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



**0 SERIES PUMP**

<b>MODEL</b>
<b>03H1-M12 S/G</b>

**THE GORMAN-RUPP COMPANY • MANSFIELD, OHIO**

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

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**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 an 0 Series, self-priming centrifugal model, with a closed impeller. The pump is de-

signed for handling most non-volatile, non-flammable liquids containing specified entrained solids. It is close-coupled to a single cylinder air cooled Kohler gasoline engine. The basic material of construction for wetted parts is aluminum with an aluminum impeller and brass wearing parts.

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

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:

### NOTE

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



INSTRUCTIONS WHICH MUST BE FOLLOWED TO AVOID CAUSING DAMAGE TO THE PRODUCT OR OTHER EQUIPMENT INCIDENTAL TO THE INSTALLATION. THESE INSTRUCTIONS DESCRIBE THE REQUIREMENTS AND THE POSSIBLE DAMAGE WHICH COULD RESULT FROM FAILURE TO FOLLOW THE PROCEDURES.



THESE INSTRUCTIONS MUST BE FOLLOWED TO AVOID CAUSING INJURY OR DEATH TO PERSONNEL, AND DESCRIBE THE PROCEDURE REQUIRED AND THE INJURY WHICH COULD RESULT FROM FAILURE TO FOLLOW THE PROCEDURE.



## WARNINGS - SECTION A

THESE WARNINGS APPLY TO 0 SERIES ENGINE DRIVEN PUMPS. REFER TO THE MANUAL ACCOMPANYING THE ENGINE BEFORE ATTEMPTING TO BEGIN OPERATION.



BEFORE ATTEMPTING TO OPEN OR SERVICE THE PUMP:

1. FAMILIARIZE YOURSELF WITH THIS MANUAL.
2. SHUT DOWN THE ENGINE AND DISCONNECT THE SPARK PLUG WIRE TO ENSURE THAT THE PUMP WILL REMAIN IN-OPERATIVE.
3. ALLOW THE PUMP TO COOL IF OVERHEATED.
4. CHECK THE TEMPERATURE BEFORE OPENING ANY COVERS, PLATES, OR PLUGS.
5. CLOSE THE SUCTION AND DISCHARGE VALVES.
6. VENT THE PUMP SLOWLY AND CAUTIOUSLY.
7. DRAIN THE PUMP.



THIS PUMP IS DESIGNED TO HANDLE MOST NON-VOLATILE, NON-FLAMMABLE LIQUIDS CONTAINING SPECIFIED ENTRAINED SOLIDS. DO NOT ATTEMPT TO PUMP VOLATILE, CORROSIVE, OR FLAMMABLE LIQUIDS WHICH MAY DAMAGE THE PUMP OR ENDANGER PERSONNEL AS A RESULT OF PUMP FAILURE.



USE LIFTING AND MOVING EQUIPMENT IN GOOD REPAIR AND WITH ADEQUATE CAPACITY TO PREVENT INJURIES TO PERSONNEL OR

DAMAGE TO EQUIPMENT. THE BAIL IS INTENDED FOR USE IN LIFTING THE PUMP ASSEMBLY ONLY. SUCTION AND DISCHARGE HOSES AND PIPING MUST BE REMOVED FROM THE PUMP BEFORE LIFTING.



AFTER THE PUMP HAS BEEN INSTALLED, MAKE CERTAIN THAT THE PUMP AND ALL PIPING OR HOSE CONNECTIONS ARE TIGHT, PROPERLY SUPPORTED AND SECURE BEFORE OPERATION.



DO NOT OPERATE THE PUMP AGAINST A CLOSED DISCHARGE VALVE FOR LONG PERIODS OF TIME. IF OPERATED AGAINST A CLOSED DISCHARGE VALVE, PUMP COMPONENTS WILL DETERIORATE, AND THE LIQUID COULD COME TO A BOIL, BUILD PRESSURE, AND CAUSE THE PUMP CASING TO RUPTURE OR EXPLODE.



OVERHEATED PUMPS CAN CAUSE SEVERE BURNS AND INJURIES. IF OVERHEATING OF THE PUMP OCCURS:

1. STOP THE PUMP IMMEDIATELY.
2. VENTILATE THE AREA.
3. ALLOW THE PUMP TO COOL.
4. CHECK THE TEMPERATURE BEFORE OPENING ANY COVERS, PLATES, GAUGES, OR PLUGS.
5. VENT THE PUMP SLOWLY AND CAUTIOUSLY.
6. REFER TO INSTRUCTIONS IN THIS MANUAL BEFORE RESTARTING THE PUMP.

**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.

**WARNING**

DO NOT OPERATE AN INTERNAL COMBUSTION ENGINE IN AN EXPLOSIVE ATMOSPHERE. WHEN OPERATING INTERNAL COMBUSTION ENGINES IN AN ENCLOSED AREA, MAKE CERTAIN THAT EXHAUST FUMES ARE PIPED TO THE OUTSIDE. THESE FUMES CONTAIN CARBON MONOXIDE, A DEADLY GAS THAT IS COLORLESS, TASTELESS, AND ODORLESS.

**WARNING**

FUEL USED BY INTERNAL COMBUSTION ENGINES PRESENTS AN EXTREME EXPLOSION AND FIRE HAZARD. MAKE CERTAIN THAT ALL FUEL LINES ARE SECURELY CONNECTED AND FREE OF LEAKS. NEVER REFUEL A HOT OR RUNNING ENGINE. AVOID OVERFILLING THE FUEL TANK. ALWAYS USE THE CORRECT TYPE OF FUEL.

**WARNING**

NEVER TAMPER WITH THE GOVERNOR TO GAIN MORE POWER. THE GOVERNOR ESTABLISHES SAFE OPERATING LIMITS THAT SHOULD NOT BE EXCEEDED. THE MAXIMUM CONTINUOUS OPERATING SPEED FOR THIS PUMP IS 3200 RPM.



