



## **SERVICE MANUAL**

# **CAMCO RING SERIES INDEX DRIVE 750RNG, 1100RNG & 1550RNG**

### **WARNING**

This is a controlled document. It is your responsibility to deliver this information to the end user of the CAMCO or FERGUSON product. Failure to deliver this could result in your liability for injury to the user or damage to the machine. For copies of this manual, call your Customer Service Representative at 800-645-5207



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# Introduction

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This service manual pertains to the disassembly and assembly of the CAMCO Ring Index Drive models 750RNG, 1100RNG and 1550RNG.

This manual is to be used in conjunction with the General Service Manual, which describes the lubrication and general maintenance of CAMCO Index Drives.

A cross section view of a typical CAMCO Ring Index Drive is included in this manual. Item numbers within this Service Manual refer to the cross section view. Also included is a generic Bill of Materials for your convenience in identifying and ordering spare or replacement parts. Always provide the serial number from the Index Drive when ordering spare or replacement parts.

Some users of Index Drives have facilities and trained personnel to accomplish service repair. You must determine the extent to which intricate servicing should be done by your own maintenance personnel. When in doubt, DE-STA-CO recommends the assistance of a trained DE-STA-CO serviceman when making repairs.

## **Warnings and Cautions**

Statements in this manual preceded by the words **WARNING** or **CAUTION** and printed in *italics* are very important. CAMCO recommends you take special notice of these during service or repair.

### **WARNING**

*Means there is the possibility of personal injury to yourself or others.*

### **CAUTION**

*Means there is the possibility of damage to the CAMCO unit.*

## **Spare Parts Kit**

DE-STA-CO offers spare parts kits for all CAMCO index drive models manufactured by DE-STA-CO. The spare parts kit for the CAMCO Ring Index Drive includes input oil seals, input bearings, and input shims. Cam followers are not included in the spare parts kit. CAMCO recommends a spare parts kit and the appropriate number of cam followers be purchased and kept on hand prior to any disassembly of your CAMCO Ring Index Drive.

## **Before Starting**

DE-STA-CO uses either Red Perma-Lok®, #HM118 or Green Perma-Lok®, #HM160 to secure most screws and set screws. Exceptions are removable covers, etc. If you encounter a fastener that is difficult to remove, apply heat to the screw and remove while still warm.

### **CAUTION**

*Localized heat can distort the part. Do not overheat any item.*

### **WARNING**

*Disassembly and repair of a CAMCO Ring Index Drive requires lifting and manipulating large cumbersome parts.*

### **CAUTION**

*Disassembly and repair of a CAMCO Ring Index Drive requires special tools not normally available. A partial list of commercially available tools is provided. Some special tools and equipment must be manufactured by maintenance personnel on site. Using the proper tool is mandatory for successfully completing repairs.*

## **Required Tools**

Repair of any CAMCO Ring Index Drive requires the following tools:

1. Spanner Wrench #10
2. Socket for M8 FHCS

## **NOTE**

During some portions of repair, the motor drive package can be used to rotate the input shaft and follower wheel. Some means for running the motor at extremely low speeds is mandatory. Use extreme caution when operating the motor during repairs. Alternatively, loosen the shrink disk connection between the reducer and Ring Drive input shaft and hand crank the input from the shaft opposite the reducer. The input shaft has a tapped hole on the end and may be cranked by inserting a screw and using a wrench to turn the shaft.

## **IMPORTANT**

Before starting disassembly of your CAMCO unit you should read and review all instructions. These provide important information on parts and procedures necessary to successfully complete your repair.

Comply with all **WARNINGS** and **CAUTIONS!**

Read the "Trouble Shooting Guide" section in your *General Service Manual* before disassembling CAMCO units. DE-STA-CO recommends the assistance of a trained DE-STA-CO serviceman whenever repairs are more involved than replacing oil seals or cam followers.

## **Torque Requirements for Tightening Screws**

This table provides torque specification for Metric Socket Head Cap Screws.

<b>Metric Socket Head Cap Screw</b>		
<b>Thread Size</b>	<b>Torque</b>	
	<b>ft-lb</b>	<b>Nm</b>
M5	6	9
M6	12	16
M8	29	39
M10	57	77
M12	100	136

Torque values are for non-lubricated threads, coated only with a residual film of oil, as received from the manufacturer. Values are for threads engaged 1.5 times the screw thread diameter and installed into steel parts.

# Inspection

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## Prepare for Inspection

1. Remove only those structural members and fixtures required to gain access to the index drive and to allow for completing the necessary procedures.
2. Drain oil and flush with flushing solvent. Retain any chips or broken pieces you may find. These may aid in diagnosis.
  - 2.1. Oil may be drained by removing the Magnetic Drain Plug (Item #25).
3. Remove the socket head cap screws (Item #33) and cover (Item #5).

## Inspection

1. While slowly rotating input, inspect cam (Item #1) surface to determine if cam must be replaced. Inspect for a rough or rippled surface, gouge marks, pitting and other imperfections.
2. Slowly index the unit and place the Index Drive in a dwell position.
  - 2.1. Check for preload by trying to rotate the cam followers (Item #15) that are in dwell.
  - 2.2. Visually observe the surface of the outer shell of the cam follower. Inspect followers for damage or radial looseness. Looseness should not exceed .001 inch. Do not confuse radial looseness with axial endplay. End play will be from .03 to .06 inch as a normal condition. If endplay exceeds .06 inch the followers should be replaced.

NOTE: Generally, cam followers are replaced as added insurance against later failure. When in doubt, replace the cam followers.

3. Broken cam followers indicate possible damage to the follower wheel. Remove any broken cam followers. See the section titled "Cam Follower Replacement", in this Service Manual. Inspect the cam follower stud hole in the follower wheel for damage, and to determine whether the cam follower stud hole is "wallowed out", elongated, oval, etc. Using the nominal size of the cam follower stud as a guide, verify a press fit between the stud and the hole, -.0005 to -.0010 inch for the full length of the hole.
4. Grinding noises during each index may indicate damage to the output bearing (Item #14 ). Further inspection requires removal of the indexing ring (Item #2 ). See the section titled "Follower Wheel / Output Bearing Replacement" in this Service Manual.
5. Replace cam followers if loose in dwell or if the outer shell is visibly damaged. See the section titled "Cam Follower Replacement" in this Service Manual.
6. Replace the cam if imperfections are noted. See the section titled "Cam and/or Input Shaft Replacement" in this Service Manual.
7. Replace the follower wheel if follower holes are oversized. See the section titled "Follower Wheel / Output Bearing Replacement" in this Service Manual. Alternatively, the follower wheel/output bearing may be returned to DE-STA-CO for rebuild.

