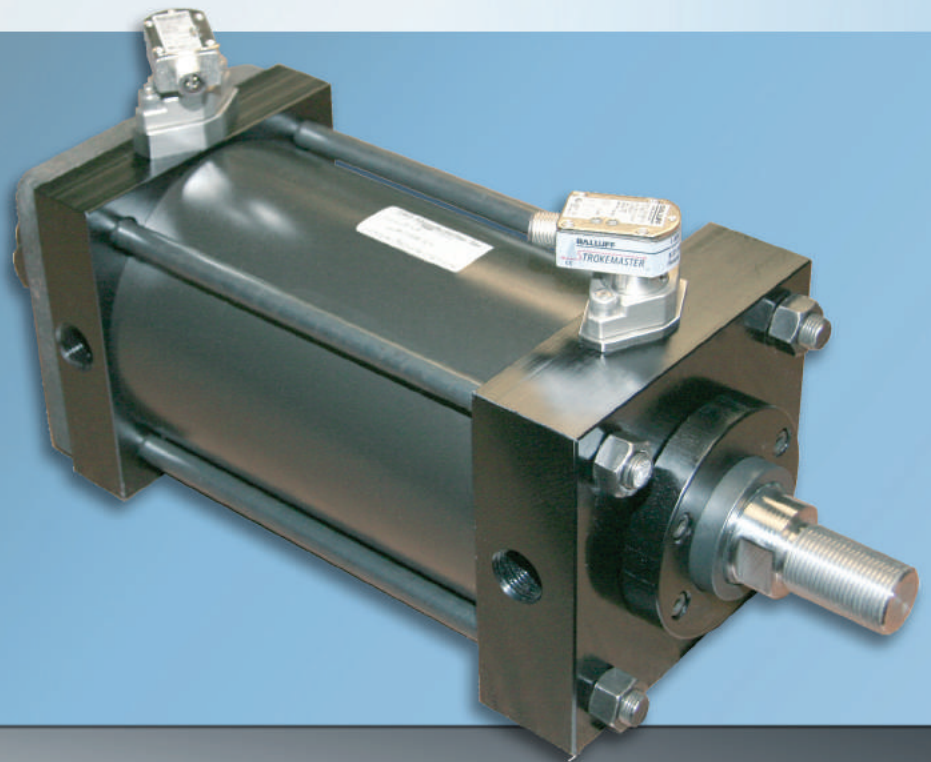


MH Series Medium Duty Industrial Hydraulic 1.50" to 8.00" Bore

Single Rod End Page 59



Double Rod End Page 80



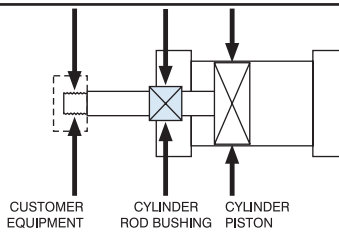
**95% OF OUR CYLINDERS SHIP IN 2-3 DAYS!
ONE DAY RUSH SERVICE AVAILABLE ON ALL CATALOGED CYLINDER MODELS!**

SERIES 'MH' (NFPA) CYLINDER

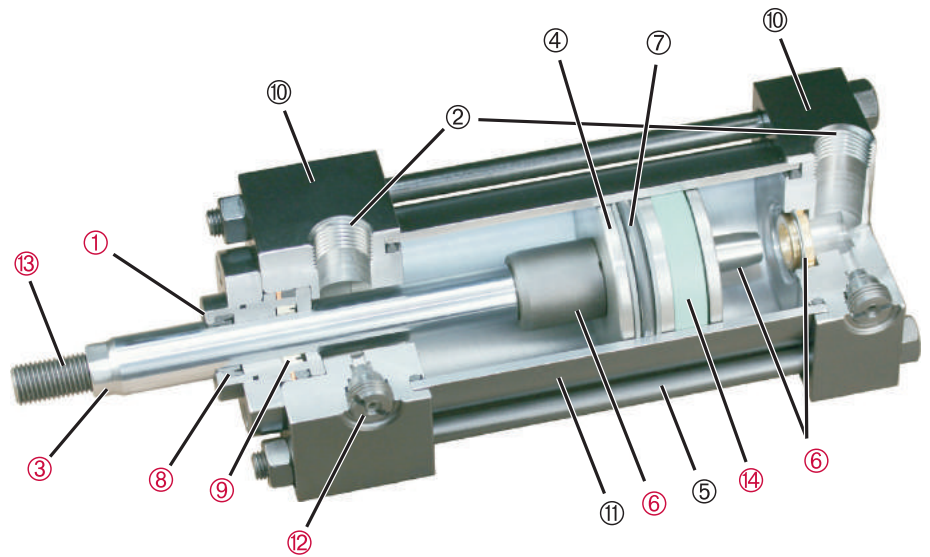
Floating Rod Bushing

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



HEAVY-DUTY DESIGN FOR RELIABLE, CONSISTENT OPERATION

- 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.
 - 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.
 - 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).
 - PISTON** – Precision machined ductile iron provides high strength and an excellent bearing surface for extended cylinder life.
 - TIE RODS** – Pre-stressed high carbon steel tie rod construction eliminates axial loading of cylinder tube and maintains compression on tube (100K min. yield).
 - CUSHION** – Precision machined cushions are available at either end and provide smooth deceleration which helps reduce end of stroke shock.
 - PISTON SEAL** – Heavy-duty, bi-directional Carboxylated Nitrile T-Seal with double back-up. Rated for shock loads and incorporates anti-extrusion technology. EP, PTFE and fluorocarbon designs available.
 - ROD WIPER** – Flocked nitrile wiper removes contaminants on retract stroke, helping ensure long life for all internal components.
 - ROD SEALS** – Polyurethane seals offer high abrasion resistance and strength. Pressure activated double lip and wear compensating for extended life.
 - HEAD & CAP** – Precision machined steel head and cap are held to tight tolerances and ensure accurate alignment for a truly square cylinder.
 - TUBE** – Precision machined steel tube with hard chrome I.D. is honed and micro finished for extended seal life and improved cycle rates.
 - CUSHION ADJUSTMENT NEEDLE** – Adjustable steel needle design has fine thread metering and is positively captured to prevent needle ejection during adjustment.
 - PISTON ROD STUD** – Standard on KK1 and KK2 threads for 5/8" - 2" rods (125K min. yield). Available up to two times standard "A" thread length.
 - WEAR BAND** – Wear Guard Nylon (standard); reinforced PTFE for E and V seal option.
- FINISH** – Black urethane paint.

Note: Items in RED are the exact same heavy-duty components used in TRD's 3000 PSI (207 BAR) 'HH' Series.

OPERATING PRESSURE

1500 PSI HYD (103 BAR)
Refer to mount section for specific PSI rating by bore size and mount.

OPERATING TEMPERATURE

Standard Seals: -20°F to 200°F (-29°C to 93°C)
Fluorocarbon: 0°F to 400°F (-18°C to 204°C)

Performance Options:

- **ST** – Stop tubes are used to reduce rod bearing and piston stress (refer to page 98 for cylinder design guidance).
- **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).
- **HP** – High-impact pistons use a high strength steel nut retained piston for fatigue resistance and additional strength in demanding applications.

HOW TO ORDER: SERIES 'MH' (MEDIUM DUTY HYDRAULIC CYLINDERS)

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

| SERIES | |
|--------|-----------------------|
| MH | MEDIUM DUTY HYDRAULIC |

| STYLE | |
|---------|------------|
| (BLANK) | 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 LOC |
|----------|
| P 1 |
| 2 |
| 3 |
| 4 |
| 5 |
| 6 |
| 7 |
| 8 |
| 9 |

Call out 'P' followed by all desired locations.

| PORT SIZE |
|------------------|
| N062 0.063" NPTF |
| N125 0.125" NPTF |
| N250 0.250" NPTF |
| N375 0.375" NPTF |
| N500 0.500" NPTF |
| N750 0.750" NPTF |
| S6 #6 SAE |
| S8 #8 SAE |
| S10 #10 SAE |
| S12 #12 SAE |

See Below for Seal Ordering Instructions

| OPTIONS | |
|---------|--|
| A= | EXTENDED PISTON ROD THREAD (EXAMPLE: A = 2") (MAX = 2 TIMES STD "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 = 0.500", THEN 1" ROD EXTENSION IS C = 1.500") |
| CS | CENTER SUPPORT |
| DBB= | DRAIN BACK BUSHING (EXAMPLE: DBB=1) |
| EK | EXTENDED KEYPLATE |
| HLP | HIGH LOAD PISTON |
| HSS | HIGH SHOCK SEALS |
| LRB | LIFT RING BOSS |
| NR | NON-ROTATING |
| PLS | PISTON LOCK SCREW (STD.) |
| RB | ROD BUSHING MATERIAL: BRONZE |
| SSR | STAINLESS STEEL PISTON ROD |
| ST= | STOP TUBE NOTE: SPECIFY STOP TUBE LENGTH (IN INCHES) SPECIFY STROKE AS ES (EFFECTIVE STROKE) EXAMPLE: MH-MS2-250X48ES-H2C6-ST=3" |
| 4WF | FOUR WRENCH FLATS (ROD SIZES: 0.625"-3.500") |
| XX= | SPECIAL VARIATION (SPECIFY) |

| NFPA MOUNTS | |
|-------------|--|
| MX0 | NO MOUNT (1.50" to 8.00" Bore) |
| MF1 | HEAD RECTANGULAR FLANGE (1.50" to 6.00" Bore) |
| MF2 | CAP RECTANGULAR FLANGE (1.50" to 6.00" Bore) |
| MF5 | HEAD SQUARE FLANGE (1.50" to 6.00" Bore) |
| MF6 | CAP SQUARE FLANGE (1.50" to 6.00" Bore) |
| ME3 | HEAD MOUNTING HOLES (8.00" Bore) |
| ME4 | CAP MOUNTING HOLES (8.00" Bore) |
| MP1 | FIXED CAP PIVOT CLEVIS (1.50" to 8.00" Bore) |
| MP2 | DETACHABLE CAP PIVOT CLEVIS (1.50" to 6.00" 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 8.00" 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) |
| 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 CAP PIVOT (1.50" to 8.00" Bore) |

| BORE |
|-----------|
| 150 1.50" |
| 200 2.00" |
| 250 2.50" |
| 325 3.25" |
| 400 4.00" |
| 500 5.00" |
| 600 6.00" |
| 800 8.00" |

| CUSHIONS |
|----------|
| H 1 |
| 2 |
| 3 |
| 4 |
| C 5 |
| 6 |
| 7 |
| 8 |

Call out 'H' for head cushion, 'C' for cap cushion, followed by the desired location(s).

| ROD END |
|-------------------------------|
| KK1 SMALL MALE THREAD |
| KK2 LARGE MALE THREAD |
| KK3 FEMALE THREAD |
| KK3M FEMALE METRIC ROD THREAD |
| KK3X FEMALE SPECIAL THREAD |
| KK4 FULL DIA. MALE THREAD |
| KK5 PLAIN END |
| KK10 ROD COUPLER END |
| KKM METRIC THREAD |
| KKX MALE SPECIAL THREAD |

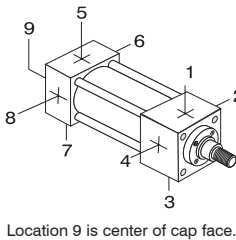
When additional thread details are required, use format "Rod end" = "Modification"
Example: KKM=M12 x 1.75

Port Note:
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.

HOW TO ORDER SEALS

| PISTON SEAL | ROD SEAL | TUBE SEAL | ROD WIPER* |
|---------------------------|---------------------------|-------------------|------------------------------|
| S STANDARD (Carboxilated) | S STANDARD (Polyurethane) | S STANDARD (Buna) | S STANDARD (Flocked Nitrile) |
| C Cast-Ring | E EP | E EP | M Metallic Scraper |
| T PTFE** | V Fluorocarbon | V Fluorocarbon | T PTFE |
| V Fluorocarbon | | | V Fluorocarbon |

*When cylinder design calls for all EP seals, use PTFE rod wiper.
**See page 97 for seal specifications.



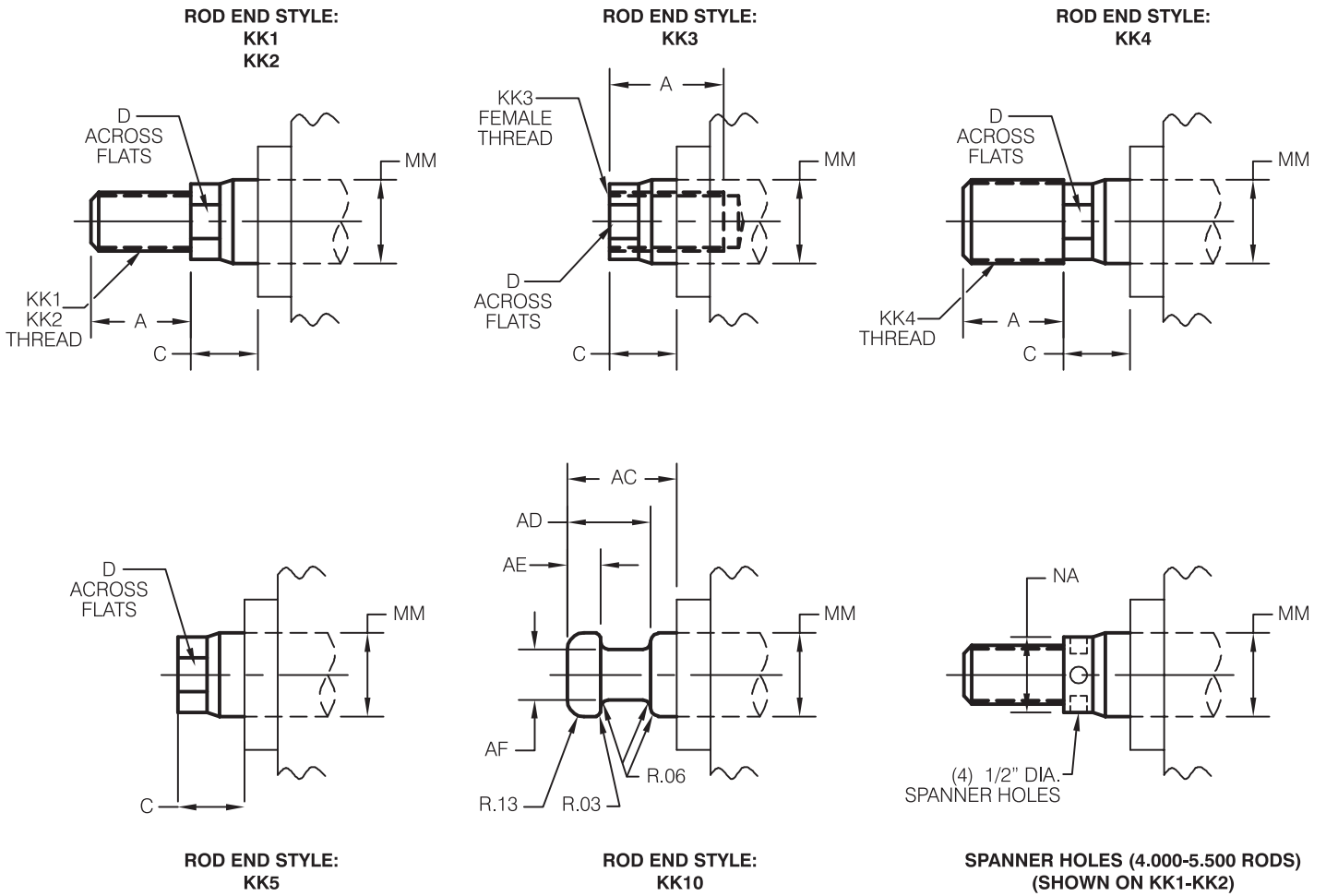
Location 9 is center of cap face.

| MAXIMUM STROKE RECOMMENDATIONS | | | |
|--------------------------------|-------------------|----------------------------------|----------------|
| BORE | NO CENTER SUPPORT | WITH CENTER SUPPORTS (CS OPTION) | |
| | | ONE SUPPORT | TWO SUPPORTS |
| 1.50", 2.00" & 2.50" | 48 INCHES | OVER 48 INCHES | OVER 72 INCHES |
| 3.25", 4.00" & 5.00" | 65 INCHES | OVER 65 INCHES | OVER 92 INCHES |
| 6.00" | 72 INCHES | OVER 72 INCHES | NOT REQUIRED |

NFPA MOUNTS

| | | | | | |
|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| 1.50"-6.00" Bores | 1.50"-6.00" Bores | 8.00" Bore | 8.00" Bore | 1.50"-8.00" Bores | 1.50"-6.00" Bores |
| 1.50"-8.00" Bores | 1.50"-8.00" Bores | 1.50"-8.00" Bores | 1.50"-8.00" Bores | 1.50"-8.00" Bores | 1.50"-8.00" Bores |
| 1.50"-8.00" Bores | 1.50"-8.00" Bores | 1.50"-8.00" Bores | 1.50"-8.00" Bores | 1.50"-8.00" Bores | 1.50"-8.00" Bores |

SERIES 'MH' 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 | 1.062 | 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.

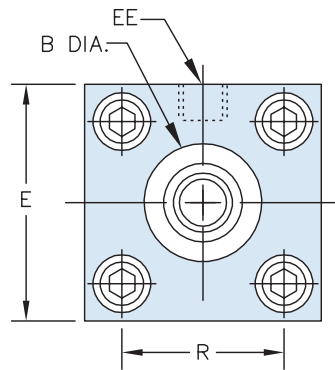
(4) Wrench flats is an option.

Note: Rods larger than 3.50" dia. utilize (4) 0.50" dia. spanner holes 0.50" deep.

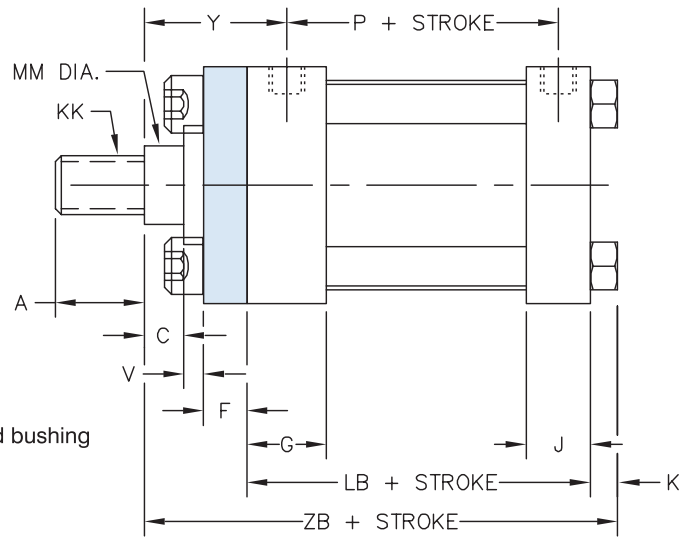
SERIES 'MH' DIMENSIONS: BASIC CYLINDER (MX0 MOUNT)

RETAINER CONSTRUCTION

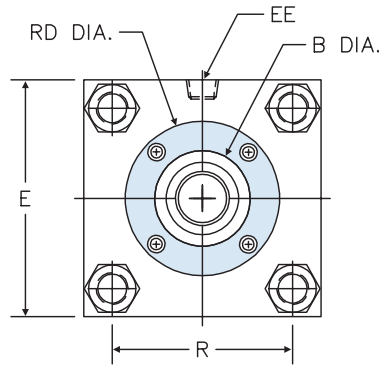
| FULL SQUARE RETAINER USED ON: | |
|-------------------------------|----------|
| BORE | ROD DIA. |
| 1.50 | 0.625 |
| | 1.000 |
| 2.00 | 1.000 |
| | 1.375 |
| 2.50 | 1.000 |
| | 1.375 |
| | 1.750 |
| 3.25 | 1.375 |
| | 1.750 |
| | 2.000 |
| 4.00 | 2.000 |
| | 2.500 |
| 5.00 | 2.500 |
| | 3.000 |
| | 3.500 |
| 6.00 | 4.000 |



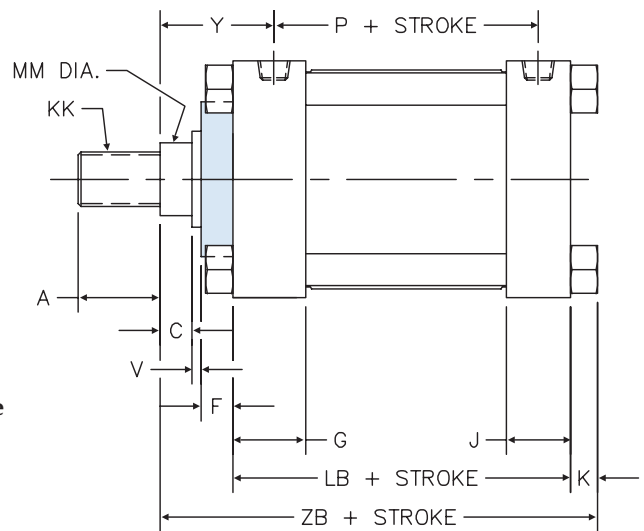
Note: Full square retainer is removable to service rod bushing



| ROUND RETAINER USED ON: | |
|-------------------------|----------|
| BORE | ROD DIA. |
| 2.00 | 0.625 |
| 2.50 | 0.625 |
| 3.25 | 1.000 |
| | 1.375 |
| 4.00 | 1.000 |
| | 1.375 |
| 5.00 | 1.000 |
| | 1.375 |
| | 1.750 |
| 6.00 | 2.000 |
| | 1.375 |
| | 1.750 |
| | 2.500 |
| 8.00 | 3.000 |
| | 3.500 |
| | 4.000 |
| | 4.500 |
| | 5.000 |
| | 5.500 |
| | 5.500 |

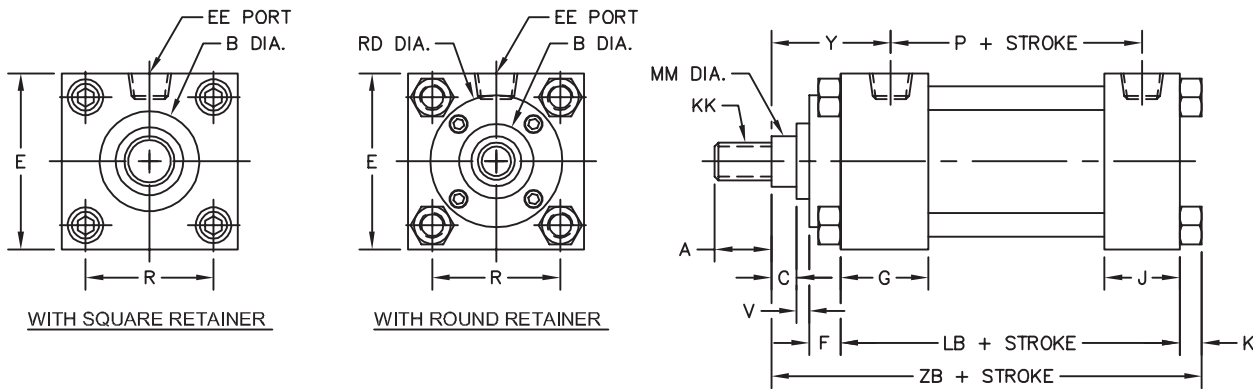


Note: Round retainer is removable to service rod bushing.



SERIES 'MH' DIMENSIONS: BASIC CYLINDER (MX0 MOUNT)