## INSTALLATION - SECTION B

**Review all WARNINGS 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 spe-

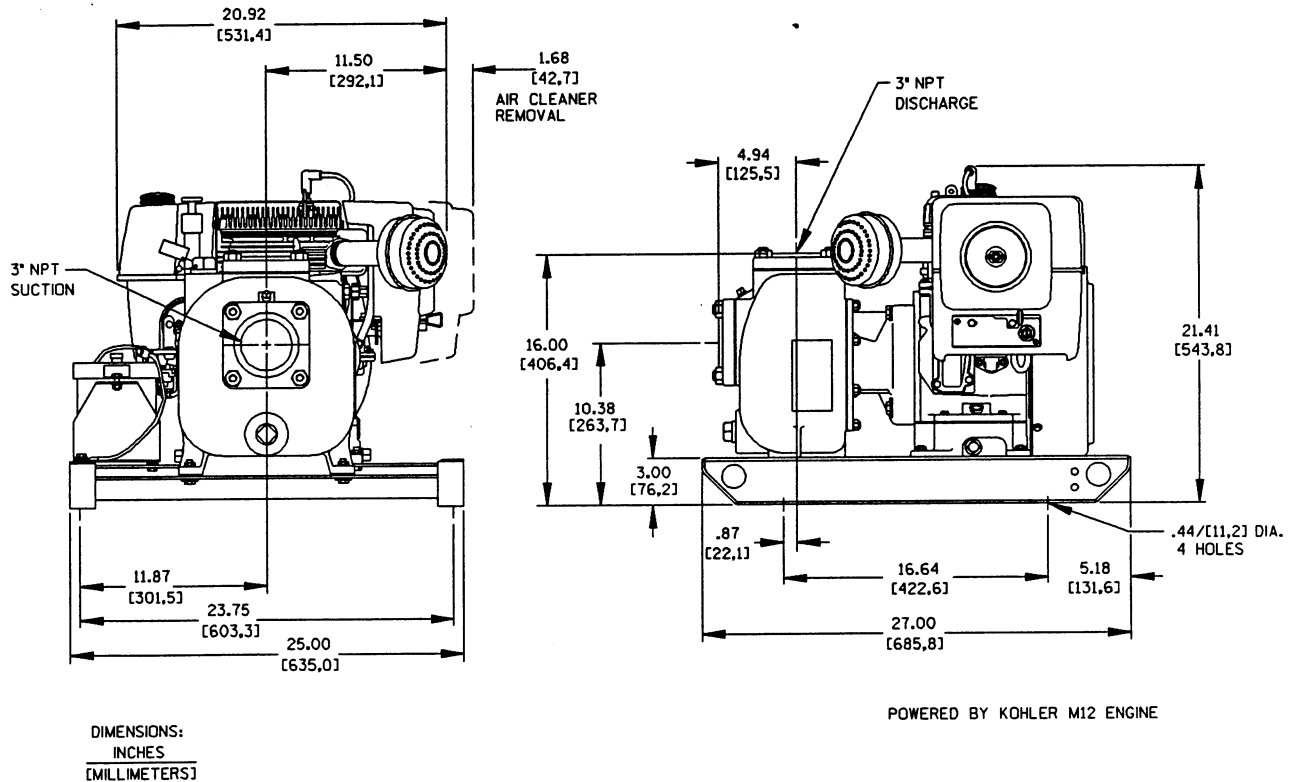
cific application. Since the pressure supplied to the pump is critical to performance and safety, **be sure** to limit the incoming pressure to 50% of the maximum permissible operating pressure as shown on the pump performance curve. (See Section E, Page 1.)

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

### Pump Dimensions

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

### OUTLINE DRAWING



**Figure 1. Pump Model 03H1-M12 S/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 and engine for cracks, dents, damaged threads, and other obvious damage.
- b. Check for and tighten loose attaching hardware. Since gaskets tend to shrink after drying, check for loose hardware at mating surfaces.
- c. Carefully read all tags, decals, and markings on the pump assembly, and perform all duties indicated.
- d. Check levels and lubricate as necessary. Refer to **LUBRICATION** in the **MAINTENANCE AND REPAIR** section of this manual and perform duties as instructed.
- e. If the pump and engine have been stored for more than 12 months, some of the components or lubricants may have exceeded their maximum shelf life. These **must be inspected or replaced** to ensure maximum pump service.

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

### Battery Specifications And Installation

Unless otherwise specified on the pump order, the engine battery was **not** included with the unit. Refer to the following specifications when selecting a battery.

Voltage	Cold Crank Amps @ 0° F	Reserve Capacity @ 80° F (Minutes)	Amp/ Hr. Rating	Approx. Overall Dims. (Inches)
12 Volts	220-255	41	33	7.75L x 5.13W x 7.38H

**Table 1. Battery Specifications**

Refer to the information accompanying the battery and/or electrolyte solution for activation and charging instructions.

Before installing the battery, clean the positive and negative cable connectors, and the battery terminals. Secure the battery by tightening the holddown brackets. The terminals and clamps may be coated with petroleum jelly to retard corrosion. Connect and tighten the positive cable first, then the negative cable.

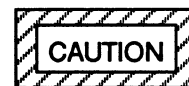
## POSITIONING PUMP



**USE LIFTING AND MOVING EQUIPMENT IN GOOD REPAIR AND WITH ADEQUATE CAPACITY TO PREVENT INJURIES TO PERSONNEL OR DAMAGE TO EQUIPMENT. THE BAIL IS INTENDED FOR USE IN LIFTING THE PUMP ASSEMBLY ONLY. SUCTION AND DISCHARGE HOSES AND PIPING MUST BE REMOVED FROM THE PUMP BEFORE LIFTING.**

### Lifting

Use lifting equipment with a capacity of at least five (5) times the weight of the unit. This pump weighs approximately **251 pounds (113,9 kg)**, not including the weight of accessories and optional wheel kit. Customer installed equipment such as suction and discharge piping **must** be removed before attempting to lift.



**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.

If the pump has been mounted on a moveable 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 notes on Page E-1 to be sure your overall application allows pump to operate within the safe operation range.

### Materials

Either pipe or hose may be 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 7/16 inch (11,1 mm) diameter spherical solids.

