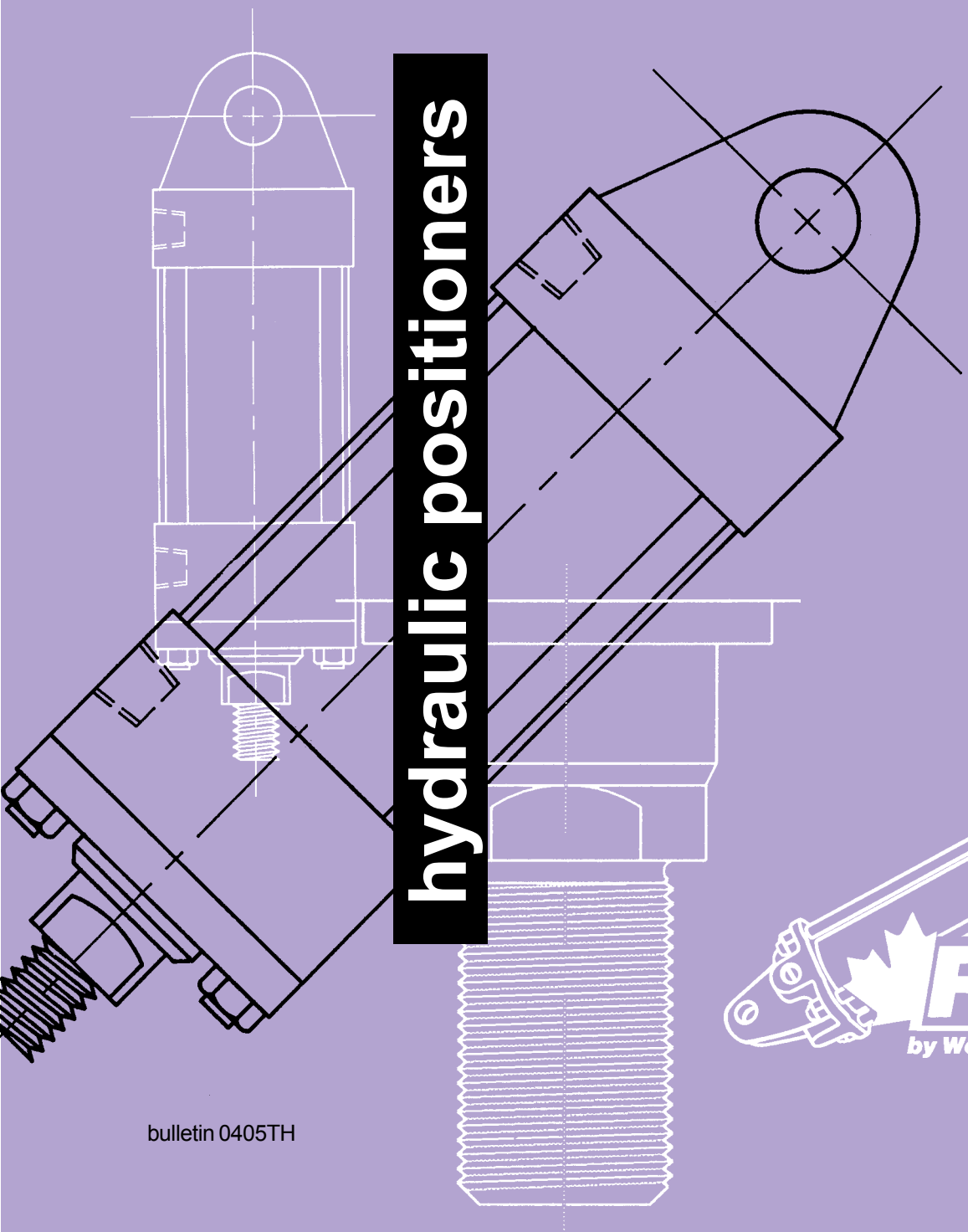
**3000**
psi rating

# series TH

## hydraulic positioners



ROYAL
by Westcoast Cylinders Inc.

bulletin 0405TH

www.royalcylinders.com

# Contents



**Royal Hydraulic Linear Positioners**
Royal offers two designs for mounting a position sensor; the standard rod style **T3H**, and the embeddable rod style with remote electronics mounted directly to the rear cylinder head **T4H**.

Royal Hydraulic Linear Positioners are designed for use with non-contact position Sensors (transducers) from manufacturers such as MTS (Temposonic) or Balluff. If other sensors will be used please contact the factory as some dimensions may change.

WCI does not supply position sensors, however customers can purchase them from their supplier and install for T3 design or send for factory installation. T4 design should be factory installed to satisfy cylinder warranty. For this, choose option letter "P" in the cylinder nomenclature.

**Side Mount Electronics**
**T4** Series Positioners are designed to accept an Internal Sensor which has it's electronic enclosure mounted remotely - typically on either side of the blind end head. The standard position is at position 4 (as shown).

**Rear Mount Electronics**
The conventional **T3** Series Positioners have the sensor-electronics unit screwed onto the rear head along the cylinder axis. A probe cover is included to protect the sensor unit.

4 *T4HC Fixed Clevis*

6 *T3NM No Mount*

4 *T4HE Pivot Eye*

6 *T3HNC Extended Tie-rods Gland End*

5 *T4HW Self-aligning Eye*

7 *T3HR Rod End Rectangular Flange*

7 *T3HRS Rod End Square Flange*

8 *T3HG Rectangular Gland End Head*

9 *T3HTR Rod End Trunnion*

9 *T3HTB Blind End Trunnion*

10 *T3HT Mid Trunnion*

11 *T3HF Foot Mount*

11 *T3HS Side Tapped*

12 *T3HC Fixed Clevis*

12 *T3HE Pivot Eye*

13 *T3HW Self-aligning Eye*

**Westcoast Cylinders Inc.:**
The Company has been manufacturing high quality, reliable ROYAL cylinders for over 40 years. Production started with a single cylinder design and expanded to a full range of multi-use, hydraulic, pneumatic cylinders and accessories.

**Quality:**
WCI is a leader in the design and manufacture of custom heavy duty cylinders. The materials, machinery and tools used to produce our products are continuously being updated. Our cylinders are built to the highest standards utilizing the latest technology and processes.

**Delivery:**
WCI maintains a large range of stock parts which gives us the flexibility to respond to your needs in emergency situations. Please contact the factory to expedite your special requirements.

**NFPA Standard Mounting:**
Mounting dimensions meet NFPA standards except for some length dimensions. The blind end head is wider to accomodate the 2" null-space sensor requirement. Please compare your requirements with our dimension tables.

ROYAL

**Westcoast Cylinders Inc.**
225 Edworthy Way
New Westminster BC
Canada V3L 5G4
Telephone: 604 527 1120
Facsimile: 604 527 1170
Phone Toll Free: 1-877-637-6925
Fax Toll Free: 1-866-527-1170
email: sales@royalcylinders.com
website: www.royalcylinders.com

### SEALS

***Hythane***® piston seals are standard on the Royal TH-Series. The rod seal is a high performance, high temperature seal compound having ultra low friction and long seal life. Both piston and rod seals have a temperature range from -40 to 230°F. The ***Hythane***® rod wiper, with internal ribs for extra stability and prevention of pressure trapping, cleans the rod on the return stroke. The static external seal is Buna-N material. Other seal options are available – contact our factory for more information.

### GLAND BUSHING

The gland bushing is manufactured from Rotocast bronze for low friction and long bearing life. Other high wear resistant materials such as Zinc-alloy are available upon request. Optional gland bushings with wear rings are available in most rod sizes – contact our factory for more information.

### THREADED LOCKING PISTON DESIGN

The TH-Series incorporates a threaded piston for maximum strength. The piston is designed with a blind bore and rear set screws design for locking the piston to the rod.

### HEADS

Heads are precision machined from high quality cold finished steel for perfect alignment of barrel and moving parts.

### ONE-PIECE PISTON

The piston is a one-piece design, incorporating a replaceable wear ring to prevent contact with the barrel and increase the life of the cylinder.

### SAE PORTS

SAE O-Ring Boss ports are the standard port on the TH-Series cylinders. SAE CODE 61 Flange ports are also available, or Manifold Transition Mount. See Port Options section for details.

### OPTIONAL INTERNAL / EXTERNAL PISTON STOP

Standard internal and external piston stops are available to reduce side load stress on the piston rod, gland bushing and piston for all cylinder sizes.

### CYLINDER FLUSHING

A cylinder flushing service is available as a standard option. To choose this, select “-F” in the Options section of the Cylinder Nomenclature. This service is **included** when a subplate with plumbing is ordered with your cylinder.

### CUSTOM CYLINDERS

If our standard product does not meet your specifications, Westcoast Cylinders will manufacture custom cylinders to meet your requirements. Please contact our factory.

### SPARE PARTS

Genuine Royal seal kits include all seal components and wear rings. Please specify genuine Royal replacement parts to ensure you will receive all feature benefits.
All Positioner components may be purchased separately as spares.

* *Hythane*® is a registered trademark of Hallite Seals International Ltd.

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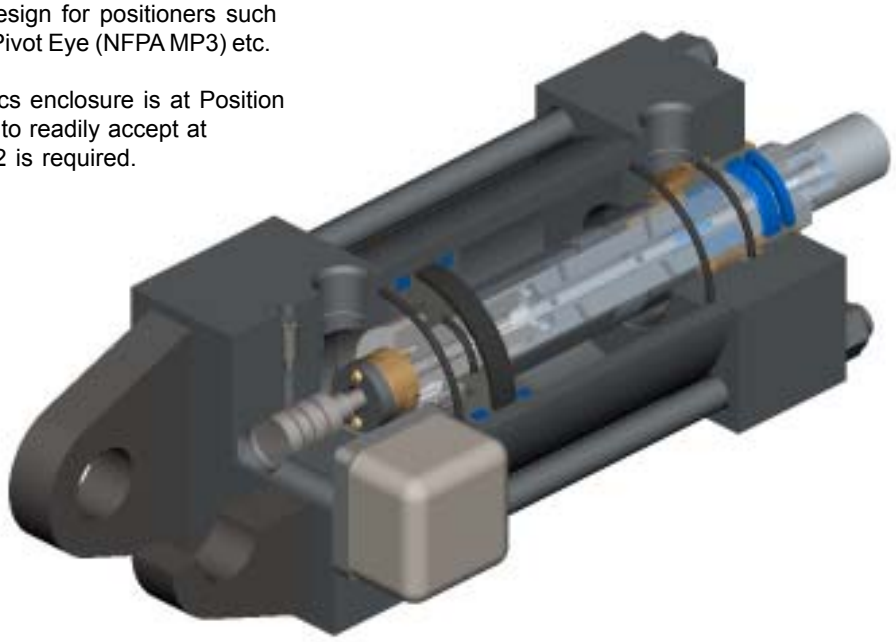
## T4H-SERIES:

### INTERNALLY MOUNTED SENSOR - EXTERNALLY MOUNTED ELECTRONICS

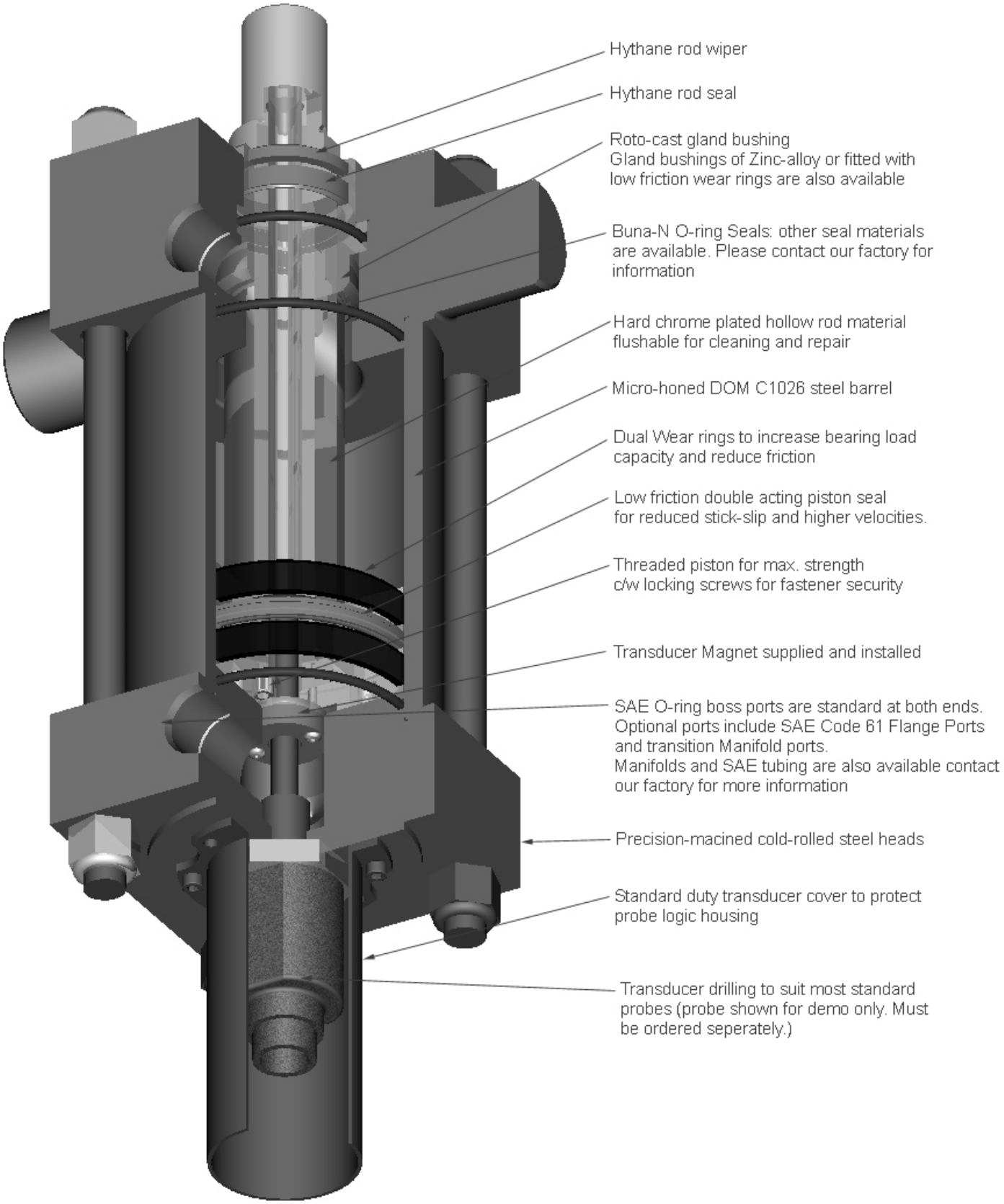
The **internal** sensor arrangement allows remote mounting of the electronics. This permits a compact design for positioners such as the Fixed Clevis (NFPA MP1) or the Pivot Eye (NFPA MP3) etc.

The standard position for the electronics enclosure is at Position 4 as shown, but the head is machined to readily accept at Position 2. Please indicate if Position 2 is required.
The unused port is plugged.



## T3H-SERIES:

### EXTERNALLY MOUNTED SENSOR (PROBE) C/W ELECTRONICS



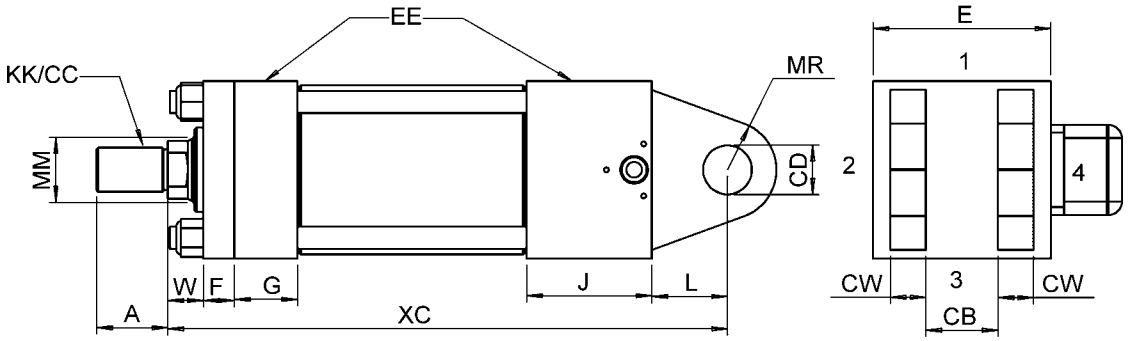

# model T4HC, T4HE

| BORE | ROD | ROD DIA MM | KK | CC | A | W | + STROKE XC | E | F | G | J | L | HC CB | HE CB | CD | CW | EE NPTF | EE SAE | MR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 1/2 | 1 | 1 | 3/4-16 | 7/8-14 | 1 1/8 | 1 | 8 5/8 | 2 1/2 | 3/8 | 1 9/16 | 3 7/16 | 3/4 | 25/32 | 3/4 | 1/2 | 1/2 | 1/2 | -08 | 1/2 |
| 2 | 1 | 1 | 3/4-16 | 7/8-14 | 1 1/8 | 3/4 | 9 1/4 | 3 | 5/8 | 1 15/32 | 3 7/32 | 1 1/4 | 1 9/32 | 1 1/4 | 3/4 | 5/8 | 1/2 | -08 | 3/4 |
| | 2 | 1 3/8 | 1-14 | 1 1/4-12 | 1 5/8 | 1 | 9 1/2 | | | | | | | | | | | | |
| 2 1/2 | 1 | 1 | 3/4-16 | 7/8-14 | 1 1/8 | 3/4 | 9 3/8 | 3 1/2 | 9/16 | 1 9/16 | 3 1/4 | 1 1/4 | 1 9/32 | 1 1/4 | 3/4 | 5/8 | 1/2 | -08 | 3/4 |
| | 2 | 1 3/8 | 1-14 | 1 1/4-12 | 1 5/8 | 1 | 9 5/8 | | | | | | | | | | | | |
| | 3 | 1 3/4 | 1 1/4-12 | 1 1/2-12 | 2 | 1 1/4 | 9 7/8 | | | | | | | | | | | | |
| 3 1/4 | 1 | 1 3/8 | 1-14 | 1 1/4-12 | 1 5/8 | 7/8 | 10 5/8 | 4 1/2 | 3/4 | 1 25/32 | 3 17/32 | 1 1/2 | 1 17/32 | 1 1/2 | 1 | 3/4 | 3/4 | -12 | 1 |
| | 2 | 1 3/4 | 1 1/4-12 | 1 1/2-12 | 2 | 1 1/8 | 10 7/8 | | | | | | | | | | | | |
| | 3 | 2 | 1 1/2-12 | 1 3/4-12 | 2 1/4 | 1 1/4 | 11 | | | | | | | | | | | | |
| 4 | 1 | 1 3/4 | 1 1/4-12 | 1 1/2-12 | 2 | 1 | 11 3/4 | 5 | 7/8 | 1 25/32 | 3 17/32 | 2 1/8 | 2 1/32 | 2 | 1 3/8 | 1 | 3/4 | -12 | 1 3/8 |
| | 2 | 2 | 1 1/2-12 | 1 3/4-12 | 2 1/4 | 1 1/8 | 11 7/8 | | | | | | | | | | | | |
| | 3 | 2 1/2 | 1 7/8-12 | 2 1/4-12 | 3 | 1 3/8 | 12 1/8 | | | | | | | | | | | | |
| 5 | 1 | 2 | 1 1/2-12 | 1 3/4-12 | 2 1/4 | 1 1/8 | 12 1/2 | 6 1/2 | 7/8 | 1 25/32 | 3 17/32 | 2 1/4 | 2 17/32 | 2 1/2 | 1 3/4 | 1 1/4 | 3/4 | -12 | 1 3/4 |
| | 2 | 2 1/2 | 1 7/8-12 | 2 1/4-12 | 3 | 1 3/8 | 12 3/4 | | | | | | | | | | | | |
| | 3 | 3 | 2 1/4-12 | 2 3/4-12 | 3 1/2 | 1 3/8 | 12 3/4 | | | | | | | | | | | | |
| | 4 | 3 1/2 | 2 1/2-12 | 3 1/4-12 | 3 1/2 | 1 3/8 | 12 3/4 | | | | | | | | | | | | |
| 6 | 1 | 2 1/2 | 1 7/8-12 | 2 1/4-12 | 3 | 1 1/4 | 14 1/8 | 7 1/2 | 1 | 2 5/32 | 4 5/32 | 2 1/2 | 2 17/32 | 2 1/2 | 2 | 1 1/4 | 1 | -16 | 2 |
| | 2 | 3 | 2 1/4-12 | 2 3/4-12 | 3 1/2 | 1 1/4 | 14 1/8 | | | | | | | | | | | | |
| | 3 | 3 1/2 | 2 1/2-12 | 3 1/4-12 | 3 1/2 | 1 1/4 | 14 1/8 | | | | | | | | | | | | |

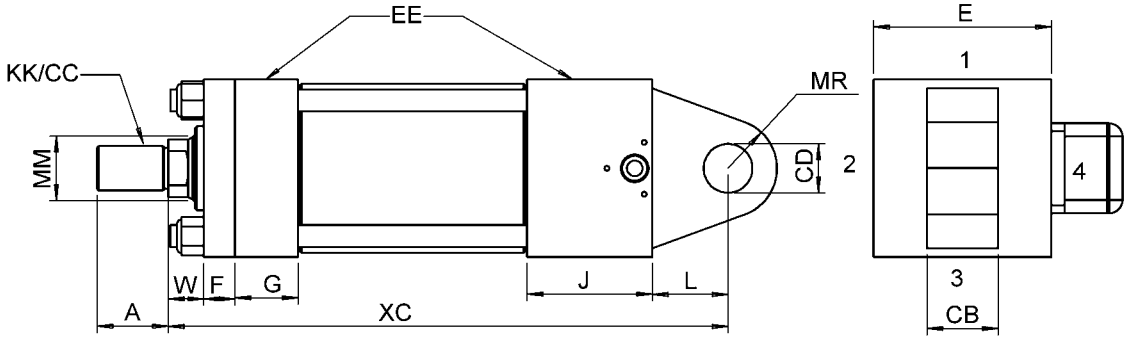
**Notes:**

1. All dimensions in inches.
2. EE standard port is SAE. See page 20 for Optional Ports.
3. See Cylinder Nomenclature for thread options.
4. For Optional Rod Ends and dimensions see page16.
5. Transducer Electronics can be mounted at P2 or P4. P4 is standard.
6. See page 14 for Maximum Probe Length.

