



# STARCYL CYLINDERS

## MULTI-STAGES AIR CYLINDERS



**MULTI-STAGES NFPA STYLE MOUNT  
HEAVY DUTY - HIGH FLOW**

**NOMINAL PRESSURE -AIR 250 PSI**

**STANDARD BORE SIZES 1.5" THROUGH 10"**

**STROKE UP TO 12"**

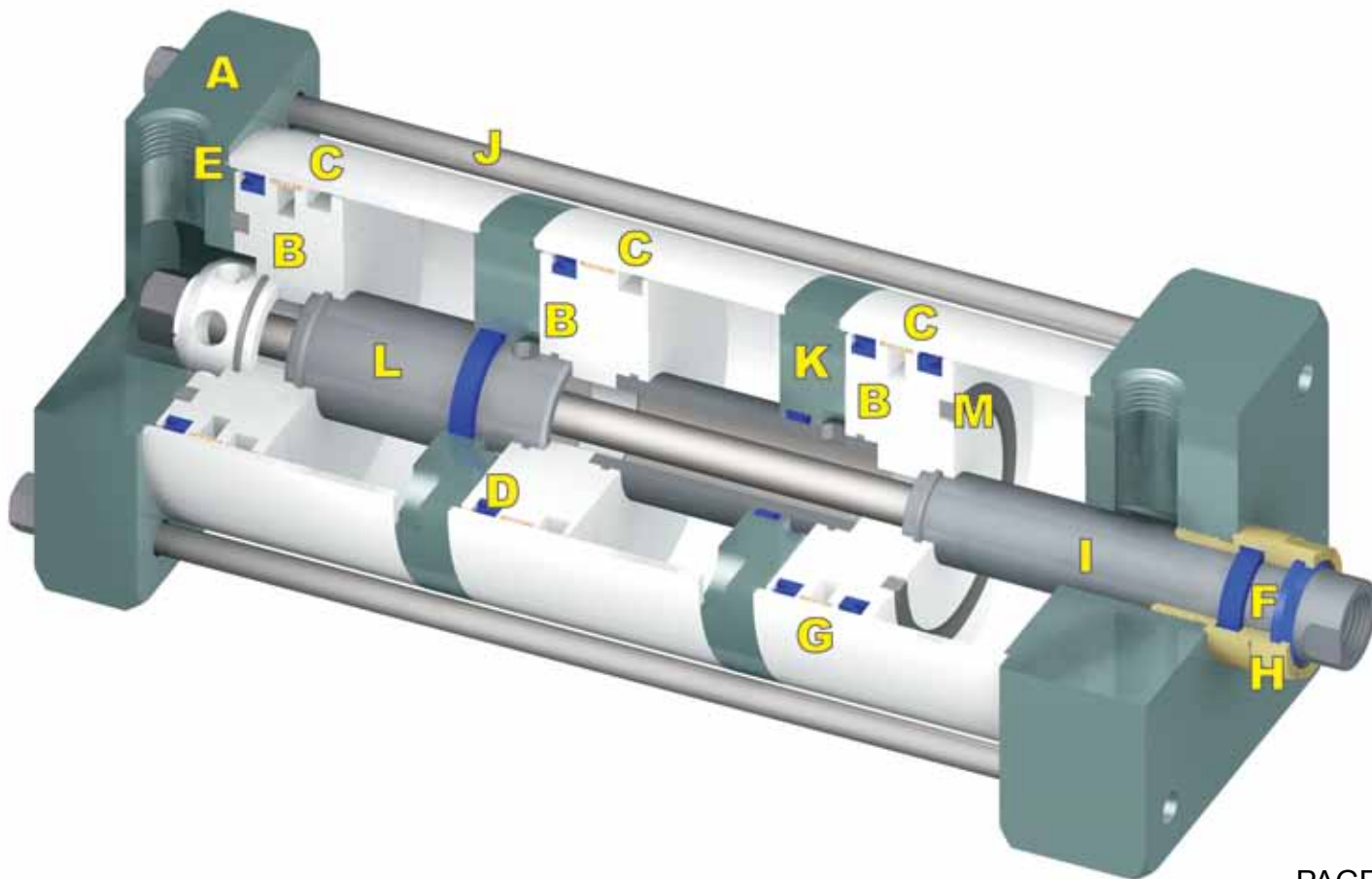
**NFPA STYLE MOUNT**

**TWO-YEAR WARRANTY**

**M3  
SERIES**

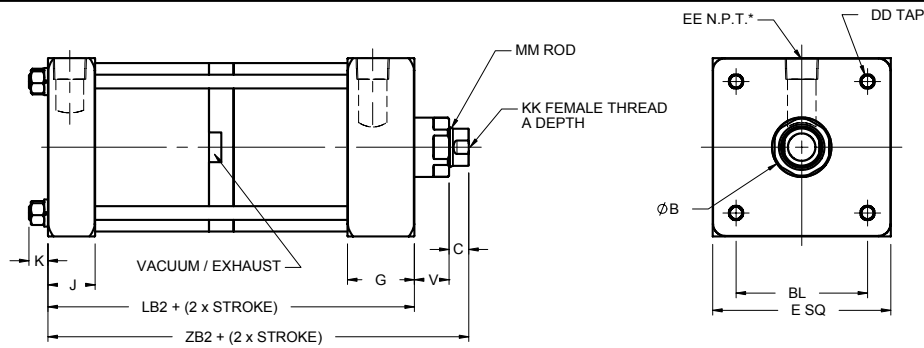
# M3 MULTISTAGE CYLINDERS - Design features

