NDS Home Page

NDS Drilling Supply, Inc.
26041 Newton Circle
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55020

SERVICE MANUAL

"L6" DRIVE END

(FRAME SIZES 1L6, 2L6, 3L6, 3M4, 6M4, 3P3, 6P3, 9P3)

1-1. INTRODUCTION

1-2. GENERAL

The Robbins & Myers Moyno® Pump is one of the most versatile pumps available. It has been proven in thousands of applications over the past 45 years. It is backed by the experience gained over these years, both in application and manufacturing know-how.

The Moyno® Pump is a progressing cavity pump. The pumping action is created by a single helical rotor rolling eccentrically in the double threaded helix of the stator. In its revolution, the rotor forms in conjunction with the stator a series of sealed cavities 180 degrees apart. As the rotor turns, the cavities progress from the suction to the discharge. As one cavity diminishes, the opposing cavity is increasing at exactly the same rate. Thus the sum of the two discharges is a constant volume. The result is a pulsation-less positive displacement flow with no valves.

1-3. NAMEPLATE DATA

The pump nameplate, located on the bearing housing, carries the Serial Number, Frame Size, Type Designation, and Trim Code. All are extremely important and must be used when ordering spare parts.

Record the nameplate data of your pump in the spaces provided at paragraph 4-33.

1-4. Frame Size. The pump frame designation is essentially an indication of size. It consists of a number, a letter, and a number (i.e. 2L6). The first number indicates the number of stages in the pumping elements. The letter indicates the model. The final number indicates the size of the rotor-stator pumping elements. A frame 2L6 pump, therefore, has two stages of size-6 pumping elements.

The "L" in the frame size indicates a standard relationship between the housing, bearings, and drive shaft, and the size of the pumping elements. Many variations may be made by adapting smaller element sizes to a larger drive end size. This may be necessary due to the severity of a specific pumping application. In cases where the drive end (housing, bearings, and drive shaft) is one size larger than the element size normally used, the pump is referred to as an "M" frame pump (i.e. 3M4). If the drive end is two sizes larger than the element size, the pump is referred to as a "P" frame. Thus, a frame 3L6, 3M4, and 3P3 would all use a common drive end.

1-5. Type Designation is a series of letters which identify the "Materials of Construction" in component groups of parts. The usual type designation will consist of three letters (i.e. CDQ).

The first letter identifies the material of the suction housing casting or the body casting where the bearing housing is a part of the suction housing.

The second letter indicates the material used in the drive shaft, pins, connecting rod, rotor, and other minor metallic parts in contact with the material being pumped.

The third letter determines the material of the stator. It identifies only the stator material and not that of the tube in which the stator is placed. The tube is either carbon steel or stainless steel, depending on Type Designation.

A typical type designation such as CDQ would result in the following:

C = Cast Iron Suction Housing
D = Tool Steel Internals including drive shaft, pins, connecting rod, rotor and other minor metallic parts in contact with the material being pumped.
Q = Buna N Synthetic Rubber Stator (70 durometer)

The following letters identify some of the actual materials that are used in standard construction:

B = EPDM	Q = Buna N (70 durometer)
C = Cast Iron	R = Natural Rubber (55 durometer)
D = Tool Steel	S = Stainless Steel, type #316
F = Viton	T = Teflon (glass impregnated)
G = Stainless Steel, type #416	

1-6. Trim Code. Also included on the nameplate is the three-character trim code designation. This only appears on pumps which have semi-standard or special construction. The first letter identifies sealing variations, the second character identifies internal variations, and the third letter identifies rotor variations.

1-7. Variations of Standard Parts. Refer to paragraphs 4-34 thru 4-36 for variations available for modifying pumps to meet specialized pumping conditions. If the trim code of your pump is other than "AAA", contact your nearest Moyno® representative for clarification. Do not use any variation unless you have determined that it is compatible with your application.

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2-1. INSTALLATION

2-2. GENERAL

Moyno® pumps are lubricated and tested at the factory prior to shipment and require minimum pre-start up maintenance.

Accessibility to the pump and adequate clearance should be a prime consideration in any installation. Enough space should surround the unit so that maintenance can be carried out with ease.

2-3. PIPING

2-4. Suction piping should be as short as possible. Normally, the suction line should be the same size as the pump suction; however, conditions, such as high viscosity or required minimum flow velocities, may dictate otherwise. Long-sweep 90 degree elbows or 45 degree elbows should be used instead of the standard elbow. Suction piping loops which trap air should be avoided.

2-5. Discharge piping diameter should generally be as large as the pump ports unless fluids conditions indicate otherwise.

An easily removable section of piping between 1-2 times longer than the stator should be mated to the discharge port. This will allow the rotor and stator to be removed without having to remove the complete pump from the base.

2-6. FOUNDATION

For maximum pump-driver unit life, each unit should be mounted on a strong, fabricated-steel base plate which can be ordered from Robbins & Myers. The base plates should be mounted on a concrete foundation built on a solid base. The foundation should be approximately 4″ to 8″ longer and wider than the base for which it is built. See figure 2-1. Anchor bolts for the base plate should be located in the foundation.

