04577961
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Edition 2
July, 2002

OPERATION AND MAINTENANCE MANUAL
for
M004RHR167AX3/6411 AIR MOTOR

NOTICE

The M004RHR167AX3/6411 Air Motor is designed for Emergency Valve Closure Systems on Gas/Liquids Storage Containers.

⚠ WARNING

IMPORTANT SAFETY INFORMATION ENCLOSED - SAVE THESE INSTRUCTIONS

READ AND UNDERSTAND THIS MANUAL BEFORE OPERATING THIS PRODUCT

IT IS YOUR RESPONSIBILITY TO MAKE THIS SAFETY INFORMATION AVAILABLE TO OTHERS THAT WILL OPERATE THIS PRODUCT

FAILURE TO OBSERVE THE FOLLOWING WARNINGS COULD RESULT IN INJURY

PLACING MOTOR IN SERVICE

- **Always install, operate, inspect and maintain this product in accordance with all applicable standards and regulations (local, state, country, federal, etc.).**
- **Always use clean, dry air at 90 psig (6.2 bar/620 kPa) maximum air pressure at the inlet. Higher pressure may result in hazardous situations including excessive speed, rupture, or incorrect output torque or force.**
- **Ensure an accessible emergency shut off valve has been installed in the air supply line, and make others aware of its location.**
- **Do not use damaged, frayed or deteriorated air hoses and fittings.**
- **Always turn off the air supply and disconnect the air supply hose before installing, removing or adjusting any accessory on this motor, or before performing any maintenance on this motor.**
- **Do not lubricate with flammable or volatile liquids such as kerosene, diesel or jet fuel. Use only recommended lubricants.**
- **Keep work area clean, uncluttered, ventilated and illuminated.**
- **Do not remove any labels. Replace any damaged label.**

USING THE MOTOR

- **Always wear eye protection when operating or performing maintenance on this motor.**
- **Always wear hearing protection when operating this motor.**
- **Always use Personal Protective Equipment appropriate to the product used and material worked. This may include dust mask or other breathing apparatus, safety glasses, ear plugs, gloves, apron, safety shoes, hard hat and other equipment.**
- **Keep others a safe distance from your work area, or ensure they use appropriate Personal Protective Equipment.**

Refer All Communications to the Nearest Ingersoll-Rand Office or Distributor.

Printed in U.S.A.

Ingersoll-Rand®

Using the Motor (Continued)

- **Prevent exposure and breathing of harmful dust and particles created by power tool use.**
  Some dust created by power sanding, sawing, grinding, drilling, and other construction activities contains chemicals known to cause cancer, birth defects or other reproductive harm. Some examples of these chemicals are:
  - **lead from lead based paints,**
  - **crystalline silica from bricks and cement and other masonry products, and**
  - **arsenic and chromium from chemically treated lumber.**

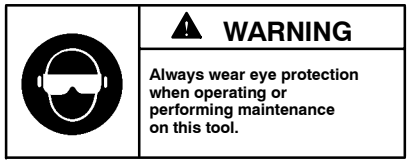
  Your risk from these exposures varies, depending on how often you do this type of work. To reduce your exposure to these chemicals: work in a well ventilated area, and work with approved safety equipment, such as those dust masks that are specially designed to filter out microscopic particles.
- **This motor is not insulated against electric shock.**
- **Keep hands, loose clothing, long hair and jewelry away from working end of motor.**
- **Motor and/or accessories may briefly continue their motion after throttle is released.**
- **Ensure work pieces are secure. Use clamps or vises to hold work piece whenever possible.**
- **Do operate when tired, or under the influence of medication, drugs, or alcohol.**
- **Never use a damaged or malfunctioning motor or accessory.**
- **Do not modify the motor, safety devices, or accessories.**
- **Do not use this motor for purposes other than those recommended.**
- **Use accessories recommended by Ingersoll Rand.**
- **All applications of this motor must be limited to 33 lb.-ft. (44.7 Nm) torque.**

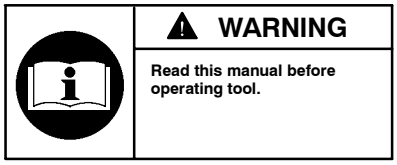
NOTICE

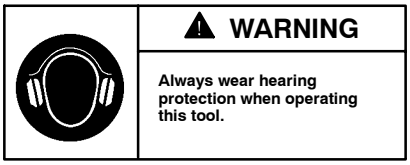
The use of other than genuine Ingersoll-Rand replacement parts may result in safety hazards, decreased motor performance, and increased maintenance, and may invalidate all warranties.

