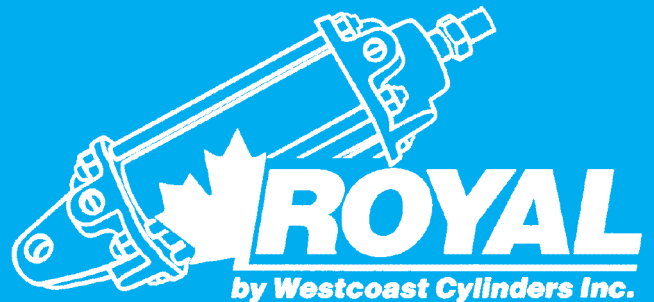


3000 psi rating

# series H

NFPA

hydraulic cylinders



**Page Description**

2&3	Mounting Styles
4	Features Description
5	Features Drawing

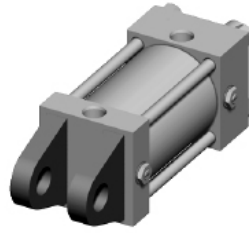
**Mounting Dimensions**

6	<b>C</b>	Fixed Clevis (MP1)
6	<b>E</b>	Pivot Eye (MP3)
6	<b>MP</b>	Detachable Clevis (MP2)
7	<b>W</b>	Self-aligning Eye (MPU3)
8	<b>NM</b>	No Mount (MX0)
8	<b>NA</b>	Extended Tie-rods Both Ends (MX1)
9	<b>NB</b>	Extended Tie-rods Blind End (MX2)
9	<b>NC</b>	Extended Tie-rods Gland End (MX3)
10	<b>R</b>	Rod End Rectangular Flange (MF1)
10	<b>RS</b>	Rod End Square Flange (MF5)
11	<b>B</b>	Blind End Rectangular Flange (MF2)
11	<b>BS</b>	Blind End Square Flange (MF6)
12	<b>G</b>	Rect. Gland End Head (ME5)
12	<b>H</b>	Rect. Blind End Head (ME6)
13	<b>TR</b>	Rod End Trunnion (MT1)
13	<b>TB</b>	Blind End Trunnion (MT2)
14	<b>T</b>	Mid Trunnion (MT4)
15	<b>F</b>	Foot Mount (MS2)
15	<b>S</b>	Side Tapped (MS4)
16	<b>D</b>	Double Rod (MD)
17	<b>CR</b>	Common Rod
17	<b>CH</b>	Common Head
18	<b>CHR</b>	Common Head + Common Rod

19-21 Rod End Styles, Accessories

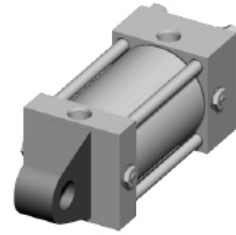
**Parts**

22	Parts Drawing
23	Parts List: 1.5 – 4" dia.
24	Parts List: 5 – 8" dia.
25	Limitations and Warranty
26-27	Technical Data/Torque Specs
Cover	Cylinder Nomenclature



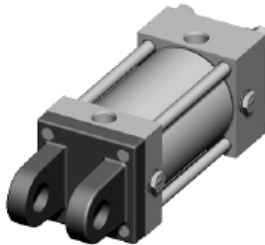
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Fixed Clevis



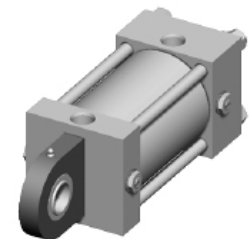
6

Pivot Eye



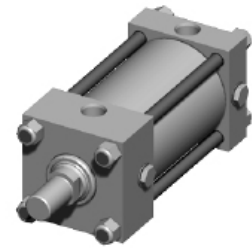
6

Detachable Clevis



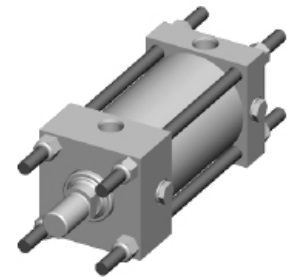
7

Self-aligning Eye



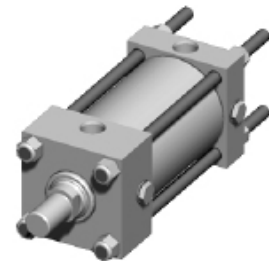
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No Mount



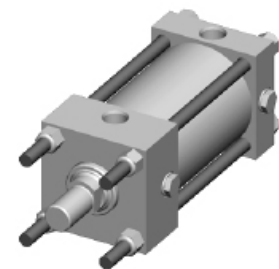
8

Extended Tie-rods Both Ends



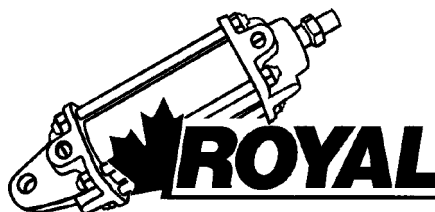
9

Extended Tie-rods Blind End



9

Extended Tie-rods Gland End

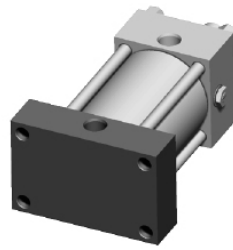
**Westcoast Cylinders Inc.**

225 Edworthy Way  
New Westminster BC  
Canada V3L 5G4

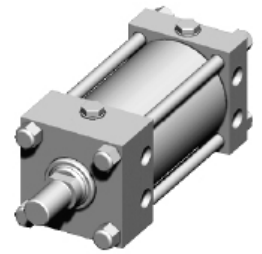
Telephone: 604 527 1120  
Facsimile: 604 527 1170  
Phone Toll Free: 1-877-637-6925  
Fax Toll Free: 1-866-527-1170  
email: sales@royalcylinders.com  
website: www.royalcylinders.com



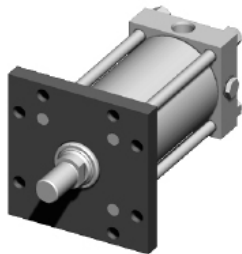
**10** *Rod End Rectangular Flange*



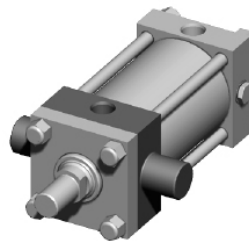
**12** *Rectangular Blind End Head*



**15** *Side-Tapped Mount*



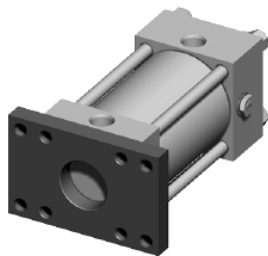
**10** *Rod End Square Flange*



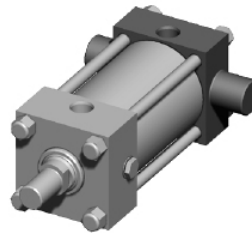
**13** *Rod End Trunnion*



**16** *Double Rod*



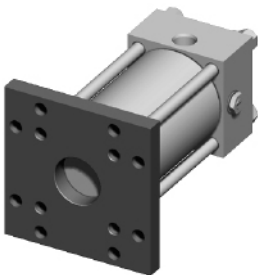
**11** *Blind End Rectangular Flange*



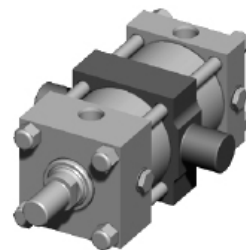
**13** *Blind End Trunnion*



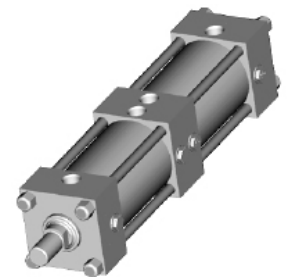
**17** *Common Rod*



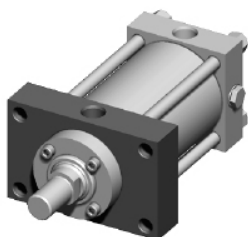
**11** *Blind End Square Flange*



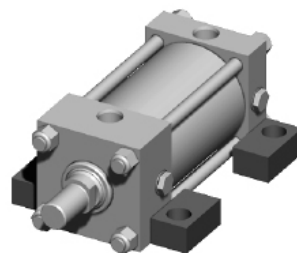
**14** *Mid Trunnion*



**17** *Common Head*



**12** *Rectangular Gland End Head*



**15** *Foot Mount*

### PISTON ROD

The piston rod is made from hard chrome plated C1045/C1050 carbon steel with a typical minimum yield strength of greater than 75,000 psi. Material strengths may vary depending on rod diameter.

Other standard material options are Induction Hardened Chrome Polished (IHCP), Chrome plated 17-4PH Stainless or Nitrotec treated piston rods. Nitrotec material is an alternative to chrome plated and provides a hardened surface (up to 71 Rc) with very good corrosion resistance.

If you require a rod material or size that is not included in this catalogue please contact the factory.

### BARREL

Our cylinder barrel is very heavy-walled, providing a very robust and rigid cylinder assembly. The inside surface is micro-honed for low friction and long reliable seal life.

### HYTHANE® SEALS

**Hythane®** piston seals are standard on the Royal H-Series. They have an exceptional temperature range of from -50 to 230°F.

The Hythane®\* rod seal is a high performance, high temperature seal compound having ultra low friction and long seal life. The Hythane/Hyslip rod wiper, with internal ribs for extra stability and prevention of pressure trapping, cleans the rod on the return stroke. The static o-rings are Buna-N with Viton as an option for higher temperatures.

### ROTOCAST BRONZE GLAND BUSHING

The gland bushing is manufactured from Rotocast bronze for low friction and long bearing life. Other materials such as Zinc-alloy are available upon request. Optional gland bushings with wear rings may be available, please contact our factory.

### COLD FINISHED HEADS

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

### CUSHIONING

The standard needle valve position is at position #4 (P4). The Ball check position is at P2. The Ball checks are designed to eliminate the need for a spring. As fluid flows through the check valve the ball is pulled into the low pressure zone, sealing when required and allowing the fluid to bypass for fast break away from the cushions.

2 1/2" and 3 1/4" bores with the #3 rod are now available with adjustable cushions both ends.

### PISTON

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

### SAE PORTS

SAE O-Ring Boss (ORB) ports are the standard port on the H-Series cylinders. SAE CODE 61 Flange ports and NPTF are among the other standard options. For NPTF ports, WCI recommends an SAE to NPTF Female adapter. Custom ports are also available.

### PISTON STOP

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

### END-OF-STROKE POSITION SENSORS

WCI offers Proximity sensors to signal when the piston is at the end of stroke. Topworx is our standard however we can manufacture our cylinders to suit the proximity you would like to supply. Please contact our factory for details.

### 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 (back cover).

### CUSTOM CYLINDERS

If our standard product does not meet your specifications, Westcoast Cylinders has a long history of manufacturing custom cylinders for many applications. Please contact our factory with your requirements.

### SPARE PARTS

Genuine Royal seal kits include all seal components, and wear rings. Specify genuine Royal replacement parts to ensure you will receive all feature benefits.

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

Factory contact 604.527.1120 or [sales@royalcylinders.com](mailto:sales@royalcylinders.com)

#### Westcoast Cylinders Inc.:

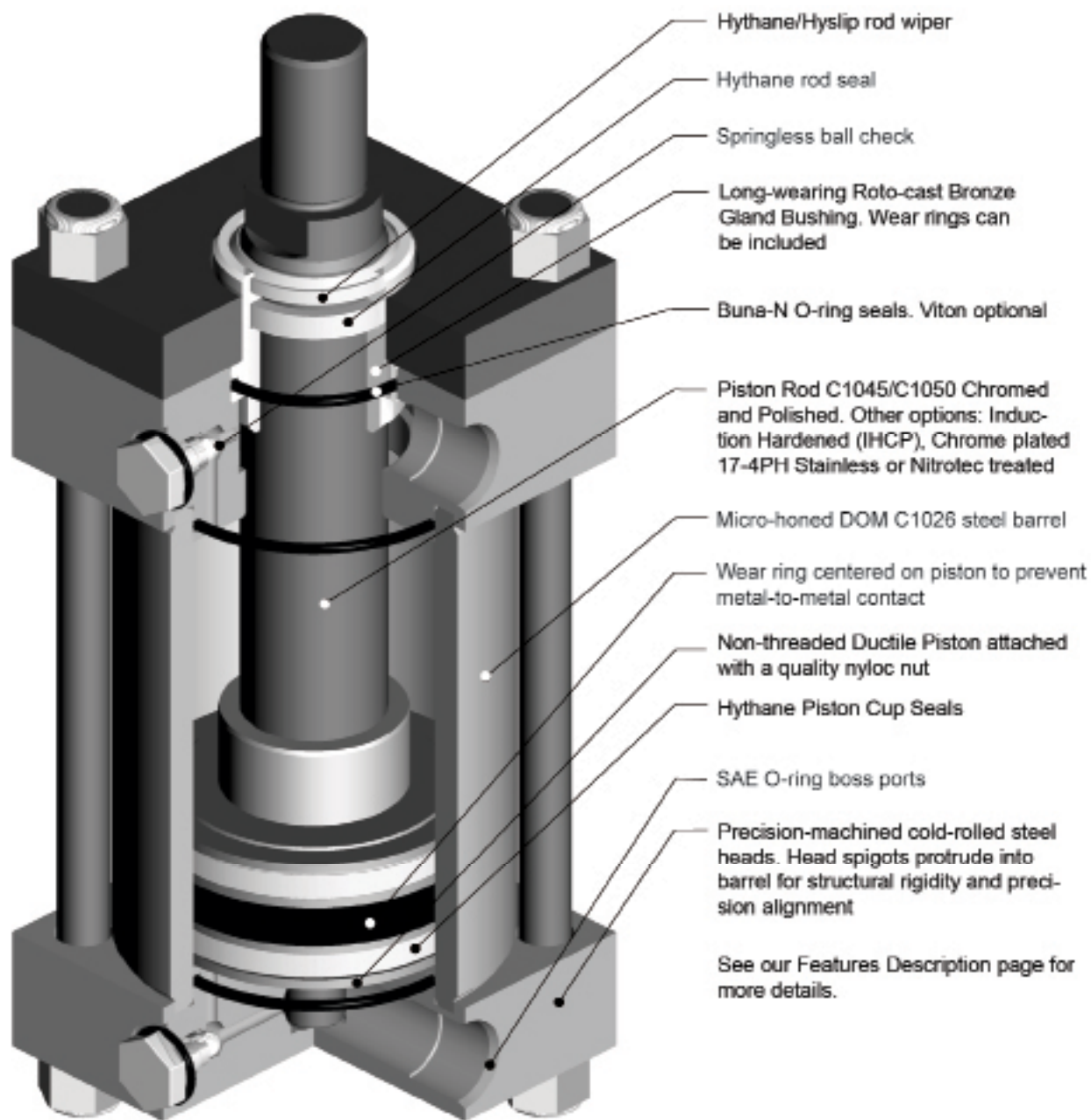
The Company has been manufacturing high quality, reliable ROYAL cylinders for over 50 years. Production started with a single cylinder design and expanded to a full range of multi-use, hydraulic, pneumatic cylinders and accessories.

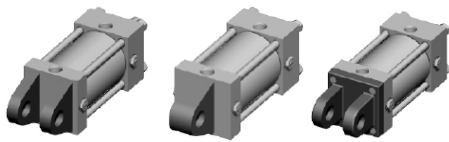
#### Quality:

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.





