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INSTALLATION, OPERATION, AND MAINTENANCE MANUAL

WITH PARTS LIST

GORMAN-RUPP PUMPS

T SERIES PUMP

MODEL

T10A3–B

INCLUDING: /F, /FM, /WW

THE GORMAN-RUPP COMPANY • MANSFIELD, OHIO

GORMAN-RUPP OF CANADA LIMITED • ST. THOMAS, ONTARIO, CANADA Printed in U.S.A.

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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 Installation, Operation, and Maintenance manual is designed to help you achieve the best performance and longest life from your Gorman-Rupp pump.

This pump is a T Series, semi-open impeller, self-priming centrifugal model with a suction check valve. The pump is flex-coupled to a gearbox driven by a Deutz diesel engine. It is designed for handling sewage, wastewater, trash and slurries containing large entrained solids. The basic material of construction for wetted parts is gray iron, with ductile iron wearing parts and stainless steel impeller shaft.

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 engine, contact the engine manufacturer's local dealer or representative.

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.

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:

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 T 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, or take other action to ensure that the pump will remain inoperative.**
3. **Allow the pump to completely cool if overheated.**
4. **Vent the pump slowly and cautiously.**
5. **Close the suction and discharge valves.**
6. **Check the temperature before opening any covers, plates, or plugs.**
7. **Drain the pump.**

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

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

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.

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.

Use lifting and moving equipment in good repair and with adequate capacity to prevent injuries to personnel or damage to equipment.

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

1. **Stop the pump immediately.**
2. **Allow the pump to completely cool.**
3. **Refer to instructions in this manual before restarting the pump.**

Do not attempt to disengage any part of an overheated pump unit. Vapor pressure within the pump casing can eject these parts with great force when they are disengaged. Allow the pump to completely cool before servicing it.

Use lifting and moving equipment in good repair and with adequate capacity to prevent injuries to personnel or damage to equipment.

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

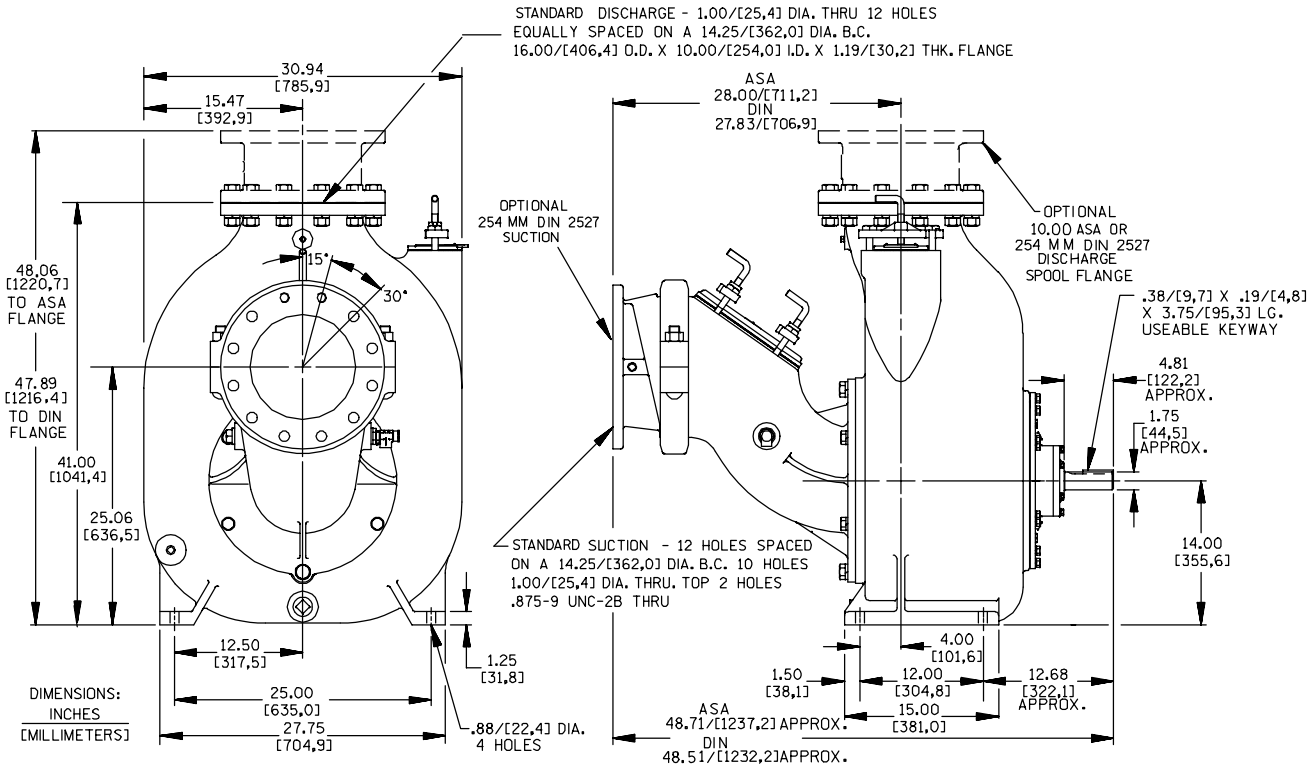


Figure 1. Pump Model T10A3–B

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 drying, check for loose hardware at mating surfaces.

c. Carefully read all warnings and cautions contained in this manual or affixed to the pump, and perform all duties indicated. Note the direction of rotation indicated on the pump.

Check that the pump shaft rotates counterclockwise when facing the impeller.

CAUTION

Only operate this pump in the direction indicated by the arrow on the pump body and on the accompanying decal. Refer to **Rotation** in **OPERATION**, Section C.

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 power source 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

Lifting

Use lifting equipment with a capacity of at least **6,700 pounds**. This pump weighs approximately **1,340 pounds**, not including the weight of accessories or customer installed equipment. Customer installed equipment such as suction and discharge piping **must** be removed before attempting to lift.

Make sure that hoists and other lifting equipment are of sufficient capacity to safely handle the pump assembly. If chains and cables are used, make certain that they are positioned so that they will not damage the pump, and so that the load will be balanced.

CAUTION

The pump assembly can be seriously damaged if the cables or chains used to lift and move the unit are improperly wrapped around the pump.

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 and operating range shown on Page E-1 to be sure your overall application allows the 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 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 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).

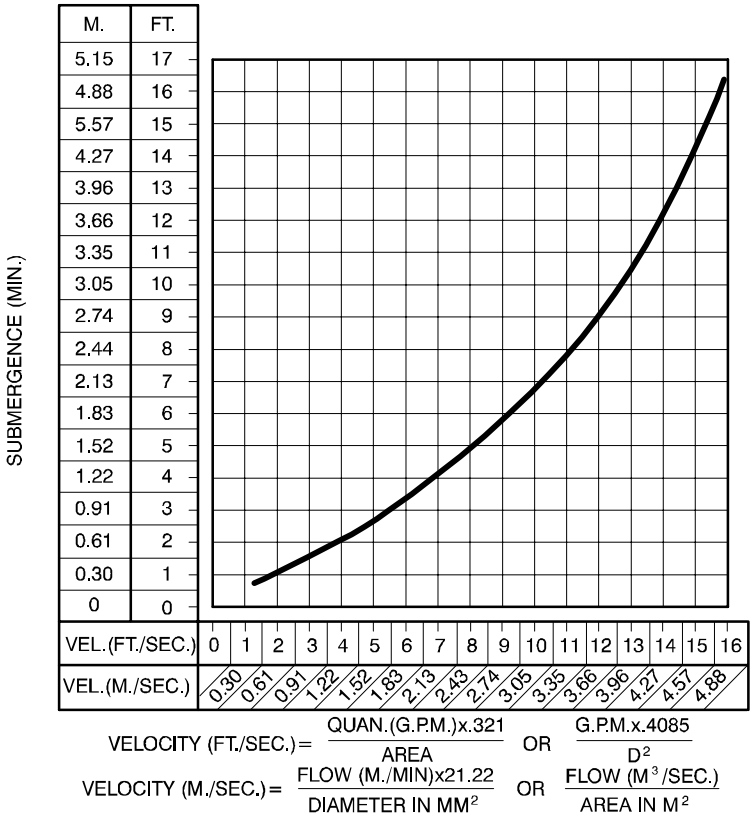


Figure 2. Recommended Minimum Suction Line Submergence vs. Velocity

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

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

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.

