Repair of Rotac® Actuators

LP Model
OVERHAUL INSTRUCTIONS
LP-11, LP-12
LP-22, LP-24
LP-33, LP-35

Read the entire contents of these instructions before installing the actuator and before making any connections to the actuator. These instructions must be followed in all respects to avoid damage to the actuator and associated components and/or injury to personnel.

For further information contact:

Micromatic
Micromatic, LLC
525 Berne St.
Berne, IN. 46711
Ph 260 589 2136 Fax 260 589 8966
www.rotachydroac.com

Page 1 of 5
Rotac® TEARDOWN, INSPECTION AND ASSEMBLY INSTRUCTIONS

I. TEARDOWN

a. Clean exterior of unit. This will help keep foreign material from getting inside the actuator, and any foreign material found in the actuator might be an indication of the cause of the actuator failure.
b. Remove any burrs from the extension and/or the end of bearing journal to prevent damage during disassembly.
c. Match mark heads and body so that their relationship can be re-established at re-assembly.
d. After removing head bolts from both heads, strike extension end of shaft with a plastic hammer or with a soft metal intermediary between the shaft and a hammer. Allow the shaft to push the head off. DO NOT PRY head off! Severe damage may occur to heads and body.
e. Pull shaft out, being careful not to let shaft drop when shaft is thru head. The shoe will usually come out by pulling it with your hands, however, it may sometimes be necessary to exert a pulling force while tapping with a soft faced mallet on alternating sides. AVOID PRYING! Damage to head may occur.
f. Remove all seals and inspect for cuts, nicks, or any other unusual conditions. (Compare to a new seal kit.)

II. INSPECTION

a. Examine oil residue inside actuator. This may give a clue as to why any damage has occurred. Dirt or grit will cause scoring of internal surfaces.
b. Metal particles may be found as a result of normal wear from valve spools, actuator internal parts and other metal components in the system.
c. The appearance of any of the above will require flushing and cleaning of the entire system.
d. WASH ALL PARTS THOROUGHLY AND EXAMINE FOR DEFECTS.

III. INSPECTION OF PARTS

a. Shaft - Check the following:
   i. Examine spline or keyways and any other area where stress may be applied.

   Keyways or splines widened may fit loosely in coupling. This problem will only get worse and may eventually cause shaft to break.
ii. Scoring on "A" diameter. Any scratch .010 or more deep calls for replacement of the shaft. Any minor scoring can be polished out with 400 grit emery cloth or equivalent.

iii. Scoring or galling on shaft journal. This problem can be repaired with hard chrome. However, it is recommended that this type of repair be performed by the factory.

iv. Scoring or galling on end of "A" hub diameter. This is another problem that can be repaired, however, it is recommended that this type repair be performed by factory.

b. Body - Check the following:
   Scoring of .010 or more deep calls for replacement of this part. Any light scoring can be polished out with 400 grit emery cloth or its equivalent.
   NOTE: When pressurized, the body will expand and contract. For this reason, plating or sleeving is not recommended by the factory for repair.

c. Heads - Check the following:
   i. Bushing may be worn or scored on either the I.D. or on the thrust surface.
      Replacement of bushing must be done in the following steps:
      1. Machine out old bushings
      2. Freeze new bushing (20) to -100 degrees F.
      3. Press in with suitable pressure and insure bushing is seated against its shoulder.
      4. Bore bushing concentric to body groove I.D. to proper size.
   ii. Scoring on face of head.
      1. Improper filtration or gritty particles in the fluid.
      2. Side load on shaft.
      NOTE: Scoring of .010 or more in dept requires replacement of this part. Any light scoring may be polished out with emery cloth.

d. Shoes - Check the following:
   i. Cracks across dowel holes or elongated dowel holes. This usually is caused by the vane coming into contact with the shoe. A shoe in this condition must be replaced.
   ii. Shoe seal wall cracked or chipped. Replacement is necessary.

e. Seals - Check the following:
   Check for cuts and shaved areas. This type of damage usually occurs at assembly. Extremely worn seals could indicate mechanical wear requiring replacement of bearings, etc. or dirty fluid requiring cleaning and flushing of the system.

