

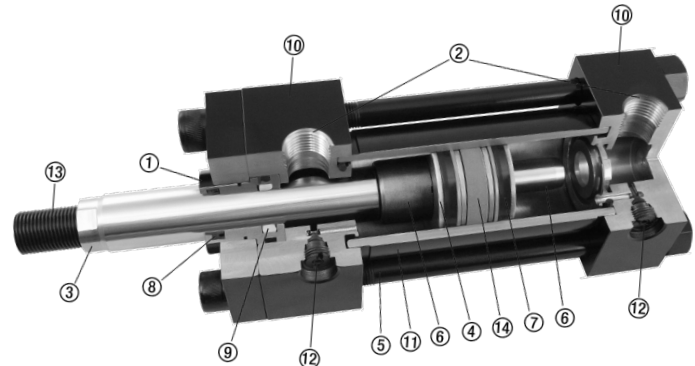
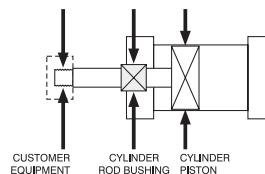
HH Series High Pressure Hydraulics

Features & Benefits

Floating Rod Bushing

Self Alignment Feature: Rod bushing is designed to float .002" to improve bearing surface alignment.

- Reduces cylinder drag and erratic operation
- Reduces cylinder wear
- Provides a minimum of 25% longer life than fixed rod bushing designs.



- 1. Floating Rod Bushing** – Precision machined from 150,000 PSI rated graphite filled ductile iron and PTFE coated to reduce friction and extend cycle life. Bushing design traps lubrication in effective bearing area. Bronze bushings also available.
- 2. Ports** – NPTF and SAE ports available standard. Non-standard locations, sizes and other port styles can be made-to-order to fit any application needs.
- 3. Piston Rod** – Steel piston rod provides high strength and damage resistance. Induction hardened and chrome plated for maximum wear resistance and long life (100K min. yield up to 5" rod; 75K min. yield for 5 1/2" rod).
- 4. Piston** – Precision machined ductile iron provides high strength and an excellent bearing surface for extended cylinder life.
Piston Lock Screw (PLS) – Former option but now standard on all hydraulic cylinders. 100% securely fastened to piston rod by thread lock, Dutch (Skotch) key and staking.
- 5. Tie Rods** – Pre-stressed, high carbon steel tie rod construction eliminates axial loading of cylinder tube and maintains compression on tube (100K min. yield).
- 6. Cushion** – Precision machined cushions are available at either end and provide smooth deceleration, which helps reduce end of stroke shock.
- 7. Piston Seals** – Heavy lip design, Carboxilated Nitrile seals with back-up rings are pressure activated and wear compensating for extended life. Cast ring, EP, PTFE and fluorocarbon designs available.
- 8. Rod Wiper** – Flocked nitrile wiper removes contaminants on retract stroke, helping ensure long life for all internal components.
- 9. Rod Seals** – Polyurethane seals offer high abrasion resistance and strength. Pressure activated double lip and wear compensating for extended life.
- 10. Head & Cap** – Precision machined steel head and cap are held to tight tolerances and ensure accurate alignment for a truly square cylinder.
- 11. Tube** – Precision machined steel tube with hard chrome I.D. is honed and micro finished for extended seal life and improved cycle rates.
- 12. Cushion Adjustment Needle** – Adjustable steel needle design has fine thread metering and is positively captured to prevent needle ejection during adjustment.
- 13. Piston Rod Stud** – Standard on KK1 and KK2 threads for .625" - 2.00" rods (125K min. yield). Available up to two times standard "A" thread length.
- 14. Wear Band** – Wear Guard; Glass Reinforced Nylon (standard). PTFE for E and V seal option.
Finish – Black urethane paint.

Operating Pressure

3000 PSI HYD (207 BAR)

Refer to mount section for specific PSI rating by bore size and mount.

Performance Options

RLH – Rod locks are used to hold linear cylinder loads stationary in any mounting orientation during power off condition (see HH Series with Rod Lock section for more information).

ST – Stop tubes are used to reduce rod bearing and piston stress (refer to HH Options for cylinder design guidance).

Operating Temperature

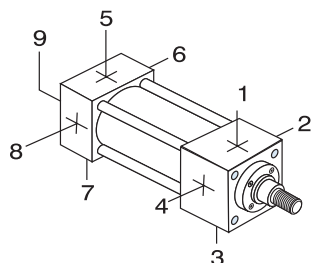
Standard Seals:	-20°F to 200°F (-29°C to 93°C)
Fluorocarbon Seals:	0°F to 400°F (-18°C to 204°C)
Ethylene Propylene Seals:	-50°F to 300°F (-45°C to 149°C)

CS – Center supports are recommended for cylinders with long strokes in horizontal applications to prevent buckling of the cylinder and extend cylinder life.

SSR – 17-4 Chrome Plated Stainless Steel Piston Rod provide corrosion resistance in outdoor applications and wet environments (100K min. yield up to 5" rod; 75K min. yield 5 1/2" rod).

Technical Data

Port Locations



Note: Location 9 is center of cap face.

For complex port designs, multiple port locations & sizes can be ordered.
Call out locations and sizes for all sets using the following format.

Example: -P15=N375 -P26=N500

(3/8" NPTF Ports at 1 & 5 and 1/2" NPTF Ports at 2 & 6)

BSPP & BSPT ports also available.

Maximum Stroke Recommendations

Bore	No Center Support	With Center Supports (CS Options)	
		One Support	Two Supports
1.50"	44 inches	Strokes over 44 inches	Strokes over 89 inches
2.00"	74 inches	Strokes over 74 inches	Strokes over 99 inches
2.50"	84 inches	Strokes over 84 inches	Not required
3.25" - 8.00"	99 inches	Strokes over 99 inches	Not required

Force Chart

Bore	Rod Dia. (MM)	Effective Piston Area	Pounds of Force at PSI										Displacement per Inches of Stroke (gallons)
			100	150	200	250	500	1000	1500	2000	2500	3000	
1.50	Extend	1.77	177	265	353	442	884	1767	2651	3534	4418	5301	.00765
	0.625	1.46	146	219	292	365	730	1460	2191	2921	3651	4381	.00635
	1.000	0.98	98	147	196	245	491	982	1473	1964	2454	2945	.00425
2.00	Extend	3.14	314	471	628	785	1571	3142	4712	6283	7854	9425	.0136
	1.000	2.36	236	353	471	589	1178	2356	3534	4712	5891	7069	.0102
	1.375	1.66	166	249	331	414	828	1657	2485	3313	4142	4970	.0071
2.50	Extend	4.91	491	736	982	1227	2454	4909	7363	9818	12272	14726	.0213
	1.000	4.12	412	619	825	1031	2062	4123	6185	8247	10308	12370	.0179
	1.375	3.42	342	514	685	856	1712	3424	5136	6848	8560	10272	.0148
	1.750	2.50	250	376	501	626	1252	2503	3755	5007	6259	7510	.0109
3.25	Extend	8.30	830	1244	1659	2074	4148	8296	12444	16592	20739	24887	.0359
	1.375	6.81	681	1022	1362	1703	3405	6811	10216	13622	17027	20433	.0294
	1.750	5.89	589	884	1178	1473	2945	5891	8836	11781	14726	17672	.0255
	2.000	5.15	515	773	1031	1289	2577	5154	7731	10308	12885	15463	.0223
4.00	Extend	12.57	1257	1885	2513	3142	6283	12566	18850	25133	31416	37699	.0544
	1.750	10.16	1016	1524	2032	2540	5081	10161	15242	20322	25403	30483	.0440
	2.000	9.42	942	1414	1885	2356	4712	9425	14137	18850	23562	28274	.0408
	2.500	7.66	766	1149	1532	1914	3829	7658	11486	15315	19144	22973	.0331
5.00	Extend	19.64	1964	2945	3927	4909	9818	19635	29453	39270	49088	58905	.0850
	2.000	16.49	1649	2474	3299	4123	8247	16493	24740	32987	41234	49480	.0714
	2.500	14.73	1473	2209	2945	3682	7363	14726	22089	29453	36816	44179	.0637
	3.000	12.57	1257	1885	2513	3142	6283	12566	18850	25133	31416	37699	.0544
	3.500	10.02	1002	1503	2004	2505	5009	10019	15028	20038	25047	30056	.0434
6.00	Extend	28.27	2827	4241	5655	7069	14137	28274	42412	56549	70686	84823	.1224
	2.500	23.37	2337	3505	4673	5841	11683	23366	35048	46731	58414	70097	.1011
	3.000	21.21	2121	3181	4241	5301	10603	21206	31809	42412	53015	63617	.0918
	3.500	18.65	1865	2798	3730	4663	9325	18650	27975	37300	46625	55950	.0808
	4.000	15.70	1570	2355	3140	3925	7850	15700	23550	31400	39250	47100	.0680
7.00	Extend	38.48	3848	5773	7697	9621	19242	38485	57727	76969	96211	115454	.1666
	3.000	31.42	3142	4712	6283	7854	15708	31416	47124	62832	78540	94248	.1360
	3.500	28.86	2886	4330	5773	7216	14432	28863	43295	57727	72158	86590	.1249
	4.000	25.92	2592	3888	5184	6480	12959	25918	38877	51836	64795	77754	.1122
	4.500	22.58	2258	3387	4516	5645	11290	22580	33870	45160	56450	67741	.0977
8.00	Extend	50.27	5027	7540	10053	12566	25133	50266	75398	100531	125664	150797	.2176
	3.500	40.64	4064	6097	8129	10161	20322	40644	60967	81289	101611	121933	.1760
	4.000	37.70	3770	5655	7540	9425	18850	37699	56549	75398	94248	113098	.1632
	4.500	34.36	3436	5154	6872	8590	17181	34361	51542	68723	85903	103084	.1488
	5.000	30.63	3063	4595	6126	7658	15315	30631	45946	61261	76577	91892	.1326
8.00	5.500	26.51	2651	3976	5301	6627	13254	26507	39761	53015	66268	79522	.1148

Note: Theoretical force. Actual force will be reduced by friction.

Cylinder Torque Charts

Tie Rod Torque Specs		
Bore	Tie Rod Size	Torque (ft-lbs)
1.50	.375 Diameter	25 ft-lbs
2.00	.500 Diameter	50 ft-lbs
2.50	.500 Diameter	50 ft-lbs
3.25	.625 Diameter	120 ft-lbs
4.00	.625 Diameter	130 ft-lbs
5.00	.875 Diameter	300 ft-lbs
6.00	1.000 Diameter	450 ft-lbs
7.00	1.125 Diameter	675 ft-lbs
8.00	1.250 Diameter	900 ft-lbs

Bushings Retainer Hex Head Screws Torque Specs	
Hex Head Screw Size	Torque (ft-lbs)
3/8-24	30 ft-lbs
1/2-20	40 ft-lbs
5/8-18	50 ft-lbs
7/8-14	90 ft-lbs
1-14	125 ft-lbs

Bushings Retainer Screws Torque Specs	
SHCS Size	Torque (ft-lbs)
1/4-28	15 ft-lbs
5/16-24	20 ft-lbs
3/8-24	30 ft-lbs
7/16-20	40 ft-lbs

All Torque Specs are based upon using anti-seize thread lubricant.

IMI Bimba Spec: LPS Premium Copper Anti-Seize

Temperature Rating: -65°F to 1800°F

Military Spec: MIL-PRF-907-E

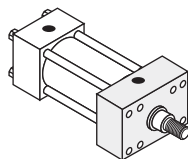
Torque Tolerance: -0% to +5%

Cylinder Weight Chart (in lbs.)

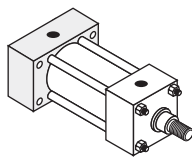
Bore	Rod Dia. (MM)	Mount													Add per Inch of Stroke
		MX0 MS4	ME5	ME6	MF1	MF2	MF5	MF6	MP1	MS2 MS3 MS7	MT1 MT2	MT4	MX1 MX2 MX3	SB	
1.50	0.625	7.3	9.5	9.2	7.9	8.5	8.7	9.2	7.7	7.6	7.8	10.4	7.5	7.6	0.47
	1.000	7.5	9.6	9.3	8.1	8.6	8.9	9.4	7.8	7.7	7.9	10.6	7.6	7.7	0.61
2.00	1.000	11.5	14.6	14.2	12.9	14.2	14.9	16.1	12.6	12.2	12.6	16.0	11.8	12.3	0.78
	1.375	11.6	14.8	14.3	13.3	14.3	15.2	16.2	12.7	12.3	12.8	16.1	11.9	12.5	0.98
2.50	1.000	15.2	18.9	18.4	18.1	18.7	20.2	20.8	16.3	17.0	16.4	20.2	15.6	16.1	1.02
	1.375	16.5	20.1	19.6	18.3	19.9	20.5	22.1	17.6	18.2	17.6	21.4	16.8	17.3	1.22
	1.750	17.1	20.8	20.3	19.2	20.6	21.3	22.7	18.2	18.8	18.2	22.0	17.4	18.0	1.48
3.25	1.375	28.7	35.4	34.6	34.4	35.5	38.4	39.5	30.7	30.5	31.1	39.0	29.4	30.4	1.50
	1.750	31.8	38.5	37.6	35.2	38.6	39.2	42.6	33.8	33.5	34.2	42.1	32.5	33.5	1.76
	2.000	32.4	39.1	38.2	36.0	39.2	40.0	43.2	34.4	34.1	34.8	42.7	33.1	34.1	1.97
4.00	1.750	39.9	47.3	46.4	47.5	49.3	52.4	54.3	45.1	43.4	42.2	49.3	40.6	44.7	2.44
	2.000	41.0	48.4	47.5	48.3	50.4	53.2	55.4	46.3	44.6	43.4	50.5	41.7	45.9	2.65
	2.500	45.7	53.2	52.3	50.9	55.2	55.9	60.1	51.0	49.3	48.1	55.2	46.5	50.6	3.15
5.00	2.000	70.4	82.3	80.8	83.9	86.1	91.7	93.9	78.3	73.9	72.8	88.7	72.5	79.1	4.01
	2.500	73.1	85.0	83.6	86.5	88.8	94.4	96.6	81.0	76.7	75.5	91.4	75.3	81.8	4.51
	3.000	76.3	88.3	86.8	89.4	92.0	97.3	99.9	84.3	79.9	78.7	94.6	78.5	85.1	5.13
	3.500	83.6	95.6	94.1	92.4	99.3	100.2	107.2	91.6	87.2	86.0	101.9	85.8	92.4	5.85
6.00	2.500	111.9	129.8	129.8	130.5	132.7	140.9	143.2	121.7	118.8	115.4	145.9	115.1	122.7	5.17
	3.000	115.0	132.9	132.9	133.3	135.9	143.7	146.4	124.9	121.9	118.6	149.0	118.2	125.8	5.78
	3.500	118.0	135.9	135.9	136.2	138.9	146.7	149.3	127.9	124.9	121.5	152.0	121.2	128.8	6.50
	4.000	124.0	141.9	141.9	141.3	144.9	151.7	155.4	133.9	131.0	127.6	158.1	127.3	134.9	7.33
7.00	3.000	167.5	194.8	194.8	191.4	194.0	204.3	206.9	184.8	179.0	174.4	214.5	172.1	—	6.46
	3.500	170.3	197.6	197.6	194.3	196.9	207.2	209.8	187.7	181.9	177.3	217.4	175.0	—	7.18
	4.000	176.8	204.1	204.1	203.0	207.2	217.8	222.0	194.2	188.4	183.8	223.9	181.5	—	8.02
	4.500	184.4	211.7	211.7	209.6	214.7	224.3	229.5	201.7	195.9	191.3	231.4	189.0	—	8.96
	5.000	191.7	219.0	219.0	217.7	222.1	232.5	236.8	209.1	203.3	198.7	238.8	196.4	—	10.02
8.00	3.500	232.6	268.9	268.9	262.9	265.6	278.5	281.2	251.2	244.2	244.6	309.6	238.9	—	7.89
	4.000	239.1	275.4	275.4	272.5	276.7	290.4	294.6	257.6	250.7	251.1	316.1	245.3	—	8.72
	4.500	246.6	282.9	282.9	279.0	284.2	296.9	302.0	265.1	258.1	258.6	323.6	252.8	—	9.67
	5.000	255.1	291.4	291.4	287.2	292.7	305.0	310.6	273.7	266.7	267.1	332.1	261.4	—	10.72
	5.500	266.3	302.6	302.6	297.1	304.0	314.9	321.8	284.9	277.9	278.3	343.4	272.6	—	11.89

Note: Add 20% to mount and stroke weight for double rod end cylinders. Add 1% for cushions.

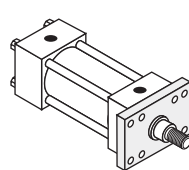
NFPA Mounting Styles



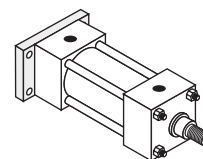
ME5
1.50"-8.00" Bores



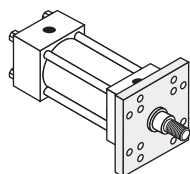
ME6
1.50"-8.00" Bores



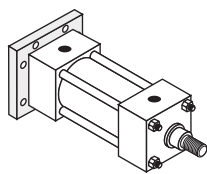
MF1
1.50"-8.00" Bores



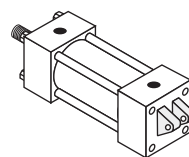
MF2
1.50"-8.00" Bores



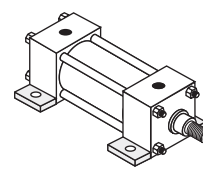
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1.50"-8.00" Bores



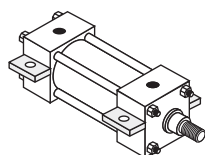
MF6
1.50"-8.00" Bores



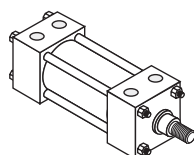
MP1
1.50"-8.00" Bores



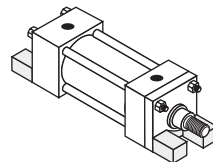
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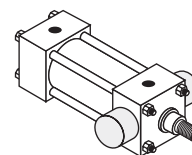
MS3
1.50"-8.00" Bores



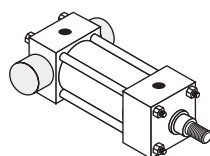
MS4
1.50"-8.00" Bores



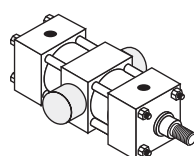
MS7
1.50"-6.00" Bores



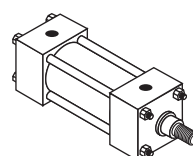
MT1
1.50"-8.00" Bores



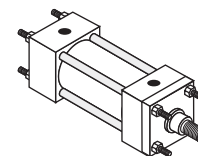
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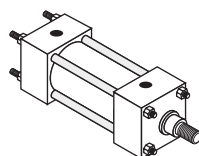
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1.50"-8.00" Bores