CAUTION

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

Bypass Lines

If it is mecessary to permit the escape of air to atmosphere during initial priming or in the repriming cycle, install a bypass line between th epump and the discharge check valve. The bypass line should be sized so that it does not affect pump discharge capacity.

It is recommended that a Gorman–Rupp Automatic Air Release Valve be installed in the bypass line.

Do Not install a manual shut – off valve in a bypass line. If a manual shut – off valve is installed to facilitate service of the Air Release Valve, the valve must not be left closed during operation. See the supplement at the end of this section for additional information on bypass lines and the Gorman – Rupp Automatic Air Release Valve.

NOTE

The bypass line may clog occasionally, particularly when pumping liquids containing large solids. If clogging occurs, locate and remove the clog. If the clog is located between the discharge check valve and the Air Release Valve, the valve will not close. If the clog is located in the Relief Valve itself, or in the line between the Relief Valve and the sump, the valve will not open.

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 could result, causing damage to the pump.

In **low discharge head applications** (less than 30 feet or 9,1 meters), it is recommended that the bypass line be run back to the wet well, and located 6 inches (152,4 mm) below the water level or cut-off point of the low level pump. In some installations, this bypass line may be terminated with a six-to-eight foot 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 or 9,1 meters), 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. See **AUTOMATIC AIR RELEASE VALVE** in this section for installation and theory of operation of the Automatic Air Release Valve. Consult your Gorman-Rupp distributor, or contact the Gorman-Rupp Company for selection of an Automatic Air Release Valve to fit your application.

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. <u>Personnel could be severely injured.</u>

<u>Allow an over-heated pump to cool before servicing.</u> <u>Do not</u> remove plates, covers, gauges, or fittings from an overheated 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. <u>After the pump cools,</u> 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 and correctly adjusted to the specific hydraulic operating conditions of the application, the 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.

Theory of Operation

Figures 3 and 4 show a cross-sectional view of the Automatic Air Release Valve, and a corresponding description of operation.

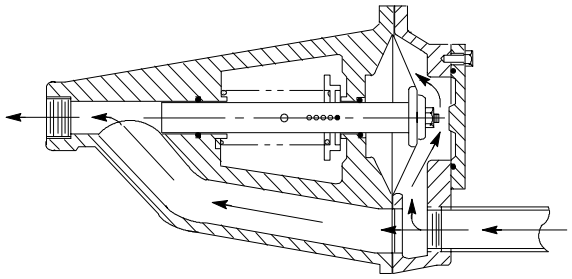


Figure 3 Valve in Open Position

During the priming cycle, air from the pump casing flows through the bypass line, and passes through the Air Release Valve to the wet well (Figure 3).

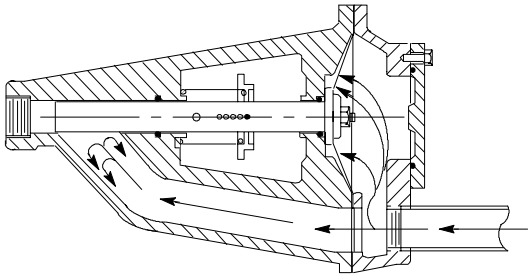


Figure 4 Valve in Closed Position

When the pump is fully primed, pressure resulting from flow against the valve diaphragm compresses the spring and closes the valve (Figure 4). The valve will remain closed, reducing the bypass of liquid to 1 to 5 gallons per minute, until the pump loses its prime or stops.

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.

When the pump shuts down, the spring returns the diaphragm to its original position. Any solids that may have accumulated in the diaphragm chamber settle to the bottom and are flushed out during the next priming cycle.

NOTE

The valve will remain open if the pump does not reach its designed capacity or head. Valve closing pressure is dependent upon the discharge head of the pump at full capacity. The range of the valve closing pressure is established by the tension rate of the spring as ordered from the factory. Valve closing pressure can be further adjusted to the exact system requirements by moving the spring retaining pin up or down the plunger rod to increase or decrease tension on the spring. Contact your Gorman-Rupp distributor or the Gorman-Rupp Company for information about an Automatic Air Release Valve for your specific application.

Air Release Valve Installation

The Automatic Air Release Valve must be independently mounted in a horizontal position and connected to the discharge line of the self-priming centrifugal pump (see Figure 5).

NOTE

*If the Air Release Valve is to be installed on a **staged** pump application, contact the factory for specific installation instructions.*

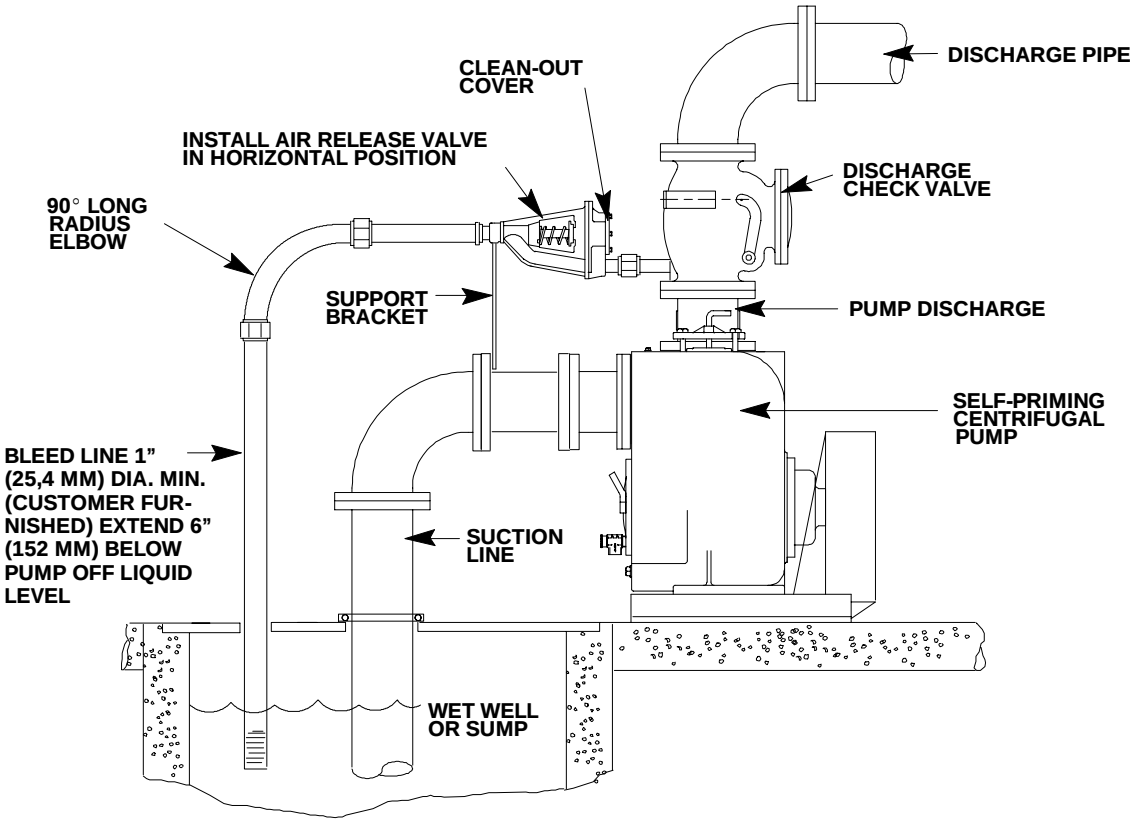


Figure 5. Typical Automatic Air Release Valve Installation

The valve inlet line must be installed between the pump discharge port and the non-pressurized side of the discharge check valve. The valve inlet is at the large end of the valve body, and is provided with standard 1 inch NPT pipe threads.

