cylinders

S Series

Stainless Steel NFPA Interchangeable Cylinder Line

numatics®

EMERSON™
Industrial Automation

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S Series
Stainless Steel NFPA Interchangeable

The **S Series** is a stainless steel NFPA Interchangeable pneumatic cylinder line. It is designed and built to perform in the toughest "wash down" applications. The stainless steel construction provides outstanding corrosion resistance while including a multitude of favorable design features. The S Series encompasses many of the same proven design features as our original NFPA Interchangeable cylinder, the A Series. This includes an extra long bushing and a standard oversized wear band located on the rear of the piston. Additionally, we have also included the proven T Seal piston seal configuration with carboxilated nitrile with self-lubricating Teflon® compound. These are just a few of the features that make the S Series the *Superior* Stainless Steel NFPA Interchangeable air cylinder line.

Tube
The 316 stainless steel **tube** is chrome plated on the ID for smooth, corrosion free operation.

End Caps
The **end caps** are accurately machined from precision 316 stainless steel blocks. 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 S Series includes a cutting edge PolyLube™ composite **rod bushing** that is extra long in length. The composite rod bushing is specifically designed for applications where corrosion, low friction, and excellent wear characteristics are desired.

Rod Seal
The carboxilated nitrile with Teflon® 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
The **piston rod** is machined from 303 stainless steel and is turned, ground, polished, and has a chrome plated surface. This surface provides maximum life for both the rod bushing and the seals.

Bushing Retainer
The **bushing retainer** is machined from highly corrosion resistant 304 stainless steel bar stock. Additionally, it is a full-face design. This is to minimize corners and crevices. It enables the cylinder to perform in food grade applications.

Tie Rods
The **tie rods** are drawn and ground 303 high strength stainless steel. The tie rod threads are rolled for superior strength and engagement. Furthermore, the tie rods are secured with 304 stainless steel acorn nuts. This eliminates exposed threads. Again, enabling the S Series cylinder to perform in food grade application.

Piston Seal
The **piston seal** is a carboxilated nitrile with Teflon® compound for self-lubrication. The "T" seal 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.

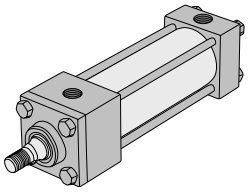
Teflon® is a registered trademark of DuPont™.

Standard Specifications:
- Meets NFPA specifications
- Bore sizes from 1-1/2" through 8"
- Piston rod diameters from 5/8" to 1-3/4"
- Nominal pressure rating is 150 psi air
- Standard temperature -10°F to 165°F (-23°C to 74°C)
- All stainless steel construction, except piston (aluminum)
- NPTF ports
- Flexible port and cushion location

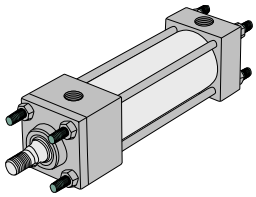
Standard S Series Mounts

Centerline Mounts

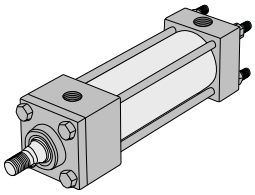
X0 Mount
Basic No Mount



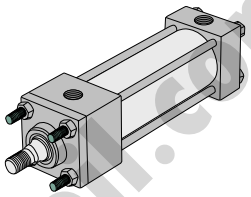
X1 Mount
Extended Tie Rods – Both Ends



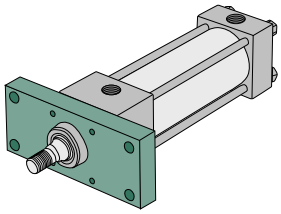
X2 Mount
Extended Tie Rods – Cap End



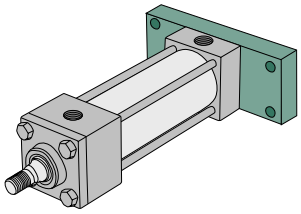
X3 Mount
Extended Tie Rods – Head End



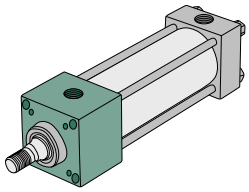
F1 Mount
Head Rectangular Flange



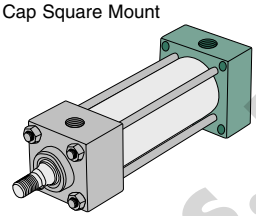
F2 Mount
Cap Rectangular Flange



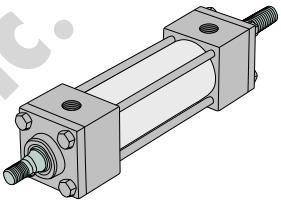
E3 Mount
Head Square Mount



E4 Mount
Cap Square Mount

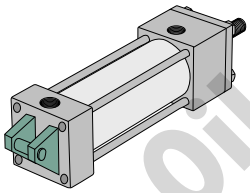


DA Mount
Double Rod End

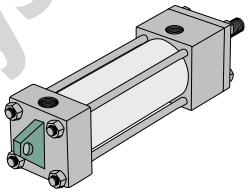


Pivot Mounts

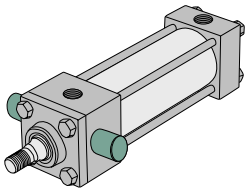
P1 Mount
Fixed Clevis



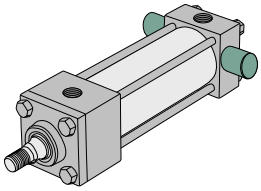
P3 Mount
Fixed Eye



T1 Mount
Head Trunnion

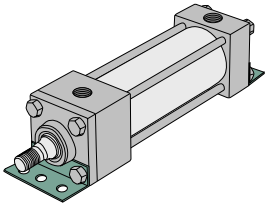


T2 Mount
Cap Trunnion

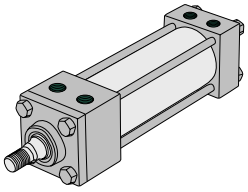


Foot Mounts

S1 Mount
Angle Mount



S4 Mount
Bottom Tapped



S Series **Cylinder** - How to Order

P1 S K - 04 A 1 D - D AA 0

Mount
E3* = Head Square Mount
E4* = Cap Square Mount
F1** = Front Flange
F2** = Rear Flange
P1 = Fixed Clevis
S1 = Angle Mount
S4 = Bottom Tapped
T1 = Head Trunnion
T2 = Cap Trunnion
X0 = Basic No Mount
X1 = Extended Tie Rods (Both Ends)
X2 = Extended Tie Rod (Cap Only)
X3 = Extended Tie Rod (Head Only)
* Only for 8" bore.
** Only for 1-1/2" - 6" Bores.

Type
S = S Series - Stainless Steel NFPA Interchageable

Bore
K = 1-1/2"
L = 2"
M = 2-1/2"
P = 3-1/4"
R = 4"
T = 5"
U = 6"
W = 8"
Consult factory for larger bore sizes.

Full Inches of Stroke
00 = 0" Stroke
01 = 1" Stroke
02 = 2" Stroke
03 = 3" Stroke
99 = 99" Stroke

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 = Reed Magnet

Options
AA = No Options
AP = Anodized Piston
BA** = Bumpers (Both Ends)
BC** = Bumper Cap End Only
BH** = Bumper Head End Only
DA = Double Rod End
EB = Silencer Bumpers
FG = Food Grade Grease (Krytox® see bottom of page for detailed information)
GA = High Temperature Rod Boot
KA* = Stroke Adjuster
LB = Low Breakaway Seals
MA = Metallic Rod Scraper
PA = Polypak Rod Seal
RB = Rod Boot
SP = Stainless Steel Piston
VA = Viton Seals
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).

