC
1-1/2"	5/8-11	1.500	.500
2"	5/8-11	1.500	.500
2-1/2"	5/8-11	1.500	.500
3-1/4"	1-14	1.250	.500
4"	1-14	1.250	.500
5"	1-14	1.250	.500
6"	1-14	1.000	.500

Save Air Stroke Adjuster



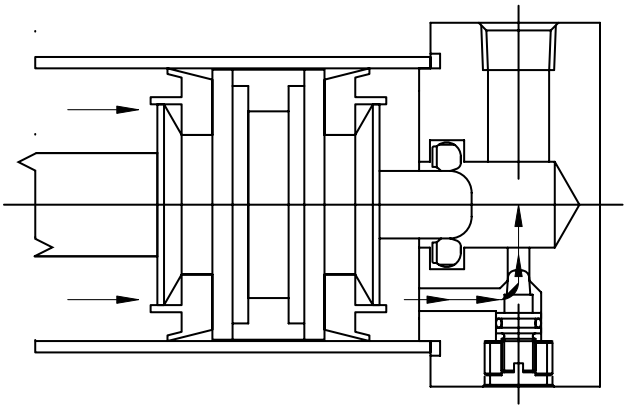
Order as “RA” Option

Bore	JD	JE	JG
1-1/2"	1-8 UNC-2A	3/8	0.50
2"	1-8 UNC-2A	3/8	0.50
2-1/2"	1 3/4-5 UNC-2A	1/2	0.50
3-1/4"	1 3/4-5 UNC-2A	3/4	0.75
4"	1 3/4-5 UNC-2A	3/4	0.75
5"	1 3/4-5 UNC-2A	3/4	0.75
6"	2-4 1/2 UNC-2A	1	0.75

Silencer Bumper Seal

Our “Silencer” design reduces the noise caused by the final impact of the piston against the cap. It also allows usage of standard pneumatic cushions in order to further reduce the amount of end of stroke noise and impact while still giving the deceleration benefits. When the cushion spear enters into the cushion seal, the cushioning effect takes place by trapping air and then metering it out at a rate set via the adjustable cushion needle.

Note: Silencer Bumper does not add length to the cylinder, but a minimum force of 100PSI must be applied to collapse the seals to reach the full extend and retract positions.



Technical Data

A Series Bore Sizes:	1 1/2", 2", 2 1/2", 4" and 5"
Temperature:	-20°F to 200°F
Pressure Rating:	150 psi air

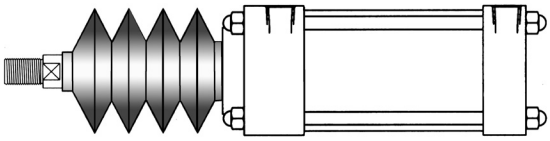
Static Stroke Length Reduction Based on PSI

Bore	0 PSI	20 PSI	40 PSI	60 PSI	80 PSI	100 PSI
1-1/2"	0.106	0.056	0.028	0.018	0.000	0.000
2"	0.090	0.070	0.046	0.037	0.018	0.000
2 1/2"	0.201	0.166	0.122	0.071	0.008	0.000
3 1/4"	0.160	0.102	0.082	0.048	0.038	0.000
4"	0.150	0.085	0.065	0.031	0.005	0.000
5"	0.219	0.158	0.099	0.530	0.015	0.000

Rod Boot

Our cylinder has a hardened bearing surface on the piston rod to protect it from external damage. Furthermore, the cylinder is also equipped with a highly efficient rod wiper. A rod wiper removes external contaminants such as dirt and dust. Exposed piston rods that are subjected to contaminants that contain hardening properties, i.e., paint, must be protected to ensure long life. In these applications, you should consider using a collapsing cover to protect the piston rod. The collapsing cover is commonly referred to as a Rod Boot.

NOTE: High temperature rood boot available (option GA). Consult factory for detailed rod boot information.

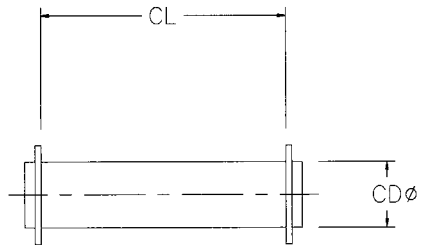


Bore	0 PSI	20 PSI	40 PSI	60 PSI	80 PSI	100 PSI
1-1/2"	0.106	0.056	0.028	0.018	0.000	0.000
2"	0.090	0.070	0.046	0.037	0.018	0.000
2 1/2"	0.201	0.166	0.122	0.071	0.008	0.000
3 1/4"	0.160	0.102	0.082	0.048	0.038	0.000
4"	0.150	0.085	0.065	0.031	0.005	0.000
5"	0.219	0.158	0.099	0.530	0.015	0.000

Accessories

Accessories Guide

Rod Thread	Rod Clevis	Eye Bracket	Pivot Pin	Rod Eye	Clevis Bracket	Bore
7/16-20	A500-301	A500-101	A500-401	A500-201	A500-001	1 1/2, 2, 2 1/2
1/2-20	A500-302	A500-101	A500-401	A500-202	A500-001	1 1/2, 2, 2 1/2
3/4-16	A500-303	A500-102	A500-402	A500-203	A500-002	3 1/4, 4, 5
7/8-14	A500-304	A500-102	A500-403	–	–	–
1-14	A500-305	A500-103	A500-403	A500-204	A500-003	6
1 1/4-12	A500-306	A500-104	A500-404	A500-205	–	–
1 1/2-12	A500-307	A500-105	A500-405	A500-206	–	–

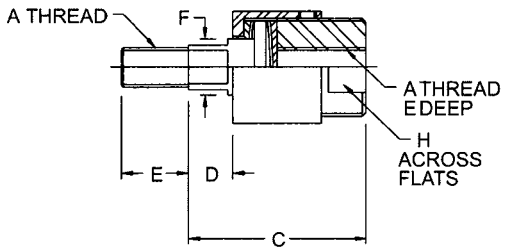


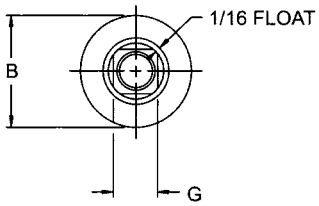
Included with mount codes P1, P2, P3 and P4

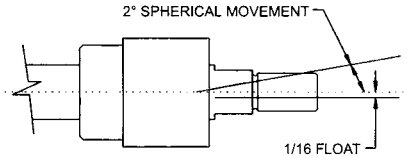
Pivot Pin

Part No.	CD	CL
A500-401	0.500	1.875
A500-402	0.750	2.625
A500-403	1.000	3.125
A500-404	1.375	4.125
A500-405	1.750	5.125

Rod Couplers







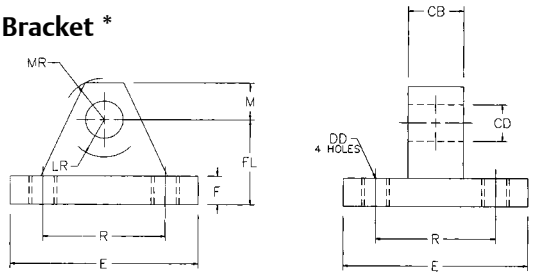
Standard Couplers

Part Number		A	B	C	D	E	F	G	H	Maximum Pull Load
Standard	Nickel									
A500-603	B500-603	7/16-20	1 1/4	2	1/2	3/4	5/8	9/16	1 1/8	2,535
A500-604	B500-604	1/2-20	1 1/4	2	1/2	3/4	5/8	9/16	1 1/8	3,500
A500-605	B500-605	5/8-18	1 1/4	2	1/2	3/4	5/8	1/2	1 1/8	4,750
A500-606	B500-606	3/4-16	1 3/4	2 5/16	5/16	1 1/8	31/32	7/8	1 1/2	8,750
A500-607	B500-607	7/8-14	1 3/4	2 5/16	5/16	1 1/8	31/32	7/8	1 1/2	9,750
A500-608	B500-608	1-14	2 1/2	2 15/16	1/2	1 5/8	1 3/8	1 1/4	2 1/4	16,125
A500-609	B500-609	1 1/4-12	2 1/2	2 15/16	1/2	1 5/8	1 3/8	1 1/4	2 1/4	19,600
A500-610	N35-1004	1 1/2-12	3 1/4	4 3/8	13/16	2 1/4	1 3/8	1 1/2	3	34,000

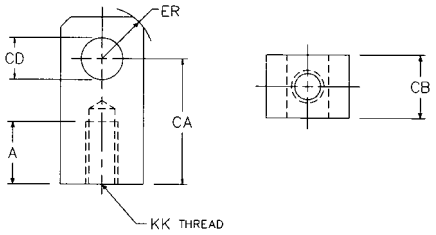
Dimensions: Inches

Accessories

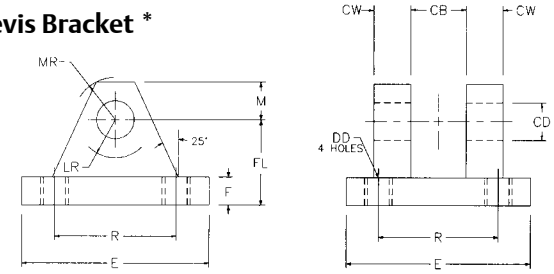
Eye Bracket *



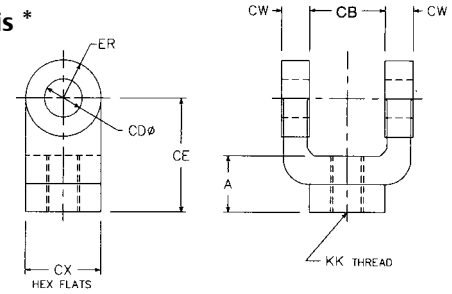
Rod Eye *



Clevis Bracket *



Rod Clevis *



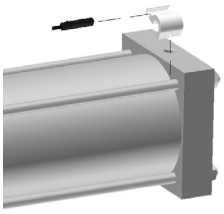
*Order pivot pin separately

Part No.	A	CA	CB	CD	CE	CW	CX	DD	E	ER	F	FL	KK	LR	M	MR	R
Clevis Bracket																	
A500-001	-	-	0.750	0.500	-	0.500	-	3/8-24	2.500	-	0.375	1.125	-	0.500	0.500	0.563	1.625
A500-002	-	-	1.250	0.750	-	0.625	-	1/2-20	3.500	-	0.625	1.875	-	1.063	0.750	1.063	2.563
A500-003	-	-	1.500	1.000	-	0.750	-	5/8-18	4.500	-	0.750	2.250	-	1.250	1.000	1.125	3.250
Eye Bracket																	
A500-101	-	-	0.750	0.500	-	-	-	0.406	2.500	-	0.375	1.125	-	0.750	0.500	0.563	1.630
A500-102	-	-	1.250	0.750	-	-	-	0.531	3.500	-	0.625	1.875	-	1.250	0.750	0.875	2.560
A500-103	-	-	1.500	1.000	-	-	-	0.656	4.500	-	0.750	2.250	-	1.500	1.000	1.250	3.250
A500-104	-	-	2.000	1.375	-	-	-	0.656	5.000	-	0.875	3.000	-	2.125	1.375	1.625	3.810
A500-105	-	-	2.500	1.750	-	-	-	0.906	6.500	-	0.875	3.125	-	2.250	1.750	2.125	4.950
Rod Clevis																	
A500-301	0.750	-	0.750	0.500	1.500	0.500	1.000	-	-	0.500	-	-	7/16-20	-	-	-	-
A500-302	0.750	-	0.750	0.500	1.500	0.500	1.000	-	-	0.500	-	-	1/2-20	-	-	-	-
A500-303	1.125	-	1.250	0.750	2.375	0.625	1.250	-	-	0.750	-	-	3/4-16	-	-	-	-
A500-304	1.625	-	1.500	1.000	3.125	0.750	1.500	-	-	1.000	-	-	7/8-14	-	-	-	-
A500-305	1.625	-	1.500	1.000	3.125	0.750	1.500	-	-	1.000	-	-	1-14	-	-	-	-
A500-306	2.000	-	2.000	1.375	4.125	1.000	2.000	-	-	1.375	-	-	1 1/4-12	-	-	-	-
A500-307	2.250	-	2.000	1.750	4.500	1.250	2.375	-	-	1.750	-	-	1 1/2-12	-	-	-	-
Rod Eye																	
A500-201	0.750	1.500	0.750	0.500	-	-	-	-	-	0.625	-	-	7/16-20	-	-	-	-
A500-202	0.750	1.500	0.750	0.500	-	-	-	-	-	0.625	-	-	1/2-20	-	-	-	-
A500-203	1.125	2.063	1.250	0.750	-	-	-	-	-	0.875	-	-	3/4-16	-	-	-	-
A500-204	1.625	2.813	1.500	1.000	-	-	-	-	-	1.188	-	-	1-14	-	-	-	-
A500-205	2.000	3.438	2.000	1.375	-	-	-	-	-	1.563	-	-	1 1/4-12	-	-	-	-
A500-206	2.250	4.000	2.500	1.750	-	-	-	-	-	2.000	-	-	1 1/2-12	-	-	-	-

NFPA Interchangeable Cylinders

A Series (Tie Rod)

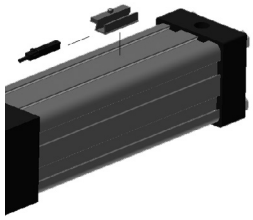
Bore	Bracket P/N
1 1/2"	P4995051680N001
2"	P4995051670N001
2 1/2"	P4995051670N001
3 1/4"	P499440617MN001
4"	P499440617MN001
5"	P4994406183N001
6"	P4994406183N001
8"	P4994406183N001
10"	P4995051660N001
12"	P4995051660N001
14"	P4995078930N001



Sensor Description	Standard Cord Set	Quick Disconnect
Reed Switch	P494A0021300A00	P494A0021600A00
Hall PNP	P494A0022300A00	P494A0022600A00
Hall NPN	P494A0022400A00	P494A0022700A00

A Series (Profile Tube)

Bore	Bracket P/N
1 1/2"	P4994406190N001
2"	P4994406190N001
2 1/2"	P4994406190N001



Sensor Description	Standard Cord Set	Quick Disconnect
Reed Switch	P494A0021300A00	P494A0021600A00
Hall PNP	P494A0022300A00	P494A0022600A00
Hall NPN	P494A0022400A00	P494A0022700A00

How to Order - A Series Piston Rod Assembly

A92 - K 1 N 0 - 01 A - A A

Type
A92 = A Series Piston Rod Assembly

Bore
K = 1-1/2" R = 4"
L = 2" T = 5"
M = 2-1/2" U = 6"
P = 3-1/4" W = 8"

Rod Code
1 = Style # 1 Standard Rod Diameter
2 = Style # 2 Standard Rod Diameter
3 = Style # 3 Standard Rod Diameter
4 = Special Standard Rod Diameter (must specify threads)
5 = Special Oversize Rod Diameter (must specify threads)
6 = Style # 1 Oversize Rod Diameter
7 = Style # 2 Oversize Rod Diameter
8 = Style # 3 Oversize Rod Diameter
A = Style # 1 Second Oversize Rod Diameter
B = Style # 2 Second Oversize Rod Diameter
C = Style # 3 Second Oversize Rod Diameter
U = Male Coupling Rod End Standard Rod Diameter
V = Male Coupling Rod End Oversize Rod Diameter

Cushion
N = No Cushion
B = Both Ends Cushioned
H = Head End Cushioned
C = Cap End Cushioned

Magnet
0 = No Magnet
2 = Reed Magnet (Is Included with Piston Rod Assembly)

Options (Does Not Include Seals)
AA = No Option
BH = Bumpered Head End
CR = Cylindicator Ready "Stroke to Go"
DA = Double Rod
EB = Bumper Seals
FA = No Wrench Flats, No Turn Down
FB = Four Wrench Flats
GA = High Temperature Rod Boot
JN = Jam Nut
KA = Stroke Adjust
LB = Low Breakaway
NA = Nickel Plated
NN = Nylock Nut
NS = Cylindicator Ready "No Stroke to Go"
PP = PolyPak Piston
RA = Save Air Stroke Adjuster
RB = Rod Boot
SA = Stainless Rod
TI = "T" Seal Piston
VA = FKM Seals
1A* = Rod Extension
1B* = Rear Rod Extension
2A* = Thread Extension
2B* = Rear Thread Extension
3A = Rod Stud
3B = Rear Rod Stud
4A* = Stop Tube
4D* = Double Piston Stop Tube

* = must specify length
Consult factory for additional options.

