

## Section C

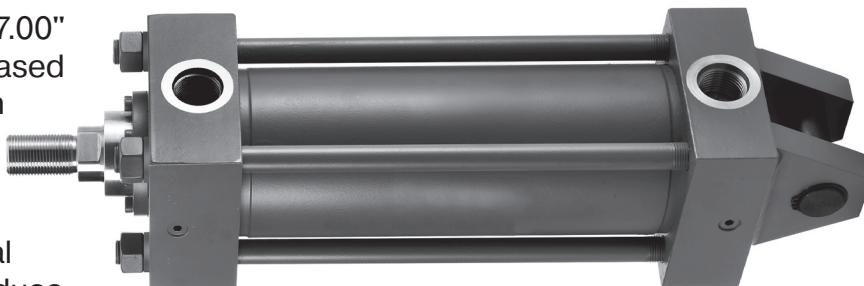
### Series 2HD 1.50"-6.00" Bore / 3HD 7.00" & 8.00" Bore Heavy Duty Hydraulic Cylinders

|                                        | 2HD 1.50"-6.00" Bore | 3HD 7.00" & 8.00" Bore |
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**⚠ PROP 65 WARNING** **WARNING:** This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

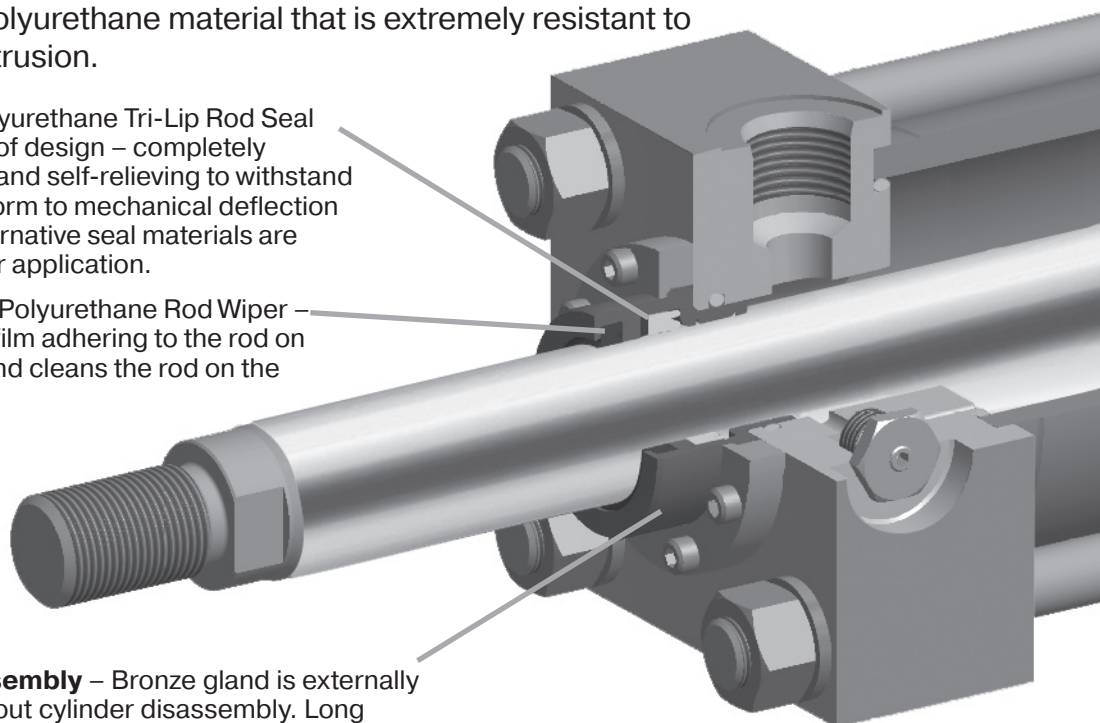
## Parker Series 2HD 1.50" - 6.00" and 3HD 7.00" & 8.00" Bore Heavy Duty Hydraulic Cylinders

Series 2HD 1.50"-6.00" and 3HD 7.00" & 8.00" Bore cylinders offer increased durability and ease of service with the addition of a bolt-on rod gland. The gland assembly is externally removable without cylinder disassembly. The rod seal has multiple sealing edges to produce "dry rod" performance and it is molded from a special polyurethane material that is extremely resistant to abrasion and extrusion.

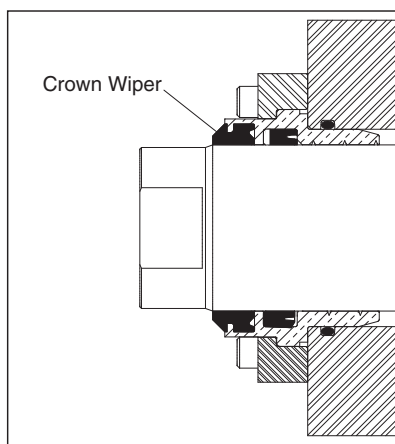


**Primary Seal** – Polyurethane Tri-Lip Rod Seal is a proven leak proof design – completely self-compensating and self-relieving to withstand variations and conform to mechanical deflection that may occur. Alternative seal materials are available to suit your application.

**Secondary Seal** – Polyurethane Rod Wiper – wipes clean any oil film adhering to the rod on the extend stroke and cleans the rod on the return stroke.



**Rod Gland Assembly** – Bronze gland is externally removable without cylinder disassembly. Long inboard bearing surface is ahead of the seals assuring lubrication by cylinder operating fluid.



**Parker Crown Wiper™ for Series 2HD 1.50"-6.00" and 7.00" & 8.00" bore 3HD** – For environments that contain fine abrasive particulate specify the Crown Wiper option. The Crown Wiper is a proven superior alternative to piston rod end boots or metallic wipers that can ingest particulate. It has a sharp leading edge to effectively clean the piston rod and a beveled shape to prevent contaminant intrusion by channeling it away from the gland. It also acts as a secondary seal to wipe clean any oil film adhering to the rod on the extend stroke.

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**Standard Specifications**

- Heavy Duty Service – ANSI/(NFPA) T3.6.7R3 - 2009 Specifications and Mounting Dimension Standards
- Standard Construction – Square Head – Tie Rod Design
- Nominal Pressure – 3000 psi<sup>1</sup>
- Standard Fluid – Hydraulic Oil
- Standard Temperature – -10°F to +165°F<sup>2</sup>
- Bore Diameters – 1.50" through 8.00" (Larger sizes available)

*In line with our policy of continuing product improvement, specifications in this catalog are subject to change.*

Note: Series 2HD and 3HD Hydraulic Cylinders fully meet ANSI/(NFPA) T3.6.7R3 - 2009 Specifications and Mounting Dimension Standards for Square Head Industrial Fluid Power Cylinders.

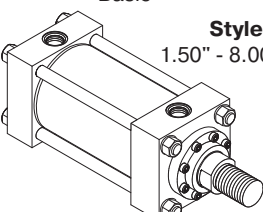
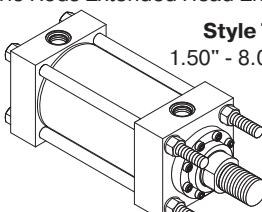
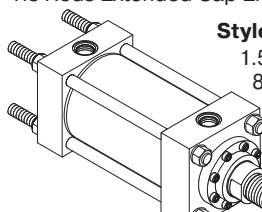
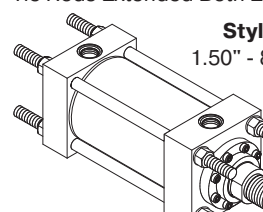
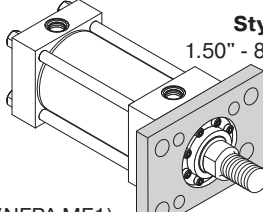
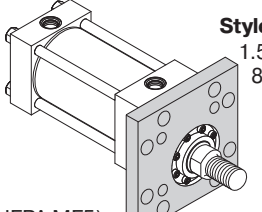
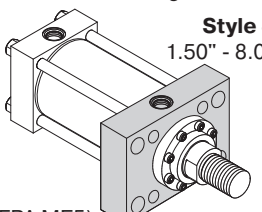
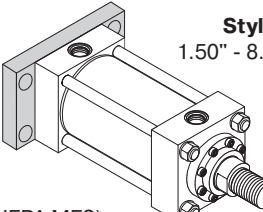
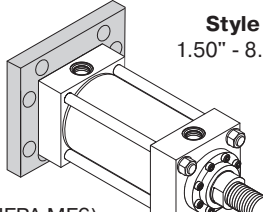
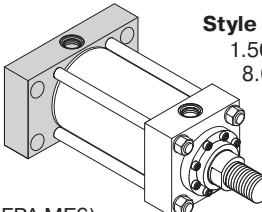
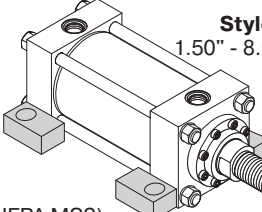
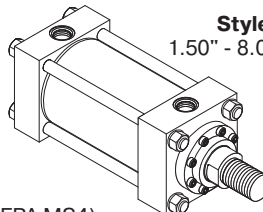
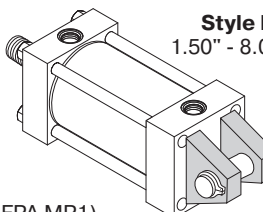
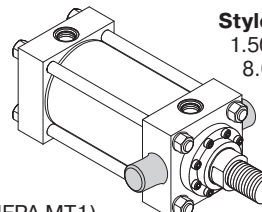
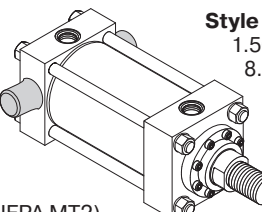
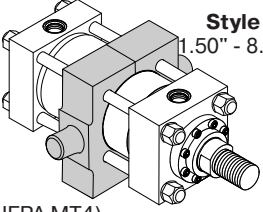
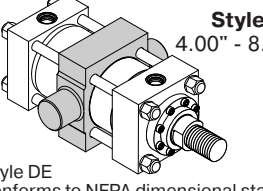
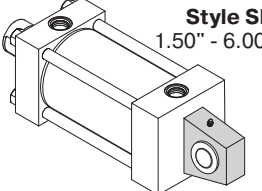
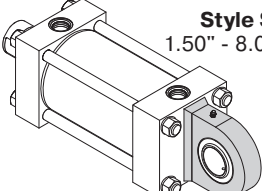
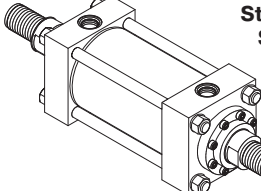
- Piston Rod Diameter – 0.625" through 5.500"
- Mounting Styles – 19 standard styles at various application ratings
- Strokes – Available in any practical stroke length
- Cushions – Optional at either end or both ends of stroke. "Float Check" standard at cap end of 1.50" - 6.00" bore.
- Rod Ends – Four Standard Choices – Specials to Order

<sup>1</sup> If hydraulic operating pressure exceeds 3000 psi, send application data for engineering evaluation and recommendation. See Section H for actual design factors.

<sup>2</sup> See Section H for higher temperature service.

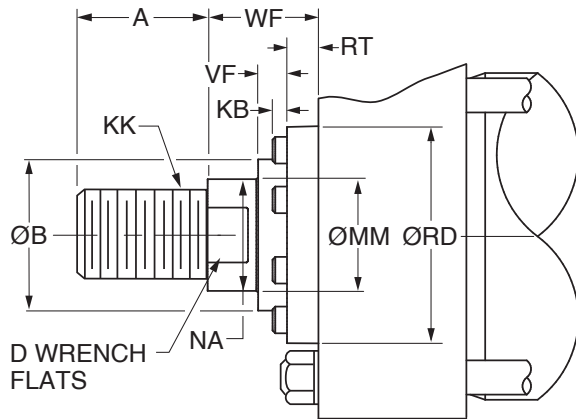
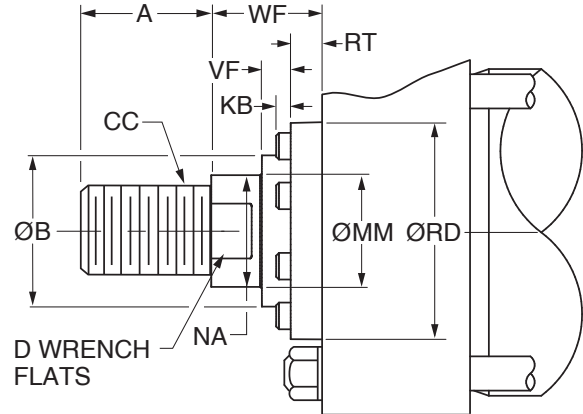
**Available Mounting Styles**

Most of the illustrated mounting styles below are available in double rod cylinders.

|                                                                                                                                                                                                                               |                                                                                                                                                                                    |                                                                                                                                                                                    |                                                                                                                                                                                         |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <p><b>Basic</b><br/><b>Style T</b><br/>1.50" - 8.00"</p> <p>(NFPA MX0)</p>                                                                  |  <p><b>Tie Rods Extended Head End</b><br/><b>Style TB</b><br/>1.50" - 8.00"</p> <p>(NFPA MX3)</p> |  <p><b>Tie Rods Extended Cap End</b><br/><b>Style TC</b><br/>1.50" - 8.00"</p> <p>(NFPA MX2)</p> |  <p><b>Tie Rods Extended Both Ends</b><br/><b>Style TD</b><br/>1.50" - 8.00"</p> <p>(NFPA MX1)</p>   |
|  <p><b>Head Rectangular Flange</b><br/><b>Style J</b><br/>1.50" - 8.00"</p> <p>(NFPA MF1)</p>                                               |  <p><b>Head Square Flange</b><br/><b>Style JB</b><br/>1.50" - 8.00"</p> <p>(NFPA MF5)</p>        |  <p><b>Head Rectangular</b><br/><b>Style JJ</b><br/>1.50" - 8.00"</p> <p>(NFPA ME5)</p>         |  <p><b>Cap Rectangular Flange</b><br/><b>Style H</b><br/>1.50" - 8.00"</p> <p>(NFPA MF2)</p>        |
|  <p><b>Cap Square Flange</b><br/><b>Style HB</b><br/>1.50" - 8.00"</p> <p>(NFPA MF6)</p>                                                   |  <p><b>Cap Rectangular</b><br/><b>Style HH</b><br/>1.50" - 8.00"</p> <p>(NFPA ME6)</p>          |  <p><b>Side Lug</b><br/><b>Style C</b><br/>1.50" - 8.00"</p> <p>(NFPA MS2)</p>                 |  <p><b>Side Tapped</b><br/><b>Style F</b><br/>1.50" - 8.00"</p> <p>(NFPA MS4)</p>                  |
|  <p><b>Cap Fixed Clevis</b><br/><b>Style BB</b><br/>1.50" - 8.00"</p> <p>(NFPA MP1)</p>                                                    |  <p><b>Head Trunnion</b><br/><b>Style D</b><br/>1.50" - 8.00"</p> <p>(NFPA MT1)</p>             |  <p><b>Cap Trunnion</b><br/><b>Style DB</b><br/>1.50" - 8.00"</p> <p>(NFPA MT2)</p>            |  <p><b>Intermediate Fixed Trunnion</b><br/><b>Style DD</b><br/>1.50" - 8.00"</p> <p>(NFPA MT4)</p> |
|  <p><b>HD Intermediate Fixed Trunnion</b><br/><b>Style DE</b><br/>4.00" - 8.00"</p> <p>Style DE conforms to NFPA dimensional standard.</p> |  <p><b>Spherical Bearing</b><br/><b>Style SB</b><br/>1.50" - 6.00"</p>                          |  <p><b>HD Spherical Bearing</b><br/><b>Style SE</b><br/>1.50" - 8.00"</p>                      |  <p><b>Double Rod Cylinders</b><br/><b>Style KT Shown</b><br/>1.50" - 8.00"</p>                    |



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**Piston Rod Ends****Heavy Duty Hydraulic Cylinders****Series 2HD 1.50" - 6.00" Bore****Rod End Dimensions – circular bolt-on retainer construction****Thread Style 4 (NFPA Style SM)  
Small Male****Thread Style 8 (NFPA Style IM)  
Intermediate Male**

See Gland Retention page to determine which bore, rod and mounting style combinations have circular bolt-on retainers and which have tie rod retained glands.

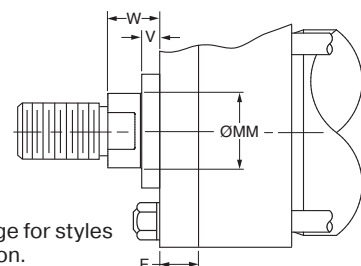
**Rod End Dimensions**

| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | Thread        |               | A    | B Ø<br>+.000<br>-.002 | D    | F    | KB   | NA   | RD   | RT   | V    | VF   | W    | WF   |
|-----------|------------|----------------|---------------|---------------|------|-----------------------|------|------|------|------|------|------|------|------|------|------|
|           |            |                | Style 8<br>CC | Style 4<br>KK |      |                       |      |      |      |      |      |      |      |      |      |      |
| 1.50      | 1 (Std.)   | 0.625          | 1/2-20        | 7/16-20       | 0.75 | 1.124                 | 0.50 | 0.38 | 0.03 | 0.56 | 1.94 | 0.36 | 0.25 | 0.27 | 0.63 | 1.00 |
|           | 2          | 1.000          | 7/8-14        | 3/4-16        | 1.13 | 1.499                 | 0.88 | 0.38 | 0.03 | 0.94 | 2.38 | 0.36 | 0.50 | 0.52 | 1.00 | 1.38 |
| 2.00      | 1 (Std.)   | 1.000          | 7/8-14        | 3/4-16        | 1.13 | 1.499                 | 0.88 | 0.63 | 0.03 | 0.94 | 2.38 | 0.36 | 0.25 | 0.52 | 0.75 | 1.38 |
|           | 2          | 1.375          | 1 1/4-12      | 1-14          | 1.63 | 1.999                 | 1.13 | 0.63 | 0.19 | 1.31 | 2.87 | 0.36 | 0.38 | 0.64 | 1.00 | 1.63 |
| 2.50      | 1 (Std.)   | 1.000          | 7/8-14        | 3/4-16        | 1.13 | 1.499                 | 0.88 | 0.63 | 0.03 | 0.94 | 2.38 | 0.36 | 0.25 | 0.52 | 0.75 | 1.38 |
|           | 2          | 1.750          | 1 1/2-12      | 1 1/4-12      | 2.00 | 2.374                 | 1.50 | 0.63 | 0.03 | 1.69 | 3.47 | 0.60 | 0.50 | 0.53 | 1.25 | 1.88 |
|           | 3          | 1.375          | 1 1/4-12      | 1-14          | 1.63 | 1.999                 | 1.13 | 0.63 | 0.19 | 1.31 | 2.87 | 0.36 | 0.38 | 0.64 | 1.00 | 1.63 |
| 3.25      | 1 (Std.)   | 1.375          | 1 1/4-12      | 1-14          | 1.63 | 1.999                 | 1.13 | 0.75 | 0.19 | 1.31 | 2.87 | 0.36 | 0.25 | 0.64 | 0.88 | 1.63 |
|           | 2          | 2.000          | 1 3/4-12      | 1 1/2-12      | 2.25 | 2.624                 | 1.69 | 0.75 | 0.13 | 1.94 | 3.72 | 0.60 | 0.38 | 0.53 | 1.25 | 2.00 |
|           | 3          | 1.750          | 1 1/2-12      | 1 1/4-12      | 2.00 | 2.374                 | 1.50 | 0.75 | 0.03 | 1.69 | 3.47 | 0.60 | 0.38 | 0.53 | 1.13 | 1.88 |
| 4.00      | 1 (Std.)   | 1.750          | 1 1/2-12      | 1 1/4-12      | 2.00 | 2.374                 | 1.50 | 0.88 | 0.03 | 1.69 | 3.47 | 0.60 | 0.25 | 0.53 | 1.00 | 1.88 |
|           | 2          | 2.500          | 2 1/4-12      | 1 7/8-12      | 3.00 | 3.124                 | 2.06 | 0.88 | 0.25 | 2.38 | 4.25 | 0.60 | 0.38 | 0.65 | 1.38 | 2.25 |
|           | 3          | 2.000          | 1 3/4-12      | 1 1/2-12      | 2.25 | 2.624                 | 1.69 | 0.88 | 0.13 | 1.94 | 3.72 | 0.60 | 0.25 | 0.53 | 1.13 | 2.00 |
| 5.00      | 1 (Std.)   | 2.000          | 1 3/4-12      | 1 1/2-12      | 2.25 | 2.624                 | 1.69 | 0.88 | 0.13 | 1.94 | 3.72 | 0.60 | 0.25 | 0.53 | 1.13 | 2.00 |
|           | 2          | 3.500          | 3 1/4-12      | 2 1/2-12      | 3.50 | 4.249                 | 3.00 | 0.88 | -    | 3.38 | 5.76 | 0.91 | 0.38 | 0.34 | 1.38 | 2.25 |
|           | 3          | 2.500          | 2 1/4-12      | 1 7/8-12      | 3.00 | 3.124                 | 2.06 | 0.88 | 0.25 | 2.38 | 4.25 | 0.60 | 0.38 | 0.65 | 1.38 | 2.25 |
|           | 4          | 3.000          | 2 3/4-12      | 2 1/4-12      | 3.50 | 3.749                 | 2.63 | 0.88 | -    | 2.88 | 5.26 | 0.85 | 0.38 | 0.41 | 1.38 | 2.25 |
| 6.00      | 1 (Std.)   | 2.500          | 2 1/4-12      | 1 7/8-12      | 3.00 | 3.124                 | 2.06 | 1.00 | 0.25 | 2.38 | 4.25 | 0.60 | 0.25 | 0.65 | 1.25 | 2.25 |
|           | 2          | 4.000          | 3 3/4-12      | 3-12          | 4.00 | 4.749                 | 3.38 | 1.00 | -    | 3.88 | 6.31 | 0.91 | 0.25 | 0.34 | 1.25 | 2.25 |
|           | 3          | 3.000          | 2 3/4-12      | 2 1/4-12      | 3.50 | 3.749                 | 2.63 | 1.00 | -    | 2.88 | 5.26 | 0.85 | 0.25 | 0.41 | 1.25 | 2.25 |
|           | 4          | 3.500          | 3 1/4-12      | 2 1/2-12      | 3.50 | 4.249                 | 3.00 | 1.00 | -    | 3.38 | 5.76 | 0.91 | 0.25 | 0.34 | 1.25 | 2.25 |

**"Special" Thread Style 3**

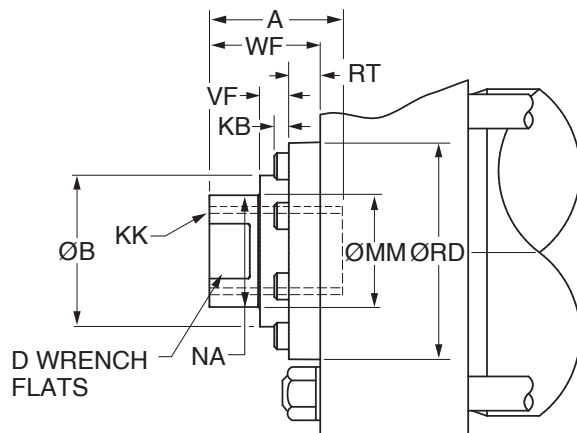
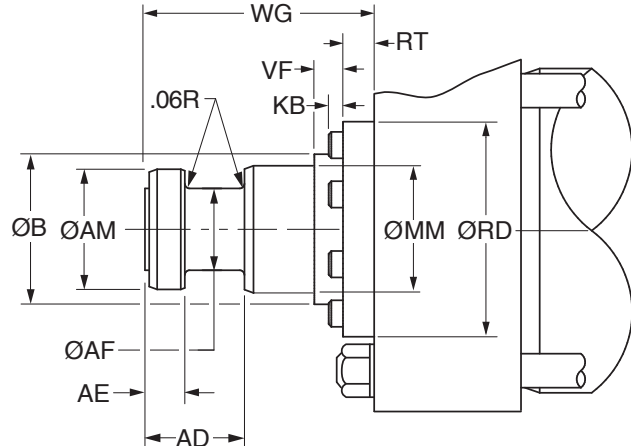
Special thread, extension, rod eye, blank, etc., are also available.

To order, specify "Style 3" and give desired dimensions for KK, A, W or WF. If otherwise special, furnish dimensioned sketch.

**Tie Rod Retained Gland**

See Gland Retention page for styles that have this construction.

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**Rod End Dimensions – circular bolt-on retainer construction****Thread Style 9<sup>2</sup>  
(NFPA Style SF) Small Female****Style 55<sup>1</sup>  
Flanged Rod End**

See Gland Retention page to determine which bore, rod and mounting style combinations have circular bolt-on retainers and which have tie rod retained glands.

**Rod End Dimensions**

| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | Thread        | A    | AD   | AE<br>+.001<br>-.001 | AF<br>Ø | AM<br>Ø | B Ø<br>+.000<br>-.002 | D    | KB   | NA   | RD   | RT   | VF   | WF   | WG   |
|-----------|------------|----------------|---------------|------|------|----------------------|---------|---------|-----------------------|------|------|------|------|------|------|------|------|
|           |            |                | Style 9<br>KK |      |      |                      |         |         |                       |      |      |      |      |      |      |      |      |
| 1.50      | 1 (Std.)   | 0.625          | 7/16-20       | 0.75 | 0.63 | 0.249                | 0.38    | 0.57    | 1.124                 | 0.50 | 0.03 | 0.56 | 1.94 | 0.36 | 0.27 | 1.00 | 1.75 |
|           | 2          | 1.000          | 3/4-16        | 1.13 | 0.94 | 0.374                | 0.69    | 0.95    | 1.499                 | 0.88 | 0.03 | 0.94 | 2.38 | 0.36 | 0.52 | 1.38 | 2.38 |
| 2.00      | 1 (Std.)   | 1.000          | 3/4-16        | 1.13 | 0.94 | 0.374                | 0.69    | 0.95    | 1.499                 | 0.88 | 0.03 | 0.94 | 2.38 | 0.36 | 0.52 | 1.38 | 2.38 |
|           | 2          | 1.375          | 1-14          | 1.63 | 1.06 | 0.374                | 0.88    | 1.32    | 1.999                 | 1.13 | 0.19 | 1.31 | 2.87 | 0.36 | 0.64 | 1.63 | 2.75 |
| 2.50      | 1 (Std.)   | 1.000          | 3/4-16        | 1.13 | 0.94 | 0.374                | 0.69    | 0.95    | 1.499                 | 0.88 | 0.03 | 0.94 | 2.38 | 0.36 | 0.52 | 1.38 | 2.38 |
|           | 2          | 1.750          | 1 1/4-12      | 2.00 | 1.31 | 0.499                | 1.13    | 1.70    | 2.374                 | 1.50 | 0.03 | 1.69 | 3.47 | 0.60 | 0.53 | 1.88 | 3.13 |
|           | 3          | 1.375          | 1-14          | 1.63 | 1.06 | 0.374                | 0.88    | 1.32    | 1.999                 | 1.13 | 0.19 | 1.31 | 2.87 | 0.36 | 0.64 | 1.63 | 2.75 |
| 3.25      | 1 (Std.)   | 1.375          | 1-14          | 1.63 | 1.06 | 0.374                | 0.88    | 1.32    | 1.999                 | 1.13 | 0.19 | 1.31 | 2.87 | 0.36 | 0.64 | 1.63 | 2.75 |
|           | 2          | 2.000          | 1 1/2-12      | 2.25 | 1.69 | 0.624                | 1.38    | 1.95    | 2.624                 | 1.69 | 0.13 | 1.94 | 3.72 | 0.60 | 0.53 | 2.00 | 3.75 |
|           | 3          | 1.750          | 1 1/4-12      | 2.00 | 1.31 | 0.499                | 1.13    | 1.70    | 2.374                 | 1.50 | 0.03 | 1.69 | 3.47 | 0.60 | 0.53 | 1.88 | 3.13 |
| 4.00      | 1 (Std.)   | 1.750          | 1 1/4-12      | 2.00 | 1.31 | 0.499                | 1.13    | 1.70    | 2.374                 | 1.50 | 0.03 | 1.69 | 3.47 | 0.60 | 0.53 | 1.88 | 3.13 |
|           | 2          | 2.500          | 1 7/8-12      | 3.00 | 1.94 | 0.749                | 1.75    | 2.45    | 3.124                 | 2.06 | 0.25 | 2.38 | 4.25 | 0.60 | 0.65 | 2.25 | 4.50 |
|           | 3          | 2.000          | 1 1/2-12      | 2.25 | 1.69 | 0.624                | 1.38    | 1.95    | 2.624                 | 1.69 | 0.13 | 1.94 | 3.72 | 0.60 | 0.53 | 2.00 | 3.75 |
| 5.00      | 1 (Std.)   | 2.000          | 1 1/2-12      | 2.25 | 1.69 | 0.624                | 1.38    | 1.95    | 2.624                 | 1.69 | 0.13 | 1.94 | 3.72 | 0.60 | 0.53 | 2.00 | 3.75 |
|           | 2          | 3.500          | 2 1/2-12      | 3.50 | 2.69 | 0.999                | 2.50    | 3.45    | 4.249                 | 3.00 | -    | 3.38 | 5.76 | 0.91 | 0.34 | 2.25 | 5.63 |
|           | 3          | 2.500          | 1 7/8-12      | 3.00 | 1.94 | 0.749                | 1.75    | 2.45    | 3.124                 | 2.06 | 0.25 | 2.38 | 4.25 | 0.60 | 0.65 | 2.25 | 4.50 |
|           | 4          | 3.000          | 2 1/4-12      | 3.50 | 2.44 | 0.874                | 2.25    | 2.95    | 3.749                 | 2.63 | -    | 2.88 | 5.26 | 0.85 | 0.41 | 2.25 | 4.88 |
| 6.00      | 1 (Std.)   | 2.500          | 1 7/8-12      | 3.00 | 1.94 | 0.749                | 1.75    | 2.45    | 3.124                 | 2.06 | 0.25 | 2.38 | 4.25 | 0.60 | 0.65 | 2.25 | 4.50 |
|           | 2          | 4.000          | 3-12          | 4.00 | 2.69 | 0.999                | 3.00    | 3.95    | 4.749                 | 3.38 | -    | 3.88 | 6.31 | 0.91 | 0.34 | 2.25 | 5.75 |
|           | 3          | 3.000          | 2 1/4-12      | 3.50 | 2.44 | 0.874                | 2.25    | 2.95    | 3.749                 | 2.63 | -    | 2.88 | 5.26 | 0.85 | 0.41 | 2.25 | 4.88 |
|           | 4          | 3.500          | 2 1/2-12      | 3.50 | 2.69 | 0.999                | 2.50    | 3.45    | 4.249                 | 3.00 | -    | 3.38 | 5.76 | 0.91 | 0.34 | 2.25 | 5.63 |

**"Special" Thread Style 3**

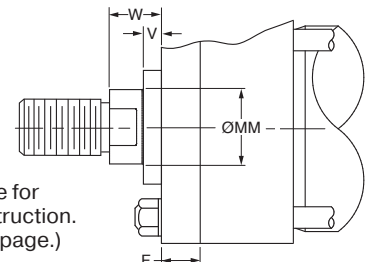
Special thread, extension, rod eye, blank, etc., are also available.

To order, specify "Style 3" and give desired dimensions for KK, A, W or WF.

If otherwise special, furnish dimensioned sketch.

<sup>1</sup> For special WG dimension, specify "Style 3" and give desired dimension for WG. For other changes, place "S" in the model code, and describe rod end with dimensioned sketch.

<sup>2</sup> Style 9 stroke restrictions may apply. See Style 9 Minimum Stroke Table on How to Order page for details.

**Tie Rod Retained Gland**

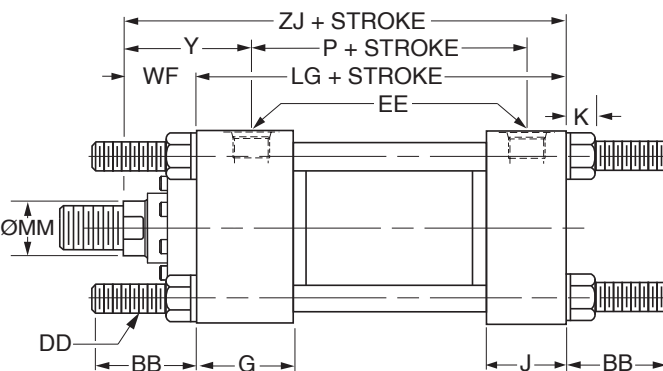
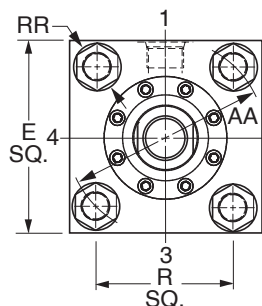
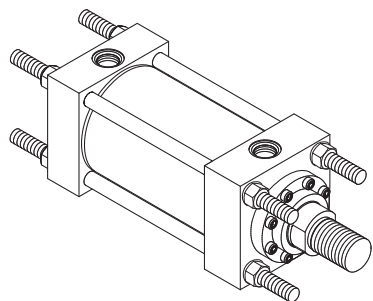
See Gland Retention page for styles that have this construction. (Dimensions on opposite page.)

**⚠ PROP 65 WARNING** WARNING: This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

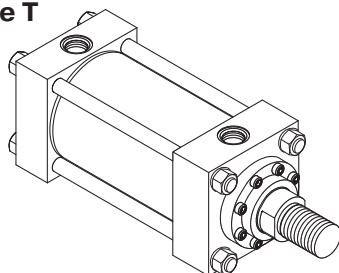
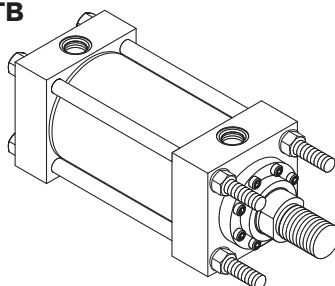
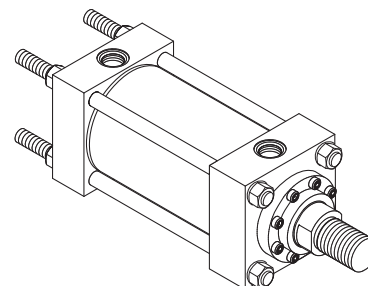
**Mounting Information****Heavy Duty Hydraulic Cylinders  
Series 2HD 1.50" - 6.00" Bore****Tie Rods Extended Both Ends Mounting**

Style TD

(NPTA Style MX1)

**Style TD – Dimensional and Mounting Data**

| Bore<br>Ø | Rod<br>No. | MM<br>Rod Ø | AA   | BB   | DD     | E    | EE                |                  | G    | J    | K<br>Max. | R    | RR   | WF   | Y    | Add Stroke |      |      |
|-----------|------------|-------------|------|------|--------|------|-------------------|------------------|------|------|-----------|------|------|------|------|------------|------|------|
|           |            |             |      |      |        |      | NPTF <sup>1</sup> | SAE <sup>2</sup> |      |      |           |      |      |      |      | LG         | P    | ZJ   |
| 1.50      | 1 (std.)   | 0.625       | 2.31 | 1.38 | 3/8-24 | 2.50 | 1/2               | 10               | 1.75 | 1.50 | 0.42      | 1.63 | 0.68 | 1.00 | 2.00 | 4.63       | 2.88 | 5.63 |
|           | 2          | 1.000       | 2.31 | 1.38 | 3/8-24 | 2.50 | 1/2               | 10               | 1.75 | 1.50 | 0.42      | 1.63 | 0.68 | 1.38 | 2.38 | 4.63       | 2.88 | 6.00 |
| 2.00      | 1 (std.)   | 1.000       | 2.90 | 1.81 | 1/2-20 | 3.00 | 1/2               | 10               | 1.75 | 1.50 | 0.57      | 2.05 | 0.90 | 1.38 | 2.38 | 4.63       | 2.88 | 6.00 |
|           | 2          | 1.375       | 2.90 | 1.81 | 1/2-20 | 3.00 | 1/2               | 10               | 1.75 | 1.50 | 0.57      | 2.05 | 0.90 | 1.63 | 2.63 | 4.63       | 2.88 | 6.25 |
| 2.50      | 1 (std.)   | 1.000       | 3.61 | 1.81 | 1/2-20 | 3.50 | 1/2               | 10               | 1.75 | 1.50 | 0.57      | 2.55 | 0.90 | 1.38 | 2.38 | 4.75       | 3.00 | 6.13 |
|           | 2          | 1.750       | 3.61 | 1.81 | 1/2-20 | 3.50 | 1/2               | 10               | 1.75 | 1.50 | 0.57      | 2.55 | 0.90 | 1.88 | 2.88 | 4.75       | 3.00 | 6.63 |
|           | 3          | 1.375       | 3.61 | 1.81 | 1/2-20 | 3.50 | 1/2               | 10               | 1.75 | 1.50 | 0.57      | 2.55 | 0.90 | 1.63 | 2.63 | 4.75       | 3.00 | 6.38 |
| 3.25      | 1 (std.)   | 1.375       | 4.60 | 2.31 | 5/8-18 | 4.50 | 3/4               | 12               | 2.00 | 1.75 | 0.68      | 3.25 | 1.11 | 1.63 | 2.75 | 5.50       | 3.50 | 7.13 |
|           | 2          | 2.000       | 4.60 | 2.31 | 5/8-18 | 4.50 | 3/4               | 12               | 2.00 | 1.75 | 0.68      | 3.25 | 1.11 | 2.00 | 3.13 | 5.50       | 3.50 | 7.50 |
|           | 3          | 1.750       | 4.60 | 2.31 | 5/8-18 | 4.50 | 3/4               | 12               | 2.00 | 1.75 | 0.68      | 3.25 | 1.11 | 1.88 | 3.00 | 5.50       | 3.50 | 7.38 |
| 4.00      | 1 (std.)   | 1.750       | 5.40 | 2.31 | 5/8-18 | 5.00 | 3/4               | 12               | 2.00 | 1.75 | 0.68      | 3.82 | 1.11 | 1.88 | 3.00 | 5.75       | 3.75 | 7.63 |
|           | 2          | 2.500       | 5.40 | 2.31 | 5/8-18 | 5.00 | 3/4               | 12               | 2.00 | 1.75 | 0.68      | 3.82 | 1.11 | 2.25 | 3.38 | 5.75       | 3.75 | 8.00 |
|           | 3          | 2.000       | 5.40 | 2.31 | 5/8-18 | 5.00 | 3/4               | 12               | 2.00 | 1.75 | 0.68      | 3.82 | 1.11 | 2.00 | 3.13 | 5.75       | 3.75 | 7.75 |
| 5.00      | 1 (std.)   | 2.000       | 7.00 | 3.19 | 7/8-14 | 6.50 | 3/4               | 12               | 2.00 | 1.75 | 0.94      | 4.95 | 1.55 | 2.00 | 3.13 | 6.25       | 4.25 | 8.25 |
|           | 2          | 3.500       | 7.00 | 3.19 | 7/8-14 | 6.50 | 3/4               | 12               | 2.00 | 1.75 | 0.94      | 4.95 | 1.55 | 2.25 | 3.38 | 6.25       | 4.25 | 8.50 |
|           | 3          | 2.500       | 7.00 | 3.19 | 7/8-14 | 6.50 | 3/4               | 12               | 2.00 | 1.75 | 0.94      | 4.95 | 1.55 | 2.25 | 3.38 | 6.25       | 4.25 | 8.50 |
|           | 4          | 3.000       | 7.00 | 3.19 | 7/8-14 | 6.50 | 3/4               | 12               | 2.00 | 1.75 | 0.94      | 4.95 | 1.55 | 2.25 | 3.38 | 6.25       | 4.25 | 8.50 |
| 6.00      | 1 (std.)   | 2.500       | 8.10 | 3.63 | 1-14   | 7.50 | 1                 | 16               | 2.25 | 2.25 | 1.05      | 5.73 | 1.77 | 2.25 | 3.50 | 7.38       | 4.88 | 9.63 |
|           | 2          | 4.000       | 8.10 | 3.63 | 1-14   | 7.50 | 1                 | 16               | 2.25 | 2.25 | 1.05      | 5.73 | 1.77 | 2.25 | 3.50 | 7.38       | 4.88 | 9.63 |
|           | 3          | 3.000       | 8.10 | 3.63 | 1-14   | 7.50 | 1                 | 16               | 2.25 | 2.25 | 1.05      | 5.73 | 1.77 | 2.25 | 3.50 | 7.38       | 4.88 | 9.63 |
|           | 4          | 3.500       | 8.10 | 3.63 | 1-14   | 7.50 | 1                 | 16               | 2.25 | 2.25 | 1.05      | 5.73 | 1.77 | 2.25 | 3.50 | 7.38       | 4.88 | 9.63 |

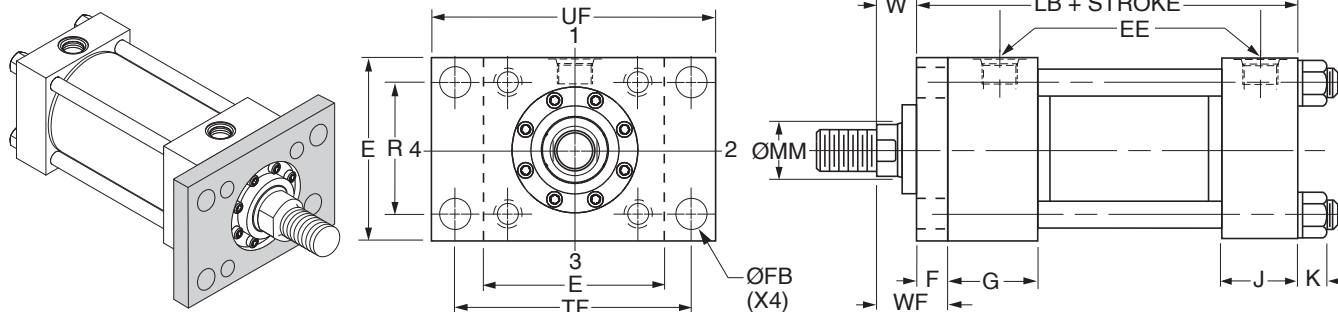
<sup>1</sup>NPTF ports are available at no extra charge.<sup>2</sup>SAE straight thread ports are standard and are indicated by port number.**Style T****Style TB****Style TC**

Dimensions for T, TB and TC Mount may be obtained from the above dimensional table.

**Mounting Information****Heavy Duty Hydraulic Cylinders  
Series 2HD 1.50" - 6.00" Bore****Head Rectangular Flange Mounting**

Style J

(NFPA Style MF1)

**Style J – Dimensional and Mounting Data**

| Bore<br>Ø | E    | EE                |                  | F    | FB<br>Ø | G    | J    | K<br>Max. | R    | TF   | UF    | Add Stroke |      |
|-----------|------|-------------------|------------------|------|---------|------|------|-----------|------|------|-------|------------|------|
|           |      | NPTF <sup>1</sup> | SAE <sup>2</sup> |      |         |      |      |           |      |      |       | LB         | P    |
| 1.50      | 2.50 | 1/2               | 10               | 0.38 | 0.44    | 1.75 | 1.50 | 0.42      | 1.63 | 3.44 | 4.25  | 5.00       | 2.88 |
| 2.00      | 3.00 | 1/2               | 10               | 0.63 | 0.56    | 1.75 | 1.50 | 0.57      | 2.05 | 4.13 | 5.13  | 5.25       | 2.88 |
| 2.50      | 3.50 | 1/2               | 10               | 0.63 | 0.56    | 1.75 | 1.50 | 0.57      | 2.55 | 4.63 | 5.63  | 5.38       | 3.00 |
| 3.25      | 4.50 | 3/4               | 12               | 0.75 | 0.69    | 2.00 | 1.75 | 0.68      | 3.25 | 5.88 | 7.13  | 6.25       | 3.50 |
| 4.00      | 5.00 | 3/4               | 12               | 0.88 | 0.69    | 2.00 | 1.75 | 0.68      | 3.82 | 6.38 | 7.63  | 6.63       | 3.75 |
| 5.00      | 6.50 | 3/4               | 12               | 0.88 | 0.94    | 2.00 | 1.75 | 0.94      | 4.95 | 8.19 | 9.75  | 7.13       | 4.25 |
| 6.00      | 7.50 | 1                 | 16               | 1.00 | 1.06    | 2.25 | 2.25 | 1.05      | 5.73 | 9.44 | 11.25 | 8.38       | 4.88 |

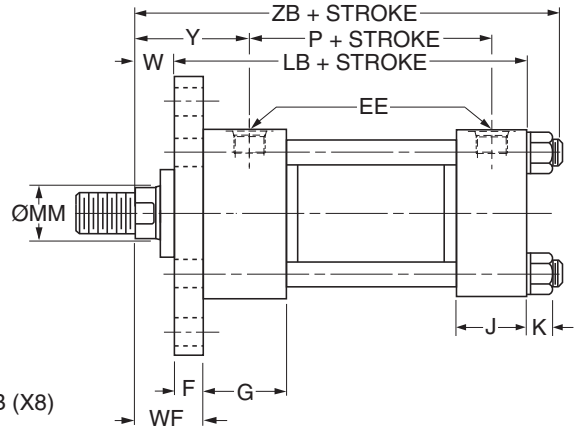
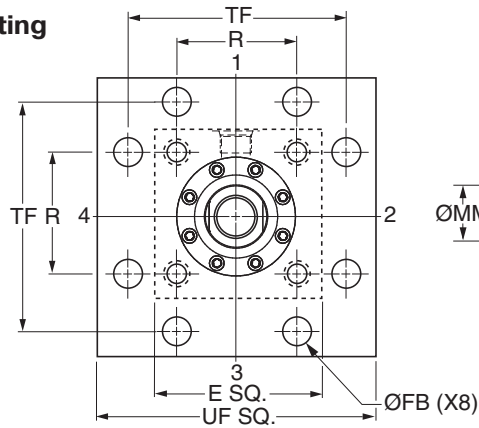
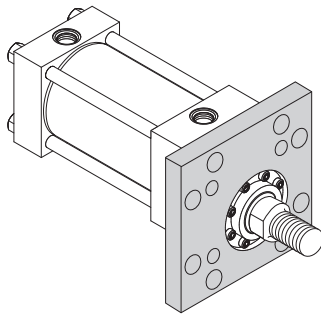
<sup>1</sup>NPTF ports are available at no extra charge.<sup>2</sup>SAE straight thread ports are standard and are indicated by port number.**Style J – Dimensional and Mounting Data**

| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | W    | WF   | Y    | Add Stroke |
|-----------|------------|----------------|------|------|------|------------|
|           |            |                |      |      |      | ZB Max.    |
| 1.50      | 1 (std.)   | 0.625          | 0.63 | 1.00 | 2.00 | 6.29       |
|           | 2          | 1.000          | 1.00 | 1.38 | 2.38 | 6.67       |
| 2.00      | 1 (std.)   | 1.000          | 0.75 | 1.38 | 2.38 | 6.81       |
|           | 2          | 1.375          | 1.00 | 1.63 | 2.63 | 7.06       |
| 2.50      | 1 (std.)   | 1.000          | 0.75 | 1.38 | 2.38 | 6.93       |
|           | 2          | 1.750          | 1.25 | 1.88 | 2.88 | 7.43       |
|           | 3          | 1.375          | 1.00 | 1.63 | 2.63 | 7.18       |
| 3.25      | 1 (std.)   | 1.375          | 0.88 | 1.63 | 2.75 | 8.06       |
|           | 2          | 2.000          | 1.25 | 2.00 | 3.13 | 8.43       |
|           | 3          | 1.750          | 1.13 | 1.88 | 3.00 | 8.31       |
| 4.00      | 1 (std.)   | 1.750          | 1.00 | 1.88 | 3.00 | 8.56       |
|           | 2          | 2.500          | 1.38 | 2.25 | 3.38 | 8.94       |
|           | 3          | 2.000          | 1.13 | 2.00 | 3.13 | 8.68       |
| 5.00      | 1 (std.)   | 2.000          | 1.13 | 2.00 | 3.13 | 9.44       |
|           | 2          | 3.500          | 1.38 | 2.25 | 3.38 | 9.69       |
|           | 3          | 2.500          | 1.38 | 2.25 | 3.38 | 9.69       |
|           | 4          | 3.000          | 1.38 | 2.25 | 3.38 | 9.69       |
| 6.00      | 1 (std.)   | 2.500          | 1.25 | 2.25 | 3.50 | 10.93      |
|           | 2          | 4.000          | 1.25 | 2.25 | 3.50 | 10.93      |
|           | 3          | 3.000          | 1.25 | 2.25 | 3.50 | 10.93      |
|           | 4          | 3.500          | 1.25 | 2.25 | 3.50 | 10.93      |

**Style J – Maximum Operating  
Pressure / 2HD**

| Bore<br>Ø | Maximum psi Push <sup>3</sup> |      |      |     |
|-----------|-------------------------------|------|------|-----|
|           | Rod Code                      |      |      |     |
|           | 1                             | 2    | 3    | 4   |
| 1.50      | 1400                          | 1000 | -    | -   |
| 2.00      | 2000                          | 1200 | -    | -   |
| 2.50      | 700                           | 1000 | 700  | -   |
| 3.25      | 800                           | 600  | 800  | -   |
| 4.00      | 1000                          | 700  | 1000 | -   |
| 5.00      | 850                           | 800  | 850  | 450 |
| 6.00      | 650                           | 400  | 650  | 400 |

<sup>3</sup>Maximum Pressure Rating – Push Application.**PROP 65 WARNING** WARNING: This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**Mounting Information****Heavy Duty Hydraulic Cylinders  
Series 2HD 1.50" - 6.00" Bore****Head Square Flange Mounting  
Style JB  
(NFFA Style MF5)****Style JB – Dimensional and Mounting Data**

| Bore<br>Ø | E    | EE                |                  | F    | FB<br>Ø | G    | J    | K<br>Max. | R    | TF   | UF    | Add Stroke |      |
|-----------|------|-------------------|------------------|------|---------|------|------|-----------|------|------|-------|------------|------|
|           |      | NPTF <sup>1</sup> | SAE <sup>2</sup> |      |         |      |      |           |      |      |       | LB         | P    |
| 1.50      | 2.50 | 1/2               | 10               | 0.38 | 0.44    | 1.75 | 1.50 | 0.42      | 1.63 | 3.44 | 4.25  | 5.00       | 2.88 |
| 2.00      | 3.00 | 1/2               | 10               | 0.63 | 0.56    | 1.75 | 1.50 | 0.57      | 2.05 | 4.13 | 5.13  | 5.25       | 2.88 |
| 2.50      | 3.50 | 1/2               | 10               | 0.63 | 0.56    | 1.75 | 1.50 | 0.57      | 2.55 | 4.63 | 5.63  | 5.38       | 3.00 |
| 3.25      | 4.50 | 3/4               | 12               | 0.75 | 0.69    | 2.00 | 1.75 | 0.68      | 3.25 | 5.88 | 7.13  | 6.25       | 3.50 |
| 4.00      | 5.00 | 3/4               | 12               | 0.88 | 0.69    | 2.00 | 1.75 | 0.68      | 3.82 | 6.38 | 7.63  | 6.63       | 3.75 |
| 5.00      | 6.50 | 3/4               | 12               | 0.88 | 0.94    | 2.00 | 1.75 | 0.94      | 4.95 | 8.19 | 9.75  | 7.13       | 4.25 |
| 6.00      | 7.50 | 1                 | 16               | 1.00 | 1.06    | 2.25 | 2.25 | 1.05      | 5.73 | 9.44 | 11.25 | 8.38       | 4.88 |

<sup>1</sup>NPTF ports are available at no extra charge.<sup>2</sup>SAE straight thread ports are standard and are indicated by port number.**Style JB – Dimensional and Mounting Data**

| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | W    | WF   | Y    | Add Stroke |
|-----------|------------|----------------|------|------|------|------------|
|           |            |                |      |      |      | ZB Max.    |
| 1.50      | 1 (std.)   | 0.625          | 0.63 | 1.00 | 2.00 | 6.29       |
|           | 2          | 1.000          | 1.00 | 1.38 | 2.38 | 6.67       |
| 2.00      | 1 (std.)   | 1.000          | 0.75 | 1.38 | 2.38 | 6.81       |
|           | 2          | 1.375          | 1.00 | 1.63 | 2.63 | 7.06       |
| 2.50      | 1 (std.)   | 1.000          | 0.75 | 1.38 | 2.38 | 6.93       |
|           | 2          | 1.750          | 1.25 | 1.88 | 2.88 | 7.43       |
|           | 3          | 1.375          | 1.00 | 1.63 | 2.63 | 7.18       |
| 3.25      | 1 (std.)   | 1.375          | 0.88 | 1.63 | 2.75 | 8.06       |
|           | 2          | 2.000          | 1.25 | 2.00 | 3.13 | 8.43       |
|           | 3          | 1.750          | 1.13 | 1.88 | 3.00 | 8.31       |
| 4.00      | 1 (std.)   | 1.750          | 1.00 | 1.88 | 3.00 | 8.56       |
|           | 2          | 2.500          | 1.38 | 2.25 | 3.38 | 8.94       |
|           | 3          | 2.000          | 1.13 | 2.00 | 3.13 | 8.68       |
| 5.00      | 1 (std.)   | 2.000          | 1.13 | 2.00 | 3.13 | 9.44       |
|           | 2          | 3.500          | 1.38 | 2.25 | 3.38 | 9.69       |
|           | 3          | 2.500          | 1.38 | 2.25 | 3.38 | 9.69       |
|           | 4          | 3.000          | 1.38 | 2.25 | 3.38 | 9.69       |
| 6.00      | 1 (std.)   | 2.500          | 1.25 | 2.25 | 3.50 | 10.93      |
|           | 2          | 4.000          | 1.25 | 2.25 | 3.50 | 10.93      |
|           | 3          | 3.000          | 1.25 | 2.25 | 3.50 | 10.93      |
|           | 4          | 3.500          | 1.25 | 2.25 | 3.50 | 10.93      |

**Style JB – Maximum Operating  
Pressure / 2HD**

| Bore<br>Ø | Maximum psi Push <sup>3</sup> |      |      |      |
|-----------|-------------------------------|------|------|------|
|           | Rod Code                      |      |      |      |
|           | 1                             | 2    | 3    | 4    |
| 1.50      | 3000                          | 3000 | -    | -    |
| 2.00      | 3000                          | 3000 | -    | -    |
| 2.50      | 3000                          | 3000 | 3000 | -    |
| 3.25      | 3000                          | 3000 | 3000 | -    |
| 4.00      | 3000                          | 3000 | 3000 | -    |
| 5.00      | 2500                          | 2300 | 2500 | 1800 |
| 6.00      | 2000                          | 1600 | 2000 | 1600 |

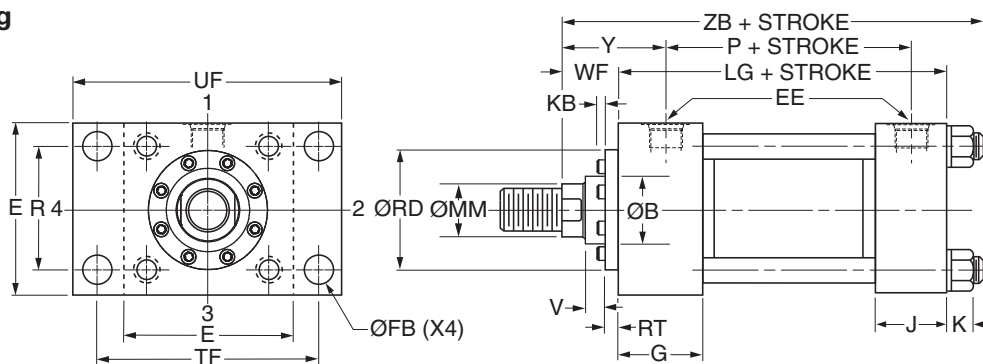
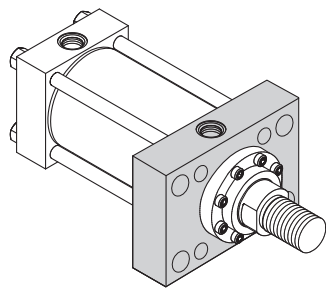
<sup>3</sup>Maximum Pressure Rating – Push Application.

**⚠ PROP 65 WARNING** WARNING: This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**Mounting Information****Heavy Duty Hydraulic Cylinders  
Series 2HD 1.50" - 6.00" Bore****Head Rectangular Mounting**

Style JJ

(NFPA Style ME5)

**Style JJ – Dimensional and Mounting Data**

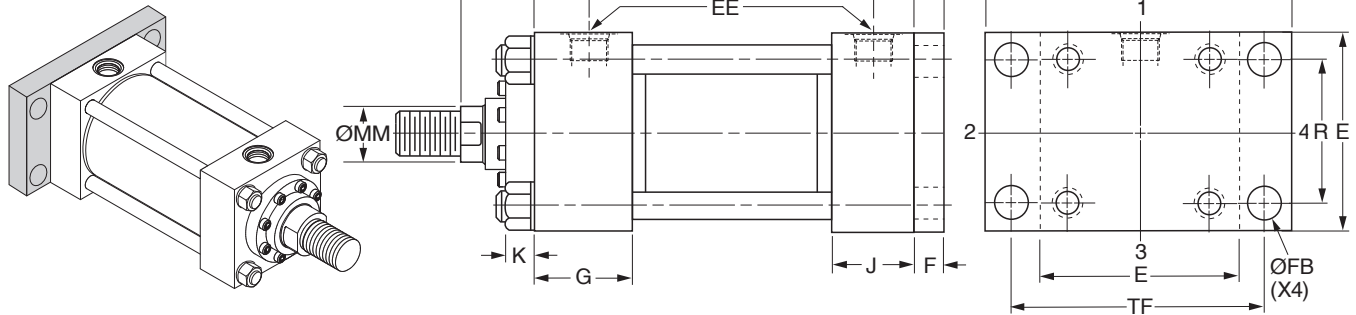
| Bore<br>Ø | E    | EE                |                  | FB<br>Ø | G    | J    | K<br>Max. | R    | TF   | UF    | Add Stroke |      |
|-----------|------|-------------------|------------------|---------|------|------|-----------|------|------|-------|------------|------|
|           |      | NPTF <sup>1</sup> | SAE <sup>2</sup> |         |      |      |           |      |      |       | LG         | P    |
| 1.50      | 2.50 | 1/2               | 10               | 0.44    | 1.75 | 1.50 | 0.42      | 1.63 | 3.44 | 4.25  | 4.63       | 2.88 |
| 2.00      | 3.00 | 1/2               | 10               | 0.56    | 1.75 | 1.50 | 0.57      | 2.05 | 4.13 | 5.13  | 4.63       | 2.88 |
| 2.50      | 3.50 | 1/2               | 10               | 0.56    | 1.75 | 1.50 | 0.57      | 2.55 | 4.63 | 5.63  | 4.75       | 3.00 |
| 3.25      | 4.50 | 3/4               | 12               | 0.69    | 2.00 | 1.75 | 0.68      | 3.25 | 5.88 | 7.13  | 5.50       | 3.50 |
| 4.00      | 5.00 | 3/4               | 12               | 0.69    | 2.00 | 1.75 | 0.68      | 3.82 | 6.38 | 7.63  | 5.75       | 3.75 |
| 5.00      | 6.50 | 3/4               | 12               | 0.94    | 2.00 | 1.75 | 0.94      | 4.95 | 8.19 | 9.75  | 6.25       | 4.25 |
| 6.00      | 7.50 | 1                 | 16               | 1.06    | 2.25 | 2.25 | 1.05      | 5.73 | 9.44 | 11.25 | 7.38       | 4.88 |

<sup>1</sup>NPTF ports are available at no extra charge.<sup>2</sup>SAE straight thread ports are standard and are indicated by port number.**Style JJ – Dimensional and Mounting Data**

| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | B Ø<br>+ .000<br>- .002 | KB   | RD<br>Ø | RT   | V    | WF   | Y    | Add Stroke |  |
|-----------|------------|----------------|-------------------------|------|---------|------|------|------|------|------------|--|
|           |            |                |                         |      |         |      |      |      |      | ZB Max     |  |
| 1.50      | 1 (std.)   | 0.625          | 1.124                   | 0.03 | 1.94    | 0.36 | 0.27 | 1.00 | 2.00 | 6.29       |  |
|           | 2          | 1.000          | 1.499                   | 0.03 | 2.38    | 0.36 | 0.52 | 1.38 | 2.38 | 6.67       |  |
| 2.00      | 1 (std.)   | 1.000          | 1.499                   | 0.03 | 2.38    | 0.36 | 0.52 | 1.38 | 2.38 | 6.81       |  |
|           | 2          | 1.375          | 1.999                   | 0.19 | 2.87    | 0.36 | 0.64 | 1.63 | 2.63 | 7.06       |  |
| 2.50      | 1 (std.)   | 1.000          | 1.499                   | 0.03 | 2.38    | 0.36 | 0.52 | 1.38 | 2.38 | 6.93       |  |
|           | 2          | 1.750          | 2.374                   | 0.03 | 3.47    | 0.60 | 0.53 | 1.88 | 2.88 | 7.43       |  |
|           | 3          | 1.375          | 1.999                   | 0.19 | 2.87    | 0.36 | 0.64 | 1.63 | 2.63 | 7.18       |  |
| 3.25      | 1 (std.)   | 1.375          | 1.999                   | 0.19 | 2.87    | 0.36 | 0.64 | 1.63 | 2.75 | 8.06       |  |
|           | 2          | 2.000          | 2.624                   | 0.13 | 3.72    | 0.60 | 0.53 | 2.00 | 3.13 | 8.43       |  |
|           | 3          | 1.750          | 2.374                   | 0.03 | 3.47    | 0.60 | 0.53 | 1.88 | 3.00 | 8.31       |  |
| 4.00      | 1 (std.)   | 1.750          | 2.374                   | 0.03 | 3.47    | 0.60 | 0.53 | 1.88 | 3.00 | 8.56       |  |
|           | 2          | 2.500          | 3.124                   | 0.25 | 4.25    | 0.60 | 0.65 | 2.25 | 3.38 | 8.94       |  |
|           | 3          | 2.000          | 2.624                   | 0.13 | 3.72    | 0.60 | 0.53 | 2.00 | 3.13 | 8.68       |  |
| 5.00      | 1 (std.)   | 2.000          | 2.624                   | 0.13 | 3.72    | 0.60 | 0.53 | 2.00 | 3.13 | 9.44       |  |
|           | 2          | 3.500          | 4.249                   | -    | 5.76    | 0.91 | 0.34 | 2.25 | 3.38 | 9.69       |  |
|           | 3          | 2.500          | 3.124                   | 0.25 | 4.25    | 0.60 | 0.65 | 2.25 | 3.38 | 9.69       |  |
|           | 4          | 3.000          | 3.749                   | -    | 5.26    | 0.85 | 0.41 | 2.25 | 3.38 | 9.69       |  |
| 6.00      | 1 (std.)   | 2.500          | 3.124                   | 0.25 | 4.25    | 0.60 | 0.65 | 2.25 | 3.50 | 10.93      |  |
|           | 2          | 4.000          | 4.749                   | -    | 6.31    | 0.91 | 0.34 | 2.25 | 3.50 | 10.93      |  |
|           | 3          | 3.000          | 3.749                   | -    | 5.26    | 0.85 | 0.41 | 2.25 | 3.50 | 10.93      |  |
|           | 4          | 3.500          | 4.249                   | -    | 5.76    | 0.91 | 0.34 | 2.25 | 3.50 | 10.93      |  |

**⚠ PROP 65 WARNING** WARNING: This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)



**Mounting Information****Heavy Duty Hydraulic Cylinders  
Series 2HD 1.50" - 6.00" Bore****Cap Rectangular Flange Mounting  
Style H  
(NPTA Style MF2)****Style H – Dimensional and Mounting Data**

| Bore<br>Ø | E    | EE                |                  | F    | FB<br>Ø | G    | J    | K<br>Max. | R    | TF   | UF    | Add Stroke |      |
|-----------|------|-------------------|------------------|------|---------|------|------|-----------|------|------|-------|------------|------|
|           |      | NPTF <sup>1</sup> | SAE <sup>2</sup> |      |         |      |      |           |      |      |       | LG         | P    |
| 1.50      | 2.50 | 1/2               | 10               | 0.38 | 0.44    | 1.75 | 1.50 | 0.42      | 1.63 | 3.44 | 4.25  | 4.63       | 2.88 |
| 2.00      | 3.00 | 1/2               | 10               | 0.63 | 0.56    | 1.75 | 1.50 | 0.57      | 2.05 | 4.13 | 5.13  | 4.63       | 2.88 |
| 2.50      | 3.50 | 1/2               | 10               | 0.63 | 0.56    | 1.75 | 1.50 | 0.57      | 2.55 | 4.63 | 5.63  | 4.75       | 3.00 |
| 3.25      | 4.50 | 3/4               | 12               | 0.75 | 0.69    | 2.00 | 1.75 | 0.68      | 3.25 | 5.88 | 7.13  | 5.50       | 3.50 |
| 4.00      | 5.00 | 3/4               | 12               | 0.88 | 0.69    | 2.00 | 1.75 | 0.68      | 3.82 | 6.38 | 7.63  | 5.75       | 3.75 |
| 5.00      | 6.50 | 3/4               | 12               | 0.88 | 0.94    | 2.00 | 1.75 | 0.94      | 4.95 | 8.19 | 9.75  | 6.25       | 4.25 |
| 6.00      | 7.50 | 1                 | 16               | 1.00 | 1.06    | 2.25 | 2.25 | 1.05      | 5.73 | 9.44 | 11.25 | 7.38       | 4.88 |

<sup>1</sup>NPTF ports are available at no extra charge.<sup>2</sup>SAE straight thread ports are standard and are indicated by port number.**Style H – Dimensional and Mounting Data**

| Bore<br>Ø | Rod<br>No. | MM<br>Rod Ø | WF   | Y    | Add Stroke |       |
|-----------|------------|-------------|------|------|------------|-------|
|           |            |             |      |      | XF         | ZF    |
| 1.50      | 1 (std.)   | 0.625       | 1.00 | 2.00 | 5.63       | 6.00  |
|           | 2          | 1.000       | 1.38 | 2.38 | 6.00       | 6.38  |
| 2.00      | 1 (std.)   | 1.000       | 1.38 | 2.38 | 6.00       | 6.63  |
|           | 2          | 1.375       | 1.63 | 2.63 | 6.25       | 6.88  |
| 2.50      | 1 (std.)   | 1.000       | 1.38 | 2.38 | 6.13       | 6.75  |
|           | 2          | 1.750       | 1.88 | 2.88 | 6.63       | 7.25  |
|           | 3          | 1.375       | 1.63 | 2.63 | 6.38       | 7.00  |
| 3.25      | 1 (std.)   | 1.375       | 1.63 | 2.75 | 7.13       | 7.88  |
|           | 2          | 2.000       | 2.00 | 3.13 | 7.50       | 8.25  |
|           | 3          | 1.750       | 1.88 | 3.00 | 7.38       | 8.13  |
| 4.00      | 1 (std.)   | 1.750       | 1.88 | 3.00 | 7.63       | 8.50  |
|           | 2          | 2.500       | 2.25 | 3.38 | 8.00       | 8.88  |
|           | 3          | 2.000       | 2.00 | 3.13 | 7.75       | 8.63  |
| 5.00      | 1 (std.)   | 2.000       | 2.00 | 3.13 | 8.25       | 9.13  |
|           | 2          | 3.500       | 2.25 | 3.38 | 8.50       | 9.38  |
|           | 3          | 2.500       | 2.25 | 3.38 | 8.50       | 9.38  |
|           | 4          | 3.000       | 2.25 | 3.38 | 8.50       | 9.38  |
| 6.00      | 1 (std.)   | 2.500       | 2.25 | 3.50 | 9.63       | 10.63 |
|           | 2          | 4.000       | 2.25 | 3.50 | 9.63       | 10.63 |
|           | 3          | 3.000       | 2.25 | 3.50 | 9.63       | 10.63 |
|           | 4          | 3.500       | 2.25 | 3.50 | 9.63       | 10.63 |

**Style H – Maximum Operating Pressure / 2HD**

| Bore<br>Ø | Maximum psi Pull <sup>3</sup> |      |      |      |
|-----------|-------------------------------|------|------|------|
|           | Rod Code                      |      |      |      |
|           | 1                             | 2    | 3    | 4    |
| 1.50      | 2500                          | 3000 | -    | -    |
| 2.00      | 3000                          | 3000 | -    | -    |
| 2.50      | 3000                          | 3000 | 3000 | -    |
| 3.25      | 3000                          | 3000 | 3000 | -    |
| 4.00      | 3000                          | 3000 | 3000 | -    |
| 5.00      | 2000                          | 3000 | 2000 | 2500 |
| 6.00      | 1800                          | 2500 | 2000 | 2000 |

<sup>3</sup>Maximum pressure rating — pull application.

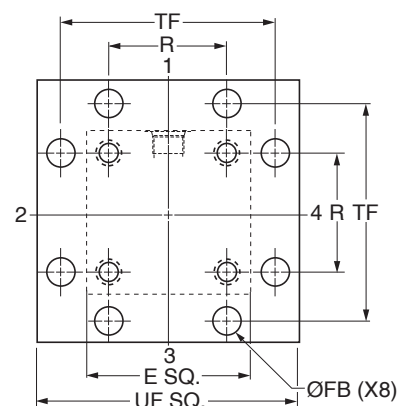
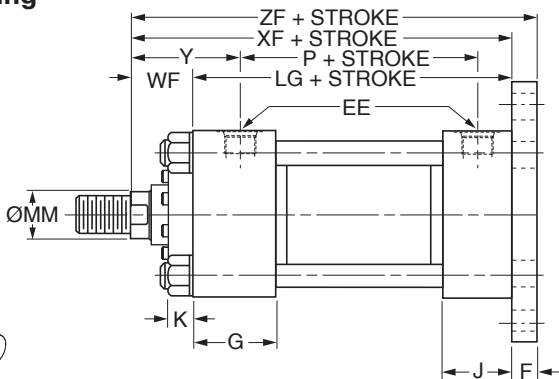
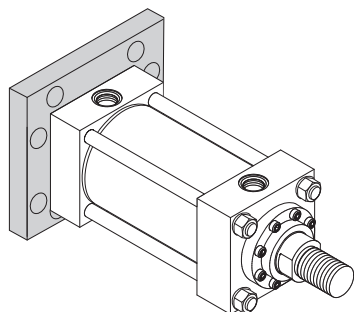
**⚠ PROP 65 WARNING** WARNING: This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)



**Mounting Information****Heavy Duty Hydraulic Cylinders  
Series 2HD 1.50" - 6.00" Bore****Cap Square Flange Mounting**

Style HB

(NFA Style MF6)

**Style HB – Dimensional and Mounting Data**

| Bore<br>Ø | E    | EE                |                  | F    | FB<br>Ø | G    | J    | K<br>Max. | R    | TF   | UF    | Add Stroke |      |
|-----------|------|-------------------|------------------|------|---------|------|------|-----------|------|------|-------|------------|------|
|           |      | NPTF <sup>1</sup> | SAE <sup>2</sup> |      |         |      |      |           |      |      |       | LG         | P    |
| 1.50      | 2.50 | 1/2               | 10               | 0.38 | 0.44    | 1.75 | 1.50 | 0.42      | 1.63 | 3.44 | 4.25  | 4.63       | 2.88 |
| 2.00      | 3.00 | 1/2               | 10               | 0.63 | 0.56    | 1.75 | 1.50 | 0.57      | 2.05 | 4.13 | 5.13  | 4.63       | 2.88 |
| 2.50      | 3.50 | 1/2               | 10               | 0.63 | 0.56    | 1.75 | 1.50 | 0.57      | 2.55 | 4.63 | 5.63  | 4.75       | 3.00 |
| 3.25      | 4.50 | 3/4               | 12               | 0.75 | 0.69    | 2.00 | 1.75 | 0.68      | 3.25 | 5.88 | 7.13  | 5.50       | 3.50 |
| 4.00      | 5.00 | 3/4               | 12               | 0.88 | 0.69    | 2.00 | 1.75 | 0.68      | 3.82 | 6.38 | 7.63  | 5.75       | 3.75 |
| 5.00      | 6.50 | 3/4               | 12               | 0.88 | 0.94    | 2.00 | 1.75 | 0.94      | 4.95 | 8.19 | 9.75  | 6.25       | 4.25 |
| 6.00      | 7.50 | 1                 | 16               | 1.00 | 1.06    | 2.25 | 2.25 | 1.05      | 5.73 | 9.44 | 11.25 | 7.38       | 4.88 |

<sup>1</sup>NPTF ports are available at no extra charge.<sup>2</sup>SAE straight thread ports are standard and are indicated by port number.**Style HB – Dimensional and Mounting Data**

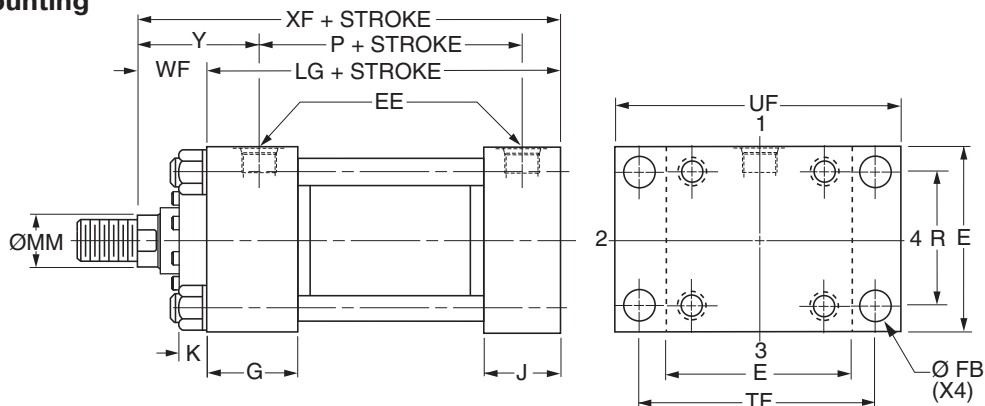
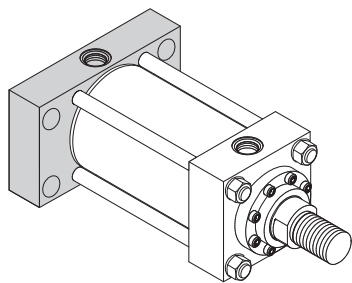
| Bore<br>Ø | Rod<br>No. | MM<br>Rod Ø | WF   | Y    | Add Stroke |       |
|-----------|------------|-------------|------|------|------------|-------|
|           |            |             |      |      | XF         | ZF    |
| 1.50      | 1 (std.)   | 0.625       | 1.00 | 2.00 | 5.63       | 6.00  |
|           | 2          | 1.000       | 1.38 | 2.38 | 6.00       | 6.38  |
| 2.00      | 1 (std.)   | 1.000       | 1.38 | 2.38 | 6.00       | 6.63  |
|           | 2          | 1.375       | 1.63 | 2.63 | 6.25       | 6.88  |
| 2.50      | 1 (std.)   | 1.000       | 1.38 | 2.38 | 6.13       | 6.75  |
|           | 2          | 1.750       | 1.88 | 2.88 | 6.63       | 7.25  |
|           | 3          | 1.375       | 1.63 | 2.63 | 6.38       | 7.00  |
| 3.25      | 1 (std.)   | 1.375       | 1.63 | 2.75 | 7.13       | 7.88  |
|           | 2          | 2.000       | 2.00 | 3.13 | 7.50       | 8.25  |
|           | 3          | 1.750       | 1.88 | 3.00 | 7.38       | 8.13  |
| 4.00      | 1 (std.)   | 1.750       | 1.88 | 3.00 | 7.63       | 8.50  |
|           | 2          | 2.500       | 2.25 | 3.38 | 8.00       | 8.88  |
|           | 3          | 2.000       | 2.00 | 3.13 | 7.75       | 8.63  |
| 5.00      | 1 (std.)   | 2.000       | 2.00 | 3.13 | 8.25       | 9.13  |
|           | 2          | 3.500       | 2.25 | 3.38 | 8.50       | 9.38  |
|           | 3          | 2.500       | 2.25 | 3.38 | 8.50       | 9.38  |
|           | 4          | 3.000       | 2.25 | 3.38 | 8.50       | 9.38  |
| 6.00      | 1 (std.)   | 2.500       | 2.25 | 3.50 | 9.63       | 10.63 |
|           | 2          | 4.000       | 2.25 | 3.50 | 9.63       | 10.63 |
|           | 3          | 3.000       | 2.25 | 3.50 | 9.63       | 10.63 |
|           | 4          | 3.500       | 2.25 | 3.50 | 9.63       | 10.63 |

**⚠ PROP 65 WARNING** WARNING: This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**Mounting Information****Heavy Duty Hydraulic Cylinders  
Series 2HD 1.50" - 6.00" Bore****Cap Rectangular Flange Mounting**

Style HH

(NFPA Style ME6)

**Style HH – Dimensional and Mounting Data**

| Bore<br>Ø | E    | EE                |                  | FB<br>Ø | G    | J    | K<br>Max. | R    | TF   | UF    | Add Stroke |      |
|-----------|------|-------------------|------------------|---------|------|------|-----------|------|------|-------|------------|------|
|           |      | NPTF <sup>1</sup> | SAE <sup>2</sup> |         |      |      |           |      |      |       | LG         | P    |
| 1.50      | 2.50 | 1/2               | 10               | 0.44    | 1.75 | 1.50 | 0.42      | 1.63 | 3.44 | 4.25  | 4.63       | 2.88 |
| 2.00      | 3.00 | 1/2               | 10               | 0.56    | 1.75 | 1.50 | 0.57      | 2.05 | 4.13 | 5.13  | 4.63       | 2.88 |
| 2.50      | 3.50 | 1/2               | 10               | 0.56    | 1.75 | 1.50 | 0.57      | 2.55 | 4.63 | 5.63  | 4.75       | 3.00 |
| 3.25      | 4.50 | 3/4               | 12               | 0.69    | 2.00 | 1.75 | 0.68      | 3.25 | 5.88 | 7.13  | 5.50       | 3.50 |
| 4.00      | 5.00 | 3/4               | 12               | 0.69    | 2.00 | 1.75 | 0.68      | 3.82 | 6.38 | 7.63  | 5.75       | 3.75 |
| 5.00      | 6.50 | 3/4               | 12               | 0.94    | 2.00 | 1.75 | 0.94      | 4.95 | 8.19 | 9.75  | 6.25       | 4.25 |
| 6.00      | 7.50 | 1                 | 16               | 1.06    | 2.25 | 2.25 | 1.05      | 5.73 | 9.44 | 11.25 | 7.38       | 4.88 |

<sup>1</sup>NPTF ports are available at no extra charge.<sup>2</sup>SAE straight thread ports are standard and are indicated by port number.**Style HH – Dimensional and Mounting Data**

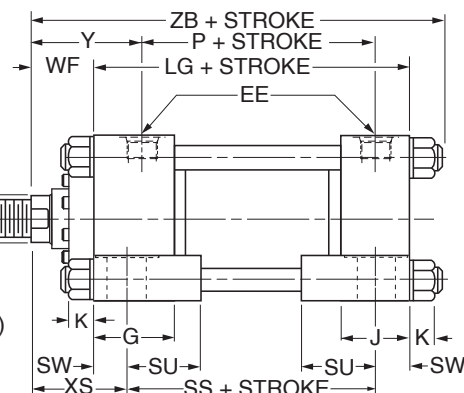
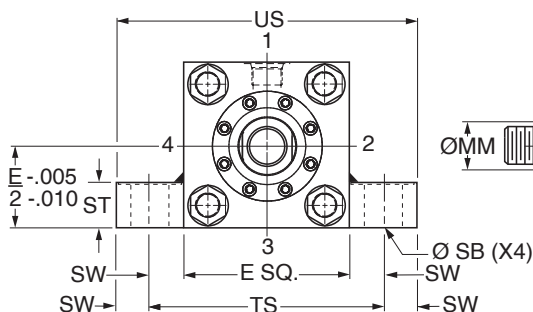
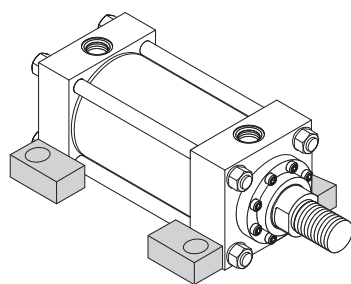
| Bore<br>Ø | Rod<br>No. | MM<br>Rod Ø | WF   | Y    | Add Stroke |
|-----------|------------|-------------|------|------|------------|
|           |            |             |      |      | XF         |
| 1.50      | 1 (std.)   | 0.625       | 1.00 | 2.00 | 5.63       |
|           | 2          | 1.000       | 1.38 | 2.38 | 6.00       |
| 2.00      | 1 (std.)   | 1.000       | 1.38 | 2.38 | 6.00       |
|           | 2          | 1.375       | 1.63 | 2.63 | 6.25       |
| 2.50      | 1 (std.)   | 1.000       | 1.38 | 2.38 | 6.13       |
|           | 2          | 1.750       | 1.88 | 2.88 | 6.63       |
|           | 3          | 1.375       | 1.63 | 2.63 | 6.38       |
| 3.25      | 1 (std.)   | 1.375       | 1.63 | 2.75 | 7.13       |
|           | 2          | 2.000       | 2.00 | 3.13 | 7.50       |
|           | 3          | 1.750       | 1.88 | 3.00 | 7.38       |
| 4.00      | 1 (std.)   | 1.750       | 1.88 | 3.00 | 7.63       |
|           | 2          | 2.500       | 2.25 | 3.38 | 8.00       |
|           | 3          | 2.000       | 2.00 | 3.13 | 7.75       |
| 5.00      | 1 (std.)   | 2.000       | 2.00 | 3.13 | 8.25       |
|           | 2          | 3.500       | 2.25 | 3.38 | 8.50       |
|           | 3          | 2.500       | 2.25 | 3.38 | 8.50       |
|           | 4          | 3.000       | 2.25 | 3.38 | 8.50       |
| 6.00      | 1 (std.)   | 2.500       | 2.25 | 3.50 | 9.63       |
|           | 2          | 4.000       | 2.25 | 3.50 | 9.63       |
|           | 3          | 3.000       | 2.25 | 3.50 | 9.63       |
|           | 4          | 3.500       | 2.25 | 3.50 | 9.63       |

**WARNING:** This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**Mounting Information****Heavy Duty Hydraulic Cylinders  
Series 2HD 1.50" - 6.00" Bore****Side Lug Mounting**

Style C

(NFPA Style MS2)

**Style C – Dimensional and Mounting Data**

| Bore<br>Ø | E    | EE                |                  | G    | J    | K<br>Max. | SB <sup>3</sup><br>Ø | ST   | SU   | SW   | TS   | US    | Add Stroke |      |      |
|-----------|------|-------------------|------------------|------|------|-----------|----------------------|------|------|------|------|-------|------------|------|------|
|           |      | NPTF <sup>1</sup> | SAE <sup>2</sup> |      |      |           |                      |      |      |      |      |       | LG         | P    | SS   |
| 1.50      | 2.50 | 1/2               | 10               | 1.75 | 1.50 | 0.42      | 0.44                 | 0.50 | 0.94 | 0.38 | 3.25 | 4.00  | 4.63       | 2.88 | 3.88 |
| 2.00      | 3.00 | 1/2               | 10               | 1.75 | 1.50 | 0.57      | 0.56                 | 0.75 | 1.25 | 0.50 | 4.00 | 5.00  | 4.63       | 2.88 | 3.63 |
| 2.50      | 3.50 | 1/2               | 10               | 1.75 | 1.50 | 0.57      | 0.81                 | 1.00 | 1.56 | 0.69 | 4.88 | 6.25  | 4.75       | 3.00 | 3.38 |
| 3.25      | 4.50 | 3/4               | 12               | 2.00 | 1.75 | 0.68      | 0.81                 | 1.00 | 1.56 | 0.69 | 5.88 | 7.25  | 5.50       | 3.50 | 4.13 |
| 4.00      | 5.00 | 3/4               | 12               | 2.00 | 1.75 | 0.68      | 1.06                 | 1.25 | 2.00 | 0.88 | 6.75 | 8.50  | 5.75       | 3.75 | 4.00 |
| 5.00      | 6.50 | 3/4               | 12               | 2.00 | 1.75 | 0.94      | 1.06                 | 1.25 | 2.00 | 0.88 | 8.25 | 10.00 | 6.25       | 4.25 | 4.50 |
| 6.00      | 7.50 | 1                 | 16               | 2.25 | 2.25 | 1.05      | 1.31                 | 1.50 | 2.50 | 1.13 | 9.75 | 12.00 | 7.38       | 4.88 | 5.13 |

<sup>1</sup>NPTF ports are available at no extra charge.<sup>2</sup>SAE straight thread ports are standard and are indicated by port number.<sup>3</sup>Upper surface spot faced for socket head screws.**Style C – Dimensional and Mounting Data**

| Bore<br>Ø | Rod<br>No. | MM<br>Rod Ø | WF   | XS   | Y    | Add Stroke |
|-----------|------------|-------------|------|------|------|------------|
|           |            |             |      |      |      | ZB Max.    |
| 1.50      | 1 (std.)   | 0.625       | 1.00 | 1.38 | 2.00 | 6.29       |
|           | 2          | 1.000       | 1.38 | 1.75 | 2.38 | 6.67       |
| 2.00      | 1 (std.)   | 1.000       | 1.38 | 1.88 | 2.38 | 6.81       |
|           | 2          | 1.375       | 1.63 | 2.13 | 2.63 | 7.06       |
| 2.50      | 1 (std.)   | 1.000       | 1.38 | 2.06 | 2.38 | 6.93       |
|           | 2          | 1.750       | 1.88 | 2.56 | 2.88 | 7.43       |
|           | 3          | 1.375       | 1.63 | 2.31 | 2.63 | 7.18       |
| 3.25      | 1 (std.)   | 1.375       | 1.63 | 2.31 | 2.75 | 8.06       |
|           | 2          | 2.000       | 2.00 | 2.69 | 3.13 | 8.43       |
|           | 3          | 1.750       | 1.88 | 2.56 | 3.00 | 8.31       |
| 4.00      | 1 (std.)   | 1.750       | 1.88 | 2.75 | 3.00 | 8.56       |
|           | 2          | 2.500       | 2.25 | 3.13 | 3.38 | 8.94       |
|           | 3          | 2.000       | 2.00 | 2.88 | 3.13 | 8.68       |
| 5.00      | 1 (std.)   | 2.000       | 2.00 | 2.88 | 3.13 | 9.44       |
|           | 2          | 3.500       | 2.25 | 3.13 | 3.38 | 9.69       |
|           | 3          | 2.500       | 2.25 | 3.13 | 3.38 | 9.69       |
|           | 4          | 3.000       | 2.25 | 3.13 | 3.38 | 9.69       |
| 6.00      | 1 (std.)   | 2.500       | 2.25 | 3.38 | 3.50 | 10.93      |
|           | 2          | 4.000       | 2.25 | 3.38 | 3.50 | 10.93      |
|           | 3          | 3.000       | 2.25 | 3.38 | 3.50 | 10.93      |
|           | 4          | 3.500       | 2.25 | 3.38 | 3.50 | 10.93      |

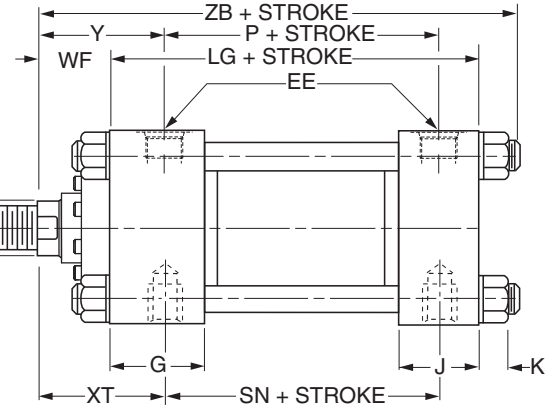
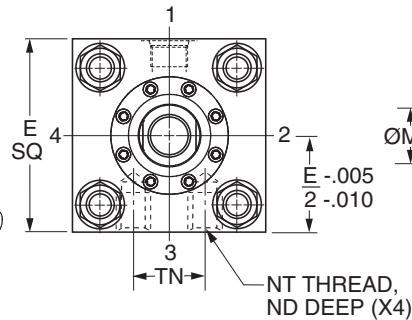
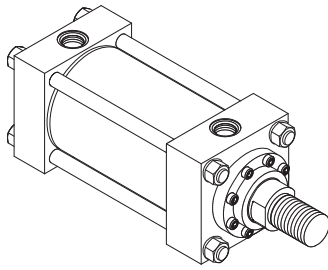
**⚠ PROP 65 WARNING** WARNING: This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)



**Mounting Information****Heavy Duty Hydraulic Cylinders  
Series 2HD 1.50" - 6.00" Bore****Side Tapped Mounting**

Style F

(NFPA Style MS4)

**Style F – Dimensional and Mounting Data**

| Bore<br>Ø | E    | EE                |                  | G    | J    | K<br>Max. | ND   | NT      | TN   | Add Stroke |      |      |
|-----------|------|-------------------|------------------|------|------|-----------|------|---------|------|------------|------|------|
|           |      | NPTF <sup>1</sup> | SAE <sup>2</sup> |      |      |           |      |         |      | LG         | P    | SN   |
| 1.50      | 2.50 | 1/2               | 10               | 1.75 | 1.50 | 0.42      | 0.38 | 3/8-16  | 0.75 | 4.63       | 2.88 | 2.88 |
| 2.00      | 3.00 | 1/2               | 10               | 1.75 | 1.50 | 0.57      | 0.44 | 1/2-13  | 0.94 | 4.63       | 2.88 | 2.88 |
| 2.50      | 3.50 | 1/2               | 10               | 1.75 | 1.50 | 0.57      | 0.50 | 5/8-11  | 1.31 | 4.75       | 3.00 | 3.00 |
| 3.25      | 4.50 | 3/4               | 12               | 2.00 | 1.75 | 0.68      | 0.69 | 3/4-10  | 1.50 | 5.50       | 3.50 | 3.50 |
| 4.00      | 5.00 | 3/4               | 12               | 2.00 | 1.75 | 0.68      | 0.69 | 1-8     | 2.06 | 5.75       | 3.75 | 3.75 |
| 5.00      | 6.50 | 3/4               | 12               | 2.00 | 1.75 | 0.94      | 1.00 | 1-8     | 2.94 | 6.25       | 4.25 | 4.25 |
| 6.00      | 7.50 | 1                 | 16               | 2.25 | 2.25 | 1.05      | 1.25 | 1 1/4-7 | 3.31 | 7.38       | 4.88 | 5.13 |

<sup>1</sup>NPTF ports are available at no extra charge.<sup>2</sup>SAE straight thread ports are standard and are indicated by port number.**Style F – Dimensional and Mounting Data**

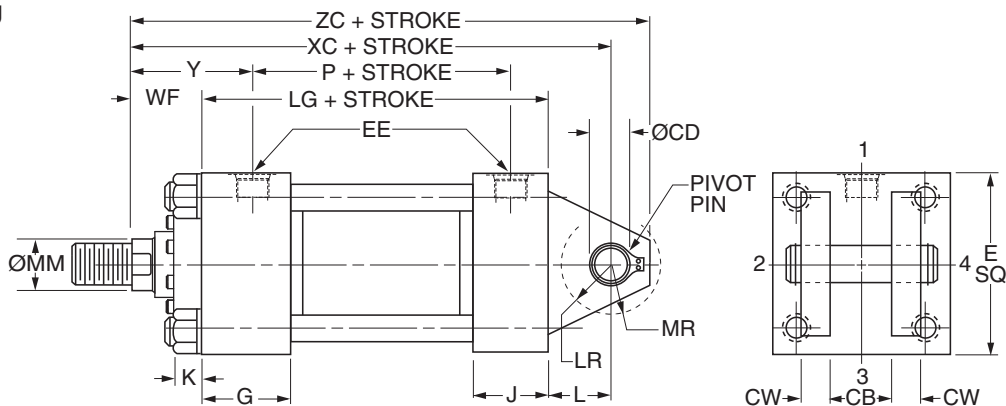
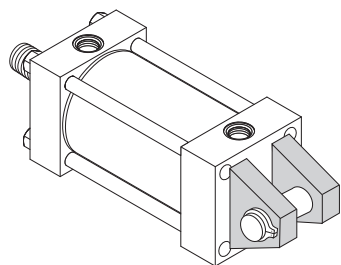
| Bore<br>Ø | Rod<br>No. | MM<br>Rod Ø | WF   | XT   | Y    | Add Stroke |
|-----------|------------|-------------|------|------|------|------------|
|           |            |             |      |      |      | ZB Max.    |
| 1.50      | 1 (std.)   | 0.625       | 1.00 | 2.00 | 2.00 | 6.29       |
|           | 2          | 1.000       | 1.38 | 2.38 | 2.38 | 6.67       |
| 2.00      | 1 (std.)   | 1.000       | 1.38 | 2.38 | 2.38 | 6.81       |
|           | 2          | 1.375       | 1.63 | 2.63 | 2.63 | 7.06       |
| 2.50      | 1 (std.)   | 1.000       | 1.38 | 2.38 | 2.38 | 6.93       |
|           | 2          | 1.750       | 1.88 | 2.88 | 2.88 | 7.43       |
|           | 3          | 1.375       | 1.63 | 2.63 | 2.63 | 7.18       |
| 3.25      | 1 (std.)   | 1.375       | 1.63 | 2.75 | 2.75 | 8.06       |
|           | 2          | 2.000       | 2.00 | 3.13 | 3.13 | 8.43       |
|           | 3          | 1.750       | 1.88 | 3.00 | 3.00 | 8.31       |
| 4.00      | 1 (std.)   | 1.750       | 1.88 | 3.00 | 3.00 | 8.56       |
|           | 2          | 2.500       | 2.25 | 3.38 | 3.38 | 8.94       |
|           | 3          | 2.000       | 2.00 | 3.13 | 3.13 | 8.68       |
| 5.00      | 1 (std.)   | 2.000       | 2.00 | 3.13 | 3.13 | 9.44       |
|           | 2          | 3.500       | 2.25 | 3.38 | 3.38 | 9.69       |
|           | 3          | 2.500       | 2.25 | 3.38 | 3.38 | 9.69       |
|           | 4          | 3.000       | 2.25 | 3.38 | 3.38 | 9.69       |
| 6.00      | 1 (std.)   | 2.500       | 2.25 | 3.50 | 3.50 | 10.93      |
|           | 2          | 4.000       | 2.25 | 3.50 | 3.50 | 10.93      |
|           | 3          | 3.000       | 2.25 | 3.50 | 3.50 | 10.93      |
|           | 4          | 3.500       | 2.25 | 3.50 | 3.50 | 10.93      |

**⚠ PROP 65 WARNING** WARNING: This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**Mounting Information****Heavy Duty Hydraulic Cylinders  
Series 2HD 1.50" - 6.00" Bore****Cap Fixed Clevis Mounting**

Style BB

(NTPA Style MP1)

**Style BB – Dimensional and Mounting Data**

| Bore<br>Ø | E    | EE                |                  | CB   | CD <sup>3</sup> Ø<br>+.000<br>-.002 | CW   | G    | J    | K<br>Max. | L    | LR   | MR   | Add Stroke |      |
|-----------|------|-------------------|------------------|------|-------------------------------------|------|------|------|-----------|------|------|------|------------|------|
|           |      | NPTF <sup>1</sup> | SAE <sup>2</sup> |      |                                     |      |      |      |           |      |      |      | LG         | P    |
| 1.50      | 2.50 | 1/2               | 10               | 0.75 | .501                                | 0.50 | 1.75 | 1.50 | 0.42      | 0.75 | 0.56 | 0.63 | 4.63       | 2.88 |
| 2.00      | 3.00 | 1/2               | 10               | 1.25 | .751                                | 0.63 | 1.75 | 1.50 | 0.57      | 1.25 | 1.00 | 0.94 | 4.63       | 2.88 |
| 2.50      | 3.50 | 1/2               | 10               | 1.25 | .751                                | 0.63 | 1.75 | 1.50 | 0.57      | 1.25 | 0.94 | 0.94 | 4.75       | 3.00 |
| 3.25      | 4.50 | 3/4               | 12               | 1.50 | 1.001                               | 0.75 | 2.00 | 1.75 | 0.68      | 1.50 | 1.25 | 1.19 | 5.50       | 3.50 |
| 4.00      | 5.00 | 3/4               | 12               | 2.00 | 1.376                               | 1.00 | 2.00 | 1.75 | 0.68      | 2.13 | 1.75 | 1.63 | 5.75       | 3.75 |
| 5.00      | 6.50 | 3/4               | 12               | 2.50 | 1.751                               | 1.25 | 2.00 | 1.75 | 0.94      | 2.25 | 2.06 | 2.13 | 6.25       | 4.25 |
| 6.00      | 7.50 | 1                 | 16               | 2.50 | 2.001                               | 1.25 | 2.25 | 2.25 | 1.05      | 2.50 | 2.31 | 2.38 | 7.38       | 4.88 |

<sup>1</sup>NPTF ports are available at no extra charge.<sup>2</sup>SAE straight thread ports are standard and are indicated by port number.<sup>3</sup>Diameter CD is Pin Diameter.**Style BB – Dimensional and Mounting Data**

| Bore<br>Ø | Rod<br>No. | MM<br>Rod Ø | WF   | Y    | Add Stroke |       |
|-----------|------------|-------------|------|------|------------|-------|
|           |            |             |      |      | XC         | ZC    |
| 1.50      | 1 (std.)   | 0.625       | 1.00 | 2.00 | 6.38       | 6.88  |
|           | 2          | 1.000       | 1.38 | 2.38 | 6.75       | 7.25  |
| 2.00      | 1 (std.)   | 1.000       | 1.38 | 2.38 | 7.25       | 8.00  |
|           | 2          | 1.375       | 1.63 | 2.63 | 7.50       | 8.25  |
| 2.50      | 1 (std.)   | 1.000       | 1.38 | 2.38 | 7.38       | 8.13  |
|           | 2          | 1.750       | 1.88 | 2.88 | 7.88       | 8.63  |
|           | 3          | 1.375       | 1.63 | 2.63 | 7.63       | 8.38  |
| 3.25      | 1 (std.)   | 1.375       | 1.63 | 2.75 | 8.63       | 9.63  |
|           | 2          | 2.000       | 2.00 | 3.13 | 9.00       | 10.00 |
|           | 3          | 1.750       | 1.88 | 3.00 | 8.88       | 9.88  |
| 4.00      | 1 (std.)   | 1.750       | 1.88 | 3.00 | 9.75       | 11.13 |
|           | 2          | 2.500       | 2.25 | 3.38 | 10.13      | 11.50 |
|           | 3          | 2.000       | 2.00 | 3.13 | 9.88       | 11.25 |
| 5.00      | 1 (std.)   | 2.000       | 2.00 | 3.13 | 10.50      | 12.25 |
|           | 2          | 3.500       | 2.25 | 3.38 | 10.75      | 12.50 |
|           | 3          | 2.500       | 2.25 | 3.38 | 10.75      | 12.50 |
|           | 4          | 3.000       | 2.25 | 3.38 | 10.75      | 12.50 |
| 6.00      | 1 (std.)   | 2.500       | 2.25 | 3.50 | 12.13      | 14.13 |
|           | 2          | 4.000       | 2.25 | 3.50 | 12.13      | 14.13 |
|           | 3          | 3.000       | 2.25 | 3.50 | 12.13      | 14.13 |
|           | 4          | 3.500       | 2.25 | 3.50 | 12.13      | 14.13 |

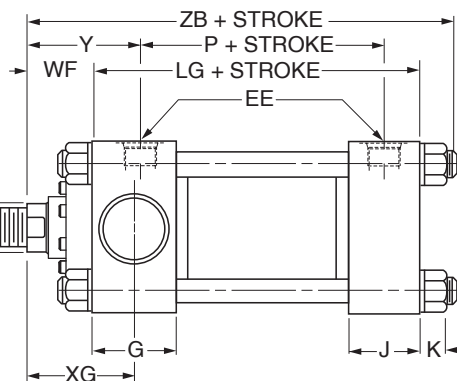
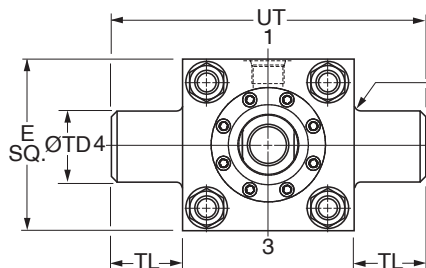
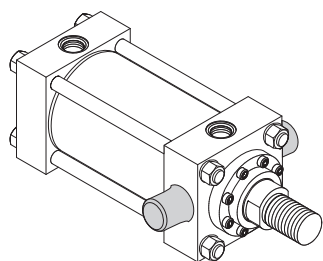
**⚠ PROP 65 WARNING** WARNING: This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)



**Mounting Information****Series 2HD 1.50" - 6.00" Bore****Head Trunnion Mounting**

Style D

(NFPA Style MT1)

**Style D – Dimensional and Mounting Data**

| Bore<br>Ø | E    | EE                |                  | G    | J    | K<br>Max. | TD Ø<br>+.000<br>-.001 | TL   | UT    | Add Stroke |      |
|-----------|------|-------------------|------------------|------|------|-----------|------------------------|------|-------|------------|------|
|           |      | NPTF <sup>1</sup> | SAE <sup>2</sup> |      |      |           |                        |      |       | LG         | P    |
| 1.50      | 2.50 | 1/2               | 10               | 1.75 | 1.50 | 0.42      | 1.000                  | 1.00 | 4.50  | 4.63       | 2.88 |
| 2.00      | 3.00 | 1/2               | 10               | 1.75 | 1.50 | 0.57      | 1.375                  | 1.38 | 5.75  | 4.63       | 2.88 |
| 2.50      | 3.50 | 1/2               | 10               | 1.75 | 1.50 | 0.57      | 1.375                  | 1.38 | 6.25  | 4.75       | 3.00 |
| 3.25      | 4.50 | 3/4               | 12               | 2.00 | 1.75 | 0.68      | 1.750                  | 1.75 | 8.00  | 5.50       | 3.50 |
| 4.00      | 5.00 | 3/4               | 12               | 2.00 | 1.75 | 0.68      | 1.750                  | 1.75 | 8.50  | 5.75       | 3.75 |
| 5.00      | 6.50 | 3/4               | 12               | 2.00 | 1.75 | 0.94      | 1.750                  | 1.75 | 10.00 | 6.25       | 4.25 |
| 6.00      | 7.50 | 1                 | 16               | 2.25 | 2.25 | 1.05      | 2.000                  | 2.00 | 11.50 | 7.38       | 4.88 |

<sup>1</sup>NPTF ports are available at no extra charge.<sup>2</sup>SAE straight thread ports are standard and are indicated by port number.**Style D – Dimensional and Mounting Data**

| Bore<br>Ø | Rod<br>No. | MM<br>Rod Ø | WF   | XG   | Y    | Add Stroke |
|-----------|------------|-------------|------|------|------|------------|
|           |            |             |      |      |      | ZB Max.    |
| 1.50      | 1 (std.)   | 0.625       | 1.00 | 1.88 | 2.00 | 6.29       |
|           | 2          | 1.000       | 1.38 | 2.25 | 2.38 | 6.67       |
| 2.00      | 1 (std.)   | 1.000       | 1.38 | 2.25 | 2.38 | 6.81       |
|           | 2          | 1.375       | 1.63 | 2.50 | 2.63 | 7.06       |
| 2.50      | 1 (std.)   | 1.000       | 1.38 | 2.25 | 2.38 | 6.93       |
|           | 2          | 1.750       | 1.88 | 2.75 | 2.88 | 7.43       |
|           | 3          | 1.375       | 1.63 | 2.50 | 2.63 | 7.18       |
| 3.25      | 1 (std.)   | 1.375       | 1.63 | 2.63 | 2.75 | 8.06       |
|           | 2          | 2.000       | 2.00 | 3.00 | 3.13 | 8.43       |
|           | 3          | 1.750       | 1.88 | 2.88 | 3.00 | 8.31       |
| 4.00      | 1 (std.)   | 1.750       | 1.88 | 2.88 | 3.00 | 8.56       |
|           | 2          | 2.500       | 2.25 | 3.25 | 3.38 | 8.94       |
|           | 3          | 2.000       | 2.00 | 3.00 | 3.13 | 8.68       |
| 5.00      | 1 (std.)   | 2.000       | 2.00 | 3.00 | 3.13 | 9.44       |
|           | 2          | 3.500       | 2.25 | 3.25 | 3.38 | 9.69       |
|           | 3          | 2.500       | 2.25 | 3.25 | 3.38 | 9.69       |
|           | 4          | 3.000       | 2.25 | 3.25 | 3.38 | 9.69       |
| 6.00      | 1 (std.)   | 2.500       | 2.25 | 3.38 | 3.50 | 10.93      |
|           | 2          | 4.000       | 2.25 | 3.38 | 3.50 | 10.93      |
|           | 3          | 3.000       | 2.25 | 3.38 | 3.50 | 10.93      |
|           | 4          | 3.500       | 2.25 | 3.38 | 3.50 | 10.93      |



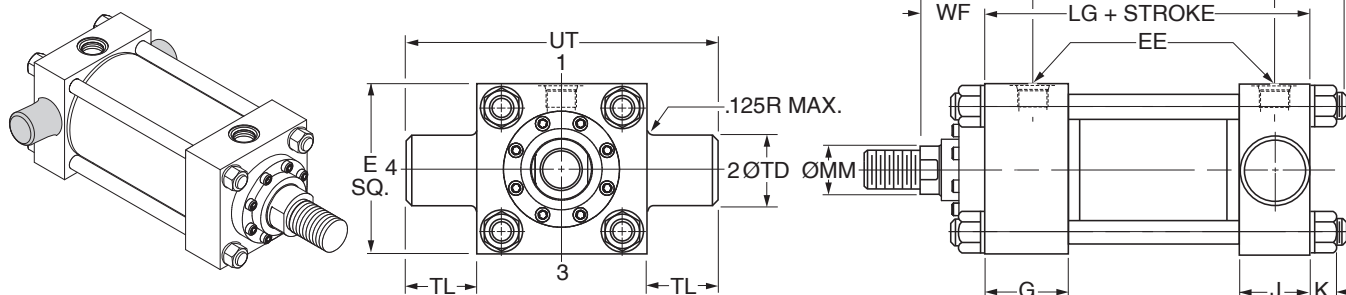
**WARNING:** This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)



**Mounting Information****Heavy Duty Hydraulic Cylinders  
Series 2HD 1.50" - 6.00" Bore****Cap Trunnion Mounting**

Style DB

(NFPA Style MT2)

**Style DB – Dimensional and Mounting Data**

| Bore<br>Ø | E    | EE                |                  | G    | J    | K<br>Max. | TD Ø<br>+.000<br>-.001 | TL   | UT    | Add Stroke |      |
|-----------|------|-------------------|------------------|------|------|-----------|------------------------|------|-------|------------|------|
|           |      | NPTF <sup>1</sup> | SAE <sup>2</sup> |      |      |           |                        |      |       | LG         | P    |
| 1.50      | 2.50 | 1/2               | 10               | 1.75 | 1.50 | 0.42      | 1.000                  | 1.00 | 4.50  | 4.63       | 2.88 |
| 2.00      | 3.00 | 1/2               | 10               | 1.75 | 1.50 | 0.57      | 1.375                  | 1.38 | 5.75  | 4.63       | 2.88 |
| 2.50      | 3.50 | 1/2               | 10               | 1.75 | 1.50 | 0.57      | 1.375                  | 1.38 | 6.25  | 4.75       | 3.00 |
| 3.25      | 4.50 | 3/4               | 12               | 2.00 | 1.75 | 0.68      | 1.750                  | 1.75 | 8.00  | 5.50       | 3.50 |
| 4.00      | 5.00 | 3/4               | 12               | 2.00 | 1.75 | 0.68      | 1.750                  | 1.75 | 8.50  | 5.75       | 3.75 |
| 5.00      | 6.50 | 3/4               | 12               | 2.00 | 1.75 | 0.94      | 1.750                  | 1.75 | 10.00 | 6.25       | 4.25 |
| 6.00      | 7.50 | 1                 | 16               | 2.25 | 2.25 | 1.05      | 2.000                  | 2.00 | 11.50 | 7.38       | 4.88 |

<sup>1</sup>NPTF ports are available at no extra charge.<sup>2</sup>SAE straight thread ports are standard and are indicated by port number.**Style DB – Dimensional and Mounting Data**

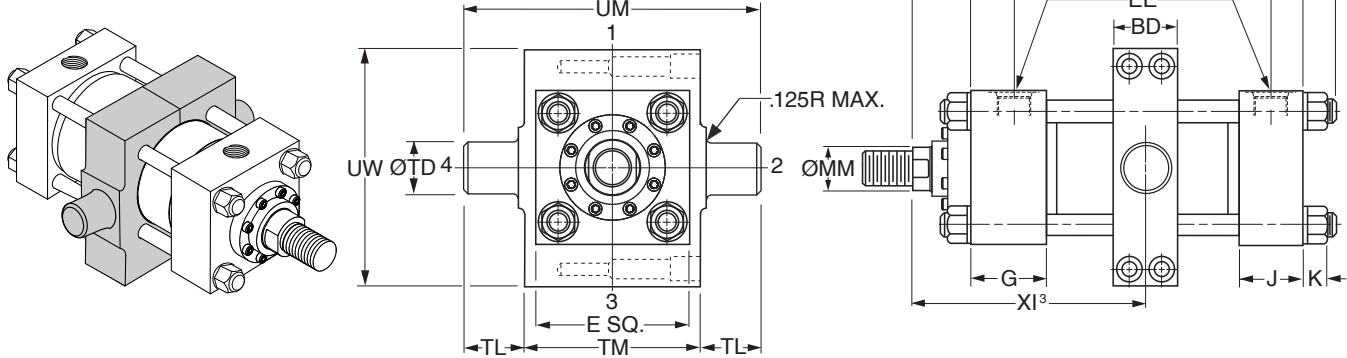
| Bore<br>Ø | Rod<br>No. | MM<br>Rod Ø | WF   | Y    | Add Stroke |         |
|-----------|------------|-------------|------|------|------------|---------|
|           |            |             |      |      | XJ         | ZB Max. |
| 1.50      | 1 (std.)   | 0.625       | 1.00 | 2.00 | 4.88       | 6.29    |
|           | 2          | 1.000       | 1.38 | 2.38 | 5.25       | 6.67    |
| 2.00      | 1 (std.)   | 1.000       | 1.38 | 2.38 | 5.25       | 6.81    |
|           | 2          | 1.375       | 1.63 | 2.63 | 5.50       | 7.06    |
| 2.50      | 1 (std.)   | 1.000       | 1.38 | 2.38 | 5.38       | 6.93    |
|           | 2          | 1.750       | 1.88 | 2.88 | 5.88       | 7.43    |
|           | 3          | 1.375       | 1.63 | 2.63 | 5.63       | 7.18    |
| 3.25      | 1 (std.)   | 1.375       | 1.63 | 2.75 | 6.25       | 8.06    |
|           | 2          | 2.000       | 2.00 | 3.13 | 6.63       | 8.43    |
|           | 3          | 1.750       | 1.88 | 3.00 | 6.50       | 8.31    |
| 4.00      | 1 (std.)   | 1.750       | 1.88 | 3.00 | 6.75       | 8.56    |
|           | 2          | 2.500       | 2.25 | 3.38 | 7.13       | 8.94    |
|           | 3          | 2.000       | 2.00 | 3.13 | 6.88       | 8.68    |
| 5.00      | 1 (std.)   | 2.000       | 2.00 | 3.13 | 7.38       | 9.44    |
|           | 2          | 3.500       | 2.25 | 3.38 | 7.63       | 9.69    |
|           | 3          | 2.500       | 2.25 | 3.38 | 7.63       | 9.69    |
|           | 4          | 3.000       | 2.25 | 3.38 | 7.63       | 9.69    |
| 6.00      | 1 (std.)   | 2.500       | 2.25 | 3.50 | 8.38       | 10.93   |
|           | 2          | 4.000       | 2.25 | 3.50 | 8.38       | 10.93   |
|           | 3          | 3.000       | 2.25 | 3.50 | 8.38       | 10.93   |
|           | 4          | 3.500       | 2.25 | 3.50 | 8.38       | 10.93   |

**⚠ PROP 65 WARNING** WARNING: This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**Mounting Information****Heavy Duty Hydraulic Cylinders  
Series 2HD 1.50" - 6.00" Bore****Intermediate Fixed Trunnion Mounting**

Style DD

(NFPA Style MT4)

**Style DD – Dimensional and Mounting Data**

| Bore<br>Ø | BD   | E    | EE                |                  | G    | J    | K<br>Max. | TD Ø<br>+.000<br>-.001 | TL   | TM   | UM    | UW    | Add Stroke |      |
|-----------|------|------|-------------------|------------------|------|------|-----------|------------------------|------|------|-------|-------|------------|------|
|           |      |      | NPTF <sup>1</sup> | SAE <sup>2</sup> |      |      |           |                        |      |      |       |       | LG         | P    |
| 1.50      | 1.25 | 2.50 | 1/2               | 10               | 1.75 | 1.50 | 0.42      | 1.000                  | 1.00 | 3.00 | 5.00  | 3.38  | 4.63       | 2.88 |
| 2.00      | 1.50 | 3.00 | 1/2               | 10               | 1.75 | 1.50 | 0.57      | 1.375                  | 1.38 | 3.50 | 6.25  | 4.13  | 4.63       | 2.88 |
| 2.50      | 1.50 | 3.50 | 1/2               | 10               | 1.75 | 1.50 | 0.57      | 1.375                  | 1.38 | 4.00 | 6.75  | 4.63  | 4.75       | 3.00 |
| 3.25      | 2.00 | 4.50 | 3/4               | 12               | 2.00 | 1.75 | 0.68      | 1.750                  | 1.75 | 5.00 | 8.50  | 5.81  | 5.50       | 3.50 |
| 4.00      | 2.00 | 5.00 | 3/4               | 12               | 2.00 | 1.75 | 0.68      | 1.750                  | 1.75 | 5.50 | 9.00  | 6.38  | 5.75       | 3.75 |
| 5.00      | 2.00 | 6.50 | 3/4               | 12               | 2.00 | 1.75 | 0.94      | 1.750                  | 1.75 | 7.00 | 10.50 | 7.75  | 6.25       | 4.25 |
| 6.00      | 3.00 | 7.50 | 1                 | 16               | 2.25 | 2.25 | 1.05      | 2.000                  | 2.00 | 8.50 | 12.50 | 10.38 | 7.38       | 4.88 |

<sup>1</sup>NPTF ports are available at no extra charge. <sup>2</sup>SAE straight thread ports are standard and are indicated by port number.**Style DD – Dimensional and Mounting Data**

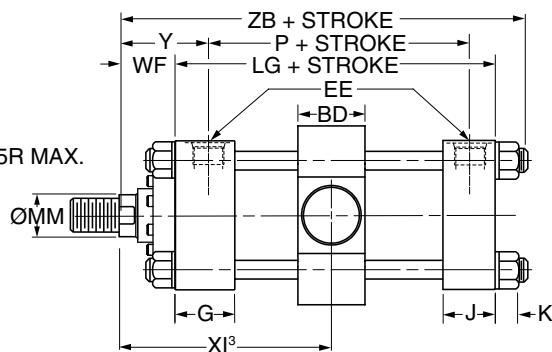
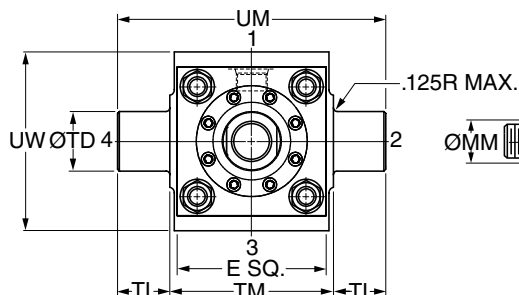
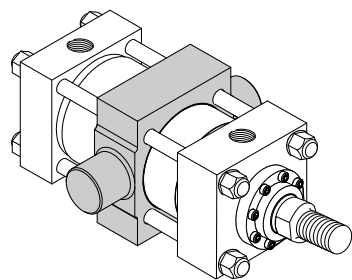
| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | WF   | Y    | Minimum XI <sup>3</sup> |             | Style<br>DD<br>Min.<br>Stroke | Add Stroke              |             |           |
|-----------|------------|----------------|------|------|-------------------------|-------------|-------------------------------|-------------------------|-------------|-----------|
|           |            |                |      |      | Styles<br>4, 8 & 9      | Style<br>55 |                               | Maximum XI <sup>4</sup> |             | ZB<br>Max |
|           |            |                |      |      |                         |             |                               | Styles<br>4, 8 & 9      | Style<br>55 |           |
| 1.50      | 1 (std.)   | 0.625          | 1.00 | 2.00 | 3.44                    | 4.19        | 0                             | 3.44                    | 4.19        | 6.29      |
|           | 2          | 1.000          | 1.38 | 2.38 | 3.81                    | 4.81        | 0                             | 3.81                    | 4.81        | 6.67      |
| 2.00      | 1 (std.)   | 1.000          | 1.38 | 2.38 | 3.94                    | 4.94        | 0.25                          | 3.69                    | 4.69        | 6.81      |
|           | 2          | 1.375          | 1.63 | 2.63 | 4.19                    | 5.31        | 0.25                          | 3.94                    | 5.06        | 7.06      |
| 2.50      | 1 (std.)   | 1.000          | 1.38 | 2.38 | 3.94                    | 4.94        | 0.13                          | 3.81                    | 4.81        | 6.93      |
|           | 2          | 1.750          | 1.88 | 2.88 | 4.44                    | 5.69        | 0.13                          | 4.31                    | 5.56        | 7.43      |
|           | 3          | 1.375          | 1.63 | 2.63 | 4.19                    | 5.31        | 0.13                          | 4.06                    | 5.19        | 7.18      |
| 3.25      | 1 (std.)   | 1.375          | 1.63 | 2.75 | 4.69                    | 5.81        | 0.38                          | 4.31                    | 5.44        | 8.06      |
|           | 2          | 2.000          | 2.00 | 3.13 | 5.06                    | 6.81        | 0.38                          | 4.69                    | 6.44        | 8.43      |
|           | 3          | 1.750          | 1.88 | 3.00 | 4.94                    | 6.19        | 0.38                          | 4.56                    | 5.81        | 8.31      |
| 4.00      | 1 (std.)   | 1.750          | 1.88 | 3.00 | 4.94                    | 6.19        | 0.13                          | 4.81                    | 6.06        | 8.56      |
|           | 2          | 2.500          | 2.25 | 3.38 | 5.31                    | 7.56        | 0.13                          | 5.19                    | 7.44        | 8.94      |
|           | 3          | 2.000          | 2.00 | 3.13 | 5.06                    | 6.81        | 0.13                          | 4.94                    | 6.69        | 8.68      |
| 5.00      | 1 (std.)   | 2.000          | 2.00 | 3.13 | 5.06                    | 6.81        | 0                             | 5.44                    | 7.19        | 9.44      |
|           | 2          | 3.500          | 2.25 | 3.38 | 5.31                    | 8.69        | 0                             | 5.69                    | 9.06        | 9.69      |
|           | 3          | 2.500          | 2.25 | 3.38 | 5.31                    | 7.56        | 0                             | 5.69                    | 7.94        | 9.69      |
|           | 4          | 3.000          | 2.25 | 3.38 | 5.31                    | 7.94        | 0                             | 5.69                    | 8.31        | 9.69      |
| 6.00      | 1 (std.)   | 2.500          | 2.25 | 3.50 | 6.06                    | 8.31        | 0.25                          | 5.81                    | 8.06        | 10.93     |
|           | 2          | 4.000          | 2.25 | 3.50 | 6.06                    | 9.56        | 0.25                          | 5.81                    | 9.31        | 10.93     |
|           | 3          | 3.000          | 2.25 | 3.50 | 6.06                    | 8.69        | 0.25                          | 5.81                    | 8.44        | 10.93     |
|           | 4          | 3.500          | 2.25 | 3.50 | 6.06                    | 9.44        | 0.25                          | 5.81                    | 9.19        | 10.93     |

<sup>3</sup>Dimension XI to be specified by customer. Reference point for rod end Style 55 is end of piston rod.<sup>4</sup>Dimensions shown are valid for standard WF and WG dimension.

