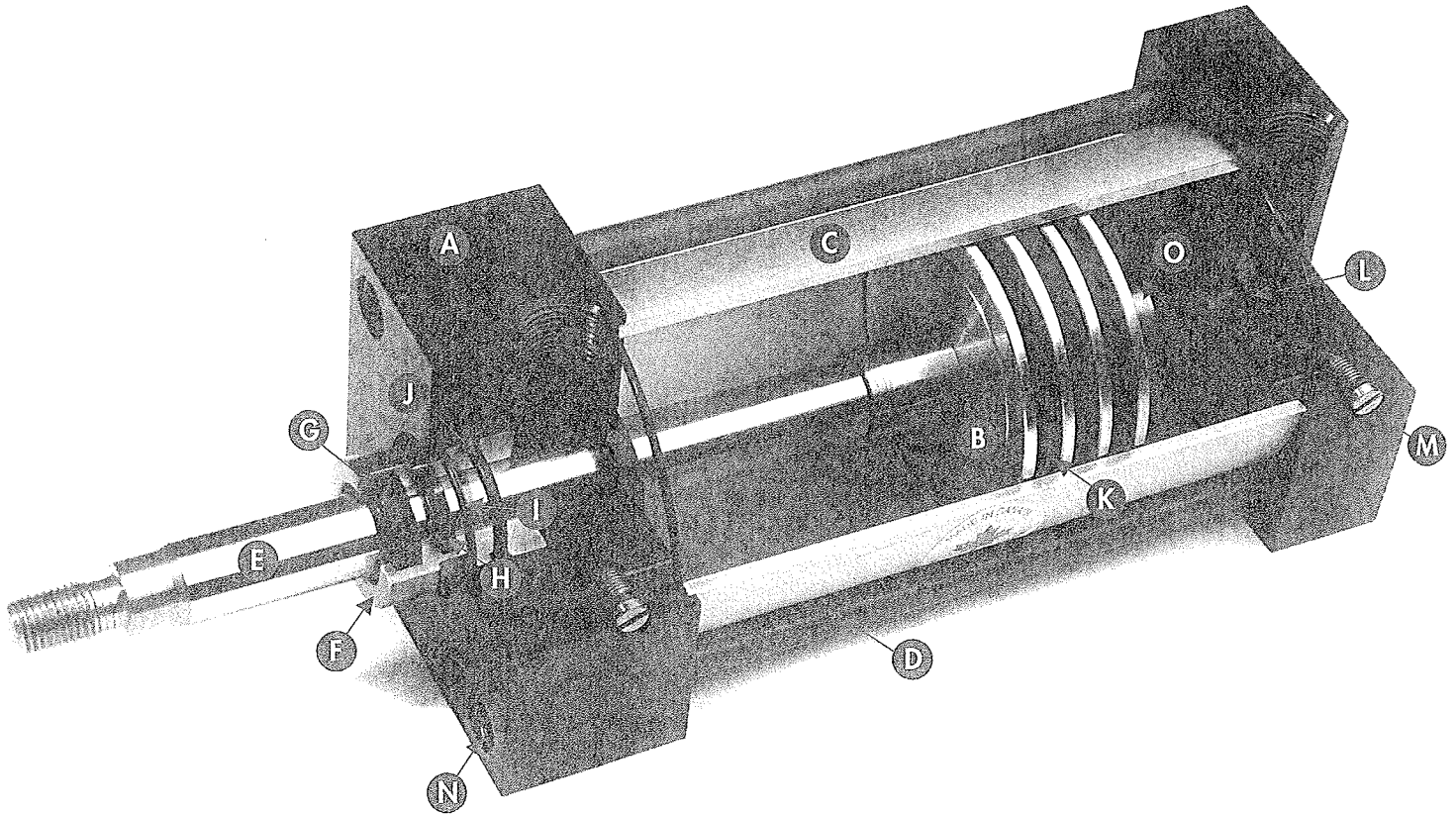


# NFPA

# NFPA

## design features



<b>A</b>	HEAD & CAP: BLACK ANODIZED, PRECISION MACHINED (6061-T6) ALUMINUM	<b>I</b>	BEARING RETAINER: WAVE BAND CLIP ALLOWS FOR EASY REMOVAL
<b>B</b>	PISTON: PRECISION MACHINED (6061-T6) SOLID ALUMINUM WITH MAGNET - PERMANENT LUB. GROOVE	<b>J</b>	BEARING SEAL: STANDARD BUNA NITRILE
<b>C</b>	CYLINDER TUBE: ALUMINUM (6063-T6) PORT HOLE EXTRUDED, CLEAR COAT ANODIZED I.D.	<b>K</b>	PISTON SEALS: STANDARD BUNA NITRILE PRESSURE ENERGIZED WEAR COMPENSATING LOW FRICTION
<b>D</b>	TIE RODS: STRESS PROOFED MATERIAL STANDARD	<b>L</b>	CUSHION SEALS: HEAVY DUTY PRESS FIT EXTRA LONG LIFE
<b>E</b>	PISTON ROD: CHROME PLATED (1045) MATERIAL .005 PER SIDE, 50-55 ROCKWELL 75,000 P.S.I. YIELD	<b>M</b>	ADJUSTING SCREWS: ONE PIECE FULL THREAD NEEDLE
<b>F</b>	ROD BEARING: PRECISION MACHINED (93200) BEARING BRONZE, DOUBLE SEAL CAPABILITY	<b>N</b>	SOCKET NUT: (4) ROD END ONLY HEAT TREATED & BLACK OXIDED
<b>G</b>	ROD WIPER: STANDARD BUNA NITRILE, DUAL FUNCTION WIPER - SECONDARY ROD SEAL	<b>O</b>	END SLEEVE: CAPSCREW RETAINED PISTON ASSEMBLY EASILY REMOVED
<b>H</b>	ROD SEAL: STANDARD BUNA NITRILE PRIMARY SEAL PRESSURE ENERGIZED		

# NFPA

## NFPA Aluminum Cylinders

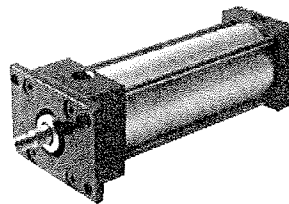
Product code EN

### FEATURES

- NFPA interchangeable
- Hard anodized aluminum cylinder barrel
- Aluminum end caps
- Hard chrome plated piston rod
- Optional magnetic piston, cushions & oversize rod

### SPECIFICATIONS

- Media - air or hydraulic
- Maximum pressure - 250 PSI
- Temperature range - -20 ~ 250°F



### ORDER CODES

PA	2	x	6	MS4	CC	N	5/8	SM	
NFPA ALUMINUM SERIES	BORE SIZE		STROKE INCHES	NFPA MOUNTING TYPE	ADJUSTABLE CUSHIONS	MAGNETIC PISTON	ROD DIAMETER	THREAD STYLE	
BORE SIZE				MOUNTING TYPE	CUSHIONS	ORDER CODE	BORE SIZE	STD. ROD	OVERSIZE ROD
1 1/2"					Both Ends	CC	1 1/2"-2 1/2"	5/8"	1"
2"	Side top and sleeve nut			MS4/MX5	Rod end only	CN	3 1/4"-5"	1"	1 3/8"
2 1/2"	Cap detachable clevis			MP2	Cap end only	NC	6"	1 3/8"	1 3/4"
3 1/4"	Cap detachable clevis, female			MP1	None	NN			
4"	Cap detachable eye			MP4			MAGNET OPTION	ORDER CODE	
5"	Head rectangular flange			MF1			None	N	
6"	Cap rectangular flange			MF2			Magnetic Piston	M	
ROD THREAD	ORDER CODE		5/8" ROD	1" ROD	1 3/8" ROD	1 3/4" ROD			
Small male	SM		7/16-20	3/4-16	1-14	1 1/4-12			
Full male	FM		5/8-18	1-14	1 3/8-12	1 3/4-12			
Small Female	SF		7/16-20	3/4-16	1-14	1 1/4-12			

BORE SIZES TO 14" AVAILABLE IN ALL STEEL CONSTRUCTION  
CONSULT US FOR PRICING AND AVAILABILITY

# NFPA

## specifications

### SPECIFICATIONS

#### OPERATING TEMPERATURES:

-40° to 200°F

Viton Seals: -20° to 400°F

#### OPERATING PRESSURES:

Pneumatic to 250 psig

Hydraulic 250 psig \*maximum\*

#### BORE DIAMETERS:

1-1/2", 2", 2-1/2", 3-1/4", 4", 5", 6"

#### ROD DIAMETERS:

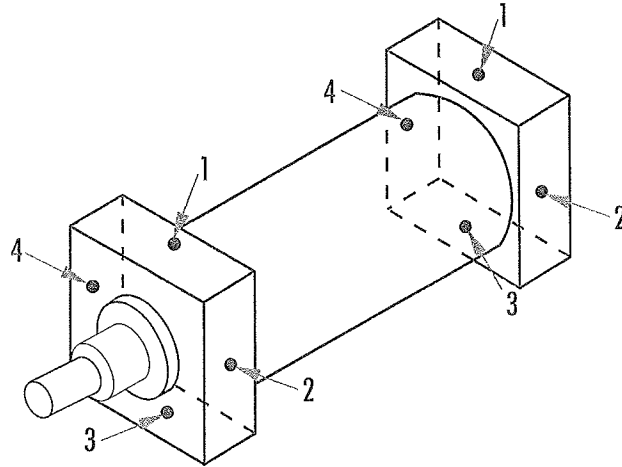
5/8", 1", 1-3/8", 1-3/4"

#### STROKE LENGTH:

9 feet maximum. For longer stroke lengths, consult factory

#### FLUIDS:

Filtered compressed air, lubricated or non-lubricated



### PORTING

#### STANDARD LOCATIONS:

Ports: POSITION #1

Cushion Screw: POSITION #2

FR (MT1) POSITION #3

FB (MT2) POSITION #3

#### OPTIONAL LOCATIONS:

Per customer request, subject to mounting limitations.

