Helical Hydraulic Rotary Actuators
L30 Series Service & Repair Manual
# Table of Contents

## Introduction
- Table of Contents .................................................................................................................. 2
- Product Introduction ................................................................................................................ 3
- General Safety Guidelines ....................................................................................................... 4
- Product Identification ............................................................................................................... 4
- Theory of Operation .................................................................................................................. 5

## Tools
- Tools Required ....................................................................................................................... 6
- Spare Parts - Tech Support ..................................................................................................... 7

## Drawings
- Assembly Drawings ............................................................................................................... 8
- Exploded Views ....................................................................................................................... 9
- Spare Parts .............................................................................................................................. 10
- Parts List ................................................................................................................................ 10
- Valve Block Exploded View ................................................................................................... 11
- Valve Block Exploded Parts List ............................................................................................. 11

## Disassembly
- Before Disassembly ............................................................................................................... 12
- Disassembly ............................................................................................................................ 12
- Inspection ................................................................................................................................ 18

## Assembly
- Seal and Wear Guide Installation .......................................................................................... 18
- Assembly .................................................................................................................................. 22

## Post Assembly
- Greasing Thrust Washers ........................................................................................................ 25
- Testing the Actuator ................................................................................................................ 25
- Installation and Bleeding ........................................................................................................ 26
- Troubleshooting Guide ........................................................................................................... 27
- Warranty Information .............................................................................................................. 28
For over 45 years, Helac Corporation has been recognized for innovation in design of hydraulic rotary actuators and construction equipment attachments. Helac products are known for their tremendous torque output, compact configurations, exceptional load bearing capabilities, and rugged, reliable performance. Over 1,000 mobile, industrial, construction and mining machinery manufacturers around the world depend on Helac actuators to perform such functions as rotation, positioning, manipulation, vehicle steering and indexing.

The L30 Series is available in several different sizes. All L30 Series actuators incorporate the same internal design, though they vary in size depending on model.
General Safety Guidelines

Many L30 actuator applications have several pinch points with the potential for severe injuries. Use extreme caution and remain clear of all rotating components when bleeding the hydraulic system and whenever the machine is in operation.

After rebuilding or repairing an actuator, it is necessary to bleed all air from the actuator as well as the hydraulic system of the machine.

Product Identification

Each Helac actuator is individually serial numbered. The serial number is a six digit number and must be provided before parts and/or service issues can be addressed.

Additionally, the serial number of the actuator is stamped onto the housing tube. It may be necessary to remove paint to expose the serial number.

The serial number can be found on the Identification (ID) Tag that is affixed to all actuators. The tag is a thin, silver colored, plastic label with a self-adhesive backing. Information is imprinted in black. The tag is located on the housing tube of the actuator. In some cases, the ID tag may be painted over by the OEM (Original Equipment Manufacturer).
Theory of Operation

The L30 Series rotary actuator is a simple mechanism that uses Helac's sliding spline technology which converts linear piston motion into powerful shaft rotation. Each actuator is composed of a housing with an integral ring gear (1) and only two moving parts: the central shaft (2) with an integrated bearing and mounting flange, and the annular piston sleeve (3).

Helical spline teeth machined on the shaft engage matching splines on the inside diameter of the piston. The outside diameter of the piston carries a second set of splines, of opposite hand, which engage the matching splines of the housing's ring gear.

As hydraulic pressure is applied, the piston is displaced axially within the housing - similar to the operation of a hydraulic cylinder - while simultaneously, the splines cause the shaft to rotate. When the control valve is closed, oil is trapped inside the housing, preventing piston movement and locking the shaft firmly in position.

The shaft is supported radially by the large upper radial bearing and the lower radial bearing (see drawings on pages 8 and 9). Axially, the shaft is separated from the housing by the upper and lower thrust washers. The end cap is adjusted for axial clearance and locked in position by set screws, pins or locking collar.

The L30 Series is available in several different sizes. All L30 Series actuators incorporate the same internal design, though they vary in size depending on model.

Many actuators are equipped with a factory installed counterbalance valve, which performs four major functions.

- Protects the actuator in the event of overload
- Enables the actuator to hold position without drifting when external loads are applied
- Reduces hydraulic backlash by pressuring the hydraulic fluid
- Provides a constant controlled rate of rotation in over-center load conditions

Bars indicate starting positions of piston and shaft. Arrows indicate direction they will rotate. The housing with integral ring gear remains stationary. For clarity, the shaft flange, bearings, and end cap are not shown.

