



# ***Cylinder Installation & Maintenance Instructions***



## PROPER STORAGE:

- 1 Store cylinder in a clean, dry, protected area that has as little temperature variance as possible.
- 2 Store cylinder in a vertical position with piston rod in up position.
- 3 Coat entire inside of cylinder with oil. Fill cylinders partially with oil if practical.
- 4 Install protective plugs in all cylinder ports.
- 5 Apply protective coating on any machined or critical mounting surfaces, including all treads.

**GENERAL PRECAUTIONS:** Cylinders which have been in storage over 30 days should be lubricated and cycled several times before they are installed on machines and subjected to actual loads. Should excessive cycling pressure be required, it may indicate the cylinder(s) had been damaged during shipment or storage.

**INSTALLATION:** For long, trouble-free, safe operation of your cylinders, extra care should be taken in the following areas:

- 1. Fasteners:** Be sure to select fasteners and bearings suitable for the forces involved. The use of Grade 8 or better nuts & bolts is recommended. Due to the wide variety available, contact your bearing supplier for bearing recommendations.
- 2. Piston Rod Attachment & Rod Accessories:** In attaching machinery components or threaded accessories to cylinder rod threads, the attachments should be tightened as securely. JIT recommends a Style 1 rod for most applications. Its square shoulder design helps assure proper alignment of cylinder to mechanism, eliminates need for a jam nut, provides fixed point for more accurate cylinder positioning, simplifies piloting to full rod diameter into mating part, and permits easier assembly of seals over rod without damage.

**PROPER CYLINDER MOUNTING:** The ideal method of mounting a cylinder is to have the point of mounting on the equipment machined to the exact dimensions with proper alignment, so that bolting the cylinder in place ensures perfect alignment. In many cases this is not practical from a cost and design standpoint. Therefore, alignment must be secured at the time of installation. Whenever the piston rod is fastened to the machine, which confines the cylinder in one position, it is best to bolt the cylinder down as a last operation of assembly. Alignment can be secured in other ways, but the following sequence of installation steps is quite effective:

- A.** Assemble the piston rod to the machinery. The piston rod must be fastened and held squarely so its centerline is parallel to the guides of the attached machinery (or parallel to the line of movement of the attached machinery in cases of fixed mounted cylinders). Torque piston rod to attachment.
- B.** Insert mounting bolts but do not tighten them.
- C.** In the case of horizontally mounted cylinders, it is necessary to support the weight of the cylinder body so as to eliminate strain on the piston rod.
- D.** Use feeler gauges under the mounting and shim at these points equal to the space indicated by the feeler gauges.
- E.** Finally, tighten the mounting bolts.
- F.** If possible, the machine operation should be tested with low pressure air to ensure that cylinder and attached parts are operating freely. This should be done with the machine operating under a no-load condition.
- G.** Make sure that all pipes and fittings are clean before connecting them to the cylinder.
- H.** Hydraulic filtration should be in accordance with the hydraulic power unit

manufacturer recommendation.

- I. Pneumatic systems should have a water separator, 50 micron (minimum) filter and a lubricator installed as close as possible to the cylinder. Use a 5W petroleum-based oil as a lubricant. When repair is necessary, we recommend using Magnalube R-G grease to pre-lubricate the piston seal and rod seal.

**REPAIR:** When cylinder repairs are necessary, a complete set of seals and tie rods should be ordered. The seal set should consist of piston seals and rod seal kit and a replacement gland if necessary. To ensure proper parts selection, please provide the serial number(s) for the unit(s) being repaired.

**SERIAL NUMBER IDENTIFICATION:** All JIT cylinders have a serial number impression stamped in the head and cap next to the port. The serial number is helpful in determining the year of manufacture in order to supply correct repair parts (seals). The serial number is necessary to supply machined replacement parts such as piston rods, tie rods, tubes, heads, caps and cushions.

A JIT serial number is the process date when the order was taken. For example: 817041448 tell us that the order was taken on August 17<sup>th</sup>, 2004 at 2:48 p.m. Using our internal systems we are then able to look up the details of that cylinder to determine the specifics regarding the cylinder and the customer's order.

**DISASSEMBLY & ASSEMBLY:** The following step-by-step outline will be a valuable aid to personnel qualified to service precision equipment. By exercising only normal care, which any good workman would accord fine machinery, no undue difficulty will be encountered.

