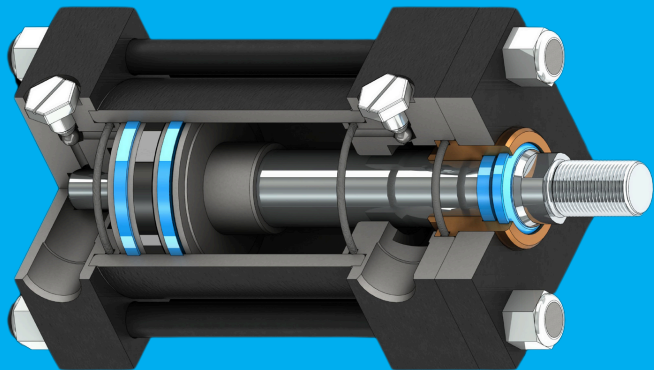
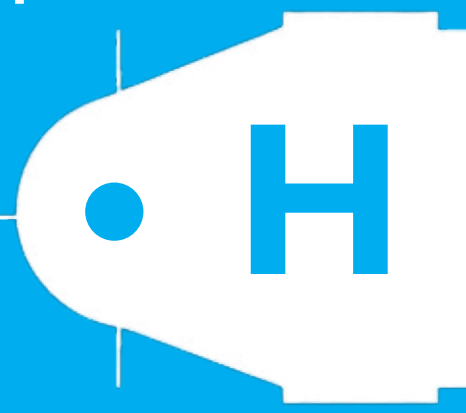




Hydraulic Cylinders

3000  
psi rating

# Hydraulic NFPA Cylinder Series



Custom Sizes and Features Available. Contact us [Sales@RoyalCylinders.com](mailto:Sales@RoyalCylinders.com)



**CUSTOMIZABLE, PRECISION-MADE HEAVY DUTY HYDRAULIC 3000\* psi NFPA CYLINDER LINE**

Heavy Duty Service	
Nominal Pressure Rating	3000* PSI
Temperature Rating	30°F to 200°F (-34°C to 93°C)
Max Speed Rating	-40°C seals are also available.
Bore Diameters	36 inch/sec (0.91 m/sec)
Piston Rod Diameters	1.50" to 20.00"
Square Head Design	0.625" to 10.00"
Mounting Styles	
Rod Ends	23 standard mounts
Lock Nut Piston	6 Styles. Custom ends available
Cushions	Reliable and serviceable Proven design, optional at either end or both ends of stroke



Accessible Design Support:  
Royal provides quality and easy to contact customer service. One phone number and email for all your cylinder application questions. 1-877-637-6925 or sales@royalcylinders.com

\*Pressure derating may apply - see page data for desired mounting style.

**PISTON ROD**

The piston rod is made from hard chrome plated C1045/C1050 carbon steel with a typical minimum yield strength of 85,000 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 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. 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. Optional ductile iron gland bushings with wear rings are also available, please contact our factory.

**SAE PORTS**

SAE O-Ring Boss (ORB) ports are the standard ports 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.

**HEADS**

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

**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.

**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.

**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.

**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.

**Westcoast Cylinders Inc.:**

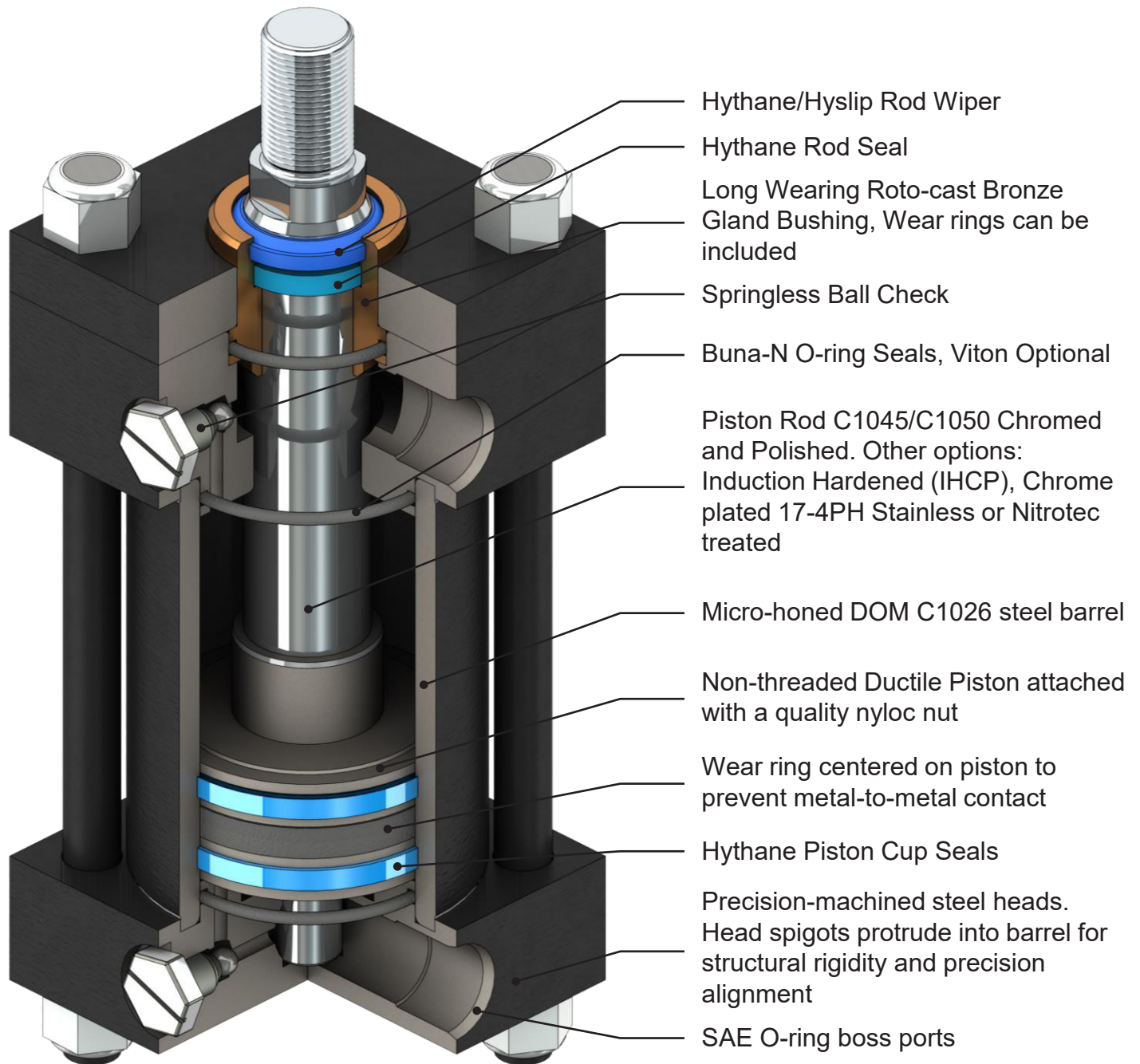
The Company has been manufacturing high quality, reliable ROYAL cylinders for over 60 years. Production started with a single cylinder design and expanded to a full range of multi-use, hydraulic, pneumatic cylinders and accessories.

**Quality:**

ROYAL 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:**

ROYAL 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.



**Description**

Mounting Styles

Features Description

Features Drawing

**Mounting Dimensions**

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

Rod End Styles, Accessories

Parts Drawing

Parts List: 1.5 – 4" dia.

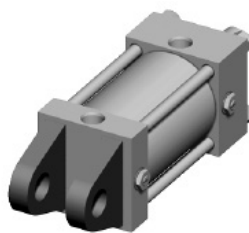
Parts List: 5 – 8" dia.

Limitations and Warranty

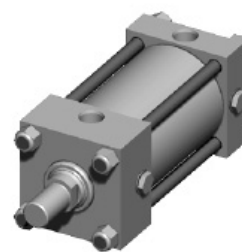
Cylinder Force/Torque Specs

Rod sizing/Piston Stop

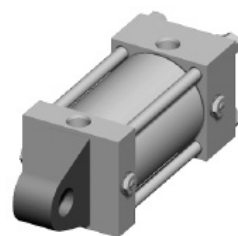
Cylinder Nomenclature



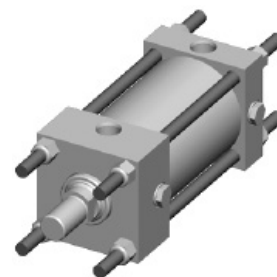
Fixed Clevis



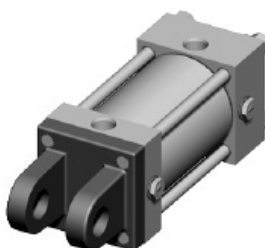
No Mount



Pivot Eye



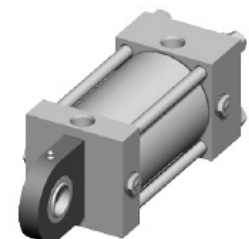
Extended Tie-rods Both Ends



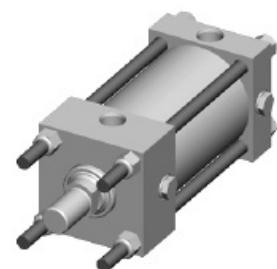
Detachable Clevis



Extended Tie-rods Blind End



Self-aligning Eye



Extended Tie-rods Gland End



WESTCOAST CYLINDERS INC.