Repairs should be made only by authorized trained personnel. Consult your nearest Ingersoll-Rand Authorized Servicenter.

WARNING SYMBOL IDENTIFICATION







LUBRICATION

Ingersoll-Rand No. 10

Mobiltemp SCH-32

Whenever the gear end of the Motor is disassembled, lubricate the gear train by working approximately 26cc of **Mobiltemp SCH-32** grease into the gear train and around the Bearings (19, 23) and the Spindle (24).

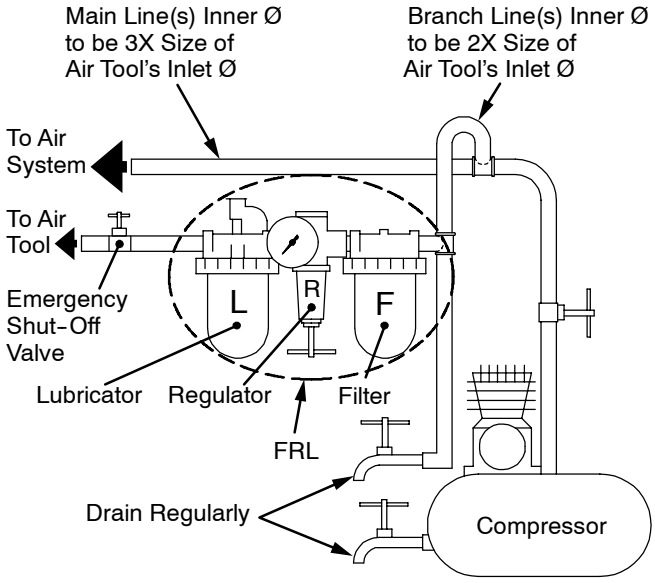
Mobiltemp SCH-32

After each (40) forty hours of operation, *or as experience indicates*, remove the Gear Case Grease Screw (15) and inject 1.5cc of Mobiltemp SCH-32 grease into the opening. Do not grease excessively. Too much grease in the Gear Case (16) will cause heating. Grease leakage from the spindle end is also an indication that an excessive amount of grease has accumulated within the Gear Case.

INSTALLATION

For non-permanent installations, we recommend the use of an air line lubricator in the air supply line. Attach the lubricator as close to the Motor as practical. Where the lubricator cannot be permanently mounted, we recommend using an Ingersoll-Rand No. **L18-03-LK** Lubricator.

For permanent installations, we recommend using an Ingersoll-Rand No. **C18-03-FKG0-28** Filter-Regulator-Lubricator (FRL) unit. These units have 3/8" pipe tap inlet and outlet and 5/16 pint (148 ml) oil capacity. Larger capacity units may be used, but do not use a unit having less than a 3/8" pipe tap inlet and outlet.



(Dwg. TPD905-2)

NOTICE

SAVE THESE INSTRUCTIONS. DO NOT DESTROY.

When the life of the motor has expired, it is recommended that the motor be disassembled, degreased and parts be separated by material so that they can be recycled.

DISASSEMBLY

General Instructions

1. Do not disassemble the Motor any further than necessary to replace or repair damaged parts.
2. Do not disassemble the Motor unless you have a complete set of new gaskets and O-rings for replacement.
3. Do not remove any part that is a press fit in or on a subassembly unless removal of that part is necessary for repair or replacement.
4. Whenever grasping a motor or part in a vise, always use leather-covered or copper-covered vise jaws to protect the surface of the part and help prevent distortion. This is particularly true of threaded members, shafts and housings.

Disassembly of Motor:

1. Clamp a large adjustable wrench in vise jaws with the adjustable opening upward.
2. Adjust the jaw of the wrench to clear the body of the Gear Case (16).
3. Roll the Motor in the wrench jaw until it stops against the Gear Case Screw (15) and, using a wrench on the flats of the Coupling Nut (30) at the motor end, loosen the Coupling Nut.
4. Roll the Motor in the opposite direction until it stops against the Gear Case Screw, and using a wrench on the flats of the Coupling Nut (at the flange end of the Gear Case), loosen the Coupling Nut.
5. Holding the Motor horizontally over a workbench, unscrew the Coupling Nut at the motor end of the Gear Case and pull the motor from the Gear Case. Do not lose the Flange Key (28).
6. Unscrew the Coupling Nut and pull the Flange Assembly and the Spindle (24) out of the Gear Case. Once the Spindle is removed from the Gear Case, the entire gear train must be disassembled to install the Spindle Planet Gears (22) on the opposite end of the Spindle. Do not lose the Flange Key (28).
7. Push the Spindle out the gear end of the Flange Assembly.
8. Remove the Spindle Seal (31) and Flange Seal (12) from inside of the Flange.
9. Using snap ring pliers, remove the Spindle Retaining Ring (25) and pull the two Spindle Bearings (26) and the Spindle Bearing Spacer (27) from the shaft of the Spindle. Remove the second Spindle Retaining Ring.
10. Remove the Motor Clamp Washer (14).
11. Pull the three Gear Head Planet Gear Assemblies (18), Gear Head (17), Gear Head Spacer (20), three Intermediate Gear Head Planet Gear Assemblies (22), the Intermediate Gear Head (21), Gear Head Spacer (20) and three Spindle Planet Gear Assemblies (22) from the Gear Case.
12. Using a thin blade screwdriver, pry one of the Coupling Nut Retainers (29) out of the groove in the Gear Case and slide the two Coupling Nuts off the Gear Case.
13. Grasp the shaft of the Rotor (7) in copper-covered vise jaws and pull the Motor Housing (1) off the assembled motor unit.
14. Pull the Front End Plate Assembly off the Rotor.
15. Remove the two Front End Plate Seals (12) from the Front End Plate (11).
16. Push the Front Rotor Bearing (13) out of the Front End Plate.
17. Separate the Cylinder (9), Vanes (8) and Cylinder Dowel (10) from the Rotor.
18. Remove the Rear End Plate Gasket (5) from inside the Motor Housing.
19. If the Rear Rotor Bearing (4) or Rear End Plate (6) must be replaced, use a wrench to remove the Rear Rotor Bearing Retaining Nut (2).
20. Supporting the Rear End Plate near the Rotor body on the table of an arbor press, press the Rotor from the End Plate and Bearing.

ASSEMBLY

General Instructions

1. Unless otherwise noted, always press on the stamped end of a needle bearing when installing the needle bearing in the recess. Do not press a needle bearing against any object or surface in a recess.
2. Always press on the inner ring of a ball-type bearing when installing the bearing on a shaft.
3. Always press on the outer ring of a ball-type bearing when installing the bearing in a bearing recess.
4. Check every bearing for roughness. If any open bearing must be cleaned, wash it thoroughly in clean solvent and dry with a clean cloth. Work grease thoroughly into every bearing before installation. Sealed or shielded bearings should never be cleaned.
5. Except for bearings, always clean every part and wipe every part with a thin film of oil before installation.
6. When grasping a Motor or one of its parts in a vise, always use leather or copper vise jaws covers to protect the surface of the part and reduce the likelihood of damage. This is particularly important when clamping threaded members, shafts with splines, etc.
7. Apply O-ring lubricant to each O-ring before assembly and use only new gaskets when reassembling the Motor.

Assembly of Motor

1. Place the Rear End Plate (6), porting slots leading, onto the threaded hub of the Rotor (7). Position the Rear Rotor Bearing (4) on the hub and using a sleeve that contacts the inner ring of the Bearing, press the Bearing onto the hub to within 1/32" (1 mm) of the Rear End Plate.
2. Place the Retaining Nut Washer (3) over the hub against the Bearing. Insert a 0.001" (.025 mm) feeler gauge or shim between the face of the Rotor and End Plate. Thread the Rear Rotor Bearing Retaining Nut (2) onto the hub of the Rotor and tighten it until the feeler gauge has a slight drag during removal.

NOTICE

- **The Rotor must spin freely while holding the End Plate.**

3. Lightly grasp the threaded hub of the Rotor in copper-covered vise jaws with the splined hub upward.
4. Wipe each Vane (8) with a film of light oil and place a Vane in each slot in the Rotor.
5. Align the cylinder dowel hole in the Cylinder (9) with the hole in the Rear End Plate (6) and install the Cylinder over the Rotor and Vanes against the Rear End Plate. The installation of the Cylinder determines the rotational direction of the motor. Looking past the Rotor body and Vanes, align the cylinder dowel hole in the Rear End Plate at twelve o'clock. There are five holes drilled crosswise into the Cylinder. If the five drilled holes are at the three o'clock side of the assembly, the rotational direction will be forward (right hand). Rotational direction will be reverse (left hand), if the holes are at the nine o'clock side of the assembly. To change rotational direction, remove the Cylinder, turn it end for end and reposition it in the assembly.

