

**INSTALLATION, OPERATION,
AND MAINTENANCE MANUAL**
WITH PARTS LIST



0 SERIES PUMP

MODEL
04A20-B

THE GORMAN-RUPP COMPANY • MANSFIELD, OHIO

www.grpumps.com

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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 an 0 Series, closed impeller, self-priming centrifugal model, with straight-in suction, without a suction check valve. It is designed to handle petroleum products or other clean liquids that do not contain large entrained solids. The basic material of construction for wetted parts is gray iron, with gray iron impeller and steel shaft.

Because pump installations are seldom identical, this manual cannot possibly provide detailed instructions and precautions for every aspect of each specific application. Therefore, it is the responsibility of the owner/installer of the pump 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. Pumps and related equipment **must** be installed and operated according to all national, local and industry standards.

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 write:

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

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

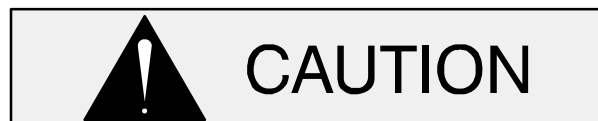
The following are used to alert maintenance personnel to procedures which require special attention, to those which could damage equipment, and to those which could be dangerous to personnel:



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.



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.



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 0 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.

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 instructions and 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 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 petroleum products or other clean liquids that do not contain large entrained solids. Do not attempt to pump liquids which may damage the pump or endanger personnel as a result of pump failure.



This pump is designed to handle petroleum products or other clean liquids that do not contain large entrained solids. If the pump is used for handling volatile, flammable liquids, all drivers and/or controls must meet industry standards and codes for use in an explosive atmosphere. Do not attempt to pump liquids for which the pump, driver and/or controls have not been approved, or which may damage the pump or endanger personnel as a result of pump failure.



If this pump is used for volatile and/or flammable liquids, be certain proper safety practices are followed before operating or servicing the pump. Provide adequate ventilation, prohibit smoking, wear static-resistant clothing and shoes. Clean up all fuel spills immediately after occurrence.



Do not install and operate a non-explosion proof motor in an explosive atmosphere. Install, connect, and operate the motor in accordance with the Na-

tional Electric Code and all local codes. If there is a conflict between the instructions in the manual accompanying the unit and the National Electric Code or the applicable local code, the National or local code shall take precedence.



If this pump is used with volatile and/or flammable liquids, overheating may produce dangerous fumes. Take precautions to ensure the area surrounding the pump is adequately ventilated. Allow the pump to cool and use extreme caution when venting the pump, or when removing covers, plates, plugs, or fittings.



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



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



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.



Overheated pumps can cause severe burns and injuries. If overheating of the pump occurs:

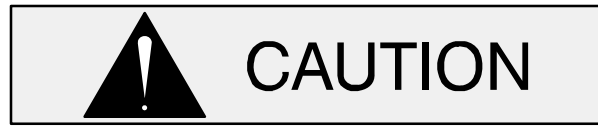
1. Stop the pump immediately.
2. Ventilate the area.
3. Allow the pump to completely cool.
4. Check the temperature before opening any covers, plates, gauges, or plugs.
5. Vent the pump slowly and cautiously.
6. Refer to instructions in this manual before restarting the pump.



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 completely cool before servicing.



Never run this pump backwards. Be certain that rotation is correct before fully engaging the pump.



Pumps and related equipment must be installed and operated according to all national, local and industry standards.

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.