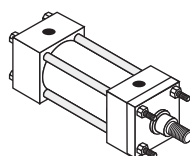
MX0
1.50"-8.00" Bores



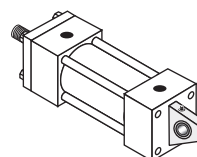
MX1
1.50"-8.00" Bores



MX2
1.50"-8.00" Bores

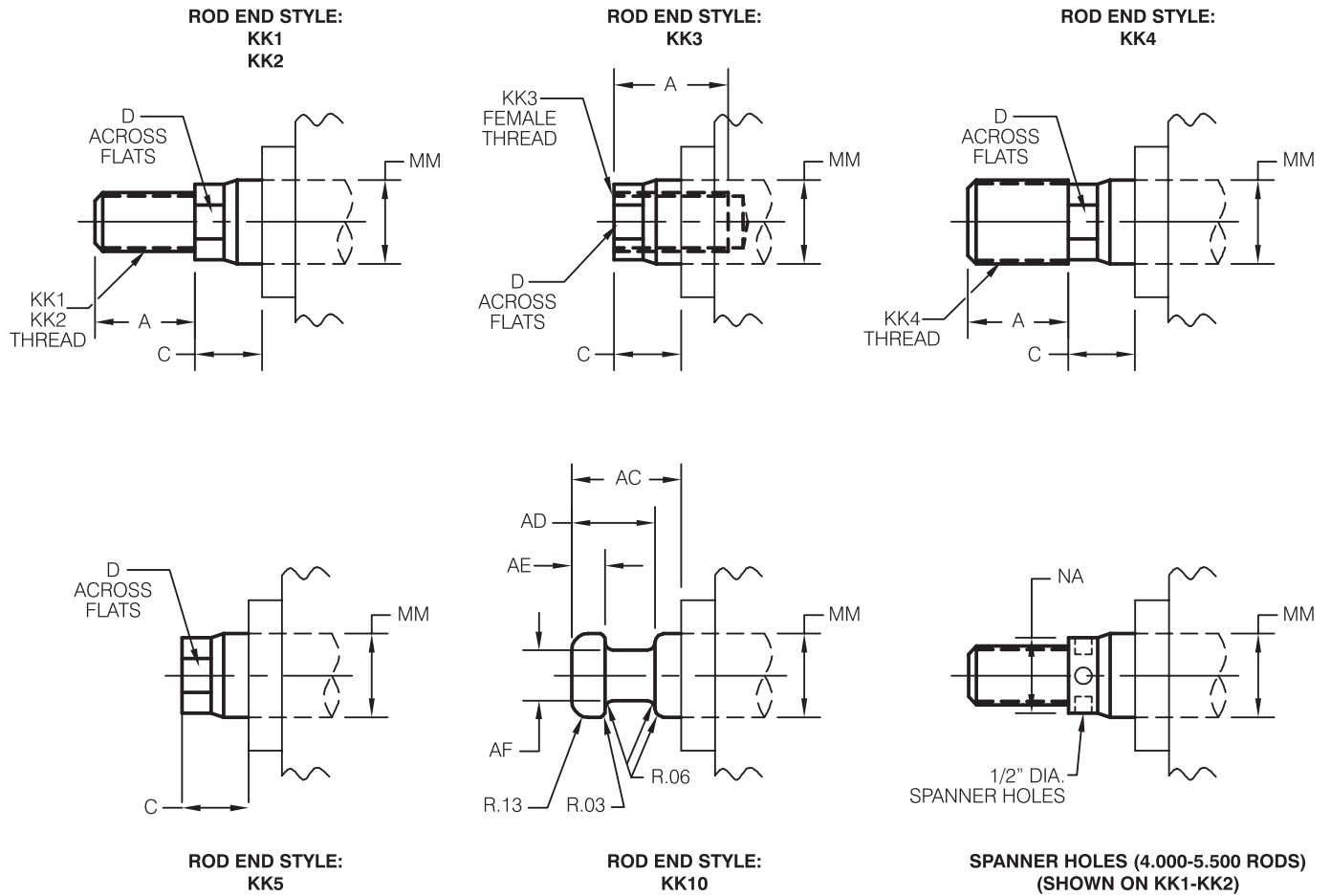


MX3
1.50"-8.00" Bores



SB
1.50"-6.00" Bores

Dimensions – Threads



Rod Dia. (MM)	A	C	D	AC	AD	AE	AF	KK1	KK2	KK3	KK4	NA ±.002
0.625	0.750	0.375	0.500	1.125	0.625	0.250	0.375	7/16- 20*	1/2 - 20*	7/16- 20	5/8 - 18	—
1.000	1.125	0.500	0.875	1.625	0.938	0.375	0.688	3/4- 16*	7/8 - 14*	3/4 - 16	1- 14	—
1.375	1.625	0.625	1.125	1.750	1.063	0.375	0.875	1- 14*	1 1/4- 12*	1- 14	1 3/8 - 12	—
1.750	2.000	0.750	1.500	2.000	1.313	0.500	1.125	1 1/4- 12*	1 1/2 - 12*	1 1/4- 12	1 3/4 - 12	—
2.000	2.250	0.875	1.750	2.625	1.688	0.625	1.375	1 1/2 - 12*	1 3/4- 12*	1 1/2 - 12	2 - 12	—
2.500	3.000	1.000	2.125	3.250	1.938	0.750	1.750	1 7/8 - 12	2 1/4 - 12	1 7/8 - 12	2 1/2 - 12	—
3.000	3.500	1.000	2.625	3.625	2.438	0.875	2.250	2 1/4 - 12	2 3/4 - 12	2 1/4 - 12	3 - 12	—
3.500	3.500	1.000	3.000	4.375	2.688	1.000	2.500	2 1/2 - 12	3 1/4 - 12	2 1/2 - 12	3 1/2 - 12	—
4.000	4.000	1.000	—	4.500	2.688	1.000	3.000	3 - 12	3 3/4 - 12	3 - 12	4 - 12	3.875
4.500	4.500	1.000	—	5.250	3.188	1.500	3.500	3 1/4 - 12	4 1/4 - 12	3 1/4 - 12	4 1/2 - 12	4.375
5.000	5.000	1.000	—	5.375	3.188	1.500	3.875	3 1/2 - 12	4 3/4 - 12	3 1/2 - 12	5 - 12	4.875
5.500	5.500	1.000	—	6.250	3.938	1.875	4.375	4- 12	5 1/4 - 12	4- 12	5 1/2 - 12	5.375

*Studded rod end.

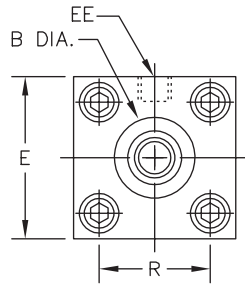
(4) wrench flats are an option.

Note: Rods larger than 3.50" dia. utilize (4) 0.500" dia. spanner holes 0.500" deep.

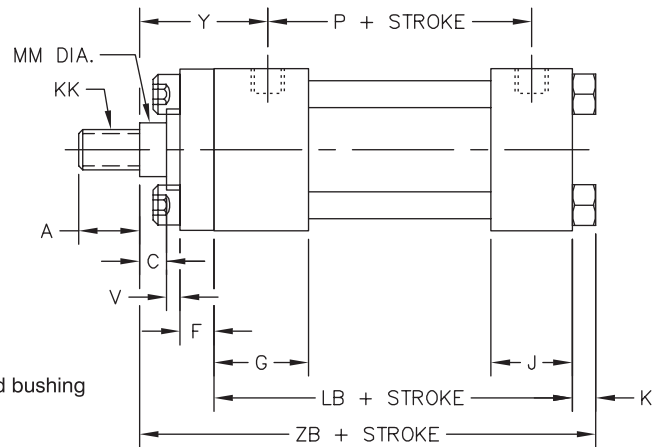
Dimensions – Basic Cylinder (MX0 Mount)

Square Retainer Construction

Full Square Retainer Used On	
Bore	Rod Diameter
1.50	0.625
1.50	1.000
2.00	1.000
2.00	1.375
2.50	1.375
2.50	1.750
3.25	1.750
3.25	2.000
4.00	2.500
5.00	3.500

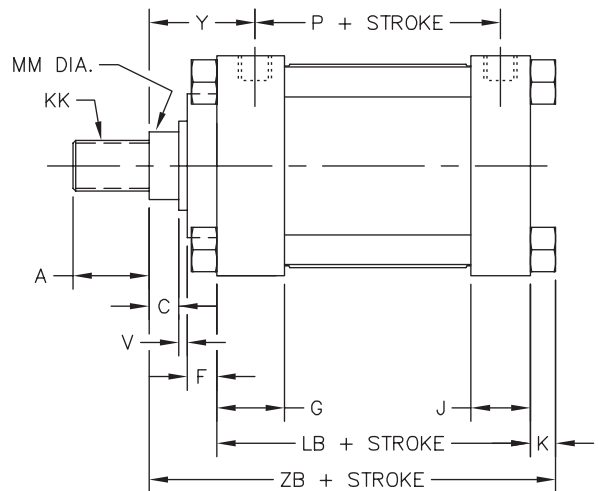
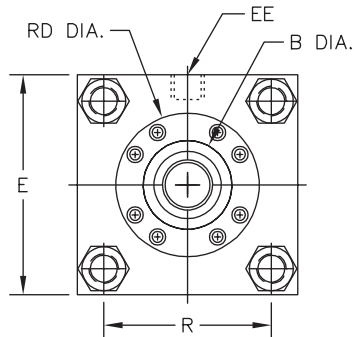


Note: Full square retainer is removable to service rod bushing



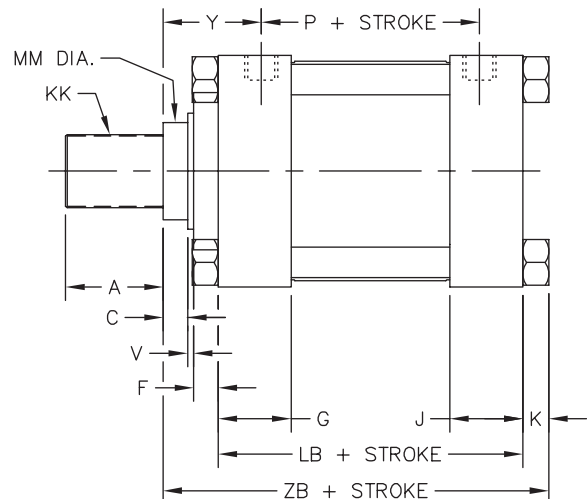
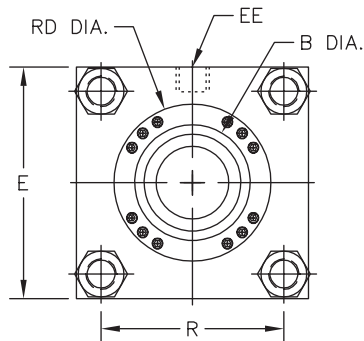
Round Retainer Construction

Round Retainer Used On	
Bore	Rod Diameter
2.50	1.000
3.25	1.375
4.00	1.750
4.00	2.000
5.00	2.000
5.00	2.500
6.00	2.500

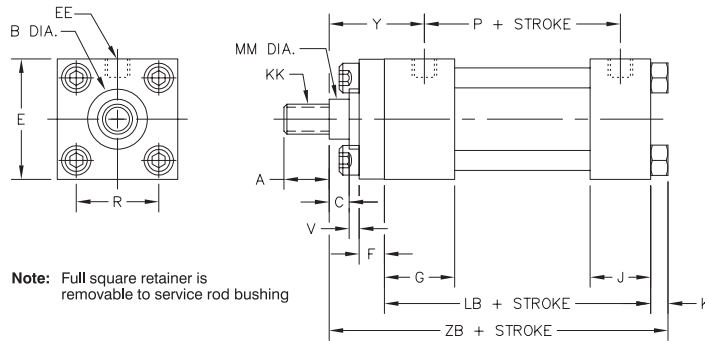


Large Round Retainer Construction

Large Round Retainer Used On	
Bore	Rod Diameter
5.00	3.000
6.00	3.000
6.00	3.500
6.00	4.000
7.00	3.000
7.00	3.500
7.00	4.000
7.00	4.500
7.00	5.000
8.00	3.500
8.00	4.000
8.00	4.500
8.00	5.000
8.00	5.500



Dimensions – Basic Cylinder (MX0 Mount)



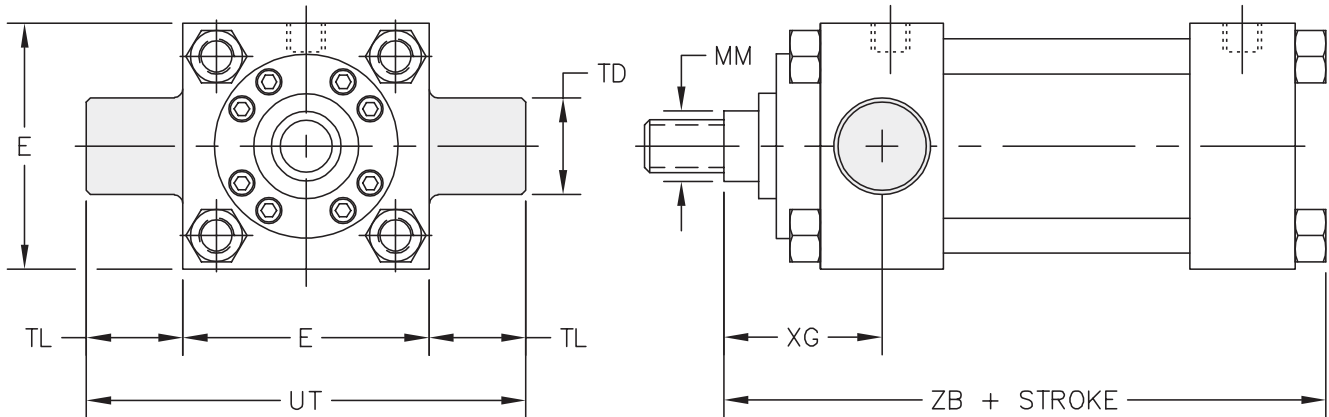
Bore	Rod Dia. (MM)	Max PSI Rating ¹	E	A	B ²	C	EE ³		F	G	J	K	KK	R	RD ⁴	V	Y	Add to Stroke			
							NPTF	SAE										LB	P	ZB	
1.50	0.625	3000	2.500	0.750	1.124	0.375	1/2	10	0.375	1.750	1.500	0.375		1.625	—	0.250	2.000	4.625	2.938	6.000	
	1.000			1.125	1.499	0.500									—	0.500	2.375				6.375
2.00	1.000	3000	3.000	1.125	1.499	0.500	1/2	10	0.625	1.750	1.500	0.500		2.050	—	0.250	2.375	4.625	2.938	6.500	
	1.375			1.625	1.999	0.625									—	0.375	2.625				6.750
2.50	1.000	3000	3.500	1.125	1.499	0.500	1/2	10	0.625	1.750	1.500	0.500		2.550	2.625	0.250	2.375	4.750	3.063	6.625	
	1.375			1.625	1.999	0.625									—	0.375	2.625				6.875
	1.750			2.000	2.374	0.750									—	0.500	2.875				7.125
3.25	1.375	3000	4.500	1.625	1.999	0.625	3/4	12	0.750	2.000	1.750	0.625		3.250	3.250	0.250	2.750	5.500	3.500	7.750	
	1.750			2.000	2.374	0.750									—	0.375	3.000				8.000
	2.000			2.250	2.624	0.875									—	0.375	3.125				8.125
4.00	1.750	3000	5.000	2.000	2.374	0.750	3/4	12	0.875	2.000	1.750	0.625		3.820	3.875	0.250	2.938	5.750	3.875	8.250	
	2.000			2.250	2.624	0.875									4.250	0.250	3.063				8.375
	2.500			3.000	3.124	1.000									—	0.375	3.313				8.625
5.00	2.000	3000	6.500	2.250	2.624	0.875	3/4	12	0.875	2.000	1.750	0.875		4.950	4.250	0.250	3.125	6.250	4.250	9.125	
	2.500			3.000	3.124	1.000									4.625	0.375	3.375				9.375
	3.000			3.500	3.749	1.000									5.250	0.375	3.375				9.375
	3.500			3.500	4.249	1.000									—	0.375	3.375				9.375
6.00	2.500	3000	7.500	3.000	3.124	1.000	1	16	0.875	2.250	2.250	1.000		5.730	4.625	0.375	3.500	7.375	5.000	10.625	
	3.000			3.500	3.749				0.875						5.250	0.375					
	3.500			3.500	4.249				0.875						5.625	0.375					
	4.000			4.000	4.749				1.000						6.438	0.250					
7.00	3.000	3000	8.500	3.500	3.749	1.000	11/4	20	0.875	2.750	2.750	1.125		6.580	5.250	0.375	3.750	8.500	5.750	11.875	
	3.500			3.500	4.249				0.875						5.625	0.375					
	4.000			4.000	4.749				1.000						6.438	0.250					
	4.500			4.500	5.249				1.000						7.125	0.250					
	5.000			5.000	5.749				1.000						7.250	0.250					
8.00	3.500	3000	9.500	3.500	4.249	1.000	11/2	24	0.875	3.000	3.000	1.250		7.500	5.625	0.375	3.938	9.500	6.313	13.000	
	4.000			4.000	4.749				1.000						6.438	0.250					
	4.500			4.500	5.249				1.000						7.125	0.250					
	5.000			5.000	5.749				1.000						7.625	0.250					
	5.500			5.500	6.249				1.000						8.375	0.250					

See rod end detail chart on page 71

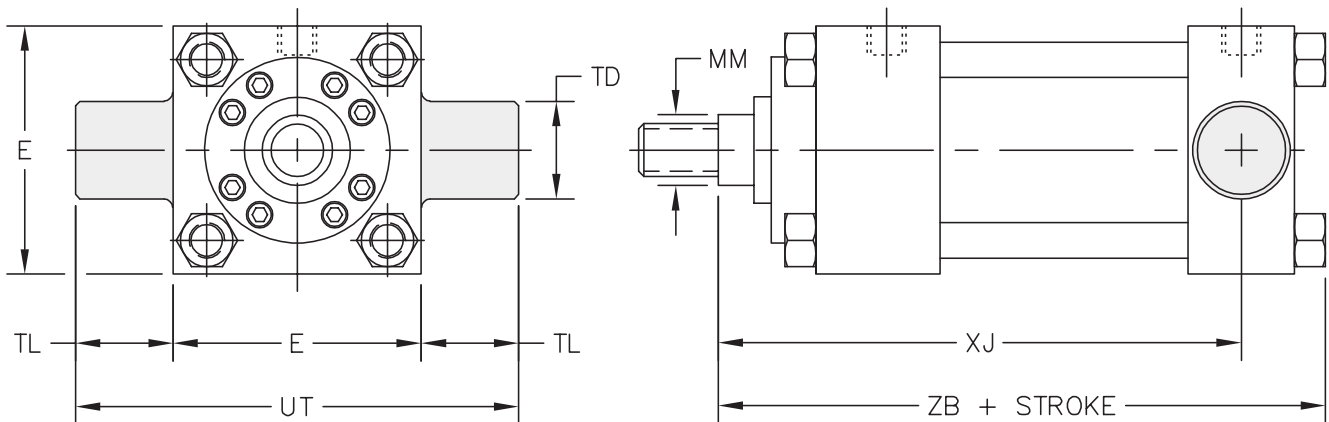
1. Max single acting pressure rating (non-shock). Any additional opposed intensified pressure related to varying impact area within the cylinder is not taken into consideration (ram cylinders).
2. B dimension tolerance is +.000 / -.002
3. Standard port sizes.
4. Where no dimension is shown, cylinder utilizes a full square retainer.

Dimensions – Trunnion Mounts

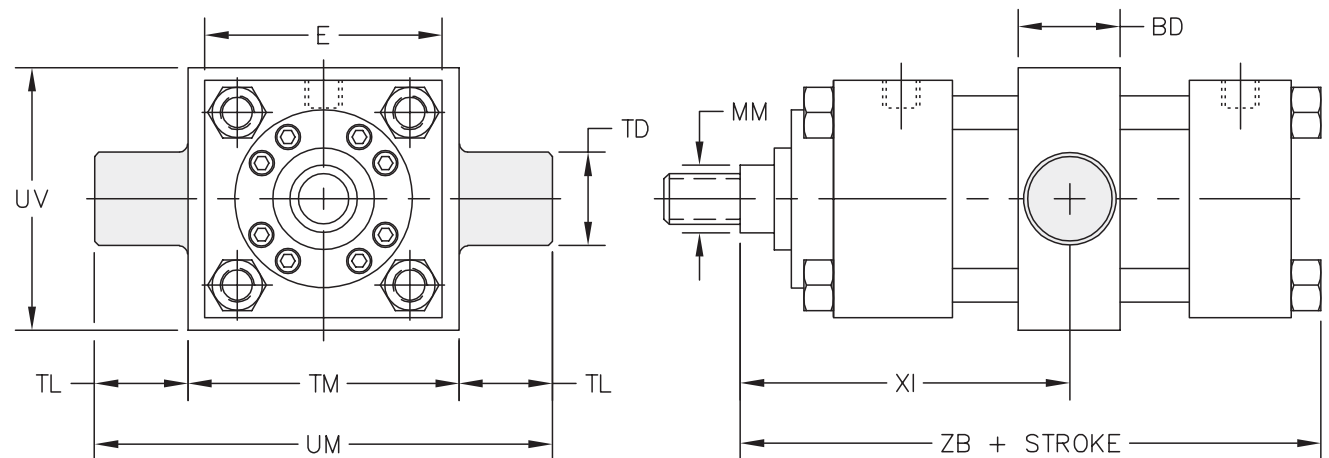
MT1: Head Trunnion



MT2: Cap Trunnion



MT4: Intermediate Trunnion



Note: XI dimension to be specified at end of cylinder description.