The valve outlet is located at the opposite end of the valve, and is also equipped with standard 1 inch NPT pipe threads. The outlet should be connected to a bleed line which slopes back to the wet well or sump. The bleed line must be the same size as the inlet piping, or larger. If **piping** is used for the bleed line, avoid the use of elbows whenever possible.

NOTE

*It is recommended that each Air Release Valve be fitted with an independent bleeder line directed back to the wet well. If multiple Air Release Valves are installed in a system, they **must** be fitted with independent bleeder lines; **never** use a common manifold pipe. Contact your Gorman-Rupp distributor or the Gorman-Rupp Company for information about installation of an Automatic Air Release Valve for your specific application.*

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 degrees. The coupling is in alignment when the hub ends are the same distance apart at all points (see Figure 6A).

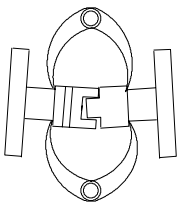


Figure 6A. Aligning Spider-Type Couplings

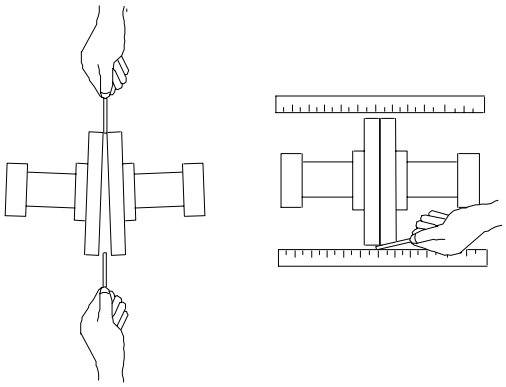


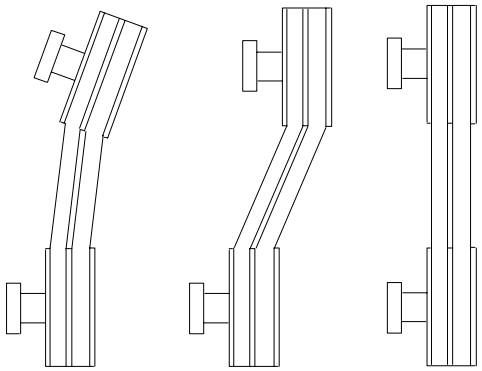
Figure 6B. Aligning Non-Spider Type Couplings

Align non-spider type couplings by using a feeler gauge or taper gauge between the coupling halves every 90 degrees. The coupling is in alignment when the hubs are the same distance apart at all points (see Figure 6B).

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 6C). 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 6C. 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 mild industrial corrosives, mud and slurries containing large entrained solids. Do not attempt to pump volatile, corrosive, or flammable materials 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.

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.

WARNING!

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

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.

WARNING!

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.

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.

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 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 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.

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.

On engine driven pumps, reduce the throttle speed slowly and allow the engine to idle briefly before stopping.

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

After stopping the pump, disconnect or lock out the power source or take other action 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 temperature 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 **MAINTENANCE AND REPAIR**). 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.

Before attempting to open or service the pump:

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

Table 1. Trouble Shooting Chart

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.

Table 1. Trouble Shooting Chart (cont.)

TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
PUMP STOPS OR FAILS TO DELIVER RATED FLOW OR PRESSURE (cont.)	Leaking or worn seal or pump gasket.	Check pump vacuum. Replace leaking or worn seal or gasket.
	Strainer clogged.	Check strainer and clean if necessary.
	Suction intake not submerged at proper level or sump too small.	Check installation and correct submergence as needed.
	Impeller or other wearing parts worn or damaged.	Replace worn or damaged parts. Check that impeller is properly centered and rotates freely.
	Impeller clogged.	Free impeller of debris.
	Discharge head too high.	Install bypass line.
	Suction lift too high.	Measure lift w/vacuum gauge. Reduce lift and/or friction losses in suction line.
	Pump speed too slow.	Check engine output; consult engine operation manual.
PUMP REQUIRES TOO MUCH POWER	Pump speed too high.	Check engine output.
	Discharge head too low.	Adjust discharge valve.
	Liquid solution too thick.	Dilute if possible.
	Bearing(s) frozen.	Disassemble pump and check bearing(s).
PUMP CLOGS FREQUENTLY	Discharge flow too slow.	Open discharge valve fully to increase flow rate, and run engine at maximum governed speed.
	Suction check valve or foot valve clogged or binding.	Clean valve.
	Liquid solution too thick.	Dilute if possible.
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.

Table 1. Trouble Shooting Chart (cont.)

TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
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

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

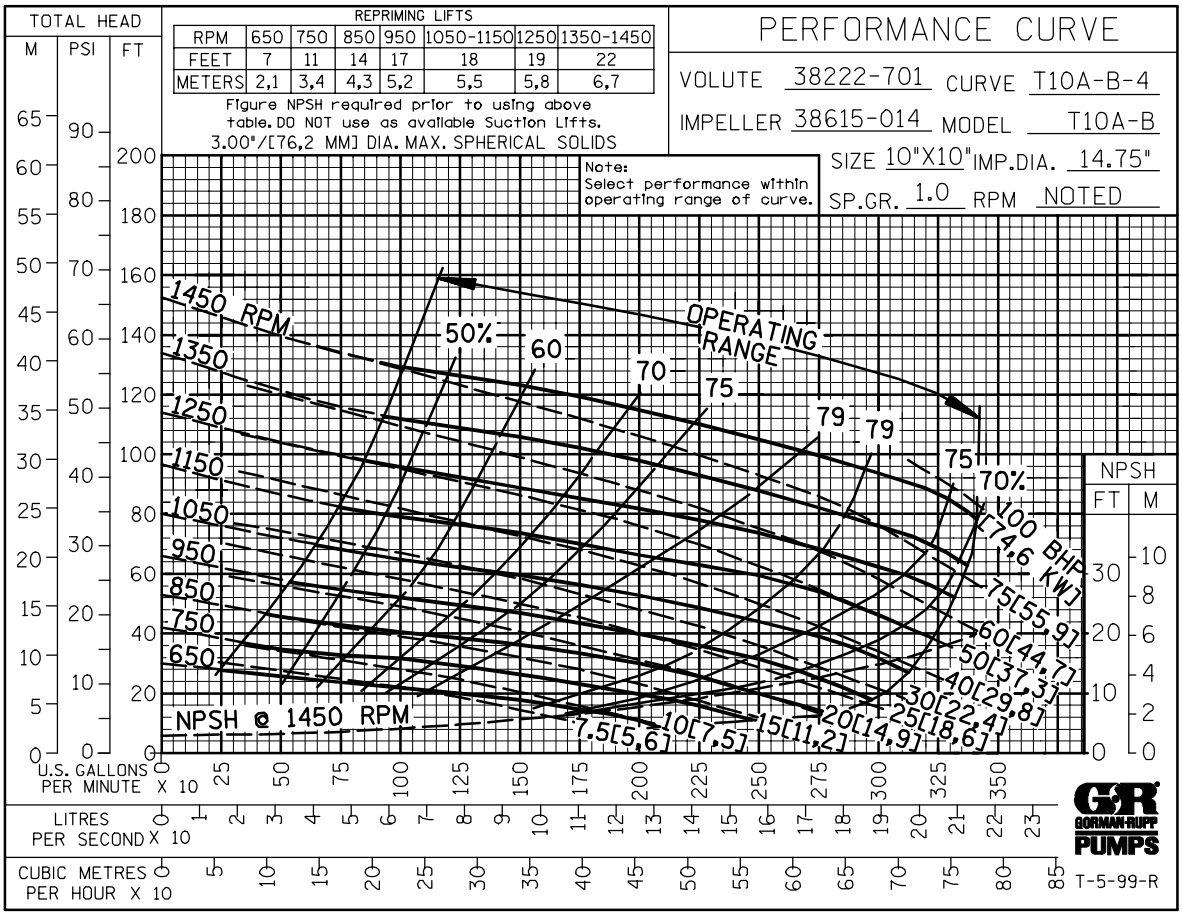
Item	Service Interval*				
	Daily	Weekly	Monthly	Semi-Annually	Annually
General Condition (Temperature, Unusual Noises or Vibrations, Cracks, Leaks, Loose Hardware, Etc.)	I				
Pump Performance (Gauges, Speed, Flow)	I				
Bearing Lubrication		I			R
Seal Lubrication (And Packing Adjustment, If So Equipped)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