- A Solid Aluminum Head & Cap**  
Machined from solid aluminum bar stock (6061 T6) and black anodized for corrosion resistance. (Also available in Stainless Steel).
- B Piston**  
Machined from solid aluminum bar stock (6061-T6). Offers long bearing support.
- C Hard Anodized ID Aluminum Tube**  
(60 Rc) Provides superior wear resistance, and lower friction coefficient for maximum seal life. (Also available in Stainless Steel.)
- D Piston Seal**  
Lip-type low friction urethane piston seals are pressure energized and wear compensating for low friction and long life (temperature: -50° to 200°F) (Viton™ also Available up to 400°F) (all seals can be used in a non lube application)
- E O-ring Tube End Seals**  
Nitrile O-ring design is pressure compensated and reusable.
- F Rod lips seal + wiper**  
Our **New Design** with a real rod u-cup is completely self compensating for zero leakage at all pressures (all seals can be used in a non lube application) The **New Wiper Wipes** dirt out for less maintenance and longer life of the cylinder. (Urethane) (temperature: -50° to 200°F)
- G Piston Wear Ring**  
Nylon material is design for low friction, and to ensure minimum wear in the cylinder in side load application. Eliminates metal-to-metal contact.
- H Rod Gland**  
Bronze gland is externally removable without cylinder disassembly for easy maintenance. Designed to provide maximum rod bearing. (Also available in Acetal)
- I Piston Rod**  
High Strength steel. NITROCARBURIZING treatment on the rod gives better corrosion-resistant properties (out performs 12-micron (.0005 in.) chromium electroplating by ratio up to 20:1.), improved wear resistance, better lubrication retention, dent resistance without induction hardening (60Rc), environmentally Friendly, no surface pitting, flaking, or hydrogen embrittlement. The finish created by the process is a lustrous black. (Available in stainless steel)
- J Tie rods**  
Corrosion resistant (Nitro carburizing), stress proof steel maintains uniform compression on tube end seals. (Available in Stainless steel)
- K Mid Plate**  
High Flow Mid plate with 2 orifice (vent/vaccum) Made of 6061-T6 Aluminum and Black anodized, design for resistance, and Flow in mind ( available with 2 or 3 port for external vent/vaccum or muffler).
- L Upper Rod**  
High Strength steel. NITROCARBURIZING treatment on the rod. High Flow design.
- M Bumper**  
Incorporated bumper in piston to ensure long life and noise free, design for long life, those bumper are incorporated into the piston with enough

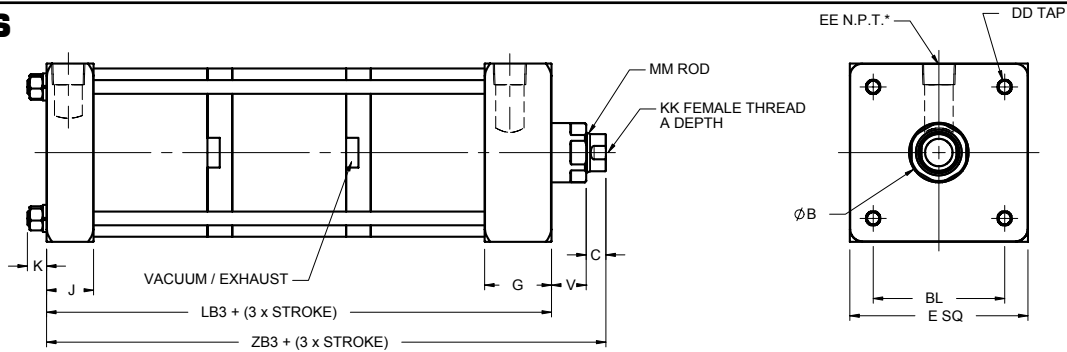


# M3 MULTISTAGE CYLINDERS - Dimensions

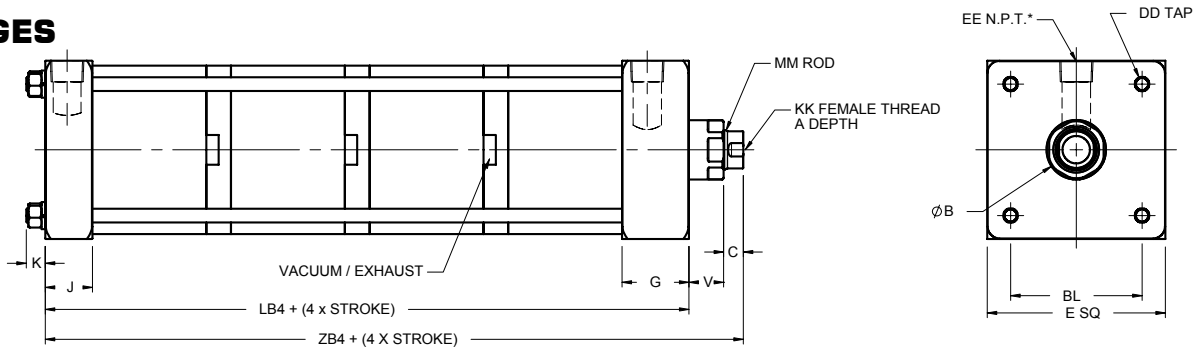
## 2 STAGES



## 3 STAGES



## 4 STAGES



BORE	A	B	BL	C	E	DD	EE	G	J	KK	MM	V
1 1/2	3/4	1 1/8	1,43	3/8	2	1/4-28	3/8	1 1/2	1	7/16-20	5/8	5/8
2	3/4	1 1/8	1,84	3/8	2 1/2	5/16-24	3/8	1 1/2	1	7/16-20	5/8	5/8
2 1/2	3/4	1 1/8	2,19	3/8	3	5/16-24	3/8	1 1/2	1	7/16-20	5/8	5/8
3 1/4	1 1/8	1 1/2	2,78	1/2	3 3/4	3/8-24	1/2	1 3/4	1 1/4	3/4-16	1	7/8
4	1 1/8	1 1/2	3,32	1/2	4 1/2	3/8-24	1/2	1 3/4	1 1/4	3/4-16	1	7/8
5	1 1/8	1 1/2	4,12	1/2	5 1/2	1/2-20	1/2	1 3/4	1 1/4	3/4-16	1	7/8
6	1 5/8	2	4,88	5/8	6 1/2	1/2-20	3/4	2	1 1/2	1-14	1 3/8	1
8	1 5/8	2	6,44	5/8	8 1/2	5/8-18	3/4	2	1 1/2	1-14	1 3/8	1