Applying fluid pressure will displace the piston axially while the helical gearing causes the piston and shaft to rotate simultaneously. The double helix design compounds rotation: shaft rotation is about twice that of the piston. Applying pressure to the opposite port will return the piston and shaft to their original starting positions.
Tools Required

Several basic tools are required for the disassembly and reassembly of the actuator. The tools and their intended functions are outlined below:

1. **PIPE VISE**
2. **BOLTS**
3. **PRY BAR**
4. **SCREWS**
5. **FLASHLIGHT**
   - Helps in locating and examining timing marks, component failure and overall condition.
6. **HEX WRENCH SET**
   - Removal and replacement of port plugs and set screws
7. **TORQUE TOOL**
8. **TORQUE WRENCHES**
9. **ASSORTED SCREWS**
10. **PLASTIC MANDREL**
    - Removal and installation of piston sleeve
11. **FELT MARKER**
    - Highlights timing marks and outlines troubled areas. Permanent ink is recommended.
12. **SAFETY GLASSES**
13. **SEAL TOOLS**
14. **RUBBER MALLET**
    - Removal and installation of shaft and piston sleeve assembly.

**MAKING A SEAL TOOL**

The seal tool is merely a customized standard flat head screwdriver.

1. Heat the flat end with a torch until it glows.
2. Secure the heated end of the screwdriver in a vise and bend the heated end to a slight radius.
3. Round off all sharp edges of the heated to a polished finish. The tool may be modified slightly to your own personal preference.

**CAUTION**

To avoid Injury:
Be careful when handling the screwdriver when hot.
Spare Parts

Spare parts must be ordered through the vehicle/machine OEM. Seals and bearings are available as complete kits only! In order to obtain the correct parts, it is essential to provide the serial number of the actuator to be repaired, see Product Identification section on page 4. To identify spare parts required, refer to the Assembly Drawing on page 9 and Parts List on page 10.

Technical Support

Technical support is available from Helac Corporation, Monday through Friday 7 am to 4 pm Pacific Standard Time by calling 800-327-2589. If possible, please have the serial number of the actuator available. (The serial number is stamped into the housing of the actuator-see page 4).
L30 Exploded View
# Parts List

## Spare Parts

Spare parts must be ordered through the vehicle/machine OEM. Seals and wear guides are available as complete kits only! In order to obtain the correct parts, it is essential to provide the serial number for the actuator to be repaired. See Product Identification on Page 4. To identify spare parts required, refer to the Assembly Drawing, Exploded View Drawing and the Parts List.

<table>
<thead>
<tr>
<th>PARTS</th>
<th>Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Housing</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Shaft</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Piston Sleeve Assembly</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>End Cap</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Lock Nut</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HARDWARE</th>
<th>Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>Dowel, Pin</td>
<td>2</td>
</tr>
<tr>
<td>105</td>
<td>Fitting, Plug SAE-4</td>
<td>4</td>
</tr>
<tr>
<td>106</td>
<td>Fitting, Port Plug SAE-6</td>
<td>2</td>
</tr>
<tr>
<td>109</td>
<td>Pull-Out Dowel, Pin</td>
<td>2</td>
</tr>
<tr>
<td>111</td>
<td>Fitting, Grease, 1/8 NPT</td>
<td>2</td>
</tr>
<tr>
<td>112</td>
<td>Fitting, Grease Relief, 1/8 NPT</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WEAR GUIDES</th>
<th>Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>300</td>
<td>Wear Guide</td>
<td>2</td>
</tr>
<tr>
<td>301</td>
<td>Wear Guide</td>
<td>1</td>
</tr>
<tr>
<td>302</td>
<td>Wear Guide</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OPTIONAL ACCESSORIES</th>
<th>Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>400</td>
<td>Stop Tube (O-Ring included)(not shown)</td>
<td>1</td>
</tr>
<tr>
<td>401</td>
<td>Counterbalance Valve</td>
<td>1</td>
</tr>
<tr>
<td>406</td>
<td>Hydraulic Tubing Assembly</td>
<td>1</td>
</tr>
</tbody>
</table>