**Sealing**

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

**Suction Lines In Sumps**

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

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

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

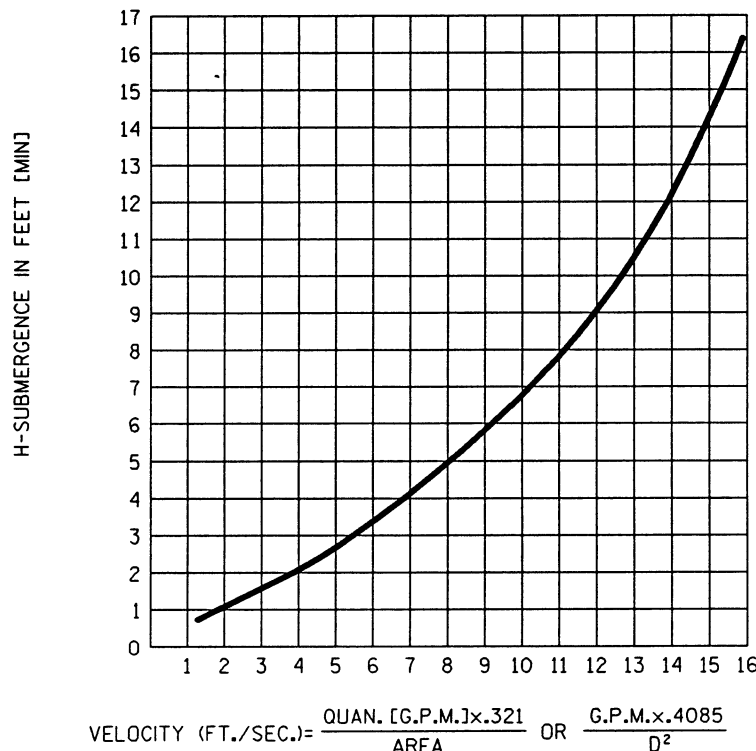
If two suction lines are installed in a single sump, the flow paths may interact, reducing the efficiency of one or both pumps. To avoid this, position the suction inlets so that they are separated by a distance equal to at least 3 times the diameter of the suction pipe.

**Suction Line Positioning**

The depth of submergence of the suction line is critical to efficient pump operation. Figure 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.

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

With high discharge heads, it is recommended that a throttling valve and a system check valve be in-

stalled in the discharge line to protect the pump from excessive shock pressure and reverse rotation when it is stopped.



IF THE APPLICATION INVOLVES A HIGH DISCHARGE HEAD, GRADUALLY CLOSE THE DISCHARGE THROTTLING VALVE BEFORE STOPPING THE PUMP.

### Bypass Lines

If a system check valve is used due to high discharge head, it may be necessary to vent trapped air from the top of the pump during the priming process. This may be accomplished by installing a bypass line from the top of the pump, back to the source of liquid. The end of the bypass line must be submerged. The line must be large enough to prevent clogging, but not so large as to affect pump discharge capacity.



## OPERATION – SECTION C

Review all warnings in Section A.

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



**THIS PUMP IS DESIGNED TO HANDLE MOST NON-VOLATILE, NON-FLAMMABLE LIQUIDS CONTAINING SPECIFIED ENTRAINED SOLIDS. DO NOT ATTEMPT TO PUMP VOLATILE, CORROSIVE, OR FLAMMABLE LIQUIDS WHICH MAY DAMAGE THE PUMP OR ENDANGER PERSONNEL AS A RESULT OF PUMP FAILURE.**

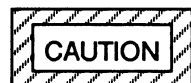


**NEVER TAMPER WITH THE GOVERNOR TO GAIN MORE POWER. THE GOVERNOR ESTABLISHES SAFE OPERATING LIMITS THAT SHOULD NOT BE EXCEEDED. THE MAXIMUM CONTINUOUS OPERATING SPEED FOR THIS PUMP IS 3200 RPM.**

### PRIMING

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

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



**NEVER OPERATE THIS PUMP UNLESS THERE IS LIQUID IN THE PUMP CASING. THE PUMP WILL NOT PRIME WHEN DRY. EXTENDED OPERATION**

**OF A DRY PUMP WILL DESTROY THE SEAL ASSEMBLY.**

Add liquid to the pump casing when:

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

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



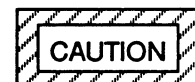
**AFTER FILLING THE PUMP CASING, REINSTALL AND TIGHTEN THE FILL PLUG. DO NOT ATTEMPT TO OPERATE THE PUMP UNLESS ALL CONNECTING PIPING IS SECURELY INSTALLED. OTHERWISE, LIQUID IN THE PUMP FORCED OUT UNDER PRESSURE COULD CAUSE INJURY TO PERSONNEL.**

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

### STARTING

Consult the operations manual furnished with the engine.

### OPERATION



**PUMP SPEED AND OPERATING CONDITION POINTS MUST BE WITHIN THE CONTINUOUS PERFORMANCE RANGE SHOWN ON THE CURVE. (SEE SECTION E, PAGE 1.)**

#### Lines With a Bypass

Close the discharge throttling valve (if so equipped) so that the pump will not have to prime against the

weight of the liquid in the discharge line. Air from the suction line will be discharged through the bypass line back to the wet well during the priming cycle. When the pump is fully primed and liquid is flowing steadily from the bypass line, open the discharge throttling valve. Liquid will then continue to circulate through the bypass line while the pump is in operation.

### Lines Without a Bypass

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

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

### Leakage

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

### Liquid Temperature And Overheating

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

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



**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.**

### Strainer Check

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

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

### Pump Vacuum Check

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

Open the suction line, and read the vacuum gauge with the pump primed and at 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, remove the engine ignition key 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.



## TROUBLESHOOTING - SECTION D

Review all WARNINGS in Section A.