BORE	2 STAGES		3 STAGES		4 STAGES	
	LB2	ZB2	LB3	ZB3	LB4	ZB4
1 1/2	5 3/8	6 3/8	7 1/8	8 1/8	8 7/8	9 7/8
2	5 3/8	6 3/8	7 1/8	8 1/8	8 7/8	9 7/8
2 1/2	5 5/8	6 5/8	7 1/2	8 1/2	9 3/8	10 3/8
3 1/4	6 1/4	7 5/8	8 1/4	9 5/8	10 1/4	11 5/8
4	6 1/4	7 5/8	8 1/4	9 5/8	10 1/4	11 5/8
5	6 3/4	8 1/8	9	10 3/8	11 1/4	12 5/8
6	7 1/2	9 1/8	10	11 5/8	12 1/2	14 1/8
8	7 3/4	9 3/8	10 3/8	12	13	14 5/8

# M3 SERIES - Rod Thread Dimensions & Forces

## ROD END STYLE

**FULL MALE #1F**

**SMALL MALE #2\***

**LARGE MALE #1**

**SMALL MALE #2S STUDED**

**FEMALE #4**

MM ROD, FF THD, KK THD, CC THD, WRENCH FLATS, D, V, C, A, A DEEP

\* FOR 5/8 & 1" ROD, THE ROD END WILL BE STUDED #2S STANDARD

ROD DIA.	A	C	D	V	CC	FF	KK
5/8	3/4	3/8	1/2	5/8	1/2-20	5/8-18	7/16-20
1	1 1/8	1/2	7/8	7/8	7/8-14	1-14	3/4-16
1 3/8	1 5/8	5/8	1 3/16	1	1 1/4-12	1 3/8-12	1-14
1 3/4	2	3/4	1 1/2	1 1/8	1 1/2-12	1 3/4-12	1 1/4-12
2	2 1/4	7/8	1 3/4	1 1/8	1 3/4-12	2-12	1 1/2-12

LARGE MALE #1F    FULL MALE #1F    SMALL MALE #2, #2S, #4

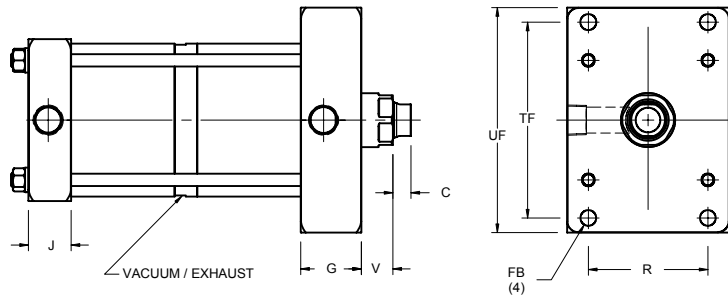
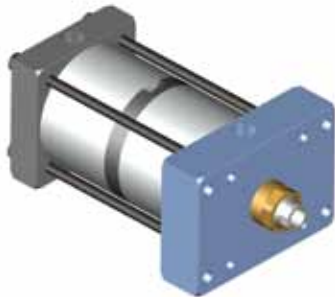
This grid is to show How much force you can get by using our M3 Multistage cylinder. All the forces are calculated with a pressure of 100 ps.i. Multistage cylinders can be use in push (extend) or Pull (retract) or Both, Stock stroke is 1, 2, 3, 4, 6", but can be ordered up to 12" stroke

FORCE (in pounds at 100 psi)						
BORE	2 STAGES		3 STAGES		4 STAGES	
	Extend	Retract	Extend	Retract	Extend	Retract
1 1/2	275	244	373	342	471	441
2	550	519	785	755	1021	990
2 1/2	903	873	1316	1285	1728	1697
3 1/4	1511	1432	2192	2113	2873	2794
4	2365	2286	3473	3394	4581	4503
5	3779	3700	5594	5515	7409	7330
6	5414	5266	8001	7853	10588	10440
8	9813	9664	14599	14450	19385	19236

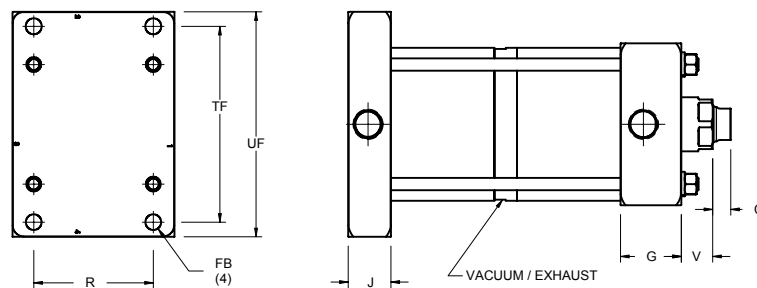
More Stage than 4 can be ordered ask your sales representative for a special quote. 10" bore also available on special request.

# M3 SERIES - Mounting Dimensions

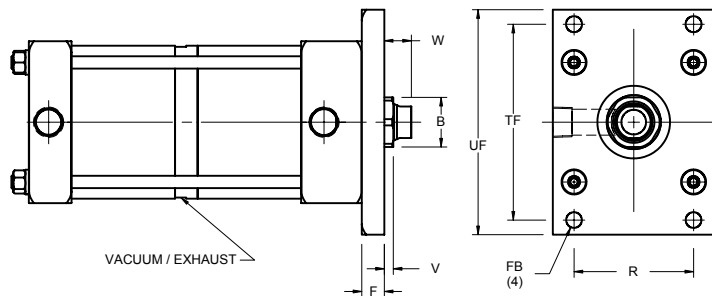
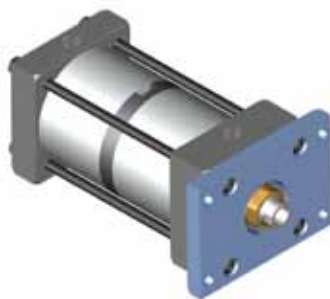
## ME5 - HEAD RECTANGULAR MOUNT



## ME6 - CAP RECTANGULAR MOUNT



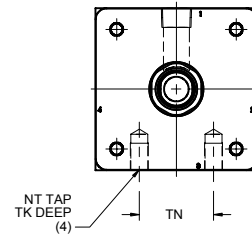
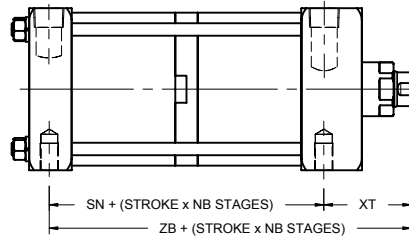
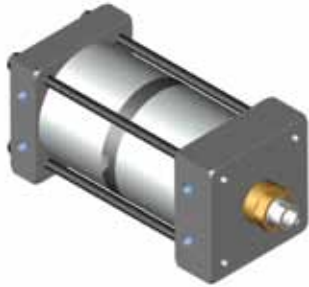
## MF1 - HEAD FLANGE MOUNT



