

valves

**F** Series

*Non-Rotating NFPA Interchangeable Cylinder Line*



**numatics®**

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The **F Series** is a Non-Rotating NFPA Interchangeable pneumatic cylinder line that provides the solution to specific applications where piston rotation is not acceptable. Our innovative dual rod design provides precision positioning and linear movement. This makes the F Series ideal for a multitude of high-tech applications.

### 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. Additionally, profile tubing is standard on 1-1/2" through 2-1/2" bore sizes (3-1/4" and 4" bores are the tie rod construction).

### 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 F Series includes a graphite filled, cast iron **rod bushing** that is extra long in length. Graphite filling offers the best bearing surface when using a hard chrome plated 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 and Wiper

The unique **rod seal and wiper** combination is made with carboxylated nitrile with Teflon® compound and is self-lubricating and durable. The rounded lip design ensures proper sealing and long life.

### 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.

### Retaining Plate

The steel **retaining plate** has dual functions. It retains the bushing as well as inhibits rod rotation. Precise tolerances on both the bushing and the retaining plate allows for an exact fit which prevents rod rotation. By simply removing the four countersunk screws that maintain exact alignment, the orientation of the piston rod and tooling plate can be rotated 90° without cylinder disassembly.

### Tooling Plate

The **tooling plate** is machined from solid steel. The tooling plate is reversible, offering both a flush or concentric mount.

### Piston Seal

The **piston seal** is a carboxylated nitrile with Teflon® compound for self-lubricating. 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 4"
- Piston rod diameters from 5/16" to 3/4"
- Nominal pressure rating is 250 psi air
- Standard temperature -10°F to 165°F (-23°C to 74°C)
- All aluminum construction, except retaining plate and tooling plate (steel)
- NPTF ports
- Flexible port and cushion locations



## F Series Non-Rotating NFPA Interchangeable

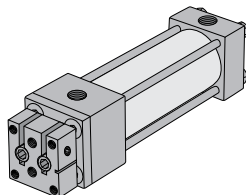
# numatics®

### Standard F Series Mounts

#### Centerline Mounts

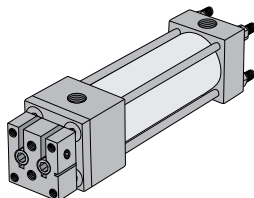
##### X0 Mount

Basic No Mount



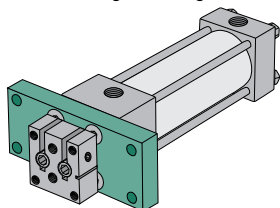
##### X2 Mount

Extended Tie Rods – Cap End



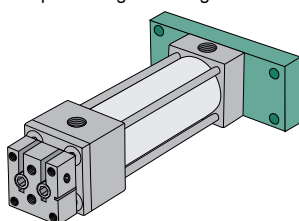
##### F1 Mount

Head Rectangular Flange



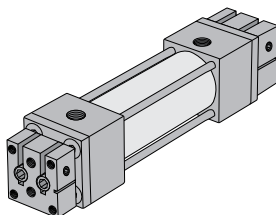
##### F2 Mount

Cap Rectangular Flange



##### DA Mount

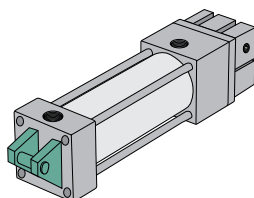
Double Rod End



#### Pivot Mounts

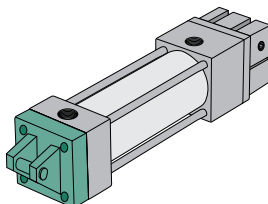
##### P1 Mount

Fixed Clevis



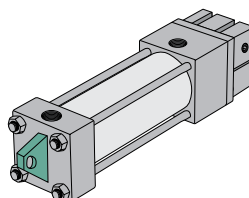
##### P2 Mount

Detachable Clevis



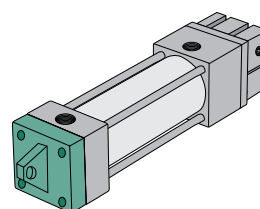
##### P3 Mount

Fixed Eye



##### P4 Mount

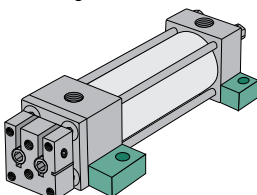
Detachable Eye



#### Foot Mounts

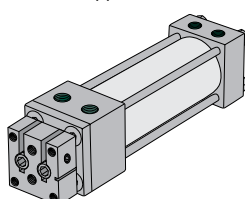
##### S2 Mount

Side Lugs



##### S4 Mount

Bottom Tapped





### How to Order

**F1 F K - 00 A 1 P - C AA 0**

#### Mounting

F1 = Front Flange  
F2 = Rear Flange  
P1 = Fixed Clevis  
P2 = Detachable Clevis  
P3 = Fixed Eye  
P4 = Detachable Eye  
S2 = Side Lug Mount  
S4 = Bottom Tapped  
X0 = Basic No Mount  
X2 = Cap Extended Tie Rods

#### Type

F = F Series Non-Rotating  
NFPA Interchangeable

#### Bore

K = 1-1/2"  
L = 2"  
M = 2 1/2"  
P = 3 1/4"  
R = 4"

#### Full Inch of Stroke

00 = 0" Stroke  
01 = 1" Stroke  
02 = 2" Stroke  
03 = 3" Stroke  
20 = 20" 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 = Magnet

#### Options

AA = No Options  
BA\*\* = Bumpers Both Ends (3-1/4" and 4" only)  
BH\*\* = Bumper Head only (3-1/4" and 4" only)  
BC\*\* = Bumper Cap only  
KA\* = Stroke Adjuster  
DA = Double Rod End  
NA = Nickel Plated Cylinder  
Stainless Steel Rod and Tie rods  
RA\* = Save Air Stroke Adjuster  
SA = Stainless Steel Piston Rod  
SS = Stainless Piston Rod and Tie Rod  
ST = Stainless Tie Rods  
1A\* = Rod Extension  
4A\* = Stop Tube  
\* Specify length.  
\*\*Bumpers add 0.062" to OAL (per bumper).

#### 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

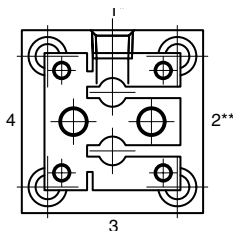
#### Ports

Position	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 End Codes

1 = Vertical Rod Style # 1  
2 = Vertical Rod Style # 2  
3 = Vertical Rod Style # 3  
4 = Special Rod Ends  
6 = Horizontal Rod Style # 1  
7 = Horizontal Rod Style # 2  
8 = Horizontal Rod Style # 3

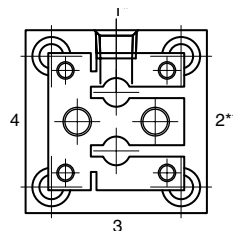
### Port and Cushion Orientation



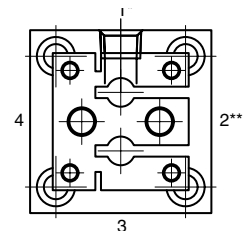
\* Ports Normally In Position 1

\*\* Cushions Normally In Position 2

### Cylinder Rod Orientation



Standard Rod  
Orientation Vertical



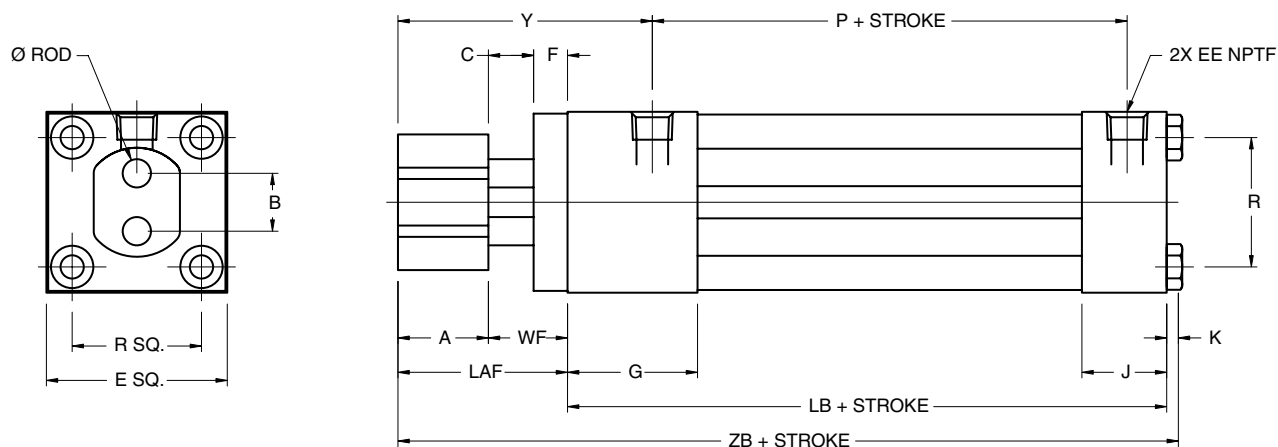
Optional Rod  
Orientation Horizontal



## F Series Non-Rotating NFPA Interchangeable

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### Basic-No Mount Cylinder



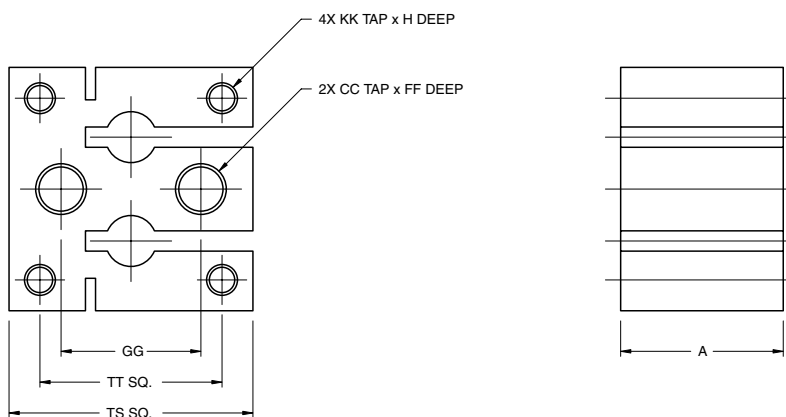
NOTE: Tooling plate removed for clarity.