# Oil Seal Replacement

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DE-STA-CO recommends replacing the Input oil seals (Item #11) anytime the input is disassembled regardless of whether they are damaged or not. After being in service for some time, the sealing lip can become brittle and easily cracked. Most damage to oil seals occurs at assembly when recommended seal installation procedures are not followed.

To replace the oil seal on the reducer side of the index drive, remove the reducer and additional drive equipment as necessary to gain access to the seal. See the reducer and other manufacturers' Service Manuals for instructions on removing this equipment. On the other side of the index drive, remove the cycle cam and limit switch or other equipment as necessary to gain access to the oil seal.

## **Oil Seal Removal**

1. To remove the oil seal, use a sharp punch and punch two (2) diametrically opposed holes through the case of the seal. Install sheet metal screws into the holes.
2. Use a Slide Hammer or Pliers (Vise Grips) to grip the sheet metal screws to pull out the existing seal.

### **CAUTION**

*Do not drill holes in the case of the seal. Chips will get into the unit and they cannot be easily removed. A punched hole provides a better "bite" when installing sheet metal screws into the metal case.*

## **Oil Seal Installation**

1. Check new seal for damage that may have occurred prior to installation.
  - 1.1. An oil seal with a sealing lip that is turned back, cut or otherwise damaged should be replaced and not used.
  - 1.2. Likewise, if the outer face or outside diameter is bent or otherwise damaged, replace the oil seal.

2. Check the input shaft for surface nicks, burrs or a groove from the sealing lip. Look for spiral machine marks that can damage the seal lip.
  - 2.1. An input shaft with a groove from the sealing lip can be repaired with a Chicago Rawhide Speedi-Sleeve, or similar product from another manufacturer. Consult the manufacturer for installation instructions.
  - 2.2. Alternatively, the input shaft can be replaced instead of repaired.
3. Check the end of the input shaft and remove any burrs or sharp edges. The end of the shaft should be chamfered.
4. Check splines and keyways for burrs or sharp edges.
5. Wrap the input shaft with plastic shim stock as a temporary sleeve to guide and protect the sealing lip.
6. Check the sealing lip direction. Make sure the new seal faces the same direction as the original. DE-STA-CO's standard practice is to mount the seal so the lip faces the lubricant or fluid to be sealed.
7. Pre-lubricate the sealing element by wiping the surface with the lubricant being retained. Apply a thin layer of "General Electric Silicone Rubber RTV-6" or equivalent to the cartridge bore as a sealant. When the seal is pressed into place, a bead of sealant will form at the back edge of the steel case and prevent any leakage around the outside edge of the seal.
8. Whenever possible use an installation tool that has been specifically manufactured for installing the seal.
  - 8.1. Installation tools should have an outside diameter .125 inch (3 mm)

larger than the bore size. The bore should be .005" (.127 mm) larger than the shaft size, and the face of the tool should be relieved so that pressure is applied only near the outside diameter of the seal.

- 8.2. During installation press the seal flush to the cartridge face to avoid cocking the seal in the bore. This also

positions the seal correctly on the shaft.

9. When an installation tool cannot be manufactured, install the seal by tapping uniformly around the seal with a soft hammer. Avoid cocking the seal and make sure the face of the seal is square to the bore.



# Cam Follower Replacement

## Cam Follower Removal

Instructions for replacing cam followers assume the cam and follower wheel will not be removed. If the follower wheel will be removed, proceed to the section titled "Follower Wheel and/or Output Bearing Replacement" in this Service Manual. Likewise, if the cam will be removed, proceed to the section titled "Cam and/or Input Shaft Replacement" in this Service Manual. Otherwise, proceed with the following steps.

If the machine builder has provided access to the cam follower screws, the tooling does not have to be removed. Otherwise the support structure and fixtures can be removed as necessary, or the support structure and fixtures can be lifted two to three feet above the unit and supported by appropriate scaffolding. CAMCO recommends using professional machinery riggers for this purpose. The assistance of a CAMCO trained serviceman is recommended.

Refer to the itemized cross-section drawings beginning on page 19 for identification of parts

1. Remove socket head cap screws (Item # 34) and remove Dial Ring (Item #2).
2. Remove lower bore plug (Item #27) located directly opposite from the cam box (Item #6).

NOTE: The bore plug may be damaged during removal. Have a replacement on hand before beginning any repairs.

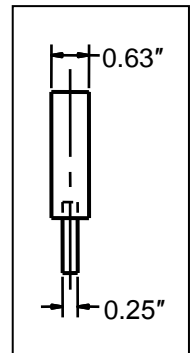
- 2.1. Hit one end to tilt the plug then pry off with screwdriver. Alternatively, drill a hole in the center of the plug and pull out with a screwdriver.
3. Hand crank the Ring Drive input shaft (Item #18) or use the motor and drive package to rotate the input shaft and follower wheel until a follower is positioned directly above and centered on the removal opening.

4. Remove , the cam follower screw (Item #20) and the heavy washer (Item #16). CAMCO used Red Perma-Lok, to secure these screws If you encounter difficulty when removing the screw, apply heat to the screw and remove while still warm.

### **CAUTION**

*Localized heat can distort the part. Do not overheat any item.*

5. Using a large soft faced hammer and a soft pin, drive the cam follower downward and out through the follower wheel. Take care not to hit the edges of the bore. Using a tool as shown (inserting narrow pin in tapped hole in follower stud) will prevent damaging the cam follower bore by keeping the pin centered.



Alternatively, you can use a slide hammer and pull the follower out from the bottom by using the hole tapped in the bottom of the cam follower.

6. Inspect the cam follower stud hole for roundness and size. The cam follower stud hole must be an interference fit. The cam follower holes must be  $-.0005$  to  $-.0010$  inch ( $.013 - .025$  mm) for the full length of the hole. Check the follower holes for roundness. These holes should be round within  $.0005$ " TIR ( $.013$  mm) to permit reuse of the follower wheel. These holes may be worn-out due to overloads.

### **CAUTION**

*Do not use a follower wheel with oversize follower holes. The cam followers and cam will fail prematurely. Replace the follower wheel / output bearing or return to DE-STACO for rework.*

## **Cam Follower Installation**

The instructions for replacing cam followers assume the follower wheel and cam were not removed. Cam followers will be installed one at a time through the follower access hole in the housing. If the follower wheel was removed, proceed by repeating the first four steps until all cam followers have been installed in the follower wheel.