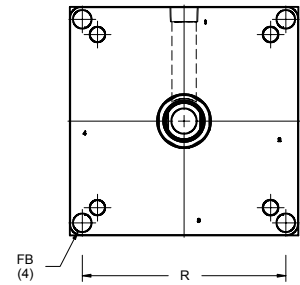
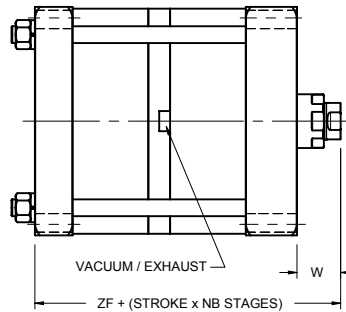
BORE	R	TF	UF	FB	B	C	E	F	G	J	V	W
1 1/2	1,43	2 3/4	2 3/8	5/16	1 1/8	3/8	2	3/8	1 1/2	1	5/8	5/8
2	1,84	3 3/8	4 1/8	3/8	1 1/8	3/8	2 1/2	3/8	1 1/2	1	5/8	5/8
2 1/2	2,19	3 7/8	4 5/8	3/8	1 1/8	3/8	3	3/8	1 1/2	1	5/8	5/8
3 1/4	2,78	4 11/16	5 1/2	7/16	1 1/2	1/2	3 3/4	5/8	1 3/4	1 1/4	7/8	7/8
4	3,32	5 7/16	6 1/4	7/16	1 1/2	1/2	4 1/2	5/8	1 3/4	1 1/4	7/8	7/8
5	4,12	6 5/8	7 5/8	7/16	1 1/2	1/2	5 1/2	5/8	1 3/4	1 1/4	7/8	7/8
6	4,88	7 5/8	8 5/8	9/16	2	5/8	6 1/2	3/4	2	1 1/2	1	1

# M3 SERIES- Mounting Dimensions

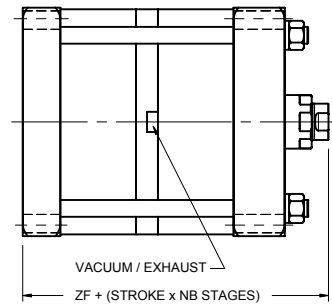
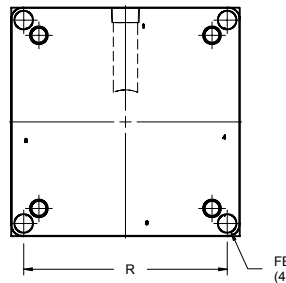
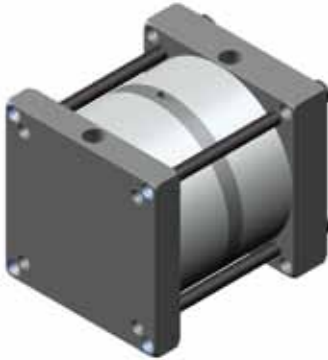
## MS4 - SIDE TAPPED MOUNT



## ME3 - SQUARE HEAD MOUNT (ONLY FOR 8, 10 & 12" BORE)



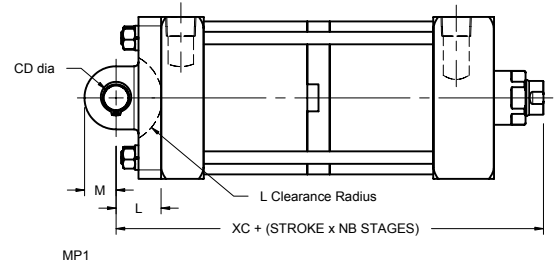
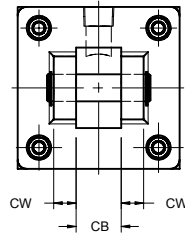
## ME4 - SQUARE CAP MOUNT (ONLY FOR 8, 10 & 12" BORE)



BORE	SN <sub>2</sub>	SN <sub>3</sub>	SN <sub>4</sub>	NT	TK	TN	XT	FB	R	W
1 1/2	4	5 3/4	7 1/2	1/4-20	3/8	5/8	1 15/16	X		
2	4	5 3/4	7 1/2	5/16-18	1/2	7/8	1 15/16			
2 1/2	4 1/4	6 1/8	8	3/8-16	5/8	1 1/4	1 15/16			
3 1/4	4 5/8	6 5/8	8 5/8	1/2-13	3/4	1 1/2	2 7/16			
4	4 5/8	6 5/8	8 5/8	1/2-13	3/4	2 1/16	2 7/16			
5	5 1/8	7 3/8	9 5/8	5/8-18	1	2 11/16	2 7/16			
6	5 5/8	8 1/8	10 5/8	3/4-10	1 1/8	3 1/4	2 13/16			
8	5 7/8	8 1/2	11 1/8	3/4-10	1 1/8	4 1/2	2 13/16			

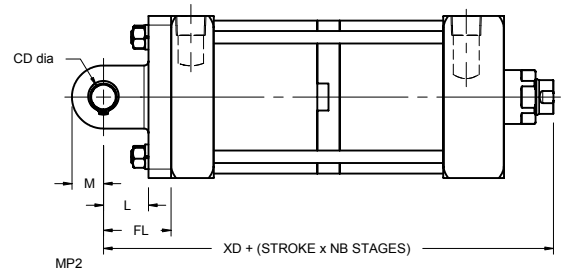
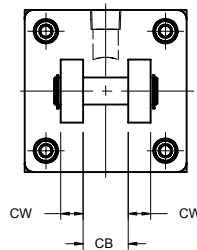
# M3 SERIES - Mounting Dimensions