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 T10A3–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

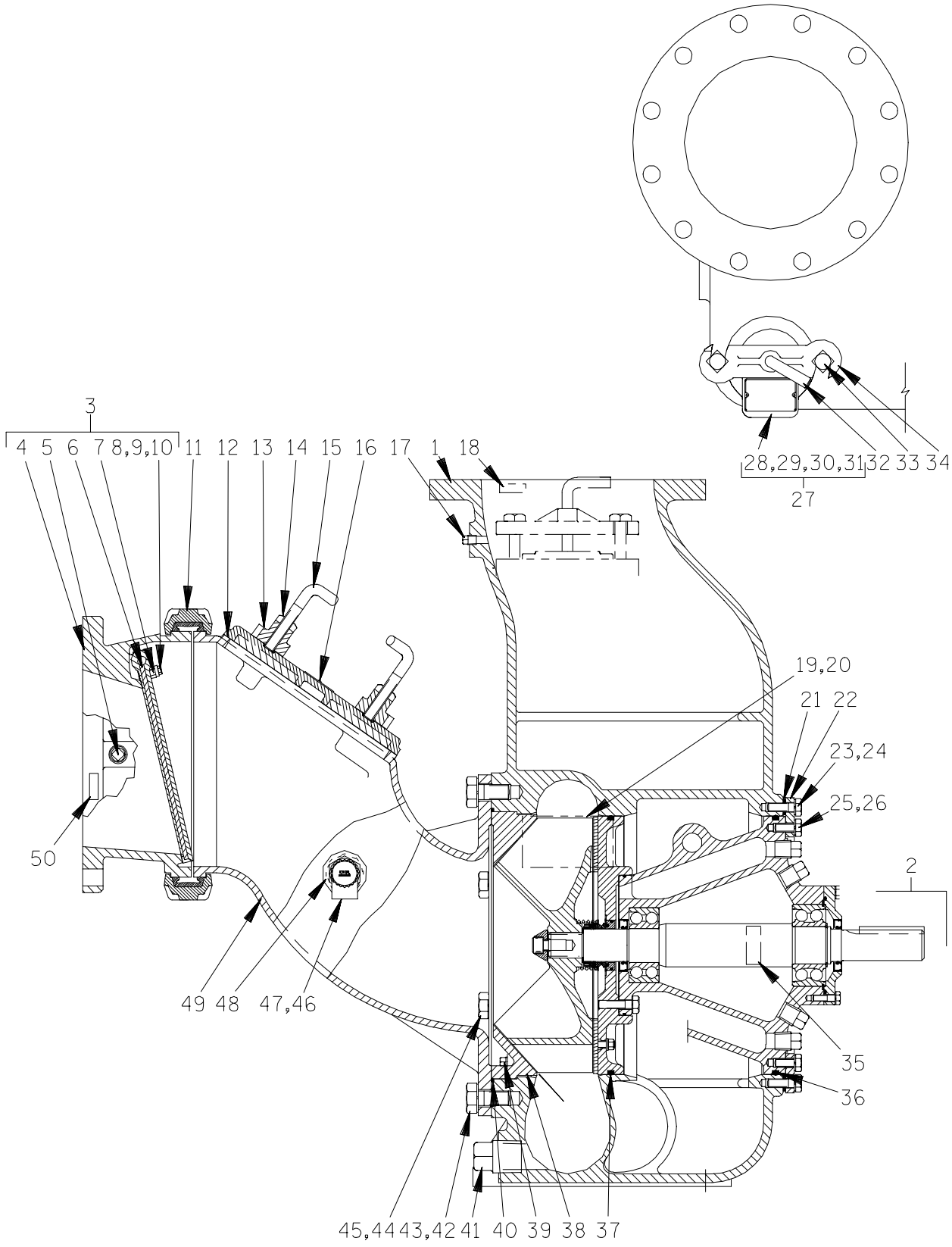


Figure E – 1. Pump Model T10A3 – B, /F, /FM, /WW

PARTS LIST

(From S/N 806819 up)

Pump Model T10A3–B, /F, /FM, /WW

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	38222–701	10010	1
2		REPAIR ROTATING ASSY	44163–024	– – –	1
		REPAIR ADI ROT ASSY	44163–233	– – –	1
		REPAIR ROTATING ASSY (/WW MODEL ONLY)	44163–246	– – –	1
3		CHECK VALVE ASSY	46421–037	– – –	1
4		–CHECK VALVE BODY	38341–805	10010	1
5		–PIPE PLUG	P08	15079	1
6	✳	–CHECK VALVE	46411–082	24010	1
7	✳	–PIVOT CAP	38141–003	11060	2
8		–HEX HD CAPSCREW	B0606	17000	2
9		–LOCKWASHER	AK06	17000	2
10		–FLAT WASHER	KB08	17090	2
11		SHOULDER TYPE CPLG	25552–213	– – –	1
12	✳	CLEANOUT CVR GSKT	38688–008	20000	1
13		CLAMP BAR	38111–004	11010	2
14		MACHINE BOLT	A1014	15991	4
15		CLAMP BAR SCREW	31912–009	15000	2
16		CLEANOUT CVR ASSY	48271–018	– – –	1
17		PIPE PLUG	P04	15079	1
18		DISCH STICKER	6588BJ	– – –	1
19		NAMEPLATE	38818–040	13990	1
20		DRIVE SCREW	BM#04–03	17000	4
21	✳	SHIM SET	48261–056	– – –	REF
22		CASING RING	31281–016	15990	1
23		HEX HD CAPSCREW	B0806	15991	6
24		LOCKWASHER	J08	15991	6
25		HEX HD CAPSCREW	B0805	15991	6
26		LOCKWASHER	J08	15991	6
27		FILL CVR PLATE ASSY	42111–344	– – –	1
28		–FILL CVR PLATE	NOT AVAILABLE		1
29		–WARNING PLATE	38816–097	13990	1
30		–DRIVE SCREW	BM#04–03	17000	2
31		–FILL COVER GASKET	50G	19210	1
32		CLAMP BAR SCREW	31912–009	15000	1
33		MACHINE BOLT	A1014	15991	2
34		CLAMP BAR	38111–004	11010	1
35		ROTATION DECAL	2613M	– – –	1
36	✳	BRG HSG O-RING	S1914	– – –	1
37	✳	SEAL END PLT O-RING	S1914	– – –	1
38	✳	FRONT WEAR PLATE	38691–826	11010	1
39		PIPE PLUG	P08	15079	1
40	✳	SUCTION HD GASKET	38682–811	20000	1
41		PIPE PLUG	P24	10009	1
42		HEX HD CAPSCREW	B1408	15991	2
43		LOCKWASHER	J14	15991	2
44		HEX HD CAPSCREW	B1207	15991	4
45		LOCKWASHER	J12	15991	4
46		PRESS RELIEF VLV	26662–005	– – –	1
47		RED PIPE BUSHING	AP2008	11999	1
48		PIPE PLUG	P20	10009	1
49		SUCTION HEAD	38246–609	10010	1
50		SUCTION STICKER	6588AG	– – –	1
NOT SHOWN:					
		FILL HR PRIME STK	6588AH	– – –	1
		LUB DECAL	11421	– – –	1
		INSTRUC LABEL	2613DK	– – –	1
		WARNING DECAL	2613FE	– – –	1
		WARNING DECAL	38816–302	– – –	1
OPTIONAL:					
		ASTL WEAR PLATE	46451–750	24160	1
		ADI WEAR PLATE	38691–826	1102H	1
		SPOOL FLANGE	38642–607	10000	1
		/FM METRIC FLNG KIT	48213–080	– – –	1
		/FM METRIC FLNG KIT	48213–084	– – –	1
		CASING HEATERS:			
		–120V	47811–014	– – –	1
		–240V	47811–015	– – –	1
		CHECK VALVE ASSYS:			
	✓	–VITON MOLDED	46411–081	– – –	1
		PRESSURE RELIEF VALVES:			
		–BRASS SEWAGE TYPE	46431–628	– – –	1
		–STAINLESS STEEL	26662–101	– – –	1
		HI TEMP SHUT-DOWN KITS:			
		–145ºF	48313–186	– – –	1
		–130ºF	48313–256	– – –	1
		–120ºF	48313–257	– – –	1
		HT SHUT DOWN THERMOSTAT KIT 145ºF	48313–172	– – –	1
		AIR RELEASE VALVES:			
		–10# COMP SPRING	GRP33–07A	– – –	1
		–25# COMP SPRING	GRP33–07	– – –	1
		–80# COMP SPRING	GRP33–07B	– – –	1
		BRG HOUSING O–RING:			
	✓	–VITON	25154–458	– – –	1