**Westcoast Cylinders Inc.**225 Edworthy Way New Westminster  
BC Canada V3L 5G4

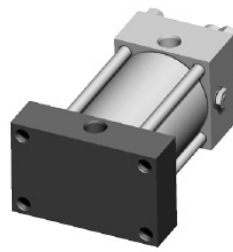
Phone Toll Free: 1-877-637-6925

Email: Sales@royalcylinders.com

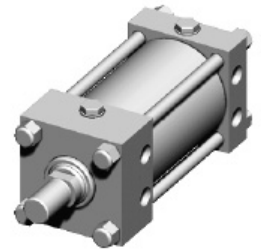
Website: www.RoyalCylinders.com



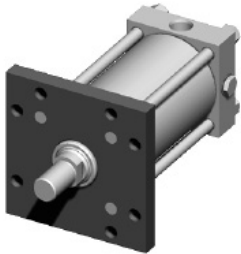
Rod End Rectangular Flange



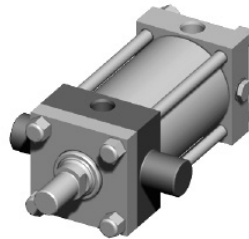
Rectangular Blind End Head



Side-Tapped Mount



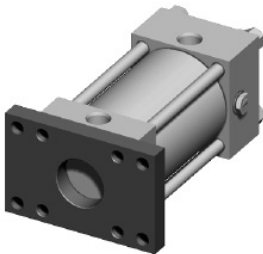
Rod End Square Flange



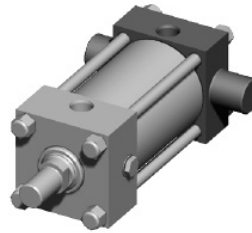
Rod End Trunnion



Double Rod



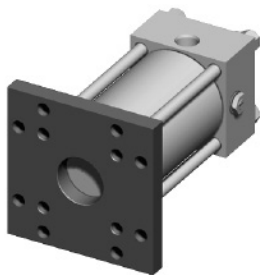
Blind End Rectangular Flange



Blind End Trunnion



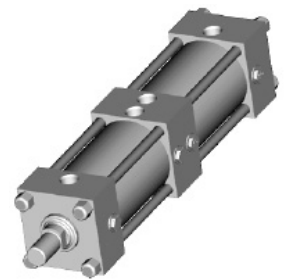
Common Rod



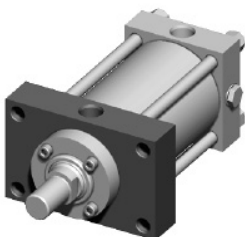
Blind End Square Flange



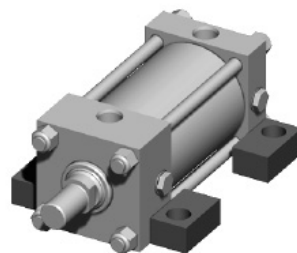
Mid Trunnion



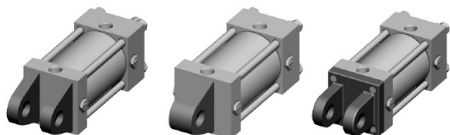
Common Head



Rectangular Gland End Head



Foot Mount



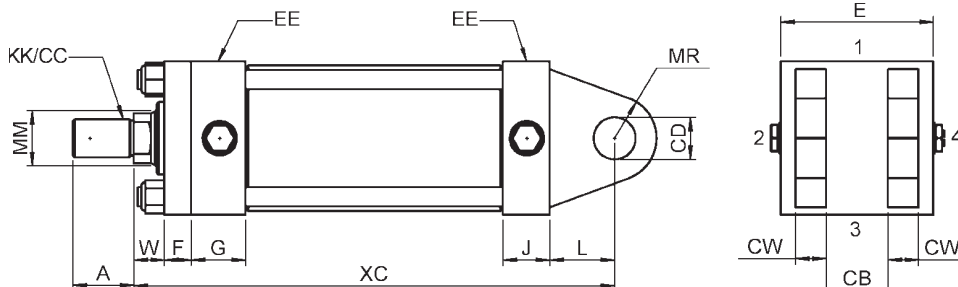
# HC, HE, HMP Fixed Clevis, Pivot Eye, Detachable Clevis

BORE	ROD DIA						ADD STROKE		E	F	F2	G	J	L	HC,HMP		HE	EE			note 6
	ROD	MM	KK	CC	A	W	XC	XD							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	0.57
	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	0.87
	2	1 3/8	1-14	1 1/4-12	1 5/8	1	7 1/2	8 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	0.87
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	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	1.2
	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 3/8
	2	2	1 1/2-12	1 3/4-12	2 1/4	1 1/8	9 7/8	10 3/4													
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	2	2 1/2	1 7/8-12	2 1/4-12	3	1 3/8	10 3/4	11 5/8													
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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 9/16	3 9/32	3 1/32	3	3	1 1/2	1 1/2	-24	2 3/4
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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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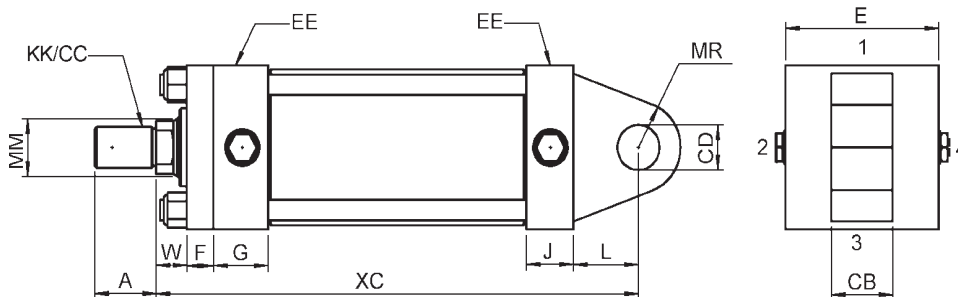
- Notes:**
- All dimensions in inches.
  - EE standard port is SAE ORB.
  - See Cylinder Nomenclature for thread options.
  - For Optional Rod Ends and dimensions see page 20.

- 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.

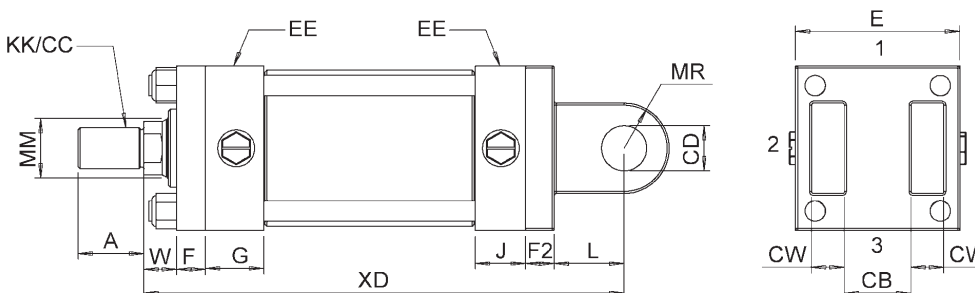
**Model HC**  
Fixed Clevis  
NFPA Style MP1

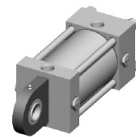


**Model HE**  
Pivot Eye  
NFPA Style MP3



**Model HMP**  
Detachable Clevis  
NFPA Style MP2



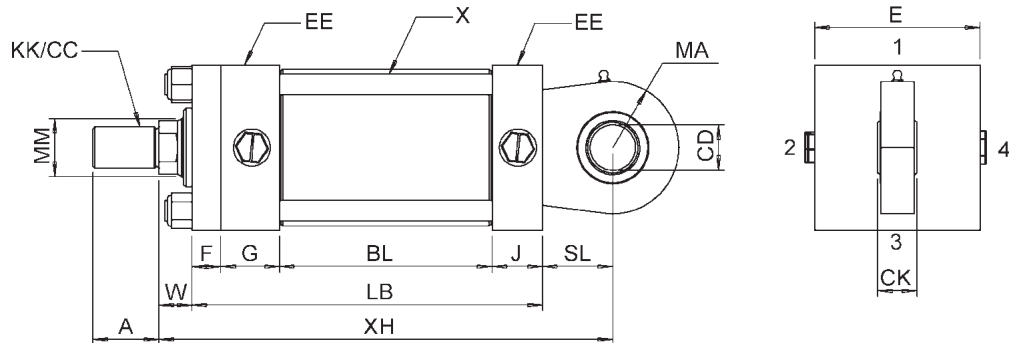


BORE	ROD DIA						ADD STROKE						EE							
	ROD	MM	KK	CC	A	W	LB	XH	BL	E	F	G	J	SL	CD	CK	NPTF	SAE	MA	X
1 1/2	1	5/8	7/16-20	1/2-20	3/4	5/8	5	6 3/8	1 3/4	2 1/2	3/8	1 9/16	1 5/16	3/4	1/2	7/16	1/2	-08	7/8	3/8
	2	1	3/4-16	7/8-14	1 1/8	1		6 3/4												
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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

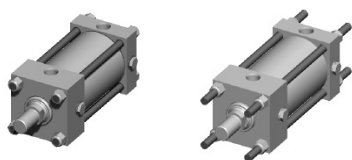
1. All dimensions in inches.
2. EE standard port is SAE ORB.
3. See Cylinder Nomenclature for thread options.
4. For Optional Rod Ends and dimensions see page 20.
5. Gland Head "G" is longer on 2", 2 1/2" and 3 1/4" bores with largest rod size and when cushioned on gland end. NFPA dimensions remain constant.