#### NOTE:

Rear cushioning only available on the PA 1 1/2 Bore Size

#### DIMENSIONS - MOUNTS

NFPA INTERCHANGEABLE

### BREAKAWAY PRESSURES

Listed right are the average breakaway pressures in psi for all PA Series Cylinder bore sizes. If your application requires a lower breakaway pressure than indicated for a particular bore size, consult factory.

Note: Breakaway pressures shown are for cylinders mounted horizontally and no load on the piston rod.

### BREAKAWAY PRESSURES IN PSI

BORE	EXTEND	RETRACT
1-1/2", 2", 2-1/2"	5	6
3-1/4", 4"	4	5
5", 6"	3	4

### WEIGHT CHART - BASIC CYLINDERS

BORE	H	MODEL						ADD PER IN. OF STROKE
		AP/FR/FB	E1*	E2*	E4*	C/F	A	
1 1/2	1.6	2.0	2.1	2.2	2.2	2.2	2.5	.20
2	2.4	2.9	3.2	3.3	3.2	3.4	3.6	.25
2 1/2	3.3	3.9	4.3	4.5	4.5	4.6	4.7	.27
3 1/4	6.5	7.9	9.2	10.1	10.0	9.8	9.0	.51
4	8.8	10.5	12.1	13.3	13.2	13.3	11.1	.55
5	13.2	14.3	17.8	19.9	19.0	20.0	17.5	.59
6	21.5	25.2	29.7	32.2	32.2	32.2	27.2	.84

All weights in LBS. Oversize rod weight add 10%

\* Weight includes mounting pin

# NFPA

## NFPA Aluminum Cylinders Accessories

Product code EN

Part Number      Description      Used with (Bore Size)

### ROD CLEVIS

PA RC-05	7/16-20 thread	1 1/2"~2 1/2"
PA RC-07	3/4-16 thread	3 1/4"~5"
PA RC-10	1-14 thread	6"



### ROD EYE

PA RE-05	7/16-20 thread	1 1/2"~2 1/2"
PA RE-07	3/4-16 thread	3 1/4"~5"
PA RE-10	1-14 thread	6"



### CLEVIS BRACKET

PA CB-05	For MP4	1 1/2"~2 1/2"
PA CB-07	For MP4	3 1/4"~5"
PA CB-10	For MP4	6"



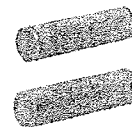
### EYE BRACKET

PA EB-05	For MP1 or MP2	1 1/2"~2 1/2"
PA EB-07	For MP1 or MP2	3 1/4"~5"
PA EB-10	For MP1 or MP2	6"



### PIVOT PIN

PA PP-05	1/2" dia. pin	PA RC-05
PA PP-07	3/4" dia. pin	PA RC-07
PA PP-10	1" dia. pin	7PA RC-10



## Reed Switch Specifications

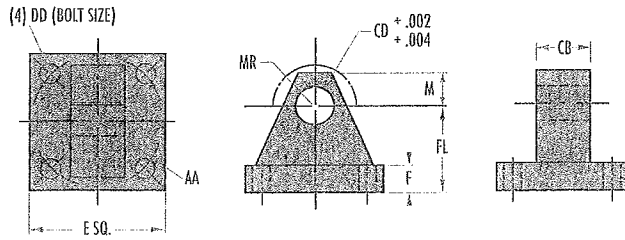
Part Number	Description
-------------	-------------

CS-6200R	Reed Switch, LED, 3 Meter/118" cable
CS-6200R-QD	Reed Switch, LED, M8 x 1 male connector

# NFFPA

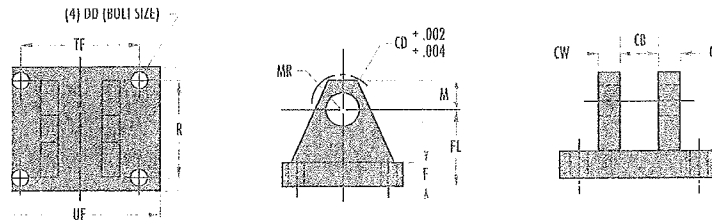
## mounting accessories

### Eye Bracket



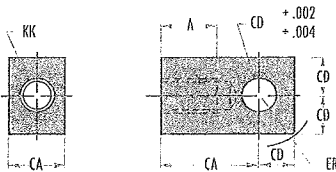
CYL. DIA	E	F	M	AA	GB	GD	DD	FL	MR
1 1/2-2 1/2	2 1/2	3/8	1/2	2.30	3/4	1/2	3/8	1 1/8	5/8
3 1/4-4-5	3 1/2	5/8	3/4	3.61	1 1/4	3/4	1/2	1 7/8	7/8
6	4 1/2	7/8	1	4.60	1 1/2	1	5/8	2 3/8	1 1/4

### Mounting Bracket



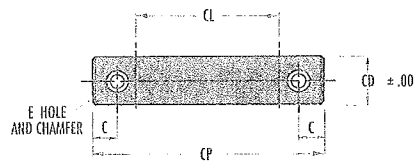
CYL. DIA	E	F	M	R	CB	CD	CW	DD	FL	MR	TF	UF
1 1/2-2 1/2	2 1/2	3/8	1/2	1.63	3/4	1/2	1/2	3/8	1 1/8	5/8	2 3/4	3 1/2
3 1/4-4-5	3 1/2	5/8	3/4	2.55	1 1/4	3/4	5/8	1/2	1 7/8	7/8	3 3/4	4 3/4
6	4 1/2	7/8	1	3.25	1 1/2	1	3/4	5/8	2 3/8	1 1/4	4 1/2	5 3/4

### Rod Eye (Female)



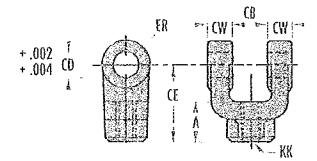
KK	A	CA	CB	CD	ER
7/16-20	3/4	1 1/2	3/4	1/2	5/8
3/4-16	1 1/8	2 1/16	1 1/4	3/4	1 1/16
1-14	1 5/8	2 13/16	1 1/2	1	1 7/16
1 1/4-12	2	3 7/16	2	1 3/8	2
1 1/2-12	2 1/4	4	2 1/2	1 3/4	2 1/16

### Pivot-Pin



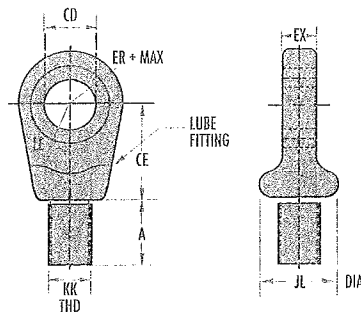
C	E	GD	CP	CL
3/16	1/8	1/2	2 3/8	1 3/4
1/4	3/16	3/4	3 1/8	2 1/2
1/4	3/16	1	3 5/8	3
1/4	3/16	1 3/8	4 3/4	4
1/4	3/16	1 3/4	5 13/16	5

### Rod Clevis (Female)



KK	A	CB	CD	CE	CW	ER
7/16-20	3/4	3/4	1/2	1 1/2	12	1/2
3/4-16	1 1/8	1 1/4	3/4	2 3/8	5/8	3/4
1-14	2 5/8	1 1/2	1	3 1/8	3/4	1
1 1/4-12	2	2	1 3/8	4 1/8	1	1 3/8
1 1/2-12	2 1/4	2 1/2	1 3/4	4 1/2	1 1/4	1 3/4