NOTICE

- **Cylinders have a drill point mark at one end of the three-hole string portion of the five-hole pattern. When the mark is near the Rear End Plate, rotation will be forward (right hand); when near the Front End Plate, rotation will be reverse (left hand).**

6. Install the two Front End Plate Seals (12) in the annular grooves in the Front End Plate (11).
7. Push the Front Rotor Bearing (13) into the recess in the Front End Plate.

NOTICE

- **This is a light press and may require the use of an arbor press.**

8. Remove the assembled motor from the vise and, standing the Rotor on the threaded end, push the Front End Plate Assembly, bearing end trailing, onto the splined shaft of the Rotor until the Front End Plate just contacts the Cylinder.
9. Align the cylinder dowel holes in the Front End Plate, Cylinder and Rear End Plate and insert an assembly dowel 3/32" (2.5 mm) diameter by 9" (230 mm) long into the aligned dowel holes in the assembly.
10. Inject 2cc of Mobiltemp SCH-32 grease into the central recess at the bottom of the bore, in the Motor Housing (1).
11. Place the Rear End Plate Gasket (5) at the bottom of the bore in the Motor Housing.

NOTICE

- **Make certain all holes and porting align.**

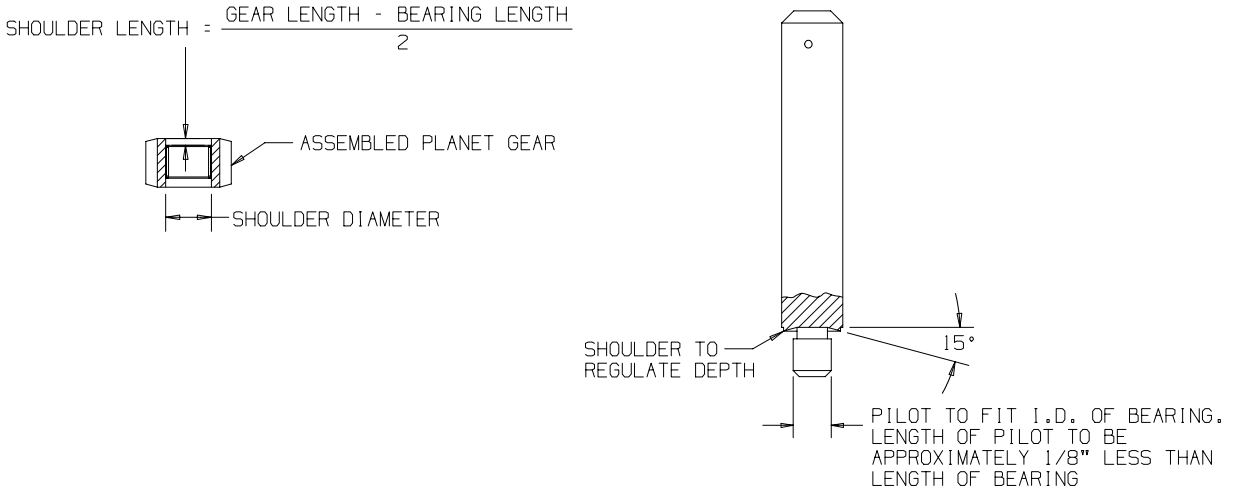
12. Insert the end of the assembly dowel nearest the Rear End Plate into one of the dowel holes at the bottom of the motor bore in the Housing. With the inlet hole at twelve o'clock and the two cylinder dowel holes at eleven and one o'clock respectively, inserting the assembly dowel in the one o'clock hole will orient the motor for forward (right hand) rotation. While inserting the assembly dowel in the eleven o'clock hole will orient the motor for reverse (left-hand) rotation. Slide the assembled motor along the assembly dowel until the motor stops against the bottom of the motor bore. Carefully withdraw the assembly dowel and install the Cylinder Dowel (10) in its place. Make certain the Dowel is below the face of the Front End Plate.
13. Install a Coupling Nut Retainer (29) in one of the grooves encircling the Gear Case.
14. Position the non-threaded ends of the two Coupling Nuts (30) against each other and slide them onto the Gear Case from the end without the Retainer.
15. Install the second Retainer in the remaining groove encircling the Gear Case.
16. Using snap ring pliers, install one of the Spindle Retaining Rings (25) in the annular groove on the Spindle (24) adjacent to the large hub.
17. In the order named, install a Spindle Bearing (26), Spindle Bearing Spacer (27) and the remaining Spindle Bearing on the spindle shaft against the Spindle Retaining Ring. Secure the three parts by installing the remaining Ring in the groove on the shaft.

