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July 15, 1998

INSTALLATION, OPERATION, AND MAINTENANCE MANUAL

WITH PARTS LIST

GORMAN-RUPP PUMPS

60 SERIES PUMPS

MODEL

64A2—G

THE GORMAN-RUPP COMPANY • MANSFIELD, OHIO

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

The engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

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INTRODUCTION

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 60 Series, semi-open impeller, centrifugal model with a straight-in suction, without a suction check valve. The pump is designed for distribution of clean liquids that do not contain large entrained solids. The basic material of construction for wetted parts is gray iron, with bronze wearing parts.

The pump is close-coupled to a 550 RPM gearbox speed increaser with a 4.82:1 ratio. Power is transmitted to the gearbox through a universal shaft assembly designed to be connected to a mobile PTO power source.

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

or

Gorman-Rupp of Canada Limited
70 Burwell Road
St. Thomas, Ontario N5P 3R7

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:

DANGER!

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

WARNING!

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

CAUTION

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

NOTE

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

SAFETY — SECTION A

This information applies to 60 Series PTO Driven pumps. 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 the power source or take other precautions 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 for high pressure distribution of clean liquids that do not contain large entrained solids. Do not attempt to pump volatile, corrosive, or flammable materials, or any 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 or hose connections are tight, properly supported and secure before operation.

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

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

Do not operate the pump without the guard(s) in place over the rotating parts. Use caution when working near the power coupling end of the power take-off shaft. Exposed rotating parts can catch clothing, fingers, or tools, causing severe injury to personnel.

WARNING!

The gearbox provided on this pump is designed for operation at a maximum input speed of 550 RPM. If operated at a higher RPM, pump or gearbox components may be destroyed.

WARNING!

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

CAUTION

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. (See Section E, Page 1.) Since the pump is fitted with a Gorman-Rupp double grease lubricated seal, the maximum incoming pressure must be reduced to 10 p.s.i.

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

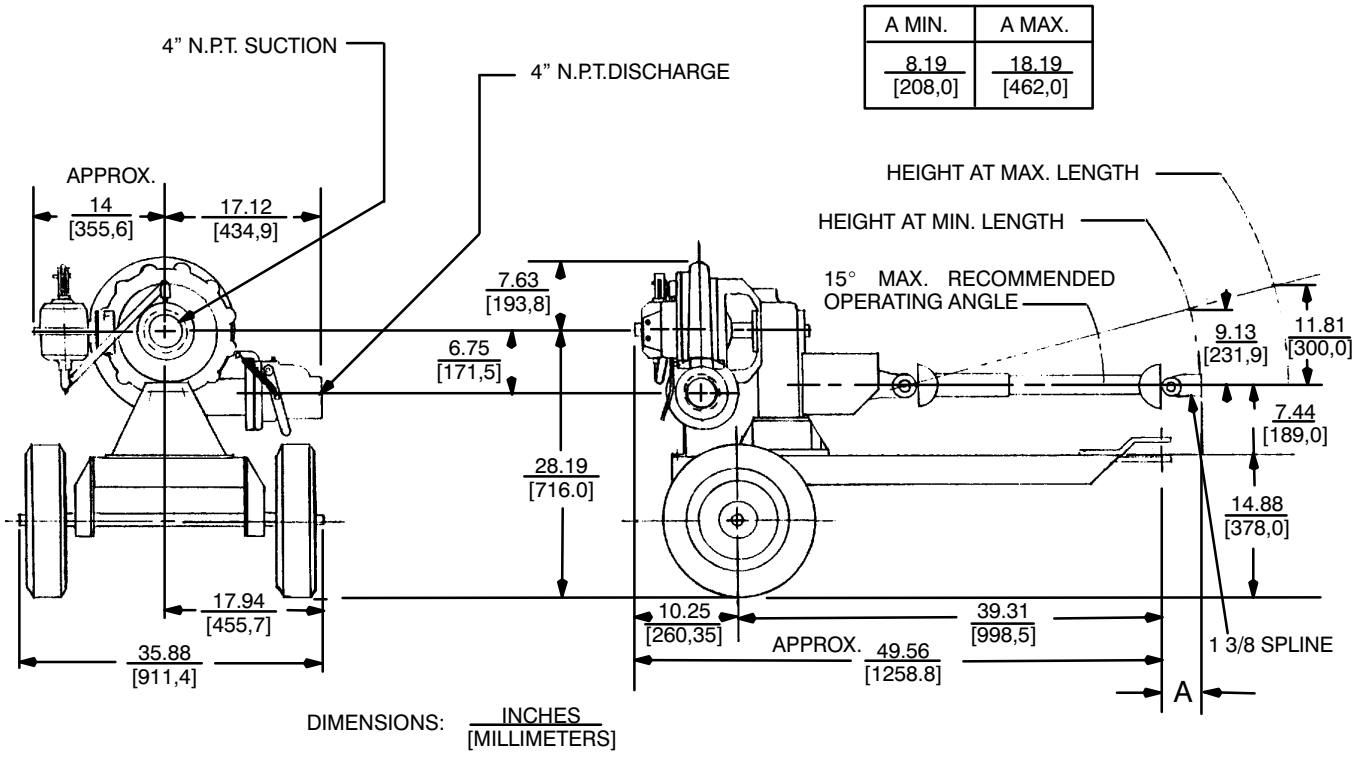


Figure 1. Pump Model 64A2–G

PREINSTALLATION INSPECTION

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

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

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

ing, check for loose hardware at mating surfaces.

c. Carefully read all tags, decals, and markings on the pump assembly, and follow the instructions 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 has been stored for more than 12 months, some of the components or lubricants may have exceeded their maximum shelf life. These **must be inspected or replaced** to ensure maximum pump service.

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

POSITIONING PUMP

Lifting

Use lifting equipment with a capacity of at least **2150 pounds (975 kg)**. This pump weighs approximately **429 pounds (195 kg)**, not including the weight of accessories and suction and discharge piping. Customer installed equipment such as suction and discharge piping **must** be removed before attempting to lift.

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.

If the pump has been mounted on a movable base, make certain the base is stationary by setting the brake and blocking the wheels before attempting to operate the pump.

To ensure sufficient lubrication and fuel supply to the engine, **do not** position the pump and engine more than 15° off horizontal for continuous operation. The pump and engine may be positioned up to 30° off horizontal for **intermittent operation only**; however, the engine manufacturer should be consulted for continuous operation at angles greater than 15°.

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 or contact the factory 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 (457,2 mm) from the suction and discharge ports and install the lines. Installation closer to the pump may result in erratic readings.

SUCTION LINES

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

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 3/8 inch (9,7 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).

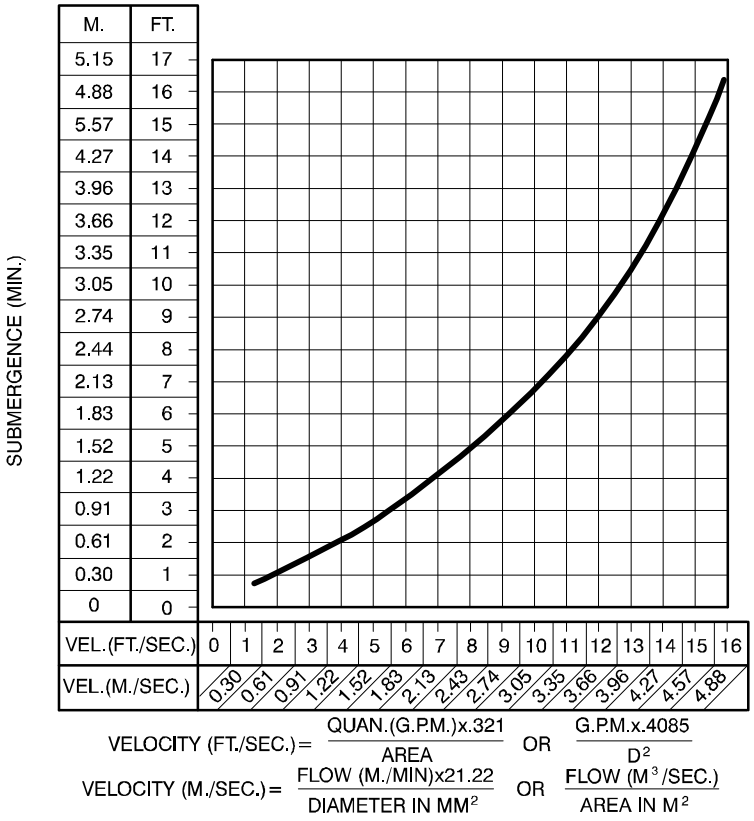


Figure 2. Recommended Minimum Suction Line Submergence vs. Velocity

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.