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

Pump Dimensions

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

OUTLINE DRAWING

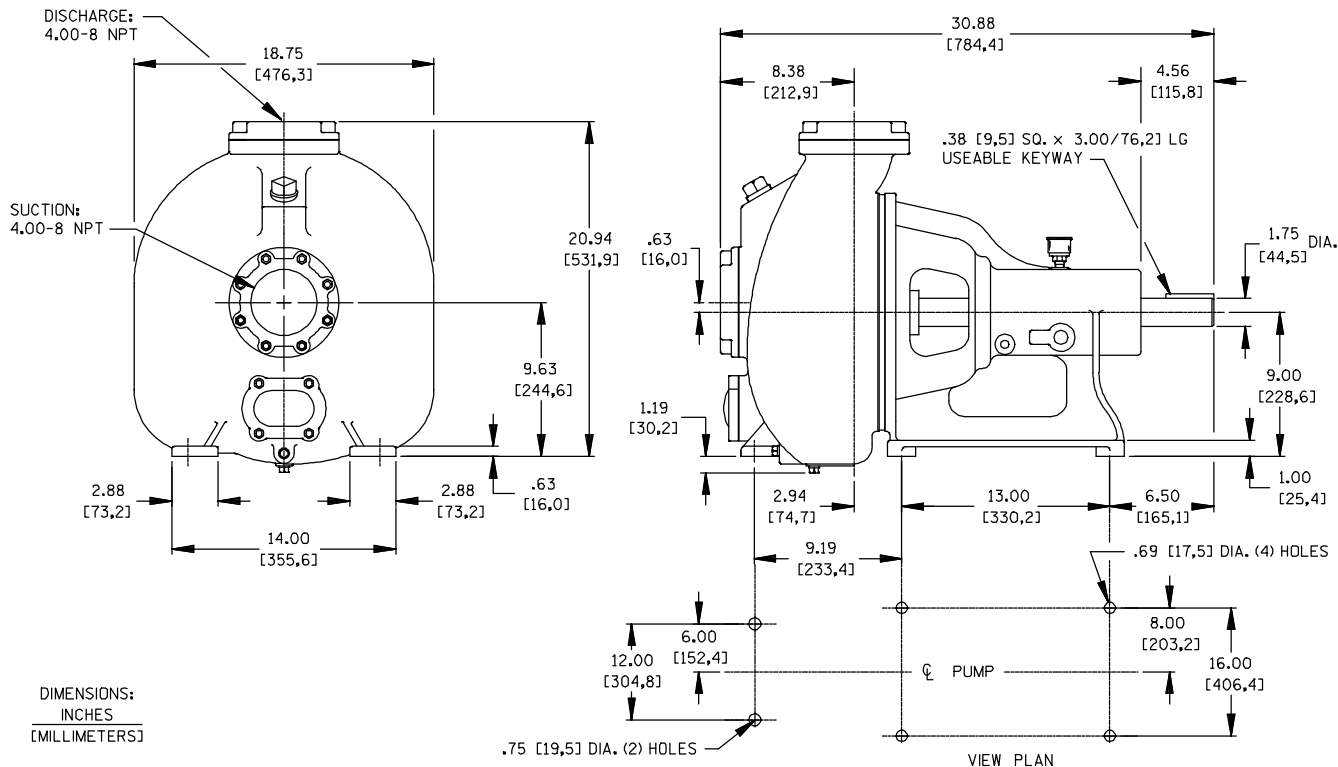


Figure 1. Pump Model 04A20-B

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 and engine for cracks, dents, damaged threads, and other obvious damage.

- b. Check for and tighten loose attaching hardware. Since gaskets tend to shrink after drying, check for loose hardware at mating surfaces.
- c. Carefully read all tags, decals, and markings on the pump assembly, and perform all duties indicated.
- 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 and engine have 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



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.

Lifting

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. Contact the factory 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 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.

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 9/16-inch (14,3 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 air-tight 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 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).

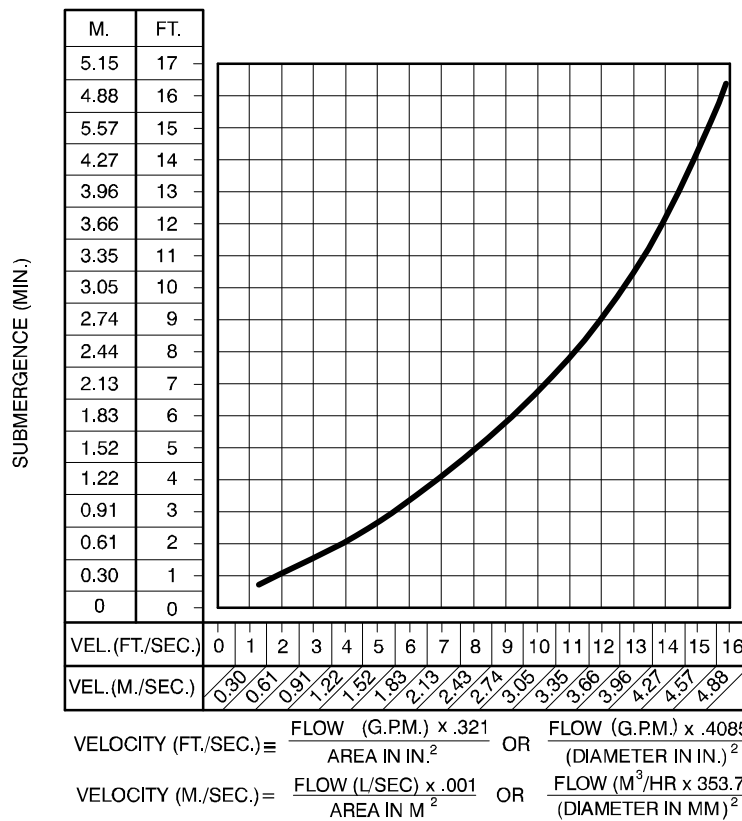


Figure 2. Recommended Minimum Suction Line Submergence vs. Velocity

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.

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.

head, gradually close the discharge throttling valve before stopping the pump.

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.



If the application involves a high discharge



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



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 3A).

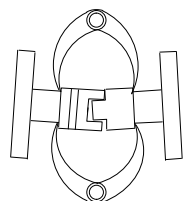


Figure 3A. Aligning Spider-Type Couplings

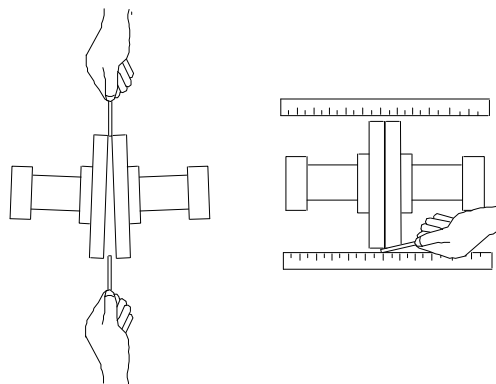


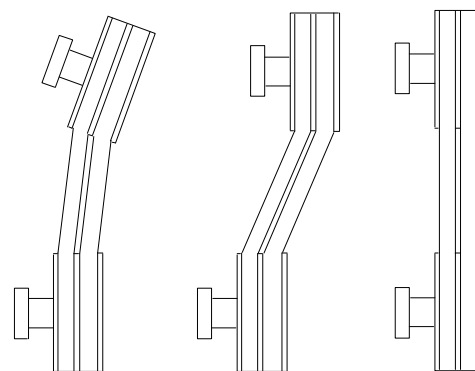
Figure 3B. Aligning Non-Spider Type Couplings

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 3B).