**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.



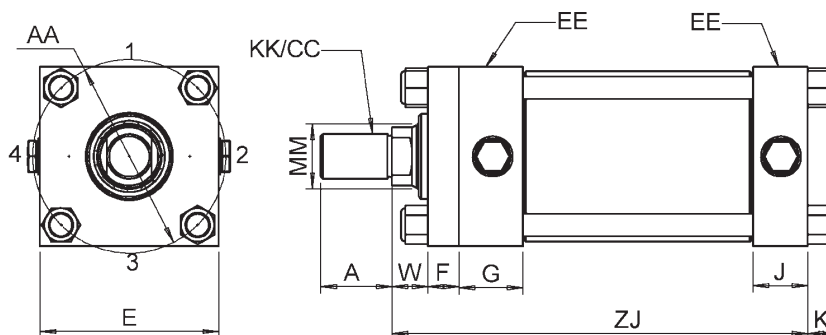
# HNM, HNA No Mount, Extended Tie-rods Both Ends

BORE	ROD	ROD DIA		CC	A	W	+ STROKE	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 1/8			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 1/4	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											
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											
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											
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											
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											
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 9/16	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											

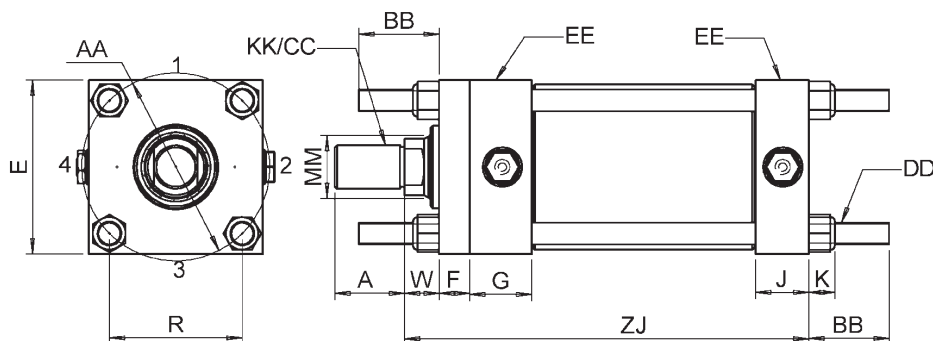
### Notes:

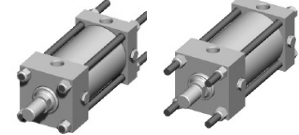
- All dimensions in inches.
- EE standard port is SAE ORB.
- See Cylinder Nomenclature for thread options.
- For Optional Rod Ends and dimensions see page 20.
- Gland Head "G" is longer on 2", 2 1/2" and 3 1/4" bores with largest rod size and when cushioned on gland end. NFPA dimensions remain constant.
- 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



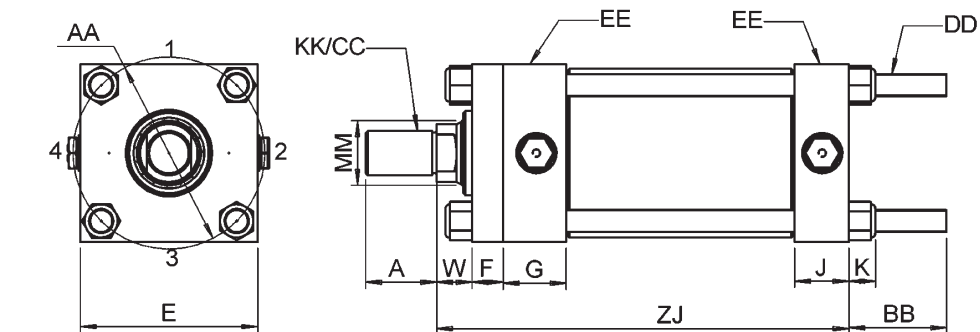


BORE	ROD	ROD DIA		CC	A	W	+ STROKE		E	F	G	J	K	R	AA	BB	DD	EE	
		MM	KK				ZJ	NPTF										SAE	
1 1/2	1	5/8	7/16-20	1/2-20	3/4	5/8	5 5/8	2 1/2	3/8	1 9/16	1 5/16	1/2	1.63	2.30	1 3/8	3/8-24	1/2	-08	
	2	1	3/4-16	7/8-14	1 1/8	1	6												
2	1	1	3/4-16	7/8-14	1 1/8	3/4	6	3	5/8	1 15/32	1 7/32	5/8	2.19	3.09	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												
	4	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												
	4	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												
	4	2																	
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 9/16	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												

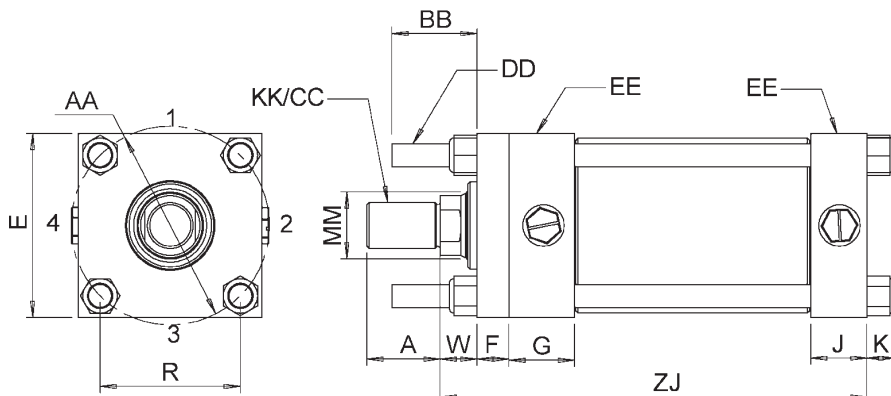
**Notes:**

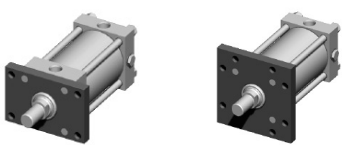
1. All dimensions in inches.
2. EE standard port is SAE ORB.
3. See Cylinder Nomenclature for thread options.
4. For Optional Rod Ends and dimensions see page 20.
5. Gland Head "G" is longer on 2", 2 1/2" and 3 1/4" bores with largest rod size and when cushioned on gland end. NFPA dimensions remain constant.
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



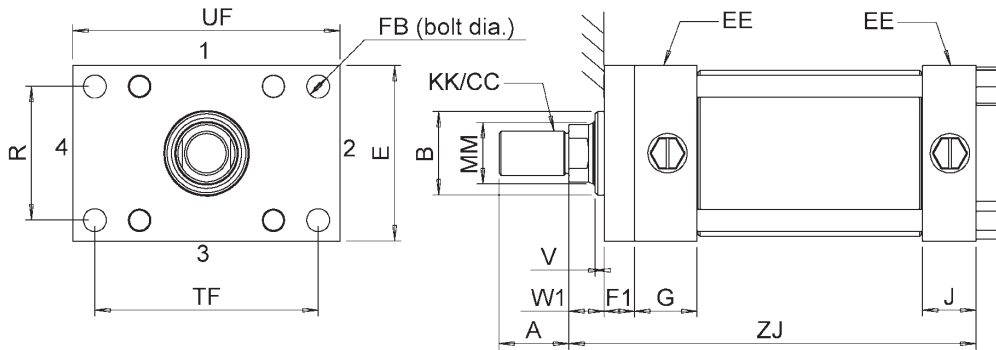


# HR, HRS Rod End Rectangular Flange, Rod End Square Flange

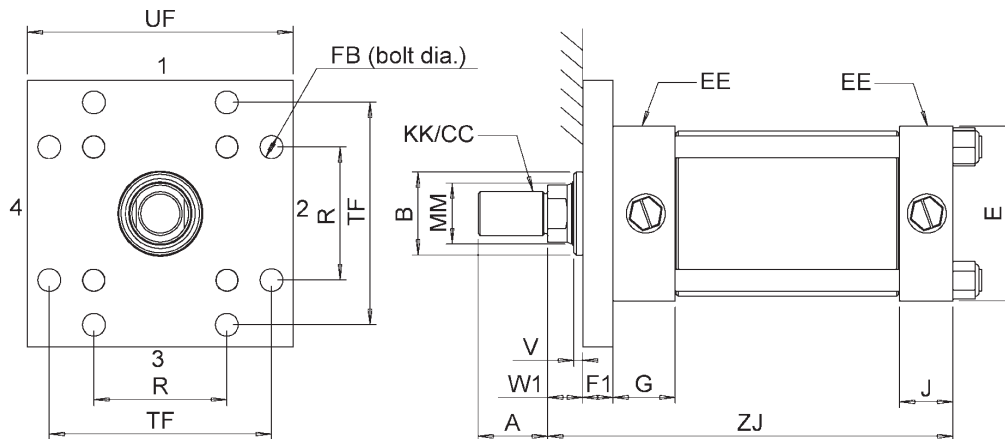
BORE	ROD DIA							+ STROKE ZJ	E	F1	G	J	EE		R	FB	TF	UF	B	V
	ROD	MM	KK	CC	A	W1	NPTF						SAE							
1 1/2	1	5/8	7/16-20	1/2-20	3/4	1/2	5 5/8	2 1/2	1/2	1 9/16	1 5/16	1/2	-08	1.63	3/8	3 7/16	4 1/4	1.125	1/8	
	2	1	3/4-16	7/8-14	1 1/8	7/8	6											1.562	3/8	
2	1	1	3/4-16	7/8-14	1 1/8	3/4	6	3	5/8	1 15/32	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	
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 1/4	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	
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	
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	
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	
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	
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 9/16	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	

- Notes:**
- All dimensions in inches.
  - EE standard port is SAE ORB.
  - See Cylinder Nomenclature for thread options.
  - For Optional Rod Ends and dimensions see page 20.
  - 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 Rectangular Flange  
NFPA Style MF1



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

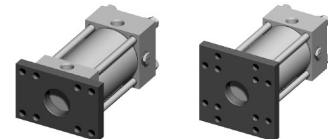


Model HR		
Max. Pressure (PSI) *		
BORE	PUSH	PULL
1 1/2	3000	3000
2	2500	3000
2 1/2	2000	3000
3 1/4	1500	3000
4	1500	3000
5	1000	3000
6	1000	3000
7	1000	3000
8	700	3000

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

Maximum pressure is based on mounting onto a surface as shown.