✳ INDICATES PARTS RECOMMENDED FOR STOCK

† OPTIONAL MECHANICAL SEAL(S) **MUST** BE USED WITH MECHANICAL SEAL SHAFT SLEEVE OR SOLID SST SHAFT.

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SECTION DRAWING

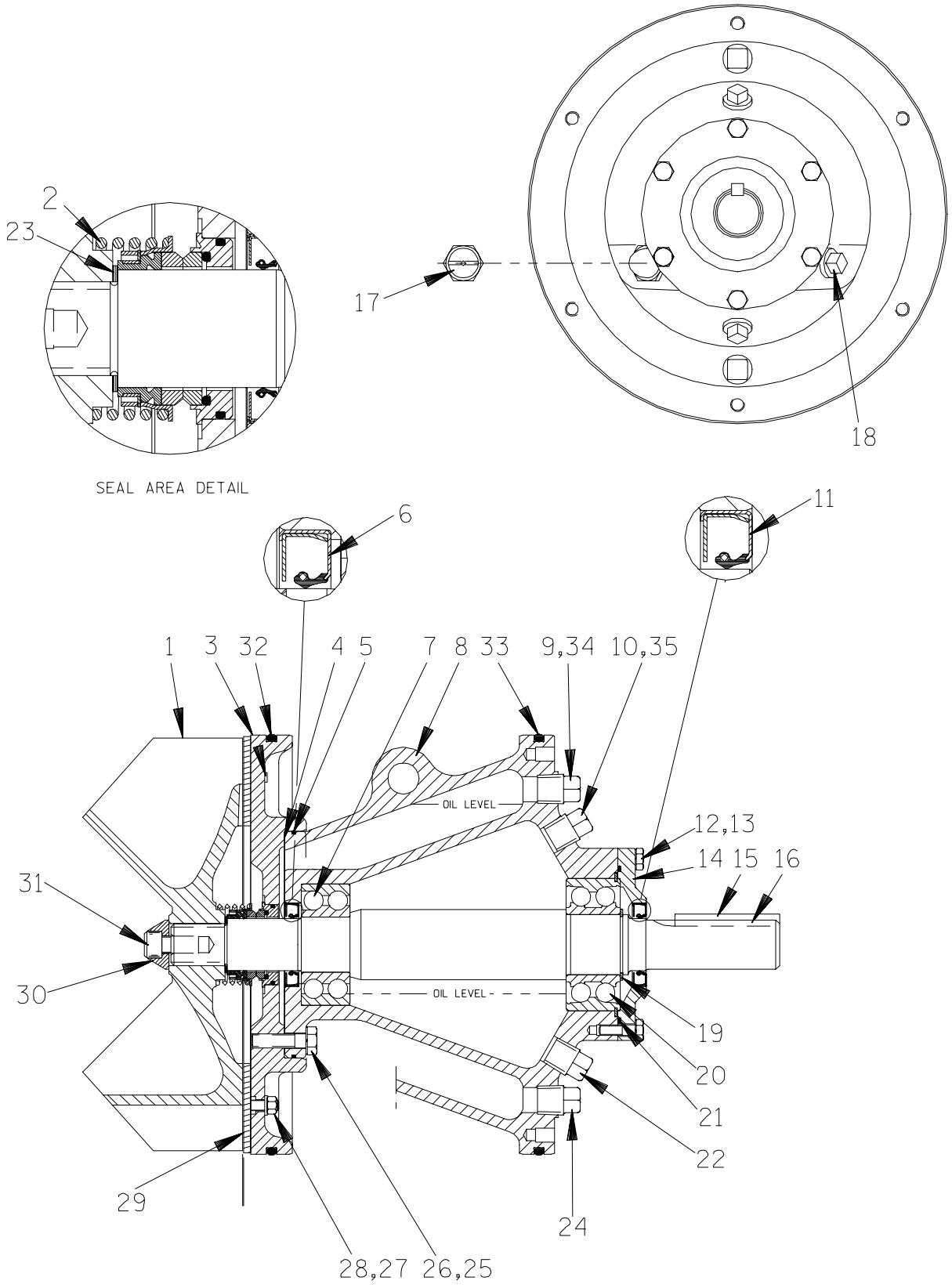

Figure E-2. 44163 – 024 And 44163 – 246 Repair Rotating Assembly

PARTS LIST
44163–024 And 44163–246 Repair Rotating Assembly

Note: Order complete Repair Rotating Assemblies for /WW and /WWS models from the Pump Model Assembly Parts List on page E–3. Repair Rotating Assemblies for /WW models include all of the standard parts listed below. Repair Rotating Assemblies for /WWS models include the stainless steel shaft, spacer washer, impeller capscrew and seal assembly listed below. All other parts are the same as the standard model.

ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY
1 ✳	IMPELLER	38615–014	11010	1
2 ✳	SEAL ASSEMBLY	12590A	– – –	1
3	SEAL END PLATE	38272–413	10010	1
4 ✳	SEAL PLATE GSKT	38684–302	19140	1
5 ✳	BEARING O-RING	S1874	– – –	1
6 ✳	INBOARD OIL SEAL	S1917	– – –	1
7 ✳	BALL BEARING	23421–461	– – –	1
8	BEARING HOUSING	38251–506	10010	1
9	VENTED SEAL PLUG	38649–009	15079	1
10	VENTED BRG PLUG	38649–009	15079	1
11 ✳	OUTBOARD OIL SEAL	S1917	– – –	1
12	HEX HD CAPSCREW	B0605 1/2	15991	6
13	LOCKWASHER	J06	15991	6
14	BEARING CAP	38322–415	10010	1
15 ✳	IMPELLER SHAFT KEY	N0612	15990	1
16 ✳	IMPELLER SHAFT	38515–548	1706H	1
17	OIL LEVEL SIGHT GAUGE	S1471	– – –	1
18	PIPE PLUG	P12	15079	1
19	RETAINING RING	S215	– – –	1
20 ✳	BALL BEARING	23422–412	– – –	1
21 ✳	BRG HOUSING O-RING	S333	– – –	1
22	BRG DRAIN PLUG	P12	15079	1
23 ✳	IMPELLER SHIM SET	5091	17090	REF
24	SEAL CVTY DRAIN PLUG	P12	15079	1
25	HEX HD CAPSCREW	21632–945	– – –	4
26	LOCKWASHER	J08	15991	4
27	LOCKWASHER	J06	15991	4
28	HEX NUT	D06	15991	4
29	WEAR PLATE ASSY	46451–722	24150	1
30 ✳	IMPELLER WASHER	10278	15030	1
31 ✳	IMPELLER CAPSCREW	DM1004S	15991	1
32 ✳	SEAL END PLATE O-RING	S1914	– – –	1
33 ✳	BRG HOUSING O-RING	S1914	– – –	1
34	SHIPPING PLUG	11495D	15079	1
35	SHIPPING PLUG	11495D	15079	1
NOT SHOWN:				
✳	ROT ASSY SHIM SET	48261–056	– – –	6
	ROTATION DECAL	2613M	– – –	1
	INSTRUCTION TAG	6588U	– – –	1
OPTIONAL:				
	SST IMPELLER	38615–014	17070	1
	ADI IMPELLER	38615–014	1102H	1
	ADI SEAL END PLATE	38272–413	1102H	1
	ROTATING ASSY O-RING:			
✓	–VITON	25154–458	– – –	1
†	METAL BELLOWS MECH SEAL ASSY			
† ★	AFLAS SEAL	46512–193	– – –	1
†	METAL BELLOWS MECH SEAL ASSY			
✓	(VITON OR EQUAL)	46512–192	– – –	1
†	METAL BELLOWS MECH SEAL ASSY			
✓	(KALREZ)	46512–183	– – –	1

