

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



D SERIES PUMP

MODEL
3D-13

THE GORMAN-RUPP COMPANY • MANSFIELD, OHIO

www.grpumps.com

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Register your new
Gorman-Rupp pump online at
www.grpumps.com/register.

Valid serial number and e-mail address required.



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

RECORD YOUR PUMP MODEL AND SERIAL NUMBER

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

Pump Model: _____

Serial Number: _____

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INTRODUCTION

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

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

This is a D Series positive displacement pump, utilizing a single-action diaphragm to produce a straight-through flow of liquid. The pump is close-coupled to a 3.5 HP Briggs and Stratton gasoline engine. It is ideally suited to industrial and contractor's applications since it will handle liquids ranging from clear water to construction-site muck. The basic material of construction for wetted parts is aluminum, with neoprene flap valves and a **Dura-Blue 1000™** diaphragm.

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

The Gorman-Rupp Company
P.O. Box 1217
Mansfield, Ohio 44901-1217
Phone: (419) 755-1011

or:

Gorman-Rupp of Canada Limited
70 Burwell Road
St. Thomas, Ontario N5P 3R7
Phone: (519) 631-2870

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



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



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



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

NOTE

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

SAFETY - SECTION A

This information applies to D Series engine driven diaphragm 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. Disconnect the spark plug wire to ensure that the pump will remain inoperative.
3. Close the discharge valve (if used).
4. Drain the pump.



This pump is designed to handle 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.



After the pump has been installed, block the wheels and secure the pump to prevent creeping. Make certain that the pump and all piping or hose connections are tight, properly supported and secure before operation.



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



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 2600 RPM.



The gearbox provided on this pump is designed for operation at 2600 RPM maximum synchronous input speed. If operated at a higher rpm, pump components may be destroyed.



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.



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.



Never install a positive shut-off valve in the discharge line; discharge restrictions will cause excessive friction loss resulting in overloading and destruction of pump and drive components. It is strongly recommended that unless absolutely necessary, no positive shut-off valve be installed in the suction line; excessive restriction will cause incomplete filling of the diaphragm chamber and result in shortened diaphragm life.

INSTALLATION – SECTION B

Review all SAFETY information in Section A.