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

Port

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 Codes
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

Rod Diameter By Bore Size

BORE	STANDARD DIAMETER	OVERSIZED DIAMETER
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
8”	1.375	1.750

Rod End Styles, Diameters and Threads

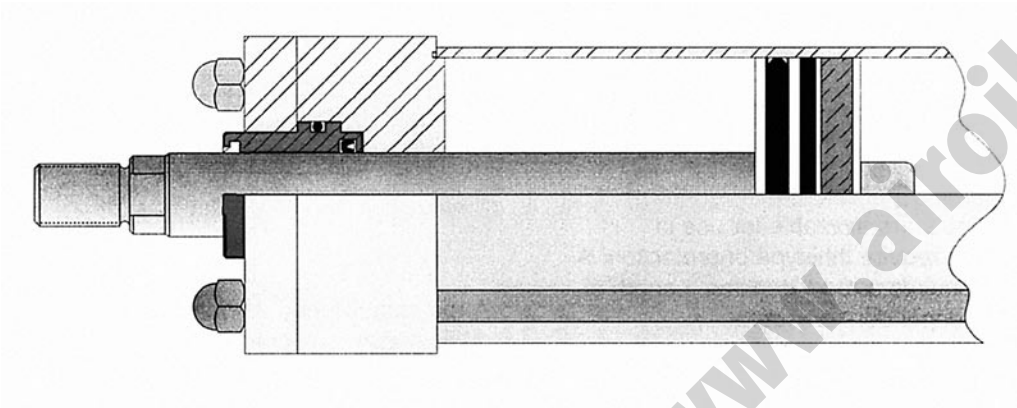
DIAMETER	STYLE #1 STANDARD MALE	STYLE #2 STANDARD FEMALE	STYLE #3 OPTIONAL FEMALE
0.625	7/16-20	1/2-20	7/16-20
1.000	3/4-16	7/8-14	3/4-16
1.375	1-14	1 1/4-12	1-14
1.750	1 1/4-12	1 1/2-12	1 1/4-12

Krytox® food grade greases deliver superior performance with a wide range of temperatures (-58°F – 600° F). Krytox® food grade greases are recommended for use in the food and packaging equipment where an H-1 rated lubricant is required. Krytox® food grade greases are nonflammable, will not carbonize, form gummy deposits, or evaporate. None of these products are intended to be used as direct food additives.

Loading and Cushioning

Load Support System

Side load and misalignment are major factors that can cause premature failure of the rod bushing and piston, the two load bearing points on a cylinder.



Rod Bushing

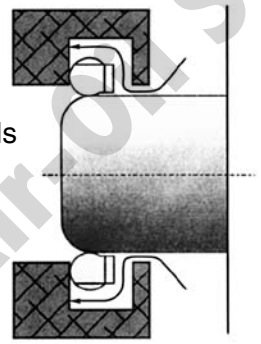
The S Series includes a cutting edge PolyLube™ composite rod bushing that is extra long in length. The composite rod bushing is specifically designed for applications where corrosion, low friction, and excellent wear characteristics are desired.

Wear Band

We separated the load bearing points by locating the wear band at the rear of the piston assembly, to give maximum support even at full extension. The wear band is a stable lubricating strip placed on the rear of the piston. Its width and placement serve to locate piston load at the optimum point. The wear band material has high compression integrity even under heavy loads.

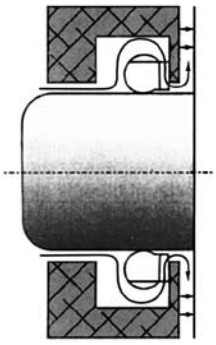
Cushion Operating Principles

Seals



Into Cushion

Our cushion seals have a built-in check function. It seals in one direction and permits full-flow in the opposite direction.



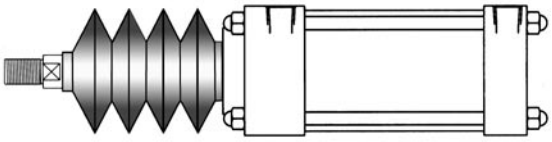
Flows

Out of Cushion

PolyLube™ is a registered trademark of Polygon Company.
For detailed information regarding the properties of PolyLube™, please call 1-800-918-9261.

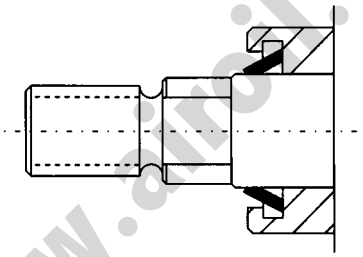
Optional Features

Rod Boots
RB option-Consult factory
for additional details



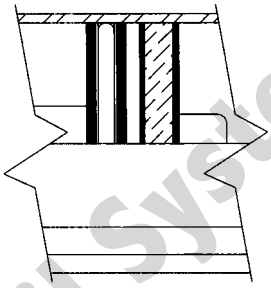
Protective rod boots are available for use in environments that require this type of protection. A Rod Boot also requires a rod extension. Length of rod extension is dependent on stroke. Consult factory for details.

Metallic Rod Scraper
MA option



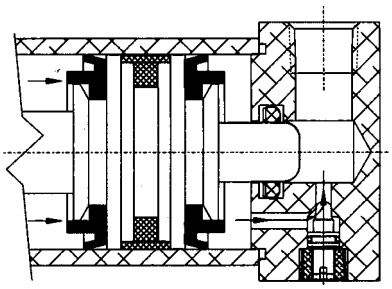
A rod scraper may be necessary when the cylinder must endure paint overspray, weld splatter or flyash.

Stainless Steel or Anodized Piston
SP option AP option



A stainless steel piston is available as well as an anodized piston.

Silencer Bumper Seal
EB option

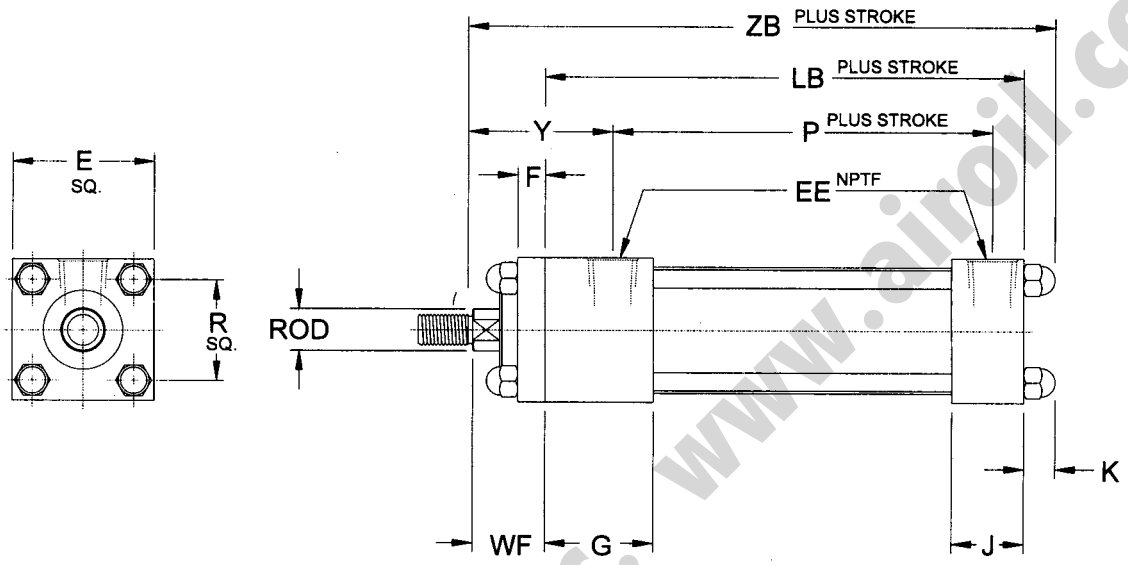


Silencer bumper seal available on cylinders up to 5" bore. Additionally, note that it requires a minimum of 100 psi for the rod to reach the full end of stroke with the EB option.

Special Cylinders
Special cylinders can be designed upon request. Please consult factory for any of your cylinder needs.