### NFPA Mount Code MX0

#### Dimensions

BORE	ROD	A	B	C	E	F	G	J	K	P	R	V	Y	EE	LB	WF	ZB	LAF
1-1/2"	0.313	1.000	0.640	0.500	2.000	0.375	1.500	1.000	0.250	2.250	1.430	0.160	2.813	3/8	3.625	0.875	5.750	1.875
2"	0.500	1.000	0.844	0.500	2.500	0.375	1.500	1.000	0.313	2.250	1.840	0.200	2.813	3/8	3.625	0.875	5.813	1.875
2-1/2"	0.625	1.250	1.219	0.500	3.000	0.375	1.500	1.000	0.313	2.375	2.190	0.200	3.063	3/8	3.750	.875	6.188	2.125
3-1/4"	0.750	1.250	1.219	0.500	3.750	0.625	1.750	1.250	0.375	2.625	2.760	0.200	3.438	3/8	4.250	1.125	7.000	2.375
4"	0.750	1.250	1.907	0.500	4.500	0.625	1.750	1.250	0.375	2.625	3.320	0.200	3.438	1/2	4.250	1.125	7.000	2.375

### Tooling Plate

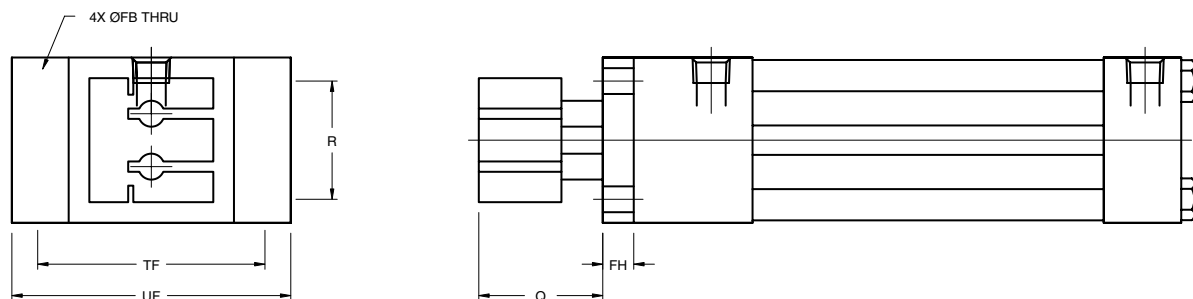


#### Dimensions

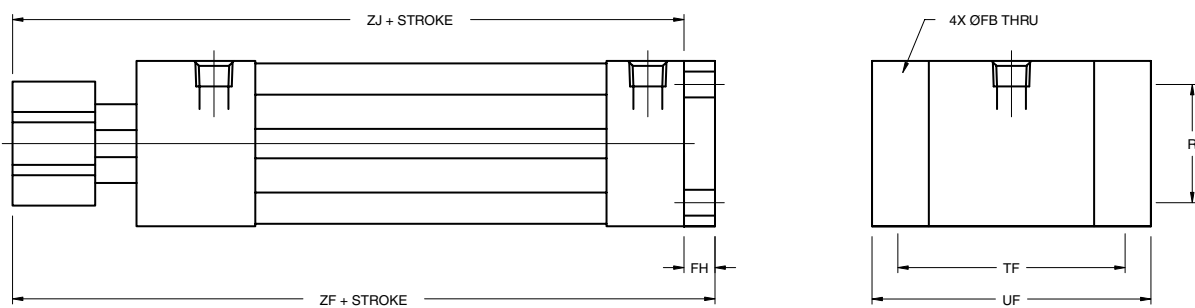
BORE	CC	FF	GG	KK	H	TS	TT
1-1/2"	5/16-18	0.375	0.860	#10-32	0.625	1.500	1.120
2"	5/16-18	0.375	1.180	1/4-28	0.750	2.000	1.430
2-1/2"	3/8-16	0.625	1.500	5/16-24	0.875	2.500	1.840
3-1/4"	1/2-13	0.625	1.790	3/8-24	0.875	3.250	1.970
4"	1/2-13	0.625	2.760	3/8-24	0.875	4.000	3.440



### Flange Mounts



Mount Code NFPA MF1



Mount Code NFPA MF2

### Dimensions

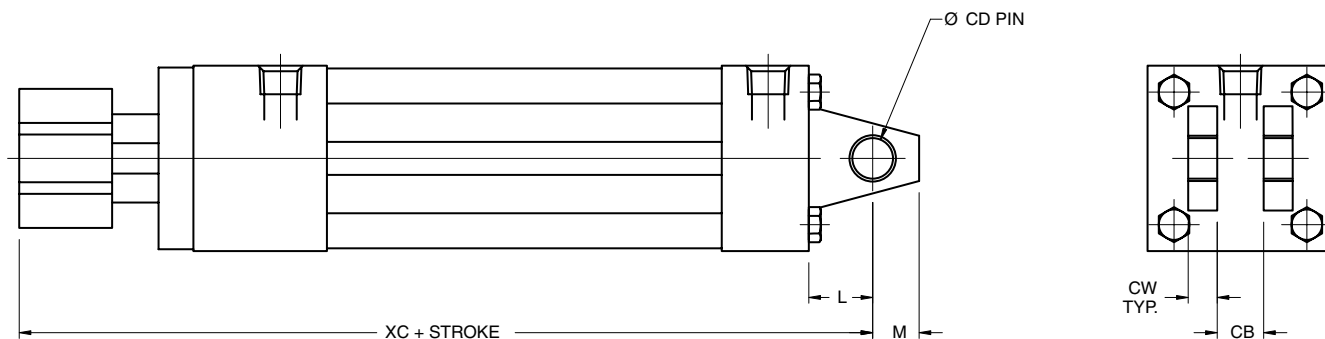
BORE	FB	FH	QR	R	TF	UF	ZF	ZJ
1-1/2"	1/4	0.375	1.500	1.430	2.750	3.375	5.875	5.500
2"	5/16	0.375	1.500	1.840	3.375	4.125	5.875	5.500
2-1/2"	5/16	0.375	1.750	2.190	3.875	4.625	6.250	5.875
3-1/4"	3/8	0.625	1.750	2.760	4.688	5.500	7.250	6.625
4"	3/8	0.625	1.750	3.320	5.438	6.250	7.250	6.625



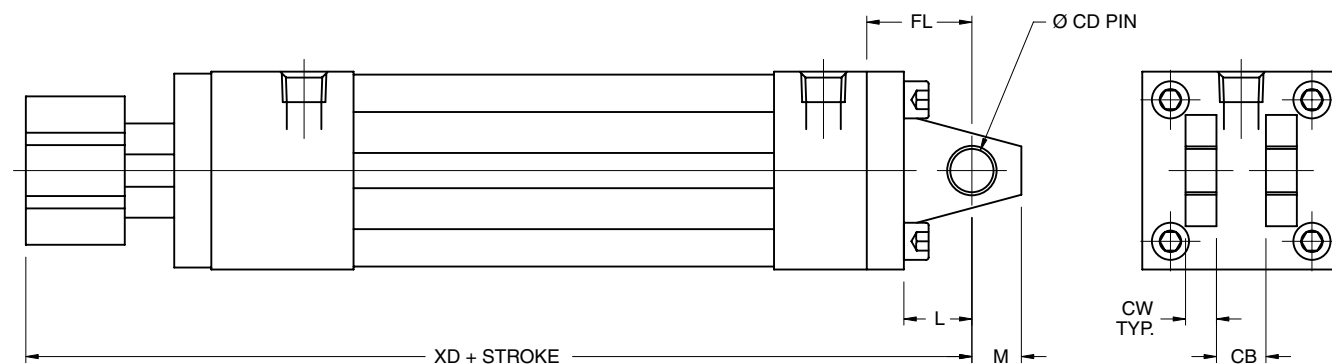
## F Series Non-Rotating NFPA Interchangeable

