



Series 2H for Heavy-Duty Service

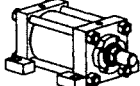
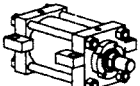
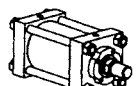
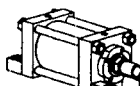
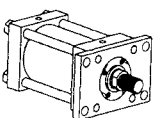
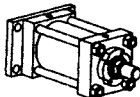
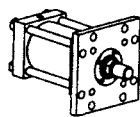
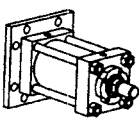
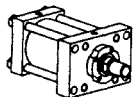
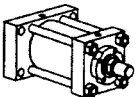
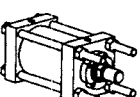
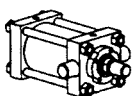
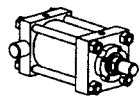
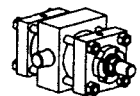
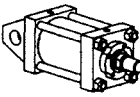
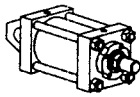
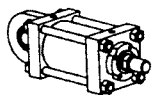
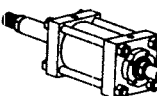
- 1.50" – 14.00" Bores
- Pressure Ratings Up to 3,000 PSI
- N.F.P.A. Interchangeability – 22 Mounting Styles

Series 3L for Medium-Duty Service

- 1.50" – 6.00" Bores
- Pressure Ratings Up to 1,800 PSI
- N.F.P.A. Interchangeability – 24 Mounting Styles

SERIES 2H HEAVY-DUTY HYDRAULIC CYLINDERS

1.50" thru 8.00" Bores

		Description		Page No.	
Side Lug Mount MS2		Centerline Lug Mount MS3		MS2	Side Lug Mount..... 4
				MS3	Centerline Lug Mount..... 6
Side Tapped Mount MS4		End Lug Mount MS7		MS4	Side Tapped Mount..... 8
				MS7	End Lug Mount..... 10
Head Rectangular Flange Mount MF1		Cap Rectangular Flange Mount MF2		MF1	Head Rectangular Flange Mount..... 12
				MF2	Cap Rectangular Flange Mount..... 14
Head Square Flange Mount MF5		Cap Square Flange Mount MF6		MF5	Head Square Flange Mount..... 16
				MF6	Cap Square Flange Mount..... 18
Head Flange Mount ME5		Cap Flange Mount ME6		ME5	Head Flange Mount..... 20
		Tie Rod Mounts MX0, MX1, MX2, MX3, MX4		ME6	Cap Flange Mount..... 22
				MXO-1-2-3-4	Tie Rod Mounts..... 24
Head Trunnion Mount MT1		Cap Trunnion Mount MT2		MT1	Head Trunnion Mount..... 26
		Intermediate Fixed Trunnion Mount MT4		MT2	Cap Trunnion Mount..... 28
				MT4	Intermediate Fixed Trunnion Mount... 30
Double Ear Fixed Clevis Mount MP1		Single Ear Fixed Clevis Mount MP3		MP1	Fixed Double Ear Clevis Mount..... 32
				MP3	Fixed Single Ear Clevis Mount..... 32
Spherical Bearing Mount MPU3		Double Rod Mount MXO-D		MPU3	Spherical Bearing Mount..... 34
				MXO-D	Double Rod Mount..... 36

10.00" thru 14.00" Bores

MP1-MT1-MT4.....	38
MS2-ME5-ME6.....	40

HOW TO ORDER.....	42/99
SERIES 3L MEDIUM-DUTY HYDRAULIC CYLINDERS.....	43
TECHNICAL INFORMATION.....	80
INSTALLATION, OPERATION AND MAINTENANCE DATA.....	88
MOUNTING ACCESSORIES, OPTIONS.....	94

HANNA
cylinders

Series 2H Hydraulic Cylinders for Heavy-Duty Service

Hanna's Series 2H heavy-duty hydraulic cylinders have been designed for today's higher pressures and faster moving machinery applications.

Ruggedly built, 2H cylinders incorporate many field-proven design features that assure trouble-free performance for millions of cycles. Included are Hanna's unique non-metallic Duralon® rod bearing, and our glass-filled Teflon® O-ring energized piston seal with two bronze-filled bearing strips, completely eliminating metal-to-metal contact at bearing surfaces. This assures long life and extremely low friction. In addition, it makes standard Series 2H cylinders the most suitable units available for applications that demand ruggedness, precision, zero leakage and day-in, day-out performance.

Series 2H cylinders give you virtually unlimited flexibility in machinery design, with a full range of bore sizes (1.50" through 14.00"*) offered. Developed for pressure ratings up to 3000 p.s.i., 2H cylinders are available in 22 N.F.P.A. mounting styles. S.A.E. porting is available at no extra cost.

* Refer to Series 3H Catalog 911 for bore sizes over 14.00". Consult factory for other special requirements.

Duralon is a Trademark of Rexnord, Inc.
Teflon and Dacron are Trademarks of DuPont Company

Series 2H Features and Benefits

1. Piston Rod End

Integral thread construction, precision-machined for close concentricity. Studded rod ends are available.

2. Duralon Rod Bearing

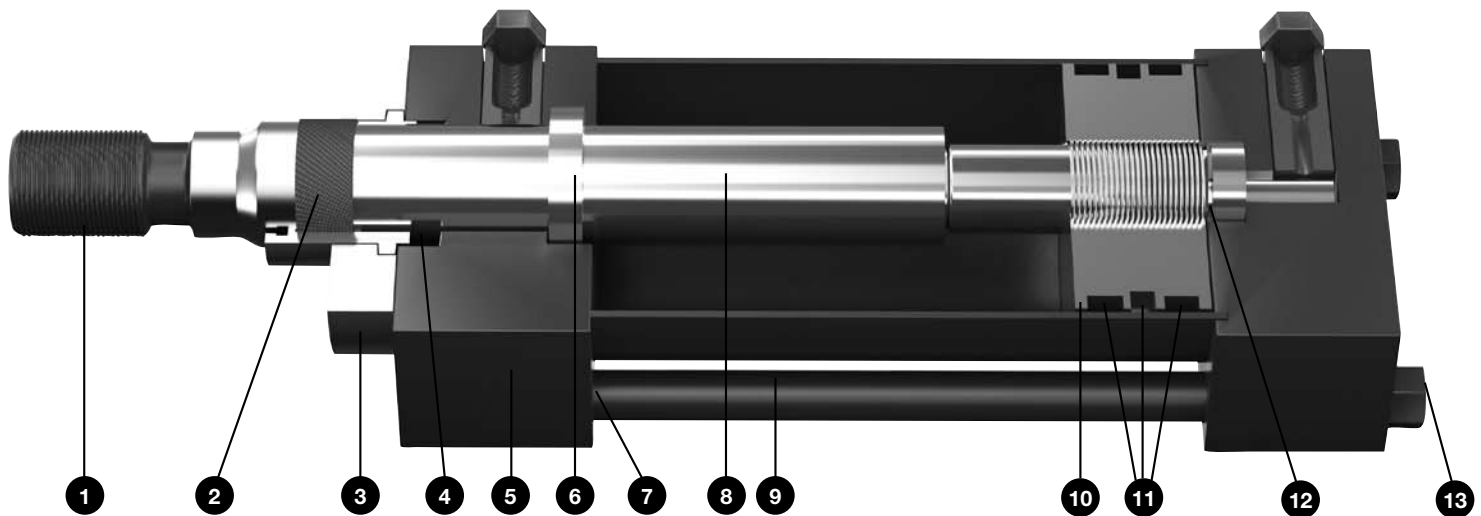
Hanna's high-tech Duralon rod bearing is designed to perform under poorly lubricated, high-load conditions. The exact combination of woven Teflon and Dacron®, plus the fiberglass structural shell, increases load-carrying capabilities and eliminates "cold-flow" associated with Teflon. Duralon bearings are capable of sustaining much higher compressive loads than either bronze or cast iron, have an extremely low coefficient of friction, and require no lubrication to the bearing surface.

3. Gland Construction

Two-piece (gland plus retainer plate), bolted-on or full-face retainer design. Packings may be captive in the gland or located in the head.

4. Rod Seal

Series 2H cylinders incorporate the industry's heaviest cross-section polyurethane U-cup piston rod seal, assuring zero leakage and outstanding wear resistance. Viton U-cup is available for use with non-petroleum based fluids or for higher temperature service.



5. Heads

Steel heads are precision-machined to assure accurate alignment and close concentricity between piston, tube, piston rod and rod bearing.

6. Cushion Check Seals

Self-aligning, full-floating design, the cushion check seals are closely fitted to cushion sleeve and spear. The seals serve as both cushion seal and check valve, providing effective cushioning and fast breakaway.

7. Tube Seal

Buna-N O-ring seal. Viton available for use with non-petroleum based fluids, or for higher temperature service.

8. Piston Rod

Hanna's piston rods are machined to a close tolerance with minimum stock removal to maximize shank size and reduce stress. Relief grooves are machined in areas of high stress to guard against fatigue failures. The rods provide 100,000 minimum yield strength in diameters up to 3.50"; 59,000 average yield strength in 4.00" diameter and above. All sizes are hard chrome plated for scratch and corrosion resistance. To maximize seal and bearing life, plated surface is polished to a 6-8 micro-inch finish.

9. Tubing

Steel tubing is precision-honed to a 16-20 micro-inch finish for close tolerance between piston bearing and tube wall.

10. Piston

One-piece piston of high impact-resistant ductile iron threaded to piston rod, and furnished with breakaway spirals on each side.

11. Piston Sealing System

Hanna's glass-filled Teflon, O-ring energized piston seal provides a positive seal without problems such as rollover or extrusion that are associated with U-cup type seals. Bronze-filled bearing strips provide non-metallic bearing points on the piston, assuring long life and extremely low friction.

12. Piston-to-Rod Connection

Piston rods are piloted to the piston to ensure concentricity, then bonded by an anaerobic adhesive, torqued and pinned.

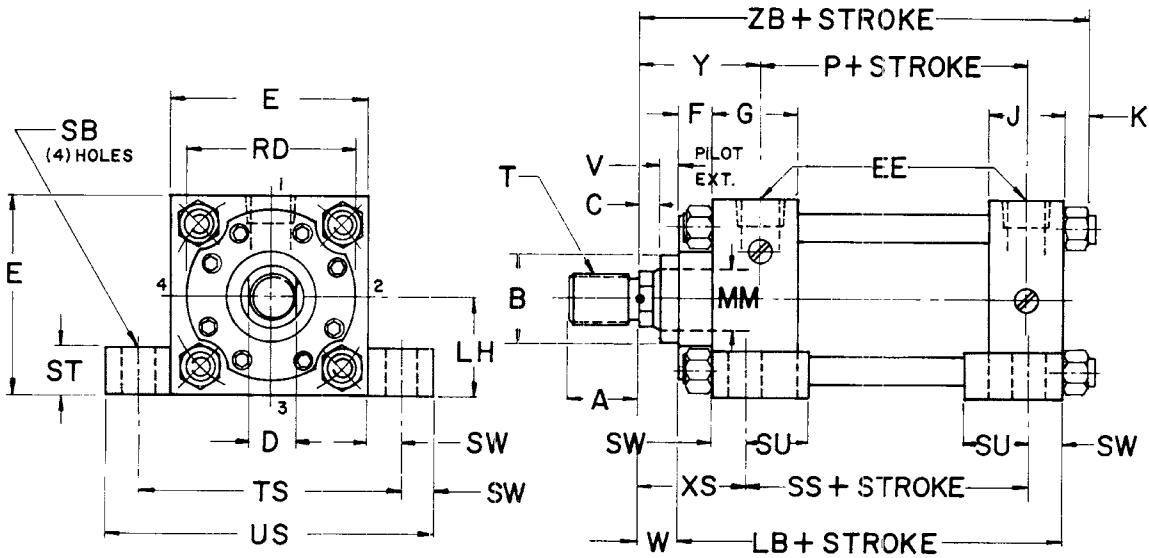
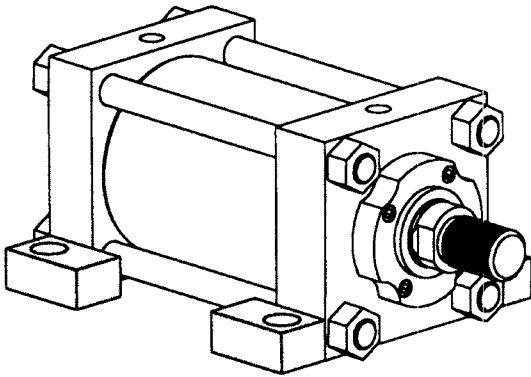
13. Tie Rods

Made from high-strength steel, the tie rods are pre-stressed for fatigue resistance.

SERIES 2H 1.50"-8.00" Bores

MS2 Side Lug Mount

(For 10.00" - 14.00" Bores, see Page 38)



NOTE: Lug mounted cylinders should be fastened at one end by using fitted bolts, a thrust key or by dowel pins. This will eliminate the tendency of the cylinder to shift when pushing or pulling.

These Dimensions are Constant Regardless of Rod Diameter

BORE	E	LH -.006 -.008	EE		F	G	J	K	LB	P	SB	SS	ST	SU	SW	TS ±.010	US
			SAE STRAIGHT THREAD	NPTF**													
1.50	2.50	1.250	#8 (750-16)	1/2	.38	1.75	1.50	.31	5.00	2.88	.438	3.88	.50	.94	.38	3.25	4.00
2.00	3.00	1.500	#8 (750-16)	1/2	.62	1.75	1.50	.44	5.25	2.88	.562	3.62	.75	1.25	.50	4.00	5.00
2.50	3.50	1.750	#8 (750-16)	1/2	.62	1.75	1.50	.44	5.38	3.00	.812	3.38	.94	1.56	.69	4.88	6.25
3.25	4.50	2.250	#12 (1 062-12)	3/4	.75	2.00	1.75	.56	6.25	3.50	.812	4.12	.94	1.56	.69	5.88	7.25
4.00	5.00	2.500	#12 (1 062-12)	3/4	.88	2.00	1.75	.56	6.62	3.75	1.062	4.00	1.19	2.00	.88	6.75	8.50
5.00	6.50	3.250	#12 (1 062-12)	3/4	.88	2.00	1.75	.75	7.12	4.25	1.062	4.50	1.19	2.00	.88	8.25	10.00
6.00	7.50	3.750	#16 (1 312-12)	1	1.00*	2.25	2.25	.88	8.38*	4.88	1.312	5.12	1.44	2.50	1.12	9.75	12.00
7.00	8.50	4.250	#20 (1.625-12)	1 1/4	1.00	2.75	2.75	1.00	9.50	5.38	1.562	5.75	1.69	2.88	1.38	11.25	14.00
8.00	9.50	4.750	#24 (1 875-12)	1 1/2	1.00	3.00	3.00	1.06	10.50	6.12	1.562	6.75	1.69	2.88	1.38	12.25	15.00

* With (K) Rod F = .88, LB = 8.25 ** NPTF ports will be furnished as standard unless SAE straight thread ports are specified

MS2

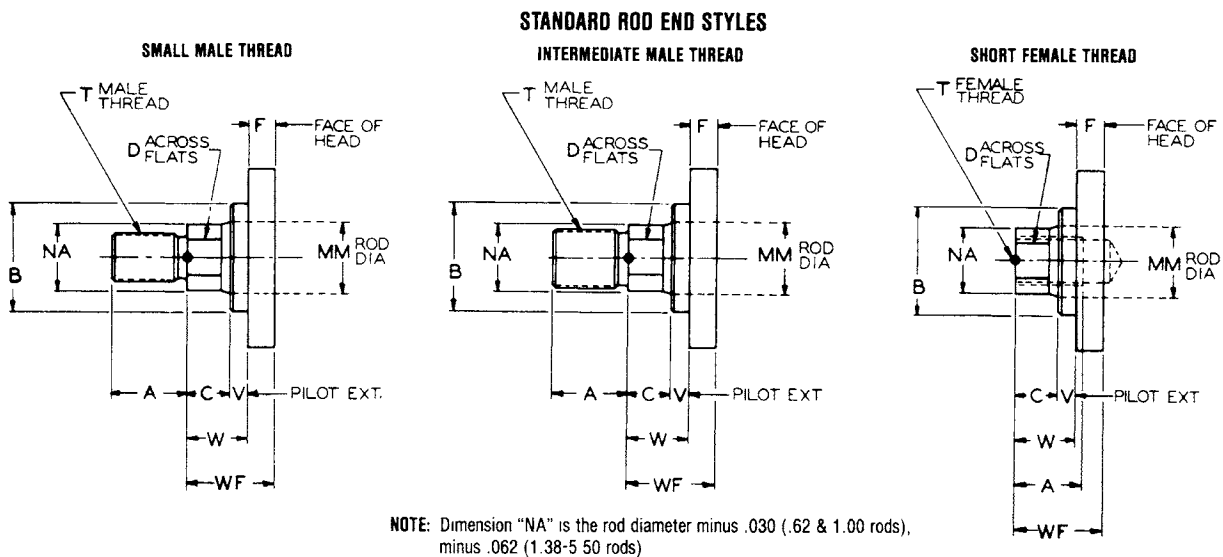
Dimensions are Affected by the Rod Diameter

CYLINDER			A	B -.001 -.003	C	D	MM ROD DIA.	RD*	T (THREAD)			V	W	XS	Y	ZB	PSI RATING†
BORE	ROD DIA. CODE	ROD DIA.							SMALL MALE SM	INTER- MEDIATE MALE IM	SHORT FEMALE SF						
1.50	D	.62	.75	1.125	.38	.50	.62	-	44-20	50-20	44-20	.25	.62	1.38	2.00	5.94	3000
	F	1.00	1.12	1.500	.50	.88	1.00	-	75-16	88-14	75-16	.50	1.00	1.75	2.38	6.31	3000
2.00	F	1.00	1.12	1.500	.50	.88	1.00	-	75-16	.88-14	75-16	.25	.75	1.88	2.38	6.44	3000
	G	1.38	1.62	2.000	.62	1.12	1.38	-	1.00-14	1.25-12	1.00-14	.38	1.00	2.12	2.62	6.69	3000
2.50	F	1.00	1.12	1.500	.50	.88	1.00	-	75-16	.88-14	75-16	.25	.75	2.06	2.38	6.56	3000
	G	1.38	1.62	2.000	.62	1.12	1.38	-	1.00-14	1.25-12	1.00-14	.38	1.00	2.31	2.62	6.81	3000
	H	1.75	2.00	2.375	.75	1.50	1.75	-	1.25-12	1.50-12	1.25-12	.50	1.25	2.56	2.88	7.06	3000
3.25	G	1.38	1.62	2.000	.62	1.12	1.38	3.50	1.00-14	1.25-12	1.00-14	.25	.88	2.31	2.75	7.69	3000
	H	1.75	2.00	2.375	.75	1.50	1.75	3.50	1.25-12	1.50-12	1.25-12	.38	1.12	2.56	3.00	7.94	3000
	J	2.00	2.25	2.625	.88	1.69	2.00	3.88	1.50-12	1.75-12	1.50-12	.38	1.25	2.69	3.12	8.06	3000
4.00	H	1.75	2.00	2.375	.75	1.50	1.75	3.50	1.25-12	1.50-12	1.25-12	.25	1.00	2.75	3.00	8.19	3000
	J	2.00	2.25	2.625	.88	1.69	2.00	4.25	1.50-12	1.75-12	1.50-12	.25	1.12	2.88	3.12	8.31	3000
	K	2.50	3.00	3.125	1.00	2.06	2.50	4.25	1.88-12	2.25-12	1.88-12	.38	1.38	3.12	3.38	8.56	3000
5.00	J	2.00	2.25	2.625	.88	1.69	2.00	4.25	1.50-12	1.75-12	1.50-12	.25	1.12	2.88	3.12	9.00	3000
	K	2.50	3.00	3.125	1.00	2.06	2.50	4.25	1.88-12	2.25-12	1.88-12	.38	1.38	3.12	3.38	9.25	3000
	L	3.00	3.50	3.750	1.00	2.62	3.00	5.62	2.25-12	2.75-12	2.25-12	.38	1.38	3.12	3.38	9.25	3000
	M	3.50	3.50	4.250	1.00	3.00	3.50	5.62	2.50-12	3.25-12	2.50-12	.38	1.38	3.12	3.38	9.25	3000
6.00	K	2.50	3.00	3.125	1.00	2.06	2.50	4.25	1.88-12	2.25-12	1.88-12	.38	1.38	3.38	3.50	10.50	3000
	L	3.00	3.50	3.750	1.00	2.62	3.00	6.38	2.25-12	2.75-12	2.25-12	.25	1.25	3.38	3.50	10.50	3000
	M	3.50	3.50	4.250	1.00	3.00	3.50	6.38	2.50-12	3.25-12	2.50-12	.25	1.25	3.38	3.50	10.50	3000
	N	4.00	4.00	4.750	1.00	3.38	4.00	6.38	3.00-12	3.75-12	3.00-12	.25	1.25	3.38	3.50	10.50	3000
7.00	L	3.00	3.50	3.750	1.00	2.62	3.00	6.38	2.25-12	2.75-12	2.25-12	.25	1.25	3.62	3.81	11.75	3000
	M	3.50	3.50	4.250	1.00	3.00	3.50	6.38	2.50-12	3.25-12	2.50-12	.25	1.25	3.62	3.81	11.75	3000
	N	4.00	4.00	4.750	1.00	3.38	4.00	6.38	3.00-12	3.75-12	3.00-12	.25	1.25	3.62	3.81	11.75	3000
	P	4.50	4.50	5.250	1.00	3.88	4.50	7.50	3.25-12	4.25-12	3.25-12	.25	1.25	3.62	3.81	11.75	3000
8.00	R	5.00	5.00	5.750	1.00	4.25	5.00	7.50	3.50-12	4.75-12	3.50-12	.25	1.25	3.62	3.81	11.75	3000
	M	3.50	3.50	4.250	1.00	3.00	3.50	6.38	2.50-12	3.25-12	2.50-12	.25	1.25	3.62	3.94	12.81	3000
	N	4.00	4.00	4.750	1.00	3.38	4.00	6.38	3.00-12	3.75-12	3.00-12	.25	1.25	3.62	3.94	12.81	3000
	P	4.50	4.50	5.250	1.00	3.88	4.50	8.00	3.25-12	4.25-12	3.25-12	.25	1.25	3.62	3.94	12.81	3000
8.00	R	5.00	5.00	5.750	1.00	4.25	5.00	8.00	3.50-12	4.75-12	3.50-12	.25	1.25	3.62	3.94	12.81	3000
	S	5.50	5.50	6.250	1.00	4.62	5.50	8.00	4.00-12	5.25-12	4.00-12	.25	1.25	3.62	3.94	12.81	3000

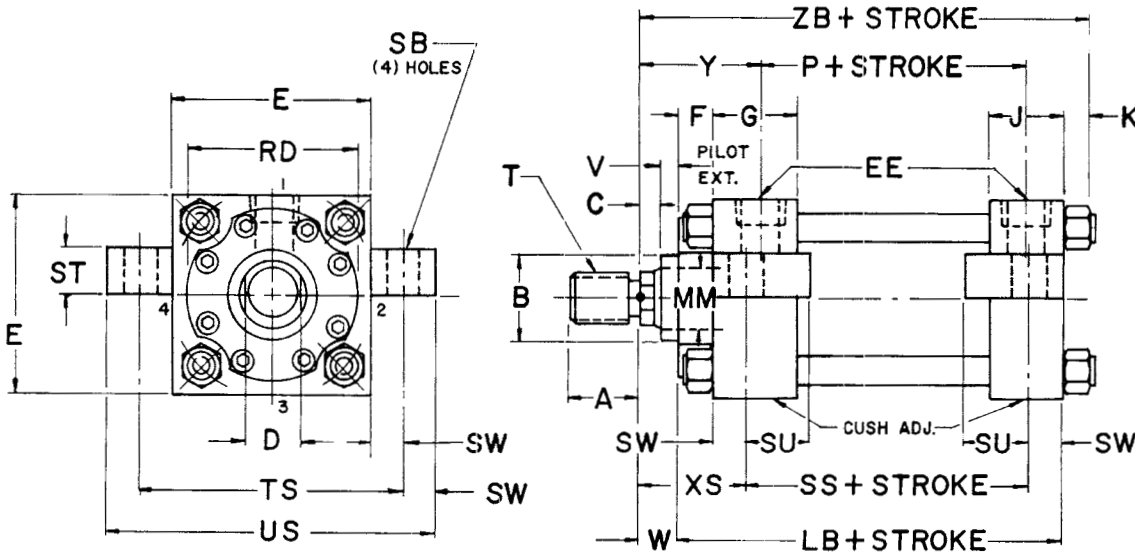
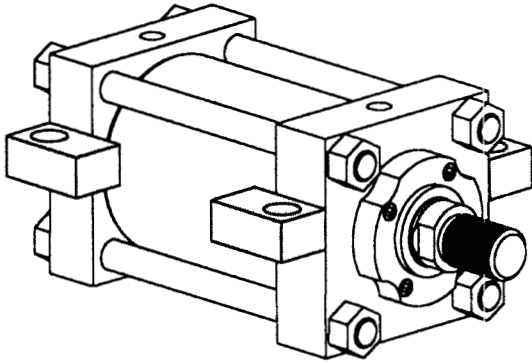
* Where RD is not shown, square retainer is used. See RETAINER PLATE CONSTRUCTION in INSTALLATION, OPERATION AND MAINTENANCE DATA section.

† CAUTION: PSI ratings shown are HANNA recommended maximum operating pressures. Check STROKE LIMITATION DATA in TECHNICAL INFORMATION section which may reduce maximum operating pressure. Check STOP TUBE DATA (TECHNICAL INFORMATION section) to determine if stop tube is required.

NOTE: Dimensions are nominal except where specifically toleranced. Tolerances on "Plus Stroke" dimensions will vary slightly from dimensions shown due to manufacturing tolerances and tube compression.



SERIES 2H 1.50"-8.00" Bores MS3 Centerline Lug Mount



NOTE: Lug mounted cylinders should be fastened at one end by using fitted bolts, a thrust key or by dowel pins. This will eliminate the tendency of the cylinder to shift when pushing or pulling.

These Dimensions are Constant Regardless of Rod Diameter

BORE	E	EE		F	G	J	K	LB	P	SB	SS	ST	SU	SW	TS ±.010	US
		SAE STRAIGHT THREAD	NPTF**													
1.50	2.50	#8 (.750-16)	1/2	38	1.75	1.50	.31	5.00	2.88	438	3.88	.50	94	.38	3.25	4.00
2.00	3.00	#8 (.750-16)	1/2	62	1.75	1.50	.44	5.25	2.88	562	3.62	.75	1.25	.50	4.00	5.00
2.50	3.50	#8 (.750-16)	1/2	62	1.75	1.50	.44	5.38	3.00	812	3.38	.94	1.56	.69	4.88	6.25
3.25	4.50	#12 (1.062-12)	3/4	75	2.00	1.75	.56	6.25	3.50	812	4.12	.94	1.56	.69	5.88	7.25
4.00	5.00	#12 (1.062-12)	3/4	.88	2.00	1.75	.56	6.62	3.75	1.062	4.00	1.19	2.00	.88	6.75	8.50
5.00	6.50	#12 (1.062-12)	3/4	.88	2.00	1.75	.75	7.12	4.25	1.062	4.50	1.19	2.00	.88	8.25	10.00
6.00	7.50	#16 (1.312-12)	1	1.00*	2.25	2.25	.88	8.38*	4.88	1.312	5.12	1.44	2.50	1.12	9.75	12.00
7.00	8.50	#20 (1.625-12)	1 1/4	1.00	2.75	2.75	1.00	9.50	5.38	1.562	5.75	1.69	2.88	1.38	11.25	14.00
8.00	9.50	#24 (1.875-12)	1 1/2	1.00	3.00	3.00	1.06	10.50	6.12	1.562	6.75	1.69	2.88	1.38	12.25	15.00

* With (K) Rod F = .88, LB = 8.25

** NPTF ports will be furnished as standard unless SAE straight thread ports are specified

MS3

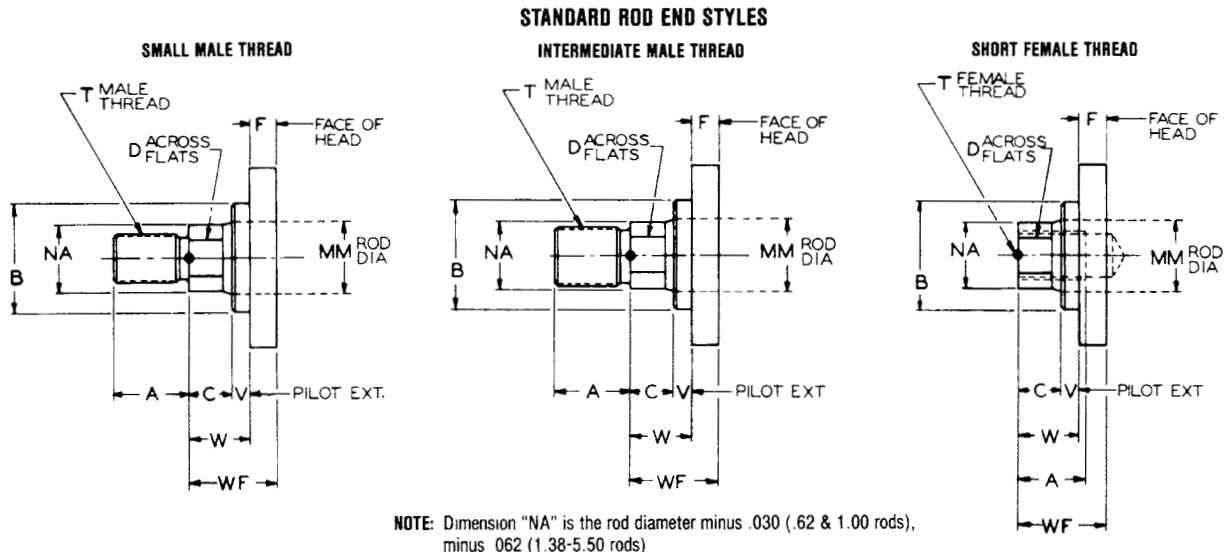
Dimensions are Affected by the Rod Diameter

BORE	CYLINDER		A	B -.001 -.003	C	D	MM ROD DIA.	RD*	T (THREAD)			V	W	XS	Y	ZB	PSI RATING†
	ROD DIA. CODE	ROD DIA.							SMALL MALE SM	INTER- MEDIATE MALE IM	SHORT FEMALE SF						
1.50	D	.62	.75	1.125	.38	.50	.62	-	44-20	50-20	44-20	25	.62	1.38	2.00	5.94	3000
	F	1.00	1.12	1.500	.50	.88	1.00	-	75-16	88-14	75-16	50	1.00	1.75	2.38	6.31	3000
2.00	F	1.00	1.12	1.500	.50	.88	1.00	-	75-16	88-14	75-16	25	.75	1.88	2.38	6.44	3000
	G	1.38	1.62	2.000	.62	1.12	1.38	-	1.00-14	1.25-12	1.00-14	38	1.00	2.12	2.62	6.69	3000
2.50	F	1.00	1.12	1.500	.50	.88	1.00	-	.75-16	88-14	75-16	25	.75	2.06	2.38	6.56	3000
	G	1.38	1.62	2.000	.62	1.12	1.38	-	1.00-14	1.25-12	1.00-14	38	1.00	2.31	2.62	6.81	3000
	H	1.75	2.00	2.375	.75	1.50	1.75	-	1.25-12	1.50-12	1.25-12	.50	1.25	2.56	2.88	7.06	3000
3.25	G	1.38	1.62	2.000	.62	1.12	1.38	3.50	1.00-14	1.25-12	1.00-14	25	.88	2.31	2.75	7.69	3000
	H	1.75	2.00	2.375	.75	1.50	1.75	3.50	1.25-12	1.50-12	1.25-12	.38	1.12	2.56	3.00	7.94	3000
	J	2.00	2.25	2.625	.88	1.69	2.00	3.88	1.50-12	1.75-12	1.50-12	.38	1.25	2.69	3.12	8.06	3000
4.00	H	1.75	2.00	2.375	.75	1.50	1.75	3.50	1.25-12	1.50-12	1.25-12	25	1.00	2.75	3.00	8.19	3000
	J	2.00	2.25	2.625	.88	1.69	2.00	4.25	1.50-12	1.75-12	1.50-12	25	1.12	2.88	3.12	8.31	3000
	K	2.50	3.00	3.125	1.00	2.06	2.50	4.25	1.88-12	2.25-12	1.88-12	38	1.38	3.12	3.38	8.56	3000
5.00	J	2.00	2.25	2.625	.88	1.69	2.00	4.25	1.50-12	1.75-12	1.50-12	25	1.12	2.88	3.12	9.00	3000
	K	2.50	3.00	3.125	1.00	2.06	2.50	4.25	1.88-12	2.25-12	1.88-12	38	1.38	3.12	3.38	9.25	3000
	L	3.00	3.50	3.750	1.00	2.62	3.00	5.62	2.25-12	2.75-12	2.25-12	38	1.38	3.12	3.38	9.25	3000
6.00	M	3.50	4.00	4.250	1.00	3.00	3.50	5.62	2.50-12	3.00-12	2.50-12	38	1.38	3.12	3.38	9.25	3000
	K	2.50	3.00	3.125	1.00	2.06	2.50	4.25	1.88-12	2.25-12	1.88-12	38	1.38	3.12	3.38	9.25	3000
	L	3.00	3.50	3.750	1.00	2.62	3.00	5.62	2.25-12	2.75-12	2.25-12	38	1.38	3.12	3.38	9.25	3000
7.00	M	3.50	4.00	4.250	1.00	3.00	3.50	5.62	2.50-12	3.00-12	2.50-12	38	1.38	3.12	3.38	9.25	3000
	N	4.00	4.00	4.750	1.00	3.38	4.00	6.38	3.00-12	3.75-12	3.00-12	25	1.25	3.62	3.81	11.75	3000
	P	4.50	4.50	5.250	1.00	3.88	4.50	7.50	3.25-12	4.25-12	3.25-12	25	1.25	3.62	3.81	11.75	3000
	R	5.00	5.00	5.750	1.00	4.25	5.00	7.50	3.50-12	4.75-12	3.50-12	25	1.25	3.62	3.81	11.75	3000
8.00	M	3.50	4.00	4.250	1.00	3.00	3.50	6.38	2.50-12	3.25-12	2.50-12	25	1.25	3.62	3.94	12.81	3000
	N	4.00	4.00	4.750	1.00	3.38	4.00	6.38	3.00-12	3.75-12	3.00-12	25	1.25	3.62	3.94	12.81	3000
	P	4.50	4.50	5.250	1.00	3.88	4.50	8.00	3.25-12	4.25-12	3.25-12	25	1.25	3.62	3.94	12.81	3000
	S	5.50	5.50	6.250	1.00	4.62	5.50	8.00	4.00-12	5.25-12	4.00-12	25	1.25	3.62	3.94	12.81	3000

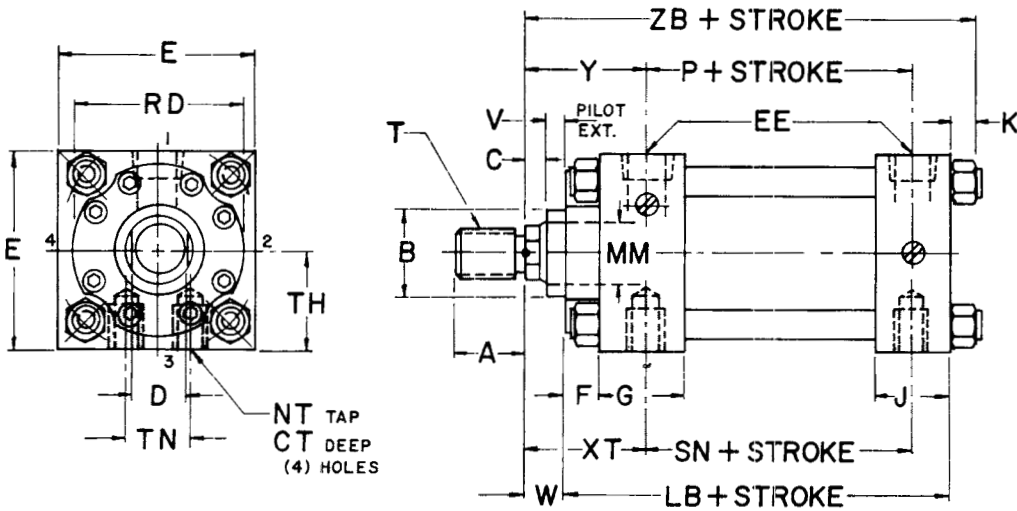
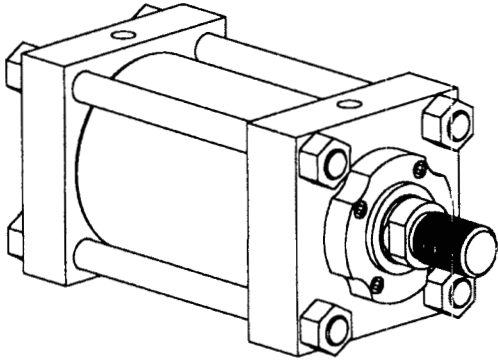
* Where RD is not shown, square retainer is used. See RETAINER PLATE CONSTRUCTION in INSTALLATION, OPERATION AND MAINTENANCE DATA section.

† CAUTION: PSI ratings shown are HANNA recommended maximum operating pressures. Check STROKE LIMITATION DATA in TECHNICAL INFORMATION section which may reduce maximum operating pressure. Check STOP TUBE DATA (TECHNICAL INFORMATION section) to determine if stop tube is required.

NOTE: Dimensions are nominal except where specifically toleranced. Tolerances on "Plus Stroke" dimensions will vary slightly from dimensions shown due to manufacturing tolerances and tube compression.



SERIES 2H 1.50"-8.00" Bores MS4 Side Tapped Mount



NOTE: For high loads, thrust key is recommended

These Dimensions are Constant Regardless of Rod Diameter

BORE	E	TH -.006 -.008	EE		F	G	J	K	LB	NT	P	SN	TN ±.010
			SAE STRAIGHT THREAD	NPTF**									
1.50	2.50	1.250	#8 (750-16)	1/2	38	1.75	1.50	31	5.00	38-16	2.88	2.88	.75
2.00	3.00	1.500	#8 (750-16)	1/2	62	1.75	1.50	44	5.25	50-13	2.88	2.88	.94
2.50	3.50	1.750	#8 (750-16)	1/2	62	1.75	1.50	44	5.38	62-11	3.00	3.00	1.31
3.25	4.50	2.250	#12 (1 062-12)	3/4	75	2.00	1.75	56	6.25	75-10	3.50	3.50	1.50
4.00	5.00	2.500	#12 (1 062-12)	3/4	88	2.00	1.75	56	6.62	100-8	3.75	3.75	2.06
5.00	6.50	3.250	#12 (1 062-12)	3/4	88	2.00	1.75	75	7.12	100-8	4.25	4.25	2.94
6.00	7.50	3.750	#16 (1 312-12)	1	1 00*	2.25	2.25	88	8.38*	125-7	4.88	5.12	3.31
7.00	8.50	4.250	#20 (1 625-12)	1 1/4	1 00	2.75	2.75	1 00	9.50	150-6	5.38	5.88	3.75
8.00	9.50	4.750	#24 (1.875-12)	1 1/2	1 00	3.00	3.00	1 06	10.50	150-5	6.12	6.62	4.25

* With (K) Rod F = .88, LB = 8.25 ** NPTF ports will be furnished as standard unless SAE straight thread ports are specified

MS4

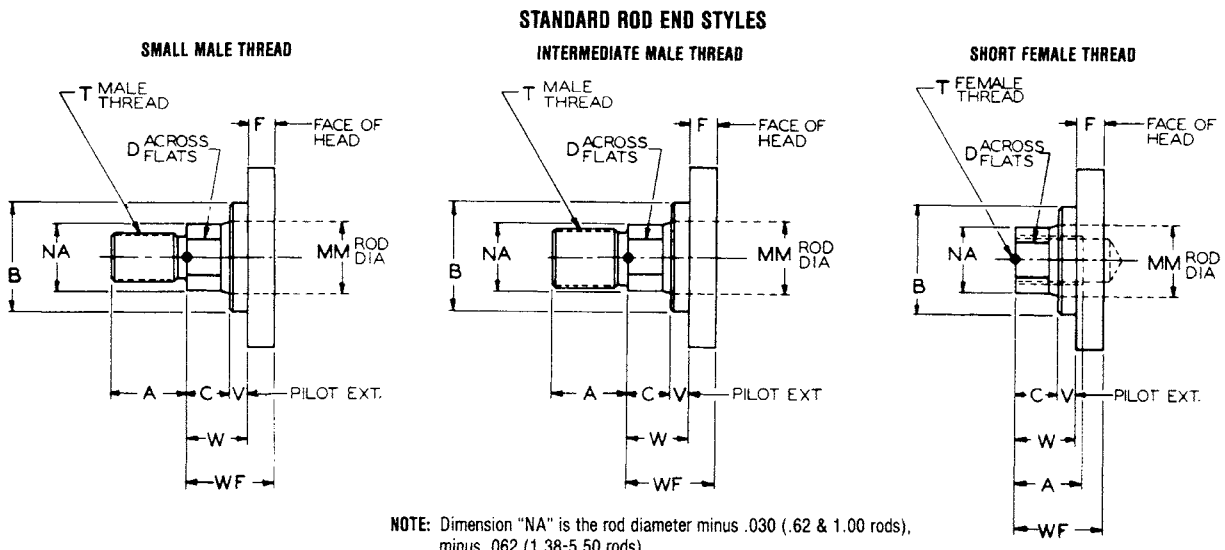
Dimensions are Affected by the Rod Diameter

CYLINDER			A	B -.001 -.003	C	D	MM ROD DIA.	RD*	T (THREAD)			V	W	CT	XT	Y	ZB	PSI RATING†
BORE	ROD DIA. CODE	ROD DIA.							SMALL MALE SM	INTER- MEDIATE MALE IM	SHORT FEMALE SF							
1.50	D	.62	.75	1.125	.38	.50	.62	-	44-20	50-20	44-20	.25	.62	.56	2.00	2.00	5.94	3000
	F	1.00	1.12	1.500	.50	.88	1.00	-	75-16	88-14	75-16	.50	1.00	.44	2.38	2.38	6.31	3000
2.00	F	1.00	1.12	1.500	.50	.88	1.00	-	75-16	88-14	75-16	.25	.75	.62	2.38	2.38	6.44	3000
	G	1.38	1.62	2.000	.62	1.12	1.38	-	1.00-14	1.25-12	1.00-14	.38	1.00	.44	2.62	2.62	6.69	3000
2.50	F	1.00	1.12	1.500	.50	.88	1.00	-	75-16	88-14	75-16	.25	.75	.69	2.38	2.38	6.56	3000
	G	1.38	1.62	2.000	.62	1.12	1.38	-	1.00-14	1.25-12	1.00-14	.38	1.00	.44	2.62	2.62	6.81	3000
	H	1.75	2.00	2.375	.75	1.50	1.75	-	1.25-12	1.50-12	1.25-12	.50	1.25	.44	2.88	2.88	7.06	3000
3.25	G	1.38	1.62	2.000	.62	1.12	1.38	3.50	1.00-14	1.25-12	1.00-14	.25	.88	.81	2.75	2.75	7.69	3000
	H	1.75	2.00	2.375	.75	1.50	1.75	3.50	1.25-12	1.50-12	1.25-12	.38	1.12	.81	3.00	3.00	7.94	3000
	J	2.00	2.25	2.625	.88	1.69	2.00	3.88	1.50-12	1.75-12	1.50-12	.38	1.25	.75	3.12	3.12	8.06	3000
4.00	H	1.75	2.00	2.375	.75	1.50	1.75	3.50	1.25-12	1.50-12	1.25-12	.25	1.00	.88	3.00	3.00	8.19	3000
	J	2.00	2.25	2.625	.88	1.69	2.00	4.25	1.50-12	1.75-12	1.50-12	.25	1.12	.75	3.12	3.12	8.31	3000
	K	2.50	3.00	3.125	1.00	2.06	2.50	4.25	1.88-12	2.25-12	1.88-12	.38	1.38	.75	3.38	3.38	8.56	3000
5.00	J	2.00	2.25	2.625	.88	1.69	2.00	4.25	1.50-12	1.75-12	1.50-12	.25	1.12	1.31	3.12	3.12	9.00	3000
	K	2.50	3.00	3.125	1.00	2.06	2.50	4.25	1.88-12	2.25-12	1.88-12	.38	1.38	1.31	3.38	3.38	9.25	3000
	L	3.00	3.50	3.750	1.00	2.62	3.00	5.62	2.25-12	2.75-12	2.25-12	.38	1.38	.81	3.38	3.38	9.25	3000
	M	3.50	3.50	4.250	1.00	3.00	3.50	5.62	2.50-12	3.25-12	2.50-12	.38	1.38	.81	3.38	3.38	9.25	3000
6.00	K	2.50	3.00	3.125	1.00	2.06	2.50	4.25	1.88-12	2.25-12	1.88-12	.38	1.38	1.75	3.50	3.50	10.50	3000
	L	3.00	3.50	3.750	1.00	2.62	3.00	6.38	2.25-12	2.75-12	2.25-12	.25	1.25	.75	3.50	3.50	10.50	3000
	M	3.50	3.50	4.250	1.00	3.00	3.50	6.38	2.50-12	3.25-12	2.50-12	.25	1.25	.94	3.50	3.50	10.50	3000
	N	4.00	4.00	4.750	1.00	3.38	4.00	6.38	3.00-12	3.75-12	3.00-12	.25	1.25	.94	3.50	3.50	10.50	3000
7.00	L	3.00	3.50	3.750	1.00	2.62	3.00	6.38	2.25-12	2.75-12	2.25-12	.25	1.25	1.38	3.81	3.81	11.75	3000
	M	3.50	3.50	4.250	1.00	3.00	3.50	6.38	2.50-12	3.25-12	2.50-12	.25	1.25	1.38	3.81	3.81	11.75	3000
	N	4.00	4.00	4.750	1.00	3.38	4.00	6.38	3.00-12	3.75-12	3.00-12	.25	1.25	1.38	3.81	3.81	11.75	3000
	P	4.50	4.50	5.250	1.00	3.88	4.50	7.50	3.25-12	4.25-12	3.25-12	.25	1.25	.88	3.81	3.81	11.75	3000
8.00	R	5.00	5.00	5.750	1.00	4.25	5.00	7.50	3.50-12	4.75-12	3.50-12	.25	1.25	.88	3.81	3.81	11.75	3000
	M	3.50	3.50	4.250	1.00	3.00	3.50	6.38	2.50-12	3.25-12	2.50-12	.25	1.25	2.00	3.94	3.94	12.81	3000
	N	4.00	4.00	4.750	1.00	3.38	4.00	6.38	3.00-12	3.75-12	3.00-12	.25	1.25	2.00	3.94	3.94	12.81	3000
	P	4.50	4.50	5.250	1.00	3.88	4.50	8.00	3.25-12	4.25-12	3.25-12	.25	1.25	1.38	3.94	3.94	12.81	3000
8.00	R	5.00	5.00	5.750	1.00	4.25	5.00	8.00	3.50-12	4.75-12	3.50-12	.25	1.25	1.38	3.94	3.94	12.81	3000
	S	5.50	5.50	6.250	1.00	4.62	5.50	8.00	4.00-12	5.25-12	4.00-12	.25	1.25	1.38	3.94	3.94	12.81	3000

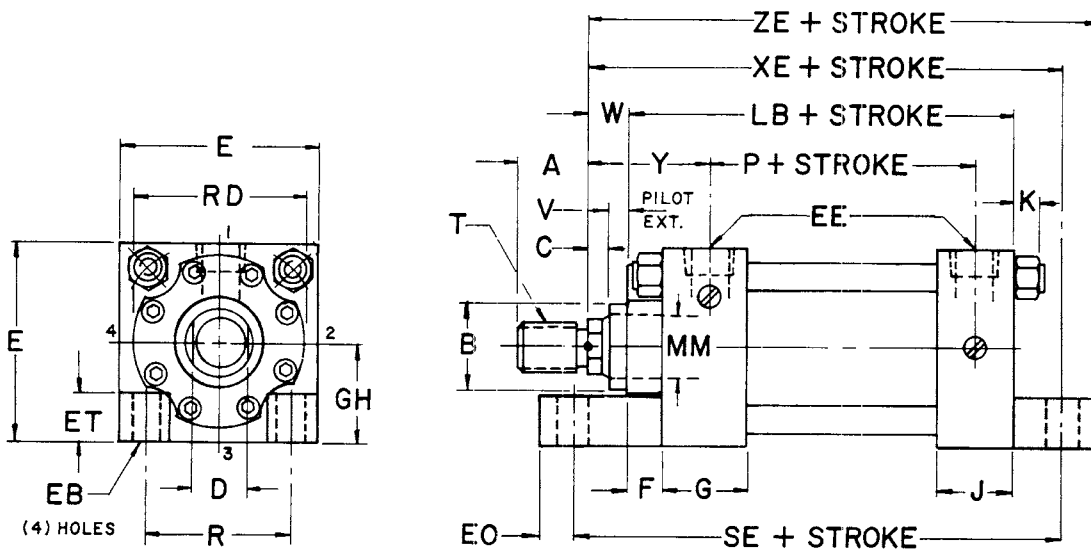
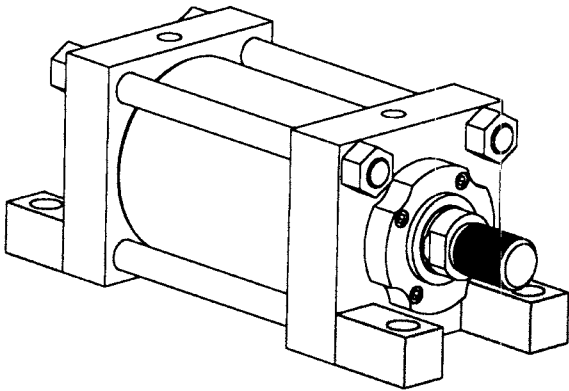
* Where RD is not shown, square retainer is used. See RETAINER PLATE CONSTRUCTION in INSTALLATION, OPERATION AND MAINTENANCE DATA section.

† CAUTION: PSI ratings shown are HANNA recommended maximum operating pressures. Check STROKE LIMITATION DATA in TECHNICAL INFORMATION section which may reduce maximum operating pressure. Check STOP TUBE DATA (TECHNICAL INFORMATION section) to determine if stop tube is required.

NOTE: Dimensions are nominal except where specifically tolerated. Tolerances on "Plus Stroke" dimensions will vary slightly from dimensions shown due to manufacturing tolerances and tube compression.



SERIES 2H 1.50"-8.00" Bores MS7 End Lug Mount



NOTE Lug mounted cylinders should be fastened at one end by using fitted bolts, a thrust key or by dowel pins. This will eliminate the tendency of the cylinder to shift when pushing or pulling.

These Dimensions are Constant Regardless of Rod Diameter

BORE	E	GH -.006 -.008	EB	EE		EO	ET	F	G	J	K	LB	P	R ±.010	SE
				SAE STRAIGHT THREAD	NPTF**										
1.50	2.50	1.250	.44	#8 (1.750-16)	1/2	.38	.88	.38	1.75	1.50	.31	5.00	2.88	1.63	6.75
2.00	3.00	1.500	.56	#8 (1.750-16)	1/2	.50	.94	.62	1.75	1.50	.44	5.25	2.88	2.05	7.12
2.50	3.50	1.750	.56	#8 (1.750-16)	1/2	.50	.94	.62	1.75	1.50	.44	5.38	3.00	2.55	7.25
3.25	4.50	2.250	.69	#12 (1.062-12)	3/4	.62	1.25	.75	2.00	1.75	.56	6.25	3.50	3.25	8.50
4.00	5.00	2.500	.69	#12 (1.062-12)	3/4	.62	1.19	.88	2.00	1.75	.56	6.62	3.75	3.82	8.88
5.00	6.50	3.250	.94	#12 (1.062-12)	3/4	.88	1.50	.88	2.00	1.75	.75	7.12	4.25	4.95	10.12
6.00	7.50	3.750	1.06	#16 (1.312-12)	1	1.00	1.75	1.00*	2.25	2.25	.88	8.38*	4.88	5.73	11.75
7.00	8.50	4.250	1.19	#20 (1.625-12)	1 1/4	1.12	1.88	1.00	2.75	2.75	1.00	9.50	5.38	6.58	13.12
8.00	9.50	4.750	1.31	#24 (1.875-12)	1 1/2	1.25	2.00	1.00	3.00	3.00	1.06	10.50	6.12	7.50	14.50

CAUTION Check for interference between rod attachment and mounting lug

Specify longer than standard "C" dimension if necessary

* With (K) Rod F = 88, LB = 8.25

** NPTF ports will be furnished as standard unless SAE straight thread ports are specified.

MS7

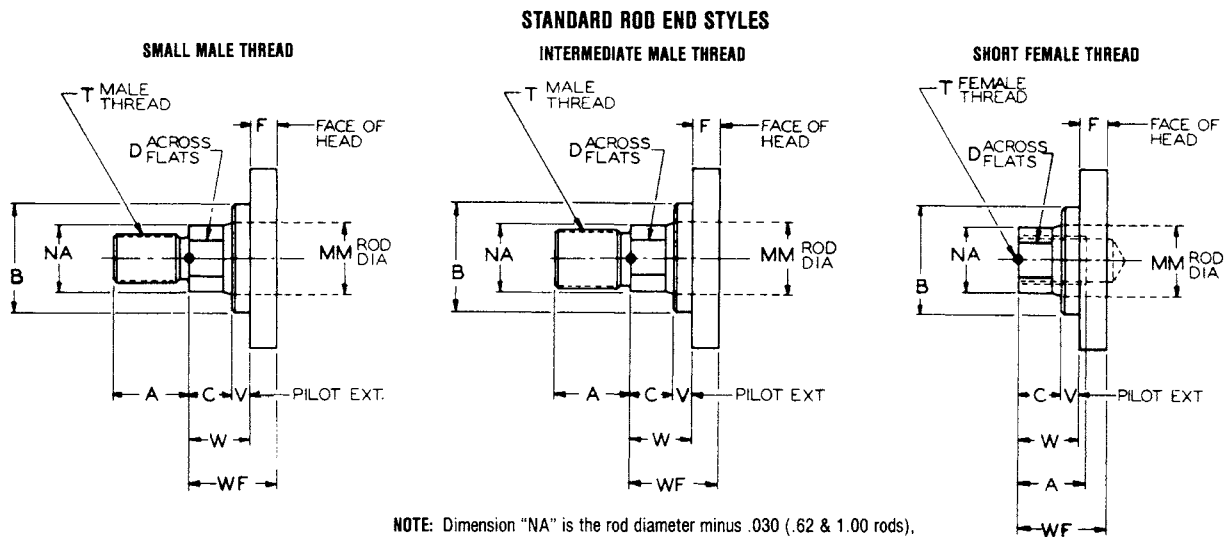
Dimensions are Affected by the Rod Diameter

CYLINDER			A	B -.001 -.003	C	D	MM ROD DIA.	ROD*	T (THREAD)			V	W	XE	Y	ZE	PSI RATING†
BORE	ROD DIA. CODE	ROD DIA.							SMALL MALE SM	INTER- MEDIATE MALE IM	SHORT FEMALE SF						
1.50	D	.62	.75	1.125	.38	50	.62	-	.44-20	50-20	.44-20	.25	.62	6.50	2.00	6.88	3000
	F	1.00	1.12	1.500	50	88	1.00	-	75-16	.88-14	75-16	50	1.00	6.88	2.38	7.25	3000
2.00	F	1.00	1.12	1.500	50	88	1.00	-	.75-16	.88-14	.75-16	.25	.75	6.94	2.38	7.44	3000
	G	1.38	1.62	2.000	62	1.12	1.38	-	1.00-14	1.25-12	1.00-14	.38	1.00	7.19	2.62	7.69	3000
2.50	F	1.00	1.12	1.500	50	88	1.00	-	.75-16	.88-14	.75-16	.25	.75	7.06	2.38	7.56	3000
	G	1.38	1.62	2.000	62	1.12	1.38	-	1.00-14	1.25-12	1.00-14	.38	1.00	7.31	2.62	7.81	3000
	H	1.75	2.00	2.375	75	1.50	1.75	-	1.25-12	1.50-12	1.25-12	.50	1.25	7.56	2.88	8.06	3000
3.25	G	1.38	1.62	2.000	.62	1.12	1.38	3.50	1.00-14	1.25-12	1.00-14	.25	.88	8.25	2.75	8.88	3000
	H	1.75	2.00	2.375	75	1.50	1.75	3.50	1.25-12	1.50-12	1.25-12	.38	1.12	8.50	3.00	9.12	3000
	J	2.00	2.25	2.625	.88	1.69	2.00	3.88	1.50-12	1.75-12	1.50-12	.38	1.25	8.62	3.12	9.25	3000
4.00	H	1.75	2.00	2.375	.75	1.50	1.75	3.50	1.25-12	1.50-12	1.25-12	.25	1.00	8.75	3.00	9.38	3000
	J	2.00	2.25	2.625	.88	1.69	2.00	4.25	1.50-12	1.75-12	1.50-12	.25	1.12	8.88	3.12	9.50	3000
	K	2.50	3.00	3.125	1.00	2.06	2.50	4.25	1.88-12	2.25-12	1.88-12	.38	1.38	9.12	3.38	9.75	3000
5.00	J	2.00	2.25	2.625	.88	1.69	2.00	4.25	1.50-12	1.75-12	1.50-12	.25	1.12	9.75	3.12	10.62	3000
	K	2.50	3.00	3.125	1.00	2.06	2.50	4.25	1.88-12	2.25-12	1.88-12	.38	1.38	10.00	3.38	10.88	3000
	L	3.00	3.50	3.750	1.00	2.62	3.00	5.62	2.25-12	2.75-12	2.25-12	.38	1.38	10.00	3.38	10.88	3000
	M	3.50	4.250	5.000	1.00	3.00	3.50	5.62	2.50-12	3.25-12	2.50-12	.38	1.38	10.00	3.38	10.88	3000
6.00	K	2.50	3.00	3.125	1.00	2.06	2.50	4.25	1.88-12	2.25-12	1.88-12	.38	1.38	11.31	3.50	12.31	3000
	L	3.00	3.50	3.750	1.00	2.62	3.00	6.38	2.25-12	2.75-12	2.25-12	.25	1.25	11.31	3.50	12.31	3000
	M	3.50	4.250	5.000	1.00	3.00	3.50	6.38	2.50-12	3.25-12	2.50-12	.25	1.25	11.31	3.50	12.31	3000
	N	4.00	4.750	5.500	1.00	3.38	4.00	6.38	3.00-12	3.75-12	3.00-12	.25	1.25	11.31	3.50	12.31	3000
7.00	L	3.00	3.50	3.750	1.00	2.62	3.00	6.38	2.25-12	2.75-12	2.25-12	.25	1.25	12.56	3.81	13.69	3000
	M	3.50	4.250	5.000	1.00	3.00	3.50	6.38	2.50-12	3.25-12	2.50-12	.25	1.25	12.56	3.81	13.69	3000
	N	4.00	4.750	5.500	1.00	3.38	4.00	6.38	3.00-12	3.75-12	3.00-12	.25	1.25	12.56	3.81	13.69	3000
	P	4.50	5.250	6.000	1.00	3.88	4.50	7.50	3.25-12	4.25-12	3.25-12	.25	1.25	12.56	3.81	13.69	3000
8.00	R	5.00	5.00	5.750	1.00	4.25	5.00	7.50	3.50-12	4.75-12	3.50-12	.25	1.25	12.56	3.81	13.69	3000
	M	3.50	3.50	4.250	1.00	3.00	3.50	6.38	2.50-12	3.25-12	2.50-12	.25	1.25	13.75	3.94	15.00	3000
	N	4.00	4.00	4.750	1.00	3.38	4.00	6.38	3.00-12	3.75-12	3.00-12	.25	1.25	13.75	3.94	15.00	3000
	P	4.50	4.50	5.250	1.00	3.88	4.50	8.00	3.25-12	4.25-12	3.25-12	.25	1.25	13.75	3.94	15.00	3000
8.00	R	5.00	5.00	5.750	1.00	4.25	5.00	8.00	3.50-12	4.75-12	3.50-12	.25	1.25	13.75	3.94	15.00	3000
	S	5.50	5.50	6.250	1.00	4.62	5.50	8.00	4.00-12	5.25-12	4.00-12	.25	1.25	13.75	3.94	15.00	3000

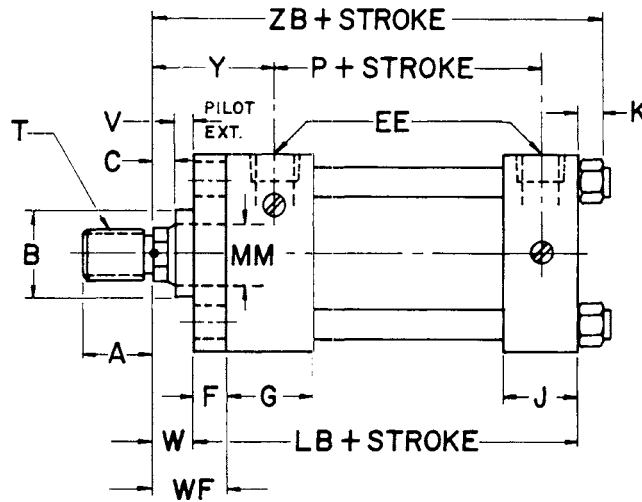
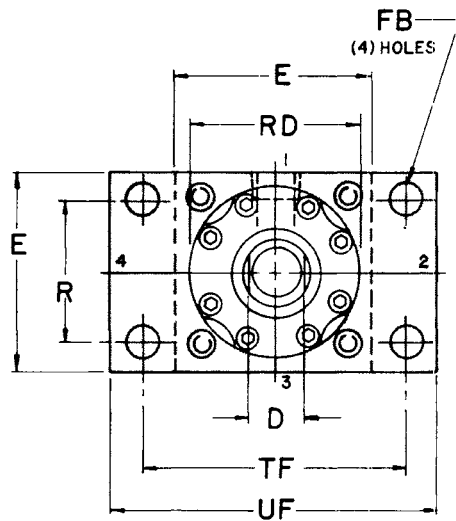
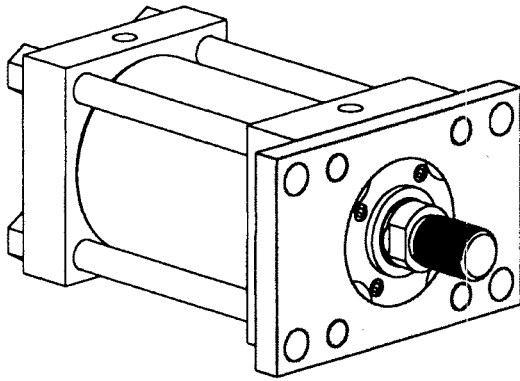
* Where RD is not shown, square retainer is used. See RETAINER PLATE CONSTRUCTION in INSTALLATION, OPERATION AND MAINTENANCE DATA section.

† CAUTION: PSI ratings shown are HANNA recommended maximum operating pressures. Check STROKE LIMITATION DATA in TECHNICAL INFORMATION section which may reduce maximum operating pressure. Check STOP TUBE DATA (TECHNICAL INFORMATION section) to determine if stop tube is required.

NOTE: Dimensions are nominal except where specifically tolerated. Tolerances on "Plus Stroke" dimensions will vary slightly from dimensions shown due to manufacturing tolerances and tube compression.



SERIES 2H 1.50"-8.00" Bores MF1 Head Rectangular Flange Mount



These Dimensions are Constant Regardless of Rod Diameter

BORE	E	EE		F	FB	G	J	K	LB	P	R ±.010	TF ±.010	UF
		SAE STRAIGHT THREAD	NPTF**										
1.50	2.50	#8 (750-16)	1/2	38	.438	1.75	1.50	31	5.00	2.88	1.63	3.43	4.25
2.00	3.00	#8 (750-16)	1/2	62	.562	1.75	1.50	.44	5.25	2.88	2.05	4.12	5.12
2.50	3.50	#8 (750-16)	1/2	62	.562	1.75	1.50	.44	5.38	3.00	2.55	4.62	5.62
3.25	4.50	#12 (1.062-12)	3/4	.75	.587	2.00	1.75	.56	6.25	3.50	3.25	5.88	7.12
4.00	5.00	#12 (1.062-12)	3/4	.88	.587	2.00	1.75	.56	6.62	3.75	3.82	6.38	7.62
5.00	6.50	#12 (1.062-12)	3/4	.88	.938	2.00	1.75	.75	7.12	4.25	4.95	8.19	9.75
6.00	7.50	#16 (1.312-12)	1	1.00	1.062	2.25	2.25	.88	8.38*	4.88	5.73	9.44	11.25
7.00	8.50	#20 (1.625-12)	1 1/4	1.00	1.187	2.75	2.75	1.00	9.50	5.38	6.58	10.62	12.62
8.00	9.50	#24 (1.875-12)	1 1/2	1.00	1.312	3.00	3.00	1.06	10.50	6.12	7.50	11.81	14.00

** NPTF ports will be furnished as standard unless SAE straight thread ports are specified

CAUTION: This mounting style has reduced pressure ratings depending on application mode. For pressures which exceed those shown in the following page dimensional chart, HANNA recommends the use of ME5 mounting style, shown on page 20.