EASY FLIP OUT PAGE FOR REFERENCE

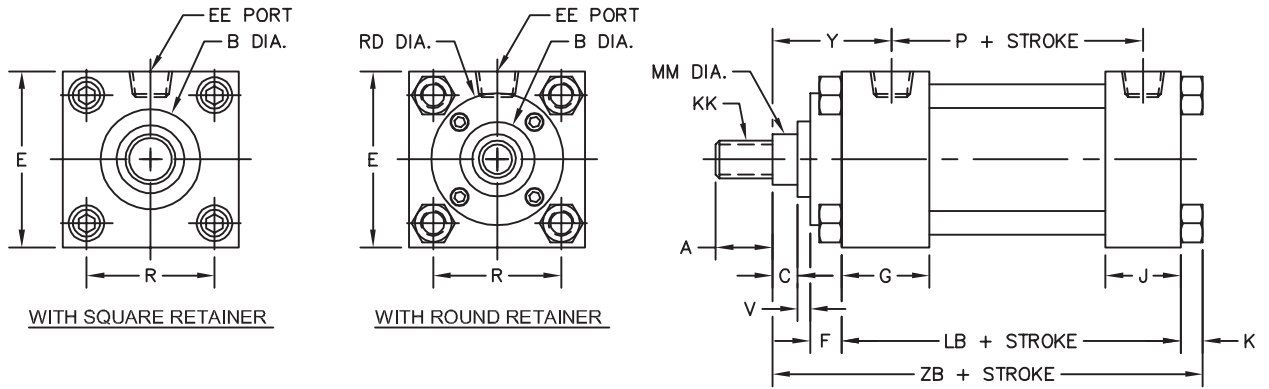


| BORE | ROD DIA. (MM) | ① MAX PSI RATING | E | A | ② B | C | EE | | F | G | J | K | KK | R | ③ RD | V | Y | ADD TO STROKE | | |
|------|---------------|------------------|-------|-------|-------|-------|------|-----|-------|-------|-------|-------|----|-------|-------|-------|-------|---------------|-------|-------|
| | | | | | | | NPTF | SAE | | | | | | | | | | LB | P | ZB |
| 1.50 | 0.625 | 1500 | 2.000 | 0.750 | 1.124 | 0.375 | 3/8 | #6 | 0.375 | 1.500 | 1.000 | 0.250 | | 1.430 | SQ | 0.250 | 1.875 | 3.625 | 2.375 | 4.875 |
| | 1.000 | 1500 | | 1.125 | 1.499 | 0.500 | | | | | | | | | SQ | 0.500 | 2.250 | | | 5.250 |
| 2.00 | 0.625 | 1500 | 2.500 | 0.750 | 1.124 | 0.375 | 3/8 | #6 | 0.375 | 1.500 | 1.000 | 0.313 | | 1.840 | 2.000 | 0.250 | 1.875 | 3.625 | 2.375 | 4.938 |
| | 1.000 | 1500 | | 1.125 | 1.499 | 0.500 | | | | | | | | | SQ | 0.500 | 2.250 | | | 5.313 |
| | 1.375 | 1500 | | 1.625 | 1.999 | 0.625 | | | | | | | | | SQ | 0.625 | 2.500 | | | 5.563 |
| 2.50 | 0.625 | 1000 | 3.000 | 0.750 | 1.124 | 0.375 | 3/8 | #6 | 0.375 | 1.500 | 1.000 | 0.313 | | 2.190 | 2.000 | 0.250 | 1.875 | 3.750 | 2.500 | 5.063 |
| | 1.000 | 1500 | | 1.125 | 1.499 | 0.500 | | | | | | | | | SQ | 0.500 | 2.250 | | | 5.438 |
| | 1.375 | 1500 | | 1.625 | 1.999 | 0.625 | | | | | | | | | SQ | 0.625 | 2.500 | | | 5.688 |
| | 1.750 | 1500 | | 2.000 | 2.374 | 0.750 | | | | | | | | | SQ | 0.750 | 2.750 | | | 5.938 |
| 3.25 | 1.000 | 1500 | 3.750 | 1.125 | 1.499 | 0.500 | 1/2 | #10 | 0.625 | 1.750 | 1.250 | 0.375 | | 2.760 | 2.750 | 0.250 | 2.375 | 4.250 | 2.750 | 6.000 |
| | 1.375 | 1500 | | 1.625 | 1.999 | 0.625 | | | | | | | | | SQ | 0.375 | 2.625 | | | 6.250 |
| | 1.750 | 1500 | | 2.000 | 2.374 | 0.750 | | | | | | | | | SQ | 0.500 | 2.875 | | | 6.500 |
| | 2.000 | 1500 | | 2.250 | 2.624 | 0.875 | | | | | | | | | SQ | 0.500 | 3.000 | | | 6.625 |
| 4.00 | 1.000 | 1000 | 4.500 | 1.125 | 1.499 | 0.500 | 1/2 | #10 | 0.625 | 1.750 | 1.250 | 0.375 | | 3.320 | 2.750 | 0.250 | 2.375 | 4.250 | 2.750 | 6.000 |
| | 1.375 | 1000 | | 1.625 | 1.999 | 0.625 | | | | | | | | | 3.500 | 0.375 | 2.625 | | | 6.250 |
| | 1.750 | 1000 | | 2.000 | 2.374 | 0.750 | | | | | | | | | SQ | 0.500 | 3.000 | | | 6.625 |
| | 2.000 | 1000 | | 2.250 | 2.624 | 0.875 | | | | | | | | | SQ | 0.625 | 3.250 | | | 6.875 |
| | 2.500 | 1000 | | 3.000 | 3.124 | 1.000 | | | | | | | | | | | | | | |
| 5.00 | 1.000 | 750 | 5.500 | 1.125 | 1.499 | 0.500 | 1/2 | #10 | 0.625 | 1.750 | 1.250 | 0.438 | | 4.100 | 2.750 | 0.250 | 2.375 | 4.500 | 3.000 | 6.313 |
| | 1.375 | 1000 | | 1.625 | 1.999 | 0.625 | | | | | | | | | 3.500 | 0.375 | 2.625 | | | 6.563 |
| | 1.750 | 1000 | | 2.000 | 2.374 | 0.750 | | | | | | | | | 3.500 | 0.500 | 2.875 | | | 6.813 |
| | 2.000 | 1000 | | 2.250 | 2.624 | 0.875 | | | | | | | | | SQ | 0.500 | 3.000 | | | 6.983 |
| | 2.500 | 1000 | | 3.000 | 3.124 | 1.000 | | | | | | | | | SQ | 0.625 | 3.250 | | | 7.188 |
| | 3.000 | 1000 | | 3.500 | 3.749 | 1.000 | | | | | | | | | SQ | 0.625 | 3.250 | | | 7.188 |
| | 3.500 | 1000 | | 3.500 | 4.249 | 1.000 | | | | | | | | | SQ | 0.625 | 3.250 | | | 7.188 |
| 6.00 | 1.375 | 750 | 6.500 | 1.625 | 1.999 | 0.625 | 3/4 | #12 | 0.750 | 2.000 | 1.500 | 0.438 | | 4.880 | 3.500 | 0.250 | 2.750 | 5.000 | 3.250 | 7.063 |
| | 1.750 | 750 | | 2.000 | 2.374 | 0.750 | | | | | | | | | 3.875 | 0.375 | 3.000 | | | 7.313 |
| | 2.000 | 750 | | 2.250 | 2.624 | 0.875 | | | | | | | | | 4.250 | 0.375 | 3.125 | | | 7.438 |
| | 2.500 | 750 | | 3.000 | 3.124 | 1.000 | | | | | | | | | 4.625 | 0.500 | 3.375 | | | 7.688 |
| | 3.000 | 750 | | 3.500 | 3.749 | 1.000 | | | | | | | | | 5.250 | 0.500 | 3.375 | | | 7.688 |
| | 3.500 | 750 | | 3.500 | 4.249 | 1.000 | | | | | | | | | 5.750 | 0.500 | 3.375 | | | 7.688 |
| | 4.000 | 750 | | 4.000 | 4.749 | 1.000 | | | | | | | | | SQ | 0.500 | 3.375 | | | 7.688 |
| | | | | | | | | | | | | | | | | | | | | |
| 8.00 | 1.375 | 500 | 8.500 | 1.625 | 1.999 | 0.625 | 3/4 | #12 | 0.750 | 2.000 | 1.500 | 0.563 | | 6.440 | 3.500 | 0.250 | 2.750 | 5.125 | 3.375 | 7.313 |
| | 1.750 | 500 | | 2.000 | 2.374 | 0.750 | | | | | | | | | 3.875 | 0.375 | 3.000 | | | 7.563 |
| | 2.000 | 675 | | 2.250 | 2.624 | 0.875 | | | | | | | | | 4.250 | 0.375 | 3.125 | | | 7.688 |
| | 2.500 | 675 | | 3.000 | 3.124 | 1.000 | | | | | | | | | 4.625 | 0.500 | 3.375 | | | 7.938 |
| | 3.000 | 675 | | 3.500 | 3.749 | 1.000 | | | | | | | | | 5.250 | 0.500 | 3.375 | | | 7.938 |
| | 3.500 | 675 | | 3.500 | 4.249 | 1.000 | | | | | | | | | 5.750 | 0.500 | 3.375 | | | 7.938 |
| | 4.000 | 675 | | 4.000 | 4.749 | 1.000 | | | | | | | | | 6.500 | 0.500 | 3.375 | | | 7.938 |
| | 4.500 | 675 | | 4.500 | 5.249 | 1.000 | | | | | | | | | 7.250 | 0.500 | 3.375 | | | 7.938 |
| | 5.000 | 675 | | 5.000 | 5.749 | 1.000 | | | | | | | | | 7.500 | 0.500 | 3.375 | | | 7.938 |
| | 5.500 | 675 | | 5.500 | 6.249 | 1.000 | | | | | | | | | 7.500 | 0.500 | 3.375 | | | 7.938 |

SEE ROD END DETAIL CHART ON PAGE 61

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 SQ is shown in chart, cylinder utilizes a full square retainer.

SERIES 'MH' DIMENSIONS: BASIC CYLINDER (MX0 MOUNT)



| BORE | ROD DIA. (MM) | ① MAX PSI RATING | E | A | ② B | C | EE | | F | G | J | K | KK | R | ③ RD | V | Y | ADD TO STROKE | | |
|------|---------------|------------------|-------|-------|-------|-------|------|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|---------------|-------|----|
| | | | | | | | NPTF | SAE | | | | | | | | | | LB | P | ZB |
| 1.50 | 0.625 | 1500 | 2.000 | 0.750 | 1.124 | 0.375 | 3/8 | #6 | 0.375 | 1.500 | 1.000 | 0.250 | 1.430 | SQ | 0.250 | 1.875 | 3.625 | 2.375 | 4.875 | |
| | 1.000 | 1500 | | 1.125 | 1.499 | 0.500 | | | | | | | | SQ | 0.500 | 2.250 | | | 5.250 | |
| 2.00 | 0.625 | 1500 | 2.500 | 0.750 | 1.124 | 0.375 | 3/8 | #6 | 0.375 | 1.500 | 1.000 | 0.313 | 1.840 | 2.000 | 0.250 | 1.875 | 3.625 | 2.375 | 4.938 | |
| | 1.000 | 1500 | | 1.125 | 1.499 | 0.500 | | | | | | | | SQ | 0.500 | 2.250 | | | 5.313 | |
| | 1.375 | 1500 | | 1.625 | 1.999 | 0.625 | | | | | | | | SQ | 0.625 | 2.500 | | | 5.563 | |
| 2.50 | 0.625 | 1000 | 3.000 | 0.750 | 1.124 | 0.375 | 3/8 | #6 | 0.375 | 1.500 | 1.000 | 0.313 | 2.190 | 2.000 | 0.250 | 1.875 | 3.750 | 2.500 | 5.063 | |
| | 1.000 | 1500 | | 1.125 | 1.499 | 0.500 | | | | | | | | SQ | 0.500 | 2.250 | | | 5.438 | |
| | 1.375 | 1500 | | 1.625 | 1.999 | 0.625 | | | | | | | | SQ | 0.625 | 2.500 | | | 5.688 | |
| | 1.750 | 1500 | | 2.000 | 2.374 | 0.750 | | | | | | | | SQ | 0.750 | 2.750 | | | 5.938 | |
| 3.25 | 1.000 | 1500 | 3.750 | 1.125 | 1.499 | 0.500 | 1/2 | #10 | 0.625 | 1.750 | 1.250 | 0.375 | 2.760 | 2.750 | 0.250 | 2.375 | 4.250 | 2.750 | 6.000 | |
| | 1.375 | 1500 | | 1.625 | 1.999 | 0.625 | | | | | | | | SQ | 0.375 | 2.625 | | | 6.250 | |
| | 1.750 | 1500 | | 2.000 | 2.374 | 0.750 | | | | | | | | SQ | 0.500 | 2.875 | | | 6.500 | |
| | 2.000 | 1500 | | 2.250 | 2.624 | 0.875 | | | | | | | | SQ | 0.500 | 3.000 | | | 6.625 | |
| 4.00 | 1.000 | 1000 | 4.500 | 1.125 | 1.499 | 0.500 | 1/2 | #10 | 0.625 | 1.750 | 1.250 | 0.375 | 3.320 | 2.750 | 0.250 | 2.375 | 4.250 | 2.750 | 6.000 | |
| | 1.375 | 1000 | | 1.625 | 1.999 | 0.625 | | | | | | | | 3.500 | 0.375 | 2.625 | | | 6.250 | |
| | 1.750 | 1000 | | 2.000 | 2.374 | 0.750 | | | | | | | | 3.500 | 0.500 | 2.875 | | | 6.500 | |
| | 2.000 | 1000 | | 2.250 | 2.624 | 0.875 | | | | | | | | SQ | 0.500 | 3.000 | | | 6.625 | |
| | 2.500 | 1000 | | 3.000 | 3.124 | 1.000 | | | | | | | | SQ | 0.625 | 3.250 | | | 6.875 | |
| 5.00 | 1.000 | 750 | 5.500 | 1.125 | 1.499 | 0.500 | 1/2 | #10 | 0.625 | 1.750 | 1.250 | 0.438 | 4.100 | 2.750 | 0.250 | 2.375 | 4.500 | 3.000 | 6.313 | |
| | 1.375 | 1000 | | 1.625 | 1.999 | 0.625 | | | | | | | | 3.500 | 0.375 | 2.625 | | | 6.563 | |
| | 1.750 | 1000 | | 2.000 | 2.374 | 0.750 | | | | | | | | 3.500 | 0.500 | 2.875 | | | 6.813 | |
| | 2.000 | 1000 | | 2.250 | 2.624 | 0.875 | | | | | | | | 4.250 | 0.500 | 3.000 | | | 6.983 | |
| | 2.500 | 1000 | | 3.000 | 3.124 | 1.000 | | | | | | | | SQ | 0.625 | 3.250 | | | 7.188 | |
| | 3.000 | 1000 | | 3.500 | 3.749 | 1.000 | | | | | | | | SQ | 0.625 | 3.250 | | | 7.188 | |
| | 3.500 | 1000 | | 3.500 | 4.249 | 1.000 | | | | | | | | SQ | 0.625 | 3.250 | | | 7.188 | |
| 6.00 | 1.375 | 750 | 6.500 | 1.625 | 1.999 | 0.625 | 3/4 | #12 | 0.750 | 2.000 | 1.500 | 0.438 | 4.880 | 3.500 | 0.250 | 2.750 | 5.000 | 3.250 | 7.063 | |
| | 1.750 | 750 | | 2.000 | 2.374 | 0.750 | | | | | | | | 3.875 | 0.375 | 3.000 | | | 7.313 | |
| | 2.000 | 750 | | 2.250 | 2.624 | 0.875 | | | | | | | | 4.250 | 0.375 | 3.125 | | | 7.438 | |
| | 2.500 | 750 | | 3.000 | 3.124 | 1.000 | | | | | | | | 4.625 | 0.500 | 3.375 | | | 7.688 | |
| | 3.000 | 750 | | 3.500 | 3.749 | 1.000 | | | | | | | | 5.250 | 0.500 | 3.375 | | | 7.688 | |
| | 3.500 | 750 | | 3.500 | 4.249 | 1.000 | | | | | | | | 5.750 | 0.500 | 3.375 | | | 7.688 | |
| | 4.000 | 750 | | 4.000 | 4.749 | 1.000 | | | | | | | | SQ | 0.500 | 3.375 | | | 7.688 | |
| 8.00 | 1.375 | 500 | 8.500 | 1.625 | 1.999 | 0.625 | 3/4 | #12 | 0.750 | 2.000 | 1.500 | 0.563 | 6.440 | 3.500 | 0.250 | 2.750 | 5.125 | 3.375 | 7.313 | |
| | 1.750 | 500 | | 2.000 | 2.374 | 0.750 | | | | | | | | 3.875 | 0.375 | 3.000 | | | 7.563 | |
| | 2.000 | 675 | | 2.250 | 2.624 | 0.875 | | | | | | | | 4.250 | 0.375 | 3.125 | | | 7.688 | |
| | 2.500 | 675 | | 3.000 | 3.124 | 1.000 | | | | | | | | 4.625 | 0.500 | 3.375 | | | 7.938 | |
| | 3.000 | 675 | | 3.500 | 3.749 | 1.000 | | | | | | | | 5.250 | 0.500 | 3.375 | | | 7.938 | |
| | 3.500 | 675 | | 3.500 | 4.249 | 1.000 | | | | | | | | 5.750 | 0.500 | 3.375 | | | 7.938 | |
| | 4.000 | 675 | | 4.000 | 4.749 | 1.000 | | | | | | | | 6.500 | 0.500 | 3.375 | | | 7.938 | |
| | 4.500 | 675 | | 4.500 | 5.249 | 1.000 | | | | | | | | 7.250 | 0.500 | 3.375 | | | 7.938 | |
| | 5.000 | 675 | | 5.000 | 5.749 | 1.000 | | | | | | | | 7.500 | 0.500 | 3.375 | | | 7.938 | |
| | 5.500 | 675 | | 5.500 | 6.249 | 1.000 | | | | | | | | 7.500 | 0.500 | 3.375 | | | 7.938 | |

SEE ROD END DETAIL CHART ON PAGE 61

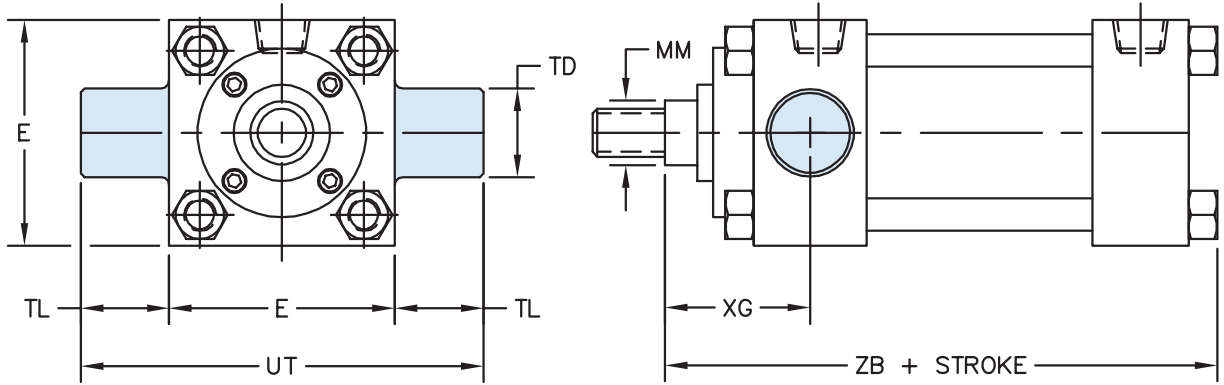
① Max single acting pressure rating (NON-Shock). Any additional opposed intensified pressure related to varying impact area within the cylinder is not taken into consideration (ram cylinders).

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

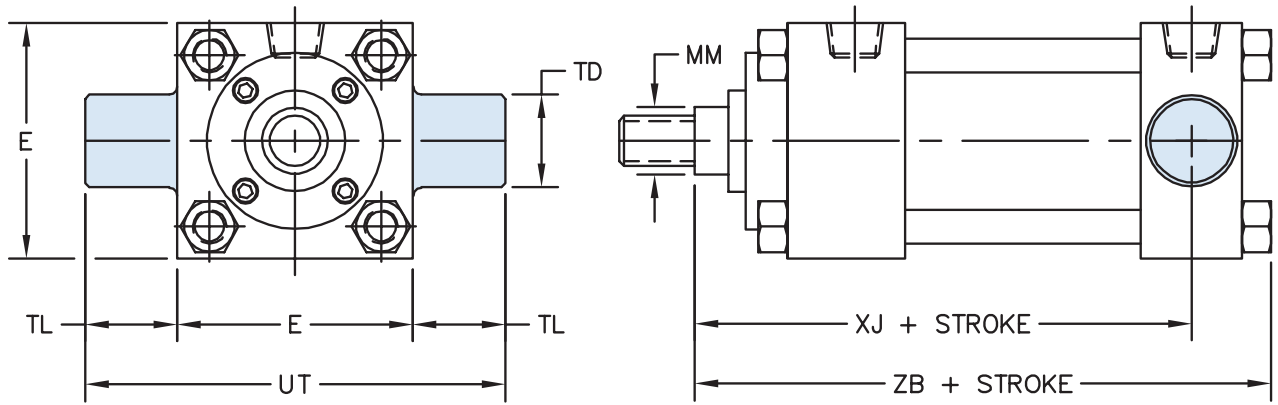
③ Where SQ is shown in chart, cylinder utilizes a full square retainer.

SERIES 'MH' DIMENSIONS: TRUNNION MOUNTS

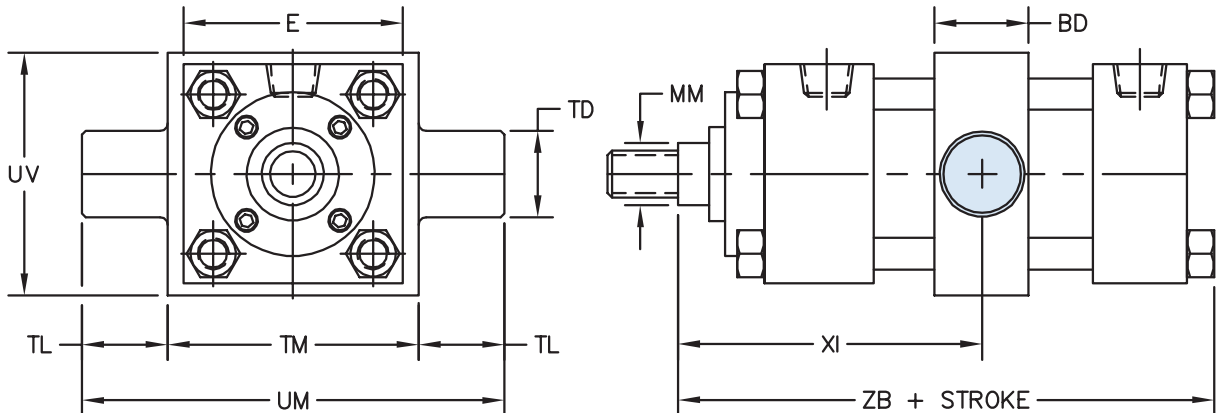
MT1: HEAD TRUNNION



MT2: CAP TRUNNION



MT4: INTERMEDIATE TRUNNION



NOTE:
'XI' DIMENSION TO BE SPECIFIED BY CUSTOMER

SERIES 'MH' DIMENSIONS: TRUNNION MOUNTS

| BORE | ROD DIA. (MM) | ① MAX PSI RATING | E | BD | ② TD | TL | TM | UM | UT | UV | XG | ③ XI | MT4 MIN STROKE | ADD TO STROKE | |
|------|---------------|------------------|-------|-------|-------|-------|-------|--------|--------|-------|-------|-------|----------------|---------------|-------|
| | | | | | | | | | | | | | | XJ | ZB |
| 1.50 | 0.625 | 1500 | 2.000 | 1.250 | 1.000 | 1.000 | 2.500 | 4.500 | 4.000 | 2.500 | 1.750 | 3.250 | 0.375 | 4.125 | 4.875 |
| | 1.000 | 1500 | | | | | | | | | 2.125 | 3.625 | | 4.500 | 5.250 |
| 2.00 | 0.625 | 1500 | 2.500 | 1.500 | 1.000 | 1.000 | 3.000 | 5.000 | 4.500 | 3.000 | 1.750 | 3.375 | 0.625 | 4.125 | 4.938 |
| | 1.000 | 1500 | | | | | | | | | 2.125 | 3.750 | | 4.500 | 5.313 |
| | 1.375 | 1500 | | | | | | | | | 2.375 | 4.000 | | 4.750 | 5.563 |
| 2.50 | 0.625 | 1000 | 3.000 | 1.500 | 1.000 | 1.000 | 3.500 | 5.500 | 5.000 | 3.500 | 1.750 | 3.375 | 0.500 | 4.250 | 5.063 |
| | 1.000 | 1500 | | | | | | | | | 2.125 | 3.750 | | 4.625 | 5.438 |
| | 1.375 | 1500 | | | | | | | | | 2.375 | 4.000 | | 4.875 | 5.688 |
| | 1.750 | 1500 | | | | | | | | | 2.625 | 4.250 | | 5.125 | 5.938 |
| 3.25 | 1.000 | 1500 | 3.750 | 2.000 | 1.000 | 1.000 | 4.500 | 6.500 | 5.750 | 4.250 | 2.250 | 4.250 | 1.000 | 5.000 | 6.000 |
| | 1.375 | 1500 | | | | | | | | | 2.500 | 4.500 | | 5.250 | 6.250 |
| | 1.750 | 1500 | | | | | | | | | 2.750 | 4.750 | | 5.500 | 6.500 |
| | 2.000 | 1500 | | | | | | | | | 2.875 | 4.875 | | 5.625 | 6.625 |
| 4.00 | 1.000 | 1000 | 4.500 | 2.000 | 1.000 | 1.000 | 5.250 | 7.250 | 6.500 | 5.000 | 2.250 | 4.250 | 1.000 | 5.000 | 6.000 |
| | 1.375 | 1000 | | | | | | | | | 2.500 | 4.500 | | 5.250 | 6.250 |
| | 1.750 | 1000 | | | | | | | | | 2.750 | 4.750 | | 5.500 | 6.500 |
| | 2.000 | 1000 | | | | | | | | | 2.875 | 4.875 | | 5.625 | 6.625 |
| | 2.500 | 1000 | | | | | | | | | 3.125 | 5.125 | | 5.875 | 6.875 |
| 5.00 | 1.000 | 750 | 5.500 | 2.000 | 1.000 | 1.000 | 6.250 | 8.250 | 7.500 | 6.000 | 2.250 | 4.250 | 0.750 | 5.250 | 6.313 |
| | 1.375 | 1000 | | | | | | | | | 2.500 | 4.500 | | 5.500 | 6.563 |
| | 1.750 | 1000 | | | | | | | | | 2.750 | 4.750 | | 5.750 | 6.813 |
| | 2.000 | 1000 | | | | | | | | | 2.875 | 4.875 | | 5.875 | 6.938 |
| | 2.500 | 1000 | | | | | | | | | 3.125 | 5.125 | | 6.125 | 7.188 |
| | 3.000 | 1000 | | | | | | | | | 3.125 | 5.125 | | 6.125 | 7.188 |
| | 3.500 | 1000 | | | | | | | | | 3.125 | 5.125 | | 6.125 | 7.188 |
| 6.00 | 1.375 | 750 | 6.500 | 2.000 | 1.375 | 1.375 | 7.625 | 10.375 | 9.250 | 7.000 | 2.625 | 4.750 | 0.750 | 5.875 | 7.063 |
| | 1.750 | 750 | | | | | | | | | 2.875 | 5.000 | | 6.125 | 7.313 |
| | 2.000 | 750 | | | | | | | | | 3.000 | 5.125 | | 6.250 | 7.438 |
| | 2.500 | 750 | | | | | | | | | 3.250 | 5.375 | | 6.500 | 7.688 |
| | 3.000 | 750 | | | | | | | | | 3.250 | 5.375 | | 6.500 | 7.688 |
| | 3.500 | 750 | | | | | | | | | 3.250 | 5.375 | | 6.500 | 7.688 |
| | 4.000 | 750 | | | | | | | | | 3.250 | 5.375 | | 6.500 | 7.688 |
| | 4.500 | 750 | | | | | | | | | 3.250 | 5.375 | | 6.500 | 7.688 |
| 8.00 | 1.375 | 500 | 8.500 | 2.500 | 1.375 | 1.375 | 9.750 | 12.500 | 11.250 | 9.500 | 2.625 | 5.000 | 1.125 | 6.000 | 7.313 |
| | 1.750 | 500 | | | | | | | | | 2.875 | 5.250 | | 6.250 | 7.563 |
| | 2.000 | 675 | | | | | | | | | 3.000 | 5.375 | | 6.375 | 7.688 |
| | 2.500 | 675 | | | | | | | | | 3.250 | 5.625 | | 6.625 | 7.938 |
| | 3.000 | 675 | | | | | | | | | 3.250 | 5.625 | | 6.625 | 7.938 |
| | 3.500 | 675 | | | | | | | | | 3.250 | 5.625 | | 6.625 | 7.938 |
| | 4.000 | 675 | | | | | | | | | 3.250 | 5.625 | | 6.625 | 7.938 |
| | 4.500 | 675 | | | | | | | | | 3.250 | 5.625 | | 6.625 | 7.938 |
| | 5.000 | 675 | | | | | | | | | 3.250 | 5.625 | | 6.625 | 7.938 |
| | 5.500 | 675 | | | | | | | | | 3.250 | 5.625 | | 6.625 | 7.938 |

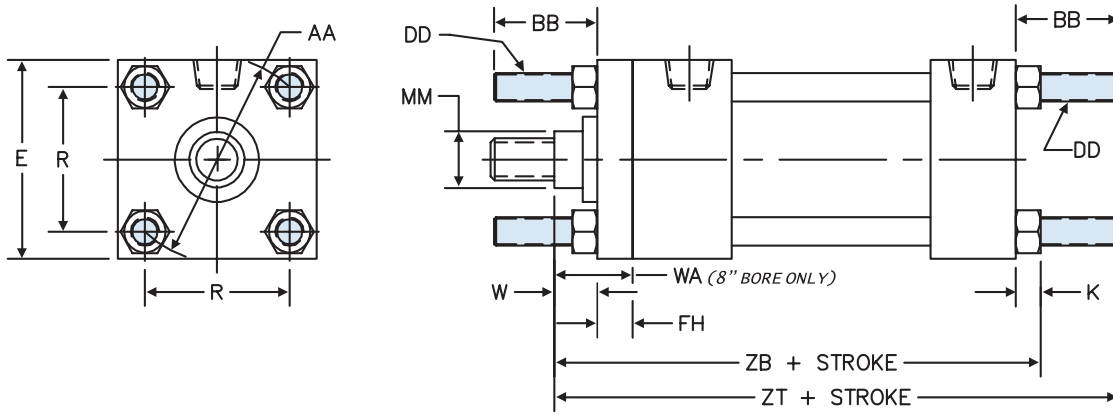
① Max single acting pressure rating (NON-Shock). Any additional opposed intensified pressure related to varying impact area within the cylinder is not taken into consideration (ram cylinders).

