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INSTALLATION, OPERATION, AND MAINTENANCE MANUAL

WITH PARTS LIST

GORMAN-RUPP PUMPS

10 SERIES PUMP

MODEL

112B60—B

GORMAN-RUPP PUMPS

www.grpumps.com

Printed in U.S.A.

Register your new
Gorman-Rupp pump online at
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Valid serial number and e-mail address required.

RECORD YOUR PUMP MODEL AND SERIAL NUMBER

Please record your pump model and serial number in the spaces provided below. Your Gorman-Rupp distributor needs this information when you require parts or service.

Pump Model: _____

Serial Number: _____

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INTRODUCTION

Thank You for purchasing a Gorman-Rupp pump. **Read this manual** carefully to learn how to safely install and operate your pump. Failure to do so could result in personal injury or damage to the pump.

This pump is a 10 Series, enclosed impeller, self-priming centrifugal model with a suction check valve. The pump is designed for handling wastewater, mud and slurries containing specified entrained solids. The basic material of construction for wetted parts is gray iron, with a ductile iron wear plate and an alloy steel impeller shaft.

This manual will alert personnel to known procedures which require special attention, to those which could damage equipment, and to those which could be dangerous to personnel. However, this manual cannot possibly anticipate and provide detailed precautions for every situation that might occur during maintenance of the unit. Therefore, it is the responsibility of the owner/maintenance personnel to ensure that **only** safe, established maintenance procedures are used, and that any procedures not addressed in this manual are performed **only** after establishing that neither personal safety nor pump integrity are compromised by such practices.

For information or technical assistance on the power source, contact the power source manufacturer's local dealer or representative.

If there are any questions regarding the pump or its application which are not covered in this manual or in other literature accompanying this unit, please contact your Gorman-Rupp distributor, or The Gorman-Rupp Company:

The Gorman-Rupp Company
P.O. Box 1217
Mansfield, Ohio 44901—1217
Phone: (419) 755—1011
or:
Gorman-Rupp of Canada Limited
70 Burwell Road
St. Thomas, Ontario N5P 3R7
Phone: (519) 631—2870

The following are used to alert maintenance personnel to procedures which require special attention, to those which could damage equipment, and to those which could be dangerous to personnel:

DANGER!

Immediate hazards which WILL result in severe personal injury or death. These instructions describe the procedure required and the injury which will result from failure to follow the procedure.

WARNING!

Hazards or unsafe practices which COULD result in severe personal injury or death. These instructions describe the procedure required and the injury which could result from failure to follow the procedure.

CAUTION

Hazards or unsafe practices which COULD result in minor personal injury or product or property damage. These instructions describe the requirements and the possible damage which could result from failure to follow the procedure.

NOTE

Instructions to aid in installation, operation, and maintenance or which clarify a procedure.

SAFETY - SECTION A

This information applies to 10 Series basic pumps. Gorman-Rupp has no control over or particular knowledge of the power source which will be used. Refer to the manual accompanying the power source before attempting to begin operation.

Because pump installations are seldom identical, this manual cannot possibly provide detailed instructions and precautions for each specific application. Therefore, it is the owner/installer's responsibility to ensure that applications not addressed in this manual are performed only after establishing that neither operator safety nor pump integrity are compromised by the installation.

Before attempting to open or service the pump:

1. **Familiarize yourself with this manual.**
2. **Disconnect or lock out the power source to ensure that the pump will remain inoperative.**
3. **Allow the pump to completely cool if overheated.**
4. **Check the temperature before opening any covers, plates, or plugs.**
5. **Close the suction and discharge valves.**
6. **Vent the pump slowly and cautiously.**
7. **Drain the pump.**

This pump is designed to handle wastewater, mud and slurries containing specified entrained solids. Do not attempt to pump volatile, corrosive or flammable liquids which may damage the pump or endanger personnel as a result of pump failure.

Death or serious personal injury and damage to the pump or components can occur if proper lifting procedures are not observed. Make certain that hoists, chains, slings or cables are in good working condition and of sufficient capacity and that they are positioned so that loads will be balanced and the pump or components will not be damaged when lifting. Suction and discharge hoses and piping must be removed from the pump before lifting. Lift the pump or component only as high as necessary and keep personnel away from suspended objects.

After the pump has been positioned, make certain that the pump and all piping or hose connections are tight, properly supported and secure before operation.

Do not operate the pump against a closed discharge valve for long periods of time. If operated against a closed discharge valve, pump components will deteriorate, and the liquid could come to a boil, build pressure, and cause the pump casing to rupture or explode.

Do not remove plates, covers, gauges, pipe plugs, or fittings from an overheated pump. Vapor pressure within the pump can cause parts being disengaged to be ejected with great force. Allow the pump to cool before servicing.

Do not operate the pump without shields and/or guards in place over the drive shafts, belts, and/or couplings, or other rotating parts. Exposed rotating parts can catch clothing, fingers, or tools, causing severe injury to personnel.

INSTALLATION — SECTION B

Review all SAFETY information in Section A.

Since pump installations are seldom identical, this section offers only general recommendations and practices required to inspect, position, and arrange the pump and piping.

Most of the information pertains to a standard **static lift** application where the pump is positioned above the free level of liquid to be pumped.

If installed in a **flooded suction application** where the liquid is supplied to the pump under pressure, some of the information such as mounting, line configuration, and priming must be tailored to the specific application. Since the pressure supplied to the pump is critical to performance and safety, **be sure** to limit the incoming pressure to 50% of the maximum permissible operating pressure as shown on the pump performance curve (see Section E, Page 1).

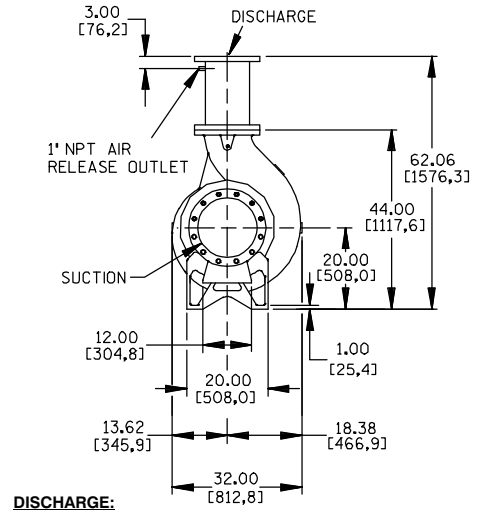
For further assistance, contact your Gorman-Rupp distributor or the Gorman-Rupp Company.

Pump Dimensions

See Figure B—1 for the approximate physical dimensions of this pump.

OUTLINE DRAWING

SUCTION:
BOTTOM 1" (25,4mm) DIAMETER SIX HOLES DRILLED THRU. TOP 0.88-9 UNC-3 SIX HOLES TAPPED TO DEPTH AS FOLLOWS: TWO HOLES LOCATED 45° FROM CENTER ARE TAPPED 1.94 (49,2mm) DEEP. REMAINING FOUR HOLES TAPPED THRU. ALL HOLES LOCATED ON 17" (431,8mm) B.C.



DISCHARGE:
125# ANSI 10" (254mm) FLANGE 16" (406,4mm) O.D. TWELVE HOLES 1" (24,4mm) DIA. ON 14.25" (362mm) B.C.

DIMENSIONS:
INCHES
[MILLIMETERS]

SUCTION LINE NOTE:
FOR SELF PRIMING APPLICATION AVOID HORIZONTAL SUCTION LINES. IF USED, MAXIMUM ACCEPTABLE RUN IS 6' (1,83m). PREFERRED INSTALLATION WOULD ANGLE SUCTION LINE DOWNWARD WITH 45° ELBOW AS SHOWN. LONG HORIZONTAL SUCTION LINES REDUCE EFFICIENCY BY CREATING INCREASED PRIMING TIME, INCREASED OPERATIONAL TIME IN PARTIAL PRIME CONDITION, SURGING, AND DECREASED SHAFT AND BEARING LIFE.

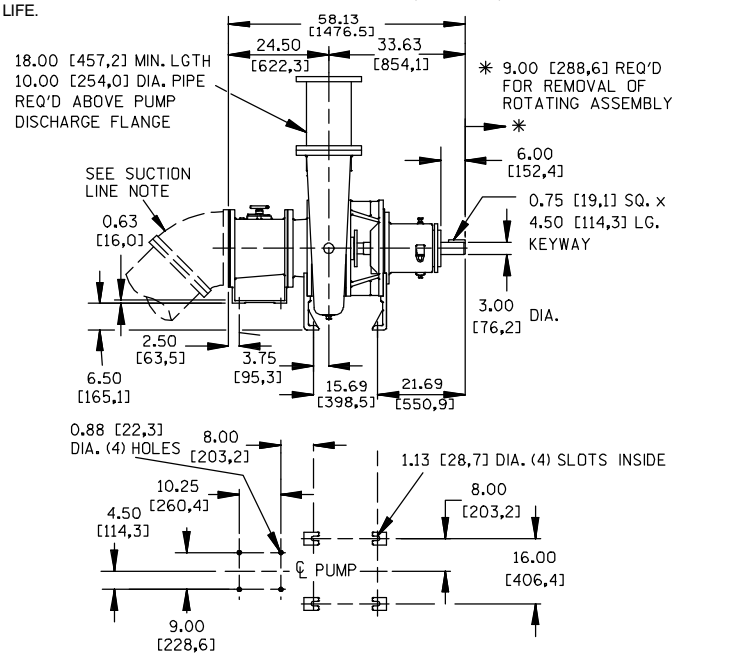


Figure B—1. Pump Model 112B60—B

PREINSTALLATION INSPECTION

The pump assembly was inspected and tested before shipment from the factory. Before installation, inspect the pump for damage which may have occurred during shipment. Check as follows:

a. Inspect the pump for cracks, dents, damaged threads, and other obvious damage.

b. Check for and tighten loose attaching hardware. Since gaskets tend to shrink after dry-

ing, check for loose hardware at mating surfaces.

c. Carefully read all tags, decals, and markings on the pump assembly, and perform all duties indicated. Note that the pump shaft rotates in the required direction.