If the cam was removed but not the follower wheel, proceed by repeating the first four steps until all but two cam followers have been replaced. Also see additional instructions below.

**NOTE:** You will need to purchase or manufacture a tool to keep the cam follower square to the bore in the follower wheel during installation and prevent damage to both the cam follower and the wheel.

The tool can be made from round stock. Bore and face the stock to suit the follower:

1.375" dia. follower: 1.376" (34.95 mm) bore

1.500" dia. follower: 1.501" (38.13 mm) bore

1. Deburr the cam follower stud before installation.
2. Coat the follower wheel stud hole with anti-seize lubricant. Place a cam follower into the follower wheel hole.
3. Push the cam follower upward hard enough to press the cam follower into the follower wheel hole using one of the methods described below. Make sure the shoulder on the cam follower seats against the follower wheel.

Insert a screw into the bottom of the follower and slide the follower into the tool. While holding the tool against the face of the wheel, tap the screw to drive the follower into the bore until it is seated against the wheel.

Alternatively, you can use the method from step 3.1 to insert the cam follower approximately  $\frac{1}{4}$ " (6 mm) into the follower wheel bore then use a slide hammer from the top to pull the follower up thru the follower bore until it is seated against the wheel.

### **CAUTION**

*Make sure the shoulder of the cam follower is seated against the follower wheel and make sure the follower is installed straight and in line with the hole. Damage to the cam follower, follower wheel or cam could occur if cam follower is improperly aligned during installation.*

4. Install the heavy-duty washer (Item #16) and flat head cap screw (#20), assembled as shown in the cross-section drawing in this Service Manual. Use Red Perma-Lok®, and torque the socket head cap screw to specification. The tightening torque depends on the size of the cam follower. See the table titled "Torque Requirements for Tightening Screws" in this Service Manual for tightening torque.
5. Repeat steps to install all cam followers.
6. Install new bore plug (Item #27) using a round, flat plate larger than plug to press in plug and seat flush to bearing.
7. Re-install the Dial Ring (Item #2) with the socket head cap screws (Item #34).

# Cam and/or Input Shaft Replacement

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## **Input Shaft Removal**

Instructions for removing the cam and input shaft assume the follower wheel will not be removed. If the follower wheel will be removed, proceed to the section titled "Follower Wheel and/or Output Bearing Replacement" in this Service Manual. Otherwise, proceed with the following steps.

The cam box should be supported during removal

1. Remove motor/reducer drive package (Item #19).
2. Remove housing (Item #6) from the base plate (Item #8).
  - 2.1. Have support for the housing/cam/input shaft assembly no more than a few inches from the bottom of the housing (Item #6).
  - 2.2. Remove the two screws (Item #36) from the opposite corners adjacent to the pull dowels (item #32) and replace with threaded rods and nuts. Drive the nuts loosely to the base plate (Item #8)
  - 2.3. Remove the remaining screws (Item #36).
  - 2.4. Remove pull dowels (Item #32) with slide hammer
  - 2.5. Slowly lower the housing (Item #6) by alternately unthreading the nuts until the housing assembly is free of the base plate.
  - 2.6. Move housing assembly to bench and clamp in place.
3. Bend lockwasher (Item #23) tabs over and away from locknut.
4. Loosen the locknuts (Item #22) that secure the cam to the input shaft (Item #18). DE-STA-CO uses Green Perma-

Lok, to secure the locknuts. If you encounter difficulty, apply heat to the locknut and remove while still warm.

## **CAUTION**

*Localized heat can distort the part. Do not overheat any item.*

- 4.1. Use a Spanner Wrench that has been locked (jammed) against the side of the housing to hold the locknut while turning the input shaft. Use a hand crank to rotate the input shaft and break loose the locknuts.
- 4.2. Break loose the locknuts.
- 4.3. In some cases it might be necessary to split the locknut before it will break loose. Use a cold chisel or other suitable tool for this purpose.
5. Remove the Input Shaft (Item #18)
  - 5.1. Install an eye bolt into the threaded "lifting hole" in the cam (Item #1) and support with an overhead crane.
  - 5.2. Remove all socket head cap screws (Item #31) securing the two (2) bearing cartridges (Item #4) to the housing (Item #6) and remove the bearing cartridges.
    - 5.2.1. This can be done by striking the cartridge with a soft faced hammer and then prying the cartridge away from the housing.

NOTE: Cartridges have O-Rings (Item #10). Make sure the O-Rings and the housing bores are not damaged.

  - 5.2.2. The input oil seal (Item #11) and input bearing cup (Item #12) will stay with each bearing cartridge when it is removed.
  - 5.2.3. Make sure to note the color and number of any input shims (Item #3) at each cartridge. The

color and number of shims used determines bearing preload.

5.3. Remove the input bearing cone (Item #13) on the side of the input shaft with the shortest extension.

5.3.1. Loosen locknuts (Item #22) until the locknut on the side with the longest shaft extension is against the bearing. This allows the shaft to be pushed through the cam on the short side far enough to mount a puller on the bearing.

5.3.2. With a soft hammer, knock the input shaft toward the short end so a bearing puller can access the bearing cone.

5.3.3. Use a bearing puller to remove the bearing cone (Item #13) from the input shaft (Item #18).

6. Before proceeding, inspect the keyway in the input shaft to make sure they are to size. Also, inspect the oil seal diameters for burrs, scratches, nicks or dings

6.1. An oversize keyway must be remanufactured to proper specification.

6.2. Alternately, replace the input shaft.

#### **CAUTION**

*Loose fitting keys can cause premature failure of the index drive.*

7. Prepare the input shaft for assembly by removing the remaining locknut and lockwasher and bearing cone from the input shaft.

8. Remove the bearing cups from the bearing cartridges, and remove the used oil seals from the bearing cartridges.

8.1. Measure the overall (stack) height of the bearing cones and bearing cups.

8.2. Record these values with the previously recorded values for input shim.

#### **Cam Installation**

1. Before placing the cam inside the housing, check the input shaft diameter and the cam bore size to ensure a slip fit.

The input shaft can be installed in the cam and then removed to ensure a slip fit.

If the input shaft binds during installation, hone the cam bore to provide a slip fit.

#### **CAUTION**

*The cam must be a slip fit or slight press fit, but the fit cannot be loose. Do not remove an excessive amount of material.*

2. With the housing clamped to a bench and any eye bolt in the cam lifting hole, use a hoist to lift the cam into the housing cavity and position it so the input shaft can be pushed through the cam.

#### **CAUTION**

*Make sure the cam is not damaged during this process.*

#### **Input Shaft Installation**

1. Prepare the input shaft (Item #18) for installation by installing a locknut (Item #22) and lockwasher (Item #23) on the side of the input shaft with the long shaft extension.