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

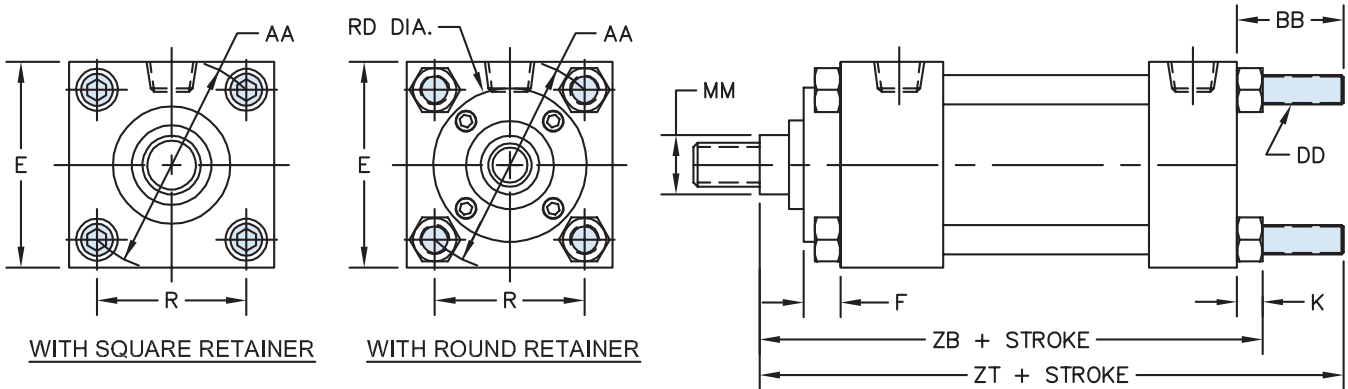
③ 'XI' dimension is the minimum that can be supplied and leaves 1/4" gap between head & trunnion block (customer to specify 'XI' dimension).

SERIES 'MH' DIMENSIONS: EXTENDED TIE ROD MOUNTS

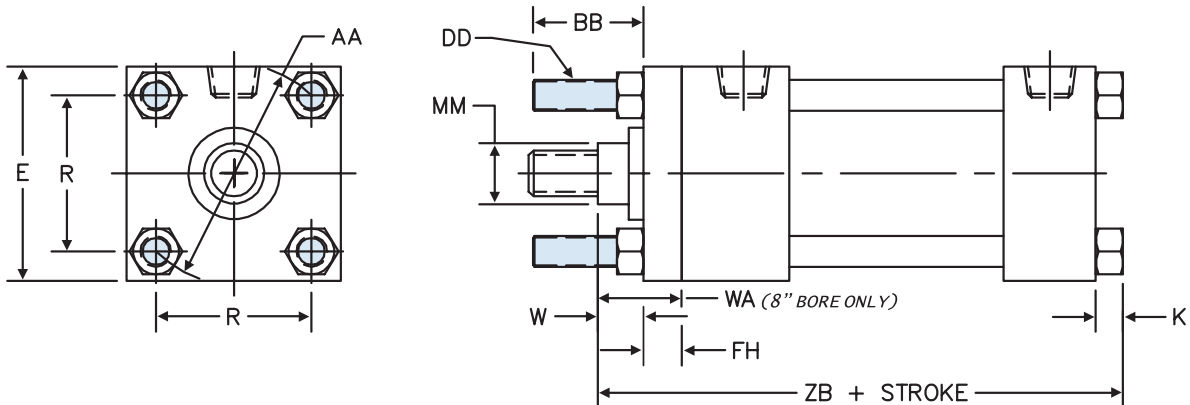
MX1: EXTENDED TIE-RODS - HEAD & CAP



MX2: EXTENDED TIE-RODS - CAP END



MX3: EXTENDED TIE-RODS - HEAD END



SERIES 'MH' DIMENSIONS: EXTENDED TIE ROD MOUNTS

| BORE | ROD DIA. (MM) | ① MAX PSI RATING | E | FH | AA | BB | DD | F | K | R | ② RD | W or WA (8") | ADD TO STROKE | |
|------|---------------|------------------|-------|-------|-------|-------|-----------|-------|-------|-------|-------|--------------|---------------|-------|
| | | | | | | | | | | | | | ZB | ZT |
| 1.50 | 0.625 | 1500 | 2.000 | 0.375 | 2.020 | 1.000 | 1/4 - 28 | 0.375 | 0.250 | 1.430 | SQ | 0.625 | 4.875 | 5.625 |
| | 1.000 | 1500 | | | | | | | | | SQ | 1.000 | 5.250 | 6.000 |
| 2.00 | 0.625 | 1500 | 2.500 | 0.375 | 2.600 | 1.125 | 5/16 - 24 | 0.375 | 0.313 | 1.840 | 2.000 | 0.625 | 4.938 | 5.750 |
| | 1.000 | 1500 | | | | | | | | | SQ | 1.000 | 5.313 | 6.125 |
| | 1.375 | 1500 | | | | | | | | | SQ | 1.250 | 5.563 | 6.375 |
| 2.50 | 0.625 | 1000 | 3.000 | 0.375 | 3.100 | 1.125 | 5/16 - 24 | 0.375 | 0.313 | 2.190 | 2.000 | 0.625 | 5.063 | 5.875 |
| | 1.000 | 1500 | | | | | | | | | SQ | 1.000 | 5.438 | 6.250 |
| | 1.375 | 1500 | | | | | | | | | SQ | 1.250 | 5.688 | 6.500 |
| | 1.750 | 1500 | | | | | | | | | SQ | 1.500 | 5.938 | 6.750 |
| 3.25 | 1.000 | 1500 | 3.750 | 0.625 | 3.900 | 1.375 | 3/8 - 24 | 0.625 | 0.375 | 2.760 | 2.750 | 0.750 | 6.000 | 7.000 |
| | 1.375 | 1500 | | | | | | | | | SQ | 1.000 | 6.250 | 7.250 |
| | 1.750 | 1500 | | | | | | | | | SQ | 1.250 | 6.500 | 7.500 |
| | 2.000 | 1500 | | | | | | | | | SQ | 1.375 | 6.625 | 7.625 |
| 4.00 | 1.000 | 1000 | 4.500 | 0.625 | 4.700 | 1.375 | 3/8 - 24 | 0.625 | 0.375 | 3.320 | 2.750 | 0.750 | 6.000 | 7.000 |
| | 1.375 | 1000 | | | | | | | | | 3.500 | 1.000 | 6.250 | 7.250 |
| | 1.750 | 1000 | | | | | | | | | 3.500 | 1.250 | 6.500 | 7.500 |
| | 2.000 | 1000 | | | | | | | | | SQ | 1.375 | 6.625 | 7.625 |
| | 2.500 | 1000 | | | | | | | | | SQ | 1.625 | 6.875 | 7.875 |
| 5.00 | 1.000 | 750 | 5.500 | 0.625 | 5.800 | 1.813 | 1/2 - 20 | 0.625 | 0.438 | 4.100 | 2.750 | 0.750 | 6.313 | 7.688 |
| | 1.375 | 1000 | | | | | | | | | 3.500 | 1.000 | 6.563 | 7.938 |
| | 1.750 | 1000 | | | | | | | | | 3.500 | 1.250 | 6.813 | 8.188 |
| | 2.000 | 1000 | | | | | | | | | 4.250 | 1.375 | 6.938 | 8.313 |
| | 2.500 | 1000 | | | | | | | | | SQ | 1.625 | 7.188 | 8.563 |
| | 3.000 | 1000 | | | | | | | | | SQ | 1.625 | 7.188 | 8.563 |
| | 3.500 | 1000 | | | | | | | | | SQ | 1.625 | 7.188 | 8.563 |
| 6.00 | 1.375 | 750 | 6.500 | 0.750 | 6.900 | 1.813 | 1/2 - 20 | 0.750 | 0.438 | 4.880 | 3.500 | 0.875 | 7.063 | 8.438 |
| | 1.750 | 750 | | | | | | | | | 3.875 | 1.125 | 7.313 | 8.688 |
| | 2.000 | 750 | | | | | | | | | 4.250 | 1.250 | 7.438 | 8.813 |
| | 2.500 | 750 | | | | | | | | | 4.625 | 1.500 | 7.688 | 9.063 |
| | 3.000 | 750 | | | | | | | | | 5.250 | 1.500 | 7.688 | 9.063 |
| | 3.500 | 750 | | | | | | | | | 5.750 | 1.500 | 7.688 | 9.063 |
| | 4.000 | 750 | | | | | | | | | SQ | 1.500 | 7.688 | 9.063 |
| | 1.375 | 500 | | | | | | | | | 3.500 | 1.625 | 7.313 | 9.063 |
| 8.00 | 1.750 | 500 | 8.500 | 0.625 | 9.100 | 2.313 | 5/8 - 18 | 0.750 | 0.563 | 6.440 | 3.875 | 1.875 | 7.563 | 9.313 |
| | 2.000 | 675 | | | | | | | | | 4.250 | 2.000 | 7.688 | 9.438 |
| | 2.500 | 675 | | | | | | | | | 4.625 | 2.250 | 7.938 | 9.688 |
| | 3.000 | 675 | | | | | | | | | 5.250 | 2.250 | 7.938 | 9.688 |
| | 3.500 | 675 | | | | | | | | | 5.750 | 2.250 | 7.938 | 9.688 |
| | 4.000 | 675 | | | | | | | | | 6.500 | 2.250 | 7.938 | 9.688 |
| | 4.500 | 675 | | | | | | | | | 7.250 | 2.250 | 7.938 | 9.688 |
| | 5.000 | 675 | | | | | | | | | 7.500 | 2.250 | 7.938 | 9.688 |
| | 5.500 | 675 | | | | | | | | | 7.500 | 2.250 | 7.938 | 9.688 |

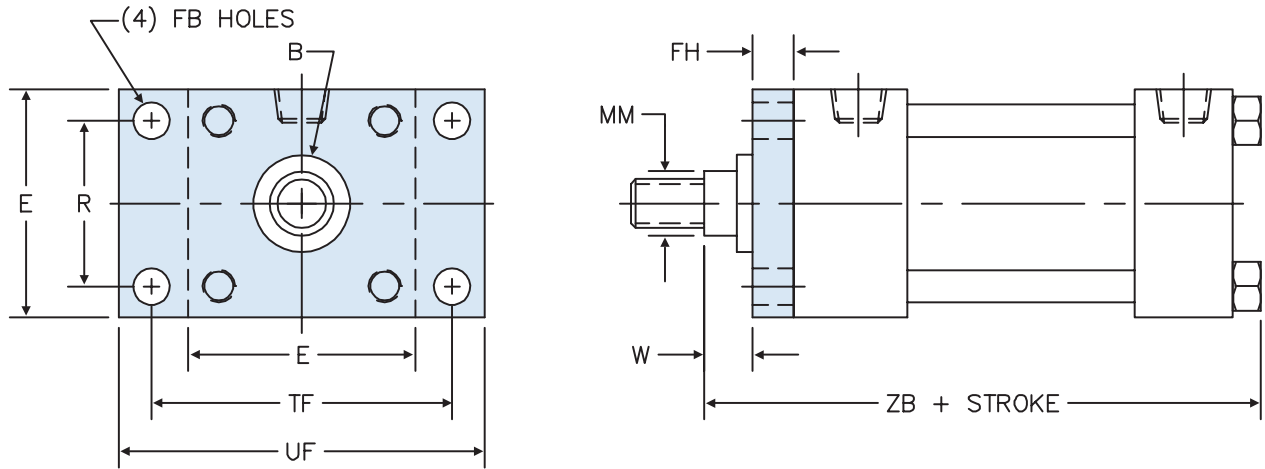
① Max single acting pressure rating (NON-Shock). Any additional opposed intensified pressure related to varying impact area within the cylinder is not taken into consideration (ram cylinders).

② Where SQ is shown in chart, cylinder utilizes a full square retainer. ALL MX1 & MX3 MOUNTS USE FULL SQ. RETAINER.

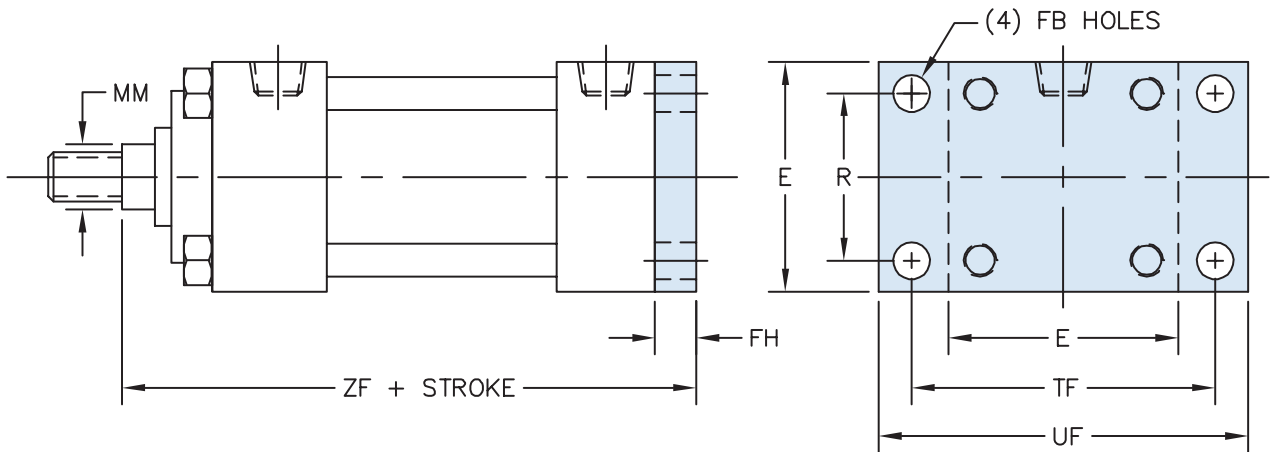
③ Round retainer used to retain bushing, not a full front plate as other bores. 'BB' is dimension from head on the 8.00" bore.

SERIES 'MH' DIMENSIONS: FLANGE MOUNTS

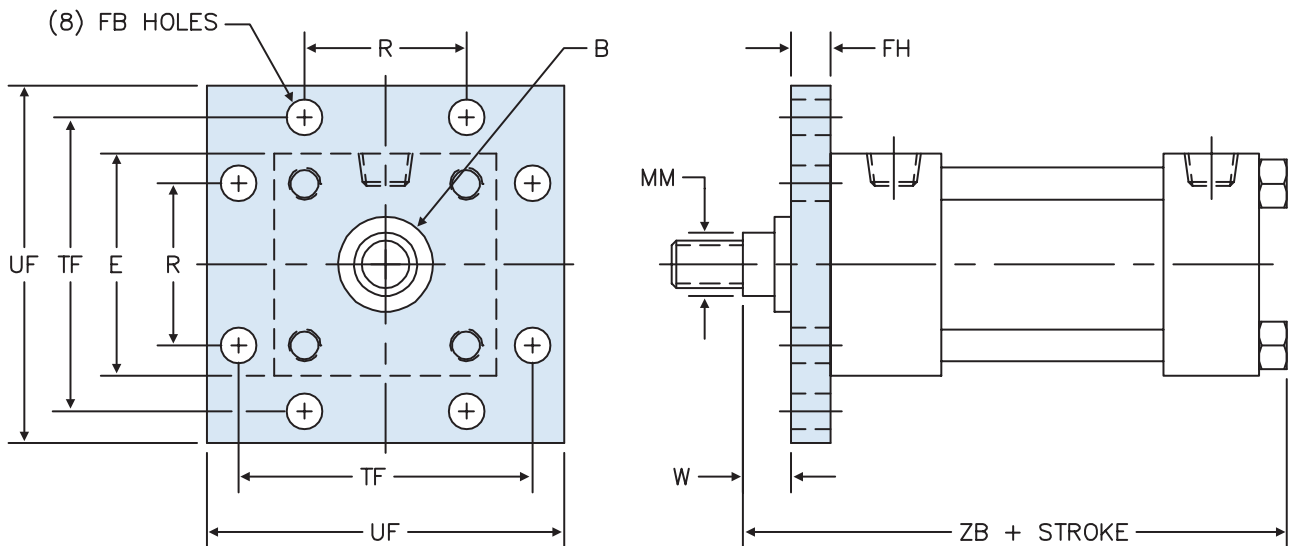
MF1: HEAD FLANGE



MF2: CAP FLANGE

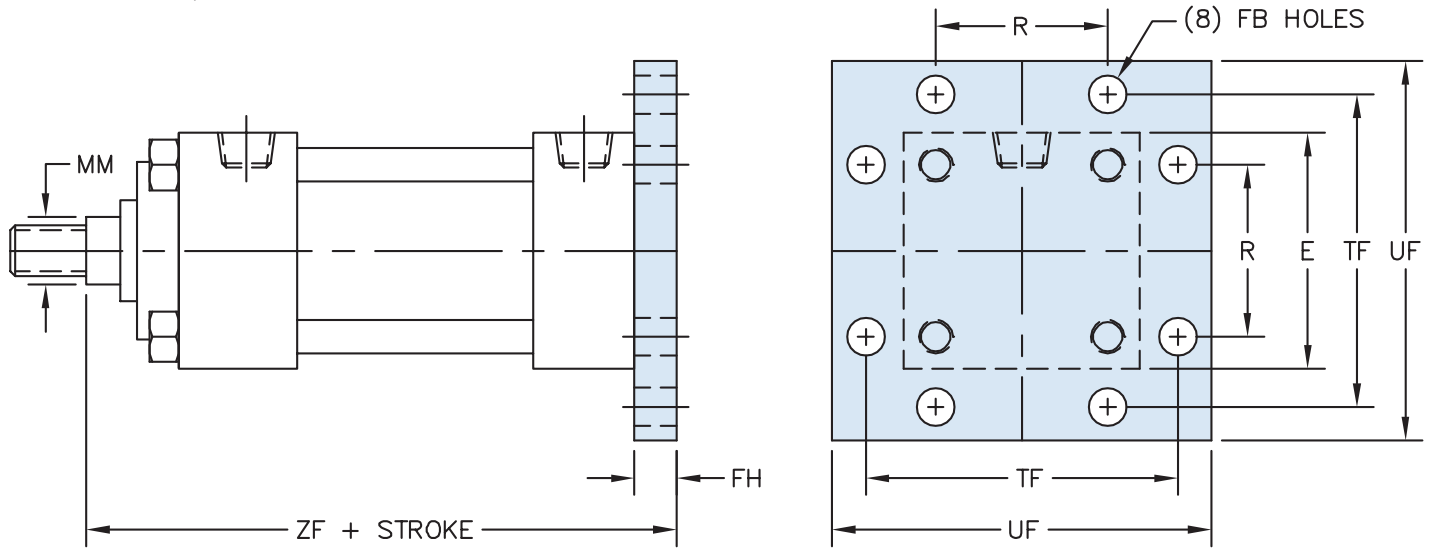


MF5: HEAD SQUARE FLANGE



SERIES 'MH' DIMENSIONS: FLANGE MOUNTS

MF6: CAP SQUARE FLANGE



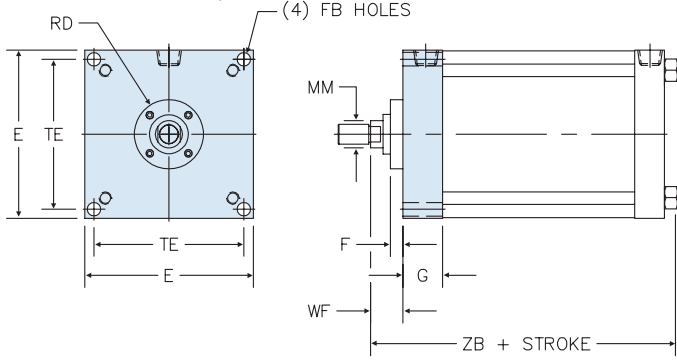
| BORE | ROD DIA. (MM) | ① MAX PSI RATING | ② B | E | FB | FH | R | TF | UF | W | ADD TO STROKE | |
|------|---------------|------------------|-------|-------|-------|-------|-------|-------|-------|-------|---------------|-------|
| | | | | | | | | | | | ZB | ZF |
| 1.50 | 0.625 | 1500 | 1.124 | 2.000 | 0.313 | 0.375 | 1.438 | 2.750 | 3.375 | 0.625 | 4.875 | 5.000 |
| | 1.000 | 1500 | 1.499 | | | | | | | 1.000 | 5.250 | 5.375 |
| 2.00 | 0.625 | 1500 | 1.124 | 2.500 | 0.375 | 0.375 | 1.844 | 3.375 | 4.125 | 0.625 | 4.938 | 5.000 |
| | 1.000 | 1500 | 1.499 | | | | | | | 1.000 | 5.313 | 5.375 |
| | 1.375 | 1500 | 1.999 | | | | | | | 1.250 | 5.563 | 5.625 |
| 2.50 | 0.625 | 1000 | 1.124 | 3.000 | 0.375 | 0.375 | 2.188 | 3.875 | 4.625 | 0.625 | 5.063 | 5.125 |
| | 1.000 | 1500 | 1.499 | | | | | | | 1.000 | 5.438 | 5.500 |
| | 1.375 | 1500 | 1.999 | | | | | | | 1.250 | 5.688 | 5.750 |
| | 1.750 | 1500 | 2.374 | | | | | | | 1.500 | 5.938 | 6.000 |
| 3.25 | 1.000 | 1500 | 1.499 | 3.750 | 0.438 | 0.625 | 2.766 | 4.688 | 5.500 | 0.750 | 6.000 | 6.250 |
| | 1.375 | 1500 | 1.999 | | | | | | | 1.000 | 6.250 | 6.500 |
| | 1.750 | 1500 | 2.374 | | | | | | | 1.250 | 6.500 | 6.750 |
| | 2.000 | 1500 | 2.624 | | | | | | | 1.375 | 6.625 | 6.875 |
| 4.00 | 1.000 | 1000 | 1.499 | 4.500 | 0.438 | 0.625 | 3.328 | 5.438 | 6.250 | 0.750 | 6.000 | 6.250 |
| | 1.375 | 1000 | 1.999 | | | | | | | 1.000 | 6.250 | 6.500 |
| | 1.750 | 1000 | 2.374 | | | | | | | 1.250 | 6.500 | 6.750 |
| | 2.000 | 1000 | 2.624 | | | | | | | 1.375 | 6.625 | 6.875 |
| | 2.500 | 1000 | 3.124 | | | | | | | 1.625 | 6.875 | 7.125 |
| 5.00 | 1.000 | 750 | 1.499 | 5.500 | 0.563 | 0.625 | 4.109 | 6.625 | 7.625 | 0.750 | 6.313 | 6.500 |
| | 1.375 | 1000 | 1.999 | | | | | | | 1.000 | 6.563 | 6.750 |
| | 1.750 | 1000 | 2.374 | | | | | | | 1.250 | 6.813 | 7.000 |
| | 2.000 | 1000 | 2.624 | | | | | | | 1.375 | 6.938 | 7.125 |
| | 2.500 | 1000 | 3.124 | | | | | | | 1.625 | 7.188 | 7.375 |
| | 3.000 | 1000 | 3.749 | | | | | | | 1.625 | 7.188 | 7.375 |
| | 3.500 | 1000 | 4.249 | | | | | | | 1.625 | 7.188 | 7.375 |
| 6.00 | 1.375 | 750 | 1.999 | 6.500 | 0.563 | 0.750 | 4.875 | 7.625 | 8.625 | 0.875 | 7.063 | 7.375 |
| | 1.750 | 750 | 2.374 | | | | | | | 1.125 | 7.313 | 7.625 |
| | 2.000 | 750 | 2.624 | | | | | | | 1.250 | 7.438 | 7.750 |
| | 2.500 | 750 | 3.124 | | | | | | | 1.500 | 7.688 | 8.000 |
| | 3.000 | 750 | 3.749 | | | | | | | 1.500 | 7.688 | 8.000 |
| | 3.500 | 750 | 4.249 | | | | | | | 1.500 | 7.688 | 8.000 |
| | 4.000 | 750 | 4.749 | | | | | | | 1.500 | 7.688 | 8.000 |

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).

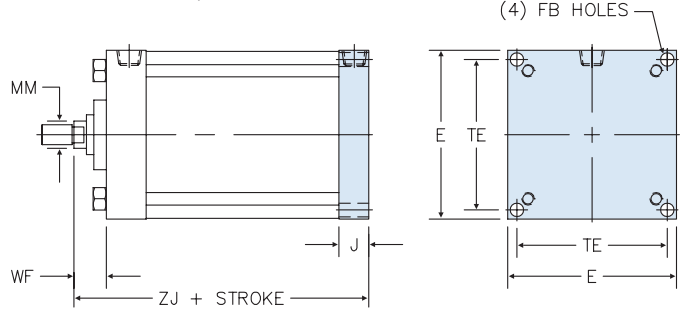
② 'B' dimension tolerance is +.000 / -.002

SERIES 'MH' DIMENSIONS: FLANGE MOUNTS

ME3: HEAD SQUARE MOUNTING HOLES

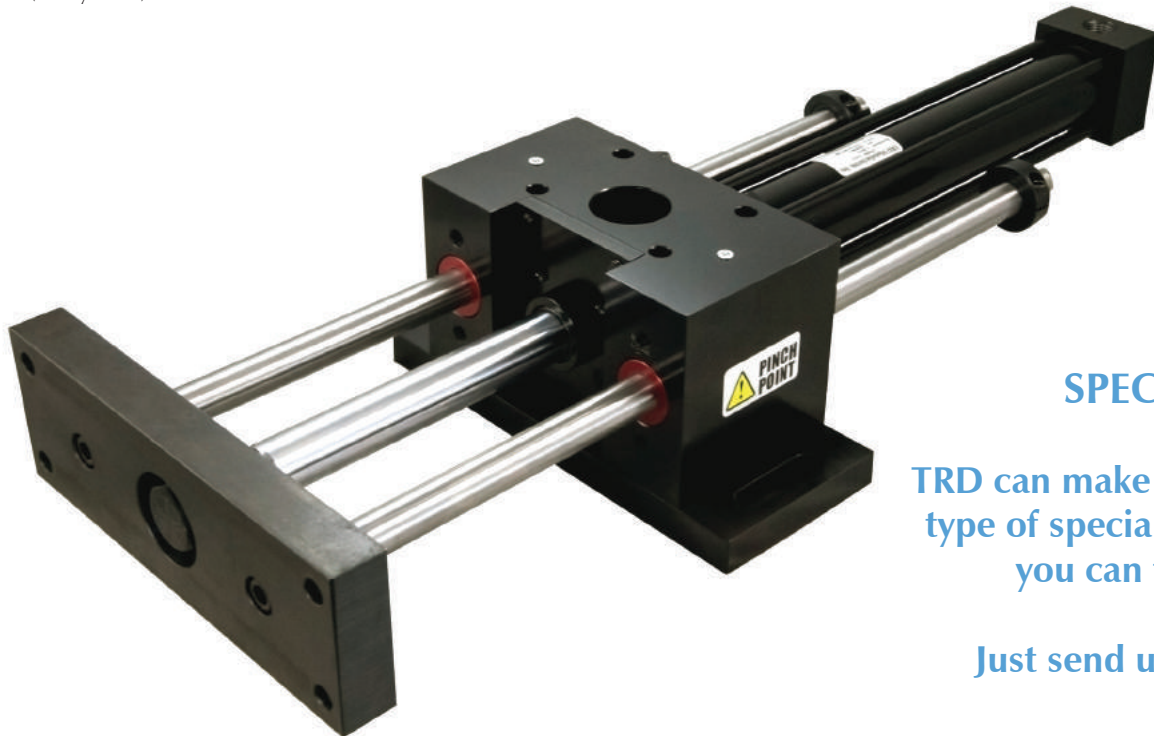


ME4: CAP SQUARE MOUNTING HOLES



| BORE | ROD DIA. (MM) | MAX PSI RATING | E | F | FB | G | J | TE | RD | WF | ADD TO STROKE | |
|------|---------------|----------------|-------|-------|-------|-------|-------|-------|-------|-------|---------------|-------|
| | | | | | | | | | | | ZB | ZJ |
| 8.00 | 1.375 | 500 | 8.500 | 0.750 | 0.688 | 2.000 | 1.500 | 7.570 | 3.500 | 1.625 | 7.313 | 6.750 |
| | 1.750 | 500 | | | | | | | 3.875 | 1.875 | 7.563 | 7.000 |
| | 2.000 | 675 | | | | | | | 4.250 | 2.000 | 7.688 | 7.125 |
| | 2.500 | 675 | | | | | | | 4.625 | 2.250 | 7.938 | 7.375 |
| | 3.000 | 675 | | | | | | | 5.250 | 2.250 | 7.938 | 7.375 |
| | 3.500 | 675 | | | | | | | 5.750 | 2.250 | 7.938 | 7.375 |
| | 4.000 | 675 | | | | | | | 6.500 | 2.250 | 7.938 | 7.375 |
| | 4.500 | 675 | | | | | | | 7.250 | 2.250 | 7.938 | 7.375 |
| | 5.000 | 675 | | | | | | | 7.500 | 2.250 | 7.938 | 7.375 |
| | 5.500 | 675 | | | | | | | 7.500 | 2.250 | 7.938 | 7.375 |

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).