Fractional Inches of Stroke

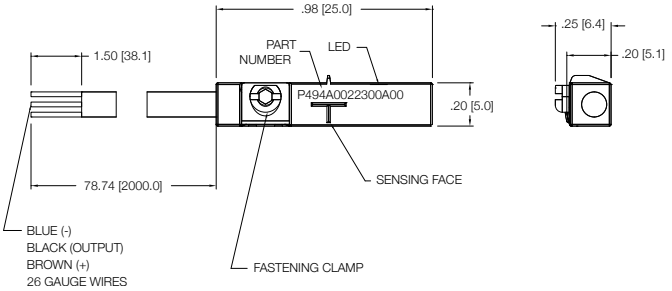
A	= 0"	E	= 1/4"	I	= 1/2"	M	= 3/4"
B	= 1/16"	F	= 5/16"	J	= 9/16"	N	= 13/16"
C	= 1/8"	G	= 3/8"	K	= 5/8"	O	= 7/8"
D	= 3/16"	H	= 7/16"	L	= 11/16"	P	= 15/16"

Full Inches of Stroke
00 = 0" Stroke
01 = 1" Stroke
02 = 2" Stroke
03 = 3" Stroke
04 = 4" Stroke
05 = 5" Stroke
99 = 99" Stroke

Note: Options listed are ones that apply to a piston rod assembly only.
Model number is set up to use option code supplied with original cylinder or with any above.
Note: Bumpers are not included with Piston Rod Assembly.

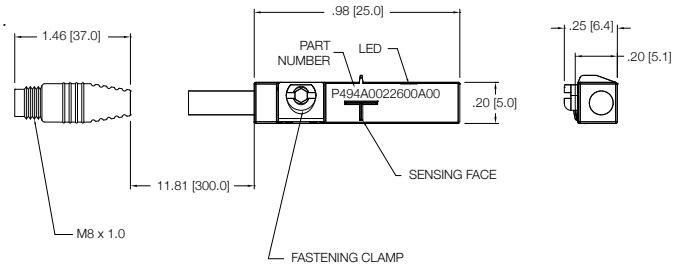
Sensing Part Numbers

P494A0022300A00



ELECTRICAL DESIGN	DC PNP
OUTPUT	Normally Open
OPERATING VOLTAGE	10-30 VDC
CURRENT RATING	100 mA
SHORT-CIRCUIT PROTECTION	Yes
OVERLOAD PROTECTION	Yes
REVERSE POLARITY PROTECTION	Yes
VOLTAGE DROP	< 2.5 V
CURRENT CONSUMPTION	< 12 mA
REPEATABILITY	< .2mm
POWER-ON DELAY TIME	< 30 ms
SWITCH FREQUENCY	> 3000 Hz
AMBIENT TEMPERATURE	-25ºC to 85ºC
PROTECTION	IP 67, III
HYSTERESIS	1.0mm
MAGNETIC SENSITIVITY	2.0 mT
TRAVEL SPEED	> 10 m/s
HOUSING MATERIAL	PA (Polyamide) Black; Fastening Clamp: Stainless Steel
FUNCTION DISPLAY SWITCHING STATUS	Yellow LED
CONNECTION	Flying Leads, Pur Cable (2m Long, 3 x26 Gauge Wire)
REMARKS	Clamping Screw with Combined Slot/Hexagon Socket Head AF 1.5 cULus - Class 2 Source Required
ACCESSORIES	Rubber Placehold, Cable Clip, and Cut Sheet To Be Provided with Every Switch
AGENCY APPROVALS	CE c UL us RoHS

P494A0022600A00

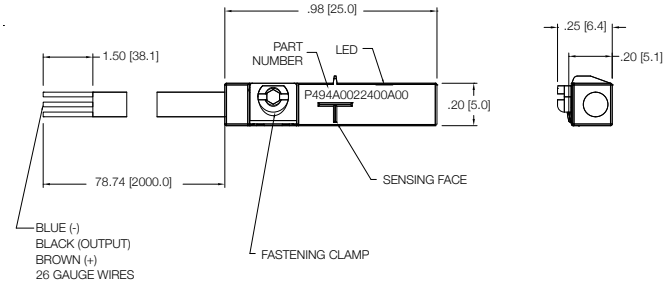


ELECTRICAL DESIGN	DC PNP
OUTPUT	Normally Open
OPERATING VOLTAGE	10-30 VDC
CURRENT RATING	100 mA
SHORT-CIRCUIT PROTECTION	Yes
OVERLOAD PROTECTION	Yes
REVERSE POLARITY PROTECTION	Yes
VOLTAGE DROP	< 2.5 V
CURRENT CONSUMPTION	< 12 mA
REPEATABILITY	< .2mm
POWER-ON DELAY TIME	< 30 ms
SWITCH FREQUENCY	> 3000 Hz
AMBIENT TEMPERATURE	-25ºC to 85ºC
PROTECTION	IP 67, III
HYSTERESIS	1.0mm
MAGNETIC SENSITIVITY	2.0 mT
TRAVEL SPEED	> 10 m/s
HOUSING MATERIAL	PA (Polyamide) Black; Fastening Clamp: Stainless Steel
FUNCTION DISPLAY SWITCHING STATUS	Yellow LED
CONNECTION	M8 Connector (Snap Fit) , Pur Cable (.3 m)
REMARKS	Clamping Screw with Combined Slot/Hexagon Socket Head AF 1.5 cULus - Class 2 Source Required
ACCESSORIES	Rubber Placehold, Cable Clip, and Cut Sheet To Be Provided with Every Switch
AGENCY APPROVALS	CE c UL us RoHS

*Switches are not designed for wet environments. Please see your distributor for additional information.

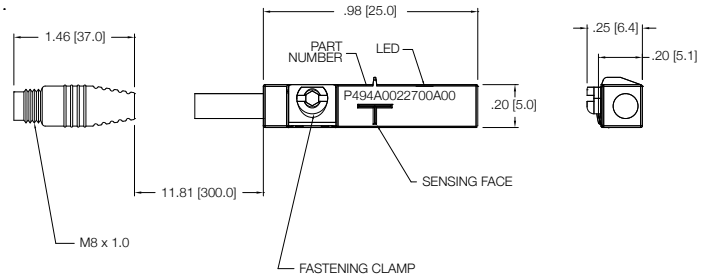
Sensing Part Numbers

P494A0022400A00



ELECTRICAL DESIGN	DC NPN
OUTPUT	Normally Open
OPERATING VOLTAGE	10-30 VDC
CURRENT RATING	100 mA
SHORT-CIRCUIT PROTECTION	Yes
OVERLOAD PROTECTION	Yes
REVERSE POLARITY PROTECTION	Yes
VOLTAGE DROP	< 2.5 V
CURRENT CONSUMPTION	< 12 mA
REPEATABILITY	< .2mm
POWER-ON DELAY TIME	< 30 ms
SWITCH FREQUENCY	> 3000 Hz
AMBIENT TEMPERATURE	-25ºC to 85ºC
PROTECTION	IP 67, III
HYSTERESIS	1.0mm
MAGNETIC SENSITIVITY	2.0 mT
TRAVEL SPEED	> 10 m/s
HOUSING MATERIAL	PA (Polyamide) Black; Fastening Clamp: Stainless Steel
FUNCTION DISPLAY SWITCHING STATUS	Yellow LED
CONNECTION	Flying Leads, Pur Cable (2m Long, 3 x26 Gauge Wire)
REMARKS	Clamping Screw with Combined Slot/Hexagon Socket Head AF 1.5 cULus - Class 2 Source Required
ACCESSORIES	Rubber Placehold, Cable Clip, and Cut Sheet To Be Provided with Every Switch
AGENCY APPROVALS	CE c UL us RoHS

P494A0022700A00

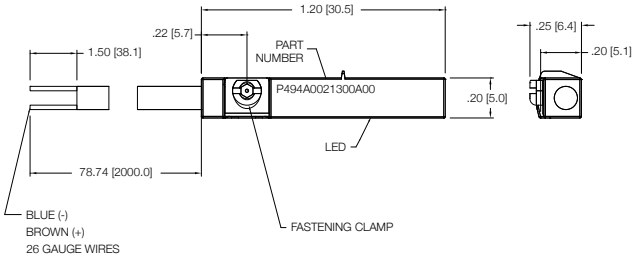


ELECTRICAL DESIGN	DC NPN
OUTPUT	Normally Open
OPERATING VOLTAGE	10-30 VDC
CURRENT RATING	100 mA
SHORT-CIRCUIT PROTECTION	Yes
OVERLOAD PROTECTION	Yes
REVERSE POLARITY PROTECTION	Yes
VOLTAGE DROP	< 2.5 V
CURRENT CONSUMPTION	< 12 mA
REPEATABILITY	< .2mm
POWER-ON DELAY TIME	< 30 ms
SWITCH FREQUENCY	> 3000 Hz
AMBIENT TEMPERATURE	-25ºC to 85ºC
PROTECTION	IP 67, III
HYSTERESIS	1.0mm
MAGNETIC SENSITIVITY	2.0 mT
TRAVEL SPEED	> 10 m/s
HOUSING MATERIAL	PA (Polyamide) Black; Fastening Clamp: Stainless Steel
FUNCTION DISPLAY SWITCHING STATUS	Yellow LED
CONNECTION	M8 Connector (Snap Fit) , Pur Cable (.3 m)
REMARKS	Clamping Screw with Combined Slot/Hexagon Socket Head AF 1.5 cULus - Class 2 Source Required
ACCESSORIES	Rubber Placehold, Cable Clip, and Cut Sheet To Be Provided with Every Switch
AGENCY APPROVALS	CE c UL us RoHS

*Switches are not designed for wet environments. Please see your distributor for additional information.

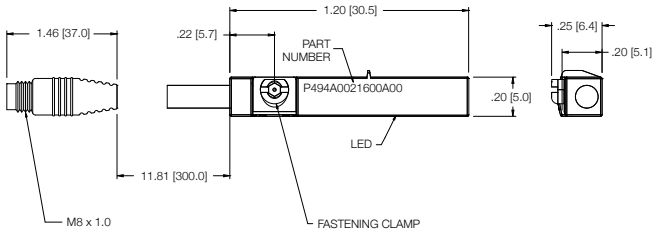
Sensing Part Numbers

P494A0021300A00



ELECTRICAL DESIGN	AC/DC REED
OUTPUT	Normally Open
OPERATING VOLTAGE	5-120 VAC/DC
CURRENT RATING	100 mA*
SHORT-CIRCUIT PROTECTION	No
OVERLOAD PROTECTION	No
REVERSE POLARITY PROTECTION	Yes
VOLTAGE DROP	< 5 V
REPEATABILITY	± .2mm
MAKETIME INCLUDING BOUNCE	< .6 ms
BREAKTIME	< .1 ms
SWITCHING POWER (MAX)	5 W
SWITCH FREQUENCY	1000 Hz
AMBIENT TEMPERATURE	-25ºC to 70ºC
PROTECTION	IP 67, II
HYSTERESIS	.9mm
HOUSING MATERIAL	PA (Polyamide) Black; Fastening Clamp: Stainless Steel
FUNCTION DISPLAY SWITCHING STATUS	Yellow LED
CONNECTION	Flying Leads, Pur Cable (2m Long, 2 x26 Gauge Wire)
REMARKS	*External Protective Circuit for Inductive Load (Valve, Contactor, Etc..) Necessary. Conforms to 2008 NEC Section 725 III, Class 2 Circuits Clamping Screw with Combined Slot/ Hexagon Socket Head AF 1.5. No LED Function in case of Polarity in DC Operation
ACCESSORIES	Rubber Placehold, Cable Clip, and Cut Sheet To Be Provided with Every Switch
AGENCY APPROVALS	CE RoHS

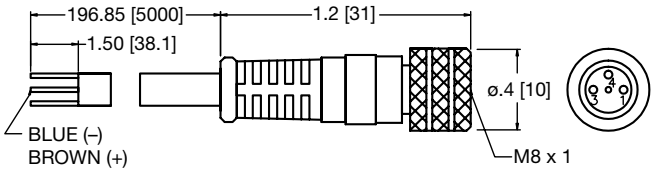
P494A0021600A00



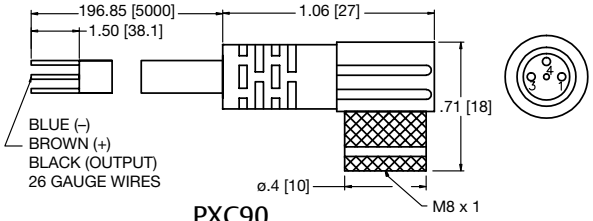
ELECTRICAL DESIGN	AC/DC REED
OUTPUT	Normally Open
OPERATING VOLTAGE	*5-60 VDC / 5-50 VAC
CURRENT RATING	100 mA
SHORT-CIRCUIT PROTECTION	No
OVERLOAD PROTECTION	No
REVERSE POLARITY PROTECTION	Yes
VOLTAGE DROP	< 5 V
REPEATABILITY	± .2mm
MAKETIME INCLUDING BOUNCE	< .6 ms
BREAKTIME	< .1 ms
SWITCHING POWER (MAX)	5 W
SWITCH FREQUENCY	1000 Hz
AMBIENT TEMPERATURE	-25ºC to 70ºC
PROTECTION	IP 67, II
HYSTERESIS	.9mm
HOUSING MATERIAL	PA (Polyamide) Black; Fastening Clamp: Stainless Steel
FUNCTION DISPLAY SWITCHING STATUS	Yellow LED
CONNECTION	M8 Connector (Snap Fit), Pur Cable (.3m)
REMARKS	*External Protective Circuit for Inductive Load (Valve, Contactor, Etc..) Necessary. Conforms to 2008 NEC Section 725 III, Class 2 Circuits M8 Connector voltage limited to 5-60 vdc / 5-50 vac to conform with 2008 IEC 61076-2-104 Clamping Screw with Combined Slot/Hexagon Socket Head AF 1.5. No LED Function in case of Polarity in DC Operation
ACCESSORIES	Rubber Placehold, Cable Clip, and Cut Sheet To Be Provided with Every Switch
AGENCY APPROVALS	CE RoHS

*Switches are not designed for wet environments. Please see your distributor for additional information.