Dimensions – Trunnion Mounts

Bore	Rod Dia. (MM)	Max PSI Rating ¹		E	BD	TD ²	TL	TM	UM	UT	UV	XG	MT4 XI Min	MT4 Min Stroke	Add to Stroke		
		MT1 MT2	MT4												MT4 XI Max ³	XJ	ZB
1.50	0.625	3000	3000	2.500	1.500	1.000	1.000	3.000	5.000	4.500	3.000	1.875	3.625	0.375	3.250	4.875	6.000
	1.000											2.250	4.000		3.625	5.250	6.375
2.00	1.000	3000	3000	3.000	1.500	1.375	1.375	3.500	6.250	5.750	3.500	2.250	4.000	0.375	3.625	5.250	6.500
	1.375											2.500	4.250		3.875	5.500	6.750
2.50	1.000	3000	3000	3.500	1.500	1.375	1.375	4.000	6.750	6.250	4.000	2.250	4.000	0.250	3.750	5.375	6.625
	1.375											2.500	4.250		4.000	5.625	6.875
	1.750											2.750	4.500		4.250	5.875	7.125
	1.375											2.625	4.750		4.250	6.250	7.750
3.25	1.750	3000	3000	4.500	2.000	1.750	1.750	5.000	8.500	8.000	5.000	2.875	5.000	0.500	4.500	6.500	8.000
	2.000											3.000	5.125		4.625	6.625	8.125
4.00	1.750	3000	3000	5.000	2.000	1.750	1.750	5.500	9.000	8.500	5.500	2.875	5.000	0.250	4.750	6.750	8.250
	2.000											3.000	5.125		4.875	6.875	8.375
	2.500											3.250	5.375		5.125	7.125	8.625
5.00	2.000	3000	3000	6.500	2.500	1.750	1.750	7.000	10.500	10.000	7.250	3.000	5.375	0.250	5.125	7.375	9.125
	2.500											3.250	5.625		5.375	7.625	9.375
	3.000											3.250	5.625		5.375	7.625	9.375
	3.500											3.250	5.625		5.375	7.625	9.375
6.00	2.500	3000	3000	7.500	3.000	2.000	2.000	8.500	12.500	11.500	8.750	3.375	6.125	0.375	5.750	8.375	10.625
	3.000																
	3.500																
7.00	4.000	3000	2700	8.500	3.000	2.500	2.500	9.750	14.750	13.500	10.000	3.625	6.625	0.250	6.375	9.375	11.875
	4.500																
	5.000																
	3.500																
8.00	4.000	3000	2500	9.500	3.500	3.000	3.000	11.000	17.000	15.500	11.750	3.750	7.125	0.250	6.875	10.250	13.000
	4.500																
	5.000																
	5.500																

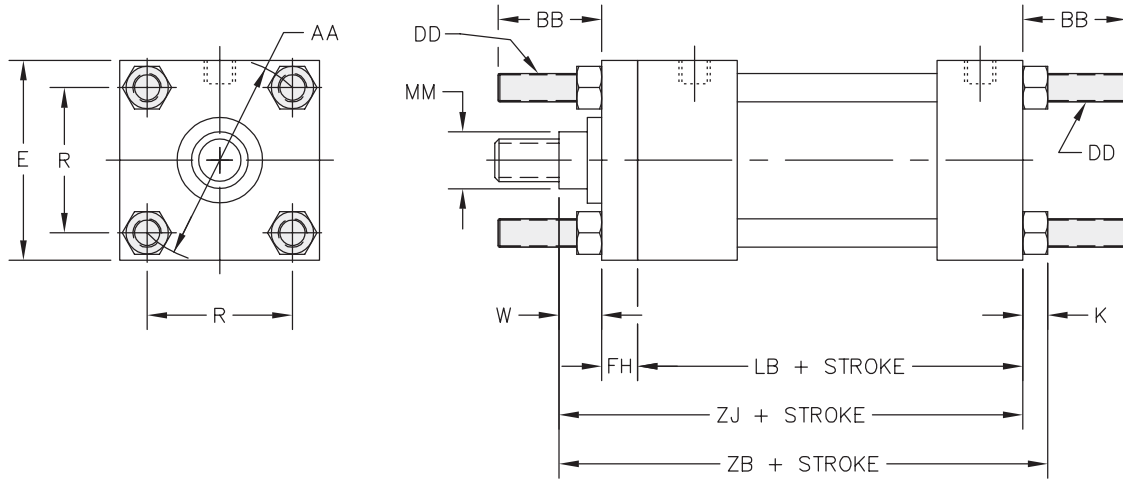
1. Max single acting pressure rating (non-shock). Any additional opposed intensified pressure related to varying impact area within the cylinder is not taken into consideration (ram cylinders).

2. TD dimension tolerance is + .000 / - .001

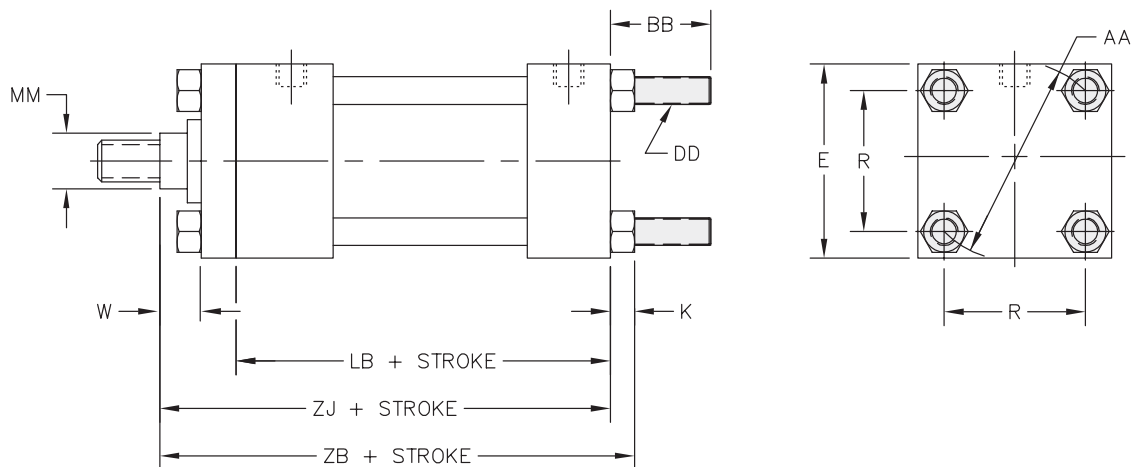
3. XI dimension is the minimum that can be supplied (customer to specify XI dimension).

Dimensions – Extended Tie Rod Mounts

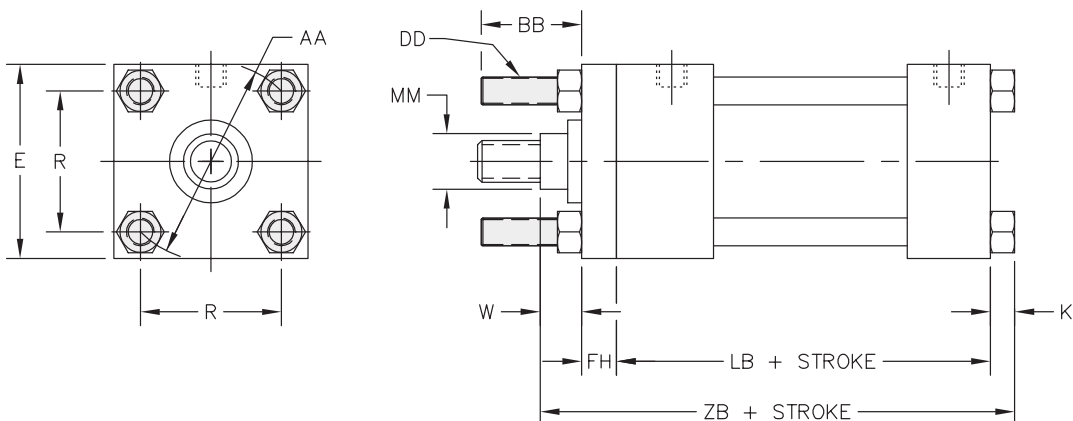
MX1: Head & Cap



MX2: Cap End



MX3: Head End



Dimensions – Extended Tie Rod Mounts

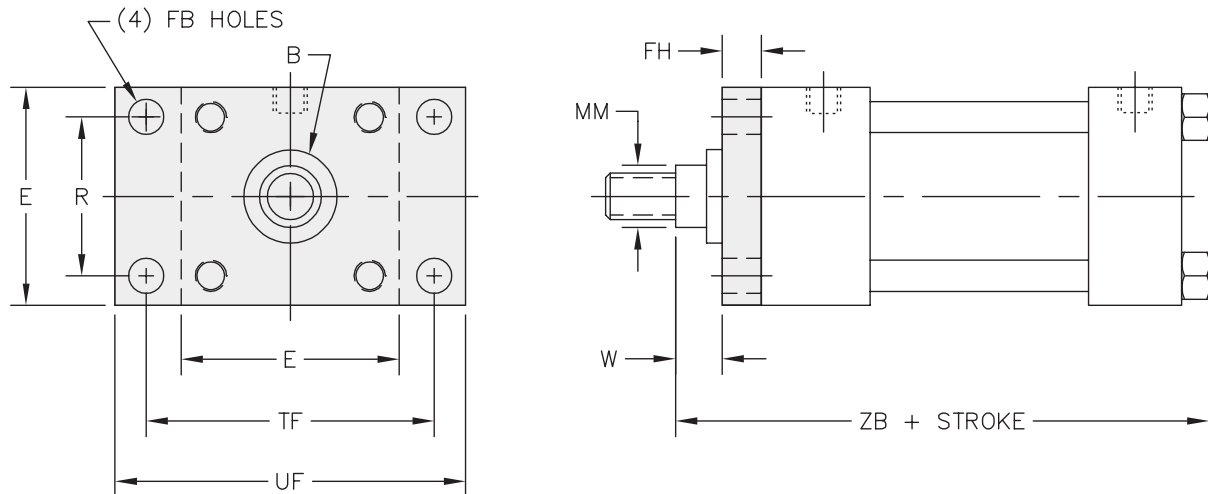
Bore	Rod Dia. (MM)	Max PSI Rating ¹	E	AA	BB	DD	FH	K	R	W	Add to Stroke		
											LB	ZB	ZJ
1.50	0.625	3000	2.500	2.300	1.375	3/8 - 24	0.375	0.375	1.625	0.625	4.625	6.000	5.625
	1.000									1.000		6.375	6.000
2.00	1.000	3000	3.000	2.900	1.813	1/2 - 20	0.625	0.500	2.047	0.750	4.625	6.500	6.000
	1.375									1.000		6.750	6.250
2.50	1.000	3000	3.500	3.600	1.813	1/2 - 20	0.625	0.500	2.547	0.750	4.750	6.625	6.128
	1.375									1.000		6.875	6.375
	1.750									1.250		7.125	6.625
3.25	1.375	3000	4.500	4.600	2.313	5/8 - 18	0.750	0.625	3.250	0.875	5.500	7.750	7.125
	1.750									1.125		8.000	7.375
	2.000									1.250		8.125	7.500
4.00	1.750	3000	5.000	5.400	2.313	5/8 - 18	0.875	0.625	3.813	1.000	5.750	8.250	7.625
	2.000									1.125		8.375	7.750
	2.500									1.375		8.625	8.000
5.00	2.000	3000	6.500	7.000	3.188	7/8 - 14	0.875	0.875	4.953	1.125	6.250	9.125	8.250
	2.500									1.375		9.375	8.500
	3.000									1.375		9.375	8.500
	3.500									1.375		9.375	8.500
6.00	2.500	3000	7.500	8.100	3.625	1 - 14	1.000	1.000	5.734	1.250*	7.375	10.625	9.625
	3.000									1.250*			
	3.500									1.250*			
	4.000									1.250			
7.00	3.000	3000	8.500	9.300	4.125	1 1/8 - 12	1.000	1.125	6.580	1.250*	8.500	11.875	10.750
	3.500									1.250*			
	4.000									1.250			
	4.500									1.250			
8.00	5.000	3000	9.500	10.600	4.500	1 1/4 - 12	1.000	1.250	7.500	1.250	9.500	13.000	11.750
	5.000									1.250			
	5.000									1.250			
	5.500									1.250			

1. Max single acting pressure rating (non-shock). Any additional opposed intensified pressure related to varying impact area within the cylinder is not taken into consideration (ram cylinders).

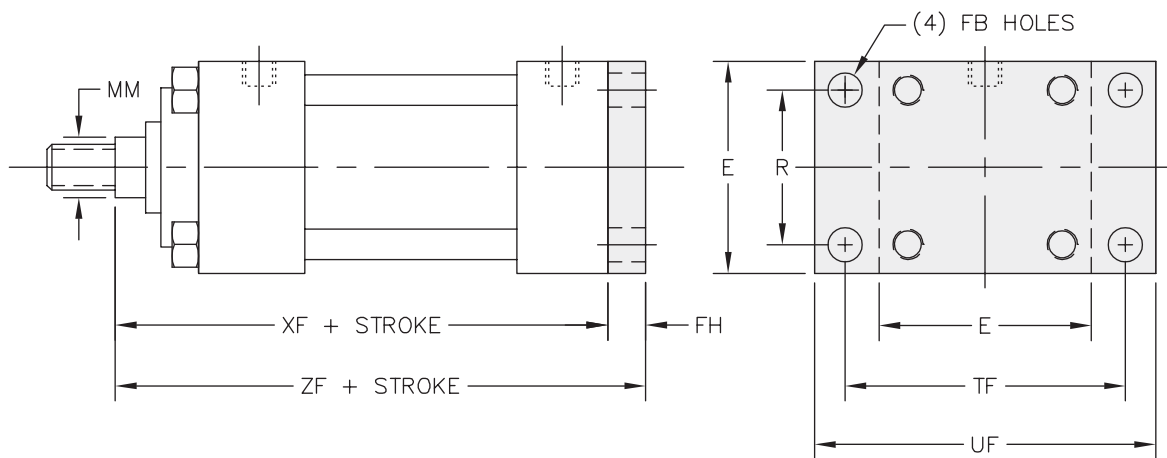
* On MX2 mount, dimension is 1.375" with a round retainer.

Dimensions – Flange Mounts

MF1: Head Flange



MF2: Cap Flange



Dimensions – Flange Mounts

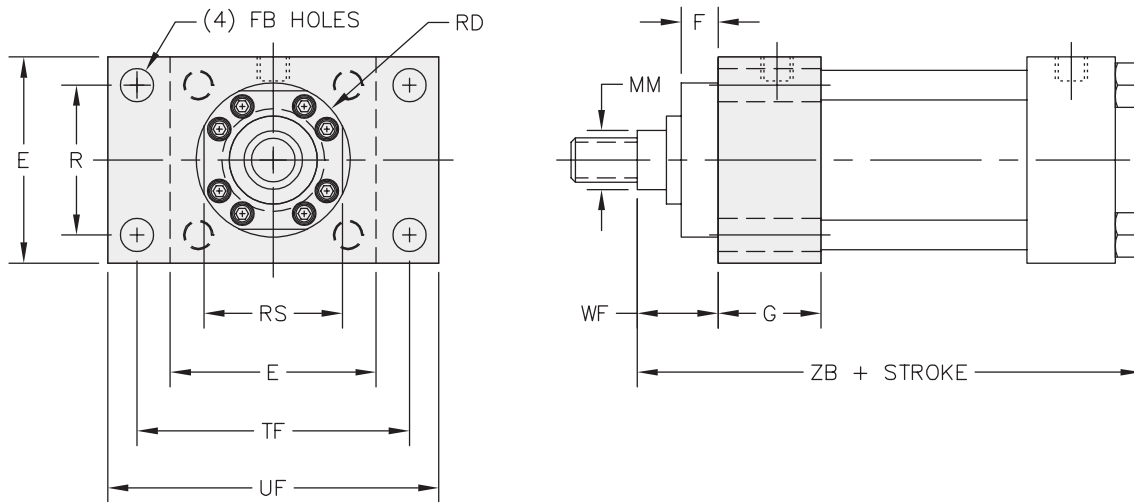
Bore	Rod Dia. (MM)	Max PSI Rating ¹		B ²	E	FB	FH	R	RD	TF	UF	W	Add to Stroke		
		MF1	MF2										XF	ZB	ZF
1.50	0.625	3000	3000	1.124	2.500	0.438	0.375	1.625	2.375	3.438	4.250	0.625	5.625	6.000	6.000
	1.000			1.499					2.563				1.000	6.000	6.375
2.00	1.000	3000	3000	1.499	3.000	0.563	0.625	2.047	2.625	4.125	5.125	0.750	6.000	6.500	6.625
	1.375			1.999					3.250				1.000	6.250	6.875
2.50	1.000	3000	3000	1.499	3.500	0.563	0.625	2.546	2.625	4.625	5.625	0.750	6.125	6.625	6.750
	1.375			1.999					3.250				1.000	6.375	7.000
	1.750			2.374					3.875				1.250	6.625	7.250
3.25	1.375	3000	3000	1.999	4.500	0.688	0.750	3.250	3.250	5.875	7.125	0.875	7.125	7.750	7.875
	1.750			2.374					3.875				1.125	7.375	8.125
	2.000			2.624					4.250				1.250	7.500	8.250
4.00	1.750	3000	3000	2.374	5.000	0.688	0.875	3.820	3.875	6.375	7.625	1.000	7.625	8.250	8.500
	2.000			2.624					4.250				1.125	7.750	8.375
	2.500			3.124					4.625				1.375	8.000	8.875
5.00	2.000	3000	3000	2.624	6.500	0.938	0.875	4.953	4.250	8.188	9.750	1.125	8.250	9.125	9.125
	2.500			3.124					4.625				1.375	8.500	9.375
	3.000			3.749					5.250				1.375	8.500	9.375
	3.500			4.249					5.625				1.375	8.500	9.375
6.00	2.500	3000	3000	3.124	7.500	1.063	1.000	5.734	4.625	9.438	11.250	1.250	9.625	10.625	10.625
	3.000			3.749					5.250						
	3.500			4.249					5.625						
	4.000			4.749					6.438						
7.00	3.000	2800	3000	3.749	8.500	1.188	1.000	6.580	5.250	10.625	12.625	1.250	10.750	11.875	11.750
	3.500	2800		4.249					5.625						
	4.000	2800		4.749					6.438						
	4.500	2600		5.249					7.125						
	5.000	2600		5.749					7.250						
8.00	3.500	2400	3000	4.249	9.500	1.313	1.000	7.500	5.625	11.813	14.000	1.250	11.750	13.000	12.750
	4.000	2200		4.749					6.438						
	4.500	2200		5.249					7.125						
	5.000	2200		5.749					7.625						
	5.500	2200		6.249					8.375						

1. Max single acting pressure rating (non-shock). Any additional opposed intensified pressure related to varying impact area within the cylinder is not taken into consideration (ram cylinders).

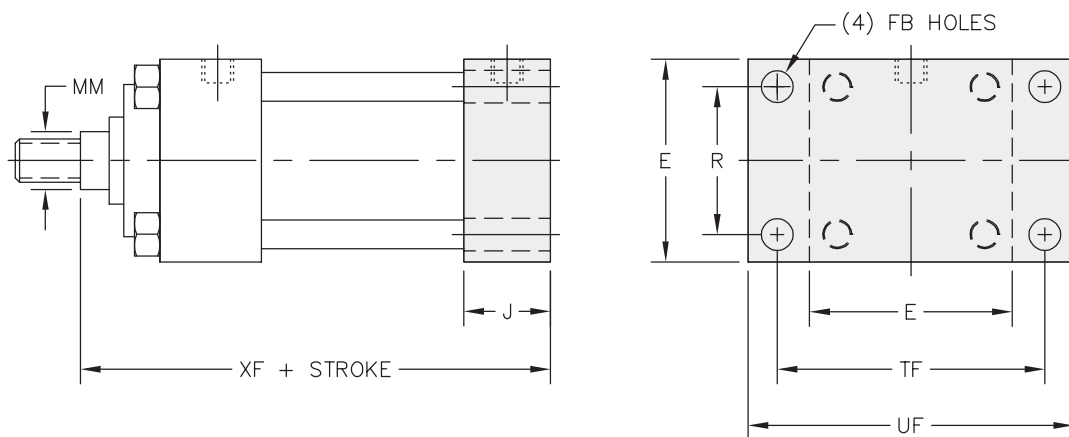
2. B dimension tolerance is +.000 / -.002

Dimensions – Flange Mounts

ME5: Head Rectangular Mounting Holes



ME6: Cap Rectangular Mounting Holes



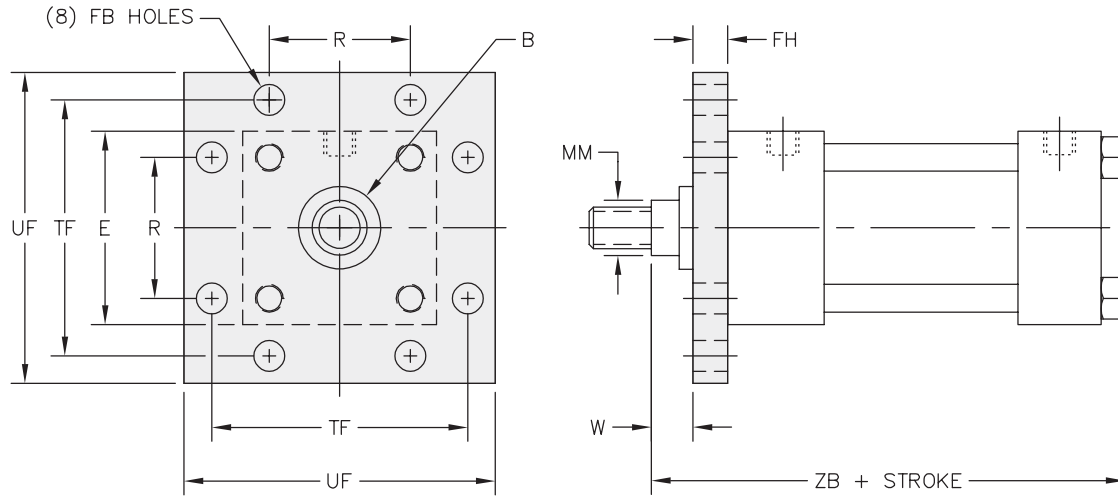
Dimensions – Flange Mounts

Bore	Rod Dia. (MM)	Max PSI Rating ¹	E	F	FB	G	J	R	RD	RS	TF	UF	WF	Add to Stroke	
														XF	ZB
1.50	0.625	3000	2.500	0.375	0.438	1.750	1.500	1.625	2.375	—	3.438	4.250	1.000	5.625	6.000
	1.000								2.563	2.438			1.375	6.000	6.375
2.00	1.000	3000	3.000	0.625	0.563	1.750	1.500	2.047	2.625	—	4.125	5.125	1.375	6.000	6.500
	1.375								3.250	2.943			1.625	6.250	6.750
2.50	1.000	3000	3.500	0.625	0.563	1.750	1.500	2.546	2.625	—	4.625	5.625	1.375	6.125	6.625
	1.375								3.250	—			1.625	6.375	6.875
	1.750								3.875	3.438			1.875	6.625	7.125
3.25	1.375	3000	4.500	0.750	0.688	2.000	1.750	3.250	3.250	5.875	7.125	8.125	1.625	7.125	7.750
	1.750			0.875					3.875				1.875	7.375	8.000
	2.000			0.875					4.250				2.000	7.500	8.125
4.00	1.750	3000	5.000	0.875	0.688	2.000	1.750	3.820	3.875	6.375	7.625	8.250	1.875	7.625	8.250
	2.000								4.250				2.000	7.750	8.375
	2.500								4.625				2.250	8.000	8.625
5.00	2.000	3000	6.500	0.875	0.938	2.000	1.750	4.953	4.250	8.188	9.750	9.125	2.000	8.250	9.125
	2.500								4.625				2.250	8.500	9.375
	3.000								5.250				2.250	8.500	9.375
	3.500								5.625				2.250	8.500	9.375
6.00	2.500	3000	7.500	0.875	1.063	2.250	2.250	5.734	4.625	9.438	11.250	2.250	9.625	10.625	
	3.000			0.875					5.250						
	3.500			0.875					5.625						
	4.000			1.000					6.438						
7.00	3.000	3000	8.50	0.875	1.188	2.750	2.750	6.580	5.250	10.625	12.625	2.250	10.750	11.875	
	3.500			0.875					5.625						
	4.000			1.000					6.438						
	4.500			1.000					7.125						
8.00	5.000	3000	9.500	1.000	1.313	3.000	3.000	7.500	7.250	11.813	14.000	2.250	11.750	13.000	
	5.000			1.000					7.125						
	5.000			1.000					7.625						
	5.500			1.000					8.375						

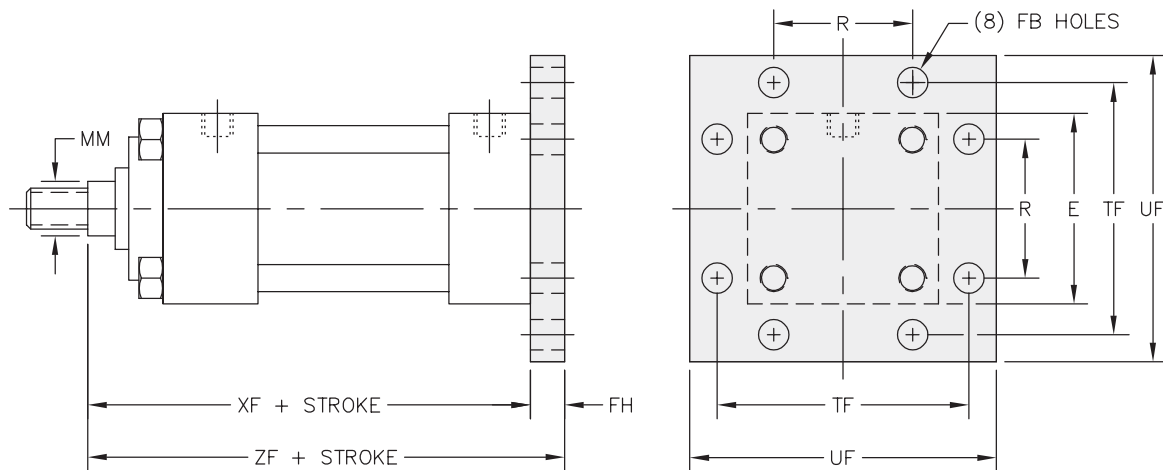
1. Max single acting pressure rating (non-shock). Any additional opposed intensified pressure related to varying impact area within the cylinder is not taken into consideration (ram cylinders).