**BEFORE ATTEMPTING TO OPEN OR SERVICE THE PUMP:**

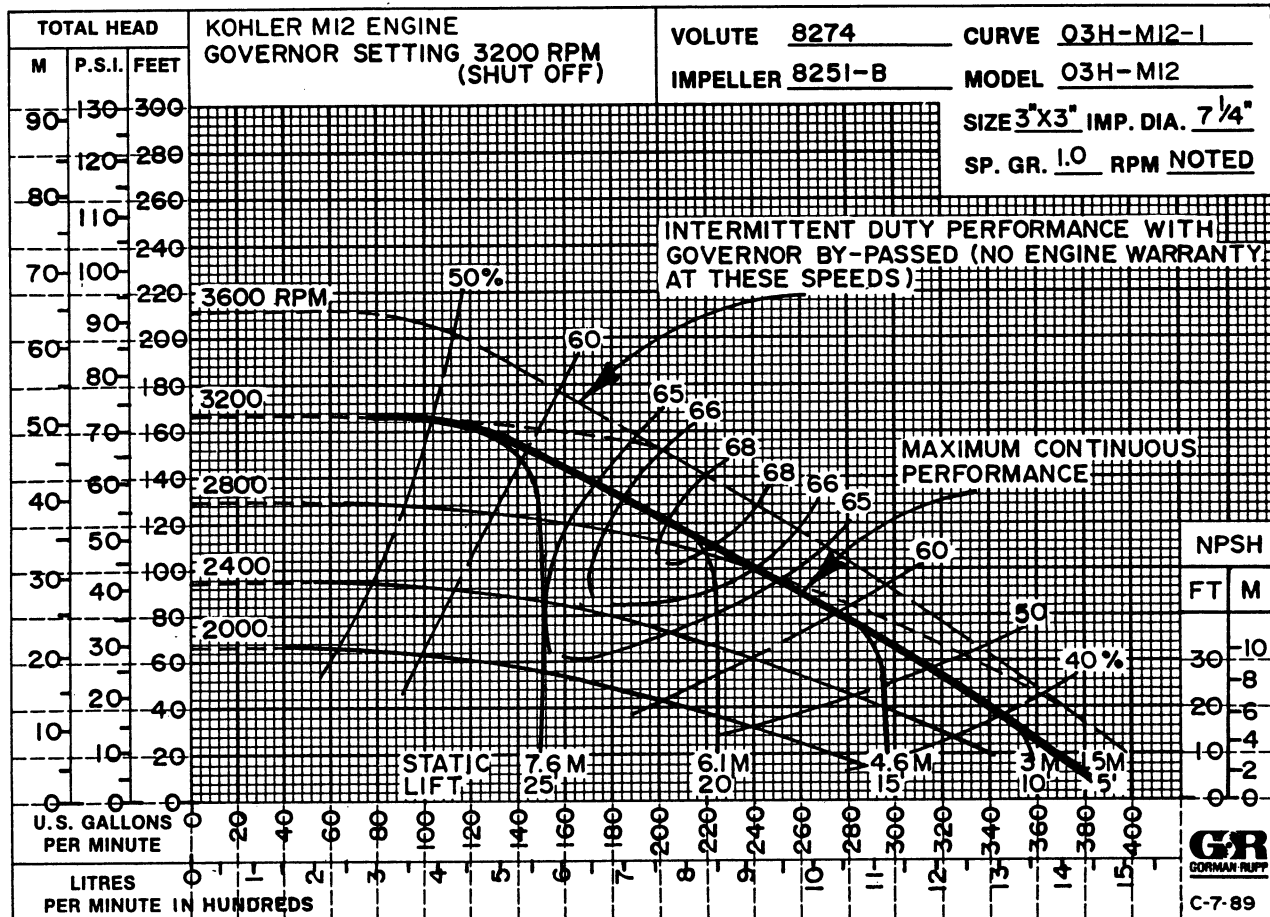
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7. DRAIN THE PUMP.

TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
<p><b>PUMP FAILS TO PRIME</b></p>	<p>Not enough liquid in casing.</p> <p>Air leak in suction line.</p> <p>Lining of suction hose collapsed.</p> <p>Leaking or worn seal or pump gasket.</p> <p>Pump speed too slow.</p> <p>Suction lift or discharge head too high.</p> <p>Strainer clogged.</p>	<p>Add liquid to casing. See <b>PRIMING</b>.</p> <p>Correct leak.</p> <p>Replace suction hose.</p> <p>Check pump vacuum. Replace leaking or worn seal or gasket.</p> <p>Check engine output; consult engine operation manual.</p> <p>Check piping installation and install bypass line if needed. See <b>INSTALLATION</b>.</p> <p>Check strainer and clean if necessary.</p>
<p><b>PUMP STOPS OR FAILS TO DELIVER RATED FLOW OR PRESSURE</b></p>	<p>Air leak in suction line.</p> <p>Suction intake not submerged at proper level or sump too small.</p> <p>Lining of suction hose collapsed.</p> <p>Leaking or worn seal or pump gasket.</p> <p>Impeller or other wearing parts worn or damaged.</p>	<p>Correct leak.</p> <p>Check installation and correct submergence as needed.</p> <p>Replace suction hose.</p> <p>Check pump vacuum. Replace leaking or worn seal or gasket.</p> <p>Replace worn or damaged parts. Check that impeller is properly centered and rotates freely.</p>

TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
PUMP STOPS OR FAILS TO DELIVER RATED FLOW OR PRESSURE (cont.)	<p>Strainer clogged.</p> <p>Impeller clogged.</p> <p>Suction lift or discharge head too high.</p> <p>Pump speed too slow.</p>	<p>Check strainer and clean if necessary.</p> <p>Free impeller of debris.</p> <p>Check piping installation and install bypass line if needed. See <b>INSTALLATION</b>.</p> <p>Check engine output; consult engine operation manual.</p>
PUMP REQUIRES TOO MUCH POWER	<p>Pump speed too high.</p> <p>Discharge head too low.</p> <p>Liquid solution too thick.</p>	<p>Check driver output; check that sheaves or couplings are correctly sized.</p> <p>Adjust discharge valve.</p> <p>Dilute if possible.</p>
PUMP CLOGS FREQUENTLY	<p>Discharge flow too slow.</p> <p>Discharge line clogged or restricted; hose kinked.</p>	<p>Open discharge valve fully to increase flow rate, and run engine at maximum governed speed.</p> <p>Check discharge lines; straighten hose.</p>
EXCESSIVE NOISE	<p>Cavitation in pump.</p> <p>Pumping entrained air.</p> <p>Pump or drive not securely mounted.</p> <p>Impeller clogged or damaged.</p>	<p>Reduce suction lift and/or friction losses in suction line. Record vacuum and pressure gauge readings and consult local representative or factory.</p> <p>Locate and eliminate source of air bubble.</p> <p>Secure mounting hardware.</p> <p>Clean out debris; replace damaged parts.</p>

## 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 03H1-M12 S/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 difference 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.



