

Repair of Rotac[®] Actuators

26R Model OVERHAUL INSTRUCTIONS



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.

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Rotac® TEARDOWN, INSPECTION AND ASSEMBLY

PURPOSE:

To instruct designated personnel in the teardown, inspection, seal replacement and the reassembly of Rotac® Rotary Actuators. Minor repairs will be examined; however, repairs without proper engineering information and machine capabilities may be costly. These cases call for factory service and should be referred to the factory for repair. Factory repairs will bring the unit to the latest design within that product line. All workmanship and parts will carry a full warranty of 6 months usage, or 12 months from date of shipment, whichever comes first.

Disassembly:

Read the special instructions below before proceeding. Reference Figure 4 for general location of parts

1. Clean exterior of unit as clean as possible. This will assure you that any material found in the unit is a result of wear, system contamination or damage. A more accurate evaluation of the unit and operating system is thus obtained..
2. Remove all burrs from the shaft (5) extension.
3. Match mark the head (2) and housing (1) so that their relationship can be re-established when reassembled.
4. After removing head screws (22) from the head (2), strike end of shaft (5) with plastic mallet or aluminum bar stock, and allow the shaft (5) to push the head (2) off. **DO NOT PRY HEADS OFF!!!** Damage will occur to the housing (1) or head (2). Some of the newer designs have threaded holes in the head (2) that allow the use a bolt to assist in separating the head (2) from the housing (1)
5. Pull the shaft (5) out, being careful that the vane on the shaft does not fall and nick the housing (1).
6. The shoe (6) will usually come out by pulling on it with your hands, however, it many sometimes be necessary to pull with your hand while tapping the shoe dowel pins (24) lightly. **NEVER PRY THE SHOE OUT!!!**
7. Remove the retainer bolts (25) and retainer (18) from head (2).
8. Remove the shaft seal cap (13), the shaft seal (12) and retainer seal (17).
9. Press-out the thrust bearing (3) and roller bearing (4), thrust washer (19) and shims (21).
10. Repeat step 7, 8 and 9 for the housing (1).
11. Remove the seals from the shoe (6) and shaft (5) and inspect for cuts, nicks, or any other unusual conditions of the seal. (Compare to new seal kit).

INSPECTION:

1. Examine oil residue inside actuator. This may give a clue as to why any damage has occurred.
 - A. Dirty or gritty oil will cause scoring of internal surfaces.
 - B. Varnish on internal parts can be a sign of oil in system running too hot.

C. Metal particles - Metal chips can be found from valve spools, Rotac® internal parts and other metal components in the system.

The appearance of symptoms a, b, or c above, will require total flushing and cleaning of the entire system.

2. Wash all parts thoroughly and examine for defects.

A. Shaft (See Figure 1.)

1. Examine welded vane for cracks at "A" diameter, splines, keyways and any other area where stress may be applied.

a. Spot-check by Magnaflux

Three different materials needed and applied in order:

SKC-S Cleaner

SKL-HF/SKL-S Penetrate

SKD-S Developer

FOLLOW DIRECTIONS CAREFULLY ON BACK OF THE CAN

b. Keyways or splines widened may fit loosely in coupling. This problem will only get worse and eventually cause shaft to break. Cause - poor fitting coupling. Too soft keys.

c. Scoring on "A" diameter. Any scratch .010 or more requires the part to be replaced.

d. Scoring or galling on shaft journal. This problem can be repaired with hard chrome, however, many critical dimensions must be held - this type of repair must be performed by factory only.