**Mounting Information****Heavy Duty Hydraulic Cylinders  
Series 2HD 1.50" - 6.00" Bore****Heavy Duty Intermediate Fixed Trunnion Mounting**

Style DE

(NFPA Style MT4)

**Style DE – Dimensional and Mounting Data**

| Bore<br>Ø | BD   | E    | EE                |                  | G    | J    | K<br>Max. | TD Ø<br>+.000<br>-.001 | TL   | TM   | UM    | UW   | Add Stroke |      |
|-----------|------|------|-------------------|------------------|------|------|-----------|------------------------|------|------|-------|------|------------|------|
|           |      |      | NPTF <sup>1</sup> | SAE <sup>2</sup> |      |      |           |                        |      |      |       |      | LG         | P    |
| 4.00      | 2.25 | 5.00 | 3/4               | 12               | 2.00 | 1.75 | 0.68      | 2.000                  | 1.75 | 5.50 | 9.00  | 6.00 | 5.75       | 3.75 |
| 5.00      | 2.75 | 6.50 | 3/4               | 12               | 2.00 | 1.75 | 0.94      | 2.500                  | 1.75 | 7.00 | 10.50 | 7.50 | 6.25       | 4.25 |
| 6.00      | 3.25 | 7.50 | 1                 | 16               | 2.25 | 2.25 | 1.05      | 3.000                  | 2.00 | 8.50 | 12.50 | 9.50 | 7.38       | 4.88 |

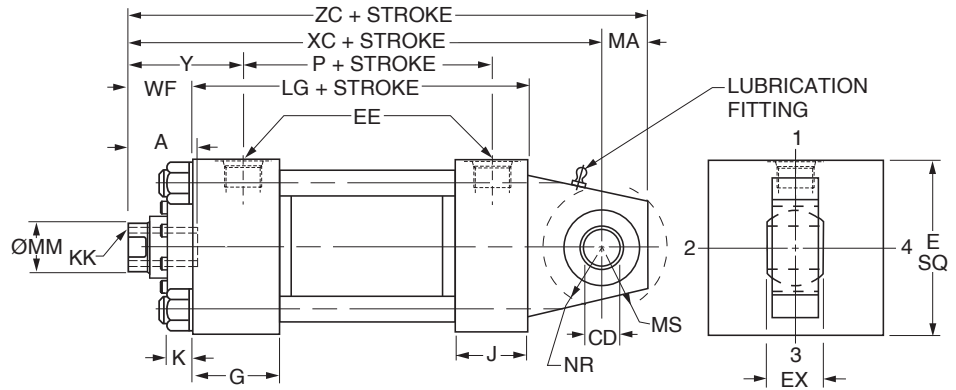
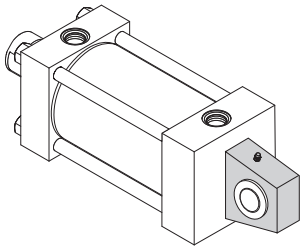
<sup>1</sup>NPTF ports are available at no extra charge.<sup>2</sup>SAE straight thread ports are standard and are indicated by port number.**Style DE – Dimensional and Mounting Data**

| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | WF   | Y    | Minimum XI <sup>3</sup> |             | Style DE<br>Minimum<br>Stroke | Add Stroke              |             |            |
|-----------|------------|----------------|------|------|-------------------------|-------------|-------------------------------|-------------------------|-------------|------------|
|           |            |                |      |      | Styles<br>4, 8 & 9      | Style<br>55 |                               | Maximum XI <sup>4</sup> |             | ZB<br>Max. |
|           |            |                |      |      |                         |             |                               | Styles<br>4, 8 & 9      | Style<br>55 |            |
| 4.00      | 1 (std.)   | 1.750          | 1.88 | 3.00 | 5.06                    | 6.31        | 0.38                          | 4.69                    | 5.94        | 8.56       |
|           | 2          | 2.500          | 2.25 | 3.38 | 5.44                    | 7.69        | 0.38                          | 5.06                    | 7.31        | 8.94       |
|           | 3          | 2.000          | 2.00 | 3.13 | 5.19                    | 6.94        | 0.38                          | 4.81                    | 6.56        | 8.68       |
| 5.00      | 1 (std.)   | 2.000          | 2.00 | 3.13 | 5.44                    | 7.19        | 0.38                          | 5.06                    | 6.81        | 9.44       |
|           | 2          | 3.500          | 2.25 | 3.38 | 5.69                    | 9.06        | 0.38                          | 5.31                    | 8.69        | 9.69       |
|           | 3          | 2.500          | 2.25 | 3.38 | 5.69                    | 7.94        | 0.38                          | 5.31                    | 7.56        | 9.69       |
|           | 4          | 3.000          | 2.25 | 3.38 | 5.69                    | 8.31        | 0.38                          | 5.31                    | 7.94        | 9.69       |
| 6.00      | 1 (std.)   | 2.500          | 2.25 | 3.50 | 6.19                    | 8.44        | 0.50                          | 5.69                    | 7.94        | 10.93      |
|           | 2          | 4.000          | 2.25 | 3.50 | 6.19                    | 9.69        | 0.50                          | 5.69                    | 9.19        | 10.93      |
|           | 3          | 3.000          | 2.25 | 3.50 | 6.19                    | 8.81        | 0.50                          | 5.69                    | 8.31        | 10.93      |
|           | 4          | 3.500          | 2.25 | 3.50 | 6.19                    | 9.56        | 0.50                          | 5.69                    | 9.06        | 10.93      |

<sup>3</sup>Dimension XI to be specified by customer. Reference point for rod end Style 55 is end of piston rod.<sup>4</sup>Dimensions shown are valid for standard WF and WG dimension.

**⚠ PROP 65 WARNING** WARNING: This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)



**Mounting Information****Heavy Duty Hydraulic Cylinders  
Series 2HD 1.50" - 6.00" Bore****Spherical Bearing Mounting  
Style SB****Style SB – Dimensional and Mounting Data**

| Bore<br>Ø | A    | CD <sup>1</sup> Ø<br>+0.0000<br>-0.0005 | E    | EE   |     | EX   | G    | J    | K<br>Max.         | MA   | MS   | NR   | Add Stroke |      | Maximum<br>Operating<br>psi <sup>2</sup> |
|-----------|------|-----------------------------------------|------|------|-----|------|------|------|-------------------|------|------|------|------------|------|------------------------------------------|
|           |      |                                         |      | NPTF | SAE |      |      |      |                   |      |      |      | LG         | P    |                                          |
| 1.50      | 0.75 | 0.5000                                  | 2.50 | 1/2  | 10  | 0.44 | 1.75 | 1.50 | 0.42              | 0.75 | 0.94 | 0.63 | 4.63       | 2.88 | 1500                                     |
| 2.00      | 1.13 | 0.7500                                  | 3.00 | 1/2  | 10  | 0.66 | 1.75 | 1.50 | 0.57              | 1.00 | 1.38 | 1.00 | 4.63       | 2.88 | 2200                                     |
| 2.50      | 1.13 | 0.7500                                  | 3.50 | 1/2  | 10  | 0.66 | 1.75 | 1.50 | 0.57              | 1.00 | 1.38 | 1.00 | 4.75       | 3.00 | 1450                                     |
| 3.25      | 1.63 | 1.0000                                  | 4.50 | 3/4  | 12  | 0.88 | 2.00 | 1.75 | 0.68              | 1.25 | 1.69 | 1.25 | 5.50       | 3.50 | 1500                                     |
| 4.00      | 2.00 | 1.3750                                  | 5.00 | 3/4  | 12  | 1.19 | 2.00 | 1.75 | 0.68              | 1.88 | 2.44 | 1.63 | 5.75       | 3.75 | 1850                                     |
| 5.00      | 2.25 | 1.7500                                  | 6.50 | 3/4  | 12  | 1.53 | 2.00 | 1.75 | 0.94              | 2.50 | 2.88 | 2.06 | 6.25       | 4.25 | 2000                                     |
| 6.00      | 3.00 | 2.0000                                  | 7.50 | 1    | 16  | 1.75 | 2.25 | 2.25 | 1.05 <sup>3</sup> | 2.50 | 3.31 | 2.38 | 7.38       | 4.88 | 1800                                     |

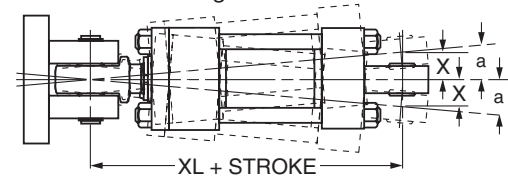
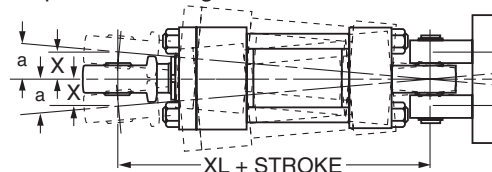
<sup>1</sup> Diameter CD is hole diameter.<sup>2</sup> Maximum operating pressure at 4:1 design factor is based on tensile strength of material. Pressure ratings are based on standard bearing ratings.<sup>3</sup> 6.00" bore is constructed with tie rod nuts on both ends.**Style SB – Dimensional and Mounting Data**

| Bore<br>Ø | Rod<br>No. | MM<br>Rod Ø | Thread                     |                            | WF   | Y    | Add Stroke |       |       |
|-----------|------------|-------------|----------------------------|----------------------------|------|------|------------|-------|-------|
|           |            |             | Style 9<br>KK <sup>4</sup> | Style 7<br>KK <sup>4</sup> |      |      | XC         | XL    | ZC    |
| 1.50      | 1 (std.)   | 0.625       | 7/16-20                    | —                          | 1.00 | 2.00 | 6.38       | 7.25  | 7.13  |
|           | 2          | 1.000       | —                          | 7/16-20                    | 1.38 | 2.38 | 6.75       | 7.63  | 7.50  |
| 2.00      | 1 (std.)   | 1.000       | 3/4-16                     | —                          | 1.38 | 2.38 | 7.25       | 8.50  | 8.25  |
|           | 2          | 1.375       | —                          | 3/4-16                     | 1.63 | 2.63 | 7.50       | 8.75  | 8.50  |
| 2.50      | 1 (std.)   | 1.000       | 3/4-16                     | —                          | 1.38 | 2.38 | 7.38       | 8.63  | 8.38  |
|           | 2          | 1.750       | —                          | 3/4-16                     | 1.88 | 2.88 | 7.88       | 9.13  | 8.88  |
| 3.25      | 1 (std.)   | 1.375       | 1-14                       | —                          | 1.63 | 2.75 | 8.63       | 10.50 | 9.88  |
|           | 2          | 2.000       | —                          | 1-14                       | 2.00 | 3.13 | 9.00       | 10.88 | 10.25 |
| 4.00      | 1 (std.)   | 1.750       | 1 1/4-12                   | —                          | 1.88 | 3.00 | 9.75       | 11.88 | 11.63 |
|           | 2          | 2.500       | —                          | 1 1/4-12                   | 2.25 | 3.38 | 10.13      | 12.25 | 12.00 |
| 5.00      | 1 (std.)   | 2.000       | 1 1/2-12                   | —                          | 2.00 | 3.13 | 10.50      | 13.00 | 13.00 |
|           | 2          | 3.500       | —                          | 1 1/2-12                   | 2.25 | 3.38 | 10.75      | 13.25 | 13.25 |
| 6.00      | 1 (std.)   | 2.500       | 1 7/8-12                   | —                          | 2.25 | 3.50 | 12.13      | 14.88 | 14.63 |
|           | 2          | 4.000       | —                          | 1 7/8-12                   | 2.25 | 3.50 | 12.13      | 14.88 | 14.63 |
| 6.00      | 3          | 3.000       | —                          | 1 7/8-12                   | 2.25 | 3.50 | 12.13      | 14.88 | 14.63 |
|           | 4          | 3.500       | —                          | 1 7/8-12                   | 2.25 | 3.50 | 12.13      | 14.88 | 14.63 |

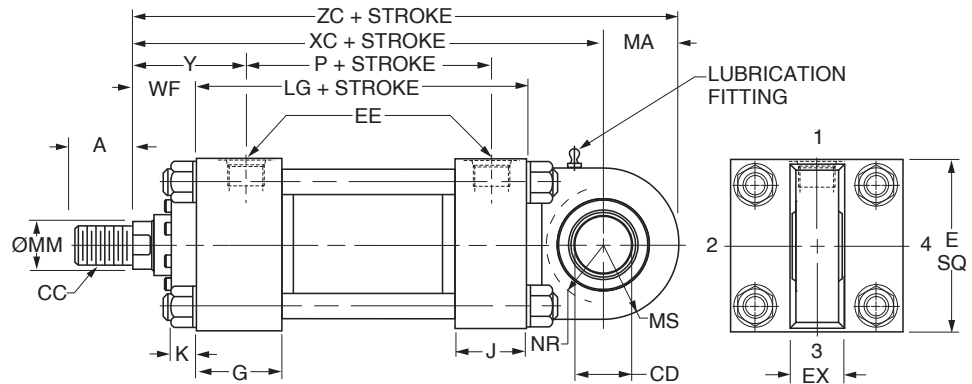
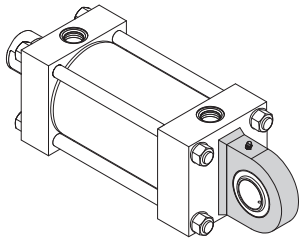
<sup>4</sup> Style 9 and Style 7 threads listed are for a spherical rod eye (sold separately) with pin diameter that matches the cap pin.**Style SB – Recommended maximum swivel  
angle on each side of the cylinder centerline.**

| Bore<br>Ø | Head End Mounted |           | Cap End Mounted |           |
|-----------|------------------|-----------|-----------------|-----------|
|           | Angle a          | Tan. of a | Angle a         | Tan. of a |
| 1.50      | 2.00°            | .035      | 2.00°           | .035      |
| 2.00      | 2.50°            | .044      | 4.50°           | .079      |
| 2.50      | 2.50°            | .044      | 4.50°           | .079      |
| 3.25      | 3.00°            | .052      | 3.00°           | .052      |
| 4.00      | 2.50°            | .044      | 3.00°           | .052      |
| 5.00      | 3.00°            | .052      | 3.00°           | .052      |
| 6.00      | 3.00°            | .052      | 3.00°           | .052      |

Note: Dimension X is the maximum off center mounting of the cylinder. To determine dimension X for various stroke lengths multiply the distance between pivot pin holes by tangent of angle a. For extended position use X = XL + 2X stroke.

**Mounting Information****Head End Mounting****Cap End Mounting**

**⚠ PROP 65 WARNING** WARNING: This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**Mounting Information****Heavy Duty Hydraulic Cylinders  
Series 2HD 1.50" - 6.00" Bore****Spherical Bearing Mounting  
Style SE****Style SE – Dimensional and Mounting Data**

| Bore<br>Ø | A    | CD <sup>1</sup><br>Ø      | E    | EE   |     | EX   | G    | J    | K<br>Max. | MA   | MS   | NR   | Add Stroke |      |
|-----------|------|---------------------------|------|------|-----|------|------|------|-----------|------|------|------|------------|------|
|           |      |                           |      | NPTF | SAE |      |      |      |           |      |      |      | LG         | P    |
| 1.50      | 0.75 | 0.7500 <sup>-0.0005</sup> | 2.50 | 1/2  | 10  | 0.66 | 1.75 | 1.50 | 0.42      | 1.00 | 1.00 | 0.75 | 4.63       | 2.88 |
| 2.00      | 1.13 | 1.0000 <sup>-0.0005</sup> | 3.00 | 1/2  | 10  | 0.88 | 1.75 | 1.50 | 0.57      | 1.25 | 1.25 | 1.00 | 4.63       | 2.88 |
| 2.50      | 1.13 | 1.2500 <sup>-0.0005</sup> | 3.50 | 1/2  | 10  | 1.09 | 1.75 | 1.50 | 0.57      | 1.50 | 1.50 | 1.31 | 4.75       | 3.00 |
| 3.25      | 1.63 | 1.5000 <sup>-0.0005</sup> | 4.50 | 3/4  | 12  | 1.31 | 2.00 | 1.75 | 0.68      | 2.00 | 2.00 | 1.75 | 5.50       | 3.50 |
| 4.00      | 2.00 | 2.0000 <sup>-0.0005</sup> | 5.00 | 3/4  | 12  | 1.75 | 2.00 | 1.75 | 0.68      | 2.25 | 2.25 | 2.13 | 5.75       | 3.75 |
| 5.00      | 2.25 | 2.5000 <sup>-0.0006</sup> | 6.50 | 3/4  | 12  | 2.19 | 2.00 | 1.75 | 0.94      | 3.00 | 3.00 | 2.75 | 6.25       | 4.25 |
| 6.00      | 3.00 | 3.0000 <sup>-0.0006</sup> | 7.50 | 1    | 16  | 2.63 | 2.25 | 2.25 | 1.05      | 3.50 | 3.50 | 3.13 | 7.38       | 4.88 |

<sup>1</sup> Diameter CD is hole diameter. <sup>2</sup> Maximum operating pressure at 4:1 design factor is based on tensile strength of material. Pressure ratings are based on standard bearing ratings.

**Style SE – Dimensional and Mounting Data**

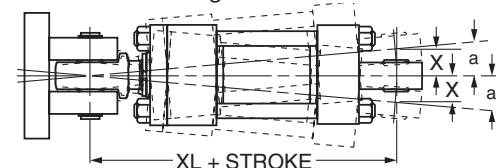
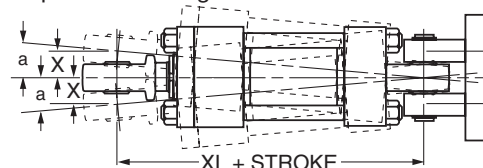
| Bore<br>Ø | Rod<br>No. | MM<br>Rod Ø | Thread<br>Style 8<br>CC <sup>3</sup> | A    | WF   | Y    | Add Stroke |       |       |
|-----------|------------|-------------|--------------------------------------|------|------|------|------------|-------|-------|
|           |            |             |                                      |      |      |      | XC         | XL    | ZC    |
| 1.50      | 1 (std.)   | 0.625       | 1/2-20                               | 0.75 | 1.00 | 2.00 | 6.88       | 9.01  | 7.88  |
|           | 2          | 1.000       | 3                                    | 3    | 1.38 | 2.38 | 7.25       | 9.38  | 8.25  |
| 2.00      | 1 (std.)   | 1.000       | 7/8-14                               | 1.13 | 1.38 | 2.38 | 7.56       | 10.56 | 8.81  |
|           | 2          | 1.375       | 3                                    | 3    | 1.63 | 2.63 | 7.81       | 10.81 | 9.06  |
| 2.50      | 1 (std.)   | 1.000       | 7/8-14                               | 1.13 | 1.38 | 2.38 | 7.75       | 10.75 | 9.25  |
|           | 2          | 1.750       | 3                                    | 3    | 1.88 | 2.88 | 8.25       | 11.25 | 9.75  |
|           | 3          | 1.375       | 3                                    | 3    | 1.63 | 2.63 | 8.00       | 11.00 | 9.50  |
| 3.25      | 1 (std.)   | 1.375       | 1 1/4-12                             | 1.63 | 1.63 | 2.75 | 9.25       | 13.38 | 11.25 |
|           | 2          | 2.000       | 3                                    | 3    | 2.00 | 3.13 | 9.63       | 13.75 | 11.63 |
|           | 3          | 1.750       | 3                                    | 3    | 1.88 | 3.00 | 9.50       | 13.63 | 11.50 |
| 4.00      | 1 (std.)   | 1.750       | 1 1/2-12                             | 2.00 | 1.88 | 3.00 | 10.13      | 15.13 | 12.38 |
|           | 2          | 2.500       | 3                                    | 3    | 2.25 | 3.38 | 10.50      | 15.50 | 12.75 |
|           | 3          | 2.000       | 3                                    | 3    | 2.00 | 3.13 | 10.25      | 15.25 | 12.50 |
| 5.00      | 1 (std.)   | 2.000       | 1 3/4-12                             | 2.25 | 2.00 | 3.13 | 11.50      | 17.25 | 14.50 |
|           | 2          | 3.500       | 3                                    | 3    | 2.25 | 3.38 | 11.75      | 17.50 | 14.75 |
|           | 3          | 2.500       | 3                                    | 3    | 2.25 | 3.38 | 11.75      | 17.50 | 14.75 |
| 6.00      | 1 (std.)   | 2.500       | 2 1/4-12                             | 3.00 | 2.25 | 3.50 | 13.38      | 20.38 | 16.88 |
|           | 2          | 4.000       | 3                                    | 3    | 2.25 | 3.50 | 13.38      | 20.38 | 16.88 |
|           | 3          | 3.000       | 3                                    | 3    | 2.25 | 3.50 | 13.38      | 20.38 | 16.88 |
|           | 4          | 3.500       | 3                                    | 3    | 2.25 | 3.50 | 13.38      | 20.38 | 16.88 |

<sup>3</sup> To match pin diameter in rod eye and cap, when an oversize rod is required, specify rod end style '3', 'CC' thread and 'A' thread length for the standard rod diameter (Rod No. 1 for the bore), and 'WF' for the oversize rod. Order the rod eye and clevis bracket for the required bore size from the tables on the Style SE Spherical Bearing Accessories page.

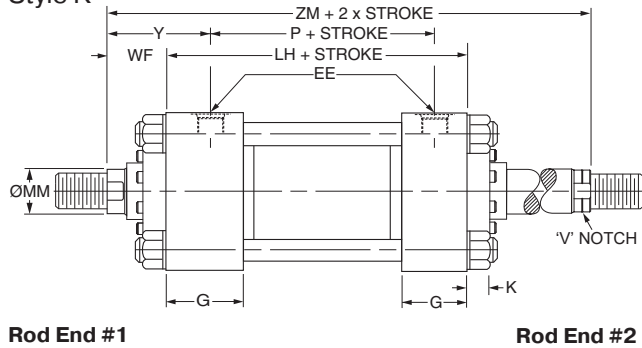
**Style SE – Recommended maximum swivel  
angle on each side of the cylinder centerline.**

| Bore<br>Ø | Head End Mounted |           | Cap End Mounted |           |
|-----------|------------------|-----------|-----------------|-----------|
|           | Angle a          | Tan. of a | Angle a         | Tan. of a |
| 1.50      | 2.50°            | 0.044     | 3.00°           | 0.052     |
| 2.00      | 3.00°            | 0.052     | 3.00°           | 0.052     |
| 2.50      | 3.00°            | 0.052     | 3.00°           | 0.052     |
| 3.25      | 3.00°            | 0.052     | 2.75°           | 0.048     |
| 4.00      | 3.00°            | 0.052     | 3.00°           | 0.052     |
| 5.00      | 3.00°            | 0.052     | 3.00°           | 0.052     |
| 6.00      | 3.00°            | 0.052     | 3.00°           | 0.052     |

Note: Dimension X is the maximum off center mounting of the cylinder. To determine dimension X for various stroke lengths multiply the distance between pivot pin holes by tangent of angle a. For extended position use  $X = XL + 2X \text{ stroke}$ .

**Mounting Information****Head End Mounting****Cap End Mounting**

**⚠ PROP 65 WARNING** WARNING: This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**Double Rod Cylinder  
Style K****Double Rod End Mounting Styles**

See Mounting Groups page in Section H for guidance on double rod end cylinder mounting style selection.

| Mounting Styles for Single Rod Models | Mounting Styles for Corresponding Double Rod Models <sup>1</sup> |                                                      | Dimensions Shown on This Page Supplement Dimensions on 1.50"-6.00" Bore Pages Listed Below |
|---------------------------------------|------------------------------------------------------------------|------------------------------------------------------|--------------------------------------------------------------------------------------------|
|                                       | Load Connected To Rod On Cylinder Mounting End                   | Load Connected To Rod Opposite Cylinder Mounting End |                                                                                            |
| T                                     | KT                                                               | KT                                                   | 54                                                                                         |
| TB                                    | KTB                                                              | KTC                                                  | 54                                                                                         |
| TD                                    | KTD                                                              | KTD                                                  | 54                                                                                         |
| J                                     | KJ                                                               | KH                                                   | 55                                                                                         |
| JB                                    | KJB                                                              | KHB                                                  | 56                                                                                         |
| JJ                                    | KJJ                                                              | KHH                                                  | 57                                                                                         |
| C                                     | KC                                                               | KC                                                   | 61                                                                                         |
| F                                     | KF                                                               | KF                                                   | 62                                                                                         |
| D                                     | KD                                                               | KDB                                                  | 64                                                                                         |
| DD                                    | KDD <sup>2</sup>                                                 | KDD <sup>2</sup>                                     | 66                                                                                         |
| DE                                    | KDE <sup>2</sup>                                                 | KDE <sup>2</sup>                                     | 67                                                                                         |

<sup>1</sup> Connect load to piston rod without "V" notch. If only one end of the Double Rod Cylinder is to be cushioned, be sure to clearly specify which end this will be.

<sup>2</sup> Specify XI dimension for Styles DD & DE from #1 rod end (without "V" notch).

**How to Use Double Rod Cylinder Dimension Drawings**

To determine dimensions for a double rod cylinder, first refer to the desired single rod mounting style cylinder shown on preceding pages of this catalog. (See table above.) After selecting necessary dimensions from that drawing, return to this page supplement the single rod dimensions with those shown on drawing at right and dimension table below. Note that double rod cylinders have a head (Dim. G) at both ends and that dimension LH replaces LG. The double rod dimensions differ from, or are in addition to those for single rod cylinders shown on preceding pages and provide the information needed to completely dimension a double rod cylinder.

On a double rod cylinder where the two rod ends are different, be sure to clearly state which rod end is to be assembled at which end. Port position 1 is standard. If other than standard, specify pos. 2, 3 or 4 when viewed from rod end #1 only. See port position information in Section H.

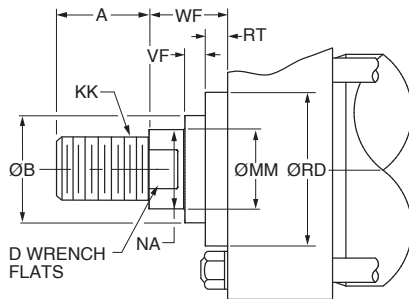
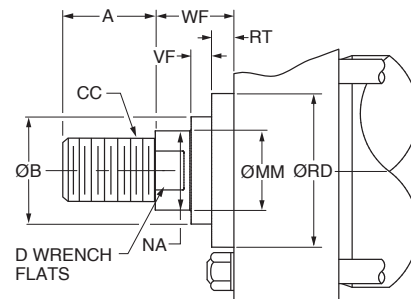
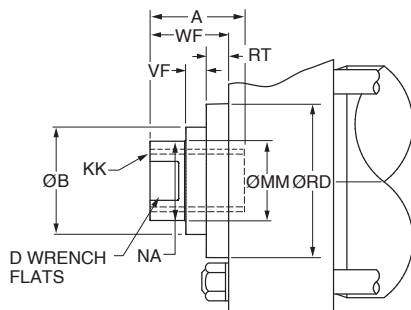
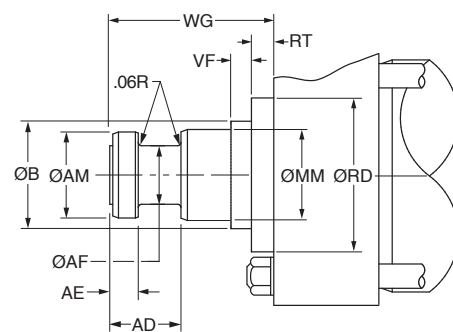
| Bore Ø                                  | Rod No.  | MM Rod Ø | Add Stroke      |      |      | Add 2X Stroke   |
|-----------------------------------------|----------|----------|-----------------|------|------|-----------------|
|                                         |          |          | LH              | SNK  | SSK  |                 |
| 1.50                                    | 1 (std.) | 0.625    | 4.88            | 2.88 | 4.13 | 6.88            |
|                                         | 2        | 1.000    | 4.88            | 2.88 | 4.13 | 7.63            |
| 2.00                                    | 1 (std.) | 1.000    | 4.88            | 2.88 | 3.88 | 7.63            |
|                                         | 2        | 1.375    | 4.88            | 2.88 | 3.88 | 8.13            |
| 2.50                                    | 1 (std.) | 1.000    | 5.00            | 3.00 | 3.63 | 7.75            |
|                                         | 2        | 1.750    | 5.00            | 3.00 | 3.63 | 8.75            |
|                                         | 3        | 1.375    | 5.00            | 3.00 | 3.63 | 8.25            |
| 3.25                                    | 1 (std.) | 1.375    | 5.75            | 3.50 | 4.38 | 9.00            |
|                                         | 2        | 2.000    | 5.75            | 3.50 | 4.38 | 9.75            |
|                                         | 3        | 1.750    | 5.75            | 3.50 | 4.38 | 9.50            |
| 4.00                                    | 1 (std.) | 1.750    | 6.00            | 3.75 | 4.25 | 9.75            |
|                                         | 2        | 2.500    | 6.00            | 3.75 | 4.25 | 10.50           |
|                                         | 3        | 2.000    | 6.00            | 3.75 | 4.25 | 10.00           |
| 5.00                                    | 1 (std.) | 2.000    | 6.50            | 4.25 | 4.75 | 10.50           |
|                                         | 2        | 3.500    | 6.50            | 4.25 | 4.75 | 11.00           |
|                                         | 3        | 2.500    | 6.50            | 4.25 | 4.75 | 11.00           |
|                                         | 4        | 3.000    | 6.50            | 4.25 | 4.75 | 11.00           |
| 6.00                                    | 1 (std.) | 2.500    | 7.38            | 4.88 | 5.13 | 11.88           |
|                                         | 2        | 4.000    | 7.38            | 4.88 | 5.13 | 11.88           |
|                                         | 3        | 3.000    | 7.38            | 4.88 | 5.13 | 11.88           |
|                                         | 4        | 3.500    | 7.38            | 4.88 | 5.13 | 11.88           |
| Replaces On single rod mounting styles: |          |          | LG              | SN   | SS   | -               |
|                                         |          |          | All Mtg. Styles | F    | C    | All Mtg. Styles |

**Series 2HD Rod Gland Retention<sup>3</sup>**

B = Bolt -On Gland with Circular Retainer  
R = Tie Rod Retained Gland

<sup>3</sup> Gland retention style may vary when thrust key retainer or gland drain option is included. Contact factory for details.

| Bore Ø | Rod No.  | MM Rod Ø | Mounting Style                                 |        |       |    |
|--------|----------|----------|------------------------------------------------|--------|-------|----|
|        |          |          | TC, H, HB, HH, C, F, D, DB, DD, DE, BB, SB, SE | TB, TD | J, JB | JJ |
| 1.50   | 1 (Std.) | 0.625    | B                                              | R      | R     | B  |
|        | 2        | 1.000    | R                                              | R      | R     | B  |
| 2.00   | 1 (Std.) | 1.000    | B                                              | R      | R     | B  |
|        | 2        | 1.375    | R                                              | R      | R     | B  |
| 2.50   | 1 (Std.) | 1.000    | B                                              | B      | B     | B  |
|        | 2        | 1.750    | B                                              | B      | R     | B  |
|        | 3        | 1.375    | B                                              | B      | B     | B  |
| 3.25   | All      | All      | B                                              | B      | B     | B  |
| 4.00   | All      | All      | B                                              | B      | B     | B  |
| 5.00   | 1 (Std.) | 2.000    | B                                              | B      | B     | B  |
|        | 2        | 3.500    | B                                              | B      | R     | B  |
|        | 3        | 2.500    | B                                              | B      | B     | B  |
|        | 4        | 3.000    | B                                              | B      | B     | B  |
| 6.00   | All      | All      | B                                              | B      | B     | B  |

**Piston Rod Ends****Heavy Duty Hydraulic Cylinders  
Series 3HD 7.00" & 8.00" Bore****Rod End Dimensions****Thread Style 4 (NFPA Style SM)  
Small Male****Thread Style 8 (NFPA Style IM)  
Intermediate Male****Thread Style 9<sup>2</sup> (NFPA Style SF)  
Small Female****Thread Style 55<sup>1</sup>****Rod End Dimensions**

| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | Thread           |                      | Rod Extensions and Pilot Dimensions |                       |                 |      |      |         |      |      |
|-----------|------------|----------------|------------------|----------------------|-------------------------------------|-----------------------|-----------------|------|------|---------|------|------|
|           |            |                | Style<br>8<br>CC | Style<br>4 & 9<br>KK | A                                   | B Ø<br>+.000<br>-.002 | D               | NA   | VF   | RD<br>Ø | RT   | WF   |
| 7.00      | 1 (std.)   | 3.000          | 2 3/4-12         | 2 1/4-12             | 3.50                                | 3.749                 | 2.63            | 2.88 | 0.40 | 5.26    | 0.85 | 2.25 |
|           | 2          | 5.000          | 4 3/4-12         | 3 1/2-12             | 5.00                                | 5.749                 | -. <sup>3</sup> | 4.88 | 0.34 | 7.25    | 0.91 | 2.25 |
|           | 3          | 3.500          | 3 1/4-12         | 2 1/2-12             | 3.50                                | 4.249                 | 3.00            | 3.38 | 0.34 | 5.76    | 0.91 | 2.25 |
|           | 4          | 4.000          | 3 3/4-12         | 3-12                 | 4.00                                | 4.749                 | 3.38            | 3.88 | 0.34 | 6.31    | 0.91 | 2.25 |
|           | 5          | 4.500          | 4 1/4-12         | 3 1/4-12             | 4.50                                | 5.249                 | -. <sup>3</sup> | 4.38 | 0.34 | 6.94    | 0.91 | 2.25 |
| 8.00      | 1 (std.)   | 3.500          | 3 1/4-12         | 2 1/2-12             | 3.50                                | 4.249                 | 3.00            | 3.38 | 0.34 | 5.76    | 0.91 | 2.25 |
|           | 2          | 5.500          | 5 1/4-12         | 4-12                 | 5.50                                | 6.249                 | -. <sup>3</sup> | 5.38 | 0.34 | 7.94    | 0.91 | 2.25 |
|           | 3          | 4.000          | 3 3/4-12         | 3-12                 | 4.00                                | 4.749                 | 3.38            | 3.88 | 0.34 | 6.31    | 0.91 | 2.25 |
|           | 4          | 4.500          | 4 1/4-12         | 3 1/4-12             | 4.50                                | 5.249                 | -. <sup>3</sup> | 4.38 | 0.34 | 6.94    | 0.91 | 2.25 |
|           | 5          | 5.000          | 4 3/4-12         | 3 1/2-12             | 5.00                                | 5.749                 | -. <sup>3</sup> | 4.88 | 0.34 | 7.25    | 0.91 | 2.25 |

**“Special” Thread Style 3**

Special thread, extension, rod eye, blank, etc., are also available.

To order, specify “Style 3” and give desired dimensions for KK, A, W or WF. If otherwise special, furnish dimensioned sketch.

<sup>1</sup> For special WG dimension, specify “Style 3” and give desired dimension for WG. For other changes, place “S” in the model code, and describe rod end with dimensioned sketch.

<sup>2</sup> Style 9 stroke restrictions may apply. See Style 9 Minimum Stroke Table on How to Order page for details.

<sup>3</sup> These piston rod numbers will have 4 spanner wrench holes instead of wrench flats. See rod drawings on 3H Large Bore Piston Rod Ends page for dimensions.

**Style 55 Rod End**

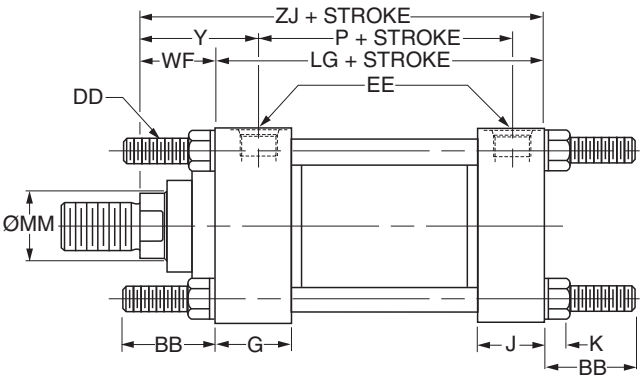
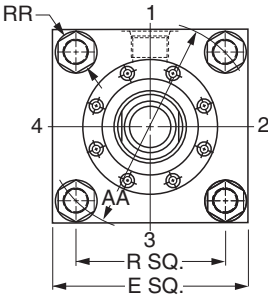
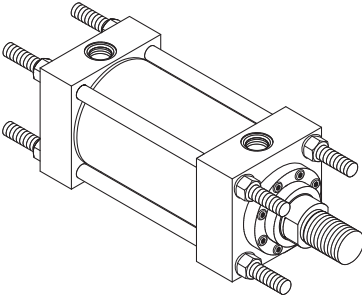
| MM<br>Rod<br>Ø | AD   | AE<br>+.001<br>-.001 | AF<br>Ø | AM<br>Ø | WG <sup>1</sup> |
|----------------|------|----------------------|---------|---------|-----------------|
| 3.000          | 2.44 | 0.874                | 2.25    | 2.95    | 4.88            |
| 3.500          | 2.69 | 0.999                | 2.50    | 3.45    | 5.63            |
| 4.000          | 2.69 | 0.999                | 3.00    | 3.95    | 5.75            |
| 4.500          | 3.19 | 1.499                | 3.50    | 4.45    | 6.50            |
| 5.000          | 3.19 | 1.499                | 3.88    | 4.95    | 6.63            |
| 5.500          | 3.94 | 1.874                | 4.38    | 5.45    | 7.50            |

**⚠ PROP 65 WARNING** This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)



**C**  
 Series 3HD 7.00" & 8.00"  
 Bore

**Tie Rods Extended Both Ends**  
**Style TD**  
(NFA Style MX1)



Basic Mounting (T) — NFA MXO — Not shown is no tie rod extended and can be supplied upon request.

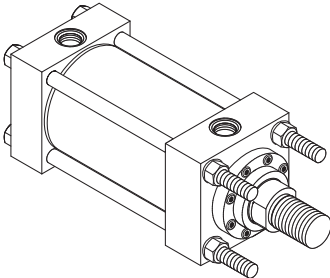
**Style TD – Dimensional and Mounting Data**

| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | AA    | BB   | DD       | E    | EE                |                  | G    | J    | K<br>Max. | R    | RR   | WF   | Y    | Add Stroke |      |       |
|-----------|------------|----------------|-------|------|----------|------|-------------------|------------------|------|------|-----------|------|------|------|------|------------|------|-------|
|           |            |                |       |      |          |      | NPTF <sup>1</sup> | SAE <sup>2</sup> |      |      |           |      |      |      |      | LG         | P    | ZJ    |
| 7.00      | 1 (std.)   | 3.000          | 9.31  | 4.13 | 1 1/8-12 | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.16      | 6.58 | 1.90 | 2.25 | 3.69 | 8.50       | 5.63 | 10.75 |
|           | 2          | 5.000          | 9.31  | 4.13 | 1 1/8-12 | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.16      | 6.58 | 1.90 | 2.25 | 3.69 | 8.50       | 5.63 | 10.75 |
|           | 3          | 3.500          | 9.31  | 4.13 | 1 1/8-12 | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.16      | 6.58 | 1.90 | 2.25 | 3.69 | 8.50       | 5.63 | 10.75 |
|           | 4          | 4.000          | 9.31  | 4.13 | 1 1/8-12 | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.16      | 6.58 | 1.90 | 2.25 | 3.69 | 8.50       | 5.63 | 10.75 |
|           | 5          | 4.500          | 9.31  | 4.13 | 1 1/8-12 | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.16      | 6.58 | 1.90 | 2.25 | 3.69 | 8.50       | 5.63 | 10.75 |
| 8.00      | 1 (std.)   | 3.500          | 10.61 | 4.50 | 1 1/4-12 | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.28      | 7.50 | 2.19 | 2.25 | 3.81 | 9.50       | 6.38 | 11.75 |
|           | 2          | 5.500          | 10.61 | 4.50 | 1 1/4-12 | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.28      | 7.50 | 2.19 | 2.25 | 3.81 | 9.50       | 6.38 | 11.75 |
|           | 3          | 4.000          | 10.61 | 4.50 | 1 1/4-12 | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.28      | 7.50 | 2.19 | 2.25 | 3.81 | 9.50       | 6.38 | 11.75 |
|           | 4          | 4.500          | 10.61 | 4.50 | 1 1/4-12 | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.28      | 7.50 | 2.19 | 2.25 | 3.81 | 9.50       | 6.38 | 11.75 |
|           | 5          | 5.000          | 10.61 | 4.50 | 1 1/4-12 | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.28      | 7.50 | 2.19 | 2.25 | 3.81 | 9.50       | 6.38 | 11.75 |

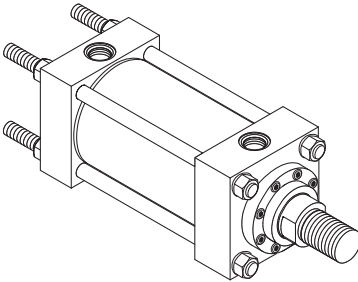
<sup>1</sup>NPTF ports are available at no extra charge.

<sup>2</sup>SAE straight thread ports are standard and are indicated by port number.

**Style TB**



**Style TC**



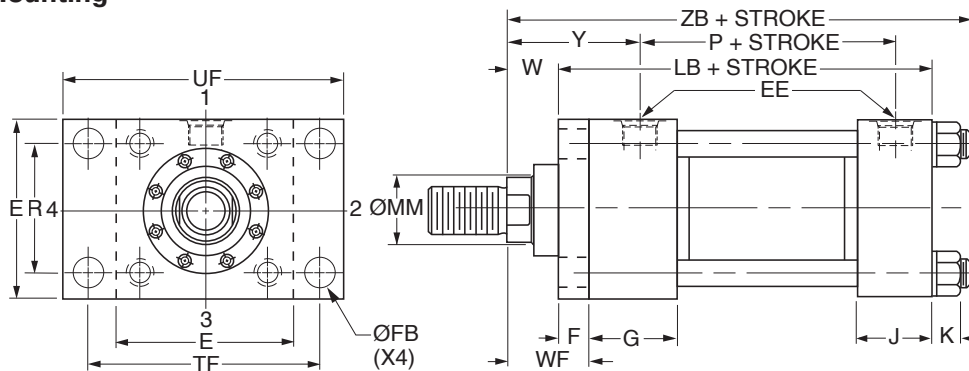
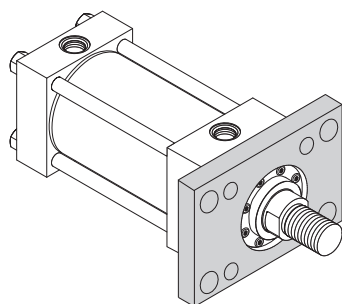
Dimensions for TB and TC Mount may be obtained from the above dimensional table.

**⚠ PROP 65 WARNING** **WARNING:** This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**Mounting Information****Heavy Duty Hydraulic Cylinders  
Series 3HD 7.00" & 8.00" Bore****Head Rectangular Flange Mounting**

Style J

(NFPA Style MF1)

**Style J – Dimensional and Mounting Data**

For pressures exceeding those shown use mounting styles JB or JJ.

| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | E    | EE                |                  | F    | FB<br>Ø | G    | J    | K<br>Max. | R    | TF    | UF    | W    | WF   | Y    | Add Stroke |      |            |
|-----------|------------|----------------|------|-------------------|------------------|------|---------|------|------|-----------|------|-------|-------|------|------|------|------------|------|------------|
|           |            |                |      | NPTF <sup>1</sup> | SAE <sup>2</sup> |      |         |      |      |           |      |       |       |      |      |      | LB         | P    | ZB<br>Max. |
| 7.00      | 1 (std.)   | 3.000          | 8.50 | 1 1/4             | 20               | 1.00 | 1.19    | 2.75 | 2.75 | 1.16      | 6.58 | 10.63 | 12.63 | 1.25 | 2.25 | 3.69 | 9.50       | 5.63 | 12.16      |
|           | 2          | 5.000          | 8.50 | 1 1/4             | 20               | 1.00 | 1.19    | 2.75 | 2.75 | 1.16      | 6.58 | 10.63 | 12.63 | 1.25 | 2.25 | 3.69 | 9.50       | 5.63 | 12.16      |
|           | 3          | 3.500          | 8.50 | 1 1/4             | 20               | 1.00 | 1.19    | 2.75 | 2.75 | 1.16      | 6.58 | 10.63 | 12.63 | 1.25 | 2.25 | 3.69 | 9.50       | 5.63 | 12.16      |
|           | 4          | 4.000          | 8.50 | 1 1/4             | 20               | 1.00 | 1.19    | 2.75 | 2.75 | 1.16      | 6.58 | 10.63 | 12.63 | 1.25 | 2.25 | 3.69 | 9.50       | 5.63 | 12.16      |
|           | 5          | 4.500          | 8.50 | 1 1/4             | 20               | 1.00 | 1.19    | 2.75 | 2.75 | 1.16      | 6.58 | 10.63 | 12.63 | 1.25 | 2.25 | 3.69 | 9.50       | 5.63 | 12.16      |
| 8.00      | 1 (std.)   | 3.500          | 9.50 | 1 1/2             | 24               | 1.00 | 1.31    | 3.00 | 3.00 | 1.28      | 7.50 | 11.81 | 14.00 | 1.25 | 2.25 | 3.81 | 10.50      | 6.38 | 13.28      |
|           | 2          | 5.500          | 9.50 | 1 1/2             | 24               | 1.00 | 1.31    | 3.00 | 3.00 | 1.28      | 7.50 | 11.81 | 14.00 | 1.25 | 2.25 | 3.81 | 10.50      | 6.38 | 13.28      |
|           | 3          | 4.000          | 9.50 | 1 1/2             | 24               | 1.00 | 1.31    | 3.00 | 3.00 | 1.28      | 7.50 | 11.81 | 14.00 | 1.25 | 2.25 | 3.81 | 10.50      | 6.38 | 13.28      |
|           | 4          | 4.500          | 9.50 | 1 1/2             | 24               | 1.00 | 1.31    | 3.00 | 3.00 | 1.28      | 7.50 | 11.81 | 14.00 | 1.25 | 2.25 | 3.81 | 10.50      | 6.38 | 13.28      |
|           | 5          | 5.000          | 9.50 | 1 1/2             | 24               | 1.00 | 1.31    | 3.00 | 3.00 | 1.28      | 7.50 | 11.81 | 14.00 | 1.25 | 2.25 | 3.81 | 10.50      | 6.38 | 13.28      |

<sup>1</sup>NPTF ports are available at no extra charge.<sup>2</sup>SAE straight thread ports are standard and are indicated by port number.**Style J – Maximum Operating Pressure / 3HD**

| Bore<br>Ø | Max. psi Push <sup>3</sup> |     |     |     |     |
|-----------|----------------------------|-----|-----|-----|-----|
|           | Rod Code                   |     |     |     |     |
|           | 1                          | 2   | 3   | 4   | 5   |
| 7.00      | 1000                       | 400 | 800 | 400 | 400 |
| 8.00      | 800                        | 400 | 700 | 400 | 400 |

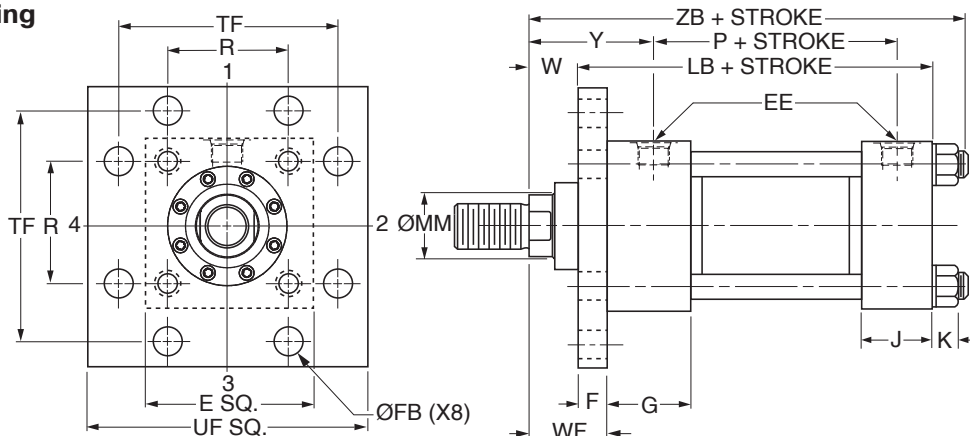
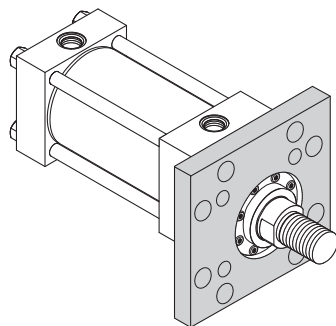
<sup>3</sup>Maximum pressure rating – push application.

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**Mounting Information****Heavy Duty Hydraulic Cylinders  
Series 3HD 7.00" & 8.00" Bore****Head Square Flange Mounting**

Style JB

(NFPA Style MF5)

**Style JB – Dimensional and Mounting Data**

| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | E    | EE                |                  | F    | FB<br>Ø | G    | J    | K<br>Max. | R    | TF    | UF    | W    | WF   | Y    | Add Stroke |      |            |
|-----------|------------|----------------|------|-------------------|------------------|------|---------|------|------|-----------|------|-------|-------|------|------|------|------------|------|------------|
|           |            |                |      | NPTF <sup>1</sup> | SAE <sup>2</sup> |      |         |      |      |           |      |       |       |      |      |      | LB         | P    | ZB<br>Max. |
| 7.00      | 1 (std.)   | 3.000          | 8.50 | 1 1/4             | 20               | 1.00 | 1.19    | 2.75 | 2.75 | 1.16      | 6.58 | 10.63 | 12.63 | 1.25 | 2.25 | 3.69 | 9.50       | 5.63 | 12.16      |
|           | 2          | 5.000          | 8.50 | 1 1/4             | 20               | 1.00 | 1.19    | 2.75 | 2.75 | 1.16      | 6.58 | 10.63 | 12.63 | 1.25 | 2.25 | 3.69 | 9.50       | 5.63 | 12.16      |
|           | 3          | 3.500          | 8.50 | 1 1/4             | 20               | 1.00 | 1.19    | 2.75 | 2.75 | 1.16      | 6.58 | 10.63 | 12.63 | 1.25 | 2.25 | 3.69 | 9.50       | 5.63 | 12.16      |
|           | 4          | 4.000          | 8.50 | 1 1/4             | 20               | 1.00 | 1.19    | 2.75 | 2.75 | 1.16      | 6.58 | 10.63 | 12.63 | 1.25 | 2.25 | 3.69 | 9.50       | 5.63 | 12.16      |
|           | 5          | 4.500          | 8.50 | 1 1/4             | 20               | 1.00 | 1.19    | 2.75 | 2.75 | 1.16      | 6.58 | 10.63 | 12.63 | 1.25 | 2.25 | 3.69 | 9.50       | 5.63 | 12.16      |
| 8.00      | 1 (std.)   | 3.500          | 9.50 | 1 1/2             | 24               | 1.00 | 1.31    | 3.00 | 3.00 | 1.28      | 7.50 | 11.81 | 14.00 | 1.25 | 2.25 | 3.81 | 10.50      | 6.38 | 13.28      |
|           | 2          | 5.500          | 9.50 | 1 1/2             | 24               | 1.00 | 1.31    | 3.00 | 3.00 | 1.28      | 7.50 | 11.81 | 14.00 | 1.25 | 2.25 | 3.81 | 10.50      | 6.38 | 13.28      |
|           | 3          | 4.000          | 9.50 | 1 1/2             | 24               | 1.00 | 1.31    | 3.00 | 3.00 | 1.28      | 7.50 | 11.81 | 14.00 | 1.25 | 2.25 | 3.81 | 10.50      | 6.38 | 13.28      |
|           | 4          | 4.500          | 9.50 | 1 1/2             | 24               | 1.00 | 1.31    | 3.00 | 3.00 | 1.28      | 7.50 | 11.81 | 14.00 | 1.25 | 2.25 | 3.81 | 10.50      | 6.38 | 13.28      |
|           | 5          | 5.000          | 9.50 | 1 1/2             | 24               | 1.00 | 1.31    | 3.00 | 3.00 | 1.28      | 7.50 | 11.81 | 14.00 | 1.25 | 2.25 | 3.81 | 10.50      | 6.38 | 13.28      |

<sup>1</sup>NPTF ports are available at no extra charge.<sup>2</sup>SAE straight thread ports are standard and are indicated by port number.**Style JB – Maximum Operating Pressure / 3HD**

| Bore<br>Ø | Max. psi Push <sup>3</sup> |      |      |      |      |
|-----------|----------------------------|------|------|------|------|
|           | Rod Code                   |      |      |      |      |
|           | 1                          | 2    | 3    | 4    | 5    |
| 7.00      | 2500                       | 1500 | 2200 | 1500 | 1500 |
| 8.00      | 2000                       | 1400 | 2000 | 1400 | 1400 |

<sup>3</sup>Maximum pressure rating – push application.

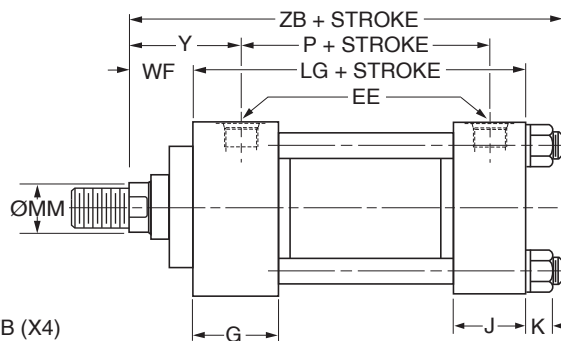
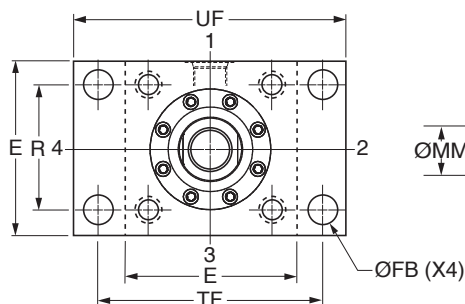
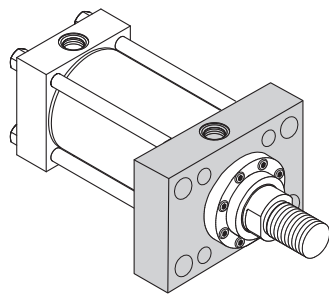
**WARNING:** This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)



**Mounting Information****Heavy Duty Hydraulic Cylinders  
Series 3HD 7.00" & 8.00" Bore****Head Rectangular Mounting**

Style JJ

(NFA Style ME5)

**Style JJ – Dimensional and Mounting Data**

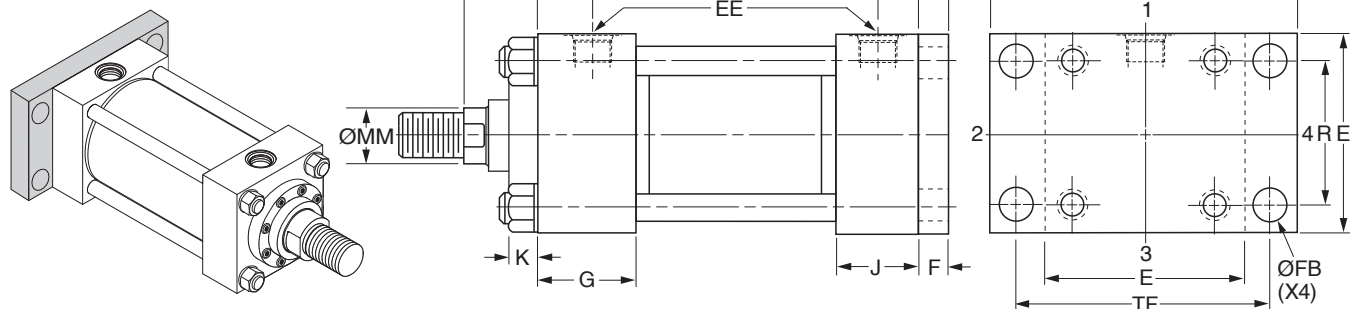
| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | E    | EE                |                  | FB<br>Ø | G    | J    | K<br>Max. | R    | TF    | UF    | WF   | Y    | Add Stroke |      |            |
|-----------|------------|----------------|------|-------------------|------------------|---------|------|------|-----------|------|-------|-------|------|------|------------|------|------------|
|           |            |                |      | NPTF <sup>1</sup> | SAE <sup>2</sup> |         |      |      |           |      |       |       |      |      | LG         | P    | ZB<br>Max. |
| 7.00      | 1 (std.)   | 3.000          | 8.50 | 1 1/4             | 20               | 1.19    | 2.75 | 2.75 | 1.16      | 6.58 | 10.63 | 12.63 | 2.25 | 3.69 | 8.50       | 5.63 | 12.16      |
|           | 2          | 5.000          | 8.50 | 1 1/4             | 20               | 1.19    | 2.75 | 2.75 | 1.16      | 6.58 | 10.63 | 12.63 | 2.25 | 3.69 | 8.50       | 5.63 | 12.16      |
|           | 3          | 3.500          | 8.50 | 1 1/4             | 20               | 1.19    | 2.75 | 2.75 | 1.16      | 6.58 | 10.63 | 12.63 | 2.25 | 3.69 | 8.50       | 5.63 | 12.16      |
|           | 4          | 4.000          | 8.50 | 1 1/4             | 20               | 1.19    | 2.75 | 2.75 | 1.16      | 6.58 | 10.63 | 12.63 | 2.25 | 3.69 | 8.50       | 5.63 | 12.16      |
|           | 5          | 4.500          | 8.50 | 1 1/4             | 20               | 1.19    | 2.75 | 2.75 | 1.16      | 6.58 | 10.63 | 12.63 | 2.25 | 3.69 | 8.50       | 5.63 | 12.16      |
| 8.00      | 1 (std.)   | 3.500          | 9.50 | 1 1/2             | 24               | 1.31    | 3.00 | 3.00 | 1.28      | 7.50 | 11.81 | 14.00 | 2.25 | 3.81 | 9.50       | 6.38 | 13.28      |
|           | 2          | 5.500          | 9.50 | 1 1/2             | 24               | 1.31    | 3.00 | 3.00 | 1.28      | 7.50 | 11.81 | 14.00 | 2.25 | 3.81 | 9.50       | 6.38 | 13.28      |
|           | 3          | 4.000          | 9.50 | 1 1/2             | 24               | 1.31    | 3.00 | 3.00 | 1.28      | 7.50 | 11.81 | 14.00 | 2.25 | 3.81 | 9.50       | 6.38 | 13.28      |
|           | 4          | 4.500          | 9.50 | 1 1/2             | 24               | 1.31    | 3.00 | 3.00 | 1.28      | 7.50 | 11.81 | 14.00 | 2.25 | 3.81 | 9.50       | 6.38 | 13.28      |
|           | 5          | 5.000          | 9.50 | 1 1/2             | 24               | 1.31    | 3.00 | 3.00 | 1.28      | 7.50 | 11.81 | 14.00 | 2.25 | 3.81 | 9.50       | 6.38 | 13.28      |

<sup>1</sup>NPTF ports are available at no extra charge.<sup>2</sup>SAE straight thread ports are standard and are indicated by port number.

Series 3HD 7.00" & 8.00"  
Bore

**⚠ PROP 65 WARNING** WARNING: This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)



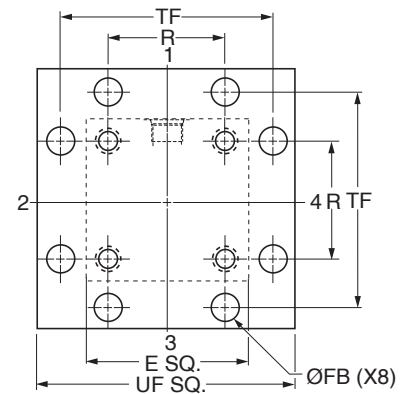
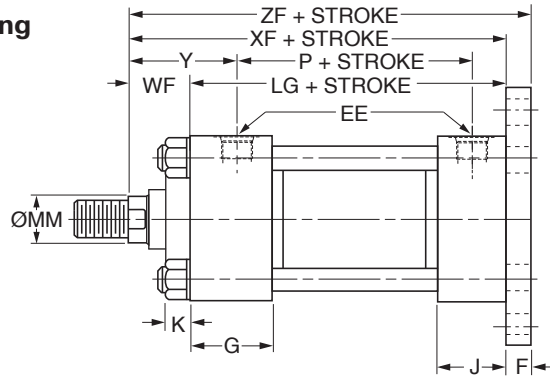
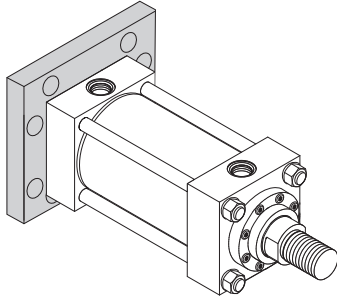
**Mounting Information****Heavy Duty Hydraulic Cylinders  
Series 3HD 7.00" & 8.00" Bore****Cap Rectangular Flange Mounting  
Style H  
(NFFA Style MF2)****Style H – Dimensional and Mounting Data**

| Bore<br>Ø | Rod<br>No. | MM<br>Rod Ø | E    | EE                |                  | F    | FB<br>Ø | G    | J    | K<br>Max. | R    | TF    | UF    | WF   | Y    | Add Stroke |      |       |       |
|-----------|------------|-------------|------|-------------------|------------------|------|---------|------|------|-----------|------|-------|-------|------|------|------------|------|-------|-------|
|           |            |             |      | NPTF <sup>1</sup> | SAE <sup>2</sup> |      |         |      |      |           |      |       |       |      |      | LG         | P    | XF    | ZF    |
| 7.00      | 1 (std.)   | 3.000       | 8.50 | 1 1/4             | 20               | 1.00 | 1.19    | 2.75 | 2.75 | 1.16      | 6.58 | 10.63 | 12.63 | 2.25 | 3.69 | 8.50       | 5.63 | 10.75 | 11.75 |
|           | 2          | 5.000       | 8.50 | 1 1/4             | 20               | 1.00 | 1.19    | 2.75 | 2.75 | 1.16      | 6.58 | 10.63 | 12.63 | 2.25 | 3.69 | 8.50       | 5.63 | 10.75 | 11.75 |
|           | 3          | 3.500       | 8.50 | 1 1/4             | 20               | 1.00 | 1.19    | 2.75 | 2.75 | 1.16      | 6.58 | 10.63 | 12.63 | 2.25 | 3.69 | 8.50       | 5.63 | 10.75 | 11.75 |
|           | 4          | 4.000       | 8.50 | 1 1/4             | 20               | 1.00 | 1.19    | 2.75 | 2.75 | 1.16      | 6.58 | 10.63 | 12.63 | 2.25 | 3.69 | 8.50       | 5.63 | 10.75 | 11.75 |
|           | 5          | 4.500       | 8.50 | 1 1/4             | 20               | 1.00 | 1.19    | 2.75 | 2.75 | 1.16      | 6.58 | 10.63 | 12.63 | 2.25 | 3.69 | 8.50       | 5.63 | 10.75 | 11.75 |
| 8.00      | 1 (std.)   | 3.500       | 9.50 | 1 1/2             | 24               | 1.00 | 1.31    | 3.00 | 3.00 | 1.28      | 7.50 | 11.81 | 14.00 | 2.25 | 3.81 | 9.50       | 6.38 | 11.75 | 12.75 |
|           | 2          | 5.500       | 9.50 | 1 1/2             | 24               | 1.00 | 1.31    | 3.00 | 3.00 | 1.28      | 7.50 | 11.81 | 14.00 | 2.25 | 3.81 | 9.50       | 6.38 | 11.75 | 12.75 |
|           | 3          | 4.000       | 9.50 | 1 1/2             | 24               | 1.00 | 1.31    | 3.00 | 3.00 | 1.28      | 7.50 | 11.81 | 14.00 | 2.25 | 3.81 | 9.50       | 6.38 | 11.75 | 12.75 |
|           | 4          | 4.500       | 9.50 | 1 1/2             | 24               | 1.00 | 1.31    | 3.00 | 3.00 | 1.28      | 7.50 | 11.81 | 14.00 | 2.25 | 3.81 | 9.50       | 6.38 | 11.75 | 12.75 |
|           | 5          | 5.000       | 9.50 | 1 1/2             | 24               | 1.00 | 1.31    | 3.00 | 3.00 | 1.28      | 7.50 | 11.81 | 14.00 | 2.25 | 3.81 | 9.50       | 6.38 | 11.75 | 12.75 |

<sup>1</sup>NPTF ports are available at no extra charge.<sup>2</sup>SAE straight thread ports are standard and are indicated by port number.**Style H – Maximum Operating Pressure / 3HD**

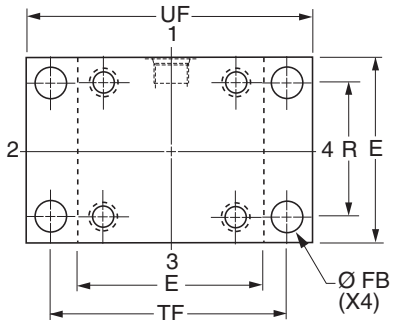
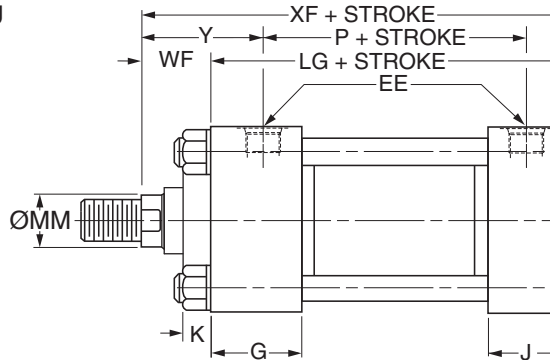
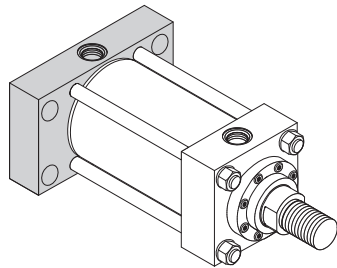
| Bore<br>Ø | Max. psi Pull <sup>3</sup> |      |      |      |      |
|-----------|----------------------------|------|------|------|------|
|           | Rod Code                   |      |      |      |      |
|           | 1                          | 2    | 3    | 4    | 5    |
| 7.00      | 2000                       | 3000 | 2000 | 2500 | 2800 |
| 8.00      | 1700                       | 2500 | 1700 | 1800 | 2200 |

<sup>3</sup>Maximum pressure rating – pull application.**WARNING:** This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**Mounting Information****Heavy Duty Hydraulic Cylinders  
Series 3HD 7.00" & 8.00" Bore****Cap Square Flange Mounting  
Style HB  
(NFA Style MF6)****Style HB – Dimensional and Mounting Data**

| Bore<br>Ø | Rod<br>No. | MM<br>Rod Ø | E    | EE                |                  | F    | FB<br>Ø | G    | J    | K<br>Max. | R    | TF    | UF    | WF   | Y    | Add Stroke |      |       |       |
|-----------|------------|-------------|------|-------------------|------------------|------|---------|------|------|-----------|------|-------|-------|------|------|------------|------|-------|-------|
|           |            |             |      | NPTF <sup>1</sup> | SAE <sup>2</sup> |      |         |      |      |           |      |       |       |      |      | LG         | P    | XF    | ZF    |
| 7.00      | 1 (std.)   | 3.000       | 8.50 | 1 1/4             | 20               | 1.00 | 1.19    | 2.75 | 2.75 | 1.16      | 6.58 | 10.63 | 12.63 | 2.25 | 3.69 | 8.50       | 5.63 | 10.75 | 11.75 |
|           | 2          | 5.000       | 8.50 | 1 1/4             | 20               | 1.00 | 1.19    | 2.75 | 2.75 | 1.16      | 6.58 | 10.63 | 12.63 | 2.25 | 3.69 | 8.50       | 5.63 | 10.75 | 11.75 |
|           | 3          | 3.500       | 8.50 | 1 1/4             | 20               | 1.00 | 1.19    | 2.75 | 2.75 | 1.16      | 6.58 | 10.63 | 12.63 | 2.25 | 3.69 | 8.50       | 5.63 | 10.75 | 11.75 |
|           | 4          | 4.000       | 8.50 | 1 1/4             | 20               | 1.00 | 1.19    | 2.75 | 2.75 | 1.16      | 6.58 | 10.63 | 12.63 | 2.25 | 3.69 | 8.50       | 5.63 | 10.75 | 11.75 |
|           | 5          | 4.500       | 8.50 | 1 1/4             | 20               | 1.00 | 1.19    | 2.75 | 2.75 | 1.16      | 6.58 | 10.63 | 12.63 | 2.25 | 3.69 | 8.50       | 5.63 | 10.75 | 11.75 |
| 8.00      | 1 (std.)   | 3.500       | 9.50 | 1 1/2             | 24               | 1.00 | 1.31    | 3.00 | 3.00 | 1.28      | 7.50 | 11.81 | 14.00 | 2.25 | 3.81 | 9.50       | 6.38 | 11.75 | 12.75 |
|           | 2          | 5.500       | 9.50 | 1 1/2             | 24               | 1.00 | 1.31    | 3.00 | 3.00 | 1.28      | 7.50 | 11.81 | 14.00 | 2.25 | 3.81 | 9.50       | 6.38 | 11.75 | 12.75 |
|           | 3          | 4.000       | 9.50 | 1 1/2             | 24               | 1.00 | 1.31    | 3.00 | 3.00 | 1.28      | 7.50 | 11.81 | 14.00 | 2.25 | 3.81 | 9.50       | 6.38 | 11.75 | 12.75 |
|           | 4          | 4.500       | 9.50 | 1 1/2             | 24               | 1.00 | 1.31    | 3.00 | 3.00 | 1.28      | 7.50 | 11.81 | 14.00 | 2.25 | 3.81 | 9.50       | 6.38 | 11.75 | 12.75 |
|           | 5          | 5.000       | 9.50 | 1 1/2             | 24               | 1.00 | 1.31    | 3.00 | 3.00 | 1.28      | 7.50 | 11.81 | 14.00 | 2.25 | 3.81 | 9.50       | 6.38 | 11.75 | 12.75 |

<sup>1</sup>NPTF ports are available at no extra charge. <sup>2</sup>SAE straight thread ports are standard and are indicated by port number.

**Cap Rectangular Mounting  
Style HH  
(NFA Style ME6)****Style HH – Dimensional and Mounting Data**

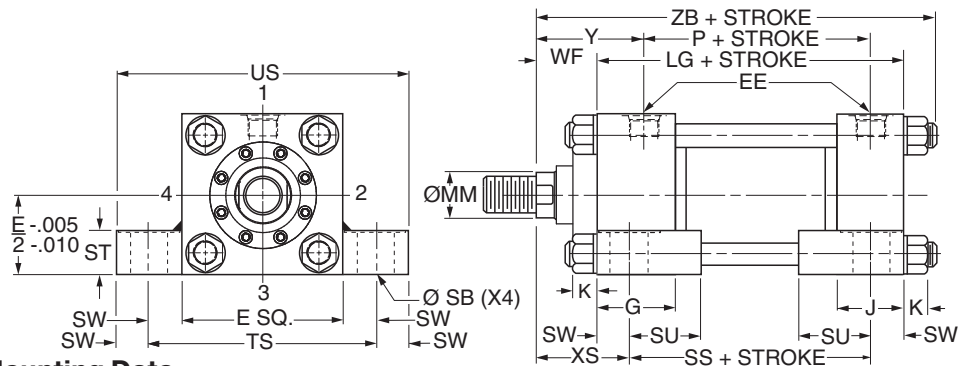
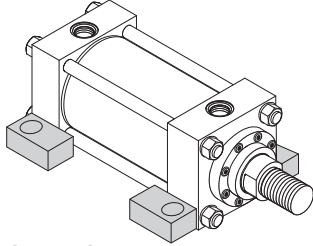
| Bore<br>Ø | Rod<br>No. | MM<br>Rod Ø | E    | EE                |                  | FB<br>Ø | G    | J    | K<br>Max. | R    | TF    | UF    | WF   | Y    | Add Stroke |      |       |
|-----------|------------|-------------|------|-------------------|------------------|---------|------|------|-----------|------|-------|-------|------|------|------------|------|-------|
|           |            |             |      | NPTF <sup>1</sup> | SAE <sup>2</sup> |         |      |      |           |      |       |       |      |      | LG         | P    | XF    |
| 7.00      | 1 (std.)   | 3.000       | 8.50 | 1 1/4             | 20               | 1.19    | 2.75 | 2.75 | 1.16      | 6.58 | 10.63 | 12.63 | 2.25 | 3.69 | 8.50       | 5.63 | 10.75 |
|           | 2          | 5.000       | 8.50 | 1 1/4             | 20               | 1.19    | 2.75 | 2.75 | 1.16      | 6.58 | 10.63 | 12.63 | 2.25 | 3.69 | 8.50       | 5.63 | 10.75 |
|           | 3          | 3.500       | 8.50 | 1 1/4             | 20               | 1.19    | 2.75 | 2.75 | 1.16      | 6.58 | 10.63 | 12.63 | 2.25 | 3.69 | 8.50       | 5.63 | 10.75 |
|           | 4          | 4.000       | 8.50 | 1 1/4             | 20               | 1.19    | 2.75 | 2.75 | 1.16      | 6.58 | 10.63 | 12.63 | 2.25 | 3.69 | 8.50       | 5.63 | 10.75 |
|           | 5          | 4.500       | 8.50 | 1 1/4             | 20               | 1.19    | 2.75 | 2.75 | 1.16      | 6.58 | 10.63 | 12.63 | 2.25 | 3.69 | 8.50       | 5.63 | 10.75 |
| 8.00      | 1 (std.)   | 3.500       | 9.50 | 1 1/2             | 24               | 1.31    | 3.00 | 3.00 | 1.28      | 7.50 | 11.81 | 14.00 | 2.25 | 3.81 | 9.50       | 6.38 | 11.75 |
|           | 2          | 5.500       | 9.50 | 1 1/2             | 24               | 1.31    | 3.00 | 3.00 | 1.28      | 7.50 | 11.81 | 14.00 | 2.25 | 3.81 | 9.50       | 6.38 | 11.75 |
|           | 3          | 4.000       | 9.50 | 1 1/2             | 24               | 1.31    | 3.00 | 3.00 | 1.28      | 7.50 | 11.81 | 14.00 | 2.25 | 3.81 | 9.50       | 6.38 | 11.75 |
|           | 4          | 4.500       | 9.50 | 1 1/2             | 24               | 1.31    | 3.00 | 3.00 | 1.28      | 7.50 | 11.81 | 14.00 | 2.25 | 3.81 | 9.50       | 6.38 | 11.75 |
|           | 5          | 5.000       | 9.50 | 1 1/2             | 24               | 1.31    | 3.00 | 3.00 | 1.28      | 7.50 | 11.81 | 14.00 | 2.25 | 3.81 | 9.50       | 6.38 | 11.75 |

<sup>1</sup>NPTF ports are available at no extra charge. <sup>2</sup>SAE straight thread ports are standard and are indicated by port number.

per.

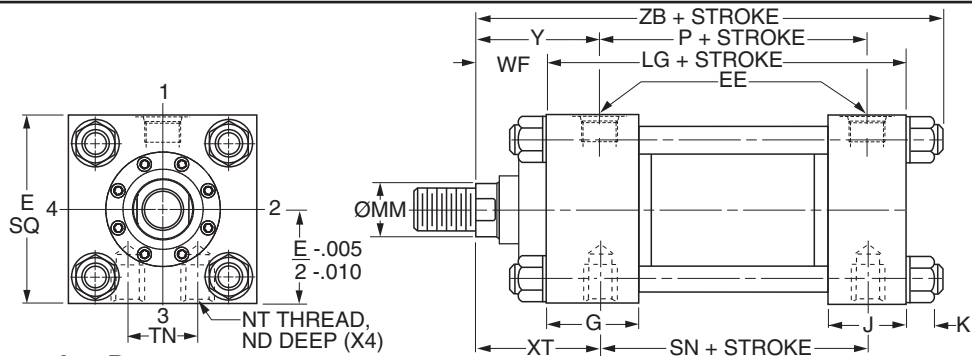
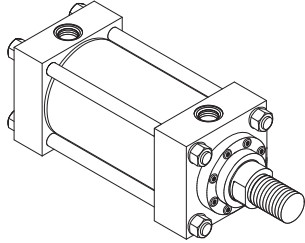
**WARNING:** This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)



**Mounting Information****Heavy Duty Hydraulic Cylinders  
Series 3HD 7.00" & 8.00" Bore****Side Lug Mounting  
Style C  
(NFPA Style MS2)****Style C – Dimensional and Mounting Data**

| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | E    | EE                |                  | G    | J    | K<br>Max. | SB<br>Ø | ST   | SU   | SW   | TS    | US    | WF   | XS   | Y    | Add Stroke |      |      |            |
|-----------|------------|----------------|------|-------------------|------------------|------|------|-----------|---------|------|------|------|-------|-------|------|------|------|------------|------|------|------------|
|           |            |                |      | NPTF <sup>1</sup> | SAE <sup>2</sup> |      |      |           |         |      |      |      |       |       |      |      |      | LG         | P    | SS   | ZB<br>Max. |
| 7.00      | 1 (std.)   | 3.000          | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.16      | 1.56    | 1.75 | 2.88 | 1.38 | 11.25 | 14.00 | 2.25 | 3.63 | 3.69 | 8.50       | 5.63 | 5.75 | 12.16      |
|           | 2          | 5.000          | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.16      | 1.56    | 1.75 | 2.88 | 1.38 | 11.25 | 14.00 | 2.25 | 3.63 | 3.69 | 8.50       | 5.63 | 5.75 | 12.16      |
|           | 3          | 3.500          | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.16      | 1.56    | 1.75 | 2.88 | 1.38 | 11.25 | 14.00 | 2.25 | 3.63 | 3.69 | 8.50       | 5.63 | 5.75 | 12.16      |
|           | 4          | 4.000          | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.16      | 1.56    | 1.75 | 2.88 | 1.38 | 11.25 | 14.00 | 2.25 | 3.63 | 3.69 | 8.50       | 5.63 | 5.75 | 12.16      |
|           | 5          | 4.500          | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.16      | 1.56    | 1.75 | 2.88 | 1.38 | 11.25 | 14.00 | 2.25 | 3.63 | 3.69 | 8.50       | 5.63 | 5.75 | 12.16      |
| 8.00      | 1 (std.)   | 3.500          | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.28      | 1.56    | 1.75 | 2.88 | 1.38 | 12.25 | 15.00 | 2.25 | 3.63 | 3.81 | 9.50       | 6.38 | 6.75 | 13.28      |
|           | 2          | 5.500          | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.28      | 1.56    | 1.75 | 2.88 | 1.38 | 12.25 | 15.00 | 2.25 | 3.63 | 3.81 | 9.50       | 6.38 | 6.75 | 13.28      |
|           | 3          | 4.000          | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.28      | 1.56    | 1.75 | 2.88 | 1.38 | 12.25 | 15.00 | 2.25 | 3.63 | 3.81 | 9.50       | 6.38 | 6.75 | 13.28      |
|           | 4          | 4.500          | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.28      | 1.56    | 1.75 | 2.88 | 1.38 | 12.25 | 15.00 | 2.25 | 3.63 | 3.81 | 9.50       | 6.38 | 6.75 | 13.28      |
|           | 5          | 5.000          | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.28      | 1.56    | 1.75 | 2.88 | 1.38 | 12.25 | 15.00 | 2.25 | 3.63 | 3.81 | 9.50       | 6.38 | 6.75 | 13.28      |

<sup>1</sup>NPTF ports are available at no extra charge. <sup>2</sup>SAE straight thread ports are standard and are indicated by port number.

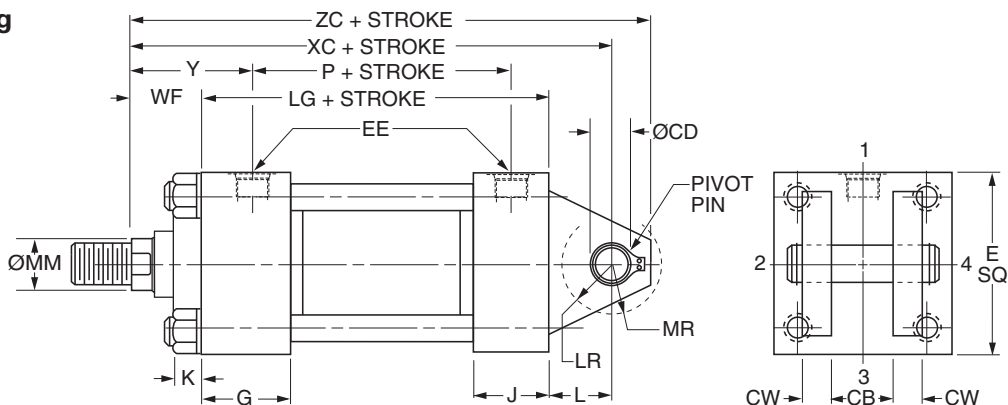
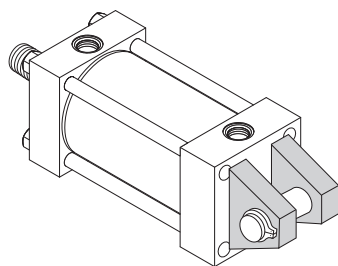
**Side Tapped Mounting  
Style F  
(NFPA Style MS4)****Style F – Dimensional and Mounting Data**

| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | E    | EE                |                  | G    | J    | K<br>Max. | ND   | NT      | TN   | WF   | XT   | Y    | Add Stroke |      |      |            |
|-----------|------------|----------------|------|-------------------|------------------|------|------|-----------|------|---------|------|------|------|------|------------|------|------|------------|
|           |            |                |      | NPTF <sup>1</sup> | SAE <sup>2</sup> |      |      |           |      |         |      |      |      |      | LG         | P    | SN   | ZB<br>Max. |
| 7.00      | 1 (std.)   | 3.000          | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.16      | 1.13 | 1 1/2-6 | 3.75 | 2.25 | 3.81 | 3.69 | 8.50       | 5.63 | 5.88 | 12.16      |
|           | 2          | 5.000          | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.16      | 1.13 | 1 1/2-6 | 3.75 | 2.25 | 3.81 | 3.69 | 8.50       | 5.63 | 5.88 | 12.16      |
|           | 3          | 3.500          | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.16      | 1.13 | 1 1/2-6 | 3.75 | 2.25 | 3.81 | 3.69 | 8.50       | 5.63 | 5.88 | 12.16      |
|           | 4          | 4.000          | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.16      | 1.13 | 1 1/2-6 | 3.75 | 2.25 | 3.81 | 3.69 | 8.50       | 5.63 | 5.88 | 12.16      |
|           | 5          | 4.500          | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.16      | 1.13 | 1 1/2-6 | 3.75 | 2.25 | 3.81 | 3.69 | 8.50       | 5.63 | 5.88 | 12.16      |
| 8.00      | 1 (std.)   | 3.500          | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.28      | 1.50 | 1 1/2-6 | 4.25 | 2.25 | 3.94 | 3.81 | 9.50       | 6.38 | 6.63 | 13.28      |
|           | 2          | 5.500          | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.28      | 1.50 | 1 1/2-6 | 4.25 | 2.25 | 3.94 | 3.81 | 9.50       | 6.38 | 6.63 | 13.28      |
|           | 3          | 4.000          | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.28      | 1.50 | 1 1/2-6 | 4.25 | 2.25 | 3.94 | 3.81 | 9.50       | 6.38 | 6.63 | 13.28      |
|           | 4          | 4.500          | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.28      | 1.50 | 1 1/2-6 | 4.25 | 2.25 | 3.94 | 3.81 | 9.50       | 6.38 | 6.63 | 13.28      |
|           | 5          | 5.000          | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.28      | 1.50 | 1 1/2-6 | 4.25 | 2.25 | 3.94 | 3.81 | 9.50       | 6.38 | 6.63 | 13.28      |

<sup>1</sup>NPTF ports are available at no extra charge. <sup>2</sup>SAE straight thread ports are standard and are indicated by port number.

**⚠ PROP 65 WARNING** WARNING: This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)



**Mounting Information****Heavy Duty Hydraulic Cylinders  
Series 3HD 7.00" & 8.00" Bore****Cap Fixed Clevis Mounting  
Style BB  
(NFPA Style MP1)****Style BB – Dimensional and Mounting Data**

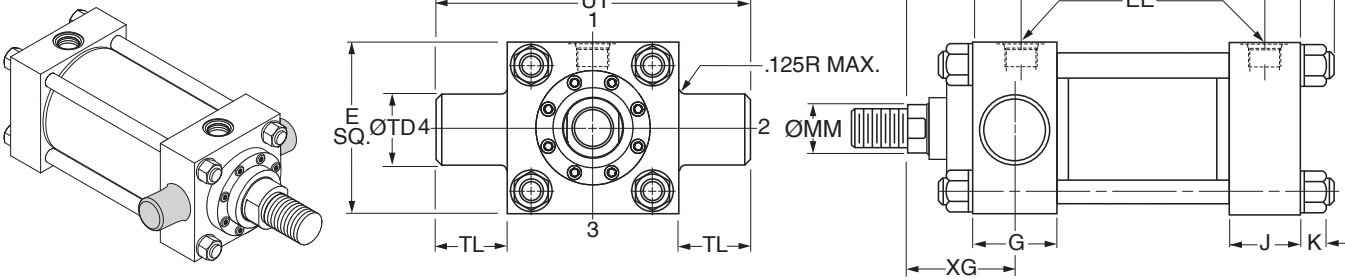
| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | CB   | CD <sup>3</sup> Ø<br>+.000<br>-.002 | CW   | E    | EE                |                  | G    | J    | K<br>Max. | L    | LR   | MR   |
|-----------|------------|----------------|------|-------------------------------------|------|------|-------------------|------------------|------|------|-----------|------|------|------|
|           |            |                |      |                                     |      |      | NPTF <sup>1</sup> | SAE <sup>2</sup> |      |      |           |      |      |      |
| 7.00      | 1 (std.)   | 3.000          | 3.00 | 2.501                               | 1.50 | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.16      | 3.00 | 2.75 | 2.88 |
|           | 2          | 5.000          | 3.00 | 2.501                               | 1.50 | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.16      | 3.00 | 2.75 | 2.88 |
|           | 3          | 3.500          | 3.00 | 2.501                               | 1.50 | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.16      | 3.00 | 2.75 | 2.88 |
|           | 4          | 4.000          | 3.00 | 2.501                               | 1.50 | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.16      | 3.00 | 2.75 | 2.88 |
|           | 5          | 4.500          | 3.00 | 2.501                               | 1.50 | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.16      | 3.00 | 2.75 | 2.88 |
| 8.00      | 1 (std.)   | 3.500          | 3.00 | 3.001                               | 1.50 | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.28      | 3.25 | 3.25 | 3.13 |
|           | 2          | 5.500          | 3.00 | 3.001                               | 1.50 | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.28      | 3.25 | 3.25 | 3.13 |
|           | 3          | 4.000          | 3.00 | 3.001                               | 1.50 | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.28      | 3.25 | 3.25 | 3.13 |
|           | 4          | 4.500          | 3.00 | 3.001                               | 1.50 | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.28      | 3.25 | 3.25 | 3.13 |
|           | 5          | 5.000          | 3.00 | 3.001                               | 1.50 | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.28      | 3.25 | 3.25 | 3.13 |

<sup>1</sup>NPTF ports are available at no extra charge.<sup>2</sup>SAE straight thread ports are standard and are indicated by port number.<sup>3</sup>Diameter CD is pin diameter.**Style BB – Dimensional and Mounting Data**

| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | WF   | Y    | Add Stroke |      |       |       |
|-----------|------------|----------------|------|------|------------|------|-------|-------|
|           |            |                |      |      | LG         | P    | XC    | ZC    |
| 7.00      | 1 (std.)   | 3.000          | 2.25 | 3.69 | 8.50       | 5.63 | 13.75 | 16.25 |
|           | 2          | 5.000          | 2.25 | 3.69 | 8.50       | 5.63 | 13.75 | 16.25 |
|           | 3          | 3.500          | 2.25 | 3.69 | 8.50       | 5.63 | 13.75 | 16.25 |
|           | 4          | 4.000          | 2.25 | 3.69 | 8.50       | 5.63 | 13.75 | 16.25 |
|           | 5          | 4.500          | 2.25 | 3.69 | 8.50       | 5.63 | 13.75 | 16.25 |
| 8.00      | 1 (std.)   | 3.500          | 2.25 | 3.81 | 9.50       | 6.38 | 15.00 | 17.75 |
|           | 2          | 5.500          | 2.25 | 3.81 | 9.50       | 6.38 | 15.00 | 17.75 |
|           | 3          | 4.000          | 2.25 | 3.81 | 9.50       | 6.38 | 15.00 | 17.75 |
|           | 4          | 4.500          | 2.25 | 3.81 | 9.50       | 6.38 | 15.00 | 17.75 |
|           | 5          | 5.000          | 2.25 | 3.81 | 9.50       | 6.38 | 15.00 | 17.75 |

**WARNING:** This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**Head Trunnion Mounting**  
**Style D**  
(NFPA Style MT1)



**Style D – Dimensional and Mounting Data**

| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | E    | EE                |                  | G    | J    | K<br>Max. | TD Ø<br>+.000<br>-.002 | TL   | UT    | WF   | Y    | XG   |
|-----------|------------|----------------|------|-------------------|------------------|------|------|-----------|------------------------|------|-------|------|------|------|
|           |            |                |      | NPTF <sup>1</sup> | SAE <sup>2</sup> |      |      |           |                        |      |       |      |      |      |
| 7.00      | 1 (std.)   | 3.000          | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.16      | 2.500                  | 2.50 | 13.50 | 2.25 | 3.69 | 3.63 |
|           | 2          | 5.000          | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.16      | 2.500                  | 2.50 | 13.50 | 2.25 | 3.69 | 3.63 |
|           | 3          | 3.500          | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.16      | 2.500                  | 2.50 | 13.50 | 2.25 | 3.69 | 3.63 |
|           | 4          | 4.000          | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.16      | 2.500                  | 2.50 | 13.50 | 2.25 | 3.69 | 3.63 |
|           | 5          | 4.500          | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.16      | 2.500                  | 2.50 | 13.50 | 2.25 | 3.69 | 3.63 |
| 8.00      | 1 (std.)   | 3.500          | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.28      | 3.000                  | 3.00 | 15.50 | 2.25 | 3.81 | 3.75 |
|           | 2          | 5.500          | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.28      | 3.000                  | 3.00 | 15.50 | 2.25 | 3.81 | 3.75 |
|           | 3          | 4.000          | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.28      | 3.000                  | 3.00 | 15.50 | 2.25 | 3.81 | 3.75 |
|           | 4          | 4.500          | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.28      | 3.000                  | 3.00 | 15.50 | 2.25 | 3.81 | 3.75 |
|           | 5          | 5.000          | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.28      | 3.000                  | 3.00 | 15.50 | 2.25 | 3.81 | 3.75 |

<sup>1</sup>NPTF ports are available at no extra charge.

<sup>2</sup>SAE straight thread ports are standard and are indicated by port number.

**Style D – Dimensional and Mounting Data**

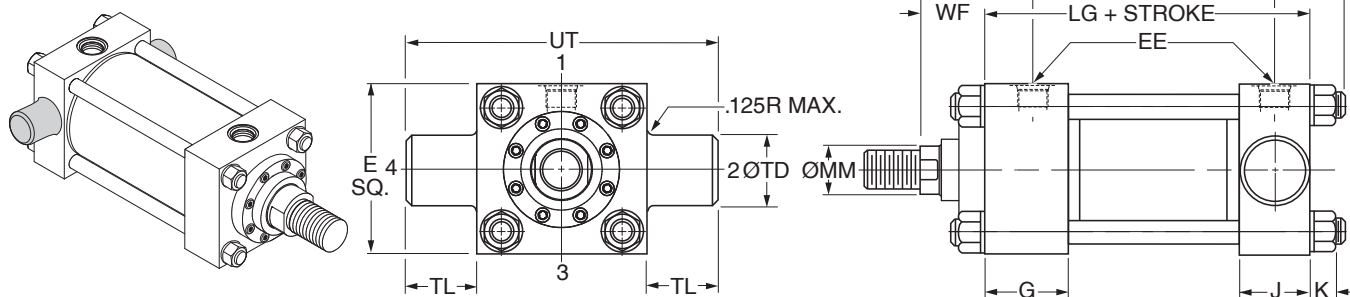
| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | Add Stroke |      |            |
|-----------|------------|----------------|------------|------|------------|
|           |            |                | LG         | P    | ZB<br>Max. |
| 7.00      | 1 (std.)   | 3.000          | 8.50       | 5.63 | 12.16      |
|           | 2          | 5.000          | 8.50       | 5.63 | 12.16      |
|           | 3          | 3.500          | 8.50       | 5.63 | 12.16      |
|           | 4          | 4.000          | 8.50       | 5.63 | 12.16      |
|           | 5          | 4.500          | 8.50       | 5.63 | 12.16      |
| 8.00      | 1 (std.)   | 3.500          | 9.50       | 6.38 | 13.28      |
|           | 2          | 5.500          | 9.50       | 6.38 | 13.28      |
|           | 3          | 4.000          | 9.50       | 6.38 | 13.28      |
|           | 4          | 4.500          | 9.50       | 6.38 | 13.28      |
|           | 5          | 5.000          | 9.50       | 6.38 | 13.28      |

**⚠ PROP 65 WARNING** **WARNING:** This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**Mounting Information****Heavy Duty Hydraulic Cylinders  
Series 3HD 7.00" & 8.00" Bore****Cap Trunnion Mounting**

Style DB

(NFPA Style MT2)

**Style DB – Dimensional and Mounting Data**

| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | E    | EE                |                  | G    | J    | K<br>Max. | TD Ø<br>+.000<br>-.002 | TL   | UT    | WF   | Y    |
|-----------|------------|----------------|------|-------------------|------------------|------|------|-----------|------------------------|------|-------|------|------|
|           |            |                |      | NPTF <sup>1</sup> | SAE <sup>2</sup> |      |      |           |                        |      |       |      |      |
| 7.00      | 1 (std.)   | 3.000          | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.16      | 2.500                  | 2.50 | 13.50 | 2.25 | 3.69 |
|           | 2          | 5.000          | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.16      | 2.500                  | 2.50 | 13.50 | 2.25 | 3.69 |
|           | 3          | 3.500          | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.16      | 2.500                  | 2.50 | 13.50 | 2.25 | 3.69 |
|           | 4          | 4.000          | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.16      | 2.500                  | 2.50 | 13.50 | 2.25 | 3.69 |
|           | 5          | 4.500          | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.16      | 2.500                  | 2.50 | 13.50 | 2.25 | 3.69 |
| 8.00      | 1 (std.)   | 3.500          | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.28      | 3.000                  | 3.00 | 15.50 | 2.25 | 3.81 |
|           | 2          | 5.500          | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.28      | 3.000                  | 3.00 | 15.50 | 2.25 | 3.81 |
|           | 3          | 4.000          | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.28      | 3.000                  | 3.00 | 15.50 | 2.25 | 3.81 |
|           | 4          | 4.500          | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.28      | 3.000                  | 3.00 | 15.50 | 2.25 | 3.81 |
|           | 5          | 5.000          | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.28      | 3.000                  | 3.00 | 15.50 | 2.25 | 3.81 |

<sup>1</sup>NPTF ports are available at no extra charge.<sup>2</sup>SAE straight thread ports are standard and are indicated by port number.**Style DB – Dimensional and Mounting Data**

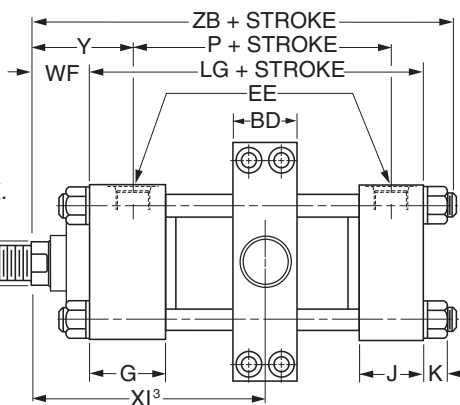
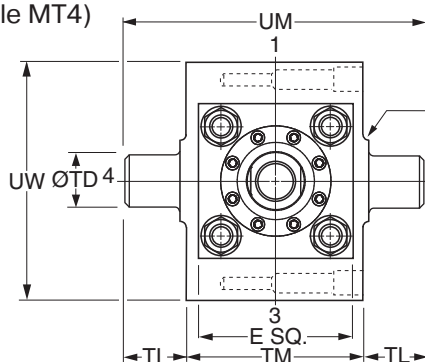
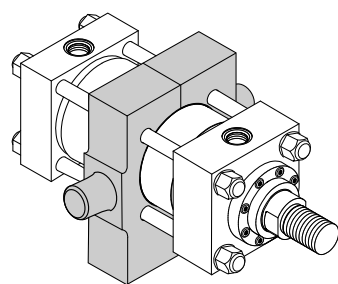
| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | Add Stroke |      |       |           |
|-----------|------------|----------------|------------|------|-------|-----------|
|           |            |                | LG         | P    | XJ    | ZB<br>Max |
| 7.00      | 1 (std.)   | 3.000          | 8.50       | 5.63 | 9.38  | 12.16     |
|           | 2          | 5.000          | 8.50       | 5.63 | 9.38  | 12.16     |
|           | 3          | 3.500          | 8.50       | 5.63 | 9.38  | 12.16     |
|           | 4          | 4.000          | 8.50       | 5.63 | 9.38  | 12.16     |
|           | 5          | 4.500          | 8.50       | 5.63 | 9.38  | 12.16     |
| 8.00      | 1 (std.)   | 3.500          | 9.50       | 6.38 | 10.25 | 13.28     |
|           | 2          | 5.500          | 9.50       | 6.38 | 10.25 | 13.28     |
|           | 3          | 4.000          | 9.50       | 6.38 | 10.25 | 13.28     |
|           | 4          | 4.500          | 9.50       | 6.38 | 10.25 | 13.28     |
|           | 5          | 5.000          | 9.50       | 6.38 | 10.25 | 13.28     |

**⚠ PROP 65 WARNING** WARNING: This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**Mounting Information****Heavy Duty Hydraulic Cylinders  
Series 3HD 7.00" & 8.00" Bore****Intermediate Fixed Trunnion Mounting**

Style DD

(NFPA Former Standard Style MT4)

**Style DD – Dimensional and Mounting Data**

| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | BD   | E    | EE                |                  | G    | J    | K<br>Max. | TD Ø<br>+.000<br>-.002 | TL   | TM    | UM    | UW    | WF   | Y    |
|-----------|------------|----------------|------|------|-------------------|------------------|------|------|-----------|------------------------|------|-------|-------|-------|------|------|
|           |            |                |      |      | NPTF <sup>1</sup> | SAE <sup>2</sup> |      |      |           |                        |      |       |       |       |      |      |
| 7.00      | 1 (std.)   | 3.000          | 3.00 | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.16      | 2.500                  | 2.50 | 9.75  | 14.75 | 11.50 | 2.25 | 3.69 |
|           | 2          | 5.000          | 3.00 | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.16      | 2.500                  | 2.50 | 9.75  | 14.75 | 11.50 | 2.25 | 3.69 |
|           | 3          | 3.500          | 3.00 | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.16      | 2.500                  | 2.50 | 9.75  | 14.75 | 11.50 | 2.25 | 3.69 |
|           | 4          | 4.000          | 3.00 | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.16      | 2.500                  | 2.50 | 9.75  | 14.75 | 11.50 | 2.25 | 3.69 |
|           | 5          | 4.500          | 3.00 | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.16      | 2.500                  | 2.50 | 9.75  | 14.75 | 11.50 | 2.25 | 3.69 |
| 8.00      | 1 (std.)   | 3.500          | 3.50 | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.28      | 3.000                  | 3.00 | 11.00 | 17.00 | 13.38 | 2.25 | 3.81 |
|           | 2          | 5.500          | 3.50 | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.28      | 3.000                  | 3.00 | 11.00 | 17.00 | 13.38 | 2.25 | 3.81 |
|           | 3          | 4.000          | 3.50 | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.28      | 3.000                  | 3.00 | 11.00 | 17.00 | 13.38 | 2.25 | 3.81 |
|           | 4          | 4.500          | 3.50 | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.28      | 3.000                  | 3.00 | 11.00 | 17.00 | 13.38 | 2.25 | 3.81 |
|           | 5          | 5.000          | 3.50 | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.28      | 3.000                  | 3.00 | 11.00 | 17.00 | 13.38 | 2.25 | 3.81 |

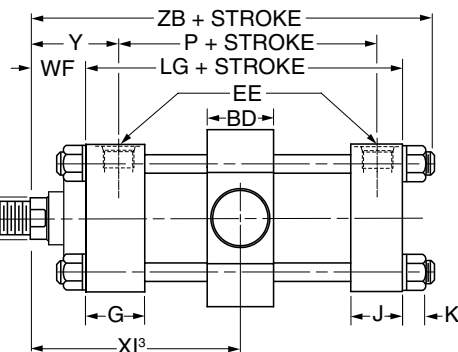
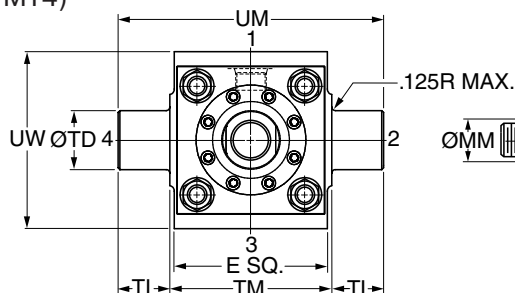
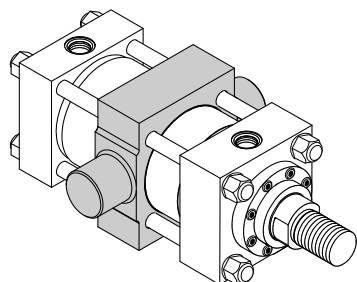
<sup>1</sup>NPTF ports are available at no extra charge.<sup>2</sup>SAE straight thread ports are standard and are indicated by port number.**Style DD – Dimensional and Mounting Data**

| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | Minimum XI <sup>3</sup> |             | Style DD<br>Minimum<br>Stroke | Add Stroke |      |                         |             |            |
|-----------|------------|----------------|-------------------------|-------------|-------------------------------|------------|------|-------------------------|-------------|------------|
|           |            |                | Styles<br>4, 8 & 9      | Style<br>55 |                               | LG         | P    | Maximum XI <sup>4</sup> |             | ZB<br>Max. |
|           |            |                |                         |             |                               |            |      | Styles<br>4, 8 & 9      | Style<br>55 |            |
| 7.00      | 1 (std.)   | 3.000          | 6.56                    | 9.19        | 0.13                          | 8.50       | 5.63 | 6.44                    | 9.06        | 12.16      |
|           | 2          | 5.000          | 6.56                    | 10.94       | 0.13                          | 8.50       | 5.63 | 6.44                    | 10.81       | 12.16      |
|           | 3          | 3.500          | 6.56                    | 9.94        | 0.13                          | 8.50       | 5.63 | 6.44                    | 9.81        | 12.16      |
|           | 4          | 4.000          | 6.56                    | 10.06       | 0.13                          | 8.50       | 5.63 | 6.44                    | 9.94        | 12.16      |
|           | 5          | 4.500          | 6.56                    | 10.81       | 0.13                          | 8.50       | 5.63 | 6.44                    | 10.69       | 12.16      |
| 8.00      | 1 (std.)   | 3.500          | 7.06                    | 10.44       | 0.13                          | 9.50       | 6.38 | 6.94                    | 10.31       | 13.28      |
|           | 2          | 5.500          | 7.06                    | 12.31       | 0.13                          | 9.50       | 6.38 | 6.94                    | 12.19       | 13.28      |
|           | 3          | 4.000          | 7.06                    | 10.56       | 0.13                          | 9.50       | 6.38 | 6.94                    | 10.44       | 13.28      |
|           | 4          | 4.500          | 7.06                    | 11.31       | 0.13                          | 9.50       | 6.38 | 6.94                    | 11.19       | 13.28      |
|           | 5          | 5.000          | 7.06                    | 11.44       | 0.13                          | 9.50       | 6.38 | 6.94                    | 11.31       | 13.28      |

<sup>3</sup>Dimension XI to be specified by customer. Reference point for rod end Style 55 is end of piston rod.<sup>4</sup>Dimensions shown are valid for standard WF and WG dimension.