### Spherical Rod Eye

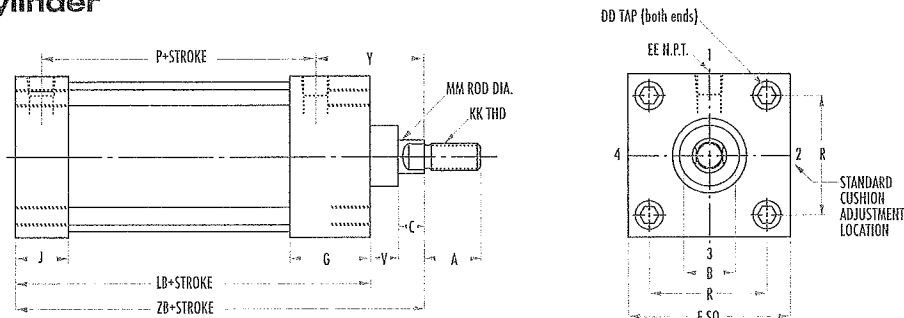


A	CD	CE	EX	ER	KK	LE	JL	MAX PULL LOAD
.687	.500	.875	.437	.875	7/16-20	.750	.875	2,644
1.000	.750	1.250	.656	1.250	3/4-16	1.062	1.312	9,441
1.500	1.000	1.875	.875	1.375	1-1/4	1.437	1.500	16,860
2.000	1.375	2.125	1.187	1.812	1 1/4-12	1.875	2.000	28,562
2.125	1.750	2.500	1.531	2.187	1 1/2-12	2.125	2.250	43,005

# NFPA

## standard rod diameters

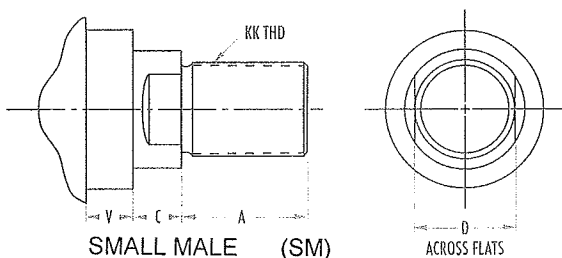
### Basic Cylinder



BORE	A	B	R	C	DD	E	EE*	G	J	KK	LB	MM	P	V	Y	ZB
1 1/2	3/4	1 1/8	1.43	3/8	1/4 - 28	2	1/4	1 1/2	1	7/16-20	3 5/8	5/8	2 3/16	5/8	1 29/32	4 5/8
2	3/4	1 1/8	1.84	3/8	5/16-24	2 1/2	3/8	1 1/2	1	7/16-20	3 5/8	5/8	2 3/16	5/8	1 29/32	4 5/8
2 1/2	3/4	1 1/8	2.19	3/8	5/16-24	3	3/8	1 1/2	1	7/16-20	3 3/4	5/8	2 5/16	5/8	1 29/32	4 3/4
3 1/4	1 1/8	1 1/2	2.78	1/2	3/8 - 24	3 3/4	1/2	1 3/4	1 1/4	3/4-16	4 1/4	1	2 5/8	7/8	2 7/16	5 5/8
4	1 1/8	1 1/2	3.32	1/2	3/8 - 24	4 1/2	1/2	1 3/4	1 1/4	3/4-16	4 1/4	1	2 5/8	7/8	2 7/16	5 5/8
5	1 1/8	1 1/2	4.12	1/2	1/2 - 20	5 1/2	1/2	1 3/4	1 1/4	3/4-16	4 1/2	1	2 7/8	7/8	2 7/16	5 7/8
6	1 5/8	2	4.88	5/8	1/2 - 20	6 1/2	3/4	2	1 1/2	1-14	5	1 3/8	3 1/8	1	2 13/16	6 5/8

\* One size larger port available upon request

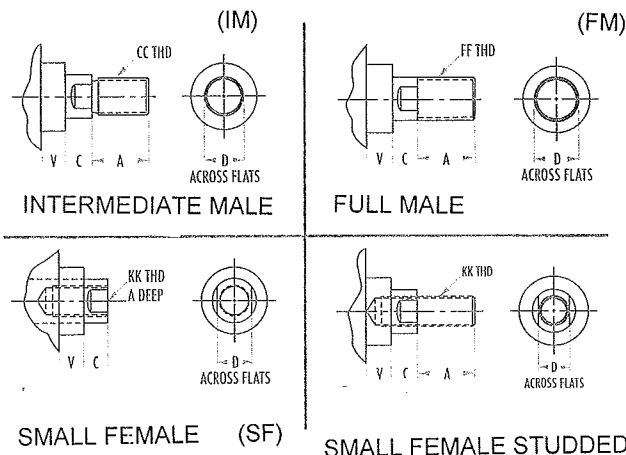
### Rod End Type Standard



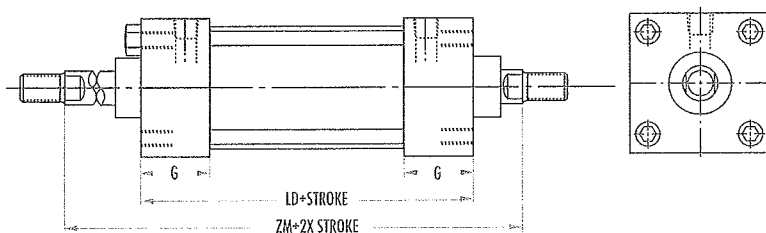
furnished as standard unless otherwise specified

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

### Optional



### Double Rod End

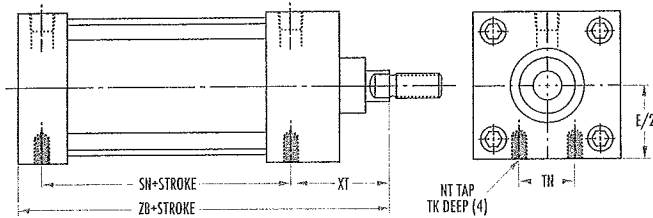


BORE	G	LD	ZM
1 1/2	1 1/2	4 1/8	6 1/8
2	1 1/2	4 1/8	6 1/8
2 1/2	1 1/2	4 1/4	6 1/4
3 1/4	1 3/4	4 3/4	7 1/2
4	1 3/4	4 3/4	7 1/2
5	1 3/4	4 3/4	7 1/2
6	2	5 1/2	8 3/4

# NFPA

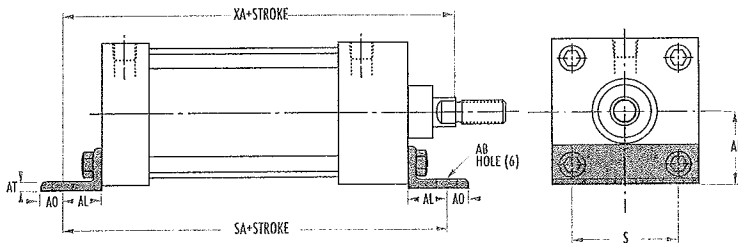
## standard rod diameters

### Bottom Tap Mount (NFPA MS4)



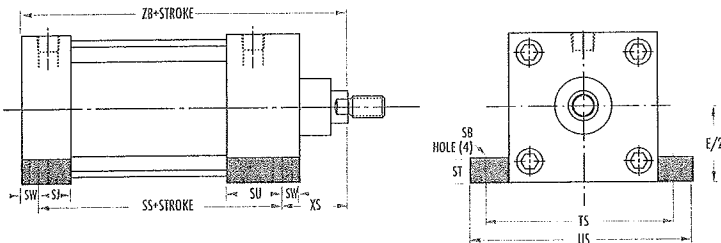
BORE	NT	TK	TN	SN	XT	ZB
1 1/2	1/4-20	3/8	5/8	2 1/4	1 15/16	4 5/8
2	5/16-18	1/2	7/8	2 1/4	1 15/16	4 5/8
2 1/2	3/8-16	5/8	1 1/4	2 3/8	1 15/16	4 3/4
3 1/4	1/2-13	3/4	1 1/2	2 5/8	2 7/16	5 5/8
4	1/2-13	3/4	2 1/16	2 5/8	2 7/16	5 5/8
5	5/8-11	1	2 11/16	2 7/8	2 7/16	5 7/8
6	3/4-10	1 1/8	3 1/4	3 1/8	2 13/16	6 5/8

### Angle Mount (NFPA MS1)



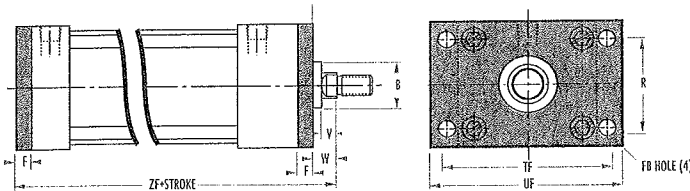
BORE	AB	AH	AL	AO	AT	S	SA	XA
1 1/2	7/16	1 3/16	1	3/8	1/8	1 1/4	5 5/8	5 5/8
2	7/16	1 7/16	1	3/8	1/8	1 3/4	5 5/8	5 5/8
2 1/2	7/16	1 5/8	1	3/8	1/8	2 1/4	5 3/4	5 3/4
3 1/4	9/16	1 15/16	1 1/4	1/2	3/16	2 3/4	6 3/4	6 3/4
4	9/16	2 1/4	1 1/4	1/2	3/16	3 1/2	6 3/4	6 3/4
5	11/16	2 3/4	1 3/8	5/8	3/16	4 1/4	7 1/4	7 1/4
6	13/16	3 1/4	1 3/8	5/8	1/4	5 1/4	7 3/4	7 3/4