Dimensions – Square Flange Mounts

MF5: Head Square Flange



MF6: Cap Square Flange



Dimensions – Square Flange Mounts

Bore	Rod Dia (MM)	Max PSI Rating ¹	B ²	E	FB	FH	R	RD ³	TF	UF	W	Add to Stroke		
												XF	ZB	ZF
1.50	0.625	3000	1.124	2.500	0.438	0.375	1.625	—	3.438	4.250	0.625	5.625	6.000	6.000
	1.000		1.499					—			1.000	6.000	6.375	6.375
2.00	1.000	3000	1.499	3.000	0.563	0.625	2.047	—	4.125	5.125	0.750	6.000	6.500	6.625
	1.375		1.999					—			1.000	6.250	6.750	6.875
2.50	1.000	3000	1.499	3.500	0.563	0.625	2.547	2.625	4.625	5.625	0.750	6.125	6.625	6.750
	1.375		1.999					—			1.000	6.375	6.875	7.000
	1.750		2.374					—			1.250	6.625	7.125	7.250
3.25	1.375	3000	1.999	4.500	0.688	0.750	3.250	3.250	5.875	7.125	0.875	7.125	7.750	7.875
	1.750		2.374					—			1.125	7.375	8.000	8.125
	2.000		2.624					—			1.250	7.500	8.125	8.250
4.00	1.750	3000	2.374	5.000	0.688	0.875	3.820	3.875	6.375	7.625	1.000	7.625	8.250	8.500
	2.000		2.624					4.250			1.125	7.750	8.375	8.625
	2.500		3.124					—			1.375	8.000	8.625	8.875
5.00	2.000	3000	2.624	6.500	0.938	0.875	4.953	4.250	8.188	9.750	1.125	8.250	9.125	9.125
	2.500		3.124					4.625			1.375	8.500	9.375	9.375
	3.000		3.749					5.250			1.375	8.500	9.375	9.375
	3.500		4.249					—			1.375	8.500	9.375	9.375
6.00	2.500	3000	3.124	7.500	1.063	1.000	5.734	4.625	9.438	11.250	1.250	9.625	10.625	10.625
	3.000		3.749					5.250						
	3.500		4.249					5.625						
	4.000		4.749					6.438						
7.00	3.000	3000	3.749	8.500	1.188	1.000	6.580	5.250	10.625	12.625	1.250	10.750	11.875	11.750
	3.500		4.249					5.625						
	4.000		4.749					6.438						
	4.500		5.249					7.125						
8.00	5.000	3000	5.749	9.500	1.313	1.000	7.500	7.250	11.813	14.000	1.250	11.750	13.000	12.750
	3.500		4.249					5.625						
	4.000		4.749					6.438						
	4.500		5.249					7.125						
	5.000		5.749					7.625						
	5.500		6.249					8.375						

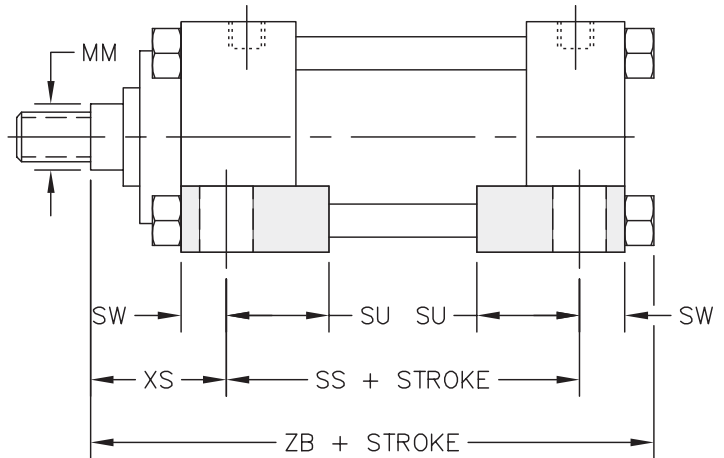
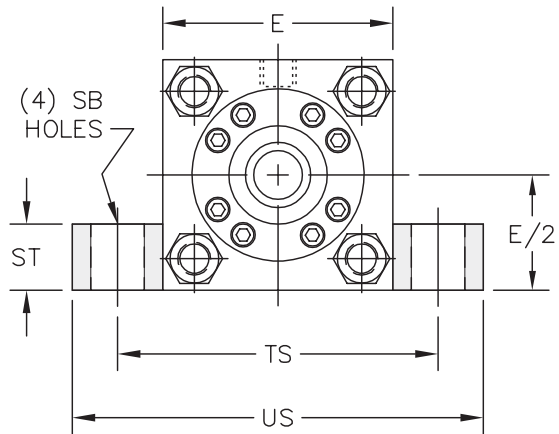
1. Max single acting pressure rating (non-shock). Any additional opposed intensified pressure related to varying impact area within the cylinder is not taken into consideration (ram cylinders).

2. 'B' dimension tolerance is +.000 / -.002

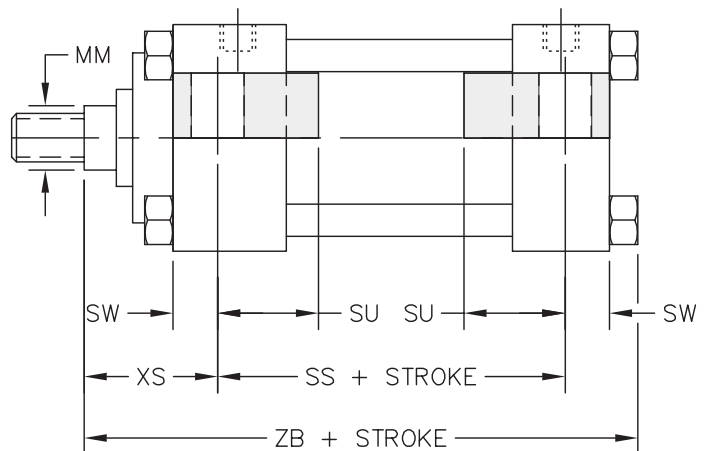
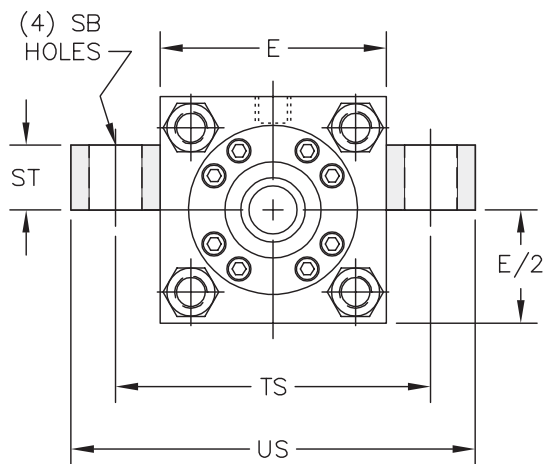
3. Where no dimension is shown, cylinder utilizes a full square retainer.

Dimensions – Lug Mounts

MS2: Side Lugs



MS3: Center Line Lugs



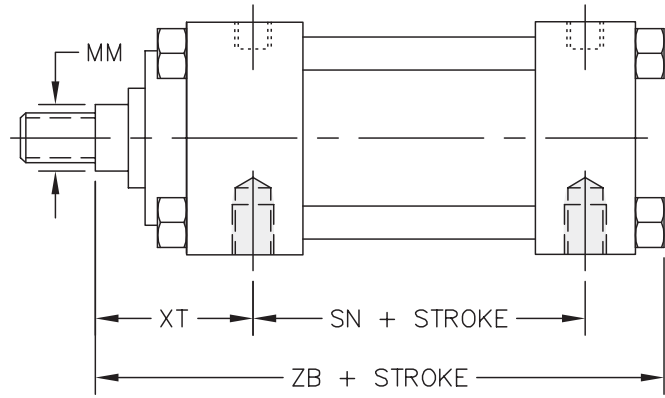
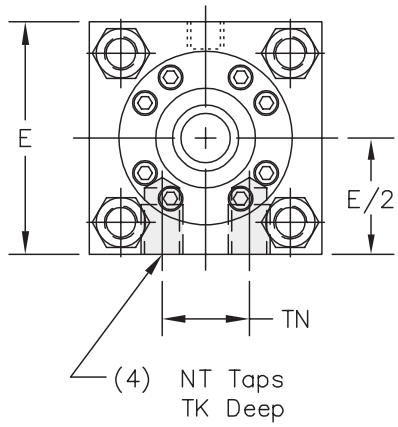
Dimensions – Lug Mounts

Bore	Rod Dia. (MM)	Max PSI Rating ¹	E	E / 2	SB	ST	SU	SW	TS	US	XS	Add to Stroke	
												SS	ZB
1.50	0.625	3000	2.500	1.250	0.438	0.500	0.938	0.375	3.250	4.000	1.375	3.875	6.000
	1.000										1.750		6.375
2.00	1.000	3000	3.000	1.500	0.563	0.750	1.250	0.500	4.000	5.000	1.875	3.625	6.500
	1.375										2.125		6.750
2.50	1.000	3000	3.500	1.750	0.813	1.000	1.563	0.688	4.875	6.250	2.063	3.375	6.625
	1.375										2.313		6.875
	1.750										2.563		7.125
3.25	1.375	3000	4.500	2.250	0.813	1.000	1.563	0.688	5.875	7.250	2.313	4.125	7.750
	1.750										2.563		8.000
	2.000										2.688		8.125
4.00	1.750	3000	5.000	2.500	1.063	1.250	2.000	0.875	6.750	8.500	2.750	4.000	8.250
	2.000										2.875		8.375
	2.500										3.125		8.625
5.00	2.000	3000	6.500	3.250	1.063	1.250	2.000	0.875	8.250	10.000	2.875	4.500	9.125
	2.500										3.125		9.375
	3.000										3.125		9.375
	3.500										3.125		9.375
6.00	2.500	3000	7.500	3.750	1.313	1.500	2.500	1.125	9.750	12.000	3.375	5.125	10.625
	3.000												
	3.500												
	4.000												
7.00	3.000	3000	8.500	4.250	1.563	1.750	2.875	1.375	11.250	14.000	3.625	5.750	11.875
	3.500												
	4.000												
	4.500												
8.00	5.000	3000	9.500	4.750	1.563	1.750	2.875	1.375	12.250	15.000	3.625	6.750	13.000
	5.000												
	5.000												
	5.500												

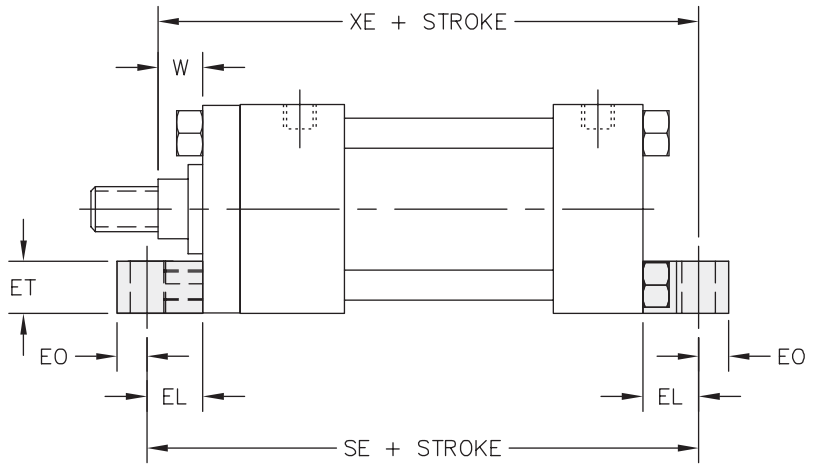
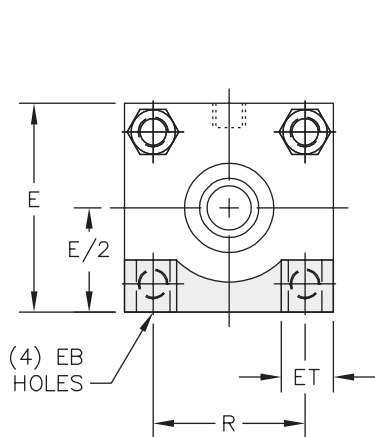
1. Max single acting pressure rating (non-shock). Any additional opposed intensified pressure related to varying impact area within the cylinder is not taken into consideration (ram cylinders).

Dimensions – Bottom Mounts

MS4: Bottom Tapped Holes



MS7: End Lugs (1.50" - 6.00" Bores)



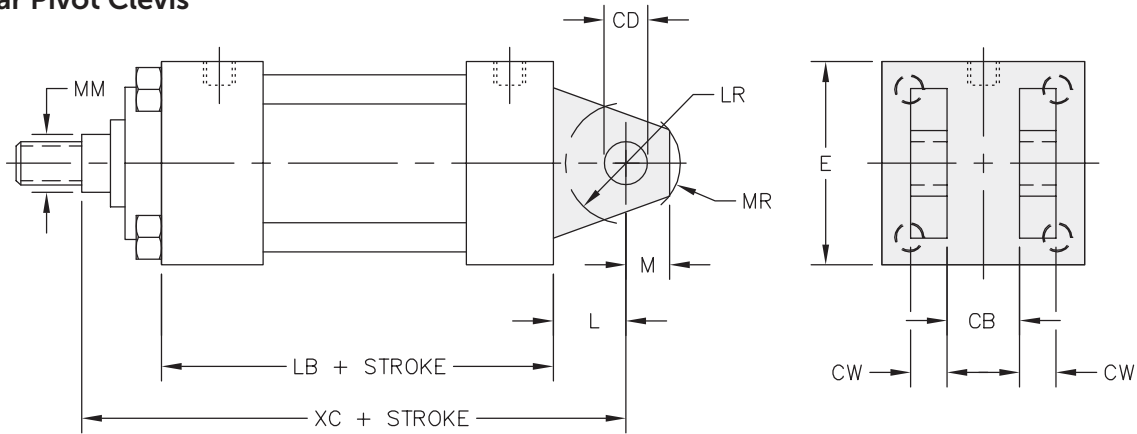
Dimensions – Bottom Mounts

Bore	Rod Dia. (MM)	Max PSI Rating ¹	E	E / 2	MS4 Dimensions						MS7 Dimensions							
					NT	TK	TN	XT	Add to Stroke		EB	EL	EO	ET	R	W	Add to Stroke	
									SN	ZB							SE	XE
1.50	0.625	3000	2.500	1.250	3/8-16	0.375	0.750	2.000	2.875	6.000	0.438	0.875	0.375	0.750	1.625	0.625	6.750	6.500
	1.000							2.375		6.375						1.000		6.875
2.00	1.000	3000	3.000	1.500	1/2-13	0.438	0.938	2.375	2.875	6.500	0.563	0.938	0.500	0.875	2.047	0.750	7.125	6.938
	1.375							2.625		6.750						1.000		7.188
2.50	1.000	3000	3.500	1.750	5/8-11	0.625	1.313	2.375	3.000	6.625	0.563	0.938	0.500	0.875	2.550	0.750	7.250	7.063
	1.375							2.625		6.875						1.000		7.313
	1.750							2.875		7.125						1.250		7.563
	1.375							2.750		7.750						0.875		8.250
3.25	1.750	3000	4.500	2.250	3/4-10	0.875	1.500	3.000	3.500	8.000	0.688	1.125	0.625	1.188	3.250	1.125	8.500	8.500
	2.000							3.125		8.125						1.250		8.625
4.00	1.750	3000	5.000	2.500	1 - 8	0.875	2.063	3.000	3.750	8.250	0.688	1.125	0.625	1.188	3.820	1.000	8.875	8.750
	2.000							3.125		8.375						1.125		8.875
	2.500							3.375		8.625						1.375		9.125
5.00	2.000	3000	6.500	3.250	1 - 8	1.000	2.938	3.125	4.250	9.125	0.938	1.500	0.750	1.500	4.953	1.125	10.125	9.750
	2.500							3.375		9.375						1.375		10.000
	3.000							3.375		9.375						1.375		10.000
	3.500							3.375		9.375						1.375		10.000
	2.500							1.250										
6.00	3.000	3000	7.500	3.750	1 1/4-7	1.250	3.313	3.500	5.125	10.625	1.063	1.688	0.875	1.750	5.734	1.250	11.750	11.313
	3.500							1.250										
	4.000							0.750										
7.00	3.000	3000	8.500	4.250	1 1/2-6	1.125	3.750	3.813	5.875	11.875	—	—	—	—	—	—	—	—
	3.500							1.125										
	4.000							1.125										
	4.500							1.125										
	5.000							0.875										
8.00	3.500	3000	9.500	4.750	1 1/2-6	1.500	4.250	3.938	6.625	13.000	—	—	—	—	—	—	—	—
	4.000							1.500										
	4.500							1.250										
	5.500							1.000										

1. Max single acting pressure rating (non-shock). Any additional opposed intensified pressure related to varying impact area within the cylinder is not taken into consideration (ram cylinders).