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

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

Pump Dimensions

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

OUTLINE DRAWING

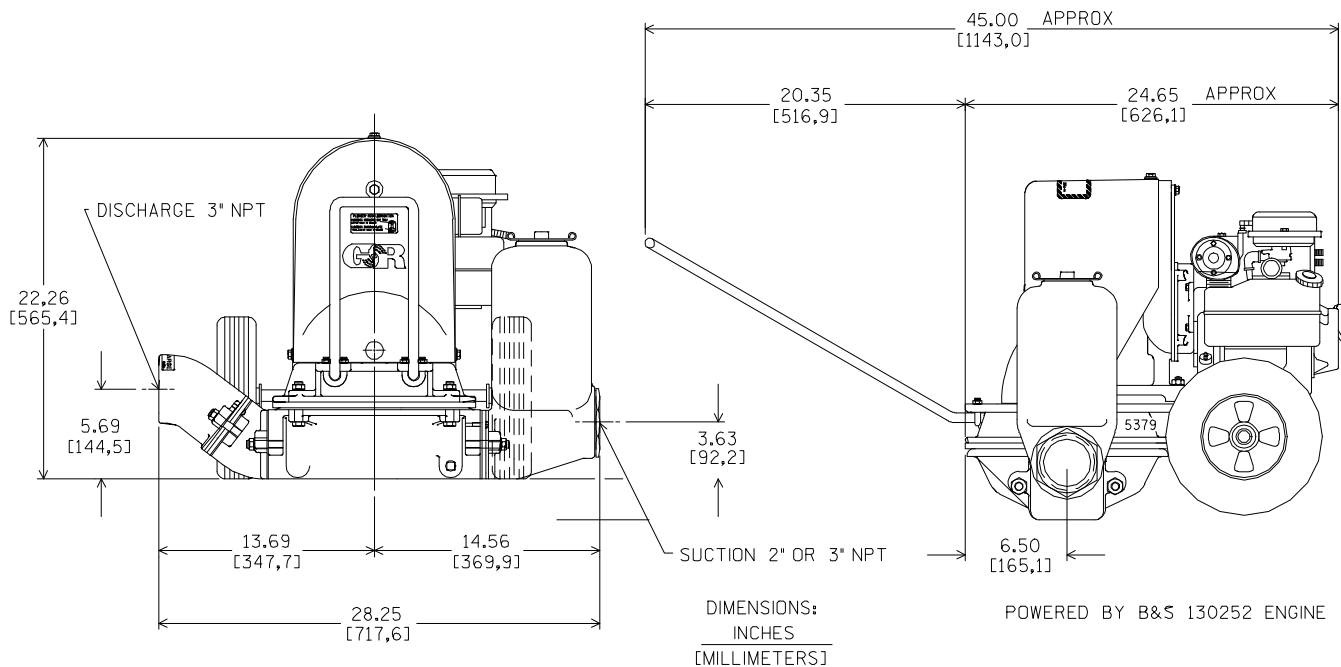


Figure 1. Pump Model 3D-13

PREINSTALLATION INSPECTION

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

- a. Inspect the pump for cracks, dents, damaged threads, and other obvious damage.
- b. Check for and tighten loose attaching hardware. Since gaskets tend to shrink after drying, check for loose hardware at mating surfaces.

- c. Carefully read all tags, decals, and markings on the pump assembly, and perform all duties indicated.
- d. Check levels and lubricate as necessary. Refer to **LUBRICATION** in the **MAINTENANCE AND REPAIR** section of this manual and perform duties as instructed.
- e. If the pump and engine have been stored for more than 12 months, some of the components or lubricants may have exceeded their maximum shelf life. These **must be inspected**

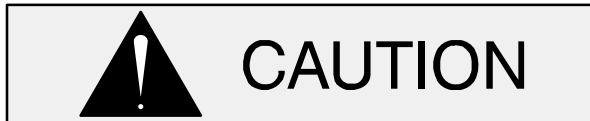
or replaced to ensure maximum pump service.

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

POSITIONING PUMP

Lifting

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



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.

After the pump has been positioned, block the wheels and secure the pump to prevent creeping.

SUCTION AND DISCHARGE PIPING

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

Materials

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

Line Configuration

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

Never pull a line into place by tightening connections at the pump. Lines near the pump must be independently supported to avoid strain on the pump which could cause excessive vibration and increased diaphragm and gear train wear. If hose-type lines are used, they should have adequate support to secure them when filled with liquid and under pressure.

Fixed, Rigid Piping

This pump is equipped with an integral suction accumulator chamber which promotes an efficient flow of liquid and acts as an air cushion against shock. Since the air in this chamber will leak away during pump operation, the air must be replenished periodically. To introduce air into the chamber, stop the pump and remove the suction accumulator plug and integral gasket; this will break prime and allow the liquid in the chamber to drain away through the suction line.

If the pump is mounted in a system with fixed, rigid piping, it is recommended that a flexible connec-

tion be installed at or near the suction and discharge ports to absorb shock which would otherwise be transmitted through the drive train and greatly accelerate pump wear.

In a fixed piping installation, properly sized surge

suppressors **must** be installed in both suction and discharge lines. If commercial surge suppressors are not readily available, air chambers may be fabricated from pipe as shown in Figure 2.