### Side Lug Mount (NFPA MS2)



BORE	SB	SJ	SS	ST	SU	SW	TS	US	ZB	XS
1 1/2	13/32	5/8	2 7/8	1/2	1 1/8	3/8	2 3/4	3 1/2	4 5/8	1 3/8
2	13/32	5/8	2 7/8	1/2	1 1/8	3/8	3 1/4	4	4 5/8	1 3/8
2 1/2	13/32	5/8	3	1/2	1 1/8	3/8	3 3/4	4 1/2	4 3/4	1 3/8
3 1/4	17/32	3/4	3 1/4	3/4	1 1/4	1/2	4 3/4	5 3/4	5 5/8	1 7/8
4	25/32	3/4	3 1/4	3/4	1 1/4	1/2	5 1/2	6 1/2	5 5/8	1 7/8
5	25/32	9/16	3 1/8	1	1 1/16	11/16	6 7/8	8 1/4	5 7/8	2 1/16
6	25/32	13/16	3 5/8	1	1 5/16	11/16	7 7/8	9 1/4	6 5/8	2 5/16

### Front Flange Mount (NFPA MF1)



BORE	B	F	FB	R	TF	UF	V	W	ZF
1 1/2	1 1/8	3/8	5/16	1.43	2 3/4	3 3/8	1/4	5/8	5
2	1 1/8	3/8	3/8	1.84	3 3/8	4 1/8	1/4	5/8	5
2 1/2	1 1/8	3/8	3/8	2.19	3 7/8	4 5/8	1/4	5/8	5 1/8
3 1/4	1 1/2	5/8	7/16	2.76	4 11/16	5 1/2	1/4	3/4	6 1/4
4	1 1/2	5/8	7/16	3.32	5 7/16	6 1/4	1/4	3/4	6 1/4
5	1 1/2	5/8	9/16	4.10	6 5/8	7 5/8	1/4	3/4	6 1/2
6	2	3/4	9/16	4.88	7 5/8	8 5/8	1/4	7/8	7 3/8

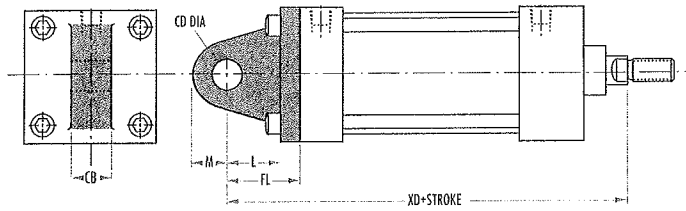
### Rear Flange Mount (NFPA MF2)



# NFPA

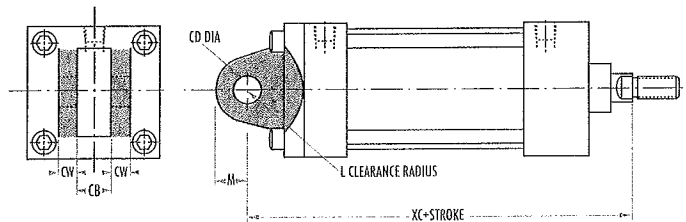
## standard rod diameters

### Detachable Eye Mount (NFPA MP4) (supplied with pin)



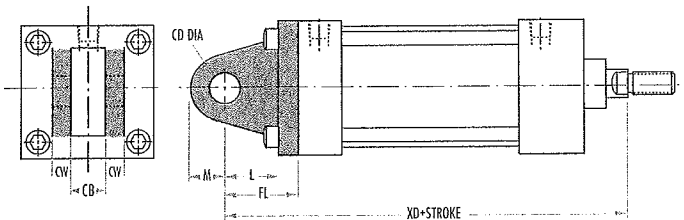
BORE	CB	CD	FL	L	M	XD
1 1/2	3/4	1/2	1 1/8	3/4	5/8	5 3/4
2	3/4	1/2	1 1/8	3/4	5/8	5 3/4
2 1/2	3/4	1/2	1 1/8	3/4	5/8	5 7/8
3 1/4	1 1/4	3/4	1 7/8	1 1/4	7/8	7 1/2
4	1 1/4	3/4	1 7/8	1 1/4	7/8	7 1/2
5	1 1/4	3/4	1 7/8	1 1/4	7/8	7 3/4
6	1 1/2	1	2 1/4	1 1/2	1 1/8	8 7/8

### Clevis Mount (NFPA MP1) (supplied with pin)



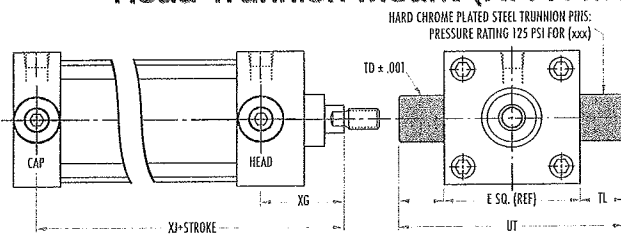
BORE	CB	CD	CW	L	M	XC
1 1/2	3/4	1/2	3/8	3/4	5/8	5 3/8
2	3/4	1/2	1/2	3/4	5/8	5 3/8
2 1/2	3/4	1/2	1/2	3/4	5/8	5 1/2
3 1/4	1 1/4	3/4	3/4	1 1/4	7/8	6 7/8
4	1 1/4	3/4	3/4	1 1/4	7/8	6 7/8
5	1 1/4	3/4	3/4	1 1/4	7/8	7 1/8
6	1 1/2	1	1	1 1/2	1 1/8	8 1/8

### Detachable Clevis Mount (NFPA MP2) (supplied with pin)



BORE	CB	CD	CW	FL	L	M	XD
1 1/2	3/4	1/2	3/8	1 1/8	3/4	5/8	5 3/4
2	3/4	1/2	1/2	1 1/8	3/4	5/8	5 3/4
2 1/2	3/4	1/2	1/2	1 1/8	3/4	5/8	5 7/8
3 1/4	1 1/4	3/4	3/4	1 7/8	1 1/4	7/8	7 1/2
4	1 1/4	3/4	3/4	1 7/8	1 1/4	7/8	7 1/2
5	1 1/4	3/4	3/4	1 7/8	1 1/4	7/8	7 3/4
6	1 1/2	1	1	2 1/4	1 1/2	1 1/8	8 7/8

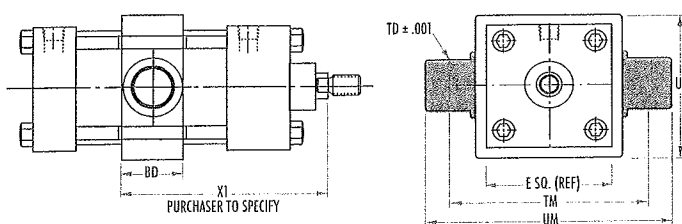
### Head Trunnion Mount (NFPA MT1)



BORE	E	TD	TL	UT	FB XJ	FB XG
1 1/2	2	1	1	4	4 1/8	1 15/16
2	2 1/2	1	1	4 1/2	4 1/8	1 15/16
2 1/2	3	1	1	5	4 1/4	1 15/16
3 1/4	3 1/4	1	1	5 3/4	5	2 7/16
4	4 1/2	1	1	6 1/2	5	2 7/16
5	5 1/2	1	1	7 1/2	5 1/4	2 7/16
6	6 1/2	1 3/8	1 3/8	9 1/4	5 7/8	2 13/16

### Cap Trunnion Mount (NFPA MT2)

### Intermediate Trunnion Mount (NFPA MT4)

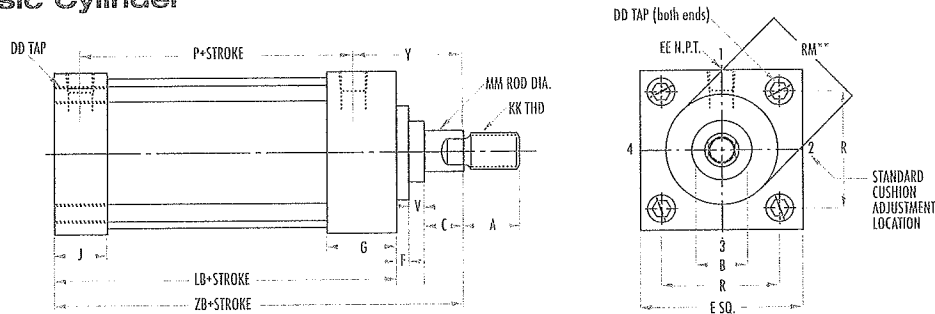


BORE	E	BD	TD	TL	TM	UM	UV	X1
1 1/2	2	1 1/4	1	1	2 1/2	4 1/2	2 1/2	Purchaser to specify
2	2 1/2	1 1/2	1	1	3	5	3	
2 1/2	3	1 1/2	1	1	3 1/2	5 1/2	3 1/2	
3 1/4	3 3/4	2	1	1	4 1/2	6 1/2	4 1/4	
4	4 1/2	2	1	1	5 1/4	7 1/4	5	
5	5 1/2	2	1	1	6 1/4	8 1/4	6	
6	6 1/2	2 1/2	1 3/8	1 3/8	7 5/8	10 3/8	7	