1.1. Place a locknut just onto the threaded portion of the input shaft. It will be snugged up later and tightened after setting the cam.

2. Measure the overall (stack) height of the new bearing cones (Item #13) and bearing cups (Item #12).

2.1. Compare the measured values to the same values as measured on the used bearing cones and bearing cups.

- 2.2. Use this measurement to adjust the amount of input shim (Item # 3) used when installing the new bearings.
3. Install a new bearing cone (Item #13) onto the long extension of the input shaft (Item #18).
  - 3.1. Coat the shaft with anti-seize lubricant prior to installation.
  - 3.2. Heat a new bearing cone in a commercial bearing oven that has been designed for this purpose. Heat evenly to about 250°F (121°C).
  - 3.3. Alternatively, heat the bearing with a heat gun.

**WARNING**

*Use protective gloves while handling bearings after they have been heated in an oven.*

- 3.4. Using a twisting motion of the hand, push the bearing cone against the shoulder on the input shaft.

**CAUTION**

*Make sure the bearing is seated against the shaft shoulder. Improper mounting of the bearing can cause premature failure.*

- 3.5. If the bearing does not immediately seat against the shaft shoulder, use a piece of tubing over the shaft and against the bearing, and a soft hammer to drive the bearing against the shoulder.
4. Install the input shaft (Item #18) into the cam (Item #1) from the long extension side of the shaft.
5. The input shaft should be a slip fit to slight press fit into the cam. Use a rocking hand motion and push the input shaft through the cam.
  - 5.1. If the shaft becomes stuck, hit the end of the input shaft with a soft faced hammer, or an aluminum bar and hammer, and drive the input shaft through the cam.

6. Install a locknut (Item #22) and lockwasher (Item #23) on the opposite side of the cam. Inspect and reuse existing locknuts and lockwashers if they are not damaged.
  - 6.1. Just start the locknut onto the threaded portion of the input shaft. It will be snugged up later and tightened after setting the cam.
7. Install a new Bearing Cone (Item #13) onto the short extension of the input shaft.
  - 7.1. Coat the shaft with anti-seize lubricant prior to installation.
  - 7.2. Heat a new Bearing Cone in a commercial bearing oven that has been designed for this purpose. Heat evenly to about 250°F (121°C).
  - 7.3. Alternatively, heat the bearing with a heat gun.

**WARNING**

*Use protective gloves while handling bearings after they have been heated in an oven.*

- 7.4. Using a twisting motion of the hand, push the Bearing Cone against the shoulder on the input shaft.

**CAUTION**

*Make sure the bearing is seated against the shaft shoulder. Improper mounting of the bearing can cause premature failure.*

- 7.5. If the bearing does not immediately seat against the shaft shoulder, use a piece of tubing over the shaft and against the bearing, and a soft hammer to drive the bearing against the shoulder.
8. Use an Arbor Press to press the bearing cups (Item #12) to the input cartridges.
  - 8.1. Coat the outside of the bearing cup with anti-seize lubricant prior to pressing into cartridge.
9. Re-install the bearing cartridges (Item #4).

- 9.1. Use duplicate shims to those previously removed, but adjust the shims for the measured height of the bearings.
- 9.2. Apply a small bead of "General Electric Silicone Rubber RTV-6" at the intersection of the pilot diameter and flange before installing the bearing cartridges.
10. Install new oil seals (Item #11). See section titled "Oil Seal Replacement" in this Service Manual for detailed instructions.
11. Check for input shaft endplay.
  - 11.1. Endplay in the input shaft is not permissible. There should be preload on the input bearings. Use a dial indicator and a pry bar to check for endplay.
  - 11.2. Heavier preload is preferred to endplay. Remove input shim if end play is detected.
  - 11.3. With just the input shaft, cam and oil seals installed, preload can be measured with a torque wrench. An adapter between the input shaft and torque wrench is required, and the torque wrench must be capable of measured torque values up to 350 in-lbs.

#### **INPUT PRELOAD TORQUE**

150 ± 30 in-lbs for all ring drives

#### **CAUTION**

*End play in the input shaft will cause premature failure of the Index Drive.*

#### **CAUTION**

*Make sure the hollow shaft of the reducer and the input shaft is properly aligned. Misalignment of the reducer and input shaft will cause premature failure of the Index Drive.*

#### **Setting Cam**

1. With a depth micrometer, measure from the face of the dwell rib on one side of the cam to the side of the housing.
2. Repeat this measurement from the opposite face of the dwell rib to the housing.
3. Use the locknuts to adjust the position of the cam relative to the dowel pin until the cam is centered.
  - 3.1. Use a Spanner Wrench to tighten the locknuts (Item #22). Final tightening will occur after the cam has been set.
4. Apply Loctite, Prussian Blue #30520 or equivalent to both sides of the entire cam track.
5. Hand crank the input shaft to rotate the cam. If resistance is encountered, adjust the cam axially to a more suitable position.
6. Repeat the process of applying Prussian Blue until the unit performs smoothly and the bluing pattern is quite uniform and there is no looseness in any dwell position. Index the unit through several indexes and check the entrance tips on all tracks.

#### **CAUTION**

*There should be no looseness in any dwell position of the output.*

- 6.1. Make sure Prussian Blue is still visible on all tips.
- 6.2. If not, readjust the position of the cam and repeat.
- 6.3. If after several attempts to adjust the cam, Prussian Blue is not visible on all tips, hand grind the tips of the entrance track to provide relief.

#### **CAUTION**

*The tips of the cam cannot be relieved prior to installation. This procedure must be completed while installing the cam.*

**CAUTION**

*Do not grind tips excessively.*

**CAUTION**

*Tip relief must be evident. If tips are not properly relieved, the cam followers will hit the tips when entering the cam. Eventually, this will crack the cam follower shell. Catastrophic damage will occur.*

7. Once proper contact has been assured, use the following procedure to tighten the locknuts and secure the lockwasher tabs.

- 7.1. Back off one locknut and lockwasher on one side of the cam.

NOTE: Do not back off both locknuts or you will lose the cam center.

- 7.2. Apply Green Perma-Lok, to the threads on the input shaft.

- 7.3. Use a Spanner Wrench that has been locked (jammed) against the side of the housing to hold the locknut while turning the input shaft. Or you can use a second wrench to lock the locknut while the first wrench is locked against the housing. Or you can put a bolt in the lifter hole of the cam (Item #1) to jam the shaft in place while tightening the locknut.