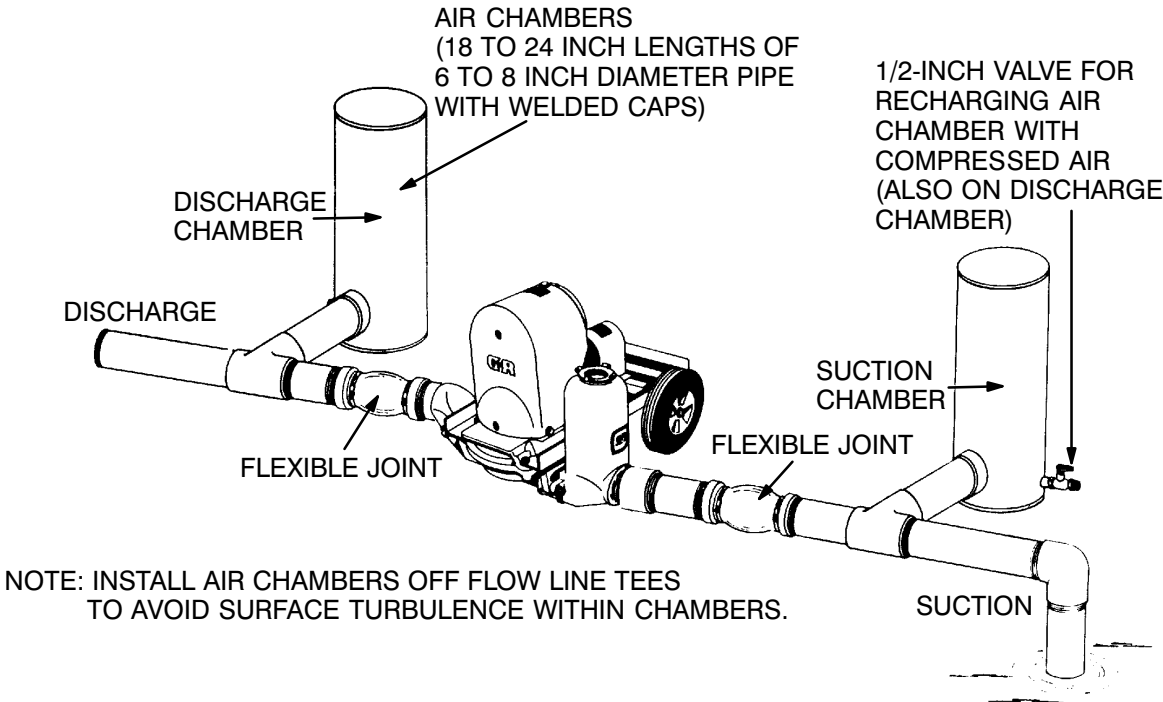


Figure 2. Fixed Piping Installation

Note that the air chambers have not been installed directly in the flow line, but have been installed off tees to avoid turbulence within the chambers. The air chambers are fitted with valves to permit introduction of small amounts of compressed air to further dampen shock; this compressed air will leak away during operation, and should be replaced from time to time. If the suction chamber floods, open the suction chamber valve to break prime and allow the liquid in chamber to drain through the suction line.

Gauges

If discharge pressure and vacuum suction gauges are desired, 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.

NOTE

Maximum pump performance is realized at suction lifts of 5 feet (1,5 m) or less. Use the shortest possible length of suction hose or piping; lengths of 25 feet (7,6 m) or longer will reduce the capacity of the pump.

It is strongly recommended that no positive shut-off valve be installed in the suction line; excessive restrictions will cause incomplete filling of the dia-

phragm chamber and result in short diaphragm life.

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. The suction line should not be restricted more than 1 inch below the nominal suction size.

The use of pipe couplings in the suction line is not recommended.

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.

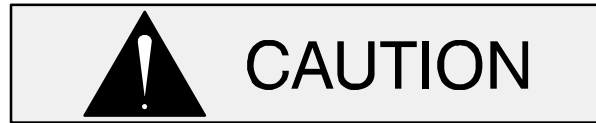
If a strainer is not furnished with the pump, but is installed by the pump user, make certain that the total area of the openings in the strainer is at least three or four times the cross section of the suction line, and that the openings will not permit passage of solids larger than the solids handling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

This pump is designed to handle up to 2-1/4 inch (57,2 mm) diameter spherical solids.