CAUTION

Only operate this pump in the direction indicated by the arrow on the pump body and on the accompanying decal. Otherwise, the impeller could become loosened from the shaft and seriously damage the pump.

d. Check levels and lubricate as necessary. Refer to **LUBRICATION** in the **MAINTENANCE AND REPAIR** section of this manual and perform duties as instructed.

e. If the pump has been stored for more than 12 months, some of the components or lubricants may have exceeded their maximum shelf life. These **must be inspected or replaced** to ensure maximum pump service.

If the maximum shelf life has been exceeded, or if anything appears to be abnormal, contact your Gorman-Rupp distributor or the factory to determine the repair or updating policy. **Do not** put the pump into service until appropriate action has been taken.

POSITIONING PUMP

Lifting

WARNING!

Death or serious personal injury and damage to the pump or components can occur if proper lifting procedures are not observed. Make certain that hoists, chains, slings or cables are in good working condition and of sufficient capacity and that they are positioned so that loads will be balanced and the pump or components will not be damaged when lifting. Suction and discharge hoses and piping must be removed from the pump before lifting. Lift the pump or component only as high as necessary and keep personnel away from suspended objects.

Pump unit weights will vary depending on the mounting and drive provided. Check the shipping tag on the unit packaging for the actual weight, and use lifting equipment with appropriate capacity. Drain the pump and remove all customer-installed equipment such as suction and discharge hoses or piping before attempting to lift existing, installed units.

Mounting

Locate the pump in an accessible place as close as practical to the liquid being pumped. Level mounting is essential for proper operation.

The pump may have to be supported or shimmed to provide for level operation or to eliminate vibration.

SUCTION AND DISCHARGE PIPING

Pump performance is adversely effected by increased suction lift, discharge elevation, and friction losses. See the performance curve on Page E-1 to be sure your overall application allows pump to operate within the safe operation range.

Materials

Either pipe or hose maybe used for suction and discharge lines; however, the materials must be compatible with the liquid being pumped. If hose is used in suction lines, it must be the rigid-wall, reinforced type to prevent collapse under suction. Using piping couplings in suction lines is not recommended.

Line Configuration

Keep suction and discharge lines as straight as possible to minimize friction losses. Make minimum use of elbows and fittings, which substantially increase friction loss. If elbows are necessary, use the long-radius type to minimize friction loss.

Connections to Pump

Before tightening a connecting flange, align it exactly with the pump port. Never pull a pipe line into place by tightening the flange bolts and/or couplings.

Lines near the pump must be independently supported to avoid strain on the pump which could cause excessive vibration, decreased bearing life, and increased shaft and seal wear. If hose-type lines are used, they should have adequate support to secure them when filled with liquid and under pressure.

Gauges

Most pumps are drilled and tapped for installing discharge pressure and vacuum suction gauges. If these gauges are desired for pumps that are not tapped, drill and tap the suction and discharge lines not less than 18 inches (457,2 mm) from the suction and discharge ports and install the lines. Installation closer to the pump may result in erratic readings.

SUCTION LINES

To avoid air pockets which could affect pump priming, the suction line must be as short and direct as possible. When operation involves a suction lift, the line must always slope upward to the pump from the source of the liquid being pumped; if the line slopes down to the pump at any point along the suction run, air pockets will be created.

Never use a suction line smaller than the pump inlet connection. This pump is designed to accept a standard 12 inch pipe flange.

If a horizontal suction line must be used, the **maximum** acceptable length is 6 feet. The preferred installation would angle the suction line down to the source of the liquid at a 45° angle.

CAUTION

Use of long horizontal suction lines increase partial prime operation time which results in erratic performance and reduced pump life.

The **maximum** vertical suction lift for this pump is 15 feet. The pump is not designed to prime or operate at a higher lift.

Fittings

Suction lines should be the same size as the pump inlet. If reducers are used in suction lines, they should be the eccentric type, and should be installed with the flat part of the reducers uppermost to avoid creating air pockets. Valves are not normally used in suction lines, but if a valve is used, install it with the stem horizontal to avoid air pockets.

Strainers

If a strainer is furnished with the pump, be certain to use it; any spherical solids which pass through a strainer furnished with the pump will also pass through the pump itself.

If a strainer is not furnished with the pump, but is installed by the pump user, make certain that the total area of the openings in the strainer is at least three or four times the cross section of the suction line, and that the openings will not permit passage of solids larger than the solids handling capability of the pump.

This pump is designed to handle up to 3 inch (76,2 mm) diameter spherical solids.

Sealing

Since even a slight leak will affect priming, head, and capacity, especially when operating with a high suction lift, all connections in the suction line should be sealed with pipe dope to ensure an airtight seal. Follow the sealant manufacturer's recommendations when selecting and applying the pipe dope. The pipe dope should be compatible with the liquid being pumped.

Suction Lines In Sumps

If a single suction line is installed in a sump, it should be positioned away from the wall of the sump at a distance equal to 1—1/2 times the diameter of the suction line.

If there is a liquid flow from an open pipe into the sump, the flow should be kept away from the suction inlet because the inflow will carry air down into the sump, and air entering the suction line will reduce pump efficiency.

If it is necessary to position inflow close to the suction inlet, install a baffle between the inflow and the suction inlet at a distance 1—1/2 times the diameter of the suction pipe. The baffle will allow entrained air to escape from the liquid before it is drawn into the suction inlet.

If two suction lines are installed in a single sump, the flow paths may interact, reducing the efficiency of one or both pumps. To avoid this, position the suction inlets so that they are separated by a distance equal to at least 3 times the diameter of the suction pipe.

Suction Line Positioning

The depth of submergence of the suction line is critical to efficient pump operation. Figure B—2 shows recommended minimum submergence vs. velocity.

NOTE

The pipe submergence required may be reduced by installing a standard pipe increaser fitting at the end of the suction line. The larger opening size will reduce the inlet velocity. Calculate the required submergence using the following formula based on the increased opening size (area or diameter).

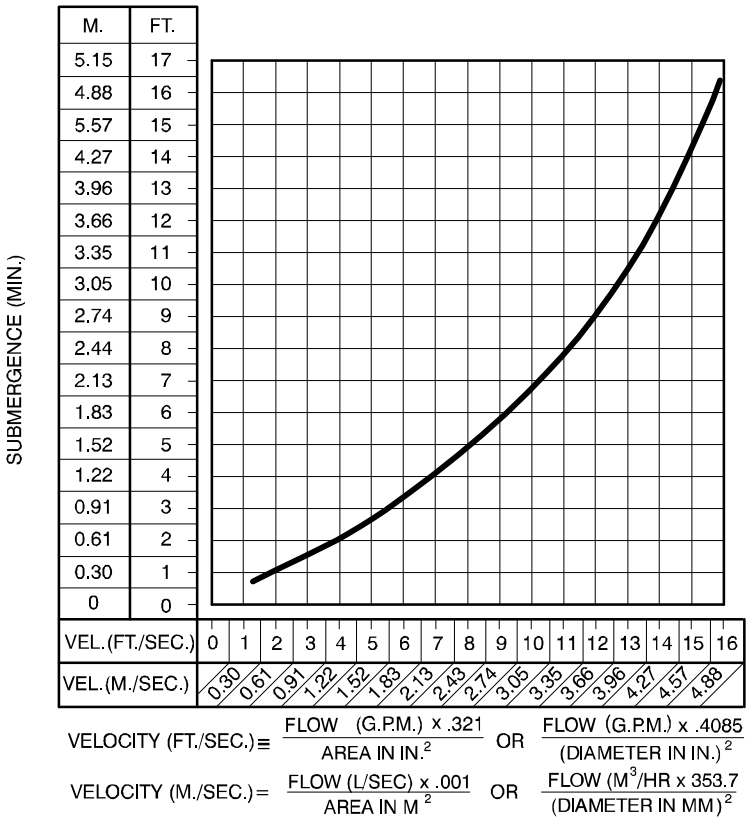


Figure B—2. Recommended Minimum Suction Line Submergence vs. Velocity

DISCHARGE LINES

Siphoning

Do not terminate the discharge line at a level lower than that of the liquid being pumped unless a siphon breaker is used in the line. Otherwise, a siphoning action causing damage to the pump could result.

Valves

If a throttling valve is desired in the discharge line, use a valve as large as the largest pipe to minimize friction losses. Never install a throttling valve in a suction line.

A check valve in the discharge line is normally recommended, but it is not necessary in low discharge head applications.

With high discharge heads, it is recommended that a throttling valve and a system check valve be installed in the discharge line to protect the pump from excessive shock pressure and reverse rotation when it is stopped.

CAUTION

If the application involves a high discharge head, gradually close the discharge throttling valve before stopping the pump.

Bypass Lines

Self-priming pumps are not air compressors. During the priming cycle, air from the suction line must be vented to atmosphere on the discharge side. If the discharge line is open, this air will be vented through the discharge. However, if a check valve has been installed in the discharge line, the discharge side of the pump must be opened to atmospheric pressure through a bypass line installed between the pump discharge and the check valve. A self-priming centrifugal pump **will not prime** if there is sufficient static liquid head to hold the discharge check valve closed.

NOTE

The bypass line should be sized so that it does not affect pump discharge capacity; however, the bypass line should be at least 1 inch (25,4 mm) in diameter to minimize the chance of plugging.

In **low discharge head applications** (less than 30 feet (9,1 m)), it is recommended that the bypass line be run back to the wet well, and located 6 inches below the water level or cut-off point of the low level pump. In some installations, this bypass outline may be terminated with a six-to-eight foot (1,8 to 2,4 m) length of 1–1/4 inch (31,8 mm) I.D. **smooth-bore** hose; air and liquid vented during the priming process will then agitate the hose and break up any solids, grease, or other substances likely to cause clogging.

CAUTION

A bypass line that is returned to a wet well must be secured against being drawn into the pump suction inlet.

It is also recommended that pipe unions be installed at each 90° elbow in a bypass line to ease disassembly and maintenance.