Seal and Bearing kits can be ordered online at [http://www.helac.com/store/](http://www.helac.com/store/)

<table>
<thead>
<tr>
<th>SEALS</th>
<th>Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>Cup Seal</td>
<td>2</td>
</tr>
<tr>
<td>201</td>
<td>Cup Seal (energizer ring removed)</td>
<td>1</td>
</tr>
<tr>
<td>202</td>
<td>Cup Seal</td>
<td>1</td>
</tr>
<tr>
<td>203</td>
<td>Cup Seal (energizer ring removed)</td>
<td>1</td>
</tr>
<tr>
<td>205</td>
<td>Main Pressure - Z-Seal</td>
<td>2</td>
</tr>
<tr>
<td>206</td>
<td>Exclusion Seal</td>
<td>2</td>
</tr>
<tr>
<td>208</td>
<td>O-Ring - Seal</td>
<td>1</td>
</tr>
<tr>
<td>209</td>
<td>O-Ring - Seal</td>
<td>1</td>
</tr>
</tbody>
</table>
Valve Block Exploded View

Valve Block Assembly
Exploded View

Valve Block Parts List

<table>
<thead>
<tr>
<th>L30 SERIES MODELS</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Item</td>
<td>Description</td>
<td>Quantity</td>
</tr>
<tr>
<td>A</td>
<td>Seal Kit - Valve Cartridges</td>
<td>1</td>
</tr>
<tr>
<td>B</td>
<td>Relief Manifold</td>
<td>1</td>
</tr>
<tr>
<td>C</td>
<td>Counterbalance/Relief Valve</td>
<td>2</td>
</tr>
<tr>
<td>V1</td>
<td>Fitting, SAE-4 OR 3/8 BSPP (not shown)</td>
<td>1</td>
</tr>
<tr>
<td>V2</td>
<td>Fitting, SAE-4 OR 3/8 BSPP (not shown)</td>
<td>1</td>
</tr>
</tbody>
</table>
Disassembly

Before Disassembly

All numbers that appear in parenthesis ( ) are referring to items on page 8 or 9.

Inspect the actuator for corrosion prior to disassembly. Severe corrosion can make it difficult to unthread and remove the lock nut (5) and end cap (4). If corrosion is evident, soak the affected areas with penetrating oil for several hours before disassembly. It is required prior to disassembly, that the shaft is rotated completely clockwise and that the valve block is removed, (See valve block drawing and parts list on page 10) and that the actuator is placed in a pipe vise.

Disassembly

Be sure actuator has been fully rotated, valve block removed, and actuator is firmly secured to the pipe vise.

1. Remove port plugs (106) and both grease relief and grease fittings (111 and 112) for ease of disassembly and assembly processes.

2. Drain the actuator of all oil into a suitable container.

3. Using a 3/16 " size hex wrench, remove the 4 port plugs (105) from the locknut (5).

4. Thread a #10-32 bolt into each pull-out dowel pin (109) located behind 2 of the port plugs (105) in the lock nut (5), pull straight out to remove.

5. Insert two SAE-4 adaptor fittings opposite each other into the lock nut (5). Place a pry bar between the adaptor fittings and turn counterclockwise to remove the lock nut (5) from the threaded end of the shaft (2).
Disassembly

6. Insert two 5/8"-11 threaded bolts opposite each other into the end cap (4). Pull straight out to remove end cap (4). See Photo Below

**NOTICE** If needed, to break the seal friction, the end cap can be removed by first removing the shaft (see step 7) then tapping the inside of the end cap through the actuator housing and piston sleeve with a rubber mallet and plastic mandrel. Do not let end cap fall.

7. Thread two M16x2 threaded bolts into the shaft (2) flange. Using a long pry bar turn the shaft (2) counterclockwise. It will start to rotate out of the housing. If it does not rotate out of the housing, use a plastic mandrel to tap the threaded end to break the hydraulic lock and start the shaft out of the housing. *(Do not rotate shaft out of gear engagement with the piston).* Look on the gear end of the piston sleeve (3) and locate the existing timing marks (center punches), make new timing marks if needed. Take a felt pen and clearly mark the gear engagement at the timing marks on both the piston and shaft. Upon reassembly the same gear engagement (timing) has to be achieved. Rotate the shaft out of the actuator. Support the weight of the shaft to prevent damage to the rod surface. See Photos to Right.
Disassembly

8. Using a plastic mandrel and rubber mallet, drive the piston sleeve assembly towards the end cap end of the actuator. Stop when the gear end of the piston sleeve is flush with the Housing (1) ring gear.