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.

V-Belt Drives

When using V-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 3C). In drive systems using two or more belts, make certain that the belts are a matched set; unmatched sets will cause accelerated belt wear.



MISALIGNED: SHAFTS NOT PARALLEL MISALIGNED: SHAFTS NOT IN LINE ALIGNED: SHAFTS PARALLEL AND SHEAVES IN LINE

Figure 3C. 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; over speeding the pump may damage both pump and power source.



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.

DRIVE BELT TENSIONING

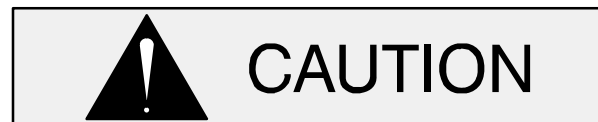
General Rules of Tensioning

For new drive belts, check the tension after 5, 20 and 50 hours of operation and re-tension as required (see the following procedure for measuring belt tension). Thereafter, check and re-tension if required monthly or at 500 hour intervals, whichever comes first.

Ideal drive belt tension is the **lowest** tension at which the belt will not slip under peak load conditions. Do not over-tension drive belts. Over-tensioning will shorten both drive belt and bearing life. Under-tensioning will cause belt slippage. Always keep belts free from dirt, grease, oil and other foreign material which may cause slippage.

GROUNDING

If the pump is used to handle volatile or flammable liquids, the unit must be grounded by attaching a ground wire assembly to a ground rod in order to eliminate electrostatic build-up by the liquid being pumped. Install the ground rod in accordance with the National Electrical Codes and all local codes. Be sure the fastening device makes a tight electrical connection with the rod and the pump.



Inspect and test the ground wire assembly for conductivity. Replace a broken or frayed wire before resuming operation.

OPERATION – SECTION C

Review all **SAFETY** information in Section A.

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



This pump is designed to handle petroleum products or other clean liquids that do not contain large entrained solids. Do not attempt to pump liquids which may damage the pump or endanger personnel as a result of pump failure.

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.



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.

When installed in a flooded suction application, simply open the system valves and permit the in-

coming liquid to evacuate the air. After the pump and piping system have completely filled, evacuate any remaining air pockets in the pump or suction line by loosening pipe plug or opening bleeder valves.

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



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

Rotation

The correct direction of pump rotation is clockwise when facing the drive end of the impeller shaft. 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.

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

Close the discharge throttling valve (if so equipped) so that the pump will not have to prime against the weight of the liquid in the discharge line. Air from the suction line will be discharged through the bypass line back to the wet well during the priming cycle. When the pump is fully primed and liquid is flowing steadily from the bypass line, open the discharge throttling valve. 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 completely cool liquid.



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 completely cool before servicing.

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.

Pump Vacuum Check

Since this pump does not have a suction check valve, the discharge line must be fitted with a check valve if a pump vacuum reading is to be taken.

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 for water or 15 to 17 inches (381 to 432 mm) or more of mercury when pumping petroleum. 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 operation speed.

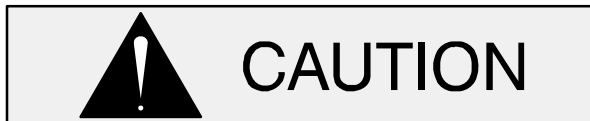
Shut off the pump. The vacuum gauge reading will immediately drop proportionate to static suction lift, and should then stabilize. If the vacuum reading falls off rapidly after stabilization, an air leak exists. Before checking for the source of the leak, check the point of installation of the vacuum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

NOTE

Petroleum products are very sensitive to changes in temperature. Warmer temperatures elevate the product vapor pressure resulting in low vacuum readings. Do not mistake temperature problems for faulty pump installation or performance.

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

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.

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.

TROUBLESHOOTING – SECTION D

Review all SAFETY information in Section A.



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	<p>Not enough liquid in casing.</p> <p>Suction check valve contaminated or damaged.</p> <p>Air leak in suction line.</p> <p>Lining of suction hose collapsed.</p> <p>Leaking or worn seal or pump gasket.</p> <p>Suction lift or discharge head too high.</p> <p>Strainer clogged.</p>	<p>Add liquid to casing. See PRIMING.</p> <p>Clean or replace check valve.</p> <p>Correct leak.</p> <p>Replace suction hose.</p> <p>Check pump vacuum. Replace leaking or worn seal or gasket.</p> <p>Check piping installation and install bypass line if needed. See INSTALLATION.</p> <p>Check strainer and clean if necessary.</p>
PUMP STOPS OR FAILS TO DELIVER RATED FLOW OR PRESSURE	<p>Air leak in suction line.</p> <p>Lining of suction hose collapsed.</p> <p>Leaking or worn seal or pump gasket.</p> <p>Strainer clogged.</p>	<p>Correct leak.</p> <p>Replace suction hose.</p> <p>Check pump vacuum. Replace leaking or worn seal or gasket.</p> <p>Check strainer and clean if necessary.</p>

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

PREVENTIVE MAINTENANCE

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. For specific questions concerning your application, contact your Gorman-Rupp distributor or the Gorman-Rupp Company.

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.

For new applications, a first inspection of wearing parts at 250 hours will give insight into the wear rate for your particular application. Subsequent inspections should be performed at the intervals shown on the chart below. Critical applications should be inspected more frequently.

