

RS Series Round USDA/FDA SS Series NFPA Tie Rod SS-MS Series Multi-Stage Stainless Steel Cylinders 1.50" to 8.00" Bore



RS Series

Page 129



SS Series Single Rod End

Page 139



SS Series Double Rod End

Page 145



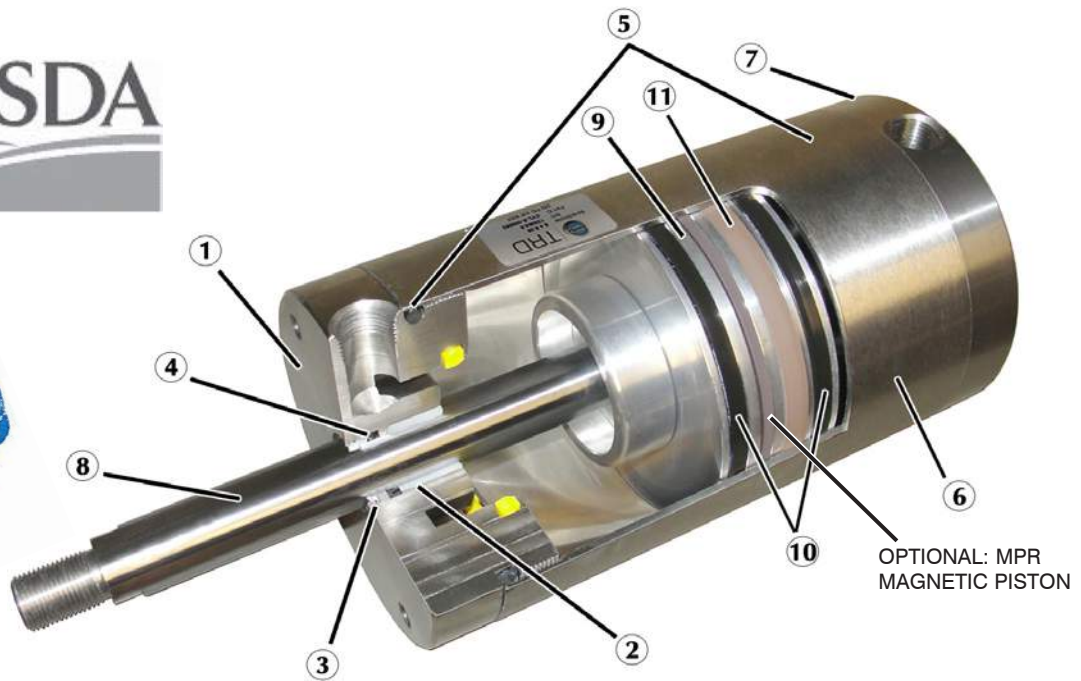
SS-MS Series

Page 149



**95% OF OUR CYLINDERS SHIP IN 2-3 DAYS!
ONE DAY RUSH SERVICE AVAILABLE ON ALL CATALOGED CYLINDER MODELS!**

REPAIRABLE STAINLESS STEEL 'RS': CONSTRUCTION



USDA APPROVAL OPTION U - EQUIPMENT ACCEPTANCE CERTIFICATE

UNITED STATES DEPARTMENT OF AGRICULTURE MARKETING AND REGULATORY PROGRAMS AGRICULTURAL MARKING SERVICE

The issuance of this form is based on U.S. Department of Agriculture, Dairy and Grading Branch, Equipment Design Review Section, evaluation of the equipment listed above for compliance with: 3-A Sanitary Standard

- ① **ROD GUIDE/HEAD** – Corrosion resistant 300 series stainless steel is ideal for wash-down applications. Designed to reduce sharp edges and corners to provide a smooth transition to the cylinder body eliminating catch points for contamination and to allow ease in cleaning. Optional Tapped holes are provided to allow easy mounting of USDA approved secondary wiper retainer or foot bracket as an option.
 - ② **ROD BUSHING** – Material is Acetal for extended life.
 - ③ **ROD WIPER** – A PTFE rod wiper is standard (high temperature or urethane material is optional) and offers resistance to a wide variety of wash-down chemicals.
 - ④ **ROD SEAL** – Nitrile rod seal (high temperature material is optional) is pressure activated and wear compensating for long life.
 - ⑤ **BODY SEALS** – Nitrile material is standard (high temperature material is optional)
 - ⑥ **BODY** – Thick walled 300 series stainless steel offers superior corrosion resistance and is designed to minimize gaps with the mating end caps where contamination can build up.
 - ⑦ **REAR CAP** – Corrosion resistant 300 series stainless steel is ideal for wash-down applications. Designed specifically to reduce sharp edges and corners and provide a smooth transition to the cylinder body eliminating catch points for contamination and to allow ease in cleaning. Optional tapped holes allow for easy mounting of NFPA rear pivot or rear clevis mounting brackets.
 - ⑧ **PISTON ROD** – Hard Chrome Plated 300 series stainless steel for maximum corrosion resistance.
 - ⑨ **PISTON** – Precision machined from aluminum (optional stainless steel for internal corrosion resistance when required).
 - ⑩ **PISTON SEALS** – Nitrile material is standard (high temperature material is optional). Seals are pressure activated and wear compensating.
 - ⑪ **PISTON WEAR BAND** – 90% Virgin PTFE and 10% Polyphenylene Sulfide filled wear band; 65,000 PSI Compressive Modules; extremely low wear rate.
- LUBRICANT** – Food Grade (H1) Grease.

OPERATING PRESSURE

200 PSI Maximum

OPERATING TEMPERATURE

Standard: -20°F to 200°F (-29°C to 93°C)
VS Option: 0°F to 400°F (-18°C to 204°C)

RS - How to Order
RS - Base Dimensions
RS - Mount Dimensions
RS - Options
Options Page 189
Accessories Page 227
Switches Page 241
Technical Data Page 277

SERIES 'RS': HOW TO ORDER

RS - MP2 - 4.00 X 1.50 - U

SERIES

RS	REPAIRABLE STAINLESS STEEL
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NFPA MOUNTS

MX0	TAPPED BOTH ENDS
MXF	TAPPED FRONT
MXR	TAPPED REAR
MP2	CLEVIS REAR
MP4	PIVOT REAR

BORE

1.50
2.00
2.50
3.25
4.00
5.00
6.00
8.00

STROKE

0" to 24"
MADE-TO-ORDER

NOTE: Longer strokes are available, consult factory for application review.

OPTIONS

ADDS LENGTH TO CYLINDER - SEE "OPTION LENGTH ADDER" CHART BELOW.

A =	EXTENDED PISTON ROD THREAD (EXAMPLE: A = 2")
X B	URETHANE BUMPER BOTH ENDS
X BC	URETHANE BUMPER CAP ONLY
X BH	URETHANE BUMPER HEAD ONLY
BP	BUMPER PISTON SEALS (1.50"-8.00" BORE)
C =	EXTENDED PISTON ROD (SPECIFY) (EXAMPLE: C=2)
FC	FIXED CUSHIONS
KK2	INTERMEDIATE MALE ROD THREAD
KK3	FEMALE ROD THREAD
KK4	FULL DIAMETER MALE ROD THREAD
KK5	BLANK ROD END (NO THREADS, "A" = 0")
L001	MAGNALUBE G GREASE
LF	LOW FRICTION SEALS
MPR	MAGNETIC PISTON FOR REED SWITCHES
OS	OVERSIZE ROD DIAMETER (5.00"-8.00" ONLY)
P	PROXIMITY SWITCH BOTH ENDS (1.50"-4.00" ONLY)
PXX	SINKING PROXIMITY SWITCH (1.50"-4.00" ONLY)
RWU	URETHANE ROD WIPER
RWV	FLUOROCARBON ROD WIPER
SSP	STAINLESS STEEL PISTON (WITH WEAR-BAND)
U	USDA APPROVED OPTIONS*
VS	FLUOROCARBON SEALS**
XX	SPECIAL VARIATION (SPECIFY) EXAMPLE - NO PISTON WEAR BAND, ETC.

OPTION NOTES:

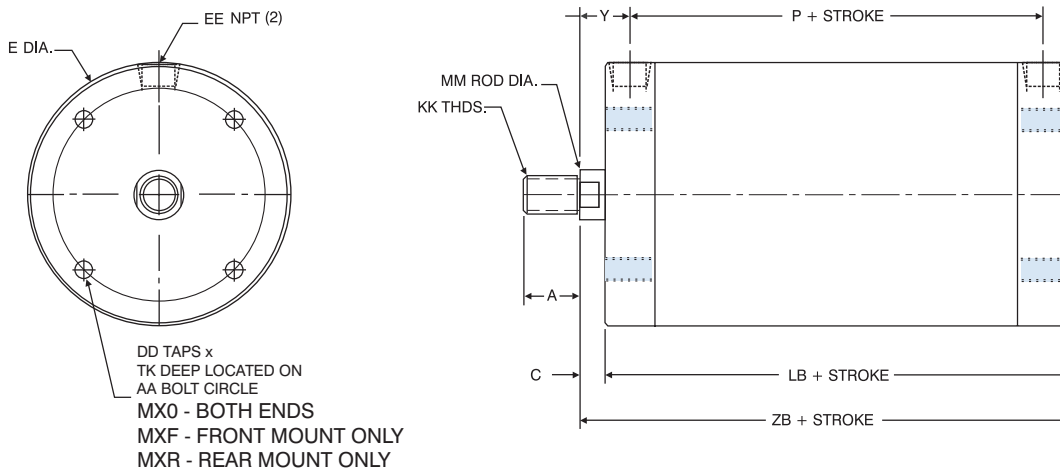
- Option (B) Bumpers cannot be combined with Option (FC) Cushions or Option (P) Prox. Switches
- If Option (P) (Proximity switch both ends) and Option (VS) are ordered in combination, the standard proximity switch thread seal material will be used
- Option (MPR) Magnetic Piston and Option (VS) High Temperature Seals should be specified for chemical compatibility requirements only. The piston magnet is nitrile based, hence the temperature rating remains at 200°F.

OPTION LENGTH ADDER
(ADD TO CATALOG BASIC OVERALL LENGTH DIMENSIONS)

BORE	OPTION		
	B	BC	BH
1.50	0.250"	0.125"	0.125"
2.00	0.250"	0.125"	0.125"
2.50	0.250"	0.125"	0.125"
3.25	0.250"	0.125"	0.125"
4.00	0.250"	0.125"	0.125"
5.00	0.500"	0.250"	0.250"
6.00	0.500"	0.250"	0.250"
8.00	0.500"	0.250"	0.250"

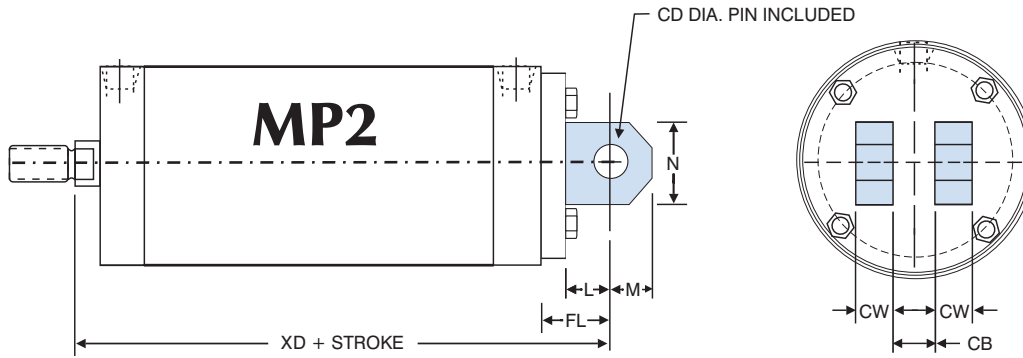
* USDA approved option includes an external wiper as required by the USDA. The cylinder rod length will automatically increase by the amount required to accommodate the seal retaining bracket.
** PTFE scraper will be used unless otherwise specified.

SERIES 'RS' DIMENSIONS: FRONT & REAR MOUNT



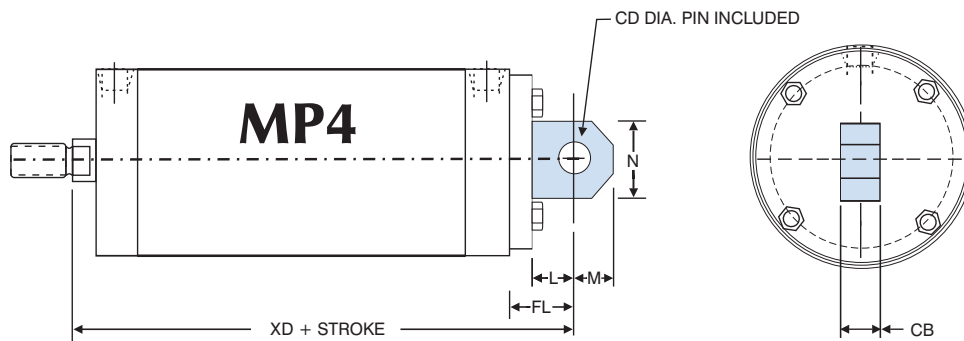
'MX0', 'MXR' & 'MXF' MOUNT DIMENSIONS														
BORE	ROD DIAMETER	A	AA	C	DD	E DIA.	EE NPT	KK	LB	MM	TK	Y	P	ZB
1.50	0.625 Standard	0.750	1.450	0.560	8-32	1.750	0.375	7/16-20	5.210	0.625	0.330	2.050	3.260	5.770
2.00	0.625 Standard	0.750	1.850	0.560	10-24	2.250	0.375	7/16-20	5.450	0.625	0.375	2.050	3.500	6.010
2.50	0.625 Standard	0.750	2.150	0.560	1/4-20	2.750	0.375	7/16-20	5.950	0.625	0.500	2.050	4.000	6.510
3.25	1.000 Standard	1.125	2.620	0.640	5/16-18	3.500	0.500	3/4-16	7.430	1.000	0.625	2.420	5.120	8.070
4.00	1.000 Standard	1.125	3.250	0.640	3/8-16	4.250	0.500	3/4-16	7.430	1.000	0.750	2.420	5.120	8.070
5.00	1.000 Standard	1.125	4.250	0.500	3/8-16	5.250	0.500	3/4-16	5.750	1.000	0.625	1.000	4.750	6.250
	1.375 Oversized	1.625	4.250	0.625	3/8-16	5.250	0.500	1-14	5.750	1.375	0.625	1.125	4.750	6.375
6.00	1.375 Standard	1.625	5.000	0.625	1/2-13	6.250	0.500	1-14	5.750	1.375	0.875	1.125	4.750	6.375
	1.750 Oversized	2.000	5.000	0.750	1/2-13	6.250	0.500	1-1/4-12	5.750	1.750	0.875	1.250	4.750	6.500
8.00	1.375 Standard	1.625	6.500	0.625	5/8-11	8.375	0.500	1-14	5.875	1.375	1.000	1.125	4.875	6.500
	1.750 Oversized	2.000	6.500	0.750	5/8-11	8.375	0.500	1-1/4-12	5.875	1.750	1.000	1.250	4.875	6.625

SERIES 'RS' DIMENSIONS: CLEVIS MOUNT



'MP2' CLEVIS MOUNT DIMENSIONS									
BORE	ROD DIAMETER	CB	CD	CW	FL	L	M	N	XD
1.50	0.625 Standard	0.750	0.500	0.490	1.125	0.750	0.350	0.700	6.900
2.00	0.625 Standard	0.750	0.500	0.500	1.125	0.750	0.400	0.800	7.140
2.50	0.625 Standard	0.750	0.500	0.500	1.125	0.750	0.400	0.800	7.640
3.25	1.000 Standard	1.250	0.750	0.625	1.875	1.250	0.600	1.000	9.940
4.00	1.000 Standard	1.250	0.750	0.625	1.875	1.250	0.750	1.400	9.940
5.00	1.000 Standard	1.250	0.750	0.625	1.875	1.250	0.875	1.750	8.125
	1.375 Oversized	1.250	0.750	0.625	1.875	1.250	0.875	1.750	8.250
6.00	1.375 Standard	1.500	1.000	0.750	2.250	1.500	1.000	2.000	8.625
	1.750 Oversized	1.500	1.000	0.750	2.250	1.500	1.000	2.000	8.750
8.00	1.375 Standard	1.500	1.000	0.750	2.250	1.500	1.000	3.500	8.750
	1.750 Oversized	1.500	1.000	0.750	2.250	1.500	1.000	3.500	8.875

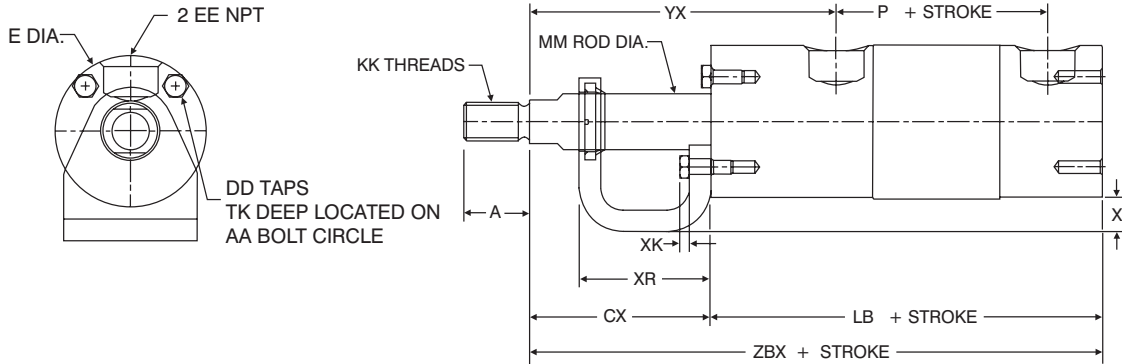
SERIES 'RS' DIMENSIONS: PIVOT MOUNT



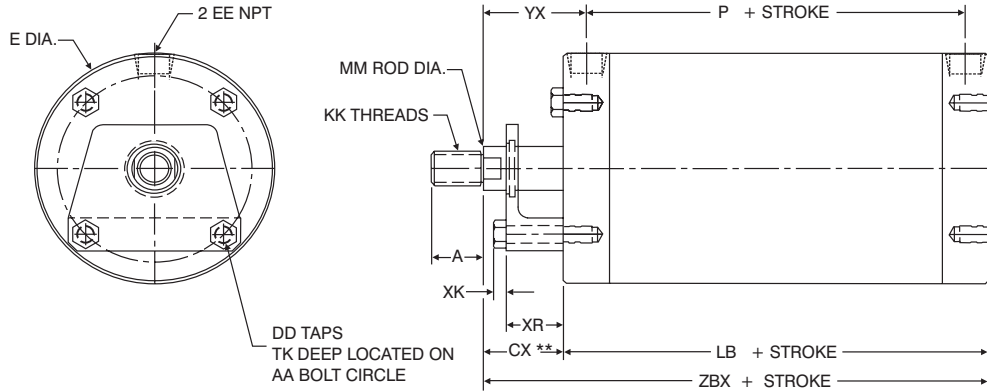
'MP4' PIVOT MOUNT DIMENSIONS								
BORE	ROD DIAMETER	CB	CD	FL	L	M	N	XD
1.50	0.625 Standard	0.750	0.500	1.125	0.750	0.350	0.700	6.900
2.00	0.625 Standard	0.750	0.500	1.125	0.750	0.400	0.800	7.140
2.50	0.625 Standard	0.750	0.500	1.125	0.750	0.400	0.800	7.640
3.25	1.000 Standard	1.250	0.750	1.875	1.250	0.600	1.000	9.940
4.00	1.000 Standard	1.250	0.750	1.875	1.250	0.750	1.400	9.940
5.00	1.000 Standard	1.250	0.750	1.875	1.250	0.875	1.750	8.125
	1.375 Oversized	1.250	0.750	1.875	1.250	0.875	1.750	8.250
6.00	1.375 Standard	1.500	1.000	2.250	1.500	1.000	2.000	8.625
	1.750 Oversized	1.500	1.000	2.250	1.500	1.000	2.000	8.750
8.00	1.375 Standard	1.500	1.000	2.250	1.500	1.000	3.500	8.750
	1.750 Oversized	1.500	1.000	2.250	1.500	1.000	3.500	8.875

RS - How to Order
 RS - Base Dimensions
 RS - Mount Dimensions
 RS - Options
 Options Page 189
 Accessories Page 227
 Switches Page 241
 Technical Data Page 277

SERIES 'RS' DIMENSIONS: USDA APPROVED OPTION "U"



1.50" - 4.00" Bores



5.00", 6.00" & 8.00" Bores

EXTERNAL WIPER 'OPTION U' DIMENSIONS																	
BORE	ROD DIAMETER	A	AA	CX	DD	E DIA.	EE NPT	KK	LB	MM	TK	YX	P	XR	XK	ZBX	X
1.50	0.625 Standard	0.750	1.450	2.060	8-32	1.750	0.375	7/16-20	5.210	0.625	0.330	3.550	3.260	1.500	0.100	7.270	0.375
2.00	0.625 Standard	0.750	1.850	2.060	10-24	2.250	0.375	7/16-20	5.450	0.625	0.375	3.550	3.500	1.500	0.120	7.510	0.500
2.50	0.625 Standard	0.750	2.150	2.060	1/4-20	2.750	0.375	7/16-20	5.950	0.625	0.500	3.550	4.000	1.500	0.170	8.010	0.260
3.25	1.000 Standard	1.125	2.620	2.140	5/16-18	3.500	0.500	3/4-16	7.430	1.000	0.625	3.920	5.120	1.500	0.240	9.570	0.250
4.00	1.000 Standard	1.125	3.250	2.140	3/8-16	4.250	0.500	3/4-16	7.430	1.000	0.750	3.920	5.120	1.500	0.270	9.570	0.250
5.00	1.000 Standard	1.125	4.250	1.750	3/8-16	5.250	0.500	3/4-16	5.750	1.000	0.625	2.250	4.750	1.250	0.270	7.500	N/A
	1.375 Oversized	1.625	4.250	1.875	3/8-16	5.250	0.500	1-14	5.750	1.375	0.625	2.375	4.750	1.250	0.270	7.625	N/A
6.00	1.375 Standard	1.625	5.000	1.875	1/2-13	6.250	0.500	1-14	5.750	1.375	0.875	2.375	4.750	1.250	0.360	7.625	N/A
	1.750 Oversized	2.000	5.000	2.000	1/2-13	6.250	0.500	1 1/4-12	5.750	1.750	0.875	2.500	4.750	1.250	0.360	7.750	N/A
8.00	1.375 Standard	1.625	6.500	1.875	5/8-11	8.375	0.500	1-14	5.875	1.375	1.000	2.375	4.875	1.250	0.440	7.750	N/A
	1.750 Oversized	2.000	6.500	2.000	5/8-11	8.375	0.500	1 1/4-12	5.875	1.750	1.000	2.500	4.875	1.250	0.440	7.875	N/A

NOTE: The USDA-approved 'Option U' includes an external wiper as required by the USDA. Cylinder rod length is increased as shown.