MF1

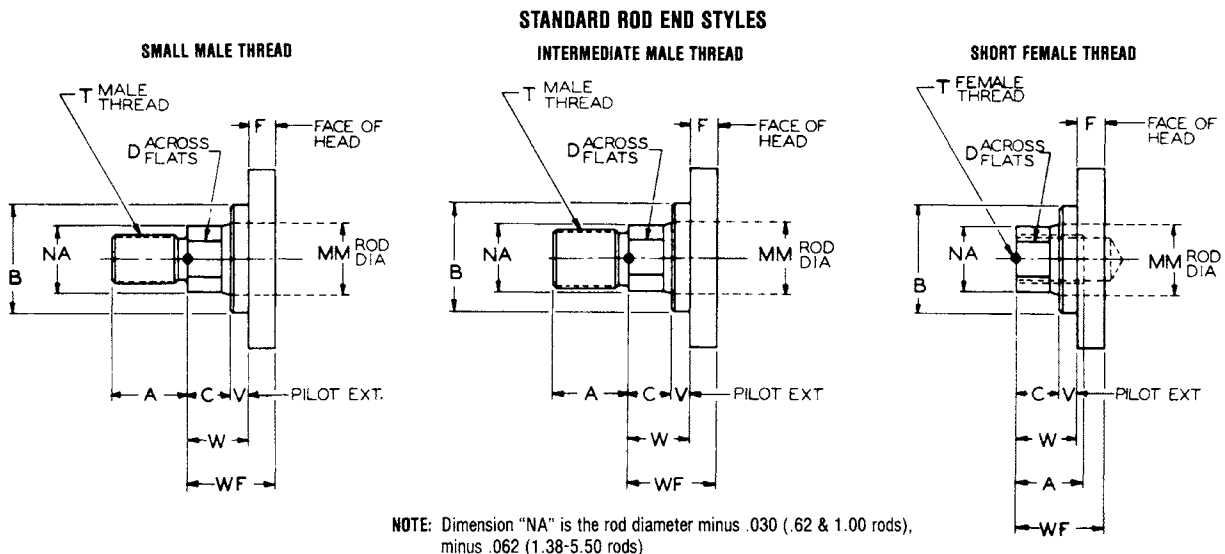
Dimensions are Affected by the Rod Diameter

BORE	CYLINDER		A	B -.001 -.003	C	D	MM ROD DIA.	RD	T (THREAD)			V	W	WF	Y	ZB	PSI RATING†
	ROD DIA. CODE	ROD DIA.							SMALL MALE SM	INTER- MEDIATE MALE IM	SHORT FEMALE SF						
1.50	D	.62	.75	1.125	.38	.50	.62	-	.44-20	.50-20	44-20	.25	.62	1.00	2.00	5.94	1300
	F	1.00	1.12	1.500	.50	.88	1.00	-	75-16	.88-14	75-16	.50	1.00	1.38	2.38	6.31	950
2.00	F	1.00	1.12	1.500	.50	.88	1.00	-	.75-16	.88-14	.75-16	.25	.75	1.38	2.38	6.44	1950
	G	1.38	1.62	2.000	.62	1.12	1.38	-	1.00-14	1.25-12	1.00-14	.38	1.00	1.62	2.62	6.69	1300
2.50	F	1.00	1.12	1.500	.50	.88	1.00	-	.75-16	.88-14	.75-16	.25	.75	1.38	2.38	6.56	1650
	G	1.38	1.62	2.000	.62	1.12	1.38	-	1.00-14	1.25-12	1.00-14	.38	1.00	1.62	2.62	6.81	1250
	H	1.75	2.00	2.375	.75	1.50	1.75	-	1.25-12	1.50-12	1.25-12	.50	1.25	1.88	2.88	7.06	925
3.25	G	1.38	1.62	2.000	.62	1.12	1.38	-	1.00-14	1.25-12	1.00-14	.25	.88	1.62	2.75	7.69	1375
	H	1.75	2.00	2.375	.75	1.50	1.75	-	1.25-12	1.50-12	1.25-12	.38	1.12	1.88	3.00	7.94	1175
	J	2.00	2.25	2.625	.88	1.69	2.00	-	1.50-12	1.75-12	1.50-12	.38	1.25	2.00	3.12	8.06	1050
4.00	H	1.75	2.00	2.375	.75	1.50	1.75	-	1.25-12	1.50-12	1.25-12	.25	1.00	1.88	3.00	8.19	1350
	J	2.00	2.25	2.625	.88	1.69	2.00	-	1.50-12	1.75-12	1.50-12	.25	1.12	2.00	3.12	8.31	1200
	K	2.50	3.00	3.125	1.00	2.06	2.50	-	1.88-12	2.25-12	1.88-12	.38	1.38	2.25	3.38	8.56	950
5.00	J	2.00	2.25	2.625	.88	1.69	2.00	-	1.50-12	1.75-12	1.50-12	.25	1.12	2.00	3.12	9.00	1000
	K	2.50	3.00	3.125	1.00	2.06	2.50	-	1.88-12	2.25-12	1.88-12	.38	1.38	2.25	3.38	9.25	850
	L	3.00	3.50	3.750	1.00	2.62	3.00	5.62	2.25-12	2.75-12	2.25-12	.38	1.38	2.25	3.38	9.25	250
6.00	M	3.50	4.00	4.250	1.00	3.00	3.50	5.62	2.50-12	3.25-12	2.50-12	.38	1.38	2.25	3.38	9.25	250
	N	4.00	4.50	4.750	1.00	3.38	4.00	6.38	3.00-12	3.75-12	3.00-12	.25	1.25	2.25	3.50	10.50	250
	O	4.50	5.00	5.250	1.00	3.75	4.50	7.14	3.50-12	4.25-12	3.50-12	.25	1.25	2.25	3.50	10.50	250
7.00	K	2.50	3.00	3.125	1.00	2.06	2.50	-	1.88-12	2.25-12	1.88-12	.25	1.25	2.25	3.50	10.50	900
	L	3.00	3.50	3.750	1.00	2.62	3.00	6.38	2.25-12	2.75-12	2.25-12	.25	1.25	2.25	3.50	10.50	250
	M	3.50	4.00	4.250	1.00	3.00	3.50	6.38	2.50-12	3.25-12	2.50-12	.25	1.25	2.25	3.50	10.50	250
	N	4.00	4.50	4.750	1.00	3.38	4.00	6.38	3.00-12	3.75-12	3.00-12	.25	1.25	2.25	3.50	10.50	250
7.00	P	4.50	5.00	5.250	1.00	3.88	4.50	7.50	3.25-12	4.25-12	3.25-12	.25	1.25	2.25	3.81	11.75	150
	Q	5.00	5.50	5.750	1.00	4.25	5.00	7.50	3.50-12	4.75-12	3.50-12	.25	1.25	2.25	3.81	11.75	150
	R	5.50	6.00	6.250	1.00	4.62	5.50	8.00	4.00-12	5.25-12	4.00-12	.25	1.25	2.25	3.94	12.81	125
8.00	M	3.50	4.00	4.250	1.00	3.00	3.50	6.38	2.50-12	3.25-12	2.50-12	.25	1.25	2.25	3.94	12.81	275
	N	4.00	4.50	4.750	1.00	3.38	4.00	6.38	3.00-12	3.75-12	3.00-12	.25	1.25	2.25	3.94	12.81	275
	P	4.50	5.00	5.250	1.00	3.88	4.50	8.00	3.25-12	4.25-12	3.25-12	.25	1.25	2.25	3.94	12.81	125
	Q	5.00	5.50	5.750	1.00	4.25	5.00	8.00	3.50-12	4.75-12	3.50-12	.25	1.25	2.25	3.94	12.81	125
8.00	R	5.50	6.00	6.250	1.00	4.62	5.50	8.00	4.00-12	5.25-12	4.00-12	.25	1.25	2.25	3.94	12.81	125
	S	6.00	6.50	6.750	1.00	5.00	6.00	8.00	4.50-12	5.75-12	4.50-12	.25	1.25	2.25	3.94	12.81	125

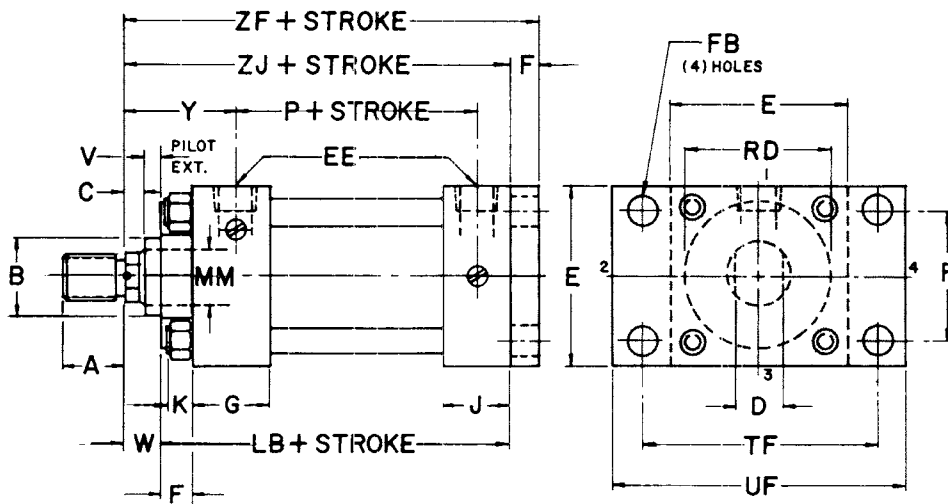
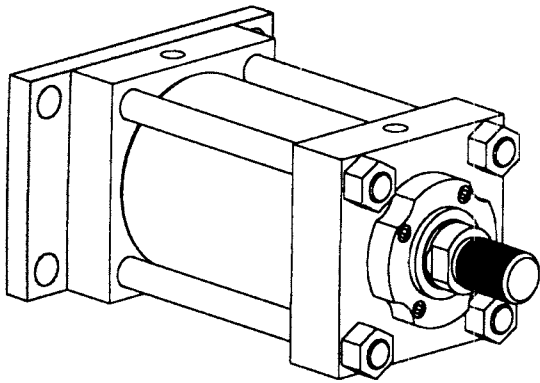
* Where RD is not shown, square retainer is used. See RETAINER PLATE CONSTRUCTION in INSTALLATION, OPERATION AND MAINTENANCE DATA section.

† CAUTION: PSI ratings shown are HANNA recommended maximum operating pressures. Check STROKE LIMITATION DATA in TECHNICAL INFORMATION section which may reduce maximum operating pressure. Check STOP TUBE DATA (TECHNICAL INFORMATION section) to determine if stop tube is required.

NOTE: Dimensions are nominal except where specifically toleranced. Tolerances on "Plus Stroke" dimensions will vary slightly from dimensions shown due to manufacturing tolerances and tube compression.



SERIES 2H 1.50"-8.00" Bores MF2 Cap Rectangular Flange Mount



These Dimensions are Constant Regardless of Rod Diameter

BORE	E	EE		F	FB	G	J	K	LB	P	R ±.010	TF ±.010	UF
		SAE STRAIGHT THREAD	NPTF**										
1.50	2.50	#8 (.750-16)	1/2	.38	.438	1.75	1.50	.31	5.00	2.88	1.63	3.43	4.25
2.00	3.00	#8 (.750-16)	1/2	.62	.562	1.75	1.50	.44	5.25	2.88	2.05	4.12	5.12
2.50	3.50	#8 (.750-16)	1/2	.62	.562	1.75	1.50	.44	5.38	3.00	2.55	4.62	5.62
3.25	4.50	#12 (1.062-12)	3/4	.75	.687	2.00	1.75	.56	6.25	3.50	3.25	5.88	7.12
4.00	5.00	#12 (1.062-12)	3/4	.88	.687	2.00	1.75	.56	6.62	3.75	3.82	6.38	7.62
5.00	6.50	#12 (1.062-12)	3/4	.88	.938	2.00	1.75	.75	7.12	4.25	4.95	8.19	9.75
6.00	7.50	#16 (1.312-12)	1	1.00	1.062	2.25	2.25	.88	8.38*	4.88	5.73	9.44	11.25
7.00	8.50	#20 (1.625-12)	1 1/4	1.00	1.187	2.75	2.75	1.00	9.50	5.38	6.58	10.62	12.62
8.00	9.50	#24 (1.875-12)	1 1/2	1.00	1.312	3.00	3.00	1.06	10.50	6.12	7.50	11.81	14.00

* With (K) Rod F = .88, LB = 8.25 ** NPTF parts will be furnished as standard unless SAE straight thread ports are specified

CAUTION: This mounting style has reduced pressure ratings depending on application mode. For pressures which exceed those shown in the following page dimensional chart, HANNA recommends the use of ME6 mounting style, shown on page 22.

MF2

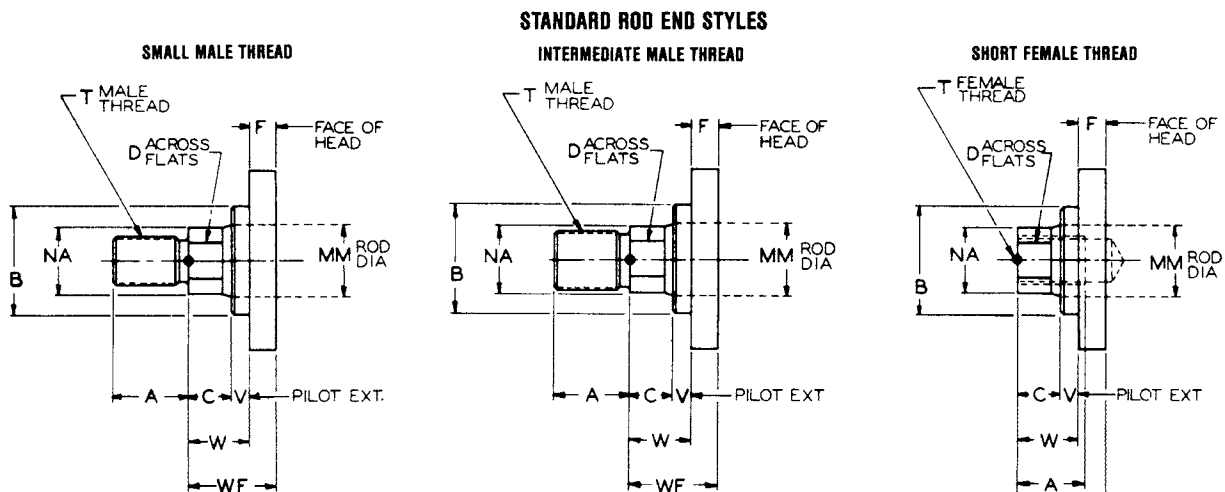
Dimensions are Affected by the Rod Diameter

CYLINDER			A	B -.001 -.003	C	D	MM ROD DIA.	RD*	T (THREAD)			V	W	Y	ZF	ZJ	PSI RATING†
BORE	ROD DIA. CODE	ROD DIA.							SMALL MALE SM	INTER- MEDIATE MALE IM	SHORT FEMALE SF						
1.50	D	.62	.75	1.125	.38	.50	.62	-	44-20	.50-20	44-20	.25	.62	2.00	6.00	5.62	1650
	F	1.00	1.12	1.500	.50	.88	1.00	-	75-16	.88-14	75-16	.50	1.00	2.38	6.38	6.00	1650
2.00	F	1.00	1.12	1.500	.50	.88	1.00	-	.75-16	.88-14	.75-16	.25	.75	2.38	6.62	6.00	2575
	G	1.38	1.62	2.000	.62	1.12	1.38	-	1.00-14	1.25-12	1.00-14	.38	1.00	2.62	6.88	6.25	2575
2.50	F	1.00	1.12	1.500	.50	.88	1.00	-	.75-16	.88-14	.75-16	.25	.75	2.38	6.75	6.12	2060
	G	1.38	1.62	2.000	.62	1.12	1.38	-	1.00-14	1.25-12	1.00-14	.38	1.00	2.62	7.00	6.38	2060
	H	1.75	2.00	2.375	.75	1.50	1.75	-	1.25-12	1.50-12	1.25-12	.50	1.25	2.88	7.25	6.62	2060
3.25	G	1.38	1.62	2.000	.62	1.12	1.38	3.50	1.00-14	1.25-12	1.00-14	.25	.88	2.75	7.88	7.12	1800
	H	1.75	2.00	2.375	.75	1.50	1.75	3.50	1.25-12	1.50-12	1.25-12	.38	1.12	3.00	8.12	7.38	1800
	J	2.00	2.25	2.625	.88	1.69	2.00	3.88	1.50-12	1.75-12	1.50-12	.38	1.25	3.12	8.25	7.50	1800
4.00	H	1.75	2.00	2.375	.75	1.50	1.75	3.50	1.25-12	1.50-12	1.25-12	.25	1.00	3.00	8.50	7.62	1650
	J	2.00	2.25	2.625	.88	1.69	2.00	4.25	1.50-12	1.75-12	1.50-12	.25	1.12	3.12	8.62	7.75	1650
	K	2.50	3.00	3.125	1.00	2.06	2.50	4.25	1.88-12	2.25-12	1.88-12	.38	1.38	3.38	8.88	8.00	1650
5.00	J	2.00	2.25	2.625	.88	1.69	2.00	4.25	1.50-12	1.75-12	1.50-12	.25	1.12	3.12	9.12	8.25	1220
	K	2.50	3.00	3.125	1.00	2.06	2.50	4.25	1.88-12	2.25-12	1.88-12	.38	1.38	3.38	9.38	8.50	1220
	L	3.00	3.50	3.750	1.00	2.62	3.00	5.62	2.25-12	2.75-12	2.25-12	.38	1.38	3.38	9.38	8.50	1220
	M	3.50	3.50	4.250	1.00	3.00	3.50	5.62	2.50-12	3.25-12	2.50-12	.38	1.38	3.38	9.38	8.50	1220
6.00	K	2.50	3.00	3.125	1.00	2.06	2.50	4.25	1.88-12	2.25-12	1.88-12	.38	1.38	3.50	10.62	9.62	1120
	L	3.00	3.50	3.750	1.00	2.62	3.00	6.38	2.25-12	2.75-12	2.25-12	.25	1.25	3.50	10.62	9.62	1120
	M	3.50	3.50	4.250	1.00	3.00	3.50	6.38	2.50-12	3.25-12	2.50-12	.25	1.25	3.50	10.62	9.62	1120
	N	4.00	4.00	4.750	1.00	3.38	4.00	6.38	3.00-12	3.75-12	3.00-12	.25	1.25	3.50	10.62	9.62	1120
7.00	L	3.00	3.50	3.750	1.00	2.62	3.00	6.38	2.25-12	2.75-12	2.25-12	.25	1.25	3.81	11.75	10.75	850
	M	3.50	3.50	4.250	1.00	3.00	3.50	6.38	2.50-12	3.25-12	2.50-12	.25	1.25	3.81	11.75	10.75	850
	N	4.00	4.00	4.750	1.00	3.38	4.00	6.38	3.00-12	3.75-12	3.00-12	.25	1.25	3.81	11.75	10.75	850
	P	4.50	4.50	5.250	1.00	3.88	4.50	7.50	3.25-12	4.25-12	3.25-12	.25	1.25	3.81	11.75	10.75	850
	R	5.00	5.00	5.750	1.00	4.25	5.00	7.50	3.50-12	4.75-12	3.50-12	.25	1.25	3.81	11.75	10.75	850
8.00	M	3.50	3.50	4.250	1.00	3.00	3.50	6.38	2.50-12	3.25-12	2.50-12	.25	1.25	3.94	12.75	11.75	600
	N	4.00	4.00	4.750	1.00	3.38	4.00	6.38	3.00-12	3.75-12	3.00-12	.25	1.25	3.94	12.75	11.75	600
	P	4.50	4.50	5.250	1.00	3.88	4.50	8.00	3.25-12	4.25-12	3.25-12	.25	1.25	3.94	12.75	11.75	600
	R	5.00	5.00	5.750	1.00	4.25	5.00	8.00	3.50-12	4.75-12	3.50-12	.25	1.25	3.94	12.75	11.75	600
	S	5.50	5.50	6.250	1.00	4.62	5.50	8.00	4.00-12	5.25-12	4.00-12	.25	1.25	3.94	12.75	11.75	600

* Where RD is not shown, square retainer is used. See RETAINER PLATE CONSTRUCTION in INSTALLATION, OPERATION AND MAINTENANCE DATA section.

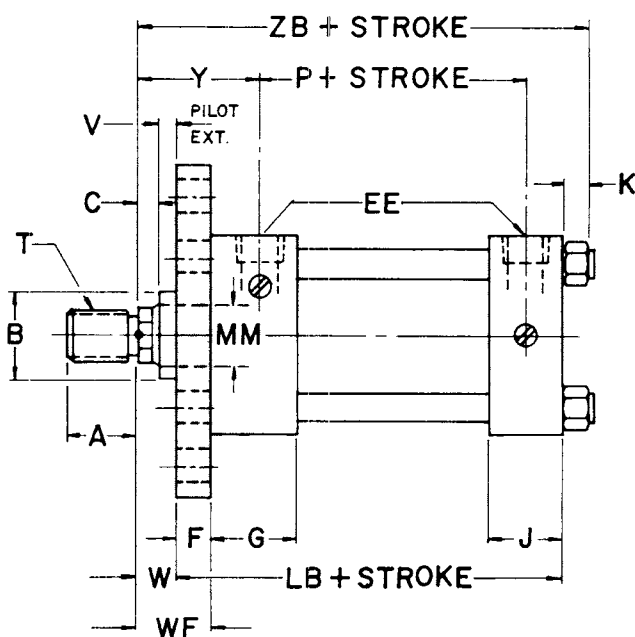
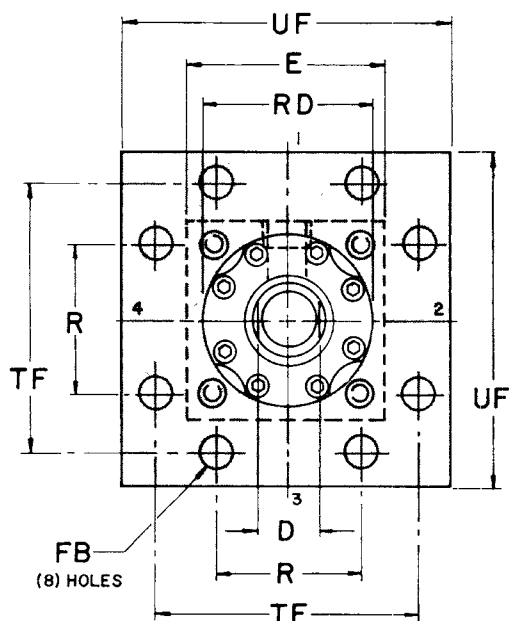
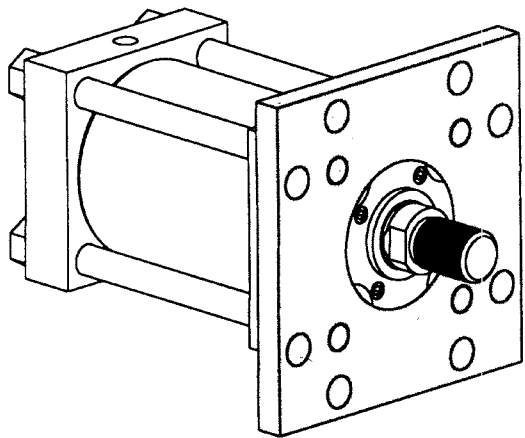
† **CAUTION:** PSI ratings shown are HANNA recommended maximum operating pressures. Check STROKE LIMITATION DATA in TECHNICAL INFORMATION section which may reduce maximum operating pressure. Check STOP TUBE DATA (TECHNICAL INFORMATION section) to determine if stop tube is required.

NOTE: Dimensions are nominal except where specifically tolerated. Tolerances on "Plus Stroke" dimensions will vary slightly from dimensions shown due to manufacturing tolerances and tube compression.



NOTE: Dimension "NA" is the rod diameter minus .030 (.62 & 1.00 rods), minus .062 (1.38-5.50 rods)

SERIES 2H 1.50"-8.00" Bores MF5 Head Square Flange Mount



These Dimensions are Constant Regardless of Rod Diameter

BORE	E	EE		F	FB	G	J	K	LB	P	R ±.010	TF ±.010	UF
		SAE STRAIGHT THREAD	NPTF**										
1.50	2.50	#8 (.750-16)	1/2	38	438	1.75	1.50	31	5.00	2.88	1.63	3.43	4.25
2.00	3.00	#8 (.750-16)	1/2	62	562	1.75	1.50	44	5.25	2.88	2.05	4.12	5.12
2.50	3.50	#8 (.750-16)	1/2	62	562	1.75	1.50	44	5.38	3.00	2.55	4.62	5.62
3.25	4.50	#12 (1.062-12)	3/4	75	687	2.00	1.75	56	6.25	3.50	3.25	5.88	7.12
4.00	5.00	#12 (1.062-12)	3/4	88	687	2.00	1.75	56	6.62	3.75	3.82	6.38	7.62
5.00	6.50	#12 (1.062-12)	3/4	88	938	2.00	1.75	75	7.12	4.25	4.95	8.19	9.75
6.00	7.50	#16 (1.312-12)	1	1.00	1.062	2.25	2.25	.88	8.38	4.88	5.73	9.44	11.25
7.00	8.50	#20 (1.625-12)	1 1/4	1.00	1.187	2.75	2.75	1.00	9.50	5.38	6.58	10.62	12.62
8.00	9.50	#24 (1.875-12)	1 1/2	1.00	1.312	3.00	3.00	1.06	10.50	6.12	7.50	11.81	14.00

** NPTF ports will be furnished as standard unless SAE straight thread ports are specified.

CAUTION: This mounting style has reduced pressure ratings depending on application mode. For pressures which exceed those shown in the following page dimensional chart, HANNA recommends the use of ME5 mounting style, shown on page 20.

MF5

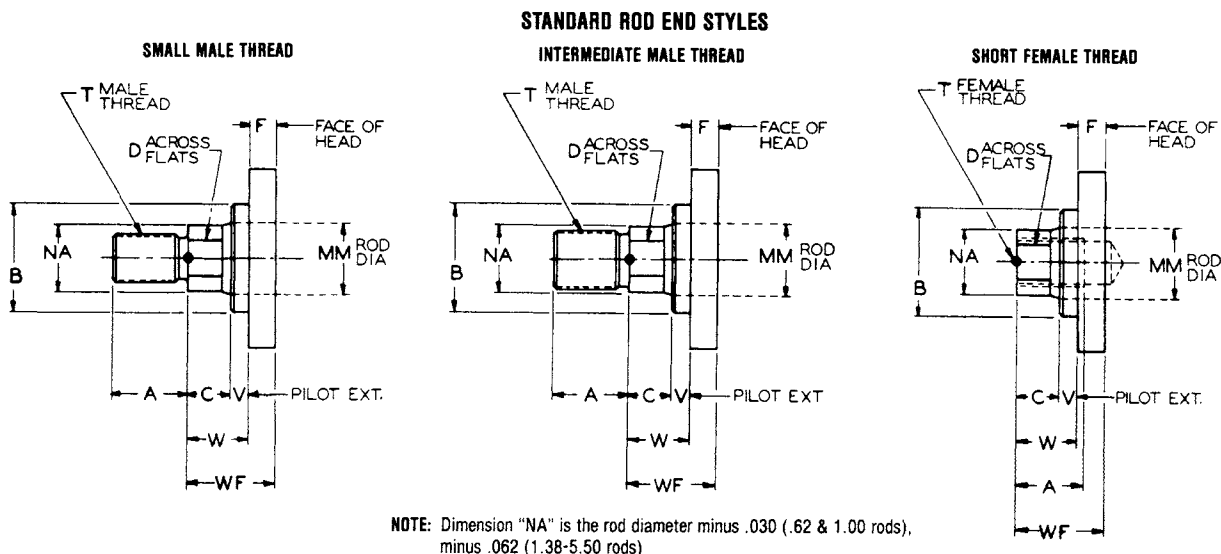
Dimensions are Affected by the Rod Diameter

CYLINDER			A	B -.001 -.003	C	D	MM ROD DIA.	RD	T (THREAD)			V	W	WF	Y	ZB	PSI RATING†
BORE	ROD DIA. CODE	ROD DIA.							SMALL MALE SM	INTER- MEDIATE MALE IM	SHORT FEMALE SF						
1.50	D	.62	.75	1.125	.38	.50	.62	-	.44-20	50-20	.44-20	.25	.62	1.00	2.00	5.94	2900
	F	1.00	1.12	1.500	.50	.88	1.00	-	75-16	88-14	.75-16	.50	1.00	1.38	2.38	6.31	2500
2.00	F	1.00	1.12	1.500	.50	.88	1.00	-	.75-16	88-14	.75-16	.25	.75	1.38	2.38	6.44	3000
	G	1.38	1.62	2.000	.62	1.12	1.38	-	1.00-14	1.25-12	1.00-14	.38	1.00	1.62	2.62	6.69	3000
2.50	F	1.00	1.12	1.500	.50	.88	1.00	-	.75-16	88-14	.75-16	.25	.75	1.38	2.38	6.56	3000
	G	1.38	1.62	2.000	.62	1.12	1.38	-	1.00-14	1.25-12	1.00-14	.38	1.00	1.62	2.62	6.81	3000
3.25	H	1.75	2.00	2.375	.75	1.50	1.75	-	1.25-12	1.50-12	1.25-12	.25	1.00	1.88	3.00	8.19	2650
	J	2.00	2.25	2.625	.88	1.69	2.00	-	1.50-12	1.75-12	1.50-12	.25	1.12	2.00	3.12	8.31	2550
4.00	K	2.50	3.00	3.125	1.00	2.06	2.50	-	1.88-12	2.25-12	1.88-12	.25	1.25	2.25	3.50	10.50	1650
	L	3.00	3.50	3.750	1.00	3.00	3.50	6.38	2.25-12	2.75-12	2.25-12	.25	1.25	2.25	3.50	10.50	1000
5.00	M	4.00	4.00	4.750	1.00	3.38	4.00	6.38	3.00-12	3.75-12	3.00-12	.25	1.25	2.25	3.50	10.50	1000
	N	4.50	4.50	5.250	1.00	3.88	4.50	7.50	3.25-12	4.25-12	3.25-12	.25	1.25	2.25	3.81	11.75	775
6.00	O	5.00	5.00	5.750	1.00	4.25	5.00	8.00	3.50-12	4.75-12	3.50-12	.25	1.25	2.25	3.81	11.75	775
	P	5.50	5.50	6.250	1.00	4.62	5.50	8.00	4.00-12	5.25-12	4.00-12	.25	1.25	2.25	3.94	12.81	650
7.00	Q	6.00	6.00	6.750	1.00	5.00	6.00	8.00	4.25-12	5.75-12	4.25-12	.25	1.25	2.25	3.94	12.81	650
	R	6.50	6.50	7.250	1.00	5.38	6.50	8.00	4.50-12	6.25-12	4.50-12	.25	1.25	2.25	3.94	12.81	500
8.00	S	7.00	7.00	7.750	1.00	5.75	7.00	8.00	4.75-12	6.75-12	4.75-12	.25	1.25	2.25	3.94	12.81	500
	T	7.50	7.50	8.250	1.00	6.12	7.50	8.00	5.00-12	7.25-12	5.00-12	.25	1.25	2.25	3.94	12.81	500

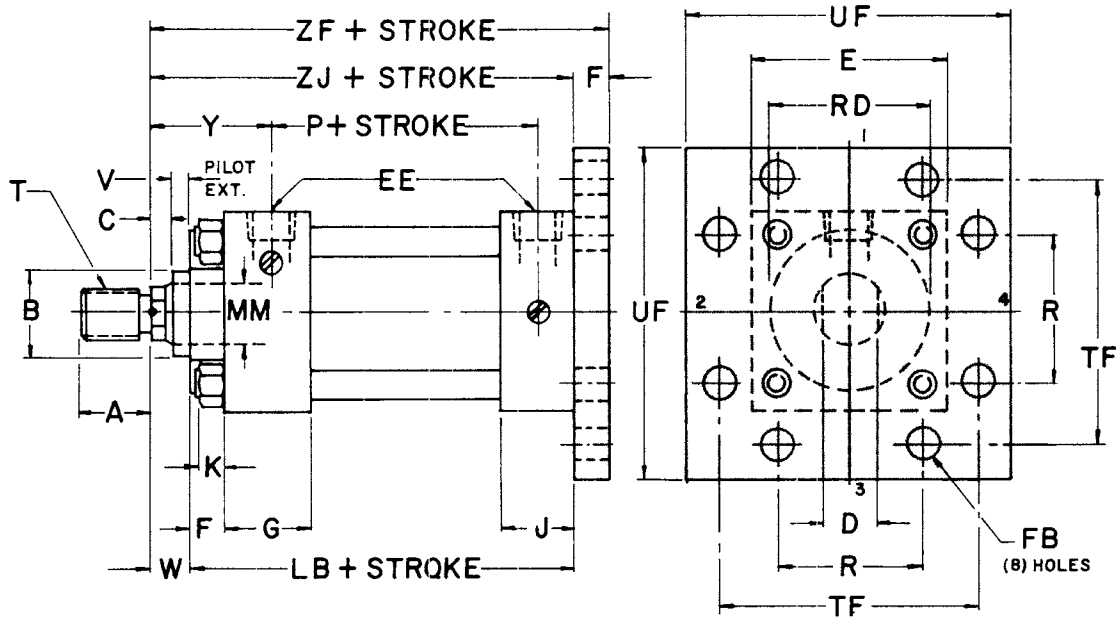
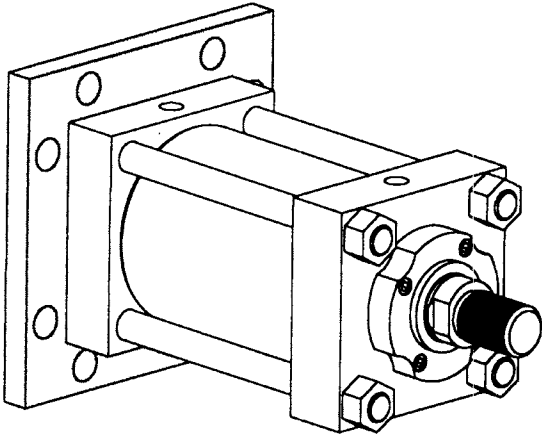
* Where RD is not shown, square retainer is used. See RETAINER PLATE CONSTRUCTION in INSTALLATION, OPERATION AND MAINTENANCE DATA section.

† CAUTION: PSI ratings shown are HANNA recommended maximum operating pressures. Check STROKE LIMITATION DATA in TECHNICAL INFORMATION section which may reduce maximum operating pressure. Check STOP TUBE DATA (TECHNICAL INFORMATION section) to determine if stop tube is required.

NOTE: Dimensions are nominal except where specifically toleranced. Tolerances on "Plus Stroke" dimensions will vary slightly from dimensions shown due to manufacturing tolerances and tube compression.



SERIES 2H 1.50"-8.00" Bores MF6 Cap Square Flange Mount



These Dimensions are Constant Regardless of Rod Diameter

BORE	E	EE		F	FB	G	J	K	LB	P	R ±.010	TF ±.010	UF
		SAE STRAIGHT THREAD	NPTF**										
1.50	2.50	#8 (750-16)	1/2	38	.438	1.75	1.50	31	5.00	2.88	1.63	3.43	4.25
2.00	3.00	#8 (750-16)	1/2	62	.562	1.75	1.50	44	5.25	2.88	2.05	4.12	5.12
2.50	3.50	#8 (750-16)	1/2	62	.562	1.75	1.50	44	5.38	3.00	2.55	4.62	5.62
3.25	4.50	#12 (1 062-12)	3/4	75	.687	2.00	1.75	56	6.25	3.50	3.25	5.88	7.12
4.00	5.00	#12 (1 062-12)	3/4	88	.687	2.00	1.75	56	6.62	3.75	3.82	6.38	7.62
5.00	6.50	#12 (1 062-12)	3/4	88	.938	2.00	1.75	75	7.12	4.25	4.95	8.19	9.75
6.00	7.50	#16 (1 312-12)	1	1 00*	1.062	2.25	2.25	88	8.38*	4.88	5.73	9.44	11.25
7.00	8.50	#20 (1.625-12)	1 1/4	1.00	1.187	2.75	2.75	1 00	9.50	5.38	6.58	10.62	12.62
8.00	9.50	#24 (1.875-12)	1 1/2	1.00	1.312	3.00	3.00	1 06	10.50	6.12	7.50	11.81	14.00

*With (K) Rod F = 88, LB = 8 25 ** NPTF ports will be furnished as standard unless SAE straight thread ports are specified.

CAUTION: This mounting style has reduced pressure ratings depending on application mode. For pressures which exceed those shown in the following page dimensional chart, HANNA recommends the use of ME6 mounting style, shown on page 22.

MF6

Dimensions are Affected by the Rod Diameter

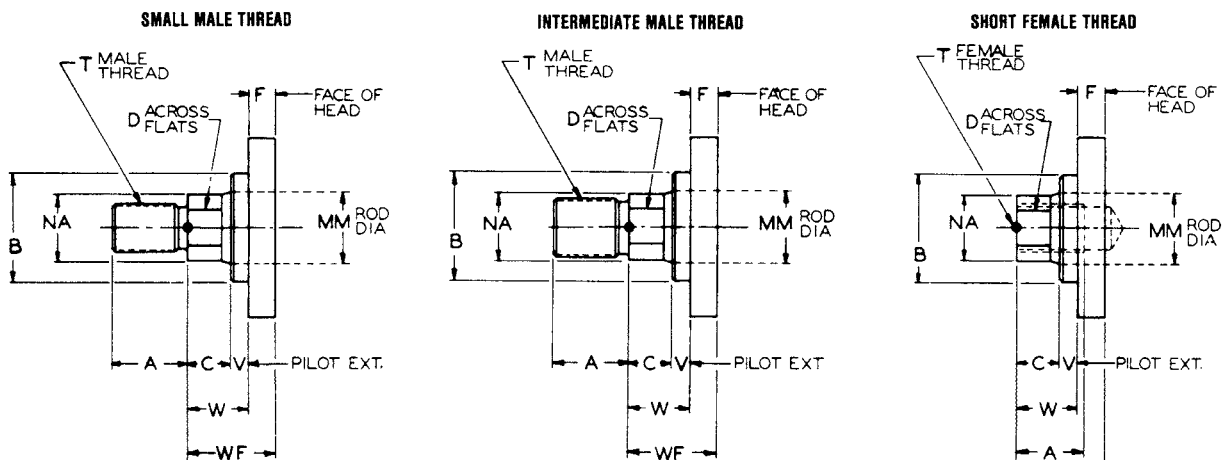
BORE	CYLINDER		A	B -.001 -.003	C	D	MM ROD DIA.	RD*	T (THREAD)			V	W	Y	ZJ	ZF	PSI RATING†
	ROD DIA. CODE	ROD DIA.							SMALL MALE SM	INTER- MEDIATE MALE IM	SHORT FEMALE SF						
1.50	D	.62	.75	1.125	.38	.50	.62	-	44-20	.50-20	.44-20	.25	.62	2.00	5.62	6.00	3000
	F	1.00	1.12	1.500	.50	.88	1.00	-	.75-16	.88-14	.75-16	.50	1.00	2.38	6.00	6.38	3000
2.00	F	1.00	1.12	1.500	.50	.88	1.00	-	.75-16	.88-14	.75-16	.25	.75	2.38	6.00	6.62	3000
	G	1.38	1.62	2.000	.62	1.12	1.38	-	1.00-14	1.25-12	1.00-14	.38	1.00	2.62	6.25	6.88	3000
2.50	F	1.00	1.12	1.500	.50	.88	1.00	-	.75-16	.88-14	.75-16	.25	.75	2.38	6.12	6.75	3000
	G	1.38	1.62	2.000	.62	1.12	1.38	-	1.00-14	1.25-12	1.00-14	.38	1.00	2.62	6.38	7.00	3000
	H	1.75	2.00	2.375	.75	1.50	1.75	-	1.25-12	1.50-12	1.25-12	.50	1.25	2.88	6.62	7.25	3000
3.25	G	1.38	1.62	2.000	.62	1.12	1.38	3.50	1.00-14	1.25-12	1.00-14	.25	.88	2.75	7.12	7.88	3000
	H	1.75	2.00	2.375	.75	1.50	1.75	3.50	1.25-12	1.50-12	1.25-12	.38	1.12	3.00	7.38	8.12	3000
	J	2.00	2.25	2.625	.88	1.69	2.00	3.88	1.50-12	1.75-12	1.50-12	.38	1.25	3.12	7.50	8.25	3000
4.00	H	1.75	2.00	2.375	.75	1.50	1.75	3.50	1.25-12	1.50-12	1.25-12	.25	1.00	3.00	7.62	8.50	3000
	J	2.00	2.25	2.625	.88	1.69	2.00	4.25	1.50-12	1.75-12	1.50-12	.25	1.12	3.12	7.75	8.62	3000
	K	2.50	3.00	3.125	1.00	2.06	2.50	4.25	1.88-12	2.25-12	1.88-12	.38	1.38	3.38	8.00	8.88	3000
5.00	J	2.00	2.25	2.625	.88	1.69	2.00	4.25	1.50-12	1.75-12	1.50-12	.25	1.12	3.12	8.25	9.12	2450
	K	2.50	3.00	3.125	1.00	2.06	2.50	4.25	1.88-12	2.25-12	1.88-12	.38	1.38	3.38	8.50	9.38	2450
	L	3.00	3.50	3.750	1.00	2.62	3.00	5.62	2.25-12	2.75-12	2.25-12	.38	1.38	3.38	8.50	9.38	2450
	M	3.50	3.50	4.250	1.00	3.00	3.50	5.62	2.50-12	3.25-12	2.50-12	.38	1.38	3.38	8.50	9.38	2450
6.00	K	2.50	3.00	3.125	1.00	2.06	2.50	4.25	1.88-12	2.25-12	1.88-12	.38	1.38	3.50	9.62	10.62	1925
	L	3.00	3.50	3.750	1.00	2.62	3.00	6.38	2.25-12	2.75-12	2.25-12	.25	1.25	3.50	9.62	10.62	1925
	M	3.50	3.50	4.250	1.00	3.00	3.50	6.38	2.50-12	3.25-12	2.50-12	.25	1.25	3.50	9.62	10.62	1925
	N	4.00	4.00	4.750	1.00	3.38	4.00	6.38	3.00-12	3.75-12	3.00-12	.25	1.25	3.50	9.62	10.62	1925
7.00	L	3.00	3.50	3.750	1.00	2.62	3.00	6.38	2.25-12	2.75-12	2.25-12	.25	1.25	3.81	10.75	11.75	1475
	M	3.50	3.50	4.250	1.00	3.00	3.50	6.38	2.50-12	3.25-12	2.50-12	.25	1.25	3.81	10.75	11.75	1475
	N	4.00	4.00	4.750	1.00	3.38	4.00	6.38	3.00-12	3.75-12	3.00-12	.25	1.25	3.81	10.75	11.75	1475
	P	4.50	4.50	5.250	1.00	3.88	4.50	7.50	3.25-12	4.25-12	3.25-12	.25	1.25	3.81	10.75	11.75	1475
8.00	R	5.00	5.00	5.750	1.00	4.25	5.00	7.50	3.50-12	4.75-12	3.50-12	.25	1.25	3.81	10.75	11.75	1475
	M	3.50	3.50	4.250	1.00	3.00	3.50	6.38	2.50-12	3.25-12	2.50-12	.25	1.25	3.94	11.75	12.75	1200
	N	4.00	4.00	4.750	1.00	3.38	4.00	6.38	3.00-12	3.75-12	3.00-12	.25	1.25	3.94	11.75	12.75	1200
	P	4.50	4.50	5.250	1.00	3.88	4.50	8.00	3.25-12	4.25-12	3.25-12	.25	1.25	3.94	11.75	12.75	1200
8.00	R	5.00	5.00	5.750	1.00	4.25	5.00	8.00	3.50-12	4.75-12	3.50-12	.25	1.25	3.94	11.75	12.75	1200
	S	5.50	5.50	6.250	1.00	4.62	5.50	8.00	4.00-12	5.25-12	4.00-12	.25	1.25	3.94	11.75	12.75	1200

* Where RD is not shown, square retainer is used. See RETAINER PLATE CONSTRUCTION in INSTALLATION, OPERATION AND MAINTENANCE DATA section.

† CAUTION: PSI ratings shown are HANNA recommended maximum operating pressures. Check STROKE LIMITATION DATA in TECHNICAL INFORMATION section which may reduce maximum operating pressure. Check STOP TUBE DATA (TECHNICAL INFORMATION section) to determine if stop tube is required.

NOTE: Dimensions are nominal except where specifically toleranced. Tolerances on "Plus Stroke" dimensions will vary slightly from dimensions shown due to manufacturing tolerances and tube compression.

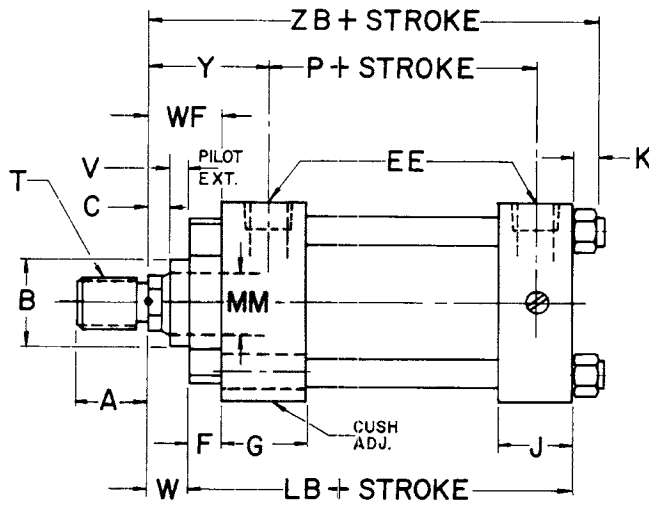
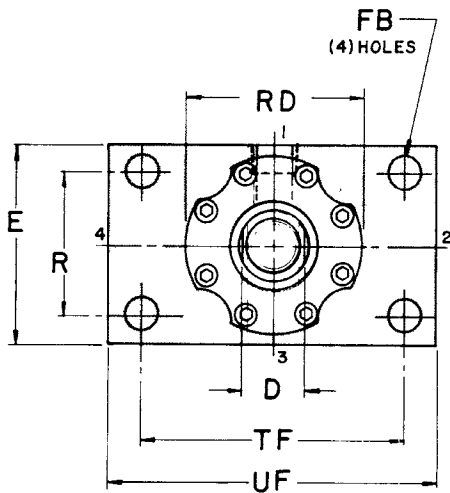
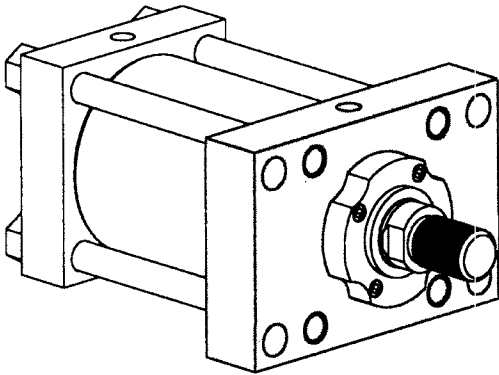
STANDARD ROD END STYLES



NOTE: Dimension "NA" is the rod diameter minus .030 (.62 & 1.00 rods), minus .062 (1.38-5.50 rods)

SERIES 2H 1.50"-8.00" Bores ME5 Head Flange Mount

(For 10.00" - 14.00" Bores, see Page 38)



These Dimensions are Constant Regardless of Rod Diameter

BORE	E	EE		F	FB	G	J	K	LB	P	R ±.010	TF ±.010	UF
		SAE STRAIGHT THREAD	NPTF**										
1.50	2.50	#8 (750-16)	1/2	.38	.438	1.75	1.50	.31	5.00	2.88	1.63	3.43	4.25
2.00	3.00	#8 (.750-16)	1/2	.62	.562	1.75	1.50	.44	5.25	2.88	2.05	4.12	5.12
2.50	3.50	#8 (750-16)	1/2	.62	.562	1.75	1.50	.44	5.38	3.00	2.55	4.62	5.62
3.25	4.50	#12 (1.062-12)	3/4	.75	.687	2.00	1.75	.56	6.25	3.50	3.25	5.88	7.12
4.00	5.00	#12 (1.062-12)	3/4	.88	.687	2.00	1.75	.56	6.62	3.75	3.82	6.38	7.62
5.00	6.50	#12 (1.062-12)	3/4	.88	.938	2.00	1.75	.75	7.12	4.25	4.95	8.19	9.75
6.00	7.50	#16 (1.312-12)	1	1.00*	1.062	2.25	2.25	.88	8.38*	4.88	5.73	9.44	11.25
7.00	8.50	#20 (1.625-12)	1 1/4	1.00	1.187	2.75	2.75	1.00	9.50	5.38	6.58	10.62	12.62
8.00	9.50	#24 (1.875-12)	1 1/2	1.00	1.312	3.00	3.00	1.06	10.50	6.12	7.50	11.81	14.00

* With (K) Rod F = 88, LB = 8.25

** NPTF ports will be furnished as standard unless SAE straight thread ports are specified

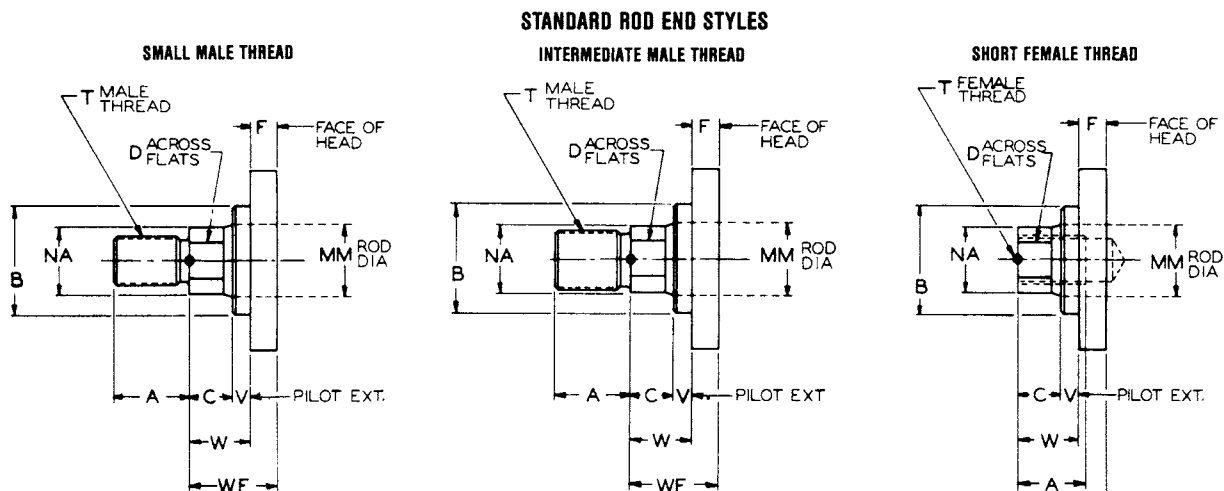
ME5

Dimensions are Affected by the Rod Diameter

CYLINDER			A	B -.001 -.003	C	D	MM ROD DIA.	RD	T (THREAD)			V	W	WF	Y	ZB	PSI RATING†
BORE	ROD DIA. CODE	ROD DIA.							SMALL MALE SM	INTER- MEDIATE MALE IM	SHORT FEMALE SF						
1.50	D	.62	.75	1.125	.38	.50	.62	2.00	.44-20	.50-20	.44-20	.25	.62	1.00	2.00	5.94	3000
	F	1.00	1.12	1.500	.50	.88	1.00	2.38	75-16	.88-14	.75-16	.50	1.00	1.38	2.38	6.31	3000
2.00	F	1.00	1.12	1.500	.50	.88	1.00	2.38	.75-16	.88-14	.75-16	.25	.75	1.38	2.38	6.44	3000
	G	1.38	1.62	2.000	.62	1.12	1.38	2.88	1.00-14	1.25-12	1.00-14	.38	1.00	1.62	2.62	6.69	3000
2.50	F	1.00	1.12	1.500	.50	.88	1.00	2.38	.75-16	.88-14	.75-16	.25	.75	1.38	2.38	6.56	3000
	G	1.38	1.62	2.000	.62	1.12	1.38	3.25	1.00-14	1.25-12	1.00-14	.38	1.00	1.62	2.62	6.81	3000
	H	1.75	2.00	2.375	.75	1.50	1.75	3.25	1.25-12	1.50-12	1.25-12	.50	1.25	1.88	2.88	7.06	3000
3.25	G	1.38	1.62	2.000	.62	1.12	1.38	3.50	1.00-14	1.25-12	1.00-14	.25	.88	1.62	2.75	7.69	3000
	H	1.75	2.00	2.375	.75	1.50	1.75	3.50	1.25-12	1.50-12	1.25-12	.38	1.12	1.88	3.00	7.94	3000
	J	2.00	2.25	2.625	.88	1.69	2.00	3.88	1.50-12	1.75-12	1.50-12	.38	1.25	2.00	3.12	8.06	3000
4.00	H	1.75	2.00	2.375	.75	1.50	1.75	3.50	1.25-12	1.50-12	1.25-12	.25	1.00	1.88	3.00	8.19	3000
	J	2.00	2.25	2.625	.88	1.69	2.00	4.25	1.50-12	1.75-12	1.50-12	.25	1.12	2.00	3.12	8.31	3000
	K	2.50	3.00	3.125	1.00	2.06	2.50	4.25	1.88-12	2.25-12	1.88-12	.38	1.38	2.25	3.38	8.56	3000
5.00	J	2.00	2.25	2.625	.88	1.69	2.00	4.25	1.50-12	1.75-12	1.50-12	.25	1.12	2.00	3.12	9.00	3000
	K	2.50	3.00	3.125	1.00	2.06	2.50	4.25	1.88-12	2.25-12	1.88-12	.38	1.38	2.25	3.38	9.25	3000
	L	3.00	3.50	3.750	1.00	2.62	3.00	5.62	2.25-12	2.75-12	2.25-12	.38	1.38	2.25	3.38	9.25	3000
6.00	M	3.50	4.00	4.250	1.00	3.00	3.50	5.62	2.50-12	3.00-12	2.50-12	.38	1.38	2.25	3.38	9.25	3000
	K	2.50	3.00	3.125	1.00	2.06	2.50	4.25	1.88-12	2.25-12	1.88-12	.38	1.38	2.25	3.50	10.50	3000
	L	3.00	3.50	3.750	1.00	2.62	3.00	6.38	2.25-12	2.75-12	2.25-12	.25	1.25	2.25	3.50	10.50	3000
7.00	M	3.50	4.00	4.250	1.00	3.00	3.50	6.38	2.50-12	3.00-12	2.50-12	.25	1.25	2.25	3.50	10.50	3000
	N	4.00	4.00	4.750	1.00	3.38	4.00	6.38	3.00-12	3.75-12	3.00-12	.25	1.25	2.25	3.81	11.75	3000
	P	4.50	4.50	5.250	1.00	3.88	4.50	7.50	3.25-12	4.25-12	3.25-12	.25	1.25	2.25	3.81	11.75	3000
8.00	R	5.00	5.00	5.750	1.00	4.25	5.00	7.50	3.50-12	4.75-12	3.50-12	.25	1.25	2.25	3.81	11.75	3000
	M	3.50	3.50	4.250	1.00	3.00	3.50	6.38	2.50-12	3.25-12	2.50-12	.25	1.25	2.25	3.94	12.81	3000
	N	4.00	4.00	4.750	1.00	3.38	4.00	6.38	3.00-12	3.75-12	3.00-12	.25	1.25	2.25	3.94	12.81	3000
8.00	P	4.50	4.50	5.250	1.00	3.88	4.50	8.00	3.25-12	4.25-12	3.25-12	.25	1.25	2.25	3.94	12.81	3000
	R	5.00	5.00	5.750	1.00	4.25	5.00	8.00	3.50-12	4.75-12	3.50-12	.25	1.25	2.25	3.94	12.81	3000
	S	5.50	5.50	6.250	1.00	4.62	5.50	8.00	4.00-12	5.25-12	4.00-12	.25	1.25	2.25	3.94	12.81	3000

† CAUTION: PSI ratings shown are HANNA recommended maximum operating pressures. Check STROKE LIMITATION DATA in TECHNICAL INFORMATION section which may reduce maximum operating pressure. Check STOP TUBE DATA (TECHNICAL INFORMATION section) to determine if stop tube is required.

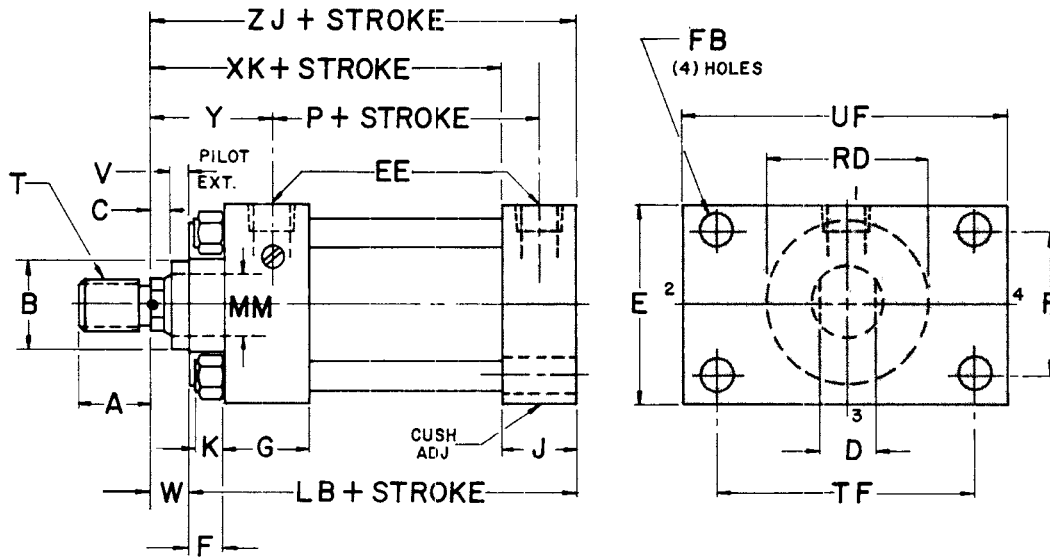
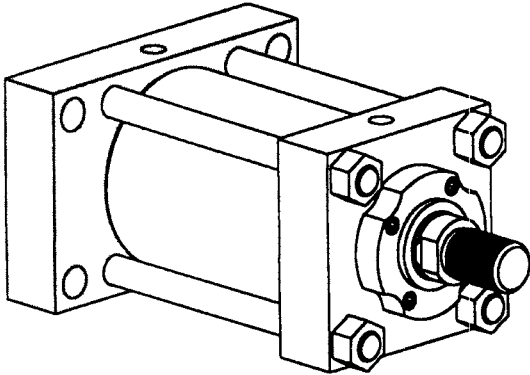
NOTE: Dimensions are nominal except where specifically tolerated. Tolerances on "Plus Stroke" dimensions will vary slightly from dimensions shown due to manufacturing tolerances and tube compression.



NOTE: Dimension "NA" is the rod diameter minus .030 (.62 & 1.00 rods), minus .062 (1.38-5.50 rods)

SERIES 2H 1.50"-8.00" Bores ME6 Cap Flange Mount

(For 10.00" - 14.00" Bores, see Page 38)



These Dimensions are Constant Regardless of Rod Diameter

BORE	E	EE		F	FB	G	J	K	LB	P	R ±.010	TF ±.010	UF
		SAE STRAIGHT THREAD	NPTF**										
1.50	2.50	#8 (750-16)	1/2	.38	.438	1.75	1.50	.31	5.00	2.88	1.63	3.43	4.25
2.00	3.00	#8 (750-16)	1/2	.62	.562	1.75	1.50	.44	5.25	2.88	2.05	4.12	5.12
2.50	3.50	#8 (750-16)	1/2	.62	.562	1.75	1.50	.44	5.38	3.00	2.55	4.62	5.62
3.25	4.50	#12 (1.062-12)	3/4	.75	.687	2.00	1.75	.56	6.25	3.50	3.25	5.88	7.12
4.00	5.00	#12 (1.062-12)	3/4	.88	.687	2.00	1.75	.56	6.62	3.75	3.82	6.38	7.62
5.00	6.50	#12 (1.062-12)	3/4	.88	.938	2.00	1.75	.75	7.12	4.25	4.95	8.19	9.75
6.00	7.50	#16 (1.312-12)	1	1.00*	1.062	2.25	2.25	.88	8.38*	4.88	5.73	9.44	11.25
7.00	8.50	#20 (1.625-12)	1 1/4	1.00	1.187	2.75	2.75	1.00	9.50	5.38	6.58	10.62	12.62
8.00	9.50	#24 (1.875-12)	1 1/2	1.00	1.312	3.00	3.00	1.06	10.50	6.12	7.50	11.81	14.00

* With (K) Rod F = .88, LB = 8.25

** NPTF ports will be furnished as standard unless SAE straight thread ports are specified.

ME6

Dimensions are Affected by the Rod Diameter

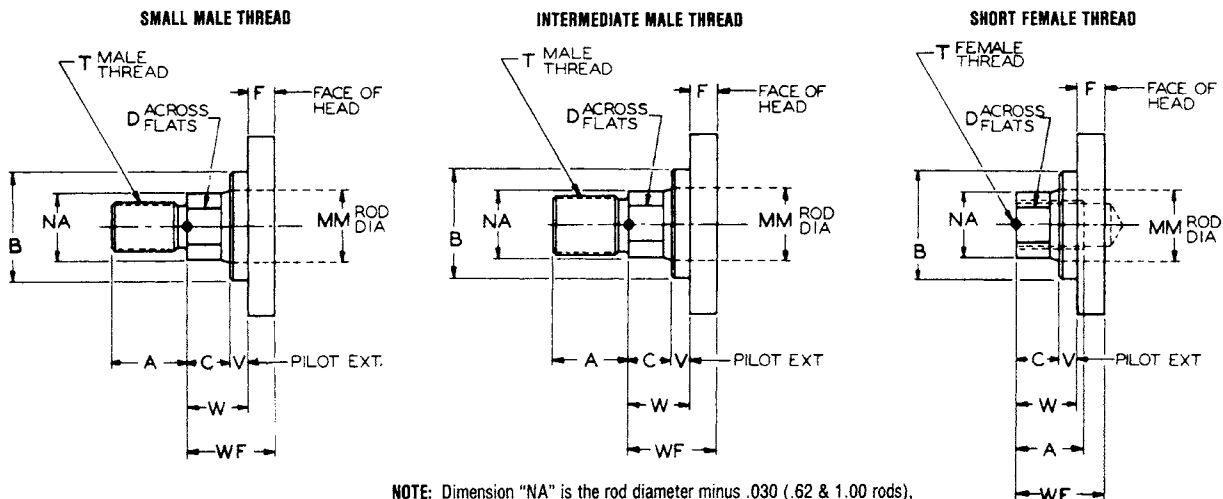
CYLINDER			A	B -001 -003	C	D	MM ROD DIA.	RD*	T (THREAD)			V	W	Y	XK	ZJ	PSI RATING†
BORE	ROD DIA. CODE	ROD DIA.							SMALL MALE SM	INTER- MEDIATE MALE IM	SHORT FEMALE SF						
1.50	D	.62	.75	1.125	.38	.50	.62	-	44-20	.50-20	44-20	25	.62	2.00	4.12	5.62	3000
	F	1.00	1.12	1.500	.50	.88	1.00	-	.75-16	.88-14	75-16	50	1.00	2.38	4.50	6.00	3000
2.00	F	1.00	1.12	1.500	.50	.88	1.00	-	.75-16	.88-14	75-16	25	.75	2.38	4.50	6.00	3000
	G	1.38	1.62	2.000	.62	1.12	1.38	-	1.00-14	1.25-12	1.00-14	38	1.00	2.62	4.75	6.25	3000
2.50	F	1.00	1.12	1.500	.50	.88	1.00	-	.75-16	.88-14	75-16	25	.75	2.38	4.62	6.12	3000
	G	1.38	1.62	2.000	.62	1.12	1.38	-	1.00-14	1.25-12	1.00-14	38	1.00	2.62	4.88	6.38	3000
	H	1.75	2.00	2.375	.75	1.50	1.75	-	1.25-12	1.50-12	1.25-12	50	1.25	2.88	5.12	6.62	3000
3.25	G	1.38	1.62	2.000	.62	1.12	1.38	3.50	1.00-14	1.25-12	1.00-14	25	.88	2.75	5.38	7.12	3000
	H	1.75	2.00	2.375	.75	1.50	1.75	3.50	1.25-12	1.50-12	1.25-12	38	1.12	3.00	5.62	7.38	3000
	J	2.00	2.25	2.625	.88	1.69	2.00	3.88	1.50-12	1.75-12	1.50-12	38	1.25	3.12	5.75	7.50	3000
4.00	H	1.75	2.00	2.375	.75	1.50	1.75	3.50	1.25-12	1.50-12	1.25-12	25	1.00	3.00	5.88	7.62	3000
	J	2.00	2.25	2.625	.88	1.69	2.00	4.25	1.50-12	1.75-12	1.50-12	25	1.12	3.12	6.00	7.75	3000
	K	2.50	3.00	3.125	1.00	2.06	2.50	4.25	1.88-12	2.25-12	1.88-12	38	1.38	3.38	6.25	8.00	3000
5.00	J	2.00	2.25	2.625	.88	1.69	2.00	4.25	1.50-12	1.75-12	1.50-12	25	1.12	3.12	6.50	8.25	3000
	K	2.50	3.00	3.125	1.00	2.06	2.50	4.25	1.88-12	2.25-12	1.88-12	38	1.38	3.38	6.75	8.50	3000
	L	3.00	3.50	3.750	1.00	2.62	3.00	5.62	2.25-12	2.75-12	2.25-12	38	1.38	3.38	6.75	8.50	3000
	M	3.50	3.50	4.250	1.00	3.00	3.50	5.62	2.50-12	3.25-12	2.50-12	38	1.38	3.38	6.75	8.50	3000
6.00	K	2.50	3.00	3.125	1.00	2.06	2.50	4.25	1.88-12	2.25-12	1.88-12	38	1.38	3.50	7.38	9.62	3000
	L	3.00	3.50	3.750	1.00	2.62	3.00	6.38	2.25-12	2.75-12	2.25-12	25	1.25	3.50	7.38	9.62	3000
	M	3.50	3.50	4.250	1.00	3.00	3.50	6.38	2.50-12	3.25-12	2.50-12	25	1.25	3.50	7.38	9.62	3000
	N	4.00	4.00	4.750	1.00	3.38	4.00	6.38	3.00-12	3.75-12	3.00-12	25	1.25	3.50	7.38	9.62	3000
7.00	L	3.00	3.50	3.750	1.00	2.62	3.00	6.38	2.25-12	2.75-12	2.25-12	25	1.25	3.81	8.00	10.75	3000
	M	3.50	3.50	4.250	1.00	3.00	3.50	6.38	2.50-12	3.25-12	2.50-12	25	1.25	3.81	8.00	10.75	3000
	N	4.00	4.00	4.750	1.00	3.38	4.00	6.38	3.00-12	3.75-12	3.00-12	25	1.25	3.81	8.00	10.75	3000
	P	4.50	4.50	5.250	1.00	3.88	4.50	7.50	3.25-12	4.25-12	3.25-12	25	1.25	3.81	8.00	10.75	3000
8.00	R	5.00	5.00	5.750	1.00	4.25	5.00	7.50	3.50-12	4.75-12	3.50-12	25	1.25	3.81	8.00	10.75	3000
	M	3.50	3.50	4.250	1.00	3.00	3.50	6.38	2.50-12	3.25-12	2.50-12	25	1.25	3.94	8.75	11.75	3000
	N	4.00	4.00	4.750	1.00	3.38	4.00	6.38	3.00-12	3.75-12	3.00-12	25	1.25	3.94	8.75	11.75	3000
	P	4.50	4.50	5.250	1.00	3.88	4.50	8.00	3.25-12	4.25-12	3.25-12	25	1.25	3.94	8.75	11.75	3000
8.00	R	5.00	5.00	5.750	1.00	4.25	5.00	8.00	3.50-12	4.75-12	3.50-12	25	1.25	3.94	8.75	11.75	3000
	S	5.50	5.50	6.250	1.00	4.62	5.50	8.00	4.00-12	5.25-12	4.00-12	25	1.25	3.94	8.75	11.75	3000

* Where RD is not shown, square retainer is used. See RETAINER PLATE CONSTRUCTION in INSTALLATION, OPERATION AND MAINTENANCE DATA section.