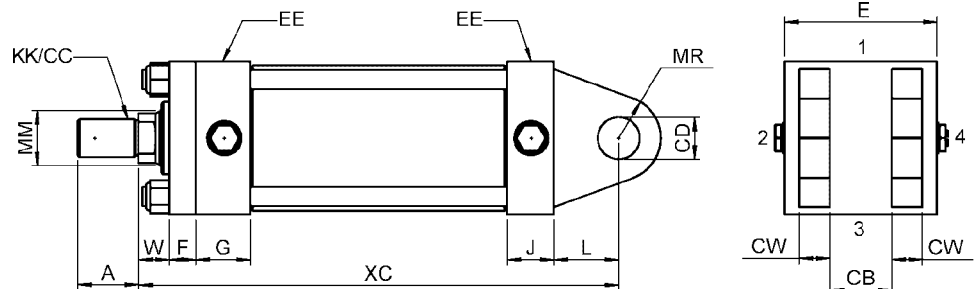
# model HC, HE, HMP

BORE	ROD	ROD DIA		ADD STROKE		HC,HMP								HE		EE			note 6		
		MM	KK	CC	A	W	XC	XD	E	F	F1	G	J	L	CB	CB	CD	CW		NPTF	SAE
1 1/2	1	5/8	7/16-20	1/2-20	3/4	5/8	6 3/8	6 3/4	2 1/2	3/8	3/8	1 9/16	1 5/16	3/4	25/32	3/4	1/2	1/2	1/2	-08	5/8
	2	1	3/4-16	7/8-14	1 1/8	1	6 3/4	7 1/8													
2	1	1	3/4-16	7/8-14	1 1/8	3/4	7 1/4	7 7/8	3	5/8	5/8	1 15/32	1 7/32	1 1/4	1 9/32	1 1/4	3/4	5/8	1/2	-08	15/16
	2	1 3/8	1-14	1 1/4-12	1 5/8	1	7 1/2	8 1/8				2 1/8									
2 1/2	1	1	3/4-16	7/8-14	1 1/8	3/4	7 3/8	8	3 1/2	9/16	5/8	1 9/16	1 1/4	1 1/4	1 9/32	1 1/4	3/4	5/8	1/2	-08	15/16
	2	1 3/8	1-14	1 1/4-12	1 5/8	1	7 5/8	8 1/4													
2 1/2	3	1 3/4	1 1/4-12	1 1/2-12	2	1 1/4	7 7/8	8 1/2				2 3/16									
	3	1 3/4	1 1/4-12	1 1/2-12	2	1 1/4	7 7/8	8 1/2													
3 1/4	1	1 3/8	1-14	1 1/4-12	1 5/8	7/8	8 5/8	9 3/8	4 1/2	3/4	3/4	1 25/32	1 17/32	1 1/2	1 17/32	1 1/2	1	3/4	3/4	-12	1 3/16
	2	1 3/4	1 1/4-12	1 1/2-12	2	1 1/8	8 7/8	9 5/8													
3 1/4	3	2	1 1/2-12	1 3/4-12	2 1/4	1 1/4	9	9 3/4				2 7/16									
	3	2	1 1/2-12	1 3/4-12	2 1/4	1 1/4	9	9 3/4													
4	1	1 3/4	1 1/4-12	1 1/2-12	2	1	9 3/4	10 5/8	5	7/8	7/8	1 25/32	1 17/32	2 1/8	2 1/32	2	1 3/8	1	3/4	-12	1 5/8
	2	2	1 1/2-12	1 3/4-12	2 1/4	1 1/8	9 7/8	10 3/4													
4	3	2 1/2	1 7/8-12	2 1/4-12	3	1 3/8	10 1/8	11													
	3	2 1/2	1 7/8-12	2 1/4-12	3	1 3/8	10 1/8	11													
5	1	2	1 1/2-12	1 3/4-12	2 1/4	1 1/8	10 1/2	11 3/8	6 1/2	7/8	7/8	1 25/32	1 17/32	2 1/4	2 17/32	2 1/2	1 3/4	1 1/4	3/4	-12	2 1/8
	2	2 1/2	1 7/8-12	2 1/4-12	3	1 3/8	10 3/4	11 5/8													
5	3	3	2 1/4-12	2 3/4-12	3 1/2	1 3/8	10 3/4	11 5/8													
	4	3 1/2	2 1/2-12	3 1/4-12	3 1/2	1 3/8	10 3/4	11 5/8													
6	1	2 1/2	1 7/8-12	2 1/4-12	3	1 1/4	12 1/8	13 1/8	7 1/2	1	1	2 5/32	2 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	12 1/8	13 1/8													
6	3	3 1/2	2 1/2-12	3 1/4-12	3 1/2	1 1/4	12 1/8	13 1/8													
	3	3 1/2	2 1/2-12	3 1/4-12	3 1/2	1 1/4	12 1/8	13 1/8													
7	1	3	2 1/4-12	2 3/4-12	3 1/2	1 1/4	13 3/4	14 3/4	8 1/2	1	1	2 17/32	2 17/32	3	3 1/32	3	2 1/2	1 1/2	1 1/4	-20	2 1/2
	2	3 1/2	2 1/2-12	3 1/4-12	3 1/2	1 1/4	13 3/4	14 3/4													
7	3	4	3-12	3 3/4-12	4	1 1/4	13 3/4	14 3/4													
	3	4	3-12	3 3/4-12	4	1 1/4	13 3/4	14 3/4													
8	1	3 1/2	2 1/2-12	3 1/4-12	3 1/2	1 1/4	15	16	9 1/2	1	1	2 31/32	2 19/32	3 1/4	3 1/32	3	3	1 1/2	1 1/2	-24	2 3/4
	2	4	3-12	3 3/4-12	4	1 1/4	15	16													
8	3	4 1/2	3 1/4-12	4 1/4-12	4 1/2	1 1/4	15	16													
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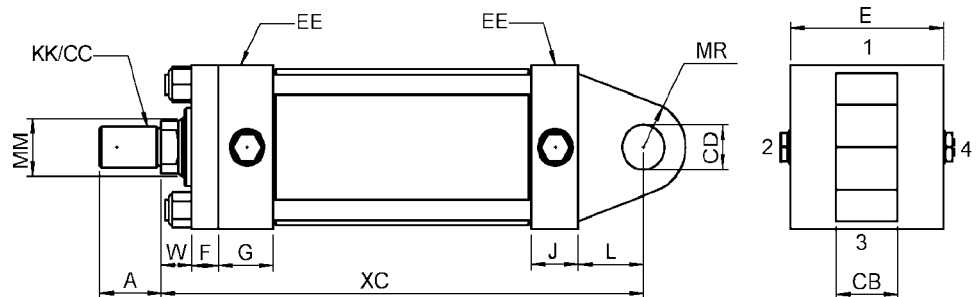
### Notes:

- All dimensions in inches.
- EE standard port is SAE ORB. Contact our factory if SAE flange or Alternate port size is required.
- See Cylinder Nomenclature for thread options.
- For Optional Rod Ends and dimensions see page 18.
- Gland Head "G" is longer on 2", 2 1/2" and 3 1/4" bores with largest rod size and when cushioned on gland end. NFPA dimensions remain constant.
- MR is also clearance radius over corners on 3 1/4" and smaller bores.

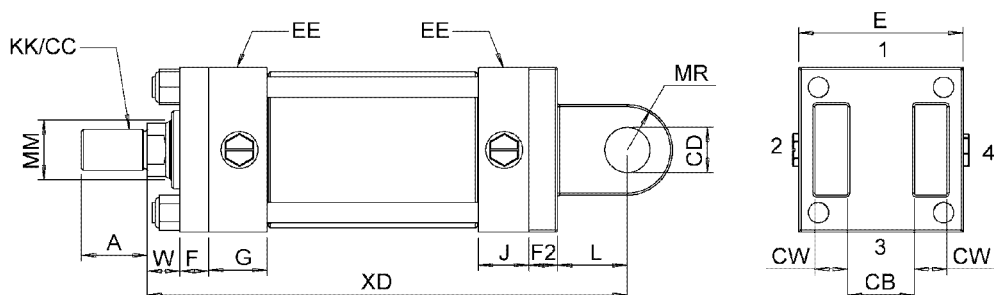
**Model HC**  
Fixed Clevis  
NFPA Style MP1



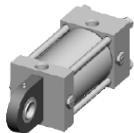
**Model HE**  
Pivot Eye  
NFPA Style MP3



**Model HMP**  
Detachable Clevis  
NFPA Style MP2





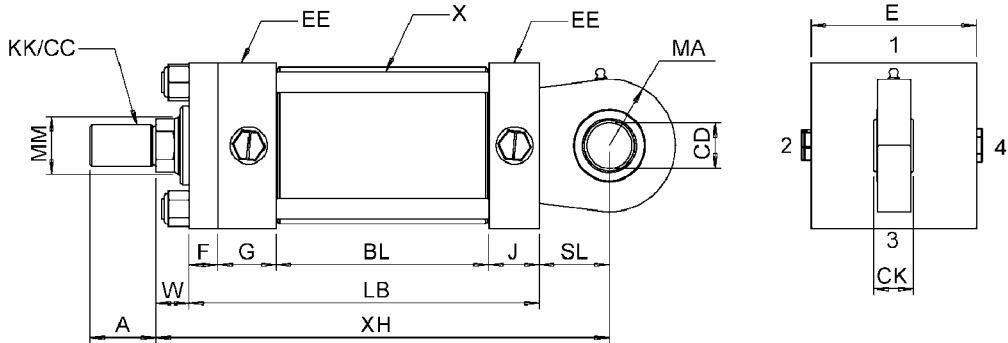


BORE	ROD DIA		ADD STROKE															EE			
	ROD	MM	KK	CC	A	W	LB	XH	BL	E	F	G	J	SL	CD	CK	NPTF	SAE	MA	X	
1 1/2	1	5/8	7/16-20	1/2-20	3/4	5/8	5	6 3/8	1 3/4	2 1/2	3/8	1 9/16	1 5/16	3/4	1/2	7/16	1/2	-08	7/8	3/8	
	2	1	3/4-16	7/8-14	1 1/8	1		6 3/4													
2	1	1	3/4-16	7/8-14	1 1/8	3/4	5 1/4	7 1/4	1 15/16	3	5/8	1 15/32	1 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		7 1/2													
note 5	2	1 3/8						1 9/32				2 1/8									
	3	1 3/8																			
2 1/2	1	1	3/4-16	7/8-14	1 1/8	3/4	5 3/8	7 3/8	2	3 1/2	9/16	1 9/16	1 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		7 5/8													
note 5	3	1 3/4	1 1/4-12	1 1/2-12	2	1 1/4		7 7/8	1 3/8			2 3/16									
	3	1 3/4																			
3 1/4	1	1 3/8	1-14	1 1/4-12	1 5/8	7/8	6 1/4	8 5/8	2 3/16	4 1/2	3/4	1 25/32	1 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		8 7/8													
note 5	3	2	1 1/2-12	1 3/4-12	2 1/4	1 1/4		9	1 17/32			2 7/16									
	3	2																			
4	1	1 3/4	1 1/4-12	1 1/2-12	2	1	6 5/8	9 3/4	2 7/16	5	7/8	1 25/32	1 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		9 7/8													
note 5	3	2 1/2	1 7/8-12	2 1/4-12	3	1 3/8		10 1/8													
	3	2 1/2																			
5	1	2	1 1/2-12	1 3/4-12	2 1/4	1 1/8	7 1/8	10 1/2	2 15/16	6 1/2	7/8	1 25/32	1 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		10 3/4													
note 5	3	3	2 1/4-12	2 3/4-12	3 1/2	1 3/8		10 3/4													
	4	3 1/2	2 1/2-12	3 1/4-12	3 1/2	1 3/8		10 3/4													
6	1	2 1/2	1 7/8-12	2 1/4-12	3	1 1/4	8 3/8	12 1/8	3 1/16	7 1/2	1	2 5/32	2 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		12 1/8													
note 5	3	3 1/2	2 1/2-12	3 1/4-12	3 1/2	1 1/4		12 1/8													
	3	3 1/2																			
7	1	3	2 1/4-12	2 3/4-12	3 1/2	1 1/4	9 1/2	13 3/4	3 7/16	8 1/2	1	2 17/32	2 17/32	3	2 1/2	2 3/16	1 1/4	-20	3 1/2	1 1/8	
	2	3 1/2	2 1/2-12	3 1/4-12	3 1/2	1 1/4		13 3/4													
note 5	3	4	3-12	3 3/4-12	4	1 1/4		13 3/4													
	3	4																			
8	1	3 1/2	2 1/2-12	3 1/4-12	3 1/2	1 1/4	10 1/2	15	3 15/16	9 1/2	1	2 31/32	2 19/32	3 1/4	3	2 5/8	1 1/2	-24	4	1 1/4	
	2	4	3-12	3 3/4-12	4	1 1/4		15													
note 5	3	4 1/2	3 1/4-12	4 1/4-12	4 1/2	1 1/4		15													

Notes:

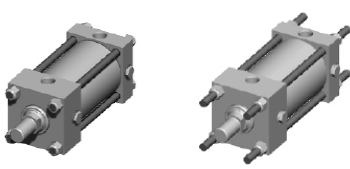
1. All dimensions in inches.
2. EE standard port is SAE ORB. Contact our factory if SAE flange or Alternate port size is required.
3. See Cylinder Nomenclature for thread options.
4. For Optional Rod Ends and dimensions see page 18.
5. Gland Head "G" is longer on 2", 2 1/2" and 3 1/4" bores with largest rod size and when cushioned on gland end. NFPA dimensions remain constant.

Model HW  
Self-aligning Eye  
NFPA Style MPU3



MAXIMUM OPERATING PRESSURE (PSI)		
MODEL HW *		
BORE	PUSH	PULL
1 1/2	1800	2200
2	2300	3000
2 1/2	1500	1800
3 1/4	1600	1900
4	1900	2400
5	2000	2400
6	1800	2200
7	2100	2600
8	2300	2900

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



# model HNM, HNA

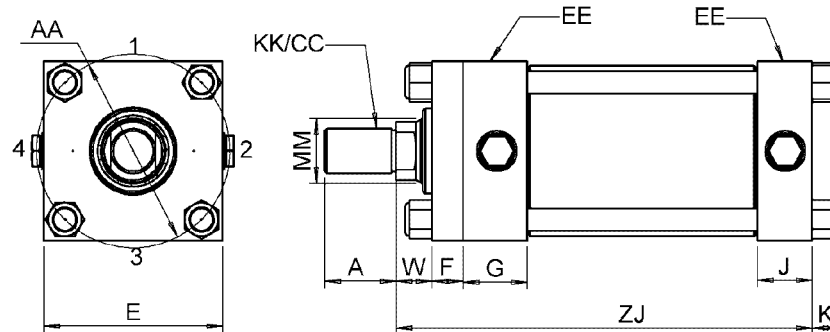
BORE	ROD	ROD DIA		CC	A	W	+ STROKE ZJ	E	F	G	J	K	R	AA	BB	DD	EE	
		MM	KK														NPTF	SAE
1 1/2	1	5/8	7/16-20	1/2-20	3/4	5/8	5 5/8	2 1/2	3/8	1 9/16	1 5/16	1/2	1.63	2.30	1 3/8	3/8-24	1/2	-08
	2	1	3/4-16	7/8-14	1 1/8	1	6											
2	1	1	3/4-16	7/8-14	1 1/8	3/4	6	3	5/8	1 15/32	1 7/32	5/8	2.19	3.09	1 13/16	1/2-20	1/2	-08
	2	1 3/8	1-14	1 1/4-12	1 5/8	1	6 1/4											
	2	1 3/8								2 1/8			note 6	note 6				
2 1/2	1	1	3/4-16	7/8-14	1 1/8	3/4	6 1/8	3 1/2	9/16	1 9/16	1 1/4	5/8	2.55	3.60	1 13/16	1/2-20	1/2	-08
	2	1 3/8	1-14	1 1/4-12	1 5/8	1	6 3/8											
	3	1 3/4	1 1/4-12	1 1/2-12	2	1 1/4	6 5/8											
	3	1 3/4								2 3/16								
3 1/4	1	1 3/8	1-14	1 1/4-12	1 5/8	7/8	7 1/8	4 1/2	3/4	1 25/32	1 17/32	3/4	3.25	4.60	2 5/16	5/8-18	3/4	-12
	2	1 3/4	1 1/4-12	1 1/2-12	2	1 1/8	7 3/8											
	3	2	1 1/2-12	1 3/4-12	2 1/4	1 1/4	7 1/2											
	3	2								2 7/16								
4	1	1 3/4	1 1/4-12	1 1/2-12	2	1	7 5/8	5	7/8	1 25/32	1 17/32	3/4	3.82	5.40	2 5/16	5/8-18	3/4	-12
	2	2	1 1/2-12	1 3/4-12	2 1/4	1 1/8	7 3/4											
	3	2 1/2	1 7/8-12	2 1/4-12	3	1 3/8	8											
5	1	2	1 1/2-12	1 3/4-12	2 1/4	1 1/8	8 1/4	6 1/2	7/8	1 25/32	1 17/32	1	4.95	7.00	3 3/16	7/8-14	3/4	-12
	2	2 1/2	1 7/8-12	2 1/4-12	3	1 3/8	8 1/2											
	3	3	2 1/4-12	2 3/4-12	3 1/2	1 3/8	8 1/2											
	4	3 1/2	2 1/2-12	3 1/4-12	3 1/2	1 3/8	8 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	1 1/8	5.73	8.10	3 5/8	1-14	1	-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											
7	1	3	2 1/4-12	2 3/4-12	3 1/2	1 1/4	10 3/4	8 1/2	1	2 17/32	2 17/32	1 3/16	6.58	9.30	4 1/8	1 1/8-12	1 1/4	-20
	2	3 1/2	2 1/2-12	3 1/4-12	3 1/2	1 1/4	10 3/4											
	3	4	3-12	3 3/4-12	4	1 1/4	10 3/4											
8	1	3 1/2	2 1/2-12	3 1/4-12	3 1/2	1 1/4	11 3/4	9 1/2	1	2 31/32	2 19/32	1 7/16	7.50	10.60	4 1/2	1 1/4-12	1 1/2	-24
	2	4	3-12	3 3/4-12	4	1 1/4	11 3/4											
	3	4 1/2	3 1/4-12	4 1/4-12	4 1/2	1 1/4	11 3/4											

### Notes:

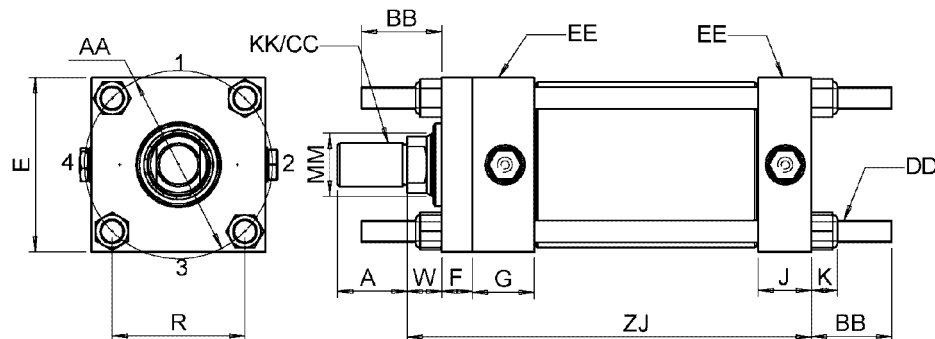
- All dimensions in inches.
- EE standard port is SAE ORB. Contact our factory if SAE flange or Alternate port size is required.
- See Cylinder Nomenclature for thread options.
- For Optional Rod Ends and dimensions see page 18.