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### Clevis Mounts



#### NFPA Mount Code MP1



#### NFPA Mount Code MP2

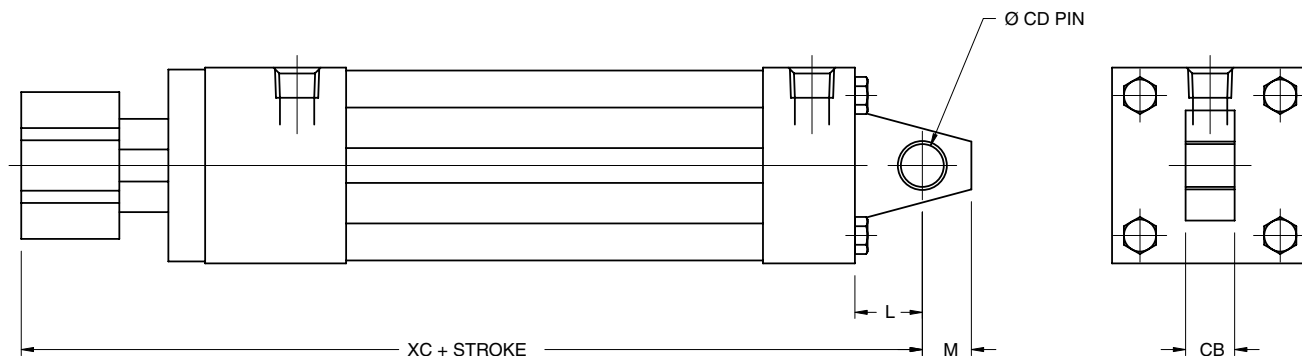
### Dimensions

BORE	L	M	CB	CD	CW	FL	XC	XD
1-1/2"	0.750	0.500	0.750	0.500	0.500	1.125	6.250	6.625
2"	0.750	0.500	0.750	0.500	0.500	1.125	6.250	6.625
2-1/2"	0.750	0.500	0.750	0.500	0.500	1.125	6.625	7.000
3-1/4"	1.250	0.750	1.250	0.750	0.625	1.875	7.875	8.500
4"	1.250	0.750	1.250	0.750	0.625	1.875	7.875	8.500

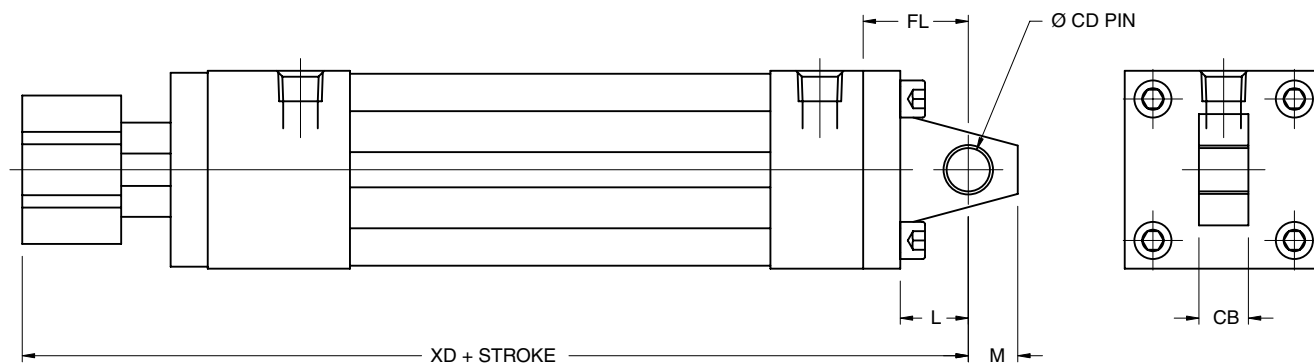




### Eye Mounts



NFPA Mount Code MP3



NFPA Mount Code MP4

### Dimensions

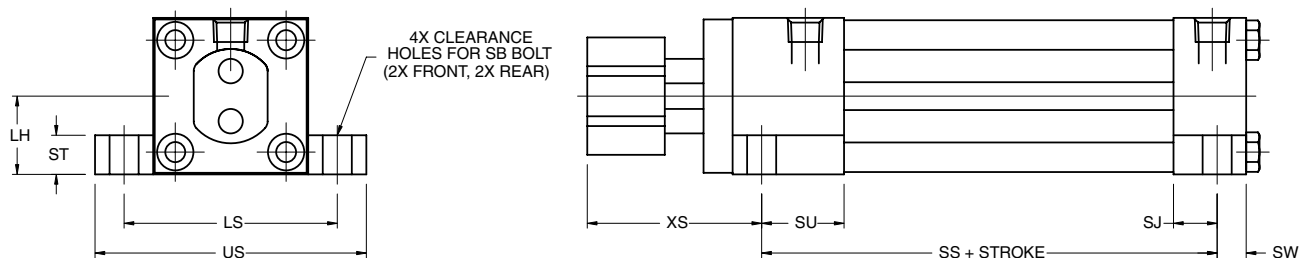
BORE	L	M	CB	CD	FL	XC	XD
1-1/2"	0.750	0.500	0.750	0.500	1.125	6.250	6.625
2"	0.750	0.500	0.750	0.500	1.125	6.250	6.625
2-1/2"	0.750	0.500	0.750	0.500	1.125	6.625	7.000
3-1/4"	1.250	0.750	1.250	0.750	1.875	7.875	8.500
4"	1.250	0.750	1.250	0.750	1.875	7.875	8.500



## F Series Non-Rotating NFPA Interchangeable

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### Side Lug Mount

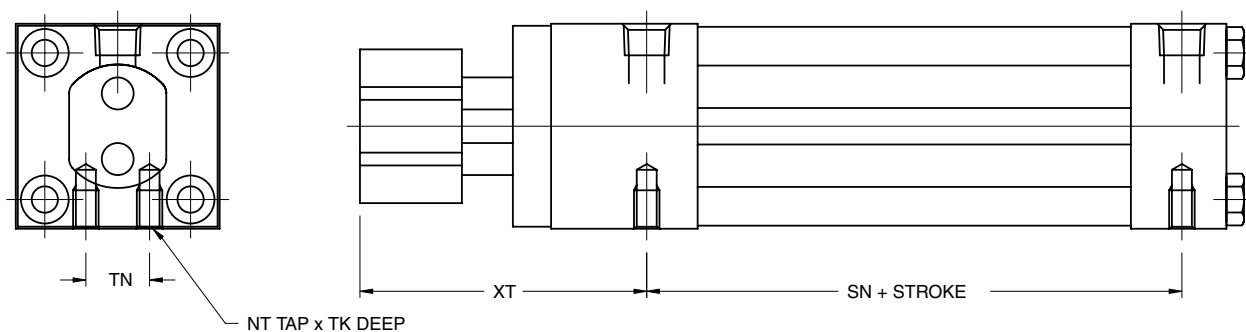


#### NFPA Mount Code MS2

#### Dimensions

BORE	LH	LS	SB	SJ	SS	ST	SU	SW	US	XS
1-1/2"	1.000	2.750	3/8	0.625	2.875	0.500	1.125	0.375	3.500	2.250
2"	1.250	3.250	3/8	0.625	2.875	0.500	1.125	0.375	4.000	2.250
2-1/2"	1.500	3.750	3/8	0.625	3.000	0.500	1.125	0.375	4.500	2.500
3-1/4"	1.875	4.750	1/2	0.750	3.250	0.750	1.250	0.500	5.750	2.875
4"	2.250	5.500	1/2	0.750	3.250	0.750	1.250	0.500	6.500	2.875

### Bottom Tap Mount



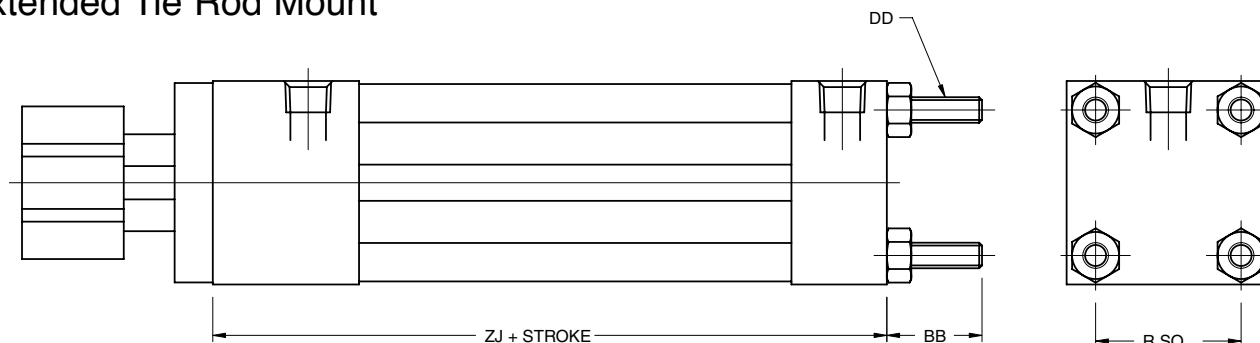
#### NFPA Mount Code MS4

#### Dimensions

BORE	NT	TK	TN	SN	XT
1-1/2"	1/4-20	0.250	0.625	2.250	2.813
2"	5/16-18	0.313	0.875	2.250	2.813
2-1/2"	3/8-16	0.375	1.250	2.375	3.063
3-1/4"	1/2-13	0.500	1.500	2.625	3.438
4"	1/2-13	0.500	2.063	2.625	3.438