**NEVER TAMPER WITH THE GOVERNOR TO GAIN MORE POWER. THE GOVERNOR ESTABLISHES SAFE OPERATING LIMITS THAT SHOULD NOT BE EXCEEDED. THE MAXIMUM CONTINUOUS OPERATING SPEED FOR THIS PUMP IS 3200 RPM.**

SECTION DRAWING

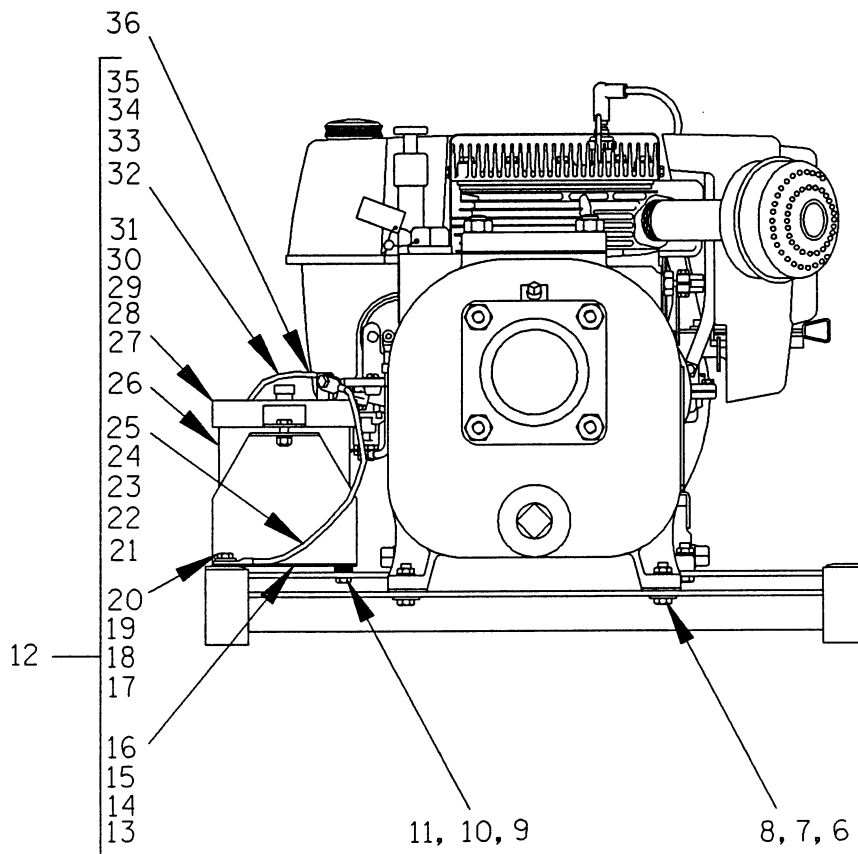
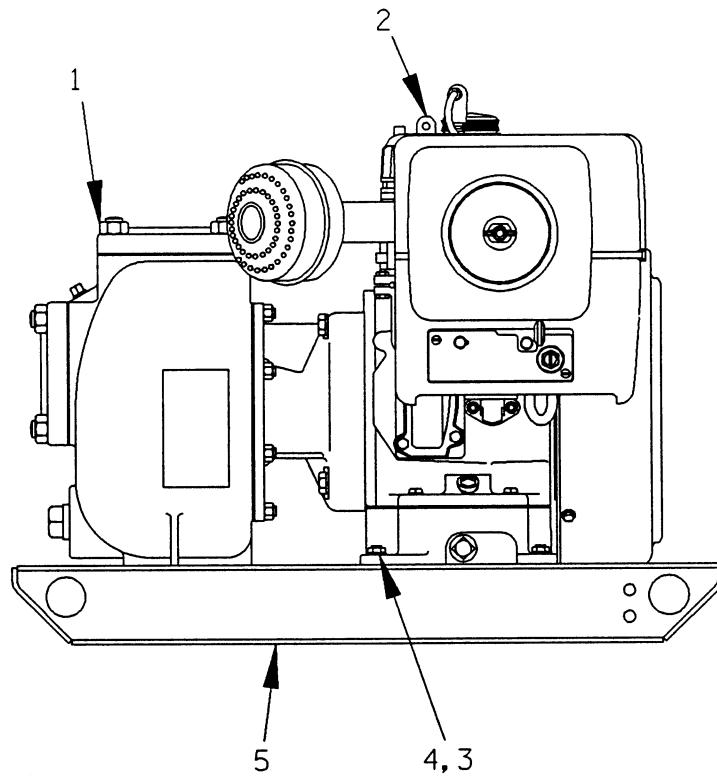


Figure 1. Pump Model 03H1-M12 S/G

**PARTS LIST**  
**Pump Model 03H1-M12 S/G**  
 (From S/N 945677 up)

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

ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY	ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY
1	PUMP END ASSY	03H1	-----	1	23	-HEX NUT	D04	15991	1
2	KOHLER M12 ENGINE	29127-123	-----	1	24	-LOCKWASHER	J04	15991	1
3	HEX HD CAPSCREW	B0605	15991	4	25	-FLAT WASHER	K04	15991	1
4	HEX NUT W/FLANGE	21765-314	-----	4	26 *	-BATTERY	SEE OPTIONS LIST		1
5	COMBINATION BASE	41566-098	24150	1	27	-BATTERY BOX COVER	11870	24000	1
6	HEX HD CAPSCREW	B0605	15991	2	28	-HEX HD CAPSCREW	B0503	15991	2
7	FLAT WASHER	K06	15991	2	29	-HEX NUT	D05	15991	2
8	HEX NUT W/FLANGE	21765-314	-----	2	30	-LOCKWASHER	J05	15991	2
9	HEX HD CAPSCREW	B0504	15991	1	31	-BATTERY TAG	38818-680	-----	1
10	FLAT WASHER	K05	15991	4	32	-HEX HD CAPSCREW	B0503	15991	1
11	HEX NUT W/FLANGE	21765-312	-----	1	33	-HEX NUT	D05	15991	1
12	BATTERY BOX ASSY	GRP40-05	-----	1	34	-LOCKWASHER	J05	15991	1
13	-BATTERY BOX	11281	24000	1	35	-FLAT WASHER	K05	15991	1
14	-HEX HD CAPSCREW	B0503	15991	1	36 *	POS CABLE ASSY	5795-AS	24040	1
15	-HEX NUT	D05	15991	1					
16	-LOCKWASHER	J05	15991	1					
17	-HEX HD CAPSCREW	B0504	15991	1	NOT SHOWN:				
18	-HEX NUT	D05	15991	1	WARNING DECAL	2613-FE	-----		1
19	-LOCKWASHER	J05	15991	1					
20	-FLAT WASHER	K05	15991	1	OPTIONAL:				
21	-CABLE ASSY	5795-AS	24040	1	12V BATTERY	S1680	-----		1
22	-HEX HD CAPSCREW	B0403	15991	1	WHEEL KIT	GRP30-39B	-----		1

\* INDICATES PARTS RECOMMENDED FOR STOCK

Above Serial Numbers Do Not Apply To Pumps Made In Canada.