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**Mounting Information****Heavy Duty Hydraulic Cylinders  
Series 3HD 7.00" & 8.00" Bore****Heavy Duty Intermediate Fixed  
Trunnion Mounting**  
Style DE  
(NFPA Current Standard Style MT4)**Style DE – Dimensional and Mounting Data**

| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | BD    | E    | EE                |                  | G    | J    | K<br>Max. | TD Ø<br>+.000<br>-.002 | TL   | TM    | UM    | UW    | WF   | Y    |
|-----------|------------|----------------|-------|------|-------------------|------------------|------|------|-----------|------------------------|------|-------|-------|-------|------|------|
|           |            |                |       |      | NPTF <sup>1</sup> | SAE <sup>2</sup> |      |      |           |                        |      |       |       |       |      |      |
| 7.00      | 1 (std.)   | 3.000          | 4.000 | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.16      | 3.500                  | 2.50 | 9.75  | 14.75 | 11.38 | 2.25 | 3.69 |
|           | 2          | 5.000          | 4.000 | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.16      | 3.500                  | 2.50 | 9.75  | 14.75 | 11.38 | 2.25 | 3.69 |
|           | 3          | 3.500          | 4.000 | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.16      | 3.500                  | 2.50 | 9.75  | 14.75 | 11.38 | 2.25 | 3.69 |
|           | 4          | 4.000          | 4.000 | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.16      | 3.500                  | 2.50 | 9.75  | 14.75 | 11.38 | 2.25 | 3.69 |
|           | 5          | 4.500          | 4.000 | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.16      | 3.500                  | 2.50 | 9.75  | 14.75 | 11.38 | 2.25 | 3.69 |
| 8.00      | 1 (std.)   | 3.500          | 4.500 | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.28      | 4.000                  | 3.00 | 11.00 | 17.00 | 12.00 | 2.25 | 3.81 |
|           | 2          | 5.500          | 4.500 | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.28      | 4.000                  | 3.00 | 11.00 | 17.00 | 12.00 | 2.25 | 3.81 |
|           | 3          | 4.000          | 4.500 | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.28      | 4.000                  | 3.00 | 11.00 | 17.00 | 12.00 | 2.25 | 3.81 |
|           | 4          | 4.500          | 4.500 | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.28      | 4.000                  | 3.00 | 11.00 | 17.00 | 12.00 | 2.25 | 3.81 |
|           | 5          | 5.000          | 4.500 | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.28      | 4.000                  | 3.00 | 11.00 | 17.00 | 12.00 | 2.25 | 3.81 |

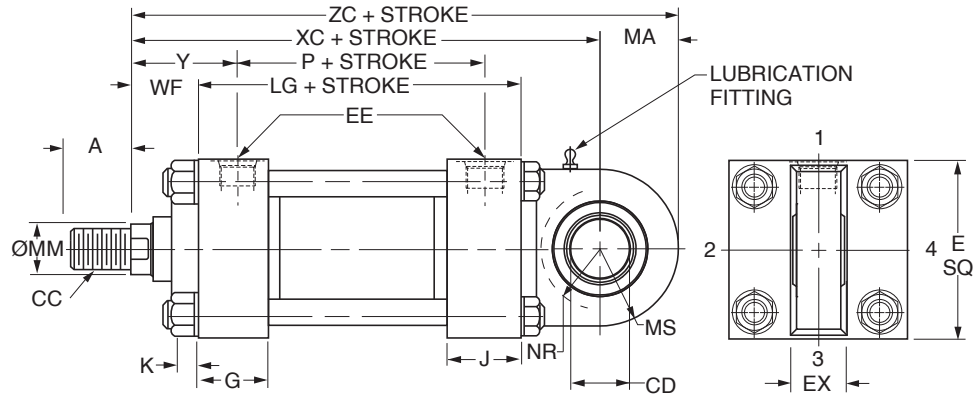
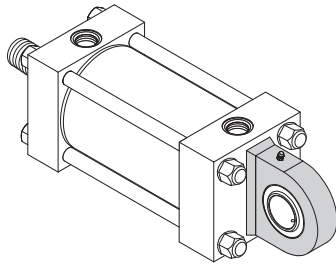
<sup>1</sup>NPTF ports are available at no extra charge.<sup>2</sup>SAE straight thread ports are standard and are indicated by port number.**Style DE – Dimensional and Mounting Data**

| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | Minimum XI <sup>3</sup> |             | Style DE<br>Minimum<br>Stroke | Add Stroke |      |                         |             |            |
|-----------|------------|----------------|-------------------------|-------------|-------------------------------|------------|------|-------------------------|-------------|------------|
|           |            |                | Styles<br>4, 8 & 9      | Style<br>55 |                               | LG         | P    | Maximum XI <sup>4</sup> |             | ZB<br>Max. |
|           |            |                |                         |             |                               |            |      | Styles<br>4, 8 & 9      | Style<br>55 |            |
| 7.00      | 1 (std.)   | 3.000          | 7.06                    | 9.69        | 1.13                          | 8.50       | 5.63 | 5.94                    | 8.56        | 12.16      |
|           | 2          | 5.000          | 7.06                    | 11.44       | 1.13                          | 8.50       | 5.63 | 5.94                    | 10.31       | 12.16      |
|           | 3          | 3.500          | 7.06                    | 10.44       | 1.13                          | 8.50       | 5.63 | 5.94                    | 9.31        | 12.16      |
|           | 4          | 4.000          | 7.06                    | 10.56       | 1.13                          | 8.50       | 5.63 | 5.94                    | 9.44        | 12.16      |
|           | 5          | 4.500          | 7.06                    | 11.31       | 1.13                          | 8.50       | 5.63 | 5.94                    | 10.19       | 12.16      |
| 8.00      | 1 (std.)   | 3.500          | 7.56                    | 10.94       | 1.13                          | 9.50       | 6.38 | 6.44                    | 9.81        | 13.28      |
|           | 2          | 5.500          | 7.56                    | 12.81       | 1.13                          | 9.50       | 6.38 | 6.44                    | 11.69       | 13.28      |
|           | 3          | 4.000          | 7.56                    | 11.06       | 1.13                          | 9.50       | 6.38 | 6.44                    | 9.94        | 13.28      |
|           | 4          | 4.500          | 7.56                    | 11.81       | 1.13                          | 9.50       | 6.38 | 6.44                    | 10.69       | 13.28      |
|           | 5          | 5.000          | 7.56                    | 11.94       | 1.13                          | 9.50       | 6.38 | 6.44                    | 10.81       | 13.28      |

<sup>3</sup>Dimension XI to be specified by customer. Reference point for rod end Style 55 is end of piston rod.<sup>4</sup>Dimensions shown are valid for standard WF and WG dimension.

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**Mounting Information****Heavy Duty Hydraulic Cylinders  
Series 3HD 7.00" & 8.00" Bore****Spherical Bearing Mounting  
Style SE****Style SE – Dimensional and Mounting Data**

| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | A    | CD <sup>3</sup> Ø<br>+0.0000<br>-0.0008 | E    | EE                |                  | EX   | G    | J    | K<br>Max. | MS   | MA   | NR   | WF   | Y    |
|-----------|------------|----------------|------|-----------------------------------------|------|-------------------|------------------|------|------|------|-----------|------|------|------|------|------|
|           |            |                |      |                                         |      | NPTF <sup>1</sup> | SAE <sup>2</sup> |      |      |      |           |      |      |      |      |      |
| 7.00      | 1 (std.)   | 3.000          | 3.50 | 3.5000                                  | 8.50 | 1 1/4             | 20               | 3.06 | 2.75 | 2.75 | 1.16      | 4.00 | 4.00 | 3.68 | 2.25 | 3.69 |
|           | 2          | 5.000          | 3.50 | 3.5000                                  | 8.50 | 1 1/4             | 20               | 3.06 | 2.75 | 2.75 | 1.16      | 4.00 | 4.00 | 3.68 | 2.25 | 3.69 |
|           | 3          | 3.500          | 3.50 | 3.5000                                  | 8.50 | 1 1/4             | 20               | 3.06 | 2.75 | 2.75 | 1.16      | 4.00 | 4.00 | 3.68 | 2.25 | 3.69 |
|           | 4          | 4.000          | 3.50 | 3.5000                                  | 8.50 | 1 1/4             | 20               | 3.06 | 2.75 | 2.75 | 1.16      | 4.00 | 4.00 | 3.68 | 2.25 | 3.69 |
|           | 5          | 4.500          | 3.50 | 3.5000                                  | 8.50 | 1 1/4             | 20               | 3.06 | 2.75 | 2.75 | 1.16      | 4.00 | 4.00 | 3.68 | 2.25 | 3.69 |
| 8.00      | 1 (std.)   | 3.500          | 3.50 | 4.0000                                  | 9.50 | 1 1/2             | 24               | 3.50 | 3.00 | 3.00 | 1.28      | 4.50 | 4.50 | 4.13 | 2.25 | 3.81 |
|           | 2          | 5.500          | 3.50 | 4.0000                                  | 9.50 | 1 1/2             | 24               | 3.50 | 3.00 | 3.00 | 1.28      | 4.50 | 4.50 | 4.13 | 2.25 | 3.81 |
|           | 3          | 4.000          | 3.50 | 4.0000                                  | 9.50 | 1 1/2             | 24               | 3.50 | 3.00 | 3.00 | 1.28      | 4.50 | 4.50 | 4.13 | 2.25 | 3.81 |
|           | 4          | 4.500          | 3.50 | 4.0000                                  | 9.50 | 1 1/2             | 24               | 3.50 | 3.00 | 3.00 | 1.28      | 4.50 | 4.50 | 4.13 | 2.25 | 3.81 |
|           | 5          | 5.000          | 3.50 | 4.0000                                  | 9.50 | 1 1/2             | 24               | 3.50 | 3.00 | 3.00 | 1.28      | 4.50 | 4.50 | 4.13 | 2.25 | 3.81 |

<sup>1</sup>NPTF ports are available at no extra charge.<sup>2</sup>SAE straight thread ports are standard and are indicated by port number.<sup>3</sup>Dimension CD is pin diameter.**Style SE – Dimensional and Mounting Data**

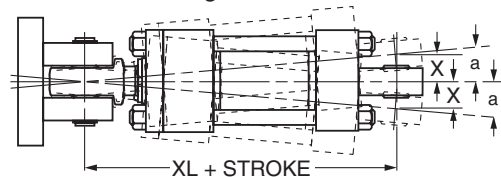
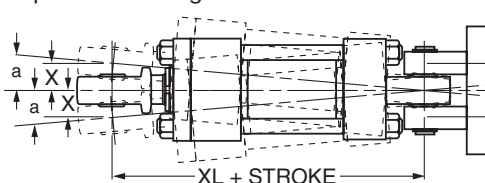
| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | Thread<br>Style 8<br>CC <sup>4</sup> | A            | Add Stroke |      |       |       |       |
|-----------|------------|----------------|--------------------------------------|--------------|------------|------|-------|-------|-------|
|           |            |                |                                      |              | LG         | P    | XC    | XL    | ZC    |
| 7.00      | 1 (std.)   | 3.000          | 2 3/4-12                             | 3.50         | 8.50       | 5.63 | 15.25 | 23.25 | 19.25 |
|           | 2          | 5.000          | <sup>4</sup>                         | <sup>4</sup> | 8.50       | 5.63 | 15.25 | 23.25 | 19.25 |
|           | 3          | 3.500          | <sup>4</sup>                         | <sup>4</sup> | 8.50       | 5.63 | 15.25 | 23.25 | 19.25 |
|           | 4          | 4.000          | <sup>4</sup>                         | <sup>4</sup> | 8.50       | 5.63 | 15.25 | 23.25 | 19.25 |
|           | 5          | 4.500          | <sup>4</sup>                         | <sup>4</sup> | 8.50       | 5.63 | 15.25 | 23.25 | 19.25 |
| 8.00      | 1 (std.)   | 3.500          | 3 1/4-12                             | 3.50         | 9.50       | 6.38 | 16.75 | 25.25 | 21.25 |
|           | 2          | 5.500          | <sup>4</sup>                         | <sup>4</sup> | 9.50       | 6.38 | 16.75 | 25.25 | 21.25 |
|           | 3          | 4.000          | <sup>4</sup>                         | <sup>4</sup> | 9.50       | 6.38 | 16.75 | 25.25 | 21.25 |
|           | 4          | 4.500          | <sup>4</sup>                         | <sup>4</sup> | 9.50       | 6.38 | 16.75 | 25.25 | 21.25 |
|           | 5          | 5.000          | <sup>4</sup>                         | <sup>4</sup> | 9.50       | 6.38 | 16.75 | 25.25 | 21.25 |

<sup>4</sup>To match pin diameter in rod eye and cap, when an oversize rod is required, specify rod end style '3', 'CC' thread and 'A' thread length for the standard rod diameter (Rod No. 1 for the bore), and 'WF' for the oversize rod. Order the rod eye and clevis bracket for the required bore size from the tables on the Style SE Spherical Bearing Accessories page.

**Style SE – Recommended maximum swivel angle on each side of the cylinder centerline.**

| Bore<br>Ø | Head End Mounted |           | Cap End Mounted |           |
|-----------|------------------|-----------|-----------------|-----------|
|           | Angle a          | Tan. of a | Angle a         | Tan. of a |
| 7.00      | 3.00°            | 0.052     | 3.00°           | 0.052     |
| 8.00      | 3.00°            | 0.052     | 3.00°           | 0.052     |

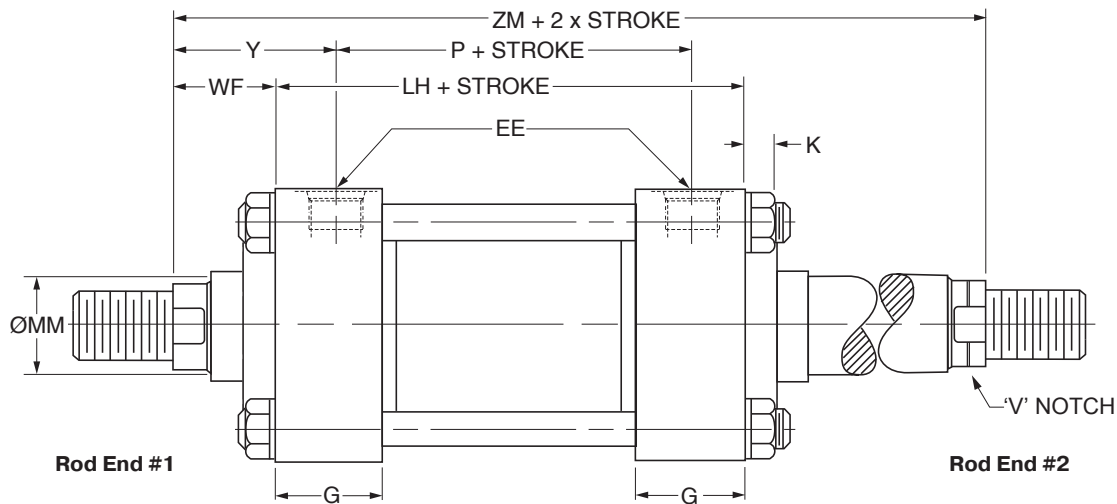
Note: Dimension X is the maximum off center mounting of the cylinder. To determine dimension X for various stroke lengths multiply the distance between pivot pin holes by tangent of angle a. For extended position use  $X = XL + 2X \text{ stroke}$ .

**Mounting Information****Head End Mounting****Cap End Mounting**

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**Double Rod Cylinder**  
**Style K**



**Double Rod End Mounting Styles**

See Mounting Groups page in Section H for guidance on double rod end cylinder mounting style selection.

| Mounting Styles for Single Rod Models | Mounting Styles for Corresponding Double Rod Models <sup>1</sup> |                                                      | Dimensions Shown on This Page Supplement Dimensions on 7.00" - 8.00" Bore Pages Listed Below |
|---------------------------------------|------------------------------------------------------------------|------------------------------------------------------|----------------------------------------------------------------------------------------------|
|                                       | Load Connected To Rod On Cylinder Mounting End                   | Load Connected To Rod Opposite Cylinder Mounting End |                                                                                              |
| TB                                    | KTB                                                              | KTC                                                  | 72                                                                                           |
| TD                                    | KTD                                                              | KTD                                                  | 72                                                                                           |
| J                                     | KJ                                                               | KH                                                   | 73                                                                                           |
| JB                                    | KJB                                                              | KHB                                                  | 74                                                                                           |
| JJ                                    | KJJ                                                              | KHH                                                  | 75                                                                                           |
| C                                     | KC                                                               | KC                                                   | 78                                                                                           |
| F                                     | KF                                                               | KF                                                   | 78                                                                                           |
| D                                     | KD                                                               | KDB                                                  | 80                                                                                           |
| DD                                    | KDD <sup>2</sup>                                                 | KDD <sup>2</sup>                                     | 82                                                                                           |
| DE                                    | KDE <sup>2</sup>                                                 | KDE <sup>2</sup>                                     | 83                                                                                           |

<sup>1</sup> Connect load to piston rod without 'V' notch. If only one end of the Double Rod Cylinder is to be cushioned, be sure to clearly specify which end this will be.

<sup>2</sup> Specify XI dimension for Styles DD & DE from #1 rod end (without 'V' notch).

| Bore Ø                                  | Rod No.  | MM Rod Ø | WF   | Add Stroke      |      |      | Add 2X Stroke   |
|-----------------------------------------|----------|----------|------|-----------------|------|------|-----------------|
|                                         |          |          |      | LH              | SNK  | SSK  |                 |
| 7.00                                    | 1 (std.) | 3.00     | 2.25 | 8.50            | 5.38 | 5.75 | 13.00           |
|                                         | 2        | 5.00     | 2.25 | 8.50            | 5.38 | 5.75 | 13.00           |
|                                         | 3        | 3.50     | 2.25 | 8.50            | 5.38 | 5.75 | 13.00           |
|                                         | 4        | 4.00     | 2.25 | 8.50            | 5.38 | 5.75 | 13.00           |
|                                         | 5        | 4.50     | 2.25 | 8.50            | 5.38 | 5.75 | 13.00           |
| 8.00                                    | 1 (std.) | 3.50     | 2.25 | 9.50            | 6.13 | 6.75 | 14.00           |
|                                         | 2        | 5.50     | 2.25 | 9.50            | 6.13 | 6.75 | 14.00           |
|                                         | 3        | 4.00     | 2.25 | 9.50            | 6.13 | 6.75 | 14.00           |
|                                         | 4        | 4.50     | 2.25 | 9.50            | 6.13 | 6.75 | 14.00           |
|                                         | 5        | 5.00     | 2.25 | 9.50            | 6.13 | 6.75 | 14.00           |
| Replaces On single rod mounting styles: |          |          |      | LG              | SN   | SS   | —               |
|                                         |          |          |      | All Mtg. Styles | F    | C    | All Mtg. Styles |

**How to Use Double Rod Cylinder Dimension Drawings**

To determine dimensions for a double rod cylinder, first refer to the desired single rod mounting style cylinder shown on preceding pages of this catalog. (See table above.) After selecting necessary dimensions from that drawing, return to this page supplement the single rod dimensions with those shown on drawing at right and dimension table below. Note that double rod cylinders have a head (Dim. G) at both ends and that dimension LH replaces LG. The double rod

dimensions differ from, or are in addition to those for single rod cylinders shown on preceding pages and provide the information needed to completely dimension a double rod cylinder.

On a double rod cylinder where the two rod ends are different, be sure to clearly state which rod end is to be assembled at which end. Port position 1 is standard. If other than standard, specify pos. 2, 3 or 4 when viewed from rod end #1 only. See port position information in Section H.

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**Notes**

Series 3HD 7.00" & 8.00"  
Bore



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## Section D

### Series 2HB 1.50" - 6.00" / 3HB 7.00" and 8.00" Bore Heavy Duty Hydraulic Cylinders

|                                        | 2HB 1.50"-6.00" Bore | 3HB 7.00" & 8.00" Bore |
|----------------------------------------|----------------------|------------------------|
| Performance                            | 88                   | 88                     |
| Specifications, Mounting Styles        | 89                   | 89                     |
| Rod End Styles and Dimensions          | 90-91                | 103                    |
| T Mount Dimensions                     | 92                   | 104                    |
| C Mount Dimensions                     | 93                   | 104                    |
| JJ Mount Dimensions                    | 94                   | 105                    |
| HH Mount Dimensions                    | 95                   | 105                    |
| BB Mount Dimensions                    | 96                   | 106                    |
| D Mount Dimensions                     | 97                   | 107                    |
| DB Mount Dimensions                    | 98                   | 108                    |
| DD Mount Dimensions                    | 99                   | —                      |
| DE Mount Dimensions                    | 99                   | 109                    |
| Style SB Spherical Bearing Mounting    | 100                  | —                      |
| Style SE Spherical Bearing Mounting    | 101                  | 110                    |
| Double Rod Cylinders / Gland Retention | 102                  | 111                    |
| 3HB 8" Bore Threaded Flange            | —                    | 112                    |

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## Parker Series 2HB 1.50" - 6.00" and 3HB 7.00" & 8.00" Bore Heavy Duty Hydraulic Cylinders

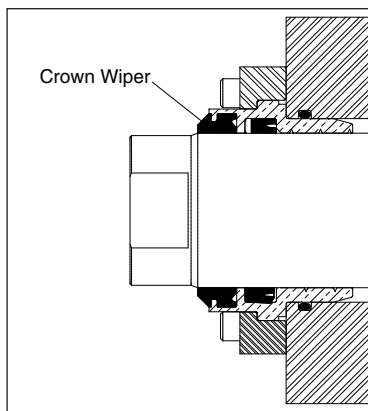
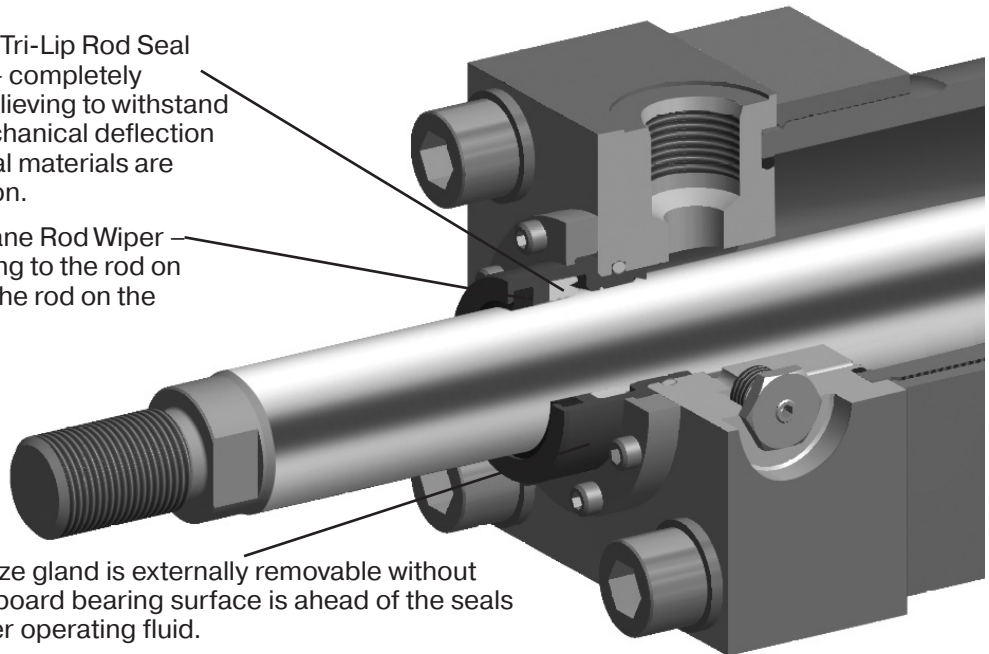
Series 2HB 1.50"-6.00" and 3HB 7.00" & 8.00" bore cylinders are envelope pressure rated at 3,000 psi across the entire bore size and mounting style range. Non-tie rod construction with bolt-on gland and robust Tri-Lip rod sealing system offer superior performance. Head and cap are bolted to flanges that are threaded to each end of the cylinder body and offer several lifetime ownership advantages.

- Improved fatigue life compared to welded flange construction
- Easier to service than tie rod styles
- Clean appearance improves machine aesthetics
- Lower weight in longer strokes

**Primary Seal** – Polyurethane Tri-Lip Rod Seal is a proven leak proof design – completely self-compensating and self-relieving to withstand variations and conform to mechanical deflection that may occur. Alternative seal materials are available to suit your application.

**Secondary Seal** – Polyurethane Rod Wiper wipes clean any oil film adhering to the rod on the extend stroke and cleans the rod on the return stroke.

**Rod Gland Assembly** – Bronze gland is externally removable without cylinder disassembly. Long inboard bearing surface is ahead of the seals assuring lubrication by cylinder operating fluid.



**Parker Crown Wiper™ for Series 2HB 1.50"-6.00" and 3HB 7.00" & 8.00" bore** – For environments that contain fine abrasive particulate specify the Crown Wiper option. The Crown Wiper is a proven superior alternative to piston rod end boots or metallic wipers that can ingest particulate. It has a sharp leading edge to effectively clean the piston rod and a beveled shape to prevent contaminant intrusion by channeling it away from the gland. It also acts as a secondary seal to wipe clean any oil film adhering to the rod on the extend stroke.

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**Standard Specifications**

- Heavy Duty Service – ANSI/(NFPA) T3.6.7R3 - 2009 Specifications and Mounting Dimension Standards
- Standard Construction – Square Head – Bolted Design
- Nominal Pressure – 3000 psi<sup>1</sup>
- Standard Fluid – Hydraulic Oil
- Standard Temperature – -10°F to +165°F<sup>2</sup>
- Bore Diameters – 1.50" through 8.00"

*In line with our policy of continuing product improvement, specifications in this catalog are subject to change.*

Note: Series 2HB and 3HB Hydraulic Cylinders fully meet ANSI/(NFPA) T3.6.7R3 - 2009 Specifications and Mounting Dimension Standards for Square Head Industrial Fluid Power Cylinders.

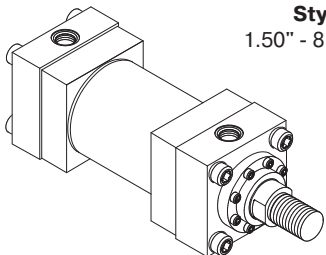
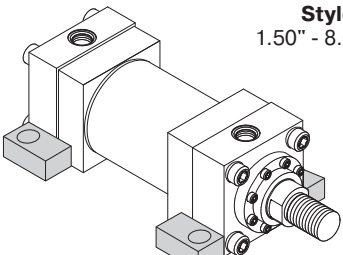
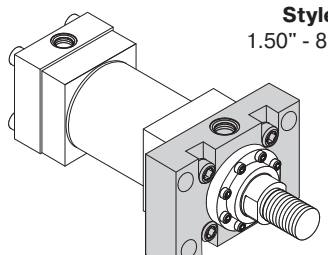
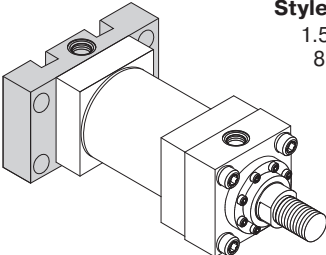
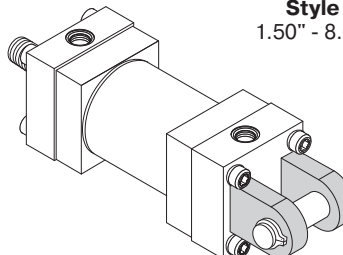
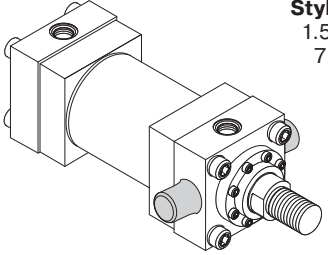
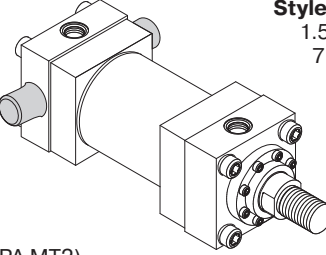
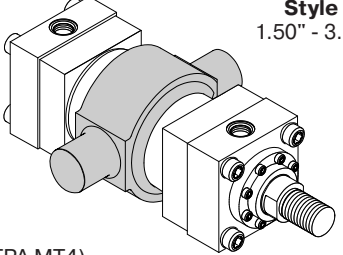
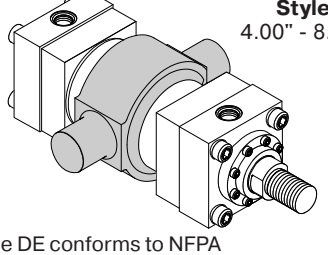
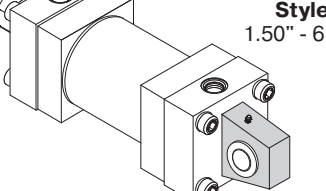
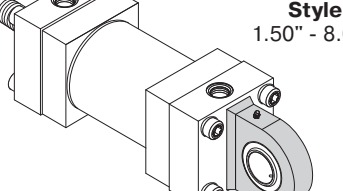
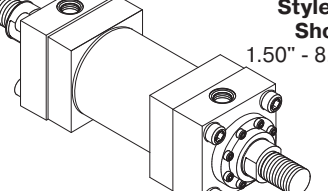
- Piston Rod Diameter – 0.625" through 5.500"
- Mounting Styles – 11 standard styles at various application ratings
- Strokes – Available in any practical stroke length. See 2H & 3H Family Model Number / How to Order page for Series 2HB & 3HB minimum stroke lengths.
- Cushions – Optional at either end or both ends of stroke. "Float Check" standard at cap end of 1.50" - 6.00" bore.
- Rod Ends – Four Standard Choices – Specials to Order

<sup>1</sup> If hydraulic operating pressure exceeds 3000 psi, send application data for engineering evaluation and recommendation. See Section H for actual design factors.

<sup>2</sup> See Section H for higher temperature service.

**Available Mounting Styles**

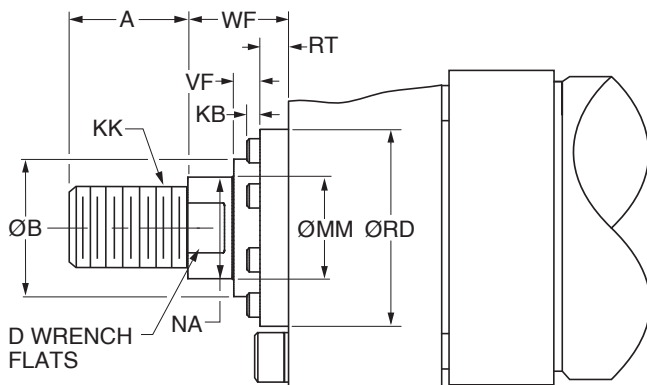
Most of the illustrated mounting styles below are available in double rod cylinders.

|                                                                                                                                                                       |                                                                                                                                                                                   |                                                                                                                                                                                                                             |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Basic</p> <p><b>Style T</b><br/>1.50" - 8.00"</p>  <p>(NFPA MX0)</p>              | <p>Side Lug</p> <p><b>Style C</b><br/>1.50" - 8.00"</p>  <p>(NFPA MS2)</p>                       | <p>Head Rectangular</p> <p><b>Style JJ</b><br/>1.50" - 8.00"</p>  <p>(NFPA ME5)</p>                                                      |
| <p>Cap Rectangular</p> <p><b>Style HH</b><br/>1.50" - 8.00"</p>  <p>(NFPA ME6)</p> | <p>Cap Fixed Clevis</p> <p><b>Style BB</b><br/>1.50" - 8.00"</p>  <p>(NFPA MP1)</p>            | <p>Head Trunnion</p> <p><b>Style D</b><br/>1.50" - 7.00"</p>  <p>(NFPA MT1)</p>                                                        |
| <p>Cap Trunnion</p> <p><b>Style DB</b><br/>1.50" - 7.00"</p>  <p>(NFPA MT2)</p>    | <p>Intermediate Fixed Trunnion</p> <p><b>Style DD</b><br/>1.50" - 3.25"</p>  <p>(NFPA MT4)</p> | <p>HD Intermediate Fixed Trunnion</p> <p><b>Style DE</b><br/>4.00" - 8.00"</p>  <p>Style DE conforms to NFPA dimensional standard.</p> |
| <p>Spherical Bearing</p> <p><b>Style SB</b><br/>1.50" - 6.00"</p>                  | <p>HD Spherical Bearing</p> <p><b>Style SE</b><br/>1.50" - 8.00"</p>                           | <p>Double Rod Cylinders</p> <p><b>Style KT Shown</b><br/>1.50" - 8.00"</p>                                                             |

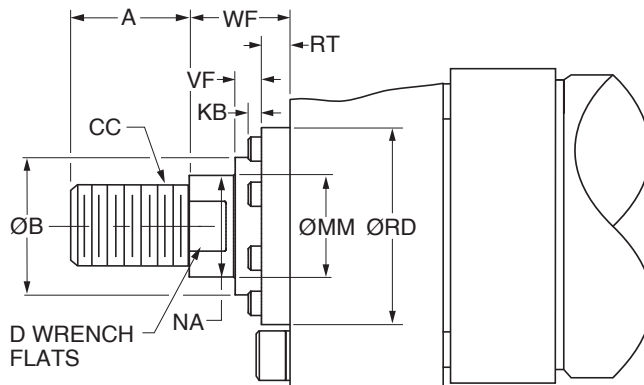
**⚠ PROP 65 WARNING** WARNING: This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

### Rod End Dimensions – circular bolt-on retainer construction

### Thread Style 4 (NFPA Style SM) Small Male



### Thread Style 8 (NFPA Style IM) Intermediate Male



See Gland Retention page to determine which bore, rod and mounting style combinations have circular bolt-on retainers and which have tie rod retained glands.

## Rod End Dimensions

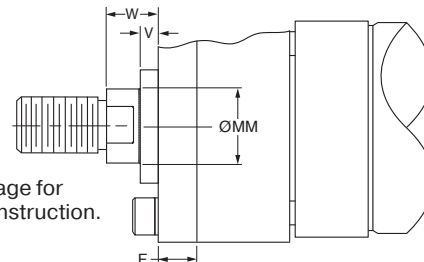
| Bore Ø | Rod No.  | MM Rod Ø | Thread        |               | A    | B Ø<br>+.000<br>-.002 | D    | F    | KB   | NA   | RD   | RT   | V    | VF   | W    | WF   |
|--------|----------|----------|---------------|---------------|------|-----------------------|------|------|------|------|------|------|------|------|------|------|
|        |          |          | Style 8<br>CC | Style 4<br>KK |      |                       |      |      |      |      |      |      |      |      |      |      |
| 1.50   | 1 (Std.) | 0.625    | 1/2-20        | 7/16-20       | 0.75 | 1.124                 | 0.50 | 0.38 | 0.03 | 0.56 | 1.94 | 0.36 | 0.25 | 0.27 | 0.63 | 1.00 |
|        | 2        | 1.000    | 7/8-14        | 3/4-16        | 1.13 | 1.499                 | 0.88 | 0.38 | 0.03 | 0.94 | 2.38 | 0.36 | 0.50 | 0.52 | 1.00 | 1.38 |
| 2.00   | 1 (Std.) | 1.000    | 7/8-14        | 3/4-16        | 1.13 | 1.499                 | 0.88 | 0.63 | 0.03 | 0.94 | 2.38 | 0.36 | 0.25 | 0.52 | 0.75 | 1.38 |
|        | 2        | 1.375    | 1 1/4-12      | 1-14          | 1.63 | 1.999                 | 1.13 | 0.63 | 0.19 | 1.31 | 2.87 | 0.36 | 0.38 | 0.64 | 1.00 | 1.63 |
| 2.50   | 1 (Std.) | 1.000    | 7/8-14        | 3/4-16        | 1.13 | 1.499                 | 0.88 | 0.63 | 0.03 | 0.94 | 2.38 | 0.36 | 0.25 | 0.52 | 0.75 | 1.38 |
|        | 2        | 1.750    | 1 1/2-12      | 1 1/4-12      | 2.00 | 2.374                 | 1.50 | 0.63 | 0.03 | 1.69 | 3.47 | 0.60 | 0.50 | 0.53 | 1.25 | 1.88 |
|        | 3        | 1.375    | 1 1/4-12      | 1-14          | 1.63 | 1.999                 | 1.13 | 0.63 | 0.19 | 1.31 | 2.87 | 0.36 | 0.38 | 0.64 | 1.00 | 1.63 |
| 3.25   | 1 (Std.) | 1.375    | 1 1/4-12      | 1-14          | 1.63 | 1.999                 | 1.13 | 0.75 | 0.19 | 1.31 | 2.87 | 0.36 | 0.25 | 0.64 | 0.88 | 1.63 |
|        | 2        | 2.000    | 1 3/4-12      | 1 1/2-12      | 2.25 | 2.624                 | 1.69 | 0.75 | 0.13 | 1.94 | 3.72 | 0.60 | 0.38 | 0.53 | 1.25 | 2.00 |
|        | 3        | 1.750    | 1 1/2-12      | 1 1/4-12      | 2.00 | 2.374                 | 1.50 | 0.75 | 0.03 | 1.69 | 3.47 | 0.60 | 0.38 | 0.53 | 1.13 | 1.88 |
| 4.00   | 1 (Std.) | 1.750    | 1 1/2-12      | 1 1/4-12      | 2.00 | 2.374                 | 1.50 | 0.88 | 0.03 | 1.69 | 3.47 | 0.60 | 0.25 | 0.53 | 1.00 | 1.88 |
|        | 2        | 2.500    | 2 1/4-12      | 1 7/8-12      | 3.00 | 3.124                 | 2.06 | 0.88 | 0.25 | 2.38 | 4.25 | 0.60 | 0.38 | 0.65 | 1.38 | 2.25 |
|        | 3        | 2.000    | 1 3/4-12      | 1 1/2-12      | 2.25 | 2.624                 | 1.69 | 0.88 | 0.13 | 1.94 | 3.72 | 0.60 | 0.25 | 0.53 | 1.13 | 2.00 |
| 5.00   | 1 (Std.) | 2.000    | 1 3/4-12      | 1 1/2-12      | 2.25 | 2.624                 | 1.69 | 0.88 | 0.13 | 1.94 | 3.72 | 0.60 | 0.25 | 0.53 | 1.13 | 2.00 |
|        | 2        | 3.500    | 3 1/4-12      | 2 1/2-12      | 3.50 | 4.249                 | 3.00 | 0.88 | -    | 3.38 | 5.76 | 0.91 | 0.38 | 0.34 | 1.38 | 2.25 |
|        | 3        | 2.500    | 2 1/4-12      | 1 7/8-12      | 3.00 | 3.124                 | 2.06 | 0.88 | 0.25 | 2.38 | 4.25 | 0.60 | 0.38 | 0.65 | 1.38 | 2.25 |
|        | 4        | 3.000    | 2 3/4-12      | 2 1/4-12      | 3.50 | 3.749                 | 2.63 | 0.88 | -    | 2.88 | 5.26 | 0.85 | 0.38 | 0.41 | 1.38 | 2.25 |
| 6.00   | 1 (Std.) | 2.500    | 2 1/4-12      | 1 7/8-12      | 3.00 | 3.124                 | 2.06 | 1.00 | 0.25 | 2.38 | 4.25 | 0.60 | 0.25 | 0.65 | 1.25 | 2.25 |
|        | 2        | 4.000    | 3 3/4-12      | 3-12          | 4.00 | 4.749                 | 3.38 | 1.00 | -    | 3.88 | 6.31 | 0.91 | 0.25 | 0.34 | 1.25 | 2.25 |
|        | 3        | 3.000    | 2 3/4-12      | 2 1/4-12      | 3.50 | 3.749                 | 2.63 | 1.00 | -    | 2.88 | 5.26 | 0.85 | 0.25 | 0.41 | 1.25 | 2.25 |
|        | 4        | 3.500    | 3 1/4-12      | 2 1/2-12      | 3.50 | 4.249                 | 3.00 | 1.00 | -    | 3.38 | 5.76 | 0.91 | 0.25 | 0.34 | 1.25 | 2.25 |

### “Special” Thread Style 3

Special thread, extension, rod eye, blank, etc., are also available.

To order, specify "Style 3" and give desired dimensions for KK, A, W or WF. If otherwise special, furnish dimensioned sketch.

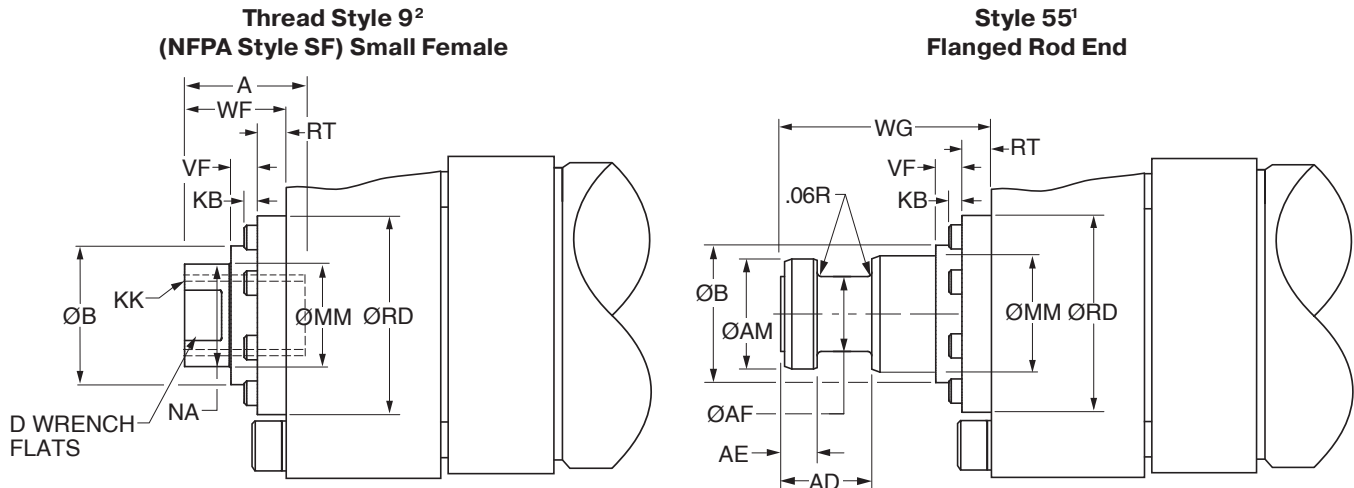
## Tie Rod Retained Gland



See Gland Retention page for styles that have this construction.



**WARNING:** This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**Piston Rod Ends****Heavy Duty Hydraulic Cylinders  
Series 2HB 1.50" - 6.00" Bore****Rod End Dimensions – circular bolt-on retainer construction**

See Gland Retention page to determine which bore, rod and mounting style combinations have circular bolt-on retainers and which have tie rod retained glands.

**Rod End Dimensions**

| Bore Ø | Rod No.  | MM Rod Ø | Thread Style 9 KK | A    | AD   | AE<br>+.001<br>-.001 | AF<br>Ø | AM<br>Ø | B Ø<br>+.000<br>-.002 | D    | KB   | NA   | RD   | RT   | VF   | WF   | WG   |
|--------|----------|----------|-------------------|------|------|----------------------|---------|---------|-----------------------|------|------|------|------|------|------|------|------|
| 1.50   | 1 (Std.) | 0.625    | 7/16-20           | 0.75 | 0.63 | 0.249                | 0.38    | 0.57    | 1.124                 | 0.50 | 0.03 | 0.56 | 1.94 | 0.36 | 0.27 | 1.00 | 1.75 |
|        | 2        | 1.000    | 3/4-16            | 1.13 | 0.94 | 0.374                | 0.69    | 0.95    | 1.499                 | 0.88 | 0.03 | 0.94 | 2.38 | 0.36 | 0.52 | 1.38 | 2.38 |
| 2.00   | 1 (Std.) | 1.000    | 3/4-16            | 1.13 | 0.94 | 0.374                | 0.69    | 0.95    | 1.499                 | 0.88 | 0.03 | 0.94 | 2.38 | 0.36 | 0.52 | 1.38 | 2.38 |
|        | 2        | 1.375    | 1-14              | 1.63 | 1.06 | 0.374                | 0.88    | 1.32    | 1.999                 | 1.13 | 0.19 | 1.31 | 2.87 | 0.36 | 0.64 | 1.63 | 2.75 |
| 2.50   | 1 (Std.) | 1.000    | 3/4-16            | 1.13 | 0.94 | 0.374                | 0.69    | 0.95    | 1.499                 | 0.88 | 0.03 | 0.94 | 2.38 | 0.36 | 0.52 | 1.38 | 2.38 |
|        | 2        | 1.750    | 1 1/4-12          | 2.00 | 1.31 | 0.499                | 1.13    | 1.70    | 2.374                 | 1.50 | 0.03 | 1.69 | 3.47 | 0.60 | 0.53 | 1.88 | 3.13 |
|        | 3        | 1.375    | 1-14              | 1.63 | 1.06 | 0.374                | 0.88    | 1.32    | 1.999                 | 1.13 | 0.19 | 1.31 | 2.87 | 0.36 | 0.64 | 1.63 | 2.75 |
| 3.25   | 1 (Std.) | 1.375    | 1-14              | 1.63 | 1.06 | 0.374                | 0.88    | 1.32    | 1.999                 | 1.13 | 0.19 | 1.31 | 2.87 | 0.36 | 0.64 | 1.63 | 2.75 |
|        | 2        | 2.000    | 1 1/2-12          | 2.25 | 1.69 | 0.624                | 1.38    | 1.95    | 2.624                 | 1.69 | 0.13 | 1.94 | 3.72 | 0.60 | 0.53 | 2.00 | 3.75 |
|        | 3        | 1.750    | 1 1/4-12          | 2.00 | 1.31 | 0.499                | 1.13    | 1.70    | 2.374                 | 1.50 | 0.03 | 1.69 | 3.47 | 0.60 | 0.53 | 1.88 | 3.13 |
| 4.00   | 1 (Std.) | 1.750    | 1 1/4-12          | 2.00 | 1.31 | 0.499                | 1.13    | 1.70    | 2.374                 | 1.50 | 0.03 | 1.69 | 3.47 | 0.60 | 0.53 | 1.88 | 3.13 |
|        | 2        | 2.500    | 1 7/8-12          | 3.00 | 1.94 | 0.749                | 1.75    | 2.45    | 3.124                 | 2.06 | 0.25 | 2.38 | 4.25 | 0.60 | 0.65 | 2.25 | 4.50 |
|        | 3        | 2.000    | 1 1/2-12          | 2.25 | 1.69 | 0.624                | 1.38    | 1.95    | 2.624                 | 1.69 | 0.13 | 1.94 | 3.72 | 0.60 | 0.53 | 2.00 | 3.75 |
| 5.00   | 1 (Std.) | 2.000    | 1 1/2-12          | 2.25 | 1.69 | 0.624                | 1.38    | 1.95    | 2.624                 | 1.69 | 0.13 | 1.94 | 3.72 | 0.60 | 0.53 | 2.00 | 3.75 |
|        | 2        | 3.500    | 2 1/2-12          | 3.50 | 2.69 | 0.999                | 2.50    | 3.45    | 4.249                 | 3.00 | -    | 3.38 | 5.76 | 0.91 | 0.34 | 2.25 | 5.63 |
|        | 3        | 2.500    | 1 7/8-12          | 3.00 | 1.94 | 0.749                | 1.75    | 2.45    | 3.124                 | 2.06 | 0.25 | 2.38 | 4.25 | 0.60 | 0.65 | 2.25 | 4.50 |
|        | 4        | 3.000    | 2 1/4-12          | 3.50 | 2.44 | 0.874                | 2.25    | 2.95    | 3.749                 | 2.63 | -    | 2.88 | 5.26 | 0.85 | 0.41 | 2.25 | 4.88 |
| 6.00   | 1 (Std.) | 2.500    | 1 7/8-12          | 3.00 | 1.94 | 0.749                | 1.75    | 2.45    | 3.124                 | 2.06 | 0.25 | 2.38 | 4.25 | 0.60 | 0.65 | 2.25 | 4.50 |
|        | 2        | 4.000    | 3-12              | 4.00 | 2.69 | 0.999                | 3.00    | 3.95    | 4.749                 | 3.38 | -    | 3.88 | 6.31 | 0.91 | 0.34 | 2.25 | 5.75 |
|        | 3        | 3.000    | 2 1/4-12          | 3.50 | 2.44 | 0.874                | 2.25    | 2.95    | 3.749                 | 2.63 | -    | 2.88 | 5.26 | 0.85 | 0.41 | 2.25 | 4.88 |
|        | 4        | 3.500    | 2 1/2-12          | 3.50 | 2.69 | 0.999                | 2.50    | 3.45    | 4.249                 | 3.00 | -    | 3.38 | 5.76 | 0.91 | 0.34 | 2.25 | 5.63 |

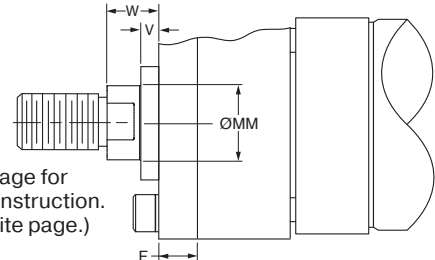
**“Special” Thread Style 3**

Special thread, extension, rod eye, blank, etc., are also available.

To order, specify “Style 3” and give desired dimensions for KK, A, W or WF. If otherwise special, furnish dimensioned sketch.

<sup>1</sup> For special WG dimension, specify “Style 3” and give desired dimension for WG. For other changes, place “S” in the model code, and describe rod end with dimensioned sketch.

<sup>2</sup> Style 9 stroke restrictions may apply. See Style 9 Minimum Stroke Table on How to Order page for details.

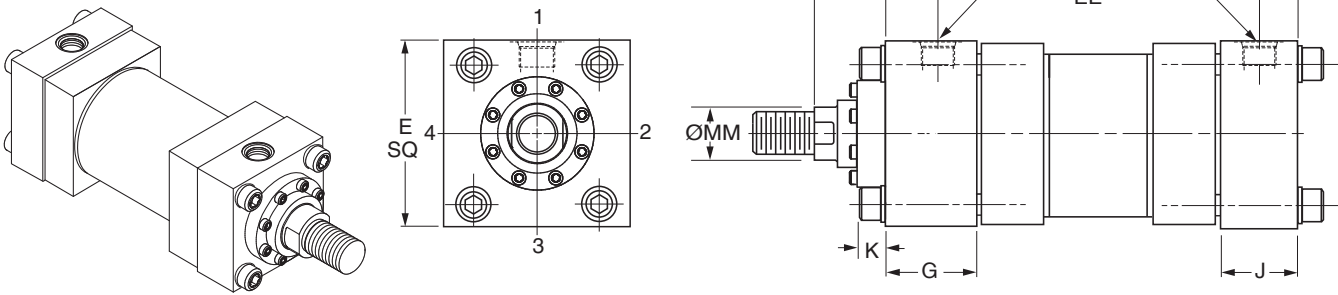
**Tie Rod Retained Gland**

See Gland Retention page for styles that have this construction. (Dimensions on opposite page.)

**⚠ PROP 65 WARNING** WARNING: This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)



**Basic Mounting**  
**Style T**  
(NFPA Style MX0)



**Style T – Dimensional and Mounting Data**

| Bore<br>Ø | Rod<br>No. | MM<br>Rod Ø | E    | EE                |                  | G    | J    | K<br>Max. | WF   | Y    | Add Stroke |      |      |
|-----------|------------|-------------|------|-------------------|------------------|------|------|-----------|------|------|------------|------|------|
|           |            |             |      | NPTF <sup>1</sup> | SAE <sup>2</sup> |      |      |           |      |      | LG         | P    | ZJ   |
| 1.50      | 1 (std.)   | 0.625       | 2.50 | 1/2               | 10               | 1.75 | 1.50 | 0.50      | 1.00 | 2.00 | 4.63       | 2.88 | 5.63 |
|           | 2          | 1.000       | 2.50 | 1/2               | 10               | 1.75 | 1.50 | 0.50      | 1.38 | 2.38 | 4.63       | 2.88 | 6.00 |
| 2.00      | 1 (std.)   | 1.000       | 3.00 | 1/2               | 10               | 1.75 | 1.50 | 0.67      | 1.38 | 2.38 | 4.63       | 2.88 | 6.00 |
|           | 2          | 1.375       | 3.00 | 1/2               | 10               | 1.75 | 1.50 | 0.67      | 1.63 | 2.63 | 4.63       | 2.88 | 6.25 |
| 2.50      | 1 (std.)   | 1.000       | 3.50 | 1/2               | 10               | 1.75 | 1.50 | 0.67      | 1.38 | 2.38 | 4.75       | 3.00 | 6.13 |
|           | 2          | 1.750       | 3.50 | 1/2               | 10               | 1.75 | 1.50 | 0.67      | 1.88 | 2.88 | 4.75       | 3.00 | 6.63 |
|           | 3          | 1.375       | 3.50 | 1/2               | 10               | 1.75 | 1.50 | 0.67      | 1.63 | 2.63 | 4.75       | 3.00 | 6.38 |
| 3.25      | 1 (std.)   | 1.375       | 4.50 | 3/4               | 12               | 2.00 | 1.75 | 0.83      | 1.63 | 2.75 | 5.50       | 3.50 | 7.13 |
|           | 2          | 2.000       | 4.50 | 3/4               | 12               | 2.00 | 1.75 | 0.83      | 2.00 | 3.13 | 5.50       | 3.50 | 7.50 |
|           | 3          | 1.750       | 4.50 | 3/4               | 12               | 2.00 | 1.75 | 0.83      | 1.88 | 3.00 | 5.50       | 3.50 | 7.38 |
| 4.00      | 1 (std.)   | 1.750       | 5.00 | 3/4               | 12               | 2.00 | 1.75 | 0.83      | 1.88 | 3.00 | 5.75       | 3.75 | 7.63 |
|           | 2          | 2.500       | 5.00 | 3/4               | 12               | 2.00 | 1.75 | 0.83      | 2.25 | 3.38 | 5.75       | 3.75 | 8.00 |
|           | 3          | 2.000       | 5.00 | 3/4               | 12               | 2.00 | 1.75 | 0.83      | 2.00 | 3.13 | 5.75       | 3.75 | 7.75 |
| 5.00      | 1 (std.)   | 2.000       | 6.50 | 3/4               | 12               | 2.00 | 1.75 | 1.11      | 2.00 | 3.13 | 6.25       | 4.25 | 8.25 |
|           | 2          | 3.500       | 6.50 | 3/4               | 12               | 2.00 | 1.75 | 1.11      | 2.25 | 3.38 | 6.25       | 4.25 | 8.50 |
|           | 3          | 2.500       | 6.50 | 3/4               | 12               | 2.00 | 1.75 | 1.11      | 2.25 | 3.38 | 6.25       | 4.25 | 8.50 |
|           | 4          | 3.000       | 6.50 | 3/4               | 12               | 2.00 | 1.75 | 1.11      | 2.25 | 3.38 | 6.25       | 4.25 | 8.50 |
| 6.00      | 1 (std.)   | 2.500       | 7.50 | 1                 | 16               | 2.25 | 2.25 | 1.25      | 2.25 | 3.50 | 7.38       | 4.88 | 9.63 |
|           | 2          | 4.000       | 7.50 | 1                 | 16               | 2.25 | 2.25 | 1.25      | 2.25 | 3.50 | 7.38       | 4.88 | 9.63 |
|           | 3          | 3.000       | 7.50 | 1                 | 16               | 2.25 | 2.25 | 1.25      | 2.25 | 3.50 | 7.38       | 4.88 | 9.63 |
|           | 4          | 3.500       | 7.50 | 1                 | 16               | 2.25 | 2.25 | 1.25      | 2.25 | 3.50 | 7.38       | 4.88 | 9.63 |

<sup>1</sup>NPTF ports are available at no extra charge.

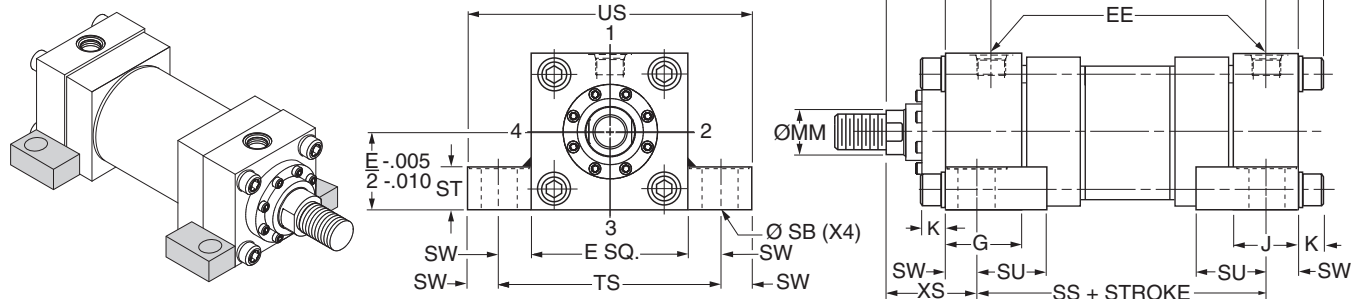
<sup>2</sup>SAE straight thread ports are standard and are indicated by port number.

**⚠ PROP 65 WARNING** **WARNING:** This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**Mounting Information****Heavy Duty Hydraulic Cylinders  
Series 2HB 1.50" - 6.00" Bore****Side Lug Mounting**

Style C

(NFPA Style MS2)

**Style C – Dimensional and Mounting Data**

| Bore<br>Ø | E    | EE                |                  | G    | J    | K<br>Max. | SB <sup>3</sup><br>Ø | ST   | SU   | SW   | TS   | US    | Add Stroke |      |      |
|-----------|------|-------------------|------------------|------|------|-----------|----------------------|------|------|------|------|-------|------------|------|------|
|           |      | NPTF <sup>1</sup> | SAE <sup>2</sup> |      |      |           |                      |      |      |      |      |       | LG         | P    | SS   |
| 1.50      | 2.50 | 1/2               | 10               | 1.75 | 1.50 | 0.50      | 0.44                 | 0.50 | 0.94 | 0.38 | 3.25 | 4.00  | 4.63       | 2.88 | 3.88 |
| 2.00      | 3.00 | 1/2               | 10               | 1.75 | 1.50 | 0.67      | 0.56                 | 0.75 | 1.25 | 0.50 | 4.00 | 5.00  | 4.63       | 2.88 | 3.63 |
| 2.50      | 3.50 | 1/2               | 10               | 1.75 | 1.50 | 0.67      | 0.81                 | 1.00 | 1.56 | 0.69 | 4.88 | 6.25  | 4.75       | 3.00 | 3.38 |
| 3.25      | 4.50 | 3/4               | 12               | 2.00 | 1.75 | 0.83      | 0.81                 | 1.00 | 1.56 | 0.69 | 5.88 | 7.25  | 5.50       | 3.50 | 4.13 |
| 4.00      | 5.00 | 3/4               | 12               | 2.00 | 1.75 | 0.83      | 1.06                 | 1.25 | 2.00 | 0.88 | 6.75 | 8.50  | 5.75       | 3.75 | 4.00 |
| 5.00      | 6.50 | 3/4               | 12               | 2.00 | 1.75 | 1.11      | 1.06                 | 1.25 | 2.00 | 0.88 | 8.25 | 10.00 | 6.25       | 4.25 | 4.50 |
| 6.00      | 7.50 | 1                 | 16               | 2.25 | 2.25 | 1.25      | 1.31                 | 1.50 | 2.50 | 1.13 | 9.75 | 12.00 | 7.38       | 4.88 | 5.13 |

<sup>1</sup>NPTF ports are available at no extra charge.<sup>2</sup>SAE straight thread ports are standard and are indicated by port number.<sup>3</sup>Upper surface spot faced for socket head screws.**Style C – Dimensional and Mounting Data**

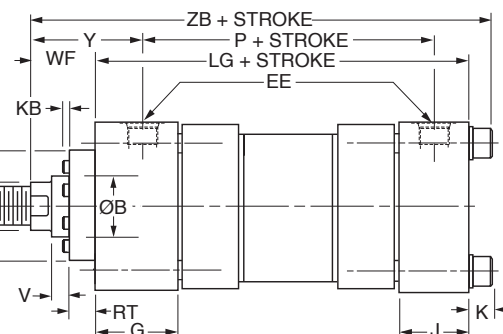
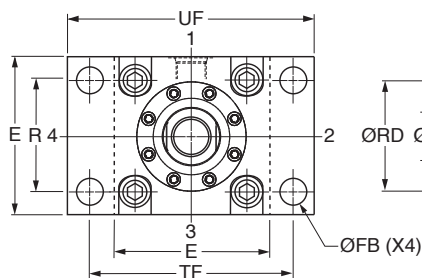
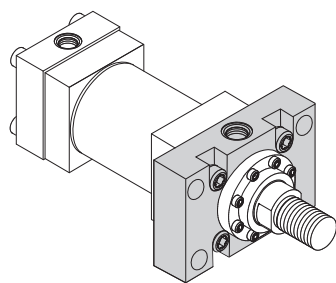
| Bore<br>Ø | Rod<br>No. | MM<br>Rod Ø | WF   | XS   | Y    | Add Stroke |
|-----------|------------|-------------|------|------|------|------------|
|           |            |             |      |      |      | ZB Max.    |
| 1.50      | 1 (std.)   | 0.625       | 1.00 | 1.38 | 2.00 | 6.13       |
|           | 2          | 1.000       | 1.38 | 1.75 | 2.38 | 6.50       |
| 2.00      | 1 (std.)   | 1.000       | 1.38 | 1.88 | 2.38 | 6.68       |
|           | 2          | 1.375       | 1.63 | 2.13 | 2.63 | 6.92       |
| 2.50      | 1 (std.)   | 1.000       | 1.38 | 2.06 | 2.38 | 6.80       |
|           | 2          | 1.750       | 1.88 | 2.56 | 2.88 | 7.30       |
|           | 3          | 1.375       | 1.63 | 2.31 | 2.63 | 7.05       |
| 3.25      | 1 (std.)   | 1.375       | 1.63 | 2.31 | 2.75 | 7.96       |
|           | 2          | 2.000       | 2.00 | 2.69 | 3.13 | 8.33       |
|           | 3          | 1.750       | 1.88 | 2.56 | 3.00 | 8.21       |
| 4.00      | 1 (std.)   | 1.750       | 1.88 | 2.75 | 3.00 | 8.46       |
|           | 2          | 2.500       | 2.25 | 3.13 | 3.38 | 8.83       |
|           | 3          | 2.000       | 2.00 | 2.88 | 3.13 | 8.58       |
| 5.00      | 1 (std.)   | 2.000       | 2.00 | 2.88 | 3.13 | 9.36       |
|           | 2          | 3.500       | 2.25 | 3.13 | 3.38 | 9.61       |
|           | 3          | 2.500       | 2.25 | 3.13 | 3.38 | 9.61       |
|           | 4          | 3.000       | 2.25 | 3.13 | 3.38 | 9.61       |
| 6.00      | 1 (std.)   | 2.500       | 2.25 | 3.38 | 3.50 | 10.88      |
|           | 2          | 4.000       | 2.25 | 3.38 | 3.50 | 10.88      |
|           | 3          | 3.000       | 2.25 | 3.38 | 3.50 | 10.88      |
|           | 4          | 3.500       | 2.25 | 3.38 | 3.50 | 10.88      |

**PROP 65 WARNING** WARNING: This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**Mounting Information****Heavy Duty Hydraulic Cylinders  
Series 2HB 1.50" - 6.00" Bore****Head Rectangular Mounting**

Style JJ

(NFPA Style ME5)

**Style JJ – Dimensional and Mounting Data**

| Bore<br>Ø | E    | EE                |                  | FB<br>Ø | G    | J    | K<br>Max. | R    | TF   | UF    | Add Stroke |      |
|-----------|------|-------------------|------------------|---------|------|------|-----------|------|------|-------|------------|------|
|           |      | NPTF <sup>1</sup> | SAE <sup>2</sup> |         |      |      |           |      |      |       | LG         | P    |
| 1.50      | 2.50 | 1/2               | 10               | 0.44    | 1.75 | 1.50 | 0.50      | 1.63 | 3.44 | 4.25  | 4.63       | 2.88 |
| 2.00      | 3.00 | 1/2               | 10               | 0.56    | 1.75 | 1.50 | 0.67      | 2.05 | 4.13 | 5.13  | 4.63       | 2.88 |
| 2.50      | 3.50 | 1/2               | 10               | 0.56    | 1.75 | 1.50 | 0.67      | 2.55 | 4.63 | 5.63  | 4.75       | 3.00 |
| 3.25      | 4.50 | 3/4               | 12               | 0.69    | 2.00 | 1.75 | 0.83      | 3.25 | 5.88 | 7.13  | 5.50       | 3.50 |
| 4.00      | 5.00 | 3/4               | 12               | 0.69    | 2.00 | 1.75 | 0.83      | 3.82 | 6.38 | 7.63  | 5.75       | 3.75 |
| 5.00      | 6.50 | 3/4               | 12               | 0.94    | 2.00 | 1.75 | 1.11      | 4.95 | 8.19 | 9.75  | 6.25       | 4.25 |
| 6.00      | 7.50 | 1                 | 16               | 1.06    | 2.25 | 2.25 | 1.25      | 5.73 | 9.44 | 11.25 | 7.38       | 4.88 |

<sup>1</sup>NPTF ports are available at no extra charge.<sup>2</sup>SAE straight thread ports are standard and are indicated by port number.**Style JJ – Dimensional and Mounting Data**

| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | B Ø<br>+ .000<br>- .002 | KB   | RD<br>Ø | RT   | V    | WF   | Y    | Add Stroke |  |
|-----------|------------|----------------|-------------------------|------|---------|------|------|------|------|------------|--|
|           |            |                |                         |      |         |      |      |      |      | ZB Max     |  |
| 1.50      | 1 (std.)   | 0.625          | 1.124                   | 0.03 | 1.94    | 0.36 | 0.27 | 1.00 | 2.00 | 6.13       |  |
|           | 2          | 1.000          | 1.499                   | 0.03 | 2.38    | 0.36 | 0.52 | 1.38 | 2.38 | 6.50       |  |
| 2.00      | 1 (std.)   | 1.000          | 1.499                   | 0.03 | 2.38    | 0.36 | 0.52 | 1.38 | 2.38 | 6.68       |  |
|           | 2          | 1.375          | 1.999                   | 0.19 | 2.87    | 0.36 | 0.64 | 1.63 | 2.63 | 6.92       |  |
| 2.50      | 1 (std.)   | 1.000          | 1.499                   | 0.03 | 2.38    | 0.36 | 0.52 | 1.38 | 2.38 | 6.80       |  |
|           | 2          | 1.750          | 2.374                   | 0.03 | 3.47    | 0.60 | 0.53 | 1.88 | 2.88 | 7.30       |  |
|           | 3          | 1.375          | 1.999                   | 0.19 | 2.87    | 0.36 | 0.64 | 1.63 | 2.63 | 7.05       |  |
| 3.25      | 1 (std.)   | 1.375          | 1.999                   | 0.19 | 2.87    | 0.36 | 0.64 | 1.63 | 2.75 | 7.96       |  |
|           | 2          | 2.000          | 2.624                   | 0.13 | 3.72    | 0.60 | 0.53 | 2.00 | 3.13 | 8.33       |  |
|           | 3          | 1.750          | 2.374                   | 0.03 | 3.47    | 0.60 | 0.53 | 1.88 | 3.00 | 8.21       |  |
| 4.00      | 1 (std.)   | 1.750          | 2.374                   | 0.03 | 3.47    | 0.60 | 0.53 | 1.88 | 3.00 | 8.46       |  |
|           | 2          | 2.500          | 3.124                   | 0.25 | 4.25    | 0.60 | 0.65 | 2.25 | 3.38 | 8.83       |  |
|           | 3          | 2.000          | 2.624                   | 0.13 | 3.72    | 0.60 | 0.53 | 2.00 | 3.13 | 8.58       |  |
| 5.00      | 1 (std.)   | 2.000          | 2.624                   | 0.13 | 3.72    | 0.60 | 0.53 | 2.00 | 3.13 | 9.36       |  |
|           | 2          | 3.500          | 4.249                   | -    | 5.76    | 0.91 | 0.34 | 2.25 | 3.38 | 9.61       |  |
|           | 3          | 2.500          | 3.124                   | 0.25 | 4.25    | 0.60 | 0.65 | 2.25 | 3.38 | 9.61       |  |
|           | 4          | 3.000          | 3.749                   | -    | 5.26    | 0.85 | 0.41 | 2.25 | 3.38 | 9.61       |  |
| 6.00      | 1 (std.)   | 2.500          | 3.124                   | 0.25 | 4.25    | 0.60 | 0.65 | 2.25 | 3.50 | 10.88      |  |
|           | 2          | 4.000          | 4.749                   | -    | 6.31    | 0.91 | 0.34 | 2.25 | 3.50 | 10.88      |  |
|           | 3          | 3.000          | 3.749                   | -    | 5.26    | 0.85 | 0.41 | 2.25 | 3.50 | 10.88      |  |
|           | 4          | 3.500          | 4.249                   | -    | 5.76    | 0.91 | 0.34 | 2.25 | 3.50 | 10.88      |  |

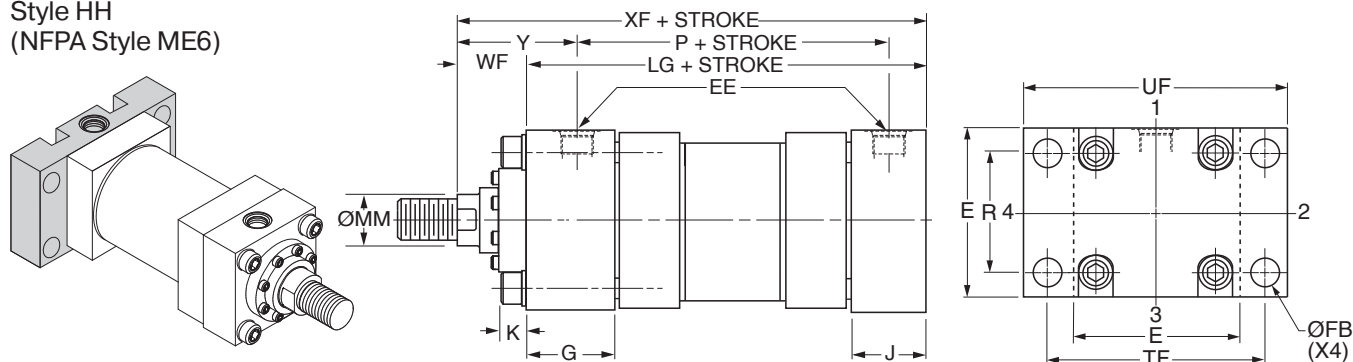
**⚠ PROP 65 WARNING** WARNING: This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)



**Mounting Information****Heavy Duty Hydraulic Cylinders  
Series 2HB 1.50" - 6.00" Bore****Cap Rectangular Flange Mounting**

Style HH

(NFA Style ME6)

**Style HH – Dimensional and Mounting Data**

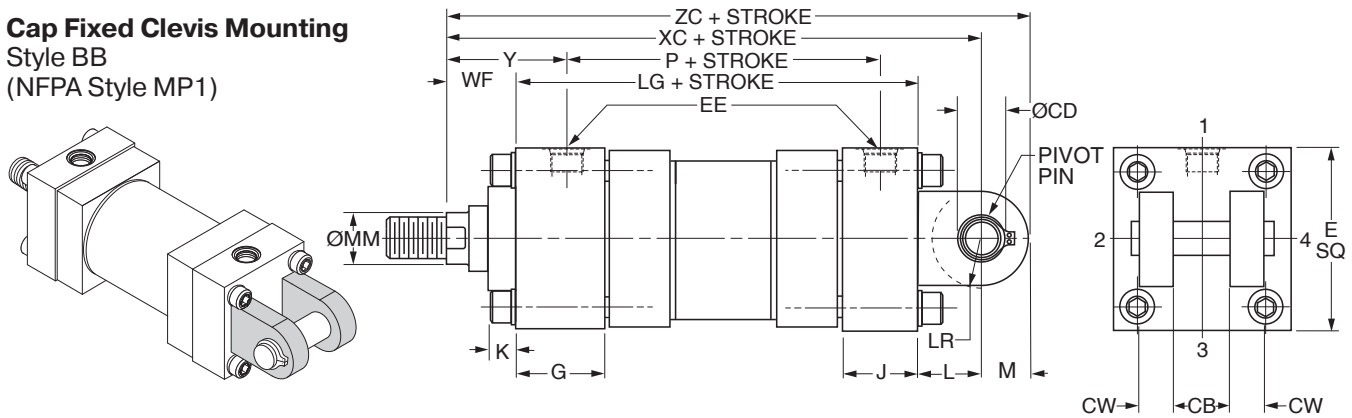
| Bore<br>Ø | E    | EE                |                  | FB<br>Ø | G    | J    | K<br>Max. | R    | TF   | UF    | Add Stroke |      |
|-----------|------|-------------------|------------------|---------|------|------|-----------|------|------|-------|------------|------|
|           |      | NPTF <sup>1</sup> | SAE <sup>2</sup> |         |      |      |           |      |      |       | LG         | P    |
| 1.50      | 2.50 | 1/2               | 10               | 0.44    | 1.75 | 1.50 | 0.50      | 1.63 | 3.44 | 4.25  | 4.63       | 2.88 |
| 2.00      | 3.00 | 1/2               | 10               | 0.56    | 1.75 | 1.50 | 0.67      | 2.05 | 4.13 | 5.13  | 4.63       | 2.88 |
| 2.50      | 3.50 | 1/2               | 10               | 0.56    | 1.75 | 1.50 | 0.67      | 2.55 | 4.63 | 5.63  | 4.75       | 3.00 |
| 3.25      | 4.50 | 3/4               | 12               | 0.69    | 2.00 | 1.75 | 0.83      | 3.25 | 5.88 | 7.13  | 5.50       | 3.50 |
| 4.00      | 5.00 | 3/4               | 12               | 0.69    | 2.00 | 1.75 | 0.83      | 3.82 | 6.38 | 7.63  | 5.75       | 3.75 |
| 5.00      | 6.50 | 3/4               | 12               | 0.94    | 2.00 | 1.75 | 1.11      | 4.95 | 8.19 | 9.75  | 6.25       | 4.25 |
| 6.00      | 7.50 | 1                 | 16               | 1.06    | 2.25 | 2.25 | 1.25      | 5.73 | 9.44 | 11.25 | 7.38       | 4.88 |

<sup>1</sup>NPTF ports are available at no extra charge.<sup>2</sup>SAE straight thread ports are standard and are indicated by port number.**Style HH – Dimensional and Mounting Data**

| Bore<br>Ø | Rod<br>No. | MM<br>Rod Ø | WF   | Y    | Add Stroke |
|-----------|------------|-------------|------|------|------------|
|           |            |             |      |      | XF         |
| 1.50      | 1 (std.)   | 0.625       | 1.00 | 2.00 | 5.63       |
|           | 2          | 1.000       | 1.38 | 2.38 | 6.00       |
| 2.00      | 1 (std.)   | 1.000       | 1.38 | 2.38 | 6.00       |
|           | 2          | 1.375       | 1.63 | 2.63 | 6.25       |
| 2.50      | 1 (std.)   | 1.000       | 1.38 | 2.38 | 6.13       |
|           | 2          | 1.750       | 1.88 | 2.88 | 6.63       |
|           | 3          | 1.375       | 1.63 | 2.63 | 6.38       |
| 3.25      | 1 (std.)   | 1.375       | 1.63 | 2.75 | 7.13       |
|           | 2          | 2.000       | 2.00 | 3.13 | 7.50       |
|           | 3          | 1.750       | 1.88 | 3.00 | 7.38       |
| 4.00      | 1 (std.)   | 1.750       | 1.88 | 3.00 | 7.63       |
|           | 2          | 2.500       | 2.25 | 3.38 | 8.00       |
|           | 3          | 2.000       | 2.00 | 3.13 | 7.75       |
| 5.00      | 1 (std.)   | 2.000       | 2.00 | 3.13 | 8.25       |
|           | 2          | 3.500       | 2.25 | 3.38 | 8.50       |
|           | 3          | 2.500       | 2.25 | 3.38 | 8.50       |
|           | 4          | 3.000       | 2.25 | 3.38 | 8.50       |
| 6.00      | 1 (std.)   | 2.500       | 2.25 | 3.50 | 9.63       |
|           | 2          | 4.000       | 2.25 | 3.50 | 9.63       |
|           | 3          | 3.000       | 2.25 | 3.50 | 9.63       |
|           | 4          | 3.500       | 2.25 | 3.50 | 9.63       |

**⚠ PROP 65 WARNING** WARNING: This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)



**Mounting Information****Heavy Duty Hydraulic Cylinders  
Series 2HB 1.50" - 6.00" Bore****Cap Fixed Clevis Mounting  
Style BB  
(NFA Style MP1)****Style BB – Dimensional and Mounting Data**

| Bore<br>Ø | E    | EE                |                  | CB   | CD <sup>3</sup> Ø<br>+.000<br>-.002 | CW   | G    | J    | K<br>Max. | L    | LR   | M    | Add Stroke |      |
|-----------|------|-------------------|------------------|------|-------------------------------------|------|------|------|-----------|------|------|------|------------|------|
|           |      | NPTF <sup>1</sup> | SAE <sup>2</sup> |      |                                     |      |      |      |           |      |      |      | LG         | P    |
| 1.50      | 2.50 | 1/2               | 10               | 0.75 | .501                                | 0.50 | 1.75 | 1.50 | 0.50      | 0.75 | 0.56 | 0.50 | 4.63       | 2.88 |
| 2.00      | 3.00 | 1/2               | 10               | 1.25 | .751                                | 0.63 | 1.75 | 1.50 | 0.67      | 1.25 | 1.00 | 0.75 | 4.63       | 2.88 |
| 2.50      | 3.50 | 1/2               | 10               | 1.25 | .751                                | 0.63 | 1.75 | 1.50 | 0.67      | 1.25 | 0.94 | 0.75 | 4.75       | 3.00 |
| 3.25      | 4.50 | 3/4               | 12               | 1.50 | 1.001                               | 0.75 | 2.00 | 1.75 | 0.83      | 1.50 | 1.25 | 1.00 | 5.50       | 3.50 |
| 4.00      | 5.00 | 3/4               | 12               | 2.00 | 1.376                               | 1.00 | 2.00 | 1.75 | 0.83      | 2.13 | 1.75 | 1.38 | 5.75       | 3.75 |
| 5.00      | 6.50 | 3/4               | 12               | 2.50 | 1.751                               | 1.25 | 2.00 | 1.75 | 1.11      | 2.25 | 2.06 | 1.75 | 6.25       | 4.25 |
| 6.00      | 7.50 | 1                 | 16               | 2.50 | 2.001                               | 1.25 | 2.25 | 2.25 | 1.25      | 2.50 | 2.31 | 2.00 | 7.38       | 4.88 |

<sup>1</sup>NPTF ports are available at no extra charge.<sup>2</sup>SAE straight thread ports are standard and are indicated by port number.<sup>3</sup>Diameter CD is Pin Diameter.**Style BB – Dimensional and Mounting Data**

| Bore<br>Ø | Rod<br>No. | MM<br>Rod Ø | WF   | Y    | Add Stroke |       |
|-----------|------------|-------------|------|------|------------|-------|
|           |            |             |      |      | XC         | ZC    |
| 1.50      | 1 (std.)   | 0.625       | 1.00 | 2.00 | 6.38       | 6.88  |
|           | 2          | 1.000       | 1.38 | 2.38 | 6.75       | 7.25  |
| 2.00      | 1 (std.)   | 1.000       | 1.38 | 2.38 | 7.25       | 8.00  |
|           | 2          | 1.375       | 1.63 | 2.63 | 7.50       | 8.25  |
| 2.50      | 1 (std.)   | 1.000       | 1.38 | 2.38 | 7.38       | 8.13  |
|           | 2          | 1.750       | 1.88 | 2.88 | 7.88       | 8.63  |
|           | 3          | 1.375       | 1.63 | 2.63 | 7.63       | 8.38  |
| 3.25      | 1 (std.)   | 1.375       | 1.63 | 2.75 | 8.63       | 9.63  |
|           | 2          | 2.000       | 2.00 | 3.13 | 9.00       | 10.00 |
|           | 3          | 1.750       | 1.88 | 3.00 | 8.88       | 9.88  |
| 4.00      | 1 (std.)   | 1.750       | 1.88 | 3.00 | 9.75       | 11.13 |
|           | 2          | 2.500       | 2.25 | 3.38 | 10.13      | 11.50 |
|           | 3          | 2.000       | 2.00 | 3.13 | 9.88       | 11.25 |
| 5.00      | 1 (std.)   | 2.000       | 2.00 | 3.13 | 10.50      | 12.25 |
|           | 2          | 3.500       | 2.25 | 3.38 | 10.75      | 12.50 |
|           | 3          | 2.500       | 2.25 | 3.38 | 10.75      | 12.50 |
|           | 4          | 3.000       | 2.25 | 3.38 | 10.75      | 12.50 |
| 6.00      | 1 (std.)   | 2.500       | 2.25 | 3.50 | 12.13      | 14.13 |
|           | 2          | 4.000       | 2.25 | 3.50 | 12.13      | 14.13 |
|           | 3          | 3.000       | 2.25 | 3.50 | 12.13      | 14.13 |
|           | 4          | 3.500       | 2.25 | 3.50 | 12.13      | 14.13 |

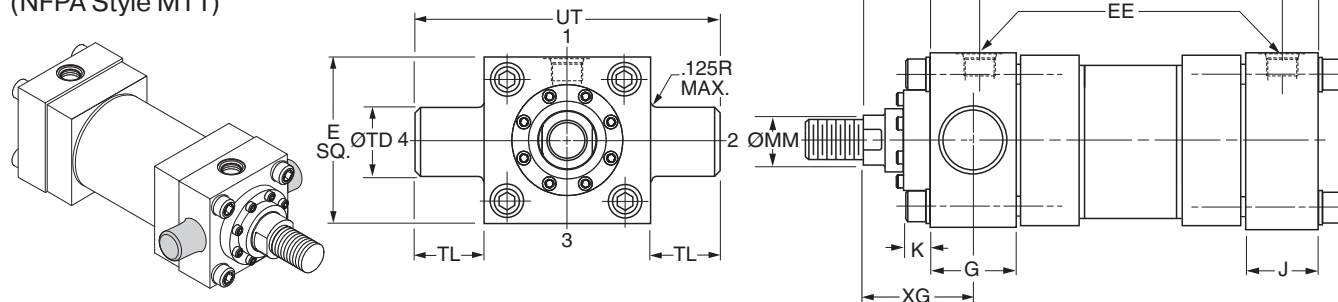
**⚠ PROP 65 WARNING** WARNING: This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)



**Mounting Information****Heavy Duty Hydraulic Cylinders  
Series 2HB 1.50" - 6.00" Bore****Head Trunnion Mounting**

Style D

(NFPA Style MT1)

**Style D – Dimensional and Mounting Data**

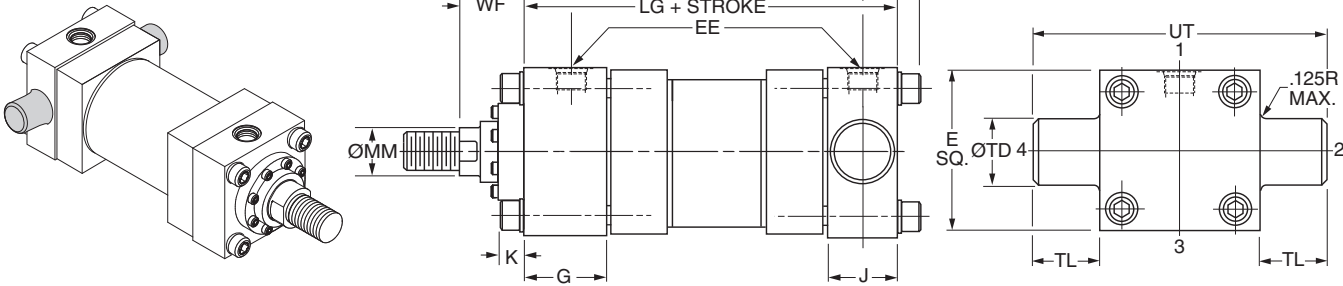
| Bore<br>Ø | E    | EE                |                  | G    | J    | K<br>Max. | TD Ø<br>+.000<br>-.001 | TL   | UT    | Add Stroke |      |
|-----------|------|-------------------|------------------|------|------|-----------|------------------------|------|-------|------------|------|
|           |      | NPTF <sup>1</sup> | SAE <sup>2</sup> |      |      |           |                        |      |       | LG         | P    |
| 1.50      | 2.50 | 1/2               | 10               | 1.75 | 1.50 | 0.50      | 1.000                  | 1.00 | 4.50  | 4.63       | 2.88 |
| 2.00      | 3.00 | 1/2               | 10               | 1.75 | 1.50 | 0.67      | 1.375                  | 1.38 | 5.75  | 4.63       | 2.88 |
| 2.50      | 3.50 | 1/2               | 10               | 1.75 | 1.50 | 0.67      | 1.375                  | 1.38 | 6.25  | 4.75       | 3.00 |
| 3.25      | 4.50 | 3/4               | 12               | 2.00 | 1.75 | 0.83      | 1.750                  | 1.75 | 8.00  | 5.50       | 3.50 |
| 4.00      | 5.00 | 3/4               | 12               | 2.00 | 1.75 | 0.83      | 1.750                  | 1.75 | 8.50  | 5.75       | 3.75 |
| 5.00      | 6.50 | 3/4               | 12               | 2.00 | 1.75 | 1.11      | 1.750                  | 1.75 | 10.00 | 6.25       | 4.25 |
| 6.00      | 7.50 | 1                 | 16               | 2.25 | 2.25 | 1.25      | 2.000                  | 2.00 | 11.50 | 7.38       | 4.88 |

<sup>1</sup>NPTF ports are available at no extra charge.<sup>2</sup>SAE straight thread ports are standard and are indicated by port number.**Style D – Dimensional and Mounting Data**

| Bore<br>Ø | Rod<br>No. | MM<br>Rod Ø | WF   | XG   | Y    | Add Stroke |
|-----------|------------|-------------|------|------|------|------------|
|           |            |             |      |      |      | ZB Max.    |
| 1.50      | 1 (std.)   | 0.625       | 1.00 | 1.88 | 2.00 | 6.13       |
|           | 2          | 1.000       | 1.38 | 2.25 | 2.38 | 6.50       |
| 2.00      | 1 (std.)   | 1.000       | 1.38 | 2.25 | 2.38 | 6.68       |
|           | 2          | 1.375       | 1.63 | 2.50 | 2.63 | 6.92       |
| 2.50      | 1 (std.)   | 1.000       | 1.38 | 2.25 | 2.38 | 6.80       |
|           | 2          | 1.750       | 1.88 | 2.75 | 2.88 | 7.30       |
|           | 3          | 1.375       | 1.63 | 2.50 | 2.63 | 7.05       |
| 3.25      | 1 (std.)   | 1.375       | 1.63 | 2.63 | 2.75 | 7.96       |
|           | 2          | 2.000       | 2.00 | 3.00 | 3.13 | 8.33       |
|           | 3          | 1.750       | 1.88 | 2.88 | 3.00 | 8.21       |
| 4.00      | 1 (std.)   | 1.750       | 1.88 | 2.88 | 3.00 | 8.46       |
|           | 2          | 2.500       | 2.25 | 3.25 | 3.38 | 8.83       |
|           | 3          | 2.000       | 2.00 | 3.00 | 3.13 | 8.58       |
| 5.00      | 1 (std.)   | 2.000       | 2.00 | 3.00 | 3.13 | 9.36       |
|           | 2          | 3.500       | 2.25 | 3.25 | 3.38 | 9.61       |
|           | 3          | 2.500       | 2.25 | 3.25 | 3.38 | 9.61       |
|           | 4          | 3.000       | 2.25 | 3.25 | 3.38 | 9.61       |
| 6.00      | 1 (std.)   | 2.500       | 2.25 | 3.38 | 3.50 | 10.88      |
|           | 2          | 4.000       | 2.25 | 3.38 | 3.50 | 10.88      |
|           | 3          | 3.000       | 2.25 | 3.38 | 3.50 | 10.88      |
|           | 4          | 3.500       | 2.25 | 3.38 | 3.50 | 10.88      |

**PROP 65 WARNING**WARNING: This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

Cap Trunnion Mounting  
Style DB  
(NFPA Style MT2)



Style DB – Dimensional and Mounting Data

| Bore<br>Ø | E    | EE                |                  | G    | J    | K<br>Max. | TD Ø<br>+.000<br>-.001 | TL   | UT    | Add Stroke |      |
|-----------|------|-------------------|------------------|------|------|-----------|------------------------|------|-------|------------|------|
|           |      | NPTF <sup>1</sup> | SAE <sup>2</sup> |      |      |           |                        |      |       | LG         | P    |
| 1.50      | 2.50 | 1/2               | 10               | 1.75 | 1.50 | 0.50      | 1.000                  | 1.00 | 4.50  | 4.63       | 2.88 |
| 2.00      | 3.00 | 1/2               | 10               | 1.75 | 1.50 | 0.67      | 1.375                  | 1.38 | 5.75  | 4.63       | 2.88 |
| 2.50      | 3.50 | 1/2               | 10               | 1.75 | 1.50 | 0.67      | 1.375                  | 1.38 | 6.25  | 4.75       | 3.00 |
| 3.25      | 4.50 | 3/4               | 12               | 2.00 | 1.75 | 0.83      | 1.750                  | 1.75 | 8.00  | 5.50       | 3.50 |
| 4.00      | 5.00 | 3/4               | 12               | 2.00 | 1.75 | 0.83      | 1.750                  | 1.75 | 8.50  | 5.75       | 3.75 |
| 5.00      | 6.50 | 3/4               | 12               | 2.00 | 1.75 | 1.11      | 1.750                  | 1.75 | 10.00 | 6.25       | 4.25 |
| 6.00      | 7.50 | 1                 | 16               | 2.25 | 2.25 | 1.25      | 2.000                  | 2.00 | 11.50 | 7.38       | 4.88 |

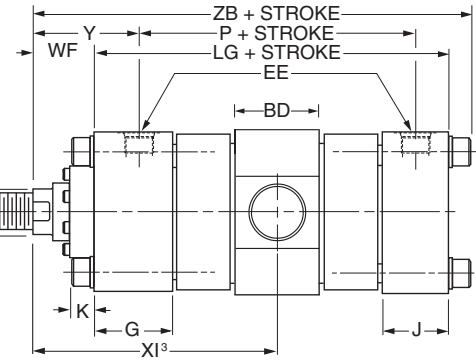
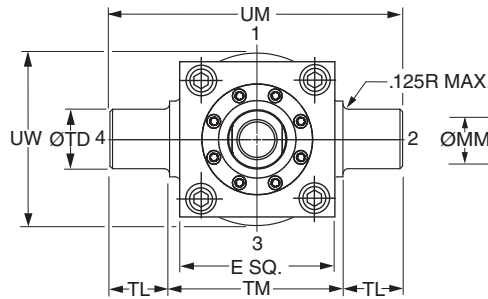
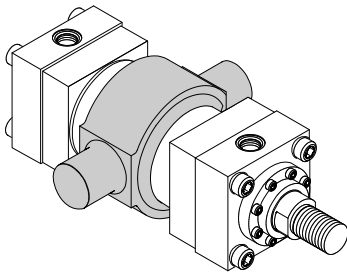
<sup>1</sup>NPTF ports are available at no extra charge.

<sup>2</sup>SAE straight thread ports are standard and are indicated by port number.

Style DB – Dimensional and Mounting Data

| Bore<br>Ø | Rod<br>No. | MM<br>Rod Ø | WF   | Y    | Add Stroke |         |
|-----------|------------|-------------|------|------|------------|---------|
|           |            |             |      |      | XJ         | ZB Max. |
| 1.50      | 1 (std.)   | 0.625       | 1.00 | 2.00 | 4.88       | 6.13    |
|           | 2          | 1.000       | 1.38 | 2.38 | 5.25       | 6.50    |
| 2.00      | 1 (std.)   | 1.000       | 1.38 | 2.38 | 5.25       | 6.68    |
|           | 2          | 1.375       | 1.63 | 2.63 | 5.50       | 6.92    |
| 2.50      | 1 (std.)   | 1.000       | 1.38 | 2.38 | 5.38       | 6.80    |
|           | 2          | 1.750       | 1.88 | 2.88 | 5.88       | 7.30    |
|           | 3          | 1.375       | 1.63 | 2.63 | 5.63       | 7.05    |
| 3.25      | 1 (std.)   | 1.375       | 1.63 | 2.75 | 6.25       | 7.96    |
|           | 2          | 2.000       | 2.00 | 3.13 | 6.63       | 8.33    |
|           | 3          | 1.750       | 1.88 | 3.00 | 6.50       | 8.21    |
| 4.00      | 1 (std.)   | 1.750       | 1.88 | 3.00 | 6.75       | 8.46    |
|           | 2          | 2.500       | 2.25 | 3.38 | 7.13       | 8.83    |
|           | 3          | 2.000       | 2.00 | 3.13 | 6.88       | 8.58    |
| 5.00      | 1 (std.)   | 2.000       | 2.00 | 3.13 | 7.38       | 9.36    |
|           | 2          | 3.500       | 2.25 | 3.38 | 7.63       | 9.61    |
|           | 3          | 2.500       | 2.25 | 3.38 | 7.63       | 9.61    |
|           | 4          | 3.000       | 2.25 | 3.38 | 7.63       | 9.61    |
| 6.00      | 1 (std.)   | 2.500       | 2.25 | 3.50 | 8.38       | 10.88   |
|           | 2          | 4.000       | 2.25 | 3.50 | 8.38       | 10.88   |
|           | 3          | 3.000       | 2.25 | 3.50 | 8.38       | 10.88   |
|           | 4          | 3.500       | 2.25 | 3.50 | 8.38       | 10.88   |

**⚠ PROP 65 WARNING** WARNING: This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**Mounting Information****Heavy Duty Hydraulic Cylinders  
Series 2HB 1.50" - 6.00" Bore****Intermediate Fixed Trunnion Mounting**Style DD – 1.50" - 3.25" Bore  
(NFFA Style MT4)**Style DD & Style DE – Dimensional and Mounting Data**

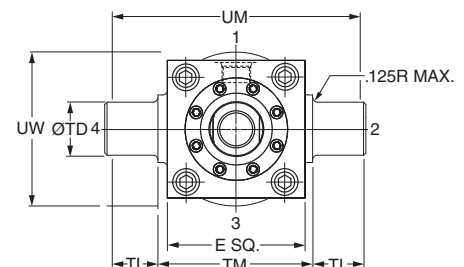
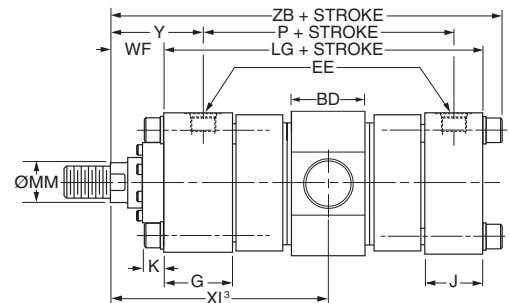
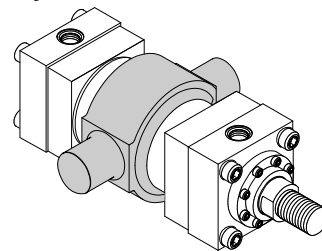
| Bore<br>Ø | BD   | E    | EE                |                  | G    | J    | K<br>Max. | TD Ø<br>+.000<br>-.001 | TL   | TM   | UM    | UW   | Add Stroke |      |
|-----------|------|------|-------------------|------------------|------|------|-----------|------------------------|------|------|-------|------|------------|------|
|           |      |      | NPTF <sup>1</sup> | SAE <sup>2</sup> |      |      |           |                        |      |      |       |      | LG         | P    |
| 1.50      | 1.31 | 2.50 | 1/2               | 10               | 1.75 | 1.50 | 0.50      | 1.000                  | 1.00 | 3.00 | 5.00  | 3.00 | 4.63       | 2.88 |
| 2.00      | 1.69 | 3.00 | 1/2               | 10               | 1.75 | 1.50 | 0.67      | 1.375                  | 1.38 | 3.50 | 6.25  | 3.50 | 4.63       | 2.88 |
| 2.50      | 1.69 | 3.50 | 1/2               | 10               | 1.75 | 1.50 | 0.67      | 1.375                  | 1.38 | 4.00 | 6.75  | 4.00 | 4.75       | 3.00 |
| 3.25      | 2.19 | 4.50 | 3/4               | 12               | 2.00 | 1.75 | 0.83      | 1.750                  | 1.75 | 5.00 | 8.50  | 5.00 | 5.50       | 3.50 |
| 4.00      | 2.44 | 5.00 | 3/4               | 12               | 2.00 | 1.75 | 0.83      | 2.000                  | 1.75 | 5.50 | 9.00  | 6.00 | 5.75       | 3.75 |
| 5.00      | 2.88 | 6.50 | 3/4               | 12               | 2.00 | 1.75 | 1.11      | 2.500                  | 1.75 | 7.00 | 10.50 | 7.38 | 6.25       | 4.25 |
| 6.00      | 3.38 | 7.50 | 1                 | 16               | 2.25 | 2.25 | 1.25      | 3.000                  | 2.00 | 8.50 | 12.50 | 9.00 | 7.38       | 4.88 |

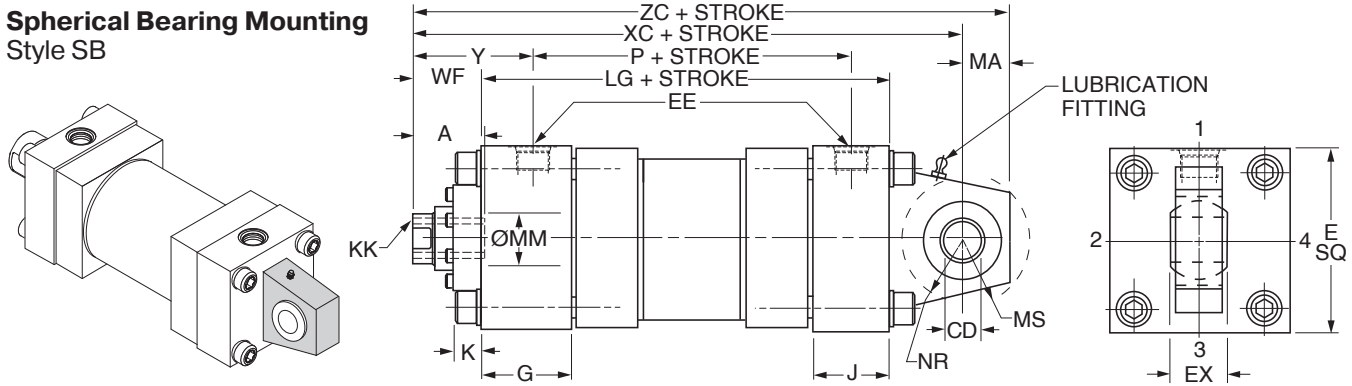
<sup>1</sup>NPTF ports are available at no extra charge.<sup>2</sup>SAE straight thread ports are standard and are indicated by port number.**Style DD & Style DE – Dimensional and Mounting Data**

| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | WF   | Y    | Minimum XI <sup>3</sup> |             | Min.<br>Stroke | Add Stroke              |             |           |
|-----------|------------|----------------|------|------|-------------------------|-------------|----------------|-------------------------|-------------|-----------|
|           |            |                |      |      | Styles<br>4, 8 & 9      | Style<br>55 |                | Maximum XI <sup>4</sup> |             | ZB<br>Max |
|           |            |                |      |      |                         |             |                | Styles<br>4, 8 & 9      | Style<br>55 |           |
| 1.50      | 1 (std.)   | 0.625          | 1.00 | 2.00 | 4.81                    | 5.63        | 2.88           | 2.00                    | 2.75        | 6.13      |
|           | 2          | 1.000          | 1.38 | 2.38 | 5.25                    | 6.25        | 2.88           | 2.44                    | 3.38        | 6.50      |
| 2.00      | 1 (std.)   | 1.000          | 1.38 | 2.38 | 5.69                    | 6.69        | 3.75           | 1.94                    | 2.94        | 6.68      |
|           | 2          | 1.375          | 1.63 | 2.63 | 5.94                    | 7.06        | 3.75           | 2.19                    | 3.31        | 6.92      |
| 2.50      | 1 (std.)   | 1.000          | 1.38 | 2.38 | 5.69                    | 6.69        | 3.63           | 2.06                    | 3.06        | 6.80      |
|           | 2          | 1.750          | 1.88 | 2.88 | 6.19                    | 7.44        | 3.63           | 2.56                    | 3.81        | 7.30      |
|           | 3          | 1.375          | 1.63 | 2.63 | 5.94                    | 7.06        | 3.63           | 2.31                    | 3.44        | 7.05      |
| 3.25      | 1 (std.)   | 1.375          | 1.63 | 2.75 | 6.69                    | 7.81        | 4.38           | 2.31                    | 3.44        | 7.96      |
|           | 2          | 2.000          | 2.00 | 3.13 | 7.06                    | 8.81        | 4.38           | 2.69                    | 4.44        | 8.33      |
|           | 3          | 1.750          | 1.88 | 3.00 | 6.94                    | 8.19        | 4.38           | 2.56                    | 3.81        | 8.21      |
| 4.00      | 1 (std.)   | 1.750          | 1.88 | 3.00 | 7.38                    | 8.63        | 5.00           | 2.39                    | 3.63        | 8.46      |
|           | 2          | 2.500          | 2.25 | 3.38 | 7.75                    | 10.00       | 5.00           | 2.75                    | 5.00        | 8.83      |
|           | 3          | 2.000          | 2.00 | 3.13 | 7.50                    | 9.25        | 5.00           | 2.50                    | 4.25        | 8.58      |
| 5.00      | 1 (std.)   | 2.000          | 2.00 | 3.13 | 7.94                    | 9.69        | 5.44           | 2.56                    | 4.31        | 9.36      |
|           | 2          | 3.500          | 2.25 | 3.38 | 8.19                    | 11.56       | 5.44           | 2.81                    | 6.19        | 9.61      |
|           | 3          | 2.500          | 2.25 | 3.38 | 8.19                    | 10.44       | 5.44           | 2.81                    | 5.00        | 9.61      |
|           | 4          | 3.000          | 2.25 | 3.38 | 8.19                    | 10.81       | 5.44           | 2.81                    | 5.44        | 9.61      |
| 6.00      | 1 (std.)   | 2.500          | 2.25 | 3.50 | 9.25                    | 11.50       | 6.69           | 2.63                    | 4.88        | 10.88     |
|           | 2          | 4.000          | 2.25 | 3.50 | 9.25                    | 12.75       | 6.69           | 2.63                    | 6.13        | 10.88     |
|           | 3          | 3.000          | 2.25 | 3.50 | 9.25                    | 11.88       | 6.69           | 2.63                    | 5.25        | 10.88     |
|           | 4          | 3.500          | 2.25 | 3.50 | 9.25                    | 12.63       | 6.69           | 2.63                    | 6.00        | 10.88     |

<sup>3</sup>Dimension XI to be specified by customer. Reference point for rod end Style 55 is end of piston rod.<sup>4</sup>Dimensions shown are valid for standard WF and WG dimension.**Heavy Duty Intermediate Fixed  
Trunnion Mounting**

Style DE – 4.00" - 6.00" Bore (NFFA Style MT4)



**Mounting Information****Heavy Duty Hydraulic Cylinders  
Series 2HB 1.50" - 6.00" Bore****Spherical Bearing Mounting  
Style SB****Style SB – Dimensional and Mounting Data**

| Bore<br>Ø | A    | CD <sup>1</sup> Ø<br>+0.0000<br>-0.0005 | E    | EE                |                  | EX   | G    | J    | K<br>Max. | MA   | MS   | NR   | Add Stroke |      | Maximum<br>Operating<br>psi <sup>2</sup> |
|-----------|------|-----------------------------------------|------|-------------------|------------------|------|------|------|-----------|------|------|------|------------|------|------------------------------------------|
|           |      |                                         |      | NPTF <sup>1</sup> | SAE <sup>2</sup> |      |      |      |           |      |      |      | LG         | P    |                                          |
| 1.50      | 0.75 | 0.5000                                  | 2.50 | 1/2               | 10               | 0.44 | 1.75 | 1.50 | 0.50      | 0.75 | 0.94 | 0.63 | 4.63       | 2.88 | 1500                                     |
| 2.00      | 1.13 | 0.7500                                  | 3.00 | 1/2               | 10               | 0.66 | 1.75 | 1.50 | 0.67      | 1.00 | 1.38 | 1.00 | 4.63       | 2.88 | 2200                                     |
| 2.50      | 1.13 | 0.7500                                  | 3.50 | 1/2               | 10               | 0.66 | 1.75 | 1.50 | 0.67      | 1.00 | 1.38 | 1.00 | 4.75       | 3.00 | 1450                                     |
| 3.25      | 1.63 | 1.0000                                  | 4.50 | 3/4               | 12               | 0.88 | 2.00 | 1.75 | 0.83      | 1.25 | 1.69 | 1.25 | 5.50       | 3.50 | 1500                                     |
| 4.00      | 2.00 | 1.3750                                  | 5.00 | 3/4               | 12               | 1.19 | 2.00 | 1.75 | 0.83      | 1.88 | 2.44 | 1.63 | 5.75       | 3.75 | 1850                                     |
| 5.00      | 2.25 | 1.7500                                  | 6.50 | 3/4               | 12               | 1.53 | 2.00 | 1.75 | 1.11      | 2.50 | 2.88 | 2.06 | 6.25       | 4.25 | 2000                                     |
| 6.00      | 3.00 | 2.0000                                  | 7.50 | 1                 | 16               | 1.75 | 2.25 | 2.25 | 1.25      | 2.50 | 3.31 | 2.38 | 7.38       | 4.88 | 1800                                     |

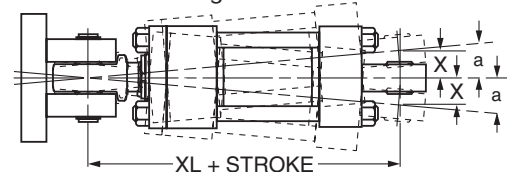
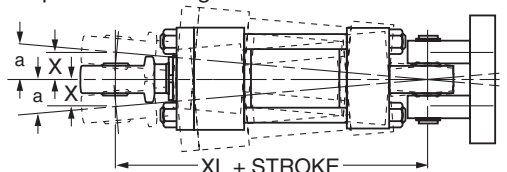
<sup>1</sup> Diameter CD is hole diameter.<sup>2</sup> Maximum operating pressure at 4:1 design factor is based on tensile strength of material. Pressure ratings are based on standard bearing ratings.**Style SB – Dimensional and Mounting Data**

| Bore<br>Ø | Rod<br>No. | MM<br>Rod Ø | Thread                     |                            | WF   | Y    | Add Stroke |       |       |
|-----------|------------|-------------|----------------------------|----------------------------|------|------|------------|-------|-------|
|           |            |             | Style 9<br>KK <sup>3</sup> | Style 7<br>KK <sup>3</sup> |      |      | XC         | XL    | ZC    |
| 1.50      | 1 (std.)   | 0.625       | 7/16-20                    | —                          | 1.00 | 2.00 | 6.38       | 7.25  | 7.13  |
|           | 2          | 1.000       | —                          | 7/16-20                    | 1.38 | 2.38 | 6.75       | 7.63  | 7.50  |
| 2.00      | 1 (std.)   | 1.000       | 3/4-16                     | —                          | 1.38 | 2.38 | 7.25       | 8.50  | 8.25  |
|           | 2          | 1.375       | —                          | 3/4-16                     | 1.63 | 2.63 | 7.50       | 8.75  | 8.50  |
| 2.50      | 1 (std.)   | 1.000       | 3/4-16                     | —                          | 1.38 | 2.38 | 7.38       | 8.63  | 8.38  |
|           | 2          | 1.750       | —                          | 3/4-16                     | 1.88 | 2.88 | 7.88       | 9.13  | 8.88  |
| 3.25      | 1 (std.)   | 1.375       | 1-14                       | —                          | 1.63 | 2.75 | 8.63       | 10.50 | 9.88  |
|           | 2          | 2.000       | —                          | 1-14                       | 2.00 | 3.13 | 9.00       | 10.88 | 10.25 |
| 4.00      | 1 (std.)   | 1.750       | 1 1/4-12                   | —                          | 1.88 | 3.00 | 9.75       | 11.88 | 11.63 |
|           | 2          | 2.500       | —                          | 1 1/4-12                   | 2.25 | 3.38 | 10.13      | 12.25 | 12.00 |
| 5.00      | 1 (std.)   | 2.000       | 1 1/2-12                   | —                          | 2.00 | 3.13 | 10.50      | 13.00 | 13.00 |
|           | 2          | 3.500       | —                          | 1 1/2-12                   | 2.25 | 3.38 | 10.75      | 13.25 | 13.25 |
| 6.00      | 1 (std.)   | 2.500       | 1 7/8-12                   | —                          | 2.25 | 3.50 | 12.13      | 14.88 | 14.63 |
|           | 2          | 4.000       | —                          | 1 7/8-12                   | 2.25 | 3.50 | 12.13      | 14.88 | 14.63 |
| 6.00      | 3          | 3.000       | —                          | 1 7/8-12                   | 2.25 | 3.50 | 12.13      | 14.88 | 14.63 |
|           | 4          | 3.500       | —                          | 1 7/8-12                   | 2.25 | 3.50 | 12.13      | 14.88 | 14.63 |

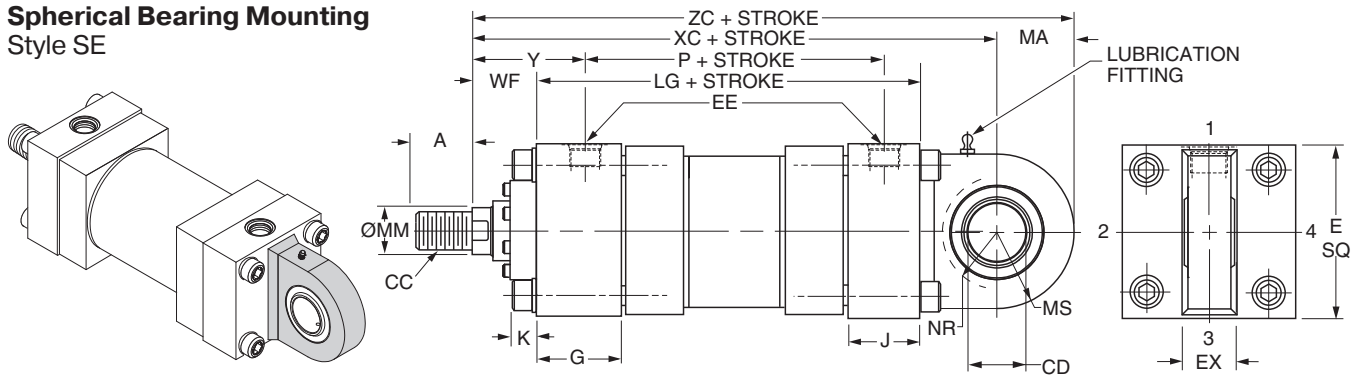
<sup>3</sup> Style 9 and Style 7 threads listed are for a spherical rod eye (sold separately) with pin diameter that matches the cap pin.**Style SB – Recommended maximum swivel  
angle on each side of the cylinder centerline.**

| Bore<br>Ø | Head End Mounted |           | Cap End Mounted |           |
|-----------|------------------|-----------|-----------------|-----------|
|           | Angle a          | Tan. of a | Angle a         | Tan. of a |
| 1.50      | 2.00°            | .035      | 2.00°           | .035      |
| 2.00      | 2.50°            | .044      | 4.50°           | .079      |
| 2.50      | 2.50°            | .044      | 4.50°           | .079      |
| 3.25      | 3.00°            | .052      | 3.00°           | .052      |
| 4.00      | 2.50°            | .044      | 3.00°           | .052      |
| 5.00      | 3.00°            | .052      | 3.00°           | .052      |
| 6.00      | 3.00°            | .052      | 3.00°           | .052      |

Note: Dimension X is the maximum off center mounting of the cylinder. To determine dimension X for various stroke lengths multiply the distance between pivot pin holes by tangent of angle a. For extended position use  $X = XL + 2X$  stroke.