SPECIALS

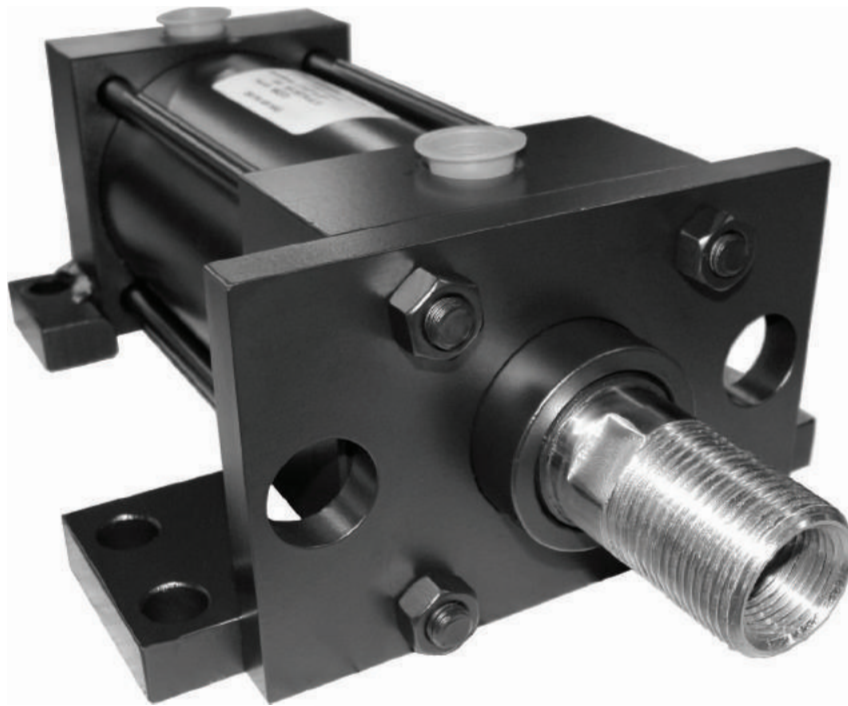
TRD can make just about any type of special cylinder that you can think of.

Just send us a sketch!

HH - Heavy Duty Hydraulic
 HH Rod Lock
 MH - Medium Duty Hydraulic
 MH Options
 TAS - Heavy Duty Pneumatic
 Accessories Page 147
 Strokemaster® Page 153
 Technical Data Page 161

Design Tips - Multiple Mounts on One Cylinder

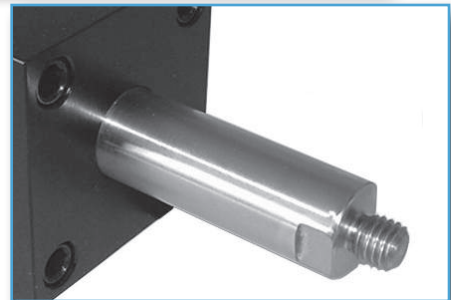
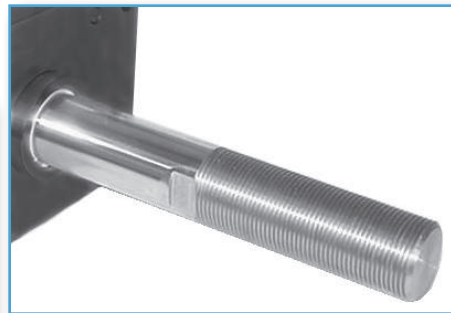
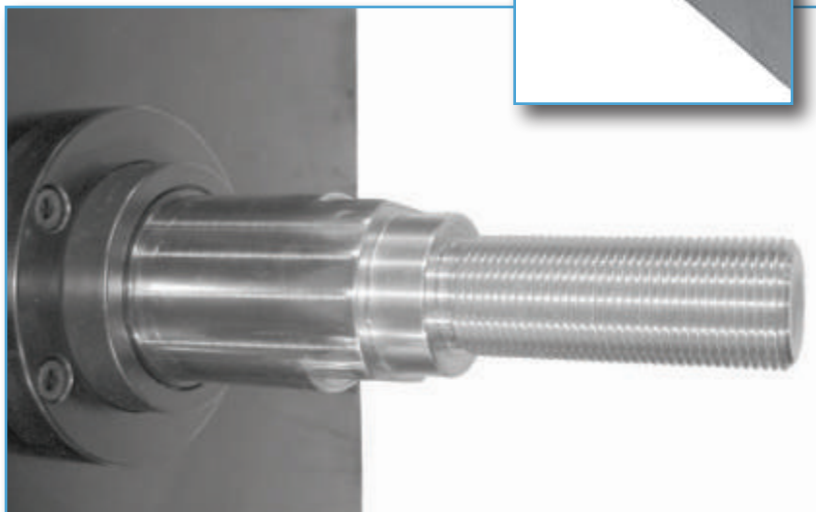
Designers and maintenance staff don't have to be limited to just one NFPA mount. Cylinders can contain multiple mounts or even special mounts to fit every possible application. Multiple mounts do not typically delay orders.



Note: 'HH' and 'MH' Series can limit thread options. Check with factory to ensure that your special thread can handle the intended loads.

Design Tips - Rod Threads

NFPA standards specify UNF fine threads. UNC coarse, metric or other types of male threads are available. It is possible to utilize male and female threads on the same rod.

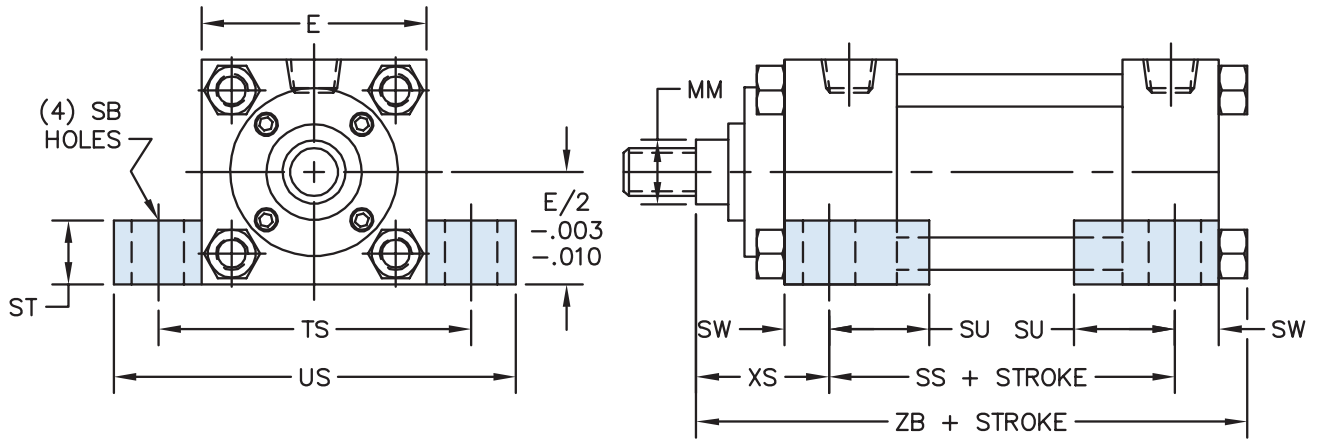


Rod Thread Lengths

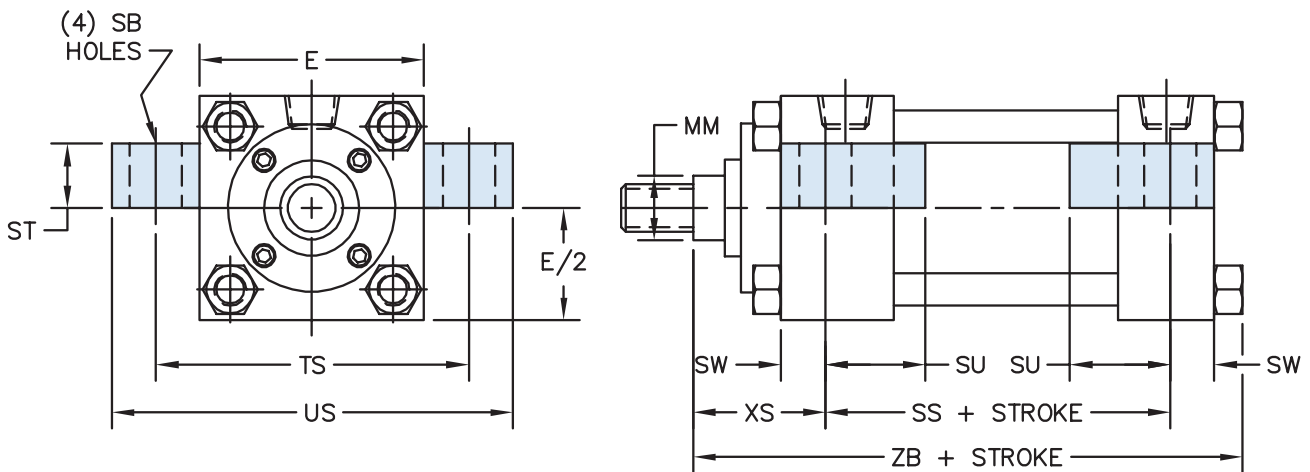
Since each piston rod is made-to-order, rod thread lengths can also be specified without delaying orders.

SERIES 'MH' DIMENSIONS: LUG MOUNTS

MS2: SIDE LUGS



MS3: CENTER LINE LUGS



SERIES 'MH' DIMENSIONS: LUG MOUNTS

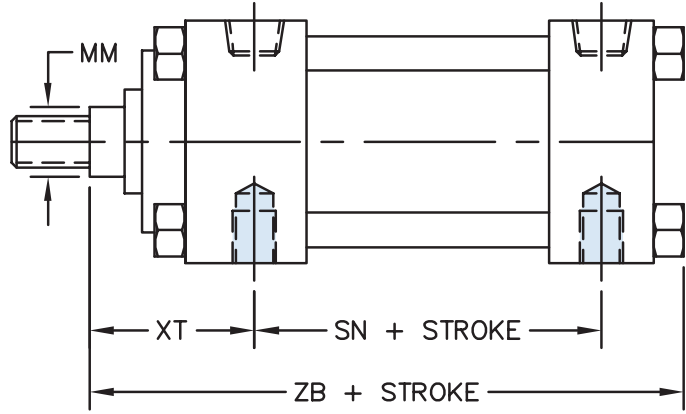
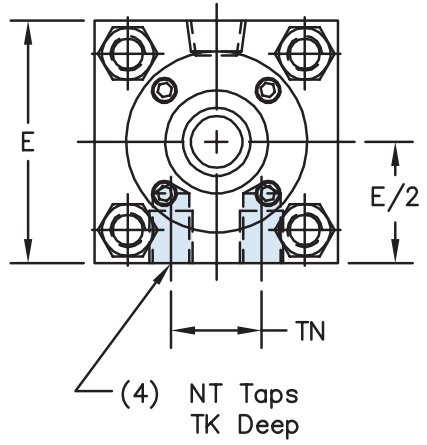
| BORE | ROD DIA. (MM) | Ⓢ MAX PSI RATING | E | SB | ST | SU | SW | TS | US | XS | ADD TO STROKE | |
|-------|---------------|------------------|-------|-------|-------|-------|-------|-------|-------|-------|---------------|-------|
| | | | | | | | | | | | SS | ZB |
| 1.50 | 0.625 | 1500 | 2.000 | 0.438 | 0.500 | 1.125 | 0.375 | 2.750 | 3.500 | 1.375 | 2.875 | 4.875 |
| | 1.000 | 1500 | | | | | | | | 1.750 | | 5.250 |
| 2.00 | 0.625 | 1500 | 2.500 | 0.438 | 0.500 | 1.125 | 0.375 | 3.250 | 4.000 | 1.375 | 2.875 | 4.938 |
| | 1.000 | 1500 | | | | | | | | 1.750 | | 5.313 |
| | 1.375 | 1500 | | | | | | | | 2.000 | | 5.563 |
| 2.50 | 0.625 | 1000 | 3.000 | 0.438 | 0.500 | 1.125 | 0.375 | 3.750 | 4.500 | 1.375 | 3.000 | 5.063 |
| | 1.000 | 1500 | | | | | | | | 1.750 | | 5.438 |
| | 1.375 | 1500 | | | | | | | | 2.000 | | 5.688 |
| | 1.750 | 1500 | | | | | | | | 2.250 | | 5.938 |
| 3.25 | 1.000 | 1500 | 3.750 | 0.563 | 0.750 | 1.250 | 0.500 | 4.750 | 5.750 | 1.875 | 3.250 | 6.000 |
| | 1.375 | 1500 | | | | | | | | 2.125 | | 6.250 |
| | 1.750 | 1500 | | | | | | | | 2.375 | | 6.500 |
| | 2.000 | 1500 | | | | | | | | 2.500 | | 6.625 |
| 4.00 | 1.000 | 1000 | 4.500 | 0.563 | 0.750 | 1.250 | 0.500 | 5.500 | 6.500 | 1.875 | 3.250 | 6.000 |
| | 1.375 | 1000 | | | | | | | | 2.125 | | 6.250 |
| | 1.750 | 1000 | | | | | | | | 2.375 | | 6.500 |
| | 2.000 | 1000 | | | | | | | | 2.500 | | 6.625 |
| | 2.500 | 1000 | | | | | | | | 2.750 | | 6.875 |
| 5.00 | 1.000 | 750 | 5.500 | 0.813 | 1.000 | 1.063 | 0.688 | 6.875 | 8.250 | 2.063 | 3.125 | 6.313 |
| | 1.375 | 1000 | | | | | | | | 2.313 | | 6.563 |
| | 1.750 | 1000 | | | | | | | | 2.563 | | 6.813 |
| | 2.000 | 1000 | | | | | | | | 2.688 | | 6.938 |
| | 2.500 | 1000 | | | | | | | | 2.938 | | 7.188 |
| | 3.000 | 1000 | | | | | | | | 2.938 | | 7.188 |
| | 3.500 | 1000 | | | | | | | | 2.938 | | 7.188 |
| 6.00 | 1.375 | 750 | 6.500 | 0.813 | 1.000 | 1.313 | 0.688 | 7.875 | 9.250 | 2.313 | 3.625 | 7.063 |
| | 1.750 | 750 | | | | | | | | 2.563 | | 7.313 |
| | 2.000 | 750 | | | | | | | | 2.688 | | 7.438 |
| | 2.500 | 750 | | | | | | | | 2.938 | | 7.688 |
| | 3.000 | 750 | | | | | | | | 2.938 | | 7.688 |
| | 3.500 | 750 | | | | | | | | 2.938 | | 7.688 |
| | 4.000 | 750 | | | | | | | | 2.938 | | 7.688 |
| | 8.00 | 1.375 | | | | | | | | 500 | | 8.500 |
| 1.750 | | 500 | 2.563 | 7.563 | | | | | | | | |
| 2.000 | | 675 | 2.688 | 7.688 | | | | | | | | |
| 2.500 | | 675 | 2.938 | 7.938 | | | | | | | | |
| 3.000 | | 675 | 2.938 | 7.938 | | | | | | | | |
| 3.500 | | 675 | 2.938 | 7.938 | | | | | | | | |
| 4.000 | | 675 | 2.938 | 7.938 | | | | | | | | |
| 4.500 | | 675 | 2.938 | 7.938 | | | | | | | | |
| 5.000 | | 675 | 2.938 | 7.938 | | | | | | | | |
| 5.500 | | 675 | 2.938 | 7.938 | | | | | | | | |

Ⓢ 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).

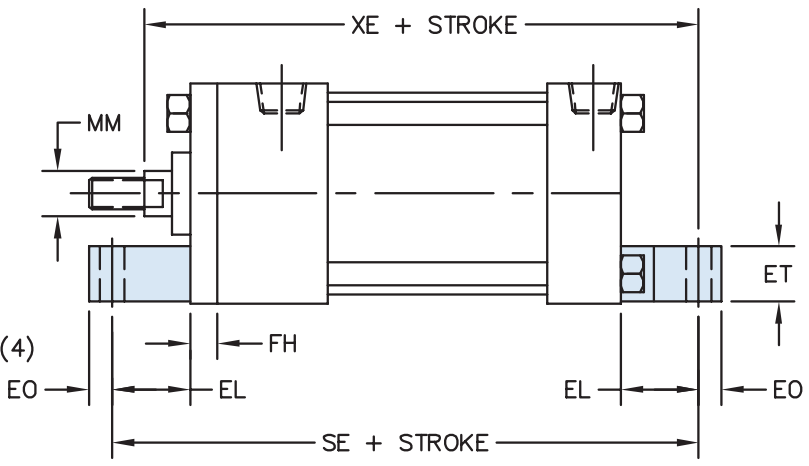
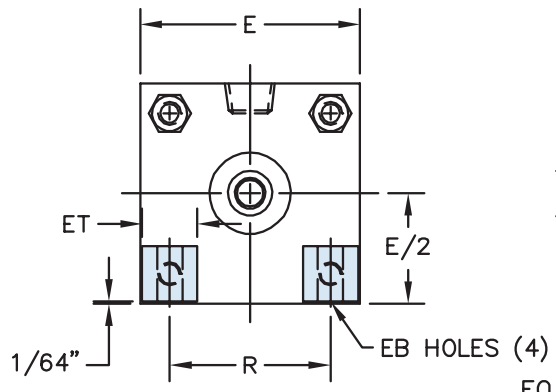
HH - Heavy Duty Hydraulic
 HH Rod Lock
 MH - Medium Duty Hydraulic
 MH Options
 TAS - Heavy Duty Pneumatic
 Accessories Page 147
 Strokmaster® Page 153
 Technical Data Page 161

SERIES 'MH' DIMENSIONS: BOTTOM MOUNTS

MS4: BOTTOM TAPPED HOLES



MS7: END LUGS



HH - Heavy Duty Hydraulic
HH Rod Lock
MH - Medium Duty Hydraulic
MH Options
TAS - Heavy Duty Pneumatic
Accessories Page 147
Strokemaster® Page 153
Technical Data Page 161

SERIES 'MH' DIMENSIONS: BOTTOM MOUNTS

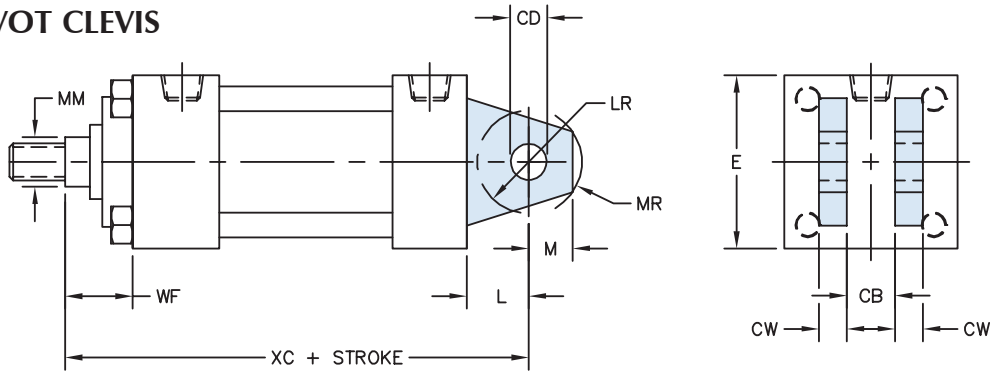
| BORE | ROD DIA. (MM) | Ⓛ MAX PSI RATING | E | EB | EL | EO | ET | FH | NT | R | TN | TK | XT | ADD TO STROKE | | | | |
|------|---------------|------------------|-------|-------|-------|-------|-------|-------|-----------|-------|-------|-------|-------|---------------|-------|-------|-------|-----|
| | | | | | | | | | | | | | | SN | ZB | SE | XE | |
| 1.50 | 0.625 | 1500 | 2.000 | 0.281 | 0.750 | 0.250 | 0.563 | 0.375 | 1/4 - 20 | 1.438 | 0.625 | 0.375 | 1.938 | 2.250 | 4.875 | 5.500 | 5.375 | |
| | 2.313 | 5.250 | | | | | | | | | | | 5.750 | | | | | |
| 2.00 | 0.625 | 1500 | 2.500 | 0.344 | 0.938 | 0.313 | 0.625 | 0.375 | 5/16 - 18 | 1.844 | 0.875 | 0.406 | 1.938 | 2.250 | 4.938 | 5.875 | 5.563 | |
| | 2.313 | 5.313 | | | | | | | | | | | 5.938 | | | | | |
| | 2.563 | 5.563 | | | | | | | | | | | 6.188 | | | | | |
| 2.50 | 0.625 | 1000 | 3.000 | 0.344 | 1.063 | 0.313 | 0.750 | 0.375 | 3/8 - 16 | 2.188 | 1.250 | 0.438 | 1.938 | 2.375 | 5.063 | 6.250 | 5.813 | |
| | 2.313 | 5.438 | | | | | | | | | | | 6.188 | | | | | |
| | 2.563 | 5.688 | | | | | | | | | | | 6.438 | | | | | |
| | 2.813 | 5.938 | | | | | | | | | | | 6.688 | | | | | |
| 3.25 | 1.000 | 1500 | 3.750 | 0.406 | 0.875 | 0.375 | 0.938 | 0.625 | 1/2 - 13 | 2.766 | 1.500 | 0.500 | 2.438 | 2.625 | 6.000 | 6.625 | 6.500 | |
| | 2.688 | 6.250 | | | | | | | | | | | 6.750 | | | | | |
| | 2.938 | 6.500 | | | | | | | | | | | 7.000 | | | | | |
| | 3.063 | 6.625 | | | | | | | | | | | 7.125 | | | | | |
| 4.00 | 1.000 | 1000 | 4.500 | 0.406 | 1.000 | 0.375 | 1.125 | 0.625 | 1/2 - 13 | 3.328 | 2.063 | 0.625 | 2.438 | 2.625 | 6.000 | 6.875 | 6.625 | |
| | 2.688 | 6.250 | | | | | | | | | | | 6.875 | | | | | |
| | 2.938 | 6.500 | | | | | | | | | | | 7.125 | | | | | |
| | 3.063 | 6.625 | | | | | | | | | | | 7.250 | | | | | |
| | 3.313 | 6.875 | | | | | | | | | | | 7.500 | | | | | |
| 5.00 | 1.000 | 750 | 5.500 | 0.531 | 1.063 | 0.500 | 1.375 | 0.625 | 5/8 - 11 | 4.109 | 2.688 | 0.750 | 2.438 | 2.875 | 6.313 | 7.250 | 6.938 | |
| | 2.688 | 6.563 | | | | | | | | | | | 7.188 | | | | | |
| | 2.938 | 6.813 | | | | | | | | | | | 7.438 | | | | | |
| | 3.063 | 6.938 | | | | | | | | | | | 7.563 | | | | | |
| | 3.313 | 7.188 | | | | | | | | | | | 7.813 | | | | | |
| | 3.313 | 7.188 | | | | | | | | | | | 7.813 | | | | | |
| | 3.313 | 7.188 | | | | | | | | | | | 7.813 | | | | | |
| 6.00 | 1.375 | 750 | 6.500 | 0.531 | 1.000 | 0.500 | 1.563 | 0.750 | 3/4 - 10 | 4.875 | 3.250 | 1.000 | 2.813 | 3.125 | 7.063 | 7.750 | 7.625 | |
| | 3.063 | 7.313 | | | | | | | | | | | 7.875 | | | | | |
| | 3.188 | 7.438 | | | | | | | | | | | 8.000 | | | | | |
| | 3.438 | 7.688 | | | | | | | | | | | 8.250 | | | | | |
| | 3.438 | 7.688 | | | | | | | | | | | 8.250 | | | | | |
| | 3.438 | 7.688 | | | | | | | | | | | 8.250 | | | | | |
| | 3.438 | 7.688 | | | | | | | | | | | 8.250 | | | | | |
| 8.00 | 1.375 | 500 | 8.500 | 0.688 | 1.125 | 0.625 | 2.000 | Ⓜ | 3/4 - 10 | 6.438 | 4.500 | 1.250 | 2.813 | 3.250 | 7.313 | 7.375 | 7.875 | |
| | 3.063 | 7.563 | | | | | | | | | | | 8.125 | | | | | |
| | 3.188 | 7.688 | | | | | | | | | | | 8.250 | | | | | |
| | 3.438 | 7.938 | | | | | | | | | | | 8.500 | | | | | |
| | 3.438 | 7.938 | | 8.500 | | | | | | | | | | | | | | |
| | 3.438 | 7.938 | | 8.500 | | | | | | | | | | | | | | |
| | 3.438 | 7.938 | | 8.500 | | | | | | | | | | | | | | |
| | N/A | N/A | | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | 3.438 | 7.938 | N/A | N/A |
| | N/A | N/A | | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | 3.438 | 7.938 | N/A | N/A |
| | N/A | N/A | | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | 3.438 | 7.938 | N/A | N/A |
| N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | 3.438 | 7.938 | N/A | N/A | | |

Ⓛ 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).

Ⓜ (1) piece MS7 brackets bolted directly to head & cap (uses round retainer).