CANADIAN SERIAL NO. .... AND UP

SECTION DRAWING

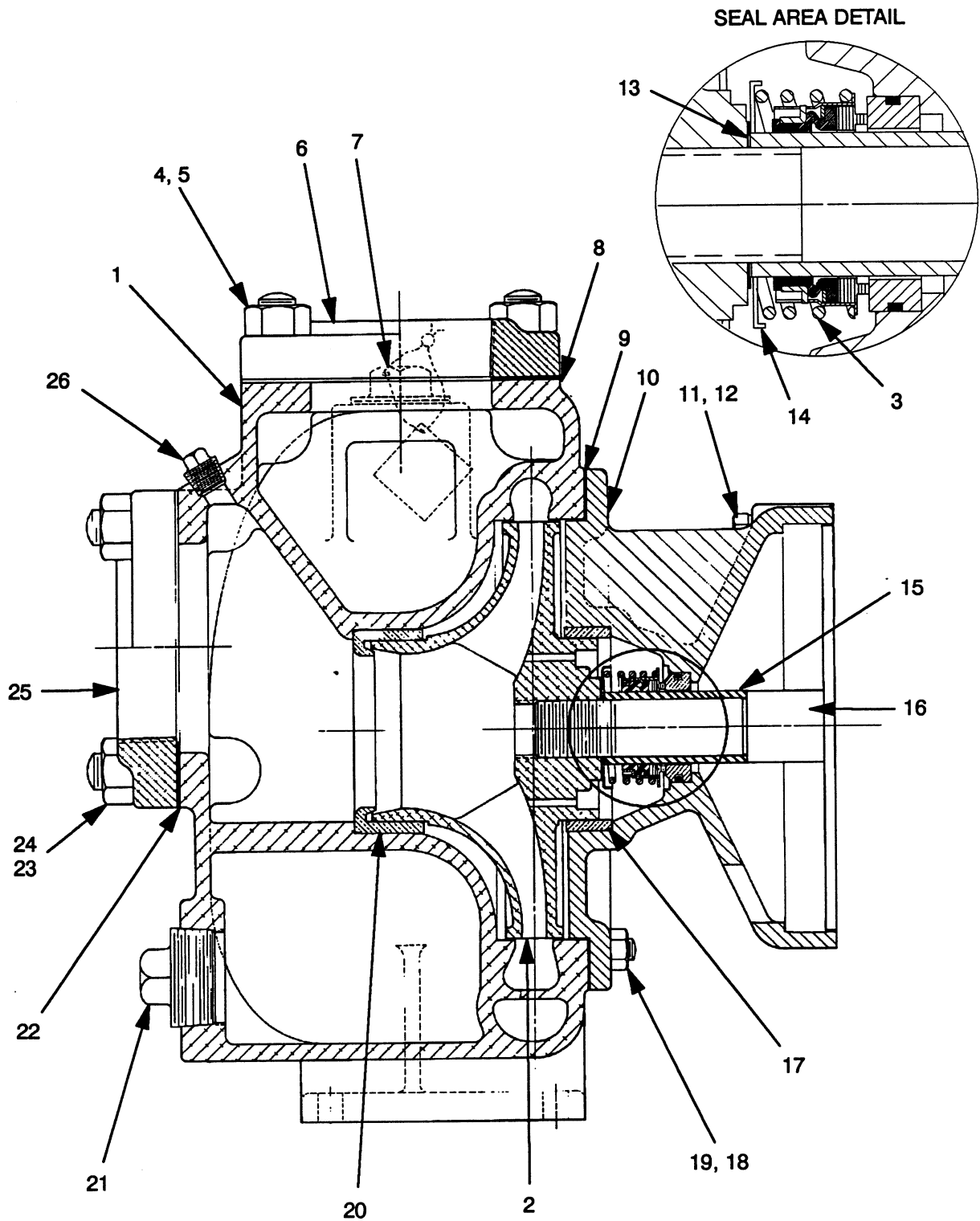


Figure 2. Pump End Assembly 03H1-(M12 S/G)



**PARTS LIST**  
**Pump End Assembly 03H1-(M12 S/G)**

ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY	ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY
1	PUMP CASING	8274	13040	1	17 *	BALANCE RING	62-ZL6	14000	1
2	IMPELLER	8251-B	13010	1	18	STUD	C0605 1/2	15991	8
3 *	SEAL ASSEMBLY	25271-192	-----	1	19	HEX NUT	D06	15991	8
4	STUD	C1009	15991	4	20 *	WEAR RING	62-ZL5	14000	1
5	HEX NUT	D10	15991	4	21	CASING DRAIN PLUG	P20	11990	1
6	DISCHARGE FLANGE	1390	13040	1	22 *	SUCT FLANGE GSKT	1318-GB	20000	1
7	FILL PLUG ASSY	48271-065	-----	1	23	STUD	C1009	15991	4
8 *	DISCH FLANGE GSKT	1318-GB	20000	1	24	HEX NUT	D10	15991	4
9 *	PUMP CASING GSKT SET	3-GC	20010	1	25	SUCTION FLANGE	1390	13040	1
10	INTERMEDIATE	8858	10010	1	26	ACCESSORY PLUG	P04	11990	1
11	HEX HD CAPSCREW	B0708	15991	4	<b>NOT SHOWN:</b>				
12	LOCKWASHER	J07	15991	4		NAME PLATE	38818-018	13990	1
13 *	ADJUSTING SHIM SET	2-X	17090	1		DRIVE SCREW	BM#04-03	15990	4
14	SRING CTR WASHER	3929-A	17000	1		SUCTION STICKER	6588-AG	-----	1
15	SPACER SLEEVE	5129	17030	1		DISCHARGE STICKER	6588-BJ	-----	1
16	ENGINE CRANKSHAFT			REF					

\* INDICATES PARTS RECOMMENDED FOR STOCK

## PUMP AND SEAL DISASSEMBLY AND REASSEMBLY

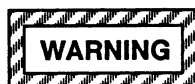
Review all warnings in Section A.