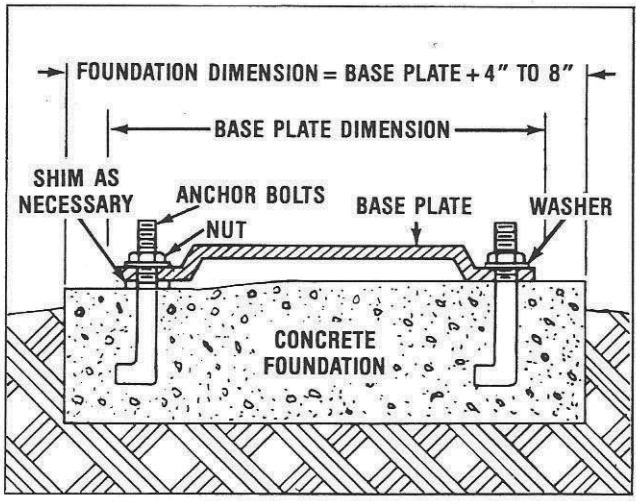

Figure 2-1. Typical Foundation Example

Check the base plate surface with a carpenter's level and place shims under the base plate at the places necessary to make it level. Then check the pump and driver shafts and the pump ports. Complete base mounted units supplied by Robbins & Myers including pump and driver are leveled with respect to the base at the factory. Shifting may occur during shipment. The pump and driver should be realigned. Care should be exercised to ensure that all components are level and mounted in a direct line.

For maximum rigidity and lower noise levels the base plate should be grouted to the foundation after the anchor bolts have been evenly tightened. A good grade of non-shrink grout is recommended. The spaces between the base plate and the foundation around the shims and inside the bushings for the anchor bolts should also be filled with grout. Allow the grout to dry according to manufacturer's instructions, then fully tighten the anchor bolts.

2-7. SHAFT ALIGNMENT

Although the base mounted units supplied by Robbins & Myers are leveled with respect to the base before shipping, most of the larger pump and driver units are shipped with the flexible coupling disconnected.

After the base has been bolted down to the foundation, check the following conditions:

2-8. On coupling connected units, be sure that the pump and driver shafts are realigned before the coupling is connected. Care should be exercised to ensure that all components are level and mounted in a direct line.

Check gap between coupling halves (refer to coupling manufacturers recommendations). Adjustment can usually be accomplished by loosening the mounting bolts on either the pump or driver and moving the loosened component into alignment with the fixed component. Do not use a hammer! On couplings with equal diameter hubs, it may be helpful to lay a straight edge axially across the coupling halves to check alignment.

2-9. On belt drive units, check to ensure that sheaves or sprockets are in alignment. Check belts for proper tension. Tension requirements will vary with type of belt, center distances, and belt speeds. Consult belt manufacturer for specific recommendation.

2-10. WATER FLUSH OF PACKING

The packing may be either grease lubricated through a grease fitting in the stuffing box or have plumbing connected to the housing to allow a water flush.

When the material being pumped is abrasive in nature, it may be advantageous to flush the packing to prevent leakage under packing and excessive shaft wear.

Clean water can be injected through a 1/8″ NPT tapped hole that normally houses the grease fitting for lubricating the packing. The water can be permitted to leak axially along the shaft in either direction or can be removed from the second tapped hole in the stuffing box. In both cases, the discharge from the stuffing box should be throttled slightly to maintain 10-15 PSI higher pressure in the stuffing box than is present in the suction housing. See figure 2-2.

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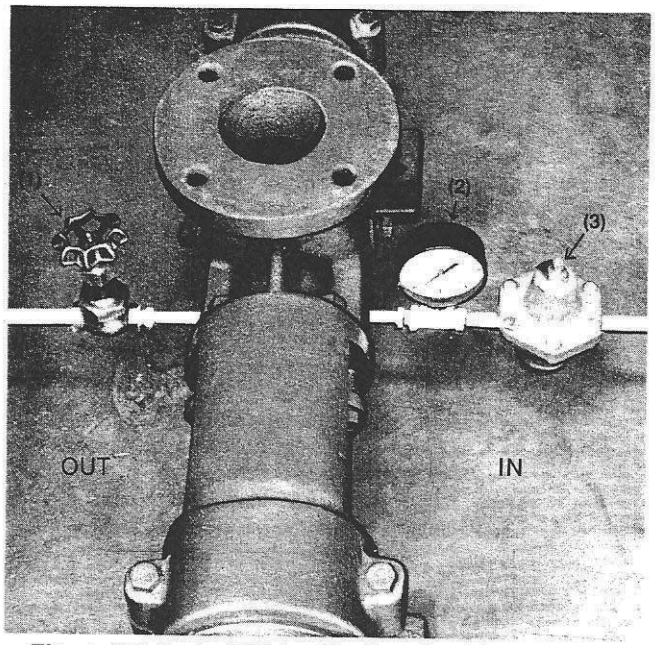

Figure 2-2. Typical Water Flush to Packing includes a (1) Throttling Valve, (2) Pressure Gauge, and (3) Pressure Regulating Valve. This is a basic arrangement; other variations can be used.

3-1. OPERATION

3-2. INITIAL CHECK

Before putting the pump into operation, the following items should be checked to ensure that each piece of equipment is installed correctly:

- — Pump, driver, coupling or sheave alignment.
- — Electrical connections.
- — Gauges and other instruments.
- — Water flush connection to the stuffing box.
- — Pump rotation. Normal rotation is indicated on the pump drive end.
- — Belt tension on belt driven units. There should be no appreciable deflection when first starting up.
- — All valves should be open on both suction and discharge sides of pump.

CAUTION: This is a positive displacement pump. Do not operate it against a closed valve.

3-3. START-UP

CAUTION: DRY OPERATION IS HARMFUL TO THE PUMP! Never allow the pump to operate without liquid, as dry operation will cause premature wear of the stator and possible damage. The stator is lubricated by the liquid which is pumped.

1. Before operating the pump for the first time, fill it with liquid (the pipe plug tap on the suction housing may be used for filling). If the liquid to be pumped is highly viscous, dilute it before filling the pump. The liquid fill-up will lubricate the stator for the initial start-up.

Note: If the pump is shut down temporarily, enough liquid will remain in the system to provide lubrication upon restarting. It is advisable to maintain the suction piping at a higher elevation than the centerline of the pump in order to contain some liquid in the pump at time of shutdown.

2. Once the pump has been filled with liquid, check for direction of pump rotation by momentarily starting and stopping the drive. See pump drive end for correct rotation.