Sealing

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

DISCHARGE LINES



The discharge line must be the same size as, or larger than, the suction line. Never install or operate the pump with a discharge line smaller than the suction; a restricted discharge line will cause excessive friction loss resulting in overloading and destruction of pump and drive components.

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

The pump is provided with integral suction and discharge check valves.



Never install a positive shut-off valve in the discharge line; discharge restrictions will cause excessive friction loss resulting in overloading and destruction of pump and drive components. It is strongly recommended that unless absolutely necessary, no positive shut-off valve be installed in the suction line; excessive restriction will cause incomplete filling of the diaphragm chamber and result in shortened diaphragm life.

OPERATION – SECTION C

Review all SAFETY information in Section A.

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



This pump is designed to handle 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.

Pump application will affect its performance, especially discharge velocities. Consult the Gorman-Rupp factory for actual performance levels for the pump.

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



Make certain that any positive shut-off valve installed in the suction line is open before operating the pump; excessive restriction will cause incomplete filling of the diaphragm chamber and result in shortened diaphragm life. No positive shut-off valve should be installed in the discharge line.

STARTING

Consult the operations manual furnished with the engine. Open any valves installed in the suction line and start the pump.

OPERATION



The pump is designed to operate at approximately 60 cycles per minute through a gearbox with a 43.36:1 ratio at a maximum input speed of 2600 RPM. Make certain that input speed does not exceed this RPM. Operation at higher RPM can cause pump components to be damaged or destroyed.

Priming

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 the engine and check the suction line for leaks.

OPERATION CHECKS

Gearbox Check

Check that the gearbox is properly lubricated (see **LUBRICATION** in **MAINTENANCE AND REPAIR**).

Leakage Check

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

Strainer Check

If a suction strainer has been installed, check and clean it as necessary. It should be cleaned if pump flow begins to drop. If a vacuum suction gauge has been installed, monitor and record the readings regularly to detect strainer blockage.

Accumulator Chamber Check

Check periodically to ensure that there is sufficient air in the integral suction accumulator chamber. Replenish as required (see **Fixed, Rigid Piping** in Section B for details).

STOPPING

After stopping the pump, disconnect the engine spark plug wire to ensure that the pump will remain inoperative.

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, flush it with clean water.

Cold Weather Preservation



The primary construction materials of this pump are aluminum, with neoprene flap valves and a **DuraBlue 1000™** diaphragm. Do not attempt to clean or flush this pump with any liquid which would attack pump fittings or components. Avoid cleaning with cleaning solvent.

In below freezing conditions, drain the water from the pump and the lines when the pump is not in operation. Also, clean out any 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.

TROUBLESHOOTING – SECTION D

Review all SAFETY information in Section A.



Before attempting to open or service the pump:

- 1. Familiarize yourself with this manual.**
- 2. Disconnect the engine spark plug wire ensure that the pump will remain inoperative.**
- 3. Close the discharge valve (if used).**
- 4. Drain the pump.**

TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
PUMP FAILS TO PRIME	Air leak in suction line. Lining of suction hose collapsed. Integral suction or discharge check valve clogged, binding, or not seating properly. Cracked or broken diaphragm. Diaphragm not securely in place. Strainer clogged. Air leak in suction line.	Correct leak. Replace suction hose. Clean valves, check that flange nuts are tight. Replace diaphragm. Secure diaphragm. Check strainer and clean if necessary Correct leak.
PUMP STOPS OR FAILS TO DELIVER RATED FLOW OR PRESSURE	Suction intake not properly submerged Lining of suction hose collapsed. Cracked or broken diaphragm. Diaphragm not securely in place. Strainer clogged. Integral suction or discharge check valve clogged, binding, or not seating properly.	Check installation. Replace suction hose. Replace diaphragm. Secure diaphragm. Check strainer and clean if necessary Clean valves, check that flange nuts are tight.

TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
PUMP REQUIRES TOO MUCH POWER	Liquid solution too thick. Pump speed too high. Integral discharge check valve clogged or binding. Bearings in engine or gearbox worn or binding.	Dilute if possible. Check engine output. Clean valve. Check bearings.
PUMP CLOGS FREQUENTLY	Integral suction or discharge check valve clogged, binding, or not seating properly. Liquid solution too thick.	Clean valves, check that flange nuts are tight. Dilute if possible.
EXCESSIVE NOISE	Pump, gearbox, or engine not securely mounted. Gearbox or engine not properly lubricated.	Check and tighten mounting bolts. See LUBRICATION in MAINTENANCE AND REPAIR .
BEARINGS RUN TOO HOT	Bearing temperature is high, but within limits. Low or incorrect lubricant. Drive misaligned.	Check bearing temperature regularly to monitor any increase. Check for proper type and level of lubricant. Align drive properly.

PUMP MAINTENANCE AND REPAIR - SECTION E

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

IN GALLONS PER MINUTE AT 60 STROKES PER MINUTE				
STATIC LIFT IN FEET	STATIC DISCHARGE HEAD IN FEET			
	5	10	15	20
5	78	67	66	68
10	73	64	66	62
15	68	60	64	59
20	64	59	65	59
25	56	56	60	56

IN LITERS PER MINUTE AT 60 STROKES PER MINUTE				
STATIC LIFT IN METERS	STATIC DISCHARGE HEAD IN METERS			
	1,5	3,0	4,6	6,1
1,5	295,2	253,6	249,8	257,4
3,0	276,3	242,2	249,8	234,7
4,6	257,4	227,1	242,2	223,3
6,1	242,2	223,3	246,0	223,3
7,6	212,0	212,0	227,1	212,0

* STANDARD PERFORMANCE TEST DATA FOR PUMP MODEL 3D-13

* Based on 70° F (21° C) clear water at sea level with minimum suction lift, using 2 inch (5,08 cm) suction hose and 3 inch (7,62 cm) non-collapsible discharge hose. Since pump installations are seldom identical, your performance may be difference due to such factors as viscosity, specific gravity, elevation, and temperature.

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.