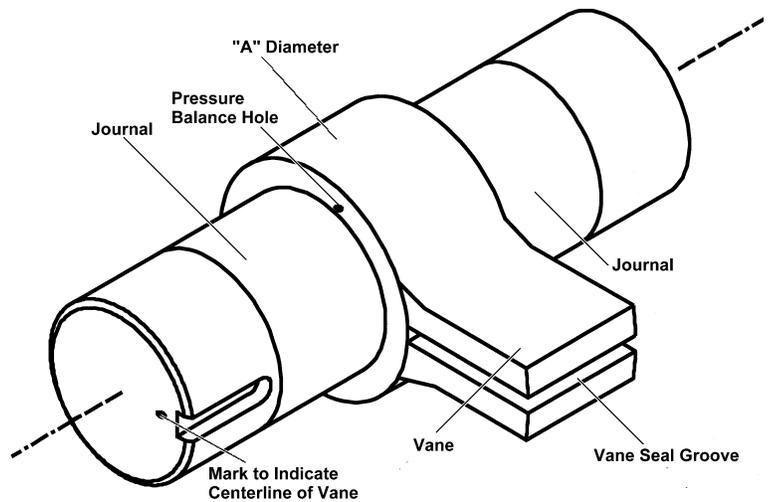


Figure 1- Shaft

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

B. Housing/Head

1. Scoring of .010 or more on the ID of the housing requires replacement of this part. Any light scoring can be polished out with 400-grit emery cloth or it's equivalent.

NOTE: When pressurized, the body will expand and contract. For this reason, plating or sleeving is not recommended by the factory for repair.

2. Cracks may be found across the dowel holes, bolt holes or ports. This requires replacement.

3. Bearing area – units will have two separate bearings, a thrust bearing (3) and roller bearings (4).
 - a. Thrust bearing may be worn or scored on either, the ID of the shoulder seal groove area of the bushing or on the face of the thrust surface itself. The roller bearing should be in good working order.
4. Oversize or elongated dowel holes.
Check both shoe dowels and head/housing dowels
 - a. Oversize or elongated shoe dowels may have been caused by the vane of the shaft contacting the shoe. Inspect the shaft at vane weld area for cracks and the shoe dowel holes for cracks.
 - b. Oversize body dowel holes may be caused by racking and twisting Rotac®. This may be a sign of over-pressurization or improper mounting.
 - c. Dowel holes may be drilled oversize and rebushed, however, the proper size and location of the dowel hole must be known to accomplish this repair.
5. Scoring on face of head/body must be repaired
Minor scoring might be removed by polishing with an emery cloth.
Possible causes are:
 - a. Improper filtration or gritty particles in the oil
 - b. Side load (axial) on shaft.
6. Cracks in head are usually around bolt circle or dowel pattern.

D. Shoes

1. Cracks across dowel holes or elongated dowel holes.
This usually is caused by the shaft vane coming into contact with the shoe. A shoe in this condition must be replaced.

E. Seals

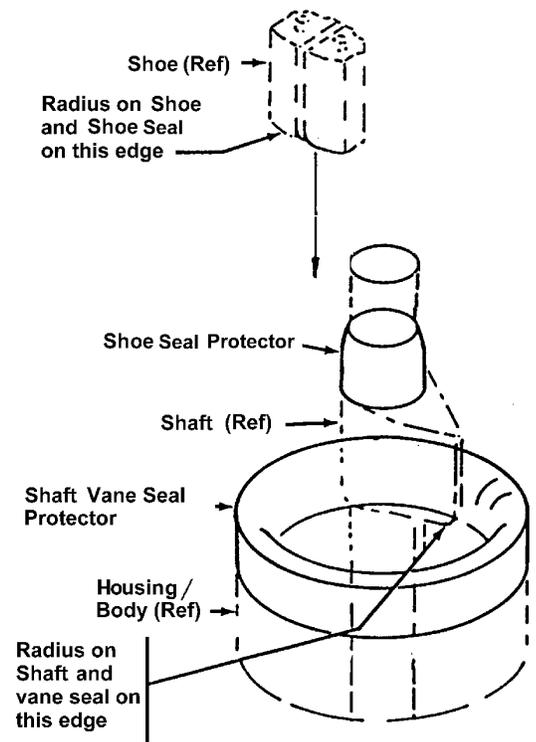
1. Cut or shaved seal is usually done when assembled.
This can occur in a number of different ways. Refer to assembly instruction for proper assembly.