Quick Disconnect Cables



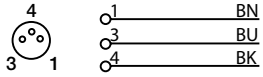
PXCST



PXC90

Wiring
Core colors

BK	black
BN	brown
BU	blue



Order Code	Type	Operating Voltage	Current Rating	Cable Material	Protection	Connector
PXCST	Straight 5 m Cable (3 x 26 Gauge wire)	60 AC/75 DC	3 A	PUR	IP 68, III	M8
PXC90	90° 5 m Cable (3 x 26 Gauge wire)	60 AC/75 DC	3 A	PUR	IP 68, III	M8

How to Order - A Series Repair Kit

A98 - K 1 N - AA

Type
A98 = A Series Repair Kit

Bore
K = 1-1/2" R = 4"
L = 2" T = 5"
M = 2-1/2" U = 6"
P = 3-1/4" W = 8"

Rod Size
0 = Standard Rod
1 = Oversize Rod
2 = Second Oversize Rod

Options
AA = No Option
BK = Back to Back
BZ = Bronze Bushing
CR = Cylindicator Ready “Stroke to Go”
CZ = Composite Bushing
DA = Double Rod
EB = Silencer Bumpers
GA = High Temperature Rod Boot
LB = Low Breakaway
LT = Low Temp Seals
MA = Metallic Rod Scraper
MB = Rear Metallic Rod Scraper
NA = Nickel Plated
NS = Cylindicator Ready “No Stroke to Go”
PA = Polypak Rod Seal
PB = Rear Polypak Rod Seal
PP = Polypak Piston Seals
RA = Save Air Stroke Adjust
TI = “T” Seal Piston
VA = FKM Seals
4D = Double Piston Stop Tube

Cushion
N = No Cushion
B = Both Ends Cushioned
H = Head End Cushioned
C = Cap End Cushioned

Note: Options listed are ones that apply to a repair kit only.
Model number is set up to use option code supplied with original cylinder or with any above.

How to Order - A Series Seal Kit

A97 - K 1 N - AA

Type
A97 = A Series Seal Kit

Bore
K = 1-1/2”
L = 2”
M = 2-1/2”
P = 3-1/4”
R = 4”
T = 5”
U = 6”
W = 8”

Rod Size
0 = Standard Rod
1 = Oversize Rod
2 = Second Oversize Rod

Options
AA = No Option
BK = Back to Back
CR = Cylindicator Ready “Stroke to Go”
DA = Double Rod
EB = Silencer Bumpers
LB = Low Breakaway
LT = Low Temp Seals
MA = Metallic Rod Scraper
MB = Rear Metallic Rod Scraper
NS = Cylindicator Ready “No Stroke to Go”
PA = Polypak Rod Seal
PB = Rear Polypak Rod Seal
PP = Polypak Piston Seals
RA = Save Air Stroke Adjust
TI = “T” Seal Piston
VA = FKM Seals
4D = Double Piston Stop Tube

Cushion
N = No Cushion
B = Both End Cushioned
H = Head End Cushioned
C = Cap End Cushioned

Note: Options listed are ones that apply to a seal kit only.
Model number is set up to use option code supplied with original cylinder or with any above.

Piston Rod Assembly Kit Installation Instructions

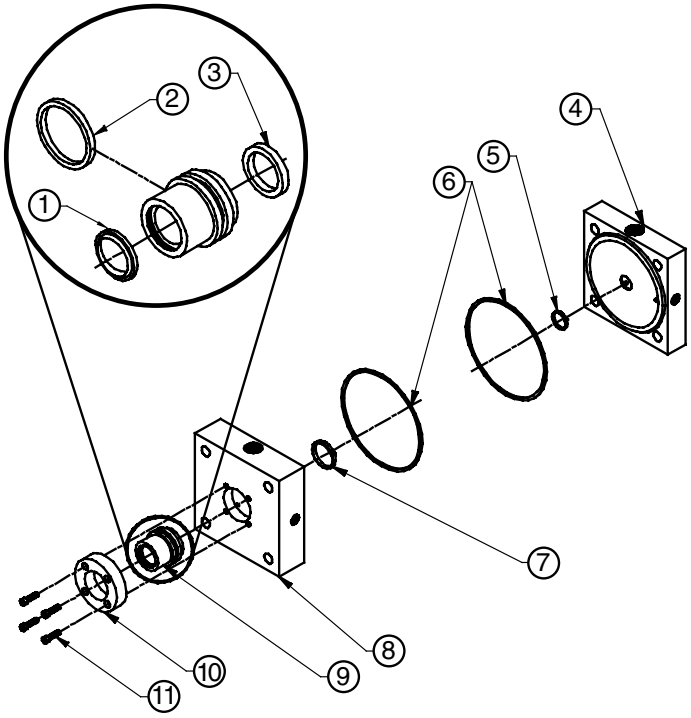
1. Loosen 4 Tie Rod Nuts (Part #20) to remove Piston/Rod Assembly (Part #18 & #19).
2. Carefully remove old seals. (Part #12, #14, & #15). Any damage to the seals may result in leakage.
3. Lubricate piston seal(s) and wearband (Part #12) with supplied Emerson's Lube. Examine seals before installing for any contamination. Contamination may cause leakage.
4. Install Piston Seal (Part #15). Make sure the piston seal is not twisted inside groove. Next install back-up rings (Part #14) if piston seal is a T-seal.
5. Install lubricated wearband onto piston. Sink piston/rod assembly into sinker tube.
6. Apply lube inside the cylinder tube (Part #17).
7. Sink piston/rod assembly into cylinder tube.
8. Press piston/rod assembly flush with the cylinder tube. Wipe off any lube from the face of the piston.
9. Examine all seals before reassembling cylinder for any contamination. Contamination may cause leakage.
10. 10. Lightly grease Rod Seal (Part #3) of Loaded Bushing before installing. This will ease the installation of the rod bushing over the rod.
11. Reassemble cylinder. Loosely torque Tie Rod Nuts (Part #20) to allow head and cap to rotate slightly.
12. Before final torque, place cylinder on level surface. This will ensure that the cylinder head and cap are square. Torque Tie Rod Nuts (Part #20) in a crisscross pattern. Use the following charts for torque tolerances for Tie Rod Nuts and Retainer Screws.
13. Stroke cylinder by hand. This will enable detection of any binding. If binding does occur, repeat steps 11 -13.

Repair Kit and Seal Kit Removal/Installation Instructions

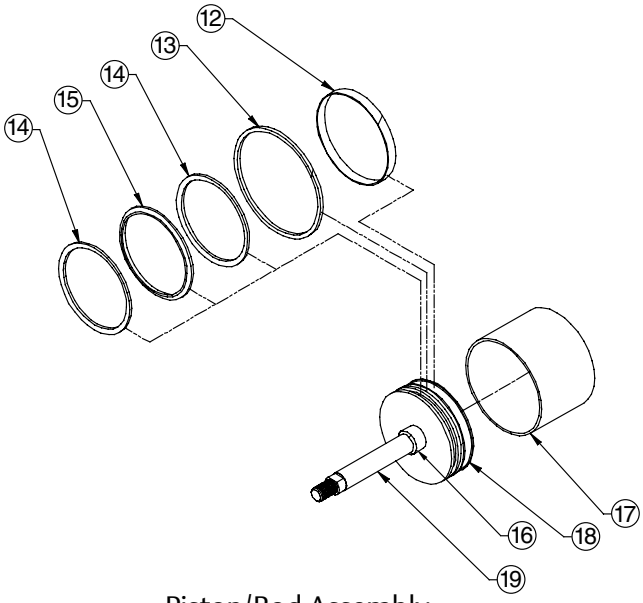
1. Loosen 2 or 4 Retainer Screws (Part #11) to remove Loaded Bushing (Part # 9)
2. Loosen 4 Tie Rod Nuts (Part #20) to remove Piston/Rod Assembly (Part #18 & #19)
3. Carefully remove old seals. (Part [#1, #2, #3 Seal kit only], #5, #6, #7, #12, #14, & #15) Any damage to the seal grooves may result in leakage.
4. Lubricate new seals with supplied Emerson's Lube. Examine seals before installing for any contamination. Contamination may cause leakage.
5. Install Piston Seal (Part #15). Make sure the piston seal is not twisted inside groove. Next install back-up rings (Part #14) if piston seal is a T-seal.
6. Install lubricated Wearband (Part #12) onto piston. Sink piston/rod assembly into sinker tube.
7. Apply lube inside the cylinder tube.
8. Sink piston/rod assembly into cylinder tube.
9. Press piston/rod assembly flush with the cylinder tube. Wipe off any lube from the face of the piston.
10. Place Tube End Seals (Part #6) into head and cap seal grooves. Examine seals after installing for any contamination. Contamination may cause leakage.
11. Install Rod Wiper (Part #1), Bushing O-ring (Part #2), and Rod Seal (Part #3) into bushing (Seal Kit only). Lightly grease Rod Seal and Bushing O-ring after installation. This will ease the installation of the rod bushing over the rod and into the head.
12. Reassemble cylinder except for loaded rod bushing (Part #9). First, loosely torque Tie Rod Nuts to allow head and cap to rotate slightly. Carefully place bushing over the rod until getting interference. With a twisting motion, slide the bushing down onto the rod and into the bushing pocket on the head.
13. Place Bushing Retainer (Part #10). Lightly tighten Retainer Screws (Part #11).
14. Before final torque, place cylinder on level surface to square head and cap. Torque Tie Rod Nuts in a crisscross pattern. Use the following charts for torque tolerances for Tie Rod Nuts and Retainer Screws.
15. Stroke cylinder by hand. This will enable detection of any binding. If binding does occur, repeat steps 12-14.

Diagrams

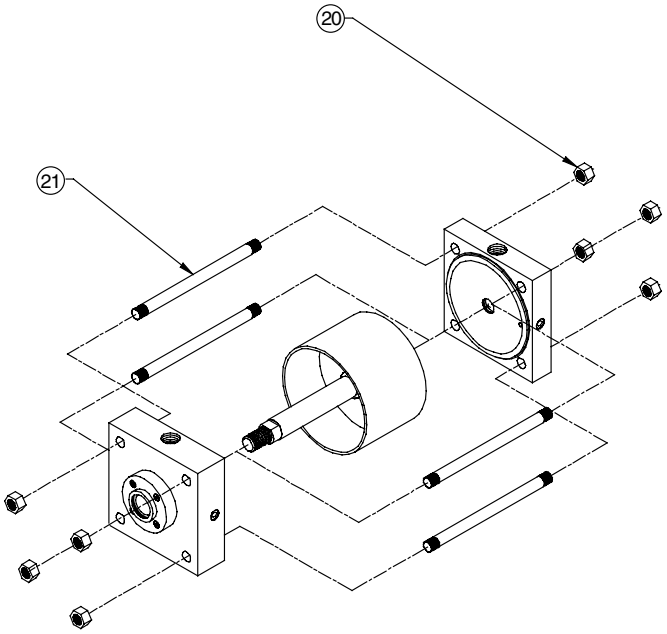
Pneumatic Service Temperatures:
Nitrile Seals: -10˚F (-23˚C) to 165˚F (74˚C)
FKM Seals: 0˚F (-17˚C) to 400˚F (204˚C)



Head, Cap, and Bushing Assembly



Piston/Rod Assembly

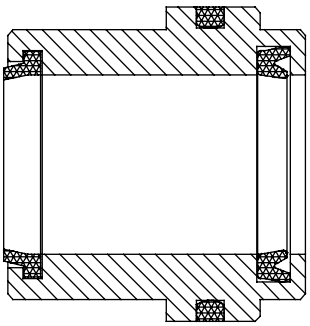


Cylinder Assembly and Tie Rod Torque

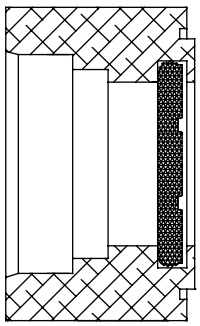
A Series

Part #	Description	Parts included in:		
		Seal Kit	Repair Kit	Piston/Rod Assembly
1	Rod Wiper	X		
2	Bushing O-ring	X		
3	Rod Seal	X		
4	Cap			
5	Cap Cushion Seal	X	X	
6	Tube End Seals	X	X	
7	Head Cushion Seal	X	X	
8	Head			
9	Loaded Bushing Assembly		X	
10	Bushing Retainer			
11	Retainer Screws			
12	Wearband	X	X	
13	Magnet			X
14	Back-up Rings	X	X	
15	Piston Seal	X	X	
16	Cushion Spear			X
17	Tube			
18	Piston			X
19	Rod			X
20	Hex Nuts			
21	Tie Rods			

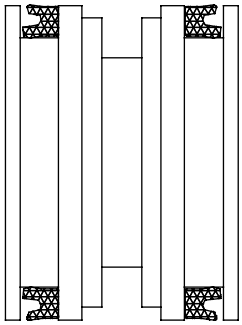
Seal Installation Guide



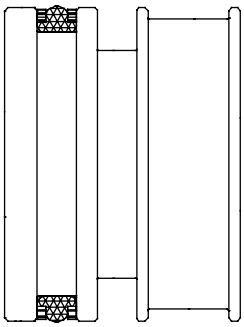
Loaded Bushing



Cushioned Head or Cap



Low Breakaway Piston



T-Seal Piston

Torque Tolerances (LBS-FT) Tie Rod Nut Part #20

Bore	Min.	Max.
1-1/2"	8	10
2"	15	20
2-1/2"	15	20
3-1/4"	23	30
4"	23	30
5"	50	60
6"	50	60
8"	80	90
10"	200	220
12"	200	220
14"	300	330

Retainer Screws Torque Tolerances (lbs-ft) Part #11

Size	Min.	Max.
#10-32	1	1.5
1/4-28	5	7
5/16-24	10	12

Note: Sinker Tubes are not included in kits. They can be ordered using the part numbers from the provided chart.

Sinker Tube Part Numbers

Bore	Part #
1-1/2"	A06-K91
2"	A06-L91
2-1/2"	A06-M91
3-1/4"	A06-P91
4"	A06-R91
5"	A06-T91
6"	A06-U91
8"	A06-W91
10"	A06-X91
12"	A06-Y91
14"	A06-B91

A Series Rod Lock Specifications

NFPA Rod Locks (in)*

Bore Ø	Rod Ø	Holding Force (lbs)	Rod Extension (RE)
1.500	0.625	180	2.625
2.000	0.625	314	2.875
2.000	1.000	250	3.875
2.500	0.625	491	2.875
3.250	1.000	830	4.500
3.250	1.375	830	4.875
4.000	1.000	1,256	4.875
4.000	1.375	1,256	5.125
5.000	1.000	1,963	5.375
5.000	1.375	1,963	5.750
6.000	1.375	2,830	6.375
6.000	1.750	2,830	6.875
8.000	1.750	5,026	7.125

A Series Rod Lock

Aventics new generation of linear holding/locking devices take rod locking technology to the next level. With superior performance, these spring-engaged, air-released units supplement air cylinders and guide rods for holding in power-off/e-stop situations. High clamping forces ensure positive holding with minimal air required for release. Choose from our standard products, or we will work with you to meet your unique application specifications.

Aventics A Series NFPA Interchangeable Cylinder with NRL Series Rod Lock Assembled.

Rod Lock Operation Specifications

- All of the Rod Locks will operate in both directions, engaging with the same holding force.
- Rod Locks can be mounted in any position.
- Rod rotation is not allowed when a Rod Lock is engaged (not intended for torsional braking).
- Release pressures can range from 60-120 psi (4-8 bar).
- The Buna-N seals used are rated to 160°F (71ºC).
- Allowable operating temperatures range from 33°F-150°F (0.5ºC-66ºC).

NFPA How to Order

A Series cylinders with “NX” in the option code include the NRL Series rod lock unit assembled to the cylinder. Note that the cylinder includes the correct amount of rod extension.

