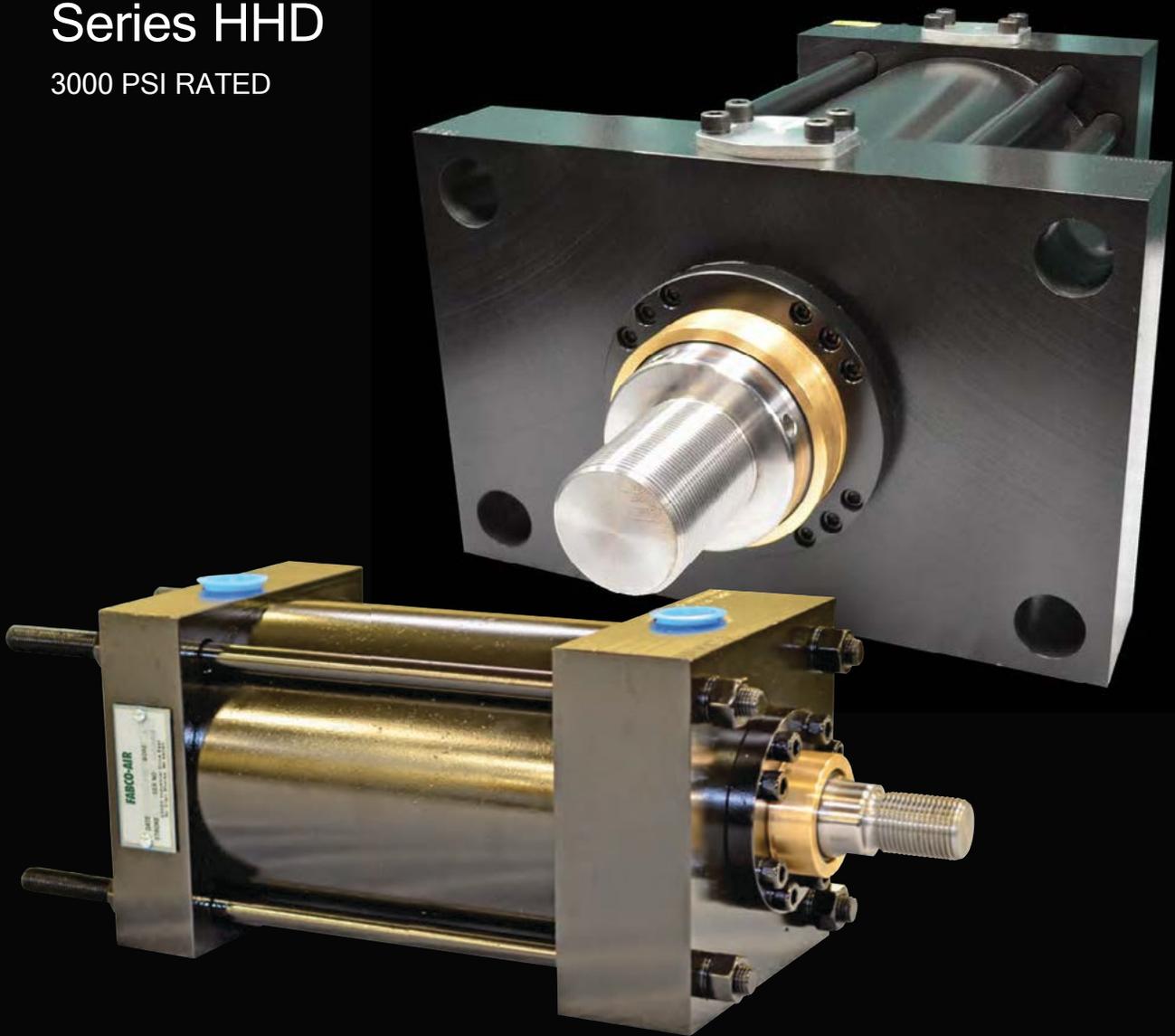


FABCO-AIR

HYDRAULIC HEAVY DUTY

Series HHD

3000 PSI RATED



10-25-16



WARNING IMPROPER SELECTION, IMPROPER USE OR FAILURE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN CAN CAUSE PROPERTY DAMAGE, PERSONAL INJURY AND/OR DEATH.

The information contained herein and other information from Fabco-Air provides product and/or system information for further investigation by users having expertise. It is the sole responsibility of the end user to analyze all aspects of your application and any consequences of any failure and to review the information about the product or system in the current catalog. Based on the vast amount of applications and operating conditions it is the sole responsibility of the end user, through its own testing and analysis, for making the final decision as to product selection and assuring all performance, safety and warning requirements of the application are met.

See "How to Order" guide - page 5.

See "Pressure Rating" notes page 4.



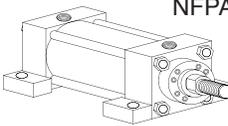
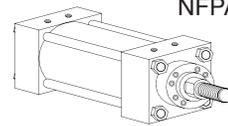
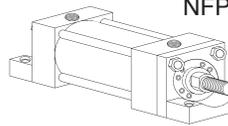
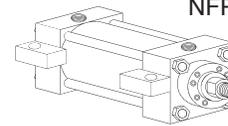
1. HEAD/CAP- Precision machined steel head and cap provide close concentricity and accurate alignment between piston, tube, piston rod and rod bearing.
2. CYLINDER BARREL- Damage resistant, heavy wall steel tubing, honed to an 8 to 16 micro finish for low frictional drag and maximum seal and piston bearing life.
3. ROD CARTRIDGE- Extra long, high strength bronze gland provides maximum bearing support and wear resistance. With certain exceptions, a removable retainer allows for gland removal without cylinder disassembly.
4. PISTON- One piece fine grained cast iron piston provides maximum strength and protection against shock loads. Anaerobic adhesive is used to permanently lock and seal the piston to the rod.
5. PISTON ROD- High strength damage resistant piston rod provides 100,000 PSI minimum yield material in 5/8" through 4 1/2" diameters. Larger diameters vary between 50,000 and 75,000 PSI minimum yield material. All rods are case hardened to 50-55 RC and hard chrome plated to provide maximum wear life. Stainless steel is also available.
6. TIE RODS- 100,000 to 125,000 PSI minimum yield steel, pre-stressed for fatigue resistance, and roll threaded for added strength.
7. CUSHIONS- Head cushion sleeve and rear cushion spear are machined to close tolerances to provide a gradual deceleration and reduced shock at end of stroke.
8. CUSHION NEEDLE ADJUSTMENT AND BALL CHECK- Flush mounted captive cushion adjustment allows for safe cushion adjustment under pressure. Special tip design and fine threads allow for precise adjustment over a broad range of operations. Cushion ball check allows for fast break-away under full power.
9. TUBE END SEALS- Extrusion resistant Teflon[®] material is compatible with virtually all fluids and can operate in temperatures to 500°F.
10. PORTS- SAE ports are standard and can be rotated to any 90 degree position in relation to each other and the mounting. NPTF ports are optional at no extra charge.
11. ROD SEAL- Twin lip urethane rod seal is pressure energized and wear-compensating for long, leak-free service. Viton[®] seals are optional.
12. PISTON SEALS- Pressure energized nitrile U-cups with back-up rings are standard. Step cut cast iron rings and Viton[®] seals are optional.
13. ROD WIPER- Nitrile double lip rod wiper acts as a secondary seal while keeping out dirt, dust and other contaminants. Optional Viton[®] wiper is available for fluid compatibility or temperatures to 400°F. Metallic scrapers and low friction wipers are also available.

Specifications and prices are subject to change without notice or incurring obligations.

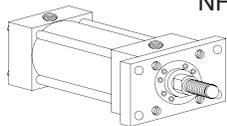
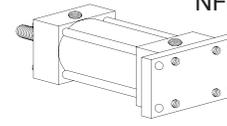
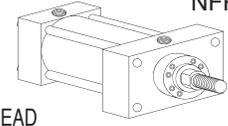
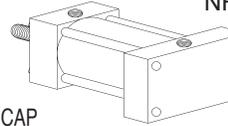
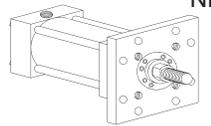
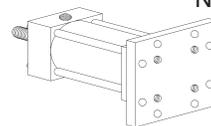
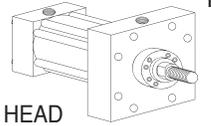
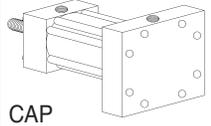
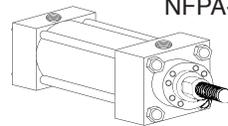
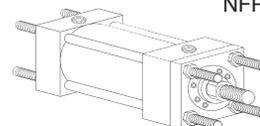
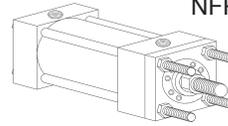
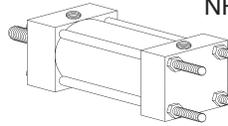
MOUNTING STYLES • SERIES HHD

SIDE MOUNTS

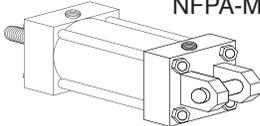
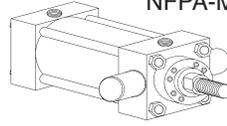
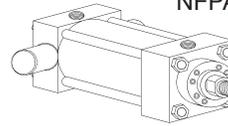
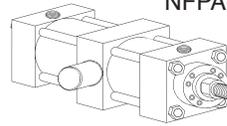
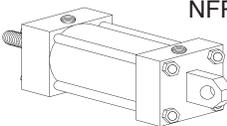
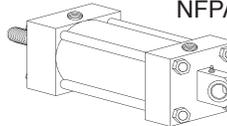
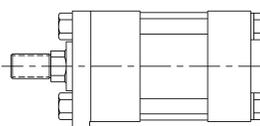
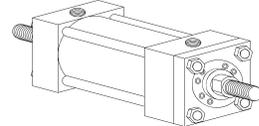
FABCO-AIR

<p>STYLE S2 PAGE 6 NFPA-MS2</p>  <p>SIDE LUGS 1 1/2-8" BORE</p>	<p>STYLE S4 PAGE 6 NFPA-MS4</p>  <p>SIDE TAPPED 1 1/2-8" BORE</p>	<p>STYLE S7 PAGE 8 NFPA-MS7</p>  <p>SIDE END LUGS 1 1/2-8" BORE</p>	<p>STYLE S3 PAGE 6 NFPA-MS3</p>  <p>CENTER-LINE LUGS 1 1/2-8" BORE</p>
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END MOUNTS

<p>STYLE F1 PAGE 20 NFPA-MF1</p>  <p>HEAD RECTANGULAR FLANGE 1 1/2-8" BORE</p>	<p>STYLE F2 PAGE 20 NFPA-MF2</p>  <p>CAP RECTANGULAR FLANGE 1 1/2-8" BORE</p>	<p>STYLE E5 PAGE 22 NFPA-ME5</p>  <p>HEAD RECTANGULAR INTEGRAL FLANGE 1 1/2-14" BORE</p>	<p>STYLE E6 PAGE 22 NFPA-ME6</p>  <p>CAP RECTANGULAR INTEGRAL FLANGE 1 1/2-14" BORE</p>
<p>STYLE F5 PAGE 20 NFPA-MF5</p>  <p>HEAD SQUARE FLANGE 1 1/2-8" BORE</p>	<p>STYLE F6 PAGE 20 NFPA-MF6</p>  <p>CAP SQUARE FLANGE 1 1/2-8" BORE</p>	<p>STYLE E3 PAGE 24 NFPA-ME3</p>  <p>HEAD SQUARE INTEGRAL FLANGE 10-24" BORE</p>	<p>STYLE E4 PAGE 24 NFPA-ME4</p>  <p>CAP SQUARE INTEGRAL FLANGE 10-24" BORE</p>
<p>STYLE X0 PAGE 26-29 NFPA-MX0</p>  <p>NO TIE RODS EXTENDED 1 1/2-24" BORE</p>	<p>STYLE X1 PAGE 26 NFPA-MX1</p>  <p>BOTH ENDS TIE RODS EXTENDED 1 1/2-8" BORE</p>	<p>STYLE X3 PAGE 26 NFPA-MX3</p>  <p>HEAD TIE RODS EXTENDED 1 1/2-8" BORE</p>	<p>STYLE X2 PAGE 26 NFPA-MX2</p>  <p>CAP TIE RODS EXTENDED 1 1/2-8" BORE</p>

PIVOT MOUNTS - CLEVIS AND TRUNNION

<p>STYLE P1 PAGE 12-15 NFPA-MP1</p>  <p>FIXED CLEVIS 1 1/2-24" BORE</p>	<p>STYLE T6 PAGE 16-19 NFPA-MT1</p>  <p>HEAD TRUNNION 1 1/2-24" BORE</p>	<p>STYLE T7 PAGE 16-19 NFPA-MT2</p>  <p>CAP TRUNNION 1 1/2-24" BORE</p>	<p>STYLE T8 PAGE 16 NFPA-MT4</p>  <p>INTERMEDIATE FIXED TRUNNION 1 1/2-8" BORE</p>
<p>STYLE P3 PAGE 12-15 NFPA-MP3</p>  <p>CAP FIXED EYE 1 1/2-14" BORE</p>	<p>STYLE PU3 PAGE 10 NFPA-MPU3</p>  <p>SPHERICAL BEARING 1 1/2-6" BORE</p>	<p>EXTENDED KEY PLATE (ADD "S" IN PART # AND STATE EXTENDED KEY PLATE IN DESCRIPTION)</p>  <p>1 1/2-8" BORE PAGE 30</p>	
		<p>DOUBLE ROD (ADD "DR" AFTER MOUNT STYLE)</p>  <p>1 1/2-20" BORE PAGE 30-31</p>	

**HEAVY DUTY HYDRAULIC CYLINDERS
ARE DESIGNED TO ACCEPT STANDARD
MOUNTING ACCESSORIES. PAGES 33-35**

Specifications and prices are subject to change without notice or incurring obligations.

SERIES HHD • PRESSURE RATINGS

FABCO-AIR

CYLINDER CODE # (BORE INCHES)	PISTON ROD DIAMETER (INCHES)			PRESSURE RATINGS (PSI)		FOR HIGHER PRESSURES CONSULT FACTORY
	STANDARD	OVERSIZE	2:1	HEAVY-DUTY SERVICE	4:1 SAFETY FACTOR	
15 (1 1/2)	5/8		1	3000 *	2000	* PRESSURE FOR F1 AND F2 MOUNTS (SEE PAGE 21) AND "PU3" MOUNTS (SEE PAGE 11) IS LOWER Φ 4:1 SAFETY FACTOR BASED ON FAILURE PRESSURES OF WEAKEST COMPONENT AND STANDARD ROD SIZE
20 (2)	1		1 3/8	3000 *	2000	
25 (2 1/2)	1	1 3/8	1 3/4	3000 *	1950	
32 (3 1/4)	1 3/8	1 3/4	2	3000 *	2100	
40 (4)	1 3/4	2	2 1/2	3000 *	1900	
50 (5)	2	2 1/2, 3	3 1/2	3000 *	1900	
60 (6)	2 1/2	3, 3 1/2	4	3000 *	2000	
70 (7)	3	3 1/2, 4, 4 1/2	5	3000 *	1850	
80 (8)	3 1/2	4, 4 1/2, 5	5 1/2	3000 *	1900	
100 (10)	4 1/2	5, 5 1/2	7	3000		
120 (12)	5 1/2	7	8	3000		
140 (14)	7	8, 9	10	3000		
160 (16)	8	9, 10		3000		
180 (18)	9	10		3000		
200 (20)	10			3000		
240 (24)	11			3000		

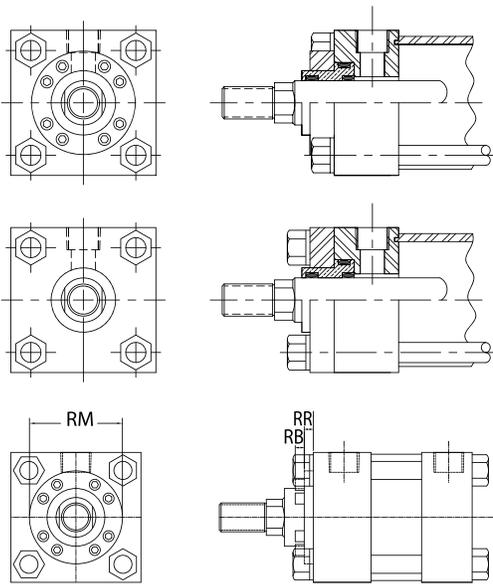
HHD RETAINER INFORMATION

HHD cylinders with the following bore and rod combinations use circular retainers which permit removal of rod cartridge without disassembling cylinder:

- 2 1/2" bore with 1" rod
- 3 1/4" bore with 1 3/8" rod
- 4" thru 20" bores with all rod diameters

HHD cylinders with the following bore and rod combinations use full plate retainer construction:

- 1 1/2" bore with 5/8" and 1" rods
- 2" bore with 1" and 1 3/8" rods
- 2 1/2" bore with 1 3/8" and 1 3/4" rods
- 3 1/4" bore with 1 3/4" and 2" rods



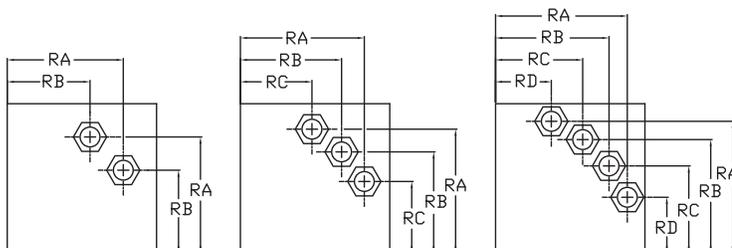
ROD DIA.	RB	RR	RM
5/8	-	3/8	2 3/8
1	1/4	3/8	2 1/2
1 3/8	5/16	5/16	3 7/32
1 3/4	5/16	5/16	3 7/8
2	5/16	5/16	4

Note: Certain small bore cylinders have full plate retainers which means the RR is not applicable. Use "F" dimension instead of "RR"

Note: 2 1/2" and larger rod retainer rings are counter-bored so the socket head cap screws are not exposed.

LARGE BORE TIE ROD INFORMATION

On large bore cylinders, two, three or four tie rods are used at each corner of the 10, 12, 14, 16, 18, 20 and 24 inch bore sizes. This reduces flexing of head and cap under pressure.



BORE	RA	RB	RC	RD	TIE ROD
10	5.291	3.775	NA	NA	1 1/8-12
12	6.27	4.555	NA	NA	1 1/4-12
14	7.485	6.143	4.409	NA	1 1/4-12
16	8.086	6.093	NA	NA	1 1/2-12
18	9.589	7.910	5.761	NA	1 1/2-12
20	10.437	8.750	6.649	NA	1 1/2-12
24	13.589	11.722	9.158	6.050	2-12

Specifications and prices are subject to change without notice or incurring obligations.

FEATURE	DESCRIPTION	PAGE #	SYMBOL	
SERIES	Hydraulic heavy duty		HDD	HDD
MOUNTING STYLE	Side lugs (MS2)	6	S2	S4
	Side tapped (MS4)	6	S4	A
SEE PAGE 3	Side end lugs (MS7)	8	S7	32
	Center-line lugs (MS3)	6	S3	N
	Head rectangular flange (MF1)	20	F1	1
	Cap rectangular flange (MF2)	20	F2	6
	Head square flange (MF5)	20	F5	5
	Cap square flange (MF6)	20	F6	0
	Head rectangular integral flange (ME5)	22	E5	S
	Cap rectangular integral flange (ME6)	22	E6	1
	Head square integral flange (ME3)	24	E3	3
	Cap square integral flange (ME4)	24	E4	8
	No tie rods extended (MX0)	26-29	X0	T
	Both ends tie rods extended (MX1)	26	X1	1
	Head tie rods extended (MX3)	26	X3	-
	Cap tie rods extended (MX2)	26	X2	1
	Cap clevis (MP1)	12-15	P1	1
	Cap eye (MP3)	12-15	P3	1
	Spherical bearing (MPU3)	10	PU3	1
	Head trunnion (MT1)	16-19	T6	1
	Cap trunnion (MT2)	16-19	T7	1
	Intermediate fixed trunnion (MT4)	16	T8	1
DOUBLE ROD	Double rod design if needed	30	DR	1
CUSHIONS	No cushions		A	
	Cushion both ends		C	
	Cushion head end only		G	
	Cushioned cap end only		L	
BORE SIZE	Specify CODE (See page 4)	36		
PISTON SEALS	Nitrile u-cups (standard)	49	N	
	Cast iron rings		C	
	Urethane loaded U-cup		P	
	Viton® seals		V	
	Viton® loaded U-cup		F	
	Nitrile high load seals		H	
	Viton high load seals		D	
STROKE	Specify in inches with 2 place decimal			
PORTS	SAE (standard)		S	
	NPTF		N	
ROD DIA.	Specify in inches with 2 place decimal	32 & 37		
ROD SEALS	Twin lip hydraulic seal (standard)	48	T	
	Urethane loaded U-cup		P	
	Viton® seals		V	
	Viton® loaded U-cup		F	
ROD END	Standard male	32	1	
	Standard female		3	
	Intermediate male		2	
	Long female		4	
	Extended standard male		5	
	Extended intermediate male		6	
	Plain rod end		7	
	Male rod coupling		9	
SPECIALS AND ENGINEERING DATA	Stop tube	37		
	Proximity switches			
HEAD PORT	Specify location 1-4		1-4	
CAP PORT	If cylinder requires multiple ports		X	
	Specify location 1-5		1-5	
	If cylinder requires multiple ports		X	

HDD S4 - A 32 N - 1 6 . 5 0 S 1 . 3 8 T 1 - 1 1

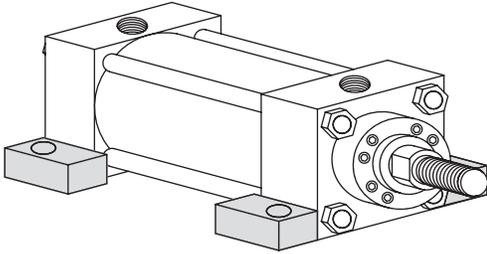
Ordering Example

HDD . . . Series
 S4 . . . MS4 side tapped mounting
 - . . . Hyphen, double rod not required
 A . . . No cushions
 32 . . . 3-1/4 bore (use code #,
 . . . see page 4.)
 N . . . Nitrile U-cup (standard) piston seals
 -16.50 . Stroke (always use
 . . . 2 place decimal)
 S . . . SAE (standard) ports
 1.38 . Rod diameter (always use
 . . . 2 place decimal)
 T . . . Twin lip (standard)
 . . . hydraulic rod seals
 1 . . . Standard male rod end
 - . . . Hyphen, no specials requirement
 1 . . . Head port location
 1 . . . Cap port location

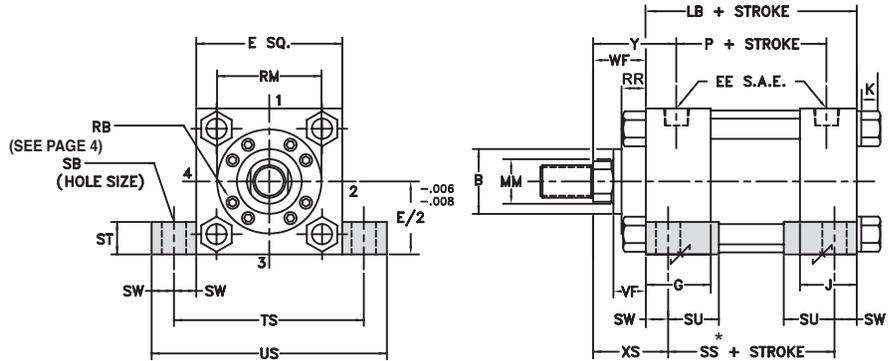
NOTE: SEE PAGE 57 FOR PORT LOCATION

Specifications and prices are subject to change without notice or incurring obligations.

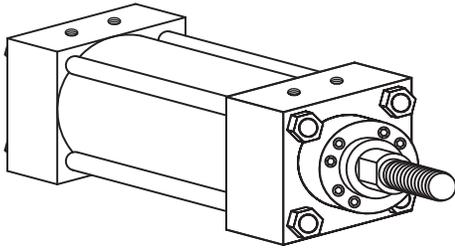
SIDE LUGS MOUNT



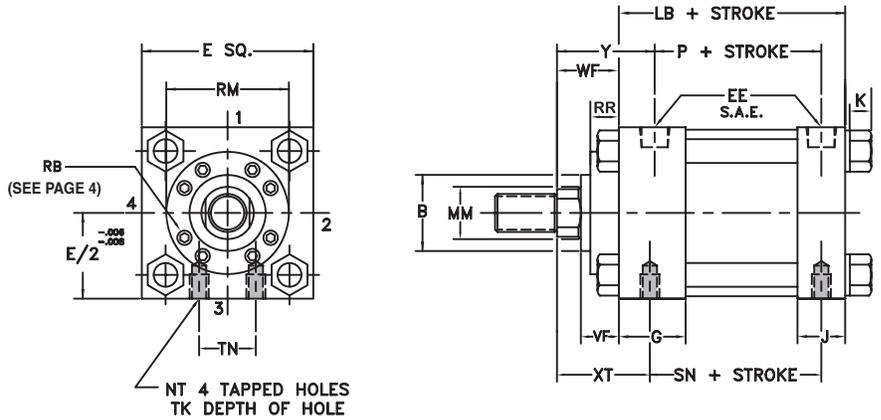
STYLE S2
NFFPA-MS2



SIDE TAPPED MOUNT

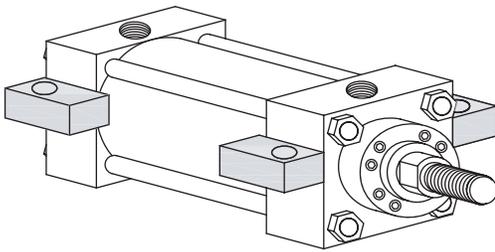


STYLE S4
NFFPA-MS4

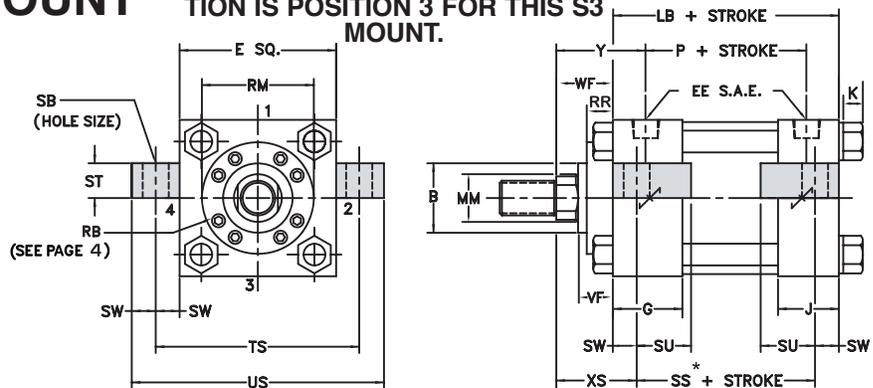


CENTER-LINE LUGS MOUNT

NOTE: STANDARD CUSHION LOCATION IS POSITION 3 FOR THIS S3 MOUNT.



STYLE S3
NFFPA-MS3



† HEAD END PORTS SHALLOW TAPPED (SOME BORES WITH OS RODS)

Δ (2) SPANNER HOLES USED INSTEAD OF FLATS (DIMENSION 'D' COLUMN) ON 3-1/2" DIA. AND LARGER RODS

§ THESE CYLINDERS HAVE FULL PLATE RETAINERS. USE "E" DIMENSIONS INSTEAD OF "RM."

USE "F" DIMENSIONS INSTEAD OF "RR" – SEE PAGE 4

‡ B DIMENSION TOLERANCE -.001/-.003

* SS DIMENSION CHANGES ON DOUBLE ROD CYLINDERS – SEE PAGE 31 FOR DETAILS

NOTE: SUGGESTED THAT THESE MOUNTS BE KEYED OR PINNED TO PREVENT SHIFTING - SEE PAGE 30

⊕ CONSULT FACTORY FOR DIMENSIONS.

NOTE: STANDARD CUSHION LOCATION IS POSITION 2 UNLESS OTHERWISE SPECIFIED BY THE CUSTOMER, EXCEPT FOR S3 MOUNT WHICH WILL BE IN POSITION 3

Specifications and prices are subject to change without notice or incurring obligations.

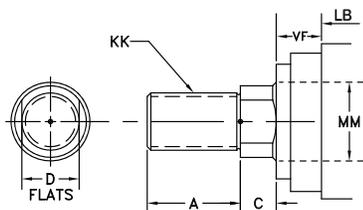
1 1/2 THRU 8 BORE • SERIES HHD

FABCO-AIR

STANDARD ROD ENDS

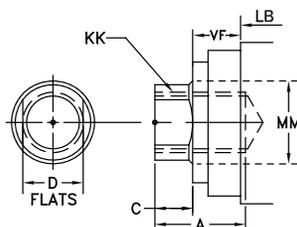
#1 STD MALE

NFPA-SM



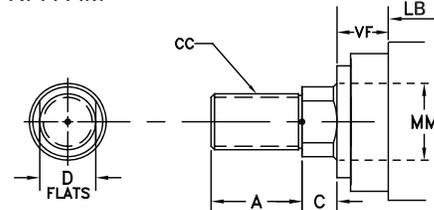
#3 STD FEMALE

NFPA-SF



#2 MALE

NFPA-IM

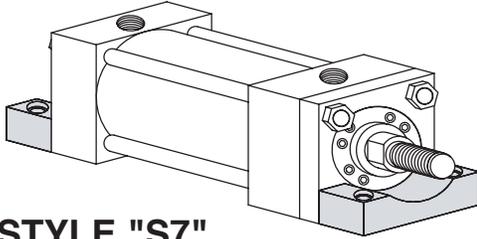


BORE																ADD STROKE			
	E	EE NPT	SAE#	F	G	J	K	NT	SB	ST	SU	SW	TN	TS	US	LB	P	SN	SS*
1 1/2	2 1/2	1/2	10	3/8	1 3/4	1 1/2	3/8	3/8-16	7/16	1/2	15/16	3/8	3/4	3 1/4	4	4 5/8	3	2 7/8	3 7/8
2	3	1/2	10	5/8	1 3/4	1 1/2	7/16	1/2-13	9/16	3/4	1 1/4	1/2	15/16	4	5	4 5/8	3	2 7/8	3 5/8
2 1/2	3 1/2	1/2	10	5/8	1 3/4	1 1/2	7/16	5/8-11	13/16	1	1 9/16	11/16	1 5/16	4 7/8	6 1/4	4 3/4	3 1/8	3	3 3/8
3 1/4	4 1/2	3/4	12	3/4	2	1 3/4	9/16	3/4-10	13/16	1	1 9/16	11/16	1 1/2	5 7/8	7 1/4	5 1/2	3 5/8	3 1/2	4 1/8
4	5	3/4	12	7/8	2	1 3/4	9/16	1-8	1 1/16	1 1/4	2	7/8	2 1/16	6 3/4	8 1/2	5 3/4	3 7/8	3 3/4	4
5	6 1/2	3/4	12	7/8	2	1 3/4	3/4	1-8	1 1/16	1 1/4	2	7/8	2 15/16	8 1/4	10	6 1/4	4 3/8	4 1/4	4 1/2
6	7 1/2	1	16	1	2 1/4	2 1/4	7/8	1 1/4-7	1 5/16	1 1/2	2 1/2	1 1/8	3 5/16	9 3/4	12	7 3/8	5	5 1/8	5 1/8
7	8 1/2	1 1/4	20	1	2 3/4	2 3/4	1	1 1/2-6	1 9/16	1 3/4	2 7/8	1 3/8	3 3/4	11 1/4	14	8 1/2	5 1/2	5 7/8	5 3/4
8	9 1/2	1 1/2	24	1	3	3	1 1/16	1 1/2-6	1 9/16	1 3/4	2 7/8	1 3/8	4 1/4	12 1/4	15	9 1/2	6 1/4	6 5/8	6 3/4

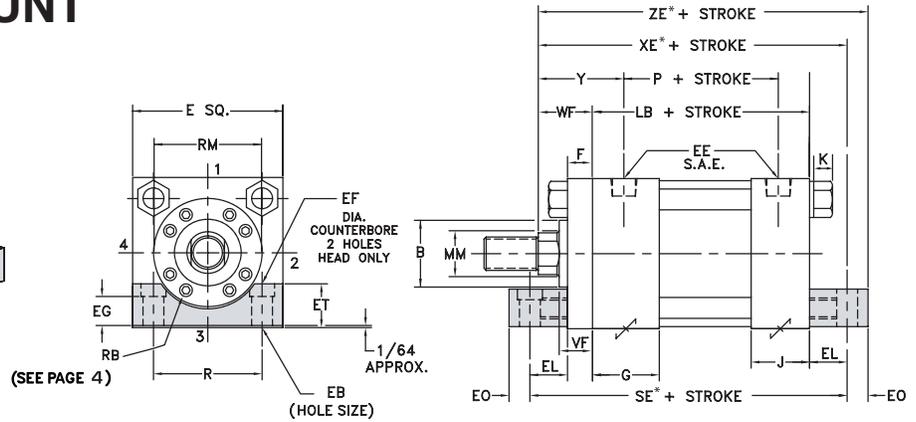
BORE	ROD DIA.	THREAD		ROD EXTENSIONS AND PILOT DIMENSIONS										ENVELOPE AND MOUNTING DIMENSIONS	
	MM	KK	CC	A	B ±	C	D	VF	TK	WF	RR	RM	Y	XS	XT
1 1/2	5/8	7/16-20	1/2-20	3/4	1 1/8	3/8	17/32	5/8	9/16	1	-	§	1 15/16	1 3/8	2
	1 †	3/4-16	7/8-14	1 1/8	1 1/2	1/2	7/8	7/8	Φ	1 3/8	-	§	2 5/16	1 3/4	2 3/8
2	1	3/4-16	7/8-14	1 1/8	1 1/2	1/2	7/8	7/8	1/2	1 3/8	-	§	2 5/16	1 7/8	2 3/8
	1 3/8 †	1-14	1 1/4-12	1 5/8	2	5/8	1 1/8	1	Φ	1 5/8	-	§	2 9/16	2 1/8	2 5/8
2 1/2	1	3/4-16	7/8-14	1 1/8	1 1/2	1/2	7/8	7/8	11/16	1 3/8	3/8	2 1/2	2 5/16	2 1/16	2 3/8
	1 3/8 †	1-14	1 1/4-12	1 5/8	2	5/8	1 1/8	1	Φ	1 5/8	-	§	2 9/16	2 5/16	2 5/8
	1 3/4 †	1 1/4-12	1 1/2-12	2	2 3/8	3/4	1 1/2	1 1/8	Φ	1 7/8	-	§	2 13/16	2 9/16	2 7/8
3 1/4	1 3/8	1-14	1 1/4-12	1 5/8	2	5/8	1 1/8	1	3/4	1 5/8	5/16	3 7/32	2 11/16	2 5/16	2 3/4
	1 3/4	1 1/4-12	1 1/2-12	2	2 3/8	3/4	1 1/2	1 1/8	3/4	1 7/8	-	§	2 15/16	2 9/16	3
4	2 †	1 1/2-12	1 3/4-12	2 1/4	2 5/8	7/8	1 3/4	1 1/8	Φ	2	-	§	3 1/16	2 11/16	3 1/8
	1 3/4	1 1/4-12	1 1/2-12	2	2 3/8	3/4	1 1/2	1 1/8	1	1 7/8	5/16	3 7/8	2 15/16	2 3/4	3
	2	1 1/2-12	1 3/4-12	2 1/4	2 5/8	7/8	1 3/4	1 1/8	Φ	2	5/16	4	3 1/16	2 7/8	3 1/8
5	2 1/2	1 7/8-12	2 1/4-12	3	3 1/8	1	2 1/8	1 1/4	Φ	2 1/4	5/8	4 7/16	3 5/16	3 1/8	3 3/8
	2	1 1/2-12	1 3/4-12	2 1/4	2 5/8	7/8	1 3/4	1 1/8	1 1/8	2	5/16	4	3 1/16	2 7/8	3 1/8
	2 1/2	1 7/8-12	2 1/4-12	3	3 1/8	1	2 1/8	1 1/4	1 1/8	2 1/4	5/8	4 7/16	3 5/16	3 1/8	3 3/8
6	3	2 1/4-12	2 3/4-12	3 1/2	3 3/4	1	2 5/8	1 1/4	1 1/8	2 1/4	3/4	5 1/4	3 5/16	3 1/8	3 3/8
	3 1/2	2 1/2-12	3 1/4-12	3 1/2	4 1/4	1	Δ	1 1/4	Φ	2 1/4	3/4	5 5/8	3 5/16	3 1/8	3 3/8
	2 1/2	1 7/8-12	2 1/4-12	3	3 1/8	1	2 1/8	1 1/4	1 5/16	2 1/4	5/8	4 7/16	3 7/16	3 3/8	3 1/2
7	3 1/2	2 1/2-12	3 1/4-12	3 1/2	4 1/4	1	Δ	1 1/4	1 5/16	2 1/4	3/4	5 5/8	3 7/16	3 3/8	3 1/2
	4	3-12	3 3/4-12	4	4 3/4	1	Δ	1 1/4	Φ	2 1/4	7/8	6 7/16	3 7/16	3 3/8	3 1/2
	3	2 1/4-12	2 3/4-12	3 1/2	3 3/4	1	2 5/8	1 1/4	1 1/8	2 1/4	3/4	5 1/4	3 3/4	3 5/8	3 13/16
8	3 1/2	2 1/2-12	3 1/4-12	3 1/2	4 1/4	1	Δ	1 1/4	1 1/8	2 1/4	3/4	5 5/8	3 7/8	3 5/8	3 15/16
	4	3-12	3 3/4-12	4	4 3/4	1	Δ	1 1/4	1 9/16	2 1/4	7/8	6 7/16	3 7/8	3 5/8	3 15/16
	4 1/2	3 1/4-12	4 1/4-12	4 1/2	5 1/4	1	Δ	1 1/4	Φ	2 1/4	7/8	7 1/8	3 3/4	3 5/8	3 13/16

Specifications and prices are subject to change without notice or incurring obligations.