✳ INDICATES PARTS RECOMMENDED FOR STOCK

† OPTIONAL MECHANICAL SEAL **MUST** BE USED WITH MECHANICAL SEAL SHAFT SLEEVE OR /WWS SOLID SST SHAFT.

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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 views (see Figures E-1 and E-2) and the accompanying parts lists.

As described on the following pages, 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.

Many service functions may be performed by draining the pump and removing the suction head. If major repair is required, the piping and/or engine must be disconnected. The following instructions assume complete disassembly is required.

Before attempting to service the pump, switch off the engine ignition and disconnect the positive battery cable to ensure that the pump will remain inoperative. Close all valves in the suction and discharge lines.

WARNING!

Before attempting to open or service the pump:

1. **Familiarize yourself with this manual.**
2. **Switch off the engine ignition and disconnect the positive battery cable 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!

Use lifting and moving equipment in good repair and with adequate capacity to prevent injuries to personnel or damage to equipment. Suction and discharge hoses and piping must be removed from the pump before lifting.

Cleanout Access And Suction Check Valve Removal

(Figure E-1)

Before attempting to service the pump, remove the casing drain plug (41) and drain the pump. Clean and reinstall the drain plug.

For cleanout access, loosen the clamp screws (15) and clamp bars (13) securing the cleanout cover (16) to the suction head (49).

To remove the check valve assembly, reach through the cleanout opening and remove the hardware (8, 9 and 10) securing the check valve (6) to the valve body (4) and suction head.

Replace the cleanout cover gasket (12) before reinstalling the cover.

Suction Head And Wear Plate Removal

(Figure E-1)

To remove the suction head, support it with a suitable hoist and sling and remove the hardware (42,43, 44 and 45) securing it to the pump casing. Remove the suction head gasket (40).

If the wear plate (38) does not slide easily from the casing bore, install capscrews (1/2-13 UNC X 1 inch long, not supplied) in the tapped holes provided. Using a suitable puller, remove it from the casing.

Rotating Assembly Removal

(Figure E-2)

The rotating assembly may be removed from either side of the casing; however, it is recommended that it be removed through the suction head opening.

The impeller (1) should be loosened while the rotating assembly is still secured to the pump casing. Before loosening the impeller, remove the seal cavity drain plug (24) and drain the seal lubricant. This will prevent the oil in the seal cavity from escaping as the impeller is loosened. Clean and reinstall the seal cavity drain plug.

Immobilize the impeller by wedging a block of wood between the vanes and remove the impeller capscrew and washer (30 and 31). Install a lathe dog on the drive end of the shaft (16) with the "V" notch positioned over the shaft keyway. Strike the lathe dog sharply in a counterclockwise direction (when facing the drive end of the shaft). When the impeller breaks loose, remove the wood block and lathe dog. Do not fully unscrew the impeller from the shaft at this time.

(Figure E-1)

An optional disassembly tool for removing and installing the rotating assembly is available from the factory. If improvised tools are used, be sure they are heavy enough for safe use and will not damage the pump.

Remove the inner hardware (25 and 26) from the casing ring (22). If the removal tool is used, follow the instructions packaged with it, and pull the rotating assembly from the pump casing (see Figure E-3 for removal tool use). If the removal tool is not used, install three of the inner capscrews in the jacking holes in the casing ring, and use them to press the rotating assembly into the pump casing until the bearing housing is free.

Remove the jacking screws from the casing ring. Remove the outer hardware (23 and 24) and shim sets (21). Separate the casing ring from the pump casing. Tie and tag the shim sets for ease of reassembly.

After the rotating assembly is loosened, screw a 5/8-11 UNC X 16 inch long threaded rod into the hole in the impeller shaft. Support the drive end of the shaft with a 1-13/16" (46 mm) minimum I.D. piece of pipe or a set of handles as shown in Figure E-3, and slide the complete rotating assembly through the suction head opening. Once free, use a suitable hoist and sling and attach it to the lifting eye provided at the top of the bearing housing to move the rotating assembly to a suitable work area for further disassembly.

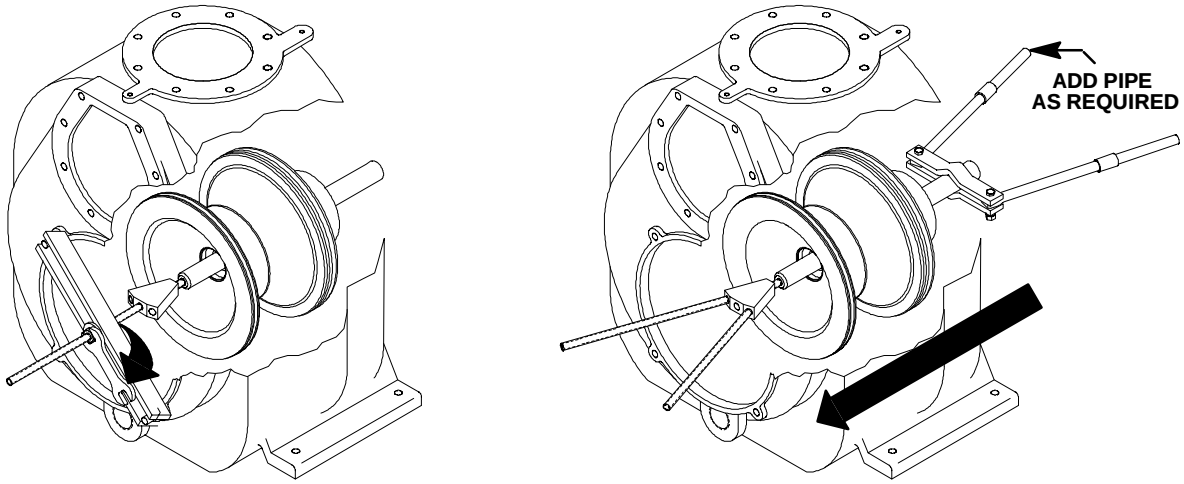


Figure E-3. Rotating Assembly Removal With Tool

Impeller Removal

(Figure E-2)

Unscrew the impeller from the shaft in a counter-clockwise direction (when facing the impeller). Use caution when unscrewing the impeller; tension on the shaft seal spring will be released as the impeller is removed.

Remove the impeller adjusting shims (23). Tie and tag the shims or measure and record their thickness for ease of reassembly.

Seal Removal And Disassembly

(Figure E-2)

Remove the seal spring. Apply oil to the shaft and work it up under the bellows. Slide the rotating portion of the seal off the shaft as a unit.

Use two stiff wires with hooked ends to remove the stationary portion of the seal.

An alternate method of removing the stationary portion of the seal is to remove the hardware (25 and 26) and separate the seal end plate (3) from the bearing housing (8). Remove the seal end plate and bearing housing O-rings (5 and 32). Position the seal end plate on a flat surface with the impeller side down. Use a wooden dowel or other suitable tool to press on the back side of the stationary seat until the seat, O-rings, and stationary element can be removed.