ASSEMBLY

The assembly area must be clean and free from all dirt, dust, or other harmful material. A plastic or metal workbench is the best type bench for the assembly. Parts should be recleaned if necessary. 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 corners on shaft "A" diameter or housing (see figure 3). Assembly tools are available (see figure 2 and Table 1), If assembly tools are not available use shim stock to protect the seals (see figure 3). For general seal location see figure 3 and figure 4.

- A.** Lubricate all seals and internal parts with grease that is compatible with the driving fluid used. DE-ES lubriplate by Fiske Brothers is used at the factory. Petroleum jelly also works fine in most hydraulic systems.
- B.** Bearing installation. The installation of the bearings and bushings must be done in the following steps:
 1. Place thrust bearing (3) into the bearing hole of the head (or housing).
 2. Insure the thrust bearing (3) is seated. Measure the distance that the thrust bearing protrudes above the face of the head or housing.

3. Adjust shims (21) at the thrust bearing (3) shoulder until a .003-.005 inch height is obtained. See figure 5
Note: If the shaft assembly thrust area is worn, the position of the thrust bearing (6) may have to be adjusted to compensate for the wear. For new parts a .003-.005 inch protrusion will give a total shaft shoulder clearance of .000-.004 inches. In units that are worn, the shaft shoulder clearance should be maintained by increasing the protrusion of the thrust bearing. Protrusion of the thrust bearing in the housing and head should be equal.
4. Press roller bearing (4) into the bearing bore, seating it tightly.
5. Place the thrust ring (19) into the bearing bore.
6. Measure the distance from the retainer mounting face to the thrust ring. See figure 5.
7. Measure the distance the retainer will protrude into the bearing bore.
8. Install shims (21) to give compression interference. See table 4 for interference amount.
9. Place the retainer seal (17), Teflon shaft seal (13) and shaft seal cushion (12) into the retainer (18).
10. Install the retainer (18), being careful not to cut or pinch the retainer seal (17).
11. Torque the retainer screws (25) to the proper torque. See table 2
12. IMPORTANT – Recheck the thrust bearing shoulder height. See figure 5
13. Repeat for the other bearing area.



C. Place shoulder seal cushion (16), wedge (15) and cap (14) into its groove. Shim to proper height - See figure 6

D. Place shoe seal cushion (8) in its groove around shoe (6).

E. Place dowel pins (24) in shoe (6).

F. Cut the shoe seal cap (9) and place it over the shoe seal cushion (8). Match the radius on the shoe seal cap (8) with the radius of the shoe (6).

G. Place shaft vane seal cushion (10) into its groove around vane on the shaft (5). Place vane seal cap (11) on top of vane seal cushion (10). Match the radius of the shaft seal cap (11) with the radius on the vane of the shaft (5).

H. Insert dowel pins(23) into housing(1).

I. Grease the ID of the housing (1) and, shaft (5) "A" diameter shoe surface to allow the shaft to slide into the actuator with ease. One of the corners of the vane has a radius (see figure 3). Match the rounded corner with the rounded corner of the ID of the housing (1).

J. Place the vane (5) at right angles to the shoe - see figure 3. Using either the installation tools (figure 2) or shim stock to protect the seals, tuck the shoe seal and the vane seal into the body (1) and push straight in until the vane is approximately 1/8 inch from the top of the head. While the shaft (5) is being inserted into the body (1), pressure must be applied to the top of the vane seal to prevent it from riding upward.

K. Using either the installation tools or shim stock to protect the seals, Install the shoe (6) into housing (1). One of the corners of the shoe (6) has a round corner. This corner goes into the housing (1). Leave the

FIGURE 2. Assembly Tools See Table1 for Parts listing

shoe approximately 1/4 inch from the bottom of the housing bore. Double vane actuators require two shoes and only one shoe should be placed in the actuator at a time.