# HB,HBS Blind End Rectangular Flange, Blind End Square Flange



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								
	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 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								
	note 5	3	2																	
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 9/16	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												

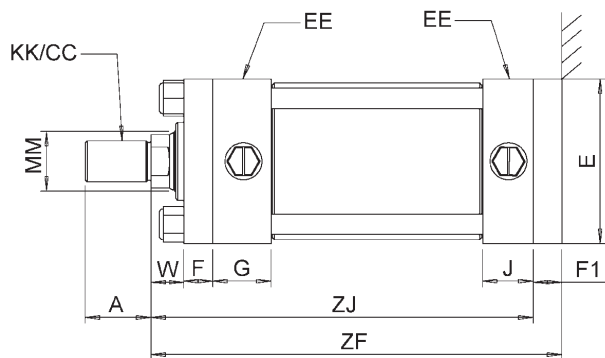
**Notes:**

1. All dimensions in inches.
2. EE standard port is SAE ORB.
3. See Cylinder Nomenclature for thread options.
4. For Optional Rod Ends and dimensions see page 20.
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.

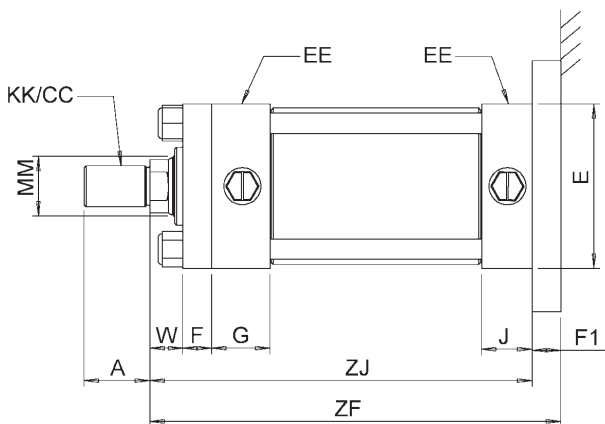
Model HB		
Max. Pressure (PSI) *		
BORE	PUSH	PULL
1 1/2	3000	3000
2	3000	2500
2 1/2	3000	2000
3 1/4	3000	1500
4	3000	1500
5	3000	1000
6	3000	1000
7	3000	1000
8	3000	700

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

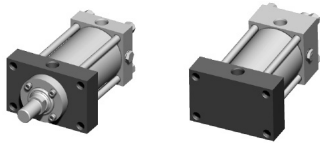
Maximum pressure is based on mounting onto a surface as shown.



**Model HB**  
Blind End Rectangular Flange  
NFPA Style MF2



**Model HBS**  
Blind End Square Flange  
NFPA Style MF6

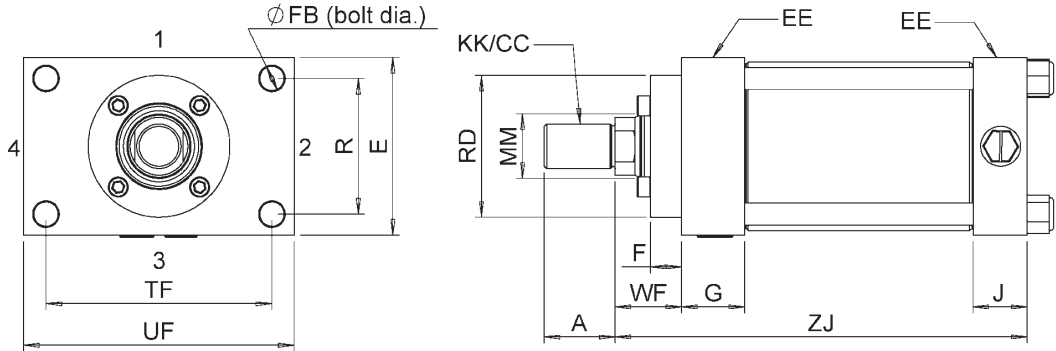


# HG, HH Rectangular Gland End Head, Blind End Head

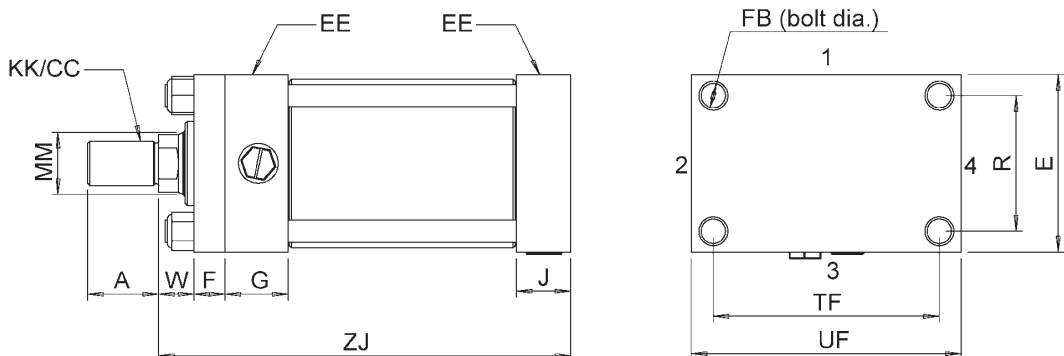
BORE	ROD DIA			CC	A	W	WF	+ STROKE			ME5		ME6		EE		+0/-0.005			
	ROD	MM	KK					ZJ	E	F	G	G	J	NPTF	SAE	R	FB	RD	TF	UF
1 1/2	1	5/8	7/16-20	1/2-20	3/4	5/8	1	5 5/8	2 1/2	3/8	1 9/16	1 9/16	1 5/16	1/2	-08	1.63	3/8	2 1/2	3 7/16	4 1/4
	2	1	3/4-16	7/8-14	1 1/8	1	1 3/8	6			1 9/16	1 9/16						2 1/2		
2	1	1	3/4-16	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		
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 9/16	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		

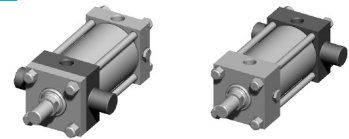
- Notes:**
- All dimensions in inches.
  - EE standard port is SAE ORB.
  - See Cylinder Nomenclature for thread options.
  - For Optional Rod Ends and dimensions see page 20.
  - Gland Head "G" is longer on 2", 2 1/2" and 3 1/4" bores with largest rod size and when cushioned on gland end. NPTA dimensions remain constant.
  - Cushion adjustment is at Position 3 on the Gland Head of model HG and the Blind Head of model HH.

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



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

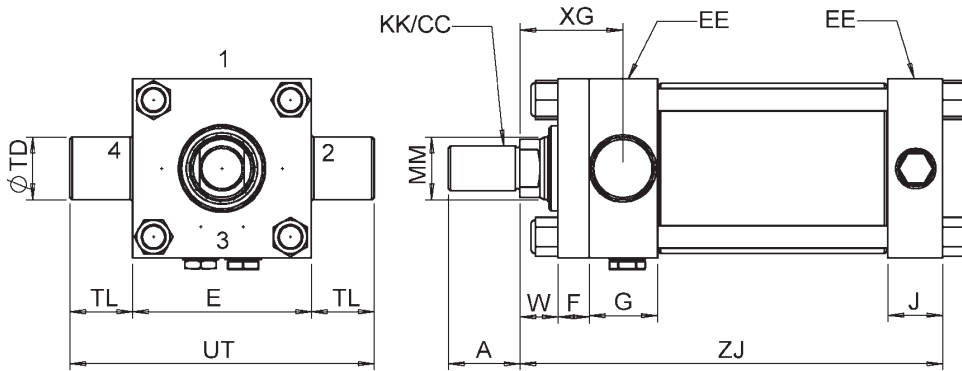




BORE	ROD	ROD DIA		KK	CC	A	HTR		HTB		XG	ADD STROKE			E	F	HTR		HTB		EE		TD	TL	UT
		MM	IN				W	W	XJ	HTR		HTB	HTR	HTB			NPTF	SAE							
1 1/2	1	5/8	7/16-20	1/2-20	3/4	5/8	5/8	1 7/8	4 7/8	5 5/8	5 5/8	2 1/2	3/8	1 9/16	1 5/16	1 9/16	1 5/16	1/2	-08	1	1	4 1/2			
	2	1	3/4-16	7/8-14	1 1/8	1	1	2 1/4	5 1/4	6	6														
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			2 5/16		2 1/8									
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 1/4	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														
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														
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														
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														
7	1	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			
	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														
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 9/16	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														