CAUTION

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

ALIGNMENT

This unit is provided with an adjustable power take-off shaft fitted with universal joints to fit a standard 1 3/8 inch, 6-tooth splined power take-off shaft. Refer to the installation drawing in this section for shaft spline size.

The alignment of the unit and the power source is critical for trouble-free mechanical operation and maximum pump performance. It is imperative that alignment be checked before the unit is put into operation.

WARNING!

When installing and/or aligning the

power take off shaft, disconnect the power source or take other precautions to ensure that the unit will remain inoperative.

When mounted at the Gorman-Rupp factory, driver and pump are aligned before shipment. Misalignment can occur in transit and handling. Pumps should be checked, and realigned if necessary, before being put into operation. Before checking alignment, make certain that all mounting hardware is tight.

The unit and the power source drive are generally positioned so that the power take-off shaft centerlines are parallel and horizontal. The maximum operating angle should not exceed 15 degrees (see Figure 3).

Check the direction of rotation of the power source drive shaft, power take-off drive shaft, and pump drive shaft before starting the pump. The pump drive shaft must rotate in the direction shown on the body of the pump, and on decals, tags, and labels.

WARNING!

Do not operate the unit without the guard in place over the rotating parts. Use caution when working near the power coupling end of the power take-off shaft. Exposed rotating parts can catch clothing, fingers, or tools, causing severe injury to personnel.

After the power take-off shaft has been aligned, block the wheels of the external power source, engage the braking system, or take other precautions to ensure that the power source will remain stationary. Block the wheels on the unit to prevent creeping.

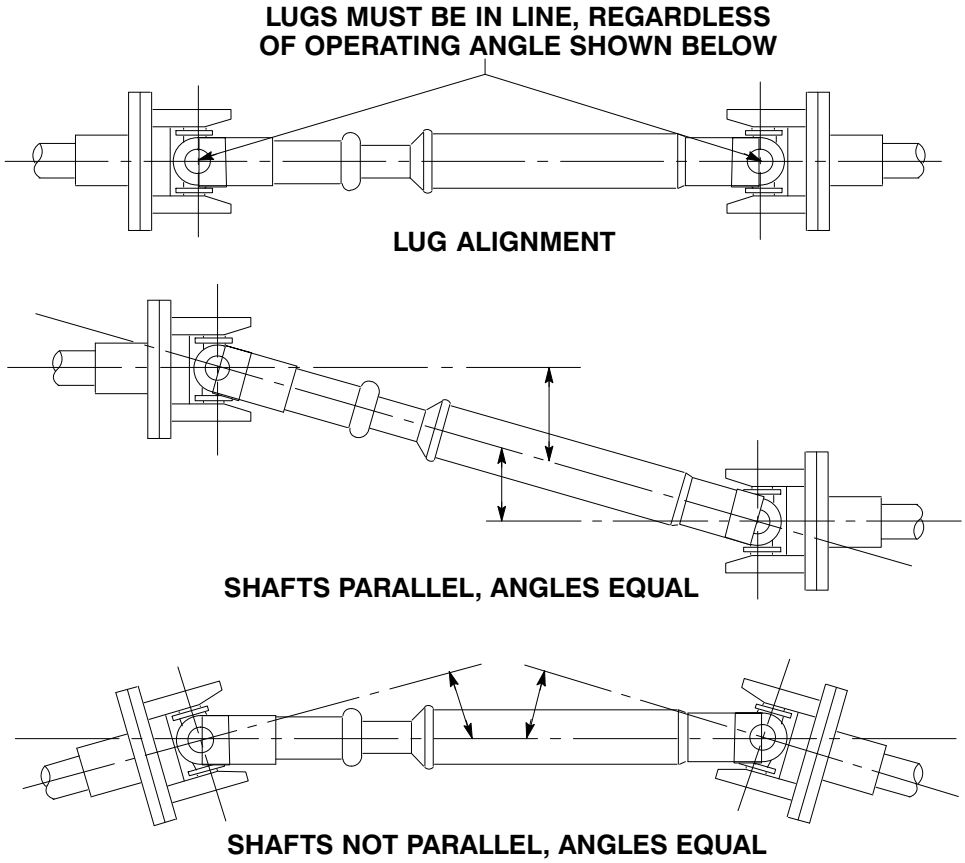


Figure 3. Proper Installation and Alignment of Universal Assembly

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 for high pressure distribution of clean liquids that do not contain large entrained solids. Do not attempt to pump volatile, corrosive, or flammable materials, or any liquids which may damage the pump or endanger personnel as a result of pump failure.

WARNING!

Do not operate the pump without the guard(s) in place over the rotating parts. Use caution when working near the power coupling end of the power take-off shaft. Exposed rotating parts can catch clothing, fingers, or tools, causing severe injury to personnel.

WARNING!

The gearbox provided on this pump is designed for operation at a maximum input speed of 550 RPM. If operated at a higher RPM, pump or gearbox components may be destroyed.

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 and gearbox are properly lubricated (see **LUBRICATION** in **MAINTENANCE AND REPAIR**).

Since this pump is not self-priming, it is equipped with a hand-operated vacuum priming pump, and a spring-loaded check valve.

Refer to the following instructions for operation of the hand primer and spring-loaded check valve. Additional information on installation, operation and maintenance of theses assemblies is contained in accompanying literature.

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.

Hand-Operated Priming Pump

The hand-operated priming pump (see Figure 1) is designed to prime the centrifugal pump by evacuating air from the pump casing and suction line. To prime a pump with a hand vacuum pump, close the discharge line throttling valve and spring-loaded check valve (if so equipped). Make sure the drain cock in the bottom of the priming pump is closed. Start the centrifugal pump, and operate the handle on the priming pump until liquid flows from the pump discharge. After shutting down the pump, **be sure** to open the drain cock in the bottom of the hand primer and drain out any liquid in preparation for the next priming cycle, and to prevent damage in the below freezing conditions.

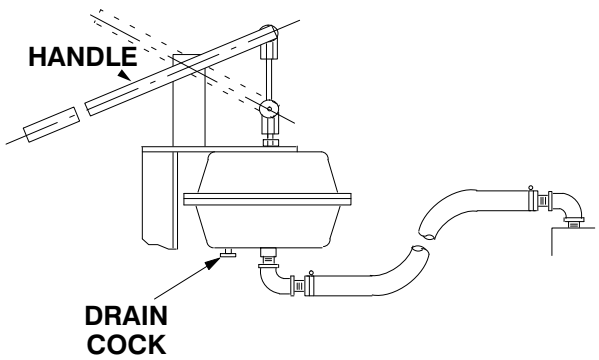


Figure 1. Hand Primer Assembly

STARTING

Consult the operations manual furnished with the power source.

OPERATION

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 110° F (43° 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!

Allow an over-heated pump to completely cool before servicing. 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.