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 and 2) and the accompanying parts lists.

Before attempting to service the pump, shut down the engine and remove the spark plug wire to ensure that it will remain inoperative. Close all valves in the suction and discharge lines.

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



### BEFORE ATTEMPTING TO OPEN OR SERVICE THE PUMP:

1. FAMILIARIZE YOURSELF WITH THIS MANUAL.
2. SHUT DOWN THE ENGINE AND DISCONNECT THE SPARK PLUG WIRE TO ENSURE THAT THE PUMP WILL REMAIN INOPERATIVE.
3. ALLOW THE PUMP TO 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.



**USE LIFTING AND MOVING EQUIPMENT IN GOOD REPAIR AND WITH ADEQUATE CAPACITY TO PREVENT INJURIES TO PERSONNEL OR DAMAGE TO EQUIPMENT. THE BAIL IS INTENDED FOR USE IN LIFTING THE PUMP ASSEMBLY ONLY. SUCTION AND DISCHARGE HOSES AND PIPING MUST BE REMOVED FROM THE PUMP BEFORE LIFTING.**

### Pump Disassembly

#### (Figure 1)

To service the impeller, wear ring or seal assembly, disconnect the discharge piping. Remove the hardware (6, 7 and 8) securing the pump casing to the base.

#### (Figure 2)

Before attempting to service the pump, remove the pump casing drain plug (21) and drain the pump. Clean and reinstall the drain plug.

Support the pump casing using a suitable hoist and sling. Remove the nuts (19) and separate the pump casing (1) and casing gasket set (9) from the intermediate (10). Tie and tag the gaskets, or measure and record their thickness for ease of reassembly. Tie and tag the any leveling shims used under the casing mounting feet to ease reassembly.

Clean the mating surfaces of the intermediate and pump casing. Inspect the wear ring (20) for excessive wear or scoring. The wear ring is secured in the pump casing by a press fit, and if replacement is required, use a suitable puller to remove it.

### Impeller Removal

#### (Figure 2)

To loosen the impeller (2), tap the vanes of the impeller in a counterclockwise direction (when facing the impeller) with a block of wood or a soft-faced mallet. **Be careful** not to damage the impeller vane. Use caution when removing the impeller; tension on the seal spring will be released as the impeller is unscrewed.

Slide the impeller adjusting shims (13) off the engine crankshaft (16). Tie and tag the shims or measure and record their thickness for ease of reassembly.

### Seal Removal and Disassembly

(Figure 2 and 3)

Carefully remove the spring centering washer (14) and spring. Remove the shaft spacer sleeve (15), retainer, bellows, and rotating element as a unit. Apply oil to the sleeve and work it up under the bellows. Slide the rotating portion of the seal off the sleeve.

Remove the hardware (11 and 12) and slide the intermediate and stationary element off the engine crankshaft as a unit. Press the stationary seal element with O-ring out of the intermediate.

Inspect the balance ring (17) for excessive or damage. If replacement is required, use a suitable puller to remove it from the intermediate (10).

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

### Seal Reassembly and Installation

(Figures 2 and 3)

Inspect the engine crankshaft (17) for damage. Small scratches or nicks may be removed with a fine file. If excessive wear exists, the shaft will have to be replaced in the engine. (Refer to the engine service manual).

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



**MOST CLEANING SOLVENTS ARE TOXIC AND FLAMMABLE. USE THEM ONLY IN A WELL-VENTILATED AREA FREE FROM EXCESSIVE HEAT, SPARKS, AND FLAME. READ AND FOLLOW ALL PRECAUTIONS PRINTED ON SOLVENT CONTAINERS.**

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

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

Inspect the seal components for wear, scoring, grooves, and other damage that might cause leakage. If any components are worn, replace the complete seal; **never mix old and new seal parts**.

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

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

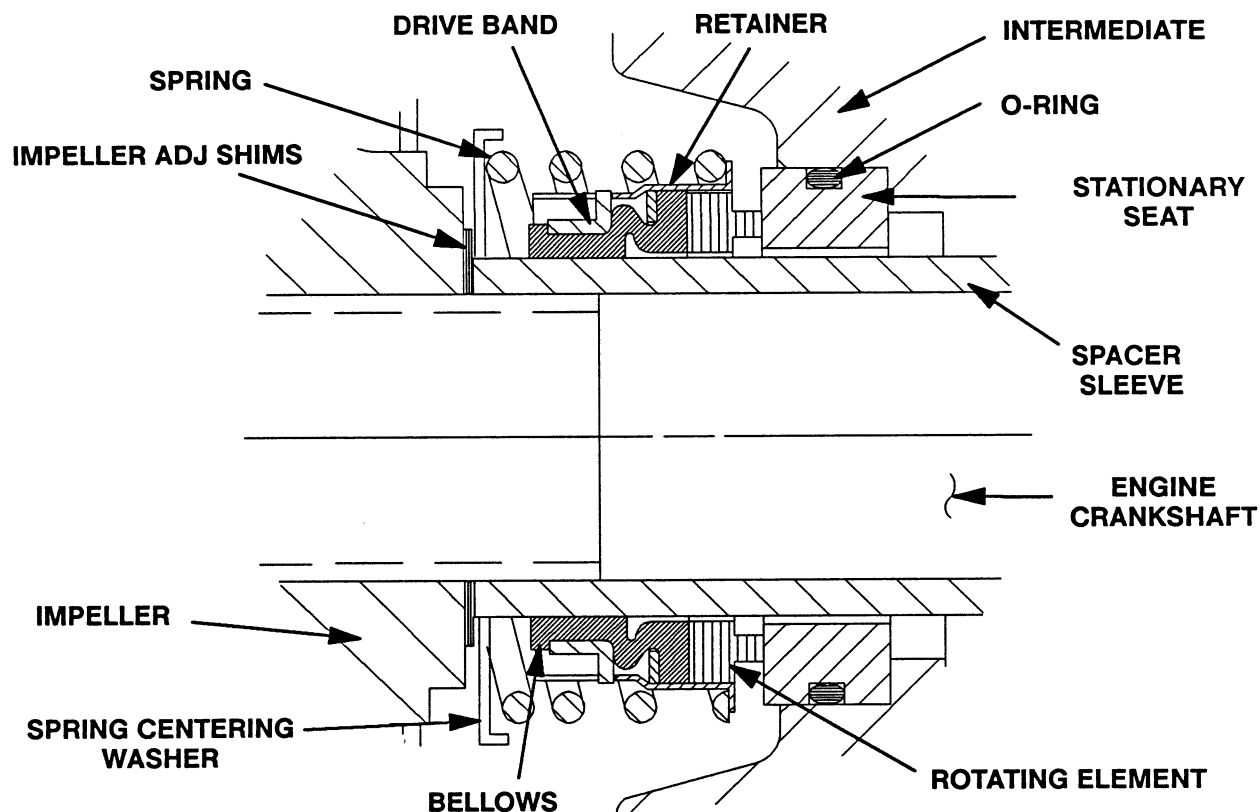
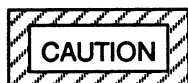
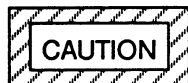