SERIES 'MH' DIMENSIONS: PIVOT MOUNTS

MP1: REAR PIVOT CLEVIS



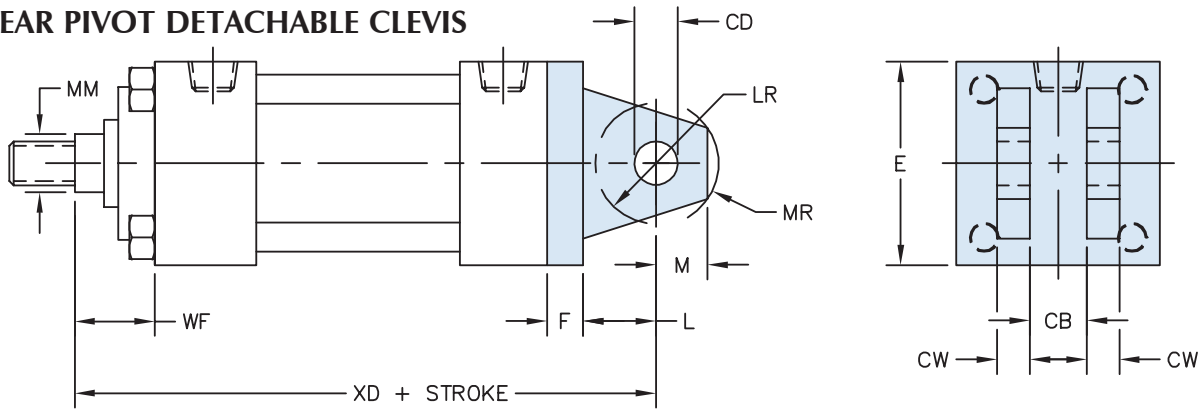
| BORE | ROD DIA. (MM) | ① MAX PSI RATING | CB | CD | CW | E | L | LR | M | MR | WF | ADD TO STROKE | |
|-------|---------------|------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|---------------|-------|
| | | | | | | | | | | | | XC | |
| 1.50 | 0.625 | 1500 | 0.750 | 0.500 | 0.500 | 2.000 | 0.750 | 0.563 | 0.500 | 0.625 | 1.000 | 5.375 | |
| | 1.000 | 1500 | | | | | | | | | | 1.375 | 5.750 |
| 2.00 | 0.625 | 1500 | 0.750 | 0.500 | 0.500 | 2.500 | 0.750 | 0.563 | 0.500 | 0.625 | 1.000 | 5.375 | |
| | 1.000 | 1500 | | | | | | | | | | 1.375 | 5.750 |
| | 1.375 | 1500 | | | | | | | | | | 1.625 | 6.000 |
| 2.50 | 0.625 | 1000 | 0.750 | 0.500 | 0.500 | 3.000 | 0.750 | 0.563 | 0.500 | 0.625 | 1.000 | 5.500 | |
| | 1.000 | 1500 | | | | | | | | | | 1.375 | 5.875 |
| | 1.375 | 1500 | | | | | | | | | | 1.625 | 6.125 |
| | 1.750 | 1500 | | | | | | | | | | 1.875 | 6.375 |
| 3.25 | 1.000 | 1500 | 1.250 | 0.750 | 0.625 | 3.750 | 1.250 | 1.000 | 0.750 | 0.938 | 1.375 | 6.875 | |
| | 1.375 | 1500 | | | | | | | | | | 1.625 | 7.125 |
| | 1.750 | 1500 | | | | | | | | | | 1.875 | 7.375 |
| | 2.000 | 1500 | | | | | | | | | | 2.000 | 7.500 |
| 4.00 | 1.000 | 1000 | 1.250 | 0.750 | 0.625 | 4.500 | 1.250 | 1.000 | 0.750 | 0.938 | 1.375 | 6.875 | |
| | 1.375 | 1000 | | | | | | | | | | 1.625 | 7.125 |
| | 1.750 | 1000 | | | | | | | | | | 1.875 | 7.375 |
| | 2.000 | 1000 | | | | | | | | | | 2.000 | 7.500 |
| | 2.500 | 1000 | | | | | | | | | | 2.250 | 7.750 |
| 5.00 | 1.000 | 750 | 1.250 | 0.750 | 0.625 | 5.500 | 1.250 | 1.000 | 0.750 | 0.938 | 1.375 | 7.125 | |
| | 1.375 | 1000 | | | | | | | | | | 1.625 | 7.375 |
| | 1.750 | 1000 | | | | | | | | | | 1.875 | 7.625 |
| | 2.000 | 1000 | | | | | | | | | | 2.000 | 7.750 |
| | 2.500 | 1000 | | | | | | | | | | 2.250 | 8.000 |
| | 3.000 | 1000 | | | | | | | | | | 2.250 | 8.000 |
| 6.00 | 1.375 | 750 | 1.500 | 1.000 | 0.750 | 6.500 | 1.500 | 1.250 | 1.000 | 1.188 | 1.625 | 8.125 | |
| | 1.750 | 750 | | | | | | | | | | 1.875 | 8.375 |
| | 2.000 | 750 | | | | | | | | | | 2.000 | 8.500 |
| | 2.500 | 750 | | | | | | | | | | 2.250 | 8.750 |
| | 3.000 | 750 | | | | | | | | | | 2.250 | 8.750 |
| | 3.500 | 750 | | | | | | | | | | 2.250 | 8.750 |
| 8.00 | 1.375 | 500 | 1.500 | 1.000 | 0.750 | 8.500 | 1.500 | 1.250 | 1.000 | 1.188 | 1.625 | 8.250 | |
| | 1.750 | 500 | | | | | | | | | | 1.875 | 8.500 |
| | 2.000 | 675 | | | | | | | | | | 2.000 | 8.625 |
| | 2.500 | 675 | | | | | | | | | | 2.250 | 8.875 |
| | 3.000 | 675 | | | | | | | | | | 2.250 | 8.875 |
| | 3.500 | 675 | | | | | | | | | | 2.250 | 8.875 |
| | 4.000 | 675 | | | | | | | | | | 2.250 | 8.875 |
| | 4.500 | 675 | | | | | | | | | | 2.250 | 8.875 |
| | 5.000 | 675 | | | | | | | | | | 2.250 | 8.875 |
| 5.500 | 675 | 2.250 | 8.875 | | | | | | | | | | |

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).

Note: Pivot pin included with cylinder cap end only.

SERIES 'MH' DIMENSIONS: PIVOT MOUNTS

MP2: REAR PIVOT DETACHABLE CLEVIS



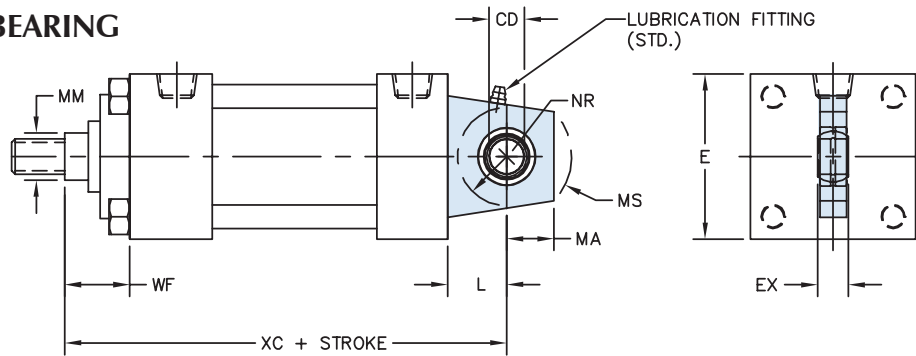
| BORE | ROD DIA. (MM) | ① MAX PSI RATING | CB | CD | CW | E | F | L | LR | M | MR | WF | ADD TO STROKE |
|------|---------------|------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|---------------|
| | | | | | | | | | | | | | XD |
| 1.50 | 0.625 | 1500 | 0.750 | 0.500 | 0.500 | 2.000 | 0.375 | 0.750 | 0.563 | 0.500 | 0.625 | 1.000 | 5.750 |
| | 1.000 | 1500 | | | | | | | | | | | 6.125 |
| 2.00 | 0.625 | 1500 | 0.750 | 0.500 | 0.500 | 2.500 | 0.375 | 0.750 | 0.563 | 0.500 | 0.625 | 1.000 | 5.750 |
| | 1.000 | 1500 | | | | | | | | | | | 6.125 |
| | 1.375 | 1500 | | | | | | | | | | | 6.375 |
| 2.50 | 0.625 | 1000 | 0.750 | 0.500 | 0.500 | 3.000 | 0.375 | 0.750 | 0.563 | 0.500 | 0.625 | 1.000 | 5.875 |
| | 1.000 | 1500 | | | | | | | | | | | 6.250 |
| | 1.375 | 1500 | | | | | | | | | | | 6.500 |
| | 1.750 | 1500 | | | | | | | | | | | 6.750 |
| 3.25 | 1.000 | 1500 | 1.250 | 0.750 | 0.625 | 3.750 | 0.625 | 1.250 | 1.000 | 0.750 | 0.938 | 1.375 | 7.500 |
| | 1.375 | 1500 | | | | | | | | | | | 7.750 |
| | 1.750 | 1500 | | | | | | | | | | | 8.000 |
| | 2.000 | 1500 | | | | | | | | | | | 8.125 |
| 4.00 | 1.000 | 1000 | 1.250 | 0.750 | 0.625 | 4.500 | 0.625 | 1.250 | 1.000 | 0.750 | 0.938 | 1.375 | 7.500 |
| | 1.375 | 1000 | | | | | | | | | | | 7.750 |
| | 1.750 | 1000 | | | | | | | | | | | 8.000 |
| | 2.000 | 1000 | | | | | | | | | | | 8.125 |
| | 2.250 | 1000 | | | | | | | | | | | 8.375 |
| 5.00 | 1.000 | 750 | 1.250 | 0.750 | 0.625 | 5.500 | 0.625 | 1.250 | 1.000 | 0.750 | 0.938 | 1.375 | 7.750 |
| | 1.375 | 1000 | | | | | | | | | | | 8.000 |
| | 1.750 | 1000 | | | | | | | | | | | 8.250 |
| | 2.000 | 1000 | | | | | | | | | | | 8.375 |
| | 2.500 | 1000 | | | | | | | | | | | 8.625 |
| | 2.250 | 1000 | | | | | | | | | | | 8.625 |
| | 2.250 | 1000 | | | | | | | | | | | 8.625 |
| 6.00 | 1.375 | 750 | 1.500 | 1.000 | 0.750 | 6.500 | 0.750 | 1.500 | 1.250 | 1.000 | 1.188 | 1.625 | 8.875 |
| | 1.750 | 750 | | | | | | | | | | | 9.125 |
| | 2.000 | 750 | | | | | | | | | | | 9.250 |
| | 2.500 | 750 | | | | | | | | | | | 9.500 |
| | 3.000 | 750 | | | | | | | | | | | 9.500 |
| | 3.500 | 750 | | | | | | | | | | | 9.500 |
| | 4.000 | 750 | | | | | | | | | | | 9.500 |

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).

Note: Pivot pin included with cylinder cap end only.

SERIES 'MH' DIMENSIONS: SPHERICAL BEARING MOUNT

SB: SPHERICAL BEARING



| BORE | ROD DIA. (MM) | ① MAX PSI RATING | CD | E | EX | L | MA | MS | NR | WF | ADD TO STROKE |
|-------|---------------|------------------|-------|-------|-------|-------|-------|-------|-------|-------|---------------|
| | | | | | | | | | | | XC |
| 1.50 | 0.625 | 1500 | 0.500 | 2.000 | 0.437 | 0.750 | 0.750 | 0.938 | 0.625 | 1.000 | 5.375 |
| | 1.000 | 1500 | | | | | | | | 1.375 | 5.750 |
| 2.00 | 0.625 | 980 | 0.500 | 2.500 | 0.437 | 0.750 | 0.750 | 0.938 | 0.625 | 1.000 | 5.375 |
| | 1.000 | 980 | | | | | | | | 1.375 | 5.750 |
| | 1.375 | 980 | | | | | | | | 1.625 | 6.000 |
| 2.50 | 0.625 | 630 | 0.500 | 3.000 | 0.437 | 0.750 | 0.750 | 0.938 | 0.625 | 1.000 | 5.500 |
| | 1.000 | 630 | | | | | | | | 1.375 | 5.875 |
| | 1.375 | 630 | | | | | | | | 1.625 | 6.125 |
| | 1.750 | 630 | | | | | | | | 1.875 | 6.375 |
| 3.25 | 1.000 | 830 | 0.750 | 3.750 | 0.656 | 1.250 | 1.000 | 1.375 | 1.000 | 1.375 | 6.875 |
| | 1.375 | 830 | | | | | | | | 1.625 | 7.125 |
| | 1.750 | 830 | | | | | | | | 1.875 | 7.375 |
| | 2.000 | 830 | | | | | | | | 2.000 | 7.500 |
| 4.00 | 1.000 | 550 | 0.750 | 4.500 | 0.656 | 1.250 | 1.000 | 1.375 | 1.000 | 1.375 | 6.875 |
| | 1.375 | 550 | | | | | | | | 1.625 | 7.125 |
| | 1.750 | 550 | | | | | | | | 1.875 | 7.375 |
| | 2.000 | 550 | | | | | | | | 2.000 | 7.500 |
| | 2.500 | 550 | | | | | | | | 2.250 | 7.750 |
| 5.00 | 1.000 | 350 | 0.750 | 5.500 | 0.656 | 1.250 | 1.000 | 1.375 | 1.000 | 1.375 | 7.125 |
| | 1.375 | 350 | | | | | | | | 1.625 | 7.375 |
| | 1.750 | 350 | | | | | | | | 1.875 | 7.625 |
| | 2.000 | 350 | | | | | | | | 2.000 | 7.750 |
| | 2.500 | 350 | | | | | | | | 2.250 | 8.000 |
| | 3.000 | 350 | | | | | | | | 2.250 | 8.000 |
| | 3.500 | 350 | | | | | | | | 2.250 | 8.000 |
| 6.00 | 1.375 | 440 | 1.000 | 6.500 | 0.875 | 1.500 | 1.250 | 1.688 | 1.250 | 1.625 | 8.125 |
| | 1.750 | 440 | | | | | | | | 1.875 | 8.375 |
| | 2.000 | 440 | | | | | | | | 2.000 | 8.500 |
| | 2.500 | 440 | | | | | | | | 2.250 | 8.750 |
| | 3.000 | 440 | | | | | | | | 2.250 | 8.750 |
| | 3.500 | 440 | | | | | | | | 2.250 | 8.750 |
| | 4.000 | 440 | | | | | | | | 2.250 | 8.750 |
| 8.00 | 1.375 | 250 | 1.000 | 8.500 | 0.875 | 1.500 | 1.250 | 1.688 | 1.250 | 1.625 | 8.250 |
| | 1.750 | 250 | | | | | | | | 1.875 | 8.500 |
| | 2.000 | 250 | | | | | | | | 2.000 | 8.625 |
| | 2.500 | 250 | | | | | | | | 2.250 | 8.875 |
| | 3.000 | 250 | | | | | | | | 2.250 | 8.875 |
| | 3.500 | 250 | | | | | | | | 2.250 | 8.875 |
| | 4.000 | 250 | | | | | | | | 2.250 | 8.875 |
| | 4.500 | 250 | | | | | | | | 2.250 | 8.875 |
| | 5.000 | 250 | | | | | | | | 2.250 | 8.875 |
| 5.500 | 250 | 2.250 | 8.875 | | | | | | | | |

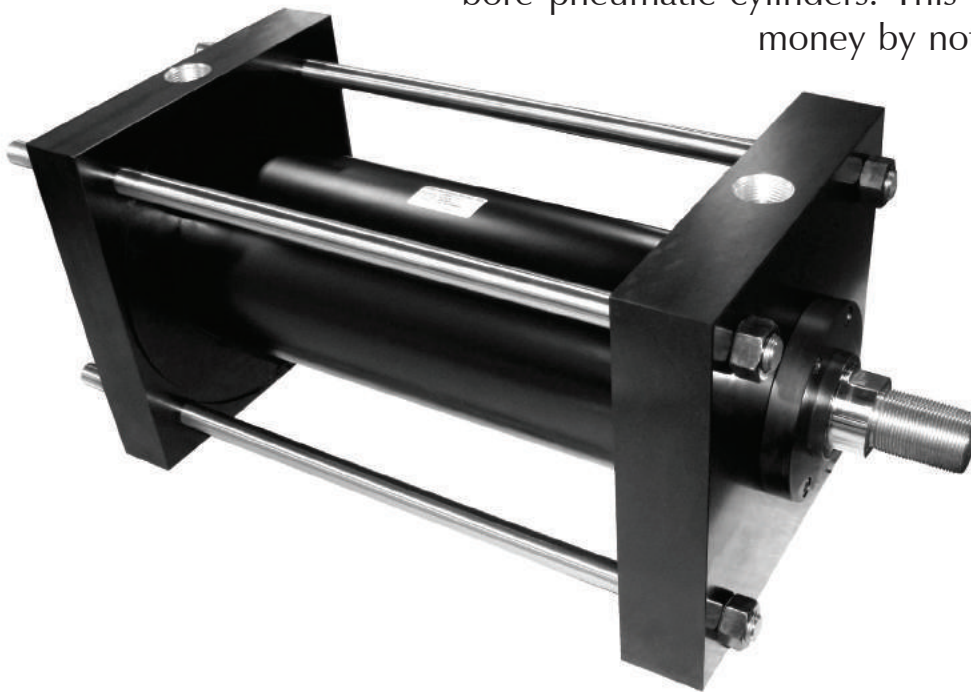
① Max single acting pressure rating (NON-Shock). Any additional opposed intensified pressure related to varying impact area within the cylinder is not taken into consideration (ram cylinders).

Note 1: Pivot pin included with cylinder cap end only; 5.00", 6.00" & 8.00" bores have tie rod nuts exposed on cap end.

Note 2: Must specify KK3 rod end if to be used with 'HH-MSRE' series rod eye.

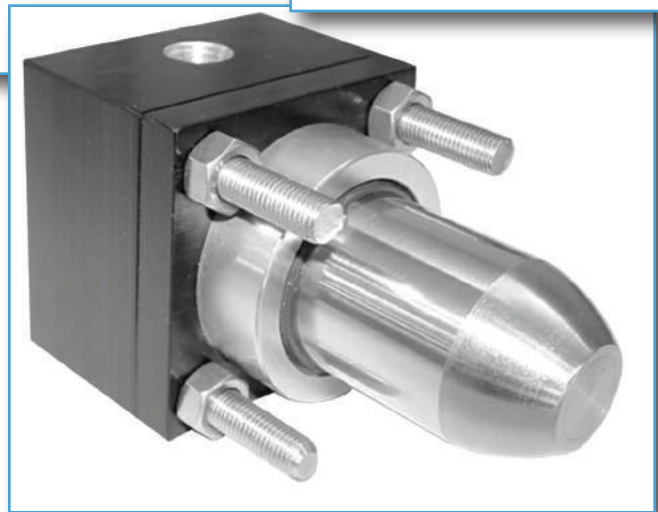
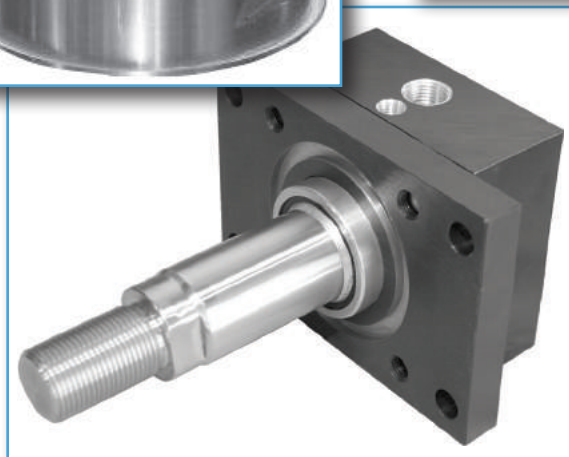
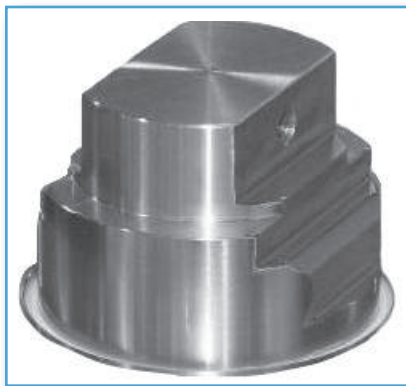
Design Tip

When pneumatic cylinders do not offer the required force, you don't have to change your tooling or application. TRD can provide a smaller bore 'MH' Series hydraulic cylinder that can be used as a drop-in, direct replacement to many large bore pneumatic cylinders. This saves you time and money by not having to retool as applications change over time.

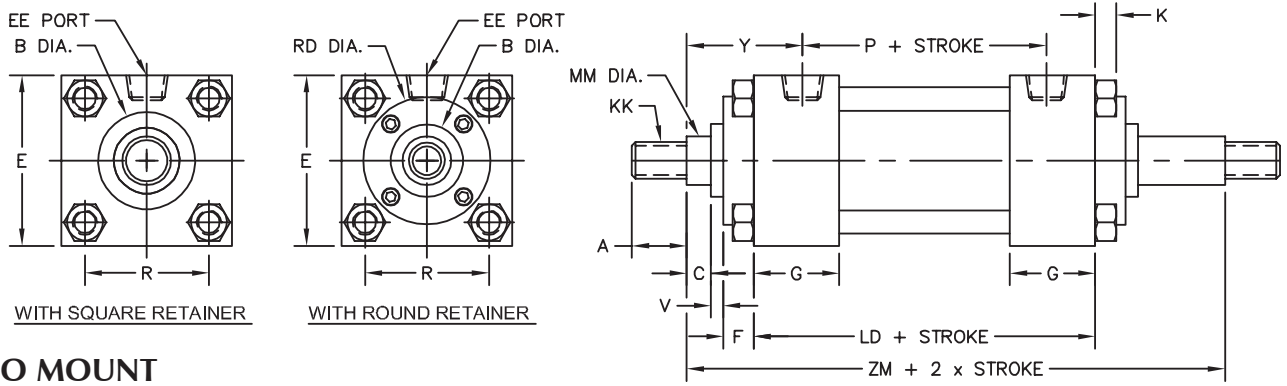


Custom Rod Ends

Each piston rod is made-to-order. Rod extensions are very low in cost and do not delay delivery. Custom machined rod ends can also be easily added to your cylinder!



SERIES 'MH' DIMENSIONS: BASIC DOUBLE END (MX0 MOUNT)



MX0D: NO MOUNT

| BORE | ROD DIA. (MM) | ① MAX PSI RATING | E | A | B | C | EE | | F | G | K | KK | R | ③ RD | V | Y | ADD TO STROKE | | ADD 2X STROKE |
|------|---------------|------------------|-------|-------|-------|-------|------|-----|-------|-------|-------|-------|----|-------|-------|-------|---------------|--------|---------------|
| | | | | | | | NPTF | SAE | | | | | | | | | LD | P | ZM |
| 1.50 | 0.625 | 1500 | 2.000 | 0.750 | 1.124 | 0.375 | 3/8 | #6 | 0.375 | 1.500 | 0.250 | 1.438 | SQ | 0.250 | 1.875 | 4.125 | 2.375 | 6.125 | |
| | 1.000 | 1500 | | 1.125 | 1.499 | 0.500 | | | | | | | | 0.500 | 2.250 | | | 6.875 | |
| 2.00 | 0.625 | 1500 | 2.500 | 0.750 | 1.124 | 0.375 | 3/8 | #6 | 0.375 | 1.500 | 0.313 | 1.844 | SQ | 0.250 | 1.875 | 4.125 | 2.375 | 6.125 | |
| | 1.000 | 1500 | | 1.125 | 1.499 | 0.500 | | | | | | | | 0.500 | 2.250 | | | 6.875 | |
| | 1.375 | 1500 | | 1.625 | 1.999 | 0.625 | | | | | | | | 0.625 | 2.500 | | | 7.375 | |
| 2.50 | 0.625 | 1000 | 3.000 | 0.750 | 1.124 | 0.375 | 3/8 | #6 | 0.375 | 1.500 | 0.313 | 2.188 | SQ | 0.250 | 1.875 | 4.250 | 2.500 | 6.250 | |
| | 1.000 | 1500 | | 1.125 | 1.499 | 0.500 | | | | | | | | 0.500 | 2.250 | | | 7.000 | |
| | 1.375 | 1500 | | 1.625 | 1.999 | 0.625 | | | | | | | | 0.625 | 2.500 | | | 7.500 | |
| | 1.750 | 1500 | | 2.000 | 2.374 | 0.750 | | | | | | | | 0.750 | 2.750 | | | 8.000 | |
| 3.25 | 1.000 | 1500 | 3.750 | 1.125 | 1.499 | 0.500 | 1/2 | #10 | 0.625 | 1.750 | 0.375 | 2.766 | SQ | 0.250 | 2.375 | 4.750 | 2.750 | 7.500 | |
| | 1.375 | 1500 | | 1.625 | 1.999 | 0.625 | | | | | | | | 0.375 | 2.625 | | | 8.000 | |
| | 1.750 | 1500 | | 2.000 | 2.374 | 0.750 | | | | | | | | 0.500 | 2.875 | | | 8.500 | |
| | 2.000 | 1500 | | 2.250 | 2.624 | 0.875 | | | | | | | | 0.500 | 3.000 | | | 8.750 | |
| 4.00 | 1.000 | 1000 | 4.500 | 1.125 | 1.499 | 0.500 | 1/2 | #10 | 0.625 | 1.750 | 0.375 | 3.328 | SQ | 0.250 | 2.375 | 4.750 | 2.750 | 7.500 | |
| | 1.375 | 1000 | | 1.625 | 1.999 | 0.625 | | | | | | | | 0.375 | 2.625 | | | 8.000 | |
| | 1.750 | 1000 | | 2.000 | 2.374 | 0.750 | | | | | | | | 0.500 | 2.875 | | | 8.500 | |
| | 2.000 | 1000 | | 2.250 | 2.624 | 0.875 | | | | | | | | 0.500 | 3.000 | | | 8.750 | |
| | 2.500 | 1000 | | 3.000 | 3.124 | 1.000 | | | | | | | | 0.625 | 3.250 | | | 9.250 | |
| 5.00 | 1.000 | 750 | 5.500 | 1.125 | 1.499 | 0.500 | 1/2 | #10 | 0.625 | 1.750 | 0.438 | 4.109 | SQ | 0.250 | 2.375 | 5.000 | 3.000 | 7.750 | |
| | 1.375 | 1000 | | 1.625 | 1.999 | 0.625 | | | | | | | | 0.375 | 2.625 | | | 8.250 | |
| | 1.750 | 1000 | | 2.000 | 2.374 | 0.750 | | | | | | | | 0.500 | 2.875 | | | 8.750 | |
| | 2.000 | 1000 | | 2.250 | 2.624 | 0.875 | | | | | | | | 0.500 | 3.000 | | | 9.000 | |
| | 2.500 | 1000 | | 3.000 | 3.124 | 1.000 | | | | | | | | 0.625 | 3.250 | | | 9.500 | |
| | 3.000 | 1000 | | 3.500 | 3.749 | 1.000 | | | | | | | | 0.625 | 3.250 | | | 9.500 | |
| 6.00 | 1.375 | 750 | 6.500 | 1.625 | 1.999 | 0.625 | 3/4 | #12 | 0.750 | 2.000 | 0.438 | 4.875 | SQ | 0.250 | 2.750 | 5.500 | 3.250 | 8.750 | |
| | 1.750 | 750 | | 2.000 | 2.374 | 0.750 | | | | | | | | 0.375 | 3.000 | | | 9.250 | |
| | 2.000 | 750 | | 2.250 | 2.624 | 0.875 | | | | | | | | 0.375 | 3.125 | | | 9.500 | |
| | 2.500 | 750 | | 3.000 | 3.124 | 1.000 | | | | | | | | 0.500 | 3.375 | | | 10.000 | |
| | 3.000 | 750 | | 3.500 | 3.749 | 1.000 | | | | | | | | 0.500 | 3.375 | | | 10.000 | |
| | 3.500 | 750 | | 3.500 | 4.249 | 1.000 | | | | | | | | 0.500 | 3.375 | | | 10.000 | |
| 8.00 | 1.375 | 500 | 8.500 | 1.625 | 1.999 | 0.625 | 3/4 | #12 | 0.750 | 2.000 | 0.563 | 6.438 | SQ | 0.250 | 2.750 | 5.625 | 3.375 | 8.875 | |
| | 1.750 | 500 | | 2.000 | 2.374 | 0.750 | | | | | | | | 0.375 | 3.000 | | | 9.375 | |
| | 2.000 | 675 | | 2.250 | 2.624 | 0.875 | | | | | | | | 0.375 | 3.125 | | | 9.625 | |
| | 2.500 | 675 | | 3.000 | 3.124 | 1.000 | | | | | | | | 0.500 | 3.375 | | | 10.125 | |
| | 3.000 | 675 | | 3.500 | 3.749 | 1.000 | | | | | | | | 0.500 | 3.375 | | | 10.125 | |
| | 3.500 | 675 | | 3.500 | 4.249 | 1.000 | | | | | | | | 0.500 | 3.375 | | | 10.125 | |
| | 4.000 | 675 | | 4.000 | 4.749 | 1.000 | | | | | | | | 0.500 | 3.375 | | | 10.125 | |
| | 4.500 | 675 | | 4.500 | 5.249 | 1.000 | | | | | | | | 0.500 | 3.375 | | | 10.125 | |
| | 5.000 | 675 | | 5.000 | 5.749 | 1.000 | | | | | | | | 0.500 | 3.375 | | | 10.125 | |
| | 5.500 | 675 | | 5.500 | 6.249 | 1.000 | | | | | | | | 0.500 | 3.375 | | | 10.125 | |

SEE ROD END DETAIL CHART ON PAGE 61

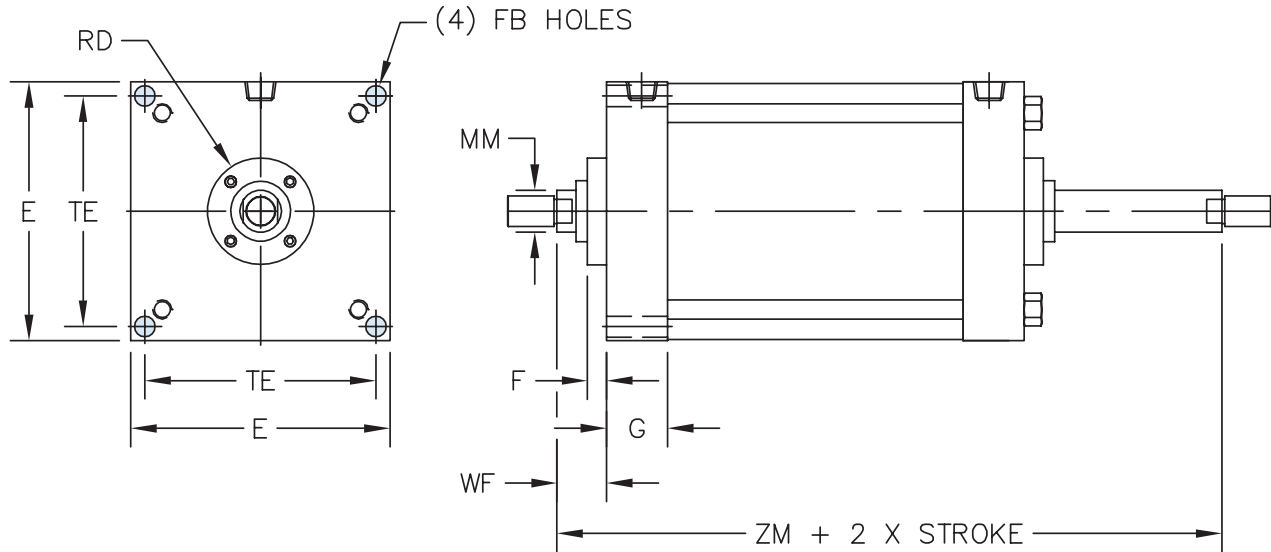
① Max single acting pressure rating (NON-Shock). Any additional opposed intensified pressure related to varying impact area within the cylinder is not taken into consideration (ram cylinders).