8. Bend over the lockwasher tabs towards the locknut and into the slot.

**CAUTION**

*A torque specification for locknuts is not available. Make sure they are tight!*

9. Repeat the above steps and tighten the locknuts on the opposite side of the cam.
10. After tightening locknuts, re-apply Prussian Blue and check for tip relief etc.

# Follower Wheel/Output Bearing Replacement

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## **Follower Wheel/Output Bearing Removal**

1. Use the motor drive package to position the input shaft keyway such that the cam is just entering dwell.
2. Remove socket head screws (Item #34) and dial ring (Item #2).
3. Remove socket head cap screws (item #35) from outer race of bearing (Item #14). DE-STA-CO used Red Perma-Lok® when tightening these screws and it may require heating the screw for ease of removal.

### **CAUTION**

*Do not overheat. Overheating can distort mating parts.*

4. Remove pull dowels (Item #37) by either pulling or knocking downward through base (preferred).
5. Thread lifting eyes into the tapped holes in the output face of the follower wheel/output bearing (Item #14). (Two places 180 degrees apart or three places 120 degrees apart).
6. Using a boom crane or hoist, lift up the follower wheel/input bearing.

## **Follower Wheel/Output Bearing Installation**

Prior to installing the follower wheel proceed as follows. If followers have been removed, replace all cam followers in the follower wheel. See the section titled "Cam Follower Installation" in this Service Manual. Install cam and input shaft if they were removed. See the section titled "Cam and Input Shaft Installation" in this Service Manual. Clean and deburr all parts before re-assembly. Follow tightening torque and Perma-Lok®, recommendations as outlined in this Service Manual and the "General Service Manual".

1. Install follower wheel using the following steps.

- 1.1. Use a boom crane or hoist to lower the follower wheel onto the base. Align dowel holes in follower wheel/output bearing (Item #14) with dowel holes in base plate (Item #8).

- 1.2. With the cam in place, be sure to position the followers on either side of the cam rib. The cam must be just entering dwell and at the start of motion.

- 1.3. Install pull dowels (Item #37). Apply Red Perma-Lok.

- 1.4. Install socket head cap screws (Item #35). Tighten to specification. See table titled "Torque Requirements For Tightening Screws" in this Service Manual.

2. Install the dial ring (Item #2).

- 2.1. Align the dowel holes in the dial ring with the dowel pins (Item #38) in the follower wheel (Item #14)

- 2.2. Re-oil the felt or rubber seal (Item #29)

- 2.3. Lower the dial ring until it touches the felt seal.

- 2.4. Continue to lower the dial ring in small increments, pausing to tuck the felt seal into the groove in the bottom of the dial ring. Once the felt seal is seated in the dial ring, lower the dial ring completely.

NOTE FOR 1100RNG & 1550RNG ONLY: If the felt or rubber seal (Item #29) needs to be replaced, refer to the assembly diagram on page 24 of this manual. The felt seal can only be replaced with the bearing off of the base plate (Item #8)

- 2.5. Reinstall socket head cap screws (Item #34) into dial ring.



## Final Assembly

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1. If removed, reinstall the housing access cover (Item #5).
  - 1.1. Apply a thin bead of "General Electric Silicone Rubber RTV-6" or equivalent to the housing area where the cover seats. Install socket head cap screws (Item #33)
2. Fill the index drive with recommended oil to level indicated by the Sight Glass (Item #26).

NOTE: Lubricating oils should be high quality, well refined petroleum oils or synthetic lubricants with extreme pressure additives. They may be subjected to high operating temperatures, so they must have good resistance to oxidation. Suggested oils are Mobilgear 630, OMA LA 220, Mobil SHC 634 or an SAE 90 EP gear oil (meeting the MIL-L-2105E specification and the API Service classification GL5), or equivalent.

See the *General Service Manual* for complete lubrication specifications.

A slightly high oil level will cause no damage. Too low a level may result in unit failure.

3. Lubricate the output bearing with grease. Use grease that conforms to NGLI #3 such as Mobilith AW3.  
  
See the *General Service Manual* for complete lubrication specifications.
4. Adequate grease can be maintained in a reused bearing by lubricating with **[four (4) oz. of grease ?]**The bearing must be rotating while lube (grease) is injected into the bearing to ensure that new grease is being distributed throughout the bearing and not just purging past the seals. Inject the recommended amount divided by the number of stops during each index for one full revolution of the table.

5. Re-install the drive package (Item #19) according to drive package manual.

## **How to Order Parts**

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Please refer to the parts lists shown in this Service Manual. These parts lists are for standard Index Drives. If you feel your drive is nonstandard or you are in doubt, you should contact DE-STA-CO CAMCO Products Customer Service at (847) 459-5200 and request a Bill of Materials for your specific unit based on its serial number. Alternatively, contact your local DE-STA-CO Sales Representative. A complete list of DE-STA-CO Sales Offices is available on DE-STA-CO's web site, (<http://www.destaco.com>).

You may order parts per the standard Bill of Material even if your unit is nonstandard. DE-STA-CO's CAMCO Customer Service Representative will review the closed order file based on the following information and supply you with the correct part.

### **Required Information**

1. Original purchase order number (if available)
2. Customer name (original purchaser of drive )
3. Model number (located on name plate)
4. Serial number (located on name plate) - essential when ordering parts
5. Approximate date of purchase

### **To Order Parts**

Contact DE-STA-CO's CAMCO Parts Department in Wheeling, Illinois

- Phone (847) 459-5200
- FAX (847) 459-3064
- E-mail: [camco@destaco.com](mailto:camco@destaco.com)

Describe the parts required and the 14 digit part number as listed in the Standard Bill of Materials or a Special Bill of Materials pertaining to your unit. State if you are using a Standard or Special Bill of Materials. Give as much of the above required information as possible.