† CAUTION: PSI ratings shown are HANNA recommended maximum operating pressures. Check STROKE LIMITATION DATA in TECHNICAL INFORMATION section which may reduce maximum operating pressure. Check STOP TUBE DATA (TECHNICAL INFORMATION section) to determine if stop tube is required.

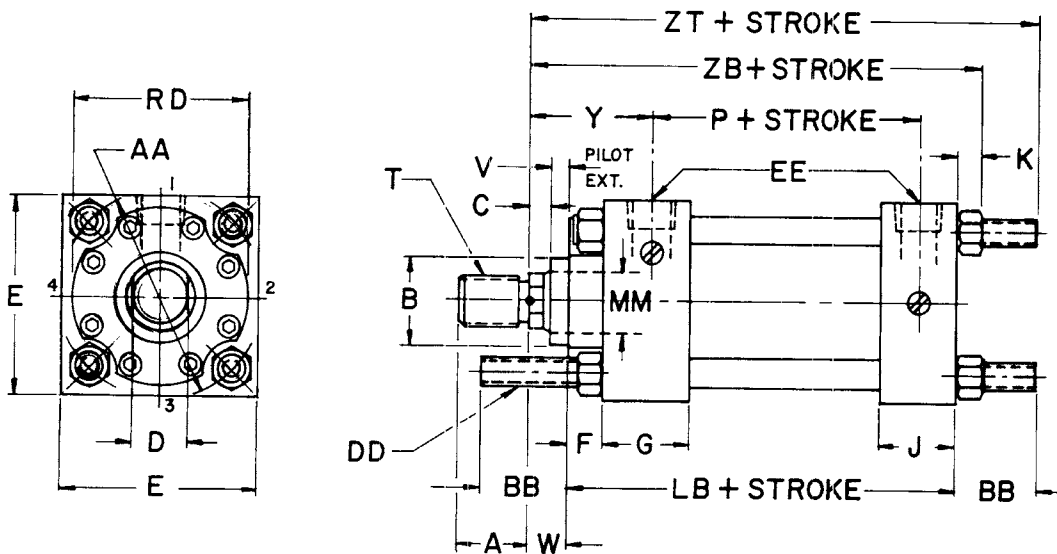
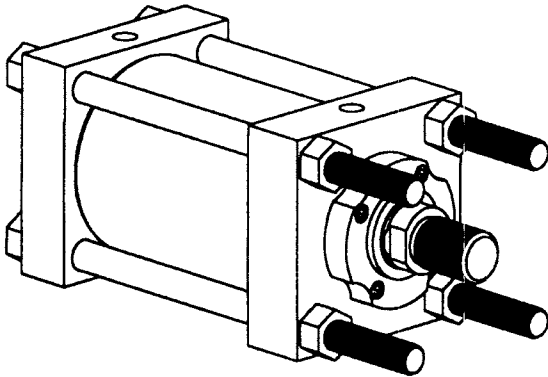
NOTE: Dimensions are nominal except where specifically toleranced. Tolerances on "Plus Stroke" dimensions will vary slightly from dimensions shown due to manufacturing tolerances and tube compression.

STANDARD ROD END STYLES



NOTE: Dimension "NA" is the rod diameter minus .030 (.62 & 1.00 rods), minus .062 (1.38-5.50 rods)

SERIES 2H 1.50"-8.00" Bores MX0, MX1, MX2, MX3, MX4 Tie Rod Mounts



These Dimensions are Constant Regardless of Rod Diameter

BORE	AA	BB	DD	E	EE		F	G	J	K	LB	P
					SAE STRAIGHT THREAD	NPTF**						
1.50	2.30	1.38	38-24	2.50	#8 (.750-16)	1/2	.38	1.75	1.50	.31	5.00	2.88
2.00	2.90	1.81	.50-20	3.00	#8 (.750-16)	1/2	.62	1.75	1.50	.44	5.25	2.88
2.50	3.60	1.81	50-20	3.50	#8 (.750-16)	1/2	.62	1.75	1.50	.44	5.38	3.00
3.25	4.60	2.31	.62-18	4.50	#12 (1.062-12)	3/4	.75	2.00	1.75	.56	6.25	3.50
4.00	5.40	2.31	.62-18	5.00	#12 (1.062-12)	3/4	.88	2.00	1.75	.56	6.62	3.75
5.00	7.00	3.19	88-14	6.50	#12 (1.062-12)	3/4	.88	2.00	1.75	.75	7.12	4.25
6.00	8.10	3.62	1.00-14	7.50	#16 (1.312-12)	1	1.00*	2.25	2.25	.38	8.38*	4.88
7.00	9.30	4.12	1.12-12	8.50	#20 (1.625-12)	1 1/4	1.00	2.75	2.75	1.00	9.50	5.38
8.00	10.60	4.50	1.25-12	9.50	#24 (1.875-12)	1 1/2	1.00	3.00	3.00	1.06	10.50	6.12

* With (K) Rod F = .88, LB = 8.25 ** NPTF ports will be furnished as standard unless SAE straight thread ports are specified.

NOTE: Specify Tie Rod Extension, "BB" dimension if other than standard.

MX0 = No Tie Rods Extended

MX1 = 4 Tie Rods Extended Both Ends

MX2 = 4 Tie Rods Extended Cap End

MX3 = 4 Tie Rods Extended Head End

MX4 = 2 Tie Rods Extended Both Ends

MX0, MX1, MX2, MX3, MX4

Dimensions are Affected by the Rod Diameter

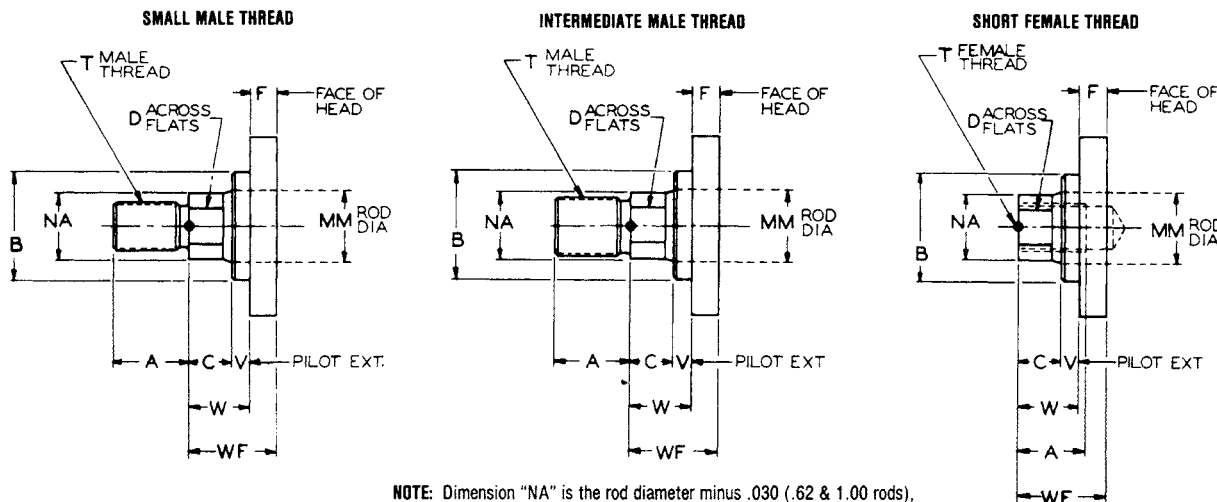
BORE	CYLINDER		A	B -.001 -.003	C	D	MM ROD DIA.	RD*	T (THREAD)			V	W	Y	ZB	ZT	PSI RATING†
	ROD DIA. CODE	ROD DIA.							SMALL MALE SM	INTER- MEDIATE MALE IM	SHORT FEMALE SF						
1.50	D	.62	.75	1.125	.38	.50	.62	-	44-20	50-20	44-20	.25	.62	2.00	5.94	7.00	3000
	F	1.00	1.12	1.500	.50	.88	1.00	-	.75-16	.88-14	.75-16	.50	1.00	2.38	6.31	7.38	3000
2.00	F	1.00	1.12	1.500	.50	.88	1.00	-	.75-16	.88-14	.75-16	.25	.75	2.38	6.44	7.81	3000
	G	1.38	1.62	2.000	.62	1.12	1.38	-	1.00-14	1.25-12	1.00-14	.38	1.00	2.62	6.69	8.06	3000
2.50	F	1.00	1.12	1.500	.50	.88	1.00	-	.75-16	.88-14	.75-16	.25	.75	2.38	6.56	7.94	3000
	G	1.38	1.62	2.000	.62	1.12	1.38	-	1.00-14	1.25-12	1.00-14	.38	1.00	2.62	6.81	8.19	3000
	H	1.75	2.00	2.375	.75	1.50	1.75	-	1.25-12	1.50-12	1.25-12	.50	1.25	2.88	7.06	8.44	3000
3.25	G	1.38	1.62	2.000	.62	1.12	1.38	3.50	1.00-14	1.25-12	1.00-14	.25	.88	2.75	7.69	9.44	3000
	H	1.75	2.00	2.375	.75	1.50	1.75	3.50	1.25-12	1.50-12	1.25-12	.38	1.12	3.00	7.94	9.69	3000
	J	2.00	2.25	2.625	.88	1.69	2.00	3.88	1.50-12	1.75-12	1.50-12	.38	1.25	3.12	8.06	9.81	3000
4.00	H	1.75	2.00	2.375	.75	1.50	1.75	3.50	1.25-12	1.50-12	1.25-12	.25	1.00	3.00	8.19	9.94	3000
	J	2.00	2.25	2.625	.88	1.69	2.00	4.25	1.50-12	1.75-12	1.50-12	.25	1.12	3.12	8.31	10.06	3000
	K	2.50	3.00	3.125	1.00	2.06	2.50	4.25	1.88-12	2.25-12	1.88-12	.38	1.38	3.38	8.56	10.31	3000
5.00	J	2.00	2.25	2.625	.88	1.69	2.00	4.25	1.50-12	1.75-12	1.50-12	.25	1.12	3.12	9.00	11.44	3000
	K	2.50	3.00	3.125	1.00	2.06	2.50	4.25	1.88-12	2.25-12	1.88-12	.38	1.38	3.38	9.25	11.69	3000
	L	3.00	3.50	3.750	1.00	2.62	3.00	5.62	2.25-12	2.75-12	2.25-12	.38	1.38	3.38	9.25	11.69	3000
	M	3.50	3.50	4.250	1.00	3.00	3.50	5.62	2.50-12	3.25-12	2.50-12	.38	1.38	3.38	9.25	11.69	3000
6.00	K	2.50	3.00	3.125	1.00	2.06	2.50	4.25	1.88-12	2.25-12	1.88-12	.38	1.38	3.50	10.50	13.25	3000
	L	3.00	3.50	3.750	1.00	2.62	3.00	6.38	2.25-12	2.75-12	2.25-12	.25	1.25	3.50	10.50	13.25	3000
	M	3.50	3.50	4.250	1.00	3.00	3.50	6.38	2.50-12	3.25-12	2.50-12	.25	1.25	3.50	10.50	13.25	3000
	N	4.00	4.00	4.750	1.00	3.38	4.00	6.38	3.00-12	3.75-12	3.00-12	.25	1.25	3.50	10.50	13.25	3000
7.00	L	3.00	3.50	3.750	1.00	2.62	3.00	6.38	2.25-12	2.75-12	2.25-12	.25	1.25	3.81	11.75	14.87	3000
	M	3.50	3.50	4.250	1.00	3.00	3.50	6.38	2.50-12	3.25-12	2.50-12	.25	1.25	3.81	11.75	14.87	3000
	N	4.00	4.00	4.750	1.00	3.38	4.00	6.38	3.00-12	3.75-12	3.00-12	.25	1.25	3.81	11.75	14.87	3000
	P	4.50	4.50	5.250	1.00	3.88	4.50	7.50	3.25-12	4.25-12	3.25-12	.25	1.25	3.81	11.75	14.87	3000
8.00	R	5.00	5.00	5.750	1.00	4.25	5.00	7.50	3.50-12	4.75-12	3.50-12	.25	1.25	3.81	11.75	14.87	3000
	M	3.50	3.50	4.250	1.00	3.00	3.50	6.38	2.50-12	3.25-12	2.50-12	.25	1.25	3.94	12.81	16.25	3000
	N	4.00	4.00	4.750	1.00	3.38	4.00	6.38	3.00-12	3.75-12	3.00-12	.25	1.25	3.94	12.81	16.25	3000
	P	4.50	4.50	5.250	1.00	3.88	4.50	8.00	3.25-12	4.25-12	3.25-12	.25	1.25	3.94	12.81	16.25	3000
8.00	R	5.00	5.00	5.750	1.00	4.25	5.00	8.00	3.50-12	4.75-12	3.50-12	.25	1.25	3.94	12.81	16.25	3000
	S	5.50	5.50	6.250	1.00	4.62	5.50	8.00	4.00-12	5.25-12	4.00-12	.25	1.25	3.94	12.81	16.25	3000

* Where RD is not shown, square retainer is used. See RETAINER PLATE CONSTRUCTION in INSTALLATION, OPERATION AND MAINTENANCE DATA section.

† CAUTION: PSI ratings shown are HANNA recommended maximum operating pressures. Check STROKE LIMITATION DATA in TECHNICAL INFORMATION section which may reduce maximum operating pressure. Check STOP TUBE DATA (TECHNICAL INFORMATION section) to determine if stop tube is required.

NOTE: Dimensions are nominal except where specifically tolerated. Tolerances on "Plus Stroke" dimensions will vary slightly from dimensions shown due to manufacturing tolerances and tube compression.

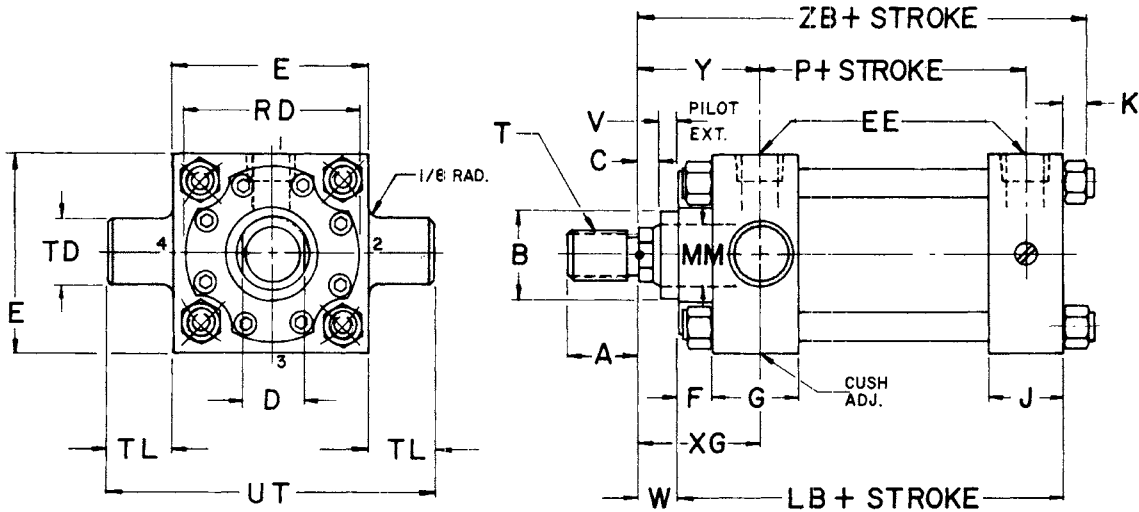
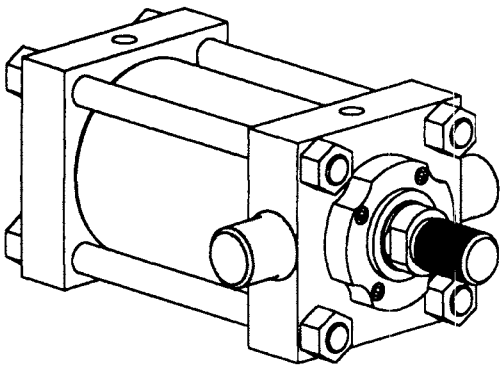
STANDARD ROD END STYLES



NOTE: Dimension "NA" is the rod diameter minus .030 (.62 & 1.00 rods), minus .062 (1.38-5.50 rods)

SERIES 2H 1.50"-8.00" Bores MT1 Head Trunnion Mount

(For 10.00" - 14.00" Bores, see Page 38)



NOTE: Align and mount pillow blocks to avoid bending moments in trunnions.

These Dimensions are Constant Regardless of Rod Diameter

BORE	E	EE		F	G	J	K	LB	P	TD +.000 -.002	TL	UT
		SAE STRAIGHT THREAD	NPTF**									
1.50	2.50	#8 (750-16)	1/2	.38	1.75	1.50	.31	5.00	2.88	1.000	1.00	4.50
2.00	3.00	#8 (750-16)	1/2	.62	1.75	1.50	.44	5.25	2.88	1.375	1.38	5.75
2.50	3.50	#8 (750-16)	1/2	.62	1.75	1.50	.44	5.38	3.00	1.375	1.38	6.25
3.25	4.50	#12 (1 062-12)	3/4	.75	2.00	1.75	.56	6.25	3.50	1.750	1.75	8.00
4.00	5.00	#12 (1 062-12)	3/4	.88	2.00	1.75	.56	6.62	3.75	1.750	1.75	8.50
5.00	6.50	#12 (1 062-12)	3/4	.88	2.00	1.75	.75	7.12	4.25	1.750	1.75	10.00
6.00	7.50	#16 (1 312-12)	1	1.00*	2.25	2.25	.88	8.38*	4.88	2.000	2.00	11.50
7.00	8.50	#20 (1 625-12)	1 1/4	1.00	2.75	2.75	1.00	9.50	5.38	2.500	2.50	13.50
8.00	9.50	#24 (1 875-12)	1 1/2	1.00	3.00	3.00	1.06	10.50	6.12	3.000	3.00	15.50

* With (K) Rod F = 88, LB = 8 25

** NPTF ports will be furnished as standard unless SAE straight thread ports are specified

MT1

Dimensions are Affected by the Rod Diameter

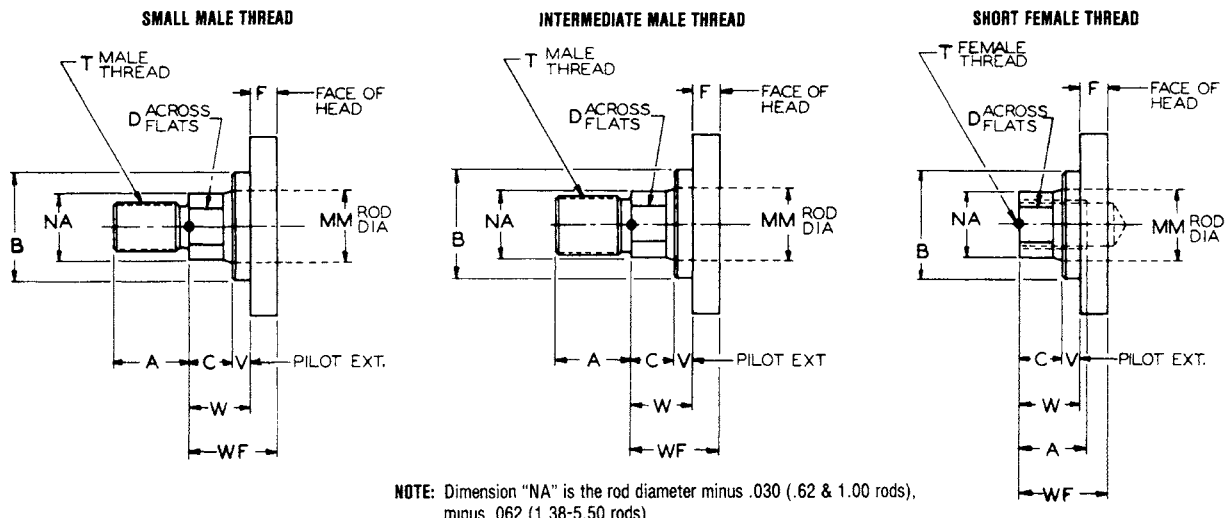
BORE	CYLINDER		A	B -.001 -.003	C	D	MM ROD DIA.	RD*	T (THREAD)			V	W	XG	Y	ZB	PSI RATING†
	ROD DIA. CODE	ROD DIA.							SMALL MALE SM	INTER- MEDIATE MALE IM	SHORT FEMALE SF						
1.50	D	.62	.75	1.125	.38	.50	.62	-	.44-20	.50-20	44-20	.25	.62	1.88	2.00	5.94	3000
	F	1.00	1.12	1.500	.50	.88	1.00	-	.75-16	.88-14	.75-16	.50	1.00	2.25	2.25	6.31	3000
2.00	F	1.00	1.12	1.500	.50	.88	1.00	-	.75-16	.88-14	.75-16	.25	.75	2.25	2.38	6.44	3000
	G	1.38	1.62	2.000	.62	1.12	1.38	-	1.00-14	1.25-12	1.00-14	.38	1.00	2.50	2.62	6.69	3000
2.50	F	1.00	1.12	1.500	.50	.88	1.00	-	.75-16	.88-14	.75-16	.25	.75	2.25	2.38	6.56	3000
	G	1.38	1.62	2.000	.62	1.12	1.38	-	1.00-14	1.25-12	1.00-14	.38	1.00	2.50	2.62	6.81	3000
	H	1.75	2.00	2.375	.75	1.50	1.75	-	1.25-12	1.50-12	1.25-12	.50	1.25	2.75	2.88	7.06	3000
3.25	G	1.38	1.62	2.000	.62	1.12	1.38	3.50	1.00-14	1.25-12	1.00-14	.25	.88	2.62	2.75	7.69	3000
	H	1.75	2.00	2.375	.75	1.50	1.75	3.50	1.25-12	1.50-12	1.25-12	.38	1.12	2.88	3.00	7.94	3000
	J	2.00	2.25	2.625	.88	1.69	2.00	3.88	1.50-12	1.75-12	1.50-12	.38	1.25	3.00	3.12	8.06	3000
4.00	H	1.75	2.00	2.375	.75	1.50	1.75	3.50	1.25-12	1.50-12	1.25-12	.25	1.00	2.88	3.00	8.19	2150
	J	2.00	2.25	2.625	.88	1.69	2.00	4.25	1.50-12	1.75-12	1.50-12	.25	1.12	3.00	3.12	8.31	2150
	K	2.50	3.00	3.125	1.00	2.06	2.50	4.25	1.88-12	2.25-12	1.88-12	.38	1.38	3.25	3.38	8.56	2150
5.00	J	2.00	2.25	2.625	.88	1.69	2.00	4.25	1.50-12	1.75-12	1.50-12	.25	1.12	3.00	3.12	9.00	1365
	K	2.50	3.00	3.125	1.00	2.06	2.50	4.25	1.88-12	2.25-12	1.88-12	.38	1.38	3.25	3.38	9.25	1365
	L	3.00	3.50	3.750	1.00	2.62	3.00	5.62	2.25-12	2.75-12	2.25-12	.38	1.38	3.25	3.38	9.25	1365
6.00	K	2.50	3.00	3.125	1.00	2.06	2.50	4.25	1.88-12	2.25-12	1.88-12	.38	1.38	3.38	3.50	10.50	1250
	L	3.00	3.50	3.750	1.00	2.62	3.00	6.38	2.25-12	2.75-12	2.25-12	.25	1.25	3.38	3.50	10.50	1250
	M	3.50	4.00	4.250	1.00	3.00	3.50	6.38	2.50-12	3.25-12	2.50-12	.25	1.25	3.38	3.50	10.50	1250
7.00	N	4.00	4.00	4.750	1.00	3.38	4.00	6.38	3.00-12	3.75-12	3.00-12	.25	1.25	3.62	3.81	11.75	1425
	P	4.50	4.50	5.250	1.00	3.88	4.50	7.50	3.25-12	4.25-12	3.25-12	.25	1.25	3.62	3.81	11.75	1425
	R	5.00	5.00	5.750	1.00	4.25	5.00	7.50	3.50-12	4.75-12	3.50-12	.25	1.25	3.62	3.81	11.75	1425
	S	5.50	5.50	6.250	1.00	4.62	5.50	8.00	4.00-12	5.25-12	4.00-12	.25	1.25	3.75	3.94	12.81	1575
8.00	M	3.50	3.50	4.250	1.00	3.00	3.50	6.38	2.50-12	3.25-12	2.50-12	.25	1.25	3.75	3.94	12.81	1575
	N	4.00	4.00	4.750	1.00	3.38	4.00	6.38	3.00-12	3.75-12	3.00-12	.25	1.25	3.75	3.94	12.81	1575
	P	4.50	4.50	5.250	1.00	3.88	4.50	8.00	3.25-12	4.25-12	3.25-12	.25	1.25	3.75	3.94	12.81	1575
	S	5.50	5.50	6.250	1.00	4.62	5.50	8.00	4.00-12	5.25-12	4.00-12	.25	1.25	3.75	3.94	12.81	1575

* Where RD is not shown, square retainer is used. See RETAINER PLATE CONSTRUCTION in INSTALLATION, OPERATION AND MAINTENANCE DATA section.

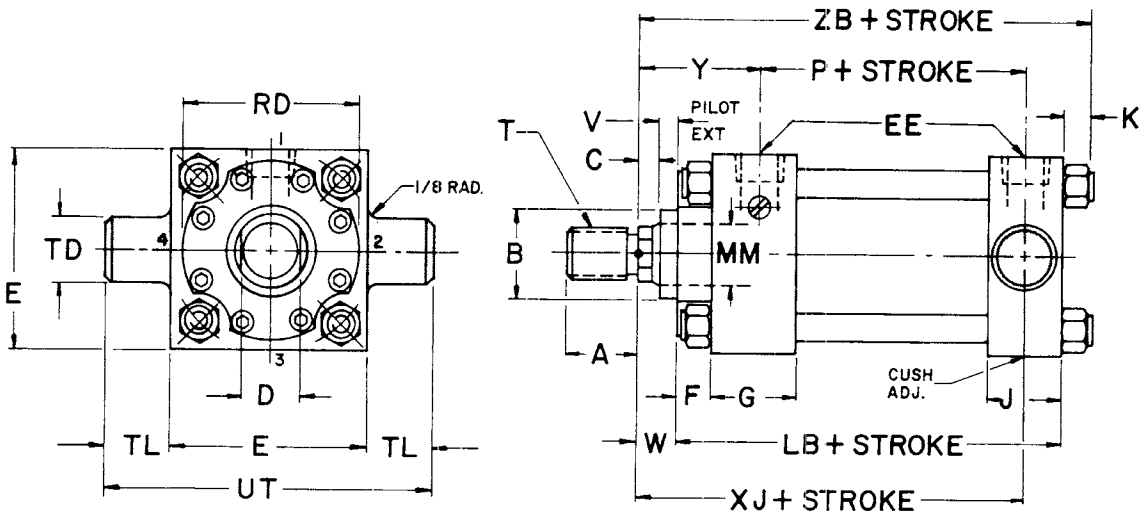
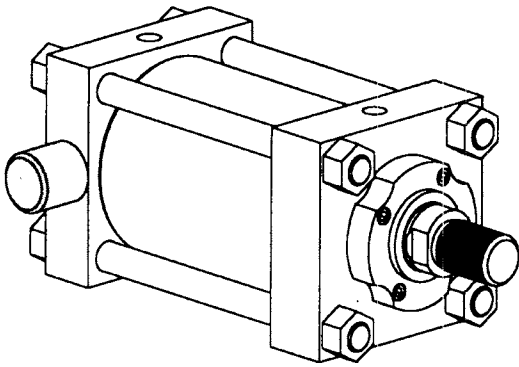
† CAUTION: PSI ratings shown are HANNA recommended maximum operating pressures. Check STROKE LIMITATION DATA in TECHNICAL INFORMATION section which may reduce maximum operating pressure. Check STOP TUBE DATA (TECHNICAL INFORMATION section) to determine if stop tube is required.

NOTE: Dimensions are nominal except where specifically toleranced. Tolerances on "Plus Stroke" dimensions will vary slightly from dimensions shown due to manufacturing tolerances and tube compression.

STANDARD ROD END STYLES



SERIES 2H 1.50"-8.00" Bores MT2 Cap Trunnion Mount



NOTE: Align and mount pillow blocks to avoid bending moments in trunnions.

These Dimensions are Constant Regardless of Rod Diameter

BORE	E	EE		F	G	J	K	LB	P	TD +.000 -.002	TL	UT
		SAE STRAIGHT THREAD	NPTF**									
1.50	2.50	#8 (.750-16)	1/2	.38	1.75	1.50	.31	5.00	2.88	1.000	1.00	4.50
2.00	3.00	#8 (.750-16)	1/2	.62	1.75	1.50	.44	5.25	2.88	1.375	1.38	5.75
2.50	3.50	#8 (.750-16)	1/2	.62	1.75	1.50	.44	5.38	3.00	1.375	1.38	6.25
3.25	4.50	#12 (1.062-12)	3/4	.75	2.00	1.75	.56	6.25	3.50	1.750	1.75	8.00
4.00	5.00	#12 (1.062-12)	3/4	.88	2.00	1.75	.56	6.62	3.75	1.750	1.75	8.50
5.00	6.50	#12 (1.062-12)	3/4	.88	2.00	1.75	.75	7.12	4.25	1.750	1.75	10.00
6.00	7.50	#16 (1.312-12)	1	1.00*	2.25	2.25	.88	8.38*	4.88	2.000	2.00	11.50
7.00	8.50	#20 (1.625-12)	1 1/4	1.00	2.75	2.75	1.00	9.50	5.38	2.500	2.50	13.50
8.00	9.50	#24 (1.875-12)	1 1/2	1.00	3.00	3.00	1.06	10.50	6.12	3.000	3.00	15.50

* With (K) Rod F = .88, LB = 8.25

** NPTF ports will be furnished as standard unless SAE straight thread ports are specified

MT2

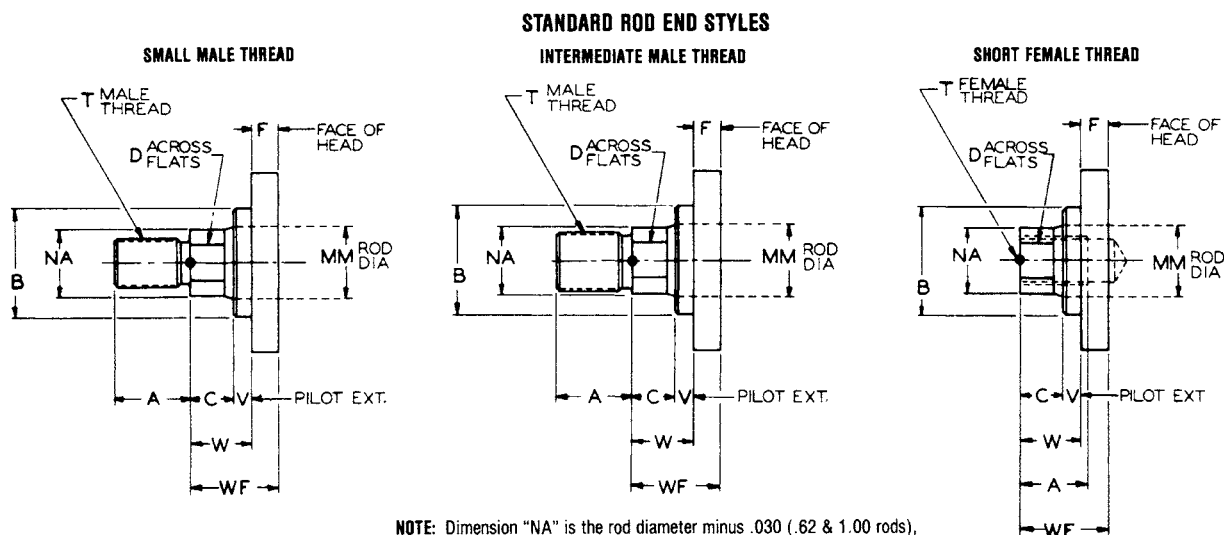
Dimensions are Affected by the Rod Diameter

CYLINDER			A	B -.001 -.003	C	D	MM ROD DIA.	RD*	T (THREAD)			V	W	XJ	Y	ZB	PSI RATING†
BORE	ROD DIA. CODE	ROD DIA.							SMALL MALE SM	INTER- MEDIATE MALE IM	SHORT FEMALE SF						
1.50	D	.62	.75	1.125	.38	.50	.62	-	.44-20	.50-20	.44-20	.25	.62	4.88	2.00	5.94	3000
	F	1.00	1.12	1.500	.50	.88	1.00	-	75-16	88-14	75-16	.50	1.00	5.25	2.38	6.31	3000
2.00	F	1.00	1.12	1.500	.50	.88	1.00	-	.75-16	88-14	75-16	.25	.75	5.25	2.38	6.44	3000
	G	1.38	1.62	2.000	.62	1.12	1.38	-	1.00-14	1.25-12	1.00-14	.38	1.00	5.50	2.62	6.69	3000
2.50	F	1.00	1.12	1.500	.50	.88	1.00	-	.75-16	88-14	75-16	.25	.75	5.38	2.38	6.56	3000
	G	1.38	1.62	2.000	.62	1.12	1.38	-	1.00-14	1.25-12	1.00-14	.38	1.00	5.62	2.62	6.81	3000
	H	1.75	2.00	2.375	.75	1.50	1.75	-	1.25-12	1.50-12	1.25-12	.50	1.25	5.88	2.88	7.06	3000
3.25	G	1.38	1.62	2.000	.62	1.12	1.38	3.50	1.00-14	1.25-12	1.00-14	.25	.88	6.25	2.75	7.69	3000
	H	1.75	2.00	2.375	.75	1.50	1.75	3.50	1.25-12	1.50-12	1.25-12	.38	1.12	6.50	3.00	7.94	3000
	J	2.00	2.25	2.625	.88	1.69	2.00	3.88	1.50-12	1.75-12	1.50-12	.38	1.25	6.62	3.12	8.06	3000
4.00	H	1.75	2.00	2.375	.75	1.50	1.75	3.50	1.25-12	1.50-12	1.25-12	.25	1.00	6.75	3.00	8.19	2150
	J	2.00	2.25	2.625	.88	1.69	2.00	4.25	1.50-12	1.75-12	1.50-12	.25	1.12	6.88	3.12	8.31	2150
	K	2.50	3.00	3.125	1.00	2.06	2.50	4.25	1.88-12	2.25-12	1.88-12	.38	1.38	7.12	3.38	8.56	2150
5.00	J	2.00	2.25	2.625	.88	1.69	2.00	4.25	1.50-12	1.75-12	1.50-12	.25	1.12	7.38	3.12	9.00	1365
	K	2.50	3.00	3.125	1.00	2.06	2.50	4.25	1.88-12	2.25-12	1.88-12	.38	1.38	7.62	3.38	9.25	1365
	L	3.00	3.50	3.750	1.00	2.62	3.00	5.62	2.25-12	2.75-12	2.25-12	.38	1.38	7.62	3.38	9.25	1365
	M	3.50	3.50	4.250	1.00	3.00	3.50	5.62	2.50-12	3.25-12	2.50-12	.38	1.38	7.62	3.38	9.25	1365
6.00	K	2.50	3.00	3.125	1.00	2.06	2.50	4.25	1.88-12	2.25-12	1.88-12	.38	1.38	8.38	3.50	10.50	1250
	L	3.00	3.50	3.750	1.00	2.62	3.00	6.38	2.25-12	2.75-12	2.25-12	.25	1.25	8.38	3.50	10.50	1250
	M	3.50	3.50	4.250	1.00	3.00	3.50	6.38	2.50-12	3.25-12	2.50-12	.25	1.25	8.38	3.50	10.50	1250
	N	4.00	4.00	4.750	1.00	3.38	4.00	6.38	3.00-12	3.75-12	3.00-12	.25	1.25	8.38	3.50	10.50	1250
7.00	L	3.00	3.50	3.750	1.00	2.62	3.00	6.38	2.25-12	2.75-12	2.25-12	.25	1.25	9.38	3.81	11.75	1425
	M	3.50	3.50	4.250	1.00	3.00	3.50	6.38	2.50-12	3.25-12	2.50-12	.25	1.25	9.38	3.81	11.75	1425
	N	4.00	4.00	4.750	1.00	3.38	4.00	6.38	3.00-12	3.75-12	3.00-12	.25	1.25	9.38	3.81	11.75	1425
	P	4.50	4.50	5.250	1.00	3.88	4.50	7.50	3.25-12	4.25-12	3.25-12	.25	1.25	9.38	3.81	11.75	1425
8.00	R	5.00	5.00	5.750	1.00	4.25	5.00	7.50	3.50-12	4.75-12	3.50-12	.25	1.25	9.38	3.81	11.75	1425
	M	3.50	3.50	4.250	1.00	3.00	3.50	6.38	2.50-12	3.25-12	2.50-12	.25	1.25	10.25	3.94	12.81	1575
	N	4.00	4.00	4.750	1.00	3.38	4.00	6.38	3.00-12	3.75-12	3.00-12	.25	1.25	10.25	3.94	12.81	1575
	P	4.50	4.50	5.250	1.00	3.88	4.50	8.00	3.25-12	4.25-12	3.25-12	.25	1.25	10.25	3.94	12.81	1575
8.00	R	5.00	5.00	5.750	1.00	4.25	5.00	8.00	3.50-12	4.75-12	3.50-12	.25	1.25	10.25	3.94	12.81	1575
	S	5.50	5.50	6.250	1.00	4.62	5.50	8.00	4.00-12	5.25-12	4.00-12	.25	1.25	10.25	3.94	12.81	1575

* Where RD is not shown, square retainer is used. See RETAINER PLATE CONSTRUCTION in INSTALLATION, OPERATION AND MAINTENANCE DATA section.

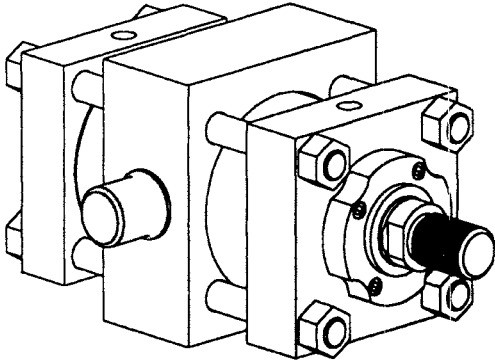
† CAUTION: PSI ratings shown are HANNA recommended maximum operating pressures. Check STROKE LIMITATION DATA in TECHNICAL INFORMATION section which may reduce maximum operating pressure. Check STOP TUBE DATA (TECHNICAL INFORMATION section) to determine if stop tube is required.

NOTE: Dimensions are nominal except where specifically toleranced. Tolerances on "Plus Stroke" dimensions will vary slightly from dimensions shown due to manufacturing tolerances and tube compression.

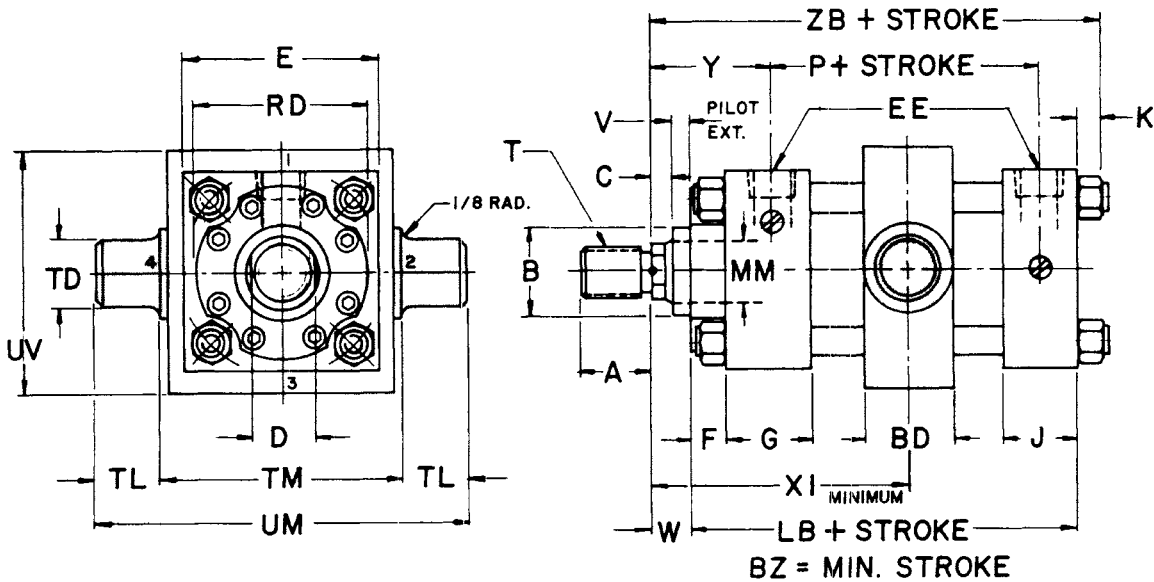


SERIES 2H 1.50"-8.00" Bores MT4 Intermediate Fixed Trunnion Mount

(For 10.00" - 14.00" Bores, see Page 38)



NOTE: Trunnion location (XI) must be specified when ordering.



NOTE: Align and mount pillow blocks to avoid bending moments in trunnions.

These Dimensions are Constant Regardless of Rod Diameter

BORE	BD	BZ	E	EE		F	G	J	K	LB	P	TD +.000 -.002	TL	TM	UM	UV
				SAE STRAIGHT THREAD	NPTF**											
1.50	1.25	.25	2.50	#8 (.750-16)	1/2	.38	1.75	1.50	.31	5.00	2.88	1.000	1.00	2.50	4.50	2.50
2.00	1.50	.25	3.00	#8 (.750-16)	1/2	.62	1.75	1.50	.44	5.25	2.88	1.375	1.38	3.38	6.12	3.38
2.50	1.75	.38	3.50	#8 (.750-16)	1/2	.62	1.75	1.50	.44	5.38	3.00	1.375	1.38	4.25	7.00	4.25
3.25	2.50	.88	4.50	#12 (1.062-12)	3/4	.75	2.00	1.75	.56	6.25	3.50	1.750	1.75	5.00	8.50	5.00
4.00	3.00	1.12	5.00	#12 (1.062-12)	3/4	.88	2.00	1.75	.56	6.62	3.75	1.750	1.75	6.25	8.75	6.25
5.00	3.50	1.12	6.50	#12 (1.062-12)	3/4	.88	2.00	1.75	.75	7.12	4.25	1.750	1.75	7.75	11.25	7.75
6.00	4.00	1.25	7.50	#16 (1.312-12)	1	1.00*	2.25	2.25	.88	8.38*	4.88	2.000	2.00	9.25	13.25	9.25
7.00	4.50	1.62	8.50	#20 (1.625-12)	1 1/4	1.00	2.75	2.75	1.00	9.50	5.38	2.500	2.50	11.25	16.25	11.50
8.00	5.50	2.12	9.50	#24 (1.875-12)	1 1/2	1.00	3.00	3.00	1.06	10.50	6.12	3.000	3.00	12.25	18.25	12.50

* With (K) Rod F = .88, LB = 8.25

** NPTF ports will be furnished as standard unless SAE straight thread ports are specified

MT4

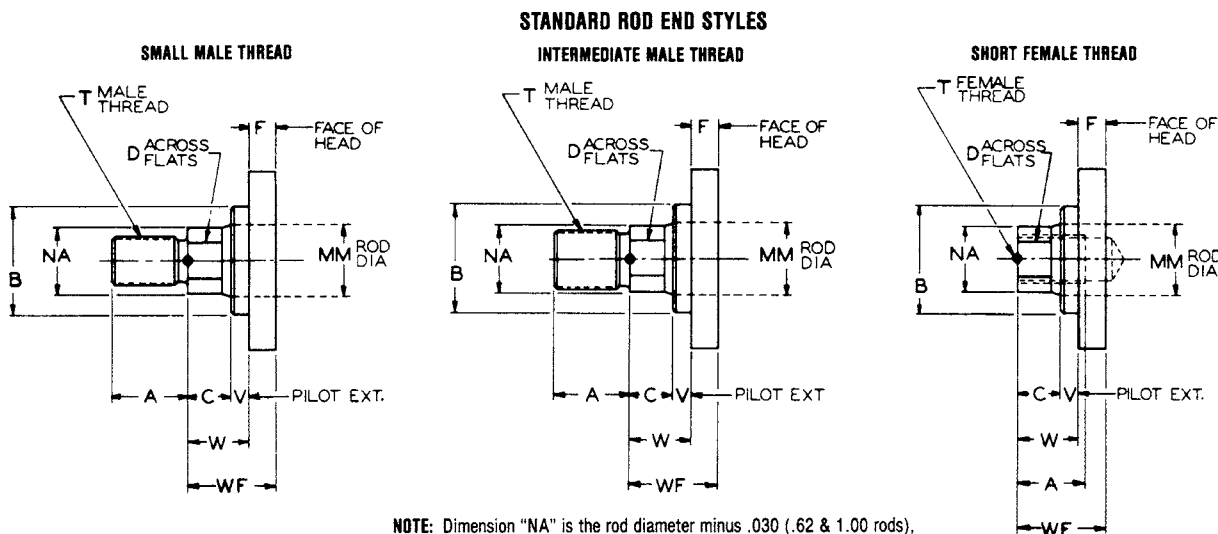
Dimensions are Affected by the Rod Diameter

CYLINDER			A	B -.001 -.003	C	D	MM ROD DIA.	RD*	T (THREAD)			V	W	XI (MIN)	Y	ZB	PSI RATING†
BORE	ROD DIA. CODE	ROD DIA.							SMALL MALE SM	INTER- MEDIATE MALE IM	SHORT FEMALE SF						
1.50	D	.62	.75	1.125	.38	.50	.62	-	.44-20	50-20	.44-20	.25	.62	3.50	2.00	5.94	3000
	F	1.00	1.12	1.500	.50	.88	1.00	-	.75-16	.88-14	.75-16	.50	1.00	3.88	2.38	6.31	3000
2.00	F	1.00	1.12	1.500	.50	.88	1.00	-	.75-16	.88-14	.75-16	.25	.75	4.00	2.38	6.44	3000
	G	1.38	1.62	2.000	.62	1.12	1.38	-	1.00-14	1.25-12	1.00-14	.38	1.00	4.25	2.62	6.69	3000
2.50	F	1.00	1.12	1.500	.50	.88	1.00	-	.75-16	.88-14	.75-16	.25	.75	4.12	2.38	6.56	3000
	G	1.38	1.62	2.000	.62	1.12	1.38	-	1.00-14	1.25-12	1.00-14	.38	1.00	4.38	2.62	6.81	3000
	H	1.75	2.00	2.375	.75	1.50	1.75	-	1.25-12	1.50-12	1.25-12	.50	1.25	4.62	2.88	7.06	3000
3.25	G	1.38	1.62	2.000	.62	1.12	1.38	3.50	1.00-14	1.25-12	1.00-14	.25	.88	5.00	2.75	7.69	3000
	H	1.75	2.00	2.375	.75	1.50	1.75	3.50	1.25-12	1.50-12	1.25-12	.38	1.12	5.25	3.00	7.94	3000
	J	2.00	2.25	2.625	.88	1.69	2.00	3.88	1.50-12	1.75-12	1.50-12	.38	1.25	5.38	3.12	8.06	3000
4.00	H	1.75	2.00	2.375	.75	1.50	1.75	3.50	1.25-12	1.50-12	1.25-12	.25	1.00	5.50	3.00	8.19	3000
	J	2.00	2.25	2.625	.88	1.69	2.00	4.25	1.50-12	1.75-12	1.50-12	.25	1.12	5.62	3.12	8.31	3000
	K	2.50	3.00	3.125	1.00	2.06	2.50	4.25	1.88-12	2.25-12	1.88-12	.38	1.38	5.88	3.38	8.56	3000
5.00	J	2.00	2.25	2.625	.88	1.69	2.00	4.25	1.50-12	1.75-12	1.50-12	.25	1.12	5.88	3.12	9.00	1850
	K	2.50	3.00	3.125	1.00	2.06	2.50	4.25	1.88-12	2.25-12	1.88-12	.38	1.38	6.12	3.38	9.25	1850
	L	3.00	3.50	3.750	1.00	2.62	3.00	5.62	2.25-12	2.75-12	2.25-12	.38	1.38	6.12	3.38	9.25	1850
	M	3.50	3.50	4.250	1.00	3.00	3.50	5.62	2.50-12	3.25-12	2.50-12	.38	1.38	6.12	3.38	9.25	1850
6.00	K	2.50	3.00	3.125	1.00	2.06	2.50	4.25	1.88-12	2.25-12	1.88-12	.38	1.38	6.62	3.50	10.50	1660
	L	3.00	3.50	3.750	1.00	2.62	3.00	6.38	2.25-12	2.75-12	2.25-12	.25	1.25	6.62	3.50	10.50	1660
	M	3.50	3.50	4.250	1.00	3.00	3.50	6.38	2.50-12	3.25-12	2.50-12	.25	1.25	6.62	3.50	10.50	1660
	N	4.00	4.00	4.750	1.00	3.38	4.00	6.38	3.00-12	3.75-12	3.00-12	.25	1.25	6.62	3.50	10.50	1660
7.00	L	3.00	3.50	3.750	1.00	2.62	3.00	6.38	2.25-12	2.75-12	2.25-12	.25	1.25	7.38	3.81	11.75	1900
	M	3.50	3.50	4.250	1.00	3.00	3.50	6.38	2.50-12	3.25-12	2.50-12	.25	1.25	7.38	3.81	11.75	1900
	N	4.00	4.00	4.750	1.00	3.38	4.00	6.38	3.00-12	3.75-12	3.00-12	.25	1.25	7.38	3.81	11.75	1900
	P	4.50	4.50	5.250	1.00	3.88	4.50	7.50	3.25-12	4.25-12	3.25-12	.25	1.25	7.38	3.81	11.75	1900
	R	5.00	5.00	5.750	1.00	4.25	5.00	7.50	3.50-12	4.75-12	3.50-12	.25	1.25	7.38	3.81	11.75	1900
8.00	M	3.50	3.50	4.250	1.00	3.00	3.50	6.38	2.50-12	3.25-12	2.50-12	.25	1.25	8.12	3.94	12.81	2100
	N	4.00	4.00	4.750	1.00	3.38	4.00	6.38	3.00-12	3.75-12	3.00-12	.25	1.25	8.12	3.94	12.81	2100
	P	4.50	4.50	5.250	1.00	3.88	4.50	8.00	3.25-12	4.25-12	3.25-12	.25	1.25	8.12	3.94	12.81	2100
	R	5.00	5.00	5.750	1.00	4.25	5.00	8.00	3.50-12	4.75-12	3.50-12	.25	1.25	8.12	3.94	12.81	2100
	S	5.50	5.50	6.250	1.00	4.62	5.50	8.00	4.00-12	5.25-12	4.00-12	.25	1.25	8.12	3.94	12.81	2100

* Where RD is not shown, square retainer is used. See RETAINER PLATE CONSTRUCTION in INSTALLATION, OPERATION AND MAINTENANCE DATA section.

† CAUTION: PSI ratings shown are HANNA recommended maximum operating pressures. Check STROKE LIMITATION DATA in TECHNICAL INFORMATION section which may reduce maximum operating pressure. Check STOP TUBE DATA (TECHNICAL INFORMATION section) to determine if stop tube is required.

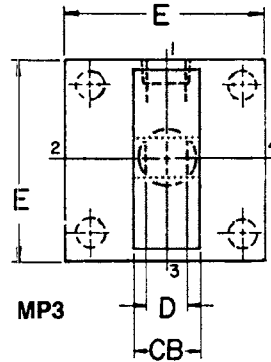
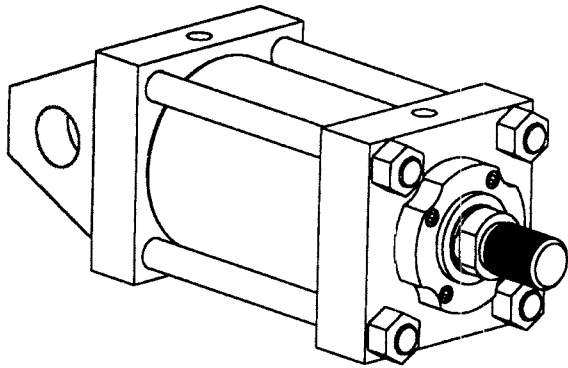
NOTE: Dimensions are nominal except where specifically tolerated. Tolerances on "Plus Stroke" dimensions will vary slightly from dimensions shown due to manufacturing tolerances and tube compression.



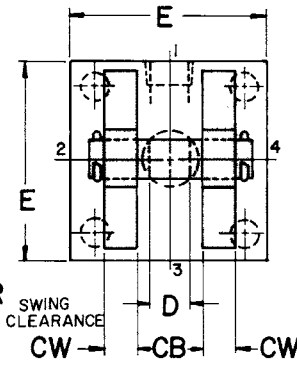
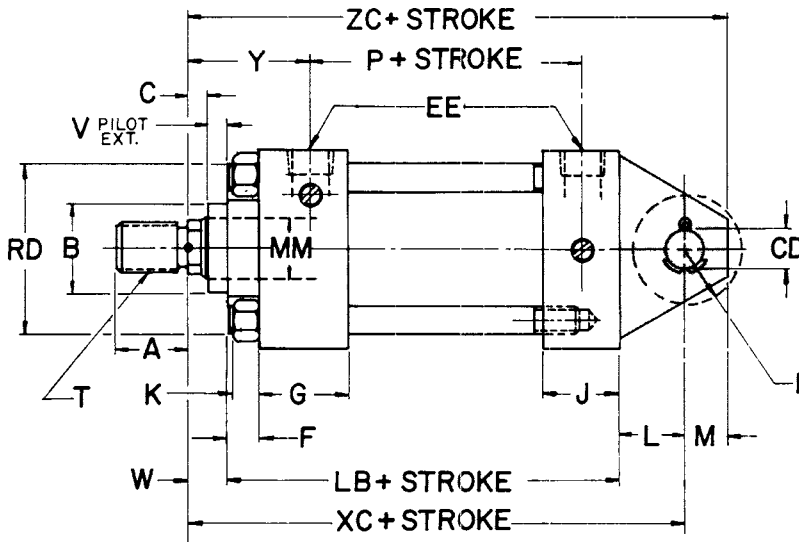
SERIES 2H 1.50"-8.00" Bores

MP1 Fixed Double Ear Clevis Mount (For 10.00" - 14.00" Bores, see Page 38)

MP3 Fixed Single Ear Clevis Mount



MP3



MP1

These Dimensions are Constant Regardless of Rod Diameter

BORE	CB†	CD††	CW	E	EE		F	G	J	K	L	LB	M	MR	P
					SAE STRAIGHT THREAD	NPTF**									
1.50	.75	.50	.50	2.50	#8 (.750-16)	1/2	.38	1.75	1.50	.31	.75	5.00	.50	.62	2.88
2.00	1.25	.75	.62	3.00	#8 (.750-16)	1/2	.62	1.75	1.50	.44	1.25	5.25	.75	.88	2.88
2.50	1.25	.75	.62	3.50	#8 (.750-16)	1/2	.62	1.75	1.50	.44	1.25	5.38	.75	.88	3.00
3.25	1.50	1.00	.75	4.50	#12 (1.062-12)	3/4	.75	2.00	1.75	.56	1.50	6.25	1.00	1.25	3.50
4.00	2.00	1.38	1.00	5.00	#12 (1.062-12)	3/4	.88	2.00	1.75	.56	2.12	6.62	1.38	1.75	3.75
5.00	2.50	1.75	1.25	6.50	#12 (1.062-12)	3/4	.88	2.00	1.75	.75	2.25	7.12	1.75	2.12	4.25
6.00	2.50	2.00	1.25	7.50	#16 (1.312-12)	1	1.00*	2.25	2.25	.88	2.50	8.38*	2.00	2.38	4.88
7.00	3.00	2.50	1.50	8.50	#20 (1.625-12)	1 1/4	1.00	2.75	2.75	1.00	3.00	9.50	2.50	2.94	5.38
8.00	3.00	3.00	1.50	9.50	#24 (1.875-12)	1 1/2	1.00	3.00	3.00	1.06	3.25	10.50	2.75	3.19	6.12

†CB tolerances are +.016, +.047 for MP1; and ±.005 for MP3 ††CD tolerances are +.003, +.005 for MP3.

* With (K) Rod F = .88, LB = 8.25 ** NPTF ports will be furnished as standard unless SAE straight thread ports are specified.

NOTE: Some bore and rod combinations have reduced pressure ratings on the tension stroke when used with a mounting bracket.

NOTE: Pivot pin supplied with MP1 cylinder; Pivot pin *not* supplied with MP3 cylinder.

MP1, MP3

Dimensions are Affected by the Rod Diameter

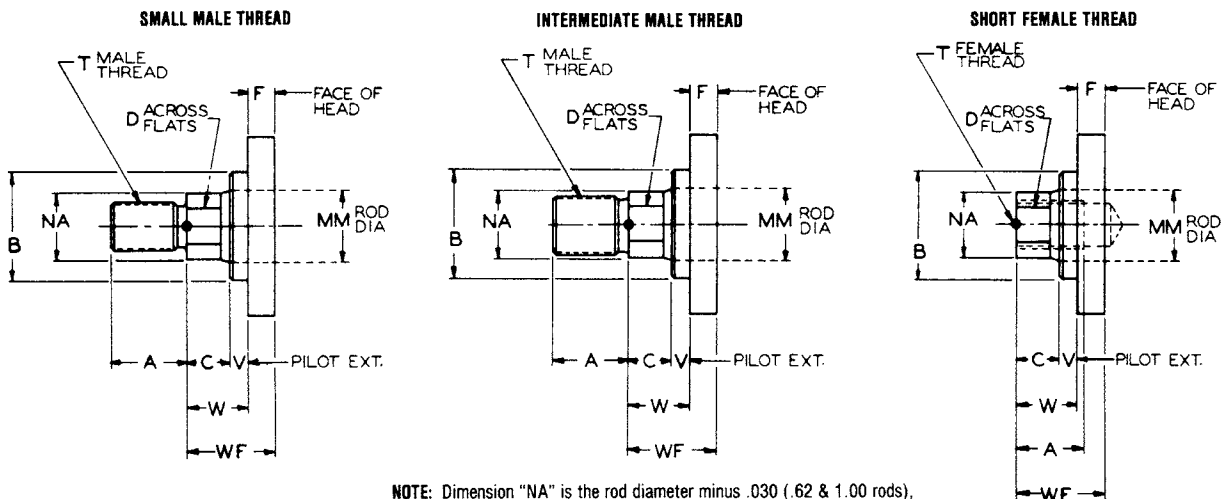
CYLINDER			A	B -.001 -.003	C	D	MM ROD DIA	RD*	T (THREAD)			V	W	XC	Y	ZC	PSI RATING†
BORE	ROD DIA. CODE	ROD DIA.							SMALL MALE SM	INTER- MEDIATE MALE IM	SHORT FEMALE SF						
1.50	D	.62	.75	1.125	.38	.50	.62	-	.44-20	.50-20	.44-20	.25	.62	6.38	2.00	6.88	3000
	F	1.00	1.12	1.500	.50	.88	1.00	-	75-16	88-14	75-16	.50	1.00	6.75	2.38	7.25	3000
2.00	F	1.00	1.12	1.500	.50	.88	1.00	-	.75-16	88-14	.75-16	.25	.75	7.25	2.38	8.00	3000
	G	1.38	1.62	2.000	.62	1.12	1.38	-	1.00-14	1.25-12	1.00-14	.38	1.00	7.50	2.62	8.25	3000
2.50	F	1.00	1.12	1.500	.50	.88	1.00	-	.75-16	88-14	.75-16	.25	.75	7.38	2.38	8.12	3000
	G	1.38	1.62	2.000	.62	1.12	1.38	-	1.00-14	1.25-12	1.00-14	.38	1.00	7.62	2.62	8.38	3000
	H	1.75	2.00	2.375	.75	1.50	1.75	-	1.25-12	1.50-12	1.25-12	.50	1.25	7.88	2.88	8.62	3000
3.25	G	1.38	1.62	2.000	.62	1.12	1.38	3.50	1.00-14	1.25-12	1.00-14	.25	.88	8.62	2.75	9.62	3000
	H	1.75	2.00	2.375	.75	1.50	1.75	3.50	1.25-12	1.50-12	1.25-12	.38	1.12	8.88	3.00	9.88	3000
	J	2.00	2.25	2.625	.88	1.69	2.00	3.88	1.50-12	1.75-12	1.50-12	.38	1.25	9.00	3.12	10.00	3000
4.00	H	1.75	2.00	2.375	.75	1.50	1.75	3.50	1.25-12	1.50-12	1.25-12	.25	1.00	9.75	3.00	11.12	3000
	J	2.00	2.25	2.625	.88	1.69	2.00	4.25	1.50-12	1.75-12	1.50-12	.25	1.12	9.88	3.12	11.25	3000
	K	2.50	3.00	3.125	1.00	2.06	2.50	4.25	1.88-12	2.25-12	1.88-12	.38	1.38	10.12	3.38	11.50	3000
5.00	J	2.00	2.25	2.625	.88	1.69	2.00	4.25	1.50-12	1.75-12	1.50-12	.25	1.12	10.50	3.12	12.25	3000
	K	2.50	3.00	3.125	1.00	2.06	2.50	4.25	1.88-12	2.25-12	1.88-12	.38	1.38	10.75	3.38	12.50	3000
	L	3.00	3.50	3.750	1.00	2.62	3.00	5.62	2.25-12	2.75-12	2.25-12	.38	1.38	10.75	3.38	12.50	3000
6.00	K	2.50	3.00	3.125	1.00	2.06	2.50	4.25	1.88-12	2.25-12	1.88-12	.38	1.38	12.12	3.50	14.12	3000
	L	3.00	3.50	3.750	1.00	2.62	3.00	6.38	2.25-12	2.75-12	2.25-12	.25	1.25	12.12	3.50	14.12	3000
	M	3.50	4.00	4.250	1.00	3.00	3.50	6.38	2.50-12	3.25-12	2.50-12	.25	1.25	12.12	3.50	14.12	3000
7.00	L	3.00	3.50	3.750	1.00	2.62	3.00	6.38	2.25-12	2.75-12	2.25-12	.25	1.25	13.75	3.81	16.25	3000
	M	3.50	4.00	4.250	1.00	3.00	3.50	6.38	2.50-12	3.25-12	2.50-12	.25	1.25	13.75	3.81	16.25	3000
	N	4.00	4.50	4.750	1.00	3.38	4.00	6.38	3.00-12	3.75-12	3.00-12	.25	1.25	13.75	3.81	16.25	3000
	P	4.50	5.00	5.250	1.00	3.88	4.50	7.50	3.25-12	4.25-12	3.25-12	.25	1.25	13.75	3.81	16.25	3000
8.00	R	5.00	5.00	5.750	1.00	4.25	5.00	8.00	3.50-12	4.75-12	3.50-12	.25	1.25	13.75	3.81	16.25	3000
	M	3.50	3.50	4.250	1.00	3.00	3.50	6.38	2.50-12	3.25-12	2.50-12	.25	1.25	15.00	3.94	17.75	3000
	N	4.00	4.00	4.750	1.00	3.38	4.00	6.38	3.00-12	3.75-12	3.00-12	.25	1.25	15.00	3.94	17.75	3000
8.00	P	4.50	4.50	5.250	1.00	3.88	4.50	8.00	3.25-12	4.25-12	3.25-12	.25	1.25	15.00	3.94	17.75	3000
	R	5.00	5.00	5.750	1.00	4.25	5.00	8.00	3.50-12	4.75-12	3.50-12	.25	1.25	15.00	3.94	17.75	3000
	S	5.50	5.50	6.250	1.00	4.62	5.50	8.00	4.00-12	5.25-12	4.00-12	.25	1.25	15.00	3.94	17.75	3000

* Where RD is not shown, square retainer is used. See RETAINER PLATE CONSTRUCTION in INSTALLATION, OPERATION AND MAINTENANCE DATA section.