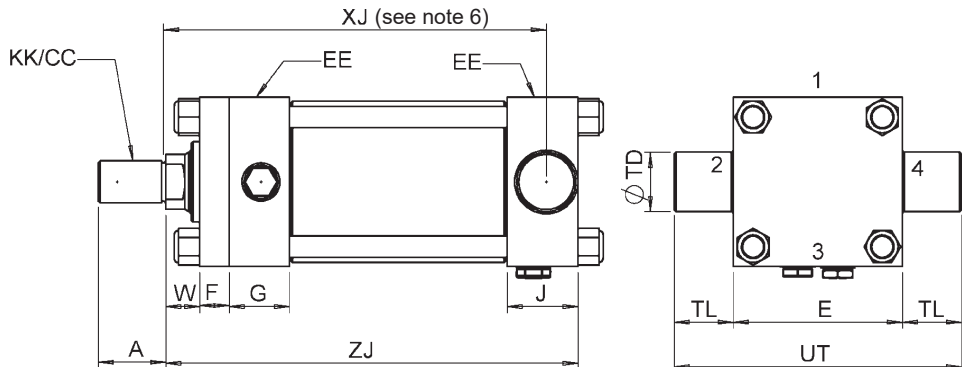
**Notes:**

- All dimensions in inches.
- EE standard port is SAE ORB.
- See Cylinder Nomenclature for thread options.
- For Optional Rod Ends and dimensions see page 20.
- 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



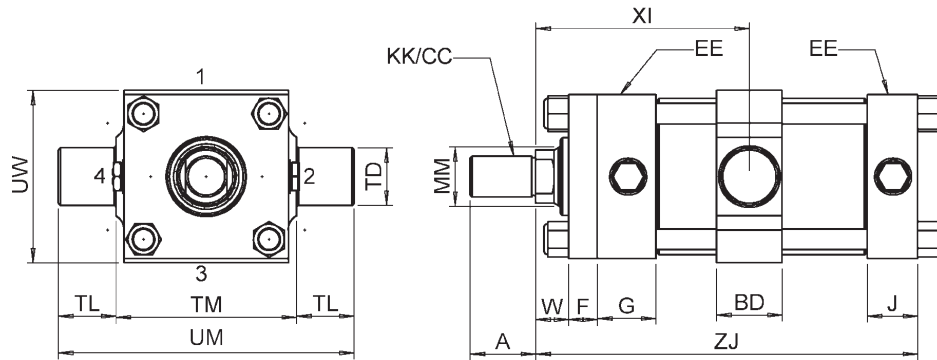
# HT Mid Trunnion

BORE	ROD DIA		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									
	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 1/2	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					
	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
3 1/4	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	5 31/32				2 7/16					
	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
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	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	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
	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
7	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 9/16	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.
- See Cylinder Nomenclature for thread options.
- For Optional Rod Ends and dimensions see page 20.
- 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.

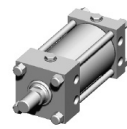
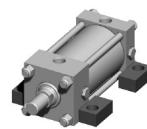
Model HT  
Mid-Trunnion  
NFPA Style MT4



**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

# HF, HS Foot Mount, Side Tapped

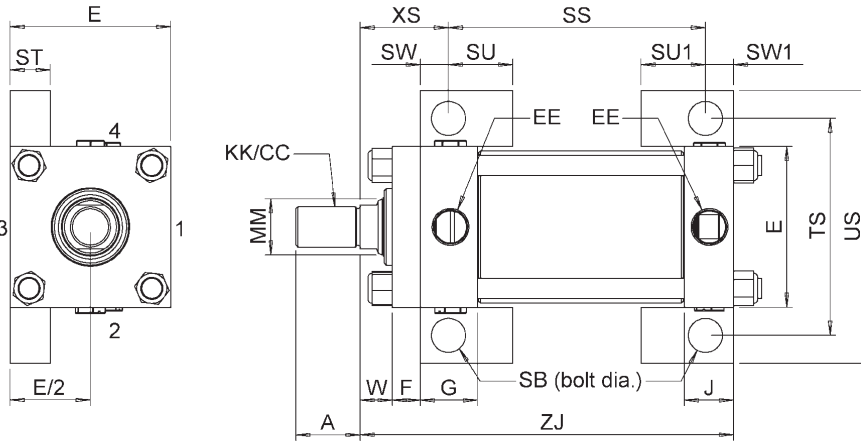


BORE	ROD DIA										ADD STROKE						EE		(min.)	note 6		note 6			
	ROD	MM	KK	CC	A	W	W1	XS	XT	ZJ	SS	E	F	G	J	NPTF	SAE	ND*	SB	SU	SW	ST	TS	US	
1 1/2	1	5/8	7/16-20	1/2-20	3/4	5/8	5/8	1 3/8	2	5 5/8	3 7/8	2 1/2	3/8	1 9/16	1 5/16	1/2	-08	3/8	3/8	15/16	3/8	1/2	3 1/4	4	
	2	1	3/4-16	7/8-14	1 1/8	1	1	1 3/4	2 3/8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

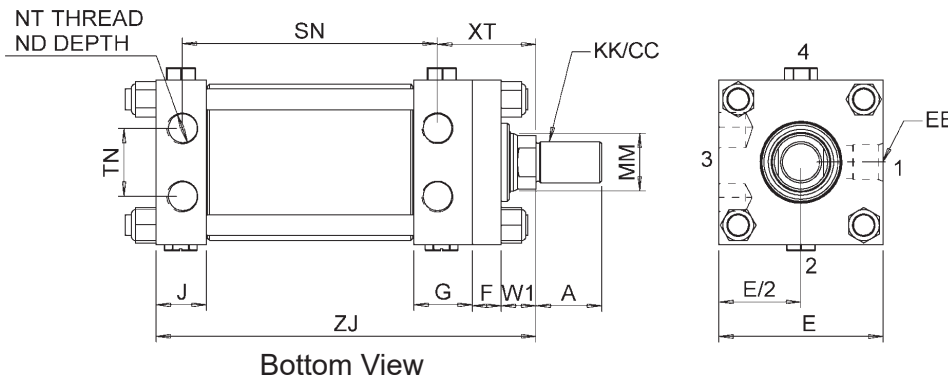
1. All dimensions in inches.
2. EE standard port is SAE ORB.
3. See Cylinder Nomenclature for thread options.
4. For Optional Rod Ends and dimensions see page 20.

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

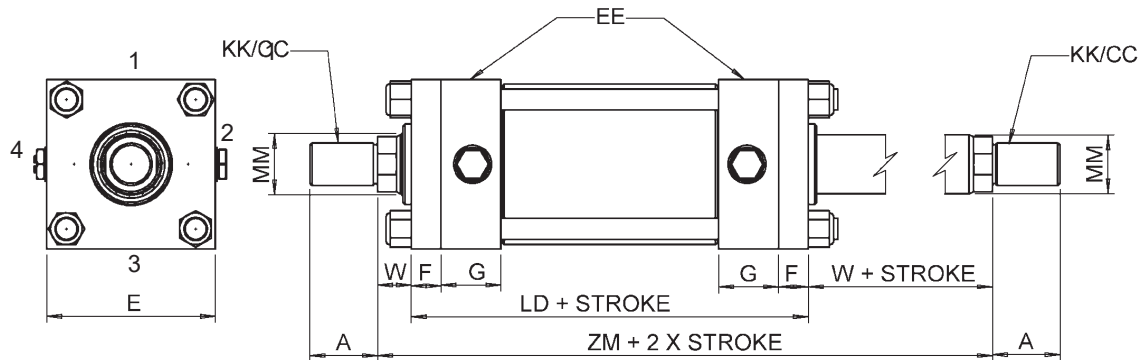


# HD Double Rod

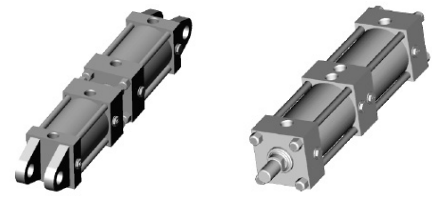
BORE	ROD	ROD DIA MM	KK	CC	A	W	ADD	ADD	E	F	G	EE	
							STROKE	STROKE X2				NPTF	SAE
							LD	ZM					
1 1/2	1	5/8	7/16-20	1/2-20	3/4	5/8	5 5/8	6 7/8	2 1/2	3/8	1 9/16	1/2	-08
	2	1	3/4-16	7/8-14	1 1/8	1	5 5/8	7 5/8					
2	1	1	3/4-16	7/8-14	1 1/8	3/4	6 1/8	7 5/8	3	5/8	1 15/32	1/2	-08
	2	1 3/8	1-14	1 1/4-12	1 5/8	1	6 1/8	8 1/8			2 1/8		
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 1/4	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					
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					
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					
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					
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					
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	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:**
- All dimensions in inches.
  - EE standard port is SAE ORB.
  - See Cylinder Nomenclature for thread options.
  - For Optional Rod Ends and dimensions see page 20.
  - 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.
  - 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