Basic Cylinder No Mount

Mount Code X0



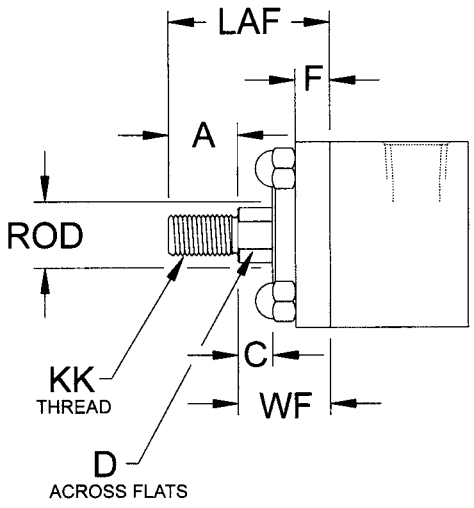
NFPA MX0

Dimensions

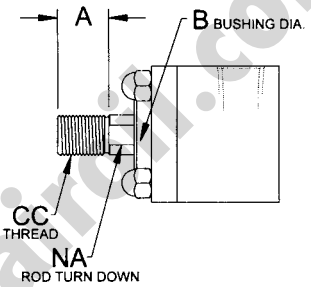
BORE	ROD	E	EE	F	G	J	K	LB	P	R	RD	WF	Y	ZB
1-1/2”	0.625	2.000	0.375	0.375	1.500	1.000	0.375	3.625	2.313	1.430	1.375	1.000	1.938	5.000
	1.000	2.000	0.250	0.375	1.500	1.000	0.375	3.625	2.103	1.430	2.000	1.375	2.460	5.375
2”	0.625	2.500	0.375	0.375	1.500	1.000	0.438	3.625	2.250	1.840	1.375	1.000	1.938	5.063
	1.000	2.500	0.375	0.375	1.500	1.000	0.438	3.625	2.250	1.840	2.500	1.375	2.313	5.438
2-1/2”	.625	3.000	0.375	0.375	1.500	1.000	0.438	3.750	2.375	2.190	1.375	1.000	1.938	5.188
	1.000	3.000	0.375	0.375	1.500	1.000	0.438	3.750	2.375	2.190	3.000	1.375	2.313	5.563
3-1/4”	1.000	3.750	0.500	0.625	1.750	1.250	0.500	4.250	2.625	2.760	2.706	1.375	2.438	6.125
	1.375	3.750	0.500	0.625	1.750	1.250	0.500	4.250	2.625	2.760	3.125	1.625	2.688	6.375
4”	1.000	4.500	0.500	0.625	1.750	1.250	0.500	4.250	2.625	3.320	2.706	1.375	2.438	6.125
	1.375	4.500	0.500	0.625	1.750	1.250	0.500	4.250	2.625	3.320	3.125	1.625	2.688	6.375
5”	1.000	5.500	0.500	0.625	1.750	1.250	0.563	4.500	2.875	4.100	2.706	1.375	2.438	6.438
	1.375	5.500	0.500	0.625	1.750	1.250	0.563	4.500	2.875	4.100	3.125	1.625	2.688	6.688
6”	1.375	6.500	0.750	0.625	2.000	1.500	0.563	5.000	3.125	4.880	3.125	1.625	2.813	7.188
	1.750	6.500	0.750	0.750	2.000	1.500	0.563	5.000	3.125	4.880	3.788	1.875	3.063	7.438
8”	1.375	8.500	0.750	0.625	2.000	1.500	1.000	5.125	3.250	6.440	3.125	1.625	2.813	7.750
	1.750	8.500	0.750	0.750	2.000	1.500	1.000	5.125	3.250	6.440	3.788	1.875	3.063	8.000

Rod Ends
Standard and Optional

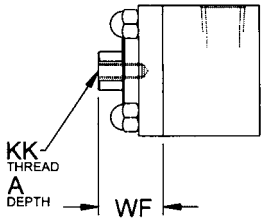
Style #1 (Standard Male)



Style #2 (Optional Male)



Style #3 (Optional Female)

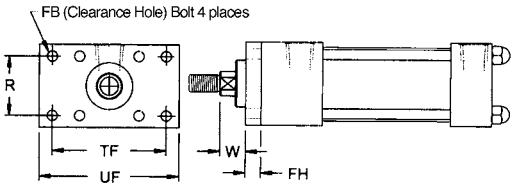


Dimensions

BORE	ROD	KK(1)	CC(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	1.400	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	3.230	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
8”	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

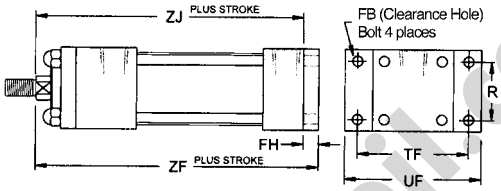
Flange Mounts

Mount Code F1 - Head Rectangular Flange



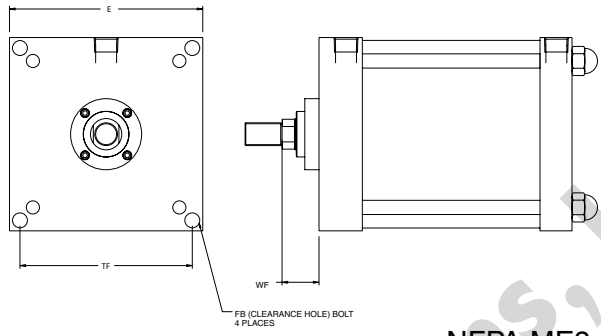
NFPA MF1

Mount Code F2 - Cap Rectangular Flange



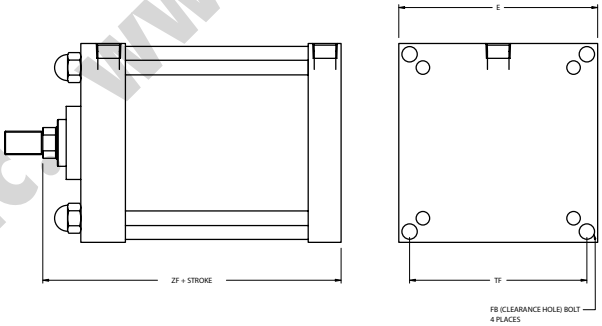
NFPA MF2

Mount Code E3 (8" Bore Only) - Head Square Mount



NFPA ME3

Mount Code E4 (8" Bore Only) - Cap Square Mount



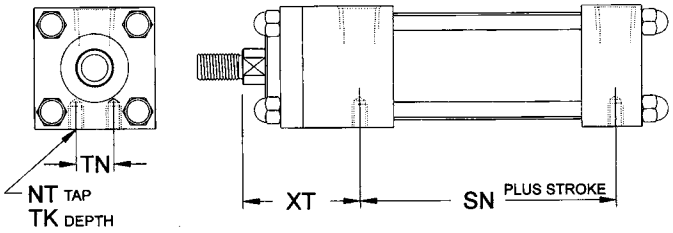
NFPA ME4

Dimensions

BORE	ROD	FB	FH	R	TF	UF	W	ZJ	ZF
1-1/2”	0.625	0.250	0.375	1.430	2.750	3.375	0.625	4.625	5.000
	1.000	0.250	0.375	1.430	2.750	3.375	1.000	5.000	5.375
2”	0.625	0.313	0.375	1.840	3.375	4.125	0.625	4.625	5.000
	1.000	0.313	0.375	1.840	3.375	4.125	1.000	5.000	5.375
2-1/2”	0.625	0.313	0.375	2.190	3.875	4.625	0.625	4.750	5.125
	1.000	0.313	0.375	2.190	3.875	4.625	1.000	5.125	5.500
3-1/4”	1.000	0.375	0.625	2.760	4.688	5.500	0.750	5.625	6.250
	1.375	0.375	0.625	2.760	4.688	5.500	1.000	5.875	6.500
4”	1.000	0.375	0.625	3.320	5.438	6.250	0.750	5.625	6.250
	1.375	0.375	0.625	3.320	5.438	6.250	1.000	5.875	6.500
5”	1.000	0.500	0.625	4.100	6.625	7.625	0.750	5.875	6.500
	1.375	0.500	0.625	4.100	6.625	7.625	1.000	6.125	6.750
6”	1.375	0.500	0.750	4.875	7.625	8.625	0.875	6.625	7.375
	1.750	0.500	0.750	4.875	7.625	8.625	1.125	6.875	7.625
8”	1.375	0.625	N/A	N/A	7.578	N/A	1.625	N/A	6.750
	1.750	0.625	N/A	N/A	7.578	N/A	1.875	N/A	7.000

Bottom Tap and Clevis Mount

Mount Code S4 -
Bottom Tapped Mount

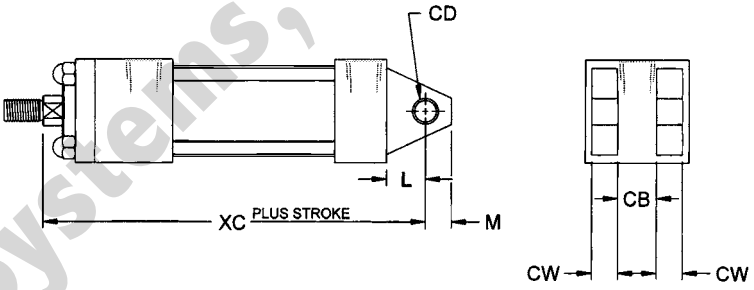


NFPA MS4

Dimensions

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
8"	1.375	3/4-10	1.125	4.500	3.250	2.813
	1.750	3/4-10	1.125	4.500	3.250	3.063