Model **T4HC**
**Fixed Clevis**
NFPA Style MP1




Model **T4HE**
**Pivot Eye**
NFPA Style MP3

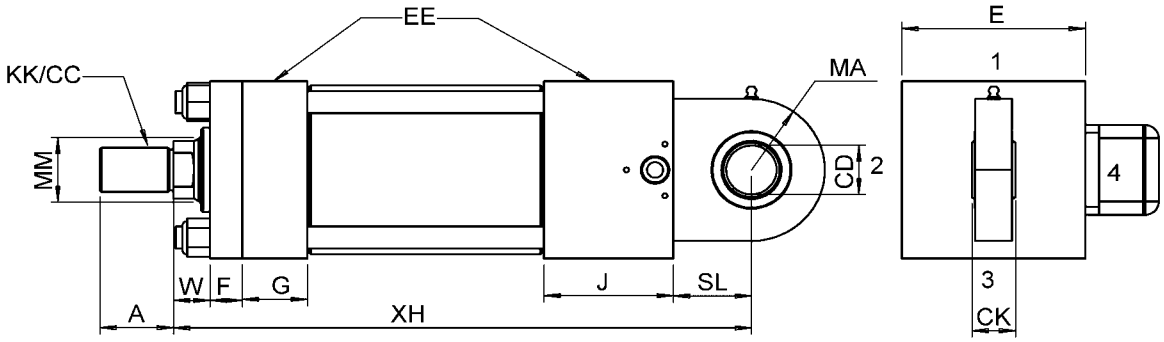


| BORE | ROD | ROD DIA MM | KK | CC | A | W | + STROKE XH | E | F | G | J | SL | CD | CK | EE NPTF | EE SAE | MA | X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1 1/2** | 1 | 1 | 3/4-16 | 7/8-14 | 1 1/8 | 1 | 8 5/8 | 2 1/2 | 3/8 | 1 9/16 | 3 7/16 | 3/4 | 1/2 | 7/16 | 1/2 | -08 | 7/8 | 3/8 |
| **2** | 1 | 1 | 3/4-16 | 7/8-14 | 1 1/8 | 3/4 | 9 1/4 | 3 | 5/8 | 1 15/32 | 3 7/32 | 1 1/4 | 3/4 | 21/32 | 1/2 | -08 | 1 1/4 | 1/2 |
| | 2 | 1 3/8 | 1-14 | 1 1/4-12 | 1 5/8 | 1 | 9 1/2 | | | | | | | | | | | |
| **2 1/2** | 1 | 1 | 3/4-16 | 7/8-14 | 1 1/8 | 3/4 | 9 3/8 | 3 1/2 | 9/16 | 1 9/16 | 3 1/4 | 1 1/4 | 3/4 | 21/32 | 1/2 | -08 | 1 1/4 | 1/2 |
| | 2 | 1 3/8 | 1-14 | 1 1/4-12 | 1 5/8 | 1 | 9 5/8 | | | | | | | | | | | |
| | 3 | 1 3/4 | 1 1/4-12 | 1 1/2-12 | 2 | 1 1/4 | 9 7/8 | | | | | | | | | | | |
| **3 1/4** | 1 | 1 3/8 | 1-14 | 1 1/4-12 | 1 5/8 | 7/8 | 10 5/8 | 4 1/2 | 3/4 | 1 25/32 | 3 17/32 | 1 1/2 | 1 | 7/8 | 3/4 | -12 | 1 1/2 | 5/8 |
| | 2 | 1 3/4 | 1 1/4-12 | 1 1/2-12 | 2 | 1 1/8 | 10 7/8 | | | | | | | | | | | |
| | 3 | 2 | 1 1/2-12 | 1 3/4-12 | 2 1/4 | 1 1/4 | 11 | | | | | | | | | | | |
| **4** | 1 | 1 3/4 | 1 1/4-12 | 1 1/2-12 | 2 | 1 | 11 3/4 | 5 | 7/8 | 1 25/32 | 3 17/32 | 2 1/8 | 1 3/8 | 1 3/16 | 3/4 | -12 | 2 | 5/8 |
| | 2 | 2 | 1 1/2-12 | 1 3/4-12 | 2 1/4 | 1 1/8 | 11 7/8 | | | | | | | | | | | |
| | 3 | 2 1/2 | 1 7/8-12 | 2 1/4-12 | 3 | 1 3/8 | 12 1/8 | | | | | | | | | | | |
| **5** | 1 | 2 | 1 1/2-12 | 1 3/4-12 | 2 1/4 | 1 1/8 | 12 1/2 | 6 1/2 | 7/8 | 1 25/32 | 3 17/32 | 2 1/4 | 1 3/4 | 1 17/32 | 3/4 | -12 | 2 3/4 | 7/8 |
| | 2 | 2 1/2 | 1 7/8-12 | 2 1/4-12 | 3 | 1 3/8 | 12 3/4 | | | | | | | | | | | |
| | 3 | 3 | 2 1/4-12 | 2 3/4-12 | 3 1/2 | 1 3/8 | 12 3/4 | | | | | | | | | | | |
| | 4 | 3 1/2 | 2 1/2-12 | 3 1/4-12 | 3 1/2 | 1 3/8 | 12 3/4 | | | | | | | | | | | |
| **6** | 1 | 2 1/2 | 1 7/8-12 | 2 1/4-12 | 3 | 1 1/4 | 14 1/8 | 7 1/2 | 1 | 2 5/32 | 4 5/32 | 2 1/2 | 2 | 1 3/4 | 1 | -16 | 3 | 1 |
| | 2 | 3 | 2 1/4-12 | 2 3/4-12 | 3 1/2 | 1 1/4 | 14 1/8 | | | | | | | | | | | |
| | 3 | 3 1/2 | 2 1/2-12 | 3 1/4-12 | 3 1/2 | 1 1/4 | 14 1/8 | | | | | | | | | | | |

**Notes:**

1. All dimensions in inches.
2. EE standard port is SAE. See page 20 for Optional Ports.
3. See Cylinder Nomenclature for thread options.
4. For Optional Rod Ends and dimensions see page16.
5. Transducer Electronics can be mounted at P2 or P4. P4 is standard.
6. See page 14 for Maximum Probe Length.

Model **T4HW**
**Self-aligning Eye**
NFPA Style MPU3




| MAXIMUM OPERATING PRESSURE (PSI) | | |
|---|---|---|
| | MODEL T4HW * | |
| BORE | CONTINUOUS | INTERMITTENT |
| **1 1/2** | 1600 | 2100 |
| **2** | 2100 | 2800 |
| **2 1/2** | 1300 | 1800 |
| **3 1/4** | 1400 | 1800 |
| **4** | 1700 | 2200 |
| **5** | 1800 | 2400 |
| **6** | 1600 | 2200 |

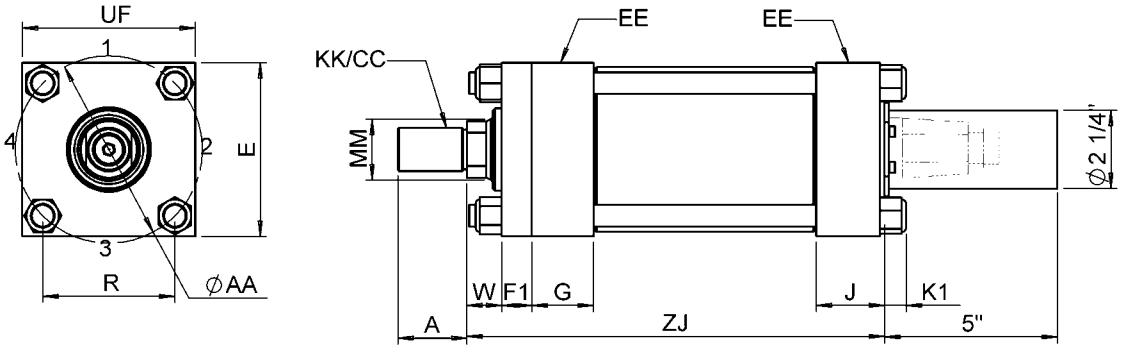
*Pressure ratings are based on the Dynamic Load Capacity of the bearing.


# model T3HNM, T3HNC

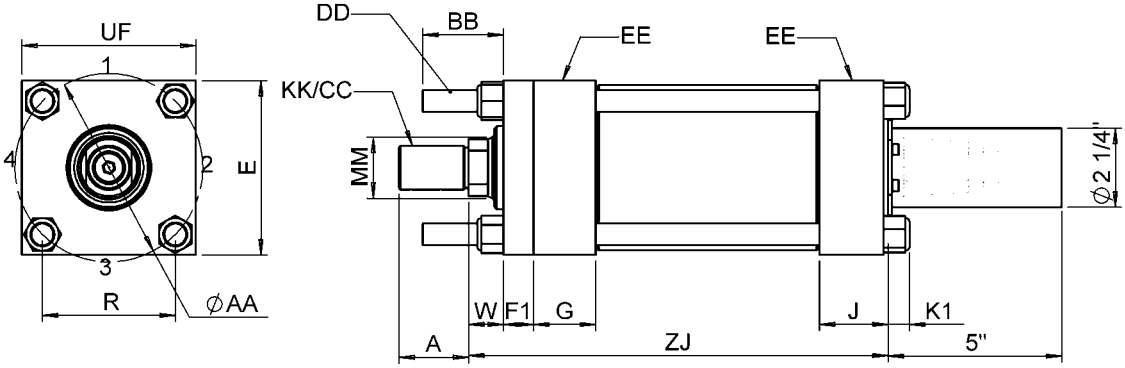
| BORE | ROD | ROD DIA MM | KK | CC | A | W | + STR ZJ | E | F | G | J | K | R | AA | BB | DD | EE SAE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 1/2 | 1 | 1 | 3/4-16 | 7/8-14 | 1 1/8 | 1 | 6 7/8 | 2 1/2 | 3/8 | 1 9/16 | 2 7/16 | 1/2 | 1.63 | 2.30 | 1 3/8 | 3/8-24 | -08 |
| 2 | 1 | 1 | 3/4-16 | 7/8-14 | 1 1/8 | 3/4 | 7 1/16 | 3 | 5/8 | 1 15/32 | 2 5/32 | 5/8 | 2.19 | 3.09 | 1 13/16 | 1/2-20 | -08 |
| | 2 | 1 3/8 | 1-14 | 1 1/4-12 | 1 5/8 | 1 | 7 5/16 | | | | | | note 6 | note 6 | | | |
| 2 1/2 | 1 | 1 | 3/4-16 | 7/8-14 | 1 1/8 | 3/4 | 7 1/16 | 3 1/2 | 9/16 | 1 9/16 | 2 3/16 | 5/8 | 2.55 | 3.60 | 1 13/16 | 1/2-20 | -08 |
| | 2 | 1 3/8 | 1-14 | 1 1/4-12 | 1 5/8 | 1 | 7 5/16 | | | | | | | | | | |
| | 3 | 1 3/4 | 1 1/4-12 | 1 1/2-12 | 2 | 1 1/4 | 7 9/16 | | | | | | | | | | |
| 3 1/4 | 1 | 1 3/8 | 1-14 | 1 1/4-12 | 1 5/8 | 7/8 | 7 5/8 | 4 1/2 | 3/4 | 1 25/32 | 2 1/32 | 3/4 | 3.25 | 4.60 | 2 5/16 | 5/8-18 | -12 |
| | 2 | 1 3/4 | 1 1/4-12 | 1 1/2-12 | 2 | 1 1/8 | 7 7/8 | | | | | | | | | | |
| | 3 | 2 | 1 1/2-12 | 1 3/4-12 | 2 1/4 | 1 1/4 | 8 | | | | | | | | | | |
| 4 | 1 | 1 3/4 | 1 1/4-12 | 1 1/2-12 | 2 | 1 | 8 1/16 | 5 | 7/8 | 1 25/32 | 1 31/32 | 3/4 | 3.82 | 5.41 | 2 5/16 | 5/8-18 | -12 |
| | 2 | 2 | 1 1/2-12 | 1 3/4-12 | 2 1/4 | 1 1/8 | 8 3/16 | | | | | | | | | | |
| | 3 | 2 1/2 | 1 7/8-12 | 2 1/4-12 | 3 | 1 3/8 | 8 7/16 | | | | | | | | | | |
| 5 | 1 | 2 | 1 1/2-12 | 1 3/4-12 | 2 1/4 | 1 1/8 | 8 11/16 | 6 1/2 | 7/8 | 1 25/32 | 1 31/32 | 1 | 4.95 | 7.00 | 3 3/16 | 7/8-14 | -12 |
| | 2 | 2 1/2 | 1 7/8-12 | 2 1/4-12 | 3 | 1 3/8 | 8 15/16 | | | | | | | | | | |
| | 3 | 3 | 2 1/4-12 | 2 3/4-12 | 3 1/2 | 1 3/8 | 8 15/16 | | | | | | | | | | |
| | 4 | 3 1/2 | 2 1/2-12 | 3 1/4-12 | 3 1/2 | 1 3/8 | 8 15/16 | | | | | | | | | | |
| 6 | 1 | 2 1/2 | 1 7/8-12 | 2 1/4-12 | 3 | 1 1/4 | 9 5/8 | 7 1/2 | 1 | 2 5/32 | 2 5/32 | 1 1/8 | 5.73 | 8.10 | 3 5/8 | 1-14 | -16 |
| | 2 | 3 | 2 1/4-12 | 2 3/4-12 | 3 1/2 | 1 1/4 | 9 5/8 | | | | | | | | | | |
| | 3 | 3 1/2 | 2 1/2-12 | 3 1/4-12 | 3 1/2 | 1 1/4 | 9 5/8 | | | | | | | | | | |

**Notes:**
1. All dimensions in inches.
2. EE standard port is SAE. See page 20 for Optional Ports.
3. See Cylinder Nomenclature for thread options.
4. For Optional Rod Ends and dimensions see page16.
5. See page 14 for Maximum Probe Length.
6. For the 2" bore only, "AA" and "R" dimensions do not match NFPA.

Model **T3HNM**
**No Mount**
NFPA Style MX0




Model **T3HNC**
**Extended Tie-Rods Gland End**
NFPA Style MX3

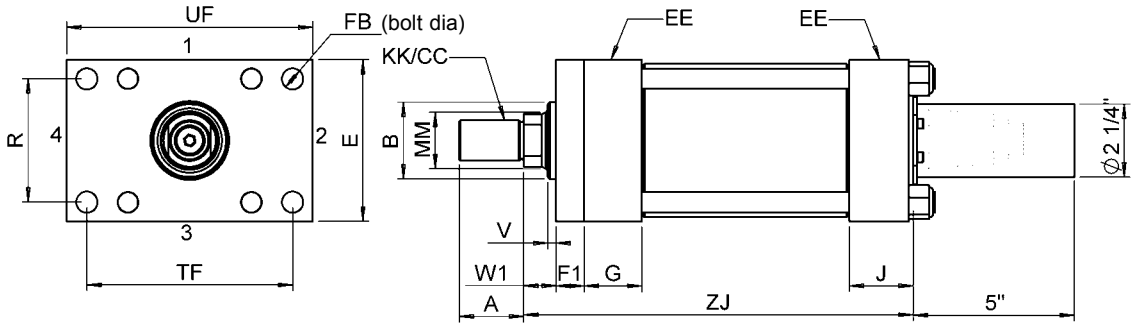


| BORE | ROD | ROD DIA MM | KK | CC | A | HR/HRS W1 | + STROKE ZJ | E | F1 | G | J | EE SAE | R | FB | TF | UF | B | V |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1 1/2** | 1 | 1 | 3/4-16 | 7/8-14 | 1 1/8 | 7/8 | 6 7/8 | 2 1/2 | 1/2 | 1 9/16 | 2 7/16 | -08 | 1.63 | 3/8 | 3 7/16 | 4 1/4 | 1.563 | 1/8 |
| **2** | 1 | 1 | 3/4-16 | 7/8-14 | 1 1/8 | 3/4 | 7 1/16 | 3 | 5/8 | 1 15/32 | 2 5/32 | -08 | 2.05 | 1/2 | 4 1/8 | 5 1/8 | 1.563 | 3/16 |
| | 2 | 1 3/8 | 1-14 | 1 1/4-12 | 1 5/8 | 1 | 7 5/16 | | | | | | | | | | 2.125 | 3/8 |
| **2 1/2** | 1 | 1 | 3/4-16 | 7/8-14 | 1 1/8 | 11/16 | 7 1/16 | 3 1/2 | 5/8 | 1 9/16 | 2 3/16 | -08 | 2.55 | 1/2 | 4 5/8 | 5 5/8 | 1.563 | 3/16 |
| | 2 | 1 3/8 | 1-14 | 1 1/4-12 | 1 5/8 | 15/16 | 7 5/16 | | | | | | | | | | 2.125 | 3/8 |
| | 3 | 1 3/4 | 1 1/4-12 | 1 1/2-12 | 2 | 1 3/16 | 7 9/16 | | | | | | | | | | 2.375 | 1/2 |
| **3 1/4** | 1 | 1 3/8 | 1-14 | 1 1/4-12 | 1 5/8 | 7/8 | 7 5/8 | 4 1/2 | 3/4 | 1 25/32 | 2 1/32 | -12 | 3.25 | 5/8 | 5 7/8 | 7 1/8 | 2.125 | 1/4 |
| | 2 | 1 3/4 | 1 1/4-12 | 1 1/2-12 | 2 | 1 1/8 | 7 7/8 | | | | | | | | | | 2.375 | 3/8 |
| | 3 | 2 | 1 1/2-12 | 1 3/4-12 | 2 1/4 | 1 1/4 | 8 | | | | | | | | | | 2.750 | 3/8 |
| **4** | 1 | 1 3/4 | 1 1/4-12 | 1 1/2-12 | 2 | 1 | 8 1/16 | 5 | 7/8 | 1 25/32 | 1 31/32 | -12 | 3.81 | 5/8 | 6 3/8 | 7 5/8 | 2.375 | 1/4 |
| | 2 | 2 | 1 1/2-12 | 1 3/4-12 | 2 1/4 | 1 1/8 | 8 3/16 | | | | | | | | | | 2.750 | 1/4 |
| | 3 | 2 1/2 | 1 7/8-12 | 2 1/4-12 | 3 | 1 3/8 | 8 7/16 | | | | | | | | | | 3.250 | 7/16 |
| **5** | 1 | 2 | 1 1/2-12 | 1 3/4-12 | 2 1/4 | 1 1/8 | 8 11/16 | 6 1/2 | 7/8 | 1 25/32 | 1 31/32 | -12 | 4.95 | 7/8 | 8 3/16 | 9 3/4 | 2.750 | 1/4 |
| | 2 | 2 1/2 | 1 7/8-12 | 2 1/4-12 | 3 | 1 3/8 | 8 15/16 | | | | | | | | | | 3.250 | 7/16 |
| | 3 | 3 | 2 1/4-12 | 2 3/4-12 | 3 1/2 | 1 3/8 | 8 15/16 | | | | | | | | | | 3.875 | 1/2 |
| | 4 | 3 1/2 | 2 1/2-12 | 3 1/4-12 | 3 1/2 | 1 3/8 | 8 15/16 | | | | | | | | | | 4.375 | 1/2 |
| **6** | 1 | 2 1/2 | 1 7/8-12 | 2 1/4-12 | 3 | 1 1/4 | 9 5/8 | 7 1/2 | 1 | 2 5/32 | 2 5/32 | -16 | 5.73 | 1 | 9 7/16 | 11 1/4 | 3.250 | 5/16 |
| | 2 | 3 | 2 1/4-12 | 2 3/4-12 | 3 1/2 | 1 1/4 | 9 5/8 | | | | | | | | | | 3.875 | 3/8 |
| | 3 | 3 1/2 | 2 1/2-12 | 3 1/4-12 | 3 1/2 | 1 1/4 | 9 5/8 | | | | | | | | | | 4.375 | 5/16 |

**Notes:**
1. All dimensions in inches.
2. EE standard port is SAE. See page 20 for Optional Ports.
3. See Cylinder Nomenclature for thread options.
4. For Optional Rod Ends and dimensions see page16.
5. See page 14 for Maximum Probe Length.