SIDE END LUGS MOUNT



STYLE "S7"
NFFA-MS7

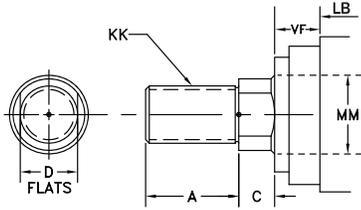


- † HEAD END PORTS SHALLOW TAPPED (SOME BORES WITH OS RODS)
- Δ (2) SPANNER HOLES USED INSTEAD OF FLATS (DIMENSION D COLUMN) ON 3 1/2" DIA. AND LARGER RODS
- ‡ B DIMENSION TOLERANCE -.001/-.003
- * SE, XE & ZE DIMENSION CHANGES ON DOUBLE ROD CYLINDERS – SEE PAGE 31 FOR DETAILS.
- § THESE CYLINDERS HAVE FULL PLATE RETAINERS. USE "E" DIMENSIONS INSTEAD OF "RM." USE "F" DIMENSIONS INSTEAD OF "RR" – SEE PAGE 4

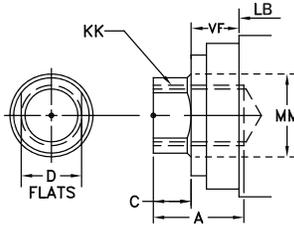
- NOTE: SUGGESTED THAT THESE MOUNTS BE KEYED OR PINNED TO PREVENT SHIFTING - SEE PAGE 30
- NOTE: BOTTOMS OF HEAD AND CAP ARE MOUNTING SURFACES. LUGS HOLD CYLINDER AGAINST MOUNTING SURFACE.
- NOTE: CHECK FOR CLEARANCE BETWEEN FRONT MOUNTING LUG AND ROD END ATTACHMENT. SPECIFY LONGER THAN STANDARD "WF" DIMENSION IF NECESSARY.
- NOTE: STANDARD CUSHION LOCATION IS POSITION 2 UNLESS OTHERWISE SPECIFIED BY THE CUSTOMER
- NOTE: 1 1/2" - 6" BORES HAVE FULL PLATE RETAINERS

STANDARD ROD ENDS

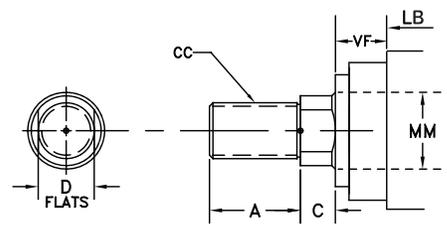
#1 STD MALE
NFPA-SM



#3 STD FEMALE
NFPA-SF



#2 MALE
NFPA-IM

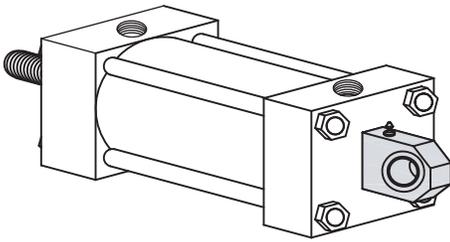


BORE															ADD STROKE		
	E	EE NPT	SAE #	F	G	J	K	EB	EF	EG	EL	EO	ET	R	LB	P	SE *
1 1/2	2 1/2	1/2	10	3/8	1 3/4	1 1/2	7/16	7/16	5/8	11/16	7/8	3/8	7/8	1.63	4 5/8	3	6 3/4
2	3	1/2	10	5/8	1 3/4	1 1/2	7/16	9/16	13/16	3/4	15/16	1/2	1	2.05	4 5/8	3	7 1/8
2 1/2	3 1/2	1/2	10	5/8	1 3/4	1 1/2	7/16	9/16	13/16	3/4	15/16	1/2	1	2.55	4 3/4	3 1/8	7 1/4
3 1/4	4 1/2	3/4	12	3/4	2	1 3/4	9/16	11/16	1	1 1/16	1 1/8	5/8	1 1/4	3.25	5 1/2	3 5/8	8 1/2
4	5	3/4	12	7/8	2	1 3/4	9/16	11/16	1	15/16	1 1/8	5/8	1 1/4	3.82	5 3/4	3 7/8	8 7/8
5	6 1/2	3/4	12	7/8	2	1 3/4	3/4	15/16	1 3/8	1 1/4	1 1/2	3/4	1 1/2	4.95	6 1/4	4 3/8	10 1/8
6	7 1/2	1	16	1	2 1/4	2 1/4	7/8	1 1/16	1 5/8	1 1/2	1 11/16	7/8	1 3/4	5.73	7 3/8	5	11 3/4
7	8 1/2	1 1/4	20	1	2 3/4	2 3/4	1	1 3/16	1 3/4	1 9/16	1 13/16	1	2	6.58	8 1/2	5 1/2	13 1/8
8	9 1/2	1 1/2	24	1	3	3	1 1/16	1 5/16	-	-	2	1 1/8	2	7.50	9 1/2	6 1/4	14 1/2

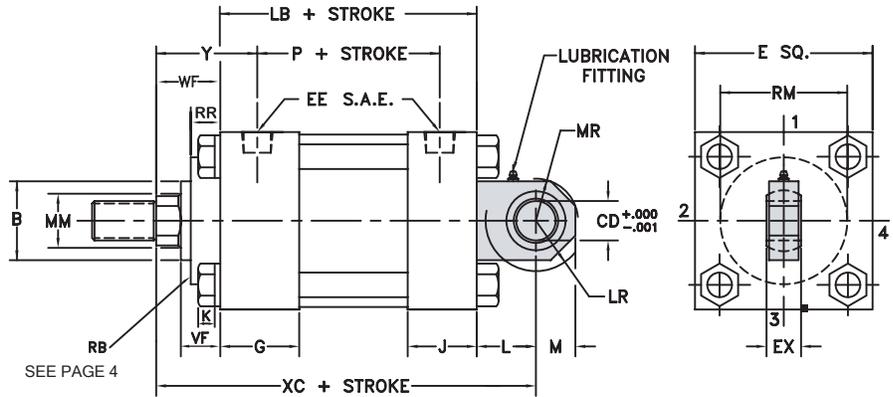
BORE	ROD DIA.	THREAD		ROD EXTENSIONS AND PILOT DIMENSIONS									ADD STROKE	
	MM	KK	CC	A	B ‡	C	D	VF	WF	RR	RM	Y	XE*	ZE*
1 1/2	5/8	7/16-20	1/2-20	3/4	1 1/8	3/8	17/32	5/8	1	-	§	1 15/16	6 1/2	6 7/8
	1 †	3/4-16	7/8-14	1 1/8	1 1/2	1/2	7/8	7/8	1 3/8	-	§	2 5/16	6 7/8	7 1/4
2	1	3/4-16	7/8-14	1 1/8	1 1/2	1/2	7/8	7/8	1 3/8	-	§	2 5/16	6 15/16	7 7/16
	1 3/8 †	1-14	1 1/4-12	1 5/8	2	5/8	1 1/8	1	1 5/8	-	§	2 9/16	7 3/16	7 11/16
2 1/2	1	3/4-16	7/8-14	1 1/8	1 1/2	1/2	7/8	7/8	1 3/8	-	§	2 5/16	7 1/16	7 9/16
	1 3/8 †	1-14	1 1/4-12	1 5/8	2	5/8	1 1/8	1	1 5/8	-	§	2 9/16	7 5/16	7 13/16
3 1/4	1 3/8	1-14	1 1/4-12	1 5/8	2	5/8	1 1/8	1	1 5/8	-	§	2 11/16	8 1/4	8 7/8
	1 3/4	1 1/4-12	1 1/2-12	2	2 3/8	3/4	1 1/2	1 1/8	1 7/8	-	§	2 13/16	7 9/16	8 1/16
4	1 3/8	1-14	1 1/4-12	1 5/8	2	5/8	1 1/8	1	1 5/8	-	§	2 11/16	8 1/4	8 7/8
	1 3/4	1 1/4-12	1 1/2-12	2	2 3/8	3/4	1 1/2	1 1/8	1 7/8	-	§	2 15/16	8 1/2	9 1/8
5	2	1 1/2-12	1 3/4-12	2 1/4	2 5/8	7/8	1 3/4	1 1/8	2	-	§	3 1/16	8 5/8	9 1/4
	2 1/2	1 7/8-12	2 1/4-12	2 1/4	2 5/8	7/8	1 3/4	1 1/8	2	-	§	3 1/16	8 3/4	9 3/8
6	2 1/2	1 7/8-12	2 1/4-12	3	3 1/8	1	2 1/8	1 1/4	2 1/4	-	§	3 1/16	8 7/8	9 1/2
	3	2 1/4-12	2 3/4-12	3	3 1/8	1	2 1/8	1 1/4	2 1/4	-	§	3 1/16	8 7/8	9 3/4
7	3 1/2	2 1/2-12	3 1/4-12	3 1/2	4 1/4	1	Δ	1 1/4	2 1/4	-	§	3 1/16	9 3/4	10 1/2
	3	2 1/4-12	2 3/4-12	3 1/2	3 3/4	1	2 5/8	1 1/4	2 1/4	-	§	3 5/16	10	10 3/4
8	2 1/2	1 7/8-12	2 1/4-12	3	3 1/8	1	2 1/8	1 1/4	2 1/4	-	§	3 5/16	10	10 3/4
	3 1/2	2 1/2-12	3 1/4-12	3 1/2	4 1/4	1	Δ	1 1/4	2 1/4	-	§	3 5/16	10	10 3/4
9	2 1/2	1 7/8-12	2 1/4-12	3	3 1/8	1	2 1/8	1 1/4	2 1/4	-	§	3 5/16	10	10 3/4
	3	2 1/4-12	2 3/4-12	3 1/2	3 3/4	1	2 5/8	1 1/4	2 1/4	-	§	3 5/16	10	10 3/4
10	3 1/2	2 1/2-12	3 1/4-12	3 1/2	4 1/4	1	Δ	1 1/4	2 1/4	-	§	3 5/16	10	10 3/4
	4	3-12	3 3/4-12	4	4 3/4	1	Δ	1 1/4	2 1/4	-	§	3 5/16	10	10 3/4
11	3	2 1/4-12	2 3/4-12	3 1/2	3 3/4	1	2 5/8	1 1/4	2 1/4	-	§	3 5/16	10	10 3/4
	3 1/2	2 1/2-12	3 1/4-12	3 1/2	4 1/4	1	Δ	1 1/4	2 1/4	-	§	3 5/16	10	10 3/4
12	4	3-12	3 3/4-12	4	4 3/4	1	Δ	1 1/4	2 1/4	-	§	3 5/16	10	10 3/4
	4 1/2	3 1/4-12	4 1/4-12	4 1/2	5 1/4	1	Δ	1 1/4	2 1/4	-	§	3 5/16	10	10 3/4
13	5	3 1/2-12	4 3/4-12	5	5 3/4	1	Δ	1 1/4	2 1/4	-	§	3 5/16	10	10 3/4
	3 1/2	2 1/2-12	3 1/4-12	3 1/2	4 1/4	1	Δ	1 1/4	2 1/4	-	§	3 5/16	10	10 3/4
14	4 1/2	3 1/4-12	4 1/4-12	4 1/2	5 1/4	1	Δ	1 1/4	2 1/4	-	§	3 5/16	10	10 3/4
	5	3 1/2-12	4 3/4-12	5	5 3/4	1	Δ	1 1/4	2 1/4	-	§	3 5/16	10	10 3/4
15	3 1/2	2 1/2-12	3 1/4-12	3 1/2	4 1/4	1	Δ	1 1/4	2 1/4	-	§	3 5/16	10	10 3/4
	4	3-12	3 3/4-12	4	4 3/4	1	Δ	1 1/4	2 1/4	-	§	3 5/16	10	10 3/4
16	4 1/2	3 1/4-12	4 1/4-12	4 1/2	5 1/4	1	Δ	1 1/4	2 1/4	-	§	3 5/16	10	10 3/4
	5	3 1/2-12	4 3/4-12	5	5 3/4	1	Δ	1 1/4	2 1/4	-	§	3 5/16	10	10 3/4
17	3 1/2	2 1/2-12	3 1/4-12	3 1/2	4 1/4	1	Δ	1 1/4	2 1/4	-	§	3 5/16	10	10 3/4
	4	3-12	3 3/4-12	4	4 3/4	1	Δ	1 1/4	2 1/4	-	§	3 5/16	10	10 3/4
18	4 1/2	3 1/4-12	4 1/4-12	4 1/2	5 1/4	1	Δ	1 1/4	2 1/4	-	§	3 5/16	10	10 3/4
	5	3 1/2-12	4 3/4-12	5	5 3/4	1	Δ	1 1/4	2 1/4	-	§	3 5/16	10	10 3/4
19	5 1/2	4-12	5 1/4-12	5 1/2	6 1/4	1	Δ	1 1/4	2 1/4	-	§	3 5/16	10	10 3/4
	5 1/2	4-12	5 1/4-12	5 1/2	6 1/4	1	Δ	1 1/4	2 1/4	-	§	3 5/16	10	10 3/4

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SPHERICAL BEARING MOUNT



STYLE "PU3"
NFFA-MPU3



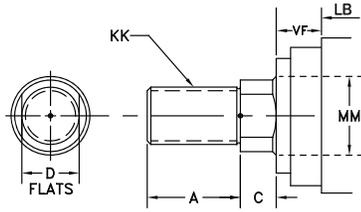
- † HEAD END PORTS SHALLOW TAPPED (SOME BORES WITH OS RODS)
- Δ (2) SPANNER HOLES USED INSTEAD OF FLATS (DIMENSION 'D' COLUMN) ON 3 1/2" DIA. AND LARGER RODS
- § THESE CYLINDERS HAVE FULL PLATE RETAINERS. USE "E" DIMENSIONS INSTEAD OF "RM."
- USE "F" DIMENSIONS INSTEAD OF "RR" – SEE PAGE 4
- ‡ B DIMENSION TOLERANCE -.001/-.003

EYE DESIGNED TO FIT FABCO STD SPHERICAL CLEVIS BRACKET - SEE PAGE 35

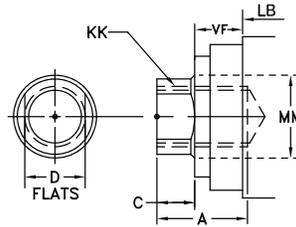
NOTE: PU3 MOUNT MAX OPERATING PSI BASED ON STANDARD COMMERCIAL BEARING RATINGS. SEE PAGE 11
 NOTE: PU3 MOUNT DOES NOT INCLUDE PIVOT PIN
 NOTE: STANDARD CUSHION LOCATION IS POSITION 2 UNLESS OTHERWISE SPECIFIED BY THE CUSTOMER

STANDARD ROD ENDS

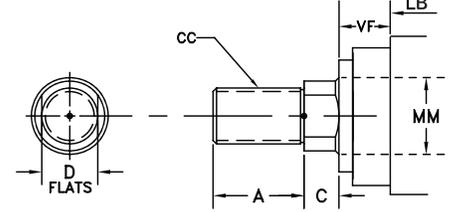
#1 STD MALE
NFPA-SM



#3 STD FEMALE
NFPA-SF



#2 MALE
NFPA-IM

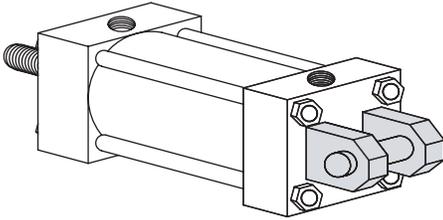


BORE	CD	EX	E	EE NPT	SAE #	F	G	J	L	LR	M	MR	K	ADD STROKE	
														LB	P
1 1/2	1/2	7/16	2 1/2	1/2	10	3/8	1 3/4	1 1/2	3/4	5/8	3/4	13/16	3/8	4 5/8	3
2	3/4	21/32	3	1/2	10	5/8	1 3/4	1 1/2	1 1/4	1	1	1 1/8	7/16	4 5/8	3
2 1/2	3/4	21/32	3 1/2	1/2	10	5/8	1 3/4	1 1/2	1 1/4	1	1	1 1/8	7/16	4 3/4	3 1/8
3 1/4	1	7/8	4 1/2	3/4	12	3/4	2	1 3/4	1 1/2	1 1/4	1 1/4	1 3/8	9/16	5 1/2	3 5/8
4	1 3/8	1 3/16	5	3/4	12	7/8	2	1 3/4	2 1/8	1 5/8	1 7/8	2 1/16	9/16	5 3/4	3 7/8
5	1 3/4	1 17/32	6 1/2	3/4	12	7/8	2	1 3/4	2 1/4	2 1/16	2 1/2	2 3/4	3/4	6 1/4	4 3/8
6	2	1 3/4	7 1/2	1	16	1	2 1/4	2 1/4	2 1/2	2 3/8	2 1/2	2 3/4	7/8	7 3/8	5

BORE	ROD DIA.	THREAD		ROD EXTENSIONS AND PILOT DIMENSIONS									ADD STROKE	MAX OPER. PSI
	MM	KK	CC	A	B †	C	D	VF	WF	RR	RM	Y	XC	
1 1/2	5/8	7/16-20	1/2-20	3/4	1 1/8	3/8	17/32	5/8	1	-	§	1 15/16	6 3/8	1675
	1 †	3/4-16	7/8-14	1 1/8	1 1/2	1/2	7/8	7/8	1 3/8	-	§	2 5/16	6 3/4	
2	1	3/4-16	7/8-14	1 1/8	1 1/2	1/2	7/8	7/8	1 3/8	-	§	2 5/16	7 1/4	2185
	1 3/8 †	1-14	1 1/4-12	1 5/8	2	5/8	1 1/8	1	1 5/8	-	§	2 9/16	7 1/2	
2 1/2	1	3/4-16	7/8-14	1 1/8	1 1/2	1/2	7/8	7/8	1 3/8	3/8	2 1/2	2 5/16	7 3/8	1410
	1 3/8 †	1-14	1 1/4-12	1 5/8	2	5/8	1 1/8	1	1 5/8	-	§	2 9/16	7 5/8	
3 1/4	1 3/8	1-14	1 1/4-12	1 5/8	2	5/8	1 1/8	1	1 5/8	5/16	3 7/32	2 11/16	8 5/8	1490
	1 3/4	1 1/4-12	1 1/2-12	2	2 3/8	3/4	1 1/2	1 1/8	1 7/8	-	§	2 15/16	8 7/8	
	2 †	1 1/2-12	1 3/4-12	2 1/4	2 5/8	7/8	1 3/4	1 1/8	2	-	§	3 1/16	9	
4	1 3/4	1 1/4-12	1 1/2-12	2	2 3/8	3/4	1 1/2	1 1/8	1 7/8	5/16	3 7/8	2 15/16	9 3/4	1800
	2	1 1/2-12	1 3/4-12	2 1/4	2 5/8	7/8	1 3/4	1 1/8	2	5/16	4	3 1/16	9 7/8	
	2 1/2	1 7/8-12	2 1/4-12	3	3 1/8	1	2 1/8	1 1/4	2 1/4	5/8	4 7/16	3 5/16	10 1/8	
5	2	1 1/2-12	1 3/4-12	2 1/4	2 5/8	7/8	1 3/4	1 1/8	2	5/16	4	3 1/16	10 1/2	1925
	2 1/2	1 7/8-12	2 1/4-12	3	3 1/8	1	2 1/8	1 1/4	2 1/4	5/8	4 7/16	3 5/16	10 3/4	
	3	2 1/4-12	2 3/4-12	3 1/2	3 3/4	1	2 5/8	1 1/4	2 1/4	3/4	5 1/4	3 5/16	10 3/4	
6	3 1/2	2 1/2-12	3 1/4-12	3 1/2	4 1/4	1	Δ	1 1/4	2 1/4	3/4	5 5/8	3 5/16	10 3/4	1765
	2 1/2	1 7/8-12	2 1/4-12	3	3 1/8	1	2 1/8	1 1/4	2 1/4	5/8	4 7/16	3 7/16	12 1/8	
	3	2 1/4-12	2 3/4-12	3 1/2	3 3/4	1	2 5/8	1 1/4	2 1/4	3/4	5 1/4	3 7/16	12 1/8	
	3 1/2	2 1/2-12	3 1/4-12	3 1/2	4 1/4	1	Δ	1 1/4	2 1/4	3/4	5 5/8	3 7/16	12 1/8	
	4	3-12	3 3/4-12	4	4 3/4	1	Δ	1 1/4	2 1/4	7/8	6 7/16	3 7/16	12 1/8	

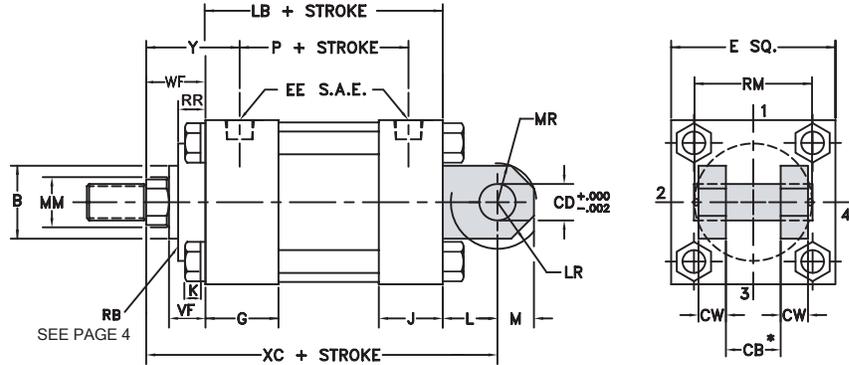
Specifications and prices are subject to change without notice or incurring obligations.

CAP FIXED CLEVIS MOUNT

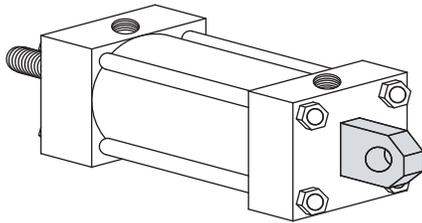


STYLE "P1"

NFPA-MP1

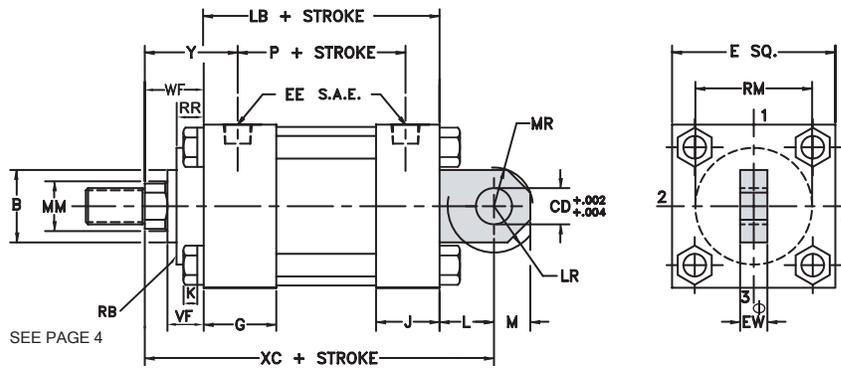


CAP FIXED EYE MOUNT



STYLE "P3"

NFPA-MP3



† HEAD END PORTS SHALLOW TAPPED (SOME BORES WITH OS RODS)

Δ (2) SPANNER HOLES USED INSTEAD OF FLATS (DIMENSION 'D' COLUMN) ON 3 1/2" DIA. AND LARGER RODS

§ THESE CYLINDERS HAVE FULL PLATE RETAINERS. USE "E" DIMENSIONS INSTEAD OF "RM." USE "F" DIMENSIONS INSTEAD OF "RR" – SEE PAGE 4

‡ B DIMENSION TOLERANCE $-.001/-.003$

* CLEVIS DESIGNED TO FIT FABCO STD EYE BRACKET - SEE PAGE 34

φ "EYE" DESIGNED TO FIT STD FABCO CLEVIS BRACKET - SEE PAGE 33

NOTE: P3 MOUNT DOES NOT INCLUDE PIVOT PIN

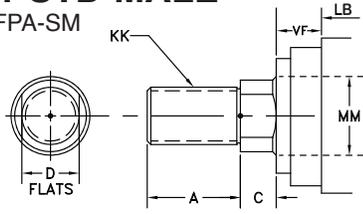
NOTE: STANDARD CUSHION LOCATION IS POSITION 2 UNLESS OTHERWISE SPECIFIED BY THE CUSTOMER

NOTE: SEE PAGE 4 FOR TIE ROD INFORMATION ON 10" THRU 24" BORES

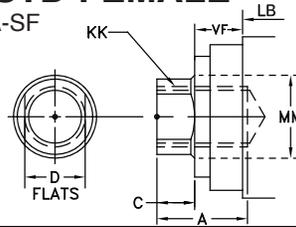
STANDARD ROD ENDS

BIG BORE CYLINDERS ON NEXT PAGE

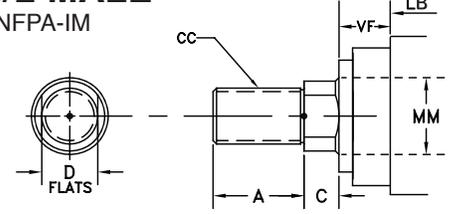
#1 STD MALE
NFPA-SM



#3 STD FEMALE
NFPA-SF



#2 MALE
NFPA-IM

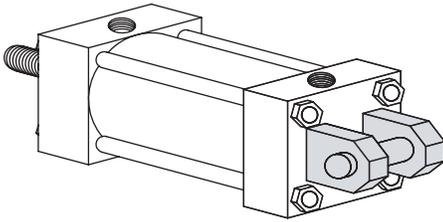


BORE	CB*	CD	CW	EWΦ	E	EE NPT	SAE #	F	G	J	L	LR	M	MR	K	ADD STROKE	
																LB	P
1 1/2	3/4	1/2	1/2	3/4	2 1/2	1/2	10	3/8	1 3/4	1 1/2	3/4	9/16	1/2	9/16	3/8	4 5/8	3
2	1 1/4	3/4	5/8	1 1/4	3	1/2	10	5/8	1 3/4	1 1/2	1 1/4	1 1/16	3/4	7/8	7/16	4 5/8	3
2 1/2	1 1/4	3/4	5/8	1 1/4	3 1/2	1/2	10	5/8	1 3/4	1 1/2	1 1/4	1 1/16	3/4	7/8	7/16	4 3/4	3 1/8
3 1/4	1 1/2	1	3/4	1 1/2	4 1/2	3/4	12	3/4	2	1 3/4	1 1/2	1 1/4	1	1 1/8	9/16	5 1/2	3 5/8
4	2	1 3/8	1	2	5	3/4	12	7/8	2	1 3/4	2 1/8	1 7/8	1 3/8	1 1/2	9/16	5 3/4	3 7/8
5	2 1/2	1 3/4	1 1/4	2 1/2	6 1/2	3/4	12	7/8	2	1 3/4	2 1/4	1 15/16	1 3/4	1 7/8	3/4	6 1/4	4 3/8
6	2 1/2	2	1 1/4	2 1/2	7 1/2	1	16	1	2 1/4	2 1/4	2 1/2	2 1/16	2	2 3/16	7/8	7 3/8	5
7	3	2 1/2	1 1/2	3	8 1/2	1 1/4	20	1	2 3/4	2 3/4	3	2 9/16	2 1/2	2 3/4	1	8 1/2	5 1/2
8	3	3	1 1/2	3	9 1/2	1 1/2	24	1	3	3	3 1/4	2 11/16	2 3/4	3	1 1/16	9 1/2	6 1/4
10	4	3 1/2	2	4	12 5/8	2	32	7/8	3 11/16	3 11/16	4	3 3/8	3 1/2	3 13/16	1	12 1/8	8 1/8

BORE	ROD DIA. MM	THREAD		ROD EXTENSIONS AND PILOT DIMENSIONS									ADD STROKE XC
		KK	CC	A	B‡	C	D	VF	WF	RR	RM	Y	
1 1/2	5/8	7/16-20	1/2-20	3/4	1 1/8	3/8	17/32	5/8	1	-	§	1 15/16	6 3/8
	1†	3/4-16	7/8-14	1 1/8	1 1/2	1/2	7/8	7/8	1 3/8	-	§	2 5/16	6 3/4
2	1	3/4-16	7/8-14	1 1/8	1 1/2	1/2	7/8	7/8	1 3/8	-	§	2 5/16	7 1/4
	1 3/8†	1-14	1 1/4-12	1 5/8	2	5/8	1 1/8	1	1 5/8	-	§	2 9/16	7 1/2
2 1/2	1	3/4-16	7/8-14	1 1/8	1 1/2	1/2	7/8	7/8	1 3/8	3/8	2 1/2	2 5/16	7 3/8
	1 3/8†	1-14	1 1/4-12	1 5/8	2	5/8	1 1/8	1	1 5/8	-	§	2 9/16	7 5/8
	1 3/4†	1 1/4-12	1 1/2-12	2	2 3/8	3/4	1 1/2	1 1/8	1 7/8	-	§	2 13/16	7 7/8
3 1/4	1 3/8	1-14	1 1/4-12	1 5/8	2	5/8	1 1/8	1	1 5/8	5/16	3 7/32	2 11/16	8 5/8
	1 3/4	1 1/4-12	1 1/2-12	2	2 3/8	3/4	1 1/2	1 1/8	1 7/8	-	§	2 15/16	8 7/8
	2	1 1/2-12	1 3/4-12	2 1/4	2 5/8	7/8	1 3/4	1 1/8	2	-	§	3 1/16	9
4	1 3/4	1 1/4-12	1 1/2-12	2	2 3/8	3/4	1 1/2	1 1/8	1 7/8	5/16	3 7/8	2 15/16	9 3/4
	2	1 1/2-12	1 3/4-12	2 1/4	2 5/8	7/8	1 3/4	1 1/8	2	5/16	4	3 1/16	9 7/8
	2 1/2	1 7/8-12	2 1/4-12	3	3 1/8	1	2 1/8	1 1/4	2 1/4	5/8	4 7/16	3 5/16	10 1/8
5	2	1 1/2-12	1 3/4-12	2 1/4	2 5/8	7/8	1 3/4	1 1/8	2	5/16	4	3 1/16	10 1/2
	2 1/2	1 7/8-12	2 1/4-12	3	3 1/8	1	2 1/8	1 1/4	2 1/4	5/8	4 7/16	3 5/16	10 3/4
	3	2 1/4-12	2 3/4-12	3 1/2	3 3/4	1	2 5/8	1 1/4	2 1/4	3/4	5 1/4	3 5/16	10 3/4
	3 1/2	2 1/2-12	3 1/4-12	3 1/2	4 1/4	1	Δ	1 1/4	2 1/4	3/4	5 5/8	3 5/16	10 3/4
6	2 1/2	1 7/8-12	2 1/4-12	3	3 1/8	1	2 1/8	1 1/4	2 1/4	5/8	4 7/16	3 7/16	12 1/8
	3	2 1/4-12	2 3/4-12	3 1/2	3 3/4	1	2 5/8	1 1/4	2 1/4	3/4	5 1/4	3 7/16	12 1/8
	3 1/2	2 1/2-12	3 1/4-12	3 1/2	4 1/4	1	Δ	1 1/4	2 1/4	3/4	5 5/8	3 7/16	12 1/8
	4	3-12	3 3/4-12	4	4 3/4	1	Δ	1 1/4	2 1/4	7/8	6 7/16	3 7/16	12 1/8
7	3	2 1/4-12	2 3/4-12	3 1/2	3 3/4	1	2 5/8	1 1/4	2 1/4	3/4	5 1/4	3 3/4	13 3/4
	3 1/2	2 1/2-12	3 1/4-12	3 1/2	4 1/4	1	Δ	1 1/4	2 1/4	3/4	5 5/8	3 3/4	13 3/4
	4	3-12	3 3/4-12	4	4 3/4	1	Δ	1 1/4	2 1/4	7/8	6 7/16	3 3/4	13 3/4
	4 1/2	3 1/4-12	4 1/4-12	4 1/2	5 1/4	1	Δ	1 1/4	2 1/4	7/8	7 1/8	3 3/4	13 3/4
	5	3 1/2-12	4 3/4-12	5	5 3/4	1	Δ	1 1/4	2 1/4	7/8	7 5/8	3 3/4	13 3/4
8	3 1/2	2 1/2-12	3 1/4-12	3 1/2	4 1/4	1	Δ	1 1/4	2 1/4	3/4	5 5/8	3 7/8	15
	4	3-12	3 3/4-12	4	4 3/4	1	Δ	1 1/4	2 1/4	7/8	6 7/16	3 7/8	15
	4 1/2	3 1/4-12	4 1/4-12	4 1/2	5 1/4	1	Δ	1 1/4	2 1/4	7/8	7 1/8	3 7/8	15
	5	3 1/2-12	4 3/4-12	5	5 3/4	1	Δ	1 1/4	2 1/4	7/8	7 5/8	3 7/8	15
	5 1/2	4-12	5 1/4-12	5 1/2	6 1/4	1	Δ	1 1/4	2 1/4	7/8	8 3/8	3 7/8	15
10	4 1/2	3 1/4-12	4 1/4-12	4 1/2	5 1/4	1	Δ	1 15/16	2 15/16	7/8	7 1/8	4 15/16	19 1/16
	5	3 1/2-12	4 3/4-12	5	5 3/4	1	Δ	2 3/16	3 3/16	7/8	7 5/8	5 3/16	19 5/16
	5 1/2	4-12	5 1/4-12	5 1/2	6 1/4	1	Δ	2 3/16	3 3/16	7/8	8 3/8	5 3/16	19 5/16
	7	5-12	6 1/2-12	7	8	1	Δ	2 1/2	3 1/2	7/8	10 7/8	5 1/2	19 5/8

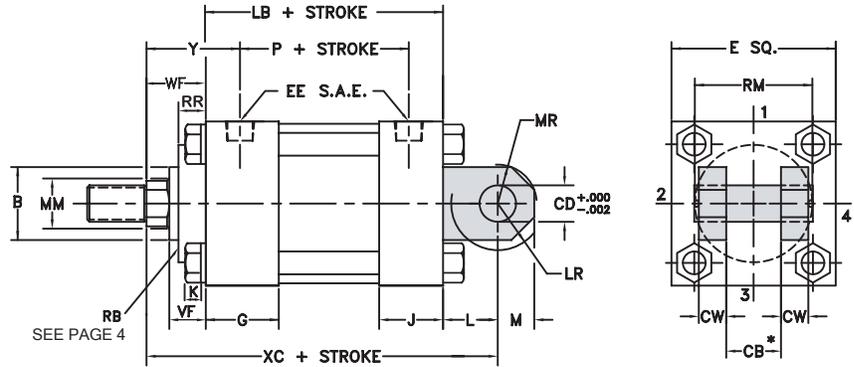
Specifications and prices are subject to change without notice or incurring obligations.