Strainer Check

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

Never introduce air or steam pressure into the pump casing or piping to remove a blockage. This could result in personal injury or damage to the equipment. If backflushing is absolutely necessary, **liquid pressure** must be limited to 50% of the maximum permissible operating pressure shown on the pump performance curve. (See Section E, Page 1.) Since the pump is fitted with a Gorman-Rupp double grease lubricated seal, the maximum incoming pressure must be reduced to 10 p.s.i.

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 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.

GEARBOX TEMPERATURE CHECK

The gearbox runs higher than ambient temperatures because of heat generated by friction. Temperatures of approximately 200° F (93° C) are considered normal, and can operate intermittently at 250° F (121° C).

Checking gearbox temperatures by hand is inaccurate. Place a contact-type thermometer against the housing and record this temperature for future reference.

A sudden increase in gearbox temperature is a warning that the bearings are at the point of failing. 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 within 20 minutes or less.

TROUBLESHOOTING – SECTION D

Review all SAFETY information in Section A.

WARNING!

The following precautions should be taken before attempting to service the pump; otherwise, injury or death could result.

1. **Familiarize yourself with this manual and with all other literature shipped with the pump.**
2. **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.**

Table D-1 Troubleshooting Chart

TROUBLE	CAUSE	REMEDY
PUMP FAILS TO PRIME	Not enough liquid in casing.	Add liquid to casing. See **PRIMING**, Section B.
	Auxiliary priming device faulty or improperly installed.	Repair priming device or check installation.
	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 discharge head too high.	Check piping installation and install bypass line if needed. See **INSTALLATION**.
	Strainer clogged.	Check strainer and clean in necessary.
	Discharge check valve open.	Check position of handle; close valve.
PUMP STOPS OR FAILS TO DELIVER RATED FLOW OR PRESSURE	Air leak in suction line.	Correct leak.
	Suction intake not submerged at proper level or sump too small.	Check installation and correct submergence as needed.
	Lining of suction hose collapsed.	Replace suction hose.
	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.
	Leaking or worn seal or pump gasket.	Check pump vacuum. Replace leaking or worn seal or gasket.

Table D-1 Troubleshooting Chart (continued)

TROUBLE	CAUSE	REMEDY
PUMP STOPS OR FAILS TO DELIVER RATED FLOW OR PRESSURE (cont.)	Suction lift too high.	Measure lift with vacuum gauge. Reduce lift and/or friction losses in suction line.
	Strainer clogged.	Check strainer and clean if necessary.
	Pump speed too slow.	Check driver output; check belts or couplings for slippage.
	Discharge throttling valve partially closed; check valve is installed improperly.	Open discharge valve fully; check piping installation.
PUMP REQUIRES TOO MUCH POWER	Pump speed too high.	Check driver speed; check that the universal joint drive is properly installed.
	Discharge head too low.	Adjust discharge valve.
	Liquid solution too thick.	Dilute if possible.
PUMP CLOGS FREQUENTLY	Discharge flow too low.	Open discharge valve fully to increase flow rate, and run power source at maximum governed speed.
	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.
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.
	Universal joint drive misaligned.	Align drive.

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

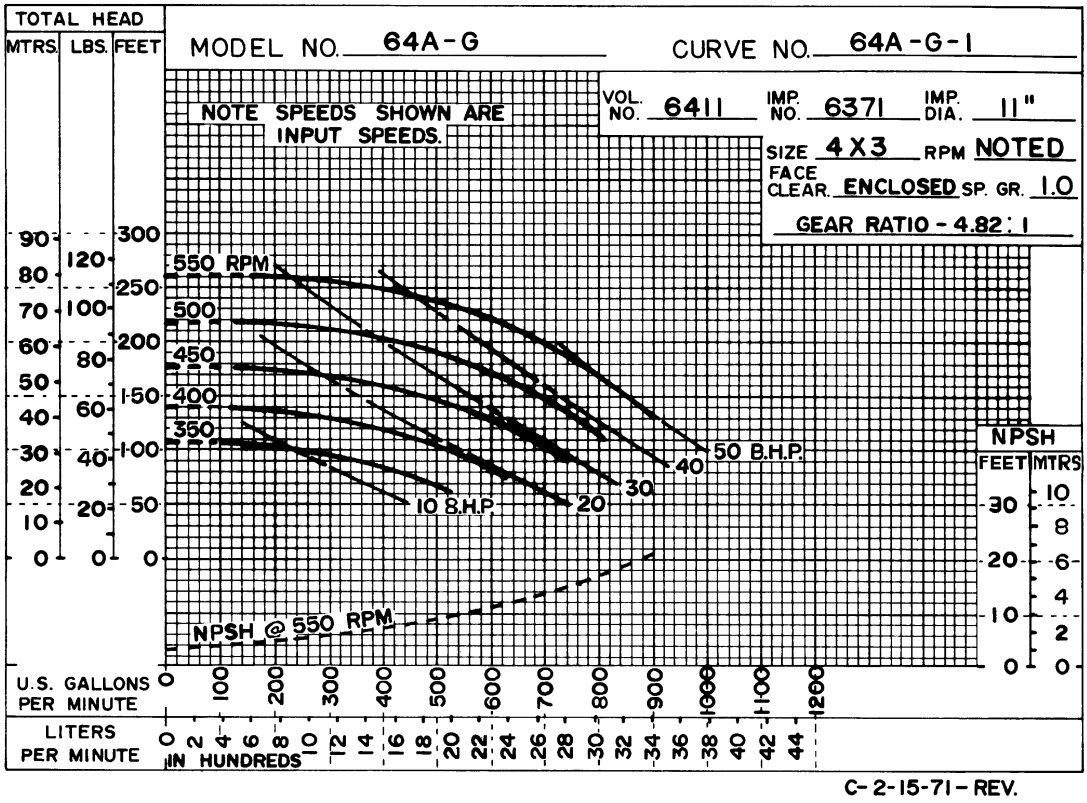
Item	Service Interval*				
	Daily	Weekly	Monthly	Semi-Annually	Annually
General Condition (Temperature, Unusual Noises or Vibrations, Cracks, Leaks, Loose Hardware, Etc.)	I				
Pump Performance (Gauges, Speed, Flow)	I				
Bearing Lubrication		I			R
Seal Lubrication (And Packing Adjustment, If So Equipped)		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 intermittant 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 64A2-G