- Gland Head "G" is longer on 2", 2 1/2" and 3 1/4" bores with largest rod size and when cushioned on gland end. NFPA dimensions remain constant.
- Due to the heavy barrel wall thickness of Royal cylinders, dimensions 'AA' and 'R' do not match NFPA standards for the 2" bore only.

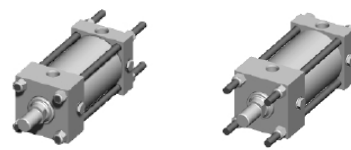
Model **HNM**  
No Mount  
NFPA Style MX0



Model **HNA**  
Extended Tie-Rods  
both ends  
NFPA Style MX1







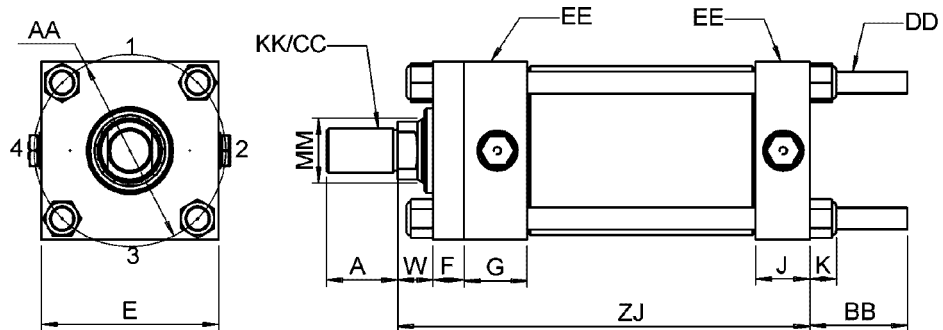
BORE	ROD	ROD DIA		CC	A	W	+ STROKE		E	F	G	J	K	R	AA	BB	DD	EE	
		MM	KK				ZJ	NPTF										SAE	
1 1/2	1	5/8	7/16-20	1/2-20	3/4	5/8	5 5/8	2 1/2	3/8	1 9/16	1 5/16	1/2	1.63	2.30	1 3/8	3/8-24	1/2	-08	
	2	1	3/4-16	7/8-14	1 1/8	1	6												
2	1	1	3/4-16	7/8-14	1 1/8	3/4	6	3	5/8	1 15/32	1 7/32	5/8	2.19	3.09	1 13/16	1/2-20	1/2	-08	
	2	1 3/8	1-14	1 1/4-12	1 5/8	1	6 1/4			2 1/8			note 6	note 6					
	3	1 3/8																	
2 1/2	1	1	3/4-16	7/8-14	1 1/8	3/4	6 1/8	3 1/2	9/16	1 9/16	1 1/4	5/8	2.55	3.60	1 13/16	1/2-20	1/2	-08	
	2	1 3/8	1-14	1 1/4-12	1 5/8	1	6 3/8												
	3	1 3/4	1 1/4-12	1 1/2-12	2	1 1/4	6 5/8												
	3	1 3/4								2 3/16									
3 1/4	1	1 3/8	1-14	1 1/4-12	1 5/8	7/8	7 1/8	4 1/2	3/4	1 25/32	1 17/32	3/4	3.25	4.60	2 5/16	5/8-18	3/4	-12	
	2	1 3/4	1 1/4-12	1 1/2-12	2	1 1/8	7 3/8												
	3	2	1 1/2-12	1 3/4-12	2 1/4	1 1/4	7 1/2												
	3	2								2 7/16									
4	1	1 3/4	1 1/4-12	1 1/2-12	2	1	7 5/8	5	7/8	1 25/32	1 17/32	3/4	3.82	5.40	2 5/16	5/8-18	3/4	-12	
	2	2	1 1/2-12	1 3/4-12	2 1/4	1 1/8	7 3/4												
	3	2 1/2	1 7/8-12	2 1/4-12	3	1 3/8	8												
5	1	2	1 1/2-12	1 3/4-12	2 1/4	1 1/8	8 1/4	6 1/2	7/8	1 25/32	1 17/32	1	4.95	7.00	3 3/16	7/8-14	3/4	-12	
	2	2 1/2	1 7/8-12	2 1/4-12	3	1 3/8	8 1/2												
	3	3	2 1/4-12	2 3/4-12	3 1/2	1 3/8	8 1/2												
	4	3 1/2	2 1/2-12	3 1/4-12	3 1/2	1 3/8	8 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	1 1/8	5.73	8.10	3 5/8	1-14	1	-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												
7	1	3	2 1/4-12	2 3/4-12	3 1/2	1 1/4	10 3/4	8 1/2	1	2 17/32	2 17/32	1 3/16	6.58	9.30	4 1/8	1 1/8-12	1 1/4	-20	
	2	3 1/2	2 1/2-12	3 1/4-12	3 1/2	1 1/4	10 3/4												
	3	4	3-12	3 3/4-12	4	1 1/4	10 3/4												
8	1	3 1/2	2 1/2-12	3 1/4-12	3 1/2	1 1/4	11 3/4	9 1/2	1	2 31/32	2 19/32	1 7/16	7.50	10.60	4 1/2	1 1/4-12	1 1/2	-24	
	2	4	3-12	3 3/4-12	4	1 1/4	11 3/4												
	3	4 1/2	3 1/4-12	4 1/4-12	4 1/2	1 1/4	11 3/4												

Notes:

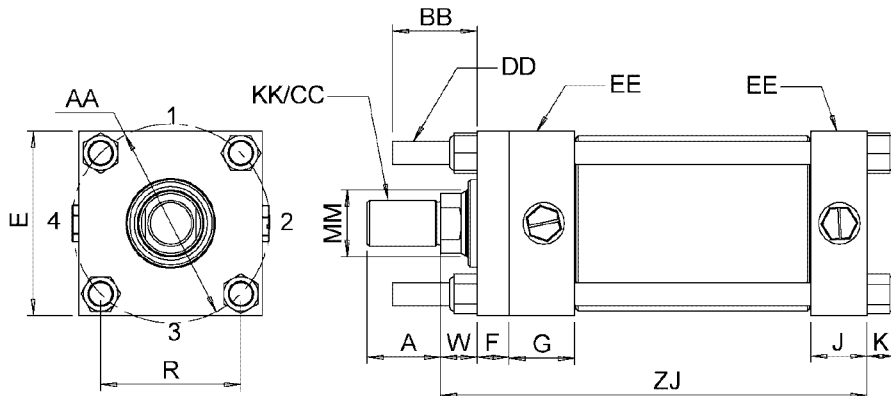
1. All dimensions in inches.
2. EE standard port is SAE ORB. Contact our factory if SAE flange or Alternate port size is required.
3. See Cylinder Nomenclature for thread options.
4. For Optional Rod Ends and dimensions see page 18.

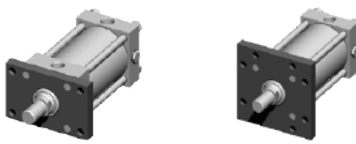
5. Gland Head "G" is longer on 2", 2 1/2" and 3 1/4" bores with largest rod size and when cushioned on gland end. NFPA dimensions remain constant.
6. Due to the heavy barrel wall thickness of Royal cylinders, dimensions 'AA' and 'R' do not match NFPA standards for the 2" bore only.

Model HNB  
Extended Tie-Rods  
Blind End  
NFPA Style MX2



Model HNC  
Extended Tie-Rods  
Gland End  
NFPA Style MX3





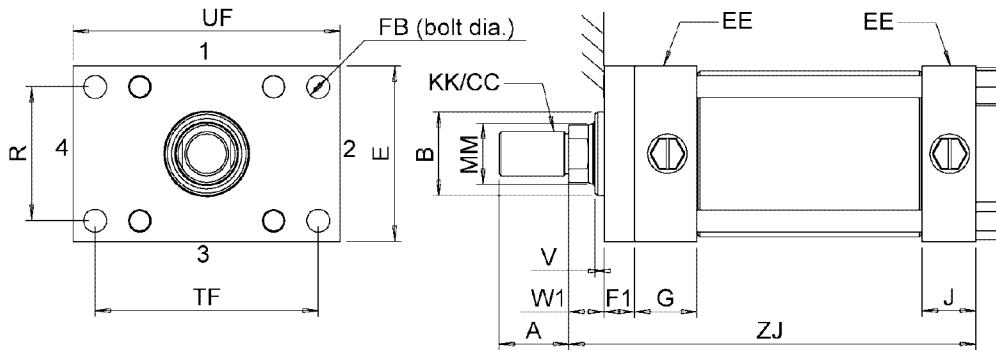
model HR, HRS

BORE	ROD	ROD DIA						+ STROKE	E	F1	G	J	EE		R	FB	TF	UF	B	V
		MM	KK	CC	A	W1	ZJ						NPTF	SAE						
1 1/2	1	5/8	7/16-20	1/2-20	3/4	1/2	5 5/8	2 1/2	1/2	1 9/16	1 5/16	1/2	-08	1.63	3/8	3 7/16	4 1/4	1.125	1/8	
	2	1	3/4-16	7/8-14	1 1/8	7/8	6											1.562	3/8	
2	1	1	3/4-16	7/8-14	1 1/8	3/4	6	3	5/8	1 15/32	1 7/32	1/2	-08	2.05	1/2	4 1/8	5 1/8	1.562	3/16	
	2	1 3/8	1-14	1 1/4-12	1 5/8	1	6 1/4			2 1/8							2.125	3/8		
	note 5	2	1 3/8																	
2 1/2	1	1	3/4-16	7/8-14	1 1/8	11/16	6 1/8	3 1/2	5/8	1 9/16	1 1/4	1/2	-08	2.55	1/2	4 5/8	5 5/8	1.562	3/16	
	2	1 3/8	1-14	1 1/4-12	1 5/8	15/16	6 3/8										2.125	3/8		
	3	1 3/4	1 1/4-12	1 1/2-12	2	1 3/16	6 5/8										2.375	1/2		
	note 5	3	1 3/4							2 3/16										
3 1/4	1	1 3/8	1-14	1 1/4-12	1 5/8	7/8	7 1/8	4 1/2	3/4	1 25/32	1 17/32	3/4	-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 3/8										2.375	3/8		
	3	2	1 1/2-12	1 3/4-12	2 1/4	1 1/4	7 1/2										2.750	3/8		
	note 5	3	2							2 7/16										
4	1	1 3/4	1 1/4-12	1 1/2-12	2	1	7 5/8	5	7/8	1 25/32	1 17/32	3/4	-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	7 3/4										2.750	1/4		
	3	2 1/2	1 7/8-12	2 1/4-12	3	1 3/8	8										3.250	3/8		
5	1	2	1 1/2-12	1 3/4-12	2 1/4	1 1/8	8 1/4	6 1/2	7/8	1 25/32	1 17/32	3/4	-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 1/2										3.250	3/8		
	3	3	2 1/4-12	2 3/4-12	3 1/2	1 3/8	8 1/2										3.875	7/16		
	4	3 1/2	2 1/2-12	3 1/4-12	3 1/2	1 3/8	8 1/2										4.375	3/8		
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	-16	5.73	1	9 7/16	11 1/4	3.250	1/4	
	2	3	2 1/4-12	2 3/4-12	3 1/2	1 1/4	9 5/8										3.875	5/16		
	3	3 1/2	2 1/2-12	3 1/4-12	3 1/2	1 1/4	9 5/8										4.375	1/4		
7	1	3	2 1/4-12	2 3/4-12	3 1/2	1 1/4	10 3/4	8 1/2	1	2 17/32	2 17/32	1 1/4	-20	6.58	1 1/8	10 5/8	12 5/8	3.875	1/4	
	2	3 1/2	2 1/2-12	3 1/4-12	3 1/2	1 1/4	10 3/4										4.375	1/4		
	3	4	3-12	3 3/4-12	4	1 1/4	10 3/4										4.875	3/8		
8	1	3 1/2	2 1/2-12	3 1/4-12	3 1/2	1 1/4	11 3/4	9 1/2	1	2 31/32	2 19/32	1 1/2	-24	7.50	1 1/4	11 13/16	14	4.375	1/4	
	2	4	3-12	3 3/4-12	4	1 1/4	11 3/4										4.875	1/4		
	3	4 1/2	3 1/4-12	4 1/4-12	4 1/2	1 1/4	11 3/4										5.750	1/4		

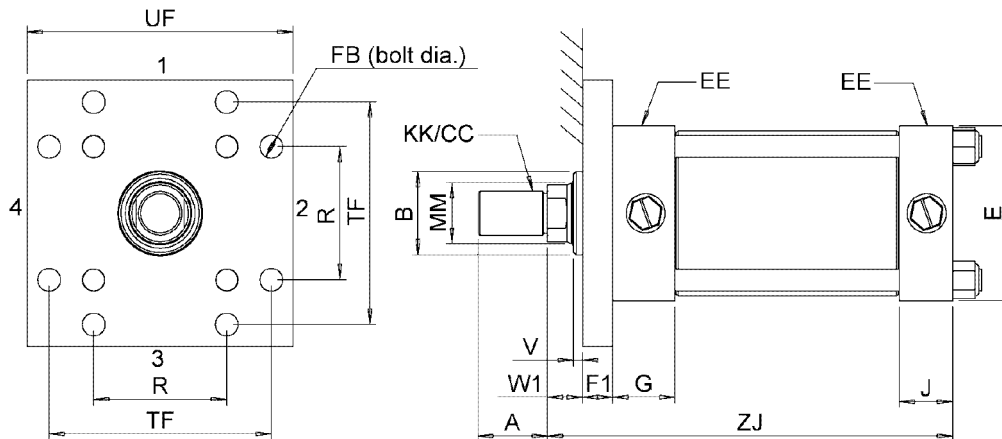
- Notes:**
1. All dimensions in inches.
  2. EE standard port is SAE ORB. Contact our factory if SAE flange or Alternate port size is required.
  3. See Cylinder Nomenclature for thread options.

4. For Optional Rod Ends and dimensions see page 18.
5. Gland Head "G" is longer on 2", 2 1/2" and 3 1/4" bores with largest rod size and when cushioned on gland end. NFPA dimensions remain constant.

**Model HR**  
Rod End Rect-  
angular Flange  
NFPA Style MF1

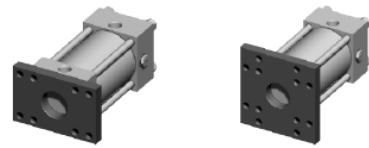


**Model HRS**  
Rod End  
Square  
Flange  
NFPA Style MF5



Model HR*		
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	3000
6	1000	3000
7	1000	3000
8	700	3000

\* For a higher Push pressure rating use model HRS or HG, or contact the factory for alternatives.