### Extended Tie Rod Mount

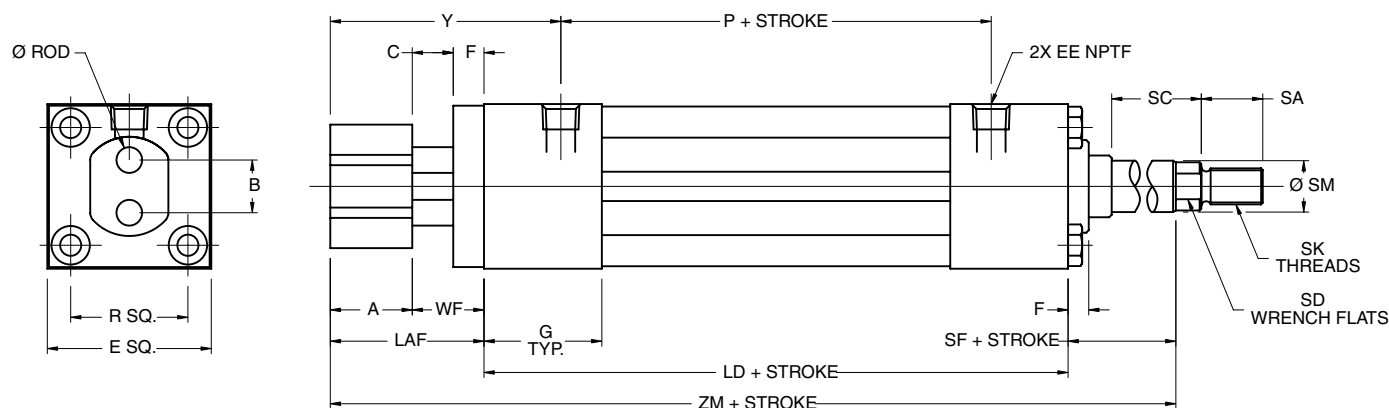


NFPA Mount Code MX2

#### Dimensions

BORE	BB	DD	R	ZJ
1-1/2"	1.000	1/4-28	1.430	5.500
2"	1.125	5/16-24	1.840	5.500
2-1/2"	1.125	5/16-24	2.190	5.875
3-1/4"	1.375	3/8-24	2.760	6.625
4"	1.375	3/8-24	3.320	6.625

### Double Rod End



Order as "DA" Option

#### Dimensions

BORE	ROD	A	B	C	E	EE	F	G	LD	LAF	P
1-1/2"	0.313	1.000	0.640	0.500	2.000	3/8	0.375	1.500	4.125	1.875	2.250
2"	0.500	1.000	0.844	0.500	2.500	3/8	0.375	1.500	4.125	1.875	2.250
2-1/2"	0.625	1.250	1.219	0.500	3.000	3/8	0.375	1.500	4.250	2.125	2.375
3-1/4"	0.750	1.250	1.129	0.500	3.750	3/8	0.625	1.750	4.750	2.375	2.625
4"	0.750	1.250	1.907	0.500	4.500	1/2	0.625	1.750	4.750	2.375	2.625

BORE	R	SA	SC	SD	SF	SK	SM	V	WF	Y	ZM
1-1/2"	1.430	0.750	0.375	0.500	1.000	7/16-20	0.625	0.160	0.875	2.813	7.000
2"	1.840	0.750	0.375	0.500	1.000	7/16-20	0.625	0.200	0.875	2.813	7.000
2-1/2"	2.190	0.750	0.375	0.500	1.000	7/16-20	0.625	0.200	0.875	3.063	7.375
3-1/4"	2.760	1.125	0.500	0.813	1.375	3/4-16	1.000	0.200	1.125	3.438	8.500
4"	3.320	1.125	0.500	0.813	1.375	3/4-16	1.000	0.200	1.125	3.438	8.500

Note: For switch ordering information see the Actuator Accessories section.



## F Series Non-Rotating NFPA Interchangeable

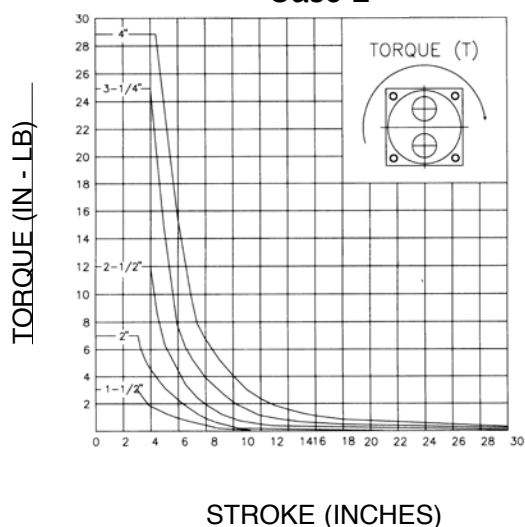
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### F Series Case Loads

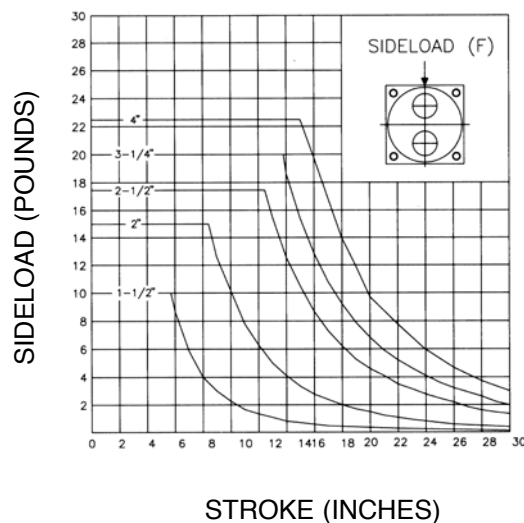
#### Case Load Instructions:

- 1) Choose the appropriate case for your application.  
(See drawings for Case 1, 2, and 3)
- 2) On the left side of the chart, locate the side load or torque that your application will experience.
- 3) On the bottom scale, locate the maximum stroke for the application.
- 4) Follow the lines up to determine the minimum cylinder your application will require.

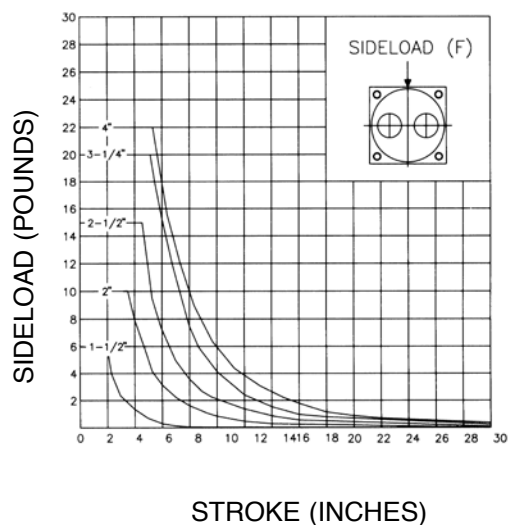
**Case 2**



**Case 1**



**Case 3**



These charts have been developed to aid in bore selection. For strokes/loads exceeding these charts, consult your Numatics Actuator distributor.

#### **NOTE:**

There is a significant difference between Case 1 and Case 3.

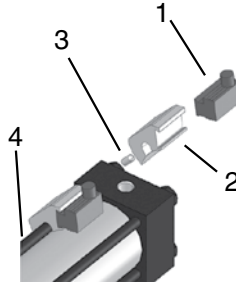


### F Series Switch Information

#### F Series World Switch Application Detail

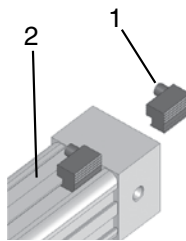
##### Round Tube and Tie Rod Detail

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



##### Profile Tube Detail

1. World Switch
2. Dove Tail extrusion



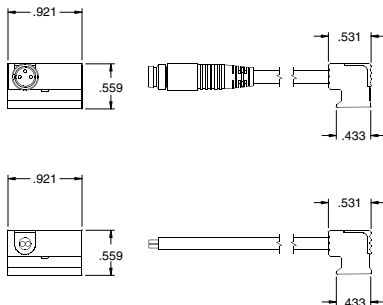
#### F series World Switch Bracket

Cylinders	Bore	Part Number
F series Profile	1 1/2"-2 1/2"	Direct Fit
F Tie Rod	3 1/4"-4"	SB6-P01

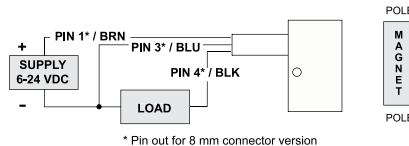
#### F series World Switch Hall Effect Part Numbers

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

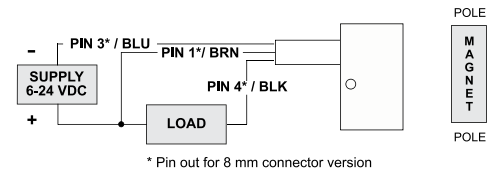
#### Hall Effect Switch



##### PNP Sourcing



##### NPN Sinking





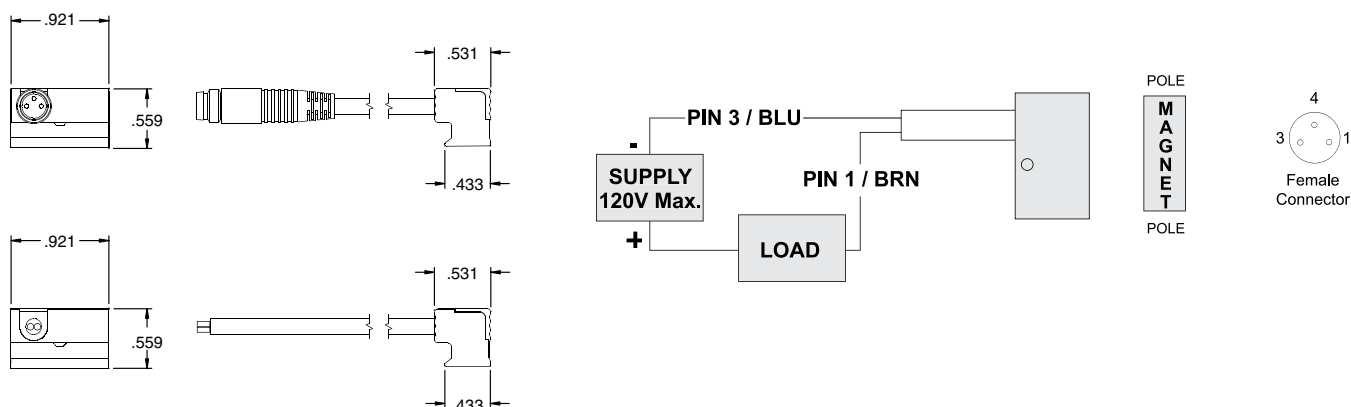
## F Series Non-Rotating NFPA Interchangeable