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

③ Where SQ is shown in chart, cylinder utilizes a full square retainer.

SERIES 'MH' DIMENSIONS: DOUBLE END MOUNTS

ME3D: HEAD SQUARE MOUNTING HOLES

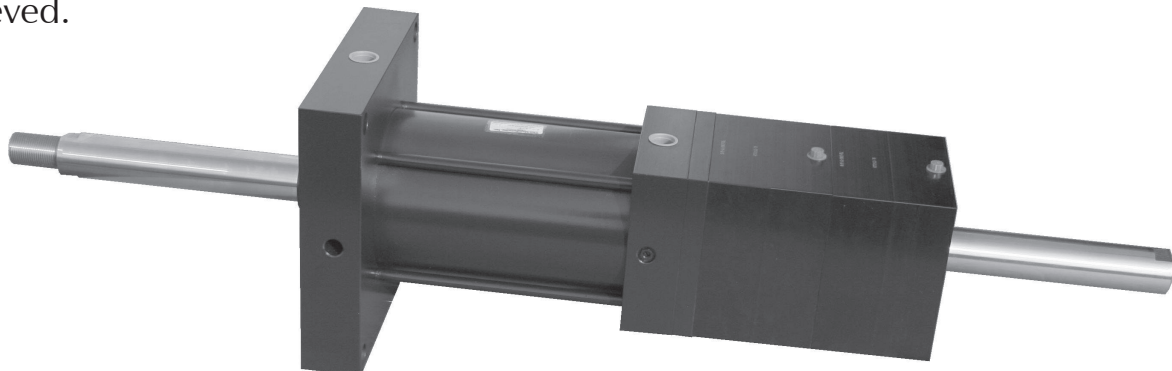


| BORE | ROD DIA. (MM) | ① MAX PSI RATING | E | F | FB | G | TE | RD | WF | ADD 2X STROKE |
|------|---------------|------------------|-------|-------|-------|-------|-------|-------|-------|---------------|
| | | | | | | | | | | ZM |
| 8.00 | 1.375 | 500 | 8.500 | 0.750 | 0.688 | 2.000 | 7.570 | 3.500 | 1.625 | 8.875 |
| | 1.750 | 500 | | | | | | 3.875 | 1.875 | 9.375 |
| | 2.000 | 675 | | | | | | 4.250 | 2.000 | 9.625 |
| | 2.500 | 675 | | | | | | 4.625 | 2.250 | 10.125 |
| | 3.000 | 675 | | | | | | 5.250 | 2.250 | 10.125 |
| | 3.500 | 675 | | | | | | 5.750 | 2.250 | 10.125 |
| | 4.000 | 675 | | | | | | 6.500 | 2.250 | 10.125 |
| | 4.500 | 675 | | | | | | 7.250 | 2.250 | 10.125 |
| | 5.000 | 675 | | | | | | 7.500 | 2.250 | 10.125 |
| | 5.500 | 675 | | | | | | 7.500 | 2.250 | 10.125 |

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).

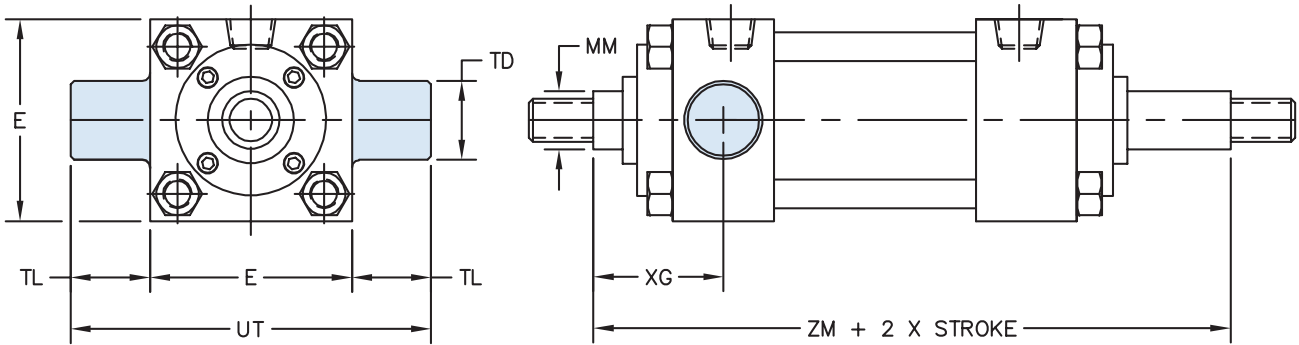
Design Tips

TRD makes a full line of pneumatic rod locks that can be adapted to 'MH' Series hydraulic cylinders. By using multiple rod locks, higher holding forces can be achieved.

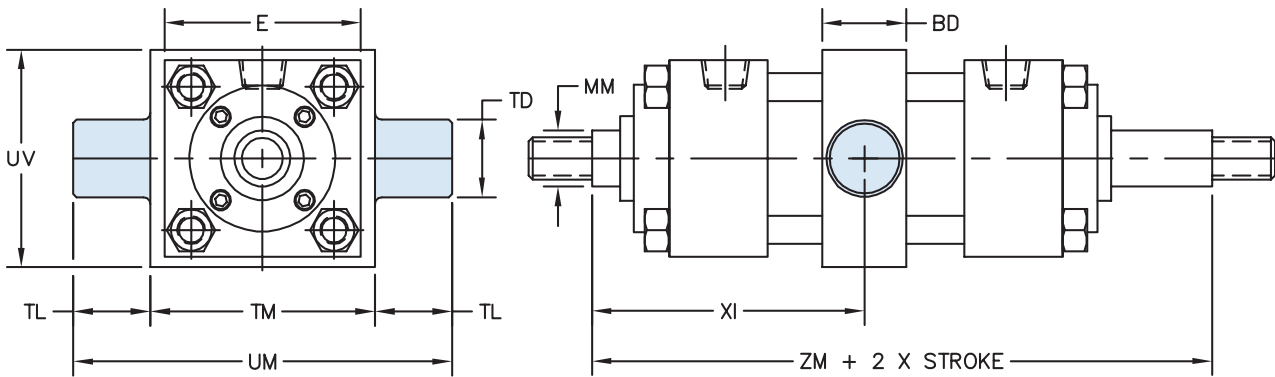


SERIES 'MH' DIMENSIONS: DOUBLE END MOUNTS

MT1D: HEAD TRUNNION



MT4D: INTERMEDIATE TRUNNION



NOTE:
 'XI' DIMENSION TO BE SPECIFIED BY CUSTOMER

SERIES 'MH' DIMENSIONS: DOUBLE END MOUNTS

| BORE | ROD DIA. (MM) | ① MAX PSI RATING | E | BD | ② TD | TL | TM | UM | UT | UV | XG | ③ XI | MT4D MIN STROKE | ADD 2X STROKE |
|------|---------------|------------------|-------|-------|-------|-------|-------|--------|--------|-------|-------|-------|-----------------|---------------|
| | | | | | | | | | | | | | | ZM |
| 1.50 | 0.625 | 1500 | 2.000 | 1.250 | 1.000 | 1.000 | 2.500 | 4.500 | 4.000 | 2.500 | 1.750 | 3.250 | 0.375 | 6.125 |
| | 1.000 | 1500 | | | | | | | | | 2.125 | 3.625 | | 6.875 |
| 2.00 | 0.625 | 1500 | 2.500 | 1.500 | 1.000 | 1.000 | 3.000 | 5.000 | 4.500 | 3.000 | 1.750 | 3.375 | 0.625 | 6.125 |
| | 1.000 | 1500 | | | | | | | | | 2.125 | 3.750 | | 6.875 |
| | 1.375 | 1500 | | | | | | | | | 2.375 | 4.000 | | 7.375 |
| 2.50 | 0.625 | 1000 | 3.000 | 1.500 | 1.000 | 1.000 | 3.500 | 5.500 | 5.000 | 3.500 | 1.750 | 3.375 | 0.500 | 6.250 |
| | 1.000 | 1500 | | | | | | | | | 2.125 | 3.750 | | 7.000 |
| | 1.375 | 1500 | | | | | | | | | 2.375 | 4.000 | | 7.500 |
| | 1.750 | 1500 | | | | | | | | | 2.625 | 4.250 | | 8.000 |
| 3.25 | 1.000 | 1500 | 3.750 | 2.000 | 1.000 | 1.000 | 4.500 | 6.500 | 5.750 | 4.250 | 2.250 | 4.250 | 1.000 | 7.500 |
| | 1.375 | 1500 | | | | | | | | | 2.500 | 4.500 | | 8.000 |
| | 1.750 | 1500 | | | | | | | | | 2.750 | 4.750 | | 8.500 |
| | 2.000 | 1500 | | | | | | | | | 2.875 | 4.875 | | 8.750 |
| 4.00 | 1.000 | 1000 | 4.500 | 2.000 | 1.000 | 1.000 | 5.250 | 7.250 | 6.500 | 5.000 | 2.250 | 4.250 | 1.000 | 7.500 |
| | 1.375 | 1000 | | | | | | | | | 2.500 | 4.500 | | 8.000 |
| | 1.750 | 1000 | | | | | | | | | 2.750 | 4.750 | | 8.500 |
| | 2.000 | 1000 | | | | | | | | | 2.875 | 4.875 | | 8.750 |
| | 2.500 | 1000 | | | | | | | | | 3.125 | 5.125 | | 9.250 |
| 5.00 | 1.000 | 750 | 5.500 | 2.000 | 1.000 | 1.000 | 6.250 | 8.250 | 7.500 | 6.000 | 2.250 | 4.250 | 0.750 | 7.750 |
| | 1.375 | 1000 | | | | | | | | | 2.500 | 4.500 | | 8.250 |
| | 1.750 | 1000 | | | | | | | | | 2.750 | 4.750 | | 8.750 |
| | 2.000 | 1000 | | | | | | | | | 2.875 | 4.875 | | 9.000 |
| | 2.500 | 1000 | | | | | | | | | 3.125 | 5.125 | | 9.500 |
| | 3.000 | 1000 | | | | | | | | | 3.125 | 5.125 | | 9.500 |
| | 3.500 | 1000 | | | | | | | | | 3.125 | 5.125 | | 9.500 |
| 6.00 | 1.375 | 750 | 6.500 | 2.000 | 1.375 | 1.375 | 7.625 | 10.375 | 9.250 | 7.000 | 2.625 | 4.750 | 0.750 | 8.750 |
| | 1.750 | 750 | | | | | | | | | 2.875 | 5.000 | | 9.250 |
| | 2.000 | 750 | | | | | | | | | 3.000 | 5.125 | | 9.500 |
| | 2.500 | 750 | | | | | | | | | 3.250 | 5.375 | | 10.000 |
| | 3.000 | 750 | | | | | | | | | 3.250 | 5.375 | | 10.000 |
| | 3.500 | 750 | | | | | | | | | 3.250 | 5.375 | | 10.000 |
| | 4.000 | 750 | | | | | | | | | 3.250 | 5.375 | | 10.000 |
| 8.00 | 1.375 | 500 | 8.500 | 2.500 | 1.375 | 1.375 | 9.750 | 12.500 | 11.250 | 9.500 | 2.625 | 5.000 | 1.125 | 8.875 |
| | 1.750 | 500 | | | | | | | | | 2.875 | 5.250 | | 9.375 |
| | 2.000 | 675 | | | | | | | | | 3.000 | 5.375 | | 9.625 |
| | 2.500 | 675 | | | | | | | | | 3.250 | 5.625 | | 10.125 |
| | 3.000 | 675 | | | | | | | | | 3.250 | 5.625 | | 10.125 |
| | 3.500 | 675 | | | | | | | | | 3.250 | 5.625 | | 10.125 |
| | 4.000 | 675 | | | | | | | | | 3.250 | 5.625 | | 10.125 |
| | 4.500 | 675 | | | | | | | | | 3.250 | 5.625 | | 10.125 |
| | 5.000 | 675 | | | | | | | | | 3.250 | 5.625 | | 10.125 |
| | 5.500 | 675 | | | | | | | | | 3.250 | 5.625 | | 10.125 |

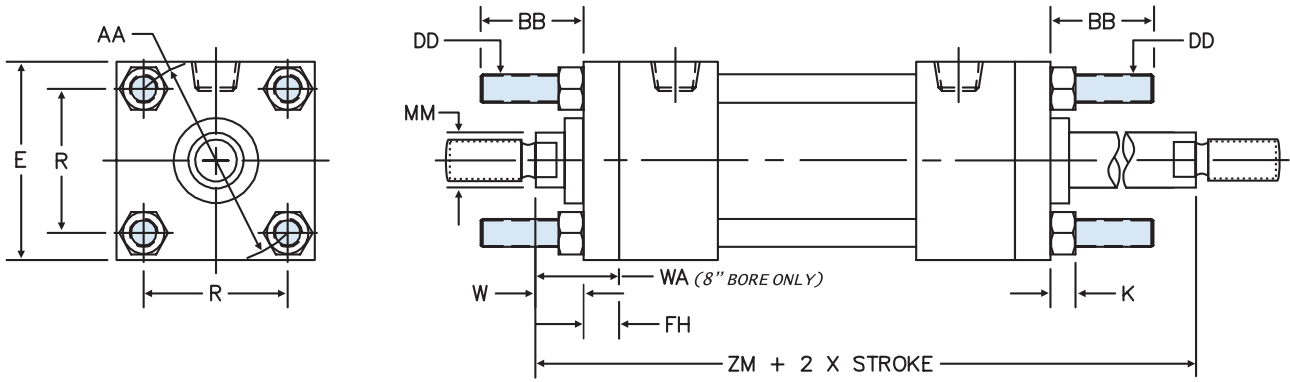
① Max single acting pressure rating (NON-Shock). Any additional opposed intensified pressure related to varying impact area within the cylinder is not taken into consideration (ram cylinders).

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

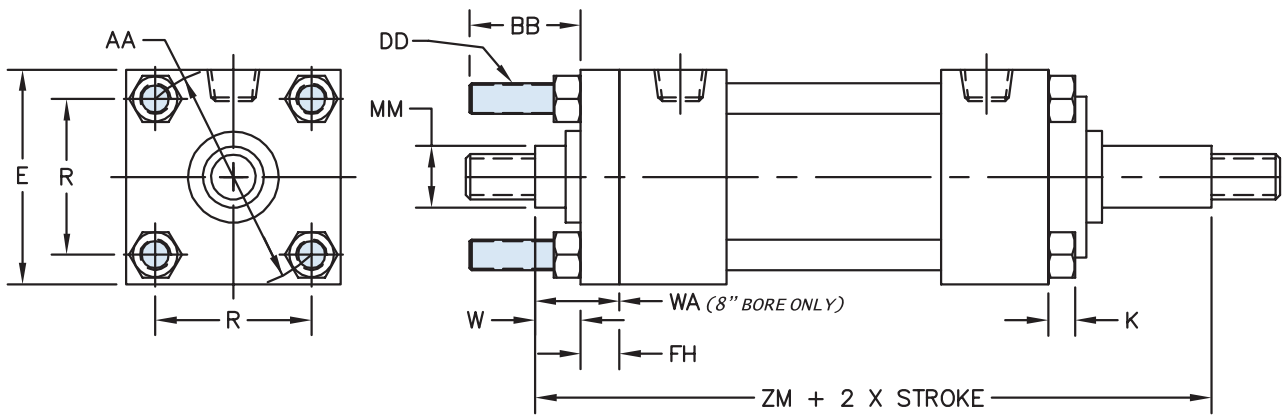
③ 'XI' dimension is the minimum that can be supplied and leaves 1/4" gap between head & trunnion block (customer to specify 'XI' dimension).

SERIES 'MH' DIMENSIONS: DOUBLE END MOUNTS

MX1D: EXTENDED TIE RODS - HEAD & CAP



MX3D: EXTENDED TIE RODS - HEAD END



SERIES 'MH' DIMENSIONS: DOUBLE END MOUNTS

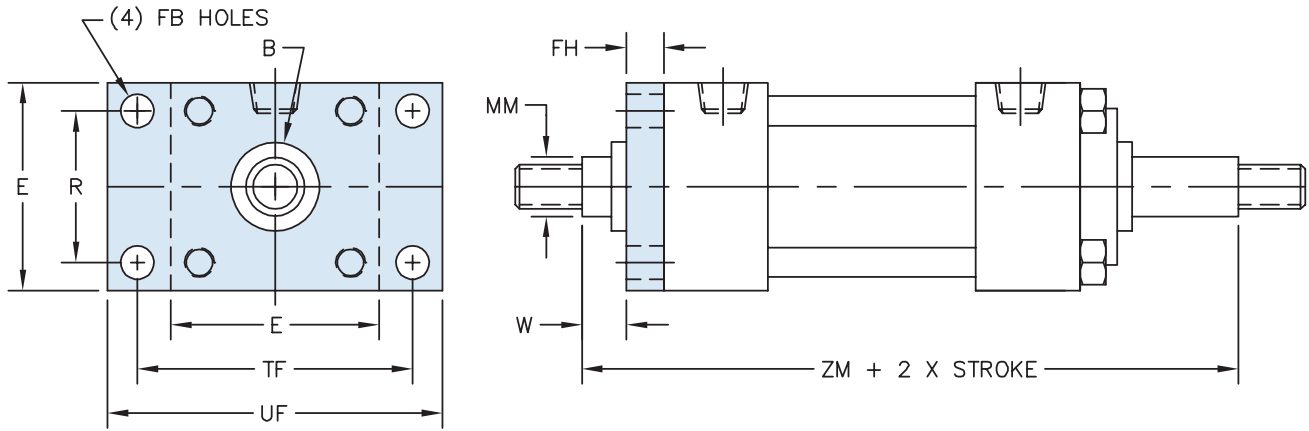
| BORE | ROD DIA. (MM) | ① MAX PSI RATING | E | FH | AA | BB | DD | K | R | W or WA (8") | ADD 2X STROKE |
|------|---------------|------------------|-------|---------|-------|-------|-----------|-------|-------|--------------|---------------|
| | | | | | | | | | | | ZM |
| 1.50 | 0.625 | 1500 | 2.000 | 0.375 | 2.020 | 1.000 | 1/4 - 28 | 0.250 | 1.430 | 0.625 | 6.125 |
| | 1.000 | 1500 | | | | | | | | | 6.875 |
| 2.00 | 0.625 | 1500 | 2.500 | 0.375 | 2.600 | 1.125 | 5/16 - 24 | 0.313 | 1.840 | 0.625 | 6.125 |
| | 1.000 | 1500 | | | | | | | | | 6.875 |
| | 1.375 | 1500 | | | | | | | | | 7.375 |
| 2.50 | 0.625 | 1000 | 3.000 | 0.375 | 3.100 | 1.125 | 5/16 - 24 | 0.313 | 2.190 | 0.625 | 6.250 |
| | 1.000 | 1500 | | | | | | | | | 7.000 |
| | 1.375 | 1500 | | | | | | | | | 7.500 |
| | 1.750 | 1500 | | | | | | | | | 8.000 |
| 3.25 | 1.000 | 1500 | 3.750 | 0.625 | 3.900 | 1.375 | 3/8 - 24 | 0.375 | 2.760 | 0.750 | 7.500 |
| | 1.375 | 1500 | | | | | | | | | 8.000 |
| | 1.750 | 1500 | | | | | | | | | 8.500 |
| | 2.000 | 1500 | | | | | | | | | 8.750 |
| 4.00 | 1.000 | 1000 | 4.500 | 0.625 | 4.700 | 1.375 | 3/8 - 24 | 0.375 | 3.320 | 0.750 | 7.500 |
| | 1.375 | 1000 | | | | | | | | | 8.000 |
| | 1.750 | 1000 | | | | | | | | | 8.500 |
| | 2.000 | 1000 | | | | | | | | | 8.750 |
| | 2.500 | 1000 | | | | | | | | | 9.250 |
| 5.00 | 1.000 | 750 | 5.500 | 0.625 | 5.800 | 1.813 | 1/2 - 20 | 0.438 | 4.100 | 0.750 | 7.750 |
| | 1.375 | 1000 | | | | | | | | | 8.250 |
| | 1.750 | 1000 | | | | | | | | | 8.750 |
| | 2.000 | 1000 | | | | | | | | | 9.000 |
| | 2.500 | 1000 | | | | | | | | | 9.500 |
| | 3.000 | 1000 | | | | | | | | | 9.500 |
| | 3.500 | 1000 | | | | | | | | | 9.500 |
| 6.00 | 1.375 | 750 | 6.500 | 0.750 | 6.900 | 1.813 | 1/2 - 20 | 0.438 | 4.880 | 0.875 | 8.750 |
| | 1.750 | 750 | | | | | | | | | 9.250 |
| | 2.000 | 750 | | | | | | | | | 9.500 |
| | 2.500 | 750 | | | | | | | | | 10.000 |
| | 3.000 | 750 | | | | | | | | | 10.000 |
| | 3.500 | 750 | | | | | | | | | 10.000 |
| | 4.000 | 750 | | | | | | | | | 10.000 |
| 8.00 | 1.375 | 500 | 8.500 | ② 0.625 | 9.10 | 2.313 | 5/8 - 18 | 0.563 | 6.440 | 1.500 | 8.875 |
| | 1.750 | 500 | | | | | | | | | 9.375 |
| | 2.000 | 675 | | | | | | | | | 9.625 |
| | 2.500 | 675 | | | | | | | | | 10.125 |
| | 3.000 | 675 | | | | | | | | | 10.125 |
| | 3.500 | 675 | | | | | | | | | 10.125 |
| | 4.000 | 675 | | | | | | | | | 10.125 |
| | 4.500 | 675 | | | | | | | | | 10.125 |
| | 5.000 | 675 | | | | | | | | | 10.125 |
| | 5.500 | 675 | | | | | | | | | 10.125 |

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).

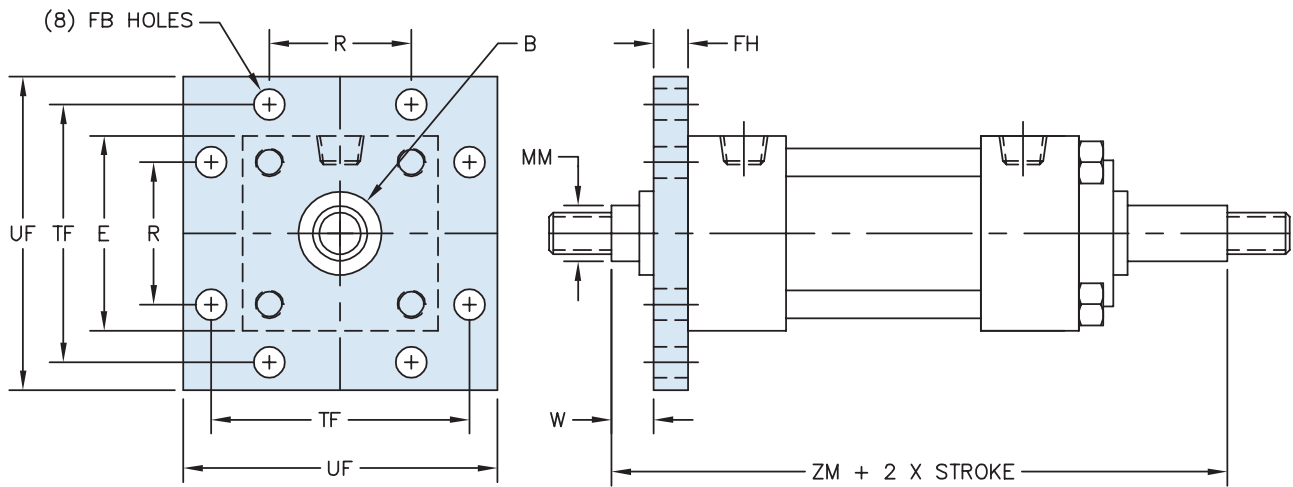
② Round retainer used to retain bushing, not a full front plate as other bores. 'BB' is dimension from head on the 8.00" bore.

