
Toro Hydraulic Cylinder 99-3051 Service Information

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Warning



Hydraulic cylinders are designed to hold hydraulic fluid under high pressure. In addition, cylinders may contain holding valves and other means that could cause pressure to remain locked in the cylinder. As such, incorrect handling or process steps can create an unsafe situation. Be sure all appropriate measures are taken to relieve any residual pressure in the cylinder and further ensure that the cylinder is restrained in such a way that it cannot fall or move during the disassembly and assembly processes.

General

This manual describes those teardown and rebuild practices that are common to all standard Texas Hydraulics cylinder designs. Specific practices are available based on the component to be rebuilt. Please see your Texas Hydraulics sales engineer for this information.

Standard Texas Hydraulics cylinders are designed to operate with fluids per MIL-L-2104 or equivalent. Fluid cleanliness should be maintained at an ISO 18/15 for maximum life.

Teardown

Remove the cylinder and drain hydraulic fluid. Clean away all dirt or other foreign substance from openings - particularly at the head.

NOTE: If excessive wear due to side-loads or binding is a possibility, mark or note the piston and head relationship to the rod and tube. This condition will usually show up as a highly polished surface on the piston and head 90° to the pin rotation axis.

Remove the head retaining device. See specific procedure for your head design.

Extend the rod until the piston bottoms out on the head. Gently tap the piston against the head to drive the rod assembly out. Place the rod assembly on a surface that will not damage the chrome. Remove the piston locknut and separate the piston from the rod. Slide the head off the rod from the piston end.

Discard all old seals.

Inspection

INSPECT ROD: There should be no scratches or pits deep enough to catch the fingernail. Pits that go to the base metal are unacceptable. Scratches that catch the fingernail but are not to the base metal, less than 0.5 inch long and primarily in the circumferential direction are acceptable provided they cannot cut the rod seal. Chrome should be present over the entire surface of the rod and the lack thereof is unacceptable. In the event that an unacceptable condition occurs, the rod should be repaired or replaced.

INSPECT HEAD: Visually inspect the inside bore for scratches or polishing. Deep scratches are unacceptable. Polishing indicates uneven loading and when this occurs, the bore should be checked for out-of-roundness. If out-of-roundness exceeds 0.007", this is unacceptable. Check the condition of the dynamic seals looking particularly for metallic particles embedded in the seal surface. It is normal to cut the static seal on the retaining ring groove upon disassembly. Remove the rod seal, static o-ring and backup and rod wiper. Damage to the seal grooves, particularly on the sealing surfaces, is unacceptable. In the event that an unacceptable condition occurs, the head should be replaced.

INSPECT PISTON: Visually inspect the outside surface for scratches or polishing. Deep scratches are unacceptable. Polishing indicates uneven loading and when this occurs, the diameter should be checked for out-of-roundness. If out-of-roundness exceeds 0.007", this is unacceptable. Check the condition of the dynamic seals and bearings looking particularly for metallic particles embedded in the bearing and in the piston seal surface. Remove the seals and bearings. Damage to the seal grooves, particularly on the sealing surfaces, is unacceptable. In the event that an unacceptable condition occurs, the piston should be replaced.

INSPECT TUBE ASSEMBLY: Visually inspect the inside bore for scratches and pits. There should be no scratches or pits deep enough to catch the fingernail. Scratches that catch the fingernail but are less than 0.5 inch long and primarily in the circumferential direction are acceptable provided they cannot cut the piston seal. The roughness of the bore should be between 10 and 20 μ inches RMS. Significant variations (greater than 8 μ inches difference) are unacceptable. In the event that an unacceptable condition occurs, the tube assembly should be repaired or replaced.

Rebuild

Thoroughly rinse the inside of the tube and allow to drain. A high-pressure rinse followed by a wipe with a lint-free rag is preferable. Clean all internal components of any foreign material.

Visually inspect for material defects and contamination.

Lubricate the head and all seals with hydraulic fluid prior to installation. Rebuild the head and seals per the specific practice for this design.

Lubricate the piston and all components with hydraulic fluid. Rebuild the piston and seals per the specific practice for this design.