Inspect the wear plate assembly (29) for excessive wear or scoring. If replacement is required, remove the hardware (27 and 28) securing it to the seal end plate.

If no further disassembly is required, refer to **Seal Installation**.

Shaft and Bearing Removal and Disassembly

(Figure E-2)

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

CAUTION

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 bearing housing drain plug (22) and drain the lubricant. Clean and reinstall the drain plug.

Disengage the hardware (12 and 13) and remove the bearing cap (14), O-ring (21) and oil seal (11) from the shaft. Press the oil seal from the bearing cap.

Remove the bearing cap O-ring (21).

Place a block of wood against the impeller end of the shaft and tap the shaft (16) and assembled bearings (7 and 20) from the bearing housing.

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

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.

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.

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 bearing housing. Replace the bearings, shaft, or bearing housing if the proper bearing fit is not achieved.

If bearing replacement is required, remove the outboard bearing retaining ring (19), and use a bearing puller or an arbor (or hydraulic) press to remove the bearings (7 and 20) from the shaft.

Press the inboard oil seal (6) from the bearing housing bore.

Shaft and Bearing Reassembly and Installation

(Figure E-2)

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 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.

Inspect the shaft for distortion, nicks or scratches, or for thread damage on the impeller end. Dress small nicks and burrs with a fine file or emery cloth. Replace the shaft if defective.

Position the inboard oil seal (6) in the bearing housing bore with the lip positioned as shown in Figure E-4. Press the oil seal into the housing until the face is **just flush** with the machined surface on the housing.

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.

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.*

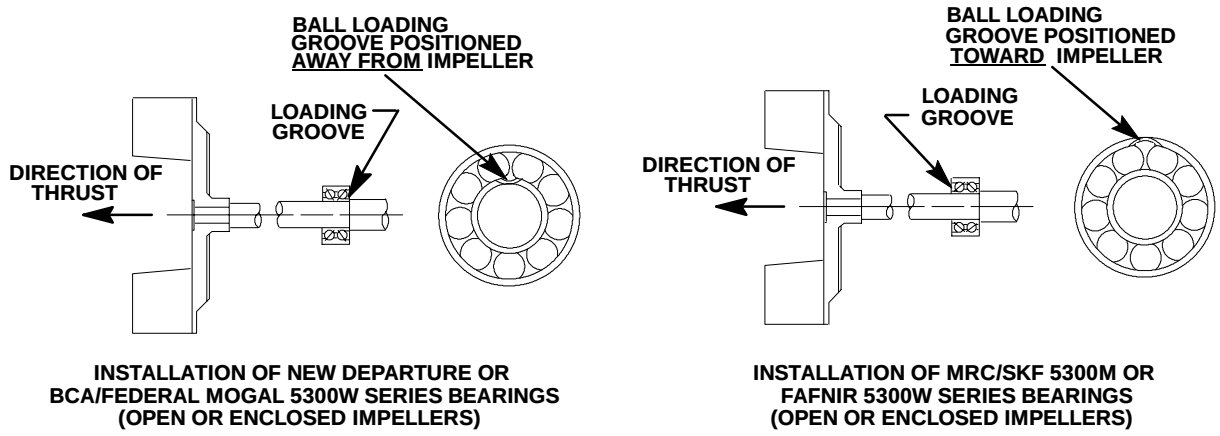
Heat the bearings to a uniform temperature **no higher than** 250°F (120°C), and slide the bearings onto the shaft, one at a time, until they are fully seated. This should be done quickly, in one continuous motion, to prevent the bearings from cooling and sticking on the shaft.

WARNING!

Use caution when handling hot bearings to prevent burns.

NOTE

Position the inboard bearing (7) on the shaft as indicated by the following illustration.



INSTALLATION OF NEW DEPARTURE OR BCA/FEDERAL MOGAL 5300W SERIES BEARINGS (OPEN OR ENCLOSED IMPELLERS)

INSTALLATION OF MRC/SKF 5300M OR FAFNIR 5300W SERIES BEARINGS (OPEN OR ENCLOSED IMPELLERS)

Figure E-4. Inboard Bearing Positioning

NOTE

Position the bearing (20) on the shaft with the retaining ring in the outer race toward the drive end of 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 suitable sized sleeve and a press to reposition the bearings against the shaft shoulders.

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

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.

Secure the outboard bearing (20) on the shaft with the bearing retaining ring (19).

Slide the shaft and assembled bearings into the bearing housing until the retaining ring on the outboard bearing seats against the bearing 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 outboard oil seal (11) into the bearing cap (14) with the lip positioned as shown in Figure E-4. Replace the bearing cap O-ring (21), and secure the bearing cap with the hardware (12 and 13). Be careful not to damage the oil seal lip on the shaft keyway.

Lubricate the bearing housing as indicated in **LUBRICATION** at the end of this section**.**

Seal Reassembly and Installation

(Figures E-2 and E-4)

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.

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. Inspect the seal area of the impeller shaft, and replace it if badly damaged. Dress any small scratches with a fine file or emery cloth. 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 stationary seat O-rings 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-5).

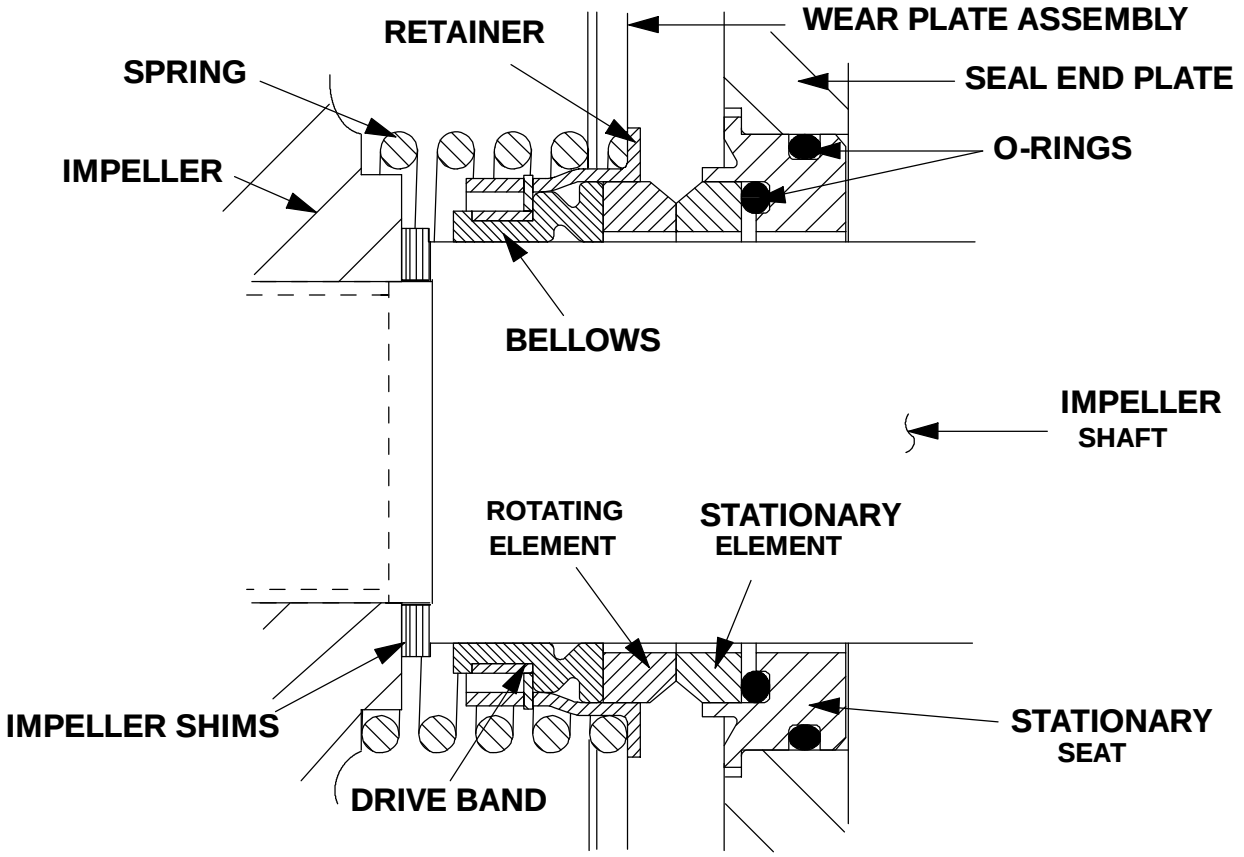


Figure E-5. 12590A Seal Assembly

CAUTION

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

If the wear plate (29) was removed, secure it to the seal plate with the hardware (27 and 28).