EXAMPLES OF 'U OPTION' MOUNTING BRACKET



SERIES 'RS': OPTIONS

About Rod End Styles

Style 1 Male Rod End is STANDARD

Other NFPA Styles can be specified (see chart).

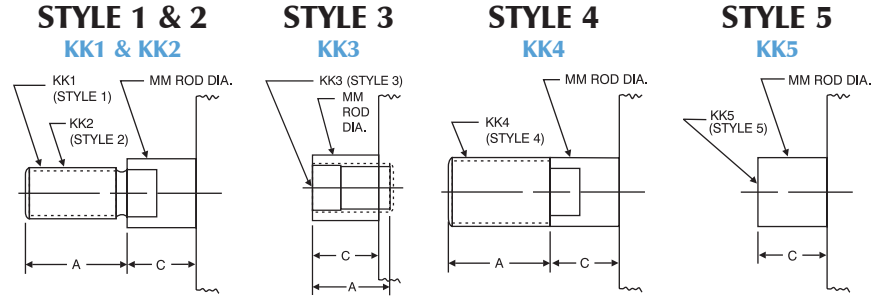
Need a rod end not listed?

NO PROBLEM! Each Piston Rod is made-to-order and does not delay shipment. Coarse UNC threads, Metric threads or just plain rod ends are common. Thread lengths are also made-to-order (Specify: "A" = Length).

NEED SOMETHING NOT LISTED?

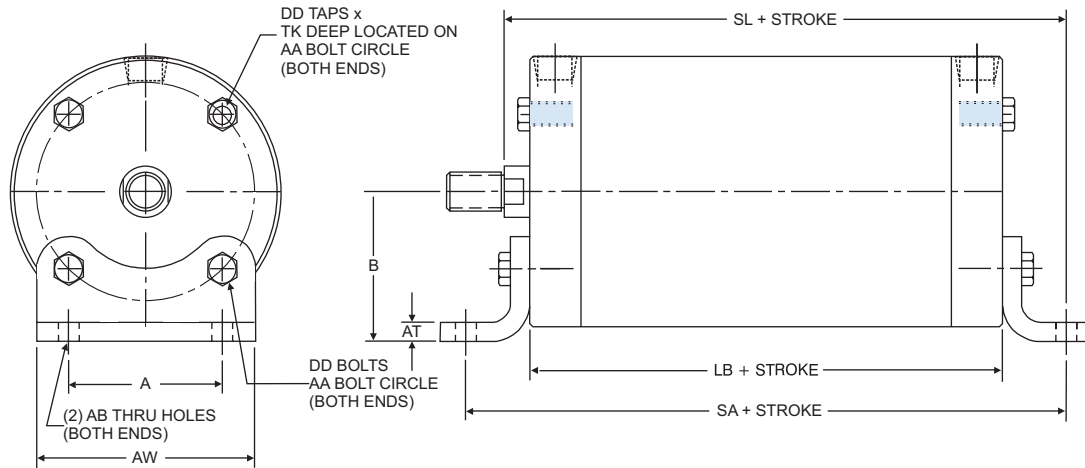
Just send us a sketch.

In most cases, quotes are turned around in one day!



BORE	MM ROD DIAMETER	STANDARD		OPTIONAL							
		Style 1 - Male		Style 2 - Male		Style 3 - Female		Style 4 - Male		Style 5 - Blank	
		KK1	A	KK2	A	KK3	A	KK4	A	KK5	C
1.50, 2.00, 2.50	0.625 Standard	7/16-20	0.750	1/2-20	0.750	7/16-20	0.750	5/8-18	0.750	No Threads	0.560
3.25 & 4.00	1.000 Standard	3/4-16	1.125	7/8-14	1.125	3/4-16	1.125	1-14	1.125	No Threads	0.640
5.00	1.000 Standard	3/4-16	1.125	7/8-14	1.125	3/4-16	1.125	1-14	1.125	No Threads	0.500
	1.375 Oversize	1-14	1.625	1 1/4-12	1.625	1-14	1.625	1 3/8-12	1.625	No Threads	0.625
6.00 & 8.00	1.375 Standard	1-14	1.625	1 1/4-12	1.625	1-14	1.625	1 3/8-12	1.625	No Threads	0.625
	1.750 Oversize	1 1/4-12	2.000	1 1/2-12	2.000	1 1/4-12	2.000	1 3/4-12	2.000	No Threads	0.750

FOOT BRACKET ACCESSORY (INCHES)



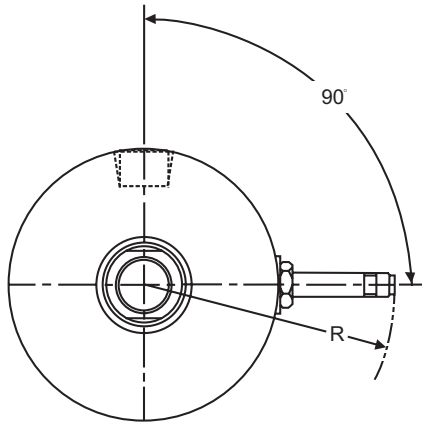
BORE	ROD DIAMETER	FOOT BRACKET KIT	A	AB	AW	B	AT	DD	AA	LB	TK	SA	SL
1.50	0.625 Standard	RS-FB150	1.030	0.188	1.520	1.250	0.250	8-32	1.450	5.210	0.330	6.620	6.460
2.00	0.625 Standard	RS-FB200	1.310	0.219	1.810	1.620	0.250	10-24	1.850	5.450	0.375	7.580	7.070
2.50	0.625 Standard	RS-FB250	1.550	0.281	2.300	1.640	0.250	1/4-20	2.150	5.950	0.500	7.900	7.480
3.25	1.000 Standard	RS-FB325	1.860	0.344	2.860	2.000	0.250	5/16-18	2.620	7.430	0.625	9.740	9.230
4.00	1.000 Standard	RS-FB400	2.300	0.406	3.500	2.375	0.250	3/8-16	3.250	7.430	0.750	10.050	9.390
5.00	1.000 Standard	RS-FB500	3.000	0.688	4.500	2.875	0.188	3/8-16	4.250	5.750	0.625	8.500	7.625
	7.750												
6.00	1.375 Standard	RS-FB600	4.000	0.813	5.500	3.375	0.188	1/2-13	5.000	5.750	0.875	8.500	7.750
	1.750 Oversized												7.875
8.00	1.375 Standard	RS-FB800	5.000	0.813	7.000	4.440	0.250	5/8-11	6.500	5.875	1.000	9.500	8.312
	1.750 Oversized												8.438

Note: Foot bracket mounting kits include two brackets and eight stainless steel screws.

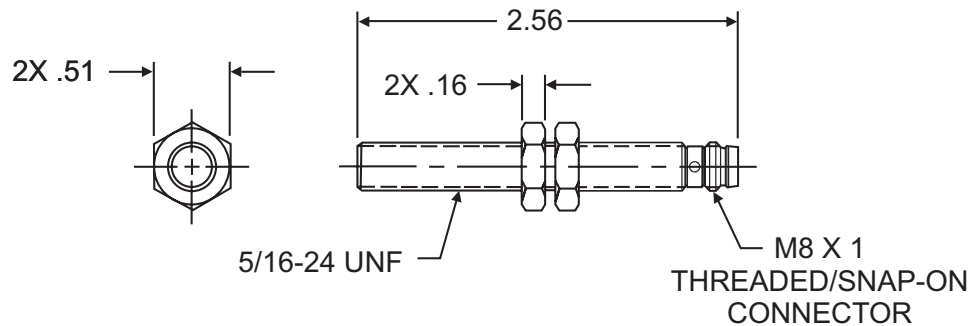
Can only be applied to MX0 mounting styles

SERIES 'RS' OPTIONS: SWITCHES

PROXIMITY SWITCH OPTION DIMENSIONS (OPTIONS P & PXX)



BORE SIZE	DIMENSION R
1.50	3.04"
2.00	3.04"
2.50	3.04"
3.25	3.19"
4.00	3.19"
5.00	N/A
6.00	N/A
8.00	N/A



Specifications

Output: **Option P:** PNP Sourcing output, normally open
Option PXX: NPN Sinking output, normally open

Load Current: 100mA max.

Leakage Current: 10uA max.

Voltage Drop: 2VDC

Short Circuit and Overload Protection: yes

Reverse Polarity Protection: yes

Supply Voltage: 10-30 VDC

LED: yes

Current Consumption: 15mA

Repeatability: 0.010° (.25mm)

Hysteresis: 5%

Response Time: 330uS

Electromagnetic Compatibility Compliance: NEMA ICS5-1996

Protection Class: IP67

Ambient Temperature: -14°F to 158°F (-25°C to 70°C)

Housing Material: Stainless Steel

Sensing Face: Crastin

Approvals: UL-General Purpose

CSA-General Purpose

FM-Nonincendive

SWITCH OPTIONS: SWITCH ORDERING INSTRUCTIONS

TO ORDER, SPECIFY: Switch Model, Lead Type and Bracket Size

R10 X

Switch Model	
R10	= AC/DC Reed
RAC	= High Power AC Reed
RHT	= Extended Temperature Reed
MSS	= Solid State
R10P	= AC/DC Reed with Circuit Protection

Switch Lead Options	
(leave blank)	= 24" Plain Cable
X	= 120" Plain Cable
Q	= 8mm Quick Connect (not available on RAC or RHT)

Refer to Switches for complete specifications.

Switch Mounting Bands	
USB25	Use with bores: 1.50", 2.00", 2.50"
USB50	Use with bores: 3.25", 4.00", 5.00"
USB80	Use with bores: 6.00", 8.00"

Switch Accessories: Quick Connect Cord Sets	
MODEL	DESCRIPTION
C4-T	8mm Straight Quick Connect Cord x 2 Meter (78")
C4X-T	8mm Straight Quick Connect Cord x 5 Meter (196")



About Our Switches

Our switches are different! The most common complaint in the market is the unreliability of magnetically operated switches. Most cylinder piston magnets have about 10-30% more power than required to operate the switch. This results in erratic operation, a nuisance for maintenance and lowering overall plant productivity.

TRD designed our magnet to have 50-100% more power than required to operate our switch! The combination of TRD R10, R10P, RAC, RHT and MSS Switches and our cylinders, raises the reliability of switch operation comparable to that of many mechanically operated limit switches.

Application Recommendations and Precautions

- Noise Suppression: Motors and valve solenoids will produce high pulses throughout an electrical system. Therefore, primary and control circuit wiring should not be mixed in the same conduit. Separate power supplies for both logic level signals (Microprocessor, P.C., CPU, Input Devices) and Output Field Devices (Motors, Valve Solenoids) is recommended.
- Never connect R10, R10P, RHT or MSS type switches without a load present. The switch will be destroyed.
- Some electrical loads may be capacitive. Capacitive loading may occur due to distributed capacity in cable runs over 25 feet. Use switch model RAC whenever capacitive loading may occur.
- To obtain optimum performance and long life, switches should not be subjected to strong magnetic fields, extreme temperatures (outside of specifications), excessive ferrous filings or chip buildup.
- Improper wiring may damage or destroy the switch. Therefore, the wiring diagrams along with the listed power ratings, should be carefully observed before connecting power to the switch.

Following these tips can save time and provide trouble-free installations!

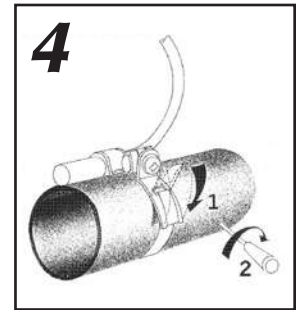
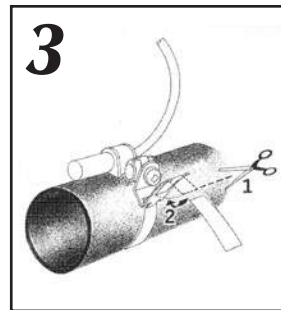
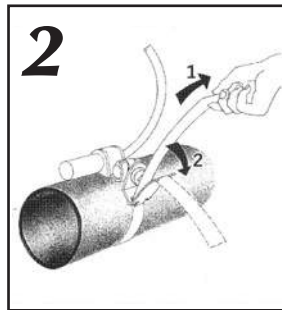
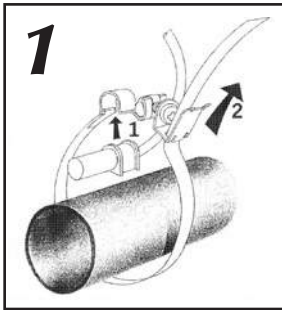
Other Switches Available:

- 12mm Quick Connect
- Special Length Cable
- Weld Immune Switch
- Pulse Extension Switch (For Sensing Mid-Stroke Positions)
- Change Over Switch (SPDT)
- (Consult factory for details)

Specify 'M' Option for ALL switch models when ordering actuators.

SERIES 'RS': ACCESSORIES

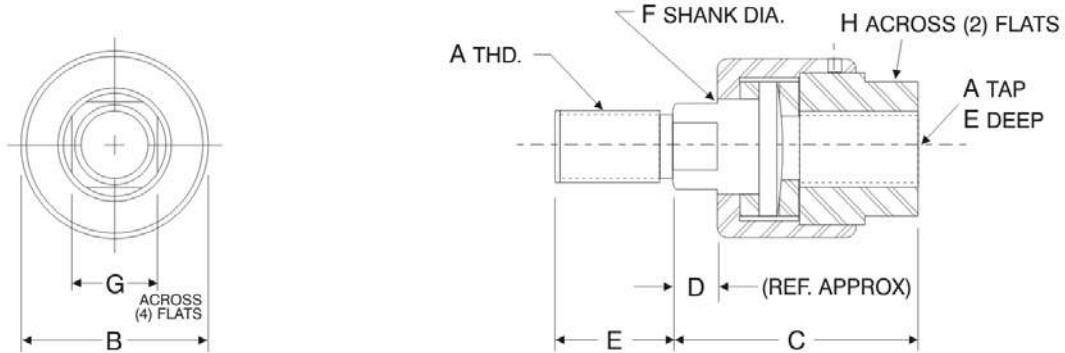
UNIVERSAL SWITCH BAND MOUNTING ILLUSTRATIONS



WARNING:

BE CAREFUL NOT TO SLIP WHEN PULLING BAND TIGHT. USE THUMB AND FINGER AND DO NOT PULL TOO HARD, THE BAND TIGHTENS WELL WITH THREAD TO SPARE.

STAINLESS STEEL ALIGNMENT COUPLERS (INCHES)

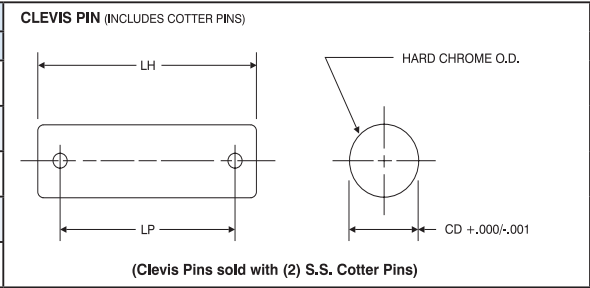


ALIGNMENT COUPLERS (INCHES)									
PART NUMBER	A	B	C	D	E	F	G	H	MAXIMUM PULL AT YIELD (LBS.)
SS-AC250	1/4-28	1.125	1.750	0.375	0.500	0.500	0.375	0.688	1,000
SS-AC312	5/16-24	1.125	1.750	0.375	0.500	0.500	0.375	0.688	1,800
SS-AC375	3/8-24	1.125	1.750	0.375	0.500	0.500	0.375	0.688	2,900
SS-AC437	7/16-20	1.250	2.000	0.438	0.750	0.625	0.500	0.813	4,000
SS-AC500	1/2-20	1.250	2.000	0.438	0.750	0.625	0.500	0.813	5,500
SS-AC625	5/8-18	1.250	2.000	0.438	0.750	0.625	0.500	0.813	7,000
SS-AC750	3/4-16	1.750	2.313	0.438	1.125	0.969	0.813	1.125	10,300
SS-AC875	7/8-14	1.750	2.313	0.438	1.125	0.969	0.813	1.125	12,000
SS-AC1000	1-14	2.500	2.938	0.438	1.625	1.344	1.156	1.625	15,000
SS-AC1250	1 1/4-12	2.500	2.938	0.438	1.625	1.344	1.156	1.625	17,000
SS-AC1500	1 1/2-12	3.250	4.375	0.875	2.250	1.969	1.750	2.375	20,000

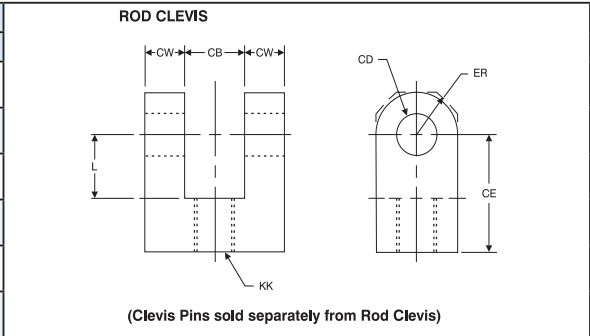
SERIES 'RS': BASIC ACCESSORIES

Accessories (303 Stainless Steel)

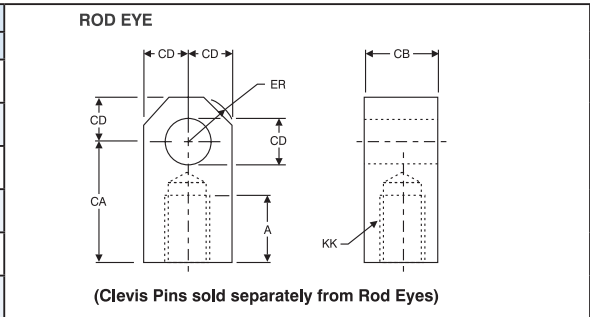
CLEVIS PIN (WITH COTTER PINS)			
PART NO.	CD	LH	LP
SS-CP500	0.500	2.250	1.938
SS-CP750	0.750	3.000	2.719
SS-CP1000	1.000	3.500	3.219
SS-CP1375	1.375	5.000	4.250
SS-CP1750	1.750	6.000	5.500