† CAUTION: PSI ratings shown are HANNA recommended maximum operating pressures. Check STROKE LIMITATION DATA in TECHNICAL INFORMATION section which may reduce maximum operating pressure. Check STOP TUBE DATA (TECHNICAL INFORMATION section) to determine if stop tube is required.

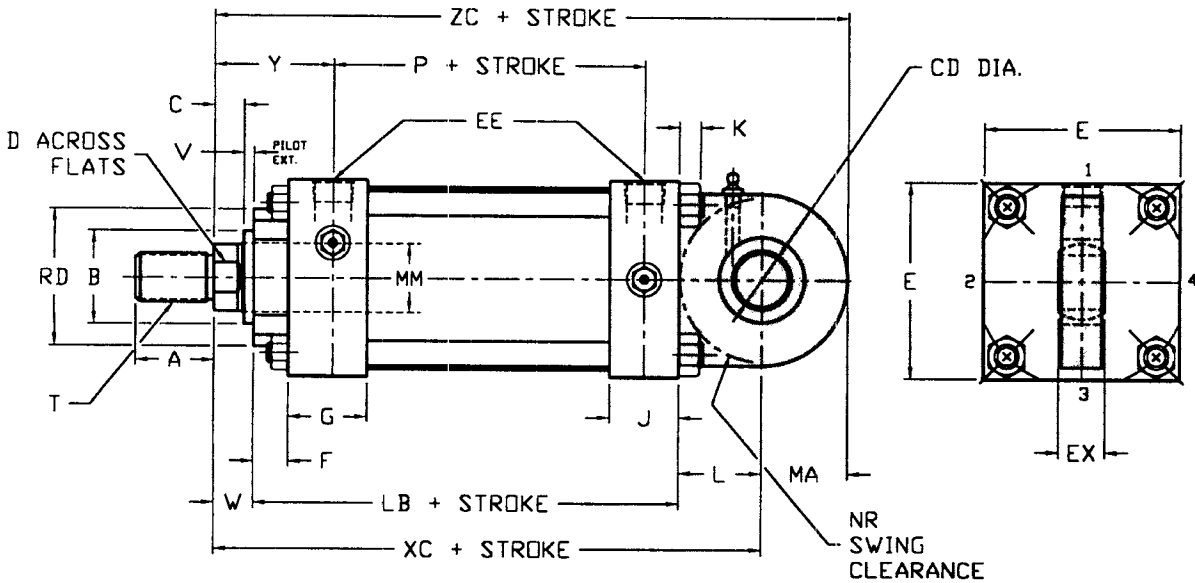
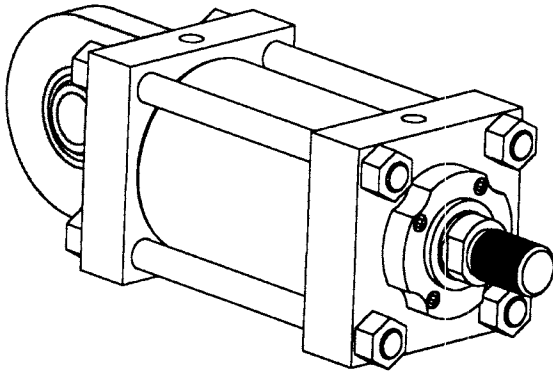
NOTE: Dimensions are nominal except where specifically tolerated. Tolerances on "Plus Stroke" dimensions will vary slightly from dimensions shown due to manufacturing tolerances and tube compression.

STANDARD ROD END STYLES



NOTE: Dimension "NA" is the rod diameter minus .030 (.62 & 1.00 rods), minus .062 (1.38-5.50 rods)

SERIES 2H 1.50"-6.00" Bores MPU3 Spherical Bearing Mount



These Dimensions Are Constant Regardless of Rod Diameter

BORE	CD -0.0005	E	EE		EX	F	G	J	K	L	LB	MA	NR	P
			SAE STRAIGHT THREAD	NPTF**										
1.50	0.5000	2.50	#8 (.750-16)	1/2	.44	.38	1.75	1.50	.31	.75	5.00	.88	.62	2.88
2.00	0.7500	3.00	#8 (.750-16)	1/2	.66	.62	1.75	1.50	.44	1.25	5.25	1.25	1.00	2.88
2.50	0.7500	3.50	#8 (.750-16)	1/2	.66	.62	1.75	1.50	.44	1.25	5.38	1.25	1.00	3.00
3.25	1.0000	4.50	#12 (1.062-12)	3/4	.88	.75	2.00	1.75	.56	1.50	6.25	1.62	1.25	3.50
4.00	1.3750	5.00	#12 (1.062-12)	3/4	1.19	.88	2.00	1.75	.56	2.12	6.62	2.19	1.62	3.75
5.00	1.7500	6.50	#12 (1.062-12)	3/4	1.53	.88	2.00	1.75	.75	2.25	7.12	2.81	2.06	4.25
6.00	2.0000	7.50	#16 (1.312-12)	1	1.75	1.00*	2.25	2.25	.88	2.50	8.38*	3.19	2.38	4.88

*With (K) Rod F = .88, LB = 8.25 **NPTF ports will be furnished as standard unless SAE straight thread ports are specified

MPU3

Dimensions Are Affected by Rod Diameter

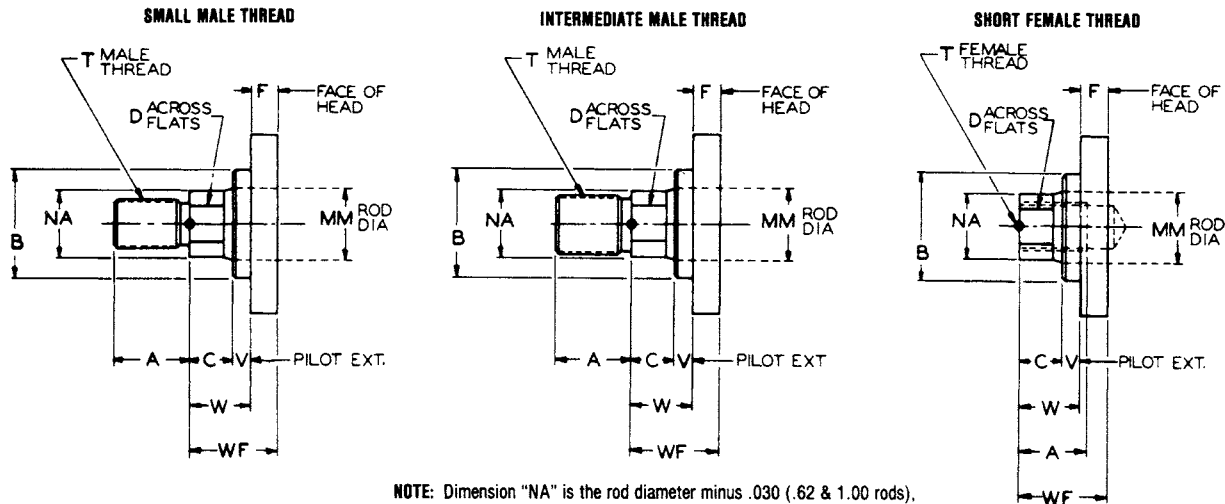
BORE	CYLINDER		A	B -.001 -.003	C	D	MM ROD DIA.	RD*	T (THREAD)			V	W	XC	Y	ZC	PSI RATING†
	ROD DIA CODE	ROD DIA.							SMALL MALE SM	INTER- MEDIATE MALE IM	SHORT FEMALE SF						
1.50	D	.62	.75	1.125	.38	.50	.62	-	44-20	.50-20	.44-20	.25	.62	6.38	2.00	7.25	1250
	F	1.00	1.12	1.500	.50	.88	1.00	-	.75-16	.88-14	.75-15	.50	1.00	6.75	2.38	7.62	1250
2.00	F	1.00	1.12	1.500	.50	.88	1.00	-	.75-16	.88-14	.75-16	.25	.75	7.25	2.38	8.50	2200
	G	1.38	1.62	2.000	.62	1.12	1.38	-	1.00-14	1.25-12	1.00-14	.38	1.00	7.50	2.62	8.75	2200
2.50	F	1.00	1.12	1.500	.50	.88	1.00	-	.75-16	.88-14	.75-16	.25	.75	7.38	2.38	8.62	1450
	G	1.38	1.62	2.000	.62	1.12	1.38	-	1.00-14	1.25-12	1.00-14	.38	1.00	7.62	2.62	8.88	1450
	H	1.75	2.00	2.375	.75	1.50	1.75	-	1.25-12	1.50-12	1.25-12	.50	1.25	7.88	2.88	9.12	1450
3.25	G	1.38	1.62	2.000	.62	1.12	1.38	3.50	1.00-14	1.25-12	1.00-14	.25	.88	8.62	2.75	10.25	1500
	H	1.75	2.00	2.375	.75	1.50	1.75	3.50	1.25-12	1.50-12	1.25-12	.38	1.12	8.88	3.00	10.50	1500
	J	2.00	2.25	2.625	.88	1.69	2.00	3.88	1.50-12	1.75-12	1.50-12	.38	1.25	9.00	3.12	10.62	1500
4.00	H	1.75	2.00	2.375	.75	1.50	1.75	3.50	1.25-12	1.50-12	1.25-12	.25	1.00	9.75	3.00	11.94	1850
	J	2.00	2.25	2.625	.88	1.69	2.00	4.25	1.50-12	1.75-12	1.50-12	.25	1.12	9.88	3.12	12.06	1850
	K	2.50	3.00	3.125	1.00	2.06	2.50	4.25	1.88-12	2.25-12	1.88-12	.38	1.38	10.12	3.38	12.31	1850
5.00	J	2.00	2.25	2.625	.88	1.69	2.00	4.25	1.50-12	1.75-12	1.50-12	.25	1.12	10.50	3.12	13.31	2000
	K	2.50	3.00	3.125	1.00	2.06	2.50	4.25	1.88-12	2.25-12	1.88-12	.38	1.38	10.75	3.38	13.56	2000
	L	3.00	3.50	3.750	1.00	2.62	3.00	5.62	2.25-12	2.75-12	2.25-12	.38	1.38	10.75	3.38	13.56	2000
	M	3.50	3.50	4.250	1.00	3.00	3.50	5.62	2.50-12	3.25-12	2.50-12	.38	1.38	10.75	3.38	13.56	2000
6.00	K	2.50	3.00	3.125	1.00	2.06	2.50	4.25	1.88-12	2.25-12	1.88-12	.38	1.38	12.12	3.50	15.31	1500
	L	3.00	3.50	3.750	1.00	2.62	3.00	6.38	2.25-12	2.75-12	2.25-12	.25	1.25	12.12	3.50	15.31	1500
	M	3.50	3.50	4.250	1.00	3.00	3.50	6.38	2.50-12	3.25-12	2.50-12	.25	1.25	12.12	3.50	15.31	1500
	N	4.00	4.00	4.750	1.00	3.38	4.00	6.38	3.00-12	3.75-12	3.00-12	.25	1.25	12.12	3.50	15.31	1500

* Where RD is not shown, square retainer is used. See RETAINER PLATE CONSTRUCTION in INSTALLATION, OPERATION AND MAINTENANCE DATA section.

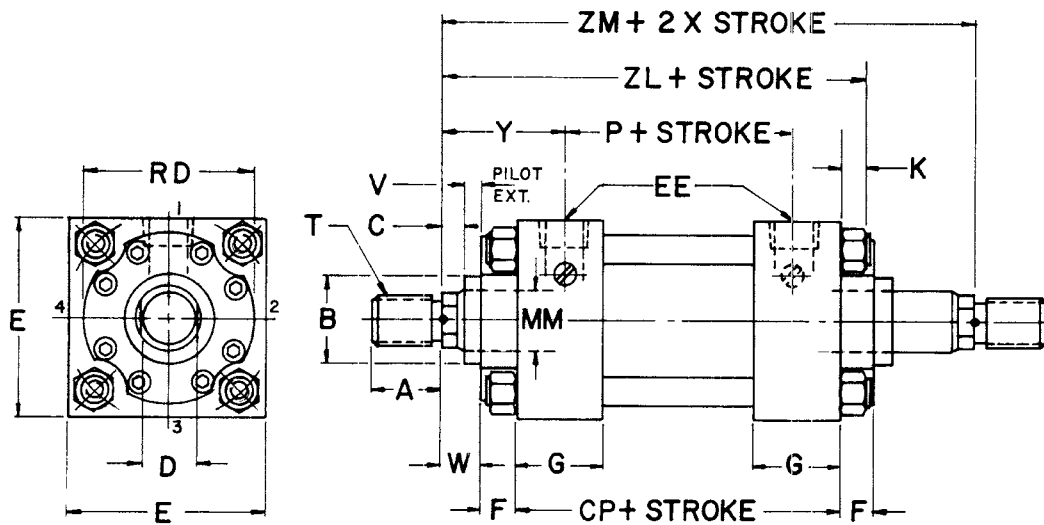
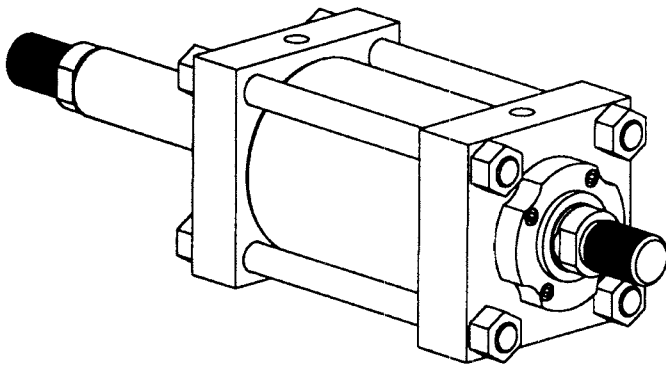
† **CAUTION:** PSI ratings shown are **HANNA** recommended maximum operating pressures. Check STROKE LIMITATION DATA in TECHNICAL INFORMATION section which may reduce maximum operating pressure. Check STOP TUBE DATA (TECHNICAL INFORMATION section) to determine if stop tube is required.

NOTE: Dimensions are nominal except where specifically tolerated. Tolerances on "Plus Stroke" dimensions will vary slightly from dimensions shown due to manufacturing tolerances and tube compression.

STANDARD ROD END STYLES



SERIES 2H 1.50"-8.00" Bores MXO-D Double Rod End†



These Dimensions are Constant Regardless of Rod Diameter

BORE	CP	E	EE		F	G	K	P
			SAE STRAIGHT THREAD	NPTF**				
1.50	4.88	2.50	#8 (750-16)	1/2	.38	1.75	.31	2.88
2.00	4.88	3.00	#8 (750-16)	1/2	.62	1.75	.44	2.88
2.50	5.00	3.50	#8 (750-16)	1/2	.62	1.75	.44	3.00
3.25	5.75	4.50	#12 (1.062-12)	3/4	.75	2.00	.56	3.50
4.00	6.00	5.00	#12 (1.062-12)	3/4	.88	2.00	.56	3.75
5.00	6.50	6.50	#12 (1.062-12)	3/4	.88	2.00	.75	4.25
6.00	7.38	7.50	#16 (1.312-12)	1	1.00*	2.25	.88	4.88
7.00	8.50	8.50	#20 (1.625-12)	1 1/4	1.00	2.75	1.00	5.38
8.00	9.50	9.50	#24 (1.875-12)	1 1/2	1.00	3.00	1.06	6.12

* With (K) Rod F = .88

** NPTF ports will be furnished as standard unless SAE straight thread ports are specified.

† Available in MS2, MS3, MS4, MS7, MF1, MF5, ME5, MT1, MT4, see single rod pages for mounting dimensions and appropriate P.S.I. Ratings.

For Models MS2 and MS3 (1.50" thru 5.00" bores), add .25" to Dimension "SS."
For Models MS7 and MS4, consult factory for Dimensions "SE" and "SN."

MXO-D

Dimensions are Affected by the Rod Diameter

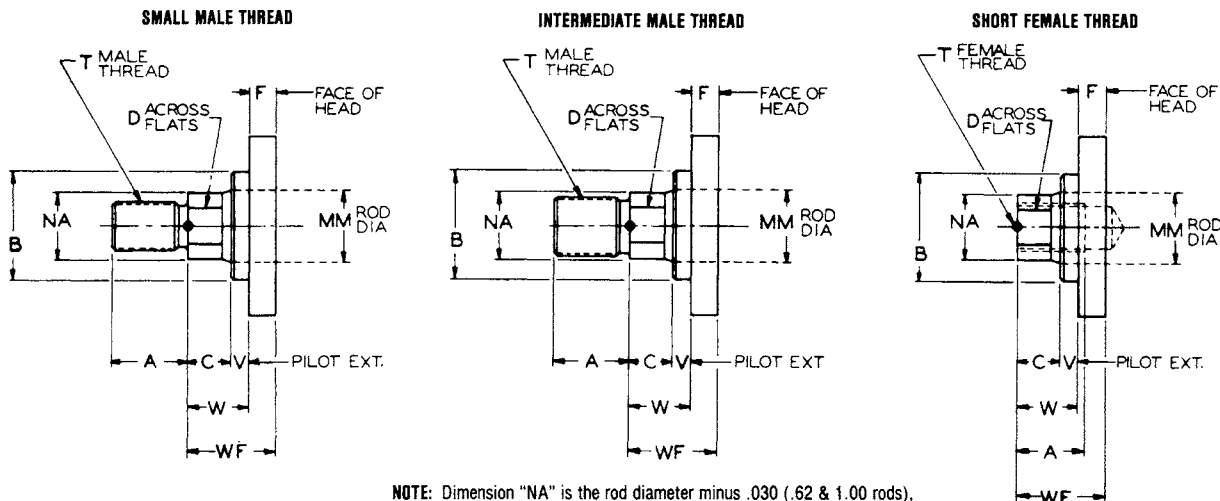
CYLINDER			A	B -.001 -.003	C	D	MM ROD DIA.	RD*	T (THREAD)			V	W	Y	ZL	ZM	PSI RATING†
BORE	ROD DIA. CODE	ROD DIA.							SMALL MALE SM	INTER- MEDIATE MALE IM	SHORT FEMALE SF						
1.50	D	.62	.75	1.125	.38	.50	.62	-	.44-20	.50-20	.44-20	.25	.62	2.00	6.19	6.88	3000
	F	1.00	1.12	1.500	.50	.88	1.00	-	.75-16	.88-14	.75-16	.50	1.00	2.38	6.94	7.62	3000
2.00	F	1.00	1.12	1.500	.50	.88	1.00	-	.75-16	.88-14	.75-16	.25	.75	2.38	6.69	7.62	3000
	G	1.38	1.62	2.000	.62	1.12	1.38	-	1.00-14	1.25-12	1.00-14	.38	1.00	2.62	7.56	8.12	3000
2.50	F	1.00	1.12	1.500	.50	.88	1.00	-	.75-16	.88-14	.75-16	.25	.75	2.38	6.81	7.75	3000
	G	1.38	1.62	2.000	.62	1.12	1.38	-	1.00-14	1.25-12	1.00-14	.38	1.00	2.62	7.69	8.25	3000
	H	1.75	2.00	2.375	.75	1.50	1.75	-	1.25-12	1.50-12	1.25-12	.50	1.25	2.88	7.94	8.75	3000
3.25	G	1.38	1.62	2.000	.62	1.12	1.38	3.50	1.00-14	1.25-12	1.00-14	.25	.88	2.75	7.94	9.00	3000
	H	1.75	2.00	2.375	.75	1.50	1.75	3.50	1.25-12	1.50-12	1.25-12	.38	1.12	3.00	8.19	9.50	3000
	J	2.00	2.25	2.625	.88	1.69	2.00	3.88	1.50-12	1.75-12	1.50-12	.38	1.25	3.12	8.31	9.75	3000
4.00	H	1.75	2.00	2.375	.75	1.50	1.75	3.50	1.25-12	1.50-12	1.25-12	.25	1.00	3.00	8.44	9.75	3000
	J	2.00	2.25	2.625	.88	1.69	2.00	4.25	1.50-12	1.75-12	1.50-12	.25	1.12	3.12	8.56	10.00	3000
	K	2.50	3.00	3.125	1.00	2.06	2.50	4.25	1.88-12	2.25-12	1.88-12	.38	1.38	3.38	8.81	10.50	3000
5.00	J	2.00	2.25	2.625	.88	1.69	2.00	4.25	1.50-12	1.75-12	1.50-12	.25	1.12	3.12	9.25	10.50	3000
	K	2.50	3.00	3.125	1.00	2.06	2.50	4.25	1.88-12	2.25-12	1.88-12	.38	1.38	3.38	9.50	11.00	3000
	L	3.00	3.50	3.750	1.00	2.62	3.00	5.62	2.25-12	2.75-12	2.25-12	.38	1.38	3.38	9.50	11.00	3000
	M	3.50	3.50	4.250	1.00	3.00	3.50	5.62	2.50-12	3.25-12	2.50-12	.38	1.38	3.38	9.50	11.00	3000
6.00	K	2.50	3.00	3.125	1.00	2.06	2.50	4.25	1.88-12	2.25-12	1.88-12	.38	1.38	3.50	10.50	11.88	3000
	L	3.00	3.50	3.750	1.00	2.62	3.00	6.38	2.25-12	2.75-12	2.25-12	.25	1.25	3.50	10.50	11.88	3000
	M	3.50	3.50	4.250	1.00	3.00	3.50	6.38	2.50-12	3.25-12	2.50-12	.25	1.25	3.50	10.50	11.88	3000
	N	4.00	4.00	4.750	1.00	3.38	4.00	6.38	3.00-12	3.75-12	3.00-12	.25	1.25	3.50	10.50	11.88	3000
7.00	L	3.00	3.50	3.750	1.00	2.62	3.00	6.38	2.25-12	2.75-12	2.25-12	.25	1.25	3.81	11.75	13.00	3000
	M	3.50	3.50	4.250	1.00	3.00	3.50	6.38	2.50-12	3.25-12	2.50-12	.25	1.25	3.81	11.75	13.00	3000
	N	4.00	4.00	4.750	1.00	3.38	4.00	6.38	3.00-12	3.75-12	3.00-12	.25	1.25	3.81	11.75	13.00	3000
	P	4.50	4.50	5.250	1.00	3.88	4.50	7.50	3.25-12	4.25-12	3.25-12	.25	1.25	3.81	11.75	13.00	3000
8.00	R	5.00	5.00	5.750	1.00	4.25	5.00	7.50	3.50-12	4.75-12	3.50-12	.25	1.25	3.81	11.75	13.00	3000
	M	3.50	3.50	4.250	1.00	3.00	3.50	6.38	2.50-12	3.25-12	2.50-12	.25	1.25	3.94	12.81	14.00	3000
	N	4.00	4.00	4.750	1.00	3.38	4.00	6.38	3.00-12	3.75-12	3.00-12	.25	1.25	3.94	12.81	14.00	3000
	P	4.50	4.50	5.250	1.00	3.88	4.50	8.00	3.25-12	4.25-12	3.25-12	.25	1.25	3.94	12.81	14.00	3000
8.00	R	5.00	5.00	5.750	1.00	4.25	5.00	8.00	3.50-12	4.75-12	3.50-12	.25	1.25	3.94	12.81	14.00	3000
	S	5.50	5.50	6.250	1.00	4.62	5.50	8.00	4.00-12	5.25-12	4.00-12	.25	1.25	3.94	12.81	14.00	3000

* Where RD is not shown, square retainer is used. See RETAINER PLATE CONSTRUCTION in INSTALLATION, OPERATION AND MAINTENANCE DATA section.

† CAUTION: PSI ratings shown are HANNA recommended maximum operating pressures. Check STROKE LIMITATION DATA in TECHNICAL INFORMATION section which may reduce maximum operating pressure. Check STOP TUBE DATA (TECHNICAL INFORMATION section) to determine if stop tube is required.

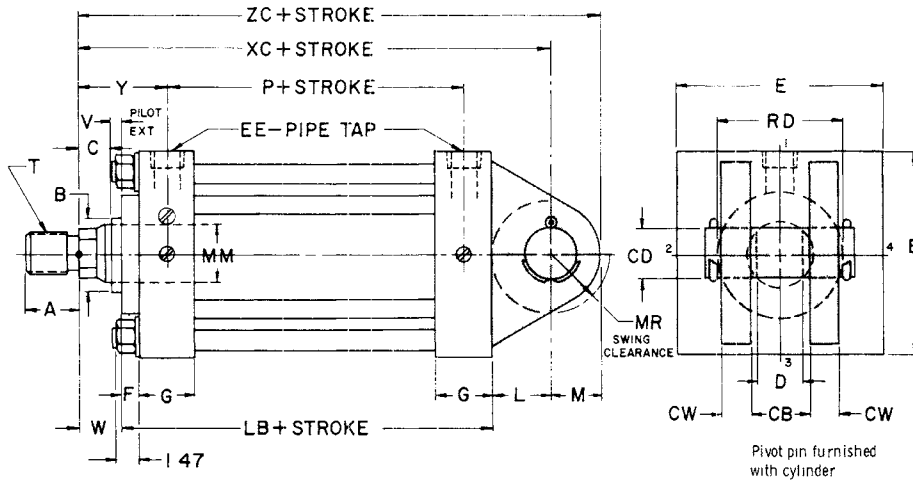
NOTE: Dimensions are nominal except where specifically tolerated. Tolerances on "Plus Stroke" dimensions will vary slightly from dimensions shown due to manufacturing tolerances and tube compression.

STANDARD ROD END STYLES

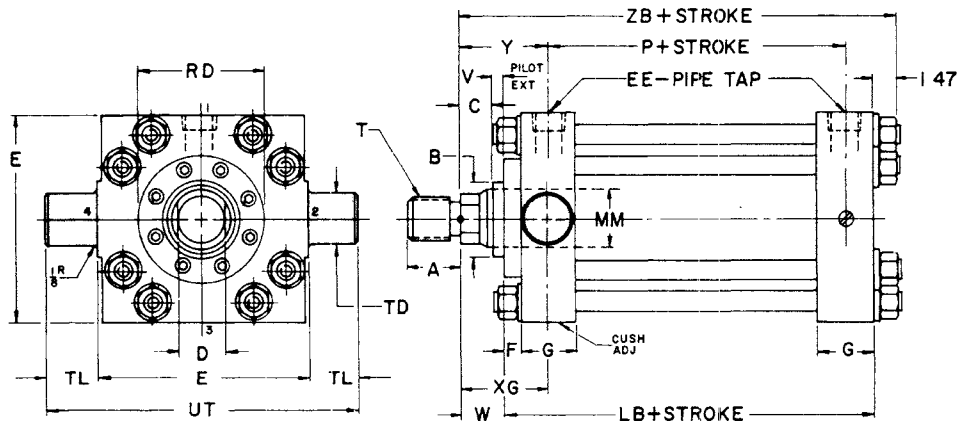


NOTE: Dimension "NA" is the rod diameter minus .030 (.62 & 1.00 rods), minus .062 (1.38-5.50 rods)

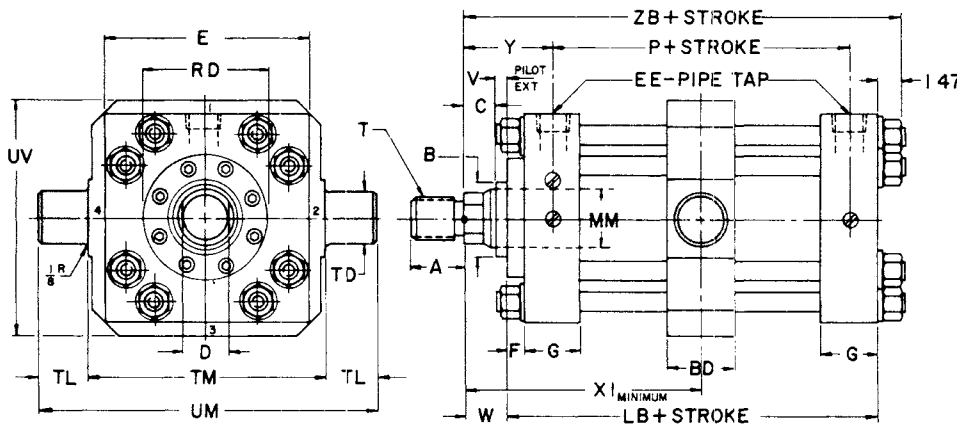
SERIES 2H 10.00"-14.00" Bores MP1 Fixed Clevis Mount



MT1 Head Trunnion Mount



MT4 Intermediate Fixed Trunnion Mount



NOTE: Align and mount pillow blocks to avoid bending moments in trunnions

NOTE: Trunion location [XI] must be specified when ordering

MP1, MT1, MT4

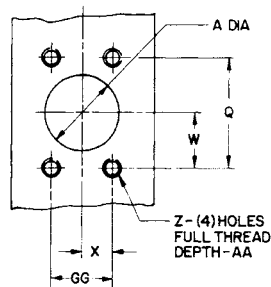
These Dimensions are Constant Regardless of Rod Diameter

BORE	BD	CB +.016 +.047	CD	CW	E	EE*	EE**	G	L	M	MR	P	TD +.000 -.002	TL	TM	UM	UT	UV
	N.P.T.F.		S.A.E. FLANGE PORT															
10.00	4.44	4.00	3.50	2.00	14	2	2	3.69	4.00	3.50	3.62	8.50	3.50	3.50	17.12	24.12	21	16
12.00	4.88	4.50	4.00	2.25	16	2½	2½	4.44	4.50	4.00	4.12	9.88	4.00	4.00	20.88	28.88	24	19.50
14.00	6.00	6.00	5.00	3.00	18	2½	2½	4.88	5.75	5.00	5.12	10.38	5.00	5.00	25.25	35.25	28	25.88

* N.P.T.F. Ports are furnished as standard.

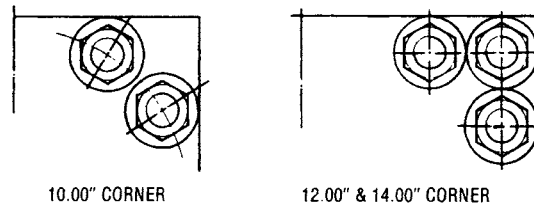
** Optional S.A.E. Flange Ports may be specified—Flange furnished by customer.

OPTIONAL SAE FLANGE PORT PATTERN CODE 61 3000 P.S.I.



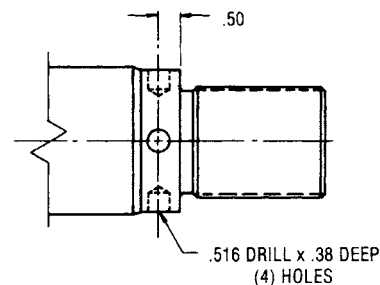
NOM. FLANGE SIZE	A	Q	GG	W	X	Z-THD. UNC-2B	AA MIN.
1-1/2	1.50	2.750	1.406	1.38	0.70	1/2-13	1.06
2	2.00	3.062	1.688	1.53	0.84	1/2-13	1.06
2-1/2	2.50	3.500	2.000	1.75	1.00	1/2-13	1.19

TIE ROD CONSTRUCTION



SPANNER HOLES

Furnished with 7, 8 & 10" Rod Diameters



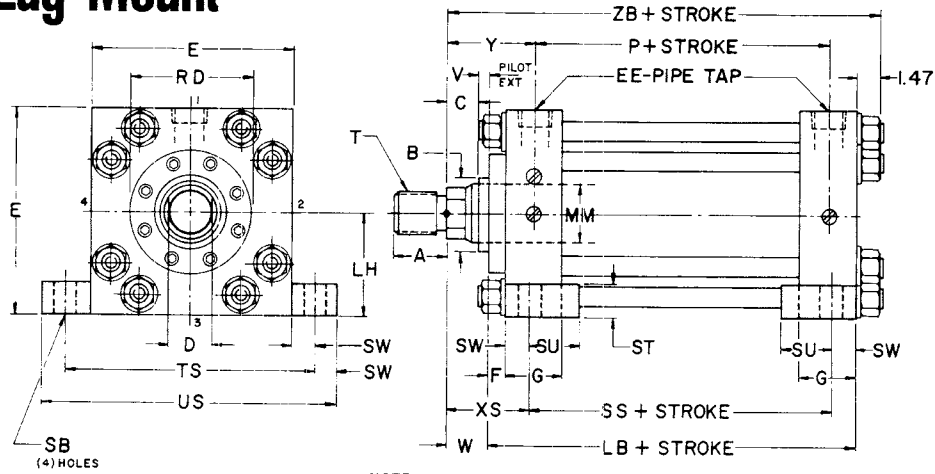
Dimensions are Affected by the Rod Diameter

BORE	MM ROD DIA.	ROD CODE	A	B -.001 -.003	C	D	F	LB	RD	T	V	W	XC	XG	XI MIN.	Y	ZB	ZC	PSI RATING†		
																			MP1	MT1 MT2	MT4
10.00	4.50	P	4.50	5.250	1.69	3.88	1.00	13.12	8.00	3.25-12	.25	1.94	19.06	4.75	8.94	4.75	16.53	22.56	3000	1365	1825
10.00	5.00	R	5.00	5.750	1.94	4.25	1.00	13.12	8.00	3.50-12	.25	2.19	19.31	5.00	9.19	5.00	16.78	22.81	3000	1365	1825
10.00	5.50	S	5.50	6.250	1.94	4.62	1.00	13.12	8.00	4.00-12	.25	2.19	19.31	5.00	9.19	5.00	16.78	22.81	3000	1365	1825
10.00	7.00	T	7.00	7.750	1.00	*—	1.06	13.19	10.00	5.50-12	1.38	2.38	19.56	5.25	9.44	5.25	17.03	23.06	3000	1365	1825
12.00	5.50	S	5.50	6.250	1.94	4.62	1.00	15.50	8.00	4.00-12	.25	2.19	22.19	5.38	10.06	5.50	19.16	26.19	3000	1250	1660
12.00	7.00	T	7.00	7.750	1.00	*—	1.06	15.56	10.00	5.50-12	1.38	2.38	22.44	5.62	10.31	5.75	19.41	26.44	3000	1250	1660
12.00	8.00	U	8.00	8.750	1.00	*—	1.12	15.62	11.00	6.00-12	1.31	2.31	22.44	5.62	10.31	5.75	19.41	26.44	3000	1250	1660
14.00	7.00	T	7.00	7.750	1.00	*—	1.06	16.69	10.00	5.50-12	1.38	2.38	24.81	5.81	11.31	6.06	20.53	29.81	3000	1425	1900
14.00	8.00	U	8.00	8.750	1.00	*—	1.12	16.75	11.00	6.00-12	1.31	2.31	24.81	5.81	11.31	6.06	20.53	29.81	3000	1425	1900
14.00	10.00	V	10.00	10.750	1.00	*—	1.12	16.75	13.00	7.50-12	1.31	2.31	24.81	5.81	11.31	6.06	20.53	29.81	3000	1425	1900

† CAUTION: PSI ratings shown are HANNA recommended maximum operating pressures. Check STROKE LIMITATION DATA in TECHNICAL INFORMATION section which may reduce maximum operating pressure. Check STOP TUBE DATA (TECHNICAL INFORMATION section) to determine if stop tube is required.

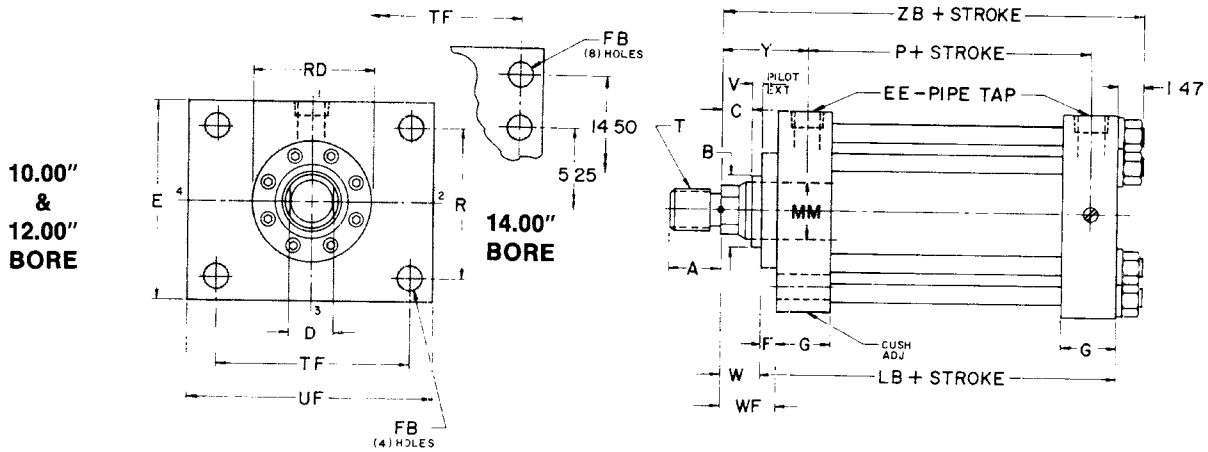
NOTE: Dimensions are nominal except where specifically toleranced. Tolerances on "Plus Stroke" dimensions will vary slightly from dimensions shown due to manufacturing tolerances and tube compression.

SERIES 2H 10.00"-14.00" Bores MS2 Side Lug Mount

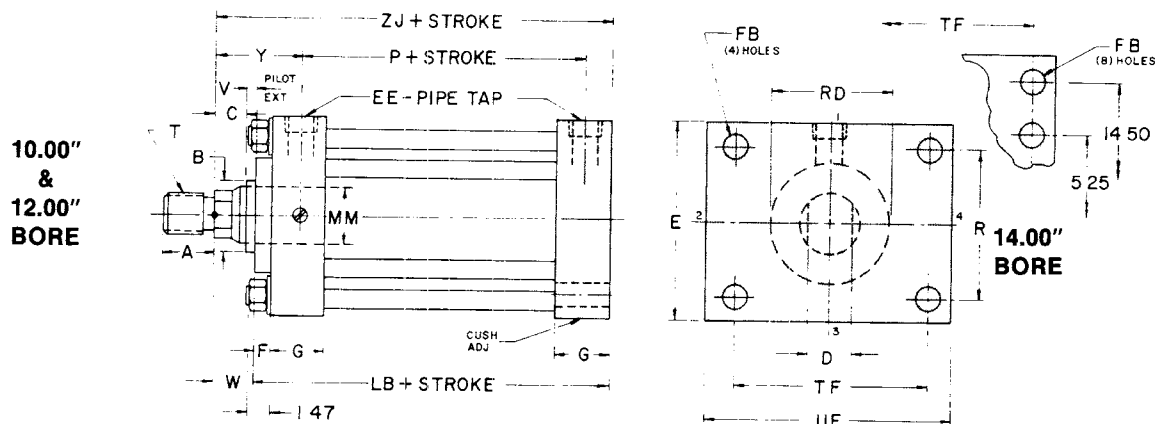


NOTE: Lug mounted cylinders should be fastened at one end by using fitted bolts, a thrust key or by dowel pins. This will eliminate the tendency of the cylinder to shift when pushing or pulling

ME5 Head Flange Mount



ME6 Cap Flange Mount



MS2, ME5, ME6

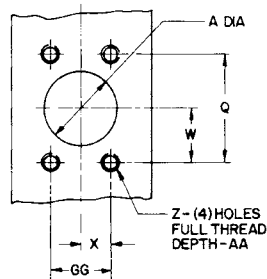
These Dimensions are Constant Regardless of Rod Diameter

BORE	EE*	EE**	E	FB	G	LH -.006 -.008	P	R	SB	SS	ST	SU	SW	TF	TS	UF	US
	N.P.T.F.	S.A.E. FLANGE PORT															
10.00	2	2	14	1.81	3.69	7.00	8.50	10.50	1.56	8.88	2.19	3.50	1.62	14	17.25	17.50	20.50
12.00	2½	2½	16	2.06	4.44	8.00	9.88	11.00	1.56	10.50	2.94	4.25	2.00	18	20.00	22	24.00
14.00	2½	2½	18	1.81	4.88	9.00	10.38	—	2.31	10.62	3.94	5.00	2.50	20.50	23.00	24	28.00

* N.P.T.F. Ports are furnished as standard

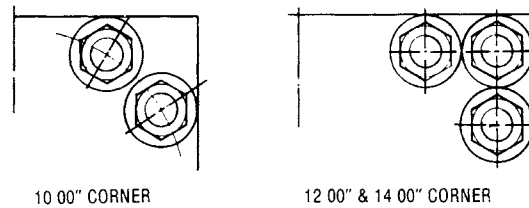
** Optional S A E Flange Ports may be specified—Flange furnished by customer

OPTIONAL SAE FLANGE PORT PATTERN CODE 61 3000 P.S.I.



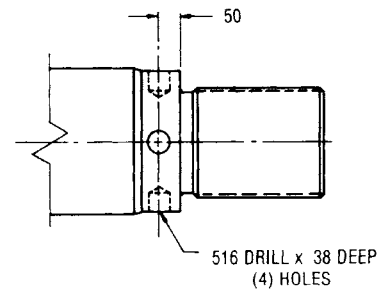
NOM. FLANGE SIZE	A	Q	GG	W	X	Z-THD. UNC-2B	AA MIN.
1-1/2	1.50	2.750	1.406	1.38	0.70	1/2-13	1.06
2	2.00	3.062	1.688	1.53	0.84	1/2-13	1.06
2-1/2	2.50	3.500	2.000	1.75	1.00	1/2-13	1.19

TIE ROD CONSTRUCTION



SPANNER HOLES

Furnished with 7, 8 & 10" Rod Diameters



Dimensions are Affected by the Rod Diameter

BORE	MM ROD DIA.	ROD CODE	A	B -.001 -.003	C	D	F	LB	RD	T	V	W	WF	XS	Y	ZB	ZJ	PSI RATING†
10.00	4.50	P	4.50	5.250	1.69	3.88	1.00	13.12	8.00	3.25-12	.25	1.94	2.94	4.56	4.75	16.53	15.06	3000
10.00	5.00	R	5.00	5.750	1.94	4.25	1.00	13.12	8.00	3.50-12	.25	2.19	3.19	4.81	5.00	16.78	15.31	3000
10.00	5.50	S	5.50	6.250	1.94	4.62	1.00	13.12	8.00	4.00-12	.25	2.19	3.19	4.81	5.00	16.78	15.31	3000
10.00	7.00	T	7.00	7.750	1.00	*—	1.06	13.19	10.00	5.50-12	1.38	2.38	3.44	5.06	5.25	17.03	15.56	3000
12.00	5.50	S	5.50	6.250	1.94	4.62	1.00	15.50	8.00	4.00-12	.25	2.19	3.19	5.19	5.50	19.16	17.69	3000
12.00	7.00	T	7.00	7.750	1.00	*—	1.06	15.56	10.00	5.50-12	1.38	2.38	3.44	5.44	5.75	19.41	17.94	3000
12.00	8.00	U	8.00	8.750	1.00	*—	1.12	15.62	11.00	6.00-12	1.31	2.31	3.44	5.44	5.75	19.41	17.94	3000
14.00	7.00	T	7.00	7.750	1.00	*—	1.06	16.69	10.00	5.50-12	1.38	2.38	3.44	5.94	6.06	20.53	19.06	3000
14.00	8.00	U	8.00	8.750	1.00	*—	1.12	16.75	11.00	6.00-12	1.31	2.31	3.44	5.94	6.06	20.53	19.06	3000
14.00	10.00	V	10.00	10.750	1.00	*—	1.12	16.75	13.00	7.50-12	1.31	2.31	3.44	5.94	6.06	20.53	19.06	3000

† CAUTION: PSI ratings shown are HANNA recommended maximum operating pressures. Check STROKE LIMITATION DATA in TECHNICAL INFORMATION section which may reduce maximum operating pressure. Check STOP TUBE DATA (TECHNICAL INFORMATION section) to determine if stop tube is required.

NOTE: Dimensions are nominal except where specifically toleranced. Tolerances on "Plus Stroke" dimensions will vary slightly from dimensions shown due to manufacturing tolerances and tube compression.

HOW TO ORDER

MF1 * -3L-CC-2.00"-9.00"-FSM1G

MOUNTING STYLE

Side Lugs..... **MS2**

Centerline Lugs..... **MS3**

Side Tapped..... **MS4**

Head Square Flange..... **MF5**

Cap Square Flange..... **MF6**

Head Trunnion..... **MT1**

Cap Trunnion..... **MT2**

Intermediate Fixed Trunnion..... **MT4**

Head Rectangular Flange..... **MF1**

Cap Rectangular Flange..... **MF2**

Tie-Rods..... **MX0, MX1, MX2, MX3, MX4**

Head Flange..... **ME5**

Cap Flange..... **ME6**

Side End Lugs..... **MS7**

Fixed Double-Ear Clevis..... **MP1**

Fixed Single-Ear Clevis..... **MP3**

Cap Detachable Clevis..... **MP2**

Spherical Bearing..... **MPU3**

Double Rod (Available in most mounting styles)..... **MX0-D**

Double Rod End..... **D**
(Specify only if required)

SERIES

Hydraulic **3L**

CUSHION

Non-Cushion **NC**

Cushion, Both Ends* **CC**

Cushion, Cap End Only **CB**

Cushion, Head End Only* **CR**

*Cushion on Head End of 1.50" Bore (F) Rod, 2.00" Bore (G) Rod and 2.50" Bore (H) Rod are not available.

BORE SIZE
(Specify)

STROKE
(Specify)

ROD END STYLE

Small Male **SM**

Intermediate Male **IM**

Short Female **SF***

Rod End Coupling **RC**

Alternate Male (Specify) ... **AL**

Alternate Female (Specify) ... **AF**

Special (Specify) **SP**

*Specify rod stud if required—up thru 2" diameter piston rod

PISTON ROD PACKING, GLAND O-RING, ROD WIPER

STANDARD—Polyurethane Packing, Buna O-Ring, Polyurethane Wiper ... **1**

OPTIONAL —Buna Packing, O-Ring, Polyurethane Wiper ... **2**

OPTIONAL —Viton Packing, Viton O-Ring, Teflon Wiper **3**

PISTON PACKING AND TUBE SEALS

STANDARD—Wear Strips, Filled Teflon Seal with Buna Expander, Buna Tube Seals **G**

OPTIONAL —Buna Packings with Teflon Back-Ups, Buna Tube Seals ... **A**

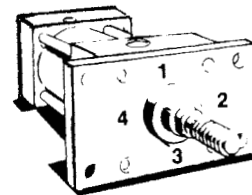
OPTIONAL —Viton Packings with Teflon Back-Ups, Viton Tube Seals ... **B**

OPTIONAL —Wear Strips, Filled Teflon Seal with Viton Expander, Viton Tube Seals **H**

NOTE: Cushion needles furnished with viton seals.

ROD DIAMETER
(Specify Piston Rod Code from dimensional chart)

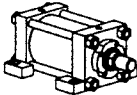
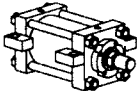
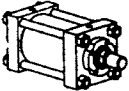
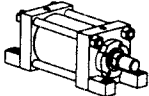
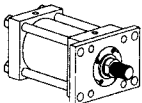
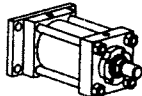
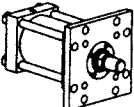
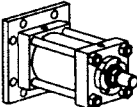
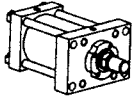
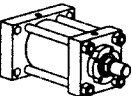
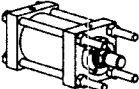
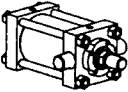
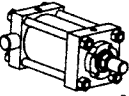
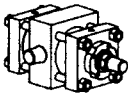
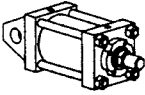
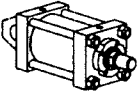
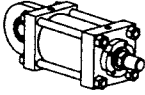
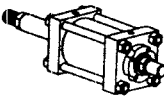
When ordering a stop tube, specify actual (working) stroke and nominal stroke. State length of stop tube.



Port location: if other than position 1, must be specified. Mounting accessories must be specified if required. See Page 85.

SERIES 3L MEDIUM-DUTY HYDRAULIC CYLINDERS

1.50" thru 6.00" Bores

				Description	Page No.		
Side Lug Mount MS2		Centerline Lug Mount MS3		MS2	Side Lug Mount..... 46		
				MS3	Centerline Lug Mount..... 48		
Side Tapped Mount MS4		End Lug Mount MS7		MS4	Side Tapped Mount..... 50		
				MS7	End Lug Mount..... 52		
Head Rectangular Flange Mount MF1		Cap Rectangular Flange Mount MF2		MF1	Head Rectangular Flange Mount..... 54		
				MF2	Cap Rectangular Flange Mount..... 56		
Head Square Flange Mount MF5		Cap Square Flange Mount MF6		MF5	Head Square Flange Mount..... 58		
				MF6	Cap Square Flange Mount..... 60		
Head Flange Mount ME5		Cap Flange Mount ME6		ME5	Head Flange Mount..... 62		
				ME6	Cap Flange Mount..... 64		
		Tie Rod Mounts MX0, MX1, MX2, MX3, MX4		MX0-1-2-3-4	Tie Rod Mounts..... 66		
Head Trunnion Mount MT1		Cap Trunnion Mount MT2		Intermediate Fixed Trunnion Mount MT4		MT1	Head Trunnion Mount..... 68
						MT2	Cap Trunnion Mount..... 70
						MT4	Intermediate Fixed Trunnion Mount... 72
Double Ear Fixed Clevis Mount MP1		Single Ear Fixed Clevis Mount MP3		MP1	Fixed Double Ear Clevis Mount..... 74		
				MP3	Fixed Single Ear Clevis Mount..... 74		
				MP2	Detachable Clevis Mount..... 74		
Spherical Bearing Mount MPU3		Double Rod Mount MX0-D		MPU3	Spherical Bearing Mount..... 76		
				MX0-D	Double Rod Mount..... 78		
TECHNICAL INFORMATION					80		
INSTALLATION, OPERATION AND MAINTENANCE DATA					88		
MOUNTING ACCESSORIES, OPTIONS					94		

HANNA
cylinders

Series 3L Medium-Duty Hydraulic Cylinders

Hanna's Series 3L medium-pressure hydraulic cylinders are designed and built to meet today's exacting industrial requirements.

Extensive laboratory testing and countless field applications have proved conclusively that 3L cylinders provide millions of maintenance-free cycles. The reason: the combination of Hanna's unique Duralon® rod bearing and our glass-filled Teflon® piston seal with a bronze-impregnated bearing strip completely eliminates metal-to-metal contact at bearing surfaces.

Series 3L cylinders give you virtually unlimited flexibility in machinery design, with a full range of bore sizes (1.50" through 6.00") offered. Developed for pressure ratings of 600 to 1,800 p.s.i., Series 3L cylinders are available in 24 N.F.P.A. mounting styles.

When ordering, specify piston packing code "G" for moderate temperatures, and Code "H" for high temperature service.

Duralon is a Trademark of Rexnord, Inc.
Teflon and Dacron are Trademarks of DuPont Company

Series 3L Features and Benefits

1. Piston Rod End

Integral thread construction, precision-machined for close concentricity. Studded rod ends are available.

2. Duralon Rod Bearing

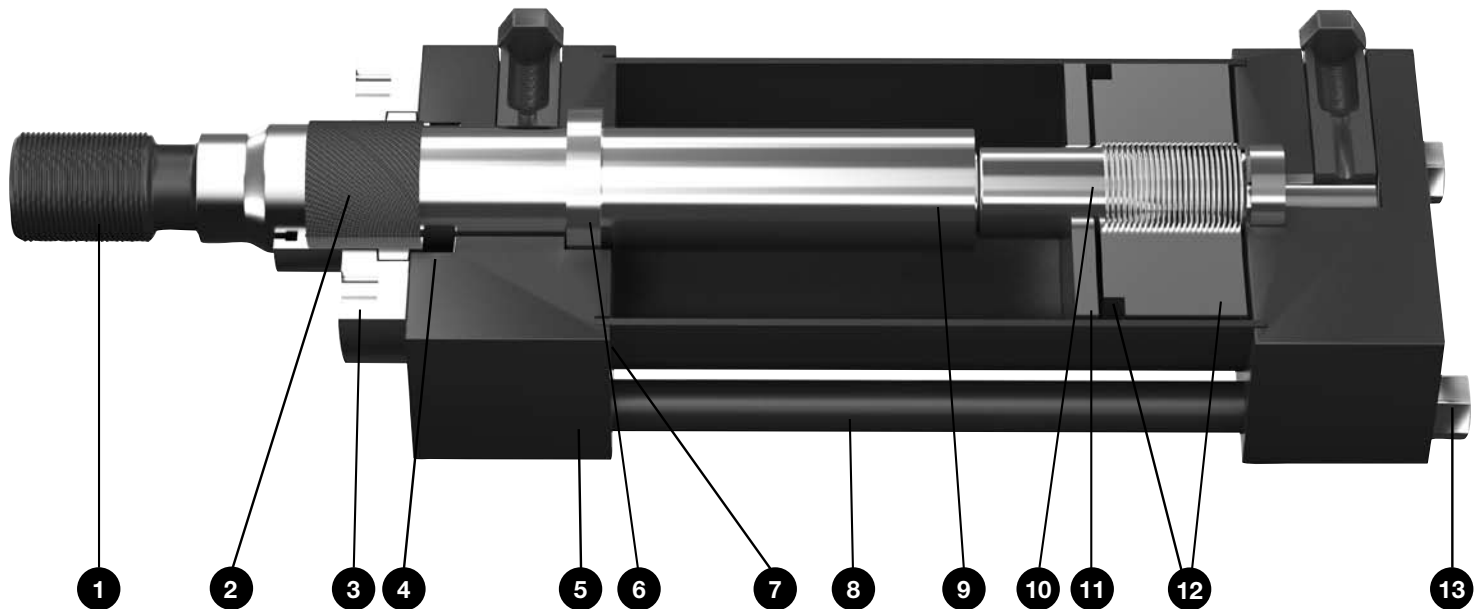
Hanna's high-tech Duralon rod bearing is designed to perform under poorly lubricated, high-load conditions. The exact combination of woven Teflon and Dacron®, plus the fiberglass structural shell, increases load-carrying capabilities and eliminates "cold-flow" associated with Teflon. Duralon bearings are capable of sustaining much higher compressive loads than either bronze or cast iron, have an extremely low coefficient of friction, and require no lubrication to the bearing surface.

3. Gland Construction

Two-piece (gland plus retainer plate), bolted-on or full-face retainer design. Packings may be captive in the gland or located in the head.

4. Rod Seal

Series 3L cylinders incorporate the industry's heaviest cross-section polyurethane U-cup piston rod seal, assuring zero leakage and outstanding wear resistance. Viton U-cup is available for higher temperature service.



5. Heads

Steel heads are precision-machined to assure accurate alignment and close concentricity between piston, tube, piston rod and rod bearing.

6. Cushion Check Seals

With self-aligning, full-floating design, the cushion check seals are closely fitted to cushion sleeve and spear. The seals serve as both cushion seal and check valve, providing effective cushioning and fast breakaway.

7. Tube Seal

Buna-N O-ring seal. Viton available for higher temperature service.

8. Tubing

Steel tubing is precision-honed to a 16-20 micro-inch finish for close fit to piston bearing and tube wall. Chrome-plated for wear resistance.

9. Piston Rod

Hanna's piston rods are machined to a close tolerance with minimum stock removal to maximize shank size and reduce stress. Relief grooves are machined in areas of high stress to guard against fatigue failures. The rods provide 100,000 minimum yield strength in diameters up to 3.50"; 59,000 average yield strength in 4.00" diameter and above. All sizes are hard chrome plated for scratch

and corrosion resistance. To maximize seal and bearing life, plated surface is polished to a 6-8 micro-inch finish. Rods up to 4.00" diameter are also case hardened for dent resistance.

10. Piston-to-Rod Connection

Piston rods are piloted to the piston to ensure concentricity, then bonded by an anaerobic adhesive, torqued and pinned.

11. Piston

One-piece piston of high impact-resistant ductile iron threaded to piston rod, and furnished with breakaway spirals on each side.

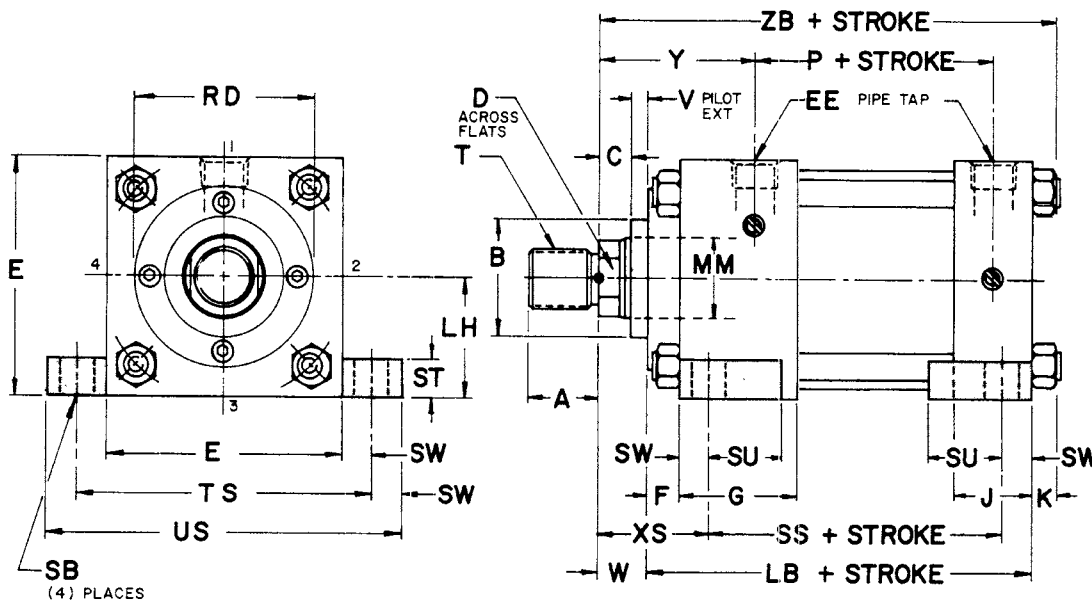
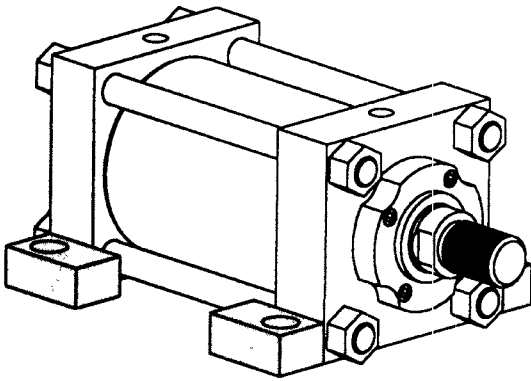
12. Piston Sealing System

Hanna's glass-filled, O-ring energized piston seal provides a positive seal without problems such as rollover or extrusion that are associated with U-cup type seals. A bronze-filled Teflon bearing strip provides a non-metallic bearing point on the piston, assuring long life and extremely low friction.

13. Tie Rods

Made from high-strength steel, the tie rods are pre-stressed for fatigue resistance.

SERIES 3L 1.50"-6.00" Bores MS2 Side Lug Mount



NOTE: Lug mounted cylinders should be fastened at one end by using fitted bolts, a thrust key or by dowel pins. This will eliminate the tendency of the cylinder to shift when pushing or pulling.

These Dimensions are Constant Regardless of Rod Diameter

BORE	E	EE (NPTF)	F	G	J	K	LB	LH -.006 -.008	P	SB	SS	ST	SU	SW	TS ±.010	US
1.50	2.00	3/8	.38	1.50	1.00	.25	4.00	1.000	2.31	.438	2.88	.50	.94	.38	2.75	3.50
2.00	2.50	3/8	.38	1.50	1.00	.31	4.00	1.250	2.31	.438	2.88	.50	.94	.38	3.25	4.00
2.50	3.00	3/8	.38	1.50	1.00	.31	4.12	1.500	2.44	.438	3.00	.50	.94	.38	3.75	4.50
3.25	3.75	1/2	.62	1.75	1.25	.38	4.88	1.875	2.69	.562	3.25	.75	1.25	.50	4.75	5.75
4.00	4.50	1/2	.62	1.75	1.25	.38	4.88	2.250	2.69	.562	3.25	.75	1.25	.50	5.50	6.50
5.00	5.50	1/2	.62	1.75	1.25	.44	5.12	2.750	2.94	.812	3.12	1.00	1.56	.69	6.88	8.25
6.00	6.50	3/4	.75	2.00	1.50	.44	5.75	3.250	3.19	.812	3.62	1.00	1.56	.69	7.88	9.25

MS2

Dimensions are Affected by the Rod Diameter

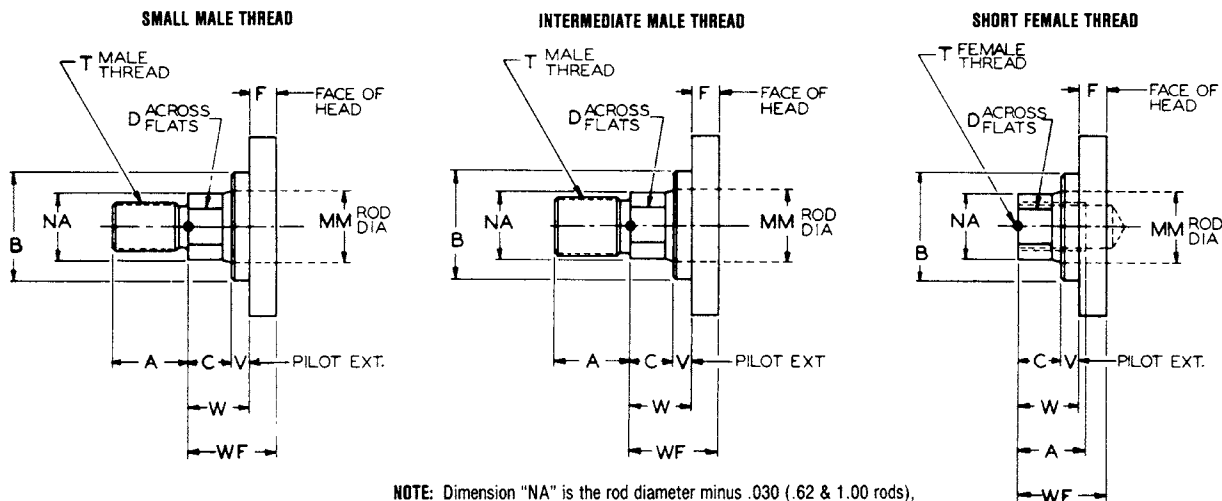
CYLINDER			A	B -.001 -.003	C	D	RD*	T (THREAD)			V	W	XS	Y	ZB	PSI RATING†
BORE	ROD DIA. CODE	MM ROD DIA.						SMALL MALE SM	INTER- MEDIATE MALE IM	SHORT FEMALE SF						
1.50	D	.62	.75	1.125	.38	.50	-	.44-20	.50-20	.44-20	.25	.62	1.38	1.88	4.88	1800
	F	1.00	1.12	1.500	.50	.88	-	.75-16	.88-14	.75-16	.50	1.00	1.75	2.25	5.25	1800
2.00	D	.62	.75	1.125	.38	.50	2.38	.44-20	.50-20	.44-20	.25	.62	1.38	1.88	4.94	1800
	F	1.00	1.12	1.500	.50	.88	2.38	.75-16	.88-14	.75-16	.50	1.00	1.75	2.25	5.31	1800
	G	1.38	1.62	2.000	.62	1.12	-	1.00-14	1.25-12	1.00-14	.62	1.25	2.00	2.50	5.56	1800
2.50	D	.62	.75	1.125	.38	.50	2.38	.44-20	.50-20	.44-20	.25	.62	1.38	1.88	5.06	1000
	F	1.00	1.12	1.500	.50	.88	2.38	.75-16	.88-14	.75-16	.50	1.00	1.75	2.25	5.44	1400
	G	1.38	1.62	2.000	.62	1.12	-	1.00-14	1.25-12	1.00-14	.62	1.25	2.00	2.50	5.69	1400
	H	1.75	2.00	2.375	.75	1.50	-	1.25-12	1.50-12	1.25-12	.75	1.50	2.25	2.75	5.94	1400
3.25	F	1.00	1.12	1.500	.50	.88	3.00	.75-16	.88-14	.75-16	.25	.75	1.88	2.38	6.00	1300
	G	1.38	1.62	2.000	.62	1.12	3.00	1.00-14	1.25-12	1.00-14	.38	1.00	2.12	2.62	6.25	1300
	H	1.75	2.00	2.375	.75	1.50	-	1.25-12	1.50-12	1.25-12	.50	1.25	2.38	2.88	6.50	1300
	J	2.00	2.25	2.625	.88	1.69	-	1.50-12	1.75-12	1.50-12	.50	1.38	2.50	3.00	6.62	1300
4.00	F	1.00	1.12	1.500	.50	.88	3.00	.75-16	.88-14	.75-16	.25	.75	1.88	2.38	6.00	900
	G	1.38	1.62	2.000	.62	1.12	3.00	1.00-14	1.25-12	1.00-14	.38	1.00	2.12	2.62	6.25	900
	H	1.75	2.00	2.375	.75	1.50	-	1.25-12	1.50-12	1.25-12	.50	1.25	2.38	2.88	6.50	900
	J	2.00	2.25	2.625	.88	1.69	-	1.50-12	1.75-12	1.50-12	.50	1.38	2.50	3.00	6.62	900
	K	2.50	3.00	3.125	1.00	2.06	-	1.88-12	2.25-12	1.88-12	.62	1.62	2.75	3.25	6.88	900
5.00	F	1.00	1.12	1.500	.50	.88	3.00	.75-16	.88-14	.75-16	.25	.75	2.06	2.38	6.31	750
	G	1.38	1.62	2.000	.62	1.12	3.00	1.00-14	1.25-12	1.00-14	.38	1.00	2.31	2.62	6.56	1000
	H	1.75	2.00	2.375	.75	1.50	-	1.25-12	1.50-12	1.25-12	.50	1.25	2.56	2.88	6.81	1000
	J	2.00	2.25	2.625	.88	1.69	-	1.50-12	1.75-12	1.50-12	.50	1.38	2.69	3.00	6.94	1000
	K	2.50	3.00	3.125	1.00	2.06	-	1.88-12	2.25-12	1.88-12	.62	1.62	2.94	3.25	7.19	1000
	L	3.00	3.50	3.750	1.00	2.62	-	2.25-12	2.75-12	2.25-12	.62	1.62	2.94	3.25	7.19	1000
6.00	G	1.38	1.62	2.000	.62	1.12	4.00	1.00-14	1.25-12	1.00-14	.25	.88	2.31	2.75	7.06	750
	H	1.75	2.00	2.375	.75	1.50	4.00	1.25-12	1.50-12	1.25-12	.38	1.12	2.56	3.00	7.31	750
	J	2.00	2.25	2.625	.88	1.69	4.00	1.50-12	1.75-12	1.50-12	.38	1.25	2.69	3.12	7.44	750
	K	2.50	3.00	3.125	1.00	2.06	-	1.88-12	2.25-12	1.88-12	.50	1.50	2.94	3.38	7.69	750
	L	3.00	3.50	3.750	1.00	2.62	-	2.25-12	2.75-12	2.25-12	.50	1.50	2.94	3.38	7.69	750
	N	4.00	4.00	4.750	1.00	3.38	-	3.00-12	3.75-12	3.00-12	.50	1.50	2.94	3.38	7.69	750

* Where RD is not shown, square retainer is used. See RETAINER PLATE CONSTRUCTION in INSTALLATION, OPERATION AND MAINTENANCE DATA section.