IV. SEAL REPLACEMENT AND ASSEMBLY: The assembly area must be cleaned to prevent possible inclusion of foreign matter in actuator. Parts should be cleaned with mineral spirits and
blown dry. A small pliable brush should be used to clean all seal grooves, dowel holes, bolt holes and other hard-to-get-at areas. Remove all burrs that may be on any part. Do not break corns on shaft "A" diameter. These sharp edges are essential to the proper function of the actuator.

a. Lubricate all seals and internal parts with grease to aid assembly. Magnalube "G" is used at the factory.
b. Place shaft seal (8) into its respective groove in each head.
c. Place vane seal (10) in its groove around vane.
d. Install shoulder seal (7) with flat side against cushion in the head (2 & 3).
e. Install (for LP 3 units) the shoulder seal cap on the shoulder seal.
f. Place head seal (16) in its groove in head (2 & 3).
g. Place shoe seal (11) in its groove around shoe (6).
h. Insert dowel pins (3) into body (1).
i. Place one head (2) on body (1). Match the marks made on the body and head when actuator was disassembled.
j. Secure with screws and torque to valve shown on chart found in Torque Table.
k. Install shoe (6) into body (1). Leave approximately 1/4 inch between end of shoe (6) and head (2). Double vane actuators require two shoes and only one shoe should be placed in the actuator at this time.
l. Grease the ID of the body (1), shaft (4) "A" diameter shoe (6) surface to allow the shaft to slide into the actuator with ease.
m. Place the vane of the shaft (4) at right angles to the shoe. Tuck the shoe seal (11) and the vane seal (10) into the body (1) and push straight in until the vane is approximately 1/8 inch from the head (2). While the shaft (4) is being inserted into the body (1), pressure must be applied to the top of the vane seal (10) to prevent the seal from riding upward.

n. Install the second shoe (6) (if required). Remember to leave the shoe about 1/8 inch higher than the shaft (4).
o. Push the shaft (4) and shoe(s) (6) down together with the shaft bottoming first. CAUTION: If the shoe bottoms first, the sharp edges of the shaft will pinch the corners of the shoe seal and cause unusual high internal leakage.
p. Press the corners of the shoe seal (11) and vane seal (10) below the surface of the body (1).
q. Install the remaining head (3).
r. Pull down evenly and secure with screws (14).
s. Torque to value shown in the torque chart in table.
INTERNAL BY-PASS LEAKAGE: Leakage checks to be made at a gauge pressure of psi listed. Air pressure to be maintained at psi listed for one (1) full minute before check is started.

BREAKAWAY PRESSURE: Rotation of a Rotac actuator output shaft must be accomplished by an internal pressure not in excess of psi listed. This applies to both single and double end units.

### Tables

#### Assembly Bolt Torque Chart

<table>
<thead>
<tr>
<th>Unit</th>
<th>Bolt Size</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>LP-11</td>
<td>#6-32 x 5/8</td>
<td>25 ln Lbs. *</td>
</tr>
<tr>
<td>LP-12</td>
<td>#6-32 x 5/8</td>
<td>25 ln Lbs. *</td>
</tr>
<tr>
<td>LP-22</td>
<td>#10-24 x 1</td>
<td>100 ln Lbs. *</td>
</tr>
<tr>
<td>LP-24</td>
<td>#10-24 x 1</td>
<td>100 ln Lbs. *</td>
</tr>
<tr>
<td>LP-33</td>
<td>#10-32 x 1</td>
<td>50 ln Lbs. **</td>
</tr>
<tr>
<td>LP-35</td>
<td>#10-32 x 1</td>
<td>50 ln Lbs. **</td>
</tr>
</tbody>
</table>

* Based on Lubriplate Lubrication on Bolt Threads
** Use Loctite Adhesive #242  DO NOT USE LUBRIPLATE

#### Breakaway Leakage Chart

<table>
<thead>
<tr>
<th>Unit</th>
<th>Max. Leakage per Min @ 100 PSI</th>
<th>Max. Leakage per Min @ 100 PSI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1V Cu Ft cc</td>
<td>2V Cu Ft cc</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Unit</th>
<th>1V</th>
<th>Cu Ft</th>
<th>cc</th>
<th>2V</th>
<th>Cu Ft</th>
<th>cc</th>
</tr>
</thead>
<tbody>
<tr>
<td>LP-11</td>
<td>15</td>
<td>.20</td>
<td>5665</td>
<td>12</td>
<td>.25</td>
<td>7080</td>
</tr>
<tr>
<td>LP-12</td>
<td>12</td>
<td>.20</td>
<td>5665</td>
<td>10</td>
<td>.25</td>
<td>7080</td>
</tr>
<tr>
<td>LP-22</td>
<td>10</td>
<td>.20</td>
<td>5665</td>
<td>10</td>
<td>.25</td>
<td>7080</td>
</tr>
<tr>
<td>LP-24</td>
<td>10</td>
<td>.20</td>
<td>5665</td>
<td>10</td>
<td>.25</td>
<td>7080</td>
</tr>
<tr>
<td>LP-33</td>
<td>10</td>
<td>.25</td>
<td>7080</td>
<td>10</td>
<td>.30</td>
<td>8500</td>
</tr>
<tr>
<td>LP-35</td>
<td>10</td>
<td>.25</td>
<td>7080</td>
<td>10</td>
<td>.30</td>
<td>8500</td>
</tr>
</tbody>
</table>