SERIES 'MH' DIMENSIONS: DOUBLE END MOUNTS

MF1D: HEAD FLANGE



MF5D: HEAD SQUARE FLANGE



HH - Heavy Duty Hydraulic
HH Rod Lock
MH - Medium Duty Hydraulic
MH Options
TAS - Heavy Duty Pneumatic
Accessories Page 147
Strokemaster® Page 153
Technical Data Page 161

SERIES 'MH' DIMENSIONS: DOUBLE END MOUNTS

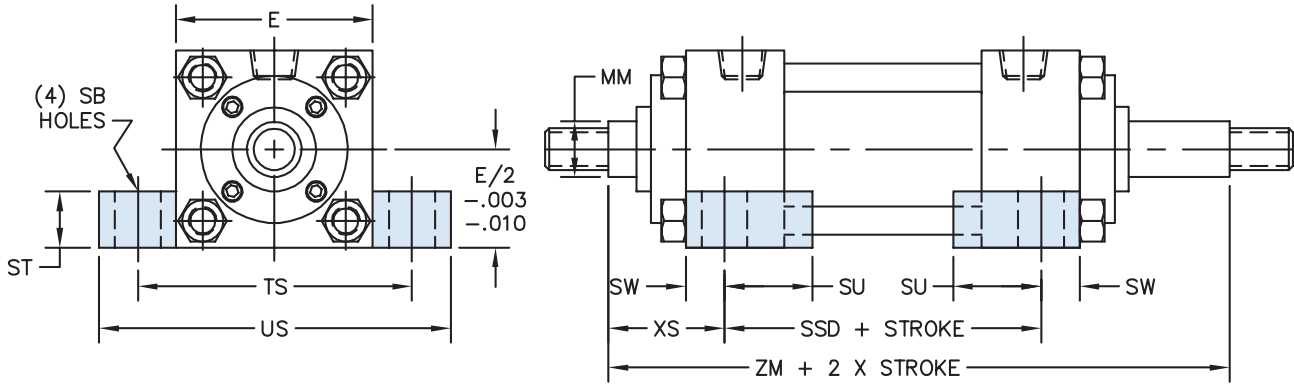
| BORE | ROD DIA. (MM) | ① MAX PSI RATING | ② B | E | FB | FH | R | TF | UF | W | ADD 2X STROKE |
|------|---------------|------------------|-------|-------|-------|-------|-------|-------|-------|-------|---------------|
| | | | | | | | | | | | ZM |
| 1.50 | 0.625 | 1500 | 1.124 | 2.000 | 0.313 | 0.375 | 1.430 | 2.750 | 3.375 | 0.625 | 6.125 |
| | 1.000 | 1500 | 1.499 | | | | | | | 1.000 | 6.875 |
| 2.00 | 0.625 | 1500 | 1.124 | 2.500 | 0.375 | 0.375 | 1.840 | 3.375 | 4.125 | 0.625 | 6.125 |
| | 1.000 | 1500 | 1.499 | | | | | | | 1.000 | 6.875 |
| | 1.375 | 1500 | 1.999 | | | | | | | 1.250 | 7.375 |
| 2.50 | 0.625 | 1000 | 1.124 | 3.000 | 0.375 | 0.375 | 2.190 | 3.875 | 4.625 | 0.625 | 6.250 |
| | 1.000 | 1500 | 1.499 | | | | | | | 1.000 | 7.000 |
| | 1.375 | 1500 | 1.999 | | | | | | | 1.250 | 7.500 |
| | 1.750 | 1500 | 2.374 | | | | | | | 1.500 | 8.000 |
| 3.25 | 1.000 | 1500 | 1.499 | 3.750 | 0.438 | 0.625 | 2.760 | 4.688 | 5.500 | 0.750 | 7.500 |
| | 1.375 | 1500 | 1.999 | | | | | | | 1.000 | 8.000 |
| | 1.750 | 1500 | 2.374 | | | | | | | 1.250 | 8.500 |
| | 2.000 | 1500 | 2.624 | | | | | | | 1.375 | 8.750 |
| 4.00 | 1.000 | 1000 | 1.499 | 4.500 | 0.438 | 0.625 | 3.320 | 5.438 | 6.250 | 0.750 | 7.500 |
| | 1.375 | 1000 | 1.999 | | | | | | | 1.000 | 8.000 |
| | 1.750 | 1000 | 2.374 | | | | | | | 1.250 | 8.500 |
| | 2.000 | 1000 | 2.624 | | | | | | | 1.375 | 8.750 |
| | 2.500 | 1000 | 3.124 | | | | | | | 1.625 | 9.250 |
| 5.00 | 1.000 | 750 | 1.499 | 5.500 | 0.563 | 0.625 | 4.100 | 6.625 | 7.625 | 0.750 | 7.750 |
| | 1.375 | 1000 | 1.999 | | | | | | | 1.000 | 8.250 |
| | 1.750 | 1000 | 2.374 | | | | | | | 1.250 | 8.750 |
| | 2.000 | 1000 | 2.624 | | | | | | | 1.375 | 9.000 |
| | 2.500 | 1000 | 3.124 | | | | | | | 1.625 | 9.500 |
| | 3.000 | 1000 | 3.749 | | | | | | | 1.625 | 9.500 |
| | 3.500 | 1000 | 4.249 | | | | | | | 1.625 | 9.500 |
| 6.00 | 1.375 | 750 | 1.999 | 6.500 | 0.563 | 0.750 | 4.880 | 7.625 | 8.625 | 0.875 | 8.750 |
| | 1.750 | 750 | 2.374 | | | | | | | 1.125 | 9.250 |
| | 2.000 | 750 | 2.624 | | | | | | | 1.250 | 9.500 |
| | 2.500 | 750 | 3.124 | | | | | | | 1.500 | 10.000 |
| | 3.000 | 750 | 3.749 | | | | | | | 1.500 | 10.000 |
| | 3.500 | 750 | 4.249 | | | | | | | 1.500 | 10.000 |
| | 4.000 | 750 | 4.749 | | | | | | | 1.500 | 10.000 |

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).

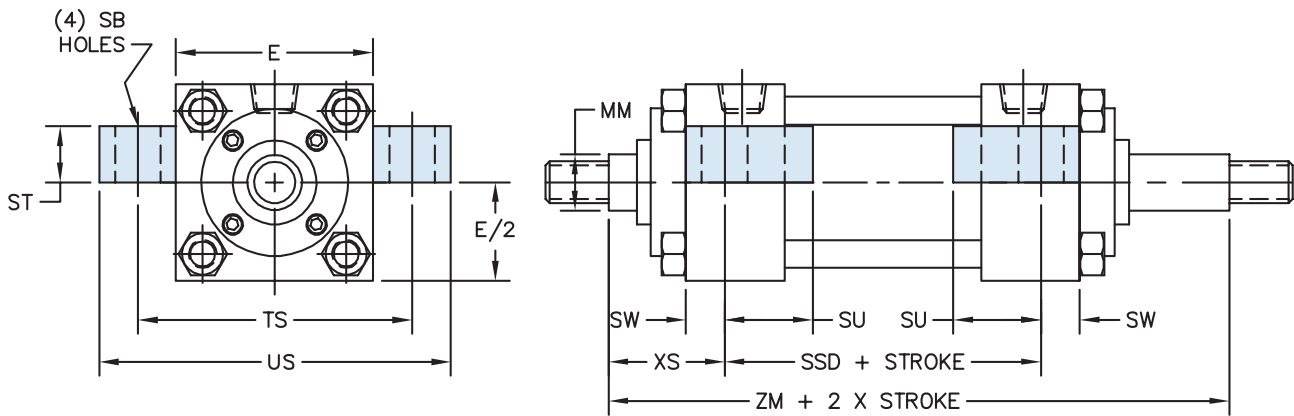
② 'B' dimension tolerance is +.000 / -.002

SERIES 'MH' DIMENSIONS: DOUBLE END MOUNTS

MS2D: SIDE LUGS



MS3D: CENTER LINE LUGS



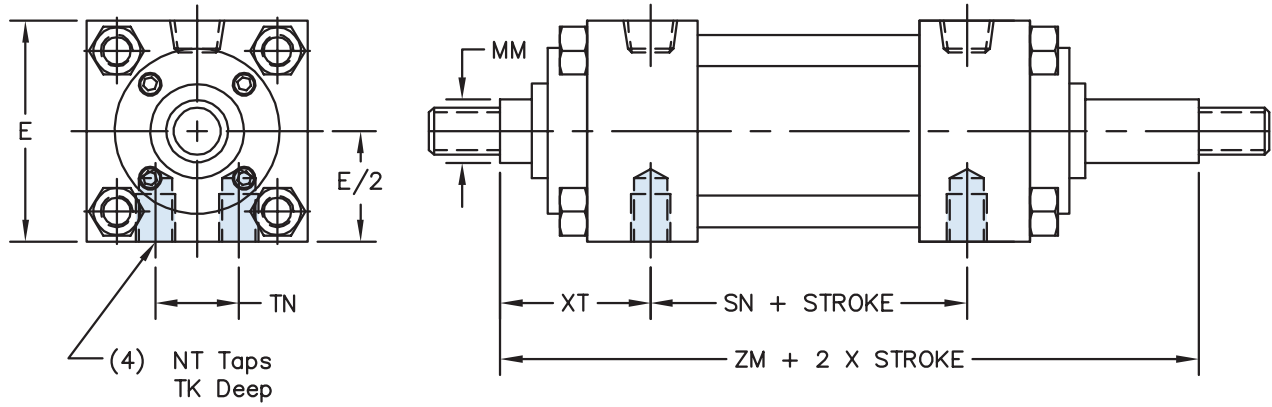
SERIES 'MH' DIMENSIONS: DOUBLE END MOUNTS

| BORE | ROD DIA. (MM) | ① MAX PSI RATING | E | SB | ST | SU | SW | TS | US | XS | ADD TO STROKE | ADD 2X STROKE |
|-------|---------------|------------------|--------|-------|-------|-------|-------|-------|--------|-------|---------------|---------------|
| | | | | | | | | | | | SSD | ZM |
| 1.50 | 0.625 | 1500 | 2.000 | 0.438 | 0.500 | 1.125 | 0.375 | 2.750 | 3.500 | 1.375 | 3.375 | 6.125 |
| | 1.000 | 1500 | | | | | | | | 1.750 | | 6.875 |
| 2.00 | 0.625 | 1500 | 2.500 | 0.438 | 0.500 | 1.125 | 0.375 | 3.250 | 4.000 | 1.375 | 3.375 | 6.125 |
| | 1.000 | 1500 | | | | | | | | 1.750 | | 6.875 |
| | 1.375 | 1500 | | | | | | | | 2.000 | | 7.375 |
| 2.50 | 0.625 | 1000 | 3.000 | 0.438 | 0.500 | 1.125 | 0.375 | 3.750 | 4.500 | 1.375 | 3.500 | 6.250 |
| | 1.000 | 1500 | | | | | | | | 1.750 | | 7.000 |
| | 1.375 | 1500 | | | | | | | | 2.000 | | 7.500 |
| | 1.750 | 1500 | | | | | | | | 2.250 | | 8.000 |
| 3.25 | 1.000 | 1500 | 3.750 | 0.563 | 0.750 | 1.250 | 0.500 | 4.75 | 5.750 | 1.875 | 3.750 | 7.500 |
| | 1.375 | 1500 | | | | | | | | 2.125 | | 8.000 |
| | 1.750 | 1500 | | | | | | | | 2.375 | | 8.500 |
| | 2.000 | 1500 | | | | | | | | 2.500 | | 8.750 |
| 4.00 | 1.000 | 1000 | 4.500 | 0.563 | 0.750 | 1.250 | 0.500 | 5.500 | 6.500 | 1.875 | 3.750 | 7.500 |
| | 1.375 | 1000 | | | | | | | | 2.125 | | 8.000 |
| | 1.750 | 1000 | | | | | | | | 2.375 | | 8.500 |
| | 2.000 | 1000 | | | | | | | | 2.500 | | 8.750 |
| | 2.500 | 1000 | | | | | | | | 2.750 | | 9.250 |
| 5.00 | 1.000 | 750 | 5.500 | 0.813 | 1.000 | 1.063 | 0.688 | 6.875 | 8.250 | 2.063 | 3.625 | 7.750 |
| | 1.375 | 1000 | | | | | | | | 2.313 | | 8.250 |
| | 1.750 | 1000 | | | | | | | | 2.563 | | 8.750 |
| | 2.000 | 1000 | | | | | | | | 2.688 | | 9.000 |
| | 2.500 | 1000 | | | | | | | | 2.938 | | 9.500 |
| | 3.000 | 1000 | | | | | | | | 2.938 | | 9.500 |
| | 3.500 | 1000 | | | | | | | | 2.938 | | 9.500 |
| 6.00 | 1.375 | 750 | 6.500 | 0.813 | 1.000 | 1.313 | 0.688 | 7.875 | 9.250 | 2.313 | 4.125 | 8.750 |
| | 1.750 | 750 | | | | | | | | 2.563 | | 9.250 |
| | 2.000 | 750 | | | | | | | | 2.688 | | 9.500 |
| | 2.500 | 750 | | | | | | | | 2.938 | | 10.000 |
| | 3.000 | 750 | | | | | | | | 2.938 | | 10.000 |
| | 3.500 | 750 | | | | | | | | 2.938 | | 10.000 |
| | 4.000 | 750 | | | | | | | | 2.938 | | 10.000 |
| 8.00 | 1.375 | 500 | 8.500 | 0.813 | 1.000 | 1.313 | 0.688 | 9.875 | 11.250 | 2.313 | 4.250 | 8.875 |
| | 1.750 | 500 | | | | | | | | 2.563 | | 9.375 |
| | 2.000 | 675 | | | | | | | | 2.688 | | 9.625 |
| | 2.500 | 675 | | | | | | | | 2.938 | | 10.125 |
| | 3.000 | 675 | | | | | | | | 2.938 | | 10.125 |
| | 3.500 | 675 | | | | | | | | 2.938 | | 10.125 |
| | 4.000 | 675 | | | | | | | | 2.938 | | 10.125 |
| | 4.500 | 675 | | | | | | | | 2.938 | | 10.125 |
| | 5.000 | 675 | | | | | | | | 2.938 | | 10.125 |
| 5.500 | 675 | 2.938 | 10.125 | | | | | | | | | |

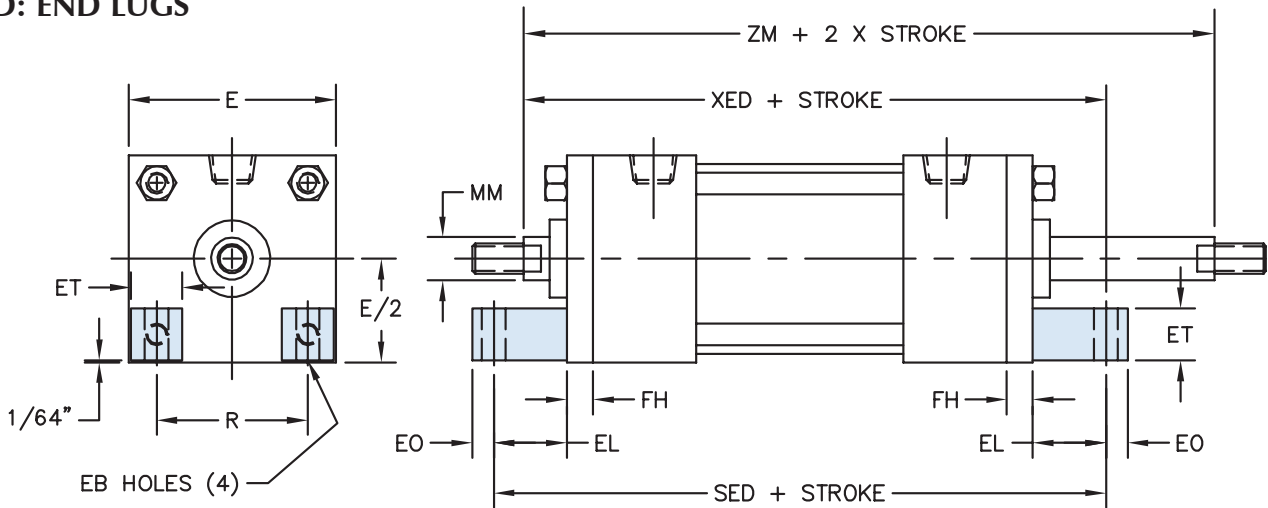
① Max single acting pressure rating (NON-Shock). Any additional opposed intensified pressure related to varying impact area within the cylinder is not taken into consideration (ram cylinders).

SERIES 'MH' DIMENSIONS: DOUBLE END MOUNTS

MS4D: BOTTOM TAPPED HOLES



MS7D: END LUGS



HH - Heavy Duty Hydraulic
 HH Rod Lock
 MH - Medium Duty Hydraulic
 MH Options
 TAS - Heavy Duty Pneumatic
 Accessories Page 147
 Strokmaster® Page 153
 Technical Data Page 161

SERIES 'MH' DIMENSIONS: DOUBLE END MOUNTS

| BORE | ROD DIA. (MM) | ① MAX PSI RATING | E | EB | EL | EO | ET | FH | NT | R | TN | TK | XT | ADD TO STROKE | | | ADD 2X STROKE |
|------|---------------|------------------|-------|-------|-------|-------|-------|-------|-----------|-------|-------|-------|-------|---------------|-------|-------|---------------|
| | | | | | | | | | | | | | | SN | SED | XED | ZM |
| 1.50 | 0.625 | 1500 | 2.000 | N/A | N/A | N/A | N/A | N/A | 1/4 - 20 | N/A | 0.625 | 0.375 | 1.938 | 2.250 | N/A | N/A | 6.125 |
| | 1.000 | 1500 | | | | | | | | | | | 2.313 | | | | 6.875 |
| 2.00 | 0.625 | 1500 | 2.500 | 0.344 | 0.938 | 0.313 | 0.375 | 0.375 | 5/16 - 18 | 1.844 | 0.875 | 0.406 | 1.938 | 2.250 | 6.750 | 6.438 | 6.125 |
| | 1.000 | 1500 | | N/A | N/A | N/A | N/A | N/A | | N/A | | | 2.313 | | N/A | N/A | 6.875 |
| | 1.375 | 1500 | | N/A | N/A | N/A | N/A | N/A | | N/A | | | 2.563 | | N/A | N/A | 7.375 |
| 2.50 | 0.625 | 1000 | 3.000 | 0.344 | 1.063 | 0.313 | 0.750 | 0.375 | 3/8 - 16 | 2.188 | 1.250 | 0.438 | 1.938 | 2.375 | 7.125 | 6.688 | 6.250 |
| | 1.000 | 1500 | | N/A | N/A | N/A | N/A | N/A | | N/A | | | 2.313 | | N/A | N/A | 7.000 |
| | 1.375 | 1500 | | N/A | N/A | N/A | N/A | N/A | | N/A | | | 2.563 | | N/A | N/A | 7.500 |
| | 1.750 | 1500 | | N/A | N/A | N/A | N/A | N/A | | N/A | | | 2.813 | | N/A | N/A | 8.000 |
| 3.25 | 1.000 | 1500 | 3.750 | 0.406 | 0.875 | 0.375 | 0.938 | 0.625 | 1/2 - 13 | 2.766 | 1.500 | 0.500 | 2.438 | 2.625 | 7.750 | 7.625 | 7.500 |
| | 1.375 | 1500 | | N/A | N/A | N/A | N/A | N/A | | N/A | | | 2.688 | | N/A | N/A | 8.000 |
| | 1.750 | 1500 | | N/A | N/A | N/A | N/A | N/A | | N/A | | | 2.938 | | N/A | N/A | 8.500 |
| | 2.000 | 1500 | | N/A | N/A | N/A | N/A | N/A | | N/A | | | 3.063 | | N/A | N/A | 8.750 |
| 4.00 | 1.000 | 1000 | 4.500 | 0.406 | 1.000 | 0.375 | 1.125 | 0.625 | 1/2 - 13 | 3.328 | 2.063 | 0.625 | 2.438 | 2.625 | 8.000 | 7.750 | 7.500 |
| | 1.375 | 1000 | | 0.406 | 1.000 | 0.375 | 1.125 | 0.625 | | 3.328 | | | 2.688 | | 8.000 | 8.000 | 8.000 |
| | 1.750 | 1000 | | N/A | N/A | N/A | N/A | N/A | | N/A | | | 2.938 | | N/A | N/A | 8.500 |
| | 2.000 | 1000 | | N/A | N/A | N/A | N/A | N/A | | N/A | | | 3.063 | | N/A | N/A | 8.750 |
| | 2.500 | 1000 | | N/A | N/A | N/A | N/A | N/A | | N/A | | | 3.313 | | N/A | N/A | 9.250 |
| 5.00 | 1.000 | 750 | 5.500 | 0.531 | 1.063 | 0.500 | 1.375 | 0.625 | 5/8 - 11 | 4.109 | 2.688 | 0.750 | 2.438 | 2.875 | 8.375 | 8.063 | 7.750 |
| | 1.375 | 1000 | | 0.531 | 1.063 | 0.500 | 1.375 | 0.625 | | 4.109 | | | 2.688 | | 8.375 | 8.313 | 8.250 |
| | 1.750 | 1000 | | 0.531 | 1.063 | 0.500 | 1.375 | 0.625 | | 4.109 | | | 2.938 | | 8.375 | 8.563 | 8.750 |
| | 2.000 | 1000 | | N/A | N/A | N/A | N/A | N/A | | N/A | | | 3.063 | | N/A | N/A | 9.000 |
| | 2.500 | 1000 | | N/A | N/A | N/A | N/A | N/A | | N/A | | | 3.313 | | N/A | N/A | 9.500 |
| | 3.000 | 1000 | | N/A | N/A | N/A | N/A | N/A | | N/A | | | 3.313 | | N/A | N/A | 9.500 |
| 6.00 | 1.375 | 750 | 6.500 | 0.531 | 1.000 | 0.500 | 1.563 | 0.750 | 3/4 - 10 | 4.875 | 3.250 | 1.000 | 2.813 | 3.125 | 9.000 | 8.875 | 8.750 |
| | 1.750 | 750 | | 0.531 | 1.000 | 0.500 | 1.563 | 0.750 | | 4.875 | | | 3.063 | | 9.000 | 9.125 | 9.250 |
| | 2.000 | 750 | | 0.531 | 1.000 | 0.500 | 1.563 | 0.750 | | 4.875 | | | 3.188 | | 9.000 | 9.250 | 9.500 |
| | 2.500 | 750 | | 0.531 | 1.000 | 0.500 | 1.563 | 0.750 | | 4.875 | | | 3.438 | | 9.000 | 9.500 | 10.000 |
| | 3.000 | 750 | | N/A | N/A | N/A | N/A | N/A | | N/A | | | 3.438 | | N/A | N/A | 10.000 |
| | 3.500 | 750 | | N/A | N/A | N/A | N/A | N/A | | N/A | | | 3.438 | | N/A | N/A | 10.000 |
| | 4.000 | 750 | | N/A | N/A | N/A | N/A | N/A | | N/A | | | 3.438 | | N/A | N/A | 10.000 |
| 8.00 | 1.375 | 500 | 8.500 | 0.688 | 1.125 | 0.625 | 2.000 | ② | 3/4 - 10 | 6.438 | 4.500 | 1.250 | 2.813 | 3.250 | 7.875 | 8.375 | 8.875 |
| | 1.750 | 500 | | 0.688 | 1.125 | 0.625 | 2.000 | ② | | 6.438 | | | 3.063 | | 7.875 | 8.625 | 9.375 |
| | 2.000 | 675 | | 0.688 | 1.125 | 0.625 | 2.000 | ② | | 6.438 | | | 3.188 | | 7.875 | 8.750 | 9.625 |
| | 2.500 | 675 | | 0.688 | 1.125 | 0.625 | 2.000 | ② | | 6.438 | | | 3.438 | | 7.875 | 9.000 | 10.125 |
| | 3.000 | 675 | | 0.688 | 1.125 | 0.625 | 2.000 | ② | | 6.438 | | | 3.438 | | 7.875 | 9.000 | 10.125 |
| | 3.500 | 675 | | 0.688 | 1.125 | 0.625 | 2.000 | ② | | 6.438 | | | 3.438 | | 7.875 | 9.000 | 10.125 |
| | 4.000 | 675 | | N/A | N/A | N/A | N/A | N/A | | N/A | | | 3.438 | | N/A | N/A | 10.125 |
| | 4.500 | 675 | | N/A | N/A | N/A | N/A | N/A | | N/A | | | 3.438 | | N/A | N/A | 10.125 |
| | 5.000 | 675 | | N/A | N/A | N/A | N/A | N/A | | N/A | | | 3.438 | | N/A | N/A | 10.125 |
| | 5.500 | 675 | | N/A | N/A | N/A | N/A | N/A | | N/A | | | 3.438 | | N/A | N/A | 10.125 |

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 MS7 bracket bolted directly to head (uses round retainer).

SERIES 'MH' BASIC OPTIONS

Index To Standard Options:

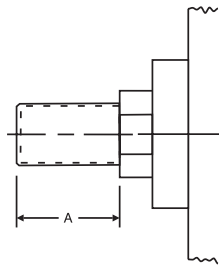
| | <u>PAGE</u> |
|--|-------------|
| • A= - Extended Piston Rod Thread | 92 |
| • AS - Adjustable Stroke (Retract) | 92 |
| • ABP= - Air Bleed Ports | 92 |
| • C= - Extended Piston Rod | 92 |
| • CS - Center Support | 93 |
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A= Extended Piston Rod 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.

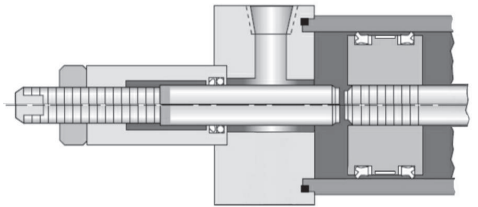


AS Adjustable Stroke (Retract)

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 |
| 8.00 | Up to 4 inch |



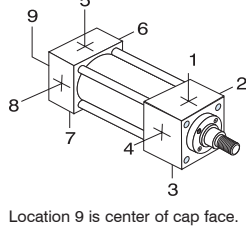
Consult factory for additional adjustable strokes offerings.

ABP= Air Bleed Ports

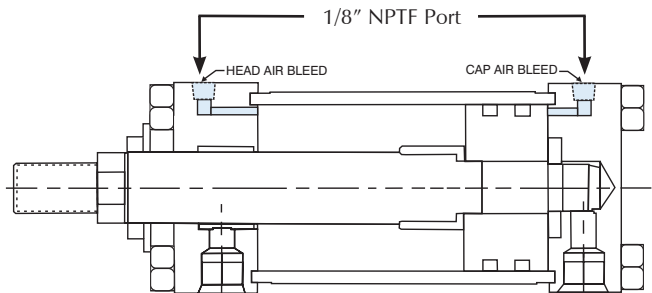
Air bleeds can be provided at either or both ends of the cylinder. Air bleeds should be located at the highest point in the cylinder for maximum effectiveness. The location needs to be specified, similar to port locations.

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

Plugged from factory.