**Mounting Information****Head End Mounting****Cap End Mounting**

**⚠ PROP 65 WARNING** WARNING: This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**Mounting Information****Heavy Duty Hydraulic Cylinders  
Series 2HB 1.50" - 6.00" Bore****Spherical Bearing Mounting  
Style SE****Style SE – Dimensional and Mounting Data**

| Bore<br>Ø | A    | CD <sup>1</sup><br>Ø      | E    | EE   |     | EX   | G    | J    | K<br>Max. | MA   | MS   | NR   | Add Stroke |      |
|-----------|------|---------------------------|------|------|-----|------|------|------|-----------|------|------|------|------------|------|
|           |      |                           |      | NPTF | SAE |      |      |      |           |      |      |      | LG         | P    |
| 1.50      | 0.75 | 0.7500 <sup>-0.0005</sup> | 2.50 | 1/2  | 10  | 0.66 | 1.75 | 1.50 | 0.50      | 1.00 | 1.00 | 0.75 | 4.63       | 2.88 |
| 2.00      | 1.13 | 1.0000 <sup>-0.0005</sup> | 3.00 | 1/2  | 10  | 0.88 | 1.75 | 1.50 | 0.67      | 1.25 | 1.25 | 1.00 | 4.63       | 2.88 |
| 2.50      | 1.13 | 1.2500 <sup>-0.0005</sup> | 3.50 | 1/2  | 10  | 1.09 | 1.75 | 1.50 | 0.67      | 1.50 | 1.50 | 1.31 | 4.75       | 3.00 |
| 3.25      | 1.63 | 1.5000 <sup>-0.0005</sup> | 4.50 | 3/4  | 12  | 1.31 | 2.00 | 1.75 | 0.83      | 2.00 | 2.00 | 1.75 | 5.50       | 3.50 |
| 4.00      | 2.00 | 2.0000 <sup>-0.0005</sup> | 5.00 | 3/4  | 12  | 1.75 | 2.00 | 1.75 | 0.83      | 2.25 | 2.25 | 2.13 | 5.75       | 3.75 |
| 5.00      | 2.25 | 2.5000 <sup>-0.0006</sup> | 6.50 | 3/4  | 12  | 2.19 | 2.00 | 1.75 | 1.11      | 3.00 | 3.00 | 2.75 | 6.25       | 4.25 |
| 6.00      | 3.00 | 3.0000 <sup>-0.0006</sup> | 7.50 | 1    | 16  | 2.63 | 2.25 | 2.25 | 1.25      | 3.50 | 3.50 | 3.13 | 7.38       | 4.88 |

<sup>1</sup> Diameter CD is hole diameter. <sup>2</sup> Maximum operating pressure at 4:1 design factor is based on tensile strength of material. Pressure ratings are based on standard bearing ratings.

**Style SE – Dimensional and Mounting Data**

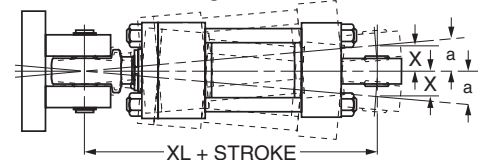
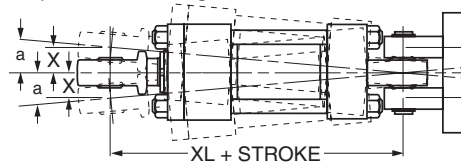
| Bore<br>Ø | Rod<br>No. | MM<br>Rod Ø | Thread<br>Style 8<br>CC <sup>3</sup> | A    | WF   | Y    | Add Stroke |       |       |
|-----------|------------|-------------|--------------------------------------|------|------|------|------------|-------|-------|
|           |            |             |                                      |      |      |      | XC         | XL    | ZC    |
| 1.50      | 1 (std.)   | 0.625       | 1/2-20                               | 0.75 | 1.00 | 2.00 | 6.88       | 9.01  | 7.88  |
|           | 2          | 1.000       | 3                                    | 3    | 1.38 | 2.38 | 7.25       | 9.38  | 8.25  |
| 2.00      | 1 (std.)   | 1.000       | 7/8-14                               | 1.13 | 1.38 | 2.38 | 7.56       | 10.56 | 8.81  |
|           | 2          | 1.375       | 3                                    | 3    | 1.63 | 2.63 | 7.81       | 10.81 | 9.06  |
| 2.50      | 1 (std.)   | 1.000       | 7/8-14                               | 1.13 | 1.38 | 2.38 | 7.75       | 10.75 | 9.25  |
|           | 2          | 1.750       | 3                                    | 3    | 1.88 | 2.88 | 8.25       | 11.25 | 9.75  |
|           | 3          | 1.375       | 3                                    | 3    | 1.63 | 2.63 | 8.00       | 11.00 | 9.50  |
| 3.25      | 1 (std.)   | 1.375       | 1 1/4-12                             | 1.63 | 1.63 | 2.75 | 9.25       | 13.38 | 11.25 |
|           | 2          | 2.000       | 3                                    | 3    | 2.00 | 3.13 | 9.63       | 13.75 | 11.63 |
|           | 3          | 1.750       | 3                                    | 3    | 1.88 | 3.00 | 9.50       | 13.63 | 11.50 |
| 4.00      | 1 (std.)   | 1.750       | 1 1/2-12                             | 2.00 | 1.88 | 3.00 | 10.13      | 15.13 | 12.38 |
|           | 2          | 2.500       | 3                                    | 3    | 2.25 | 3.38 | 10.50      | 15.50 | 12.75 |
|           | 3          | 2.000       | 3                                    | 3    | 2.00 | 3.13 | 10.25      | 15.25 | 12.50 |
| 5.00      | 1 (std.)   | 2.000       | 1 3/4-12                             | 2.25 | 2.00 | 3.13 | 11.50      | 17.25 | 14.50 |
|           | 2          | 3.500       | 3                                    | 3    | 2.25 | 3.38 | 11.75      | 17.50 | 14.75 |
|           | 3          | 2.500       | 3                                    | 3    | 2.25 | 3.38 | 11.75      | 17.50 | 14.75 |
|           | 4          | 3.000       | 3                                    | 3    | 2.25 | 3.38 | 11.75      | 17.50 | 14.75 |
| 6.00      | 1 (std.)   | 2.500       | 2 1/4-12                             | 3.00 | 2.25 | 3.50 | 13.38      | 20.38 | 16.88 |
|           | 2          | 4.000       | 3                                    | 3    | 2.25 | 3.50 | 13.38      | 20.38 | 16.88 |
|           | 3          | 3.000       | 3                                    | 3    | 2.25 | 3.50 | 13.38      | 20.38 | 16.88 |
|           | 4          | 3.500       | 3                                    | 3    | 2.25 | 3.50 | 13.38      | 20.38 | 16.88 |

<sup>3</sup> To match pin diameter in rod eye and cap, when an oversize rod is required, specify rod end style '3', 'CC' thread and 'A' thread length for the standard rod diameter (Rod No. 1 for the bore), and 'WF' for the oversize rod. Order the rod eye and clevis bracket for the required bore size from the tables on the Style SE Spherical Bearing Accessories page.

**Style SE – Recommended maximum swivel  
angle on each side of the cylinder centerline.**

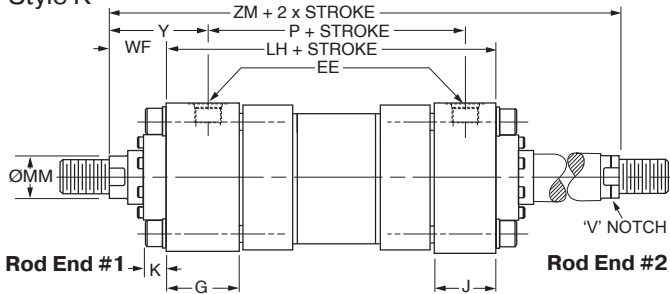
| Bore<br>Ø | Head End Mounted |           | Cap End Mounted |           |
|-----------|------------------|-----------|-----------------|-----------|
|           | Angle a          | Tan. of a | Angle a         | Tan. of a |
| 1.50      | 2.50°            | 0.044     | 3.00°           | 0.052     |
| 2.00      | 3.00°            | 0.052     | 3.00°           | 0.052     |
| 2.50      | 3.00°            | 0.052     | 3.00°           | 0.052     |
| 3.25      | 3.00°            | 0.052     | 2.75°           | 0.048     |
| 4.00      | 3.00°            | 0.052     | 3.00°           | 0.052     |
| 5.00      | 3.00°            | 0.052     | 3.00°           | 0.052     |
| 6.00      | 3.00°            | 0.052     | 3.00°           | 0.052     |

Note: Dimension X is the maximum off center mounting of the cylinder. To determine dimension X for various stroke lengths multiply the distance between pivot pin holes by tangent of angle a. For extended position use  $X = XL + 2X$  stroke.

**Mounting Information****Head End Mounting****Cap End Mounting**

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**Double Rod Cylinder  
Style K****Double Rod End Mounting Styles**

See Mounting Groups page in Section H for guidance on double rod end cylinder mounting style selection.

| Mounting Styles for Single Rod Models | Mounting Styles for Corresponding Double Rod Models <sup>1</sup> |                                                      | Dimensions Shown on This Page Supplement Dimensions on 1.50" - 6.00" Bore Pages Listed Below |
|---------------------------------------|------------------------------------------------------------------|------------------------------------------------------|----------------------------------------------------------------------------------------------|
|                                       | Load Connected To Rod On Cylinder Mounting End                   | Load Connected To Rod Opposite Cylinder Mounting End |                                                                                              |
| T                                     | KT                                                               | KT                                                   | 92                                                                                           |
| C                                     | KC                                                               | KC                                                   | 93                                                                                           |
| JJ                                    | KJJ                                                              | KHH                                                  | 94                                                                                           |
| D                                     | KD                                                               | KDB                                                  | 97                                                                                           |
| DD                                    | KDD <sup>2</sup>                                                 | KDD <sup>2</sup>                                     | 99                                                                                           |
| DE                                    | KDE <sup>2</sup>                                                 | KDE <sup>2</sup>                                     | 99                                                                                           |

<sup>1</sup> Connect load to piston rod without 'V' notch. If only one end of the Double Rod Cylinder is to be cushioned, be sure to clearly specify which end this will be.

<sup>2</sup> Specify XI dimension for Styles DD & DE from #1 rod end (without 'V' notch).

**How to Use Double Rod Cylinder  
Dimension Drawings**

To determine dimensions for a double rod cylinder, first refer to the desired single rod mounting style cylinder shown on preceding pages of this catalog. (See table above.) After selecting necessary dimensions from that drawing, return to this page supplement the single rod dimensions with those shown on drawing at right and dimension table below. Note that double rod cylinders have a head (Dim. G) at both ends and that dimension LH replaces LG. The double rod dimensions differ from, or are in addition to those for single rod cylinders shown on preceding pages and provide the information needed to completely dimension a double rod cylinder.

On a double rod cylinder where the two rod ends are different, be sure to clearly state which rod end is to be assembled at which end. Port position 1 is standard. If other than standard, specify pos. 2, 3 or 4 when viewed from rod end #1 only. See port position information in Section H.

| Bore Ø                                  | Rod No.  | MM Rod Ø | Add Stroke      |      | Add 2X Stroke   |
|-----------------------------------------|----------|----------|-----------------|------|-----------------|
|                                         |          |          | LH              | SSK  | ZM              |
| 1.50                                    | 1 (std.) | 0.625    | 4.88            | 4.13 | 6.88            |
|                                         | 2        | 1.000    | 4.88            | 4.13 | 7.63            |
| 2.00                                    | 1 (std.) | 1.000    | 4.88            | 3.88 | 7.63            |
|                                         | 2        | 1.375    | 4.88            | 3.88 | 8.13            |
| 2.50                                    | 1 (std.) | 1.000    | 5.00            | 3.63 | 7.75            |
|                                         | 2        | 1.750    | 5.00            | 3.63 | 8.75            |
|                                         | 3        | 1.375    | 5.00            | 3.63 | 8.25            |
| 3.25                                    | 1 (std.) | 1.375    | 5.75            | 4.38 | 9.00            |
|                                         | 2        | 2.000    | 5.75            | 4.38 | 9.75            |
|                                         | 3        | 1.750    | 5.75            | 4.38 | 9.50            |
| 4.00                                    | 1 (std.) | 1.750    | 6.00            | 4.25 | 9.75            |
|                                         | 2        | 2.500    | 6.00            | 4.25 | 10.50           |
|                                         | 3        | 2.000    | 6.00            | 4.25 | 10.00           |
| 5.00                                    | 1 (std.) | 2.000    | 6.50            | 4.75 | 10.50           |
|                                         | 2        | 3.500    | 6.50            | 4.75 | 11.00           |
|                                         | 3        | 2.500    | 6.50            | 4.75 | 11.00           |
|                                         | 4        | 3.000    | 6.50            | 4.75 | 11.00           |
| 6.00                                    | 1 (std.) | 2.500    | 7.38            | 5.13 | 11.88           |
|                                         | 2        | 4.000    | 7.38            | 5.13 | 11.88           |
|                                         | 3        | 3.000    | 7.38            | 5.13 | 11.88           |
|                                         | 4        | 3.500    | 7.38            | 5.13 | 11.88           |
| Replaces On single rod mounting styles: |          |          | LG              | SS   | -               |
|                                         |          |          | All Mtg. Styles | C    | All Mtg. Styles |

**Series 2HB Rod Gland Retention<sup>3</sup>**

B = Bolt -On Gland with Circular Retainer

R = Full Square Gland Retainer

<sup>3</sup> Gland retention style may vary when thrust key retainer or gland drain option is included. Contact factory for details.

| Bore Ø | Rod No.  | MM Rod Ø | Mounting Style                   |    |
|--------|----------|----------|----------------------------------|----|
|        |          |          | HH, C, D, DB, DD, DE, BB, SB, SE | JJ |
| 1.50   | 1 (Std.) | 0.625    | B                                | B  |
|        | 2        | 1.000    | R                                | B  |
| 2.00   | 1 (Std.) | 1.000    | B                                | B  |
|        | 2        | 1.375    | R                                | B  |
| 2.50   | 1 (Std.) | 1.000    | B                                | B  |
|        | 2        | 1.750    | B                                | B  |
|        | 3        | 1.375    | B                                | B  |
| 3.25   | All      | All      | B                                | B  |
| 4.00   | All      | All      | B                                | B  |
| 5.00   | All      | All      | B                                | B  |
| 6.00   | All      | All      | B                                | B  |

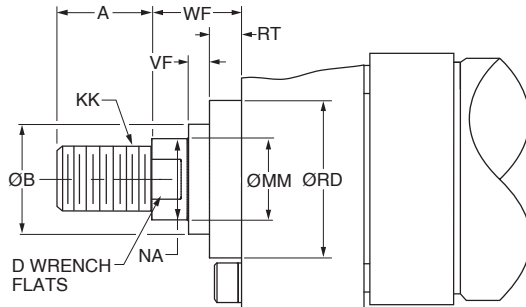


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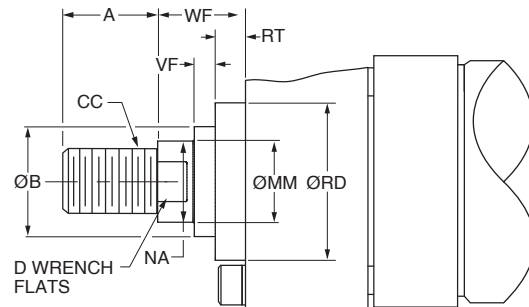


**Rod End Dimensions**

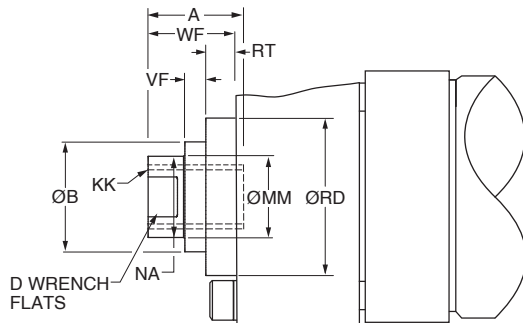
**Thread Style 4 (NFPA Style SM)  
 Small Male**



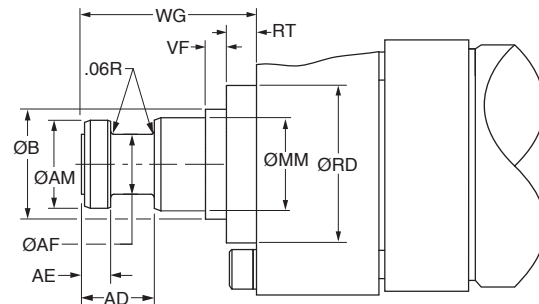
**Thread Style 8 (NFPA Style IM)  
 Intermediate Male**



**Thread Style 9<sup>2</sup> (NFPA Style SF)  
 Small Female**



**Thread Style 55<sup>1</sup>**



**Rod End Dimensions**

| Bore<br>Ø | Rod<br>No. | MM Rod<br>Ø | Thread           |                      | Rod Extensions and Pilot Dimensions |                       |                 |      |      |         |      |      |
|-----------|------------|-------------|------------------|----------------------|-------------------------------------|-----------------------|-----------------|------|------|---------|------|------|
|           |            |             | Style<br>8<br>CC | Style<br>4 & 9<br>KK | A                                   | B Ø<br>+.000<br>-.002 | D               | NA   | VF   | RD<br>Ø | RT   | WF   |
| 7.00      | 1 (std.)   | 3.000       | 2 3/4-12         | 2 1/4-12             | 3.50                                | 3.749                 | 2.63            | 2.88 | 0.40 | 5.26    | 0.85 | 2.25 |
|           | 2          | 5.000       | 4 3/4-12         | 3 1/2-12             | 5.00                                | 5.749                 | -. <sup>3</sup> | 4.88 | 0.34 | 7.25    | 0.91 | 2.25 |
|           | 3          | 3.500       | 3 1/4-12         | 2 1/2-12             | 3.50                                | 4.249                 | 3.00            | 3.38 | 0.34 | 5.76    | 0.91 | 2.25 |
|           | 4          | 4.000       | 3 3/4-12         | 3-12                 | 4.00                                | 4.749                 | 3.38            | 3.88 | 0.34 | 6.31    | 0.91 | 2.25 |
|           | 5          | 4.500       | 4 1/4-12         | 3 1/4-12             | 4.50                                | 5.249                 | -. <sup>3</sup> | 4.38 | 0.34 | 6.94    | 0.91 | 2.25 |
| 8.00      | 1 (std.)   | 3.500       | 3 1/4-12         | 2 1/2-12             | 3.50                                | 4.249                 | 3.00            | 3.38 | 0.34 | 5.76    | 0.91 | 2.25 |
|           | 2          | 5.500       | 5 1/4-12         | 4-12                 | 5.50                                | 6.249                 | -. <sup>3</sup> | 5.38 | 0.34 | 7.94    | 0.91 | 2.25 |
|           | 3          | 4.000       | 3 3/4-12         | 3-12                 | 4.00                                | 4.749                 | 3.38            | 3.88 | 0.34 | 6.31    | 0.91 | 2.25 |
|           | 4          | 4.500       | 4 1/4-12         | 3 1/4-12             | 4.50                                | 5.249                 | -. <sup>3</sup> | 4.38 | 0.34 | 6.94    | 0.91 | 2.25 |
|           | 5          | 5.000       | 4 3/4-12         | 3 1/2-12             | 5.00                                | 5.749                 | -. <sup>3</sup> | 4.88 | 0.34 | 7.25    | 0.91 | 2.25 |

**"Special" Thread Style 3**

Special thread, extension, rod eye, blank, etc., are also available.

To order, specify "Style 3" and give desired dimensions for KK, A, W or WF. If otherwise special, furnish dimensioned sketch.

<sup>1</sup> For special WG dimension, specify "Style 3" and give desired dimension for WG. For other changes, place "S" in the model code, and describe rod end with dimensioned sketch.

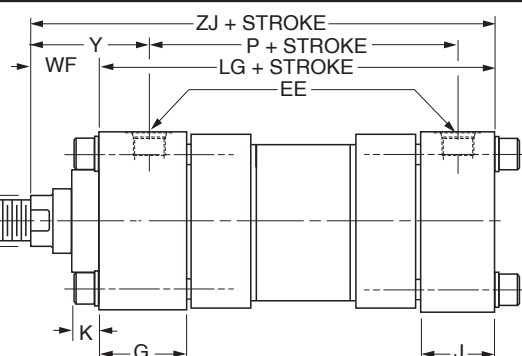
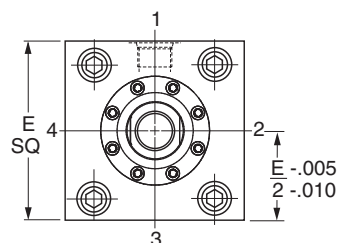
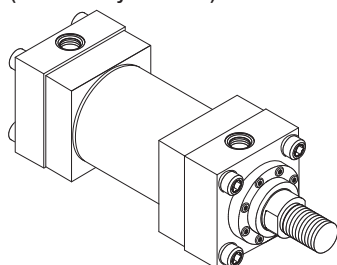
<sup>2</sup> Style 9 stroke restrictions may apply. See Style 9 Minimum Stroke Table on How to Order page for details.

<sup>3</sup> These piston rod numbers will have 4 spanner wrench holes instead of wrench flats. See rod drawings on 3H Large Bore Piston Rod Ends page for dimensions.

**Style 55 Rod End**

| MM Rod<br>Ø | AD   | AE<br>+.001<br>-.001 | AF<br>Ø | AM<br>Ø | WG <sup>1</sup> |
|-------------|------|----------------------|---------|---------|-----------------|
| 3.000       | 2.44 | 0.874                | 2.25    | 2.95    | 4.88            |
| 3.500       | 2.69 | 0.999                | 2.50    | 3.45    | 5.63            |
| 4.000       | 2.69 | 0.999                | 3.00    | 3.95    | 5.75            |
| 4.500       | 3.19 | 1.499                | 3.50    | 4.45    | 6.50            |
| 5.000       | 3.19 | 1.499                | 3.88    | 4.95    | 6.63            |
| 5.500       | 3.94 | 1.874                | 4.38    | 5.45    | 7.50            |

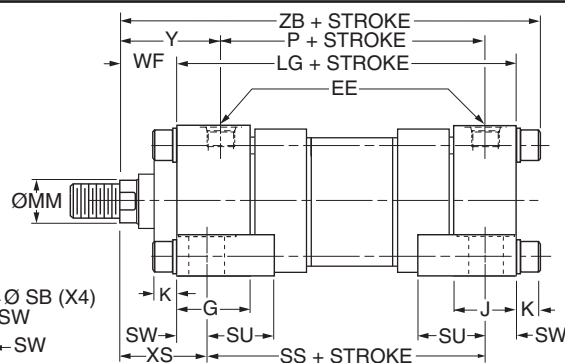
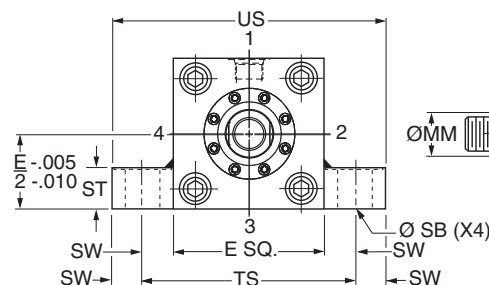
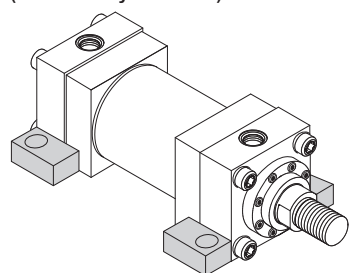
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### Style T – Dimensional and Mounting Data

| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | E    | EE                |                  | G    | J    | K<br>Max. | WF   | Y    | Add Stroke |      |       |
|-----------|------------|----------------|------|-------------------|------------------|------|------|-----------|------|------|------------|------|-------|
|           |            |                |      | NPTF <sup>1</sup> | SAE <sup>2</sup> |      |      |           |      |      | LG         | P    | ZJ    |
| 7.00      | 1 (std.)   | 3.000          | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.44      | 2.25 | 3.69 | 8.50       | 5.63 | 10.75 |
|           | 2          | 5.000          | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.44      | 2.25 | 3.69 | 8.50       | 5.63 | 10.75 |
|           | 3          | 3.500          | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.44      | 2.25 | 3.69 | 8.50       | 5.63 | 10.75 |
|           | 4          | 4.000          | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.44      | 2.25 | 3.69 | 8.50       | 5.63 | 10.75 |
|           | 5          | 4.500          | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.44      | 2.25 | 3.69 | 8.50       | 5.63 | 10.75 |
| 8.00      | 1 (std.)   | 3.500          | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.56      | 2.25 | 3.81 | 9.50       | 6.38 | 11.75 |
|           | 2          | 5.500          | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.56      | 2.25 | 3.81 | 9.50       | 6.38 | 11.75 |
|           | 3          | 4.000          | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.56      | 2.25 | 3.81 | 9.50       | 6.38 | 11.75 |
|           | 4          | 4.500          | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.56      | 2.25 | 3.81 | 9.50       | 6.38 | 11.75 |
|           | 5          | 5.000          | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.56      | 2.25 | 3.81 | 9.50       | 6.38 | 11.75 |

### Side Lug Mounting Style C (NFPA Style MS2)



Note: 8.00" bore threaded flanges extend beyond head and cap E square. See 8.00" Bore Threaded Flange page for details.

### Style C – Dimensional and Mounting Data

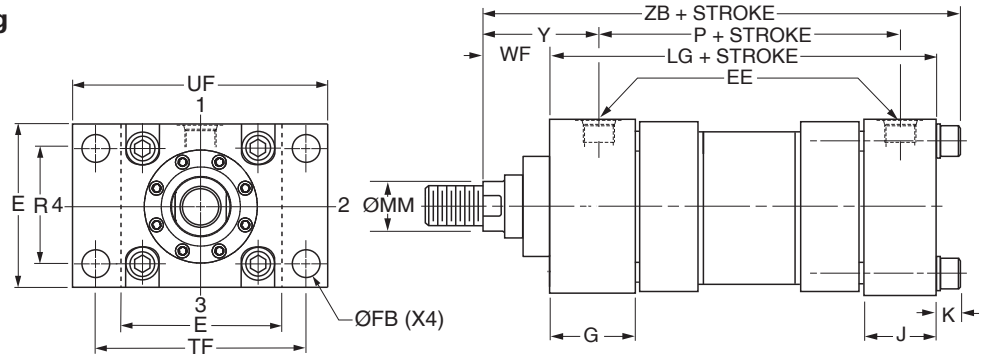
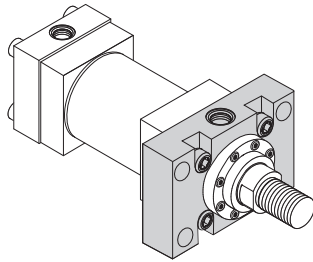
| Bore<br>Ø | Rod<br>No. | MM<br>Rod Ø | E    | EE                |                  | G    | J    | K<br>Max. | SB<br>Ø | ST   | SU   | SW   | TS    | US    | WF   | XS   | Y    | Add Stroke |      |      |        |
|-----------|------------|-------------|------|-------------------|------------------|------|------|-----------|---------|------|------|------|-------|-------|------|------|------|------------|------|------|--------|
|           |            |             |      | NPTF <sup>1</sup> | SAE <sup>2</sup> |      |      |           |         |      |      |      |       |       |      |      |      | LG         | P    | SS   | ZB Max |
| 7.00      | 1 (std.)   | 3.000       | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.44      | 1.56    | 1.75 | 2.88 | 1.38 | 11.25 | 14.00 | 2.25 | 3.63 | 3.69 | 8.50       | 5.63 | 5.75 | 12.19  |
|           | 2          | 5.000       | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.44      | 1.56    | 1.75 | 2.88 | 1.38 | 11.25 | 14.00 | 2.25 | 3.63 | 3.69 | 8.50       | 5.63 | 5.75 | 12.19  |
|           | 3          | 3.500       | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.44      | 1.56    | 1.75 | 2.88 | 1.38 | 11.25 | 14.00 | 2.25 | 3.63 | 3.69 | 8.50       | 5.63 | 5.75 | 12.19  |
|           | 4          | 4.000       | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.44      | 1.56    | 1.75 | 2.88 | 1.38 | 11.25 | 14.00 | 2.25 | 3.63 | 3.69 | 8.50       | 5.63 | 5.75 | 12.19  |
|           | 5          | 4.500       | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.44      | 1.56    | 1.75 | 2.88 | 1.38 | 11.25 | 14.00 | 2.25 | 3.63 | 3.69 | 8.50       | 5.63 | 5.75 | 12.19  |
| 8.00      | 1 (std.)   | 3.500       | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.56      | 1.56    | 1.75 | 2.88 | 1.38 | 12.25 | 15.00 | 2.25 | 3.63 | 3.81 | 9.50       | 6.38 | 6.75 | 13.31  |
|           | 2          | 5.500       | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.56      | 1.56    | 1.75 | 2.88 | 1.38 | 12.25 | 15.00 | 2.25 | 3.63 | 3.81 | 9.50       | 6.38 | 6.75 | 13.31  |
|           | 3          | 4.000       | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.56      | 1.56    | 1.75 | 2.88 | 1.38 | 12.25 | 15.00 | 2.25 | 3.63 | 3.81 | 9.50       | 6.38 | 6.75 | 13.31  |
|           | 4          | 4.500       | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.56      | 1.56    | 1.75 | 2.88 | 1.38 | 12.25 | 15.00 | 2.25 | 3.63 | 3.81 | 9.50       | 6.38 | 6.75 | 13.31  |
|           | 5          | 5.000       | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.56      | 1.56    | 1.75 | 2.88 | 1.38 | 12.25 | 15.00 | 2.25 | 3.63 | 3.81 | 9.50       | 6.38 | 6.75 | 13.31  |



**Mounting Information****Heavy Duty Hydraulic Cylinders  
Series 3HB 7.00" & 8.00" Bore****Head Rectangular Mounting**

Style JJ

(NFFA Style ME5)

**Style JJ – Dimensional and Mounting Data**

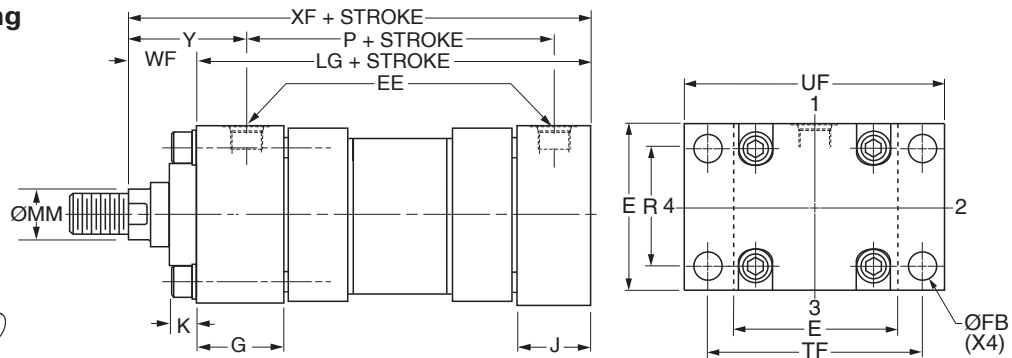
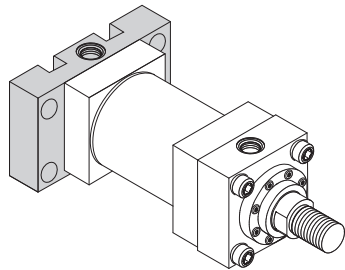
Note: 8.00" bore threaded flanges extend beyond head and cap E square. See 8.00" Bore Threaded Flange page for details.

| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | E    | EE                |                  | FB<br>Ø | G    | J    | K<br>Max. | R    | TF    | UF    | WF   | Y    | Add Stroke |      |            |
|-----------|------------|----------------|------|-------------------|------------------|---------|------|------|-----------|------|-------|-------|------|------|------------|------|------------|
|           |            |                |      | NPTF <sup>1</sup> | SAE <sup>2</sup> |         |      |      |           |      |       |       |      |      | LG         | P    | ZB<br>Max. |
| 7.00      | 1 (std.)   | 3.000          | 8.50 | 1 1/4             | 20               | 1.19    | 2.75 | 2.75 | 1.44      | 6.58 | 10.63 | 12.63 | 2.25 | 3.69 | 8.50       | 5.63 | 12.19      |
|           | 2          | 5.000          | 8.50 | 1 1/4             | 20               | 1.19    | 2.75 | 2.75 | 1.44      | 6.58 | 10.63 | 12.63 | 2.25 | 3.69 | 8.50       | 5.63 | 12.19      |
|           | 3          | 3.500          | 8.50 | 1 1/4             | 20               | 1.19    | 2.75 | 2.75 | 1.44      | 6.58 | 10.63 | 12.63 | 2.25 | 3.69 | 8.50       | 5.63 | 12.19      |
|           | 4          | 4.000          | 8.50 | 1 1/4             | 20               | 1.19    | 2.75 | 2.75 | 1.44      | 6.58 | 10.63 | 12.63 | 2.25 | 3.69 | 8.50       | 5.63 | 12.19      |
|           | 5          | 4.500          | 8.50 | 1 1/4             | 20               | 1.19    | 2.75 | 2.75 | 1.44      | 6.58 | 10.63 | 12.63 | 2.25 | 3.69 | 8.50       | 5.63 | 12.19      |
| 8.00      | 1 (std.)   | 3.500          | 9.50 | 1 1/2             | 24               | 1.31    | 3.00 | 3.00 | 1.56      | 7.50 | 11.81 | 14.00 | 2.25 | 3.81 | 9.50       | 6.38 | 13.31      |
|           | 2          | 5.500          | 9.50 | 1 1/2             | 24               | 1.31    | 3.00 | 3.00 | 1.56      | 7.50 | 11.81 | 14.00 | 2.25 | 3.81 | 9.50       | 6.38 | 13.31      |
|           | 3          | 4.000          | 9.50 | 1 1/2             | 24               | 1.31    | 3.00 | 3.00 | 1.56      | 7.50 | 11.81 | 14.00 | 2.25 | 3.81 | 9.50       | 6.38 | 13.31      |
|           | 4          | 4.500          | 9.50 | 1 1/2             | 24               | 1.31    | 3.00 | 3.00 | 1.56      | 7.50 | 11.81 | 14.00 | 2.25 | 3.81 | 9.50       | 6.38 | 13.31      |
|           | 5          | 5.000          | 9.50 | 1 1/2             | 24               | 1.31    | 3.00 | 3.00 | 1.56      | 7.50 | 11.81 | 14.00 | 2.25 | 3.81 | 9.50       | 6.38 | 13.31      |

<sup>1</sup>NPTF ports are available at no extra charge. <sup>2</sup>SAE straight thread ports are standard and are indicated by port number.**Cap Rectangular Mounting**

Style HH

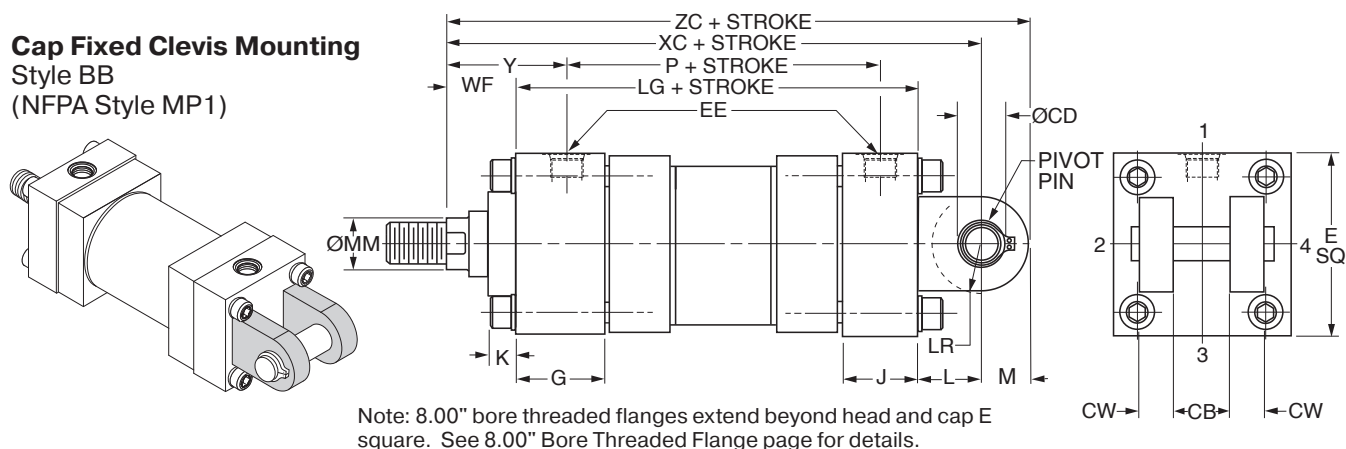
(NFFA Style ME6)

**Style HH – Dimensional and Mounting Data**

Note: 8.00" bore threaded flanges extend beyond head and cap E square. See 8.00" Bore Threaded Flange page for details.

| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | E    | EE                |                  | FB<br>Ø | G    | J    | K<br>Max. | R    | TF    | UF    | WF   | Y    | Add Stroke |      |       |
|-----------|------------|----------------|------|-------------------|------------------|---------|------|------|-----------|------|-------|-------|------|------|------------|------|-------|
|           |            |                |      | NPTF <sup>1</sup> | SAE <sup>2</sup> |         |      |      |           |      |       |       |      |      | LG         | P    | XF    |
| 7.00      | 1 (std.)   | 3.000          | 8.50 | 1 1/4             | 20               | 1.19    | 2.75 | 2.75 | 1.44      | 6.58 | 10.63 | 12.63 | 2.25 | 3.69 | 8.50       | 5.63 | 10.75 |
|           | 2          | 5.000          | 8.50 | 1 1/4             | 20               | 1.19    | 2.75 | 2.75 | 1.44      | 6.58 | 10.63 | 12.63 | 2.25 | 3.69 | 8.50       | 5.63 | 10.75 |
|           | 3          | 3.500          | 8.50 | 1 1/4             | 20               | 1.19    | 2.75 | 2.75 | 1.44      | 6.58 | 10.63 | 12.63 | 2.25 | 3.69 | 8.50       | 5.63 | 10.75 |
|           | 4          | 4.000          | 8.50 | 1 1/4             | 20               | 1.19    | 2.75 | 2.75 | 1.44      | 6.58 | 10.63 | 12.63 | 2.25 | 3.69 | 8.50       | 5.63 | 10.75 |
|           | 5          | 4.500          | 8.50 | 1 1/4             | 20               | 1.19    | 2.75 | 2.75 | 1.44      | 6.58 | 10.63 | 12.63 | 2.25 | 3.69 | 8.50       | 5.63 | 10.75 |
| 8.00      | 1 (std.)   | 3.500          | 9.50 | 1 1/2             | 24               | 1.31    | 3.00 | 3.00 | 1.56      | 7.50 | 11.81 | 14.00 | 2.25 | 3.81 | 9.50       | 6.38 | 11.75 |
|           | 2          | 5.500          | 9.50 | 1 1/2             | 24               | 1.31    | 3.00 | 3.00 | 1.56      | 7.50 | 11.81 | 14.00 | 2.25 | 3.81 | 9.50       | 6.38 | 11.75 |
|           | 3          | 4.000          | 9.50 | 1 1/2             | 24               | 1.31    | 3.00 | 3.00 | 1.56      | 7.50 | 11.81 | 14.00 | 2.25 | 3.81 | 9.50       | 6.38 | 11.75 |
|           | 4          | 4.500          | 9.50 | 1 1/2             | 24               | 1.31    | 3.00 | 3.00 | 1.56      | 7.50 | 11.81 | 14.00 | 2.25 | 3.81 | 9.50       | 6.38 | 11.75 |
|           | 5          | 5.000          | 9.50 | 1 1/2             | 24               | 1.31    | 3.00 | 3.00 | 1.56      | 7.50 | 11.81 | 14.00 | 2.25 | 3.81 | 9.50       | 6.38 | 11.75 |

<sup>1</sup>NPTF ports are available at no extra charge. <sup>2</sup>SAE straight thread ports are standard and are indicated by port number.**WARNING:** This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**Mounting Information****Heavy Duty Hydraulic Cylinders  
Series 3HB 7.00" & 8.00" Bore****Cap Fixed Clevis Mounting  
Style BB  
(NFPA Style MP1)****Style BB – Dimensional and Mounting Data**

| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | CB   | CD <sup>3</sup> Ø<br>+.000<br>-.002 | CW   | E    | EE                |                  | G    | J    | K<br>Max. | L    | LR   | M    | WF   | Y    |
|-----------|------------|----------------|------|-------------------------------------|------|------|-------------------|------------------|------|------|-----------|------|------|------|------|------|
|           |            |                |      |                                     |      |      | NPTF <sup>1</sup> | SAE <sup>2</sup> |      |      |           |      |      |      |      |      |
| 7.00      | 1 (std.)   | 3.000          | 3.00 | 2.501                               | 1.50 | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.44      | 3.00 | 2.75 | 2.50 | 2.25 | 3.69 |
|           | 2          | 5.000          | 3.00 | 2.501                               | 1.50 | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.44      | 3.00 | 2.75 | 2.50 | 2.25 | 3.69 |
|           | 3          | 3.500          | 3.00 | 2.501                               | 1.50 | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.44      | 3.00 | 2.75 | 2.50 | 2.25 | 3.69 |
|           | 4          | 4.000          | 3.00 | 2.501                               | 1.50 | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.44      | 3.00 | 2.75 | 2.50 | 2.25 | 3.69 |
|           | 5          | 4.500          | 3.00 | 2.501                               | 1.50 | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.44      | 3.00 | 2.75 | 2.50 | 2.25 | 3.69 |
| 8.00      | 1 (std.)   | 3.500          | 3.00 | 3.001                               | 1.50 | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.56      | 3.25 | 3.25 | 2.75 | 2.25 | 3.81 |
|           | 2          | 5.500          | 3.00 | 3.001                               | 1.50 | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.56      | 3.25 | 3.25 | 2.75 | 2.25 | 3.81 |
|           | 3          | 4.000          | 3.00 | 3.001                               | 1.50 | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.56      | 3.25 | 3.25 | 2.75 | 2.25 | 3.81 |
|           | 4          | 4.500          | 3.00 | 3.001                               | 1.50 | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.56      | 3.25 | 3.25 | 2.75 | 2.25 | 3.81 |
|           | 5          | 5.000          | 3.00 | 3.001                               | 1.50 | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.56      | 3.25 | 3.25 | 2.75 | 2.25 | 3.81 |

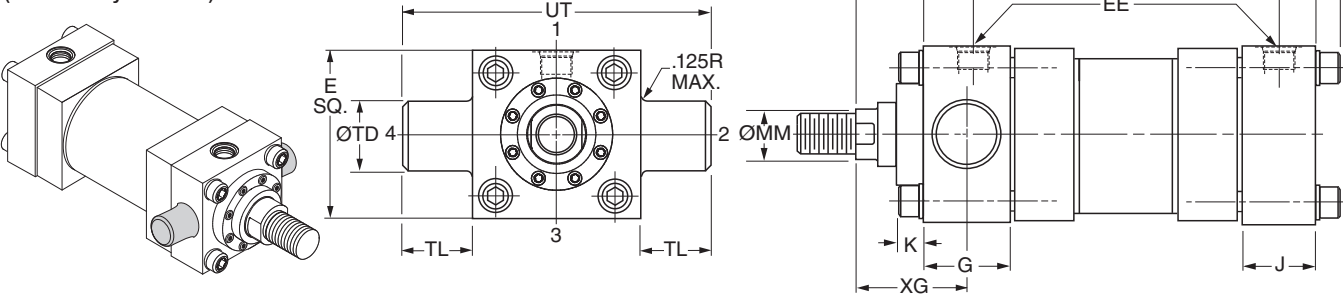
<sup>1</sup>NPTF ports are available at no extra charge.<sup>2</sup>SAE straight thread ports are standard and are indicated by port number.<sup>3</sup>Diameter CD is pin diameter.**Style BB – Dimensional and Mounting Data**

| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | Add Stroke |      |       |       |
|-----------|------------|----------------|------------|------|-------|-------|
|           |            |                | LG         | P    | XC    | ZC    |
| 7.00      | 1 (std.)   | 3.000          | 8.50       | 5.63 | 13.75 | 16.25 |
|           | 2          | 5.000          | 8.50       | 5.63 | 13.75 | 16.25 |
|           | 3          | 3.500          | 8.50       | 5.63 | 13.75 | 16.25 |
|           | 4          | 4.000          | 8.50       | 5.63 | 13.75 | 16.25 |
|           | 5          | 4.500          | 8.50       | 5.63 | 13.75 | 16.25 |
| 8.00      | 1 (std.)   | 3.500          | 9.50       | 6.38 | 15.00 | 17.75 |
|           | 2          | 5.500          | 9.50       | 6.38 | 15.00 | 17.75 |
|           | 3          | 4.000          | 9.50       | 6.38 | 15.00 | 17.75 |
|           | 4          | 4.500          | 9.50       | 6.38 | 15.00 | 17.75 |
|           | 5          | 5.000          | 9.50       | 6.38 | 15.00 | 17.75 |



**WARNING:** This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**Head Trunnion Mounting**  
**Style D**  
(NFPA Style MT1)



**Style D – Dimensional and Mounting Data**

| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | E    | EE                |                  | G    | J    | K<br>Max. | TD Ø<br>+.000<br>-.002 | TL   | UT    | WF   | Y    | XG   |
|-----------|------------|----------------|------|-------------------|------------------|------|------|-----------|------------------------|------|-------|------|------|------|
|           |            |                |      | NPTF <sup>1</sup> | SAE <sup>2</sup> |      |      |           |                        |      |       |      |      |      |
| 7.00      | 1 (std.)   | 3.000          | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.44      | 2.500                  | 2.50 | 13.50 | 2.25 | 3.69 | 3.63 |
|           | 2          | 5.000          | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.44      | 2.500                  | 2.50 | 13.50 | 2.25 | 3.69 | 3.63 |
|           | 3          | 3.500          | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.44      | 2.500                  | 2.50 | 13.50 | 2.25 | 3.69 | 3.63 |
|           | 4          | 4.000          | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.44      | 2.500                  | 2.50 | 13.50 | 2.25 | 3.69 | 3.63 |
|           | 5          | 4.500          | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.44      | 2.500                  | 2.50 | 13.50 | 2.25 | 3.69 | 3.63 |

<sup>1</sup>NPTF ports are available at no extra charge.

<sup>2</sup>SAE straight thread ports are standard and are indicated by port number.

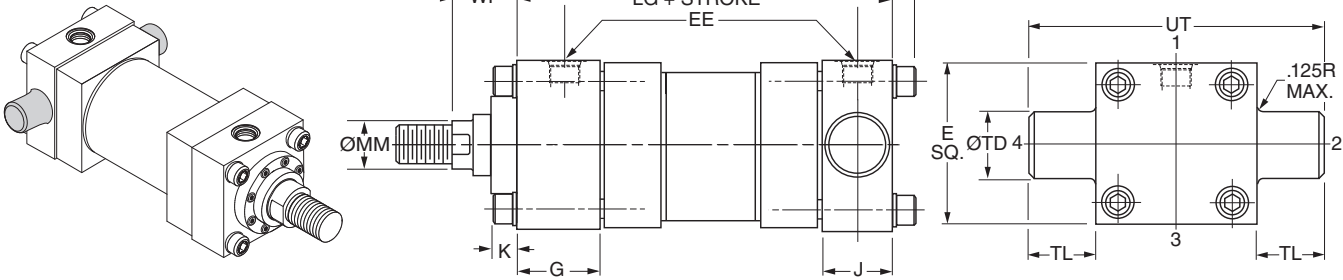
**Style D – Dimensional and Mounting Data**

| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | Add Stroke |      |            |
|-----------|------------|----------------|------------|------|------------|
|           |            |                | LG         | P    | ZB<br>Max. |
| 7.00      | 1 (std.)   | 3.000          | 8.50       | 5.63 | 12.19      |
|           | 2          | 5.000          | 8.50       | 5.63 | 12.19      |
|           | 3          | 3.500          | 8.50       | 5.63 | 12.19      |
|           | 4          | 4.000          | 8.50       | 5.63 | 12.19      |
|           | 5          | 4.500          | 8.50       | 5.63 | 12.19      |

**D**  
Series 3HB 7.00" & 8.00"  
Bore

**⚠ PROP 65 WARNING** **WARNING:** This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**Cap Trunnion Mounting**  
Style DB  
(NFPA Style MT2)



**Style DB – Dimensional and Mounting Data**

| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | E    | EE                |                  | G    | J    | K<br>Max. | TD Ø<br>+.000<br>-.002 | TL   | UT    | WF   | Y    |
|-----------|------------|----------------|------|-------------------|------------------|------|------|-----------|------------------------|------|-------|------|------|
|           |            |                |      | NPTF <sup>1</sup> | SAE <sup>2</sup> |      |      |           |                        |      |       |      |      |
| 7.00      | 1 (std.)   | 3.000          | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.44      | 2.500                  | 2.50 | 13.50 | 2.25 | 3.69 |
|           | 2          | 5.000          | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.44      | 2.500                  | 2.50 | 13.50 | 2.25 | 3.69 |
|           | 3          | 3.500          | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.44      | 2.500                  | 2.50 | 13.50 | 2.25 | 3.69 |
|           | 4          | 4.000          | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.44      | 2.500                  | 2.50 | 13.50 | 2.25 | 3.69 |
|           | 5          | 4.500          | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.44      | 2.500                  | 2.50 | 13.50 | 2.25 | 3.69 |

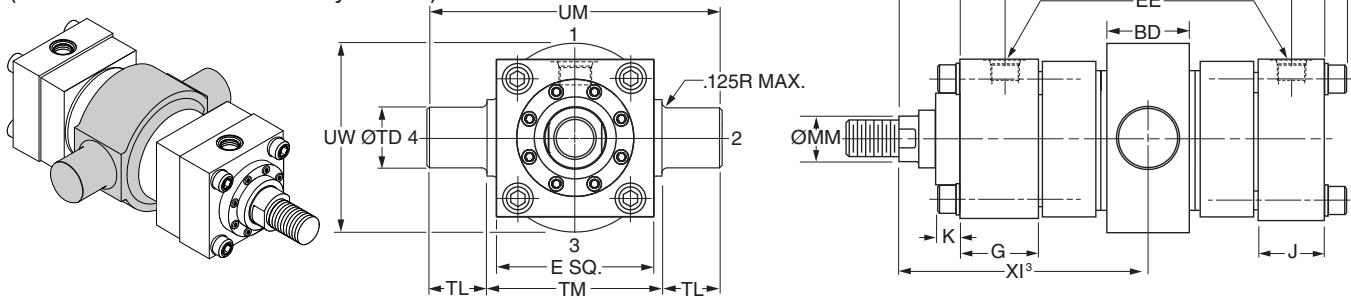
<sup>1</sup>NPTF ports are available at no extra charge.

<sup>2</sup>SAE straight thread ports are standard and are indicated by port number.

**Style DB – Dimensional and Mounting Data**

| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | Add Stroke |      |      |           |
|-----------|------------|----------------|------------|------|------|-----------|
|           |            |                | LG         | P    | XJ   | ZB<br>Max |
| 7.00      | 1 (std.)   | 3.000          | 8.50       | 5.63 | 9.38 | 12.19     |
|           | 2          | 5.000          | 8.50       | 5.63 | 9.38 | 12.19     |
|           | 3          | 3.500          | 8.50       | 5.63 | 9.38 | 12.19     |
|           | 4          | 4.000          | 8.50       | 5.63 | 9.38 | 12.19     |
|           | 5          | 4.500          | 8.50       | 5.63 | 9.38 | 12.19     |

**⚠ PROP 65 WARNING** **WARNING:** This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**Mounting Information****Heavy Duty Hydraulic Cylinders  
Series 3HB 7.00" & 8.00" Bore****Heavy Duty Intermediate Fixed  
Trunnion Mounting  
Style DE  
(NFPA Current Standard Style MT4)**

Note: 8.00" bore threaded flanges extend beyond head and cap E square. See 8.00" Bore Threaded Flange page for details.

**Style DE – Dimensional and Mounting Data**

| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | BD   | E    | EE                |                  | G    | J    | K<br>Max. | TD Ø<br>+.000<br>-.002 | TL   | TM    | UM    | UW    | WF   | Y    |
|-----------|------------|----------------|------|------|-------------------|------------------|------|------|-----------|------------------------|------|-------|-------|-------|------|------|
|           |            |                |      |      | NPTF <sup>1</sup> | SAE <sup>2</sup> |      |      |           |                        |      |       |       |       |      |      |
| 7.00      | 1 (std.)   | 3.000          | 3.88 | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.44      | 3.500                  | 2.50 | 9.75  | 14.75 | 10.25 | 2.25 | 3.69 |
|           | 2          | 5.000          | 3.88 | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.44      | 3.500                  | 2.50 | 9.75  | 14.75 | 10.25 | 2.25 | 3.69 |
|           | 3          | 3.500          | 3.88 | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.44      | 3.500                  | 2.50 | 9.75  | 14.75 | 10.25 | 2.25 | 3.69 |
|           | 4          | 4.000          | 3.88 | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.44      | 3.500                  | 2.50 | 9.75  | 14.75 | 10.25 | 2.25 | 3.69 |
|           | 5          | 4.500          | 3.88 | 8.50 | 1 1/4             | 20               | 2.75 | 2.75 | 1.44      | 3.500                  | 2.50 | 9.75  | 14.75 | 10.25 | 2.25 | 3.69 |
| 8.00      | 1 (std.)   | 3.500          | 4.44 | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.56      | 4.000                  | 3.00 | 11.00 | 17.00 | 11.75 | 2.25 | 3.81 |
|           | 2          | 5.500          | 4.44 | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.56      | 4.000                  | 3.00 | 11.00 | 17.00 | 11.75 | 2.25 | 3.81 |
|           | 3          | 4.000          | 4.44 | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.56      | 4.000                  | 3.00 | 11.00 | 17.00 | 11.75 | 2.25 | 3.81 |
|           | 4          | 4.500          | 4.44 | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.56      | 4.000                  | 3.00 | 11.00 | 17.00 | 11.75 | 2.25 | 3.81 |
|           | 5          | 5.000          | 4.44 | 9.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.56      | 4.000                  | 3.00 | 11.00 | 17.00 | 11.75 | 2.25 | 3.81 |

<sup>1</sup>NPTF ports are available at no extra charge.

<sup>2</sup>SAE straight thread ports are standard and are indicated by port number.

**Style DE – Dimensional and Mounting Data**

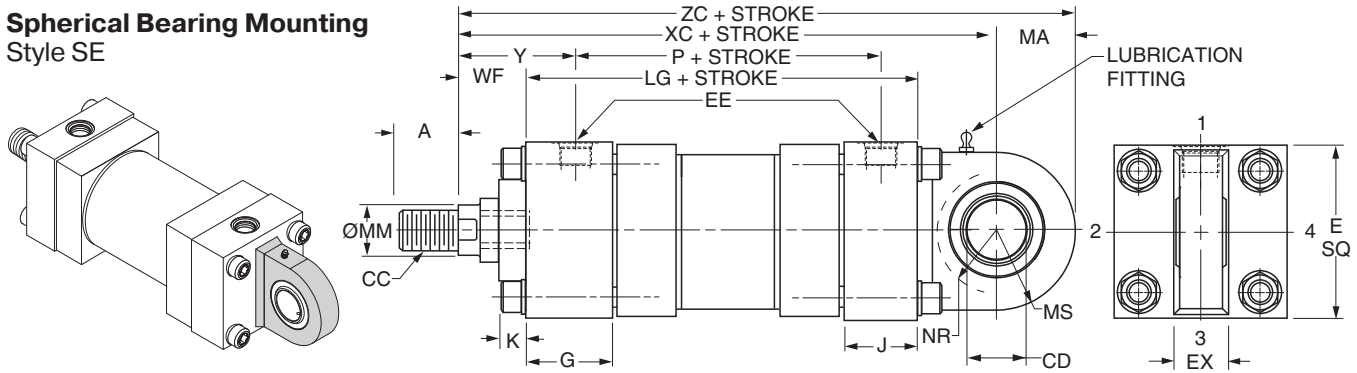
| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | Style DE<br>Minimum<br>Stroke | Minimum XI <sup>3</sup> |             | Add Stroke |      |                         |             |            |
|-----------|------------|----------------|-------------------------------|-------------------------|-------------|------------|------|-------------------------|-------------|------------|
|           |            |                |                               | Styles<br>4, 8 & 9      | Style<br>55 | LG         | P    | Maximum XI <sup>4</sup> |             | ZB<br>Max. |
|           |            |                |                               |                         |             |            |      | Styles<br>4, 8 & 9      | Style<br>55 |            |
| 7.00      | 1 (std.)   | 3.000          | 8.06                          | 10.50                   | 13.13       | 8.50       | 5.63 | 2.50                    | 5.13        | 12.19      |
|           | 2          | 5.000          | 8.06                          | 10.50                   | 14.88       | 8.50       | 5.63 | 2.50                    | 6.88        | 12.19      |
|           | 3          | 3.500          | 8.06                          | 10.50                   | 13.88       | 8.50       | 5.63 | 2.50                    | 5.87        | 12.19      |
|           | 4          | 4.000          | 8.06                          | 10.50                   | 14.00       | 8.50       | 5.63 | 2.50                    | 6.00        | 12.19      |
|           | 5          | 4.500          | 8.06                          | 10.50                   | 14.75       | 8.50       | 5.63 | 2.50                    | 6.75        | 12.19      |
| 8.00      | 1 (std.)   | 3.500          | 8.25                          | 11.13                   | 14.50       | 9.50       | 6.38 | 2.88                    | 6.25        | 13.31      |
|           | 2          | 5.500          | 8.25                          | 11.13                   | 16.38       | 9.50       | 6.38 | 2.88                    | 8.13        | 13.31      |
|           | 3          | 4.000          | 8.25                          | 11.13                   | 14.63       | 9.50       | 6.38 | 2.88                    | 6.39        | 13.31      |
|           | 4          | 4.500          | 8.25                          | 11.13                   | 15.38       | 9.50       | 6.38 | 2.88                    | 7.13        | 13.31      |
|           | 5          | 5.000          | 8.25                          | 11.13                   | 15.50       | 9.50       | 6.38 | 2.88                    | 7.25        | 13.31      |

<sup>3</sup>Dimension XI to be specified by customer. Reference point for rod end Style 55 is end of piston rod.

<sup>4</sup>Dimensions shown are valid for standard WF and WG dimension.

**⚠ PROP 65 WARNING** WARNING: This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)



**Mounting Information****Heavy Duty Hydraulic Cylinders  
Series 3HB 7.00" & 8.00" Bore****Spherical Bearing Mounting  
Style SE**

Note: 8.00" bore threaded flanges extend beyond head and cap E square.  
See 8.00" Bore Threaded Flange page for details.

**Style SE – Dimensional and Mounting Data**

| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | A     | CD <sup>3</sup> Ø<br>+0.0000<br>-0.0008 | E    | EX   | EE                |                  | G    | J    | K<br>Max. | MS   | MA   | NR   | WF   | Y    |
|-----------|------------|----------------|-------|-----------------------------------------|------|------|-------------------|------------------|------|------|-----------|------|------|------|------|------|
|           |            |                |       |                                         |      |      | NPTF <sup>1</sup> | SAE <sup>2</sup> |      |      |           |      |      |      |      |      |
| 7.00      | 1 (std.)   | 3.000          | 3.500 | 3.5000                                  | 8.50 | 3.06 | 1 1/4             | 20               | 2.75 | 2.75 | 1.44      | 4.00 | 4.00 | 3.68 | 2.25 | 3.69 |
|           | 2          | 5.000          | 3.500 | 3.5000                                  | 8.50 | 3.06 | 1 1/4             | 20               | 2.75 | 2.75 | 1.44      | 4.00 | 4.00 | 3.68 | 2.25 | 3.69 |
|           | 3          | 3.500          | 3.500 | 3.5000                                  | 8.50 | 3.06 | 1 1/4             | 20               | 2.75 | 2.75 | 1.44      | 4.00 | 4.00 | 3.68 | 2.25 | 3.69 |
|           | 4          | 4.000          | 3.500 | 3.5000                                  | 8.50 | 3.06 | 1 1/4             | 20               | 2.75 | 2.75 | 1.44      | 4.00 | 4.00 | 3.68 | 2.25 | 3.69 |
|           | 5          | 4.500          | 3.500 | 3.5000                                  | 8.50 | 3.06 | 1 1/4             | 20               | 2.75 | 2.75 | 1.44      | 4.00 | 4.00 | 3.68 | 2.25 | 3.69 |
| 8.00      | 1 (std.)   | 3.500          | 3.500 | 4.0000                                  | 9.50 | 3.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.56      | 4.50 | 4.50 | 4.13 | 2.25 | 3.81 |
|           | 2          | 5.500          | 3.500 | 4.0000                                  | 9.50 | 3.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.56      | 4.50 | 4.50 | 4.13 | 2.25 | 3.81 |
|           | 3          | 4.000          | 3.500 | 4.0000                                  | 9.50 | 3.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.56      | 4.50 | 4.50 | 4.13 | 2.25 | 3.81 |
|           | 4          | 4.500          | 3.500 | 4.0000                                  | 9.50 | 3.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.56      | 4.50 | 4.50 | 4.13 | 2.25 | 3.81 |
|           | 5          | 5.000          | 3.500 | 4.0000                                  | 9.50 | 3.50 | 1 1/2             | 24               | 3.00 | 3.00 | 1.56      | 4.50 | 4.50 | 4.13 | 2.25 | 3.81 |

<sup>1</sup>NPTF ports are available at no extra charge.

<sup>2</sup>SAE straight thread ports are standard and are indicated by port number.

<sup>3</sup>Dimension CD is pin diameter.

**Style SE – Dimensional and Mounting Data**

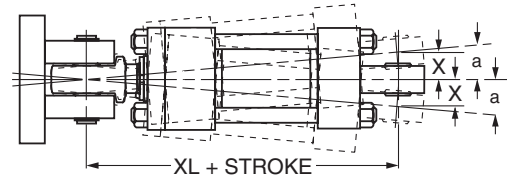
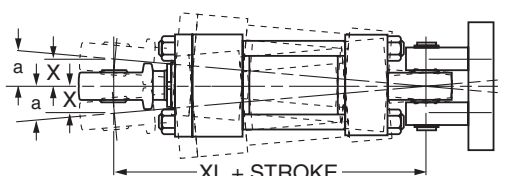
| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | Thread<br>Style 8<br>CC <sup>4</sup> | A    | Add Stroke |      |       |       |       |
|-----------|------------|----------------|--------------------------------------|------|------------|------|-------|-------|-------|
|           |            |                |                                      |      | LG         | P    | XC    | XL    | ZC    |
| 7.00      | 1 (std.)   | 3.000          | 2 3/4-12                             | 3.50 | 8.50       | 5.63 | 15.25 | 23.25 | 19.25 |
|           | 2          | 5.000          | 4                                    | 4    | 8.50       | 5.63 | 15.25 | 23.25 | 19.25 |
|           | 3          | 3.500          | 4                                    | 4    | 8.50       | 5.63 | 15.25 | 23.25 | 19.25 |
|           | 4          | 4.000          | 4                                    | 4    | 8.50       | 5.63 | 15.25 | 23.25 | 19.25 |
|           | 5          | 4.500          | 4                                    | 4    | 8.50       | 5.63 | 15.25 | 23.25 | 19.25 |
| 8.00      | 1 (std.)   | 3.500          | 3 1/4-12                             | 3.50 | 9.50       | 6.38 | 16.75 | 25.25 | 21.25 |
|           | 2          | 5.500          | 4                                    | 4    | 9.50       | 6.38 | 16.75 | 25.25 | 21.25 |
|           | 3          | 4.000          | 4                                    | 4    | 9.50       | 6.38 | 16.75 | 25.25 | 21.25 |
|           | 4          | 4.500          | 4                                    | 4    | 9.50       | 6.38 | 16.75 | 25.25 | 21.25 |
|           | 5          | 5.000          | 4                                    | 4    | 9.50       | 6.38 | 16.75 | 25.25 | 21.25 |

<sup>4</sup>To match pin diameter in rod eye and cap, when an oversize rod is required, specify rod end style '3', 'CC' thread and 'A' thread length for the standard rod diameter (Rod No. 1 for the bore), and 'WF' for the oversize rod. Order the rod eye and clevis bracket for the required bore size from the tables on the Style SE Spherical Bearing Accessories page.

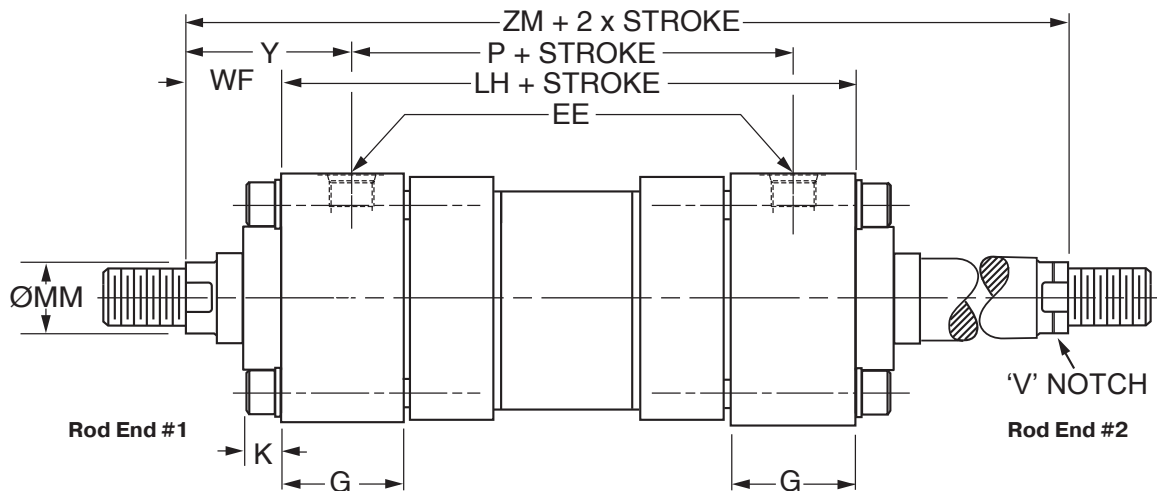
**Style SE – Recommended maximum swivel  
angle on each side of the cylinder centerline.**

| Bore<br>Ø | Head End Mounted |           | Cap End Mounted |           |
|-----------|------------------|-----------|-----------------|-----------|
|           | Angle a          | Tan. of a | Angle a         | Tan. of a |
| 7.00      | 3.00°            | 0.052     | 3.00°           | 0.052     |
| 8.00      | 3.00°            | 0.052     | 3.00°           | 0.052     |

Note: Dimension X is the maximum off center mounting of the cylinder. To determine dimension X for various stroke lengths multiply the distance between pivot pin holes by tangent of angle a. For extended position use X = XL + 2X stroke.

**Mounting Information****Head End Mounting****Cap End Mounting**

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**Double Rod Cylinder  
Style K****Double Rod End Mounting Styles**

See Mounting Groups page in Section H for guidance on double rod end cylinder mounting style selection.

| Mounting Styles for Single Rod Models | Mounting Styles for Corresponding Double Rod Models <sup>1</sup> |                                                      | Dimensions Shown on This Page Supplement Dimensions on 7.00" - 8.00" Bore Pages Listed Below |
|---------------------------------------|------------------------------------------------------------------|------------------------------------------------------|----------------------------------------------------------------------------------------------|
|                                       | Load Connected To Rod On Cylinder Mounting End                   | Load Connected To Rod Opposite Cylinder Mounting End |                                                                                              |
| C                                     | KC                                                               | KC                                                   | 104                                                                                          |
| JJ                                    | KJJ                                                              | KHH                                                  | 105                                                                                          |
| D                                     | KD                                                               | KDB                                                  | 107                                                                                          |
| DE                                    | KDE <sup>2</sup>                                                 | KDE <sup>2</sup>                                     | 109                                                                                          |

<sup>1</sup> Connect load to piston rod without 'V' notch. If only one end of the Double Rod Cylinder is to be cushioned, be sure to clearly specify which end this will be.

<sup>2</sup> Specify XI dimension for Styles DD & DE from #1 rod end (without 'V' notch).

| Bore Ø                                  | Rod No.  | MM Rod Ø | WF   | Add Stroke      |      | Add 2X Stroke   |
|-----------------------------------------|----------|----------|------|-----------------|------|-----------------|
|                                         |          |          |      | LH              | SSK  | ZM              |
| 7.00                                    | 1 (std.) | 3.00     | 2.25 | 8.50            | 5.75 | 13.00           |
|                                         | 2        | 5.00     | 2.25 | 8.50            | 5.75 | 13.00           |
|                                         | 3        | 3.50     | 2.25 | 8.50            | 5.75 | 13.00           |
|                                         | 4        | 4.00     | 2.25 | 8.50            | 5.75 | 13.00           |
|                                         | 5        | 4.50     | 2.25 | 8.50            | 5.75 | 13.00           |
| 8.00                                    | 1 (std.) | 3.50     | 2.25 | 9.50            | 6.75 | 14.00           |
|                                         | 2        | 5.50     | 2.25 | 9.50            | 6.75 | 14.00           |
|                                         | 3        | 4.00     | 2.25 | 9.50            | 6.75 | 14.00           |
|                                         | 4        | 4.50     | 2.25 | 9.50            | 6.75 | 14.00           |
|                                         | 5        | 5.00     | 2.25 | 9.50            | 6.75 | 14.00           |
| Replaces On single rod mounting styles: |          |          |      | LG              | SS   | —               |
|                                         |          |          |      | All Mtg. Styles | C    | All Mtg. Styles |

**How to Use Double Rod Cylinder  
Dimension Drawings**

To determine dimensions for a double rod cylinder, first refer to the desired single rod mounting style cylinder shown on preceding pages of this catalog. (See table above.) After selecting necessary dimensions from that drawing, return to this page supplement the single rod dimensions with those shown on drawing at right and dimension table below. Note that double rod cylinders have a head (Dim. G) at both ends and that dimension LH replaces LG. The double rod

dimensions differ from, or are in addition to those for single rod cylinders shown on preceding pages and provide the information needed to completely dimension a double rod cylinder.

On a double rod cylinder where the two rod ends are different, be sure to clearly state which rod end is to be assembled at which end. Port position 1 is standard. If other than standard, specify pos. 2, 3 or 4 when viewed from rod end #1 only. See port position information in Section H.

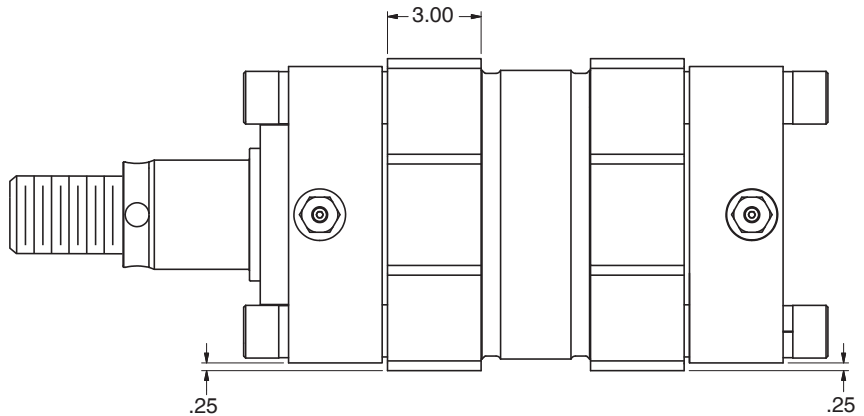
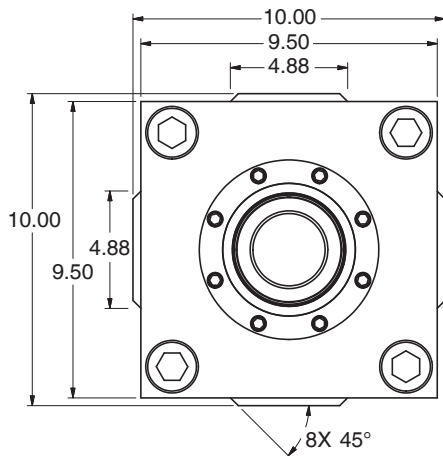
**PROP 65 WARNING**

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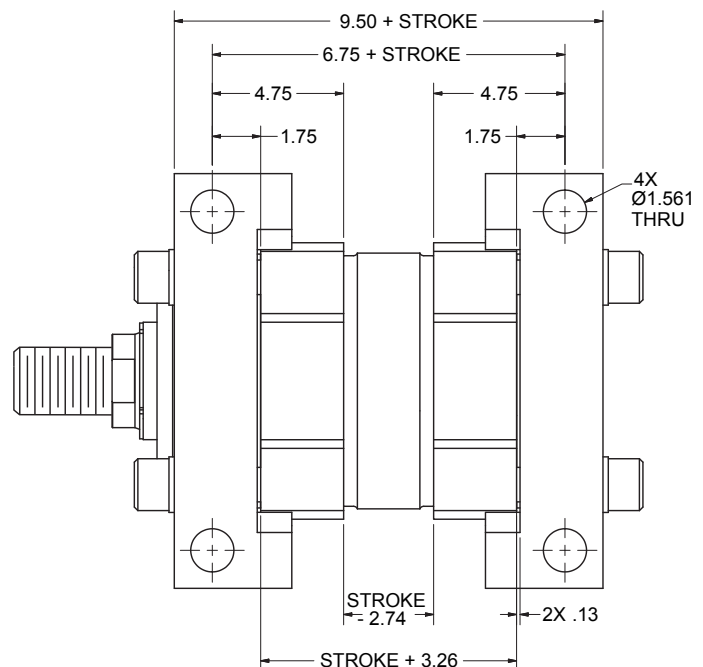
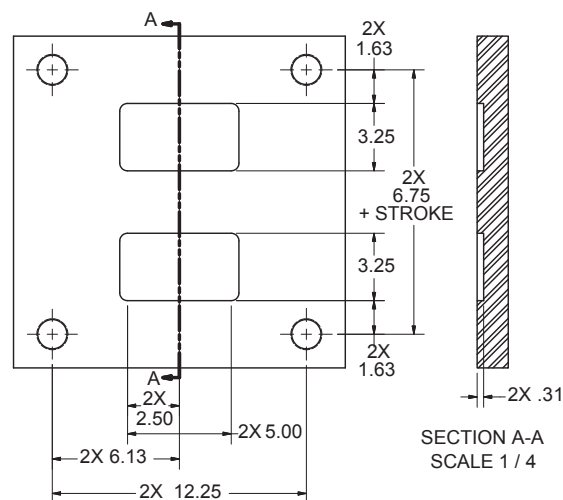
**Threaded Flange Dimensions  
for 8.00" Bore 3HB**

Threaded flanges that secure the 8.00" bore 3HB head and cap to the ends of the cylinder body extend beyond the head and cap 'E' square. Dimensions of the flange extensions are detailed below.

**Suggested Machining for Mounting  
Series 3HB, 8.00" Bore Style C**

To install an 8.00" bore Mounting Style C, Series 3HB cylinder, the extension of the threaded flanges below the mounting lug surface must be considered. The

drawings and dimensions below can be used as a suggested guide for preparing the machine mounting surface with slots to accommodate the extensions.



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## **Section E**

### **Series 3H Large Bore Heavy Duty Hydraulic Cylinders**

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## The large bore, high pressure hydraulic cylinder Parker designed to meet your needs

Parker Series 3H large bore cylinders provide unmatched reliability, performance, and innovative design features that aid in increasing productivity while reducing operating costs.

Parker's externally removable bolt-on gland assembly makes preventive and routine maintenance quick and easy! In many cases, the cylinder does not have to be removed or disassembled to facilitate service. Our innovative design provides for fast turn around, reduced downtime, and increased productivity.

In addition to our removable gland assembly, Series 3H cylinders also include a multitude of innovative design features such as: anti-extrusion body end seals, floating cushions, hi load piston (standard), and various port and rod end options to meet your application requirements.

Every Series 3H cylinder is individually tested before leaving our plant to assure proper and leak free operation. All Series 3H cylinders come with an eighteen month warranty standard.



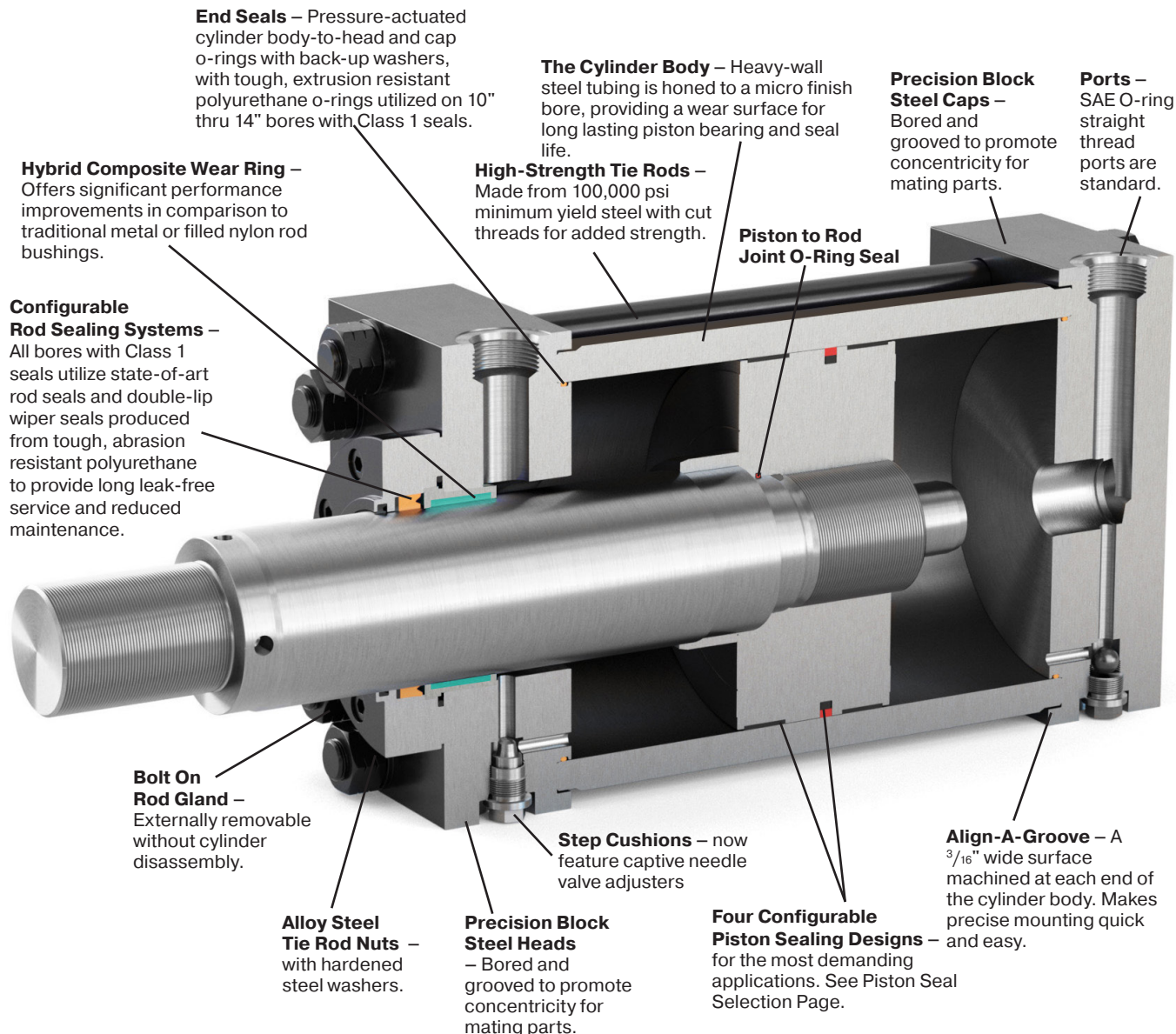
Series 3H / Large Bore

**E**

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# These innovative design features make Parker Series 3H Large Bore your best choice...

## for all your large bore heavy duty hydraulic cylinder applications.



**E**  
Series 3H / Large Bore

**⚠ PROP 65 WARNING** **WARNING:** This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**Standard Specifications**

- Heavy Duty Service
- Standard Construction – Square Head – Tie Rod Design
- Nominal Pressure – 3000 psi<sup>1</sup>
- Standard Fluid – Hydraulic Oil
- Standard Temperature – -10°F to +165°F<sup>2</sup>
- Bore Sizes – 10.00" through 20.00"
- Piston Rod Diameter – 4.500" through 10.000"

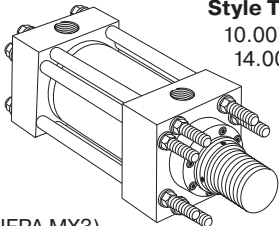
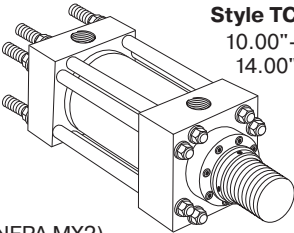
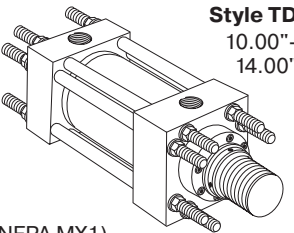
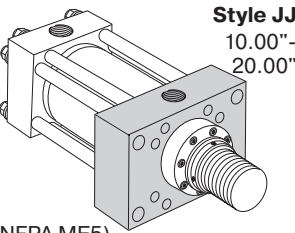
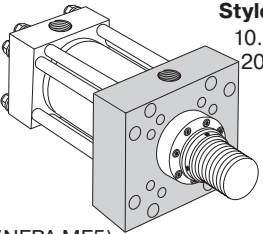
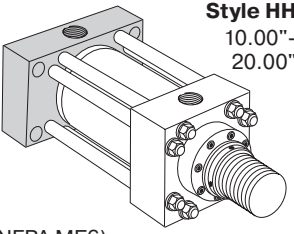
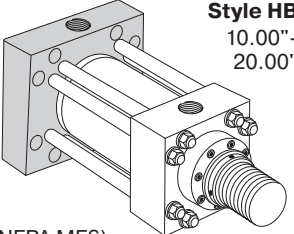
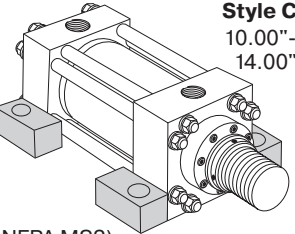
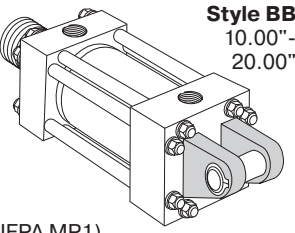
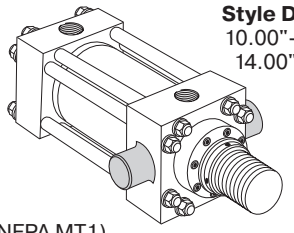
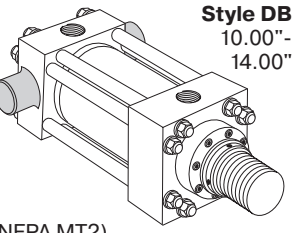
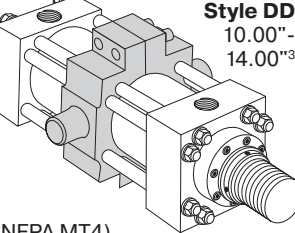
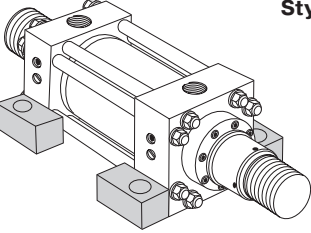
<sup>1</sup> If hydraulic operating pressure exceeds 3000 psi, send application data for engineering evaluation and recommendation.  
See Section H for actual design factors.

<sup>2</sup> See Section H for higher temperature service.

*In line with our policy of continuing product improvement, specifications in this catalog are subject to change.*

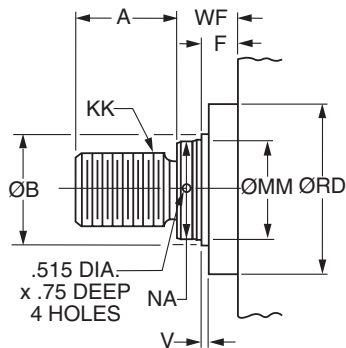
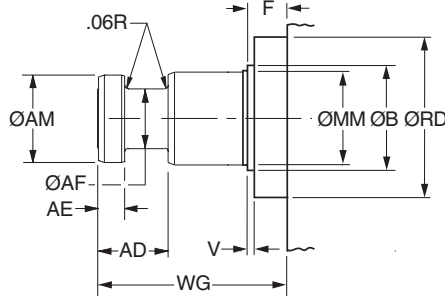
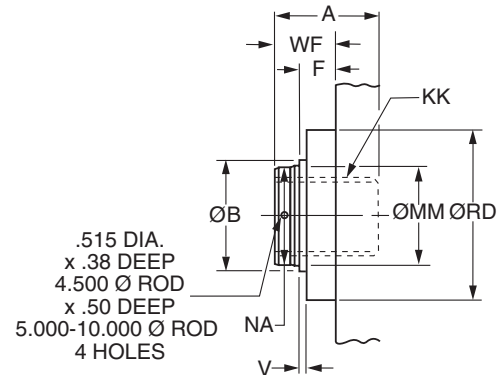
- Mounting Styles – 12 standard styles at various application ratings
- Strokes – Available in any practical stroke length
- Cushions – Optional at either end or both ends of stroke
- Rod Ends – Three Standard Choices – Specials to Order

**Available Mounting Styles**

|                                                                                                                                                                                                                                          |                                                                                                                                                                               |                                                                                                                                                                                  |                                                                                                                                                                                                 |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Tie Rods Extended Head End</p>  <p><b>Style TB</b><br/>10.00"-14.00"</p> <p>(NFPA MX3)</p>                                                           | <p>Tie Rods Extended Cap End</p>  <p><b>Style TC</b><br/>10.00"-14.00"</p> <p>(NFPA MX2)</p> | <p>Tie Rods Extended Both Ends</p>  <p><b>Style TD</b><br/>10.00"-14.00"</p> <p>(NFPA MX1)</p> | <p>Head Rectangular</p>  <p><b>Style JJ</b><br/>10.00"-20.00"</p> <p>(NFPA ME5)</p>                          |
| <p>Head Square Flange</p>  <p><b>Style JB</b><br/>10.00"-20.00"</p> <p>(NFPA MF5)</p>                                                                 | <p>Cap Rectangular</p>  <p><b>Style HH</b><br/>10.00"-20.00"</p> <p>(NFPA ME6)</p>         | <p>Cap Square Flange</p>  <p><b>Style HB</b><br/>10.00"-20.00"</p> <p>(NFPA MF6)</p>         | <p>Side Lug</p>  <p><b>Style C</b><br/>10.00"-14.00"</p> <p>(NFPA MS2)</p>                                 |
| <p>Cap Fixed Clevis</p>  <p><b>Style BB</b><br/>10.00"-20.00"</p> <p>(NFPA MP1)</p>                                                                   | <p>Head Trunnion</p>  <p><b>Style D</b><br/>10.00"-14.00"</p> <p>(NFPA MT1)</p>            | <p>Cap Trunnion</p>  <p><b>Style DB</b><br/>10.00"-14.00"</p> <p>(NFPA MT2)</p>              | <p>Intermediate Fixed Trunnion</p>  <p><b>Style DD</b><br/>10.00"-14.00"<sup>3</sup></p> <p>(NFPA MT4)</p> |
| <p>Double Rod Cylinders</p>  <p><b>Style KC Shown</b></p> <p>Most of the above illustrated mounting styles are available in double rod cylinders.</p> |                                                                                                                                                                               |                                                                                                                                                                                  |                                                                                                                                                                                                 |

<sup>3</sup> Consult factory for 16.00"-20.00"

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**Rod End Dimensions – 10.00" - 20.00" Bore****Thread Style 4 (NFPA Style SM)  
Small Male****Thread Style 55<sup>1</sup>  
Flanged Rod End****Thread Style 9<sup>2</sup> (NFPA Style SF)  
Small Female****Rod End Dimensions – 10.00" - 20.00" Bore**

| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | Thread<br>Style<br>4 & 9<br>KK | Rod Extensions and Pilot Dimensions |                       |      |      |                      |      |      |
|-----------|------------|----------------|--------------------------------|-------------------------------------|-----------------------|------|------|----------------------|------|------|
|           |            |                |                                | A                                   | B Ø<br>+.000<br>-.005 | F    | NA   | RD<br>+.000<br>-.005 | V    | WF   |
| 10.00     | 1 (std.)   | 4.500          | 3 1/4-12                       | 4.50                                | 5.249                 | 1.94 | 4.38 | 8.249                | 0.25 | 2.94 |
|           | 2          | 7.000          | 5-12                           | 7.00                                | 7.999                 | 1.94 | 6.88 | 10.499               | 0.38 | 3.50 |
|           | 3          | 5.000          | 3 1/2-12                       | 5.00                                | 5.749                 | 1.94 | 4.88 | 8.874                | 0.25 | 3.19 |
|           | 4          | 5.500          | 4-12                           | 5.50                                | 6.249                 | 1.94 | 5.38 | 9.374                | 0.25 | 3.19 |
| 12.00     | 1 (std.)   | 5.500          | 4-12                           | 5.50                                | 6.249                 | 1.94 | 5.38 | 9.374                | 0.25 | 3.19 |
|           | 2          | 8.000          | 5 3/4-12                       | 8.00                                | 8.999                 | 1.94 | 7.88 | 12.499               | 0.38 | 4.00 |
|           | 3          | 7.000          | 5-12                           | 7.00                                | 7.999                 | 1.94 | 6.88 | 10.499               | 0.38 | 3.50 |
| 14.00     | 1 (std.)   | 7.000          | 5-12                           | 7.00                                | 7.999                 | 1.94 | 6.88 | 10.499               | 0.38 | 3.50 |
|           | 2          | 10.000         | 7 1/4-12                       | 10.00                               | 10.999                | 1.94 | 9.88 | 14.499               | 0.38 | 4.50 |
|           | 3          | 8.000          | 5 3/4-12                       | 8.00                                | 8.999                 | 1.94 | 7.88 | 12.499               | 0.38 | 4.00 |
| 16.00     | 1          | 8.000          | 5 3/4-12                       | 8.00                                | 8.999                 | 1.94 | 7.88 | 12.499               | 0.38 | 4.00 |
|           | 3          | 9.000          | 6 1/2-12                       | 9.00                                | 9.999                 | 1.94 | 8.88 | 13.499               | 0.38 | 4.25 |
|           | 4          | 10.000         | 7 1/4-12                       | 10.00                               | 10.999                | 1.94 | 9.88 | 14.499               | 0.38 | 4.50 |
| 18.00     | 1          | 9.000          | 6 1/2-12                       | 9.00                                | 9.999                 | 1.94 | 8.88 | 13.499               | 0.38 | 4.25 |
|           | 3          | 10.000         | 7 1/4-12                       | 10.00                               | 10.999                | 1.94 | 9.88 | 14.499               | 0.38 | 4.50 |
| 20.00     | 1          | 10.000         | 7 1/4-12                       | 10.00                               | 10.999                | 1.94 | 9.88 | 14.499               | 0.38 | 4.50 |

**"Special" Thread Style 3**

Special thread, extension, rod eye, blank, etc., are also available.

To order, specify "Style 3" and give desired dimensions for KK, A & WF. If otherwise special, furnish dimensioned sketch.

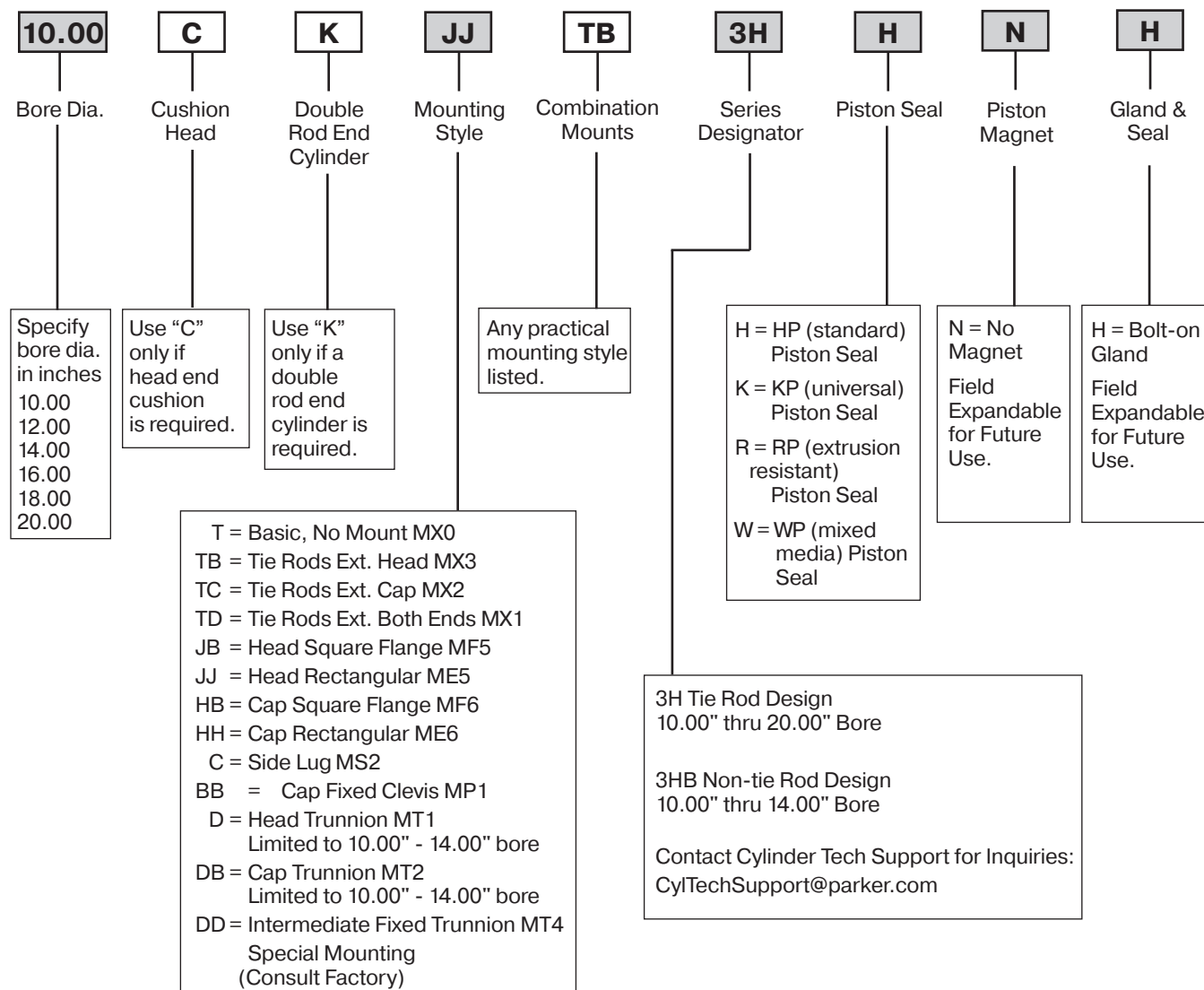
<sup>1</sup>For special WG dimension, specify "Style 3" and give desired dimension for WG. For other changes, place "S" in the model code, and describe rod end with dimensioned sketch.

<sup>2</sup>Style 9 stroke restrictions may apply. See Style 9 Minimum Stroke Table on How to Order page for details.

**Style 55 Rod End**

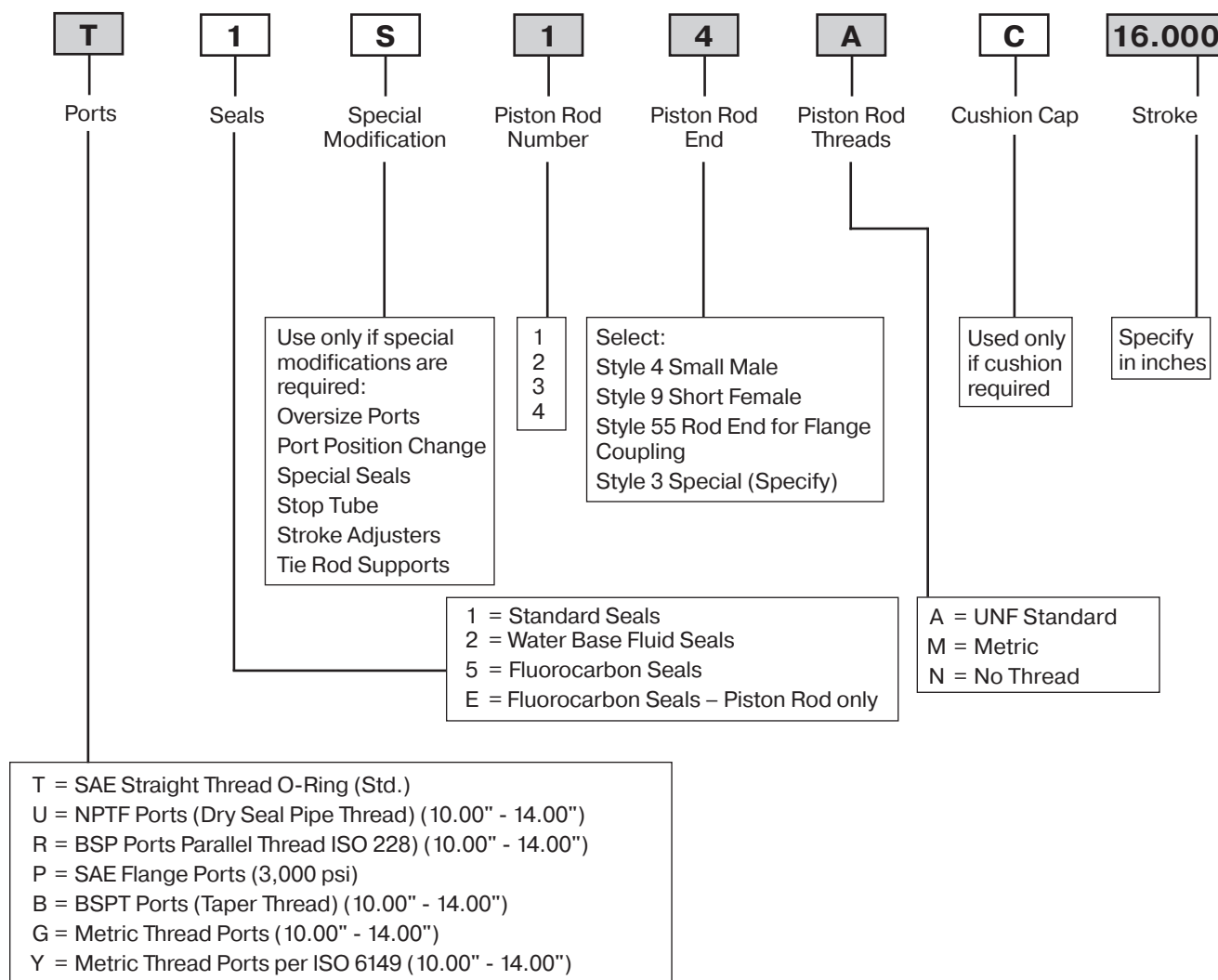
| MM<br>Rod<br>Ø | AD   | AE<br>+.001<br>-.001 | AF<br>Ø | AM<br>Ø | WG <sup>1</sup> |
|----------------|------|----------------------|---------|---------|-----------------|
| 4.500          | 3.19 | 1.499                | 3.50    | 4.45    | 6.50            |
| 5.000          | 3.19 | 1.499                | 3.88    | 4.95    | 6.63            |
| 5.500          | 3.94 | 1.874                | 4.38    | 5.45    | 7.50            |
| 7.000          | 4.06 | 1.999                | 5.75    | 6.95    | 8.44            |
| 8.000          | 4.06 | 1.999                | 6.50    | 7.95    | 8.69            |
| 9.000          | 4.63 | 2.374                | 7.25    | 8.95    | 8.75            |
| 10.000         | 4.63 | 2.374                | 8.00    | 9.95    | 9.75            |

**⚠ PROP 65 WARNING** WARNING: This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**3H Large Bore Model Code**

Shaded boxes identify required model number fields.

**⚠ PROP 65 WARNING** **WARNING:** This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**3H Large Bore Model Code****Style 9 Minimum Stroke Table**

| Bore Ø | Rod Ø  | Minimum Stroke |
|--------|--------|----------------|
| 10.00  | 4.500  | 1.125          |
|        | 5.000  | 1.375          |
|        | 5.500  | 2.000          |
|        | 7.000  | 3.125          |
| 12.00  | 5.500  | 1.250          |
|        | 7.000  | 2.375          |
|        | 8.000  | 3.125          |
| 14.00  | 7.000  | 2.000          |
|        | 8.000  | 2.750          |
|        | 10.000 | 4.250          |

| Bore Ø | Rod Ø  | Minimum Stroke |
|--------|--------|----------------|
| 16.00  | 8.000  | 1.750          |
|        | 9.000  | 2.500          |
|        | 10.000 | 3.250          |
| 18.00  | 9.000  | 1.500          |
|        | 10.000 | 2.250          |
| 20.00  | 10.000 | 1.250          |

Shaded boxes identify required model number fields.

**⚠ PROP 65 WARNING** **WARNING:** This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

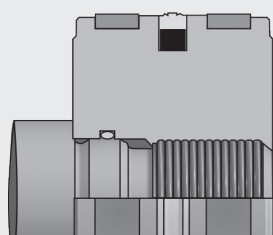
## Piston Seal Selection

Parker Piston Seal options HP, KP, RP and WP are available in a number of different Seal Classes. Because the Parker Model Number includes Seal Class but does not include a code for piston seal style, a default piston seal style is designated for each seal class. In the table below rows list each seal class and columns column list each piston style. Available piston styles

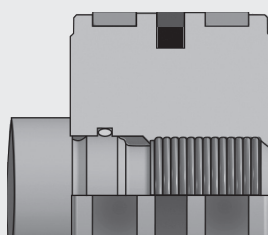
for each seal class are identified with an 'X' and the default piston seal style is in the shaded cell. To specify an available piston seal style that is not standard, place an 'S' in the Special Modification field of the model number and specify the required piston seal style with text.

| Seal Class                                                           | Piston Seal Options<br>(Shaded cell is default standard) |    |     |     |
|----------------------------------------------------------------------|----------------------------------------------------------|----|-----|-----|
|                                                                      | HM                                                       | KM | RM  | WM  |
| <b>TG</b> - Class 1 - Polyurethane & Nitrile                         | X                                                        | X  | X   | X   |
| <b>NG</b> - Class 2 - Nitrile                                        | N/A                                                      | X  | X   | X   |
| <b>XG</b> - Class 3 - EPR                                            | N/A                                                      | X  | X   | X   |
| <b>LG</b> - Class 4 - Low Temperature Nitrile                        | X                                                        | X  | X   | N/A |
| <b>VG</b> - Class 5 - Fluorocarbon                                   | N/A                                                      | X  | X   | X   |
| <b>EG</b> - Class 5 Rod Bushing Seals Only                           | N/A                                                      | X  | X   | X   |
| <b>JG</b> - Class 6 - Nitroxile                                      | N/A                                                      | X  | X   | X   |
| <b>HG</b> - Class 8 - Filled PTFE High Temperature                   | N/A                                                      | X  | N/A | N/A |
| <b>GG</b> - Class 8 Rod Bushing Seals Only (all others Fluorocarbon) | N/A                                                      | X  | X   | X   |

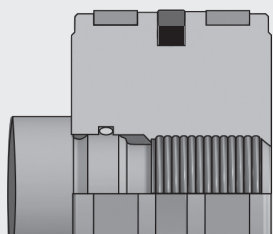
### One Common Piston for 4 Seal Styles



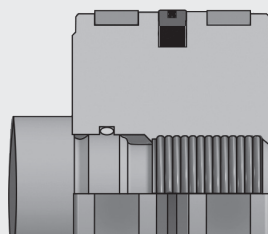
**Standard HP** style with polyurethane piston seal – excellent for most cycling and load holding applications.



**Optional RP** style with thermoplastic piston seal – superior extrusion resistance to extreme pressure spikes with drift-free performance.



**Optional KP** style with filled PTFE piston seal – low friction, high heat resistance for cycling and load holding service.



**Optional WP** style mixed media piston seal – low friction primary seal with redundant elastomer delivers superior performance with dissimilar media on either side of the piston.

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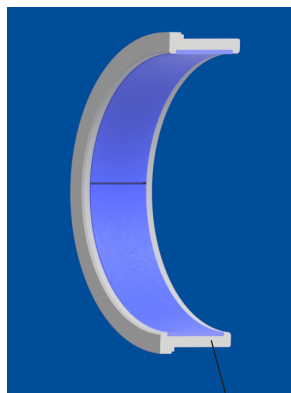


# 3H Series Large Bore Hybrid Composite Bushing

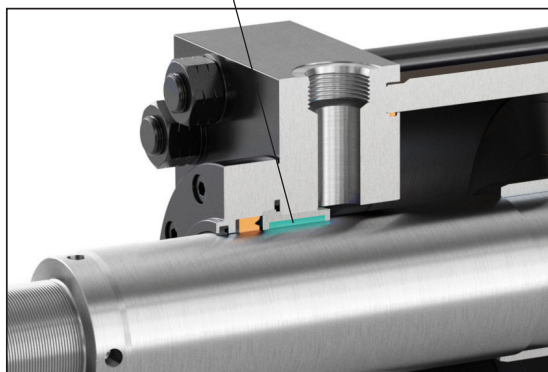
Innovative Solutions from  
Parker Hannifin Cylinders



## Customer Value Proposition:



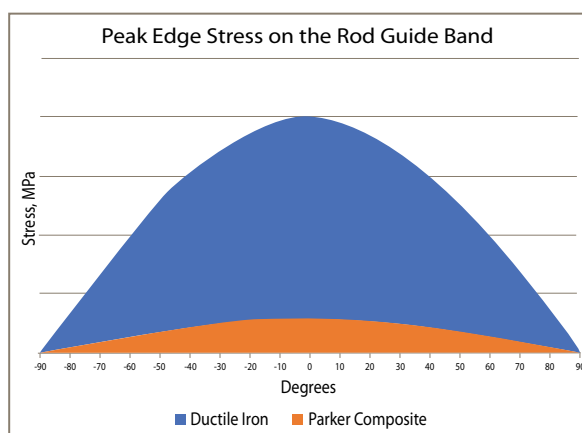
The Parker Cylinders 3H Series Large Bore Hybrid Composite Bushing installed inboard of the primary rod sealing package offers significant performance improvements in comparison to Metal or Filled Nylon Rod Bushings



## Contact Information:

Parker Hannifin  
**Hydraulic Actuator Division**  
500 S. Wolf Rd.  
Des Plaines, IL 60016  
[www.parker.com/had](http://www.parker.com/had)

**phone 847 298 2400**  
**fax 800 892 1008**



### Key Takeaway:

Contact stress is reduced when any side load force is distributed over a greater area.  
See how Parker Cylinders' composite bearing performs over Ductile Iron.