3. In suction lift applications, when water flush is not utilized, replace the zerk fitting at the stuffing box (in suction housing) with a pipe plug. This will prevent loss of prime due to air leakage.

4. If applicable, turn on the seal water to packing.

5. Start pump.

3-4. PACKING LEAKAGE

The packed stuffing box is designed to control leakage, not to stop it completely. Leakage is necessary to reduce friction and to dissipate heat.

1. Upon initial start up of the pump, be sure that the packing gland nuts are only finger-tight and evenly adjusted. See figure 3-1.

2. Adjust the gland nuts for a leakage rate of 50-100 drops per minute until the packing has seated and adjusted to the operating temperature (approximately 10-15 minutes).

3. If excessive leakage is present after 15 minutes of operation, tighten the gland nuts 1/6 of a turn.

4. Tighten the gland nuts 1/6 of a turn after an additional 15 minutes if necessary, and repeat until desired leakage of 1-2 drops per minute is obtained.

CAUTION: Do not tighten until zero leakage is obtained. Over-tightening of the packing gland may result in accelerated wear on the packing and damage to the shaft.

5. When new packing is placed in the stuffing box, often all but one ring will fit, until pump operation compacts them. In such cases, a single packing ring is included in a small bag attached to the packing gland nut. After the pump has run, and the packing has compressed, the final packing ring can be added.

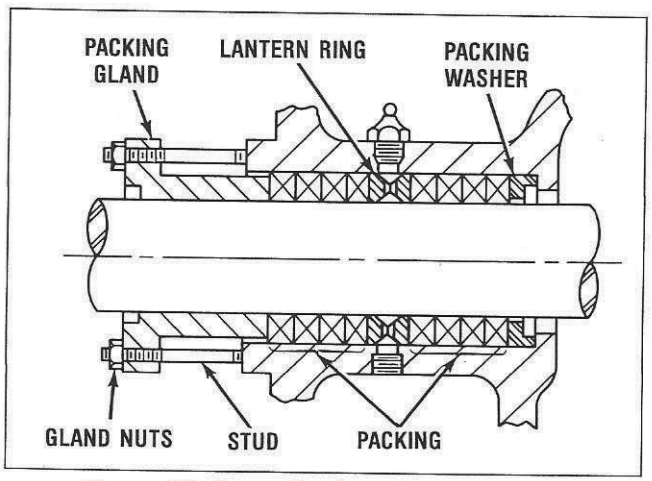

Figure 3-1. Cross Section of Stuffing Box

4-1. MAINTENANCE

4-2. GENERAL

The Moyno pump has been designed for a minimum of maintenance, the extent of which is routine lubrication and adjustment of packing, and infrequent lubrication of the bearings. The pump is one of the easiest to work on in that the main elements are very accessible and require few tools to disassemble.

4-3. PACKING LUBRICATION

The zerk fitting on the side of the suction housing leads to the lantern ring halves in the mid-section of the packings. At least once a week, inject a small quantity of good quality grease, such as Mobil Temp Grease (Mobil Chemical Co.), or equivalent, into the zerk fitting to lubricate the packings.

4-4. PACKING ADJUSTMENT

Packing gland attaching nuts should be evenly adjusted so they are little more than finger tight. Overtightening of the packing gland may result in premature packing failure and possible damage to the shaft and gland.

When the packing is new, frequent minor adjustments are recommended for the first few hours of operation in order to compress and seat the packing.

When leakage can no longer be regulated by tightening the gland nuts, remove and replace the packings in accordance with the DISASSEMBLY and REASSEMBLY instructions. The entire pump need not be disassembled to replace the packings. Briefly, replace as follows:

1. Remove gland nuts, and slide gland along drive shaft.

2. Use a packing puller tool to remove four packing rings, lantern ring halves, and four additional packing rings.

3. Inspect surface of drive shaft for excessive wear or grooves due to packing rub. If shaft is worn, disassemble pump drive to replace drive shaft.

4. If drive shaft is not worn, install four packing rings, the lantern ring halves, and four more packing rings. Be sure to stagger the packing ring joints at 90° increments.

5. When installing the new packing, it may be found that all but one ring will go on the drive shaft. When the pump has run for a short time and the new packing is compressed, this final ring can be installed.

CAUTION: Always use a proper packing tamper tool to install packings. Do not use a pointed or sharp tool, as damage to the packing material or drive shaft could result. To assure proper shaft lubrication, never use a one-piece spiral wrap packing.

4-5. BEARING LUBRICATION

The bearings are lubricated at the factory and do not need additional lubrication for at least 15,000 hours of normal operation.

1. Remove the drive shaft and bearing assembly in accordance with the DISASSEMBLY instructions.

2. Clean bearings and shaft assembly to remove all old grease.

3. Use a good grade of EP (Extreme Pressure) Lithium soap-base grease such as Mobilux EP2 Grease (Mobil Chemical Co.), or equivalent, to lubricate bearings.

4. Reassemble in accordance with the REASSEMBLY instructions.

Note: It is normal for bearings to run warm to the touch for the first few hours of operation.

4-6. DISASSEMBLY

4-7. Disconnect Pump.

1. Disconnect the power source.

2. Close the suction and discharge valves to isolate the pump from the line.

3. Turn off flush water to packing if used.

4. Remove drain plug in bottom of suction housing to drain away any fluid remaining in pump.

5. Place a support block under suction housing in area of drain plug. Wooden blocks are sufficient. The purpose is to prevent undue stress on pump support when pump is disassembled.

6. Disconnect piping from stator end of pump.

4-8. Stator Removal.

1. With pipe wrench or strap wrench, remove discharge reducer (31).

2. Remove cap of stator support (30).

Note: On most "M" and "P" frame pumps, a two-piece bushing (28) will be installed around stator (27) at support (30). On the 3P3 frame pump, a second two-piece bushing (29) is used.