X0 A M - 50 A 1 B - A NX 0

Mount
X0 = Basic No Mount

Type
A = A Series

Bore
M = 2-1/2”

Full Inches of Stroke
50 = 50“ Stroke

Fractional Inches of Stroke
A = 0”

Rod Code
1 = Style #1 Standard Rod Diameter

Magnet
0 = No Magnet

Options
NX = NRL Rod Lock Mount

Cushions
A = No Cushions

Ports
B = 1/8” Port Position 1

NFPA Examples
A Series X0AR-25A1B-ANX0

Locking Mode Sensors

NPN Flying Leads	P494A0022400A00
NPN w/ a Quick Disconnect	P494A0022700A00
PNP Flying Leads	P494A0022300A00
PNP w/ Quick Disconnect	P494A0022600A00

Cylinder Requirements

- Extra length = rod extension required (RE) – cylinder pilot length (see below)
- RE = Rod Extension
- Mounting bolts included with NFPA*
- **Operating dynamic forces must not exceed the static holding force**

*With the exception of the NFPA 8" bore, where extended tie rods and hex nuts are used.

Red Lock Air Chamber Volume & Engagement Time

NFPA Rod Locks (in)*

Bore Ø	Rod Ø	Air Chamber Volume	Approximate Engagement Time (seconds)
1.500	0.625	0.250in^3	0.030
2.000	0.625	0.710in^3	0.040
2.000	1.000	0.680in^3	0.040
2.500	0.625	1.260in^3	0.045
3.250	1.000	3.200in^3	0.070
3.250	1.375	2.110in^3	0.060
4.000	1.000	6.730in^3	0.100
4.000	1.375	4.780in^3	0.100
5.000	1.000	11.500in^3	0.150
5.000	1.375	9.500in^3	0.130
6.000	1.375	14.080in^3	0.175
6.000	1.750	12.750in^3	0.165
8.000	1.750	23.210in^3	0.265

*Dimensions shown in inches

Manual Release Rod Locks for NFPA Cylinders

Manual Release Specifications

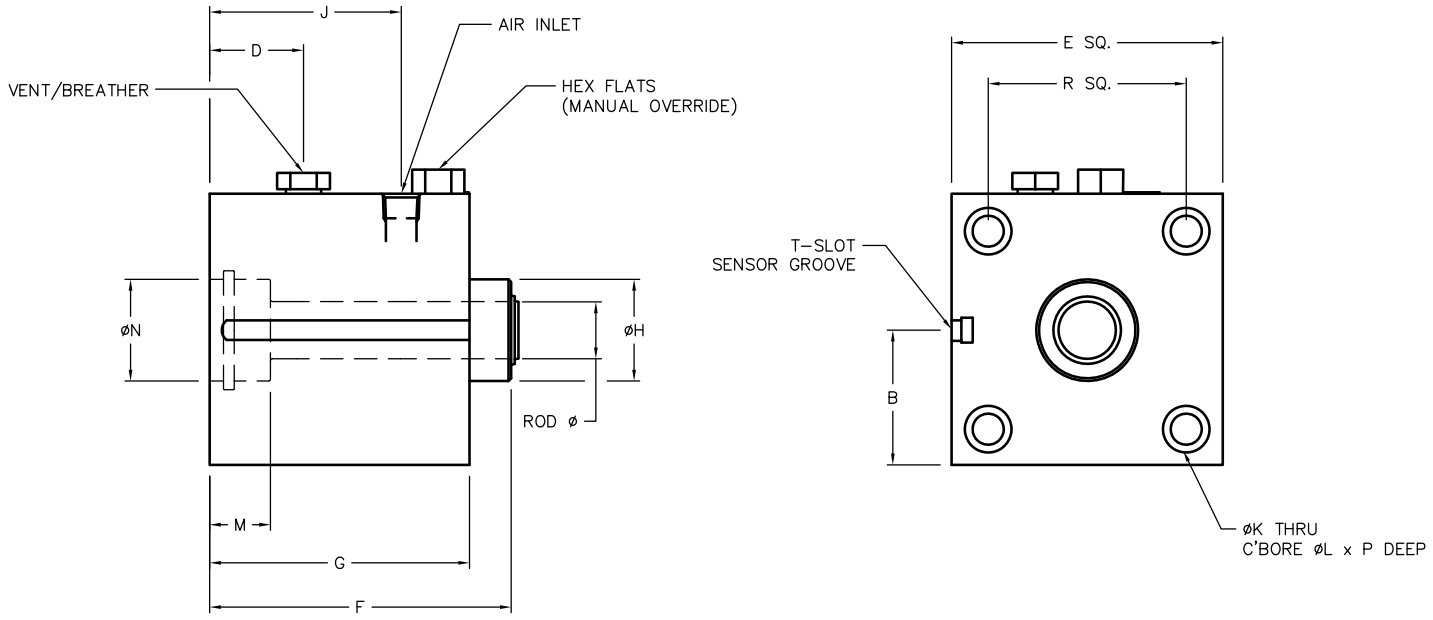
- Cam operated, default to the lock function
- No special tools needed for manual disengagement, uses standard size hex head
- Steel Disengagement Screw
- Locking mode feedback sensor (optional/ see page 4)

NFPA Rod Locks (in)*

Bore Ø	Rod Ø	Air Chamber Volume	Approximate Engagement Time (seconds)	Holding Force (lbs)	Minimum Torque to Override (ft-lbs)
1.500	0.625	0.250in^3	0.030	180	2
2.000	0.625	0.710in^3	0.040	314	5
2.000	1.000	0.680in^3	0.040	250	5
2.500	0.625	1.260in^3	0.045	491	7
3.250	1.000	3.200in^3	0.070	830	17
3.250	1.375	2.110in^3	0.060	830	17
4.000	1.000	6.730in^3	0.100	1,256	45
4.000	1.375	4.780in^3	0.100	1,256	45
5.000	1.000	11.500in^3	0.150	1,963	72
5.000	1.375	9.500in^3	0.130	1,963	72
6.000	1.375	14.080in^3	0.175	2,830	135
6.000	1.750	12.750in^3	0.165	2,830	135
* *8	1.750	23.210in^3	0.265	5,026	160

* Dimensions shown in inches
* * These products do not have locking mode T slot provisions.

Manual Release Rod Locks for NFPA Cylinders, Dimensions



NFPA Rod Locks (in)*

Bore Ø	Rod Ø	B (to slot)	D	E	F	G	H Ø	J	K Ø	L Ø	M	N Ø	P	R	NPT Air Inlet	Hex Flats
1.500	0.625	0.990	1.005	2.000	3.000	2.625	1.124/1.122	1.906	0.281	0.438	0.652	1.128/1.126	0.910	1.430	1/8 NPT	0.313
2.000	0.625	1.240	1.005	2.500	3.250	2.875	1.124/1.122	1.975	0.344	0.516	0.673	1.128/1.126	1.030	1.840	1/8 NPT	0.500
2.000	1.000	1.240	1.674	2.500	4.375	3.875	1.499/1.497	2.814	0.344	0.516	0.902	1.503/1.501	1.030	1.840	1/8 NPT	0.500
2.500	0.625	1.490	1.039	3.000	3.375	2.875	1.124/1.122	2.119	0.344	0.516	0.673	1.128/1.126	1.030	2.190	1/8 NPT	0.500
3.250	1.000	1.865	1.374	3.750	5.000	4.500	1.499/1.497	2.992	0.406	0.719	0.913	1.503/1.501	1.030	2.760	1/4 NPT	0.625
3.250	1.375	1.865	1.678	3.750	5.500	4.875	1.999/1.997	3.228	0.406	0.719	1.000	2.003/2.001	1.280	2.760	1/4 NPT	0.625
4.000	1.000	2.240	1.685	4.500	5.375	4.875	1.499/1.497	3.154	0.406	0.719	0.875	1.503/1.501	1.030	3.320	1/4 NPT	0.875
4.000	1.375	2.240	1.633	4.500	5.875	5.125	1.999/1.997	3.446	0.406	0.719	1.075	2.003/2.001	1.280	3.320	1/4 NPT	0.875
5.000	1.000	2.740	1.500	5.500	5.875	5.375	1.499/1.497	3.380	0.531	0.844	0.875	1.503/1.501	1.500	4.100	1/4 NPT	0.875
5.000	1.375	2.740	1.545	5.500	6.500	5.750	1.999/1.997	3.425	0.531	0.844	1.070	2.003/2.001	1.500	4.100	1/4 NPT	0.875
6.000	1.375	3.240	1.870	6.500	7.125	6.375	1.999/1.997	3.670	0.545	0.844	1.055	2.003/2.001	1.500	4.880	1/4 NPT	1.313
6.000	1.750	3.240	1.950	6.500	7.750	6.875	2.374/2.372	3.820	0.545	0.844	1.197	2.378/2.376	1.500	4.880	1/4 NPT	1.313
* *8	1.750	4.240	2.100	8.500	8.000	7.125	2.374/2.372	3.975	0.656	-	1.232	2.378/2.376	-	6.440	1/4 NPT	1.313

* Dimensions shown in inches
* * These products do not have locking mode T slot provisions.

The **Large Bore A Series** is an NFPA Interchangeable cylinder line that is designed and built to excel in the most demanding applications. The Large Bore A Series encompasses many of the proven design features of the A Series.

Tube
The 8" bore **tube** is hard coat anodized aluminum. The hard coating is an electro-chemical process, which produces a very dense surface of aluminum oxide. This surface has extreme hardness (60 RC.), excellent wear and corrosion resistance, and a low coefficient of friction. The 10", 12", and 14" bores use a honed, chrome plated steel tube.

End Caps
The **end caps** are accurately machined from (6061-T6) solid aluminum bar stock. They are anodized for corrosion resistance. Additionally, a recess on the piston-mating surface (at both ends) enables the air to work on a larger piston area for effortless breakaway.

Rod Bushing
The 8" bore includes a graphite filled, cast iron **rod bushing**. The 10", 12", and 14" bores are equipped with a bronze bushing. Both bushing types are extra long in length. The added length adds superior alignment and support of the piston rod as well as provides maximum load bearing support. Both bushing materials offer an excellent bearing surface for a hard chrome plated piston rod.

Rod Seal
The carboxilated nitrile with PTFE compound **rod seal** is self-lubricating and durable. The rounded lip design ensures proper sealing and long life.

Rod Wiper
The standard **rod wiper** construction is a highly durable polyurethane.

Piston Rod
High strength steel (100,000 psi minimum yield) **piston rod** has a ground, polished, and chrome plated surface. This surface provides maximum life for both the rod bushing and the seals.

Bushing Retainer
The **bushing retainer** allows cartridge removal (cylinder repair) without complete disassembly.

Tie Rods
The **tie rods** are 100,000 psi minimum yield steel for maximum holding power. The threads are roll formed for superior strength and engagement.

Piston Seal
The **piston seal** is a carboxilated nitrile with PTFE compound making it self-lubricating. The "T" seal with back-up ring configuration is standard on the 8" bore design. A lip seal configuration is used on 10", 12", and 14" bores. Both seal types prevent rolling and are designed to seal at all pressures.

Wear Band
The **wear band** is a stable, lubricating strip located on the piston. We separated the load bearing points by locating the wear band at the rear of the piston. This maximizes column strength at full extension.

Piston
The solid aluminum alloy **piston** is strong and durable. On the 10", 12", and 14" bores we use a nylon locking insert nut to attach the piston to the piston rod. This enables piston rod disassembly if necessary.

Cushion Seal
The floating **cushion seal** design enables rapid stroke reversal by providing instantaneous full flow to the piston. Each cushion has a flush, retained adjustment needle.

Tube End Seal
The **tube end seals** are compression type and reusable.

Ports
Our enhanced **port** design enables the cylinder to work more efficiently. Through the use of precise machining depths and tool shape, we are able to smooth the flow path into and out of the cylinder.

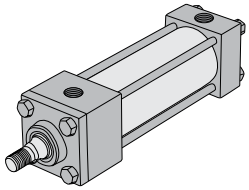
Standard Specifications:

- Meets NFPA specifications
- Bore sizes from 8" through 14"
- Piston rod diameters from 1-3/8" through 2-1/2"
- Maximum pressure rating is 250 psi air
- Standard temperature -10°F to 165°F (-23°C to 74°C)
- NPTF ports
- Flexible port and cushion location
- Multitude of mounting options

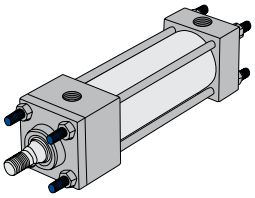
Standard Large Bore A Series Mounts

Centerline Mounts

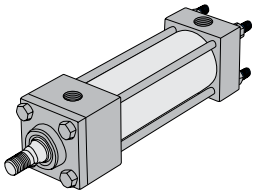
X0 Mount
Basic No Mount



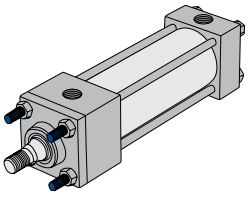
X1 Mount
Extended Tie Rods – Both Ends



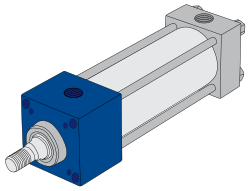
X2 Mount
Extended Tie Rods – Cap End



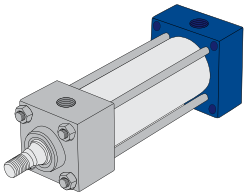
X3 Mount
Extended Tie Rods – Head End



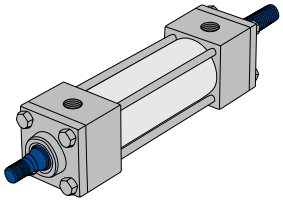
E3 Mount
Head Square Mount



E4 Mount
Cap Square Mount

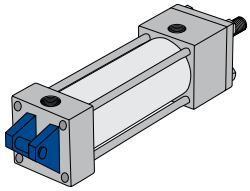


DA Mount
Double Rod End

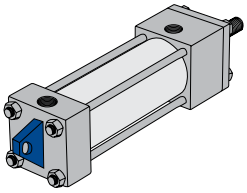


Pivot Mounts

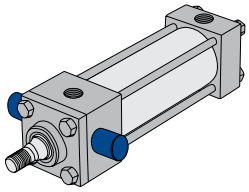
P1 Mount
Fixed Clevis



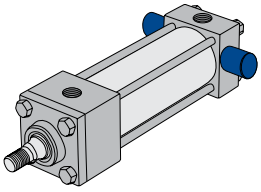
P3 Mount
Fixed Eye



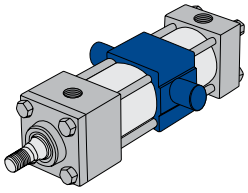
T1 Mount
Head Trunnion



T2 Mount
Cap Trunnion

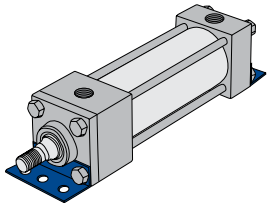


T4 Mount
Intermediate Trunnion

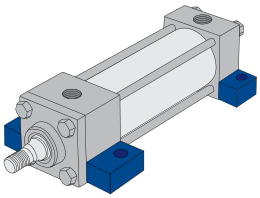


Foot Mounts

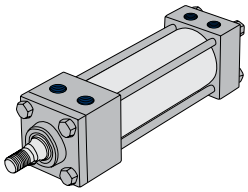
S1 Mount
Angle Mount



S2 Mount
Side Lugs



S4 Mount
Bottom Tapped



How to Order

E3 A W - 06 A 1 F - C AA 0

Mount
E3 = Head Square Mount
E4 = Cap Square Mount
P1 = Fixed Clevis
P2 = Removable Clevis (8" bore only)
P3 = Fixed Eye
S1 = Angle Mount
S2 = Side Lug Mount
S4 = Bottom Tap
X0 = Basic No Mount
X1 = Extended Tie Rods Both Ends
X2 = Extended Tie Rod Cap
X3 = Extended Tie Rod Head
T1 = Head Trunnion
T2 = Cap Trunnion
T4* = Mid Trunnion
U3 = Spherical Mount

Type
A = Large Bore A Series
NFPA Interchangeable

Bore
W = 8"
X = 10"
Y = 12"
B = 14"

Full Inches of Stroke
00 = 0" Stroke
01 = 1" Stroke
02 = 2" Stroke
03 = 3" Stroke
99 = 99" Stroke
NOTE: Consult factory for strokes greater than 99".