In **high discharge head applications** (more than 30 feet (9,1 m), an excessive amount of liquid may be bypassed and forced back to the wet well under the full working pressure of the pump; this will reduce overall pumping efficiency. **Therefore, it is recommended that a Gorman-Rupp Automatic Air Release Valve be installed in the bypass line.**

Gorman-Rupp Automatic Air Release Valves are reliable, and require minimum maintenance. Consult your Gorman-Rupp distributor, or contact the Gorman-Rupp Company for selection of an Automatic Air Release Valve to fit your application.

CAUTION

Except in certain specific applications (to prevent flooding during service of an automatic air release valve in a below-ground lift station), if a manual shut-off valve is installed **anywhere** in a bypass line, it **must** be a full-opening, **ball-type** valve to prevent plugging by solids.

WARNING!

A manual shut-off valve <u>should not</u> be installed in any bypass line. A manual shut-off valve may inadvertently be left closed during operation. A pump which has lost prime may continue to operate without reaching prime, causing dangerous overheating and possible explosive rupture of the pump casing. Personnel could be severely injured.

<u>Allow an over-heated pump to completely cool before servicing.</u> <u>Do not</u> re-

move plates, covers, gauges, or fittings from an over-heated pump. Liquid within the pump can reach boiling temperatures, and vapor pressure within the pump can cause parts being disengaged to be ejected with great force. After the pump completely cools, drain the liquid from the pump by removing the casing drain plug. Use caution when removing the plug to prevent injury to personnel from hot liquid.

AUTOMATIC AIR RELEASE VALVE

When properly installed, a Gorman-Rupp Automatic Air Release Valve will permit air to escape through the bypass line and then close automatically when the pump is fully primed and pumping at full capacity.

WARNING!

Some leakage (1 to 5 gallons [3.8 to 19 liters] per minute) will occur when the valve is fully closed. Be sure the bypass line is directed back to the wet well or tank to prevent hazardous spills.

Consult the manual accompanying the Air Release Valve for additional information on valve installation and performance.

ALIGNMENT

The alignment of the pump and its power source is critical for trouble-free mechanical operation. In either a flexible coupling or V-belt driven system, the driver and pump must be mounted so that their shafts are aligned with and parallel to each other. It is imperative that alignment be checked after the pump and piping are installed, and before operation.

NOTE

*Check **Rotation**, Section C, before final alignment of the pump.*

When mounted at the Gorman-Rupp factory, driver and pump are aligned before shipment. Misalignment will occur in transit and handling. Pumps **must** be checked and realigned before operation. Before checking alignment, tighten the foundation bolts. The pump casing feet and/or pedestal feet, and the driver mounting bolts should also be tightly secured.

WARNING!

When checking alignment, disconnect the power source to ensure that the pump will remain inoperative.

CAUTION

Adjusting the alignment in one direction may alter the alignment in another direction. Check each procedure after altering alignment.

Coupled Drives

When using couplings, the axis of the power source must be aligned to the axis of the pump shaft in both the horizontal and vertical planes. Most couplings require a specific gap or clearance between the driving and the driven shafts. Refer to the coupling manufacturer's service literature.

Align spider insert type couplings by using calipers to measure the dimensions on the circumference of the outer ends of the coupling hub every 90°. The coupling is in alignment when the hub ends are the same distance apart at all points (see Figure B—3).

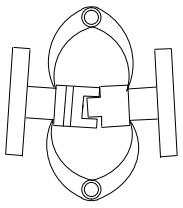


Figure B—3. Aligning Spider-Type Couplings

Align non-spider type couplings by using a feeler gauge or taper gauge between the coupling halves

every 90°. The coupling is in alignment when the hubs are the same distance apart at all points (see Figure B—4).

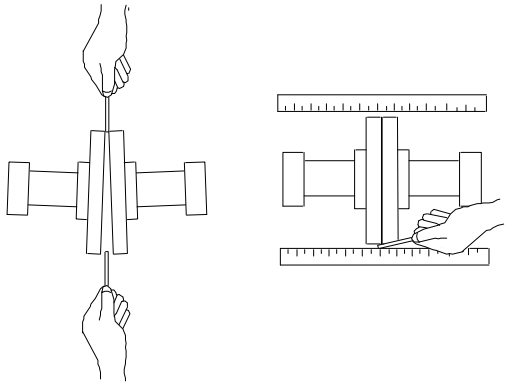


Figure B—4. Aligning Non-Spider-Type Couplings

Check parallel adjustment by laying a straightedge across both coupling rims at the top, bottom, and side. When the straightedge rests evenly on both halves of the coupling, the coupling is in horizontal parallel alignment. If the coupling is misaligned, use a feeler gauge between the coupling and the straightedge to measure the amount of misalignment.

Belt Drives

When using belt drives, the power source and the pump must be parallel. Use a straightedge along the sides of the pulleys to ensure that the pulleys are properly aligned (see Figure B—5). In drive systems using two or more belts, make certain that the belts are a matched set; unmatched sets will cause accelerated belt wear.

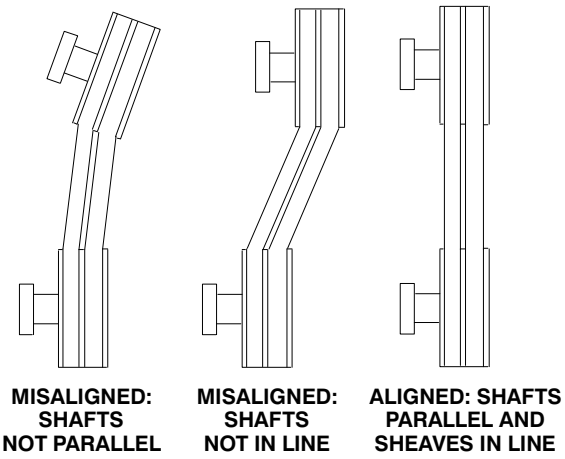


Figure B—5. Alignment of V-Belt Driven Pumps

Tighten the belts in accordance with the belt manufacturer's instructions. If the belts are too loose, they will slip; if the belts are too tight, there will be excessive power loss and possible bearing failure. Select pulleys that will match the proper speed ratio; overspeeding the pump may damage both pump and power source.

WARNING!

Do not operate the pump without the guard in place over the rotating parts. Exposed rotating parts can catch clothing, fingers, or tools, causing severe injury to personnel.

OPERATION — SECTION C

Review all SAFETY information in Section A.

Follow the instructions on all tags, labels and decals attached to the pump.

WARNING!

This pump is designed to handle wastewater, mud and slurries containing specified entrained solids. Do not attempt to pump volatile, corrosive or flammable liquids which may damage the pump or endanger personnel as a result of pump failure.

CAUTION

Pump speed and operating condition points must be within the continuous performance range shown on the curve (see Section E, Page 1).

PRIMING

Install the pump and piping as described in **INSTALLATION**. Make sure that the piping connections are tight, and that the pump is securely mounted. Check that the pump is properly lubricated (see **LUBRICATION** in **MAINTENANCE AND REPAIR**).

This pump is self-priming, but the pump should never be operated unless there is liquid in the pump casing.

CAUTION

Never operate this pump unless there is liquid in the pump casing. The pump will not prime when dry. Extended operation of a dry pump will destroy the seal assembly.

Add liquid to the pump casing when:

1. The pump is being put into service for the first time.
2. The pump has not been used for a considerable length of time.
3. The liquid in the pump casing has evaporated.

Once the pump casing has been filled, the pump will prime and reprime as necessary.

WARNING!

After filling the pump casing, reinstall and tighten the fill plug. Do not attempt to operate the pump unless all connecting piping is securely installed. Otherwise, liquid in the pump forced out under pressure could cause injury to personnel.

To fill the pump, remove the pump casing fill cover or fill plug in the top of the casing, and add clean liquid until the casing is filled. Replace the fill cover or fill plug before operating the pump.

STARTING

Consult the operations manual furnished with the power source.

Rotation

The pump could be damaged and performance adversely affected by incorrect rotation. If pump performance is not within the specified limits (see the curve on page E-1), check the direction of power source rotation before further troubleshooting.

CAUTION

The pump must operate in the direction indicated by the arrow on the pump, or accompanying decals.

Consult the operating manual furnished with the pump power source before attempting to start the power source.

If an electric motor is used to drive the pump, remove V-belts, couplings, or otherwise disconnect the pump from the motor before checking motor rotation. Operate the motor independently while observing the direction of the motor shaft, or cooling fan.

If rotation is incorrect on a three-phase motor, have a qualified electrician interchange any two of the three phase wires to change direction. If rotation is incorrect on a single-phase motor, consult the literature supplied with the motor for specific instructions.

OPERATION

Lines With a Bypass

If a Gorman-Rupp Automatic Air Release Valve has been installed, the valve will automatically open to allow the pump to prime, and automatically close after priming is complete (see **INSTALLATION** for Air Release Valve operation).

If the bypass line is open, air from the suction line will be discharged through the bypass line back to the wet well during the priming cycle. Liquid will then continue to circulate through the bypass line while the pump is in operation.

Lines Without a Bypass

Open all valves in the discharge line and start the power source. Priming is indicated by a positive reading on the discharge pressure gauge or by a quieter operation. The pump may not prime immediately because the suction line must first fill with liquid. If the pump fails to prime within five minutes, stop it and check the suction line for leaks.

After the pump has been primed, partially close the discharge line throttling valve in order to fill the line slowly and guard against excessive shock pressure which could damage pipe ends, gaskets, sprinkler heads, and any other fixtures connected to the line. When the discharge line is completely filled, adjust the throttling valve to the required flow rate.

Leakage

No leakage should be visible at pump mating surfaces, or at pump connections or fittings. Keep all line connections and fittings tight to maintain maximum pump efficiency.

Liquid Temperature And Overheating

The **maximum** liquid temperature for this pump is 160° F (71°C). Do not apply it at a higher operating temperature.

Overheating can occur if operated with the valves in the suction or discharge lines closed. Operating against closed valves could bring the liquid to a boil, build pressure, and cause the pump to rupture or explode. If overheating occurs, stop the pump and allow it to cool before servicing it. Refill the pump casing with cool liquid.