# NFPA

## oversize rod diameters

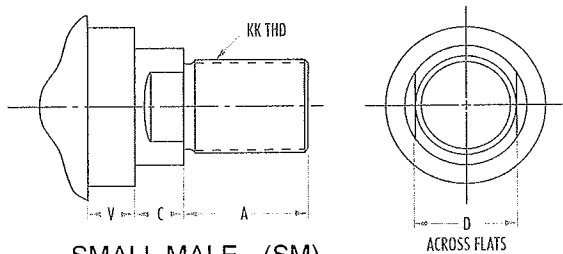
### Basic Cylinder



BORE	A	B	R	C	DD	E	EE*	F	G	J	KK	LB	MM	P	RM	V	Y	ZB
1 1/2	1 1/8	1 5/16	1.43	1/2	1/4 - 28	2	1/4	--	1 1/2	1	3/4-16	3 5/8	1	2 3/16	--	.875	2 9/32	5
2	1 1/8	1 1/2	1.84	1/2	5/16-24	2 1/2	3/8	--	1 1/2	1	3/4-16	3 5/8	1	2 3/16	--	.875	2 9/32	5
2 1/2	1 1/8	1 1/2	2.19	1/2	5/16-24	3	3/8	--	1 1/2	1	3/4-16	3 3/4	1	2 5/16	--	.875	2 9/32	5 1/8
3 1/4	1 5/8	2	2.78	5/8	3/8 - 24	3 3/4	1/2	--	1 3/4	1 1/4	1-14	4 1/4	1 3/8	2 5/8	--	1.00	2 11/16	5 7/8
4	1 5/8	2	3.32	5/8	3/8 - 24	4 1/2	1/2	--	1 3/4	1 1/4	1-14	4 1/4	1 3/8	2 5/8	--	1.00	2 11/16	5 7/8
5	1 5/8	2	4.12	5/8	1/2 - 20	5 1/2	1/2	--	1 3/4	1 1/4	1-14	4 1/2	1 3/8	2 7/8	--	1.00	2 11/16	6 1/8
6	2	2 3/8	4.88	3/4	1/2 - 20	6 1/2	3/4	19/32	2	1 1/2	1 1/4-12	5	1 3/4	3 1/8	3.875	1.125	3 1/16	6 7/8

\* One size larger port available upon request

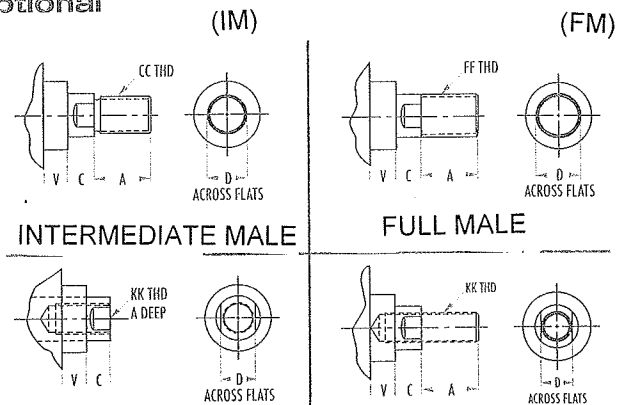
### Rod End Type Standard



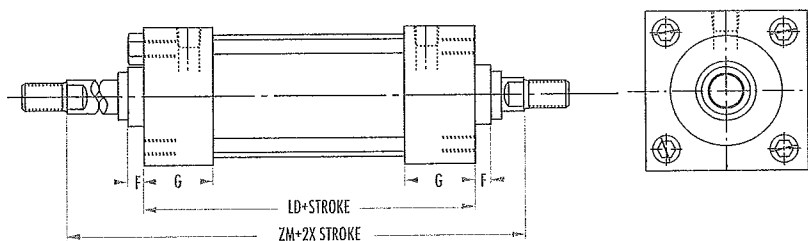
Note: #4 furnished as standard unless otherwise specified

ROD DIA	A	G	D	V	CC	FF	KK
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	1.125	1 1/2-12	1 3/4-12	1 1/4-12

### Optional



### Double Rod End

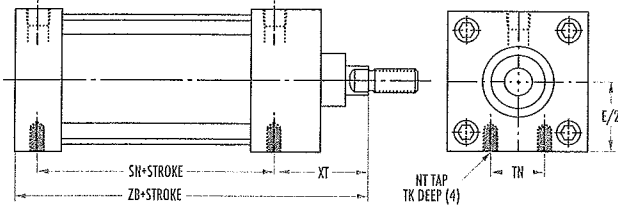


BORE	F	G	LD	ZM
1 1/2	--	1 1/2	4 1/8	6 7/8
2	--	1 1/2	4 1/8	6 7/8
2 1/2	--	1 1/2	4 1/4	7
3 1/4	--	1 3/4	4 3/4	8
4	--	1 3/4	4 3/4	8
5	--	1 3/4	4 3/4	8
6	19/32	2	6 11/16	9 1/4

# NFPA

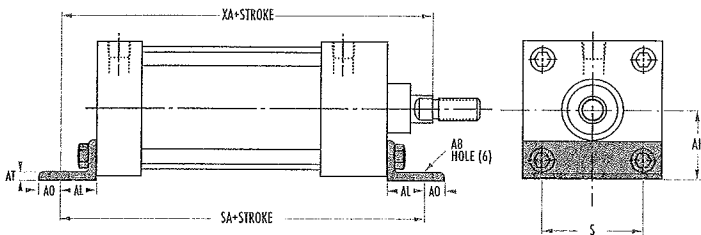
**oversize rod diameters**

## Bottom Tap Mount (NFPA MS4)



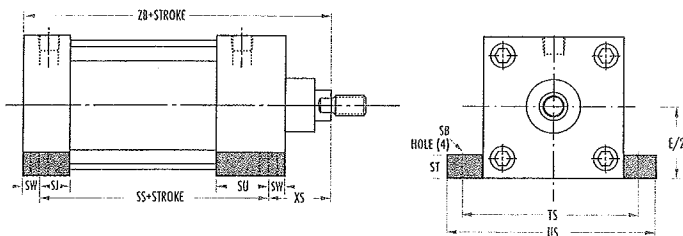
BORE	NT	TK	TN	SN	XT	ZB
1 1/2	1/4-20	3/8	5/8	2 1/4	1 15/16	4 5/8
2	5/16-18	1/2	7/8	2 1/4	1 15/16	4 5/8
2 1/2	3/8-16	5/8	1 1/4	2 3/8	1 15/16	4 3/4
3 1/4	1/2-13	3/4	1 1/2	2 5/8	2 7/16	5 5/8
4	1/2-13	3/4	2 1/16	2 5/8	2 7/16	5 5/8
5	5/8-11	1	2 11/16	2 7/8	2 7/16	5 7/8
6	3/4-10	1 1/8	3 1/4	3 1/8	2 13/16	6 5/8

## Angle Mount (NFPA MS1)



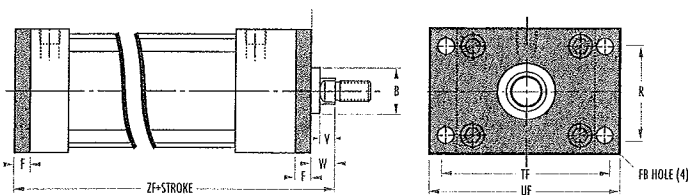
BORE	AB	AH	AL	AO	AT	S	SA	XA
1 1/2	7/16	1 3/16	1	3/8	1/8	1 1/4	5 5/8	5 5/8
2	7/16	1 7/16	1	3/8	1/8	1 3/4	5 5/8	5 5/8
2 1/2	7/16	1 5/8	1	3/8	1/8	2 1/4	5 3/4	5 3/4
3 1/4	9/16	1 15/16	1 1/4	1/2	3/16	2 3/4	6 3/4	6 3/4
4	9/16	2 1/4	1 1/4	1/2	3/16	3 1/2	6 3/4	6 3/4
5	11/16	2 3/4	1 3/8	5/8	3/16	4 1/4	7 1/4	7 1/4
6	13/16	3 1/4	1 3/8	5/8	1/4	5 1/4	7 3/4	7 3/4