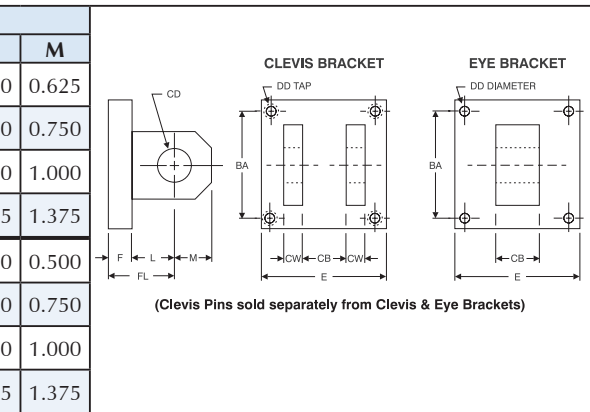
ROD CLEVIS							
PART NO.	CB	CD	CE	CW	ER	KK	L
SS-RC437	0.750	0.500	1.500	0.500	0.500	7/16-20	0.750
SS-RC500	0.750	0.500	1.500	0.500	0.500	1/2-20	0.750
SS-RC750	1.250	0.750	2.375	0.625	0.750	3/4-16	1.250
SS-RC1000	1.500	1.000	3.125	0.750	1.000	1-14	1.500
SS-RC1250	2.000	1.375	4.125	1.000	1.375	1 1/4-12	2.125
SS-RC1500	2.500	1.750	4.500	1.250	1.750	1 1/2-12	2.250



ROD EYE						
PART NO.	A	CA	CB	CD	ER	KK
SS-RE437	0.750	1.500	0.750	0.500	0.625	7/16-20
SS-RE500	0.750	1.500	0.750	0.500	0.625	1/2-20
SS-RE750	1.125	2.063	1.250	0.750	0.875	3/4-16
SS-RE1000	1.625	2.813	1.500	1.000	1.188	1-14
SS-RE1250	2.000	3.438	2.000	1.375	1.563	1 1/4-12
SS-RE1500	2.250	4.000	2.500	1.750	2.000	1 1/2-12



CLEVIS BRACKETS AND EYE BRACKETS											
	PART NO.	BA	CB	CD	CW	DD	E	F	FL	L	M
CLEVIS BRACKETS	SS-CB500	1.625	0.750	0.500	0.500	3/4-24	2.500	0.375	1.125	0.750	0.625
	SS-CB750	2.563	1.250	0.750	0.625	1/2-20	3.500	0.625	1.875	1.250	0.750
	SS-CB1000	3.250	1.500	1.000	0.750	5/8-18	4.500	0.750	2.250	1.500	1.000
	SS-CB1375	3.813	2.000	1.375	1.000	5/8-18	5.000	0.875	3.000	2.125	1.375
EYE BRACKETS	SS-EB500	1.625	0.750	0.500	N/A	0.406	2.500	0.375	1.125	0.750	0.500
	SS-EB750	2.563	1.250	0.750		0.532	3.500	0.625	1.875	1.250	0.750
	SS-EB1000	3.250	1.500	1.000		0.656	4.500	0.750	2.250	1.500	1.000
	SS-EB1375	3.813	2.000	1.375		0.656	5.000	0.875	3.000	2.125	1.375



WEIGHTS OF CYLINDERS

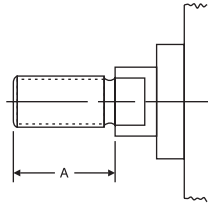
APPROXIMATE WEIGHT FOR STANDARD RODS (LBS.)					
CYLINDER BORE	BASE WEIGHT	ADD PER INCH OF STROKE	CYLINDER BORE	BASE WEIGHT	ADD PER INCH OF STROKE
1.50	2.82	0.27	4.00	30.20	0.70
2.00	5.25	0.33	5.00	24.10	0.84
2.50	8.92	0.39	6.00	36.45	1.12
3.25	20.63	0.61	8.00	69.80	1.80

SERIES 'RS': OPTIONS

A= Extended Piston Rod Thread

"A=" refers to the length of piston rod thread.

Shorter than standard lengths can be furnished at no charge. Longer than standard lengths can be furnished at a nominal price adder. *Special length threads do not delay orders!*

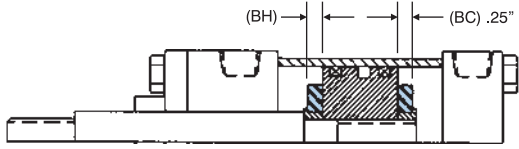


B BC BH Bumpers



Urethane impact dampening bumpers, used when cylinder speeds do not allow for standard cushions.

BC=Cap Bumper BH=Head Bumper B=Head & Cap Bumper

*Note: Each bumper for 1.50"-4.00" Bore adds .125" to cylinder length
Each bumper for 5.00"-8.00" Bore adds .250" to cylinder length*



BP Bumper Piston Seals

1.50" Bore Shown **Available on 1.50" to 8.00" Bore**

TRD's Bumper Piston Seal, when used with our advanced cushion design, decelerates the cylinder at end of stroke; reducing noise and extending cylinder life.


Standard Material: Nitrile
Operating Temp: -20°F to 200°F (-29°C to 93°C)

Optional Material: Fluorocarbon
Available in 1.50"-8.00" Bores
Operating Temp: 0°F to 400°F (-18°C to 204°C)

Operating Pressure: 200 PSI Air (17 BAR)

L001 Magnalube-G Grease

Magnalube-G Grease is our standard lubricant used for all products except for PFLF and RS Series.



Magnalube-G is a non-soap elastomer/PTFE grease designed for superior performance in a wide range of applications. Insoluble in water, Magnalube-G is a nonmigratory grease that tends to stay put in the cylinder if there is no other oil present. Note: if an FRL is used in the pneumatic system, the FRL must be properly maintained to provide continued cylinder lubrication as any oil will negate the Magnalube-G.

See www.magnalube.com for more information.

Color: Green

Recommended temperature range: -20°F to 200°F (-29°C to 93°C)

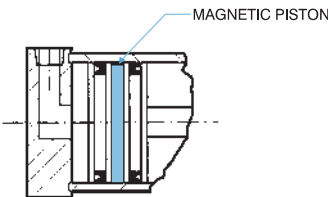
LF Low Friction

Low Friction (LF) option incorporates the use of round-lip, extremely low friction carboxylated nitrile seals. Round-lip seals "hydroplane" on opposed sealing surfaces, and have a lower running and break-away friction.


BORE SIZES: 1.50" to 8.00" Bore
MATERIAL: Carboxylated Nitrile
OPERATING TEMPERATURE: -20°F TO 200°F (-29°C TO 93°C)
OPERATING PRESSURE: 200 PSI AIR (17 BAR)

MPR Magnetic Piston

Magnetic Pistons (MPR) are used in conjunction with TRD R10, R10P, RHT, RAC Reed and MSS Solid State Switches. (See Switches for more information)



OS Oversize Rod



OVERSIZED PISTON ROD **STANDARD PISTON ROD**

Applications requiring long strokes may require oversize piston rod diameters to prevent sagging or buckling. To determine the recommended rod diameter, refer to Chart 3 on page 202 in Full Line Catalog (**available on 5.00"-8.00" bore in RS Series only**).

RWU Rod Wiper made of Urethane

Abrasion resistant urethane provides aggressive wiping action in most environments. External lip design prevents debris from entering cylinder.

VS RWV Fluorocarbon Seals

Higher temperature performance: 0°F to 400°F (-18°C to 204°C)
Higher Chemical resistance: Resists most wash down solutions.

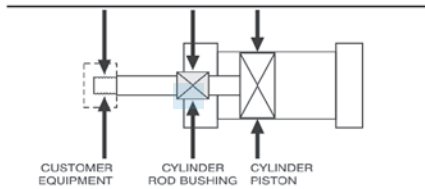
Note: Teflon wiper is used on "VS" Fluorocarbon seal option unless RWV is requested also.

HEAVY DUTY 'SS' STAINLESS STEEL: CONSTRUCTION

Floating Rod Bushing

SELF ALIGNMENT FEATURE

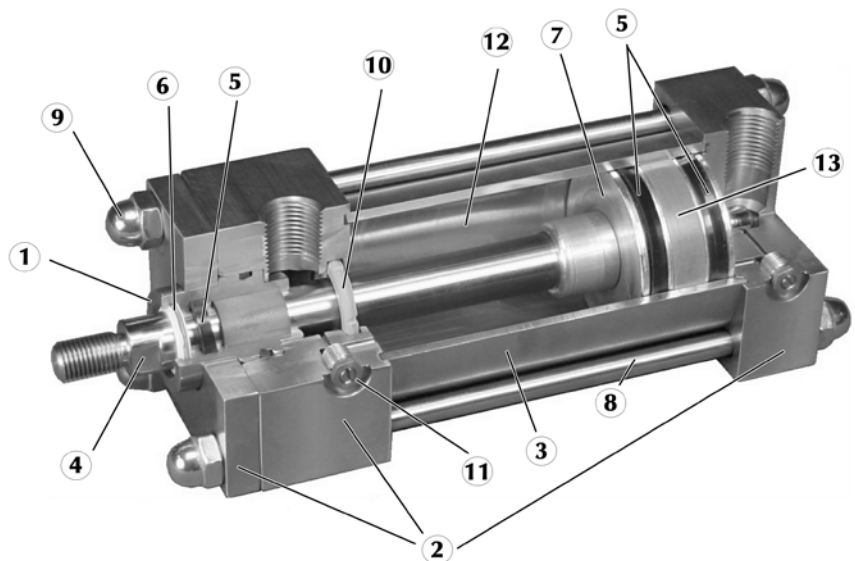
Rod Bushing is designed to float .002" to improve bearing surface alignment.



- Reduces cylinder wear
- Provides a minimum of 25% longer life than fixed Rod Bushing designs

Ideal for:

- Food Processing Applications
- Chemical, Medical or Pharmaceutical
- Offshore or Marine Equipment
- Energy Production or Waste Treatment



- FLOATING ROD BUSHING** – Precision machined from 303 stainless steel, extra-long PTFE composite wear band for extended service.
- HEAD, CAP & RETAINER** – 100% Precision machined from highly corrosion resistant 303 stainless steel bar for tough and corrosive environments.
- CYLINDER TUBE** – Precision machined and honed from 304 stainless steel, providing smooth consistent operation.
- PISTON ROD** – Drawn, ground and polished high yield 303 stainless steel, hard chrome plated.
- PISTON & ROD SEALS** – Heavy lip design Carboxylated Nitrile construction. Seals are pressure activated and wear compensating for long life.
- ROD WIPER** – PTFE scraper design for maximum compatibility with wash-down and chemical solutions (FDA approved material).
- PISTON** – Precision machined from 6061-T651 alloy aluminum for excellent bearing surface to extend life (Optional: Stainless Steel with PTFE wear band).
- TIE RODS** – Drawn and ground 303 high strength stainless steel, rolled threads for maximum strength.
- ACORN NUTS** – 304 Stainless steel, eliminates exposed threads for food grade applications.
- CUSHIONS** – (Options H & C) Floating cushion seal designed for maximum cushion performance, quick return stroke break-away and extended life.
- CUSHION ADJUSTMENT NEEDLE** - 303 stainless steel design has fine thread metering and is positively captured to prevent needle ejection during adjustment.
- LUBRICATION** - Permanently lubricated with Magnalube-G PTFE based grease on all internal components. This lubricant is a non-migratory type high performance grease, providing outstanding service for life (no additional lubrication is required).
- PISTON WEAR BAND** - 90% Virgin PTFE and 10% Polyphenylene Sulfide filled wear band; extremely low wear rate.

OPERATING PRESSURE

250 PSI AIR (17 BAR)
400 PSI Hydraulic (27 BAR)
("TH" Option)

OPERATING TEMPERATURE

Carboxylated Nitrile: -20°F to 200°F (-29°C to 93°C)
Fluorocarbon: 0°F to 400°F (-18°C to 204°C)

Performance options:

- **FDAL** – FDA approved lubricant, rated for 0°F to 300°F (-18°C to 149°C).
- **DRB** – Solid Delrin® Rod Bushing (FDA approved) for extra long life under "high pressure" wash-down applications. This bearing material requires ZERO lubrication due to self lubricating properties.
- **VS** – Fluorocarbon seals provide a higher chemical resistance to most wash-down solutions. Note: PTFE scraper will be used unless otherwise specified.
- **SSP** – Solid Stainless Steel Piston provides maximum corrosion resistance and FDA approval for food contact (PTFE wear band standard).

SERIES 'SS': HOW TO ORDER

SS - MF1 - 2.50 x 10 - HC - MPR

SERIES	
SS	250 PSI AIR

STYLE	
SINGLE ROD (LEAVE BLANK)	
D = DOUBLE ROD END	

BORE	
1.50	
2.00	
2.50	
3.25	
4.00	
5.00	
6.00	
8.00	

STROKE	
0" TO 120"	
CONSULT FACTORY FOR OTHER STROKES	

CUSHIONS	
H = HEAD CUSHION POSITION 2 STANDARD SPECIFY FOR POSITIONS 1, 3 OR 4	
C = CAP CUSHION POSITION 6 STANDARD SPECIFY FOR POSITIONS 5, 7 OR 8	

OPTIONS	
ADDS LENGTH TO CYLINDER. SEE OPTION LENGTH ADDER CHART BELOW.	
A=	EXTENDED PISTON ROD THREAD (SPECIFY)
A/O	AIR/OIL PISTON
AS	ADJUSTABLE STROKE (RETRACT)
X B	.25" URETHANE BUMPER BOTH ENDS
X BC	.25" URETHANE BUMPER CAP ONLY
X BH	.25" URETHANE BUMPER HEAD ONLY
BP	BUMPER PISTON SEAL (1.50"-8.00" BORE)
BSPP	BRITISH STANDARD PIPE TAPER (SPECIFY)
BSPT	BRITISH STANDARD PIPE PARALLEL (SPECIFY)
C=	EXTENDED PISTON ROD (SPECIFY)
FDAL	FDA APPROVED LUBRICANT
KK2	INTERMEDIATE MALE ROD THREAD
KK3	FEMALE ROD THREAD
KK3S	STUDDED PISTON ROD (WITH KK3)
KK4	FULL DIAMETER MALE ROD THREAD
KK5	BLANK ROD END (NO THREADS, A=0)
LF	LOW FRICTION (250 PSI AIR)
MA	MICRO-ADJUST (12" MAX STROKE) AVAILABLE ON DOUBLE ROD END MODELS
MAB	MICRO-ADJUST WITH SOUND DAMPENING BUMPER (12" MAX STROKE)
MPR	MAGNETIC PISTON FOR REED SWITCHES
MS	METALLIC ROD SCRAPER (BRASS)
NR	NON-ROTATING
OP	OPTIONAL PORT LOCATION
OS	OVERSIZED ROD DIAMETER (SPECIFY)
RBD	SOLID DELRIN® ROD BUSHING
SAE	SAE PORTS (SPECIFY, E.G. SAE #10)
X SE	SPRING EXTEND (CONSULT FACTORY)
X SR	SPRING RETURN (CONSULT FACTORY)
SSP	STAINLESS STEEL PISTON (WITH WEARBAND)
X ST	STOP TUBE, SPECIFY ST LENGTH (INCHES), SPECIFY STROKE AS ES (EFFECTIVE STROKE) EXAMPLE: SS-MS4-2X24ES-ST=3
TH	400 PSI HYDRAULIC (NON-SHOCK)
VS1	FLUOROCARBON SEALS
XX	SPECIAL VARIATION (SPECIFY)

About Our Part Number System

- Simple, easy to understand
- No excessive codes!
- Eliminates mistakes when ordering

Example: A 2.50" Bore by 10" Stroke, Front Flange Mount, Head & Cap Cushions, Magnetic Piston for Switches.

Part Number: SS-MF1-2.50 x 10-HC-MPR

OPTION LENGTH ADDER						
(ADD TO CATALOG BASIC OVERALL LENGTH DIMENSIONS)						
BORE	OPTION					
	B	BC	BH	SE	SR	ST ¹ (STOP TUBE) EXAMPLE: ST=2
1.50	0.500	0.250	0.250	REFER TO BASIC OPTIONS FOR LENGTH ADDERS AND AVAILABLE BORE SIZES AND STROKES	2	
2.00	0.500	0.250	0.250		2	
2.50	0.500	0.250	0.250		2	
3.25	0.500	0.250	0.250		2	
4.00	0.500	0.250	0.250		2	
5.00	0.500	0.250	0.250		2	
6.00	0.500	0.250	0.250		2	
8.00	0.500	0.250	0.250		2	

¹ The desired stop tube (ST) length adds directly to the overall cylinder length. Specify stop tube location.

STANDARD PORT AND CUSHION ADJUSTMENT POSITIONS

- Ports - Positions 1 and 5
- Cushion Adjustment - Positions 2 and 6
- Specify Non-Standard Positions When Ordering

NFPA MOUNTS

 ME3 8.00" Bore	 ME4 8.00" Bore	 MF1 1.50"-6.00" Bores	 MF2 1.50"-6.00" Bores	 MP1 1.50"-8.00" Bores
 MP4 1.50"-6.00" Bores	 MS2 1.50"-8.00" Bores	 MS4 1.50"-8.00" Bores	 MT1 1.50"-8.00" Bores	 MT2 1.50"-8.00" Bores
 MX0 1.50"-8.00" Bores	 MX1 1.50"-8.00" Bores	 MX2 1.50"-8.00" Bores	 MX3 1.50"-8.00" Bores	

SERIES 'SS' DIMENSIONS: BASIC CYLINDER (NO MOUNT)

EASY FLIP OUT PAGE FOR REFERENCE

About Rod End Styles

Style 1 Male Rod End is STANDARD

Other NFPA Styles can be specified (see chart).

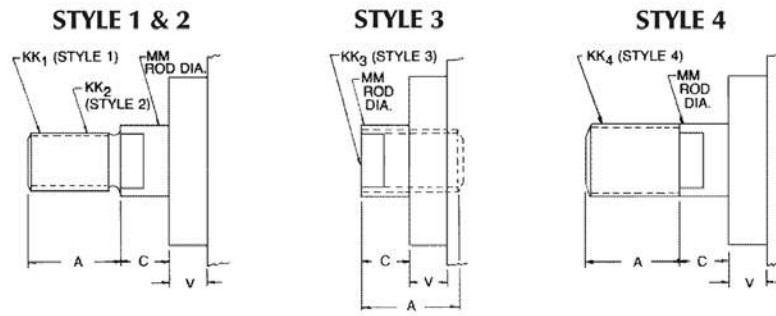
Need a rod end not listed? NO PROBLEM! Each Piston Rod is made-to-order and does not delay shipment. Coarse UNC threads, Metric threads or just plain rod ends are common. Thread lengths are also made-to-order (Specify: "A"=Length).

NEED SOMETHING NOT LISTED?

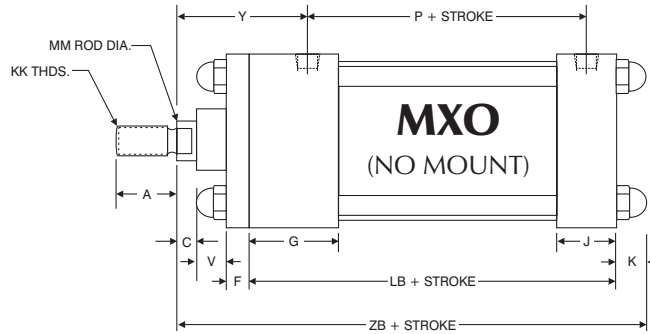
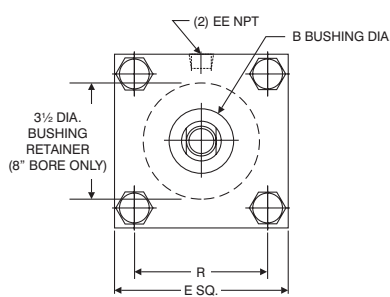
Just send us a sketch.

In most cases, quotes are turned around in one day!