Place the rod on a clean table. Install the static o-ring seal per the recommended practice. Install the head followed by the piston onto the rod noting the proper orientation of each component. Torque the piston nut to the proper torque.

When the rod assembly is ready to be installed in the tube, liberally apply an anti-seize lubricant per the below specification to the head outer surface, especially the static seal.

Permatex Industrial Division of Loctite
Anti-Seize Lubricant
Brush-on: P/N 80208
Spray-on: P/N 80470

Dip the entire rod assembly into hydraulic fluid and stuff this assembly into the tube. Watch the seals as they pass over the rod port (if visible) to be sure they are not nicked or cut.

Tighten the head per the specific procedure for this design.

Test

Set test stand pressure to the recommended test pressure and attach hose fittings to cylinder.

The cylinder shall be stroked its full length in both directions to fill it with oil and remove trapped air.

Pressurize to recommended test pressure at each end, beginning with the rod end, for a minimum of 10 seconds per end. While under pressure, cylinder shall be checked for leaks at welds, pipe fittings, and at all external static and dynamic seals.

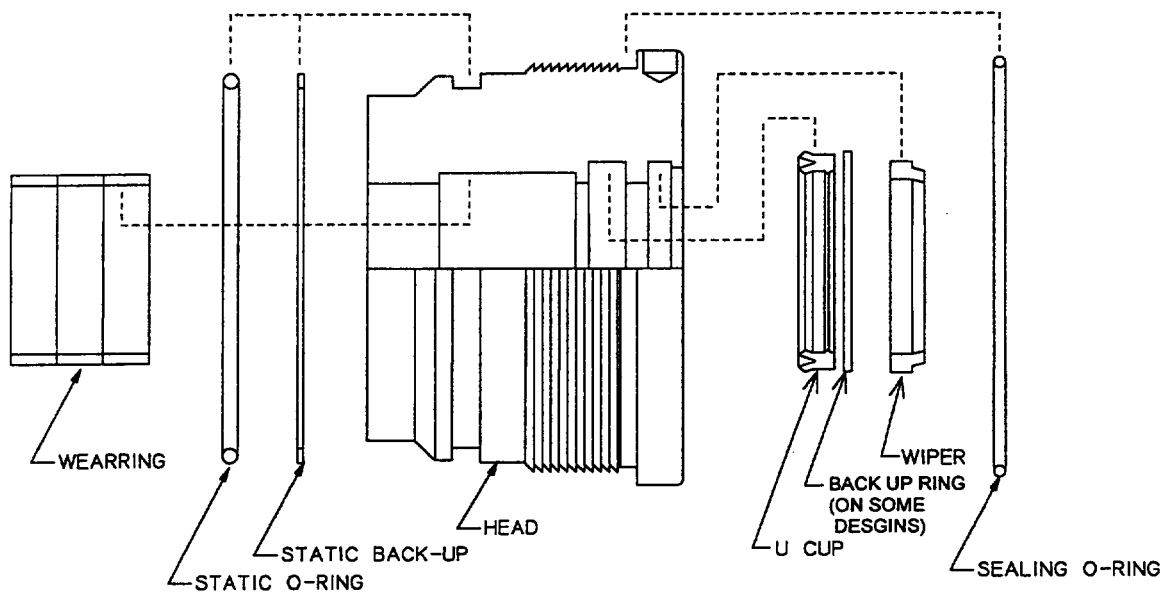
When testing is complete, retract the cylinder using air in the rod port to remove oil.

Seal ports with port plugs to prevent contamination from entering cylinder.

Z Head

General

The Z series head uses ductile iron material and has a u-cup as the primary sealing element. Cylinders rated for high pressures or cylinders which experience pressure spikes, may have a back up ring behind the u-cup. The wiper is a standard type D. The head is retained within the tube by means of its own buttress threads. There is a sealing o-ring that prevents contaminant from reaching the threads and provides an anti-rotation function. General procedures for teardown, inspection, and rebuild are contained in the General Procedures Maintenance Manual. See your Texas Hydraulics Sales Engineer if you have any questions.