3. With strap wrench or pipe wrench, unscrew stator (27) from suction housing. Pull stator off the rotor.

4-9. Rotor Removal.

1. At shaft collar (12), remove two retaining screws (10).

2. Use a small punch or drift pin to drive pin (13) from shaft (8).

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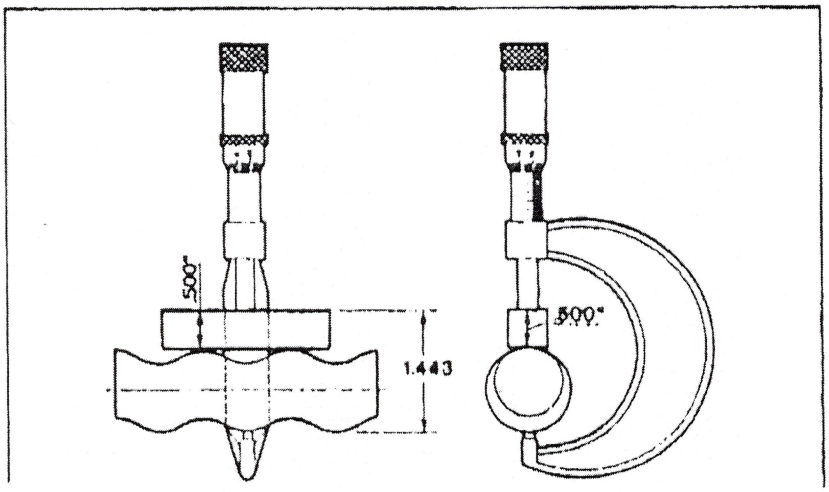
Pump Size	Diameter (in Inches)	Replating (in Inches)
1	0.78	0.73
2	0.943	0.893
3	1.415	1.365
4	1.888	1.838
6	2.281	2.231
8	3.139	3.089
10	3.745	3.695
10H	3.745	3.695
12	4.725	4.675
12H	4.725	4.675
66	4.385	4.335
14	6.062	6.012
20	5.551	5.501
23	5.8	5.75
E	2.676	2.626
F	3.425	3.375
G	4.015	3.965
H	4.906	4.858
J	5.709	5.659
K	6.635	6.585



3. Slide shaft collar (12) toward packing gland (14) and remove a washer (11) from each side of shaft (8).

4. Pull rotor and connecting rod unit (22 thru 26) from pump.

4-10. Rotor Disassembly.

1. Use a vise to clamp the mid-section of connecting rod (23).

2. Use a drift pin to carefully drive pin retainer (24) from end of rotor (26).

3. Remove rotor pin (25), and separate connecting rod (23) from rotor (26).

4. If present, remove washers (22).

5. On most "M" and "P" frame pumps, a detachable rotor head (33) is present. Drive off the second pin retainer (24) to remove head pin (32).

6. On 9P3 frame pumps, remove O-ring (34).

4-11. Packing Removal.

1. Remove two nuts (D) and packing gland (14).

2. If packing is to be removed without further disassembly of pump, use a packing puller tool to remove packing (15).

3. Carefully work out lantern ring halves (16).

Note: If pump is to be disassembled, remove packings **AFTER** removal of the suction from the bearing housing assembly. Refer to paragraph 4-12, step 5.

4-12. Drive Shaft and Bearing Removal.

1. Remove stator and rotor per paragraphs 4-8 and 4-9.

2. Remove two nuts (D) and packing gland (14).

3. Remove four screws and lock washers (A). Pull cover plate (2) from drive shaft.

4. Insert a bar or rod into the hollow end of drive shaft (8), and tap the rod to force the shaft unit (3 thru 8) out of the pump.

5. If the packing was not previously removed, use a small rod through stator port of suction housing (20) to tap on packing washer (17). Carefully drive packings (15), lantern ring halves (16), and packing washer (17) out of suction housing (20).

6. To disassemble drive shaft and bearing unit, remove nut (3) and washer (4). Use an arbor press on inner race of radial bearing (7) to press radial bearing (7), spacer (6), and thrust bearing (5) from shaft.

Note: If replacing drive shaft or bearings, it is recommended that both grease seals (1 and 9) also be replaced.

7. Drive seal (1) out of plate (2). Drive seal (9) out of bearing housing (19).

4-13. CLEANING

Clean all parts in a suitable cleaning solvent. Be sure to clean stuffing box cavity in suction housing (20).

4-14. INSPECTION

4-15. Bearings. After cleaning, rotate bearings very slowly under hand pressure to feel for smooth and even action. Never spin a dry bearing. Check for cracks, galling, pitting, burrs, etc. Replace bearing if there is any doubt concerning complete serviceability.

4-16. Drive Shaft. Inspect drive shaft for scoring, burrs, cracks, damaged threads, etc. Replace as necessary.

4-17. Seals. It is sound practice to always replace seals whenever bearings and drive shaft are removed.

4-18. Packing. It is sound practice to always replace packing whenever the pump drive end is disassembled. However, examine old packings as an indication of operating conditions.

4-19. Rotor.

1. To check for excessive rotor wear, measure the rotor crest-to-crest diameter and compare with the following chart:

Frame Size	Standard Crest-to-Crest Dia. (in.)
L6	2.281 ± 0.003
M4	1.888 ± 0.003
P3	1.415 ± 0.003

2. If the measured crest-to-crest diameter is within 0.010″ of the standard value, the rotor is re-usable.

3. Rotors with crest-to-crest diameters of 0.011 to 0.050 inch under the standard value should be replaced. These rotors can be renewed by chrome plating to standard dimensions provided that:

a. the rotor pin holes are not excessively worn.

b. the rotor surface is not cracked, pitted or deeply grooved (1/32″ or more).

c. the base metal surface is not pitted or corroded.