- L. Install the second shoe (if required) . Remember that the rounded corner of the shoe (6) with the rounded corner of the ID of the housing (1). Remember to leave the shoe about 1/4 inch from the bottom.
- M. Push the shaft (5) 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.
- N. Press the corners of the shoe and vane seals below the surface of the top of the housing.
- O. Remove the shim stock, or assembly tools.
- P. Install the head (2).
- Q. Pull down evenly and secure with the head screws (22).
- R. Torque to the value shown on chart on Table 2.

Factory built Rotac® actuators are then tested for internal by-pass leakage and breakaway pressure. See chart on Table 3.

FIGURE 3. – Shoe and Shaft Installation

Note: Install shoe into body with shaft in the approximate location as shown, Position #1 (adjacent to the shoe).

Caution: DO NOT ALLOW VANE SEALS TO CROSS SHOE DOWELS HOLES OR PORT HOLES. After shoe and shaft are installed, rotate shaft to Position #2 (Vane Seal approximately opposite the shoe).

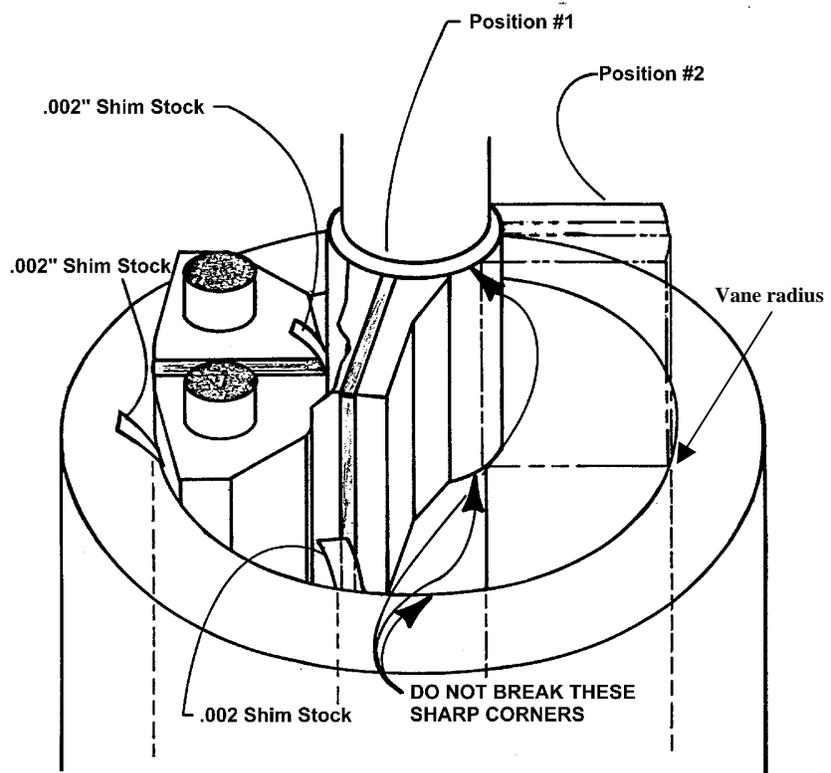


Table 1. Assembly Tool Kits for 26R Models

Includes the Shoe Seal Protector, the Vane Seal Protector and the Shaft Seal Proctor. Assembly numbers available on request.