1. **CLEAN ENVIRONMENT:** Wipe all external surfaces clean. Drain excess oil from hydraulic cylinders. Paint or draw a line on one side of the cylinder running from the cylinder cap to the mounting end of the piston rod. This will serve as a reference line when inspecting components and reassembling the cylinder.
2. **VISUAL INSPECTION:** Visually inspect all exterior surfaces for evidence of damage, and, in particular, damage to the piston rod and barrel. Evidence of rod-seal leakage can usually be traced to nicks in the piston rod or misalignment. If a slight nick is noticed in the piston rod, it can often be removed by using No. 400 grit emery cloth. The rod should then be wiped carefully for removal of any matter. **UNDER NO CIRCUMSTANCES SHOULD COMPRESSED AIR BE USED TO REMOVE FOREIGN MATTER**, as this practice may tend to drive such particles into close clearances. Misalignment can often be detected by observing the condition of the piston rod for evidence of excessive wear, polishing, burnishing or scoring on the side of the piston rod. Check carefully the end of the piston rod and the area around the flats on the end of the rod for burrs and nicks. If burrs and nicks are present, remove with a file or emery cloth to avoid damage to the piston rod seal, rod wiper and gland during removal and assembly.
3. **REMOVAL OF GLAND:**
  - a. Loosen and remove the cap screws that hold the gland in the cylinder head.
  - b. Use jack screws to aid in the gland retraction from rod end head.
  - c. Remove wiper, rod seal and any dirt, contaminates, etc., from the gland cavity and head.
4. **LOOSENING THE CYLINDER TIE RODS:**
  - a. **CAUTION—SPRING-RETURN CYLINDERS:** An installed spring can injure a person if special precautions are not exercised in removing the tie rods. In some cases, clamps may be used to contain the cylinder assembly while the tie rods are being removed. If such is the case, the clamps should, of course, be designed to permit gradual release of spring compression to its free length.
  - b. **NON-SPRING-RETURN CYLINDERS:** Proceed to gradually loosen the cylinder tie rods nuts. Please note: if the tie rods were tightened evenly it may be necessary in some cases to grip the tie rods with vise grips—on the diameter located between the head and cap—to prevent the tie rod from turning.
5. **REMOVAL OF CYLINDER HEAD:** Remove cylinder head from cylinder.
6. **REMOVAL OF PISTON ROD AND ASSEMBLY:** Remove piston rod and piston assembly from

cylinder barrel. (If barrel comes off the cap pilot, merely slide piston assembly from cylinder barrel.)

7. REMOVE TIE RODS FROM CYLINDER CAP.

8. INSPECTION OF INTERNAL PARTS: Inspect internal surfaces of all cylinder parts, noting particularly any evidence of foreign matter. (Retain all foreign matter for future study if necessary.) Examine parts for misalignment as evidenced by excessive or uneven wear.

9. CONDITION OF COMPONENTS: If barrel, piston rod or piston rod gland is damaged, the part, if available, should be replaced. If a replacement part is unavailable, repair the damaged part by removing nicks, burrs and other forms of damage. However, do not remove enough material to change the diameters, affecting the clearance and fit.

10. PISTON SEAL REMOVAL: The replacement of the piston seals does not require the removal of the piston from the piston rod. Remove the piston cup seal and repeat the procedure to remove the opposite seal. If a high load piston design, remove the wearband by locating the split in the wear ring and pulling the ends apart. Normally the piston will not require removal.

11. PISTON REMOVAL: Piston assemblies are mechanically locked with a set screw between the piston and rod to prevent the parts from coming loose in operation. If the piston assembly must be taken apart, first drill out the peen and unscrew the set screw/s to facilitate disassembly. Loctite is used as an extra precaution in preventing the piston coming off. The piston rod must be heated to approximately 500°F to loosen the Loctite.

An alternate method is to clamp the piston assembly by the faces of the followers in a vise and screw out the piston rod using the flat on the end of the piston rod for turning. (BY NO MEANS CLAMP THE PISTON ON ITS OUTSIDE DIAMETER.) The vise should be equipped with bronze or brass jaw protectors if clamping piston rod on chrome-plated area.