4. Rotors may be sent to Robbins & Myers or any other competent plating shop. Surface should be buffed, re-plated to standard dimensions, then polished.

4-20. Stator. A stator is worn and in need of replacement if its surface is pitted and gouged. However, even a smooth surface may be worn. Performance is the best measure of rotor to stator fit. Suspected stator wear can be evaluated by a Robbins & Myers' sales or factory representative.

4-21. All Other Parts. Check for cracks, excessive wear, damage to threaded holes, burrs, etc. Replace as necessary. Replace O-ring (34) at each disassembly.

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4-22. ASSEMBLY

4-23. Grease Seals.

1. Use an arbor press to install grease seal (1) in cover plate (2). Be sure lip of seal is directed toward interior of cover plate (pump interior).
2. Use an arbor press to install grease seal (9) in bearing housing (19) so that lip of seal is directed toward bearing cavity.

3. Apply a few drops of oil to ID of seals just before further assembly.

4-24. Drive Shaft, Bearings, and Packing.

1. Use an arbor press to install radial bearing (7), spacer (6), and thrust bearing (5) on drive shaft (8). Press only on inner race of bearings. Be sure radial bearing (7) is seated on shaft shoulder.

2. Install lock washer (4) and nut (3), and tighten nut securely. Bend one tab of lock washer against flat of nut.

3. Lubricate bearings per paragraph 4-5.

4. Carefully and slowly insert hollow end of drive shaft (8) through seal (9) in bearing housing (19). As the shaft emerges from the seal, slip the following parts, in order, over the shaft:

a. Shaft collar (12).

b. Packing gland (14).

Note: If the packing set consists of hard foil rings and soft asbestos plastic rings, install the rings alternately; first a hard, then a soft, etc.

c. Four or three packing rings (15) with their joints staggered 90° on adjacent rings.

Note: When installing new packing, it may be found that all but one ring will go on the drive shaft. When the pump has run for a short time and the new packing is compressed, this final ring can be installed. Remember, for proper lubrication, FOUR rings must ALWAYS be installed between washer (17) and lantern ring halves (16).

d. Two lantern ring halves (16) with their flat faces against the packing.

e. Four packing rings (15) with joints staggered 90°.

f. Packing washer (17) with its flat face against packing.

5. Push drive shaft through suction housing (20). Carefully install cover plate assembly (1,2), and attach with four screws and lock washers (A). Tighten screws evenly and alternately.

6. Push packing (15) and packing gland (14) into stuffing box of suction housing (20). Attach gland to studs (F) with two nuts (D) finger tight. Final gland adjustment should be done during the next start up.

4-25. Rotor.

1. Slip connecting rod (23) and one washer (22) (if used) into rotor (26). Align pin holes, and install pin (25). Press retainer (24) over end of rotor (26) to secure pin (25).

2. On "M" and "P" frame pumps, attach rotor to rotor head (33) with pin (32). Secure pin (32) with retainer (24).

Note: On 9P3 frame pumps, install O-ring (34).

3. Insert connecting rod (23) with washer (22) (if used) into hollow drive shaft (8). Align hole in end of rod (23) with hole in shaft (8) and hole in collar (12).

4. Insert shaft pin (13) through collar, shaft, and rod. Retain with a washer (11) and retaining screw (10) on each end of shaft pin (13).

Note: Be sure that the hollow end of retaining screw (10) fits over end of shaft pin (13) to ensure a tight fit. Retaining screws must seat on washers (11) and **not** on pin (13).

4-26. Stator.

1. If the stator (27) has a stainless steel tube, apply Teflon™ tape or a similar sealing material to its threads. If the stator has a carbon steel sleeve, apply pipe dope to its threads.

2. Just before installation of stator, lubricate the rotor with water or glycerine to allow stator to slip on easier.

Note: Be sure to use a lubricant that is compatible with the stator material. Grease or oil is not compatible with type R or B stators.

3. Slip stator over rotor, and screw into the suction housing. Tighten with a pipe wrench as close to the suction housing as possible.

4. Secure stator in stator support(s) (30) with support cap and screws (C).

Note: For frames 3M4, 3P3, and 6P3, install bushing (28) at each support (30). For frame 3P3, install an extra smaller bushing (29) under the bushing (28).

4-27. Pump Connections.

1. Connect piping to stator end of pump.

2. Check complete pump installation per INSTALLATION instructions.

3. Perform INITIAL CHECK and START-UP operations per paragraphs 3-2 and 3-3.

4-28. STORAGE

4-29. Short Term Storage. Storage of 6 months or less will not damage the pump. However, to ensure the best possible protection, the following is advised:

1. Store pump inside whenever possible or cover with some type of protective covering. Do not allow moisture to collect around pump.

2. Remove drain plug to allow the suction housing to drain and dry completely.

3. Loosen the packing gland and inject a liberal amount of grease into the stuffing box. Tighten the gland nut only hand tight. When water flush systems are to be used, do not use grease. A small amount of light oil is recommended.

4. See manufacturer's instructions for motor and/or drive storage.

5. Every 2 or 3 weeks, rotate the pump manually a few revolutions to avoid a "set" condition of rotor in stator elastomer. This will prevent hard starting and excessive torque requirements when pump is again put in operation.

6. See OPERATION paragraphs 3-1 thru 3-4 before start-up.

4-30. Long Term Storage. If pump is to be in storage for more than 6 months, perform the above short term storage procedures. Then do the following:

1. Apply rust inhibitor.

2. Remove drive belts.

Note: If storage is for more than 6 months, and the pump will be unattended, remove the stator to avoid a "set" condition of rotor in stator elastomer.