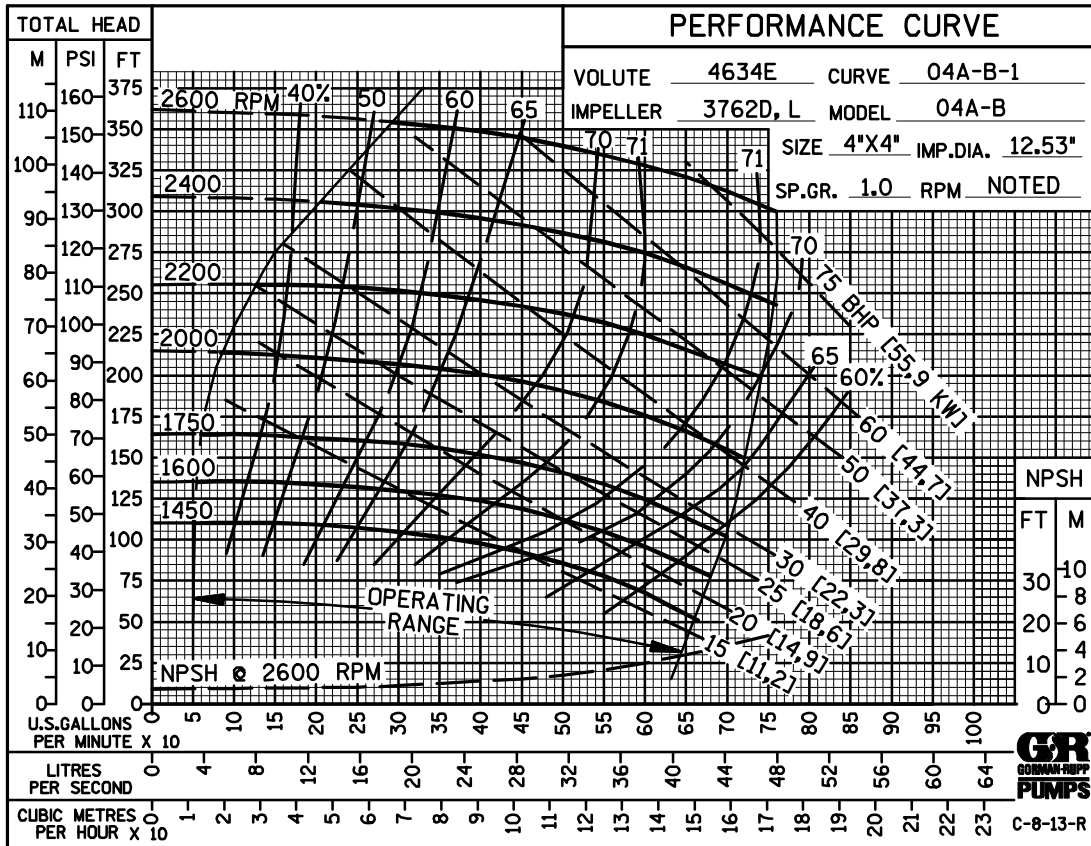
Preventive Maintenance Schedule					
Item	Service Interval*				
	Daily	Weekly	Monthly	Semi-Annually	Annually
General Condition (Temperature, Unusual Noises or Vibrations, Cracks, Leaks, Loose Hardware, Etc.)	I				
Pump Performance (Gauges, Speed, Flow)	I				
Bearing Lubrication		I			R
Seal Lubrication (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					I

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 04A20-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 difference due to such factors as viscosity, specific gravity, elevation, temperature, and impeller trim.

Contact the Gorman-Rupp Company to verify performance or part numbers.



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

If your pump serial number is followed by an "N", your pump is **NOT** a standard production model.

