



TECHNICAL SERVICE MANUAL

STAINLESS STEEL HEAVY DUTY PUMPS
 SERIES 337 AND 4337
 SIZES N AND R

SECTION	TSM 163
PAGE	1 OF 15
ISSUE	D

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FIGURE 1
 R337 SIZE SHOWN

INTRODUCTION

The illustrations used in this manual are for identification purposes only and cannot be used for ordering parts. Obtain a parts list from the factory or a Viking® representative. Always give complete name of part, part number and material with model number and serial number of pump when ordering repair parts. The unmounted pump or pump unit model number and serial number are on the nameplate.

In the Viking model number system, basic size letters are combined with series number (337 and 4337) are used to indicate either an unmounted pump or mounted pump unit.

Model Chart Number

UNMOUNTED PUMP		UNITS
PACKED	MECH. SEAL	
N337	N4337	Units are designated by the unmounted pump model numbers followed by a letter(s) indicating drive style. P = Commercial Speed Reducer
R337	R4337	

This manual deals only with Series 337 and 4337 Stainless Steel Heavy Duty Pumps. Refer to Figures 1 through 20 for general configuration and nomenclature used in this manual. Pump specifications and recommendations are listed in Catalog Section 163, Series 337 and 4337 Heavy Duty Steel External Pumps.

SPECIAL INFORMATION

DANGER !

Before opening any Viking pump liquid chamber (pumping chamber, reservoir, relief valve adjusting cap fitting, etc.) Be sure:

1. That any pressure in the chamber has been completely vented through the suction or discharge lines or other appropriate openings or connections.
2. That the driving means (motor, turbine, engine, etc.) has been "locked out" or made non-operational so that it cannot be started while work is being done on pump.
3. That you know what liquid the pump has been handling and the precautions necessary to safely handle the liquid. Obtain a material safety data sheet (MSDS) for the liquid to be sure these precautions are understood.

Failure to follow above listed precautionary measures may result in serious injury or death.

SPECIAL INFORMATION

ROTATION: Viking pumps operate equally well in a clockwise or counterclockwise rotation. Shaft rotation determines which port is suction and which is discharge. The suction port location is where pumping elements (gear teeth) come out of mesh.

FLUSH LINES: mechanically sealed pumps have a flush connection from the seal chamber to the discharge port as standard equipment and must be hooked up properly. If the pump rotation is reversed, be sure the flush connections are hooked up to the suction or discharge port as noted above to avoid excessive leakage or damage to pump. If the pump is handling heated product, be sure the flush line is insulated to assure continued flow.

Jacketed head (R only, optional on N size) and rotor bearing sleeve provide large chambers at both ends of the pumping chamber for temperature control of product in pump. These features do not alter basic steps in the disassembly and assembly of your pump.

PRESSURE RELIEF VALVES:

1. Viking pumps are positive displacement pumps and must be provided with some sort of pressure protection. This may be a relief valve mounted directly on the pump, an inline pressure relief valve, a torque limiting device or a rupture disk.
2. Relief valve options are available on these pumps. Options include plain and jacketed relief valves. N size pumps with a jacketed head are not available with a relief valve.
3. If the pump rotation is to be reversed during operation, pressure protection must be provided on **both** sides of pump.
4. Relief valve adjusting screw cap must always point towards suction side of pump. If pump rotation is reversed, remove the pressure relief valve and turn end for end. **Refer to Figure 2 below.**
5. Pressure relief valves cannot be used to control the pump flow or regulate discharge pressure.

For additional information on pressure relief valves, refer to Technical Service Manual TSM000 and Engineering Service Bulletin ESB-31.

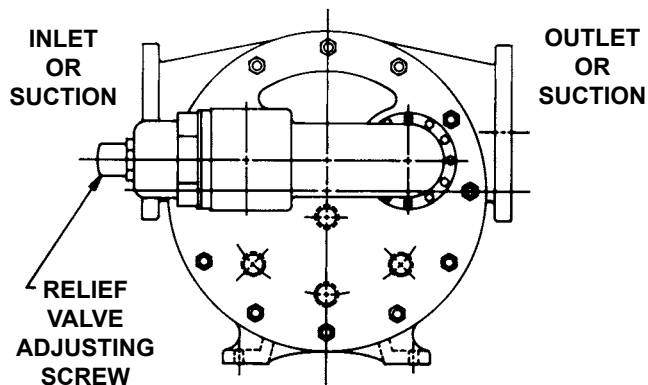


FIGURE 2

SPECIAL MECHANICAL SEALS: can be installed in a modified stuffing box.

Extra care must be taken in repair of pumps with mechanical seals. Read and follow all special information supplied with the pump.

MAINTENANCE

Series 337 and 4337 pumps are designed for long trouble free life under a wide variety of application conditions with a minimum of maintenance. The points listed below will help provide long service life.

LUBRICATION: External lubrication must be applied slowly with a handgun to all lubrication fittings every 500 hours of operation with multi-purpose grease, NLGI # 2. Do not over-grease. Applications involving very high or low temperatures will require other types of lubrication. **Refer to Engineering Service Bulletin ESB-515.** Consult factory with specific lubrication questions.

PACKING ADJUSTMENT: New packed pumps require initial packing adjustment to control leakage as packing "runs in". Make initial adjustments carefully and do not over-tighten packing gland. After initial adjustment, inspection will reveal the need for packing gland adjustment or packing replacement. **Refer to instructions under DISASSEMBLY, page 5, and Assembly, page 6,** regarding repacking the pump.

CLEANING PUMP: Keep the pump as clean as possible. This will facilitate inspection; adjustment and repair work and help prevent overlooking a dirt covered grease fitting.

STORAGE: If the pump is to be stored, or not used for six months or more, pump must be drained and a light coat of non-detergent SAE 30 weight oil must be applied to all internal pump parts. Lubricate fittings and apply grease to the pump shaft extension. Viking suggests rotating the pump shaft by hand one complete revolution every 30 days to circulate the oil.

SUGGESTED REPAIR TOOLS: The following tools must be available to properly repair Series 337 and 4337 pumps. These tools are in addition to standard mechanics' tools such as open end wrenches, pliers, screwdrivers etc. Most of the items can be obtained from an industrial supply house.

1. Soft Headed Hammer
2. Allen Wrenches (some mechanical seals and set collars)
3. Packing hooks, flexible (packed pumps)
Large for 0.375 inch and up cross section packing
4. Bearing locknut spanner wrench
(Source: #471 J.H. Williams & Co. or equal)
5. Spanner wrench (Supplied with pump)
Viking Part Number 3-810-009-631
6. Brass Bar
7. Arbor Press