DANGER!

Allow an over-heated pump to completely cool before servicing. Do not remove plates, covers, gauges, or fittings from an over-heated pump. Liquid within the pump can reach boiling temperatures, and vapor pressure within the pump can cause parts being disengaged to be ejected with great force. After the pump completely cools, drain the liquid from the pump by removing the casing drain plug. Use caution when removing the plug to prevent injury to personnel from hot liquid.

As a safeguard against rupture or explosion due to heat, this pump is equipped with a pressure relief valve which will open if vapor pressure within the pump casing reaches a critical point. If overheating does occur, stop the pump immediately and allow it to cool before servicing it. **Approach any overheated pump cautiously**. It is recommended that the pressure relief valve assembly be replaced at each overhaul, or any time the pump casing overheats and activates the valve. **Never** replace this valve with a substitute which has not been specified or provided by the Gorman-Rupp Company.

Strainer Check

If a suction strainer has been shipped with the pump or installed by the user, check the strainer regularly, and clean it as necessary. The strainer should also be checked if pump flow rate begins to drop. If a vacuum suction gauge has been installed, monitor and record the readings regularly to detect strainer blockage.

Never introduce air or steam pressure into the pump casing or piping to remove a blockage. This could result in personal injury or damage to the equipment. If backflushing is absolutely necessary, **liquid pressure** must be limited to 50% of the maximum permissible operating pressure shown on the pump performance curve (see Section E, Page 1).

Pump Vacuum Check

With the pump inoperative, install a vacuum gauge in the system, using pipe dope on the threads. Block the suction line and start the pump. At operating speed the pump should pull a vacuum of 20 inches (508,0 mm) or more of mercury. If it does not, check for air leaks in the seal, gasket, or discharge valve.

Open the suction line, and read the vacuum gauge with the pump primed and at operating speed. Shut off the pump. The vacuum gauge reading will immediately drop proportionate to static suction lift, and should then stabilize. If the vacuum reading falls off rapidly after stabilization, an air leak exists. Before checking for the source of the leak, check the point of installation of the vacuum gauge.

STOPPING

Never halt the flow of liquid suddenly. If the liquid being pumped is stopped abruptly, damaging shock waves can be transmitted to the pump and piping system. Close all connecting valves slowly.

If the application involves a high discharge head, gradually close the discharge throttling valve before stopping the pump.

After stopping the pump, disconnect the power source or lock it out to ensure that the pump will remain inoperative.

Cold Weather Preservation

In below freezing conditions, drain the pump to prevent damage from freezing. Also, clean out any solids by flushing with a hose. Operate the pump for approximately one minute; this will remove any remaining liquid that could freeze the pump rotating parts. If the pump will be idle for more than a few hours, or if it has been pumping liquids containing a large amount of solids, drain the pump, and flush it thoroughly with clean water. To prevent large solids from clogging the drain port and preventing the pump from completely draining, insert a rod or stiff wire in the drain port, and agitate the liquid during the draining process. Clean out any remaining solids by flushing with a hose.

BEARING TEMPERATURE CHECK

Bearings normally run at higher than ambient temperatures because of heat generated by friction. Temperatures up to 160°F (71°C) are considered normal for bearings, and they can operate safely to at least 180°F (82°C).

Checking bearing temperatures by hand is inaccurate. Bearing temperatures can be measured accurately by placing a contact-type thermometer against the housing. Record this temperature for future reference.

A sudden increase in bearing temperatures is a warning that the bearings are at the point of failing to operate properly. Make certain that the bearing lubricant is of the proper viscosity and at the correct level (see **LUBRICATION** in Section E). Bearing overheating can also be caused by shaft misalignment and/or excessive vibration.

When pumps are first started, the bearings may seem to run at temperatures above normal. Continued operation should bring the temperatures down to normal levels.

TROUBLESHOOTING – SECTION D

Review all SAFETY information in Section A.

WARNING!

Before attempting to open or service the pump:

1. **Familiarize yourself with this manual.**
2. **Disconnect or lock out the power source to ensure that the pump will remain inoperative.**
3. **Allow the pump to completely cool if overheated.**
4. **Check the temperature before opening any covers, plates, or plugs.**
5. **Close the suction and discharge valves.**
6. **Vent the pump slowly and cautiously.**
7. **Drain the pump.**

TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
PUMP FAILS TO PRIME	Not enough liquid in casing.	Add liquid to casing. See **PRIMING**.
	Suction check valve contaminated or damaged.	Clean or replace check valve.
	Air leak in suction line.	Correct leak.
	Lining of suction hose collapsed.	Replace suction hose.
	Leaking or worn seal or pump gasket.	Check pump vacuum. Replace leaking or worn seal or gasket.
	Suction lift or discharge head too high.	Check piping installation and install bypass line if needed. See **INSTALLATION**.
	Strainer clogged.	Check strainer and clean if necessary.
PUMP STOPS OR FAILS TO DELIVER RATED FLOW OR PRESSURE	Air leak in suction line.	Correct leak.
	Lining of suction hose collapsed.	Replace suction hose.
	Suction intake not submerged at proper level or sump too small.	Check installation and correct submergence as needed.

TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
PUMP STOPS OR FAILS TO DELIVER RATED FLOW OR PRESSURE (cont.)	Impeller or other wearing parts worn or damaged.	Replace worn or damaged parts. Check that impeller is properly centered and rotates freely.
	Leaking or worn seal or pump gasket.	Check pump vacuum. Replace leaking or worn seal or gasket.
	Impeller clogged.	Free impeller of debris.
	Pump speed too slow.	Check driver output; check belts or couplings for slippage.
	Pump running backwards.	Check direction of rotation and correct by interchanging any two motor leads at control box. (See **Pump Rotation**, Section C).
	Suction lift or discharge head too high.	Check piping installation and install bypass line if needed. See **INSTALLATION**.
PUMP REQUIRES TOO MUCH POWER	Pump speed too high.	Check driver output check that sheaves or couplings are correctly sized.
	Discharge head too low.	Adjust discharge valve.
	Liquid solution too thick.	Dilute if possible.
PUMP CLOGS FREQUENTLY	Discharge flow too slow.	Open discharge valve fully to increase flow rate, and run power source at maximum governed speed.
	Suction check valve or foot valve clogged or binding.	Clean valve.
EXCESSIVE NOISE	Cavitation in pump.	Reduce suction lift and/or friction losses in suction line. Record vacuum and pressure gauge readings and consult local representative or factory.
	Pumping entrained air.	Locate and eliminate source of air bubble.
	Pump or drive not securely mounted.	Secure mounting hardware.
	Impeller clogged or damaged.	Clean out debris; replace damaged parts.
BEARINGS RUN TOO HOT	Bearing temperature is high, but within limits.	Check bearing temperature regularly to monitor any increase.
	Low or incorrect lubricant.	Check for proper type and level of lubricant.
	Suction and discharge lines not properly supported.	Check piping installation for proper support.
	Drive misaligned.	Align drive properly.

PREVENTIVE MAINTENANCE

Routine preventive maintenance of the pump will maintain peak operating performance. Since pump applications are seldom identical, and pump wear is directly affected by such things as the abrasive qualities, pressure and temperature of the liquid being pumped, this section is intended only to provide general recommendations and practices for preventive maintenance. Regardless of the application however, following a routine preventive maintenance schedule will help assure trouble-free performance and long life from your Gorman-Rupp pump.

Record keeping is an essential component of a good preventive maintenance program. Changes in suction and discharge gauge readings (if so equipped) between regularly scheduled inspections can indicate problems that can be corrected before system damage or catastrophic failure occurs. The appearance of wearing parts should also be documented at each inspection for comparison as well. Also, if records indicate that a certain part (such as the seal) fails at approximately the same duty cycle, the part can be checked and replaced before failure occurs, reducing unscheduled down time.

Preventive Maintenance Schedule

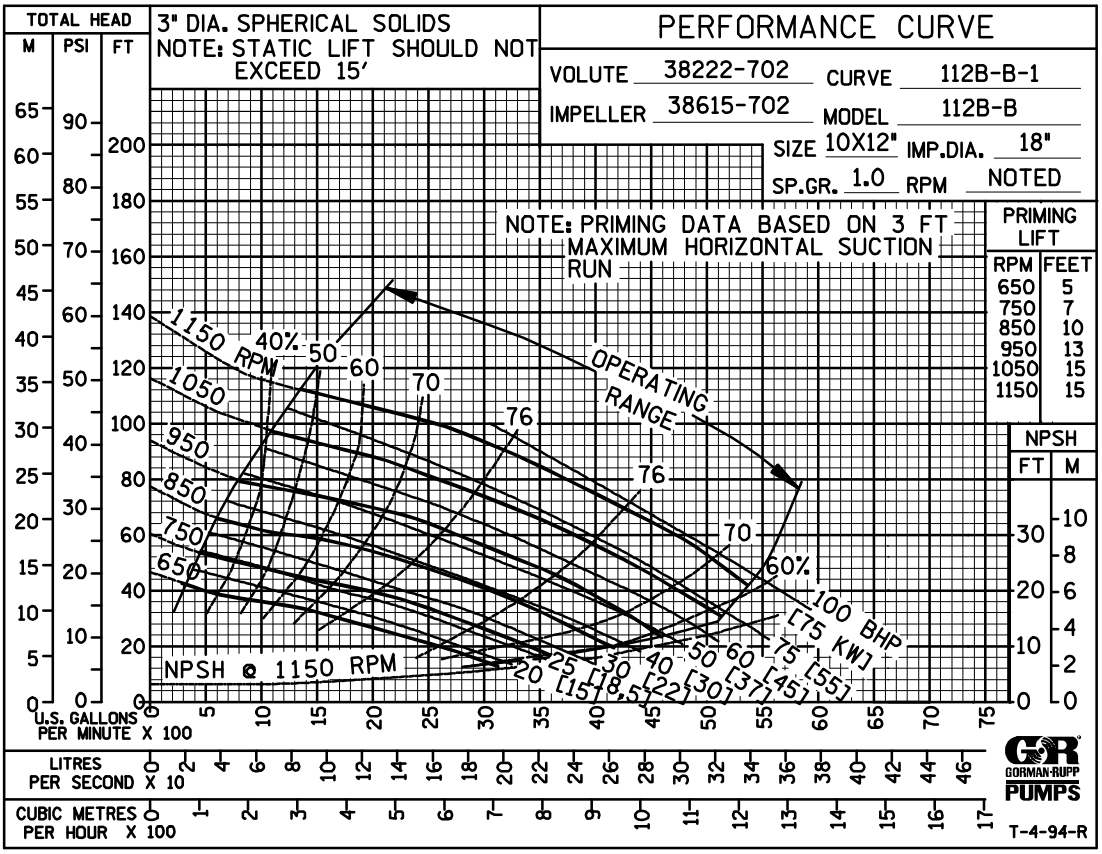
Item	Service Interval*				
	Daily	Weekly	Monthly	Semi-Annually	Annually
General Condition (Temperature, Unusual Noises or Vibrations, Cracks, Leaks, Loose Hardware, Etc.)	I				
Pump Performance (Gauges, Speed, Flow)	I				
Bearing Lubrication		I			R
Seal Lubrication (And Packing Adjustment, If So Equipped)		I			R
V-Belts (If So Equipped)			I		
Air Release Valve Plunger Rod (If So Equipped)			I	C	
Front Impeller Clearance (Wear Plate)				I	
Rear Impeller Clearance (Seal Plate)				I	
Check Valve					I
Pressure Relief Valve (If So Equipped)					C
Pump and Driver Alignment					I
Shaft Deflection					I
Bearings					I
Bearing Housing					I
Piping					I
Driver Lubrication – See Mfgr's Literature					