18. Lubricate the Spindle Seal (31) with a thin coat of Mobiltemp SCH-32 Grease and insert it, lip end trailing, into threaded end of Flange (32).
19. Insert the Flange Seal (12) into the groove inside the threaded end of the Flange.
20. Being careful not to damage the Spindle Seal, install the Flange Assembly, threaded end first, over the Spindle.
21. Align a notch in the Flange with a notch in the Gear Case and maintain the alignment by installing a Flange Key (28) in the two notches.
22. Thread the Coupling Nut onto the Flange until it is hand tight.
23. Insert the pin end of the Spindle into the unsplined end of the Gear Case and push the large spindle hub against the spline.
24. If the Planet Gear Bearings (19 or 23) are being replaced in the Planet Gear Assemblies (18 or 22), use a bearing inserting tool similar to the one shown per Dwg. TPC488 and press the Bearings into the Gears.

NOTICE

- **Always press on the stamped end of the Bearing and center the Bearing in the Gear. (See Dwg. TPC488)**

25. Using long tweezers, install a Spindle Planet Gear (22) on each spindle gear shaft.
26. Install a Gear Head Spacer (20) against the Spindle Planet Gears. Install the Intermediate Gear Head (21), three Intermediate Gear Head Planet Gears (22), Gear Head Spacer (20), Gear Head (17) and three Gear Head Planet Gears (18) in the Gear Case (16).
27. Thread the Gear Case Grease Screw (15) into the Gear Case, if it was removed, and hand tighten it with a hex wrench.
28. Place the Motor Clamp Washer (14), concave end leading, against the Planet Gears.
29. Being careful that the Spindle does not move out of position, engage the gear case gearing with the splined shaft of the Rotor.
30. Align the Gear Case with the Motor Housing by installing a Flange Key (28) to enter the notches in both the Housing and Gear Case. Hand tighten the Coupling Nut onto the Motor Housing.
31. Clamp a large adjustable wrench in vise jaws with the adjustable opening upward.
32. Adjust the jaw of the wrench to clear the body of the Gear Case.
33. Roll the Motor in the wrench jaw until it stops against the Gear Case Grease Screw and, using a torque wrench on the flats of one Coupling Nut, tighten the Nut between 45 to 50 ft-lb. (61 to 68 Nm) torque.
34. Roll the Motor in the opposite direction until it stops against the Gear Case Grease Screw and, using a torque wrench on the flats of the second Coupling Nut, tighten the Nut between 45 to 50 ft-lb. (61 to 68 Nm) torque.