Mount Code P1 -
Fixed Clevis Mount



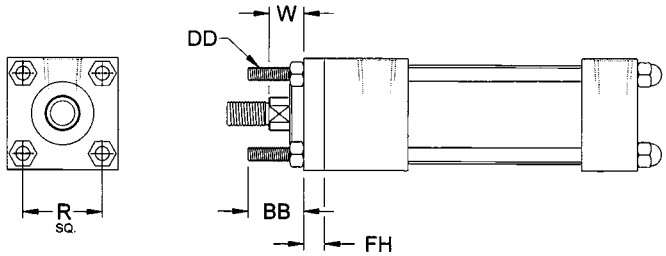
NFPA MP1

Dimensions

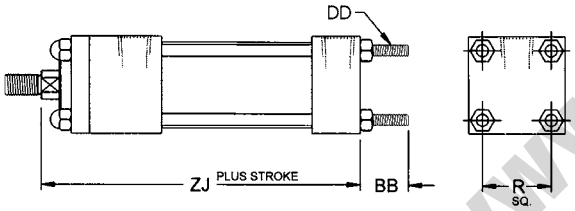
BORE	ROD	CB	CD	CW	L	M	XC
1-1/2"	0.625	0.750	0.500	0.500	0.750	0.500	5.375
	1.000	0.750	0.500	0.500	0.750	0.500	5.750
2"	0.625	0.750	0.500	0.500	0.750	0.500	5.375
	1.000	0.750	0.500	0.500	0.750	0.500	5.750
2-1/2"	0.625	0.750	0.500	0.500	0.750	0.500	5.500
	1.000	0.750	0.500	0.500	0.750	0.500	5.875
3-1/4"	1.000	1.250	0.750	0.625	1.250	0.750	6.875
	1.375	1.250	0.750	0.625	1.250	0.750	7.125
4"	1.000	1.250	0.750	0.625	1.250	0.750	6.875
	1.375	1.250	0.750	0.625	1.250	0.750	7.125
5"	1.000	1.250	0.750	0.625	1.250	0.750	7.125
	1.375	1.250	0.750	0.625	1.250	0.750	7.375
6"	1.375	1.500	1.000	0.750	1.500	1.000	8.125
	1.750	1.500	1.000	0.750	1.500	1.000	8.375
8"	1.375	1.500	1.000	0.750	1.500	1.000	8.250
	1.750	1.500	1.000	0.750	1.500	1.000	8.500

Extended Tie Rod Mounts

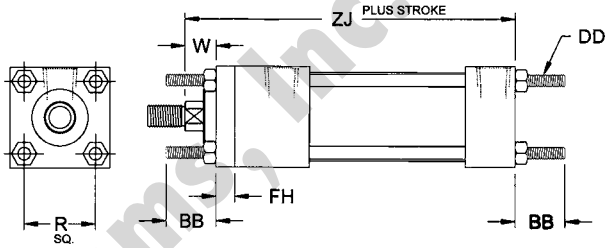
Mount Code X3 - Extended Tie Rods - Head End — NFPA MX3



Mount Code X2 - Extended Tie Rods - Cap End — NFPA MX2



Mount Code X1 - Extended Tie Rods - Both Ends — NFPA MX1



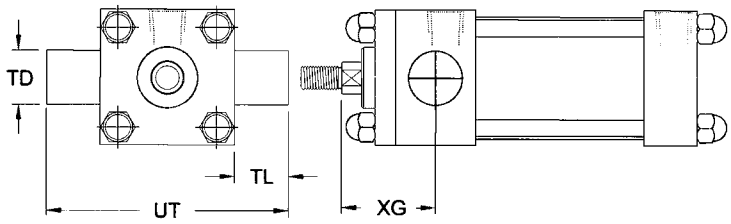
Dimensions

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
8”	1.375	2.313	5/8-18	N/A	6.440	1.625	6.750
	1.750	2.313	5/8-18	N/A	6.440	1.875	7.000

Trunnion Mounts

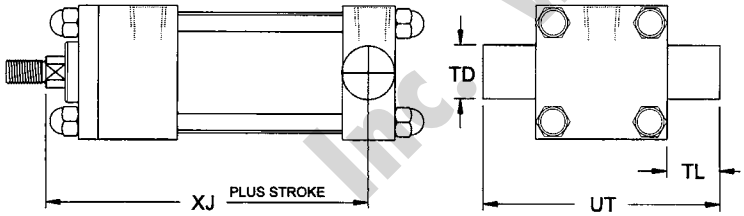
Mount Code T1 - Head Trunnion Mount

NFPA MT1



Mount Code T2 - Cap Trunnion Mount

NFPA MT2



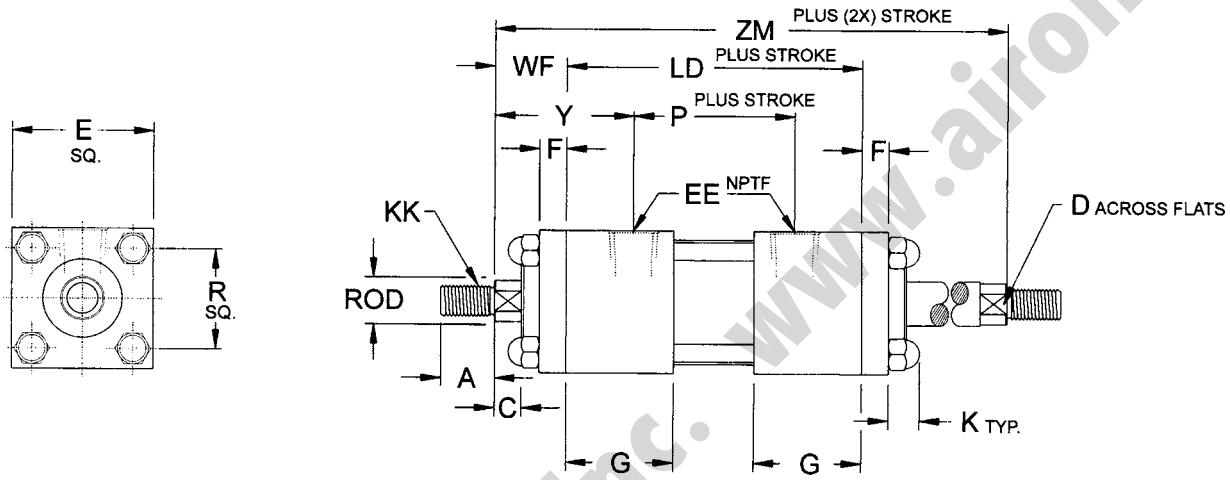
Dimensions

BORE	ROD	TD	TL	UT	XG	XJ
1-1/2”	0.625	1.000	1.000	4.000	1.750	4.125
	1.000	1.000	1.000	4.000	2.125	4.500
2”	0.625	1.000	1.000	4.500	1.750	4.125
	1.000	1.000	1.000	4.500	2.125	4.500
2-1/2”	0.625	1.000	1.000	5.000	1.750	4.250
	1.000	1.000	1.000	5.000	2.125	4.625
3-1/4”	1.000	1.000	1.000	5.750	2.250	5.000
	1.375	1.000	1.000	5.750	2.500	5.250
4”	1.000	1.000	1.000	6.500	2.250	5.000
	1.375	1.000	1.000	6.500	2.500	5.250
5”	1.000	1.000	1.000	7.500	2.250	5.250
	1.375	1.000	1.000	7.500	2.500	5.500
6”	1.375	1.375	1.375	9.250	2.625	5.875
	1.750	1.375	1.375	9.250	2.875	6.125
8”	1.375	1.375	1.375	11.250	2.625	6.000
	1.750	1.375	1.375	11.250	2.875	6.250

Double Rod End Cylinders

This configuration has a piston rod which extends out both ends of the cylinder. It is also called a through rod cylinder.