## Model **T3HR** Rod End Rectangular Flange

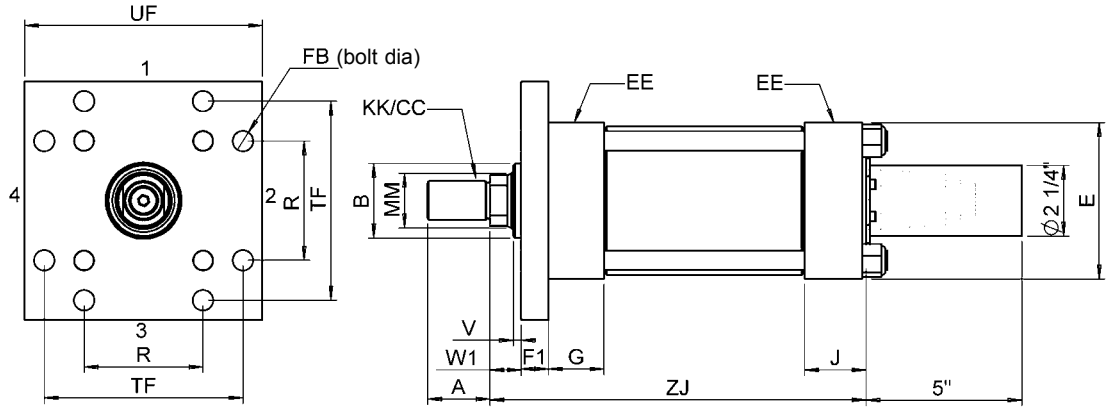
NFPA Style MF1




| Model **T3HR** Max. Pressure (PSI) | | |
|---|---|---|
| **BORE** | **PUSH** | **PULL** |
| **1 1/2** | 3000 | 3000 |
| **2** | 2500 | 3000 |
| **2 1/2** | 2000 | 3000 |
| **3 1/4** | 1500 | 3000 |
| **4** | 1500 | 3000 |
| **5** | 1000 | 2000 |
| **6** | 1000 | 2000 |

## Model **T3HRS** Rod End Square Flange

NFPA Style MF5



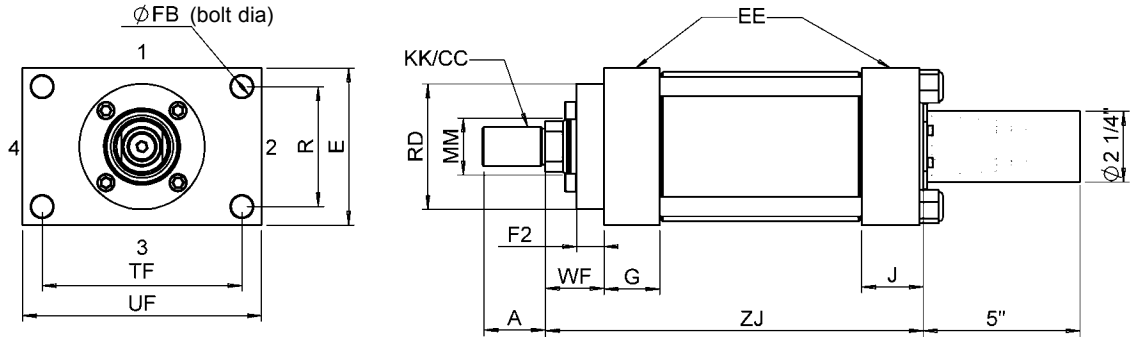

| Model **T3HRS** Max. Pressure (PSI) | | |
|---|---|---|
| **BORE** | **PUSH** | **PULL** |
| **1 1/2** | 3000 | 3000 |
| **2** | 3000 | 3000 |
| **2 1/2** | 2500 | 3000 |
| **3 1/4** | 2200 | 3000 |
| **4** | 2100 | 3000 |
| **5** | 1400 | 2000 |
| **6** | 1800 | 2000 |

# model T3HG

| BORE | ROD | ROD DIA MM | KK | CC | A | WF | + STROKE ZJ | E | F | ME5 G | J | EE SAE | R | FB | RD | TF | UF |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 1/2 | 1 | 1 | 3/4-16 | 7/8-14 | 1 1/8 | 1 3/8 | 7 1/16 | 3 1/2 | 9/16 | 1 1/2 | 2 3/16 | -08 | 2.55 | 1/2 | 3 | 4 5/8 | 5 5/8 |
| | 2 | 1 3/8 | 1-14 | 1 1/4-12 | 1 5/8 | 1 5/8 | 7 5/16 | | | | | | | | 3 1/2 | | |
| | 3 | 1 3/4 | 1 1/4-12 | 1 1/2-12 | 2 | 1 7/8 | 7 9/16 | | | | | | | | 3 3/4 | | |
| 3 1/4 | 1 | 1 3/8 | 1-14 | 1 1/4-12 | 1 5/8 | 1 5/8 | 7 5/8 | 4 1/2 | 3/4 | 1 25/32 | 2 3/97 | -12 | 3.25 | 5/8 | 3 1/2 | 5 7/8 | 7 1/8 |
| | 2 | 1 3/4 | 1 1/4-12 | 1 1/2-12 | 2 | 1 7/8 | 7 7/8 | | | | | | | | 4 | | |
| | 3 | 2 | 1 1/2-12 | 1 3/4-12 | 2 1/4 | 2 | 8 | | | | | | | | 4 1/2 | | |
| 4 | 1 | 1 3/4 | 1 1/4-12 | 1 1/2-12 | 2 | 1 7/8 | 8 1/16 | 5 | 7/8 | 1 25/32 | 1 31/32 | -12 | 3.81 | 5/8 | 4 | 6 3/8 | 7 5/8 |
| | 2 | 2 | 1 1/2-12 | 1 3/4-12 | 2 1/4 | 2 | 8 3/16 | | | | | | | | 4 1/2 | | |
| | 3 | 2 1/2 | 1 7/8-12 | 2 1/4-12 | 3 | 2 1/4 | 8 7/16 | | | | | | | | 5 | | |
| 5 | 1 | 2 | 1 1/2-12 | 1 3/4-12 | 2 1/4 | 2 | 8 11/16 | 6 1/2 | 7/8 | 1 25/32 | 1 31/32 | -12 | 4.95 | 7/8 | 4 1/2 | 8 3/16 | 9 3/4 |
| | 2 | 2 1/2 | 1 7/8-12 | 2 1/4-12 | 3 | 2 1/4 | 8 15/16 | | | | | | | | 5 | | |
| | 3 | 3 | 2 1/4-12 | 2 3/4-12 | 3 1/2 | 2 1/4 | 8 15/16 | | | | | | | | 5 3/4 | | |
| | 4 | 3 1/2 | 2 1/2-12 | 3 1/4-12 | 3 1/2 | 2 1/4 | 8 15/16 | | | | | | | | 6 | | |
| 6 | 1 | 2 1/2 | 1 7/8-12 | 2 1/4-12 | 3 | 2 1/4 | 9 5/8 | 7 1/2 | 1 | 2 5/32 | 2 5/32 | -16 | 5.73 | 1 | 5 | 9 7/16 | 11 1/4 |
| | 2 | 3 | 2 1/4-12 | 2 3/4-12 | 3 1/2 | 2 1/4 | 9 5/8 | | | | | | | | 6 1/2 | | |
| | 3 | 3 1/2 | 2 1/2-12 | 3 1/4-12 | 3 1/2 | 2 1/4 | 9 5/8 | | | | | | | | 6 1/2 | | |

**Notes:**
1. All dimensions in inches.
2. EE standard port is SAE. See page 20 for Optional Ports.
3. See Cylinder Nomenclature for thread options.
4. For Optional Rod Ends and dimensions see page 16.
5. See page 14 for Maximum Probe Length.

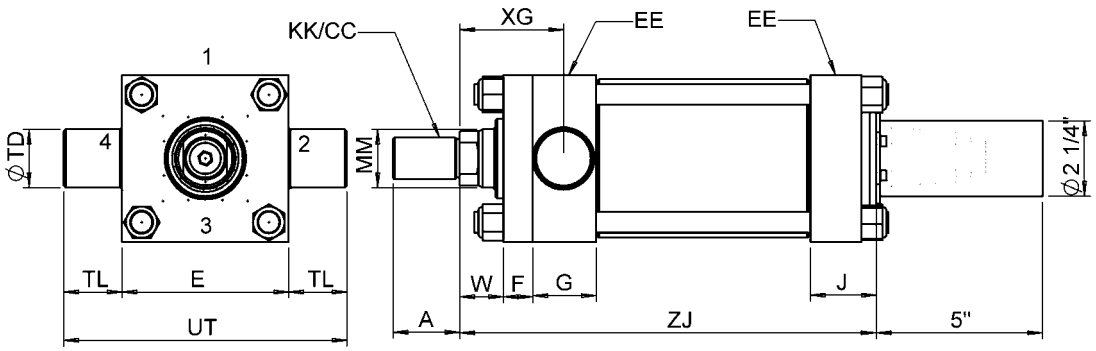
## Model **T3HG**
## Rectangular Gland End Head
NFPA Style ME5



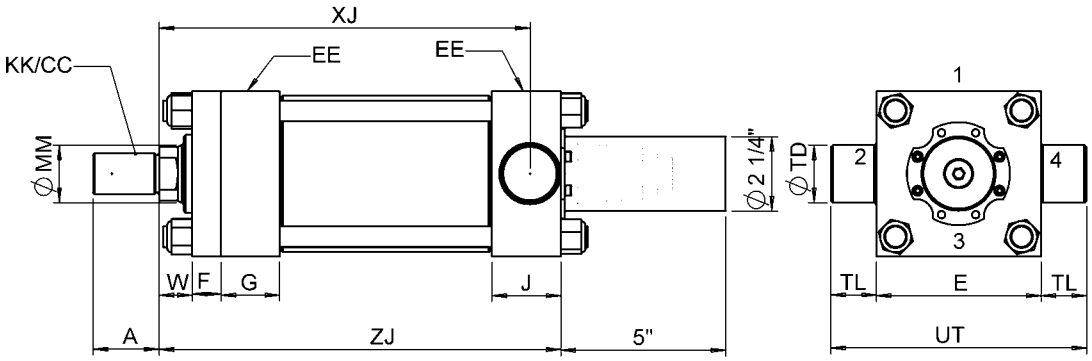
| BORE | ROD | ROD DIA MM | KK | CC | A | W | XG | ADD STROKE XJ | ADD STROKE HTR ZJ | ADD STROKE HTB ZJ | E | F | HTR G | HTR J | HTB G | HTB J | EE SAE | TD | TL | UT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1 1/2** | 1 | 1 | 3/4-16 | 7/8-14 | 1 1/8 | 1 | 2 1/4 | 5 1/4 | 6 7/8 | 6 7/8 | 2 1/2 | 3/8 | 1 9/16 | 2 7/16 | 1 9/16 | 2 7/16 | -08 | 1 | 1 | 4 1/2 |
| **2** | 1 | 1 | 3/4-16 | 7/8-14 | 1 1/8 | 3/4 | 2 1/4 | 5 1/2 | 7 1/8 | 6 15/16 | 3 | 5/8 | 1 21/32 | 2 5/32 | 1 15/32 | 2 5/32 | -08 | 1 3/8 | 1 3/8 | 5 3/4 |
| | 2 | 1 3/8 | 1-14 | 1 1/4-12 | 1 5/8 | 1 | 2 1/2 | 5 3/4 | 7 3/8 | 7 3/16 | | | | | | | | | | |
| **2 1/2** | 1 | 1 | 3/4-16 | 7/8-14 | 1 1/8 | 3/4 | 2 1/4 | 5 11/16 | 7 1/4 | 7 1/16 | 3 1/2 | 9/16 | 1 3/4 | 2 3/16 | 1 9/16 | 2 3/16 | -08 | 1 3/8 | 1 3/8 | 6 1/4 |
| | 2 | 1 3/8 | 1-14 | 1 1/4-12 | 1 5/8 | 1 | 2 1/2 | 5 15/16 | 7 1/2 | 7 5/16 | | | | | | | | | | |
| | 3 | 1 3/4 | 1 1/4-12 | 1 1/2-12 | 2 | 1 1/4 | 2 3/4 | 6 3/16 | 7 3/4 | 7 9/16 | | | | | | | | | | |
| **3 1/4** | 1 | 1 3/8 | 1-14 | 1 1/4-12 | 1 5/8 | 7/8 | 2 5/8 | 6 1/2 | 7 3/4 | 7 5/8 | 4 1/2 | 3/4 | 1 29/32 | 2 1/32 | 1 25/32 | 2 1/32 | -12 | 1 3/4 | 1 3/4 | 8 |
| | 2 | 1 3/4 | 1 1/4-12 | 1 1/2-12 | 2 | 1 1/8 | 2 7/8 | 6 3/4 | 8 | 7 7/8 | | | | | | | | | | |
| | 3 | 2 | 1 1/2-12 | 1 3/4-12 | 2 1/4 | 1 1/4 | 3 | 6 7/8 | 8 1/8 | 8 | | | | | | | | | | |
| **4** | 1 | 1 3/4 | 1 1/4-12 | 1 1/2-12 | 2 | 1 | 2 7/8 | 7 1/4 | 8 1/4 | 8 1/8 | 5 | 7/8 | 1 31/32 | 1 31/32 | 1 25/32 | 2 1/32 | -12 | 1 3/4 | 1 3/4 | 8 1/2 |
| | 2 | 2 | 1 1/2-12 | 1 3/4-12 | 2 1/4 | 1 1/8 | 3 | 7 3/8 | 8 3/8 | 8 1/4 | | | | | | | | | | |
| | 3 | 2 1/2 | 1 7/8-12 | 2 1/4-12 | 3 | 1 3/8 | 3 1/4 | 7 5/8 | 8 5/8 | 8 1/2 | | | | | | | | | | |
| **5** | 1 | 2 | 1 1/2-12 | 1 3/4-12 | 2 1/4 | 1 1/8 | 3 | 7 3/4 | 8 7/8 | 8 7/8 | 6 1/2 | 7/8 | 1 31/32 | 1 31/32 | 1 25/32 | 2 5/32 | -12 | 1 3/4 | 1 3/4 | 10 |
| | 2 | 2 1/2 | 1 7/8-12 | 2 1/4-12 | 3 | 1 3/8 | 3 1/4 | 8 | 9 1/8 | 9 1/8 | | | | | | | | | | |
| | 3 | 3 | 2 1/4-12 | 2 3/4-12 | 3 1/2 | 1 3/8 | 3 1/4 | 8 | 9 1/8 | 9 1/8 | | | | | | | | | | |
| | 4 | 3 1/2 | 2 1/2-12 | 3 1/4-12 | 3 1/2 | 1 3/8 | 3 1/4 | 8 | 9 1/8 | 9 1/8 | | | | | | | | | | |
| **6** | 1 | 2 1/2 | 1 7/8-12 | 2 1/4-12 | 3 | 1 1/4 | 3 3/8 | 8 9/16 | 9 3/4 | 9 5/8 | 7 1/2 | 1 | 2 9/32 | 2 5/32 | 2 5/32 | 2 5/32 | -16 | 2 | 2 | 11 1/2 |
| | 2 | 3 | 2 1/4-12 | 2 3/4-12 | 3 1/2 | 1 1/4 | 3 3/8 | 8 9/16 | 9 3/4 | 9 5/8 | | | | | | | | | | |
| | 3 | 3 1/2 | 2 1/2-12 | 3 1/4-12 | 3 1/2 | 1 1/4 | 3 3/8 | 8 9/16 | 9 3/4 | 9 5/8 | | | | | | | | | | |

**Notes:**
1. All dimensions in inches.
2. EE standard port is SAE. See page 20 for Optional Ports.
3. See Cylinder Nomenclature for thread options.
4. For Optional Rod Ends and dimensions see page16.
5. See page 14 for Maximum Probe Length.

Model **T3HTR**
**Rod End Trunnion**
NFPA Style MT1




Model **T3HTB**
**Blind End Trunnion**
NFPA Style MT2



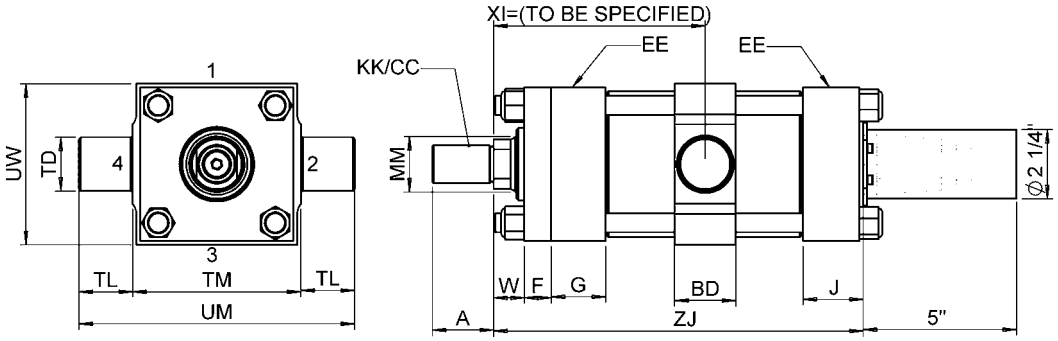

**Warning:** Trunnion mounted cylinders swivel in one direction and are designed to carry shear loads only. Pins must be held rigidly and in accurate alignment. Improper mounting may result in failure of mount.