PISTON ROD END STYLES



BORE	MM ROD DIAMETER	STANDARD		OPTIONAL						C	V
		STYLE 1 - MALE		STYLE 2 - MALE		STYLE 3 - FEMALE		STYLE 4 - MALE			
		KK1	A	KK2	A	KK3	A	KK4	A		
1.50, 2.00, 2.50	0.625 Standard	7/16-20	0.750	1/2-20	0.750	7/16-20	0.750	5/8-18	0.750	0.375	0.250
	1.000 Oversize	3/4-16	1.125	7/8-14	1.125	3/4-16	1.125	1-14	1.125	0.500	0.500
3.25, 4.00, 5.00	1.000 Standard	3/4-16	1.125	7/8-14	1.125	3/4-16	1.125	1-14	1.125	0.500	0.250
	1.375 Oversize	1-14	1.625	1 1/4-12	1.625	1-14	1.625	1 3/8-12	1.625	0.625	0.375
6.00	1.375 Standard	1-14	1.625	1 1/4-12	1.625	1-14	1.625	1 3/8-12	1.625	0.625	0.250
	1.750 Oversize	1 1/4-12	2.000	1 1/2-12	2.000	1 1/4-12	2.000	1 3/4-12	2.000	0.750	0.375
8.00	1.375 Standard	1-14	1.625	1 1/4-12	1.625	1-14	1.625	1 3/8-12	1.625	0.625	0.375
	1.750 Oversize	1 1/4-12	2.000	1 1/2-12	2.000	1 1/4-12	2.000	1 3/4-12	2.000	0.750	0.500



BASIC DIMENSIONS 'MXO' STANDARD & OVERSIZED RODS

BORE	ROD DIAMETER	A	B	C	E	EE	F	G	J	K	KK	LB	MM	P	R	V	Y	ZB
1.50	0.625 Standard	0.750	1.125	0.375	2.000	0.375	0.375	1.500	1.000	0.438	7/16-20	3.625	0.625	2.375	1.430	0.250	1.875	5.063
	1.000 Oversize	1.125	1.500	0.500							3/4-16		1.000			0.500	2.250	5.438
2.00	0.625 Standard	0.750	1.125	0.375	2.500	0.375	0.375	1.500	1.000	0.563	7/16-20	3.625	0.625	2.375	1.840	0.250	1.875	5.188
	1.000 Oversize	1.125	1.500	0.500							3/4-16		1.000			0.500	2.250	5.563
2.50	0.625 Standard	0.750	1.125	0.375	3.000	0.375	0.375	1.500	1.000	0.563	7/16-20	3.750	0.625	2.500	2.190	0.250	1.875	5.313
	1.000 Oversize	1.125	1.500	0.500							3/4-16		1.000			0.500	2.250	5.688
3.25	1.000 Standard	1.125	1.500	0.500	3.750	0.500	0.625	1.750	1.250	0.625	3/4-16	4.250	1.000	2.750	2.760	0.250	2.375	6.250
	1.375 Oversize	1.625	2.000	0.625							1-14		1.375			0.375	2.625	6.500
4.00	1.000 Standard	1.125	1.500	0.500	4.500	0.500	0.625	1.750	1.250	0.625	3/4-16	4.250	1.000	2.750	3.320	0.250	2.375	6.250
	1.375 Oversize	1.625	2.000	0.625							1-14		1.375			0.375	2.625	6.500
5.00	1.000 Standard	1.125	1.500	0.500	5.500	0.500	0.625	1.750	1.250	0.813	3/4-16	4.500	1.000	3.000	4.100	0.250	2.375	6.625
	1.375 Oversize	1.625	2.000	0.625							1-14		1.375			0.375	2.625	6.875
6.00	1.375 Standard	1.625	2.000	0.625	6.500	0.750	0.750	2.000	1.500	0.813	1-14	5.000	1.375	3.250	4.880	0.250	2.750	7.375
	1.750 Oversize	2.000	2.375	0.750							1 1/4-12		1.750			0.375	3.000	7.625
8.00	1.375 Standard	1.625	2.000	0.625	8.500	0.750	0.625	2.000	1.500	1.000	1-14	5.125	1.375	3.375	6.440	0.375	2.750	7.750
	1.750 Oversize	2.000	2.375	0.750							1 1/4-12		1.750			0.500	3.000	8.000

SERIES 'SS' DIMENSIONS: BASIC CYLINDER (NO MOUNT)

About Rod End Styles

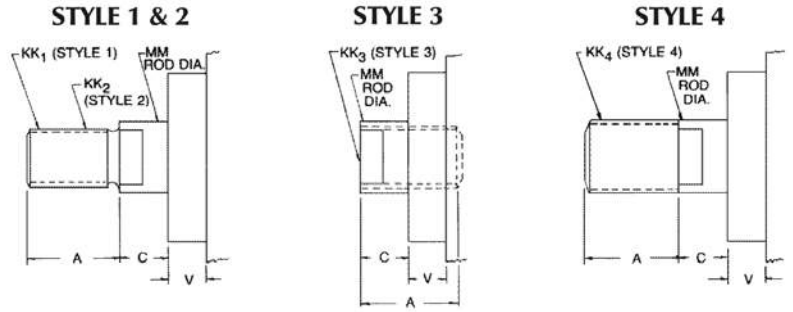
Style 1 Male Rod End is STANDARD

Other NFPA Styles can be specified (see chart).

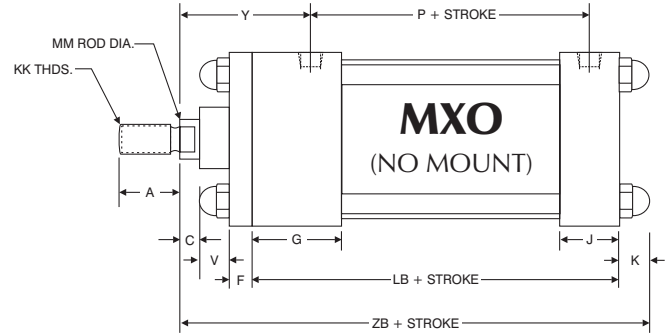
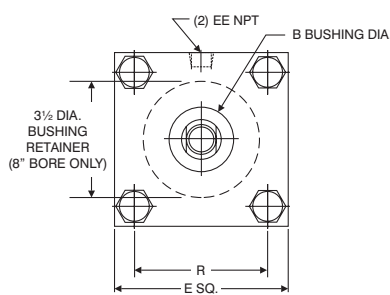
Need a rod end not listed?
NO PROBLEM! Each Piston Rod is made-to-order and does not delay shipment. Coarse UNC threads, Metric threads or just plain rod ends are common. Thread lengths are also made-to-order (Specify: "A"=Length).

NEED SOMETHING NOT LISTED?
Just send us a sketch.
In most cases, quotes are turned around in one day!

PISTON ROD END STYLES

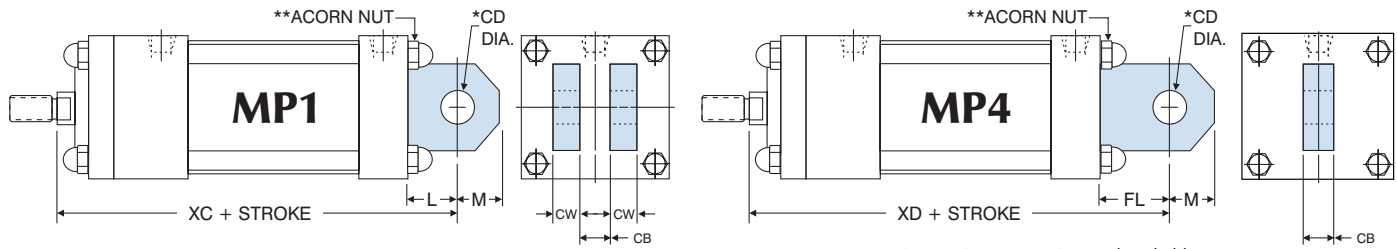


BORE	MM ROD DIAMETER	STANDARD		OPTIONAL						C	V
		STYLE 1 - MALE		STYLE 2 - MALE		STYLE 3 - FEMALE		STYLE 4 - MALE			
		KK1	A	KK2	A	KK3	A	KK4	A		
1.50, 2.00, 2.50	0.625 Standard	7/16-20	0.750	1/2-20	0.750	7/16-20	0.750	5/8-18	0.750	0.375	0.250
	1.000 Oversize	3/4-16	1.125	7/8-14	1.125	3/4-16	1.125	1-14	1.125	0.500	0.500
3.25, 4.00, 5.00	1.000 Standard	3/4-16	1.125	7/8-14	1.125	3/4-16	1.125	1-14	1.125	0.500	0.250
	1.375 Oversize	1-14	1.625	1 1/4-12	1.625	1-14	1.625	1 3/8-12	1.625	0.625	0.375
6.00	1.375 Standard	1-14	1.625	1 1/4-12	1.625	1-14	1.625	1 3/8-12	1.625	0.625	0.250
	1.750 Oversize	1 1/4-12	2.000	1 1/2-12	2.000	1 1/4-12	2.000	1 3/4-12	2.000	0.750	0.375
8.00	1.375 Standard	1-14	1.625	1 1/4-12	1.625	1-14	1.625	1 3/8-12	1.625	0.625	0.375
	1.750 Oversize	1 1/4-12	2.000	1 1/2-12	2.000	1 1/4-12	2.000	1 3/4-12	2.000	0.750	0.500



BASIC DIMENSIONS 'MXO' STANDARD & OVERSIZED RODS																		
BORE	ROD DIAMETER	A	B	C	E	EE	F	G	J	K	KK	LB	MM	P	R	V	Y	ZB
1.50	0.625 Standard	0.750	1.125	0.375	2.000	0.375	0.375	1.500	1.000	0.438	7/16-20	3.625	0.625	2.375	1.430	0.250	1.875	5.063
	1.000 Oversize	1.125	1.500	0.500							3/4-16		1.000			0.500	2.250	5.438
2.00	0.625 Standard	0.750	1.125	0.375	2.500	0.375	0.375	1.500	1.000	0.563	7/16-20	3.625	0.625	2.375	1.840	0.250	1.875	5.188
	1.000 Oversize	1.125	1.500	0.500							3/4-16		1.000			0.500	2.250	5.563
2.50	0.625 Standard	0.750	1.125	0.375	3.000	0.375	0.375	1.500	1.000	0.563	7/16-20	3.750	0.625	2.500	2.190	0.250	1.875	5.313
	1.000 Oversize	1.125	1.500	0.500							3/4-16		1.000			0.500	2.250	5.688
3.25	1.000 Standard	1.125	1.500	0.500	3.750	0.500	0.625	1.750	1.250	0.625	3/4-16	4.250	1.000	2.750	2.760	0.250	2.375	6.250
	1.375 Oversize	1.625	2.000	0.625							1-14		1.375			0.375	2.625	6.500
4.00	1.000 Standard	1.125	1.500	0.500	4.500	0.500	0.625	1.750	1.250	0.625	3/4-16	4.250	1.000	2.750	3.320	0.250	2.375	6.250
	1.375 Oversize	1.625	2.000	0.625							1-14		1.375			0.375	2.625	6.500
5.00	1.000 Standard	1.125	1.500	0.500	5.500	0.500	0.625	1.750	1.250	0.813	3/4-16	4.500	1.000	3.000	4.100	0.250	2.375	6.625
	1.375 Oversize	1.625	2.000	0.625							1-14		1.375			0.375	2.625	6.875
6.00	1.375 Standard	1.625	2.000	0.625	6.500	0.750	0.750	2.000	1.500	0.813	1-14	5.000	1.375	3.250	4.880	0.250	2.750	7.375
	1.750 Oversize	2.000	2.375	0.750							1 1/4-12		1.750			0.375	3.000	7.625
8.00	1.375 Standard	1.625	2.000	0.625	8.500	0.750	0.625	2.000	1.500	1.000	1-14	5.125	1.375	3.375	6.440	0.375	2.750	7.750
	1.750 Oversize	2.000	2.375	0.750							1 1/4-12		1.750			0.500	3.000	8.000

SERIES 'SS' DIMENSIONS: PIVOT MOUNTS



Note: Pivot Mount is non-detachable.
Contact factory for detachable mount options.

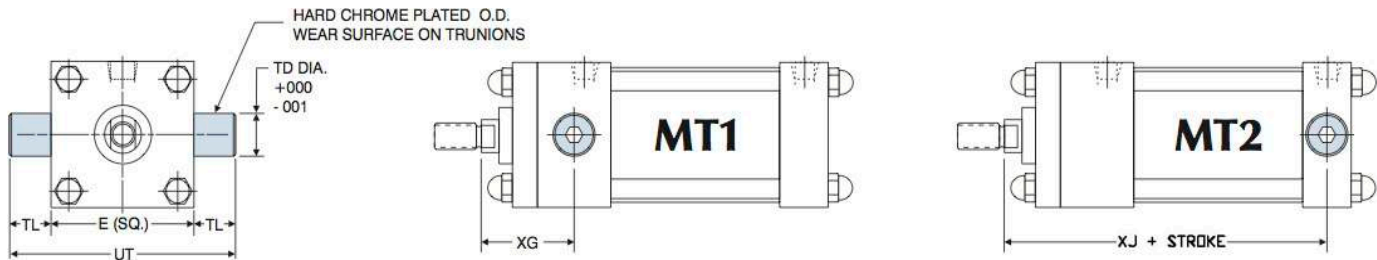
'MP1' CLEVIS AND 'MP4' EYE MOUNT DIMENSIONS								ACCESSORIES (SEE PAGE 210 FOR DIMENSIONS)					
BORE	ROD DIAMETER	CB	CD	CW	FL	L	M	XC	XD	ROD CLEVIS	ROD EYE	CLEVIS PIN	EYE BRACKET (FOR MP1)
1.50	0.625 Standard	0.750	0.500	0.500	1.125	0.750	0.625	5.375	5.750	SS-RC437	SS-RE437	SS-CP500	SS-EB500
	1.000 Oversize							5.750	6.125	SS-RC750	SS-RE750	SS-CP750	
2.00	0.625 Standard	0.750	0.500	0.500	1.125	0.750	0.625	5.375	5.750	SS-RC437	SS-RE437	SS-CP500	SS-EB500
	1.000 Oversize							5.750	6.125	SS-RC750	SS-RE750	SS-CP750	
2.50	0.625 Standard	0.750	0.500	0.500	1.125	0.750	0.625	5.500	5.875	SS-RC437	SS-RE437	SS-CP500	SS-EB500
	1.000 Oversize							5.875	6.250	SS-RC750	SS-RE750	SS-CP750	
3.25	1.000 Standard	1.250	0.750	0.625	1.875	1.250	0.875	6.875	7.500	SS-RC750	SS-RE750	SS-CP750	SS-EB750
	1.375 Oversize							7.125	7.750	SS-RC1000	SS-RE1000	SS-CP1000	
4.00	1.000 Standard	1.250	0.750	0.625	1.875	1.250	0.875	6.875	7.500	SS-RC750	SS-RE750	SS-CP750	SS-EB750
	1.375 Oversize							7.125	7.750	SS-RC1000	SS-RE1000	SS-CP1000	
5.00	1.000 Standard	1.250	0.750	0.625	1.875	1.250	0.875	7.125	7.750	SS-RC750	SS-RE750	SS-CP750	SS-EB750
	1.375 Oversize							7.375	8.000	SS-RC1000	SS-RE1000	SS-CP1000	
6.00	1.375 Standard	1.500	1.000	0.750	2.250	1.500	1.000	8.125	8.875	SS-RC1000	SS-RE1000	SS-CP1000	SS-EB1000
	1.750 Oversize							8.375	9.125	SS-RC1250	SS-RE1250	SS-CP1375	
8.00	1.375 Standard	1.500	1.000	0.750	N/A	1.500	1.000	8.250	N/A	SS-RC1000	SS-RE1000	SS-CP1000	SS-EB1000
	1.750 Oversize							8.500	N/A	SS-RC1250	SS-RE1250	SS-CP1375	

For dimensions not shown, see page 141.

*Clevis pin provided with MP1 and MP4 mounts.

**Acorn nuts are located on cap end (4.00"-8.00" bores).

Note: MP4 8.00" bore not available.



MT1 / MT2

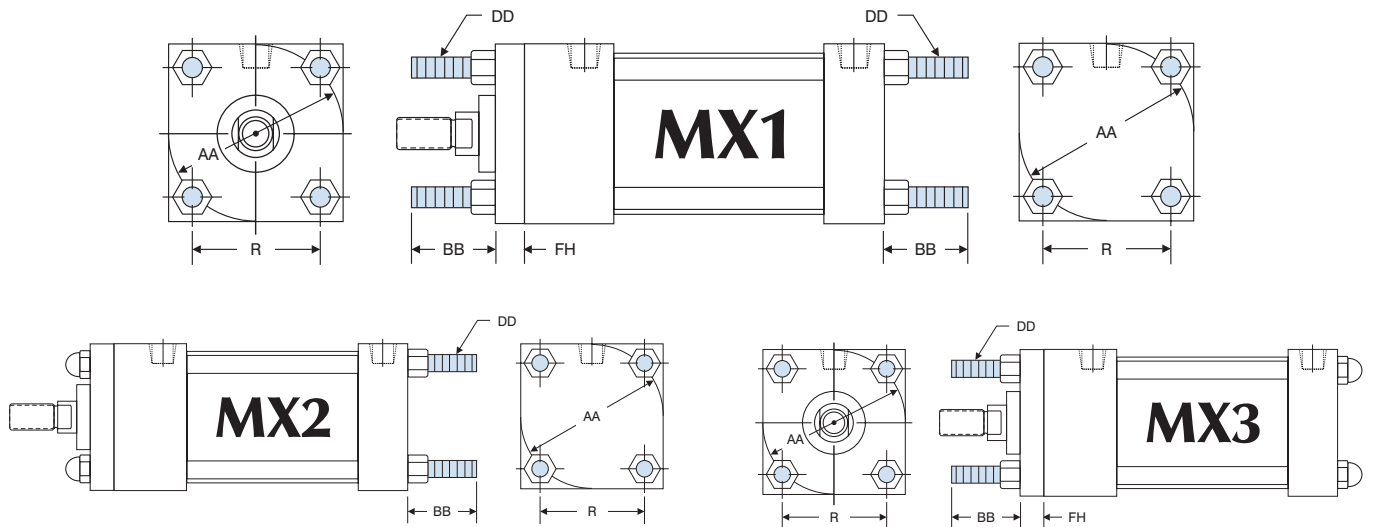
Note: Trunnions are bolt on, non-removable design.

'MT1' HEAD TRUNNION AND 'MT2' CAP TRUNNION MOUNT DIMENSIONS								ACCESSORIES (SEE PAGE 210 FOR DIMENSIONS)		
BORE	ROD DIAMETER	E	TD	TL	UT	XG	XJ	ROD CLEVIS	ROD EYE	CLEVIS PIN
1.50	0.625 Standard	2.000	1.000	1.000	4.000	1.750	4.125	SS-RC437	SS-RE437	SS-CP500
	1.000 Oversize*					N/A	4.500	SS-RC750	SS-RE750	SS-CP750
2.00	0.625 Standard	2.500	1.000	1.000	4.500	1.750	4.125	SS-RC437	SS-RE437	SS-CP500
	1.000 Oversize					2.125	4.500	SS-RC750	SS-RE750	SS-CP750
2.50	0.625 Standard	3.000	1.000	1.000	5.000	1.750	4.250	SS-RC437	SS-RE437	SS-CP500
	1.000 Oversize					2.125	4.625	SS-RC750	SS-RE750	SS-CP750
3.25	1.000 Standard	3.750	1.000	1.000	5.750	2.250	5.000	SS-RC750	SS-RE750	SS-CP750
	1.375 Oversize					2.500	5.250	SS-RC1000	SS-RE1000	SS-CP1000
4.00	1.000 Standard	4.500	1.000	1.000	6.500	2.250	5.000	SS-RC750	SS-RE750	SS-CP750
	1.375 Oversize					2.500	5.250	SS-RC1000	SS-RE1000	SS-CP1000
5.00	1.000 Standard	5.500	1.000	1.000	7.500	2.250	5.250	SS-RC750	SS-RE750	SS-CP750
	1.375 Oversize					2.500	5.500	SS-RC1000	SS-RE1000	SS-CP1000
6.00	1.375 Standard	6.500	1.375	1.375	9.250	2.625	5.875	SS-RC1000	SS-RE1000	SS-CP1000
	1.750 Oversize					2.875	6.125	SS-RC1250	SS-RE1250	SS-CP1375
8.00	1.375 Standard	8.500	1.375	1.375	11.250	2.625	6.000	SS-RC1000	SS-RE1000	SS-CP1000
	1.750 Oversize					2.875	6.250	SS-RC1250	SS-RE1250	SS-CP1375

*No Oversize rod on 1.50" bore on MT1 mount.

For dimensions not shown, see page 141.

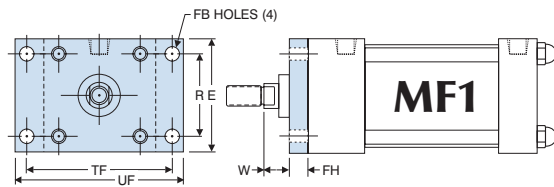
SERIES 'SS' DIMENSIONS: TIE ROD & FLANGE MOUNTS



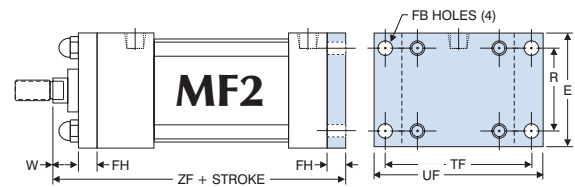
TIE ROD EXTENDED 'MX1', 'MX2' & 'MX3' MOUNT DIMENSIONS						
BORE	ROD DIAMETER	AA	BB	DD	FH	R
1.50	0.625 Standard	2.020	1.000	1/4-28	0.375	1.430
	1.000 Oversize					
2.00	0.625 Standard	2.600	1.125	5/16-24	0.375	1.840
	1.000 Oversize					
2.50	0.625 Standard	3.100	1.125	5/16-24	0.375	2.190
	1.000 Oversize					
3.25	1.000 Standard	3.900	1.375	3/8-24	0.625	2.760
	1.375 Oversize					

TIE ROD EXTENDED 'MX1', 'MX2' & 'MX3' MOUNT DIMENSIONS						
BORE	ROD DIAMETER	AA	BB	DD	FH	R
4.00	1.000 Standard	4.700	1.375	3/8-24	0.625	3.320
	1.375 Oversize					
5.00	1.000 Standard	5.800	1.813	1/2-20	0.625	4.100
	1.375 Oversize					
6.00	1.375 Standard	6.900	1.813	1/2-20	0.750	4.880
	1.750 Oversize					
8.00	1.375 Standard	9.100	2.313	5/8-18	0.625*	6.440
	1.750 Oversize					

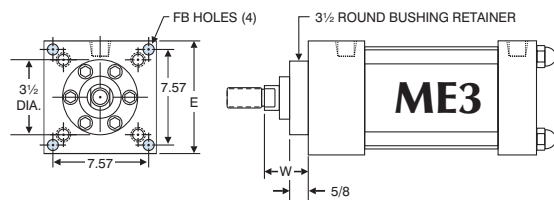
Full square bushing retainer on 1.50" through 6.00" bore.
 *Round retainer on 8.00" bore. BB dimension from face of head.
 For dimensions not shown, see page 141.