## Side Lug Mount (NFPA MS2)



BORE	SB	SJ	SS	ST	SU	SW	TS	US	ZB	XS
1 1/2	13/32	5/8	2 7/8	1/2	1 1/8	3/8	2 3/4	3 1/2	5	1 3/4
2	13/32	5/8	2 7/8	1/2	1 1/8	3/8	3 1/4	4	5	1 3/4
2 1/2	13/32	5/8	3	1/2	1 1/8	3/8	3 3/4	4 1/2	5 1/8	1 3/4
3 1/4	17/32	3/4	3 1/4	3/4	1 1/4	1/2	4 3/4	5 3/4	5 7/8	2 1/8
4	25/32	3/4	3 1/4	3/4	1 1/4	1/2	5 1/2	6 1/2	5 7/8	2 1/8
5	25/32	9/16	3 1/8	1	1 1/16	11/16	6 7/8	8 1/4	6 1/8	2 5/16
6	25/32	13/16	3 5/8	1	1 5/16	11/16	7 7/8	9 1/4	6 7/8	2 9/16

## Front Flange Mount (NFPA MF1)



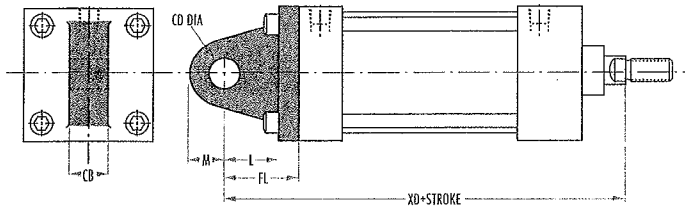
BORE	B	F	FB	R	TF	UF	V	W	ZF
1 1/2	1 5/16	3/8	5/16	1.43	2 3/4	3 3/8	1/2	1	5 3/8
2	1 1/2	3/8	3/8	1.84	3 3/8	4 1/8	1/2	1	5 3/8
2 1/2	1 1/2	3/8	3/8	2.19	3 7/8	4 5/8	1/2	1	5 1/2
3 1/4	2	5/8	7/16	2.76	4 11/16	5 1/2	3/8	1	6 1/2
4	2	5/8	7/16	3.32	5 7/16	6 1/4	3/8	1	6 1/2
5	2	5/8	9/16	4.10	6 5/8	7 5/8	3/8	1	6 3/4
6	2 3/8	3/4	9/16	4.88	7 5/8	8 5/8	3/8	1 1/8	7 5/8

## Rear Flange Mount (NFPA MF2)

# NFPA

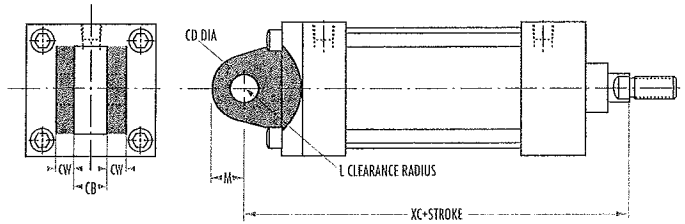
**oversize rod diameters**

## Detachable Eye Mount (NFPA MP4) (supplied with pin)



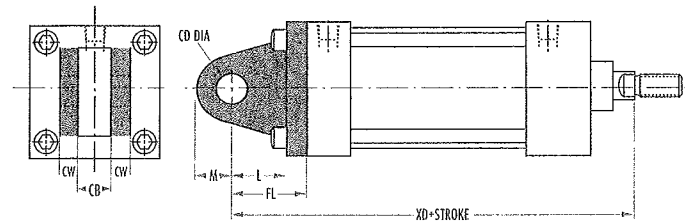
BORE	GB	CD	FL	L	M	XD
1 1/2	3/4	1/2	1 1/8	3/4	5/8	6 1/8
2	3/4	1/2	1 1/8	3/4	5/8	6 1/8
2 1/2	3/4	1/2	1 1/8	3/4	5/8	6 1/4
3 1/4	1 1/4	3/4	1 7/16	1 1/4	7/8	7 3/4
4	1 1/4	3/4	1 7/16	1 1/4	7/8	7 3/4
5	1 1/4	3/4	1 7/16	1 1/4	7/8	8
6	1 1/2	1	2 1/4	1 1/2	1 1/8	9 1/8

## Clevis Mount (NFPA MP1) (supplied with pin)



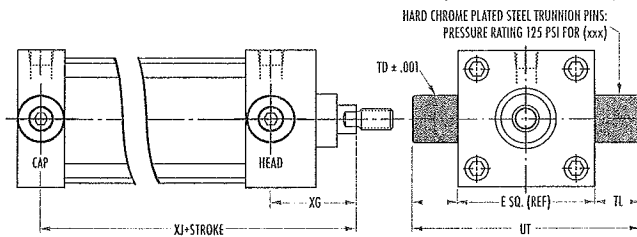
BORE	GB	CD	CW	L	M	XG
1 1/2	3/4	1/2	3/8	3/4	5/8	5 3/4
2	3/4	1/2	1/2	3/4	5/8	5 3/4
2 1/2	3/4	1/2	1/2	3/4	5/8	5 7/8
3 1/4	1 1/4	3/4	3/4	1 1/4	7/8	7 1/8
4	1 1/4	3/4	3/4	1 1/4	7/8	7 1/8
5	1 1/4	3/4	3/4	1 1/4	7/8	7 3/8
6	1 1/2	1	1	1 1/2	1 1/8	8 3/8

## Detachable Clevis Mount (NFPA MP2) (supplied with pin)



BORE	CB	CD	CW	FL	L	M	XD
1 1/2	3/4	1/2	3/8	1 1/8	3/4	5/8	6 1/8
2	3/4	1/2	1/2	1 1/8	3/4	5/8	6 1/8
2 1/2	3/4	1/2	1/2	1 1/8	3/4	5/8	6 1/4
3 1/4	1 1/4	3/4	3/4	1 7/8	1 1/4	7/8	7 3/4
4	1 1/4	3/4	3/4	1 7/8	1 1/4	7/8	7 3/4
5	1 1/4	3/4	3/4	1 7/8	1 1/4	7/8	8
6	1 1/2	1	1	2 1/4	1 1/2	1 1/8	9 1/8

## Head Trunnion Mount (NFPA MT1)

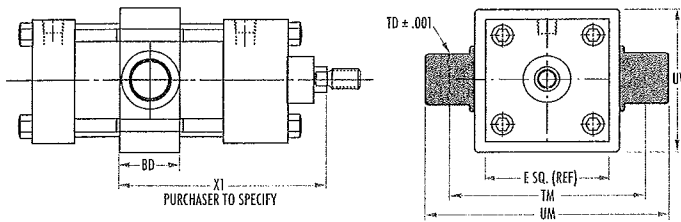


\*\* MT1 Not Available on 1 1/2" or 2" Bore

BORE	E	TD	TL	UT	FR	
					XJ	XB
**1 1/2	2	1	1	4	4 1/2	NA
**2	2 1/2	1	1	4 1/2	4 1/2	NA
2 1/2	3	1	1	5	4 5/8	2 5/16
3 1/4	3 3/4	1	1	5 3/4	5 1/4	2 11/16
4	4 1/2	1	1	6 1/2	5 1/4	2 11/16
5	5 1/2	1	1	7 1/2	5 1/2	2 11/16
6	6 1/2	1 3/8	1 3/8	9 1/4	6 1/8	3 1/16

## Cap Trunnion Mount (NFPA MT2)

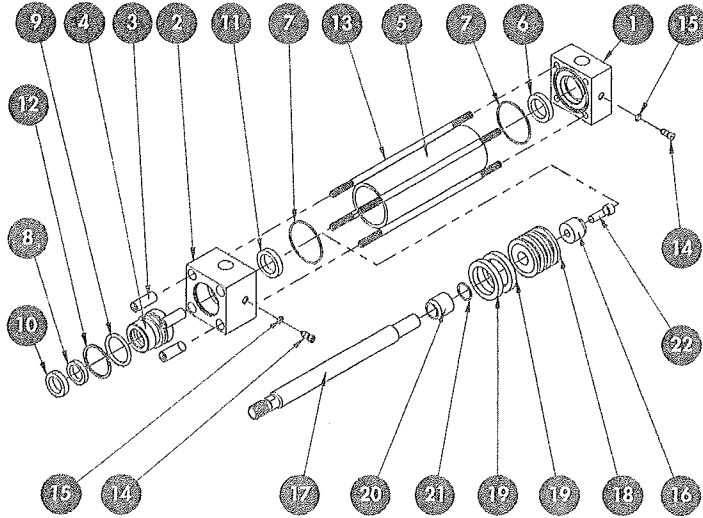
## Intermediate Trunnion Mount (NFPA MT4)