# model T3HT

| BORE | ROD | ROD DIA MM | KK | CC | A | W | + STR ZJ | HT XI (min) | E | F | G | J | EE SAE | TD | TL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 1/2 | 1 | 1 | 3/4-16 | 7/8-14 | 1 1/8 | 1 | 6 7/8 | 3 9/16 | 2 1/2 | 3/8 | 1 9/16 | 2 7/16 | -08 | 1 | 1 |
| | 2 | | | | | | | | | | | | | 1 | 1 |
| 2 | 1 | 1 | 3/4-16 | 7/8-14 | 1 1/8 | 3/4 | 7 1/16 | 3 5/8 | 3 | 5/8 | 1 15/32 | 2 5/32 | -08 | 1 3/8 | 1 3/8 |
| | 2 | 1 3/8 | 1-14 | 1 1/4-12 | 1 5/8 | 1 | 7 5/16 | 3 7/8 | | | | | | 1 3/8 | 1 3/8 |
| 2 1/2 | 1 | 1 | 3/4-16 | 7/8-14 | 1 1/8 | 3/4 | 7 1/16 | 3 5/8 | 3 1/2 | 9/16 | 1 9/16 | 2 3/16 | -08 | 1 3/8 | 1 3/8 |
| | 2 | 1 3/8 | 1-14 | 1 1/4-12 | 1 5/8 | 1 | 7 5/16 | 3 15/16 | | | | | | 1 3/8 | 1 3/8 |
| | 3 | 1 3/4 | 1 1/4-12 | 1 1/2-12 | 2 | 1 1/4 | 7 9/16 | 4 3/16 | | | | | | 1 3/8 | 1 3/8 |
| 3 1/4 | 1 | 1 3/8 | 1-14 | 1 1/4-12 | 1 5/8 | 7/8 | 7 5/8 | 4 7/16 | 4 1/2 | 3/4 | 1 25/32 | 2 1/32 | -12 | 1 3/4 | 1 3/4 |
| | 2 | 1 3/4 | 1 1/4-12 | 1 1/2-12 | 2 | 1 1/8 | 7 7/8 | 4 11/16 | | | | | | 1 3/4 | 1 3/4 |
| | 3 | 2 | 1 1/2-12 | 1 3/4-12 | 2 1/4 | 1 1/4 | 8 | 4 13/16 | | | | | | 1 3/4 | 1 3/4 |
| 4 | 1 | 1 3/4 | 1 1/4-12 | 1 1/2-12 | 2 | 1 | 8 1/16 | 4 11/16 | 5 | 7/8 | 1 25/32 | 1 31/32 | -12 | 1 3/4 | 1 3/4 |
| | 2 | 2 | 1 1/2-12 | 1 3/4-12 | 2 1/4 | 1 1/8 | 8 3/16 | 4 13/16 | | | | | | 1 3/4 | 1 3/4 |
| | 3 | 2 1/2 | 1 7/8-12 | 2 1/4-12 | 3 | 1 3/8 | 8 7/16 | 5 1/16 | | | | | | 1 3/4 | 1 3/4 |
| 5 | 1 | 2 | 1 1/2-12 | 1 3/4-12 | 2 1/4 | 1 1/8 | 8 11/16 | 4 13/16 | 6 1/2 | 7/8 | 1 25/32 | 1 31/32 | -12 | 1 3/4 | 1 3/4 |
| | 2 | 2 1/2 | 1 7/8-12 | 2 1/4-12 | 3 | 1 3/8 | 8 15/16 | 5 1/16 | | | | | | 1 3/4 | 1 3/4 |
| | 3 | 3 | 2 1/4-12 | 2 3/4-12 | 3 1/2 | 1 3/8 | 8 15/16 | 5 1/16 | | | | | | 1 3/4 | 1 3/4 |
| | 4 | 3 1/2 | 2 1/2-12 | 3 1/4-12 | 3 1/2 | 1 3/8 | 8 15/16 | 5 1/16 | | | | | | 1 3/4 | 1 3/4 |
| 6 | 1 | 2 1/2 | 1 7/8-12 | 2 1/4-12 | 3 | 1 1/4 | 9 5/8 | 5 15/16 | 7 1/2 | 1 | 2 5/32 | 2 5/32 | -16 | 2 | 2 |
| | 2 | 3 | 2 1/4-12 | 2 3/4-12 | 3 1/2 | 1 1/4 | 9 5/8 | 5 15/16 | | | | | | 2 | 2 |
| | 3 | 3 1/2 | 2 1/2-12 | 3 1/4-12 | 3 1/2 | 1 1/4 | 9 5/8 | 5 15/16 | | | | | | 2 | 2 |

**Notes:**
1. All dimensions in inches.
2. EE standard port is SAE. See page 20 for Optional Ports.
3. See Cylinder Nomenclature for thread options.
4. For Optional Rod Ends and dimensions see page16.
5. See page 14 for Maximum Probe Length.

Model **T3HT**
**Mid-Trunnion**
NFPA Style MT4




| BORE | HT BD | TM | UM | UW |
|---|---|---|---|---|
| 1 1/2 | 1 3/16 | 3 | 5 | 2 7/8 |
| 2 | 1 1/2 | 3 1/2 | 6 1/4 | 3 1/2 |
| 2 1/2 | 1 1/2 | 4 | 6 3/4 | 4 |
| 3 1/4 | 2 | 5 | 8 1/2 | 5 |
| 4 | 2 | 5 1/2 | 9 | 5 1/4 |
| 5 | 2 | 7 | 10 1/2 | 6 3/4 |
| 6 | 3 | 8 1/2 | 12 1/2 | 9 |
| 7 | 3 | 9 3/4 | 14 3/4 | 10 |
| 8 | 3 1/2 | 11 | 17 | 12 |

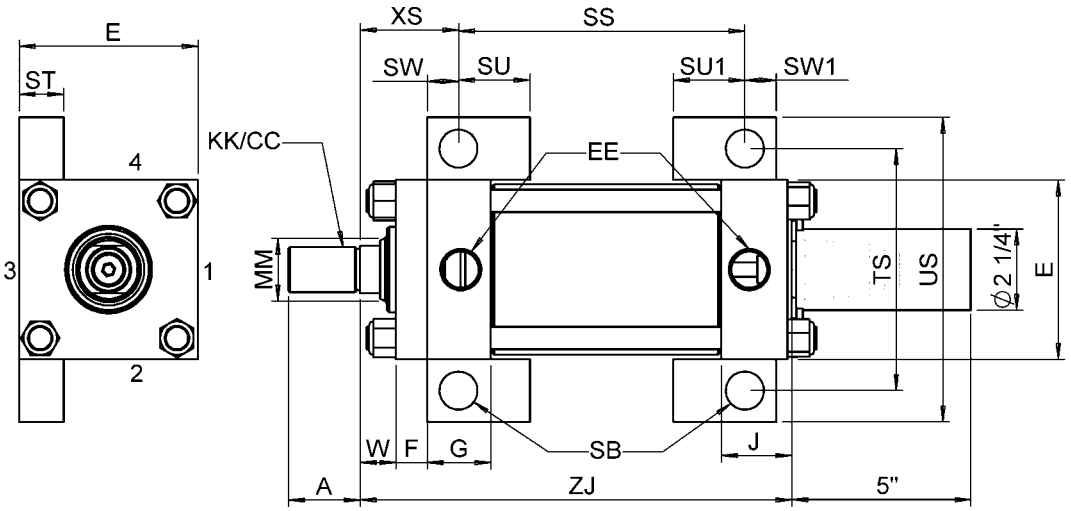
**Warning:** Trunnion mounted cylinders swivel in one direction and are designed to carry shear loads only. Pins must be held rigidly and in accurate alignment. Improper mounting may result in failure of mount.

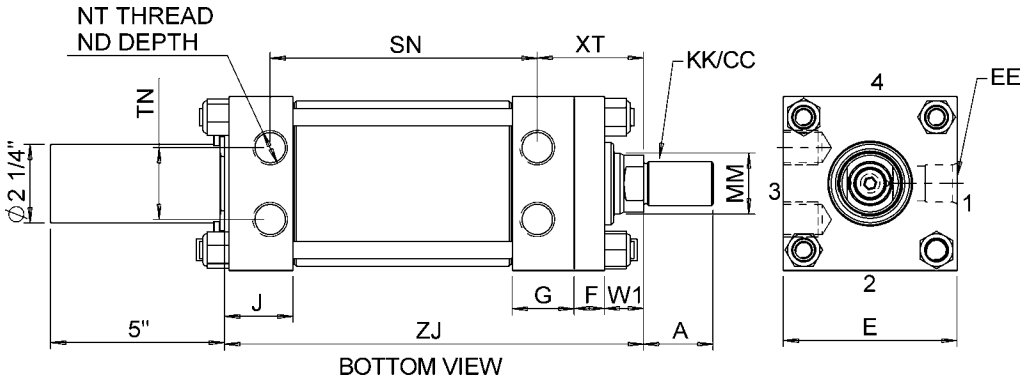
| BORE | ROD DIA ROD | ROD DIA MM | KK | CC | A | W | W1 | XS | XT | ADD STROKE ZJ | ADD STROKE SS | E | F | G | J | EE SAE | SB | SU | SW | ST | TS | US |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1 1/2** | 1 | 1 | 3/4-16 | 7/8-14 | 1 1/8 | 1 | 1 | 1 3/4 | 2 3/8 | 6 7/8 | 3 7/8 | 2 1/2 | 3/8 | 1 9/16 | 2 7/16 | -08 | 3/8 | 15/16 | 3/8 | 1/2 | 3 1/4 | 4 |
| **2** | 1 | 1 | 3/4-16 | 7/8-14 | 1 1/8 | 3/4 | 3/4 | 1 7/8 | 2 3/8 | 7 1/16 | 3 5/8 | 3 | 5/8 | 1 15/32 | 2 5/32 | -08 | 1/2 | 1 1/4 | 1/2 | 3/4 | 4 | 5 |
| | 2 | 1 3/8 | 1-14 | 1 1/4-12 | 1 5/8 | 1 | 1 | 2 1/8 | 2 5/8 | 7 5/16 | 3 5/8 | | | | | | | | | | | |
| **2 1/2** | 1 | 1 | 3/4-16 | 7/8-14 | 1 1/8 | 3/4 | 3/4 | 2 1/16 | 2 3/8 | 7 1/16 | 3 3/8 | 3 1/2 | 9/16 | 1 9/16 | 2 3/16 | -08 | 3/4 | 1 1/2 | 3/4 | 1 | 4 7/8 | 6 1/4 |
| | 2 | 1 3/8 | 1-14 | 1 1/4-12 | 1 5/8 | 1 | 1 | 2 5/16 | 2 5/8 | 7 5/16 | 3 3/8 | | | | | | | note 5 | note 5 | | | |
| | 3 | 1 3/4 | 1 1/4-12 | 1 1/2-12 | 2 | 1 1/4 | 1 1/4 | 2 9/16 | N/A | 7 9/16 | 3 3/8 | | | | | | | | | | | |
| **3 1/4** | 1 | 1 3/8 | 1-14 | 1 1/4-12 | 1 5/8 | 7/8 | 7/8 | 2 5/16 | 2 3/4 | 7 5/8 | 4 1/8 | 4 1/2 | 3/4 | 1 25/32 | 2 1/32 | -12 | 3/4 | 1 9/16 | 11/16 | 1 | 5 7/8 | 7 1/4 |
| | 2 | 1 3/4 | 1 1/4-12 | 1 1/2-12 | 2 | 1 1/8 | 1 1/8 | 2 9/16 | 3 | 7 7/8 | 4 1/8 | | | | | | | | | | | |
| | 3 | 2 | 1 1/2-12 | 1 3/4-12 | 2 1/4 | 1 1/4 | 1 1/4 | 2 11/16 | N/A | 8 | 4 1/8 | | | | | | | | | | | |
| **4** | 1 | 1 3/4 | 1 1/4-12 | 1 1/2-12 | 2 | 1 | 1 1/16 | 2 3/4 | 3 | 8 1/16 | 4 | 5 | 7/8 | 1 25/32 | 1 31/32 | -12 | 1 | 2 | 7/8 | 1 1/4 | 6 3/4 | 8 1/2 |
| | 2 | 2 | 1 1/2-12 | 1 3/4-12 | 2 1/4 | 1 1/8 | 1 3/16 | 2 7/8 | 3 1/8 | 8 3/16 | 4 | | | | | | | | | | | |
| | 3 | 2 1/2 | 1 7/8-12 | 2 1/4-12 | 3 | 1 3/8 | 1 7/16 | 3 1/8 | N/A | 8 7/16 | 4 | | | | | | | | | | | |
| **5** | 1 | 2 | 1 1/2-12 | 1 3/4-12 | 2 1/4 | 1 1/8 | 1 3/16 | 2 7/8 | 3 1/8 | 8 11/16 | 4 1/2 | 6 1/2 | 7/8 | 1 25/32 | 1 31/32 | -12 | 1 | 2 | 7/8 | 1 1/4 | 8 1/4 | 10 |
| | 2 | 2 1/2 | 1 7/8-12 | 2 1/4-12 | 3 | 1 3/8 | 1 7/16 | 3 1/8 | 3 3/8 | 8 15/16 | 4 1/2 | | | | | | | | | | | |
| | 3 | 3 | 2 1/4-12 | 2 3/4-12 | 3 1/2 | 1 3/8 | 1 7/16 | 3 1/8 | 3 3/8 | 8 15/16 | 4 1/2 | | | | | | | | | | | |
| | 4 | 3 1/2 | 2 1/2-12 | 3 1/4-12 | 3 1/2 | 1 3/8 | 1 7/16 | 3 1/8 | 3 3/8 | 8 15/16 | 4 1/2 | | | | | | | | | | | |
| **6** | 1 | 2 1/2 | 1 7/8-12 | 2 1/4-12 | 3 | 1 1/4 | 1 1/4 | 3 3/8 | 3 1/2 | 9 5/8 | 5 1/8 | 7 1/2 | 1 | 2 5/32 | 2 5/32 | -16 | 1 1/4 | 2 1/2 | 1 1/8 | 1 1/2 | 9 3/4 | 12 |
| | 2 | 3 | 2 1/4-12 | 2 3/4-12 | 3 1/2 | 1 1/4 | 1 1/4 | 3 3/8 | 3 1/2 | 9 5/8 | 5 1/8 | | | | | | | | | | | |
| | 3 | 3 1/2 | 2 1/2-12 | 3 1/4-12 | 3 1/2 | 1 1/4 | 1 1/4 | 3 3/8 | 3 1/2 | 9 5/8 | 5 1/8 | | | | | | | | | | | |

**Notes:**

1. All dimensions in inches.
2. EE standard port is SAE. See page 20 for Optional Ports.
3. See Cylinder Nomenclature for thread options.
4. For Optional Rod Ends and dimensions see page16.
5. SU1 = SU and SW1 = SW except for 2 1/2" bore, where SU1 = 1 9/16" and SW1 = 11/16".
6. See page 14 for Maximum Probe Length.

Model **T3HF**
**Foot Mount**
NFPA Style MS2




Model **T3HS**
**Side Tapped**
NFPA Style MS4

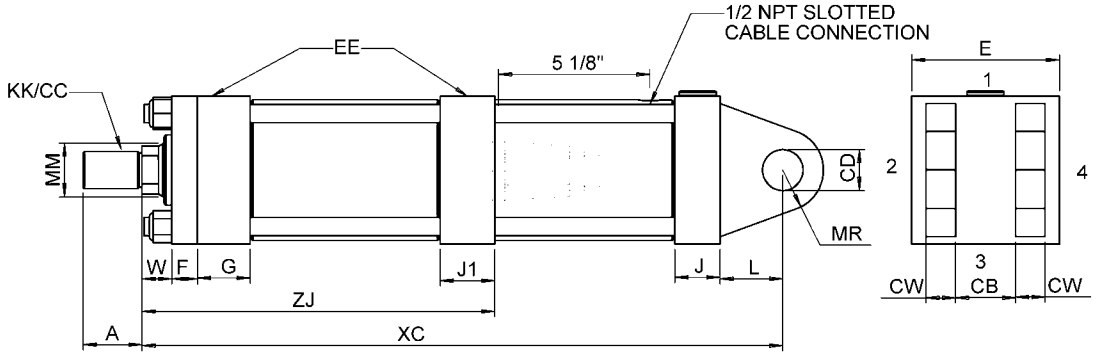
| BORE | NT | TN | ADD STROKE SN |
|---|---|---|---|
| **1 1/2** | 3/8-16 | 3/4 | 2 7/8 |
| **2** | 1/2-13 | 15/16 | 2 7/8 |
| **2 1/2** | 5/8-11 | 1 5/16 | 3 |
| **3 1/4** | 3/4-10 | 1 1/2 | 3 1/2 |
| **4** | 1-8 | 2 1/16 | 3 3/4 |
| **5** | 1-8 | 2 15/16 | 4 1/4 |
| **6** | 1 1/4-7 | 3 5/16 | 5 1/8 |


# model T3HC, T3HE

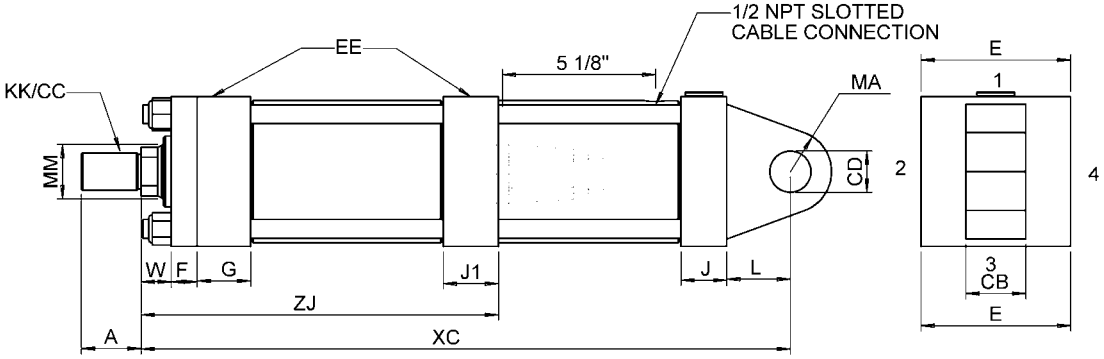
| BORE | ROD | ROD DIA MM | KK | CC | A | W | + STR XC | + STR ZJ | E | F | G | J | J1 | L | HC CB | HE CB | CD | CW | EE SAE | MR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 1 | 1 | 3/4-16 | 7/8-14 | 1 1/8 | 3/4 | 15 3/8 | 7 1/16 | 3 | 5/8 | 1 15/32 | 1 7/32 | 2 1/32 | 1 1/4 | 1 9/32 | 1 1/4 | 3/4 | 5/8 | -08 | 3/4 |
| | 2 | 1 3/8 | 1-14 | 1 1/4-12 | 1 5/8 | 1 | 15 5/8 | 7 5/16 | | | | | | | | | | | | |
| 2 1/2 | 1 | 1 | 3/4-16 | 7/8-14 | 1 1/8 | 3/4 | 15 9/16 | 7 1/16 | 3 1/2 | 9/16 | 1 9/16 | 1 1/4 | 2 5/32 | 1 1/4 | 1 9/32 | 1 1/4 | 3/4 | 5/8 | -08 | 3/4 |
| | 2 | 1 3/8 | 1-14 | 1 1/4-12 | 1 5/8 | 1 | 15 13/16 | 7 5/16 | | | | | | | | | | | | |
| | 3 | 1 3/4 | 1 1/4-12 | 1 1/2-12 | 2 | 1 1/4 | 16 1/16 | 7 9/16 | | | | | | | | | | | | |
| 3 1/4 | 1 | 1 3/8 | 1-14 | 1 1/4-12 | 1 5/8 | 7/8 | 16 5/8 | 7 5/8 | 4 1/2 | 3/4 | 1 25/32 | 1 17/32 | 2 1/16 | 1 1/2 | 1 17/32 | 1 1/2 | 1 | 3/4 | -12 | 1 |
| | 2 | 1 3/4 | 1 1/4-12 | 1 1/2-12 | 2 | 1 1/8 | 16 7/8 | 7 7/8 | | | | | | | | | | | | |
| | 3 | 2 | 1 1/2-12 | 1 3/4-12 | 2 1/4 | 1 1/4 | 17 | 8 | | | | | | | | | | | | |
| 4 | 1 | 1 3/4 | 1 1/4-12 | 1 1/2-12 | 2 | 1 | 17 7/8 | 8 1/16 | 5 | 7/8 | 1 25/32 | 1 17/32 | 1 27/32 | 2 1/8 | 2 1/32 | 2 | 1 3/8 | 1 | -12 | 1 3/8 |
| | 2 | 2 | 1 1/2-12 | 1 3/4-12 | 2 1/4 | 1 1/8 | 18 | 8 3/16 | | | | | | | | | | | | |
| | 3 | 2 1/2 | 1 7/8-12 | 2 1/4-12 | 3 | 1 3/8 | 18 1/4 | 8 7/16 | | | | | | | | | | | | |
| 5 | 1 | 2 | 1 1/2-12 | 1 3/4-12 | 2 1/4 | 1 1/8 | 18 7/16 | 8 11/16 | 6 1/2 | 7/8 | 1 25/32 | 1 17/32 | 1 27/32 | 2 1/4 | 2 17/32 | 2 1/2 | 1 3/4 | 1 1/4 | -12 | 1 3/4 |
| | 2 | 2 1/2 | 1 7/8-12 | 2 1/4-12 | 3 | 1 3/8 | 18 11/16 | 8 15/16 | | | | | | | | | | | | |
| | 3 | 3 | 2 1/4-12 | 2 3/4-12 | 3 1/2 | 1 3/8 | 18 11/16 | 8 15/16 | | | | | | | | | | | | |
| | 4 | 3 1/2 | 2 1/2-12 | 3 1/4-12 | 3 1/2 | 1 3/8 | 18 11/16 | 8 15/16 | | | | | | | | | | | | |
| 6 | 1 | 2 1/2 | 1 7/8-12 | 2 1/4-12 | 3 | 1 1/4 | 20 1/4 | 9 5/8 | 7 1/2 | 1 | 2 5/32 | 2 5/32 | 2 1/32 | 2 1/2 | 2 17/32 | 2 1/2 | 2 | 1 1/4 | -16 | 2 |
| | 2 | 3 | 2 1/4-12 | 2 3/4-12 | 3 1/2 | 1 1/4 | 20 1/4 | 9 5/8 | | | | | | | | | | | | |
| | 3 | 3 1/2 | 2 1/2-12 | 3 1/4-12 | 3 1/2 | 1 1/4 | 20 1/4 | 9 5/8 | | | | | | | | | | | | |

**Notes:**
1. All dimensions in inches.
2. EE standard port is SAE. See page 20 for Optional Ports.
3. See Cylinder Nomenclature for thread options.
4. For Optional Rod Ends and dimensions see page16.
5. See page 14 for Maximum Probe Length.

