Cylinder Maintenance & Repair Instructions
Model HP High Pressure Hydraulic Cylinders

Proximity Switch & Non – Proximity Switch Designs

Model HP

- High Pressure NFPA Hydraulic Cylinder

(5,000 PSI Rated - 3,000 PSI Working Pressure)

- 1 ½” to 20” Bore Sizes
- Teflon Backup Seals at all Pressure Points
- Designed for Destructive Applications

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ISO 9001:2000 Registered
Cylinder Maintenance and Repair Instructions
Model HP High Pressure Hydraulic Cylinders

Please refer to the Cylinder Parts List drawing and related charts when performing maintenance on a cylinder.

NOTE: FOR YOUR SAFETY, BE CERTAIN THAT CYLINDER IS FULLY DE-PRESSURIZED AND DRAINED OF FLUID PRIOR TO PERFORMING ANY MAINTENANCE OPERATION DESCRIBED BELOW...

ROD CARTRIDGE SEALS

To replace the Rod Cartridge Seals:

1. Remove the Rod Bearing Cartridge Retainer Plate Screws (items 36). Normally, the Tie Rod Nuts (items 17) DO NOT have to be loosened to replace the Rod Bearing Cartridge Seals which consist of the Rod Wiper Seal (item 3), the Rod Seal (item 35), the Rod Bearing Cartridge O-Ring Seal (item 6) and the Rod Bearing Cartridge O-Ring Backup Seal (item 5) unless the cylinder is supplied with a "Tie Rod Retained Cartridge".
2. Remove the Rod Bearing Cartridge Retainer Plate (item 4).
3. Remove the Rod Bearing Cartridge (item 2) from the Front End Cap (item 7) by pulling it straight out while twisting slightly.
4. Remove the Rod Wiper Seal (item 3), Rod Seal Retainer (item 34), the Rod Seal (item 35), the Rod Bearing Cartridge O-Ring Seal (item 6) and the Rod Bearing Cartridge O-Ring Backup Seal (item 5). It is very important to note the location and orientation of all of these seals in the seal grooves. The new seals must be placed in the exact same grooves and be oriented the exact same way during replacement.
5. Clean the Rod Bearing Cartridge (item 2) and inspect it for excessive wear or scoring. Replace the Rod Bearing Cartridge if necessary.
6. Install a new Rod Wiper Seal (item 3), new Rod Seal (item 35), new Rod Bearing Cartridge O-Ring Seal (item 6) and new Rod Bearing Cartridge O-Ring Backup Seal (item 5). Coat the I.D. of the Rod Bearing Cartridge (item 2) with Acrolube™ grease or system hydraulic fluid.
7. Check the Piston Rod end (item 1) for burrs in the rod thread areas and on the wrench flats. Remove and polish sharp edges as required.
8. Install the reassembled Rod Bearing Cartridge Assembly over the Piston Rod end (item 1) with a slight twisting motion. Push the Rod Bearing Cartridge Assembly into the bored cavity machined into the Front End Cap (item 7).
9. Install the Rod Bearing Cartridge Retainer Plate (item 4) and torque the Rod Bearing Cartridge Retainer Plate Screws (items 36) to the values in our torque table on Page 7.

TUBE END SEALS

To replace the Tube End O-Ring Seals:

1. Remove the Tie Rod Nuts (items 17). It may be helpful to grip the Tie Rods (items 18) with Vise Grip Pliers to prevent the Tie Rods from twisting.
2. Remove the Front End Cap (item 7) and the Rear End Cap (item 20) from the cylinder.

("TUBE END SEALS" section continued on the following page)
(“TUBE END SEALS” section continued from the previous page)

3. Remove the old End Cap to Sleeve O-Ring Seals (items 9) and old End Cap to Sleeve O-Ring Backup Seals (items 8). It is especially important to note the position and orientation of these end cap to tube seals. Clean the Front and Rear End Cap seal grooves thoroughly.

4. Install new End Cap to Sleeve O-Ring Backup Seals (items 8) and new old End Cap to Sleeve O-Ring Seals (items 9) into the Front and Rear End Caps (items 7 & 20). A small amount of grease on the seals may be helpful to hold them in place during assembly. It is very important that the seals are fully seated in the seal grooves before proceeding.

5. Re-assemble the Front and Rear End Caps (items 7 & 20) to the Cylinder Sleeve (item 10) being careful not to pinch the O-Rings.

6. Hand tighten the Tie Rod Nuts (items 17) while making sure the Front and Rear End Caps (items 7 & 20) are square to the Cylinder Sleeve (item 10). Assembling the cylinder on a flat surface is helpful to assure proper alignment of the Front and Rear End Caps (items 7 & 20) to the Cylinder Sleeve (item 10).

7. Torque the Tie Rod Nuts (items 17) in the order and values shown in the torque chart on Page 7. Gripping the Tie Rods (items 18) with Vise Grip Pliers may be helpful to avoid twisting the Tie Rods during tightening.