## MP1 - SHORT CLEVIS MOUNT



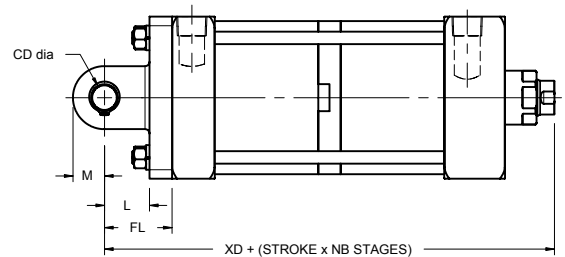
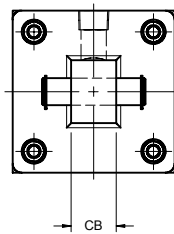
MP1

## MP2 - LONG CLEVIS MOUNT



MP2

## MP4 - EYE PIVOT MOUNT



MP4

BORE	CB	CD	CW	FL	L	M	2 STAGES		3 STAGES		4 STAGES	
							XC <sub>2</sub>	XD <sub>2</sub>	XC <sub>3</sub>	XD <sub>3</sub>	XC <sub>4</sub>	XD <sub>4</sub>
1 1/2	3/4	1/2	1/2	1 1/8	3/4	5/8	7 1/8	7 1/2	8 7/8	9 1/4	10 5/8	11
2	3/4	1/2	1/2	1 1/8	3/4	5/8	7 1/8	7 1/2	8 7/8	9 1/4	10 5/8	11
2 1/2	3/4	1/2	1/2	1 1/8	3/4	5/8	7 3/8	7 3/4	9 1/4	9 5/8	11 1/8	11 1/2
3 1/4	1 1/4	3/4	5/8	1 7/8	1 1/4	7/8	8 7/8	9 1/2	10 7/8	11 1/2	12 7/8	13 1/2
4	1 1/4	3/4	5/8	1 7/8	1 1/4	7/8	8 7/8	9 1/2	10 7/8	11 1/2	12 7/8	13 1/2
5	1 1/4	3/4	5/8	1 7/8	1 1/4	7/8	9 3/8	10	11 5/8	12 1/4	13 7/8	14 1/2
6	1 1/2	1	3/4	2 1/4	1 1/2	1 1/4	10 5/8	11 3/8	13 1/8	13 7/8	15 5/8	16 3/8
8	2	1	3/4	2 1/4	1 1/2	1 1/4	10 7/8		13 1/2		16 1/8	

# M3 SERIES - Hall Effect & Reed switches

**Reed switches** are constructed of two overlapping ferromagnetic reeds which are sealed in a glass tube with the ends aligned and a small gap between them. When an external magnetic force is applied, the reed assumes opposite polarity, the ends of the reeds attract each other and make contact, completing the circuit. Reed switches are not recommended in sensitive areas since they can introduce electrical noise into the circuit due to bounce and vibration from mechanical closing of the reeds.

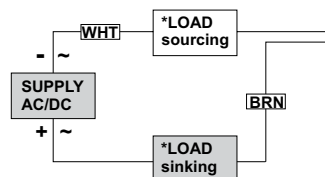
**Hall Effect switches** are solid state switches with no moving parts. The solid state switches is activated when the silicon chip (Hall) senses a magnetic field. Since there are no moving parts, Hall effect switches can operate in sensitive areas without sending interference or noise into the circuit.

## Switch specifications

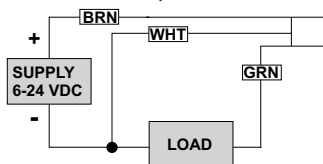
Switch part Number	862-100-004	862-100-031	862-100-032
Spec	Reed switch, MOV, LED	Electronic Sensor, LED, Sourcing	Electronic Sensor, LED, Sinking
Cable Length	9 ft PVC Cable		
Switching Voltage	5-120 VDC/VAC 50/60 Hz	6-24 VDC	6-24 VDC
Switching Current	0.5 Amp Max .005 Amp Min	0.5 Amp Max	0.5 Amp Max
Switching Power	10 Watts Max.	12 Watts Max.	12 Watts Max.
Switching Speed	0.5 $\mu$ s operate 0.1 $\mu$ s release	1.5 $\mu$ s operate 0.5 $\mu$ s release	0.5 $\mu$ s operate 0.1 $\mu$ s release
Voltage Drop	3.5 Volts	1.0 Volts	1.0 Volts
Temperature Range	-20° to 80°C -4° to 176°F		
Switch Function	SPST Normally Open	Normally Open PNP output	Normally Open NPN output
Shock	Up to 30G (11 msec.)	-	-
Vibration	Up to 20G (10-55 Hz)	-	-

## Wiring Diagrams

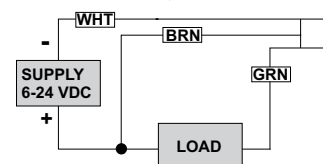
### REED SWITCH 04



### ELECTRONIC SWITCH 31 LED, SOURCING



### ELECTRONIC SWITCH 32 LED, SINKING



## How To Order

*Order Clamp Separately see below*

**862 - 100 - X XX**

Series	Connections	Type Code
862	0 - 9ft PCV wire	02 - Reed switches
762	1 - 8 mm Quick Connect with Pigtail (std)	04 - Reed switches
	3 - 8 mm Quick Connect	31 - Hall Effect PNP
		32 - Hall Effect NPN

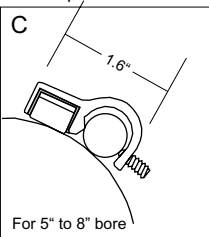
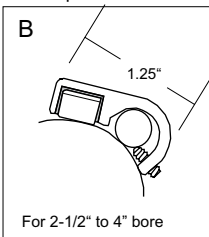
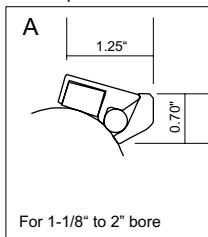
*quick connect switches available*