Model **T3HC**
**Fixed Clevis**
NFPA Style MP1



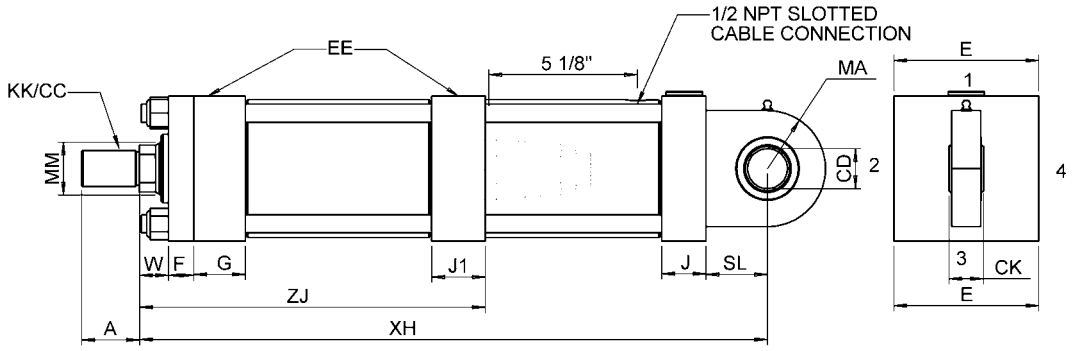

Model **T3HE**
**Pivot Eye**
NFPA Style MP3



| BORE | ROD | ROD DIA MM | KK | CC | A | W | + STR XH | + STR ZJ | E | F | G | J | J1 | SL | CD | CK | EE SAE | MA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **2** | 1 | 1 | 3/4-16 | 7/8-14 | 1 1/8 | 3/4 | 15 3/8 | 7 1/16 | 3 | 5/8 | 1 15/32 | 1 7/32 | 2 1/32 | 1 1/4 | 3/4 | 21/32 | -08 | 1 1/4 |
| | 2 | 1 3/8 | 1-14 | 1 1/4-12 | 1 5/8 | 1 | 15 5/8 | 7 5/16 | | | | | | | | | | |
| **2 1/2** | 1 | 1 | 3/4-16 | 7/8-14 | 1 1/8 | 3/4 | 15 9/16 | 7 1/16 | 3 1/2 | 9/16 | 1 9/16 | 1 1/4 | 2 5/32 | 1 1/4 | 3/4 | 21/32 | -08 | 1 1/4 |
| | 2 | 1 3/8 | 1-14 | 1 1/4-12 | 1 5/8 | 1 | 15 13/16 | 7 5/16 | | | | | | | | | | |
| | 3 | 1 3/4 | 1 1/4-12 | 1 1/2-12 | 2 | 1 1/4 | 16 1/16 | 7 9/16 | | | | | | | | | | |
| **3 1/4** | 1 | 1 3/8 | 1-14 | 1 1/4-12 | 1 5/8 | 7/8 | 16 5/8 | 7 5/8 | 4 1/2 | 3/4 | 1 25/32 | 1 17/32 | 2 1/16 | 1 1/2 | 1 | 7/8 | -12 | 1 1/2 |
| | 2 | 1 3/4 | 1 1/4-12 | 1 1/2-12 | 2 | 1 1/8 | 16 7/8 | 7 7/8 | | | | | | | | | | |
| | 3 | 2 | 1 1/2-12 | 1 3/4-12 | 2 1/4 | 1 1/4 | 17 | 8 | | | | | | | | | | |
| **4** | 1 | 1 3/4 | 1 1/4-12 | 1 1/2-12 | 2 | 1 | 17 7/8 | 8 1/16 | 5 | 7/8 | 1 25/32 | 1 17/32 | 1 27/32 | 2 1/8 | 1 3/8 | 1 3/16 | -12 | 2 |
| | 2 | 2 | 1 1/2-12 | 1 3/4-12 | 2 1/4 | 1 1/8 | 18 | 8 3/16 | | | | | | | | | | |
| | 3 | 2 1/2 | 1 7/8-12 | 2 1/4-12 | 3 | 1 3/8 | 18 1/4 | 8 7/16 | | | | | | | | | | |
| **5** | 1 | 2 | 1 1/2-12 | 1 3/4-12 | 2 1/4 | 1 1/8 | 18 7/16 | 8 11/16 | 6 1/2 | 7/8 | 1 25/32 | 1 17/32 | 1 27/32 | 2 1/4 | 1 3/4 | 1 17/32 | -12 | 2 3/4 |
| | 2 | 2 1/2 | 1 7/8-12 | 2 1/4-12 | 3 | 1 3/8 | 18 11/16 | 8 15/16 | | | | | | | | | | |
| | 3 | 3 | 2 1/4-12 | 2 3/4-12 | 3 1/2 | 1 3/8 | 18 11/16 | 8 15/16 | | | | | | | | | | |
| | 4 | 3 1/2 | 2 1/2-12 | 3 1/4-12 | 3 1/2 | 1 3/8 | 18 11/16 | 8 15/16 | | | | | | | | | | |
| **6** | 1 | 2 1/2 | 1 7/8-12 | 2 1/4-12 | 3 | 1 1/4 | 20 1/4 | 9 5/8 | 7 1/2 | 1 | 2 5/32 | 2 5/32 | 2 1/32 | 2 1/2 | 2 | 1 3/4 | -16 | 3 |
| | 2 | 3 | 2 1/4-12 | 2 3/4-12 | 3 1/2 | 1 1/4 | 20 1/4 | 9 5/8 | | | | | | | | | | |
| | 3 | 3 1/2 | 2 1/2-12 | 3 1/4-12 | 3 1/2 | 1 1/4 | 20 1/4 | 9 5/8 | | | | | | | | | | |

**Notes:**
1. All dimensions in inches.
2. EE standard port is SAE. See page 20 for Optional Ports.
3. See Cylinder Nomenclature for thread options.
4. For Optional Rod Ends and dimensions see page16.
5. See page 14 for Maximum Probe Length.

Model **T3HW**
**Self-aligning Eye**
NFPA Style MPU3

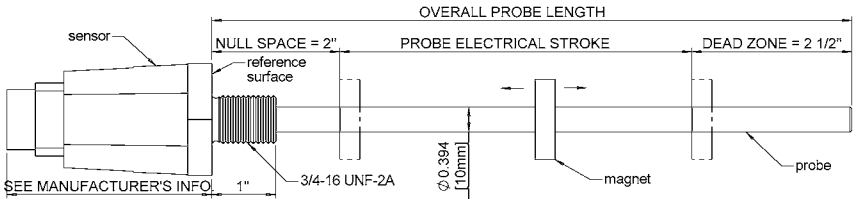



| MAXIMUM OPERATING PRESSURE (PSI) * | | |
|---|---|---|
| | MODEL T3HW | |
| BORE | CONTINUOUS | INTERMITTENT |
| **1 1/2** | 1600 | 2100 |
| **2** | 2100 | 2800 |
| **2 1/2** | 1300 | 1800 |
| **3 1/4** | 1400 | 1800 |
| **4** | 1700 | 2200 |
| **5** | 1800 | 2400 |
| **6** | 1600 | 2200 |

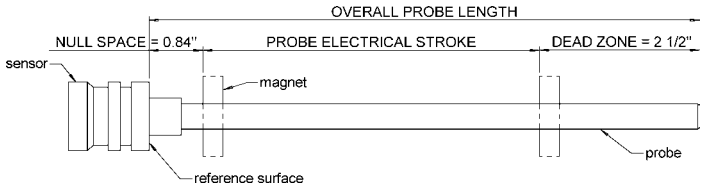
*Pressure ratings are based on the Dynamic Load Capacity of the bearing.

Referring to the probe illustrations below, sensors have a null and dead space where there is no positioning sensing. To ensure position sensing, the probe's electrical stroke must be no less then the stroke of the cylinder. A longer probe can be used, but care must be taken to make sure that it will fit. The tables below are to be used to establish the maximum overall length of a probe. If necessary, the maximum overall probe length can be increased by adding a rod extension 'W', a piston stop 'PS', or thread extension 'A' (male threads only) to the cylinder. Such additions must be specified in the cylinder nomenclature.

**T3H**




**T4H**




**T3H-Series**

| BORE | ROD | ROD DIA MM | Standard Values A | Standard Values W | Maximum Overall Probe Length – Add Cylinder Stroke – Male thread | Maximum Overall Probe Length – Add Cylinder Stroke – Female thread |
|---|---|---|---|---|---|---|
| 1 1/2 | 1 | 1 | 1 1/8 | 1 | 7 3/16 | 4 15/16 |
| 2 | 1 | 1 | 1 1/8 | 3/4 | 7 1/4 | 5 |
| | 2 | 1 3/8 | 1 5/8 | 1 | 8 | 4 11/16 |
| 2 1/2 | 1 | 1 | 1 1/8 | 3/4 | 7 3/8 | 5 1/8 |
| | 2 | 1 3/8 | 1 5/8 | 1 | 8 1/8 | 4 13/16 |
| | 3 | 1 3/4 | 2 | 1 1/4 | 8 11/16 | 4 5/8 |
| 3 1/4 | 1 | 1 3/8 | 1 5/8 | 7/8 | 8 7/16 | 5 1/8 |
| | 2 | 1 3/4 | 2 | 1 1/8 | 9 | 4 15/16 |
| | 3 | 2 | 2 1/4 | 1 1/4 | 9 5/16 | 4 11/16 |
| 4 | 1 | 1 3/4 | 2 | 1 | 9 3/16 | 5 1/8 |
| | 2 | 2 | 2 1/4 | 1 1/8 | 9 1/2 | 4 7/8 |
| | 3 | 2 1/2 | 3 | 1 3/8 | 10 3/8 | 4 5/16 |
| 5 | 1 | 2 | 2 1/4 | 1 1/8 | 10 | 5 3/8 |
| | 2 | 2 1/2 | 3 | 1 3/8 | 10 7/8 | 4 13/16 |
| | 3 | 3 | 3 1/2 | 1 3/8 | 11 1/2 | 4 3/8 |
| | 4 | 3 1/2 | 3 1/2 | 1 3/8 | 11 3/8 | 4 5/16 |
| 6 | 1 | 2 1/2 | 3 | 1 1/4 | 11 9/16 | 5 1/2 |
| | 2 | 3 | 3 1/2 | 1 1/4 | 12 3/16 | 5 1/16 |
| | 3 | 3 1/2 | 3 1/2 | 1 1/4 | 12 1/16 | 5 |

**T4H-Series**

| BORE | ROD | ROD DIA MM | Standard Values A | Standard Values W | Maximum Overall Probe Length – Add Cylinder Stroke – Male thread | Maximum Overall Probe Length – Add Cylinder Stroke – Female thread |
|---|---|---|---|---|---|---|
| 1 1/2 | 1 | 1 | 1 1/8 | 1 | 6 1/16 | 3 3/4 |
| 2 | 1 | 1 | 1 1/8 | 3/4 | 6 1/8 | 3 13/16 |
| | 2 | 1 3/8 | 1 5/8 | 1 | 6 13/16 | 3 1/2 |
| 2 1/2 | 1 | 1 | 1 1/8 | 3/4 | 6 1/4 | 3 15/16 |
| | 2 | 1 3/8 | 1 5/8 | 1 | 6 15/16 | 3 5/8 |
| | 3 | 1 3/4 | 2 | 1 1/4 | 7 1/2 | 3 7/16 |
| 3 1/4 | 1 | 1 3/8 | 1 5/8 | 7/8 | 7 5/8 | 4 5/16 |
| | 2 | 1 3/4 | 2 | 1 1/8 | 8 3/16 | 4 1/8 |
| | 3 | 2 | 2 1/4 | 1 1/4 | 8 1/2 | 3 15/16 |
| 4 | 1 | 1 3/4 | 2 | 1 | 8 1/2 | 4 7/16 |
| | 2 | 2 | 2 1/4 | 1 1/8 | 8 13/16 | 4 1/4 |
| | 3 | 2 1/2 | 3 | 1 3/8 | 9 11/16 | 3 5/8 |
| 5 | 1 | 2 | 2 1/4 | 1 1/8 | 9 5/16 | 4 3/4 |
| | 2 | 2 1/2 | 3 | 1 3/8 | 10 3/16 | 4 1/8 |
| | 3 | 3 | 3 1/2 | 1 3/8 | 10 13/16 | 3 3/4 |
| | 4 | 3 1/2 | 3 1/2 | 1 3/8 | 10 11/16 | 3 5/8 |
| 6 | 1 | 2 1/2 | 3 | 1 1/4 | 11 5/16 | 5 1/4 |
| | 2 | 3 | 3 1/2 | 1 1/4 | 11 15/16 | 4 7/8 |
| | 3 | 3 1/2 | 3 1/2 | 1 1/4 | 11 13/16 | 4 3/4 |

**Considerations when specifying a Feedback Device for a Linear Positioner:**

- Accuracy required
- Available stroke lengths
- Output required (digital / analog)

**Positioner Accuracy**

The overall system accuracy is affected by:

- Mechanical integrity of linkages and alignments
- Sensor resolution and linearity

**Factors affecting system accuracy:**

- Non-Linearity – The difference from the indicated position (input) of the magnet to the actual position (output).
- Resolution – The smallest increment that can be detected by the transducer. Resolution can vary dependent upon the speed of the system and the number of interrogation cycles.
- Repeatability– defined as the error by returning to the same position when approaching from the same direction.
- Hysteresis – defined as the error by returning to the same position when approaching from opposite directions.
- Temperature Coefficient – defined as the potential fluctuation in actual to detected position over a temperature range.

The above parameters are additive. When specifying a feedback device refer to the documentation for the sensor for more information.

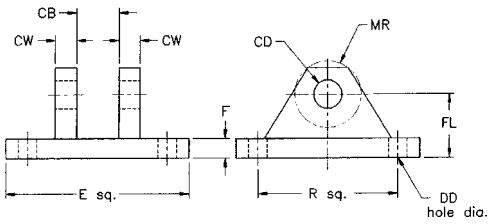
**How it Works (General)**

The probe wave-guide runs the length of the probe. The wave-guide which is a very small diameter tube has a conductor wire threaded coaxially through it. To begin a measurement for the cylinder position an electronic circuit sends an electrical pulse along the conductor wire. The electrical field generated by the pulse reacts with the magnetic field of a magnet attached to the piston.The effect of the reaction between the two fields creates a strainwave which travels down the wave guide at sonic speed and is sensed by the probe electronics. A high speed clock measures the time between the electronic pulse and the sonic wave to determine position.

## Clevis Type Mounting Bracket

Adapts to HE mount cylinder or HE rod eye

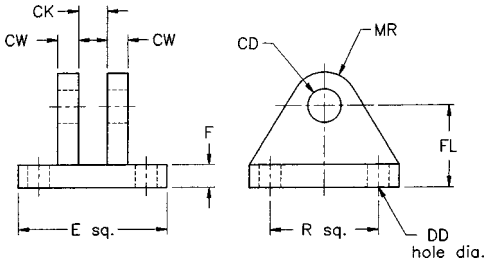
| PART | HCM15 | HCM2 | HCM32 | HCM4 | HCM5 | HCM6 | HCM7 | HCM8 | HCM10 | HCM12 |
|---|---|---|---|---|---|---|---|---|---|---|
| CB | 25/32 | 1 9/32 | 1 17/32 | 2 1/32 | 2 9/16 | 2 9/16 | 3 1/16 | 3 1/16 | 4 1/16 | 4 9/16 |
| CD | 1/2 | 3/4 | 1 | 1 3/8 | 1 3/4 | 2 | 2 1/2 | 3 | 3 1/2 | 4 |
| CW | 1/2 | 5/8 | 3/4 | 1 | 1 1/4 | 1 1/4 | 1 1/2 | 1 1/2 | 2 | 2 |
| DD | 13/32 | 17/32 | 21/32 | 21/32 | 15/16 | 1 1/16 | 1 3/16 | 1 5/16 | 1 13/16 | 2 1/16 |
| E | 3 1/2 | 5 | 6 1/2 | 7 1/2 | 9 1/2 | 12 3/4 | 12 3/4 | 12 3/4 | 15 1/2 | 17 1/2 |
| F | 1/2 | 5/8 | 3/4 | 7/8 | 7/8 | 1 | 1 | 1 | 1 11/16 | 1 15/16 |
| FL | 1 1/2 | 1 7/8 | 2 1/4 | 3 | 3 5/8 | 4 1/4 | 4 1/2 | 6 | 6 11/16 | 7 11/16 |
| MR | 1/2 | 3/4 | 1 | 1 3/8 | 1 3/4 | 2 | 2 1/2 | 3 | 3 1/2 | 4 |
| R | 2.55 | 3.82 | 4.95 | 5.73 | 7.50 | 9.40 | 9.40 | 9.40 | 12.00 | 13.75 |




## Mounting Bracket for Self-Aligning Rod Eye

Adapts to HW mount cylinder, HWE and HRES rod eyes

| PART | HWM15 | HWM2-D | HWM2* | HWM32 | HWM4 | HWM5 | HWM6 |
|---|---|---|---|---|---|---|---|
| CD | 1/2 | 3/4 | 3/4 | 1 | 1 3/8 | 1 3/4 | 2 |
| CK | 15/32 | 11/16 | 11/16 | 29/32 | 1 7/32 | 1 19/32 | 1 13/16 |
| CW | 5/16 | 1/2 | 1/2 | 5/8 | 3/4 | 3/4 | 7/8 |
| DD | 13/32 | 17/32 | 1/2"-20 | 21/32 | 21/32 | 15/16 | 1 1/16 |
| E | 2 1/2 | 3 1/2 | 3 1/2 | 4 1/2 | 5 | 6 1/2 | 7 1/2 |
| F | 3/8 | 9/16 | 9/16 | 11/16 | 13/16 | 15/16 | 15/16 |
| FL | 1 1/2 | 2 1/16 | 2 1/16 | 2 7/16 | 3 1/16 | 3 15/16 | 4 3/16 |
| MR | 1/2 | 3/4 | 3/4 | 1 | 1 3/8 | 1 3/4 | 2 |
| R | 1.63 | 2.55 | 2.55 | 3.25 | 3.82 | 4.95 | 5.73 |




**Notes:**

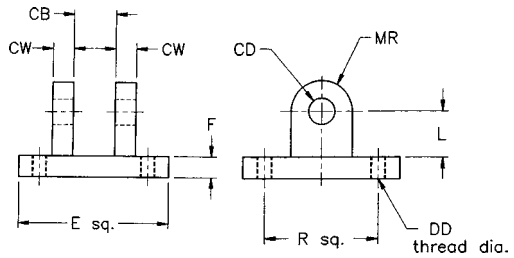
All HWM mounting brackets are spotfaced for use with Socket Head Cap Screws only.