### **Under Warranty**

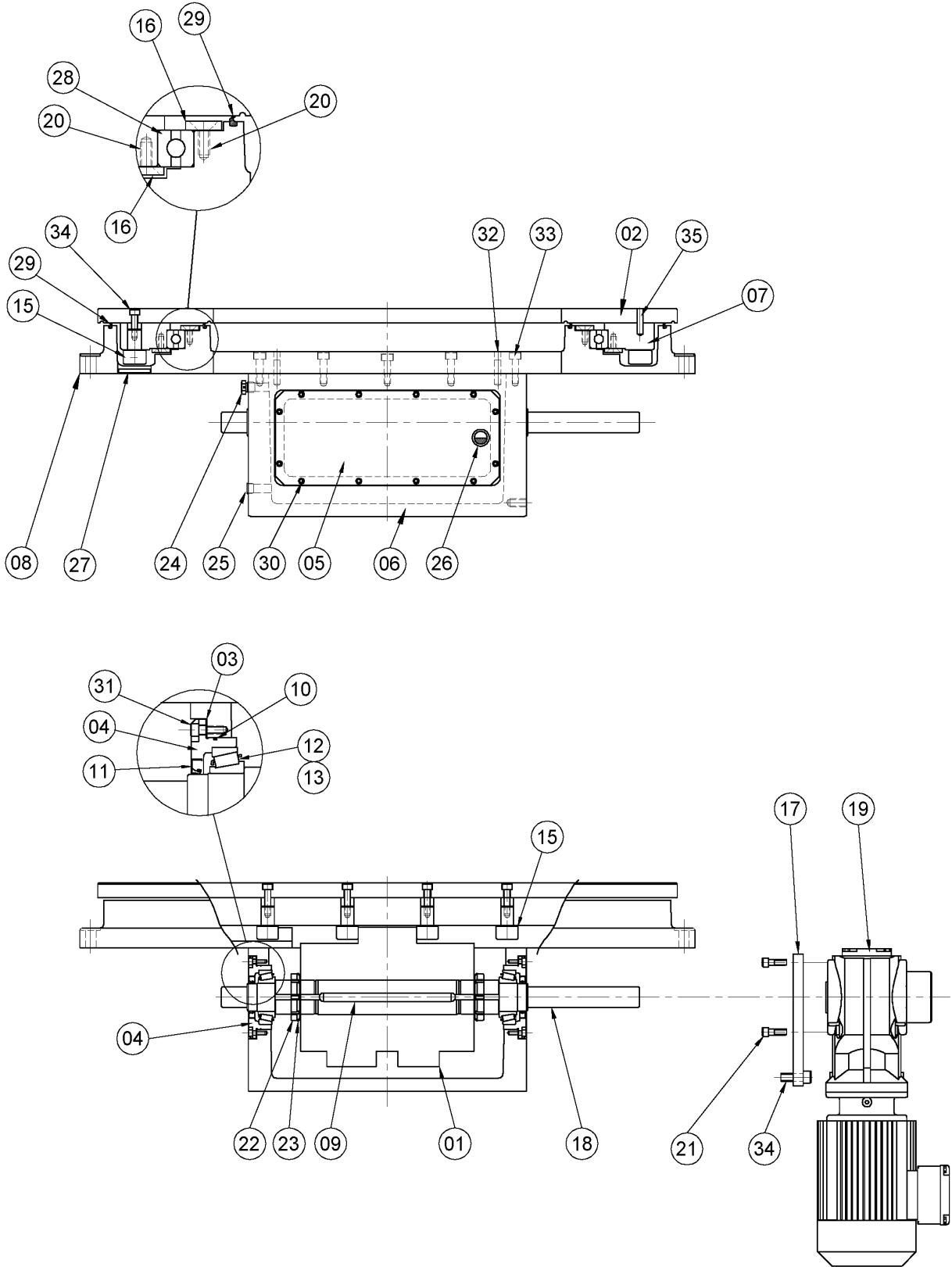
DE-STA-CO will send replacement parts freight prepaid via the most practical means.

DE-STA-CO will issue a "Returned Material Authorization Number" (RMA#) for the return of defective parts for inspection. DE-STA-CO will invoice customer for repair parts. When inspection of returned parts has been completed and determined to be a warranty problem, DE-STA-CO will then issue a credit to the customer for repair parts and freight charges.

### **Out of Warranty**

Replacement or spare parts, with approved credit, are F.O.B. DE-STA-CO/CAMCO Products plant, Wheeling, Illinois.