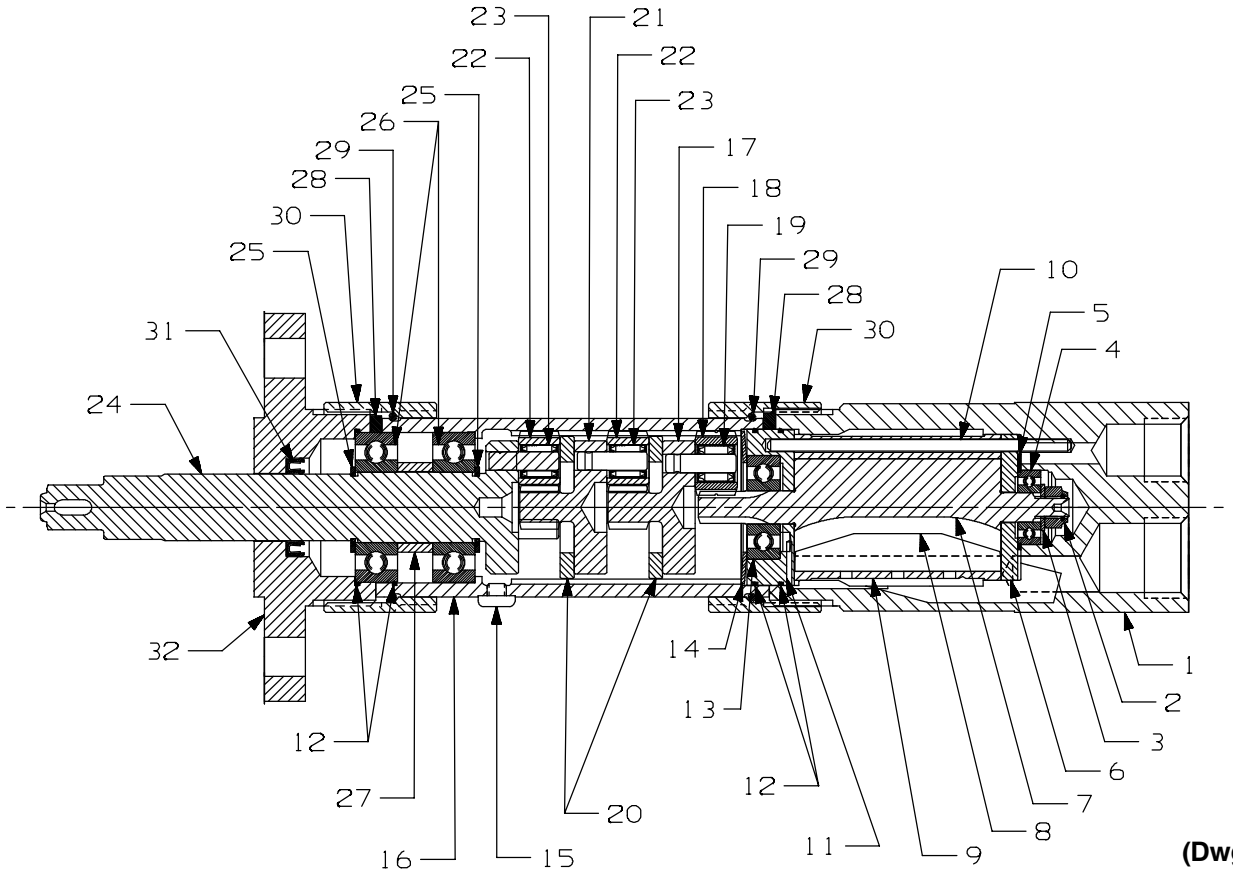
NEEDLE BEARING TOOL FOR PLANET GEARS

(Dwg. TPC488)

TROUBLESHOOTING GUIDE

Trouble	Probable Cause	Solution
Loss of Power	Low air pressure at the Motor	Check air supply. For top performance, air pressure must be 90 psig (6.2 bar/620 kPa) at the inlet.
	Worn Vanes (8)	Install a new set of Vanes.
	Damaged Rear End Plate Gasket (5)	Install a new Rear End Plate Gasket.
	Inadequate Motor lubrication	Check air line lubricator. Refer to Page 3 for lubrication specifications.
	Worn or damaged parts	Disassemble the Motor and examine the parts. Replace any worn or damaged parts.
Motor heats up	Inadequate lubrication	Refer to **Lubrication** Section on page 3.
Gear Case heats up	Improper lubrication	Refer to **Lubrication** Section on page 3.
Grease leakage	Too much grease in Gear Case (16)	Refer to **Lubrication** Section on page 3.

Parts List
Operation and Maintenance Manual (P7516) — Air Motor



(Dwg. TP1905)

Item	Part Description	Part Number	Item	Part Description	Part Number
1	Motor Housing	M004-N40	17	Gear Head	6LR-216A
2	Rear Rotor Bearing Retaining Nut	6WT-118	18	Gear Head Planet Gear (3 Required)	6WTK-10
3	Retaining Nut Washer	6WT-117	19	Planet Gear Bearing (3 Required)	7AJ-500
4	Rear Rotor Bearing	DG20-22	20	Gear Head Spacer (2 Required)	6LM-80
5	Rear End Plate Gasket	M004-739	21	Intermediate Gear Head	6LQ-216A
6	Rear End Plate	M004-12	22	Intermediate Gear Head Planet Gear (6 Required)	6WTP-10
7	Rotor	M004-53	23	Planet Gear Bearing (6 Required)	WFS182-654
8	Vane Packet (1 set of 5 Vanes)	4RL-42-5	24	Spindle	VSM-6410
9	Cylinder	M004-N3	25	Spindle Retaining Ring (2 Required)	RX3-729
10	Cylinder Dowel	88V60-98	26	Spindle Bearing (2 Required)	M004-510
	Front End Plate Assembly	M004-A11	27	Spindle Bearing Spacer	M004-111
11	Front End Plate	M004-11	28	Flange Key (2 Required)	M002-561
12	Front End Plate Seal (4 Required)	M004-210	29	Coupling Nut Retainer (2 Required)	M004-29
13	Front Rotor Bearing	WWA100-97	30	Coupling Nut (2 Required)	M004-27
14	Motor Clamp Washer	M004-207	31	Spindle Seal	M004-271
15	Gear Case Grease Screw	M002-95	32	Flange	M004-580
16	Gear Case	M004-237			

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