* Tapped mounting holes for this model only

## Detachable Clevis - MP2 Mount (NFPA)

Mounts on cylinder and adapts to HM eye-type mounting bracket

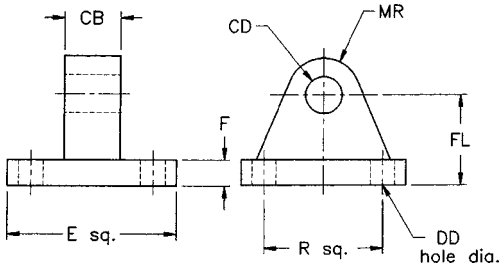
| PART | HMP2-15T | HMP2-25T | HMP2-32T | HMP2-4T | HMP2-5T | HMP2-6T | HMP2-7T | HMP2-8T |
|---|---|---|---|---|---|---|---|---|
| CB | 0.76 | 0.76 | 1.51 | 2.03 | 2.53 | 2.53 | 3.03 | 3.03 |
| CD | 1/2 | 3/4 | 1 | 1 3/8 | 1 3/4 | 2 | 2 1/2 | 3 |
| CW | 1/2 | 5/8 | 3/4 | 1 | 1 1/4 | 1 1/4 | 1 1/2 | 1 1/2 |
| DD | 3/8-24 | 1/2-20 | 5/8-18 | 5/8-18 | 7/8-14 | 1-14 | 1 1/8-12 | 1 1/4-12 |
| E | 2 1/2 | 3 1/2 | 4 1/2 | 5 | 6 1/2 | 7 1/2 | 8 1/2 | 9 1/2 |
| F | 3/8 | 5/8 | 3/4 | 7/8 | 7/8 | 1 | 1 | 1 |
| L | 3/4 | 1 1/4 | 1 1/2 | 2 1/8 | 2 1/4 | 2 1/2 | 3 | 3 1/4 |
| MR | 1/2 | 3/4 | 1 | 1 3/8 | 1 3/4 | 2 | 2 1/2 | 3 |
| R | 1.63 | 2.56 | 3.25 | 3.81 | 4.94 | 5.75 | 6.59 | 7.50 |



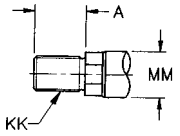

## Eye Type Mounting Bracket

Adapts to HC mount cylinder or HC rod clevis

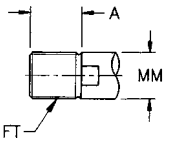
| PART | HM15 | HM25 | HM32 | HM4 | HM5 | HM6 | HM7 | HM8 | HM10 | HM12 |
|---|---|---|---|---|---|---|---|---|---|---|
| CB | 3/4 | 1 1/4 | 1 1/2 | 2 | 2 1/2 | 2 1/2 | 3 | 3 | 4 | 4 1/2 |
| CD | 1/2 | 3/4 | 1 | 1 3/8 | 1 3/4 | 2 | 2 1/2 | 3 | 3 1/2 | 4 |
| DD | 13/32 | 17/32 | 21/32 | 21/32 | 29/32 | 1 1/16 | 1 3/16 | 1 5/16 | 1 13/16 | 2 1/16 |
| E | 2 1/2 | 3 1/2 | 4 1/2 | 5 | 6 1/2 | 7 1/2 | 8 1/2 | 9 1/2 | 12 5/8 | 14 7/8 |
| F | 3/8 | 5/8 | 3/4 | 7/8 | 7/8 | 1 | 1 | 1 | 1 11/16 | 1 15/16 |
| FL | 1 1/8 | 1 7/8 | 2 1/4 | 3 | 3 1/8 | 3 1/2 | 4 | 4 1/4 | 5 11/16 | 6 7/16 |
| MR | 1/2 | 3/4 | 1 | 1 3/8 | 1 3/4 | 2 | 2 1/2 | 3 | 3 1/2 | 4 |
| R | 1.63 | 2.56 | 3.25 | 3.81 | 4.95 | 5.75 | 6.59 | 7.50 | 9.62 | 11.50 |



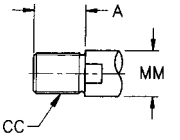
**Rod End Styles**
(See model dimension tables for dimension values)



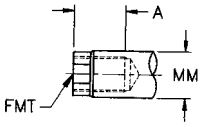

**A**
Standard Male Thread
NFPA Style SM




**C**
Full Thread
NFPA Style FM

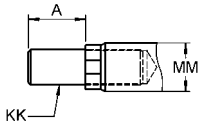



**B**
Oversize Male Thread
NFPA Style IM

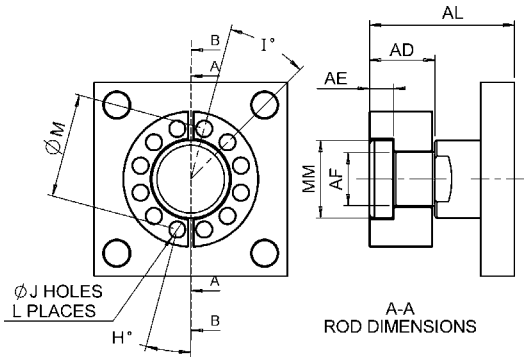



**D**
Female Thread
NFPA Style SF

**E**
No Thread



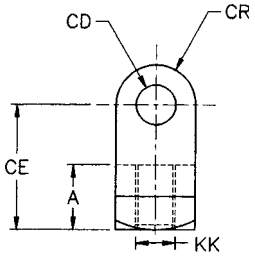

**G**
Rod Stud
NFPA Style SM

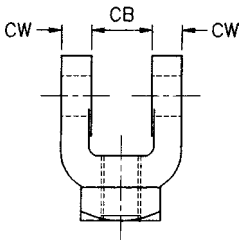



**F**
Rod End Coupler
Contact Our Factory for Details

**Rod Clevis**
Adapts to male thread on piston rod

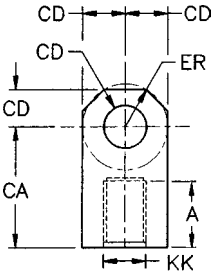
| PART | HC15 | HC15C | HC2 | HC2C | HC32 | HC4 | HC5 | HC5C | HC6 | HC7 | HC8 | HC7C | HC10 | HC10C | HC12C | HC12D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | 3/4 | 3/4 | 1 1/8 | 1 5/8 | 1 5/8 | 2 | 2 1/4 | 3 | 3 | 3 1/2 | 3 1/2 | 3 1/2 | 3 1/2 | 3 1/2 | 4 | 4 1/2 |
| CB | 0.781 | 0.781 | 1.281 | 1.531 | 1.531 | 2.031 | 2.563 | 2.563 | 2.563 | 3.063 | 3.063 | 3.063 | 4.063 | 4.063 | 4.531 | 4.531 |
| CD | 1/2 | 1/2 | 3/4 | 1 | 1 | 1 3/8 | 1 3/4 | 2 | 2 | 2 1/2 | 3 | 3 | 3 1/2 | 3 1/2 | 4 | 4 |
| CE | 1 1/2 | 1 1/2 | 2 3/8 | 3 1/8 | 3 1/8 | 4 1/8 | 4 1/2 | 5 1/2 | 5 1/2 | 6 1/2 | 6 3/4 | 6 3/4 | 7 3/4 | 7 3/4 | 8 1/2 | 9 |
| CW | 1/2 | 1/2 | 5/8 | 3/4 | 3/4 | 1 | 1 1/4 | 1 1/4 | 1 1/4 | 1 1/2 | 1 1/2 | 1 1/2 | 2 | 2 | 2 1/4 | 2 1/4 |
| CR | 1/2 | 1/2 | 3/4 | 1 | 1 | 1 3/8 | 1 3/4 | 2 | 2 | 2 1/2 | 2 3/4 | 2 3/4 | 3 1/2 | 3 1/2 | 4 | 4 |
| KK | 7/16-20 | 1/2-20 | 3/4-16 | 7/8-14 | 1-14 | 1 1/4-12 | 1 1/2-12 | 1 3/4-12 | 1 7/8-12 | 2 1/4-12 | 2 1/2-12 | 2 3/4-12 | 3 1/4-12 | 3-12 | 3 3/4-12 | 4 1/4-12 |

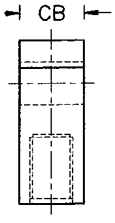



**Rod Eye**
Adapts to HCM clevis-type mounting bracket

| PART | HE15 | HE15C | HE2 | HE2C | HE32 | HE4 | HE5 | HE5C | HE6 | HE7 | HE7C | HE8 | HE10 | HE12C | HE12D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | 3/4 | 3/4 | 1 1/8 | 1 1/8 | 1 5/8 | 2 | 2 1/4 | 2 1/4 | 3 | 3 1/2 | 3 5/8 | 3 1/2 | 4 1/2 | 4 | 4 1/2 |
| CA | 1/2 | 1/2 | 2 1/16 | 2 3/8 | 2 13/16 | 3 7/16 | 4 | 4 3/8 | 5 | 5 13/16 | 6 1/2 | 6 1/8 | 7 5/8 | 7 5/8 | 8 1/8 |
| CB | 3/4 | 3/4 | 1 1/4 | 1 1/2 | 1 1/2 | 2 | 2 1/2 | 2 1/2 | 2 1/2 | 3 | 3 1/2 | 3 | 4 | 4 1/2 | 5 |
| CD | 1/2 | 1/2 | 3/4 | 1 | 1 | 1 3/8 | 1 3/4 | 2 | 2 | 2 1/2 | 3 | 3 | 3 1/2 | 4 | 4 |
| ER | 5/8 | 5/8 | 7/8 | 1 1/8 | 1 3/16 | 1 9/16 | 2 | 2 7/8 | 2 1/2 | 2 13/16 | 3 1/4 | 3 1/4 | 3 7/8 | 4 | 4 |
| KK | 7/16-20 | 1/2-20 | 3/4-16 | 7/8-14 | 1-14 | 1 1/4-12 | 1 1/2-12 | 1 3/4-12 | 1 7/8-12 | 2 1/4-12 | 2 3/4-12 | 2 1/2-12 | 3 1/4-12 | 3 3/4-12 | 4 1/4-12 |



**Accessories for Rod End**

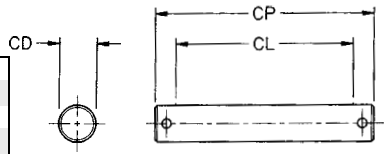
| BORE | | | ROD DIA. MM | THREAD SIZE | ROD CLEVIS | LUG MOUNTING BRACKET | PIVOT PIN | ROD EYE | CLEVIS MOUNTING BRACKET | SELF ALIGNING ROD EYE | SELF ALIGNING MOUNTING BRACKET | SELF ALIGNING PIVOT PIN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 1/2 | | | 5/8 | 7/16-20 | HC15 | HM15 | P3 | HE15 | HCM15 | HWE15 | HWM15 | HWP15 |
| | | | 5/8 | 1/2-20 | HC15C | HM15 | P3 | HE15C | HCM15 | N/A | N/A | N/A |
| | 2 1/2 | 2 | 1 | 3/4-16 | HC2 | HM25 | P4 | HE2 | HCM2 | HWE2 | HWM2 | HWP2 |
| | | | 1 | 7/8-14 | HC2C | HM32 | P6 | HE2C | HCM32 | N/A | N/A | N/A |
| 3 1/4 | | | 1 3/8 | 1-14 | HC32 | HM32 | P6 | HE32 | HCM32 | HWE32 | HWM32 | HWP32 |
| | | | 1 3/8 | 1 1/4-12 | HC4 | HM4 | HP4 | HE4 | HCM4 | HWE4 | HWM4 | HWP4 |
| | | 4 | 1 3/4 | 1 1/4-12 | HC4 | HM4 | HP4 | HE4 | HCM4 | HWE4 | HWM4 | HWP4 |
| | | | 1 3/4 | 1 1/2-12 | HC5 | HM5 | P12 | HE5 | HCM5 | HWE5 | HWM5 | HWP5 |
| | 5 | | 2 | 1 1/2-12 | HC5 | HM5 | P12 | HE5 | HCM5 | HWE5 | HWM5 | HWP5 |
| | | | 2 | 1 3/4-12 | HC5C | HM6 | HP6 | HE5C | HCM6 | N/A | N/A | N/A |
| 6 | | | 2 1/2 | 2 1/2-12 | HC6 | HM6 | HP6 | HE6 | HCM6 | HWE6 | HWM6 | HWP6 |
| | | | 2 1/2 | 2 3/4-12 | HC7 | HM7 | HP7 | HE7 | HCM7 | N/A | N/A | N/A |
| | | 7 | 3 | 3 1/2-12 | HC7 | HM7 | HP7 | HE7 | HCM7 | N/A | N/A | N/A |
| | | | 3 | 3 3/4-12 | HC7C | HM8 | HP8 | HE7C | HCM8 | N/A | N/A | N/A |
| | | | 3 1/2 | 4 1/2-12 | HC8 | HM8 | HP8 | HE8 | HCM8 | HWE8 | HWM8 | HWP8 |
| | | | 3 1/2 | 4 3/4-12 | HC10 | HM10 | HP10 | HE10 | HCM10 | N/A | N/A | N/A |
| | | | 4 | 5 1/2-12 | HC10C | HM10 | HP10 | HE10 | HCM10 | N/A | N/A | N/A |
| | | | 4 | 5 3/4-12 | HC12C | HM12 | HP12 | HE12C | HCM12 | N/A | N/A | N/A |
| | | | 4 1/2 | 6 1/2-12 | HC10 | HM10 | HP10 | HE10 | HCM10 | N/A | N/A | N/A |
| | | | 4 1/2 | 6 3/4-12 | HC12D | HM12 | HP12 | HE12D | HCM12 | N/A | N/A | N/A |

**Pivot Pin**

Comes complete with cotter pins

Adapts to HC rod clevis or HCM clevis-type mounting bracket

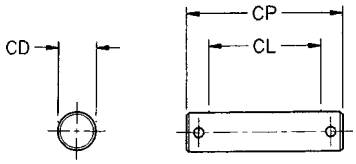
| PART | P3 | P4 | P6 | HP4 | P12 | HP6 | HP5C | HP7 | HP8 | HP7C | HP10 | HP12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CD | 1/2 | 3/4 | 1 | 1 3/8 | 1 3/4 | 2 | 2 | 2 1/2 | 3 | 3 | 3 1/2 | 4 |
| CL | 1 3/4 | 2 1/2 | 3 | 4 | 5 | 5 1/2 | 5 13/16 | 6 3/16 | 6 | 6 1/2 | 8 | 9 |
| CP | 2 5/16 | 3 1/8 | 3 3/4 | 4 13/16 | 6 1/8 | 6 | 6 3/8 | 7 1/4 | 7 1/4 | 7 5/8 | 9 1/4 | 10 1/4 |




**Pivot Pin for Self-Aligning Rod Eye**

Adapts to HWM mounting bracket. Comes complete with cotter pins

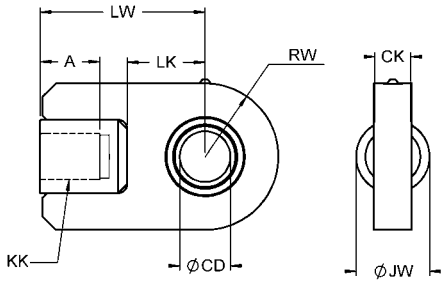
| PART | HWP15 | HWP2 | HWP32 | HWP4 | HWP5 | HWP6 | HWP8 |
|---|---|---|---|---|---|---|---|
| CD | 1/2 | 3/4 | 1 | 1 3/8 | 1 3/4 | 2 | 3 |
| CL | 1 5/16 | 2 | 2 17/32 | 3 3/32 | 3 7/16 | 3 15/16 | 6 1/8 |
| CP | 1 7/8 | 2 9/16 | 3 3/16 | 3 3/4 | 4 3/16 | 4 11/16 | 7 1/4 |




**Self-Aligning Rod Eye - Female**

Adapts to male thread on piston rod

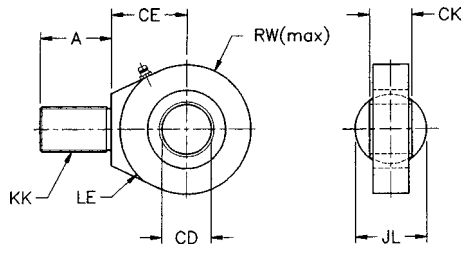
| PART | HWE15 | HWE2 | HWE32 | HWE4 | HWE5 | HWE6 | HWE7 | HWE8 |
|---|---|---|---|---|---|---|---|---|
| A | 3/4 | 1 1/8 | 1 5/8 | 2 | 2 1/4 | 3 | 3 1/2 | 3 1/2 |
| CD | 1/2 | 3/4 | 1 | 1 3/8 | 1 3/4 | 2 | 2 1/2 | 3 |
| CK | 7/16 | 21/32 | 7/8 | 1 3/16 | 1 17/32 | 1 3/4 | 2 3/16 | 2 5/8 |
| JW | 3/4 | 1 3/8 | 1 3/4 | 2 | 2 1/2 | 3 | 3 1/2 | 4 |
| KK | 7/16-20 | 3/4-16 | 1-14 | 1 1/4-12 | 1 1/2-12 | 1 7/8-12 | 2 1/4-12 | 2 1/2-12 |
| LW | 1 3/4 | 2 3/4 | 3 5/8 | 4 1/2 | 5 5/8 | 6 3/4 | 7 | 7 1/8 |
| RW | 7/8 | 1 1/4 | 1 1/2 | 2 | 2 3/4 | 3 | 3 1/8 | 4 |
| LK | 5/8 | 1 1/4 | 1 5/8 | 2 1/8 | 2 5/8 | 3 1/2 | 3 1/8 | 3 1/4 |




**Self-Aligning Rod Eye - Male**

Adapts to female thread on piston rod

| PART | HRES-1 | HRES-2 | HRES-3 | HRES-4 | HRES-5 | HRES-6 |
|---|---|---|---|---|---|---|
| A | 11/16 | 1 | 1 1/2 | 2 | 2 1/8 | 2 7/8 |
| CD | 1/2 | 3/4 | 1 | 1 3/8 | 1 3/4 | 2 |
| CE | 7/8 | 1 1/4 | 1 7/8 | 2 1/8 | 2 1/2 | 2 3/4 |
| CK | 7/16 | 21/32 | 7/8 | 1 3/16 | 1 17/32 | 1 3/4 |
| JL | 7/8 | 1 5/16 | 1 1/2 | 2 | 2 1/4 | 2 3/4 |
| KK | 7/16-20 | 3/4-16 | 1-14 | 1 1/4-12 | 1 1/2-12 | 1 7/8-12 |
| LE | 3/4 | 1 1/16 | 1 7/16 | 1 7/8 | 2 1/8 | 2 1/2 |
| RW | 7/8 | 1 1/4 | 1 3/8 | 1 13/16 | 2 3/16 | 2 5/8 |