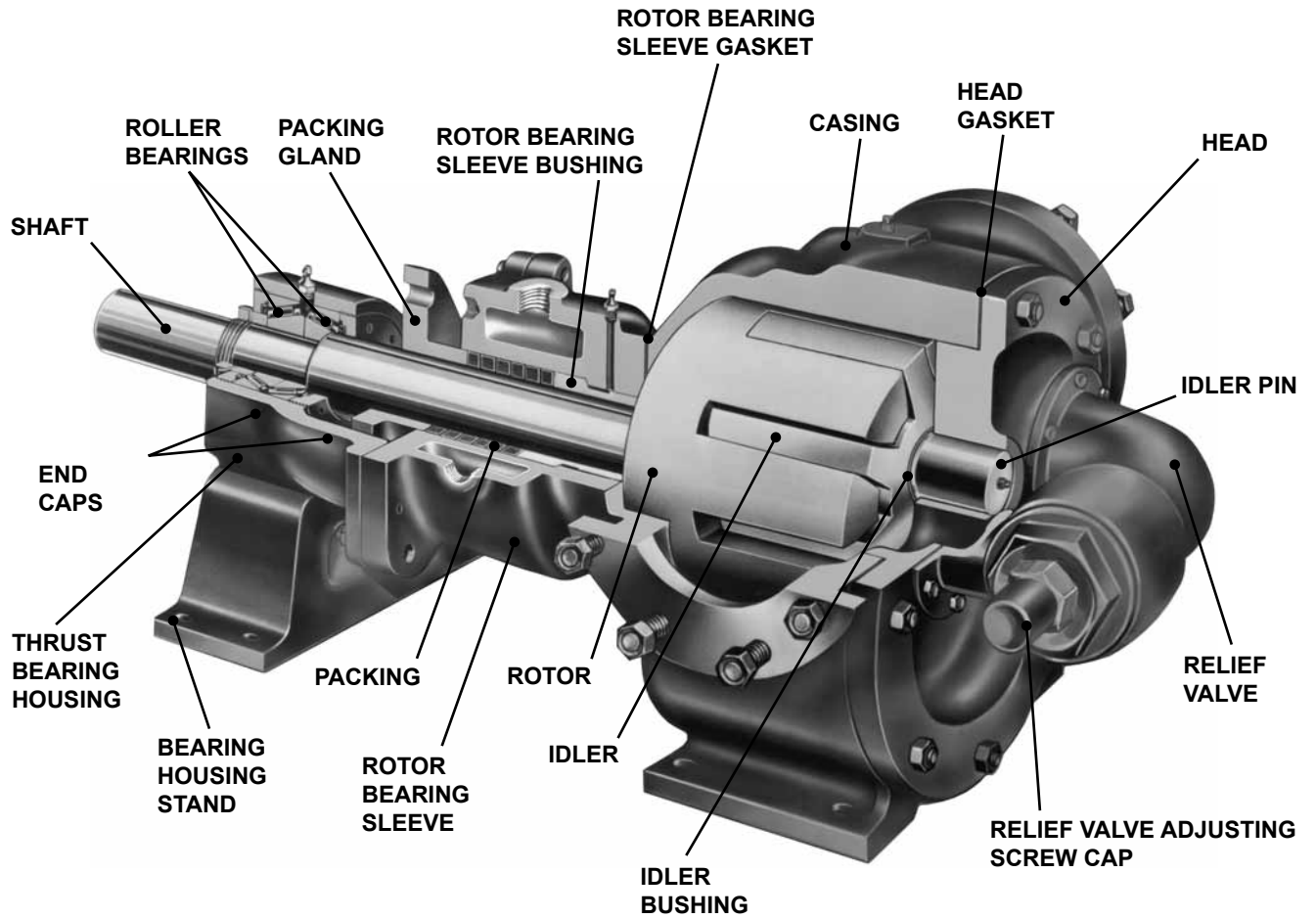


FIGURE 3
CUTAWAY FROM PACKED PUMP
MODEL N337

PACKED PUMPS

Model N and R337

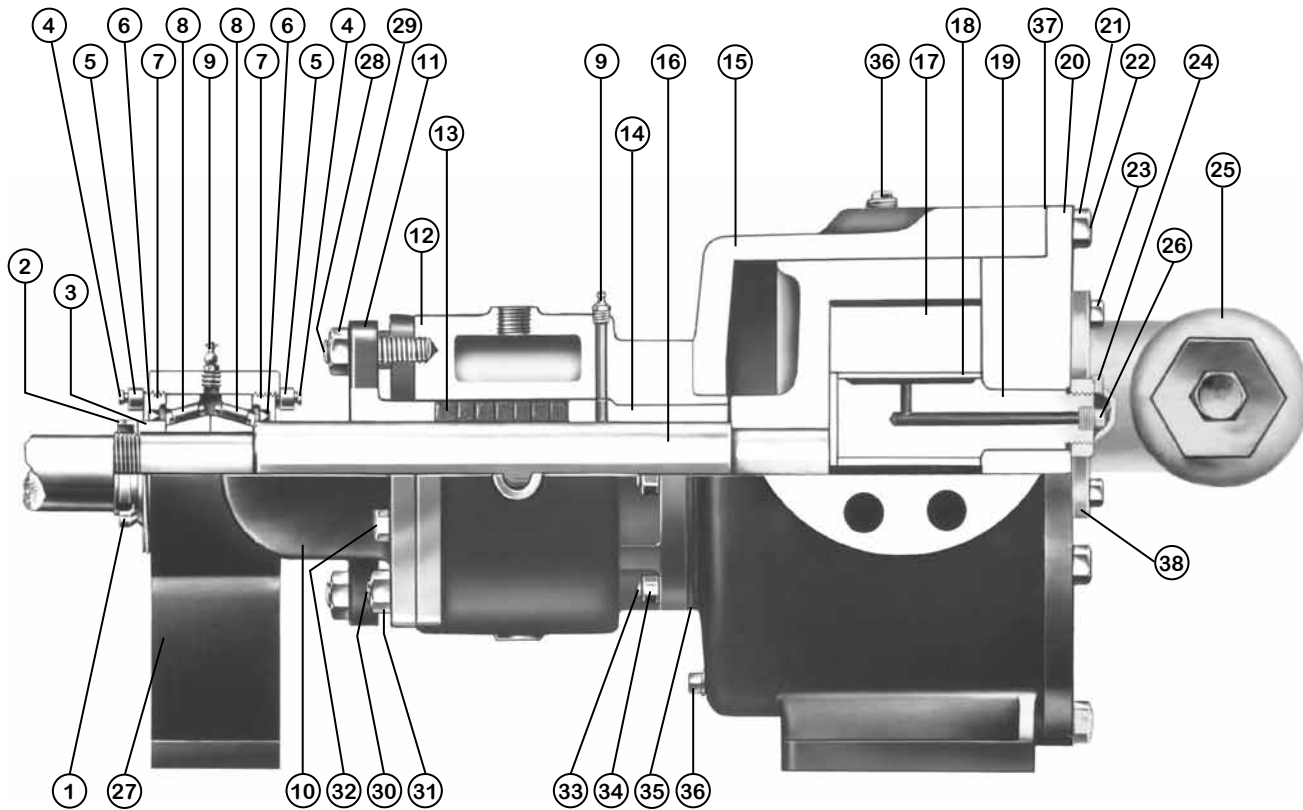


FIGURE 4
SECTIONAL VIEW MODELS N AND R337

ITEM	NAME OF PART	ITEM	NAME OF PART	ITEM	NAME OF PART
1	Locknut	14	Bushing, Rotor Bearing Sleeve	27	Bearing Housing Stand
2	Lockwasher	15	Casing	28	Packing Gland Stud
3	Bearing Spacer Collar	16	Rotor and Shaft	29	Packing Gland Nut
4	Capscrew for End Cap Lock	17	Idler and Bushing	30	Bearing Housing Stud
5	End Cap Lock	18	Idler Bushing	31	Bearing Housing Nut
6	Lip Seal	19	Idler Pin	32	Bearing Housing Capscrew
7	End Cap	20	Head and Idler Pin	33	Stud for Rotor Bearing Sleeve
8	Roller Bearing	21	Nut for Head	34	Nut for Rotor Bearing Sleeve
9	Grease Fitting	22	Stud for Head	35	Rotor Bearing Sleeve Gasket
10	Thrust Bearing Housing	23	Capscrew for Valve	36	Pipe Plug
11	Packing Gland	24	Idler Pin Nut (Not N)	37	Head Gasket
12	Rotor Bearing Sleeve & Bushing	25	Internal Relief Valve	38	Relief Valve Gasket
13	Packing	26	Pipe Plug		

DISASSEMBLY

DANGER !