BORE	E	BD	TD	TL	TM	UM	UV	X1
1 1/2	2	1 1/2	1	1	2 1/2	4 1/2	2 1/2	Purchaser to specify
2	2 1/2	1 1/2	1	1	3	5	3	
2 1/2	3	1 1/2	1	1	3 1/2	5 1/2	3 1/2	
3 1/4	3 3/4	2	1	1	4 1/2	6 1/2	4 1/4	
4	4 1/2	2	1	1	5 1/4	7 1/4	5	
5	5 1/2	2	1	1	6 1/4	8 1/4	6	
6	6 1/2	2 1/2	1 3/8	1 3/8	7 5/8	10 3/8	7	

# NFPA

## CYLINDER ASSEMBLY

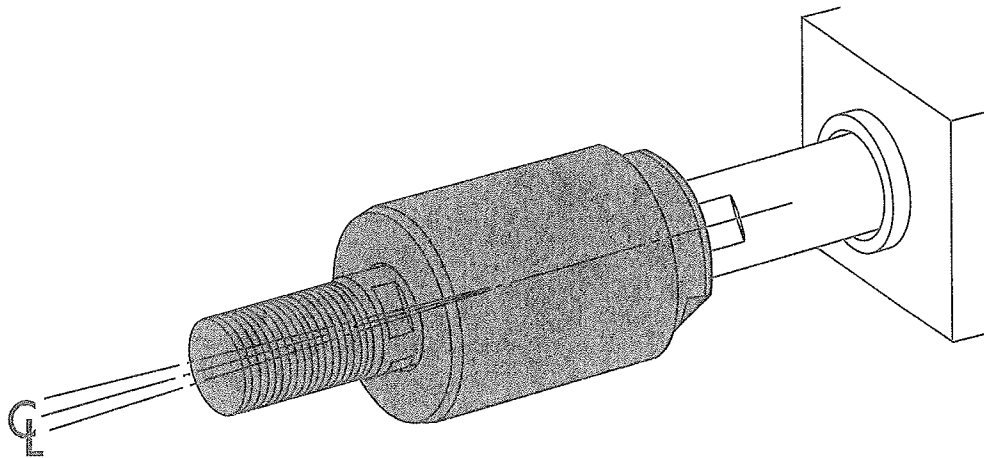


ITEM NUMBER	PART NUMBER	QTY
1	BLIND HEAD	1
2	ROD HEAD	1
3	TIE ROD SOCKET NUT	4
4	BEARING	1
5	TUBE	1
6	BLIND CUSHION SEAL	1
7	TUBE SEAL	2
8	PRIMARY ROD SEAL	1
9	BEARING O-RING SEAL	1
10	ROD WIPER SEAL COMBO	1
11	ROD CUSHION SEAL	1
12	BEARING RETAINING RING	1
13	TIE ROD	4
14	CUSHION ADJUSTMENT SCREW	2
15	ADJUSTMENT SCREW O-RING	2
16	CUSHION END SLEEVE	1
17	PISTON ROD	1
18	PISTON	1
19	PISTON SEAL	2
20	ROD END CUSHION SLEEVE	1
21	PISTON O-RING	1
22	[945] 1/4-20 UNC x 3/4	1

\*ITEMS INCLUDED IN REPAIR KIT

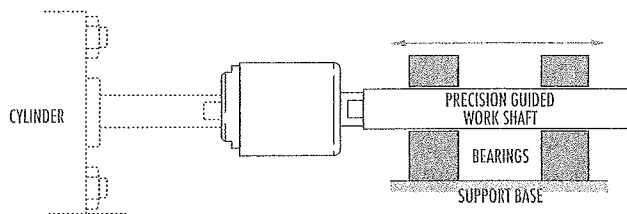
# NFPA

## "The Cylinder Saver" Self Aligning Rod Couplers

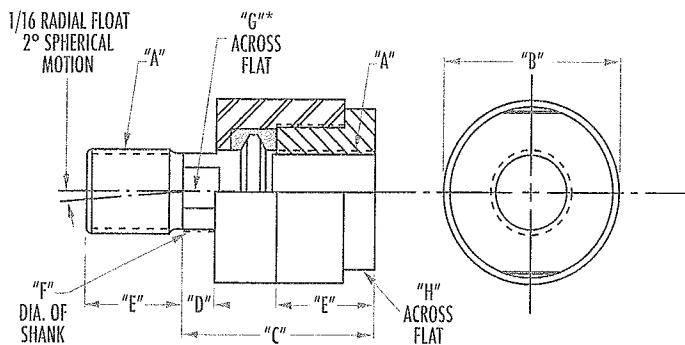
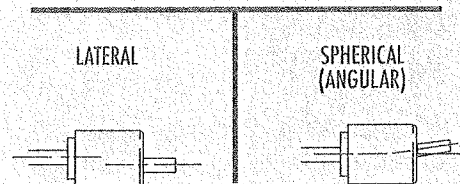


### Self Aligning Rod Couplers

- ✦ Eliminates expensive precision machining for mounting fixed or rigid guide in cylinder for slide applications.
- ✦ Increases cylinder efficiency by eliminating friction caused by misalignment.
- ✦ Compensates for 2° angular error and 1/16 lateral misalignment on push and pull stroke.
- ✦ Greater reliability - Reduces cylinder and component wear.
- ✦ Simplifies alignment problems in the field.
- ✦ All components heat treated for improved corrosion and wear resistance, fatigue properties and black appearance.



### SELF-ADJUSTING



"A"	"B"	"C"	"D"	"E"	"F"	"G"	"H"	MAX. PULL AT YIELD
1/4-28	7/8	1 1/4	1/4	5/8	5/16	3/16	3/4	6,000
5/16-24	7/8	1 1/4	1/4	5/8	5/16	1/4	3/4	8,300
3/8-24	7/8	1 1/4	1/4	5/8	5/16	5/16	3/4	8,300
3/8-16	7/8	1 1/4	1/4	5/8	5/16	5/16	3/4	5,000
7/16-20	1 1/4	2	1/2	3/4	5/8	1/2	1	10,000
1/2-20	1 1/4	2	1/2	3/4	5/8	1/2	1	14,000
1/2-13	1 1/4	2	1/2	3/4	5/8	1/2	1	14,000
5/8-18	1 1/4	2	1/2	3/4	5/8	1/2	1	19,000
3/4-16	1 3/4	2 5/16	1/2	1 1/8	31/32	13/16	1 1/2	34,000
3/4-10	1 3/4	2 5/16	1/2	1 1/8	31/32	13/16	1 1/2	34,000
7/8-14	1 3/4	2 5/16	1/2	1 1/8	31/32	13/16	1 1/2	39,000
1-14	2 1/2	2 15/16	1/2	1 5/8	1 3/8	1 5/32	2 1/4	64,000
1-8	2 1/2	2 15/16	1/2	1 5/8	1 3/8	1 5/32	2 1/4	64,000
1 1/4-12	2 1/2	2 15/16	1/2	1 5/8	1 3/8	1 5/32	2 1/4	78,000
1 3/8-12	2 1/2	2 15/16	1/2	1 5/8	1 3/8	1 5/32	2 1/4	78,000
1 1/2-12	3 1/4	4 3/8	13/16	2 1/4	1 3/4	1 1/2	3	134,000
1 3/4-12	3 1/4	4 3/8	13/16	2 1/4	1 3/4	1 1/2	3	134,000

# NFPA

## rod & stop tube selection - technical data

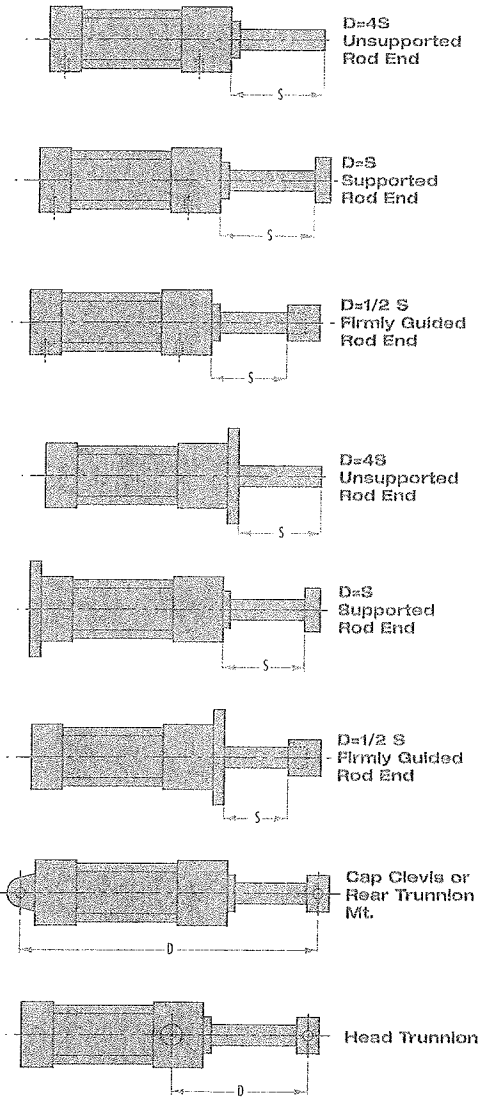
### Piston Rod Diameter Selection

To determine the minimum recommended piston rod diameter for your application, first determine the cylinder thrust using the force volume chart. (Thrust equals bore area multiplied by the operating pressure.)