Teardown

Remove the head as follows: Insert a spanner wrench into the holes provided. Turn the head counter-clockwise (it is a right-hand thread) to remove it. If the head is difficult to remove or moves erratically, tap the tube adjacent to the head with a brass or plastic mallet while turning it.

Rebuild

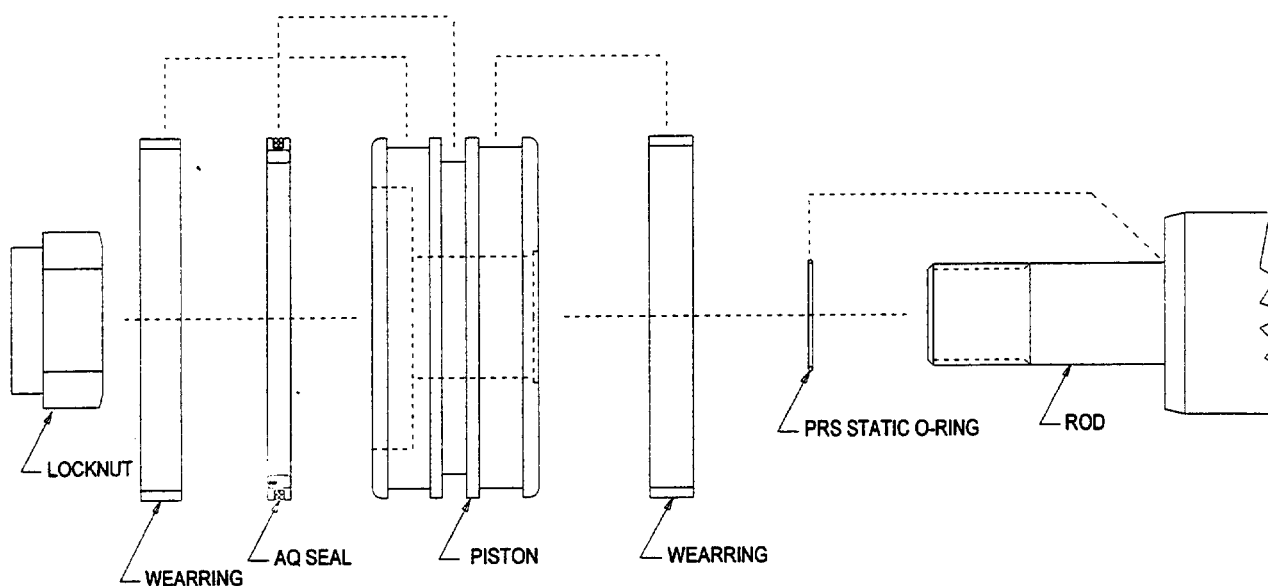
Lubricate the head and all seals with hydraulic fluid prior to installation. Using round-nose pliers or special installation tools, twist the dual lip u-cup seal into a "C" shape and allow it to snap into groove. Use a similar technique for installing the wiper. Install the static o-ring and backup into the static seal groove verifying that the backup is closest to the threads. Install the sealing o-ring into the groove between the threads and the flange lip. If possible, the head/seal assembly should sit for at least one hour to allow the seals to elastically restore.

Slide the head into the tube and engage the threads. Turn the head counterclockwise until the first thread just passes the engagement point (The head will move noticeably) then turn the head clockwise until it is hand-tight or fully seated. Insert a spanner wrench into the holes provided and tighten 1/8 to 1/4 turn past fully seated.

Z Piston

General

The Z series piston uses ductile iron material and wearrings (bearing rings). The seal groove is sized for a specially designed "zero drift" piston seal. The teflon sealing ring has a small groove on its outside diameter that houses a quad ring seal. The entire ring is energized by a square section rubber loader. A small static o-ring seal is fitted to a groove in the piston and is held in place by the shoulder of the rod. General procedures for teardown, inspection, and rebuild are contained in the General Procedures Maintenance Manual. See your Texas Hydraulics Sales Engineer if you have any questions.



Teardown

After removing the piston, remove and discard the PRS static o-ring from the rod shoulder. Remove the piston seal by means of blunt instruments of bronze or aluminum. Be sure there are no sharp edges on these tools. Be particularly careful of scratching the groove surface finish.