DA Option

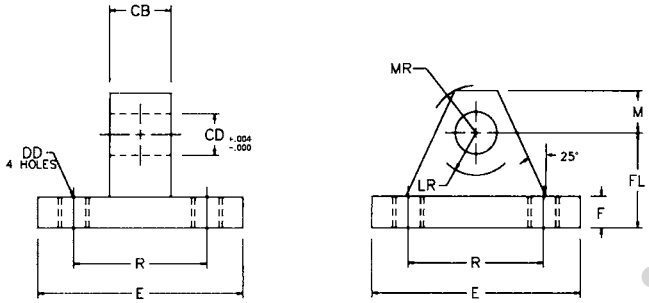


Dimensions

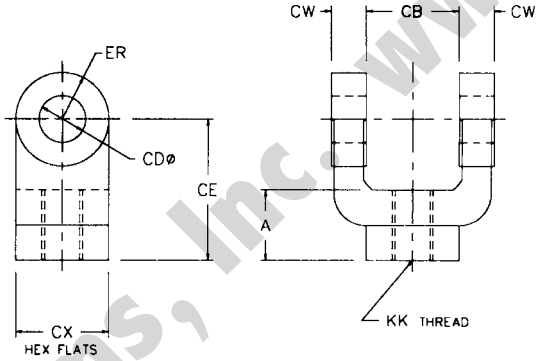
BORE	ROD	A	C	D	E	EE	F	G	K	KK	LD	P	R	SN	SS	RD	WF	Y	ZM
1-1/2”	0.625	0.750	0.375	0.500	2.000	0.375	0.375	1.500	0.375	7/16-20	4.125	2.250	1.430	2.250	3.375	1.375	1.000	1.938	6.125
	1.000	1.125	0.500	0.813	2.000	0.250	0.375	1.500	0.375	3/4-16	4.125	1.955	1.430	2.250	3.375	2.000	1.375	2.460	6.875
2”	0.625	0.750	0.375	0.500	2.500	0.375	0.375	1.500	0.438	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	0.438	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	0.438	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	0.438	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	0.500	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	0.500	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	0.500	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	0.500	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	0.563	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	0.563	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	0.563	1-14	5.500	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	0.563	1 1/4-12	5.500	3.125	4.880	3.125	4.125	3.788	1.875	3.063	9.250
8”	1.375	1.625	0.625	1.125	8.500	0.750	.0.625	2.000	1.000	1-14	5.625	3.250	6.440	3.250	4.250	3.125	1.625	2.813	8.875
	1.750	2.000	0.750	1.500	8.500	0.750	0.750	2.000	1.000	1 1/4-12	5.625	3.250	6.440	3.250	4.250	3.788	1.875	3.063	9.375

Accessories - Stainless Steel

Eye Bracket



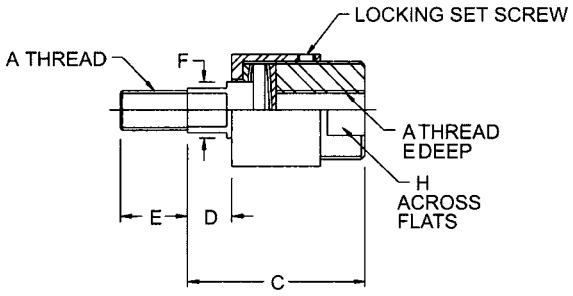
Rod Clevis

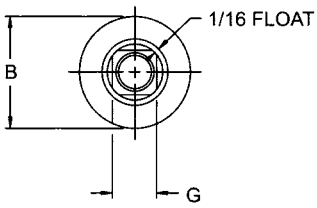


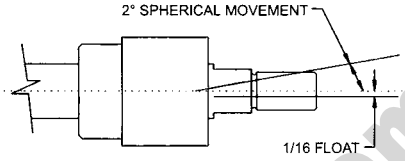
Dimensions

PART NO.	A	CA	CB	CD	CE	CW	CX	DD	E	ER	F	FL	KK	LR	M	MR	R
Eye Bracket																	
S500-101	-	-	0.750	0.500	-	-	-	0.406	2.500	-	0.375	1.125	-	0.750	0.500	0.563	1.630
S500-102	-	-	1.250	0.750	-	-	-	0.531	3.500	-	0.625	1.875	-	1.250	0.750	0.875	2.560
S500-103	-	-	1.500	1.000	-	-	-	0.656	4.500	-	0.750	2.250	-	1.500	1.000	1.250	3.250
S500-104	-	-	2.000	1.375	-	-	-	0.656	5.000	-	0.875	3.000	-	2.125	1.375	1.625	3.810
S500-105	-	-	2.500	1.750	-	-	-	0.906	6.500	-	0.875	3.125	-	2.250	1.750	2.125	4.950
Rod Clevis																	
S500-301	0.750	-	0.750	0.500	1.500	0.500	1.000	-	-	0.500	-	-	7/16-20	-	-	-	-
S500-302	0.750	-	0.750	0.500	1.500	0.500	1.000	-	-	0.500	-	-	1/2-20	-	-	-	-
S500-303	1.125	-	1.250	0.750	2.375	0.625	1.250	-	-	0.750	-	-	3/4-16	-	-	-	-
S500-304	1.625	-	1.500	1.000	3.125	0.750	1.500	-	-	1.000	-	-	7/8-14	-	-	-	-
S500-305	1.625	-	1.500	1.000	3.125	0.750	1.500	-	-	1.000	-	-	1-14	-	-	-	-
S500-306	2.000	-	2.000	1.375	4.125	1.000	2.000	-	-	1.375	-	-	1 1/4-12	-	-	-	-
S500-307	2.250	-	2.500	1.750	4.500	1.250	2.375	-	-	1.750	-	-	1 1/2-12	-	-	-	-

Rod Couplers







Standard Couplers

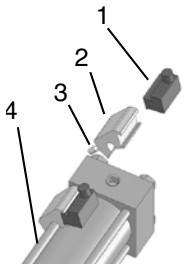
PART NUMBER		A	B	C	D	E	F	G	H	MAXIMUM PULL LOAD
STANDARD	NICKEL									
A500-603	B500-603	7/16-20	1 1/4	2	1/2	3/4	5/8	1/2	1	2,535
A500-604	B500-604	1/2-20	1 1/4	2	1/2	3/4	5/8	1/2	1	3,500
A500-605	B500-605	5/8-18	1 1/4	2	1/2	3/4	5/8	1/2	1	4,750
A500-606	B500-606	3/4-16	1 3/4	2 5/16	1/2	1 1/8	31/32	13/16	1 1/2	8,750
A500-607	B500-607	7/8-14	1 3/4	2 5/16	1/2	1 1/8	31/32	13/16	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 5/32	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 5/32	2 1/4	19,600
N35-1001	N35-1004	1 1/2-12	3 1/4	4 3/8	13/16	2 1/4	1 3/4	1 1/2	3	34,000

S Series Switch Information

S Series World Switch Application Detail

Round Tube and Tie Rod Detail

1. World Switch
2. Tie Rod Bracket
3. Adjustment Screw
4. Cylinder Tie Rod



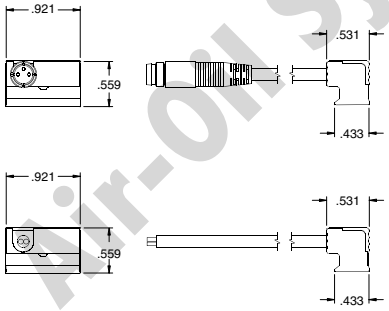
S Series World Switch Bracket

Cylinders	Bore	Part Number
S series Tie Rod	1 1/2”	SB6-K01
S series Tie Rod	2”-2 1/2”	SB6-L01
S series Tie Rod	3 1/4”-4”	SB6-P01
S series Tie Rod	5»-6»	SB6-T01
S series Tie Rod	8»	SB6-W01

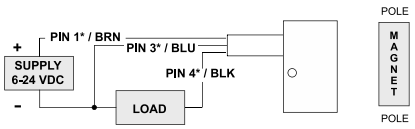
S series World Switch Hall Effect Part Numbers