Figure 3. 25271-192 Seal Assembly



THIS SEAL IS NOT DESIGNED FOR OPERATION AT TEMPERATURES ABOVE 160°F (71°C). DO NOT USE AT HIGHER OPERATING TEMPERATURES.

Lay the intermediate (10) on a flat surface with the impeller side facing up. If the balance ring (17) was removed, press the replacement ring into the intermediate until it seats squarely against the bore shoulder.



THE BALANCE RING MUST SEAT SQUARELY IN THE INTERMEDIATE BORE OR BINDING AND/OR EXCESSIVE WEAR WILL RESULT.

Subassemble the O-ring onto the stationary element and use even pressure to press this subassembly into the intermediate until it seats squarely against the shoulder bore. Position the shaft spacer sleeve

(15) through the I.D. of the stationary element with the chamfered end down.

Subassemble the rotating element into the retainer and bellows and slide this subassembly over the spacer sleeve until the polished faces contact.

Carefully slide the assembled intermediate, sleeve and seal over the shaft. Secure the intermediate to the engine with the hardware (11 and 12). Install the seal spring and the spring centering washer (14). Make sure that all components of the seal are seated squarely.

### Impeller Installation And Adjustment

(Figure 2 and 4)

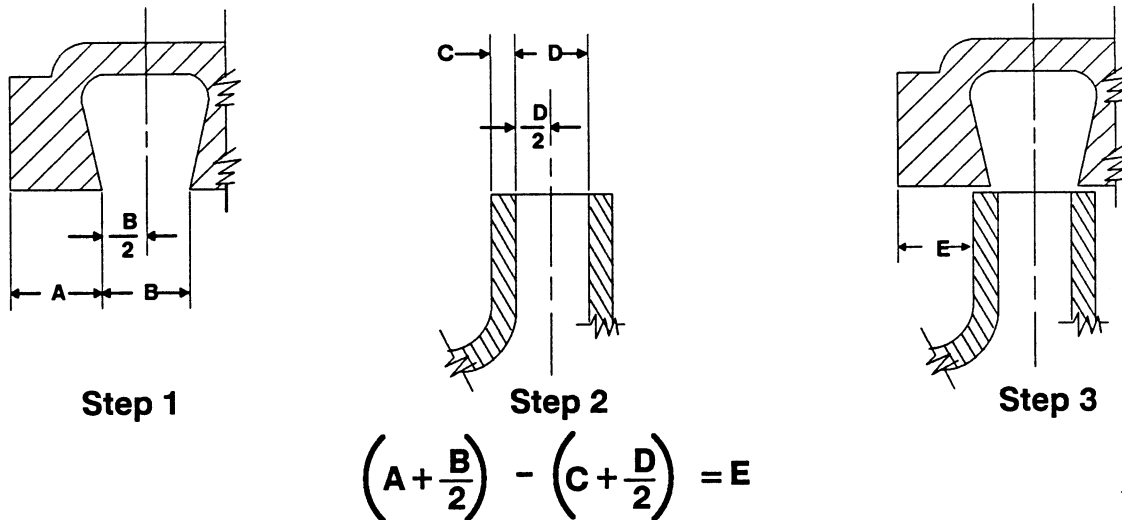
Inspect the impeller, and replace it if cracked or badly worn. Install the same thickness of impeller shims (13) as previously removed, and screw the impeller onto the shaft until tight.

For maximum pump efficiency, the impeller should be centered within the volute scroll. To verify the impeller positioning, measure the pump casing and

impeller as shown in Figure 4. Use these measurements to calculate the required impeller location (dimension E). Add or remove impeller adjusting shims and pump casing gaskets (9) until dimension E is obtained.

**NOTE**

When calculating pump casing positioning, figure 30% compression for pump casing gaskets.



**Figure 4. Centering Impeller Within Pump Casing**

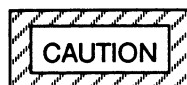
**NOTE**

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

**Pump Reassembly**

(Figure 2)

If the wear ring (20) was removed for replacement, press the replacement ring into the pump casing until it seats squarely against the shoulder bore.



**THE WEAR RING MUST SEAT SQUARELY IN THE CASING BORE OR BINDING AND/OR EXCESSIVE WEAR WILL RESULT.**

Install the same thickness of pump casing gaskets (9) as previously removed and secure the pump casing to the intermediate with the nuts (19).

Install any leveling shims under the casing mounting feet and secure the casing to the base with the hardware (6, 7 and 8, Figure 1)

**Final Pump Assembly**

(Figure 1)

**Be sure** the pump and engine are securely mounted to the base.

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

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

Fill the pump casing with clean liquid. Reinstall the fill plug (7) and tighten it.

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

**LUBRICATION**

**Seal Assembly**

The seal assembly is lubricated by the medium being pumped and no additional lubrication is required.

**Engine**

Consult the literature supplied with the engine, or contact your local Kohler engine representative.

**For U.S. and International Warranty Information,  
Please Visit [www.grpumps.com/warranty](http://www.grpumps.com/warranty)  
or call:  
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519-631-2870**