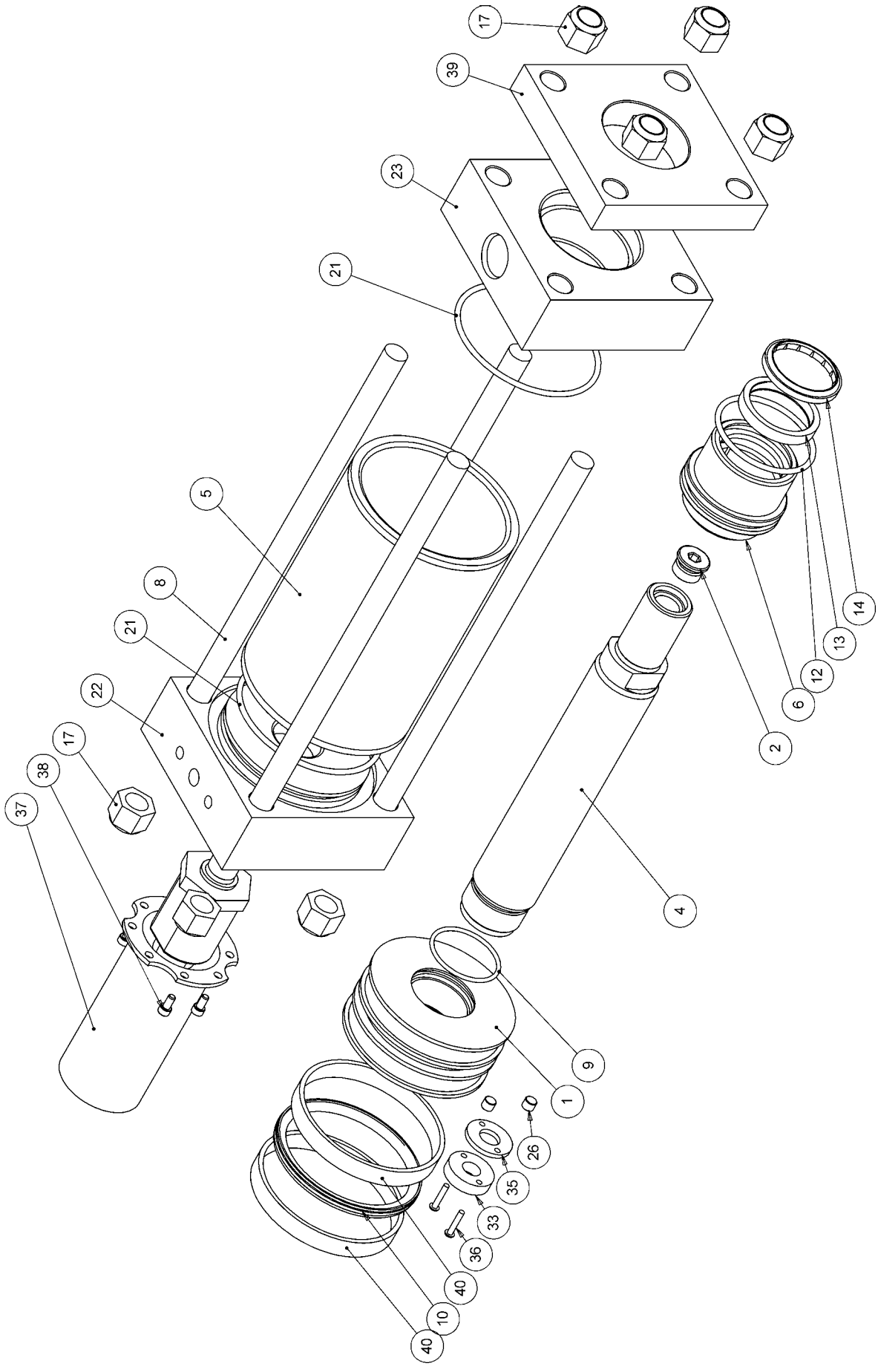


| * T3H-SERIES PARTS LIST 1 1/2" BORE T0 4" BORE | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | BORE | | | | | | | | | | | |
| | DESCRIPTION | QTY | 1 1/2 | 2 | | 2 1/2 | | | 3 1/4 | | | 4 | | |
| | ROD SIZE | | 1 | 1 | 1 3/8 | 1 | 1 3/8 | 1 3/4 | 1 3/8 | 1 3/4 | 2 | 1 3/4 | 2 | 2 1/2 |
| 1 | PISTON | 1 | 1TH15-1 | 1TH20-1 | 1TH20-2 | 1TH25-1 | 1TH25-2 | 1TH25-3 | 1TH32-1 | 1TH32-2 | 1TH32-3 | 1TH40-1 | 1TH40-2 | 1TH40-3 |
| 2 | ROD PLUG | 1 | 35H05 | 35H05 | 35H06 | 35H05 | 35H06 | 35H08 | 35H06 | 35H08 | 35H10 | 35H08 | 35H10 | 35H14 |
| 4 | ROD - MALE | 1 | 4TH21510- | 4TH22010- | 4TH22013- | 4TH22510- | 4TH22513- | 4TH22517- | 4TH23213- | 4TH23217- | 4TH23220- | 4TH24017- | 4TH24020- | 4TH24025- |
| 5 | BARREL (M-HONED STEEL) | 1 | 5TH015- | 5H020- | | 5H025- | | | 5H032- | | | 5H040- | | |
| 5 | BARREL HT2 TRUN. MOUNT | 1 | N/A | 5H2T020- | | 5H2T025- | | | 5H2T032- | | | 5H2T040- | | |
| 6 | GLAND BUSHING | 1 | 6H1510H | 6H2010H | 6H3213H | 6H2010H | 6H3213H | 6H2517H | 6H3213H | 6H4017H | 6H5020H | 6H4017H | 6H5020H | 6H6025H |
| 8 | TIE ROD (EA) (STANDARD) | 4 | 8TH_156- | 8TH_208- | | 8TH_258- | | | 8TH_3210- | | | 8TH_4010- | | |
| 9 | PISTON SEAL INTERNAL | 1 | 9A120 | 9A120 | 9A126 | 9A120 | 9A126 | 9A132 | 9A126 | 9A132 | 9A136 | 9A132 | 9A136 | 9A144 |
| 10 | PISTON CUP | 1 | 10H755-15 | 10H755-20 | | 10H755-25 | | | 10H755-32 | | | 10H755-4 | | |
| 12 | GLAND BUSHING SEAL | 1 | 9H222 | 9H224 | 9H227 | 9H224 | 9H227 | 9H230 | 9H227 | 9H230 | 9H232 | 9H230 | 9H232 | 9H236 |
| 13 | ROD SEAL | 1 | 13H10H | 13H10H | 13H13H | 13H10H | 13H13H | 13H17H | 13H13H | 13H17H | 13H20H | 13H17H | 13H20H | 13H25H |
| 14 | ROD WIPER | 1 | 14H10 | 14H10 | 14H13 | 14H10 | 14H13 | 14H17 | 14H13 | 14H17 | 14H20 | 14H17 | 14H20 | 14H25 |
| 17 | LOCK NUT - TIE ROD | 4,8 | 19A006 | 19A008 | | 19A008 | | | 19A010 | | | 19A010 | | |
| 21 | BARREL SEAL | 2 | 9H031/9H218 | 9H224 | | 9H228 | | | 9H234 | | | 9H240 | | |
| 22 | HEAD BLIND END | 1 | T1H_15BSP08 | T1H_2BSP08 | | T1H_25BSP08 | | | T1H_32BSP12 | | | T1H_4BSP12 | | |
| 23 | HEAD GLAND END | 1 | H_15G10SP08 | H_2G10SP08 | H_2G13SP08 | H_25G10SP08 | H_25G13SP08 | H_25G17SP08 | H_32G13SP12 | H_32G17SP12 | H_32G20SP12 | H_4G17SP12 | H_4G20SP12 | H_4G25SP12 |
| 24 | TRUNNION | 1 | HT15 | HT2 | | HT2.5 | | | HT3.25 | | | HT4 | | |
| 24 | TRUNNION (H2T) | 1 | N/A | H2T2 | | H2T2.5 | | | H2T3.25 | | | H2T4 | | |
| 26 | PISTON LOCKING SCREWS | 2 | 35T250-.25 | 35T250-.25 | | 35T250-.25 | | | 35T313-.25NF | | | 35T313-.25NF | | |
| 33 | MAGNET | 1 | 9510 | 9510 | | 9510 | | | 9510 | | | 9510 | | |
| 35 | MAGNET ISOLATOR | 1 | 9511 | 9511 | | 9511 | | | 9511 | | | 9511 | | |
| 36 | MAGNET SCREW | 2 | 9500 | 9500 | | 9500 | | | 9500 | | | 9500 | | |
| 37 | PROBE COVER | 1 | N/A | TCV910 | | TCV910 | | | TCV910 | | | TCV910 | | |
| 38 | PROBE COVER SCREWS | 4 | N/A | 9509 | | 9509 | | | 9509 | | | 9509 | | |
| 39 | FRONT PLATE | 1 | FP1510 | FP2010 | FP2013 | FP2510 | FP2513 | FP2517 | FP3213 | FP3217 | FP3220 | FP4017 | FP4020 | FP4025 |
| 40 | PISTON WEAR STRIP | 2 | 40H1525 | 40H2037 | | 40H2537 | | | 40H323 | | | 40H405 | | |
| 41 | SEAL KIT | 1 | KT1510 | KT2010 | KT2013 | KT2510 | KT2513 | KT2517 | KT3213 | KT3217 | KT3220 | KT4017 | KT4020 | KT4025 |

| * T3H-SERIES PARTS LIST 5" BORE T0 6" BORE | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | BORE | | | | | | |
| | DESCRIPTION | QTY | 5 | | | | 6 | | |
| | ROD SIZE | | 2 | 2 1/2 | 3 | 3 1/2 | 2 1/2 | 3 | 3 1/2 |
| 1 | PISTON | 1 | 1TH50-1 | 1TH50-2 | 1TH50-3 | 1TH50-4 | 1TH60-1 | 1TH60-2 | 1TH60-3 |
| 2 | ROD PLUG | 1 | 35H10 | 35H14 | 35H14 | 35H14 | 35H14 | 35H14 | 35H14 |
| 4 | ROD - MALE | 1 | 4TH25020- | 4TH25025- | 4TH25030- | 4TH25035- | 4TH26025- | 4TH26030- | 4TH26035- |
| 5 | BARREL (M-HONED STEEL) | 1 | 5H050- | | | | 5H060- | | |
| 5 | BARREL HT2 TRUN. MOUNT | 1 | 5H2T050- | | | | 5H2T060- | | |
| 6 | GLAND BUSHING | 1 | 6H5020H | 6H6025H | 6H6030H | 6H5035H | 6H6025H | 6H6030H | 6H5035H |
| 8 | TIE ROD (EA) (STANDARD) | 4 | 8TH_5014- | | | | 8TH_6016- | | |
| 9 | PISTON SEAL INTERNAL | 1 | 9A136 | 9A144 | 9A151 | 9A153 | 9A144 | 9A151 | 9A153 |
| 10 | PISTON CUP | 1 | 10H755-5 | | | | 10H755-6 | | |
| 12 | GLAND BUSHING SEAL | 1 | 9H232 | 9H236 | 9H242 | 9H245 | 9H236 | 9H242 | 9H245 |
| 13 | ROD SEAL | 1 | 13H20H | 13H25H | 13H30H | 13H35H | 13H25H | 13H30H | 13H35H |
| 14 | ROD WIPER | 1 | 14H20 | 14H25 | 14H30 | 14H35 | 14H25 | 14H30 | 14H35 |
| 17 | LOCK NUT - TIE ROD | 4,8 | 19A014 | | | | 19A016 | | |
| 21 | BARREL SEAL | 2 | 9H248 | | | | 9H256 | | |
| 22 | HEAD BLIND END | 1 | T1H_5BSP12 | | | | T1H_6BSP16 | | |
| 23 | HEAD GLAND END | 1 | H_5G20SP12 | H_5G25SP12 | H_5G30SP12 | H_5G35SP12 | H_6G25SP16 | H_6G30SP16 | H_6G35SP16 |
| 24 | TRUNNION | 1 | HT5 | | | | HT6 | | |
| 24 | TRUNNION (H2T) | 1 | H2T5 | | | | H2T6 | | |
| 26 | PISTON LOCKING SCREWS | 2 | 35T313-.25NF | | | | 35T313-.25NF | | |
| 33 | MAGNET | 1 | 9510 | | | | 9510 | | |
| 35 | MAGNET ISOLATOR | 1 | 9511 | | | | 9511 | | |
| 36 | MAGNET SCREW | 2 | 9500 | | | | 9500 | | |
| 37 | PROBE COVER | 1 | TCV910 | | | | TCV910 | | |
| 38 | PROBE COVER SCREWS | 4 | 9509 | | | | 9509 | | |
| 39 | FRONT PLATE | 1 | FP5020 | FP5025 | FP5030 | FP5035 | FP6025 | FP6030 | FP6035 |
| 40 | PISTON WEAR STRIP | 2 | 40H507 | | | | 40H607 | | |
| 41 | SEAL KIT | 1 | KT5020 | KT5025 | KT5030 | KT5035 | KT6025 | KT6030 | KT6035 |

* For T4H parts or further information, please contact the factory.

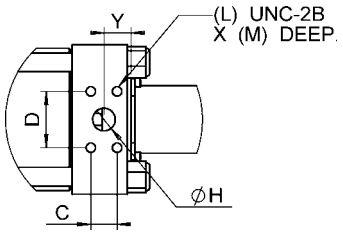
# T3H-Series Parts Drawing



**Standard Ports are SAE O-Ring Boss. Optional Ports are Transition Manifold and SAE Code 61 Flange, as shown below.**

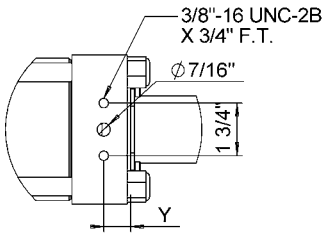
## T3H

Port Option **"E"** (T3H), **SAE Code 61 Flange** (4 bolt flange)

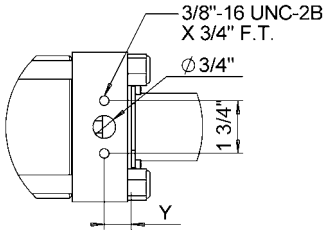



| BORE | SAE | C | D | H | L | M | Y |
|---|---|---|---|---|---|---|---|
| 1 1/2 | -08 | 11/16 | 1 1/2 | 1/2 | 5/16-18 UNC | 1 | 1 7/8 |
| 2 | -08 | 11/16 | 1 1/2 | 1/2 | 5/16-18 UNC | 3/4 | 1 |
| 2 1/2 | -08 | 11/16 | 1 1/2 | 1/2 | 5/16-18 UNC | 3/4 | 1 1/32 |
| 3 1/4 | -12 | 7/8 | 1 7/8 | 3/4 | 3/8-16 UNC | 7/8 | 15/16 |
| 4 | -12 | 7/8 | 1 7/8 | 3/4 | 3/8-16 UNC | 1 | 29/32 |
| 5 | -12 | 7/8 | 1 7/8 | 3/4 | 3/8-16 UNC | 1 1/8 | 29/32 |
| 6 | -16 | 1 1/32 | 2 1/16 | 1 | 3/8-16 UNC | 1 1/4 | 1 |

Port Option **"D"** (T3H)
**Transition Manifold**




Port Option **"Z"** (T3H)
**Transition Manifold**

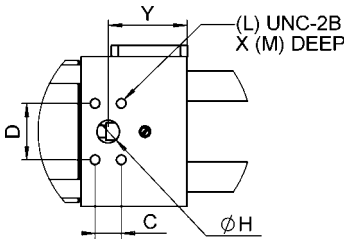



Dimensions
**Transition Manifold**

| BORE | Y |
|---|---|
| 1 1/2 | 1 1/8 |
| 2 | 1 |
| 2 1/2 | 1 1/32 |
| 3 1/4 | 15/16 |
| 4 | 29/32 |
| 5 | 29/32 |
| 6 | 1 |

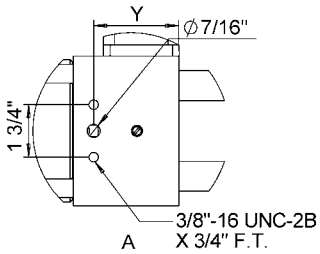
## T4H

Port Option **"E"** (T4H), **SAE Code 61 Flange** (4 bolt flange)

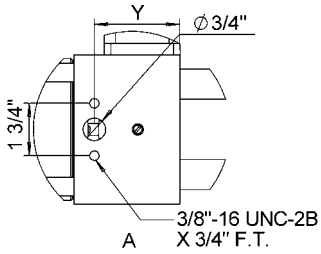



| BORE | SAE | C | D | H | L | M | Y |
|---|---|---|---|---|---|---|---|
| 1 1/2 | -08 | 11/16 | 1 1/2 | 1/2 | 5/16-18 UNC | 3/4 | 2 7/16 |
| 2 | -08 | 11/16 | 1 1/2 | 1/2 | 5/16-18 UNC | 3/4 | 2 7/16 |
| 2 1/2 | -08 | 11/16 | 1 1/2 | 1/2 | 5/16-18 UNC | 3/4 | 2 1/2 |
| 3 1/4 | -12 | 7/8 | 1 7/8 | 3/4 | 3/8-16 UNC | 3/4 | 2 5/8 |
| 4 | -12 | 7/8 | 1 7/8 | 3/4 | 3/8-16 UNC | 3/4 | 2 5/8 |
| 5 | -12 | 7/8 | 1 7/8 | 3/4 | 3/8-16 UNC | 3/4 | 2 5/8 |
| 6 | -16 | 1 1/32 | 2 1/16 | 1 | 3/8-16 UNC | 1 | 3 |

Port Option **"D"** (T4H)
**Transition Manifold**




Port Option **"Z"** (T4H)
**Transition Manifold**



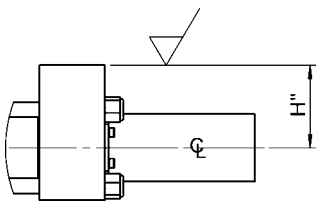

Dimensions
**Transition Manifold**

| BORE | Y |
|---|---|
| 2 | 2 9/16 |
| 2 1/2 | 2 9/16 |
| 3 1/4 | 2 27/32 |
| 4 | 2 27/32 |
| 5 | 2 27/32 |
| 6 | 3 |

## T3H
## T4H

**Port Height**
Flange port heads may be taller due to size constraints. Bold values have the taller heads.

| BORE | SAE Flange H | 'D' or 'Z' Transition Manifold H |
|---|---|---|
| 1 1/2 | 2 1/4 | 2 1/4 |
| 2 | 2 1/2 | 2 1/2 |
| 2 1/2 | 1 3/4 | 2 3/4 |
| 3 1/4 | 2 1/4 | 2 1/4 |
| 4 | 2 1/2 | 2 1/2 |
| 5 | 3 1/4 | 3 1/4 |
| 6 | 3 3/4 | 3 3/4 |



**Warning**

These products are intended for industrial use only. Do not use these products in applications where the pressure and temperature exceed the values listed below.

Through misuse, age or malfunction, components used in fluid power systems can fail. A designer utilizing these products must consider all modes of failure when designing machines and provide safeguards or warn the end user of possible modes of failure.

**Cylinder Pressure and Temperature Ratings**

TH-Series cylinders are rated to 3000 psig hydraulic pressure for normal use, and 5000 psi for non shock applications. Some mounting styles are pressure downrated. In those cases a pressure rating table is shown on the dimension sheet page.

Temperature ratings for cylinders are limited to the maximum published temperature range of the least resistant seal component. In most cases that would be the standard Buna-N O-ring seals. Buna-N temperature ratings: -30°F to 200°F (-34°C to 93°C). For higher temperatures specify a “V” in the Options box of the Cylinder Nomenclature.

When choosing a Sensor, please ensure that it is rated to meet the pressure and temperature requirements of your application.

**Published Design Data**

Westcoast Cylinders Inc. reserves the right to change specifications and other information included in this catalogue without notice. All information, data and dimension tables in this catalogue have been carefully compiled and thoroughly checked. However, no responsibility for possible errors or omissions can be assumed.