Fractional Inches of Stroke

A	= 0"	I	= 1/2"
B	= 1/16"	J	= 9/16"
C	= 1/8"	K	= 5/8"
D	= 3/16"	L	= 11/16"
E	= 1/4"	M	= 3/4"
F	= 5/16"	N	= 13/16"
G	= 3/8"	O	= 7/8"
H	= 7/16"	P	= 15/16"

Magnet
0 = No Magnet
2 = Magnet

Options
AA = No Option
DA = Double Rod
MA = Metallic Rod Scraper
1A* = Rod Extension
2A* = Thread Extension
3A = Studded Rod End
4A* = Stop Tube
CT = Composite Tube
AT = Aluminum Tube (Standard on 8")
SA = Stainless Steel Rod
SS = Stainless Steel Rod and Tie Rods
ST = Stainless Steel Tie Rods
*Must specify length.

Cushions

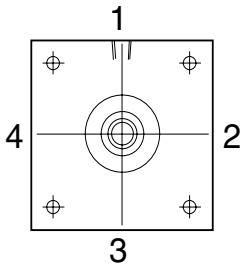
Position	1	2	3	4
No Cushion	A	A	A	A
Head and Cap	B	C	D	E
Head Only	F	G	H	J
Cap Only	K	L	M	N

Ports

Position	3/4"	1"	1 1/4"
1	F	G	1
2	L	M	2
3	R	S	3
4	X	Y	4

Rod End Codes
1 = #1 Standard Rod Diameter
2 = #2 Standard Rod Diameter
3 = #3 Standard Rod Diameter
4* = Special Standard Rod Diameter
5* = Special Oversize Rod Diameter
6 = #1 Oversize Rod Diameter
7 = #2 Oversize Rod Diameter
8 = #3 Oversize Rod Diameter
A = #1 Second Oversize Rod Diameter
B = #2 Second Oversize Rod Diameter
C = #3 Second Oversize Rod Diameter
* Must specify threads.

Cylinder Orientation



Ports Normally in Position 1

Ports are normally located in position 1.

Cushions are normally located in position 2.

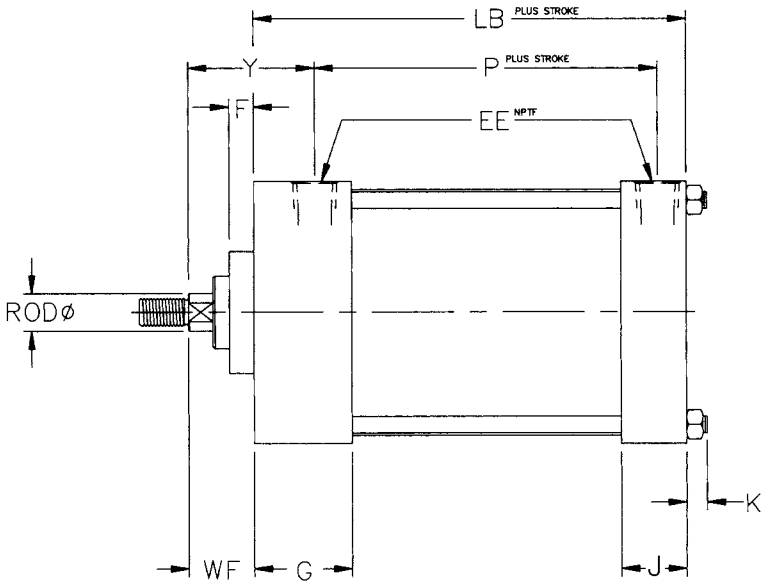
NOTE: Ports -
8" Bore-standard port size is 3/4" NPTF.
10" & 12" Bore-standard port size is 1" NPTF, smaller port sizes available.
14" Bore-standard port size is 1 1/4" NPTF, smaller port sizes available.

Rod End Styles, Diameters and Threads

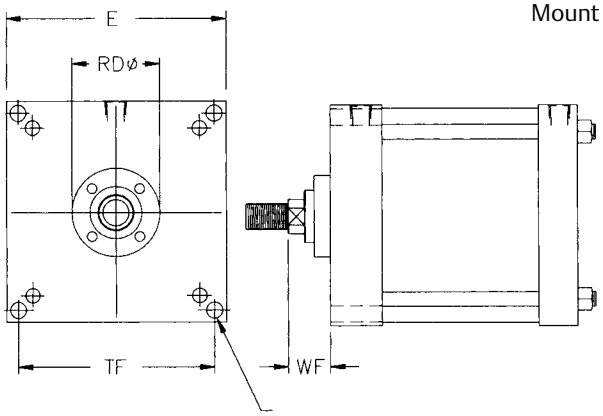
Diameter	Style #1 Standard Male	Style #2 Optional Male	Style #3 Optional Female
1.38	1-14	1 1/4-12	1-14
1.75	1 1/4-12	1 1/2-12	1 1/4-12
2.00	1 1/4-12	1 3/4-12	1 1/2-12
2.50	1 7/8-12	2 1/4-12	1 7/8-12

Dimensions: Inches

Basic No Mount Cylinder

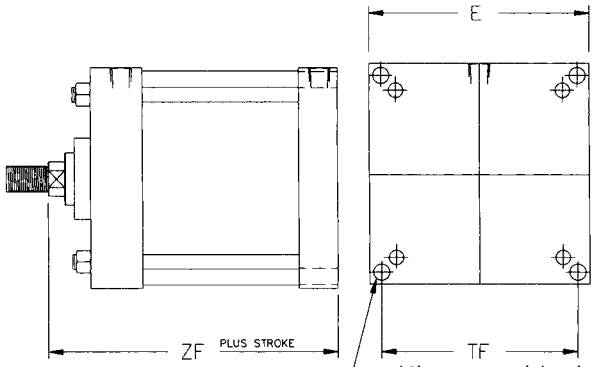


Mount Code X0 NFPA MX0



FB (Clearance Hole) Bolt 4 places

Mount Code E3 NFPA ME3



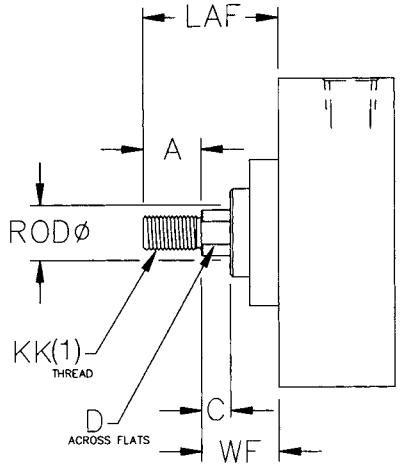
FB (Clearance Hole) Bolt 4 places

Mount Code E4 NFPA ME4

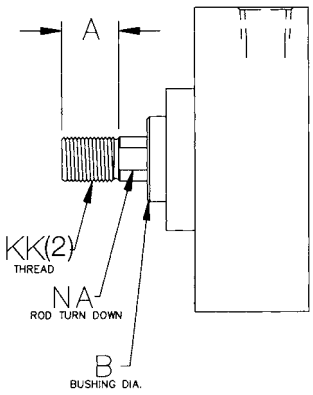
Bore	Rod	E	EE	F	FB	G	J	K	LB	P	RD	TF	WF	Y	ZF
8"	1.375	8.500	0.750	0.630	0.630	2.000	1.500	0.630	5.125	3.250	3.130	7.580	1.630	2.810	6.750
	1.750	8.500	0.750	0.750	0.630	2.000	1.500	0.630	5.125	3.250	3.790	7.580	1.880	3.060	7.000
10"	1.750	10.630	1.000	0.750	0.750	2.250	2.000	0.750	6.375	4.130	5.500	9.400	1.880	3.130	8.250
	2.000	10.630	1.000	0.750	0.750	2.250	2.000	0.750	6.375	4.130	5.500	9.400	2.000	3.250	8.380
	2.500	10.630	1.000	0.750	0.750	2.250	2.000	0.750	6.375	4.130	5.500	9.400	2.250	3.500	8.630
12"	2.000	12.750	1.000	0.750	0.750	2.250	2.000	0.750	6.875	4.630	5.500	11.100	2.000	3.250	8.880
	2.500	12.750	1.000	0.750	0.750	2.250	2.000	0.750	6.875	4.630	5.500	11.100	2.250	3.500	9.130
14"	2.500	14.750	1.250	0.750	0.880	2.750	2.250	0.880	8.125	5.500	5.500	12.870	2.250	3.810	10.380

Dimensions: Inches

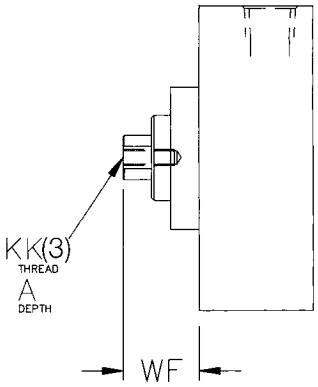
Standard and Optional Rod Ends



Style #1 (Standard Male)



Style #2 (Optional Male)



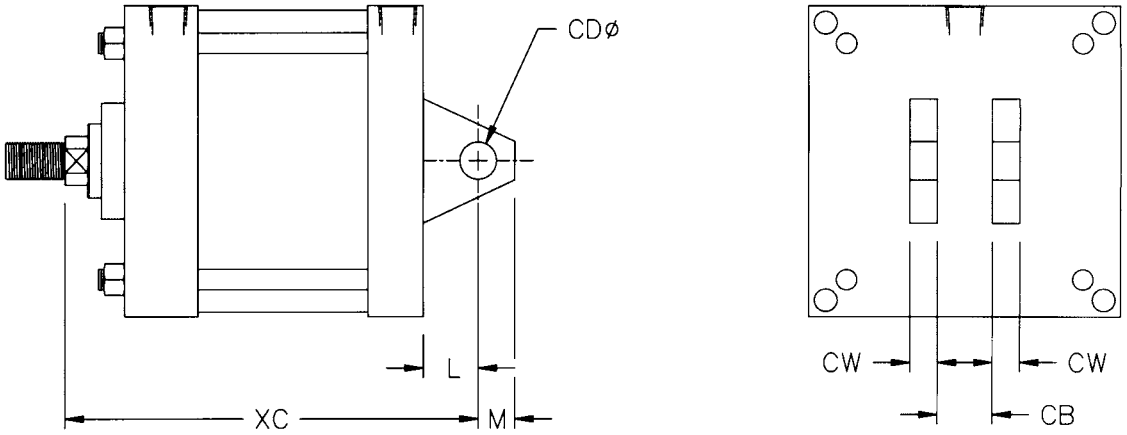
Style #3 (Optional Female)

Bore	Rod*	KK(1)	KK(2)	KK(3)	A	B	C	D	NA	LAF	WF
8"	1.375	1-14	1 1/4-12	1-14	1.625	2.000	0.630	1.130	1.310	3.250	1.630
	1.750	1 1/4-12	1 1/2-12	1 1/4-12	2.000	2.380	0.750	1.500	1.690	3.880	1.880
10"	1.750	1 1/4-12	1 1/2-12	1 1/4-12	2.000	3.120	0.750	1.500	1.690	3.880	1.880
	2.000	1 1/2-12	1 3/4-12	1 1/2-12	2.250	3.120	0.880	1.750	1.940	4.250	2.000
	2.500	1 7/8-12	2 1/4-12	1 7/8-12	3.000	3.120	1.000	2.060	2.440	5.250	2.250
12"	2.000	1 1/2-12	1 3/4-12	1 1/2-12	2.250	3.120	0.880	1.750	1.940	4.250	2.000
	2.500	1 7/8-12	2 1/4-12	1 7/8-12	3.000	3.120	1.000	2.060	2.440	5.250	2.250
14"	2.500	1 7/8-12	2 1/4-12	1 7/8-12	3.000	3.120	1.000	2.060	2.440	5.250	2.250

*Other rod sizes available. Consult factory for details.

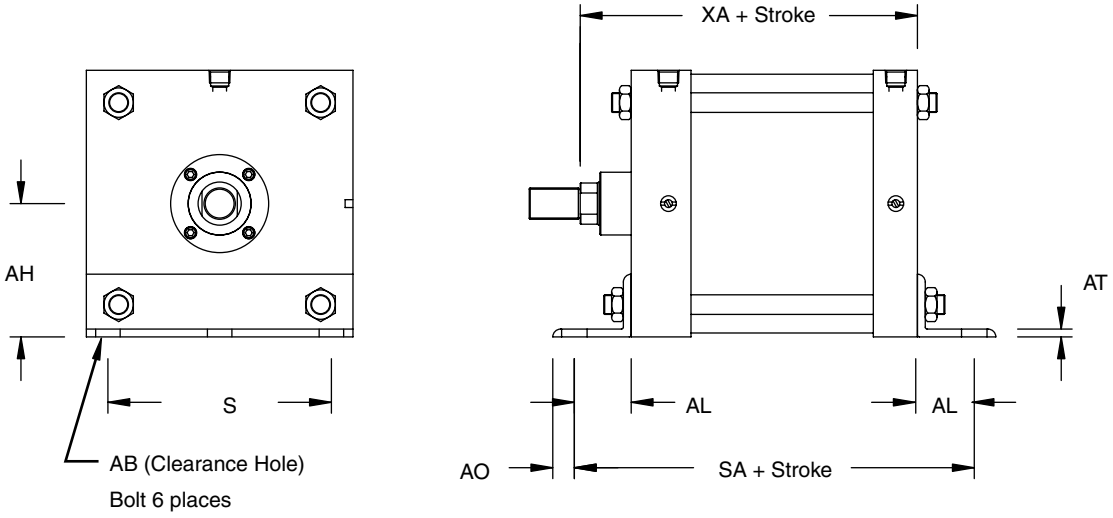
Dimensions: Inches

Clevis and Angle Mount



Mount Code P1

NFPA MP1

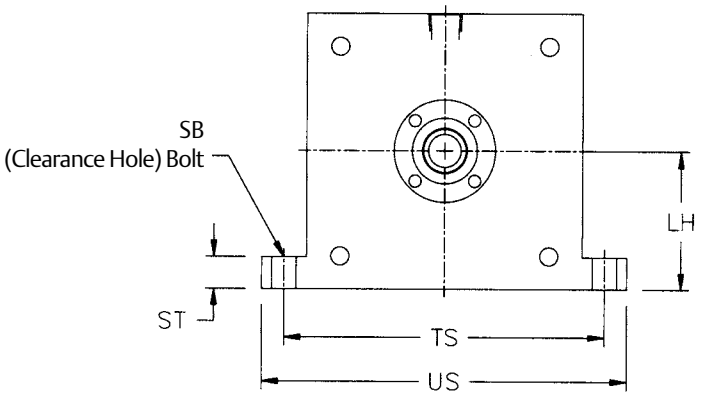


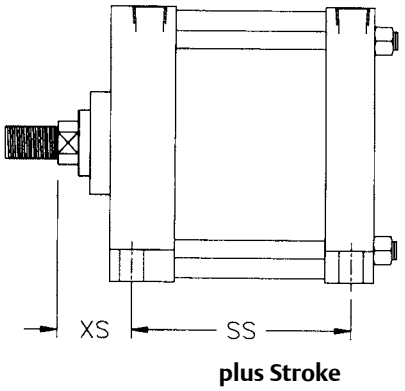
Mount Code S1

NFPA MS1

Bore	Rod	AB	AH	AL	AO	AT	CB	CD	CW	L	M	S	SA	XA	XC
8"	1.375	0.750	4.250	1.810	0.690	0.250	1.500	1.000	0.750	1.500	1.000	7.130	8.750	8.560	8.250
	1.750	0.750	4.250	1.810	0.690	0.250	1.500	1.000	0.750	1.500	1.000	7.130	8.750	8.810	8.500
10"	1.750	1.000	5.310	2.130	0.880	0.250	2.000	1.375	1.000	2.130	1.380	8.880	10.630	10.380	10.380
	2.000	1.000	5.310	2.130	0.880	0.250	2.000	1.375	1.000	2.130	1.380	8.880	10.630	10.500	10.500
	2.500	1.000	5.310	2.130	0.880	0.250	2.000	1.375	1.000	2.130	1.380	8.880	10.630	10.750	10.750
12"	2.000	1.000	6.380	2.130	0.880	0.380	2.500	1.750	1.250	2.250	1.750	11.000	11.130	11.000	11.130
	2.500	1.000	6.380	2.130	0.880	0.380	2.500	1.750	1.250	2.250	1.750	11.000	11.130	11.250	11.380
14"	2.500	1.250	7.380	2.440	1.060	0.380	2.500	2.000	1.250	2.500	2.000	12.630	13.000	12.810	12.880