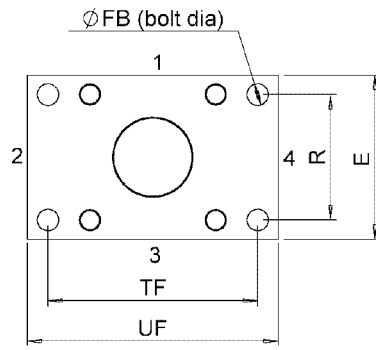
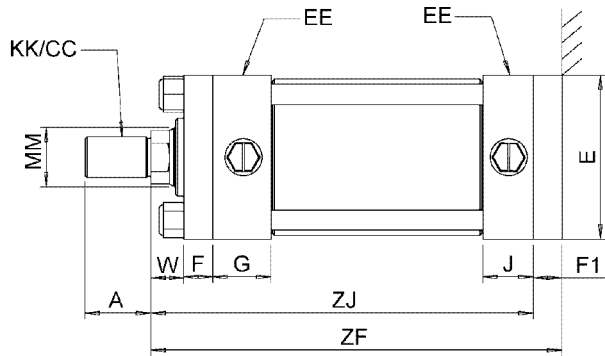
BORE	ROD	ROD DIA		KK	CC	A	W	ADD STROKE		E	F	F1	G	J	EE		R	FB	TF	UF
		MM						ZF	ZJ						NPTF	SAE				
1 1/2	1	5/8	7/16-20	1/2-20	3/4	5/8	6 1/8	5 5/8	2 1/2	3/8	1/2	1 9/16	1 5/16	1/2	-08	1.63	3/8	3 7/16	4 1/4	
	2	1	3/4-16	7/8-14	1 1/8	1	6 1/2	6												
2	1	1	3/4-16	7/8-14	1 1/8	3/4	6 5/8	6	3	5/8	5/8	1 15/32	1 7/32	1/2	-08	2.05	1/2	4 1/8	5 1/8	
	2	1 3/8	1-14	1 1/4-12	1 5/8	1	6 7/8	6 1/4				2 1/8								
	note 5	2	1 3/8																	
2 1/2	1	1	3/4-16	7/8-14	1 1/8	3/4	6 3/4	6 1/8	3 1/2	9/16	5/8	1 9/16	1 1/4	1/2	-08	2.55	1/2	4 5/8	5 5/8	
	2	1 3/8	1-14	1 1/4-12	1 5/8	1	7	6 3/8												
	3	1 3/4	1 1/4-12	1 1/2-12	2	1 1/4	7 1/4	6 5/8				2 3/16								
3 1/4	1	1 3/8	1-14	1 1/4-12	1 5/8	7/8	7 7/8	7 1/8	4 1/2	3/4	3/4	1 25/32	1 17/32	3/4	-12	3.25	5/8	5 7/8	7 1/8	
	2	1 3/4	1 1/4-12	1 1/2-12	2	1 1/8	8 1/8	7 3/8												
	3	2	1 1/2-12	1 3/4-12	2 1/4	1 1/4	8 1/4	7 1/2				2 7/16								
4	1	1 3/4	1 1/4-12	1 1/2-12	2	1	8 1/2	7 5/8	5	7/8	7/8	1 25/32	1 17/32	3/4	-12	3.82	5/8	6 3/8	7 5/8	
	2	2	1 1/2-12	1 3/4-12	2 1/4	1 1/8	8 5/8	7 3/4												
	3	2 1/2	1 7/8-12	2 1/4-12	3	1 3/8	8 7/8	8												
5	1	2	1 1/2-12	1 3/4-12	2 1/4	1 1/8	9 1/8	8 1/4	6 1/2	7/8	7/8	1 25/32	1 17/32	3/4	-12	4.95	7/8	8 3/16	9 3/4	
	2	2 1/2	1 7/8-12	2 1/4-12	3	1 3/8	9 3/8	8 1/2												
	3	3	2 1/4-12	2 3/4-12	3 1/2	1 3/8	9 3/8	8 1/2												
	4	3 1/2	2 1/2-12	3 1/4-12	3 1/2	1 3/8	9 3/8	8 1/2												
6	1	2 1/2	1 7/8-12	2 1/4-12	3	1 1/4	10 5/8	9 5/8	7 1/2	1	1	2 5/32	2 5/32	1	-16	5.73	1	9 7/16	11 1/4	
	2	3	2 1/4-12	2 3/4-12	3 1/2	1 1/4	10 5/8	9 5/8												
	3	3 1/2	2 1/2-12	3 1/4-12	3 1/2	1 1/4	10 5/8	9 5/8												
7	1	3	2 1/4-12	2 3/4-12	3 1/2	1 1/4	11 3/4	10 3/4	8 1/2	1	1	2 17/32	2 17/32	1 1/4	-20	6.58	1 1/8	10 5/8	12 5/8	
	2	3 1/2	2 1/2-12	3 1/4-12	3 1/2	1 1/4	11 3/4	10 3/4												
	3	4	3-12	3 3/4-12	4	1 1/4	11 3/4	10 3/4												
8	1	3 1/2	2 1/2-12	3 1/4-12	3 1/2	1 1/4	12 3/4	11 3/4	9 1/2	1	1	2 31/32	2 19/32	1 1/2	-24	7.50	1 1/4	11 13/16	14	
	2	4	3-12	3 3/4-12	4	1 1/4	12 3/4	11 3/4												
	3	4 1/2	3 1/4-12	4 1/4-12	4 1/2	1 1/4	12 3/4	11 3/4												

Notes:

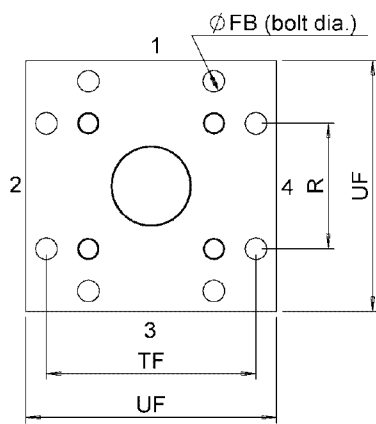
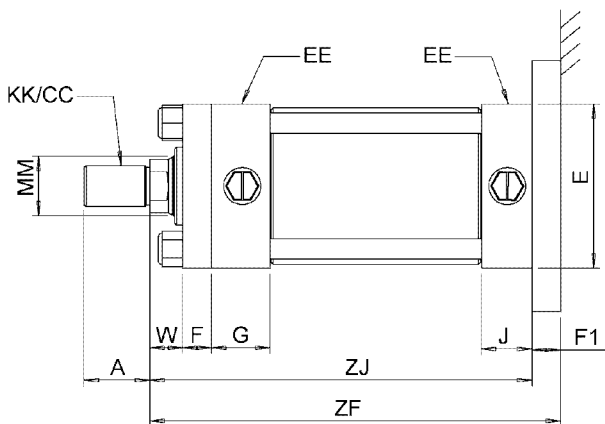
1. All dimensions in inches.
2. EE standard port is SAE ORB. Contact our factory if SAE flange or Alternate port size is required.
3. See Cylinder Nomenclature for thread options.
4. For Optional Rod Ends and dimensions see page 18.
5. Gland Head "G" is longer on 2", 2 1/2" and 3 1/4" bores with largest rod size and when cushioned on gland end. NFPA dimensions remain constant.

Model HB*		
Max. Pressure (PSI)		
BORE	PUSH	PULL
1 1/2	3000	3000
2	3000	2500
2 1/2	3000	2000
3 1/4	3000	1500
4	3000	1500
5	3000	1000
6	3000	1000
7	3000	1000
8	3000	700

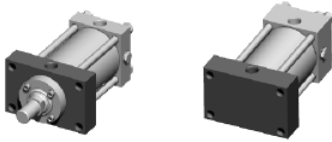
\* For a higher Pull pressure rating use model HBS or HH, or contact the factory for alternatives.



Model HB  
Blind End Rectangular Flange  
NFPA Style MF2



Model HBS  
Blind End Square Flange  
NFPA Style MF6

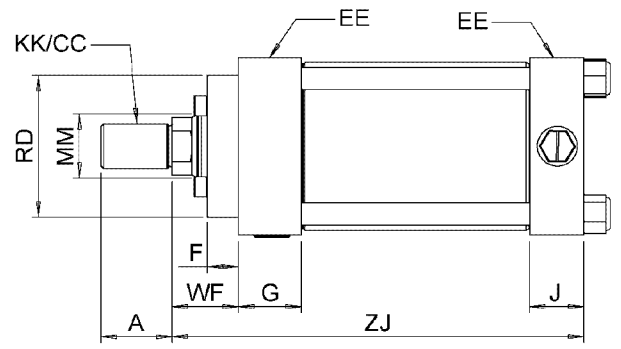
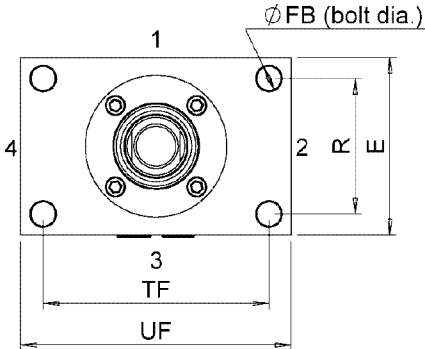


model HG, HH

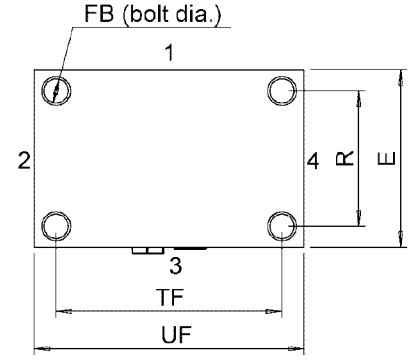
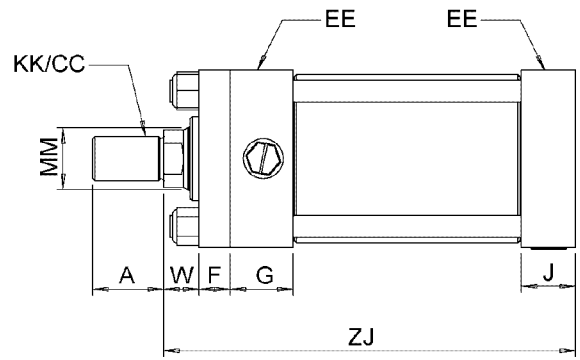
BORE	ROD DIA			CC	A	W	WF	+ STROKE ZJ	E	F	ME5		ME6		J	EE		+0/- .005		
	ROD	MM	KK								G	G	NPTF	SAE		R	FB	RD	TF	UF
1 1/2	1	5/8	7/16-20	1/2-20	3/4	5/8	1	5 5/8	2 1/2	3/8	1 9/16	1 9/16	1 5/16	1/2	-08	1.63	3/8	2 1/2	3 7/16	4 1/4
	2	1	3/4-16	7/8-14	1 1/8	1	1 3/8	6			1 9/16	1 9/16						2 1/2		
2	1	1	3/4-16	7/8-14	1 1/8	3/4	1 3/8	6	3	5/8	1 1/2	1 15/32	1 7/32	1/2	-08	2.05	1/2	3	4 1/8	5 1/8
	2	1 3/8	1-14	1 1/4-12	1 5/8	1	1 5/8	6 1/4			1 15/32							3		
	2	1 3/8									1 15/32							3		
2 1/2	1	1	3/4-16	7/8-14	1 1/8	3/4	1 3/8	6 1/8	3 1/2	5/8	1 1/2	1 9/16	1 1/4	1/2	-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	1 5/8	6 3/8										3 1/2		
	3	1 3/4	1 1/4-12	1 1/2-12	2	1 1/4	1 7/8	6 5/8										3 3/4		
	3	1 3/4									2 1/8	2 3/16								
3 1/4	1	1 3/8	1-14	1 1/4-12	1 5/8	7/8	1 5/8	7 1/8	4 1/2	3/4	1 25/32	1 25/32	1 17/32	3/4	-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 1/8	1 7/8	7 3/8										4		
	3	2	1 1/2-12	1 3/4-12	2 1/4	1 1/4	2	7 1/2			2 7/16	3 7/16						4 1/2		
	3	2																		
4	1	1 3/4	1 1/4-12	1 1/2-12	2	1	1 7/8	7 5/8	5	7/8	1 25/32	1 25/32	1 17/32	3/4	-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	1 1/8	2	7 3/4										4 1/2		
	3	2 1/2	1 7/8-12	2 1/4-12	3	1 3/8	2 1/4	8										5		
	3	2 1/2																		
5	1	2	1 1/2-12	1 3/4-12	2 1/4	1 1/8	2	8 1/4	6 1/2	7/8	1 25/32	1 25/32	1 17/32	3/4	-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	1 3/8	2 1/4	8 1/2										5		
	3	3	2 1/4-12	2 3/4-12	3 1/2	1 3/8	2 1/4	8 1/2										5 3/4		
	4	3 1/2	2 1/2-12	3 1/4-12	3 1/2	1 3/8	2 1/4	8 1/2										6		
6	1	2 1/2	1 7/8-12	2 1/4-12	3	1 1/4	2 1/4	9 5/8	7 1/2	1	2 5/32	2 5/32	2 5/32	1	-16	5.73	1	5	9 7/16	11 1/4
	2	3	2 1/4-12	2 3/4-12	3 1/2	1 1/4	2 1/4	9 5/8										6 3/8		
	3	3 1/2	2 1/2-12	3 1/4-12	3 1/2	1 1/4	2 1/4	9 5/8										6 1/2		
7	1	3	2 1/4-12	2 3/4-12	3 1/2	1 1/4	2 1/4	10 3/4	8 1/2	1	2 17/32	2 17/32	2 17/32	1 1/4	-20	6.58	1 1/8	6 1/2	10 5/8	12 5/8
	2	3 1/2	2 1/2-12	3 1/4-12	3 1/2	1 1/4	2 1/4	10 3/4										6 1/2		
	3	4	3-12	3 3/4-12	4	1 1/4	2 1/4	10 3/4										7 1/2		
8	1	3 1/2	2 1/2-12	3 1/4-12	3 1/2	1 1/4	2 1/4	11 3/4	9 1/2	1	2 31/32	2 31/32	2 19/32	1 1/2	-24	7.50	1 1/4	6 1/2	11 13/16	14
	2	4	3-12	3 3/4-12	4	1 1/4	2 1/4	11 3/4										7 1/2		
	3	4 1/2	3 1/4-12	4 1/4-12	4 1/2	1 1/4	2 1/4	11 3/4										8 1/2		

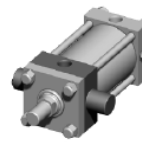
- Notes:**
- All dimensions in inches.
  - EE standard port is SAE ORB. Contact our factory if SAE flange or Alternate port size is required.
  - See Cylinder Nomenclature for thread options.
  - For Optional Rod Ends and dimensions see page 18.
  - Gland Head "G" is longer on 2", 2 1/2" and 3 1/4" bores with largest rod size and when cushioned on gland end. NFPA dimensions remain constant.
  - Cushion adjustment is at Position 3 on the Gland Head of model HG and the Blind Head of model HH.
- \* This dimension does not match NFPA standard.

**Model HG**  
Rectangular Gland  
End Head  
NFPA Style ME5



**Model HH**  
Rectangular Blind  
End Head  
NFPA Style ME6

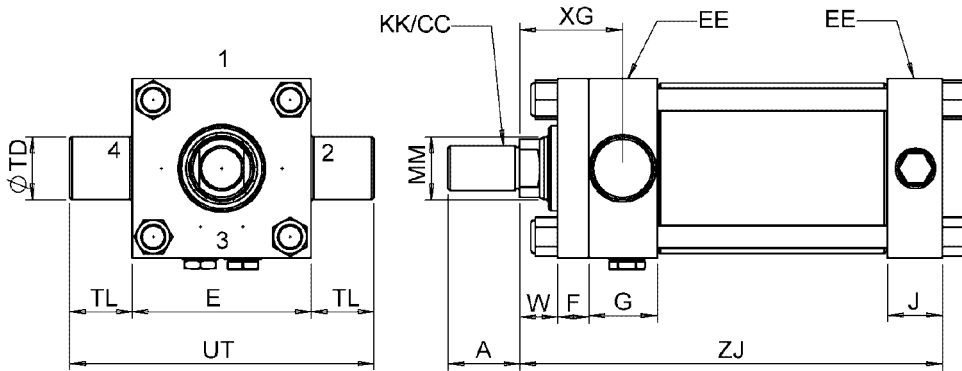




BORE	ROD DIA				HTR		HTB		ADD STROKE			E	F	HTR		HTB		EE		+0/- .001		
	ROD	MM	KK	CC	A	W	W	XG	XJ	HTR	HTB			G	J	G	J	NPTF	SAE	TD	TL	UT
										ZJ	ZJ											
1 1/2	1	5/8	7/16-20	1/2-20	3/4	5/8	5/8	1 7/8	4 7/8	5 5/8	5 5/8	2 1/2	3/8	1 9/16	1 5/16	1 9/16	1 5/16	1/2	-08	1	1	4 1/2
	2	1	3/4-16	7/8-14	1 1/8	1	1	2 1/4	5 1/4	6	6											
2	1	1	3/4-16	7/8-14	1 1/8	3/4	3/4	2 1/4	5 1/2	6 3/16	6 1/4	3	5/8	1 21/32	1 7/32	1 15/32	1 7/32	1/2	-08	1 3/8	1 3/8	5 3/4
	2	1 3/8	1-14	1 1/4-12	1 5/8	1	1	2 1/2	5 3/4	6 7/16	6 1/2											
note 5	2	1 3/8												2 5/16		2 1/8						
	3	1 3/8																				
2 1/2	1	1	3/4-16	7/8-14	1 1/8	3/4	3/4	2 1/4	5 11/16	6 5/16	6 7/16	3 1/2	9/16	1 3/4	1 1/4	1 9/16	1 9/16	1/2	-08	1 3/8	1 3/8	6 1/4
	2	1 3/8	1-14	1 1/4-12	1 5/8	1	1	2 1/2	5 15/16	6 9/16	6 11/16											
3	1 3/4	1 1/4-12	1 1/4-12	1 1/2-12	2	1 1/4	1 1/4	2 3/4	6 3/16	6 13/16	6 15/16											
	note 5	3	1 3/4											2 3/8		2 3/16						
3 1/4	1	1 3/8	1-14	1 1/4-12	1 5/8	7/8	7/8	2 5/8	6 1/2	7 1/4	7 1/2	4 1/2	3/4	1 29/32	1 17/32	1 25/32	1 29/32	3/4	-12	1 3/4	1 3/4	8
	2	1 3/4	1 1/4-12	1 1/2-12	2	1 1/8	1 1/8	2 7/8	6 3/4	7 1/2	7 3/4											
3	2	1 1/2-12	1 3/4-12	2 1/4	1 1/4	1 1/4	1 1/4	3	6 7/8	7 5/8	7 7/8											
	note 5	3	2											2 9/16		2 7/16						
4	1	1 3/4	1 1/4-12	1 1/2-12	2	1	1	2 7/8	7 1/4	7 13/16	8 3/16	5	7/8	1 31/32	1 17/32	1 25/32	2 1/32	3/4	-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	1 1/8	3	7 3/8	7 15/16	8 5/16											
3	2 1/2	1 7/8-12	2 1/4-12	3	1 3/8	1 3/8	3 1/4	7 5/8	8 3/16	8 9/16												
	note 5	3	2 1/2																			
5	1	2	1 1/2-12	1 3/4-12	2 1/4	1 3/16	1 1/8	3	7 3/4	8 1/2	8 13/16	6 1/2	7/8	1 31/32	1 17/32	1 25/32	2 5/32	3/4	-12	1 3/4	1 3/4	10
	2	2 1/2	1 7/8-12	2 1/4-12	3	1 7/16	1 3/8	3 1/4	8	8 3/4	9 1/16											
3	2 1/4-12	2 3/4-12	3 1/2	1 7/16	1 3/8	3/4	3/4	8	8 3/4	9 1/16												
	4	3 1/2	2 1/2-12	3 1/4-12	3 1/2	1 7/16	1 3/8	3 1/4	8	8 3/4	9 1/16											
6	1	2 1/2	1 7/8-12	2 1/4-12	3	1 1/4	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	1	-16	2	2	11 1/2
	2	3	2 1/4-12	2 3/4-12	3 1/2	1 1/4	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	1 1/4	3 3/8	8 9/16	9 3/4	9 5/8												
	note 5	3	2 1/4-12	2 3/4-12	3 1/2	1 5/16	1 1/4	3 5/8	9 11/16	10 91/97	10 3/4	8 1/2	1	2 21/32	2 17/32	2 17/32	2 17/32	1 1/4	-20	2 1/2	2 1/2	13 1/2
7	2	3 1/2	2 1/2-12	3 1/4-12	3 1/2	1 5/16	1 1/4	3 5/8	9 11/16	10 91/97	10 3/4											
	3	4	3-12	3 3/4-12	4	1 5/16	1 1/4	3 5/8	9 11/16	10 91/97	10 3/4											
8	1	3 1/2	2 1/2-12	3 1/4-12	3 1/2	1 1/4	1 1/4	3 3/4	10 11/16	11 7/8	12 5/32	9 1/2	1	3 3/32	2 19/32	2 31/32	3 1/16	1 1/2	-24	3	3	15 1/2
	2	4	3-12	3 3/4-12	4	1 1/4	1 1/4	3 3/4	10 11/16	11 7/8	12 5/32											
3	4 1/2	3 1/4-12	4 1/4-12	4 1/2	1 1/4	1 1/4	3 3/4	10 11/16	11 7/8	12 5/32												