9. Locate the timing marks on the piston sleeve assembly (3) and the housing (1) ring gear, clearly mark them with a felt pen (make new timing marks if none are found). Continue to drive the piston sleeve assembly out of the housing ring gear. Stop immediately after the gear teeth come out of engagement. Take a felt pen and put a mark on top of the piston and a corresponding mark on the thrust surface of the housing (see photo below). This mark will simplify assembly later. Remove the piston sleeve assembly from the housing.

10. Remove the OD O-ring (209) from the locknut (5) using a pick or seal tool.

11. Remove the ID O-ring (208) from the locknut (5) using a pick or seal tool.

12. Remove the ID cup seal (200) from the end cap (4) using a pick or seal tool.
Disassembly

13. Remove the wear guide (302) from the end cap (4).

14. Remove the main pressure seal (205) from the end cap (4) using a seal tool.

15. Remove the thrust washer (304) from the end cap (4).

16. Remove the exclusion seal (206) from the end cap (4) using a seal tool.

17. Remove the ID cup seal (200) from the piston sleeve assembly (3) using a seal tool.

18. Remove the ID wear guide (301) from the piston sleeve assembly (3) using a pick tool.
Disassembly

19. Remove the ID cup seal (201) from the piston sleeve assembly (3) using a small pick or seal tool.

20. Remove the wear guide (300) from the piston sleeve assembly (3).

21. Remove the OD cup seal (202) from the piston sleeve assembly (3) using a small pick or seal tool.

22. Remove the OD cup seal (203) from the piston sleeve assembly (3) using a small pick or seal tool.

23. Remove the wear guides (300 & 302) from the shaft (2).

24. Remove the wear guides (300 & 302) from the shaft (2).

25. Remove the main pressure seal (205) from the shaft (2) using a seal tool.
Disassembly

26. Remove the thrust washer (304) from the shaft (2).

27. Remove the exclusion seal (206) from the shaft (2) using a seal tool.
Seal and Wear Guide Installation

**Pre-Assembly**

All actuators are timed according to OEM specifications at Helac's production facility. The timing ensures that the actuator will stop at the required position at the end of the rotation in either direction. Wrong timing can cause the actuator to over rotate resulting in interference and damage of equipment components. Rotation being too short can limit the operating range of the equipment. The proper gear engagement of shaft, piston and housing ensures the correct timing.

For repair personnel not familiar with the L30 actuator, it is recommended that a "dry run" without the seals installed but with the wear guides and thrust washer installed, be performed prior to final assembly. Proceed to assembly procedures starting on page 22, insure proper fit and timing of actuator, then disassemble and apply all seals and wear guides. For seal and wear guide orientation use the cut-away drawing on page 7 as a reference.

**Inspection**

1. Clean all parts in a wash tank and dry with compressed air prior to inspecting.
2. Carefully inspect all critical areas: Seal grooves, wear guide grooves, thrust surfaces, shaft surfaces, housing bore and gear teeth for any surface finish abnormalities.

1. Using a seal tool install the OD O-ring (209) onto the locknut (5).

2. Install the ID O-ring (208) into the lock nut (5).

3. Install the ID cup seal (200) into the end cap (4).

Lubricate all seals and contact surfaces with hydraulic oil. Apply a thin layer of lubricating grease to the thrust washers.
Seal and Wear Guide Installation

4. Install the exclusion seal (206) onto the end cap (4) using a seal tool.

5. Lightly grease both sides of the thrust washer with Lithium grease (304) and install onto the end cap (4).

6. Install the main pressure seal (205) onto the end cap (4) using a seal tool.

7. Install the wear guide (302) onto the end cap (4).

8. Install the OD cup seal (203) with the energizer ring removed, onto the piston sleeve assembly (3) using a seal tool.

9. Install the OD cup seal (202) onto the piston sleeve assembly (3) using a seal tool.

* NOTE: Several models use O.D. T-seal that comes without an energizer ring. Install the O.D. seal and two backup rings.
Seal and Wear Guide Installation