Before opening any Viking pump liquid chamber (pumping chamber, reservoir, relief valve adjusting cap fitting, etc.) Be sure:

1. That any pressure in the chamber has been completely vented through the suction or discharge lines or other appropriate openings or connections.
2. That the driving means (motor, turbine, engine, etc.) has been "locked out" or made non-operational so that it cannot be started while work is being done on pump.
3. That you know what liquid the pump has been handling and the precautions necessary to safely handle the liquid. Obtain a material safety data sheet (MSDS) for the liquid to be sure these precautions are understood.

Failure to follow above listed precautionary measures may result in serious injury or death.

1. Mark the head and casing before disassembly to ensure proper reassembly. The idler pin, which is offset in pump head, must be positioned towards and equal distance between the port connections to allow for proper flow of liquid through pump.

It is not necessary to remove relief valve to take head off pump; however, removing relief valve will lessen total weight of part. Do not use chain or cable around relief valve body to support the head during removal. **For PRESSURE RELIEF VALVE INSTRUCTIONS, refer to page 14.**

Remove nuts from the head. Jackscrews should be used to back head away from casing. Refer to figure 5. Proper size and length of jackscrews for pump size are shown in figure 6. The use of a hoist to support head will facilitate its removal.

Back the head away from casing. Remove the head from pump. Do not allow the idler to fall from the idler pin. To prevent this, tilt the top of head back when removing. If a hoist is not available, cribbing or blocking can be used to support head. This will eliminate having to lift head into position when reassembling pump.

2. Remove the head gasket, idler and bushing assembly.
3. Remove the pipe plug from the drain hole in the casing, this breaks the vacuum behind rotor.
4. Remove the packing gland nuts and slide the gland out of the rotor bearing sleeve.

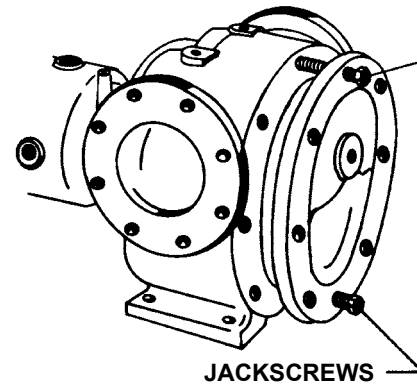
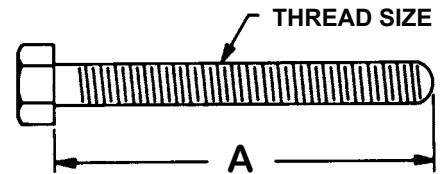


FIGURE 5



PUMP SIZE	NO. SCREWS USED	A	THREAD SIZE (INCH)
N	2	4.00	0.50" - 13 NC
R	2	4.50	0.63" - 11 NC

FIGURE 6
MINIMUM LENGTH OF JACK SCREWS

5. Insert length of hard wood or brass bar through the port opening between the rotor teeth to keep the shaft from turning.
6. Bend the tang on the lock washer up and with a spanner wrench; remove locknut and lockwasher from the shaft. **Refer to figure 7, page 6.**
7. Remove the length of hardwood or brass bar from the port opening.
8. Cushion the end of the shaft with a hardwood block or piece of block and drive the rotor out of casing, being careful to avoid damaging the rotor bearing sleeve bushing. Support the weight of rotor with a hoist. A cable sling can be used around the shaft, or around rotor teeth, to carry weight of the part.
9. Loosen the end cap lockscrews, disengage the end cap locks and with a spanner wrench remove the end caps. Remove the roller bearings.
10. Remove the nuts and capscrews and take off the thrust bearing housing. Remove the packing from the rotor bearing sleeve.
11. Check the rotor bearing sleeve bushing while the rotor bearing sleeve is mounted on the casing. If worn, the bushing must be replaced. Remove the rotor bearing sleeve from casing. A press must be used to remove the old bushing. If bushing has a shoulder on the stuffing box end, it must be pressed out from the packing end of rotor bearing sleeve. If bushing is carbon graphite, **refer to INSTALLATION OF CARBON GRAPHITE BUSHINGS, page 13.**

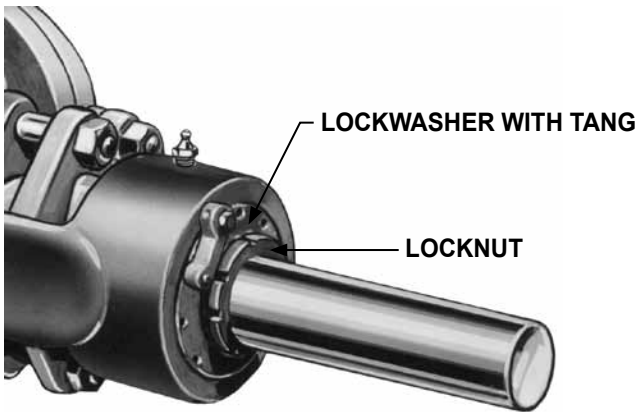


FIGURE 7

12. Clean all parts thoroughly and examine for wear and damage. Check the idler bushing and idler pin, replace if necessary.

If the idler pin is to be replaced, the oil groove must be installed facing center of the crescent on the head.

If lipseals need replacement, press in the end cap with the lip facing the end of the shaft.

If the idler bushing is to be replaced, a press must be used to remove the old bushing and install the new one. The bushing position after being pressed in should be flush with the face of the idler.

For a carbon graphite idler bushing, refer to **INSTALLATION OF CARBON GRAPHITE BUSHINGS, page 13.**

NOTE: R idler bushings are shrink fit.

Wash the anti-friction bearings (roller bearings) in clean solvent. Blow out the bearings with compressed air. Do not allow the bearings to spin; turn the bearings slowly by hand. Spinning the bearings will damage the race and rollers. Make sure the bearings are clean, then lubricate with non-detergent SAE 30 weight oil and check for roughness. Roughness can be determined by turning the outer race by hand. **CAUTION:** do not intermix inner and outer races for the roller bearings. Replace the bearings if they have roughness.

Examine the casing for wear. Check the condition of casing at seal area (surface between suction and discharge port). If the surface is in good condition, the casing need not be replaced.

When making major repairs, such as replacement of a rotor, it is usually considered advisable to install a new head and idler. When making minor repairs, where only an idler bushing and idler pin are required, other new parts are usually not necessary.

ASSEMBLY

1. Install the rotor bearing sleeve and gasket on the casing. Coat both sides of the gasket with thread sealant (pipe dope) and quickly install the gasket and rotor bearing sleeve on the casing. Place a support under rotor bearing sleeve to prevent casing and rotor bearing sleeve from tilting down while the rotor is being installed.
2. Check the casing to be sure the drain plug has been removed.
3. Carefully check the shaft, remove any burrs or rough surfaces to avoid damaging the rotor bearing sleeve bushing while installing the rotor and shaft into the casing. Coat the inner diameter of the rotor bearing sleeve bushing and shaft with a thin coat of non-detergent SAE 30 weight oil.