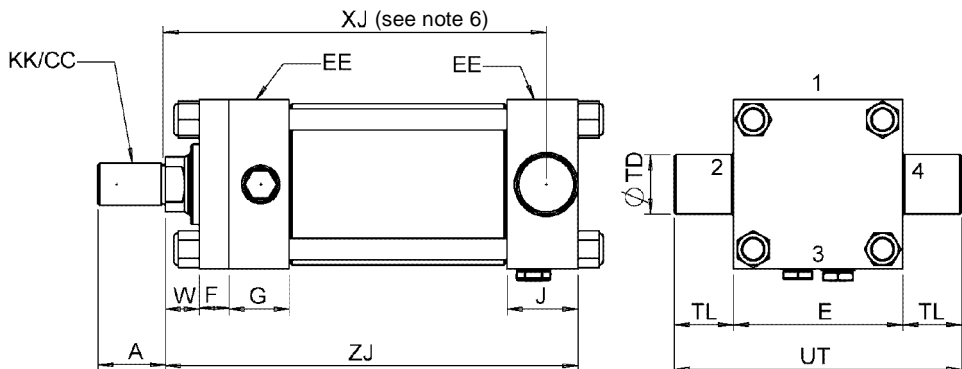
**Notes:**

- All dimensions in inches.
- EE standard port is SAE ORB. Contact our factory if SAE flange or Alternate port size is required.
- See Cylinder Nomenclature for thread options.
- For Optional Rod Ends and dimensions see page 18.
- Gland Head "G" is longer on 2", 2 1/2" and 3 1/4" bores with largest rod size and when cushioned on gland end. NFPA dimensions remain constant.
- Cushion adjustment is at Position 3 on the Gland Head of model HTR and the Blind Head of model HTB.
- XJ dimensions are not NFPA compliant for 2" through 8" bores.



Model HTR  
Rod End Trunnion  
NFPA Style MT1

**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 HTB  
Blind End Trunnion  
NFPA Style MT2



## model HT

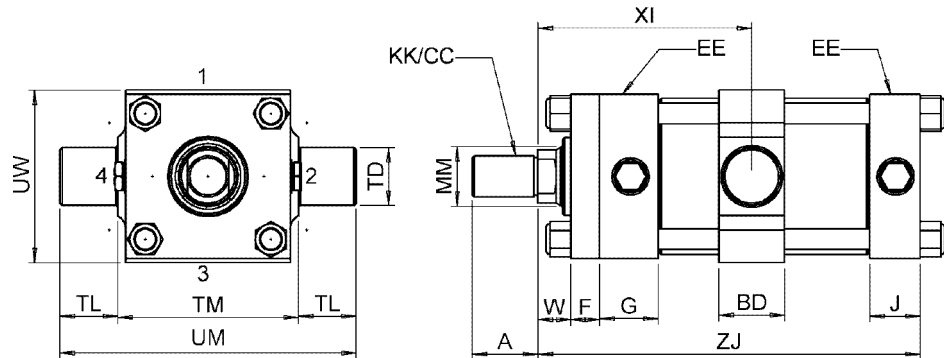
BORE	ROD DIA		KK	CC	A	W	XI (min)	ADD STROKE		E	F	G	J	EE		+0/-0.001	
	ROD	MM						XI (max)	ZJ					NPTF	SAE	TD	TL
1 1/2	1	5/8	7/16-20	1/2-20	3/4	5/8	3 5/32	3 23/32	5 5/8	2 1/2	3/8	1 9/16	1 5/16	1/2	-08	1	1
	2	1	3/4-16	7/8-14	1 1/8	1	3 17/32	4 3/32	6							1	1
2	1	1	3/4-16	7/8-14	1 1/8	3/4	3 19/32	4 1/32	6	3	5/8	1 15/32	1 7/32	1/2	-08	1 3/8	1 3/8
	2	1 3/8	1-14	1 1/4-12	1 5/8	1	3 27/32	4 9/32	6 1/4			2 1/8				1 3/8	1 3/8
	note 5	2	1 3/8				4 1/2	4 9/32									
2 1/2	1	1	3/4-16	7/8-14	1 1/8	3/4	3 5/8	4 1/8	6 1/8	3 1/2	9/16	1 9/16	1 1/4	1/2	-08	1 3/8	1 3/8
	2	1 3/8	1-14	1 1/4-12	1 5/8	1	3 7/8	4 3/8	6 3/8							1 3/8	1 3/8
	3	1 3/4	1 1/4-12	1 1/2-12	2	1 1/4	4 1/8	4 5/8	6 5/8							1 3/8	1 3/8
	note 5	3	1 3/4				4 3/4	4 5/8				2 3/16					
3 1/4	1	1 3/8	1-14	1 1/4-12	1 5/8	7/8	4 13/32	4 19/32	7 1/8	4 1/2	3/4	1 25/32	1 17/32	3/4	-12	1 3/4	1 3/4
	2	1 3/4	1 1/4-12	1 1/2-12	2	1 1/8	4 21/32	4 27/32	7 3/8							1 3/4	1 3/4
	3	2	1 1/2-12	1 3/4-12	2 1/4	1 1/4	4 25/32	4 31/32	7 1/2							1 3/4	1 3/4
	note 5	3	2				5 7/16	4 31/32				2 7/16					
4	1	1 3/4	1 1/4-12	1 1/2-12	2	1	4 21/32	5 3/32	7 5/8	5	7/8	1 25/32	1 17/32	3/4	-12	1 3/4	1 3/4
	2	2	1 1/2-12	1 3/4-12	2 1/4	1 1/8	4 25/32	5 7/32	7 3/4							1 3/4	1 3/4
	3	2 1/2	1 7/8-12	2 1/4-12	3	1 3/8	5 1/32	5 15/32	8							1 3/4	1 3/4
5	1	2	1 1/2-12	1 3/4-12	2 1/4	1 1/8	4 25/32	5 23/32	8 1/4	6 1/2	7/8	1 25/32	1 17/32	3/4	-12	1 3/4	1 3/4
	2	2 1/2	1 7/8-12	2 1/4-12	3	1 3/8	5 1/32	5 31/32	8 1/2							1 3/4	1 3/4
	3	3	2 1/4-12	2 3/4-12	3 1/2	1 3/8	5 1/32	5 31/32	8 1/2							1 3/4	1 3/4
	4	3 1/2	2 1/2-12	3 1/4-12	3 1/2	1 3/8	5 1/32	5 31/32	8 1/2							1 3/4	1 3/4
6	1	2 1/2	1 7/8-12	2 1/4-12	3	1 1/4	5 29/32	5 31/32	9 5/8	7 1/2	1	2 5/32	2 5/32	1	-16	2	2
	2	3	2 1/4-12	2 3/4-12	3 1/2	1 1/4	5 29/32	5 31/32	9 5/8							2	2
	3	3 1/2	2 1/2-12	3 1/4-12	3 1/2	1 1/4	5 29/32	5 31/32	9 5/8							2	2
7	1	3	2 1/4-12	2 3/4-12	3 1/2	1 1/4	6 9/32	6 23/32	10 3/4	8 1/2	1	2 17/32	2 17/32	1 1/4	-20	2 1/2	2 1/2
	2	3 1/2	2 1/2-12	3 1/4-12	3 1/2	1 1/4	6 9/32	6 23/32	10 3/4							2 1/2	2 1/2
	3	4	3-12	3 3/4-12	4	1 1/4	6 9/32	6 23/32	10 3/4							2 1/2	2 1/2
8	1	3 1/2	2 1/2-12	3 1/4-12	3 1/2	1 1/4	6 31/32	7 13/32	11 3/4	9 1/2	1	2 31/32	2 19/32	1 1/2	-24	3	3
	2	4	3-12	3 3/4-12	4	1 1/4	6 31/32	7 13/32	11 3/4							3	3
	3	4 1/2	3 1/4-12	4 1/4-12	4 1/2	1 1/4	6 31/32	7 13/32	11 3/4							3	3

## Notes:

- All dimensions in inches.
- EE standard port is SAE ORB. Contact our factory if SAE flange or Alternate port size is required.
- See Cylinder Nomenclature for thread options.

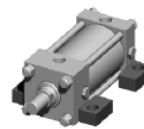
- For Optional Rod Ends and dimensions see page 18.
- Gland Head "G" is longer on 2", 2 1/2" and 3 1/4" bores with largest rod size and when cushioned on gland end. NFPA dimensions remain constant.

Model HT  
Mid-Trunnion  
NFPA Style MT4



**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	MODEL HT			
	BD	TM	UM	UW
1 1/2	1 3/16	3	5	3
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

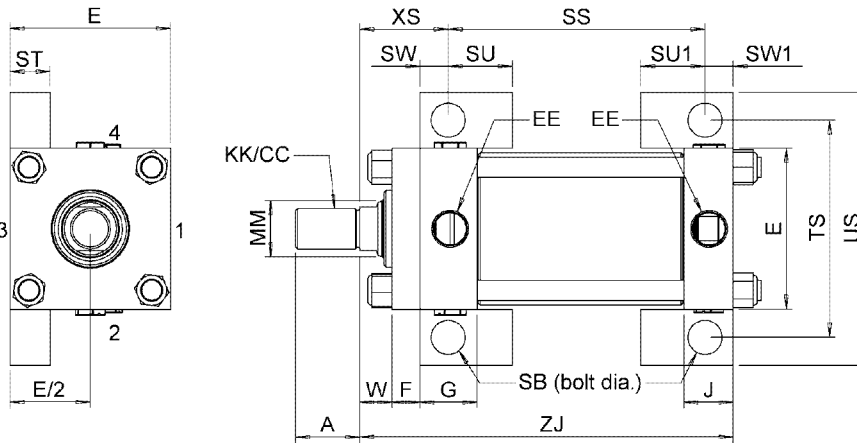


BORE	ROD DIA										ADD STROKE		EE		(min.)									
	ROD	MM	KK	CC	A	W	W1	XS	XT	ZJ	SS	E	F	G	J	NPTF	SAE	ND*	SB	SU	SW	ST	TS	US
1 1/2	1	5/8	7/16-20	1/2-20	3/4	5/8	5/8	1 3/8	2	5 5/8	3 7/8	2 1/2	3/8	1 9/16	1 5/16	1/2	-08	3/8	3/8	15/16	3/8	1/2	3 1/4	4
	2	1	3/4-16	7/8-14	1 1/8	1	1	1 3/4	2 3/8	6	3 7/8							3/8						
2	1	1	3/4-16	7/8-14	1 1/8	3/4	3/4	1 7/8	2 3/8	6	3 5/8	3	5/8	1 15/32	1 7/32	1/2	-08	7/16	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	6 1/4	3 5/8			2 1/8			7/16							
	3	1 3/8																7/16						
2 1/2	1	1	3/4-16	7/8-14	1 1/8	3/4	3/4	2 1/16	2 3/8	6 1/8	3 3/8	3 1/2	9/16	1 9/16	1 1/4	1/2	-08	5/8	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	6 3/8	3 3/8							5/8		note 6	note 6			
	3	1 3/4	1 1/4-12	1 1/2-12	2	1 1/4	1 1/4	2 9/16	2 7/8	6 5/8	3 3/8			2 3/16				1/2						
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 1/8	4 1/8	4 1/2	3/4	1 25/32	1 17/32	3/4	-12	3/4	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 3/8	4 1/8							3/4						
	3	2	1 1/2-12	1 3/4-12	2 1/4	1 1/4	1 1/4	2 11/16	3 1/8	7 1/2	4 1/8			2 7/16				5/8						
4	1	1 3/4	1 1/4-12	1 1/2-12	2	1	1 1/16	2 3/4	3	7 9/16	4	5	7/8	1 25/32	1 17/32	3/4	-12	1	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	7 11/16	4							1						
	3	2 1/2	1 7/8-12	2 1/4-12	3	1 3/8	1 7/16	3 1/8	3 3/8	7 15/16	4							5/8						
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 3/16	4 1/2	6 1/2	7/8	1 25/32	1 17/32	3/4	-12	1	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 7/16	4 1/2							1						
	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 7/16	4 1/2							1						
	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 7/16	4 1/2							7/8						
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	1	-16	1 1/4	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							1 1/4						
	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							1 1/8						
7	1	3	2 1/4-12	2 3/4-12	3 1/2	1 1/4	1 1/4	3 5/8	3 13/16	10 3/4	5 3/4	8 1/2	1	2 17/32	2 17/32	1 1/4	-20	1 1/2	1 1/2	2 7/8	1 3/8	1 1/2	11 1/4	14
	2	3 1/2	2 1/2-12	3 1/4-12	3 1/2	1 1/4	1 1/4	3 5/8	3 13/16	10 3/4	5 3/4							1 1/2						
	3	4	3-12	3 3/4-12	4	1 1/4	1 1/4	3 5/8	3 13/16	10 3/4	5 3/4							1 7/16						
8	1	3 1/2	2 1/2-12	3 1/4-12	3 1/2	1 1/4	1 1/4	3 5/8	3 15/16	11 3/4	6 3/4	9 1/2	1	2 31/32	2 19/32	1 1/2	-24	1 1/2	1 1/2	2 7/8	1 3/8	1 1/2	12 1/4	15
	2	4	3-12	3 3/4-12	4	1 1/4	1 1/4	3 5/8	3 15/16	11 3/4	6 3/4							1 1/2						
	3	4 1/2	3 1/4-12	4 1/4-12	4 1/2	1 1/4	1 1/4	3 5/8	3 15/16	11 3/4	6 3/4							1 1/2						

Notes:

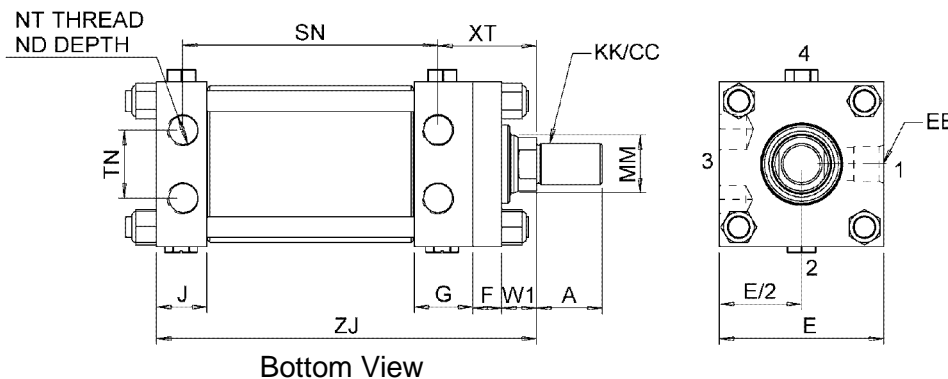
1. All dimensions in inches.
2. EE standard port is SAE ORB. Contact our factory if SAE flange or Alternate port size is required.
3. See Cylinder Nomenclature for thread options.
4. For Optional Rod Ends and dimensions see page 18.