10. Install the wear guide (300) onto the piston sleeve assembly (3).

11. Install the ID cup seal (201) with the energizer ring removed, into the piston sleeve assembly (3).

12. Install the ID wear guide (301) into the piston sleeve assembly (3).

13. Install the ID cup seal (200) into the piston sleeve assembly (3).

14. Install the exclusion seal (206) onto the shaft (2).

15. Lightly grease both sides of the thrust washer with Lithium grease (304) and install onto the shaft (2).
Seal and Wear Guide Installation

16. Install the main pressure seal (205) onto the shaft (2).

17. Install wear guides (300&302) onto the shaft (2).
Assembly

1. Secure the actuator to a pipe vise, then carefully slide the piston sleeve assembly (3), gear teeth first, into the end cap end of the actuator. (Be careful not to bind or jam the piston sleeve assembly in the housing). Stop when the end of the piston is flush with the thrust surface of the housing (1) and the two reference marks, made during disassembly line up. (The gear teeth of the piston sleeve assembly should be almost ready to engage the housing (1) ring gear teeth).

2. Confirm proper gear alignment from the shaft flange end, then use a rubber mallet and plastic mandrel to engage the piston sleeve assembly gear teeth and housing ring gear teeth. Drive piston in until the front of the piston sleeve is lined up with the housing ring gear (see photo below). Locate the timing marks on the piston sleeve gear teeth and the housing ring gear teeth. Both timing marks should be lined up. If not, disengage the piston from the ring gear and line up with the correct gear engagement.

3. Using a rubber mallet and plastic mandrel, continue to drive piston sleeve assembly (3) towards the shaft flange end of actuator until the piston sleeve assembly is fully seated against the housing ring gear.
Assembly

4. Install the shaft (2) threaded end first into the piston sleeve assembly (3). The shaft (2) gear teeth timing mark and the piston sleeve assembly (3) gear teeth timing mark must be lined up.

5. Install two M16x2 bolts into the shaft (2) flange. Using a long pry bar turn the shaft (2) clockwise. Be sure both timing marks on the gear teeth are lined up. Rotate shaft (2) in until approximately 2 inches are still between the shaft flange and the housing.

6. Grease the end cap (4) splines with Lithium grease. Install two 5/8"-11 bolts in the end cap and slide end cap into the housing. Carefully tap the end cap (4) with a rubber mallet until the seals enter the housing and the end cap becomes flush with the housing.

7. Using the pry bar turn the shaft (2) clockwise slowly to engage the shaft (2) splines and the end cap (4) splines. If needed, use the two bolts on the end cap to turn end cap for proper alignment of the splines. After engagement of splines, fully seat the shaft (2) clockwise into the housing.

**NOTICE**

To avoid damage to machined parts:
Carefully remove seals using removal tools with rounded edges.
Assembly

8. Grease the threads and contact surfaces of the end cap (4), shaft (2) and locknut (5). Thread the locknut (5) onto the threaded end of the shaft (2). Install two SAE #4 adaptor fittings opposite each other into the locknut (5). Using the pry bar, turn lock nut clockwise and tighten, per chart on page 24.

10. Install and tighten the 4 SAE-4 port plugs (105) into the locknut (5) using a 3/16" hex wrench.

9. Rotate the locknut (5) counterclockwise just far enough to insert the 2 pull-out dowel pins (109) opposite each other.

11. Install the valve block (if equipped), hydraulic lines, all port plugs and grease fittings onto the actuator.

L30 End Cap / Lock Nut Torque Chart

<table>
<thead>
<tr>
<th>Model</th>
<th>Ft-Lbs</th>
<th>Nm</th>
</tr>
</thead>
<tbody>
<tr>
<td>L30 – 25</td>
<td>200</td>
<td>271</td>
</tr>
<tr>
<td>L30 – 65</td>
<td>200</td>
<td>271</td>
</tr>
<tr>
<td>L30 – 95</td>
<td>250</td>
<td>339</td>
</tr>
<tr>
<td>L30 – 125</td>
<td>250</td>
<td>339</td>
</tr>
</tbody>
</table>
Testing the Actuator

**Testing the Actuator for Internal Leakage**

Plug the valve ports and connect the hydraulic lines to the housing ports. Bleed all air from the actuator (see Installation and Bleeding Procedure on page 26) Rotate the shaft to the end of rotation at 3000 psi (210 bar) and maintain pressure. Remove the hydraulic line from the non-pressurized side.