4-31. STANDARD HARDWARE

REF. NO	DESCRIPTION	SIZE	QTY
A	Screw, Hex head	3/8-16 x 1	4
	Lock Washer	3/8	4
B	Key, Square	1/4 x 1/4 x 2-1/2	1
C	Screw, Hex head:		
	1L6, 2L6, 3M4, 3P3	1/2-13 x 1-1/2	4
	3L6, 6M4, 6P3, 9P3	1/2-13 x 1-1/2	6
D	Nut, Hex	7/16-14	2
E	Plug, Pipe	1/8 NPT	2
F	Stud	7/16-14 x 3-3/8	2
G	Fitting, Grease	1/8 NPT	1
H	Plug, Pipe	1/2 NPT	3
J	Screw, Hex head	1/2-13 x 1/2	4
	Lock Washer	1/2	4

4-32. RECOMMENDED SPARE PARTS

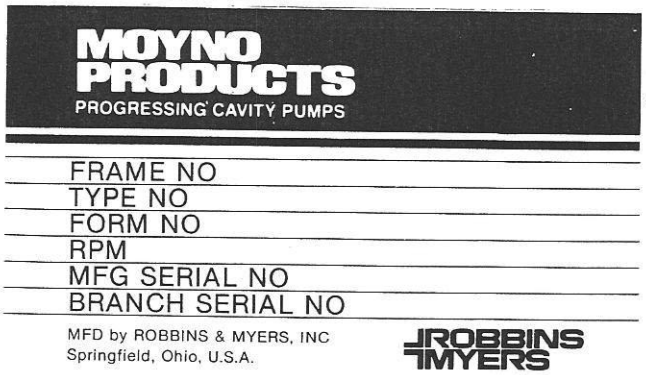
The Moyno® pump has been designed and built with all wearable parts replaceable. A recommended inventory of spare parts is dependent upon the application and importance of continued operation.

For the shortest possible down time, we recommend the following parts be stocked:

1 - Rotor
1 - Stator
1 - Connecting Rod Kit
1 - Packing Set

The above is only a suggested list. For further assistance in determining what you'll need for your application, contact your Moyno® representative.

4-33. NAMEPLATE DATA



4-34. VARIATIONS OF STANDARD PARTS

Below are variations available for modifying pumps to meet specialized pumping conditions. If the trim code of your pump is other than "AAA", contact your nearest Moyno® representative for clarification. Do not use any variation unless you have determined that is is compatible with your application.

4-35. Rotors identified on parts listing are standard size with hard chrome plated surface. Other variations of rotor size and finish may be ordered by selecting the standard rotor part number and changing the last digit of the rotor number as follows:

2 = Standard size, non-plated
3 = Undersize, chrome-plated
4 = Undersize, non-plated
5 = Oversize, chrome-plated

Do not change rotor sizes without consulting your local Moyno® Sales Office. These variations are used for certain specialized pumping conditions only.

4-36. Drive Shafts shown have hard-chrome plating on the packing wear area. If non-plated drive shafts are required, select the standard part number and change the last digit to next higher number. Example: B06261 to B06262.

4-37. PACKING

The last digit of the packing part number is listed below according to the pump Type Designation.

PUMP TYPE DESIGNATION	PACKING PART NO. LAST DIGIT	PACKING MATERIAL
CDB,CDD,CDF CDG,CDQ,CDT	1	Alternate die molded rings of lead foil wrapped asbestos, and rings of dura-plastic asbestos fiber and lead shreads.
CDR,CSR,SSR	3	Die molded dura-plastic consisting of pure, long asbestos fiber and lead shreads lubricated throughout.
CSB,CSD,CSG CSQ,SSB,SSG SSQ,CSF	5	Die molded dura-plastic consisting of pure, long asbestos fiber and aluminum shreads lubricated throughout.
CST,SSF SST	7	Flexible braided Polytetrafluoroethylene.

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26041 Newton Circle
Elko, MN 55020
Phone # 800-637-1940
Fax # 952-461-3403

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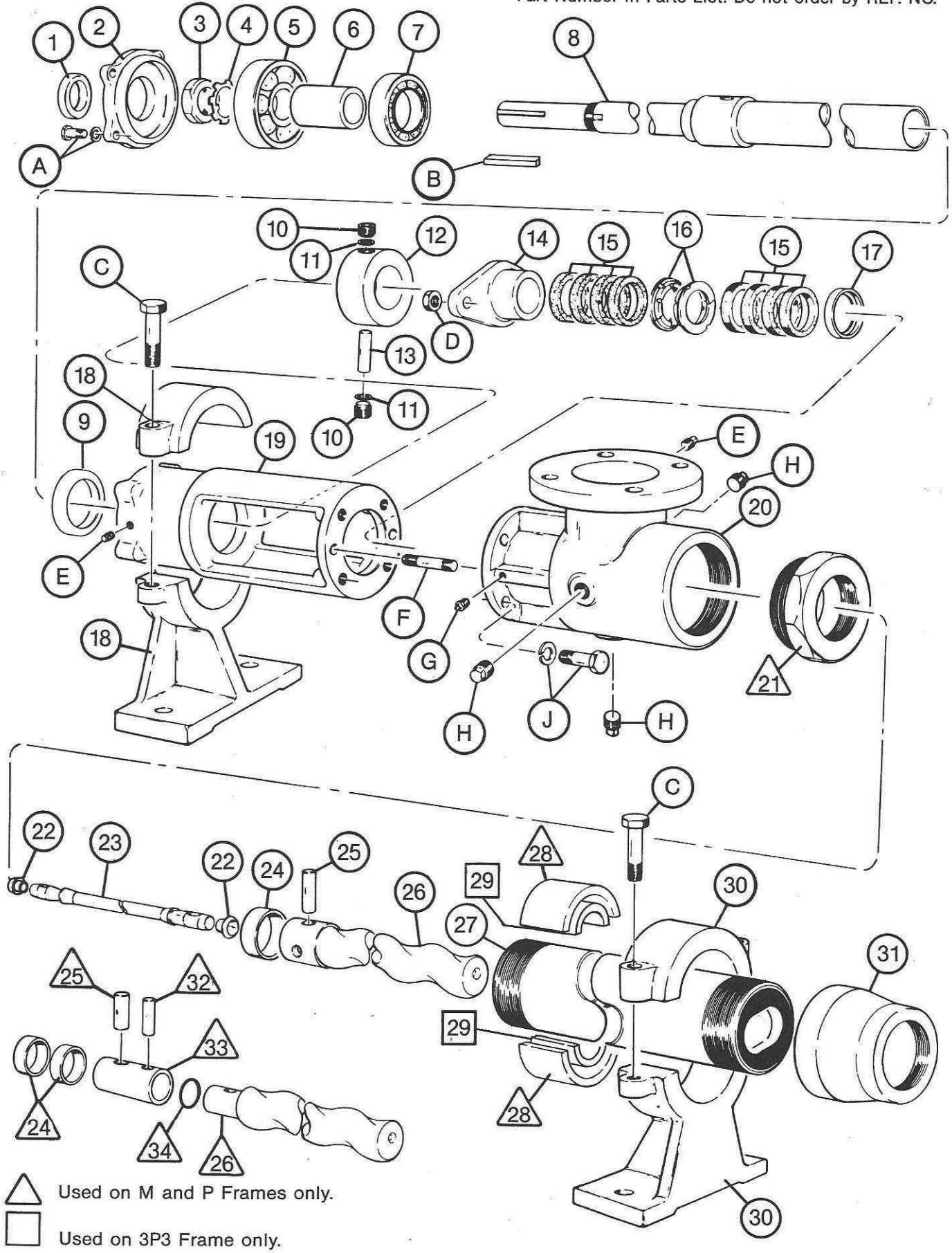
Phone # 800-637-1940
Fax # 952-461-3403