5. Gland Head "G" is longer on 2", 2 1/2" and 3 1/4" bores with largest rod size and when cushioned on gland end. NFPA dimensions remain constant.
  6. SU1 = SU and SW1 = SW except for 2 1/2" bore, where SU1 = 1 9/16" and SW1 = 11/16".
- \* Some values of ND thread depth do not match NFPA.



Model HF  
Foot Mount  
NFPA Style MS2

Model HS  
Side Tapped  
NFPA Style MS4



MODEL HS			
BORE	NT	TN	SN +STROKE
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
7	1 1/2-6	3 3/4	5 7/8
8	1 1/2-6	4 1/4	6 5/8





model HD

BORE	ROD	ROD DIA MM	KK	CC	A	W	ADD	ADD	E	F	G	EE	
							STROKE	STROKE X2				NPTF	SAE
							LD	ZM					
1 1/2	1	5/8	7/16-20	1/2-20	3/4	5/8	5 5/8	6 7/8	2 1/2	3/8	1 9/16	1/2	-08
	2	1	3/4-16	7/8-14	1 1/8	1	5 5/8	7 5/8					
2	1	1	3/4-16	7/8-14	1 1/8	3/4	6 1/8	7 5/8	3	5/8	1 15/32	1/2	-08
	2	1 3/8	1-14	1 1/4-12	1 5/8	1	6 1/8	8 1/8					
note 5	2	1 3/8											
2 1/2	1	1	3/4-16	7/8-14	1 1/8	3/4	6 1/4	7 3/4	3 1/2	9/16	1 9/16	1/2	-08
	2	1 3/8	1-14	1 1/4-12	1 5/8	1	6 1/4	8 1/4					
	3	1 3/4	1 1/4-12	1 1/2-12	2	1 1/4	6 1/4	8 3/4					
note 5	3	1 3/4											
3 1/4	1	1 3/8	1-14	1 1/4-12	1 5/8	7/8	7 1/4	9	4 1/2	3/4	1 25/32	3/4	-12
	2	1 3/4	1 1/4-12	1 1/2-12	2	1 1/8	7 1/4	9 1/2					
	3	2	1 1/2-12	1 3/4-12	2 1/4	1 1/4	7 1/4	9 3/4					
note 5	3	2											
4	1	1 3/4	1 1/4-12	1 1/2-12	2	1	7 3/4	9 3/4	5	7/8	1 25/32	3/4	-12
	2	2	1 1/2-12	1 3/4-12	2 1/4	1 1/8	7 3/4	10					
	3	2 1/2	1 7/8-12	2 1/4-12	3	1 3/8	7 3/4	10 1/2					
5	1	2	1 1/2-12	1 3/4-12	2 1/4	1 1/8	8 1/4	10 1/2	6 1/2	7/8	1 25/32	3/4	-12
	2	2 1/2	1 7/8-12	2 1/4-12	3	1 3/8	8 1/4	11					
	3	3	2 1/4-12	2 3/4-12	3 1/2	1 3/8	8 1/4	11					
	4	3 1/2	2 1/2-12	3 1/4-12	3 1/2	1 3/8	8 1/4	11					
6	1	2 1/2	1 7/8-12	2 1/4-12	3	1 1/4	9 3/8	11 7/8	7 1/2	1	2 5/32	1	-16
	2	3	2 1/4-12	2 3/4-12	3 1/2	1 1/4	9 3/8	11 7/8					
	3	3 1/2	2 1/2-12	3 1/4-12	3 1/2	1 1/4	9 3/8	11 7/8					
7	1	3	2 1/4-12	2 3/4-12	3 1/2	1 1/4	10 1/2	13	8 1/2	1	2 17/32	1 1/4	-20
	2	3 1/2	2 1/2-12	3 1/4-12	3 1/2	1 1/4	10 1/2	13					
	3	4	3-12	3 3/4-12	4	1 1/4	10 1/2	13					
8	1	3 1/2	2 1/2-12	3 1/4-12	3 1/2	1 1/4	11 7/8	14 3/8	9 1/2	1	2 31/32	1 1/2	-24
	2	4	3-12	3 3/4-12	4	1 1/4	11 7/8	14 3/8					
	3	4 1/2	3 1/4-12	4 1/4-12	4 1/2	1 1/4	11 7/8	14 3/8					

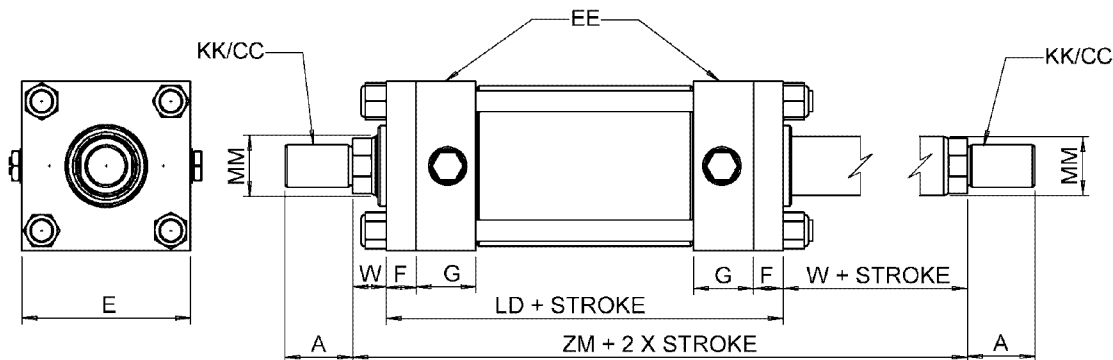
Notes:

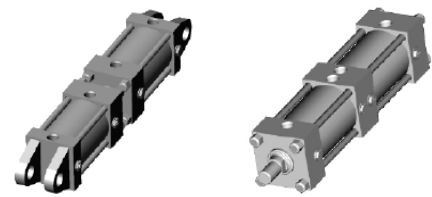
1. All dimensions in inches.
2. EE standard port is SAE ORB. Contact our factory if SAE flange or Alternate port size is required.
3. See Cylinder Nomenclature for thread options.
4. For Optional Rod Ends and dimensions see page 18.
5. Gland Head "G" is longer on 2", 2 1/2" and 3 1/4" bores with largest rod size and when cushioned on gland end. NFPA dimensions remain constant.
6. Other standard mounting styles are available. Add the required mounting code after the "D" for Double rod in the cylinder nomenclature. Examples:

- H\_DF\_ Foot Mount
- H\_DS\_ Side Tapped
- H\_DT\_ Mid Trunnion (include XI in nomenclature)

For mounting styles not common to both ends, please contact the factory.

Model HD  
Double Rod

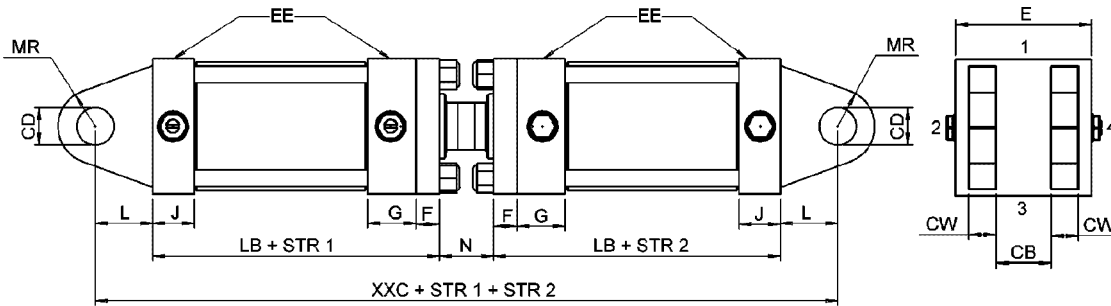




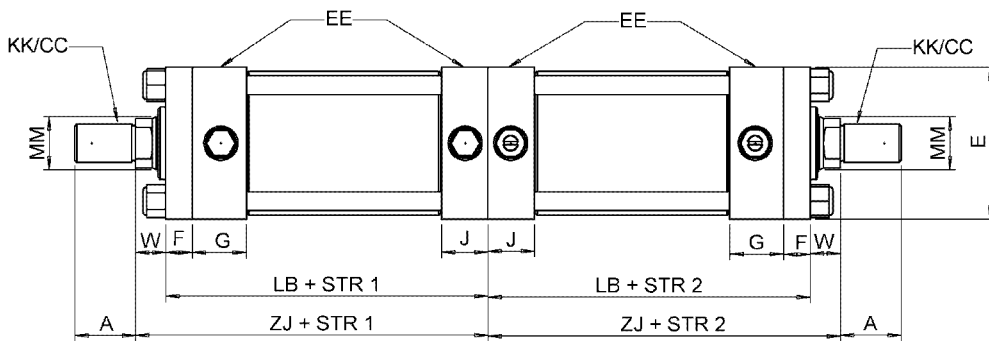
BORE	ROD DIA						ADD	ADD	ADD	N	E	F	G	J	L	HC		HE		EE		MR	
	ROD	MM	KK	CC	A	W	STROKE LB	STROKE ZJ	STR1+STR2 XXC							CB	CB	NPTF	SAE				
1 1/2	1	5/8	7/16-20	1/2-20	3/4	5/8	5	5 5/8	12 3/4	1 1/4	2 1/2	3/8	1 9/16	1 5/16	3/4	25/32	3/4	1/2	1/2	1/2	-08	1/2	
	2	1	3/4-16	7/8-14	1 1/8	1		6	12 3/4														
2	1	1	3/4-16	7/8-14	1 1/8	3/4	5 1/4	6	14 1/2	1 1/2	3	5/8	1 15/32	1 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		6 1/4	14 1/2														
note 5	2	1 3/8										2 1/8											
	2	1	3/4-16	7/8-14	1 1/8	3/4	5 3/8	6 1/8	14 3/4	1 1/2	3 1/2	9/16	1 9/16	1 1/4	1 1/4	1 9/32	1 1/4	3/4	5/8	1/2	-08	3/4	
2 1/2	1	1 3/8	1-14	1 1/4-12	1 5/8	1		6 3/8	14 3/4														
	2	1 3/4	1 1/4-12	1 1/2-12	2	1 1/4		6 5/8	14 3/4														
note 5	3	1 3/4										2 3/16											
	3	1 3/4	1-14	1 1/4-12	1 5/8	7/8	6 1/4	7 1/8	17 1/4	1 3/4	4 1/2	3/4	1 25/32	1 17/32	1 1/2	1 17/32	1 1/2	1	3/4	3/4	-12	1	
3 1/4	1	1 3/8	1-14	1 1/4-12	1 5/8	7/8		7 3/8	17 1/4														
	2	1 3/4	1 1/4-12	1 1/2-12	2	1 1/8		7 1/2	17 1/4														
note 5	3	2	1 1/2-12	1 3/4-12	2 1/4	1 1/4						2 7/16											
	3	2																					
4	1	1 3/4	1 1/4-12	1 1/2-12	2	1	6 5/8	7 5/8	19 5/8	2 1/8	5	7/8	1 25/32	1 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		7 3/4	19 5/8														
5	1	2	1 1/2-12	1 3/4-12	2 1/4	1 1/8	7 1/8	8 1/4	21	2 1/4	6 1/2	7/8	1 25/32	1 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		8 1/2	21														
6	1	2 1/2	1 7/8-12	2 1/4-12	3	1 1/4	8 3/8	9 5/8	24 1/4	2 1/2	7 1/2	1	2 5/32	2 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		9 5/8	24 1/4														
7	1	3	2 1/4-12	2 3/4-12	3 1/2	1 1/4	9 1/2	10 3/4	28	3	8 1/2	1	2 17/32	2 17/32	3	3 1/32	3	2 1/2	1 1/2	1 1/4	-20	2 1/2	
	2	3 1/2	2 1/2-12	3 1/4-12	3 1/2	1 1/4		10 3/4	28														
8	1	3 1/2	2 1/2-12	3 1/4-12	3 1/2	1 1/4	10 1/2	11 3/4	30 3/4	3 1/4	9 1/2	1	2 31/32	2 19/32	3 1/4	3 1/32	3	3	1 1/2	1 1/2	-24	2 3/4	
	2	4	3-12	3 3/4-12	4	1 1/4		11 3/4	30 3/4														

Notes:

1. All dimensions in inches.
2. EE standard port is SAE ORB. Contact our factory if SAE flange or Alternate port size is required.
3. See Cylinder Nomenclature for thread options.
4. For Optional Rod Ends and dimensions see page 18.
5. Gland Head "G" is longer on 2", 2 1/2" and 3 1/4" bores with largest rod size and when cushioned on gland end. NFPA dimensions remain constant.
6. For mounting styles other than shown below, please contact the factory.



Model HCR  
Common Rod

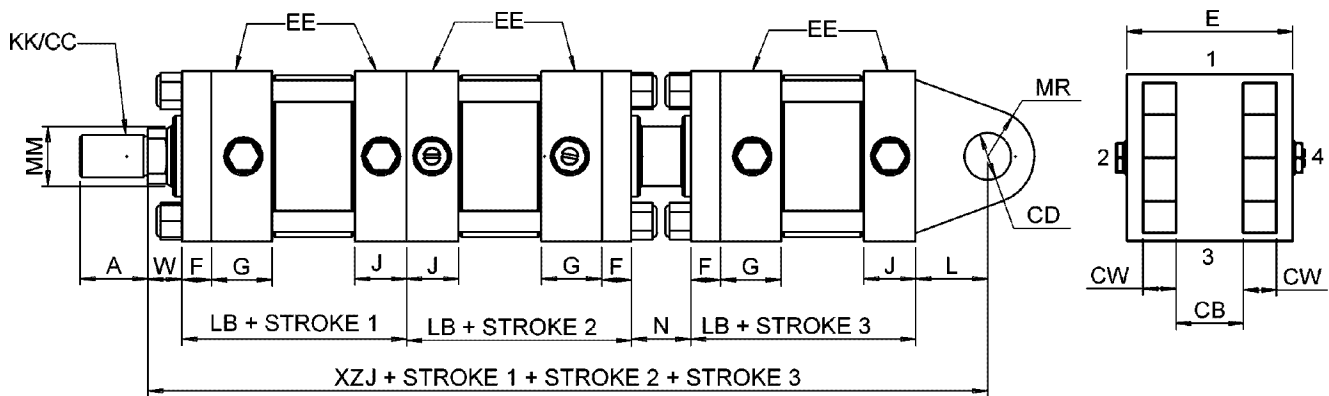


Model HCH  
Common Head

BORE	ROD DIA		KK	CC	A	W	ADD	ADD STR1+	E	F	G	J	L	N	HC	CD	CW	EE		MR
	STROKE	STR2+STR3					CB	NPTF							SAE					
	ROD	MM					LB	XZJ												
1 1/2	1	5/8	7/16-20	1/2-20	3/4	5/8	5	17 5/8	2 1/2	3/8	1 9/16	1 5/16	3/4	1 1/4	25/32	1/2	1/2	1/2	-08	1/2
	2	1	3/4-16	7/8-14	1 1/8	1		18												
2	1	1	3/4-16	7/8-14	1 1/8	3/4	5 1/4	19 1/4	3	5/8	1 15/32	1 7/32	1 1/4	1 1/2	1 9/32	3/4	5/8	1/2	-08	3/4
	2	1 3/8	1-14	1 1/4-12	1 5/8	1		19 1/2												
note 5	2	1 3/8									2 1/8									
2 1/2	1	1	3/4-16	7/8-14	1 1/8	3/4	5 3/8	19 5/8	3 1/2	9/16	1 9/16	1 1/4	1 1/4	1 1/2	1 9/32	3/4	5/8	1/2	-08	3/4
	2	1 3/8	1-14	1 1/4-12	1 5/8	1		19 7/8												
3 1/4	1	1 3/8	1-14	1 1/4-12	1 5/8	7/8	6 1/4	22 7/8	4 1/2	3/4	1 25/32	1 17/32	1 1/2	1 3/4	1 17/32	1	3/4	3/4	-12	1
	2	1 3/4	1 1/4-12	1 1/2-12	2	1 1/8		23 1/8												
note 5	3	1 3/4	1 1/4-12	1 1/2-12	2	1 1/4		23 1/4			2 3/16									
4	1	1 3/4	1 1/4-12	1 1/2-12	2	1	6 5/8	25	5	7/8	1 25/32	1 17/32	2 1/8	2	2 1/32	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		25 1/8												
5	1	2	1 1/2-12	1 3/4-12	2 1/4	1 1/8	7 1/8	27	6 1/2	7/8	1 25/32	1 17/32	2 1/4	2 1/4	2 17/32	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		27 1/4												
6	1	2 1/2	1 7/8-12	2 1/4-12	3	1 1/4	8 3/8	31 3/8	7 1/2	1	2 5/32	2 5/32	2 1/2	2 1/2	2 17/32	2	1 1/4	1	-16	2
	2	3	2 1/4-12	2 3/4-12	3 1/2	1 1/4		31 3/8												
7	1	3	2 1/4-12	2 3/4-12	3 1/2	1 1/4	9 1/2	35 3/4	8 1/2	1	2 17/32	2 17/32	3	3	3 1/32	2 1/2	1 1/2	1 1/4	-20	2 1/2
	2	3 1/2	2 1/2-12	3 1/4-12	3 1/2	1 1/4		35 3/4												
8	1	3 1/2	2 1/2-12	3 1/4-12	3 1/2	1 1/4	10 1/2	39 1/4	9 1/2	1	2 31/32	2 19/32	3 1/4	3 1/4	3 1/32	3	1 1/2	1 1/2	-24	2 3/4
	2	4	3-12	3 3/4-12	4	1 1/4		39 1/4												
note 5	3	4 1/2	3 1/4-12	4 1/4-12	4 1/2	1 1/4		39 1/4												

- Notes:**
1. All dimensions in inches.
  2. EE standard port is SAE ORB. Contact our factory if SAE flange or Alternate port size is required.
  3. See Cylinder Nomenclature for thread options.
  4. For Optional Rod Ends and dimensions see page18.
  5. Gland Head "G" is longer on 2", 2 1/2" and 3 1/4" bores with largest rod size and when cushioned on gland end. NFPA dimensions remain constant.