✳ 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

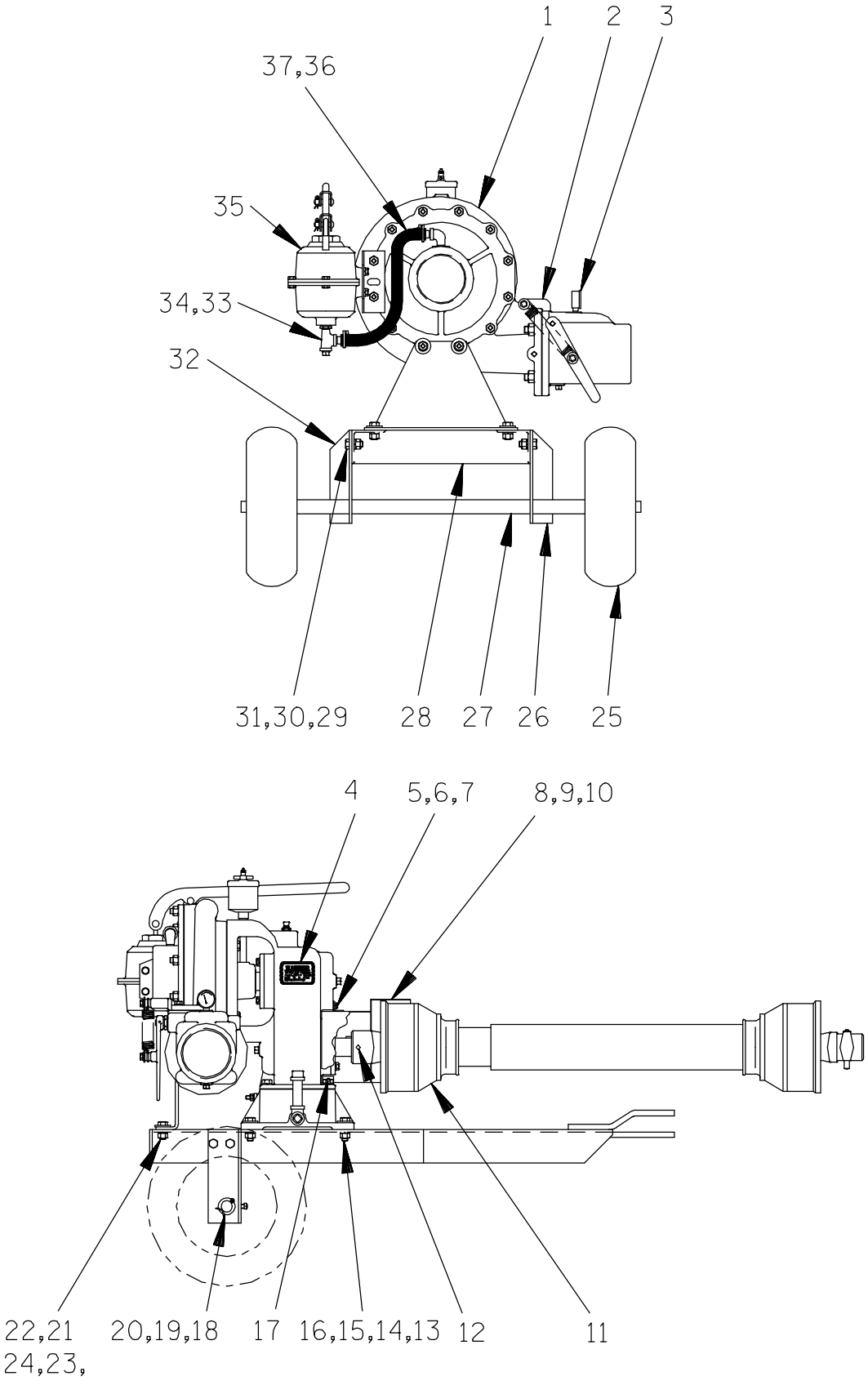


Figure 1. 64A2-G Pump Model

PARTS LIST
64A2-G Pump Model
(From S/N 1152040 up)

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

ITEM NO.		PART NAME	PART NUMBER	MAT'L CODE	QTY
1		PUMP END	64A2-(G)	–––	1
2		DISCH CHCK VALVE ASSY	GRP14–12A	–––	1
3		DISCH PRESS GAUGE	S180	–––	1
4		GRD WARNING STICKER	38816–063	–––	1
5		HEX HD CAPSCREW	B0402	15991	1
6		LOCKWASHER	J04	15991	1
7		FLAT WASHER	K04	15991	1
8		UNIVERSAL GUARD	42357–005	24150	1
9		GRD WARNING STICKER	38816–062	–––	1
10		RPM INPUT DECAL	2613FM	–––	8
11		UNIVERSAL ASSY	S1413A	–––	1
12	✳	COTTER PIN	M0616	15990	1
13		HEX HD CAPSCREW	B0807	15991	4
14		LOCKWASHER	J08	15991	1
15		FLAT WASHER	K08	15991	4
16		HEX NUT	D08	15991	4
17		PAN HD TAP SCREW	BP#14–02	15991	2
18		SQ HD TAP SCREW	G0604	15990	2
19	✳	COTTER PIN	M0306	15990	2
20		FLAT WASHER	S1532	–––	4
21		HEX HD CAPSCREW	B0805	15991	2
22		LOCKWASHER	J08	15991	2
23		FLAT WASHER	K08	15991	2
24		HEX NUT	D08	15991	2
25		PNEUMATIC WHEEL	S2005	–––	2
26		AXLE BRACKET	6417A	15990	1
27		AXLE	6423	15000	1
28		BASE	6419	24000	1
29		HEX HD CAPSCREW	B0805	15991	4
30		LOCKWASHER	J08	15991	4
31		HEX NUT	D08	15991	4
32		AXLE BRACKET	6417B	15990	1
33		SERVICE TEE	US06	11999	1
34		PIPE PLUG	P06	15079	1
35		HAND PRIMER ASSY	GRP43–02A	–––	1
36		STREET ELBOW	RS06	11999	1
37		HOSE	31412–101	19180	1
OPTIONAL:					
		A HD SET SCREW	GA0601 1/2	15990	1
		ROTATION DECAL	2613BM	–––	1
		LUBE DECAL	38816–148	–––	1
		INSTRUCTION TAG	38817–035	–––	1