† CAUTION: PSI ratings shown are HANNA recommended maximum operating pressures. Check STROKE LIMITATION DATA in TECHNICAL INFORMATION section which may reduce maximum operating pressure. Check STOP TUBE DATA (TECHNICAL INFORMATION section) to determine if stop tube is required.

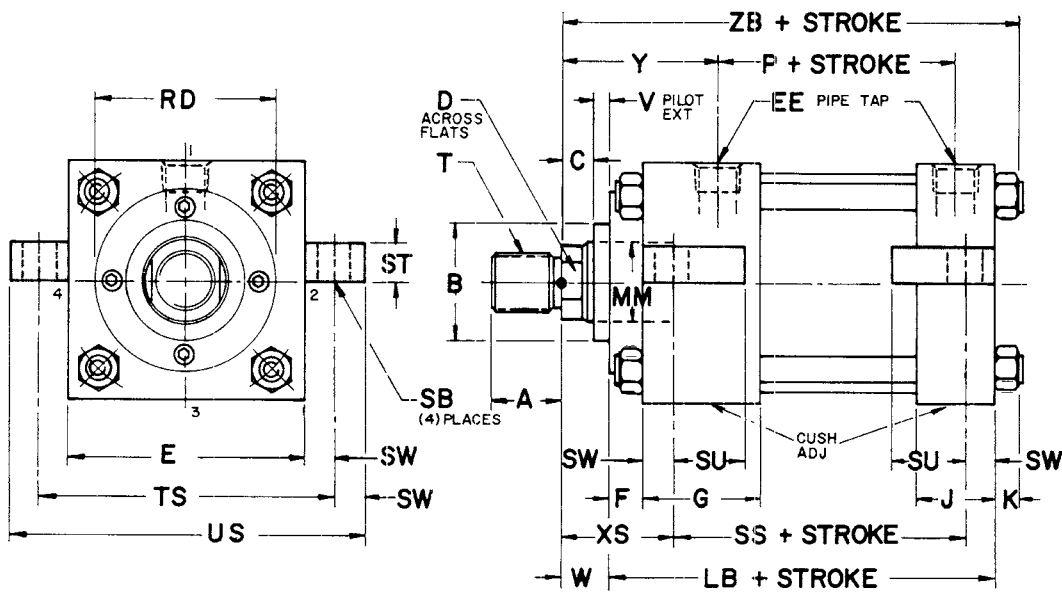
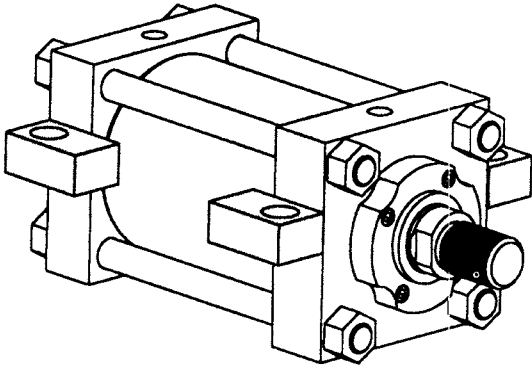
NOTE: Dimensions are nominal except where specifically tolerated. Tolerances on "Plus Stroke" dimensions will vary slightly from dimensions shown due to manufacturing tolerances and tube compression.

STANDARD ROD END STYLES



NOTE: Dimension "NA" is the rod diameter minus .030 (.62 & 1.00 rods), minus .062 (1.38-5.50 rods)

SERIES 3L 1.50"-6.00" Bores MS3 Centerline Lug Mount



NOTE: Lug mounted cylinders should be fastened at one end by using fitted bolts, a thrust key or by dowel pins. This will eliminate the tendency of the cylinder to shift when pushing or pulling.

These Dimensions are Constant Regardless of Rod Diameter

BORE	E	EE (NPTF)	F	G	J	K	LB	P	SB	SS	ST	SU	SW	TS ±.010	US
1.50	2.00	3/8	.38	1.50	1.00	.25	4.00	2.31	.438	2.88	.50	.94	.38	2.75	3.50
2.00	2.50	3/8	.38	1.50	1.00	.31	4.00	2.31	.438	2.88	.50	.94	.38	3.25	4.00
2.50	3.00	3/8	.38	1.50	1.00	.31	4.12	2.44	.438	3.00	.50	.94	.38	3.75	4.50
3.25	3.75	1/2	.62	1.75	1.25	.38	4.88	2.69	.562	3.25	.75	1.25	.50	4.75	5.75
4.00	4.50	1/2	.62	1.75	1.25	.38	4.88	2.69	.562	3.25	.75	1.25	.50	5.50	6.50
5.00	5.50	1/2	.62	1.75	1.25	.44	5.12	2.94	.812	3.12	1.00	1.56	.69	6.88	8.25
6.00	6.50	3/4	.75	2.00	1.50	.44	5.75	3.19	.812	3.62	1.00	1.56	.69	7.88	9.25

MS3

Dimensions are Affected by the Rod Diameter

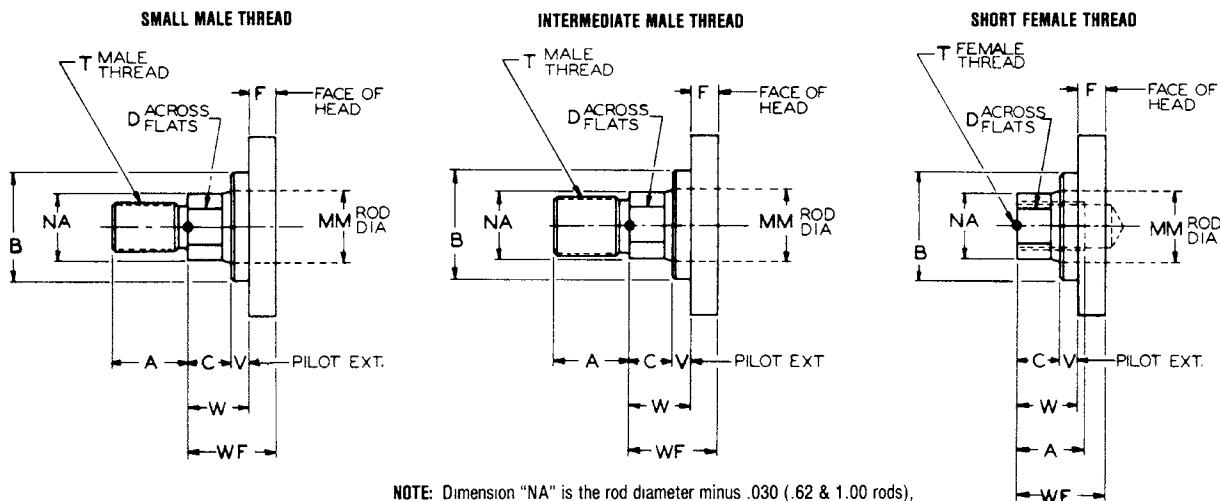
BORE	CYLINDER			A	B -.001 -.003	C	D	RD*	T (THREAD)			V	W	XS	Y	ZB	PSI RATING†
	ROD DIA. CODE	MM ROD DIA.							SMALL MALE SM	INTER- MEDIATE MALE IM	SHORT FEMALE SF						
1.50	D	.62	.75	1.125	.38	.50	-		44-20	50-20	44-20	.25	.62	1.38	1.88	4.88	1800
	F	1.00	1.12	1.500	.50	.88	-		.75-16	.88-14	75-16	.50	1.00	1.75	2.25	5.25	1800
2.00	D	.62	.75	1.125	.38	.50	2.38		44-20	50-20	44-20	.25	.62	1.38	1.88	4.94	1800
	F	1.00	1.12	1.500	.50	.88	2.38		.75-16	.88-14	75-16	.50	1.00	1.75	2.25	5.31	1800
	G	1.38	1.62	2.000	.62	1.12	-		1.00-14	1.25-12	1.00-14	.62	1.25	2.00	2.50	5.56	1800
2.50	D	.62	.75	1.125	.38	.50	2.38		44-20	50-20	44-20	.25	.62	1.38	1.88	5.06	1000
	F	1.00	1.12	1.500	.50	.88	2.38		.75-16	.88-14	75-16	.50	1.00	1.75	2.25	5.44	1400
	G	1.38	1.62	2.000	.62	1.12	-		1.00-14	1.25-12	1.00-14	.62	1.25	2.00	2.50	5.69	1400
	H	1.75	2.00	2.375	.75	1.50	-		1.25-12	1.50-12	1.25-12	.75	1.50	2.25	2.75	5.94	1400
3.25	F	1.00	1.12	1.500	.50	.88	3.00		.75-16	.88-14	75-16	.25	.75	1.88	2.38	6.00	1300
	G	1.38	1.62	2.000	.62	1.12	3.00		1.00-14	1.25-12	1.00-14	.38	1.00	2.12	2.62	6.25	1300
	H	1.75	2.00	2.375	.75	1.50	-		1.25-12	1.50-12	1.25-12	.50	1.25	2.38	2.88	6.50	1300
	J	2.00	2.25	2.625	.88	1.69	-		1.50-12	1.75-12	1.50-12	.50	1.38	2.50	3.00	6.62	1300
4.00	F	1.00	1.12	1.500	.50	.88	3.00		.75-16	.88-14	75-16	.25	.75	1.88	2.38	6.00	900
	G	1.38	1.62	2.000	.62	1.12	3.00		1.00-14	1.25-12	1.00-14	.38	1.00	2.12	2.62	6.25	900
	H	1.75	2.00	2.375	.75	1.50	-		1.25-12	1.50-12	1.25-12	.50	1.25	2.38	2.88	6.50	900
	J	2.00	2.25	2.625	.88	1.69	-		1.50-12	1.75-12	1.50-12	.50	1.38	2.50	3.00	6.62	900
	K	2.50	3.00	3.125	1.00	2.06	-		1.88-12	2.25-12	1.88-12	.62	1.62	2.75	3.25	6.88	900
5.00	F	1.00	1.12	1.500	.50	.88	3.00		.75-16	.88-14	75-16	.25	.75	2.06	2.38	6.31	750
	G	1.38	1.62	2.000	.62	1.12	3.00		1.00-14	1.25-12	1.00-14	.38	1.00	2.31	2.62	6.56	1000
	H	1.75	2.00	2.375	.75	1.50	-		1.25-12	1.50-12	1.25-12	.50	1.25	2.56	2.88	6.81	1000
	J	2.00	2.25	2.625	.88	1.69	-		1.50-12	1.75-12	1.50-12	.50	1.38	2.69	3.00	6.94	1000
	K	2.50	3.00	3.125	1.00	2.06	-		1.88-12	2.25-12	1.88-12	.62	1.62	2.94	3.25	7.19	1000
	L	3.00	3.50	3.750	1.00	2.62	-		2.25-12	2.75-12	2.25-12	.62	1.62	2.94	3.25	7.19	1000
6.00	M	3.50	3.50	4.250	1.00	3.00	-		2.50-12	3.25-12	2.50-12	.62	1.62	2.94	3.25	7.19	1000
	N	4.00	4.00	4.750	1.00	3.38	-		3.00-12	3.75-12	3.00-12	.50	1.50	2.94	3.38	7.69	750
	G	1.38	1.62	2.000	.62	1.12	4.00		1.00-14	1.25-12	1.00-14	.25	.88	2.31	2.75	7.06	750
	H	1.75	2.00	2.375	.75	1.50	4.00		1.25-12	1.50-12	1.25-12	.38	1.12	2.56	3.00	7.31	750
	J	2.00	2.25	2.625	.88	1.69	4.00		1.50-12	1.75-12	1.50-12	.38	1.25	2.69	3.12	7.44	750
	K	2.50	3.00	3.125	1.00	2.06	-		1.88-12	2.25-12	1.88-12	.50	1.50	2.94	3.38	7.69	750
	L	3.00	3.50	3.750	1.00	2.62	-		2.25-12	2.75-12	2.25-12	.50	1.50	2.94	3.38	7.69	750
M	3.50	3.50	4.250	1.00	3.00	-		2.50-12	3.25-12	2.50-12	.50	1.50	2.94	3.38	7.69	750	
N	4.00	4.00	4.750	1.00	3.38	-		3.00-12	3.75-12	3.00-12	.50	1.50	2.94	3.38	7.69	750	

* Where RD is not shown, square retainer is used. See RETAINER PLATE CONSTRUCTION in INSTALLATION, OPERATION AND MAINTENANCE DATA section.

† CAUTION: PSI ratings shown are HANNA recommended maximum operating pressures. Check STROKE LIMITATION DATA in TECHNICAL INFORMATION section which may reduce maximum operating pressure. Check STOP TUBE DATA (TECHNICAL INFORMATION section) to determine if stop tube is required.

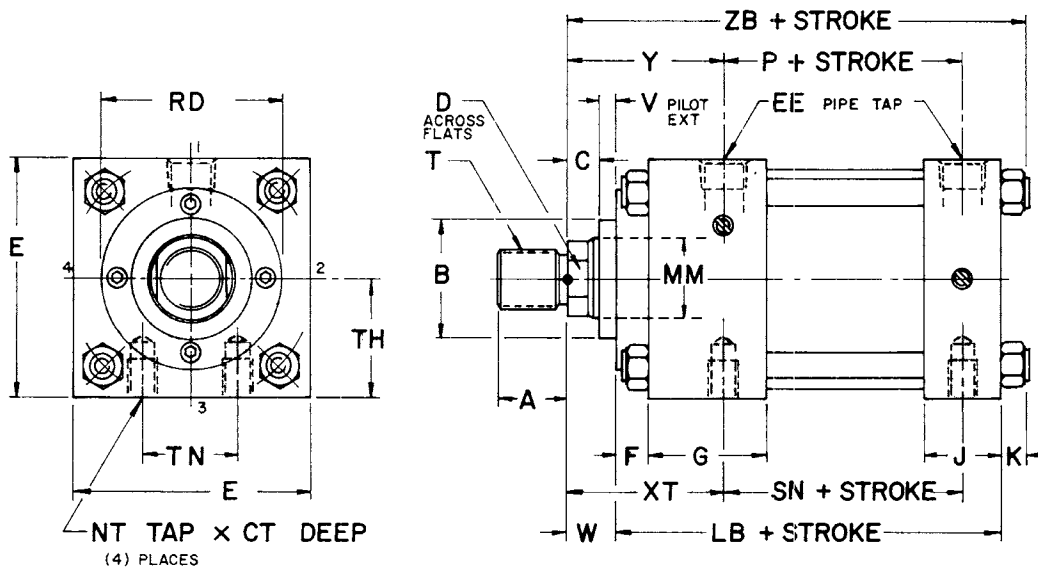
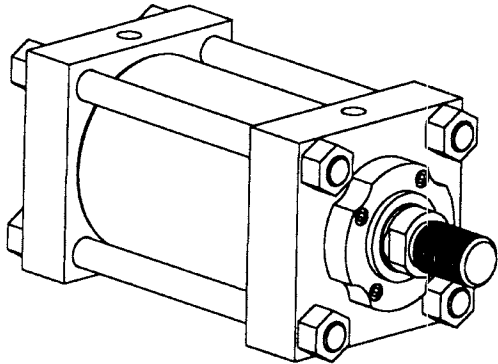
NOTE: Dimensions are nominal except where specifically toleranced. Tolerances on "Plus Stroke" dimensions will vary slightly from dimensions shown due to manufacturing tolerances and tube compression.

STANDARD ROD END STYLES



NOTE: Dimension "NA" is the rod diameter minus .030 (.62 & 1.00 rods), minus .062 (1.38-5.50 rods)

SERIES 3L 1.50"-6.00" Bores MS4 Side Tapped Mount



NOTE: For high loads thrust key is recommended.

These Dimensions are Constant Regardless of Rod Diameter

BORE	E	TH -.006 -.008	EE (NPTF)	F	G	J	K	LB	NT	P	SN	TN ±.010
1.50	2.00	1.000	3/8	.38	1.50	1.00	25	4.00	.25-20	2.31	2.25	.62
2.00	2.50	1.250	3/8	.38	1.50	1.00	31	4.00	.31-18	2.31	2.25	.88
2.50	3.00	1.500	3/8	.38	1.50	1.00	31	4.12	.38-16	2.44	2.38	1.25
3.25	3.75	1.875	1/2	.62	1.75	1.25	38	4.88	.50-13	2.69	2.62	1.50
4.00	4.50	2.250	1/2	.62	1.75	1.25	.38	4.88	.50-13	2.69	2.62	2.06
5.00	5.50	2.750	1/2	.62	1.75	1.25	.44	5.12	.62-11	2.94	2.88	2.69
6.00	6.50	3.250	3/4	.75	2.00	1.50	.44	5.75	.75-10	3.19	3.12	3.25

MS4

Dimensions are Affected by the Rod Diameter

BORE	CYLINDER		A	B -.001 -.003	C	D	RD*	T (THREAD)			V	*CT	XT	Y	ZB	PSI RATING†
	ROD DIA. CODE	MM ROD DIA.						SMALL MALE SM	INTER- MEDIATE MALE IM	SHORT FEMALE SF						
1.50	D	.62	.75	1.125	.38	.50	-	.44-20	.50-20	.44-20	.25	.38	1.94	1.88	4.88	1800
	F	1.00	1.12	1.500	.50	.88	-	.75-16	.88-14	.75-16	.50	-	-	2.25	5.25	1800
2.00	D	.62	.75	1.125	.38	.50	2.38	.44-20	.50-20	44-20	.25	.38	1.94	1.88	4.94	1800
	F	1.00	1.12	1.500	.50	.88	2.38	.75-16	.88-14	75-16	.50	.38	2.31	2.25	5.31	1800
	G	1.38	1.62	2.000	.62	1.12	-	1.00-14	1.25-12	1.00-14	.62	-	-	2.50	5.56	1800
2.50	D	.62	.75	1.125	.38	.50	2.38	.44-20	.50-20	.44-20	.25	.50	1.94	1.88	5.06	1000
	F	1.00	1.12	1.500	.50	.88	2.38	.75-16	.88-14	.75-16	.50	.50	2.31	2.25	5.44	1400
	G	1.38	1.62	2.000	.62	1.12	-	1.00-14	1.25-12	1.00-14	.62	.50	2.56	2.50	5.69	1400
	H	1.75	2.00	2.375	.75	1.50	-	1.25-12	1.50-12	1.25-12	.75	-	-	2.75	5.94	1400
3.25	F	1.00	1.12	1.500	.50	.88	3.00	.75-16	.88-14	.75-16	.25	.50	2.44	2.38	6.00	1300
	G	1.38	1.62	2.000	.62	1.12	3.00	1.00-14	1.25-12	1.00-14	.38	.50	2.69	2.62	6.25	1300
	H	1.75	2.00	2.375	.75	1.50	-	1.25-12	1.50-12	1.25-12	.50	.50	2.88	2.88	6.50	1300
	J	2.00	2.25	2.625	.88	1.69	-	1.50-12	1.75-12	1.50-12	.50	.50	3.06	3.00	6.62	1300
4.00	F	1.00	1.12	1.500	.50	.88	3.00	.75-16	.88-14	.75-16	.25	.75	2.44	2.38	6.00	900
	G	1.38	1.62	2.000	.62	1.12	3.00	1.00-14	1.25-12	1.00-14	.38	.75	2.69	2.62	6.25	900
	H	1.75	2.00	2.375	.75	1.50	-	1.25-12	1.50-12	1.25-12	.50	.75	2.94	2.88	6.50	900
	J	2.00	2.25	2.625	.88	1.69	-	1.50-12	1.75-12	1.50-12	.50	.75	3.06	3.00	6.62	900
	K	2.50	3.00	3.125	1.00	2.06	-	1.88-12	2.25-12	1.88-12	.62	.75	3.31	3.25	6.88	900
5.00	F	1.00	1.12	1.500	.50	.88	3.00	.75-16	.88-14	.75-16	.25	1.00	2.44	2.38	6.31	750
	G	1.38	1.62	2.000	.62	1.12	3.00	1.00-14	1.25-12	1.00-14	.38	1.00	2.69	2.62	6.56	1000
	H	1.75	2.00	2.375	.75	1.50	-	1.25-12	1.50-12	1.25-12	.50	1.00	2.94	2.88	6.81	1000
	J	2.00	2.25	2.625	.88	1.69	-	1.50-12	1.75-12	1.50-12	.50	1.00	3.06	3.00	6.94	1000
	K	2.50	3.00	3.125	1.00	2.06	-	1.88-12	2.25-12	1.88-12	.62	1.00	3.31	3.25	7.19	1000
	L	3.00	3.50	3.750	1.00	2.62	-	2.25-12	2.75-12	2.25-12	.62	1.00	3.31	3.25	7.19	1000
6.00	M	3.50	3.50	4.250	1.00	3.00	-	2.50-12	3.25-12	2.50-12	.62	1.00	3.31	3.25	7.19	1000
	G	1.38	1.62	2.000	.62	1.12	4.00	1.00-14	1.25-12	1.00-14	.25	1.12	2.81	2.75	7.06	750
	H	1.75	2.00	2.375	.75	1.50	4.00	1.25-12	1.50-12	1.25-12	.38	1.12	3.06	3.00	7.31	750
	J	2.00	2.25	2.625	.88	1.69	4.00	1.50-12	1.75-12	1.50-12	.38	1.12	3.19	3.12	7.44	750
	K	2.50	3.00	3.125	1.00	2.06	-	1.88-12	2.25-12	1.88-12	.50	1.12	3.44	3.38	7.69	750
	L	3.00	3.50	3.750	1.00	2.62	-	2.25-12	2.75-12	2.25-12	.50	1.12	3.44	3.38	7.69	750
	M	3.50	3.50	4.250	1.00	3.00	-	2.50-12	3.25-12	2.50-12	.50	1.12	3.44	3.38	7.69	750
N	4.00	4.00	4.750	1.00	3.38	-	3.00-12	3.75-12	3.00-12	.50	1.12	3.44	3.38	7.69	750	

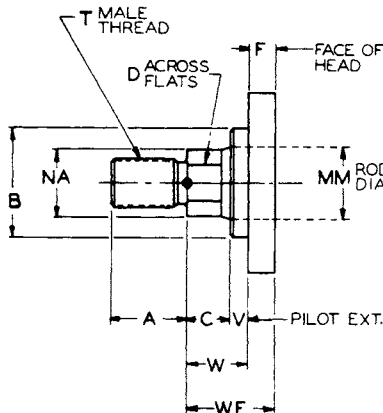
* Where RD is not shown, square retainer is used. See RETAINER PLATE CONSTRUCTION in INSTALLATION, OPERATION AND MAINTENANCE DATA section.

† CAUTION: PSI ratings shown are HANNA recommended maximum operating pressures. Check STROKE LIMITATION DATA in TECHNICAL INFORMATION section which may reduce maximum operating pressure. Check STOP TUBE DATA (TECHNICAL INFORMATION section) to determine if stop tube is required.

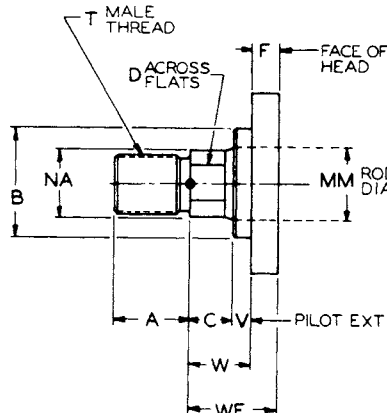
NOTE: Dimensions are nominal except where specifically tolerated. Tolerances on "Plus Stroke" dimensions will vary slightly from dimensions shown due to manufacturing tolerances and tube compression.

STANDARD ROD END STYLES

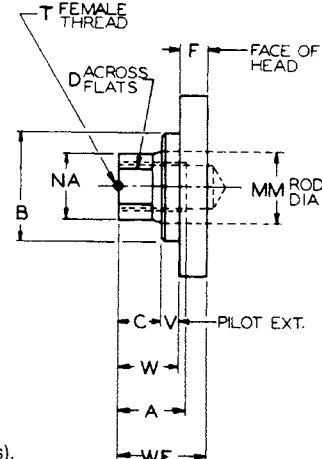
SMALL MALE THREAD



INTERMEDIATE MALE THREAD

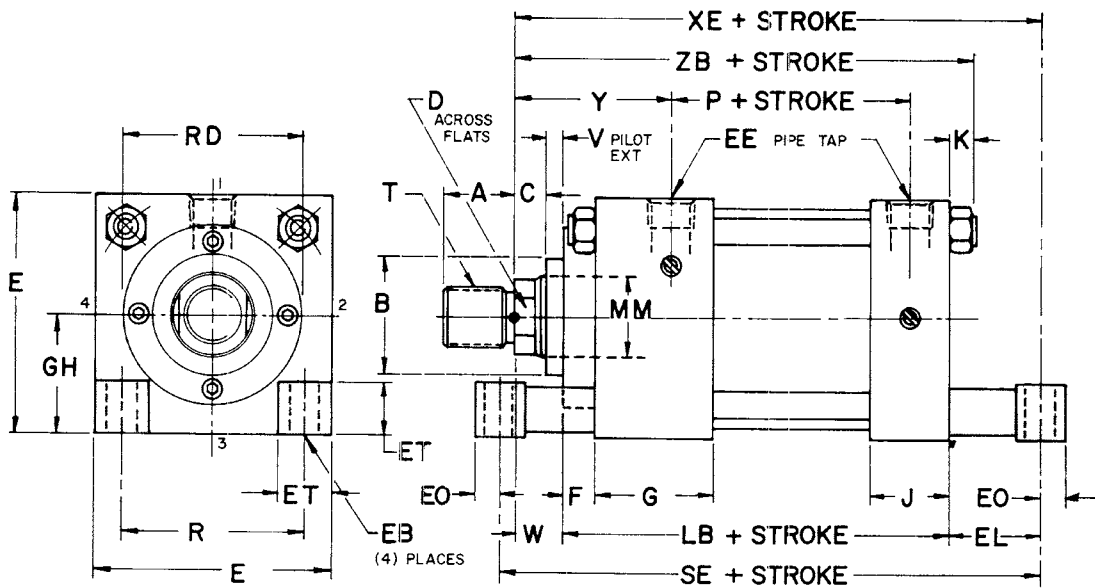
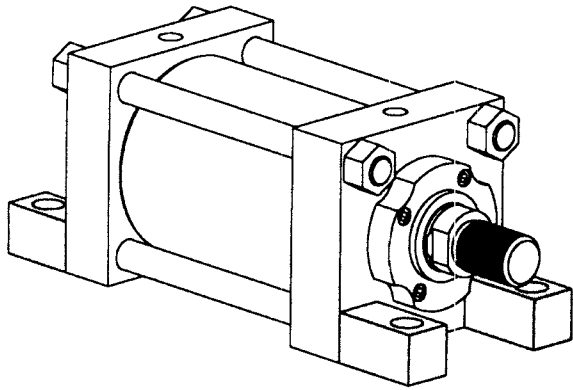


SHORT FEMALE THREAD



NOTE: Dimension "NA" is the rod diameter minus .030 (.62 & 1.00 rods), minus .062 (1.38-5.50 rods)

SERIES 3L 1.50"-6.00" Bores MS7 End Lug Mount



NOTE Lug mounted cylinders should be fastened at one end by using fitted bolts, a thrust key or by dowel pins. This will eliminate the tendency of the cylinder to shift when pushing or pulling.

These Dimensions are Constant Regardless of Rod Diameter

BORE	E	GH -.006 -.008	EB	EE (NPTF)	EL	EO	ET	F	G	J	K	LB	P	R ±.010	SE
1.50	2.00	1.000	.31	3/8	.75	.34	.56	.38	1.50	1.00	.25	4.00	2.31	1.43	5.50
2.00	2.50	1.250	.38	3/8	.94	.31	.62	.38	1.50	1.00	.31	4.00	2.31	1.84	5.88
2.50	3.00	1.500	.38	3/8	1.06	.31	.81	.38	1.50	1.00	.31	4.12	2.44	2.19	6.25
3.25	3.75	1.875	.44	1/2	.88	.38	1.00	.62	1.75	1.25	.38	4.88	2.69	2.76	6.62
4.00	4.50	2.250	.44	1/2	1.00	.38	1.19	.62	1.75	1.25	.38	4.88	2.69	3.32	6.88
5.00	5.50	2.750	.56	1/2	1.06	.50	1.40	.62	1.75	1.25	.44	5.12	2.94	4.10	7.25
6.00	6.50	3.250	.56	3/4	1.00	.50	1.62	.75	2.00	1.50	.44	5.75	3.19	4.88	7.75

CAUTION: Check for interference between rod attachment and mounting lug. If necessary, specify longer than standard "C" dimension.

MS7

Dimensions are Affected by the Rod Diameter

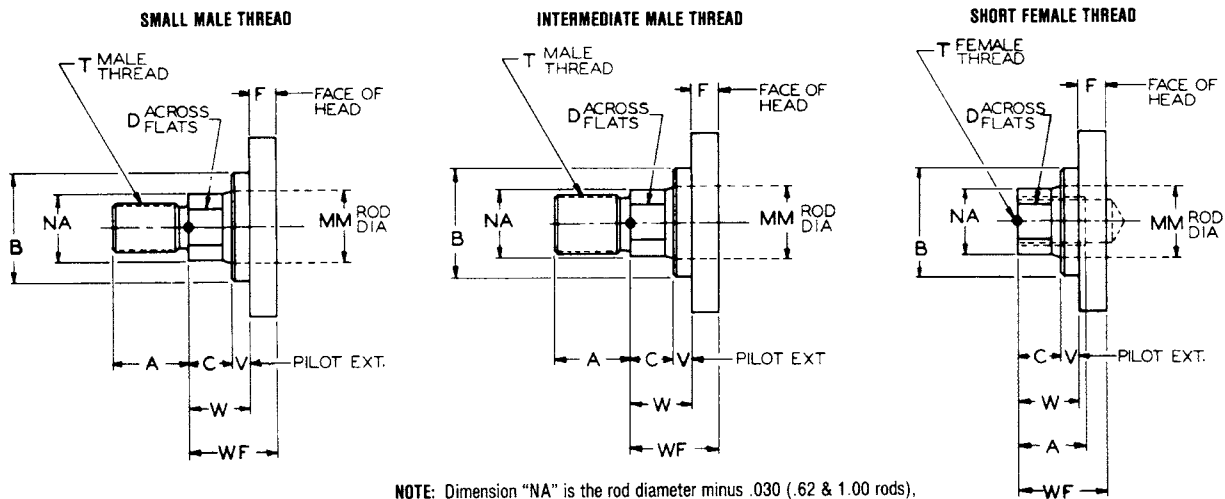
CYLINDER			A	B -.001 -.003	C	D	RD*	T (THREAD)			V	W	XE	Y	ZB	PSI RATING†
BORE	ROD DIA. CODE	MM ROD DIA.						SMALL MALE SM	INTER- MEDIATE MALE IM	SHORT FEMALE SF						
1.50	D	.62	.75	1.125	.38	.50	-	.44-20	.50-20	.44-20	.25	.62	5.38	1.88	4.88	1800
	F	1.00	1.12	1.500	.50	.88	-	.75-16	.88-14	.75-16	50	1.00	5.75	2.25	5.25	1800
2.00	D	.62	.75	1.125	.38	.50	2.38	.44-20	.50-20	.44-20	.25	.62	5.56	1.88	4.94	1800
	F	1.00	1.12	1.500	.50	.88	2.38	.75-16	.88-14	.75-16	50	1.00	5.94	2.25	5.31	1800
	G	1.38	1.62	2.000	.62	1.12	-	1.00-14	1.25-12	1.00-14	62	1.25	6.19	2.50	5.56	1800
2.50	D	.62	.75	1.125	.38	.50	2.38	.44-20	.50-20	.44-20	.25	.62	5.81	1.88	5.06	1000
	F	1.00	1.12	1.500	.50	.88	2.38	.75-16	.88-14	.75-16	50	1.00	6.19	2.25	5.44	1400
	G	1.38	1.62	2.000	.62	1.12	-	1.00-14	1.25-12	1.00-14	62	1.25	6.44	2.50	5.69	1400
	H	1.75	2.00	2.375	.75	1.50	-	1.25-12	1.50-12	1.25-12	.75	1.50	6.69	2.75	5.94	1400
3.25	F	1.00	1.12	1.500	.50	.88	3.00	.75-16	.88-14	.75-16	.25	.75	6.50	2.38	6.00	1300
	G	1.38	1.62	2.000	.62	1.12	3.00	1.00-14	1.25-12	1.00-14	.38	1.00	6.75	2.62	6.25	1300
	H	1.75	2.00	2.375	.75	1.50	-	1.25-12	1.50-12	1.25-12	.50	1.25	7.00	2.88	6.50	1300
	J	2.00	2.25	2.625	.88	1.69	-	1.50-12	1.75-12	1.50-12	.50	1.38	7.12	3.00	6.62	1300
4.00	F	1.00	1.12	1.500	.50	.88	3.00	.75-16	.88-14	.75-16	.25	.75	6.62	2.38	6.00	900
	G	1.38	1.62	2.000	.62	1.12	3.00	1.00-14	1.25-12	1.00-14	.38	1.00	6.88	2.62	6.25	900
	H	1.75	2.00	2.375	.75	1.50	-	1.25-12	1.50-12	1.25-12	.50	1.25	7.12	2.88	6.50	900
	J	2.00	2.25	2.625	.88	1.69	-	1.50-12	1.75-12	1.50-12	.50	1.38	7.25	3.00	6.62	900
	K	2.50	3.00	3.125	1.00	2.06	-	1.88-12	2.25-12	1.88-12	.62	1.62	7.50	3.25	6.88	900
5.00	F	1.00	1.12	1.500	.50	.88	3.00	.75-16	.88-14	.75-16	.25	.75	6.94	2.38	6.31	750
	G	1.38	1.62	2.000	.62	1.12	3.00	1.00-14	1.25-12	1.00-14	.38	1.00	7.19	2.62	6.56	1000
	H	1.75	2.00	2.375	.75	1.50	-	1.25-12	1.50-12	1.25-12	.50	1.25	7.44	2.88	6.81	1000
	J	2.00	2.25	2.625	.88	1.69	-	1.50-12	1.75-12	1.50-12	.50	1.38	7.56	3.00	6.94	1000
	K	2.50	3.00	3.125	1.00	2.06	-	1.88-12	2.25-12	1.88-12	.62	1.62	7.81	3.25	7.19	1000
	L	3.00	3.50	3.750	1.00	2.62	-	2.25-12	2.75-12	2.25-12	.62	1.62	7.81	3.25	7.19	1000
6.00	M	3.50	3.50	4.250	1.00	3.00	-	2.50-12	3.25-12	2.50-12	.62	1.62	7.81	3.25	7.19	1000
	N	4.00	4.00	4.750	1.00	3.38	-	3.00-12	3.75-12	3.00-12	.50	1.50	8.25	3.38	7.69	750
	G	1.38	1.62	2.000	.62	1.12	4.00	1.00-14	1.25-12	1.00-14	.25	.88	7.62	2.75	7.06	750
	H	1.75	2.00	2.375	.75	1.50	4.00	1.25-12	1.50-12	1.25-12	.38	1.12	7.88	3.00	7.31	750
	J	2.00	2.25	2.625	.88	1.69	4.00	1.50-12	1.75-12	1.50-12	.38	1.25	8.00	3.12	7.44	750
	K	2.50	3.00	3.125	1.00	2.06	-	1.88-12	2.25-12	1.88-12	.50	1.50	8.25	3.38	7.69	750

* Where RD is not shown, square retainer is used. See RETAINER PLATE CONSTRUCTION in INSTALLATION, OPERATION AND MAINTENANCE DATA section.

† CAUTION: PSI ratings shown are HANNA recommended maximum operating pressures. Check STROKE LIMITATION DATA in TECHNICAL INFORMATION section which may reduce maximum operating pressure. Check STOP TUBE DATA (TECHNICAL INFORMATION section) to determine if stop tube is required.

NOTE: Dimensions are nominal except where specifically toleranced. Tolerances on "Plus Stroke" dimensions will vary slightly from dimensions shown due to manufacturing tolerances and tube compression.

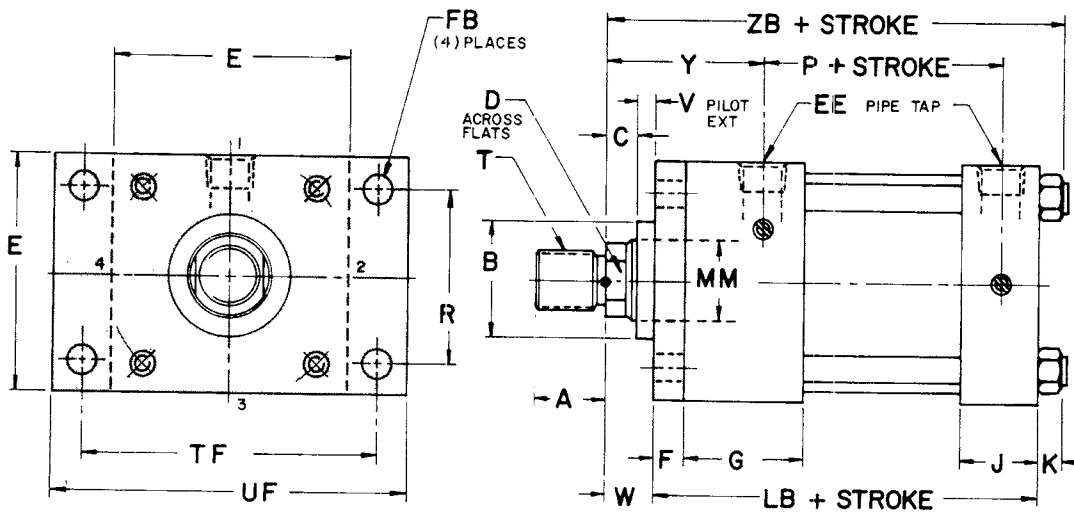
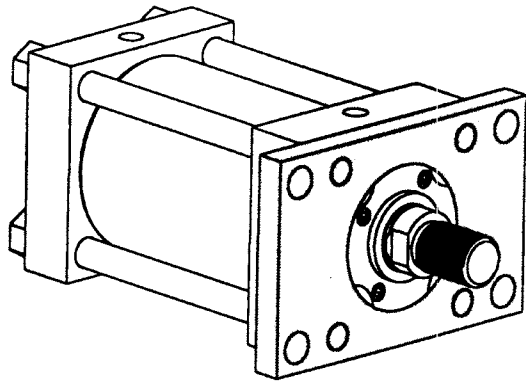
STANDARD ROD END STYLES



NOTE: Dimension "NA" is the rod diameter minus .030 (.62 & 1.00 rods), minus .062 (1.38-5.50 rods)

SERIES 3L 1.50"-6.00" Bores

MF1 Head Rectangular Flange Mount



These Dimensions are Constant Regardless of Rod Diameter

BORE	E	EE (NPTF)	F	FB	G	J	K	LB	P	R ±.010	TF ±.010	UF
1.50	2.00	3/8	.38	.312	1.50	1.00	.25	4.00	2.31	1.43	2.75	3.38
2.00	2.50	3/8	.38	.375	1.50	1.00	.31	4.00	2.31	1.84	3.38	4.12
2.50	3.00	3/8	.38	.375	1.50	1.00	.31	4.12	2.44	2.19	3.88	4.62
3.25	3.75	1/2	.62	.438	1.75	1.25	.38	4.88	2.69	2.76	4.69	5.50
4.00	4.50	1/2	.62	.438	1.75	1.25	.38	4.88	2.69	3.32	5.44	6.25
5.00	5.50	1/2	.62	.562	1.75	1.25	.44	5.12	2.94	4.10	6.62	7.62
6.00	6.50	3/4	.75	.562	2.00	1.50	.44	5.75	3.19	4.88	7.62	8.62

MF1

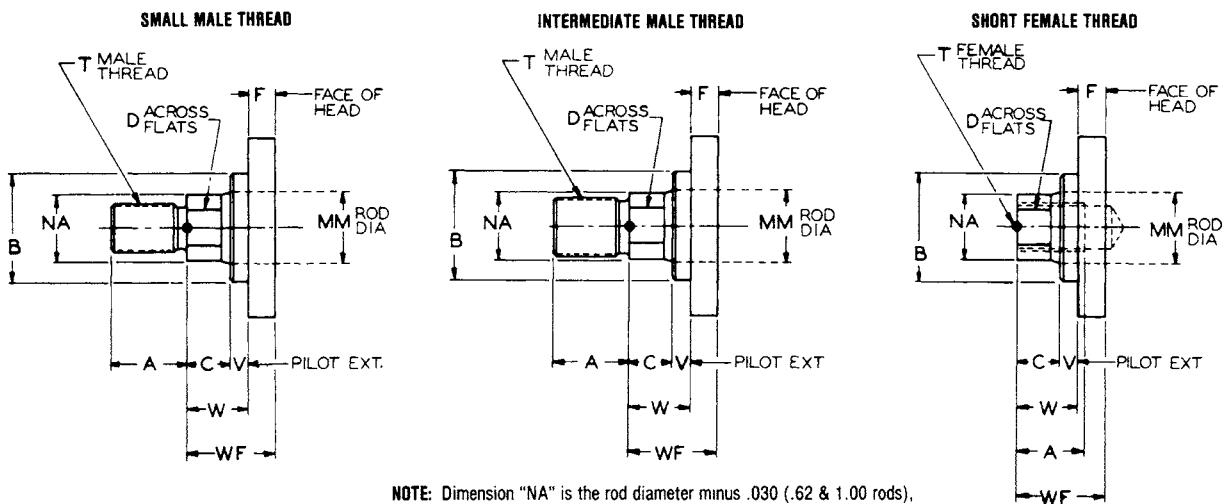
Dimensions are Affected by the Rod Diameter

BORE	CYLINDER		A	B -.001 -.003	C	D	T (THREAD)			V	W	WF	Y	ZB	PSI RATING†
	ROD DIA. CODE	MM ROD DIA.					SMALL MALE SM	INTER- MEDIATE MALE IM	SHORT FEMALE SF						
1.50	D	.62	.75	1.125	.38	.50	44-20	.50-20	.44-20	.25	.62	1.00	1.88	4.88	1100
	F	1.00	1.12	1.500	.50	.88	.75-16	.88-14	.75-16	.50	1.00	1.38	2.25	5.25	850
2.00	D	.62	.75	1.125	.38	.50	.44-20	.50-20	.44-20	.25	.62	1.00	1.88	4.94	800
	F	1.00	1.12	1.500	.50	.88	.75-16	.88-14	.75-16	.50	1.00	1.38	2.25	5.31	800
	G	1.38	1.62	2.000	.62	1.12	1.00-14	1.25-12	1.00-14	.62	1.25	1.62	2.50	5.56	400
2.50	D	.62	.75	1.125	.38	.50	44-20	.50-20	.44-20	.25	.62	1.00	1.88	5.06	700
	F	1.00	1.12	1.500	.50	.88	.75-16	.88-14	.75-16	.50	1.00	1.38	2.25	5.44	500
	G	1.38	1.62	2.000	.62	1.12	1.00-14	1.25-12	1.00-14	.62	1.25	1.62	2.50	5.69	500
	H	1.75	2.00	2.375	.75	1.50	1.25-12	1.50-12	1.25-12	.75	1.50	1.88	2.75	5.94	300
3.25	F	1.00	1.12	1.500	.50	.88	.75-16	.88-14	.75-16	.25	.75	1.38	2.38	6.00	1200
	G	1.38	1.62	2.000	.62	1.12	1.00-14	1.25-12	1.00-14	.38	1.00	1.62	2.62	6.25	1200
	H	1.75	2.00	2.375	.75	1.50	1.25-12	1.50-12	1.25-12	.50	1.25	1.88	2.88	6.50	800
	J	2.00	2.25	2.625	.88	1.69	1.50-12	1.75-12	1.50-12	.50	1.38	2.00	3.00	6.62	800
4.00	F	1.00	1.12	1.500	.50	.88	.75-16	.88-14	.75-16	.25	.75	1.38	2.38	6.00	900
	G	1.38	1.62	2.000	.62	1.12	1.00-14	1.25-12	1.00-14	.38	1.00	1.62	2.62	6.25	750
	H	1.75	2.00	2.375	.75	1.50	1.25-12	1.50-12	1.25-12	.50	1.25	1.88	2.88	6.50	650
	J	2.00	2.25	2.625	.88	1.69	1.50-12	1.75-12	1.50-12	.50	1.38	2.00	3.00	6.62	500
	K	2.50	3.00	3.125	1.00	2.06	1.88-12	2.25-12	1.88-12	.62	1.62	2.25	3.25	6.88	500
5.00	F	1.00	1.12	1.500	.50	.88	.75-16	.88-14	.75-16	.25	.75	1.38	2.38	6.31	700
	G	1.38	1.62	2.000	.62	1.12	1.00-14	1.25-12	1.00-14	.38	1.00	1.62	2.62	6.56	550
	H	1.75	2.00	2.375	.75	1.50	1.25-12	1.50-12	1.25-12	.50	1.25	1.88	2.88	6.81	550
	J	2.00	2.25	2.625	.88	1.69	1.50-12	1.75-12	1.50-12	.50	1.38	2.00	3.00	6.94	500
	K	2.50	3.00	3.125	1.00	2.06	1.88-12	2.25-12	1.88-12	.62	1.62	2.25	3.25	7.19	400
	L	3.00	3.50	3.750	1.00	2.62	2.25-12	2.75-12	2.25-12	.62	1.62	2.25	3.25	7.19	200
	M	3.50	3.50	4.250	1.00	3.00	2.50-12	3.25-12	2.50-12	.62	1.62	2.25	3.25	7.19	200
6.00	G	1.38	1.62	2.000	.62	1.12	1.00-14	1.25-12	1.00-14	.25	.88	1.62	2.75	7.06	700
	H	1.75	2.00	2.375	.75	1.50	1.25-12	1.50-12	1.25-12	.38	1.12	1.88	3.00	7.31	600
	J	2.00	2.25	2.625	.88	1.69	1.50-12	1.75-12	1.50-12	.38	1.25	2.00	3.12	7.44	600
	K	2.50	3.00	3.125	1.00	2.06	1.88-12	2.25-12	1.88-12	.50	1.50	2.25	3.38	7.69	500
	L	3.00	3.50	3.750	1.00	2.62	2.25-12	2.75-12	2.25-12	.50	1.50	2.25	3.38	7.69	400
	M	3.50	3.50	4.250	1.00	3.00	2.50-12	3.25-12	2.50-12	.50	1.50	2.25	3.38	7.69	300
	N	4.00	4.00	4.750	1.00	3.38	3.00-12	3.75-12	3.00-12	.50	1.50	2.25	3.38	7.69	300

† CAUTION: PSI ratings shown are HANNA recommended maximum operating pressures. Check STROKE LIMITATION DATA in TECHNICAL INFORMATION section which may reduce maximum operating pressure. Check STOP TUBE DATA (TECHNICAL INFORMATION section) to determine if stop tube is required.

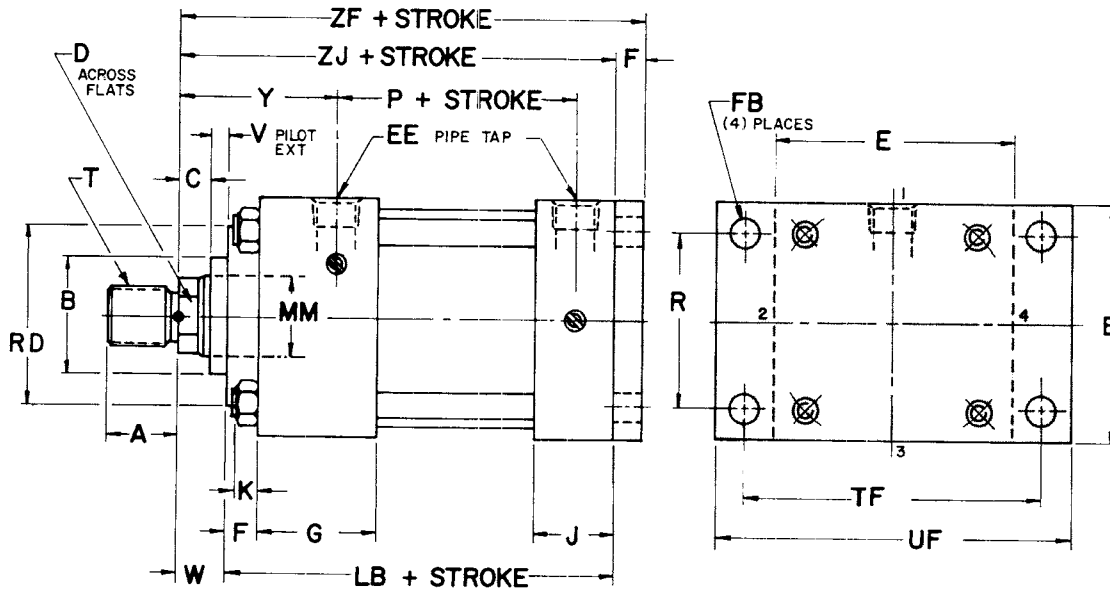
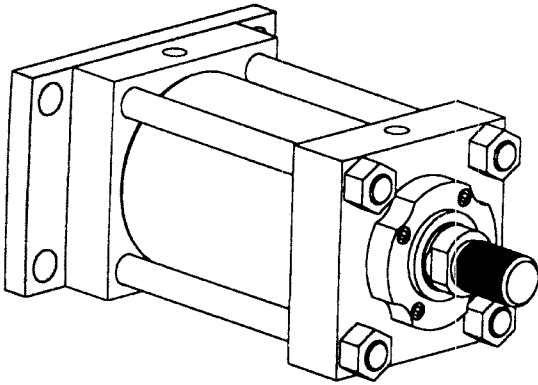
NOTE: Dimensions are nominal except where specifically toleranced. Tolerances on "Plus Stroke" dimensions will vary slightly from dimensions shown due to manufacturing tolerances and tube compression.

STANDARD ROD END STYLES



NOTE: Dimension "NA" is the rod diameter minus .030 (.62 & 1.00 rods), minus .062 (1.38-5.50 rods)

SERIES 3L 1.50"-6.00" Bores MF2 Cap Rectangular Flange Mount



These Dimensions are Constant Regardless of Rod Diameter

BORE	E	EE (NPTF)	F	FB	G	J	K	LB	P	R ±.010	TF ±.010	UF
1.50	2.00	3/8	.38	.312	1.50	1.00	25	4.00	2.31	1.43	2.75	3.38
2.00	2.50	3/8	.38	.375	1.50	1.00	31	4.00	2.31	1.84	3.38	4.12
2.50	3.00	3/8	.38	.375	1.50	1.00	31	4.12	2.44	2.19	3.88	4.62
3.25	3.75	1/2	.62	.438	1.75	1.25	38	4.88	2.69	2.76	4.69	5.50
4.00	4.50	1/2	.62	.438	1.75	1.25	38	4.88	2.69	3.32	5.44	6.25
5.00	5.50	1/2	.62	.562	1.75	1.25	44	5.12	2.94	4.10	6.62	7.62
6.00	6.50	3/4	.75	.562	2.00	1.50	44	5.75	3.19	4.88	7.62	8.62

MF2

Dimensions are Affected by the Rod Diameter

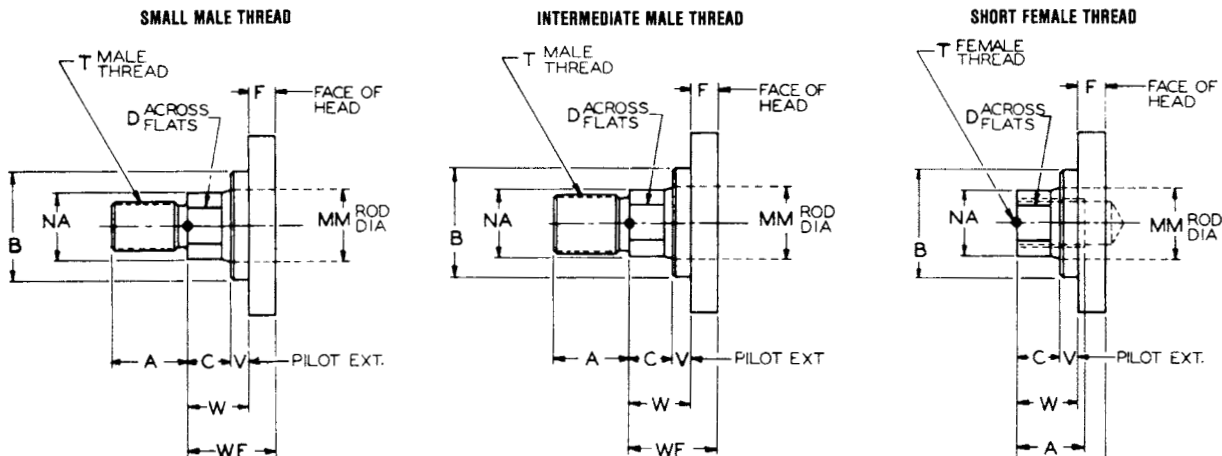
CYLINDER								T (THREAD)								PSI RATING†
BORE	ROD DIA. CODE	MM ROD DIA.	A	B -.001 -.003	C	D	RD*	SMALL MALE SM	INTER-MEDIATE MALE IM	SHORT FEMALE SF	V	W	Y	ZF	ZJ	
1.50	D	.62	.75	1.125	.38	.50	-	.44-20	.50-20	.44-20	.25	.62	1.88	5.00	4.62	1800
	F	1.00	1.12	1.500	.50	.88	-	.75-16	.88-14	.75-16	.50	1.00	2.25	5.38	5.00	1800
2.00	D	.62	.75	1.125	.38	.50	2.38	.44-20	.50-20	.44-20	.25	.62	1.88	5.00	4.62	1500
	F	1.00	1.12	1.500	.50	.88	2.38	.75-16	.88-14	.75-16	.50	1.00	2.25	5.38	5.00	1500
	G	1.38	1.62	2.000	.62	1.12	-	1.00-14	1.25-12	1.00-14	.62	1.25	2.50	5.62	5.25	1500
2.50	D	.62	.75	1.125	.38	.50	2.38	.44-20	.50-20	.44-20	.25	.62	1.88	5.12	4.75	1000
	F	1.00	1.12	1.500	.50	.88	2.38	.75-16	.88-14	.75-16	.50	1.00	2.25	5.50	5.12	1000
	G	1.38	1.62	2.000	.62	1.12	-	1.00-14	1.25-12	1.00-14	.62	1.25	2.50	5.75	5.38	1000
	H	1.75	2.00	2.375	.75	1.50	-	1.25-12	1.50-12	1.25-12	.75	1.50	2.75	6.00	5.62	1000
3.25	F	1.00	1.12	1.500	.50	.88	3.00	.75-16	.88-14	.75-16	.25	.75	2.38	6.25	5.62	1300
	G	1.38	1.62	2.000	.62	1.12	3.00	1.00-14	1.25-12	1.00-14	.38	1.00	2.62	6.50	5.88	1300
	H	1.75	2.00	2.375	.75	1.50	-	1.25-12	1.50-12	1.25-12	.50	1.25	2.88	6.75	6.12	1300
	J	2.00	2.25	2.625	.88	1.69	-	1.50-12	1.75-12	1.50-12	.50	1.38	3.00	6.88	6.25	1300
4.00	F	1.00	1.12	1.500	.50	.88	3.00	.75-16	.88-14	.75-16	.25	.75	2.38	6.25	5.62	900
	G	1.38	1.62	2.000	.62	1.12	3.00	1.00-14	1.25-12	1.00-14	.38	1.00	2.62	6.50	5.88	900
	H	1.75	2.00	2.375	.75	1.50	-	1.25-12	1.50-12	1.25-12	.50	1.25	2.88	6.75	6.12	900
	J	2.00	2.25	2.625	.88	1.69	-	1.50-12	1.75-12	1.50-12	.50	1.38	3.00	6.88	6.25	900
	K	2.50	3.00	3.125	1.00	2.06	-	1.88-12	2.25-12	1.88-12	.62	1.62	3.25	7.12	6.50	900
5.00	F	1.00	1.12	1.500	.50	.88	3.00	.75-16	.88-14	.75-16	.25	.75	2.38	6.50	5.88	750
	G	1.38	1.62	2.000	.62	1.12	3.00	1.00-14	1.25-12	1.00-14	.38	1.00	2.62	6.75	6.12	750
	H	1.75	2.00	2.375	.75	1.50	-	1.25-12	1.50-12	1.25-12	.50	1.25	2.88	7.00	6.38	750
	J	2.00	2.25	2.625	.88	1.69	-	1.50-12	1.75-12	1.50-12	.50	1.38	3.00	7.12	6.50	750
	K	2.50	3.00	3.125	1.00	2.06	-	1.88-12	2.25-12	1.88-12	.62	1.62	3.25	7.38	6.75	750
	L	3.00	3.50	3.750	1.00	2.62	-	2.25-12	2.75-12	2.25-12	.62	1.62	3.25	7.38	6.75	750
6.00	G	1.38	1.62	2.000	.62	1.12	4.00	1.00-14	1.25-12	1.00-14	.25	.88	2.75	7.38	6.62	750
	H	1.75	2.00	2.375	.75	1.50	4.00	1.25-12	1.50-12	1.25-12	.38	1.12	3.00	7.62	6.88	750
	J	2.00	2.25	2.625	.88	1.69	4.00	1.50-12	1.75-12	1.50-12	.38	1.25	3.12	7.75	7.00	750
	K	2.50	3.00	3.125	1.00	2.06	-	1.88-12	2.25-12	1.88-12	.50	1.50	3.38	8.00	7.25	750
	L	3.00	3.50	3.750	1.00	2.62	-	2.25-12	2.75-12	2.25-12	.50	1.50	3.38	8.00	7.25	750
	M	3.50	3.50	4.250	1.00	3.00	-	2.50-12	3.25-12	2.50-12	.50	1.50	3.38	8.00	7.25	750
	N	4.00	4.00	4.750	1.00	3.38	-	3.00-12	3.75-12	3.00-12	.50	1.50	3.38	8.00	7.25	750

* Where RD is not shown, square retainer is used. See RETAINER PLATE CONSTRUCTION in INSTALLATION, OPERATION AND MAINTENANCE DATA section.

† CAUTION: PSI ratings shown are HANNA recommended maximum operating pressures. Check STROKE LIMITATION DATA in TECHNICAL INFORMATION section which may reduce maximum operating pressure. Check STOP TUBE DATA (TECHNICAL INFORMATION section) to determine if stop tube is required.

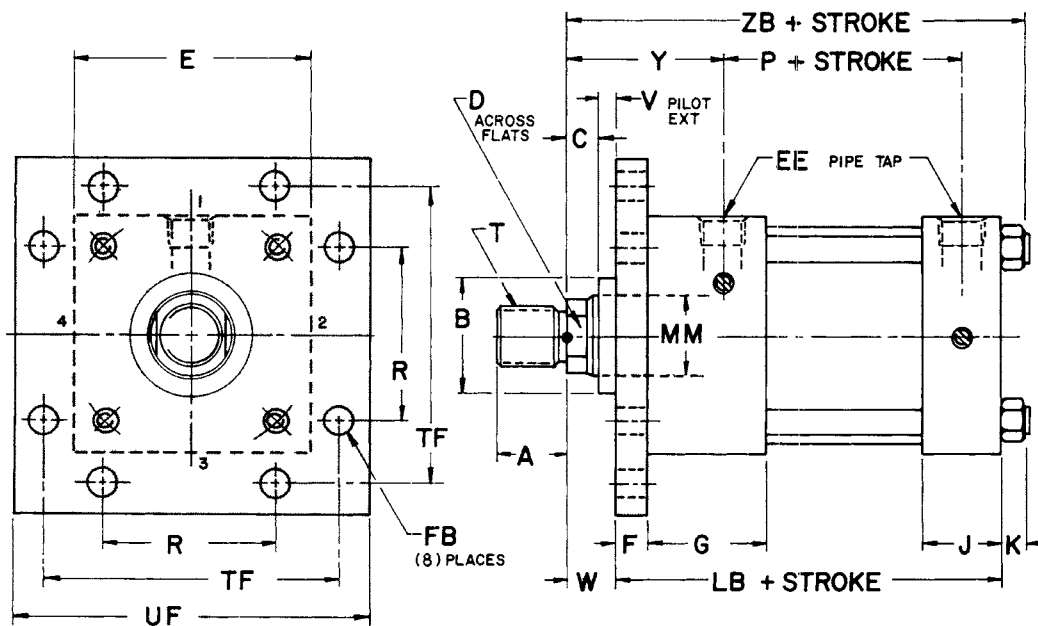
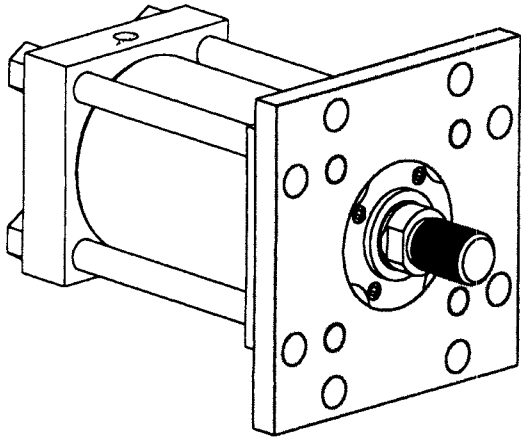
NOTE: Dimensions are nominal except where specifically toleranced. Tolerances on "Plus Stroke" dimensions will vary slightly from dimensions shown due to manufacturing tolerances and tube compression.