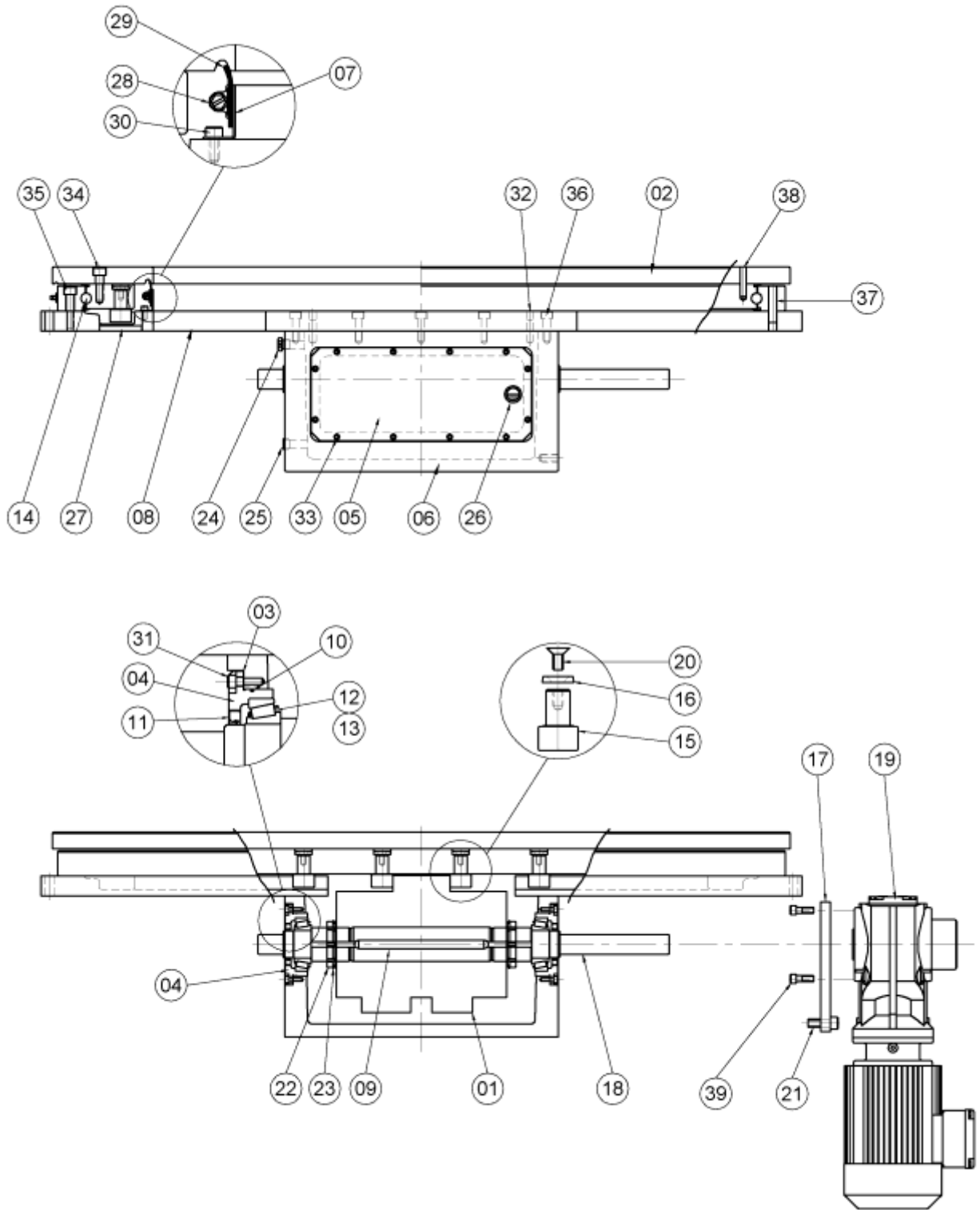
# 750RNG Parts Drawing



## 750RNG Parts List

<i>Item Number</i>	<i>Part Number</i>	<i>Description</i>
1 .....	Consult Factory .....	CAM
2 .....	Consult Factory .....	DIAL RING
3 .....	E7A84828018800 .....	SHIM .002 THK INPUT 1100RNG
.....	E7A84828028800 .....	SHIM .005 THK INPUT 1100RNG
.....	E7A84828038800 .....	SHIM .010 THK INPUT 1100RNG
4 .....	E7B84307003002 .....	INPUT CARTRIDGE 1100RNG
5 .....	E7B84731002002 .....	COVER 1100RNG
6 .....	E1D88711001002 .....	CAM HOUSING 750RNG
7 .....	Consult Factory .....	FOLLOWER WHEEL
8 .....	E1G88707000000 .....	BASE PLATE 750RNG
9 .....	050K600 .....	KEY .500 SQ X 6.00
10 .....	84A15729030000 .....	O-RING 2-153 N674 70
11 .....	84C65421170000 .....	OIL SEAL C/R 15845
12 .....	86D07328280022 .....	BEARING CUP 26822 CLASS 2
13 .....	86D07328360021 .....	BEARING CONE 26885 CLASS 2
15 .....	82A85963000000 .....	CAM FOLLOWER H40
16 .....	95A89925040000 .....	COUNTERSUNK WASHER WSRB25-6
17 .....	E7C84318009100 .....	MOUNTING PLATE RING DRIVE/KH37
18 .....	E1D88712007002 .....	SHAFT INPUT DE 750RNG W/KH37
19 .....	Consult Factory .....	GEARMOTOR
20 .....	95A49312430000 .....	FHCS M8 X 20
21 .....	95A33040320000 .....	SHCS M8 X 16 LG
22 .....	95A26009100000 .....	LOCKNUT PN-10
23 .....	92A26010100000 .....	LOCKWASHER W10
24 .....	95A33000010000 .....	AIR VENT 3/8-18 NPT AV53
25 .....	95A33003010000 .....	MAGNETIC PLUG
26 .....	95A84361000000 .....	SIGHT GLASS ¾ THREAD W/NUT
27 .....	4MA51903000000 .....	BORE PLUG 1.81
28 .....	86A48575000000 .....	OUTPUT BEARING KG200XPOL
29 .....	84A86887000000 .....	SEAL EXTRUSION
30 .....	95A33040040000 .....	SHCS M5 X 12
31 .....	95A33040180000 .....	SHCS M6 X 16
32 .....	95K23129290000 .....	PULL DOWEL 3/8 X 1-1/2
33 .....	95A33040510000 .....	SHCS M10 X 30
34 .....	95A33040660000 .....	SHCS M12 X 30 MM
35 .....	95A26007630000 .....	DOWEL PIN ½ X 1-1/4