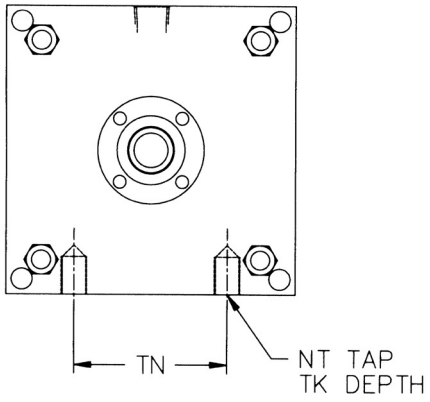
Side Lug and Bottom Tap Mount

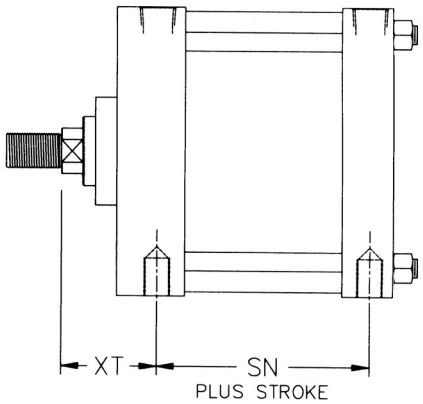




Mount Code S2 NFPA MS2

NOTE: Use this "drawing" below as well. Note on the one below, the drawing is the only change the letter call outs will remain the same.



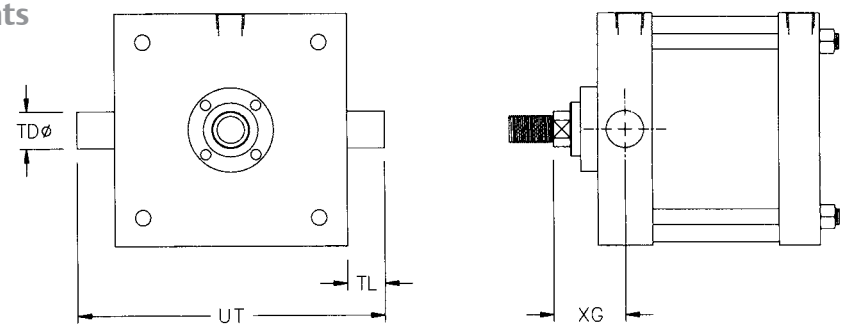


Mount Code S4 NFPA MS4

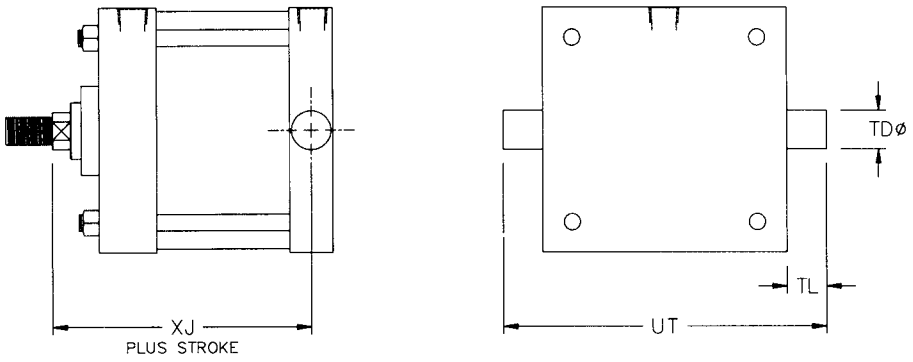
Bore	Rod	LH	NT	SB	SN	SS	ST	TK	TN	TS	US	XS	XT
8"	1.375	4.250	3/4-10	0.750	3.250	3.750	1.000	1.130	4.500	9.880	11.250	2.310	2.810
	1.750	4.250	3/4-10	0.750	3.250	3.750	1.000	1.130	4.500	9.880	11.250	2.560	3.060
10"	1.750	5.313	1-8	1.000	4.130	4.630	1.250	2.000	5.500	12.380	14.130	2.750	3.130
	2.000	5.313	1-8	1.000	4.130	4.630	1.250	2.000	5.500	12.380	14.130	2.880	3.250
	2.500	5.313	1-8	1.000	4.130	4.630	1.250	2.000	5.500	12.380	14.130	3.130	3.500
12"	2.000	6.375	1-8	1.000	4.630	5.130	1.250	2.000	7.250	14.500	16.250	2.880	3.250
	2.500	6.375	1-8	1.000	4.630	5.130	1.250	2.000	7.250	14.500	16.250	3.130	3.500
14"	2.500	7.375	1 1/4-7	1.250	5.500	5.880	1.500	2.500	8.380	17.000	19.250	3.380	3.810

Dimensions: Inches

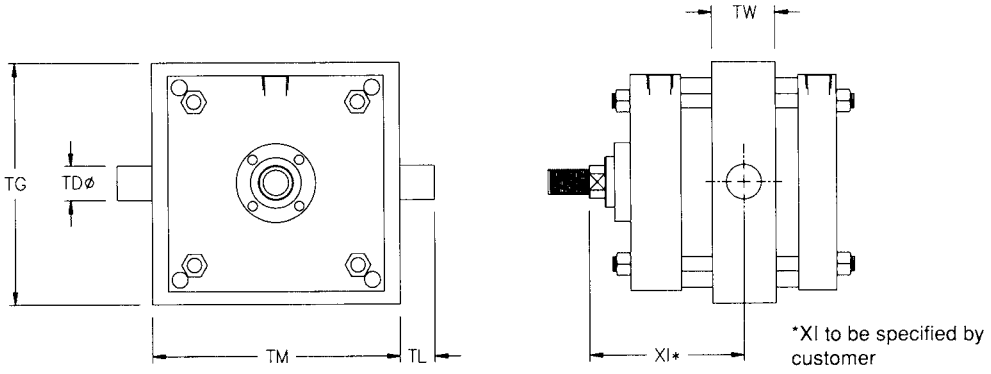
Trunnion Mounts



Mount Code T1 NFPA MT1



Mount Code T2 NFPA MT2



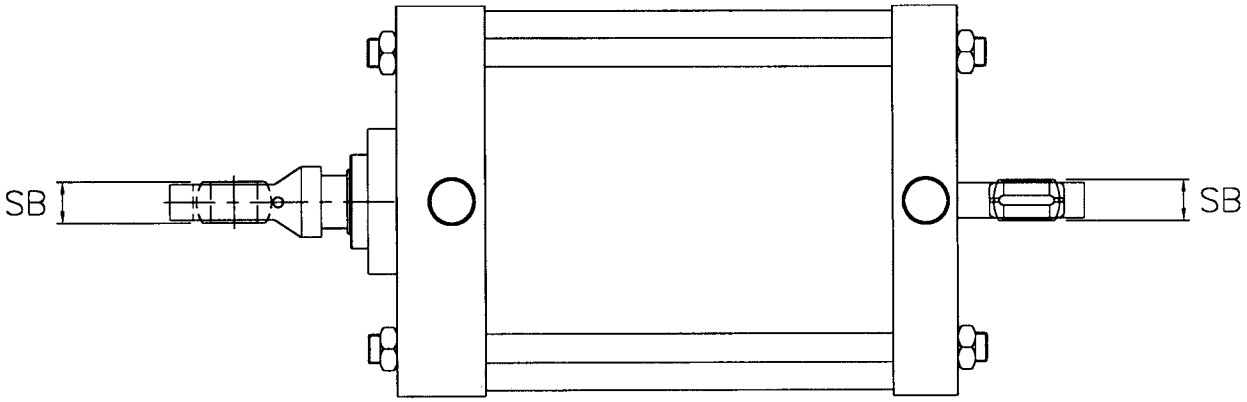
Mount Code T4 NFPA MT4

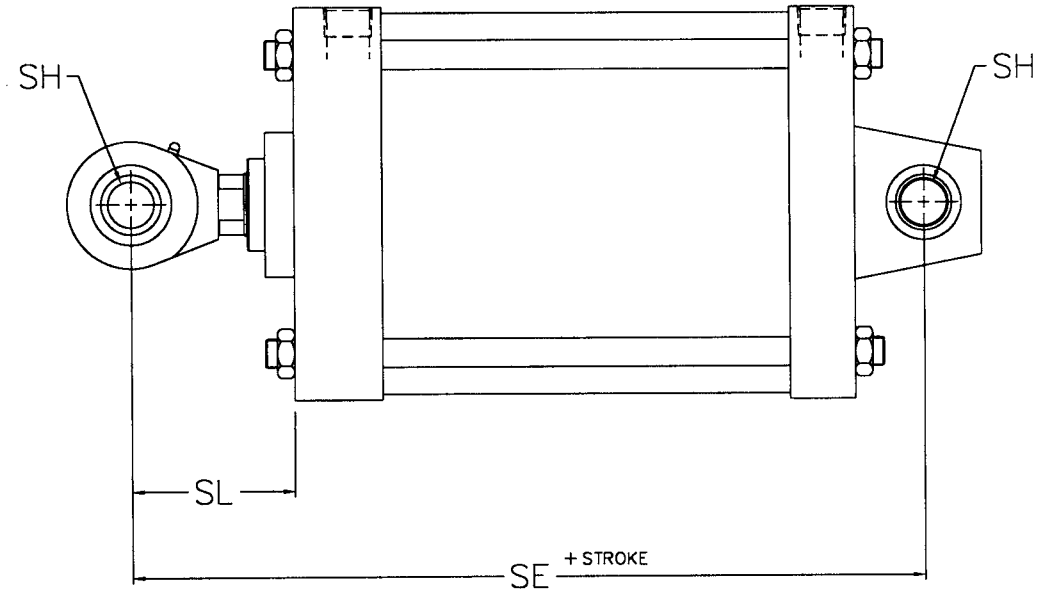
NOTE: All Large Bore A Series trunnion mounts are one piece machined steel.

Bore	Rod	TD	TG	TL	TM	TW	UT	XG	XI (Min.)	XJ
8"	1.375	1.375	9.500	1.380	9.750	2.500	11.250	2.630	4.880	6.000
	1.750	1.375	9.500	1.380	9.750	2.500	11.250	2.880	5.130	6.250
10"	1.750	1.750	11.750	1.750	12.000	3.000	14.130	3.000	5.630	7.250
	2.000	1.750	11.750	1.750	12.000	3.000	14.130	3.130	5.750	7.380
	2.500	1.750	11.750	1.750	12.000	3.000	14.130	3.380	6.000	7.630
12"	2.000	1.750	13.750	1.750	14.000	3.000	16.250	3.130	5.750	7.880
	2.500	1.750	13.750	1.750	14.000	3.000	16.250	3.380	6.000	8.130
14"	2.500	2.000	16.000	2.000	16.250	3.500	18.750	3.630	6.750	9.250

Dimensions: Inches

Spherical Mount

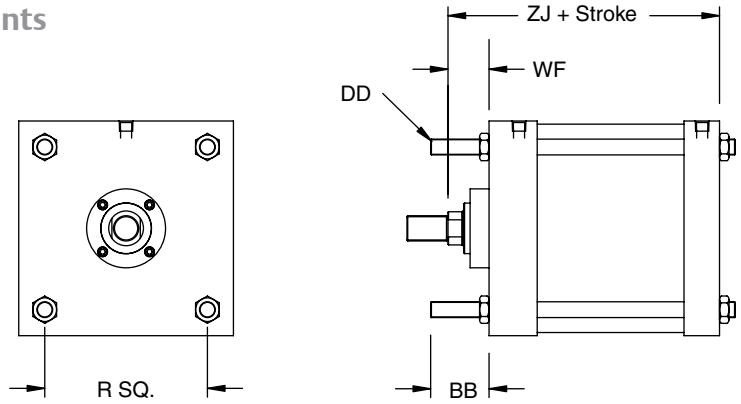




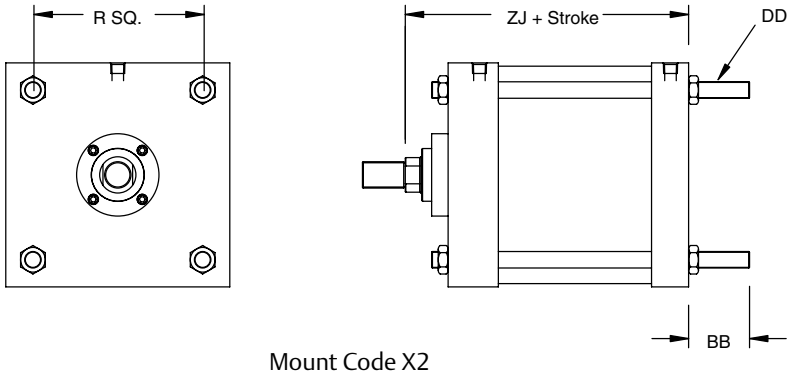
Bore	Rod	SH	SB	SL	SE
8"	1.375	1.000	0.875	3.500	10.130
	1.750	1.000	0.875	3.750	10.380
10"	1.750	1.375	1.188	4.000	12.500
	2.000	1.375	1.188	4.130	12.630
	2.500	1.375	1.188	4.380	12.880
12"	2.000	1.750	1.531	4.500	13.630
	2.500	1.750	1.531	4.750	13.880
14"	2.500	2.000	1.750	5.000	15.630