✳ INDICATES PARTS RECOMMENDED FOR STOCK

SECTION DRAWING

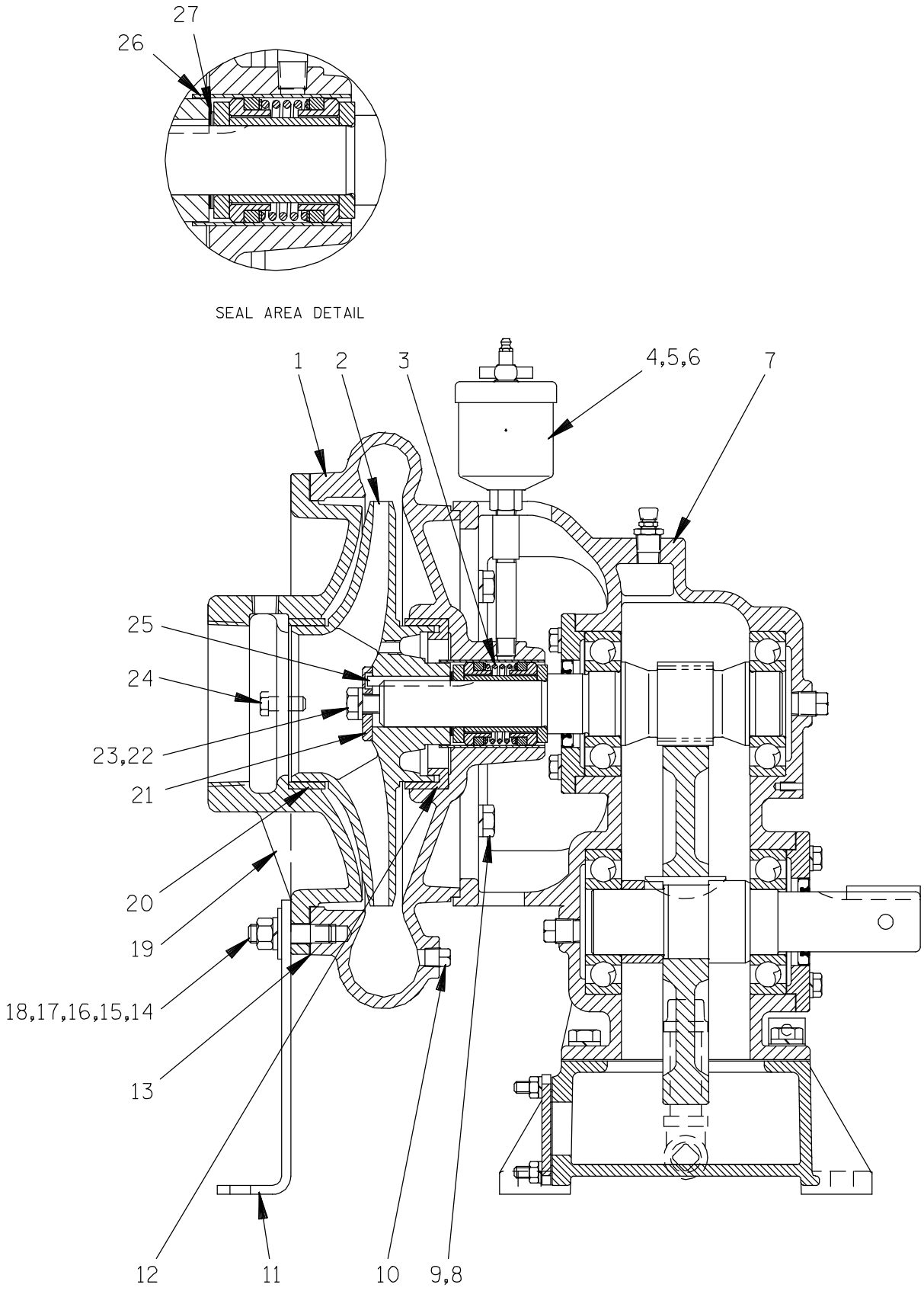


Figure 2. 64A2—(G) Pump End Assy

PARTS LIST
64A2–(G) Pump End Assy

ITEM NO.		PART NAME	PART NUMBER	MAT'L CODE	QTY
1		PUMP CASING ASSEMBLY	6411	10010	1
2	✳	IMPELLER	6371	10010	1
3	✳	GREASE SEAL ASSY	GS1250	–––	1
4		PIPE NIPPLE	T0412	15079	1
5		PIPE COUPLING	AE04	15079	1
6		GREASE CUP	S1509	–––	1
7		GEARBOX ASSY	44161–031	–––	1
8		HEX HD CAPSCREW	B0805	15991	4
9		LOCKWASHER	J08	15991	4
10		CASING DRAIN PLUG	P04	15079	1
11		CASING SUPPORT	6415	15990	1
12	✳	WEAR RING	6520	14000	1
13	✳	PUMP CASING GASKET	2202G	18000	1
14		STUD	C0809	15991	4
15		STUD	C0807	15991	8
16		LOCKWASHER	J08	15991	4
17		FLAT WASHER	K08	15991	4
18		HEX NUT	D08	15991	12
19		SUCTION HEAD	6407	10010	1
20	✳	WEAR RING	6402	14000	1
21		IMPELLER WASHER	6403	15991	1
22	✳	NYLOCK CAPSCREW	BT0806	15991	1
23		LOCKWASHER	J08	15991	1
24		HEX HD CAPSCREW	B0604	15991	2
25	✳	SHAFT KEY	N0409	15990	1
26	✳	SEAL LINER	2205A	14080	1
27	✳	IMPELLER SHIM SET	37J	17090	REF
NOT SHOWN:					
		STRAINER	S1528	–––	1
		NAME PLATE	2613R	13990	1
		DRIVE SCREW	BM#04–03	17000	4
		G-R DECAL	GR–03	–––	1
		SUCTION STICKER	6588AG	–––	1
		GREASE CUP INSTRUCTION	6588BD	–––	1
		DISCHARGE STICKER	6588BJ	–––	1