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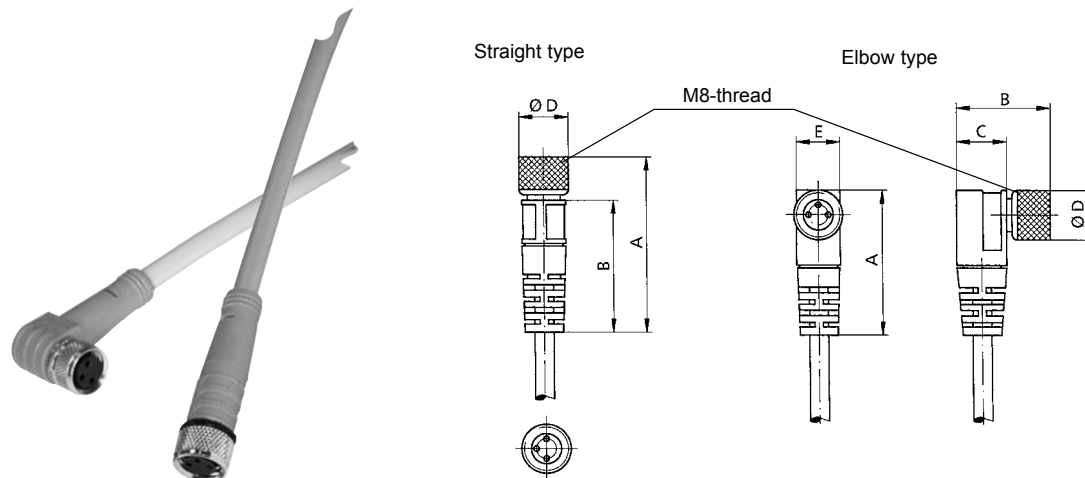
### F Series World Switch Reed Switch Part Numbers

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)

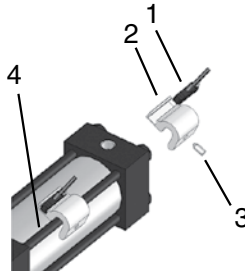
Type		A	B	C	D	E	Weight (approx. kg)	Order Code
Straight with 5m-cable	(3x0.25 mm <sup>2</sup> )	32.3	24.4	—	9.0	—	0.143	SC6-001
Elbow with 5m-cable	(3x0.25 mm <sup>2</sup> )	26.3	17.1	9.2	9.0	8.0	0.145	SC6-002



### F Series Global Application Detail

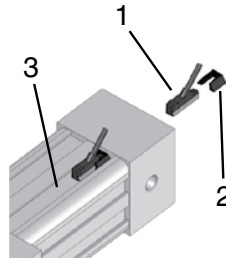
#### Round Tube and Tie Rod Detail

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



#### Profile Tube Detail

1. Global Switch
2. Included Dovetail adapter
3. Dove Tail extrusion

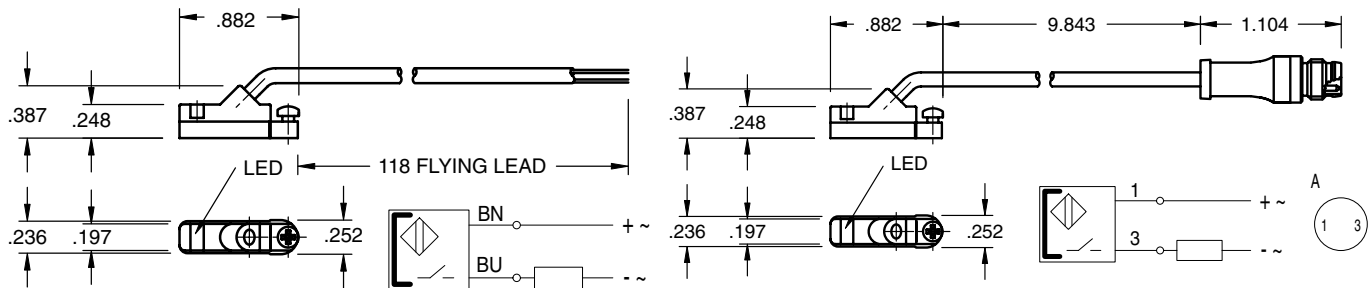


### F series Global Switch Bracket

Cylinders	Bore	Part Number
F series Profile	1 1/2"-2 1/2"	Direct Fit w/included adapter
F Tie Rod	3 1/4"-4" Bore	N199-1018

### F Series Global Switches

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



#### Sensing Data

Ambient temperature range  $T_a$   
Frequency of operating cycles  $f$  at  $U_e$   
Turn on time  $t$   
turn off time  $t$   
LED function indication

(°F/°C) -4 to 176 (-20 to 80)  
(kHz) 0.5  
(ms)  $\leq 0.25$   
(ms) 0.03  
yes

#### 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

#### Electrical Data

Rated operational voltage  $U_e$   
Supply voltage  $U_B$   
Voltage drop  $U_d$  at  $I_e$  Stat./dyn.  
Rated insulation voltage  $U_i$   
Rated supply frequency  
Rated operational current  $I_e$   
No-load supply current  $I_0$  at  $U_e$  d./und.  
Observe polarity for correct LED function

(V) 3...130 AC/DC  
(V) 3...130 AC/DC  
(V) 3.5  
(V) 2750 DC (EN 60335-1)  
(Hz) AC/DC  
(mA) 50 (10W max.)  
(mA) 0

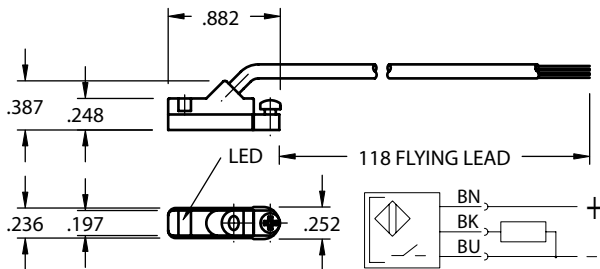




## F Series Non-Rotating NFPA Interchangeable

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

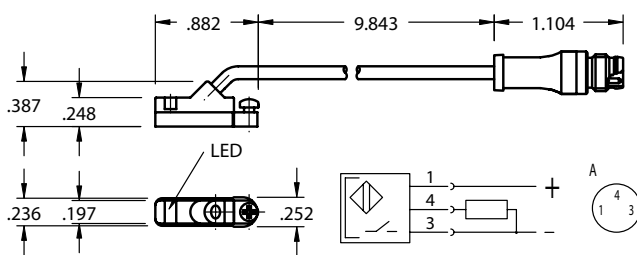


#### Sensing Data

Ambient temperature range $\theta_d$	(°F/°C)	-13 to +158 (-25 to +70)
Temperature drift	(% of )	$\leq 0.3\%/^{\circ}\text{C}$
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

#### 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 voltage $U_i$	(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

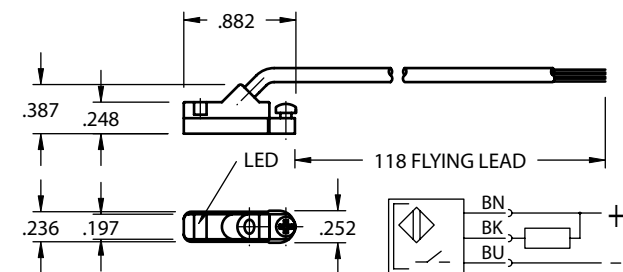


#### Mechanical Data

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	



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

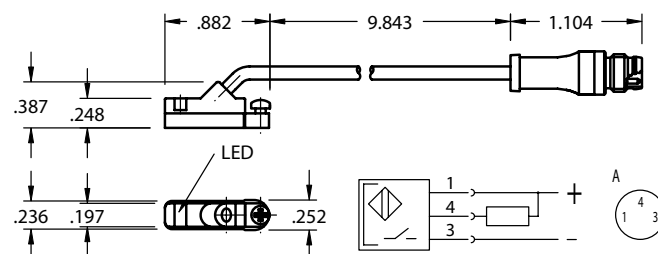


#### Sensing Data

Ambient temperature range $\theta_d$	(°F/°C)	-13 to +158 (-25 to +70)
Temperature drift	(% of $S_T$ )	$\leq 0.3\%/^{\circ}\text{C}$
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

#### 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 voltage $U_i$	(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