CAP FIXED CLEVIS MOUNT

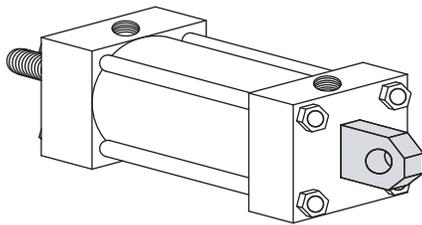


STYLE "P1"

NFPA-MP1

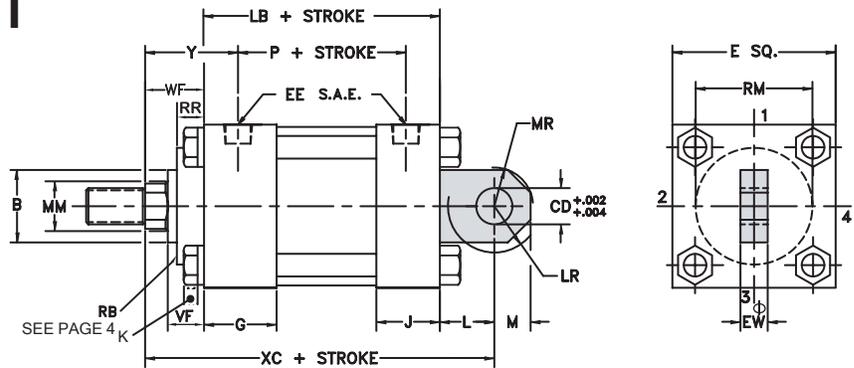


CAP FIXED EYE MOUNT



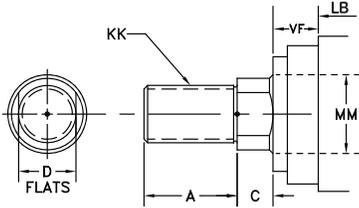
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NFPA-MP3

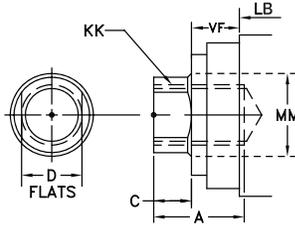


STANDARD ROD ENDS

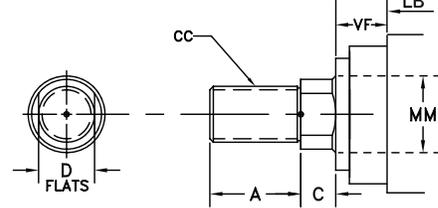
#1 STD MALE
NFPA-SM



#3 STD FEMALE
NFPA-SF



#2 MALE
NFPA-IM



BORE	CB*	CD	CW	EW ϕ	E	EE NPT	SAE #	F	G	J	L	LR	M	MR	K	ADD STROKE	
																LB	P
12	4 1/2	4	2 1/4	4 1/2	14 7/8	2 1/2	32	1 3/8	4 7/16	4 7/16	4 1/2	4	4	4 3/8	1 1/16	14 1/2	9 1/2
14	6	5	3	6	17 1/8	2 1/2	32	1 5/8	4 7/8	4 7/8	5 3/4	5	5	5 7/16	1 1/16	15 5/8	9 7/8
16	7	6	3 1/2	-	19 1/4	3	32	1 7/8	5 7/8	5 7/8	7	6	6	6 1/2	1 9/32	18 1/8	11
18	8	6 1/2	4	-	22	3	32	2 3/16	6 7/8	6 7/8	7 5/8	6 1/2	6 1/2	7 1/16	1 9/32	21 1/8	12
20	9	7 1/2	4 1/2	-	23 5/8	3	32	2 11/16	7 7/8	7 7/8	8 3/4	7 1/2	7 1/2	8 1/8	1 9/32	23 5/8	12 1/2
24	11	9	5	-	31	3	32	2 11/16	10	10	17	-	-	9	3	29 1/2	18

BORE	ROD DIA.		THREAD		ROD EXTENSIONS AND PILOT DIMENSIONS									ADD STROKE	
	MM	KK	CC	A	B \ddagger	C	D	VF	WF	RR	RM	Y	XC		
12	5 1/2	4-12	5 1/4-12	5 1/2	6 1/4	1	Δ	2 3/16	3 3/16	1 3/8	8 3/8	5 11/16	22 3/16		
	7	5-12	6 1/2-12	7	8	1	Δ	2 1/2	3 1/2	1 3/8	10 13/16	6	22 1/2		
	8	5 3/4-12	7 1/2-12	8	9	1	Δ	3	4	1 3/8	12 3/8	6 1/2	23		
14	7	5-12	6 1/2-12	7	8	1	Δ	2 1/2	3 1/2	1 5/8	10 13/16	6 3/8	24 7/8		
	8	5 3/4-12	7 1/2-12	8	9	1	Δ	3	4	1 5/8	12 3/8	6 7/8	25 3/8		
	9	6 1/2-12	8 1/2-12	9	10	1	Δ	3 1/4	4 1/4	1 5/8	13 1/8	7 1/8	25 5/8		
	10	7 1/4-12	9 1/2-12	10	11	1	Δ	3 1/2	4 1/2	1 5/8	14 5/8	7 3/8	25 7/8		
16	8	5 3/4-12	7 1/2-12	8	9	1	Δ	3	4	1 7/8	12 3/8	7 9/16	29 1/8		
	9	6 1/2-12	8 1/2-12	9	10	1	Δ	3 1/4	4 1/4	1 7/8	13 1/8	7 13/16	29 3/8		
	10	7 1/4-12	9 1/2-12	10	11	1	Δ	3 1/2	4 1/2	1 7/8	14 5/8	8 1/16	29 5/8		
18	9	6 1/2-12	8 1/2-12	9	10	1	Δ	3 1/4	4 1/4	2 3/16	13 1/8	8 13/16	33		
	10	7 1/4-12	9 1/2-12	10	11	1	Δ	3 1/2	4 1/2	2 3/16	14 5/8	9 1/16	33 1/4		
20	10	7 1/4-12	9 1/2-12	10	11	1	Δ	3 1/2	4 1/2	2 11/16	14 5/8	10 1/16	36 7/8		
24	11	8-8	-	11	12	1	Δ	3 1/2	4 1/2	2 11/16	16	10 1/4	51		

Δ (2) SPANNER HOLES USED INSTEAD OF FLATS ON 3 1/2" DIA. AND LARGER RODS

\ddagger B DIMENSION TOLERANCE -.001/-.003

ϕ DESIGNED TO FIT FABCO STD CLEVIS BRACKET - SEE PAGE 33

* CLEVIS DESIGNED TO FIT FABCO STD EYE BRACKET - SEE PAGE 34

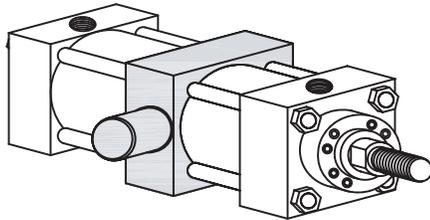
NOTE: P3 MOUNT DOES NOT INCLUDE PIVOT PIN

NOTE: STANDARD CUSHION LOCATION IS POSITION 2 UNLESS OTHERWISE SPECIFIED BY THE CUSTOMER

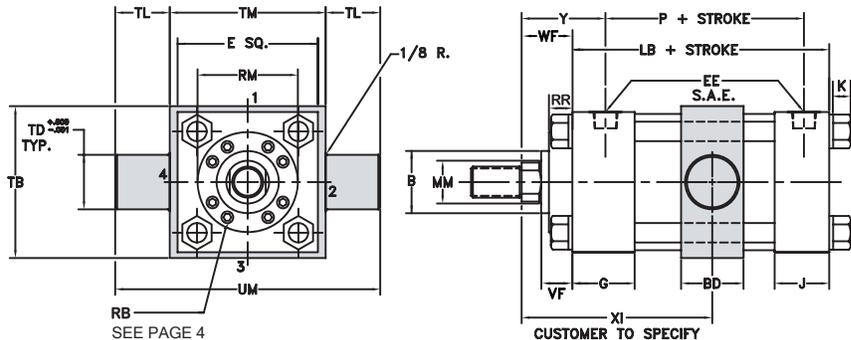
NOTE: SEE PAGE 4 FOR TIE ROD INFORMATION ON 10" THRU 24" BORES

NOTE: P3 MOUNT AVAILABLE 1 1/2" -14" BORE

NOTE: STANDARD CUSHION LOCATION IS POSITION 3 FOR THESE TRUNNION MOUNTS.

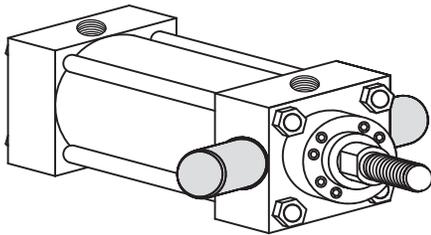


STYLE "T8"
NFPA-MT4

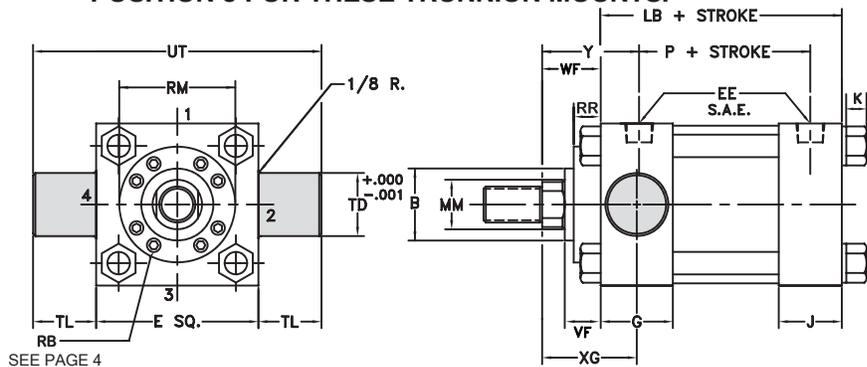


HEAD TRUNNION MOUNT

NOTE: STANDARD CUSHION LOCATION IS POSITION 3 FOR THESE TRUNNION MOUNTS.

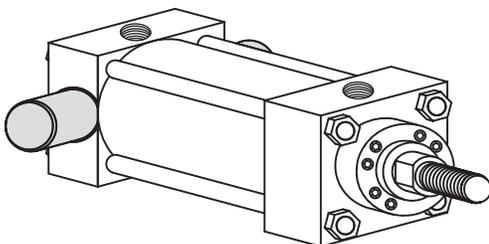


STYLE "T6"
NFPA-MT1

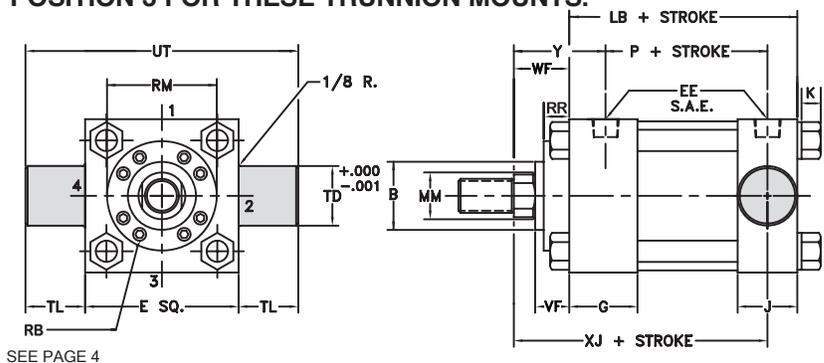


CAP TRUNNION MOUNT

NOTE: STANDARD CUSHION LOCATION IS POSITION 3 FOR THESE TRUNNION MOUNTS.

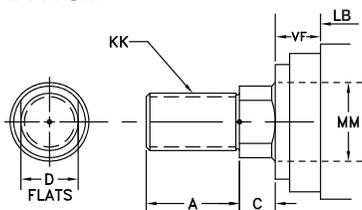


STYLE "T7"
NFPA-MT2

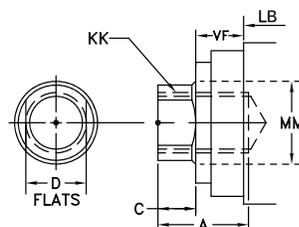


STANDARD ROD ENDS

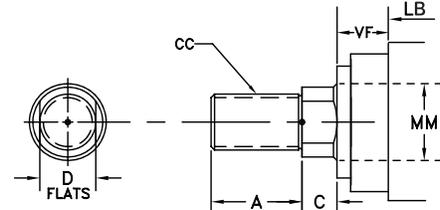
#1 STD MALE
NFPA-SM



#3 STD FEMALE
NFPA-SF



#2 MALE
NFPA-IM



Specifications and prices are subject to change without notice or incurring obligations.

1 1/2 THRU 10 BORE • SERIES HHD

FABCO-AIR

BIG BORE CYLINDERS ON NEXT PAGE

BORE	E	EE(NPT)	SAE #	F	G	J	K	TD	TL	TB	TM	UM	UT	BD	XI	ADD STROKE	
																LB	P
1 1/2	2 1/2	1/2	10	3/8	1 3/4	1 1/2	3/8	1	1	2 3/4	3	5	4 1/2	1 1/4	CUSTOMER TO SPECIFY	4 5/8	3
2	3	1/2	10	5/8	1 3/4	1 1/2	7/16	1 3/8	1 3/8	3 3/8	3 1/2	6 1/4	5 3/4	1 3/4		4 5/8	3
2 1/2	3 1/2	1/2	10	5/8	1 3/4	1 1/2	7/16	1 3/8	1 3/8	3 7/8	4	6 3/4	6 1/4	2		4 3/4	3 1/8
3 1/4	4 1/2	3/4	12	3/4	2	1 3/4	9/16	1 3/4	1 3/4	4 7/8	5	8 1/2	8	2 1/4		5 1/2	3 5/8
4	5	3/4	12	7/8	2	1 3/4	9/16	1 3/4	1 3/4	5 1/2	5 1/2	9	8 1/2	2 1/4		5 3/4	3 7/8
5	6 1/2	3/4	12	7/8	2	1 3/4	3/4	1 3/4	1 3/4	7 1/4	7	10 1/2	10	3		6 1/4	4 3/8
6	7 1/2	1	16	1	2 1/4	2 1/4	7/8	2	2	8 1/2	8 1/2	12 1/2	11 1/2	3 1/2		7 3/8	5
7	8 1/2	1 1/4	20	1	2 3/4	2 3/4	1	2 1/2	2 1/2	9 3/4	9 3/4	14 3/4	13 1/2	4		8 1/2	5 1/2
8	9 1/2	1 1/2	24	1	3	3	1 1/16	3	3	11	11	17	15 1/2	4 1/4		9 1/2	6 1/4
10	12 5/8	2	32	7/8	3 11/16	3 11/16	1	3 1/2	3 1/2	N/A	N/A	N/A	19 5/8	N/A		12 1/8	8 1/8

BORE	ROD DIA.	THREAD		ROD EXTENSIONS AND PILOT DIMENSIONS										ADD STROKE
	MM	KK	CC	A	B ‡	C	D	VF	WF	RR	RM	Y	XG	XJ
1 1/2	5/8	7/16-20	1/2-20	3/4	1 1/8	3/8	17/32	5/8	1	-	§	1 15/16	1 7/8	4 7/8
	1 †	3/4-16	7/8-14	1 1/8	1 1/2	1/2	7/8	7/8	1 3/8	-	§	2 5/16	2 1/4	5 1/4
2	1	3/4-16	7/8-14	1 1/8	1 1/2	1/2	7/8	7/8	1 3/8	-	§	2 5/16	2 1/4	5 1/4
	1 3/8 †	1-14	1 1/4-12	1 5/8	2	5/8	1 1/8	1	1 5/8	-	§	2 9/16	2 1/2	5 1/2
2 1/2	1	3/4-16	7/8-14	1 1/8	1 1/2	1/2	7/8	7/8	1 3/8	3/8	2 1/2	2 5/16	2 1/4	5 3/8
	1 3/8 †	1-14	1 1/4-12	1 5/8	2	5/8	1 1/8	1	1 5/8	-	§	2 9/16	2 1/2	5 5/8
3 1/4	1 3/4 †	1 1/4-12	1 1/2-12	2	2 3/8	3/4	1 1/2	1 1/8	1 7/8	-	§	2 13/16	2 3/4	5 7/8
	1 3/8	1-14	1 1/4-12	1 5/8	2	5/8	1 1/8	1	1 5/8	5/16	3 7/32	2 11/16	2 5/8	6 1/4
4	1 3/4	1 1/4-12	1 1/2-12	2	2 3/8	3/4	1 1/2	1 1/8	1 7/8	-	§	2 15/16	2 7/8	6 1/2
	2 †	1 1/2-12	1 3/4-12	2 1/4	2 5/8	7/8	1 3/4	1 1/8	2	-	§	3 1/16	3	6 5/8
5	1 3/4	1 1/4-12	1 1/2-12	2	2 3/8	3/4	1 1/2	1 1/8	1 7/8	5/16	3 7/8	2 15/16	2 7/8	6 3/4
	2	1 1/2-12	1 3/4-12	2 1/4	2 5/8	7/8	1 3/4	1 1/8	2	5/16	4	3 1/16	3	6 7/8
6	2 1/2	1 7/8-12	2 1/4-12	3	3 1/8	1	2 1/8	1 1/4	2 1/4	5/8	4 7/16	3 5/16	3 1/4	7 1/8
	2	1 1/2-12	1 3/4-12	2 1/4	2 5/8	7/8	1 3/4	1 1/8	2	5/16	4	3 1/16	3	6 3/4
7	2 1/2	2 1/4-12	2 3/4-12	3 1/2	3 3/4	1	2 5/8	1 1/4	2 1/4	3/4	5 1/4	3 5/16	3 1/4	7 5/8
	3 1/2	2 1/2-12	3 1/4-12	3 1/2	4 1/4	1	Δ	1 1/4	2 1/4	3/4	5 5/8	3 5/16	3 1/4	7 5/8
8	3 1/2	2 1/2-12	3 1/4-12	3 1/2	4 1/4	1	Δ	1 1/4	2 1/4	3/4	5 1/4	3 7/16	3 3/8	8 3/8
	4	3-12	3 3/4-12	4	4 3/4	1	Δ	1 1/4	2 1/4	7/8	6 7/16	3 7/16	3 3/8	8 3/8
9	3	2 1/4-12	2 3/4-12	3 1/2	3 3/4	1	2 5/8	1 1/4	2 1/4	3/4	5 1/4	3 3/4	3 5/8	9 3/8
	3 1/2	2 1/2-12	3 1/4-12	3 1/2	4 1/4	1	Δ	1 1/4	2 1/4	3/4	5 5/8	3 3/4	3 5/8	9 3/8
10	4	3-12	3 3/4-12	4	4 3/4	1	Δ	1 1/4	2 1/4	7/8	6 7/16	3 3/4	3 5/8	9 3/8
	4 1/2	3 1/4-12	4 1/4-12	4 1/2	5 1/4	1	Δ	1 1/4	2 1/4	7/8	7 1/8	3 3/4	3 5/8	9 3/8
11	5	3 1/2-12	4 3/4-12	5	5 3/4	1	Δ	1 1/4	2 1/4	7/8	7 5/8	3 3/4	3 5/8	9 3/8
	5 1/2	2 1/2-12	3 1/4-12	3 1/2	4 1/4	1	Δ	1 1/4	2 1/4	3/4	5 5/8	3 7/8	3 3/4	10 1/4
12	4	3-12	3 3/4-12	4	4 3/4	1	Δ	1 1/4	2 1/4	7/8	6 7/16	3 7/8	3 3/4	10 1/4
	4 1/2	3 1/4-12	4 1/4-12	4 1/2	5 1/4	1	Δ	1 1/4	2 1/4	7/8	7 1/8	3 7/8	3 3/4	10 1/4
13	5	3 1/2-12	4 3/4-12	5	5 3/4	1	Δ	1 1/4	2 1/4	7/8	7 5/8	3 7/8	3 3/4	10 1/4
	5 1/2	4-12	5 1/4-12	5 1/2	6 1/4	1	Δ	1 1/4	2 1/4	7/8	8 3/8	3 7/8	3 3/4	10 1/4
14	4 1/2	3 1/4-12	4 1/4-12	4 1/2	5 1/4	1	Δ	1 15/16	2 15/16	7/8	7 7/8	4 15/16	4 3/4	13 1/4
	5	3 1/2-12	4 3/4-12	5	5 3/4	1	Δ	2 3/16	3 3/16	7/8	7 5/8	5 3/16	5	13 1/2
15	5 1/2	4-12	5 1/4-12	5 1/2	6 1/4	1	Δ	2 3/16	3 3/16	7/8	8 3/8	5 3/16	5	13 1/2
	7	5-12	6 1/2-12	7	8	1	Δ	2 1/2	3 1/2	7/8	10 7/8	5 1/2	5 5/16	13 13/16

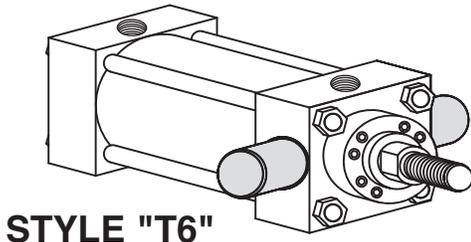
- † HEAD END PORTS SHALLOW TAPPED (SOME BORES WITH OS RODS)
- Δ (2) SPANNER HOLES USED INSTEAD OF FLATS (DIMENSION 'D' COLUMN) ON 3 1/2" DIA. AND LARGER RODS
- § THESE CYLINDERS HAVE FULL PLATE RETAINERS. USE "E" DIMENSIONS INSTEAD OF "RM."
USE "F" DIMENSIONS INSTEAD OF "RR" – SEE PAGE 4
- ‡ B DIMENSION TOLERANCE -.001/-.003

NOTE: STANDARD CUSHION LOCATION IS POSITION 3 UNLESS OTHERWISE SPECIFIED BY THE CUSTOMER
NOTE: SEE PAGE 4 FOR TIE ROD INFORMATION ON 10" THRU 24" BORES

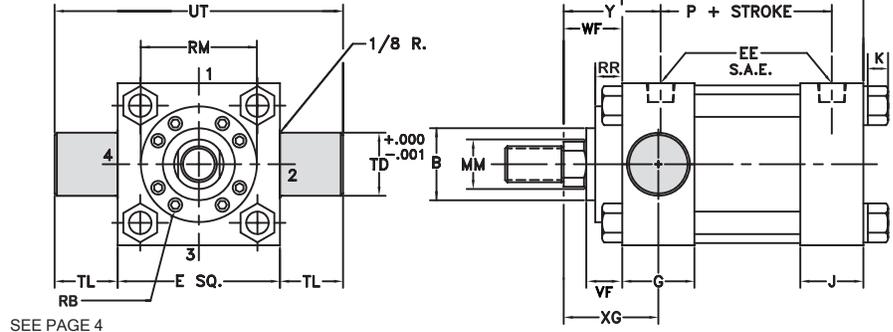
Specifications and prices are subject to change without notice or incurring obligations.

HEAD TRUNNION MOUNT

NOTE: STANDARD CUSHION LOCATION IS POSITION 3 FOR THESE TRUNNION MOUNTS.

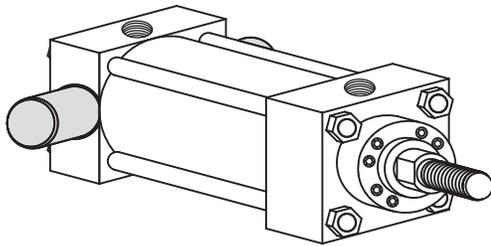


STYLE "T6"
NFPA-MT1

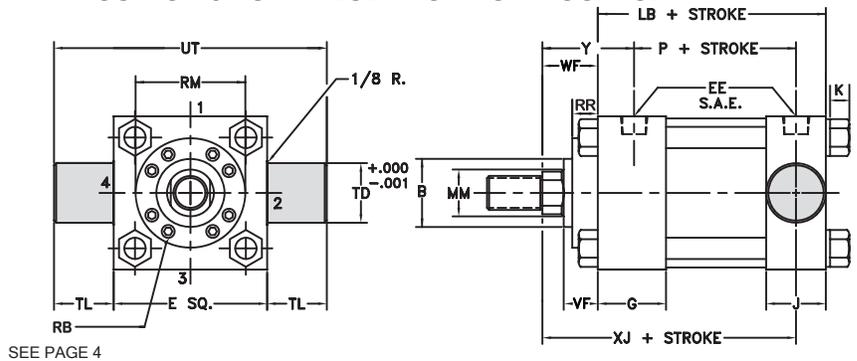


CAP TRUNNION MOUNT

NOTE: STANDARD CUSHION LOCATION IS POSITION 3 FOR THESE TRUNNION MOUNTS.



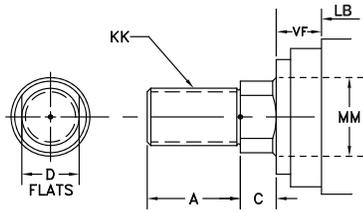
STYLE "T7"
NFPA-MT2



STANDARD ROD ENDS

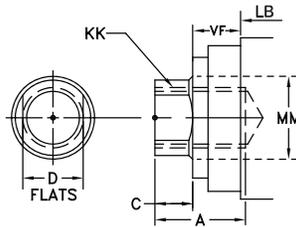
#1 STD MALE

NFPA-SM



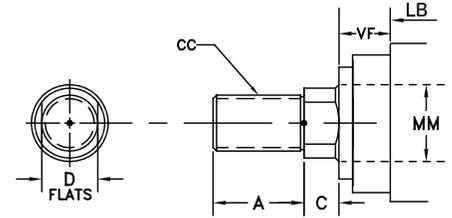
#3 STD FEMALE

NFPA-SF



#2 MALE

NFPA-IM



BORE	E	EE (NPT)	SAE#	F	G	J	K	TD	TL	UT	ADD STROKE	
											LB	P
12	14 7/8	2 1/2	32	1 3/8	4 7/16	4 7/16	1 1/16	4	4	22 7/8	14 1/2	9 1/2
14	17 1/8	2 1/2	32	1 5/8	4 7/8	4 7/8	1 1/16	4 1/2	4 1/2	26 1/8	15 5/8	9 7/8
16	19 1/4	3	32	1 7/8	5 7/8	5 7/8	1 9/32	5	5	29 1/4	18 1/8	11
18	22	3	32	2 3/16	6 7/8	6 7/8	1 9/32	5 3/4	5 3/4	33 1/2	21 1/8	12
20	23 5/8	3	32	2 11/16	7 7/8	7 7/8	1 9/32	6 1/4	6 1/4	36 1/8	23 5/8	12 1/2
24	31	3	32	2 11/16	10	10	3	7 1/2	7 1/2	46	29 1/2	18

BORE	ROD DIA.	THREAD		ROD EXTENSIONS AND PILOT DIMENSIONS										ADD STROKE
	MM	KK	CC	A	B †	C	D	VF	WF	RR	RM	Y	XG	XJ
12	5 1/2	4-12	5 1/4-12	5 1/2	6 1/4	1	Δ	2 3/16	3 3/16	1 3/8	8 3/8	5 11/16	5 3/8	15 1/2
	7	5-12	6 1/2-12	7	8	1	Δ	2 1/2	3 1/2	1 3/8	10 13/16	6	5 11/16	15 13/16
	8	5 3/4-12	7 1/2-12	8	9	1	Δ	3	4	1 3/8	12 3/8	6 1/2	6 3/16	16 5/16
14	7	5-12	6 1/2-12	7	8	1	Δ	2 1/2	3 1/2	1 5/8	10 13/16	6 3/8	5 15/16	16 11/16
	8	5 3/4-12	7 1/2-12	8	9	1	Δ	3	4	1 5/8	12 3/8	6 7/8	6 7/16	17 3/16
	9	6 1/2-12	8 1/2-12	9	10	1	Δ	3 1/4	4 1/4	1 5/8	13 1/8	7 1/8	6 11/16	17 7/16
16	8	5 3/4-12	7 1/2-12	8	9	1	Δ	3	4	1 7/8	12 3/8	7 9/16	6 15/16	19 3/16
	9	6 1/2-12	8 1/2-12	9	10	1	Δ	3 1/4	4 1/4	1 7/8	13 1/8	7 13/16	7 3/16	19 7/16
	10	7 1/4-12	9 1/2-12	10	11	1	Δ	3 1/2	4 1/2	1 7/8	14 5/8	8 1/16	7 7/16	19 11/16
18	9	6 1/2-12	8 1/2-12	9	10	1	Δ	3 1/4	4 1/4	2 3/16	13 1/8	8 13/16	7 15/16	21 15/16
	10	7 1/4-12	9 1/2-12	10	11	1	Δ	3 1/2	4 1/2	2 3/16	14 5/8	9 1/16	7 11/16	22 3/16
20	10	7 1/4-12	9 1/2-12	10	11	1	Δ	3 1/2	4 1/2	2 11/16	14 5/8	10 1/16	8 7/16	24 3/16
	11	8-8	-	11	12	1	Δ	3 1/2	4 1/2	2 11/16	16	10 1/4	9.5	29

† HEAD END PORTS SHALLOW TAPPED

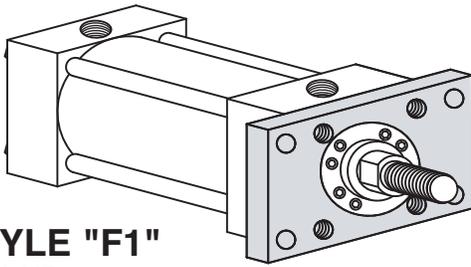
Δ (2) SPANNER HOLES USED INSTEAD OF FLATS ON 3 1/2" DIA. AND LARGER RODS

‡ B DIMENSION TOLERANCE -.001/ -.003

NOTE: STANDARD CUSHION LOCATION IS POSITION 3 UNLESS OTHERWISE SPECIFIED BY THE CUSTOMER

NOTE: SEE PAGE 4 FOR TIE ROD INFORMATION ON 10" THRU 24" BORES

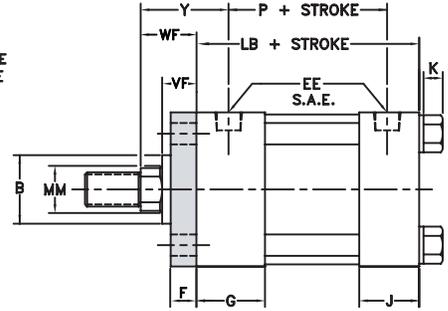
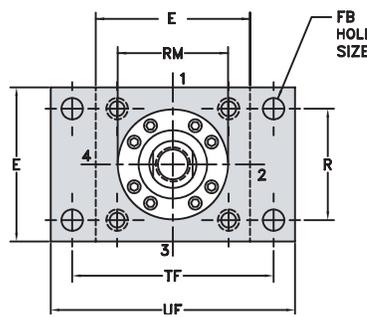
HEAD RECTANGULAR FLANGE MOUNT



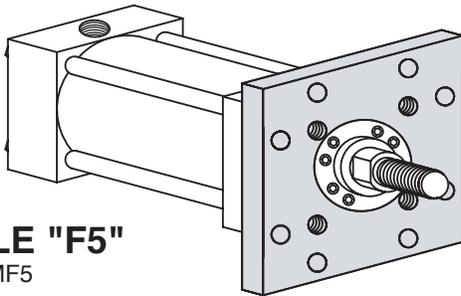
STYLE "F1"

NFPA-MF1

SEE PAGE 21 FOR DERATED PRESSURES

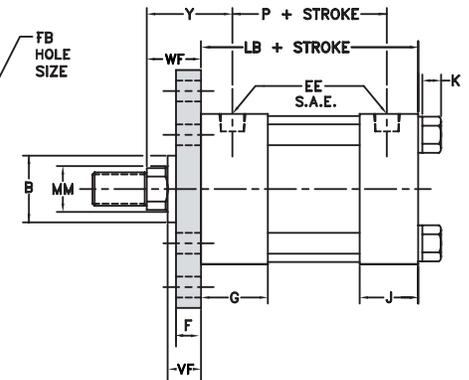
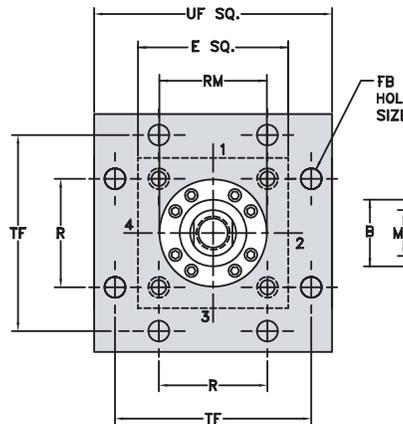


HEAD SQUARE FLANGE MOUNT

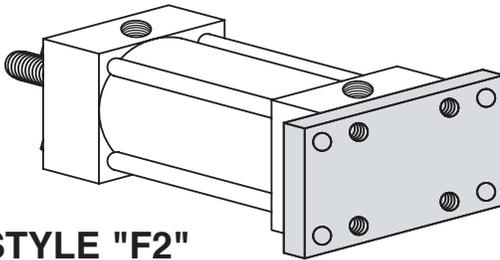


STYLE "F5"

NFPA-MF5



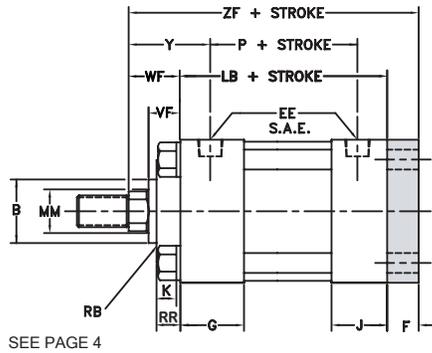
CAP RECTANGULAR FLANGE MOUNT



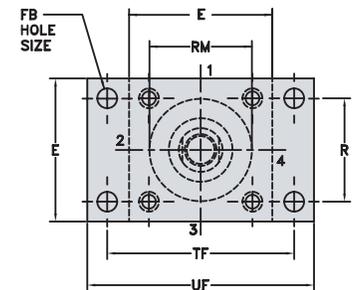
STYLE "F2"

NFPA-MF2

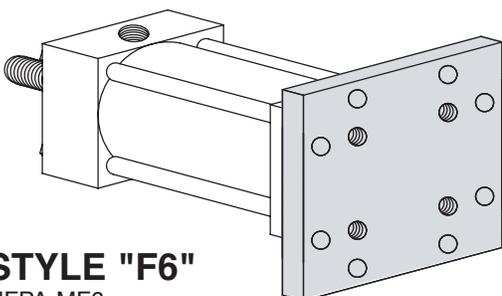
SEE PAGE 21 FOR DERATED PRESSURES



SEE PAGE 4

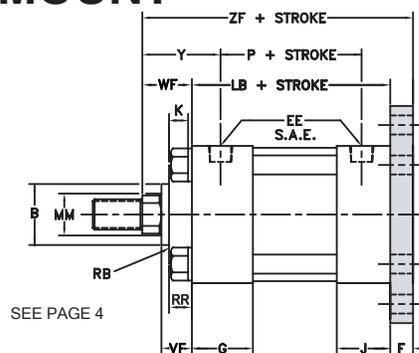


CAP SQUARE FLANGE MOUNT

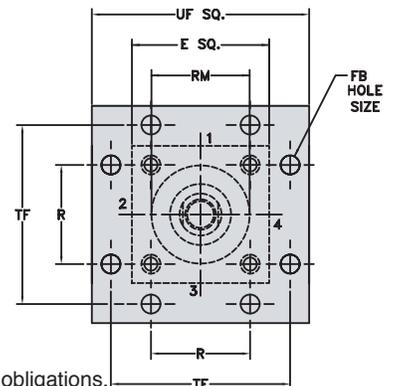


STYLE "F6"

NFPA-MF6



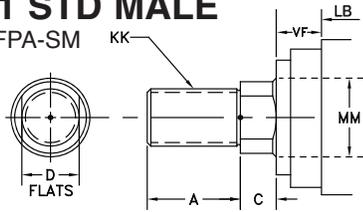
SEE PAGE 4



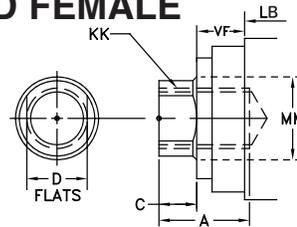
Specifications and prices are subject to change without notice or incurring obligations.