P/N	Switch Style	Switch Type	Function	Switching Voltage	Switching Current	Switching Power	Voltage Drop
SH6-031	3m Wire Version	Hall Effect for Reed Magnet & Light Sourcing	Normally Open Sourcing (PNP)	6 -24 VDC	0.3 Amps Max.	7.2 Watts Max.	0.5 Volts
SH6-021	8m Connector Pigtail	Hall Effect for Reed Magnet & Light Sourcing	Normally Open Sourcing (PNP)	6 -24 VDC	0.3 Amps Max.	7.2 Watts Max.	0.5 Volts
SH6-032	3m Wire Version	Hall Effect for Reed Magnet & Light Sourcing	Normally Open Sourcing (NPN)	6 -24 VDC	0.3 Amps Max.	7.2 Watts Max.	0.5 Volts
SH6-022	8m Connector Pigtail	Hall Effect for Reed Magnet & Light Sourcing	Normally Open Sourcing (NPN)	6 -24 VDC	0.3 Amps Max.	7.2 Watts Max.	0.5 Volts

Hall Effect Switch

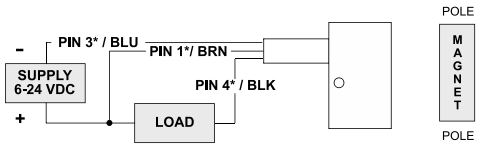


PNP Sourcing



* Pin out for 8 mm connector version

NPN Sinking

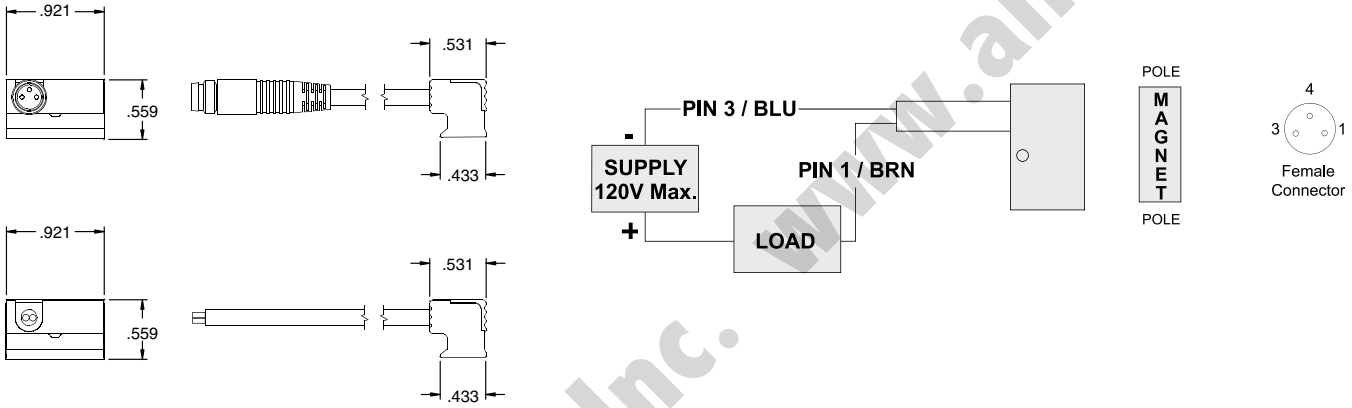


* Pin out for 8 mm connector version

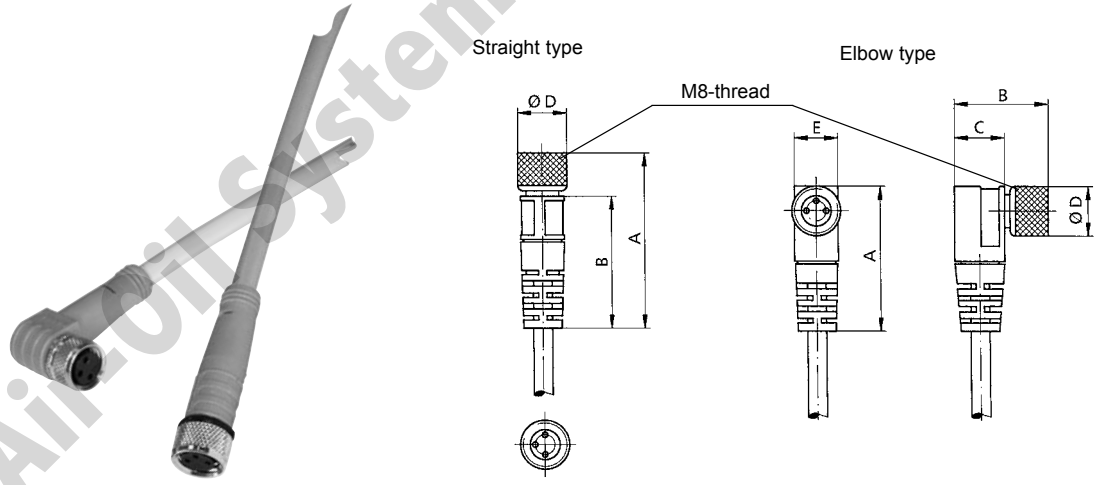
S Series World Switch Reed Switch Part Numbers

P/N	Switch Style	Switch Type	Function	Switching Voltage	Switching Current	Switching Power	Voltage Drop
SR6-002	3m Wire Version	Reed Switch, LED	SPST Normally Open	5 -120V AC/DC	0.025 Amps Max. 0.001 Amps Min.	3 Watts Max.	3.5 Volts
SR6-004	3m Wire Version	Reed Switch, LED & MOV	SPST Normally Open	5 -120V AC/DC	0.5 Amps Max. 0.005 Amps Min.	10 Watts Max.	3.0 Volts
SR6-021	8mm Pigtail	Reed Switch	SPST Normally Open	0 -120V AC/DC	0.5 Amps Max.	10 Watts Max.	0 Volts
SR6-022	8mm Pigtail	Reed Switch, LED	SPST Normally Open	5 -120V AC/DC	0.025 Amps Max. 0.001 Amps Min.	3 Watts Max.	3.5 Volts
SR6-024	8mm Pigtail	Reed Switch, LED & MOV	SPST Normally Open	5 -120V AC/DC	0.5 Amps Max. 0.005 Amps Min.	10 Watts Max.	3.0 Volts

Reed Switch - Normally Open Type SR6



Cords M8-thread for Switches and Sensors with Connector



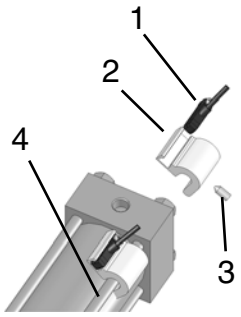
Dimensions (mm)

Type		A	B	C	D	E	Weight (approx. kg)	Order Code
Straight with 5m-cable	(3x0.25 mm^2)	32.3	24.4	–	9.0	–	0.143	SC6-001
Elbow with 5m-cable	(3x0.25 mm^2)	26.3	17.1	9.2	9.0	8.0	0.145	SC6-002

S Series Global application Detail

Round Tube and Tie Rod Detail

1. Global Switch
2. Tie Rod Bracket
3. Adjustment Screw
4. Cylinder Tie Rod

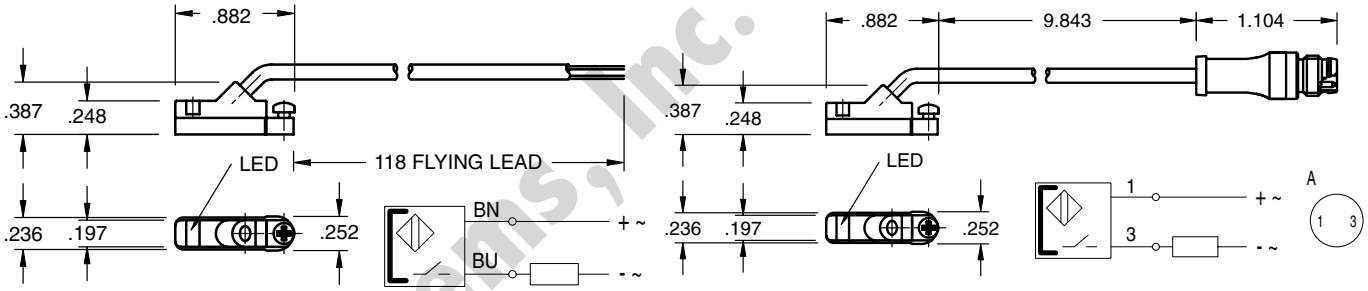


S Series Global Switch Bracket

Cylinders	Bore	Part Number
S series Tie Rod	1 1/2"-2 1/2"	N199-1017
S series Tie Rod	3 1/4»-4»	N199-1018
S series Tie Rod	5»-8»	N199-1019