STANDARD ROD END STYLES



NOTE: Dimension "NA" is the rod diameter minus .030 (.62 & 1.00 rods), minus .062 (1.38-5.50 rods)

SERIES 3L 1.50"-6.00" Bores MF5 Head Square Flange Mount



These Dimensions are Constant Regardless of Rod Diameter

BORE	E	EE (NPTF)	F	FB	G	J	K	LB	P	R ±.010	TF ±.010	UF
1.50	2.00	3/8	.38	.312	1.50	1.00	.25	4.00	2.31	1.43	2.75	3.38
2.00	2.50	3/8	.38	.375	1.50	1.00	.31	4.00	2.31	1.84	3.38	4.12
2.50	3.00	3/8	.38	.375	1.50	1.00	.31	4.12	2.44	2.19	3.83	4.62
3.25	3.75	1/2	.62	.438	1.75	1.25	.38	4.88	2.69	2.76	4.69	5.50
4.00	4.50	1/2	.62	.438	1.75	1.25	.38	4.88	2.69	3.32	5.44	6.25
5.00	5.50	1/2	.62	.562	1.75	1.25	.44	5.12	2.94	4.10	6.62	7.62
6.00	6.50	3/4	.75	.562	2.00	1.50	.44	5.75	3.19	4.88	7.62	8.62

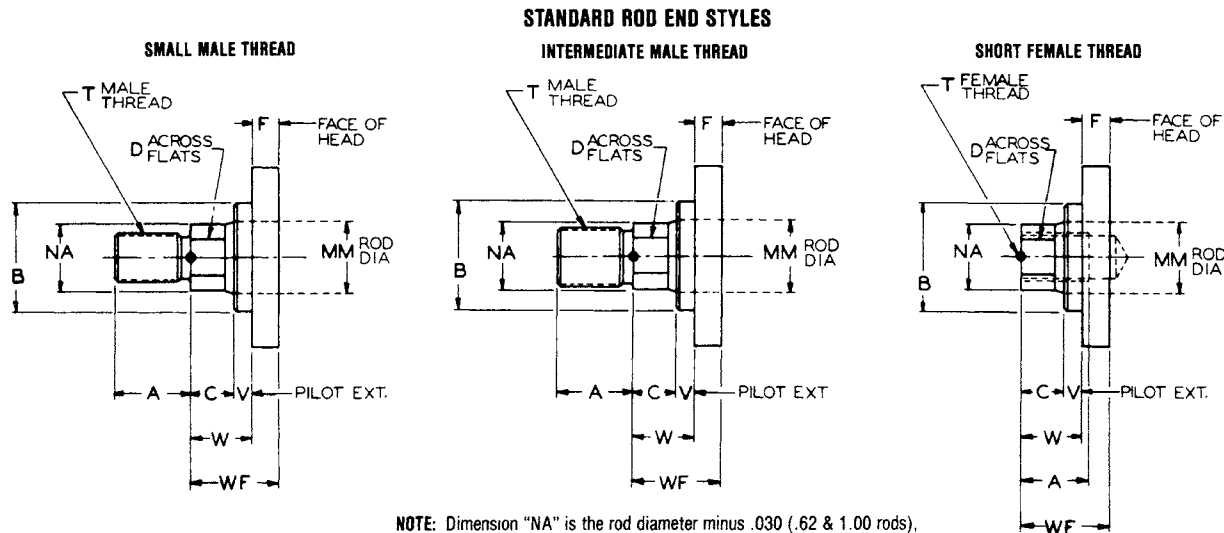
MF5

Dimensions are Affected by the Rod Diameter

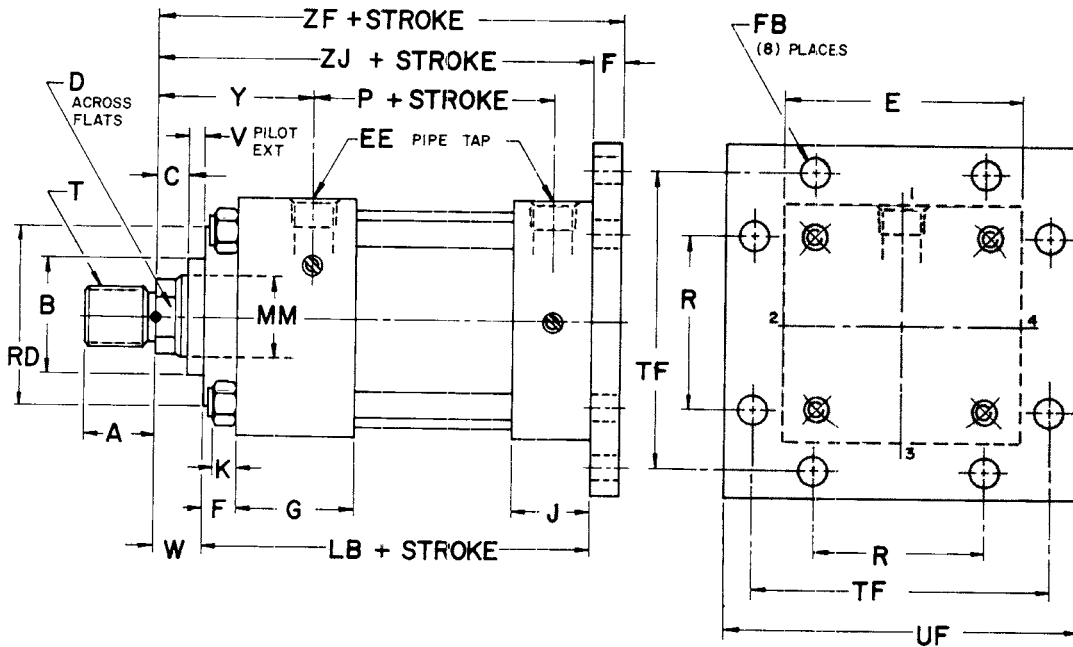
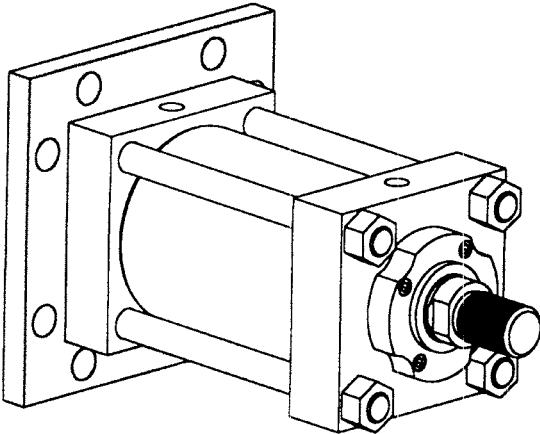
BORE	CYLINDER		A	B -001 -003	C	D	T (THREAD)			V	W	WF	Y	ZB	PSI RATING†
	ROD DIA. CODE	MM ROD DIA.					SMALL MALE SM	INTER- MEDIATE MALE IM	SHORT FEMALE SF						
1.50	D	.62	.75	1.125	.38	.50	.44-20	.50-20	.44-20	.25	.62	1.00	1.88	4.88	1800
	F	1.00	1.12	1.500	.50	.88	.75-16	.88-14	.75-16	.50	1.00	1.38	2.25	5.25	1800
2.00	D	.62	.75	1.125	.38	.50	.44-20	.50-20	.44-20	.25	.62	1.00	1.88	4.94	1800
	F	1.00	1.12	1.500	.50	.88	.75-16	.88-14	.75-16	.50	1.00	1.38	2.25	5.31	1800
2.50	G	1.38	1.62	2.000	.62	1.12	1.00-14	1.25-12	1.00-14	.62	1.25	1.62	2.50	5.56	1800
	H	1.75	2.00	2.375	.75	1.50	1.25-12	1.50-12	1.25-12	.75	1.50	1.88	2.75	5.94	1000
	D	.62	.75	1.125	.38	.50	.44-20	.50-20	.44-20	.25	.62	1.00	1.88	5.06	1000
	F	1.00	1.12	1.500	.50	.88	.75-16	.88-14	.75-16	.50	1.00	1.38	2.25	5.44	1000
3.25	G	1.38	1.62	2.000	.62	1.12	1.00-14	1.25-12	1.00-14	.38	1.00	1.62	2.62	6.25	1300
	H	1.75	2.00	2.375	.75	1.50	1.25-12	1.50-12	1.25-12	.50	1.25	1.88	2.88	6.50	1300
	J	2.00	2.25	2.625	.88	1.69	1.50-12	1.75-12	1.50-12	.50	1.38	2.00	3.00	6.62	1300
	D	.62	.75	1.125	.38	.50	.44-20	.50-20	.44-20	.25	.62	1.00	1.88	5.06	1000
4.00	F	1.00	1.12	1.500	.50	.88	.75-16	.88-14	.75-16	.25	.75	1.38	2.38	6.00	900
	G	1.38	1.62	2.000	.62	1.12	1.00-14	1.25-12	1.00-14	.38	1.00	1.62	2.62	6.25	900
	H	1.75	2.00	2.375	.75	1.50	1.25-12	1.50-12	1.25-12	.50	1.25	1.88	2.88	6.50	900
	J	2.00	2.25	2.625	.88	1.69	1.50-12	1.75-12	1.50-12	.50	1.38	2.00	3.00	6.62	900
	K	2.50	3.00	3.125	1.00	2.06	1.88-12	2.25-12	1.88-12	.62	1.62	2.25	3.25	6.88	900
5.00	F	1.00	1.12	1.500	.50	.88	.75-16	.88-14	.75-16	.25	.75	1.38	2.38	6.31	750
	G	1.38	1.62	2.000	.62	1.12	1.00-14	1.25-12	1.00-14	.38	1.00	1.62	2.62	6.56	750
	H	1.75	2.00	2.375	.75	1.50	1.25-12	1.50-12	1.25-12	.50	1.25	1.88	2.88	6.81	750
	J	2.00	2.25	2.625	.88	1.69	1.50-12	1.75-12	1.50-12	.50	1.38	2.00	3.00	6.94	750
	K	2.50	3.00	3.125	1.00	2.06	1.88-12	2.25-12	1.88-12	.62	1.62	2.25	3.25	7.19	750
	L	3.00	3.50	3.750	1.00	2.62	2.25-12	2.75-12	2.25-12	.62	1.62	2.25	3.25	7.19	550
6.00	M	3.50	3.50	4.250	1.00	3.00	2.50-12	3.25-12	2.50-12	.62	1.62	2.25	3.25	7.19	550
	G	1.38	1.62	2.000	.62	1.12	1.00-14	1.25-12	1.00-14	.25	.88	1.62	2.75	7.06	750
	H	1.75	2.00	2.375	.75	1.50	1.25-12	1.50-12	1.25-12	.38	1.12	1.88	3.00	7.31	750
	J	2.00	2.25	2.625	.88	1.69	1.50-12	1.75-12	1.50-12	.38	1.25	2.00	3.12	7.44	750
	K	2.50	3.00	3.125	1.00	2.06	1.88-12	2.25-12	1.88-12	.50	1.50	2.25	3.38	7.69	750
	L	3.00	3.50	3.750	1.00	2.62	2.25-12	2.75-12	2.25-12	.50	1.50	2.25	3.38	7.69	750
	M	3.50	3.50	4.250	1.00	3.00	2.50-12	3.25-12	2.50-12	.50	1.50	2.25	3.38	7.69	600
N	4.00	4.00	4.750	1.00	3.38	3.00-12	3.75-12	3.00-12	.50	1.50	2.25	3.38	7.69	600	

† CAUTION: PSI ratings shown are HANNA recommended maximum operating pressures. Check STROKE LIMITATION DATA in TECHNICAL INFORMATION section which may reduce maximum operating pressure. Check STOP TUBE DATA (TECHNICAL INFORMATION section) to determine if stop tube is required.

NOTE: Dimensions are nominal except where specifically toleranced. Tolerances on "Plus Stroke" dimensions will vary slightly from dimensions shown due to manufacturing tolerances and tube compression.



SERIES 3L 1.50"-6.00" Bores MF6 Cap Square Flange Mount



These Dimensions are Constant Regardless of Rod Diameter

BORE	E	EE (NPTF)	F	FB	G	J	K	LB	P	R ±.010	TF ±.010	UF
1.50	2.00	3/8	.38	.312	1.50	1.00	.25	4.00	2.31	1.43	2.75	3.38
2.00	2.50	3/8	.38	.375	1.50	1.00	.31	4.00	2.31	1.84	3.38	4.12
2.50	3.00	3/8	.38	.375	1.50	1.00	.31	4.12	2.44	2.19	3.88	4.62
3.25	3.75	1/2	.62	.438	1.75	1.25	.38	4.88	2.69	2.76	4.69	5.50
4.00	4.50	1/2	.62	.438	1.75	1.25	.38	4.88	2.69	3.32	5.44	6.25
5.00	5.50	1/2	.62	.562	1.75	1.25	.44	5.12	2.94	4.10	6.62	7.62
6.00	6.50	3/4	.75	.562	2.00	1.50	.44	5.75	3.19	4.88	7.62	8.62

MF6

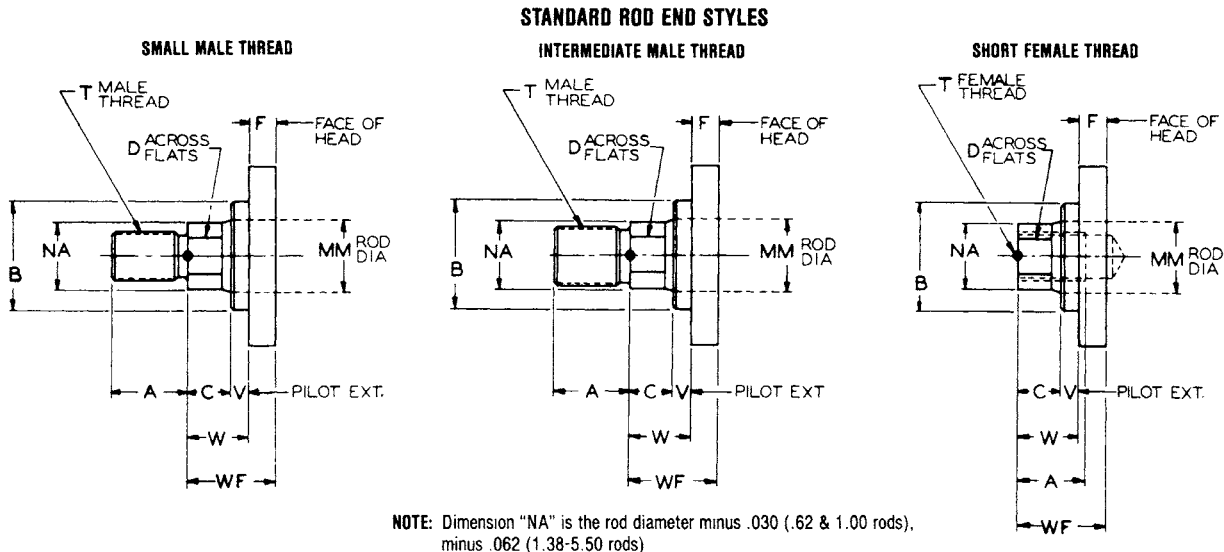
Dimensions are Affected by the Rod Diameter

CYLINDER			A	B -.001 -.003	C	D	RD*	T (THREAD)			V	W	Y	ZF	ZJ	PSI RATING†
BORE	ROD DIA. CODE	MM ROD DIA.						SMALL MALE SM	INTER- MEDIATE MALE IM	SHORT FEMALE SF						
1.50	D	.62	.75	1.125	.38	.50	-	44-20	50-20	44-20	.25	.62	1.88	5.00	4.62	1800
	F	1.00	1.12	1.500	.50	.88	-	.75-16	.88-14	.75-16	.50	1.00	2.25	5.38	5.00	1800
2.00	D	.62	.75	1.125	.38	.50	2.38	44-20	50-20	44-20	.25	.62	1.88	5.00	4.62	1800
	F	1.00	1.12	1.500	.50	.88	2.38	.75-16	.88-14	.75-16	.50	1.00	2.25	5.38	5.00	1800
	G	1.38	1.62	2.000	.62	1.12	-	1.00-14	1.25-12	1.00-14	.62	1.25	2.50	5.62	5.25	1800
2.50	D	.62	.75	1.125	.38	.50	2.38	44-20	50-20	44-20	.25	.62	1.88	5.12	4.75	1000
	F	1.00	1.12	1.500	.50	.88	2.38	.75-16	.88-14	.75-16	.50	1.00	2.25	5.50	5.12	1400
	G	1.38	1.62	2.000	.62	1.12	-	1.00-14	1.25-12	1.00-14	.62	1.25	2.50	5.75	5.38	1400
	H	1.75	2.00	2.375	.75	1.50	-	1.25-12	1.50-12	1.25-12	.75	1.50	2.75	6.00	5.62	1400
3.25	F	1.00	1.12	1.500	.50	.88	3.00	.75-16	.88-14	.75-16	.25	.75	2.38	6.25	5.62	1300
	G	1.38	1.62	2.000	.62	1.12	3.00	1.00-14	1.25-12	1.00-14	.38	1.00	2.62	6.50	5.88	1300
	H	1.75	2.00	2.375	.75	1.50	-	1.25-12	1.50-12	1.25-12	.50	1.25	2.88	6.75	6.12	1300
	J	2.00	2.25	2.625	.88	1.69	-	1.50-12	1.75-12	1.50-12	.50	1.38	3.00	6.88	6.25	1300
4.00	F	1.00	1.12	1.500	.50	.88	3.00	.75-16	.88-14	.75-16	.25	.75	2.38	6.25	5.62	900
	G	1.38	1.62	2.000	.62	1.12	3.00	1.00-14	1.25-12	1.00-14	.38	1.00	2.62	6.50	5.88	900
	H	1.75	2.00	2.375	.75	1.50	-	1.25-12	1.50-12	1.25-12	.50	1.25	2.88	6.75	6.12	900
	J	2.00	2.25	2.625	.88	1.69	-	1.50-12	1.75-12	1.50-12	.50	1.38	3.00	6.88	6.25	900
	K	2.50	3.00	3.125	1.00	2.06	-	1.88-12	2.25-12	1.88-12	.62	1.62	3.25	7.12	6.50	900
5.00	F	1.00	1.12	1.500	.50	.88	3.00	.75-16	.88-14	.75-16	.25	.75	2.38	6.50	5.88	750
	G	1.38	1.62	2.000	.62	1.12	3.00	1.00-14	1.25-12	1.00-14	.38	1.00	2.62	6.75	6.12	1000
	H	1.75	2.00	2.375	.75	1.50	-	1.25-12	1.50-12	1.25-12	.50	1.25	2.88	7.00	6.38	1000
	J	2.00	2.25	2.625	.88	1.69	-	1.50-12	1.75-12	1.50-12	.50	1.38	3.00	7.12	6.50	1000
	K	2.50	3.00	3.125	1.00	2.06	-	1.88-12	2.25-12	1.88-12	.62	1.62	3.25	7.38	6.75	1000
	L	3.00	3.50	3.750	1.00	2.62	-	2.25-12	2.75-12	2.25-12	.62	1.62	3.25	7.38	6.75	1000
6.00	G	1.38	1.62	2.000	.62	1.12	4.00	1.00-14	1.25-12	1.00-14	.25	.88	2.75	7.38	6.62	750
	H	1.75	2.00	2.375	.75	1.50	4.00	1.25-12	1.50-12	1.25-12	.38	1.12	3.00	7.62	6.88	750
	J	2.00	2.25	2.625	.88	1.69	4.00	1.50-12	1.75-12	1.50-12	.38	1.25	3.12	7.75	7.00	750
	K	2.50	3.00	3.125	1.00	2.06	-	1.88-12	2.25-12	1.88-12	.50	1.50	3.38	8.00	7.25	750
	L	3.00	3.50	3.750	1.00	2.62	-	2.25-12	2.75-12	2.25-12	.50	1.50	3.38	8.00	7.25	750
	M	3.50	3.50	4.250	1.00	3.00	-	2.50-12	3.25-12	2.50-12	.50	1.50	3.38	8.00	7.25	750
	N	4.00	4.00	4.750	1.00	3.38	-	3.00-12	3.75-12	3.00-12	.50	1.50	3.38	8.00	7.25	750

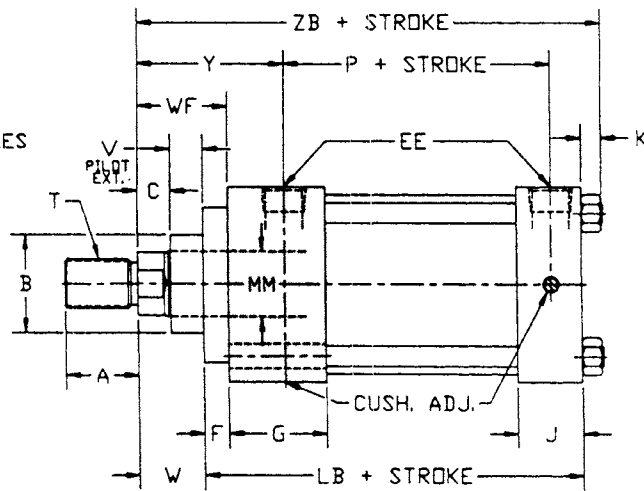
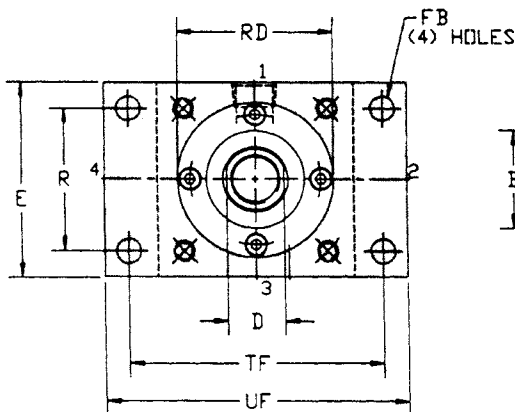
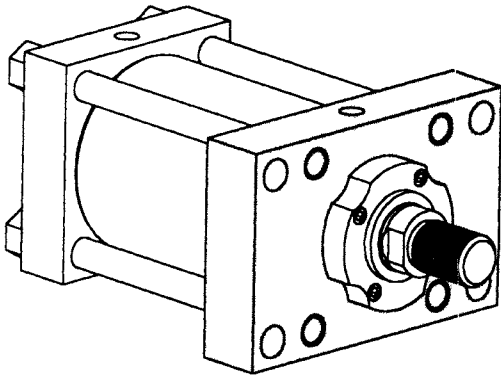
* Where RD is not shown, square retainer is used. See RETAINER PLATE CONSTRUCTION in INSTALLATION, OPERATION AND MAINTENANCE DATA section.

† CAUTION: PSI ratings shown are HANNA recommended maximum operating pressures. Check STROKE LIMITATION DATA in TECHNICAL INFORMATION section which may reduce maximum operating pressure. Check STOP TUBE DATA (TECHNICAL INFORMATION section) to determine if stop tube is required.

NOTE: Dimensions are nominal except where specifically tolerated. Tolerances on "Plus Stroke" dimensions will vary slightly from dimensions shown due to manufacturing tolerances and tube compression.



SERIES 3L 1.50"-6.00" Bores ME5 Head Flange Mount



These Dimensions are Constant Regardless of Rod Diameter

BORE	E	EE (NPTF)	F	FB	G	J	K	LB	P	R ±.010	TF ±.010	UF
1.50	2.00	3/8	.38	.312	1.50	1.00	.25	4.00	2.31	1.43	2.75	3.38
2.00	2.50	3/8	.38	.375	1.50	1.00	.31	4.00	2.31	1.84	3.38	4.12
2.50	3.00	3/8	.38	.375	1.50	1.00	.31	4.12	2.44	2.19	3.88	4.62
3.25	3.75	1/2	.62	.438	1.75	1.25	.38	4.88	2.69	2.76	4.69	5.50
4.00	4.50	1/2	.62	.438	1.75	1.25	.38	4.88	2.69	3.32	5.44	6.25
5.00	5.50	1/2	.62	.562	1.75	1.25	.44	5.12	2.94	4.10	6.62	7.62
6.00	6.50	3/4	.75	.562	2.00	1.50	.44	5.75	3.19	4.88	7.62	8.62

ME5

Dimensions are Affected by the Rod Diameter

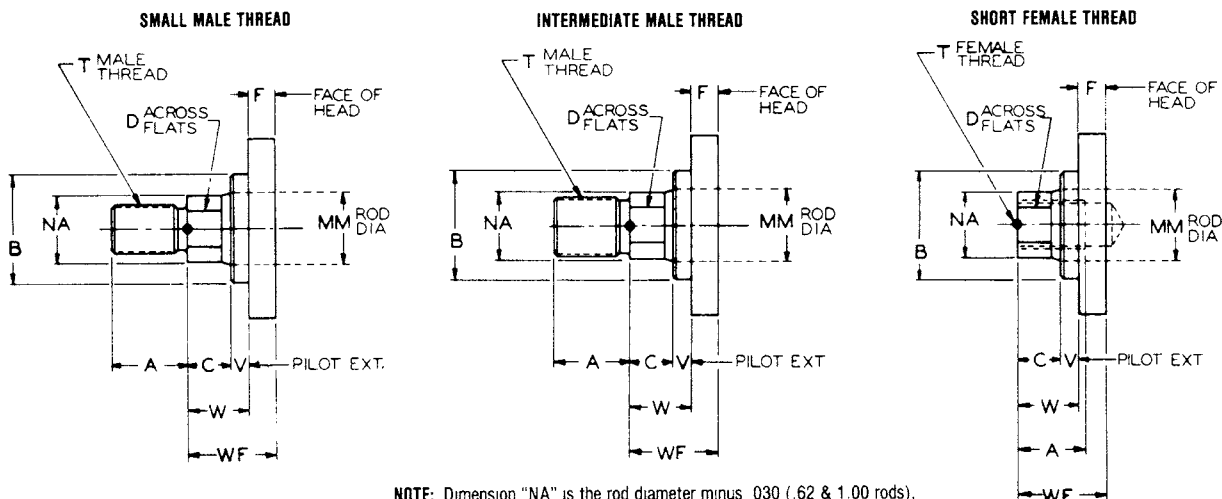
CYLINDER			A	B -.001 -.003	C	D	RD* ±.005	T (THREAD)			V	W	WF	Y	ZB	PSI RATING†
BORE	ROD DIA. CODE	MM ROD DIA.						SMALL MALE SM	INTER- MEDIATE MALE IM	SHORT FEMALE SF						
1.50	D	.62	.75	1.125	.38	.50	-	.44-20	50-20	.44-20	.25	.62	1.00	1.88	4.88	1800
	F	1.00	1.12	1.500	.50	.88	-	.75-16	88-14	.75-16	.50	1.00	1.38	2.25	5.25	1800
2.00	D	.62	.75	1.125	.38	.50	2.38	.44-20	50-20	.44-20	.25	.62	1.00	1.88	4.94	1800
	F	1.00	1.12	1.500	.50	.88	2.38	.75-16	88-14	.75-16	.50	1.00	1.38	2.25	5.31	1800
	G	1.38	1.62	2.000	.62	1.12	-	1.00-14	1.25-12	1.00-14	.62	1.25	1.62	2.50	5.56	1800
2.50	D	.62	.75	1.125	.38	.50	2.38	.44-20	50-20	.44-20	.25	.62	1.00	1.88	5.06	1000
	F	1.00	1.12	1.500	.50	.88	2.38	.75-16	88-14	.75-16	.50	1.00	1.38	2.25	5.44	1400
	G	1.38	1.62	2.000	.62	1.12	2.94	1.00-14	1.25-12	1.00-14	.62	1.25	1.62	2.50	5.69	1400
	H	1.75	2.00	2.375	.75	1.50	-	1.25-12	1.50-12	1.25-12	.75	1.50	1.88	2.75	5.94	1400
3.25	F	1.00	1.12	1.500	.50	.88	3.00	.75-16	88-14	.75-16	.25	.75	1.38	2.38	6.00	1300
	G	1.38	1.62	2.000	.62	1.12	3.00	1.00-14	1.25-12	1.00-14	.38	1.00	1.62	2.62	6.25	1300
	H	1.75	2.00	2.375	.75	1.50	3.50	1.25-12	1.50-12	1.25-12	.50	1.25	1.88	2.88	6.50	1300
	J	2.00	2.25	2.625	.88	1.69	-	1.50-12	1.75-12	1.50-12	.50	1.38	2.00	3.00	6.62	1300
4.00	F	1.00	1.12	1.500	.50	.88	3.00	.75-16	88-14	.75-16	.25	.75	1.38	2.38	6.00	900
	G	1.38	1.62	2.000	.62	1.12	3.00	1.00-14	1.25-12	1.00-14	.38	1.00	1.62	2.62	6.25	900
	H	1.75	2.00	2.375	.75	1.50	3.50	1.25-12	1.50-12	1.25-12	.50	1.25	1.88	2.88	6.50	900
	J	2.00	2.25	2.625	.88	1.69	4.12	1.50-12	1.75-12	1.50-12	.50	1.38	2.00	3.00	6.62	900
	K	2.50	3.00	3.125	1.00	2.06	4.12	1.88-12	2.25-12	1.88-12	.62	1.62	2.25	3.25	6.88	900
5.00	F	1.00	1.12	1.500	.50	.88	3.00	.75-16	88-14	.75-16	.25	.75	1.38	2.38	6.31	750
	G	1.38	1.62	2.000	.62	1.12	3.00	1.00-14	1.25-12	1.00-14	.38	1.00	1.62	2.62	6.56	1000
	H	1.75	2.00	2.375	.75	1.50	3.50	1.25-12	1.50-12	1.25-12	.50	1.25	1.88	2.88	6.81	1000
	J	2.00	2.25	2.625	.88	1.69	4.12	1.50-12	1.75-12	1.50-12	.50	1.38	2.00	3.00	6.94	1000
	K	2.50	3.00	3.125	1.00	2.06	4.12	1.88-12	2.25-12	1.88-12	.62	1.62	2.25	3.25	7.19	1000
	L	3.00	3.50	3.750	1.00	2.62	5.38	2.25-12	2.75-12	2.25-12	.62	1.62	2.25	3.25	7.19	1000
	M	3.50	3.50	4.250	1.00	3.00	5.38	2.50-12	3.25-12	2.50-12	.62	1.62	2.25	3.25	7.19	1000
6.00	G	1.38	1.62	2.000	.62	1.12	4.00	1.00-14	1.25-12	1.00-14	.25	.88	1.62	2.75	7.06	750
	H	1.75	2.00	2.375	.75	1.50	4.00	1.25-12	1.50-12	1.25-12	.38	1.12	1.88	3.00	7.31	750
	J	2.00	2.25	2.625	.88	1.69	4.00	1.50-12	1.75-12	1.50-12	.38	1.25	2.00	3.12	7.44	750
	K	2.50	3.00	3.125	1.00	2.06	5.25	1.88-12	2.25-12	1.88-12	.50	1.50	2.25	3.38	7.69	750
	L	3.00	3.50	3.750	1.00	2.62	5.25	2.25-12	2.75-12	2.25-12	.50	1.50	2.25	3.38	7.69	750
	M	3.50	3.50	4.250	1.00	3.00	6.25	2.50-12	3.25-12	2.50-12	.50	1.50	2.25	3.38	7.69	750
	N	4.00	4.00	4.750	1.00	3.38	6.25	3.00-12	3.75-12	3.00-12	.50	1.50	2.25	3.38	7.69	750

* Where RD is not shown, square retainer is used. See RETAINER PLATE CONSTRUCTION in INSTALLATION, OPERATION AND MAINTENANCE DATA section.

† CAUTION: PSI ratings shown are HANNA recommended maximum operating pressures. Check STROKE LIMITATION DATA in TECHNICAL INFORMATION section which may reduce maximum operating pressure. Check STOP TUBE DATA (TECHNICAL INFORMATION section) to determine if stop tube is required.

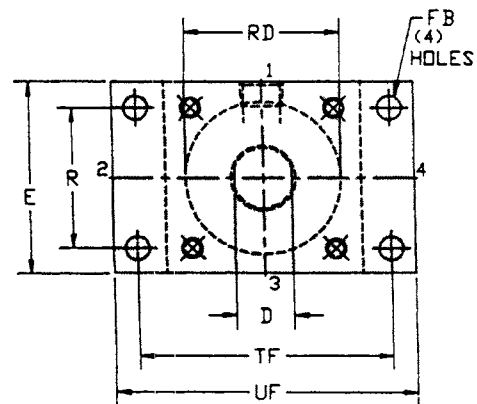
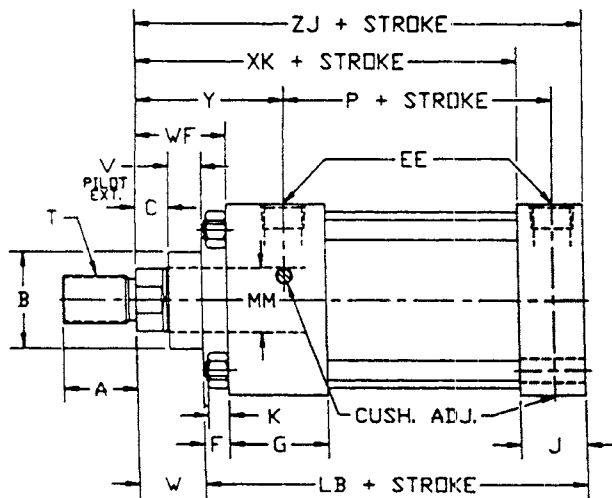
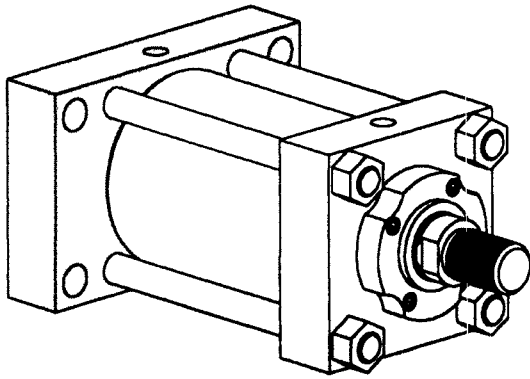
NOTE: Dimensions are nominal except where specifically toleranced. Tolerances on "Plus Stroke" dimensions will vary slightly from dimensions shown due to manufacturing tolerances and tube compression.

STANDARD ROD END STYLES



NOTE: Dimension "NA" is the rod diameter minus .030 (.62 & 1.00 rods), minus .062 (1.38-5.50 rods)

SERIES 3L 1.50"-6.00" Bores ME6 Cap Flange Mount



These Dimensions are Constant Regardless of Rod Diameter

BORE	E	EE (NPTF)	F	FB	G	J	K	LB	P	R ±.010	TF ±.010	UF
1.50	2.00	3/8	.38	.312	1.50	1.00	.25	4.00	2.31	1.43	2.75	3.38
2.00	2.50	3/8	.38	.375	1.50	1.00	.31	4.00	2.31	1.84	3.38	4.12
2.50	3.00	3/8	.38	.375	1.50	1.00	.31	4.12	2.44	2.19	3.88	4.62
3.25	3.75	1/2	.62	.438	1.75	1.25	.38	4.88	2.69	2.76	4.69	5.50
4.00	4.50	1/2	.62	.438	1.75	1.25	.38	4.88	2.69	3.32	5.44	6.25
5.00	5.50	1/2	.62	.562	1.75	1.25	.44	5.12	2.94	4.10	6.62	7.62
6.00	6.50	3/4	.75	.562	2.00	1.50	.44	5.75	3.19	4.88	7.62	8.62

ME6

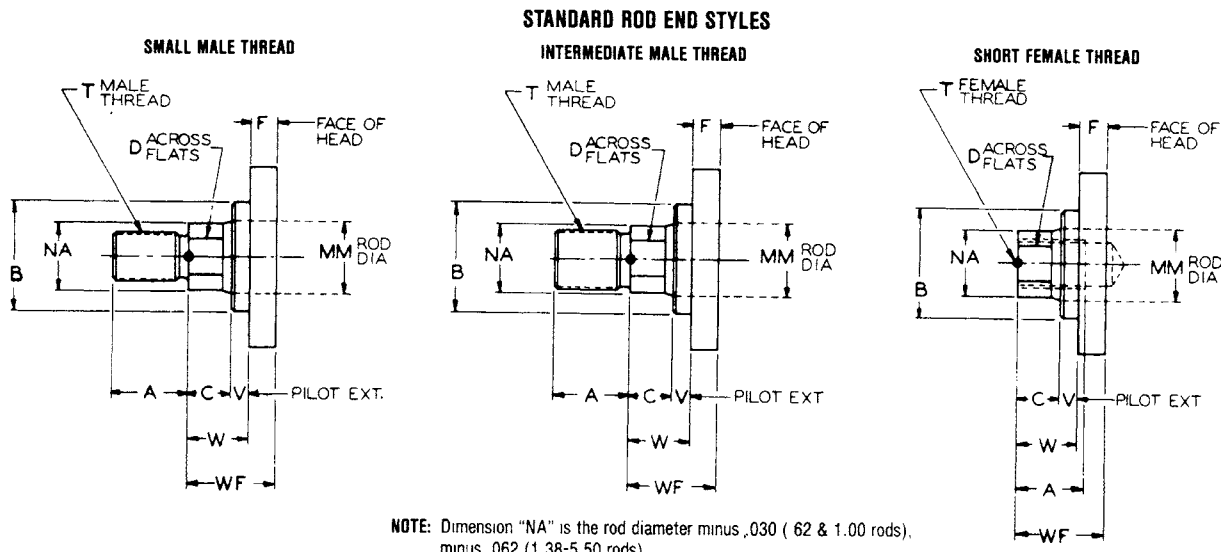
Dimensions are Affected by the Rod Diameter

CYLINDER			A	B -.001 -.003	C	D	RD*	T (THREAD)			V	W	Y	XK	ZJ	PSI RATING†
BORE	ROD DIA. CODE	MM ROD DIA.						SMALL MALE SM	INTER- MEDIATE MALE IM	SHORT FEMALE SF						
1.50	D	.62	.75	1.125	.38	.50	-	.44-20	.50-20	.44-20	.25	.62	1.88	3.62	4.62	1800
	F	1.00	1.12	1.500	.50	.88	-	.75-16	.88-14	.75-16	.50	1.00	2.25	4.00	5.00	1800
2.00	D	.62	.75	1.125	.38	.50	2.38	.44-20	.50-20	.44-20	.25	.62	1.88	3.62	4.62	1800
	F	1.00	1.12	1.500	.50	.88	2.38	.75-16	.88-14	.75-16	.50	1.00	2.25	4.00	5.00	1800
2.50	G	1.38	1.62	2.000	.62	1.12	-	1.00-14	1.25-12	1.00-14	.62	1.25	2.50	4.25	5.25	1800
	H	1.75	2.00	2.375	.75	1.50	-	1.25-12	1.50-12	1.25-12	.75	1.50	2.75	4.62	5.62	1400
	J	2.00	2.25	2.625	.88	1.69	-	1.50-12	1.75-12	1.50-12	.50	1.38	3.00	5.00	6.25	1300
3.25	F	1.00	1.12	1.500	.50	.88	3.00	.75-16	.88-14	.75-16	.25	.75	2.38	4.38	5.62	1300
	G	1.38	1.62	2.000	.62	1.12	3.00	1.00-14	1.25-12	1.00-14	.38	1.00	2.62	4.62	5.88	1300
	H	1.75	2.00	2.375	.75	1.50	-	1.25-12	1.50-12	1.25-12	.50	1.25	2.88	4.88	6.12	1300
	J	2.00	2.25	2.625	.88	1.69	-	1.50-12	1.75-12	1.50-12	.50	1.38	3.00	5.00	6.25	1300
4.00	F	1.00	1.12	1.500	.50	.88	3.00	.75-16	.88-14	.75-16	.25	.75	2.38	4.38	5.62	900
	G	1.38	1.62	2.000	.62	1.12	3.00	1.00-14	1.25-12	1.00-14	.38	1.00	2.62	4.62	5.88	900
	H	1.75	2.00	2.375	.75	1.50	-	1.25-12	1.50-12	1.25-12	.50	1.25	2.88	4.88	6.12	900
	J	2.00	2.25	2.625	.88	1.69	-	1.50-12	1.75-12	1.50-12	.50	1.38	3.00	5.00	6.25	900
	K	2.50	3.00	3.125	1.00	2.06	-	1.88-12	2.25-12	1.88-12	.62	1.62	3.25	5.25	6.50	900
5.00	F	1.00	1.12	1.500	.50	.88	3.00	.75-16	.88-14	.75-16	.25	.75	2.38	4.62	5.88	750
	G	1.38	1.62	2.000	.62	1.12	3.00	1.00-14	1.25-12	1.00-14	.38	1.00	2.62	4.88	6.12	1000
	H	1.75	2.00	2.375	.75	1.50	-	1.25-12	1.50-12	1.25-12	.50	1.25	2.88	6.12	6.38	1000
	J	2.00	2.25	2.625	.88	1.69	-	1.50-12	1.75-12	1.50-12	.50	1.38	3.00	5.25	6.50	1000
	K	2.50	3.00	3.125	1.00	2.06	-	1.88-12	2.25-12	1.88-12	.62	1.62	3.25	5.50	6.75	1000
	L	3.00	3.50	3.750	1.00	2.62	-	2.25-12	2.75-12	2.25-12	.62	1.62	3.25	5.50	6.75	1000
6.00	M	3.50	3.50	4.250	1.00	3.00	-	2.50-12	3.25-12	2.50-12	.62	1.62	3.25	5.50	6.75	1000
	N	4.00	4.00	4.750	1.00	3.38	-	3.00-12	3.75-12	3.00-12	.50	1.50	3.38	5.75	7.25	750
	G	1.38	1.62	2.000	.62	1.12	4.00	1.00-14	1.25-12	1.00-14	.25	.88	2.75	5.12	6.62	750
	H	1.75	2.00	2.375	.75	1.50	4.00	1.25-12	1.50-12	1.25-12	.38	1.12	3.00	5.38	6.88	750
	J	2.00	2.25	2.625	.88	1.69	4.00	1.50-12	1.75-12	1.50-12	.38	1.25	3.12	5.50	7.00	750
	K	2.50	3.00	3.125	1.00	2.06	-	1.88-12	2.25-12	1.88-12	.50	1.50	3.38	5.75	7.25	750
	L	3.00	3.50	3.750	1.00	2.62	-	2.25-12	2.75-12	2.25-12	.50	1.50	3.38	5.75	7.25	750
M	3.50	3.50	4.250	1.00	3.00	-	2.50-12	3.25-12	2.50-12	.50	1.50	3.38	5.75	7.25	750	
N	4.00	4.00	4.750	1.00	3.38	-	3.00-12	3.75-12	3.00-12	.50	1.50	3.38	5.75	7.25	750	

* Where RD is not shown, square retainer is used. See RETAINER PLATE CONSTRUCTION in INSTALLATION, OPERATION AND MAINTENANCE DATA section.

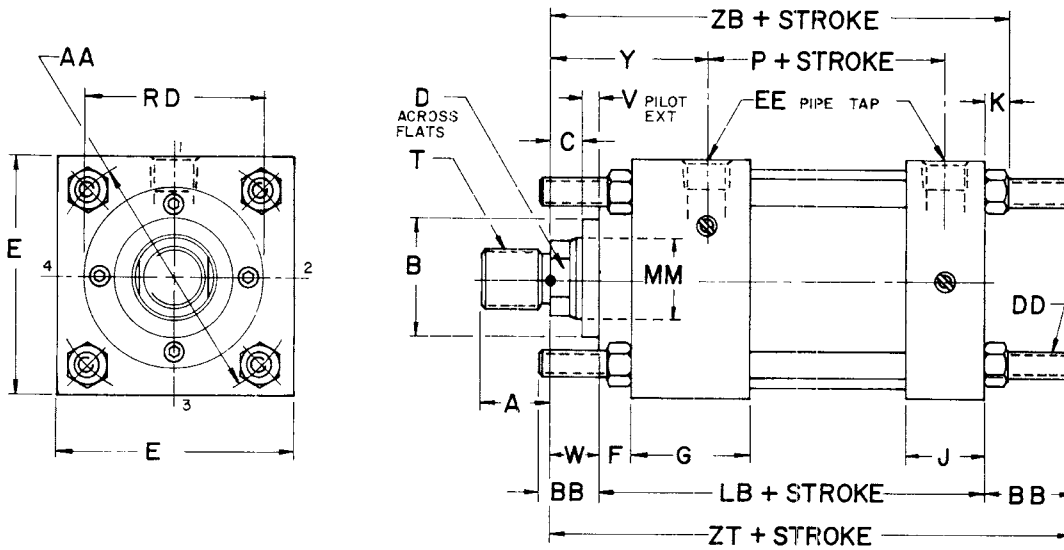
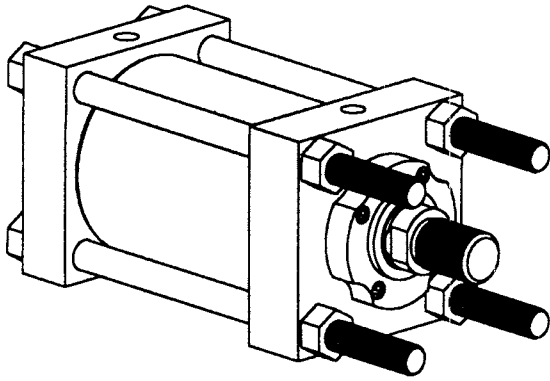
† **CAUTION:** PSI ratings shown are HANNA recommended maximum operating pressures. Check STROKE LIMITATION DATA in TECHNICAL INFORMATION section which may reduce maximum operating pressure. Check STOP TUBE DATA (TECHNICAL INFORMATION section) to determine if stop tube is required.

NOTE: Dimensions are nominal except where specifically toleranced. Tolerances on "Plus Stroke" dimensions will vary slightly from dimensions shown due to manufacturing tolerances and tube compression.



SERIES 3L 1.50"-6.00" Bores

MX0, MX1, MX2, MX3, MX4 Tie Rod Mounts



These Dimensions are Constant Regardless of Rod Diameter

BORE	AA	BB	DD	E	EE (NPTF)	F	G	J	K	LB	P
1.50	2.02	1.00	25-28	2.00	3/8	.38	1.50	1.00	.25	4.00	2.31
2.00	2.60	1.12	31-24	2.50	3/8	.38	1.50	1.00	.31	4.00	2.31
2.50	3.10	1.12	31-24	3.00	3/8	.38	1.50	1.00	.31	4.12	2.44
3.25	3.90	1.38	38-24	3.75	1/2	.62	1.75	1.25	.38	4.88	2.69
4.00	4.70	1.38	38-24	4.50	1/2	.62	1.75	1.25	.38	4.88	2.69
5.00	5.80	1.81	50-20	5.50	1/2	.62	1.75	1.25	.44	5.12	2.94
6.00	6.90	1.81	50-20	6.50	3/4	.75	2.00	1.50	.44	5.75	3.19

NOTE Specify Tie Rod Extension, "BB" dimension if other than standard
 MX0 = No Tie Rods Extended
 MX1 = 4 Tie Rods Extended Both Ends
 MX2 = 4 Tie Rods Extended Cap End
 MX3 = 4 Tie Rods Extended Head End
 MX4 = 2 Tie Rods Extended Both Ends

Dimensions are Affected
by the Rod Diameter

MX0, MX1, MX2, MX3, MX4

BORE	CYLINDER		A	B -.001 -.003	C	D	RD*	T (THREAD)			V	W	Y	ZB	ZT	PSI RATING†
	ROD DIA. CODE	MM ROD DIA.						SMALL MALE SM	INTER- MEDIATE MALE IM	SHORT FEMALE SF						
1.50	D	.62	.75	1.125	.38	.50	-	.44-20	50-20	44-20	25	.62	1.88	4.88	5.62	1800
	F	1.00	1.12	1.500	.50	.88	-	75-16	88-14	75-16	50	1.00	2.25	5.25	6.00	1800
2.00	D	.62	.75	1.125	.38	.50	2.38	44-20	50-20	44-20	25	.62	1.88	4.94	5.75	1800
	F	1.00	1.12	1.500	.50	.88	2.38	75-16	88-14	75-16	50	1.00	2.25	5.31	6.12	1800
	G	1.38	1.62	2.000	.62	1.12	-	1.00-14	1.25-12	1.00-14	.62	1.25	2.50	5.56	6.38	1800
2.50	D	.62	.75	1.125	.38	.50	2.38	.44-20	.50-20	.44-20	25	.62	1.88	5.06	5.88	1000
	F	1.00	1.12	1.500	.50	.88	2.38	.75-16	.88-14	.75-16	.50	1.00	2.25	5.44	6.25	1400
	G	1.38	1.62	2.000	.62	1.12	-	1.00-14	1.25-12	1.00-14	.62	1.25	2.50	5.69	6.50	1400
	H	1.75	2.00	2.375	.75	1.50	-	1.25-12	1.50-12	1.25-12	.75	1.50	2.75	5.94	6.75	1400
3.25	F	1.00	1.12	1.500	.50	.88	3.00	75-16	88-14	75-16	25	.75	2.38	6.00	7.00	1300
	G	1.38	1.62	2.000	.62	1.12	3.00	1.00-14	1.25-12	1.00-14	.38	1.00	2.62	6.25	7.25	1300
	H	1.75	2.00	2.375	.75	1.50	-	1.25-12	1.50-12	1.25-12	.50	1.25	2.88	6.50	7.50	1300
	J	2.00	2.25	2.625	.88	1.69	-	1.50-12	1.75-12	1.50-12	.50	1.38	3.00	6.62	7.62	1300
4.00	F	1.00	1.12	1.500	.50	.88	3.00	75-16	.88-14	.75-16	25	.75	2.38	6.00	7.00	900
	G	1.38	1.62	2.000	.62	1.12	3.00	1.00-14	1.25-12	1.00-14	.38	1.00	2.62	6.25	7.25	900
	H	1.75	2.00	2.375	.75	1.50	-	1.25-12	1.50-12	1.25-12	.50	1.25	2.88	6.50	7.50	900
	J	2.00	2.25	2.625	.88	1.69	-	1.50-12	1.75-12	1.50-12	.50	1.38	3.00	6.62	7.62	900
	K	2.50	3.00	3.125	1.00	2.06	-	1.88-12	2.25-12	1.88-12	.62	1.62	3.25	6.88	7.88	900
5.00	F	1.00	1.12	1.500	.50	.88	3.00	75-16	.88-14	75-16	25	.75	2.38	6.31	7.69	750
	G	1.38	1.62	2.000	.62	1.12	3.00	1.00-14	1.25-12	1.00-14	.38	1.00	2.62	6.56	7.94	1000
	H	1.75	2.00	2.375	.75	1.50	-	1.25-12	1.50-12	1.25-12	.50	1.25	2.88	6.81	8.19	1000
	J	2.00	2.25	2.625	.88	1.69	-	1.50-12	1.75-12	1.50-12	.50	1.38	3.00	6.94	8.31	1000
	K	2.50	3.00	3.125	1.00	2.06	-	1.88-12	2.25-12	1.88-12	.62	1.62	3.25	7.19	8.56	1000
	L	3.00	3.50	3.750	1.00	2.62	-	2.25-12	2.75-12	2.25-12	.62	1.62	3.25	7.19	8.56	1000
6.00	G	1.38	1.62	2.000	.62	1.12	4.00	1.00-14	1.25-12	1.00-14	25	.88	2.75	7.06	8.44	750
	H	1.75	2.00	2.375	.75	1.50	4.00	1.25-12	1.50-12	1.25-12	.38	1.12	3.00	7.31	8.69	750
	J	2.00	2.25	2.625	.88	1.69	4.00	1.50-12	1.75-12	1.50-12	.38	1.25	3.12	7.44	8.81	750
	K	2.50	3.00	3.125	1.00	2.06	-	1.88-12	2.25-12	1.88-12	.50	1.50	3.38	7.69	9.06	750
	L	3.00	3.50	3.750	1.00	2.62	-	2.25-12	2.75-12	2.25-12	.50	1.50	3.38	7.69	9.06	750
	M	3.50	3.50	4.250	1.00	3.00	-	2.50-12	3.25-12	2.50-12	.50	1.50	3.38	7.69	9.06	750
	N	4.00	4.00	4.750	1.00	3.38	-	3.00-12	3.75-12	3.00-12	.50	1.50	3.38	7.69	9.06	750

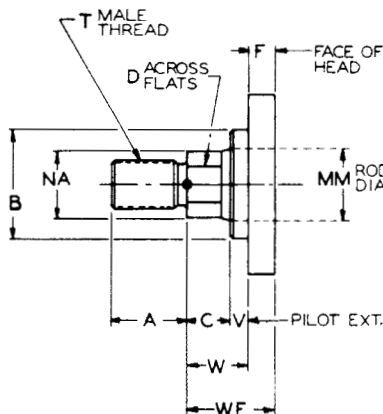
* Where RD is not shown, square retainer is used. See RETAINER PLATE CONSTRUCTION in INSTALLATION, OPERATION AND MAINTENANCE DATA section.

† CAUTION: PSI ratings shown are HANNA recommended maximum operating pressures. Check STROKE LIMITATION DATA in TECHNICAL INFORMATION section which may reduce maximum operating pressure. Check STOP TUBE DATA (TECHNICAL INFORMATION section) to determine if stop tube is required.

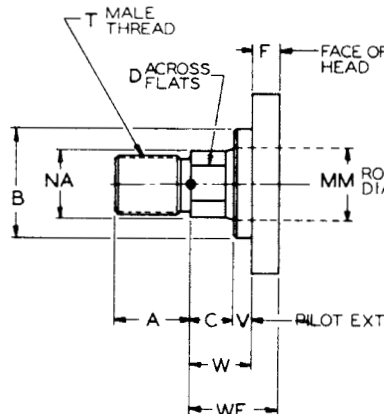
NOTE: Dimensions are nominal except where specifically toleranced. Tolerances on "Plus Stroke" dimensions will vary slightly from dimensions shown due to manufacturing tolerances and tube compression.

STANDARD ROD END STYLES

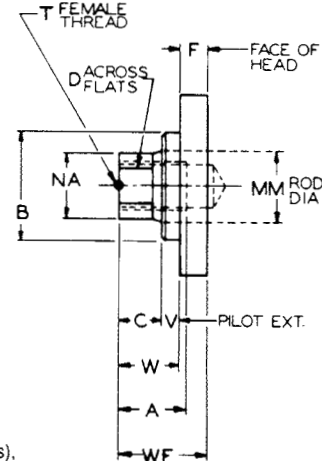
SMALL MALE THREAD



INTERMEDIATE MALE THREAD

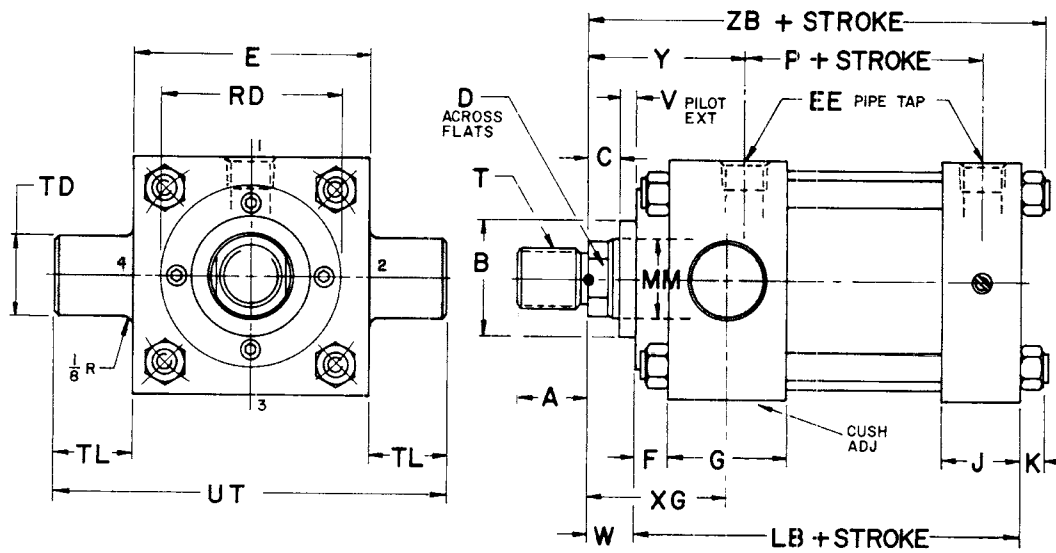
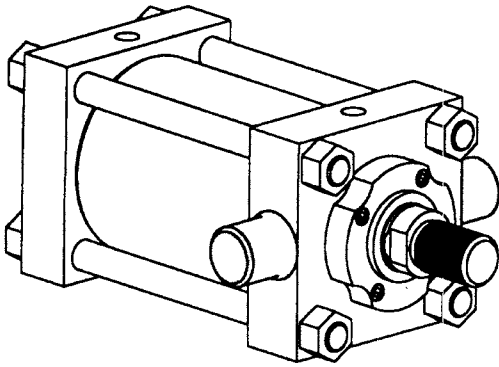


SHORT FEMALE THREAD



NOTE: Dimension "NA" is the rod diameter minus .030 (.62 & 1.00 rods), minus .062 (1.38-5.50 rods)

SERIES 3L 1.50"-6.00" Bores MT1 Head Trunnion Mount



NOTE: Align and mount pillow blocks to avoid bending moments in trunnions.

These Dimensions are Constant Regardless of Rod Diameter

BORE	E	EE (NPTF)	F	G	J	K	LB	P	TD +.000 -.002	TL	UT
1.50	2.00	3/8	.38	1.50	1.00	.25	4.00	2.31	1.000	1.00	4.00
2.00	2.50	3/8	.38	1.50	1.00	.31	4.00	2.31	1.000	1.00	4.50
2.50	3.00	3/8	.38	1.50	1.00	.31	4.12	2.44	1.000	1.00	5.00
3.25	3.75	1/2	.62	1.75	1.25	.38	4.88	2.69	1.000	1.00	5.75
4.00	4.50	1/2	.62	1.75	1.25	.38	4.88	2.69	1.000	1.00	6.50
5.00	5.50	1/2	.62	1.75	1.25	.44	5.12	2.94	1.000	1.00	7.50
6.00	6.50	3/4	.75	2.00	1.50	.44	5.75	3.19	1.375	1.38	9.25

MT1

Dimensions are Affected by the Rod Diameter

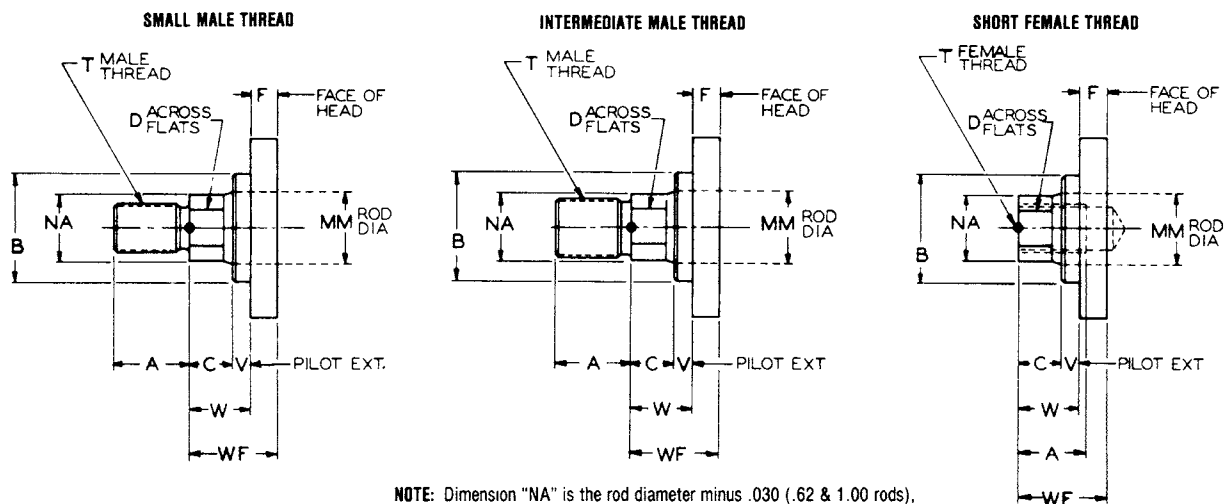
CYLINDER			A	B -.001 -.003	C	D	RD*	T (THREAD)			V	W	XG	Y	ZB	PSI RATING†
BORE	ROD DIA. CODE	MM ROD DIA.						SMALL MALE SM	INTER- MEDIATE MALE IM	SHORT FEMALE SF						
1.50	D	.62	.75	1.125	.38	.50	-	.44-20	.50-20	.44-20	.25	.62	1.75	1.88	4.88	1800
	F	1.00	1.12	1.500	.50	.88	-	.75-16	.88-14	.75-16	.50	1.00	2.12	2.25	5.25	1800
2.00	D	.62	.75	1.125	.38	.50	2.38	.44-20	.50-20	.44-20	.25	.62	1.75	1.88	4.94	1800
	F	1.00	1.12	1.500	.50	.88	2.38	.75-16	.88-14	.75-16	.50	1.00	2.12	2.25	5.31	1800
	G	1.38	1.62	2.000	.62	1.12	-	1.00-14	1.25-12	1.00-14	.62	1.25	2.38	2.50	5.56	1800
2.50	D	.62	.75	1.125	.38	.50	2.38	.44-20	.50-20	.44-20	.25	.62	1.75	1.88	5.06	1000
	F	1.00	1.12	1.500	.50	.88	2.38	.75-16	.88-14	.75-16	.50	1.00	2.12	2.25	5.44	1400
	G	1.38	1.62	2.000	.62	1.12	-	1.00-14	1.25-12	1.00-14	.62	1.25	2.38	2.50	5.69	1400
	H	1.75	2.00	2.375	.75	1.50	-	1.25-12	1.50-12	1.25-12	.75	1.50	2.62	2.75	5.94	1400
3.25	F	1.00	1.12	1.500	.50	.88	3.00	.75-16	.88-14	.75-16	.25	.75	2.25	2.38	6.00	1300
	G	1.38	1.62	2.000	.62	1.12	3.00	1.00-14	1.25-12	1.00-14	.38	1.00	2.50	2.62	6.25	1300
	H	1.75	2.00	2.375	.75	1.50	-	1.25-12	1.50-12	1.25-12	.50	1.25	2.75	2.88	6.50	1300
	J	2.00	2.25	2.625	.88	1.69	-	1.50-12	1.75-12	1.50-12	.50	1.38	2.88	3.00	6.62	1300
4.00	F	1.00	1.12	1.500	.50	.88	3.00	.75-16	.88-14	.75-16	.25	.75	2.25	2.38	6.00	900
	G	1.38	1.62	2.000	.62	1.12	3.00	1.00-14	1.25-12	1.00-14	.38	1.00	2.50	2.62	6.25	900
	H	1.75	2.00	2.375	.75	1.50	-	1.25-12	1.50-12	1.25-12	.50	1.25	2.75	2.88	6.50	900
	J	2.00	2.25	2.625	.88	1.69	-	1.50-12	1.75-12	1.50-12	.50	1.38	2.88	3.00	6.62	900
	K	2.50	3.00	3.125	1.00	2.06	-	1.88-12	2.25-12	1.88-12	.62	1.62	3.12	3.25	6.88	900
5.00	F	1.00	1.12	1.500	.50	.88	3.00	.75-16	.88-14	.75-16	.25	.75	2.25	2.38	6.31	750
	G	1.38	1.62	2.000	.62	1.12	3.00	1.00-14	1.25-12	1.00-14	.38	1.00	2.50	2.62	6.56	1000
	H	1.75	2.00	2.375	.75	1.50	-	1.25-12	1.50-12	1.25-12	.50	1.25	2.75	2.88	6.81	1000
	J	2.00	2.25	2.625	.88	1.69	-	1.50-12	1.75-12	1.50-12	.50	1.38	2.88	3.00	6.94	1000
	K	2.50	3.00	3.125	1.00	2.06	-	1.88-12	2.25-12	1.88-12	.62	1.62	3.12	3.25	7.19	1000
	L	3.00	3.50	3.750	1.00	2.62	-	2.25-12	2.75-12	2.25-12	.62	1.62	3.12	3.25	7.19	1000
	M	3.50	3.50	4.250	1.00	3.00	-	2.50-12	3.25-12	2.50-12	.62	1.62	3.12	3.25	7.19	1000
6.00	G	1.38	1.62	2.000	.62	1.12	4.00	1.00-14	1.25-12	1.00-14	.25	.88	2.62	2.75	7.06	750
	H	1.75	2.00	2.375	.75	1.50	4.00	1.25-12	1.50-12	1.25-12	.38	1.12	2.88	3.00	7.31	750
	J	2.00	2.25	2.625	.88	1.69	4.00	1.50-12	1.75-12	1.50-12	.38	1.25	3.00	3.12	7.44	750
	K	2.50	3.00	3.125	1.00	2.06	-	1.88-12	2.25-12	1.88-12	.50	1.50	3.25	3.38	7.69	750
	L	3.00	3.50	3.750	1.00	2.62	-	2.25-12	2.75-12	2.25-12	.50	1.50	3.25	3.38	7.69	750
	M	3.50	3.50	4.250	1.00	3.00	-	2.50-12	3.25-12	2.50-12	.50	1.50	3.25	3.38	7.69	750
	N	4.00	4.00	4.750	1.00	3.38	-	3.00-12	3.75-12	3.00-12	.50	1.50	3.25	3.38	7.69	750

* Where RD is not shown, square retainer is used. See RETAINER PLATE CONSTRUCTION in INSTALLATION, OPERATION AND MAINTENANCE DATA section.

† CAUTION: PSI ratings shown are HANNA recommended maximum operating pressures. Check STROKE LIMITATION DATA in TECHNICAL INFORMATION section which may reduce maximum operating pressure. Check STOP TUBE DATA (TECHNICAL INFORMATION section) to determine if stop tube is required.

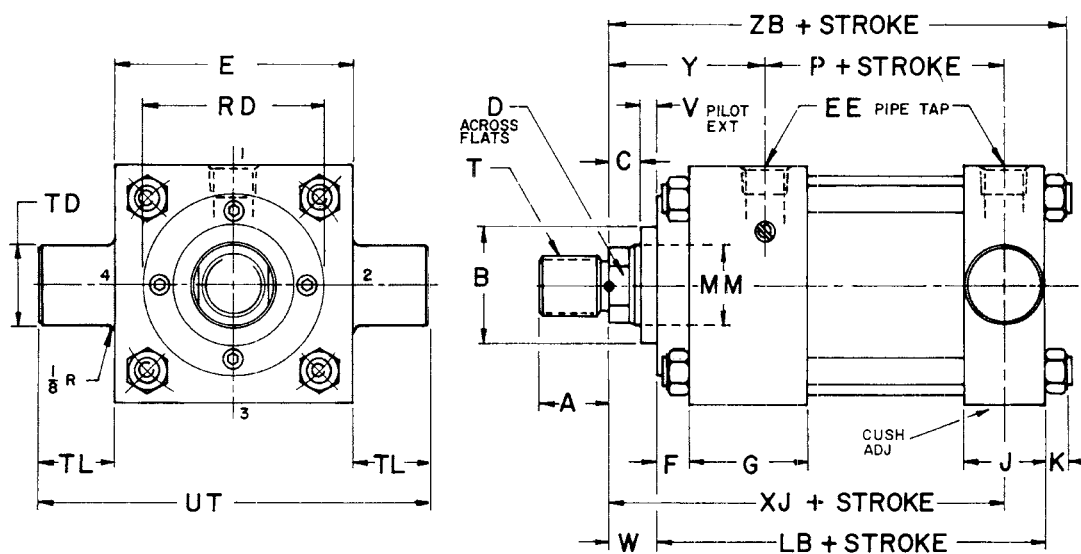
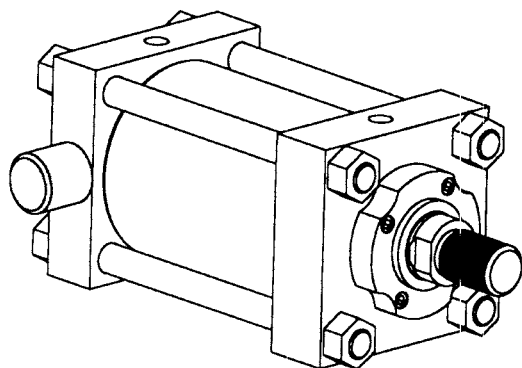
NOTE: Dimensions are nominal except where specifically tolerated. Tolerances on "Plus Stroke" dimensions will vary slightly from dimensions shown due to manufacturing tolerances and tube compression.