STANDARD ROD ENDS

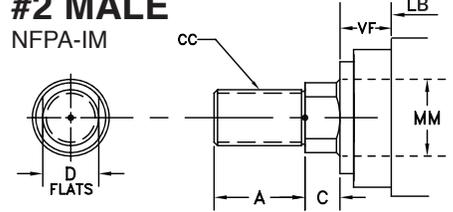
#1 STD MALE
NFFPA-SM



#3 STD FEMALE
NFFPA-SF



#2 MALE
NFFPA-IM



BORE	E	EE(NPT)	SAE #	F	FB	G	J	K	R	TF	UF	ADD STROKE	
												LB	P
1 1/2	2 1/2	1/2	10	3/8	7/16	1 3/4	1 1/2	3/8	1.63	3 7/16	4 1/4	4 5/8	3
2	3	1/2	10	5/8	9/16	1 3/4	1 1/2	7/16	2.05	4 1/8	5 1/8	4 5/8	3
2 1/2	3 1/2	1/2	10	5/8	9/16	1 3/4	1 1/2	7/16	2.55	4 5/8	5 5/8	4 3/4	3 1/8
3 1/4	4 1/2	3/4	12	3/4	11/16	2	1 3/4	9/16	3.25	5 7/8	7 1/8	5 1/2	3 5/8
4	5	3/4	12	7/8	11/16	2	1 3/4	9/16	3.82	6 3/8	7 5/8	5 3/4	3 7/8
5	6 1/2	3/4	12	7/8	15/16	2	1 3/4	3/4	4.95	8 3/16	9 3/4	6 1/4	4 3/8
6	7 1/2	1	16	1	1 1/16	2 1/4	2 1/4	7/8	5.73	9 7/16	11 1/4	7 3/8	5
7	8 1/2	1 1/4	20	1	1 3/16	2 3/4	2 3/4	1	6.58	10 5/8	12 5/8	8 1/2	5 1/2
8	9 1/2	1 1/2	24	1	1 5/16	3	3	1 1/16	7.50	11 13/16	14	9 1/2	6 1/4

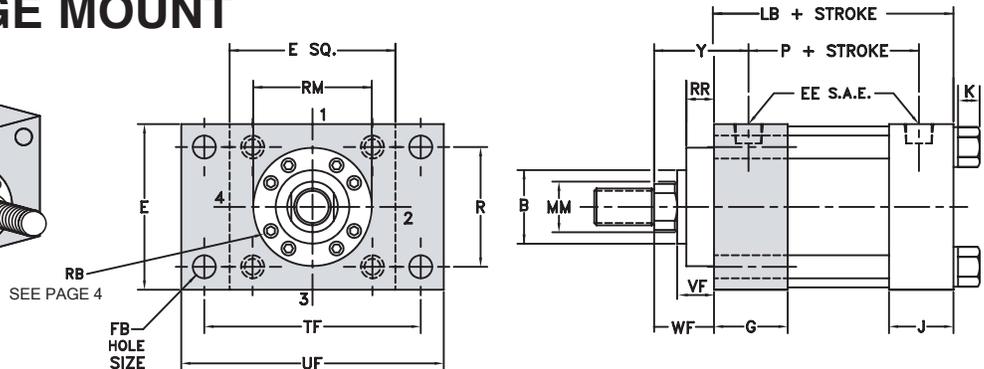
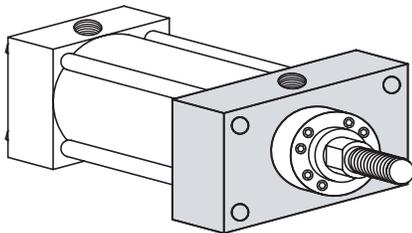
BORE	ROD DIA. MM	THREAD		ROD EXTENSIONS AND PILOT DIMENSIONS									ADD STROKE ZF	"F1" MOUNT MAX PSI PUSH	"F2" MOUNT MAX PSI PULL
		KK	CC	A	B [‡]	C	D	VF	WF	RR	RM	Y			
1 1/2	5/8	7/16-20	1/2-20	3/4	1 1/8	3/8	17/32	5/8	1	-	§	1 15/16	6	2500	3000
	1 †	3/4-16	7/8-14	1 1/8	1 1/2	1/2	7/8	7/8	1 3/8	-	§	2 5/16	6 3/8	1500	3000
2	1	3/4-16	7/8-14	1 1/8	1 1/2	1/2	7/8	7/8	1 3/8	-	§	2 5/16	6 5/8	2500	3000
	1 3/8 †	1-14	1 1/4-12	1 5/8	2	5/8	1 1/8	1	1 5/8	-	§	2 9/16	6 7/8	1500	3000
2 1/2	1	3/4-16	7/8-14	1 1/8	1 1/2	1/2	7/8	7/8	1 3/8	3/8	2 1/2	2 5/16	6 3/4	2500	3000
	1 3/8 †	1-14	1 1/4-12	1 5/8	2	5/8	1 1/8	1	1 5/8	-	§	2 9/16	7	1900	3000
	1 3/4 †	1 1/4-12	1 1/2-12	2	2 3/8	3/4	1 1/2	1 1/8	1 7/8	-	§	2 13/16	7 1/4	1500	3000
3 1/4	1 3/8	1-14	1 1/4-12	1 5/8	2	5/8	1 1/8	1	1 5/8	5/16	3 7/32	2 11/16	7 7/8	2500	3000
	1 3/4	1 1/4-12	1 1/2-12	2	2 3/8	3/4	1 1/2	1 1/8	1 7/8	-	§	2 15/16	8 1/8	2100	3000
	2 †	1 1/2-12	1 3/4-12	2 1/4	2 5/8	7/8	1 3/4	1 1/8	2	-	§	3 1/16	8 1/4	1500	3000
4	1 3/4	1 1/4-12	1 1/2-12	2	2 3/8	3/4	1 1/2	1 1/8	1 7/8	5/16	3 7/8	2 15/16	8 1/2	2500	3000
	2	1 1/2-12	1 3/4-12	2 1/4	2 5/8	7/8	1 3/4	1 1/8	2	5/16	4	3 1/16	8 5/8	1800	3000
	2 1/2	1 7/8-12	2 1/4-12	3	3 1/8	1	2 1/8	1 1/4	2 1/4	5/8	§	3 5/16	8 7/8	1500	3000
5	2	1 1/2-12	1 3/4-12	2 1/4	2 5/8	7/8	1 3/4	1 1/8	2	5/16	4	3 1/16	9 1/8	2200	2000
	2 1/2	1 7/8-12	2 1/4-12	3	3 1/8	1	2 1/8	1 1/4	2 1/4	5/8	4 7/16	3 5/16	9 3/8	1650	2500
	3	2 1/4-12	2 3/4-12	3 1/2	3 3/4	1	2 5/8	1 1/4	2 1/4	3/4	5 1/4	3 5/16	9 3/8	1200	2800
	3 1/2	2 1/2-12	3 1/4-12	3 1/2	4 1/4	1	Δ	1 1/4	2 1/4	3/4	§	3 5/16	9 3/8	750	3000
6	2 1/2	1 7/8-12	2 1/4-12	3	3 1/8	1	2 1/8	1 1/4	2 1/4	5/8	4 7/16	3 7/16	10 5/8	1800	2000
	3	2 1/4-12	2 3/4-12	3 1/2	3 3/4	1	2 5/8	1 1/4	2 1/4	3/4	5 1/4	3 7/16	10 5/8	1450	2500
	3 1/2	2 1/2-12	3 1/4-12	3 1/2	4 1/4	1	Δ	1 1/4	2 1/4	3/4	5 5/8	3 7/16	10 5/8	1100	2800
	4	3-12	3 3/4-12	4	4 3/4	1	Δ	1 1/4	2 1/4	7/8	§	3 7/16	10 5/8	750	3000
7	3	2 1/4-12	2 3/4-12	3 1/2	3 3/4	1	2 5/8	1 1/4	2 1/4	3/4	5 1/4	3 3/4	11 3/4	740	1500
	3 1/2	2 1/2-12	3 1/4-12	3 1/2	4 1/4	1	Δ	1 1/4	2 1/4	3/4	5 5/8	3 3/4	11 3/4	650	1700
	4	3-12	3 3/4-12	4	4 3/4	1	Δ	1 1/4	2 1/4	7/8	6 7/16	3 3/4	11 3/4	450	1800
	4 1/2	3 1/4-12	4 1/4-12	4 1/2	5 1/4	1	Δ	1 1/4	2 1/4	7/8	7 1/8	3 3/4	11 3/4	360	1900
	5	3 1/2-12	4 3/4-12	5	5 3/4	1	Δ	1 1/4	2 1/4	7/8	§	3 3/4	11 3/4	270	2000
8	3 1/2	2 1/2-12	3 1/4-12	3 1/2	4 1/4	1	Δ	1 1/4	2 1/4	3/4	5 5/8	3 7/8	12 3/4	620	1500
	4	3-12	3 3/4-12	4	4 3/4	1	Δ	1 1/4	2 1/4	7/8	6 7/16	3 7/8	12 3/4	470	1700
	4 1/2	3 1/4-12	4 1/4-12	4 1/2	5 1/4	1	Δ	1 1/4	2 1/4	7/8	7 1/8	3 7/8	12 3/4	410	1800
	5	3 1/2-12	4 3/4-12	5	5 3/4	1	Δ	1 1/4	2 1/4	7/8	7 5/8	3 7/8	12 3/4	340	1900
	5 1/2	4-12	5 1/4-12	5 1/2	6 1/4	1	Δ	1 1/4	2 1/4	7/8	§	3 7/8	12 3/4	280	2000

† HEAD END PORTS SHALLOW TAPPED (SOME BORES WITH OS RODS)
 Δ (2) SPANNER HOLES USED INSTEAD OF FLATS (DIMENSION 'D' COLUMN) ON 3 1/2" DIA. AND LARGER RODS
 ‡ B DIMENSION TOLERANCE -.001/- .003
 § THESE CYLINDERS HAVE FULL PLATE RETAINERS. USE "E" DIMENSIONS INSTEAD OF "RM." USE "F" DIMENSIONS INSTEAD OF "RR" - SEE PAGE 4

NOTE: "F1" AND "F2" MOUNTS HAVE DERATED PRESSURE RATINGS, FOR HIGHER PRESSURE USE "E5" AND "E6" MOUNTS
 NOTE: STANDARD CUSHION LOCATION IS POSITION 2 UNLESS OTHERWISE SPECIFIED BY THE CUSTOMER

Specifications and prices are subject to change without notice or incurring obligations.

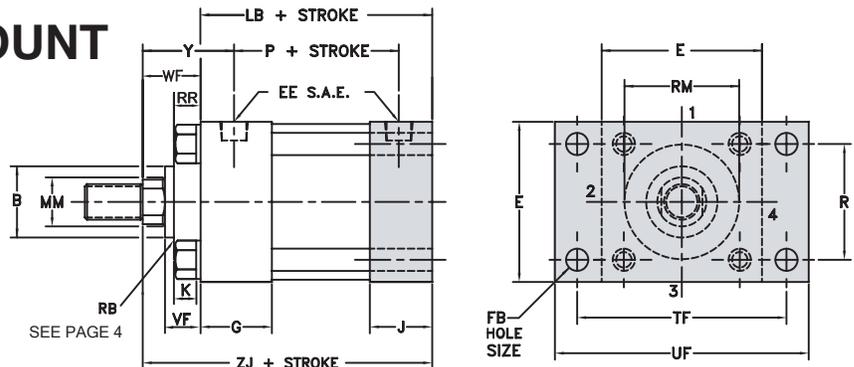
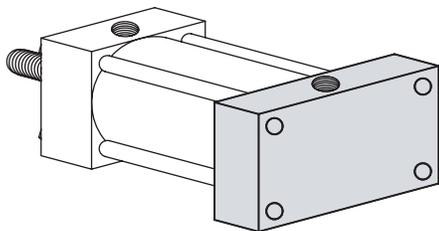
HEAD RECTANGULAR INTEGRAL FLANGE MOUNT



STYLE "E5"

NFPA-ME5

CAP RECTANGULAR INTEGRAL FLANGE MOUNT



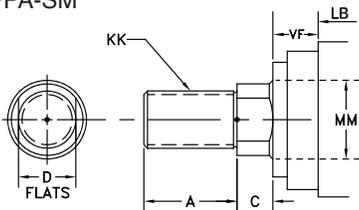
STYLE "E6"

NFPA-ME6

STANDARD ROD ENDS

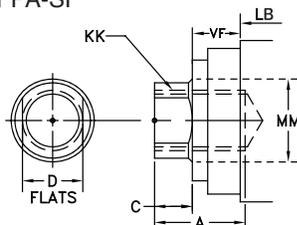
#1 STD MALE

NFPA-SM



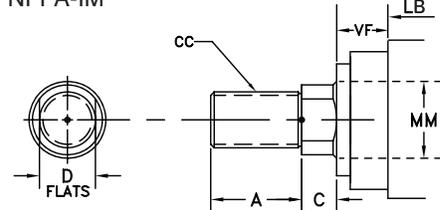
#3 STD FEMALE

NFPA-SF



#2 MALE

NFPA-IM



† HEAD END PORTS SHALLOW TAPPED (SOME BORES WITH OS RODS)

Δ (2) SPANNER HOLES USED INSTEAD OF FLATS (DIMENSION 'D' COLUMN) ON 3 1/2" DIA. AND LARGER RODS

§ ME6 MOUNT CYLINDERS HAVE FULL PLATE RETAINERS. USE "E" DIMENSIONS INSTEAD OF "RM." USE "F" DIMENSIONS INSTEAD OF "RR" - SEE PAGE 4

‡ B DIMENSION TOLERANCE -.001/-.003

NOTE: STANDARD CUSHION LOCATION IS POSITION 2 UNLESS OTHERWISE SPECIFIED BY THE CUSTOMER

NOTE: SEE PAGE 4 FOR TIE ROD INFORMATION ON 10" THRU 24" BORES

1 1/2 THRU 14 BORE • SERIES HHD

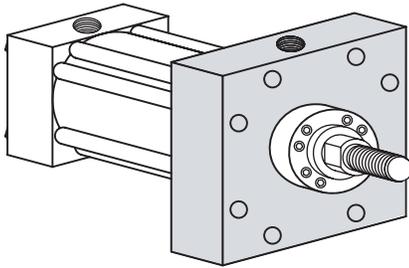
FABCO-AIR

BORE	E	EE (NPT)	SAE #	F	FB	G	J	K	R	TF	UF	ADD STROKE	
												LB	P
1 1/2	2 1/2	1/2	10	3/8	7/16	1 3/4	1 1/2	3/8	1.63	3 7/16	4 1/4	4 5/8	3
2	3	1/2	10	5/8	9/16	1 3/4	1 1/2	7/16	2.05	4 1/8	5 1/8	4 5/8	3
2 1/2	3 1/2	1/2	10	5/8	9/16	1 3/4	1 1/2	7/16	2.55	4 5/8	5 5/8	4 3/4	3 1/8
3 1/4	4 1/2	3/4	12	3/4	11/16	2	1 3/4	9/16	3.25	5 7/8	7 1/8	5 1/2	3 5/8
4	5	3/4	12	7/8	11/16	2	1 3/4	9/16	3.82	6 3/8	7 5/8	5 3/4	3 7/8
5	6 1/2	3/4	12	7/8	15/16	2	1 3/4	3/4	4.95	8 3/16	9 3/4	6 1/4	4 3/8
6	7 1/2	1	16	1	1 1/16	2 1/4	2 1/4	7/8	5.73	9 7/16	11 1/4	7 3/8	5
7	8 1/2	1 1/4	20	1	1 3/16	2 3/4	2 3/4	1	6.58	10 5/8	12 5/8	8 1/2	5 1/2
8	9 1/2	1 1/2	24	1	1 5/16	3	3	1 1/16	7.50	11 13/16	14	9 1/2	6 1/4
10	12 5/8	2	32	7/8	1 13/16	3 11/16	3 11/16	1	9.62	15 7/8	19	12 1/8	8 1/8
12	14 7/8	2 1/2	32	1 3/8	2 1/16	4 7/16	4 7/16	1 1/8	11.45	18 1/2	22	14 1/2	9 1/2
14	17 1/8	2 1/2	32	1 5/8	2 5/16	4 7/8	4 7/8	1 1/8	13.26	21	25	15 5/8	9 7/8

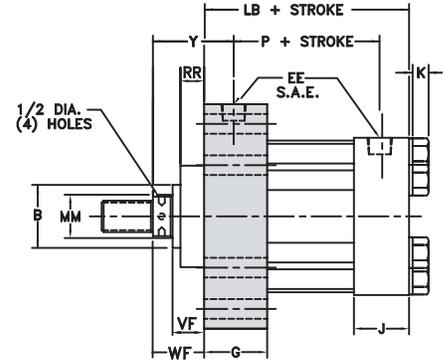
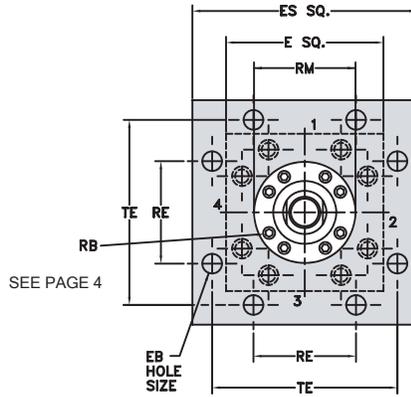
BORE	ROD DIA.	THREAD		ROD EXTENSIONS AND PILOT DIMENSIONS									ADD STROKE
	MM	KK	CC	A	B ‡	C	D	VF	WF	RR	RM	Y	ZJ
1 1/2	5/8	7/16-20	1/2-20	3/4	1 1/8	3/8	17/32	5/8	1	3/8	2 3/8 §	1 15/16	5 5/8
	1 †	3/4-16	7/8-14	1 1/8	1 1/2	1/2	7/8	7/8	1 3/8	3/8	2 1/2 §	2 5/16	6
2	1	3/4-16	7/8-14	1 1/8	1 1/2	1/2	7/8	7/8	1 3/8	3/8	2 1/2 §	2 5/16	6
	1 3/8 †	1-14	1 1/4-12	1 5/8	2	5/8	1 1/8	1	1 5/8	5/16	3 7/32 §	2 9/16	6 1/4
2 1/2	1	3/4-16	7/8-14	1 1/8	1 1/2	1/2	7/8	7/8	1 3/8	3/8	2 1/2	2 5/16	6 1/8
	1 3/8 †	1-14	1 1/4-12	1 5/8	2	5/8	1 1/8	1	1 5/8	5/16	3 7/32 §	2 9/16	6 3/8
	1 3/4 †	1 1/4-12	1 1/2-12	2	2 3/8	3/4	1 1/2	1 1/8	1 7/8	5/16	3 7/8 §	2 13/16	6 5/8
3 1/4	1 3/8	1-14	1 1/4-12	1 5/8	2	5/8	1 1/8	1	1 5/8	5/16	3 7/32	2 11/16	7 1/8
	1 3/4	1 1/4-12	1 1/2-12	2	2 3/8	3/4	1 1/2	1 1/8	1 7/8	5/16	3 7/8 §	2 15/16	7 3/8
	2 †	1 1/2-12	1 3/4-12	2 1/4	2 5/8	7/8	1 3/4	1 1/8	2	5/16	4 §	3 1/16	7 1/2
4	1 3/4	1 1/4-12	1 1/2-12	2	2 3/8	3/4	1 1/2	1 1/8	1 7/8	5/16	3 7/8	2 15/16	7 5/8
	2	1 1/2-12	1 3/4-12	2 1/4	2 5/8	7/8	1 3/4	1 1/8	2	5/16	4	3 1/16	7 3/4
	2 1/2	1 7/8-12	2 1/4-12	3	3 1/8	1	2 1/8	1 1/4	2 1/4	5/8	4 7/16	3 5/16	8
5	2	1 1/2-12	1 3/4-12	2 1/4	2 5/8	7/8	1 3/4	1 1/8	2	5/16	4	3 1/16	8 1/4
	2 1/2	1 7/8-12	2 1/4-12	3	3 1/8	1	2 1/8	1 1/4	2 1/4	5/8	4 7/16	3 5/16	8 1/2
	3	2 1/4-12	2 3/4-12	3 1/2	3 3/4	1	2 5/8	1 1/4	2 1/4	3/4	5 1/4	3 5/16	8 1/2
3 1/2	2 1/2	2 1/2-12	3 1/4-12	3 1/2	4 1/4	1	Δ	1 1/4	2 1/4	3/4	5 5/8	3 5/16	8 1/2
	2 1/2	1 7/8-12	2 1/4-12	3	3 1/8	1	2 1/8	1 1/4	2 1/4	5/8	4 7/16	3 7/16	9 5/8
	3	2 1/4-12	2 3/4-12	3 1/2	3 3/4	1	2 5/8	1 1/4	2 1/4	3/4	5 1/4	3 7/16	9 5/8
6	3 1/2	2 1/2-12	3 1/4-12	3 1/2	4 1/4	1	Δ	1 1/4	2 1/4	3/4	5 5/8	3 7/16	9 5/8
	4	3-12	3 3/4-12	4	4 3/4	1	Δ	1 1/4	2 1/4	7/8	6 7/16	3 7/16	9 5/8
	3	2 1/4-12	2 3/4-12	3 1/2	3 3/4	1	2 5/8	1 1/4	2 1/4	3/4	5 1/4	3 7/16	9 5/8
7	3 1/2	2 1/2-12	3 1/4-12	3 1/2	4 1/4	1	Δ	1 1/4	2 1/4	3/4	5 5/8	3 3/4	10 3/4
	4	3-12	3 3/4-12	4	4 3/4	1	Δ	1 1/4	2 1/4	7/8	6 7/16	3 3/4	10 3/4
	4 1/2	3 1/4-12	4 1/4-12	4 1/2	5 1/4	1	Δ	1 1/4	2 1/4	7/8	7 1/8	3 3/4	10 3/4
8	5	3 1/2-12	4 3/4-12	5	5 3/4	1	Δ	1 1/4	2 1/4	7/8	7 5/8	3 3/4	10 3/4
	3 1/2	2 1/2-12	3 1/4-12	3 1/2	4 1/4	1	Δ	1 1/4	2 1/4	3/4	5 5/8	3 7/8	11 3/4
	4	3-12	3 3/4-12	4	4 3/4	1	Δ	1 1/4	2 1/4	7/8	6 7/16	3 7/8	11 3/4
4 1/2	3 1/4	3 1/4-12	4 1/4-12	4 1/2	5 1/4	1	Δ	1 1/4	2 1/4	7/8	7 1/8	3 7/8	11 3/4
	5	3 1/2-12	4 3/4-12	5	5 3/4	1	Δ	1 1/4	2 1/4	7/8	7 5/8	3 7/8	11 3/4
	5 1/2	4-12	5 1/4-12	5 1/2	6 1/4	1	Δ	1 1/4	2 1/4	7/8	8 3/8	3 7/8	11 3/4
10	4 1/2	3 1/4-12	4 1/4-12	4 1/2	5 1/4	1	Δ	1 15/16	2 15/16	7/8	7 1/8	4 15/16	15 1/16
	5	3 1/2-12	4 3/4-12	5	5 3/4	1	Δ	2 3/16	3 3/16	7/8	7 5/8	5 3/16	15 5/16
	5 1/2	4-12	5 1/4-12	5 1/2	6 1/4	1	Δ	2 3/16	3 3/16	7/8	8 3/8	5 3/16	15 5/16
12	7	5-12	6 1/2-12	7	8	1	Δ	2 1/2	3 1/2	7/8	10 13/16	5 1/2	15 5/8
	5 1/2	4-12	5 1/4-12	5 1/2	6 1/4	1	Δ	2 3/16	3 3/16	1 3/8	8 3/8	5 11/16	17 11/16
	7	5-12	6 1/2-12	7	8	1	Δ	2 1/2	3 1/2	1 3/8	10 13/16	6	18
8	5 3/4-12	7 1/2-12	8	9	1	Δ	3	4	1 3/8	12 3/8	6 1/2	18 1/2	
	7	5-12	6 1/2-12	7	8	1	Δ	2 1/2	3 1/2	1 5/8	10 13/16	6 3/8	19 1/8
	8	5 3/4-12	7 1/2-12	8	9	1	Δ	3	4	1 5/8	12 3/8	6 7/8	19 5/8
14	9	6 1/2-12	8 1/2-12	9	10	1	Δ	3 1/4	4 1/4	1 5/8	13 1/8	7 1/8	19 7/8
	10	7 1/4-12	9 1/2-12	10	11	1	Δ	3 1/2	4 1/2	1 5/8	14 5/8	7 3/8	20 1/8

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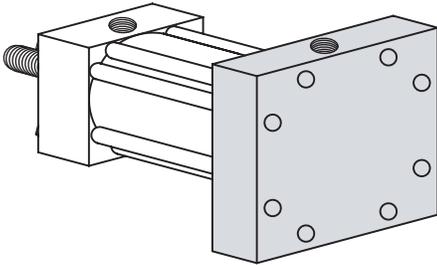
HEAD SQUARE INTEGRAL FLANGE MOUNT



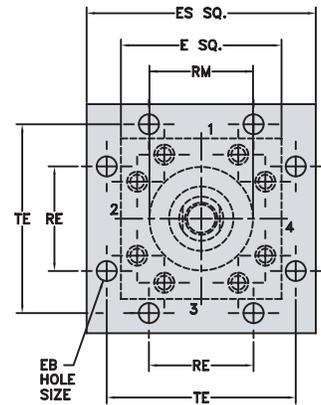
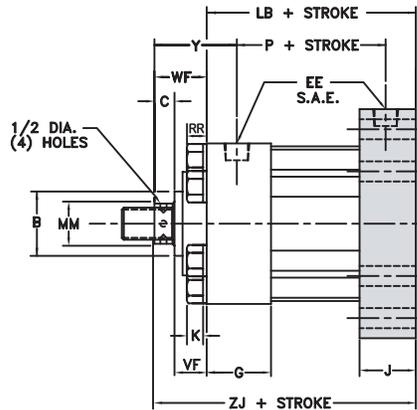
STYLE "E3"
NFPA-ME3



CAP SQUARE INTEGRAL FLANGE MOUNT



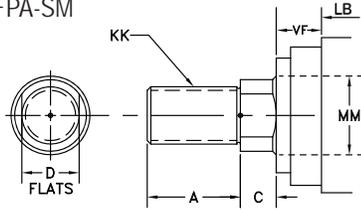
STYLE "E4"
NFPA-ME4



STANDARD ROD ENDS

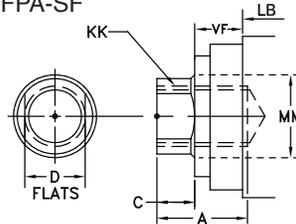
#1 STD MALE

NFPA-SM



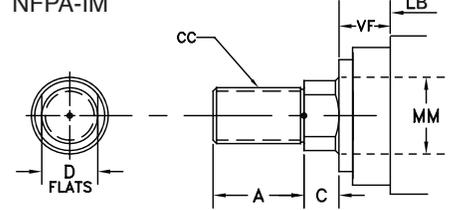
#3 STD FEMALE

NFPA-SF



#2 MALE

NFPA-IM



BORE	E	EB	EE(NPT)	SAE #	F	ES	G	J	K	RE	TE	ADD STROKE	
												LB	P
10	12 5/8	1 5/16	2	32	7/8	16 5/8	3 11/16	3 11/16	1	9 7/8	14 1/8	12 1/8	8 1/8
12	14 7/8	1 9/16	2 1/2	32	1 3/8	19 3/4	4 7/16	4 7/16	1 1/16	11 3/4	16 3/4	14 1/2	9 1/2
14	17 1/8	1 13/16	2 1/2	32	1 5/8	21 3/4	4 7/8	4 7/8	1 1/16	12 15/16	18 7/16	15 5/8	9 7/8
16	19 1/4	1 13/16	3	32	1 7/8	24 1/2	5 7/8	5 7/8	1 9/32	15 1/4	21 1/16	18 1/8	11
18	22	2 1/16	3	32	2 3/16	26 1/2	6 7/8	6 7/8	1 9/32	16 7/16	22 5/8	21 1/8	12
20	23 5/8	2 1/16	3	32	2 11/16	29	7 7/8	7 7/8	1 9/32	18 1/16	24 7/8	23 5/8	12 1/2
24	31	2 9/16	3	32	2 11/16	36	10	10	3	22 1/8	31 1/4	29 1/2	18

BORE	ROD DIA.		THREAD		ROD EXTENSIONS AND PILOT DIMENSIONS								ADD STROKE	
	MM	KK	CC	A	B ‡	C	D	VF	WF	RR	RM	Y	ZJ	
10	4 1/2	3 1/4-12	4 1/4-12	4 1/2	5 1/4	1	Δ	1 15/16	2 15/16	7/8	7 1/8	4 15/16	15 1/16	
	5	3 1/2-12	4 3/4-12	5	5 3/4	1	Δ	2 3/16	3 3/16	7/8	7 5/8	5 3/16	15 5/16	
	5 1/2	4-12	5 1/4-12	5 1/2	6 1/4	1	Δ	2 3/16	3 3/16	7/8	8 3/8	5 3/16	15 5/16	
	7	5-12	6 1/2-12	7	8	1	Δ	2 1/2	3 1/2	7/8	10 13/16	5 1/2	15 5/8	
12	5 1/2	4-12	5 1/4-12	5 1/2	6 1/4	1	Δ	2 3/16	3 3/16	1 3/8	8 3/8	5 11/16	17 11/16	
	7	5-12	6 1/2-12	7	8	1	Δ	2 1/2	3 1/2	1 3/8	10 13/16	6	18	
	8	5 3/4-12	7 1/2-12	8	9	1	Δ	3	4	1 3/8	12 3/8	6 1/2	18 1/2	
14	7	5-12	6 1/2-12	7	8	1	Δ	2 1/2	3 1/2	1 5/8	10 13/16	6 3/8	19 1/8	
	8	5 3/4-12	7 1/2-12	8	9	1	Δ	3	4	1 5/8	12 3/8	6 7/8	19 5/8	
	9	6 1/2-12	8 1/2-12	9	10	1	Δ	3 1/4	4 1/4	1 5/8	13 1/8	7 1/8	19 7/8	
	10	7 1/4-12	9 1/2-12	10	11	1	Δ	3 1/2	4 1/2	1 5/8	14 5/8	7 3/8	20 1/8	
16	8	5 3/4-12	7 1/2-12	8	9	1	Δ	3	4	1 7/8	12 3/8	7 9/16	22 1/8	
	9	6 1/2-12	8 1/2-12	9	10	1	Δ	3 1/4	4 1/4	1 7/8	13 1/8	7 13/16	22 3/8	
	10	7 1/4-12	9 1/2-12	10	11	1	Δ	3 1/2	4 1/2	1 7/8	14 5/8	8 1/16	22 5/8	
18	9	6 1/2-12	8 1/2-12	9	10	1	Δ	3 1/4	4 1/4	2 3/16	13 1/8	8 13/16	25 3/8	
	10	7 1/4-12	9 1/2-12	10	11	1	Δ	3 1/2	4 1/2	2 3/16	14 5/8	9 1/16	25 5/8	
20	10	7 1/4-12	9 1/2-12	10	11	1	Δ	3 1/2	4 1/2	2 11/16	14 5/8	10 1/16	28 1/8	
24	11	8-8	-	11	12	1	Δ	3 1/2	4 1/2	2 11/16	16	10 1/4	34	

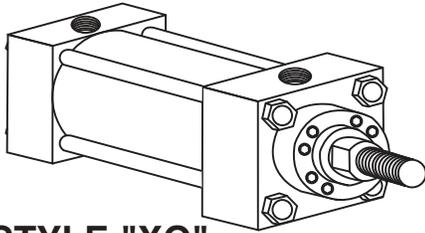
Δ (2) SPANNER HOLES USED INSTEAD OF FLATS ON 3 1/2" DIA. AND LARGER RODS

‡ B DIMENSION TOLERANCE -.001/-.003

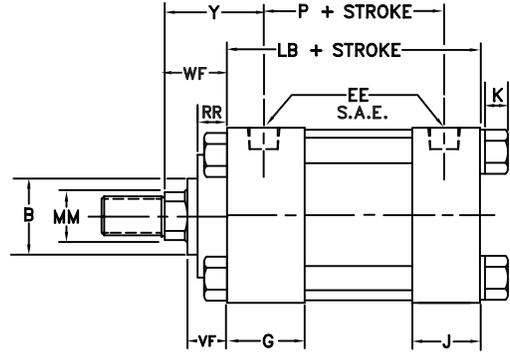
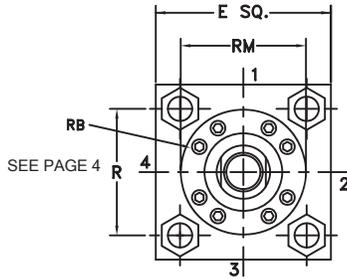
NOTE: SEE PAGE 4 FOR TIE ROD INFORMATION ON 10" THRU 24" BORES

NOTE: STANDARD CUSHION LOCATION IS POSITION 2 UNLESS OTHERWISE SPECIFIED BY THE CUSTOMER

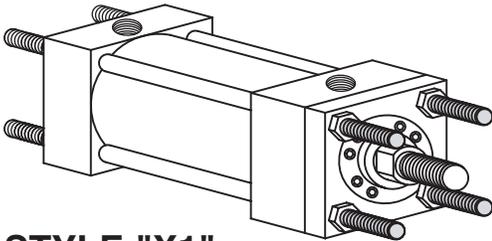
NO TIE RODS EXTENDED MOUNT



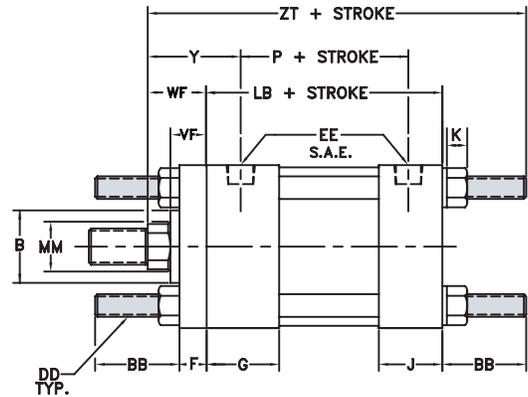
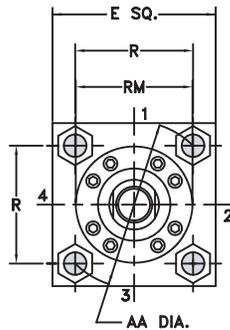
STYLE "X0"
NFPA-MX0



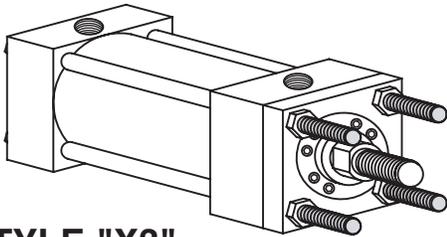
BOTH ENDS TIE RODS EXTENDED MOUNT



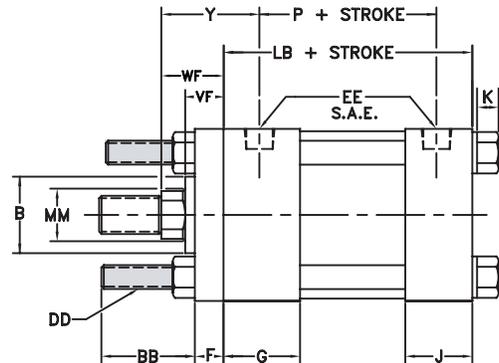
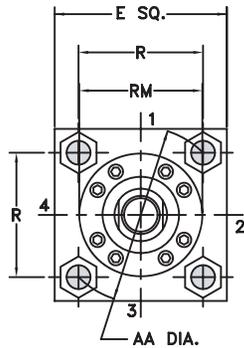
STYLE "X1"
NFPA-MX1



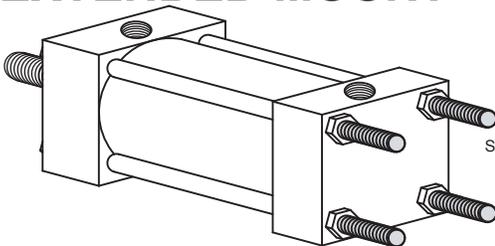
HEAD TIE RODS EXTENDED MOUNT



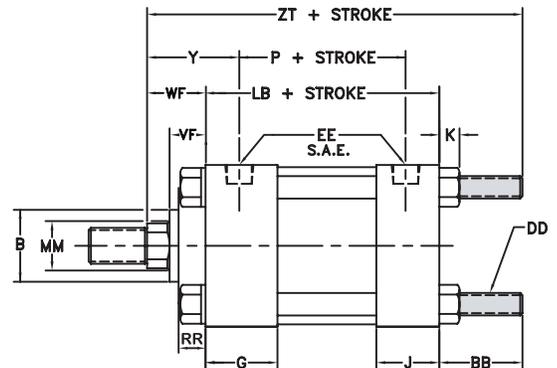
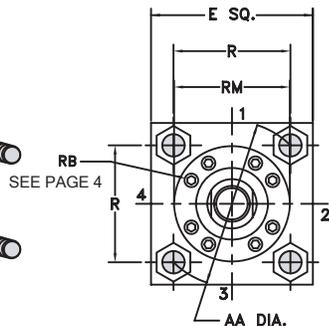
STYLE "X3"
NFPA-MX3



CAP TIE RODS EXTENDED MOUNT



STYLE "X2"
NFPA-MX2

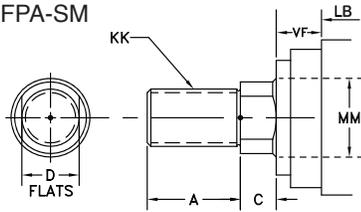


Specifications and prices are subject to change without notice or incurring obligations.