Support the weight of the rotor with a hoist. A cable sling can be used around the shaft, or around rotor teeth, to carry weight of the part while being assembled into the casing.

Place end of the rotor shaft through the casing, into the bushing slowly turn rotor from right to left while pushing into casing. When the shaft first protrudes from stuffing box, stop pushing. Check to see if the large diameter of the shaft has protruded far enough into rotor bearing sleeve to permit installing packing rings.

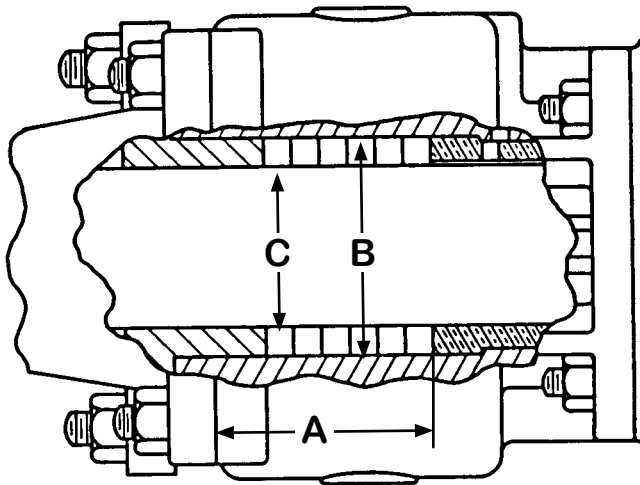
Use packing suitable for the liquid being pumped. Lubricate packing rings with oil, grease or graphite to aid assembly. Packing ring joints should be staggered from one side of shaft to the other. A length of pipe will help set each packing ring.

4. Place the packing gland and inner end cap (position spanner wrench holes on side next to packing gland) with lip seal (lip facing away from packing gland) over the end of the shaft.
5. Push the rotor far into the casing as far as it will go.
6. Prior to installing the head, coat the casing face with thread sealant (pipe dope) and place a new .015" head gasket on the mounting studs. Coat the dry side of gasket with thread sealant (pipe dope) and prepare to mount the head and idler assembly.

The pump head and casing were marked before disassembly to ensure proper reassembly. If not, be sure idler pin, which is offset in the pump head, is positioned toward and equal distance between the port connections to allow for proper flow of liquid through the pump. Place the head on the pump, slightly tilting the top of the head back away from casing until the crescent enters the inside diameter of rotor. Rotate the idler on idler pin until the idler teeth mesh with the rotor teeth. Raise head until the face of the head is parallel with face of the casing and work into position. Care must be taken to avoid damaging the head gasket. Fasten the head to casing with nuts and tighten evenly.

If relief valve was not removed from head, install on head with adjusting screw cap pointed toward such port. **Refer to Figure 2, page 2. For PRESSURE RELIEF INSTRUCTIONS, refer to page 14.**

7. Push the rotor back against the head.
8. Install the drain plug in the casing.
9. Place packing retainer washer in bottom of packing chamber and pack pump with new packing. Use packing suitable for liquid being pumped. Install packing, staggering the joints from one side of the shaft to the other. Lubricate packing rings with oil, grease or graphite to aid assembly. A length of pipe will help to seat each packing ring. **Refer to Figure 8 below.**
10. Install the thrust bearing housing on the end of rotor ring sleeve and tighten the nuts and capscrews securely. It is not necessary to use gasket between these parts.



**FIGURE 8
STUFFING BOX DIMENSIONS**

PUMP MODEL	A (INCH)	B (INCH)	C (INCH)
N337	4.63"	4.69"	3.44"
R337	4.63"	4.69"	3.44"

11. Insert both tapered roller bearings in the thrust bearing housing, large end of inner races together. It is possible to install bearings incorrectly, for proper assembly **refer to Figure 9 below.**

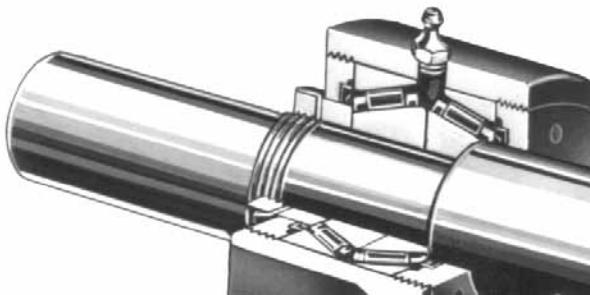


FIGURE 9

12. Install the bearing spacer collar on the shaft next to the inner race of the roller bearing.
13. Turn the inner end cap into the thrust bearing housing just far enough to hold in place.
Install the outer end cap and turn in approximately half way.
14. Insert a length of hardwood or brass bar through the port opening between the rotor teeth to keep the rotor from turning.
15. Install the lockwasher placing tang in the keyway on the shaft. Tighten the locknut to 170-190 ft – lbs. Torque. Bend one tang of lock washer into slot of locknut. If tang does not line up with slot tighten lock nut until it does. Failure to tighten locknut or engage the lock washer tang could result in early bearing failure and cause damage to rest of pump.
16. Remove the length of hardwood or brass bar from the port opening.
17. Install the nuts on the packing gland studs and tighten. Do not over tighten, as it may cause bind on rotor shaft.
18. Reinstall the suckback tubing to the casing and rotor bearing sleeve.
19. Lubricate all grease fittings with multi-purpose grease, NLGI #2.
20. Adjust the pump end clearance. **Refer to THRUST BEARING AND IDLER END CLEARANCE ADJUSTMENT, page 12.**

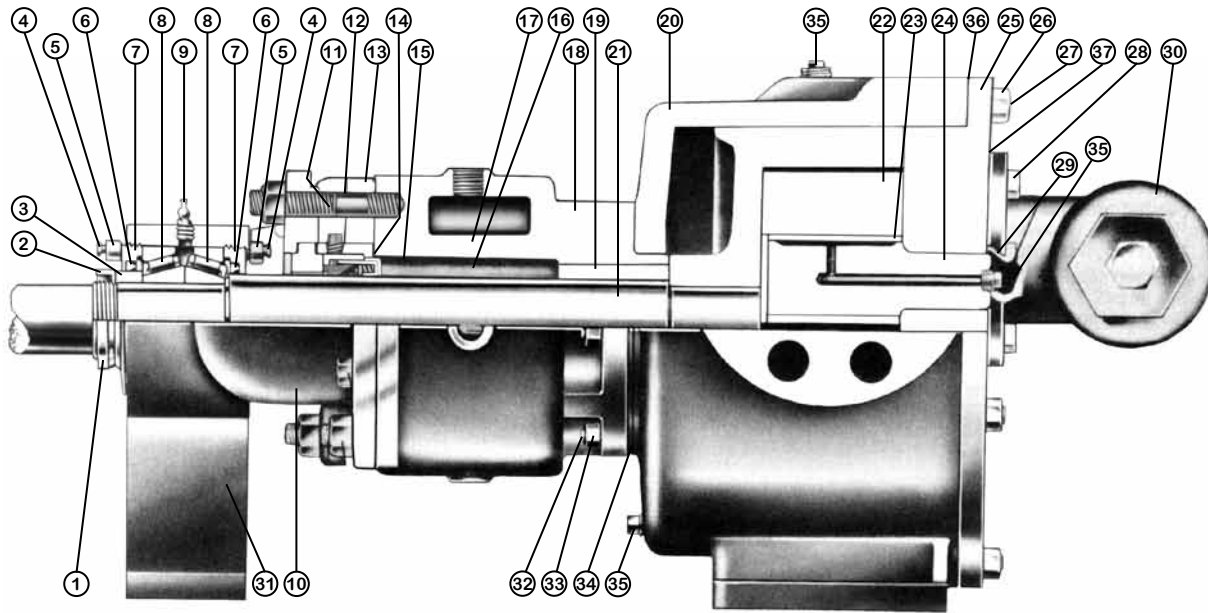
DANGER !