## Product Features:

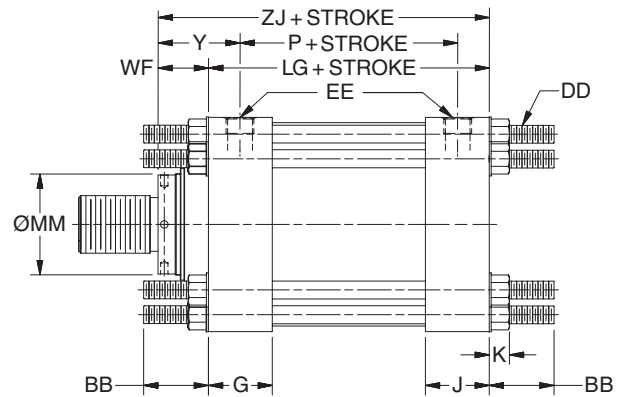
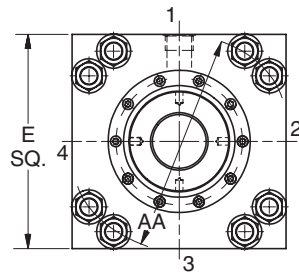
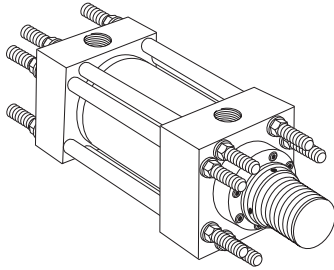
### Parker's Hybrid Composite Versus Metal Bushings

- Better ability to conform to bending deflections resulting in lower peak stresses
- Self lubricating with lower friction
- Ideal for High Water Content fluids

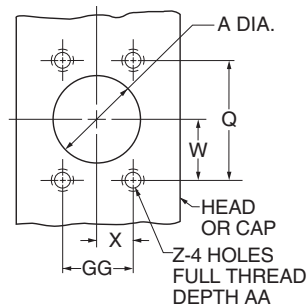
### Parker's Hybrid Composite Versus Filled Nylon Bushings

- Higher strength
- Very low water absorption
- Wider temperature range

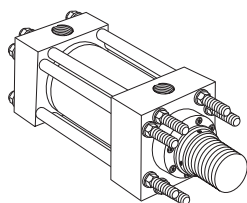
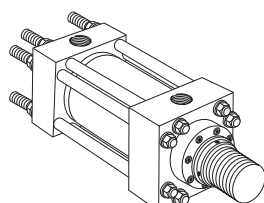
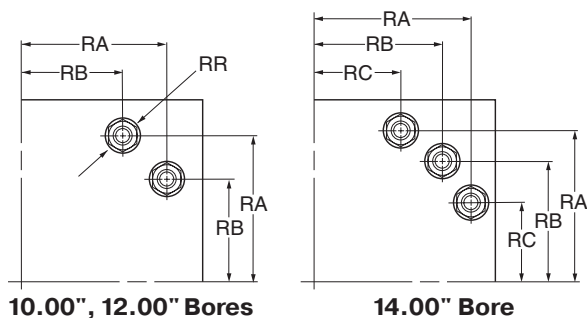
**⚠ PROP 65 WARNING** WARNING: This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**Mounting Information****Heavy Duty Hydraulic Cylinders  
Series 3H Large Bore****Tie Rods Extended Both Ends Mounting  
Style TD  
(NFPA Style MX1)****Style TD – Dimensional and Mounting Data**

| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | AA    | BB   | DD       | E     | EE                |                                     |                                        | G    | J    | K<br>Max. | WF   | Y    | Add Stroke |       |       |
|-----------|------------|----------------|-------|------|----------|-------|-------------------|-------------------------------------|----------------------------------------|------|------|-----------|------|------|------------|-------|-------|
|           |            |                |       |      |          |       | NPTF <sup>1</sup> | SAE<br>Flange<br>Ports <sup>2</sup> | SAE<br>Straight<br>Thread <sup>3</sup> |      |      |           |      |      | LG         | P     | ZJ    |
| 10.00     | 1 (std.)   | 4.500          | 13.00 | 4.13 | 1 1/8-12 | 12.63 | 2.00              | 2.00                                | 24                                     | 3.69 | 3.69 | 1.17      | 2.94 | 4.75 | 12.13      | 8.50  | 15.06 |
|           | 2          | 7.000          | 13.00 | 4.13 | 1 1/8-12 | 12.63 | 2.00              | 2.00                                | 24                                     | 3.69 | 3.69 | 1.17      | 3.50 | 5.31 | 12.13      | 8.50  | 15.63 |
|           | 3          | 5.000          | 13.00 | 4.13 | 1 1/8-12 | 12.63 | 2.00              | 2.00                                | 24                                     | 3.69 | 3.69 | 1.17      | 3.19 | 5.00 | 12.13      | 8.50  | 15.31 |
|           | 4          | 5.500          | 13.00 | 4.13 | 1 1/8-12 | 12.63 | 2.00              | 2.00                                | 24                                     | 3.69 | 3.69 | 1.17      | 3.19 | 5.00 | 12.13      | 8.50  | 15.31 |
| 12.00     | 1 (std.)   | 5.500          | 15.50 | 4.50 | 1 1/4-12 | 14.88 | 2.50              | 2.50 <sup>4</sup>                   | 24                                     | 4.44 | 4.44 | 1.30      | 3.19 | 5.38 | 14.50      | 10.13 | 17.69 |
|           | 2          | 8.000          | 15.50 | 4.50 | 1 1/4-12 | 14.88 | 2.50              | 2.50 <sup>4</sup>                   | 24                                     | 4.44 | 4.44 | 1.30      | 4.00 | 6.19 | 14.50      | 10.13 | 18.50 |
|           | 3          | 7.000          | 15.50 | 4.50 | 1 1/4-12 | 14.88 | 2.50              | 2.50 <sup>4</sup>                   | 24                                     | 4.44 | 4.44 | 1.30      | 3.50 | 5.69 | 14.50      | 10.13 | 18.00 |
| 14.00     | 1 (std.)   | 7.000          | 17.38 | 4.50 | 1 1/4-12 | 17.13 | 2.50              | 2.50 <sup>4</sup>                   | 24                                     | 4.88 | 4.88 | 1.30      | 3.50 | 5.88 | 15.63      | 10.88 | 19.13 |
|           | 2          | 10.000         | 17.38 | 4.50 | 1 1/4-12 | 17.13 | 2.50              | 2.50 <sup>4</sup>                   | 24                                     | 4.88 | 4.88 | 1.30      | 4.50 | 6.88 | 15.63      | 10.88 | 20.13 |
|           | 3          | 8.000          | 17.38 | 4.50 | 1 1/4-12 | 17.13 | 2.50              | 2.50 <sup>4</sup>                   | 24                                     | 4.88 | 4.88 | 1.30      | 4.00 | 6.38 | 15.63      | 10.88 | 19.63 |

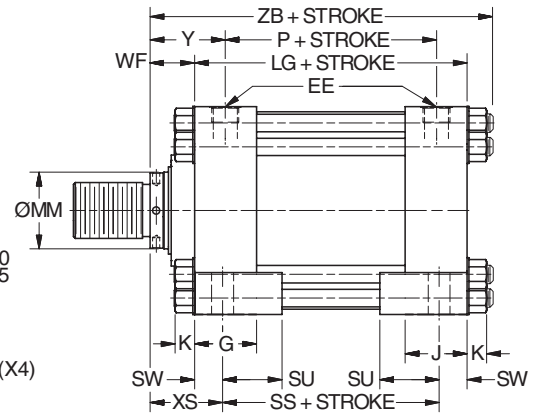
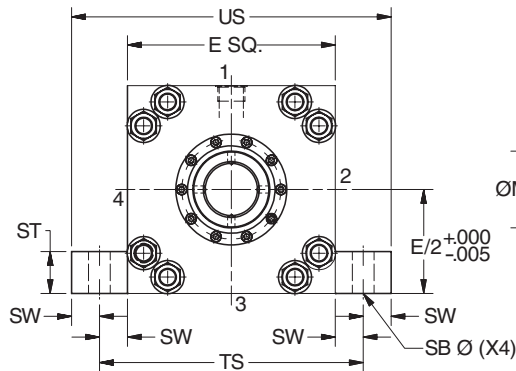
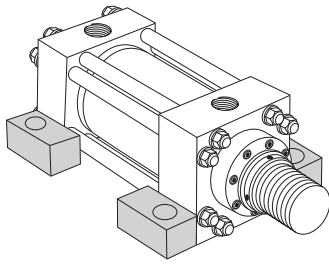
<sup>1</sup> NPTF ports are available at no extra charge.<sup>2</sup> Optional SAE flange ports may be specified – flange to be supplied by customer. See Optional SAE Flange Port Pattern table for dimensions.<sup>3</sup> SAE straight thread ports are standard and are indicated by port number.<sup>4</sup> 2.50 SAE flange port is rated at 2500 psi**Optional SAE Flange Port Pattern**

| Nom. Flange Size | A    | Q     | GG    | W    | X    | Z-THD UNC-2B | AA Min. | SAE |
|------------------|------|-------|-------|------|------|--------------|---------|-----|
| 2                | 2.00 | 3.062 | 1.688 | 1.53 | 0.84 | 1/2-13       | 1.06    | 32  |
| 2 1/2            | 2.50 | 3.500 | 2.000 | 1.75 | 1.00 | 1/2-13       | 1.19    | 40  |

**Style TB****Style TC****Style TD – Tie Rod Information**

| Bore Ø  | 10.00  | 12.00    | 14.00    |
|---------|--------|----------|----------|
| Tie Rod | 1 1/8- | 1 1/4-12 | 1 1/4-12 |
| Thread  | 12     | 6.270    | 7.485    |
| RA      | 5.291  | 4.555    | 6.143    |
| RB      | 3.775  | —        | 4.409    |
| RC      | —      | 2.19     | 2.19     |
| RR      | 2.00   |          |          |

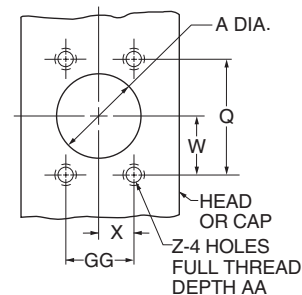
Dimensions for TB and TC Mount may be obtained from the above dimensional table.

**Mounting Information****Heavy Duty Hydraulic Cylinders  
Series 3H Large Bore****Side Lugs Mounting  
Style C  
(NFA Style MS2)****Style C – Dimensional and Mounting Data**

| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | E     | Ports (EE)        |                                    |                                                | G    | J    | K<br>Max. | SB<br>Ø | ST   | SU   | SW   | Y    | TS    | US    | WF   | XS   |
|-----------|------------|----------------|-------|-------------------|------------------------------------|------------------------------------------------|------|------|-----------|---------|------|------|------|------|-------|-------|------|------|
|           |            |                |       | NPTF <sup>1</sup> | SAE<br>Flange<br>Port <sup>2</sup> | SAE<br>Straight<br>Thread<br>Port <sup>3</sup> |      |      |           |         |      |      |      |      |       |       |      |      |
| 10.00     | 1 (std.)   | 4.500          | 12.63 | 2.00              | 2.00                               | 24                                             | 3.69 | 3.69 | 1.17      | 1.563   | 2.25 | 3.50 | 1.63 | 4.75 | 15.88 | 19.13 | 2.94 | 4.56 |
|           | 2          | 7.000          | 12.63 | 2.00              | 2.00                               | 24                                             | 3.69 | 3.69 | 1.17      | 1.563   | 2.25 | 3.50 | 1.63 | 5.31 | 15.88 | 19.13 | 3.50 | 5.13 |
|           | 3          | 5.000          | 12.63 | 2.00              | 2.00                               | 24                                             | 3.69 | 3.69 | 1.17      | 1.563   | 2.25 | 3.50 | 1.63 | 5.00 | 15.88 | 19.13 | 3.19 | 4.81 |
|           | 4          | 5.500          | 12.63 | 2.00              | 2.00                               | 24                                             | 3.69 | 3.69 | 1.17      | 1.563   | 2.25 | 3.50 | 1.63 | 5.00 | 15.88 | 19.13 | 3.19 | 4.81 |
| 12.00     | 1 (std.)   | 5.500          | 14.88 | 2.50              | 2.50 <sup>4</sup>                  | 24                                             | 4.44 | 4.44 | 1.30      | 1.563   | 3.00 | 4.25 | 2.00 | 5.38 | 18.88 | 22.88 | 3.19 | 5.19 |
|           | 2          | 8.000          | 14.88 | 2.50              | 2.50 <sup>4</sup>                  | 24                                             | 4.44 | 4.44 | 1.30      | 1.563   | 3.00 | 4.25 | 2.00 | 6.19 | 18.88 | 22.88 | 4.00 | 6.00 |
|           | 3          | 7.000          | 14.88 | 2.50              | 2.50 <sup>4</sup>                  | 24                                             | 4.44 | 4.44 | 1.30      | 1.563   | 3.00 | 4.25 | 2.00 | 5.69 | 18.88 | 22.88 | 3.50 | 5.50 |
| 14.00     | 1 (std.)   | 7.000          | 17.13 | 2.50              | 2.50 <sup>4</sup>                  | 24                                             | 4.88 | 4.88 | 1.30      | 2.313   | 4.00 | 4.75 | 2.25 | 5.88 | 21.63 | 26.13 | 3.50 | 5.75 |
|           | 2          | 10.000         | 17.13 | 2.50              | 2.50 <sup>4</sup>                  | 24                                             | 4.88 | 4.88 | 1.30      | 2.313   | 4.00 | 4.75 | 2.25 | 6.88 | 21.63 | 26.13 | 4.50 | 6.75 |
|           | 3          | 8.000          | 17.13 | 2.50              | 2.50 <sup>4</sup>                  | 24                                             | 4.88 | 4.88 | 1.30      | 2.313   | 4.00 | 4.75 | 2.25 | 6.38 | 21.63 | 26.13 | 4.00 | 6.25 |

<sup>1</sup>NPTF ports are available at no extra charge.<sup>2</sup>Optional SAE flange ports may be specified – flange to be supplied by customer. See Optional SAE Flange Port Pattern table for dimensions.<sup>3</sup>SAE straight thread ports are standard and are indicated by port number.<sup>4</sup>2.50 SAE flange port is rated at 2500 psi**Style C – Dimensional and Mounting Data (cont.)**

| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | Add Stroke |       |       |            |
|-----------|------------|----------------|------------|-------|-------|------------|
|           |            |                | LG         | P     | SS    | ZB<br>Max. |
| 10.00     | 1 (std.)   | 4.500          | 12.13      | 8.50  | 8.88  | 16.49      |
|           | 2          | 7.000          | 12.13      | 8.50  | 8.88  | 17.05      |
|           | 3          | 5.000          | 12.13      | 8.50  | 8.88  | 16.74      |
|           | 4          | 5.500          | 12.13      | 8.50  | 8.88  | 16.74      |
| 12.00     | 1 (std.)   | 5.500          | 14.50      | 10.13 | 10.50 | 19.24      |
|           | 2          | 8.000          | 14.50      | 10.13 | 10.50 | 20.05      |
|           | 3          | 7.000          | 14.50      | 10.13 | 10.50 | 19.55      |
| 14.00     | 1 (std.)   | 7.000          | 15.63      | 10.88 | 11.13 | 20.68      |
|           | 2          | 10.000         | 15.63      | 10.88 | 11.13 | 21.68      |
|           | 3          | 8.000          | 15.63      | 10.88 | 11.13 | 21.18      |

**Optional SAE Flange Port Pattern**

| Nom.<br>Flange<br>Size | A    | Q     | GG    | W    | X    | Z-THD<br>UNC-<br>2B | AA<br>Min. | SAE |
|------------------------|------|-------|-------|------|------|---------------------|------------|-----|
| 2                      | 2.00 | 3.062 | 1.688 | 1.53 | 0.84 | 1/2-13              | 1.06       | 32  |
| 2 1/2                  | 2.50 | 3.500 | 2.000 | 1.75 | 1.00 | 1/2-13              | 1.19       | 40  |

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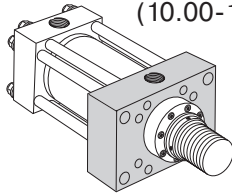


**Mounting Information****Heavy Duty Hydraulic Cylinders  
Series 3H Large Bore****Head Rectangular Mounting**

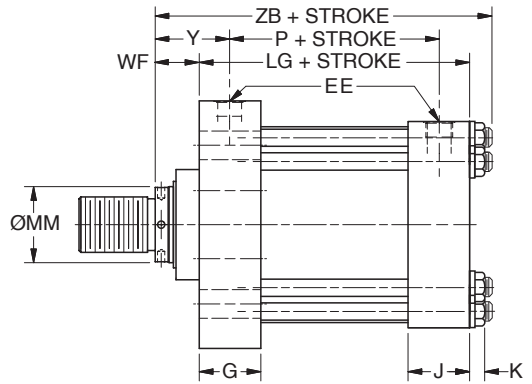
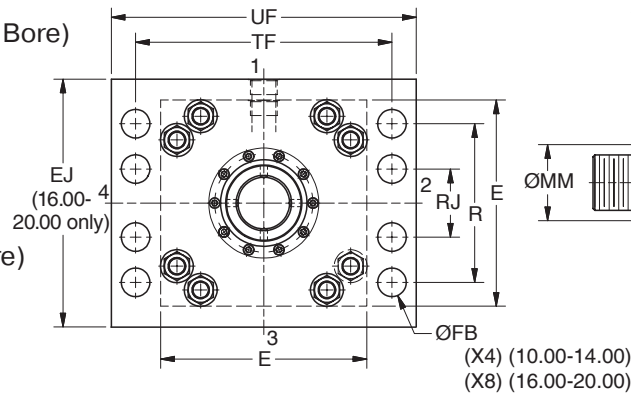
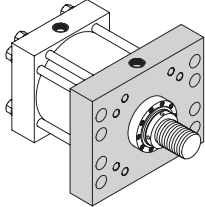
Style JJ

(NFPA Style ME5)

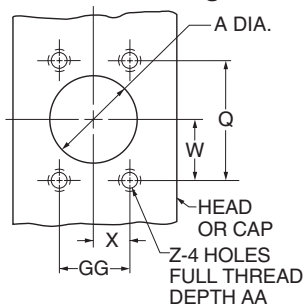
(10.00-14.00 Bore)



(16.00-20.00 Bore)

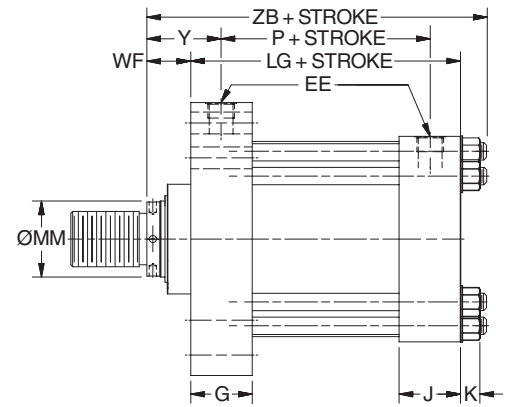
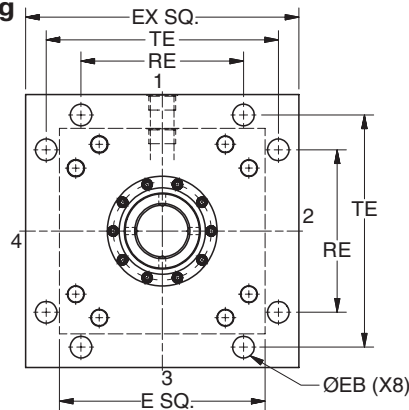
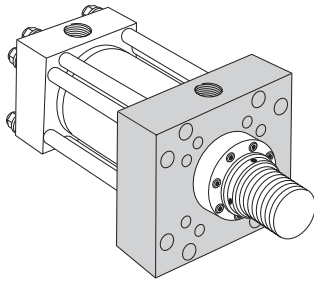
**Style JJ – Dimensional and Mounting Data**

| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | E     | EJ    | Ports (EE)        |                                    |                                                | FB<br>Ø | G    | J    | K<br>Max. | R     | RJ   | TF    | UF    | WF   | Y    | Add Stroke |       |            |
|-----------|------------|----------------|-------|-------|-------------------|------------------------------------|------------------------------------------------|---------|------|------|-----------|-------|------|-------|-------|------|------|------------|-------|------------|
|           |            |                |       |       | NPTF <sup>1</sup> | SAE<br>Flange<br>Port <sup>2</sup> | SAE<br>Straight<br>Thread<br>Port <sup>3</sup> |         |      |      |           |       |      |       |       |      |      | LG         | P     | ZB<br>Max. |
| 10.00     | 1 (std.)   | 4.500          | 12.63 | -     | 2.00              | 2.00                               | 24                                             | 1.81    | 3.69 | 3.69 | 1.17      | 9.62  | -    | 15.88 | 19.00 | 2.94 | 4.75 | 12.13      | 8.50  | 16.49      |
|           | 2          | 7.000          | 12.63 | -     | 2.00              | 2.00                               | 24                                             | 1.81    | 3.69 | 3.69 | 1.17      | 9.62  | -    | 15.88 | 19.00 | 3.50 | 5.31 | 12.13      | 8.50  | 17.05      |
|           | 3          | 5.000          | 12.63 | -     | 2.00              | 2.00                               | 24                                             | 1.81    | 3.69 | 3.69 | 1.17      | 9.62  | -    | 15.88 | 19.00 | 3.19 | 5.00 | 12.13      | 8.50  | 16.74      |
|           | 4          | 5.500          | 12.63 | -     | 2.00              | 2.00                               | 24                                             | 1.81    | 3.69 | 3.69 | 1.17      | 9.62  | -    | 15.88 | 19.00 | 3.19 | 5.00 | 12.13      | 8.50  | 16.74      |
| 12.00     | 1 (std.)   | 5.500          | 14.88 | -     | 2.50              | 2.50 <sup>4</sup>                  | 24                                             | 2.06    | 4.44 | 4.44 | 1.30      | 11.45 | -    | 18.50 | 22.00 | 3.19 | 5.38 | 14.50      | 10.13 | 19.24      |
|           | 2          | 8.000          | 14.88 | -     | 2.50              | 2.50 <sup>4</sup>                  | 24                                             | 2.06    | 4.44 | 4.44 | 1.30      | 11.45 | -    | 18.50 | 22.00 | 4.00 | 6.19 | 14.50      | 10.13 | 20.05      |
|           | 3          | 7.000          | 14.88 | -     | 2.50              | 2.50 <sup>4</sup>                  | 24                                             | 2.06    | 4.44 | 4.44 | 1.30      | 11.45 | -    | 18.50 | 22.00 | 3.50 | 5.69 | 14.50      | 10.13 | 19.55      |
| 14.00     | 1 (std.)   | 7.000          | 17.13 | -     | 2.50              | 2.50 <sup>4</sup>                  | 24                                             | 2.31    | 4.88 | 4.88 | 1.30      | 13.26 | -    | 21.00 | 25.00 | 3.50 | 5.88 | 15.63      | 10.88 | 20.68      |
|           | 2          | 10.000         | 17.13 | -     | 2.50              | 2.50 <sup>4</sup>                  | 24                                             | 2.31    | 4.88 | 4.88 | 1.30      | 13.26 | -    | 21.00 | 25.00 | 4.50 | 6.88 | 15.63      | 10.88 | 21.68      |
|           | 3          | 8.000          | 17.13 | -     | 2.50              | 2.50 <sup>4</sup>                  | 24                                             | 2.31    | 4.88 | 4.88 | 1.30      | 13.26 | -    | 21.00 | 25.00 | 4.00 | 6.38 | 15.63      | 10.88 | 21.18      |
| 16.00     | 1 (std.)   | 8.000          | 19.00 | 20.00 | -                 | 3.00 <sup>5</sup>                  | 24                                             | 1.81    | 5.88 | 5.88 | 1.70      | 15.50 | 8.00 | 21.00 | 24.50 | 4.00 | 7.00 | 18.13      | 12.13 | 24.08      |
|           | 3          | 9.000          | 19.00 | 20.00 | -                 | 3.00 <sup>5</sup>                  | 24                                             | 1.81    | 5.88 | 5.88 | 1.70      | 15.50 | 8.00 | 21.00 | 24.50 | 4.25 | 7.25 | 18.13      | 12.13 | 24.33      |
|           | 4          | 10.000         | 19.00 | 20.00 | -                 | 3.00 <sup>5</sup>                  | 24                                             | 1.81    | 5.88 | 5.88 | 1.70      | 15.50 | 8.00 | 21.00 | 24.50 | 4.50 | 7.50 | 18.13      | 12.13 | 24.58      |
| 18.00     | 1 (std.)   | 9.000          | 22.00 | 23.00 | -                 | 3.00 <sup>5</sup>                  | 24                                             | 2.06    | 6.88 | 6.88 | 1.70      | 18.00 | 7.25 | 24.25 | 28.25 | 4.25 | 7.25 | 21.13      | 15.13 | 27.33      |
|           | 3          | 10.000         | 22.00 | 23.00 | -                 | 3.00 <sup>5</sup>                  | 24                                             | 2.06    | 6.88 | 6.88 | 1.70      | 18.00 | 7.25 | 24.25 | 28.25 | 4.50 | 7.50 | 21.13      | 15.13 | 27.58      |
| 20.00     | 1 (std.)   | 10.000         | 24.00 | 25.00 | -                 | 3.00 <sup>5</sup>                  | 24                                             | 2.06    | 7.88 | 7.88 | 1.70      | 20.00 | 8.00 | 26.50 | 30.50 | 4.50 | 7.50 | 23.63      | 17.63 | 30.08      |

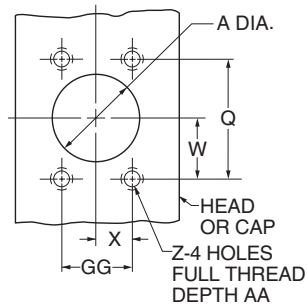
<sup>1</sup> NPTF ports are available at no extra charge.<sup>2</sup> Optional SAE flange ports may be specified – flange to be supplied by customer. See Optional SAE Flange Port Pattern table for dimensions.<sup>3</sup> SAE straight thread ports are standard and are indicated by port number.<sup>4</sup> 2.50 SAE flange port is rated at 2500 psi<sup>5</sup> 3.00 SAE flange port is rated at 2000 psi**Optional SAE Flange Port Pattern**

| Nom.<br>Flange<br>Size | A    | Q     | GG    | W    | X    | Z-THD<br>UNC-<br>2B | AA<br>Min. | SAE |
|------------------------|------|-------|-------|------|------|---------------------|------------|-----|
| 2                      | 2.00 | 3.062 | 1.688 | 1.53 | 0.84 | 1/2-13              | 1.06       | 32  |
| 2 1/2                  | 2.50 | 3.500 | 2.000 | 1.75 | 1.00 | 1/2-13              | 1.19       | 40  |
| 3                      | 3.00 | 4.188 | 2.438 | 2.09 | 1.22 | 5/8-11              | 1.19       | 48  |

**⚠ PROP 65 WARNING** WARNING: This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

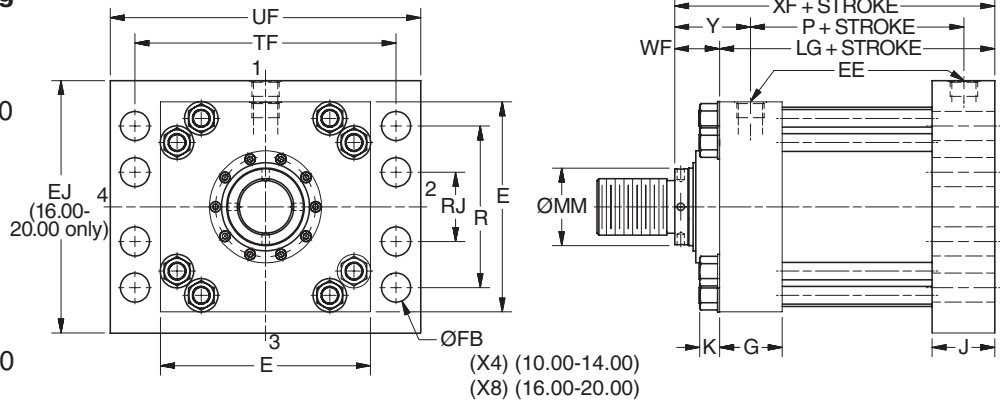
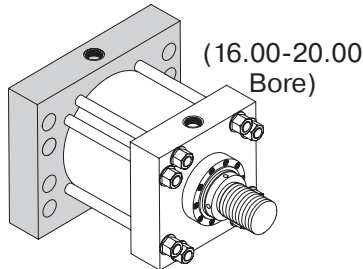
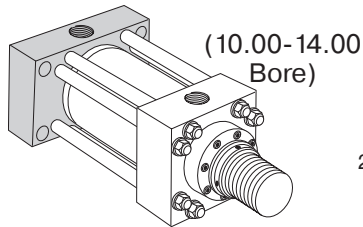
**Mounting Information****Heavy Duty Hydraulic Cylinders  
Series 3H Large Bore****Head Square Flange Mounting  
Style JB  
(NFPA Style MF5)****Style JB – Dimensional and Mounting Data**

| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | E     | EB<br>Ø | Ports (EE)        |                                    |                                                | EX    | G    | J    | K<br>Max. | RE    | TE    | WF   | Y    | Add Stroke |       |            |
|-----------|------------|----------------|-------|---------|-------------------|------------------------------------|------------------------------------------------|-------|------|------|-----------|-------|-------|------|------|------------|-------|------------|
|           |            |                |       |         | NPTF <sup>1</sup> | SAE<br>Flange<br>Port <sup>2</sup> | SAE<br>Straight<br>Thread<br>Port <sup>3</sup> |       |      |      |           |       |       |      |      | LG         | P     | ZB<br>Max. |
| 10.00     | 1 (std.)   | 4.500          | 12.63 | 1.31    | 2.00              | 2.00                               | 24                                             | 16.63 | 3.69 | 3.69 | 1.17      | 9.89  | 14.13 | 2.94 | 4.75 | 12.13      | 8.50  | 16.49      |
|           | 2          | 7.000          | 12.63 | 1.31    | 2.00              | 2.00                               | 24                                             | 16.63 | 3.69 | 3.69 | 1.17      | 9.89  | 14.13 | 3.50 | 5.31 | 12.13      | 8.50  | 17.05      |
|           | 3          | 5.000          | 12.63 | 1.31    | 2.00              | 2.00                               | 24                                             | 16.63 | 3.69 | 3.69 | 1.17      | 9.89  | 14.13 | 3.19 | 5.00 | 12.13      | 8.50  | 16.74      |
|           | 4          | 5.500          | 12.63 | 1.31    | 2.00              | 2.00                               | 24                                             | 16.63 | 3.69 | 3.69 | 1.17      | 9.89  | 14.13 | 3.19 | 5.00 | 12.13      | 8.50  | 16.74      |
| 12.00     | 1 (std.)   | 5.500          | 14.88 | 1.56    | 2.50              | 2.50 <sup>4</sup>                  | 24                                             | 19.75 | 4.44 | 4.44 | 1.30      | 11.75 | 16.79 | 3.19 | 5.38 | 14.50      | 10.13 | 19.24      |
|           | 2          | 8.000          | 14.88 | 1.56    | 2.50              | 2.50 <sup>4</sup>                  | 24                                             | 19.75 | 4.44 | 4.44 | 1.30      | 11.75 | 16.79 | 4.00 | 6.19 | 14.50      | 10.13 | 20.05      |
|           | 3          | 7.000          | 14.88 | 1.56    | 2.50              | 2.50 <sup>4</sup>                  | 24                                             | 19.75 | 4.44 | 4.44 | 1.30      | 11.75 | 16.79 | 3.50 | 5.69 | 14.50      | 10.13 | 19.55      |
| 14.00     | 1 (std.)   | 7.000          | 17.13 | 1.81    | 2.50              | 2.50 <sup>4</sup>                  | 24                                             | 21.75 | 4.88 | 4.88 | 1.30      | 12.90 | 18.43 | 3.50 | 5.88 | 15.63      | 10.88 | 20.68      |
|           | 2          | 10.000         | 17.13 | 1.81    | 2.50              | 2.50 <sup>4</sup>                  | 24                                             | 21.75 | 4.88 | 4.88 | 1.30      | 12.90 | 18.43 | 4.50 | 6.88 | 15.63      | 10.88 | 21.68      |
|           | 3          | 8.000          | 17.13 | 1.81    | 2.50              | 2.50 <sup>4</sup>                  | 24                                             | 21.75 | 4.88 | 4.88 | 1.30      | 12.90 | 18.43 | 4.00 | 6.38 | 15.63      | 10.88 | 21.18      |
| 16.00     | 1 (std.)   | 8.000          | 19.00 | 1.81    | -                 | 3.00 <sup>5</sup>                  | 24                                             | 24.50 | 5.88 | 5.88 | 1.70      | 15.28 | 21.03 | 4.00 | 7.00 | 18.13      | 12.13 | 24.08      |
|           | 3          | 9.000          | 19.00 | 1.81    | -                 | 3.00 <sup>5</sup>                  | 24                                             | 24.50 | 5.88 | 5.88 | 1.70      | 15.28 | 21.03 | 4.25 | 7.25 | 18.13      | 12.13 | 24.33      |
|           | 4          | 10.000         | 19.00 | 1.81    | -                 | 3.00 <sup>5</sup>                  | 24                                             | 24.50 | 5.88 | 5.88 | 1.70      | 15.28 | 21.03 | 4.50 | 7.50 | 18.13      | 12.13 | 24.58      |
| 18.00     | 1 (std.)   | 9.000          | 22.00 | 2.06    | -                 | 3.00 <sup>5</sup>                  | 24                                             | 26.50 | 6.88 | 6.88 | 1.70      | 16.45 | 22.65 | 4.25 | 7.25 | 21.13      | 15.13 | 27.33      |
|           | 3          | 10.000         | 22.00 | 2.06    | -                 | 3.00 <sup>5</sup>                  | 24                                             | 26.50 | 6.88 | 6.88 | 1.70      | 16.45 | 22.65 | 4.50 | 7.50 | 21.13      | 15.13 | 27.58      |
| 20.00     | 1 (std.)   | 10.000         | 24.00 | 2.06    | -                 | 3.00 <sup>5</sup>                  | 24                                             | 29.00 | 7.88 | 7.88 | 1.70      | 18.07 | 24.87 | 4.50 | 7.50 | 23.63      | 17.63 | 30.08      |

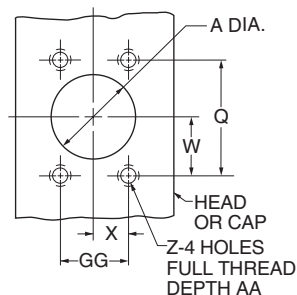
<sup>1</sup> NPTF ports are available at no extra charge.<sup>2</sup> Optional SAE flange ports may be specified – flange to be supplied by customer. See Optional SAE Flange Port Pattern table for dimensions.<sup>3</sup> SAE straight thread ports are standard and are indicated by port number.<sup>4</sup> 2.50 SAE flange port is rated at 2500 psi<sup>5</sup> 3.00 SAE flange port is rated at 2000 psi**Optional SAE Flange Port Pattern**

| Nom.<br>Flange<br>Size | A    | Q     | GG    | W    | X    | Z-THD<br>UNC-<br>2B | AA<br>Min. | SAE |
|------------------------|------|-------|-------|------|------|---------------------|------------|-----|
| 2                      | 2.00 | 3.062 | 1.688 | 1.53 | 0.84 | 1/2-13              | 1.06       | 32  |
| 2 1/2                  | 2.50 | 3.500 | 2.000 | 1.75 | 1.00 | 1/2-13              | 1.19       | 40  |
| 3                      | 3.00 | 4.188 | 2.438 | 2.09 | 1.22 | 5/8-11              | 1.19       | 48  |

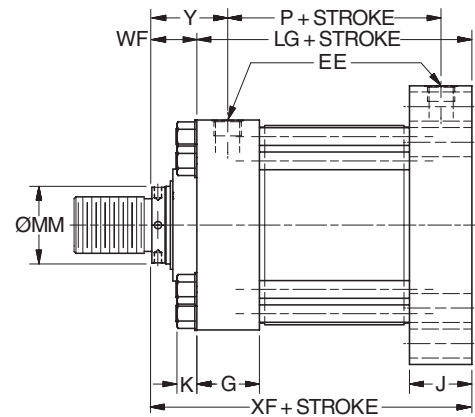
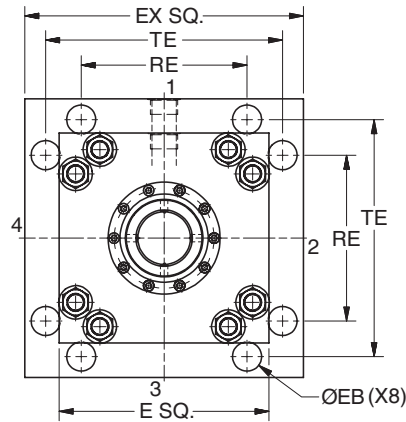
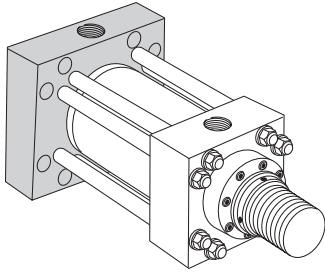
**⚠ PROP 65 WARNING** **WARNING:** This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**Mounting Information****Heavy Duty Hydraulic Cylinders  
Series 3H Large Bore****Cap Rectangular Mounting**Style HH  
(NFA Style ME6)**Style HH – Dimensional and Mounting Data**

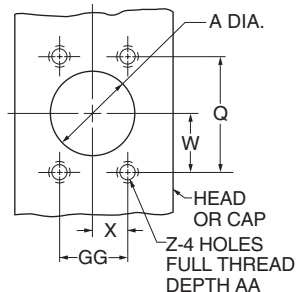
| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | E     | Ports (EE)        |                                    |                                                | EJ    | FB<br>Ø | G    | J    | K<br>Max. | R     | RJ   | TF    | UF    | WF   | Y    | Add Stroke |       |       |
|-----------|------------|----------------|-------|-------------------|------------------------------------|------------------------------------------------|-------|---------|------|------|-----------|-------|------|-------|-------|------|------|------------|-------|-------|
|           |            |                |       | NPTF <sup>1</sup> | SAE<br>Flange<br>Port <sup>2</sup> | SAE<br>Straight<br>Thread<br>Port <sup>3</sup> |       |         |      |      |           |       |      |       |       |      |      | LG         | P     | XF    |
| 10.00     | 1 (std.)   | 4.500          | 12.63 | 2.00              | 2.00                               | 24                                             | -     | 1.81    | 3.69 | 3.69 | 1.17      | 9.62  | -    | 15.88 | 19.00 | 2.94 | 4.75 | 12.13      | 8.50  | 15.06 |
|           | 2          | 7.000          | 12.63 | 2.00              | 2.00                               | 24                                             | -     | 1.81    | 3.69 | 3.69 | 1.17      | 9.62  | -    | 15.88 | 19.00 | 3.50 | 5.31 | 12.13      | 8.50  | 15.63 |
|           | 3          | 5.000          | 12.63 | 2.00              | 2.00                               | 24                                             | -     | 1.81    | 3.69 | 3.69 | 1.17      | 9.62  | -    | 15.88 | 19.00 | 3.19 | 5.00 | 12.13      | 8.50  | 15.31 |
|           | 4          | 5.500          | 12.63 | 2.00              | 2.00                               | 24                                             | -     | 1.81    | 3.69 | 3.69 | 1.17      | 9.62  | -    | 15.88 | 19.00 | 3.19 | 5.00 | 12.13      | 8.50  | 15.31 |
| 12.00     | 1 (std.)   | 5.500          | 14.88 | 2.50              | 2.50 <sup>4</sup>                  | 24                                             | -     | 2.06    | 4.44 | 4.44 | 1.30      | 11.45 | -    | 18.50 | 22.00 | 3.19 | 5.38 | 14.50      | 10.13 | 17.69 |
|           | 2          | 8.000          | 14.88 | 2.50              | 2.50 <sup>4</sup>                  | 24                                             | -     | 2.06    | 4.44 | 4.44 | 1.30      | 11.45 | -    | 18.50 | 22.00 | 4.00 | 6.19 | 14.50      | 10.13 | 18.50 |
|           | 3          | 7.000          | 14.88 | 2.50              | 2.50 <sup>4</sup>                  | 24                                             | -     | 2.06    | 4.44 | 4.44 | 1.30      | 11.45 | -    | 18.50 | 22.00 | 3.50 | 5.69 | 14.50      | 10.13 | 18.00 |
| 14.00     | 1 (std.)   | 7.000          | 17.13 | 2.50              | 2.50 <sup>4</sup>                  | 24                                             | -     | 2.31    | 4.88 | 4.88 | 1.30      | 13.26 | -    | 21.00 | 25.00 | 3.50 | 5.88 | 15.63      | 10.88 | 19.13 |
|           | 2          | 10.000         | 17.13 | 2.50              | 2.50 <sup>4</sup>                  | 24                                             | -     | 2.31    | 4.88 | 4.88 | 1.30      | 13.26 | -    | 21.00 | 25.00 | 4.50 | 6.88 | 15.63      | 10.88 | 20.13 |
|           | 3          | 8.000          | 17.13 | 2.50              | 2.50 <sup>4</sup>                  | 24                                             | -     | 2.31    | 4.88 | 4.88 | 1.30      | 13.26 | -    | 21.00 | 25.00 | 4.00 | 6.38 | 15.63      | 10.88 | 19.63 |
| 16.00     | 1 (std.)   | 8.000          | 19.00 | -                 | 3.00 <sup>5</sup>                  | 24                                             | 20.00 | 1.81    | 5.88 | 5.88 | 1.70      | 15.50 | 8.00 | 21.00 | 24.50 | 4.00 | 7.00 | 18.13      | 12.13 | 22.13 |
|           | 3          | 9.000          | 19.00 | -                 | 3.00 <sup>5</sup>                  | 24                                             | 20.00 | 1.81    | 5.88 | 5.88 | 1.70      | 15.50 | 8.00 | 21.00 | 24.50 | 4.25 | 7.25 | 18.13      | 12.13 | 22.38 |
|           | 4          | 10.000         | 19.00 | -                 | 3.00 <sup>5</sup>                  | 24                                             | 20.00 | 1.81    | 5.88 | 5.88 | 1.70      | 15.50 | 8.00 | 21.00 | 24.50 | 4.50 | 7.50 | 18.13      | 12.13 | 22.63 |
| 18.00     | 1 (std.)   | 9.000          | 22.00 | -                 | 3.00 <sup>5</sup>                  | 24                                             | 23.00 | 2.06    | 6.88 | 6.88 | 1.70      | 18.00 | 7.25 | 24.25 | 28.25 | 4.25 | 7.25 | 21.13      | 15.13 | 25.38 |
|           | 3          | 10.000         | 22.00 | -                 | 3.00 <sup>5</sup>                  | 24                                             | 23.00 | 2.06    | 6.88 | 6.88 | 1.70      | 18.00 | 7.25 | 24.25 | 28.25 | 4.50 | 7.50 | 21.13      | 15.13 | 25.63 |
| 20.00     | 1 (std.)   | 10.000         | 24.00 | -                 | 3.00 <sup>5</sup>                  | 24                                             | 25.00 | 2.06    | 7.88 | 7.88 | 1.70      | 20.00 | 8.00 | 26.50 | 30.50 | 4.50 | 7.50 | 23.63      | 17.63 | 28.13 |

<sup>1</sup>NPTF ports are available at no extra charge.<sup>2</sup>Optional SAE flange ports may be specified – flange to be supplied by customer. See Optional SAE Flange Port Pattern table for dimensions.<sup>3</sup>SAE straight thread ports are standard and are indicated by port number.<sup>4</sup>2.50 SAE flange port is rated at 2500 psi<sup>5</sup>3.00 SAE flange port is rated at 2000 psi**Optional SAE Flange Port Pattern**

| Nom. Flange Size | A    | Q     | GG    | W    | X    | Z-THD UNC-2B | AA Min. | SAE |
|------------------|------|-------|-------|------|------|--------------|---------|-----|
| 2                | 2.00 | 3.062 | 1.688 | 1.53 | 0.84 | 1/2-13       | 1.06    | 32  |
| 2 1/2            | 2.50 | 3.500 | 2.000 | 1.75 | 1.00 | 1/2-13       | 1.19    | 40  |
| 3                | 3.00 | 4.188 | 2.438 | 2.09 | 1.22 | 5/8-11       | 1.19    | 48  |

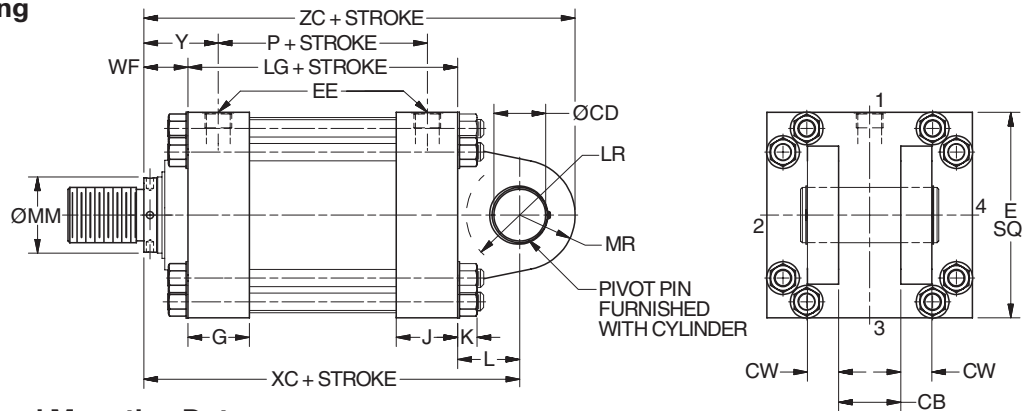
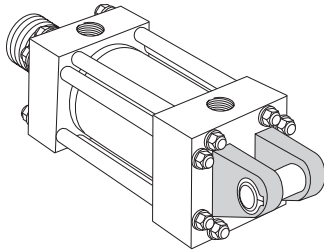
**Mounting Information****Heavy Duty Hydraulic Cylinders  
Series 3H Large Bore****Cap Square Flange Mounting  
Style HB  
(NFA Style MF6)****Style HB – Dimensional and Mounting Data**

| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | E     | EB<br>Ø | Ports (EE)        |                                    |                                                | EX    | G    | J    | K<br>Max. | RE    | TE    | WF   | Y    | Add Stroke |       |       |
|-----------|------------|----------------|-------|---------|-------------------|------------------------------------|------------------------------------------------|-------|------|------|-----------|-------|-------|------|------|------------|-------|-------|
|           |            |                |       |         | NPTF <sup>1</sup> | SAE<br>Flange<br>Port <sup>2</sup> | SAE<br>Straight<br>Thread<br>Port <sup>3</sup> |       |      |      |           |       |       |      |      | LG         | P     | XF    |
| 10.00     | 1 (std.)   | 4.500          | 12.63 | 1.31    | 2.00              | 2.00                               | 24                                             | 16.63 | 3.69 | 3.69 | 1.17      | 9.89  | 14.13 | 2.94 | 4.75 | 12.13      | 8.50  | 15.06 |
|           | 2          | 7.000          | 12.63 | 1.31    | 2.00              | 2.00                               | 24                                             | 16.63 | 3.69 | 3.69 | 1.17      | 9.89  | 14.13 | 3.50 | 5.31 | 12.13      | 8.50  | 15.63 |
|           | 3          | 5.000          | 12.63 | 1.31    | 2.00              | 2.00                               | 24                                             | 16.63 | 3.69 | 3.69 | 1.17      | 9.89  | 14.13 | 3.19 | 5.00 | 12.13      | 8.50  | 15.31 |
|           | 4          | 5.500          | 12.63 | 1.31    | 2.00              | 2.00                               | 24                                             | 16.63 | 3.69 | 3.69 | 1.17      | 9.89  | 14.13 | 3.19 | 5.00 | 12.13      | 8.50  | 15.31 |
| 12.00     | 1 (std.)   | 5.500          | 14.88 | 1.56    | 2.50              | 2.50 <sup>4</sup>                  | 24                                             | 19.75 | 4.44 | 4.44 | 1.30      | 11.75 | 16.79 | 3.19 | 5.38 | 14.50      | 10.13 | 17.69 |
|           | 2          | 8.000          | 14.88 | 1.56    | 2.50              | 2.50 <sup>4</sup>                  | 24                                             | 19.75 | 4.44 | 4.44 | 1.30      | 11.75 | 16.79 | 4.00 | 6.19 | 14.50      | 10.13 | 18.50 |
|           | 3          | 7.000          | 14.88 | 1.56    | 2.50              | 2.50 <sup>4</sup>                  | 24                                             | 19.75 | 4.44 | 4.44 | 1.30      | 11.75 | 16.79 | 3.50 | 5.69 | 14.50      | 10.13 | 18.00 |
| 14.00     | 1 (std.)   | 7.000          | 17.13 | 1.81    | 2.50              | 2.50 <sup>4</sup>                  | 24                                             | 21.75 | 4.88 | 4.88 | 1.30      | 12.90 | 18.43 | 3.50 | 5.88 | 15.63      | 10.88 | 19.13 |
|           | 2          | 10.000         | 17.13 | 1.81    | 2.50              | 2.50 <sup>4</sup>                  | 24                                             | 21.75 | 4.88 | 4.88 | 1.30      | 12.90 | 18.43 | 4.50 | 6.88 | 15.63      | 10.88 | 20.13 |
|           | 3          | 8.000          | 17.13 | 1.81    | 2.50              | 2.50 <sup>4</sup>                  | 24                                             | 21.75 | 4.88 | 4.88 | 1.30      | 12.90 | 18.43 | 4.00 | 6.38 | 15.63      | 10.88 | 19.63 |
| 16.00     | 1 (std.)   | 8.000          | 19.00 | 1.81    | -                 | 3.00 <sup>5</sup>                  | 24                                             | 24.50 | 5.88 | 5.88 | 1.70      | 15.28 | 21.03 | 4.00 | 7.00 | 18.13      | 12.13 | 22.13 |
|           | 3          | 9.000          | 19.00 | 1.81    | -                 | 3.00 <sup>5</sup>                  | 24                                             | 24.50 | 5.88 | 5.88 | 1.70      | 15.28 | 21.03 | 4.25 | 7.25 | 18.13      | 12.13 | 22.38 |
|           | 4          | 10.000         | 19.00 | 1.81    | -                 | 3.00 <sup>5</sup>                  | 24                                             | 24.50 | 5.88 | 5.88 | 1.70      | 15.28 | 21.03 | 4.50 | 7.50 | 18.13      | 12.13 | 22.63 |
| 18.00     | 1 (std.)   | 9.000          | 22.00 | 2.06    | -                 | 3.00 <sup>5</sup>                  | 24                                             | 26.50 | 6.88 | 6.88 | 1.70      | 16.45 | 22.65 | 4.25 | 7.25 | 21.13      | 15.13 | 25.38 |
|           | 3          | 10.000         | 22.00 | 2.06    | -                 | 3.00 <sup>5</sup>                  | 24                                             | 26.50 | 6.88 | 6.88 | 1.70      | 16.45 | 22.65 | 4.50 | 7.50 | 21.13      | 15.13 | 25.63 |
| 20.00     | 1 (std.)   | 10.000         | 24.00 | 2.06    | -                 | 3.00 <sup>5</sup>                  | 24                                             | 29.00 | 7.88 | 7.88 | 1.70      | 18.07 | 24.87 | 4.50 | 7.50 | 23.63      | 17.63 | 28.13 |

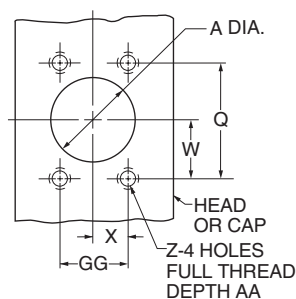
<sup>1</sup>NPTF ports are available at no extra charge.<sup>2</sup>Optional SAE flange ports may be specified – flange to be supplied by customer. See Optional SAE Flange Port Pattern table for dimensions.<sup>3</sup>SAE straight thread ports are standard and are indicated by port number.<sup>4</sup>2.50 SAE flange port is rated at 2500 psi<sup>5</sup>3.00 SAE flange port is rated at 2000 psi**Optional SAE Flange Port Pattern**

| Nom.<br>Flange<br>Size | A    | Q     | GG    | W    | X    | Z-THD<br>UNC-<br>2B | AA<br>Min. | SAE |
|------------------------|------|-------|-------|------|------|---------------------|------------|-----|
| 2                      | 2.00 | 3.062 | 1.688 | 1.53 | 0.84 | 1/2-13              | 1.06       | 32  |
| 2 1/2                  | 2.50 | 3.500 | 2.000 | 1.75 | 1.00 | 1/2-13              | 1.19       | 40  |
| 3                      | 3.00 | 4.188 | 2.438 | 2.09 | 1.22 | 5/8-11              | 1.19       | 48  |

**⚠ PROP 65 WARNING** **WARNING:** This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**Mounting Information****Heavy Duty Hydraulic Cylinders  
Series 3H Large Bore****Cap Fixed Clevis Mounting  
Style BB  
(NFPA Style MP1)****Style BB – Dimensional and Mounting Data**

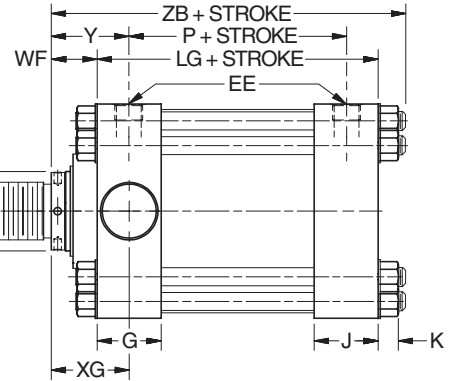
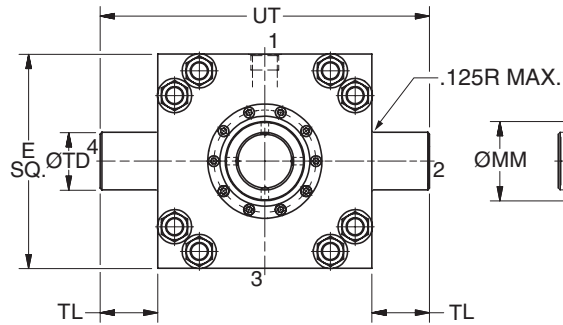
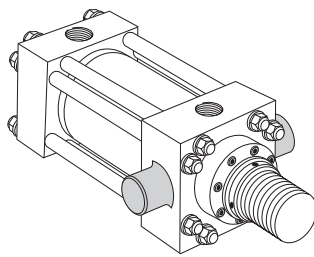
| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | CB   | CD <sup>4</sup> Ø<br>+.000<br>-.002 | CW   | E     | EE Ports          |                                    |                                                | G    | J    | K<br>Max. | L    | LR   | MR   | WF   | Y    | Add Stroke |       |       |       |
|-----------|------------|----------------|------|-------------------------------------|------|-------|-------------------|------------------------------------|------------------------------------------------|------|------|-----------|------|------|------|------|------|------------|-------|-------|-------|
|           |            |                |      |                                     |      |       | NPTF <sup>1</sup> | SAE<br>Flange<br>Port <sup>2</sup> | SAE<br>Straight<br>Thread<br>Port <sup>3</sup> |      |      |           |      |      |      |      |      | LG         | P     | XC    | ZC    |
| 10.00     | 1 (std.)   | 4.500          | 4.00 | 3.501                               | 2.00 | 12.63 | 2.00              | 2.00                               | 24                                             | 3.69 | 3.69 | 1.17      | 4.00 | 3.38 | 3.50 | 2.94 | 4.75 | 12.13      | 8.50  | 19.06 | 22.56 |
|           | 2          | 7.000          | 4.00 | 3.501                               | 2.00 | 12.63 | 2.00              | 2.00                               | 24                                             | 3.69 | 3.69 | 1.17      | 4.00 | 3.38 | 3.50 | 3.50 | 5.31 | 12.13      | 8.50  | 19.63 | 23.13 |
|           | 3          | 5.000          | 4.00 | 3.501                               | 2.00 | 12.63 | 2.00              | 2.00                               | 24                                             | 3.69 | 3.69 | 1.17      | 4.00 | 3.38 | 3.50 | 3.19 | 5.00 | 12.13      | 8.50  | 19.31 | 22.81 |
|           | 4          | 5.500          | 4.00 | 3.501                               | 2.00 | 12.63 | 2.00              | 2.00                               | 24                                             | 3.69 | 3.69 | 1.17      | 4.00 | 3.38 | 3.50 | 3.19 | 5.00 | 12.13      | 8.50  | 19.31 | 22.81 |
| 12.00     | 1 (std.)   | 5.500          | 4.50 | 4.001                               | 2.25 | 14.88 | 2.50              | 2.50 <sup>5</sup>                  | 24                                             | 4.44 | 4.44 | 1.30      | 4.50 | 3.88 | 4.00 | 3.19 | 5.38 | 14.50      | 10.13 | 22.19 | 26.19 |
|           | 2          | 8.000          | 4.50 | 4.001                               | 2.25 | 14.88 | 2.50              | 2.50 <sup>5</sup>                  | 24                                             | 4.44 | 4.44 | 1.30      | 4.50 | 3.88 | 4.00 | 4.00 | 6.19 | 14.50      | 10.13 | 23.00 | 27.00 |
|           | 3          | 7.000          | 4.50 | 4.001                               | 2.25 | 14.88 | 2.50              | 2.50 <sup>5</sup>                  | 24                                             | 4.44 | 4.44 | 1.30      | 4.50 | 3.88 | 4.00 | 3.50 | 5.69 | 14.50      | 10.13 | 22.50 | 26.50 |
| 14.00     | 1 (std.)   | 7.000          | 6.00 | 5.001                               | 3.00 | 17.13 | 2.50              | 2.50 <sup>5</sup>                  | 24                                             | 4.88 | 4.88 | 1.30      | 5.75 | 4.19 | 5.00 | 3.50 | 5.88 | 15.63      | 10.88 | 24.88 | 29.88 |
|           | 2          | 10.000         | 6.00 | 5.001                               | 3.00 | 17.13 | 2.50              | 2.50 <sup>5</sup>                  | 24                                             | 4.88 | 4.88 | 1.30      | 5.75 | 4.19 | 5.00 | 4.50 | 6.88 | 15.63      | 10.88 | 25.88 | 30.88 |
|           | 3          | 8.000          | 6.00 | 5.001                               | 3.00 | 17.13 | 2.50              | 2.50 <sup>5</sup>                  | 24                                             | 4.88 | 4.88 | 1.30      | 5.75 | 4.19 | 5.00 | 4.00 | 6.38 | 15.63      | 10.88 | 25.38 | 30.38 |
| 16.00     | 1 (std.)   | 8.000          | 7.00 | 6.001                               | 3.50 | 19.00 | -                 | 3.00 <sup>6</sup>                  | 24                                             | 5.88 | 5.88 | 1.70      | 7.00 | 6.25 | 6.00 | 4.00 | 7.00 | 18.13      | 12.13 | 29.13 | 35.13 |
|           | 3          | 9.000          | 7.00 | 6.001                               | 3.50 | 19.00 | -                 | 3.00 <sup>6</sup>                  | 24                                             | 5.88 | 5.88 | 1.70      | 7.00 | 6.25 | 6.00 | 4.25 | 7.25 | 18.13      | 12.13 | 29.38 | 35.38 |
|           | 4          | 10.000         | 7.00 | 6.001                               | 3.50 | 19.00 | -                 | 3.00 <sup>6</sup>                  | 24                                             | 5.88 | 5.88 | 1.70      | 7.00 | 6.25 | 6.00 | 4.50 | 7.50 | 18.13      | 12.13 | 29.63 | 35.63 |
| 18.00     | 1 (std.)   | 9.000          | 8.00 | 6.501                               | 4.00 | 22.00 | -                 | 3.00 <sup>6</sup>                  | 24                                             | 6.88 | 6.88 | 1.70      | 7.63 | 6.75 | 6.50 | 4.25 | 7.25 | 21.13      | 15.13 | 33.00 | 39.50 |
|           | 3          | 10.000         | 8.00 | 6.501                               | 4.00 | 22.00 | -                 | 3.00 <sup>6</sup>                  | 24                                             | 6.88 | 6.88 | 1.70      | 7.63 | 6.75 | 6.50 | 4.50 | 7.50 | 21.13      | 15.13 | 33.25 | 39.75 |
| 20.00     | 1 (std.)   | 10.000         | 9.00 | 7.501                               | 4.50 | 24.00 | -                 | 3.00 <sup>6</sup>                  | 24                                             | 7.88 | 7.88 | 1.70      | 8.75 | 7.75 | 7.50 | 4.50 | 7.50 | 23.63      | 17.63 | 36.88 | 44.38 |

<sup>1</sup>NPTF ports are available at no extra charge.<sup>2</sup>Optional SAE flange ports may be specified – flange to be supplied by customer. See Optional SAE Flange Port Pattern table for dimensions.<sup>3</sup>SAE straight thread ports are standard and are indicated by port number.<sup>4</sup>Diameter CD is pin diameter.<sup>5</sup>2.50 SAE flange port is rated at 2500 psi<sup>6</sup>3.00 SAE flange port is rated at 2000 psi**Optional SAE Flange Port Pattern**

| Nom.<br>Flange<br>Size | A    | Q     | GG    | W    | X    | Z-THD<br>UNC-<br>2B | AA<br>Min. | SAE |
|------------------------|------|-------|-------|------|------|---------------------|------------|-----|
| 2                      | 2.00 | 3.062 | 1.688 | 1.53 | 0.84 | 1/2-13              | 1.06       | 32  |
| 2 1/2                  | 2.50 | 3.500 | 2.000 | 1.75 | 1.00 | 1/2-13              | 1.19       | 40  |
| 3                      | 3.00 | 4.188 | 2.438 | 2.09 | 1.22 | 5/8-11              | 1.19       | 48  |

**WARNING:** This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**Head Trunnion Mounting**  
**Style D**  
(NFPA Style MT1)



**Style D – Dimensional and Mounting Data**

| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | E     | Ports (EE)        |                                    |                                                | G    | J    | K<br>Max. | TD Ø<br>+.000<br>-.001 | TL   | UT    | WF   | XG   | Y    | Add Stroke |       |            |
|-----------|------------|----------------|-------|-------------------|------------------------------------|------------------------------------------------|------|------|-----------|------------------------|------|-------|------|------|------|------------|-------|------------|
|           |            |                |       | NPTF <sup>1</sup> | SAE<br>Flange<br>Port <sup>2</sup> | SAE<br>Straight<br>Thread<br>Port <sup>3</sup> |      |      |           |                        |      |       |      |      |      | LG         | P     | ZB<br>Max. |
| 10.00     | 1 (std.)   | 4.500          | 12.63 | 2.00              | 2.00                               | 24                                             | 3.69 | 3.69 | 1.17      | 3.500                  | 3.50 | 19.63 | 2.94 | 4.75 | 4.75 | 12.13      | 8.50  | 16.49      |
|           | 2          | 7.000          | 12.63 | 2.00              | 2.00                               | 24                                             | 3.69 | 3.69 | 1.17      | 3.500                  | 3.50 | 19.63 | 3.50 | 5.31 | 5.31 | 12.13      | 8.50  | 17.05      |
|           | 3          | 5.000          | 12.63 | 2.00              | 2.00                               | 24                                             | 3.69 | 3.69 | 1.17      | 3.500                  | 3.50 | 19.63 | 3.19 | 5.00 | 5.00 | 12.13      | 8.50  | 16.74      |
|           | 4          | 5.500          | 12.63 | 2.00              | 2.00                               | 24                                             | 3.69 | 3.69 | 1.17      | 3.500                  | 3.50 | 19.63 | 3.19 | 5.00 | 5.00 | 12.13      | 8.50  | 16.74      |
| 12.00     | 1 (std.)   | 5.500          | 14.88 | 2.50              | 2.50 <sup>4</sup>                  | 24                                             | 4.44 | 4.44 | 1.30      | 4.000                  | 4.00 | 22.88 | 3.19 | 5.38 | 5.38 | 14.50      | 10.13 | 19.24      |
|           | 2          | 8.000          | 14.88 | 2.50              | 2.50 <sup>4</sup>                  | 24                                             | 4.44 | 4.44 | 1.30      | 4.000                  | 4.00 | 22.88 | 4.00 | 6.19 | 6.19 | 14.50      | 10.13 | 20.05      |
|           | 3          | 7.000          | 14.88 | 2.50              | 2.50 <sup>4</sup>                  | 24                                             | 4.44 | 4.44 | 1.30      | 4.000                  | 4.00 | 22.88 | 3.50 | 5.69 | 5.69 | 14.50      | 10.13 | 19.55      |
| 14.00     | 1 (std.)   | 7.000          | 17.13 | 2.50              | 2.50 <sup>4</sup>                  | 24                                             | 4.88 | 4.88 | 1.30      | 4.500                  | 4.50 | 26.13 | 3.50 | 5.94 | 5.88 | 15.63      | 10.88 | 20.68      |
|           | 2          | 10.000         | 17.13 | 2.50              | 2.50 <sup>4</sup>                  | 24                                             | 4.88 | 4.88 | 1.30      | 4.500                  | 4.50 | 26.13 | 4.50 | 6.94 | 6.88 | 15.63      | 10.88 | 21.68      |
|           | 3          | 8.000          | 17.13 | 2.50              | 2.50 <sup>4</sup>                  | 24                                             | 4.88 | 4.88 | 1.30      | 4.500                  | 4.50 | 26.13 | 4.00 | 6.44 | 6.38 | 15.63      | 10.88 | 21.18      |

<sup>1</sup> NPTF ports are available at no extra charge.

<sup>2</sup> Optional SAE flange ports may be specified – flange to be supplied by customer. See Optional SAE Flange Port Pattern table for dimensions.

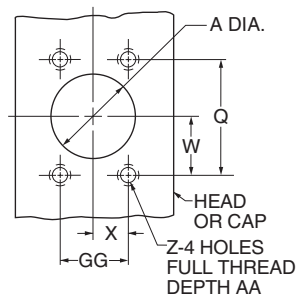
<sup>3</sup> SAE straight thread ports are standard and are indicated by port number.

<sup>4</sup> 2.50 SAE flange port is rated at 2500 psi

**Style D – Maximum Operating Pressure**

| Bore<br>Ø | psi  |
|-----------|------|
| 10.00     | 2800 |
| 12.00     | 2350 |
| 14.00     | 2200 |

**Optional SAE Flange Port Pattern**



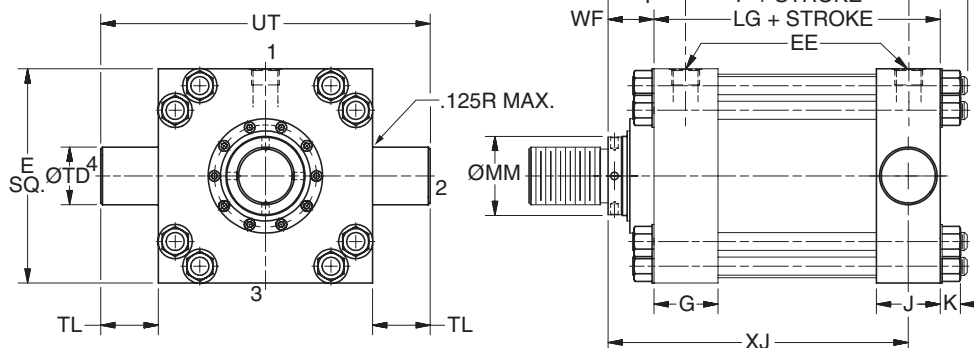
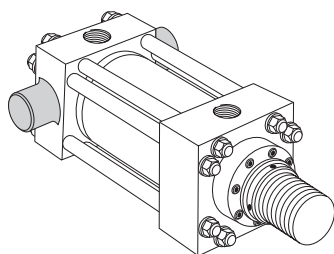
| Nom.<br>Flange<br>Size | A    | Q     | GG    | W    | X    | Z-THD<br>UNC-<br>2B | AA<br>Min. | SAE |
|------------------------|------|-------|-------|------|------|---------------------|------------|-----|
| 2                      | 2.00 | 3.062 | 1.688 | 1.53 | 0.84 | 1/2-13              | 1.06       | 32  |
| 2 1/2                  | 2.50 | 3.500 | 2.000 | 1.75 | 1.00 | 1/2-13              | 1.19       | 40  |

**⚠ PROP 65 WARNING** WARNING: This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

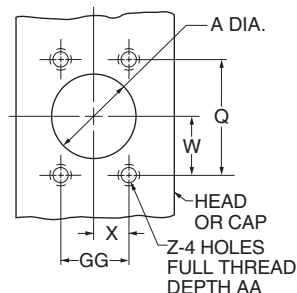
**Mounting Information****Heavy Duty Hydraulic Cylinders  
Series 3H Large Bore****Cap Trunnion Mounting**

Style DB

(NFPA Style MT2)

**Style DB – Dimensional and Mounting Data**

| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | E     | Ports (EE)        |                                    |                                                | G    | J    | K<br>Max. | TD Ø<br>+.000<br>-.001 | TL   | UT    | WF   | Y    | Add Stroke |       |       |            |
|-----------|------------|----------------|-------|-------------------|------------------------------------|------------------------------------------------|------|------|-----------|------------------------|------|-------|------|------|------------|-------|-------|------------|
|           |            |                |       | NPTF <sup>1</sup> | SAE<br>Flange<br>Port <sup>2</sup> | SAE<br>Straight<br>Thread<br>Port <sup>3</sup> |      |      |           |                        |      |       |      |      | LG         | P     | XJ    | ZB<br>Max. |
| 10.00     | 1 (std.)   | 4.500          | 12.63 | 2.00              | 2.00                               | 24                                             | 3.69 | 3.69 | 1.17      | 3.500                  | 3.50 | 19.63 | 2.94 | 4.75 | 12.13      | 8.50  | 13.38 | 16.49      |
|           | 2          | 7.000          | 12.63 | 2.00              | 2.00                               | 24                                             | 3.69 | 3.69 | 1.17      | 3.500                  | 3.50 | 19.63 | 3.50 | 5.31 | 12.13      | 8.50  | 13.94 | 17.05      |
|           | 3          | 5.000          | 12.63 | 2.00              | 2.00                               | 24                                             | 3.69 | 3.69 | 1.17      | 3.500                  | 3.50 | 19.63 | 3.19 | 5.00 | 12.13      | 8.50  | 13.63 | 16.74      |
|           | 4          | 5.500          | 12.63 | 2.00              | 2.00                               | 24                                             | 3.69 | 3.69 | 1.17      | 3.500                  | 3.50 | 19.63 | 3.19 | 5.00 | 12.13      | 8.50  | 13.63 | 16.74      |
| 12.00     | 1 (std.)   | 5.500          | 14.88 | 2.50              | 2.50 <sup>4</sup>                  | 24                                             | 4.44 | 4.44 | 1.30      | 4.000                  | 4.00 | 22.88 | 3.19 | 5.38 | 14.50      | 10.13 | 15.50 | 19.24      |
|           | 2          | 8.000          | 14.88 | 2.50              | 2.50 <sup>4</sup>                  | 24                                             | 4.44 | 4.44 | 1.30      | 4.000                  | 4.00 | 22.88 | 4.00 | 6.19 | 14.50      | 10.13 | 16.31 | 20.05      |
|           | 3          | 7.000          | 14.88 | 2.50              | 2.50 <sup>4</sup>                  | 24                                             | 4.44 | 4.44 | 1.30      | 4.000                  | 4.00 | 22.88 | 3.50 | 5.69 | 14.50      | 10.13 | 15.81 | 19.55      |
| 14.00     | 1 (std.)   | 7.000          | 17.13 | 2.50              | 2.50 <sup>4</sup>                  | 24                                             | 4.88 | 4.88 | 1.30      | 4.500                  | 4.50 | 26.13 | 3.50 | 5.88 | 15.63      | 10.88 | 16.69 | 20.68      |
|           | 2          | 10.000         | 17.13 | 2.50              | 2.50 <sup>4</sup>                  | 24                                             | 4.88 | 4.88 | 1.30      | 4.500                  | 4.50 | 26.13 | 4.50 | 6.88 | 15.63      | 10.88 | 17.69 | 21.68      |
|           | 3          | 8.000          | 17.13 | 2.50              | 2.50 <sup>4</sup>                  | 24                                             | 4.88 | 4.88 | 1.30      | 4.500                  | 4.50 | 26.13 | 4.00 | 6.38 | 15.63      | 10.88 | 17.19 | 21.18      |

<sup>1</sup> NPTF ports are available at no extra charge.<sup>2</sup> Optional SAE flange ports may be specified – flange to be supplied by customer. See Optional SAE Flange Port Pattern table for dimensions.<sup>3</sup> SAE straight thread ports are standard and are indicated by port number.<sup>4</sup> 2.50 SAE flange port is rated at 2500 psi**Optional SAE Flange Port Pattern**

| Nom.<br>Flange<br>Size | A    | Q     | GG    | W    | X    | Z-THD<br>UNC-<br>2B | AA<br>Min. | SAE |
|------------------------|------|-------|-------|------|------|---------------------|------------|-----|
| 2                      | 2.00 | 3.062 | 1.688 | 1.53 | 0.84 | 1/2-13              | 1.06       | 32  |
| 2 1/2                  | 2.50 | 3.500 | 2.000 | 1.75 | 1.00 | 1/2-13              | 1.19       | 40  |

**Style DB – Maximum  
Operating Pressure**

| Bore<br>Ø | psi  |
|-----------|------|
| 10.00     | 2800 |
| 12.00     | 2350 |
| 14.00     | 2200 |

**PROP 65 WARNING**

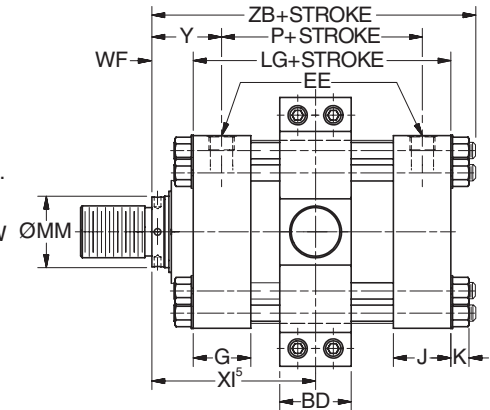
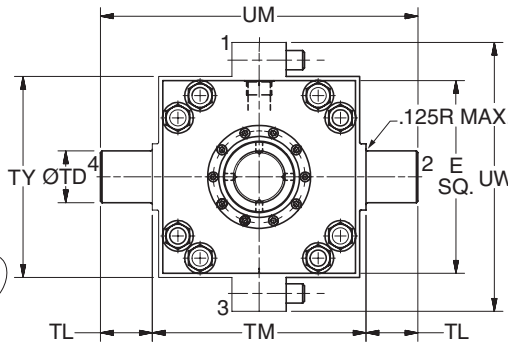
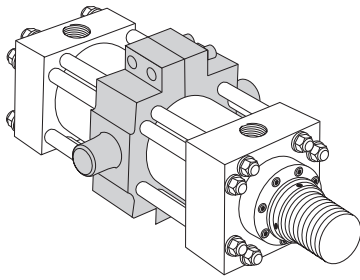
**WARNING:** This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)



# Mounting Information

## Heavy Duty Hydraulic Cylinders Series 3H Large Bore

### Intermediate Fixed Trunnion Mounting Style DD (NFPA Style MT4)



### Style DD – Dimensional and Mounting Data

| Bore<br>Ø | Rod<br>No. | MM<br>Rod<br>Ø | E     | EE Ports          |                                   |                                          | BD   | G    | J    | K<br>Max. | TD Ø<br>+0.000<br>-0.001 | TL   | TM    | TY    | UM    | UW    | WF   | Min.<br>XI <sup>5</sup><br>Styles<br>4 & 9 | Y    | Add Stroke |       |            |
|-----------|------------|----------------|-------|-------------------|-----------------------------------|------------------------------------------|------|------|------|-----------|--------------------------|------|-------|-------|-------|-------|------|--------------------------------------------|------|------------|-------|------------|
|           |            |                |       | NPTF <sup>1</sup> | SAE<br>Flge.<br>Port <sup>2</sup> | SAE<br>Str.<br>Thr.<br>Port <sup>3</sup> |      |      |      |           |                          |      |       |       |       |       |      |                                            |      | LG         | P     | ZB<br>Max. |
| 10.00     | 1(std.)    | 4.500          | 12.63 | 2.00              | 2.00                              | 24                                       | 4.50 | 3.69 | 3.69 | 1.17      | 3.500                    | 3.50 | 14.00 | 13.00 | 21.00 | 17.50 | 2.94 | 9.06                                       | 4.75 | 12.13      | 8.50  | 16.49      |
|           | 2          | 7.000          | 12.63 | 2.00              | 2.00                              | 24                                       | 4.50 | 3.69 | 3.69 | 1.17      | 3.500                    | 3.50 | 14.00 | 13.00 | 21.00 | 17.50 | 3.50 | 9.63                                       | 5.31 | 12.13      | 8.50  | 17.05      |
|           | 3          | 5.000          | 12.63 | 2.00              | 2.00                              | 24                                       | 4.50 | 3.69 | 3.69 | 1.17      | 3.500                    | 3.50 | 14.00 | 13.00 | 21.00 | 17.50 | 3.19 | 9.31                                       | 5.00 | 12.13      | 8.50  | 16.74      |
|           | 4          | 5.500          | 12.63 | 2.00              | 2.00                              | 24                                       | 4.50 | 3.69 | 3.69 | 1.17      | 3.500                    | 3.50 | 14.00 | 13.00 | 21.00 | 17.50 | 3.19 | 9.31                                       | 5.00 | 12.13      | 8.50  | 16.74      |
| 12.00     | 1(std.)    | 5.500          | 14.88 | 2.50              | 2.50 <sup>6</sup>                 | 24                                       | 5.50 | 4.44 | 4.44 | 1.30      | 4.000                    | 4.00 | 16.50 | 15.50 | 24.50 | 20.75 | 3.19 | 10.63                                      | 5.38 | 14.50      | 10.13 | 19.24      |
|           | 2          | 8.000          | 14.88 | 2.50              | 2.50 <sup>6</sup>                 | 24                                       | 5.50 | 4.44 | 4.44 | 1.30      | 4.000                    | 4.00 | 16.50 | 15.50 | 24.50 | 20.75 | 4.00 | 11.50                                      | 6.19 | 14.50      | 10.13 | 20.05      |
|           | 3          | 7.000          | 14.88 | 2.50              | 2.50 <sup>6</sup>                 | 24                                       | 5.50 | 4.44 | 4.44 | 1.30      | 4.000                    | 4.00 | 16.50 | 15.50 | 24.50 | 20.75 | 3.50 | 10.94                                      | 5.69 | 14.50      | 10.13 | 19.55      |
| 14.00     | 1(std.)    | 7.000          | 17.13 | 2.50              | 2.50 <sup>6</sup>                 | 24                                       | 5.50 | 4.88 | 4.88 | 1.30      | 4.500                    | 4.50 | 19.50 | 19.25 | 28.50 | 24.75 | 3.50 | 11.44                                      | 5.88 | 15.63      | 10.88 | 20.68      |
|           | 2          | 10.000         | 17.13 | 2.50              | 2.50 <sup>6</sup>                 | 24                                       | 5.50 | 4.88 | 4.88 | 1.30      | 4.500                    | 4.50 | 19.50 | 19.25 | 28.50 | 24.75 | 4.50 | 12.44                                      | 6.88 | 15.63      | 10.88 | 21.68      |
|           | 3          | 8.000          | 17.13 | 2.50              | 2.50 <sup>6</sup>                 | 24                                       | 5.50 | 4.88 | 4.88 | 1.30      | 4.500                    | 4.50 | 19.50 | 19.25 | 28.50 | 24.75 | 4.00 | 11.94                                      | 6.38 | 15.63      | 10.88 | 21.18      |
| 16.00     | 1(std.)    | 8.000          | 19.00 | 4                 | 3.00 <sup>7</sup>                 | 24                                       | 4    | 5.88 | 5.88 | 1.70      | 4                        | 4    | 4     | 4     | 4     | 4     | 4.00 | 4                                          | 7.00 | 18.13      | 12.13 | 24.08      |
|           | 3          | 9.000          | 19.00 | 4                 | 3.00 <sup>7</sup>                 | 24                                       | 4    | 5.88 | 5.88 | 1.70      | 4                        | 4    | 4     | 4     | 4     | 4     | 4.25 | 4                                          | 7.25 | 18.13      | 12.13 | 24.33      |
|           | 4          | 10.000         | 19.00 | 4                 | 3.00 <sup>7</sup>                 | 24                                       | 4    | 5.88 | 5.88 | 1.70      | 4                        | 4    | 4     | 4     | 4     | 4     | 4.50 | 4                                          | 7.50 | 18.13      | 12.13 | 24.58      |
| 18.00     | 1(std.)    | 9.000          | 22.00 | 4                 | 3.00 <sup>7</sup>                 | 24                                       | 4    | 6.88 | 6.88 | 1.70      | 4                        | 4    | 4     | 4     | 4     | 4     | 4.25 | 4                                          | 7.25 | 21.13      | 15.13 | 27.33      |
|           | 3          | 10.000         | 22.00 | 4                 | 3.00 <sup>7</sup>                 | 24                                       | 4    | 6.88 | 6.88 | 1.70      | 4                        | 4    | 4     | 4     | 4     | 4     | 4.50 | 4                                          | 7.50 | 21.13      | 15.13 | 27.58      |
| 20.00     | 1(std.)    | 10.000         | 24.00 | 4                 | 3.00 <sup>7</sup>                 | 24                                       | 4    | 7.88 | 7.88 | 1.70      | 4                        | 4    | 4     | 4     | 4     | 4     | 4.50 | 4                                          | 7.50 | 23.63      | 17.63 | 30.08      |

<sup>1</sup>NPTF ports are available at no extra charge.

<sup>2</sup>Optional SAE flange ports may be specified – flange to be supplied by customer. See Optional SAE Flange Port Pattern table for dimensions.

<sup>3</sup>SAE straight thread ports are standard and are indicated by port number.

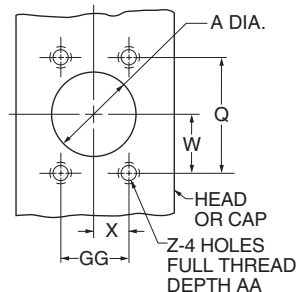
<sup>4</sup>Consult Factory

<sup>5</sup>Dimension XI to be specified by customer. Reference point for rod end Style 55 is end of piston rod.

<sup>6</sup>2.50 SAE flange port is rated at 2500 psi

<sup>7</sup>3.00 SAE flange port is rated at 2000 psi

### Optional SAE Flange Port Pattern



| Nom.<br>Flange<br>Size | A    | Q     | GG    | W    | X    | Z-THD<br>UNC-<br>2B | AA<br>Min. | SAE |
|------------------------|------|-------|-------|------|------|---------------------|------------|-----|
| 2                      | 2.00 | 3.062 | 1.688 | 1.53 | 0.84 | 1/2-13              | 1.06       | 32  |
| 2 1/2                  | 2.50 | 3.500 | 2.000 | 1.75 | 1.00 | 1/2-13              | 1.19       | 40  |
| 3                      | 3.00 | 4.188 | 2.438 | 2.09 | 1.22 | 5/8-11              | 1.19       | 48  |

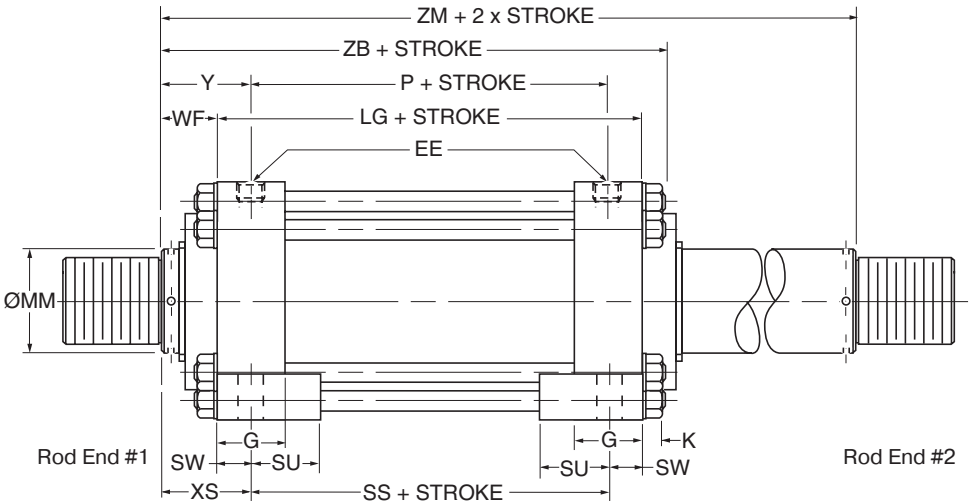
### Style DD – Maximum Operating Pressure

| Bore<br>Ø | psi  |
|-----------|------|
| 10.00     | 2800 |
| 12.00     | 2350 |
| 14.00     | 2200 |

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**Double Rod Cylinder**  
**Style K**



| Mounting Styles for Single Rod Models | Mounting Styles for Corresponding Double Rod Models <sup>1</sup> | Dimension Shown on This Page Supplement Dimensions on Pages Listed Below |
|---------------------------------------|------------------------------------------------------------------|--------------------------------------------------------------------------|
| TB                                    | KTB                                                              | 120                                                                      |
| TD                                    | KTD                                                              | 120                                                                      |
| C                                     | KC                                                               | 121                                                                      |
| JJ                                    | KJJ                                                              | 122                                                                      |
| JB                                    | KJB                                                              | 123                                                                      |
| D                                     | KD                                                               | 127                                                                      |
| DD                                    | KDD <sup>2</sup>                                                 | 129                                                                      |

<sup>1</sup>If only one end of these Double Rod Cylinders is to be cushioned, be sure to specify clearly which end this will be.

<sup>2</sup>Specify XI dimension from rod end #1.

| Bore Ø | Rod Code | Rod Ø  | Add 2X Stroke |
|--------|----------|--------|---------------|
|        |          |        | ZM            |
| 10.00  | 1        | 4.500  | 18.00         |
|        | 2        | 7.000  | 19.12         |
|        | 3        | 5.000  | 18.50         |
|        | 4        | 5.500  | 18.50         |
| 12.00  | 1        | 5.500  | 20.88         |
|        | 2        | 8.000  | 22.50         |
|        | 3        | 7.000  | 21.50         |
| 14.00  | 1        | 7.000  | 22.63         |
|        | 2        | 10.000 | 24.63         |
|        | 3        | 8.000  | 23.63         |
| 16.00  | 1        | 8.000  | 26.13         |
|        | 3        | 9.000  | 26.63         |
|        | 4        | 10.000 | 27.13         |
| 18.00  | 1        | 9.000  | 29.63         |
|        | 3        | 10.000 | 30.13         |
| 20.00  | 1        | 10.000 | 32.63         |

**How to Use Double Rod Cylinder**  
**Dimension Drawings**

To obtain dimensioning information on a double rod cylinder, first select the desired mounting style and refer to the corresponding single rod cylinder model shown on the preceding pages. (See table above.) After you have determined all necessary dimensions from that drawing, turn back to this page and supplement those dimensions with additional ones from the drawing above and table at right. These added dimensions differ from, or are in addition to, those

shown on the preceding pages and provide the additional information needed to completely dimension a double rod cylinder model.

On a double rod cylinder where the two rod ends are different, be sure to clearly state which rod end is to be assembled at which end. Port position 1 is standard. If other than standard, specify pos. 2, 3 or 4 when viewed from rod end #1 only. See port position information in Section H.

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## Section F

### Cylinder Accessories and Replacement Parts

|                                                                                                                                                                                   |         |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| Mounting Accessories                                                                                                                                                              | 134-137 |
| Style SB Spherical Bearing Mounting Accessories                                                                                                                                   | 138     |
| Style SE Spherical Bearing Mounting Accessories                                                                                                                                   | 139     |
| Linear Alignment Couplers                                                                                                                                                         | 140     |
| Split Couplers / Weld Plates / Dual Axis Knuckles                                                                                                                                 | 141     |
| 2H / 2HD Parts Identification and Tie Rod Torque                                                                                                                                  | 142     |
| 2HB Parts Identification and Flange Screw Torque                                                                                                                                  | 143     |
| 2H / 2HD / 2HB Rod Gland and Rod Seal Kits (Including Crown Wiper Kits),<br>Gland Retainer Screw Torque, Piston Seal and Body Seal Kits                                           | 144-145 |
| 3H / 3HD / 3HB 7.00"-8.00" Bore Parts Identification, Rod Gland and Rod Seal Kits<br>(Including Crown Wiper Kits), Gland Retainer Screw Torque, Piston Seal and Body<br>Seal Kits | 146-147 |
| 10.00" - 20.00" Bore Series 3H                                                                                                                                                    | 148-149 |
| Gland and Spanner Wrenches                                                                                                                                                        | 150     |

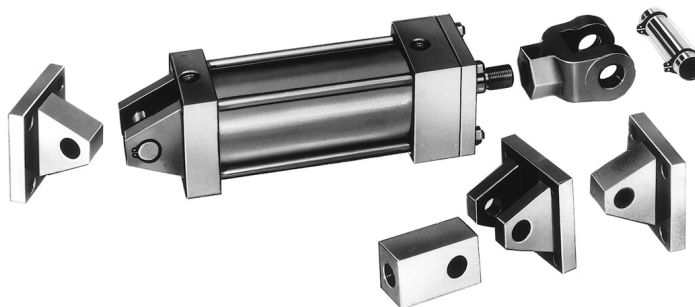
**⚠ PROP 65 WARNING** **WARNING:** This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**Cylinder Accessories**

Parker offers a complete range of cylinder accessories to assure flexibility and versatility in present or future cylinder applications.

**Rod End Accessories**

Accessories offered for the rod end of the cylinder include: Rod Clevis, Eye Bracket, Knuckle, Clevis Bracket and Pivot Pin. To select the proper part number for any desired accessory, refer to Chart A below and look opposite the thread size of the rod end as indicated in the first column. The Pivot Pins, Eye Brackets and Clevis Brackets are listed opposite the thread size which their mating Knuckles or Clevises fit.

**Accessory Load Capacity**

The various accessories on this and the following pages have been load rated for your convenience. The load capacity shown in lbs. is the recommended maximum load for that accessory based on a 4:1 design factor in tension. (Pivot Pin is rated in shear.)

Before specifying, compare the actual load or the tension (pull) force at maximum operating pressure of the cylinder with the load capacity of the accessory you plan to use. If load or pull force of cylinder exceeds load capacity of accessory, consult factory.

**Chart A**

| Thread Size | Pin Ø | Rod Clevis              |                    | Mounting Plate or Eye Bracket     |                    | Pivot Pin   |                     |
|-------------|-------|-------------------------|--------------------|-----------------------------------|--------------------|-------------|---------------------|
|             |       | Part Number             | Load Capacity (lb) | Forged Steel or Cast Ductile Iron |                    | Part Number | Shear Capacity (lb) |
|             |       |                         |                    | Part Number                       | Load Capacity (lb) |             |                     |
| 5/16-24     | 0.312 | 0512210000 <sup>1</sup> | 2,600              | 0959810031                        | 1,850              | —           | —                   |
| 7/16-20     | 0.500 | 0509400000              | 4,250              | 0959810050 <sup>2</sup>           | 4,620              | 0683680000  | 8,600               |
| 1/2-20      | 0.500 | 0509410000              | 4,900              | 0959810050 <sup>2</sup>           | 4,620              | 0683680000  | 8,600               |
| 3/4-16      | 0.750 | 0509420000              | 11,200             | 0959810075 <sup>2</sup>           | 12,370             | 0683690000  | 19,300              |
| 3/4-16      | 0.750 | 1332840000              | 11,200             | 0959810075 <sup>2</sup>           | 12,370             | 0683690000  | 19,300              |
| 7/8-14      | 1.000 | 0509430000              | 18,800             | 0959810100 <sup>2</sup>           | 20,450             | 0683700000  | 34,300              |
| 1-14        | 1.000 | 0509440000              | 19,500             | 0959810100 <sup>2</sup>           | 20,450             | 0683700000  | 34,300              |
| 1-14        | 1.000 | 1332850000              | 19,500             | 0959810100 <sup>2</sup>           | 20,450             | 0683700000  | 34,300              |
| 1 1/4-12    | 1.375 | 0509450000              | 33,500             | 0959810138                        | 33,500             | 0683710000  | 65,000              |
| 1 1/4-12    | 1.375 | 1332860000              | 33,500             | 0959810138                        | 33,500             | 0683710000  | 65,000              |
| 1 1/2-12    | 1.750 | 0509460000              | 45,600             | 0959810175                        | 49,480             | 0683720000  | 105,200             |
| 1 3/4-12    | 2.000 | 0509470000              | 65,600             | 0959810200 <sup>2</sup>           | 70,100             | 0683730000  | 137,400             |
| 1 7/8-12    | 2.000 | 0509480000              | 65,600             | 0959810200 <sup>2</sup>           | 70,100             | 0683730000  | 137,400             |
| 2 1/4-12    | 2.500 | 0509490000              | 98,200             | 0959810250 <sup>2</sup>           | 98,200             | 0683740000  | 214,700             |
| 2 1/2-12    | 3.000 | 0509500000              | 98,200             | 0959810300 <sup>2</sup>           | 121,940            | 0683750000  | 309,200             |
| 2 3/4-12    | 3.000 | 0509510000              | 98,200             | 0959810300 <sup>2</sup>           | 121,940            | 0683750000  | 309,200             |
| 3 1/4-12    | 3.500 | 0509520000              | 156,700            | 0959810350                        | 187,910            | 0735450000  | 420,900             |
| 3 1/2-12    | 4.000 | 0509530000              | 193,200            | 0959810400                        | 268,000            | 0735470000  | 565,800             |
| 4-12        | 4.000 | 0509540000              | 221,200            | 0959810400                        | 268,000            | 0735470000  | 565,800             |

<sup>1</sup>Includes pivot pin. <sup>2</sup>Cylinder accessory dimensions conform to ANSI/NFPA/T3.6.8 R3-2010.

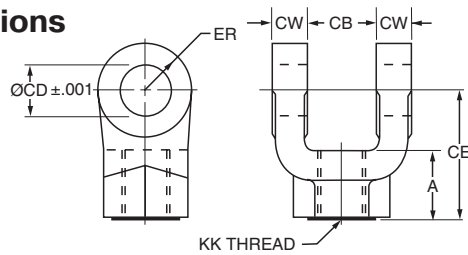
**Mounting Plates**

Mounting Plates for Style BB (clevis mounted) cylinders are offered. To select proper part number for your application, refer to Chart B at right.

**Chart B**

| Series 2H, 2HD, 2HB        |            | Series 3H, 3HD             |        |
|----------------------------|------------|----------------------------|--------|
| Mounting Plate Part Number | Bore Ø     | Mounting Plate Part Number | Bore Ø |
| 0959810050                 | 1.50       | 0959810250                 | 7.00   |
| 0959810075                 | 2.00, 2.50 | 0959810300                 | 8.00   |
| 0959810100                 | 3.25       | 0959810350                 | 10.00  |
| 0959810138                 | 4.00       | 0959810400                 | 12.00  |
| 0959810175                 | 5.00       |                            |        |
| 0959810200                 | 6.00       |                            |        |

## Rod Clevis Dimensions



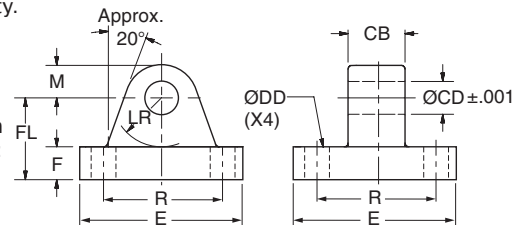
| Part Number <sup>1</sup> | Pin Ø | A                 | CB   | CD Ø  | CE   | CW   | ER   | KK Thread |
|--------------------------|-------|-------------------|------|-------|------|------|------|-----------|
| 0512210000 <sup>2</sup>  | 0.310 | 0.81              | 0.34 | 0.314 | 2.25 | 0.20 | 0.30 | 5/16-24   |
| 0509400000               | 0.500 | 0.75              | 0.77 | 0.503 | 1.50 | 0.49 | 0.50 | 7/16-20   |
| 0509410000               | 0.500 | 0.75              | 0.77 | 0.503 | 1.50 | 0.49 | 0.50 | 1/2-20    |
| 0509420000               | 0.750 | 1.13              | 1.27 | 0.753 | 2.13 | 0.62 | 0.75 | 3/4-16    |
| 1332840000               | 0.750 | 1.13              | 1.27 | 0.753 | 2.38 | 0.62 | 0.75 | 3/4-16    |
| 0509430000               | 1.000 | 1.63              | 1.52 | 1.003 | 2.94 | 0.74 | 1.00 | 7/8-14    |
| 0509440000               | 1.000 | 1.63              | 1.52 | 1.003 | 2.94 | 0.74 | 1.00 | 1-14      |
| 1332850000               | 1.000 | 1.63              | 1.52 | 1.003 | 3.13 | 0.74 | 1.00 | 1-14      |
| 0509450000               | 1.375 | 1.88              | 2.04 | 1.378 | 3.75 | 0.99 | 1.38 | 1 1/4-12  |
| 1332860000               | 1.375 | 2.00              | 2.04 | 1.378 | 4.13 | 0.99 | 1.38 | 1 1/4-12  |
| 0509460000               | 1.750 | 2.25              | 2.54 | 1.753 | 4.50 | 1.24 | 1.75 | 1 1/2-12  |
| 0509470000               | 2.000 | 3.00              | 2.54 | 2.003 | 5.50 | 1.24 | 2.00 | 1 3/4-12  |
| 0509480000               | 2.000 | 3.00              | 2.54 | 2.003 | 5.50 | 1.24 | 2.00 | 1 7/8-12  |
| 0509490000               | 2.500 | 3.50              | 3.04 | 2.503 | 6.50 | 1.49 | 2.50 | 2 1/4-12  |
| 0509500000               | 3.000 | 3.50              | 3.04 | 3.003 | 6.75 | 1.49 | 2.75 | 2 1/2-12  |
| 0509510000               | 3.000 | 3.50              | 3.04 | 3.003 | 6.75 | 1.49 | 2.75 | 2 3/4-12  |
| 0509520000               | 3.500 | 3.50 <sup>3</sup> | 4.04 | 3.503 | 7.75 | 1.98 | 3.50 | 3 1/4-12  |
| 0509530000               | 4.000 | 4.00 <sup>3</sup> | 4.54 | 4.003 | 8.81 | 2.23 | 4.00 | 3 1/2-12  |
| 0509540000               | 4.000 | 4.00 <sup>3</sup> | 4.54 | 4.003 | 8.81 | 2.23 | 4.00 | 4-12      |

<sup>1</sup> Rod Clevises with pin diameters 0.312 thru 1.375 are forged steel. Rod Clevises with 1.750 pin diameter and larger are cast ductile iron.

<sup>2</sup> Includes Pivot Pin <sup>3</sup> Consult appropriate cylinder rod end dimensions for compatibility.

### Forged Steel or Cast Ductile Iron Mounting Plate or Eye Bracket Dimensions<sup>5</sup>

**Note: Cast ductile iron eye brackets must not be welded in place.**



| Cast or Forged <sup>6</sup> Part Number | Pin Ø | CB   | CD Ø  | DD Ø | E (As Cast) | F                 | FL                | LR   | M (As Cast) | R     |
|-----------------------------------------|-------|------|-------|------|-------------|-------------------|-------------------|------|-------------|-------|
| 0959810031                              | 0.312 | 0.31 | 0.314 | 0.27 | 2.25        | 0.38              | 1.00              | 0.59 | 0.38        | 1.75  |
| 0959810050                              | 0.500 | 0.75 | 0.503 | 0.41 | 2.50        | 0.38              | 1.13              | 0.69 | 0.50        | 1.63  |
| 0959810075                              | 0.750 | 1.25 | 0.753 | 0.53 | 3.50        | 0.63              | 1.88              | 1.13 | 0.75        | 2.55  |
| 0959810100                              | 1.000 | 1.50 | 1.003 | 0.66 | 4.50        | 0.88              | 2.38              | 1.37 | 1.00        | 3.25  |
| 0959810138                              | 1.375 | 2.00 | 1.378 | 0.66 | 5.00        | 1.00 <sup>7</sup> | 3.00              | 1.88 | 1.38        | 3.82  |
| 0959810175                              | 1.750 | 2.50 | 1.753 | 0.91 | 6.50        | 1.25 <sup>7</sup> | 3.38              | 2.13 | 1.75        | 4.95  |
| 0959810200                              | 2.000 | 2.50 | 2.003 | 1.06 | 7.50        | 1.50              | 4.00              | 2.38 | 2.00        | 5.73  |
| 0959810250                              | 2.500 | 3.00 | 2.503 | 1.19 | 8.50        | 1.75              | 4.75              | 2.88 | 2.50        | 6.58  |
| 0959810300                              | 3.000 | 3.00 | 3.003 | 1.31 | 9.50        | 2.00              | 5.25              | 3.13 | 3.00        | 7.50  |
| 0959810350                              | 3.500 | 4.00 | 3.503 | 1.81 | 12.63       | 2.50 <sup>8</sup> | 6.50 <sup>8</sup> | 3.88 | 3.50        | 9.62  |
| 0959810400                              | 4.000 | 4.50 | 4.003 | 2.06 | 14.88       | 3.00 <sup>8</sup> | 7.50 <sup>8</sup> | 4.38 | 4.06        | 11.45 |

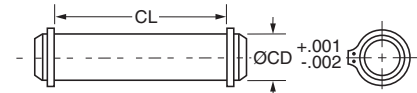
<sup>5</sup> When used to mate with the Rod Clevis, select by pin diameter in the table above.

<sup>6</sup> Eye Brackets with pin diameters 0.500 thru 1.375 are forged steel. Eye Brackets with 0.312 and 1.750 pin diameter and larger are cast ductile iron.

<sup>7</sup> These dimensions vary from NFPA standard. F is increased by 0.13. Sufficient LR clearance remains for full swing arc with Parker cap clevis cylinders and rod clevises.

<sup>8</sup> Mounting base thickness dimension F is increased on these sizes to provide greater load capacity than the former fabricated steel design. Cast ductile iron dimensions F and FL are 0.81 larger for 3.500 pin diameter and 1.06 larger for 4.000 pin diameter.

## Pivot Pin Dimensions



| Part Number             | CD Ø  | CL   |
|-------------------------|-------|------|
| 0683680000              | 0.500 | 1.88 |
| 0683690000              | 0.750 | 2.63 |
| 0683700000              | 1.000 | 3.13 |
| 0683710000              | 1.375 | 4.19 |
| 0683720000              | 1.750 | 5.19 |
| 0683730000              | 2.000 | 5.19 |
| 0683740000              | 2.500 | 6.19 |
| 0683750000              | 3.000 | 6.25 |
| 0735450000              | 3.500 | 8.25 |
| 0735470000 <sup>4</sup> | 4.000 | 9.00 |

<sup>4</sup> This size supplied with cotter pins.

1. Pivot Pins are furnished with Clevis Mounted Cylinders as standard.
2. Pivot Pins are furnished with (2) Retainer Rings.
3. Pivot Pins must be ordered as a separate item if to be used with Knuckles, Rod Clevises, or Clevis Brackets.

**Mounting Accessories****Rod End Accessories**

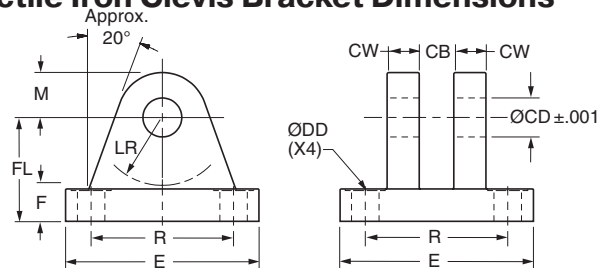
Accessories offered for the rod end of the cylinder include Rod Clevis, Eye Bracket, Knuckle, Clevis Bracket, and Pivot Pin. To select the proper part number for any desired accessory, refer to the table below or on the opposite page and look in the row to the right of the rod thread in the first column. For economical accessory selection, it is recommended that rod end style 4 be specified on your cylinder order.

**Heavy Duty Hydraulic Cylinders****Cylinder Accessories and Replacement Parts****Accessory Load Capacity**

The various accessories have been load rated for your convenience. The Load Capacity in pounds is the recommended maximum load for that accessory based on a 4:1 design factor in tension. (Pivot Pin is rated in shear.) Before specifying, compare the actual load or the tension (pull) force at the maximum operating pressure of the cylinder with the load capacity of the accessory you plan to use. If load or pull force of cylinder exceeds load capacity of accessory, consult factory.

| Thread Size | Pin Ø | Knuckle     |                    | Clevis Bracket                    |                    |                  |                    | Pivot Pin               |                     |
|-------------|-------|-------------|--------------------|-----------------------------------|--------------------|------------------|--------------------|-------------------------|---------------------|
|             |       | Part Number | Load Capacity (lb) | Forged Steel or Cast Ductile Iron |                    | Fabricated Steel |                    | Part Number             | Shear Capacity (lb) |
|             |       |             |                    | Part Number                       | Load Capacity (lb) | Part Number      | Load Capacity (lb) |                         |                     |
| 5/16-24     | 0.438 | 0740750000  | 3,300              | 0960160044                        | 2,830              | 0740760000       | 3,600              | 0740780000              | 6,600               |
| 7/16-20     | 0.500 | 0690890000  | 5,000              | 0960160050                        | 7,740              | 0692050000       | 7,300              | 0683680000              | 8,600               |
| 1/2-20      | 0.500 | 0690900000  | 5,700              | 0960160050                        | 7,740              | 0692050000       | 7,300              | 0683680000              | 8,600               |
| 3/4-16      | 0.750 | 0690910000  | 12,100             | 0960160075                        | 13,600             | 0692060000       | 10,880             | 0683690000              | 19,300              |
| 7/8-14      | 1.000 | 0690920000  | 13,000             | 0960160100                        | 23,000             | 0692070000       | 15,180             | 0683700000              | 34,300              |
| 1-14        | 1.000 | 0690930000  | 21,700             | 0960160100                        | 23,000             | 0692070000       | 15,180             | 0683700000              | 34,300              |
| 1 1/4-12    | 1.375 | 0690940000  | 33,500             | 0960160138                        | 39,500             | 0692080000       | 23,560             | 0683710000              | 65,000              |
| 1 1/2-12    | 1.750 | 0690950000  | 45,000             | 0960160175                        | 49,480             | 0692090000       | 21,520             | 0683720000              | 105,200             |
| 1 3/4-12    | 2.000 | 0690960000  | 53,500             | 0960160200                        | 72,400             | 0692100000       | 26,000             | 0692150000              | 137,400             |
| 1 7/8-12    | 2.000 | 0962160000  | 75,000             | 0960160200                        | 72,400             | 0692100000       | 26,000             | 0692150000              | 137,400             |
| 2 1/4-12    | 2.500 | 0962170000  | 98,700             | 0960160250                        | 98,700             | 0692110000       | 28,710             | 0683740000              | 214,700             |
| 2 1/2-12    | 3.000 | 0962180000  | 110,000            | 0960160300                        | 123,300            | 0692120000       | 28,190             | 0683750000              | 309,200             |
| 2 3/4-12    | 3.000 | 0962190000  | 123,300            | N/A                               | N/A                | 0692130000       | 31,390             | 0692160000              | 309,200             |
| 3 1/4-12    | 3.500 | 0962200000  | 161,300            | 0960160350                        | 200,400            | 0735420000       | 80,250             | 0735450000              | 420,900             |
| 3 1/2-12    | 3.500 | 0962210000  | 217,300            | 0960160350                        | 200,400            | 0735420000       | 80,250             | 0735450000              | 420,900             |
| 4-12        | 4.000 | 0962220000  | 273,800            | 0960160400                        | 292,100            | 0735430000       | 98,420             | 0821810000              | 565,800             |
| N/A         | 4.000 | N/A         | N/A                | N/A                               | N/A                | N/A              | N/A                | 0735470000 <sup>1</sup> | 565,800             |

<sup>1</sup>This size supplied with cotter pins.

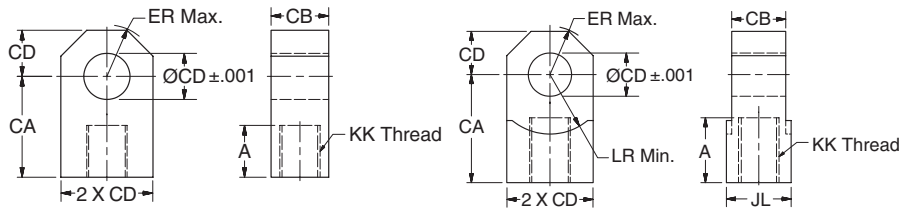
**Forged Steel or Cast Ductile Iron Clevis Bracket Dimensions**

**Note: Cast ductile iron clevis brackets must not be welded in place.**

| Cast or Forged <sup>2</sup> Part Number | Pin Ø | CB   | CD Ø  | CW   | DD Ø | E (As Cast) | F    | FL   | LR   | M (As Cast) | R     |
|-----------------------------------------|-------|------|-------|------|------|-------------|------|------|------|-------------|-------|
| 0960160044                              | 0.438 | 0.46 | 0.440 | 0.37 | 0.27 | 2.25        | 0.38 | 1.00 | 0.56 | 0.44        | 1.75  |
| 0960160050                              | 0.500 | 0.78 | 0.503 | 0.50 | 0.41 | 2.50        | 0.38 | 1.13 | 0.63 | 0.56        | 1.63  |
| 0960160075                              | 0.750 | 1.28 | 0.753 | 0.63 | 0.53 | 3.50        | 0.63 | 1.88 | 1.06 | 0.75        | 2.56  |
| 0960160100                              | 1.000 | 1.53 | 1.003 | 0.75 | 0.66 | 4.50        | 0.75 | 2.25 | 1.25 | 1.00        | 3.25  |
| 0960160138                              | 1.375 | 2.03 | 1.378 | 1.00 | 0.66 | 5.00        | 0.88 | 3.00 | 1.94 | 1.38        | 3.81  |
| 0960160175                              | 1.750 | 2.53 | 1.753 | 1.25 | 0.91 | 6.50        | 0.94 | 3.13 | 2.00 | 1.75        | 4.94  |
| 0960160200                              | 2.000 | 2.53 | 2.003 | 1.25 | 1.06 | 7.50        | 1.38 | 3.75 | 2.25 | 2.00        | 5.75  |
| 0960160250                              | 2.500 | 3.03 | 2.503 | 1.50 | 1.19 | 8.50        | 1.50 | 4.50 | 2.81 | 2.50        | 6.59  |
| 0960160300                              | 3.000 | 3.03 | 3.003 | 1.50 | 1.31 | 9.50        | 1.88 | 5.38 | 3.31 | 3.00        | 7.50  |
| 0960160350                              | 3.500 | 4.03 | 3.503 | 2.00 | 1.81 | 12.63       | 2.31 | 6.38 | 3.88 | 3.50        | 9.62  |
| 0960160400                              | 4.000 | 4.53 | 4.003 | 2.25 | 2.06 | 14.88       | 2.88 | 7.50 | 4.50 | 4.00        | 11.50 |

<sup>2</sup> Clevis Brackets with pin diameters 0.500 thru 1.375 are forged steel. Clevis Brackets with 0.438 and 1.750 pin diameter and larger are cast ductile iron.

## Knuckle Dimensions

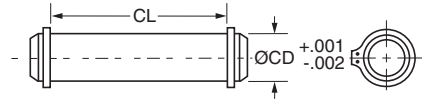


Thread Size thru 1 3/4-12

Thread Size 1 7/8-12 &amp; Larger

| Part Number | Pin<br>Ø | A    | CA   | CB   | CD<br>Ø | ER   | JL   | LR<br>min | KK<br>Thread |
|-------------|----------|------|------|------|---------|------|------|-----------|--------------|
| 0740750000  | 0.438    | 0.75 | 1.50 | 0.43 | 0.440   | 0.53 | —    | —         | 5/16-24      |
| 0690890000  | 0.500    | 0.75 | 1.50 | 0.75 | 0.503   | 0.59 | —    | —         | 7/16-20      |
| 0690900000  | 0.500    | 0.75 | 1.50 | 0.75 | 0.503   | 0.59 | —    | —         | 1/2-20       |
| 0690910000  | 0.750    | 1.13 | 2.06 | 1.25 | 0.753   | 0.87 | —    | —         | 3/4-16       |
| 0690920000  | 1.000    | 1.13 | 2.38 | 1.50 | 1.003   | 1.15 | —    | —         | 7/8-14       |
| 0690930000  | 1.000    | 1.63 | 2.81 | 1.50 | 1.003   | 1.15 | —    | —         | 1-14         |
| 0690940000  | 1.375    | 2.00 | 3.44 | 2.00 | 1.378   | 1.55 | —    | —         | 1 1/4-12     |
| 0690950000  | 1.750    | 2.25 | 4.00 | 2.50 | 1.753   | 1.96 | —    | —         | 1 1/2-12     |
| 0690960000  | 2.000    | 2.25 | 4.38 | 2.50 | 2.003   | 2.24 | —    | —         | 1 3/4-12     |
| 0962160000  | 2.000    | 3.00 | 5.00 | 2.50 | 2.003   | 2.24 | 3.00 | 2.77      | 1 7/8-12     |
| 0962170000  | 2.500    | 3.50 | 5.81 | 3.00 | 2.503   | 2.76 | 3.50 | 3.09      | 2 1/4-12     |
| 0962180000  | 3.000    | 3.50 | 6.13 | 3.00 | 3.003   | 3.30 | 4.00 | 3.58      | 2 1/2-12     |
| 0962190000  | 3.000    | 3.63 | 6.50 | 3.50 | 3.003   | 3.30 | 4.00 | 3.58      | 2 3/4-12     |
| 0962200000  | 3.500    | 4.50 | 7.63 | 4.00 | 3.503   | 3.87 | 6.00 | 4.18      | 3 1/4-12     |
| 0962210000  | 3.500    | 5.00 | 7.63 | 4.00 | 3.503   | 3.87 | 6.00 | 4.18      | 3 1/2-12     |
| 0962220000  | 4.000    | 5.50 | 9.13 | 4.50 | 4.003   | 4.43 | 6.00 | 4.80      | 4-12         |

## Pivot Pin Dimensions

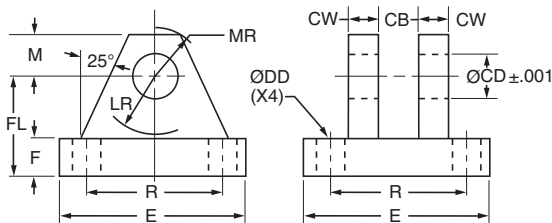


| Part Number             | CD<br>Ø | CL   |
|-------------------------|---------|------|
| 0740780000              | 0.438   | 1.31 |
| 0683680000              | 0.500   | 1.88 |
| 0683690000              | 0.750   | 2.63 |
| 0683700000              | 1.000   | 3.13 |
| 0683710000              | 1.375   | 4.19 |
| 0683720000              | 1.750   | 5.19 |
| 0692150000              | 2.000   | 5.69 |
| 0683740000              | 2.500   | 6.19 |
| 0683750000              | 3.000   | 6.25 |
| 0692160000              | 3.000   | 6.75 |
| 0735450000              | 3.500   | 8.25 |
| 0821810000              | 4.000   | 8.69 |
| 0735470000 <sup>1</sup> | 4.000   | 9.00 |

<sup>1</sup>This size supplied with cotter pins.

- Pivot Pins are furnished with Clevis Mounted Cylinders as standard.
- Pivot Pins are furnished with (2) Retainer Rings.
- Pivot Pins must be ordered as a separate item if to be used with Knuckles, Rod Clevises, or Clevis Brackets.