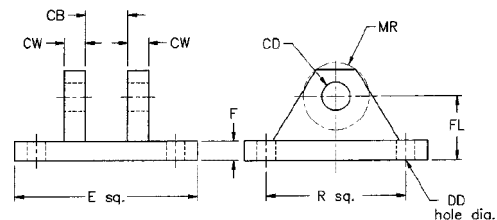
**Model HCCHR**  
Common Head Common Rod



**Clevis Type Mounting Bracket**

Adapts to HE mount cylinder or HE rod eye

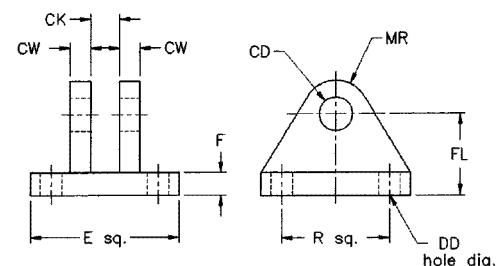
PART	HCM15	HCM2	HCM32	HCM4	HCM5	HCM6	HCM7	HCM8	HCM10	HCM12
CB	25/32	1 9/32	1 17/32	2 1/32	2 9/16	2 9/16	3 1/16	3 1/16	4 1/16	4 9/16
CD	1/2	3/4	1	1 3/8	1 3/4	2	2 1/2	3	3 1/2	4
CW	1/2	5/8	3/4	1	1 1/4	1 1/4	1 1/2	1 1/2	2	2
DD	13/32	17/32	21/32	21/32	15/16	1 1/16	1 3/16	1 5/16	1 13/16	2 1/16
E	3 1/2	5	6 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 eye

PART	HWM15	HWM2-D	HWM2*	HWM32	HWM4	HWM5	HWM6	HWM7	HWM8
CD	1/2	3/4	3/4	1	1 3/8	1 3/4	2	2 1/2	3
CK	15/32	11/16	11/16	29/32	1 7/32	1 19/32	1 13/16	2 1/4	2 23/32
CW	5/16	1/2	1/2	5/8	3/4	3/4	7/8	1 1/4	1 1/2
DD	13/32	17/32	1/2"-20	21/32	21/32	15/16	1 1/16	1 3/16	1 5/16
E	2 1/2	3 1/2	3 1/2	4 1/2	5	6 1/2	7 1/2	8 1/2	9 1/2
F	3/8	9/16	9/16	11/16	13/16	15/16	15/16	15/16	1
FL	1 1/2	2 1/16	2 1/16	2 7/16	3 1/16	3 15/16	4 3/16	4 11/16	5 1/4
MR	1/2	3/4	3/4	1	1 3/8	1 3/4	2	2 1/2	3
R	1.63	2.55	2.55	3.25	3.82	4.95	5.73	6.58	7.50



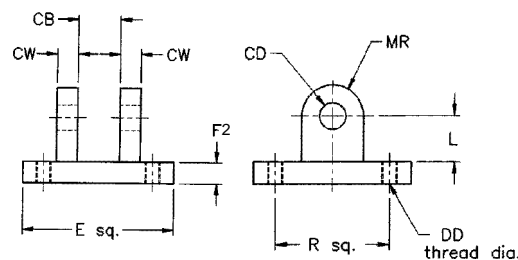
**Notes:**

- 1. For use with Socket Head Cap Screws only.
- \* Tapped mounting holes this model only.

**Detachable Clevis - MP2 Mount (NFPA)**

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

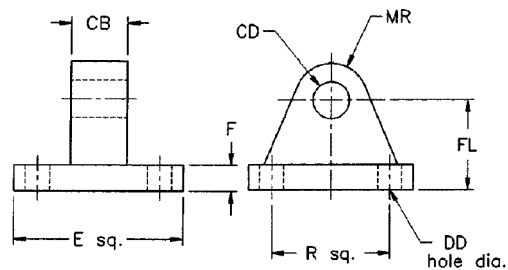
PART	HMP2-15T	HMP2-2T	HMP2-25T	HMP2-32T	HMP2-4T	HMP2-5T	HMP2-6T	HMP2-7T	HMP2-8T
CB	0.765	1.281	1.265	1.515	2.032	2.531	2.531	3.032	3.032
CD	1/2	3/4	3/4	1	1 3/8	1 3/4	2	2 1/2	3
CW	1/2	5/8	5/8	3/4	1	1 1/4	1 1/4	1 1/2	1 1/2
DD	3/8-24	1/2-20	1/2-20	5/8-18	5/8-18	7/8-14	1-14	1 1/8-12	1 1/4-12
E	2 1/2	3	3 1/2	4 1/2	5	6 1/2	7 1/2	8 1/2	9 1/2
F2	3/8	5/8	5/8	3/4	7/8	7/8	1	1	1
FL	1 1/8	1 7/8	1 7/8	2 1/4	3	3 1/8	3 1/2	4	4 1/4
MR	1/2	13/16	3/4	1	1 3/8	1 3/4	2 1/8	2 1/2	3
R	1 5/8	2 3/16	2 9/16	3 1/4	3 13/16	4 15/16	5 3/4	6 19/32	7 1/2



**Eye Type Mounting Bracket**

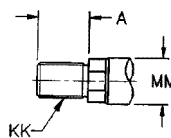
Adapts to HC mount cylinder or HC rod clevis

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

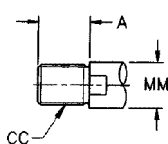


**Rod End Styles**

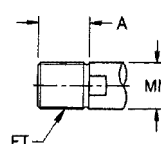
(See model dimension tables for dimension values)



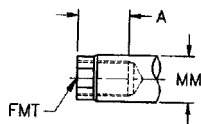
**A**  
Standard Male Thread  
NFPA Style SM



**B**  
Oversize Male Thread  
NFPA Style IM



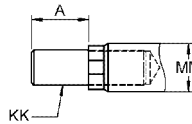
**C**  
Full Thread  
NFPA Style FM



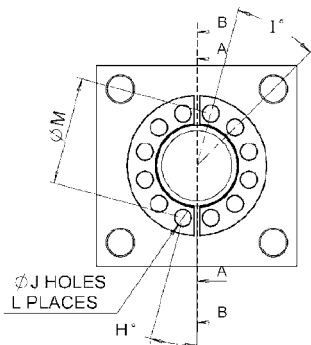
**D**  
Female Thread  
NFPA Style SF



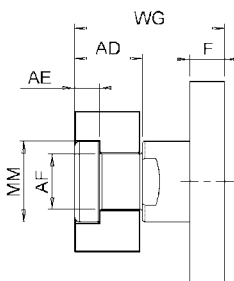
**E**  
No Thread



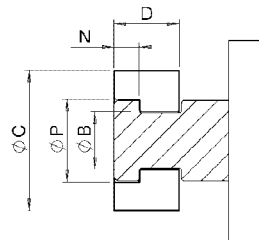
**G**  
Rod Stud  
NFPA Style SM



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



**A-A**  
ROD DIMENSIONS

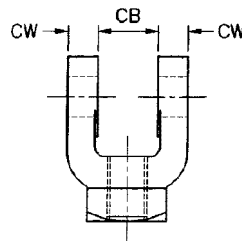
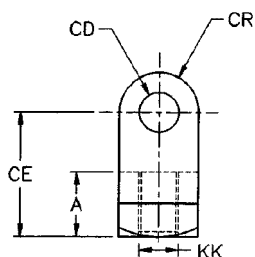


**B-B**  
COUPLING DIMENSIONS

**Rod Clevis**

Adapts to male thread on piston rod

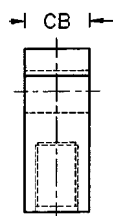
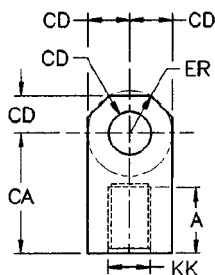
PART	HC15	HC15C	HC2	HC2C	HC32-M	HC32	HC4	HC5	HC5C	HC6	HC7	HC8	HC7C	HC10	HC10C
A	3/4	3/4	1 1/8	1 5/8	1 5/8	1 5/8	2	2 1/4	3	3	3 1/2	3 1/2	3 1/2	3 1/2	3 1/2
CB	0.765	0.765	1.265	1.515	1.515	1.515	2.031	2.531	2.531	2.531	3.032	3.032	3.032	4.032	4.032
CD	1/2	1/2	3/4	1	1	1	1 3/8	1 3/4	2	2	2 1/2	3	3	3 1/2	3 1/2
CE	1 1/2	1 1/2	2 3/8	3 1/8	2 15/16	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
CW	1/2	1/2	5/8	3/4	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
CR	1/2	1/2	3/4	1	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
KK	7/16-20	1/2-20	3/4-16	7/8-14	1-14	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



**Rod Eye**

Adapts to HCM clevis-type mounting bracket

PART	HE15	HE15C	HE2	HE2C	HE32	HE4	HE5	HE5C	HE6	HE7	HE7C	HE8	HE10
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
CA	1 1/2	1 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
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
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
ER	5/8	5/8	7/8	1 7/16	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
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



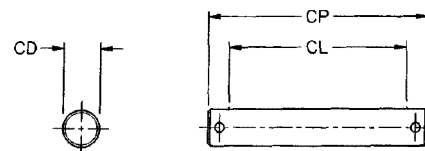
Accessories for Rod End

BORE	ROD DIA. MM	THREAD SIZE	ROD CLEVIS	LUG MOUNTING BRACKET	PIVOT PIN	ROD EYE	CLEVIS MOUNTING BRACKET	SELF ALIGNING		
								ROD EYE	MOUNTING BRACKET	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	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
	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
3 1/4	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
	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	1 7/8-12	HC6	HM6	HP6	HE6	HCM6	HWE6	HWM6	HWP6
	2 1/2	2 1/4-12	HC7	HM7	HP7	HE7	HCM7	N/A	N/A	N/A
	3	2 1/4-12	HC7	HM7	HP7	HE7	HCM7	N/A	N/A	N/A
	3	2 3/4-12	HC7C	HM8	HP8	HE7C	HCM8	N/A	N/A	N/A
	3 1/2	2 1/2-12	HC8	HM8	HP8	HE8	HCM8	HWE8	HWM8	HWP8
	3 1/2	3 1/4-12	HC10	HM10	HP10	HE10	HCM10	N/A	N/A	N/A
8	4	3-12	HC10C	HM10	HP10	HE10	HCM10	N/A	N/A	N/A
	4	3 3/4-12	HC12C	HM12	HP12	HE12C	HCM12	N/A	N/A	N/A
	4 1/2	3 1/4-12	HC10	HM10	HP10	HE10	HCM10	N/A	N/A	N/A
	4 1/2	4 1/4-12	HC12D	HM12	HP12	HE12D	HCM12	N/A	N/A	N/A

Pivot Pin

Adapts to HC rod clevis or HCM clevis-type mounting bracket. Comes complete with cotter pins

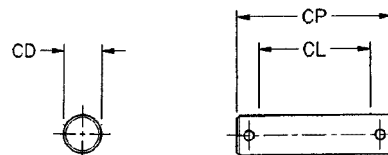
PART	P3	P4	P6	HP4	P12	HP6	HP5C	HP7	HP8	HP7C	HP10	HP12
CD	1/2	3/4	1	1 3/8	1 3/4	2	2	2 1/2	3	3	3 1/2	4
CL	1 3/4	2 1/2	3 1/16	4	5	5 1/2	5 13/16	6 3/16	6	6 1/2	8	9
CP	2 5/16	3 1/8	3 19/32	4 13/16	6 1/8	6	6 3/8	7 1/4	7 1/4	7 5/8	9 1/4	10 1/4