✳ INDICATES PARTS RECOMMENDED FOR STOCK

SECTION DRAWING

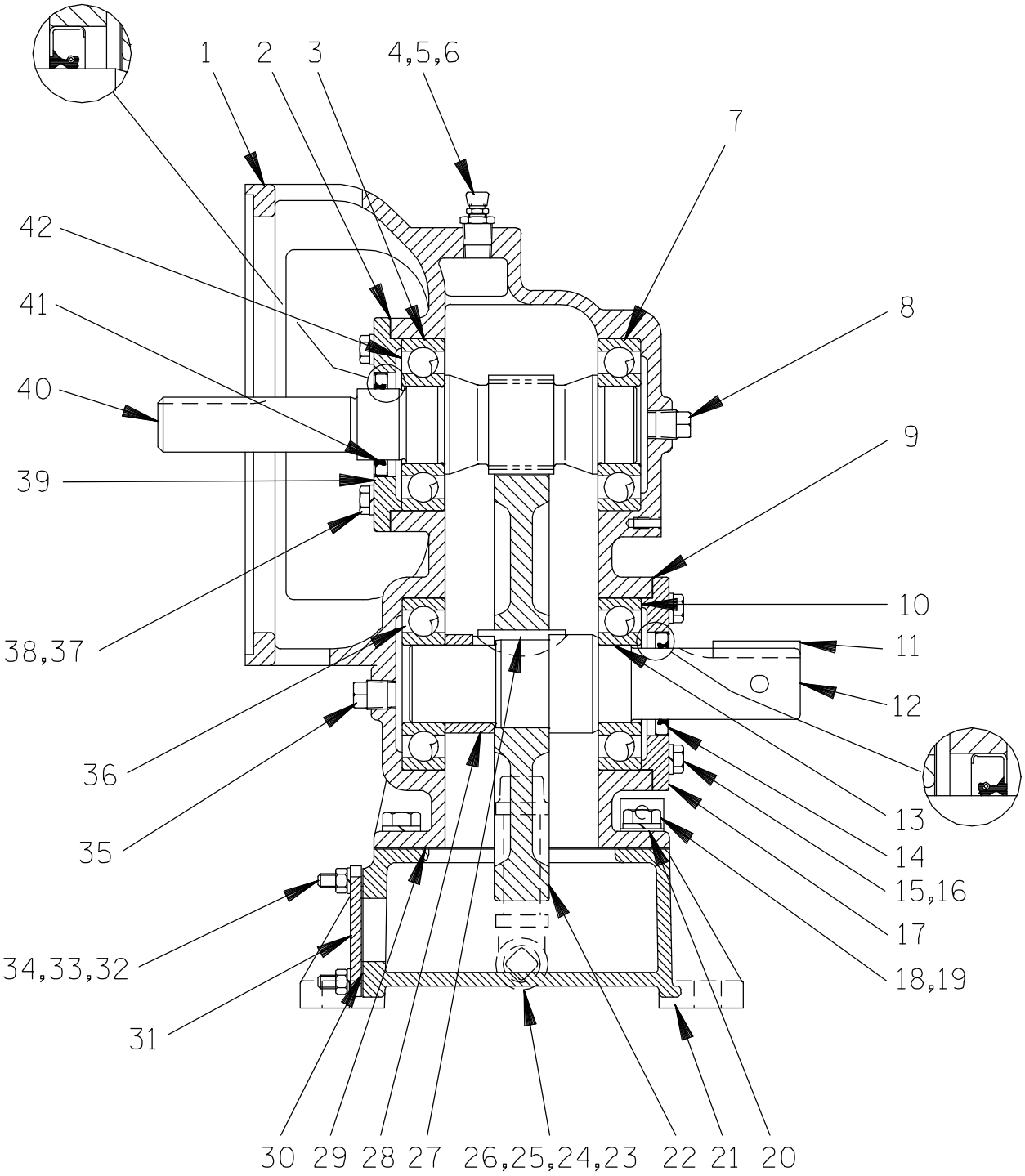


Figure 3. 44161—031 Gearbox Assy

PARTS LIST
44161–031 Gearbox Assy

ITEM NO.		PART NAME	PART NUMBER	MAT'L CODE	QTY
1		GEAR HOUSING	6412A	10010	1
2	✳	GASKET	12934G	18000	1
3	✳	BALL BEARING	S1088	–––	1
4		AIR VENT FITTING	S2162	–––	1
5		REDUCING BUSHING	AP0602	15079	1
6		SHIPPING PLUG	11495A	15079	1
7	✳	BALL BEARING	S1088	–––	1
8		PIPE PLUG	P06	15079	1
9	✳	GASKET	12934G	18000	1
10	✳	BEARING SHIM SET	8545	15990	1
11	✳	SHAFT KEY	N0608	15990	1
12		DRIVE SHAFT	6405	16040	1
13	✳	BALL BEARING	S1088	–––	1
14	✳	OIL SEAL	25258–526	–––	1
15		HEX HD CAPSCREW	B0604	15991	4
16		LOCKWASHER	J06	15991	4
17		BEARING CAP	38325–009	10010	1
18		HEX HD CAPSCREW	B0804	15991	8
19		LOCKWASHER	J08	15991	8
20		BRACKET	6408C	15990	1
21		GEAR BASE	6409	10010	1
22		HELICAL GEAR	38541–616	16060	1
23		SERVIVE TEE	US08	11999	1
24		PIPE PLUG	P08	15079	2
25		PIPE NIPPLE	T0812	15079	1
26		DIP STICK	42111–319	–––	1
27	✳	WOODRUFF KEY	AV1622	15990	1
28		SPACER SLEEVE	6414	15990	1
29	✳	GASKET	6409G	18000	1
30	✳	GASKET	6518G	18000	1
31		COVER PLATE	6518A	15020	1
32		STUD	C0505	15991	6
33		LOCKWASHER	J05	15991	6
34		HEX NUT	D05	15991	6
35		PIPE PLUG	P06	15079	1
36	✳	BALL BEARING	S1088	–––	1
37		HEX HD CAPSCREW	B0604	15991	4
38		LOCKWASHER	J06	15991	4
39		BEARING CAP	38325–009	10010	1
40		PINION SHAFT	38521–709	16060	1
41	✳	OIL SEAL	25258–526	–––	1
42	✳	BEARING SHIM SET	8545	15990	1

NOT SHOWN:

	GEAR LUBE DECAL	38816–086	–––	1
	LUBE TAG	38816–087	–––	1

✳ INDICATES PARTS RECOMMENDED FOR STOCK

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 1, 2 and 3) 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.

Most service functions, such as wear plate, impeller and seal replacement may be performed by draining the pump and removing the suction head. However, the following instructions assume complete disassembly is required.

If the gearbox (7, Figure 1) requires repair, proceed with **PUMP DISASSEMBLY** followed by **GEARBOX DISASSEMBLY AND REASSEMBLY**.

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

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

WARNING!

Before attempting to open or service the pump:

1. **Familiarize yourself with this manual.**
2. **Disconnect the power source or take other precautions 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 Head And Wear Ring Removal

(Figure 2)

Before attempting to service the pump, remove the suction and discharge piping. Remove the casing drain plug (10) and drain the pump. Clean and reinstall the drain plug. The wear ring (20) and impeller (2) are easily accessible and may be serviced by removing the suction head (19).

Disconnect the hand primer hose and street elbow (36 and 37, Figure 1) from the suction head. Disconnect the two hex nuts, flat washers and lockwashers (16, 17 and 18) and separate the hand primer assembly (35) from the suction head.

Remove the balance of the hardware (16, 17 and 18) securing the suction head to the pump casing (1). Disconnect the hardware (21, 22, 23 and 24, Figure 1) and remove the casing support (11). Use

the jacking screws (24) to jack the suction head and wear ring out of the pump casing. Remove the pump casing gasket (13).

Inspect the wear ring (20) for excessive wear or scoring. If replacement is required, use a chisel to cut it from the suction head.

CAUTION

Use caution not to damage the suction head when removing the wear ring.

Impeller Removal

(Figure 2)

See Figure 1 and remove the hardware securing the discharge check valve assembly (2) to the pump casing.

Before attempting to remove the impeller (2), remove the grease cup and piping (4, 5 and 6). This will prevent grease from escaping when the impeller is removed.

Immobilize the impeller by inserting a brass rod through the discharge port and wedging it in the impeller vanes. **Be careful** not to damage the impeller. Remove the impeller capscrew, lockwasher and washer (21, 22 and 23). Remove the brass rod. Install three 3/8-16 UNC X 2 1/2 inch long capscrews in the tapped holes in the impeller, and use a suitable puller to remove the impeller from the shaft. Retain the shaft key (25). Remove the impeller adjusting shims (27).

Inspect the wear ring (12) for excessive wear or scoring and if replacement is required, use a suitable puller to remove it from the pump casing.

Seal Removal And Disassembly

(Figure 2)

Make certain that the cross arm on the grease cup has been turned down against the cover before removing the seal assembly.

To remove the seal assembly (3), disengage the hardware (8 and 9) securing the pump casing to the gearbox (7). Carefully slide the pump casing and seal assembly off the shaft as a unit.

Place the pump casing on a clean work surface, and carefully press the seal components from the pump casing. Inspect the seal liner for excessive wear or scoring. If replacement is required, see **Seal Reassembly And Installation**.

NOTE

The Seal assembly may be removed without completely disassembling the pump by removing the impeller and using two stiff wires with hooked ends to pull the seal parts out of the pump casing.

Inspect the seal liner (26) for wear or grooves that could cause leakage or damage to the seal packing rings. The seal liner is secured by a press fit into the pump casing (1) and does not normally require replacement. If replacement is required, see **Seal Installation**.

If no further disassembly is required, proceed with **PUMP AND SEAL REASSEMBLY**. If the gearbox requires disassembly, do not reassemble the pump components at this time. Refer to **GEARBOX DISASSEMBLY AND REASSEMBLY**, followed by **PUMP AND SEAL REASSEMBLY**.

PUMP AND SEAL REASSEMBLY

If the gearbox requires disassembly, refer to **GEARBOX DISASSEMBLY** and **GEARBOX REASSEMBLY**, followed by **PUMP AND SEAL REASSEMBLY**.

Seal Reassembly And Installation

(Figures 2 and 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. Clean and polish the seal liner, or replace it if there are nicks or cuts on either end. If any components are worn, replace the complete seal; **never mix old and new seal parts**.

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

To ease installation of the seal, lubricate the packing rings and seal liner 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 4).