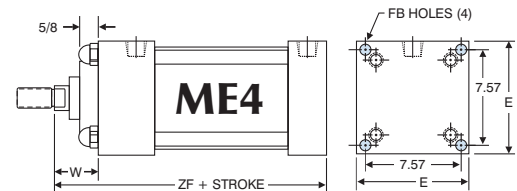
1.50" - 6.00" BORES



1.50" - 6.00" BORES



8.00" BORE ONLY



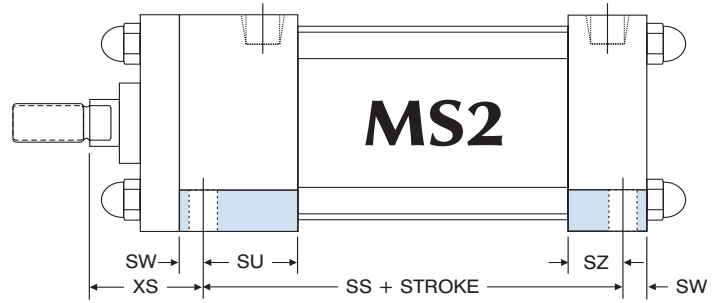
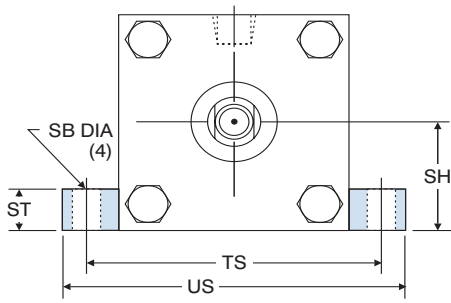
8.00" BORE ONLY

'MF1', 'MF2' FLANGE & 'ME3', 'ME4' CAP MOUNT DIMENSIONS									
BORE	ROD DIAMETER	E	FB	FH	R	TF	UF	W	ZF
1.50	0.625 Standard	2.000	0.313	0.375	1.430	2.750	3.375	0.625	5.000
	1.000 Oversize							1.000	5.375
2.00	0.625 Standard	2.500	0.375	0.375	1.840	3.375	4.125	0.625	5.000
	1.000 Oversize							1.000	5.375
2.50	0.625 Standard	3.000	0.375	0.375	2.190	3.875	4.625	0.625	5.125
	1.000 Oversize							1.000	5.500
3.25	1.000 Standard	3.750	0.438	0.625	2.760	4.688	5.500	0.750	6.250
	1.375 Oversize							1.000	6.500

'MF1', 'MF2' FLANGE & 'ME3', 'ME4' CAP MOUNT DIMENSIONS									
BORE	ROD DIAMETER	E	FB	FH	R	TF	UF	W	ZF
4.00	1.000 Standard	4.500	0.438	0.625	3.320	5.438	6.250	0.750	6.250
	1.375 Oversize							1.000	6.500
5.00	1.000 Standard	5.500	0.563	0.625	4.100	6.625	7.625	0.750	6.500
	1.375 Oversize							1.000	6.750
6.00	1.375 Standard	6.500	0.563	0.750	4.880	7.625	8.625	0.875	7.375
	1.750 Oversize							1.125	7.625
8.00	1.375 Standard	8.500	0.688	N/A	N/A	N/A	N/A	1.625	6.750
	1.750 Oversize							1.875	7.000

Full square bushing retainer on 1.50" through 6.00" bore.
 *Round retainer on 8.00" bore.
 For dimensions not shown, see page 141.

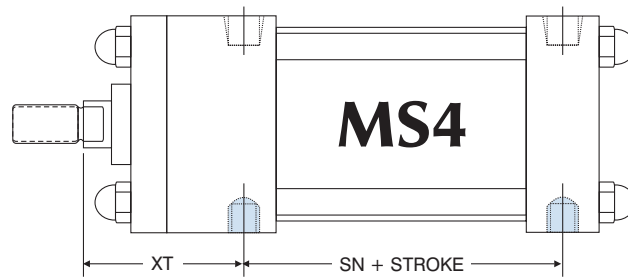
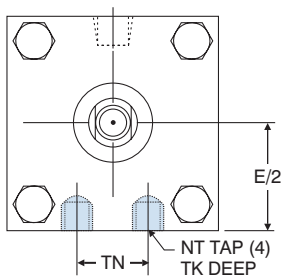
SERIES 'SS' DIMENSIONS: BASE MOUNTS



'MS2' SIDE LUG MOUNT DIMENSIONS

BORE	ROD DIAMETER	SB	SH	ST	SU	SW	SZ	TS	US	XS	SS ADD STROKE
1.50	0.625 Standard	0.438	1.000	0.500	1.125	0.375	0.625	2.750	3.500	1.375	2.875
	1.000 Oversize									1.750	
2.00	0.625 Standard	0.438	1.250	0.500	1.125	0.375	0.625	3.250	4.000	1.375	2.875
	1.000 Oversize									1.750	
2.50	0.625 Standard	0.438	1.500	0.500	1.125	0.375	0.625	3.750	4.500	1.375	3.000
	1.000 Oversize									1.750	
3.25	1.000 Standard	0.563	1.875	0.750	1.250	0.500	0.750	4.750	5.750	1.875	3.250
	1.375 Oversize									2.125	
4.00	1.000 Standard	0.563	2.250	0.750	1.250	0.500	0.750	5.500	6.500	1.875	3.250
	1.375 Oversize									2.125	
5.00	1.000 Standard	0.813	2.750	1.000	1.063	0.688	0.563	6.875	8.250	2.063	3.125
	1.375 Oversize									2.313	
6.00	1.375 Standard	0.813	3.250	1.000	1.313	0.688	0.813	7.875	9.250	2.313	3.625
	1.750 Oversize									2.563	
8.00	1.375 Standard	0.813	4.250	1.000	1.563	0.688	0.813	9.875	11.250	2.313	3.750
	1.750 Oversize									2.563	

Full square bushing retainer on 1.50" through 6.00" bore.
Round retainer on 8.00" bore.
For dimensions not shown, see page 141.



'MS4' BOTTOM TAP MOUNT DIMENSIONS

BORE	ROD DIAMETER	E/2	NT	TK	TN	XT	SN ADD STROKE
1.50	0.625 Standard	1.000	1/4 -20	0.375	0.625	1.938	2.250
	1.000 Oversize					2.313	
2.00	0.625 Standard	1.250	5/16 -18	0.500	0.875	1.938	2.250
	1.000 Oversize					2.313	
2.50	0.625 Standard	1.500	3/8 -16	0.625	1.250	1.938	2.375
	1.000 Oversize					2.313	
3.25	1.000 Standard	1.875	1/2 -13	0.750	1.500	2.438	2.625
	1.375 Oversize					2.688	
4.00	1.000 Standard	2.250	1/2 -13	0.750	2.063	2.438	2.625
	1.375 Oversize					2.688	
5.00	1.000 Standard	2.750	5/8 -11	1.000	2.688	2.438	2.875
	1.375 Oversize					2.688	
6.00	1.375 Standard	3.250	3/4 -10	1.125	3.250	2.813	3.125
	1.750 Oversize					3.063	
8.00	1.375 Standard	4.250	3/4 -10	1.125	4.500	2.813	3.250
	1.750 Oversize					3.063	

Full square bushing retainer on 1.50" through 6.00" bore
Round retainer on 8.00" bore.
For dimensions not shown, see page 141.

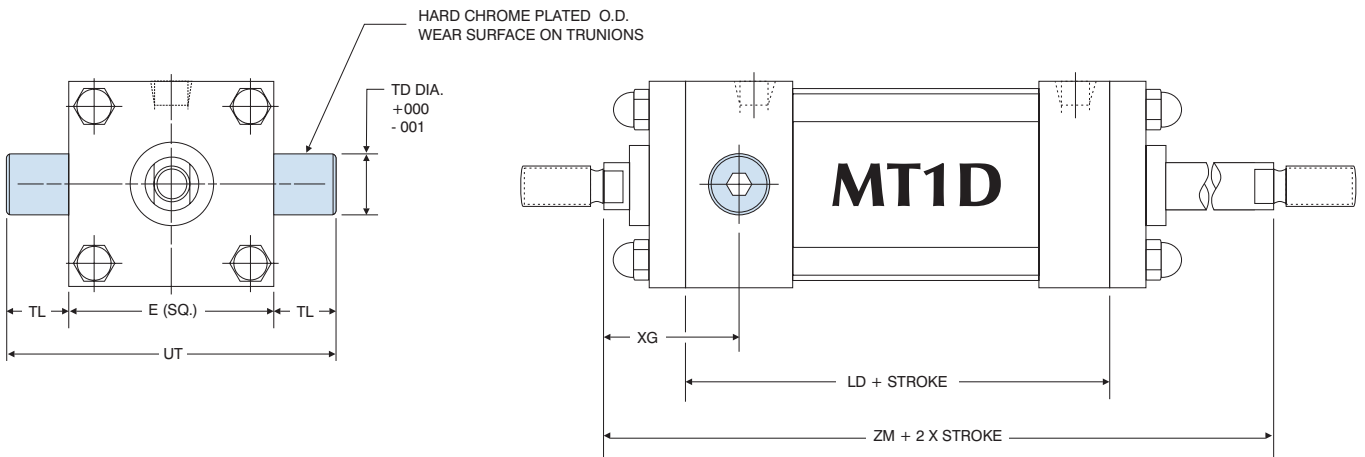
SERIES 'SS' DIMENSIONS: DOUBLE ROD END

Benefits

- Standard and Oversized Piston Rods available.
- Full range of Standard Options.
- Durable design. Full Rod Bearing at each end of cylinder.
- Can be provided with Hollow Piston Rods (gun-drilled through, to your size requirements).
- Can be used in adjustable extend stroke applications (by adding a stop collar on one rod end).



(MT1D MOUNT SHOWN)



Note: Trunnions are bolt on, non-removable design.

'SS-MT1D' HEAD TRUNNION MOUNT DIMENSIONS								
BORE	ROD DIAMETER	E	LD	TD	TL	UT	XG	ZM
1.50	0.625 Standard	2.000	4.125	1.000	1.000	4.000	1.750	6.125
	N/A*						N/A	
2.00	0.625 Standard	2.500	4.125	1.000	1.000	4.500	1.750	6.125
	1.000 Oversize						2.125	6.875
2.50	0.625 Standard	3.000	4.250	1.000	1.000	5.000	1.750	6.250
	1.000 Oversize						2.125	7.000
3.25	1.000 Standard	3.750	4.750	1.000	1.000	5.750	2.250	7.500
	1.375 Oversize						2.500	8.000
4.00	1.000 Standard	4.500	4.750	1.000	1.000	6.500	2.250	7.500
	1.375 Oversize						2.500	8.000
5.00	1.000 Standard	5.500	5.000	1.000	1.000	7.500	2.250	7.750
	1.375 Oversize						2.500	8.250
6.00	1.375 Standard	6.500	5.500	1.375	1.375	9.250	2.625	8.750
	1.750 Oversize						2.875	9.250
8.00	1.375 Standard	8.500	5.625	1.375	1.375	11.250	2.625	8.875
	1.750 Oversize						2.875	9.375

* No oversized rod available on 1.50" bore.

SERIES 'SS' DIMENSIONS: DOUBLE ROD END

EASY FLIP OUT PAGE FOR REFERENCE

About Rod End Styles

Style 1 Male Rod End is STANDARD

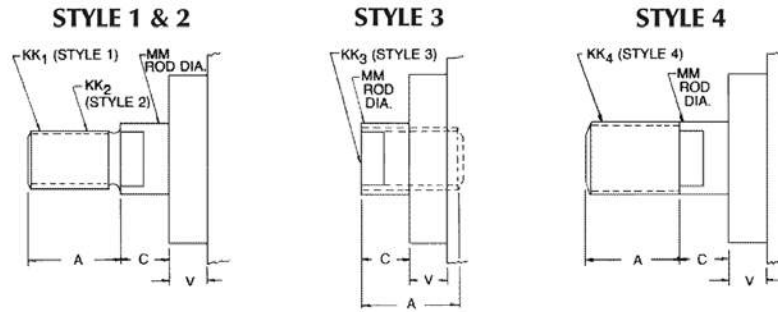
Other NFPA Styles can be specified (see chart).

Need a rod end not listed?
NO PROBLEM! Each Piston Rod is made-to-order and does not delay shipment. Coarse UNC threads, Metric threads or just plain rod ends are common. Thread lengths are also made-to-order (Specify: "A"=Length).

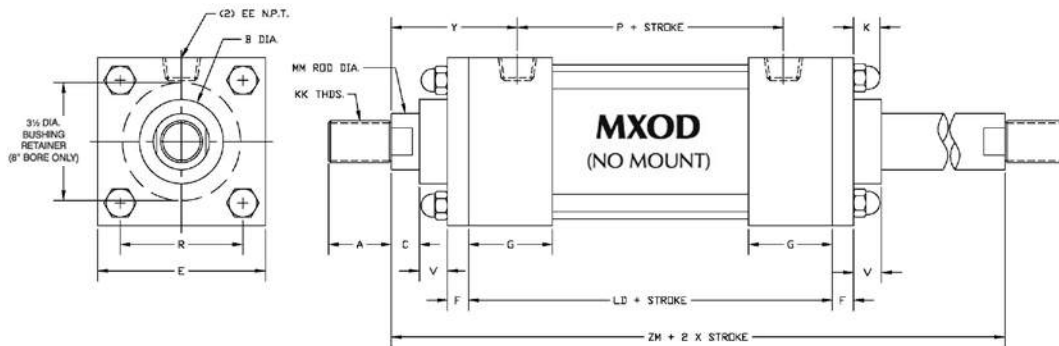
NEED SOMETHING NOT LISTED?
Just send us a sketch.

In most cases, quotes are turned around in one day!

PISTON ROD END STYLES



BORE	MM ROD DIAMETER	STANDARD		OPTIONAL						C	V
		STYLE 1 - MALE		STYLE 2 - MALE		STYLE 3 - FEMALE		STYLE 4 - MALE			
		KK1	A	KK2	A	KK3	A	KK4	A		
1.50, 2.00, 2.50	0.625 Standard	7/16-20	0.750	1/2-20	0.750	7/16-20	0.750	5/8-18	0.750	0.375	0.250
	1.000 Oversize	3/4-16	1.125	7/8-14	1.125	3/4-16	1.125	1-14	1.125	0.500	0.500
3.25, 4.00, 5.00	1.000 Standard	3/4-16	1.125	7/8-14	1.125	3/4-16	1.125	1-14	1.125	0.500	0.250
	1.375 Oversize	1-14	1.625	1 1/4-12	1.625	1-14	1.625	1 3/8-12	1.625	0.625	0.375
6.00	1.375 Standard	1-14	1.625	1 1/4-12	1.625	1-14	1.625	1 3/8-12	1.625	0.625	0.250
	1.750 Oversize	1 1/4-12	2.000	1 1/2-12	2.000	1 1/4-12	2.000	1 3/4-12	2.000	0.750	0.375
8.00	1.375 Standard	1-14	1.625	1 1/4-12	1.625	1-14	1.625	1 3/8-12	1.625	0.625	0.375
	1.750 Oversize	1 1/4-12	2.000	1 1/2-12	2.000	1 1/4-12	2.000	1 3/4-12	2.000	0.750	0.500



DOUBLE ROD 'MX0D' DIMENSIONS STANDARD & OVERSIZED RODS																	
BORE	ROD DIAMETER	A	B	C	E	EE	F	G	K	KK	LD	MM	P	R	V	Y	ZM
1.50	0.625 Standard	0.750	1.125	0.375	2.000	0.375	0.375	1.500	0.438	7/16-20	4.125	0.625	2.375	1.430	0.250	1.875	6.125
	1.000 Oversize	1.125	1.500	0.500						3/4-16		1.000					
2.00	0.625 Standard	0.750	1.125	0.375	2.500	0.375	0.375	1.500	0.563	7/16-20	4.125	0.625	2.375	1.840	0.250	1.875	6.125
	1.000 Oversize	1.125	1.500	0.500						3/4-16		1.000					
2.50	0.625 Standard	0.750	1.125	0.375	3.000	0.375	0.375	1.500	0.563	7/16-20	4.250	0.625	2.500	2.190	0.250	1.875	6.250
	1.000 Oversize	1.125	1.500	0.500						3/4-16		1.000					
3.25	1.000 Standard	1.125	1.500	0.500	3.750	0.500	0.625	1.750	0.625	3/4-16	4.750	1.000	2.750	2.760	0.250	2.375	7.500
	1.375 Oversize	1.625	2.000	0.625						1-14		1.375					
4.00	1.000 Standard	1.125	1.500	0.500	4.500	0.500	0.625	1.750	0.625	3/4-16	4.750	1.000	2.750	3.320	0.250	2.375	7.500
	1.375 Oversize	1.625	2.000	0.625						1-14		1.375					
5.00	1.000 Standard	1.125	1.500	0.500	5.500	0.500	0.625	1.750	0.813	3/4-16	5.000	1.000	3.000	4.100	0.250	2.375	7.750
	1.375 Oversize	1.625	2.000	0.625						1-14		1.375					
6.00	1.375 Standard	1.625	2.000	0.625	6.500	0.750	0.750	2.000	0.813	1-14	5.500	1.375	3.250	4.880	0.250	2.750	8.750
	1.750 Oversize	2.000	2.375	0.750						1 1/4-12		1.750					
8.00	1.375 Standard	1.625	2.000	0.625	8.500	0.750	0.625	2.000	1.000	1-14	5.625	1.375	3.375	6.440	0.375	2.750	8.875
	1.750 Oversize	2.000	2.375	0.750						1 1/4-12		1.750					

SERIES 'SS' DIMENSIONS: DOUBLE ROD END

About Rod End Styles

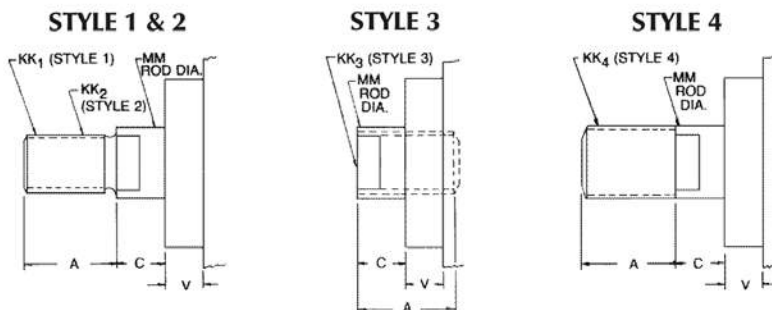
Style 1 Male Rod End is STANDARD

Other NFPA Styles can be specified (see chart).

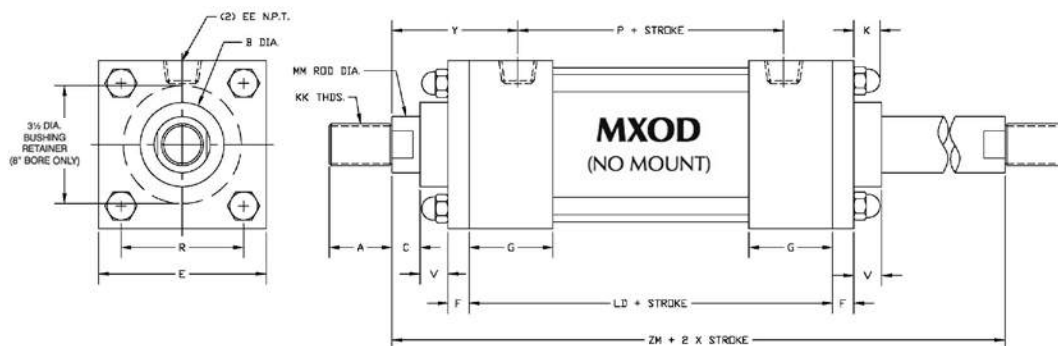
Need a rod end not listed? NO PROBLEM! Each Piston Rod is made-to-order and does not delay shipment. Coarse UNC threads, Metric threads or just plain rod ends are common. Thread lengths are also made-to-order (Specify: "A"=Length).