TABLE 2. –TORQUE CHART

26R Rotac® Models

MODEL	Retainer		Head	
	SCREW SIZE	TORQUE	SCREW SIZE	TORQUE
26R-2	1/4-20	15 Ft. Lbs.	3/8 -16	52Ft. Lbs.
26R-5	1/4-20	15 Ft. Lbs.	1/2-13	126 Ft. Lbs.
26R-10	5/16-18	30 Ft. Lbs.	5/8-11	250 Ft. Lbs.
26R-17	3/8-19	52 Ft. Lbs.	3/4-10	441 Ft. Lbs.
26R-31	3/8-16	52 Ft. Lbs.	7/8-9	709 Ft. Lbs.
26R-62	1/2-13	126 Ft. Lbs.	1.0-8	1061 Ft. Lbs.
26R-124	1/2-13	126 Ft. Lbs.	1.0-8	1061 Ft. Lbs.

TABLE 3. – BREAKAWAY & LEAKAGE CHART

26R Rotac® Models

INTERNAL BY-PASS LEAKAGE: Leakage checks to be made at a gauge pressure as listed. Air pressure to be maintained at pressure listed for one (1) full minute before check is started.

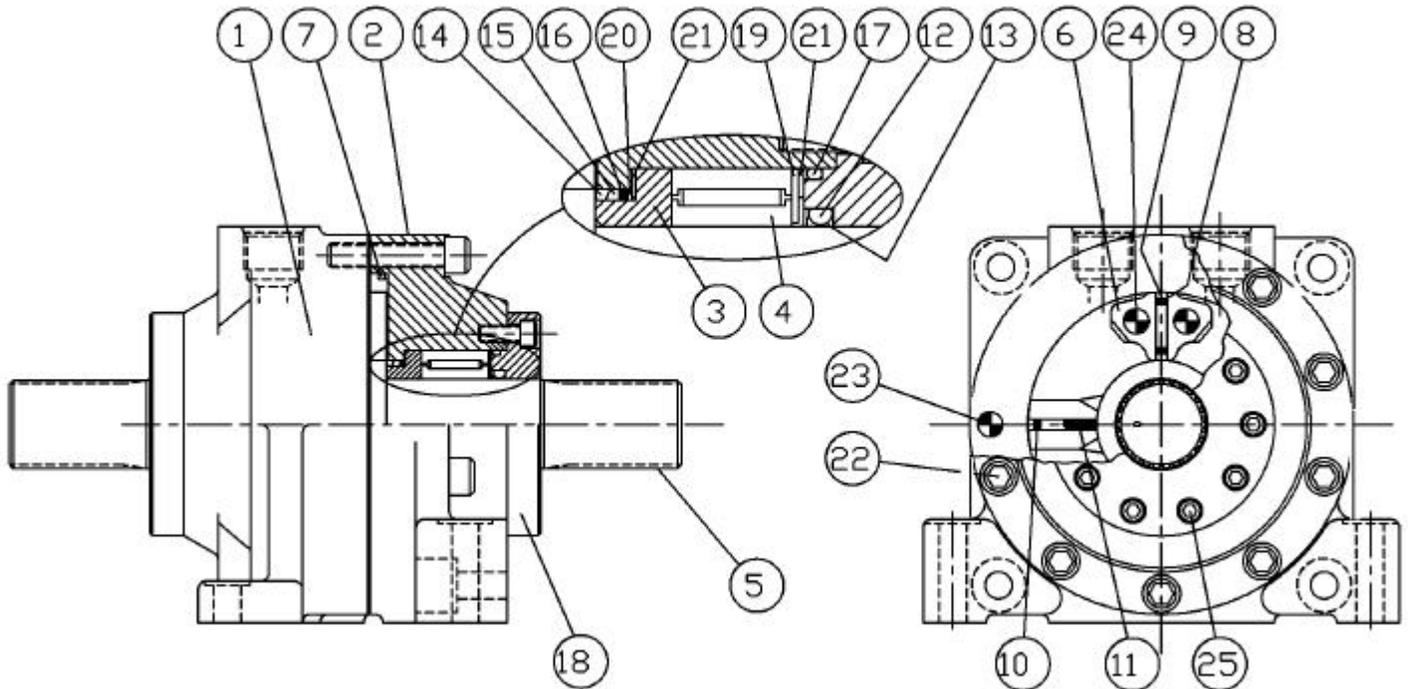
BREAKAWAY PRESSURE: Rotation of a Rotac® actuator output shaft must be accomplished by an internal pressure not in excess of pressure listed. This applies to both single and double vane units.