## Fabricated Steel Clevis Bracket Dimensions



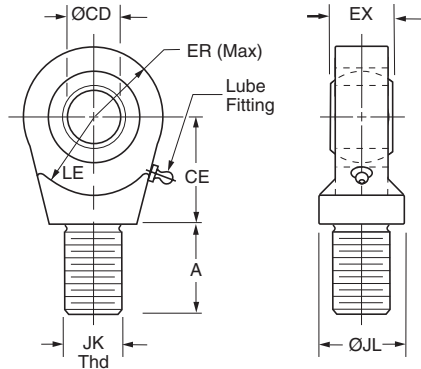
| Fabricated Steel<br>Part Number | Pin <sup>2</sup><br>Ø | CB   | CD<br>Ø | CW   | DD<br>Ø | E     | F    | FL   | LR   | M    | MR   | R     |
|---------------------------------|-----------------------|------|---------|------|---------|-------|------|------|------|------|------|-------|
| 0692050000                      | 0.500                 | 0.80 | 0.503   | 0.50 | 0.41    | 3.50  | 0.50 | 1.50 | 0.75 | 0.50 | 0.63 | 2.55  |
| 0692060000                      | 0.750                 | 1.30 | 0.753   | 0.63 | 0.53    | 5.00  | 0.63 | 1.88 | 1.19 | 0.75 | 0.91 | 3.82  |
| 0692070000                      | 1.000                 | 1.59 | 1.003   | 0.75 | 0.66    | 6.50  | 0.75 | 2.25 | 1.50 | 1.00 | 1.25 | 4.95  |
| 0692080000                      | 1.375                 | 2.09 | 1.378   | 1.00 | 0.66    | 7.50  | 0.88 | 3.00 | 2.00 | 1.38 | 1.66 | 5.73  |
| 0692090000                      | 1.750                 | 2.59 | 1.753   | 1.25 | 0.91    | 9.50  | 0.88 | 3.63 | 2.75 | 1.75 | 2.22 | 7.50  |
| 0692100000                      | 2.000                 | 2.59 | 2.003   | 1.50 | 1.06    | 12.75 | 1.00 | 4.25 | 3.19 | 2.25 | 2.78 | 9.40  |
| 0692110000                      | 2.500                 | 3.09 | 2.503   | 1.50 | 1.19    | 12.75 | 1.00 | 4.50 | 3.50 | 2.50 | 3.13 | 9.40  |
| 0692120000                      | 3.000                 | 3.09 | 3.003   | 1.50 | 1.31    | 12.75 | 1.00 | 6.00 | 4.25 | 3.00 | 3.59 | 9.40  |
| 0692130000                      | 3.000                 | 3.59 | 3.003   | 1.50 | 1.31    | 12.75 | 1.00 | 6.00 | 4.25 | 3.00 | 3.59 | 9.40  |
| 0735420000                      | 3.500                 | 4.09 | 3.503   | 2.00 | 1.81    | 15.50 | 1.69 | 6.69 | 5.00 | 3.50 | 4.13 | 12.00 |
| 0735430000                      | 4.000                 | 4.59 | 4.003   | 2.00 | 2.06    | 17.50 | 1.94 | 7.69 | 5.75 | 4.00 | 4.88 | 13.75 |

<sup>2</sup> Clevis Bracket for 0.438 diameter pin is only available in cast ductile iron construction. See part number 0960160044 on previous page.

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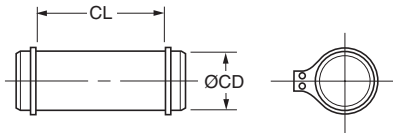
Parker offers a complete range of Cylinder Accessories to assure you of the greatest versatility in present or future cylinder applications. Accessories

offered for spherical bearing mount cylinders include the Rod Eye, Pivot Pin and Clevis Bracket. To select the proper part number for any desired accessory refer to the tables below.

**Spherical Rod Eye Dimensions**

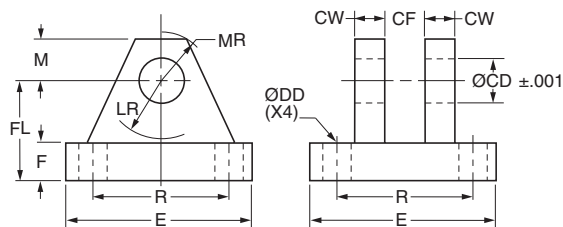
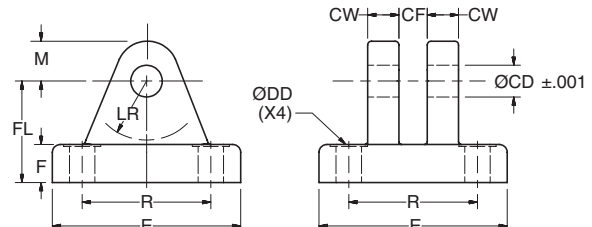
| Bore Ø      | Part Number | CD Ø         | A    | CE   | EX   | ER   | LE   | JK Thread | JL Ø | Load Capacity (lb) |
|-------------|-------------|--------------|------|------|------|------|------|-----------|------|--------------------|
| 1.50        | 0961000050  | .5000-.0005  | 0.72 | 0.86 | 0.44 | 0.80 | 0.78 | 7/16-20   | 0.88 | 2,644              |
| 2.00 & 2.50 | 0961000075  | .7500-.0005  | 1.02 | 1.25 | 0.66 | 1.14 | 1.06 | 3/4-16    | 1.31 | 9,441              |
| 3.25        | 0961000100  | 1.0000-.0005 | 1.52 | 1.88 | 0.88 | 1.34 | 1.45 | 1-14      | 1.50 | 16,860             |
| 4.00        | 0961000138  | 1.3750-.0005 | 2.02 | 2.13 | 1.19 | 1.67 | 1.91 | 1 1/4-12  | 2.00 | 28,562             |
| 5.00        | 0961000175  | 1.7500-.0005 | 2.14 | 2.50 | 1.53 | 2.05 | 2.16 | 1 1/2-12  | 2.00 | 43,005             |
| 6.00        | 0961000200  | 2.0000-.0005 | 2.89 | 2.75 | 1.75 | 2.60 | 2.50 | 1 7/8-12  | 2.75 | 70,193             |

Order to fit Piston Rod Thread Size.

**Pivot Pin Dimensions**

| Bore Ø      | Part Number | CD Ø         | CL   | Shear Capacity (lb) |
|-------------|-------------|--------------|------|---------------------|
| 1.50        | 0839620000  | .4997-.0004  | 1.56 | 8,600               |
| 2.00 & 2.50 | 0839630000  | .7497-.0005  | 2.03 | 19,300              |
| 3.25        | 0839640000  | .9997-.0005  | 2.50 | 34,300              |
| 4.00        | 0839650000  | 1.3746-.0006 | 3.31 | 65,000              |
| 5.00        | 0839660000  | 1.7496-.0006 | 4.22 | 105,200             |
| 6.00        | 0839670000  | 1.9996-.0007 | 4.94 | 137,400             |

Pivot Pins are furnished with (2) Retainer Rings.

**Clevis Bracket Dimensions****Fabricated Steel****Cast Ductile Iron**

Order to fit Cylinder Cap or Rod Eye.

| Bore Ø      | Pin Ø | Cast Ductile Iron Part Number | Fabricated Steel Part Number | CD Ø  | CF   | CW   | DD Ø | E     | F    | FL   | LR   | M    | MR   | R    | Load Capacity (lb) |
|-------------|-------|-------------------------------|------------------------------|-------|------|------|------|-------|------|------|------|------|------|------|--------------------|
| 1.50        | 0.500 | 0959450000                    | 0839470000                   | 0.503 | 0.45 | 0.50 | 0.41 | 3.00  | 0.50 | 1.50 | 0.94 | 0.50 | 0.63 | 2.05 | 5,770              |
| 2.00 & 2.50 | 0.750 | 0959300000                    | 0839480000                   | 0.753 | 0.67 | 0.63 | 0.53 | 3.75  | 0.63 | 2.00 | 1.38 | 0.88 | 1.00 | 2.76 | 9,450              |
| 3.25        | 1.000 | 0959310000                    | 0839490000                   | 1.003 | 0.89 | 0.75 | 0.53 | 5.50  | 0.75 | 2.50 | 1.69 | 1.00 | 1.19 | 4.10 | 14,300             |
| 4.00        | 1.375 | 0959320000                    | 0839500000                   | 1.378 | 1.20 | 1.00 | 0.66 | 6.50  | 0.88 | 3.50 | 2.44 | 1.38 | 1.63 | 4.95 | 20,322             |
| 5.00        | 1.750 | 0959330000                    | 0839510000                   | 1.753 | 1.55 | 1.25 | 0.91 | 8.50  | 1.25 | 4.50 | 2.88 | 1.75 | 2.06 | 6.58 | 37,800             |
| 6.00        | 2.000 | 0959340000                    | 0839520000                   | 2.003 | 1.77 | 1.50 | 0.91 | 10.63 | 1.50 | 5.00 | 3.00 | 2.00 | 2.38 | 7.92 | 50,375             |

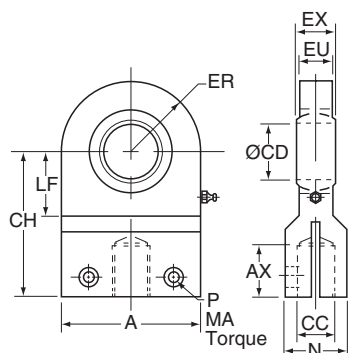


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Parker offers a complete range of Cylinder Accessories to assure you of the greatest versatility in present or future cylinder applications. Accessories

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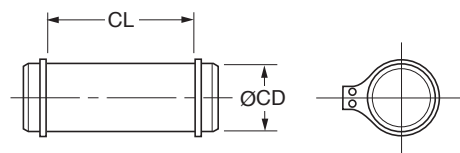
### Spherical Rod Eye Dimensions



| Bore Ø | Part Number | A    | AX (min.) | CH   | CD Ø                      | ER   | EU   | EX    | CC Thread | LF   | MA (lb-ft) | N    | P (SHCS) | Load Cap. (lb) |
|--------|-------------|------|-----------|------|---------------------------|------|------|-------|-----------|------|------------|------|----------|----------------|
| 1.50   | 0978200075  | 1.75 | 0.75      | 1.75 | 0.7500 <sup>-0.0004</sup> | 0.88 | 0.56 | 0.656 | 1/2-20    | 0.94 | 11         | 0.88 | 1/4-28   | 5,301          |
| 2.00   | 0978200100  | 2.50 | 1.13      | 2.50 | 1.0000 <sup>-0.0004</sup> | 1.25 | 0.75 | 0.875 | 7/8-14    | 1.19 | 40         | 1.25 | 3/8-24   | 9,425          |
| 2.50   | 0978200125  | 3.00 | 1.13      | 2.75 | 1.2500 <sup>-0.0005</sup> | 1.50 | 0.94 | 1.093 | 7/8-14    | 1.44 | 40         | 1.38 | 3/8-24   | 14,726         |
| 3.25   | 0978200150  | 4.00 | 1.63      | 3.75 | 1.5000 <sup>-0.0005</sup> | 2.00 | 1.13 | 1.312 | 1 1/4-12  | 1.75 | 100        | 2.00 | 1/2-20   | 24,887         |
| 4.00   | 0978200200  | 4.50 | 2.00      | 4.50 | 2.0000 <sup>-0.0005</sup> | 2.25 | 1.50 | 1.750 | 1 1/2-12  | 2.25 | 185        | 2.50 | 5/8-18   | 37,699         |
| 5.00   | 0978200250  | 6.00 | 2.25      | 5.25 | 2.5000 <sup>-0.0006</sup> | 3.00 | 1.88 | 2.187 | 1 3/4-12  | 2.81 | 325        | 2.75 | 3/4-16   | 58,905         |
| 6.00   | 0978200300  | 7.00 | 3.00      | 6.75 | 3.0000 <sup>-0.0006</sup> | 3.50 | 2.25 | 2.625 | 2 1/4-12  | 3.31 | 525        | 3.50 | 7/8-14   | 84,823         |
| 7.00   | 0978200350  | 8.00 | 3.50      | 8.00 | 3.5000 <sup>-0.0008</sup> | 4.00 | 2.63 | 3.062 | 2 3/4-12  | 3.94 | 800        | 4.50 | 1-14     | 115,454        |
| 8.00   | 0978200400  | 9.00 | 3.50      | 8.50 | 4.0000 <sup>-0.0008</sup> | 4.50 | 3.00 | 3.500 | 3 1/4-12  | 4.50 | 800        | 5.00 | 1-14     | 150,796        |

Order to fit Piston Rod Thread Size.

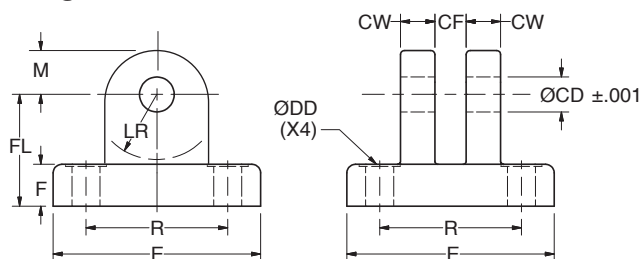
### Pivot Pin Dimensions



Pivot Pins are furnished with (2) Retainer Rings.

| Bore Ø | Pin Ø | Part Number | CD Ø                      | CL   | Shear Capacity (lb) |
|--------|-------|-------------|---------------------------|------|---------------------|
| 1.50   | 0.750 | 0977260075  | 0.7497 <sup>-0.0005</sup> | 1.78 | 19,300              |
| 2.00   | 1.000 | 0977260100  | 0.9997 <sup>-0.0005</sup> | 2.00 | 34,300              |
| 2.50   | 1.250 | 0977260125  | 1.2496 <sup>-0.0006</sup> | 2.50 | 53,600              |
| 3.25   | 1.500 | 0977260150  | 1.4996 <sup>-0.0006</sup> | 3.00 | 77,300              |
| 4.00   | 2.000 | 0977260200  | 1.9996 <sup>-0.0007</sup> | 3.94 | 137,400             |
| 5.00   | 2.500 | 0977260250  | 2.4996 <sup>-0.0007</sup> | 4.88 | 214,700             |
| 6.00   | 3.000 | 0977260300  | 2.9996 <sup>-0.0007</sup> | 5.31 | 309,100             |
| 7.00   | 3.500 | 0977260350  | 3.4995 <sup>-0.0009</sup> | 6.25 | 420,700             |
| 8.00   | 4.000 | 0977260400  | 3.9995 <sup>-0.0009</sup> | 6.69 | 549,400             |

### Forged Steel or Cast Ductile Iron Clevis Bracket Dimensions<sup>1</sup>



Order to fit Cylinder Cap or Rod Eye.

| Bore Ø | Pin Ø | Part Number | CD Ø ±0.001 | CF   | CW   | DD Ø | E     | F    | FL   | LR   | M    | R    | Load Capacity (lb) |
|--------|-------|-------------|-------------|------|------|------|-------|------|------|------|------|------|--------------------|
| 1.50   | 0.750 | 0977270075  | 0.753       | 0.67 | 0.50 | 0.41 | 2.75  | 0.38 | 1.63 | 1.06 | 0.63 | 2.00 | 5,301              |
| 2.00   | 1.000 | 0977270100  | 1.003       | 0.89 | 0.50 | 0.47 | 3.25  | 0.50 | 2.00 | 1.31 | 0.81 | 2.44 | 9,425              |
| 2.50   | 1.250 | 0977270125  | 1.253       | 1.11 | 0.63 | 0.53 | 4.00  | 0.75 | 2.50 | 1.56 | 1.00 | 3.00 | 14,726             |
| 3.25   | 1.500 | 0977270150  | 1.503       | 1.33 | 0.75 | 0.66 | 5.00  | 0.75 | 3.00 | 2.06 | 1.25 | 3.75 | 24,887             |
| 4.00   | 2.000 | 0977270200  | 2.003       | 1.77 | 1.00 | 0.66 | 5.50  | 1.00 | 3.50 | 2.31 | 1.63 | 4.31 | 37,699             |
| 5.00   | 2.500 | 0977270250  | 2.503       | 2.20 | 1.25 | 0.91 | 7.00  | 1.25 | 4.50 | 3.06 | 2.00 | 5.44 | 58,905             |
| 6.00   | 3.000 | 0977270300  | 3.003       | 2.64 | 1.25 | 1.06 | 8.25  | 1.50 | 5.25 | 3.56 | 2.50 | 6.38 | 84,823             |
| 7.00   | 3.500 | 0977270350  | 3.503       | 3.08 | 1.50 | 1.19 | 9.25  | 1.75 | 6.00 | 4.06 | 3.00 | 7.38 | 115,454            |
| 8.00   | 4.000 | 0977270400  | 4.003       | 3.52 | 1.50 | 1.31 | 10.50 | 2.00 | 6.75 | 4.56 | 3.50 | 8.50 | 150,796            |

<sup>1</sup> Clevis Brackets with pin diameters 0.750 thru 2.000 are forged steel. Clevis Brackets with 2.500 pin diameter and larger are cast ductile iron.

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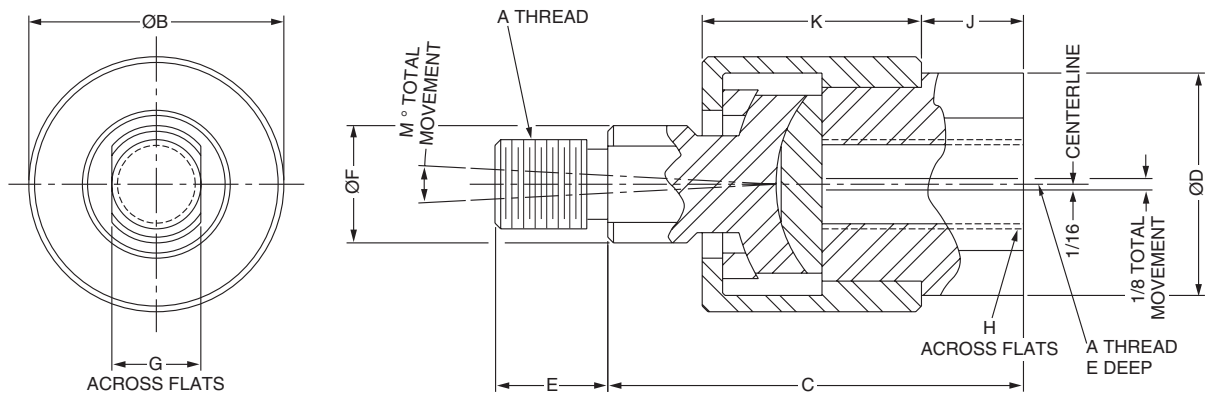
## Linear Alignment Couplers are available in 19 standard thread sizes...

### Cost Saving Features and Benefits Include

- Maximum reliability for trouble-free operation, long life and lower operating costs
- Increased cylinder life by reducing wear on Piston and Rod bearings
- Simplifying Cylinder installation and reducing assembly costs
- Increase Rod Bearing and Rod Seal life for lower maintenance costs



### Alignment Coupler



### Part Numbers and Dimensions

| Part Number | A        | B Ø   | C     | D Ø  | E    | F Ø  | G    | H    | J    | K    | M   | Max. Pull Load (lb) | Max. Approx. Weight (lb) |
|-------------|----------|-------|-------|------|------|------|------|------|------|------|-----|---------------------|--------------------------|
| 1347570031  | 5/16-24  | 1.13  | 1.75  | 0.94 | 0.50 | 0.50 | 0.38 | 0.75 | 0.38 | 0.94 | 6"  | 1,200               | .35                      |
| 1347570038  | 3/8-24   | 1.13  | 1.75  | 0.94 | 0.50 | 0.50 | 0.38 | 0.75 | 0.38 | 0.94 | 6"  | 2,425               | .35                      |
| 1347570044  | 7/16-20  | 1.38  | 2.00  | 1.13 | 0.75 | 0.63 | 0.50 | 0.88 | 0.38 | 1.09 | 6"  | 3,250               | .55                      |
| 1347570050  | 1/2-20   | 1.38  | 2.00  | 1.13 | 0.75 | 0.63 | 0.50 | 0.88 | 0.38 | 1.09 | 6"  | 4,450               | .55                      |
| 1347570063  | 5/8-18   | 1.38  | 2.00  | 1.13 | 0.75 | 0.63 | 0.50 | 0.88 | 0.38 | 1.09 | 6"  | 6,800               | .55                      |
| 1347570075  | 3/4-16   | 2.00  | 2.31  | 1.63 | 1.13 | 0.94 | 0.75 | 1.31 | 0.44 | 1.28 | 6"  | 9,050               | 1.4                      |
| 1347570088  | 7/8-14   | 2.00  | 2.31  | 1.63 | 1.13 | 0.94 | 0.75 | 1.31 | 0.44 | 1.28 | 6"  | 14,450              | 1.4                      |
| 1347570100  | 1-14     | 3.13  | 3.00  | 2.38 | 1.63 | 1.44 | 1.25 | 1.88 | 0.75 | 1.78 | 6"  | 19,425              | 4.8                      |
| 1347570125  | 1 1/4-12 | 3.13  | 3.00  | 2.38 | 1.63 | 1.44 | 1.25 | 1.88 | 0.75 | 1.78 | 6"  | 30,500              | 4.8                      |
| 1337390125  | 1 1/4-12 | 3.50  | 4.00  | 2.00 | 2.00 | 1.50 | 1.25 | 1.69 | 0.75 | 2.50 | 10" | 30,500              | 6.9                      |
| 1337390150  | 1 1/2-12 | 4.00  | 4.38  | 2.25 | 2.25 | 1.75 | 1.50 | 1.94 | 0.88 | 2.75 | 10" | 45,750              | 9.8                      |
| 1337390175  | 1 3/4-12 | 4.00  | 4.38  | 2.25 | 2.25 | 1.75 | 1.50 | 1.94 | 0.88 | 2.75 | 10" | 58,350              | 9.8                      |
| 1337390188  | 1 7/8-12 | 5.00  | 5.63  | 3.00 | 3.00 | 2.25 | 2.00 | 2.63 | 1.38 | 3.38 | 10" | 67,550              | 19.8                     |
| 1337390200  | 2-12     | 5.00  | 5.63  | 3.00 | 3.00 | 2.25 | 2.00 | 2.63 | 1.38 | 3.38 | 10" | 77,450              | 19.8                     |
| 1337390225  | 2 1/4-12 | 6.75  | 6.38  | 3.25 | 3.50 | 2.75 | 2.38 | 2.88 | 1.63 | 3.75 | 10" | 99,250              | 35.3                     |
| 1337390250  | 2 1/2-12 | 7.00  | 6.50  | 4.00 | 3.50 | 3.25 | 2.88 | 3.38 | 1.63 | 3.88 | 10" | 123,750             | 45.3                     |
| 1337390275  | 2 3/4-12 | 7.00  | 6.50  | 4.00 | 3.50 | 3.25 | 2.88 | 3.38 | 1.63 | 3.88 | 10" | 150,950             | 45.3                     |
| 1337390300  | 3-12     | 7.00  | 6.50  | 4.00 | 3.50 | 3.25 | 2.88 | 3.38 | 1.63 | 3.88 | 10" | 180,850             | 45.3                     |
| 1337390325  | 3 1/4-12 | 9.25  | 8.50  | 5.25 | 4.50 | 4.00 | 3.38 | 4.50 | 2.00 | 5.50 | 10" | 213,450             | —                        |
| 1337390425  | 4 1/4-12 | 12.88 | 11.25 | 7.75 | 4.50 | 5.50 | 4.88 | 7.00 | 1.50 | 8.75 | 10" | 370,850             | —                        |

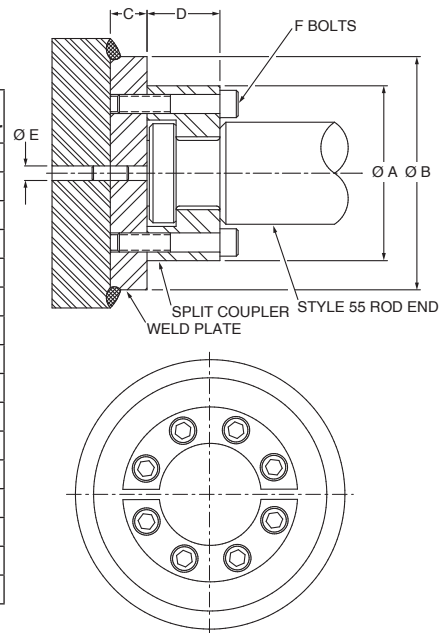
**How to Order Linear Alignment Couplers** — When ordering a cylinder with a threaded male rod end, specify the coupler of equal thread size by part number as listed in Table 1, i.e.; Piston Rod "KK" or "CC" dimension is 3/4" - 16", specify coupler part number 1347570075.

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## Split Couplers and Weld Plates for Parker "Style 55" Piston Rod End

| Rod<br>Ø | A<br>Ø | B<br>Ø | C    | D    | E<br>Ø | F  | Bolt Size         | Bolt<br>Circle | Split Coupler<br>Part Number | Weld Plate<br>Part Number |
|----------|--------|--------|------|------|--------|----|-------------------|----------------|------------------------------|---------------------------|
| 0.625    | 1.50   | 2.00   | 0.50 | 0.56 | 0.25   | 4  | #10-24 x .94 LG   | 1.125          | 1472340062                   | 1481740062                |
| 1.000    | 2.00   | 2.50   | 0.50 | 0.88 | 0.25   | 6  | .250-20 x 1.25 LG | 1.500          | 1472340100                   | 1481740100                |
| 1.375    | 2.50   | 3.00   | 0.63 | 1.00 | 0.25   | 6  | .312-18 x 1.50 LG | 2.000          | 1472340138                   | 1481740138                |
| 1.750    | 3.00   | 4.00   | 0.63 | 1.25 | 0.25   | 8  | .312-18 x 1.75 LG | 2.375          | 1472340175                   | 1481740175                |
| 2.000    | 3.50   | 4.00   | 0.75 | 1.63 | 0.38   | 12 | .375-16 x 2.25 LG | 2.687          | 1472340200                   | 1481740200                |
| 2.500    | 4.00   | 4.50   | 0.75 | 1.88 | 0.38   | 12 | .375-16 x 2.50 LG | 3.187          | 1472340250                   | 1481740250                |
| 3.000    | 5.00   | 5.50   | 1.00 | 2.38 | 0.38   | 12 | .500-13 x 3.25 LG | 4.000          | 1472340300                   | 1481740300                |
| 3.500    | 5.88   | 7.00   | 1.00 | 2.63 | 0.38   | 12 | .625-11 x 3.50 LG | 4.687          | 1472340350                   | 1481740350                |
| 4.000    | 6.38   | 7.00   | 1.00 | 2.63 | 0.38   | 12 | .625-11 x 3.50 LG | 5.187          | 1472340400                   | 1481740400                |
| 4.500    | 6.88   | 8.00   | 1.00 | 3.13 | 0.38   | 12 | .625-11 x 4.00 LG | 5.687          | 1472340450                   | 1481740450                |
| 5.000    | 7.38   | 8.00   | 1.00 | 3.13 | 0.38   | 12 | .625-11 x 4.00 LG | 6.187          | 1472340500                   | 1481740500                |
| 5.500    | 8.25   | 9.00   | 1.25 | 3.88 | 0.38   | 12 | .750-10 x 5.00 LG | 6.875          | 1472340550                   | 1481740550                |
| 7.000    | 10.38  | 11.00  | 1.75 | 4.00 | 0.50   | 12 | 1.00-8 x 5.50 LG  | 8.750          | 1472340700                   | 1481740700                |
| 8.000    | 11.38  | 12.00  | 2.00 | 4.00 | 0.50   | 16 | 1.00-8 x 5.50 LG  | 9.750          | 1472340800                   | 1481740800                |
| 9.000    | 13.12  | 14.00  | 2.25 | 4.00 | 0.50   | 12 | 1.25-7 x 6.00 LG  | 11.125         | 1472340900                   | 1481740900                |
| 10.000   | 14.12  | 15.00  | 2.50 | 4.50 | 0.50   | 16 | 1.25-7 x 6.50 LG  | 12.125         | 1472341000                   | 1481741000                |

Note: Bolts are not included with split coupler or weld plate.



**⚠ WARNING:** Piston rod separation from the machine member can result in severe personal injury or even death to nearby personnel. The cylinder user must make sure the weld holding the weld plate to the machine is of sufficient quality and size to hold the intended load. The cylinder user must also make sure the bolts holding split coupler to the weld plate are of sufficient strength to hold the intended load and installed in such a way that they will not become loose during the machine's operation.

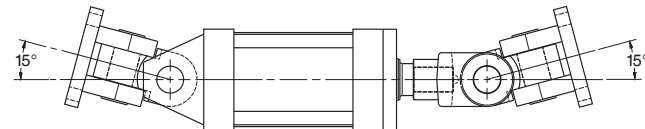
## Dual Axis Knuckles

Using a Dual Axis Knuckle permits increased angular movement from the cylinder center line. Clevis or Eye mounted cylinders often require movement beyond the plane that two pivot pins allow. Spherical bearing mounts permit angular movement up to 4.5° within

the pivoting plane. A Dual Axis Knuckle, with two pin holes 90° apart, installed at the cap and rod end of a mounting style BB cylinder adds two pivot points, thereby providing up to 30° movement in another plane at each end.

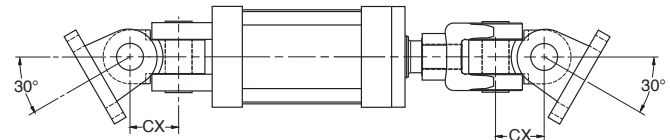
### Maximum Achievable Angular Movement from Cylinder Centerline<sup>1</sup>

**Inboard Pin - 15°** maximum movement for cylinder misalignment only.



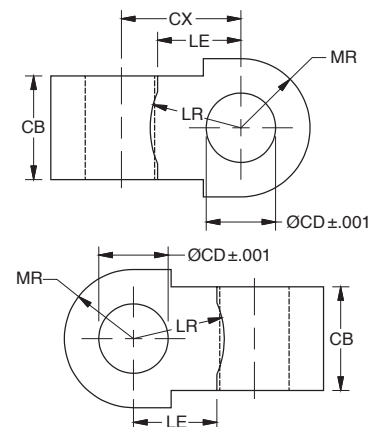
<sup>1</sup> Maximum movement is achieved with cast clevis brackets. Movement is reduced when using fabricated clevis brackets.

**Outboard Pin - 30°** maximum movement when applying force to a load moving in a curved plane.



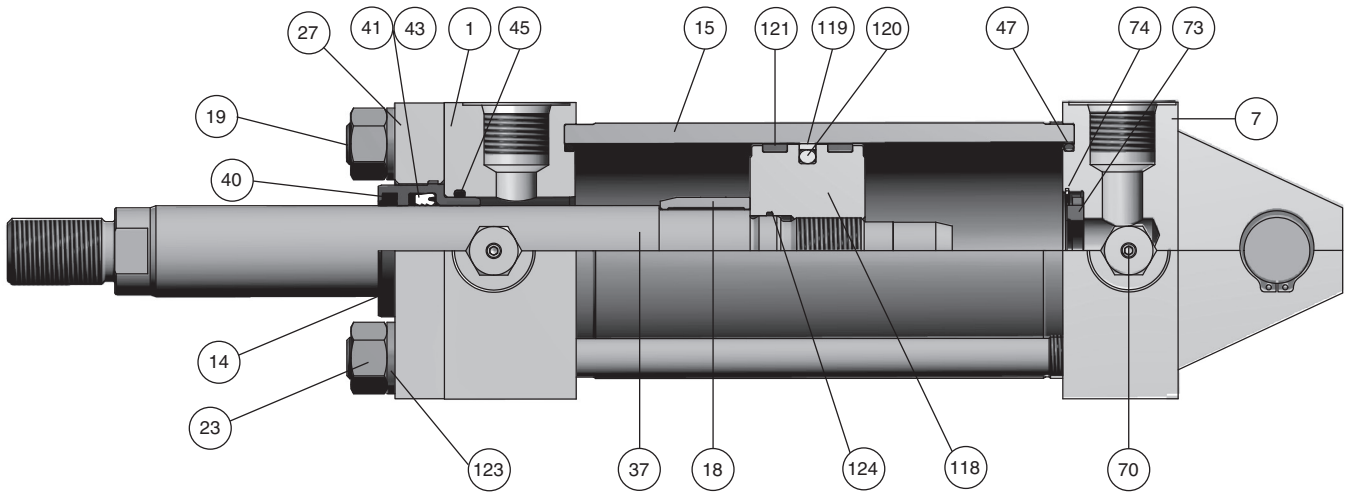
### Dual Axis Knuckle Dimensions and Usage

| Part<br>Number | Pin<br>Ø | Load<br>Cap.<br>(lb) | CB   | CD<br>Ø | CX   | LE   | LR   | MR   | Mating Parts      |                                          | BB Mount<br>Usage by<br>Series & Bore |
|----------------|----------|----------------------|------|---------|------|------|------|------|-------------------|------------------------------------------|---------------------------------------|
|                |          |                      |      |         |      |      |      |      | Clevis<br>Bracket | Rod Clevis                               |                                       |
| 0952670000     | 0.500    | 4,380                | 0.75 | 0.503   | 0.88 | 0.54 | 0.63 | 0.50 | 0960160050        | 0509400000,<br>0509410000                | 1.50                                  |
| 0952680000     | 0.750    | 12,370               | 1.25 | 0.753   | 1.19 | 0.80 | 0.94 | 0.75 | 0960160075        | 0509420000,<br>1332840000                | 2.00, 2.50                            |
| 0952690000     | 1.000    | 20,500               | 1.50 | 1.003   | 1.69 | 1.05 | 1.22 | 1.00 | 0960160100        | 0509430000,<br>0509440000,<br>1332850000 | 3.25                                  |
| 0952700000     | 1.375    | 30,500               | 2.00 | 1.378   | 2.38 | 1.44 | 1.69 | 1.38 | 0960160138        | 0509450000,<br>1332860000                | 4.00                                  |
| 0952710000     | 1.750    | 49,500               | 2.50 | 1.753   | 3.06 | 1.81 | 2.19 | 1.75 | 0960160175        | 0509460000                               | 5.00                                  |
| 0952720000     | 2.000    | 68,000               | 2.50 | 2.003   | 3.63 | 2.09 | 2.44 | 2.00 | 0960160200        | 0509470000,<br>0509480000                | 6.00                                  |

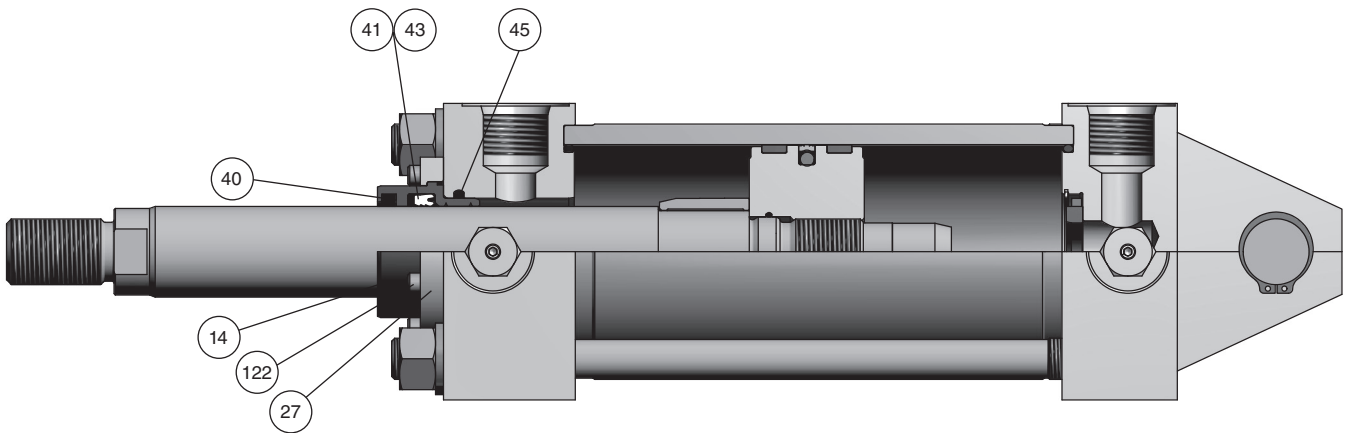


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**1.50" - 6.00" Bore Series 2H**



**1.50" - 6.00" Bore Series 2HD**



**Piston and Rod Assemblies**

Factory assembled piston and rod assemblies (that include seals for piston type specified) are recommended.

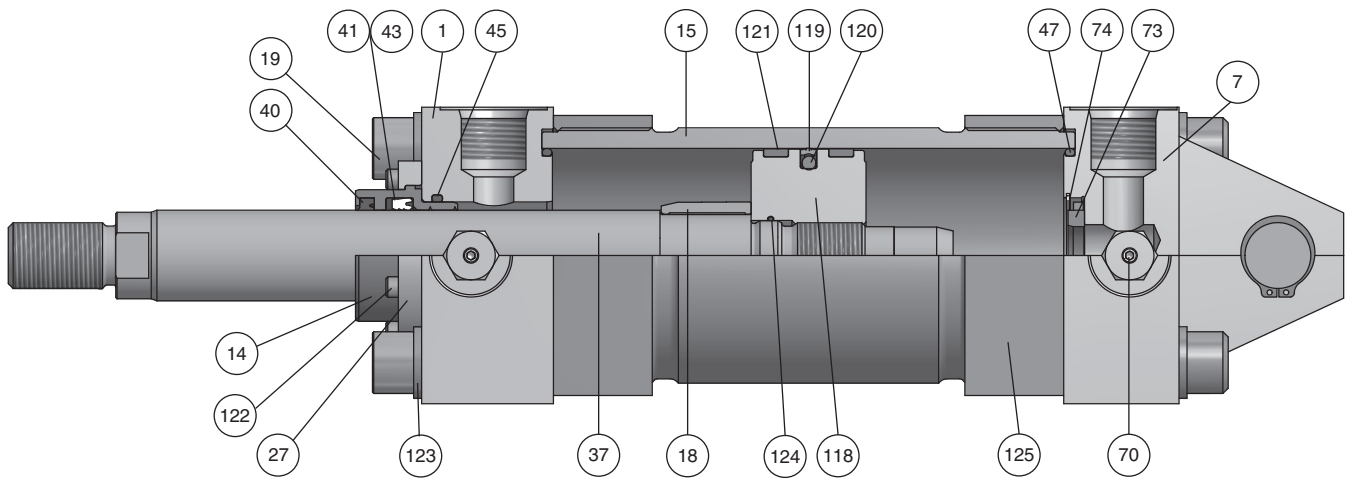
**Parts List — 1.50" through 6.00" Bore**

| Symbol | Description                      |
|--------|----------------------------------|
| 1      | Head                             |
| 7      | Cap                              |
| 14     | Rod Gland                        |
| 15     | Cylinder Body                    |
| 18     | Cushion Sleeve, head end cushion |
| 19     | Tie Rod                          |
| 23     | Tie Rod Nut                      |
| 27     | Retainer                         |
| 37     | Piston Rod, single rod type      |
| 40     | Rod Wiper                        |
| 41     | Rod Seal                         |
| 43     | Back-up Washer, rod seal         |

| Symbol | Description                                 |
|--------|---------------------------------------------|
| 45     | Gland O-Ring                                |
| 47     | O-Ring, cylinder tube to head and cap seal  |
| 70     | Needle Valve, cushion adjustment cartridge  |
| 73     | Bushing, float check, cushion on cap end    |
| 74     | Retaining Ring, float check cushion bushing |
| 118    | Piston                                      |
| 119    | Piston Seal                                 |
| 120    | Piston Seal Energizer                       |
| 121    | Wear Ring                                   |
| 122    | Retainer Bolt                               |
| 123    | Washer, tie rod nut                         |
| 124    | O-Ring, piston to rod seal                  |

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**1.50" - 6.00" Bore Series 2HB**



**Piston and Rod Assemblies**

Factory assembled piston and rod assemblies (that include seals for piston type specified) are recommended.

**Parts List — 1.50" through 6.00" Bore**

| Symbol | Description                      |
|--------|----------------------------------|
| 1      | Head                             |
| 7      | Cap                              |
| 14     | Rod Gland                        |
| 15     | Cylinder Body                    |
| 18     | Cushion Sleeve, head end cushion |
| 19     | Tie Bolt                         |
| 27     | Retainer                         |
| 37     | Piston Rod, single rod type      |
| 40     | Rod Wiper                        |
| 41     | Rod Seal                         |
| 43     | Back-up Washer, rod seal         |
| 45     | Gland O-Ring                     |

| Symbol | Description                                 |
|--------|---------------------------------------------|
| 47     | O-Ring, cylinder tube to head and cap seal  |
| 70     | Needle Valve, cushion adjustment cartridge  |
| 73     | Bushing, float check, cushion on cap end    |
| 74     | Retaining Ring, float check cushion bushing |
| 118    | Piston                                      |
| 119    | Piston Seal                                 |
| 120    | Piston Seal Energizer                       |
| 121    | Wear Ring                                   |
| 122    | Retainer Bolt                               |
| 123    | Washer, tie bolt                            |
| 124    | O-Ring, piston to rod seal                  |
| 125    | Body Flange                                 |

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## Series 2H Gland Cartridge Kits and Rod Seal Kits

| Rod<br>Ø | Seal Type                                   |                               |                                         |                               |                                         |                               |                                         |                               |                                                 |                               |
|----------|---------------------------------------------|-------------------------------|-----------------------------------------|-------------------------------|-----------------------------------------|-------------------------------|-----------------------------------------|-------------------------------|-------------------------------------------------|-------------------------------|
|          | Class 1 Service<br>(Polyurethane & Nitrile) |                               | Class 3 Service<br>(EPR)                |                               | Class 5 Service<br>(FKM)                |                               | Class 2 & 6 Service<br>(Nitroxile)      |                               | Class 8 Service<br>(Filled PTFE & Fluorocarbon) |                               |
|          | Contains 1 ea. Sym.<br>#14, 40, 41 & 45     |                               | Contains 1 ea. Sym.<br>#14, 40, 41 & 45 |                               | Contains 1 ea. Sym.<br>#14, 40, 41 & 45 |                               | Contains 1 ea. Sym.<br>#14, 40, 41 & 45 |                               | Contains 1 ea. Sym.<br>#14, 40, 41 & 45         |                               |
|          | Gland<br>Cartridge<br>Kits                  | Rod Seal<br>Kits <sup>1</sup> | Gland<br>Cartridge<br>Kits              | Rod Seal<br>Kits <sup>1</sup> | Gland<br>Cartridge<br>Kits              | Rod Seal<br>Kits <sup>1</sup> | Gland<br>Cartridge<br>Kits              | Rod Seal<br>Kits <sup>1</sup> | Gland<br>Cartridge<br>Kits                      | Rod Seal<br>Kits <sup>1</sup> |
| 0.625    | RG2HLG2061                                  | RK2HLG2061                    | RG2HLG2063                              | RK2HLG2063                    | RG2HLG2065                              | RK2HLG2065                    | RG2HLG2062                              | RK2HLG2062                    | N/A                                             | N/A                           |
| 1.000    | RG2HLG2101                                  | RK2HLG2101                    | RG2HLG2103                              | RK2HLG2103                    | RG2HLG2105                              | RK2HLG2105                    | RG2HLG2102                              | RK2HLG2102                    | RG2HLLF108                                      | RK2HLLF108                    |
| 1.375    | RG2HLG2131                                  | RK2HLG2131                    | RG2HLG2133                              | RK2HLG2133                    | RG2HLG2135                              | RK2HLG2135                    | RG2HLG2132                              | RK2HLG2132                    | RG2HLLF138                                      | RK2HLLF138                    |
| 1.750    | RG2HLG2171                                  | RK2HLG2171                    | RG2HLG2173                              | RK2HLG2173                    | RG2HLG2175                              | RK2HLG2175                    | RG2HLG2172                              | RK2HLG2172                    | RG2HLLF178                                      | RK2HLLF178                    |
| 2.000    | RG2HLG2201                                  | RK2HLG2201                    | RG2HLG2203                              | RK2HLG2203                    | RG2HLG2205                              | RK2HLG2205                    | RG2HLG2202                              | RK2HLG2202                    | RG2HLLF208                                      | RK2HLLF208                    |
| 2.500    | RG2HLG2251                                  | RK2HLG2251                    | RG2HLG2253                              | RK2HLG2253                    | RG2HLG2255                              | RK2HLG2255                    | RG2HLG2252                              | RK2HLG2252                    | RG2HLLF258                                      | RK2HLLF258                    |
| 3.000    | RG2HLG2301                                  | RK2HLG2301                    | RG2HLG2303                              | RK2HLG2303                    | RG2HLG2305                              | RK2HLG2305                    | RG2HLG2302                              | RK2HLG2302                    | RG2HLLF308                                      | RK2HLLF308                    |
| 3.500    | RG2HLG2351                                  | RK2HLG2351                    | RG2HLG2353                              | RK2HLG2353                    | RG2HLG2355                              | RK2HLG2355                    | RG2HLG2352                              | RK2HLG2352                    | RG2HLLF358                                      | RK2HLLF358                    |
| 4.000    | RG2HLG2401                                  | RK2HLG2401                    | RG2HLG2403                              | RK2HLG2403                    | RG2HLG2405                              | RK2HLG2405                    | RG2HLG2402                              | RK2HLG2402                    | RG2HLLF408                                      | RK2HLLF408                    |
| 4.500    | RG2HLG2451                                  | RK2HLG2451                    | RG2HLG2453                              | RK2HLG2453                    | RG2HLG2455                              | RK2HLG2455                    | RG2HLG2452                              | RK2HLG2452                    | RG2HLLF458                                      | RK2HLLF458                    |
| 5.000    | RG2HLG2501                                  | RK2HLG2501                    | RG2HLG2503                              | RK2HLG2503                    | RG2HLG2505                              | RK2HLG2505                    | RG2HLG2502                              | RK2HLG2502                    | RG2HLLF508                                      | RK2HLLF508                    |
| 5.500    | RG2HLG2551                                  | RK2HLG2551                    | RG2HLG2553                              | RK2HLG2553                    | RG2HLG2555                              | RK2HLG2555                    | RG2HLG2552                              | RK2HLG2552                    | RG2HLLF558                                      | RK2HLLF558                    |

## Series 2HD &amp; 2HB Gland Cartridge Kits and Rod Seal Kits

<sup>1</sup> Rod Seal Kits do not include Sym. #14

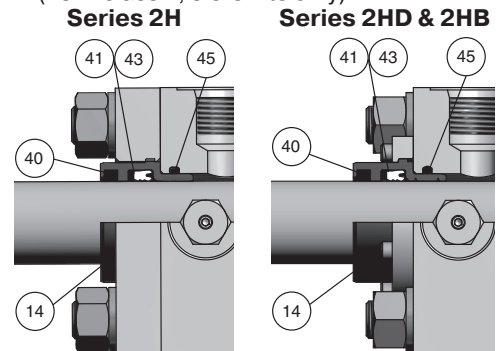
| Rod<br>Ø | Seal Type                                   |                               |                                         |                               |                                         |                               |                                         |                               |                                                 |                               |
|----------|---------------------------------------------|-------------------------------|-----------------------------------------|-------------------------------|-----------------------------------------|-------------------------------|-----------------------------------------|-------------------------------|-------------------------------------------------|-------------------------------|
|          | Class 1 Service<br>(Polyurethane & Nitrile) |                               | Class 3 Service<br>(EPR)                |                               | Class 5 Service<br>(FKM)                |                               | Class 2 & 6 Service<br>(Nitroxile)      |                               | Class 8 Service<br>(Filled PTFE & Fluorocarbon) |                               |
|          | Contains 1 ea. Sym.<br>#14, 40, 41 & 45     |                               | Contains 1 ea. Sym.<br>#14, 40, 41 & 45 |                               | Contains 1 ea. Sym.<br>#14, 40, 41 & 45 |                               | Contains 1 ea. Sym.<br>#14, 40, 41 & 45 |                               | Contains 1 ea. Sym.<br>#14, 40, 41 & 45         |                               |
|          | Gland<br>Cartridge<br>Kits                  | Rod Seal<br>Kits <sup>1</sup> | Gland<br>Cartridge<br>Kits              | Rod Seal<br>Kits <sup>1</sup> | Gland<br>Cartridge<br>Kits              | Rod Seal<br>Kits <sup>1</sup> | Gland<br>Cartridge<br>Kits              | Rod Seal<br>Kits <sup>1</sup> | Gland<br>Cartridge<br>Kits                      | Rod Seal<br>Kits <sup>1</sup> |
| 0.625    | RG2HDG2061                                  | RK2HDG2061                    | RG2HDG2063                              | RK2HDG2063                    | RG2HDG2065                              | RK2HDG2065                    | RG2HDG2062                              | RK2HDG2062                    | N/A                                             | N/A                           |
| 1.000    | RG2HDG2101                                  | RK2HDG2101                    | RG2HDG2103                              | RK2HDG2103                    | RG2HDG2105                              | RK2HDG2105                    | RG2HDG2102                              | RK2HDG2102                    | RG2HDG2108                                      | RK2HLLF108                    |
| 1.375    | RG2HDG2131                                  | RK2HDG2131                    | RG2HDG2133                              | RK2HDG2133                    | RG2HDG2135                              | RK2HDG2135                    | RG2HDG2132                              | RK2HDG2132                    | RG2HDG2138                                      | RK2HLLF138                    |
| 1.750    | RG2HDG2171                                  | RK2HDG2171                    | RG2HDG2173                              | RK2HDG2173                    | RG2HDG2175                              | RK2HDG2175                    | RG2HDG2172                              | RK2HDG2172                    | RG2HDG2178                                      | RK2HLLF178                    |
| 2.000    | RG2HDG2201                                  | RK2HDG2201                    | RG2HDG2203                              | RK2HDG2203                    | RG2HDG2205                              | RK2HDG2205                    | RG2HDG2202                              | RK2HDG2202                    | RG2HDG2208                                      | RK2HLLF208                    |
| 2.500    | RG2HDG2251                                  | RK2HDG2251                    | RG2HDG2253                              | RK2HDG2253                    | RG2HDG2255                              | RK2HDG2255                    | RG2HDG2252                              | RK2HDG2252                    | RG2HDG2258                                      | RK2HLLF258                    |
| 3.000    | RG2HDG2301                                  | RK2HDG2301                    | RG2HDG2303                              | RK2HDG2303                    | RG2HDG2305                              | RK2HDG2305                    | RG2HDG2302                              | RK2HDG2302                    | RG2HDG2308                                      | RK2HLLF308                    |
| 3.500    | RG2HDG2351                                  | RK2HDG2351                    | RG2HDG2353                              | RK2HDG2353                    | RG2HDG2355                              | RK2HDG2355                    | RG2HDG2352                              | RK2HDG2352                    | RG2HDG2358                                      | RK2HLLF358                    |
| 4.000    | RG2HDG2401                                  | RK2HDG2401                    | RG2HDG2403                              | RK2HDG2403                    | RG2HDG2405                              | RK2HDG2405                    | RG2HDG2402                              | RK2HDG2402                    | RG2HDG2408                                      | RK2HLLF408                    |
| 4.500    | RG2HDG2451                                  | RK2HDG2451                    | RG2HDG2453                              | RK2HDG2453                    | RG2HDG2455                              | RK2HDG2455                    | RG2HDG2452                              | RK2HDG2452                    | RG2HDG2458                                      | RK2HLLF458                    |
| 5.000    | RG2HDG2501                                  | RK2HDG2501                    | RG2HDG2503                              | RK2HDG2503                    | RG2HDG2505                              | RK2HDG2505                    | RG2HDG2502                              | RK2HDG2502                    | RG2HDG2508                                      | RK2HLLF508                    |
| 5.500    | RG2HDG2551                                  | RK2HDG2551                    | RG2HDG2553                              | RK2HDG2553                    | RG2HDG2555                              | RK2HDG2555                    | RG2HDG2552                              | RK2HDG2552                    | RG2HDG2558                                      | RK2HLLF558                    |

Series 2HD & 2HB / 3HD & 3HB Crown Wiper  
Gland Cartridge Kits and Rod Seal Kits

| Rod<br>Ø | Seal Type                                   |                                              |                                         |                                              | Retainer<br>Bolt Torque<br>(Torque<br>values are<br>for bolts<br>installed<br>with<br>lubrication) |
|----------|---------------------------------------------|----------------------------------------------|-----------------------------------------|----------------------------------------------|----------------------------------------------------------------------------------------------------|
|          | Class 1 Service<br>(Polyurethane & Nitrile) |                                              | Class 5 Service<br>(FKM)                |                                              |                                                                                                    |
|          | Contains 1 ea. Sym. #14, 40,<br>41 & 45     |                                              | Contains 1 ea. Sym. #14, 40,<br>41 & 45 |                                              |                                                                                                    |
|          | Crown Wiper<br>Gland<br>Cartridge Kits      | Crown Wiper<br>Rod Seal<br>Kits <sup>2</sup> | Crown Wiper<br>Gland<br>Cartridge Kits  | Crown Wiper<br>Rod Seal<br>Kits <sup>2</sup> |                                                                                                    |
| 0.625    | RG2HDGC061                                  | RK2HDGC061                                   | RG2HDGC065                              | RK2HDGC065                                   | 40 - 42 lb-in                                                                                      |
| 1.000    | RG2HDGC101                                  | RK2HDGC101                                   | RG2HDGC105                              | RK2HDGC105                                   | 40 - 42 lb-in                                                                                      |
| 1.375    | RG2HDGC131                                  | RK2HDGC131                                   | RG2HDGC135                              | RK2HDGC135                                   | 56 - 58 lb-in                                                                                      |
| 1.750    | RG2HDGC171                                  | RK2HDGC171                                   | RG2HDGC175                              | RK2HDGC175                                   | 56 - 58 lb-in                                                                                      |
| 2.000    | RG2HDGC201                                  | RK2HDGC201                                   | RG2HDGC205                              | RK2HDGC205                                   | 11 - 12 ft-lb                                                                                      |
| 2.500    | RG2HDGC251                                  | RK2HDGC251                                   | RG2HDGC255                              | RK2HDGC255                                   | 11 - 12 ft-lb                                                                                      |
| 3.000    | RG2HDGC301                                  | RK2HDGC301                                   | RG2HDGC305                              | RK2HDGC305                                   | 23 - 25 ft-lb                                                                                      |
| 3.500    | RG2HDGC351                                  | RK2HDGC351                                   | RG2HDGC355                              | RK2HDGC355                                   | 23 - 25 ft-lb                                                                                      |
| 4.000    | RG2HDGC401                                  | RK2HDGC401                                   | RG2HDGC405                              | RK2HDGC405                                   | 41 - 43 ft-lb                                                                                      |
| 4.500    | RG2HDGC451                                  | RK2HDGC451                                   | RG2HDGC455                              | RK2HDGC455                                   | 41 - 43 ft-lb                                                                                      |
| 5.000    | RG2HDGC501                                  | RK2HDGC501                                   | RG2HDGC505                              | RK2HDGC505                                   | 41 - 43 ft-lb                                                                                      |
| 5.500    | RG2HDGC551                                  | RK2HDGC551                                   | RG2HDGC555                              | RK2HDGC555                                   | 41 - 43 ft-lb                                                                                      |

2H, 2HD & 2B Rod Gland Cartridge  
Kit and Rod Seal Kit Parts  
Identification

- Gland Cartridge Kits contain items 14, 40, 41 and 45 (43 in class 2, 5 & 6 kits only)
- Rod Seal Kits contain items 40, 41 and 45 (43 in class 2, 5 & 6 kits only)

<sup>2</sup> Rod Seal Kits do not include Sym. #14

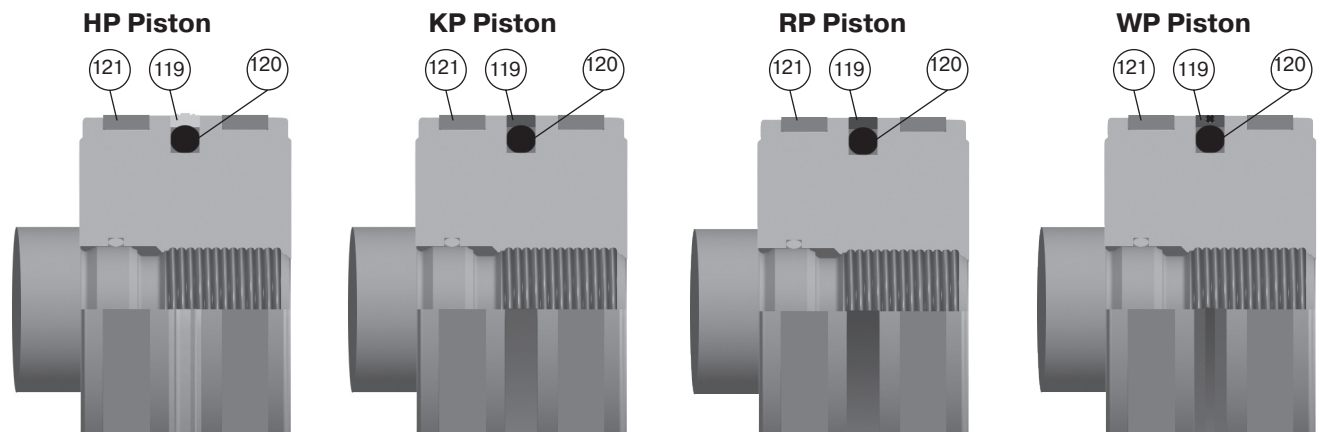
**Piston Seal Kits – Series 2H / 2HD / 2HB – Includes cylinder body end seals**

| Piston Seal Code                                           | Piston Magnet Code | Seal Class | Bore Diameter                                                                                                               |               |               |                 |                 |                 |                 |
|------------------------------------------------------------|--------------------|------------|-----------------------------------------------------------------------------------------------------------------------------|---------------|---------------|-----------------|-----------------|-----------------|-----------------|
|                                                            |                    |            | Kits include two each of items 47 & 121 (one of item 121 for magnetic piston) and one each of items 119 <sup>1</sup> & 120. |               |               |                 |                 |                 |                 |
|                                                            |                    |            | 1.50                                                                                                                        | 2.00          | 2.50          | 3.25            | 4.00            | 5.00            | 6.00            |
| H                                                          | N                  | 1          | PK152HH001                                                                                                                  | PK202HH001    | PK252HH001    | PK322HH001      | PK402HH001      | PK502HH001      | PK602HH001      |
| H                                                          | 3, 7               | 1          | PK152HHM01                                                                                                                  | PK202HHM01    | PK252HHM01    | PK322HHM01      | PK402HHM01      | PK502HHM01      | PK602HHM01      |
| H                                                          | N                  | 4          | PK152HH004                                                                                                                  | PK202HH004    | PK252HH004    | PK322HH004      | PK402HH004      | PK502HH004      | PK602HH004      |
| H                                                          | 3, 7               | 4          | PK152HHM04                                                                                                                  | PK202HHM04    | PK252HHM04    | PK322HHM04      | PK402HHM04      | PK502HHM04      | PK602HHM04      |
| K                                                          | N                  | 1          | PK152HF001                                                                                                                  | PK202HF001    | PK252HF001    | PK322HF001      | PK402HF001      | PK502HF001      | PK602HF001      |
| K                                                          | N                  | 2, 6       | PK152HF002                                                                                                                  | PK202HF002    | PK252HF002    | PK322HF002      | PK402HF002      | PK502HF002      | PK602HF002      |
| K                                                          | 3, 7               | 1          | PK152HFM01                                                                                                                  | PK202HFM01    | PK252HFM01    | PK322HFM01      | PK402HFM01      | PK502HFM01      | PK602HFM01      |
| K                                                          | 3, 7               | 2, 6       | PK152HFM02                                                                                                                  | PK202HFM02    | PK252HFM02    | PK322HFM02      | PK402HFM02      | PK502HFM02      | PK602HFM02      |
| K                                                          | N                  | 3          | PK152HF003                                                                                                                  | PK202HF003    | PK252HF003    | PK322HF003      | PK402HF003      | PK502HF003      | PK602HF003      |
| K                                                          | 3, 7               | 3          | PK152HFM03                                                                                                                  | PK202HFM03    | PK252HFM03    | PK322HFM03      | PK402HFM03      | PK502HFM03      | PK602HFM03      |
| K                                                          | N                  | 4          | PK152HF004                                                                                                                  | PK202HF004    | PK252HF004    | PK322HF004      | PK402HF004      | PK502HF004      | PK602HF004      |
| K                                                          | 3, 7               | 4          | PK152HFM04                                                                                                                  | PK202HFM04    | PK252HFM04    | PK322HFM04      | PK402HFM04      | PK502HFM04      | PK602HFM04      |
| K                                                          | N                  | 5          | PK152HF005                                                                                                                  | PK202HF005    | PK252HF005    | PK322HF005      | PK402HF005      | PK502HF005      | PK602HF005      |
| K                                                          | N                  | 8          | PK152HF008                                                                                                                  | PK202HF008    | PK252HF008    | PK322HF008      | PK402HF008      | PK502HF008      | PK602HF008      |
| K                                                          | 3, 7               | 5          | PK152HFM05                                                                                                                  | PK202HFM05    | PK252HFM05    | PK322HFM05      | PK402HFM05      | PK502HFM05      | PK602HFM05      |
| R                                                          | N                  | 1          | PK152HR001                                                                                                                  | PK202HR001    | PK252HR001    | PK322HR001      | PK402HR001      | PK502HR001      | PK602HR001      |
| R                                                          | N                  | 2, 6       | PK152HR002                                                                                                                  | PK202HR002    | PK252HR002    | PK322HR002      | PK402HR002      | PK502HR002      | PK602HR002      |
| R                                                          | 3, 7               | 1          | PK152HRM01                                                                                                                  | PK202HRM01    | PK252HRM01    | PK322HRM01      | PK402HRM01      | PK502HRM01      | PK602HRM01      |
| R                                                          | 3, 7               | 2, 6       | PK152HRM02                                                                                                                  | PK202HRM02    | PK252HRM02    | PK322HRM02      | PK402HRM02      | PK502HRM02      | PK602HRM02      |
| R                                                          | N                  | 3          | PK152HR003                                                                                                                  | PK202HR003    | PK252HR003    | PK322HR003      | PK402HR003      | PK502HR003      | PK602HR003      |
| R                                                          | 3, 7               | 3          | PK152HRM03                                                                                                                  | PK202HRM03    | PK252HRM03    | PK322HRM03      | PK402HRM03      | PK502HRM03      | PK602HRM03      |
| R                                                          | N                  | 4          | PK152HR004                                                                                                                  | PK202HR004    | PK252HR004    | PK322HR004      | PK402HR004      | PK502HR004      | PK602HR004      |
| R                                                          | 3, 7               | 4          | PK152HRM04                                                                                                                  | PK202HRM04    | PK252HRM04    | PK322HRM04      | PK402HRM04      | PK502HRM04      | PK602HRM04      |
| R                                                          | N                  | 5          | PK152HR005                                                                                                                  | PK202HR005    | PK252HR005    | PK322HR005      | PK402HR005      | PK502HR005      | PK602HR005      |
| R                                                          | 3, 7               | 5          | PK152HRM05                                                                                                                  | PK202HRM05    | PK252HRM05    | PK322HRM05      | PK402HRM05      | PK502HRM05      | PK602HRM05      |
| W                                                          | N                  | 1          | PK152HW001                                                                                                                  | PK202HW001    | PK252HW001    | PK322HW001      | PK402HW001      | PK502HW001      | PK602HW001      |
| W                                                          | N                  | 2, 6       | PK152HW002                                                                                                                  | PK202HW002    | PK252HW002    | PK322HW002      | PK402HW002      | PK502HW002      | PK602HW002      |
| W                                                          | 3, 7               | 1          | PK152HWM01                                                                                                                  | PK202HWM01    | PK252HWM01    | PK322HWM01      | PK402HWM01      | PK502HWM01      | PK602HWM01      |
| W                                                          | 3, 7               | 2, 6       | PK152HWM02                                                                                                                  | PK202HWM02    | PK252HWM02    | PK322HWM02      | PK402HWM02      | PK502HWM02      | PK602HWM02      |
| W                                                          | N                  | 3          | PK152HW003                                                                                                                  | PK202HW003    | PK252HW003    | PK322HW003      | PK402HW003      | PK502HW003      | PK602HW003      |
| W                                                          | 3, 7               | 3          | PK152HWM03                                                                                                                  | PK202HWM03    | PK252HWM03    | PK322HWM03      | PK402HWM03      | PK502HWM03      | PK602HWM03      |
| W                                                          | N                  | 5          | PK152HW005                                                                                                                  | PK202HW005    | PK252HW005    | PK322HW005      | PK402HW005      | PK502HW005      | PK602HW005      |
| W                                                          | 3, 7               | 5          | PK152HWM05                                                                                                                  | PK202HWM05    | PK252HWM05    | PK322HWM05      | PK402HWM05      | PK502HWM05      | PK602HWM05      |
| <b>2H / 2HD Tie Rod Torque<br/>and 2HB Tie Bolt Torque</b> |                    |            | <b>1.50</b>                                                                                                                 | <b>2.00</b>   | <b>2.50</b>   | <b>3.25</b>     | <b>4.00</b>     | <b>5.00</b>     | <b>6.00</b>     |
|                                                            |                    |            | 18 - 19 lb-ft                                                                                                               | 45 - 49 lb-ft | 45 - 49 lb-ft | 120 - 124 lb-ft | 131 - 135 lb-ft | 312 - 316 lb-ft | 528 - 544 lb-ft |

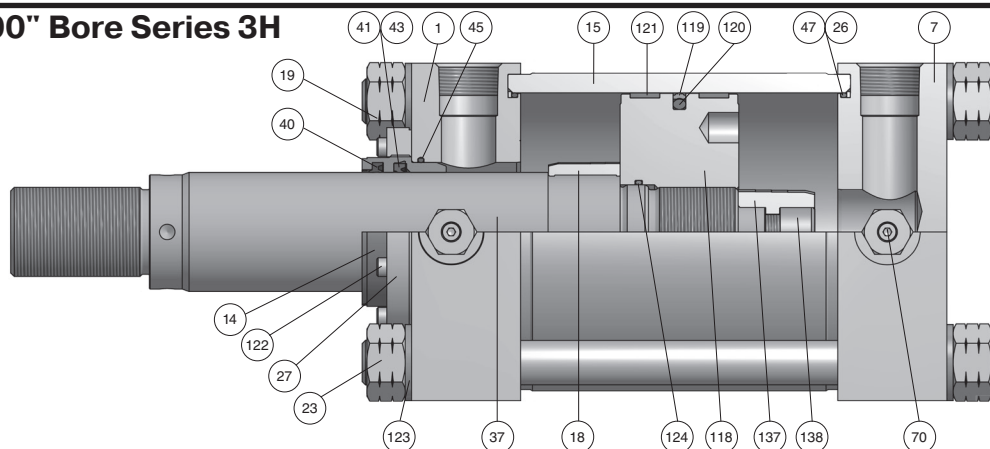
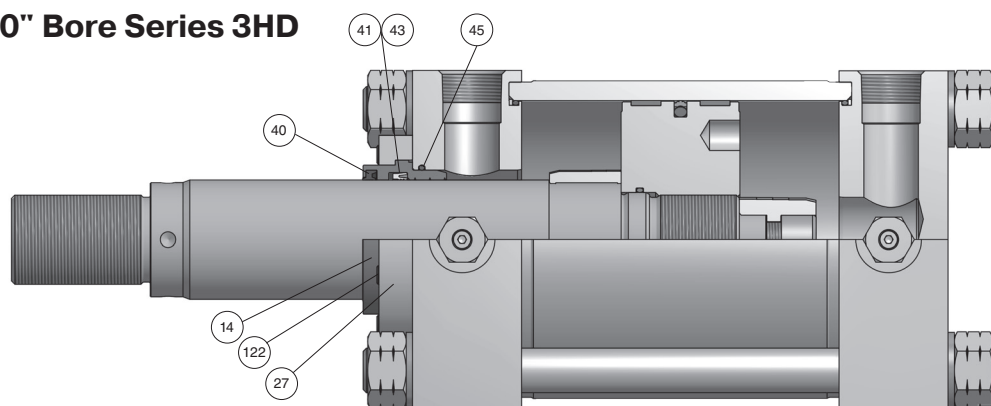
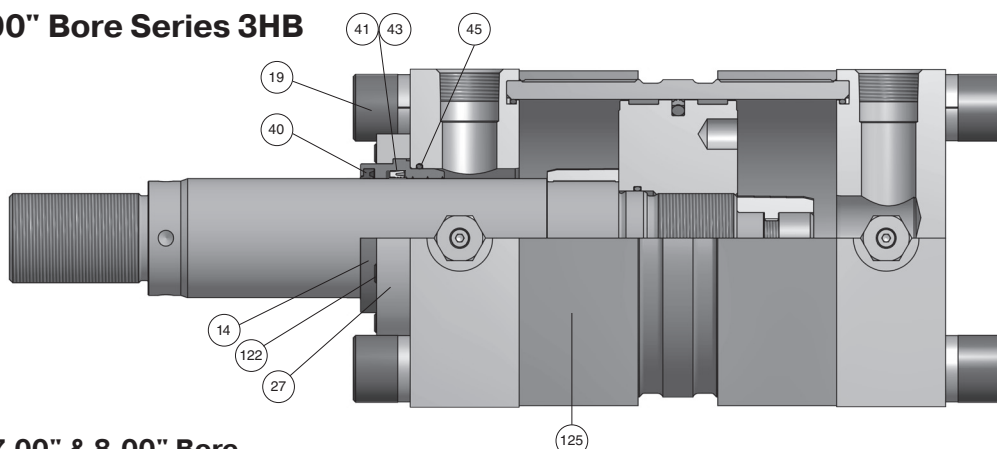
Note: The tie rod torque values are for cylinders rated at 3,000 psi. Consult the factory for torque values for cylinders rated above 3,000 psi.

<sup>1</sup> Item 119 for piston style WP (model number code W) includes both the PTFE primary seal and the redundant quad ring seal.

<sup>2</sup> The 1.50" bore WP seal groove is unique and not universal to the other seal styles. Changing an existing 1.50" bore cylinder either from or to a WP piston seal requires that a new piston and rod assembly be ordered.



Note: Item 47, cylinder body end seal, is not shown.

**7.00" & 8.00" Bore Series 3H****7.00" & 8.00" Bore Series 3HD****7.00" & 8.00" Bore Series 3HB****Parts List – 7.00" & 8.00" Bore**

| Symbol | Description                      |
|--------|----------------------------------|
| 1      | Head                             |
| 7      | Cap                              |
| 14     | Rod Gland                        |
| 15     | Cylinder Body                    |
| 18     | Cushion Sleeve, head end cushion |
| 19     | Tie Rod or Tie Bolt              |
| 23     | Tie Rod Nut                      |
| 26     | Back-up Washer, tube end seal    |
| 27     | Retainer                         |
| 37     | Piston Rod, single rod type      |
| 40     | Rod Wiper                        |
| 41     | Rod Seal                         |
| 43     | Back-up Washer, rod seal         |

| Symbol | Description                                |
|--------|--------------------------------------------|
| 45     | Gland O-Ring                               |
| 47     | O-Ring, cylinder tube to head and cap seal |
| 70     | Needle Valve, cushion adjustment cartridge |
| 118    | Piston                                     |
| 119    | Piston Seal                                |
| 120    | Piston Seal Energizer                      |
| 121    | Wear Ring                                  |
| 122    | Retainer Bolt                              |
| 123    | Washer, tie rod or tie bolt                |
| 124    | O-Ring, piston to rod seal                 |
| 125    | Body Flange                                |
| 137    | Cushion Spear, detachable                  |
| 138    | Bolt, cushion spear                        |

**⚠ PROP 65 WARNING** **WARNING:** This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

### Series 3H – 7.00" & 8.00" Bore Gland Cartridge Kits and Rod Seal Kits

| Rod<br>Ø | Seal Type                                   |                               |                                         |                               |                                         |                               |                                         |                               |                                                 |                               |
|----------|---------------------------------------------|-------------------------------|-----------------------------------------|-------------------------------|-----------------------------------------|-------------------------------|-----------------------------------------|-------------------------------|-------------------------------------------------|-------------------------------|
|          | Class 1 Service<br>(Polyurethane & Nitrile) |                               | Class 3 Service<br>(EPR)                |                               | Class 5 Service<br>(FKM)                |                               | Class 2 & 6 Service<br>(Nitroxile)      |                               | Class 8 Service<br>(Filled PTFE & Fluorocarbon) |                               |
|          | Contains 1 ea. Sym.<br>#14, 40, 41 & 45     |                               | Contains 1 ea. Sym.<br>#14, 40, 41 & 45 |                               | Contains 1 ea. Sym.<br>#14, 40, 41 & 45 |                               | Contains 1 ea. Sym.<br>#14, 40, 41 & 45 |                               | Contains 1 ea. Sym.<br>#14, 40, 41 & 45         |                               |
|          | Gland<br>Cartridge<br>Kits                  | Rod Seal<br>Kits <sup>1</sup> | Gland<br>Cartridge<br>Kits              | Rod Seal<br>Kits <sup>1</sup> | Gland<br>Cartridge<br>Kits              | Rod Seal<br>Kits <sup>1</sup> | Gland<br>Cartridge<br>Kits              | Rod Seal<br>Kits <sup>1</sup> | Gland<br>Cartridge<br>Kits                      | Rod Seal<br>Kits <sup>1</sup> |
| 3.000    | RG2HLG2301                                  | RK2HLG2301                    | RG2HLG2303                              | RK2HLG2303                    | RG2HLG2305                              | RK2HLG2305                    | RG2HLG2302                              | RK2HLG2302                    | RG2HLLF308                                      | RK2HLLF308                    |
| 3.500    | RG2HLG2351                                  | RK2HLG2351                    | RG2HLG2353                              | RK2HLG2353                    | RG2HLG2355                              | RK2HLG2355                    | RG2HLG2352                              | RK2HLG2352                    | RG2HLLF358                                      | RK2HLLF358                    |
| 4.000    | RG2HLG2401                                  | RK2HLG2401                    | RG2HLG2403                              | RK2HLG2403                    | RG2HLG2405                              | RK2HLG2405                    | RG2HLG2402                              | RK2HLG2402                    | RG2HLLF408                                      | RK2HLLF408                    |
| 4.500    | RG2HLG2451                                  | RK2HLG2451                    | RG2HLG2453                              | RK2HLG2453                    | RG2HLG2455                              | RK2HLG2455                    | RG2HLG2452                              | RK2HLG2452                    | RG2HLLF458                                      | RK2HLLF458                    |
| 5.000    | RG2HLG2501                                  | RK2HLG2501                    | RG2HLG2503                              | RK2HLG2503                    | RG2HLG2505                              | RK2HLG2505                    | RG2HLG2502                              | RK2HLG2502                    | RG2HLLF508                                      | RK2HLLF508                    |
| 5.500    | RG2HLG2551                                  | RK2HLG2551                    | RG2HLG2553                              | RK2HLG2553                    | RG2HLG2555                              | RK2HLG2555                    | RG2HLG2552                              | RK2HLG2552                    | RG2HLLF558                                      | RK2HLLF558                    |

<sup>1</sup> Rod Seal Kits do not include Sym. #14

### Series 3HD & 3HB – 7.00" & 8.00" Bore Gland Cartridge Kits and Rod Seal Kits

| Rod<br>Ø | Seal Type                                   |                               |                                         |                               |                                         |                               |                                         |                               |                                                 |                               |
|----------|---------------------------------------------|-------------------------------|-----------------------------------------|-------------------------------|-----------------------------------------|-------------------------------|-----------------------------------------|-------------------------------|-------------------------------------------------|-------------------------------|
|          | Class 1 Service<br>(Polyurethane & Nitrile) |                               | Class 3 Service<br>(EPR)                |                               | Class 5 Service<br>(FKM)                |                               | Class 2 & 6 Service<br>(Nitroxile)      |                               | Class 8 Service<br>(Filled PTFE & Fluorocarbon) |                               |
|          | Contains 1 ea. Sym.<br>#14, 40, 41 & 45     |                               | Contains 1 ea. Sym.<br>#14, 40, 41 & 45 |                               | Contains 1 ea. Sym.<br>#14, 40, 41 & 45 |                               | Contains 1 ea. Sym.<br>#14, 40, 41 & 45 |                               | Contains 1 ea. Sym.<br>#14, 40, 41 & 45         |                               |
|          | Gland<br>Cartridge<br>Kits                  | Rod Seal<br>Kits <sup>1</sup> | Gland<br>Cartridge<br>Kits              | Rod Seal<br>Kits <sup>1</sup> | Gland<br>Cartridge<br>Kits              | Rod Seal<br>Kits <sup>1</sup> | Gland<br>Cartridge<br>Kits              | Rod Seal<br>Kits <sup>1</sup> | Gland<br>Cartridge<br>Kits                      | Rod Seal<br>Kits <sup>1</sup> |
| 3.000    | RG2HDG2301                                  | RK2HDG2301                    | RG2HDG2303                              | RK2HDG2303                    | RG2HDG2305                              | RK2HDG2305                    | RG2HDG2302                              | RK2HDG2302                    | RG2HDLF308                                      | RK2HLLF308                    |
| 3.500    | RG2HDG2351                                  | RK2HDG2351                    | RG2HDG2353                              | RK2HDG2353                    | RG2HDG2355                              | RK2HDG2355                    | RG2HDG2352                              | RK2HDG2352                    | RG2HDLF358                                      | RK2HLLF358                    |
| 4.000    | RG2HDG2401                                  | RK2HDG2401                    | RG2HDG2403                              | RK2HDG2403                    | RG2HDG2405                              | RK2HDG2405                    | RG2HDG2402                              | RK2HDG2402                    | RG2HDLF408                                      | RK2HLLF408                    |
| 4.500    | RG2HDG2451                                  | RK2HDG2451                    | RG2HDG2453                              | RK2HDG2453                    | RG2HDG2455                              | RK2HDG2455                    | RG2HDG2452                              | RK2HDG2452                    | RG2HDLF458                                      | RK2HLLF458                    |
| 5.000    | RG2HDG2501                                  | RK2HDG2501                    | RG2HDG2503                              | RK2HDG2503                    | RG2HDG2505                              | RK2HDG2505                    | RG2HDG2502                              | RK2HDG2502                    | RG2HDLF508                                      | RK2HLLF508                    |
| 5.500    | RG2HDG2551                                  | RK2HDG2551                    | RG2HDG2553                              | RK2HDG2553                    | RG2HDG2555                              | RK2HDG2555                    | RG2HDG2552                              | RK2HDG2552                    | RG2HDLF558                                      | RK2HLLF558                    |

<sup>1</sup> Rod Seal Kits do not include Sym. #14

### Piston Seal Kits – Series 3H / 3HD / 3HB – Includes cylinder body end seals

| Piston<br>Seal<br>Code                             | Piston<br>Magnet<br>Code | Seal<br>Class | Bore Diameter<br>Kits include two each of items 47 & 121 and one each of items 119 <sup>1</sup> & 120. |                   | Piston<br>Seal<br>Code                             | Piston<br>Magnet<br>Code | Seal<br>Class | Bore Diameter<br>Kits include two each of items 47 & 121 and one each of items 119 <sup>1</sup> & 120. |                   |
|----------------------------------------------------|--------------------------|---------------|--------------------------------------------------------------------------------------------------------|-------------------|----------------------------------------------------|--------------------------|---------------|--------------------------------------------------------------------------------------------------------|-------------------|
|                                                    |                          |               | 7.00                                                                                                   | 8.00              |                                                    |                          |               | 7.00                                                                                                   | 8.00              |
| H                                                  | N                        | 1             | PK703HH001                                                                                             | PK803HH001        | R                                                  | N                        | 1             | PK703HR001                                                                                             | PK803HR001        |
| H                                                  | N                        | 4             | PK703HH004                                                                                             | PK803HH004        | R                                                  | N                        | 2, 6          | PK703HR002                                                                                             | PK803HR002        |
| K                                                  | N                        | 1             | PK703HF001                                                                                             | PK803HF001        | R                                                  | N                        | 3             | PK703HR003                                                                                             | PK803HR003        |
| K                                                  | N                        | 2, 6          | PK703HF002                                                                                             | PK803HF002        | R                                                  | N                        | 4             | PK703HR004                                                                                             | PK803HR004        |
| K                                                  | N                        | 3             | PK703HF003                                                                                             | PK803HF003        | R                                                  | N                        | 5             | PK703HR005                                                                                             | PK803HR005        |
| K                                                  | N                        | 4             | PK703HF004                                                                                             | PK803HF004        | W                                                  | N                        | 1             | PK703HW001                                                                                             | PK803HW001        |
| K                                                  | N                        | 5             | PK703HF005                                                                                             | PK803HF005        | W                                                  | N                        | 2, 6          | PK703HW002                                                                                             | PK803HW002        |
| K                                                  | N                        | 8             | PK703HF008                                                                                             | PK803HF008        | W                                                  | N                        | 3             | PK703HW003                                                                                             | PK803HW003        |
| 3H / 3HD Tie Rod Torque<br>and 3HB Tie Bolt Torque |                          |               | 7.00                                                                                                   | 8.00              | W                                                  | N                        | 5             | PK703HW005                                                                                             | PK803HW005        |
|                                                    |                          |               | 800 - 816 lb-ft                                                                                        | 1168 - 1184 lb-ft | 3H / 3HD Tie Rod Torque<br>and 3HB Tie Bolt Torque |                          |               | 7.00                                                                                                   | 8.00              |
|                                                    |                          |               |                                                                                                        |                   |                                                    |                          |               | 800 - 816 lb-ft                                                                                        | 1168 - 1184 lb-ft |

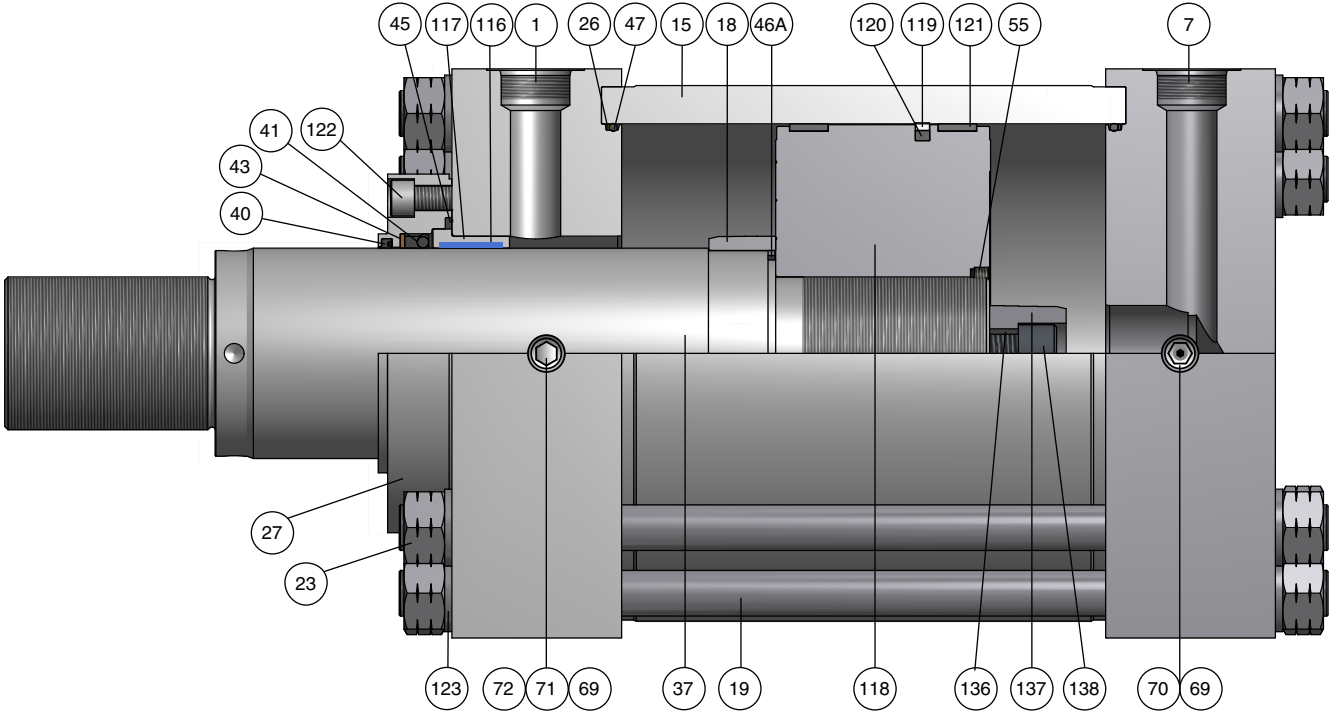
Note: The tie rod torque values are for cylinders rated at 3,000 psi.  
Consult the factory for torque values for cylinders rated above 3,000 psi

<sup>1</sup> Item 119 for piston style WP (model number code W) includes both the PTFE primary seal and the redundant quad ring seal.

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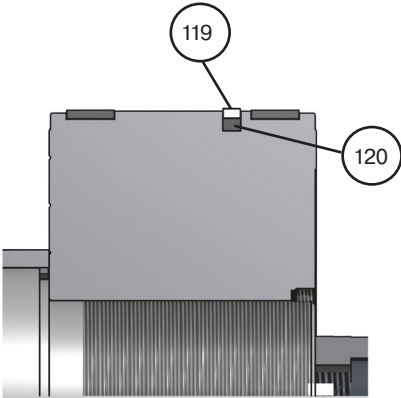


**10.00" - 20.00" Bore Series 3H**

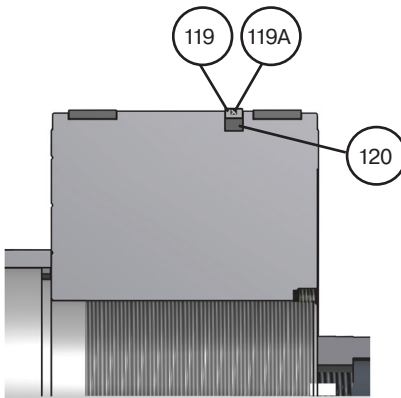


| Symbol | Description                                |
|--------|--------------------------------------------|
| 1      | Head                                       |
| 7      | Cap                                        |
| 15     | Cylinder Body                              |
| 18     | Cushion Sleeve, head end cushion           |
| 19     | Tie Rod                                    |
| 23     | Tie Rod Nut                                |
| 26     | Back-up Washer, tube end seal              |
| 27     | Retainer                                   |
| 37     | Piston Rod, single rod type                |
| 40     | Rod Wiperseal                              |
| 41     | Rod Seal                                   |
| 43     | Back-up Washer, rod seal                   |
| 45     | Gland O-Ring                               |
| 46A    | Cushion Sealing Ring                       |
| 47     | O-Ring, cylinder tube to head and cap seal |

| Symbol     | Description                             |
|------------|-----------------------------------------|
| 55         | Set Screw, piston lock                  |
| 70         | Cushion Adjusting Needle Assembly       |
| 72, 71, 69 | Check Valve Screw, Ball, O-Ring         |
| 116        | Wear Ring Rod                           |
| 117        | Rod Bushing (Gland)                     |
| 118        | Piston                                  |
| 119        | Piston Seal                             |
| 119 A      | Quad (WP only) Ring (see closeup below) |
| 120        | Piston Seal Energizer                   |
| 121        | Wear Ring                               |
| 122        | Retainer Bolt                           |
| 123        | Washer, tie rod nut                     |
| 136        | Spacer, cushion                         |
| 137        | Cushion Spear, detachable               |
| 138        | Bolt, cushion spear                     |



**Standard HP, KP, RP Style  
Piston Seals**



**Optional WP Style  
Mixed Media Piston Seal**

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# 10.00" - 20.00" Bore Series 3H

## 3H Large Bore Seal Kits

| Ø Rod  | Rod Seal Kits (including Wear Ring) |            |            | Rod Seal Kits (including Wear Ring & Bushing) |            |            |
|--------|-------------------------------------|------------|------------|-----------------------------------------------|------------|------------|
|        | Contains Symbols                    |            |            | Contains Symbols                              |            |            |
|        | 40, 41, 43, 45, 116                 |            |            | 40, 41, 43, 45, 116, 117                      |            |            |
|        | Group 1                             | Group 2    | Group 5    | Group 1                                       | Group 2    | Group 5    |
| 4.500  | RK3HHG0451                          | RK3HHG0452 | RK3HHG0455 | RG3HHG0451                                    | RG3HHG0452 | RG3HHG0455 |
| 5.000  | RK3HHG0501                          | RK3HHG0502 | RK3HHG0505 | RG3HHG0501                                    | RG3HHG0502 | RG3HHG0505 |
| 5.500  | RK3HHG0551                          | RK3HHG0552 | RK3HHG0555 | RG3HHG0551                                    | RG3HHG0552 | RG3HHG0555 |
| 7.000  | RK3HHG0701                          | RK3HHG0702 | RK3HHG0705 | RG3HHG0701                                    | RG3HHG0702 | RG3HHG0705 |
| 8.000  | RK3HHG0801                          | RK3HHG0802 | RK3HHG0805 | RG3HHG0801                                    | RG3HHG0802 | RG3HHG0805 |
| 9.000  | RK3HHG0901                          | RK3HHG0902 | RK3HHG0905 | RG3HHG0901                                    | RG3HHG0902 | RG3HHG0905 |
| 10.000 | RK3HHG1001                          | RK3HHG1002 | RK3HHG1005 | RG3HHG1001                                    | RG3HHG1002 | RG3HHG1005 |

| Ø Rod  | Retainer Bolt Torques |                 |
|--------|-----------------------|-----------------|
|        | Nom. Bolt Size        | Torque          |
| 4.500  | 1/2                   | 100 - 105 lb-ft |
| 5.000  | 5/8                   | 185 - 194 lb-ft |
| 5.500  | 5/8                   | 185 - 194 lb-ft |
| 7.000  | 1/2                   | 100 - 105 lb-ft |
| 8.000  | 3/4                   | 330 - 346 lb-ft |
| 9.000  | 3/4                   | 330 - 346 lb-ft |
| 10.000 | 3/4                   | 330 - 346 lb-ft |

| Ø Bore | Tie Rod Torques   |
|--------|-------------------|
| 10.00  | 800 - 850 lb-ft   |
| 12.00  | 1300 - 1350 lb-ft |
| 14.00  | 1175 - 1225 lb-ft |
| 16.00  | 2900 - 3000 lb-ft |
| 18.00  | 2350 - 2450 lb-ft |
| 20.00  | 2900 - 3000 lb-ft |

| Ø Bore | Cylinder Body End Seals |                  |            |
|--------|-------------------------|------------------|------------|
|        | Contains Symbols        |                  |            |
|        | (2X) 47                 | (2X) 26, (2X) 47 |            |
|        | Group 1                 | Group 2          | Group 5    |
| 10.00  | CB1003HG01              | CB1003HG02       | CB1003HG05 |
| 12.00  | CB1203HG01              | CB1203HG02       | CB1203HG05 |
| 14.00  | CB1403HG01              | CB1403HG02       | CB1403HG05 |
| 16.00  | CB1603HG01              | CB1603HG02       | CB1603HG05 |
| 18.00  | CB1803HG01              | CB1803HG02       | CB1803HG05 |
| 20.00  | CB2003HG01              | CB2003HG02       | CB2003HG05 |

## 3H Large Bore Piston Seal Kits

| Ø Bore | Piston Seal Kits                                |            |            |            |
|--------|-------------------------------------------------|------------|------------|------------|
|        | Contains Symbols                                |            |            |            |
|        | (2X) 47, 119, 120, (2X) 121, 119A (WP Kit only) |            |            |            |
|        | HP Group 1                                      | KP Group 1 | RP Group 1 | WP Group 1 |
| 10.00  | PK1003HH01                                      | PK1003HK01 | PK1003HR01 | PK1003HW01 |
| 12.00  | PK1203HH01                                      | PK1203HK01 | PK1203HR01 | PK1203HW01 |
| 14.00  | PK1403HH01                                      | PK1403HK01 | PK1403HR01 | PK1403HW01 |
| 16.00  | PK1603HH01                                      | PK1603HK01 | PK1603HR01 | PK1603HW01 |
| 18.00  | PK1803HH01                                      | PK1803HK01 | PK1803HR01 | PK1803HW01 |
| 20.00  | PK2003HH01                                      | PK2003HK01 | PK2003HR01 | PK2003HW01 |

| Ø Bore | Piston Seal Kits                                         |            |            |            |            |            |
|--------|----------------------------------------------------------|------------|------------|------------|------------|------------|
|        | Contains Symbols                                         |            |            |            |            |            |
|        | (2X) 26, (2X) 47, 119, 120, (2X) 121, 119A (WP Kit only) |            |            |            |            |            |
|        | KP Group 2                                               | RP Group 2 | WP Group 2 | KP Group 5 | RP Group 5 | WP Group 5 |
| 10.00  | PK1003HK02                                               | PK1003HR02 | PK1003HW02 | PK1003HK05 | PK1003HR05 | PK1003HW05 |
| 12.00  | PK1203HK02                                               | PK1203HR02 | PK1203HW02 | PK1203HK05 | PK1203HR05 | PK1203HW05 |
| 14.00  | PK1403HK02                                               | PK1403HR02 | PK1403HW02 | PK1403HK05 | PK1403HR05 | PK1403HW05 |
| 16.00  | PK1603HK02                                               | PK1603HR02 | PK1603HW02 | PK1603HK05 | PK1603HR05 | PK1603HW05 |
| 18.00  | PK1803HK02                                               | PK1803HR02 | PK1803HW02 | PK1803HK05 | PK1803HR05 | PK1803HW05 |
| 20.00  | PK2003HK02                                               | PK2003HR02 | PK2003HW02 | PK2003HK05 | PK2003HR05 | PK2003HW05 |

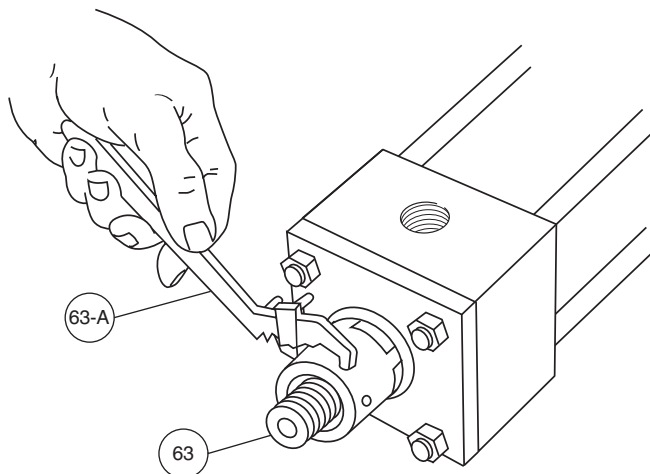
**⚠ PROP 65 WARNING** WARNING: This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**Gland Cartridge Wrenches**

Parker's exclusive gland cartridge design makes gland replacement only a minute's work...and the Gland Cartridge Wrench Set makes it even simpler. A specially designed face-type gland wrench with flared lugs slips into an exact, sure fit on the gland, while a self-locking spanner wrench grips the gland wrench securely. No fumbling for adjustment – no accidental scoring of the piston rod, the job is done quickly...easily...safely.

You can order the Cartridge Wrench or Spanner Wrench to fit the piston rod size used in your Parker Hannifin Cylinder.

| Rod Ø | Gland Wrench (Symbol 63) | Spanner Wrench (Symbol 63-A) |
|-------|--------------------------|------------------------------|
| 0.625 | 0695900000               | 0116760000                   |
| 1.000 | 0695910000               |                              |
| 1.375 | 0695920000               |                              |
| 1.750 | 0695930000               | 0116770000                   |
| 2.000 | 0695940000               |                              |
| 2.500 | 0695950000               |                              |
| 3.000 | 0695960000               | 0116770000                   |
| 3.500 | 0695970000               |                              |
| 4.000 | 0695980000               |                              |
| 4.500 | 0838770000               | 0116780000                   |
| 5.000 | 0695990000               |                              |
| 5.500 | 0696000000               |                              |



## **Section G**

### **Custom Modifications**

|                                                                                       |         |
|---------------------------------------------------------------------------------------|---------|
| Magnetic Piston                                                                       | 152     |
| Magnetic Switch Choices: Tie Rod Mounted ALS and Global Switches                      | 153     |
| Head and Cap Mounted End-of-Stroke Proximity Switches                                 | 156-157 |
| Water Submersible Option and How to Order                                             | 158-159 |
| Buffer Seal Gland, Rod End Styles and Seal Kits                                       | 160-161 |
| Metallic Rod Scraper, Crown Wiper, Rod End Boots, Gland Drain and Air Bleeds          | 162     |
| Tie Rod Supports, Stroke Adjusters, Thrust Key Mountings and Metric Piston Rod Thread | 163     |
| Global Shield™ Rod Coating Technology                                                 | 164     |

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## Series 2H Magnetic Piston

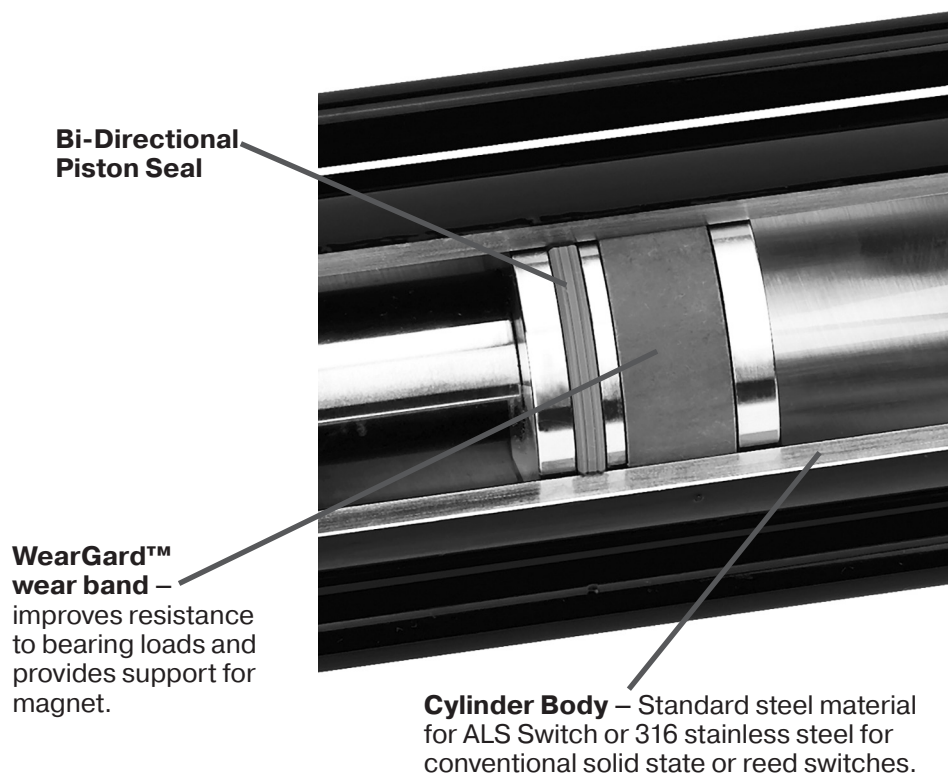
### Position Sensing Technology for Hydraulic Cylinders – 1.50" thru 6.00" Bore

#### Customer Value Proposition

Parker's magnetic sensing option for heavy duty hydraulic cylinders provides OEM's and end users the ability to sense piston position economically and reliably through the use of innovative magnet and switching technology. The magnetic piston option offers all users the ability to eliminate added

cylinder machining costs, stand alone external brackets / hardware and reduced system set-up time. By incorporating sensing capability into hydraulic cylinders, the need to install, wire and adjust stand alone proximity switches can be eliminated – thus providing a clean and more efficient position monitoring system.

#### Series 2H Cylinder with magnetic piston



#### Sensing Technologies

- Parker's ALS switch works with a magnetic piston in a standard steel tube by detecting the change in polarity of the steel material as the magnet passes under the switch. Standard steel tube is more economical in longer strokes than non-ferrous stainless steel tubes required for conventional sensors. Solid State ALS switches are available in both PNP and NPN outputs and can be wired either normally open or normally closed. Magnetic piston with steel tube for ALS switches is available 1.50" – 6.00" bore and is specified with a '7' in the Piston Magnet field of the cylinder model number.
- Parker Global Switches are available in both Reed and Solid State types. Solid State switches are available in both PNP and NPN outputs. They work with a magnetic piston in a 316 stainless steel tube. Magnetic piston with a stainless steel tube for Global Switches is available 1.50" – 4.00" bore and is specified with a '3' in the Piston Magnet field of the cylinder model number.

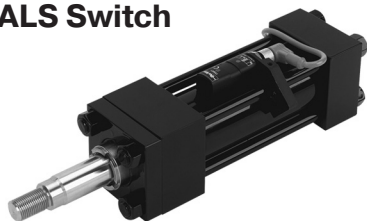
**⚠ PROP 65 WARNING** **WARNING:** This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

## Magnetic Switch Choices

Parker's ALS switch and Global switch are designed to offer customers an alternative means of sensing hydraulic cylinder piston position. Depending on the application, and the budget, one switch type may be better suited to fulfill customer needs than the

other. Some of the important things to consider when deciding which technology to choose are shown below. For more details on ALS and Global switches as well as other position sensing options see catalog HY08-1132.

### ALS Switch



- Compatible with standard steel tube
- +10 to +30 VDC power requirement
- PNP/NPN wired NO or NC
- Solid state construction
- 2 LED indicators (power & target)
- 12mm connector
- IP 67 rated
- Temperature Range: -25°C to +85°C
- Short circuit protection

### ALS Switch Kit Part Numbers

Switches are packaged with a mounting bracket.

| Part Number |         | Switch Bracket Usage       |
|-------------|---------|----------------------------|
| PNP         | NPN     |                            |
| ALS-PH      | ALS-NH  | Series 2H 1.50 – 4.00 Bore |
| ALS-PHA     | ALS-NHA | Series 2H 5.00 & 6.00 Bore |

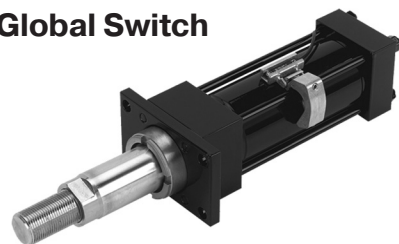
### Minimum Stroke for ALS Switch

| Bore Ø | Minimum Stroke |
|--------|----------------|
| 1.50   | 3.00           |
| 2.00   | 3.00           |
| 2.50   | 2.88           |
| 3.25   | 2.75           |

| Bore Ø | Minimum Stroke |
|--------|----------------|
| 4.00   | 2.63           |
| 5.00   | 2.38           |
| 6.00   | 2.19           |

ALS Switches allow a .38 - .50 inch stroke-to-go piston travel for end-of-stroke mounting locations.

### Global Switch



- Uses 316 stainless steel tube
- +10 to +30 VDC power requirement
- PNP/NPN, Reed
- Solid state construction
- 1 power LED indicator
- 8mm connector or flying leads
- IP67 rated
- Temperature Range: -25°C to + 75°C
- Short circuit protection

### Global Drop-In Switches

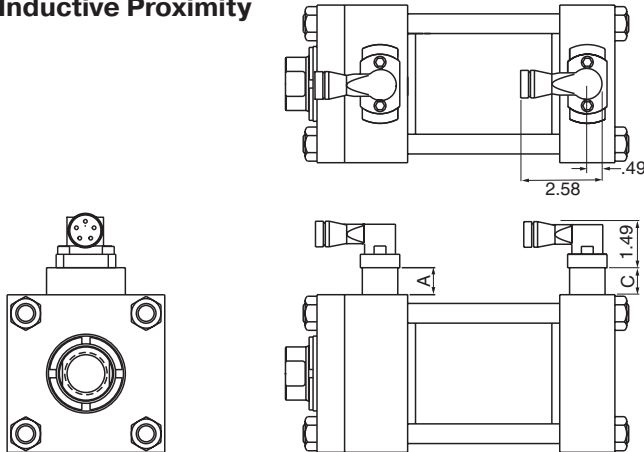
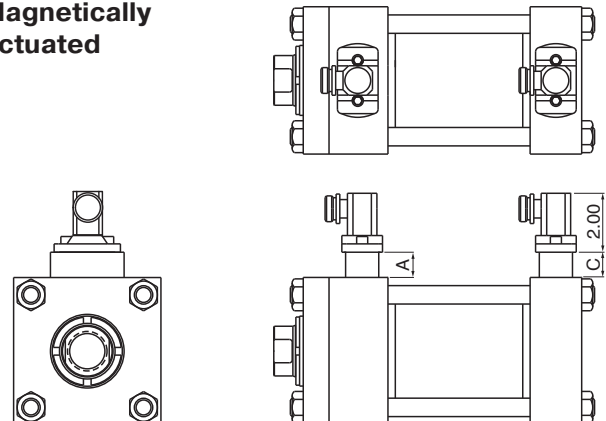


| Wiring                       | Reed       | PNP Switch | NPN Switch |
|------------------------------|------------|------------|------------|
| 3m Flying Leads              | P8SAGRFX   | P8SAGPFAX  | P8SAGNFAX  |
| 10m Flying Leads             | P8SAGRFDX2 | P8SAGPFDX  | P8SAGNFDX  |
| 0.3m Lead with 8mm connector | P8SAGRCHX  | P8SAGPCHX  | P8SAGNCHX  |

| Wiring          | PNP Switch ATEX Certified | PNP Switch High Temperature |
|-----------------|---------------------------|-----------------------------|
| 3m Flying Leads | P8SAGPFAXS                | P8S-GPFLH                   |

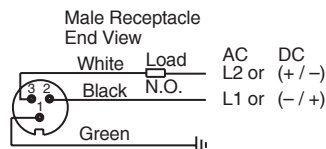
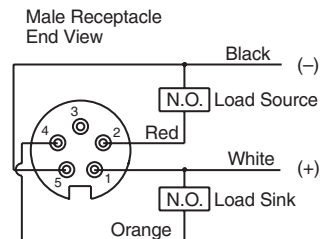
Global switch tie rod mounting bracket, part number P8S-TMA0X, must be ordered separately.

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**EPS 7 & 6 Sensors  
Inductive Proximity****CLS 1 & 4 Sensors  
Non-Contacting  
Magnetically  
Actuated****Spacer Height  
EPS & CLS Sensors**

| A max. | C max. |
|--------|--------|
| .86    | 1.75   |

For exact dimensions, see Bulletin  
0840-G-E1.

**Connector Pin Numbering****3-Pin Mini****EPS-7****5-Pin Mini****EPS-6****Series and Parallel Wiring**

When Parker EPS-6 or 7 sensors are used as inputs to programmable controllers the preferred practice is to connect each sensor to a separate input channel of the PLC. Series or parallel operations may then be accomplished by the internal PLC programming.

Parker EPS-6 or 7 sensors may be hard wired for series operation, but the voltage drop through the sensors (see specifications) must not reduce the available voltage below what is needed to actuate the load.

Parker EPS-6 or 7 sensors may also be hard wired for parallel operation. However, the leakage current of each sensor will pass through the load. The total of all leakage currents must not exceed the current required to actuate the load. In most cases, the use of two or more EPS-6 or 7 sensors in parallel will require the use of a bypass (shunt) resistor.

**Minimum Stroke**

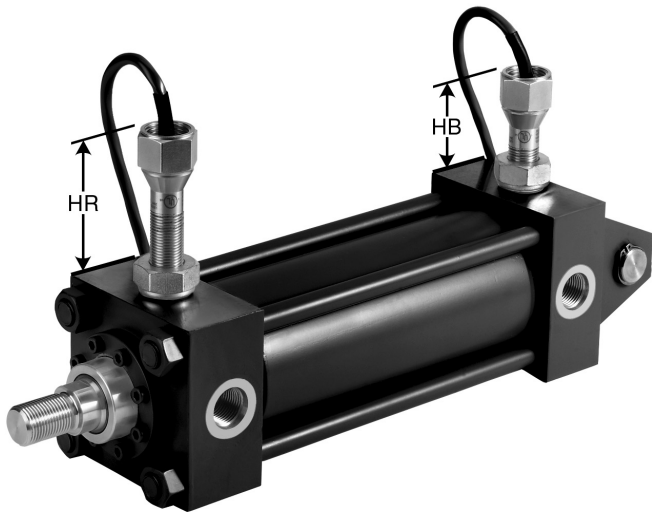
The minimum stroke for EPS-6 or 7 and CLS-1 or 4 sensors, utilizing standard components, is the cushion sleeve or spear length for the cylinder series in which the sensor is installed. See the Cushion Length Chart in this catalog for details. Contact the factory if a shorter stroke is required.



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**CLS-2 Threaded Style Switches**

Spacers are not required. Threaded switches can be adjusted for small changes to end of stroke position sensing.

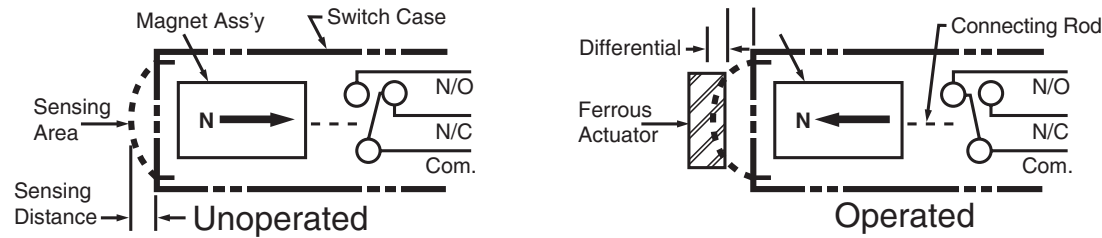


As shown in the illustrations below, these switches are magnetically operated. Dual magnets provide a dependable “snap action” for positive position sensing.

In the “Unoperated” position, the magnet assembly is attracted in the opposite direction of the arrow, causing a finely ground stainless steel connecting rod to hold the contacts open.

In the “Operated” position a ferrous part (cushion or piston) enters the sensing area and attracts the magnet assembly which causes the rod to draw the contacts together.

**Operating Principle**



**Sensing gap:** .030" to .060"

**Trip point:** Factory set with piston bottomed out.

**Release point:** Approx. 0.25" piston travel.

Minimum cylinder stroke is .50" on 1.50" & 2.00" bores;  
and .75" on 2.50" bore and larger.

See the CLS Specification table for additional details.