NEED SOMETHING NOT LISTED? Just send us a sketch. In most cases, quotes are turned around in one day!

PISTON ROD END STYLES



BORE	MM ROD DIAMETER	STANDARD		OPTIONAL						C	V
		STYLE 1 - MALE		STYLE 2 - MALE		STYLE 3 - FEMALE		STYLE 4 - MALE			
		KK1	A	KK2	A	KK3	A	KK4	A		
1.50, 2.00, 2.50	0.625 Standard	7/16-20	0.750	1/2-20	0.750	7/16-20	0.750	5/8-18	0.750	0.375	0.250
	1.000 Oversize	3/4-16	1.125	7/8-14	1.125	3/4-16	1.125	1-14	1.125	0.500	0.500
3.25, 4.00, 5.00	1.000 Standard	3/4-16	1.125	7/8-14	1.125	3/4-16	1.125	1-14	1.125	0.500	0.250
	1.375 Oversize	1-14	1.625	1 1/4-12	1.625	1-14	1.625	1 3/8-12	1.625	0.625	0.375
6.00	1.375 Standard	1-14	1.625	1 1/4-12	1.625	1-14	1.625	1 3/8-12	1.625	0.625	0.250
	1.750 Oversize	1 1/4-12	2.000	1 1/2-12	2.000	1 1/4-12	2.000	1 3/4-12	2.000	0.750	0.375
8.00	1.375 Standard	1-14	1.625	1 1/4-12	1.625	1-14	1.625	1 3/8-12	1.625	0.625	0.375
	1.750 Oversize	1 1/4-12	2.000	1 1/2-12	2.000	1 1/4-12	2.000	1 3/4-12	2.000	0.750	0.500

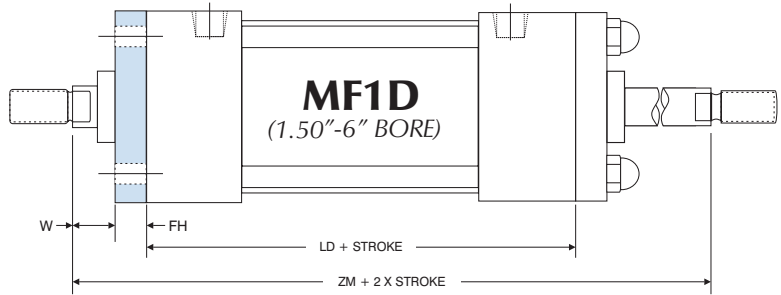
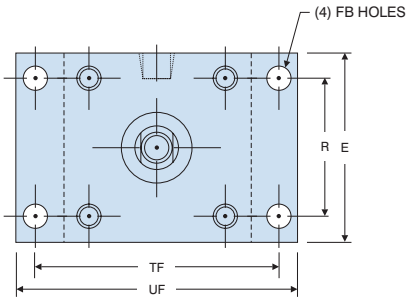


DOUBLE ROD 'MXOD' DIMENSIONS STANDARD & OVERSIZED RODS																	
BORE	ROD DIAMETER	A	B	C	E	EE	F	G	K	KK	LD	MM	P	R	V	Y	ZM
1.50	0.625 Standard	0.750	1.125	0.375	2.000	0.375	0.375	1.500	0.438	7/16-20	4.125	0.625	2.375	1.430	0.250	1.875	6.125
	1.000 Oversize	1.125	1.500	0.500						3/4-16		1.000					
2.00	0.625 Standard	0.750	1.125	0.375	2.500	0.375	0.375	1.500	0.563	7/16-20	4.125	0.625	2.375	1.840	0.250	1.875	6.125
	1.000 Oversize	1.125	1.500	0.500						3/4-16		1.000					
2.50	0.625 Standard	0.750	1.125	0.375	3.000	0.375	0.375	1.500	0.563	7/16-20	4.250	0.625	2.500	2.190	0.250	1.875	6.250
	1.000 Oversize	1.125	1.500	0.500						3/4-16		1.000					
3.25	1.000 Standard	1.125	1.500	0.500	3.750	0.500	0.625	1.750	0.625	3/4-16	4.750	1.000	2.750	2.760	0.250	2.375	7.500
	1.375 Oversize	1.625	2.000	0.625						1-14		1.375					
4.00	1.000 Standard	1.125	1.500	0.500	4.500	0.500	0.625	1.750	0.625	3/4-16	4.750	1.000	2.750	3.320	0.250	2.375	7.500
	1.375 Oversize	1.625	2.000	0.625						1-14		1.375					
5.00	1.000 Standard	1.125	1.500	0.500	5.500	0.500	0.625	1.750	0.813	3/4-16	5.000	1.000	3.000	4.100	0.250	2.375	7.750
	1.375 Oversize	1.625	2.000	0.625						1-14		1.375					
6.00	1.375 Standard	1.625	2.000	0.625	6.500	0.750	0.750	2.000	0.813	1-14	5.500	1.375	3.250	4.880	0.250	2.750	8.750
	1.750 Oversize	2.000	2.375	0.750						1 1/4-12		1.750					
8.00	1.375 Standard	1.625	2.000	0.625	8.500	0.750	0.625	2.000	1.000	1-14	5.625	1.375	3.375	6.440	0.375	2.750	8.875
	1.750 Oversize	2.000	2.375	0.750						1 1/4-12		1.750					

SERIES 'SS' DIMENSIONS: DOUBLE ROD END FLANGE MOUNTS

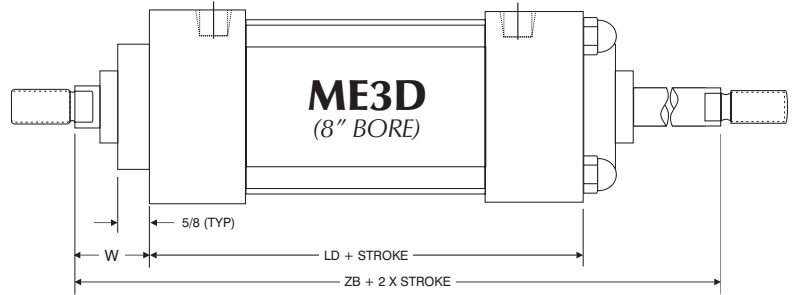
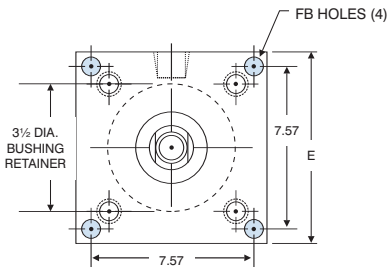
SS - How to Order

SS - Base Dimensions



SS - Single Rod Mounts

SS - Double Rod Mounts



Options Page 189

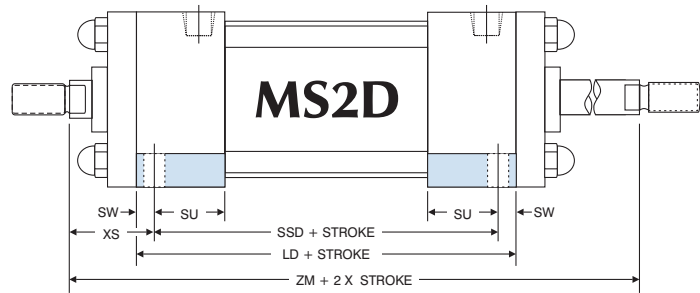
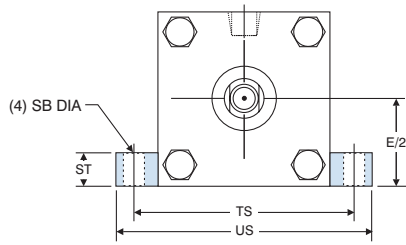
Accessories Page 227

Switches Page 241

Technical Data Page 278

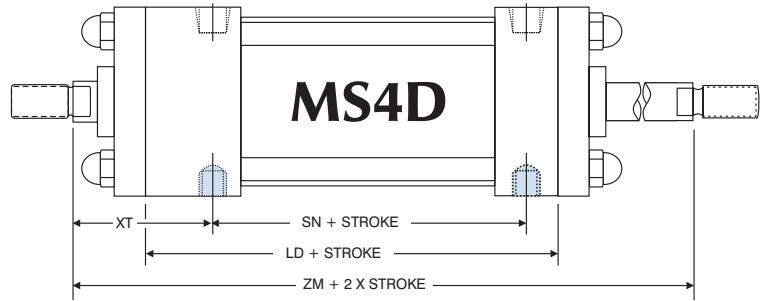
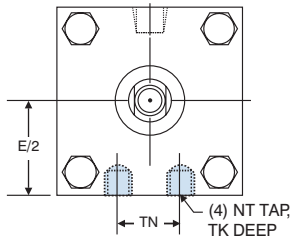
'SS-MF1D' FLANGE & 'SS-ME3D' HEAD MOUNT DIMENSIONS										
BORE	ROD DIAMETER	E	FB	FH	LD	R	TF	UF	W	ZM
1.50	0.625 Standard	2.000	0.313	0.375	4.125	1.430	2.750	3.375	0.625	6.125
	1.000 Oversize								1.000	6.875
2.00	0.625 Standard	2.500	0.375	0.375	4.125	1.840	3.375	4.125	0.625	6.125
	1.000 Oversize								1.000	6.875
2.50	0.625 Standard	3.000	0.375	0.375	4.250	2.190	3.875	4.625	0.625	6.250
	1.000 Oversize								1.000	7.000
3.25	1.000 Standard	3.750	0.438	0.625	4.750	2.760	4.688	5.500	0.750	7.500
	1.375 Oversize								1.000	8.000
4.00	1.000 Standard	4.500	0.438	0.625	4.750	3.320	5.438	6.250	0.750	7.500
	1.375 Oversize								1.000	8.000
5.00	1.000 Standard	5.500	0.563	0.625	5.000	4.100	6.625	7.625	0.750	7.750
	1.375 Oversize								1.000	8.250
6.00	1.375 Standard	6.500	0.563	0.750	5.500	4.880	7.625	8.625	0.875	8.750
	1.750 Oversize								1.125	9.250
8.00	1.375 Standard	8.500	0.688	N/A	5.625	N/A	N/A	N/A	1.625	8.875
	1.750 Oversize								1.875	9.375

SERIES 'SS' DIMENSIONS: DOUBLE ROD END BASE MOUNTS



'SS-MS2D' SIDE LUG MOUNT DIMENSIONS												
BORE	ROD DIAMETER	E/2	LD	SB	ST	SU	SW	TS	US	XS	ZM	SSD
1.50	0.625 Standard	1.000	4.125	0.438	0.500	1.125	0.375	2.750	3.500	1.375	6.125	3.375
	1.000 Oversize									1.750	6.875	
2.00	0.625 Standard	1.250	4.125	0.438	0.500	1.125	0.375	3.250	4.000	1.375	6.125	3.375
	1.000 Oversize									1.750	6.875	
2.50	0.625 Standard	1.500	4.250	0.438	0.500	1.125	0.375	3.750	4.500	1.375	6.250	3.500
	1.000 Oversize									1.750	7.000	
3.25	1.000 Standard	1.875	4.750	0.563	0.750	1.250	0.500	4.750	5.750	1.875	7.500	3.750
	1.375 Oversize									2.125	8.000	
4.00	1.000 Standard	2.250	4.750	0.563	0.750	1.250	0.500	5.500	6.500	1.875	7.500	3.750
	1.375 Oversize									2.125	8.000	
5.00	1.000 Standard	2.750	5.000	0.813	1.000	1.063	0.688	6.875	8.250	2.063	7.750	3.625
	1.375 Oversize									2.313	8.250	
6.00	1.375 Standard	3.250	5.500	0.813	1.000	1.313	0.688	7.875	9.250	2.313	8.750	4.125
	1.750 Oversize									2.563	9.250	
8.00	1.375 Standard	4.250	5.625	0.813	1.000	1.313	0.688	9.875	11.250	2.313	8.875	4.250
	1.750 Oversize									2.563	9.375	

Note: Round retainer on 8.00" bore only.



'SS-MS4D' BOTTOM TAPPED MOUNT DIMENSIONS									
BORE	ROD DIAMETER	E/2	LD	NT	TK	TN	XT	SN	ZM
1.50	0.625 Standard	1.000	4.125	1/4-20	0.375	0.625	1.938	2.250	6.125
	1.000 Oversize						2.313		6.875
2.00	0.625 Standard	1.250	4.125	5/16-18	0.500	0.875	1.938	2.250	6.125
	1.000 Oversize						2.313		6.875
2.50	0.625 Standard	1.500	4.250	3/8-16	0.625	1.250	1.938	2.375	6.250
	1.000 Oversize						2.313		7.000
3.25	1.000 Standard	1.875	4.750	1/2-13	0.750	1.500	2.438	2.625	7.500
	1.375 Oversize						2.688		8.000
4.00	1.000 Standard	2.250	4.750	1/2-13	0.750	2.063	2.438	2.625	7.500
	1.375 Oversize						2.688		8.000
5.00	1.000 Standard	2.750	5.000	5/8-11	1.000	2.688	2.438	2.875	7.750
	1.375 Oversize						2.688		8.125
6.00	1.375 Standard	3.250	5.500	3/4-10	1.125	3.250	2.813	3.125	8.750
	1.750 Oversize						3.063		9.250
8.00	1.375 Standard	4.250	5.625	3/4-10	1.125	4.500	2.813	3.250	8.875
	1.750 Oversize						3.063		9.375

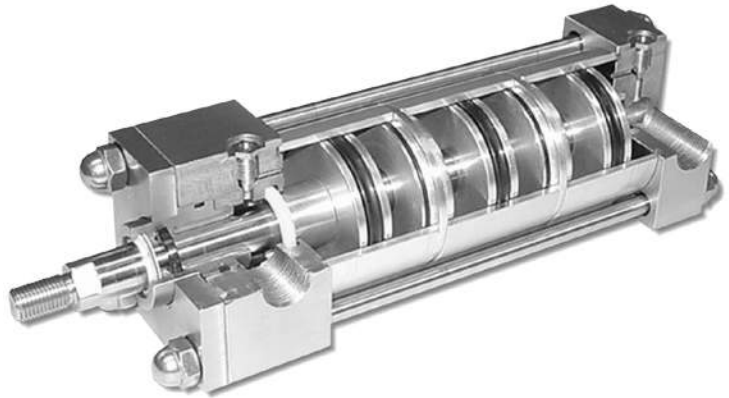
Note: Round retainer on 8.00" bore only.

SERIES 'SS-MS': MULTI-STAGE

FORCE MULTIPLYING CYLINDERS

Benefits

- Rated for 125 PSI Air or Hydraulic (non-shock)
- Eliminates the need for high pressure systems
- Bore size vs output force saves space
- Optional Double Rod End Models available
- Optional force multiplying in both extend and retract strokes available
- Heavy Duty 'SS' construction
- 2 Stage, 3 Stage and 4 Stage models



The TRD SS-MSE and SS-MSR Series are double acting, single rod end cylinders that multiply the force output by supplying air to multiple pistons.

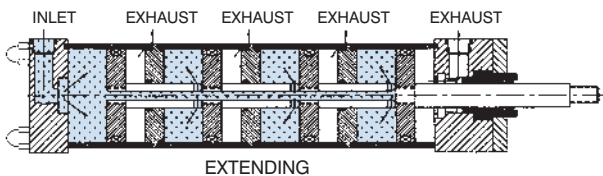
The SS-MSE multiplies the force on the extend stroke, the SS-MSR multiplies the force on the retract stroke. Both models use only one piston on the return stroke, saving air volume and operating costs.

How They Work

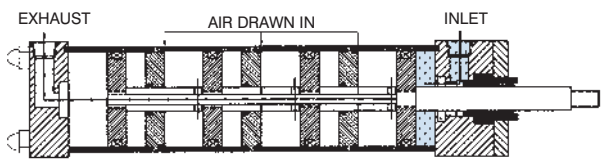
Model SS-MSE

4 Stage Shown

Extension-air supplied to multiple pistons



Retraction-air supplied to one piston



Force multiplying in both Extend and Retract strokes

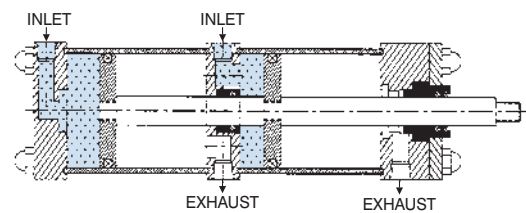
(Note: Overall lengths are increased-consult factory for details)

To Order, specify:

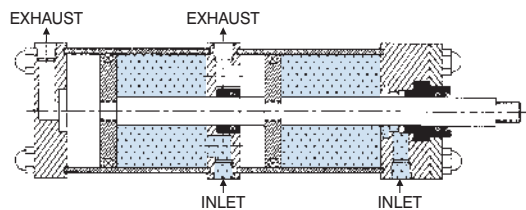
"SS-MSE/MSR" as model number.

Extension AND Retraction Air supplied to multiple pistons

EXTENDING STROKE



RETRACTING STROKE

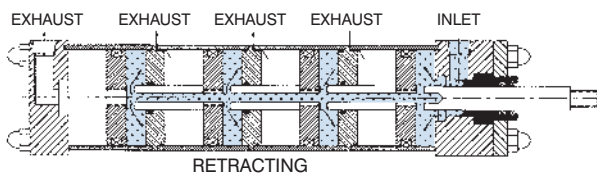


Model SS-MSE/MSR 2 Stage Shown

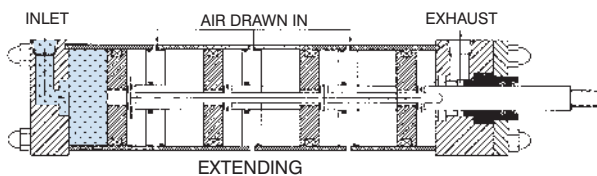
Model SS-MSR

4 Stage Shown

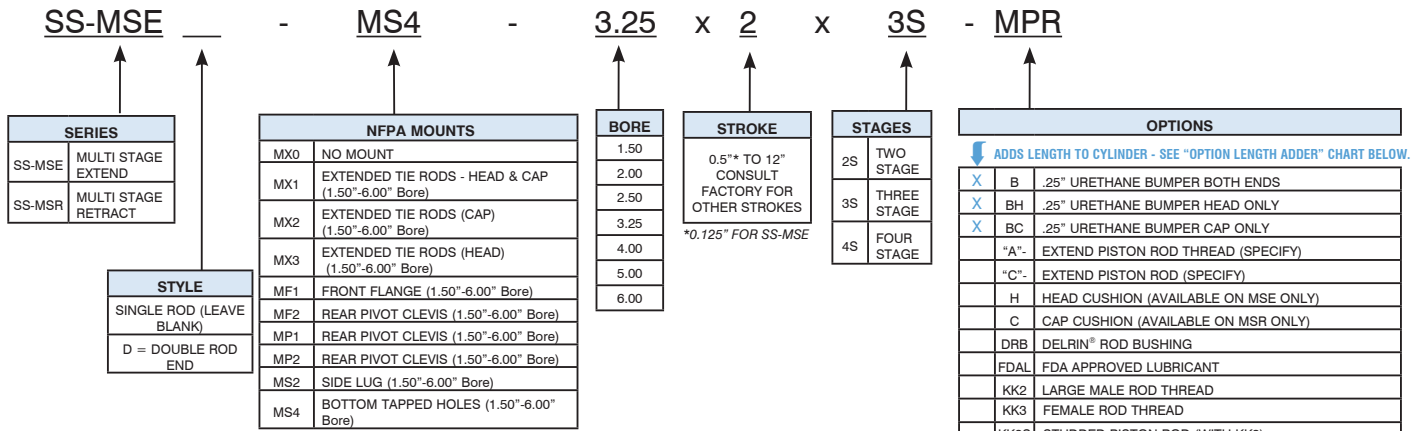
Retraction-air supplied to multiple pistons



Extension-air supplied to one piston



SERIES 'SS-MS': ORDERING INSTRUCTIONS



ORDERING EXAMPLES:

EXAMPLE 1: MF1 3.25" Bore, 2" Stroke, 3 Stage
Force Multiplied in EXTEND is:
SS-MSE MF1 3.25 x 2 x 3S

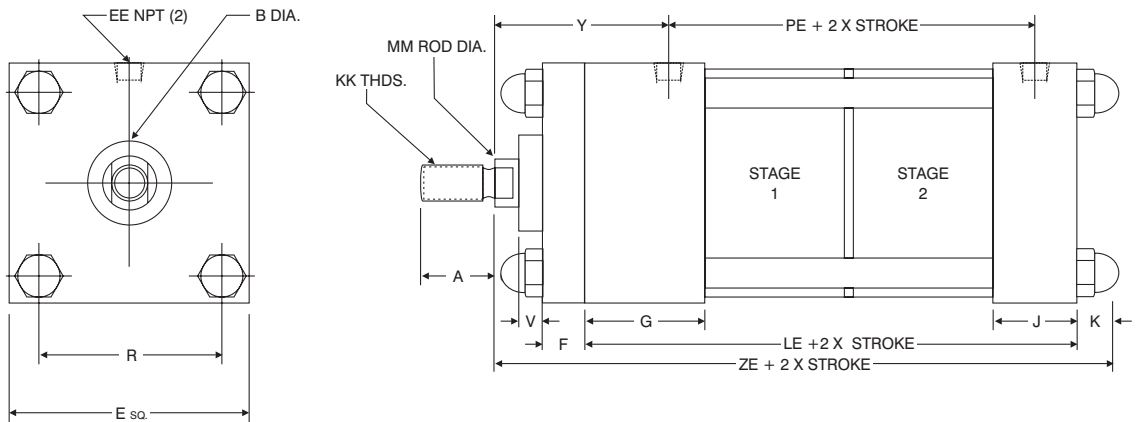
EXAMPLE 2: Double Rod End MS4 Mount, 2 Stage, 6.00" Bore, 3" Stroke, Force Multiplied in RETRACT with Magnetic Piston for REED Switches is:
SS-MSR MS4D 6 x 3 x 2S - MPR
(Note: MPR Option adds 0.750" to Cylinder length.)