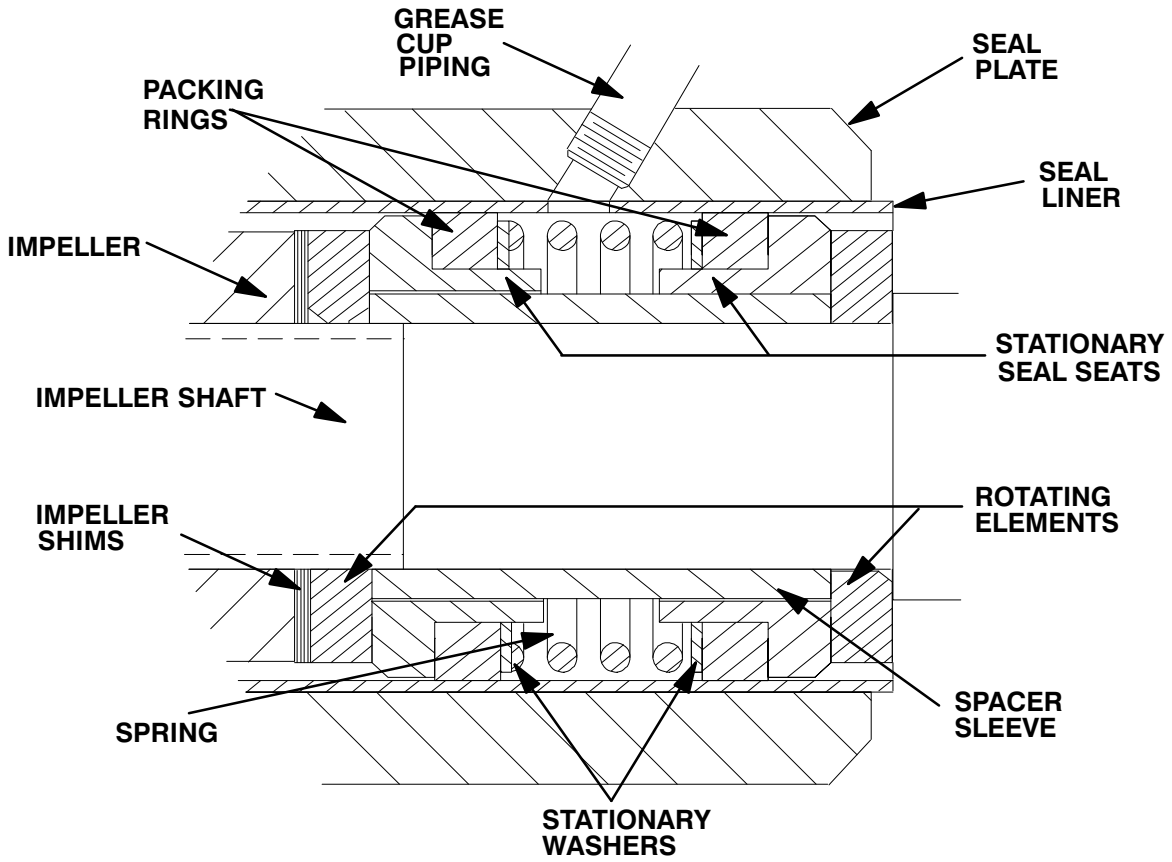


Figure 4. GS1250 Seal Assembly

CAUTION

This seal is not designed for operation at temperatures above 110°F (43°C). Do not use at higher operating temperatures.

Inspect the pump casing, seal liner and the impeller shaft for burrs or sharp corners, and remove any that exist. Replace the seal liner (26) if wear or grooves exist which could cause leakage or damage to the seal packing rings.

To replace the seal liner, position the pump casing on the bed of an arbor (or hydraulic) press and use

a new seal liner to press the old liner out. After the new liner is properly installed, a 1/4-inch diameter (6,35 mm) hole must be drilled through it to permit the flow of lubricant to the seal assembly. **Be careful** to center the drill in the threaded hole so not to damage the threads in the pump casing. Deburr the hole from the inside of the seal liner after drilling.

Secure the pump casing to the gearbox (7) with the hardware (8 and 9).

NOTE

*If the wear ring (12) was removed, press the replacement ring into the pump casing until fully seated before reinstalling the pump casing. The wear ring **must** seat squarely in the pump casing; otherwise, binding and/or excessive wear will occur as the shaft turns.*

Slide the inboard rotating element onto the shaft until the chamfered side seats against the shaft shoulder.

Subassemble the inboard stationary seat, packing ring and spring washer. Press this subassembly into the lubricated seal liner. A push tube cut from a length of plastic pipe would aid this installation. The O.D. of the pipe should be approximately the same diameter as the O.D. of the seal spring.

Install the spacer sleeve and spring.

Subassemble the outboard stationary seat, packing ring and spring washer. Press this subassembly into the lubricated seal liner.

Install the outboard rotating element with the chamfered side facing the impeller.

After the impeller has been installed, lubricate the seal as indicated in **LUBRICATION**.

Impeller Installation

(Figure 2)

Inspect the impeller, and replace it if cracked or badly worn. Install the same thickness of impeller shims (27) as previously removed. Install the impeller key (25) and press the impeller onto the shaft until fully seated.

For maximum pump efficiency, the impeller should be centered within the volute scroll. Center the impeller by adding or removing adjusting shims.

To verify the impeller positioning, measure the pump casing and impeller as shown in Figure 5. Use these measurements to calculate the required impeller location (dimension E). Add or remove impeller adjusting shims until dimension E is obtained.

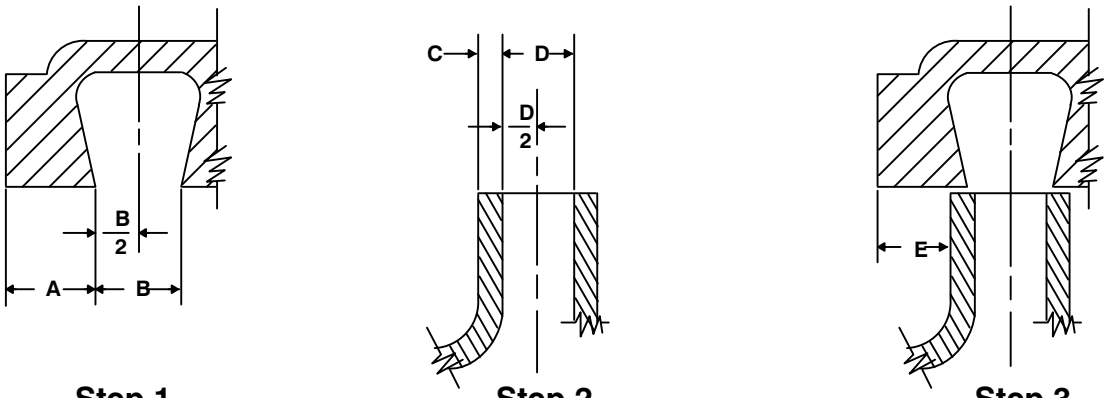


Figure 5. Centering Impeller Within Volute Scroll

NOTE

After the impeller has been properly positioned, check for free rotation. Correct any scraping binding before further reassembly.

After the impeller is properly positioned, install the impeller washer (21) and lockwasher (23), and secure by torquing the impeller capscrew (22) to 49 ft. lbs. (480 in. lbs. or 5,5 m. kg.).

Install the grease cup and piping (4, 5 and 6). Lubricate the seal assembly as indicated in **LUBRICATION** at the end of this section, after final pump assembly.

NOTE

If the grease cup piping (4 and 5) has been cleaned, pack the piping with No. 2 lithium base grease before installing it in the pump casing. This will ensure sufficient lubrication to the seal assembly upon initial startup.

Suction Head And Wear Ring Installation

(Figure 2)

If the wear ring (20) was removed, position the replacement ring in the suction head with the chamfered end toward the bore shoulder. Press the wear ring into the suction head until fully seated.

NOTE

*The wear ring **must** seat squarely in the suction head; otherwise, binding and/or excessive wear will occur as the shaft turns.*

Replace the pump casing gasket (13) and secure the suction head (19) to the pump casing (1) with the nuts (18). Make sure the jacking screws (24) do not interfere with the suction head seating.

Final Pump Reassembly

(Figure 2)

Reinstall the pump casing support (11, Figure 2) and secure it to the pump casing with the hardware (16, 17 and 18).

(Figure 1)

Secure the support to the base (28) with the hardware (21, 22, 23 and 24).

Install the discharge check valve assembly (2) and secure it to the pump casing with the previously removed hardware.

Secure the hand primer hose and elbow (36 and 37) to the pump casing. Secure the hand primer assembly (35) to the pump casing with the hardware (16, 17 and 18, Figure 2).

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

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

Refer to **OPERATION**, Section C, and start the pump.

GEARBOX DISASSEMBLY

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

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

If the gearbox requires disassembly, first disassemble the pump components as indicated in **PUMP AND SEAL DISASSEMBLY**.

Gearbox Removal

(Figure 1)

With the pump components removed, disengage the hardware (5, 6, 7 and 17) and remove the universal guard (8). Remove the cotter pin (12) and pull the universal assembly (11) off the drive shaft (12, Figure 3). Retain the drive shaft key (11, Figure 3).

Disengage the hardware (13, 14, 15 and 16) securing the gearbox to the base, and move the gearbox to a clean, well equipped shop for disassembly.

Gearbox Disassembly

(Figure 3)

Before attempting to disassemble the gearbox, remove the drain plug (24) and drain the gearbox lubricant. Clean and reinstall the drain plug.

To remove the gearbox base (21), disengage the hardware (18 and 19). Remove the guard bracket (20), and separate the gearbox base from the gearbox. Remove and discard the gasket (29).

It is not necessary to remove the cover plate (31) from the base unless leakage is apparent. If removal is required, disengage the hardware (33 and 34) and remove the cover plate and gasket (30).