Lubricate the stationary seat O-rings with water or light oil, and install them in the stationary seat. Install the stationary seal element in the stationary seat. Press this stationary subassembly into the front of the seal end plate (3) until it seats squarely against the bore shoulder. **Be careful** not to damage the seal face.

Install the seal plate gasket (4) and seal plate O-ring (32). Position the seal plate and stationary seat over the shaft. Position the seal plate so that the cast word “TOP” is upper most and secure it to the bearing housing (8) with the hardware (25 and 26). Torque the hardware to 90 ft. lbs. (1,080 in. lbs. or

12,4 m. kg.). **Be careful** not to damage the stationary element on the shaft threads.

NOTE

It is recommended that a tapered sleeve be installed over the threads of the impeller shaft to ease installation of the rotating seal components.

Lubricate the shaft with a **small** amount of light oil and slide the rotating subassembly (consisting of rotating element, bellows and retainer), onto the shaft. Apply firm, steady pressure on the seal retainer as it slides onto the shaft until the seal faces contact.

Install the seal spring. Lubricate the seal as indicated in **LUBRICATION** after the impeller is installed.

If necessary to reuse an old seal in an emergency, carefully separate the rotating and stationary seal faces from the bellows retainer and stationary seat.

CAUTION

A new seal assembly should be installed **any time** the old seal is removed from the pump. Wear patterns on the finished faces cannot be realigned during reassembly. Reusing an old seal could result in premature failure.

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.

Carefully wash all metallic parts in fresh cleaning solvent and allow to dry thoroughly.

Inspect the seal components for wear, scoring, grooves, and other damage that might cause leakage. Inspect the seal area of the impeller shaft, and replace it if badly damaged. Dress any small scratches with a fine file or emery cloth. If any components are worn, replace the complete seal; **never mix old and new seal parts**.

Install the stationary seal element in the stationary seat. Press this stationary subassembly into the seal plate bore until it seats squarely against the bore shoulder. A push tube made from a piece of plastic pipe would aid this installation. The I.D. of the pipe should be about the same as the I.D. of the seal spring.

Slide the rotating portion of the seal (consisting of rotating element, bellows and retainer) onto the shaft until the seal faces contact.

Install the seal spring. Lubricate the seal as indicated in **LUBRICATION** after the impeller is installed.

Impeller Installation

(Figure E-2)

Inspect the impeller, and replace it if cracked or badly worn. Inspect the impeller and shaft threads for dirt or damage, and clean or dress the threads as required.

CAUTION

The shaft and impeller threads **must** be completely clean before reinstalling the impeller. Even the slightest amount of dirt on the threads can cause the impeller to seize to the shaft, making future removal difficult or impossible without damage to the impeller or shaft.

Install the same thickness of impeller adjusting shims (23) as previously removed. Apply 'Never-Seez' or equivalent compound to the shaft threads and screw the impeller onto the shaft until tight. **Be sure** the seal spring seats squarely over the shoulder on the back side of the impeller.

NOTE

At the slightest sign of scraping, immediately back the impeller off, and check the threads for dirt. ***Do not*** *try to force the impeller onto the shaft.*

A clearance of .020 to .025 inch (0,51 to 0,64 mm) between the impeller and the wear plate is recommended for maximum pump efficiency. Measure this clearance, and add or remove impeller adjusting shims as required.

NOTE

If the rotating assembly has been installed in the pump casing, this clearance may be measured by reaching through the priming port with a feeler gauge.

After the rotating assembly is installed in the pump casing, coat the threads of the impeller capscrew (31) with 'Never-Seez' or equivalent compound, and install the impeller washer (30) and capscrew; torque the capscrew to 90 ft. lbs. (1080 in. lbs. or 12,4 m. kg.).

Rotating Assembly Installation

(Figure E-1)

Install the rotating assembly and seal plate O-rings (36 and 37), and lubricate them with light grease. Ease the rotating assembly into the pump casing using the installation tool. **Be careful** not to damage the O-rings.

Install the pump casing ring (22), and secure it to the rotating assembly with the inner hardware (25 and 26).

NOTE

The inner capscrews are 1/4 inch (3,2 mm) shorter than the outer capscrews.

Install an equal thickness of rotating assembly shims (21) under the pump casing ring, and secure the ring to the pump casing with the outer hardware (23 and 24).

NOTE

If the pump has been completely disassembled, it is recommended that the wear plate (38) and suction head (49) be reinstalled at this point. The suction head and wear plate must be in place to adjust the impeller face clearance.

A clearance of .020 to .025 inch (0,51 to 0,64 mm) between the impeller and the wear plate is also recommended for maximum pump efficiency. This clearance can be obtained by removing an equal amount of shims from each rotating assembly shim set (21) until the impeller scrapes against the wear plate when the shaft is turned. After the impeller scrapes, add approximately .020 (0,51 mm) of shims to each shim set.

NOTE

An alternate method of adjusting this clearance is to reach through the suction port with a feeler gauge and measure the gap. Add or subtract rotating assembly shims accordingly.

Suction Head And Wear Plate Installation

(Figure E-1)

Clean any scale or debris from the contacting surfaces in the pump casing that might prevent a good seal with the suction head or interfere with the wear plate (38). Inspect the wear plate for wear or damage and replace as required. Slide the wear plate into the pump casing until fully seated.

Replace the suction head gasket (40) and lubricate it with a generous amount of No. 2 grease. Use a suitable hoist and sling to position the suction head against the pump casing and secure it with the hardware (42, 43, 44 and 45).

NOTE

To ease future disassembly, apply a film of grease or 'Never-Seez' on the suction head, or any surface which contacts the pump casing. This action will reduce rust and scale build-up.

Suction Check Valve Installation

(Figure E-1)

Inspect the check valve components and replace if badly worn.

Reach through the cleanout cover opening with the check valve and secure it with the hardware (8, 9 and 10).

NOTE

If the check valve body (4) was removed, install the check valve and secure the body to the suction head with the shoulder type clamp (11).

PRESSURE RELIEF VALVE MAINTENANCE

(Figure E-1)

The suction head is equipped with a pressure relief valve (46) to provide additional safety for the pump and operator (refer to **Liquid Temperature And Overheating** in **OPERATION**).

It is recommended that the pressure relief valve assembly be replaced at each overhaul, or any time the pump overheats and activates the valve. **Never** replace this valve with a substitute which has not been specified or provided by the Gorman-Rupp Company.

Periodically, the valve should be removed for inspection and cleaning. When reinstalling the relief valve, apply 'Loctite Pipe Sealant With Teflon No. 592', or equivalent compound, on the relief valve threads. Position the valve as shown in Figure E-1, with the discharge port pointing down.

LUBRICATION

Seal Assembly

(Figure E-2)

Before starting the pump, remove the vented plug (9) and fill the seal cavity with approximately 25 ounces (0,7 liters) of SAE No. 30 non-detergent oil, or to a level just below the tapped vented plug hole. Clean and reinstall the vented plug. Maintain the oil at this level.

Bearings

(Figure E-2)

The bearing housing was fully lubricated when shipped from the factory. Check the oil level regularly through the sight gauge (17) 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 (10). **Do not** over-lubricate. Over-lubrication can cause the bearings to overheat, 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 approximately 32 ounces (1 liter) clean oil. Change the oil more frequently if the pump is operated continuously or installed in an environment with rapid temperature change.

CAUTION

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.

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