STANDARD ROD ENDS

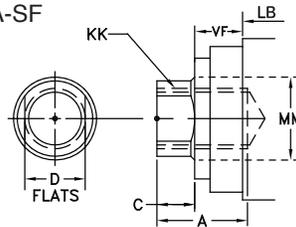
#1 STD MALE

NFPA-SM



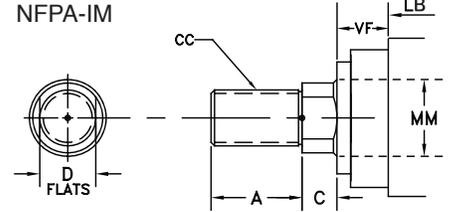
#3 STD FEMALE

NFPA-SF



#2 MALE

NFPA-IM



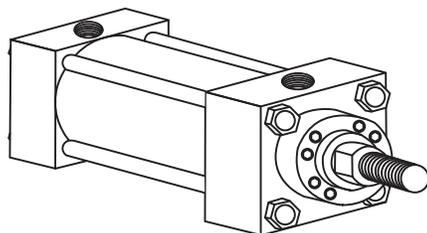
BORE	AA	BB	DD	E	EE (NPT)	SAE #	F	G	J	K	R	ADD STROKE	
												LB	P
1 1/2	2.3	1 3/8	3/8-24	2 1/2	1/2	10	3/8	1 3/4	1 1/2	3/8	1.63	4 5/8	3
2	2.9	1 13/16	1/2-20	3	1/2	10	5/8	1 3/4	1 1/2	7/16	2.05	4 5/8	3
2 1/2	3.6	1 13/16	1/2-20	3 1/2	1/2	10	5/8	1 3/4	1 1/2	7/16	2.55	4 3/4	3 1/8
3 1/4	4.6	2 5/16	5/8-18	4 1/2	3/4	12	3/4	2	1 3/4	9/16	3.25	5 1/2	3 5/8
4	5.4	2 5/16	5/8-18	5	3/4	12	7/8	2	1 3/4	9/16	3.82	5 3/4	3 7/8
5	7.0	3 3/16	7/8-14	6 1/2	3/4	12	7/8	2	1 3/4	3/4	4.95	6 1/4	4 3/8
6	8.1	3 5/8	1-14	7 1/2	1	16	1	2 1/4	2 1/4	7/8	5.73	7 3/8	5
7	9.3	4 1/8	1 1/8-12	8 1/2	1 1/4	20	1	2 3/4	2 3/4	1	6.58	8 1/2	5 1/2
8	10.6	4 1/2	1 1/4-12	9 1/2	1 1/2	24	1	3	3	1 1/16	7.50	9 1/2	6 1/4

BORE	ROD DIA.	THREAD		ROD EXTENSIONS AND PILOT DIMENSIONS									ADD STROKE
	MM	KK	CC	A	B ‡	C	D	VF	WF	RR	RM	Y	ZT*
1 1/2	5/8	7/16-20	1/2-20	3/4	1 1/8	3/8	17/32	5/8	1	-	§	1 15/16	7
	1 †	3/4-16	7/8-14	1 1/8	1 1/2	1/2	7/8	7/8	1 3/8	-	§	2 5/16	7 3/8
2	1	3/4-16	7/8-14	1 1/8	1 1/2	1/2	7/8	7/8	1 3/8	-	§	2 5/16	7 13/16
	1 3/8 †	1-14	1 1/4-12	1 5/8	2	5/8	1 1/8	1	1 5/8	-	§	2 9/16	8 1/16
2 1/2	1	3/4-16	7/8-14	1 1/8	1 1/2	1/2	7/8	7/8	1 3/8	3/8	2 1/2	2 5/16	7 15/16
	1 3/8 †	1-14	1 1/4-12	1 5/8	2	5/8	1 1/8	1	1 5/8	-	§	2 9/16	8 3/16
3 1/4	1 3/8	1-14	1 1/4-12	1 5/8	2	5/8	1 1/8	1	1 5/8	5/16	3 7/32	2 11/16	9 7/16
	1 3/4	1 1/4-12	1 1/2-12	2	2 3/8	3/4	1 1/2	1 1/8	1 7/8	-	§	2 15/16	9 11/16
4	2 †	1 1/2-12	1 3/4-12	2 1/4	2 5/8	7/8	1 3/4	1 1/8	2	-	§	3 1/16	9 13/16
	1 3/4	1 1/4-12	1 1/2-12	2	2 3/8	3/4	1 1/2	1 1/8	1 7/8	5/16	3 7/8	2 15/16	9 15/16
5	2	1 1/2-12	1 3/4-12	2 1/4	2 5/8	7/8	1 3/4	1 1/8	2	5/16	4	3 1/16	10 1/16
	2 1/2	1 7/8-12	2 1/4-12	3	3 1/8	1	2 1/8	1 1/4	2 1/4	5/8	4 7/16	3 5/16	10 5/16
6	2	1 1/2-12	1 3/4-12	2 1/4	2 5/8	7/8	1 3/4	1 1/8	2	5/16	4	3 1/16	11 7/16
	2 1/2	1 7/8-12	2 1/4-12	3	3 1/8	1	2 1/8	1 1/4	2 1/4	5/8	4 7/16	3 5/16	11 11/16
7	3	2 1/4-12	2 3/4-12	3 1/2	3 3/4	1	2 5/8	1 1/4	2 1/4	3/4	5 1/4	3 5/16	11 11/16
	3 1/2	2 1/2-12	3 1/4-12	3 1/2	4 1/4	1	Δ	1 1/4	2 1/4	3/4	5 5/8	3 5/16	11 11/16
8	2 1/2	1 7/8-12	2 1/4-12	3	3 1/8	1	2 1/8	1 1/4	2 1/4	5/8	4 7/16	3 7/16	13 1/4
	3	2 1/4-12	2 3/4-12	3 1/2	3 3/4	1	2 5/8	1 1/4	2 1/4	3/4	5 1/4	3 7/16	13 1/4
9	3 1/2	2 1/2-12	3 1/4-12	3 1/2	4 1/4	1	Δ	1 1/4	2 1/4	3/4	5 5/8	3 7/16	13 1/4
	4	3-12	3 3/4-12	4	4 3/4	1	Δ	1 1/4	2 1/4	7/8	6 7/16	3 7/16	13 1/4
10	3	2 1/4-12	2 3/4-12	3 1/2	3 3/4	1	2 5/8	1 1/4	2 1/4	3/4	5 1/4	3 3/4	14 7/8
	3 1/2	2 1/2-12	3 1/4-12	3 1/2	4 1/4	1	Δ	1 1/4	2 1/4	3/4	5 5/8	3 3/4	14 7/8
11	4	3-12	3 3/4-12	4	4 3/4	1	Δ	1 1/4	2 1/4	7/8	6 7/16	3 3/4	14 7/8
	4 1/2	3 1/4-12	4 1/4-12	4 1/2	5 1/4	1	Δ	1 1/4	2 1/4	7/8	7 1/8	3 3/4	14 7/8
12	5	3 1/2-12	4 3/4-12	5	5 3/4	1	Δ	1 1/4	2 1/4	7/8	7 5/8	3 3/4	14 7/8
	5 1/2	4-12	5 1/4-12	5 1/2	6 1/4	1	Δ	1 1/4	2 1/4	7/8	8 3/8	3 7/8	16 1/4

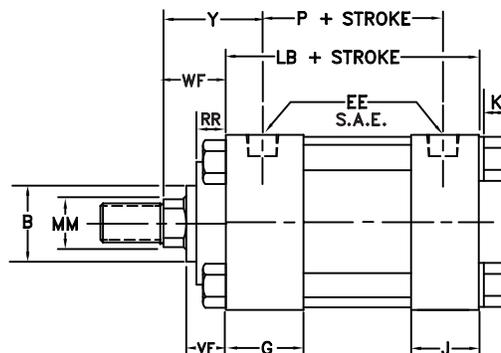
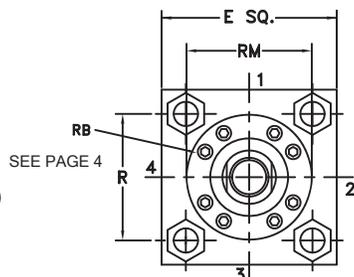
† HEAD END PORTS SHALLOW TAPPED (SOME BORES WITH OS RODS)
 Δ (2) SPANNER HOLES USED INSTEAD OF FLATS (DIMENSION 'D' COLUMN)
 ON 3 1/2" DIA. AND LARGER RODS
 ‡ B DIMENSION TOLERANCE -.001/-0.003
 * ZT DIMENSION CHANGES ON DOUBLE ROD CYLINDERS - SEE PAGE 31 FOR DETAILS
 § THESE CYLINDERS HAVE FULL PLATE RETAINERS. USE "E" DIMENSIONS INSTEAD OF "RM." USE "F" DIMENSIONS INSTEAD OF "RR" - SEE PAGE 4
 NOTE: 1 1/2 THRU 8" BORE CYLINDERS ON X1 & X3 MOUNTS HAVE FULL PLATE RETAINERS. USE "E" SQ. DIMENSION INSTEAD OF RM
 NOTE: STANDARD CUSHION LOCATION IS ON POSITION 2 UNLESS OTHERWISE SPECIFIED BY THE CUSTOMER

Specifications and prices are subject to change without notice or incurring obligations.

NO TIE RODS EXTENDED MOUNT

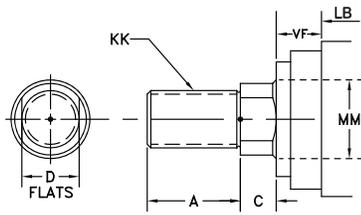


STLYE "XO"
NFPA-MX0

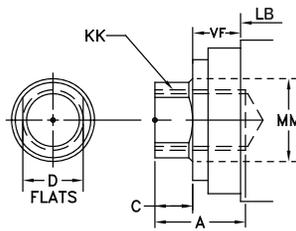


STANDARD ROD ENDS

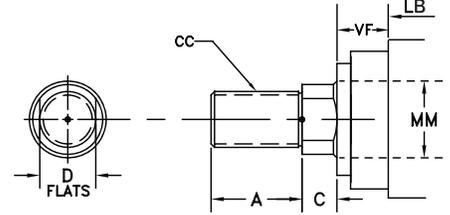
#1 STD MALE NFPA-SM



#3 STD FEMALE NFPA-SF



#2 MALE NFPA-IM

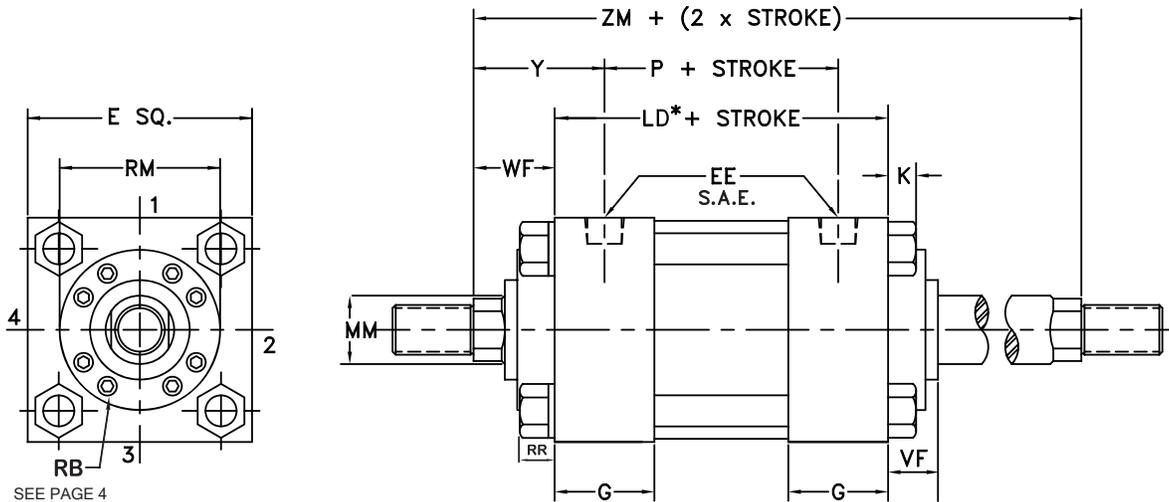


BORE	E	EE (NPT)	SAE #	F	G	J	K	ADD STROKE	
								LB	P
10	12 5/8	2	32	7/8	3 11/16	3 11/16	1	12 1/8	8 1/8
12	14 7/8	2 1/2	32	1 3/8	4 7/16	4 7/16	1 1/16	14 1/2	9 1/2
14	17 1/8	2 1/2	32	1 5/8	4 7/8	4 7/8	1 1/16	15 5/8	9 7/8
16	19 1/4	3	32	1 7/8	5 7/8	5 7/8	1 9/32	18 1/8	11
18	22	3	32	2 3/16	6 7/8	6 7/8	1 9/32	21 1/8	12
20	23 5/8	3	32	2 11/16	7 7/8	7 7/8	1 9/32	23 5/8	12 1/2
24	31	3	32	2 11/16	10	10	3	29 1/2	18

BORE	ROD DIA.	THREAD		ROD EXTENSIONS AND PILOT DIMENSIONS								
	MM	KK	CC	A	B ‡	C	D	VF	WF	RR	RM	Y
10	4 1/2	3 1/4-12	4 1/4-12	4 1/2	5 1/4	1	Δ	1 15/16	2 15/16	7/8	7 1/8	4 15/16
	5	3 1/2-12	4 3/4-12	5	5 3/4	1	Δ	2 3/16	3 3/16	7/8	7 5/8	5 3/16
	5 1/2	4-12	5 1/4-12	5 1/2	6 1/4	1	Δ	2 3/16	3 3/16	7/8	8 3/8	5 3/16
	7	5-12	6 1/2-12	7	8	1	Δ	2 1/2	3 1/2	7/8	10 13/16	5 1/2
12	5 1/2	4-12	5 1/4-12	5 1/2	6 1/4	1	Δ	2 3/16	3 3/16	1 3/8	8 3/8	5 11/16
	7	5-12	6 1/2-12	7	8	1	Δ	2 1/2	3 1/2	1 3/8	10 13/16	6
	8	5 3/4-12	7 1/2-12	8	9	1	Δ	3	4	1 3/8	12 3/8	6 1/2
14	7	5-12	6 1/2-12	7	8	1	Δ	2 1/2	3 1/2	1 5/8	10 13/16	6 3/8
	8	5 3/4-12	7 1/2-12	8	9	1	Δ	3	4	1 5/8	12 3/8	6 7/8
	9	6 1/2-12	8 1/2-12	9	10	1	Δ	3 1/4	4 1/4	1 5/8	13 1/8	7 1/8
	10	7 1/4-12	9 1/2-12	10	11	1	Δ	3 1/2	4 1/2	1 5/8	14 5/8	7 3/8
16	8	5 3/4-12	7 1/2-12	8	9	1	Δ	3	4	1 7/8	12 3/8	7 9/16
	9	6 1/2-12	8 1/2-12	9	10	1	Δ	3 1/4	4 1/4	1 7/8	13 1/8	7 13/16
	10	7 1/4-12	9 1/2-12	10	11	1	Δ	3 1/2	4 1/2	1 7/8	14 5/8	8 1/16
18	9	6 1/2-12	8 1/2-12	9	10	1	Δ	3 1/4	4 1/4	2 3/16	13 1/8	8 13/16
	10	7 1/4-12	9 1/2-12	10	11	1	Δ	3 1/2	4 1/2	2 3/16	14 5/8	9 1/16
20	10	7 1/4-12	9 1/2-12	10	11	1	Δ	3 1/2	4 1/2	2 11/16	14 5/8	10 1/16
24	11	8-8	-	11	12	1	Δ	3/12	4 1/2	2 11/16	16	10 1/4

Δ (2) SPANNER HOLES USED INSTEAD OF FLATS ON 3 1/2" DIA. AND LARGER RODS
 ‡ B DIMENSION TOLERANCE -.001/-.003
 NOTE: SEE PAGE 4 FOR TIE ROD INFORMATION ON 10" THRU 24" BORES
 NOTE: STANDARD CUSHION LOCATION IS POSITION 2 UNLESS OTHERWISE SPECIFIED BY THE CUSTOMER

DOUBLE ROD CYLINDERS



AVAILABLE IN MOUNTING STYLES:

S2, S4, S7, S3, F1, F5, E5, E3, X0, X1, X3, T6, AND T8

FOR ORDERING DOUBLE ROD END CYLINDERS ADD "DR" AFTER STYLE

Example: Style "S2" side lug mount with double rod end is style "HHDS2DR"

Where the two rod ends will be different, state which rod end is to go at which end of cylinder.

If only one end of double rod cylinder is to be cushioned, clearly specify which end.

*LD = Replaces "LB" Dimension on all styles with double rod ends

EXTENDED KEY PLATE MOUNTINGS

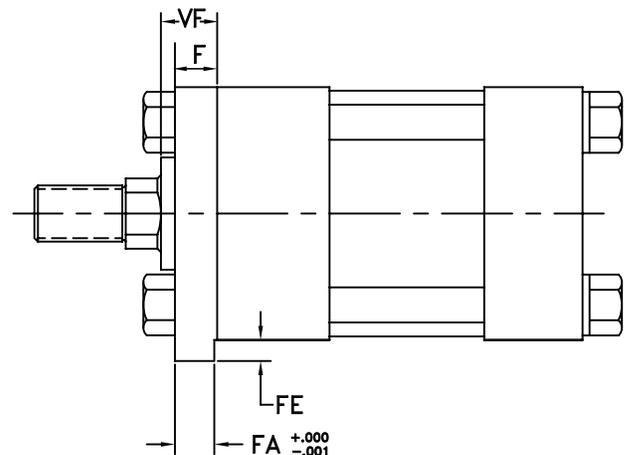
BORE	FA	FE	F
1 1/2	.362	3/16	3/8
2	.612	5/16	5/8
2 1/2	.612	5/16	5/8
3 1/4	.737	3/8	3/4
4	.862	7/16	7/8
5	.862	7/16	7/8
6	.987	1/2	1
7	.987	1/2	1
8	.987	1/2	1

FOR ORDERING EXTENDED KEY PLATE

add "S" in part # & state extended key plate in description.

RECOMMENDED FOR MOUNTING STYLES

**"S2", "S4", AND
"S7"**



DOUBLE ROD CYLINDERS

BORE	ROD DIA.	ROD EXTENSIONS AND PILOT DIMENSIONS						ADD 2X STROKE
	MM	LD*	SE	SS	XE	ZE	ZT	ZM
1 1/2	5/8	4 7/8	7 3/8	4 1/8	7 1/8	7 1/2	7 5/8	6 7/8
	1	4 7/8	7 3/8	4 1/8	7 1/2	7 7/8	8	7 5/8
2	1	4 7/8	8	3 7/8	7 13/16	8 5/16	8 11/16	7 5/8
	1 3/8	4 7/8	8	3 7/8	8 1/16	8 9/16	8 15/16	8 1/8
2 1/2	1	5	8 1/8	3 5/8	7 15/16	8 7/16	8 13/16	7 3/4
	1 3/8	5	8 1/8	3 5/8	8 3/16	8 11/16	9 1/16	8 1/4
	1 3/4	5	8 1/8	3 5/8	8 7/16	8 15/16	9 5/16	8 3/4
3 1/4	1 3/8	5 3/4	9 1/2	4 3/8	9 1/4	9 7/8	10 7/16	9
	1 3/4	5 3/4	9 1/2	4 3/8	9 1/2	10 1/8	10 11/16	9 1/2
	2 †	5 3/4	9 1/2	4 3/8	9 5/8	10 1/4	10 13/16	9 3/4
4	1 3/4	6	10	4 1/4	9 7/8	10 1/2	11 1/16	9 3/4
	2	6	10	4 1/4	10	10 5/8	11 3/16	10
	2 1/2	6	10	4 1/4	10 1/4	10 7/8	11 7/16	10 1/2
	2	6 1/2	11 1/4	4 3/4	10 7/8	11 5/8	12 9/16	10 1/2
5	2 1/2	6 1/2	11 1/4	4 3/4	11 1/8	11 7/8	12 13/16	11
	3	6 1/2	11 1/4	4 3/4	11 1/8	11 7/8	12 13/16	11
	3 1/2	6 1/2	11 1/4	4 3/4	11 1/8	11 7/8	12 13/16	11
	2 1/2	7 3/8	12 3/4	5 1/8	12 5/16	13 3/16	14 1/4	11 7/8
	3	7 3/8	12 3/4	5 1/8	12 5/16	13 3/16	14 1/4	11 7/8
6	3 1/2	7 3/8	12 3/4	5 1/8	12 5/16	13 3/16	14 1/4	11 7/8
	4	7 3/8	12 3/4	5 1/8	12 5/16	13 3/16	14 1/4	11 7/8
	3	8 1/2	14 1/8	5 3/4	13 9/16	14 9/16	15 7/8	13
	3 1/2	8 1/2	14 1/8	5 3/4	13 9/16	14 9/16	15 7/8	13
7	4	8 1/2	14 1/8	5 3/4	13 9/16	14 9/16	15 7/8	13
	4 1/2	8 1/2	14 1/8	5 3/4	13 9/16	14 9/16	15 7/8	13
	5	8 1/2	14 1/8	5 3/4	13 9/16	14 9/16	15 7/8	13
	3 1/2	9 1/2	15 1/2	6 3/4	14 3/4	15 7/8	17 1/4	14
	4	9 1/2	15 1/2	6 3/4	14 3/4	15 7/8	17 1/4	14
8	4 1/2	9 1/2	15 1/2	6 3/4	14 3/4	15 7/8	17 1/4	14
	5	9 1/2	15 1/2	6 3/4	14 3/4	15 7/8	17 1/4	14
	5 1/2	9 1/2	15 1/2	6 3/4	14 3/4	15 7/8	17 1/4	14
	4 1/2	12 1/8	NA	NA	NA	NA	NA	18
10	5	12 1/8	NA	NA	NA	NA	NA	18 1/2
	5 1/2	12 1/8	NA	NA	NA	NA	NA	18 1/2
	7	12 1/8	NA	NA	NA	NA	NA	19 1/8
12	5 1/2	14 1/2	NA	NA	NA	NA	NA	20 7/8
	7	14 1/2	NA	NA	NA	NA	NA	21 1/2
	8	14 1/2	NA	NA	NA	NA	NA	22 1/2
14	7	15 5/8	NA	NA	NA	NA	NA	22 5/8
	8	15 5/8	NA	NA	NA	NA	NA	23 5/8
	9	15 5/8	NA	NA	NA	NA	NA	24 1/8
	10	15 5/8	NA	NA	NA	NA	NA	24 5/8
16	8	18 1/8	NA	NA	NA	NA	NA	26 1/8
	9	18 1/8	NA	NA	NA	NA	NA	26 5/8
	10	18 1/8	NA	NA	NA	NA	NA	27 1/8
18	9	21 1/8	NA	NA	NA	NA	NA	29 5/8
	10	21 1/8	NA	NA	NA	NA	NA	30 1/8
20	10	23 5/8	NA	NA	NA	NA	NA	32 5/8

Specifications and prices are subject to change without notice or incurring obligations.

SERIES HHD • ROD END OPTIONS

FABCO-AIR

STANDARD ROD END STYLES

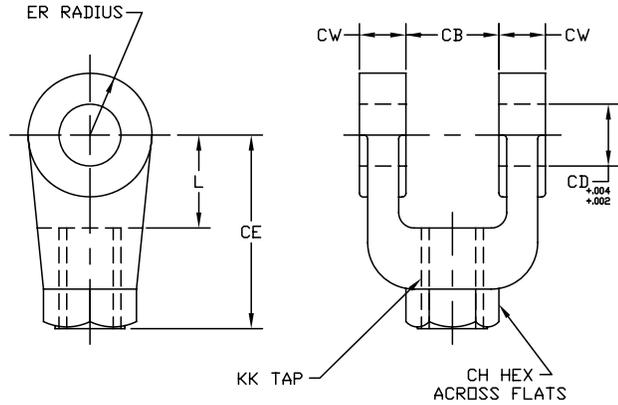
ROD END STYLE #	DIMENSIONS	ROD END STYLE #	DIMENSIONS																																																																																															
#1** STANDARD MALE (NFPA-SM)		#3 STANDARD FEMALE (NFPA-SF)																																																																																																
#2 MALE (NFPA-IM)		<table border="1" style="width: 100%; border-collapse: collapse; font-size: 0.8em;"> <thead> <tr> <th colspan="5" style="text-align: center;">ADDITIONAL DIMENSIONS</th> </tr> <tr> <th colspan="5" style="text-align: center;">STYLE 9</th> </tr> <tr> <th style="text-align: left;">ROD</th> <th>AC +/- .030</th> <th>AD +/- .010</th> <th>AE+ .000/- .010</th> <th>AF +/- .010</th> </tr> </thead> <tbody> <tr><td>5/8</td><td>1 1/8</td><td>5/8</td><td>1/4</td><td>3/8</td></tr> <tr><td>1</td><td>1 1/2</td><td>15/16</td><td>3/8</td><td>11/16</td></tr> <tr><td>1 3/8</td><td>1 3/4</td><td>1 1/16</td><td>3/8</td><td>7/8</td></tr> <tr><td>1 3/4</td><td>2</td><td>1 5/16</td><td>1/2</td><td>1 1/8</td></tr> <tr><td>2</td><td>2 5/8</td><td>1 11/16</td><td>5/8</td><td>1 3/8</td></tr> <tr><td>2 1/2</td><td>3 1/4</td><td>1 15/16</td><td>3/4</td><td>1 3/4</td></tr> <tr><td>3</td><td>3 5/8</td><td>2 7/16</td><td>7/8</td><td>2 1/4</td></tr> <tr><td>3 1/2</td><td>4 3/8</td><td>2 11/16</td><td>1</td><td>2 1/2</td></tr> <tr><td>4</td><td>4 1/2</td><td>2 11/16</td><td>1</td><td>3</td></tr> <tr><td>4 1/2</td><td>5 1/4</td><td>3 3/16</td><td>1 1/2</td><td>3 1/2</td></tr> <tr><td>5</td><td>5 3/8</td><td>3 3/16</td><td>1 1/2</td><td>3 7/8</td></tr> <tr><td>5 1/2</td><td>6 1/4</td><td>3 15/16</td><td>1 7/8</td><td>4 3/8</td></tr> <tr><td>7</td><td>6 1/2</td><td>4 1/16</td><td>2</td><td>5 3/4</td></tr> <tr><td>8</td><td>6 1/2</td><td>4 1/16</td><td>2</td><td>6 1/2</td></tr> <tr><td>9</td><td>6 3/4</td><td>4 1/8</td><td>2 3/8</td><td>7 1/4</td></tr> <tr><td>10</td><td>7 1/4</td><td>4 5/8</td><td>2 3/8</td><td>8</td></tr> </tbody> </table>		ADDITIONAL DIMENSIONS					STYLE 9					ROD	AC +/- .030	AD +/- .010	AE+ .000/- .010	AF +/- .010	5/8	1 1/8	5/8	1/4	3/8	1	1 1/2	15/16	3/8	11/16	1 3/8	1 3/4	1 1/16	3/8	7/8	1 3/4	2	1 5/16	1/2	1 1/8	2	2 5/8	1 11/16	5/8	1 3/8	2 1/2	3 1/4	1 15/16	3/4	1 3/4	3	3 5/8	2 7/16	7/8	2 1/4	3 1/2	4 3/8	2 11/16	1	2 1/2	4	4 1/2	2 11/16	1	3	4 1/2	5 1/4	3 3/16	1 1/2	3 1/2	5	5 3/8	3 3/16	1 1/2	3 7/8	5 1/2	6 1/4	3 15/16	1 7/8	4 3/8	7	6 1/2	4 1/16	2	5 3/4	8	6 1/2	4 1/16	2	6 1/2	9	6 3/4	4 1/8	2 3/8	7 1/4	10	7 1/4	4 5/8	2 3/8	8
ADDITIONAL DIMENSIONS																																																																																																		
STYLE 9																																																																																																		
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7	6 1/2	4 1/16	2	5 3/4																																																																																														
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9	6 3/4	4 1/8	2 3/8	7 1/4																																																																																														
10	7 1/4	4 5/8	2 3/8	8																																																																																														

OPTIONAL ROD END STYLES

ROD END STYLE #	DIMENSIONS	ROD END STYLE #	DIMENSIONS
#5		#4 (NFPA-LF)	
#6		#7 (NFPA-PL)	
#9		<p>** MALE ROD END STYLE #1 WILL BE FURNISHED UNLESS OTHERWISE SPECIFIED</p> <p>(2) SPANNER HOLES ARE USED INSTEAD OF FLATS ON 3-1/2" DIA. AND LARGER.</p> <p>NOTE: CONSULT FACTORY FOR ROD END CONFIGURATIONS OTHER THAN THOSE SHOWN.</p>	

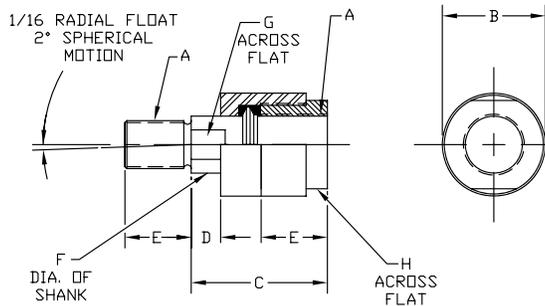
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FEMALE CLEVIS



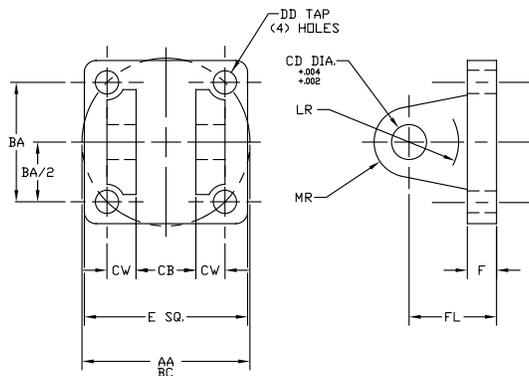
PART NO.	CB	CD	CE	CH	CW	ER	KK	L
HRC-7/16-20	.765	1/2	1 1/2	1	1/2	1/2	7/16-20	3/4
HRC-3/4-16-A	1.1265	3/4	2 3/8	1 1/4	5/8	3/4	3/4-16	1 1/4
HRC-3/4-16-M	1.1265	3/4	2 1/8	1 3/8	5/8	3/4	3/4-16	1
HRC-1-14-A	1.515	1	3 1/8	1 1/2	3/4	1	1-14	1 1/2
HRC-1-14-M	1.515	1	2 15/16	1 1/2	3/4	1	1-14	1 5/16
HRC-1-1/4-12-A	2.032	1 3/8	4 1/8	2	1	1 3/8	1 1/4-12	2 1/8
HRC-1-1/4-12-M	2.032	1 3/8	3 3/4	2	1	1 3/8	1 1/4-12	1 3/4
HRC-1-1/2-12	2.531	1 3/4	4 1/2	2 3/8	1 1/4	1 3/4	1 1/2-12	2 1/4
HRC-1-7/8-12	2.531	2	5 1/2	2 15/16	1 1/4	2	1 7/8-12	2 1/2
HRC-2-1/4-12	3.032	2 1/2	6 1/2	3 1/2	1 1/2	2 1/2	2 1/4-12	3
HRC-2-1/2-12-A	3.032	3	6 3/4	3 7/8	1 1/2	2 3/4	2 1/2-12	3 1/4
HRC-2-1/2-12-M	3.032	3	6 3/4	3 7/8	1 1/2	3	2 1/2-12	3 1/4
HRC-3-1/4-12-A	4.032	3 1/2	8 1/2	5	2	3 1/2	3 1/4-12	4
HRC-3-1/4-12-M	4.032	3 1/2	7 3/4	5	2	3 1/2	3 1/4-12	4 1/4
HRC-4-12	4.532	4	10	6 1/8	2 1/4	4	4-12	4 1/2