**Switch Height**

| Bore Ø | Rod Ø | HR   | HB   |
|--------|-------|------|------|
| 1.50   | 0.625 | 2.56 | 3.31 |
|        | 1.000 | 2.75 |      |
| 2.00   | 1.000 | 2.56 | 3.25 |
|        | 1.375 | 2.69 |      |
| 2.50   | 1.000 | 2.31 | 2.94 |
|        | 1.375 | 2.50 |      |
|        | 1.750 | 2.69 |      |
| 3.25   | 1.375 | 2.94 | 2.56 |
|        | 1.750 | 3.13 |      |
|        | 2.000 | 3.31 |      |
| 4.00   | 1.750 | 2.88 | 2.44 |
|        | 2.000 | 3.06 |      |
|        | 2.500 | 2.50 |      |
| 5.00   | 2.000 | 2.31 | 2.31 |
|        | 2.500 | 2.63 |      |
|        | 3.000 | 2.88 |      |
|        | 3.500 | 3.13 |      |
| 6.00   | 2.500 | 2.13 | 3.00 |
|        | 3.000 | 2.38 |      |
|        | 3.500 | 2.63 |      |
|        | 4.000 | 2.88 |      |
| 7.00   | 3.000 | 3.38 | 2.69 |
|        | 3.500 | 2.13 |      |
|        | 4.000 | 2.38 |      |
|        | 4.500 | 2.63 |      |
|        | 5.000 | 3.00 |      |
| 8.00   | 3.500 | 3.13 | 2.25 |
|        | 4.000 | 3.38 |      |
|        | 4.500 | 2.13 |      |
|        | 5.000 | 2.50 |      |
|        | 5.500 | 2.69 |      |

**⚠ PROP 65 WARNING** **WARNING:** This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

## End-of-Stroke Proximity Switches

Heavy Duty Hydraulic Cylinders  
Custom Modifications

| Specifications                    |                                                                                                                                                                                           |                                                                                                                                                                           |                                                                                                                                                                                                   |                                                                                                                                                                                                                     |                                                                                                                                                                                                         |
|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Style:                            | EPS-7                                                                                                                                                                                     | EPS-6                                                                                                                                                                     | CLS-1                                                                                                                                                                                             | CLS-4                                                                                                                                                                                                               | CLS-2                                                                                                                                                                                                   |
| Code Designator:                  | H                                                                                                                                                                                         | D                                                                                                                                                                         | F                                                                                                                                                                                                 | B                                                                                                                                                                                                                   | G                                                                                                                                                                                                       |
| Description:                      | Economical, General Purpose, 2 wire device, primarily for AC applications. (Not suitable for 3 wire 24 volt Sinking or Sourcing applications.) Also for automotive industry applications. | Economical, General Purpose, 3 wire, DC sensor, dual output: sinking and sourcing                                                                                         | Functional replacement for AB (Mechanical) Limit Switches in many applications, or where customer needs NC contacts, zero leakage, zero voltage drop, higher or lower load current than EPS-style | Functional replacement for AB (Mechanical) Limit Switches in many High Temperature applications, or where customer needs NC contacts, zero leakage, zero voltage drop, higher or lower load current than EPS-style. | For applications where the customer needs NC contacts, zero leakage, zero voltage drop, higher or lower load current than EPS style. Threaded style permits small adjustability of make/break location. |
| Supply Voltage:                   | 20 to 250 VAC/DC                                                                                                                                                                          | 10 to 30 VDC                                                                                                                                                              | 24 to 240 VAC/DC                                                                                                                                                                                  | 24 to 240 VAC/DC                                                                                                                                                                                                    | 24 to 240 VAC/DC                                                                                                                                                                                        |
| Load Current, min:                | 8 mA                                                                                                                                                                                      | N/A                                                                                                                                                                       | NA                                                                                                                                                                                                | NA                                                                                                                                                                                                                  | NA                                                                                                                                                                                                      |
| Load Current, max:                | 300 mA                                                                                                                                                                                    | 200 mA                                                                                                                                                                    | 4 AMPS @ 120 VAC<br>3 AMPS @ 24 VDC                                                                                                                                                               | 4 AMPS @ 120 VAC<br>3 AMPS @ 24 VDC                                                                                                                                                                                 | 4 AMPS @ 120 VAC<br>3 AMPS @ 24 VDC                                                                                                                                                                     |
| Leakage Current:                  | 1.7 mA, max.                                                                                                                                                                              | 10 micro amps max                                                                                                                                                         | –                                                                                                                                                                                                 | –                                                                                                                                                                                                                   | –                                                                                                                                                                                                       |
| Voltage Drop:                     | 7 V, max.                                                                                                                                                                                 | 2 VDC max.                                                                                                                                                                | N/A                                                                                                                                                                                               | NA                                                                                                                                                                                                                  | None                                                                                                                                                                                                    |
| Operating Temperature:            | -14° to +158° F                                                                                                                                                                           | -14° to +158° F                                                                                                                                                           | -40°F to +221°F                                                                                                                                                                                   | -40°F to +400°F                                                                                                                                                                                                     | -40°F to +221°F                                                                                                                                                                                         |
| Sensor Type:                      | Inductive proximity                                                                                                                                                                       | Inductive proximity                                                                                                                                                       | non-contacting magnetically actuated                                                                                                                                                              | non-contacting magnetically actuated                                                                                                                                                                                | non-contacting magnetically actuated                                                                                                                                                                    |
| Part Number:                      | 148897 <sup>1</sup>                                                                                                                                                                       | 148896 <sup>1</sup>                                                                                                                                                       | 148275 <sup>1</sup>                                                                                                                                                                               | 149109 <sup>1</sup>                                                                                                                                                                                                 | 117000, 117017, 117034                                                                                                                                                                                  |
| Part Number Suffix <sup>1</sup> : | <sup>1</sup> 4-digit suffix indicates probe length: 0125=1.25", 0206=2.06", 0287=2.875", 0456=4.562"                                                                                      |                                                                                                                                                                           |                                                                                                                                                                                                   |                                                                                                                                                                                                                     | Switch selection is application dependent – Contact Factory                                                                                                                                             |
| Connection:                       | 3 pin mini                                                                                                                                                                                | 5 pin mini                                                                                                                                                                | 3 pin mini                                                                                                                                                                                        | 144" PTFE Coated Flying Leads with 1/2" conduit hub                                                                                                                                                                 | 36" Potted-in PVC cable (most sizes also with 1/2" conduit hub)                                                                                                                                         |
| Enclosure Rating:                 | IEC IP67                                                                                                                                                                                  | IEC IP67                                                                                                                                                                  | NEMA 1, 2, 3, 4, 4x, 5, 6, 6P, 11, 12, 12K, 13                                                                                                                                                    | NEMA 1, 2, 3, 4, 4x, 5                                                                                                                                                                                              | NEMA 4, 4X, 6, 6P, 7, 9                                                                                                                                                                                 |
| LED indication:                   | Yes                                                                                                                                                                                       | Yes                                                                                                                                                                       | Yes                                                                                                                                                                                               | No                                                                                                                                                                                                                  | No                                                                                                                                                                                                      |
| Short Circuit Protection:         | Yes                                                                                                                                                                                       | Yes                                                                                                                                                                       | No                                                                                                                                                                                                | No                                                                                                                                                                                                                  | No                                                                                                                                                                                                      |
| Weld Field Immunity:              | Yes                                                                                                                                                                                       | Yes                                                                                                                                                                       | Yes                                                                                                                                                                                               | Yes                                                                                                                                                                                                                 | Yes                                                                                                                                                                                                     |
| Output:                           | 2 wire, Normally Open with leakage current                                                                                                                                                | Dual Output: DC Sinking and DC Sourcing, user selectable via wiring                                                                                                       | SPDT (Single Pole Double Throw), Normally Open/ Normally Closed, Form C                                                                                                                           | SPDT (Single Pole Double Throw), Normally Open/ Normally Closed, Form C                                                                                                                                             | SPDT (Single Pole Double Throw), Normally Open/ Normally Closed, Form C                                                                                                                                 |
| Approvals/Marks:                  | CE, UL, CSA                                                                                                                                                                               | CE, UL, CSA                                                                                                                                                               | UL or CSA <sup>2</sup>                                                                                                                                                                            | UL or CSA <sup>2</sup>                                                                                                                                                                                              | UL or CSA <sup>2</sup>                                                                                                                                                                                  |
| Make/Break Location:              | 0.13" from end of stroke, typical. Tolerance is +0/-0.13"                                                                                                                                 |                                                                                                                                                                           |                                                                                                                                                                                                   |                                                                                                                                                                                                                     | –                                                                                                                                                                                                       |
| Wiring Instructions:              | Pin 1: AC Ground (Green)<br>Pin 2: Output (Black)<br>Pin 3: AC Line (White)                                                                                                               | Pin 1: +10 to 30 VDC (White)<br>Pin 2: Sourcing Output (Red)<br>Pin 3: Grounded (not connected or required)<br>Pin 4: Sinking Output (Orange)<br>Pin 5: DC Common (Black) | Pin 1: Common (Green)<br>Pin 2: Normally Closed (Black)<br>Pin 3: Normally Open (White)                                                                                                           | Common (Black)<br>Normally Open (Blue)<br>Normally Closed (Red)                                                                                                                                                     | Common (Black)<br>Normally Open (Blue)<br>Normally Closed (Red)                                                                                                                                         |
| Cable: 6'                         | 0853550006                                                                                                                                                                                | 0859170006                                                                                                                                                                | 0853550006                                                                                                                                                                                        | –                                                                                                                                                                                                                   | –                                                                                                                                                                                                       |
| Cable: 12'                        | 0853550012                                                                                                                                                                                | 0859170012                                                                                                                                                                | 0853550012                                                                                                                                                                                        | –                                                                                                                                                                                                                   | –                                                                                                                                                                                                       |
| Cable: 6', Right Angle            | 0875470006                                                                                                                                                                                | –                                                                                                                                                                         | 0875470006                                                                                                                                                                                        | –                                                                                                                                                                                                                   | –                                                                                                                                                                                                       |

<sup>2</sup>CSA available upon request – contact factory.

**⚠ PROP 65 WARNING** WARNING: This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**How to Specify EPS Proximity Switches**

Parker EPS proximity switches may be ordered on Series 2H, 2HD, 2HB & 3H, 3HD, 3HB cylinders as follows:

- 1) Complete the basic cylinder model number.
- 2) Place an "S" in the model number to denote switches and/or special features.
- 3) Mounting styles D, DB, JJ, J, or H should be used with caution because of possible mounting interferences. See Available Switch Position table below for additional details.
- 4) Special modifications to cylinders other than switches must have a written description.

**Head End**

| <b>H</b>                                                                                                                                                                                                                           | <b>1</b>                       | <b>3</b>                         | <b>A</b>                                                              | <b>GG</b>                                                                                                                          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|----------------------------------|-----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| Specify:<br>"H" = EPS-7<br>"D" = EPS-6<br>"F" = CLS-1 <sup>1</sup><br>"B" = CLS-4 <sup>1</sup><br>"G" = CLS-2<br>"N" = Prep for EPS-6 and EPS-7 switches<br>"P" = Prep for CLS-1 and CLS-4 switches<br>"T" = Prep for CLS-2 switch | Port Location<br>See Figure 1. | Switch Location<br>See Figure 1. | Switch Orientation<br>See Figure 2 for EPS-7, EPS-6, CLS-1 and CLS-4. | Actuation Point<br>GG = End of Stroke<br>FF = Stroke to Go <sup>2</sup> ;<br>See Bulletins 0840-G-E1, 2 or 3 for stroke remaining. |

5) Specify letter prefix "H" for EPS-7, "D" for EPS-6, and "F" for CLS-1, "B" for CLS-4 or "G" for CLS-2, then fill in the four blanks specifying port location, switch orientation and actuation point for both head and cap. If only one switch is used, place "XXXX" in the unused blanks.

Example = H13AGG-XXXX denotes a switch on the head end only, EPS-7

Example = XXXX-H42AGG denotes a switch on the cap end only, CLS-4

**Cap End**

| <b>H</b>                                                                                                                                                                                                                           | <b>4</b>                       | <b>2</b>                         | <b>A</b>                                                              | <b>GG</b>                                                                                                                          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|----------------------------------|-----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| Specify:<br>"H" = EPS-7<br>"D" = EPS-6<br>"F" = CLS-1 <sup>1</sup><br>"B" = CLS-4 <sup>1</sup><br>"G" = CLS-2<br>"N" = Prep for EPS-6 and EPS-7 switches<br>"P" = Prep for CLS-1 and CLS-4 switches<br>"T" = Prep for CLS-2 switch | Port Location<br>See Figure 1. | Switch Location<br>See Figure 1. | Switch Orientation<br>See Figure 2 for EPS-7, EPS-6, CLS-1 and CLS-4. | Actuation Point<br>GG = End of Stroke<br>FF = Stroke to Go <sup>2</sup> ;<br>See Bulletins 0840-G-E1, 2 or 3 for stroke remaining. |

Note: All specified switch and port locations are as seen from rod end of cylinder.

<sup>1</sup> CLS-1 and CLS-4 proximity switches are not available on the head end of 1.50" bore with 1.00" rod and 2.00" bore with 1.375" rod.

<sup>2</sup> FF Stroke to Go not available with CLS-2 switch.

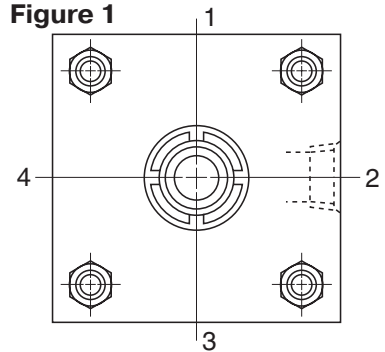
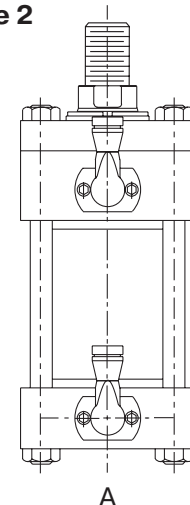
**Available Mounting Positions<sup>1</sup> for EPS-6, EPS-7, CLS-1, CLS-4**

| <b>MOUNTING STYLES</b>           | <b>Bore Ø</b> |             |             |             |             |             |             |             |             |
|----------------------------------|---------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
|                                  | <b>1.50</b>   | <b>2.00</b> | <b>2.50</b> | <b>3.25</b> | <b>4.00</b> | <b>5.00</b> | <b>6.00</b> | <b>7.00</b> | <b>8.00</b> |
| <b>T,TB,TC,TD,BB,DD,DE,SB,SE</b> | HEAD          | 1,2,3,4     | 1,2,3,4     | 1,2,3,4     | 1,2,3,4     | 1,2,3,4     | 1,2,3,4     | 1,2,3,4     | 1,2,3,4     |
|                                  | CAP           | 1,2,3,4     | 1,2,3,4     | 1,2,3,4     | 1,2,3,4     | 1,2,3,4     | 1,2,3,4     | 1,2,3,4     | 1,2,3,4     |
| <b>J,D,JJ<sup>2</sup></b>        | HEAD          | 1,3         | 1,3         | 1,3         | 1,3         | 1,3         | 1,3         | 1,3         | 1,3         |
|                                  | CAP           | 1,2,3,4     | 1,2,3,4     | 1,2,3,4     | 1,2,3,4     | 1,2,3,4     | 1,2,3,4     | 1,2,3,4     | 1,2,3,4     |
| <b>H,DB,HH</b>                   | HEAD          | 1,2,3,4     | 1,2,3,4     | 1,2,3,4     | 1,2,3,4     | 1,2,3,4     | 1,2,3,4     | 1,2,3,4     | 1,2,3,4     |
|                                  | CAP           | 1,3         | 1,3         | 1,3         | 1,3         | 1,3         | 1,3         | 1,3         | 1,3         |
| <b>C<sup>3</sup></b>             | HEAD          | 1           | 1           | 1           | 1           | 1           | 1,2,4       | 1,2,4       | 1,2,4       |
|                                  | CAP           | 1           | 1           | 1           | 1           | 1           | 1,2,4       | 1,2,4       | 1,2,4       |
| <b>F</b>                         | HEAD          | 1           | 1           | 1,2,4       | 1,2,4       | 1,2,4       | 1,2,4       | 1,2,4       | 1,2,4       |
|                                  | CAP           | 1           | 1           | 1,2,4       | 1,2,4       | 1,2,4       | 1,2,4       | 1,2,4       | 1,2,4       |
| <b>JB</b>                        | HEAD          | NA          | NA          | NA          | 1,2,3,4     | 1,2,3,4     | 1,2,3,4     | 1,2,3,4     | 1,2,3,4     |
|                                  | CAP           | 1,2,3,4     | 1,2,3,4     | 1,2,3,4     | 1,2,3,4     | 1,2,3,4     | 1,2,3,4     | 1,2,3,4     | 1,2,3,4     |
| <b>HB</b>                        | HEAD          | 1,2,3,4     | 1,2,3,4     | 1,2,3,4     | 1,2,3,4     | 1,2,3,4     | 1,2,3,4     | 1,2,3,4     | 1,2,3,4     |
|                                  | CAP           | NA          | NA          | NA          | 1,2,3,4     | 1,2,3,4     | 1,2,3,4     | 1,2,3,4     | 1,2,3,4     |

<sup>1</sup> Positions 1, 2, 3 and 4 are determined by viewing cylinder from piston rod end (See Figure 1). The electrical connector orientation may be restricted in some cases.

<sup>2</sup> On 1.50" - 5.00" bore Style JJ cylinders, switches will extend beyond mounting surface of cylinder.

<sup>3</sup> On 6.00" bore cylinders and larger switches mounted in position 2 or 4 will interfere with the installation and removal of mounting bolts.

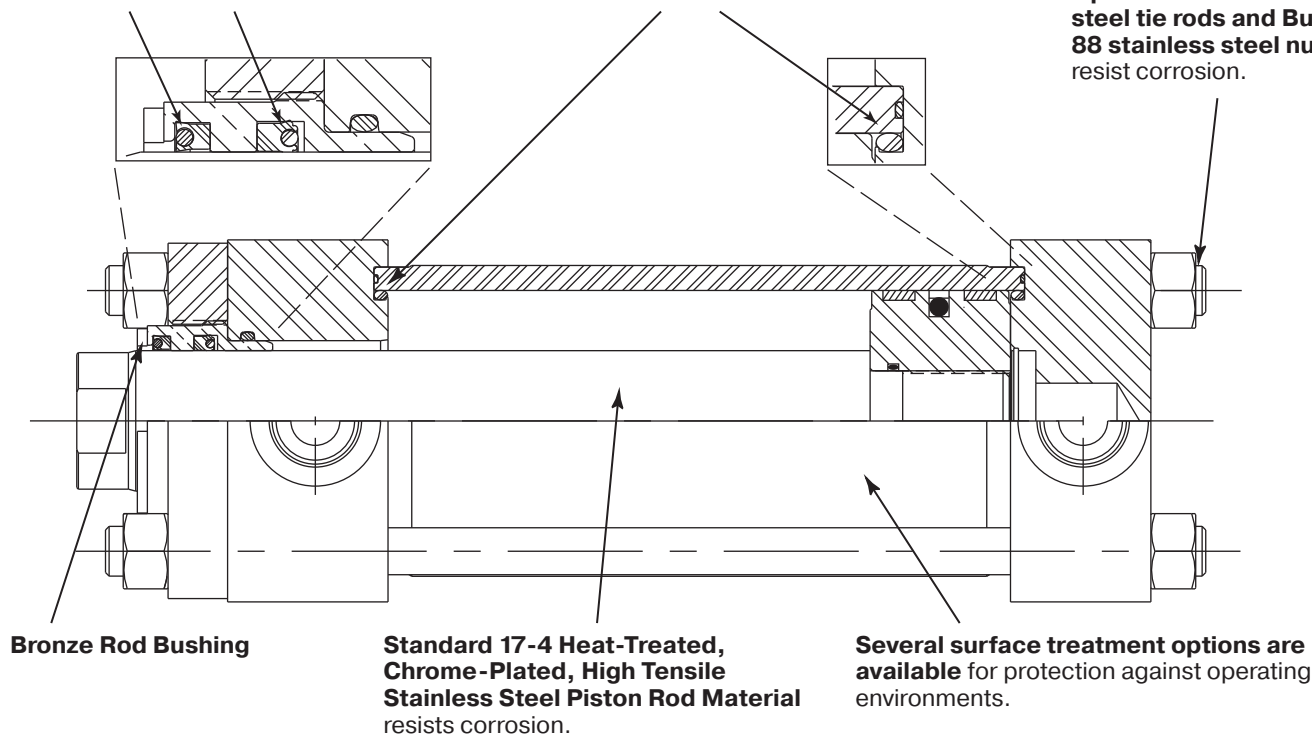
**Figure 1****Figure 2**

## Water Submersible Option for Series 2H, 2HD, 2HB and 3H, 3HD, 3HB Hydraulic Cylinders

**Optional Polypak Inner and Outer Rod Seals**  
resist internal and external pressure. Required  
for depths over 25 ft and up to 5000 ft.

**Optional Dual Cylinder Body Seals**  
resist external pressure. Required for  
depths over 25 ft and up to 5000 ft.

**Optional 17-4 stainless  
steel tie rods and Bumax  
88 stainless steel nuts**  
resist corrosion.



### Specifications:

- Submersion Depth: up to 5000 ft
- Heavy Duty Service – ANSI (NFPA) T3.6.7R2 – 1996 Specifications and Mounting Dimension Standards
- Nominal Pressure – 3000 psi
- Operating Temperature – -10°F to +165°F
- 17-4 PH chrome plated stainless steel piston rod
- Stainless steel name tag affixed with stainless steel wire around tie rod

### Cylinder Seal Construction:

- Up to 25 ft – Standard rod seal and body seals
- Over 25 ft to 5000 ft
  - Subsea rod seal package that includes a Polypak oil seal and an outward facing Polypak wiper to seal against water intrusion.
  - Subsea body seal package with ID oil seal and body-end o-ring to seal against water intrusion.
  - Not available with 0.625 Ø piston rod

### Standard Options for Water Submersible Cylinders:

#### Material

- 17-4 PH stainless steel tie rods and Bumax 88 stainless steel tie rod nuts
- Chrome plated body ID

#### Surface Treatments for Corrosion Protection

- Electroless nickel plated exterior (head, cap, body and retainer)
- Inorganic zinc primer (zinc primer only – without bond coating)
- Inorganic zinc primer with epoxy undercoat and anacrylic topcoat
- Epoxy undercoat and topcoat

### Custom Options available for Special Order:

- End-of-Stroke Switches
- All stainless steel construction

**⚠ PROP 65 WARNING** **WARNING:** This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

## Water Submersible Option for Series 2H, 2HD, 2HB and 3H, 3HD, 3HB Hydraulic Cylinders

### How to order:

1. Specify the complete Parker Cylinder Model Number.
2. Put an "S" in the model number to indicate a special cylinder.
3. Include the 3 digit Submersible Code.
4. For custom options, such as switches, provide a complete description or drawing of your requirements.

### Submersible Code

When selecting the submersible option, an S must be placed in the Model Number. Select Submersible Code values for the required Submersion Depth, Cylinder Body, and Corrosion Protection. See the example Model Number below:

| Feature              | Code | Specification                                                                                                | For                                                                                 |
|----------------------|------|--------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Submersion Depth     | 1    | Conventional rod gland and body seal design                                                                  | Depths to 25 ft                                                                     |
|                      | 2    | Submersible rod gland and dual cylinder body seals                                                           | Depths to 5000 ft                                                                   |
|                      | 3    | Other                                                                                                        | Specify depth / requirements                                                        |
| Cylinder Body        | P    | Plain ID                                                                                                     |                                                                                     |
|                      | C    | Chrome plated ID                                                                                             |                                                                                     |
| Corrosion Protection | 1    | Inorganic zinc primer                                                                                        | Splash & short term immersion service where equipment is top coated by the customer |
|                      | 2    | Inorganic zinc primer with stainless steel tie rods, nuts, & fasteners                                       |                                                                                     |
|                      | 3    | Electroless nickel plated exterior with stainless steel tie rods, nuts, & fasteners                          |                                                                                     |
|                      | 4    | Inorganic zinc primer, epoxy undercoat, & anacrylic topcoat.                                                 |                                                                                     |
|                      | 5    | Inorganic zinc primer, epoxy undercoat, & anacrylic topcoat with stainless steel tie rods, nuts, & fasteners | Splash & short term immersion service                                               |
|                      | 6    | Epoxy base & top coat.                                                                                       |                                                                                     |
|                      | 7    | Epoxy base & top coat. with stainless steel tie rods, nuts, & fasteners                                      | Long term immersion service                                                         |
|                      | 9    | Other                                                                                                        | Specify requirements                                                                |

### Example:

**4.00 BB 2HK T S 14 X 24.00**

**S=Submersible Code: 2P1**

(describes a 4" x 24" cylinder for submersion up to 5000 ft, with a plain cylinder body ID and Inorganic Zinc Primer corrosion protection.)

### Water Submersible Codes and Features Supplied

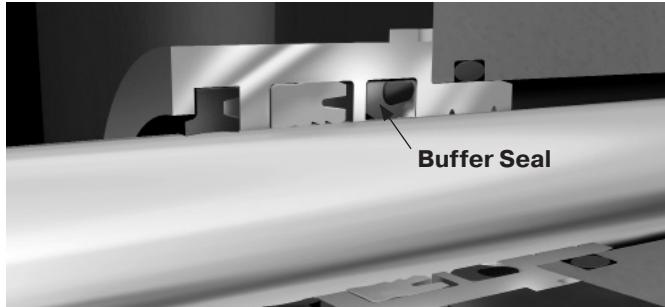
#### Depths to 5000 ft<sup>1</sup>

| Submersible Cylinder Feature        | Water Submersible Code <sup>1</sup> |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-------------------------------------|-------------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                                     | 2P1                                 | 2P2 | 2P3 | 2P4 | 2P5 | 2P6 | 2P7 | 2C1 | 2C2 | 2C3 | 2C4 | 2C5 | 2C6 | 2C7 |
| 17-4 PH piston rod                  | X                                   | X   | X   | X   | X   | X   | X   | X   | X   | X   | X   | X   | X   | X   |
| Stainless steel tag                 | X                                   | X   | X   | X   | X   | X   | X   | X   | X   | X   | X   | X   | X   | X   |
| Submersible rod gland               | X                                   | X   | X   | X   | X   | X   | X   | X   | X   | X   | X   | X   | X   | X   |
| Dual cylinder body seals            | X                                   | X   | X   | X   | X   | X   | X   | X   | X   | X   | X   | X   | X   | X   |
| Chrome plated cylinder ID           |                                     |     |     |     |     |     |     | X   | X   | X   | X   | X   | X   | X   |
| SS tie rods, nuts, & fasteners      |                                     | X   | X   |     | X   |     | X   |     | X   | X   |     | X   |     | X   |
| Electroless nickel plated exterior  |                                     |     | X   |     |     |     |     |     |     | X   |     |     |     |     |
| Inorganic zinc primer               | X                                   | X   |     |     |     |     |     | X   | X   |     |     |     |     |     |
| Inorganic zinc primer with topcoats |                                     |     |     | X   | X   |     |     |     |     |     | X   | X   |     |     |
| Epoxy base & topcoat                |                                     |     |     |     |     | X   | X   |     |     |     |     |     | X   | X   |

<sup>1</sup> Corresponding submersible codes for depths to 25 ft begin with 1 (e.g. 1P1, 1P2, etc.) and include all of the features marked for 5000 ft depth **except** Submersible Rod Gland and Dual Cylinder Body Seals.

## Parker Buffer Seal's Unique Design

The Parker Buffer Seal Gland is recommended for heavy duty applications where pressure spikes on the rod side of the piston produce premature rod seal failure. Whether the pressure spikes are caused by an external force or intensification due to differential piston



areas, the resultant rod seal damage drives the need for more frequent unplanned service downtime.

Parker Buffer Seal is a secondary, upstream seal that protects the primary rod seal from damage caused by pressure spikes. The polyurethane Buffer Seal for Class 1 service and filled PTFE Buffer Seal for all other Seal Classes is o-ring energized, low friction and extrusion resistant.

The Parker Buffer Seal is a unique design that allows trapped pressure back into the cylinder. When the rod extends from the cylinder the Buffer Seal is riding on a high compression sealing point to limit leakage. On the retract stroke the seal rocks forward to allow trapped fluid to pass under the seal and return to the system.

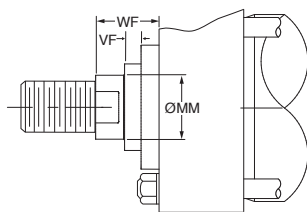
Buffer Seals are available with Series 2HD/3HD and 2HB/3HB in 1.50"-8.00" bores. They are available with Seal Classes 1, 2, 3, 4, 5 & 6. Selection of the Buffer Seal is made with a code in the cylinder model number.

## Rod Extension Dimensions for Buffer Seal Glands

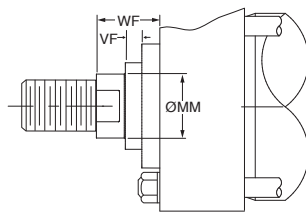
Buffer Seal glands are from 0.31" to 0.81" longer (see table at right) than glands without a Buffer Seal. The longer gland causes the piston rod to extend beyond its location for a standard gland. A differentiating rod end style 4B vs. 4, 9B vs. 9 etc. must also be specified when selecting the Buffer Seal gland option. Rod end extension dimensions – V, VF, W, WF and WG – for Buffer Seal rod end styles are in the table at right. All other rod end dimensions are unchanged and can be found on the Piston Rod Ends page for each series.

### Series 2HD/2HB & 3HD/3HB 7.00" & 8.00" Bore Rod End Styles

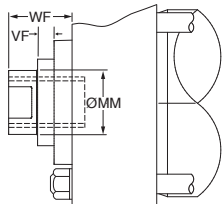
**Style 4B –  
Small Male**



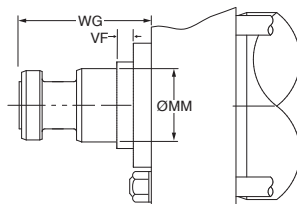
**Style 8B –  
Intermediate Male**



**Style 9B –  
Short Female**



**Style 55B –  
Flanged Rod End**



### Rod End Dimensions

| Bore Ø | Rod No.  | MM Rod Ø | Gland Length In-crease                  | V <sup>1</sup> | VF   | W <sup>1</sup> | WF   | WG <sup>2</sup> |
|--------|----------|----------|-----------------------------------------|----------------|------|----------------|------|-----------------|
| 1.50   | 1 (Std.) | 0.625    | Buffer Seal Not Available in 0.625" Rod |                |      |                |      |                 |
|        | 2        | 1.000    | 0.31                                    | 0.81           | 0.83 | 1.31           | 1.69 | 2.38            |
| 2.00   | 1 (Std.) | 1.000    | 0.31                                    | 0.56           | 0.83 | 1.06           | 1.69 | 2.38            |
|        | 2        | 1.375    | 0.38                                    | 0.75           | 1.02 | 1.38           | 2.00 | 2.75            |
| 2.50   | 1 (Std.) | 1.000    | 0.31                                    | 0.56           | 0.83 | 1.06           | 1.69 | 2.38            |
|        | 2        | 1.750    | 0.44                                    | 0.94           | 0.97 | 1.69           | 2.31 | 3.13            |
|        | 3        | 1.375    | 0.38                                    | 0.75           | 1.02 | 1.38           | 2.00 | 2.75            |
| 3.25   | 1 (Std.) | 1.375    | 0.38                                    | 0.63           | 1.02 | 1.25           | 2.00 | 2.75            |
|        | 2        | 2.000    | 0.44                                    | 0.81           | 0.97 | 1.69           | 2.44 | 3.75            |
|        | 3        | 1.750    | 0.44                                    | 0.81           | 0.97 | 1.56           | 2.31 | 3.13            |
| 4.00   | 1 (Std.) | 1.750    | 0.44                                    | 0.69           | 0.97 | 1.44           | 2.31 | 3.13            |
|        | 2        | 2.500    | 0.44                                    | 0.81           | 1.09 | 1.81           | 2.69 | 4.50            |
|        | 3        | 2.000    | 0.44                                    | 0.69           | 0.97 | 1.56           | 2.44 | 3.75            |
| 5.00   | 1 (Std.) | 2.000    | 0.44                                    | 0.69           | 0.97 | 1.56           | 2.44 | 3.75            |
|        | 2        | 3.500    | 0.44                                    | 0.81           | 0.78 | 1.81           | 2.69 | 5.63            |
|        | 3        | 2.500    | 0.44                                    | 0.81           | 1.09 | 1.81           | 2.69 | 4.50            |
| 6.00   | 4        | 3.000    | 0.44                                    | 0.81           | 0.85 | 1.81           | 2.69 | 4.88            |
|        | 1 (Std.) | 2.500    | 0.44                                    | 0.69           | 1.09 | 1.69           | 2.69 | 4.50            |
|        | 2        | 4.000    | 0.44                                    | 0.69           | 0.78 | 1.69           | 2.69 | 5.75            |
|        | 3        | 3.000    | 0.44                                    | 0.69           | 0.85 | 1.69           | 2.69 | 4.88            |
| 7.00   | 4        | 3.500    | 0.44                                    | 0.69           | 0.78 | 1.69           | 2.69 | 5.63            |
|        | 1 (Std.) | 3.000    | 0.44                                    | 1.06           | 0.84 | 1.69           | 2.69 | 4.88            |
|        | 2        | 5.000    | 0.81                                    | 1.15           | 1.15 | 2.06           | 3.06 | 6.63            |
|        | 3        | 3.500    | 0.44                                    | 1.07           | 0.78 | 1.69           | 2.69 | 5.63            |
|        | 4        | 4.000    | 0.44                                    | 0.94           | 0.78 | 1.69           | 2.69 | 5.75            |
| 8.00   | 5        | 4.500    | 0.44                                    | 0.94           | 0.78 | 1.69           | 2.69 | 6.50            |
|        | 1 (Std.) | 3.500    | 0.44                                    | 1.06           | 0.78 | 1.69           | 2.69 | 5.63            |
|        | 2        | 5.500    | 0.81                                    | 1.15           | 1.15 | 2.06           | 3.06 | 7.50            |
|        | 3        | 4.000    | 0.44                                    | 0.94           | 0.78 | 1.69           | 2.69 | 5.75            |
|        | 4        | 4.500    | 0.44                                    | 0.94           | 0.78 | 1.69           | 2.69 | 6.50            |
|        | 5        | 5.000    | 0.81                                    | 1.15           | 1.15 | 2.06           | 3.06 | 6.63            |

1 'V' and 'W' dimensions are for Mounting Styles J & JB and tie rod retained gland styles.

2 The 'WG' dimension for Buffer Seal Glands matches the 'WG' for standard glands.

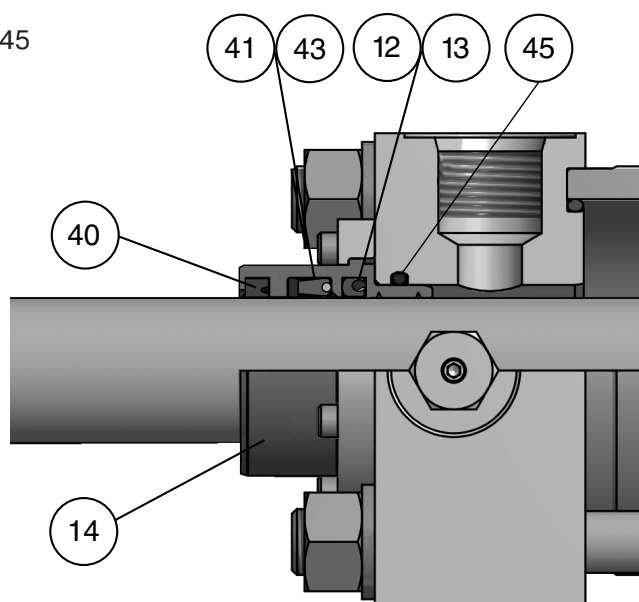
**⚠ PROP 65 WARNING** WARNING: This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

## 2HD/3HD & 2HB/3HB Buffer Seal Rod Gland Cartridge Kit and Rod Seal Kit Parts Identification

- Gland Cartridge Kits contain items 12, 13, 14, 40, 41 and 45 (43 in class 2, 5, and 6 kits only)
- Rod Seal Kits contain items 12, 13, 40, 41 and 45 (43 in class 2, 5 and 6 kits only)

### Parts List — Buffer Seal Gland

| Symbol | Description              |
|--------|--------------------------|
| 12     | Buffer Seal              |
| 13     | Buffer Seal Energizer    |
| 14     | Rod Gland                |
| 40     | Rod Wiper                |
| 41     | Rod Seal                 |
| 43     | Back-up Washer, rod seal |
| 45     | Gland O-Ring             |



## Series 2HD / 3HD & 2HB / 3HB Buffer Seal Gland Cartridge Kits and Rod Seal Kits

| Rod<br>Ø | Seal Type                                   |                               |                                         |                               |                                         |                               |                                         |                               |                                         |                               |
|----------|---------------------------------------------|-------------------------------|-----------------------------------------|-------------------------------|-----------------------------------------|-------------------------------|-----------------------------------------|-------------------------------|-----------------------------------------|-------------------------------|
|          | Class 1 Service<br>(Polyurethane & Nitrile) |                               | Class 2 Service<br>(Nitrile)            |                               | Class 3 Service<br>(EPR)                |                               | Class 5 Service<br>(FKM)                |                               | Class 6 Service<br>(Nitroxile)          |                               |
|          | Contains 1 ea.<br>Sym.# 14, 40, 41 & 45     |                               | Contains 1 ea.<br>Sym.# 14, 40, 41 & 45 |                               | Contains 1 ea.<br>Sym.# 14, 40, 41 & 45 |                               | Contains 1 ea.<br>Sym.# 14, 40, 41 & 45 |                               | Contains 1 ea.<br>Sym.# 14, 40, 41 & 45 |                               |
|          | Gland<br>Cartridge Kits                     | Rod Seal<br>Kits <sup>1</sup> | Gland<br>Cartridge<br>Kits              | Rod Seal<br>Kits <sup>1</sup> | Gland<br>Cartridge<br>Kits              | Rod Seal<br>Kits <sup>1</sup> | Gland<br>Cartridge<br>Kits              | Rod Seal<br>Kits <sup>1</sup> | Gland<br>Cartridge<br>Kits              | Rod Seal<br>Kits <sup>1</sup> |
| 0.625    | RG2HDB0061                                  | RK2HDB0061                    | RG2HDB0062                              | RK2HDB0062                    | RG2HDB0063                              | RK2HDB0063                    | RG2HDB0065                              | RK2HDB0065                    | RG2HDB0066                              | RK2HDB0066                    |
| 1.000    | RG2HDB0101                                  | RK2HDB0101                    | RG2HDB0102                              | RK2HDB0102                    | RG2HDB0103                              | RK2HDB0103                    | RG2HDB0105                              | RK2HDB0105                    | RG2HDB0106                              | RK2HDB0106                    |
| 1.375    | RG2HDB0131                                  | RK2HDB0131                    | RG2HDB0132                              | RK2HDB0132                    | RG2HDB0133                              | RK2HDB0133                    | RG2HDB0135                              | RK2HDB0135                    | RG2HDB0136                              | RK2HDB0136                    |
| 1.750    | RG2HDB0171                                  | RK2HDB0171                    | RG2HDB0172                              | RK2HDB0172                    | RG2HDB0173                              | RK2HDB0173                    | RG2HDB0175                              | RK2HDB0175                    | RG2HDB0176                              | RK2HDB0176                    |
| 2.000    | RG2HDB0201                                  | RK2HDB0201                    | RG2HDB0202                              | RK2HDB0202                    | RG2HDB0203                              | RK2HDB0203                    | RG2HDB0205                              | RK2HDB0205                    | RG2HDB0206                              | RK2HDB0206                    |
| 2.500    | RG2HDB0251                                  | RK2HDB0251                    | RG2HDB0252                              | RK2HDB0252                    | RG2HDB0253                              | RK2HDB0253                    | RG2HDB0255                              | RK2HDB0255                    | RG2HDB0256                              | RK2HDB0256                    |
| 3.000    | RG2HDB0301                                  | RK2HDB0301                    | RG2HDB0302                              | RK2HDB0302                    | RG2HDB0303                              | RK2HDB0303                    | RG2HDB0305                              | RK2HDB0305                    | RG2HDB0306                              | RK2HDB0306                    |
| 3.500    | RG2HDB0351                                  | RK2HDB0351                    | RG2HDB0352                              | RK2HDB0352                    | RG2HDB0353                              | RK2HDB0353                    | RG2HDB0355                              | RK2HDB0355                    | RG2HDB0356                              | RK2HDB0356                    |
| 4.000    | RG2HDB0401                                  | RK2HDB0401                    | RG2HDB0402                              | RK2HDB0402                    | RG2HDB0403                              | RK2HDB0403                    | RG2HDB0405                              | RK2HDB0405                    | RG2HDB0406                              | RK2HDB0406                    |
| 4.500    | RG2HDB0451                                  | RK2HDB0451                    | RG2HDB0452                              | RK2HDB0452                    | RG2HDB0453                              | RK2HDB0453                    | RG2HDB0455                              | RK2HDB0455                    | RG2HDB0456                              | RK2HDB0456                    |
| 5.000    | RG2HDB0501                                  | RK2HDB0501                    | RG2HDB0502                              | RK2HDB0502                    | RG2HDB0503                              | RK2HDB0503                    | RG2HDB0505                              | RK2HDB0505                    | RG2HDB0506                              | RK2HDB0506                    |
| 5.500    | RG2HDB0551                                  | RK2HDB0551                    | RG2HDB0552                              | RK2HDB0552                    | RG2HDB0553                              | RK2HDB0553                    | RG2HDB0555                              | RK2HDB0555                    | RG2HDB0556                              | RK2HDB0556                    |

<sup>1</sup>Rod seal kits do not include item 14.

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## Common Modifications

**Modifications:** The following modifications can be supplied on most Parker cylinders.

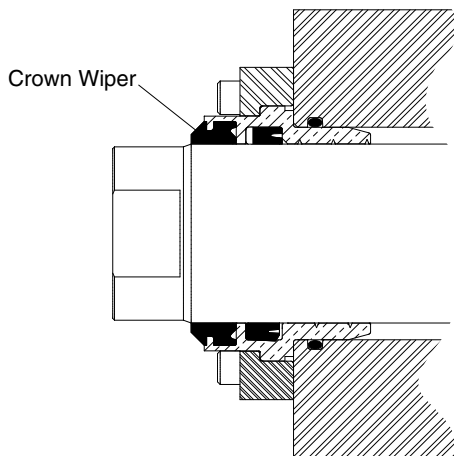
### Metallic Rod Scraper

When specified metallic rod scrapers can be supplied instead of the standard polyurethane wiperseal. Recommended in applications where contaminants tend to cling to the extended piston rod and would damage the polyurethane wiperseal. Installation of metallic rod scraper does not affect cylinder dimensions. It is available at extra cost.

### Parker Crown Wiper™ for Series 2HD / 2HB and 7.00" & 8.00" bore 3HD / 3HB

For environments that contain fine abrasive particulate specify the Crown Wiper option. The Crown Wiper is a proven superior alternative to piston rod end boots or metallic wipers that can ingest particulate. It has a sharp leading edge to effectively clean the piston rod and a beveled shape to prevent contaminant intrusion by channeling it away from the gland. It also acts as a secondary seal to wipe clean any oil film adhering to the rod on the extend stroke.

Standard Crown Wiper material for Seal Class 1 and 2 service is durable polyurethane. Optional FKM material is available for Class 5 service. The Crown Wiper requires a unique gland but does not change cylinder mounting dimensions



Crown Wiper Rod Gland Kits are available to retrofit existing 2HD / 2HB & 3HD / 3HB cylinders. See Section F Replacement Parts for details.

## Heavy Duty Hydraulic Cylinders Custom Modifications

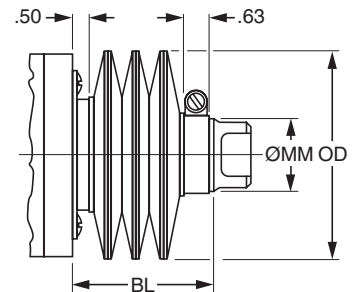
### Rod End Boots

Cylinders have a hardened bearing surface on the piston rod to resist external damage, and are equipped with the high efficiency "Wiperseal" to remove external dust and dirt. Exposed piston rods that are subjected to contaminants with air hardening properties, such as paint, should be protected. In such applications, the use of a collapsing cover should be considered. This is commonly referred to as a "boot". Calculate the longer rod end required to accommodate the collapsed length of the boot from the following data.

| LF | .13  | .13   | .13   | .13   | .13   | .13   | .10   | .10   | .10   | .10   | .10   |
|----|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| OD | 2.25 | 2.63  | 3.00  | 3.38  | 3.75  | 4.38  | 5.13  | 5.63  | 6.25  | 7.00  | 7.50  |
| MM | .625 | 1.000 | 1.375 | 1.750 | 2.000 | 2.500 | 3.000 | 3.500 | 4.000 | 5.000 | 5.500 |

To determine extra length of piston rod required to accommodate boot, calculate  
 $BL = \text{Stroke} \times LF + 1.13"$   
 $BL + \text{Std. W or WF} = \text{length of piston rod to extend beyond the retainer.}$

NOTE: Check all Boot O.D's against std. "E" dimension from catalog. This may be critical on foot mounted cylinders.



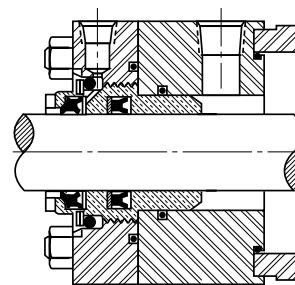
### Gland Drain

Hydraulic fluids tend to adhere to the piston rods, during the extend stroke, and an accumulation of fluid can collect in the cavity behind the gland wiperseal on long stroke cylinders.

A 1/8" NPTF gland drain port can be provided in the gland retainer. A passage in the gland between the wiperseal and lipseal is provided to drain off any accumulation of fluid between the seals. See drawing below.

It is recommended that the gland drain port be piped back to the fluid reservoir and that the reservoir be located below the level of the head of the cylinder.

On 1.50" bore with 0.625" rod the drain port is located in the head adjacent to the port. The retainer thickness on



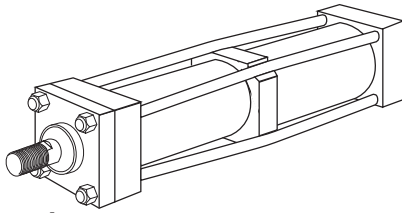
1.50" bore with 1.000" rod and gland drain is increased to 0.63". On 2.00"-8.00" bore sizes the drain port is located in the retainer as shown. On Style JJ with gland drain, the drain port is in the head.

### Air Bleeds

In most hydraulic circuits, cylinders are considered self-bleeding when cycled full stroke. If air bleeds are required and specified, 1/8" NPTF Air Bleed Ports for venting air can be provided at both ends of the cylinder body, or on the head or cap. To order, specify "Bleed Port", and indicate position desired.

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## Common Modifications



### Tie Rod Supports

**Rigidity of Envelope** – Parker heavy duty hydraulic cylinders have advantages in rigidity within the limits of the cylinder tube to resist buckling. For long stroke tie rod cylinders, within practical limits, Parker provides Tie Rod Supports (see table below) that move the tie rod centerlines radially outward.

To avoid the need for Tie Rod Supports, specify Series 2HB non-tie rod style for long stroke applications.

Standard tie rod supports are kept within the envelope dimensions of the head and cap, and generally do not interfere with mounting a long cylinder.

| Number of<br>Supports Required | Bore<br>Ø | Stroke (Inches) |    |    |    |    |    |     |     |     |     |     |     |
|--------------------------------|-----------|-----------------|----|----|----|----|----|-----|-----|-----|-----|-----|-----|
|                                |           | 36              | 48 | 60 | 72 | 84 | 96 | 108 | 120 | 132 | 144 | 156 | 168 |
|                                | 1.50      | —               | —  | 1  | 1  | 1  | 2  | 2   | 2   | 3   | 3   | 3   | 4   |
|                                | 2.00      | —               | —  | —  | 1  | 1  | 1  | 1   | 2   | 2   | 2   | 2   | 3   |
|                                | 2.50      | —               | —  | —  | —  | —  | 1  | 1   | 1   | 1   | 1   | 2   | 2   |
|                                | 3.25      | —               | —  | —  | —  | —  | —  | —   | 1   | 1   | 1   | 1   | 1   |
|                                | 4.00      | —               | —  | —  | —  | —  | —  | —   | —   | —   | 1   | 1   | 1   |

Note: 5.00" through 14.00" bore sizes — no supports required.

### Stroke Adjusters

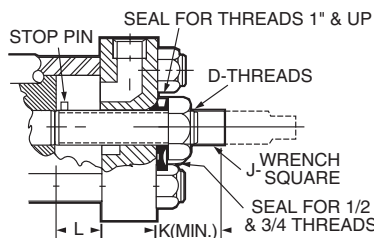
For the requirement where adjusting the stroke is specified. Parker has several designs to offer, one of which is illustrated below. This is suitable for infrequent adjustment and is economical<sup>1</sup>.

| Bore<br>Ø  | D          | J    | K    | L<br>(Max.) |
|------------|------------|------|------|-------------|
| 1.50       | 1/2 - 20   | 0.31 | 0.94 | 5           |
| 2.00       | 3/4 - 16   | 0.44 | 1.25 | 8           |
| 2.50, 3.25 | 1 - 14     | 0.63 | 1.69 | 9           |
| 4.00       | 1 1/2 - 12 | 0.94 | 2.13 | 18          |
| 5.00       | 2 - 12     | 0.94 | 2.69 | 20          |
| 6.00       | 2 1/2 - 12 | 1.69 | 3.13 | 20          |
| 7.00       | 3 - 12     | 2.00 | 3.25 | 20          |
| 8.00       | 3 1/2 - 12 | 2.38 | 3.50 | 20          |

Here a "retracting stroke adjuster" must be called for in specifications, and the length of the adjustment must be specified.

Where frequent adjustment or cushions at the cap end are required, other designs are available according to application needs.

<sup>1</sup> Infrequent is defined by positioning the retract stroke in a couple of attempts at original machine set up. The frequent stroke adjuster is recommended for adjustments required after the original equipment has been adjusted by the original machine manufacturer.

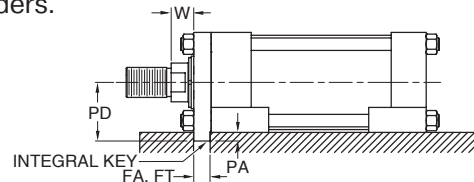


## Heavy Duty Hydraulic Cylinders Custom Modifications

### Thrust Key Mountings

Thrust key mountings eliminate the need of using fitted bolts or external keys on side mounted cylinders. Parker cylinders in mounting styles CP and FP can be provided with the gland retainer plate extended below the mounting side of the cylinder (see illustration below). This extended retainer plate can then be fitted into a keyway milled into the mounting surface of the machine member. This is referred to as the "P" Modification of any side mounting style.

Note: Please consult factory when replacing HD Series cylinders.



| Bore<br>Ø | FA<br>(Series 2HD/<br>3HD, 2HB/3HB)                         | FT<br>(Series<br>2H/3H)                                     | PA   | PD<br>Mtg. Styles<br>CP & FP |
|-----------|-------------------------------------------------------------|-------------------------------------------------------------|------|------------------------------|
| 1.50      | .361 $\begin{smallmatrix} -.001 \\ +.000 \end{smallmatrix}$ | .312 $\begin{smallmatrix} -.002 \\ +.000 \end{smallmatrix}$ | 0.19 | 1.44                         |
| 2.00      | .611 $\begin{smallmatrix} -.001 \\ +.000 \end{smallmatrix}$ | .562 $\begin{smallmatrix} -.002 \\ +.000 \end{smallmatrix}$ | 0.31 | 1.81                         |
| 2.50      | .611 $\begin{smallmatrix} -.001 \\ +.000 \end{smallmatrix}$ | .562 $\begin{smallmatrix} -.002 \\ +.000 \end{smallmatrix}$ | 0.31 | 2.06                         |
| 3.25      | .736 $\begin{smallmatrix} -.001 \\ +.000 \end{smallmatrix}$ | .687 $\begin{smallmatrix} -.003 \\ +.000 \end{smallmatrix}$ | 0.38 | 2.63                         |
| 4.00      | .861 $\begin{smallmatrix} -.001 \\ +.000 \end{smallmatrix}$ | .812 $\begin{smallmatrix} -.003 \\ +.000 \end{smallmatrix}$ | 0.44 | 2.94                         |
| 5.00      | .861 $\begin{smallmatrix} -.001 \\ +.000 \end{smallmatrix}$ | .812 $\begin{smallmatrix} -.003 \\ +.000 \end{smallmatrix}$ | 0.44 | 3.69                         |
| 6.00      | .986 $\begin{smallmatrix} -.001 \\ +.000 \end{smallmatrix}$ | .937 $\begin{smallmatrix} -.003 \\ +.000 \end{smallmatrix}$ | 0.50 | 4.25                         |
| 7.00      | .986 $\begin{smallmatrix} -.001 \\ +.000 \end{smallmatrix}$ | .937 $\begin{smallmatrix} -.003 \\ +.000 \end{smallmatrix}$ | 0.50 | 4.75                         |
| 8.00      | .986 $\begin{smallmatrix} -.001 \\ +.000 \end{smallmatrix}$ | .937 $\begin{smallmatrix} -.003 \\ +.000 \end{smallmatrix}$ | 0.50 | 5.25                         |

### Metric Piston Rod Thread

The table below lists the standard thread supplied when Piston Rod Thread type M is specified in the cylinder model code.

| MM<br>Rod<br>Ø | Thread            |                         | A     |
|----------------|-------------------|-------------------------|-------|
|                | Style<br>8M<br>CC | Styles<br>4M & 9M<br>KK |       |
| 0.625          | M12x1.5           | M10x1.5                 | 0.75  |
| 1.000          | M22x1.5           | M20x1.5                 | 1.13  |
| 1.375          | M30x2             | M26x1.5                 | 1.63  |
| 1.750          | M39x2             | M33x2                   | 2.00  |
| 2.000          | M45x2             | M39x2                   | 2.25  |
| 2.500          | M56x2             | M48x2                   | 3.00  |
| 3.000          | M68x2             | M58x2                   | 3.50  |
| 3.500          | M76x2             | M64x2                   | 3.50  |
| 4.000          | M95x2             | M76x2                   | 4.00  |
| 4.500          | M110x2            | M80x2                   | 4.50  |
| 5.000          | M110x2            | M90x2                   | 5.00  |
| 5.500          | M130x2            | M100x2                  | 5.50  |
| 7.000          | -                 | M125x4                  | 7.00  |
| 8.000          | -                 | M140x4                  | 8.00  |
| 9.000          | -                 | M160x4                  | 9.00  |
| 10.000         | -                 | M180x4                  | 10.00 |

## Global Shield™ Rod Coating Technology

### A Dramatically Different Approach to Resisting Corrosion

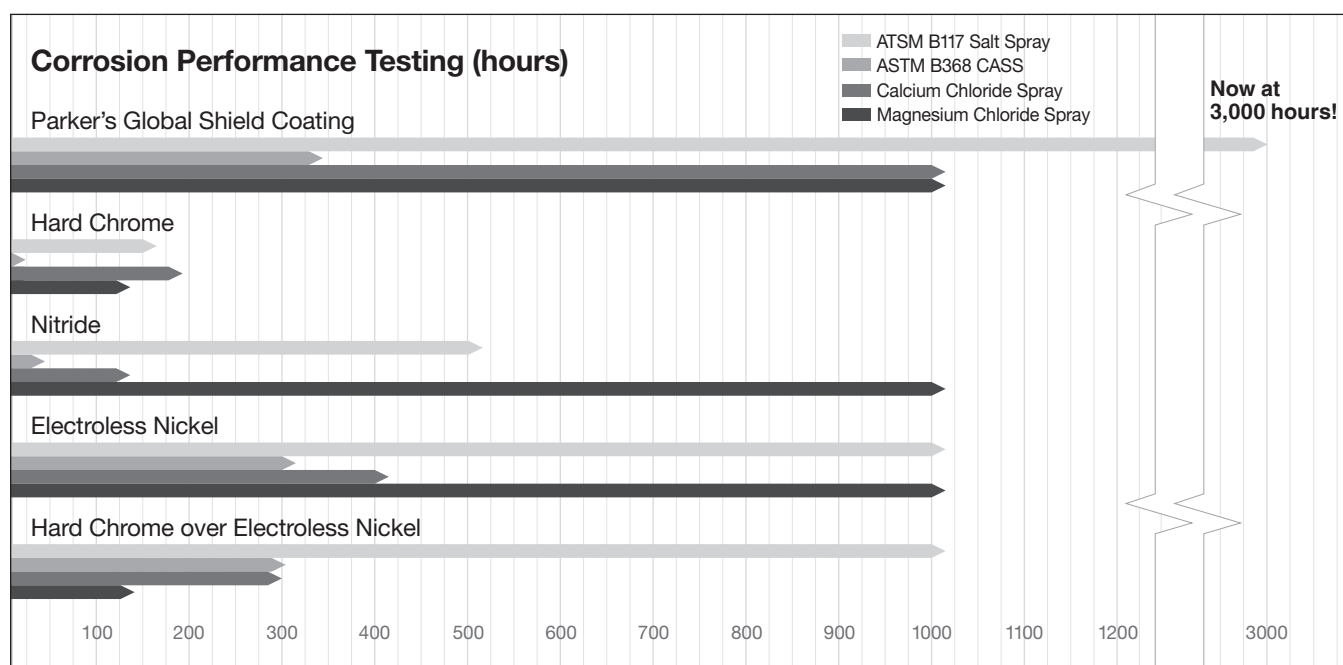
Parker's **Global Shield** rod coating technology is specifically designed to address corrosion resistance requirements of challenging industrial applications. When compared to traditional rod coatings, **Global Shield** has the following advantages:

- **Significantly Improved Corrosion Resistance** from the single-layer, fully dense, submicron structure and the lack of micro cracks inherent to chrome plating.
- **Lower Friction**
- **Ductile and Tough** so when the rod bends, it does too

- **Engineered Hardness** (HRC 54 minimum) for wear-resistance

The **value** that you will receive from **Global Shield** includes:

- **Less Downtime** from reduced maintenance intervals (cylinder repairs and seal replacements)
- **Longer Seal Life** in corrosive environments
- **Lower Service Costs** since you won't need to replace the piston rod due to corrosion



### Performance Validated in the Lab and in the field

This breakthrough proprietary technology, owned and manufactured by Parker Hannifin Corporation, has been thoroughly tested in the lab and in the field to validate performance in the areas of corrosion and dynamic wear resistance. Cylinders protected with

Parker's Global Shield coating have demonstrated resistance to corrosion up to 8x longer than conventional coatings. Tests also confirm leak-free performance even after 1 million cycles and 2,000 hours of salt spray.

### Availability

- Rod diameters from 1/2" to 15"
- Rod lengths to 13 feet
- Standard thickness – 0.001"  
*Up to 0.020" available; corrosion protection increases as the thickness increases*
- Standard substrate – 1045/1050 carbon steel  
*Other substrates available*

### How to Order

Enter an 'S' in the Special Modifications field of the model number and specify Global Shield Piston Rod Coating. Unless otherwise specified, standard 0.001" thickness will be supplied.

For additional Global Shield information see Bulletin HY08-0896.

**⚠ PROP 65 WARNING** WARNING: This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

Section H

Engineering Data

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## Theoretical Push Forces for Hydraulic Cylinders

| Cylinder Bore Ø | Piston Area (Sq. In.) | Cylinder Push Stroke Force in Pounds at Various Pressures |       |        |        |        |        |        |
|-----------------|-----------------------|-----------------------------------------------------------|-------|--------|--------|--------|--------|--------|
|                 |                       | 100                                                       | 250   | 500    | 1000   | 1500   | 2000   | 3000   |
| 1.50            | 1.77                  | 177                                                       | 443   | 885    | 1770   | 2651   | 3540   | 5310   |
| 2.00            | 3.14                  | 314                                                       | 785   | 1570   | 3140   | 4712   | 6280   | 9420   |
| 2.50            | 4.91                  | 491                                                       | 1228  | 2455   | 4910   | 7363   | 9820   | 14730  |
| 3.25            | 8.30                  | 830                                                       | 2075  | 4150   | 8300   | 12444  | 16600  | 24900  |
| 4.00            | 12.57                 | 1257                                                      | 3143  | 6285   | 12570  | 18850  | 25140  | 37710  |
| 5.00            | 19.64                 | 1964                                                      | 4910  | 9820   | 19640  | 29453  | 39280  | 58920  |
| 6.00            | 28.27                 | 2827                                                      | 7068  | 14135  | 28270  | 42412  | 56540  | 84810  |
| 7.00            | 38.49                 | 3849                                                      | 9623  | 19245  | 38490  | 57727  | 76980  | 115470 |
| 8.00            | 50.27                 | 5027                                                      | 12568 | 25135  | 50270  | 75398  | 100540 | 150810 |
| 10.00           | 78.54                 | 7854                                                      | 19635 | 39270  | 78540  | 117810 | 157080 | 235620 |
| 12.00           | 113.10                | 11310                                                     | 28275 | 56550  | 113100 | 169650 | 226200 | 339300 |
| 14.00           | 153.94                | 15394                                                     | 38485 | 76970  | 153940 | 230910 | 307880 | 461820 |
| 16.00           | 201.06                | 20106                                                     | 50265 | 100530 | 201060 | 301590 | 402120 | 603180 |
| 18.00           | 254.47                | 25447                                                     | 63620 | 127230 | 254470 | 381700 | 508940 | 763410 |
| 20.00           | 314.16                | 31416                                                     | 78540 | 157080 | 314160 | 471240 | 628320 | 942480 |

## General Formula

The cylinder output forces are derived from the formula:

$$F = P \times A$$

Where F = Force in pounds.

P = Pressure at the cylinder in pounds per square inch, gauge.

A = Effective area of cylinder piston in square inches.

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**Theoretical Pull Forces for Hydraulic Cylinders**

| Cylinder Bore Ø | Piston Rod Ø | Piston Rod Area (Sq. In.) | Cylinder Pull Force in Pounds at Various Pressures (psi) |       |        |        |        |        |        |
|-----------------|--------------|---------------------------|----------------------------------------------------------|-------|--------|--------|--------|--------|--------|
|                 |              |                           | 100                                                      | 250   | 500    | 1000   | 1500   | 2000   | 3000   |
| 1.50            | 0.625        | 0.307                     | 146                                                      | 365   | 730    | 1460   | 2190   | 2920   | 4380   |
|                 | 1.000        | 0.785                     | 98                                                       | 245   | 491    | 982    | 1473   | 1964   | 2946   |
| 2.00            | 1.000        | 0.785                     | 236                                                      | 589   | 1178   | 2355   | 3533   | 4710   | 7065   |
|                 | 1.375        | 1.48                      | 166                                                      | 414   | 828    | 1655   | 2483   | 3310   | 4965   |
| 2.50            | 1.000        | 0.785                     | 413                                                      | 1031  | 2063   | 4125   | 6188   | 8250   | 12375  |
|                 | 1.375        | 1.48                      | 343                                                      | 856   | 1713   | 3425   | 5138   | 6850   | 10275  |
|                 | 1.750        | 2.41                      | 250                                                      | 625   | 1250   | 2500   | 3750   | 5000   | 7500   |
| 3.25            | 1.375        | 1.48                      | 682                                                      | 1704  | 3408   | 6815   | 10223  | 13630  | 20445  |
|                 | 1.750        | 2.41                      | 589                                                      | 1473  | 2945   | 5890   | 8835   | 11780  | 17670  |
|                 | 2.000        | 3.14                      | 516                                                      | 1290  | 2580   | 5160   | 7740   | 10320  | 15480  |
| 4.00            | 1.750        | 2.41                      | 1016                                                     | 2540  | 5080   | 10160  | 15240  | 20320  | 30480  |
|                 | 2.000        | 3.14                      | 943                                                      | 2358  | 4715   | 9430   | 14145  | 18860  | 28290  |
|                 | 2.500        | 4.91                      | 766                                                      | 1915  | 3830   | 7660   | 11490  | 15320  | 22980  |
| 5.00            | 2.000        | 3.14                      | 1650                                                     | 4125  | 8250   | 16500  | 24750  | 33000  | 49500  |
|                 | 2.500        | 4.91                      | 1473                                                     | 3683  | 7365   | 14730  | 22095  | 29460  | 44190  |
|                 | 3.000        | 7.07                      | 1257                                                     | 3143  | 6285   | 12570  | 18855  | 25140  | 37710  |
|                 | 3.500        | 9.62                      | 1002                                                     | 2505  | 5010   | 10020  | 15030  | 20040  | 30060  |
| 6.00            | 2.500        | 4.91                      | 2336                                                     | 5840  | 11680  | 23360  | 35040  | 46720  | 70080  |
|                 | 3.000        | 7.07                      | 2120                                                     | 5300  | 10600  | 21200  | 31800  | 42400  | 63600  |
|                 | 3.500        | 9.62                      | 1865                                                     | 4663  | 9325   | 18650  | 27975  | 37300  | 55950  |
|                 | 4.000        | 12.57                     | 1570                                                     | 3925  | 7850   | 15700  | 23550  | 31400  | 47100  |
| 7.00            | 3.000        | 7.07                      | 3142                                                     | 7855  | 15710  | 31420  | 47130  | 62840  | 94260  |
|                 | 3.500        | 9.62                      | 2887                                                     | 7218  | 14435  | 28870  | 43305  | 57740  | 86610  |
|                 | 4.000        | 12.57                     | 2592                                                     | 6480  | 12960  | 25920  | 38880  | 51840  | 77760  |
|                 | 4.500        | 15.90                     | 2259                                                     | 5648  | 11295  | 22590  | 33885  | 45180  | 67770  |
|                 | 5.000        | 19.63                     | 1886                                                     | 4715  | 9430   | 18860  | 28290  | 37720  | 56580  |
| 8.00            | 3.500        | 9.62                      | 4065                                                     | 10163 | 20325  | 40650  | 60975  | 81300  | 121950 |
|                 | 4.000        | 12.57                     | 3770                                                     | 9425  | 18850  | 37700  | 56550  | 75400  | 113100 |
|                 | 4.500        | 15.90                     | 3437                                                     | 8593  | 17185  | 34370  | 51555  | 68740  | 103110 |
|                 | 5.000        | 19.63                     | 3064                                                     | 7660  | 15320  | 30640  | 45960  | 61280  | 91920  |
|                 | 5.500        | 23.76                     | 2651                                                     | 6628  | 13255  | 26510  | 39765  | 53020  | 79530  |
| 10.00           | 4.500        | 15.90                     | 6264                                                     | 15660 | 31320  | 62640  | 93960  | 125280 | 187920 |
|                 | 5.000        | 19.63                     | 5891                                                     | 14728 | 29455  | 58910  | 88365  | 117820 | 176730 |
|                 | 5.500        | 23.76                     | 5478                                                     | 13695 | 27390  | 54780  | 82170  | 109560 | 164340 |
|                 | 7.000        | 38.48                     | 4006                                                     | 10015 | 20030  | 40060  | 60090  | 80120  | 120180 |
| 12.00           | 5.500        | 23.76                     | 8934                                                     | 22335 | 44670  | 89340  | 134010 | 178680 | 268020 |
|                 | 7.000        | 38.48                     | 7462                                                     | 18655 | 37310  | 74620  | 111930 | 149240 | 223860 |
|                 | 8.000        | 50.26                     | 6284                                                     | 15710 | 31420  | 62840  | 94260  | 125680 | 188520 |
| 14.00           | 7.000        | 38.48                     | 11546                                                    | 28865 | 57730  | 115460 | 173190 | 230920 | 346380 |
|                 | 8.000        | 50.26                     | 10368                                                    | 25920 | 51840  | 103680 | 155520 | 207360 | 311040 |
|                 | 10.000       | 78.54                     | 7540                                                     | 18850 | 37700  | 75400  | 113100 | 150800 | 226200 |
| 16.00           | 8.000        | 50.26                     | 15080                                                    | 37700 | 75400  | 150800 | 226200 | 301600 | 452400 |
|                 | 9.000        | 63.62                     | 13744                                                    | 34360 | 68720  | 137440 | 206160 | 274880 | 412320 |
|                 | 10.000       | 78.54                     | 12252                                                    | 30630 | 61260  | 122520 | 183780 | 245040 | 367560 |
| 18.00           | 9.000        | 63.62                     | 19085                                                    | 47713 | 95425  | 190850 | 286275 | 381700 | 572550 |
|                 | 10.000       | 78.54                     | 17593                                                    | 43983 | 87965  | 175930 | 263895 | 351860 | 527790 |
| 20.00           | 10.000       | 78.54                     | 23562                                                    | 58905 | 117810 | 235620 | 353430 | 471240 | 706860 |

**Cylinder Weights – Series 2H/2HD & 3H/3HD** Engineering Data

The weights shown below are for standard Series 2H / 2HD and 3H / 3HD hydraulic cylinders equipped with various diameter piston rods. To determine the net weights of a cylinder, first select the proper basic weight for zero stroke, then calculate the weight of the cylinder stroke and add the result to the basic weight. For extra

rod extension use piston rod weights per inch shown in Table C. Weights of cylinders with intermediate rods may be estimated from table below by taking the difference between the piston rod weights per inch and adding it to the Code 1 weight for the cylinder bore size involved.

**Table A** Cylinder Weights, in pounds, for Series 2H / 2HD, 3H / 3HD (7.00" & 8.00") hydraulic cylinders

| Bore Ø | Rod Ø | Rod Code | Single Rod Cylinders<br>Basic Weight Zero Stroke |                                      | Add Per Inch of Stroke | Double Rod Cylinders<br>Basic Weight Zero Stroke |                       | Add Per Inch of Stroke |
|--------|-------|----------|--------------------------------------------------|--------------------------------------|------------------------|--------------------------------------------------|-----------------------|------------------------|
|        |       |          | F, H, HB, J, JB, T, TB, TC, TD                   | BB, C, D, DB, DD, DE, HH, JJ, SB, SE |                        | KF, KJ, KJB, KT, KTB, KTD                        | KC, KD, KDD, KDE, KJJ |                        |
| 1.50   | 0.625 | 1        | 7.8                                              | 9.0                                  | 0.5                    | 9.7                                              | 10.8                  | 0.6                    |
|        | 1.000 | 2        | 8.4                                              | 9.3                                  | 0.6                    | 9.1                                              | 10.7                  | 0.8                    |
| 2.00   | 1.000 | 1        | 11.6                                             | 13.2                                 | 0.8                    | 14.6                                             | 16.8                  | 1.0                    |
|        | 1.375 | 2        | 13.5                                             | 17.1                                 | 1.0                    | 19.4                                             | 20.6                  | 1.4                    |
| 2.50   | 1.000 | 1        | 17.0                                             | 19.5                                 | 1.1                    | 21.0                                             | 24.5                  | 1.3                    |
|        | 1.750 | 2        | 22.5                                             | 25.5                                 | 1.5                    | 27.0                                             | 30.0                  | 2.2                    |
| 3.25   | 1.375 | 1        | 32.0                                             | 41.0                                 | 1.8                    | 43.0                                             | 52.0                  | 2.2                    |
|        | 2.000 | 2        | 37.0                                             | 46.0                                 | 2.2                    | 48.0                                             | 57.0                  | 3.1                    |
| 4.00   | 1.750 | 1        | 48.0                                             | 53.0                                 | 2.5                    | 59.0                                             | 63.0                  | 3.2                    |
|        | 2.500 | 2        | 52.0                                             | 58.0                                 | 3.2                    | 92.0                                             | 97.0                  | 4.6                    |
| 5.00   | 2.000 | 1        | 76.0                                             | 82.0                                 | 3.4                    | 96.0                                             | 102.0                 | 4.8                    |
|        | 3.500 | 2        | 88.0                                             | 86.0                                 | 5.2                    | 117.0                                            | 123.0                 | 7.9                    |
| 6.00   | 2.500 | 1        | 125.0                                            | 133.0                                | 5.2                    | 153.0                                            | 159.0                 | 6.6                    |
|        | 4.000 | 2        | 133.0                                            | 140.0                                | 7.3                    | 182.0                                            | 190.0                 | 10.9                   |
| 7.00   | 3.000 | 1        | 233.0                                            | 242.0                                | 6.7                    | 320.0                                            | 339.0                 | 8.7                    |
|        | 5.000 | 2        | 240.0                                            | 253.0                                | 10.3                   | 341.0                                            | 360.0                 | 15.9                   |
| 8.00   | 3.500 | 1        | 262.0                                            | 276.0                                | 9.0                    | 323.0                                            | 331.0                 | 11.7                   |
|        | 5.500 | 2        | 300.0                                            | 309.0                                | 13.0                   | 390.0                                            | 411.0                 | 19.7                   |

**Table B** Cylinder Weights, in pounds, for Series 3H large bore hydraulic cylinders

| Bore Ø | Rod Ø  | Rod Code | Single Rod Cylinders<br>Basic Weight Zero Stroke |            |        |       |                        | Double Rod Cylinders                                |                        |
|--------|--------|----------|--------------------------------------------------|------------|--------|-------|------------------------|-----------------------------------------------------|------------------------|
|        |        |          | D, DB                                            | DD, JJ, HH | JB, HB | BB, C | Add Per Inch of Stroke | Basic Weight Zero Stroke Add to All Mounting Styles | Add Per Inch of Stroke |
| 10.00  | 4.500  | 1        | 562                                              | 646        | 684    | 607   |                        | 43                                                  | 20                     |
|        | 5.000  | 3        | 574                                              | 656        | 695    | 619   | 15                     | 50                                                  | 21                     |
|        | 5.500  | 4        | 583                                              | 667        | 705    | 628   | 16                     | 64                                                  | 24                     |
|        | 7.000  | 2        | 620                                              | 704        | 742    | 665   | 17                     | 101                                                 | 32                     |
| 12.00  | 5.500  | 1        | 924                                              | 1057       | 1136   | 1000  | 21                     | 64                                                  | 29                     |
|        | 7.000  | 3        | 961                                              | 1094       | 1173   | 1036  | 22                     | 101                                                 | 37                     |
|        | 8.000  | 2        | 1022                                             | 1155       | 1234   | 1097  | 26                     | 162                                                 | 43                     |
| 14.00  | 7.000  | 1        | 1335                                             | 1520       | 1582   | 1485  | 29                     | 101                                                 | 39                     |
|        | 8.000  | 3        | 1396                                             | 1581       | 1643   | 1546  | 28                     | 162                                                 | 45                     |
|        | 10.000 | 2        | 1496                                             | 1681       | 1743   | 1646  | 31                     | 262                                                 | 61                     |

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| Bore Ø | Rod Ø  | Rod Code | Single Rod Cylinders<br>Basic Weight Zero Stroke |        |      |                        | Double Rod Cylinders                                |                        |
|--------|--------|----------|--------------------------------------------------|--------|------|------------------------|-----------------------------------------------------|------------------------|
|        |        |          | JJ, HH                                           | JB, HB | BB   | Add Per Inch of Stroke | Basic Weight Zero Stroke Add to All Mounting Styles | Add Per Inch of Stroke |
| 16.00  | 8.000  | 1        | 2073                                             | 2257   | 2226 | 35                     | 149                                                 | 49                     |
|        | 9.000  | 3        | 2122                                             | 2305   | 2275 | 39                     | 198                                                 | 57                     |
|        | 10.000 | 4        | 2181                                             | 2364   | 2334 | 43                     | 257                                                 | 65                     |
| 18.00  | 9.000  | 1        | 3165                                             | 3256   | 3330 | 45                     | 198                                                 | 63                     |
|        | 10.000 | 3        | 3224                                             | 3315   | 3390 | 50                     | 257                                                 | 72                     |
| 20.00  | 10.000 | 1        | 4231                                             | 4406   | 4551 | 57                     | 257                                                 | 79                     |

**Table C** Extra weight for longer than standard rod extensions can be calculated from the table below.

| Rod Ø | Piston Rod Weight Per Inch | Rod Ø | Piston Rod Weight Per Inch | Rod Ø  | Piston Rod Weight Per Inch |
|-------|----------------------------|-------|----------------------------|--------|----------------------------|
| 0.625 | 0.09                       | 2.500 | 1.40                       | 5.000  | 5.56                       |
| 1.000 | 0.22                       | 3.000 | 2.00                       | 5.500  | 6.72                       |
| 1.375 | 0.42                       | 3.500 | 2.72                       | 7.000  | 10.89                      |
| 1.750 | 0.68                       | 4.000 | 3.56                       | 8.000  | 14.22                      |
| 2.000 | 0.89                       | 4.500 | 4.51                       | 10.000 | 22.23                      |

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The weights shown below are for standard Series 2HB and 3HB hydraulic cylinders with various diameter piston rods. To determine the net weight of a cylinder, first select the proper basic weight for zero stroke, then calculate the weight of the cylinder stroke and add the result to the basic weight. For extra rod

extension use piston rod weights per inch shown in Table B. Weights of cylinders with intermediate rods may be estimated from the table below by taking the difference between the piston rod weights per inch and adding it to the Code 1 weight for the cylinder bore size involved.

**Table A** Cylinder weights, in pounds, for Series 2HB and 3HB 7.00" - 8.00" hydraulic cylinders

| Bore Ø | Rod Ø | Rod Code | Single Rod Cylinders<br>Basic Weight Zero Stroke |                     |                       | Add Per Inch<br>of Stroke | Double Rod Cylinders<br>Basic Weight Zero Stroke |                          | Add Per Inch<br>of Stroke |
|--------|-------|----------|--------------------------------------------------|---------------------|-----------------------|---------------------------|--------------------------------------------------|--------------------------|---------------------------|
|        |       |          | T                                                | C, D, DB,<br>DD, DE | BB, HH,<br>JJ, SB, SE |                           | KT                                               | KC, KD,<br>KDD, KDE, KJJ |                           |
| 1.50   | 0.625 | 1        | 9.1                                              | 10.3                | 10.3                  | 0.4                       | 11.0                                             | 12.1                     | 0.5                       |
|        | 1.000 | 2        | 9.7                                              | 10.6                | 10.6                  | 0.5                       | 10.4                                             | 12.0                     | 0.7                       |
| 2.00   | 1.000 | 1        | 13.6                                             | 15.2                | 15.3                  | 0.6                       | 16.6                                             | 18.9                     | 0.8                       |
|        | 1.375 | 2        | 15.5                                             | 19.1                | 19.2                  | 0.8                       | 21.4                                             | 22.7                     | 1.2                       |
| 2.50   | 1.000 | 1        | 19.5                                             | 22.0                | 22.1                  | 0.8                       | 23.5                                             | 27.1                     | 1.1                       |
|        | 1.750 | 2        | 25.0                                             | 28.0                | 28.1                  | 1.3                       | 29.5                                             | 32.6                     | 2.0                       |
| 3.25   | 1.375 | 1        | 37.3                                             | 46.3                | 46.5                  | 1.4                       | 48.3                                             | 57.5                     | 1.8                       |
|        | 2.000 | 2        | 42.3                                             | 51.3                | 51.5                  | 1.9                       | 53.3                                             | 62.5                     | 2.8                       |
| 4.00   | 1.750 | 1        | 55.6                                             | 60.6                | 60.8                  | 1.8                       | 66.6                                             | 70.8                     | 2.5                       |
|        | 2.500 | 2        | 59.6                                             | 65.6                | 65.8                  | 2.6                       | 99.6                                             | 104.8                    | 4.0                       |
| 5.00   | 2.000 | 1        | 92.1                                             | 98.1                | 98.8                  | 2.7                       | 112.1                                            | 118.8                    | 3.6                       |
|        | 3.500 | 2        | 104.1                                            | 102.1               | 102.8                 | 4.5                       | 133.1                                            | 139.8                    | 7.2                       |
| 6.00   | 2.500 | 1        | 149.6                                            | 157.6               | 158.6                 | 4.3                       | 177.6                                            | 184.6                    | 5.7                       |
|        | 4.000 | 2        | 157.6                                            | 164.6               | 165.6                 | 6.5                       | 206.6                                            | 215.6                    | 10.0                      |
| 7.00   | 3.000 | 1        | 271.1                                            | 280.1               | 281.9                 | 5.3                       | 358.1                                            | 378.9                    | 7.3                       |
|        | 5.000 | 2        | 278.1                                            | 291.1               | 292.9                 | 8.9                       | 379.1                                            | 399.9                    | 14.5                      |
| 8.00   | 3.500 | 1        | 304.5                                            | 318.5               | 320.9                 | 7.5                       | 365.5                                            | 375.9                    | 10.2                      |
|        | 5.500 | 2        | 342.5                                            | 351.5               | 353.9                 | 11.5                      | 432.5                                            | 455.9                    | 18.2                      |

**Table B** Extra weight for longer than standard rod extensions can be calculated from the table below.

| Rod Ø | Piston Rod Weight Per Inch | Rod Ø | Piston Rod Weight Per Inch | Rod Ø | Piston Rod Weight Per Inch |
|-------|----------------------------|-------|----------------------------|-------|----------------------------|
| 0.625 | 0.09                       | 2.000 | 0.89                       | 4.000 | 3.56                       |
| 1.000 | 0.22                       | 2.500 | 1.40                       | 4.500 | 4.51                       |
| 1.375 | 0.42                       | 3.000 | 2.00                       | 5.000 | 5.56                       |
| 1.750 | 0.68                       | 3.500 | 2.72                       | 5.500 | 6.72                       |

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**Operating Fluids and Temperature Range**

Fluid Power cylinders are designed for use with pressurized air, hydraulic oil and fire resistant fluids, in some cases special seals are required.

**Class 1 – Standard Seals**

Class 1 seals are intended for use with fluids such as: air, nitrogen, mineral base hydraulic oil or MIL-H-5606 within the temperature range of -10°F (-23°C) to +165°F (+74°C). Generally they are nitrile except for piston rod seals in hydraulic cylinders. However the individual seals may be nitrile (Buna-N) enhanced polyurethane, polymyte, PTFE or filled PTFE.

**Class 2 – Water Base Fluid Seals**

Generally class 2 seals are intended for use with water base fluids within the temperature of -10°F (-23°C) to +165°F (+74°C) except for High Water Content Fluids (HWCF) in which case Class 6 seals should be used. Typical water base fluids are: Water, Water-Glycol, Water-in-Oil Emulsion, Houghto-Safe 27, 620, 5040, Mobil Pyrogard D, Shell Iru 905, Ucon Hydrolube J-4. These seals are nitrile.

**Class 3 – Ethylene Propylene (EPR) Seals**

Class 3 seals are intended for use with some Phosphate Ester Fluids between the temperatures of -10°F (-23°C) to +130°F (+54°C). Typical fluids compatible with EPR seals are Skydrol 500 and 700. EPR are Ethylene Propylene. Note: EPR seals are not compatible with mineral base hydraulic oil or greases. Even limited exposure to these fluids will cause severe swelling.

**Class 4 – Low Temperature Nitrile Seals**

Class 4 seals are intended for low temperature service with the same type of fluids as used with Class 1 seals within the temperature range of -50°F (-46°C) to +150°F (+66°C). Note: Certain fluids may react adversely with Class 4 seals compared to Class 1 seals.

**Class 5 – Fluorocarbon (FKM) Seals**

Class 5 seals are intended for elevated temperature service or for some Phosphate Ester Fluids such as Houghto-Safe 1010, 1055, 1120; Fyrquel 150, 220, 300, 350; Mobile Pyrogard 42, 43, 53, and 55. However, they are not compatible with Phosphate Ester Fluids such as Skydrols. Class 5 seals can operate with a temperature range of -10°F (-23°C) to +300°F (+149°C). For temperatures above +250°F (+121°C) the cylinder must be manufactured with non-studded piston rod and thread and a pinned piston to rod connection.

**Class E – Fluorocarbon piston rod gland seals only**

Intended for applications where only the rod gland is exposed to fluids or temperatures needing fluorocarbon compatibility.

**Class 6 – HWCF Seals**

Class 6 seals are intended for High Water Content Fluids (HWCF) such as Houghton, Hydrolube 120B and Sonsel Lubrizol within the temperature range of +40°F (+4°C) to +120°F (+49°C). Class 6 seals are special nitrile compound dynamic seals. Because of the viscosity of these fluids, cylinders specified with class 6 seals, will also be modified to have straight cushions.

**Class 8 – High Temperature Seals**

Class 8 seals consist of filled PTFE piston seal, rod seals and wiperseal. They are intended for high temperature applications, to 400° F (204° C), where longer seal life and improved high temperature sealing performance is required. Minimum operating temperature is -15° F (-26° C). Body and gland o-ring seals will be fluorocarbon. Fluid resistance is comparable to Class 5. Cylinders incorporating Class 8 Seals will not have studded piston rods.

**Class N – Class 8 piston rod gland seals only – all other seals are fluorocarbon** Intended for applications where only the rod gland is exposed to fluids or temperatures needing filled PTFE seal compatibility.

**Warning** ⚠

The piston rod stud and the piston rod to piston threaded connections are secured with an anaerobic adhesive which is temperature sensitive. Cylinders are assembled with anaerobic adhesive having a maximum temperature rating of +250°F (+121°C). Cylinders specified with all other seal compounds (built before 1997) were assembled with anaerobic adhesive having a maximum operating temperature rating +165°F (+74°C). These temperature limitations are necessary to prevent the possible loosening of the threaded connections. Cylinders originally manufactured (before 1997) with class 1 seals (Nitrile) that will be exposed to ambient temperatures above +165°F (+74°C) must be modified for higher temperature service. Contact the factory immediately and arrange for the piston to rod and the stud to piston rod connections to be properly re-assembled to withstand the higher temperature service.

**Water Service**

Series 2H cylinders can be modified to make them more suitable for use with water as the operating medium. The modifications include chrome-plated cylinder bore; electroless nickel-plated head, cap and piston; chrome-plated 17-4 stainless steel piston rod; chrome plated cushion sleeve or cushion spear. Water and high water base fluid operated cylinders are best used on short stroke applications or where high pressure is applied only to clamp the load.

**Warranty**

Parker Hannifin will warrant cylinders modified for water or high water content fluid service to be free of defects in materials or workmanship, but cannot accept responsibility to premature failure due to excessive wear due to lack of lubricity or where failure is caused by corrosion, electrolysis or mineral deposits within the cylinder.

**Seal Materials & Piston Seal Availability by Seal Class**

| Seal Code (Class) | Description             | Rod Wiperseal | Rod Seal    | Gland O-Ring | Piston Wear Rings | Piston Seal Material & Availability by Type |                |                   |                | Piston Seal Energizer <sup>1</sup> | Piston Joint O-Ring | Body End Seals | Seal Back-Up Washer (If re-quired) |
|-------------------|-------------------------|---------------|-------------|--------------|-------------------|---------------------------------------------|----------------|-------------------|----------------|------------------------------------|---------------------|----------------|------------------------------------|
|                   |                         |               |             |              |                   | HP Urethane                                 | KP Filled PTFE | RP Thermo-plastic | WP Filled PTFE |                                    |                     |                |                                    |
| 1                 | Standard Seals          | Urethane      | Urethane    | Nitrile      | WearGard™         | Yes                                         | Yes            | Yes               | Yes            | Nitrile                            | Urethane            | Urethane       | Nitrile                            |
| 2                 | Water Base Fluid Seals  | Nitrile       | Nitrile     | Nitrile      | WearGard™         | No                                          | Yes            | Yes               | Yes            | Nitrile                            | Nitrile             | Nitrile        | Nitrile                            |
| 3                 | EPR Seals               | EPR           | EPR         | EPR          | WearGard™         | No                                          | Yes            | Yes               | Yes            | EPR                                | EPR                 | EPR            | EPR                                |
| 4                 | Low Temp. Nitrile Seals | Nitrile       | Nitrile     | Nitrile      | WearGard™         | Yes                                         | Yes            | Yes               | No             | Nitrile                            | Nitrile             | Nitrile        | Nitrile                            |
| 5                 | Fluorocarbon Seals      | FKM           | FKM         | FKM          | WearGard™         | No                                          | Yes            | Yes               | Yes            | FKM                                | FKM                 | FKM            | FKM                                |
| 6                 | HWCF Seals              | Nitrile       | Nitrile     | Nitrile      | WearGard™         | No                                          | Yes            | Yes               | Yes            | Nitrile                            | Nitrile             | Nitrile        | Nitrile                            |
| 8                 | High Temp. Seals        | Filled PTFE   | Filled PTFE | FKM          | WearGard™         | No                                          | Yes            | No                | No             | FKM                                | FKM                 | FKM            | FKM                                |

<sup>1</sup> Includes material of redundant quad ring seal for Parker WP Mixed Media Seal

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**Fluids and Temperature Range**

| Class No.                                                                                                                                                                      | Typical Fluids                                                                                                                                                   | Temperature Range                                                            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|
| 1 (Standard)<br>(Nitrile Polyurethane)                                                                                                                                         | Air, Nitrogen<br>Hydraulic Oil, Mil-H-5606 Oil                                                                                                                   | -10°F (-23°C) to<br>+165°F (+74°C)                                           |
| 2 Optional<br>Water Base Fluid Seal                                                                                                                                            | Water, Water-Glycol, HWCF — See Class 6<br>below. Water-in-Oil Emulsion Houghto-Safe, 271,<br>620, 5040. Mobil Pyrogard D, Shell Irus 905.<br>Ucon Hydrolube J-4 | -10°F (-23°C) to<br>+165°F (+74°C)                                           |
| 3 Special (EPR) (at extra cost)<br><br>Note: (EPR) seals are not compatible with Hydraulic Oil                                                                                 | Some Phosphate Ester Fluids<br>Skydrol 500, 7000                                                                                                                 | -10°F (-23°C) to<br>+130°F (+54°C)                                           |
| 4 Special (Nitrile) (at extra cost)                                                                                                                                            | Low Temperature Air or Hydraulic Oil                                                                                                                             | -50°F (-46°C) to +150°F (+66°C)                                              |
| 5 Optional (at extra cost)<br>(Fluorocarbon Seals)<br><br>Note: Fluorocarbon seals are not suitable for use with Skydrol fluid, but can be used with hydraulic oil if desired. | High Temperature<br>Houghto-Safe 1010, 1055, 1120<br>Fyrquel 150, 220, 300, 550<br>Mobil Pyrogard 42,43,53,55                                                    | See paragraph on Fluorocarbon<br>seals for recommended<br>temperature range. |
| 6 Optional (HWCF) (at extra cost)                                                                                                                                              | Houghton, Hydrolubric 120B<br>Sonsol Lubrizol, for other HWCF —<br>consult factory.                                                                              | +40°F (+4°C) to<br>+120°F (+49°C)                                            |
| 8 Optional (at extra cost)<br>Energized PTFE                                                                                                                                   | See Class 5 Seals                                                                                                                                                | -15°F (-26°C) to<br>+400°F (+204°C)                                          |

**Application Data**

The proper application of a fluid power cylinder requires consideration of the operating pressure, the fluid medium, the mounting style, the length of stroke, the type of piston rod connection to the load, thrust or

tension loading on the rod, mounting attitude, the speed of stroke, and how the load in motion will be stopped. Information given here provides pressure rating data for Series 2H/2HD/2HB and 3H/3HD/3HB hydraulic cylinders.

**Pressure Ratings**

Standard operating fluid — clean, filtered hydraulic oil. Pressure ratings for heavy-duty hydraulic cylinders are shown in the table.

Series 2H/2HD/2HB and 3H/3HD hydraulic cylinders are recommended for pressures to 3000 psi for heavy-duty service with hydraulic oil. The 4:1 design factor ratings shown are based on tensile strength of material and are for standard rod diameter only. The rating is conservative for continuous severe applications. Design factors at other pressures can be calculated from this rating. In addition, mounting styles, stroke, etc., should be considered because of the limiting effect they may have on these ratings.

**Heavy Duty Industrial Tie Rod Hydraulic Cylinders  
(depicted in this catalog)****Maximum Pressure Ratings**

| Bore<br>Ø | Rod<br>Ø | 4:1 <sup>1</sup><br>Design Factor<br>(Tensile) (psi) | Heavy-Duty<br>Service<br>(psi) |
|-----------|----------|------------------------------------------------------|--------------------------------|
| 1.50      | 0.625    | 2530                                                 | 3000                           |
| 2.00      | 1.000    | 2950                                                 | 3000                           |
| 2.50      | 1.000    | 2340                                                 | 3000                           |
| 3.25      | 1.375    | 2250                                                 | 3000                           |
| 4.00      | 1.750    | 2130                                                 | 3000                           |
| 5.00      | 2.000    | 2170                                                 | 3000                           |
| 6.00      | 2.500    | 2270                                                 | 3000                           |
| 7.00      | 3.000    | 2030                                                 | 3000                           |
| 8.00      | 3.500    | 2040                                                 | 3000                           |
| 10.00     | 4.500    | 2720                                                 | 3000                           |
| 12.00     | 5.500    | 2580                                                 | 3000                           |
| 14.00     | 7.000    | 2320                                                 | 3000                           |
| 16.00     | 8.000    | 2750                                                 | 3000                           |
| 18.00     | 9.000    | 2900                                                 | 3000                           |
| 20.00     | 10.000   | 2640                                                 | 3000                           |

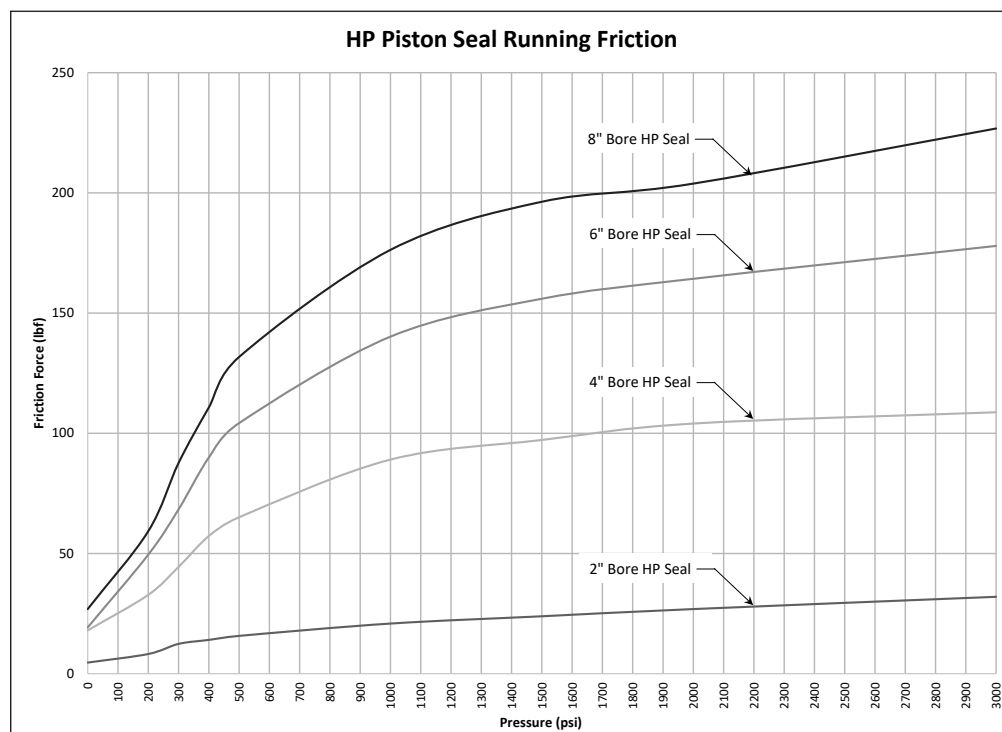
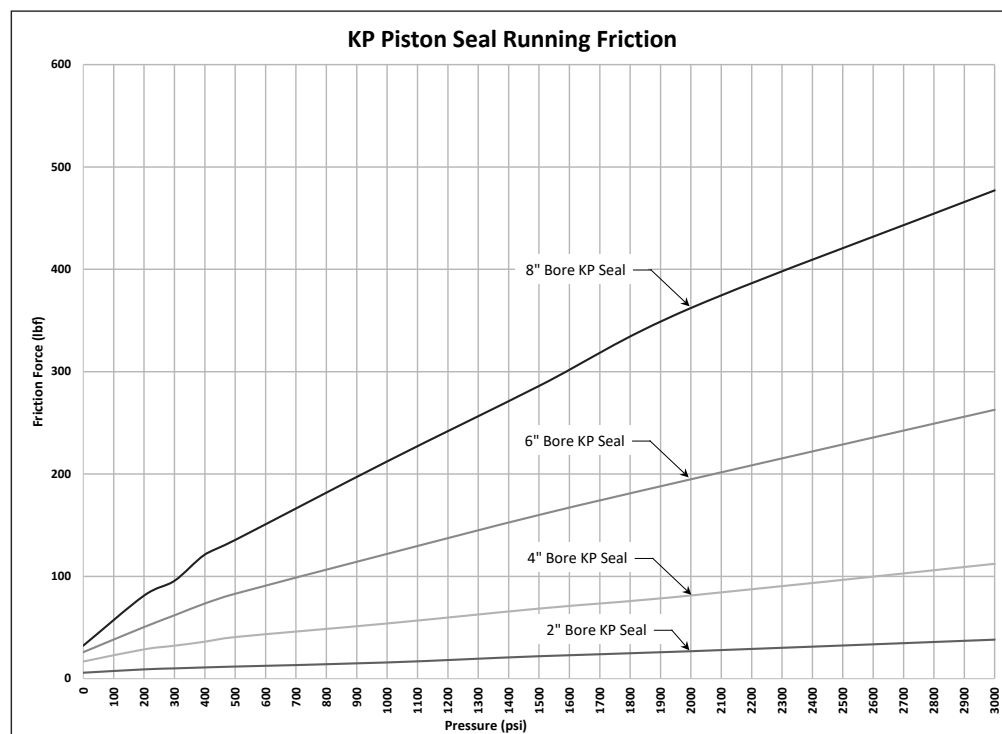
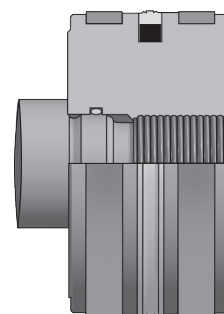
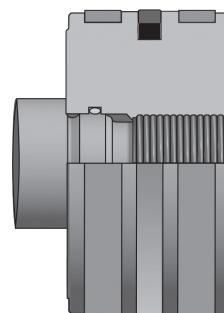
<sup>1</sup> Applies to all mountings except Styles J, JB and H.

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**Piston Friction**

Parker's new universal piston design provides not only superior sealing and wear performance, but also conserves operating energy with reduced running friction when compared to traditional sealing technologies. Running friction test results for the most

popular seal configurations, HP Polyurethane Piston Seal and KP filled PTFE Piston Seal in 2.00", 4.00", 6.00" and 8.00" bores are shown in graphs below. Friction for intermediate bore sizes can be estimated using curves for bore sizes tested.

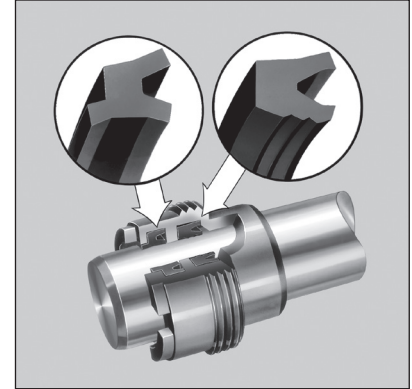
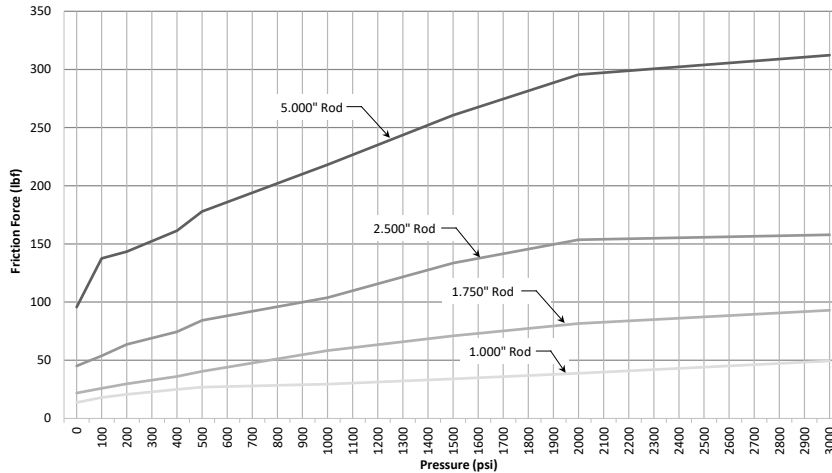
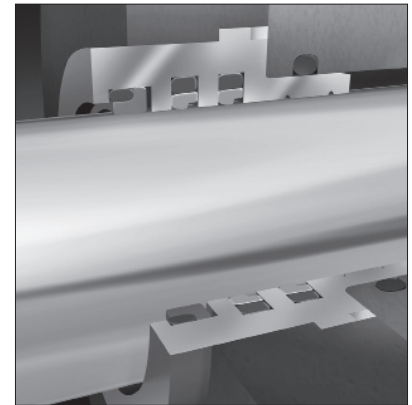
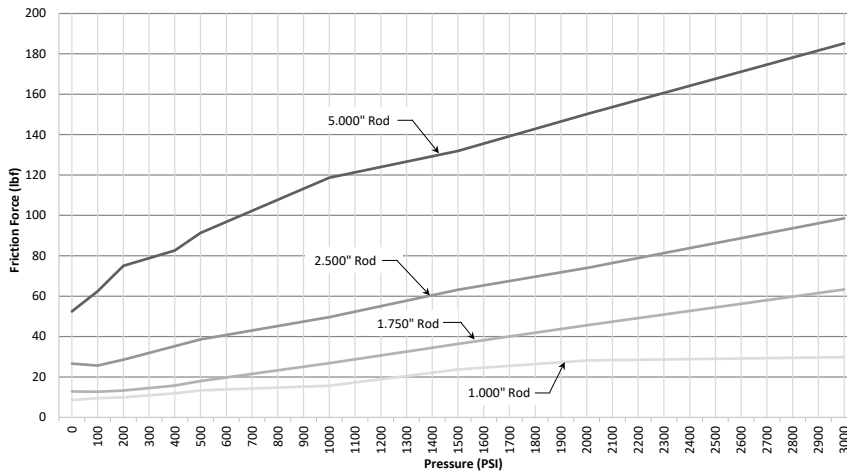
**Parker HP  
Polyurethane  
Piston Seal****Parker KP Filled  
PTFE Piston Seal**

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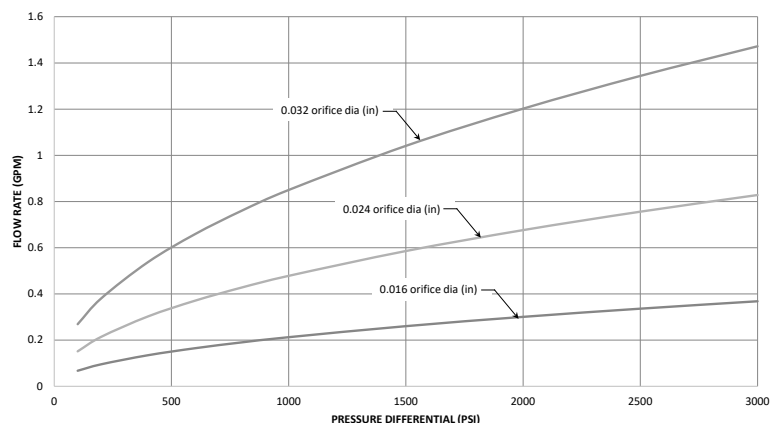
**Gland Friction**

Gland friction is also a factor in cylinder operating efficiency and combined with piston seal friction will yield an overall cylinder running friction value. Running friction test results for 2H (TS2000) and 2HD / 2HB (Tri-

Lip) lipseal glands and Low Friction glands in 1.000", 1.750", 2.500" and 5.000" piston rod diameters are shown in the graphs below. Friction for intermediate rod diameters can be estimated using curves for bore sizes tested.

**TS2000 and Tri-Lip Class 1 Gland Running Friction****Low Friction Gland Running Friction****Piston Orifice**

Parker's RP Thermoplastic piston seal is fully extrusion resistant and the choice for applications formerly served by cast iron rings. For some applications, cast iron rings are selected because of the inherent piston bypass. Where bypass is required for the RP seal (or any other universal piston seal style), a piston orifice option is available. There are three orifice diameters to choose from, 0.016", 0.024" and 0.032". Flow charts at right detail the bypass flow at various pressures for each orifice. Specify the orifice by placing an 'S' in the Special field of the model number and describe the orifice as in the following example: S = 0.024" Piston Orifice (insert desired orifice dia). Piston orifice not available in bores 1.50", 2.00" and 2.50" with rod codes 2 & 3.

**ORIFICE FLOW RATE  
MIL-H 5606 @ 60F****PROP 65 WARNING**

**WARNING:** This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)



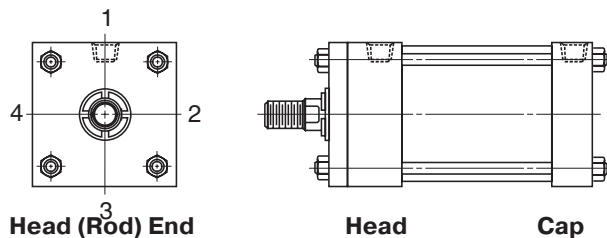
## Ports

### Ports

Series 2H/2HD/2HB and 3H/3HD/3HB cylinders can be supplied with SAE straight O-ring ports or NPTF pipe thread ports. If specified on your order, extra ports can be provided on the sides of heads or caps that are not occupied by mountings or cushion valve.

Standard port location is position 1 as shown on line drawings in product catalog and Figure 1 below. Cushion adjustment needle and check valves are at positions 2 and 4 (or 3), depending on mounting style. Heads or caps which do not have an integral mounting can be rotated and assembled with ports at 90° or 180° from standard position. Mounting styles on which head or cap can be rotated at no extra charge are shown in Table A below. To order, specify by position number. In such assemblies the cushion adjustment needle and check valve rotate accordingly since their relationship with port position does not change.

**Figure 1**



**Table A**

| Mounting Style                   | Port Position Available |              |
|----------------------------------|-------------------------|--------------|
|                                  | Head End                | Cap End      |
| TB, TC, TD, J, H, JB, HB, DD, DE | 1, 2, 3 or 4            | 1, 2, 3 or 4 |
| HH, DB, BB, SB, SE               | 1, 2, 3 or 4            | 1 or 3       |
| JJ, D                            | 1 or 3                  | 1, 2, 3 or 4 |
| C, F                             | 1                       | 1            |

Ports can be supplied at positions other than those shown in Table A at an extra charge. To order, specify port position as shown in Figure 1.

### Straight Thread Ports

The SAE straight thread O-ring port is recommended for hydraulic applications. Parker will furnish this port configuration at positions shown in Table A. This port can also be provided at positions other than those shown in Table A at an extra charge. SAE port size numbers are listed next to the NPTF pipe thread counterparts for each bore size in the respective product catalogs. Size number, tube O.D., and port thread size for SAE ports are listed in Table B.

**Table D – Standard Port Sizes**

| Bore Ø | T SAE | U NPTF | P SAE Code 61 Flange | Y ISO 6149 | B BSPT R BSPP | G Metric  |
|--------|-------|--------|----------------------|------------|---------------|-----------|
| 1.50   | 10    | 1/2    | N/A                  | M22 x 1.5  | 1/2           | M22 x 1.5 |
| 2.00   | 10    | 1/2    | N/A                  | M22 x 1.5  | 1/2           | M22 x 1.5 |
| 2.50   | 10    | 1/2    | 1/2"                 | M22 x 1.5  | 1/2           | M22 x 1.5 |
| 3.25   | 12    | 3/4    | 3/4                  | M27 x 2    | 3/4           | M27 x 2   |
| 4.00   | 12    | 3/4    | 3/4                  | M27 x 2    | 3/4           | M27 x 2   |
| 5.00   | 12    | 3/4    | 3/4                  | M27 x 2    | 3/4           | M27 x 2   |
| 6.00   | 16    | 1      | 1                    | M33 x 2    | 1             | M33 x 2   |

## Heavy Duty Hydraulic Cylinders

### Engineering Data

**Table B — SAE Straight Thread O-Ring Ports**

| Size No. | Tube O.D. (In.) | Thread Size | Size No. | Tube O.D. (In.) | Thread Size |
|----------|-----------------|-------------|----------|-----------------|-------------|
| 2        | 0.13            | 5/16 - 24   | 12       | 0.75            | 1 1/16 - 12 |
| 3        | 0.19            | 3/8 - 24    | —        | —               | —           |
| 4        | 0.25            | 7/16 - 20   | 16       | 1.00            | 1 5/16 - 12 |
| 5        | 0.31            | 1/2 - 20    | 20       | 1.25            | 1 5/8 - 12  |
| 6        | 0.38            | 9/16 - 18   | 24       | 1.50            | 1 7/8 - 12  |
| 8        | 0.50            | 3/4 - 16    | 32       | 2.00            | 2 1/2 - 12  |
| 10       | 0.63            | 7/8 - 14    | —        | —               | —           |

**Note:** For the pressure ratings of individual connectors, contact your connector supplier. Hydraulic cylinders applied with meter out or deceleration circuits are subject to intensified pressure at the cylinder piston rod end. The rod end pressure is approximately equal to:

$$\frac{\text{Effective Cap End Piston Area}}{\text{Effective Rod End Piston Area}} \times \text{Operating Pressure}$$

### International Ports

Other port configurations to meet international requirements are available at extra cost. Parker Series 2H/2HD/2HB and 3H/3HD/3HB cylinders can be supplied, on request, with British standard taper port (BSPT). Such port has a taper of 1 in 16 measured on the diameter (1/16" per inch). The thread form is Whitworth System, and size and number of threads per inch are as follows:

**Table C — British Standard Pipe Threads**

| Nominal Pipe Size | No. Threads Per Inch | Pipe O.D. |
|-------------------|----------------------|-----------|
| 1/8               | 28                   | 0.383     |
| 1/4               | 19                   | 0.518     |
| 3/8               | 19                   | 0.656     |
| 1/2               | 14                   | 0.825     |
| 3/4               | 14                   | 1.041     |
| 1                 | 11                   | 1.309     |
| 1 1/4             | 11                   | 1.650     |
| 1 1/2             | 11                   | 1.882     |
| 2                 | 11                   | 2.347     |

British standard parallel internal threads are designated as BSPP and have the same thread form and number of threads per inch as the BSPT type and can be supplied, on request, at extra cost. Unless otherwise specified, the BSPP or BSPT port size supplied will be the same nominal pipe size as the NPTF port for a given bore size cylinder.

Metric ports can also be supplied to order at extra cost. See table below for standard port size for each bore.

| Bore Ø      | T SAE | U NPTF | P SAE Code 61 Flange | Y ISO 6149 | B BSPT R BSPP | G Metric |
|-------------|-------|--------|----------------------|------------|---------------|----------|
| 7.00        | 20    | 1 1/4  | 1 1/4                | M42 x 2    | 1 1/4         | M42 x 2  |
| 8.00        | 24    | 1 1/2  | 1 1/2                | M48 x 2    | 1 1/2         | M48 x 2  |
| 10.00       | 24    | 2      | 2                    | M48 x 2    | 2             | M48 x 2  |
| 12.00       | 24    | 2 1/2  | 2 1/2                | M48 x 2    | 2 1/2         | M48 x 2  |
| 14.00       | 24    | 2 1/2  | 2 1/2                | M48 x 2    | 2 1/2         | M48 x 2  |
| 16.00-20.00 | 24    | —      | 3                    | —          | —             | —        |

\*Available with 1.000 inch rod diameter only.



## Ports

## Heavy Duty Hydraulic Cylinders Engineering Data

### Override Ports

Override NPTF or SAE straight thread ports can be provided, at an extra charge. For ports one size larger than standard, welded port bosses which protrude from the side of the head or cap are supplied. For dimensions, see drawings and tables below. Series 2H/2HD/2HB and 3H/3HD/3HB cylinders equipped with cushions at the cylinder cap end can sustain damage to the cushion check valve (cushion bushing) if excessive oil flow enters the cylinder from the cap end port. Cylinders which are equipped with cap end cushions and ordered with one size override ports having hydraulic fluid velocity exceeding 25 ft./sec. in the line entering the cap end of the cylinder should

be ordered with a “solid cushion” at cap end. All cylinders ordered with double override ports should always be ordered with a “solid cushion” at cap end.

Cylinders which are connected to a meter out flow control with flow entering the cap end of a cylinder provided by an accumulator may also experience damage to the cushion bushing due to high instantaneous fluid flows. This condition can be eliminated by using a meter in flow control or “solid cushions” at cap end.

### Override NPTF Port Boss Dimensions

| Bore<br>Ø | EE<br>(NPTF) | A<br>Ø | B    | C    | D    | P    |
|-----------|--------------|--------|------|------|------|------|
| 1.50      | 3/4          | 1.38   | 1.00 | 0.75 | 0.78 | 2.91 |
| 2.00      | 3/4          | 1.38   | 1.00 | 0.75 | 0.78 | 2.91 |
| 2.50      | 3/4          | 1.38   | 1.00 | 0.75 | 0.78 | 3.03 |
| 3.25      | 1            | 1.75   | 1.19 | 0.91 | 0.88 | 3.53 |
| 4.00      | 1            | 1.75   | 1.19 | 0.91 | 0.88 | 3.78 |
| 5.00      | 1            | 1.75   | 1.19 | 0.91 | 0.88 | 4.28 |
| 6.00      | 1 1/4        | 2.25   | 1.31 | 1.13 | 1.13 | 5.13 |
| 7.00      | 1 1/2        | 2.50   | 1.56 | 1.38 | 1.38 | 5.75 |
| 8.00      | 2            | 3.00   | 1.69 | 1.50 | 1.50 | 6.50 |

### Override SAE Straight Thread Port Boss Dimensions

| Bore<br>Ø | EE (SAE)        |                 | A<br>Ø | B    | C    | D    | P    |
|-----------|-----------------|-----------------|--------|------|------|------|------|
|           | 2H              | 2HD             |        |      |      |      |      |
| 1.50      | 12 <sup>1</sup> | 12              | 1.38   | 1.00 | 0.81 | 0.78 | 2.97 |
| 2.00      | 12 <sup>1</sup> | 12              | 1.38   | 1.00 | 0.81 | 0.78 | 2.97 |
| 2.50      | 12 <sup>2</sup> | 12 <sup>3</sup> | 1.38   | 1.00 | 0.81 | 0.81 | 3.13 |
| 3.25      | 16              | 16              | 1.75   | 1.19 | 0.91 | 0.91 | 3.56 |
| 4.00      | 16              | 16              | 1.75   | 1.19 | 0.91 | 0.91 | 3.81 |
| 5.00      | 16              | 16              | 1.75   | 1.19 | 0.91 | 0.91 | 4.31 |
| 6.00      | 20 <sup>2</sup> | 20 <sup>2</sup> | —      | —    | 1.13 | 1.17 | 5.19 |
| 7.00      | 24 <sup>2</sup> | 24 <sup>2</sup> | —      | —    | —    | —    | 5.63 |
| 8.00      | N/A             | N/A             | —      | —    | —    | —    | 6.38 |

<sup>1</sup> Port tapped directly in head with code 1 rod these bores.