SECTION DRAWING

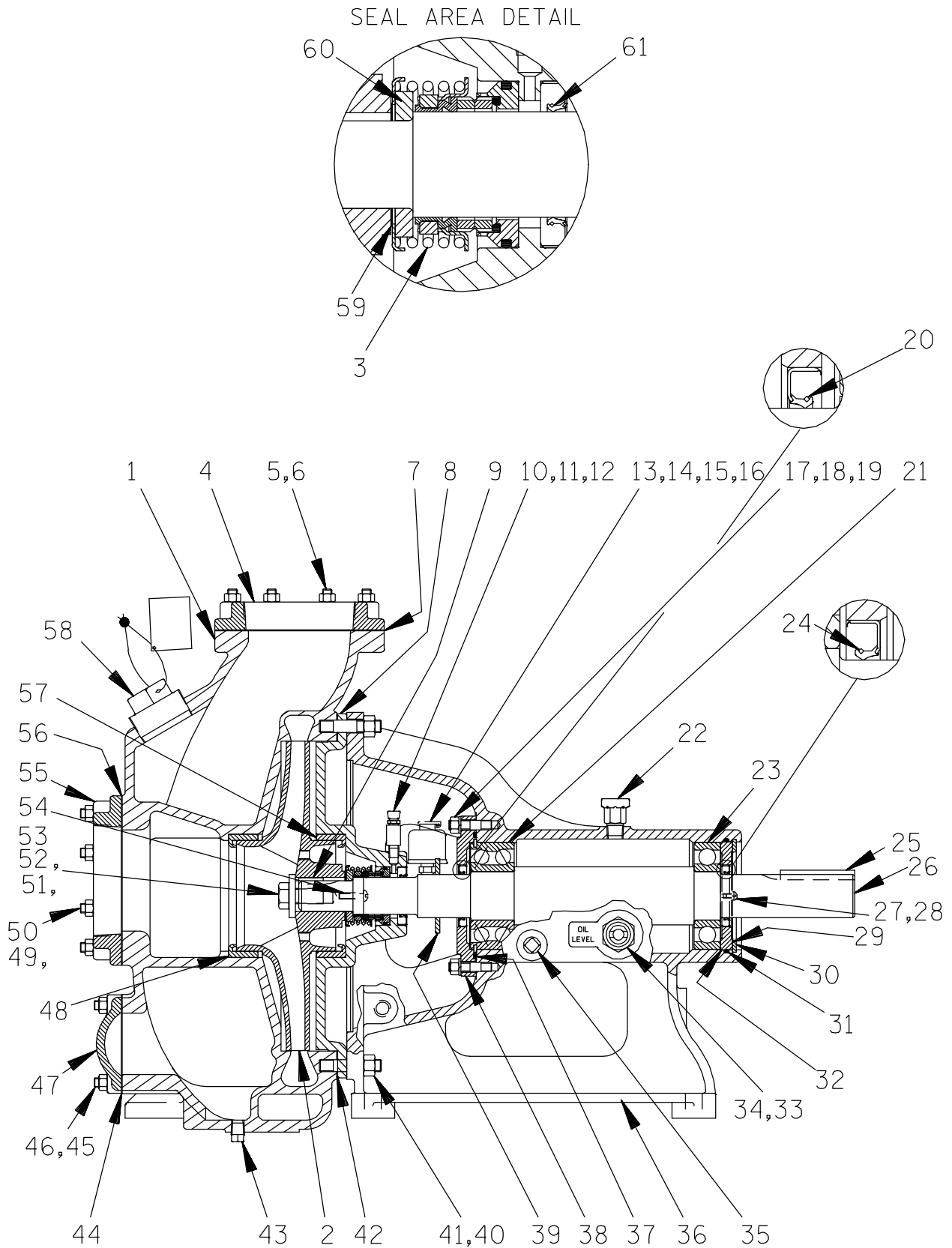


Figure 1. Pump Model 04A20-B

PARTS LIST
Pump Model 04A20-B
 (From S/N 818101 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	ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY
☞ 1	PUMP CASING	SEE NOTE BELOW			38	BEARING CAP	38322-418	10010	1
2 *	IMPELLER	3762D	10010	1	39	SLINGER RING	3209	19120	1
3 *	MECH SEAL ASSY	12364A	----	1	☞40	STUD	C0810	15991	12
4	DISCHARGE FLANGE	9586	11000	1	41	HEX NUT	D08	15991	12
☞ 5	STUD	C0608	15991	8	42 *	CASING GASKET	3768GB	20000	1
6	HEX NUT	D06	15991	8	☞43	PPE PLUG	P04	15079	1
7 *	DISCH FLANGE GASKET	5372G	20000	1	44 *	GASKET	4635GA	20000	1
8	SEAL PLATE	38272-519	10010	1	☞45	STUD	C0606	15991	4
9 *	IMPELLER KEY	N0404	15990	1	46	HEX NUT	D06	15991	4
10	PIPE NIPPLE	T02	15079	1	47	COVER PLATE	4635	10010	1
11	PIPE COUPLING	AE02	15079	1	☞48 *	WEAR RING	3765A	10010	1
12	AIR VENT FITTING	S2162	----	1	☞49	STUD	C0608	15991	8
13	STREET ELBOW	AGS02	11999	1	50	HEX NUT	D06	15991	8
14	PIPE NIPPLE	T0212	15079	1	51 *	IMPELLER CAPSCREW	B1005S	15991	1
15	PIPE ELBOW	R02	11999	1	52 *	IMPELLER WASHER	5718	15990	1
16	BOTTLE OILER	S1933	----	1	53 *	IMPELLER LOCK WASHER AK10		15990	1
17	STUD	C0607	15991	6	54	RD HD MACH SCREW	X0404	17000	2
18	LOCK WASHER	J06	15991	6	55	SUCTION FLANGE	9586	11000	1
19	HEX NUT	D06	15991	6	56 *	SUCT FLANGE GASKET	5372G	20000	1
20 *	OIL SEAL	25227-534	----	1	57 *	WEAR RING	3765A	10010	1
21 *	INBOARD BALL BRG	S1030	----	1	☞58	FILL PLUG ASSY	48271-068	----	1
22	AIR VENT	S1703	----	1	59 *	IMP ADJ SHIM SET	37J	17090	1
23 *	OUTBOARD BALL BRG	S1077	----	1	60 *	SEAL SPACER WASHER	38329-040	17130	1
24 *	OIL SEAL	25227-534	----	1	61 *	OIL SEAL	S506	----	1
25 *	SHAFT KEY	N0612	15990	1		NOT SHOWN:			
26	IMPELLER SHAFT	38512-518	15014	1		ROTATION DECAL	2613M	----	1
27	RD HD MACH SCREW	X#10-01-1/2S	15991	2		NAME PLATE	38818-020	13990	1
28	LOCK WASHER	J#10	15991	2		DRIVE SCREW	BM#04-03	17000	4
29	BRG ADJ SHIM SET	8546	15990	1		SUCTION STICKER	6588AG	----	1
30	RETAINING RING	S1165	----	1		PRIMING STICKER	6588AH	----	1
31 *	O-RING	25152-245	----	1		DISCHARGE STICKER	6588BJ	----	1
32	BEARING RETAINER	38322-522	26000	1		G-R DECAL	GR-03	----	1
33	SIGHT GAUGE	S1471	----	1		LUBE DECAL	38816-079	----	1
34	PIPE PLUG	P12	15079	1		INSTRUCTION TAG	38817-011	----	1
35	CASING DRAIN PLUG	P06	15079	1		INSTRUCTION TAG	38817-028	----	1
36	PEDESTAL	3020C	10010	1					
37 *	O-RING	25152-248	----	1					

* INDICATES PARTS RECOMMENDED FOR STOCK

☞ INCLUDED WITH REPAIR 46471-208 ---- 1
 PUMP CASING ASSY

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 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, switch off 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.