Select Type Designation column in Parts List according to Type No. on nameplate. Refer to Frame No. to select proper rotor and stator and other related parts. Order by Part Number in Parts List. Do not order by REF. NO.



△ Used on M and P Frames only.

□ Used on 3P3 Frame only.

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Elko, MN 55020
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Fax # 952-461-3403

4-38. PARTS LIST

REF. NO.	DESCRIPTION	PUMP TYPE DESIGNATIONS: CDQ CDR CDB CDF	CDD CDG CDT	CSQ CSR CSB CSF	CSD CSG CST	SSQ SSR SSB SSF	SSG SST
	Bearing Kit (See note A)	K06291	K06291	K06291	K06291	K06291	K06291
	Rod Kit, Connecting (See Note B): All but Type F	K0625D	K0625D	K0625S	K0625S	K0625S	K0625S
	Rod Kit, Connecting (See Note B): CDF, CSF, SSF	KF625D	------	KF625D	------	KF625D	------
1	Seal, Grease (Thrust)	A06621	A06621	A06621	A06621	A06621	A06621
2	Plate, Bearing Cover	A06341	A06341	A06341	A06341	A06341	A06341
3	Nut, Bearing Lock	A06581	A06581	A06581	A06581	A06581	A06581
4	Washer, Bearing Lock	A06591	A06591	A06591	A06591	A06591	A06591
5	Bearing, Ball (Thrust)	A06301	A06301	A06301	A06301	A06301	A06301
6	Spacer, Bearing	A06331	A06331	A06331	A06331	A06331	A06331
7	Bearing, Ball (Radial)	A06291	A06291	A06291	A06291	A06291	A06291
8	Shaft, Drive	B06261*	B06261*	B06266*	B06266*	B06266*	B06266*
9	Seal, Grease (Radial)	A06611	A06611	A06611	A06611	A06611	A06611
10	Screw, Drive Pin Retaining (2)	B0654D	B0654D	B0654S	B0654S	B0654S	B0654S
11	Washer, Retaining Screw (2)	A06731	A06731	A06731	A06731	A06731	A06731
12	Collar, Shaft	A06491	A06491	A06491	A06491	A06491	A06491
13	Pin, Shaft	B0646D	B0646D	B0646S	B0646S	B0646S	B0646S
14	Gland, Packing	B0641D	B0641D	B0641D	B0641S	B0641S	B0641S
15	Packing Set	B0642#	B0642#	B0642#	B0642#	B0642#	B0642#
16	Ring Half, Lantern (2)	A06571	A06571	A06571	A06571	A06571	A06571
17	Washer, Packing	B0665D	B0665D	B0665D	B0665S	B0665S	B0665S
18	Support with Cap, Pump	A06371	A06371	A06371	A06371	A06371	A06371
19	Housing, Bearing	A06051	A06051	A06051	A06051	A06051	A06051
20	Housing, Suction	B06021	B06021	B06021	B06021	B06026	B06026
21	Bushing, Adapter: 3M4, 6P3 only	B06511	B06512	B06511	B06512	B06516	B06517
	3P3 only	B06513	B06511	B06513	B06511	B06518	B06516
	9P3 only	B06512	------	B06512	------	B06517	------
22	Washer, Connecting Rod: All but Type F	A0653Q	------	A0653Q	------	A0653Q	------
	Washer, Connecting Rod: CDF, CSF, SSF	A0653F	------	A0653F	------	A0653F	------
23	Rod, Connecting	B0625D	B0625D	B0625S	B0625S	B0625S	B0625S
24	Retainer, Pin	A06501	A06501	A06501	A06501	A06501	A06501
25	Pin, Rotor	B0645D	B0645D	B0645S	B0645S	B0645S	B0645S
26	Rotor: 1L6	C71061*	C71061*	C81061*	C81061*	C81061*	C81061*
	2L6	C72061*	C72061*	C82061*	C82061*	C82061*	C82061*
	3L6	C73061*	C73061*	C83061*	C83061*	C83061*	C83061*
	3M4	C73041*	C73041*	C83041*	C83041*	C83041*	C83041*
	6M4	C76041*	C76041*	C86041*	C86041*	C86041*	C86041*
	3P3	C73031*	C73031*	C83031*	C83031*	C83031*	C83031*
	6P3	C76031*	C76031*	C86031*	C86031*	C86031*	C86031*
	9P3	C79031*	C79031*	C89031*	C89031*	C89031*	C89031*
27	Stator: 1L6	C4106+	C4106+	C4106+	C4106+	C5106+	C5106+
	2L6	C4206+	C4206+	C4206+	C4206+	C5206+	C5206+
	3L6	C4306+	C4306+	C4306+	C4306+	C5306+	C5306+
	3M4	C4304+	C4304+	C4304+	C4304+	C5304+	C5304+
	6M4	C4604+	C4604+	C4604+	C4604+	C5604+	C5604+
	3P3	C4303+	C4303+	C4303+	C4303+	C5303+	C5303+
	6P3	C4603+	C4603+	C4603+	C4603+	C5603+	C5603+
	9P3	C4903+	C4903+	C4903+	C4903+	C5903+	C5903+
28	Bushing, Support: 3M4, 3P3, 6P3 only	A06711	A06711	A06711	A06711	A06711	A06712
29	Bushing, Support: 3P3 only	A04711	A04711	A04711	A04711	A04711	A06711
30	Support with Cap, Stator: All but 9P3	A06381	A06381	A06381	A06381	A06381	A06381
	9P3	A06382	------	A06382	------	A06382	------
31	Reducer: 1L6, 2L6, 3L6, 6M4	B06091	B06091	B06091	B06091	B06096	B06096
	3M4, 6P3	B04091	B04092	B04091	B04092	B04096	B04097
	3P3	B03091	B04091	B03091	B03092	B03096	B03097
	9P3	B04092	------	A04092	------	B04097	------
32	Pin, Rotor Head: 3P3 only	B06471	B06471	B06472	B06472	B06472	B06472
	3M4, 6P3 only	B06473	B06473	B06474	B06474	B06474	B06474
	9P3 only	B0645D	------	B0645S	------	B0645S	------
33	Head, Rotor: 3M4, 6P3 only	B06321	B06321	B06322	B06322	B06322	B06322
	3P3 only	B06323	B06323	B06324	B06324	B06324	B06324
	9P3 only	B06325	B06325	B06326	B06326	B06326	B06326
34	O-Ring: 9P3 only	A06111	A06111	A06111	A06111	A06111	A06111