Remove the shaft key (11). Remove the hardware (15 and 16) securing the bearing cap (17) to the gearbox housing. Slide the bearing cap and assembled oil seal (14) off the shaft. Remove the bearing adjusting shims (10).

Inspect the oil seal and, if replacement is required, press it from the bearing cap.

Position two spacer bars on the drive side of the helical gear (22) to prevent it from moving as the drive shaft (12) is removed. Remove the pipe plug (35) and use a drift pin to tap the drive shaft and bearing (13) out of the gearbox housing, retaining the spacer sleeve (28), woodruff key (27), and helical gear as they come free of the shaft.

The inboard bearing (36) will remain in the gearbox housing when the shaft is removed. Use a suitable puller to remove the bearing from the gearbox.

Remove the hardware (37 and 38) securing the bearing cap (39) to the gearbox housing (1). Slide the bearing cap and assembled oil seal (41) off the shaft. Remove the gasket (2) and bearing adjusting shims (42).

Inspect the oil seal (41) and, if replacement is required, press it from the bearing cap.

Remove the pipe plug (8) and use a drift pin to tap the pinion shaft (40) and bearings (3 and 7) out of the gearbox housing.

NOTE

If the bearing (7) remains in the gearbox housing when the shaft is removed, use a suitable puller to remove it from the housing.

Use a suitable puller to remove the bearings (3 and 13) from the pinion and drive shafts.

GEARBOX REASSEMBLY

Bearing Cleaning And Inspection

(Figure 3)

After removing the bearings, clean and inspect them as follows.

CAUTION

It is **strongly** recommended that the bearings be replaced **any** time they are removed.

Clean the gearbox housing, shafts 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 bearing 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 shafts and a snug slip fit into the gearbox housing. Replace the bearings, shaft, or gearbox housing if the proper fit is not achieved.

Gearbox Reassembly

(Figure 3)

Inspect the shafts for distortion, chipped teeth, damaged keyways, nicks or scratches, or for damage on the impeller or drive ends. Dress small nicks and burrs with a fine file or emery cloth. Replace the shafts if defective.

NOTE

The bearings used in the gearbox are identical parts.

Lay the gearbox housing on a flat surface with the pump side up, and position the pinion shaft bearing (7) in the bearing bore. Use an arbor (or hydraulic) press and a suitable sized sleeve to press the bearing into the gearbox housing until fully seated.

CAUTION

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

Slide the pinion shaft into the gearbox housing until the inboard shoulder of the pinion shaft seats squarely against the inner race of the bearing (7).

Use a suitable sized sleeve and an arbor (or hydraulic) press to install the bearing (3) on the pinion shaft until full seated.

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.

Apply a light coating of oil to the lip of the oil seal (41), and press it into the bearing cap (39) with the lip positioned as shown in Figure 3. The face of the oil seal should be just flush with the outer face of the bearing cap.

Install the same thickness of bearing shims (42) as previously removed. Install the bearing cap gasket (2). Slide the bearing cap over the shaft, being careful not to damage or roll the oil seal lip. Secure the bearing cap with the hardware (37 and 38).

NOTE

Shaft endplay should be between .005 and .012 inch (0,127 and 0,305 mm). Add or remove bearing shims to achieve the correct endplay.

Invert the gearbox housing, supporting it so it is level. Position the inboard bearing (36) in the bearing bore. Use an arbor (or hydraulic) press and a suitable sized sleeve to press the bearing into the gearbox housing until fully seated.

CAUTION

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

Align the spacer sleeve (28), woodruff key (27), and helical gear (22), and press the drive shaft through the parts until the spacer and helical gear are firmly seated against the inner race of the bearing (36).

Use a suitable sized sleeve, and an arbor (or hydraulic) press to install the bearing (13) on the drive shaft until fully seated.

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.

Apply a light coating of oil to the lip of the oil seal (14), and press it into the bearing cap (17) with the lip positioned as shown in Figure 3. The face of the oil seal should be just flush with the outer face of the bearing cap.

Install the same thickness of bearing shims (10) as previously removed. Install the bearing cap gasket (9). Slide the bearing cap over the shaft, being careful not to damage or roll the oil sel lip. Secure the bearing cap with the hardware (15 and 16).

NOTE

Shaft endplay should be between .005 and .012 inch (0,127 and 0,305 mm). Add or remove bearing shims to achieve the correct endplay.

Install the pipe plugs (8 and 35) in the gearbox housing.

Install the base gasket (29), and secure the base to the gearbox with the hardware (18 and 19). Be sure to reinstall the universal guard bracket (20).

If the cover plate (31) was removed, install a new gasket (30), and secure the cover plate to the base with the hardware (33 and 34).

Gearbox Installation

(Figure 1)

Secure the gearbox to the base with the hardware (13, 14, 15 and 16). Install the key (11, Figure 3), and secure the universal assembly (11) to the drive shaft with the cotter pin (12).

Install the universal guard (7), and secure it with the hardware (5, 6, 7 and 17).

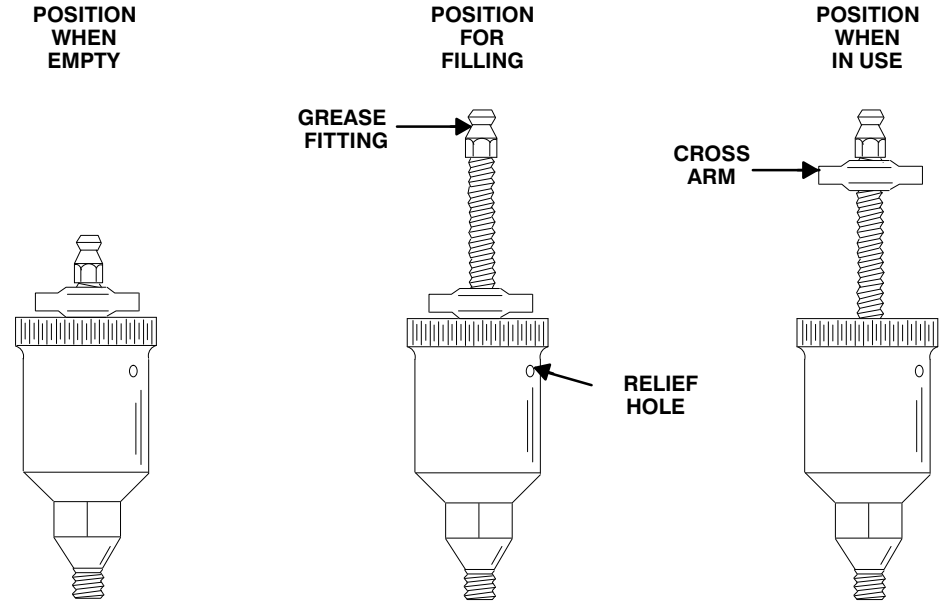
Lubricate the gearbox as indicated in **LUBRICATION** at the end of this section after reinstalling the pump end components.

LUBRICATION

Seal Assembly

(Figures 2 and 6)

Fill the grease cup (6) through the grease fitting with No. 2 lithium base grease until grease escapes from the relief hole. Turn the grease cup arm counterclockwise until it is at the top of the stem; this will release the spring to apply grease to the seal (see Figure 6).



NOTE:
When installing a new grease cup, lubricate the cup as indicated on the installation tag furnished with the grease cup.

Figure 6. Automatic Lubricating Grease Cup

Gearbox

(Figure 3)

The gearbox was fully lubricated when shipped from the factory. Check the oil level regularly with the dipstick (26) and maintain it at the proper level. When lubrication is required, add SAE No. 90 non-detergent oil through the pipe nipple (25). **Do not** over-lubricate. Over-lubrication can cause the bearings to over-heat, resulting in premature bearing failure.

Under normal conditions, drain the gearbox once each year. Add four ounces of “Molykote ’M’” Gear Guard, and then refill with clean oil to the proper level on the dipstick. 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 gearbox 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.

Power Source

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