Before starting pump, be sure all drive equipment guards are in place.

Failure to properly mount guards may result in serious injury or death.

MECHANICAL SEAL PUMPS

Models N and R4337



SECTIONAL VIEW MODELS N AND R4337
FIGURE 10

ITEM	NAME OF PART	ITEM	NAME OF PART	ITEM	NAME OF PART
1	Locknut	15	Packing Box Extension	29	Bearing Housing Stand
2	Lockwasher	16	Mechanical Seal (Complete)	30	Stud for Rotor Bearing Stand
3	Bearing Spacer Collar	17	Rotor Bearing Sleeve	31	Nut for Rotor Bearing Sleeve
4	Capscrew for End Cap Lock	18	Bushing, Rotor Bearing Sleeve	32	Rotor Bearing Sleeve Gasket
5	End Cap Lock	19	Casing	33	Pipe Plug
6	Lip Seal	20	Rotor and Shaft	34	Head Gasket
7	End Cap	21	Idler	35	Relief Valve Gasket
8	Roller Bearing	22	Idler Bushing	36	Bearing Housing Stud
9	Grease Fitting	23	Idler Pin	37	Bearing Housing Nut
10	Thrust Bearing Housing	24	Head	38	Capscrew for Bearing Housing
11	Stud for Seal Plate	25	Nut for Head	N.I.	Pipe Flange Gasket
12	Nut for Seal Plate	26	Stud for Head	N.I.	Stud for Flanges
13	Seal Holder Plate	27	Capscrew for Valve	N.I.	Nut for Flanges
14	Gasket for Packing Box Extension	28	Internal Relief Valve (Complete)		

DISASSEMBLY

DANGER !

Before opening any Viking pump liquid chamber (pumping chamber, reservoir, relief valve adjusting cap fitting, etc.) Be sure:

1. That any pressure in the chamber has been completely vented through the suction or discharge lines or other appropriate openings or connections.
2. That the driving means (motor, turbine, engine, etc.) has been "locked out" or made non-operational so that it cannot be started while work is being done on pump.
3. That you know what liquid the pump has been handling and the precautions necessary to safely handle the liquid. Obtain a material safety data sheet (MSDS) for the liquid to be sure these precautions are understood.

Failure to follow above listed precautionary measures may result in serious injury or death.

1. Mark the head and casing before disassembly to ensure proper reassembly. The idler pin, which is offset in the pump head, must be positioned toward and equal distance between the port connections to allow for proper flow of liquid through the pump.

It is not necessary to remove the relief valve to take the head off the pump; however, removing the relief valve will lessen total weight of the part. Do not use a chain or cable around relief valve body to support head during removal. **For PRESSURE RELIEF VALVE INSTRUCTIONS, refer to page 14.**

Remove the nuts from the head. Jackscrews should be used to back the head away from the casing. **Refer to figure 11.** The proper size and length of jackscrews for the pump size are shown in **figure 12.** The use of a hoist to support head will facilitate its removal.

Back the head away from the casing. Remove head from the pump. Do not allow the idler to fall from the idler pin. To prevent this, tilt the top of head back when removing.

2. Remove the head gasket, idler and bushing assembly.
3. To remove the rotor, remove seal plate nuts from studs and remove seal plate, gaskets and stationary seat. Remove Packing box extension and gasket. Loosen set screws in mechanical seal retainer cartridge and remove from rotor shaft. **Refer to Figure 14, page 10.**
4. Remove the casing drain plug to break the vacuum between back of the rotor and the casing. Remove any deposit of material from the exposed portion of the shaft between the seal plate and the thrust bearing assembly.

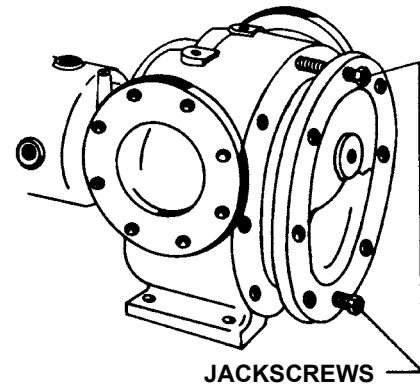
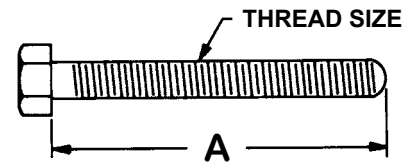


FIGURE 11



PUMP SIZE	NO. SCREWS USED	A	THREAD SIZE (INCH)
N	2	4.00	0.50" - 13 NC
R	2	4.50	0.63" - 11 NC

FIGURE 12
MINIMUM LENGTH OF JACK SCREWS

5. Insert a length of hardwood or brass through the port opening between the rotor teeth to keep the shaft from turning.
6. Bend the tang on the lockwasher up and with a spanner wrench, remove the locknut and lockwasher from the shaft. **Refer to figure 13 below.**

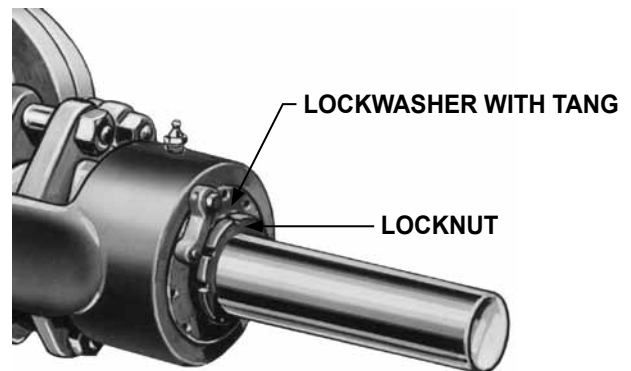


FIGURE 13

7. Remove the length of hardwood or brass bar from the port opening.
8. Cushion the end of the shaft with a hardwood block or piece of brass and drive the rotor out of the casing being careful to avoid damaging rotor bearing sleeve bushing. Support the weight of rotor with a hoist. A cable sling can be used around the shaft, or around the rotor teeth to carry the weight of the part.

9. Loosen the end cap lock screws, disengage the end cap locks and with a spanner wrench, remove the end caps. Examine the lip seal and replace if worn.

Remove the roller bearings.

10. Remove the nuts and capscrews and take off thrust bearing housing.
11. Check the rotor bearing sleeve bushing while the rotor bearing sleeve is mounted on the casing. If worn, the bushing must be replaced.

A press must be used to remove the old bushing. If the bushing has a shoulder on the stuffing box end, it must be pressed out from the mechanical seal end of the rotor bearing sleeve. Carbon graphite bushings are standard for model 4337 pumps. To replace carbon graphite bushings, refer to **INSTALLATION CARBON GRAPHITE BUSHINGS, page 13.**

12. Clean all parts thoroughly and examine for wear and damage. If lip seal replacement is needed, press in the end cap with the lip facing the end of the shaft. Check the idler bushing and idler pin, replace if necessary.

If the idler pin is to be replaced, the oil groove on the pin must be installed facing the center of the crescent on the head.