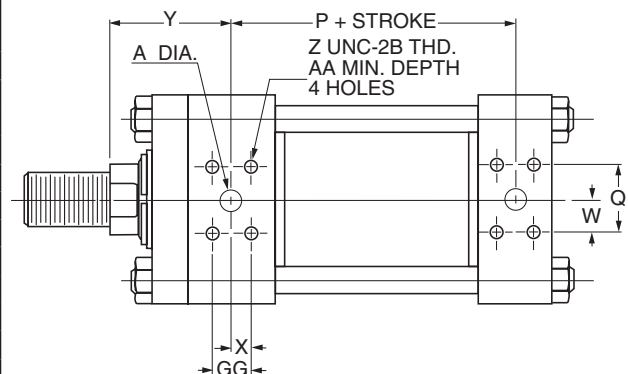
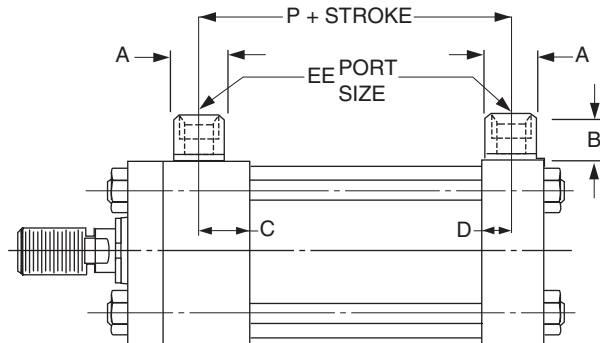
<sup>2</sup> Port tapped directly in head (all rod codes) and cap these bores.

<sup>3</sup> Port tapped directly in cap this bore.

### Flange Ports (Code 61, 3000 psi) SAE 4 Bolt Flange Ports

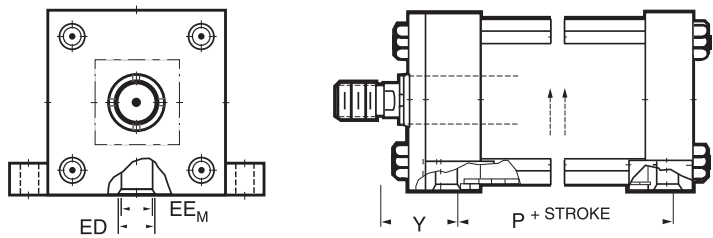
| Bore<br>Ø           | Rod<br>No. | SAE<br>Dash<br>No. | A<br>Ø | AA   | GG   | P    | Q    | W    | X   | Y    | Z         |
|---------------------|------------|--------------------|--------|------|------|------|------|------|-----|------|-----------|
| 2.50 <sup>4,5</sup> | 1          | 8                  | .50    | .81  | .69  | 3.00 | 1.50 | .75  | .34 | 2.38 | 5/16 - 18 |
| 3.25 <sup>4</sup>   | 1          | 12                 | .75    | .75  | .87  | 3.50 | 1.87 | .94  | .44 | 2.75 | 3/8 - 16  |
|                     | 2          |                    |        |      |      |      |      |      |     | 3.13 |           |
|                     | 3          |                    |        |      |      |      |      |      |     | 3.00 |           |
| 4.00 <sup>4</sup>   | 1          | 12                 | .75    | .75  | .87  | 3.75 | 1.87 | .94  | .44 | 3.00 | 3/8 - 16  |
|                     | 2          |                    |        |      |      |      |      |      |     | 3.38 |           |
|                     | 3          |                    |        |      |      |      |      |      |     | 3.13 |           |
| 5.00 <sup>4</sup>   | 1          | 12                 | .75    | .75  | .87  | 4.25 | 1.87 | .94  | .44 | 3.13 | 3/8 - 16  |
|                     | 2          |                    |        |      |      |      |      |      |     | 3.38 |           |
|                     | 3          |                    |        |      |      |      |      |      |     | 3.38 |           |
|                     | 4          |                    |        |      |      |      |      |      |     | 3.38 |           |
| 6.00                | All        | 16                 | 1.00   | .87  | 1.03 | 4.87 | 2.06 | 1.03 | .52 | 3.50 | 3/8 - 16  |
| 7.00                | All        | 20                 | 1.25   | 1.00 | 1.19 | 5.50 | 2.31 | 1.16 | .59 | 3.75 | 7/16 - 14 |
| 8.00                | All        | 24                 | 1.50   | 1.06 | 1.41 | 6.25 | 2.75 | 1.37 | .70 | 3.88 | 1/2 - 13  |

<sup>4</sup> 2.50", 3.25", 4.00" & 5.00" bores cap-flange port not available on Style HB. Style H not available at position 2 or 4. Port flange overhangs cap on Style HH. <sup>5</sup> 2.50" bore head flange port available with 1.000" rod only.



Manifold Ports

Side mounted cylinders, Style C can be furnished with the cylinder ports arranged for mounting and sealing to a manifold surface. The ports are drilled and counterbored for O-ring seals which are provided. With these specifications, the mounting is designated Style CM or KCM.



Manifold Ports for Single and Double Rod Cylinders Dimensions  
Series 2H, 3H (7" & 8"), HD Cylinders

| Bore<br>Ø | Rode<br>Code | Rod Dia.<br>MM | Y±1/32                          | P±1/32 | PK±1/32                        | EE <sub>M</sub> | ED |
|-----------|--------------|----------------|---------------------------------|--------|--------------------------------|-----------------|----|
| 1½        | 1            | ⅝              | 2                               | 2⅞     | 2⅞                             | ¾               | 1⅞ |
|           | 2            | 1              | 2⅜                              |        |                                |                 |    |
| 2         | 1            | 1              | 2⅜                              | 2⅞     | 2⅞                             | ¾               | 1⅞ |
|           | 2            | 1⅝             | 2⅝                              |        |                                |                 |    |
| 2½        | 1            | 1              | 2⅜                              | 3      | 3                              | ¾               | 1⅞ |
|           | 2            | 1¼             | 2⅞                              |        |                                |                 |    |
|           | 3            | 1⅝             | 2⅝                              |        |                                |                 |    |
| 3¼        | 1            | 1⅝             | 2¾                              | 3½     | 3½                             | 1               | 1⅝ |
|           | 2            | 2              | 3⅝                              |        |                                |                 |    |
|           | 3            | 1¾             | 3                               |        |                                |                 |    |
| 4         | 1            | 1¾             | 2 <sup>27</sup> / <sub>32</sub> | 4      | 4 <sup>1</sup> / <sub>16</sub> | 1               | 1⅝ |
|           | 2            | 2½             | 3 <sup>7</sup> / <sub>32</sub>  |        |                                |                 |    |
|           | 3            | 2              | 2 <sup>31</sup> / <sub>32</sub> |        |                                |                 |    |
| 5         | 1            | 2              | 3⅝                              | 4¼     | 4¼                             | 1               | 1⅝ |
|           | 2            | 3½             | 3⅝                              |        |                                |                 |    |
|           | 3            | 2½             |                                 |        |                                |                 |    |
|           | 4            | 3              |                                 |        |                                |                 |    |
| 6         | 1            | 2½             | 3½                              | 5⅝     | 4⅞                             | 1¼              | 1⅝ |
|           | 2            | 4              |                                 |        |                                |                 |    |
|           | 3            | 3              |                                 |        |                                |                 |    |
|           | 4            | 3½             |                                 |        |                                |                 |    |
| 7         | 1            | 3              | 3 <sup>13</sup> / <sub>16</sub> | 5⅞     | 5⅝                             | 1½              | 1⅝ |
|           | 2            | 5              |                                 |        |                                |                 |    |
|           | 3            | 3½             |                                 |        |                                |                 |    |
|           | 4            | 4              |                                 |        |                                |                 |    |
|           | 5            | 4½             |                                 |        |                                |                 |    |
| 8         | 1            | 3½             | 3 <sup>15</sup> / <sub>16</sub> | 6⅝     | 6⅞                             | 1½              | 1⅝ |
|           | 2            | 5½             |                                 |        |                                |                 |    |
|           | 3            | 4              |                                 |        |                                |                 |    |
|           | 4            | 4½             |                                 |        |                                |                 |    |
|           | 5            | 5              |                                 |        |                                |                 |    |

**Stroke Data / Mounting Groups****Stroke Data**

Parker cylinders are available in any practical stroke length. The following information should prove helpful to you in selecting the proper stroke for your cylinder application.

**Stroke Tolerances**

Stroke length tolerances are required due to buildup of tolerances of piston, head, cap and cylinder tube. Standard production of stroke tolerances run  $+.031"$  to

**Heavy Duty Hydraulic Cylinders  
Engineering Data**

$-.015"$  up to 20" stroke,  $+.031"$  to  $-.020"$  for 21" to 60" and  $+.031"$  to  $-.031"$  for greater than 60" stroke. For closer tolerances on stroke length, it is necessary to specify the required tolerance plus the pressure and temperature at which the cylinder will operate. Stroke tolerances smaller than  $.015"$  are not generally practical due to elasticity of cylinders. If machine design requires such close tolerances, use of a stroke adjuster may achieve the desired result.

**Mounting Groups**

Standard mountings for fluid power cylinders fall into three basic groups. The groups can be summarized as follows:

**Group 1** Straight Line Force Transfer with fixed mounts which absorb force on cylinder centerline.

**Group 2** Pivot Force Transfer. Pivot mountings permit a cylinder to change its alignment in one plane.

**Group 3** Straight Line Force Transfer with fixed mounts which do not absorb force on cylinder centerline.

Because a cylinder's mounting directly affects the maximum pressure at which the cylinder can be used, the chart below should be helpful in selection of the proper mounting combination for your application. Stroke length, piston rod connection to load, extra piston rod length over standard, etc., should be considered for thrust loads. Alloy steel mounting bolts are recommended for all mounting styles, and thrust keys are recommended for Styles C and F.

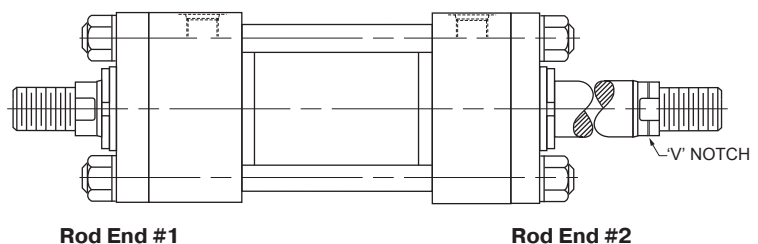
**Double Rod End Cylinders**

The piston connection to rod #1 (without 'V' notch) of 1.50"-8.00" bore double rod end heavy duty hydraulic cylinders is pre-stressed for maximum fatigue life. For this reason the load should always be attached to the rod without 'V' notch. Extension rod #2 with 'V' notch is threaded to rod #1 and is recommended for non-load bearing attachment only.

For thrust (compression) load applications where the mounting style end of a double rod end cylinder is opposite the rod connected to the load it should be specified as a cap mounting style. For example, a head trunnion mounting style opposite the rod connected to the load should be specified as DB. This will ensure that the rod end without 'V' notch will be oriented opposite the head trunnion end. See the table below for guidance in selecting mounting styles that fit this criteria.

**Double Rod End Mounting Styles**

| Mounting Styles for Single Rod Models | Mounting Styles for Corresponding Double Rod Models with the Load Connected To Rod Opposite Cylinder Mounting End |
|---------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| TB                                    | KTC                                                                                                               |
| J                                     | KH                                                                                                                |
| JB                                    | KHB                                                                                                               |
| JJ                                    | KHH                                                                                                               |
| D                                     | KDB                                                                                                               |

**Double Rod Cylinder  
Style K****Group 1 FIXED MOUNTS** which absorb force on cylinder centerline

|                                                                     |                                            |
|---------------------------------------------------------------------|--------------------------------------------|
| <b>Heavy-Duty Service</b><br>For Thrust Loads<br>For Tension Loads  | <br>Styles HB, HH, TC<br>Styles JB, JJ, TB |
| <b>Medium-Duty Service</b><br>For Thrust Loads<br>For Tension Loads | Styles H, HB<br>Styles J, JB               |
| <b>Light-Duty Service</b><br>For Thrust Loads<br>For Tension Loads  | Style H<br>Style J                         |

**Group 2 PIVOT MOUNTS** which absorb force on cylinder centerline.

|                                                                     |                                                          |
|---------------------------------------------------------------------|----------------------------------------------------------|
| <b>Heavy-Duty Service</b><br>For Thrust Loads<br>For Tension Loads  | <br>Styles DD, D, DE, SE<br>Styles BB, DD, D, DB, DE, SE |
| <b>Medium-Duty Service</b><br>For Thrust Loads<br>For Tension Loads | Styles BB, SB<br>Styles BB, SB                           |

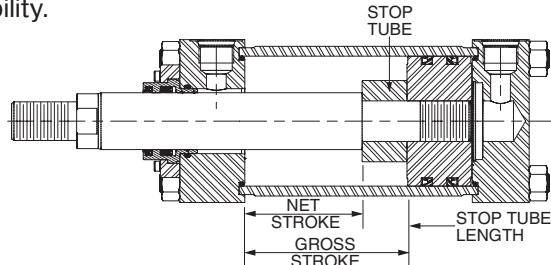
**Group 3 FIXED MOUNTS** which do not absorb force on the centerline.

|                                                                     |                                  |
|---------------------------------------------------------------------|----------------------------------|
| <b>Heavy-Duty Service</b><br>For Thrust Loads<br>For Tension Loads  | <br>Styles C, CP<br>Styles C, CP |
| <b>Medium-Duty Service</b><br>For Thrust Loads<br>For Tension Loads | Styles F, FP<br>Styles F, FP     |

**⚠ PROP 65 WARNING** WARNING: This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**Stop Tubing****Stop Tubing**

Stop tube is recommended to lengthen the distance between the rod bearing and piston bearing to reduce bearing loads on long push stroke cylinders when the cylinder is fully extended. This is especially true of horizontally mounted cylinders. As part of the piston assembly and positioned between the piston and head, a stop tube restricts the extended position of the rod using the increased distance to achieve additional stability.



Use the following steps to determine the need for stop tube and, if required, how long it should be.

1. Examine the groups of cylinder illustrations below and determine which mounting and rod guiding group type match the required cylinder application.

**Stop Tube Length vs Basic Length (L)**

| Pivot Mounts<br>(BB, D, DB, DD,<br>DE, SB and SE) |                        | Fixed Mounts<br>(C, F, H, HB, HH, J, JB, JJ, TB, TC, TD) |                        |                                     |                        |                        |                        |
|---------------------------------------------------|------------------------|----------------------------------------------------------|------------------------|-------------------------------------|------------------------|------------------------|------------------------|
| Pivoted and Rigidly<br>Guided Rod End             |                        | Fixed & Rigidly<br>Guided Rod End                        |                        | Pivoted & Rigidly<br>Guided Rod End |                        | Unguided<br>Rod End    |                        |
| Basic<br>Length<br>(L)                            | Stop<br>Tube<br>Length | Basic<br>Length<br>(L)                                   | Stop<br>Tube<br>Length | Basic<br>Length<br>(L)              | Stop<br>Tube<br>Length | Basic<br>Length<br>(L) | Stop<br>Tube<br>Length |
| 0 - 40                                            | 0                      | 0 - 80                                                   | 0                      | 0 - 57                              | 0                      | 0 - 20                 | 0                      |
| 41 - 50                                           | 1                      | 81 - 100                                                 | 1                      | 58 - 71                             | 1                      | 21 - 25                | 1                      |
| 51 - 60                                           | 2                      | 101 - 120                                                | 2                      | 72 - 86                             | 2                      | 26 - 30                | 2                      |
| 61 - 70                                           | 3                      | 121 - 140                                                | 3                      | 87 - 100                            | 3                      | 31 - 35                | 3                      |
| 71 - 80                                           | 4                      | 141 - 160                                                | 4                      | 101 - 114                           | 4                      | 36 - 40                | 4                      |
| 81 - 90                                           | 5                      | 161 - 180                                                | 5                      | 115 - 129                           | 5                      | 41 - 45                | 5                      |
| 91 - 100                                          | 6                      | 181 - 200                                                | 6                      | 130 - 143                           | 6                      | 46 - 50                | 6                      |
| 101 - 110                                         | 7                      | 201 - 220                                                | 7                      | 144 - 157                           | 7                      | 51 - 55                | 7                      |
| 111 - 120                                         | 8                      | 221 - 240                                                | 8                      | 158 - 171                           | 8                      | 56 - 60                | 8                      |
| 121 - 130                                         | 9                      | 241 - 260                                                | 9                      | 172 - 186                           | 9                      | 61 - 65                | 9                      |
| 131 - 140                                         | 10                     | 261 - 280                                                | 10                     | 187 - 200                           | 10                     | 66 - 70                | 10                     |
| 141 - 150                                         | 11                     | 281 - 300                                                | 11                     | 201 - 214                           | 11                     | 71 - 75                | 11                     |
| 151 - 160                                         | 12                     | Consult Factory                                          |                        | 215 - 229                           | 12                     | 76 - 80                | 12                     |
| 161 - 170                                         | 13                     |                                                          |                        | 230 - 243                           | 13                     | 81 - 85                | 13                     |
| 171 - 180                                         | 14                     |                                                          |                        | 244 - 257                           | 14                     | 86 - 90                | 14                     |
| 181 - 190                                         | 15                     |                                                          |                        | 258 - 271                           | 15                     | 91 - 95                | 15                     |
| 191 - 200                                         | 16                     |                                                          |                        | 272 - 286                           | 16                     | 96 - 100               | 16                     |
| 201 - 210                                         | 17                     |                                                          |                        | 287 - 300                           | 17                     | 101 - 105              | 17                     |
| 211 - 220                                         | 18                     |                                                          |                        | Consult Factory                     |                        | 106 - 110              | 18                     |
| 221 - 230                                         | 19                     |                                                          |                        |                                     |                        | 111 - 115              | 19                     |
| 231 - 240                                         | 20                     |                                                          |                        |                                     |                        | 116 - 120              | 20                     |
| 241 - 250                                         | 21                     |                                                          |                        |                                     |                        | 121 - 125              | 21                     |
| 251 - 260                                         | 22                     |                                                          |                        |                                     |                        | 126 - 130              | 22                     |
| 261 - 270                                         | 23                     |                                                          |                        |                                     |                        | 131 - 135              | 23                     |
| 271 - 280                                         | 24                     |                                                          |                        |                                     |                        | 136 - 140              | 24                     |
| 281 - 290                                         | 25                     |                                                          |                        |                                     |                        | 141 - 145              | 25                     |
| 291 - 300                                         | 26                     |                                                          |                        |                                     |                        | 146 - 150              | 26                     |
| Consult Factory                                   |                        |                                                          |                        |                                     |                        | Consult Factory        |                        |

**Heavy Duty Hydraulic Cylinders  
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2. Establish the Basic Length (L), with the piston rod fully extended, for the selected illustration by using the dimensional tables on previous pages of this catalog. For pivot mounted cylinders, the pin-to-pin dimension with the piston rod fully extended must be used. Regardless of mounting style, be sure to include any extended piston rod length beyond the catalog standard.
3. In the Stop Tube Table select the column for the appropriate mounting style and rod end guiding type. In the Basic Length (L) column, find the row with the range that includes the value calculated in Step 2. The next respective column to the right has the required length of stop tube.

**Note:** Mounting Styles BB, DB, H, HB, HH, SB and SE are mounted horizontally should also be checked for turning moments and loads between the rod bearing and piston to ensure they are not excessive. Weight of oil must be included in determining bearing loads.

When specifying cylinders with stop tube be sure to call out the net stroke and the length of the stop tube. Machine design can be continued without delay by laying in a cylinder equivalent in length to the NET STROKE PLUS STOP TUBE LENGTH, which is referred to as GROSS STROKE.

**Cylinder Mounting and Rod Guiding Groups**

| Pivot Mount – Pivoted and rigidly guided rod end |                      |
|--------------------------------------------------|----------------------|
| <br>Styles BB, SB, SE                            | <br>Styles DD, DE    |
| <br>Style D                                      | <br>Style DB         |
| Fixed Mount – Fixed and rigidly guided rod end   |                      |
| <br>Styles J, JB, JJ                             | <br>Styles H, HB, HH |
| <br>Styles C, F                                  |                      |
| Fixed Mount – Pivoted and rigidly guided rod end |                      |
| <br>Styles J, JB, JJ                             | <br>Styles H, HB, HH |
| <br>Styles C, F                                  |                      |
| Fixed Mount – Unguided rod end                   |                      |
| <br>Styles J, JB, JJ                             | <br>Styles H, HB, HH |

**Piston Rod Selection Data****Heavy Duty Hydraulic Cylinders  
Engineering Data****Piston Rod Diameter Selection**

Long stroke cylinders that work on push with the piston rod loaded in compression should be checked, using the following steps, to ensure an appropriate piston rod diameter is specified.

1. First, determine whether stop tubing is required as described on the previous page.
2. Use the Basic Length (L) that was established for determining the stop tube length and then add the required stop tube length to the Basic Length to obtain an Adjusted Basic Length (L<sub>A</sub>).
3. In the table below, for the mounting style and rod end guiding condition that will be used, find the row for the Bore and Rod combination that is required.
4. Follow the Bore and Rod row to the right and find the Operating Pressure column that is closest, but

exceeds the system pressure. The intersection of the Bore and Rod row and Operating Pressure column displays the maximum allowable L<sub>A</sub>. If L<sub>A</sub> in the table is greater than or equal to the calculated L<sub>A</sub>, the rod diameter selected is satisfactory for the application.

5. If L<sub>A</sub> in the table is less than the calculated Adjusted Basic Length move down the column to a rod diameter with an L<sub>A</sub> that exceeds the requirement.
6. If the L<sub>A</sub> specifies a rod diameter in a larger bore then restart the process of sizing the stop tube and re-check the rod diameter. Contact the factory if L<sub>A</sub> exceeds 300 inches.

**Note:** Data in these tables assume standard rod extension (W or WF dimension) and standard rod end accessories. If different, consult factory.

**Maximum Basic Lengths (L<sub>A</sub>) (all dimensions in inches)**

| Bore<br>Ø | Rod<br>Ø | Front and Side Fixed Mounts (J <sup>1</sup> , JB <sup>1</sup> , JJ, TB, TD, C, F)         |      |      |      |      |      |                                                                                             |      |      |      |      |      |                                                                           |      |      |      |      |      |     |
|-----------|----------|-------------------------------------------------------------------------------------------|------|------|------|------|------|---------------------------------------------------------------------------------------------|------|------|------|------|------|---------------------------------------------------------------------------|------|------|------|------|------|-----|
|           |          | Fixed and Rigidly Guided Rod End<br>Max. Allowable Basic Length (L <sub>A</sub> ) at psi: |      |      |      |      |      | Pivoted and Rigidly Guided Rod End<br>Max. Allowable Basic Length (L <sub>A</sub> ) at psi: |      |      |      |      |      | Unguided Rod End<br>Max. Allowable Basic Length (L <sub>A</sub> ) at psi: |      |      |      |      |      |     |
|           |          | 500                                                                                       | 1000 | 1500 | 2000 | 2500 | 3000 | 500                                                                                         | 1000 | 1500 | 2000 | 2500 | 3000 | 500                                                                       | 1000 | 1500 | 2000 | 2500 | 3000 |     |
| 1.50      | 0.625    | 50                                                                                        | 35   | 29   | 25   | 22   | 20   | 36                                                                                          | 25   | 21   | 18   | 16   | 15   | 13                                                                        | 9    | 7    | 6    | 6    | 5    |     |
|           | 1.000    | 128                                                                                       | 91   | 74   | 64   | 57   | 52   | 92                                                                                          | 65   | 53   | 46   | 41   | 37   | 32                                                                        | 23   | 19   | 16   | 14   | 13   |     |
| 2.00      | 1.000    | 96                                                                                        | 68   | 56   | 48   | 43   | 39   | 69                                                                                          | 49   | 40   | 34   | 31   | 28   | 24                                                                        | 17   | 14   | 12   | 11   | 10   |     |
|           | 1.375    | 182                                                                                       | 129  | 105  | 91   | 81   | 74   | 130                                                                                         | 92   | 75   | 65   | 58   | 53   | 45                                                                        | 32   | 26   | 23   | 20   | 19   |     |
| 2.50      | 1.000    | 77                                                                                        | 54   | 44   | 38   | 34   | 31   | 55                                                                                          | 39   | 32   | 27   | 25   | 22   | 19                                                                        | 14   | 11   | 10   | 9    | 8    |     |
|           | 1.375    | 146                                                                                       | 103  | 84   | 73   | 65   | 59   | 104                                                                                         | 73   | 60   | 52   | 46   | 42   | 36                                                                        | 26   | 21   | 18   | 16   | 15   |     |
| 3.25      | 1.750    | 236                                                                                       | 167  | 136  | 118  | 105  | 96   | 168                                                                                         | 119  | 97   | 84   | 75   | 69   | 59                                                                        | 42   | 34   | 29   | 26   | 24   |     |
|           | 1.375    | 112                                                                                       | 79   | 65   | 56   | 50   | 46   | 80                                                                                          | 57   | 46   | 40   | 36   | 33   | 28                                                                        | 20   | 16   | 14   | 13   | 11   |     |
|           | 1.750    | 181                                                                                       | 128  | 105  | 91   | 81   | 74   | 130                                                                                         | 92   | 75   | 65   | 58   | 53   | 45                                                                        | 32   | 26   | 23   | 20   | 19   |     |
| 4.00      | 2.000    | 237                                                                                       | 167  | 137  | 118  | 106  | 97   | 169                                                                                         | 120  | 98   | 85   | 76   | 69   | 59                                                                        | 42   | 34   | 30   | 26   | 24   |     |
|           | 1.750    | 147                                                                                       | 104  | 85   | 74   | 66   | 60   | 105                                                                                         | 74   | 61   | 53   | 47   | 43   | 37                                                                        | 26   | 21   | 18   | 16   | 15   |     |
|           | 2.000    | 192                                                                                       | 136  | 111  | 96   | 86   | 79   | 137                                                                                         | 97   | 79   | 69   | 61   | 56   | 48                                                                        | 34   | 28   | 24   | 22   | 20   |     |
| 5.00      | 2.500    | 300                                                                                       | 213  | 174  | 150  | 134  | 123  | 215                                                                                         | 152  | 124  | 107  | 96   | 88   | 75                                                                        | 53   | 43   | 38   | 34   | 31   |     |
|           | 2.000    | 154                                                                                       | 109  | 89   | 77   | 69   | 63   | 110                                                                                         | 78   | 63   | 55   | 49   | 45   | 38                                                                        | 27   | 22   | 19   | 17   | 16   |     |
|           | 2.500    | 241                                                                                       | 170  | 139  | 120  | 108  | 98   | 172                                                                                         | 121  | 99   | 86   | 77   | 70   | 60                                                                        | 43   | 35   | 30   | 27   | 25   |     |
|           | 3.000    | 300                                                                                       | 245  | 200  | 173  | 155  | 141  | 247                                                                                         | 175  | 143  | 124  | 111  | 101  | 87                                                                        | 61   | 50   | 43   | 39   | 35   |     |
| 6.00      | 3.500    | 300                                                                                       | 300  | 272  | 236  | 211  | 192  | 300                                                                                         | 238  | 194  | 168  | 151  | 137  | 118                                                                       | 83   | 68   | 59   | 53   | 48   |     |
|           | 2.500    | 200                                                                                       | 142  | 116  | 100  | 90   | 82   | 143                                                                                         | 101  | 83   | 72   | 64   | 58   | 50                                                                        | 35   | 29   | 25   | 22   | 20   |     |
|           | 3.000    | 289                                                                                       | 204  | 167  | 144  | 129  | 118  | 206                                                                                         | 146  | 119  | 103  | 92   | 84   | 72                                                                        | 51   | 42   | 36   | 32   | 29   |     |
|           | 3.500    | 300                                                                                       | 278  | 227  | 196  | 176  | 160  | 281                                                                                         | 198  | 162  | 140  | 125  | 115  | 98                                                                        | 69   | 57   | 49   | 44   | 40   |     |
| 7.00      | 4.000    | 300                                                                                       | 300  | 296  | 257  | 229  | 209  | 300                                                                                         | 259  | 212  | 183  | 164  | 150  | 128                                                                       | 91   | 74   | 64   | 57   | 52   |     |
|           | 3.000    | 247                                                                                       | 175  | 143  | 124  | 111  | 101  | 177                                                                                         | 125  | 102  | 88   | 79   | 72   | 62                                                                        | 44   | 36   | 31   | 28   | 25   |     |
|           | 3.500    | 300                                                                                       | 238  | 194  | 168  | 151  | 137  | 241                                                                                         | 170  | 139  | 120  | 108  | 98   | 84                                                                        | 60   | 49   | 42   | 38   | 34   |     |
|           | 4.000    | 300                                                                                       | 300  | 254  | 220  | 197  | 180  | 300                                                                                         | 222  | 181  | 157  | 140  | 128  | 110                                                                       | 78   | 63   | 55   | 49   | 45   |     |
| 8.00      | 4.500    | 300                                                                                       | 300  | 300  | 278  | 249  | 227  | 300                                                                                         | 281  | 230  | 199  | 178  | 162  | 139                                                                       | 98   | 80   | 70   | 62   | 57   |     |
|           | 5.000    | 300                                                                                       | 300  | 300  | 300  | 300  | 281  | 300                                                                                         | 300  | 283  | 245  | 220  | 200  | 172                                                                       | 121  | 99   | 86   | 77   | 70   |     |
|           | 3.500    | 295                                                                                       | 208  | 170  | 147  | 132  | 120  | 210                                                                                         | 149  | 122  | 105  | 94   | 86   | 74                                                                        | 52   | 43   | 37   | 33   | 30   |     |
|           | 4.000    | 300                                                                                       | 272  | 222  | 192  | 172  | 157  | 275                                                                                         | 194  | 159  | 137  | 123  | 112  | 96                                                                        | 68   | 56   | 48   | 43   | 39   |     |
| 10.00     | 4.500    | 300                                                                                       | 300  | 281  | 244  | 218  | 199  | 300                                                                                         | 246  | 201  | 174  | 156  | 142  | 122                                                                       | 86   | 70   | 61   | 54   | 50   |     |
|           | 5.000    | 300                                                                                       | 300  | 300  | 300  | 269  | 245  | 300                                                                                         | 300  | 248  | 215  | 192  | 175  | 150                                                                       | 106  | 87   | 75   | 67   | 61   |     |
|           | 5.500    | 300                                                                                       | 300  | 300  | 300  | 300  | 297  | 300                                                                                         | 300  | 300  | 260  | 232  | 212  | 182                                                                       | 129  | 105  | 91   | 81   | 74   |     |
|           | 4.500    | 300                                                                                       | 276  | 225  | 195  | 174  | 159  | 278                                                                                         | 197  | 161  | 139  | 124  | 114  | 97                                                                        | 69   | 56   | 49   | 44   | 40   |     |
| 12.00     | 5.000    | 300                                                                                       | 300  | 278  | 241  | 215  | 196  | 300                                                                                         | 243  | 198  | 172  | 154  | 140  | 120                                                                       | 85   | 69   | 60   | 54   | 49   |     |
|           | 5.500    | 300                                                                                       | 300  | 300  | 291  | 260  | 238  | 300                                                                                         | 294  | 240  | 208  | 186  | 170  | 146                                                                       | 103  | 84   | 73   | 65   | 59   |     |
|           | 7.000    | 300                                                                                       | 300  | 300  | 300  | 300  | 300  | 300                                                                                         | 300  | 300  | 300  | 300  | 275  | 236                                                                       | 167  | 136  | 118  | 105  | 96   |     |
|           | 5.500    | 300                                                                                       | 300  | 280  | 243  | 217  | 198  | 300                                                                                         | 245  | 200  | 173  | 155  | 141  | 121                                                                       | 86   | 70   | 61   | 54   | 50   |     |
| 14.00     | 7.000    | 300                                                                                       | 300  | 300  | 300  | 300  | 300  | 300                                                                                         | 300  | 300  | 281  | 251  | 229  | 196                                                                       | 139  | 113  | 98   | 88   | 80   |     |
|           | 8.000    | 300                                                                                       | 300  | 300  | 300  | 300  | 300  | 300                                                                                         | 300  | 300  | 300  | 300  | 299  | 257                                                                       | 181  | 148  | 128  | 115  | 105  |     |
|           | 10.000   | 300                                                                                       | 300  | 300  | 300  | 300  | 300  | 300                                                                                         | 300  | 300  | 300  | 300  | 300  | 300                                                                       | 243  | 198  | 172  | 154  | 140  |     |
| 16.00     | 8.000    | 300                                                                                       | 300  | 300  | 300  | 300  | 300  | 300                                                                                         | 300  | 300  | 275  | 246  | 224  | 192                                                                       | 136  | 111  | 96   | 86   | 79   |     |
|           | 9.000    | 300                                                                                       | 300  | 300  | 300  | 300  | 300  | 300                                                                                         | 300  | 300  | 300  | 300  | 300  | 284                                                                       | 244  | 172  | 141  | 122  | 109  | 99  |
|           | 10.000   | 300                                                                                       | 300  | 300  | 300  | 300  | 300  | 300                                                                                         | 300  | 300  | 300  | 300  | 300  | 300                                                                       | 300  | 213  | 174  | 150  | 134  | 123 |
| 18.00     | 9.000    | 300                                                                                       | 300  | 300  | 300  | 300  | 300  | 300                                                                                         | 300  | 300  | 300  | 300  | 277  | 252                                                                       | 216  | 153  | 125  | 108  | 97   | 88  |
|           | 10.000   | 300                                                                                       | 300  | 300  | 300  | 300  | 300  | 300                                                                                         | 300  | 300  | 300  | 300  | 300  | 300                                                                       | 267  | 189  | 154  | 134  | 120  | 109 |
| 20.00     | 10.000   | 300                                                                                       | 300  | 300  | 300  | 300  | 300  | 300                                                                                         | 300  | 300  | 300  | 300  | 300  | 281                                                                       | 241  | 170  | 139  | 120  | 108  | 98  |

<sup>1</sup> Maximum operating pressure is limited for Mounting Styles J and JB. Please refer to maximum operating pressure per bore in Pressure Ratings table located on the dimension page for each of these mounting styles.

**Piston Rod Selection Data****Heavy Duty Hydraulic Cylinders  
Engineering Data****Maximum Basic Lengths (L<sub>A</sub>) (all dimensions in inches)**

| Bore<br>Ø | Rod<br>Ø | Rear Fixed Mounts (H <sup>1</sup> , HB, HH, TC)                                              |      |      |      |      |      |                                                                                                |      |      |      |      |      |                                                                              |      |      |      |      |      |
|-----------|----------|----------------------------------------------------------------------------------------------|------|------|------|------|------|------------------------------------------------------------------------------------------------|------|------|------|------|------|------------------------------------------------------------------------------|------|------|------|------|------|
|           |          | Fixed and Rigidly Guided Rod End<br>Max. Allowable Basic Length (L <sub>A</sub> ) at<br>psi: |      |      |      |      |      | Pivoted and Rigidly Guided Rod End<br>Max. Allowable Basic Length (L <sub>A</sub> ) at<br>psi: |      |      |      |      |      | Unguided Rod End<br>Max. Allowable Basic Length (L <sub>A</sub> ) at<br>psi: |      |      |      |      |      |
|           |          | 500                                                                                          | 1000 | 1500 | 2000 | 2500 | 3000 | 500                                                                                            | 1000 | 1500 | 2000 | 2500 | 3000 | 500                                                                          | 1000 | 1500 | 2000 | 2500 | 3000 |
| 1.50      | 0.625    | 70                                                                                           | 50   | 40   | 35   | 31   | 29   | 50                                                                                             | 35   | 29   | 25   | 22   | 20   | 18                                                                           | 12   | 10   | 9    | 8    | 7    |
|           | 1.000    | 170                                                                                          | 120  | 98   | 85   | 76   | 69   | 121                                                                                            | 86   | 70   | 61   | 54   | 50   | 42                                                                           | 30   | 25   | 21   | 19   | 17   |
| 2.00      | 1.000    | 132                                                                                          | 93   | 76   | 66   | 59   | 54   | 94                                                                                             | 67   | 54   | 47   | 42   | 38   | 33                                                                           | 23   | 19   | 16   | 15   | 13   |
|           | 1.375    | 232                                                                                          | 164  | 134  | 116  | 104  | 95   | 166                                                                                            | 117  | 96   | 83   | 74   | 68   | 58                                                                           | 41   | 33   | 29   | 26   | 24   |
| 2.50      | 1.000    | 107                                                                                          | 76   | 62   | 54   | 48   | 44   | 77                                                                                             | 54   | 44   | 38   | 34   | 31   | 27                                                                           | 19   | 16   | 13   | 12   | 11   |
|           | 1.375    | 197                                                                                          | 140  | 114  | 99   | 88   | 81   | 141                                                                                            | 100  | 81   | 70   | 63   | 58   | 49                                                                           | 35   | 28   | 25   | 22   | 20   |
|           | 1.750    | 300                                                                                          | 213  | 174  | 151  | 135  | 123  | 215                                                                                            | 152  | 124  | 108  | 96   | 88   | 75                                                                           | 53   | 43   | 38   | 34   | 31   |
| 3.25      | 1.375    | 156                                                                                          | 110  | 90   | 78   | 70   | 64   | 111                                                                                            | 79   | 64   | 56   | 50   | 45   | 39                                                                           | 28   | 22   | 19   | 17   | 16   |
|           | 1.750    | 246                                                                                          | 174  | 142  | 123  | 110  | 100  | 176                                                                                            | 124  | 102  | 88   | 79   | 72   | 62                                                                           | 44   | 36   | 31   | 28   | 25   |
|           | 2.000    | 300                                                                                          | 221  | 181  | 157  | 140  | 128  | 224                                                                                            | 158  | 129  | 112  | 100  | 91   | 78                                                                           | 55   | 45   | 39   | 35   | 32   |
| 4.00      | 1.750    | 203                                                                                          | 144  | 117  | 102  | 91   | 83   | 145                                                                                            | 103  | 84   | 73   | 65   | 59   | 51                                                                           | 36   | 29   | 25   | 23   | 21   |
|           | 2.000    | 261                                                                                          | 185  | 151  | 131  | 117  | 107  | 187                                                                                            | 132  | 108  | 93   | 83   | 76   | 65                                                                           | 46   | 38   | 33   | 29   | 27   |
|           | 2.500    | 300                                                                                          | 274  | 224  | 194  | 173  | 158  | 277                                                                                            | 196  | 160  | 138  | 124  | 113  | 97                                                                           | 69   | 56   | 48   | 43   | 40   |
| 5.00      | 2.000    | 214                                                                                          | 151  | 123  | 107  | 96   | 87   | 153                                                                                            | 108  | 88   | 76   | 68   | 62   | 53                                                                           | 38   | 31   | 27   | 24   | 22   |
|           | 2.500    | 300                                                                                          | 231  | 188  | 163  | 146  | 133  | 233                                                                                            | 165  | 135  | 117  | 104  | 95   | 82                                                                           | 58   | 47   | 41   | 36   | 33   |
|           | 3.000    | 300                                                                                          | 300  | 261  | 226  | 202  | 184  | 300                                                                                            | 228  | 186  | 161  | 144  | 132  | 113                                                                          | 80   | 65   | 56   | 50   | 46   |
|           | 3.500    | 300                                                                                          | 300  | 300  | 289  | 259  | 236  | 300                                                                                            | 292  | 239  | 207  | 185  | 169  | 145                                                                          | 102  | 83   | 72   | 65   | 59   |
| 6.00      | 2.500    | 278                                                                                          | 197  | 161  | 139  | 124  | 114  | 199                                                                                            | 141  | 115  | 99   | 89   | 81   | 70                                                                           | 49   | 40   | 35   | 31   | 28   |
|           | 3.000    | 300                                                                                          | 278  | 227  | 197  | 176  | 161  | 281                                                                                            | 199  | 162  | 140  | 126  | 115  | 98                                                                           | 70   | 57   | 49   | 44   | 40   |
|           | 3.500    | 300                                                                                          | 300  | 300  | 260  | 233  | 212  | 300                                                                                            | 263  | 215  | 186  | 166  | 152  | 130                                                                          | 92   | 75   | 65   | 58   | 53   |
|           | 4.000    | 300                                                                                          | 300  | 300  | 300  | 292  | 266  | 300                                                                                            | 300  | 269  | 233  | 208  | 190  | 163                                                                          | 115  | 94   | 82   | 73   | 67   |
| 7.00      | 3.000    | 300                                                                                          | 241  | 197  | 171  | 153  | 139  | 244                                                                                            | 172  | 141  | 122  | 109  | 100  | 85                                                                           | 60   | 49   | 43   | 38   | 35   |
|           | 3.500    | 300                                                                                          | 300  | 263  | 228  | 204  | 186  | 300                                                                                            | 230  | 188  | 163  | 146  | 133  | 114                                                                          | 81   | 66   | 57   | 51   | 46   |
|           | 4.000    | 300                                                                                          | 300  | 300  | 289  | 259  | 236  | 300                                                                                            | 292  | 239  | 207  | 185  | 169  | 145                                                                          | 102  | 83   | 72   | 65   | 59   |
|           | 4.500    | 300                                                                                          | 300  | 300  | 300  | 300  | 288  | 300                                                                                            | 300  | 290  | 252  | 225  | 205  | 176                                                                          | 124  | 102  | 88   | 79   | 72   |
|           | 5.000    | 300                                                                                          | 300  | 300  | 300  | 300  | 300  | 300                                                                                            | 300  | 300  | 296  | 264  | 241  | 207                                                                          | 146  | 119  | 103  | 93   | 84   |
| 8.00      | 3.500    | 300                                                                                          | 288  | 235  | 203  | 182  | 166  | 291                                                                                            | 205  | 168  | 145  | 130  | 119  | 102                                                                          | 72   | 59   | 51   | 45   | 42   |
|           | 4.000    | 300                                                                                          | 300  | 300  | 261  | 234  | 213  | 300                                                                                            | 264  | 216  | 187  | 167  | 152  | 131                                                                          | 92   | 75   | 65   | 58   | 53   |
|           | 4.500    | 300                                                                                          | 300  | 300  | 300  | 290  | 264  | 300                                                                                            | 300  | 267  | 231  | 207  | 189  | 162                                                                          | 114  | 93   | 81   | 72   | 66   |
|           | 5.000    | 300                                                                                          | 300  | 300  | 300  | 300  | 300  | 300                                                                                            | 300  | 300  | 277  | 248  | 226  | 194                                                                          | 137  | 112  | 97   | 87   | 79   |
|           | 5.500    | 300                                                                                          | 300  | 300  | 300  | 300  | 300  | 300                                                                                            | 300  | 300  | 300  | 289  | 264  | 226                                                                          | 160  | 131  | 113  | 101  | 92   |
| 10.00     | 4.500    | 300                                                                                          | 300  | 300  | 269  | 241  | 220  | 300                                                                                            | 272  | 222  | 192  | 172  | 157  | 135                                                                          | 95   | 78   | 67   | 60   | 55   |
|           | 5.000    | 300                                                                                          | 300  | 300  | 300  | 294  | 268  | 300                                                                                            | 300  | 271  | 235  | 210  | 192  | 164                                                                          | 116  | 95   | 82   | 73   | 67   |
|           | 5.500    | 300                                                                                          | 300  | 300  | 300  | 300  | 300  | 300                                                                                            | 300  | 300  | 280  | 250  | 229  | 196                                                                          | 139  | 113  | 98   | 88   | 80   |
|           | 7.000    | 300                                                                                          | 300  | 300  | 300  | 300  | 300  | 300                                                                                            | 300  | 300  | 300  | 300  | 300  | 296                                                                          | 209  | 171  | 148  | 132  | 121  |
| 12.00     | 5.500    | 300                                                                                          | 300  | 300  | 300  | 299  | 273  | 300                                                                                            | 300  | 276  | 239  | 213  | 195  | 167                                                                          | 118  | 96   | 84   | 75   | 68   |
|           | 7.000    | 300                                                                                          | 300  | 300  | 300  | 300  | 300  | 300                                                                                            | 300  | 300  | 300  | 300  | 300  | 300                                                                          | 260  | 184  | 150  | 130  | 116  |
|           | 8.000    | 300                                                                                          | 300  | 300  | 300  | 300  | 300  | 300                                                                                            | 300  | 300  | 300  | 300  | 300  | 300                                                                          | 300  | 231  | 189  | 163  | 146  |
| 14.00     | 7.000    | 300                                                                                          | 300  | 300  | 300  | 300  | 300  | 300                                                                                            | 300  | 300  | 300  | 291  | 266  | 228                                                                          | 161  | 132  | 114  | 102  | 93   |
|           | 8.000    | 300                                                                                          | 300  | 300  | 300  | 300  | 300  | 300                                                                                            | 300  | 300  | 300  | 300  | 300  | 300                                                                          | 290  | 205  | 167  | 145  | 129  |
|           | 10.000   | 300                                                                                          | 300  | 300  | 300  | 300  | 300  | 300                                                                                            | 300  | 300  | 300  | 300  | 300  | 300                                                                          | 300  | 293  | 240  | 207  | 186  |
| 16.00     | 8.000    | 300                                                                                          | 300  | 300  | 300  | 300  | 300  | 300                                                                                            | 300  | 300  | 300  | 300  | 300  | 300                                                                          | 300  | 260  | 184  | 150  | 130  |
|           | 9.000    | 300                                                                                          | 300  | 300  | 300  | 300  | 300  | 300                                                                                            | 300  | 300  | 300  | 300  | 300  | 300                                                                          | 300  | 227  | 186  | 161  | 144  |
|           | 10.000   | 300                                                                                          | 300  | 300  | 300  | 300  | 300  | 300                                                                                            | 300  | 300  | 300  | 300  | 300  | 300                                                                          | 300  | 272  | 222  | 192  | 172  |
| 18.00     | 9.000    | 300                                                                                          | 300  | 300  | 300  | 300  | 300  | 300                                                                                            | 300  | 300  | 300  | 300  | 300  | 300                                                                          | 293  | 207  | 169  | 146  | 131  |
|           | 10.000   | 300                                                                                          | 300  | 300  | 300  | 300  | 300  | 300                                                                                            | 300  | 300  | 300  | 300  | 300  | 300                                                                          | 300  | 250  | 204  | 177  | 158  |
| 20.00     | 10.000   | 300                                                                                          | 300  | 300  | 300  | 300  | 300  | 300                                                                                            | 300  | 300  | 300  | 300  | 300  | 300                                                                          | 300  | 231  | 188  | 163  | 146  |

<sup>1</sup> Maximum operating pressure is limited for Mounting Style H. Please refer to maximum operating pressure per bore in Pressure Ratings table located on the dimension page for Mounting Style H.

**⚠ PROP 65 WARNING** WARNING: This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)



**Piston Rod Selection Data****Engineering Data****Maximum Basic Lengths (L<sub>A</sub>) (all dimensions in inches)**

| Bore<br>Ø | Rod<br>Ø | Rear Pivot Mounts<br>(BB, SB <sup>1</sup> , SE, DB)                                       |      |      |      |      |      | Front and Intermediate Pivot Mounts<br>(D, DD, DE)                                        |      |      |      |      |      |
|-----------|----------|-------------------------------------------------------------------------------------------|------|------|------|------|------|-------------------------------------------------------------------------------------------|------|------|------|------|------|
|           |          | Pivoted & Rigidly Guided Rod End<br>Max. Allowable Basic Length (L <sub>A</sub> ) at psi: |      |      |      |      |      | Pivoted & Rigidly Guided Rod End<br>Max. Allowable Basic Length (L <sub>A</sub> ) at psi: |      |      |      |      |      |
|           |          | 500                                                                                       | 1000 | 1500 | 2000 | 2500 | 3000 | 500                                                                                       | 1000 | 1500 | 2000 | 2500 | 3000 |
| 1.50      | 0.625    | 35                                                                                        | 25   | 20   | 18   | 16   | 14   | 25                                                                                        | 18   | 14   | 13   | 11   | 10   |
|           | 1.000    | 85                                                                                        | 60   | 49   | 42   | 38   | 35   | 64                                                                                        | 45   | 37   | 32   | 29   | 26   |
| 2.00      | 1.000    | 66                                                                                        | 47   | 38   | 33   | 29   | 27   | 48                                                                                        | 34   | 28   | 24   | 22   | 20   |
|           | 1.375    | 116                                                                                       | 82   | 67   | 58   | 52   | 47   | 91                                                                                        | 64   | 53   | 45   | 41   | 37   |
| 2.50      | 1.000    | 54                                                                                        | 38   | 31   | 27   | 24   | 22   | 38                                                                                        | 27   | 22   | 19   | 17   | 16   |
|           | 1.375    | 99                                                                                        | 70   | 57   | 49   | 44   | 40   | 73                                                                                        | 51   | 42   | 36   | 33   | 30   |
| 3.25      | 1.750    | 151                                                                                       | 106  | 87   | 75   | 67   | 61   | 118                                                                                       | 83   | 68   | 59   | 53   | 48   |
|           | 1.375    | 78                                                                                        | 55   | 45   | 39   | 35   | 32   | 56                                                                                        | 40   | 32   | 28   | 25   | 23   |
| 4.00      | 1.750    | 123                                                                                       | 87   | 71   | 62   | 55   | 50   | 91                                                                                        | 64   | 52   | 45   | 41   | 37   |
|           | 2.000    | 157                                                                                       | 111  | 90   | 78   | 70   | 64   | 118                                                                                       | 84   | 68   | 59   | 53   | 48   |
| 5.00      | 1.750    | 102                                                                                       | 72   | 59   | 51   | 45   | 41   | 74                                                                                        | 52   | 43   | 37   | 33   | 30   |
|           | 2.000    | 131                                                                                       | 92   | 75   | 65   | 58   | 53   | 96                                                                                        | 68   | 56   | 48   | 43   | 39   |
| 6.00      | 2.500    | 194                                                                                       | 137  | 112  | 97   | 87   | 79   | 150                                                                                       | 106  | 87   | 75   | 67   | 61   |
|           | 2.000    | 107                                                                                       | 76   | 62   | 53   | 48   | 44   | 77                                                                                        | 54   | 44   | 38   | 34   | 31   |
| 7.00      | 2.500    | 163                                                                                       | 115  | 94   | 82   | 73   | 67   | 120                                                                                       | 85   | 69   | 60   | 54   | 49   |
|           | 3.000    | 226                                                                                       | 160  | 130  | 113  | 101  | 92   | 173                                                                                       | 122  | 100  | 87   | 77   | 71   |
| 8.00      | 3.500    | 289                                                                                       | 204  | 167  | 145  | 129  | 118  | 236                                                                                       | 167  | 136  | 118  | 105  | 96   |
|           | 2.500    | 139                                                                                       | 98   | 80   | 70   | 62   | 57   | 100                                                                                       | 71   | 58   | 50   | 45   | 41   |
| 9.00      | 3.000    | 197                                                                                       | 139  | 114  | 98   | 88   | 80   | 144                                                                                       | 102  | 83   | 72   | 65   | 59   |
|           | 3.500    | 260                                                                                       | 184  | 150  | 130  | 116  | 106  | 196                                                                                       | 139  | 113  | 98   | 88   | 80   |
| 10.00     | 4.000    | 300                                                                                       | 231  | 188  | 163  | 146  | 133  | 257                                                                                       | 181  | 148  | 128  | 115  | 105  |
|           | 3.000    | 171                                                                                       | 121  | 99   | 85   | 76   | 70   | 124                                                                                       | 87   | 71   | 62   | 55   | 50   |
| 11.00     | 3.500    | 228                                                                                       | 161  | 132  | 114  | 102  | 93   | 168                                                                                       | 119  | 97   | 84   | 75   | 69   |
|           | 4.000    | 289                                                                                       | 204  | 167  | 145  | 129  | 118  | 220                                                                                       | 155  | 127  | 110  | 98   | 90   |
| 12.00     | 4.500    | 300                                                                                       | 249  | 203  | 176  | 157  | 144  | 278                                                                                       | 197  | 161  | 139  | 124  | 114  |
|           | 5.000    | 300                                                                                       | 293  | 239  | 207  | 185  | 169  | 300                                                                                       | 243  | 198  | 172  | 154  | 140  |
| 13.00     | 3.500    | 203                                                                                       | 144  | 117  | 102  | 91   | 83   | 147                                                                                       | 104  | 85   | 74   | 66   | 60   |
|           | 4.000    | 261                                                                                       | 185  | 151  | 131  | 117  | 107  | 192                                                                                       | 136  | 111  | 96   | 86   | 79   |
| 14.00     | 4.500    | 300                                                                                       | 229  | 187  | 162  | 145  | 132  | 244                                                                                       | 172  | 141  | 122  | 109  | 99   |
|           | 5.000    | 300                                                                                       | 274  | 224  | 194  | 174  | 158  | 300                                                                                       | 213  | 174  | 150  | 134  | 123  |
| 15.00     | 5.500    | 300                                                                                       | 300  | 261  | 226  | 202  | 185  | 300                                                                                       | 257  | 210  | 182  | 163  | 149  |
|           | 4.500    | 269                                                                                       | 190  | 155  | 135  | 120  | 110  | 195                                                                                       | 138  | 112  | 97   | 87   | 80   |
| 16.00     | 5.000    | 300                                                                                       | 232  | 190  | 164  | 147  | 134  | 291                                                                                       | 206  | 168  | 146  | 130  | 119  |
|           | 5.500    | 300                                                                                       | 277  | 226  | 196  | 175  | 160  | 300                                                                                       | 300  | 272  | 236  | 211  | 192  |
| 17.00     | 7.000    | 300                                                                                       | 300  | 300  | 296  | 265  | 242  | 241                                                                                       | 170  | 139  | 120  | 108  | 98   |
|           | 5.500    | 300                                                                                       | 236  | 193  | 167  | 149  | 136  | 243                                                                                       | 171  | 140  | 121  | 108  | 99   |
| 18.00     | 7.000    | 300                                                                                       | 300  | 300  | 260  | 233  | 213  | 300                                                                                       | 300  | 296  | 257  | 229  | 209  |
|           | 8.000    | 300                                                                                       | 300  | 300  | 300  | 292  | 267  | 300                                                                                       | 278  | 227  | 196  | 176  | 160  |
| 19.00     | 7.000    | 300                                                                                       | 300  | 263  | 228  | 204  | 186  | 300                                                                                       | 238  | 194  | 168  | 151  | 137  |
|           | 8.000    | 300                                                                                       | 300  | 300  | 290  | 259  | 236  | 300                                                                                       | 300  | 300  | 300  | 300  | 281  |
| 20.00     | 10.000   | 300                                                                                       | 300  | 300  | 300  | 300  | 300  | 300                                                                                       | 300  | 254  | 220  | 197  | 180  |
|           | 8.000    | 300                                                                                       | 300  | 300  | 260  | 233  | 213  | 300                                                                                       | 272  | 222  | 192  | 172  | 157  |
| 21.00     | 9.000    | 300                                                                                       | 300  | 300  | 300  | 288  | 263  | 300                                                                                       | 300  | 281  | 244  | 218  | 199  |
|           | 10.000   | 300                                                                                       | 300  | 300  | 300  | 300  | 300  | 300                                                                                       | 300  | 300  | 300  | 269  | 245  |
| 22.00     | 9.000    | 300                                                                                       | 300  | 300  | 293  | 262  | 239  | 300                                                                                       | 300  | 250  | 216  | 194  | 177  |
|           | 10.000   | 300                                                                                       | 300  | 300  | 300  | 300  | 289  | 300                                                                                       | 300  | 300  | 267  | 239  | 218  |
| 23.00     | 10.000   | 300                                                                                       | 300  | 300  | 300  | 292  | 267  | 300                                                                                       | 300  | 278  | 241  | 215  | 196  |

<sup>1</sup> Maximum operating pressure is limited for Mounting Style SB. Please refer to maximum operating pressure per bore in Pressure Ratings table located on the dimension page for Mounting Styles SB.

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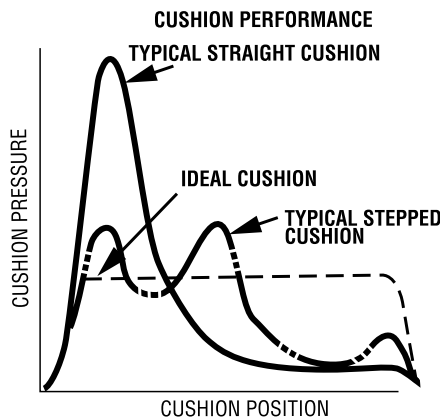
## Cushioning

### An Introduction to Cushioning

Cushioning is recommended as a means of controlling the deceleration of masses, or for applications where piston speed is in excess of 4 in/sec and the piston will make full stroke. Cushioning extends cylinder life and reduces undesirable noise and hydraulic shock. Built-in "cushions" are optional and can be supplied at the head and cap ends of a cylinder without affecting its envelope or mounting dimensions.

### Standard Cushioning

**Ideal cushion performance shows an almost uniform absorption of energy along the cushioning length, as shown. Many forms of cushioning exist, and each has its own specific merits and advantages.**



In order to cover the majority of applications, 2H/3H cylinders are supplied with profiled cushioning as standard. Final speed may be adjusted using the cushion screw. The performance of profiled cushioning is

indicated on the diagram, and cushion performance for each of the rod sizes available is illustrated graphically in the charts on the following pages.

Note: Cushion performance will be affected by the use of water or high water based fluids. Please consult factory for details.

### Cushion Length

Where specified, 2H/2HD/2HB and 3H/3HD/3HB cylinders incorporate the longest cushion sleeve and spear that can be accommodated within the standard envelope without reducing the rod bearing and piston bearing length. See cushion lengths on the next page. Cushions are adjustable via recessed needle valves.

### Cushion Calculation

The charts on the cushion energy absorption capacity data page show the energy absorption capacity for each bore/rod combination at the head (annulus) and the cap (full bore) ends of cylinder. The charts are valid for piston velocities within a range of 0.33 to 1 ft/s. For velocities between 1 ft/s and 1.64 ft/s the energy values derived from the charts should be reduced by 25%. For velocities less than 0.33 ft/s where large masses are involved, and for velocities greater than 1.60 ft/s, a special cushion profile may be required. Please consult the factory for details.

The cushion capacity of the head end is less than the cap, and reduces to zero at high drive pressures due to the pressure intensification effect across the piston.

The energy absorption capacity of the cushion decreases with drive pressure.

## Heavy Duty Hydraulic Cylinders Engineering Data

### Formula

Cushioning calculations are based on the formula  $E = (1/2)mv^2$  for horizontal applications. For inclined or vertically downward or upward applications, this is modified to:

$$E = (1/2)mv^2 + mg(L/12) \times \sin(a)$$

(for inclined or vertically downward direction of mass)

$$E = (1/2)mv^2 - mg(L/12) \times \sin(a)$$

(for inclined vertically upward direction of mass)

where:

E = energy absorbed in ft-lb

g = acceleration due to gravity = 32.2 ft/s<sup>2</sup>

v = velocity in ft/s

L = length of cushion in inches (see cushion length chart on the next page).

m = mass of load in slug (including piston, rod and rod end accessories).

a = angle to the horizontal in degrees

p = pressure in psi

### Example:

The following example shows how to calculate the energy developed by masses moving in a straight line. For non-linear motion, other calculations are required; please consult the factory. The example assumes that the bore and rod diameter are already appropriate for the application. The effects of friction on the cylinder and load have been ignored.

Selected bore/rod 6.00" bore x 2.50" rod (No. 1 rod)

Cushion at the cap end.

Pressure = 2,500 psi

Mass = 685 slugs = weight in lb / (32.2 ft/s<sup>2</sup>)

Velocity = 1.3 ft/s

Cushion length = 1.313 inch

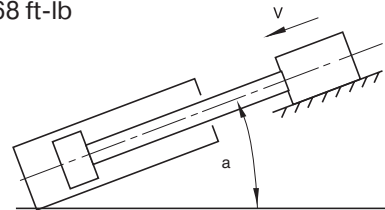
a = 45°

Sin (a) = 0.70

$$E = (1/2)mv^2 + mgl/12 \times \sin(a)$$

$$= (1/2) \times 685 \times 1.3^2 + 685 \times 32.2 \times 1.313/12 \times 0.70$$

$$= 2,268 \text{ ft-lb}$$



Note: In the above example velocity is greater than 1 ft/s. Therefore, a de-rating factor of 0.75 must be applied to the calculated value of E. Applying this correction factor will increase the energy value to 3024 ft-lb (2268/0.75 = 3024 ft-lb). A review of the graph for the cap end cushion of a 6 inch bore x 2.50" rod cylinder operating at 2500 psi indicates that it can absorb approximately 3200 ft-lb maximum of energy. Since 3024 ft-lb is less than the maximum allowable of 3200 ft-lb, the cylinder can be applied as indicated. If the calculated energy exceeds the value shown on the curve, select a larger bore cylinder and/or reduce the operating pressure and recalculate the energy. Compare the newly calculated energy value to the appropriate curve to ensure it does not exceed the maximum allowable energy.



**Cushion Length Chart (Series 2H/2HD/2HB & 3H/3HD/3HB Cylinders)**

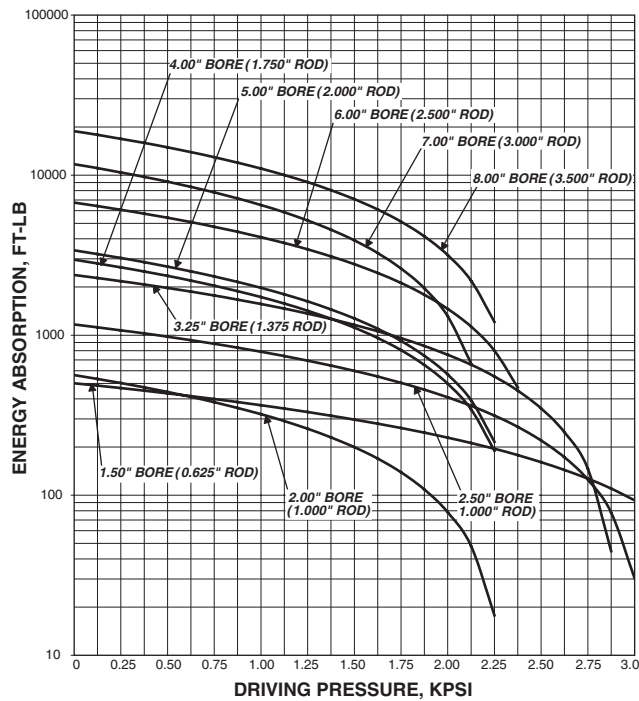
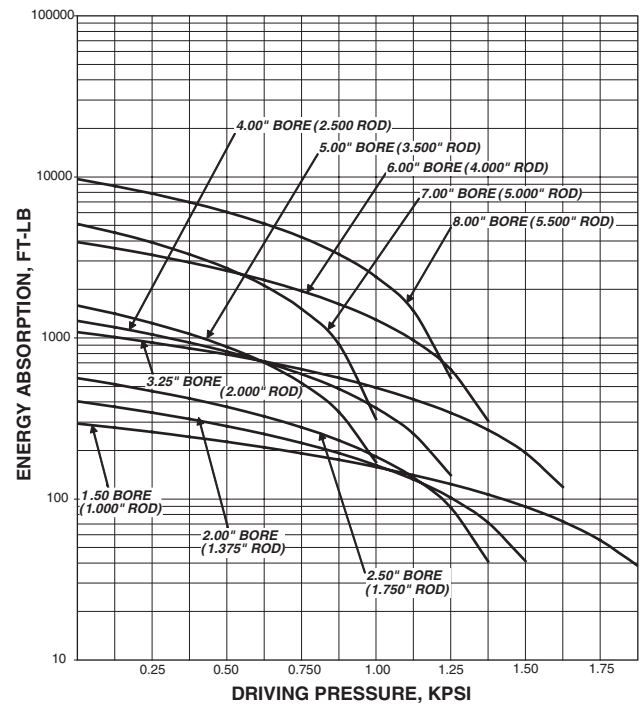
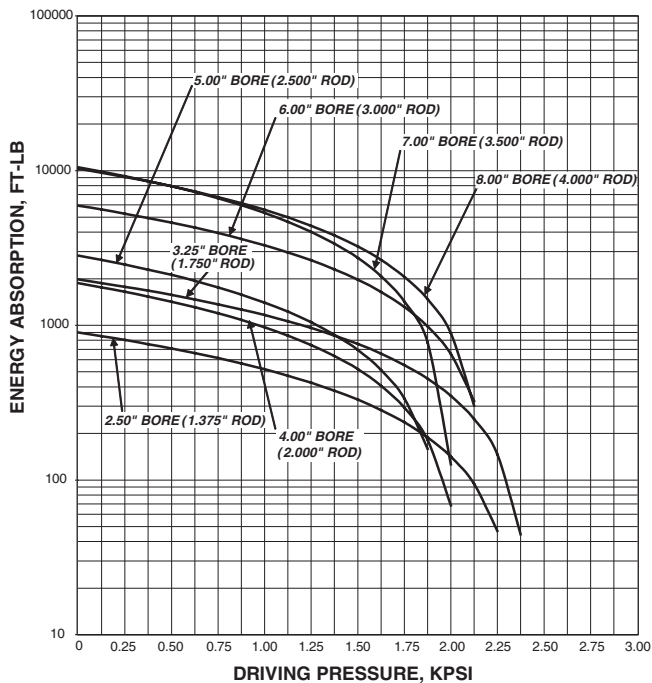
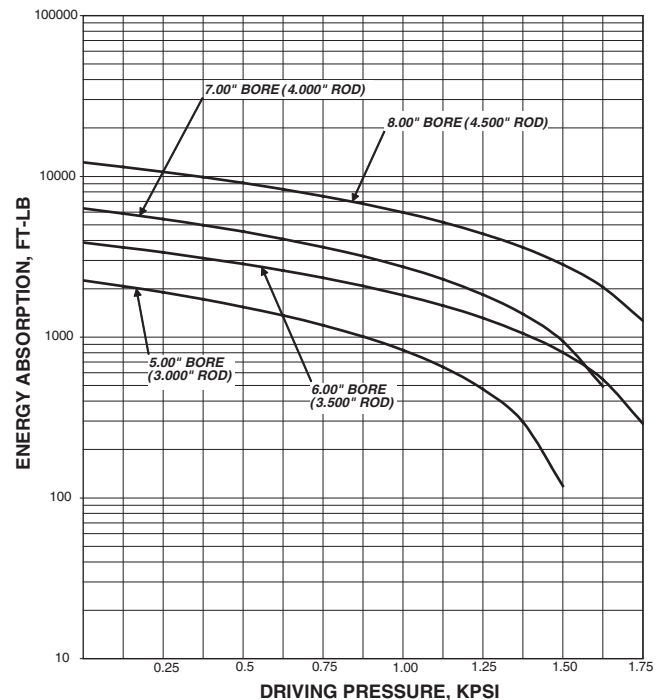
| Bore<br>Ø | Rod<br>Ø | Effective Cushion Length |       |
|-----------|----------|--------------------------|-------|
|           |          | Head                     | Cap   |
| 1.50      | 0.625    | 0.924                    | 1.000 |
|           | 1.000    | 0.927                    | 1.000 |
| 2.00      | 1.000    | 0.927                    | 0.938 |
|           | 1.375    | 0.925                    | 0.938 |
| 2.50      | 1.000    | 0.927                    | 0.938 |
|           | 1.750    | 0.928                    | 0.938 |
|           | 1.375    | 0.925                    | 0.938 |
| 3.25      | 1.375    | 1.175                    | 1.125 |
|           | 2.000    | 0.862                    | 1.125 |
|           | 1.750    | 1.178                    | 1.125 |
| 4.00      | 1.750    | 1.178                    | 1.063 |
|           | 2.500    | 0.869                    | 1.063 |
|           | 2.000    | 0.862                    | 1.063 |
| 5.00      | 2.000    | 0.862                    | 0.938 |
|           | 3.500    | 0.869                    | 0.938 |
|           | 2.500    | 0.869                    | 0.938 |
|           | 3.000    | 0.869                    | 0.938 |
| 6.00      | 2.500    | 1.119                    | 1.313 |
|           | 4.000    | 1.119                    | 1.313 |
|           | 3.000    | 1.119                    | 1.313 |
|           | 3.500    | 0.869                    | 1.313 |
| 7.00      | 3.000    | 1.619                    | 1.750 |
|           | 5.000    | 1.496                    | 1.750 |
|           | 3.500    | 1.619                    | 1.750 |
|           | 4.000    | 1.119                    | 1.750 |
|           | 4.500    | 1.496                    | 1.750 |
| 8.00      | 3.500    | 1.869                    | 1.813 |
|           | 5.500    | 1.745                    | 1.813 |
|           | 4.000    | 1.119                    | 1.813 |
|           | 4.500    | 1.496                    | 1.813 |
|           | 5.000    | 1.496                    | 1.813 |

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**Cushion Energy Absorption Capacity Data**

The cushion energy absorption data shown below is based on the maximum fatigue-free pressure developed in the tube. For application with a life cycle of less than  $10^6$  cycles,

greater energy absorption figures can be applied. Please consult the factory if further information is required.

**Head End****STANDARD ROD DIA.****MAXIMUM ROD DIA.****FIRST OVERSIZE ROD DIA.****SECOND OVERSIZE ROD DIA.**

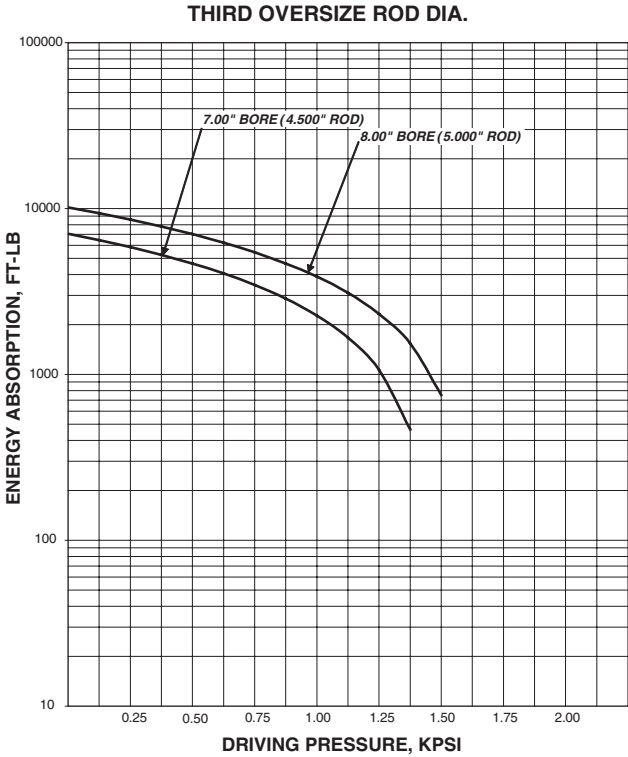
**⚠ PROP 65 WARNING** WARNING: This product can expose you to chemicals including **Lead and Lead Compounds** which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**Cushion Energy Absorption Capacity Data**

The cushion energy absorption data shown below is based on the maximum fatigue-free pressure developed in the tube. For application with a life cycle of less than 10<sup>6</sup> cycles,

greater energy absorption figures can be applied. Please consult the factory if further information is required.

**Head End**



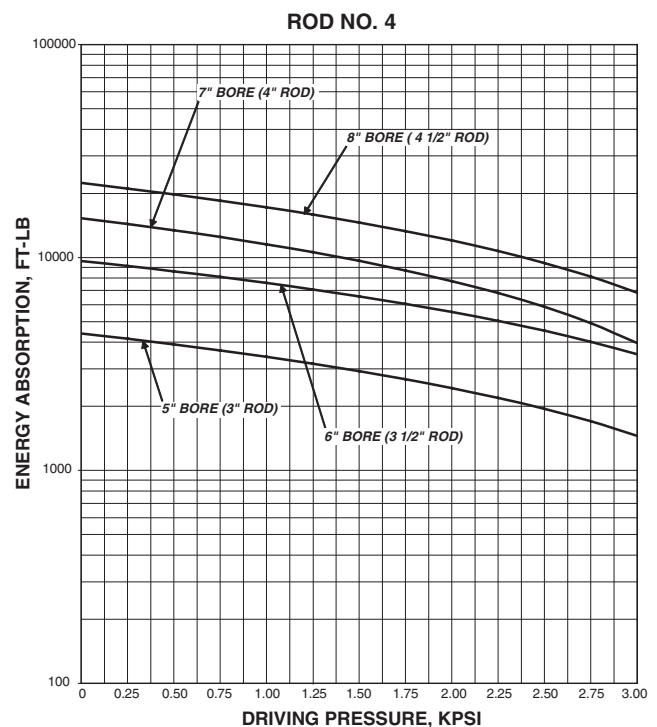
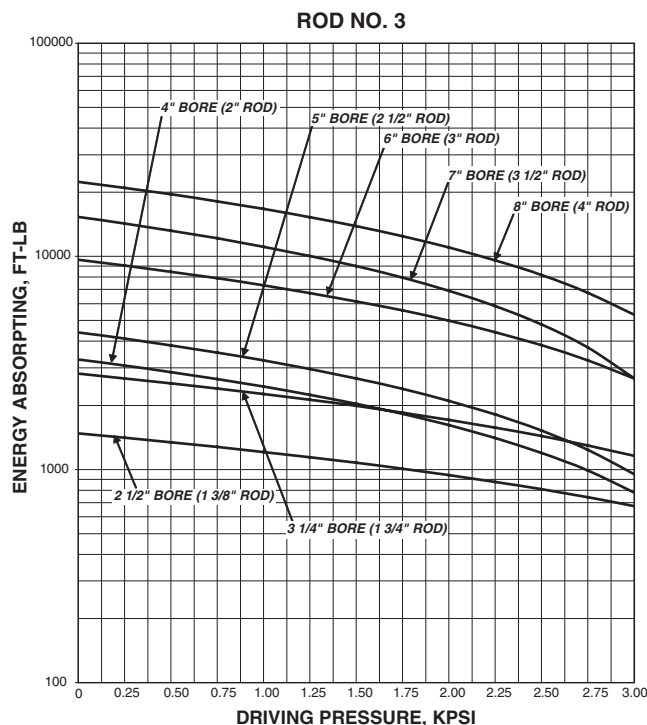
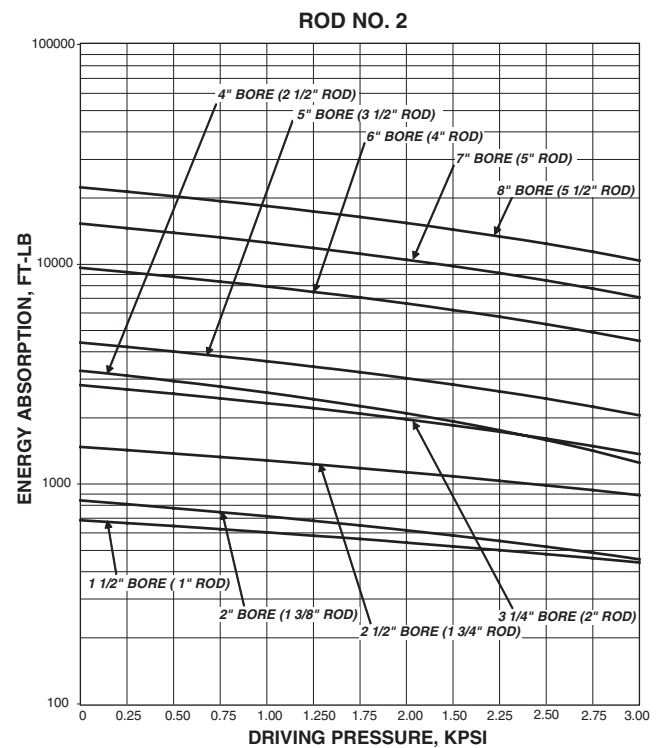
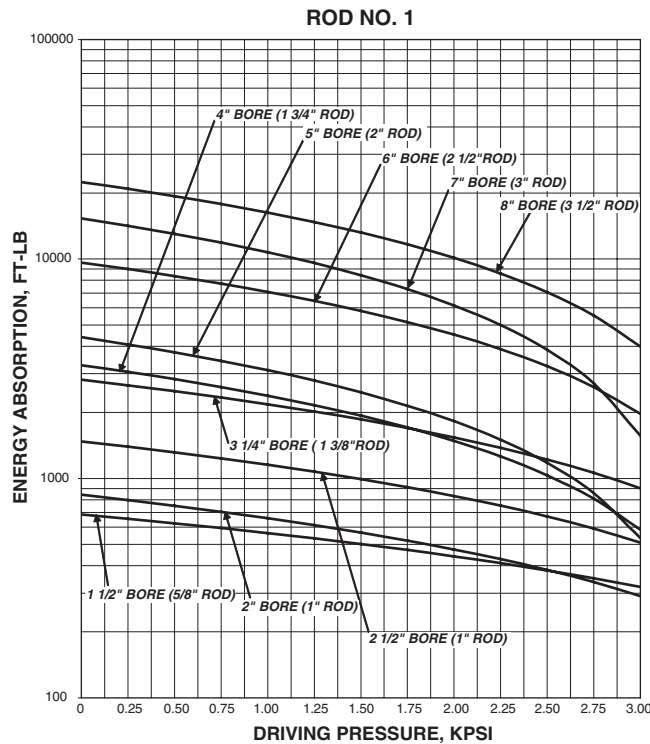
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**Cushion Energy Absorption Capacity Data**

The cushion energy absorption data shown below is based on the maximum fatigue-free pressure developed in the tube. For application with a life cycle of less than  $10^6$  cycles, greater energy absorption figures can be applied. Please consult the factory if further information is required.

**Note: Cap end cushioned cylinders with oversize port and hydraulic fluid flow entering the cap that exceeds 25 ft/second should be specified with solid cap cushion design.**

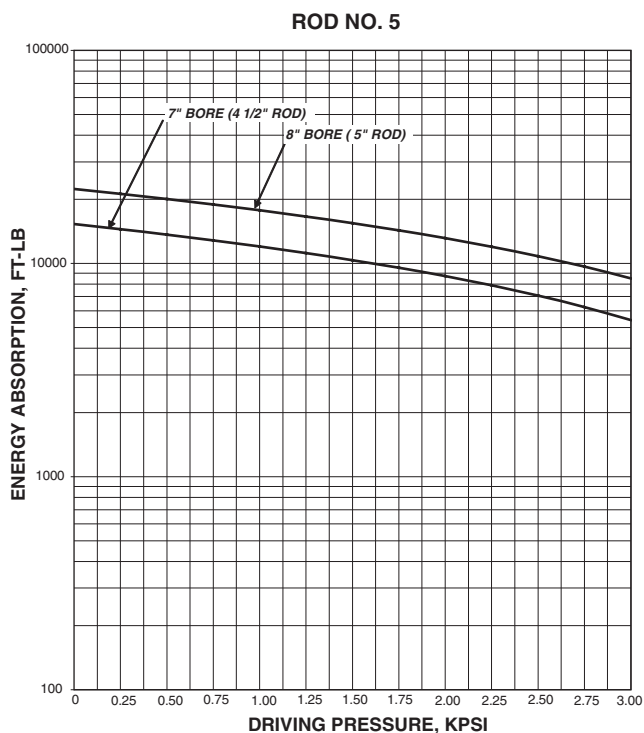
**Cap End**

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**Cushion Energy Absorption Capacity Data**

The cushion energy absorption data shown below is based on the maximum fatigue-free pressure developed in the tube. For application with a life cycle of less than  $10^6$  cycles, greater energy absorption figures can be applied. Please consult the factory if further information is required.

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**Cap End**

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## Notes

This image shows a full page of blank graph paper. The grid consists of thin, light gray horizontal and vertical lines that intersect to form small squares across the entire surface. There are no margins, text, or other markings on the paper.

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## Safety Guide for Selecting and Using Hydraulic, Pneumatic Cylinders and Their Accessories

**WARNING:**  **FAILURE OF THE CYLINDER, ITS PARTS, ITS MOUNTING, ITS CONNECTIONS TO OTHER OBJECTS, OR ITS CONTROLS CAN RESULT IN:**

- Unanticipated or uncontrolled movement of the cylinder or objects connected to it.
- Falling of the cylinder or objects held up by it.
- Fluid escaping from the cylinder, potentially at high velocity.

**THESE EVENTS COULD CAUSE DEATH OR PERSONAL INJURY BY, FOR EXAMPLE, PERSONS FALLING FROM HIGH LOCATIONS, BEING CRUSHED OR STRUCK BY HEAVY OR FAST MOVING OBJECTS, BEING PUSHED INTO DANGEROUS EQUIPMENT OR SITUATIONS, OR SLIPPING ON ESCAPED FLUID.**

Before selecting or using Parker Hannifin Corporation (the Company) cylinders or related accessories, it is important that you read, understand and follow the following safety information. Training is advised before selecting and using the Company's products.

### 1.0 General Instructions

**1.1 Scope** – This safety guide provides instructions for selecting and using (including assembling, installing, and maintaining) cylinder products. This safety guide is a supplement to and is to be used with the specific Company publications for the specific cylinder products that are being considered for use.

**1.2 Fail Safe** – Cylinder products can and do fail without warning for many reasons. All systems and equipment should be designed in a fail-safe mode so that if the failure of a cylinder product occurs people and property won't be endangered.

**1.3 Distribution** – Provide a free copy of this safety guide to each person responsible for selecting or using cylinder products. Do not select or use the Company's cylinders without thoroughly reading and understanding this safety guide as well as the specific Company publications for the products considered or selected.

**1.4 User Responsibility** – Due to very wide variety of cylinder applications and cylinder operating conditions, the Company does not warrant that any particular cylinder is suitable for any specific application. This safety guide does not analyze all technical parameters that must be considered in selecting a product. The hydraulic and pneumatic cylinders outlined in this catalog are designed to the Company's design guidelines and do not necessarily meet the design guideline of other agencies such as American Bureau of Shipping, ASME Pressure Vessel Code etc. The user, through its own analysis and testing, is solely responsible for:

- Making the final selection of the cylinders and related accessories.
- Determining if the cylinders are required to meet specific design requirements as required by the Agency(s) or industry standards covering the design of the user's equipment.
- Assuring that the user's requirements are met, OSHA requirements are met, and safety guidelines from the applicable agencies such as but not limited to ANSI are followed and that the use presents no health or safety hazards.
- Providing all appropriate health and safety warnings on the equipment on which the cylinders are used.

**1.5 Additional Questions** – Call the appropriate Company technical service department if you have any questions or require any additional information. See the Company publication for the product being considered or used, or call 1-847-298-2400, or go to [www.parker.com](http://www.parker.com), for telephone numbers of the appropriate technical service department.

### 2.0 Cylinder and Accessories Selection

**2.1 Seals** – Part of the process of selecting a cylinder is the selection of seal compounds. Before making this selection, consult the "seal information page(s)" of the publication for the series of cylinders of interest.

The application of cylinders may allow fluids such as cutting fluids, wash down fluids etc. to come in contact with the external area of the cylinder. These fluids may attack the piston rod wiper and or the primary seal and must be taken into account when selecting and specifying seal compounds.

Dynamic seals will wear. The rate of wear will depend on many operating factors. Wear can be rapid if a cylinder is mis-aligned or if the cylinder has been improperly serviced. The user must take seal wear into consideration in the application of cylinders.

**2.2 Piston Rods** – Possible consequences of piston rod failure or separation of the piston rod from the piston include, but are not limited to are:

- Piston rod and or attached load thrown off at high speed.
- High velocity fluid discharge.
- Piston rod extending when pressure is applied in the piston retract mode.

Piston rods or machine members attached to the piston rod may move suddenly and without warning as a consequence of other conditions occurring to the machine such as, but not limited to:

- Unexpected detachment of the machine member from the piston rod.
- Failure of the pressurized fluid delivery system (hoses, fittings, valves, pumps, compressors) which maintain cylinder position.
- Catastrophic cylinder seal failure leading to sudden loss of pressurized fluid.
- Failure of the machine control system.

Follow the recommendations of the "Piston Rod Selection Chart and Data" in the publication for the series of cylinders of interest. The suggested piston rod diameter in these charts must be followed in order to avoid piston rod buckling.

Piston rods are not normally designed to absorb bending moments or loads which are perpendicular to the axis of piston rod motion. These additional loads can cause the piston rod to fail. If these types of additional loads are expected to be imposed on the piston rod, their magnitude should be made known to our engineering department.

The cylinder user should always make sure that the piston rod is securely attached to the machine member.

On occasion cylinders are ordered with double rods (a piston rod extended from both ends of the cylinder). In some cases a stop is threaded on to one of the piston rods and used as an external stroke adjuster. On occasions spacers are attached to the machine member connected to the piston rod and also used as a stroke adjuster. In both cases the stops will create a pinch point and the user should consider appropriate use of guards. If these

external stops are not perpendicular to the mating contact surface, or if debris is trapped between the contact surfaces, a bending moment will be placed on the piston rod, which can lead to piston rod failure. An external stop will also negate the effect of cushioning and will subject the piston rod to impact loading. Those two (2) conditions can cause piston rod failure. Internal stroke adjusters are available with and without cushions. The use of external stroke adjusters should be reviewed with our engineering department.

The piston rod to piston and the stud to piston rod threaded connections are secured with an anaerobic adhesive. The strength of the adhesive decreases with increasing temperature. Cylinders which can be exposed to temperatures above +250°F (+121°C) are to be ordered with a non studded piston rod and a pinned piston to rod joint.

**2.3 Cushions** – Cushions should be considered for cylinder applications when the piston velocity is expected to be over 4 inches/second.

Cylinder cushions are normally designed to absorb the energy of a linear applied load. A rotating mass has considerably more energy than the same mass moving in a linear mode. Cushioning for a rotating mass application should be reviewed by our engineering department.

**2.4 Cylinder Mountings** – Some cylinder mounting configurations may have certain limitations such as but not limited to minimum stroke for side or foot mounting cylinders or pressure de-ratings for certain mounts. Carefully review the catalog for these types of restrictions.

Always mount cylinders using the largest possible high tensile alloy steel socket head cap screws that can fit in the cylinder mounting holes and torque them to the manufacturer's recommendations for their size.

**2.5 Port Fittings** – Hydraulic cylinders applied with meter out or deceleration circuits are subject to intensified pressure at piston rod end.

The rod end pressure is approximately equal to:

$$\frac{\text{operating pressure} \times \text{effective cap end area}}{\text{effective rod end piston area}}$$

Contact your connector supplier for the pressure rating of individual connectors.

### 3.0 Cylinder and Accessories Installation and Mounting

#### 3.1 Installation

**3.1.1** – Cleanliness is an important consideration, and cylinders are shipped with the ports plugged to protect them from contaminants entering the ports. These plugs should not be removed until the piping is to be installed. Before making the connection to the cylinder ports, piping should be thoroughly cleaned to remove all chips or burrs which might have resulted from threading or flaring operations.

**3.1.2** – Cylinders operating in an environment where air drying materials are present such as fast-drying chemicals, paint, or weld splatter, or other hazardous conditions such as excessive heat, should have shields installed to prevent damage to the piston rod and piston rod seals.

**3.1.3** – Proper alignment of the cylinder piston rod and its mating component on the machine should be checked in both the extended and retracted positions. Improper alignment will result in excessive rod gland and/or cylinder bore wear. On fixed mounting cylinders attaching the piston rod while the rod is retracted will help in achieving proper alignment.

**3.1.4** – Sometimes it may be necessary to rotate the piston rod in order to thread the piston rod into the machine member. This operation must always be done with zero pressure being applied to either side of the piston. Failure to follow this procedure may result in loosening the piston to rod-threaded connection. In some rare cases the turning of the piston rod may rotate a threaded piston rod gland and loosen it from the cylinder head. Confirm that this condition is not occurring. If it does, re-tighten the piston rod gland firmly against the cylinder head.

For double rod cylinders it is also important that when attaching or detaching the piston rod from the machine member that the torque be applied to the piston rod end of the cylinder that is directly attaching to the machine member with the opposite end unrestrained. If the design of the machine is such that only the rod end of the cylinder opposite to where the rod attaches to the machine member can be rotated, consult the factory for further instructions.

### 3.2 Mounting Recommendations

**3.2.1** – Always mount cylinders using the largest possible high tensile alloy steel socket head screws that can fit in the cylinder mounting holes and torque them to the manufacturer's recommendations for their size.

**3.2.2** – Side-Mounted Cylinders – In addition to the mounting bolts, cylinders of this type should be equipped with thrust keys or dowel pins located so as to resist the major load.

**3.2.3** – Tie Rod Mounting – Cylinders with tie rod mountings are recommended for applications where mounting space is limited. The standard tie rod extension is shown as BB in dimension tables. Longer or shorter extensions can be supplied. Nuts used for this mounting style should be torqued to the same value as the tie rods for that bore size.

**3.2.4** – Flange Mount Cylinders – The controlled diameter of the rod gland extension on head end flange mount cylinders can be used as a pilot to locate the cylinders in relation to the machine. After alignment has been obtained, the flanges may be drilled for pins or dowels to prevent shifting.

**3.2.5** – Trunnion Mountings – Cylinders require lubricated bearing blocks with minimum bearing clearances. Bearing blocks should be carefully aligned and rigidly mounted so the trunnions will not be subjected to bending moments. The rod end should also be pivoted with the pivot pin in line and parallel to axis of the trunnion pins.

**3.2.6** – Clevis Mountings – Cylinders should be pivoted at both ends with centerline of pins parallel to each other. After cylinder is mounted, be sure to check to assure that the cylinder is free to swing through its working arc without interference from other machine parts.

### 4.0 Cylinder and Accessories Maintenance, Troubleshooting and Replacement

**4.1 Storage** – At times cylinders are delivered before a customer is ready to install them and must be stored for a period of time. When storage is required the following procedures are recommended.

**4.1.1** – Store the cylinders in an indoor area which has a dry, clean and noncorrosive atmosphere. Take care to protect the cylinder from both internal corrosion and external damage.

**4.1.2** – Whenever possible cylinders should be stored in a vertical position (piston rod up). This will minimize corrosion due to possible condensation which could occur inside the cylinder. This will also minimize seal damage.

**4.1.3** – Port protector plugs should be left in the cylinder until the time of installation.

**4.1.4** – If a cylinder is stored full of hydraulic fluid, expansion of the fluid due to temperature changes must be considered. Installing a check valve with free flow out of the cylinder is one method.

**4.1.5** – When cylinders are mounted on equipment that is stored outside for extended periods, exposed unpainted surfaces, e.g. piston rod, must be coated with a rust-inhibiting compound to prevent corrosion.

### 4.2 Cylinder Trouble Shooting

#### 4.2.1 – External Leakage

**4.2.1.1** – Rod seal leakage can generally be traced to worn or

damaged seals. Examine the piston rod for dents, gouges or score marks, and replace piston rod if surface is rough.

Rod seal leakage could also be traced to gland wear. If clearance is excessive, replace rod bushing and seal. Rod seal leakage can also be traced to seal deterioration. If seals are soft or gummy or brittle, check compatibility of seal material with lubricant used if air cylinder, or operating fluid if hydraulic cylinder. Replace with seal material, which is compatible with these fluids. If the seals are hard or have lost elasticity, it is usually due to exposure to temperatures in excess of 165°F. (+74°C). Shield the cylinder from the heat source to limit temperature to 350°F. (+177°C.) and replace with fluorocarbon seals.

**4.2.1.2** – Cylinder body seal leak can generally be traced to loose tie rods. Torque the tie rods to manufacturer's recommendation for that bore size.

Excessive pressure can also result in cylinder body seal leak. Determine maximum pressure to rated limits. Replace seals and retorque tie rods as in paragraph above. Excessive pressure can also result in cylinder body seal leak. Determine if the pressure rating of the cylinder has been exceeded. If so, bring the operating pressure down to the rating of the cylinder and have the tie rods replaced.

Pinched or extruded cylinder body seal will also result in a leak. Replace cylinder body seal and retorque as in paragraph above.

Cylinder body seal leakage due to loss of radial squeeze which shows up in the form of flat spots or due to wear on the O.D. or I.D. – Either of these are symptoms of normal wear due to high cycle rate or length of service. Replace seals as per paragraph above.

#### 4.2.2 – Cylinder Fails to Move the Load

**4.2.2.1** – Pneumatic or hydraulic pressure is too low. Check the pressure at the cylinder to make sure it is to circuit requirements.

**4.2.2.2** – Piston Seal Leak – Operate the valve to cycle the cylinder and observe fluid flow at valve exhaust ports at end of cylinder stroke. Replace piston seals if flow is excessive.

**4.2.2.3** – Cylinder is undersized for the load – Replace cylinder with one of a larger bore size.

#### 4.3 Erratic or Chatter Operation

**4.3.1** – Excessive friction at rod gland or piston bearing due to load misalignment – Correct cylinder-to-load alignment.

**4.3.2** – Cylinder sized too close to load requirements – Reduce load or install larger cylinder.

**4.3.3** – Erratic operation could be traced to the difference between static and kinetic friction. Install speed control valves to provide a back pressure to control the stroke.

**4.4 Cylinder Modifications, Repairs, or Failed Component** – Cylinders as shipped from the factory are not to be disassembled and or modified. If cylinders require modifications, these modifications must be done at company locations or by the Company's certified facilities. The Cylinder Division Engineering Department must be notified in the event of a mechanical fracture or permanent deformation of any cylinder component (excluding seals). This includes a broken piston rod, tie rod, mounting accessory or any other cylinder component. The notification should include all operation and application details. This information will be used to provide an engineered repair that will prevent recurrence of the failure.

It is allowed to disassemble cylinders for the purpose of replacing seals or seal assemblies. However, this work must be done by strictly following all the instructions provided with the seal kits.

## Catalog HY08-1314-2/NA Offer of Sale

The items described in this document and other documents and descriptions provided by Parker Hannifin Corporation, its subsidiaries and its authorized distributors ("Seller") are hereby offered for sale at prices to be established by Seller. This offer and its acceptance by any customer ("Buyer") shall be governed by all of the following Terms and Conditions. Buyer's order for any item described in its document, when communicated to Seller verbally, or in writing, shall constitute acceptance of this offer. All goods, services or work described by will be referred to as "Products".

**1. Terms.** All sales of Products by Seller will be governed by, and are expressly conditioned upon Buyer's assent to, these Terms. These Terms are incorporated into any Quote provided by Seller to Buyer. Buyer's order for any Products whether communicated to Seller verbally, in writing, by electronic data interface or other electronic commerce, shall constitute acceptance of these Terms. Seller objects to any contrary or additional terms or conditions of Buyer. Reference in Seller's order acknowledgement to Buyer's purchase order or purchase order number shall in no way constitute an acceptance of any of Buyer's terms or conditions of purchase. Any Quote made by Seller to Buyer shall be considered a firm and definite offer and shall not be deemed to be otherwise despite any language on the face of the Quote. Seller reserves all rights to accept or reject any purported acceptance by Buyer to Seller's Quote if such purported acceptance attempts to vary the terms of the Quote. If Seller ships Products after Buyer issues an acceptance to the Quote, any additional or different terms proposed by Buyer will not become part of the parties' business relationship unless agreed to in a writing that is signed by an authorized representative of Seller, excluding email correspondence. If the transaction proceeds without such agreement on the part of Seller, the business relationship will be governed solely by these Terms and the specific terms in Seller's Quote.

**2. Price; Payment.** The Products set forth in the Quote are offered for sale at the prices indicated in the Quote. Unless otherwise specifically stated in the Quote, prices are valid for thirty (30) days and do not include any sales, use, or other taxes or duties. Seller reserves the right to modify prices for any reason and at any time by giving ten (10) days prior written notice. Unless otherwise specified by Seller, all prices are F.C.A. Seller's facility (INCOTERMS 2020). All sales are contingent upon credit approval and full payment for all purchases is due thirty (30) days from the date of invoice (or such date as may be specified in the Quote). Under any circumstances, Buyer may not withhold or suspend payment of any amounts due and payable as a deduction, set-off or recoupment of any amount, claim or dispute with Seller. Unpaid invoices beyond the specified payment date incur interest at the rate of 1.5% per month or the maximum allowable rate under applicable law. Seller reserves the right to require advance payment or provision of securities for first and subsequent deliveries if there is any doubt, in Seller's sole determination, regarding the Buyer's creditworthiness or for other business reasons. If the requested advance payment or securities are not provided to Seller's satisfaction, Seller reserves the right to suspend performance or reject the purchase order, in whole or in part, without prejudice to Seller's other rights or remedies, including the right to full compensation. Seller may revoke or shorten any payment periods previously granted in Seller's sole determination. The rights and remedies herein reserved to Seller are cumulative and in addition to any other or further rights and remedies available at law or in equity. No waiver by Seller of any breach by Buyer of any provision of these terms will constitute a waiver by Seller of any other breach of such provision.

**3. Shipment; Delivery;** Title and Risk of Loss. All delivery dates are approximate, and Seller is not responsible for damages or additional costs resulting from any delay. All deliveries are subject to our ability to procure materials from our suppliers. Regardless of the manner of shipment, delivery occurs and title and risk of loss or damage pass to Buyer, upon placement of the Products with the carrier at Seller's facility. Unless otherwise agreed prior to shipment and for domestic delivery locations only, Seller will select and arrange, at Buyer's sole expense, the carrier and means of delivery. When Seller selects and arranges the carrier and means of delivery, freight and insurance costs for shipment to the designated delivery location will be prepaid by Seller and added as a separate line item to the invoice. Buyer shall be responsible for any additional shipping charges incurred by Seller due to Buyer's acts or omissions. Buyer shall not return or repackage any Products without the prior written authorization from Seller, and any return shall be at the sole cost and expense of Buyer.

**4. Warranty.** The warranty for the Products is as follows: (i) Goods are warranted against defects in material or workmanship for a period of eighteen (18) months from the date of delivery or 2,000 hours of use, whichever occurs first; (ii) Services shall be performed in accordance with generally accepted practices and using the degree of care and skill that is ordinarily exercised and customary in the field to which the Services pertain and are warranted for a period of six (6) months from the date of completion of the Services; and (iii) Software is only warranted to perform in accordance with applicable specifications provided by Seller to Buyer for ninety (90) days from the date of delivery or, when downloaded by a Buyer or end-user, from the date of the initial download. All prices are based upon the exclusive limited warranty stated above, and upon the following disclaimer: **EXEMPTION CLAUSE; DISCLAIMER OF WARRANTY, CONDITIONS, REPRESENTATIONS: THIS WARRANTY IS THE SOLE AND ENTIRE WARRANTY, CONDITION, AND REPRESENTATION, PERTAINING TO PRODUCTS. SELLER DISCLAIMS ALL OTHER WARRANTIES, CONDITIONS, AND REPRESENTATIONS, WHETHER STATUTORY, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THOSE RELATING TO DESIGN, NONINFRINGEMENT, MERCHANTABILITY, AND FITNESS FOR A PARTICULAR PURPOSE. SELLER DOES NOT WARRANT THAT THE SOFTWARE IS ERROR-FREE OR FAULT-TOLERANT, OR THAT BUYER'S USE THEREOF WILL BE SECURE OR UNINTERRUPTED, UNLESS OTHERWISE AUTHORIZED IN WRITING BY SELLER, THE SOFTWARE SHALL NOT BE USED IN CONNECTION WITH HAZARDOUS OR HIGH-RISK ACTIVITIES OR ENVIRONMENTS. EXCEPT AS EXPRESSLY STATED HEREIN, ALL PRODUCTS ARE PROVIDED "AS IS".**

**5. Claims; Commencement of Actions.** Buyer shall promptly inspect all Products upon receipt. No claims for shortages will be allowed unless reported to Seller within ten (10) days of delivery. Buyer shall notify Seller of any alleged breach of warranty within thirty (30) days after the date the non-conformance is or should have been discovered by Buyer. Any claim or action against Seller based upon breach of contract or any other theory, including tort, negligence, or otherwise must be commenced within twelve (12) months from the date of the alleged breach or other alleged event, without regard to the date of discovery.

**6. LIMITATION OF LIABILITY. IN THE EVENT OF A BREACH OF WARRANTY, SELLER WILL, AT ITS OPTION, REPAIR OR REPLACE THE NON-CONFORMING PRODUCTS, RE-PERFORM THE SERVICES, OR REFUND THE PURCHASE PRICE PAID WITHIN A REASONABLE PERIOD OF TIME. IN NO EVENT IS SELLER LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES INCLUDING ANY LOSS OF REVENUE OR PROFITS, WHETHER BASED IN CONTRACT, TORT OR OTHER LEGAL THEORY. IN NO EVENT SHALL SELLER'S LIABILITY UNDER ANY CLAIM MADE BY BUYER EXCEED THE PURCHASE PRICE PAID FOR THE PRODUCTS.**

**7. Confidential Information.** Buyer acknowledges and agrees that Confidential Information has been and will be received in confidence and will remain the property of Seller. Buyer further agrees that it will not use Seller's Confidential Information for any purpose other than for the benefit of Seller and shall return all such Confidential Information to Seller within thirty (30) days upon request.

**8. Loss to Buyer's Property.** Buyer's Property will be considered obsolete and may be destroyed by Seller after two (2) consecutive years have elapsed without Buyer ordering the Products manufactured using Buyer's Property. Also, Seller shall not be responsible for any loss or damage to Buyer's Property while it is in Seller's possession or control.

**9. Special Tooling.** Seller may impose a tooling charge for any Special Tooling. Special Tooling shall be and remain Seller's property. In no event will Buyer acquire any interest in the Special Tooling, even if such Special Tooling has been specially converted or adapted for manufacture of Goods for Buyer and notwithstanding any charges paid by Buyer. Unless otherwise agreed, Seller has the right to alter, discard or otherwise dispose of any Special Tooling or other property owned by Seller in its sole determination at any time.

**10. Security Interest.** To secure payment of all sums due from Buyer, Seller retains a security interest in all Products delivered to Buyer and, Buyer's acceptance of these Terms is deemed to be a Security Agreement under the Uniform Commercial Code. Buyer authorizes Seller as its attorney to execute and file on Buyer's behalf all documents Seller deems necessary to perfect Seller's security interest.

**11. User Responsibility.** Buyer, through its own analysis and testing, is solely responsible for making the final selection of the Products and assuring that all performance, endurance, maintenance, safety and warning requirements of the application of the Products are met. Buyer must analyze all aspects of the application and follow applicable industry standards, specifications, and any technical information provided with the Quote or the Products, such as Seller's instructions, guides and specifications. If Seller provides options of or for Products based upon data or specifications provided by Buyer, Buyer is responsible for determining that such data and specifications are suitable and sufficient for all applications and reasonably foreseeable uses of the Products. In the event Buyer is not the end-user of the Products, Buyer will ensure such end-user complies with this paragraph.

**12. Use of Products, Indemnity by Buyer.** Buyer shall comply with all instructions, guides and specifications provided by Seller with the Quote or the Products. If Buyer uses or resells the Products in any way prohibited by Seller's instructions, guides or specifications, or Buyer otherwise fails to comply with Seller's instructions, guides and specifications, Buyer acknowledges that any such use, resale, or non-compliance is at Buyer's sole risk. Further, Buyer shall indemnify, defend, and hold Seller harmless from any losses, claims, liabilities, damages, lawsuits, judgments and costs (including attorney fees and defense costs), whether for personal injury, property damage, intellectual property infringement or any other claim, arising out of or in connection with: (a) improper selection, design, specification, application, or any misuse of Products; (b) any act or omission, negligent or otherwise, of Buyer; (c) Seller's use of Buyer's Property; (d)

## Heavy Duty Hydraulic Cylinders Engineering Data

damage to the Products from an external cause, repair or attempted repair by anyone other than Seller, failure to follow instructions, guides and specifications provided by Seller, use with goods not provided by Seller, or opening, modifying, deconstructing, tampering with or repackaging the Products; or (e) Buyer's failure to comply with these Terms, including any legal or administrative proceedings, collection efforts, or other actions arising from or relating to such failure to comply. Seller shall not indemnify Buyer under any circumstance except as otherwise provided in these Terms.

**13. Cancellations and Changes.** Buyer may not cancel or modify, including but not limited to movement of delivery dates for the Products, any order for any reason except with Seller's written consent and upon terms that will indemnify, defend and hold Seller harmless against all direct, incidental and consequential loss or damage and any additional expense. Seller, at any time, may change features, specifications, designs and availability of Products.

**14. Assignment.** Buyer may not assign its rights or obligations without the prior written consent of Seller.

**15. Force Majeure.** Seller is not liable for delay or failure to perform any of its obligations by reason of any events or circumstances beyond its reasonable control. Such circumstances include without limitation: accidents, labor disputes or stoppages, government acts or orders, acts of nature, pandemics, epidemics, other widespread illness, or public health emergency, cyber related disruptions, cyber-attacks, ransomware sabotage, delays or failures in delivery from carriers or suppliers, shortages of materials, sudden increases in the price of raw material or components, shutdowns or slowdowns affecting the supply of raw materials or components, or the transportation thereof, oil shortages or oil price increases, energy crisis, energy or fuel interruption, war (whether declared or not) or the serious threat of same, riots, rebellions, acts of terrorism, embargoes, fire or any reason whether similar to the foregoing or otherwise. Seller will resume performance as soon as practicable after the event of force majeure has been removed. All delivery dates affected by an event of force majeure shall be tolled for the duration of such event of force majeure and rescheduled for mutually agreed dates as soon as practicable after the event of force majeure ceases to exist. The right to allocate capacity is in the Seller's sole discretion. An event of force majeure shall not include financial distress, insolvency, bankruptcy, or other similar conditions affecting one of the parties, affiliates and/or sub-contractors. An event of force majeure in the meaning of these Terms means any circumstances beyond Seller's control that permanently or temporarily hinders performance, even where that circumstance was already foreseen. Buyer shall not be entitled to cancel any orders following its claim of an event of force majeure.

**16. Waiver and Severability.** Failure to enforce any provision of these Terms will not invalidate that provision; nor will any such failure prejudice either party's right to enforce that provision in the future. Invalidation of any provision of these Terms shall not invalidate any other provision herein and, the remaining provisions will remain in full force and effect.

**17. Duration.** Unless otherwise stated in the Quote, any agreement governed by or arising from these Terms shall: (a) be for an initial duration of one (1) year; and (b) shall automatically renew for successive one-year terms unless terminated by Buyer with at least 180-days written notice to Seller or if Seller terminates the agreement pursuant to Section 19 of these Terms.

**18. Termination.** Seller may, without liability to Buyer, terminate any agreement governed by or arising from these Terms for any reason and at any time by giving Buyer thirty (30) days prior written notice. Seller may immediately terminate, in writing, if Buyer: (a) breaches any provision of these Terms, (b) becomes or is deemed insolvent, (c) appoints or has appointed a trustee, receiver or custodian for all or any part of Buyer's property, (d) files a petition for relief in bankruptcy on its own behalf, or one is filed against Buyer by a third party, (e) makes an assignment for the benefit of creditors; or (f) dissolves its business or liquidates all or a majority of its assets.

**19. Ownership of Rights.** Buyer agrees that (a) Seller (and/or its affiliates) owns or is the valid licensee of Seller's IP and (b) the furnishing of information, related documents or other materials by Seller to Buyer does not grant or transfer any ownership interest or license in or to Seller's IP to Buyer, unless expressly agreed in writing. Without limiting the foregoing, Seller retains ownership of all Software supplied to Buyer. In no event shall Buyer obtain any greater right in and to the Software than a right in a license limited to the use thereof and subject to compliance with any other terms provided with the Software. Buyer further agrees that it will not, directly or through intermediaries, reverse engineer, decompile, or disassemble any Software (including firmware) comprising or contained within a Product, except and only to the extent that such activity may be expressly permitted, either by applicable law or, in the case of open source software, the applicable open source license.

**20. Indemnity for Infringement of Intellectual Property Rights.** Seller is not liable for infringement of any Intellectual Property Rights except as provided in this Section. Seller will defend at its expense and will pay the cost of any settlement or damages awarded in an action brought against Buyer based on a third-party claim that one or more of the Products infringes the Intellectual Property Rights of a third party in the country of delivery of the Products by Seller to Buyer. Seller's obligation to defend and indemnify Buyer is contingent on Buyer notifying Seller within ten (10) days after Buyer becomes aware of any such claim, and Seller having sole control over the defense of the claim including all negotiations for settlement or compromise. If one or more Products is subject to such a claim, Seller may, at its sole expense and option, procure for Buyer the right to continue using the Products, replace or modify the Products to render them non-infringing, or offer to accept return of the Products and refund the purchase price less a reasonable allowance for depreciation. Seller has no obligation or liability for any claim of infringement: (i) arising from information provided by Buyer (including Seller's use of Buyer's Property); or (ii) directed to any Products for which the designs are specified in whole or part by Buyer; or (iii) resulting from the modification, combination or use in a system of any Products. The foregoing provisions of this Section constitute Seller's sole and exclusive liability and Buyer's sole and exclusive remedy for claims of infringement of Intellectual Property Rights.

**21. Governing Law.** These Terms, the terms of any Quote, and the sale and delivery of all Products are deemed to have taken place in, and shall be governed and construed in accordance with, the laws of the State of Ohio, as applicable to contracts executed and wholly performed therein and without regard to conflicts of laws principles. Buyer irrevocably agrees and consents to the exclusive jurisdiction and venue of the courts of Cuyahoga County, Ohio with respect to any dispute, controversy or claim arising out of or relating to the sale and delivery of the Products.

**22. Entire Agreement.** These Terms, along with the terms set forth in the Quote, forms the entire agreement between the Buyer and Seller and constitutes the final, complete and exclusive expression of the terms of sale and purchase. In the event of a conflict between any term set forth in the Quote and these Terms, the terms set forth in the Quote shall prevail. All prior or contemporaneous written or oral agreements or negotiations with respect to the subject matter shall have no effect. No modification to these Terms will be binding on Seller unless agreed to in a writing that is signed by an authorized representative of Seller, excluding email correspondence, "clickwrap" or other purported electronic assent to different or additional terms. Sections 2-25 of these Terms shall survive termination or cancellation of any agreement governed by or arising from these Terms.

**23. No 'Wrap' Agreements/No Authority to Bind.** Seller's clicking any buttons or any similar action, such as clicking "I Agree" or "Confirm," to utilize Buyer's software or webpage for the placement of orders, is NOT an agreement to Buyer's Terms and Conditions. NO EMPLOYEE, AGENT OR REPRESENTATIVE OF SELLER HAS THE AUTHORITY TO BIND SELLER BY THE ACT OF CLICKING ANY BUTTON OR SIMILAR ACTION ON BUYER'S WEBSITE OR PORTAL.

**24. Compliance with Laws.** Buyer agrees to comply with all applicable laws, regulations, and industry and professional standards, including those of the United States of America, and the country or countries in which Buyer may operate, including without limitation the U.S. Foreign Corrupt Practices Act ("FCPA"), the U.S. Anti-Kickback Act ("Anti-Kickback Act"), U.S. and E.U. export control and sanctions laws ("Export Laws"), the U.S. Food Drug and Cosmetic Act ("FDCA"), and the rules and regulations promulgated by the U.S. Food and Drug Administration ("FDA"), each as currently amended. Buyer agrees to indemnify, defend, and hold harmless Seller from the consequences of any violation of such laws, regulations and standards by Buyer, its employees or agents. Buyer represents that it is familiar with all applicable provisions of the FCPA, the Anti-Kickback Act, Export Laws, the FDCA and the FDA and certifies that Buyer will adhere to the requirements thereof and not take any action that would make Seller violate such requirements. Buyer represents and agrees that Buyer will not make any payment or give anything of value, directly or indirectly, to any governmental official, foreign political party or official thereof, candidate for foreign political office, or commercial entity or person, for any improper purpose, including the purpose of influencing such person to purchase Products or otherwise benefit the business of Seller. Buyer further represents and agrees that it will not receive, use, service, transfer or ship any Products from Seller in a manner or for a purpose that violates Export Laws or would cause Seller to be in violation of Export Laws. Buyer agrees to promptly and reliably provide Seller all requested information or documents, including end-user statements and other written assurances, concerning Buyer's ongoing compliance with Export Law. 9/22





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