S Series Global Switches

Reed Switch (AC/DC NO), flying lead - RSS02, 8mm connector - RSQ02



Sensing Data

Ambient temperature range T_a	(°F/°C)	-4 to 176 (-20 to 80)
Frequency of operating cycles f at U_e	(kHz)	0.5
Turn on time t	(ms)	<= 0.25
turn off time t	(ms)	0.03
LED function indication		yes

Electrical Data

Rated operational voltage U_e	(V)	3...130 AC/DC
Supply voltage U_B	(V)	3...130 AC/DC
Voltage drop U_d at I_e Stat./dyn.	(V)	3.5
Rated insulation volatage U_i	(V)	2750 DC (EN 60335-1)
Rated supply frequency	(Hz)	AC/DC
Rated operational current I_e	(mA)	50 (10W max.)
No-load supply current I_o at U_e d./und.	(mA)	0

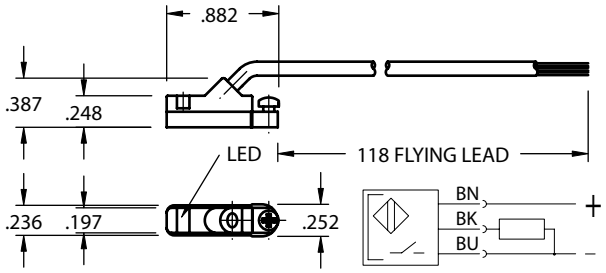
Observe polarity for correct LED function

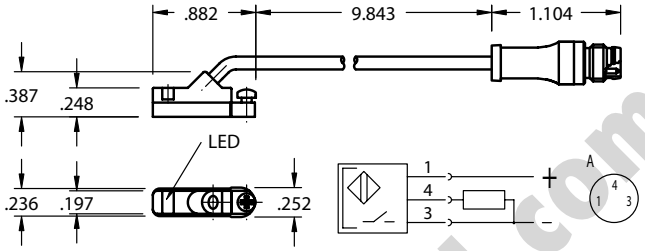
Mechanical Data

Housing material		Polyamide
Material of sensing face		Polyamide
Connection		PVC cable
Degree of Protection	IP	67

Rated shock: half-sinus, 50g, 11 ms
Rated vibration environment: 10g, 10...2000 Hz. 90 min

Electronic Switch (PNP NO), flying lead - HPNPS31, 8mm connector - HPNPQ31





Sensing Data

Ambient temperature range $_d$	(°F/°C)	-13 to +158 (-25 to +70)
Temperature drift	(% of)	<= 0.3%/°C
Frequency of operating cycles f at U_e	(kHz)	10
Turn on time t	(ms)	.05
turn off time t	(ms)	.05
Utilization categories		DC13
Function–/supply voltage indication		YES

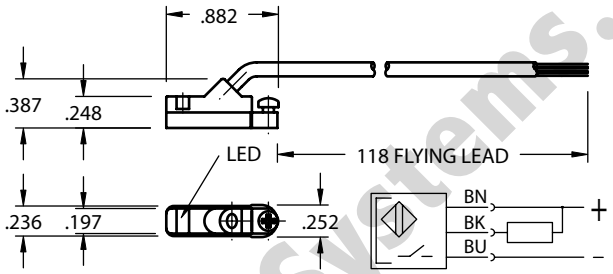
Mechanical Data

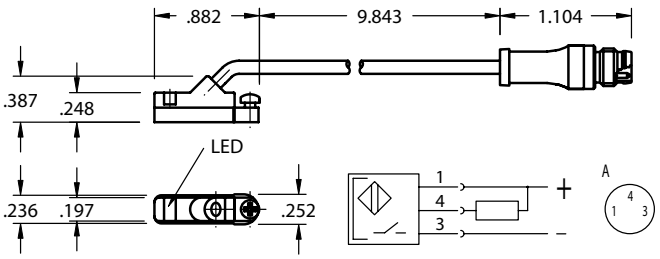
Housing material		Polyamide
Material of sensing face		Polyamide
Connection		PVC cable
Degree of Protection	IP	67
Rated shock: half-sinus, 30 g, 11 ms		
Rated vibration environment: 55 Hz, 1mm amplitude, 3 x 30		

Electrical Data

Rated operational voltage U_e	(V)	24 DC
Supply voltage U_B	(V)	10...30 DC
incl. ripple	(% of U_e)	15
Voltage drop U_d at I_e Stat./dyn.	(V)	1/–
Rated insulation volatage U_i	(V)	75 AC
Rated supply frequency	(Hz)	DC
Rated operational current I_e	(mA)	200
No-load supply current I_o at U_e d./und.	(mA)	25/13
Protected against polarity reversal		YES

Electronic Switch (NPN NO), flying lead - HNPNS32, 8mm connector - HNPNQ32





Sensing Data

Ambient temperature range $_d$	(°F/°C)	-13 to +158 (-25 to +70)
Temperature drift	(% of S_r)	<= 0.3%/°C
Frequency of operating cycles f at U_e	(kHz)	10
Turn on time t	(ms)	.05
turn off time t	(ms)	.05
Utilization categories		DC13
Function–/supply voltage indication		YES

Mechanical Data

Housing material		Polyamide
Material of sensing face		Polyamide
Connection		PVC cable
Degree of Protection	IP	67
Rated shock: half-sinus, 30 g, 11 ms		
Rated vibration environment: 55 Hz, 1mm amplitude, 3 x 30		

Electrical Data

Rated operational voltage U_e	(V)	24 DC
Supply voltage U_B	(V)	10...30 DC
incl. ripple	(% of U_e)	15
Voltage drop U_d at I_e Stat./dyn.	(V)	1/–
Rated insulation volatage U_i	(V)	75 AC
Rated supply frequency	(Hz)	DC
Rated operational current I_e	(mA)	200
No-load supply current I_o at U_e d./und.	(mA)	25/13
Protected against polarity reversal		YES

How to Order - S Series **Piston Rod Assembly**

S92 - K 1 N 0 - 01 A - AA

Type
S92 = S Series Piston Rod Assembly

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

Rod Code
1 = Style #1 Standard Rod Diameter
2 = Style #2 Standard Rod Diameter
3 = Style #3 Standard Rod Diameter
4 = Special Rod End Standard Rod Diameter (Must Specify Threads)
5 = Special Rod End Oversize Rod Diameter (Must Specify Threads)
6 = Style #1 Oversize Rod Diameter
7 = Style #2 Oversize Rod Diameter
8 = Style #3 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

Option
AA = No Option
AP = Anodized Piston
BC = Bumpered Cap End
BH = Bumpered Head End
DA = Double Rod
EB = Silencer Bumpers
FA = No Wrench Flats, No Turn Down
FB = Four Wrench Flats
GA = High Temp Rod Boot
KA = Stroke Adjust
LB = Low Breakaway
RB = Rod Boot
RA = Save Air Stroke Adjuster
SP = Stainless Piston
VA = Viton 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

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
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.
* = must specify length

Rod Diameter by Bore Size

Bore	Standard Diameter	Oversized Diameter
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
8”	1.375	1.750

Rod End Styles, Diameters and Threads

Diameter	Style #1 Standard Male	Style #2 Standard Female	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

How to Order - S Series **Repair Kit**

S98 - K 1 N - AA

Type
S98 = S 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

Options
AA = No Option
DA = Double Rod
EB = Silencer Bumpers
GA = High Temperature Rod Boot
LB = Low Breakaway
MA = Metallic Rod Scraper
MB = Rear Metallic Rod Scraper
PA = Polypak Rod Seal
PB = Rear Polypak Rod Seal
PP = Polypak Piston Seals
RA = Save Air Stroke Adjust
VA = Viton 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 - S Series **Seal Kit**

S97 - K 1 N - AA

Type
S97 = S 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

Options
AA = No Option
DA = Double Rod
EB = Silencer Bumpers
GA = High Temperature Rod Boot
LB = Low Breakaway
MA = Metallic Rod Scraper
MB = Rear Metallic Rod Scraper
PA = Polypak Rod Seal
PB = Rear Polypak Rod Seal
PP = Polypak Piston Seals
RA = Save Air Stroke Adjust
VA = Viton 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 seal kit only.
Model number is set up to use option code supplied with original cylinder or with any above.