**To Order Switch Clamp Use:** (no charge when ordered with switches)

A clamp = 800-A00-000

B clamp = 800-B00-000

C clamp = 800-C00-000



## Clamp dimensions

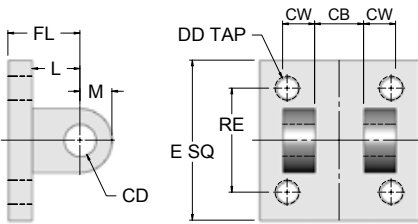




# M3 SERIES - Accessories

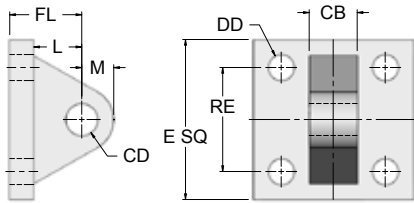


## NFPA CLEVIS BRACKET



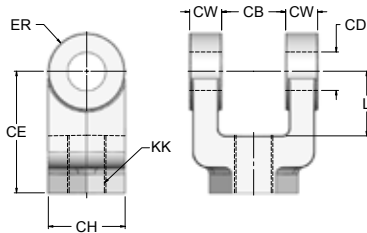
Part #	CB	CD PIN DIA.	CW	DD	E	FL	L	M	RE	USED WITH MP4
CB-05	.765	1/2	1/2	3/8-24	2 1/2	1 1/8	3/4	1/2	1 5/8	1.5, 2 & 2.5
CB-07	1.265	3/4	5/8	1/2-20	3 1/2	1 7/8	1 1/4	3/4	2 9/16	3.25, 4 & 5
CB-10	1.515	1	3/4	5/8-18	4 1/2	2 1/4	1 1/2	1	3 1/4	6, 7 & 8
CB-13	2.032	1 3/8	1	5/8-18	5	3	2 1/8	1 3/8	3 13/16	8, 10 & 12
CB-17	2.531	1 3/4	1 1/4	7/8-14	6 1/2	3 1/8	2 1/4	1 3/4	4 15/16	10 & 12

## NFPA EYE BRACKET



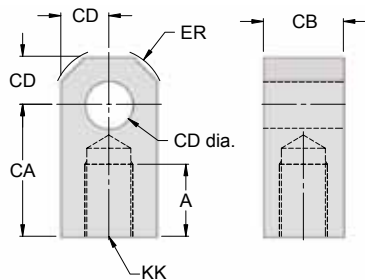
Part #	CB	CD PIN DIA.	DD	E	FL	L	M	RE	USED WITH MP1 & MP2
EB-05	.750	1/2	13/32	2 1/2	1 1/8	3/4	1/2	1 5/8	1.5, 2 & 2.5
EB-07	1.25	3/4	17/32	3 1/2	1 7/8	1 1/4	3/4	2 9/16	3.25, 4 & 5
EB-10	1.50	1	21/32	4 1/2	2 1/4	1 1/2	1	3 1/4	6, 7 & 8
EB-13	2.00	1 3/8	21/32	5	3	2 1/8	1 3/8	3 13/16	8, 10 & 12
EB-17	2.50	1 3/4	29/32	6 1/2	3 1/8	2 1/4	1 3/4	4 15/16	10 & 12

## NFPA ROD CLEVIS



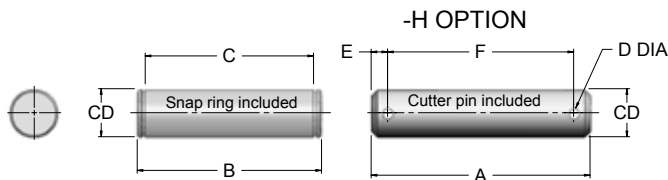
Part #	CB	CD PIN DIA.	CE	CH HEX.	CW	ER	KK	L
RC-05	.765	1/2	1 1/2	1	1/2	1/2	7/16-20	3/4
RC-07	1.265	3/4	2 3/8	1 1/4	5/8	3/4	3/4-16	1 1/4
RC-10	1.515	1	3 1/8	1 1/2	3/4	1	1-14	1 1/2
RC-13	2.032	1 3/8	4 1/8	2	1	1 3/8	1 1/4-12	2 1/8
RC-17	2.531	1 3/4	4 1/2	2 3/8	1 1/4	1 3/4	1 1/2-12	2 1/4
RC-20	2.531	2	5 1/2	2 15/16	1 1/4	2	1 7/8-12	2 1/2

## NFPA ROD EYE



Part #	A	CA	CB	CD PIN DIA.	ER	KK
RE-05	3/4	1 1/2	3/4	1/2	5/8	7/16-20
RE-07	1 1/8	2 1/16	1 1/4	3/4	7/8	3/4-16
RE-10	1 5/8	2 13/16	1 1/2	1	1 3/16	1-14
RE-13	2	3 7/16	2	1 3/8	1 9/16	1 1/4-12
RE-17	2 1/4	4	2 1/2	1 3/4	2	1 1/2-12
RE-20	3	5	2 1/2	2	2 1/2	1 7/8-12