If the idler bushing is to be replaced, a press must be used to move the old bushing and install new. The bushing position after being pressed in should be flush with the face of the idler. For carbon graphite idler bushing, refer to **INSTALLATION OF CARBON GRAPHITE BUSHINGS, page 13.**

NOTE: R size idler bushings are shrink fit

13. Wash the bearing in clean solvent. Blow out bearings with compressed air. Do not allow bearings to spin; turn the bearing slowly by hand. Spinning the bearings will damage the race and rollers. Make sure the bearings are clean, then lubricate with non-detergent SAE 30 weight oil and check for roughness. Roughness can be determined by turning the outer race by hand. **CAUTION:** do not intermix the inner and outer races for the roller bearings.

14. Examine the casing for wear. Check the condition of the casing at the seal area (surface between suction and discharge ports). If the surface is in good condition, the casing need not be replaced. When making major repairs, such as replacement of a rotor, it is usually considered advisable to install a new head and idler. When making minor repairs, when only an idler bushing and idler pin are required, other new parts are usually not necessary.

15. Inspect the mechanical seal for wear or damage. Refer to figure 14 for mechanical seal list of parts. In general, if the pump has been operated long enough to exhibit other worn parts, it is likely the seal will have to be replaced. Replacing individual seal parts is not recommended, i.e., a used seal washer will not perform satisfactorily when run against a new stationary seat.

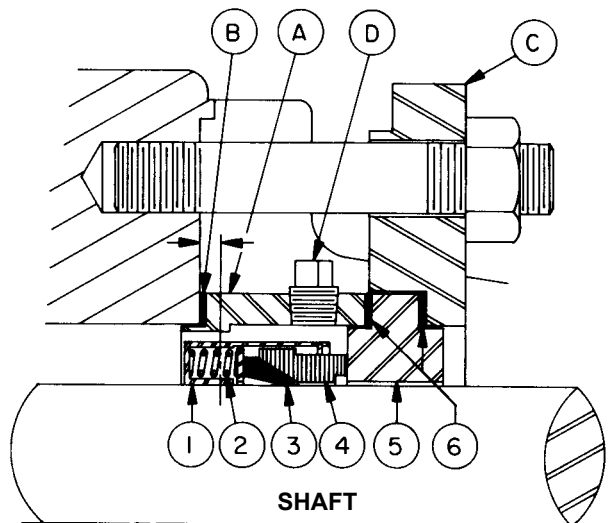


FIGURE 14

**PTFE Fitted Mechanical Seal Assembly
For Models N-R4333, 4335 & 4337**

1. Retainer Cartridge
2. Springs
3. PTFE Shaft Ring (wedge)
4. Rotating Face (washer)
5. Stationary Seal Seat
6. Seat Gaskets

Seal Mounting Parts

- A. Packing box extension
- B. Packing box extension gasket
- C. Seal plate
- D. Flush openings

**ASSEMBLY
(PTFE Fitted Type)**

Prepare all parts for reassembly ahead of time. Pack roller bearings with multi-purpose grease, NLGI # 2 and have all new gaskets on hand.

Three components are furnished in mechanical seal assembly: Refer to figure 14, item numbers 1 thru 6.

1. The rotating assembly in which a retainer cartridge encloses a spring loaded PTFE shaft ring and polished rotating face. Set screws located around the outside of the retainer cartridge are provided for securing rotating assembly to pump shaft.
2. The stationary seal seat.
3. Two seal seat gaskets.

Three pump parts necessary for mounting PTFE mechanical seal are illustrated in figure 14, item letters A, B, C and D.

1. The packing box extension has a machine pilot on the end for installation in the rotor bearing sleeve and two tapped holes for the seal flush.
2. The packing box extension gasket.
3. The seal plate is machined to accept seal seat and gasket.

Be especially careful to keep mechanical seal parts clean. Minute dirt particles especially on seal faces, will cause leakage. Never touch the seal faces with anything except clean hands or a clean cloth.

1. Deburr the threads on the rotor shaft with a fine file and place a layer of tape over the threads to protect the rotor bearing sleeve bushing during assembly. Gently radius leading edge of the largest diameter on the shaft (.03 inch is sufficient to aid in seal installation). Smooth radius with a very fine grit emery cloth. Polish the rotor shaft from leading edge through mechanical seal area with the emery cloth. Any scratches left on shaft in seal area will provide leakage paths under mechanical seal.
2. Install the rotor bearing sleeve and gasket on the casing. Coat both sides of the gasket with thread sealant (pipe dope) and quickly install the gasket and rotor bearing sleeve on the casing. Place a support under the rotor bearing sleeve to prevent the casing and rotor bearing sleeve from tilting down while the rotor is being installed.
3. Check the casing to be sure the drain plug has been removed.
4. Coat the inner diameter of the rotor bearing sleeve bushing with a thin coat of non-detergent SAE30 weight oil.

Support the weight of the rotor with a hoist. A cable sling can be used around the shaft, or around rotor teeth, to carry weight of part while being assembled into the casing.

Place the end of rotor shaft through casing into bushing. Do not allow any portion of the shaft to strike the bushing. A carbon graphite bushing can be severely damaged if struck. Slowly turn the rotor from right to left while pushing into the casing. Push the rotor as far into casing as it will go.

5. Prior to installing the head, coat the casing face with thread sealant (pipe dope) and place a new .015 inch head gasket on the mounting studs. Coat the dry side of the gasket with thread sealant (pipe dope) and prepare to mount the head and idler assembly.
6. The pump head and casing were marked before disassembly to ensure proper reassembly. If not, be sure the idler pin, which is off set in the pump head, is positioned toward and equal distance between the port connections to allow for an even flow of liquid through the pump.

NOTE: The R4337 pump has a special idler arrangement, refer to section **THRUST BEARING AND IDLER END CLEARANCE ADJUSTMENT**, page 12.

Place the head on pump, slightly tilting top of the head back away from casing until the crescent enters inside diameter of the rotor. Rotate the idler on idler pin until the idler teeth mesh with the rotor teeth. Raise the head until the face of head is parallel with the face of casing and then work into position. Care must be taken to avoid damaging the head gasket. Fasten the head to casing with head nuts and tighten evenly.

If the relief valve was removed from the head, install on head with the adjusting screw cap pointed toward suction port. Refer to figure 15. For **PRESSURE RELIEF VALVE INSTRUCTIONS**, refer to page 14.

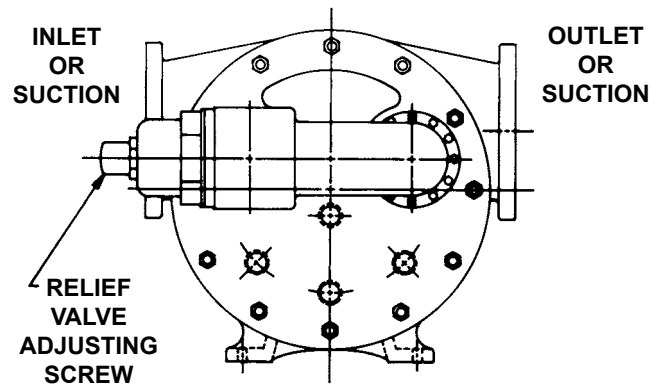


FIGURE 15

7. Push the rotor back against the head.
8. Install the drain plug in the casing.
9. Wipe the shaft clean in seal area and thoroughly coat with non-detergent SAE 30 weight oil.