#### 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	



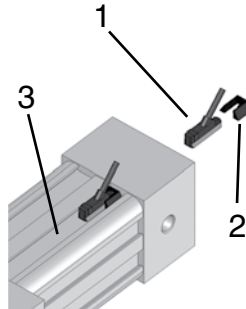




### F Series 9000 Application Detail

#### Profile Tube Detail

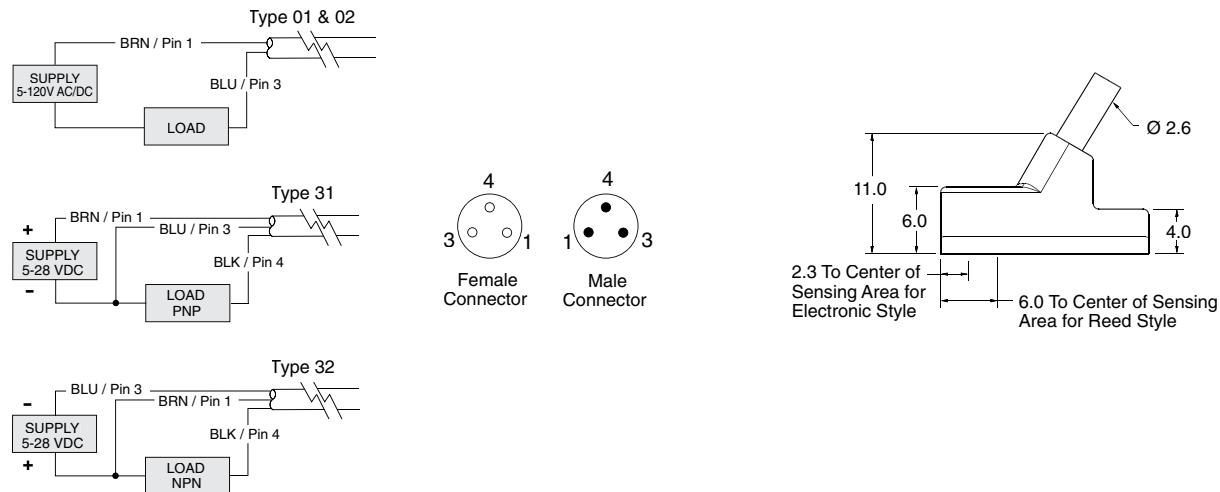
1. 9000 Switch
2. Included Dovetail adapter
3. Dove Tail extrusion



### F series 9000 Series Switch

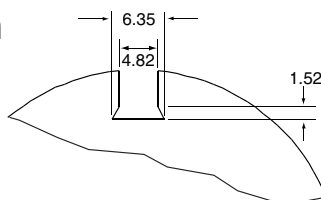
Cylinders	Bore	Part Number
F series Profile	1 1/2"-2 1/2" Bore	Direct Fit w/ included adapter

### Series 9000 Type 02, 31 & 32 Wiring Diagrams



Type Code	Description	Function	Switching Voltage	Switching Current	Switching Power	Switching Speed	Voltage Drop
940-100-002	Reed Switch for PLC's, LED (current limiting)	SPST Normally Open	5-120V AC/DC 50/60 Hz	0.03 Amps max. 0.001 Amps min.	4 Watts max.	0.4 ms operate 0.1 ms release	3.5 Volts @ 5 mA
940-100-031	Electronic for Reed Magnet, LED & Sourcing	PNP Normally Open	5-28 VDC	0.2 Amps max.	4.8 Watts max.	4 µs operate 4 µs release	1.0 Volts max
940-100-032	Electronic for Reed Magnet, LED & Sourcing	NPN Normally Open	5-28 VDC	0.2 Amps max.	4.8 Watts max.	4 µs operate 4 µs release	1.0 Volts max

### Groove Dimension

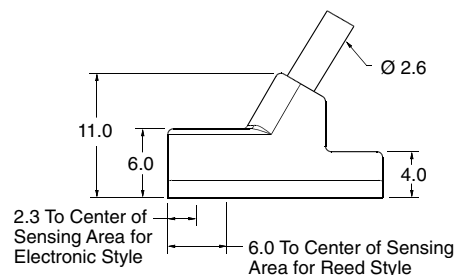
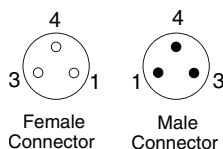
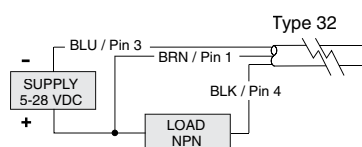
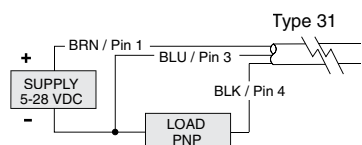
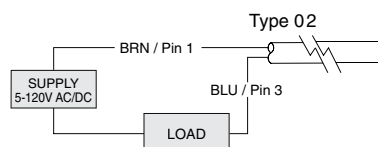




## F Series Non-Rotating NFPA Interchangeable

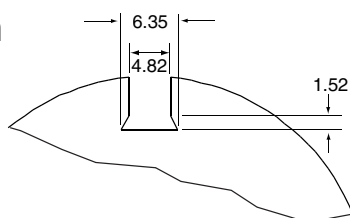
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### Series 9000 Type 02, 31 & 32 Wiring Diagrams



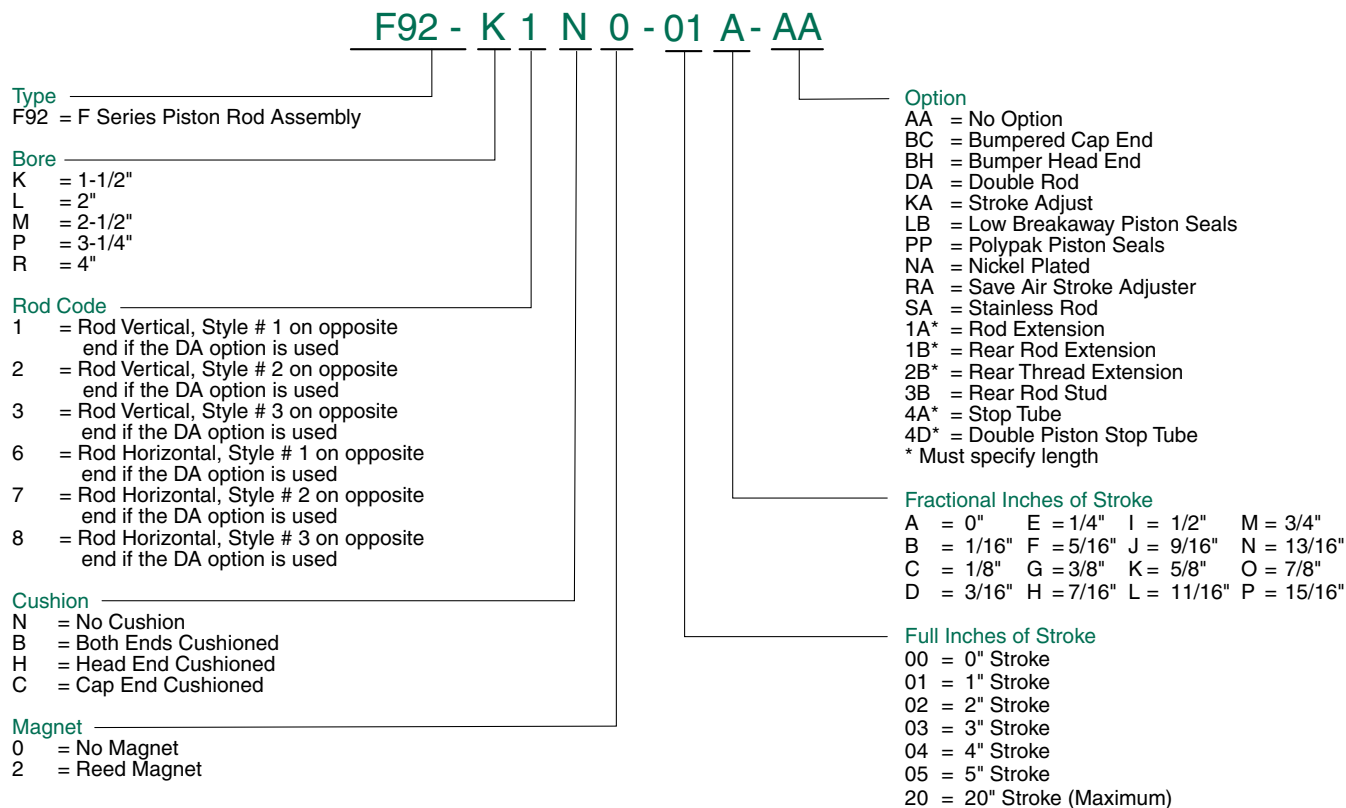
Type Code	Description	Function	Switching Voltage	Switching Current	Switching Power	Switching Speed	Voltage Drop
940-100-002	Reed Switch for PLC's, LED (current limiting)	SPST Normally Open	5-120V AC/DC 50/60 Hz	0.03 Amps max. 0.001 Amps min.	4 Watts max.	0.4 ms operate 0.1 ms release	3.5 Volts @ 5 mA
940-100-031	Electronic for Reed Magnet, LED & Sourcing	PNP Normally Open	5-28 VDC	0.2 Amps max.	4.8 Watts max.	4 $\mu$ s operate 4 $\mu$ s release	1.0 Volts max
940-100-032	Electronic for Reed Magnet, LED & Sourcing	NPN Normally Open	5-28 VDC	0.2 Amps max.	4.8 Watts max.	4 $\mu$ s operate 4 $\mu$ s release	1.0 Volts max