Legend:
I = Inspect, Clean, Adjust, Repair or Replace as Necessary
C = Clean
R = Replace

* Service interval based on an intermittent duty cycle equal to approximately 4000 hours annually. Adjust schedule as required for lower or higher duty cycles or extreme operating conditions.

PUMP MAINTENANCE AND REPAIR - SECTION E

MAINTENANCE AND REPAIR OF THE WEARING PARTS OF THE PUMP WILL MAINTAIN PEAK OPERATING PERFORMANCE.



✳ STANDARD PERFORMANCE FOR PUMP MODEL 112B60—B

✳ Based on 70°F (21°C) clear water at sea level with minimum suction lift. Since pump installations are seldom identical, your performance may be different due to such factors as viscosity, specific gravity, elevation, temperature, and impeller trim.

If your pump serial number is followed by an “N”, your pump is **NOT** a standard production model. Contact the Gorman-Rupp Company to verify performance or part numbers.

CAUTION

Pump speed and operating condition points must be within the continuous performance range shown on the curve.

SECTION DRAWING

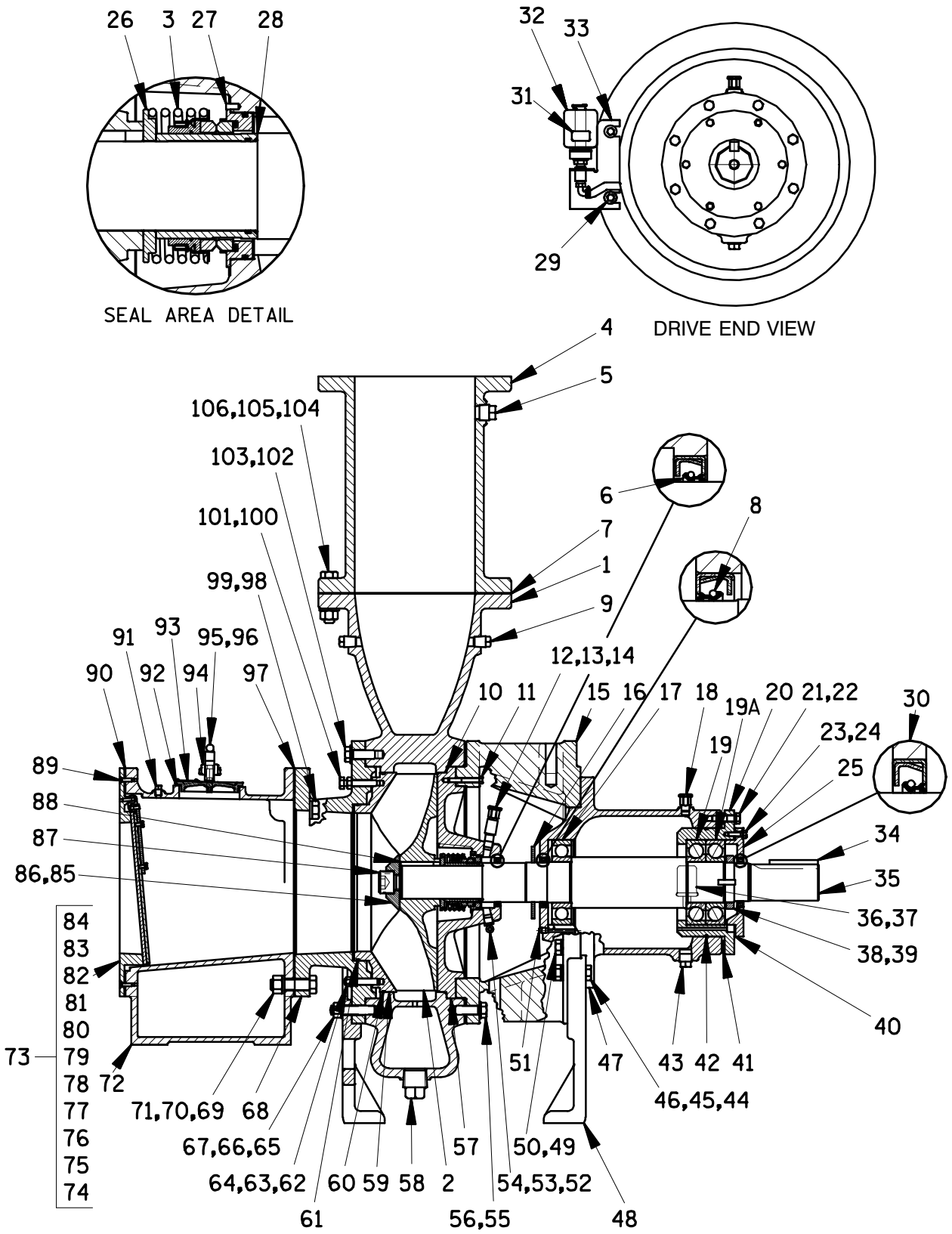


Figure E–1. Pump Model 112B60–B

PARTS LIST
Pump Model 112B60–B
(From S/N 758209 Up)

If your pump serial number is followed by an "N", your pump is **NOT** a standard production model. Contact the Gorman-Rupp Company to verify part numbers.

ITEM NO.		PART NAME	PART NUMBER	MAT'L CODE	QTY
☞ 1		PUMP CASING	SEE NOTE BELOW		1
2	✳	IMPELLER	38615–702	11010	1
3	✳	SEAL ASSEMBLY	46512–062	–––	1
4		DISCHARGE SPOOL FLG	38642–605	10010	1
5		PIPE PLUG	P16	10009	1
6	✳	OIL SEAL	25258–910	–––	1
7	✳	GASKET	2751G	18000	1
8	✳	OIL SEAL	25227–931	–––	1
☞ 9		PIPE PLUG	P08	15079	2
10	✳	O-RING	25152–283	–––	1
11		HEX HD CAPSCREW	B0610	15991	2
12		PIPE NIPPLE	T0606	15079	1
13		PIPE COUPLING	AE06	15079	1
14		AIR VENT	S1703	–––	1
15		INTERMEDIATE	38264–701	10010	1
16		DEFLECTOR RING	31134–047	19080	1
17	✳	BALL BEARING	23275–018	–––	1
18		AIR VENT	S1703	–––	1
19	✳	BALL BEARING	23413–418	–––	1
19A	✳	BALL BEARING	23413–418	–––	1
20		BEARING HOUSING	38331–603	10010	1
21		HEX HD CAPSCREW	B0808	15991	8
22		LOCK WASHER	J08	15991	8
23		HEX HD CAPSCREW	B0605	15991	6
24		LOCK WASHER	J06	15991	6
25		BEARING HOUSING CAP	38322–416	10010	1
26		SPRING CTR WASHER	31512–025	17200	1
27		GROOVED PIN	21142–268	–––	1
28	✳	SHAFT SLEEVE	31572–002	17200	1
29		FLAT WASHER	K12	15991	2
30	✳	OIL SEAL	25258–880	–––	1
31		OIL LEVEL DECAL	38816–123	–––	1
32		BOTTLE OILER	26713–004	–––	1
33		BRACKET ASSY	41881–617	24150	1
34	✳	SHAFT KEY	N1216	15990	1
35	✳	IMPELLER SHAFT	38512–520	16040	1
36		NIPPLE	T0408	15079	1
37		BOTTLE OILER	26713–025	–––	1
38		BEARING LOCK NUT	23962–018	–––	1
39		BEARING LOCK WASHER	23962–518	–––	1
40		GASKET/SHIM SET	48211–041	–––	1
41		BEARING SHIM SET	48261–056	–––	1
42	✳	BRG HOUSING O-RING	25152–266	–––	1
43		PIPE PLUG	P12	15079	1
44		HEX HD CAPSCREW	B1212	15991	4
45		LOCK WASHER	J12	15991	4
46		HEX NUT	D12	15991	4
47		PEDESTAL BODY	38251–507	10010	1
48		PEDESTAL FOOT	38151–002	10010	2
49		HEX HD CAPSCREW	B1211	15991	4
50		LOCK WASHER	J12	15991	4
51		BARBED ELBOW	26523–506	–––	2
52		3/8" ID x 17" LG. HOSE	31411–226	19360	1
54		HOSE CLAMP	26518–642	–––	2
55		HEX HD CAPSCREW	B1210	15991	12
56		LOCK WASHER	J12	15991	12
57		SEAL PLATE	38272–702	10010	1
☞58		PIPE PLUG	P24	10009	1
59	✳	WEAR PLATE	38691–851	11030	1
60	✳	O-RING	25152–283	–––	1
61	✳	O-RING	25152–278	–––	1
62		STUD	C0814	15991	4
63		LOCK WASHER	J08	15991	4
64		HEX NUT	D08	15991	4
☞65		STUD	C1215	15991	4
66		LOCK WASHER	J12	15991	4
67		HEX NUT	D12	15991	4
68		SUCTION HEAD	38246–610	10010	1
69		HEX HD CAPSCREW	B1413	15991	10
70		LOCK WASHER	J14	15991	10
71		HEX NUT	D14	15991	10
72		CHK VALVE FLANGE	14270A	10010	1
73		CHECK VALVE ASSY	14284	–––	1
74		–CHECK VALVE SHAFT	14282	17010	2
75		–BEARING PIVOT	14274	17070	2
76		–DRY SLEEVE BEARING	S2282	–––	4
77		–GROOVED PIN	21142–433	–––	4
78		–VALVE PLATE	14283	15990	1
79		–BUTTON HD CAPSCREW	CM0403	15990	2
80		–BUTTON HD CAPSCREW	CM0404	15990	2
81		–FLANGED SEAT	14273A	10010	1
82		–HEX HD CAPSCREW	B0402	14991	4
83		–LOCK WASHER	J04	15991	4
84	✳	–CHECK VALVE ASSY	14281	24010	1
85	✳	IMPELLER WASHER	31167–017	15030	1
86	✳	ROLL PIN	S2197	–––	1
87	✳	IMPELLER SCREW	BD2008S	17090	1
88	✳	IMPELLER KEY	N1011	15990	1
89		FLT SCH CAP SCREW	B0404	15990	2
90	✳	GASKET	14273G	20000	2
91		PIPE PLUG	P04	15079	1
92	✳	GASKET	38681–817	20000	1
93		COVER PLATE ASSY	48271–020	–––	1
94		CLAMP BAR12370	11010	1	
95		HEX HD CAPSCREW	B0808	15991	2
96		CLAMP BAR SCREW	8618	24000	1
97		GASKET	14273G	20000	1
98		HEX HD CAPSCREW	B1410	15991	2
99		LOCK WASHER	J14	15991	2
100		TAP BOLT	21612–199	–––	4
101		JAM NUT	AT08	15991	4
102		HEX HD CAPSCREW	B1209	15991	8
103		LOCK WASHER	J12	15991	8
104		HEX HD CAPSCREW	B1415	15991	12
105		LOXK WASHER	J14	15991	12
106		HEX NUT	D14	15991	12
NOT SHOWN:					
		NAME PLATE	2613D	13990	1
		DRIVE SCREW	BM#04–03	17000	4
		STRAINER	46641–012	24150	1
		LUBE DECAL	38816–079	–––	1
		CAUTION DECAL	38816–236	–––	1