Continuous oil flow from the open housing port indicates internal leakage across the piston. Replace the line and rotate the shaft to the end of rotation in the opposite direction. Repeat the test procedure outlined above for the other port. If there is an internal leak, disassemble, inspect and repair.

**Testing the Actuator**

If the equipment is available, the actuator should be tested on a hydraulic test bench. The breakaway pressure—the pressure at which the shaft begins to rotate—should be to 650 psi (45 bar) maximum. Cycle the actuator at least 25 times at 3000 psi (210 bar) pressure. After the 25 rotations, increase the pressure to 4500 psi (315 bar) to check for leaks and cracks. Perform the test again at the end of the rotation in the opposite direction.

---

**Greasing Thrust Washers**

After the actuator is assembled but before it is put back into service, the thrust washers and exclusion seals must be packed with Lithium grease.

1. There are two male grease fittings (111) and two grease relief ports (112), one of each (111, 112) is located at both ends of the outer diameter of the housing (1). (See exploded view on page 8 for reference).

2. Insert the tip of the female grease nozzle onto the male grease fitting (111) and apply grease. Continue applying until grease flows from the relief port (112). Cycle the actuator five times and apply grease again. Repeat this process at the other end of the housing (1).

---

**NOTICE**

If a hydraulic test bench is not available, the actuator can be rotated by hand, open the pressure ports and use a pry bar with cap screws inserted into the shaft flange to turn the shaft in the desired direction.
Installation and Bleeding

After installation of the actuator onto the equipment, it is important that all safety devices such as tie rods or safety cables be properly reattached. The actuator body is equipped with a pair of port plugs (106) which can be removed for bleeding.

For actuators with an optional valve block installed.

1. Connect the pressure lines to ports V1 and V2.
2. Connect a hydraulic line to port P1 routed either back to tank or to a 5 gallon container to collect the purged oil.
3. Apply pressure to port V2 until actuator has fully rotated to one side.
4. With port P1 still open, apply pressure to the primary port V1 allowing oil/air to be purged from the open port.
5. Install port P1 plug and attach purge line to port P2.
6. Apply pressure to port V1 until actuator has fully rotated in the opposite direction.
7. With port P2 still open, apply pressure to port V2 allowing oil/air to be purged from the open port.
8. Install port P2 plug.
9. All air should be purged from the actuator.

For actuator without optional valve block installed.

Air should be purged through the upper ports P1 and P2. With that in mind, apply pressure hoses to the lower ports P1 and P2.

1. Connect a hydraulic line to upper port P1 routed either back to tank or to a 5 gallon container to collect the purged oil.
2. Apply pressure to lower port P2 until actuator has fully rotated to one side.
3. With upper port P1 still open, apply pressure to the lower port P1 allowing oil/air to be purged from the open port.
4. Install upper port P1 plug and attach purge line to upper port P2.
5. Apply pressure to lower port P1 until actuator has fully rotated to the opposite side.
6. With upper port P2 still open, apply pressure to the lower port P2 allowing oil/air to be purged from the open port.
7. Install upper port P2 plug.
8. All air should be purged from the actuator.
## Troubleshooting Guide

### PROBLEM

| Shaft rotates slowly or not at all | 1 - 6 |
| Operation is erratic or not responsive | 7 |
| Shaft will not fully rotate | 8, 9 |
| Selected position cannot be maintained | 3, 4, 7 |

### CAUSE

| 1. Insufficient torque output | 
|---|---|
| 2. Low rate of fluid flow | 
| 3. Control or counterbalance valve has internal leak | 
| 4. Piston and/or shaft seal leak | 
| 5. Corrosion build-up on the thrust surfaces | 
| 6. Swollen seals and composite bearings caused by incompatible hydraulic fluid (Standard actuators only) | 
| 7. Air in actuator | 
| 8. Twisted or chipped gear teeth overload condition. | 
| 9. Port fittings are obstructing the piston during stroke | |