Before attempting to open or service the pump:

- 1. Familiarize yourself with this manual.**
- 2. Lock out or disconnect 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.**



If this pump is used for volatile and/or flammable liquids, be certain proper safety practices are followed before operating or servicing the pump. Provide adequate ventilation, prohibit smoking, wear static-resistant clothing and shoes. Clean up all fuel spills immediately after occurrence.

Pump Casing and Wear Ring Removal



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.

Before attempting to service the pump, remove the hex nuts (46) securing the cover plate (47) and drain the pump. Clean and reinstall the cover plate.

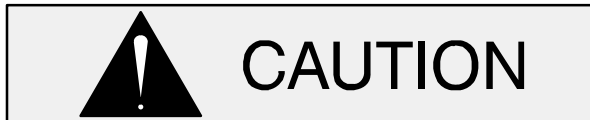
To service the wear ring (48), impeller (2) or seal assembly (3) the pump casing (1) must be separated from the base and pedestal (36).

Remove the suction and discharge lines. Remove the nuts (41) and use a suitable hoist and sling to

separate the pump casing and gasket (42) from the seal plate and pedestal.

Tie and tag any leveling shims used under the casing feet to ease reassembly.

Inspect the wear ring (48) for excessive wear or scoring. The wear ring is secured in the pump casing by a press fit. If replacement is required, use a small bit to drill two holes through the ring horizontally, 180° apart. Use a saw or chisel to complete the cuts through the ring, and remove it from the pump casing. **Use caution** not to damage the pump casing bore when removing the wear ring.



Use caution not to damage the pump casing bore when removing the wear ring.

Impeller Removal

Before attempting to remove the impeller, remove the bottle oiler and piping (13, 14, 15 and 16) to prevent the seal lubricant from escaping when the impeller is removed.

Immobilize the impeller by inserting a bar between the impeller vanes, being careful not to damage the vanes. Disengage the hardware (51, 52 and 53). Remove the bar from the impeller.

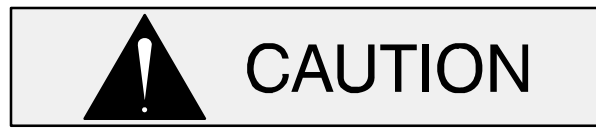
Install 3/8–16 UNC by 4-inch long capscrews in the tapped holes in the impeller. Use the capscrews and a suitable puller to remove the impeller from the shaft. Use caution when removing the impeller; tension on the seal spring will be released as the impeller is removed. Retain the impeller key (9).

Remove the impeller adjusting shims (59). Tie and tag the shims or measure and record their thickness for ease of reassembly.

Seal Removal and Disassembly

(Figures 1 and 2)

Remove the spring retainer, spring washer (60) and seal spring. Lubricate the seal area of the shaft and work oil up under the bellows. Slide the rotating portion of the seal off the shaft as a unit.



Use caution not to damage the seal plate bore when removing the wear ring.

Remove the machine screws (54) and slide the seal plate and stationary portion of the seal off the impeller shaft (26) as a unit. Press the stationary seal element and O-ring out of the seal plate from the back side.

Pry or press the oil seal (61) out of the seal plate.

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 pedestal drain plug (35) and drain the lubricant. Clean and reinstall the drain plug.

Remove the slinger ring (39). Disengage the hardware (18 and 19) and slide the assembled bearing cap (38) and oil seal (20) off the shaft. Remove the O-ring (37). Press the oil seal from the bearing cap.

Use snap ring pliers to remove the bearing retaining ring (30) from the pedestal bore. Remove the bearing shim set (29); tie and tag the shims, or measure and record their thickness for ease of reassembly.

Loosen, but do not remove, the machine screws (27). Pry the retainer from the pedestal bore using a pair of screwdrivers against the heads of the machine screws. After removing the retainer, tighten the machine screws in the retainer.

Press the oil seal (24) from the bearing retainer, and remove the O-ring (31) from the pedestal bore.

Place a block of wood against the drive end of the shaft and tap the shaft and assembled bearings (21 and 23) from the bearing housing.

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



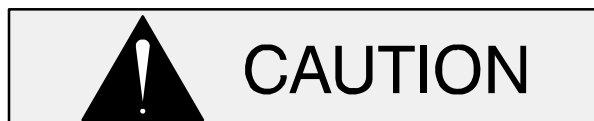
To prevent damage during removal from the shaft, it is recommended that bearings be cleaned and inspected **in place**. It is **strongly** recommended that the bearings be replaced **any** time the shaft and bearings are removed.

Clean the 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.



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.



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, use a suitable bearing puller to remove the bearings from the shaft.

Shaft And Bearing Reassembly And Installation

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



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 shaft for distortion, nicks or scratches. Dress small nicks and burrs with a fine file or emery cloth. Replace the shaft if defective.