### Groove Dimension





### How to Order - F Series Piston Rod Assembly



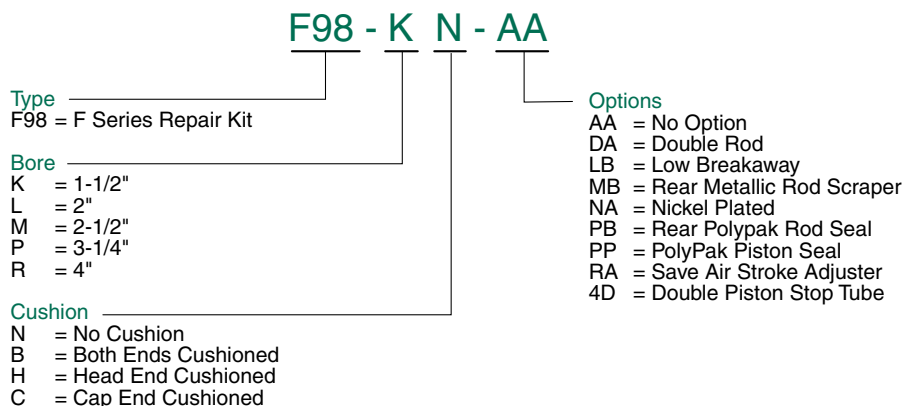
**Note:** Options listed are ones that apply to a piston rod assembly only.  
Model number is set up to use option code supplied with original cylinder or with any above.



## F Series Non-Rotating NFPA Interchangeable

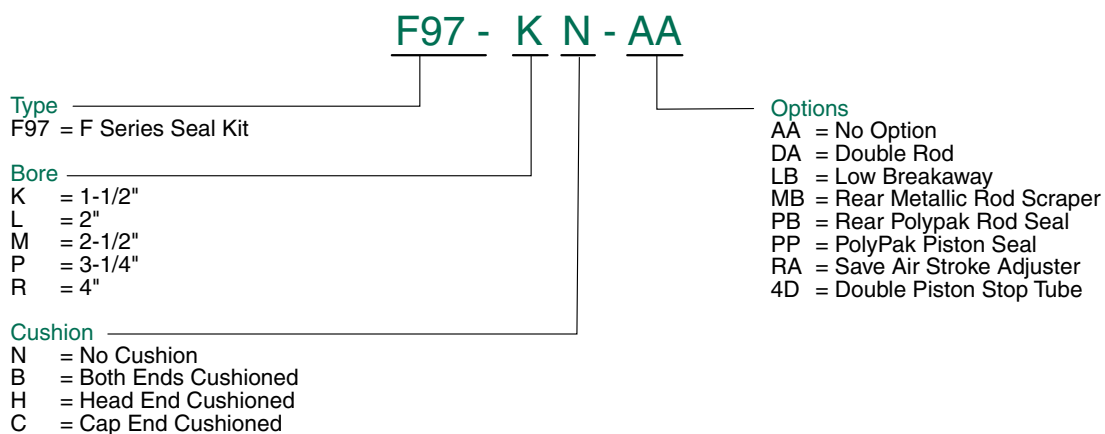
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### How to Order - F Series **Repair Kit**



**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 - F Series **Seal Kit**



**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 2 Tooling Plate Socket Head Cap Screws (Part #25) to remove Tooling Plate (Part #24)
2. Loosen 4 Bushing Retainer Flat Head Cap Screws (Part #13) to remove bushing retainer.
3. Loosen 4 Head Sleeve Bolts (Part #23) and 4 Hex Head Cap Screws (Part #22) to remove Piston/Rod Assembly (Part #20 & #26).
4. Carefully remove old seals and wearband (Part #14, #16, and #17). Any damage to the seals may result in leakage.
5. Lubricate seals with supplied Numatics' Lube. Examine seals before installing for any contamination. Contamination may cause leakage.
6. Install Piston Seal (Part #17). Make sure the piston seal is not twisted inside groove. Next, install back-up rings (Part #16) if piston seal is a T-seal. See Seal Installation guide.
7. Install lubricated wearband (Part #14) onto piston. Sink piston/rod assembly into sinker tube. See Sinker Tube Part Numbers Chart.
8. Apply lube inside the cylinder tube.
9. Sink piston/rod assembly into cylinder tube.
10. Press piston/rod assembly flush with the cylinder tube. Wipe off any lube from the face of the piston.
11. Place Tube End Seals (Part #8) into head and cap seal grooves. Examine seals after installing for any contamination. Contamination may cause leakage.
12. Lightly grease Rod Seal/Wiper and Bushing O-rings after installation. This will ease the installation of the rod bushing over the rod and into the head.
13. Reassemble cylinder except for loaded bushing. First, loosely torque Head Sleeve Bolts and Hex Head Cap Screws to allow head and cap to rotate slightly. Carefully place bushing over the rod until getting interference. Slide the bushing down onto the rods and into the bushing pocket on the head.
14. Before final torque, place cylinder on level surface to square head and cap. Torque Head Sleeve Bolts and Hex Head Cap Screws in a crisscross pattern. Use torque tolerance chart for Head Sleeve Bolts and Hex Head Cap Screws.
15. Place Bushing Retainer (Part #12) over bushing. Lightly tighten Retainer Screws (Part #13). Place Tooling Plate over rods and hand tighten Tooling Plate Socket Head Cap Screws.
16. Stroke cylinder by hand. This will enable detection of any binding. If binding does occur, repeat steps 13-15. If there is no binding, torque Retainer Screws to torque tolerances for bushing retainer screws.

See Seal Installation Guide on page 24 for additional (visual) instructions.



**F Series**  
**Non-Rotating NFPA Interchangeable**

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## Repair and Seal Kit Removal/Installation Instructions

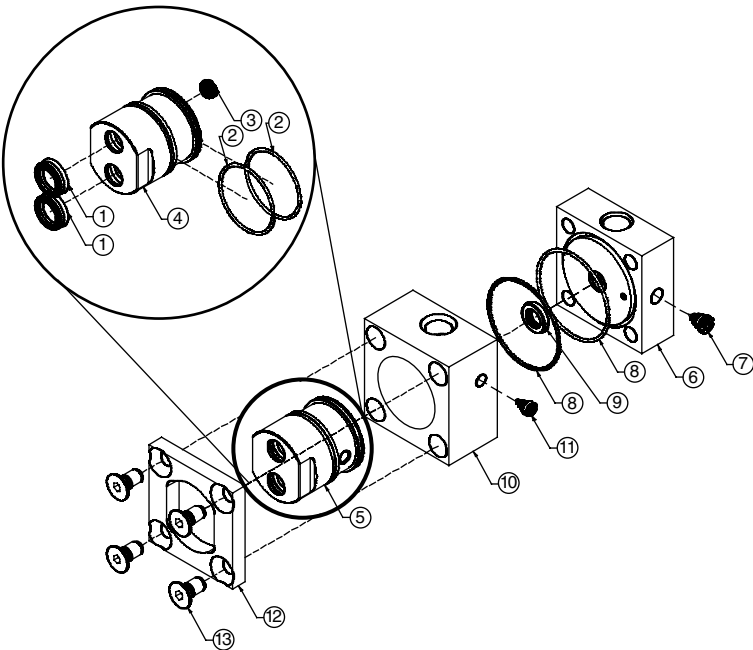
1. Loosen 2 Tooling Plate Socket Head Cap Screws (Part #25) to remove Tooling Plate (Part #24)
2. Loosen 4 Bushing Retainer Flat Head Cap Screws (Part #13) to remove bushing retainer (Part #12) and Loaded Bushing (Part #5).
3. Loosen 4 Head Sleeve Bolts (Part #23) and 4 Hex Head Cap Screws (Part #22) to remove Piston/Rod Assembly (Part #20 & #26).
4. Carefully remove old seals and wearband. (Part [#1, #2, #3 Seal Kit only], #8, #9, #14, #16, and #17) Any damage to the seal grooves may result in leakage.
5. Lubricate new seals with supplied Numatics' Lube. Examine seals before installing for any contamination. Contamination may cause leakage.
6. Install Piston Seal (Part #17). Make sure the piston seal is not twisted inside groove. Next, install back-up rings (Part #16) if piston seal is a T-seal. See Seal Installation guide.
7. Install lubricated wearband (Part #14) onto piston. Sink piston/rod assembly into sinker tube. See Sinker Tube Part Numbers Chart.
8. Apply lube inside the cylinder tube.
9. Sink piston/rod assembly into cylinder tube.
10. Press piston/rod assembly flush with the cylinder tube. Wipe off any lube from the face of the piston.
11. Place Tube End Seals (Part #8) into head and cap seal grooves. Examine seals after installing for any contamination. Contamination may cause leakage.
12. Install Rod Seal/Wiper (Part #1), Bushing O-rings (Part #2), and Head Cushion Seal (Part #3\*) if available into bushing (Seal Kit only for this step). See Seal Installation Guide. Lightly grease Rod Seal/Wiper and Bushing O-rings after installation. This will ease the installation of the rod bushing over the rod and into the head.
13. Reassemble cylinder except for loaded bushing. First, loosely torque Head Sleeve Bolts and Hex Head Cap Screws (Part #22) to allow head and cap to rotate slightly. Carefully place bushing over the rods until getting interference. Slide the bushing down onto the rods and into the bushing pocket on the head.
14. Before final torque, place cylinder on level surface to square head and cap. Torque Head Sleeve Bolts and Hex Head Cap Screws in a crisscross pattern. Use torque tolerance charts for Head Sleeve Bolts and Hex Head Cap Screws.
15. Place Bushing Retainer (Part #12) over bushing. Lightly tighten Retainer Screws (Part #13). Place Tooling Plate over rods and hand tighten Tooling Plate Socket Head Cap Screws.
16. Stroke cylinder by hand. This will enable detection of any binding. If binding does occur, repeat steps 13-15. If there is no binding, torque Retainer Screws to torque tolerances for bushing retainer screws.