MODEL	Maximum Breakaway in PSI	By-Pass Leakage - Maximum allowable amount in			
		Cubic Inches per Minute at 3000 psi		Cubic CM per minute At 3000 psi	
		1V	2V	1V	2V
26R-2	150	6	8	98.3	131.1
26R-5	140	6	8	98.3	131.1
26R-10	130	8	10	131.1	163.9
26R-17	120	8	10	131.1	163.9
26R-31	110	10	12	163.9	196.7
26R-62	100	10	12	163.9	196.7
26R-124	90	12	15	196.7	245.9

TABLE 4 – Bearing Compression Interference Table

MODEL	SHIM
26R-2	.002-.003
26R-5	.003-.004
26R-10	.004-.005
26R-17	.005-.006
26R-31	.006-.007
26R-62	.007-.009
26R-124	.008-.010

Figure 4 - Parts List Drawing



Item	Description
1	Housing
2	Head
3	Bearing Thrust
4	Bearing Roller
5	Shaft
6	Shoe
7	Seal, Head
8	Seal, Shoe Cushion
9	Seal Shoe Cap
10	Seal Vane Cushion
11	Seal Vane Cap
12	Seal Shaft Cushion
13	Seal Shaft Cap

Item	Description
14	Seal Shoulder Cap
15	Seal Shoulder Wedge
16	Seal Shoulder Cushion
17	Seal Retainer
18	Retainer Bearing
19	Thrust Ring
20	Shims Shoulder Seal Area
21	Shims Bearing Area
22	Screw Head
23	Dowel Head
24	Dowel Shoe
25	Screw Retainer

Cutting instructions for the shoe seal cap.