Piston Rod Assembly Kit Removal/Installation Instructions

1. Loosen 4 Acorn Nuts (Part #13) to remove Full Face Retainer (Part #11) and Piston/Rod Assembly (Part #19 & #20).
2. Carefully remove old seals and wearband (Part #15, #17, & #18). Any damage to the seal may result in leakage.
3. Lubricate piston seal(s) and Wearband (Part #15) with supplied Numatics' Lube. Examine seals before installing for any contamination. Contamination may cause leakage.
4. Install Piston Seal (Part #18). Make sure the piston seal is not twisted inside groove. Next install back-up rings (Part #17) if piston seal is a T-seal.
5. Install lubricated wearband onto piston. Sink piston/rod assembly into sinker tube. See Sinker Tube Part Numbers Chart.
6. Apply lube inside the cylinder tube.
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 seals after installing 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. Assemble cylinder. Carefully place loaded 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.
12. Place Full Face Retainer over bushing and loosely torque Acorn Nuts to allow head and cap to rotate slightly.
13. Before final torque, place cylinder on level surface to square head and cap. Torque Acorn Nuts in a crisscross pattern. Use the torque tolerance chart for Acorn Nuts.
14. 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 25 for additional (visual) instructions.

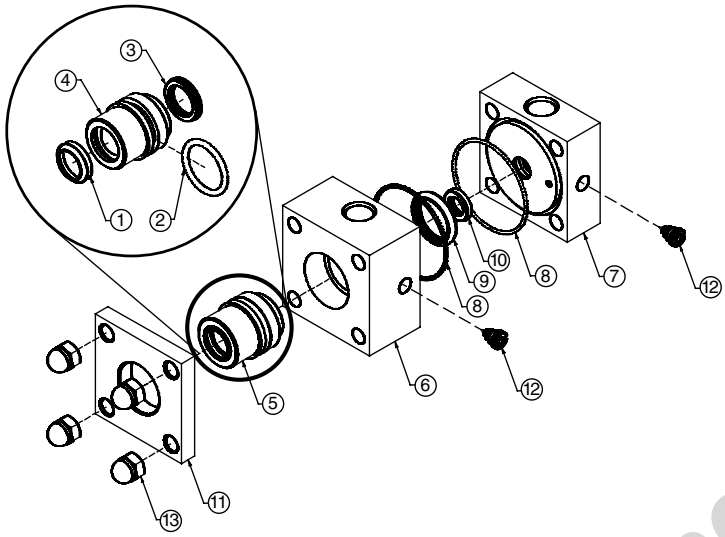
Repair and Seal Kit Removal/Installation Instructions

1. Loosen 4 Acorn Nuts (Part #13) to remove Full Face Retainer (Part #11), Loaded Bushing (Part # 5), and Piston/Rod Assembly (Part #19 & #20).
2. Carefully remove old seals and wearband (Part [#1, #2, #3 Seal Kit only], #8, #9, #10, #15, #17, & #18). Any damage to the seal grooves may result in leakage.
3. Lubricate new seals and Wearband (Part #15) with supplied Numatics' Lube. Examine seals before installing for any contamination. Contamination may cause leakage.
4. Install Piston Seal (Part #18). Make sure the piston seal is not twisted inside groove. Next install back-up rings (Part #17) if piston seal is a T-seal.
5. Install lubricated wearband onto piston. Sink piston/rod assembly into sinker tube. See Sinker Tube Part Numbers Chart.
6. Apply lube inside the cylinder tube.
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. Place Tube End Seals (Part #8) into head and cap seal grooves. Examine seals after installing for any contamination. Contamination may cause leakage.
10. 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.
11. Assemble cylinder. Carefully place loaded 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.
12. Place Full Face Retainer over bushing and loosely torque Acorn Nuts to allow head and cap to rotate slightly.
13. Before final torque, place cylinder on level surface to square head and cap. Torque Acorn Nuts in a crisscross pattern. Use the torque tolerance chart for Acorn Nuts.
14. 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 25 for additional (visual) instructions.

Diagrams

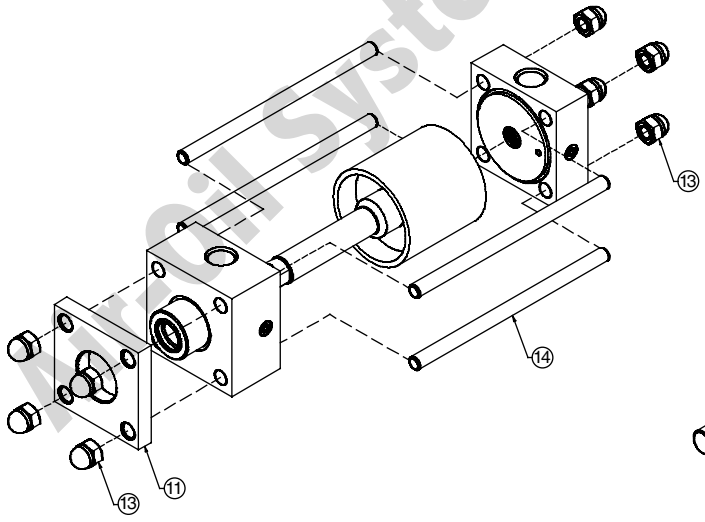
Pneumatic Service Temperatures:
Nitrile Seals: -10˚F (-23˚C) to 165˚F (74˚C)



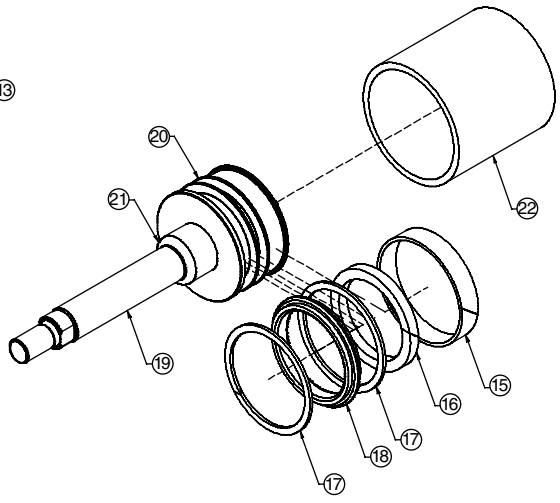
Head, Cap, and Bushing Assembly

S 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	Bushing			
5	Loaded Bushing Assembly		X	
6	Head			
7	Cap			
8	Tube End Seals	X	X	
9	Head Cushion Seal	X	X	
10	Cap Cushion Seal	X	X	
11	Bushing Retainer			
12	Cushion Needle			
13	Acorn Hex Nuts			
14	Tie Rods			
15	Wearband	X	X	
16	Magnet			X
17	Back-up Rings	X	X	
18	Piston Seal	X	X	
19	Rod			X
20	Piston			X
21	Head Cushion Spear			
22	Tube			X

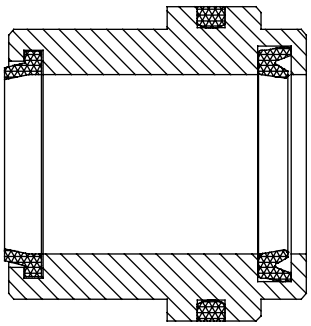


Cylinder Assembly and Tie Rod Torque

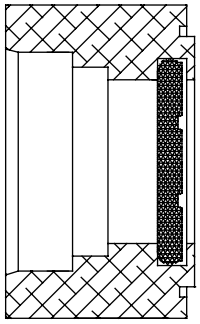


Piston/Rod Assembly

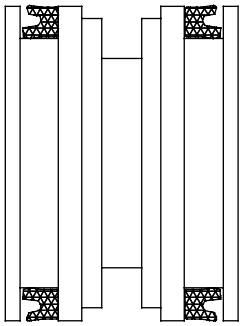
Seal Installation Guide



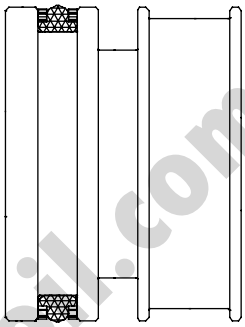
Loaded Bushing



Cushioned Head or Cap



Low Breakaway Piston



T-Seal Piston

Tie Rod Nut Torque Tolerances (lbs-ft) Part #13

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

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

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

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