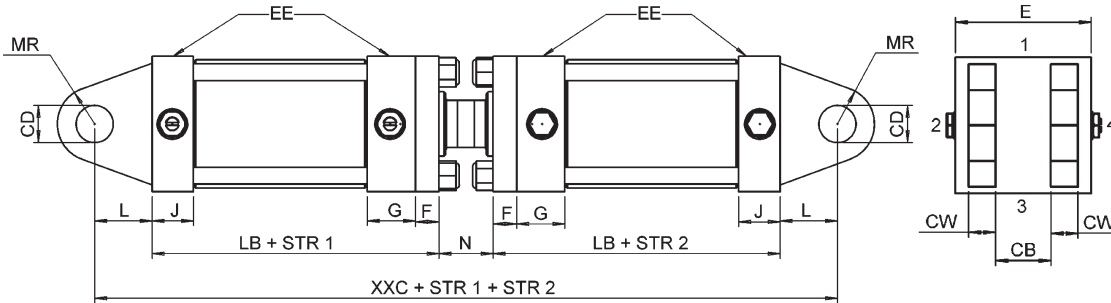
# HCR,HCH Common Head, Common Rod



BORE	ROD DIA						ADD	ADD	ADD	N	E	F	G	J	L	HC	HE	CD	CW	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 1/2	1	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 3/8	1-14	1 1/4-12	1 5/8	1		6 3/8	14 3/4														
	3	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 1/4	1	1 3/8	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	
	2	1 3/4	1 1/4-12	1 1/2-12	2	1 1/8		7 3/8	17 1/4														
	3	2	1 1/2-12	1 3/4-12	2 1/4	1 1/4		7 1/2	17 1/4														
note 5	3	2										2 7/16											
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														
	3	2 1/2	1 7/8-12	2 1/4-12	3	1 3/8		8	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														
	3	3	2 1/4-12	2 3/4-12	3 1/2	1 3/8		8 1/2	21														
	4	3 1/2	2 1/2-12	3 1/4-12	3 1/2	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														
	3	3 1/2	2 1/2-12	3 1/4-12	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														
	3	4	3-12	3 3/4-12	4	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 9/16	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														
	3	4 1/2	3 1/4-12	4 1/4-12	4 1/2	1 1/4		11 3/4	30 3/4														

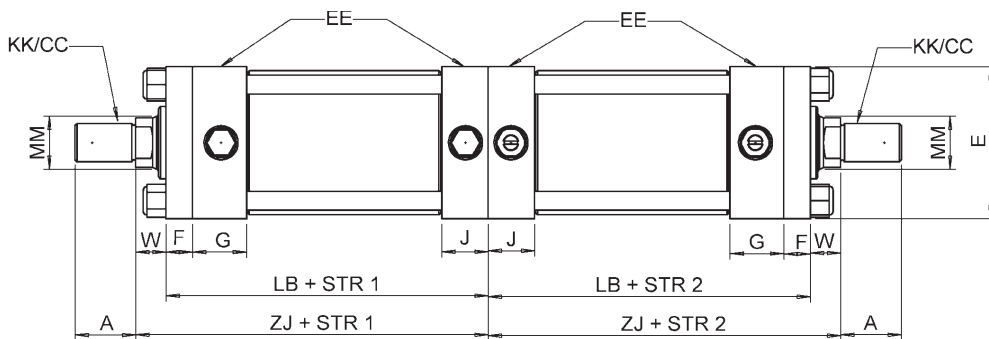
**Notes:**

1. All dimensions in inches.
2. EE standard port is SAE ORB.
3. See Cylinder Nomenclature for thread options.
4. For Optional Rod Ends and dimensions see page 20.
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

\*If ports are required at P2 or P4 and must be all on the same side, please indicate at time of ordering.

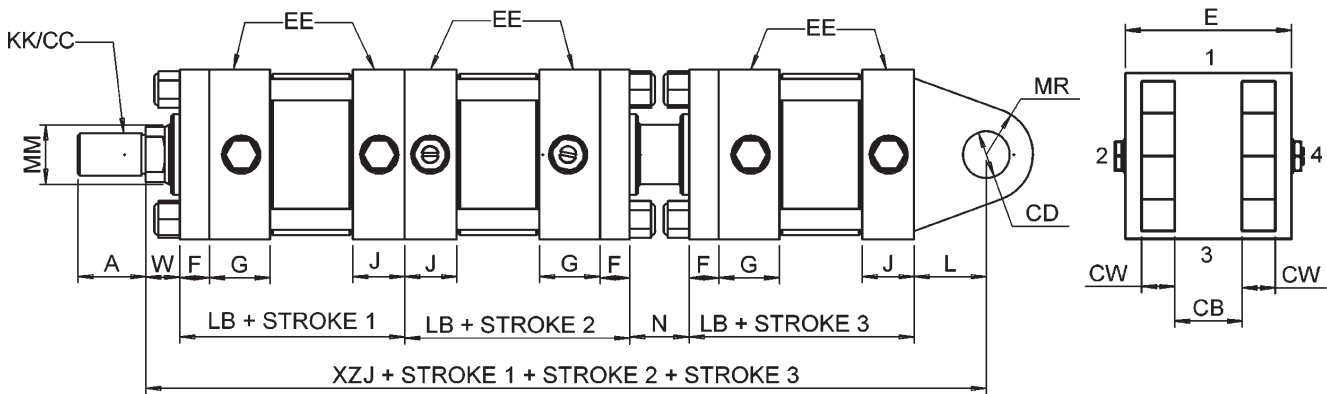


Model HCH  
Common Head

BORE	ROD DIA						ADD STROKE	ADD STR1+ STR2+STR3	E	F	G	J	L	N	HC	CD	CW	EE		MR	
	ROD	MM	KK	CC	A	W	LB	XZJ							CB			NPTF	SAE		
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 3/4	1 1/4-12	1 1/4-12	2	1 1/4		20 1/8														
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	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													
3	2	2	1 1/2-12	1 3/4-12	2 1/4	1 1/4		23 1/4													
note 5	3	2									2 7/16										
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													
3	2 1/2	1 7/8-12	2 1/4-12	3	1 3/8		25 3/8														
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													
3	3	2 1/4-12	2 3/4-12	3 1/2	1 3/8		27 1/4														
4	3 1/2	2 1/2-12	3 1/4-12	3 1/2	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													
3	3 1/2	2 1/2-12	3 1/4-12	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													
3	4	3-12	3 3/4-12	4	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 9/16	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													
3	4 1/2	3 1/4-12	4 1/4-12	4 1/2	1 1/4		39 1/4														

- Notes:**
- All dimensions in inches.
  - EE standard port is SAE ORB.
  - See Cylinder Nomenclature for thread options.
  - For Optional Rod Ends and dimensions see page 20.
  - 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.

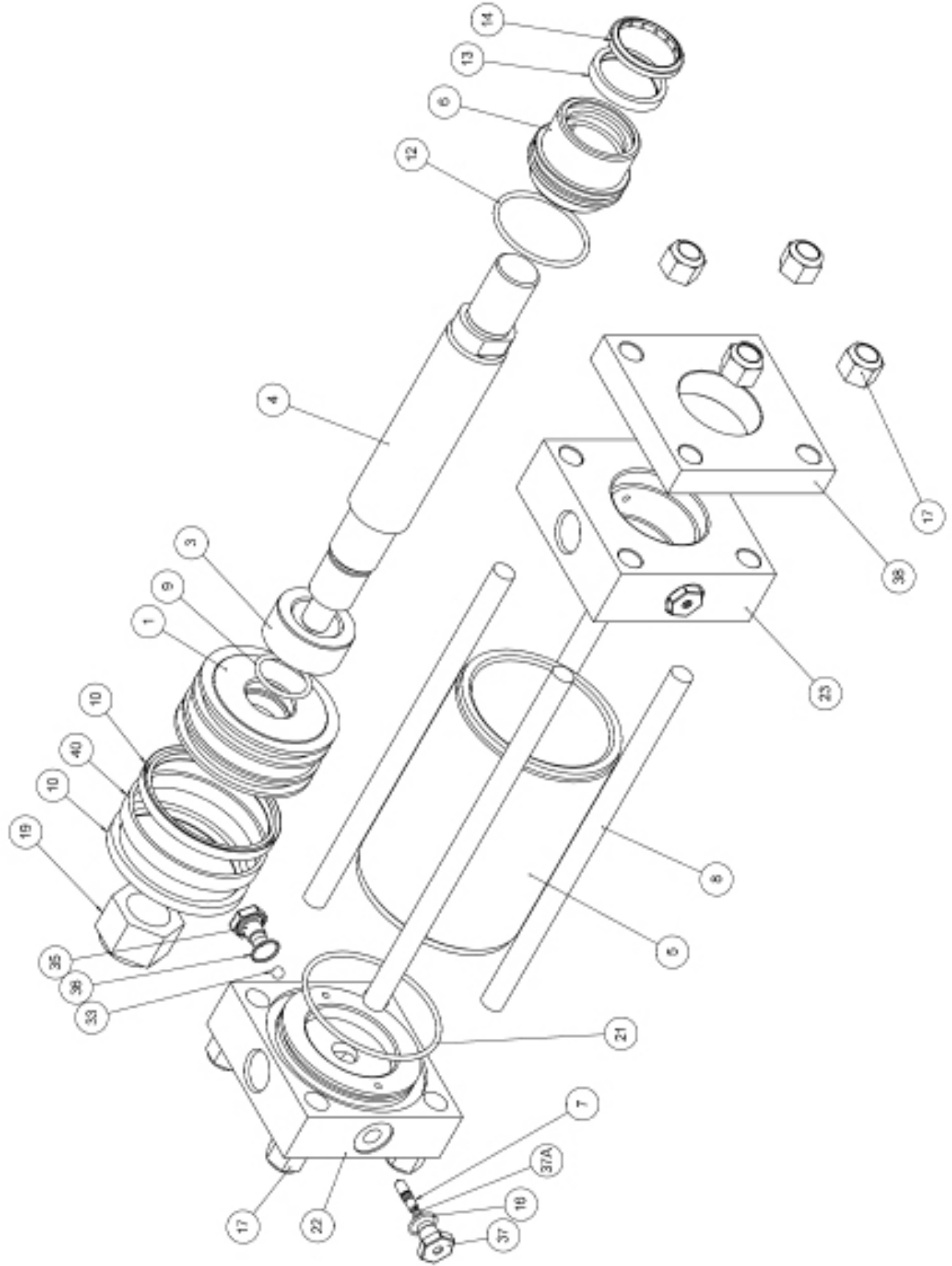
**Model HCCHR**  
Common Head Common Rod



\*If ports are required at P2 or P4 and must be all on the same side, please indicate at time of ordering.