STANDARD ROD END STYLES



NOTE: Dimension "NA" is the rod diameter minus .030 (.62 & 1.00 rods), minus .062 (1.38-5.50 rods)

SERIES 3L 1.50"-6.00" Bores MT2 Cap Trunnion Mount



NOTE: Align and mount pillow blocks to avoid bending moments in trunnions

These Dimensions are Constant Regardless of Rod Diameter

BORE	E	EE (NPTF)	F	G	J	K	LB	P	TD +.000 -.002	TL	UT
1.50	2.00	3/8	38	1.50	1.00	25	4.00	2.31	1.000	1.00	4.00
2.00	2.50	3/8	38	1.50	1.00	31	4.00	2.31	1.000	1.00	4.50
2.50	3.00	3/8	38	1.50	1.00	31	4.12	2.44	1.000	1.00	5.00
3.25	3.75	1/2	62	1.75	1.25	38	4.88	2.69	1.000	1.00	5.75
4.00	4.50	1/2	62	1.75	1.25	38	4.88	2.69	1.000	1.00	6.50
5.00	5.50	1/2	62	1.75	1.25	44	5.12	2.94	1.000	1.00	7.50
6.00	6.50	3/4	75	2.00	1.50	44	5.75	3.19	1.375	1.38	9.25

MT2

Dimensions are Affected by the Rod Diameter

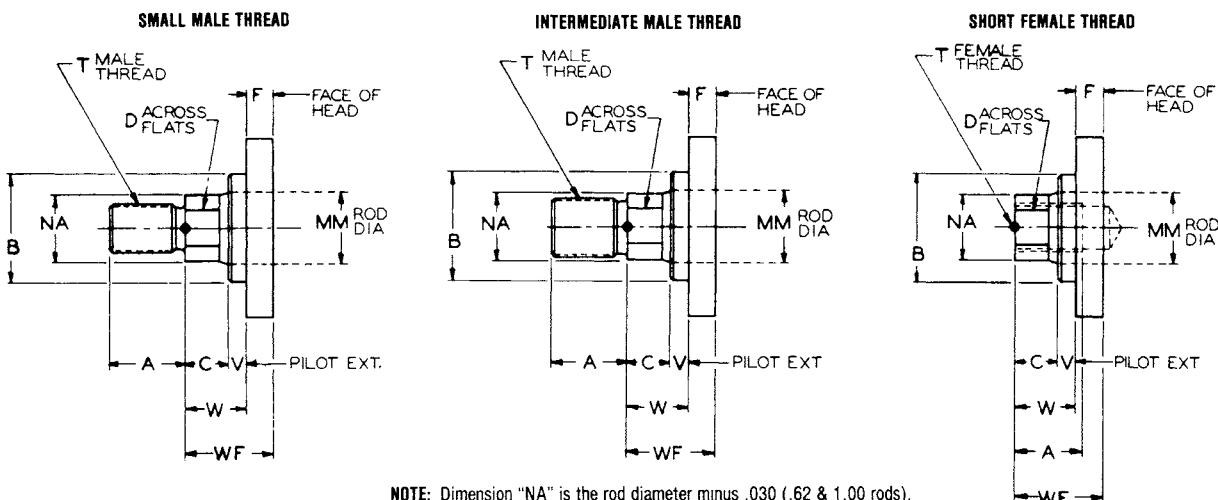
BORE	CYLINDER		A	B -.001 -.003	C	D	RD*	T (THREAD)			V	W	XJ	Y	ZB	PSI RATING†
	ROD DIA. CODE	MM ROD DIA.						SMALL MALE SM	INTER- MEDIATE MALE IM	SHORT FEMALE SF						
1.50	D	.62	.75	1.125	.38	.50	-	44-20	50-20	44-20	.25	.62	4.12	1.88	4.88	1800
	F	1.00	1.12	1.500	.50	.88	-	75-16	88-14	75-16	.50	1.00	4.50	2.25	5.25	1800
2.00	D	.62	.75	1.125	.38	.50	2.38	44-20	50-20	44-20	.25	.62	4.12	1.88	4.94	1800
	F	1.00	1.12	1.500	.50	.88	2.38	75-16	88-14	75-16	.50	1.00	4.50	2.25	5.31	1800
2.50	G	1.38	1.62	2.000	.62	1.12	-	1.00-14	1.25-12	1.00-14	.62	1.25	4.75	2.50	5.56	1800
	D	.62	.75	1.125	.38	.50	2.38	44-20	50-20	44-20	.25	.62	4.25	1.88	5.06	1000
	F	1.00	1.12	1.500	.50	.88	2.38	75-16	88-14	75-16	.50	1.00	4.62	2.25	5.44	1400
3.25	G	1.38	1.62	2.000	.62	1.12	-	1.00-14	1.25-12	1.00-14	.62	1.25	4.88	2.50	5.69	1400
	H	1.75	2.00	2.375	.75	1.50	-	1.25-12	1.50-12	1.25-12	.75	1.50	5.12	2.75	5.94	1400
	H	1.75	2.00	2.375	.75	1.50	-	1.25-12	1.50-12	1.25-12	.75	1.50	5.12	2.75	5.94	1400
4.00	J	2.00	2.25	2.625	.88	1.69	-	1.50-12	1.75-12	1.50-12	.75	1.50	5.00	2.38	6.00	1300
	K	2.50	3.00	3.125	1.00	2.06	-	1.88-12	2.25-12	1.88-12	.62	1.62	5.88	3.25	6.88	900
	K	2.50	3.00	3.125	1.00	2.06	-	1.88-12	2.25-12	1.88-12	.62	1.62	5.88	3.25	6.88	900
5.00	F	1.00	1.12	1.500	.50	.88	3.00	.75-16	88-14	75-16	.25	.75	5.00	2.38	6.00	900
	G	1.38	1.62	2.000	.62	1.12	3.00	1.00-14	1.25-12	1.00-14	.38	1.00	5.25	2.62	6.25	900
	H	1.75	2.00	2.375	.75	1.50	-	1.25-12	1.50-12	1.25-12	.50	1.25	5.50	2.88	6.50	900
	J	2.00	2.25	2.625	.88	1.69	-	1.50-12	1.75-12	1.50-12	.50	1.38	5.62	3.00	6.62	900
	K	2.50	3.00	3.125	1.00	2.06	-	1.88-12	2.25-12	1.88-12	.62	1.62	6.12	3.25	7.19	1000
	L	3.00	3.50	3.750	1.00	2.62	-	2.25-12	2.75-12	2.25-12	.62	1.62	6.12	3.25	7.19	1000
6.00	M	3.50	3.50	4.250	1.00	3.00	-	2.50-12	3.25-12	2.50-12	.62	1.62	6.12	3.25	7.19	1000
	M	3.50	3.50	4.250	1.00	3.00	-	2.50-12	3.25-12	2.50-12	.62	1.62	6.12	3.25	7.19	1000
	G	1.38	1.62	2.000	.62	1.12	4.00	1.00-14	1.25-12	1.00-14	.25	.88	5.88	2.75	7.06	750
	H	1.75	2.00	2.375	.75	1.50	4.00	1.25-12	1.50-12	1.25-12	.38	1.12	6.12	3.00	7.31	750
	J	2.00	2.25	2.625	.88	1.69	4.00	1.50-12	1.75-12	1.50-12	.38	1.25	6.25	3.12	7.44	750
	K	2.50	3.00	3.125	1.00	2.06	-	1.88-12	2.25-12	1.88-12	.50	1.50	6.50	3.38	7.69	750
6.00	L	3.00	3.50	3.750	1.00	2.62	-	2.25-12	2.75-12	2.25-12	.50	1.50	6.50	3.38	7.69	750
	M	3.50	3.50	4.250	1.00	3.00	-	2.50-12	3.25-12	2.50-12	.50	1.50	6.50	3.38	7.69	750
	N	4.00	4.00	4.750	1.00	3.38	-	3.00-12	3.75-12	3.00-12	.50	1.50	6.50	3.38	7.69	750
	N	4.00	4.00	4.750	1.00	3.38	-	3.00-12	3.75-12	3.00-12	.50	1.50	6.50	3.38	7.69	750

* Where RD is not shown, square retainer is used. See RETAINER PLATE CONSTRUCTION in INSTALLATION, OPERATION AND MAINTENANCE DATA section.

† CAUTION: PSI ratings shown are HANNA recommended maximum operating pressures. Check STROKE LIMITATION DATA in TECHNICAL INFORMATION section which may reduce maximum operating pressure. Check STOP TUBE DATA (TECHNICAL INFORMATION section) to determine if stop tube is required.

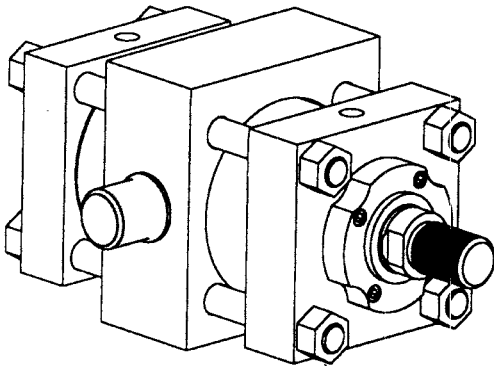
NOTE: Dimensions are nominal except where specifically tolerated. Tolerances on "Plus Stroke" dimensions will vary slightly from dimensions shown due to manufacturing tolerances and tube compression.

STANDARD ROD END STYLES

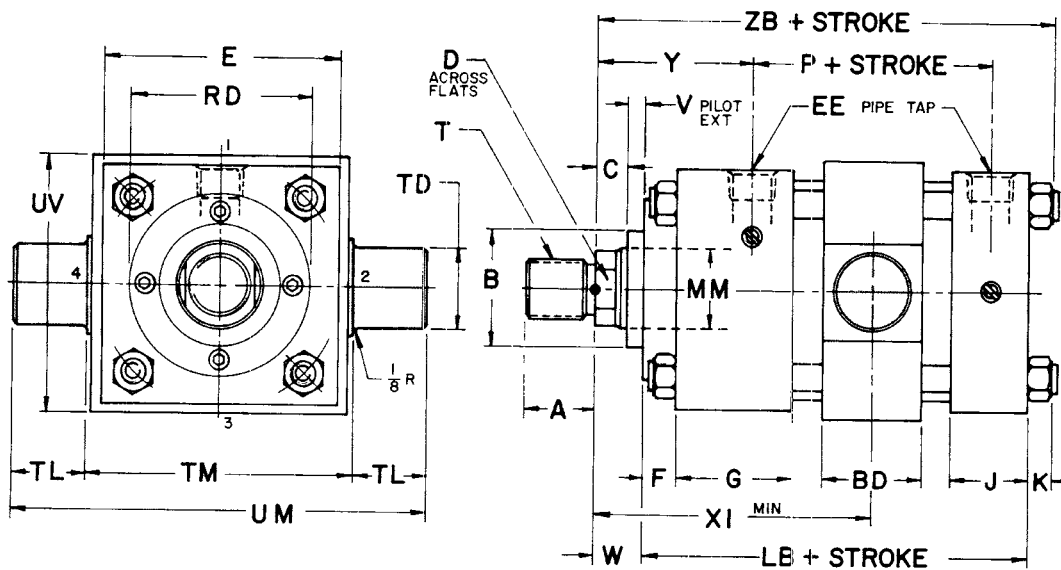


NOTE: Dimension "NA" is the rod diameter minus .030 (.62 & 1.00 rods), minus .062 (1.38-5.50 rods)

SERIES 3L 1.50"-6.00" Bores MT4 Intermediate Fixed Trunnion Mount



NOTE: Trunnion location (XI) must be specified when ordering.



NOTE: Align and mount pillow blocks to avoid bending moments in trunnions.

These Dimensions are Constant Regardless of Rod Diameter

BORE	BD	BZ MIN. STROKE	E	EE (NPTF)	F	G	J	K	LB	P	TD +.000 -.002	TL	TM	UM	UV
1.50	1.25	12	2.00	3/8	.38	1.50	1.00	25	4.00	2.31	1.000	1.00	2.50	4.50	2.50
2.00	1.50	38	2.50	3/8	.38	1.50	1.00	31	4.00	2.31	1.000	1.00	3.00	5.00	3.00
2.50	1.50	25	3.00	3/8	.38	1.50	1.00	31	4.12	2.44	1.000	1.00	3.50	5.50	3.50
3.25	2.00	75	3.75	1/2	.62	1.75	1.25	38	4.88	2.69	1.000	1.00	4.50	6.50	4.25
4.00	2.00	75	4.50	1/2	.62	1.75	1.25	38	4.88	2.69	1.000	1.00	5.25	7.25	5.00
5.00	2.00	50	5.50	1/2	.62	1.75	1.25	44	5.12	2.94	1.000	1.00	6.25	8.25	6.00
6.00	2.00	1.00	6.50	3/4	.75	2.00	1.50	44	5.75	3.19	1.375	1.38	7.62	10.38	7.00

MT4

Dimensions are Affected by the Rod Diameter

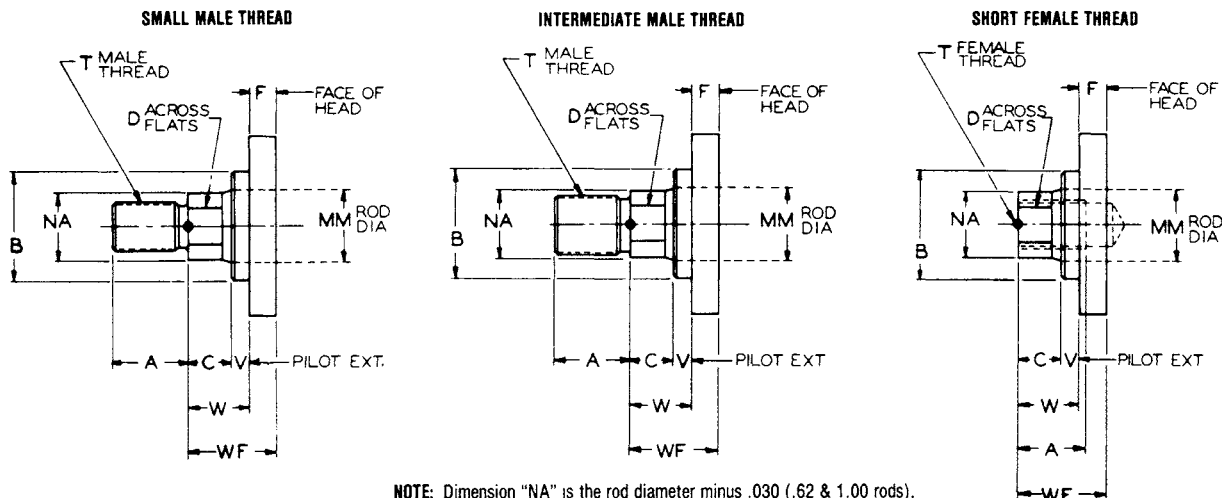
CYLINDER			A	B -.001 -.003	C	D	RD*	T (THREAD)			V	W	XI (MIN)	Y	ZB	PSI RATING†
BORE	ROD DIA. CODE	MM ROD DIA.						SMALL MALE SM	INTER- MEDIATE MALE IM	SHORT FEMALE SF						
1.50	D	.62	.75	1.125	.38	.50	-	.44-20	50-20	44-20	.25	.62	3.12	1.88	4.88	1800
	F	1.00	1.12	1.500	.50	.88	-	75-16	88-14	75-16	50	1.00	3.50	2.25	5.25	1800
2.00	D	.62	.75	1.125	.38	.50	2.38	.44-20	50-20	44-20	.25	.62	3.25	1.88	4.94	1800
	F	1.00	1.12	1.500	.50	.88	2.38	.75-16	88-14	75-16	50	1.00	3.62	2.25	5.31	1800
2.50	G	1.38	1.62	2.000	.62	1.12	-	1.00-14	1.25-12	1.00-14	.62	1.25	3.88	2.50	5.56	1800
	H	1.75	2.00	2.375	.75	1.50	-	1.25-12	1.50-12	1.25-12	.75	1.50	4.12	2.75	5.94	1400
	J	2.00	2.25	2.625	.88	1.69	-	1.50-12	1.75-12	1.50-12	.50	1.38	4.75	3.00	6.62	1300
3.25	F	1.00	1.12	1.500	.50	.88	3.00	.75-16	88-14	75-16	.25	.75	4.12	2.38	6.00	1300
	G	1.38	1.62	2.000	.62	1.12	3.00	1.00-14	1.25-12	1.00-14	.38	1.00	4.38	2.62	6.25	1300
	H	1.75	2.00	2.375	.75	1.50	-	1.25-12	1.50-12	1.25-12	.50	1.25	4.62	2.88	6.50	1300
4.00	J	2.00	2.25	2.625	.88	1.69	-	1.50-12	1.75-12	1.50-12	.50	1.38	4.75	3.00	6.62	900
	K	2.50	3.00	3.125	1.00	2.06	-	1.88-12	2.25-12	1.88-12	.62	1.62	5.00	3.25	6.88	900
	M	3.50	3.50	4.250	1.00	3.00	-	2.50-12	3.25-12	2.50-12	.62	1.62	5.00	3.25	7.19	900
5.00	F	1.00	1.12	1.500	.50	.88	3.00	.75-16	88-14	75-16	.25	.75	4.12	2.38	6.31	750
	G	1.38	1.62	2.000	.62	1.12	3.00	1.00-14	1.25-12	1.00-14	.38	1.00	4.38	2.62	6.56	1000
	H	1.75	2.00	2.375	.75	1.50	-	1.25-12	1.50-12	1.25-12	.50	1.25	4.62	2.88	6.81	1000
	J	2.00	2.25	2.625	.88	1.69	-	1.50-12	1.75-12	1.50-12	.50	1.38	4.75	3.00	6.94	1000
	K	2.50	3.00	3.125	1.00	2.06	-	1.88-12	2.25-12	1.88-12	.62	1.62	5.00	3.25	7.19	1000
6.00	L	3.00	3.50	3.750	1.00	2.62	-	2.25-12	2.75-12	2.25-12	.62	1.62	5.00	3.25	7.19	1000
	M	3.50	3.50	4.250	1.00	3.00	-	2.50-12	3.25-12	2.50-12	.50	1.50	5.50	3.38	7.69	750
	N	4.00	4.00	4.750	1.00	3.38	-	3.00-12	3.75-12	3.00-12	.50	1.50	5.50	3.38	7.69	750
	G	1.38	1.62	2.000	.62	1.12	4.00	1.00-14	1.25-12	1.00-14	.38	1.12	5.12	3.00	7.31	750
	H	1.75	2.00	2.375	.75	1.50	4.00	1.25-12	1.50-12	1.25-12	.50	1.25	5.25	3.12	7.44	750
	J	2.00	2.25	2.625	.88	1.69	4.00	1.50-12	1.75-12	1.50-12	.38	1.25	5.25	3.12	7.44	750
6.00	K	2.50	3.00	3.125	1.00	2.06	-	1.88-12	2.25-12	1.88-12	.50	1.50	5.50	3.38	7.69	750
	L	3.00	3.50	3.750	1.00	2.62	-	2.25-12	2.75-12	2.25-12	.50	1.50	5.50	3.38	7.69	750
	M	3.50	3.50	4.250	1.00	3.00	-	2.50-12	3.25-12	2.50-12	.50	1.50	5.50	3.38	7.69	750
	N	4.00	4.00	4.750	1.00	3.38	-	3.00-12	3.75-12	3.00-12	.50	1.50	5.50	3.38	7.69	750

* Where RD is not shown, square retainer is used. See RETAINER PLATE CONSTRUCTION in INSTALLATION, OPERATION AND MAINTENANCE DATA section.

† CAUTION: PSI ratings shown are HANNA recommended maximum operating pressures. Check STROKE LIMITATION DATA in TECHNICAL INFORMATION section which may reduce maximum operating pressure. Check STOP TUBE DATA (TECHNICAL INFORMATION section) to determine if stop tube is required.

NOTE: Dimensions are nominal except where specifically tolerated. Tolerances on "Plus Stroke" dimensions will vary slightly from dimensions shown due to manufacturing tolerances and tube compression.

STANDARD ROD END STYLES

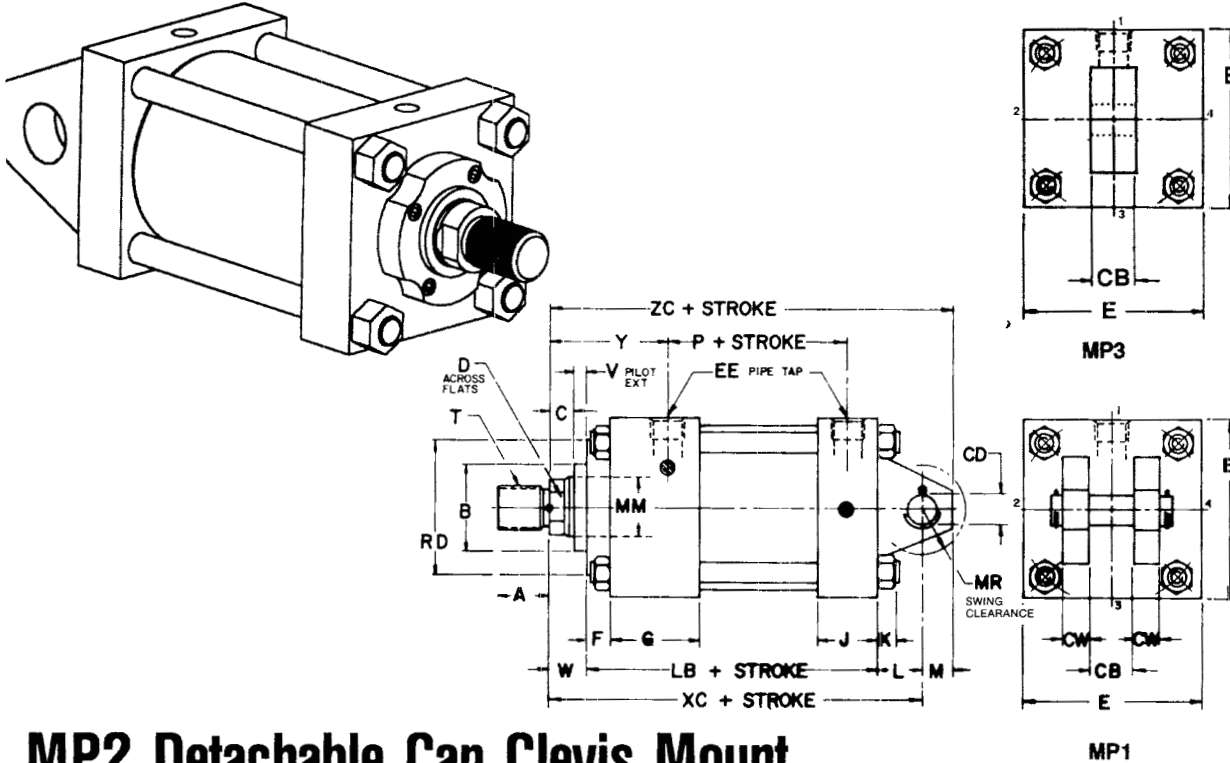


NOTE: Dimension "NA" is the rod diameter minus .030 (.62 & 1.00 rods), minus .062 (1.38-5.50 rods)

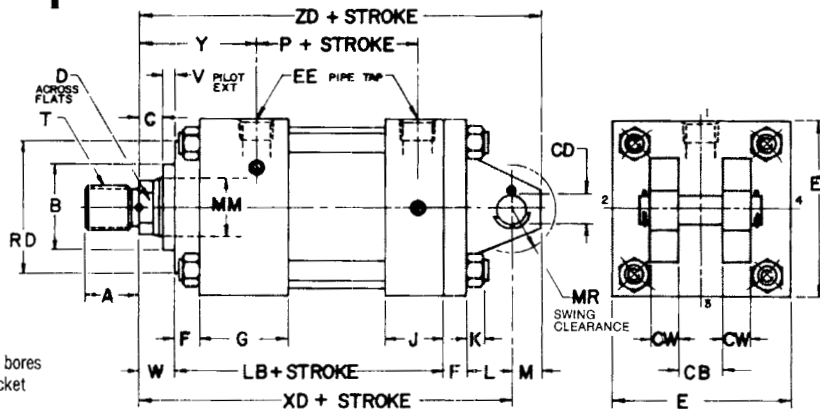
SERIES 3L 1.50"-6.00" Bores

MP1 Fixed Double Ear Clevis Mount

MP3 Fixed Single Ear Clevis Mount



MP2 Detachable Cap Clevis Mount



NOTE: 1.50", 2.00" and 3.25" bores have tapped cap or bracket

These Dimensions are Constant Regardless of Rod Diameter

BORE	CB †	CD ††	CW	E	EE (NPTF)	F	G	J	K	L	LB	M	MR	P
1.50	750	500	.50	2.00	3/8	38	1.50	1.00	.25	75	4.00	.50	.62	2.31
2.00	750	500	.50	2.50	3/8	38	1.50	1.00	.31	75	4.00	.50	.62	2.31
2.50	750	500	.50	3.00	3/8	38	1.50	1.00	.31	.75	4.12	.50	.62	2.44
3.25	1.250	750	.62	3.75	1/2	62	1.75	1.25	.38	1.25	4.88	.75	1.12	2.69
4.00	1.250	750	.62	4.50	1/2	62	1.75	1.25	.38	1.25	4.88	.75	1.12	2.69
5.00	1.250	750	.62	5.50	1/2	62	1.75	1.25	.44	1.25	5.12	.75	1.12	2.94
6.00	1.500	1.000	.75	6.50	3/4	75	2.00	1.50	.44	1.50	5.75	1.00	1.38	3.19

†CB tolerances are +.016, +.047 for MP1 and MP2; and ± .005 for MP3. ††CD tolerances are +.003, +.005 for MP3.
 NOTE: Pivot pin supplied with MP1 and MP2 cylinders; Pivot pin *not* supplied with MP3 cylinder.

MP1, MP2, MP3

Dimensions are Affected by the Rod Diameter

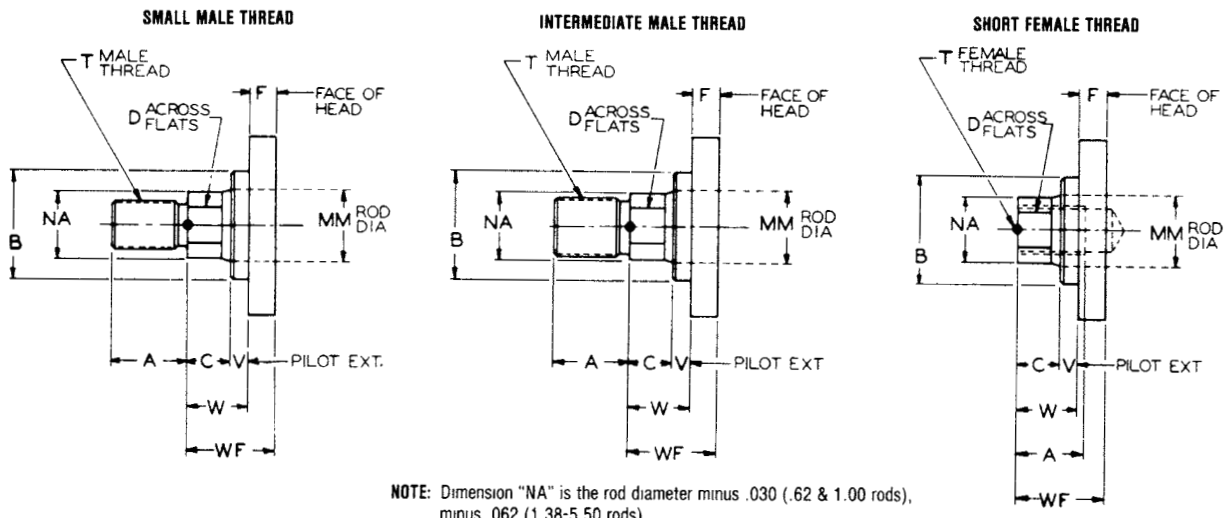
CYLINDER			A	B -.001 -.003	C	D	RD*	T (THREAD)			V	W	XC	XD	Y	ZC	ZD	PSI RATING†
BORE	ROD DIA. CODE	MM ROD DIA.						SMALL MALE SM	INTER- MEDIATE MALE IM	SHORT FEMALE SF								
1.50	D	.62	.75	1.125	.38	.50	-	44-20	50-20	44-20	.25	.62	5.38	5.75	1.88	5.88	6.25	1800
	F	1.00	1.12	1.500	.50	.88	-	75-16	88-14	75-16	.50	1.00	5.75	6.12	2.25	6.25	6.62	1800
2.00	D	.62	.75	1.125	.38	.50	2.38	44-20	50-20	44-20	.25	.62	5.38	5.75	1.88	5.88	6.25	1800
	F	1.00	1.12	1.500	.50	.88	2.38	75-16	88-14	75-16	.50	1.00	5.75	6.12	2.25	6.25	6.62	1800
	G	1.38	1.62	2.000	.62	1.12	-	1.00-14	1.25-12	1.00-14	.62	1.25	6.00	6.38	2.50	6.50	6.88	1800
2.50	D	.62	.75	1.125	.38	.50	2.38	44-20	50-20	44-20	.25	.62	5.50	5.88	1.88	6.00	6.38	1000
	F	1.00	1.12	1.500	.50	.88	2.38	75-16	88-14	75-16	.50	1.00	5.88	6.25	2.25	6.38	6.75	1400
	G	1.38	1.62	2.000	.62	1.12	-	1.00-14	1.25-12	1.00-14	.62	1.25	6.12	6.50	2.50	6.62	7.00	1400
	H	1.75	2.00	2.375	.75	1.50	-	1.25-12	1.50-12	1.25-12	.75	1.50	6.38	6.75	2.75	6.88	7.25	1400
3.25	F	1.00	1.12	1.500	.50	.88	3.00	75-16	88-14	75-16	.25	.75	6.88	7.50	2.38	7.62	8.25	1300
	G	1.38	1.62	2.000	.62	1.12	3.00	1.00-14	1.25-12	1.00-14	.38	1.00	7.12	7.75	2.62	7.88	8.50	1300
	H	1.75	2.00	2.375	.75	1.50	-	1.25-12	1.50-12	1.25-12	.50	1.25	7.38	8.00	2.88	8.12	8.75	1300
	J	2.00	2.25	2.625	.88	1.69	-	1.50-12	1.75-12	1.50-12	.50	1.38	7.50	8.12	3.00	8.25	8.88	1300
4.00	F	1.00	1.12	1.500	.50	.88	3.00	75-16	88-14	75-16	.25	.75	6.88	7.50	2.38	7.62	8.25	900
	G	1.38	1.62	2.000	.62	1.12	3.00	1.00-14	1.25-12	1.00-14	.38	1.00	7.12	7.75	2.62	7.88	8.50	900
	H	1.75	2.00	2.375	.75	1.50	-	1.25-12	1.50-12	1.25-12	.50	1.25	7.38	8.00	2.88	8.12	8.75	900
	J	2.00	2.25	2.625	.88	1.69	-	1.50-12	1.75-12	1.50-12	.50	1.38	7.50	8.12	3.00	8.25	8.88	900
	K	2.50	3.00	3.125	1.00	2.06	-	1.88-12	2.25-12	1.88-12	.62	1.62	7.75	8.38	3.25	8.50	9.12	900
5.00	F	1.00	1.12	1.500	.50	.88	3.00	75-16	88-14	75-16	.25	.75	7.12	7.75	2.38	7.88	8.50	750
	G	1.38	1.62	2.000	.62	1.12	3.00	1.00-14	1.25-12	1.00-14	.38	1.00	7.38	8.00	2.62	8.12	8.75	1000
	H	1.75	2.00	2.375	.75	1.50	-	1.25-12	1.50-12	1.25-12	.50	1.25	7.62	8.25	2.88	8.38	9.00	1000
	J	2.00	2.25	2.625	.88	1.69	-	1.50-12	1.75-12	1.50-12	.50	1.38	7.75	8.38	3.00	8.50	9.12	1000
	K	2.50	3.00	3.125	1.00	2.06	-	1.88-12	2.25-12	1.88-12	.62	1.62	8.00	8.62	3.25	8.75	9.38	1000
	L	3.00	3.50	3.750	1.00	2.62	-	2.25-12	2.75-12	2.25-12	.62	1.62	8.00	8.62	3.25	8.75	9.38	1000
6.00	M	3.50	3.50	4.250	1.00	3.00	-	2.50-12	3.25-12	2.50-12	.62	1.62	8.00	8.62	3.25	8.75	9.38	1000
	G	1.38	1.62	2.000	.62	1.12	4.00	1.00-14	1.25-12	1.00-14	.25	.88	8.12	8.88	2.75	9.12	9.88	750
	H	1.75	2.00	2.375	.75	1.50	4.00	1.25-12	1.50-12	1.25-12	.38	1.12	8.38	9.12	3.00	9.38	10.12	750
	J	2.00	2.25	2.625	.88	1.69	4.00	1.50-12	1.75-12	1.50-12	.38	1.25	8.50	9.25	3.12	9.50	10.25	750
	K	2.50	3.00	3.125	1.00	2.06	-	1.88-12	2.25-12	1.88-12	.50	1.50	8.75	9.50	3.38	9.75	10.50	750
	L	3.00	3.50	3.750	1.00	2.62	-	2.25-12	2.75-12	2.25-12	.50	1.50	8.75	9.50	3.38	9.75	10.50	750
	M	3.50	3.50	4.250	1.00	3.00	-	2.50-12	3.25-12	2.50-12	.50	1.50	8.75	9.50	3.38	9.75	10.50	750
N	4.00	4.00	4.750	1.00	3.38	-	3.00-12	3.75-12	3.00-12	.50	1.50	8.75	9.50	3.38	9.75	10.50	750	

* Where RD is not shown, square retainer is used. See RETAINER PLATE CONSTRUCTION in INSTALLATION, OPERATION AND MAINTENANCE DATA section.

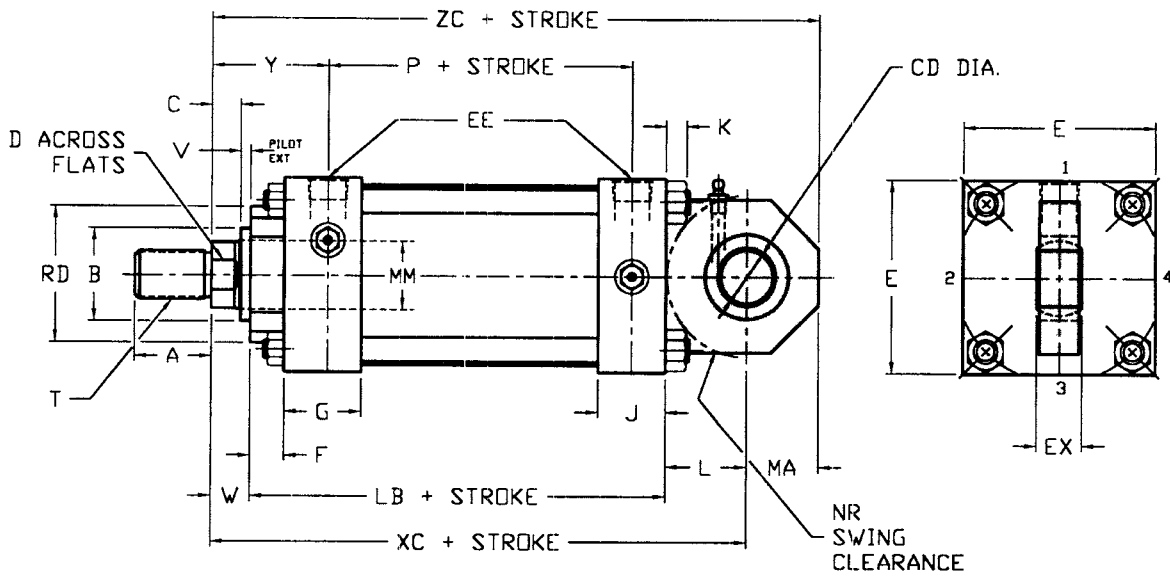
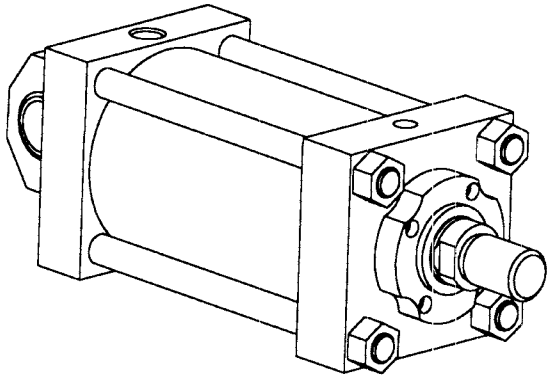
† CAUTION: PSI ratings shown are HANNA recommended maximum operating pressures. Check STROKE LIMITATION DATA in TECHNICAL INFORMATION section which may reduce maximum operating pressure. Check STOP TUBE DATA (TECHNICAL INFORMATION section) to determine if stop tube is required.

NOTE: Dimensions are nominal except where specifically tolerated. Tolerances on "Plus Stroke" dimensions will vary slightly from dimensions shown due to manufacturing tolerances and tube compression.

STANDARD ROD END STYLES



SERIES 3L 1.50"-6.00" Bores MPU3 Spherical Bearing Mount



These Dimensions Are Constant Regardless of Rod Diameter

BORE	CD -0.0005	E	EE NPTF	EX	F	G	J	K	L	LB	MA	NR	P
1.50	0.5000	2.00	3/8	.44	.38	1.50	1.00	.25	.75	4.00	.75	.62	2.31
2.00	0.5000	2.50	3/8	.44	.38	1.50	1.00	.31	.75	4.00	.75	.62	2.31
2.50	0.5000	3.00	3/8	.44	.38	1.50	1.00	.31	.75	4.12	.75	.62	2.44
3.25	0.7500	3.75	1/2	.66	.62	1.75	1.25	.38	1.25	4.88	1.25	1.00	2.69
4.00	0.7500	4.50	1/2	.66	.62	1.75	1.25	.38	1.25	4.88	1.25	1.00	2.69
5.00	0.7500	5.50	1/2	.66	.62	1.75	1.25	.44	1.25	5.12	1.25	1.00	2.94
6.00	1.0000	6.50	3/4	.88	.75	2.00	1.50	.44	1.50	5.75	1.50	1.25	3.19

MPU3

Dimensions Are Affected by Rod Diameter

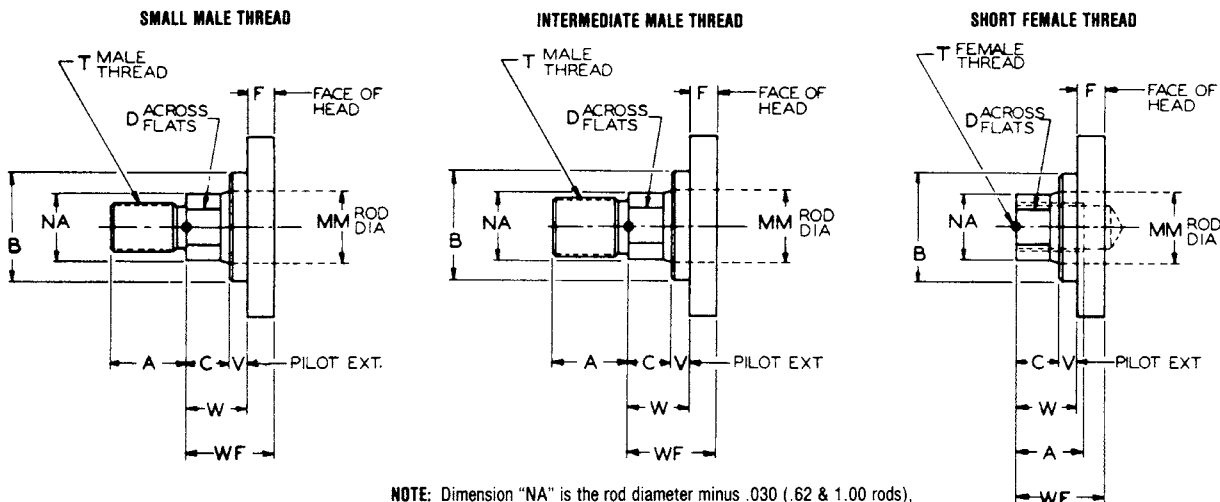
CYLINDER			A	B -.001 -.003	C	D	RD*	T (THREAD)			V	W	XC	Y	ZC	PSI RATING†
BORE	ROD DIA CODE	ROD DIA.						SMALL MALE SM	INTER- MEDIATE MALE	SHORT FEMALE SF IM						
1.50	D	.62	.75	1.125	.38	.50	-	.44-20	50-20	44-20	.25	.62	5.38	1.88	6.13	1750
	F	1.00	1.12	1.500	.50	.88	-	75-16	88-14	75-16	.50	1.00	5.75	2.25	6.50	1750
2.00	D	.62	.75	1.125	.38	.50	2.38	44-20	50-20	44-20	.25	.62	5.38	1.88	6.13	980
	F	1.00	1.12	1.500	.50	.88	2.38	75-16	88-14	75-16	.50	1.00	5.75	2.25	6.50	980
	G	1.38	1.62	2.000	.62	1.12	-	1.00-14	1.25-12	1.00-14	.62	1.25	6.00	2.50	6.75	980
2.50	D	.62	.75	1.125	.38	.50	2.38	44-20	50-20	44-20	.25	.62	5.50	1.88	6.25	630
	F	1.00	1.12	1.500	.50	.88	2.38	75-16	88-14	75-16	.50	1.00	5.88	2.25	6.62	630
	G	1.38	1.62	2.000	.62	1.12	-	1.00-14	1.25-12	1.00-14	.62	1.25	6.12	2.50	6.88	630
	H	1.75	2.00	2.375	.75	1.50	-	1.25-12	1.50-12	1.25-12	.75	1.50	6.38	2.75	7.13	630
3.25	F	1.00	1.12	1.500	.50	.88	3.00	75-16	88-14	75-16	.25	.75	6.88	2.38	8.12	830
	G	1.38	1.62	2.000	.62	1.12	3.00	1.00-14	1.25-12	1.00-14	.38	1.00	7.12	2.62	8.38	830
	H	1.75	2.00	2.375	.75	1.50	-	1.25-12	1.50-12	1.25-12	.50	1.25	7.38	2.88	8.62	830
	J	2.00	2.25	2.625	.88	1.69	-	1.50-12	1.75-12	1.50-12	.50	1.38	7.50	3.00	8.75	830
4.00	F	1.00	1.12	1.500	.50	.88	3.00	75-16	88-14	75-16	.25	.75	6.88	2.38	8.12	550
	G	1.38	1.62	2.000	.62	1.12	3.00	1.00-14	1.25-12	1.00-14	.38	1.00	7.12	2.62	8.38	550
	H	1.75	2.00	2.375	.75	1.50	-	1.25-12	1.50-12	1.25-12	.50	1.25	7.38	2.88	8.62	550
	J	2.00	2.25	2.625	.88	1.69	-	1.50-12	1.75-12	1.50-12	.50	1.38	7.50	3.00	8.75	550
	K	2.50	3.00	3.125	1.00	2.06	-	1.88-12	2.25-12	1.88-12	.62	1.62	7.75	3.25	9.00	550
5.00	F	1.00	1.12	1.500	.50	.88	3.00	75-16	88-14	75-16	.25	.75	7.12	2.38	8.38	350
	G	1.38	1.62	2.000	.62	1.12	3.00	1.00-14	1.25-12	1.00-14	.38	1.00	7.38	2.62	8.62	350
	H	1.75	2.00	2.375	.75	1.50	-	1.25-12	1.50-12	1.25-12	.50	1.25	7.62	2.88	8.88	350
	J	2.00	2.25	2.625	.88	1.69	-	1.50-12	1.75-12	1.50-12	.50	1.38	7.75	3.00	9.00	350
	K	2.50	3.00	3.125	1.00	2.06	-	1.88-12	2.25-12	1.88-12	.62	1.62	8.00	3.25	9.25	350
	L	3.00	3.50	3.750	1.00	2.62	-	2.25-12	2.75-12	2.25-12	.62	1.62	8.00	3.25	9.25	350
6.00	G	1.38	1.62	2.000	.62	1.12	4.00	1.00-14	1.25-12	1.00-14	.25	.88	8.12	2.75	9.62	440
	H	1.75	2.00	2.375	.75	1.50	4.00	1.25-12	1.50-12	1.25-12	.38	1.12	8.38	3.00	9.88	440
	J	2.00	2.25	2.625	.88	1.69	4.00	1.50-12	1.75-12	1.50-12	.38	1.25	8.50	3.12	10.00	440
	K	2.50	3.00	3.125	1.00	2.06	-	1.88-12	2.25-12	1.88-12	.50	1.50	8.75	3.38	10.25	440
	L	3.00	3.50	3.750	1.00	2.62	-	2.25-12	2.75-12	2.25-12	.50	1.50	8.75	3.38	10.25	440
	M	3.50	3.50	4.250	1.00	3.00	-	2.50-12	3.25-12	2.50-12	.50	1.50	8.75	3.38	10.25	440
	N	4.00	4.00	4.750	1.00	3.38	-	3.00-12	3.75-12	3.00-12	.50	1.50	8.75	3.38	10.25	440

* Where RD is not shown, square retainer is used. See RETAINER PLATE CONSTRUCTION in INSTALLATION, OPERATION AND MAINTENANCE DATA section.

† CAUTION: PSI ratings shown are HANNA recommended maximum operating pressures. Check STROKE LIMITATION DATA in TECHNICAL INFORMATION section which may reduce maximum operating pressure. Check STOP TUBE DATA (TECHNICAL INFORMATION section) to determine if stop tube is required.

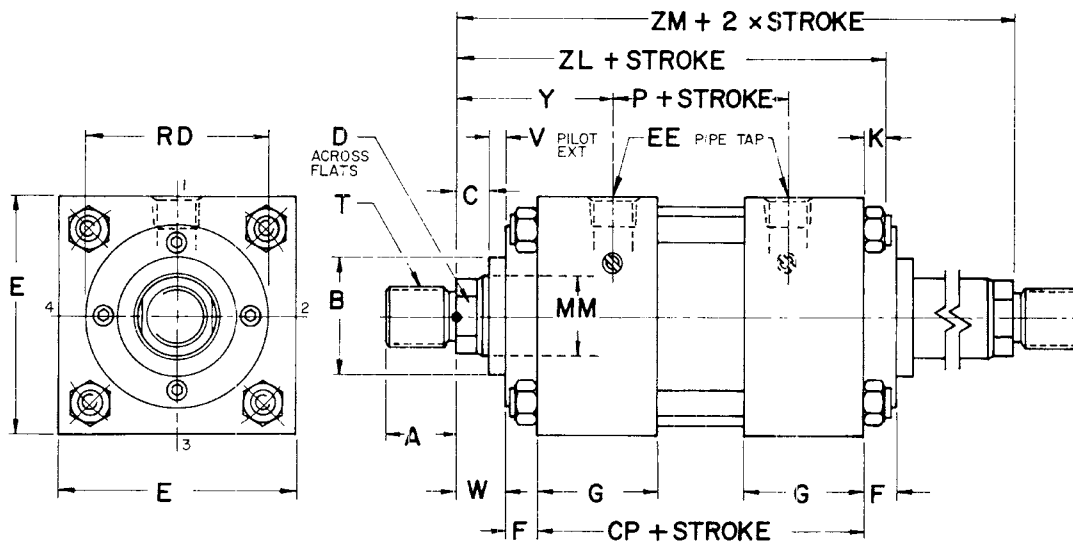
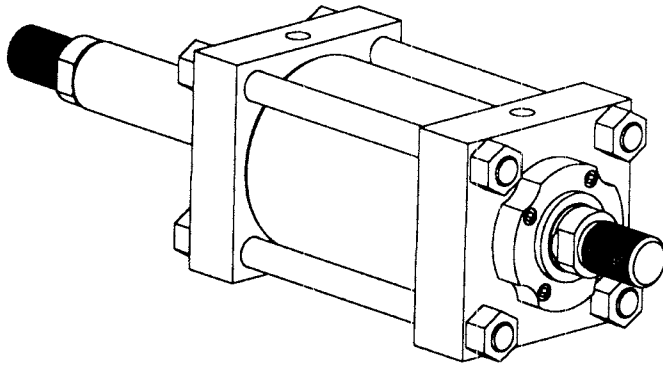
NOTE: Dimensions are nominal except where specifically toleranced. Tolerances on "Plus Stroke" dimensions will vary slightly from dimensions shown due to manufacturing tolerances and tube compression.

STANDARD ROD END STYLES



NOTE: Dimension "NA" is the rod diameter minus .030 (.62 & 1.00 rods), minus .062 (1.38-5.50 rods)

SERIES 3L 1.50"-6.00" Bores MXO-D Double Rod End*



These Dimensions are Constant Regardless of Rod Diameter

BORE	CP	E	EE NPTF	F	G	K	P
1.50	4 12	2 00	3/8	38	1.50	25	2 31
2.00	4 12	2 50	3/8	38	1 50	31	2 31
2.50	4 25	3 00	3/8	38	1 50	31	2 44
3.25	4 75	3 75	1/2	62	1 75	38	2 69
4.00	4 75	4 50	1/2	62	1 75	38	2 69
5.00	5 00	5 50	1/2	62	1 75	44	2 94
6.00	5 50	6 50	3/4	75	2 00	44	3 19

* Available in MS2, MS3, MS4, MS7, MF1, MF5, ME5, MT1 MT4, see single rod pages for mounting dimensions and appropriate P.S.I. Ratings

For Models MS2 and MS3 (1 50" thru 5 00" bores), add 50" to Dimension "SS."
For Models MS7 and MS4, consult factory for Dimensions "SE" and "SN"

MXO-D

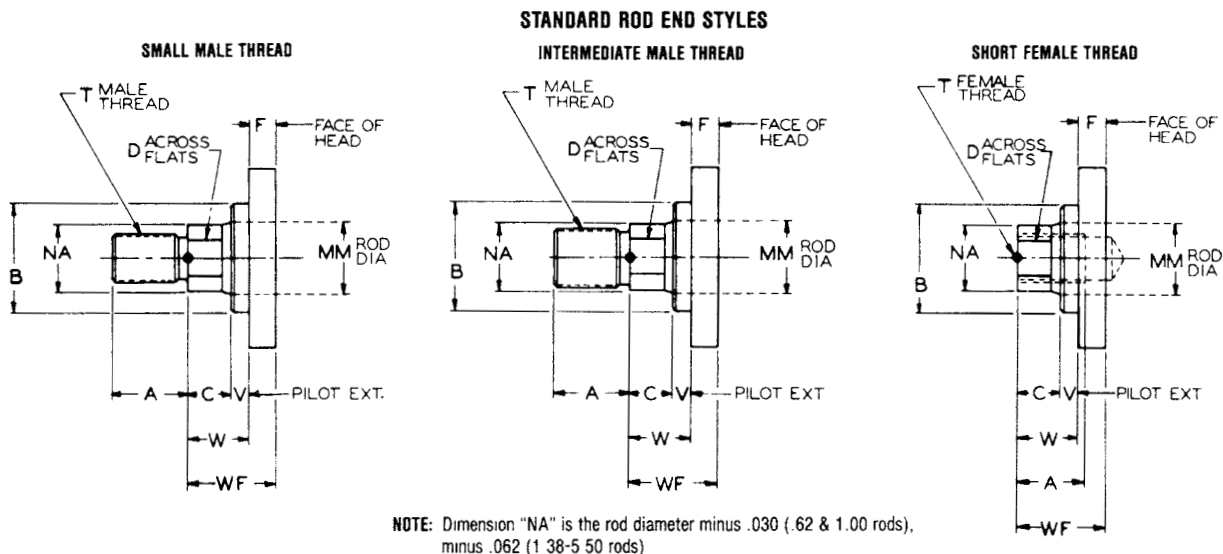
Dimensions are Affected by the Rod Diameter

BORE	CYLINDER		A	B -.001 -.003	C	D	RD*	T (THREAD)			V	W	Y	ZL	ZM	PSI RATING†
	ROD DIA. CODE	MM ROD DIA.						SMALL MALE SM	INTER- MEDIATE MALE IM	SHORT FEMALE SF						
1.50	D	.62	.75	1.125	.38	.50	-	44-20	50-20	44-20	.25	.62	1.88	5.75	6.12	1800
	F	1.00	1.12	1.500	.50	.88	-	75-16	88-14	75-16	.50	1.00	2.25	6.12	6.88	1800
2.00	D	.62	.75	1.125	.38	.50	2.38	44-20	50-20	44-20	.25	.62	1.88	5.44	6.12	1800
	F	1.00	1.12	1.500	.50	.88	2.38	75-16	88-14	75-16	.50	1.00	2.25	5.81	6.88	1800
	G	1.38	1.62	2.000	.62	1.12	-	1.00-14	1.25-12	1.00-14	.62	1.25	2.50	6.44	7.38	1800
2.50	D	.62	.75	1.125	.38	.50	2.38	44-20	50-20	44-20	.25	.62	1.88	5.56	6.25	1000
	F	1.00	1.12	1.500	.50	.88	2.38	75-16	88-14	75-16	.50	1.00	2.25	5.94	7.00	1400
	G	1.38	1.62	2.000	.62	1.12	-	1.00-14	1.25-12	1.00-14	.62	1.25	2.50	6.56	7.50	1400
	H	1.75	2.00	2.375	.75	1.50	-	1.25-12	1.50-12	1.25-12	.75	1.50	2.75	6.81	8.00	1400
3.25	F	1.00	1.12	1.500	.50	.88	3.00	75-16	88-14	75-16	.25	.75	2.38	6.50	7.50	1300
	G	1.38	1.62	2.000	.62	1.12	3.00	1.00-14	1.25-12	1.00-14	.38	1.00	2.62	6.75	8.00	1300
	H	1.75	2.00	2.375	.75	1.50	-	1.25-12	1.50-12	1.25-12	.50	1.25	2.88	7.62	8.50	1300
	J	2.00	2.25	2.625	.88	1.69	-	1.50-12	1.75-12	1.50-12	.50	1.38	3.00	7.75	8.75	1300
4.00	F	1.00	1.12	1.500	.50	.88	3.00	75-16	88-14	75-16	.25	.75	2.38	6.50	7.50	900
	G	1.38	1.62	2.000	.62	1.12	3.00	1.00-14	1.25-12	1.00-14	.38	1.00	2.62	6.75	8.00	900
	H	1.75	2.00	2.375	.75	1.50	-	1.25-12	1.50-12	1.25-12	.50	1.25	2.88	7.62	8.50	900
	J	2.00	2.25	2.625	.88	1.69	-	1.50-12	1.75-12	1.50-12	.50	1.38	3.00	7.75	8.75	900
	K	2.50	3.00	3.125	1.00	2.06	-	1.88-12	2.25-12	1.88-12	.62	1.62	3.25	8.00	9.25	900
5.00	F	1.00	1.12	1.500	.50	.88	3.00	75-16	88-14	75-16	.25	.75	2.38	6.81	7.75	750
	G	1.38	1.62	2.000	.62	1.12	3.00	1.00-14	1.25-12	1.00-14	.38	1.00	2.62	7.06	8.25	1000
	H	1.75	2.00	2.375	.75	1.50	-	1.25-12	1.50-12	1.25-12	.50	1.25	2.88	7.94	8.75	1000
	J	2.00	2.25	2.625	.88	1.69	-	1.50-12	1.75-12	1.50-12	.50	1.38	3.00	8.06	9.00	1000
	K	2.50	3.00	3.125	1.00	2.06	-	1.88-12	2.25-12	1.88-12	.62	1.62	3.25	8.31	9.50	1000
	L	3.00	3.50	3.750	1.00	2.62	-	2.25-12	2.75-12	2.25-12	.62	1.62	3.25	8.31	9.50	1000
	M	3.50	3.50	4.250	1.00	3.00	-	2.50-12	3.25-12	2.50-12	.62	1.62	3.25	8.31	9.50	1000
6.00	G	1.38	1.62	2.000	.62	1.12	4.00	1.00-14	1.25-12	1.00-14	.25	.88	2.75	7.56	8.75	750
	H	1.75	2.00	2.375	.75	1.50	4.00	1.25-12	1.50-12	1.25-12	.38	1.12	3.00	7.81	9.25	750
	J	2.00	2.25	2.625	.88	1.69	4.00	1.50-12	1.75-12	1.50-12	.38	1.25	3.12	7.94	9.50	750
	K	2.50	3.00	3.125	1.00	2.06	-	1.88-12	2.25-12	1.88-12	.50	1.50	3.38	8.94	10.00	750
	L	3.00	3.50	3.750	1.00	2.62	-	2.25-12	2.75-12	2.25-12	.50	1.50	3.38	8.94	10.00	750
	M	3.50	3.50	4.250	1.00	3.00	-	2.50-12	3.25-12	2.50-12	.50	1.50	3.38	8.94	10.00	750
	N	4.00	4.00	4.750	1.00	3.38	-	3.00-12	3.75-12	3.00-12	.50	1.50	3.38	8.94	10.00	750

* Where RD is not shown, square retainer is used. See RETAINER PLATE CONSTRUCTION in INSTALLATION, OPERATION AND MAINTENANCE DATA section.

† CAUTION: PSI ratings shown are HANNA recommended maximum operating pressures. Check STROKE LIMITATION DATA in TECHNICAL INFORMATION section which may reduce maximum operating pressure. Check STOP TUBE DATA (TECHNICAL INFORMATION section) to determine if stop tube is required.

NOTE: Dimensions are nominal except where specifically tolerated. Tolerances on "Plus Stroke" dimensions will vary slightly from dimensions shown due to manufacturing tolerances and tube compression.



TECHNICAL INFORMATION

DESCRIPTION	PAGE
Port Size and Location.....	81
Stroke Limitation Data.....	82
Stop Tube Data.....	83
Hydraulic Force Data.....	84
Cylinder Cushion.....	86

PORT LOCATION

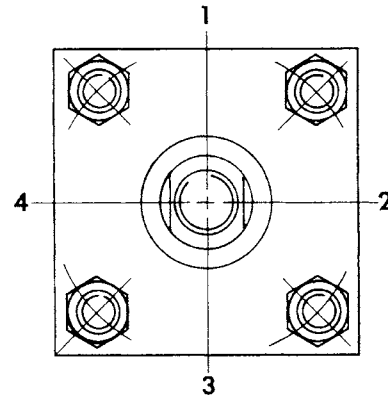
Numbers 1, 2, 3 and 4 around end view of cylinder drawings are for describing optional pipe port locations. Position 1 is standard. In many cases ports can be positioned at 2, 3 or 4 by rotating the heads at assembly. In other cases where it is undesirable to rotate the heads because of corresponding rotation of cylinder mountings, additional ports can usually be placed at positions 2, 3 or 4. Orders or inquiries should state port locations for rod and cap end heads, if other than standard. When changing port locations, careful attention should be paid to clearance between pipes, cylinder mountings, and the heads of any mounting screws.

Standard ports will be supplied at Position 1. Orders should specify pipe port locations if other than standard. Optional ports and bossed ports are available. Refer to the charts below to select the appropriate port.

CAUTION:

Cylinders are intended for operation with standard ports. Oversize or additional ports may result in unacceptable fluid velocities within the cylinder. **Fluid velocities in the supply line in excess of 15 feet per second are not recommended.**

PORT NUMBERING AND POSITIONING



Position location for both the Front Head and Blind Head is determined by viewing the cylinder at the Rod End.

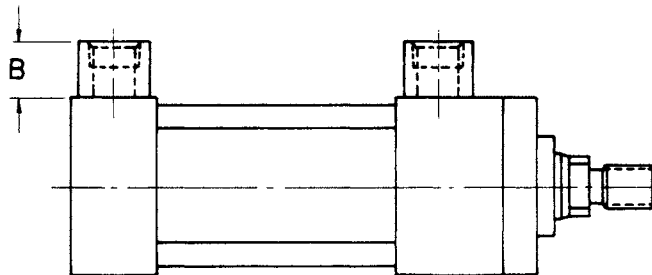
PORT SIZE

SERIES 2H OPTIONAL PORTING

BORE	STANDARD SAE PORT	OVERSIZED BOSSED SAE	DIM. B	STANDARD NPT PORT	OVERSIZE BOSSED PORT
1.50	#8 (.750-16)	#12 (1.062-12)	15/16	1/2	3/4
2.00	#8 (.750-16)	#12 (1.062-12)	15/16	1/2	3/4
2.50	#8 (.750-16)	#12 (1.062-12)	15/16	1/2	3/4
3.25	#12 (1.062-12)	#16 (1.312-12)	1-1/8	3/4	1
4.00	#12 (1.062-12)	#16 (1.312-12)	1-1/8	3/4	1
5.00	#12 (1.062-12)	#16 (1.312-12)	1-1/8	3/4	1
6.00	#16 (1.312-12)	#20 (1.625-12)	1-1/4	1	1-1/4
7.00	#20 (1.625-12)	#24 (1.875-12)	1-1/2	1-1/4	1-1/2
8.00	#24 (1.875-12)	#32 (2.50-12)	1-19/32	1-1/2	2
10.00			1-19/32	2	2-1/2
12.00				2-1/2	3
14.00				2-1/2	3

SERIES 3L OPTIONAL PORTING

BORE	STANDARD NPT PORT	OVERSIZED BOSSED NPT	DIM. B	OPTIONAL SAE PORT	OVERSIZE BOSSED SAE
1.50	3/8	1/2	15/16	#6 (.562-18)	#10 (.875-14)
2.00	3/8	1/2	15/16	#6 (.562-18)	#10 (.875-14)
2.50	3/8	1/2	15/16	#6 (.562-18)	#10 (.875-14)
3.25	1/2	3/4	15/16	#10 (.875-14)	#12 (1.062-12)
4.00	1/2	3/4	15/16	#10 (.875-14)	#12 (1.062-12)
5.00	1/2	3/4	15/16	#10 (.875-14)	#12 (1.062-12)
6.00	3/4	1	1-1/8	#12 (1.062-14)	#16 (1.312-12)



STROKE LIMITATION DATA

The rod diameter has to be capable of withstanding any compressive force developed by the cylinder working against the load. A piston rod diameter with adequate column strength to handle the compressive force of the application can be selected from the convenient pre-calculated chart below.

To use this chart find the force value, developed by the application, in the left column. Next, select the figure which resembles your application and then multiply "D" times the factor given in that figure. Finally, opposite the corresponding force value, find the value of "L" which is equal to, or greater than, the figure derived from factoring "D". Directly above is the rod diameter which is capable of withstanding the forces developed in the application.

NOTE: SEE APPLICATION FIGURES ON NEXT PAGE.

EXAMPLE: Cylinder Bore = 4.00" Operating PSI = 750
 Force Value 9428 lbs.
 Application - Resembles Fig. 2 - Foot Lug Mtg.
 Stroke = 40"
 "L" = 0.7 x 40; L = 28"
 Correct Rod Diameter = 1.38"

The total force is 9428 lbs., and the value of "L" is 28 inches in this application. The smallest diameter rod capable of handling this situation is 1.38 inches.

If a stop tube is required for the application, be sure to include the stop tube length when determining the length of "D".

FORCE VALUE	VALUE OF "L" IN INCHES												
	PISTON ROD DIAMETER												
in pounds	.62	1.00	1.38	1.75	2.00	2.50	3.00	3.50	4.00	4.50	5.00	5.50	7.00
100	66												
200	47												
400	33	85											
600	27	70	132										
800	24	60	114	184									
1000	21	54	102	165	215								
1300	18	47	90	145	188								
1700	16	41	78	127	165	258							
2100	14	37	71	114	149	232							
2500	13	34	65	104	136	213	304						
3000	12	31	58	95	124	192	280	381					
4000	10	27	51	83	108	162	242	330	430				
5000	9	24	46	74	96	150	217	295	385				
6000	8	22	42	67	89	137	198	269	352	443			
8000	7	19	36	58	76	119	172	233	305	384	475		
10000		17	32	52	68	106	153	209	273	344	426	514	
12000		15	29	48	62	97	139	190	249	314	328	468	761
16000		13	26	42	54	84	121	165	215	272	316	407	659
20000			23	38	48	75	109	148	193	243	301	365	590
30000			18	31	39	61	89	120	153	198	245	297	481
40000				27	34	53	77	104	136	172	213	257	417
50000				23	31	48	69	93	122	153	190	230	373
60000				21	28	44	63	85	111	140	174	210	340
80000					24	38	54	74	96	122	143	192	295
100000						34	48	66	86	109	132	163	264
120000						31	44	60	79	100	121	142	240
140000							41	56	73	92	112	135	223
160000							38	52	63	86	105	129	209
200000								47	61	77	93	115	187
250000								42	54	69	84	103	167
300000													152
350000													141
400000													131
500000													118

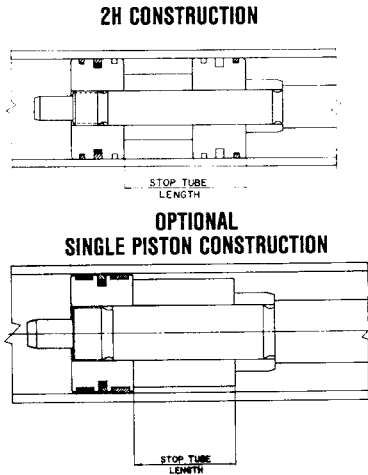
If a stop tube is required for the application, be sure to include the stop tube length when determining the length of "D".

STOP TUBE DATA

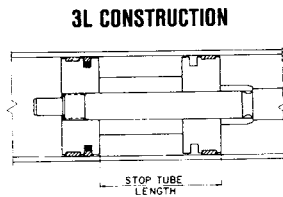
Long stroke cylinders can be subjected to a buckling action and excessive bearing wear due to the weight of the exposed rod. To reduce wear a stop tube is recommended.

All cylinders cushioned and non-cushioned are supplied with the double piston construction. General construction of cylinder stop tube is illustrated below.

SERIES 2H	
DUAL PISTON CONSTRUCTION MINIMUM STOP TUBE LENGTHS	
1.50 BORE	1.38 LG.
2.00 BORE	1.38 LG.
2.50 BORE	1.50 LG.
3.25 BORE	1.75 LG.
4.00 BORE	2.00 LG.
5.00 BORE	2.50 LG.
6.00 BORE	2.88 LG.
7.00 BORE	3.00 LG.
8.00 BORE	3.50 LG.



SERIES 3L	
DUAL PISTON CONSTRUCTION MINIMUM STOP TUBE LENGTHS	
1.50 BORE	1.12 LG.
2.00 BORE	1.12 LG.
2.50 BORE	1.25 LG.
3.25 BORE	1.25 LG.
4.00 BORE	1.25 LG.
5.00 BORE	1.50 LG.
6.00 BORE	1.50 LG.