OPTION LENGTH ADDER (ADD TO CATALOG BASIC OVERALL LENGTH DIMENSIONS)							
BORE	OPTION						
	B	BC	BH	MPR	MPH	NR	
1.50	0.500	0.250	0.250	0.625	0.625	0.625	
2.00	0.500	0.250	0.250	0.625	0.625	0.625	
2.50	0.500	0.250	0.250	0.750	0.750	0.750	
3.25	0.500	0.250	0.250	0.625	0.625	0.625	
4.00	0.500	0.250	0.250	0.625	0.625	0.625	
5.00	0.500	0.250	0.250	0.875	0.875	0.875	
6.00	0.500	0.250	0.250	0.750	0.750	0.750	

MPR/MPH OPTION: Magnet is located in stage at cap for standard units, in stage at head for 'NR' units

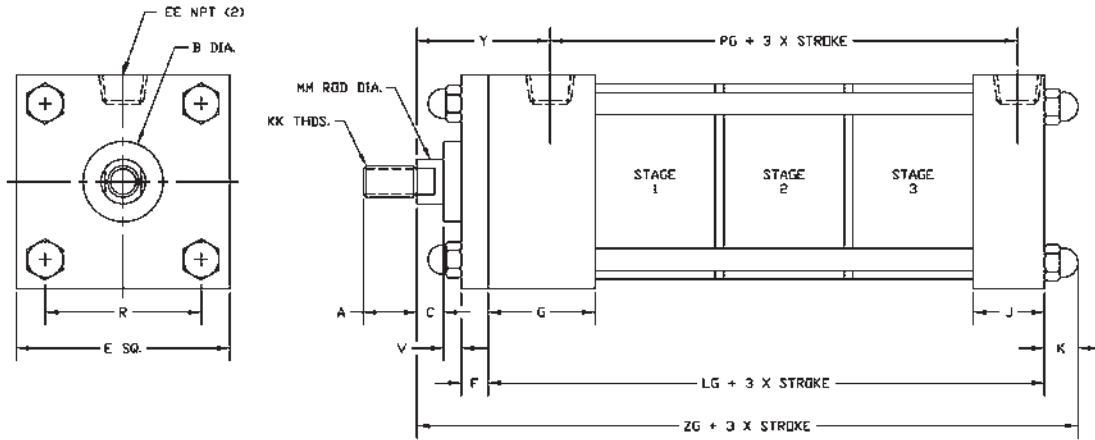
* PTFE scraper will be used unless otherwise specified.

'SS-MS' SERIES CYLINDERS: 2 STAGE EXTEND OR RETRACT STANDARD ROD DIAMETER BASIC DIMENSIONS MX0



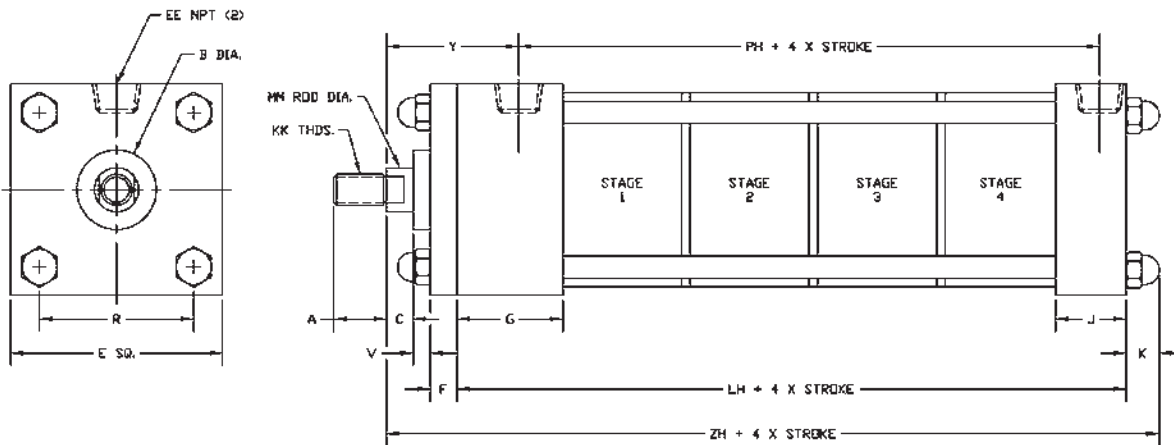
BORE	A	B	C	E	EE	F	G	J	K	KK	LE	MM	PE	R	V	Y	ZE
1.50	0.750	1.125	0.375	2.000	0.375	0.375	1.500	1.000	0.438	7/16-20	4.000	0.625	2.750	1.430	0.250	1.875	5.438
2.00	0.750	1.125	0.375	2.500	0.375	0.375	1.500	1.000	0.563	7/16-20	4.000	0.625	2.750	1.840	0.250	1.875	5.563
2.50	0.750	1.125	0.375	3.000	0.375	0.375	1.500	1.000	0.563	7/16-20	4.000	0.625	2.750	2.190	0.250	1.875	5.563
3.25	1.125	1.500	0.500	3.750	0.500	0.625	1.750	1.250	0.625	3/4-16	4.875	1.000	3.375	2.760	0.250	2.375	6.875
4.00	1.125	1.500	0.500	4.500	0.500	0.625	1.750	1.250	0.625	3/4-16	4.875	1.000	3.375	3.320	0.250	2.375	6.875
5.00	1.125	1.500	0.500	5.500	0.500	0.625	1.750	1.250	0.813	3/4-16	4.875	1.000	3.375	4.100	0.250	2.375	7.063
6.00	1.625	2.000	0.625	6.500	0.750	0.750	2.000	1.500	0.813	1-14	5.750	1.375	4.000	4.880	0.250	2.750	8.313

'SS-MS' SERIES CYLINDERS: 3 STAGE EXTEND OR RETRACT STANDARD ROD DIAMETER BASIC DIMENSIONS MX0



BORE	A	B	C	E	EE	F	G	J	K	KK	LG	MM	PG	R	V	Y	ZG
1.50	0.750	1.125	0.375	2.000	0.375	0.375	1.500	1.000	0.438	7/16-20	5.000	0.625	3.750	1.430	0.250	1.875	6.438
2.00	0.750	1.125	0.375	2.500	0.375	0.375	1.500	1.000	0.563	7/16-20	5.000	0.625	3.750	1.840	0.250	1.875	6.563
2.50	0.750	1.125	0.375	3.000	0.375	0.375	1.500	1.000	0.563	7/16-20	5.000	0.625	3.750	2.190	0.250	1.875	6.563
3.25	1.125	1.500	0.500	3.750	0.500	0.625	1.750	1.250	0.625	3/4-16	6.125	1.000	4.625	2.760	0.250	2.375	8.125
4.00	1.125	1.500	0.500	4.500	0.500	0.625	1.750	1.250	0.625	3/4-16	6.125	1.000	4.625	3.320	0.250	2.375	8.125
5.00	1.125	1.500	0.500	5.500	0.500	0.625	1.750	1.250	0.813	3/4-16	6.125	1.000	4.625	4.100	0.250	2.375	8.313
6.00	1.625	2.000	0.625	6.500	0.750	0.750	2.000	1.500	0.813	1-14	7.250	1.375	5.500	4.880	0.250	2.750	9.813

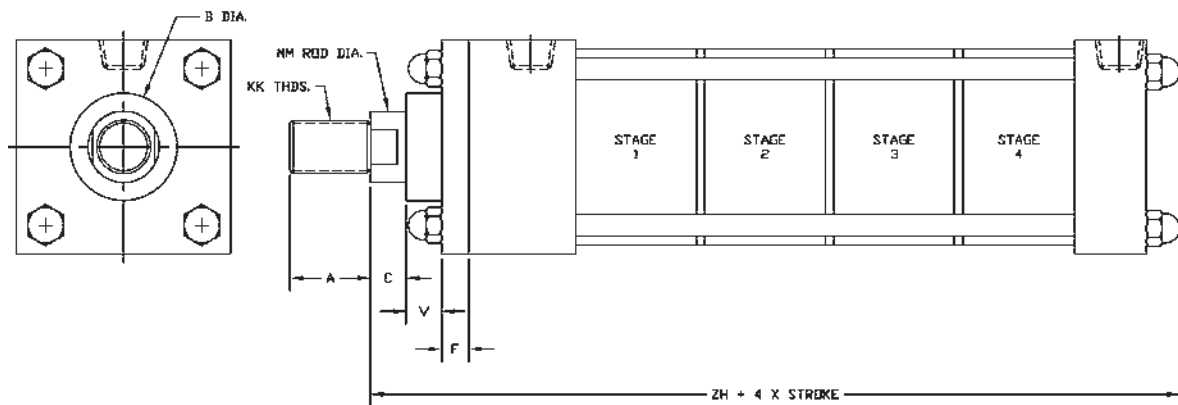
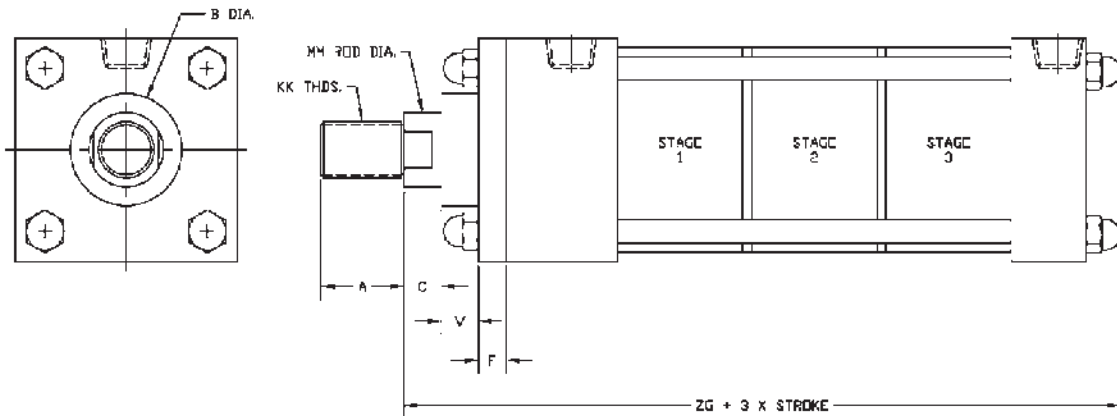
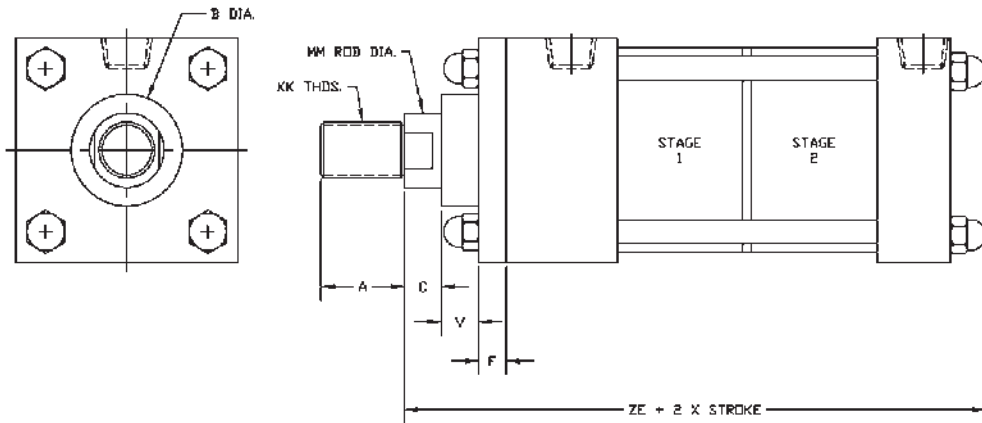
'SS-MS' SERIES CYLINDERS: 4 STAGE EXTEND OR RETRACT STANDARD ROD DIAMETER BASIC DIMENSIONS MX0



BORE	A	B	C	E	EE	F	G	J	K	KK	LH	MM	PH	R	V	Y	ZH
1.50	0.750	1.125	0.375	2.000	0.375	0.375	1.500	1.000	0.438	7/16-20	6.000	0.625	4.750	1.430	0.250	1.875	7.438
2.00	0.750	1.125	0.375	2.500	0.375	0.375	1.500	1.000	0.563	7/16-20	6.000	0.625	4.750	1.840	0.250	1.875	7.563
2.50	0.750	1.125	0.375	3.000	0.375	0.375	1.500	1.000	0.563	7/16-20	6.000	0.625	4.750	2.190	0.250	1.875	7.563
3.25	1.125	1.500	0.500	3.750	0.500	0.625	1.750	1.250	0.625	3/4-16	7.375	1.000	5.875	2.760	0.250	2.375	9.375
4.00	1.125	1.500	0.500	4.500	0.500	0.625	1.750	1.250	0.625	3/4-16	7.375	1.000	5.875	3.320	0.250	2.375	9.375
5.00	1.125	1.500	0.500	5.500	0.500	0.625	1.750	1.250	0.813	3/4-16	7.375	1.000	5.875	4.100	0.250	2.375	9.563
6.00	1.625	2.000	0.625	6.500	0.750	0.750	2.000	1.500	0.813	1-14	8.750	1.375	7.000	4.880	0.250	2.750	11.313

SERIES 'SS-MS' DIMENSIONS: OVERSIZED ROD

OVERSIZED ROD DIAMETER BASIC DIMENSIONS MX0 (NO MOUNT)



MULTI-STAGE OVERSIZE ROD DIAMETER								ADD STROKE PER STAGE		
BORE	A	B	C	F	V	KK	MM	ZE	ZG	ZH
1.50	1.125	1.500	0.500	0.375	0.500	3/4-16	1.000	5.813	6.813	7.813
2.00	1.125	1.500	0.500	0.375	0.500	3/4-16	1.000	5.938	6.938	7.938
2.50	1.125	1.500	0.500	0.375	0.500	3/4-16	1.000	5.938	6.938	7.938
3.25	1.625	2.000	0.625	0.625	0.375	1-14	1.375	7.125	8.375	9.625
4.00	1.625	2.000	0.625	0.625	0.375	1-14	1.375	7.125	8.375	9.625
5.00	1.625	2.000	0.625	0.625	0.375	1-14	1.375	7.313	8.563	9.813
6.00	2.000	2.375	0.750	0.750	0.375	1 1/4-12	1.750	8.438	9.938	11.438

For dimensions not shown see pages 150-151.

SERIES 'SS' DIMENSIONS: 'SS-MS' DIMENSIONS

EASY FLIP OUT PAGE FOR REFERENCE

About Rod End Styles

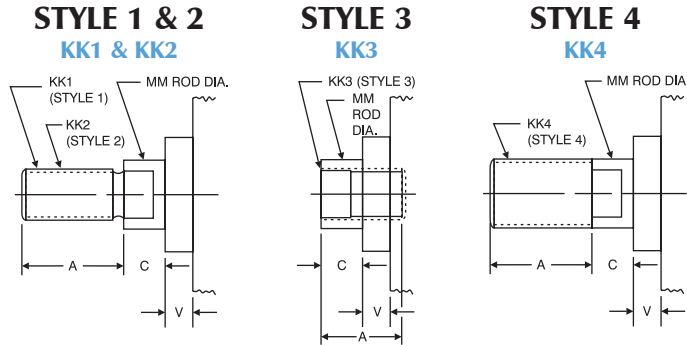
Style 1 Male Rod End is STANDARD

Other NFPA Styles can be specified (see chart).

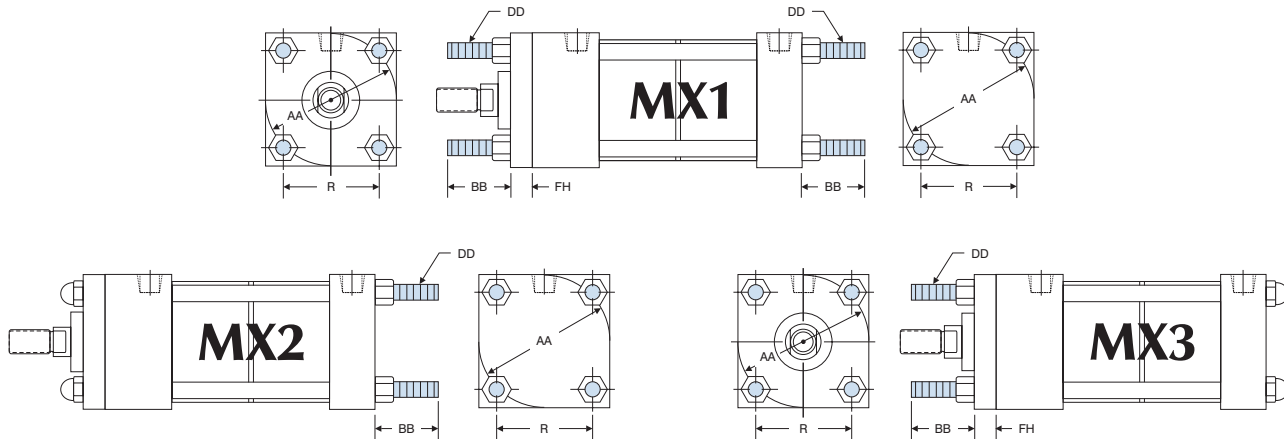
Need a rod end not listed? NO PROBLEM! Each Piston Rod is made-to-order and does not delay shipment. Coarse UNC threads, Metric threads or just plain rod ends are common. Thread lengths are also made-to-order (Specify: "A"=Length).

NEED SOMETHING NOT LISTED? Just send us a sketch. In most cases, quotes are turned around in one day!

PISTON ROD END STYLES



BORE	MM ROD DIAMETER	STANDARD		OPTIONAL				C	V		
		STYLE 1 - MALE KK1	A	STYLE 2 - MALE KK2	A	STYLE 3 - FEMALE KK3	A			STYLE 4 - MALE KK4	A
1.50, 2.00, 2.50	0.625 Standard	7/16-20	0.750	1/2-20	0.750	7/16-20	0.750	5/8-18	0.750	0.375	0.250
	1.000 Oversize	3/4-16	1.125	7/8-14	1.125	3/4-16	1.125	1-14	1.125	0.500	0.500
3.25, 4.00, 5.00	1.000 Standard	3/4-16	1.125	7/8-14	1.125	3/4-16	1.125	1-14	1.125	0.500	0.250
	1.375 Oversize	1-14	1.625	1 1/4-12	1.625	1-14	1.625	1 3/8-12	1.625	0.625	0.375
6.00 & 8.00	1.375 Standard	1-14	1.625	1 1/4-12	1.625	1-14	1.625	1 3/8-12	1.625	0.625	0.375
	1.750 Oversize	1 1/4-12	2.000	1 1/4-12	2.000	1 1/4-12	2.000	1 3/4-12	2.000	0.750	0.500



BORE	ROD DIAMETER	AA	BB	DD	FH	R
1.50	0.625 Standard	2.020	1.000	1/4-28	0.375	1.430
	1.000 Oversize					
2.00	0.625 Standard	2.600	1.125	5/16-24	0.375	1.840
	1.000 Oversize					
2.50	0.625 Standard	3.100	1.125	5/16-24	0.375	2.190
	1.000 Oversize					
3.25	1.000 Standard	3.900	1.375	3/8-24	0.625	2.760
	1.375 Oversize					

BORE	ROD DIAMETER	AA	BB	DD	FH	R
4.00	1.000 Standard	4.700	1.375	3/8-24	0.625	3.320
	1.375 Oversize					
5.00	1.000 Standard	5.800	1.813	1/2-20	0.625	4.100
	1.375 Oversize					
6.00	1.375 Standard	6.900	1.813	1/2-20	0.750	4.880
	1.750 Oversize					

SERIES 'SS' DIMENSIONS: 'SS-MS' DIMENSIONS

About Rod End Styles

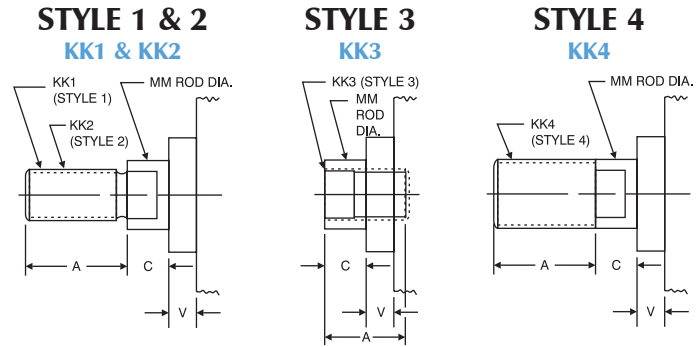
Style 1 Male Rod End is STANDARD

Other NFPA Styles can be specified (see chart).