Dimensions – Pivot Mounts

MP1: Rear Pivot Clevis



Note: Pivot Pin included with Cylinder

Bore	Rod Dia. (MM)	Max PSI Rating ¹	E	CB ²	CD ³	CW	L	LR	M	MR	Add to Stroke	
											LB	XC
1.50	0.625	3000	2.500	0.750	0.500	0.500	0.750	0.563	0.500	0.625	4.625	6.375
	1.000											6.750
2.00	1.000	3000	3.000	1.250	0.750	0.625	1.250	1.000	0.750	0.938	4.625	7.250
	1.375											7.500
2.50	1.000	3000	3.500	1.250	0.750	0.625	1.250	1.000	0.750	0.938	4.750	7.375
	1.375											7.625
	1.750											7.875
3.25	1.375	3000	4.500	1.500	1.000	0.750	1.500	1.250	1.000	1.188	5.500	8.625
	1.750											8.875
	2.000											9.000
4.00	1.750	3000	5.000	2.000	1.375	1.000	2.125	1.875	1.375	1.625	5.750	9.750
	2.000											9.875
	2.500											10.125
5.00	2.000	3000	6.500	2.500	1.750	1.250	2.250	2.000	1.750	2.125	6.250	10.500
	2.500											10.750
	3.000											10.750
	3.500											10.750
6.00	2.500	3000	7.500	2.500	2.000	1.250	2.500	2.188	2.000	2.375	7.375	12.125
	3.000											
	3.500											
	4.000											
7.00	3.000	3000	8.500	3.000	2.500	1.500	3.000	2.688	2.500	2.875	8.500	13.750
	3.500											
	4.000											
	4.500											
8.00	5.000	3000	9.500	3.000	3.000	1.500	3.250	2.938	2.750	3.125	9.500	15.000
	5.000											
	5.000											
	5.000											

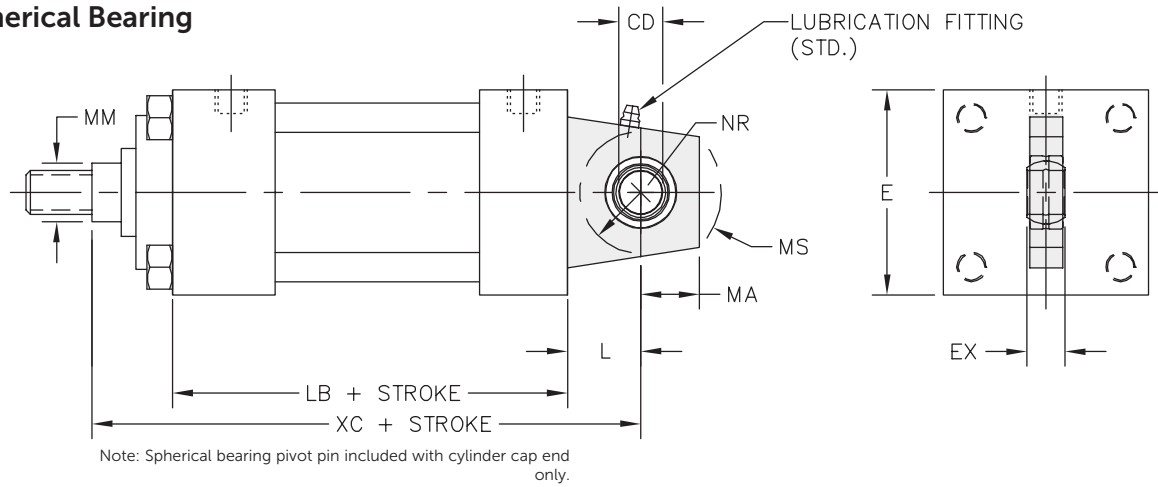
1. Max single acting pressure rating (non-shock). Any additional opposed intensified pressure related to varying impact area within the cylinder is not taken into consideration (ram cylinders).

2. CB dimension tolerance is +.010 to +.030 depending on bore size.

3. CD dimension tolerance for pin is ± 0.01 .

Dimensions – SB Mounts

SB: Spherical Bearing



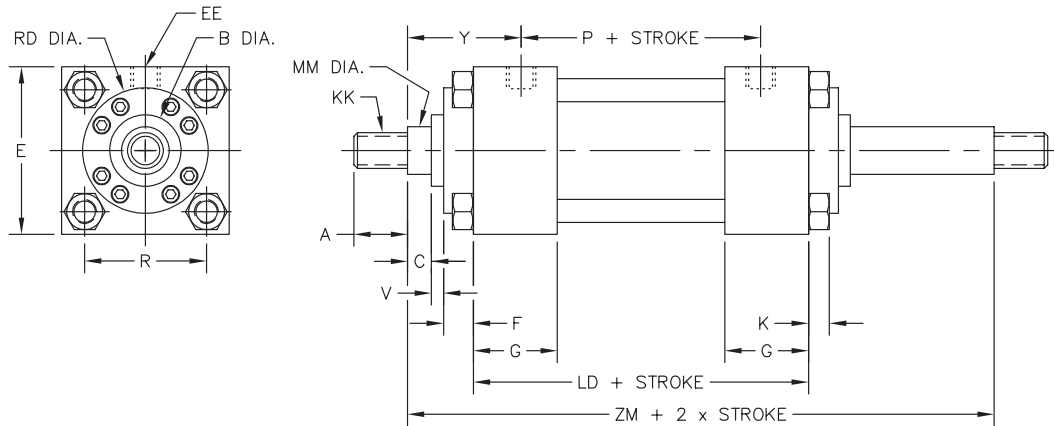
Bore	Rod Dia. (MM)	Max PSI Rating ¹	E	CD ²	EX	L	NR	MA	MS	Add to Stroke	
										LB	XC
1.50	0.625	1650	2.500	0.500	0.437	0.750	0.625	0.750	0.938	4.625	6.375
	1.000	1650									6.750
2.00	1.000	2200	3.000	0.750	0.656	1.250	1.000	1.000	1.375	4.625	7.250
	1.375	2200									7.500
2.50	1.000	1400	3.500	0.750	0.656	1.250	1.000	1.000	1.375	4.750	7.375
	1.375	1400									7.625
	1.750	1400									7.875
3.25	1.375	1500	4.500	1.000	0.875	1.500	1.250	1.250	1.688	5.500	8.625
	1.750	1500									8.875
	2.000	1500									9.000
4.00	1.750	1750	5.000	1.375	1.188	2.125	1.625	1.875	2.438	5.750	9.750
	2.000	1750									9.875
	2.500	1750									10.125
5.00	2.000	1900	6.500	1.750	1.531	2.250	2.063	2.500	2.875	6.250	10.500
	2.500	1900									10.750
	3.000	1900									10.750
	3.500	1900									10.750
6.00	2.500	1700	7.500	2.000	1.750	2.500	2.375	2.500	3.313	7.375	12.125
	3.000	1700									12.125
	3.500	1700									12.125
	4.000	1700									12.125

1. Max single acting pressure rating (non-shock). Any additional opposed intensified pressure related to varying impact area within the cylinder is not taken into consideration (ram cylinders).

2. CD dimension tolerance for pin is -.0005 / -.001.

Dimensions – Double End Mounts

MX0D: No Mount



Bore	Rod Dia. (MM)	Max PSI Rating ¹	E	A	B ²	C	EE		F	G	K	KK	R	RD ³	V	Y	Add to Stroke		Add 2x Stroke ZM
							NPTF	SAE									LD	P	
1.50	0.625	3000	2.500	0.750	1.124	0.375	1/2	10	0.375	1.750	0.375		1.625	—	0.250	2.000	4.875	2.875	6.875
	1.000			1.125	1.499	0.500		8						—	0.500	2.375			7.625
2.00	1.000	3000	3.000	1.125	1.499	0.500	1/2	10	0.625	1.750	0.500		2.047	—	0.250	2.375	4.875	2.875	7.625
	1.375			1.625	1.999	0.625		8						—	0.375	2.625			8.125
2.50	1.000	3000	3.500	1.125	1.499	0.500	1/2	10	0.625	1.750	0.500		2.547	2.625	0.250	2.375	5.000	3.000	7.750
	1.375			1.625	1.999	0.625								—	0.375	2.625			8.250
	1.750			2.000	2.374	0.750								—	0.500	2.875			8.750
	1.375			1.625	1.999	0.625								3.250	0.250	2.750			9.000
3.25	1.750	3000	4.500	2.000	2.374	0.750	3/4	12	0.750	2.000	0.625		3.250	—	0.375	3.000	5.750	3.500	9.500
	2.000			2.250	2.624	0.875								—	0.375	3.125			9.750
4.00	1.750	3000	5.000	2.000	2.374	0.750	3/4	12	0.875	2.000	0.625		3.820	3.875	0.250	2.938	6.000	3.875	9.750
	2.000			2.250	2.624	0.875								4.250	0.250	3.063			10.000
	2.500			3.000	3.124	1.000								—	0.375	3.313			10.500
5.00	2.000	3000	6.500	2.250	2.624	0.875	3/4	12	0.875	2.000	0.875		4.953	4.250	0.250	3.125	6.500	4.250	10.500
	2.500			3.000	3.124	1.000								4.625	0.375	3.375			11.000
	3.000			3.500	3.749	1.000								5.250	0.375	3.375			11.000
	3.500			3.500	4.249	1.000								—	0.375	3.375			11.000
6.00	2.500	3000	7.500	3.000	3.124	1.000	1	16	0.875	2.250	1.000		5.734	4.625	0.375	3.500	7.375	4.875	11.875
	3.000			3.500	3.749				0.875					5.250	0.375				
	3.500			3.500	4.249				0.875					5.625	0.375				
	4.000			4.000	4.749				1.000					6.438	0.250				
7.00	3.000	3000	8.500	3.500	3.749	1.000	1	20	0.875	2.750	1.125		6.580	5.250	0.375	3.750	8.500	5.500	13.000
	3.500			3.500	4.249				0.875					5.625	0.375				
	4.000			4.000	4.749				1.000					6.438	0.250				
	4.500			4.500	5.249				1.000					7.125	0.250				
8.00	5.000	3000	9.500	5.000	5.749	1.000	1 1/2	24	1.000	3.000	1.250		7.500	7.250	0.250	3.938	9.500	6.125	14.000
	3.500			3.500	4.249				0.875					5.625	0.375				
	4.000			4.000	4.749				1.000					6.438	0.250				
	4.500			4.500	5.249				1.000					7.125	0.250				
	5.500			5.500	6.249				1.000					8.375	0.250				

See rod end detail chart on page 71

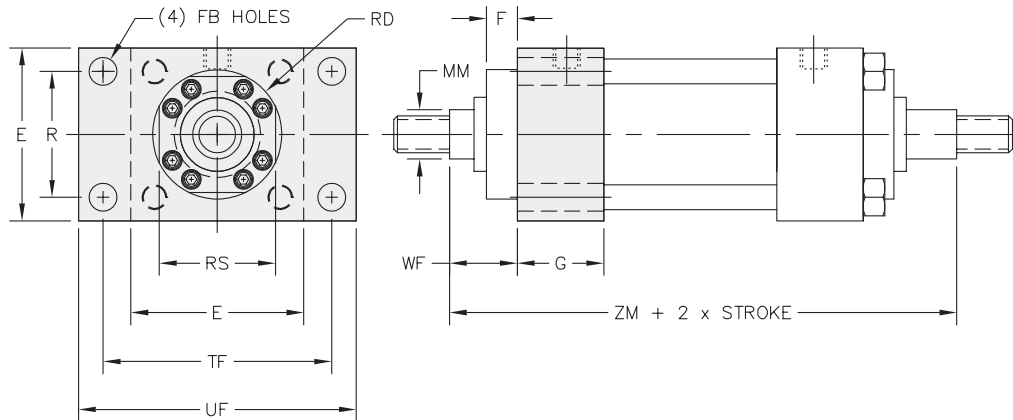
1. Max single acting pressure rating (non-shock). Any additional opposed intensified pressure related to varying impact area within the cylinder is not taken into consideration (ram cylinders).

2. B dimension tolerance is +.000 / -.002.

3. Where no dimension is shown, cylinder utilizes a full square retainer.

Dimensions – Double End Mounts

ME5D: Head Rectangular Mounting Holes

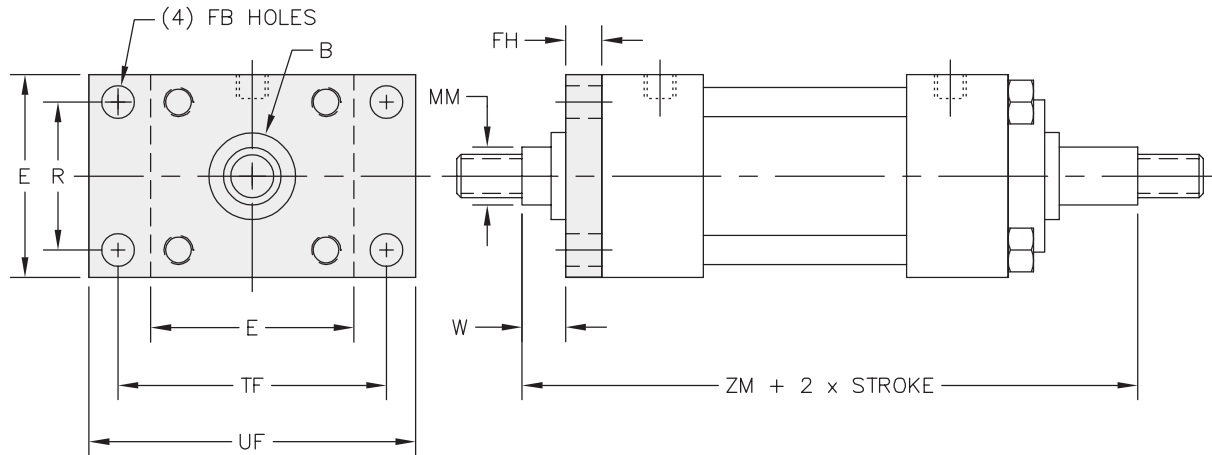


Bore	Rod Dia. (MM)	Max PSI Rating ¹	E	F	FB	G	R	RD	RS	TF	UF	WF	Add 2x Stroke ZM
1.50	0.625	3000	2.500	0.375	0.438	1.750	1.625	2.375	—	3.438	4.250	1.000	6.875
	1.000							2.563	2.438			1.375	7.625
2.00	1.000	3000	3.000	0.625	0.563	1.750	2.047	2.625	—	4.125	5.125	1.375	7.625
	1.375							3.250	2.938			1.625	8.125
2.50	1.000	3000	3.500	0.625	0.563	1.750	2.547	2.625	—	4.625	5.625	1.375	7.750
	1.375							3.250	—			1.625	8.250
	1.750							3.875	3.438			1.875	8.750
3.25	1.375	3000	4.500	0.750	0.688	2.000	3.250	3.250	—	5.875	7.125	1.625	9.000
	1.750			0.875				3.875	—			1.875	9.500
	2.000			0.875				4.250	—			2.000	9.750
4.00	1.750	3000	5.000	0.875	0.688	2.000	3.820	3.875	—	6.375	7.625	1.875	9.750
	2.000							4.250	—			2.000	10.000
	2.500							4.625	—			2.250	10.500
5.00	2.000	3000	6.500	0.875	0.938	2.000	4.953	4.250	—	8.188	9.750	2.000	10.500
	2.500							4.625	—			2.250	11.000
	3.000							5.250	—			2.250	11.000
	3.500							5.625	—			2.250	11.000
6.00	2.500	3000	7.500	0.875	1.063	2.250	5.725	4.625	—	9.438	11.250	2.250	11.875
	3.000			0.875				5.250	—				
	3.500			0.875				5.625	—				
	4.000			1.000				6.438	—				
7.00	3.000	3000	8.500	0.875	1.188	2.750	6.580	5.250	—	10.625	12.625	2.250	13.000
	3.500			0.875				5.625	—				
	4.000			1.000				6.438	—				
	4.500			1.000				7.125	—				
8.00	5.000	3000	9.500	1.000	1.313	3.000	7.500	7.250	—	11.813	14.000	2.250	14.000
	5.000			1.000				7.625	—				
	5.000			1.000				7.625	—				
	5.500			1.000				8.375	—				

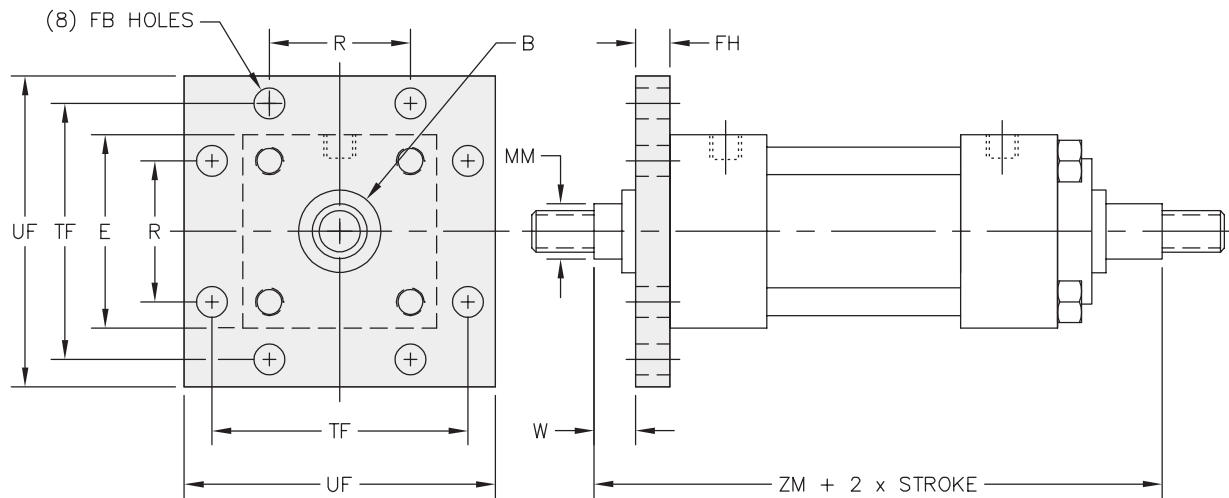
1. Max single acting pressure rating (non-shock). Any additional opposed intensified pressure related to varying impact area within the cylinder is not taken into consideration (ram cylinders).

Dimensions – Double End Mounts

MF1D: Head Flange



MF5D: Head Square Flange



Dimensions – Double End Mounts

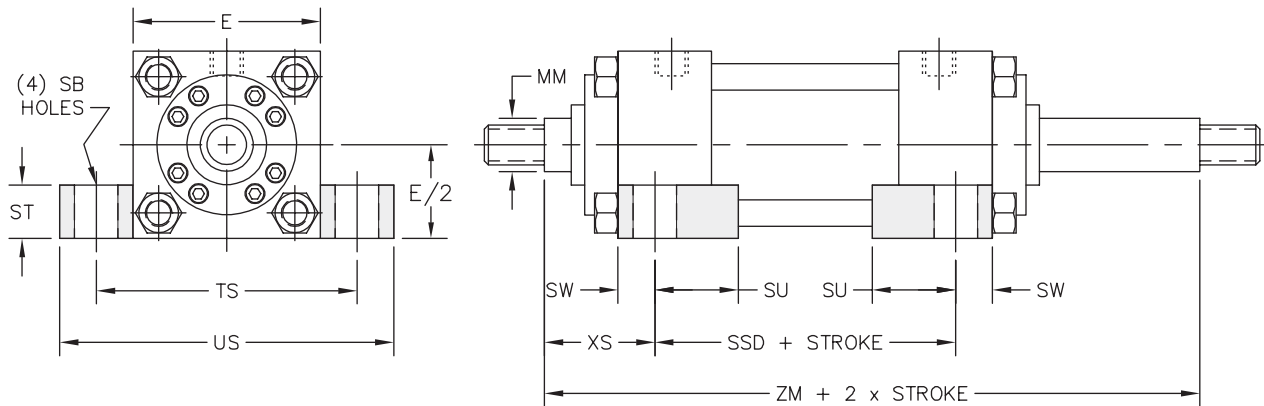
Bore	Rod Dia. (MM)	Max PSI Rating ¹	E	B ²	FH	FB	R	TF	UF	W	Add 2x Stroke ZM
1.50	0.625	3000	2.500	1.124	0.375	0.438	1.625	3.438	4.250	0.625	6.875
	1.000			1.499						1.000	7.625
2.00	1.000	3000	3.000	1.499	0.625	0.563	2.047	4.125	5.125	0.750	7.625
	1.375			1.999						1.000	8.125
2.50	1.000	3000	3.500	1.499	0.625	0.563	2.547	4.625	5.625	0.750	7.750
	1.375			1.999						1.000	8.250
	1.750			2.374						1.250	8.750
3.25	1.375	3000	4.500	1.999	0.750	0.688	3.250	5.875	7.125	0.875	9.000
	1.750			2.374						1.125	9.500
	2.000			2.624						1.250	9.750
4.00	1.750	3000	5.000	2.374	0.875	0.688	3.820	6.375	7.625	1.000	9.750
	2.000			2.624						1.125	10.000
	2.500			3.124						1.375	10.500
5.00	2.000	3000	6.500	2.624	0.875	0.938	4.953	8.188	9.750	1.125	10.500
	2.500			3.124						1.375	11.000
	3.000			3.749						1.375	11.000
	3.500			4.249						1.375	11.000
6.00	2.500	3000	7.500	3.124	1.000	1.063	5.725	9.438	11.250	1.250	11.875
	3.000			3.749							
	3.500			4.249							
	4.000			4.749							
7.00	3.000	3000	8.500	3.749	1.000	1.188	6.580	10.625	12.625	1.250	13.000
	3.500			4.249							
	4.000			4.749							
	4.500			5.249							
8.00	5.000	3000	9.500	5.749	1.000	1.313	7.500	11.813	14.000	1.250	14.000
	5.000			5.749							
	5.000			5.749							
	5.500			6.249							

1. Max single acting pressure rating (non-shock). Any additional opposed intensified pressure related to varying impact area within the cylinder is not taken into consideration (ram cylinders).

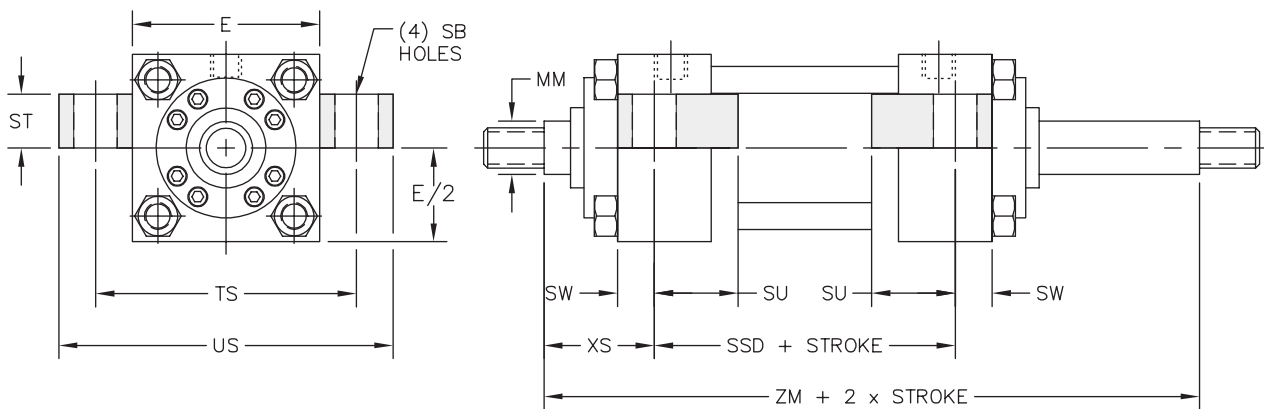
2. B dimension tolerance is +.000 / -.002.