Accessories		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	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
3 1/4	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
	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
6	5	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
	7	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
		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
8	5	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
	7	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	7	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
	8	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

# H-Series Parts Drawing



H-SERIES PARTS LIST - 1 1/2" BORE TO 4" BORE (see page 24 for larger bores)												
DESCRIPTION	QTY	BORE										
		1 1/2	1	2	1 3/8	1 1/2	1 3/4	1 3/8	1 3/4	2	4	
ROD SIZE	5/8	1H2015H	3H152	3H202	3H202H	1H2025H	1H2025H	1H2025H	1H2025H	1H2025H	1H2025H	1H2025H
PISTON	1	3H152	3H202	3H202	3H202H	3H252	3H252	3H252	3H252	3H322	3H322	3H402
CUSHION SLEEVE	1	4H1325-	4H134-	4H234-	4H2355-	4H284-	4H284-	4H284-	4H284-	4H3355-	4H3355-	4H437-
ROD - MALE	1	26H1325-	26H134-	26H234-	26H2355-	26H284-	26H284-	26H284-	26H284-	26H3355-	26H3355-	26H437-
ROD - FEMALE "HD" MODEL	1	44H1325-	44H134-	44H234-	44H2355-	44H284-	44H284-	44H284-	44H284-	44H3355-	44H3355-	44H437-
ROD COMMON	1	4H1125-	4H114-	4H204-	4H2055-	4H254-	4H254-	4H254-	4H254-	4H3055-	4H3055-	4H407-
ROD (CUSHIONED - CBE)	1	5H015-										
BARREL (M-HONED STEEL)	1	6H1562H	6H1510H	6H2010H	6H3213H	6H3210H	6H3213H	6H3213H	6H3213H	6H4017H	6H4017H	6H6025H
GLAND BUSHING	1	N/A	N/A	7H832-2A	7H832-2A	7H832-2A	7H832-2A	7H832-2A	7H832-2A	7H850-3A	7H850-3A	7H850-3A
NEEDLE VALVE STEM	2	8H_156-		8H_208-		8H_208-		8H_208-		8H_3210-	8H_3210-	8H_4010-
TIE ROD (EA) (STANDARD)	4	N/A	N/A	9A210	9A210	9A210	9A210	9A210	9A210	9A210	9A210	9A210
PISTON SEAL INTERNAL	1	N/A	9A113	10H20H	10H20H	10H25H	10H25H	10H25H	10H25H	10H32H	10H32H	10H40H
PISTON CUP	2	10H755-15										
GLAND BUSHING SEAL	1	9H218	9H222	9H224	9H228	9H228	9H228	9H228	9H228	9H232	9H232	9H240
ROD SEAL	1	13H62H	13H10H	13H10H	13H13H	13H10H	13H13H	13H13H	13H13H	13H17H	13H17H	13H20H
ROD WIPER	1	14H62	14H10	14H10	14H13	14H10	14H13	14H13	14H13	14H17	14H17	14H20
NEEDLE VALVE SEAL	2	N/A	N/A	9A013	9A013	9A013	9A013	9A013	9A013	9A017	9A017	9A017
LOCK NUT - TIE ROD	4,8	19A006										
LOCK NUT - PISTON	1	19A007	19H008-1	19A010	19A010	19A008	19A008	19A008	19A008	19A010	19A010	19A010
BARREL SEAL	2	9H218		9H224	9H228	9H228	9H228	9H228	9H228	9H232	9H232	9H240
HEAD BLIND END (see below)	1	H_15B		H_2B		H_25B		H_25B		H_32B		H_4B
HEAD GLAND END (see below)	1	H_15G62SP08	H_15G10SP08	H_2G10SP08	H_2G13SP08	H_25G10SP08	H_25G13SP08	H_25G17SP08	H_32G13SP12	H_32G20SP12	H_4G17SP12	H_4G25SP12
TRUNNION	1	HT15		HT2		HT25		HT25		HT32		HT4
CHECK BALL	2	N/A	N/A	33H18		33H18		33H18		33A32		33A32
CHECK PLUG	2	N/A	N/A	35H320-1		35H320-1		35H320-1		35H500-1		35H500-1
CHECK VALVE SEAL	2	N/A	N/A	9A013		9A013		9A013		9A017		9A017
NEEDLE VALVE HOUSING	2	N/A	N/A	7H832-2B		7H832-2B		7H832-2B		7H850-3B		7H850-3B
NEEDLE VALVE HOUSING SEAL	2	N/A	N/A	9H008		9H008		9H008		9A007		9A007
FRONT PLATE	1	FP1562	FP1510	FP2010	FP2013	FP2510	FP2513	FP2517	FP3213	FP3217	FP3220	FP4017
PISTON WEAR STRIP	1	40H1525	40H2037	40H2037	40H2037	40H2537	40H2537	40H2537	40H323	40H323	40H405	40H405
SEAL KIT	1	KH1562H	KH1510H	KH2010H	KH2013H	KH2510H	KH2513H	KH2517H	KH3213H	KH3217H	KH3220H	KH4017H
SEAL KIT UNIVERSAL	1	KH1562U	KH1510U	KH2010U	KH2013U	KH2510U	KH2513U	KH2517U	KH3213U	KH3217U	KH3220U	KH4017U

NOTES:

A part no. having an underscore indicates a model letter code is required. See tables to right.

Part numbers terminating in a dash must have the stroke value added immediately afterward.

\* Blind end cushion on 1-1/2" bore cylinder is a cushion nut-spear. Part #3H152B (Rod #1), 3H150B (Rod #2) (Self regulating - no needle valve)

\*\* 2", 2 1/2" and 3 1/4" Bore Cushioned Rod end require (1) std barrel seal and (1) other seal see item #21.

UNIVERSAL SEAL KIT: Seal kit contains all legacy seals for obsolete designs

The following models have unique components - contact factory for parts list:

4" and 5" bore HS (Side-tapped) model.

All bores HTR (Rod End Trunnion) model.

2", 2 1/2" and 3 1/4" bores that use the largest rod size and are cushioned on the gland end.

HEAD PART NUMBER STRUCTURE:

- 1) Use "H" for Series - H
- 2) Use table (to right) to select head mounting style.
- 3) BORE eg 3-1/4" bore use 32, 4" bore use 4.
- 4) LOCATION: B=Blind G=Gland or Rod end.
- 5) Rod Size (Gland end only) 1" = 10, 1-3/4" = 17 etc.
- 6) CUSHIONED = "C", NON-CUSHIONED = BLANK
- 7) PORT SIZE, SAE-08 = SP08, SAE-12 = SP12

SAE-12 Code 61 = SF12 etc.

eg. Cyl. Model "HRS", 3-1/4" Bore, 1 3/8" Rod, Cushioned

Gland end head "HC32G13CSP12" Blind end head "HR32BCSP12"

SEE PAGE FOLLOWING PARTS DRAWING FOR 5" BORE THROUGH 8" BORE PARTS AND TIE-ROD PART NUMBER STRUCTURE.

MOUNTING STYLE	GLAND HEAD	BLIND HEAD	BORE	CODE	ROD DIA.	CODE
B	C	R	1 1/2	15	5/8	62
BS	C	R	2	2	1	10
C	C	C	2 1/2	25	1 3/8	13
D	C	n/a	3 1/4	32	1 3/4	17
E	C	E	4	4	2	20
F	F	F	5	5	2 1/2	25
G	G	R	6	6	3	30
H	C	H	7	7	3 1/2	35
MP	C	R	8	8	4	40
NA	C	R			4 1/2	45
NB	C	R				
NC	C	R				
NM	C	R				
R	C	R				
RS	C	R				
S	ST	ST				
T	C	R				
TB	C	T				
TR	T	R				
W	C	W				