ROD COUPLERS



PART NUMBER	ROD DIA.	A	B	C	D	E	F	G	H	MAX PULL
HCP-7/16-20	5/8	7/16-20	1 1/4	2	1/2	3/4	5/8	9/16	1 1/8	10,000
HCP-1/2-20	5/8	1/2-20	1 1/4	2	1/2	3/4	5/8	9/16	1 1/8	14,000
HCP-5/8-18	5/8	5/8-18	1 1/4	2	1/2	3/4	5/8	1/2	1 1/8	14,000
HCP-3/4-1	1	3/4-16	1 3/4	2 5/16	5/16	1 1/8	31/32	7/8	1 1/2	34,000
HCP-7/8-14	1	7/8-14	1 3/4	2 5/16	5/16	1 1/8	31/32	7/8	1 1/2	34,000
HCP-1-14	1 3/8	1-14	2 1/2	2 15/16	1/2	1 5/8	1 3/8	1 1/4	2 1/4	64,000
HCP-1-1/4-12	1 3/8	1 1/4-12	2 1/2	2 15/16	1/2	1 5/8	1 3/8	1 1/4	2 1/4	64,000
HCP-1-3/8-12	1 3/8	1 3/8-12	2 1/2	2 15/16	1/2	1 5/8	1 3/8	1 1/4	2 1/4	64,000
HCP-1-1/2-12	2	1 1/2-12	3 1/4	4 3/8	13/16	2 1/4	1 3/4	1 1/2	3	120,000
HCP-1-3/4-12	2	1 3/4-12	3 1/4	4 3/8	13/16	2 1/4	1 3/4	1 1/2	3	120,000
HCP-1-7/8-12	2 1/2	1 7/8-12	3 3/4	5 7/16	11/16	3	2 1/4	1 7/8	3 1/2	240,000
HCP-2-12	2 1/2	2-12	3 3/4	5 7/16	11/16	3	2 1/4	1 7/8	3 1/2	240,000
HCP-2-1/4-12	3	2 1/4-12	6 3/4	6 3/8	1	3 1/2	2 3/4	2 3/8	2 7/8	397,000
HCP-2-1/2-12	3 1/2	2 1/2-12	7	6 1/2	1	3 1/2	3 1/4	2 7/8	3 3/8	495,000
HCP-2-3/4-12	3 1/2	2 3/4-12	7	6 1/2	1	3 1/2	3 1/4	2 7/8	3 3/8	603,800
HCP-3-1/4-12	4 1/2	3 1/4-12	9 1/4	8 1/2	1	4 1/2	4	3 3/8	4 1/2	853,800
HCP-4-1/4-12	4 1/2	4 1/4-12	12 7/8	11 1/4	1	4 1/2	5 1/2	4 7/8	7	1,483,400

CLEVIS BRACKET



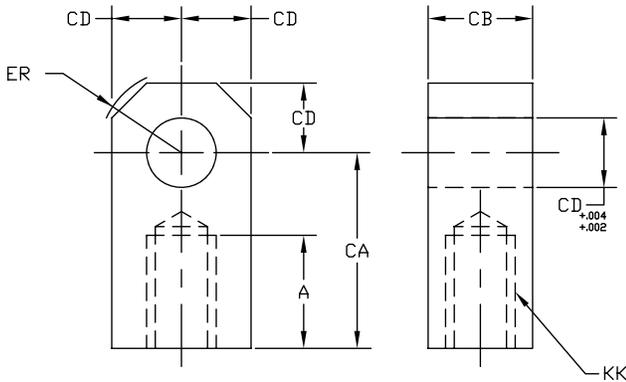
PART NUMBER	AA	BA	CB	CD	CW	DD	E	F	FL	LR	MR
HPM-1-1/2	2.3	1 5/8	.765	1/2	1/2	3/8-24	2 1/2	3/8	1 1/8	1/2	9/16
HPM-2	2.9	2 1/16	1.265	3/4	5/8	1/2-20	3	5/8	1 7/8	1	1 1/16
HPM-3-1/4	3.6	2 9/16	1.265	3/4	5/8	1/2-20	3 1/2	5/8	1 7/8	1 1/16	1 1/16
HPM-6	4.6	3 1/4	1.515	1	3/4	5/8-18	4 1/2	3/4	2 1/4	1 1/4	1 1/8
HPM-10	5.4	3 13/16	2.032	1 3/8	1	5/8-18	5	7/8	3	1 7/8	1 3/4
HPM-12	7.0	4 15/16	2.531	1 3/4	1 1/4	7/8-14	6 1/2	7/8	3 1/8	2	1 7/8
HPM-12-A	8.1	5 3/4	2.531	2	1 1/4	1-14	7 1/2	1	3 1/2	2 1/8	2 1/8
HPM-14	9.3	6 19/32	3.032	2 1/2	1 1/2	1 1/8-12	8 1/2	1	4	2 5/8	2 1/2
HPM-16	10.6	7 1/2	3.032	3	1 1/2	1 1/4-12	9 1/2	1	4 1/4	2 7/8	2 3/4
HPM-20	13.6	9 5/8	4.032	3 1/2	2	1 3/4-12	12 5/8	1 11/16	5 11/16	3 5/8	3 1/2
HPM-24	16.2	11 1/2	4.532	4	2 1/4	2-12	14 7/8	1 15/16	6 7/16	4	4

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SERIES HHD • MOUNTING ACCESSORIES

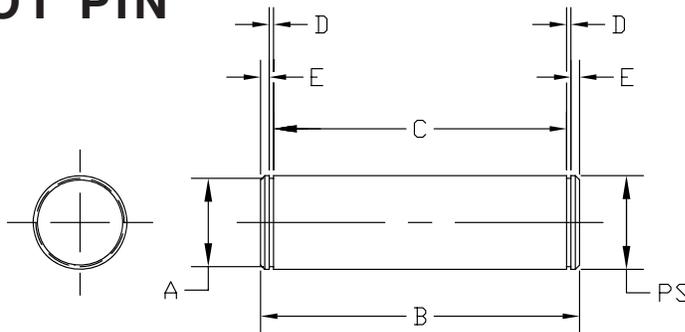
FABCO-AIR

FEMALE EYE



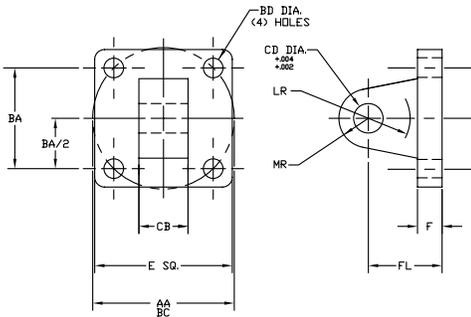
PART NUMBER	A	CA	CB	CD	ER	KK
HRE-7/16-20	3/4	1 1/2	3/4	1/2	5/8	7/16-20
HRE-3/4-16	1 1/8	2 1/16	1 1/4	3/4	7/8	3/4-16
HRE-1-14	1 5/8	2 13/16	1 1/2	1	1 3/16	1-14
HRE-7/8-14	1 1/8	2 3/8	1 1/2	1	1 7/16	7/8-14
HRE-1-1/4-12	2	3 7/16	2	1 3/8	1 9/16	1 1/4-12
HRE-1-1/2-12	2 1/4	4	2 1/2	1 3/4	2	1 1/2-12
HRE-1-7/8-12	3	5	2 1/2	2	2 1/2	1 7/8-12
HRE-1-3/4-12	2 1/4	4 3/8	2 1/2	2	2 7/8	1 3/4-12
HRE-2-1/4-12	3 1/2	5 13/16	3	2 1/2	2 13/16	2 1/4-12
HRE-2-1/2-12	3 1/2	6 1/8	3	3	3 1/4	2 1/2-12
HRE-2-3/4-12	3 5/8	6 1/2	3 1/2	3	3 1/4	2 3/4-12
HRE-3-1/4-12	4 1/2	7 5/8	4	3 1/2	3 7/8	3 1/4-12
HRE-3-1/2-12	5	7 5/8	4	3 1/2	3 7/8	3 1/2-12
HRE-4-12	5 1/2	9 1/8	4 1/2	4	4 7/16	4-12
HRE-4-1/2-12	5 3/4	9 1/8	5	4	4 7/16	4 1/2-12

PIVOT PIN



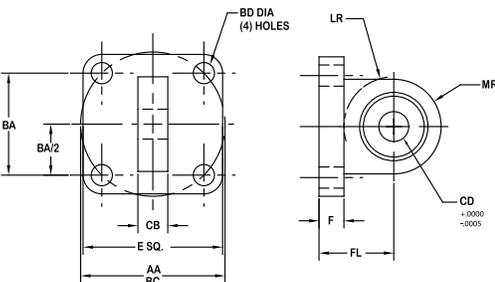
PART NUMBER	PIN SIZE	A	B	C	D	E
HPP-0.500	.500	.470	2.109	1.875	.039	.078
HPP-0.750	.750	.707	2.901	2.625	.046	.092
HPP-1.000	1.000	.943	3.401	3.125	.046	.092
HPP-1.375	1.375	1.295	4.461	4.125	.056	.112
HPP-1.750	1.750	1.655	5.545	5.125	.070	.140
HPP-2.000	2.000	1.891	5.545	5.125	.070	.140
HPP-2.500	2.500	2.366	6.641	6.125	.086	.172
HPP-3.000	3.000	2.844	6.792	6.125	.103	.206
HPP-3.500	3.500	3.322	8.845	8.125	.120	.240
HPP-4.000	4.000	3.792	9.845	9.125	.120	.240

EYE BRACKET



PART NUMBER	AA	BA	BD	CB	CD	E	F	FL	LR	MR
HEM-1-1/2	2.3	1 5/8	13/32	3/4	1/2	2 1/2	3/8	1 1/8	3/4	9/16
HEM-3-1/4	3.6	2 9/16	17/32	1 1/4	3/4	3 1/2	5/8	1 7/8	1 1/4	7/8
HEM-6	4.6	3 1/4	21/32	1 1/2	1	4 1/2	3/4	2 1/4	1 1/2	1 1/4
HEM-10	5.4	3 13/16	21/32	2	1 3/8	5	7/8	3	2 1/8	1 5/8
HEM-12	7.0	4 15/16	29/32	2 1/2	1 3/4	6 1/2	7/8	3 1/8	2 1/4	2 1/8
HEM-12-H	7.0	4 15/16	29/32	2 1/2	1 3/4	6 1/2	1 1/8	3 3/8	2 1/4	2 1/8
HEM-12-A	8.1	5 3/4	1 1/16	2 1/2	2	7 1/2	1	3 1/2	2 1/2	2 7/16
HEM-12-AH	8.1	5 3/4	1 1/16	2 1/2	2	7 1/2	1 1/2	4	2 1/2	2 7/16
HEM-14	9.3	6 19/32	1 3/16	3	2 1/2	8 1/2	1	4	3	3
HEM-14-H	9.3	6 19/32	1 3/16	3	2 1/2	8 1/2	1 3/4	4 3/4	3	3
HEM-16	10.6	7 1/2	1 5/16	3	3	9 1/2	1	4 1/4	3 1/4	3 1/4
HEM-16-H	10.6	7 1/2	1 5/16	3	3	9 1/2	2	5 1/4	3 1/4	3 1/4
HEM-20	13.6	9 5/8	1 13/16	4	3 1/2	12 5/8	1 11/16	5 11/16	4	4 1/8
HEM-24	16.2	11 1/2	2 1/16	4 1/2	4	14 7/8	1 15/16	6 7/16	4 1/2	5 1/4

SWIVEL EYE BRACKET

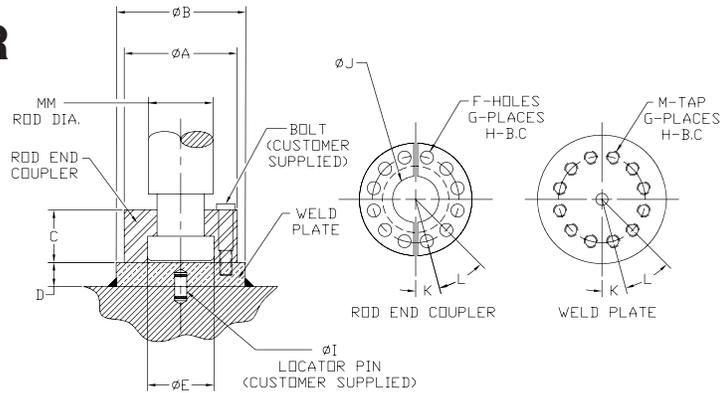


PART NUMBER	AA	BA	BD	CB	CD	E	F	FL	LR	MR	DYNAMIC	STATIC
HSB-1-1/2	2.3	1 5/8	13/32	1/2	1/2	2 1/2	3/8	1 1/8	3/4	11/16	3,150	9,338
HSB-3-1/4	3.6	2 9/16	17/32	3/4	3/4	3 1/2	5/8	1 7/8	1 1/4	1 3/16	7,088	20,925
HSB-6	4.6	3 1/4	21/32	1	1	4 1/2	3/4	2 1/4	1 1/2	1 3/8	12,600	37,350
HSB-10	5.4	3 13/16	21/32	1 3/8	1 3/8	5	7/8	3	2 1/8	2	23,400	69,750
HSB-12	7.0	4 15/16	29/32	1 1/2	1 3/4	6 1/2	7/8	3 1/8	2 1/4	2 1/8	38,250	114,750
HSB-12-A	8.1	5 3/4	1 1/32	1 3/4	2	7 1/2	1	3 1/2	2 1/2	2 3/8	50,400	150,750

(Includes spacers to allow swivel action up to 7" and to make dimensions interchangeable with standard eye bracket.)
NOTE: Swivel brackets that are ordered with a "P1" mount will include pin and spacers. Otherwise the pins are sold separately

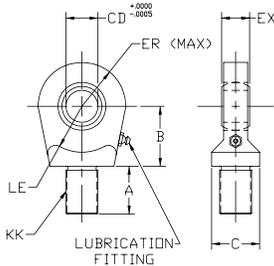
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ROD END COUPLER AND WELD PLATE



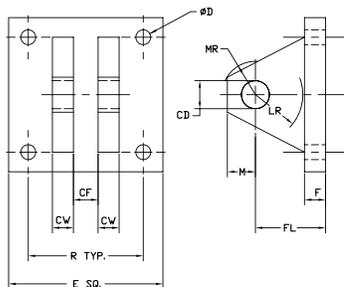
ROD END	WELD PLATE	WELD PLATE	MM	A	B	C	D	E	F	G	H	I	J	K	L	M
COUPLER PART#	PART#	MATERIAL														
HEC-5/8	HWP-5/8	CD 1018	5/8	1.500	2.000	.562	.500	.656	.218	4	1.125	.250	.406	45°	90°	10-24
HEC-1	HWP-1	CD 1018	1	2.000	2.500	.875	.500	1.063	.281	6	1.500	.250	.750	30°	60°	1/4-20
HEC-1-3/8	HWP-1-3/8	CD 1018	1 3/8	2.500	3.000	1.000	.625	1.438	.343	6	2.000	.250	.938	30°	60°	5/16-18
HEC-1-3/4	HWP-1-3/4	CD 1018	1 3/4	3.000	4.000	1.250	.625	1.813	.343	8	2.375	.250	1.187	22.5°	45°	5/16-18
HEC-2	HWP-2	CD 1018	2	3.500	4.000	1.625	.750	2.063	.406	12	2.688	.375	1.438	15°	30°	3/8-16
HEC-2-1/2	HWP-2-1/2	CD 1018	2 1/2	4.000	4.500	1.875	.750	2.625	.406	12	3.188	.375	1.875	15°	30°	3/8-16
HEC-3	HWP-3	CD 1018	3	5.000	5.500	2.375	1.000	3.125	.531	12	4.000	.375	2.375	15°	30°	1/2-13
HEC-3-1/2	HWP-3-1/2	A 36 HRS	3 1/2	5.875	7.000	2.625	1.000	3.625	.656	12	4.688	.375	2.625	15°	30°	5/8-11
HEC-4	HWP-4	A 36 HRS	4	6.375	7.000	2.625	1.000	4.125	.656	12	5.188	.375	3.125	15°	30°	5/8-11
HEC-4-1/2	HWP-4-1/2	A 36 HRS	4 1/2	6.875	8.000	3.125	1.000	4.625	.656	12	5.688	.375	3.625	15°	30°	5/8-11
HEC-5	HWP-5	A 36 HRS	5	7.375	8.000	3.125	1.000	5.125	.656	12	6.188	.375	4.000	15°	30°	5/8-11
HEC-5-1/2	HWP-5-1/2	A 36 HRS	5 1/2	8.250	9.000	3.875	1.250	5.625	.781	12	6.875	.375	4.500	15°	30°	3/4-10
HEC-7	HWP-7	A 36 HRS	7	10.375	11.000	4.000	1.750	7.125	1.031	12	8.750	.375	5.938	15°	30°	1"-8

MALE SPHERICAL ROD EYE



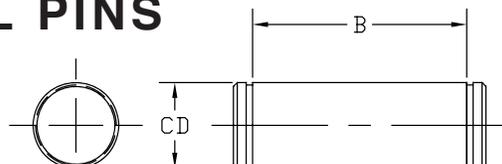
PART NUMBER	CD	KK	A	B	C	ER	EX	LE	MAX LOAD
HSR-7/16-20	.5000	7/16-20	11/16	7/8	7/8	7/8	7/16	3/4	2,600
HSR-3/4-16	.7500	3/4-16	1	1 1/4	1 5/16	1 1/4	21/32	1 1/16	7,080
HSR-1-14	1.000	1-14	1 1/2	1 7/8	1 1/2	1 3/8	7/8	1 7/16	12,590
HSR-1-1/4-12	1.3750	1 1/4-12	2	2 1/8	2	1 13/16	1 3/16	1 7/8	22,930
HSR-1-1/2-12	1.7500	1 1/2-12	2 1/8	2 1/2	2 1/4	2 3/16	1 17/32	2 1/8	38,220
HSR-1-7/8-12	2.000	1 7/8-12	2 7/8	2 3/4	2 3/4	2 5/8	1 3/4	2 1/2	50,360

SPHERICAL CLEVIS BRACKET



PART NUMBER	CD	CF	CW	D	E	F	FL	M	MR	LR	R
HSCB-1-1/2	.500	.44	.50	.41	3.00	.50	1.50	.50	.62	.94	2.05
HSCB-2	.750	.66	.62	.53	3.75	.62	2.00	.88	1.00	1.38	2.76
HSCB-3-1/4	1.000	.88	.75	.53	5.50	.75	2.50	1.00	1.19	1.69	4.10
HSCB-4	1.375	1.19	1.00	.66	6.50	.88	3.50	1.38	1.62	2.44	4.95
HSCB-5	1.750	1.53	1.25	.91	8.50	1.25	4.50	1.75	2.06	2.88	6.58
HSCB-6	2.000	1.75	1.50	.91	10.62	1.50	5.00	2.00	2.38	3.31	7.92

SPHERICAL PINS



PART NUMBER	CD	B
HSP-0.500	.4997 +.0000 / -.0004	1 9/16
HSP-0.750	.7497 +.0000 / -.0005	2 1/32
HSP-1.000	.9997 +.0000 / -.0005	2 1/2
HSP-1.375	1.3746 +.0000 / -.0006	3 5/16
HSP-1.750	1.7496 +.0000 / -.0006	4 7/32
HSP-2.000	1.9996 +.0000 / -.0007	4 15/16

ALL PINS INCLUDE (2) RETAINING RINGS

Specifications and prices are subject to change without notice or incurring obligations.

SELECTING THE CYLINDER

To select the proper size cylinder for the job, you must first determine the maximum push and/or pull force needed to accomplish its task.

Add an additional 10% to both the push and pull force for friction in the cylinder and also pressure drop in the lines. Using the charts below, select the proper bore and rod combination to best suit your application.

PULL FORCES AND DISPLACEMENT

ROD (INCHES)	ROD AREA (SQ. IN.)	ROD DIAMETER FORCE IN POUNDS (AT VARIOUS PRESSURES)										DISPLACEMENT PER INCH OF STROKE (GALLONS)
		25	50	65	80	100	250	500	1000	2000	3000	
0.625	0.31	8	16	20	25	31	78	155	310	620	9130	0.0013
1.000	0.79	20	40	51	65	79	198	395	790	1580	2370	0.0034
1.375	1.49	37	75	97	119	149	373	745	1490	2980	4470	0.0065
1.750	2.41	60	121	157	193	241	603	1205	2410	4820	7230	0.0104
2.000	3.14	79	157	204	251	314	785	1570	3140	6280	9420	0.0136
2.500	4.91	123	245	319	393	491	1228	2455	4910	9820	14730	0.0213
3.000	7.07	177	354	460	566	707	1767	3535	7070	14140	21210	0.0306
3.500	9.62	241	481	625	770	962	2405	4810	9620	19240	28860	0.0416
4.000	12.57	314	628	817	1006	1257	3143	6285	12570	25140	37710	0.0544
4.500	15.90	398	795	1034	1272	1590	3976	7950	15900	31800	47700	0.0688
5.000	19.63	491	982	1276	1570	1963	4908	9815	19630	39260	58890	0.0850
5.500	23.76	594	1188	1544	1901	2376	5940	11880	23760	47520	71280	0.1028
7.000	38.48	962	1924	2501	3078	3848	9620	19240	38480	76960	115440	0.1666
8.000	50.27	1257	2513	3267	4021	5027	12568	25135	50270	100540	150810	0.2176
9.000	63.62	1590	3181	4135	5090	6362	15905	31810	63620	127240	190860	0.2754
10.000	78.54	1964	3927	5105	6283	7854	19635	39270	78540	157080	235620	0.3400

NOTE: TO DETERMINE CYLINDER PULL FORCE OR DISPLACEMENT SUBTRACT THE FORCE OR DISPLACEMENT OF THE ROD SIZE FROM SELECTED PUSH FORCE OR DISPLACEMENT OF THE BORE SIZE IN CHART BELOW

PUSH FORCES AND DISPLACEMENT

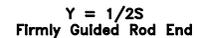
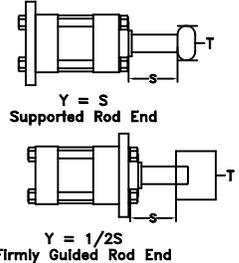
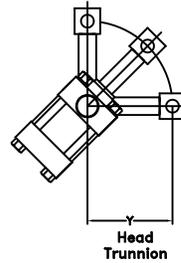
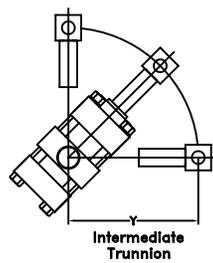
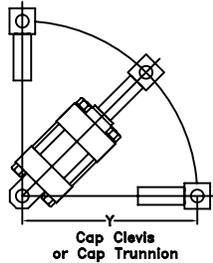
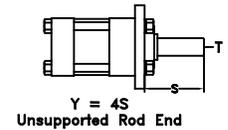
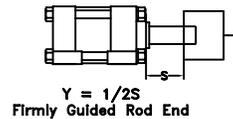
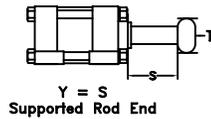
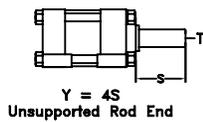
CYLINDER BORE SIZE (INCHES)	PISTON AREA (SQ. IN.)	CYLINDER PUSH FORCE IN POUNDS (AT VARIOUS PRESSURES)										DISPLACEMENT PER INCH OF STROKE (GALLONS)
		25	50	65	80	100	250	500	1000	2000	3000	
1.50	1.77	44	88	115	142	177	443	885	1770	3540	5310	0.0077
2.00	3.14	79	157	204	251	314	785	1570	3140	6280	9420	0.0136
2.50	4.91	123	245	319	393	491	1228	2455	4910	9820	14730	0.0213
3.25	8.30	208	415	540	664	830	2075	4150	8300	16600	24900	0.0359
4.00	12.57	314	628	817	1006	1257	3143	6285	12570	25140	37710	0.0544
5.00	19.64	491	982	1277	1571	1964	4910	9820	19640	39280	58920	0.0850
6.00	28.27	707	1414	1838	2262	2827	7068	14135	28270	56540	84810	0.1224
7.00	38.49	962	1924	2502	3079	3849	9623	19245	38490	76980	115470	0.1666
8.00	50.26	1257	2513	3267	4021	5026	12565	25130	50260	100520	150780	0.2176
10.00	78.54	1964	3927	5105	6283	7854	19635	39270	78540	157080	235620	0.3400
12.00	113.10	2828	5655	7352	9048	11310	28275	56550	113100	226200	339300	0.4896
14.00	153.94	3849	7697	10006	12315	15394	38485	76970	153940	307880	461820	0.6664
16.00	201.06	5027	10053	13069	16085	20106	50265	100530	201060	402120	603180	0.8704
18.00	254.46	6362	12724	16541	20358	25447	63618	127235	254470	508940	763410	1.1016
20.00	314.16	7854	15708	20420	25133	31416	78540	157080	314160	628320	942480	1.3600

PNEUMATIC AND FLUID POWER FORMULAS

FORMULA FOR:	EXPLANATION	FORMULA
FLUID PRESSURE <i>Pounds/ Square Inch</i>	PRESSURE = $\frac{\text{FORCE (Pounds)}}{\text{UNIT AREA (Square Inches)}}$	$P = \frac{F}{A}$ OR $PSI = \frac{F}{A}$
CYLINDER PISTON AREA <i>Square Inches</i>	AREA = $\pi \times \text{RADIUS}^2 (\text{Inches})$	$A = \pi r^2$
CYLINDER OUTPUT FORCE <i>Pounds, Push or Pull</i>	FORCE = PRESSURE (psi) x NET AREA (Square Inches)	$F = \text{psi} \times A$ or $F=PA$
CYLINDER VELOCITY OR SPEED <i>Feet/Second</i>	VELOCITY = $\frac{231 \times \text{FLOW RATE (GPM)}}{12 \times 60 \times \text{NET AREA (SQUARE INCHES)}}$	$V = \frac{231Q}{720A}$ OR $V = \frac{.3208Q}{A}$
CYLINDER VOLUME CAPACITY <i>Gallons of Fluid</i>	VOLUME = $\frac{\text{PISTON AREA (Square Inches)} \times \text{STROKE (Inches)}}{231}$	$V = \frac{A \times L}{231}$ OR <i>Length of Stroke</i>
CYLINDER FLOW RATE <i>Gallons Per Minute</i>	FLOW RATE = $\frac{12 \times 60 \times \text{VELOCITY (Feet/Sec.)} \times \text{NET AREA (Square Inches.)}}{231}$	$Q = \frac{720VA}{231}$ OR $Q = 3.117vA$
PUMP OUTLET FLOW <i>Gallons/Minute</i>	FLOW = $\frac{\text{RPM} \times \text{PUMP DISPLACEMENT (Cu. In./Rev.)}}{231}$	$Q = \frac{nd}{231}$
PUMP INPUT POWER <i>Horsepower Required</i>	HORSEPOWER INPUT = $\frac{\text{FLOW RATE OUTPUT (GPM)} \times \text{PRESSURE}}{1714 \times \text{EFFICIENCY (Overall)}}$	$HP_{in} = \frac{QP}{1714\text{Eff}}$ OR $\frac{\text{GPM} \times \text{psi}}{1714\text{Eff}}$
FLOW RATE THROUGH PIPING <i>Ft./Sec. Velocity</i>	VELOCITY = $\frac{.3208 \times \text{FLOW RATE THROUGH I.D. (GPM)}}{\text{INTERNAL AREA (Square Inches)}}$	$v = \frac{.3208Q}{A}$
COMPRESSIBILITY OF OIL <i>Additional Required Oil To Reach Pressure</i>	ADDITIONAL VOLUME = $\frac{\text{PRESSURE (psi)} \times \text{VOLUME OF OIL UNDER PRESSURE}}{250,000}$	$V_A = \frac{PV}{250,000}$ (APPROXIMATELY 1/2% Per 1,000 psi.)
AIR USAGE-CFM <i>In Cubic Feet Per Minute of Pressure Air (PSIG) Displaced Per Stroke</i>	CFM = $\frac{\text{Cyl. Piston Area Sq. In.} \times \text{Cyl. Stroke In.} \times \text{In./Min. Piston Speed}}{14.7 \times 1728}$	$CFM = \frac{A \times \text{Stroke} \times \text{Speed}}{1728}$
FREE AIR USAGE <i>(Output Volume of Free Air in Cubic Ft.) Used to size a compressor</i>	FREE AIR (psia) = $\frac{\text{Cyl. Piston Area Sq. In.} \times \text{Cyl. Stroke In.} \times \text{In./Min. Piston Speed}}{14.7 \times 1728}$	$FA (\text{Cu. Ft.}) = A \times \text{Stroke} \times (\text{Force} + 14.7) \frac{14.7 \times 1728}{\text{Force}}$

Specifications and prices are subject to change without notice or incurring obligations.

SELECTING THE CYLINDER - CALCULATE Y WITH ROD FULLY EXTENDED



STOP TUBE

Stop tubes are installed between the piston and front head on long stroke cylinders. The stop tube lengthens the distance between the piston and the rod bearing and reduces load when fully extended. To determine if a stop tube is required and the length, first determine the value of "Y" from one of the illustrations above.

If "Y" is less than 40", no stop tube is needed. If "Y" is over 40", a one inch stop tube is recommended for every 10" or fraction thereof over 40". (see Chart 27-A)

ROD DIAMETER SELECTION

In most applications the standard rod size is suitable. On long stroke or high thrust applications, an oversized rod may be required.

To arrive at the minimum rod size for your application, first determine the bore size, stroke, and thrust (See Page 36). Now select from the above illustration the type of mounting and determine the length "Y" with the piston rod in the fully extended position.

NOTE: "Y" or "S" are calculated from mounting point with rod extended.

**CHART 27-A
STOP TUBE TABLE**

"Y" (Inches)	Stop Tube Length (Inches)	"Y" (Inches)	Stop Tube Length (Inches)
0-40	0	101-110	7
41-50	1	111-120	8
51-60	2	121-130	9
61-70	3	131-140	10
71-80	4	141-150	11
81-90	5	151-160	12
91-100	6	161-170	13

Using Chart 27-B look for the maximum thrust for your cylinder, then look across for the "Y" length determined from the illustrations. If the exact value is not shown, continue to the next larger number. Now go to the top of the column and you will find the recommended rod size for your application.

CHART 27-B

CHART 27-B VALUE OF COLUMN LENGTH "Y" IN INCHES																	
Thrust in lbs.	PISTON ROD DIAMETER																
	5/8"	1"	1 3/8"	1 3/4"	2"	2 1/2"	3"	3 1/2"	4"	4 1/2"	5"	5 1/2"	7"	8"	9"	10"	
50	62																
100	55	112															
200	47	99															
250	43	94	146														
300	44	88	142														
400	37	83	134	186													
500	38	75	130	180													
700	30	68	118	168	202	275											
1,000	25	60	103	156	190	257	330										
1,400	24	53	92	142	174	244	308	385									
1,800	23	48	82	127	160	230	296	366	440								
2,400	19	45	75	114	145	213	281	347	415	488							
3,200	16	41	67	103	130	194	261	329	400	461							
4,000	12	31	62	96	119	175	240	310	378	446							
5,000	9	34	60	87	110	163	225	289	360	426	494						
6,000	5	30	56	82	102	152	208	274	342	410	476						
8,000	5	22	45	75	93	137	188	245	310	375	447						
10,000	4	21	40	67	89	125	172	222	279	349	412	482					
12,000	3	17	41	65	84	118	155	210	269	326	388	454					
16,000		9	34	57	75	110	142	188	235	292	350	420					
20,000			27	48	68	103	136	172	218	270	326	385					
30,000			12	40	55	87	120	156	189	230	285	330					
40,000				22	43	74	108	142	177	210	248	294					
50,000				15	30	66	96	130	165	200	234	269	408				
60,000					18	57	88	119	154	190	225	256	384				
80,000					16	36	71	104	137	170	204	240	336				
100,000						22	57	90	120	154	189	222	324	400			
120,000						21	45	77	108	140	175	207	313	377			
140,000						19	27	64	98	128	160	194	301	365			
160,000							26	47	86	118	148	182	279	350	421		
200,000								31	67	98	131	161	260	330	402		
250,000								28	36	72	109	141	236	301	375		
300,000								25	34	42	86	120	212	281	351	420	
350,000										39	52	100	195	261	328	396	
400,000											45	77	182	241	309	374	
500,000											41	49	152	212	274	341	
600,000												45	114	183	247	310	
700,000													70	162	221	280	
800,000														63	118	197	260

Specifications and prices are subject to change without notice or incurring obligations.

MOUNTING CONSIDERATIONS:

FABCO-AIR's fluid power cylinders can be found in many mounting configurations. The decision on the proper mount should take into consideration what style is best suited for the application at hand. We can break these mounts into 3 groups:

CENTERLINE FORCE TRANSFER (Mounts include F1, F2, E5, E6, F5, F6, E3, E4, X0, X1, X3, X2)

These are cylinders with fixed mounts that absorb forces along their center-line in both thrust and tension applications. Mounting bolts are not subjected to compound forces and, if properly installed, sideload damage is removed, extending rod gland life.

OFF-CENTERLINE FORCE TRANSFER (Mounts include S2, S4, S7)

These are cylinders with fixed mounts that do not absorb forces along their centerline. These mounts tend to produce a twisting in the cylinder as it applies force to a load. To avoid problems, these cylinders must be securely mounted with loads well guided when possible. Depending on application, pinning the mounting lugs or adding an extended key plate may reduce side load to rod gland and piston bearings. Consult factory with questions or concerns with your application.

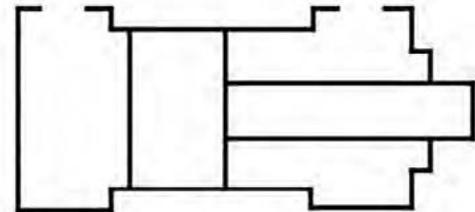
PIVOT FORCE CYLINDERS (Mounts include P1, P3, PU3, T8, T6, T7)

These cylinders absorb forces along their centerline and are used when the load must travel in a curved path. The type of mount will depend on the load staying in one curved path or the need to pivot on two axis. Choose the mount based on your application and consult the piston rod selection chart on page 4. For long stroke applications, a larger rod diameter or stop tube may be required.

TYPES OF CYLINDERS

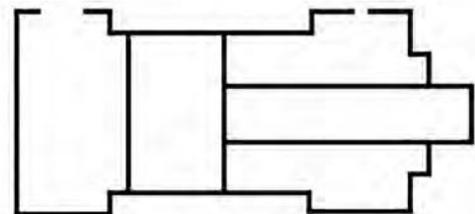
DOUBLE ACTING CYLINDERS

This is the most common type of cylinder. This type of cylinder is for use in applications where force is needed in both directions.



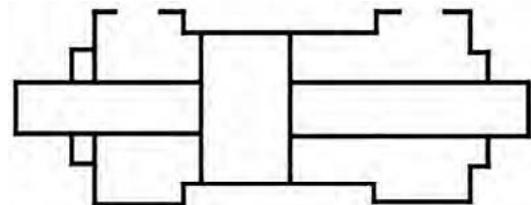
SINGLE ACTING CYLINDERS

This type of cylinder is used when force is needed in only one direction, either extend or retract. Commonly the opposite end of the cylinder is vented to atmosphere, or in a hydraulic application the opposite port can be vented back to the tank. Depending on the application either gravity or the weight of the load will retract the cylinder.



DOUBLE ROD CYLINDERS

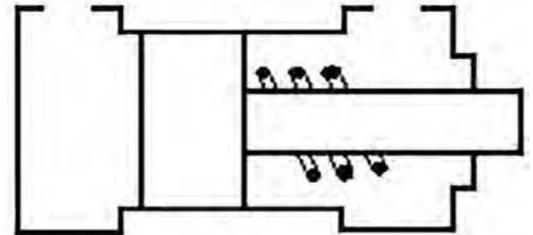
These cylinders can have load attached to both ends of the cylinder and work in both directions. Other applications for double rod cylinders include equal displacement on both sides of the cylinder, or operating switches of cams.



TYPES OF CYLINDERS

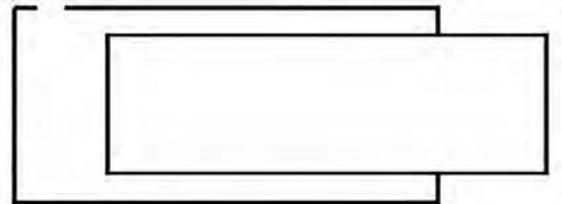
SPRING CYLINDERS

Spring cylinders have a spring built inside to extend, retract, or center the cylinder on its own or to assist pneumatic or hydraulic pressure. These cylinders are commonly used as clamp cylinders. Note that the addition of a spring can increase the length of a cylinder as much as 3 times or more.