Dimensions – Double End Mounts

MS2D: Side Lugs



MS3D: Center Line Lugs



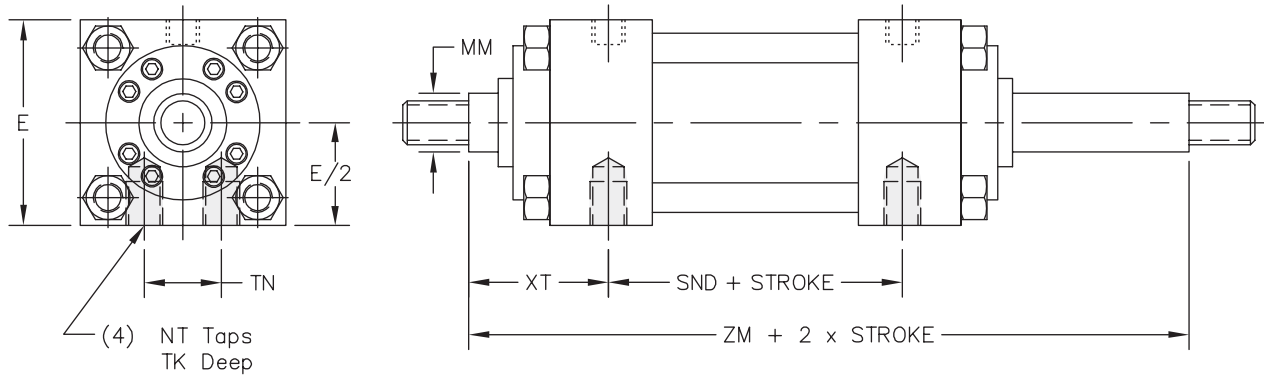
Dimensions – Double End Mounts

Bore	Rod Dia. (MM)	Max PSI Rating ¹	E	E / 2	SB	ST	SU	SW	TS	US	XS	Add to Stroke SSD	Add 2x Stroke ZM
1.50	0.625	3000	2.500	1.250	0.438	0.500	0.938	0.375	3.250	4.000	1.375	4.125	6.875
	1.000										1.750		7.625
2.00	1.000	3000	3.000	1.500	0.563	0.750	1.250	0.500	4.000	5.000	1.875	3.875	7.625
	1.375										2.125		8.125
2.50	1.000	3000	3.500	1.750	0.813	1.000	1.563	0.688	4.875	6.250	2.063	3.625	7.750
	1.375										2.313		8.250
	1.750										2.563		8.750
3.25	1.375	3000	4.500	2.250	0.813	1.000	1.563	0.688	5.875	7.250	2.313	4.375	9.000
	1.750										2.563		9.500
	2.000										2.688		9.750
4.00	1.750	3000	5.000	2.500	1.063	1.250	2.000	0.875	6.750	8.500	2.750	4.250	9.750
	2.000										2.875		10.000
	2.500										3.125		10.500
5.00	2.000	3000	6.500	3.250	1.063	1.250	2.000	0.875	8.250	10.000	2.875	4.750	10.500
	2.500										3.125		11.000
	3.000										3.125		11.000
	3.500										3.125		11.000
6.00	2.500	3000	7.500	3.750	1.313	1.500	2.500	1.125	9.750	12.000	3.375	5.125	11.875
	3.000												
	3.500												
	4.000												
7.00	3.000	3000	8.500	4.250	1.563	1.750	2.875	1.375	11.250	14.000	3.625	5.750	13.000
	3.500												
	4.000												
	4.500												
8.00	5.000	3000	9.500	4.750	1.563	1.750	2.875	1.375	12.250	15.000	3.625	6.750	14.000
	5.500												

1. Max single acting pressure rating (non-shock). Any additional opposed intensified pressure related to varying impact area within the cylinder is not taken into consideration (ram cylinders).

Dimensions – Double End Mounts

MS4D: Bottom Tapped Holes

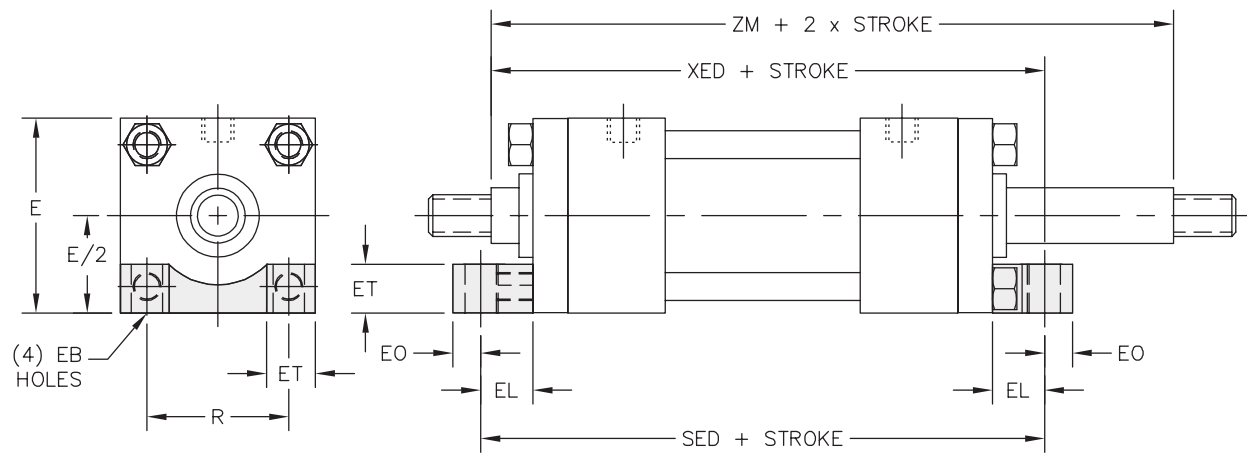


Bore	Rod Dia. (MM)	Max PSI Rating ¹	E	E / 2	NT	TK	TN	XT	Add to Stroke SND	Add 2x Stroke ZM
1.50	0.625	3000	2.500	1.250	3/8 - 16	0.375	0.750	2.000	2.875	6.875
	1.000					0.375		2.375		7.625
2.00	1.000	3000	3.000	1.500	1/2 - 13	0.438	0.938	2.375	2.875	7.625
	1.375					0.438		2.625		8.125
2.50	1.000	3000	3.500	1.750	5/8 - 11	0.750	1.313	2.375	3.000	7.750
	1.375					0.625		2.625		8.250
	1.750					0.500		2.875		8.750
3.25	1.375	3000	4.500	2.250	3/4 - 10	1.000	1.500	2.750	3.500	9.000
	1.750					0.875		3.000		9.500
	2.000					0.750		3.125		9.750
4.00	1.750	3000	5.000	2.500	1 - 8	0.875	2.063	3.000	3.750	9.750
	2.000					0.750		3.125		10.000
	2.500					0.750		3.375		10.500
5.00	2.000	3000	6.500	3.250	1 - 8	1.000	2.938	3.125	4.250	10.500
	2.500									11.000
	3.000									11.000
	3.500									11.000
6.00	2.500	3000	7.500	3.750	1 1/4 - 7	1.250	3.313	3.500	4.875	11.875
	3.000					1.250				
	3.500					1.250				
	4.000					0.750				
7.00	3.000	3000	8.500	4.250	1 1/2 - 6	1.125	3.750	3.813	5.375	13.000
	3.500									
	4.000									
	4.500									
8.00	5.000	3000	9.500	4.750	1 1/2 - 6	1.500	4.250	3.938	6.125	14.000
	4.000					1.500				
	4.500					1.500				
	5.000					1.250				
	5.500					1.000				

1. Max single acting pressure rating (non-shock). Any additional opposed intensified pressure related to varying impact area within the cylinder is not taken into consideration (ram cylinders).

Dimensions – Double End Mounts

MS7D: End Lugs¹



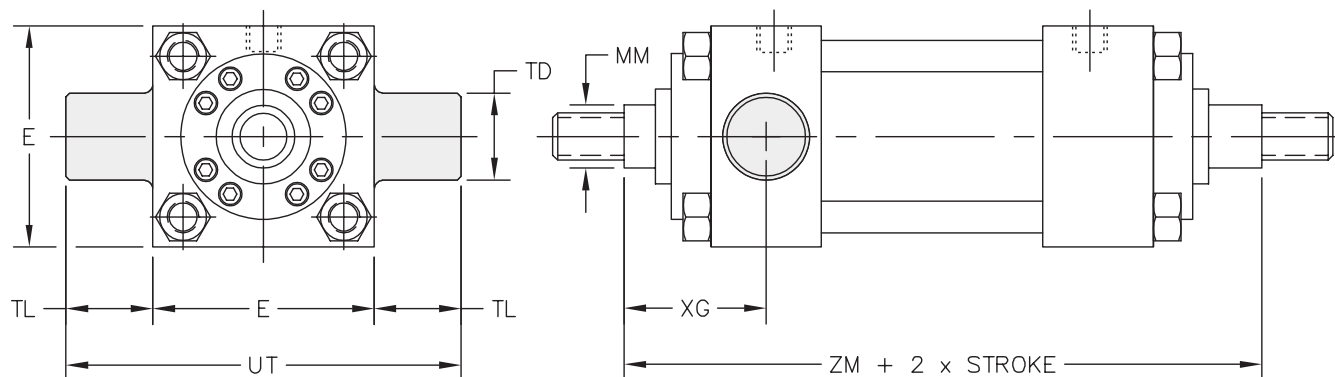
Bore	Rod Dia. (MM)	Max PSI Rating ²	E	E / 2	EB	EL	EO	ET	R	Add to Stroke		Add 2x Stroke
										SED	XED	ZM
1.50	0.625	3000	2.500	1.250	0.438	0.875	0.375	0.750	1.625	7.375	7.125	6.875
	1.000	Not Available										
2.00	1.000	3000	3.000	1.500	0.563	0.938	0.500	0.875	2.047	8.000	7.687	7.625
	1.375	Not Available										
2.50	1.000	3000	3.500	1.750	0.563	0.938	0.500	0.875	2.547	8.125	7.938	7.750
	1.375										8.188	8.250
	2.000	Not Available										
3.25	1.375	3000	4.500	2.250	0.688	1.125	0.625	1.188	3.250	9.500	9.250	9.000
	1.750	Not Available										
	2.000											
4.00	1.750	3000	5.000	2.500	0.688	1.125	0.625	1.188	3.820	10.000	9.875	9.750
	2.000	Not Available										
	2.500											
5.00	2.000	3000	6.500	3.250	0.938	1.500	0.750	1.500	4.953	11.250	10.875	10.500
	2.500										11.125	11.000
	3.000										11.125	11.000
	3.500	Not Available										
6.00	2.500	3000	7.500	3.750	1.063	1.688	0.875	1.750	5.734	12.750	12.313	11.875
	3.000											
	3.500											
	4.000	Not Available										

1. When using this mount, the cylinder feet, head & cap are to be firmly supported.

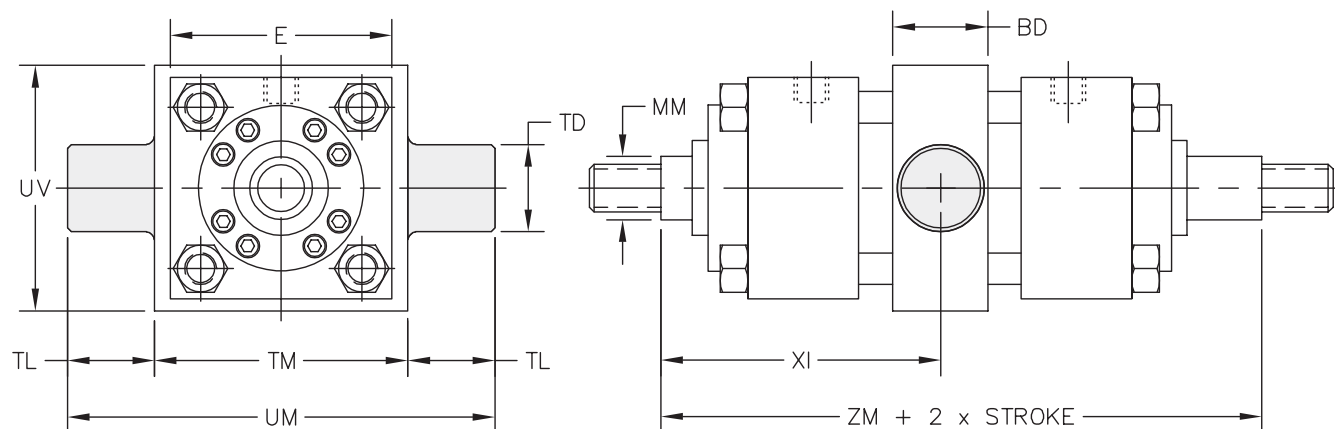
2. Max single acting pressure rating (non-shock). Any additional opposed intensified pressure related to varying impact area within the cylinder is not taken into consideration (ram cylinders).

Dimensions – Double End Mounts

MT1D: Head Trunnion



MT4D: Intermediate Trunnion



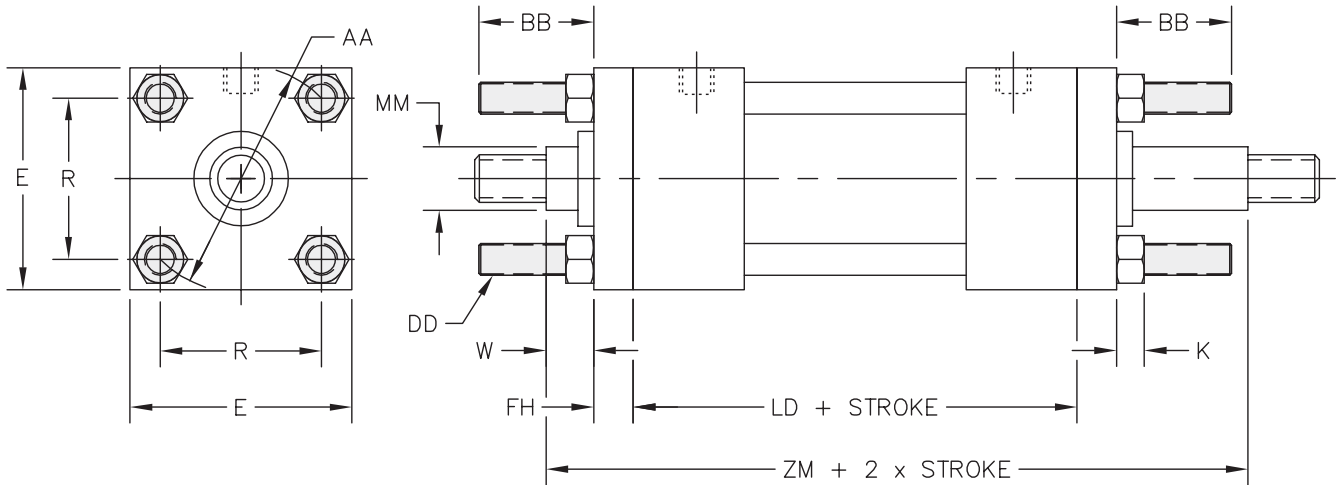
Dimensions – Double End Mounts

Bore	Rod Dia. (MM)	Max PSI Rating ¹	E	BD	TD ²	TL	TM	UM	UT	UV	XG	MT4 XI Min ³	MT4 Min Stroke	Add To Stroke MT4 XI Max	Add 2x Stroke ZM
1.50	0.625	3000	2.500	1.500	1.000	1.000	3.000	5.000	4.500	3.000	1.875	3.625	0.375	3.250	6.875
	1.000										2.250	4.000		3.625	7.625
2.00	1.000	3000	3.000	1.500	1.375	1.375	3.500	6.250	5.750	3.500	2.250	4.000	0.375	3.625	7.625
	1.375										2.500	4.250		3.875	8.125
2.50	1.000	3000	3.500	1.500	1.375	1.375	4.000	6.750	6.250	4.000	2.250	4.000	0.250	3.750	7.750
	1.375										2.500	4.250		4.000	8.250
	1.750										2.750	4.500		4.250	8.750
3.25	1.375	3000	4.500	2.000	1.750	1.750	5.000	8.500	8.000	5.000	2.625	4.750	0.500	4.250	9.000
	1.750										2.875	5.000		4.500	9.500
	2.000										3.000	5.125		4.625	9.750
4.00	1.750	3000	5.000	2.000	1.750	1.750	5.500	9.000	8.500	5.500	2.875	5.000	0.250	4.750	9.750
	2.000										3.000	5.125		4.875	10.000
	2.500										3.250	5.375		5.125	10.500
5.00	2.000	3000	6.500	2.500	1.750	1.750	7.000	10.500	10.000	7.250	3.000	5.375	0.250	5.125	10.500
	2.500										3.250	5.625		5.375	11.000
	3.000										3.250	5.625		5.375	11.000
	3.500										3.250	5.625		5.375	11.000
6.00	2.500	3000	7.500	3.000	2.000	2.000	8.500	12.500	11.500	8.750	3.375	6.125	0.375	5.750	11.875
	3.000														
	3.500														
	4.000														
7.00	3.000	3000	8.500	3.000	2.500	2.500	9.750	14.750	13.500	10.000	3.625	6.625	0.250	6.375	13.000
	3.500														
	4.000														
	4.500														
8.00	5.000	3000	9.500	3.500	3.000	3.000	11.000	17.000	15.500	11.750	3.750	7.125	0.250	6.875	14.000
	4.000														
	4.500														
	5.000														
	5.500														

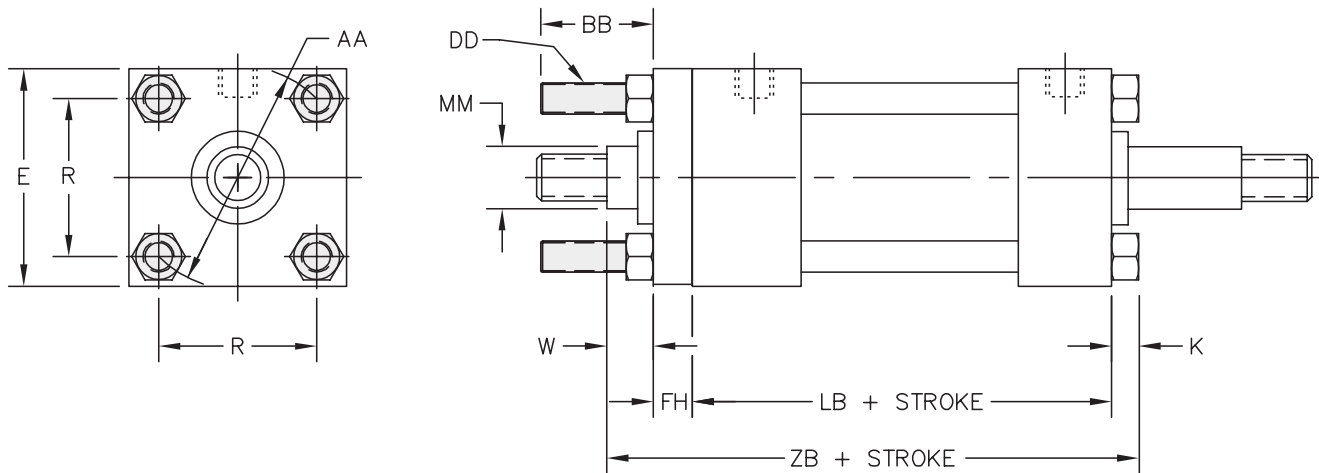
1. Max single acting pressure rating (non-shock). Any additional opposed intensified pressure related to varying impact area within the cylinder is not taken into consideration (ram cylinders).
2. TD dimension tolerance is + .000 / - .001.
3. XI dimension is the minimum that can be supplied (customer to specify XI dimension).

Dimensions – Double End Mounts

MX1D: Extended Tie Rods – Head & Cap



MX3D: Extended Tie Rods – Head End



Dimensions – Double End Mounts

Bore	Rod Dia. (MM)	Max PSI Rating ¹	E	AA	BB	DD	FH	K	R	W	Add To Stroke LD	Add 2x Stroke ZM
1.50	0.625	3000	2.500	2.300	1.375	3/8 - 24	0.375	0.375	1.625	0.625	4.875	6.875
	1.000									1.000		7.625
2.00	1.000	3000	3.000	2.900	1.813	1/2 - 20	0.625	0.500	2.047	0.750	4.875	7.625
	1.375									1.000		8.125
2.50	1.000	3000	3.500	3.600	1.813	1/2 - 20	0.625	0.500	2.547	0.750	5.000	7.750
	1.375									1.000		8.250
	1.750									1.250		8.750
	1.375									0.875		9.000
3.25	1.750	3000	4.500	4.600	2.313	5/8 - 18	0.750	0.625	3.250	1.125	5.750	9.500
	2.000									1.250		9.750
	1.750									1.000		9.750
4.00	2.000	3000	5.000	5.400	2.313	5/8 - 18	0.875	0.625	3.820	1.125	6.000	10.000
	2.500									1.375		10.500
	2.000									1.125		10.500
5.00	2.500	3000	6.500	7.000	3.188	7/8 - 14	0.875	0.875	4.953	1.375	6.500	11.000
	3.000									1.375		11.000
	3.500									1.375		11.000
	2.500									1.250		11.875
6.00	3.000	3000	7.500	8.100	3.625	1 - 14	1.000	1.000	5.734	1.250	7.375	11.875
	3.500									1.250		
	4.000									1.250		
	3.000									1.250		
7.00	3.500	3000	8.500	9.300	4.125	1 1/8 - 12	1.000	1.125	6.580	1.250	8.500	13.000
	4.000									1.250		
	4.500									1.250		
	5.000									1.250		
8.00	3.500	3000	9.500	10.600	4.500	1 1/4 - 12	1.000	1.250	7.500	1.250	9.500	14.000
	4.000									1.250		
	4.500									1.250		
	5.000									1.250		
8.00	5.500	3000	9.500	10.600	4.500	1 1/4 - 12	1.000	1.250	7.500	1.250	9.500	14.000
	5.500									1.250		

1. Max single acting pressure rating (non-shock). Any additional opposed intensified pressure related to varying impact area within the cylinder is not taken into consideration (ram cylinders).