See Seal Installation Guide on page 24 for additional (visual) instructions.

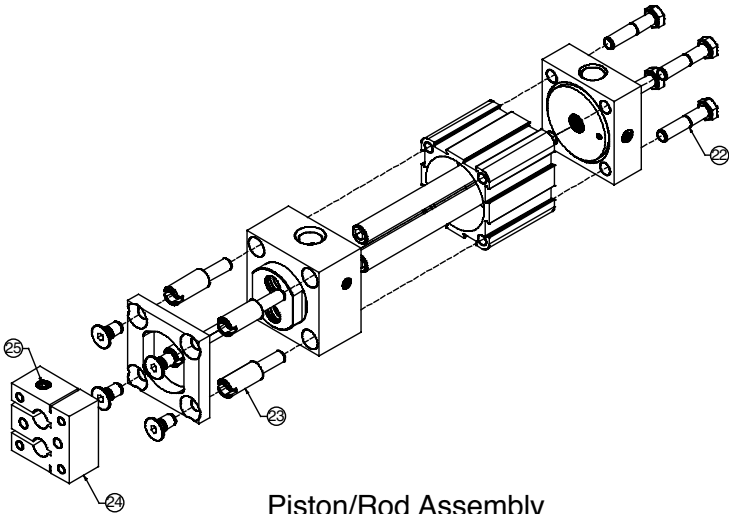


Diagrams

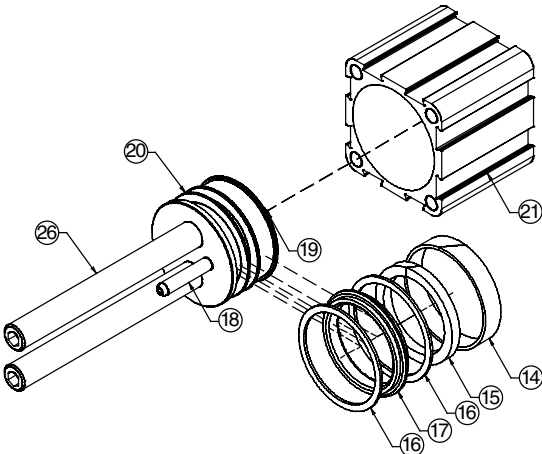
Pneumatic Service Temperatures:  
Nitrile Seals: -10°F (-23°C) to 165°F (74°C)



Head, Cap, and Bushing Assembly



Piston/Rod Assembly



Cylinder Assembly and Tie Rod Torque

F Series

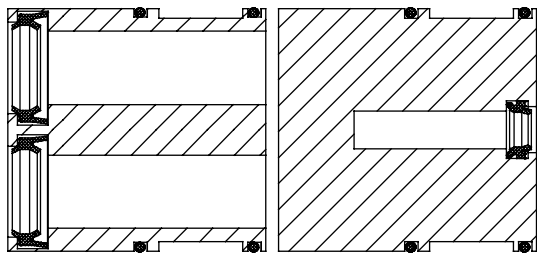
Part #	Description	Parts included in:		
		Seal Kit	Repair Kit	Piston/Rod Assembly
1	Rod Seal/Wiper	X		
2	Bushing O-ring	X		
3	Head Cushion Seal	X	X	
4	Bushing			
5	Loaded Bushing Assembly		X	
6	Cap			
7	Cap Cushion Needle			
8	Tube End Seal	X	X	
9	Cap Cushion Seal	X	X	
10	Head			
11	Head Cushion Needle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



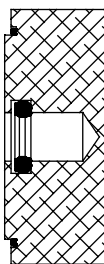
## F Series Non-Rotating NFPA Interchangeable

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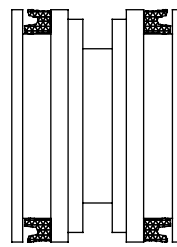
### Seal Installation Guide



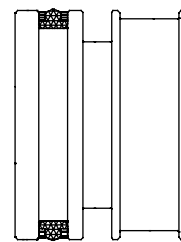
Loaded Bushing



Cushioned Cap



Low Breakaway Piston



T-Seal Piston

#### Bushing Retainer Screws Torque Tolerances (lbs-ft) Part #13

Size	Min.	Max.
1/4-28	5	7
5/16-24	10	12
3/8 - 24	15	20

#### Head & Cap Screw Torque Tolerances (lbs-ft) Parts #23 & #22

Bore	Min.	Max.
1-1/2"	8	10
2"	15	20
2-1/2"	15	20
3-1/4"	23	30
4"	23	30

#### Sinker Tube Part Numbers

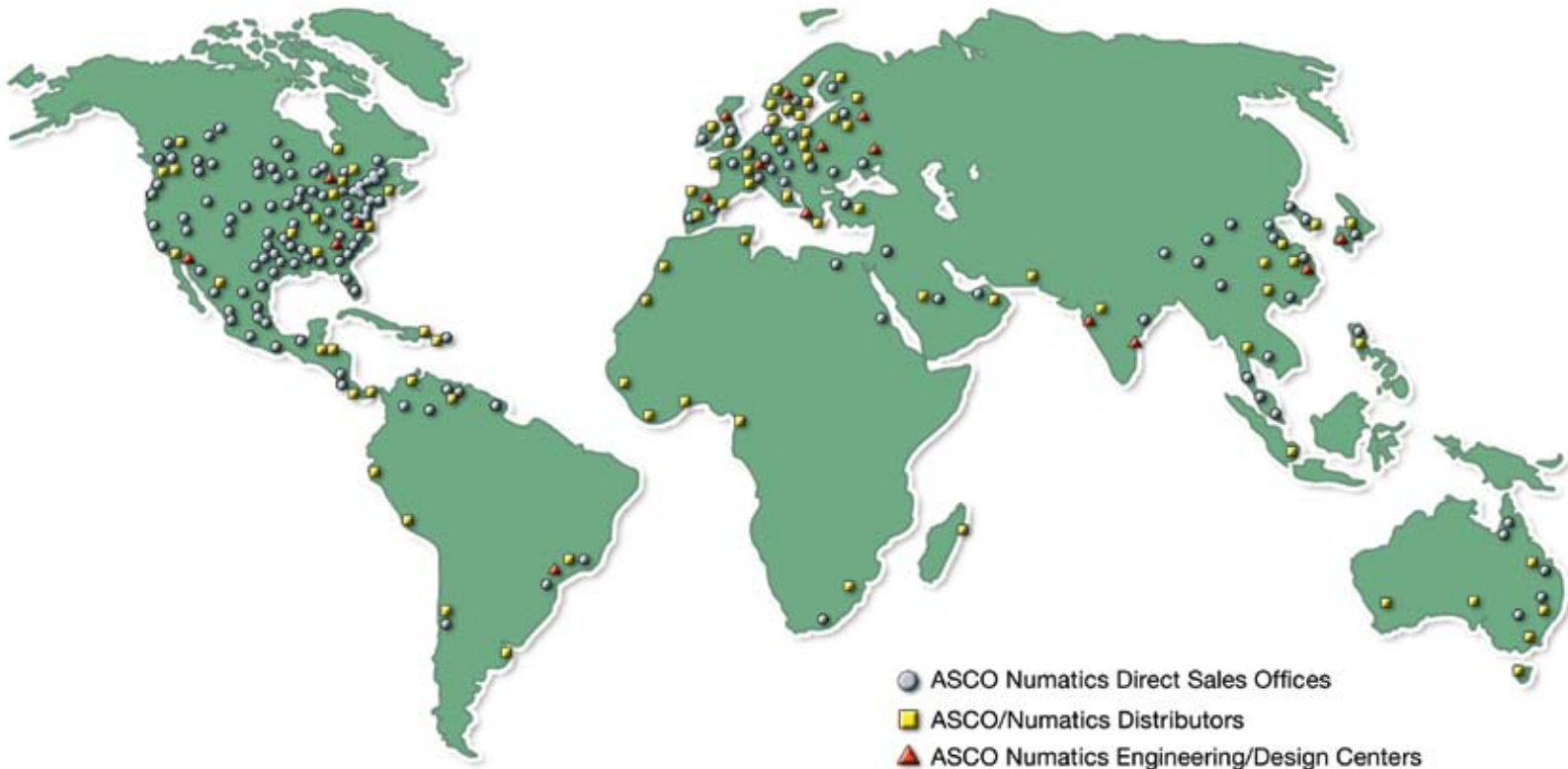
Bore	Part #
1-1/2"	A06-K91
2"	A06-L91
2-1/2"	A06-M91
3-1/4"	A06-P91
4"	A06-R91

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



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1-888-686-2842

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#### Numatics de Mexico S.A. de C.V.

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