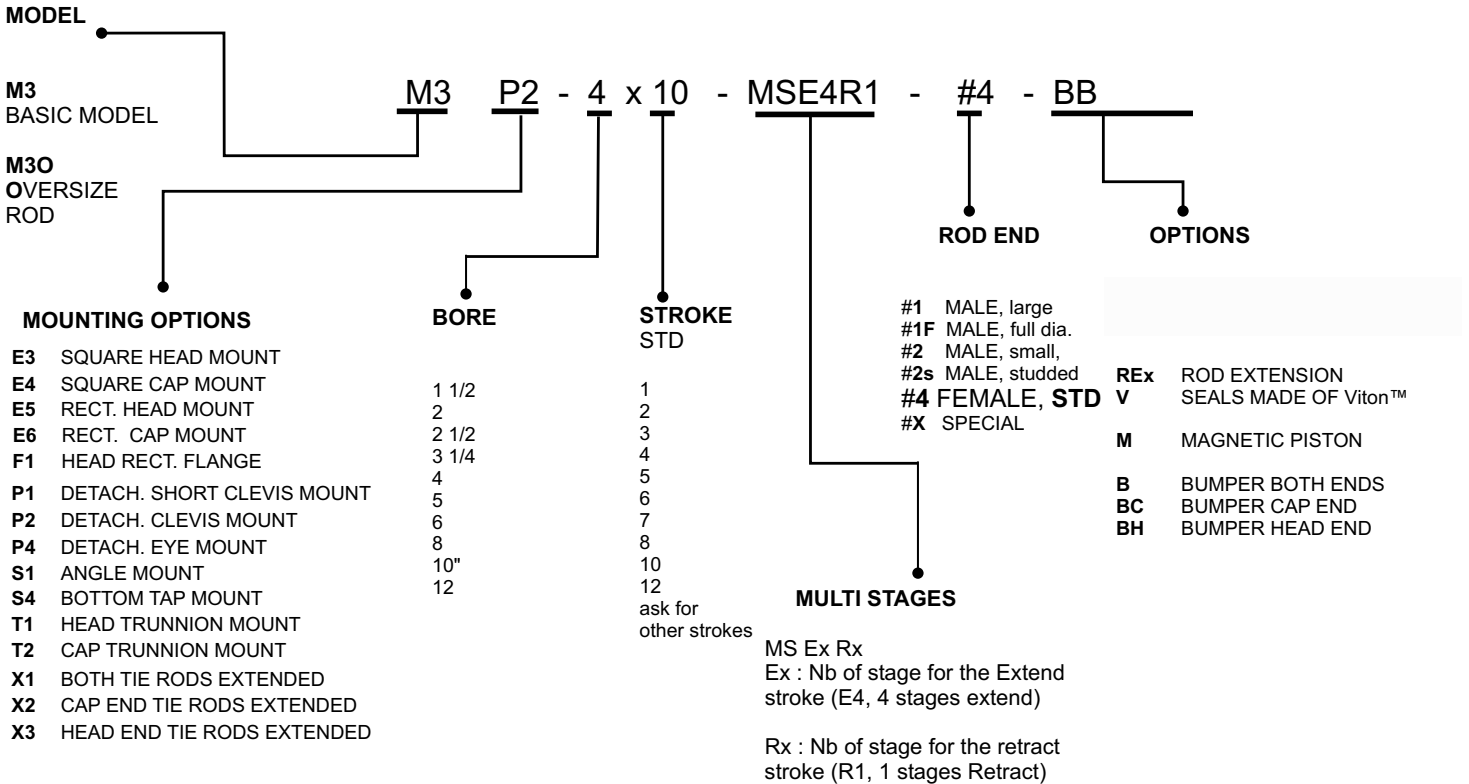
## NFPA PIN



Part #	CD	A	B	C	D	E	F
P-05	1/2	2.281	2.094	1.875	0.106	0.172	1.938
P-07	3/4	3.094	2.875	2.625	0.140	0.188	2.719
P-10	1	3.594	3.375	3.125	0.140	0.188	3.219
P-13	1 3/8	4.656	4.485	4.187	0.173	0.203	4.25
P-17	1 3/4	5.656	5.547	5.188	0.173	0.219	5.250
P-20	2	5.719	5.547	5.188	0.204	0.234	5.281

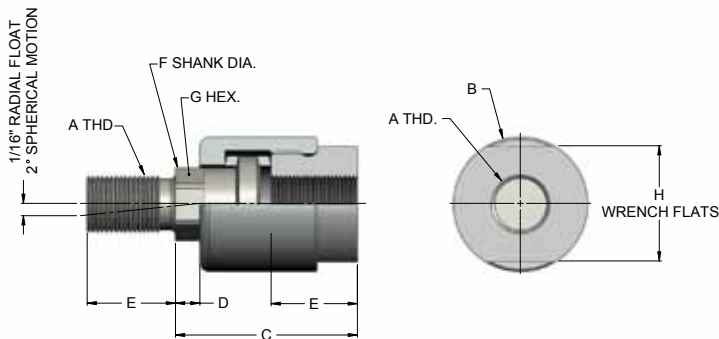
# M3 CYLINDERS - How to Order

EXAMPLE M3P2-4x10-MSE4R1-B is a M3 series, 4" bore, 10" stroke, 4 stages in extend Stroke, 1 in retract ,clevis mount, female rod thread, with Bumpers



To order seal kits add the prefix M3SK to the bore and rod diameter ex: M3SK-4000-1000-ExRx and for gland kit add the prefix M3BK to the rod diameter ex: M3BK-1375