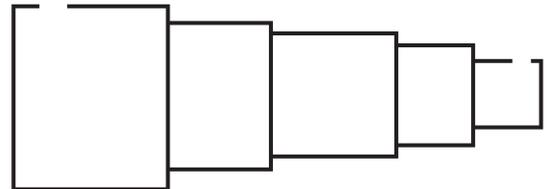
RAM CYLINDERS

Ram cylinders are commonly known as displacement cylinders. Mainly used for long strokes where gravity or the weight of the load can retract the cylinder and are almost always mounted vertically.



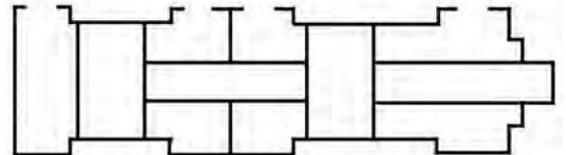
TELESCOPIC CYLINDERS

Telescopic cylinders are commonly used in mobile equipment and machinery. The multiple “stages” of the cylinders allow applications to get long strokes with short retracted lengths and are available in single or double acting configurations.



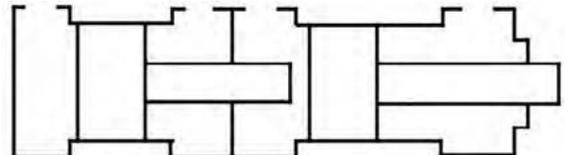
TANDEM CYLINDERS

Tandem cylinders consist of two cylinders mounted inline together with one piston rod connecting both pistons together with one working rod end to gain increased output forces while having a compact design.



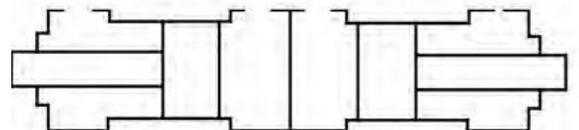
DUPLEX CYLINDERS

Duplex cylinders are sometimes known as three position cylinders. They consist of two cylinders mounted inline together without having the pistons connected together by one common piston rod.

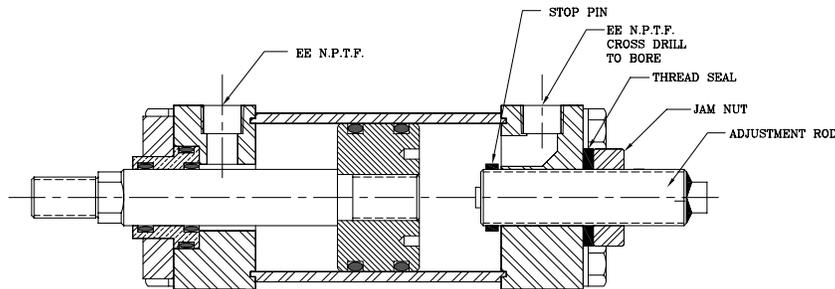


BACK TO BACK CYLINDERS

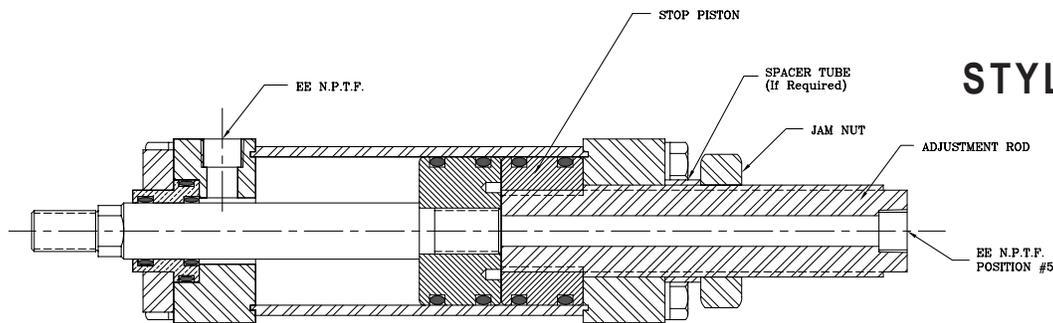
Back to back cylinders consist of two cylinders mounted together on the cap or blind end. This lets both cylinders act separately from each other or together as in a double rod cylinder application.



ADJUSTABLE STROKE CYLINDERS



STYLE #1



STYLE #2

For Style #1 adjustable stroke cylinders, stroke adjustment is available up to a maximum of 6".

For Style #2 adjustable stroke cylinders, a stop piston is furnished to allow full face, piston-to-piston contact and to allow stability for longer strokes.

- Available in all Fabco-Air HHD series cylinders.
- A longer spacer tube may be required on X1, X2 mounts for style # 2.
- Cushions not available at cap end.
- Not available in double rod cylinders.
- Other designs are available based on application needs. For adjustable stroke cylinders that require frequent adjustment, contact factory for details.
- Available with an extended key plate.

ORDERING INSTRUCTIONS

When ordering adjustable stroke cylinders, complete the part number then place an "S" in the part number. Under specials, specify length of adjustment and type of adjustable stroke (Style #1 or Style #2) and any other required specials.

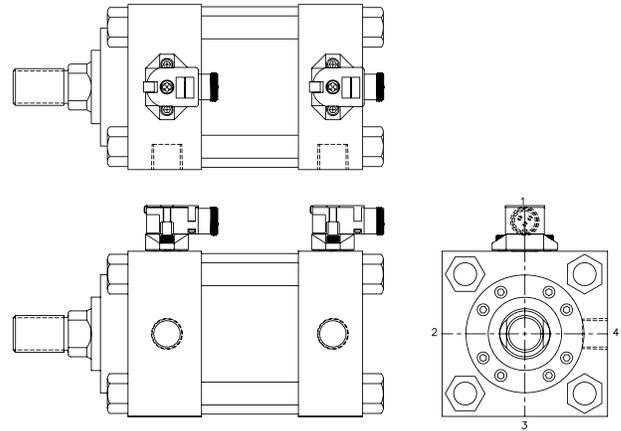
AVAILABLE MOUNTING STYLES		
STYLE	NAME	N.F.P.A. CODE
S2	SIDE LUGS	MS2
S4	SIDE TAPPED	MS4
F1	HEAD RECTANGULAR FLANGE	MF1
E5	HEAD RECTANGULAR INTEGRAL FLANGE	ME5
S3	CENTER-LINE LUGS	MS3
F5	HEAD SQUARE FLANGE	MF5
E3	HEAD INTEGRAL FLANGE	ME3
X0	NO TIE RODS EXTENDED	MX0
X1	BOTH ENDS TIE RODS EXTENDED	MX1
X3	HEAD TIE RODS EXTENDED	MX3
X2	CAP TIE RODS EXTENDED	MX2
T6	HEAD TRUNNION	MT1
T7	CAP TRUNNION	MT2
T8	INTERMEDIATE FIXED TRUNNION	MT4

Specifications and prices are subject to change without notice or incurring obligations.

PROXIMITY SWITCH AND OPTIONS

Available for HHD series cylinders

Factory installed. No adjustment needed.	
Shock and Vibration Resistant	
360° rotatable switch for easy cable routing	
Operation pressure	1,500 PSI (Max. 3000 PSI)
Output Function	Normally Open (2 wire)
Operation Temperature	-13°F to +158°F (-25°C to +70°C)
LED Function	Green: Power On
	On Red: Out Put Energized
Short	Circuit Protection
Power-On Protection	Incorporated
Sensing range	2mm (.079" Normal)
Operation Voltage	20 - 140 VAC/DC
Line Frequency	40 - 60 Hz
Switching Frequency	30Hz
Response time	15ms Max.
Minimum load current	≥ 3.0mA
Continuous Load Current	≤ 400mA
Leakage (off-state) Current	≥ 1.7mA
Normally Closed available upon special request.	



Optional Features

- Intrinsically Safe
- Hi-Temp up to 400°F (204°C)
- Underwater service up to 2,000 foot depths
- Solid state operation
- Heavy duty operation up to 3 ,000 PSI
- Explosion proof

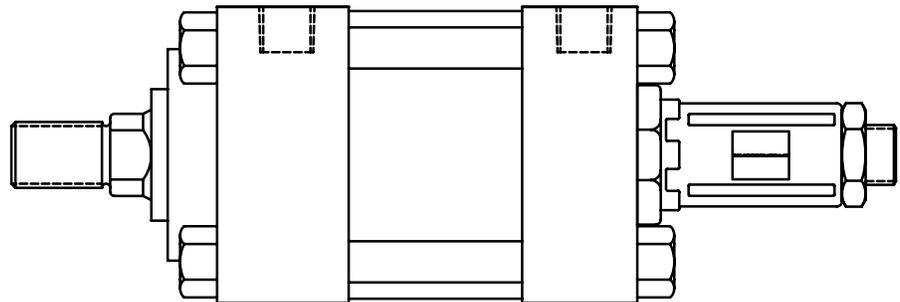
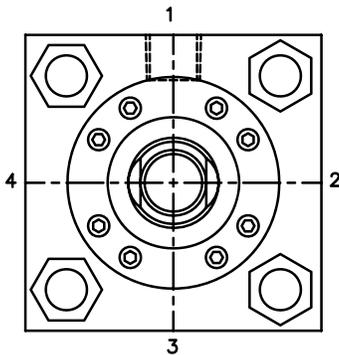
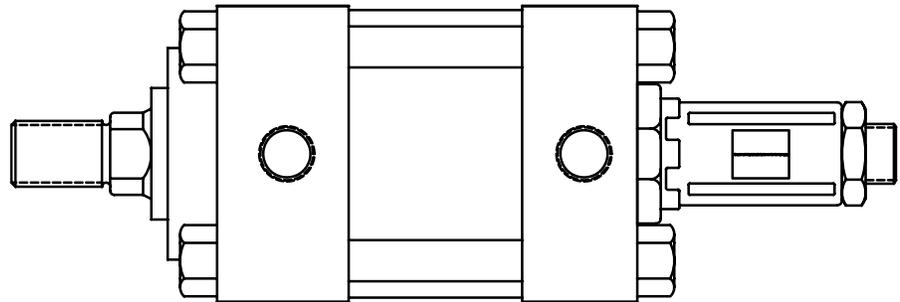
Please consult factory for switch specifications

LDT

MAGNETOSTRICTIVE LINEAR DISPLACEMENT TRANSDUCER FOR HIGH SHOCK AND VIBRATION APPLICATIONS.

Standard LDT is lab tested and field proven to survive high shock and vibration. With tested results of 2,000 G's of shock and 30 G's of random vibration with no false signals or mechanical damage, it can survive in the most rugged and demanding applications.

Sensing tube construction is welded stainless steel, suitable for 3000 PSI hydraulic cylinders. The electronics are enclosed inside an aluminum housing with o-ring seals for IP67 indoor applications. Type NEMA 6 rating and stainless steel housings and connectors are available as a special option.



Consult factory for dimensional information
about your specific application.

LDT ELECTRICAL INFORMATION

INPUT VOLTAGE	7 VDC to 30 VDC
CURRENT DRAW	40mA at 24 VDC
OUTPUT	
ANALOG	Absolute analog position via digital-to-analog converter 0 to 10 VDC 10 to 0 VDC -10 to 10 VDC 10 to -10 VDC 0 to 5 VDC 5 to 0 VDC -5 to 5 VDC 5 to -5 VDC 4 to 20mA 20 to 4mA
DIGITAL	Digital available upon request
RESOLUTION	
INTERNAL	0.00006
ANALOG OUTPUT	16-Bit
NON-LINEARITY/ ACCURACY	<0.01% or +/- 0.005", whichever is greater (+/- 0.002 typical)
REPEATABILITY	
953D REPEATABILITY	Equal to resolution of controller
953A REPEATABILITY	Equal to resolution
953SSI REPEATABILITY	Equal to output resolution
HYSTERESIS	.001" (.025 mm) maximum
OPERATING TEMPERATURE	
HEAD ELECTRONICS	-40° to 185°F (-40° to 70° C)
GUIDE TUBE	-40° to 221°F (-40° to 105° C)
OPERATING PRESSURE	3000 psi operational, 8,000 psi spike
SPAN LENGTH	1" - 300"
NULL ZONE	2"
DEAD ZONE	2.50"
CONNECTORS	5 pin 12mm Euro micro Potted pigtail assembly available optionally
UPDATE TIME	2 MS typically

Specifications and prices are subject to change without notice or incurring obligations.

AIR OIL TANKS

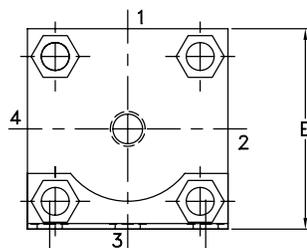
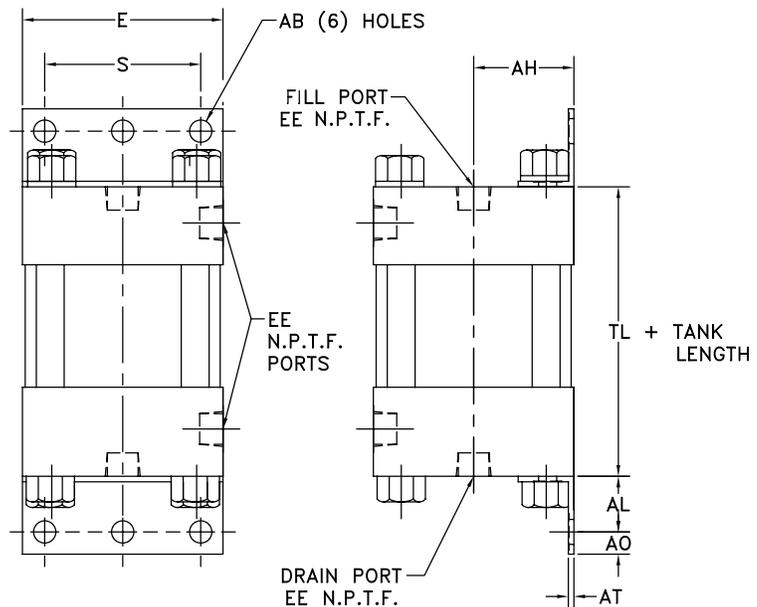
Fabco-Air's air/oil tanks are used to obtain smooth hydraulic pressure without the high cost of hydraulic systems. Shop air pressure is applied into the top of the air/oil tanks and then dispenses the oil into the work cylinder. The hydraulic pressure generated is a 1 to 1 ratio. 80 PSI air produces 80 PSI hydraulic pressure (see figure 25-1 on next page).

BORE SIZES: 3 1/4, 4, 5, 6, & 8

PRESSURES: up to 200 PSI

CONSTRUCTION AND FEATURES:

- Lightweight aluminum end caps
- High-strength composite tube is also translucent and provides oil level indication without the use of expensive sight gauges
- Two air/oil baffles, one installed on both end caps, eliminates oil foaming and provides smooth oil flow into the work cylinder
- Tube and o-ring seal positively seals end caps to tube
- Side end angle mounts come standard (other mounts available)



Mount with axis of tank vertically, either end UP.

Port position 2 is standard, note if needed otherwise.

BORE	TANK DIMENSIONS									
	E	J	S	AB	AH	AL	AO	AT	EE	TL
3 1/4	3 3/4	1 1/4	2 3/4	1/2	1 15/16	1 1/4	1/2	1/8	1/2	2 1/2
4	4 1/2	1 1/4	3 1/2	1/2	2 1/4	1 1/4	1/2	1/8	1/2	2 1/2
5	5 1/2	1 1/4	4 1/4	5/8	2 3/4	1 3/8	5/8	3/16	1/2	2 1/2
6	6 1/2	1 1/2	5 1/4	3/4	3 1/4	1 3/8	5/8	1/4	3/4	3
8	8 1/2	1 1/2	7 1/8	3/4	4 1/4	1 13/16	11/16	1/4	3/4	3

Specifications and prices are subject to change without notice or incurring obligations.

AIR OIL TANKS

SELECTING THE AIR/OIL TANKS

1. Determine the volume of oil necessary to fill the work cylinder when at full stroke.
This can be determined by multiplying the piston area by the stroke length.
2. Next, select the bore and tank length from Chart 25-2 which is equal to or greater than the volume determined in step 1.

NOTE: Smaller bore sizes with longer lengths are generally more economical than larger bores with shorter lengths.

WHEN ORDERING SPECIFY: CONSULT FACTORY FOR ORDERING INFORMATION AFTER DETERMINING BORE SIZE AND TANK LENGTH.

FIGURE 25-1

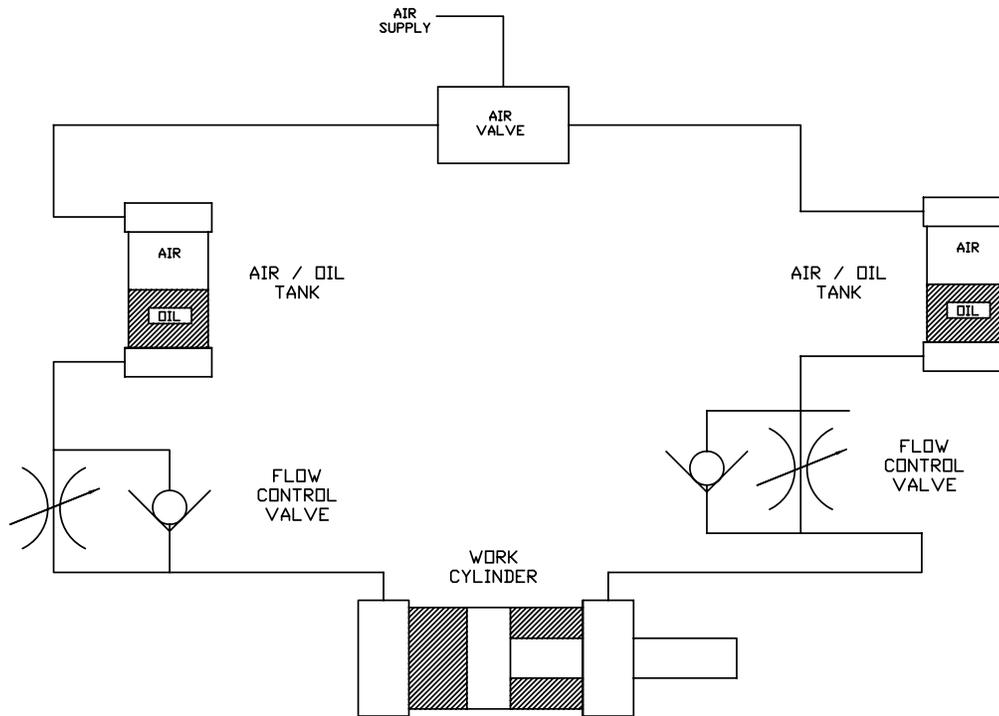
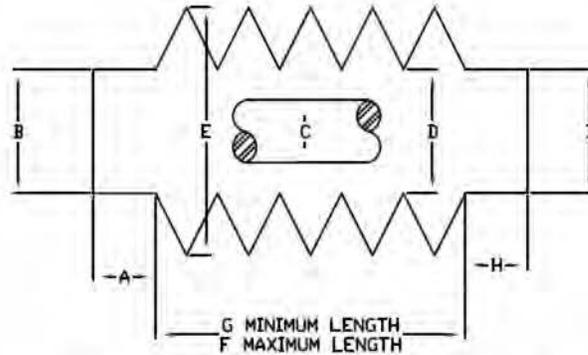


CHART 25-2

BORE	TANK LENGTH (INCHES)														
	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
3 1/4	25	32	39	46	53	60	68	75	82	90	97	104	111	119	126
4	37	48	59	70	81	92	104	115	126	137	149	160	171	182	194
5	56	73	90	107	124	142	159	176	193	211	229	246	263	282	299
6	81	106	131	156	181	206	231	256	281	306	332	357	382	407	432
8	145	190	235	280	324	368	412	456	500	544	588	634	678	724	768

Specifications and prices are subject to change without notice or incurring obligations.

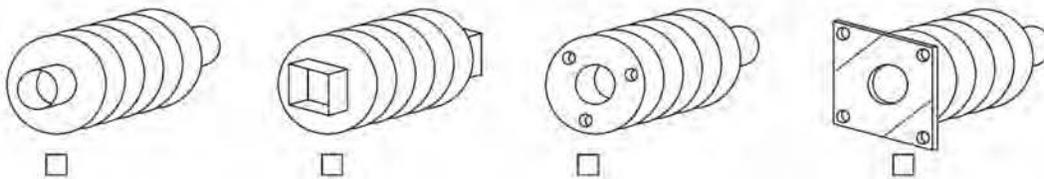
ROD BOOT ORDER FORM



A LENGTH OF CUFF	<input type="text"/>	F MAX. LENGTH WITHOUT CUFF	<input type="text"/>
B INSIDE DIA. OF CUFF	<input type="text"/>	G MIN. LENGTH WITHOUT CUFF	<input type="text"/>
C ROD DIAMETER	<input type="text"/>	H LENGTH OF CUFF	<input type="text"/>
D INSIDE DIA. OF BOOT	<input type="text"/>	I INSIDE DIA. OF CUFF	<input type="text"/>
E OUTSIDE DIA. OF BOOT	<input type="text"/>	J OD <input type="checkbox"/> ID <input type="checkbox"/> SQ <input type="checkbox"/> RND <input type="checkbox"/>	
	RECT. LENGTH <input type="text"/>		RECT. WIDTH <input type="text"/>

NOTE IF A ROUND OR SQUARE FLANGE IS REQUIRED, FILL IN ITEM "J".
IF USING ANOTHER METHOD OF CONNECTING, PLEASE SEND DRAWING

METHOD OF CONNECTING BOOT



QUANTITY

BOOT MATERIAL

See page 47

ROD BOOT

ORDERING INSTRUCTIONS

When ordering rod boots with a cylinder, under "specials" state that "S" equals rod boot along with any additional specials that may be required. In most cases rod extension is required to compensate for the boot compression. Complete the rod boot order form and return with cylinder specifications to your **FABCO-AIR** distributor.

When ordering a rod boot without a cylinder, complete the rod boot order form and return to your **FABCO-AIR** distributor.

Please check box for material specification:

- Neoprene-Coated Nylon .022" thick -60°F to +250°F
- PVC-Coated Nylon .022" thick -20°F to +180°F
- Hypalon-Coated Nylon .022" thick -60°F to +350°
- Neoprene-Coated Nylon .033" thick -60°F to +250°F
- Aluminized Fiberglass .025" thick -100°F to +650°F
- PTFE-Coated Fiberglass .018" thick -100°F to +550°F

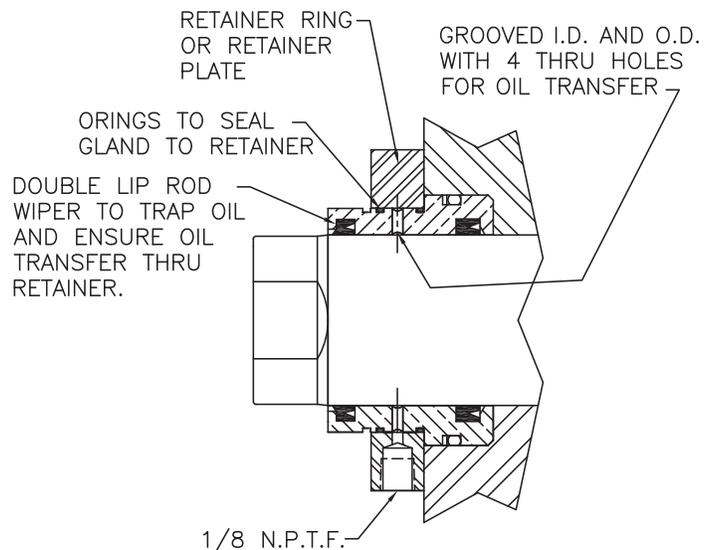
Standard rod boot mounting uses a round cuff that mounts to the cylinder's retainer ring but there are some exceptions. (See chart at right)

BORE	ROD DIA.	GLAND MOUNT
1 1/2	5/8	X
1 1/2	1	X
2	1	X
2	1 3/8	X
3 1/4	1 3/4	X
3 1/4	2	X
4	2 1/2	X
5	3 1/2	X
7	5	X

NOTE: NOTE: X3, X1, S7, F1 AND F5 MOUNTS HAVE RETAINER PLATES OR FLANGES THAT WILL INTERFERE WITH STANDARD BOOT MOUNTING. CONSULT FACTORY FOR BOOT MOUNTING OPTIONS.

DRAIN BACK GLAND

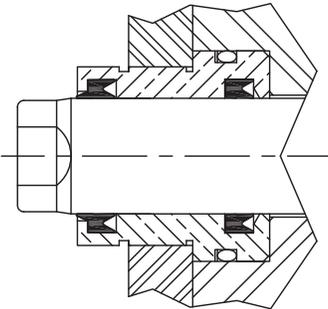
The purpose of a drain-back gland is to prevent residual oil which has bypassed the rod seal from reaching the rod wiper. The image that is shown represents a standard seal configuration, however, there are multiple types of seal configurations that can incorporate a drain-back gland design. Fabco recommends piping the drain-back port, which is commonly a 1/8 NPTF, to the hydraulic fluid holding tank. Standard drain-back port position is #3 although this may vary based on application. Review page 57 to reference drain back port location options. Please contact Fabco for more details on other possible seal & drain-back gland options/configurations.



Specifications and prices are subject to change without notice or incurring obligations.

COMMON ROD GLAND CONFIGURATIONS

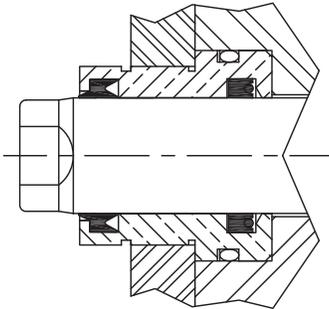
STANDARD ROD SEAL
'H' WIPER



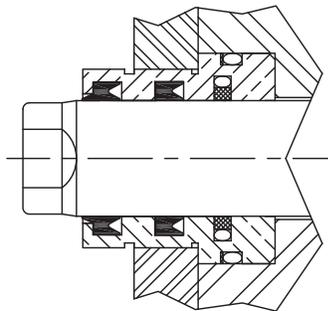
STANDARD SEALS

HYTHANE (Twin Lip): Standard for the HHD cylinders. This material exhibits most all of polyurethane's mechanical and physical properties, specifically its wear and extrusion resistance. The twin-lip is known as a lower friction seal with the same if not better seal capabilities as a loaded lip poly seal. Its temperature range is generally -49°F to +230°F (-45°C to +110°C). This type of polyurethane is generally less sensitive to humidity and water than other plain urethanes.

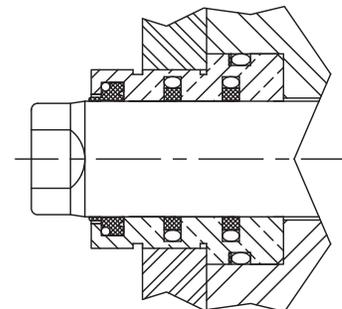
LOADED LIP ROD SEAL
LOADED LIP URETHANE
'H' WIPER



TWIN LIP ROD SEAL w/BUFFER
TWIN LIP URETHANE
BRONZE FILLED ROD BUFFER
'H' WIPER



LOW FRICTION ROD SEAL
BRONZE FILLED BUFFER SEALS
BRONZE FILLED EXCLUDER WIPER



LOADED LIP SEALS

Loaded lip seal designs are pre-energized to help seal in low pressure applications. In high pressure applications the loaded seal expands even more to increase pressure on the sealing surface to ensure a bypass free seal. Loaded lip seals are an extremely durable, high compression seal design.

TWIN LIP AND BUFFER

Seal combination of one filled Teflon buffer ring with an elastomer expander underneath along with a filled Teflon rod wiper. This seal combination offers high durability without adding the friction of an additional lip style rod seal. This seal package is available in a wide variety of materials to suit your temperature and fluid requirements.

LOW FRICTION ROD SEALS

Seal combination of two filled Teflon buffer rings with elastomer expander underneath alone with a filled Teflon rod wiper. This seal combination offers low friction and higher speeds. This seal package is available in a wide variety of materials to suit your temperature and fluid requirements.

OPERATING FLUIDS AND SEALS

STANDARD SEALS

Standard seals are what is normally provided unless otherwise specified. Seals provided are generally nitrile and intended for use with: air, mineral-based hydraulic oils and nitrogen within normal operating temperatures of -10°F to +165°F. P.T.F.E. back ups are used where required.

LOADED LIP SEALS

Loaded lip seal designs are pre-energized to help seal in low pressure applications. In high pressure applications the loaded seal expands even more to increase pressure on the sealing surface to ensure a bypass free seal. Loaded lip seals are an extremely durable, high compression seal design.

FLUOROCARBON SEALS

Provided when higher temperature service is intended. Used with some Phosphate Ester fluids (with exception of Skydrols) and many fire resistant formulas. Fluorocarbon seals can be operated within -10°F to +250°F. They may also be used to +400°F with shorter seal life expectancy. For applications over +250°F, cylinders must be ordered with the piston set screwed to piston rod. P.T.F.E. back ups will be provided as needed.

HI-LOAD SEALS

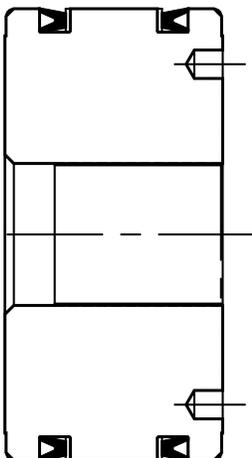
Seal combination of one or two bronze filled Teflon rings with elastomer expander underneath, with a pair of wear bands on the outer edges. This configuration is virtually leak-free under static conditions and compatible with high pressures. The configuration is also capable of handling high sideload applications.

CAST IRON PISTON RINGS

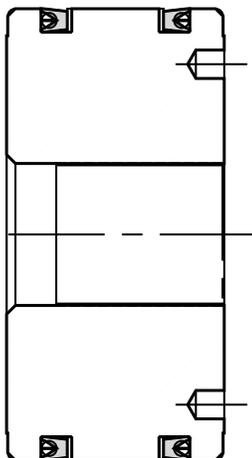
Offering the widest operating conditions in temperatures, pressures and fluids, this configuration can be used in many applications. Note: cast iron rings do allow a small amount of bypass that increases with bore size and pressures used.

COMMON PISTON CONFIGURATIONS

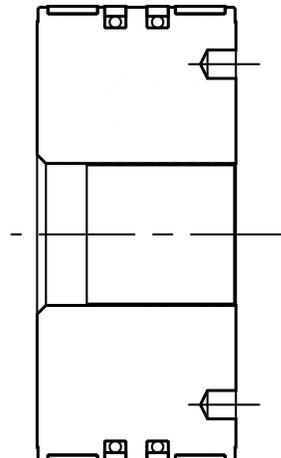
STANDARD PISTON
U CUPS AND
TEFLON
BACK-UPS
CAST IRON PISTON



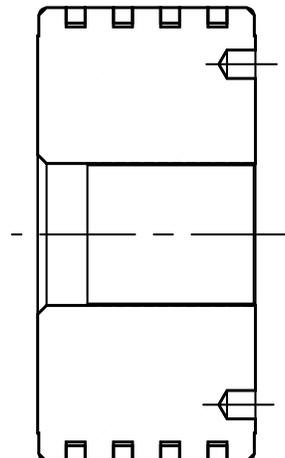
LOADED LIP PISTON
LOADED U CUPS WITH
ENERGIZER
TEFLON BACK-UPS
CAST IRON PISTON



HI LOAD PISTON
TEFLON GLIDE RINGS WITH
ELASTOMER EXPANDERS
AND WEAR BANDS
STEEL OR CAST IRON PISTON



CAST IRON RING PISTON
STEP CUT
CAST IRON RINGS
CAST IRON PISTON



Specifications and prices are subject to change without notice or incurring obligations.

CORROSIVE RESISTANT CYLINDERS

Water processing, food processing, marine, waste water treatment, etc.

STAINLESS STEEL CYLINDERS

- All external components manufactured from series 300 stainless steel
- Flash hard chrome plated stainless steel piston rod standard on all stainless steel cylinders. Available in 303 or 17-4 ph.
- An extra long, high strength bronze gland provides maximum bearing support and wear resistance.
- Electroless nickel plated, flush mounted captive cushion adjustment allows safe cushion adjustment under pressure
- One piece fine grained cast iron piston provides maximum strength and protection against shock loads (optional stainless steel piston with wear band)
- Pressure rated to 250 psi air service. Consult factory for hydraulic pressure service.
- Available in most mounting styles.

ELECTROLESS NICKEL PLATED CYLINDERS

- Electroless nickel plated cylinders are an economical alternative to stainless steel cylinders in many corrosive applications.
- All external components are electroless nickel plated (optional stainless steel fasteners are available depending on pressure rating)
- Chrome plated stainless steel piston rod standard on all electroless nickel plated cylinders.
- Available in most mounting styles.

ADDITIONAL CORROSIVE RESISTANT OPTIONS

- Epoxy paint (food grade, marine grade, etc.)
- Composite components available: heads, caps, pistons, tubes and glands.
- Nitrotec® piston rods
- Black oxide of all external components



FABCO-AIR CYLINDERS can be submitted for Product Design Assessment (PDA) by the American Bureau of Shipping. Please contact your FABCO sales representative for more details.

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REPAIR INFORMATION

INTRODUCTION This manual will help users store, install, maintain and, if needed, repair HHD Series cylinders.

CYLINDER IDENTIFICATION

HHD Series cylinders can be identified by serial number or model number. Cylinders are tagged with bore, stroke, and serial number on a metal tag attached to the head. In addition, the serial number is stamped into the steel of the front head. These numbers should always be referenced when requesting parts or for general service inquiries.

STORING OF CYLINDERS

If there is a need to store the cylinders for any period of time, please follow these simple instructions to help keep the cylinder in ready condition:

1. Coat the interior of the cylinder with oil and leave half filled if practical.
2. Plug all ports to ensure foreign matter is kept out of the cylinder.
3. Try to store the cylinder in a vertical position if at all possible; if not, regularly rotate the cylinder 90 degrees to ensure seals maintain proper shape and elasticity.
4. Keep all mounting surfaces and threads either covered or coated with protective lubricant.
5. Try to store components in a clean, dry area that maintains a relatively constant temperature.

IF STORING FOR LONGER THAN ONE MONTH, ALWAYS THOROUGHLY LUBRICATE THE CYLINDER. STROKE NUMEROUS TIMES BEFORE INSTALLATION OR USING UNDER LOAD.

INSTALLATION

The preferred method of mounting the cylinder to a machine is to have the equipment machined to fit the cylinder's exact dimensions with proper alignment already taken into account so that mounting the cylinder ensures perfect alignment. Unfortunately, this is not always an option from a cost or design aspect so alignment must be ensured at time of installation. On fixed mount cylinders that are secured in one position, it is always best to bolt the cylinder down as the last step in installation.

When attaching the piston rod end to the load, the piston rod must be attached and held squarely to ensure the centerline is parallel to the guides of the attached load or parallel to the line of movement along the entire stroke. Torque piston rod to load. Insert mounting bolts securely enough to cycle cylinder but do not tighten.

The application operation should be cycled with low pressure air under reduced or no load to ensure that all components are operating freely. Finish torquing mounting bolts and re-check.

Piping: All fittings should be free of burrs and sealed with either o-ring or appropriate pipe tape. Make sure all hoses are properly flushed of contaminants before attachment. Do not overtighten fittings. On oversized rods, beware of shallow tapped ports.

Hydraulic filtration should be to power unit manufacturer's specifications. Pneumatic systems should have a water separator, 50 micron or smaller filter, and a lubricator as close to the cylinder as possible.

Specifications and prices are subject to change without notice or incurring obligations.

REPAIR INFORMATION

TROUBLESHOOTING

Cylinders that are properly installed and maintained should have millions of trouble-free cycles. Most failures are due to application or system problems that could be prevented. Some problems, possible causes and solutions follow:

BROKEN ROD END

Cause: Misalignment or load in excess of cylinder capability.