✳ INDICATES PARTS RECOMMENDED FOR STOCK

☞	INCLUDED WITH REPAIR PUMP CASING ASSY	46471–534	–––	1

PUMP AND SEAL DISASSEMBLY AND REASSEMBLY

Review all SAFETY information in Section A.

Follow the instructions on all tags, label and decals attached to the pump.

This pump requires little service due to its rugged, minimum-maintenance design. However, if it becomes necessary to inspect or replace the wearing parts, follow these instructions which are keyed to the sectional view (see Figure E—1) and the accompanying parts list.

This manual will alert personnel to known procedures which require special attention, to those which could damage equipment, and to those which could be dangerous to personnel. However, this manual cannot possibly anticipate and provide detailed precautions for every situation that might occur during maintenance of the unit. Therefore, it is the responsibility of the owner/maintenance personnel to ensure that **only** safe, established maintenance procedures are used, and that any procedures not addressed in this manual are performed **only** after establishing that neither personal safety nor pump integrity are compromised by such practices.

Before attempting to service the pump, disconnect or lock out the power source to ensure that the pump will remain inoperative. Close all valves in the suction and discharge lines.

For power source disassembly and repair, consult the literature supplied with the power source, or contact your local power source representative.

WARNING!

Before attempting to open or service the pump:

1. **Familiarize yourself with this manual.**
2. **Disconnect or lock out the power source to ensure that the pump will remain inoperative.**
3. **Allow the pump to completely cool if overheated.**
4. **Check the temperature before opening any covers, plates, or plugs.**
5. **Close the suction and discharge valves.**
6. **Vent the pump slowly and cautiously.**
7. **Drain the pump.**

WARNING!

Death or serious personal injury and damage to the pump or components can occur if proper lifting procedures are not observed. Make certain that hoists, chains, slings or cables are in good working condition and of sufficient capacity and that they are positioned so that loads will be balanced and the pump or components will not be damaged when lifting. Suction and discharge hoses and piping must be removed from the pump before lifting. Lift the pump or component only as high as necessary and keep personnel away from suspended objects.

Suction Check Valve Removal and Disassembly

Before attempting to service the pump, remove the pump casing drain plug (58) and drain the pump. Clean and reinstall the drain plug.

To service the suction check valve assembly (73), remove the suction piping. Remove the recessed screws (89) securing the check valve assembly (73) and gasket (90) to the check valve flange (72). Remove the button head capscrews (80) which secure the check valve shafts (74) to the flange seat (81). Remove the attaching hardware (82 and 83) to separate the molded valve assembly (84) from the valve plate (78).

Inspect the check valve parts for wear or damage. If replacement of the check valve shafts (74), bearing pivot brackets (75), or the dry sleeve bearings (76) is required, remove the remaining button head capscrew (79) securing the lower check valve shaft to the valve plate. Drive the grooved pins (77) out of the shafts and slide the bearing pivot brackets off, along with the bearings (76). Inspect the bearings

for wear or damage and if replacement is required, press them from the pivot brackets.

If no further disassembly is required, see **Suction Check Valve Installation**.

Wear Plate And Suction Head Removal

Service to the wear plate (59), impeller (2) or seal assembly (3), can be accomplished from either side of the pump casing (1). The following instructions are based on service from the suction side of the pump.

Remove the hardware securing the check valve flange to the base. Tie and tag any leveling shims used under the mounting feet to ease reassembly.

Remove the hardware (69, 70, 71, 98 and 99) and use a suitable hoist and sling to separate the valve flange (72) and gasket (97) from the suction head (68).

Before attempting to remove the suction head, support the pump body by wedging a block of wood under the pump casing. Install an eye bolt (1-8 UNC threads, not supplied) in the tapped hole in the top of the intermediate (15). Be sure the eye bolt is fully engaged before attaching a hoist. The hoist is used to support the pump only, **do not try** to lift it.

Remove the hardware securing the pedestal foot (48) to the base. Tie and tag any leveling shims used under the mounting feet to ease reassembly. Remove the hardware (66, 67, 100, and 101) securing the foot and suction head (68) to the pump casing and separate the assemblies.

NOTE

*To ease the removal of the suction head, it may be necessary to loosen the wear plate retaining hardware (63 and 64). If the wear plate is loosened the impeller face clearance will require readjustment. See **Pump Reassembly.**)*

Inspect the wear plate (59) and O-ring (60) for damage or wear. If the wear plate must be replaced, remove the hardware, (63 and 64) from the wear plate studs (62). Loosen the jam nuts (101) and back off the adjusting screws (100) until the wear plate is free. Inspect the suction head O-ring (61) for damage and replace as required.

Impeller Removal

To loosen the impeller (2), remove the impeller capscrew and washer (85 and 87). Install two capscrews in the 3/8-16 UNC tapped holes located in the impeller hub and use a suitable puller to remove the impeller from the shaft (35). Retain the impeller key (88).

Inspect the roll pin (86) and replace it if worn or bent. Inspect the impeller and replace it if cracked or badly worn.

Seal Removal and Disassembly

(Figures E—1 and E—3)

Before removing the seal, disconnect the feed tube (53) from the barbed elbow (52) in the seal plate (57). Plug the tube to stop the flow of oil from the bottle oiler (32). Allow the seal cavity to drain.

Remove the spring centering washer and seal spring. Slide the shaft sleeve (28) and rotating portion of the seal off the shaft as a single unit. Remove both shaft sleeve O-rings. Apply oil to the sleeve and work it up under the bellows. Slide the rotating portion of the seal off the shaft sleeve.

Use a stiff wire with a hooked end to remove the stationary element, seat and O-rings from the seal plate.

Inspect the grooved pin (27) for wear or damage. Using pliers, remove the grooved pin if replacement is required.

Clean the seal cavity and shaft with a soft cloth soaked in cleaning solvent.

Most cleaning solvents are toxic and flammable. Use them only in a well ventilated area free from excessive heat, sparks, and flame. Read and follow all precautions printed on solvent containers.

If no further disassembly is required, see **Seal Reassembly and Installation**.

Pump Disassembly

Remove the discharge piping. Remove the hardware (104, 105 and 106) securing the discharge spool flange (4) and flange gasket (7) to the pump casing (1).

Remove the hardware (29, 55 and 56) securing the bottle oiler bracket to the intermediate (15). Inspect the bottle oiler (32) for cracks or leaks.

Use a suitable hoist and sling to support the pump casing, and remove the remaining hardware (55 and 56). Separate the casing from the intermediate assembly.

Remove the seal plate O-ring (10) and inspect it for damage.

To separate the rotating assembly from the power source, use the eye bolt previously installed to support the intermediate (15). Remove the mounting hardware and separate the rotating assembly from the power source. Tie and tag any shims used under the mounting foot. Remove the shaft key (34).

Separate the seal plate (57) from the intermediate by removing the capscrews (11). Press the oil seal (6) from the seal plate and inspect it for wear or damage.

Separate the intermediate from the pedestal body (47) by removing the hardware (49 and 50). Before opening the pedestal cavity, remove the bottle oiler and nipple (36 and 37) and drain the lubricant from the pedestal by removing the pedestal drain plug (43). Clean and reinstall the plug.