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.

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.*

NOTE

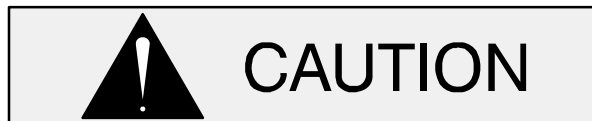
When installing the bearings, position the inboard bearing (21) on the shaft with the integral retaining

ring on the bearing O.D. toward the impeller of the shaft.

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.

After the bearings have been installed and allowed to cool, check to ensure that they have not moved away from the shaft shoulders in shrinking. If movement has occurred, use a suitably sized sleeve and a press to reposition the bearings against the shaft shoulders.

If heating the bearings is not practical, use a suitably sized sleeve and an arbor (or hydraulic) press to install the bearings on the shaft.



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.

Slide the shaft and assembled bearings into the pedestal until the retaining ring on the inboard bearing seats against the pedestal.



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

Position the oil seal (20) in the bearing cap (38) with the lip positioned as shown in Figure 1. Press the oil seal into the bearing cap until the face is **just flush** with the outer surface of the bearing cap.

Install the O-ring (37) and secure the bearing cap to the pedestal with hardware (18 and 19). Use caution not to roll the lip of the oil seal during installation.

Position the oil seal (24) in the bearing retainer (32) with the lip positioned as shown in Figure 1. Press the oil seal into the retainer until fully seated.

Replace the bearing retainer O-ring (31) in the pedestal, and lubricate it with grease. Press the bearing retainer into the pedestal until it seats against the bearing. Be careful not to cut the oil seal lip on the shaft keyway. **Be sure** the machine screws (27) in the bearing retainer are positioned horizontally inline.

Install the same thickness of bearing adjusting shims (29) as previously removed. Reinstall the retaining ring (30) and check shaft endplay.

NOTE

Shaft endplay should be .002 to .010 inch (0,05 to 0,25 mm). Add or remove bearing adjusting shims to obtain this endplay.

Install the slinger ring (39).

Lubricate the bearing housing as indicated in **LUBRICATION**.

Seal Reassembly and Installation

(Figures 1 and 2)

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

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. 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 bellows and O-rings with water or a very **small** amount of light lubricating oil, and apply a drop of light lubricating oil on the finished faces. Assemble the seal as follows, (see Figure 2).

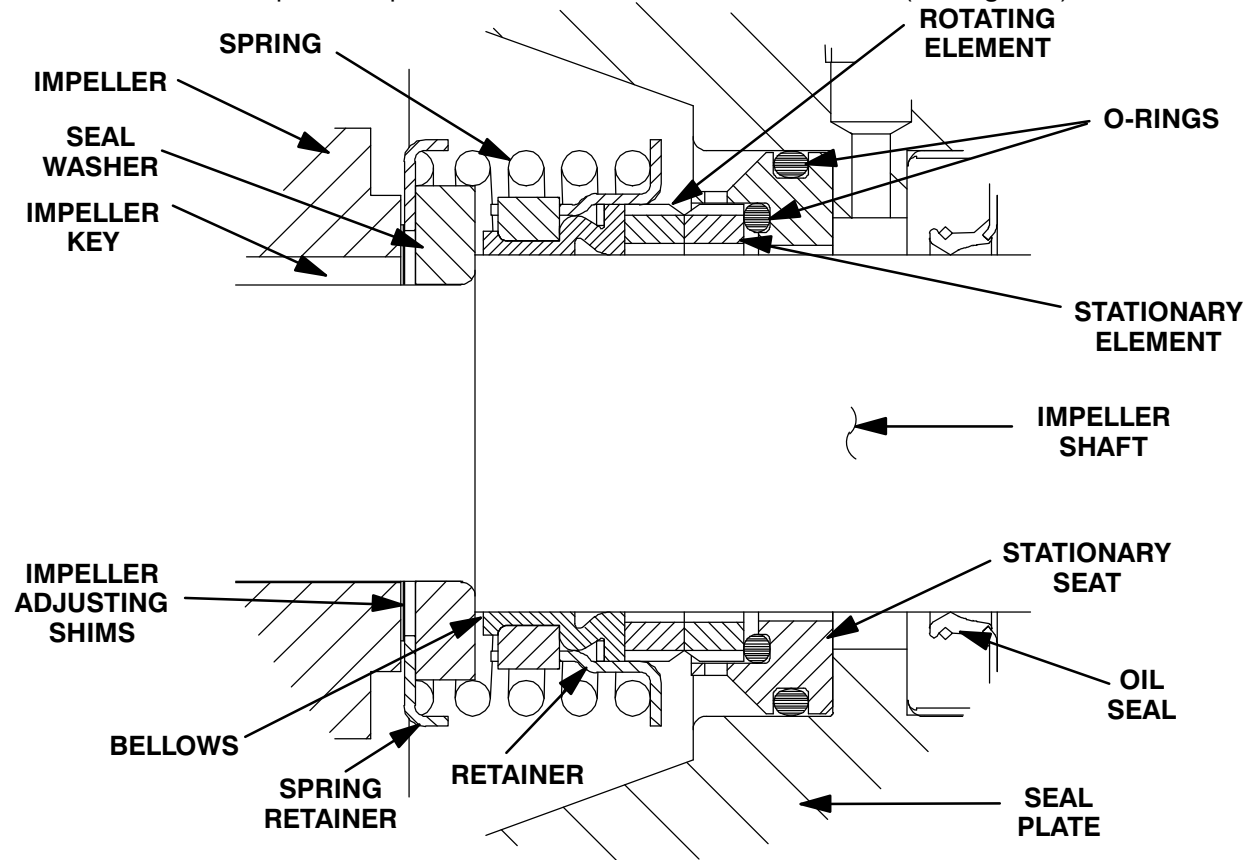


Figure 2. Seal Assembly



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

Position the seal plate (8) on a flat surface with the impeller side down. Press the oil seal (61) into the seal plate with the lip positioned as shown in Figure 1.