Solution: Make sure that load is properly aligned. Select larger rod end threads or stud rod end for greater strength.

2. BROKEN OR BENT ROD

Cause: Misalignment or load in excess of cylinder capability.

Solution: Make sure that rod is aligned properly through entire stroke.

Consult your FABCO-AIR distributor to select proper rod size for application.

3. SEAL DAMAGE

Cause: Improper seal selection or system contamination.

Solution: Consult your FABCO-AIR distributor for proper seal for temperature or fluid media. Use proper filtration from system manufacturer's spec.

4. EXCESSIVE PISTON ROD WEAR

Cause: Side load or long stroke and improper stop tube selection.

Solution: Check alignment of rod and load along entire stroke.

Consult FABCO-AIR catalog for proper stop tube configuration.

5. BROKEN PARTS

Cause: Exceeding cylinder pressure rating. Need for system speed controls or improperly adjusted cylinder cushions.

Solution: Lower system pressure to minimum required to accommodate application.

Adjust speed controls or cushions to lower shock.

REPAIR INFORMATION

REPLACEMENT PARTS

If needed, any cylinder component can be replaced. When contacting a FABCO-AIR distributor, please have the following information: model number, bore, stroke or serial number (as found on the metal tag attached to the cylinder or stamped into the front head) and part description from diagram on page 54.

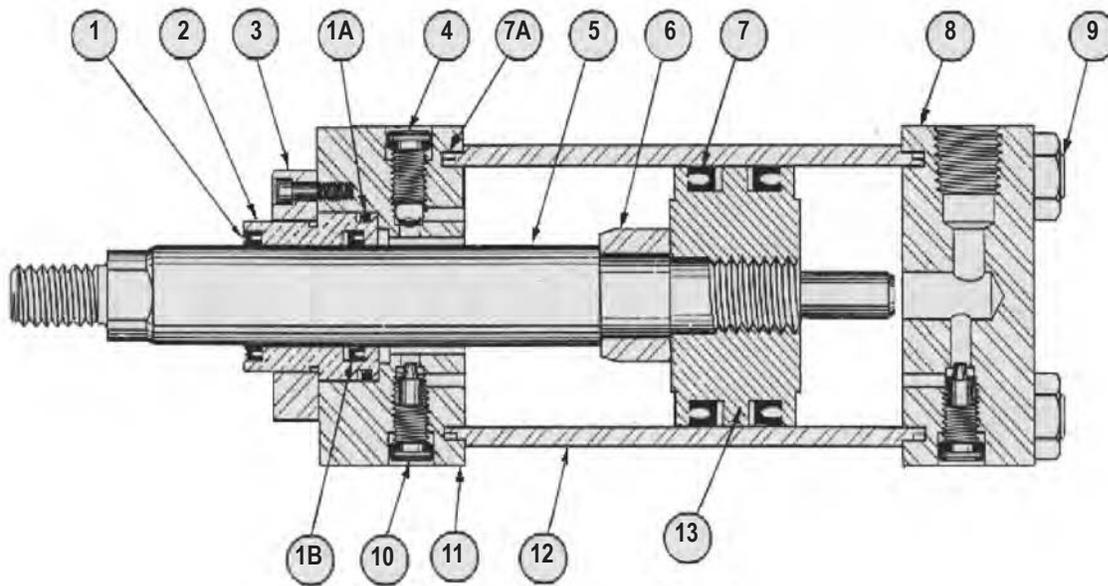
If repair becomes necessary due to seal leakage, a complete rebuild set should be obtained. These sets include piston seals, barrel to head seals, rod seals and bronze rod gland. For seal replacement instruction, refer to pages 55 & 56. (For seal orientation, refer to diagram on page 54)



REPAIR INFORMATION

REPLACEMENT PARTS

HHD SERIES CYLINDER



REPLACEMENT PARTS			
ITEM	DESCRIPTION	ITEM	DESCRIPTION
1, 1A, & 1B	ROD SEAL KIT	8	REAR CAP
1, 1A, 1B, & 2	ROD GLAND KIT	9	TIE RODS AND NUTS
3	RETAINER RING/PLATE	10	CUSHION NEEDLE ASSEMBLY
4	BALL CHECK ASSEMBLY	11	FRONT HEAD
5	PISTON ROD	12	CYLINDER TUBE
6	CUSHION SPUD ASSEMBLY	13	PISTON
7 & 7A	PISTON SEAL KIT		

**WHEN ORDERING REPLACEMENT PARTS,
specify serial number, model number, bore, stroke and piston rod diameter.**

REPAIR INFORMATION

PISTON REPLACEMENT

1. To remove Loctited® piston from rod, heat piston and rod to 450 degrees.
2. Using a spanner wrench, remove piston (while hot) by turning counter-clockwise.
3. Allow piston & rod to air cool before cleaning and reassembling.
4. Clean threads of piston and rod with Loctite® cleaner and degreaser. Spray threads with Loctite® #7649 primer and allow to air dry (DO NOT BLOW DRY).
5. Screw piston to rod making sure of a good fit, then back the piston off about 3/4 of the way.
6. Apply (high strength) grade 680 Loctite® to rod thread and into piston thread on top of rod. Screw the piston clockwise all the way down.
7. Use spanner wrench to torque down piston.
8. Prick punch rod with center punch (2 places) so rod thread protrudes into piston thread. Clean any loose material and Loctite®.
9. Install new seals on piston; lubricate with grease or equivalent.
10. Install piston into tube without damaging.

NOTE: Allow Loctite® to cure for 3 hours before applying test pressure to assembled cylinder.

ROD CARTRIDGE REPLACEMENT

1. There will be a circular retainer or a square retainer at the rod end. If there is a circular retainer, remove the socket head cap screws. If it is a square retainer, remove the tie rod nuts.
2. Remove the circular retainer as shown in Fig. 2
3. Remove the rod cartridge by inserting a screwdriver in the external groove. Pry carefully. See Fig. 3
4. Clean cartridge recess in the head.
5. Lubricate new rod cartridge and seals with grease or equivalent inside and out before assembly.
6. (Caution) Place new cartridge on the rod end being sure to use a "screwing motion".
7. Insert cartridge (now mounted on rod) into head recess.
8. Replace circular retainer plate, tie rod nuts or socket head cap screws and tighten to original torque specs. See Fig.1 for Torque Specs or see Fig 4 for tie rod nut tightening pattern.

FIG. 1

RETAINER RING SCREW TORQUE	
SCREW SIZE	TORQUE FT/LBS.
1/4-20	15
5/16-18	32
3/8-16	60
1/2-13	110
5/8-11	220

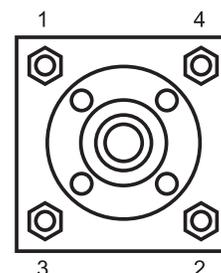


FIG. 2



FIG. 3

FIG. 4



Specifications and prices are subject to change without notice or incurring obligations.

BARREL TO HEAD REPLACEMENT

1. Remove tie rod, nuts and washers.
2. Remove head and cap from cylinder.
3. Discard old seals and clean all parts, including inside tube and grooves in head and cap.
4. When installing PTFE continuous ring type seals for 1 1/2" through 6" Bore, avoid stretching seals.
5. When installing PTFE non-continuous ring type seal for 7" Bore and up, insert seal carefully to avoid stretching. (See Fig. 1 and Fig. 2)
5. Assemble cylinder and tighten tie rod nuts hand tight.
6. Torque tie rod nuts in order shown in Fig. 3 (using chart below for Torque specifications).



FIG. 1
Be sure to butt ends of seal together as you begin to seat seal in groove.



FIG. 2
Hold the ends together and in place with one finger while seating the rest of the seal with your other hand.

SERIES HHD		
BORE	TIE ROD	TORQUE
	DIA. (IN)	(FT./LB/)
1 1/2	3/8	27 ±2
2	1/2	33 ±3
2.5	1/2	65 ±5
3.25	5/8	155 ±10
4	5/8	180 ±10
5	7/8	435 ±20
6	1	545 ±20
7	1 1/8	755 ±30
8	1 1/4	980 ±40
10	1 1/8	750 ±30
12	1 1/4	980 ±40
14	1 1/4	980 ±40
16	1 1/2	2100 ±50
18	1 1/2	1750 ±50
20	1 1/2	2100 ±50
24	2	3100 ±60

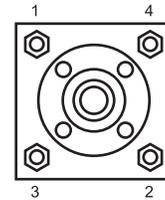
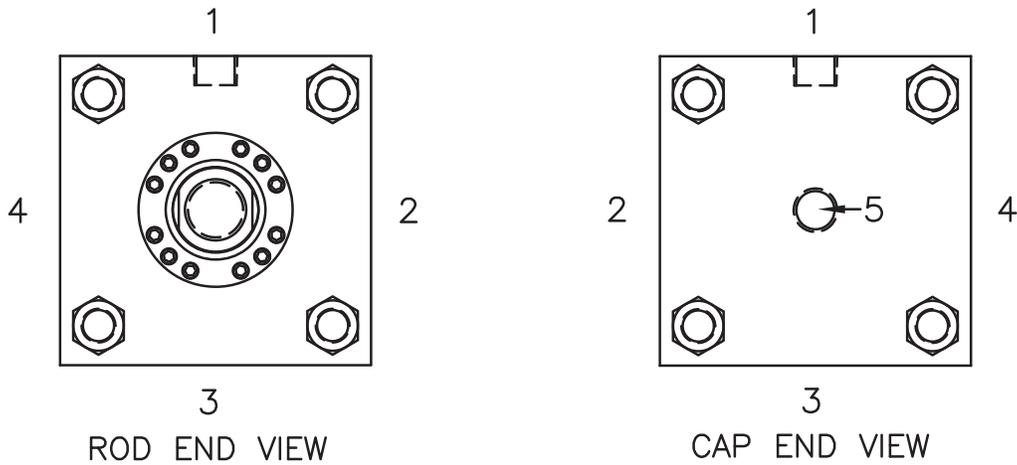


FIG. 3

PORT POSITION



CUSHION ADJUSTMENT

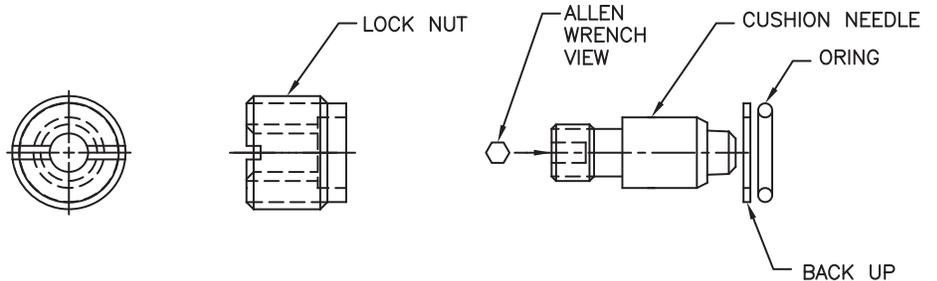
HHD Series cushion design is in a category of its own. Each cylinder head that is machined for cushion operation is held to specific tolerance's to insure the customer is getting optimal cushion performance. Most cushion applications are adjustable but there are certain cylinder designs cushions will either not fit or a permanent cushion design is required. Permanent cushion design is not adjustable.

Making Adjustments

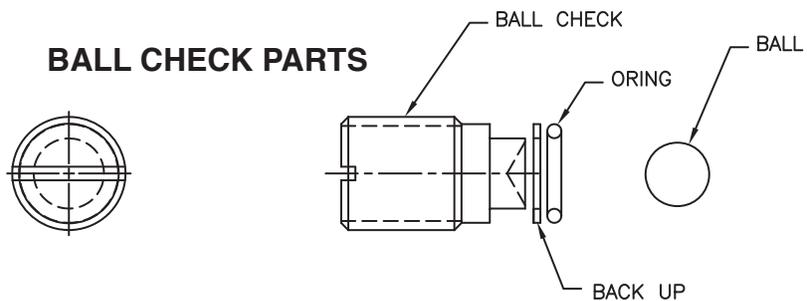
Turn clockwise for more cushion and counter clockwise for less cushion.

Small and medium cushion adjustments use 3/32 Allen Wrench. Large cushion adjustments use 5/32 Allen Wrench

CUSHION ADJUSTMENT PARTS



BALL CHECK PARTS



ACCEPTANCE

This quotation together with any other documents herein or attached hereto, constitutes an offer by Seller to supply Buyer the Goods to be purchased pursuant to this quotation. This quotation supersedes any prior oral or written communications between Seller and Buyer. BY ACCEPTING THE GOODS, ORDERING THE GOODS, OR ACKNOWLEDGING RECEIPT OF THIS QUOTATION, BUYER AGREES TO AND ACCEPTS THE TERMS AND CONDITIONS, CONTAINED HEREIN. ANY ADDITIONAL OR DIFFERENT TERMS OR CONDITIONS, INCLUDING THOSE CONTAINED IN BUYER'S PURCHASE ORDER OR ACCEPTANCE OF THIS OFFER ARE HEREBY OBJECTED TO. If any terms or conditions in the purchase order or acceptance of this offer are in conflict or not identical to the terms of this offer, the terms and conditions of this offer shall prevail. This offer may be withdrawn by Seller at any time prior to Buyer's acceptance of the terms and conditions contained herein, and will expire automatically 30 days from the date hereof unless accepted by Buyer.

PRICES - Prices quoted by Seller in this quotation are:

1. Subject to change without notice prior to acceptance of Buyer's order by Seller.
2. Exclusive of all Federal, State, Municipal or other Government Excise Sales Use, Occupational or like taxes now in force or to be enacted in the future.
3. Subject to an increase equal in amount to any tax Seller may be required to collect to pay upon the sale of the items quoted.
4. Quoted FOB, place of manufacture.

TERMS

1. Interest may be charged at the rate of one and one-half percent per month or the maximum rate allowed under state law, if it is a lesser number, on any payments which are not received by the due date. Any expenses of collection, including reasonable attorney's fees, shall be borne by Buyer.
2. Seller reserves the right to modify these terms for export business and special projects.
3. To the extent Buyer asserts any rights, claims, suits or demands in any way related to this agreement Fabco-Air Inc. including their past, present and future parent, subsidiaries, domestic and foreign corporations, divisions, affiliates, partners, stockholders, predecessors, successors, assigns, officers, directors, employees, administrators, and agents but not as "Seller", these terms and conditions shall nonetheless be applied in favor of the Fabco-Air Inc. entity as if it were "Seller" herein.

SHIPPING ESTIMATES

1. The shipping date shown in this quotation is approximate and dependent upon prior sales and circumstances beyond Seller's control.
2. The Shipping date will be computed from the date of receipt of all data required to enable complete engineering or acceptance of Buyer's order as provided in the Acceptance paragraph above, whichever is later.
3. Seller shall not be liable for delays, stoppages, or defaults in shipments directly or indirectly due to causes beyond its control, or caused by Act of God, fire, strikes, flood, embargo, epidemic, quarantine restrictions, war, insurrection or riot, acts of civil or military authorities, acts of government, delays in transportation of fabrication, priorities of Seller, unusually severe weather, inability to obtain materials, or defaults of suppliers or subcontractors. In the event of any such delay, the date of shipment shall be extended for a reasonable length of time and the period of such extension shall not be less than the period of delay. If at any time Seller has reason to believe that delivery will not be made as scheduled, it will notify Buyer in writing of the causes of the anticipated delay. Buyer's receipt of the Goods, upon their delivery, waives all of Buyer's claims for delay. Buyer's damages under this section are limited to the terms of the Limitation of Liability section of this quotation.
4. IN NO EVENT SHALL SELLER BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES OCCASIONED BY DELAYS WHETHER OR NOT SUCH DELAYS ARE BEYOND SELLER'S CONTROL.

DELIVERY

All Goods shall be shipped FOB, Seller's plant. Seller shall have the right to select the carrier unless the carrier is designated by Buyer and upon delivery of the Goods by Seller to the carrier, the carrier shall be deemed to be the agent of Buyer and thereafter risk of loss shall be on Buyer.

INSTALLATION

All costs incidental to the erection and installation of the Goods shall be borne by Buyer. Additional or special services will be quoted on request.

PRODUCTION ESTIMATES

1. Production estimates, if made a part of this quotation, are based on Seller's analysis and understanding of the work to be performed and assume various production factors including normal working conditions, competent operators, proper maintenance of the Goods, and the use of materials which conform to: (i) the specifications contained herein, (ii) the specifications attached to the Goods and (iii) the standards of the industry.
It is therefore EXPRESSLY UNDERSTOOD THAT PRODUCTION ESTIMATES ARE NOT GUARANTEED.
2. Work tolerances, if any, to be obtained by the Goods are based on Seller's assumption that the material to be processed will have been properly processed through all previous operations and the locating surfaces will be of a quality which will not impede achievement of the quoted tolerances.
3. Seller's obligation with respect to production estimates shall be fully and completely satisfied when Buyer has approved and acknowledged that the Goods have been operated at the estimated performance level for a period acceptable to Buyer but in no event for more than (1) one hour. Such operation of the Goods shall be performed at the place of final assembly of the Goods by or at the direction of Seller.

LIMITED WARRANTY

1. Seller warrants that the Goods to be delivered will be of the kind and quality described in this quotation. Should any of the Goods covered by this quotation which, under normal operating conditions in the plant of Buyer, prove defective in material or workmanship within (3) three years for standard NFPA mounting style HHD Series cylinders, (1) one year for Welded Construction, (1) one year for Mill Cylinders and (6) six months in the case of reconditioned or repaired cylinders, from the date of shipment by Seller, as determined by inspection by Seller, Seller will repair or replace it free of charge, provided that Buyer promptly notifies Seller of the defect and establishes that the Goods have been properly installed and maintained and operated on a single work shift basis, within the limits of rated and normal usage. Seller will not accept any charge for removal, installation, assembly, or any other charges in connection with replacement or repair of the cylinder. All cylinders under warranty which are alleged to be defective are to be returned to Seller, freight prepaid. A complete explanation is required of the alleged defects and circumstances of such claimed failure. Seller will provide an RMA# (return material authorization) that must accompany the item being returned.
2. WITH RESPECT TO ALL COMPONENTS AND SPECIAL CYLINDERS MANUFACTURED PER CUSTOMER SUPPLIED DRAWINGS AND OR SPECIFICATIONS WHETHER VERBAL OR WRITTEN, SELLER MAKES NO WARRANTY, EITHER EXPRESS OR IMPLIED, AND SPECIFICALLY DISCLAIMS ALL OTHER WARRANTIES, INCLUDING, WITHOUT LIMITATION, WARRANTIES FOR MERCHANTABILITY, NON-INFRINGEMENT AND FITNESS FOR ANY PARTICULAR PURPOSE. SELLER'S SOLE OBLIGATION AND LIABILITY FOR PRODUCT DEFECTS SHALL BE, AT SELLER'S CHOICE, TO REPLACE SUCH DEFECTIVE PRODUCT OR REFUND TO BUYER THE AMOUNT PAID BY BUYER THEREFOR. IN NO EVENT SHALL SELLER'S LIABILITY EXCEED THE BUYER'S PURCHASE PRICE.
THE FOREGOING REMEDY SHALL BE SUBJECT TO BUYER'S WRITTEN NOTIFICATION OF DEFECT AND RETURN OF THE DEFECTIVE PRODUCT WITHIN NINETY (90) DAYS OF PURCHASE. THE FOREGOING REMEDY DOES NOT APPLY TO PRODUCTS THAT HAVE BEEN SUBJECT TO MISUSE, NEGLIGENCE, ACCIDENT OR MODIFICATION, OR TO PRODUCTS THAT HAVE BEEN ALTERED DURING ASSEMBLY, OR ARE OTHERWISE NOT CAPABLE OF BEING TESTED, OR IF DAMAGE OCCURS AS A RESULT OF THE FAILURE OF BUYER TO FOLLOW SPECIFIC INSTRUCTIONS.
IN NO EVENT SHALL SELLER BE LIABLE TO THE BUYER OR TO ANY THIRD PARTY FOR ANY INDIRECT, INCIDENTAL, SPECIAL, CONSEQUENTIAL, PUNITIVE OR EXEMPLARY DAMAGES (INCLUDING WITHOUT LIMITATION LOST PROFITS, LOST SAVINGS, OR LOSS OF BUSINESS OPPORTUNITY) ARISING OUT OF OR RELATING TO ANY PRODUCT OR SERVICE PROVIDED OR TO BE PROVIDED BY SELLER, OR THE USE OR INABILITY TO USE THE SAME, EVEN IF SELLER HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

Specifications and prices are subject to change without notice or incurring obligations.

3. The terms of this limited warranty apply only to equipment manufactured by Seller and do not apply to components, parts or accessories purchased by Seller including but not limited to pumps, gear reducers, electrical controls, motors and other purchased items. These items will carry only the warranty issued by the original manufacturer, and Seller is not responsible for any warranty claims beyond that covered by the original equipment manufacturer.
4. This limited warranty shall be void and Seller shall not be liable for any reasons whatsoever if the Goods or parts covered by this quotation have been repaired or altered by persons other than Seller unless expressly authorized in writing by Seller or if the Goods are operated or installed contrary to Seller's instructions or subjected to misuse, negligence or accident.
5. THE FOREGOING WARRANTY IS EXCLUSIVE AND IS IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED. ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED BY SELLER AND ARE EXCLUDED FROM THIS AGREEMENT. THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF. No agent, employee or representative of Seller other than an officer duly authorized in writing has any authority to bind Seller to any confirmation, representation or warranty concerning the Goods that are covered by this quotation beyond that specifically included in this quotation.
6. The cost of all non-warranty service will be charged by Seller at a per diem rate, per man, per work day, plus transportation and living expenses.

**These disclaimers and exclusions shall apply even if the express warranty set forth above fails of its essential purpose.*

**Customer acknowledges and agrees that Seller has set its prices and entered into the Agreement in reliance upon the disclaimers of warranty and the limitations of liability set forth herein, that the same reflect an allocation of risk between the parties (including the risk that a contract remedy may fail of its essential purpose and cause consequential loss), and that the same form an essential basis of the bargain between the parties.*

LIMITATION OF LIABILITY

1. BUYER'S EXCLUSIVE AND SOLE REMEDY FOR ANY CLAIMS, ACTIONS OR SUITS ON ANY THEORY OF LIABILITY IN ANY WAY RELATING TO DEFECTIVE GOODS SHALL BE REPAIR OR REPLACEMENT OF DEFECTIVE GOODS as provided in the limited warranty stated herein. This EXCLUSIVE REMEDY shall not be deemed to have failed of its essential purpose so long as Seller is willing and able to repair or replace defective parts in the prescribed manner. However, if the Goods are incapable of being repaired or replaced, Buyer's exclusive remedy shall be money damages, but such damages shall not exceed the purchase price of the defective Goods. Seller recommends that Buyer purchase mechanical break-down insurance as an additional protection to the limited warranty.
2. Any claims under Seller's limited warranty must be in writing, addressed to Seller and must set forth the alleged defect in sufficient detail to permit its easy identification by Seller. Buyer's failure to notify Seller as set forth above will be conclusively deemed Buyer's waiver of its claim.
3. Seller's liability on any claims, actions or suits of any kind whatsoever for any loss or damage in any way related to this quotation or from the performance or breach thereof, or from the design, manufacture, sale, delivery, resale, installation, technical direction of installation, inspection, repair, operation or use of any Goods covered by or furnished under this quotation shall in no case (except as provided in the paragraph entitled Property and Patent Rights), exceed the purchase price allocable to the Goods and shall terminate one year after the Goods have been shipped.
4. IN NO EVENT, WHETHER AS A RESULT OF BREACH OF CONTRACT OR WARRANTY OR ALLEGED NEGLIGENCE

OR OTHERWISE, SHALL SELLER BE LIABLE FOR ANY SPECIAL, INCIDENTAL, INDIRECT OR CONSEQUENTIAL DAMAGES, INCLUDING, BUT NOT LIMITED TO, ANY LOSS OF PROFIT, LOSS BY REASON OF PLANT SHUTDOWN, INCREASED EXPENSE OF OPERATION, LOSS OF PRODUCT OR MATERIALS, LOSS OF USE OF THE GOODS OR ANY ASSOCIATED EQUIPMENT, COST OF CAPITAL, COST OF SUBSTITUTE EQUIPMENT, FACILITIES OR SERVICES, DOWNTIME COSTS OR CLAIMS OF CUSTOMERS OF BUYER FOR SUCH DAMAGES OR ANYTHING DONE IN CONNECTION WITH THIS QUOTATION INCLUDING ANY MAINTENANCE OR INSTALLATION SERVICES) OR ANY OTHER LOSSES RESULTING FROM THE OPERATION OR NON-OPERATION OF THE GOODS UNDER ANY THEORY OF LIABILITY WHETHER BASED UPON CONTRACT, TORT (INCLUDING NEGLIGENCE AND GROSS NEGLIGENCE), STRICT LIABILITY OR OTHERWISE EVEN THOUGH SELLER MAY HAVE BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. IN ANY EVENT, SELLER'S LIABILITY WITH RESPECT TO THE GOODS SHALL NOT EXCEED AN AMOUNT EQUAL TO THE PURCHASE PRICE THEREOF.

5. If Buyer or Buyer's customers re-label, re-package, alter, or modify the Goods, then Seller shall be released from all obligations and liabilities to Buyer and Buyer shall defend, indemnify and hold Seller harmless from and against all claims, costs and liabilities arising out of or related to any product defect, including any resulting personal injury, property damage, and consequential damages.

PRODUCT LIABILITY AND INDEMNIFICATION

1. Buyer shall use and shall require its employees to use all safety devices, guards and safe and proper operating procedures as set forth in the nameplates, signs, manuals and instruction sheets relating to the Goods furnished by Seller. Buyer shall not remove or modify any such device or guard or warning sign. Buyer shall not permit non-operating personnel to remain within ten (10) feet of any machine or accessory that is purchased pursuant to this quotation, while such machine or accessory is in operation. If Buyer fails to strictly observe each and every one of the obligations set forth in this paragraph with regard to any machine or accessory purchased pursuant to this quotation, Buyer agrees to defend, indemnify and hold Seller harmless to the fullest extent permitted by law from any and all liability or obligation incurred by Seller to persons injured directly or indirectly in connection with the operation of any such machine or accessory.
2. Buyer shall notify Seller promptly and in any event within thirty (30) days of any accident or malfunction involving any of the Goods which results in personal injury or damage to property and shall cooperate fully with Seller in investigating and determining the cause of such accident or malfunction. In the event that Buyer fails to give such notice to Seller and so cooperate, Buyer agrees to defend, indemnify and hold Seller harmless from any and all claims arising from such accident or malfunction.
3. Customer acknowledges and agrees that customer will indemnify and hold harmless Fabco-Air Inc. including their past, present and future parent, subsidiaries, domestic and foreign corporations, divisions, affiliates, partners, stockholders, predecessors, successors, assigns, officers, directors, employees, administrators, and agents from and against any and all losses, expenses, attorney fees, claims, suits, demands of whatever nature resulting from damages or injuries, including death, to any property or persons caused by or arising out of any action, omission or operation of any Fabco-Air Inc. manufactured product or service.

PROPERTY AND PATENT RIGHTS

1. Seller retains for itself any and all property rights in and to all designs, inventions and improvements pertaining to any Goods designed in connection with the quotation and to all patents, trademarks, copyrights and related industrial property rights arising out of the work done in connection therewith. Buyer expressly agrees that it will not assert any rights to property rights retained herein by Seller.
2. Seller will indemnify and hold harmless Buyer from any and all costs, expenses and damages resulting from any suit based on any claim of infringement of a United States patent by reason of its use (in the manner contemplated by Seller) of the Goods, or any part thereof, furnished under this quotation, provided that Buyer: (i) promptly notifies in writing Seller of any such claim or the institution of any such suit; (ii) fully cooperates with Seller in connection with the defense thereof; and (iii) allows, without condition, Seller to have the full and exclusive right to defend any such suit to the extent any of the Goods furnished under the quotation is involved therein. In the event of any such claim or suit, Seller shall have the right to modify or replace the Goods involved in any claim of infringement or to remove such Goods and refund to Buyer the purchase price thereof less fifteen (15) percent to each full year from the date of shipment of the Goods. **NOTWITHSTANDING THE FOREGOING, SELLER'S CUMULATIVE LIABILITY FOR INDEMNIFICATION UNDER THIS PARAGRAPH SHALL NOT EXCEED THE PURCHASE PRICE FOR THE GOODS INVOLVED IN ANY SUCH CLAIM OF INFRINGEMENT.** This Paragraph shall not apply to (i) any foreign patents; (ii) any process in which the Goods are used; (iii) any product made by Buyer; or (iv) any claims or suits involving solely goods not manufactured or designed by Seller harmless from any liability arising out of any infringement of any patent in the manufacture, sale or use of any goods or parts thereof manufactured by Seller to Buyer's design specifications.

RESERVATION OF RIGHTS IN RESPECT TO SELLER'S OTHER PRODUCTS

Seller reserves the right to make improvements and changes in design of the Goods it offers for sale without any obligation to make such changes or improvements upon the Goods that are the subject of this quotation or Goods previously manufactured and sold by it.

CHANGES

Buyer accepts the limited capabilities of the Goods, their materials and components upon approving the design of the Goods. Buyer shall bear the cost of all subsequent changes to the design, materials and/or components of the Goods subsequent to approving the design. Buyer shall request all such changes by change order, and pay the cost of the change, in full, within 30 days of submitting the change order.

LIMITATION OF ACTIONS

Buyer agrees that, any action to recover for any loss or damage under any theory of liability, in any way related to this quotation or from the performance or breach thereof, or from the design, manufacture, sale, delivery, resale, installation, technical direction of installation, inspection, repair, operation or use of any Goods covered by or furnished under this quotation must be commenced within one year after the cause of action accrues to Buyer, unless otherwise extended by Seller in writing. It is expressly agreed that there are no warranties of future performance pertaining to the Goods that are the subject of this quotation that would extend beyond such one year period of limitation.

CANCELLATION

1. In the event Buyer requests Seller to stop work or cancel its purchase order based on this quotation, the order or any part thereof, cancellation charges shall be paid to Seller as follows: Any and all work that is complete or scheduled for completion within thirty (30) days of the date of notification in writing to stop work or to cancel, shall be invoiced and paid in full.
2. For work in process, other than covered by item 1, and any materials and supplies procured or for which definite commitments have been made by Seller in connection with Buyer's order, Buyer shall pay the actual costs and overhead expenses determined in accordance with good accounting practices, plus 15 percent.
3. An amount equal to 15 percent of the difference between the cancellation charge as computed in item 2 and the full purchase price of the Goods will be charged as compensation for business irretrievably lost as a result of accepting a purchase order based on this quotation and having such purchase order cancelled by Buyer.
4. Buyer shall promptly instruct Seller as to the disposition of the Goods and the latter shall, if requested, hold the Goods for Buyer's account. All costs of storage, insurance, handling, boxing or other costs in connection therewith shall be borne by Buyer.

APPLICABLE LAW

These Terms and Conditions, quotation and the rights, obligations and liabilities of the parties, shall be construed pursuant to the laws of the State of Florida.

COMPLETE AGREEMENT

1. Any orders received by Seller in response to this quotation shall not be binding or firm orders until approved by Seller. This quotation, when accepted by Buyer in accordance with the Acceptance paragraph hereof, and when Seller's acknowledgement of receipt of acceptance is given to Buyer, shall constitute the entire agreement between the parties relating to this quotation and the Goods provided pursuant thereto, shall supersede all previous communications or understandings between Buyer and Seller with respect to the subject matter hereof and no alteration or addition to this quotation shall be binding on Seller unless it is in writing and signed by a duly authorized officer of Seller.
2. The parties hereto agree that if any clause is held unenforceable by a court of competent jurisdiction, the balance of the contract shall remain in full force and effect.

WAIVER OF TERMS AND CONDITIONS

Failure or delay of Seller to insist upon strict performance of any of the Terms and conditions of this quotation or to exercise any rights or remedies Provided herein or by law, shall not release Buyer from any of the obligations of this quotation and shall not be deemed a waiver of any right of Seller to insist upon strict performance hereof or of any rights or remedy of Seller as to any prior or subsequent default hereunder.

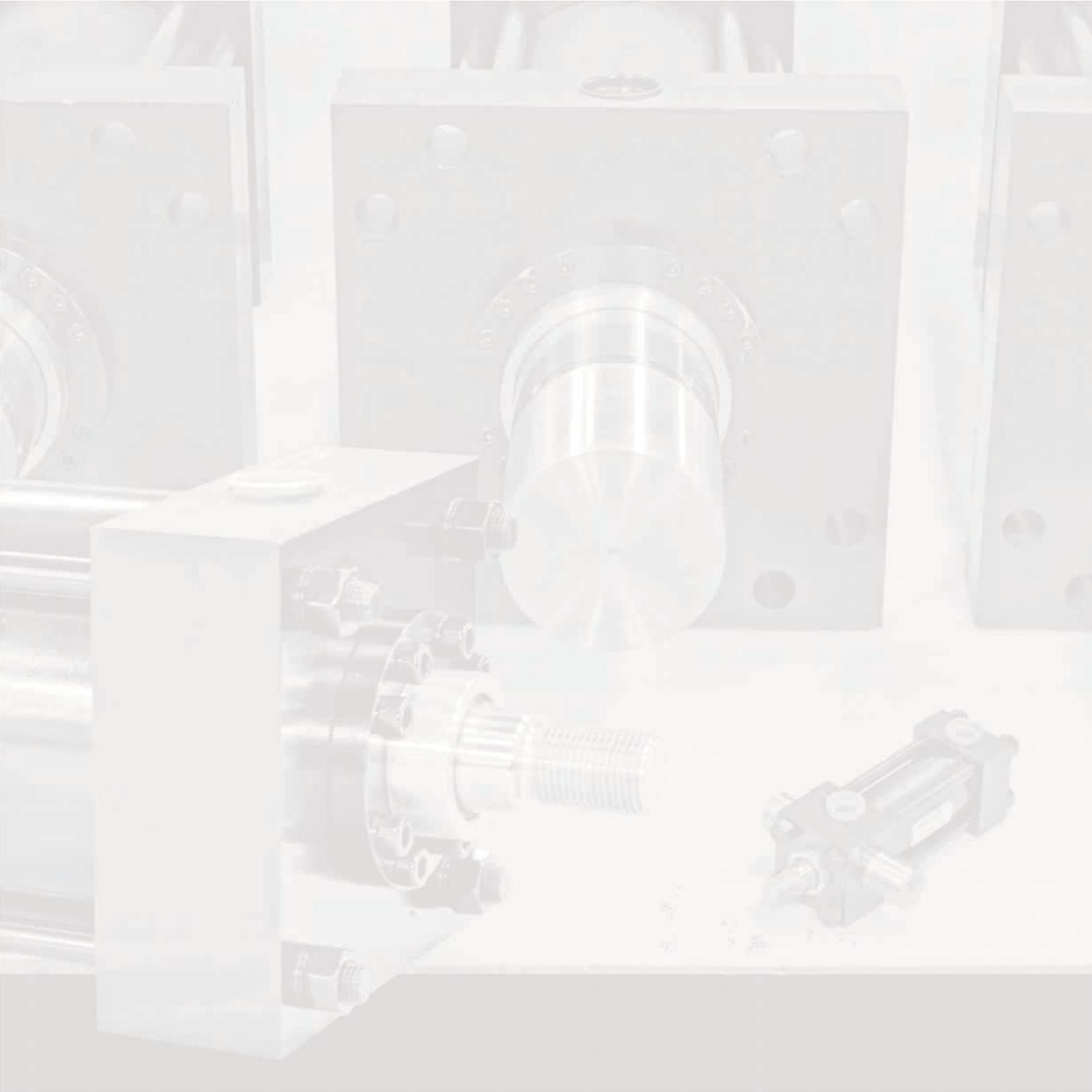
Rev 10/16

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Tel: 352-373-3578; Fax 352-375-8024 • email: service@fabco-air.com

FABCO-AIR

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MILL CYLINDERS



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SPECIALS! ASK
US!**