Before installing parts contained in the mechanical seal, refer to figure 14, page 10 to become familiar with part name and location in packing box extension.

10. A tapered seal installation sleeve for N & R size pumps is available, at extra cost, from Viking pump Division.
11. Coat the large diameter of shaft, tapered sleeve, and inside of diameter of seal with non-detergent SAE 30 weight oil.
12. Place the tapered installation sleeve (if on hand) and install the seal on the shaft over the tapered sleeve. Position the seal on the shaft inside the rotor bearing sleeve bore with end of seal located 0.19 inch inside the machined face of the rotor bearing sleeve. Refer to Figure 14, page 10.
13. Tighten all seal drive set screws securely to the shaft.
14. Remove the tapered installation sleeve.
15. Place the gasket on the packing box extension and install the extension with machined pilot inside the rotor bearing sleeve bore.
16. Place the seat gasket over the shoulder of the stationary seal seat and insert seat into the seal plate. Place the remaining seat gasket over shoulder of polished surface of stationary seat. Refer to Figure 14, page 10.
17. Place the seal plate with the stationary seat over the mounting studs and push the shoulder of stationary seat into the packing box extension, the polished face against the carbon rotating face.
18. Install the nuts on mounting studs and against seal holder. Tighten the nuts evenly so the seal plate and stationary seat will not be distorted when seal is compressed.

19. Place inner end cap with lipseal (lip facing end of shaft) on shaft.
20. Install thrust bearing housing on end of rotor bearing sleeve and tighten nuts and capscrews securely.
21. Insert both tapered roller bearings in thrust bearing housing, large end of inner races together.
CAUTION: It is possible to install bearings incorrectly. For proper assembly, refer to figure 16 below.
22. Install bearing spacer collar on shaft next to inner race of roller bearing.
23. Turn inner end cap into thrust bearing housing just far enough to hold in place.
Install outer end cap and turn in approximately halfway.
24. Insert length of hardwood or brass bar through port opening between rotor teeth, to keep rotor from turning.
25. Install lockwasher with tang in keyway on shaft. Tighten locknut to 170-190 ft – lbs. Torque. Bend one tang of lock washer into slot of locknut. If tang does not line up with slot, tighten locknut until it does. Failure to tighten locknut or engage lockwasher tang could result in early bearing failure and cause damage to rest of pump. Bend one tang of lockwasher into slot of locknut.
26. Remove the length of hardwood or brass bar from port opening.
27. Lubricate all grease fittings with multi-purpose grease, NLGI # 2.
28. Adjust pump end clearance. **Refer to THRUST BEARING AND IDLER END CLEARANCE ADJUSTMENT.**

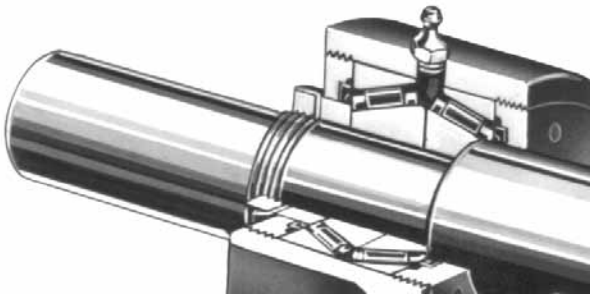


FIGURE 16

DANGER !

Before starting pump, be sure all drive equipment guards are in place.

Failure to properly mount guards may result in serious injury or death.

THRUST BEARING AND IDLER END CLEARANCE ADJUSTMENT

Use spanner wrench (provided with pump) and turn outer end cap until rotor is tight against head and rotor shaft cannot be turned.

With pencil or chalk, make reference mark on bearing housing and outer end cap. Back off outer end cap approximately 4 holes. One hole is equivalent to .005" of end clearance. Tighten inner end cap. Check rotor to determine if it turns freely in the casing. If not, make further adjustment until rotor does turn in casing.

Standard catalog pumps require the following end clearance settings; N, .015", R, .020" minimum. Pumps built for viscous liquid or high temperature service may require extra end clearance. Consult factory.

Lock both end caps securely in position with end cap locks and screws.

NOTE:

The R 4337 pump has a special idler arrangement which must have its end clearance adjusted prior to setting the rotor end clearance.

The Carbon Graphite idler bushing extends beyond the idler face on one side of the idler. This side of the idler is placed toward the head which allows the Carbon Graphite bushing to contact the head and provide clearance between the stainless steel idler face and the head. The Carbon Graphite bushing extension is 0.008 – 0.012" (**See Figure 1**).

The idler bushing has a high interference fit and must be installed by heat shrinking. The idler must be heated to 600 °F before installing the idler bushing. The idler bushing is to extend beyond the idler face 0.008 – 0.012".

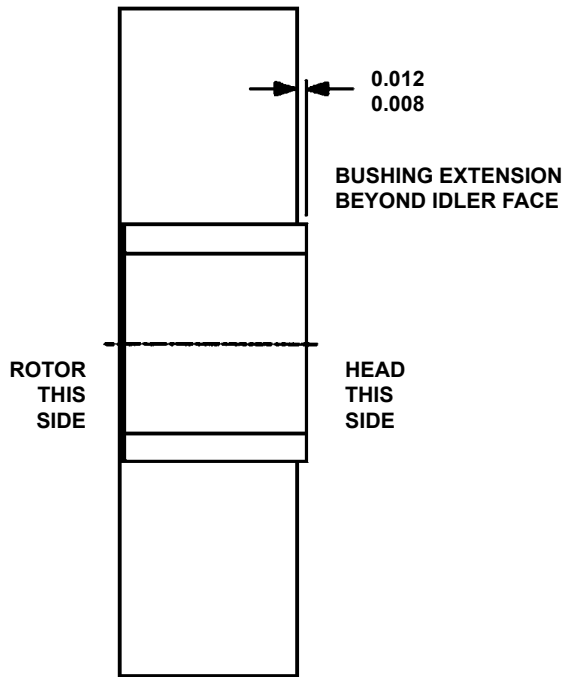


FIGURE 17 - IDLER AND BUSHING ASSEMBLY

Install the idler & bushing over the idler pin placing the side of the idler with the bushing extension against the head (**See Figure 18 below**). Place a 0.010" shim stock between the idler bushing and the head. This provides 0.010" of end clearance between the ends of the idler bushing and the mating surfaces (head and idler pin locknut). Install idler pin locknut and turn clockwise until it touches the idler bushing. Tighten the three setscrews in the face of the idler pin locknut to lock it against the idler pin. Remove the 0.010" shim stock.

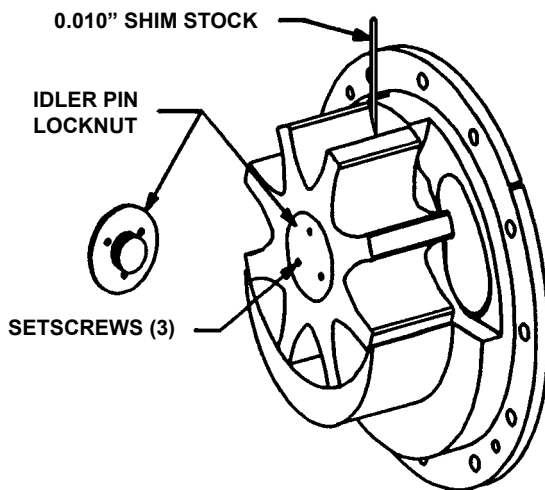


FIGURE 18

INSTALLATION OF CARBON GRAPHITE BUSHINGS

When installing carbon graphite bushings, extreme care must be taken to prevent breaking. Carbon graphite is a brittle material and easily cracked. If cracked, the bushing will quickly disintegrate. Using a lubricant and adding a chamfer on the bushing and the mating part will help with installation. The additional precautions listed below must be followed for proper installation:

1. A press must be used for installation.
2. Be certain the bushing is started straight.
3. Do not stop the pressing operation until the bushing is in the proper position; starting and stopping will result in a cracked bushing.