Dimensions: Inches

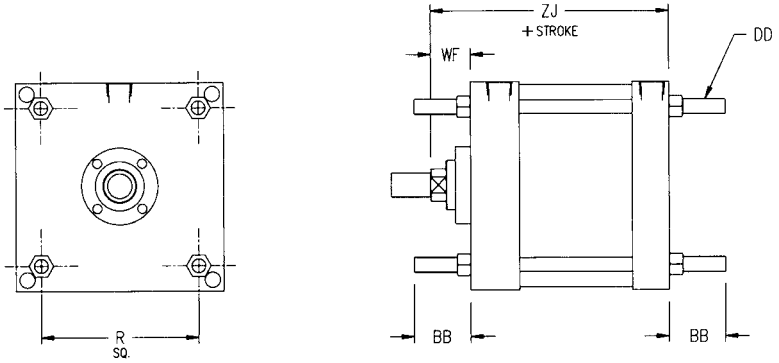
Extended Tie Rod Mounts



Mount Code X3 NFPA MX3



Mount Code X2 NFPA MX2

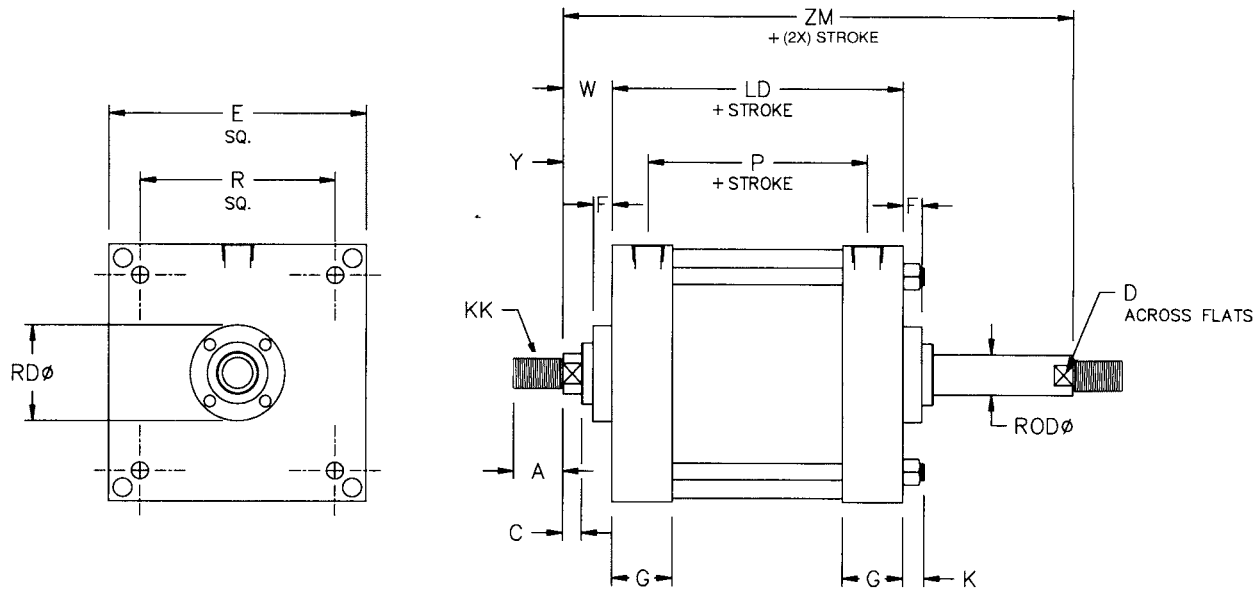


Mount Code X1 NFPA MX1

Bore	Rod	BB	DD	R	WF	ZJ
8"	1.375	2.310	5/8-18	6.440	1.630	6.750
	1.750	2.310	5/8-18	6.440	1.880	7.000
10"	1.750	2.690	3/4-16	8.060	1.880	8.250
	2.000	2.690	3/4-16	8.060	2.000	8.380
	2.500	2.690	3/4-16	8.060	2.250	8.630
12"	2.000	2.690	3/4-16	9.410	2.000	8.880
	2.500	2.690	3/4-16	9.410	2.250	9.130
14"	2.500	3.190	7/8-14	10.900	2.250	10.380

Dimensions: Inches

Double Rod End



Order as "DA" Option NFPA MDX0

Bore	Rod	A	C	D	E	F	G	K	KK	LD	P	R	RD	W	Y	ZM
8"	1.375	1.630	0.630	1.130	8.500	0.63	2.000	0.630	1-14	5.630	3.250	6.440	3.130	1.630	2.810	8.880
	1.750	2.000	0.750	1.500	8.500	0.750	2.000	0.630	1 1/4-12	5.630	3.250	6.440	3.790	1.880	3.060	9.380
10"	1.750	2.000	0.750	1.500	10.630	0.750	2.250	0.750	1 1/4-12	6.630	4.130	8.060	5.500	1.880	3.130	10.380
	2.000	2.250	0.880	1.750	10.630	0.750	2.250	0.750	1 1/2-12	6.630	4.130	8.060	5.500	2.000	3.250	10.630
	2.500	3.000	1.000	2.060	10.630	0.750	2.250	0.750	1 7/8-12	6.630	4.130	8.060	5.500	2.250	3.500	11.130
12"	2.000	2.250	0.880	1.750	12.750	0.750	2.250	0.750	1 1/2-12	7.130	4.630	9.410	5.500	2.000	3.250	11.130
	2.500	3.000	1.000	2.060	12.750	0.750	2.250	0.750	1 7/8-12	7.130	4.630	9.410	5.500	2.250	3.500	11.630
14"	2.500	3.000	1.000	2.060	14.750	0.750	2.750	0.880	1 7/8-12	8.630	5.500	10.900	5.500	2.250	3.810	13.130

Stop Tube Data

Step 1 - Determine which mount below corresponds to your application.

Step 2 - Determine the value of “L” from Table 1 below. Then find “L” dimension in Table 2 and read across to determine the required stop tube length.

Step 3 - Add the stop tube length to the original “L” value from Step 2. This is the corrected “L.” If the corrected “L” still falls within the same range as the original “L” then this is the required stop length. Otherwise, use this number in Table 2 to determine the second stop tube length.

Step 4 - Add the second stop length to the original “L.” If this value falls within the same range then the second stop tube length is the required length. Otherwise, repeat Step 4.

NOTE: Specify the effective stroke and the stop tube length when ordering.

Example:

Step 1: 10" bore cylinder, 1 3/4 diameter rod, P1 mount, 82 inch stroke
From catalog, XC = 10.375
From table 1, "L"=XC=(2xStroke)

Step 2: From Table 1, “L” = 10.375 + 164 = 174.375 inches
From Table 2, when “L” = 174.375, stop tube length = 14 inches

Step 3: Corrected “L” = 14 + 174.375 = 188.375 inches
From Table 2, when “L” = 188.375, stop tube length = 15 inches

Step 4: New corrected “L” = 15 + 174.375 = 189.375 inches
From Table 2, when “L” = 189.375, stop tube length = 15 inches

The stop tube length from Step 3 and 4 are the same, therefore, 15 inches is the required stop tube length.

Table 1

Rod	BB
E3*	4 x (W + Stroke)
E4*	4 x (WF + Stroke)
P1 & U3	XC + (2 x Stroke)
S1*	4 x (WF + Stroke)
S2*	4 x (WF + Stroke)
S4*	4 x (WF + Stroke)
X3*	4 x (WF + Stroke)
X2*	4 x (WF + Stroke)
X1*	4 x (WF + Stroke)
T1	XG + Stroke
T2	XJ + (2 x Stroke)
T3	XI + Stroke

* “L” given is for an unsupported rod end. If rod end is supported with a guide less than 1" in width, divide “L” by 4. If rod end is supported with a guide greater than 1" in width, divide “L” by 8.

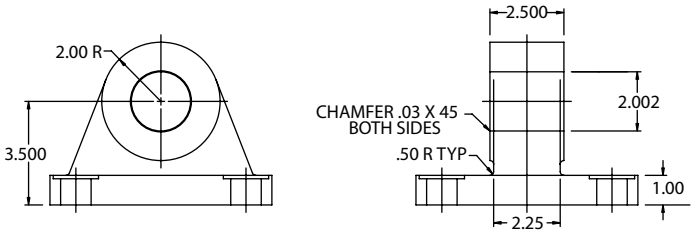
Table 2

"L" (Inches)	Stop Tube Length (Inches)
0-40	0
41-50	1
51-60	2
61-70	3
71-80	4
81-90	5
91-100	6
101-110	7
111-120	8
121-130	9
131-140	10
141-150	11
151-160	12
161-170	13
171-180	14
181-190	15
191-200	16
201-210	17
211-220	18
221-230	19
231-240	20
241-250	21
251-260	22
261-270	23
271-280	24
281-290	25
291-300	26
301-310	27

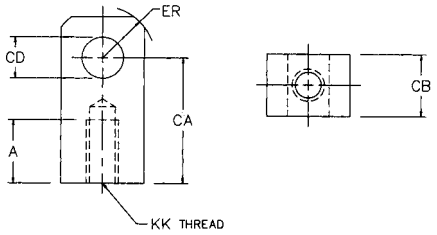
For P1 mount, “L” assumes that the rod extends and the cylinder pivots with the rod. Multiply “L” by four so the rod extends and the cylinder does not pivot with the rod.

Accessories

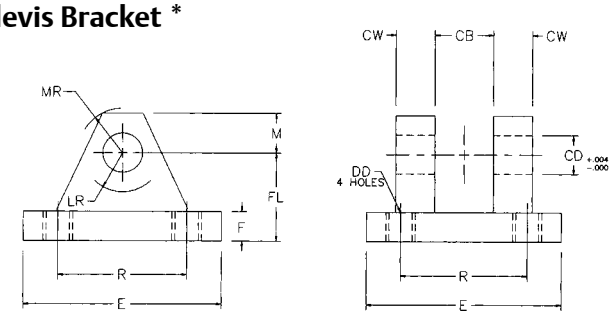
Eye Bracket *



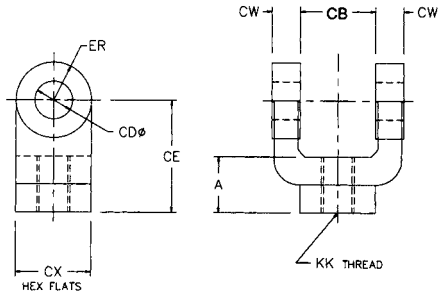
Rod Eye *



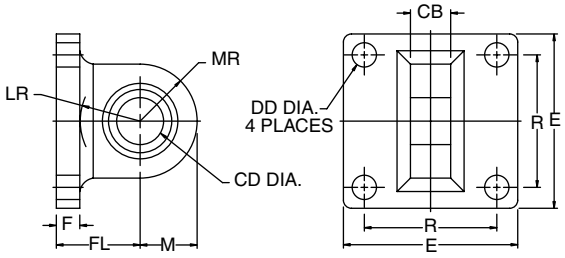
Clevis Bracket *



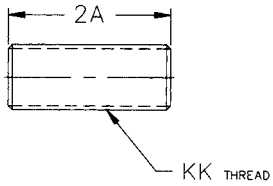
Rod Clevis *



Spherical Eye Assembly *



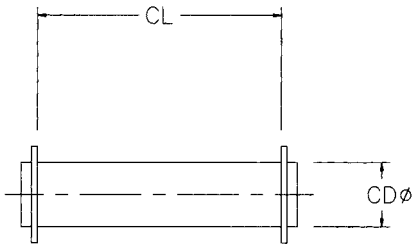
Rod Stud



NOTE: Assembly includes bracket and two spacers.

* Order pivot pin separately

Pivot Pin



Included with mount codes P1 and U3

Accessories

Clevis Bracket

Part No.	CB	CD	CW	DD	E	F	FL	LR	M	MR	R
A500-003	1.500	1.000	0.750	5/8-18	4.500	0.750	2.250	1.250	1.000	1.125	3.250
N29-1006	2.000	1.375	1.000	5/8-18	5.000	0.875	3.000	1.875	1.375	1.750	3.810
N29-1005	2.500	1.750	1.250	7/8-14	6.500	0.875	3.125	2.000	1.750	1.875	4.950
N29-1004	2.500	2.000	1.250	1-14	7.500	1.000	3.500	2.125	2.000	2.125	5.750
N29-1002	3.000	2.500	1.500	1 1/8-12	8.500	1.000	4.000	2.625	2.500	2.500	6.590

Eye Bracket

Part No.	CB	CD	DD	E	F	FL	LR	M	MR	R
A500-003	1.500	1.000	0.656	4.500	0.750	2.250	1.500	1.000	1.250	3.250
A500-104	2.000	1.375	0.656	5.000	0.875	3.000	2.125	1.375	1.625	3.810
A500-105	2.500	1.750	0.906	6.500	0.875	3.125	2.250	1.750	2.125	4.950
A500-106	2.500	2.000	1.062	7.500	1.000	3.500	2.500	2.000	2.438	5.750
N30-1004	3.000	2.500	1.188	8.500	1.000	4.000	3.000	2.500	3.000	6.590

Rod Clevis

Part No.	A	CB	CD	CE	CW	CX	ER	KK
A500-305	1.625	1.500	1.000	3.125	0.750	1.500	1.000	1-14
A500-306	2.000	2.000	1.375	4.125	1.000	2.000	1.375	1 1/4-12
A500-307	2.250	2.500	1.750	4.500	1.250	2.375	1.750	1 1/2-12
N27-1001	2.250	2.500	1.750	4.500	1.250	2.375	1.750	1 3/4-12
A500-308	3.000	2.500	2.000	5.500	1.250	2.938	2.000	1 7/8-12
A500-309	3.000	3.000	2.000	6.500	1.500	3.500	2.500	2 1/4-12

Rod Eye

Part No.	A	CA	CB	CD	ER	KK
A500-204	1.625	2.813	1.500	1.000	1.188	1-14
A500-205	2.000	3.438	2.000	1.375	1.563	1 1/4-12
A500-206	2.250	4.000	2.500	1.750	2.000	1 1/2-12
N26-1004	2.250	4.000	2.500	1.750	2.000	1 3/4-12
N26-1003	3.000	5.000	2.500	2.000	2.500	1 7/8-12
N26-1002	3.500	5.813	3.000	2.500	2.813	2 1/4-12

Spherical Eye Bracket

Part No.	CB	CD	DD	E	F	FL	LR	M	MR	R
N30-1005	1.000	1.000	0.656	4.500	0.750	2.250	1.500	1.375	1.375	3.250
N30-1006	1.375	1.375	0.656	5.000	0.875	3.000	2.125	2.000	2.000	3.810
N30-1003	1.500	1.750	0.906	6.500	0.875	3.125	2.250	2.125	2.125	4.940
N30-1007	1.750	2.000	1.032	7.500	1.000	3.500	2.500	2.375	2.375	5.750

Rod Stud

Part No.	2A	KK
A500-T01	3.250	1-14
N82-1009	4.000	1 1/4-12
N82-1010	1.500	1 1/2-12
N82-1011	6.000	1 7/8-12

Pivot Pin

Part No.	CD	CL
A500-403	1.000	3.125
A500-404	1.375	4.125
A500-405	1.750	5.125
A500-406	2.000	6.125
N131-1003	2.500	6.188

How to Order - A Series Piston Rod Assembly

A92 - K 1 N 0 - 01 A - A A

Type
A92 = A Series Piston Rod Assembly

Bore
K = 1-1/2" R = 4"
L = 2" T = 5"
M = 2-1/2" U = 6"
P = 3-1/4" W = 8"

Rod Code
1 = Style # 1 Standard Rod Diameter
2 = Style # 2 Standard Rod Diameter
3 = Style # 3 Standard Rod Diameter
4 = Special Standard Rod Diameter (must specify threads)
5 = Special Oversize Rod Diameter (must specify threads)
6 = Style # 1 Oversize Rod Diameter
7 = Style # 2 Oversize Rod Diameter
8 = Style # 3 Oversize Rod Diameter
A = Style # 1 Second Oversize Rod Diameter
B = Style # 2 Second Oversize Rod Diameter
C = Style # 3 Second Oversize Rod Diameter
U = Male Coupling Rod End Standard Rod Diameter
V = Male Coupling Rod End Oversize Rod Diameter

Cushion
N = No Cushion
B = Both Ends Cushioned
H = Head End Cushioned
C = Cap End Cushioned

Magnet
0 = No Magnet
2 = Reed Magnet (Is Included with Piston Rod Assembly)

Options (Does Not Include Seals)
AA = No Option
BH = Bumpered Head End
CR = Cylindicator Ready "Stroke to Go"
DA = Double Rod
EB = Bumper Seals
FA = No Wrench Flats, No Turn Down
FB = Four Wrench Flats
GA = High Temperature Rod Boot
JN = Jam Nut
KA = Stroke Adjust
LB = Low Breakaway
NA = Nickel Plated
NN = Nylock Nut
NS = Cylindicator Ready "No Stroke to Go"
PP = PolyPak Piston
RA = Save Air Stroke Adjuster
RB = Rod Boot
SA = Stainless Rod
TI = "T" Seal Piston
VA = FKM Seals
1A* = Rod Extension
1B* = Rear Rod Extension
2A* = Thread Extension
2B* = Rear Thread Extension
3A = Rod Stud
3B = Rear Rod Stud
4A* = Stop Tube
4D* = Double Piston Stop Tube

* = must specify length
Consult factory for additional options.