On double rod-end cylinders, the female piston rod must be heated to approximately 500°F to loosen Loctite used to hold the rods together. Unscrew the rods by holding one rod by the flats in a rod clamp or soft-jawed vice while unscrewing the other rod with a wrench on the piston rod flats on the other end.

#### **REASSEMBLY OF PISTON TO ROD:**

12. Piston and Rod Assembly: Clean the piston and piston rod thoroughly. Apply Loctite sealant to the rod and screw the Piston onto the rod. When piston is seated against the shoulder of the rod then torque them to the value shown below.

**NOTE:** The rod-end cushion Collar must be installed prior to assembling the piston and piston rod.

13. REASSEMBLY OF PISTON SEALS: The following instructions give a detailed breakdown of the proper methods to be used when assembling 'U' cup piston seals. These instructions should be followed closely to prevent damage to the cups during assembly.

1) Make certain that all parts are free from any contamination or foreign material and that the assembly area is clean.

2) Install the first Piston Seal closest to the rod first. Be sure to face the flat side facing out towards the rod.

3) Insert the piston rod, with the first seal into the cylinder tube until the empty piston groove is showing out the back end.

4) Install the 2nd piston seal on the piston with the flat side facing out the cap end.

5) Push the piston assembly and seal into the tube until the piston seal is inside the tube.

**Note:** if you have a "barrel loader" then you can install both seals on the piston and use the barrel loader to insert the piston assembly into the barrel.

14. REASSEMBLY OF THE CYLINDER: After the cylinder has been assembled in the reverse order of the disassembly, tighten tie rods snugly with hand wrench and light pressure, and accomplish final tightening gradually, working from one tie rod to the diagonally opposite tie rod to ensure evenness of tie rod tightening. DO NOT TIGHTEN ONE TIE ROD COMPLETELY AND THEN THE OTHERS. THIS WILL RESULT IN IMPROPER TIGHTENING OF TIE RODS AND IMPROPER ALIGNMENT OF THE HEAD AND CAP. See Charts below for proper torque values of bolted gland screws and tie rod nuts.

<b>Bolted Gland Mounting Screw Torque</b>	
<b>Cap-Screw Size</b>	<b>Torque</b>
3/8-24	22 FT/lbs.
1/2-20	50 FT/lbs.
1/4-28	7 FT/lbs.
5/16 – 24	12 FT/lbs.
3/8-24	47 FT/lbs.
1/2-20	114 FT/lbs.

<b>Tie Rod Torque (Ft./Lbs.)</b>		
<b>Bore</b>	<b>A &amp; LH Series</b>	<b>H Series</b>
1-1/2	8	28
2	16	66
2-1/2	16	66
3-1/4	28	150
4	28	150
5	66	360
6	66	560
7	66	800
8	66	1100
10	150	560
12	150	560
14	225	560
16	-	1600
18	-	2000

15. TESTING THE RE-ASSEMBLED CYLINDER: Test freedom of movement in small-bore, short-stroke cylinders by laying the cylinder horizontally and cycling the piston rod by hand. Large-bore or long-stroke cylinders that may be difficult to cycle by hand can be cycled with low pressure (10 to 24 psi) air. Double rod-end cylinders, cylinders with oversized piston-rod diameters and strokes longer than 6 feet may require more than 25 psi to move the piston. In no case, however, should more than 45 psi be required to cycle the cylinder. Consistent cycling pressure of 45 psi can indicate improper assembly, which will result in mechanical damage and premature failure of cylinder components. The cylinder should, therefore, be disassembled, re-assembled after corrective action, and re-checked before installation into the mechanism. Before installing the rebuilt cylinder into the machine, it is advisable to test it for seal leakage. To test 'U' cup or lip-type piston seals, connect one end of a short length of hose to the head-end port and submerge the other end in a small container of water. Pressurize the cap-end port with shop air

and observe the container of water. If more than an occasional bubble appears in the water, the cap-end piston cup is not sealing properly. To test the head-end cup, repeat the procedure with the hose connected to the cap-end port and shop air applied to the head-end. Rod seal leakage can be checked when the head-end port is pressurized. An occasional bubble in the oil indicates that the rod seal is expected to be leakproof when operated hydraulically. If more than an occasional bubble appears, the rod seal should be tested for oil leakage by hydraulically pressurizing the head-end port.