Shaft and Bearing Removal and Disassembly

When the pump is properly operated and maintained, the pedestal should not require disassembly. Disassemble the shaft and bearings **only** when there is evidence of wear or damage.

Shaft and bearing disassembly in the field is not recommended. These operations should be performed only in a properly-equipped shop by qualified personnel.

Remove the hardware (21 and 22) securing the bearing housing (20) to the pedestal (47). Remove the bearing shim set (41); tie and tag the shims or measure and record their thickness for ease of reassembly.

Remove the slinger ring (16) from the impeller shaft (35).

Place a block of wood against the impeller end of the shaft and tap the shaft, assembled bearings and bearing housing (17, 19 and 20) from the pedestal bore. **Be careful** not to damage the shaft.

Remove the bearing housing O-ring (42) from the bearing housing.

Press the oil seal (8) from the pedestal body. Inspect it for wear or damage.

Remove the hardware (23 and 24) securing the bearing housing cap (25) to the bearing housing. Pull the bearing cap and the bearing cap gasket set (40) from the bearing housing.

Press the oil seal (30) from the bearing cap.

Apply heat to the outside of the bearing housing (20) and press the heated bearing housing off the outboard bearings (19 and 19A) and remove it from the shaft.

After removing the shaft and bearings, clean and inspect the bearings **in place** as follows.

To prevent damage during removal from the shaft, it is recommended that bearings be cleaned and inspected **in place**. It is **strongly** recommended that the bearings be replaced **any** time the shaft and bearings are removed.

Clean the pedestal, bearing housing, shaft and all component parts (except the bearings) with a soft cloth soaked in cleaning solvent. Inspect the parts for wear or damage and replace as necessary.

WARNING!

Most cleaning solvents are toxic and flammable. Use them only in a well ventilated area free from excessive heat, sparks, and flame. Read and follow all precautions printed on solvent containers.

Clean the bearings thoroughly in **fresh** cleaning solvent. Dry the bearings with filtered compressed air and coat with light oil.

CAUTION

Bearings must be kept free of all dirt and foreign material. Failure to do so will greatly shorten bearing life. **Do not** spin dry bearings. This may scratch the balls or races and cause premature bearing failure.

Rotate the bearings by hand to check for roughness or binding and inspect the bearing balls. If rotation is rough or the bearing balls are discolored, replace the bearings.

The bearing tolerances provide a tight press fit onto the shaft and a snug slip fit into the pedestal. Replace the bearings, shaft, or pedestal if the proper bearing fit is not achieved.

If bearing replacement is required, bend the tabs of the lockwasher (39) away from the locknut (38) and disengage the locknut from the shaft. Use a bearing puller to remove the bearings from the shaft.

NOTE

*The outboard bearings (19 and 19A) are a matched set and **cannot** be replaced separately.*

Shaft and Bearing Reassembly and Installation

Clean and inspect the bearings as indicated in **Shaft and Bearing Removal and Disassembly**.

CAUTION

To prevent damage during removal from the shaft, it is recommended that bearings be cleaned and inspected **in place**. It is **strongly** recommended that the bearings be replaced **any** time the shaft and bearings are removed.

Be sure the oil return hole in the bottom of the bearing housing is clean and free of dirt.

The bearings may be heated to ease installation. An induction heater, hot oil bath, electric oven, or hot plate may be used to heat the bearings. Bearings should **never** be heated with a direct flame or directly on a hot plate.

NOTE

If a hot oil bath is used to heat the bearings, both the oil and the container must be **absolutely** *clean. If the oil has been previously used, it must be* **thoroughly** *filtered.*

Heat the bearings to a uniform temperature **no higher than** 250°F (120°C) and slide the bearings onto the shaft, one at a time, until they are fully seated. This should be done quickly, in one continuous motion, to prevent the bearings from cooling and sticking on the shaft.

WARNING!

Use caution when handling hot bearings to prevent burns.

CAUTION

When installing the bearings onto the shaft, **never** press or hit against the outer race, balls, or ball cage. Press **only** on the inner race.

NOTE

When installing the outboard bearings (19 and 19A) on the impeller shaft, make certain that they are installed with the loading opening sides facing each other and the ball contact angles converging to-

ward the center (see Figure E—2). Also make certain that the inner bearing is seated squarely against the shaft shoulder, and that the inner races contact each other.

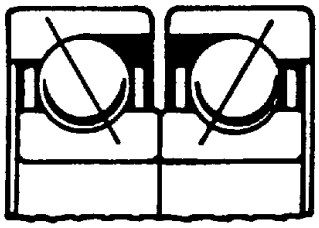


Figure E—2. Correct Bearing Mounting

While the bearings are still hot, promptly install the bearing lockwasher and locknut (38 and 39). Tighten the locknut and bend the tabs of the lockwasher over the locknut.

Make certain that there are no burrs or dirt on the interior surfaces of the bearing housing (20). Heat the bearing housing and slide the shaft and bearings into the heated bearing housing. Make certain that the bearings are pressed squarely against the step of the housing.

CAUTION

When installing the shaft and bearings into the bearing bore, push against the outer race. **Never** hit the balls or ball cage.

Press the oil seal (30) into the bearing housing cap (25) with the lip positioned as shown in Figure E—1. **Be careful** not to damage the oil seal lip.

Align the words “TOP” on the bearing cap and the bearing housing and secure the bearing cap and to the bearing housing using the hardware (23 and 24).

Use a feeler gauge to measure the gap between the outboard surface of the bearing housing and the inboard surface of the bearing cap. Add .002 inch (.05 mm) to the measurement to obtain the total thickness of gaskets required.

NOTE

This gap can also be measured by inserting pieces of solder wire between the two surfaces before the capscrews are fully tightened. Tighten the screws, back them off, and measure the thickness of the crushed solder wire.

Remove the bearing cap and add the calculated thickness of bearing cap gaskets between the bearing cap and the bearing housing. Since the bearing cap acts as a clamp to **preload** the bearings, measurement of the and gaskets is **critical**.

Install the bearing cap gaskets (40) and the hardware (23 and 24) and secure the bearing cap to the bearing housing. Check the shaft for end play. If end play exists, remove bearing cap gaskets until the end play is eliminated.

Install the bearing housing O-ring (42). Apply a light coating of grease to the O-ring and contacting surfaces for ease of reassembly.

Install the oil seal (8) in the pedestal body (47) with the lip positioned as shown in Figure E—1.

Install the same number of bearing housing shims (41) as previously removed.

NOTE

Position the bearing housing “TOP” at the 12 o’clock position and the groove plug (51) at the 6 o’clock position.

Slide the shaft, assembled bearings and bearing housing into the pedestal body until the inboard bearing seats against the pedestal bore. **Be careful** not to damage the oil seal lip. Secure the bearing housing using the hardware (21 and 22).

Install the slinger ring (16) on the shaft. Using the hardware (49 and 50), secure the pedestal assembly to the intermediate (15) with “TOP” in the proper position.

Install the bottle oiler and nipple (36 and 37) in the side of the pedestal body.

Secure the pedestal to the base with the previously removed hardware. Be sure to reinstall any leveling shims used under the mounting feet.

Lubricate the bearings and pedestal as indicated in **LUBRICATION** at the end of this section.

Impeller Back Clearance

Before the seal assembly is installed, temporarily assemble the seal plate (57), shaft sleeve (28),

centering washer (26), and impeller onto the shaft. A clearance of .015 inch (0,38 mm) is required between the impeller and seal plate to achieve maximum pump efficiency. Adjust the back clearance by adding bearing housing shims (41) until the impeller scrapes against the seal plate when the shaft is turned. After the impeller scrapes, subtract .015 inch (0,38 mm) of bearing housing shims. Disassemble the impeller, washer, sleeve and seal plate and proceed with **Seal Reassembly**.

Seal Reassembly and Installation

Clean the seal cavity and shaft with a cloth soaked in fresh cleaning solvent.

WARNING!

Most cleaning solvents are toxic and flammable. Use them only in a well ventilated area free from excessive heat, sparks, and flame. Read and follow all precautions printed on solvent containers.

Inspect the impeller shaft for damage. Small scratches or nicks may be removed with a fine file or emery cloth. If excessive wear exists, the shaft will have to be replaced.

The seal is not normally reused because wear patterns on the finished faces cannot be realigned during reassembly. This could result in premature failure. If necessary to reuse an old seal in an emergency, **carefully** wash all metallic parts in **fresh** cleaning solvent and allow to dry thoroughly.

Handle the seal parts with extreme care to prevent damage. Be careful not to contaminate precision finished faces; even fingerprints on the faces can shorten seal life. If necessary, clean the faces with a non-oil based solvent and a clean, lint-free tissue. Wipe **lightly** in a concentric pattern to avoid scratching the faces.

Inspect the seal components for wear, scoring, grooves, and other damage that might cause leakage. Clean and polish the shaft sleeve (28), or replace it if there are nicks or cuts on either end. If any components are worn, replace the complete seal; **never mix old and new seal parts**.

If a replacement seal is being used, remove it from the container and inspect the precision finished faces to ensure that they are free of any foreign matter.

To ease installation of the seal, lubricate the O-rings, bellows and shaft sleeve with water or a very **small** amount of oil, and apply a drop of light lubricating oil on the finished faces. Assemble the seal as follows, (see Figure E–3).