Need a rod end not listed? NO PROBLEM! Each Piston Rod is made to order and does not delay shipment. Coarse UNC threads, Metric threads or just plain rod ends are common. Thread lengths are also made to order (Specify: "A"=Length).

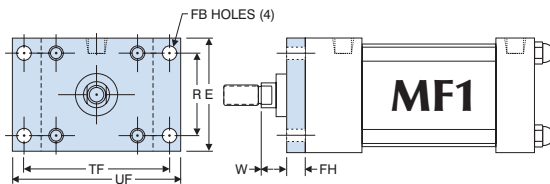
NEED SOMETHING NOT LISTED? Just send us a sketch. In most cases, quotes are turned around in one day!

PISTON ROD END STYLES

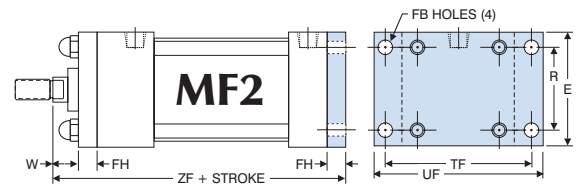


BORE	MM ROD DIAMETER	STANDARD		OPTIONAL						C	V
		STYLE 1 - MALE		STYLE 2 - MALE		STYLE 3 - FEMALE		STYLE 4 - MALE			
		KK1	A	KK2	A	KK3	A	KK4	A		
1.50, 2.00, 2.50	0.625 Standard	7/16-20	0.750	1/2-20	0.750	7/16-20	0.750	5/8-18	0.750	0.375	0.250
	1.000 Oversize	3/4-16	1.125	7/8-14	1.125	3/4-16	1.125	1-14	1.125	0.500	0.500
3.25, 4.00, 5.00	1.000 Standard	3/4-16	1.125	7/8-14	1.125	3/4-16	1.125	1-14	1.125	0.500	0.250
	1.375 Oversize	1-14	1.625	1 1/4-12	1.625	1-14	1.625	1 3/8-12	1.625	0.625	0.375
6.00 & 8.00	1.375 Standard	1-14	1.625	1 1/4-12	1.625	1-14	1.625	1 3/8-12	1.625	0.625	0.375
	1.750 Oversize	1 1/4-12	2.000	1 1/4-12	2.000	1 1/4-12	2.000	1 3/4-12	2.000	0.750	0.500

SERIES 'SS-MS' DIMENSIONS: FLANGE MOUNTS



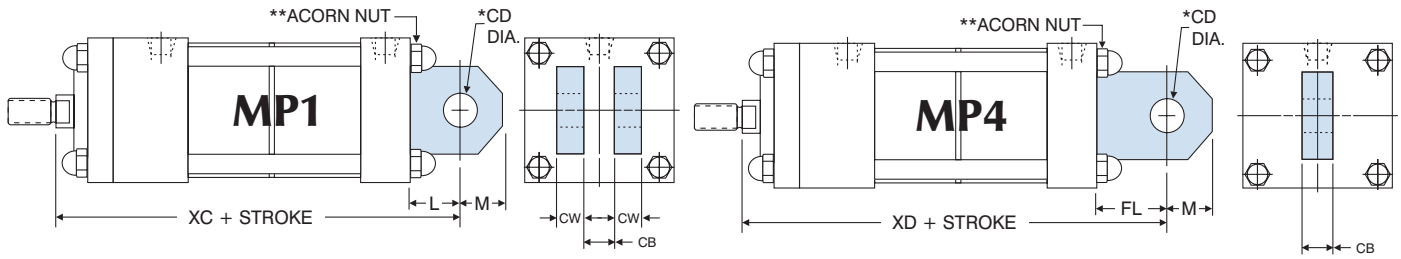
1.50" - 6.00" BORES



1.50" - 6.00" BORES

'MF1', 'MF2' FLANGE DIMENSIONS											
BORE	ROD DIAMETER	E	FB	FH	R	TF	UF	W	ZF + STROKE PER STAGE		
									2 STAGE	3 STAGE	4 STAGE
1.50	0.625 Standard	2.000	0.313	0.375	1.430	2.750	3.375	0.625	5.375	6.375	7.375
	1.000 Oversize										
2.00	0.625 Standard	2.500	0.375	0.375	1.840	3.375	4.125	0.625	5.375	6.375	7.375
	1.000 Oversize										
2.50	0.625 Standard	3.000	0.375	0.375	2.190	3.875	4.625	0.625	5.375	6.375	7.375
	1.000 Oversize										
3.25	1.000 Standard	3.750	0.438	0.625	2.760	4.688	5.500	0.750	6.875	8.125	9.375
	1.375 Oversize							1.000	7.125	8.375	9.625
4.00	1.000 Standard	4.500	0.438	0.625	3.320	5.438	6.250	0.750	6.875	8.125	9.375
	1.375 Oversize							1.000	7.125	8.375	9.625
5.00	1.000 Standard	5.500	0.563	0.625	4.100	6.625	7.625	0.750	6.875	8.125	9.375
	1.375 Oversize							1.000	7.125	8.375	9.625
6.00	1.375 Standard	6.500	0.563	0.750	4.880	7.625	8.625	0.875	8.250	9.750	11.250
	1.750 Oversize							1.125	8.500	10.000	11.500

SERIES 'SS-MS' DIMENSIONS: PIVOT MOUNTS



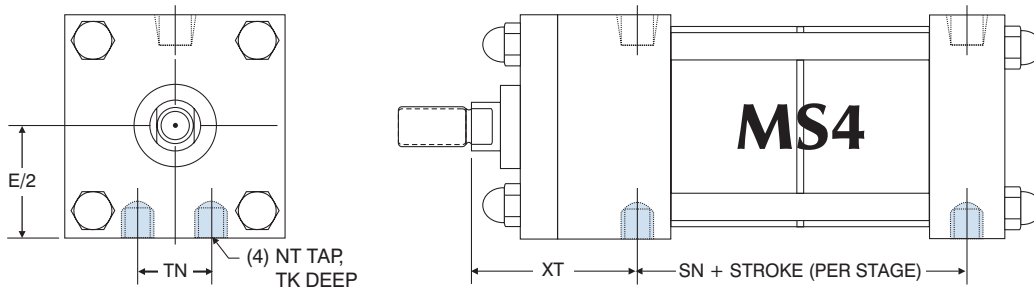
MULTI-STAGE 'MP1' & 'MP2' CLEVIS AND 'MP4' EYE MOUNT DIMENSIONS								ADD STROKE PER STAGE					
BORE	ROD DIAMETER	CB	CD	CW	FL	L	M	2 STAGE		3 STAGE		4 STAGE	
								XC	XD	XC	XD	XC	XD
1.50	0.625 Standard	0.750	0.500	0.500	1.125	0.750	0.625	5.750	6.125	6.750	7.125	7.750	8.125
	1.000 Oversize							6.125	6.500	7.125	7.500	8.125	8.500
2.00	0.625 Standard	0.750	0.500	0.500	1.125	0.750	0.625	5.750	6.125	6.750	7.125	7.750	8.125
	1.000 Oversize							6.125	6.500	7.125	7.500	8.125	8.500
2.50	0.625 Standard	0.750	0.500	0.500	1.125	0.750	0.625	5.750	6.125	6.750	7.125	7.750	8.125
	1.000 Oversize							6.125	6.500	7.125	7.500	8.125	8.500
3.25	1.000 Standard	1.250	0.750	0.625	1.875	1.250	0.875	7.500	8.125	8.750	9.375	10.000	10.625
	1.375 Oversize							7.750	8.375	9.000	9.625	10.250	10.875
4.00	1.000 Standard	1.250	0.750	0.625	1.875	1.250	0.875	7.500	8.125	8.750	9.375	10.000	10.625
	1.375 Oversize							7.750	8.375	9.000	9.625	10.250	10.875
5.00	1.000 Standard	1.250	0.750	0.625	1.875	1.250	0.875	7.500	8.125	8.750	9.375	10.000	10.625
	1.375 Oversize							7.750	8.375	9.000	9.625	10.250	10.875
6.00	1.375 Standard	1.500	1.000	0.750	2.250	1.500	1.000	8.875	9.625	10.375	11.125	11.875	12.625
	1.750 Oversize							9.125	9.875	10.625	11.375	12.125	12.875

For dimensions not shown see pages 150-151.

*Clevis pin provided with MP1 and MP4 mounts.

**Acorn nuts are located on cap end (4.00"-6.00" bores).

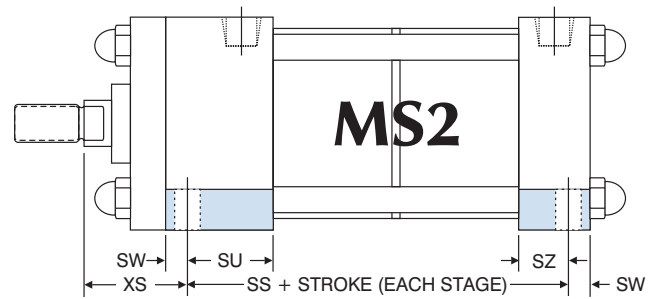
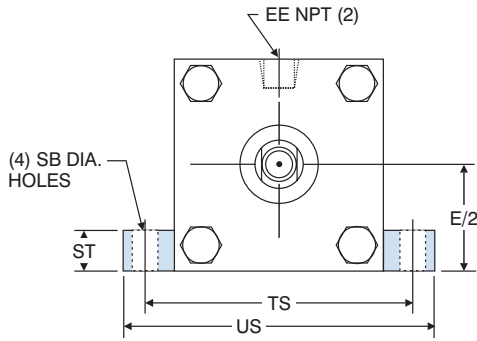
'SS-MS' SERIES: BASE MOUNTS



'MS4' BOTTOM TAPPED MOUNT DIMENSIONS									
BORE	ROD DIAMETER	E/2	NT	TK	TN	XT	SN + STROKE PER STAGE		
							2 STAGE	3 STAGE	4 STAGE
1.50	0.625 Standard	1.000	1/4-20	0.375	0.625	1.938	2.625	3.625	4.625
	1.000 Oversize					2.313			
2.00	0.625 Standard	1.250	5/16-18	0.500	0.875	1.938	2.625	3.625	4.625
	1.000 Oversize					2.313			
2.50	0.625 Standard	1.500	3/8-16	0.625	1.250	1.938	2.625	3.625	4.625
	1.000 Oversize					2.313			
3.25	1.000 Standard	1.875	1/2-13	0.750	1.500	2.438	3.250	4.500	5.750
	1.375 Oversize					2.688			
4.00	1.000 Standard	2.250	1/2-13	0.750	2.063	2.438	3.250	4.500	5.750
	1.375 Oversize					2.688			
5.00	1.000 Standard	2.750	5/8-11	1.000	2.688	2.438	3.250	4.500	5.750
	1.375 Oversize					2.688			
6.00	1.375 Standard	3.250	3/4-10	1.125	3.250	2.813	3.875	5.375	6.875
	1.750 Oversize					3.063			

For dimensions not shown see pages 150-151.

SERIES 'SS-MS' DIMENSIONS: BASE MOUNTS



'MS2' SIDE LUG MOUNT DIMENSIONS													
BORE	ROD DIAMETER	E/2	SB	ST	SU	SW	SZ	TS	US	XS	SS + STROKE PER STAGE		
											2 STAGE	3 STAGE	4 STAGE
1.50	0.625 Standard	1.000	0.438	0.500	1.125	0.375	0.625	2.750	3.500	1.375	3.250	4.250	5.250
	1.000 Oversize												
2.00	0.625 Standard	1.250	0.438	0.500	1.125	0.375	0.625	3.250	4.000	1.375	3.250	4.250	5.250
	1.000 Oversize												
2.50	0.625 Standard	1.500	0.438	0.500	1.125	0.375	0.625	3.750	4.500	1.375	3.250	4.250	5.250
	1.000 Oversize												
3.25	1.000 Standard	1.875	0.563	0.750	1.250	0.500	0.750	4.750	5.750	1.875	3.875	5.125	6.375
	1.375 Oversize												
4.00	1.000 Standard	2.250	0.563	0.750	1.250	0.500	0.750	5.500	6.500	1.875	3.875	5.125	6.375
	1.375 Oversize												

* SS dimensions increase 0.500" on double rod cylinders
For dimensions not shown see pages 150-151.

Note: Overall lengths will change with the addition of non-rotating or magnetic pistons; consult factory.

'SS-MS' SERIES EFFECTIVE PISTON AREA/FORCE CHART

BORE	STAGES	EFF. PISTON AREA (SQ. IN.)				FORCE IN LBS. AT 60 PSI				FORCE IN LBS. AT 100 PSI			
		EXTEND (MSE)		RETRACT (MSR)		EXTEND (MSE)		RETRACT (MSR)		EXTEND (MSE)		RETRACT (MSR)	
		STD. ROD Ø	O'SIZE Ø	STD. ROD Ø	O'SIZE Ø	STD. ROD Ø	O'SIZE Ø	STD. ROD Ø	O'SIZE Ø	STD. ROD Ø	O'SIZE Ø	STD. ROD Ø	O'SIZE Ø
1.50	2	3.228	2.749	2.922	1.964	193	164	175	117	322	274	292	196
	3	4.687	3.731	4.383	2.946	281	223	262	176	468	373	438	294
	4	6.150	4.713	5.844	3.928	369	282	350	235	615	471	584	392
2.00	2	5.974	5.499	5.668	4.714	358	329	340	282	597	549	566	471
	3	8.808	7.856	8.502	7.071	528	471	510	424	880	785	850	707
	4	11.642	10.213	11.336	9.428	698	612	680	565	1164	1021	1133	942
2.50	2	9.490	9.033	9.188	8.248	569	541	551	494	949	903	918	824
	3	14.080	13.157	13.782	12.372	844	789	826	742	1408	1315	1378	1237
	4	18.680	17.281	18.376	16.496	1120	1036	1102	989	1868	1728	1837	1649
3.25	2	15.807	15.107	15.022	13.622	948	906	901	817	1580	1510	1502	1362
	3	23.317	21.918	22.532	20.433	1399	1315	1351	1225	2331	2191	2253	2043
	4	30.828	28.729	30.043	27.244	1849	1723	1802	1634	3082	2872	3004	2724
4.00	2	24.347	23.647	23.562	22.166	1460	1418	1413	1329	2434	2364	2356	2216
	3	36.127	34.728	35.342	33.243	2167	2083	2120	1994	3612	3472	3534	3324
	4	47.908	45.809	47.123	44.324	2874	2748	2827	2659	4790	4580	4712	4432
5.00	2	38.485	37.785	37.700	36.3	2309	2267	2262	2178	3848	3778	3770	3630
	3	57.334	55.935	56.549	54.45	3440	3356	3392	3267	5733	5593	5654	5445
	4	76.184	74.085	75.399	72.6	4571	4445	4523	4356	7618	7408	7539	7260
6.00	2	55.065	54.143	53.582	51.736	3303	3248	3214	3104	5506	5414	5358	5136
	3	81.854	80.012	80.370	77.607	4911	4800	4822	4656	8185	8001	8037	7760
	4	108.644	105.881	107.16	103.476	6518	6352	6429	6208	10864	10588	10716	10347

SERIES 'SS': TECHNICAL DATA

How to Determine the Right Size Cylinder for the Job.

To determine what size cylinder the task requires, you need to answer a few questions about three main points: load, velocity and air pressure.

How heavy (in pounds) is the load to be moved? The answer to this is usually given, set by the machine design. However, unless you are lifting a load vertically-with no external friction, it can be difficult to determine the true load. If the load cannot be calculated, try to physically measure the load. The closer the true load is known, the better the results. In order to move the load, you need to choose a cylinder that provides force greater than the load. So, if the load is 100 lbs., it will take a force greater than 100 lbs. to move it. In fact, it's a good idea to allow an additional factor of 25% force to allow for friction.

What's the required velocity? Although velocity may also be set by machine design, often you have some latitude within a range. Whenever possible, for best results, we recommend using moderate speed because the greater the velocity required, the greater the *additional* force needed to achieve it. Slow speeds (up to 4 in/sec) require 25% more force than the load, moderate speeds (4 to 16 in/sec) about 50% more, and high speeds (greater than 16 in/sec) about 100% more force. So, for that 100 lb. load, you need 125 lbs. of force to move it slowly, 150 lbs. of force to move it at moderate speeds and 200 lbs. of force to move it quickly. *Don't forget to add 25 lbs. (25% of 100 lbs.) for friction!*

What's the minimum effective air pressure you can use and is your pressure source constant?

This is important because high pressures can accelerate seal wear and create stress on the cylinder, and inconsistent pressures can cause system malfunctions or failures. So, to maximize cylinder life and performance, you need to provide consistent airflow at the minimum effective pressure to maintain the desired velocity. The idea then, is for the cylinder to be able to move the maximum load, at the minimum acceptable velocity and at the minimum available pressure.

About bore sizes. Once you've determined the force you need to move the load at the desired velocity and allow for friction, here's how to find the cylinder bore that meets your specifications.

The force generated by a cylinder is determined by the effective piston area times the air pressure. The chart below lists the effective piston area for each bore size, the "Push" (extend) and "Pull" (retract) stroke, at various air pressures. If you assume a maximum load of 100 lbs., a minimum velocity of 4 in/sec and a minimum pressure of 60 psi, here's how to select the right cylinder bore. Since the velocity is slow, the force should be 25% greater than the load, or 125 lbs. After adding 25 lbs. for friction (25% of 100 lbs.), the total force needed is 150 lbs. The chart below shows that at 60 psi, the 2.00" bore with 0.625" rod extend force is 188 lbs. and retract force is 170 lbs.; the right cylinder for the application.

FORCE/VOLUME CHART

CYLINDER		STROKE TYPE	EFFECTIVE PISTON AREA	POUNDS OF FORCE AT PSI						CU. FT. DISPLACEMENT PER IN. OF STROKE
BORE	ROD			60	80	100	200	250	400	
1.50	ALL	PUSH	1.767	106	142	177	353	442	706	.00102
	0.625	PULL	1.460	88	117	146	292	365	584	.00084
	1.000	PULL	0.982	59	79	98	196	246	392	.00057
2.00	ALL	PUSH	3.142	188	251	314	628	785	1256	.00182
	0.625	PULL	2.835	170	227	284	567	708	1134	.00164
	1.000	PULL	2.357	141	189	236	471	589	942	.00136
2.50	ALL	PUSH	4.909	295	393	491	981	1227	1961	.00284
	0.625	PULL	4.602	267	368	460	920	1150	1840	.00266
	1.000	PULL	4.124	247	330	412	825	1031	1650	.00239
3.25	ALL	PUSH	8.296	498	664	830	1659	2074	3318	.00480
	1.000	PULL	7.511	451	601	751	1502	1877	3004	.00435
	1.375	PULL	6.811	409	545	681	1362	1702	2724	.00394
4.00	ALL	PUSH	12.566	754	1005	1257	2513	3141	5026	.00727
	1.000	PULL	11.781	707	942	1178	2356	2945	4712	.00682
	1.375	PULL	11.081	665	886	1108	2216	2770	4432	.00641
5.00	ALL	PUSH	19.635	1178	1571	1964	3927	4908	7854	.01136
	1.000	PULL	18.850	1131	1508	1885	3770	4712	7540	.01090
	1.375	PULL	18.150	1089	1452	1815	3630	4537	7260	.01050
6.00	ALL	PUSH	28.274	1696	2262	2827	5655	7068	11310	.01636
	1.375	PULL	26.789	1607	2144	2679	5358	6697	10716	.01550
	1.750	PULL	25.869	1552	2070	2587	5174	6467	10348	.01497
8.00	ALL	PUSH	50.265	3016	4021	5026	10053	12566	20106	.02908
	1.375	PULL	48.780	2927	3902	4878	9756	12195	19512	.02823
	1.750	PULL	47.860	2872	3829	4786	9572	11965	19144	.02770