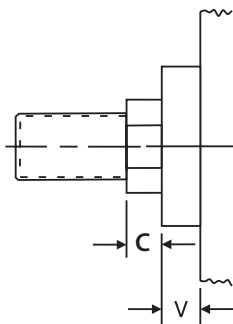


Location 9 is center of cap face.



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.

SERIES 'MH' BASIC OPTIONS

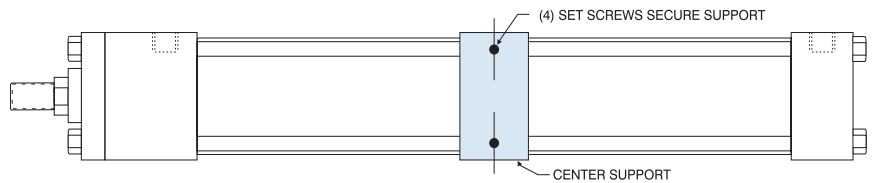
CS Center Supports

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 TRD for more information.

| BORE | MAXIMUM STROKE RECOMMENDATIONS | | |
|----------------------|--------------------------------|----------------------------------|----------------|
| | NO CENTER SUPPORT | WITH CENTER SUPPORTS (CS OPTION) | |
| | | ONE SUPPORT | TWO SUPPORTS |
| 1.50", 2.00" & 2.50" | 48 INCHES | OVER 48 INCHES | OVER 72 INCHES |
| 3.25", 4.00" & 5.00" | 65 INCHES | OVER 65 INCHES | OVER 92 INCHES |
| 6.00" | 72 INCHES | OVER 72 INCHES | NOT REQUIRED |



H C Cushions

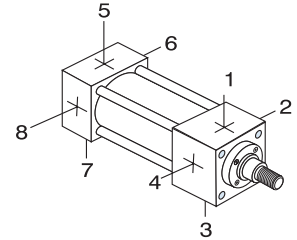
TRD's cushion design features industry proven technology and ultra fine adjustment needles for perfect deceleration and long life. Cushion adjustment needle positions need to be specified.

Example: H2C6

| CUSHION LOCATIONS | |
|-------------------|-------------|
| HEAD CUSHION | CAP CUSHION |
| H1 | C5 |
| H2 | C6 |
| H3 | C7 |
| H4 | C8 |

| STANDARD CUSHION LOCATIONS | |
|----------------------------|-------------------|
| MOUNT | 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 |



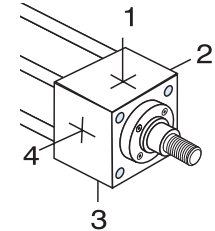
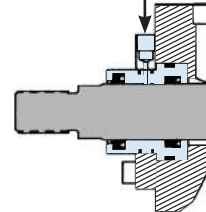
Note: Cylinders with a short stroke (value varies with bore/rod diameter and cushion combinations) may result in improper cylinder operation. Consult factory for availability.

DBB= Drain Back Bushing

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.

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

1/16" or 1/8" NPTF Port



EK Extended Key Plate

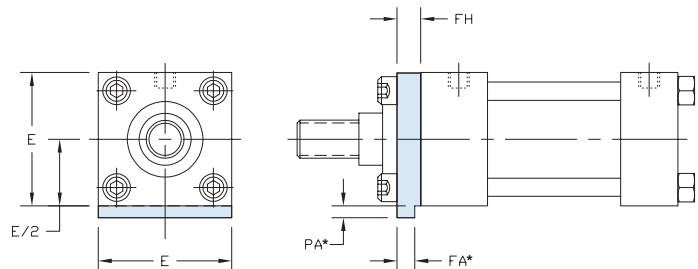
Extended key plate or thrust key is made from a full square bushing retainer plate. The key is designed to fit in a milled slot on the equipment to prevent the cylinder from shifting.

An additional mount needs to be specified to secure cylinder.

Available bore sizes: MH - 1.50" to 6.00" Bore

| 'MH' DIMENSIONS FOR EXTENDED KEY PLATE | | | | |
|--|-------|---------------|-------|-------|
| BORE | E | FA* | FH | PA* |
| 1.50 | 2.000 | 0.312 / 0.310 | 0.375 | 0.188 |
| 2.00 | 2.500 | 0.312 / 0.310 | 0.375 | 0.188 |
| 2.50 | 3.000 | 0.312 / 0.310 | 0.375 | 0.188 |
| 3.25 | 3.750 | 0.562 / 0.560 | 0.625 | 0.313 |
| 4.00 | 4.500 | 0.562 / 0.560 | 0.625 | 0.313 |
| 5.00 | 5.500 | 0.562 / 0.560 | 0.625 | 0.313 |
| 6.00 | 6.500 | 0.687 / 0.685 | 0.750 | 0.375 |

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



SERIES 'MH' BASIC OPTIONS

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.

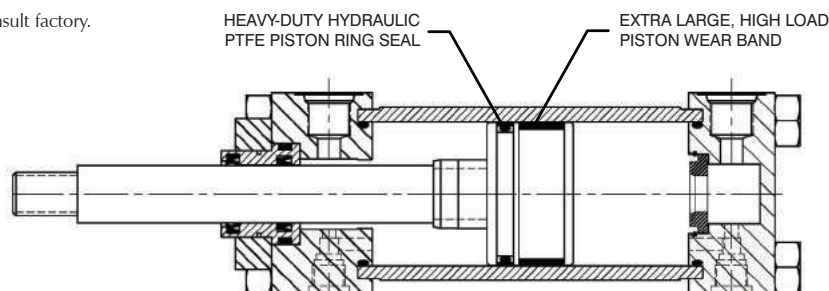
Design Benefits

- 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 (Viton): 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.

*Other materials are available, consult factory.

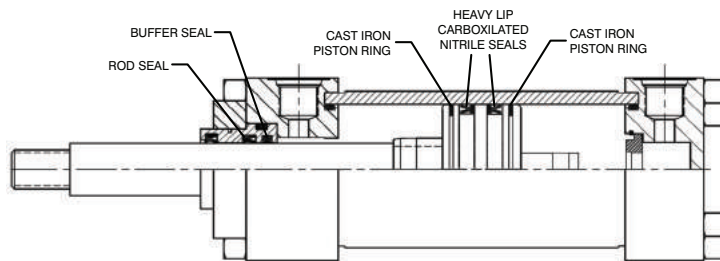


HSS High Shock Seals

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 Carboxylated 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.



KKX Non-Standard Rod Threads

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

Ordering Example: MH - MF1 - 150 X 24 - 100 - KKX = 7/8 - 9UNC - P15 = N375 - SSSS

↑ Add special thread to part number

KK3M Female Metric Rod Threads

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.

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

Ordering Example: MH - MF1 - 150 X 24 - 100 - KK3M = M8 X 1 - P15 = N375 - SSSS

KK3X Female Special Rod Threads

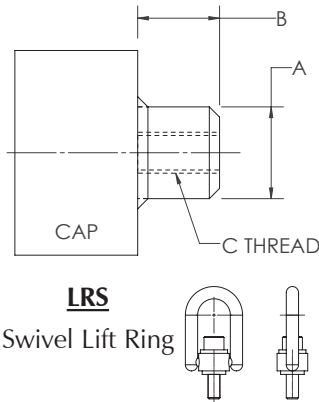
TRD can machine a wide range of female rod threads. Standard NFPA rod threads are UNF (fine), class 2 threads. Common alternative choices are UNC (coarse) threads. Note: unless otherwise specified, the rod thread will be standard catalog "A" dimension lengths.

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

SERIES 'MH' BASIC OPTIONS

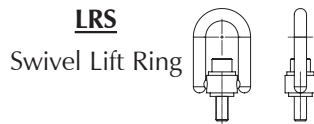
LRB Lift Ring Boss

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 below options). 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 |
| 8.00 | 2.500 | 2.000 | 1-8 | 9000 |

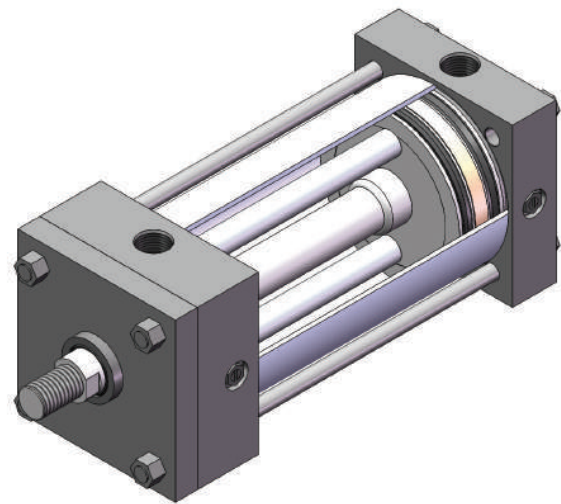
*Lifting capacity is the maximum capacity for intermittent lifting and placement of cylinder only. It is NOT intended to be used as the primary cylinder mount. Note: Not available on MF2, MF6, ME6, MP1 and SB mounts.



NR Non-Rotating (NFPA) Cylinders

Benefits

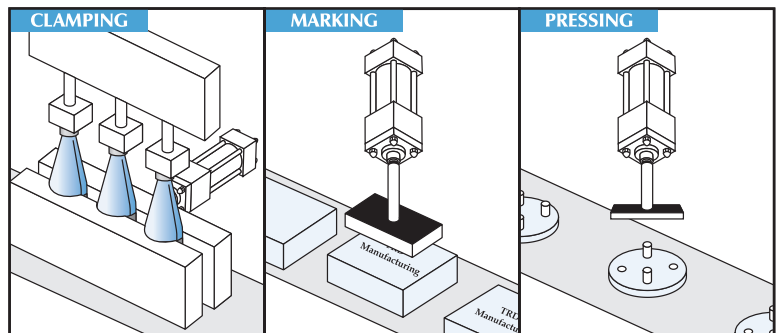
- Two internal guide rods throughout stroke
- High repeatability at each end of stroke (+/- 1 degree)
- All external dimensions are the same as standard cylinder (no additional length or width required)
- Standard diameter guide rod seals & bronze Bearings for long life and reliable operation
- Available in double rod end models



Advantages

- Eliminates the need for external guide shafts in many positioning applications
- Guide rods are internal, self-cleaning and not subjected to harsh cleaners
- Compact design saves space; no larger than standard NFPA cylinders!
- Durable, self-contained construction

Application Possibilities



AVAILABLE BORE SIZES WITH 'NR' GUIDE ROD SIZES AND MAX STROKE

| BORE | ROD DIA. (MM) | CUSHIONS |
|------|-----------------------------|--|
| 4.00 | 1.000 & 1.375 | No Cushions |
| 5.00 | 1.000, 1.375, 1.750 & 2.000 | Cap Cushions Only |
| 6.00 | 1.375 - 3.000 | Both Cushioned (3.000" Rod - Cap Only) |
| 8.00 | 1.375 - 3.500 | Both Cushioned (3.500" Rod - Cap Only) |

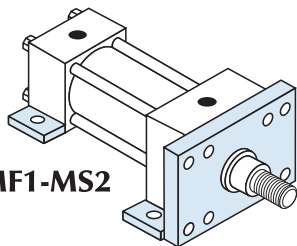
Note: Cushions restricted by some mounts on ALL bore and rod sizes.

SERIES 'MH' BASIC OPTIONS

MULTIPLE MOUNTS

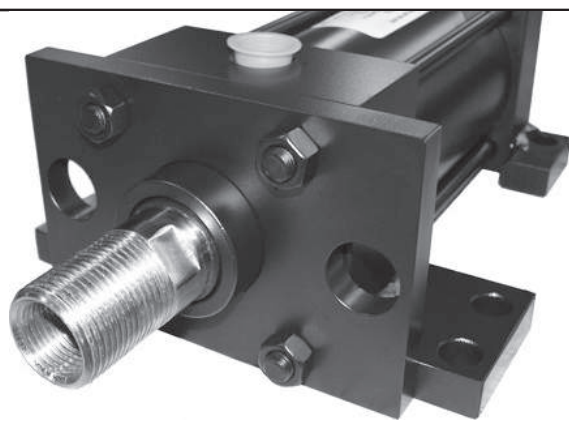
Cylinders can be furnished with a wide selection of multiple mounts.

Ordering Example: MH - MF1 - MS2 - 250 X 12 - 100 - KK1 - P15 = N375 - SSSS



MF1-MS2

↑ Add additional mount to part number



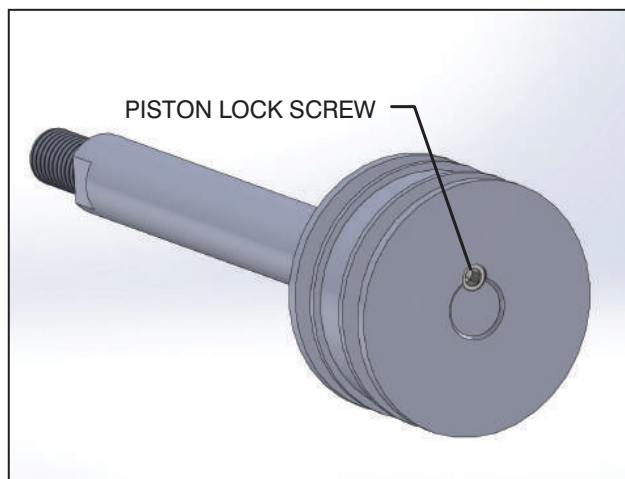
PLS *Piston Lock Screw* (For higher shock load applications)

Now standard on all hydraulic series!

Hydraulic cylinders develop high forces and can also be subjected to severe shock in demanding applications due to piston-to-end cap impact. The Piston Lock Screw acts as a shear pin between the piston and rod threads, eliminating any chance of a piston coming loose from the rod.

All TRD hydraulic cylinders use a specified torque with a permanent anaerobic thread lock/sealant to secure pistons to the piston rod; threads are then staked. This standard connection method has proven to be very effective in almost all applications. However, in severe shock load applications, the piston lock screw option provides a 100% positive connection that cannot come apart.

Note: Also referred to as Dutch Key or Skotch Key.



PORT OPTIONS

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

Cylinders can be furnished with BSPP or BSPT for additional cost.

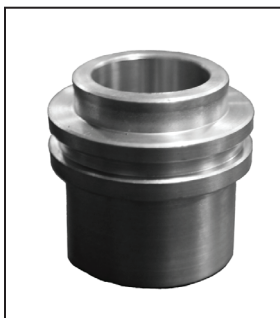
BSPT *British Standard Pipe Taper*

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)

RBB *Solid Bronze Rod Bushing*



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: TRD can provide special length rod bushings; contact your local distributor for details

SERIES 'MH' BASIC OPTIONS

SSR 17-4 Stainless Steel Hard Chrome Plated Piston Rod

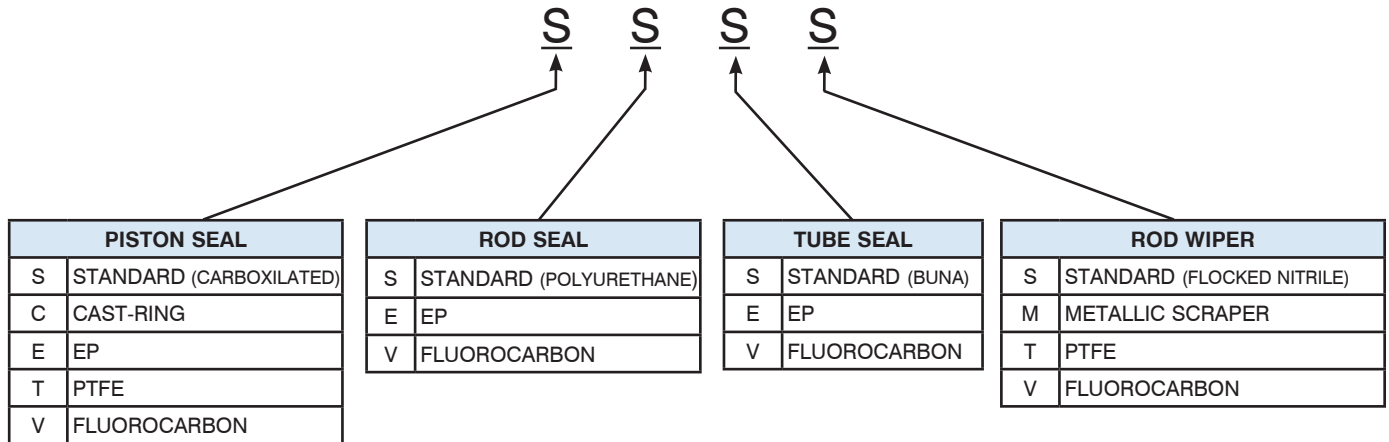
Cylinders can be furnished with hard chrome plated stainless steel piston rods.

100,000 min. yield (rods up to 5.00)
75,000 min. yield (5.500 rod)

SEALS

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

HOW TO ORDER SEALS



S Standard Seals

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

Rod Seal: Polyurethane
Rod Wiper: Flocked Nitrile

E Ethylene Propylene

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

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

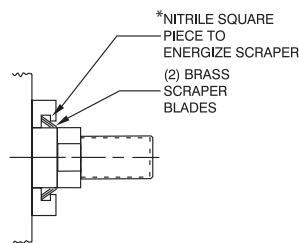
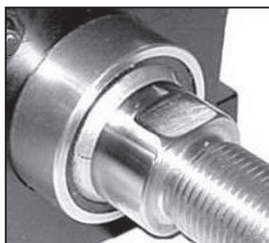
*When cylinder is equipped with Viton seals.

T Glass 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 (Viton): 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

M Metallic Rod Scraper

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



*Standard energizer will match cylinder seals.

V Fluorocarbon

Temperature Rating: 0°F to 400°F (-18°C to 204°C)
(Up to 400°F with reduced service life)

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

XX Special

Non-standard seals can be furnished.
Contact TRD for more information.

SERIES 'MH' BASIC OPTIONS

HH - Heavy Duty Hydraulic

HH Rod Lock

MH - Medium Duty Hydraulic

MH Options

TAS - Heavy Duty Pneumatic

Accessories Page 147

Strokemaster® Page 153

Technical Data Page 161

ST Stop Tube and Rod Size Selection

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: TRD 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 a 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-MS2-2.50 X 42ES-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)

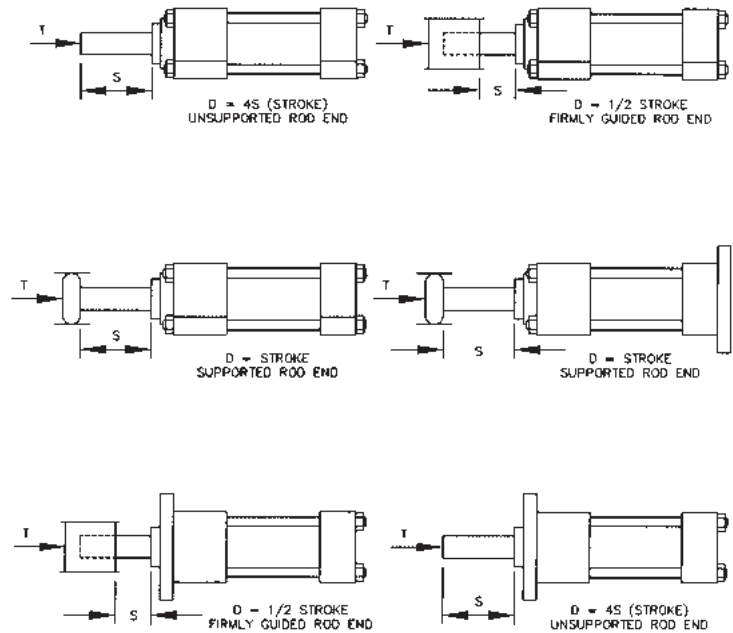
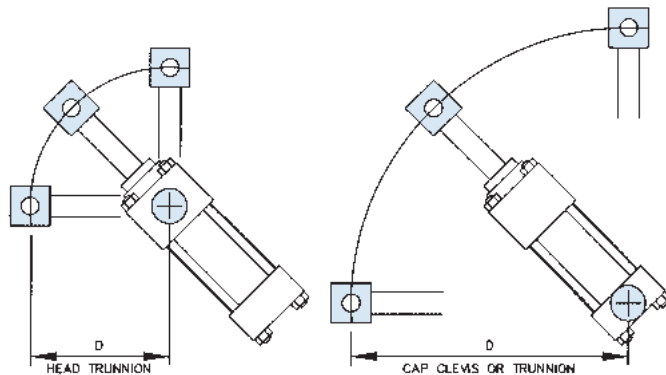
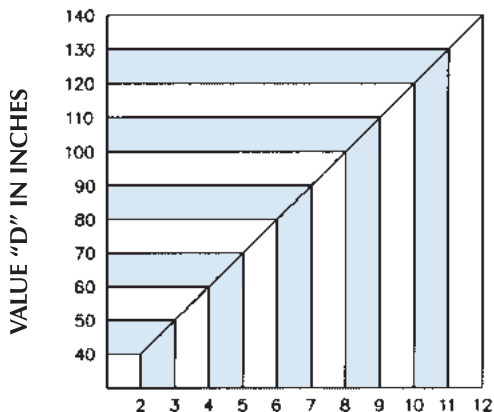


Chart 2

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



Note: Measure "D" when cylinder is fully extended.

Refer to page 99 for Rod Size Selection Chart

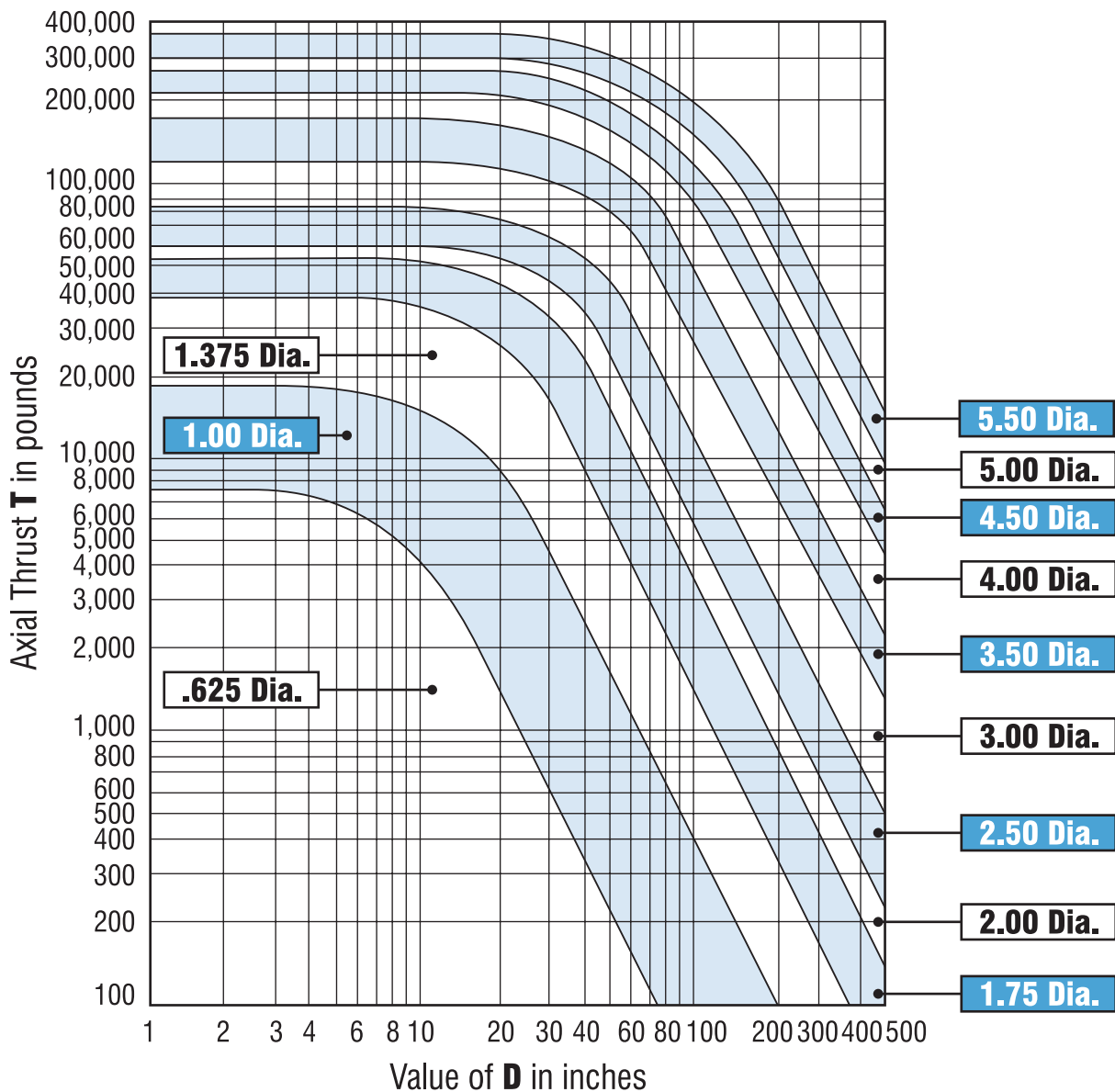
SERIES 'MH' BASIC OPTIONS

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 98, determine the value of "D" for the application.
3. Find the value of "D" in the chart below. 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)



SERIES 'MH' UNCOMMON OPTIONS

3P Three-Position Cylinder

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 DESIGNS** — 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 TRD for more information.

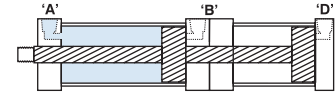
3-POSITION CYLINDERS

HOW THEY WORK

■ = PRESSURE

POSITION 1 (RETRACT)

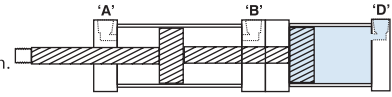
Pressure to port 'A' fully retracts cylinder.



(RETRACT)

POSITION 2 (MID-STROKE)

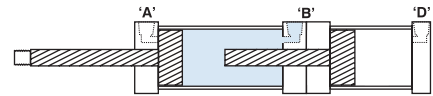
Pressure to port 'D' advances cylinder to mid-stroke position.



(MID-STROKE)

POSITION 3 (EXTEND)

Pressure to port 'B' fully extends cylinder.

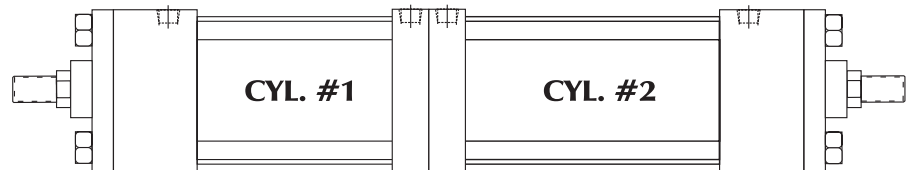


(EXTEND)

BTB Back-To-Back Cylinders

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

Contact TRD for more information.

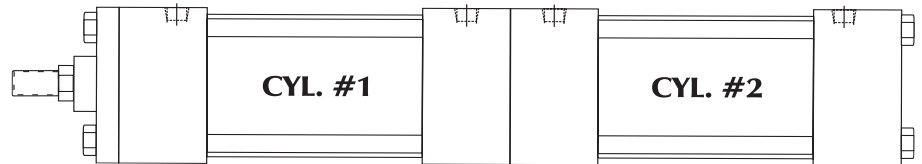


TM Tandem Cylinders

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

Note: Piston rods are connected.

Contact TRD 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: TRD can provide paint in any color or type.

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

Contact TRD with your specifications — we would be pleased to provide a quote!