4. Check the bushing for cracks after installation.

Carbon graphite bushings with extra interference fits are frequently furnished for high temperature operation. These bushings must be installed by a shrink fit.

1. Heat the rotor bearing sleeve or idler to **750 °F**.
2. Install cool bushings with a press.
3. If facilities are not available to reach **750 °F** temperature, it is possible to install with **450 °F** temperature; however, the lower the temperature, the greater the possibility of cracking the bushing.

Consult factory with specific questions on high temperature applications. **Refer to Engineering Service Bulletin ESB-3.**

PRESSURE RELIEF VALVE INSTRUCTIONS

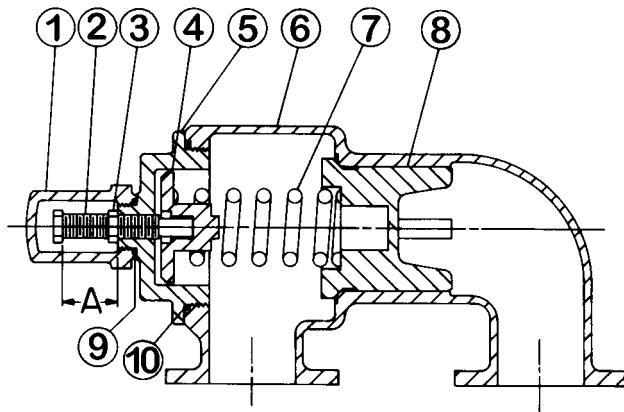


FIGURE 19
Sizes N and R

LIST OF PARTS

- | | |
|--------------------|-----------------|
| 1. Valve Cap | 6. Valve Body |
| 2. Adjusting Screw | 7. Valve Spring |
| 3. Lock Nut | 8. Poppet |
| 4. Spring Guide | 9. Cap Gasket |
| 5. Bonnet | 10. Bonnet |

DISASSEMBLY

DANGER !

Before opening any Viking pump liquid chamber (pumping chamber, reservoir, relief valve adjusting cap fitting, etc.) Be sure:

1. That any pressure in the chamber has been completely vented through the suction or discharge lines or other appropriate openings or connections.
2. That the driving means (motor, turbine, engine, etc.) has been "locked out" or made non-operational so that it cannot be started while work is being done on pump.
3. That you know what liquid the pump has been handling and the precautions necessary to safely handle the liquid. Obtain a material safety data sheet (MSDS) for the liquid to be sure these precautions are understood.

Failure to follow above listed precautionary measures may result in serious injury or death.

Mark valve and head before disassembly to ensure proper reassembly.

1. Remove the valve cap.
2. Measure and record the length of extension of adjusting screw. Refer to "A" on Figure 19.
3. Loosen the locknut and back out the adjusting screw until the spring pressure is being released.
4. Remove the bonnet, spring guide, spring and poppet from the valve body. Clean and inspect all parts for wear and damage and replace as necessary.

ASSEMBLY

Reverse the procedures outlined under **DISASSEMBLY**. If the valve is removed for repairs, be sure to replace in the same position. The relief valve adjusting screw cap must **always** point towards suction side of the pump. If pump rotation is reversed, remove the relief valve and turn end for end. Refer to Figure 20 below.

DANGER !

Before starting pump, be sure all drive equipment guards are in place.

Failure to properly mount guards may result in serious injury or death.

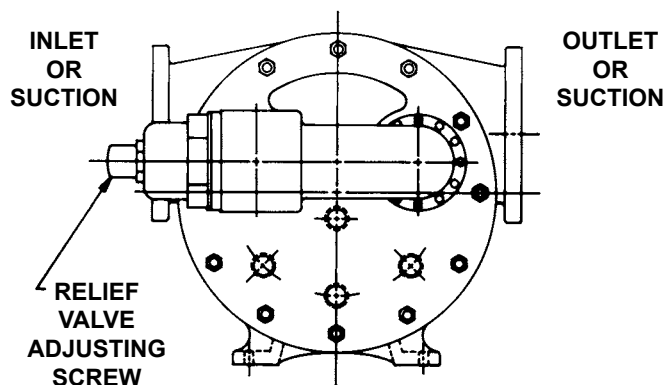


FIGURE 20



TECHNICAL SERVICE MANUAL

STAINLESS STEEL HEAVY-DUTY PUMPS

SERIES 337 AND 4337

SIZES N AND R

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PRESSURE ADJUSTMENT

If a new spring is installed or if the pressure setting of the pressure relief valve is to be changed from that which the factory has set, the following instructions must be carefully followed.

1. Carefully remove the valve cap which covers the adjusting screw.
Loosen the locknut which locks adjusting screw so the pressure setting will not change during operation of pump.
2. Install a pressure gauge in discharge line for actual adjustment operation.
3. Turn adjusting screw in to increase pressure and out to decrease pressure.
4. With discharge line closed at a point beyond pressure gauge, gauge will show maximum pressure valve will allow while pump is in operation.

IMPORTANT

In ordering parts for pressure relief valve, always give model number and serial number of pump as it appears on nameplate and name of part wanted. When ordering springs, be sure to give pressure setting desired.



WARRANTY

Viking warrants all products manufactured by it to be free from defects in workmanship or material for a period of one (1) year from date of startup, provided that in no event shall this warranty extend more than eighteen (18) months from the date of shipment from Viking. The warranty period for Universal Seal series pumps ONLY (Universal Seal models listed below) is three (3) years from date of startup, provided that in no event shall this warranty extend more than forty-two (42) months from the date of shipment from Viking.

UNDER NO CIRCUMSTANCES SHALL VIKING BE LIABLE UNDER THIS WARRANTY OR OTHERWISE FOR SPECIAL, INCIDENTAL, INDIRECT, CONSEQUENTIAL OR PUNITIVE DAMAGES OF ANY KIND, INCLUDING, BUT NOT LIMITED TO, LOST OR UNREALIZED SALES, REVENUES, PROFITS, INCOME, COST SAVINGS OR BUSINESS, LOST OR UNREALIZED CONTRACTS, LOSS OF GOODWILL, DAMAGE TO REPUTATION, LOSS OF PROPERTY, LOSS OF INFORMATION OR DATA, LOSS OF PRODUCTION, DOWNTIME, OR INCREASED COSTS, IN CONNECTION WITH ANY PRODUCT, EVEN IF VIKING HAS BEEN ADVISED OR PLACED ON NOTICE OF THE POSSIBILITY OF SUCH DAMAGES AND NOTWITHSTANDING THE FAILURE OF ANY ESSENTIAL PURPOSE OF ANY PRODUCT.

THIS WARRANTY IS AND SHALL BE VIKING'S SOLE AND EXCLUSIVE WARRANTY AND SHALL BE IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ALL WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NON-INFRINGEMENT ALL OF WHICH OTHER WARRANTIES ARE EXPRESSLY EXCLUDED.

See complete warranty at www.vikingpump.com.