ROD END CONNECTION	
FIXED & WELL GUIDED	FIG 1 "L" = 0.5 X D
PIVOTED AND WELL GUIDED	
PIVOTED AND WELL GUIDED	FIG 2 "L" = 0.7 X D
SUPPORTED NOT WELL GUIDED	
SUPPORTED NOT WELL GUIDED	FIG 3 "L" = 2 X D
PIVOTED AND WELL GUIDED	
	FIG 4 "L" = 0.7 X D FOR LONG STROKE SUPPORT HEAD HEAD NOT SUPPORTED
	FIG 5 "L" = 0.7 X D
PIVOTED AND WELL GUIDED	
	FIG 6 "L" = D
PIVOTED AND WELL GUIDED	FIG 7 "L" = D
PIVOTED AND WELL GUIDED	
	FIG 8 "L" = D

To determine if a stop tube is required, find the total value of "L" using the stroke limitation chart. Compare this value with the stop tube chart. If the value of "L" exceeds 40 inches, you can find the recommendation for stop tube length at the bottom of the chart.

EXAMPLE PROBLEM:
 Cylinder Model MP1-3L-NC-4-27-KSM-1A
 Accessory - V-6 Clevis
 Pressure - 1500 PSI
 Clevis Mount - Horizontal

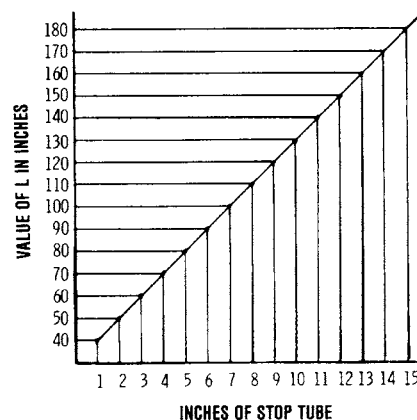
From the description, the cylinder falls into Fig. 8. To determine the value of "L":

ADD:	MP1	"XC" Dimension	7-3/4"
	V-6	"CE" Dimension	5-1/2"
		Two times stroke (2 x 27)	54"
	Total Value of "L"		67-1/4"

Looking this up on the chart, you'll find a recommended stop tube length of 4 inches.

The amount of stop tube will increase the stroke-plus dimensions of the cylinder by the same value. Add length of the stop tube to the value of "L" and recheck column strength on stroke limitation chart.

STOP TUBE CHART



HYDRAULIC FORCE DATA

WHAT BORE SIZE DO YOU NEED?

The force formula for determining the force produced by a cylinder is

$$F = A \times \text{PSI}$$

$$\text{Force (lbs.)} = \text{Cylinder Piston Area (sq. in.)} \times \text{Line Pressure (lbs./sq. in.)}$$

Chart C1 shows the force produced by specific cylinder bore sizes at various pressures. Forces not listed on the chart can be calculated by using the formula $F = A \times \text{PSI}$. An example of this formula follows:

EXAMPLE: Determine the thrust of a 14.00" bore cylinder operating at 1250 p.s.i. hydraulic line pressure.
 $F = 153.94 \times 1250 \quad F = 192,425$

To select the proper bore size, first determine the force required for your particular application. then add a factor of five percent to allow for internal frictional losses.

Locate the total required force in Chart C1 in the column that matches your system's operating pressure. The bore size that produces the necessary total force at the desired operating pressure is the proper size for your application.

Chart C1 HYDRAULIC CYLINDER FORCE CHART*

Bore	Piston Area Sq. In.	PUSH STROKE Values are Pounds of Force								Gallons of Oil Consumed Per Inch of Travel
		250 PSI	500 PSI	750 PSI	1000 PSI	1500 PSI	2000 PSI	2500 PSI	3000 PSI	
1.50	1.77	442	884	1325	1767	2651	3534	4420	5304	.00765
2.00	3.14	786	1571	2357	3142	4713	6285	7850	9420	.0136
2.50	4.91	1227	2455	3682	4909	7364	9815	12270	14730	.0212
3.25	8.29	2074	4148	6222	8296	12440	16590	20740	24890	.0359
4.00	12.56	3143	6285	9428	12560	18860	25140	31415	37700	.0544
5.00	19.63	4910	9820	14730	19640	29460	39280	49085	58900	.0860
6.00	28.27	7068	14140	21200	28270	42400	56540	70685	84820	.1224
7.00	38.48	9623	19240	28870	38490	57740	76980	96210	115450	.1666
8.00	50.26	12570	25140	37700	50270	75400	100500	125660	150800	.2176
10.00	78.54	19640	39270	58900	78540	117800	157100	196350	235620	.3393
12.00	113.10	28280	56550	84820	113100	169600	226200	282750	339300	.4886
14.00	153.94	38480	76970	115455	153940	230910	307880	384850	461820	.6664

$$\text{Force (pounds)} = \text{Cylinder Piston Area (in square inches)} \times \text{Line Pressure (in pounds per sq. in.)}$$

EXAMPLE:

Determine the thrust of a 4.00 inch bore cylinder operating at 1000 psi hydraulic line pressure
 $F = 12.56 \times 1000$
 $F = 12,560 \text{ lbs.}$

Chart C1A

Rod Dia.	Rod Area Sq. In.	PULL STROKE To determine pull stroke thrust or consumption, deduct the value for the rod diameter from the corresponding cylinder bore in Chart C1.								Gallons of Oil Consumed Per Inch of Travel
		250 PSI	500 PSI	750 PSI	1000 PSI	1500 PSI	2000 PSI	2500 PSI	3000 PSI	
62	307	77	154	230	307	461	615	767	920	00133
1 00	78	196	393	590	785	1175	1570	1950	2355	.0034
1 37	1 48	371	742	1113	1485	2230	2970	3500	4455	0067
1.75	2 40	601	1202	1803	2405	3610	4810	6010	7510	0104
2 00	3 14	786	1572	2357	3142	4715	6285	7850	9420	.0136
2 50	4 91	1225	2450	3682	4909	7350	9815	12270	14730	0212
3 00	7 07	1767	3535	5302	7070	10605	14140	17680	21200	0306
3 50	9 62	2405	4810	7216	9620	14435	19240	24005	28810	.0417
4 00	12.56	3142	6284	9426	12570	18850	25140	31415	37700	.0544
4 50	15 90	3976	7952	11930	15900	23860	31810	38200	47750	.0688
5 00	19 63	4909	9820	14730	19640	29450	39270	49085	58900	.0860
5 50	23 76	5940	11880	17820	23760	35640	47575	59250	71250	1028
6 00	28 27	7068	14140	21200	28270	42400	56540	70685	84820	1224
7 00	38 49	9623	19240	28870	38490	57740	76980	96210	115450	1666
8 00	50 26	12570	25140	37700	50270	75400	100500	125660	150800	2176
10 00	78.54	19635	39270	58905	78540	117810	157080	196350	235620	3400

To obtain forces not given, multiply piston area times operating pressure
 * Forces given do not allow for frictional or other power losses.
 1 U S Gallon = 231 Cubic inches

COMPARE PRESSURE RATINGS

Chart C2 shows the pressure ratings for HANNA Hydraulic Cylinders and may help you in determining the most economical cylinder for your application. The 3L Series

is designed for medium duty service (under 2000 PSI). The 2H Series is a heavy-duty high pressure cylinder line (3000 PSI).

Chart C2 HYDRAULIC CYLINDER RATING* (P.S.I.)

SERIES 2H		
Bore	3:1 Factor of Safety	4:1 Factor of Safety
1.50	2900	2180
2 00	3730	2800
2.50	3140	2360
3 25	3040	2280
4 00	2960	2220
5 00	2785	2090
6 00	2540	1905
7 00	2740	2053
8 00	2540	1905
10.00	2400	1800
12.00	2600	1950
14 00	2570	1930

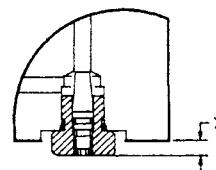
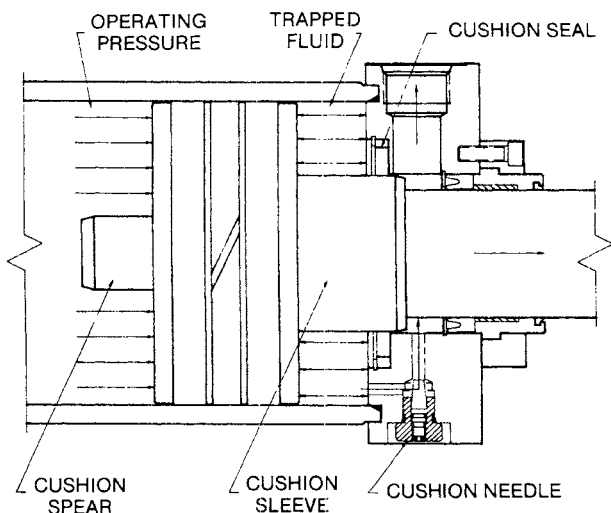
SERIES 3L		
Bore	3:1 Factor of Safety	4:1 Factor of Safety
1 50	1915	1435
2 00	1200	900
2 50	750	560
3 25	1180	885
4 00	790	595
5 00	600	460
6 00	650	490

Models MF1, MF2, MF5 and MF6 may carry lower Pressure Ratings in some cases. Refer to the appropriate catalog pages for exact ratings on these Models.

* Ratings are based on the yield point of the weakest component and smallest rod size. See mounting pages for maximum recommended operating pressures.

Hydraulic Cylinders equipped with stainless steel piston rods have reduced Pressure Ratings due to the lower strength properties of stainless steel. Consult Factory for specific Ratings.

CYLINDER CUSHION



NOTE: Cushion needle extends beyond the edge of head on the following:

2H-LINE (both heads)

Bore	X
1.50	.148
2.00	.195

3L-LINE

Bore	F.H.	B.H.
	X	X
1.50	.235	.195
2.00	.235	.195
2.50	.235	.195
3.25	.125	.085

DETERMINING ENERGY OF THE APPLICATION

Cushions in cylinders are primarily intended to protect the cylinder from damaging impacts at the ends of the stroke. Properly selected and adjusted cushions may also reduce noise, reduce loading damage, may increase machine output.

As a general guide line, the use of hydraulic cushions should be considered whenever the velocity of the piston approaches 20 to 25 feet per minute. When piston velocity exceeds 35 to 40 feet per minute, the amount of energy being generated will usually demand the use of cushions to decelerate the piston. Cushions should also be seriously considered when a large mass imparts inertia loading to the cylinder.

Cushions work by trapping a volume of fluid at the end of the stroke to create a back pressure which resists the force being exerted on the working side of the piston. As shown above, this back pressure is developed when the cushion sleeve or spear enters into the cushion seal and the fluid is bled down through the orifice at the cushion seal and past the cushion adjustment needle. The back pressure developed must be sufficient to resist the force developed by the application. To determine if a suitable cushion can be provided in the cylinder selected for the application calculate the total energy which must be absorbed, as outlined below, and compare with the cushion capacity listed in the cushion capacity table.

NOTE: On Series 2H, the Head End Cushion on 1.50" Bore with (F) Rod is not adjustable.

On Series 3L, Cushions are not available on the Head End of 1.50" Bore (F) Rod, 2.00" Bore (G) Rod and 2.50" Bore (H) Rod.

Things to consider:

1. Kinetic energy.
2. Propelling energy (including gravity).

- I. To solve for kinetic energy:
 $0.1865 \times W \times V^2 = K.E.$
 W = Weight of the entire moving mass (pounds) (include cylinder piston rod in the mass figure)
 V = Velocity at entering the cushion (feet/sec.)
 K.E. = Kinetic Energy (inch pounds).
- II. To solve for propelling energy:
 $F \times S = P_1$
 F = Force exerted by the cylinder (Piston Area x PSI at relief valve setting).
 S = Cushion length (inches)
 P₁ = Propelling Energy (inch pounds).
- III. Gravity effects must also be considered if the cylinder is mounted in a vertical plane. If the mass is moving down into the cylinder cushion, the energy due to gravity must be added to the propelling energy, P₁. If the mass is moving up into the cushion, the gravity is negative and this energy may be subtracted from the propelling energy, P₁.

To solve for propelling energy due to gravity:
 $W \times S = P_2$
 W = Weight of moving mass
 S = Length of cushion
 P₂ = Propelling energy due to gravity (inch pounds).

If the load is horizontal, the effect of gravity is zero and will not affect the total propelling energy.

TOTAL ENERGY IS:
 $K.E. + P_1 \pm P_2^*$
 K.E. = Total Kinetic Energy Formula I.
 P₁ = Total Propelling Energy Formula II.
 P₂ = Total Propelling Energy Formula III.

* Add if gravity is positive —
 Subtract if gravity is negative —
 Disregard if cylinder travel is horizontal.

CUSHION CAPACITY CHART

SERIES 2H

BORE	ROD DIA.	HEAD END		CAP END	
		CUSHION LENGTH	CAPACITY (IN.-LBS.)	CUSHION LENGTH	CAPACITY (IN.-LBS.)
1.50	.62	.73	4,840	74	6,310
	1.00	.84	3,250		
2.00	1.00	.73	7,845	74	10,900
	1.38	.73	5,545		
2.50	1.00	.73	11,990	74	17,430
	1.38	.73	8,510		
	1.75	.73	8,510		
3.25	1.38	.77	17,470	83	32,280
	1.75	.77	17,470		
	2.00	.77	13,970		
4.00	1.75	.77	33,910	83	50,190
	2.00	.77	28,525		
	2.50	.77	28,525		
5.00	2.00	.77	47,230	77	71,760
	2.50	.77	47,230		
	3.00	.77	25,690		
	3.50	.77	25,690		
6.00	2.50	.88	91,995	96	127,930
	3.00	.88	48,475		
	3.50	.88	48,475		
	4.00	.88	47,475		
7.00	3.00	1.25	132,670	1.39	249,570
	3.50	1.25	132,670		
	4.00	1.25	132,670		
	4.50	1.22	79,780		
	5.00	1.22	79,780		
8.00	3.50	1.38	227,750	1.46	339,515
	4.00	1.38	227,750		
	4.50	1.35	136,320		
	5.00	1.35	136,320		
	5.50	1.35	136,320		
10.00	4.50	1.83	438,100	1.84	677,440
	5.00	1.83	438,100		
	5.50	1.83	438,100		
	7.00	1.83	341,110		
12.00	5.50	2.58	1,063,430	2.09	1,130,050
	7.00	2.58	926,710		
	8.00	2.58	769,700		
14.00	7.00	2.58	1,453,540	2.34	1,743,680
	8.00	2.58	1,296,550		
	10.00	2.58	921,750		

SERIES 3L

BORE	ROD DIA.	HEAD END		CAP END	
		CUSHION LENGTH	CAPACITY (IN.-LBS.)	CUSHION LENGTH	CAPACITY (IN.-LBS.)
1.50	.62	.62	2,050	50	2,130
	1.00	N/A	N/A		
2.00	.62	.62	3,495	50	3,850
	1.00	.62	3,495		
	1.38	N/A	N/A		
2.50	.62	.62	3,740	50	3,635
	1.00	.62	3,740		
	1.38	.62	3,050		
	1.75	N/A	N/A		
3.25	1.00	.81	10,810	61	9,730
	1.38	.81	10,810		
	1.75	.81	7,350		
	2.00	.81	7,350		
4.00	1.00	.81	8,865	61	7,470
	1.38	.81	8,865		
	1.75	.81	7,140		
	2.00	.81	7,140		
	2.50	.81	5,800		
5.00	1.00	.81	11,670	61	9,425
	1.38	.81	11,670		
	1.75	.81	10,290		
	2.00	.81	10,290		
	2.50	.81	9,216		
	3.00	.81	6,035		
3.50	.81	6,035			
6.00	1.38	.81	19,430	73	18,180
	1.75	.81	17,875		
	2.00	.81	17,875		
	2.50	.81	16,670		
	3.00	.81	13,350		
	3.50	.81	13,350		
	4.00	.81	11,164		

TYPICAL APPLICATION PROBLEM

You have tentatively chosen a 2H Series cylinder with a 3-1/4" bore to move a 4000 pound mass horizontally at 3 feet per second. The system relief valve setting is 1000 psi. The cylinder is equipped with the standard 1-3/8" diameter piston rod and the effective cushion stroke or length is .77 inch.

Kinetic Energy:
 $0.1865 \times 4000 \text{ lbs.} \times (3)^2$
 $746 \times 9 = 6714 \text{ in. lbs.}$
 Propelling Energy:
 $8.29 \times 1000 \times .77 = 6383$
 Total Application Energy:
 $6714 + 6383 = 13097 \text{ in. lbs.}$

The total energy seen by the cushion in this application is 13097 inch pounds. By referring to the cushion capacity chart shown above, we find the standard 3-1/4" bore 2H Series cushion can adequately handle the energy. If the energy developed exceeds the capacity of the standard cushion consider use of supercushions or changes in the hydraulic circuit which will reduce the amount of energy the cushions must absorb. (Supercushions have the same physical appearance as the standard cushion described above, except that the effective cushion length is doubled. An additional head or cap on both are added to accommodate the longer cushion sleeve or spear. The overall length of the cylinder body changes accordingly. Capacities of supercushions are double those shown in the cushion capacity chart.)

If in doubt about selecting a cushion, consult the factory with detailed application information and a recommendation will be made.

Caution: Cushion adjustment needles require only about one to one-half turn adjustment. Do not unscrew beyond the point at which the head of the screw is flushed with the surface of the head or cap.

INSTALLATION, OPERATION AND MAINTENANCE DATA

DESCRIPTION	PAGE
Seal Kits	89
Parts List	90
Retainer Plate Construction	92
Fastener Torques and Cylinder Weights	93

STORAGE:

If cylinders are to be stored before use, they should be stored in the vertical position, rod end up. Cylinders in storage should always be fully protected against the elements or other adverse conditions.

INSTALLATION:

The pipe ports of cylinders are sealed with plastic plugs. The plugs protect the precision internal parts by sealing out damaging dirt and grit. Do not remove port seals until ready to connect piping. To protect cylinders, clean all pipes and pipe fittings of dirt, scale, and thread chips. A filter is recommended to keep the operating fluid free of foreign matter.

Accurate mounting and alignment are essential to proper cylinder performance. By eliminating side loading, packing and bearing life will be increased. Mounting surfaces should be straight, bearings for pin and trunnion mounting must be in line.

Dirt or abrasive matter adhering to the piston rod may cause excessive wear to the piston rod and gland. For best results, protect the cylinder from such dirt. A piston rod protective shield is ideal for this purpose.

OPERATION:

Needle valves in cylinder head and cap of adjustable cushioned cylinders permit regulation of cushioning effect. Adjust needle valve using an Allen wrench, rotating clockwise to increase cushioning and counterclockwise to decrease cushioning effect. Speed control valves are essential for obtaining the best cushioning operation. A proper balance of cushion needle and flow control valve adjustment should result in a smooth stop with no bouncing.

MAINTENANCE:

Parts which may need replacement in the course of normal use are the rod wiper, rod seal and piston seals.

The need for replacement of the rod seal will become evident through the escaping of fluid around the gland.

To replace rod wiper or rod seal, remove the gland from the cylinder. Remove worn rod wiper and rod seal. To reassemble, slip new rod wiper and rod seal into grooves. Care should be exercised not to nick the lips of the seals. Be sure to retorque gland screws to the specified torque for the cylinder.

To replace piston seal, cut the old piston seal, and remove it and the old O-ring from the groove. Install new O-ring. Next, slightly stretch the Teflon piston seal and work it into the groove. Replace wear strip(s). Carefully insert the ram assembly into the tube—this will assure the Teflon seal is reshaped equally.

It is recommended that new "O" rings be installed each time the cylinder is disassembled for maintenance. This applies to tube and gland "O" rings. The cushion needle valve "O" rings should also be replaced if these parts are disassembled. When reassembling, be sure to apply proper tie rod torque.

If the cushion action of the cylinder fails, check the cushion float sealing. Check to determine if the bronze ring has been worn on its internal diameter, and if foreign particles have become lodged between the face of the ring and the cylinder head recess face. A free play of the ring, both radially and axially, is normal to allow for centering and cushion float action.

If the cylinder fails to perform the job for which it is ordered, check the following items: 1. That the correct cylinder diameter has been chosen to do the job required. 2. That there is adequate line pressure at the cylinder, under both static and dynamic conditions. 3. That the piston rod is aligned correctly with the load it is pushing or pulling. 4. That the piston seal or the rod seal is not worn, allowing pressure to escape.

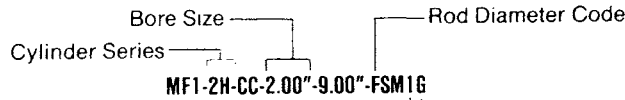
Replacement parts can be furnished quickly if you will indicate the serial number of the cylinder as shown on the name plate, and the part name and number.

The cylinder illustrated is for reference purposes only, and does not represent any particular model.

SEAL KITS

All cylinders are fully field identifiable, including packing option codes.

NAMEPLATE CODE EXAMPLE



PISTON ROD KITS

Ordering Example:

SEAL KIT F-1 For Series 2H

From piston rod code | From rod packing code | From Series Code

Order by Piston Rod Packing Code, Rod Diameter Code, and Cylinder Series Code from nameplate as outlined.

- 1 (STANDARD)
Temperature Range -20°F to +200°F
Buna-N O-Rings, Polyurethane Rod Packing and Rod Wiper.
- 2 (OPTIONAL)
Temperature Range -20°F to +200°F
Buna-N O-Rings, Buna-N Multiple Lip Rod Packing, Polyurethane Rod Wiper.
- 3 (OPTIONAL)
Temperature Range -20°F to +400°F
Viton O-Rings, Viton Rod Packing, Teflon Rod Wiper.

PISTON PACKING KITS

Ordering Example:

SEAL KIT G-2.00 For Series 2H

From piston packing code | Bore size | From Series Code

Order by Piston Packing Code, Bore Size and Cylinder Series Code from nameplate as outlined.

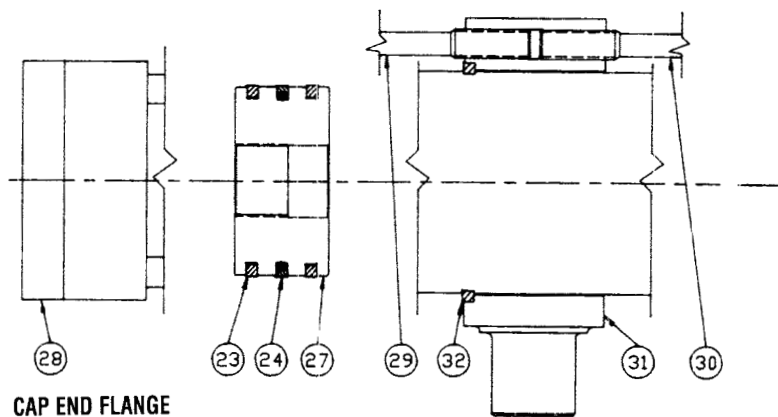
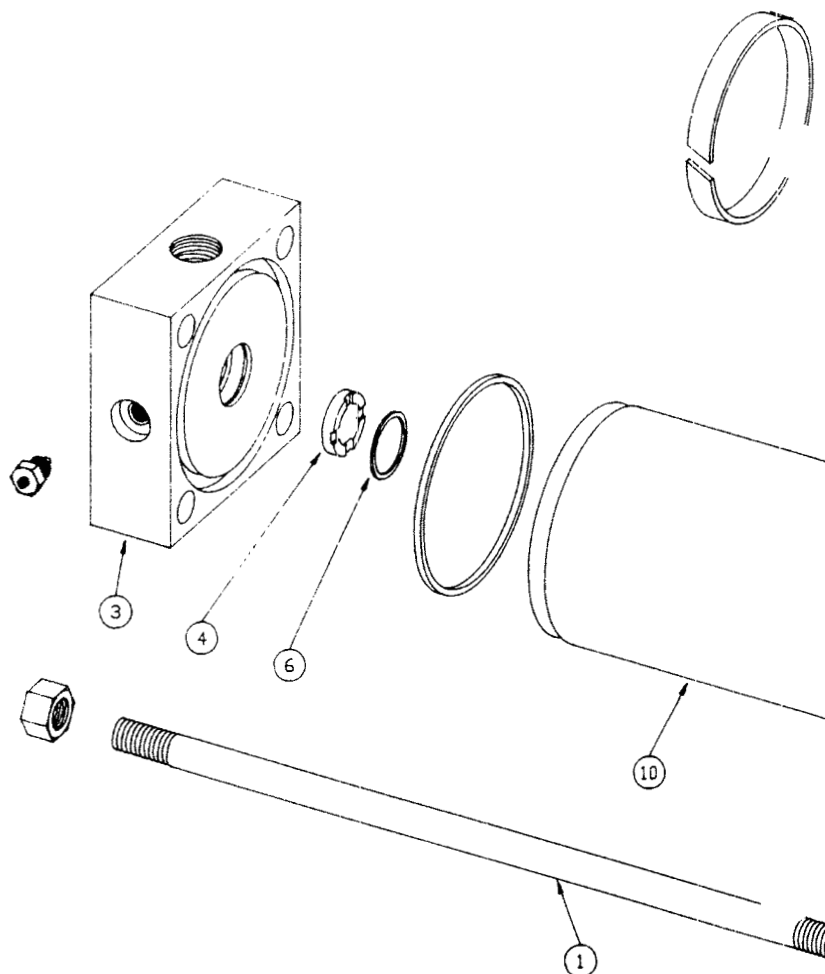
- A Temperature Range -20°F to +200°F
Buna-N U-Cups, Teflon Back-Up Washers, Buna-N Tube Seals. **(Series 3L only).**
- A Temperature Range -20°F to +200°F
Polyurethane U-Cup Seal, Buna Tube Seals. **(Series 2H only).**
- B Temperature Range -20°F to +400°F
Viton U-Cups, Teflon Back-Up Washers, Viton Tube Seals. **(Series 3L only).**
- B Temperature Range -20°F to +400°F
Viton U-Cup Seal, Viton Tube Seals. **(Series 2H only).**
- E Temperature Range -20°F to +200°F
Cast Iron Rings, Filled Teflon Seal w/Buna-N Expander, Buna-N Tube Seals. **(Series 2H only).**
- F Temperature Range -20°F to +400°F
Cast Iron Rings, Filled Teflon Seal w/Viton Expander, Viton Tube Seals. **(Series 2H only).**
- G Temperature Range -20°F to +200°F
Piston Wear Strip(s), Filled Teflon Seal w/Buna-N Expander, Buna-N Tube Seals.
- H Temperature Range -20°F to +400°F
Piston Wear Strip(s), Filled Teflon Seal w/Viton Expander, Viton Tube Seals.

The correct Rod Piston Kits and Piston Packing Kits can be furnished quickly if you will indicate the serial number of the cylinder as shown on the nameplate, and/or by accurately following the ordering examples shown above.

PARTS LIST

When ordering replacement parts, identify Model Number, Serial Number and Part Number, as shown below.

PART NO.	NO. REQ'D.	DESCRIPTION
1	**	Tie Rod
2	**	Tie Rod Nut
3	1	Cap
4	1	Cap Cushion Float
5	2	O-Ring (Tube)
6	1	Cap Retaining Ring
7	1	2H Standard Piston
8	1	Cushion Sleeve
9	1	Piston Rod
10	1	Tube
11*	1	Head Cushion Retaining Ring
12*	1	Head Cushion Float
13	1	Packing Retaining Ring
14	1	Rod Washer
15	1	Rod Packing
16	1	Front Head
17	1	Retainer Plate
18	1	Gland Assembly
19	1	Rod Wiper
20	2	Cushion Needle
21	2	Piston U-Cup
22	2	Back Up (3L Only)
23	2	Cast Iron Ring (2H Only)
24	1	Filled Teflon Seal with Buna Expander
25	2	Wear Strip
26	4/8	Gland Screw
27	1	Optional Piston (2H Only)
28	1	Cap End Flange
29	**	Cap End Tie Rod
30	**	Head End Tie Rod
31	1	Center Trunnion Band
32	4	Trunnion Locator Key (2H Only)
33	1	O-Ring (Gland)
34	1	Back-Up (2H Only)
35	1	Front Flange
36	1	Detachable Clevis (3L Only)
37	1	Optional Piston (2H or 3L)
38	1	3L Standard Piston
39	1	Filled Teflon Seal with Buna Expander
40	1	Wear Strip

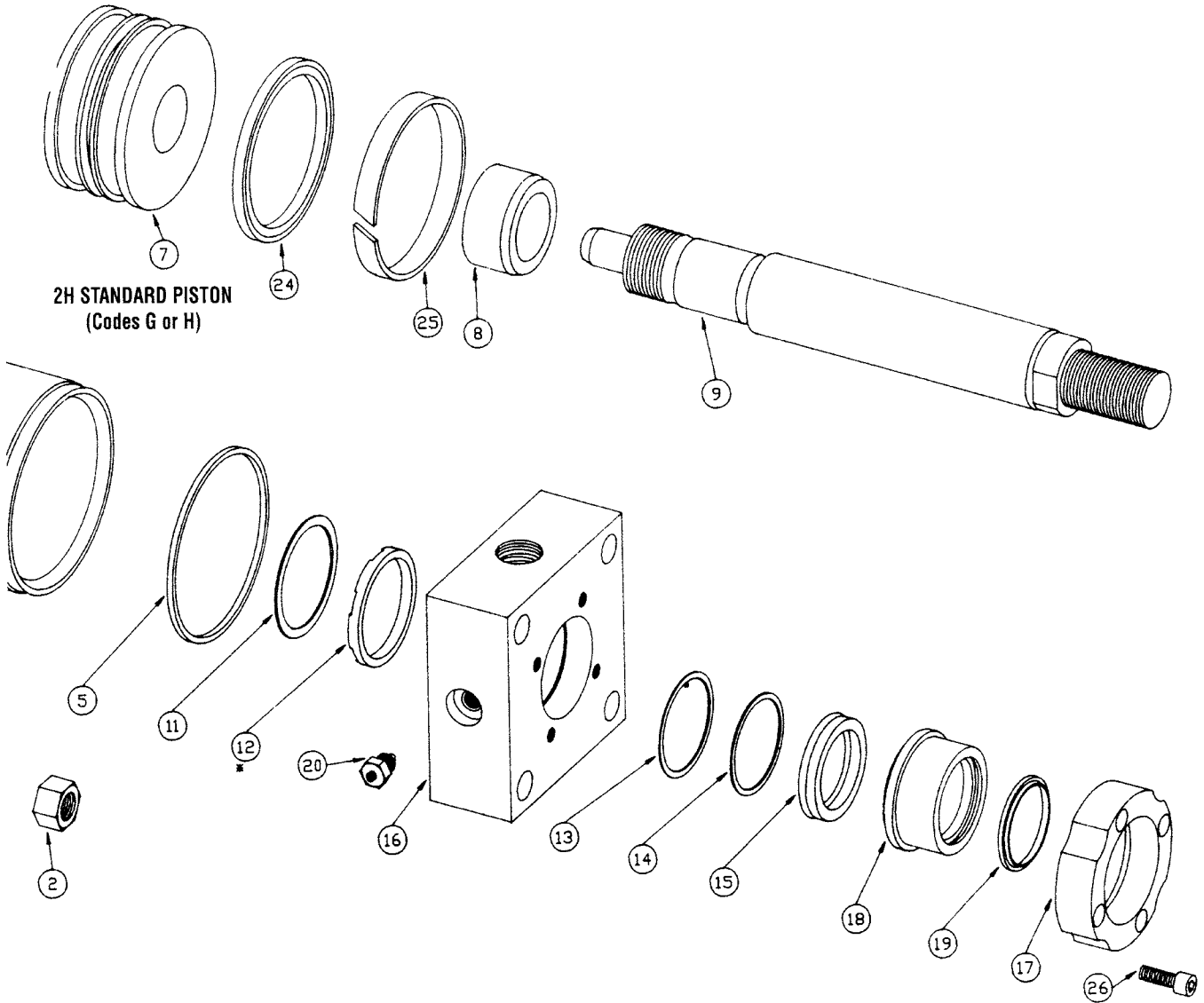


CAP END FLANGE

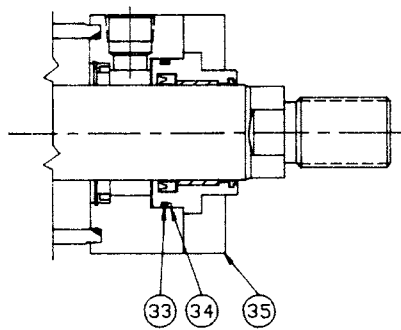
2H OPTIONAL PISTON
(Codes E or F)

CENTER TRUNNION

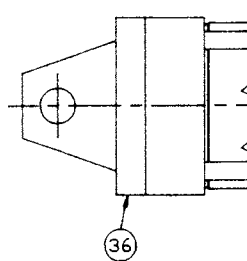
* 1.50 through 8.00" Bores only.



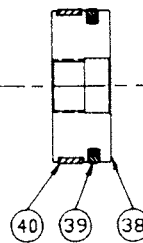
2H STANDARD PISTON
(Codes G or H)



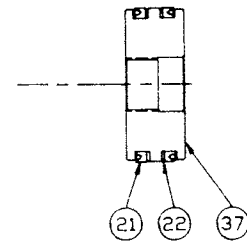
**HEAD END FLANGE
BEARING RETAINER**



**3L DETACHABLE
CLEVIS**



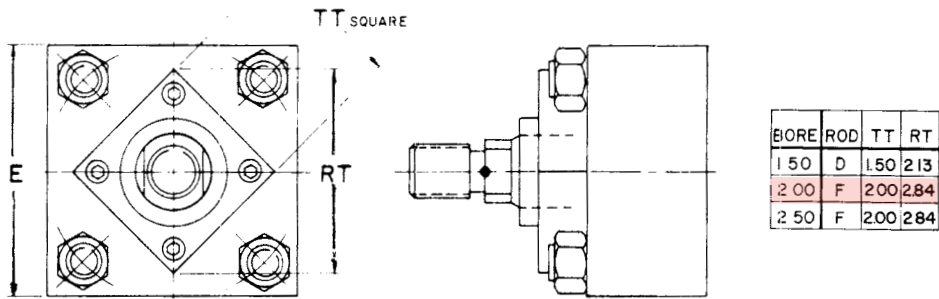
3L STANDARD PISTON
(Codes G or H)



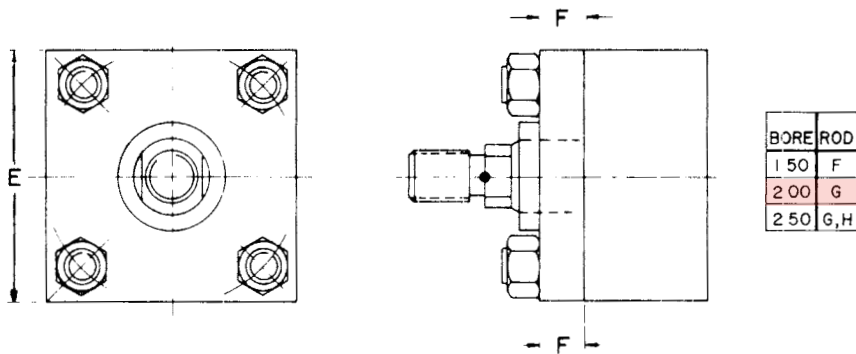
2H/3L OPTIONAL PISTON
(Codes A or B)
(No Part Number 22 on 2H Series)

RETAINER PLATE CONSTRUCTION

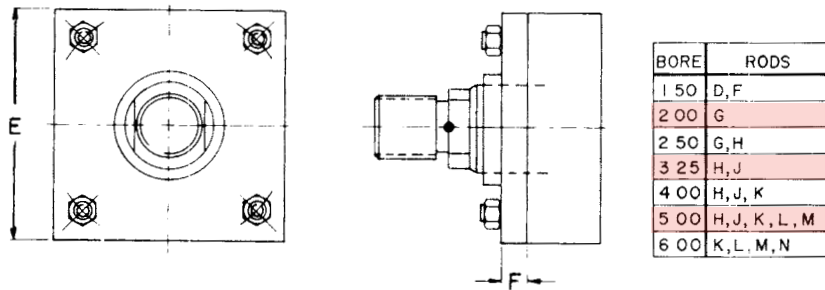
SQUARE RETAINER CONSTRUCTION SERIES 2H



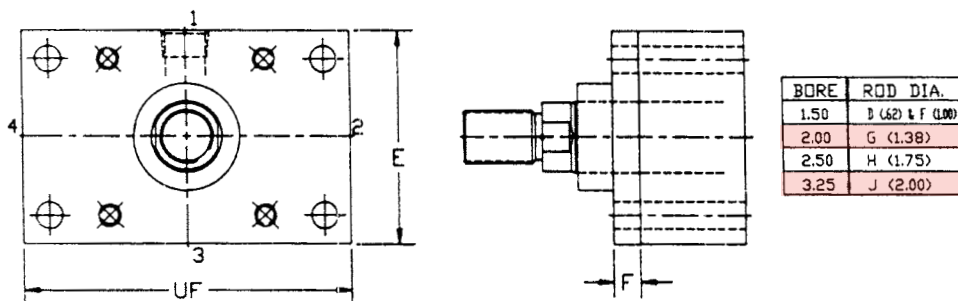
For all mounts except ME5.



SQUARE RETAINER CONSTRUCTION SERIES 3L



ME5 RETAINER CONSTRUCTION SERIES 3L



FASTENER TORQUES AND CYLINDER WEIGHTS

2H SERIES TIE ROD TORQUE			
BORE	SIZE	TORQUE	TORQUE MX1, 2, 3, 4
1.5	38-24	25 ft-lbs	30 ft-lbs
2.0	.50-20	55	70
2.5	50-20	55	70
3.25	62-18	100	140
4.00	62-18	110	160
5.00	88-14	230	375
6.00	1 00-14	300	600
7.00	1 12-12	600	800
8.00	1 25-12	850	1,000
10.00	1 25-12	850	1,000
12.00	1 25-12	850	1,000
14.00	1 25-12	850	1,000

3L SERIES TIE ROD TORQUE			
BORE	SIZE	TORQUE	TORQUE MX1, 2, 3, 4
1.5	25-28	8 ft-lbs.	8 ft-lbs
2.0	31-24	14	14
2.5	.31-24	14	14
3.25	38-24	25	28
4.00	38-24	25	28
5.00	.50-20	35	48
6.00	.50-20	35	48

2H SERIES GLAND SCREW TORQUES			
BORE	ROD	SCREW SIZE	TORQUE
1.5	ALL	#10-32	4 ft-lbs.
2.0	ALL	#10-32	4
2.5	ALL	#10-32	4
3.25	ALL	312-24	18
4.00	ALL	312-24	18
5.00	J, K	.312-24	18
5.00	L, M	.375-24	42
6.00	K	312-24	18
6.00	L, M, N	.438-20	50
7.00	L, M, N	438-20	50
7.00	P, R	.500-20	75
8.00	M, N	438-20	50
8.00	P, R, S	500-20	75
10.00	P, R, S	500-20	75
10.00	T	438-20	50
12.00	S, U	500-20	75
12.00	T	438-20	50
14.00	T	438-20	50
14.00	U, V	.500-20	75

3L SERIES GLAND SCREW TORQUES		
BORE	SCREW SIZE	TORQUE
1.5	—	—
2.0	#10-32	4 ft-lbs
2.5	#10-32	4
3.25	#10-32	4
4.00	#10-32	4
5.00	#10-32	4
6.00	25-28	10

2H SERIES		
CYLINDER BORE	BASE WEIGHT AT ZERO STROKE	WEIGHT PER INCH OF STROKE
1.50	8 lbs	.4 lbs
2.00	14	.8
2.50	19	1.0
3.25	37	1.5
4.00	51	2.3
5.00	90	4.0
6.00	140	5.1
7.00	210	6.5
8.00	294	8.2
10.00	660	16.0
12.00	1,110	23.0
14.00	1,541	44.0

3L SERIES		
CYLINDER BORE	BASE WEIGHT AT ZERO STROKE	WEIGHT PER INCH OF STROKE
1.50	5 lbs	4 lbs
2.00	6.5	5
2.50	10	6
3.25	20	9
4.00	27	1.0
5.00	40	1.2
6.00	68	1.6

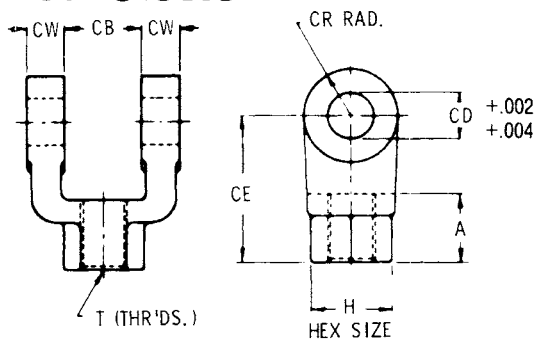
MOUNTING ACCESSORIES

These are standard accessories matched to bore size and piston rod code. The Mounting Bracket fits the cap end of Model MP1. The Bracket also fits the piston Rod Clevis with the same number (i.e. B-7 Bracket fits V-7 Rod Clevis). The pin is furnished with Model MP1 and fits the bracket, however, specify if additional pins are required. Pins also fit rod clevis and rod eyes. If you require accessories other than standard for that bore size or piston rod, specify the item number on your order.

***CAUTION:**

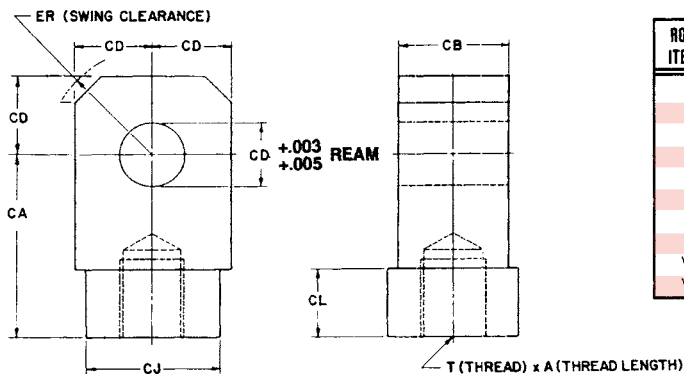
Accessory load rating may be lower than maximum force available from cylinder. Accessories load ratings are in pounds. Before specifying, compare maximum operating pull force in pounds developed by cylinder with load rating of accessory. Accessory load rating is the maximum recommended operating load for that accessory.

Rod Clevis



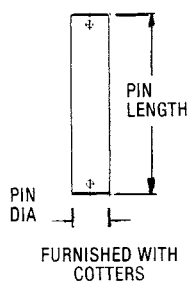
ROD CLEVIS ITEM NO.	PISTON ROD CODE	A	CB	CD	CE	CR	CW	H	T	*LBS. CAPACITY
V-1	D	.75	.75	.50	1.50	.62	.50	1.00	.44-20	5,360
V-2	F	1.12	1.25	.75	2.38	.88	.62	1.25	.75-16	14,000
V-3	G	1.62	1.50	1.00	3.12	1.12	.75	1.75	1.00-14	22,500
V-4	H	2.00	2.00	1.37	4.12	1.62	1.00	2.00	1.25-12	41,250
V-5	J	2.25	2.50	1.75	4.50	2.00	1.25	2.75	1.50-12	57,000
V-6	K	3.00	2.50	2.00	5.50	2.25	1.25	3.00	1.88-12	75,000
V-7	L	3.50	3.00	2.50	6.50	2.88	1.50	3.50	2.25-12	112,500
V-8	M	3.50	3.00	3.00	6.75	3.12	1.50	3.88	2.50-12	135,000
V-10	P	4.50	4.00	3.50	8.50	3.88	2.00	5.00	3.25-12	210,000
V-12	S	5.50	4.50	4.00	10.00	4.38	2.25	6.19	4.00-12	270,000

Rod Eye



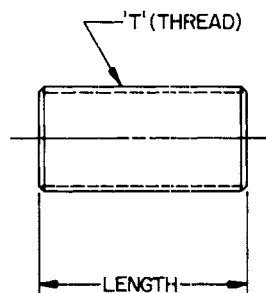
ROD EYE ITEM NO.	PISTON ROD CODE	A	CA	CB	CD	CJ DIA.	CL	ER	T	*LBS. CAPACITY
Y-1	D	.75	1.50	.75	.50	-	-	.75	.44-20	5,060
Y-2	F	1.12	2.06	1.25	.75	-	-	1.12	.75-16	12,500
Y-3	G	1.62	2.81	1.50	1.00	-	-	1.44	1.00-14	20,250
Y-4	H	2.00	3.44	2.00	1.37	-	-	2.00	1.25-12	37,000
Y-5	J	2.25	4.00	2.50	1.75	-	-	2.50	1.50-12	59,000
Y-6	K	3.00	5.00	2.50	2.00	3.25	2.50	2.88	1.88-12	67,500
Y-7	L	3.50	5.81	3.00	2.50	4.00	2.81	3.56	2.25-12	101,250
Y-8	M	3.50	6.12	3.00	3.00	5.00	2.50	4.25	2.50-12	121,500
Y-10	P	4.50	7.62	4.00	3.50	6.12	3.50	5.00	3.25-12	189,000
Y-12	S	5.50	9.12	4.50	4.00	7.00	4.50	5.75	4.00-12	243,000

Pin



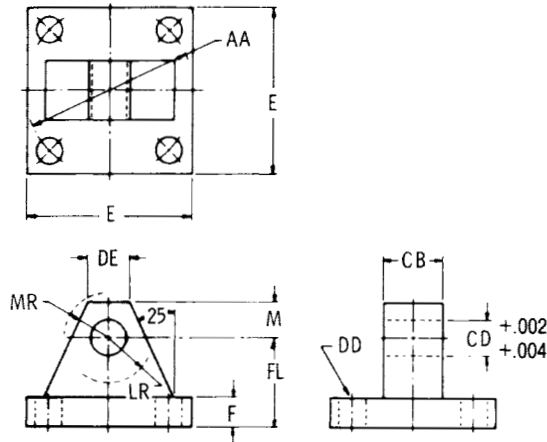
PIN ITEM NO.	LENGTH	DIAMETER	*LBS. CAPACITY
P1	2.28	.50	6,125
P2	3.09	.75	13,800
P3	3.60	1.00	24,500
P4	4.66	1.37	46,500
P5	5.66	1.75	75,150
P6	5.72	2.00	98,150
P7	6.94	2.50	153,400
P8	7.19	3.00	220,900
P10	9.31	3.50	300,650
P12	10.31	4.00	307,850

Piston Rod Stud



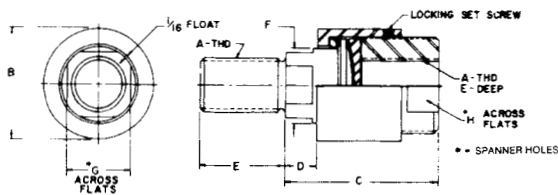
ITEM NO.	T	LENGTH
Stud 1	.44-20	1.50
Stud 2	.75-16	2.25
Stud 3	1.00-14	3.25
Stud 4	1.25-12	4.00
Stud 5	1.50-12	4.50

Brackets



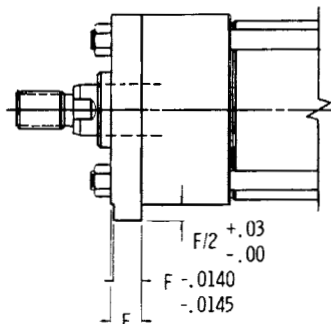
2H SERIES BORE DIA.	3L SERIES BORE DIA.	BRACKET ITEM	AA	CB	CD	DD	DE	E	F	FL	LR	M	MR	*LBS. CAPACITY
1.50	1.50, 2.00 2.50	B-1	2.30	.75	.500	.44	.56	2.50	.38	1.12	.62	.50	.62	2,500
2.00 2.50	3.25, 4.00 5.00	B-2	3.60	1.25	.750	.56	.88	3.50	.62	1.88	.88	.75	.88	6,300
3.25	6.00	B-3	4.60	1.50	1.000	.69	1.38	4.50	.75	2.25	1.25	1.00	1.25	10,000
4.00		B-4	5.40	2.00	1.375	.69	1.75	5.00	.88	3.00	1.75	1.38	1.75	19,250
5.00		B-5	7.00	2.50	1.750	.94	2.25	6.50	.88	3.12	2.12	1.75	2.12	21,200
6.00		B-6	8.10	2.50	2.000	1.06	2.56	7.50	1.00	3.50	2.38	2.00	2.38	24,500
7.00	—	B-7	9.30	3.00	2.500	1.19	3.12	8.50	1.00	4.00	2.94	2.50	2.94	25,000
8.00	—	B-8	10.60	3.00	3.000	1.31	3.25	9.50	1.00	4.25	3.19	2.75	3.19	22,500
10.00	—	B-10	13.60	4.00	3.500	1.81		12.62	1.69	7.25	3.62	3.50	3.62	58,500
12.00	—	B-12	16.19	4.50	4.000	2.06		14.88	1.94	7.75	4.12	4.00	4.12	73,250

Linear Alignment Coupler



PART NO.	A	B	C	D	E	F	G	H	MAX. PULL LOAD
S-1	7/16 - 20	1-1/4	2	1/2	3/4	5/8		13/16	2,535
S-2	3/4 - 16	1-3/4	2-5/16	1/2	1-1/8	31/32		13/16	8,750
S-3	1 - 14	2-1/2	2-15/16	17/32	1-5/8	1-11/32		1-5/8	16,125
S-4	1-1/4 - 12	2-1/2	2-15/16	17/32	1-5/8	1-11/32		1-5/8	19,600
S-5	1-1/2 - 12	3-1/4	4-3/8	7/8	2-1/4	1-31/32		1-3/4	34,000
S-6	1-7/8 - 12	3-3/4	5-5/8	1	3	2-15/32		—	41,250

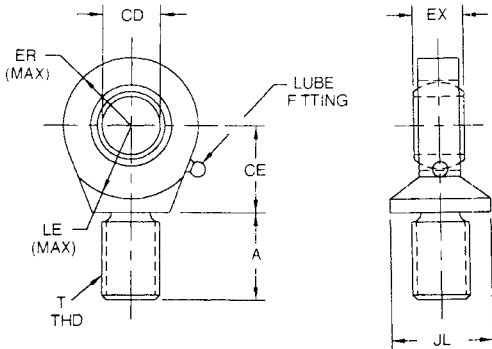
Thrust Key



Thrust keys are available on most side type mountings. Please refer to model dimension charts for F dimensions. A thrust key eliminates the need for fitted bolts or external keys. It adds extra rigidity to your cylinder mounting when the key is fitted to a keyway milled into your mounting surface.

Spherical Rod Eyes

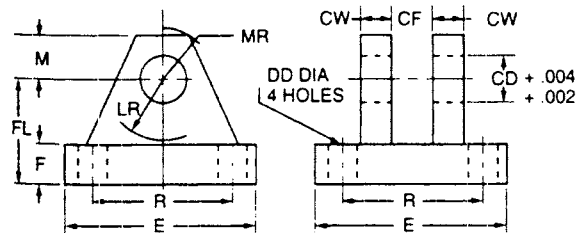
Order to fit Piston Rod thread size.



ROD EYE ITEM NO.	CD -0.0005	A	CE	EX	ER	LE	T	JL	*LBS. CAPACITY
SBY-1	0.5000	.69	.88	.44	.88	.75	.44-20	.88	2,644
SBY-2	0.7500	1.00	1.25	.66	1.25	1.06	.75-16	1.31	9,441
SBY-3	1.0000	1.50	1.88	.88	1.38	1.44	1.00-14	1.50	16,860
SBY-4	1.3750	2.00	2.13	1.19	1.81	1.88	1.25-12	2.00	28,562
SBY-5	1.7500	2.13	2.50	1.53	2.19	2.13	1.50-12	2.25	43,005
SBY-6	2.0000	2.88	2.75	1.75	2.63	2.50	1.88-12	2.75	70,193

Spherical Clevis Brackets

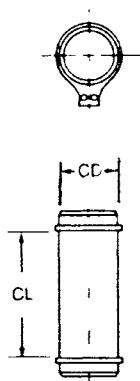
Order to fit Mounting Plate or Rod Eye.



BRACKET ITEM	E	F	M	R	CD	CF	CW	DD	FL	LR	MR	*LBS. CAPACITY
SBB-1	3.00	.50	50	2.05	0.500	.44	50	.41	1.50	.94	.62	5,770
SBB-2	3.75	.62	88	2.76	0.750	.66	66	.62	2.00	1.38	1.00	9,450
SBB-3	5.50	.75	1.00	4.10	1.000	.88	75	.53	2.50	1.69	1.19	14,300
SBB-4	6.50	.88	1.38	4.95	1.375	1.19	1.00	.66	3.50	2.44	1.62	20,322
SBB-5	8.50	1.25	1.75	6.58	1.750	1.53	1.25	.91	4.50	2.88	2.06	37,800
SBB-6	10.62	1.50	2.00	7.92	2.000	1.75	1.50	.91	5.00	3.31	2.38	50,375

Pivot Pins

Pivot Pins are furnished with two retainer rings.



PIN ITEM NO.	CD	CL	*LBS. CAPACITY
SBP-1	.4997-.0004	1.56	8,600
SBP-2	.7497-.0005	2.03	19,300
SBP-3	.9997-.0005	2.50	34,300
SBP-4	1.3746-.0006	3.31	65,000
SBP-5	1.7496-.0006	4.22	105,200
SBP-6	1.9996-.0007	4.94	137,400

*CAUTION

Accessory load rating may be lower than maximum force available from cylinder. Accessories load ratings are in pounds. Before specifying, compare maximum operating pull force in pounds developed by cylinder with load rating of accessory. Accessory load rating is the maximum recommended operating load for that accessory.

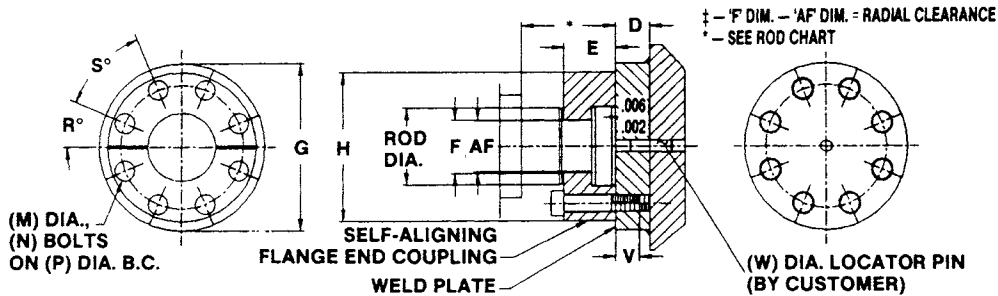
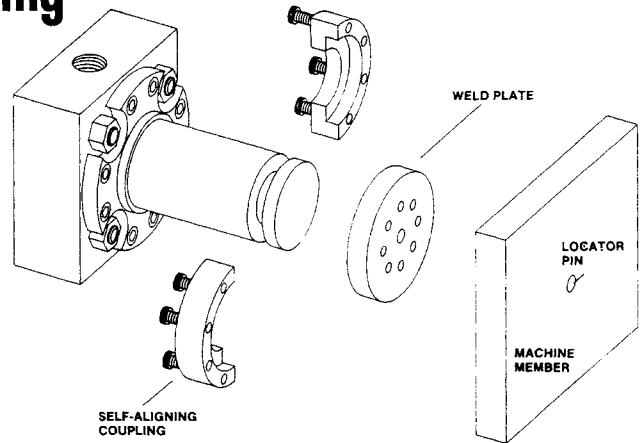
Self-Aligning Rod End Coupling

Hanna's Self-Aligning Rod End Coupling permits fast, easy assembly, disassembly, installation and servicing. Precision-machined, two-piece steel construction provides close radial alignment between piston rod end and machine member.

Allowing for radial movement increases a cylinder's seal and bearing life by eliminating much of the side load. High-tensile alloy steel, socket head cap screws and all-steel construction are designed to take full cylinder load with a factor of safety.

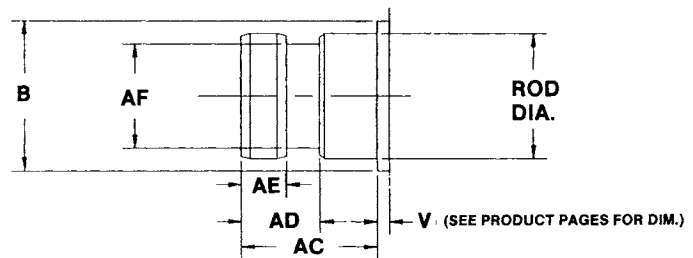
The Self-Aligning Rod End Coupling is used in conjunction with Hanna's RC rod end.

A Weld Plate is an accessory for use with the Self-Aligning Rod End Coupling. It eliminates lay-out, drilling and tapping each hole to match the coupling on your machine. The hole in the center of the Weld Plate is accurately drilled for a locating pin for fast, close positioning to the machine prior to welding.



COUPLING NO.	ROD DIA MM	AF †	E	F †	H	M	N	P	R	S	V	WELD PLATE NO.	D	G	W PIN DIA.	BOLT TORQUE FT./LB.
CP-062	62	38	44	41	1.50	10-24	4	1.12	45	90	44	WP-062	50	2.00	25	5
CP-100	100	69	62	75	2.00	250-20	6	1.50	30	60	38	WP-100	50	2.50	.25	13
CP-138	128	88	69	94	2.50	312-18	6	2.00	30	60	56	WP-138	62	3.00	25	25
CP-175	175	112	88	119	3.00	.375-16	8	2.38	22.5	45	62	WP-175	75	3.50	25	45
CP-200	200	1.38	1.25	1.44	3.50	.375-16	12	2.69	15	30	.75	WP-200	88	4.00	38	45
CP-250	2.50	1.75	1.38	1.88	4.25	500-13	8	3.44	22.5	45	.88	WP-250	1.00	5.00	38	80
CP-300	3.00	2.25	1.88	2.38	5.00	500-13	12	4.00	15	30	.88	WP-300	1.00	5.50	38	80
CP-350	3.50	2.50	2.00	2.62	5.88	625-11	12	4.69	15	30	1.00	WP-350	1.12	6.50	38	200
CP-400	4.00	3.00	2.00	3.12	6.38	625-11	12	5.19	15	30	1.00	WP-400	1.12	7.00	38	200
CP-450	4.50	3.50	2.39	3.62	6.88	750-10	8	5.69	22.5	45	1.12	WP-450	1.25	7.50	38	350
CP-500	5.00	3.88	2.50	4.00	7.38	625-11	12	6.19	15	30	1.00	WP-500	1.38	8.00	.38	200
CP-550	5.50	4.38	3.12	4.50	8.25	750-10	12	6.88	15	30	1.38	WP-550	1.50	9.00	38	350
CP-700	7.00	5.75	4.00	5.94	10.38	1000-8	12	8.75	15	30	1.50	WP-700	1.75	11.00	50	1090
CP-800	8.00	6.50	4.00	6.69	11.38	1000-8	16	9.75	11.25	22.5	1.50	WP-800	2.00	12.00	50	1090
CP-900	9.00	7.25	4.00	7.50	12.12	1,250-7	12	11.12	15	30	2.00	WP-900	2.25	14.00	50	2180
CP-1000	10.00	8.00	4.50	8.25	14.12	1,250-7	16	12.12	11.25	22.5	2.00	WP-1000	2.50	15.00	50	2180
CP-1200	12.00	10.00	5.12	10.25	16.25	1,250-7	20	14.62	18	16	2.00	WP-1200	2.50	18.00	50	2180

ROD STYLE	ROD CODE	ROD DIA. MM	AC	AD	AE	AF DIA.	B DIA. -0.001 -0.003
RC-062	D	62	1.12	62	25	38	1.12
RC-100	F	100	1.62	94	38	69	1.50
RC-138	G	138	2.25	106	38	88	2.00
RC-175	H	175	2.75	131	50	112	2.38
RC-200	J	200	3.12	169	.62	1.38	2.62
RC-250	K	2.50	4.00	1.94	.75	1.75	3.12
RC-300	L	3.00	4.50	2.44	.88	2.25	3.75
RC-350	M	3.50	4.50	2.69	1.00	2.50	4.25
RC-400	N	4.00	5.00	2.99	1.00	3.00	4.75
RC-450	P	4.50	5.50	3.19	1.50	3.50	5.25
RC-500	R	5.00	6.00	3.19	1.50	3.88	5.75
RC-550	S	5.50	6.50	3.94	1.88	4.38	6.25
RC-700	T	7.00	6.50	4.06	2.00	5.75	8.00
RC-800	U	8.00	6.50	4.06	2.00	6.50	9.00
RC-900	Z	9.00	6.75	4.12	2.00	7.25	10.00
RC-1000	V	10.00	7.25	4.62	2.38	8.00	11.00
RC-1200	W	12.00	7.75	5.12	2.88	10.00	13.00



OPTIONS

Hanna offers a wide variety of modifications and options to our Standard 2H and 3L Product Lines.
Please contact your local authorized Distributor for more information.

SERIES 2H

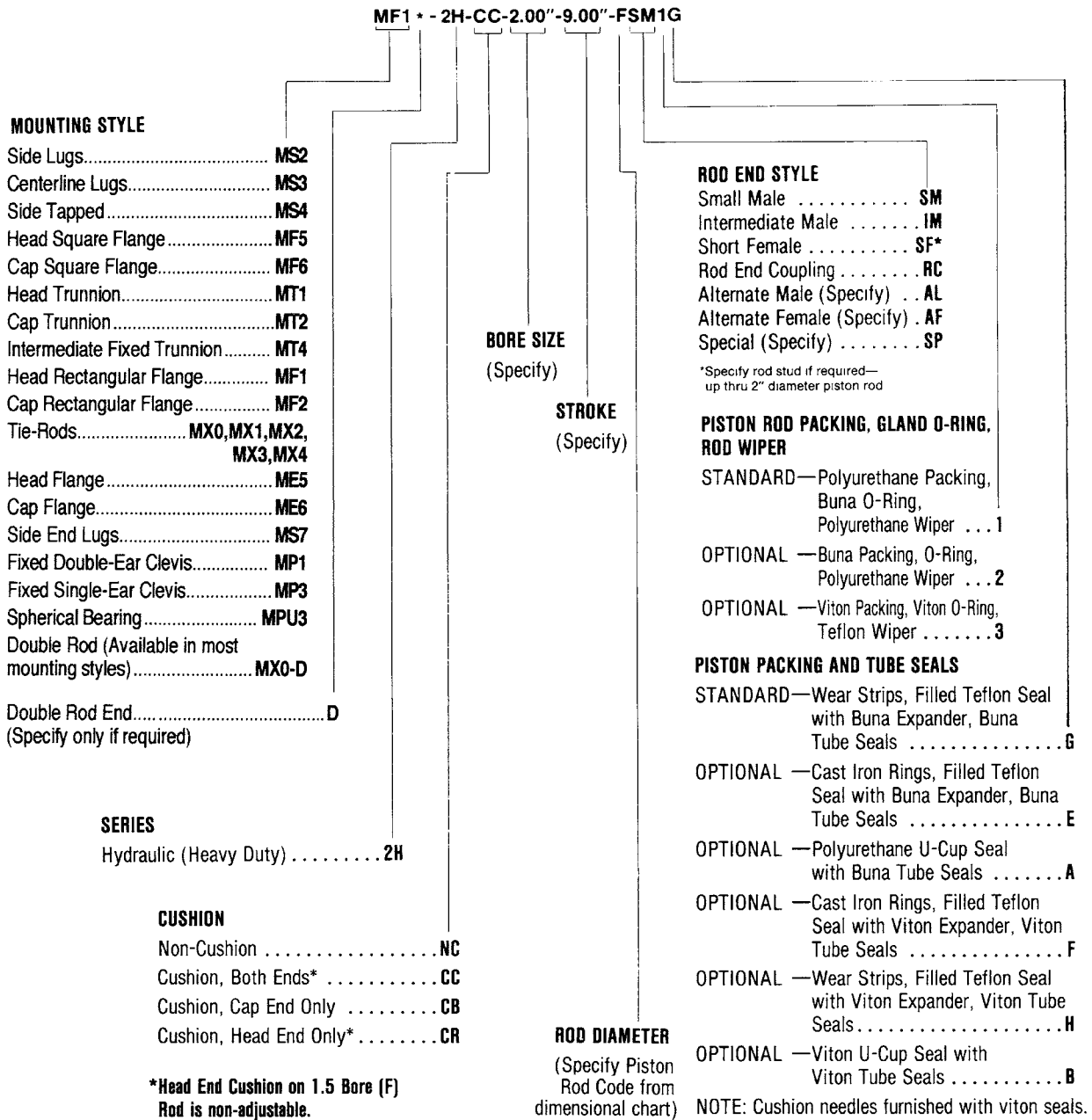
Stroke Adjustable Cylinders
Drain Glands
Metallic Rod Scrapers
S.A.E. Flange Fitted Ports
Super Cushions
Spring Return Cylinders
Heavy Duty Air Cylinders
Stainless Steel Piston Rods
Air Bleeds
Epoxy Painting
Rod Boots
Heavy Chrome Plated Piston Rods
Intermediate Center Supports
Tightened Stroke Tolerance
Full Face Retainer Plates
MS1 Mount
Tandem Mounted Cylinders

SERIES 3L

Stroke Adjustable Cylinders
Drain Glands
Metallic Rod Scrapers
S.A.E. Flange Fitted Ports
Super Cushions
Water Service Cylinders
Spring Return Cylinders
Stainless Steel Piston Rods
Air Bleeds
Epoxy Painting
Rod Boots
Heavy Chrome Plated Piston Rods
Intermediate Center Supports
Tightened Stroke Tolerance
Full Face Retainer Plates
MS1 Mount
Tandem Mounted Cylinders

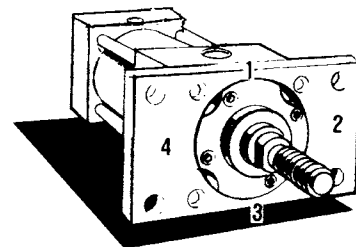
Contact factory for other special options.

HOW TO ORDER



When ordering a stop tube, specify actual (working) stroke and nominal stroke. State length of stop tube.

NPTF ports will be furnished as standard unless SAE straight thread ports are specified.



Port location: if other than position 1, must be specified. Mounting accessories must be specified if required.