# 1100RNG & 1550RNG Parts Drawing



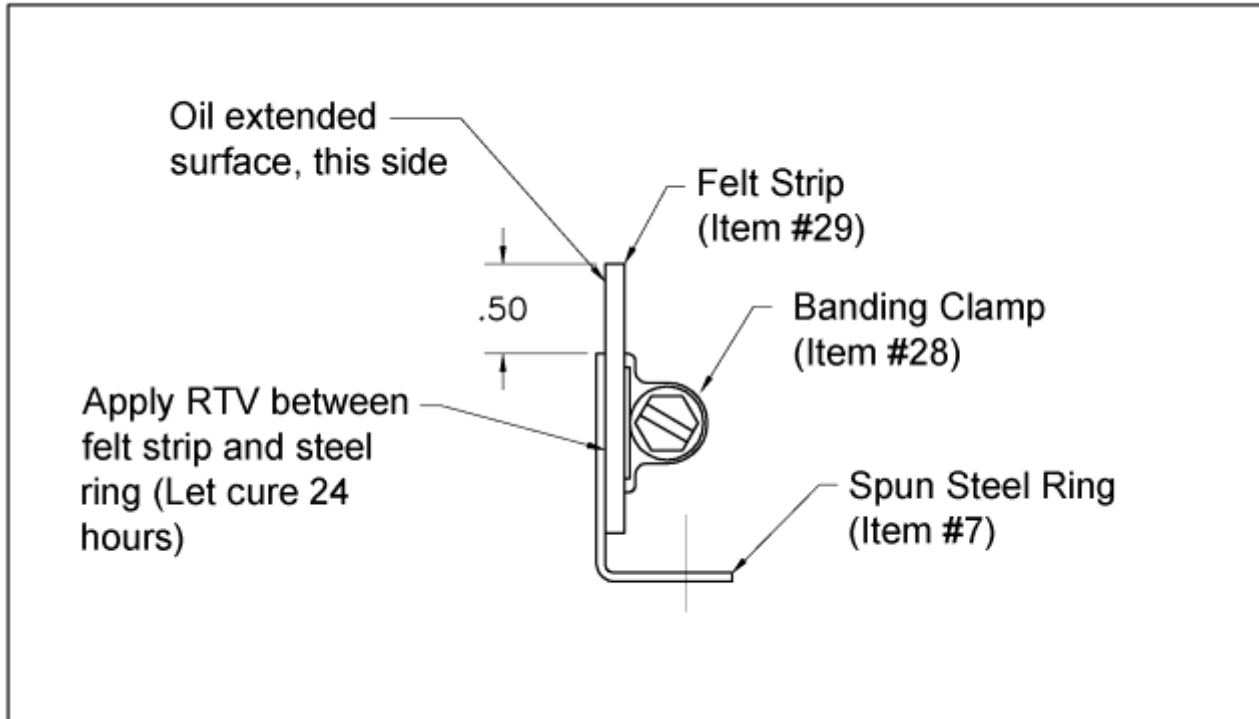
## 1100RNG Parts List

<i>Item Number</i>	<i>Part Number</i>	<i>Description</i>
1 .....	Consult Factory .....	CAM
2 .....	E7G84543000000 .....	DIAL RING – STEEL (STANDARD)
	E7G85086000000 .....	DIAL RING – ALUMINUM (SPECIAL)
3 .....	E7A84828XX0000 .....	SHIM, INPUT
4 .....	E7B84307003002 .....	CARTRIDGE, INPUT
5 .....	E7B84731002002 .....	COVER
6 .....	E7D84726001002 .....	HOUSING
7 .....	E7D86002000000 .....	FORMED SEAL RING
8 .....	E7G84816000000 .....	BASE PLATE (STANDARD)
	E7G86079000000 .....	BASE PLATE (WITH KH47 REDUCER)
9 .....	050K750 .....	KEY .50 SQ X 7.50 LONG
10 .....	84A15729030000 .....	O-RING 2-153
11 .....	84C65421170000 .....	OIL SEAL C/R 15845
12 .....	86D07328280022 .....	BEARING CUP 26822, INPUT
13 .....	86D07328360021 .....	BEARING CONE 26885, INPUT
14 .....	Consult Factory .....	FOLLOWER WHEEL/OUTPUT BEARING
15 .....	82A85963000000 .....	CAM FOLLOWER H40 1.25 DIA
16 .....	95A69395060000 .....	WASHER, C'SUNK 13912
17 .....	E7C84318009100 .....	MOUNTING PLATE, KH37 REDUCER
	E8C84736009100 .....	MOUNTING PLATE, KH47 REDUCER
18 .....	E7D84317007002 .....	SHAFT DE INPUT, KH37 REDUCER
	E8C84733007002 .....	SHAFT DE INPUT, KH47 REDUCER
19 .....	Consult Factory .....	GEARMOTOR
20 .....	95A49312420000 .....	FHCS M8 X 16
21 .....	95A33040660000 .....	SHCS M12 X 30
22 .....	95A26009100000 .....	LOCKNUT PN-10
23 .....	95A26010100000 .....	LOCKWASHER W10
24 .....	95A33000010000 .....	AIR VENT 3/8-18 NPT AV53
25 .....	95A33003010000 .....	MAGNETIC PLUG
26 .....	95A84361000000 .....	SIGHT GLASS 3/4 THREAD W/NUT
27 .....	99A67365000000 .....	BORE PLUG
28 .....	99A86694000000 .....	BANDING CLAMP KIT
29 .....	99A86895000000 .....	FELT STRIP 1.5 X .12 X 10 FT
30 .....	95A33040160000 .....	SHCS M6 X 10
31 .....	95A33040180000 .....	SHCS M6 X 16
32 .....	95K23129290000 .....	PULL DOWEL 3/8 X 1-1/2
33 .....	95A33040040000 .....	SHCS M5 X 12
34 .....	95A33040660000 .....	SHCS M12 X 30
35 .....	95A33040690000 .....	SHCS M12 X 45
36 .....	95A33040510000 .....	SHCS M10 X 30
37 .....	95K23129450000 .....	PULL DOWEL 1/2 X 2-1/2
38 .....	95A26007630000 .....	DOWEL PIN, RING 1/2 X 1-14
39 .....	95A33040320000 .....	SHCS M8 X 16

## 1550RNG Parts List

<i>Item Number</i>	<i>Part Number</i>	<i>Description</i>
1 .....	Consult Factory .....	CAM
2 .....	E8G85069000000 .....	DIAL RING – STEEL (STANDARD)
	E8G85087000000 .....	DIAL RING – ALUMINUM (SPECIAL)
3 .....	E7A84828XX0000 .....	SHIM, INPUT
4 .....	E7B84307003002 .....	CARTRIDGE, INPUT
5 .....	E7B84731002002 .....	COVER
6 .....	E7D84726001002 .....	HOUSING
7 .....	E8G86513000000 .....	FORMED SEAL RING
8 .....	E8G85068000000 .....	BASE PLATE (STANDARD)
9 .....	050K750 .....	KEY .50 SQ X 7.50 LONG
10.....	84A15729030000 .....	O-RING 2-153
11.....	84C65421170000 .....	OIL SEAL C/R 15845
12.....	86D07328280022 .....	BEARING CUP 26822, INPUT
13.....	86D07328360021 .....	BEARING CONE 26885, INPUT
14.....	Consult Factory .....	FOLLOWER WHEEL/OUTPUT BEARING
15.....	82A85964000000 .....	CAM FOLLOWER H48 1.50 DIA
16.....	95A69395060000 .....	WASHER, C'SUNK 13912
17.....	E8C84736009100 .....	MOUNTING PLATE, KH47 REDUCER
18.....	E8D84733007002 .....	SHAFT DE INPUT, KH47 REDUCER
19.....	Consult Factory .....	GEARMOTOR
20.....	95A49312420000 .....	FHCS M8 X 16
21.....	95A33040660000 .....	SHCS M12 X 30
22.....	95A26009100000 .....	LOCKNUT PN-10
23.....	95A26010100000 .....	LOCKWASHER W10
24.....	95A33000010000 .....	AIR VENT 3/8-18 NPT AV53
25.....	95A33003010000 .....	MAGNETIC PLUG
26.....	95A84361000000 .....	SIGHT GLASS 3/4 THREAD W/NUT
27.....	84A65330000000 .....	BORE PLUG
28.....	99A86914000000 .....	SS HOSE BANDING
28.....	99A86914010000 .....	WORM HOUSING & SCREW
29.....	99A86911000000 .....	FELT STRIP 1.5 X .12 X 25 FT
30.....	95A33040160000 .....	SHCS M6 X 10
31.....	95A33040180000 .....	SHCS M6 X 16
32.....	95K23129290000 .....	PULL DOWEL 3/8 X 1-1/2
33.....	95A33040040000 .....	SHCS M5 X 12
34.....	95A33040670000 .....	SHCS M12 X 35
35.....	95A33040700000 .....	SHCS M12 X 50
36.....	95A33040520000 .....	SHCS M10 X 35
37.....	95K23129580000 .....	PULL DOWEL 5/8 X 3
38.....	95A38175480000 .....	DOWEL PIN, RING 12 MM X 36 MM
39.....	95A33040320000 .....	SHCS M8 X 16

## Felt Seal Installation





## **NOTES**

## **NOTES**





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