HH Cylinders

HH-MF1 -250 x 10-H2C6-100-KK1-P15 = N375-S S S S-

Product Series HH High Pressure Hydraulic	Style Single Rod D Double Rod	Stroke 0" to 120" Made to Order (Use decimals for fractional strokes)	Rod Size 062 0.625" Rod Dia. 100 1.000" Rod Dia. 137 1.375" Rod Dia. 175 1.750" Rod Dia. 200 2.000" Rod Dia. 250 2.500" Rod Dia. 300 3.000" Rod Dia. 350 3.500" Rod Dia. 400 4.000" Rod Dia. 450 4.500" Rod Dia. 500 5.000" Rod Dia. 550 5.500" Rod Dia.	Port Loc³ P 1 2 3 4 5 6 7 8 9	Piston Seal S Standard (Carboxylated) C Cast-Ring E EP T PTFE ⁵ V Fluorocarbon	Rod Seal S Standard (Polyurethane) E EP V Fluorocarbon	Tube Seal S Standard (Buna) E EP V Fluorocarbon	Rod Wiper⁴ S Standard (Flocked Nitrile) M Metallic Scraper T PTFE V Fluorocarbon	Options A= Extended Piston Rod Thread (Example: A = 2") (Max = 2 Times ST'D "A" Dim.) ABP= Air Bleed Ports (Example: ABP=15) AS= Adjustable Stroke - Retract (Specify Length, Example: AS = 4") C= Extended Piston Rod (Example: IF C = 0.50", Then 1" Rod Extension Is C = 1.50") CS Center Support DBB= Drain Back Bushing (Example: DBB=1) EK Extended Key Plate HLP High Load Piston HSS High Shock Seals LRB Lift Ring Boss NR Non-Rotating RBB Rod Bushing Material: Bronze RLH "Rod Lock Ready" Cylinder RLH= Rod Lock Model Number Example: RLH=1002501000 SSR Stainless Steel Piston Rod ST ⁵ Stop Tube (Specify Stop Tube Length (in inches). Specify Stroke as ES (effective stroke). Example: HH-MS2-250x48 ES-H2C6-ST=37) 4WF Four Wrench Flats (Rod Sizes: .625"-3.50") XX= Special Variation (Specify)
NFPA Mounts MX0 No Mount (1.50" to 8.00" Bore) MF1 Head Rectangular Flange (1.50" to 8.00" Bore) MF2 Cap Rectangular Flange (1.50" to 8.00" Bore) MF5 Head Square Flange (1.50" to 8.00" Bore) MF6 Cap Square Flange (1.50" to 8.00" Bore) ME5 Head Rectangular Mounting Holes (1.50" to 8.00" Bore) ME6 Cap Rectangular Mounting Holes (1.50" to 8.00" Bore) MP1 Fixed Cap Pivot Clevis (1.50" to 8.00" Bore) MS2 Side Lugs (1.50" to 8.00" Bore) MS3 Center Line Lugs (1.50" to 8.00" Bore) MS4 Bottom Tapped Holes (1.50" to 8.00" Bore) MS7 End Lugs (1.50" to 6.00" Bore) MT1 Head Trunnion (1.50" to 8.00" Bore) MT2 Cap Trunnion (1.50" to 8.00" Bore) MT4 Intermediate (Center) Trunnion (1.50" to 8.00" Bore) ¹ MX1 Extended Tie Rods - Head & Cap (1.50" to 8.00" Bore) MX2 Extended Tie Rods - Cap (1.50" to 8.00" Bore) MX3 Extended Tie Rods - Head (1.50" to 8.00" Bore) SB Spherical Bearing (1.50" to 6.00" Bore)	Bore 150 1.50" 200 2.00" 250 2.50" 325 3.25" 400 4.00" 500 5.00" 600 6.00" 700 7.00" 800 8.00"	Cushions¹ H 1 2 3 4 C 5 6 7 8 Cushions ¹	Rod End² KK1 Small Male Thread KK2 Large Male Thread KK3 Female Thread KK3M Female Metric Rod Thread KK3X Female Special Thread KK4 Full Diameter Male Thread KK5 Plain End KK10 Rod Coupler End KKM Metric Thread KKX Male Special Thread	Port Size N062 1/16" NPTF N125 1/8" NPTF N250 1/4" NPTF N375 3/8" NPTF N500 1/2" NPTF N750 3/4" NPTF N1000 1" NPTF N1500 1 1/2" NPTF S2 #2 SAE S3 #3 SAE S4 #4 SAE S5 #5 SAE S6 #6 SAE S8 #8 SAE S10 #10 SAE S12 #12 SAE S16 #16 SAE S24 #24 SAE					

1. Call out 'H' for head cushion, 'C' for cap cushion, followed by the desired location(s).
2. When additional thread details are required, use format: Rod End = Modification Example: KKX=1.00x8
3. Call out 'P' followed by all desired locations.
4. When cylinder design calls for all EP seals, use PTFE rod wiper.
5. The desired stop tube length adds directly to the overall cylinder length.
Note: Refer to HH Options for specifications.

HH Seal Kits

To ensure proper seals are supplied for all models, ALWAYS supply IMI Bimba serial number.

HH-SK 137 - 250 - S S S S											
Seal Kit Series		Rod Size		Bore		Piston Seal		Tube Seal		Rod Wiper*	
HH-SK	HH Series Seal Kit	062	0.625" Rod Dia.	150	1.50" Bore	C	Cast Ring	E	EP	C	Metallic Scrapper
HH-SKD	Double Rod	100	1.000" Rod Dia.	200	2.00" Bore	E	EP	S	Standard (Buna)	E	Standard (Flocked Nitrile)
		137	1.375" Rod Dia.	250	2.50" Bore	S	Standard (Carboxilated)	V	Fluorocarbon	T	PTFE
		175	1.750" Rod Dia.	325	3.25" Bore	T	PTFE			V	Fluorocarbon
		200	2.000" Rod Dia.	400	4.00" Bore	V	Fluorocarbon				
		250	2.500" Rod Dia.	500	5.00" Bore						
		300	3.000" Rod Dia.	600	6.00" Bore						
		350	3.500" Rod Dia.	700	7.00" Bore						
		400	4.000" Rod Dia.	800	8.00" Bore						
		450	4.500" Rod Dia.								
		500	5.000" Rod Dia.								
		550	5.500" Rod Dia.								

Rod Seal	
E	EP
S	Standard (Polyurethane)
V	Fluorocarbon

* When cylinder design calls for all EP seals, use PTFE rod wiper.

Examples:

HH-SK175-400-SSSS

HH-SK100-250-VVVT

All seal kits come with proper backup rings when required. To order replacement seal kits, call out the rod size, bore size and the seal selection from the original order.

Index to Options

- 105** A = Extended Piston Rod Thread
- 105** AS = Adjustable Stroke (Retract)
- 105** ABP = Air Bleed Ports
- 105** C = Extended Piston Rod
- 106** CS = Center Support
- 106** C or H = Cushions
- 106** DBB = Drain Back Bushing
- 107** EK = Extended Key Plate
- 107** T = PTFE Piston Seal
- 108** HSS = High Shock Seals

- 108** KXX = Non-Standard Rod Threads
- 108** KKM = Male Metric Rod Threads
- 108** KK3M = Female Metric Rod Threads
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- 108** Multiple Mounts
- 109** LRB = Lift Ring Boss
- 109** NR = Non-Rotating
- 110** RBB = Rod Bushing - Bronze (Ductile Iron is standard)
- 110** RLH = Rod Lock
- 110** SSR = Stainless Steel Piston Rod

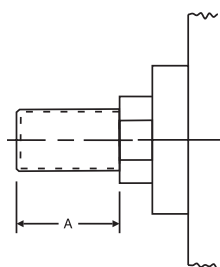
- 110** Rod Boots
- 111** Port Options (BSPP, BSPT, NPTF)
- 112** Seals (Piston, Rod, Tube, Wiper)
- 113** ST = Stop Tube & Rod Size Selection
- 114** Piston Rod Size Selection
- 115** 3P = Three-Position Cylinders
- 115** BTB = Back-To-Back Cylinders
- 115** TM = Tandem Cylinders
- 115** Special Finishes

A Extended Piston Rod Thread

A = refers to the length of piston rod thread.

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

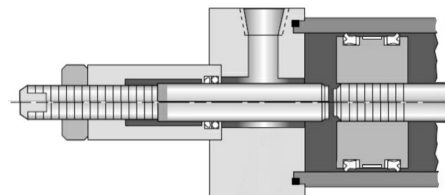
Note: Maximum thread length is double the standard "A" length.



AS Adjustable Stroke (Retract)

AS = Consists of a threaded rod in the cylinder cap, non-removable. Provides an adjustable positive stop on the cylinder retract.

To order, specify "AS" and length of adjustment (Example: AS=3").



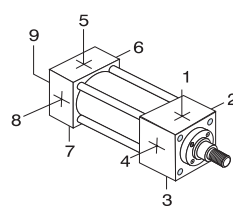
Adjustable Stroke

Bore	Max "AS"
1.50	Up to 8 inch
2.00-3.25	Up to 6 inch
4.00-6.00	Up to 5 inch
7.00 & 8.00	Up to 4 inch

Consult factory for additional adjustable strokes offerings.

ABP Air Bleed Ports

ABP = Air bleeds can be provided at either or both ends of the cylinder. Air bleeds should be located at the highest point in the cylinder for maximum effectiveness. The location needs to be specified, similar to port locations.

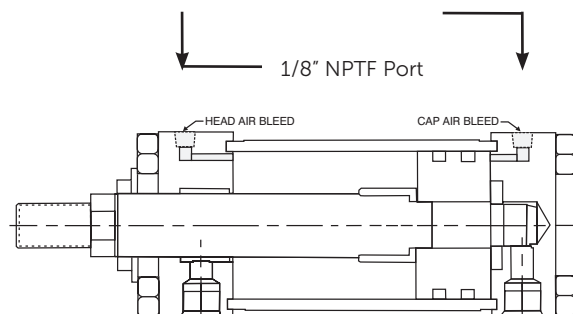


Location 9 is center of cap face.

Bore & Rod Size Limits: Air bleed ports not available on the head end for 1.5" bore with 1" rod, 2" bore with 1.375" rod, and 2.5" bore with 1.75" rod.

Example: ABP=15 (Air Bleed ports at position 1 & 5)

Plugged from factory.

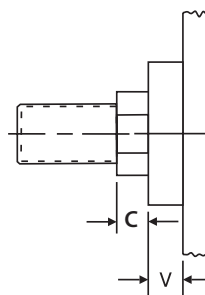


C Extended Piston Rod

C = is commonly referred to as piston rod extension. Piston rods can be extended to any length up to 120" total piston rod length, including stroke portion. Cylinders with long "C" lengths can be mounted away from obstacles or outside hazardous environments.

Example: If C=0.50", then 1" rod extension is C=1.50"

Be sure to check piston rod column strength charts to properly size the rod and prevent buckling. Extended piston rods do not delay delivery.

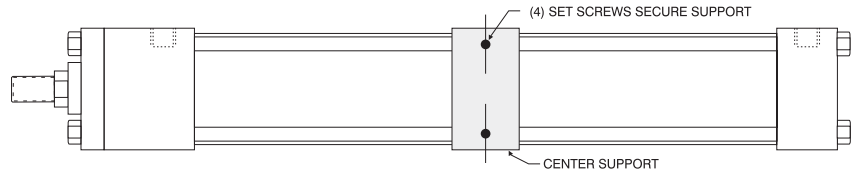


CS Center Supports

CS = Center supports are recommended for long stroke cylinders to support tube and prevent the tie rods from sagging. Properly supported cylinders will eliminate premature cylinder wear and eliminate tie rod vibration.

Center supports can include MS2 mounts.

Contact IMI Bimba for more information.

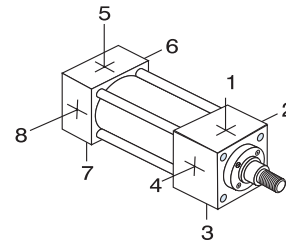


Center Support Recommendations		
Bore	One Support	Two Supports
1.50"	Strokes over 44 inches	Strokes over 89 inches
2.00"	Strokes over 74 inches	Strokes over 99 inches
2.50"	Strokes over 84 inches	Not Required
3.25" - 8.00"	Strokes over 99 inches	

H/C Head & Cap Cushions

C or H = IMI Bimba's cushion design features industry proven technology and ultra fine adjustment needles for perfect deceleration and long life. Cushion adjustment needle positions need to be specified.

Example: H2C6



Cushion Locations	
Head Cushion	Cap Cushion
H1	C5
H2	C6
H3	C7
H4	C8

Standard Cushion Locations	
Most Mounts	H2 C6
MS3 Mount	H3 C7
MT1 Mount	H3 C6
MT2 Mount	H2 C7

Unavailable Cushion Locations by Mount		
Mount	Head Cushion	Cap Cushion
ME5	H2, H4	—
ME6	—	C6, C8
MS3	H2, H4	C6, C8
MT1	H2, H4	—
MT2	—	C6, C8

Note: Cylinders with a short stroke (value varies with bore/rod diameter and cushion combinations) may result in improper cylinder operation. Consult factory for availability.

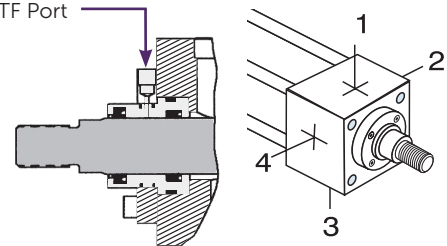
DBB Drain Back Bushing

DBB = When oil leakage cannot be tolerated, a rod bushing drain port can be provided. Since there isn't any pressure in the drain line, clear tubing can offer a visual inspection of any leakage. A constant leak indicates that the rod seal is worn and needs to be replaced.

Note: Some bore and rod sizes are not available or may require special thickness retainers.

Example: DBB=1 (drain port at position 1)

1/16" or 1/8" NPTF Port



EK Extended Key Plate

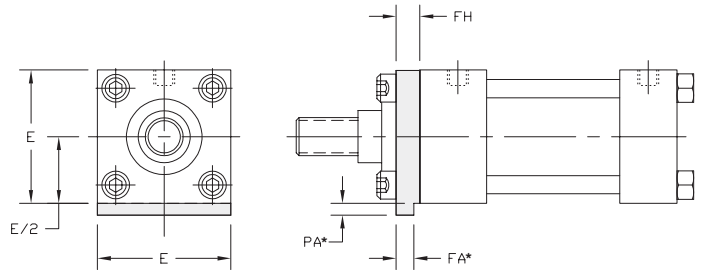
EK = Extended key plate or thrust key is made from a full square bushing retainer plate.

The key is designed to fit in a milled slot on the equipment to prevent the cylinder from shifting.

An additional mount needs to be specified to secure cylinder.

HH Dimensions Extended Key Plate				
Bore	E	FA*	FH	PA*
1.50	2.500	0.312 / 0.314	0.375	0.188
2.00	3.000	0.562 / 0.564	0.625	0.313
2.50	3.500	0.562 / 0.564	0.625	0.313
3.25	4.500	0.687 / 0.689	0.750	0.375
4.00	5.000	0.812 / 0.814	0.875	0.438
5.00	6.500	0.812 / 0.814	0.875	0.438
6.00	7.500	0.937 / 0.939	1.000	0.500
7.00	8.500	0.937 / 0.939	1.000	0.500
8.00	9.500	0.937 / 0.939	1.000	0.500

* FA & PA dimensions will have a black oxide finish and will not be painted.



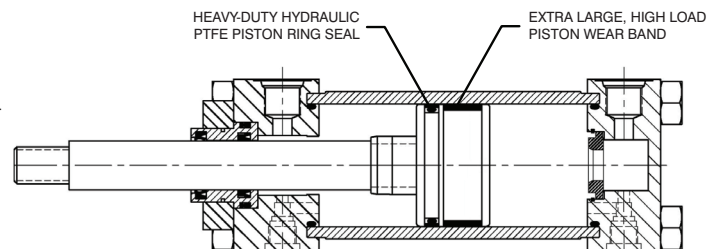
Option T (PTFE) Piston Seal - Recommended for High Load & Low Friction Applications

Long stroke cylinders and pivot type mounting can create severe cylinder piston-to-tube side loads. The PTFE piston seal provides increased side load capacity and low friction without increasing the cylinder base dimensions.

– Design Benefits

- Bi-direction piston seal offers low leakage rating
- Piston seal design offers lower friction than cast iron rings or lip seals, which eliminate stick/slip breakaway issues
- Glass filled PTFE piston seal is 20% stronger than bronze filled seals
- High contamination tolerant; offers the longest life of any seal type
- Temperature Rating (PTFE):
-100°F to 400°F (-73°C to 204°C)
- Temperature Rating (Nitrile):
-20°F to 200°F (-29°C to 93°C)
- Temperature Rating (FKM):
0°F to 400°F (-18°C to 204°C)

- High Load Piston Wear Band - Our superior design is 35% to 80% wider than competitive models and we locate the wear band at the furthest point from the rod bearing to increase overall effectiveness
- Piston Ring Seal - Glass filled PTFE with Nitrile* expander.



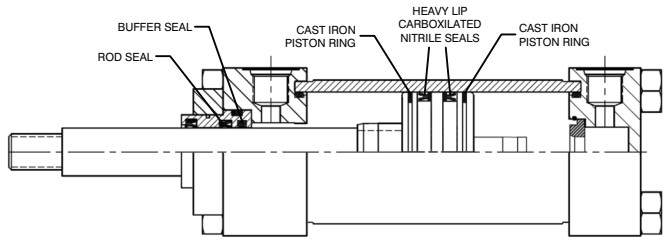
HSS High Shock Seals

HSS = High shock seal option provides shock protection to the rod and piston seal.

Piston Seal - Consists of two (2) bidirectional sealing, step-cut, cast iron piston rings to buffer the shock and two (2) heavy-lip design Carboxilated Nitrile seals (with back-up rings), to provide near leak-free operation.

Rod Seals - Consists of a buffer seal to handle the shock and a double lip polyurethane block vee seal for leak free operation.

Note: Some bore and rod sizes are not available.



KKX Non-Standard Rod Threads

KKX = Cylinders piston rods can be furnished with non-standard rod threads.

Ordering Example: HH - MF1 - 150 X 24 - 100 - KKX = 3/4-10 - P15 = N375 - SSSS

Add special thread to part number

KK3M Female Metric Rod Threads

KK3M = Equipment that is imported to the United States will typically contain metric tie-rod cylinders. In general, ISO tie rod cylinders are not as robust as NFPA cylinder designs and some customers prefer to replace the metric cylinders with NFPA designs to provide longer life.

IMI Bimba can provide cylinders with metric piston rod end threads to assist customers in mating replacement cylinders to existing equipment.

Ordering Example: HH - MF1 - 150 X 24 - 100 - KK3M = M18 x 1.5 - P15 = N375 - SSSS

KKM Male Metric Rod Threads

KKM = Equipment that is imported to the United States will typically contain metric tie-rod cylinders. In general, ISO tie rod cylinders are not as robust as NFPA cylinder designs and some customers prefer to replace the metric cylinders with NFPA designs to provide longer life.

IMI Bimba can provide cylinders with metric piston rod end threads to assist customers in mating replacement cylinders to existing equipment.

Ordering Example: HH - MF1 - 150 X 24 - 100 - KKM = M18 x 1.5 - P15 = N375 - SSSS

KK3X Female Special Rod Threads

KK3X = IMI Bimba can machine a wide range of female rod threads. Standard NFPA rod threads are UNF (fine), class 2 threads. Common alternative choices are UNC (coarse) threads. Note: unless otherwise specified, the rod thread will be standard catalog "A" dimension lengths.

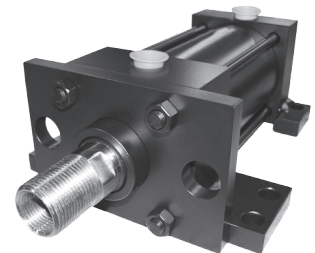
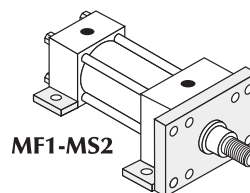
Ordering Example: HH - MF1 - 150 X 24 - 100 - KK3X = 3/4-10 - P15 = N375 - SSSS

Multiple Mounts

Cylinders can be furnished with a wide selection of multiple mounts.