H-SERIES PARTS LIST - 5" BORE TO 8" BORE												
DESCRIPTION	QTY	BORE										
		2	2 1/2	3	3 1/2	4	5	6	7	8		
PISTON	1	1H205	3H500	3H501	3H500	3H602	3H603	3H600	3H702	3H803	1H207	1H208
CUSHION SLEEVE	1	3H602	3H503	3H501	3H500	3H602	3H603	3H600	3H702	3H803	3H802	3H800
ROD - MALE	1	4H538-	4H5310-	4H5312-	4H5314-	4H6310-	4H6312-	4H6314-	4H7312-	4H7316-	4H8314-	4H8318-
ROD - FEMALE "HD" MODEL	1	26H538-	26H5310-	26H5312-	26H5314-	26H6310-	26H6312-	26H6314-	26H7312-	26H7316-	26H8314-	26H8318-
ROD COMMON	1	44H538-	44H5310-	44H5312-	44H5314-	44H6310-	44H6312-	44H6314-	44H7312-	44H7316-	44H8314-	44H8318-
ROD (CUSHIONED CBE)	1	4H508-	4H5010-	4H5012-	4H5014-	4H6010-	4H6012-	4H6014-	4H7012-	4H7016-	4H8016-	4H8018-
BARREL (M-HONED STEEL)	1	5H050-										
GLAND BUSHING	1	6H5020H	6H6025H	6H5030H	6H5035H	6H6025H	6H6030H	6H5035H	6H7030H	6H7040H	6H8035H	6H8045H
NEEDLE VALVE STEM	2	7H850-3A										
TIE ROD (EA) (STANDARD)	4	8H_5014-										
PISTON SEAL INTERNAL	1	9A223										
PISTON CUP	2	10H50H										
GLAND BUSHING SEAL	1	9H232	9H236	9H242	9H245	9H236	9H242	9H245	9H242	9H252	9H248	9H256
ROD SEAL	1	13H20H	13H25H	13H30H	13H35H	13H25H	13H30H	13H35H	13H30H	13H40H	13H35H	13H45H
ROD WIPER	1	14H20	14H25	14H30	14H35	14H25	14H30	14H35	14H30	14H40	14H35	14H45
NEEDLE VALVE SEAL	2	9A017										
LOCK NUT - TIE ROD	4.8	19A014										
LOCK NUT - PISTON	1	19H024										
BARREL SEAL	2	9H248										
HEAD BLIND END (see below)	1	H_5BSP12	H_5G30SP12	H_5G30SP12	H_5G35SP12	H_6G25SP16	H_6G30SP16	H_6G35SP16	H_7G30SP20	H_7G40SP20	H_8G35SP24	H_8G45SP24
HEAD GLAND END (see below)	1	H_5G20SP12	H_5G25SP12	H_5G30SP12	H_5G35SP12	H_6G25SP16	H_6G30SP16	H_6G35SP16	H_7G30SP20	H_7G40SP20	H_8G35SP24	H_8G45SP24
TRUNNION	1	HT5										
CHECK BALL	2	33A32										
CHECK PLUG	2	35H500-1										
CHECK VALVE SEAL	2	9A017										
NEEDLE VALVE HOUSING	2	7H850-3B										
NEEDLE VALVE HOUSING SEAL	2	9A007										
FRONT PLATE	1	FP5020	FP5025	FP5030	FP5035	FP6025	FP6030	FP6035	FP7030	FP7040	FP8035	FP8045
PISTON WEAR STRIP	1	40H507										
SEAL KIT	1	KH5020H	KH5025H	KH5030H	KH5035H	KH6025H	KH6030H	KH6035H	KH7030H	KH7040H	KH8035H	KH8045H
SEAL KIT UNIVERSAL	1	KH5020U	KH5025U	KH5030U	KH5035U	KH6025U	KH6030U	KH6035U	KH7030U	KH7040U	KH8035U	KH8045U

**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 in the features description section.

Through misuse, age or malfunction, components used in fluid power systems can fail. A designer signer 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.

**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.

## CYLINDER DEVELOPED FORCE

BORE in	ROD DIA in	Major Area (in <sup>2</sup> )	Minor Area (in <sup>2</sup> )	Developed Force (lbs)													
				500 psi		750 psi		1000 psi		1500 psi		2000 psi		2500 psi		3000 psi	
				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** with the rod fully extended 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 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 is recommended on long push stroke cylinders in order to prevent the following:

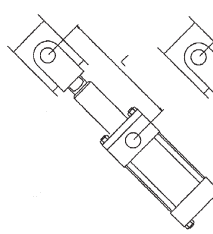
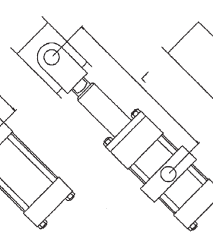
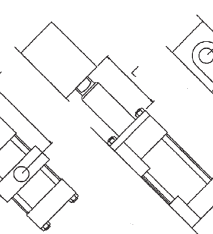
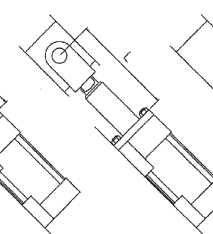
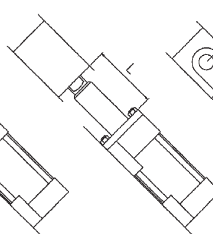
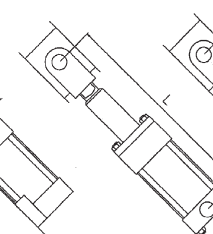
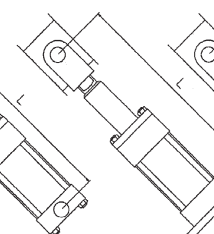
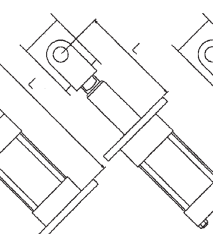
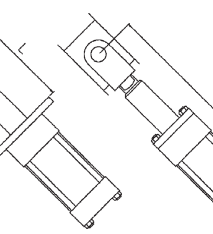
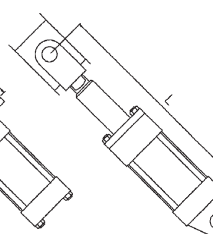
- excessive wear on the gland bushing and piston
- piston rod buckling
- cylinder jack-knifing

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

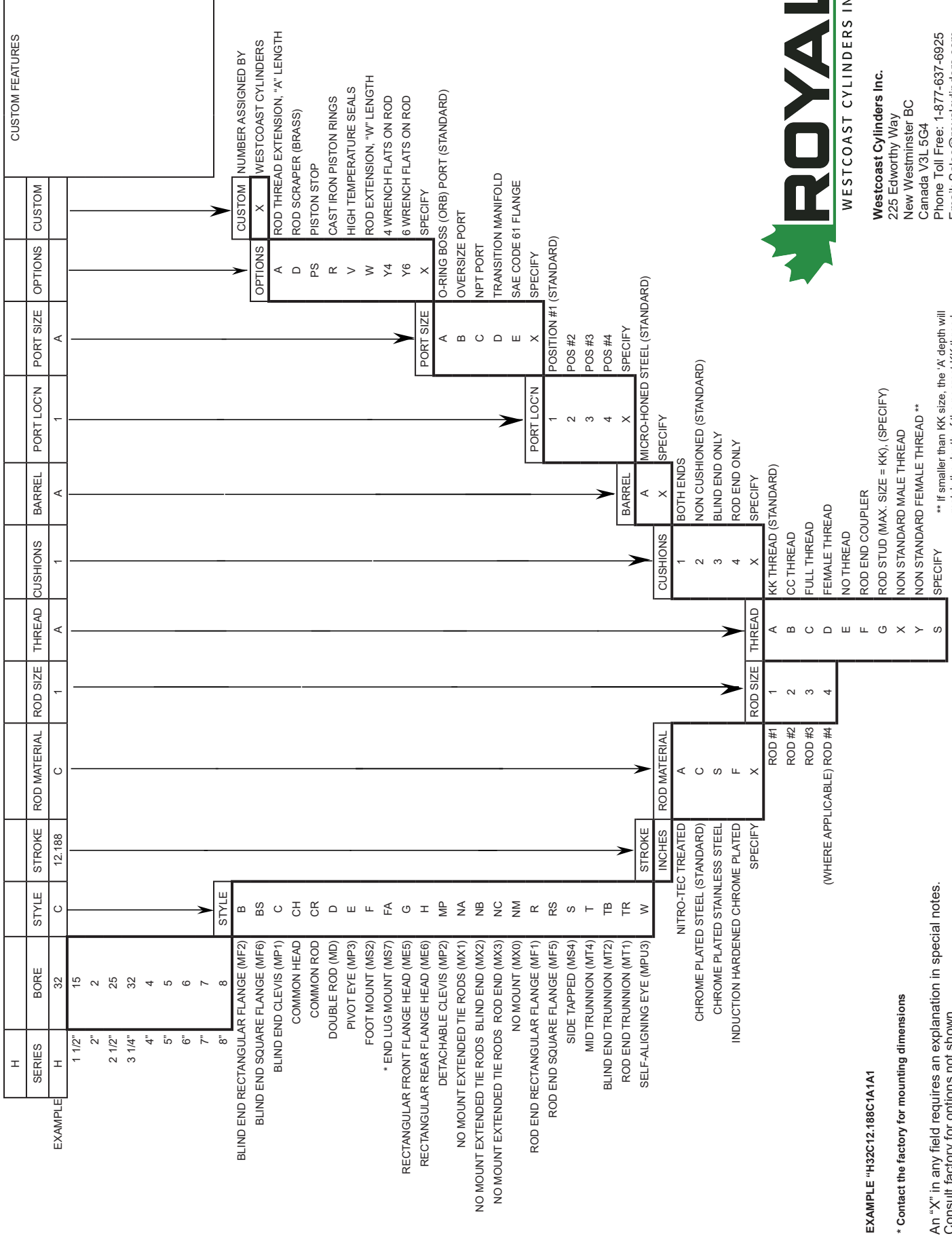
No piston stop is needed if the cylinder is loaded on pull stroke only, unless it is a long stroke and mounted horizontally.

**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 accordingly.

**CYLINDER MOUNTING STYLE and ROD END CONNECTIONS. \*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
									
<b>K values</b>	1.0	1.0	2.0	.70	.50	1.0	.70	.70	1.0
<b>Effective Length Factor (K)</b>									

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



**Westcoast Cylinders Inc.**  
 225 Edworthy Way  
 New Westminster BC  
 Canada V3L 5G4  
 Phone Toll Free: 1-877-637-6925  
 Email: Sales@royalcylinders.com  
 Website: www.RoyalCylinders.com

**EXAMPLE "H32C12.188C1A1A1**  
 \* Contact the factory for mounting dimensions  
 An "X" in any field requires an explanation in special notes.  
 Consult factory for options not shown.  
 \*\* If smaller than KK size, the 'A' depth will match the depth of the nearest KK thread.