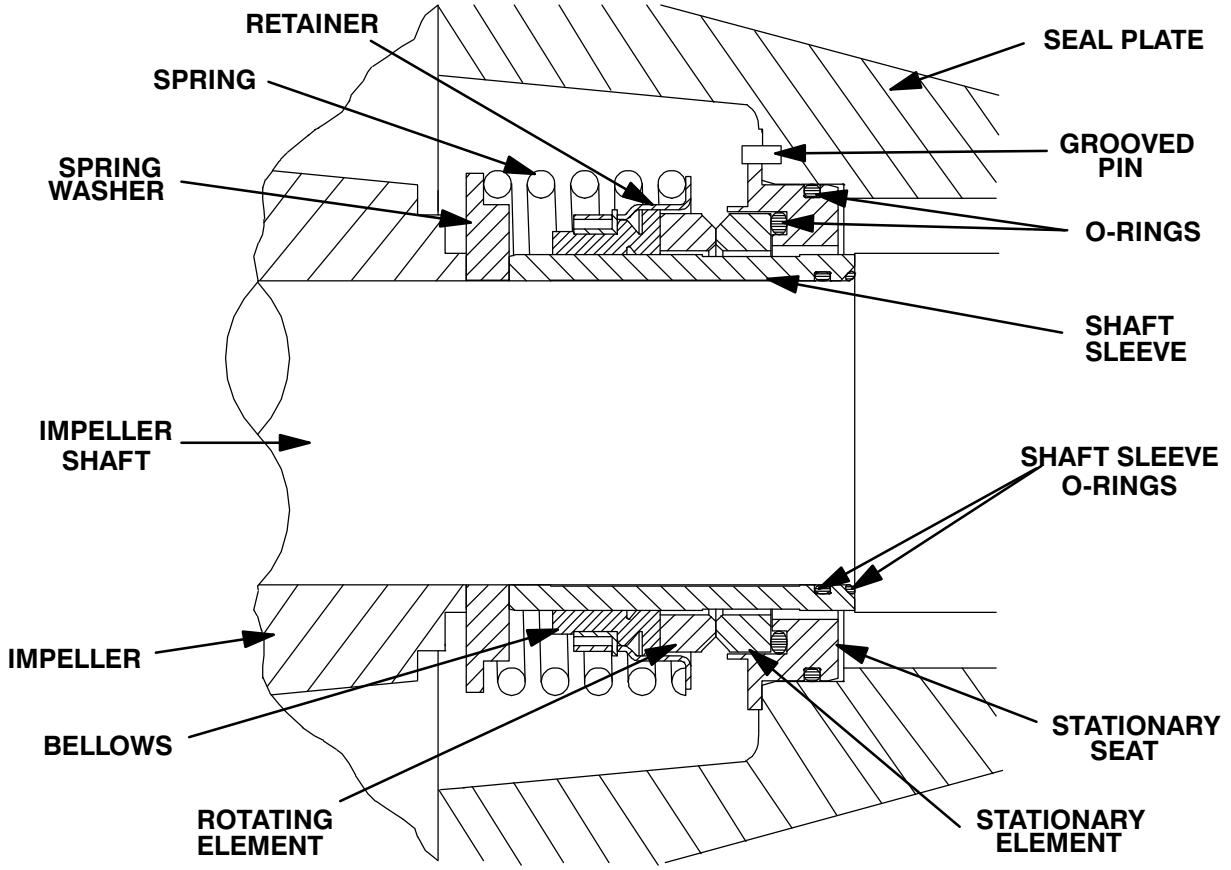


Figure E—3. 46512—062 Seal Assembly

CAUTION

This seal is not designed for operation at temperatures above 160°F (71°C). Do not use at higher operating temperatures.

Lay the seal plate on a flat surface with the impeller side down. Press the oil seal (6) into the seal plate (57) with the lip positioned as shown in Figure E—1.

Turn the seal plate over so the impeller side is up. If removed, use a hammer and a drift pin to install the grooved pin (27). Line up the slot in the stationary seat with the grooved pin in the seal plate.

Press the stationary subassembly (consisting of the stationary seat, O-rings and stationary element) into the seal plate until the stationary seat bottoms against the seal plate bore. Be sure to line up the groove pin with the slot in the stationary seat.

Slide the seal plate onto the shaft and secure it to the intermediate with the capscrews (11). **Be careful** not to damage the oil seal lip on the shaft keyway. Install the O-ring on the shaft that seals the shaft sleeve to the shaft shoulder.

Slide the rotating subassembly (consisting of the rotating element, retainer and bellows) onto the lubricated shaft sleeve until the rotating element is **just flush** with the chamfered end of the shaft. Lubricate and install the O-ring in the I.D. of the sleeve (28). Slide the sleeve and rotating subassembly onto the shaft until the seal elements contact. Continue to push the sleeve through the seal until it bottoms against the shaft shoulder and O-ring. Install the seal spring and the spring centering washer (26).

Reinstall the air vent and piping (12, 13 and 14), and lubricate the seal assembly as indicated in **LUBRICATION**, after the impeller has been installed.

Impeller Installation And Adjustment

Inspect the impeller, and replace it if cracked or badly worn. Make certain that the seal components are seated squarely on the shaft sleeve. Reinstall the impeller key (88). Add a uniform coat of

"Never-Seez" to the shaft in the area under the impeller and press the impeller onto the shaft. Check the impeller clearance to ensure that it is within tolerance, (see **Impeller Back Clearance**).

Make sure the tapped threads in the impeller shaft are clean. Install the impeller washer and roll pin (85 and 86). Prime the threads of the socket head capscrew (87) with "Loctite Primer-T" or equivalent and apply four drops of "Loctite 243-31" adhesive sealant or equivalent around the circumference of the threads, one inch from the end. Reinstall the capscrew and torque to 300 ft. lbs. or 3600 in. lbs.(42 m. kg.). Recheck the impeller back clearance.

NOTE

If the pump casing (1) has not been secured to the pedestal assembly, this clearance may be measured with a feeler gauge and adjusted accordingly.

Pump Casing Installation

Install the shaft key (34) and connect the rotating assembly to the power source. **Be sure** the pump and power source are proper aligned, (see **Alignment** in **INSTALLATION**) before installing the leveling shims and base mounting hardware.

Lubricate the seal plate O-ring (10) with a very **small** amount of oil and install it on the seal plate. Secure the pump casing to the intermediate assembly (15) with the hardware (55 and 56).

Replace the discharge flange gasket (7) and connect the discharge spool flange (4) and discharge piping.

Secure the bottle oiler and bracket (32 and 33). Remove the plug from the feed tube (53), reconnect it to the barbed elbow (52) in the seal plate and secure with the clamps (54).

Wear Plate And Suction Head Installation

Lubricate the suction head O-ring (61) with "Never-Seez" or a small amount of grease and press the wear plate (59) into the suction head (68). Secure with the hardware (63 and 64).

Lubricate the wear plate O-ring (60) with "Never-Seez" or a small amount of grease and install it on the wear plate. Secure the suction and wear plate to the pump casing with the hardware (102 and 103). Secure the pedestal foot (48) to the pump casing using the hardware (66 and 67). Be sure to reinstall any leveling shims used under the pedestal feet.

A clearance of .015 inch (0,38 mm) between the impeller and the wear plate (59) is also recommended for maximum pump efficiency. Set this clearance by adjusting the wear plate. Back off the jam nuts (101) until they contact the heads of the wear plate adjusting screws (100). Tighten the adjusting screws evenly, no more than a half turn at a time, while rotating the impeller shaft until the wear plate makes contact with the impeller. Back off each of the adjusting screws a half turn, and tighten the jam nuts until they are snug against the suction head. The clearance should now be correct.

Secure the check valve flange (72) and the suction head gasket (97) to the suction head with the hardware (69, 70 and 71).

Suction Check Valve Installation

Press the drive sleeve bearings (76) into the bearing pivot brackets (75). Slide the brackets and assembled bearings onto the two check valve shafts (74) and secure with the grooved pins (77).

Apply a thin coat of "Loctite Threadlocker No. 271" or equivalent to the threads of the button head capscrews (79 and 80) and secure one shaft to the valve plate (78) and the other shaft to the flange seat (81).

Inspect the molded valve assembly (84) for wear and replace as necessary. Secure the valve to the valve plate using the hardware (82 and 83).

NOTE

Be sure to center the check valve on the check valve seat before securing with the mounting hardware.

Secure the flange gasket (90) and the check valve assembly to the check valve flange using the recessed screws (89). Check the operation of the check valve to ensure proper seating and free movement.

Final Pump Assembly

Be sure the pump and power source are securely mounted to the base and that they are properly aligned. If used, removed the eye bolt used to lift component parts.

Install the suction and discharge lines and open all valves. Make certain that all piping connections are tight, properly supported and secure. Open all the valves in the suction and discharge lines.

Be sure the pump and power source have been properly lubricated, see **LUBRICATION**.

Remove the fill cover assembly (93) and fill the pump casing with clean liquid. Reinstall the fill cover and tighten it.

Refer to **OPERATION**, Section C, before putting the pump back into service.

LUBRICATION

Bearings

The pedestal was fully lubricated when shipped from the factory. Check the oil level regularly and maintain it at the middle of the glass in the oil cup reservoir. When lubrication is required, unscrew the glass from the base of the reservoir. Fill the glass through the beveled tube with SAE No. 30 non-detergent oil. When the glass is full, quickly turn it over, inserting the beveled tube into the reservoir base. Repeat as necessary until the oil level is in the middle of the glass, then screw the glass back into the base. Maintain the oil at this level.

When lubricating a dry (overhauled) pedestal, add approximately 128 ounces (3,8 Liters) through the reservoir piping. **Do not** overfill. Over-lubrication can cause the bearings to over-heat, resulting in premature bearing failure.

Under normal conditions, change the oil each 5000 hours of operation, or at twelve month intervals, which ever occurs first. Change the oil more frequently if the pump is operated continuously or installed in an environment with rapid temperature change.

Monitor the condition of the bearing lubricant regularly for evidence of rust or moisture condensation. This is especially important in areas where variable hot and cold temperatures are common.

For cold weather operation, consult the factory or a lubricant supplier for the recommended grade of oil.

Seal Assembly

Check the seal lubricant before starting the pump and periodically during operation. Fill the bottle oiler (32) with SAE No. 30 non-detergent oil. Check the oil level regularly. The oil level **must be maintained** above the oil level indicated (31).

Periodically clean and reinstall the seal cavity air vent (14).

Power Source

Consult the literature supplied with the power source, or contact your local power source representative.

For U.S. and International Warranty Information,
Please Visit www.grpumps.com/warranty
or call:
U.S.: 419—755—1280
International: +1—419—755—1352

For Canadian Warranty Information,
Please Visit www.grcanada.com/warranty
or call:
519—631—2870