Rebuild

Separate the three components of the seal assembly. For easiest installation, warm the teflon outer ring in 150 to 200°F hydraulic fluid or water. Lubricate the piston and all components with hydraulic fluid. Stretch the inner rubber expander into the seal groove. Do not use sharp edged tools and verify that it has not twisted. Likewise, stretch the teflon outer ring into the groove. Be extremely careful to avoid damaging the seal grooves during installation. Scratching the groove may cause by-pass leakage. The teflon ring will have a memory and may take as long as 24 hours to return to the correct size. This can be accelerated by pushing the piston/seal assembly through a honed or polished tube with an ID equal to the nominal cylinder bore to plus .010 inches. Clean the groove in the teflon ring and install the rubber quad ring. Verify that it has not twisted. Install the wearrings into the wearing groove. If possible, allow the piston/seal assembly to sit at least one hour to allow the seals to elastically restore.

Z Piston (Threaded)

General

The Z series piston uses ductile iron material, wearings (bearing rings), and a specially designed piston seal as the primary sealing element. The teflon sealing ring has a small groove on its outside diameter that houses a quad ring seal. The entire ring is energized by a square section rubber loader. A small static o-ring seal is fitted to a groove in the piston and is held in place by the shoulder of the rod. General procedures for teardown, inspection, and rebuild are contained in the General Procedures Maintenance Manual. See your Texas Hydraulics Sales Engineer if you have any questions.

Teardown

Remove the piston as follows: locate and remove the set-screw (it may be underneath one of the wearings)***. Insert a spanner wrench into the holes provided and turn the piston counter-clockwise (it is a right-handed thread) to remove it. After removing the piston, remove and discard the PRS static o-ring from the rod shoulder. Remove the AQ seal by means of blunt instruments of bronze or aluminum. Be sure there are no sharp edges on these tools. Be particularly careful of scratching the groove surface finish.

Rebuild

Separate the three components of the seal assembly. For easiest installation, warm the teflon outer ring in 120 to 150 °F hydraulic fluid or water. Lubricate the piston and all components with hydraulic fluid. Stretch the inner rubber expander into the seal groove. Do not use sharp edged tools and verify that it has not twisted. Likewise, stretch the teflon outer ring into the groove. Be extremely careful to avoid damaging the seal grooves during installation. Scratching the groove may cause by-pass leakage. The teflon ring will have a memory and may take as long as 24 hours to return to the correct size. This can be accelerated by pushing the piston/seal assembly through a honed or polished tube with an ID equal to the nominal cylinder bore to plus .010 inches. Clean the groove in the teflon ring and install the rubber quad ring. Verify that it has not twisted. If possible, allow the piston/seal assembly to sit at least one hour to allow the seals to elastically restore.

Place the rod on a clean table. Slide the piston onto the rod noting the proper orientation. Apply Loctite #242 (blue) to the threads. Turn the piston clockwise until it is hand tight or fully seated (it is a right-handed thread). Insert a spanner wrench into the holes provided, torque the piston and install set-screws as indicated on the print. Install the wearings into the wearing grooves.

Valve Installation

Toro cylinder 99-3051 (THI P/N S24008020CCBZ) is unique in that it has “flow through,” or “rephase,” functionality when fully retracted. The valve should be placed into the I.D. cavity of the thread-on “Z” piston. Lubricate the valve oring prior to inserting the valve. The side with the valve oring nearest the end should be firmly inserted into the piston cavity until it is seated against the back of the piston. Use a hollow installation arbor to install the valve. Caution: Pressing on the exposed plunger when installing the valve will damage the valve causing the cylinder not to properly support the load.

Explanation of Operation: “Rephase”

The “rephase” functionality of the cylinder allows fluid to flow through the cylinder when fully retracted. This is accomplished by means of a plunger actuator which unseats a check valve within .200” of being fully retracted. The fluid is channeled through drilled passages in the rod and then through the valve which is housed in the piston/rod end cavity. Upon extending, flow is blocked allowing the rod to extend without bypassing fluid.