Fractional Inches of Stroke

A = 0"	E = 1/4"	I = 1/2"	M = 3/4"
B = 1/16"	F = 5/16"	J = 9/16"	N = 13/16"
C = 1/8"	G = 3/8"	K = 5/8"	O = 7/8"
D = 3/16"	H = 7/16"	L = 11/16"	P = 15/16"

Full Inches of Stroke
00 = 0" Stroke
01 = 1" Stroke
02 = 2" Stroke
03 = 3" Stroke
04 = 4" Stroke

Note: Options listed are ones that apply to a piston rod assembly only.
Model number is set up to use option code supplied with original cylinder or with any above.
Note: Bumpers are not included with Piston Rod Assembly.

Rod End Styles, Diameters and Threads

Diameter	Style #1 Standard Male	Style #2 Optional Male	Style #3 Optional Female
0.625	7/16-20	1/2-20	7/16-20
1.000	3/4-16	7/8-14	3/4-16
1.375	1-14	1 1/4-12	1-14
1.750	1 1/4-12	1 1/2-12	1 1/4-12
2.000	1 1/2-12	1 3/4-12	1 1/2-12
2.500	1 7/8-12	2 1/4-12	1 7/8-12

Rod Diameter by Bore Size

Bore	Standard Dia.	Oversized Dia.
8"	1.375	1.750
10"	1.750	2.000
12"	2.000	2.500
14"	2.500	N/A

How to Order - A Series Repair Kit

A98 - K 1 N - AA

Type
A98 = A Series Repair Kit

Bore
K = 1-1/2" R = 4"
L = 2" T = 5"
M = 2-1/2" U = 6"
P = 3-1/4" W = 8"

Rod Size
0 = Standard Rod
1 = Oversize Rod
2 = Second Oversize Rod

Options
AA = No Option
BK = Back to Back
BZ = Bronze Bushing
CR = Cylindicator Ready “Stroke to Go”
CZ = Composite Bushing
DA = Double Rod
EB = Silencer Bumpers
GA = High Temperature Rod Boot
LB = Low Breakaway
LT = Low Temp Seals
MA = Metallic Rod Scraper
MB = Rear Metallic Rod Scraper
NA = Nickel Plated
NS = Cylindicator Ready “No Stroke to Go”
PA = Polypak Rod Seal
PB = Rear Polypak Rod Seal
PP = Polypak Piston Seals
RA = Save Air Stroke Adjust
TI = “T” Seal Piston
VA = FKM Seals
4D = Double Piston Stop Tube

Cushion
N = No Cushion
B = Both Ends Cushioned
H = Head End Cushioned
C = Cap End Cushioned

Note: Options listed are ones that apply to a repair kit only.
Model number is set up to use option code supplied with original cylinder or with any above.

How to Order - A Series Seal Kit

A97 - K 1 N - AA

Type
A97 = A Series Seal Kit

Bore
K = 1-1/2” R = 4”
L = 2” T = 5”
M = 2-1/2” U = 6”
P = 3-1/4” W = 8”

Rod Size
0 = Standard Rod
1 = Oversize Rod
2 = Second Oversize Rod

Options
AA = No Option
BK = Back to Back
CR = Cylindicator Ready “Stroke to Go”
DA = Double Rod
EB = Silencer Bumpers
LB = Low Breakaway
LT = Low Temp Seals
MA = Metallic Rod Scraper
MB = Rear Metallic Rod Scraper
NS = Cylindicator Ready “No Stroke to Go”
PA = Polypak Rod Seal
PB = Rear Polypak Rod Seal
PP = Polypak Piston Seals
RA = Save Air Stroke Adjust
TI = “T” Seal Piston
VA = FKM Seals
4D = Double Piston Stop Tube

Cushion
N = No Cushion
B = Both End Cushioned
H = Head End Cushioned
C = Cap End Cushioned

Note: Options listed are ones that apply to a seal kit only.
Model number is set up to use option code supplied with original cylinder or with any above.

Piston Rod Assembly Kit Installation Instructions

1. Loosen 4 Tie Rod Nuts (Part #20) to remove Piston/Rod Assembly (Part #18 & #19).
2. Carefully remove seals. (Part #12, #14, & #15). Any damage to the seals may result in leakage.
3. Lubricate piston seal(s) and wearband (Part #12) with supplied Emerson's Lube. Examine seals before installing for any contamination. Contamination may cause leakage.
4. Install Piston Seal (Part #15). Make sure the piston seal is not twisted inside groove. Next install back-up rings if piston seal is a T-seal.
5. Install lubricated wearband onto piston. Sink piston/rod assembly into sinker tube.
6. Apply lube inside the cylinder tube (Part #17).
7. Sink piston/rod assembly into cylinder tube.
8. Press piston/rod assembly flush with the cylinder tube. Wipe off any lube from the face of the piston.
9. Examine all seals before reassembling cylinder for any contamination. Contamination may cause leakage.
10. Lightly grease Rod Seal (Part #3) of Loaded Bushing before installing. This will ease the installation of the rod bushing over the rod.
11. Reassemble cylinder. Loosely torque Tie Rod Nuts (Part #20) to allow head and cap to rotate slightly.
12. Before final torque, place cylinder on level surface. This will ensure that the cylinder head and cap are square. Torque Tie Rod Nuts (Part #20) in a crisscross pattern. Use torque tolerances chart for Tie Rod Nuts and Retainer Screws.
13. Stroke cylinder by hand. This will enable detection of any binding. If binding does occur, repeat steps 11-13.

See Seal Installation Guide on page 27 for additional (visual) instructions.

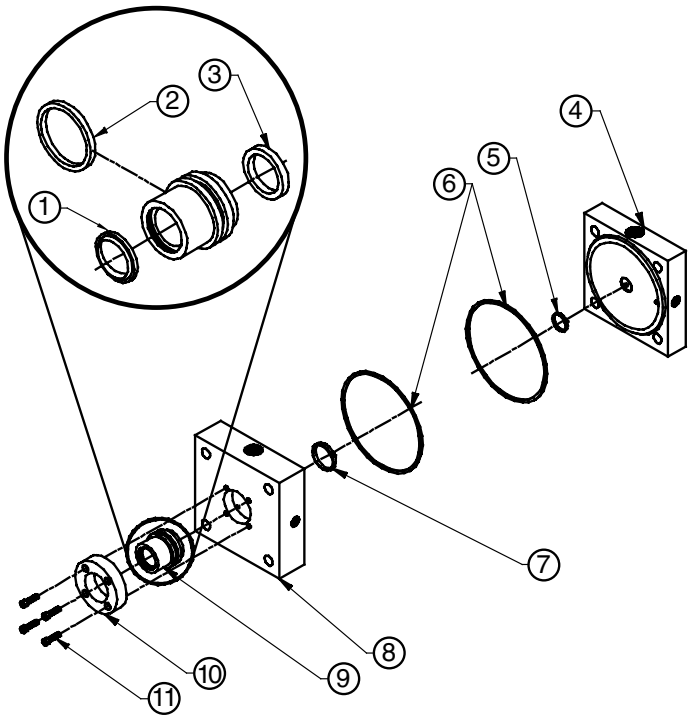
Repair Kit and Seal Kit Removal/Installation Instructions

1. Loosen 2 or 4 Retainer Screws (Part #11) to remove Loaded Bushing (Part # 9)
2. Loosen 4 Tie Rod Nuts (Part #20) to remove Piston/Rod Assembly (Part #18 & #19)
3. Carefully remove old seals. (Part [#1, #2, #3 Seal kit only], #5, #6, #7, #12, #14, & #15) Any damage to the seal grooves may result in leakage.
4. Lubricate new seals with supplied Emerson's Lube. Examine seals before installing for any contamination. Contamination may cause leakage.
5. Install Piston Seal (Part #15). Make sure the piston seal is not twisted inside groove. Next install back-up rings (Part #14) if piston seal is a T-seal.
6. Install lubricated Wearband (Part #12) onto piston. Sink piston/rod assembly into sinker tube.
7. Apply lube inside the cylinder tube.
8. Sink piston/rod assembly into cylinder tube.
9. Press piston/rod assembly flush with the cylinder tube. Wipe off any lube from the face of the piston.
10. Place Tube End Seals (Part #6) into head and cap seal grooves. Examine seals after installing for any contamination. Contamination may cause leakage.
11. Install Rod Wiper (Part #1), Bushing O-ring (Part #2), and Rod Seal (Part #3) into bushing (Seal Kit only). Lightly grease Rod Seal and Bushing O-ring after installation. This will ease the installation of the rod bushing over the rod and into the head.
12. Reassemble cylinder except for loaded rod bushing (Part #9). First, loosely torque Tie Rod Nuts to allow head and cap to rotate slightly. Carefully place bushing over the rod until getting interference. With a twisting motion, slide the bushing down onto the rod and into the bushing pocket on the head.
13. Place Bushing Retainer (Part #10). Lightly tighten Retainer Screws (Part #11).
14. Before final torque, place cylinder on level surface to square head and cap. Torque Tie Rod Nuts in a crisscross pattern. Use the following charts for torque tolerances for Tie Rod Nuts and Retainer Screws.
15. Stroke cylinder by hand. This will enable detection of any binding. If binding does occur, repeat steps 12-14.

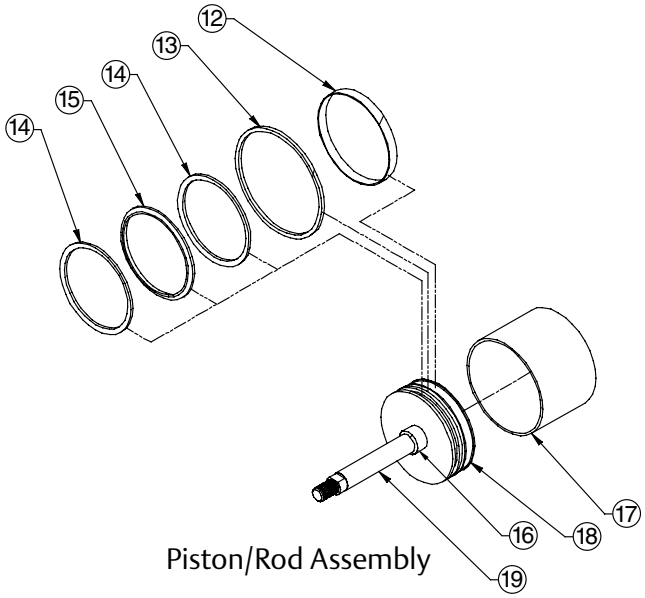
See Seal Installation Guide on page 27 for additional (visual) instructions.

Diagrams

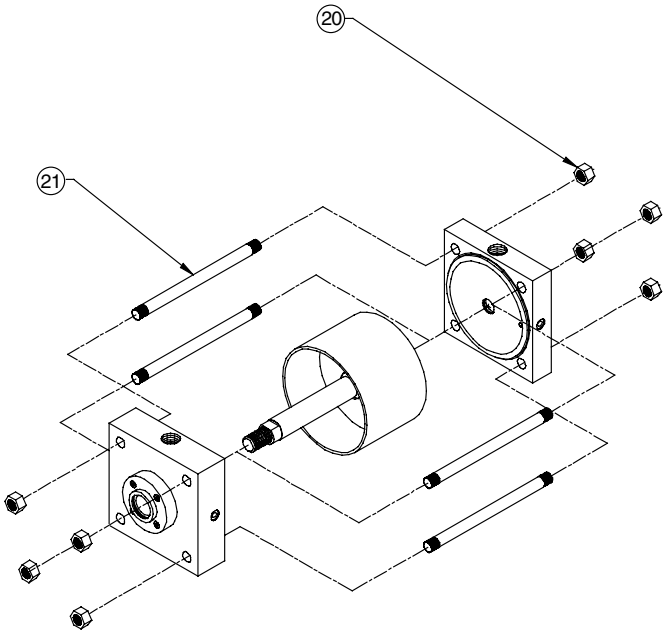
Pneumatic Service Temperatures:
Nitrile Seals: -10˚F (-23˚C) to 165˚F (74˚C)
FKM Seals: 0˚F (-17˚C) to 400˚F (204˚C)



Head, Cap, and Bushing Assembly



Piston/Rod Assembly

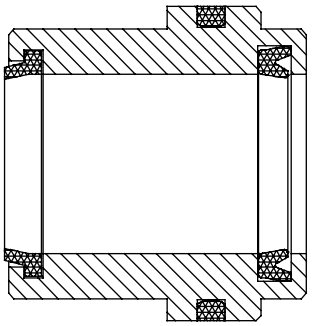


Cylinder Assembly and Tie Rod Torque

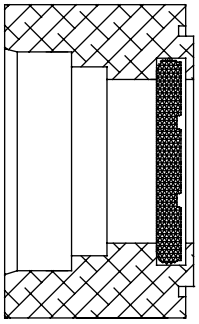
A Series

Part #	Description	Parts included in:		
		Seal Kit	Repair Kit	Piston/Rod Assembly
1	Rod Wiper	X		
2	Bushing O-ring	X		
3	Rod Seal	X		
4	Cap			
5	Cap Cushion Seal	X	X	
6	Tube End Seals	X	X	
7	Head Cushion Seal	X	X	
8	Head			
9	Loaded Bushing Assembly		X	
10	Bushing Retainer			
11	Retainer Screws			
12	Wearband	X	X	
13	Magnet			X
14	Back-up Rings	X	X	
15	Piston Seal	X	X	
16	Cushion Spear			X
17	Tube			
18	Piston			X
19	Rod			X
20	Hex Nuts			
21	Tie Rods			

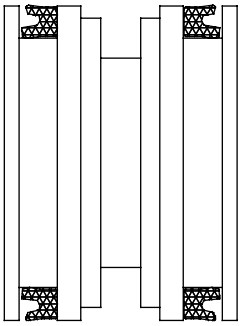
Seal Installation Guide



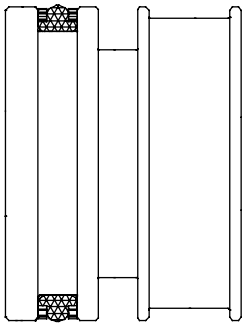
Loaded Bushing



Cushioned Head or Cap



Low Breakaway Piston



T-Seal Piston

Torque Tolerances (LBS-FT)
Tie Rod Nut Part #20

Bore	Min.	Max.
8"	80	90
10"	200	220
12"	200	220
14"	300	330

Retainer Screws Torque Tolerances (lbs-ft) Part #11

Size	Min.	Max.
#10-32	1	1.5
1/4-28	5	7
5/16-24	10	12

Note: Sinker Tubes are not included in kits. They can be ordered using the part numbers from the provided chart.

Sinker Tube Part Numbers

Bore	Part #
8"	A06-W91
10"	A06-X91
12"	A06-Y91
14"	A06-B91

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