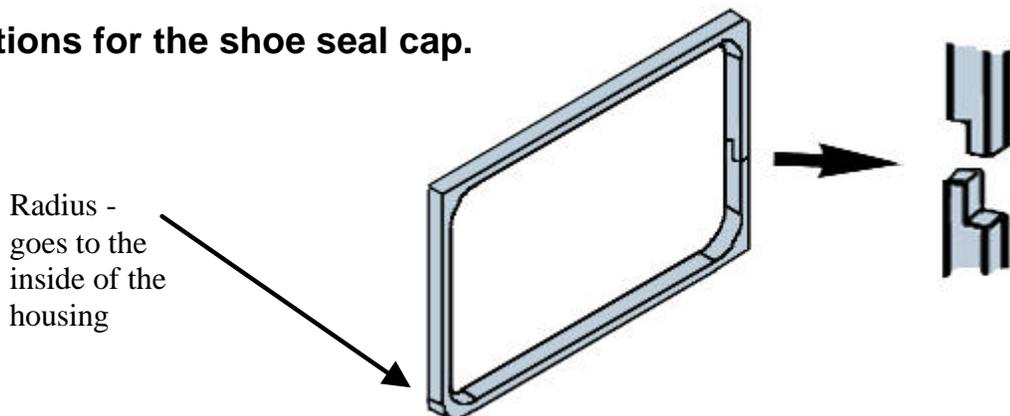


Figure 5 - Thrust Bearing

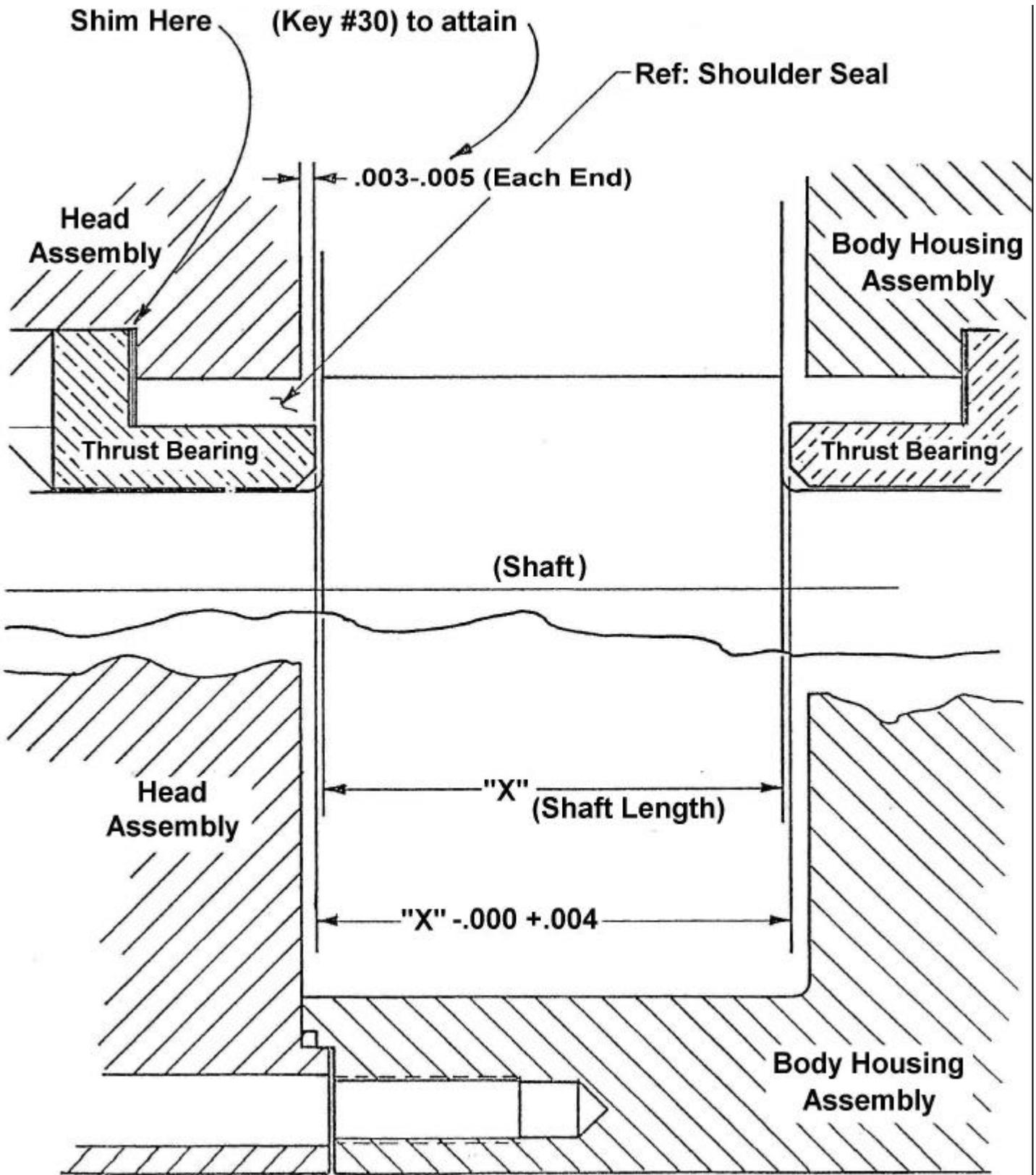
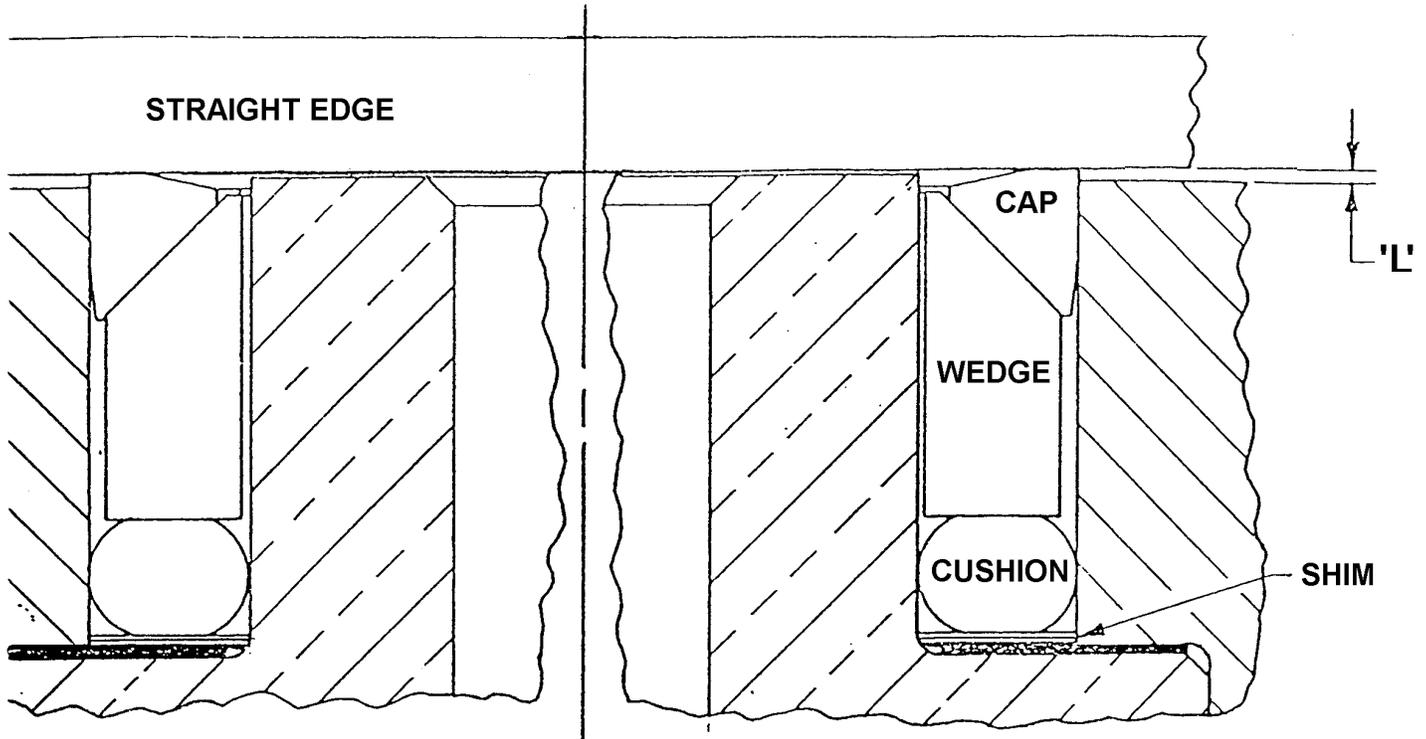


Figure 6 -Shoulder seal



	26R-2	26R-5	26R-10	26R-17	26R-31	26R-62	26R-124
L Dimension	.024-.029	.037-.042	.037-.042	.058-.063	.058-.063	.081-.087	.081-.087

1. Place half of the shoulder seal shim set in the bottom of the seal groove.
2. Place the shoulder seal cushion into the groove. (Make sure that the cushion is seated in the bottom of the groove.)
3. Install the shoulder seal wedge with the flat side against the cushion as pictured above.
4. Place the shoulder seal cap against the wedge so the 45-degree angles match as pictured above.
5. Check the amount of cap protrusion into the body, (L dimension) using a straight edge and shim stock.
6. Adjust, if necessary, the amount of shim stock in the shoulder seal groove until the L dimension is within the tolerance listed in the chart above.
7. Proceed with the installation of the shoe.