## Linear Alignment Couplers

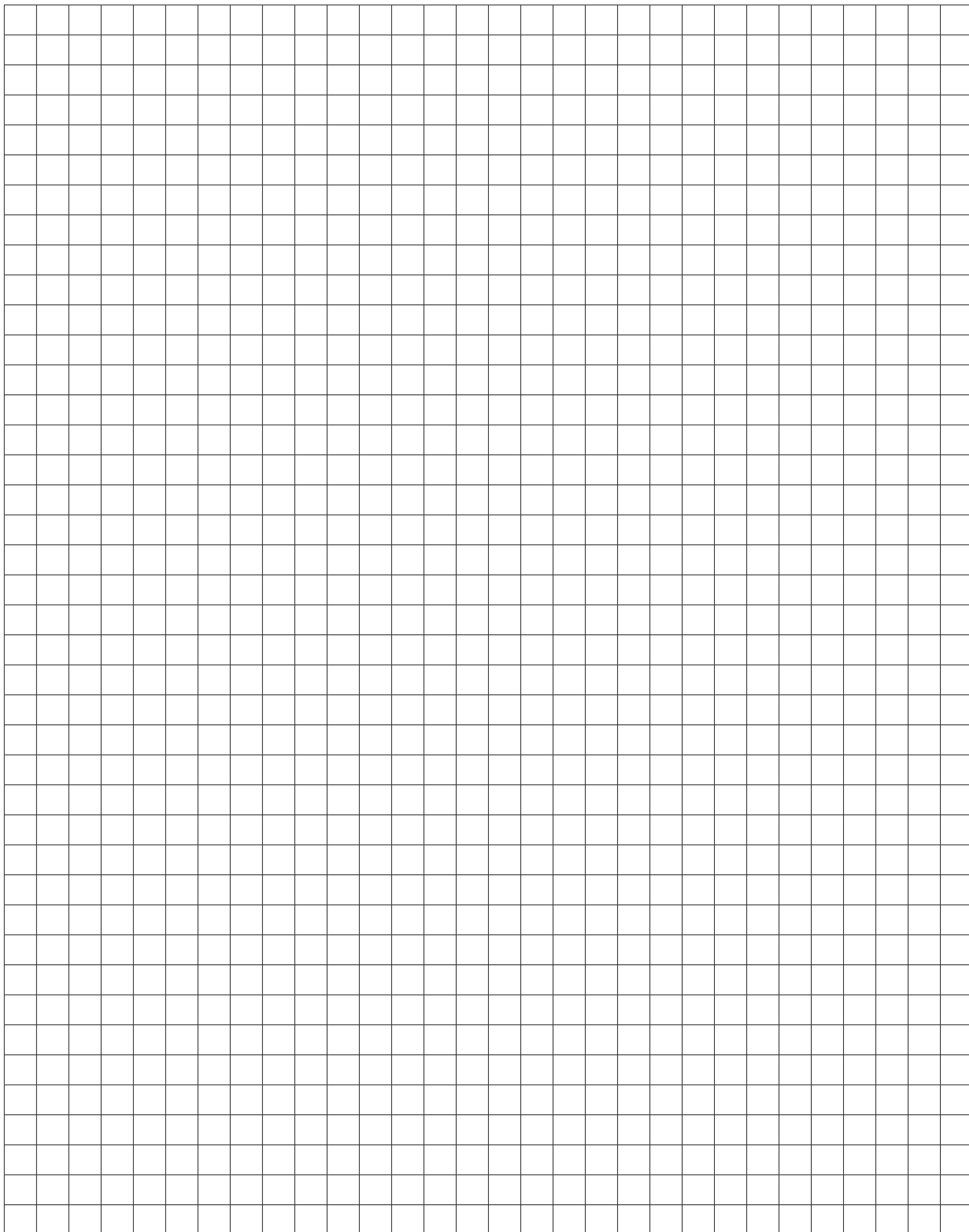


Star cyl's linear alignment couplers extend the bearing and seal life of your cylinders. Our couplers prevent binding and erratic movement that misalignment causes, which eventually wears down your cylinders. Not only do Starcyl couplers work equally well in "push" and "pull" applications, but they allow a greater tolerance between the cylinder center line and the mating member.

\* Use jam nut to lock coupler to rod when used with full diameter threads.

Part #	A	B	C	D	E	F	G	H	MAX PULL AT YIELD
AC-250F	1/4-28	7/8	1 1/4	1/4	5/8	0.245	3/16	13/16	6000
AC-312F	5/16-24	7/8	1 1/4	1/4	5/8	0.308	1/4	13/16	8300
AC-375C	3/8-16	7/8	1 1/4	1/4	5/8	0.369	5/16	13/16	5000
AC-375F	3/8-24	7/8	1 1/4	1/4	5/8	0.370	5/16	13/16	8300
AC-437F	7/16-20	1 1/4	2	1/2	3/4	5/8	9/16	1 1/8	10000
AC-500C	1/2-13	1 1/4	2	1/2	3/4	5/8	9/16	1 1/8	14000
AC-500F	1/2-20	1 1/4	2	1/2	3/4	5/8	9/16	1 1/8	14000
AC-625F	5/8-18	1 1/4	2	1/2	3/4	5/8	1/2	1 1/8	14000
AC-750C	3/4-10	1 3/4	2 5/16	5/16	1 1/8	31/32	7/8	1 1/2	34000
AC-750F	3/4-16	1 3/4	2 5/16	5/16	1 1/8	31/32	7/8	1 1/2	34000
AC-875F	7/8-14	1 3/4	2 5/16	5/16	1 1/8	31/32	7/8	1 1/2	34000
AC-1000C	1-8	2 1/2	2 15/16	1/2	1 5/8	1 3/8	1 1/4	2 1/4	64000
AC-1000F	1-14	2 1/2	2 15/16	1/2	1 5/8	1 3/8	1 1/4	2 1/4	64000
AC-1250F	1 1/4-12	2 1/2	2 15/16	1/2	1 5/8	1 3/8	1 1/4	2 1/4	64000
AC-1375F	1 3/8-12	2 1/2	2 15/16	1/2	1 5/8	1 3/8	1 1/4	2 1/4	64000
AC-1500F	1 1/2-12	3 1/4	4 3/8	13/16	2 1/4	1 3/4	1 1/2	3	134000
AC-1750F	1 3/4-12	3 1/4	4 3/8	13/16	2 1/4	1 3/4	1 1/2	3	134000
AC-1875F	1 7/8-12	3 3/4	5 7/16	11/16	3	2 1/4	1 7/8	3 1/2	240000
AC-2000F	2-12	3 3/4	5 7/16	11/16	3	2 1/4	1 7/8	3 1/2	240000

# M3 CYLINDERS - NOTES



PNEUMATIC & HYDRAULIC

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Don't Change The Design  
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- Stroke up to 40"
- Save Space up to 35%
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- Economic design

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- Flush Mount Standard
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- 200 PSI AIR/OIL
- Two-Year Warranty
- Economic Design

**STAR3 - Heavy Duty**  
NFPA interchangeable air cylinders  
Aluminum construction

**STARCYL**  
**NFPA ROD LOCK CYLINDER**

**ST3RL option**

FEATURES	BENEFITS
No Rod Displacement on Engagement	Maintains Accurate Positioning
Large Clamping Surface	Consistent Clamping Force
IPET Rated (exceeds NEMA 4X)	Suitable for Wash-Down Areas
Fast Response Time	High Cycle Rates, Accuracy
Extremely Low Backlash	Precision Holding
Spring-Engaged Units	Holds Load During Power/Pressure Loss
Stroke up to 200,000 Cycles	Long Maintenance-Free Life
4 bar (60 psi) Release Pressure	Compact Unit, Easy Integration
	Broad Application

**ST3RL - NFPA Rod**  
Lock for STAR3 air cylinders

**STARCYL AIR CYLINDERS**  
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Space. The Final Frontier...

**Space Saver Air Cylinders**

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MEDIUM DUTY SERVICES  
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STANDARD BORE SIZES 1.5" THROUGH 6"  
PISTON ROD DIAMETERS 5/8" THROUGH 5/16"  
20 STANDARD MOUNTING STYLES  
STARRITE™ AVAILABLE ON EVERY STEEL PARTS

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Steel Construction  
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STARRITE™ AVAILABLE ON ALL STEEL PARTS

**STAR6 - Heavy Duty**  
NFPA interchangeable Hydraulic cylinders,  
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