Note A - Bearing Kit includes items 1, 3 thru 7, and 9.
Note B - Connecting Rod Kit includes items 10, 11, 13, 22, 23, and 25.
* See paragraph 4-34, VARIATIONS OF STANDARD PARTS, for part numbers of special applications.
\+ Add third letter of Type Designation to complete part number; i.e., for Type CDQ, add Q to basic number of stator.
\# See PACKING, paragraph 4-37, for last digit of part number and packing material.

NOTE: See paragraph 4-31 for STANDARD HARDWARE.

4-39. TROUBLE SHOOTING CHART

PUMP PROBLEMS PROBABLE CAUSE *AND REMEDY*	Pump does not rotate.	Pump does not discharge.	Discharge output low.	Discharge output fluctuates.	Pump drive overloaded.	Pump noisy.	Shaft seal leaks.	Stator wears too fast.	Rotor wears too fast.
Incorrect power supply; drive not properly wired. *Check motor nameplate data; test voltage, phase, & frequency.*				●	●	●			
Foreign matter in pump. *Remove foreign matter.*				●		●			
If pump or stator is new, too much static friction. *Fill with liquid, and hand turn. If still tight, lubricate stator with glycerine.*				●		●			
Stator swells due to chemical attack. *Change stator material.*			●	●		●			
Stator swells due to high liquid temp. *Reduce liquid temp. or use an undersized rotor.*		●	●	●		●			
Blockage due to solids in liquid. *Decrease solids-to-liquid ratio.*			●	●		●			
Liquid settles and hardens after pump shut down. *Clean and rinse pump after each use.*		●	●	●		●			
Suction pipe not submerged. *Reposition suction pipe.*							●		
Air in suction pipe. *Tighten connections to stop leaks.*					●	●	●		
Pump speed too low. *Increase drive speed.*						●	●		
Suction lift too high (cavitation). *Reduce suction losses; move pump to lower elevation.*		●	●		●	●	●		
Pump running dry; no prime. *Fill pump with liquid; relocate suction piping.*		●	●	●		●	●		
Stator worn excessively. *Replace stator.*				●		●	●		
Rotor worn excessively. *Replace rotor.*		●	●			●	●		
Wrong direction of rotation. *Reverse drive motor polarity.*			●				●		
Discharge pressure too high. *Open discharge valve; reduce discharge pipe length; remove obstruction.*	●	●		●		●			
Suction pipe leaks. *Tighten pipe connections.*				●	●	●			
Shaft packing leaks. *Tighten packing gland; replace packing.*					●	●			
Stator material brittle. *Replace stator.*	●	●		●		●			
Pump speed too high. *Reduce drive speed.*					●				
Liquid viscosity or specific gravity too high. *Measure and compare with specification.*					●				
Packing too tight. *Loosen gland nuts.*					●				
Bent drive shaft. *Replace drive shaft.*				●	●				
Drive and pump misaligned. *Re-align drive and pump.*				●					
Flexible drive coupling worn. *Repair or replace coupling.*				●					
Drive shaft bearings worn. *Replace bearings.*			●	●					
Incorrect packing. *Change packing material.*			●						
Packing too loose. *Tighten gland nuts.*			●						

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