PISTON SEALS

To replace the Piston Seals:

1. Remove the Tie Rod Nuts (items 17), the Tie Rods (items 18) and the Front and Rear End Caps (items 7 & 20) See instructions 1 & 2 under the “Tube End Seals” section above.

2. Pull the Piston and Piston Rod Assembly from the Cylinder Sleeve (item 10).

3. Remove the old Piston U-cup Seals (items 27) and old Piston U-Cup Backup Seals (items 26) from their grooves in the Piston (item 28) (which is the bottom area of the Piston on the illustration). Again, it is very important to note the location and orientation of these four seals in the two piston seal grooves. The new seals must be placed in the exact same grooves and be oriented the exact same way during replacement. Use a brass or plastic tool (avoid any tools which might damage the seal groove surfaces). In the event optional Cast Iron Piston Rings (items 15) are used, remove them from their four grooves in the Piston (item 14) (which is the top area of the Piston on the illustration).

4. Clean the Piston and Cylinder Sleeve (item 10) with suitable solvent. Blow dry with compressed air. Inspect parts for wear or scoring and replace if necessary.

5. Install new (2) Piston U-cup Seals (items 27) and new (2) Piston U-Cup Backup Seals (items 26) into the two seal grooves on the piston. (Note: Lips on U-cup type seals must face system pressure in cylinder. See the parts list illustration for proper seal orientation). Lightly coat seals and tube I.D. with hydraulic system fluid. In the event optional Cast Iron Piston Rings (items 15) are used, install new (4) Cast Iron Piston Rings (items 15) into the four seal grooves on the Piston. Lightly coat seals and tube I.D. with hydraulic system fluid to ease installation.

6. Reinstall the Piston Rod Assembly into the Cylinder Sleeve (item 10) being careful to avoid damage to piston seals.

7. Reinstall the Front & Rear End Caps (items 7 and 20), Tie Rods (items 18) and Tie Rod Nuts (items 17). Tighten the Tie Rod Nuts following the instructions 5 thru 7 under "Tube End Seals".
CUSHION INSERT, CUSHION ADJUSTMENT SCREW & BALL CHECKS

To replace the Cushion Insert (item 19), the Cushion Adjustment Screw (item 23) and/or the Ball Check or Seals:

(The procedure described below applies to both the Cushion Adjustment Screw and the Ball Check hardware). The Cushion Adjustment Screw (or Ball Check) and its sealing O-ring Seals & Backup Seal may be replaced without dismantling the cylinder. (Make sure that the cylinder is not pressurized before attempting this procedure).

1. Remove the Lock Screw (item 24). Unscrew Cushion Adjustment Screw(s) and/or Ball Check Plug(s) (items 23 & 32) by turning counter clockwise.
2. For the Cushion Adjustment Screw - Inspect the Cushion Adjustment Screw tip (item 23), Cushion Adjustment Screw O-ring Seal (item 21) and Cushion Adjustment Screw O-ring Backup Seal (item 22). Replace any worn or damaged parts.
   For the Ball Check System - Inspect the Ball Check Plug (item 32), Ball Check Steel Ball (item 30), Ball Check O-ring Seal (item 33) and Ball Check O-ring Backup Seal (item 31). Replace any worn or damaged parts.
3. Install a new O-ring seal and O-ring Backup Seal on the Cushion Adjustment Screw and/or Ball Check Plug. Lubricate O-ring Seals(s) and Backup O-ring Seals(s) with system hydraulic fluid and reinstall components into the Front and/or Rear End Caps (items 7 and 20).
4. To replace the hydraulic Cushion Insert (item 19), the Rear End Cap (item 20) must be removed (See the instructions under the "Tube End Seals" section). Once the Rear End Cap is removed, the Cushion Insert (item 19) may be replaced by removing the Cushion Insert Retaining Ring (item 16) and pulling the Cushion Insert out of its insert bore. Clean out the Cushion Insert bore and install a new Cushion Insert (item 19) by simply pushing it into the bore. Re-install the Retaining Ring (item 16) and make sure it is properly seated into its groove.

PISTON

To remove Piston from Piston Rod:

1. The Piston Rod (item 1) and Piston (item 14 or 28) are assembled at the factory with a high strength locking sealant.
2. Remove the Piston Rod Assembly (referred to as the Piston Rod Assembly when the Piston is installed on the Piston Rod) from the cylinder (see instructions 1 through 3 under the "Piston Seals" section). Remove the Piston U-Cup Seals (items 27) and Piston U-Cup Backup Seals (items 26) from their grooves on the piston.
3. Heat the Piston Rod Assembly to 400 degrees - 450 degrees Fahrenheit.
4. Disassemble the Piston (item 14 or 28) from the Piston Rod (item 1) while hot. Remove the Piston Retaining Nut (item 25). Do not damage the surface of the rear cushion hub. Use a spanner wrench to remove the Piston from the Piston Rod (the Piston is machined with Slots and/or Spanner Wrench Holes).
5. Clean the Piston Rod threads (on the Piston area of the Piston Rod) with solvent and bristle brush. Blow dry with compressed air. Replace the Piston U-Cup Seals (items 27) and Piston U-Cup Backup Seals (items 26) into their grooves on the piston. Again, it is very important to note the location and orientation of these four seals in the two piston seal grooves. The new seals must be placed in the exact same grooves and must be oriented the exact same way during replacement.
6. Apply "Loctite" sealant #277 or equivalent to the threads of the Piston Rod. Assemble Piston to Piston Rod and torque to specifications (see torque chart on Page 6). Allow the sealant to cure for 30 minutes before operating the cylinder.
Model HP - NFPA - High Pressure Hydraulic Cylinder

Complete Cylinder Parts List

(Drawing is not to scale - Please use for informational purposes only)

1. Piston Rod
2. Rod Bearing Cartridge
3. Rod Wiper Seal
4. Rod Bearing Cartridge Retainer Plate
5. Rod Bearing Cartridge O-Ring Backup Seal
6. Rod Bearing Cartridge O-Ring Seal
7. Front End Cap
8. End Cap to Sleeve O-Ring Backup Seals
9. End Cap to Sleeve O-Ring Seals
10. Cylinder Sleeve
11. Cushion Bushing (for Front Cushion)
12. Piston O-ring Backup Seals
13. Piston O-ring Seal
14. OPTIONAL METAL PISTON SEALING
   (shown on the top side of the Piston Schematic)
15. Cast Iron Piston Ring Seals
16. Cushion Insert Retaining Ring
17. Tie Rod Nuts
18. Tie Rods
19. Cushion Insert (for Rear Cushion)
20. Rear End Cap
21. Cushion Adjustment Screw O-Ring Seals
22. Cushion Adjustment Screw O-Ring Backup Seals
23. Cushion Adjustment Screws
24. Lock Screw (for Cushion Adjustment Screw)
25. Piston Retaining Nut
26. Piston U-Cup Backup Seals (Standard)
27. Piston U-Cup Seals (Standard)
28. STANDARD SOFT PISTON SEALING
   (shown on the bottom side of the Piston Schematic)
29. Cushion Bushing O-ring Seal
30. Ball Check Steel Balls
31. Ball Check O-ring Backup Seals
32. Ball Check Plugs
33. Ball Check O-ring Seals
34. Rod Seal Retainer
35. Rod Seal
36. Rod Bearing Cartridge Retainer Plate Screws
# HP Series Hydraulic Cylinders

## Seal & Repair Kit Part Numbers

### Standard Seals & Viton Seals

(See Page 6 for an Illustration and Listing of each Seal and Repair Kit)

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**Model HP - NFPA - High Pressure Hydraulic Cylinder**

**Complete Seal and Repair Kits**

(Drawing is not to scale - Please use for informational purposes only)

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**Complete Cylinder Seal Kit includes:**

- **A** (1) Rod Wiper Seal
- **B** (1) Rod Seal
- **C** (1) Rod Bearing Cartridge Backup Seal
- **D** (1) Rod Bearing Cartridge O-Ring Seal
- **E** (2) End Cap to Sleeve Backup Seals
- **F** (2) End Cap to Sleeve O-Ring Seals
- **G** (1) Cushion Bushing O-ring Seal
- **H** (2) Piston O-ring Backup Seals
- **I** (1) Piston O-ring Seal
- **J** (2) Piston U-Cup Backup Seals
- **K** (2) Piston U-Cup Seals
- **L** (2) Cushion Adjustment Screw Backup Seals
- **M** (2) Cushion Adjustment Screw O-Ring Seals
- **N** (2) Ball Check Backup Seals
- **O** (2) Ball Check O-ring Seals

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**Complete Cylinder Repair Kit includes:**

Includes all of the seals in the Complete Cylinder Seal Kit plus:

- **P** (1) Rod Bearing Cartridge

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**Complete Rod Bearing Cartridge Kit includes:**

- **A** (1) Rod Wiper Seal
- **B** (1) Rod Seal
- **C** (1) Rod Bearing Cartridge Backup Seal
- **D** (1) Rod Bearing Cartridge O-Ring Seal
- **P** (1) Rod Bearing Cartridge
# HP SERIES HYDRAULIC CYLINDER FASTENER TORQUE CHART

## TABLE 1

Torque Values Shown For Up To And Including 3,000 P.S.I. Above Consult Factory

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**FASTENER TORQUE INSTRUCTIONS:**

Tighten tie rod nuts & retainer nuts in pattern shown at the right and to torque values in Table 1.

Use MoS2 grease or equivalent on both the threads and bearing surface.

Should lubricant not be available, torque values should be increased by 50%.

**TIE ROD TORQUE PATTERN**

![Tie Rod Torque Pattern](image)