**Warranty**

Westcoast Cylinders Inc. warrants the material and workmanship of our cylinders for one full year when used under normal conditions, subject to factory inspection. WCI will repair or replace, at no cost, defective parts or cylinders. WCI will not assume expenses incurred in the field, pertaining to such repairs or replacements, except upon written authority. For a complete statement of terms and warranty, contact Westcoast Cylinders Inc.
Installation of the Sensor (Probe), for the T4 design, by parties other than Westcoast Cylinders may void the cylinder warranty. Please contact Westcoast Cylinders should you have any further questions.

## CYLINDER DEVELOPED FORCE

| BORE in | ROD DIA in | Work Major Area (in²) | Work Minor Area (in²) | Developed Force (lb) @ Differential Pressure | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 500 | | 750 | | 1000 | | 1500 | | 2000 | | 2500 | | 3000 | |
| | | | | push | pull | push | pull | push | pull | push | pull | push | pull | push | pull | push | pull |
| 1 1/2 | 1 | 1.77 | 0.98 | 884 | 491 | 1325 | 736 | 1767 | 982 | 2651 | 1473 | 3534 | 1963 | 4418 | 2454 | 5301 | 2945 |
| 2 | 1 | 3.14 | 2.36 | 1571 | 1178 | 2356 | 1767 | 3142 | 2356 | 4712 | 3534 | 6283 | 4712 | 7854 | 5890 | 9425 | 7069 |
| | 1 3/8 | 3.14 | 1.66 | 1571 | 828 | 2356 | 1243 | 3142 | 1657 | 4712 | 2485 | 6283 | 3313 | 7854 | 4142 | 9425 | 4970 |
| 2 1/2 | 1 | 4.91 | 4.12 | 2454 | 2062 | 3682 | 3093 | 4909 | 4123 | 7363 | 6185 | 9817 | 8247 | 12272 | 10308 | 14726 | 12370 |
| | 1 3/8 | 4.91 | 3.42 | 2454 | 1712 | 3682 | 2568 | 4909 | 3424 | 7363 | 5136 | 9817 | 6848 | 12272 | 8560 | 14726 | 10272 |
| | 1 3/4 | 4.91 | 2.50 | 2454 | 1252 | 3682 | 1878 | 4909 | 2503 | 7363 | 3755 | 9817 | 5007 | 12272 | 6259 | 14726 | 7510 |
| 3 1/4 | 1 3/8 | 8.30 | 6.81 | 4148 | 3405 | 6222 | 5108 | 8296 | 6811 | 12444 | 10216 | 16592 | 13622 | 20739 | 17027 | 24887 | 20433 |
| | 1 3/4 | 8.30 | 5.89 | 4148 | 2945 | 6222 | 4418 | 8296 | 5890 | 12444 | 8836 | 16592 | 11781 | 20739 | 14726 | 24887 | 17671 |
| | 2 | 8.30 | 5.15 | 4148 | 2577 | 6222 | 3866 | 8296 | 5154 | 12444 | 7731 | 16592 | 10308 | 20739 | 12885 | 24887 | 15463 |
| 4 | 1 3/4 | 12.57 | 10.16 | 6283 | 5081 | 9425 | 7621 | 12566 | 10161 | 18850 | 15242 | 25133 | 20322 | 31416 | 25403 | 37699 | 30483 |
| | 2 | 12.57 | 9.42 | 6283 | 4712 | 9425 | 7069 | 12566 | 9425 | 18850 | 14137 | 25133 | 18850 | 31416 | 23562 | 37699 | 28274 |
| | 2 1/2 | 12.57 | 7.66 | 6283 | 3829 | 9425 | 5743 | 12566 | 7658 | 18850 | 11486 | 25133 | 15315 | 31416 | 19144 | 37699 | 22973 |
| 5 | 2 | 19.63 | 16.49 | 9817 | 8247 | 14726 | 12370 | 19635 | 16493 | 29452 | 24740 | 39270 | 32987 | 49087 | 41233 | 58905 | 49480 |
| | 2 1/2 | 19.63 | 14.73 | 9817 | 7363 | 14726 | 11045 | 19635 | 14726 | 29452 | 22089 | 39270 | 29452 | 49087 | 36816 | 58905 | 44179 |
| | 3 | 19.63 | 12.57 | 9817 | 6283 | 14726 | 9425 | 19635 | 12566 | 29452 | 18850 | 39270 | 25133 | 49087 | 31416 | 58905 | 37699 |
| | 3 1/2 | 19.63 | 10.01 | 9817 | 5007 | 14726 | 7510 | 19635 | 10014 | 29452 | 15021 | 39270 | 20028 | 49087 | 25035 | 58905 | 30041 |
| 6 | 2 1/2 | 28.27 | 23.37 | 14137 | 11683 | 21206 | 17524 | 28274 | 23366 | 42412 | 35048 | 56549 | 46731 | 70686 | 58414 | 84823 | 70097 |
| | 3 | 28.27 | 21.21 | 14137 | 10603 | 21206 | 15904 | 28274 | 21206 | 42412 | 31809 | 56549 | 42412 | 70686 | 53014 | 84823 | 63617 |
| | 3 1/2 | 28.27 | 18.65 | 14137 | 9327 | 21206 | 13990 | 28274 | 18653 | 42412 | 27980 | 56549 | 37306 | 70686 | 46633 | 84823 | 55960 |

### CYLINDER SIZING

- A cylinder must generate sufficient force to accelerate a load and overcome friction losses.
- System pressure losses must also be considered.
- The cylinder developed force table does not take into account friction, pressure losses or acceleration force.

| PISTON ROD MAX LENGTH Le (in.) @ ROD DIAMETER (in.) | | | | | | | |
|---|---|---|---|---|---|---|---|
| AXIAL FORCE (lbs) | 1 | 1 3/8 | 1 3/4 | 2 | 2 1/2 | 3 | 3 1/2 |
| 100 | 165 | 310 | | | | | |
| 200 | 115 | 220 | | | | | |
| 300 | 95 | 180 | 300 | | | | |
| 400 | 82 | 160 | 260 | | | | |
| 600 | 67 | 130 | 210 | 280 | | | |
| 800 | 58 | 110 | 180 | 240 | | | |
| 1000 | 52 | 100 | 160 | 210 | | | |
| 1200 | 48 | 90 | 148 | 195 | 300 | | |
| 1400 | 44 | 84 | 137 | 180 | 280 | | |
| 1600 | 41 | 78 | 128 | 170 | 260 | | |
| 1800 | 39 | 74 | 120 | 160 | 250 | | |
| 2000 | 37 | 70 | 115 | 150 | 240 | | |
| 2500 | 33 | 63 | 102 | 135 | 210 | 300 | |
| 3000 | 30 | 58 | 92 | 120 | 190 | 270 | |
| 4000 | 26 | 50 | 80 | 105 | 170 | 240 | |
| 5000 | 23 | 44 | 72 | 96 | 150 | 280 | 290 |
| 6000 | 21 | 40 | 66 | 88 | 130 | 190 | 260 |
| 8000 | 17 | 35 | 56 | 76 | 115 | 170 | 225 |
| 10000 | 12 | 31 | 51 | 68 | 100 | 150 | 200 |
| 12000 | | 29 | 46 | 62 | 94 | 137 | 185 |
| 16000 | | 22 | 40 | 54 | 82 | 120 | 160 |
| 20000 | | 13 | 35 | 46 | 72 | 105 | 142 |
| 24000 | | | 31 | 43 | 66 | 96 | 130 |
| 30000 | | | 20 | 37 | 60 | 86 | 117 |
| 34000 | | | 10 | 32 | 56 | 82 | 110 |
| 40000 | | | | 23 | 50 | 76 | 100 |
| 50000 | | | | | 42 | 66 | 90 |
| 60000 | | | | | 31 | 62 | 82 |
| 80000 | | | | | | 46 | 71 |
| 100000 | | | | | | 23 | 59 |
| 120000 | | | | | | | 43 |
| 140000 | | | | | | | 20 |
| 160000 | | | | | | | |

## ROD SIZE SELECTION

To ensure adequate column strength of the piston rod, the rod diameter should be selected as follows:

**1)** Using the mounting style table below, find the length **L** and the effective length factor **K** by referencing the appropriate mounting style and rod end connection.

**2)** Calculate the rod effective length **Le** where:
**Le = L x K**
If Le is greater than 40 inches, refer to the piston stop section below.

**3)** From the Cylinder Developed Force Table, determine the maximum force available at system operating pressure.

**4)** Using the Rod Size Table, find the axial force value which is equal to or greater than the cylinder developed force. Read horizontally across the table to the piston rod maximum length **Le**. Read the rod diameter from the indicated column. If the rod size is not available for the cylinder bore size, always choose the the next larger size.

## PISTON STOP

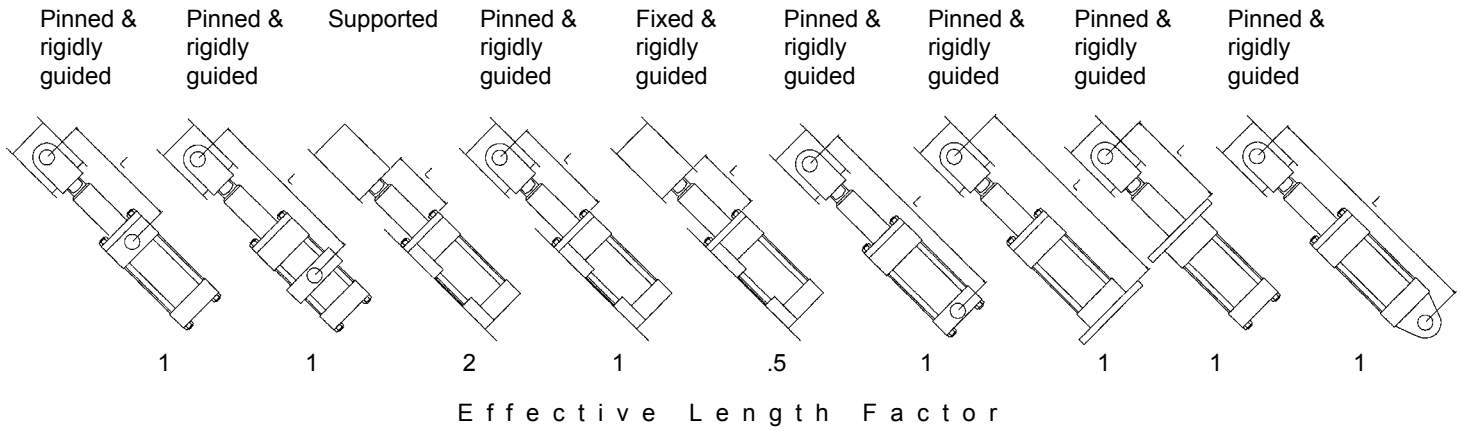
A piston stop may be required on long push stroke cylinders in order to prevent the following:

- excessive wear on the gland bushing and piston
- piston rod buckling
- cylinder jack-knifing

If the effective length **Le** exceeds 40 inches, then add 1 inch of piston stop for every 10 inches of stroke in excess of 40 inches.

**Note:** When adding a piston stop the effective stroke is reduced by the piston stop length. If stroke length must be maintained increase the stroke as required.

**MOUNTING STYLE** (shown with rod extended)



## LINEAR POSITIONER CYLINDER ASSEMBLY

The following is a general overview of the steps involved. The specific procedure for your cylinder may differ. Assembly work must be done in a clean workspace.

### 1) Seal Assembly

Install the seals on components before you begin assembling the cylinder. Piston seals or any external seal can be installed using a plastic strap to stretch them over top of their retaining groove. Do not overstretch the seals. In most cases, seals can be installed by sliding one corner into its groove and edging it into position. If a standard seal is stretched it will return to its original shape over a period of time.

Rod seals or internal seals are installed using a seal collapsing tool.

NOTE: do not use screwdrivers or hard metal tools to install seals. You can damage the seals or the gland bushing or both and cause premature seal failure.

### 2) Royal Cylinders TH-Series Piston Assembly Procedure

The piston for a TH-Series Cylinder is held in place using an adhesive such as *Loctite®*. Use *Loctite® 243*. (Use *Loctite®* recommendations for applying the treatment.) The piston also incorporates locking screws in the back of the piston for locking the thread. Pin holes on the back surface of the piston are for use with a pin wrench or spanner. See table for Piston Torque values and pin sizes. Pre-assemble the piston and piston rod to ensure proper fit. Disassemble and apply the locking adhesive.

NOTE: Check piston rod for seal lead-in. The piston rod requires a chamfer to allow the seals to expand to the rod diameter. If the piston rod has a piston side lead-in, then you must assemble the gland bushing and gland end head onto the piston rod before assembling the piston and lock bolt. Piston side lead-ins are required for rods with oversize or full threads, and all 1” diameter rods.

If *Loctite* is applied without the primer, then a 24-hour curing period is required before testing.

| Cylinder Bore | Lock Bolt Torque (lbs.-ft) | Pin Diameter | Pin Centers |
|---|---|---|---|
| 1 ½” | 25 | 3/16” | 15/16” |
| 2” | 25 | 3/16” | 1 7/16” |
| 2 ½” | 50 | 1/4” | 1 13/16” |
| 3 ¼” | 50 | 1/4” | 2 1/2” |
| 4” | 100 | 5/16” | 2 3/4” |
| 5” | 100 | 5/16” | 4” |

### 3) Gland End Head Installation

Slide the gland end head on to the piston rod if you have not done it already due to the piston side lead-in requirement. Now slide the gland bushing up to the chamfer. Slowly apply steady pressure to allow the seals to expand to the rod diameter. Once the gland bushing is on the rod, slide the gland end head and gland bushing together. Again apply steady pressure to assemble the components together. Slide the assembly back to the face of the piston. Do not apply excessive force.

### 4) Front Plate Installation

Slide the front plate on to the piston rod up to the gland bushing. The gland-bushing spigot will fit inside the front plate. Slide the front plate up to the gland end head sandwiching the gland bushing between the head and the front plate.

**5) Barrel Installation**

Set the barrel on end and set the piston assembly onto the end of the barrel. The piston seals will stop the assembly from sliding into the barrel. Tilt the piston rod assembly slightly to one side so a portion of the seal is inside the barrel. Using a hard plastic pry tool, slide the tool along the edge of the barrel between the seal and the barrel. While sliding the tool along the edge straighten the rod allowing the seal to slip inside the barrel.

Once the seal is inside the barrel, it still may not move. Lightly tap the end of the rod with a rubber hammer to advance it to the next seal. The next seal will install easily because its lip is facing away from the barrel. Be careful not to pinch the seal as it slides past the barrel edge.

Slide the whole rod assembly down until the gland end head seal reaches the barrel. Be careful not to pinch the barrel seal as it enters the barrel.

**6) Blind End Head Assembly**

Lay the cylinder assembly flat on a bench. Prop the barrel up with a small piece of wood along the barrel so the end of the barrel is off the workbench. Lift the blind end head into place making sure the ports are oriented in the proper positions. Slide the spigot into the barrel until the barrel seal makes contact with the barrel. Apply even pressure until the head seats on the barrel. Be careful not to pinch the barrel seal.

**7) Tie Rod Assembly**

While the cylinder assembly is flat on a bench, install the tie rods through the tie rod holes.

For cylinders with threaded holes in the heads, thread the Nyloc Locknut onto the tie rod, then insert the other end of the tie rod into the head and begin threading it in. The tie rod will stop turning once it has bottomed out. Tighten the locknuts to the torque specified below.

For cylinders with through-connections on the heads, thread the tie rods through. At this point a set of vise grips would be helpful to stop the tie rods from turning. Pinch the tie rod with the vice grips at some point between the two heads. Tighten up the locknut on one side until one full thread is visible. Do all four tie rods in this manner. Tighten all the locknuts on the opposite side until they are snug. Torque the tie rods to the specified torque in a crossing pattern. Watch the head to make sure it is not being twisted to one side. The torquing procedure may require a two- or three-step process to ensure the cylinder heads have the proper alignment.

| Cylinder Bore | Tie Rod Thread | Torque (lbs.-ft) |
|---|---|---|
| 1 ½” | 3/8-24 | 25 |
| 2” | ½-20 | 55 |
| 2 ½” | ½-20 | 60 |
| 3 ¼” | 5/8-18 | 100 |
| 4” | 5/8-18 | 150 |
| 5” | 7/8-14 | 320 |
| 6” | 1-14 | 450 |

**8) Testing**

After assembling the cylinder, it should be tested for leaks. The testing procedure will also flush out of the cylinder any contaminants that may have been present during the assembly. All heavy-duty hydraulic cylinders are tested to 3000 PSI.

**SPECIFYING AN "X" IN ANY FIELD REQUIRES AN EXPLANATION IN THE SPECIFICATION NOTES FIELD.**

| T3H | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SERIES | BORE | STYLE | STROKE | ROD MATERIAL | ROD SIZE | THREAD | CUSHIONS | BARREL | PORT LOC'N | PORT SIZE | OPTIONS | CUSTOM |
| EXAMPLE T3H | 32 | C | 12.188 | C | 1 | A | 2 | A | 1 | A | | |

EXTERNAL SENSOR T3H
INTERNAL SENSOR T4H

| BORE | |
|---|---|
| 1 1/2" | 15 |
| 2 | 2 |
| 2 1/2" | 25 |
| 3 1/4" | 32 |
| 4" | 4 |
| 5" | 5 |
| 6" | 6 |

| STYLE | |
|---|---|
| BLIND END CLEVIS (MP1) | C |
| PIVOT EYE (MP3) | E |
| FOOT MOUNT (MS2) | F |
| RECTANGULAR FRONT FLANGE HEAD (ME5) | G |
| NO MOUNT EXTENDED TIE RODS ROD END (MX3) | NC |
| NO MOUNT (MX0) | NM |
| ROD END RECTANGULAR FLANGE (MF1) | R |
| ROD END SQUARE FLANGE (MF5) | RS |
| SIDE TAPPED (MS4) | S |
| MID TRUNNION (MT4) | T |
| BLIND END TRUNNION (MT2) | TB |
| ROD END TRUNNION (MT1) | TR |
| SELF-ALIGNING EYE (MPU3) | W |

| STROKE | |
|---|---|
| INCHES | |

| ROD MATERIAL | |
|---|---|
| CHROME PLATED STEEL | C |
| CHROME PLATED STAINLESS STEEL | E |
| SPECIFY | X |

| ROD SIZE | |
|---|---|
| ROD #1 | 1 |
| ROD #2 | 2 |
| ROD #3 | 3 |
| ROD #4 | 4 |

| THREAD | |
|---|---|
| STANDARD THREAD KK | A |
| CC THREAD | B |
| FULL THREAD | C |
| FEMALE THREAD | D |
| NO THREAD | E |
| ROD END COUPLER | F |
| ROD STUD (KK ONLY) | G |
| SPECIFY | X |

| CUSHIONS | |
|---|---|
| 2 | NON CUSHIONED |

| BARREL | |
|---|---|
| A | MICRO-HONED STEEL BARREL |
| X | SPECIFY |

| PORT LOC'N | |
|---|---|
| 1 | POS #1 (STANDARD) |
| 2 | POS #2 |
| 3 | POS #3 |
| 4 | POS #4 |
| X | SPECIFY |

| PORT SIZE | |
|---|---|
| A | O-RING BOSS (ORB) PORT |
| B | OVERSIZE PORT |
| C | NPT PORT |
| D | STANDARD (7/16") TRANSITION MANIFOLD PORT |
| E | SAE CODE 61 FLANGE PORT |
| Z | OVERSIZE (3/4") TRANSITION MANIFOLD PORT |
| X | SPECIFY |

| OPTIONS | |
|---|---|
| A | THREAD LENGTH |
| - F | FLUSH CYLINDER |
| P | INSTALL PROBE * |
| PS | PISTON STOP |
| V | HIGH TEMPERATURE SEALS |
| W | ROD EXTENSION SPECIFY "W" LENGTH |
| X | SPECIFY |
| Y | BALLUFF TRANSDUCER MAGNET |
| Y4 | 4 WRENCH FLATS |
| Y6 | 6 WRENCH FLATS |

* OPTION 'P' - CUSTOMER TO SUPPLY PROBE AND WCI TO INSTALL (Recommended for T4H style).

| CUSTOM | |
|---|---|
| X | ASSIGNED BY WESTCOAST CYLINDERS. |

**EXAMPLE "T3H32C12.188C1A2A1A"**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