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

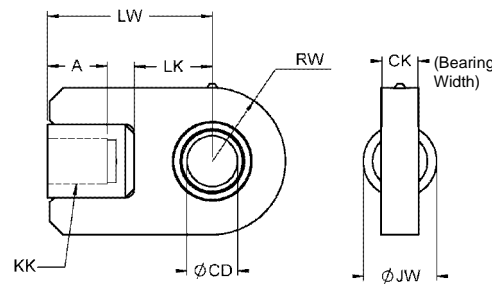


Self-Aligning Rod Eye - Female

Adapts to male thread on piston rod

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

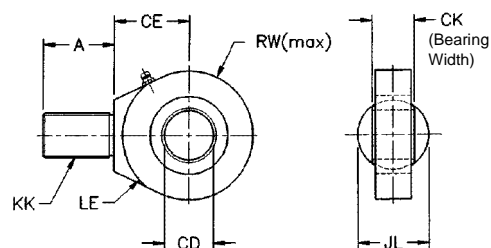
\* "-C" denotes Clamping style Rod Eye



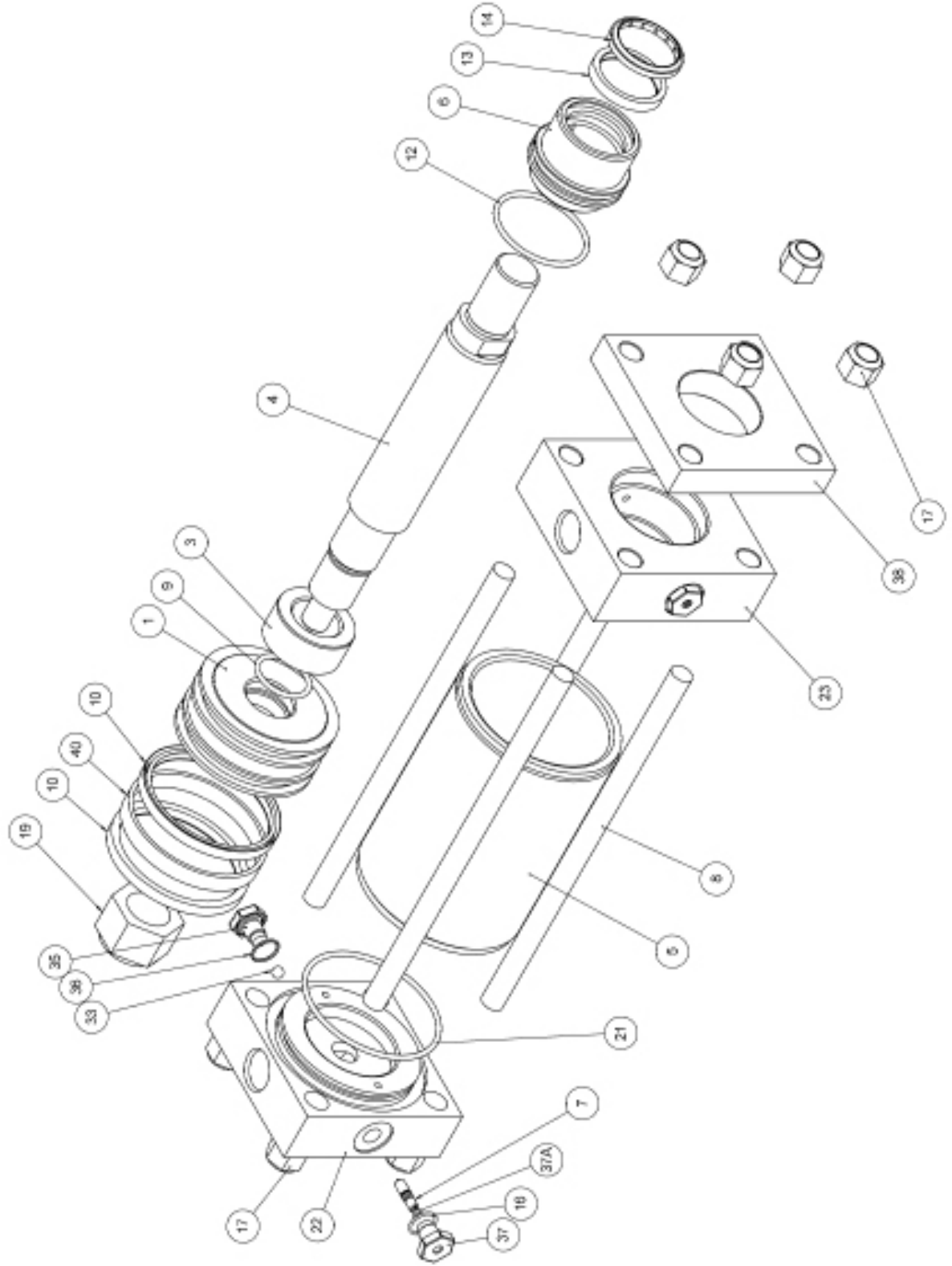
Self-Aligning Rod Eye - Male

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



# H-Series Parts Drawing







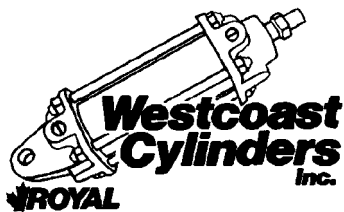
H-SERIES PARTS LIST - 5" BORE TO 8" BORE												
DESCRIPTION	QTY	BORE										
		2	3	3 1/2	4	5	6	7	8			
ROD SIZE		2 1/2	3	3 1/2	4	5	6	7	8			
1 PISTON	1	1H205	1H206	1H207	1H208	1H209	1H210	1H211	1H212	1H213	1H214	1H215
3 CUSHION SLEEVE	1	3H503	3H504	3H505	3H506	3H507	3H508	3H509	3H510	3H511	3H512	3H513
4 ROD - MALE	1	4H538	4H539	4H540	4H541	4H542	4H543	4H544	4H545	4H546	4H547	4H548
4 ROD - FEMALE "HD" MODEL	1	26H538	26H539	26H540	26H541	26H542	26H543	26H544	26H545	26H546	26H547	26H548
4 ROD COMMON	1	44H538	44H539	44H540	44H541	44H542	44H543	44H544	44H545	44H546	44H547	44H548
4 ROD (CUSHIONED CBE)	1	4H508	4H509	4H510	4H511	4H512	4H513	4H514	4H515	4H516	4H517	4H518
5 BARREL (M-HONED STEEL)	1	5H050	5H051	5H052	5H053	5H054	5H055	5H056	5H057	5H058	5H059	5H060
6 GLAND BUSHING	1	6H6020H	6H6025H	6H6030H	6H6035H	6H6040H	6H6045H	6H6050H	6H6055H	6H6060H	6H6065H	6H6070H
7 NEEDLE VALVE STEM	2	7H850-3A	7H850-3B	7H850-3C	7H850-3D	7H850-3E	7H850-3F	7H850-3G	7H850-3H	7H850-3I	7H850-3J	7H850-3K
8 TIE ROD (EA) (STANDARD)	4	8H_5014	8H_6016	8H_7018	8H_8020	8H_9022	8H_10024	8H_11026	8H_12028	8H_13030	8H_14032	8H_15034
9 PISTON SEAL INTERNAL	1	9A223	9A224	9A225	9A226	9A227	9A228	9A229	9A230	9A231	9A232	9A233
10 PISTON CUP	2	10H50H	10H51H	10H52H	10H53H	10H54H	10H55H	10H56H	10H57H	10H58H	10H59H	10H60H
12 GLAND BUSHING SEAL	1	9H232	9H233	9H234	9H235	9H236	9H237	9H238	9H239	9H240	9H241	9H242
13 ROD SEAL	1	13H20H	13H25H	13H30H	13H35H	13H40H	13H45H	13H50H	13H55H	13H60H	13H65H	13H70H
14 ROD W/PER	1	14H20	14H25	14H30	14H35	14H40	14H45	14H50	14H55	14H60	14H65	14H70
16 NEEDLE VALVE SEAL	2	9A017	9A018	9A019	9A020	9A021	9A022	9A023	9A024	9A025	9A026	9A027
17 LOCK NUT - TIE ROD	4.8	19A014	19A015	19A016	19A017	19A018	19A019	19A020	19A021	19A022	19A023	19A024
19 LOCK NUT - PISTON	1	19H024	19H025	19H026	19H027	19H028	19H029	19H030	19H031	19H032	19H033	19H034
21 BARREL SEAL	2	9H248	9H249	9H250	9H251	9H252	9H253	9H254	9H255	9H256	9H257	9H258
22 HEAD BLIND END (see below)	1	H_5BSP12	H_6BSP12	H_7BSP12	H_8BSP12	H_9BSP12	H_10BSP12	H_11BSP12	H_12BSP12	H_13BSP12	H_14BSP12	H_15BSP12
23 HEAD GLAND END (see below)	1	H_5G20SP12	H_5G25SP12	H_5G30SP12	H_5G35SP12	H_5G40SP12	H_5G45SP12	H_5G50SP12	H_5G55SP12	H_5G60SP12	H_5G65SP12	H_5G70SP12
24 TRUNNION	1	HT5	HT6	HT7	HT8	HT9	HT10	HT11	HT12	HT13	HT14	HT15
33 CHECK BALL	2	33A32	33A33	33A34	33A35	33A36	33A37	33A38	33A39	33A40	33A41	33A42
35 CHECK PLUG	2	35H500-1	35H500-2	35H500-3	35H500-4	35H500-5	35H500-6	35H500-7	35H500-8	35H500-9	35H500-10	35H500-11
36 CHECK VALVE SEAL	2	9A017	9A018	9A019	9A020	9A021	9A022	9A023	9A024	9A025	9A026	9A027
37 NEEDLE VALVE HOUSING	2	7H850-3B	7H850-3C	7H850-3D	7H850-3E	7H850-3F	7H850-3G	7H850-3H	7H850-3I	7H850-3J	7H850-3K	7H850-3L
37A NEEDLE VALVE HOUSING SEAL	2	9A007	9A008	9A009	9A010	9A011	9A012	9A013	9A014	9A015	9A016	9A017
38 FRONT PLATE	1	FP5020	FP5025	FP5030	FP5035	FP5040	FP5045	FP5050	FP5055	FP5060	FP5065	FP5070
40 PISTON WEAR STRIP	1	40H507	40H508	40H509	40H510	40H511	40H512	40H513	40H514	40H515	40H516	40H517
41 SEAL KIT	1	KH5020H	KH5025H	KH5030H	KH5035H	KH5040H	KH5045H	KH5050H	KH5055H	KH5060H	KH5065H	KH5070H
42 SEAL KIT UNIVERSAL	1	KH5020U	KH5025U	KH5030U	KH5035U	KH5040U	KH5045U	KH5050U	KH5055U	KH5060U	KH5065U	KH5070U

**TIE ROD PART NUMBER STRUCTURE:**

- 1) Start with "8H"
- 2) Use table to select mounting style.
- 3) Add Bore Code in space provided.
- 4) - STROKE
- 5) -XI (only for mounting style "T").

eg. Cyl. Model "HRS", 3-1/4" Bore, 12" Stroke  
 Tie Rod Part Number 8HR3210-12

MOUNTING STYLE	TIE ROD PART NUMBERS	BORE	CODE
C,E,W/MPH	8HC(BORE CODE)-STROKE	1 1/2	1506
D	8HD(BORE CODE)-STROKE	2	208
NM, HT, F, S	8HF(BORE CODE)-STROKE	2 1/2	258
NA	8HA(BORE CODE)-STROKE	3 1/4	3210
NB,NC	8HB(BORE CODE)-STROKE	4	4010
R,RS,B,BS	8HR(BORE CODE)-STROKE	5	5014
G	8HG(BORE CODE)-STROKE	6	6016
TR	8HTR(BORE CODE)-STROKE	7	7018
TB	8HT(BORE CODE)-STROKE	8	8020
T (Rod size 1)	8HTA(BORE CODE)-STROKE-XI		
T (Rod size 2)	8HTB(BORE CODE)-STROKE-XI		
T (Rod size 3)	8HTC(BORE CODE)-STROKE-XI		
T (Rod size 4)	8HTD(BORE CODE)-STROKE-XI		

**Warning**

These products are intended for industrial use only. Do not use these products in applications where the pressure and temperature exceeds 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**

H-Series cylinders are rated to 3000 psig hydraulic pressure for normal use. Some mounting styles are downrated, see model pages for operating pressures.

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.

**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.

## CYLINDER DEVELOPED FORCE

BORE in	ROD DIA in	Major Area (in <sup>2</sup> )	Minor Area (in <sup>2</sup> )	Developed Force (lbs)													
				500		750		1000		1500		2000		2500		3000	
				push	pull	push	pull	push	pull	push	pull	push	pull	push	pull	push	pull
1 1/2	5/8	1.77	1.46	884	730	1325	1095	1767	1460	2651	2191	3534	2921	4418	3651	5301	4381
	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
7	3	38.48	31.42	19242	15708	28863	23562	38485	31416	57727	47124	76969	62832	96211	78540	115454	94248
	3 1/2	38.48	28.86	19242	14432	28863	21648	38485	28863	57727	43295	76969	57727	96211	72158	115454	86590
	4	38.48	25.92	19242	12959	28863	19439	38485	25918	57727	38877	76969	51836	96211	64795	115454	77754
8	3 1/2	50.27	40.64	25133	20322	37699	30483	50265	40644	75398	60967	100531	81289	125664	101611	150796	121933
	4	50.27	37.70	25133	18850	37699	28274	50265	37699	75398	56549	100531	75398	125664	94248	150796	113097
	4 1/2	50.27	34.36	25133	17181	37699	25771	50265	34361	75398	51542	100531	68722	125664	85903	150796	103084

## 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.

TIE-ROD LOCKNUT TORQUE		
BORE	TIE ROD	TORQUE (FT-LBS)
1 1/2	3/8-24	20
2	1/2-20	45
2 1/2	1/2-20	60
3 1/4	5/8-18	100
4	5/8-18	130
5	7/8-14	300
6	1-14	500
7	1 1/8-12	750
8	1 1/4-12	1000

Values based on unlubricated (dry) threads

**ROD SIZING TABLE**

PUSH FORCE lbs	PISTON ROD MAX. RECOMMENDED LENGTH $L_e$ (in.) at ROD DIAMETER (in.)									
	5/8	1	1 3/8	1 3/4	2	2 1/2	3	3 1/2	4	4 1/2
	100	64	165	310						
200	45	115	220							
300	37	95	180	300						
400	32	82	160	260						
600	26	67	130	210	280					
800	23	58	110	180	240					
1000	20	52	100	160	210					
1200	19	48	90	148	195	300				
1400	17	44	84	137	180	280				
1600	16	41	78	128	170	260				
1800	15	39	74	120	160	250				
2000	14	37	70	115	150	240				
2500	13	33	63	102	135	210	300			
3000	11	30	58	92	120	190	270			
4000	6	26	50	80	105	170	240			
5000	4	23	44	72	96	150	215	290		
6000		21	40	66	88	130	190	260		
8000		17	35	56	76	115	170	225	290	
10000		12	31	51	68	100	150	200	260	
12000			29	46	62	94	137	185	230	300
16000			22	40	54	82	120	160	210	260
20000			13	35	46	72	105	142	190	235
24000				31	43	66	96	130	170	215
30000				20	37	60	86	117	150	190
34000				10	32	56	82	110	145	180
40000					23	50	76	100	132	170
50000						42	66	90	120	150
60000						31	62	82	110	138
80000							46	71	94	120
100000							23	59	80	107
120000								43	70	96
140000								20	60	86
160000									50	78

**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 end connections.
- 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 push force available at system operating pressure.
- 4) Using the Rod Sizing 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 recommended length **Le**. Read the rod diameter from the top of the column. If the rod size is not available for the cylinder bore size, choose a larger bore size.

**PISTON STOP**

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

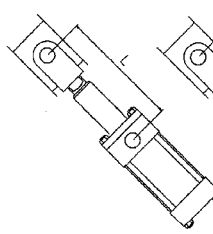
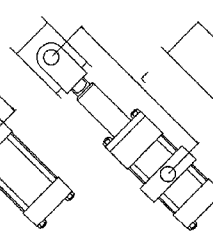
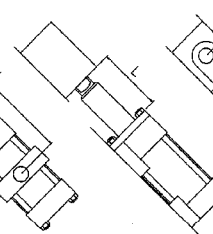
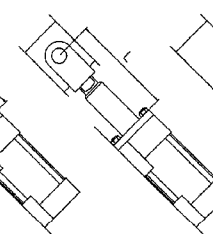
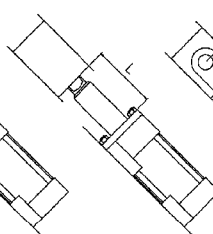
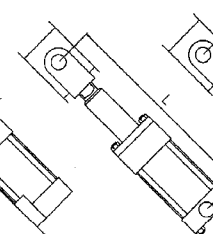
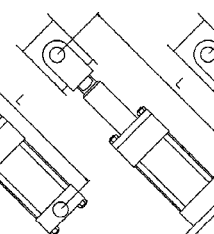
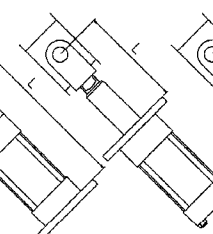
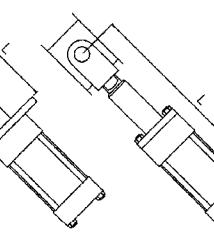
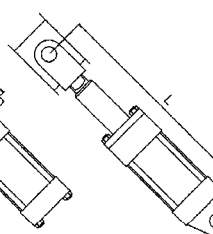
- excessive wear on the gland bushing and piston
- piston rod buckling
- cylinder jack-knifing

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

**Note when ordering:** When adding a piston stop the stroke is reduced by the piston stop length which results in an "effective" stroke. **GROSS stroke - PISTON STOP = EFFECTIVE stroke**. If stroke length must be maintained, increase the stroke as required.

No piston stop is needed if the cylinder is loaded on pull stroke only.

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

Pinned & rigidly guided	Pinned & rigidly guided	Supported	Pinned & rigidly guided	Fixed & rigidly guided	Pinned & rigidly guided	Pinned & rigidly guided	Pinned & rigidly guided	Pinned & rigidly guided	Pinned & rigidly guided
									
K values	1	1	2	1	.5	1	1	1	1
Effective Length Factor (K)									

SPECIFYING AN "X" IN ANY FIELD REQUIRES DETAILS IN THE CUSTOM FEATURES BOX

							CUSTOM FEATURES						
EXAMPLE	H	BORE	STYLE	STROKE	ROD MATERIAL	ROD SIZE	THREAD	CUSHIONS	BARREL	PORT LOCN	PORT SIZE	OPTIONS	CUSTOM
H													
1 1/2"	15	C	C	12.188	C	1	A	1	A	1	A		
2"	2												
2 1/2"	25												
3 1/4"	32												
4"	4												
5"	5												
6"	6												
7"	7												
8"	8												
			STYLE										
			B										
			BS										
			C										
			CH										
			CR										
			D										
			E										
			F										
			FA										
			G										
			H										
			MP										
			NA										
			NB										
			NC										
			NM										
			R										
			RS										
			S										
			T										
			TB										
			TR										
			W										

CUSTOM NUMBER ASSIGNED BY

X WESTCOAST CYLINDERS

A ROD THREAD EXTENSION, "A" LENGTH

D ROD SCRAPER (BRASS)

PS PISTON STOP

R CAST IRON PISTON RINGS

V HIGH TEMPERATURE SEALS

W ROD EXTENSION, "W" LENGTH

Y4 4 WRENCH FLATS ON ROD

Y6 6 WRENCH FLATS ON ROD

X SPECIFY

A O-RING BOSS (ORB) PORT (STANDARD)

B OVERSIZE PORT

C NPT PORT

D TRANSITION MANIFOLD

E SAE CODE 61 FLANGE

BLIND END RECTANGULAR FLANGE (MF2)  
 BLIND END SQUARE FLANGE (MF6)  
 BLIND END CLEVIS (MP1)  
 COMMON HEAD  
 COMMON ROD  
 DOUBLE ROD (MD)  
 PIVOT EYE (MP3)  
 FOOT MOUNT (MS2)  
 \* END LUG MOUNT (MS7)  
 RECTANGULAR FRONT FLANGE HEAD (ME8)  
 RECTANGULAR REAR FLANGE HEAD (ME9)  
 DETACHABLE CLEVIS (MP2)  
 NO MOUNT EXTENDED THE RODS (MX1)  
 NO MOUNT EXTENDED THE RODS (MX2)  
 NO MOUNT EXTENDED THE RODS (MX3)  
 NO MOUNT (MX0)

ROD END RECTANGULAR FLANGE (MF1)  
 ROD END SQUARE FLANGE (MF5)  
 SIDE TAPPED (MS4)  
 MID TRUNNION (MT4)  
 BLIND END TRUNNION (MT1)  
 ROD END TRUNNION (MT2)  
 SELF-ALIGNING EYE (MPU3)

NITRO-TEC TREATED  
 CHROME PLATED STEEL (STANDARD)  
 CHROME PLATED STAINLESS STEEL  
 INDUCTION HARDENED CHROME PLATED

ROD #1  
 ROD #2  
 ROD #3  
 (WHERE APPLICABLE) ROD #4

ROD SIZE  
 THREAD  
 CUSHIONS  
 BARREL  
 PORT LOCN  
 PORT SIZE  
 POSITION #1 (STANDARD)  
 POSITION #2  
 POSITION #3  
 POSITION #4  
 SPECIFY

ROD MATERIAL  
 A  
 C  
 S  
 F  
 X

ROD #1  
 ROD #2  
 ROD #3  
 ROD #4

ROD SIZE  
 THREAD  
 CUSHIONS  
 BARREL  
 PORT LOCN  
 PORT SIZE  
 POSITION #1 (STANDARD)  
 POSITION #2  
 POSITION #3  
 POSITION #4  
 SPECIFY



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\*Contact the factory for mounting dimensions

EXAMPLE "H32C12.188C1A1A1

An "X" in any field requires an explanation in special notes.  
 Consult factory for options not shown.