Ordering Example: HH - MF1 - MS2 - 250 X 12 - 100 - KK1 - P15 - SSSS

Add additional mount to part number

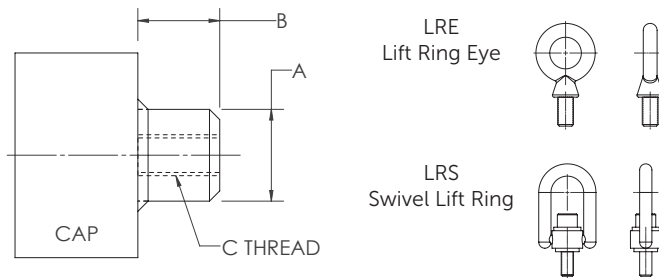


LRB Lift Ring Boss

LRB = A steel, tapped lug is welded to the center of the cylinder cap.

UNC coarse threads are provided to accept high load type lifting eyes (lift eyes are available with the options to the right).

Also available in additional locations and styles.



Lift Lug Dimensions

Bore	A	B	C	Straight Pull Lifting Capacity *
1.50	1.120	1.000	1/2-13	2500
2.00	1.500	1.250	5/8-11	4000
2.50	1.500	1.250	5/8-11	4000
3.25	2.000	1.500	3/4-10	6000
4.00	2.000	1.500	3/4-10	6000
5.00	2.000	1.500	3/4-10	6000
6.00	2.500	2.000	1-8	9000
7.00	2.500	2.000	1-8	9000
8.00	2.500	2.000	1-8	9000

* Lifting capacity is the maximum capacity for intermittent lifting and placement of cylinder only. It is NOT intended to be used as the primary cylinder mount.

Note: Not available on MF2, MF6, ME6, MP1 and SB mounts.

NR Non-Rotating Cylinders - NFPA

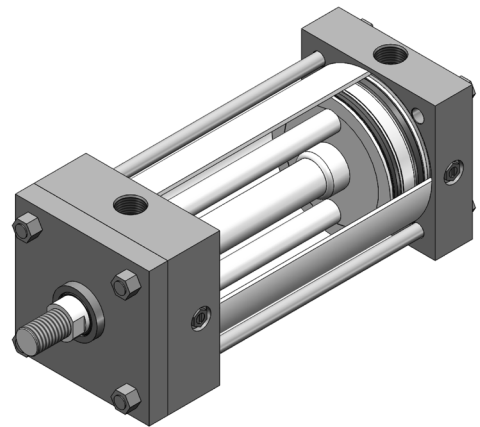
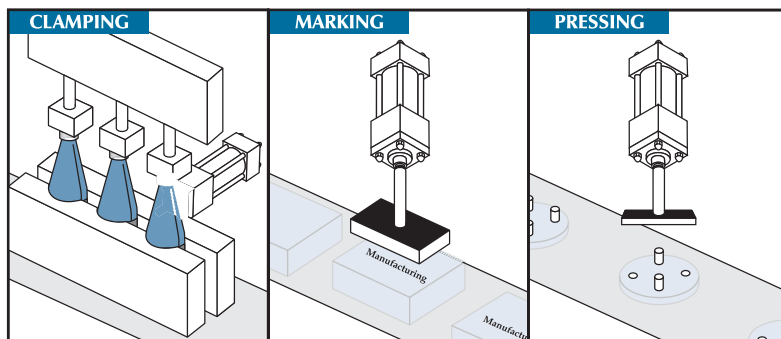
– Benefits

- Two integral guide rods throughout stroke torqued with hex nuts on cap end
- High repeatability at each end of stroke (+/- 1 degree)
- All external dimensions are the same as standard cylinder (no additional length or width required)
- Standard diameter guide rod seals & bronze Bearings for long life and reliable operation
- Steel, hard chrome plated guide rods offer an abrasive resistant surface

– Advantages

- Eliminates the need for external guide shafts in many positioning applications
- Guide rods are self-cleaning and not subjected to harsh cleaners
- Compact design saves space; no larger than standard NFPA cylinders!
- Durable
- Great when rod end rotation is not wanted

– Application Possibilities



Available Bore Sizes with 'NR' Guide Rod Sizes and Max. Stroke

Bore	Rod Dia. (MM)	Guide Rod	Cushions	Max. Stroke
3.25	1.375	.375	Cap Only	18"
5.00	2.000	.625	Available	30"
6.00	2.500	.625	Available	30"
	3.000			
8.00	3.500	1.000	Available	40"

Note: External guide rod models are available with rectangular head and cap. Contact factory for additional information.

RBB Solid Bronze Rod Bushing

RBB = Our standard floating rod bushing design is used in conjunction with solid SAE 660 bronze material. Material specifications: 20,000 PSI compressive strength.

Some customers prefer to use bronze rod bushings. Most common uses are in water hydraulic applications.

Note: Since the mechanical properties of bronze is much lower than cast iron, bronze rod bushings typically do not provide the same long life that our standard PTFE coated cast iron rod bushings provide.

Specials: IMI Bimba can provide special length rod bushings; contact your local distributor for details.

RLH Rod Lock

RLH = Cylinders can be furnished with Hydraulic Rod Locks. Refer to HH Series Rod Locks for complete specifications.

SSR 17-4 Stainless Steel Hard Chrome Plated Piston Rod

SSR = Cylinders can be furnished with hard chrome plated stainless steel piston rods.

100,000 min. yield (rods up to 5.00)

75,000 min. yield (5.500 rod)

Rod Boots

Rod boots are common in dirty environments; a standard spec for many applications.

Note: Rod boots add length to cylinder rod extension.



Port Options

Cylinders can be furnished with NPTF or SAE O-Ring Boss (SAEJ514) ports at no-charge.

Cylinders can be furnished with BSPP, BSPT or SAE Flange Ports for additional cost.

BSPT = British Standard Pipe Taper

British Standard Pipe Taper (BSPT) threads have the same taper as American NPT tapered threads, but use a 55° Whitworth thread form and different diameters. (Not interchangeable with NPT)

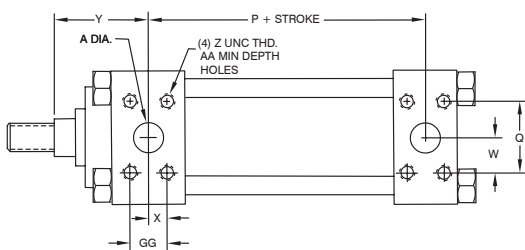
BSPP = British Standard Pipe Parallel

British Standard Pipe Parallel (BSPP), also referred to as BSP "Straight" Thread. (Not interchangeable with NPT)

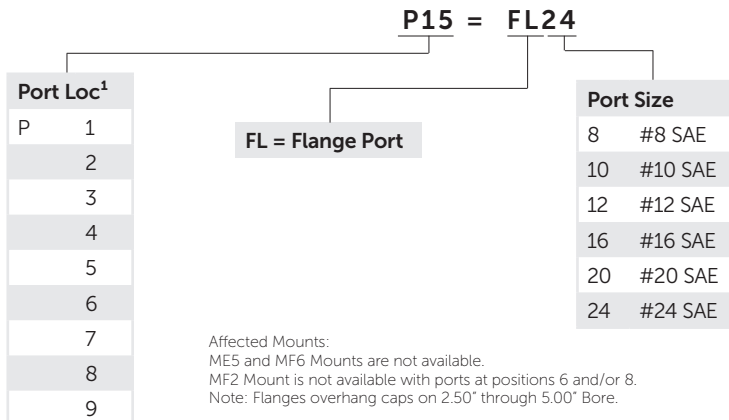
Flange Ports

Bore	Rod Dia. (MM)	Max PSI Rating	SAE Dash No.	Y	P	A	Q	W	X	Z	AA	GG	Ref. Main Flange Size
2.50	1.000	3000	8	2.250	3.250	0.500	1.500	0.750	0.344	5/16 - 18	0.813	0.688	1/2
3.25	1.375	3000	12	2.625	3.750	0.750	1.875	0.938	0.438	3/8 - 16	0.750	0.875	3/4
	1.750			2.875									
	2.000			3.000									
4.00	1.750	3000	12	2.875	4.000	0.750	1.875	0.938	0.438	3/8 - 16	0.750	0.875	3/4
	2.000			3.000									
	2.500			3.250									
5.00	2.000	3000	12	3.000	4.500	0.750	1.875	0.938	0.438	3/8 - 16	0.750	0.875	3/4
	2.500			3.250									
	3.000			3.250									
	3.500			3.250									
6.00	2.500	3000	16	3.375	5.125	1.000	2.063	1.031	0.515	3/8 - 16	0.875	1.031	1
	3.000												
	3.500												
	4.000												
7.00	3.000	3000	20	3.688	5.625	1.250	2.313	1.156	0.594	7/16 - 14	1.000	1.188	1 1/4
	3.500												
	4.000												
	4.500												
8.00	5.000	3000	24	3.750	6.500	1.500	2.750	1.375	0.703	1/2 - 13	1.063	1.406	1 1/2
	3.500												
	4.000												
	5.500												

Port Call Out Information



Series 61 Flange Port (3000 PSI Rating)
(Available on HH Series Only)



¹Call out "P" followed by all desired locations.

Seals

The HH Series allows for the use of different types of seal design and material compounds in every area, for maximum flexibility and performance.

S Standard Seals

Piston:	Carboxilated Nitrile
Rod Seal:	Polyurethane
Tube Seals:	Buna
Rod Wiper:	Flocked Nitrile
Temperature Rating:	-20°F to 200°F (-29°C to 93°C)
Compatible with:	Mineral based hydraulic fluids

S	S	S	S
Piston Seal		Tube Seal	
S Standard (Carboxilated)		S Standard (Buna)	
C Cast-Ring		E EP	
E EP		V Fluorocarbon	
T PTFE			
V Fluorocarbon			
	Rod Seal		Rod Wiper
	S Standard (Polyurethane)		S Standard (Flocked Nitrile)
	E EP		M Metallic Scraper
	V Fluorocarbon		T PTFE
			V Fluorocarbon

E Ethylene Propylene

Temperature Range:	-50°F to 300°F (-45°C to 149°C)
Compatible with:	Most Phosphate Ester (Skydrol 500 and 7000, type 2) fluids

Note: Requires a PTFE rod wiper and L011 lubricant option for EP compatible seal grease.

T Glassed Filled PTFE

Temperature Rating (PTFE):	-100°F to 400°F (-73°C to 204°C)
Temperature Rating (Nitrile):	-20°F to 200°F (-29°C to 93°C)
Temperature Rating (FKM):	0°F to 400°F (-18°C to 204°C)
Compatible with:	All hydraulic fluids and almost any fluid
Use:	Low friction and high side load

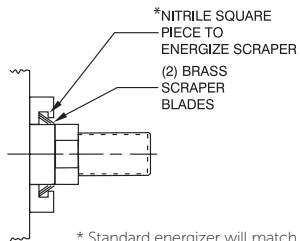
C Cast Iron Piston Rings

Temperature Range:	-20°F to 400°F* (-29°C to 204°C)
Compatible with:	Virtually all fluids
Uses:	Hydraulic shock protection

* When cylinder is equipped with FKM seals.

M Metallic Rod Scraper

M = Aggressively scrapes the piston rod, removing foreign material such as spatter, sprays and powders (brass construction).



V Fluorocarbon

Temperature Range:	0°F to 400°F (-18°C to 204°C)
Compatible with:	Some Phosphate Ester (Houghto-Safe 1000, 1120; Pyrogard 42, 43, 53, 55) fluids; mineral based petroleum, halogenated hydrocarbons, silicate ester and diester fluids

(Up to 400°F with reduced service life)

XX Special

Non-standard seals can be furnished.

Contact IMI Bimba for more information.

Stop Tube and Rod Size Selection

ST = Stop tubes are designed to reduce the piston rod bushing stress to within the designed range of the bearing material. This will ensure proper cylinder performance in any given application. Stop tubes lower the cylinder bearing stress by adding length to the piston, which increases the overall length of the cylinder

Note: IMI Bimba uses a double piston design when possible.

Stop Tube Selection - To determine the proper amount of stop tube for your application, you must first find the value of "D", which represents the stroke (adjusted for mounting condition). Each mounting condition creates different levels of bushing stress, which has direct impact on the amount of stop tube required (see Chart 1).

Once the value of "D" is known, refer to Chart 2 for the recommended amount of stop tube.

To Order Stop Tube

- Add the stop tube prefix "ST=" and the stop tube length to the cylinder model number.
- Add "ES" after the cylinder stroke to indicate that the stroke is the effective stroke.

Example:

HH-MS2-250X42 ES-100-KK2-P15=N375-SSSS-ST=2

Chart 1

Find the value of "D" for your application

D = Stroke, adjusted for mounting condition

S = Actual cylinder stroke

T = Axial thrust (refer to Chart 3 on page 114)

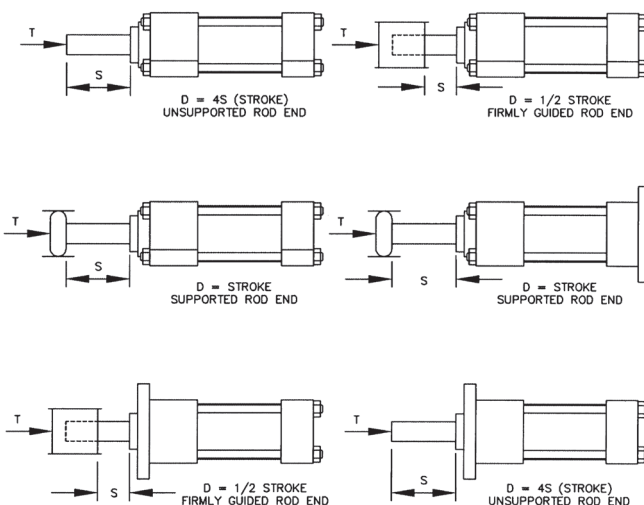
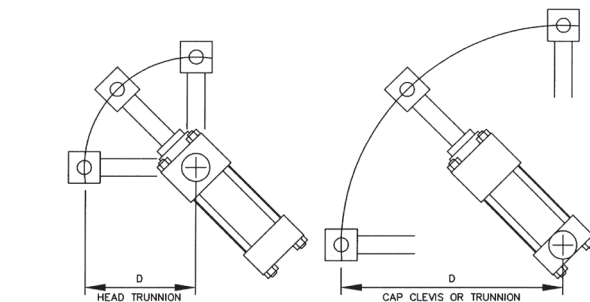
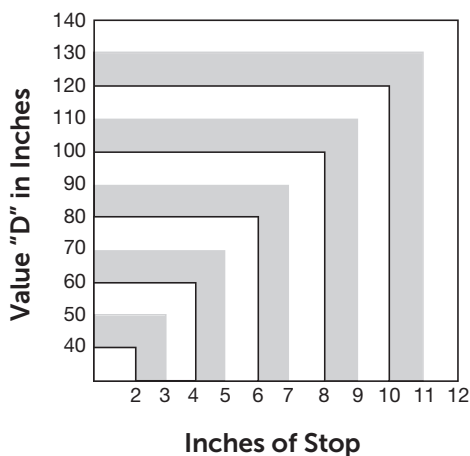


Chart 2

Using the value of "D", find the recommended amount of stop tube



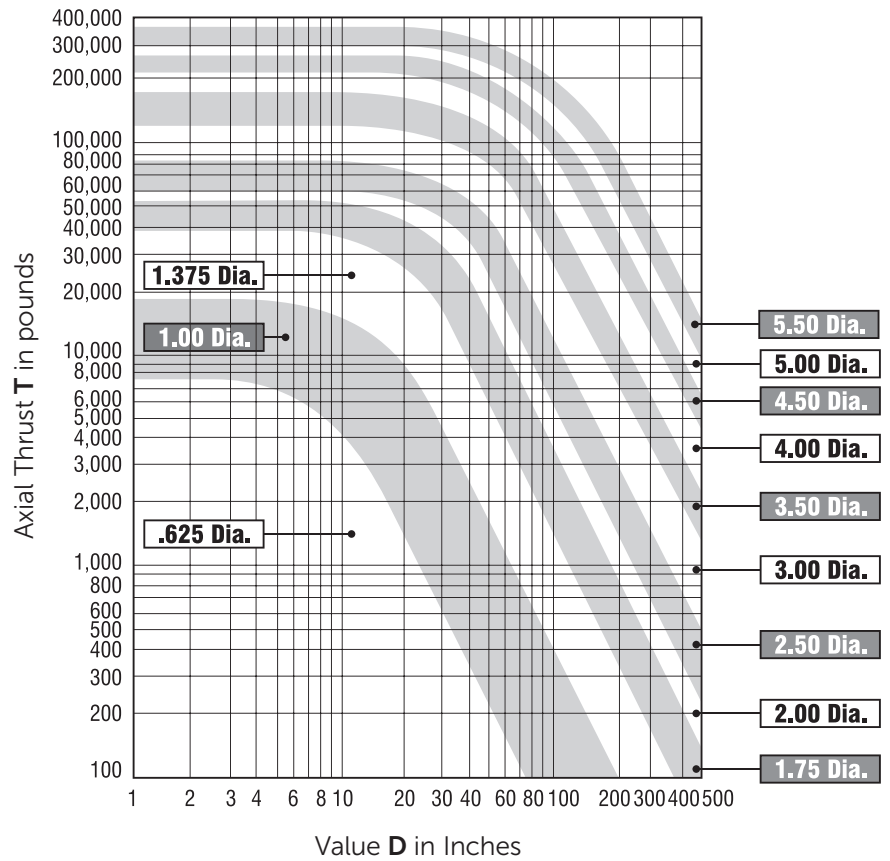
Note: Measure "D" when cylinder is fully extended.
Refer to page 114 for Rod Size Selection Chart.

Piston Rod Size Selection

Standard rod sizes are usually suitable for shorter stroke applications at lower hydraulic pressures. With high thrust force or long stroke applications, you must check the column strength of the rod in the mounting style to determine the proper rod diameter size.

1. Determine the total axial thrust by multiplying the bore area size (in inches) by the operating pressure (in PSI).
2. From page 113, determine the value of "D" for the application.
3. Find the value of "D" in the chart to the right. Follow the value of "D" vertically on the graph until it intersects with the axial thrust value of the cylinder. The intersection of these two values will fall within one of the shaded areas representing the piston rod diameter size required for the application.

Chart 3 (Piston Rod Diameter Selection)



3P Three-Position Cylinders

3P = You can create a 3-Position cylinder from two of the same bore size cylinders.

3-Position cylinders consist of multiple cylinders built as one unit having one exposed working rod end, capable of delivering three rod positions.

3-Position Benefits

- 3-Positions in one cylinder — One cylinder produces three different rod end positions. By varying stroke lengths, a multitude of positions can be created
- Simplifies machine design — Eliminates the need for an additional cylinder to create a third position. 3-Position cylinders reduce space and the cost to mount multiple cylinders

Note: Piston rods are not connected.

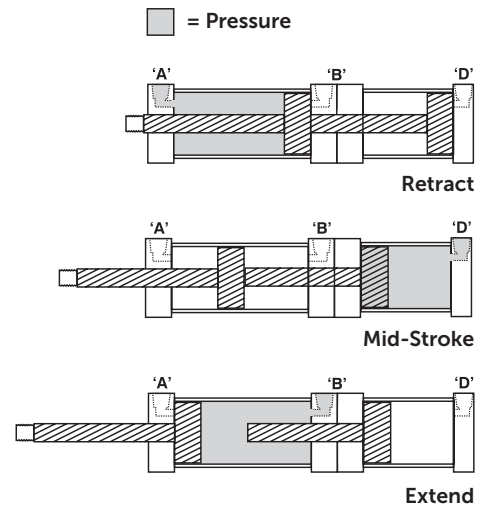
Contact IMI Bimba for more information.

How They Work

Position 1 (retract): Pressure to port "A" fully retracts cylinder

Position 2 (mid-stroke): Pressure to port "D" advances cylinder to mid-stroke position

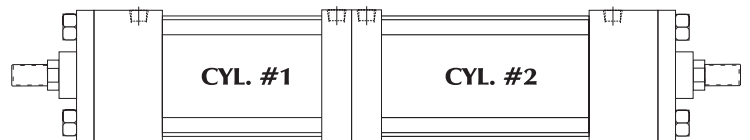
Position 3 (extend): Pressure to port "B" fully extends cylinder



BTB Back-To-Back Cylinders

BTB = Back-to-Back cylinders consist of two individual cylinders built as one unit. These cylinders can act as a four position cylinder.

Contact IMI Bimba for more information.

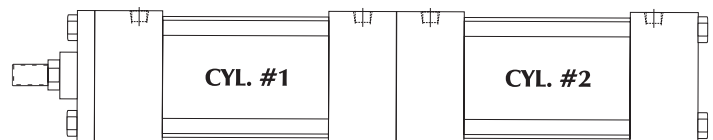


TM Tandem Cylinders

TM = You can tandem different cylinders together to create unlimited design possibilities.

Note: Piston rods are connected.

Contact IMI Bimba for more information.



Special Finishes

Standard Finish: Black Urethane Paint (suitable for indoor or outdoor use)

Optional Paint: Black Epoxy Paint (suitable for indoor use only)

Additional Paint Choices: IMI Bimba can provide paint in any color or type with customer supplied paint specification and color code.

Additional Finishes: IMI Bimba can provide special finishes, i.e. Nutride Plate Heavy Chrome Plated Piston Rods.

Contact IMI Bimba with your specifications – we would be pleased to provide a quote!