### SOLUTION

| 1. Insufficient torque output | Verify correct operating pressure. Do not exceed OEM's pressure specifications. Load may be above maximum capacity of the actuator. |
| 2. Low rate of fluid flow | Inspect ports for obstructions and hydraulic lines for restrictions and leaks. |
| 3. Control or counterbalance valve has internal leak | Disconnect hydraulic lines and bypass valve. Leave valve ports open and operate the actuator through housing ports (do not exceed OEM's operating pressure). The valve must be replaced if a steady flow of fluid is seen coming from the valve ports. |
| 4. Piston and/or shaft seal leak | Remove the plug and the housing's valve ports. Operate the actuator through the housing ports. Conduct the internal leakage test as described in the Testing section on page 23 of this manual. |
| 5. Corrosion build-up on the thrust surfaces | Re-build the actuator. Remove all rust then polish.* |
| 6. Swollen seals and composite bearings caused by incompatible hydraulic fluid (Standard actuators only) | Re-build the actuator. Use fluid that is compatible with seals and bearings. Contact Helac Corporation for more information. |
| 7. Air in actuator | Purge air from actuator. See bleeding procedures outlined on page 24. |
| 8. Twisted or chipped gear teeth overload condition. | Check for gear binding. Actuator may not be able to be re-built and may need to be replaced. |
| 9. Port fittings are obstructing the piston during stroke | Check thread length of port fittings. Fittings should not reach inside the housing bore. |

* Replacement parts may be needed.
Warranty Information

Hydraulic Rotary Actuator Product Warranty

Standard Warranty Information

Helac Corporation warrants its manufactured products to be free from defective material and factory workmanship. Helac Corporation shall replace or repair such products, which under normal use and service disclose such defects, and return the repaired or replacement products to the purchaser prepaid. Claims under this warranty will be satisfied only by repair or replacement of the unit or any defective part thereof. No cash payment or credit will be made for defective materials, workmanship, labor or incidental charges. Products under warranty shall be returned to Helac Corporation’s manufacturing facility at 225 Battersby Avenue, Enumclaw, Washington 98022 USA, transportation prepaid by the purchaser, for inspection by Helac Corporation, whose opinion as to defects shall be conclusive.

The warranty period shall be 12 months from the date of shipment from Helac Corporation’s manufacturing facility for Helac Corporation approved applications. This warranty shall be voided as to any products which have been repaired, worked upon, or altered by persons not authorized by Helac Corporation, or which have been subject to misuse, negligence, accident, or overload. In no event shall Helac Corporation be liable for any incidental or consequential damages.

Helac Corporation reserves the right to make changes in the design or construction of any of its products at any time without incurring any obligations to make changes or alterations to products previously sold.

This warranty is in lieu of all other and/or prior warranties, expressed or implied, and no other company or person is authorized to represent or assume for Helac Corporation any liability in connection with the sale of Helac Corporation products other than set forth herein.

Return and Debit Policy for Actuators

Unless agreed to in advance, all actuators will be shipped to Helac Corporation, freight prepaid within seven days after receipt of return authorization. Prior to any returns, a Return Material Authorization (RMA) form is to be requested from an authorized Helac Corporation representative. Upon receipt of the RMA form, the customer is to provide when applicable, the part number, serial number, failure date, description of problem and the customer claim or reference number. All shipments to Helac Corporation are to include the completed RMA form.

Upon receipt of the actuator(s) at the Helac Corporation facilities, an inspection will be performed and an authorized representative will provide a written quote. This quote will list the findings of the inspection and will state whether or not the warranty claim has been accepted. Actuators returned for credit may be subject to the Helac Corporation re-stocking fee.

If Helac Corporation does not receive a response to their quote within 30 calendar days, the actuator will be either scrapped or returned and an invoice for the debit amount, including the freight charges, will be sent to the claim originator.

Return and Debit Policy for Service Parts

Return of service parts, normally stocked by Helac Corporation, must be authorized in advance. This will include seal and bearing kits as well as any and all fabricated parts. Return of any special order parts will be authorized on a case-by-case basis. All returns are to be shipped to Helac Corporation freight prepaid within seven days after receipt of return authorization. Helac Corporation has a minimum re-stocking fee of 20 percent.

Prior to any returns, Return Material Authorization (RMA) form is to be requested from an authorized Helac Corporation representative. Upon receipt of the RMA form, the customer is to provide part number, receipt date, description of problem and the customer claim number. All shipments to Helac Corporation are to include the completed RMA form.