Turn the seal plate over so the impeller side is facing up. Subassemble the O-ring onto the stationary seat and lubricate it with water or light oil. Use even pressure to press the stationary portion of the seal into the seal plate until it seats squarely against the shoulder bore.

Carefully slide the assembled seal plate, lip seal and stationary portion of the seal over the shaft. Use caution not to roll or cut the lip of the oil seal or nick or damage the stationary seat. Secure the seal plate to the pedestal with the machine screws (54).

Subassemble the rotating element into the retainer and bellows. Lubricate the I.D. of the bellows with water and slide this subassembly over the shaft until the polished faces contact.

Install the seal spring, seal spacer (60) and spring retainer.

Reinstall the bottle oiler and piping (13, 14, 15 and 16) after the impeller is installed.

Impeller Installation

Inspect the impeller and replace it if cracked or badly worn.

For maximum pump efficiency, the impeller should be centered within the volute scroll.

To verify the impeller positioning, measure the pump casing and impeller as shown in Figure 3. Use these measurements to calculate the required impeller location (dimension E). Add or remove impeller adjusting shims (59) until dimension E is obtained.

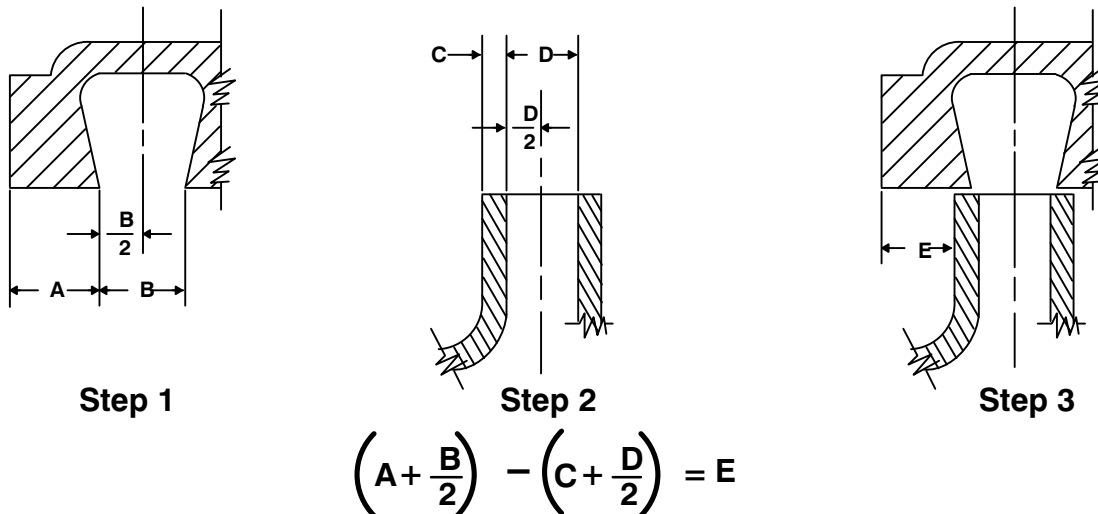


Figure 3. Centering Impeller Within Volute Scroll

Install the correct thickness of impeller shims and install the impeller key (9) in the shaft keyway. Align the impeller keyway with the key and slide the impeller onto the shaft until fully seated.

Reinstall any leveling shims under the casing mounting feet, and secure the casing to the base with the previously removed hardware.

Immobilize the impeller by inserting a bar between the impeller vanes, being careful not to damage the vanes. Secure the impeller with the hardware (51, 52 and 53). Remove the bar from the impeller vanes.

NOTE

After the pump casing has been installed, check for free shaft rotation. Correct any scraping binding before further reassembly.

Pump Casing and Wear Ring Installation

If removed at disassembly, press the replacement wear ring (57) into the pump casing until it seats squarely against the shoulder bore.

Final Pump Assembly

Be sure the pump and power source are securely mounted to the base.

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



The wear ring **must** seat squarely in the casing bore or binding and/or excessive wear will result.

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

Fill the pump casing with clean liquid. Reinstall the fill plug (58) and tighten it.

Install the casing gasket (42) and secure the casing to the seal plate and pedestal with the nuts (41).

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

LUBRICATION

Seal Assembly

Fill the bottle oiler (16) with SAE No. 30 non-detergent oil. Check the oil level regularly and keep the bottle oiler full.

Bearings

The pedestal was fully lubricated when shipped from the factory. Check the oil level regularly through the sight gauge (33) and maintain it at the middle of the gauge. When lubrication is required, add SAE No. 30 non-detergent oil through the hole for the air vent (22). **Do not** over-lubricate. Over-lubrication can cause the bearings to over-heat, resulting in premature bearing failure.

NOTE

The white reflector in the sight gauge must be positioned horizontally to provide proper drainage.

Under normal conditions, drain the bearing housing once each year and refill with clean oil. 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 for the recommended grade of oil.

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