Next, select from the diagrams below the type of mounting you'll use. Then determine the length of "D" with the piston rod in the fully extended position.

Finally, find the value of "D" at the bottom of the selector chart. Follow its line upward until it intersects with the horizontal line representing the thrust. The stripe within which these lines intersect represents the minimum recommended piston rod diameter.

### MOUNTINGS



ALL PISTON RODS SHOWN IN EXTENDED POSITION

### Cylinder Force and Volume Chart

#### Extend Forces (in Pounds)

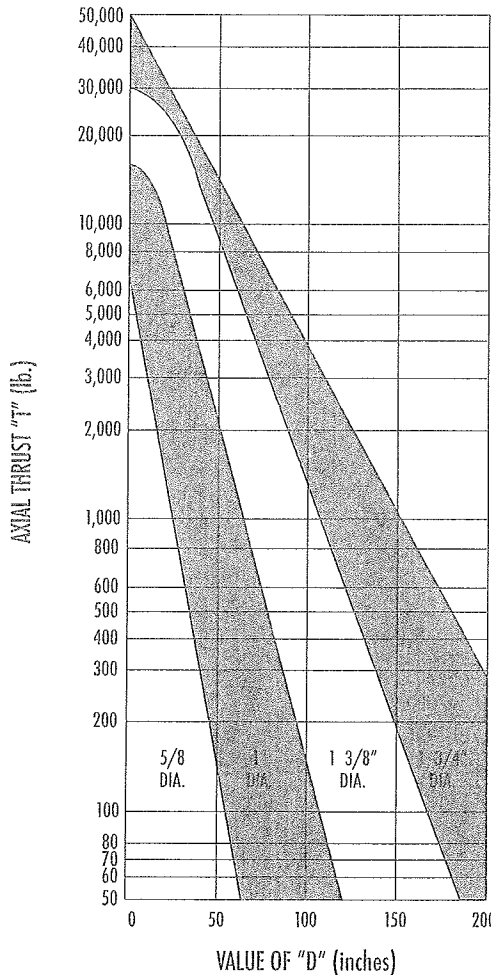
BORE	PISTON AREA	PSI										ROD <sup>3</sup> DISPLACEMENT
1 1/2	1.77	40	50	60	80	100	125	150	175	200	250	.00102
2	3.14	71	88	106	142	177	221	266	310	353	442	.00182
2 1/2	4.91	126	157	189	251	314	392	471	549	628	785	.00284
3 1/4	8.30	322	415	498	664	830	1037	1245	1452	1659	2075	.00480
4	12.57	503	629	754	1005	1257	1571	1886	2200	2513	3142	.00727
5	19.64	785	982	1178	1571	1964	2455	2946	3437	3928	4910	.01137
6	28.27	1131	1414	1696	2262	2827	3534	4241	4947	5654	7068	.01636

#### Deduct these forces for retract strokes

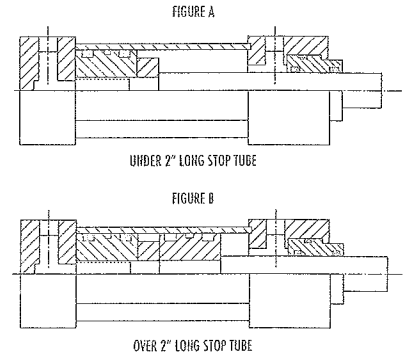
ROD DIA	PISTON AREA	PSI										ROD <sup>3</sup> DISPLACEMENT
5/8	.307	12	15	18	25	31	38	46	54	61	77	.00018
1	.785	31	39	47	63	79	98	118	137	157	196	.00045
1 3/8	1.485	59	74	89	119	149	186	223	260	297	371	.00086
1 3/4	2.405	96	120	144	192	241	301	361	421	481	601	.00139

\*cubic feet / inch of stroke

### SELECTOR CHART



### STOP TUBE CONFIGURATIONS



### Stop Tube Selection

Stop tubes are installed between the piston and the head on long stroke cylinders to reduce the load on the bearing. That, in turn, reduces bearing wear and tendency to buckle.

To determine if a stop tube is required and, if so, its length, first determine the value of "D" from the diagrams at left. If "D" is less than 40", no stop tube is needed. If "D" is over 40", a one inch stop tube is recommended for every 10" (or fraction thereof) over 40".

We supply two types of stop tubes for air cylinders. A cylinder with over two inches of stop tube, cushioned or non-cushioned, utilizes dual piston construction for added bearing surface as well as increasing distance between bearings (figure B). A cylinder requiring a stop tube under two inches uses a spacer only (figure A).

# NFPA

## air oil tanks - general information

**PA**, air-oil tanks are used as a simple economical method to supply a make up source of oil to any hydraulic circuit. Mounting the tank in a vertical position above the circuit that is being supplied, automatically bleeds the entire circuit system. The air supply to the air over oil tank is supplied by the same shop air source that provides low pressure power to the booster. In addition, air-oil tanks offer a means of smooth hydraulic speed control.

### Design Features:

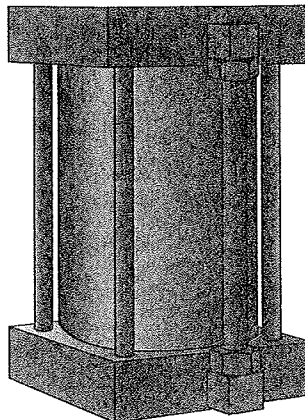
- ✦ Baffles on either end of the tank to reduce turbulence caused by rapid intake of air and discharge of oil causing aeration, whirlpooling and foaming.
- ✦ Replaceable sight gauge mounted in heads on the tank side. The transparent plastic sight tube clearly shows oil levels in the tank and is compatible with most hydraulic fluids.
- ✦ Large pipe ports enable the quick filling or draining of the tank. Aluminum heads are standard for tank diameters of 2½" through 6" diameter.

### Note:

Tanks are also available with glass wound filament fiberglass tubing. Because it is translucent, it provides a visual oil level indication. This eliminates the use of a sight gauge. Fiberglass tubing has the highest strength to weight ratio commercially available. It has a higher resistance for high impact and dents than brass or aluminum tubing. Corrosion resistant to a wide range of chemicals, acids, high moisture and other severe conditions make for a trouble-free operation in most environments. We can economically supply you with either tank depending on your choice preference or specification.

### How to select the correct sized air-oil tank:

- ✦ Determine the bore diameter and stroke of the work cylinder.
- ✦ Calculate the cubic inch oil displacement of work cylinder by multiplying the piston square inch area times the stroke in inches. (Use Table B Blind End Displacement for piston square inch area for ready reference.) Your determination will result in the cubic inch displacement volume requirement needed to select an air-oil tank.



Example: Work cylinder has a 4 inch diameter bore with 15 inch long stroke.

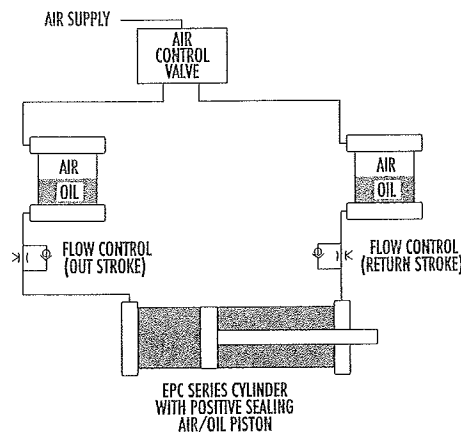
12.57 sq. in. area 4" bore  
 $\times$  15 Stroke Length  
188.55 Cubic inch displacement  
volume needed.

See the tank selector chart below to select proper choice. Select a bore-height combination that has a capacity closest to, but larger than 188.55 cu". Your options are the 4 inch diameter bore with a 21 inch long tank length or the 5 inch bore with a 14 inch tank length or a 6 inch bore with an 11 inch tank length.

Economics recommends that your selection be the smaller 4 inch diameter bore with the 21 inch long tank length. This of course is predicated on available space. The smaller bore tanks are generally less costly than larger bores. Exceptions to this are the booster-tank combination which then makes your selection to be that the tank diameter be the same diameter as the booster. Next selection would be the type of mount applicable to your requirements. See the chart on opposite page for selection and dimensions.

When boosters and air-oil tanks are ordered, specify whether air-oil tanks should be separate or integral. It is assumed that air-oil tanks are to be separate unless specified.

## Typical Air-Oil Circuit







# NFPA