SECTION DRAWING

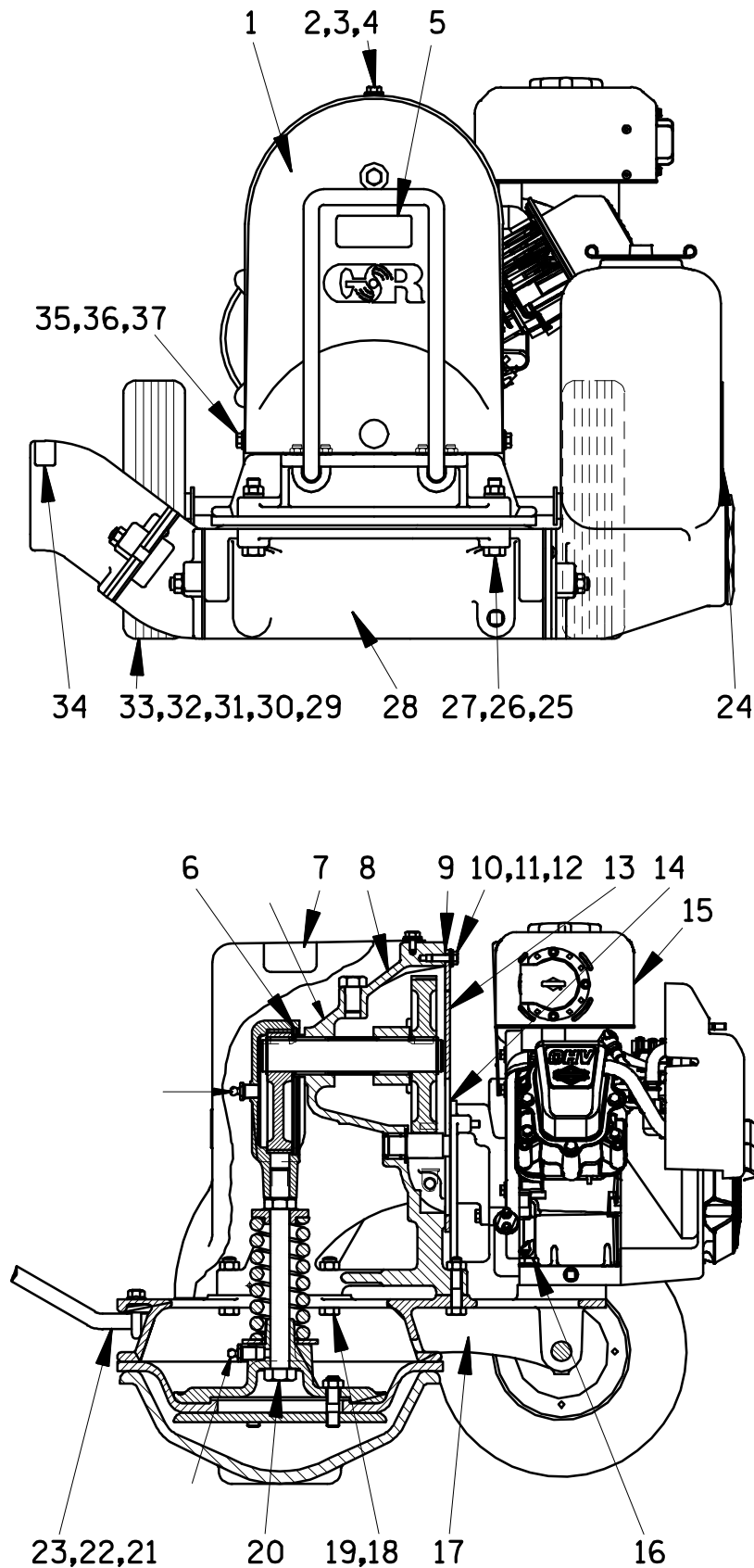


Figure 1. Pump Model 3D-13

PARTS LIST
Pump Model 3D-13
 (From S/N 883285 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	ECCENTRIC GUARD	38861-501	23200	1	24	SUCTION DECAL	6588AG	----	1
2	NYLOCK CAPSCREW	BT0403	15991	1	25	FLAT WASHER	K08	15991	4
3	WASHER	S157	----	1	26	HEX NUT	D08	15991	4
4	FLAT WASHER	K04	15991	1	27	HEX HD CAPSCREW	B0811	15991	4
5	LUBRICATION DECAL	38817-066	----	1	28	DIAPHRAGM POT ASSY	46475-701	----	1
6	SNAP RING	5385	----	1	29	HAIRCLIP PIN	21183-010	----	2
7	GUARD WARNING DECAL	38816-063	----	1	30	SQ HD SETSCREW	G0604	15990	2
8	GEARBOX ASSY	44161-007	----	1	31	SPACER WASHER	5382	15990	4
9 *	HOUSING GSKT	5367G	20050	1	32	AXLE	5645	15990	1
10	HEX HD CAPSCREW	B0403	15991	7	33	PNEUMATIC TIRE	S752	----	2
11	LOCKWASHER	J04	15991	9	34	DISCHARGE DECAL	6588BJ	----	1
12	HEX HD CAPSCREW	B0407	15991	2	35	HEX HD CAPSCREW	B0402-1/2	15991	2
13	COVER PLATE	5396	15990	1	36	T-TYPE LOCKWASHER	AK04	15991	2
14 *	GASKET	S825	----	1	37	FLAT WASHER	K04	15991	2
15	B & S ENGINE	44311-018	----	1	NOT SHOWN:				
16	FLANGED CAPSCREW	21634-510	----	2		STRAINER	9026D	24001	1
17	DIAPHRAGM RING	5379	13010	1		NAME PLATE	2613BP	13990	1
18	HEX HD CAPSCREW	B0608	15990	5		DRIVE SCREW	BM#04-03	17000	4
19	HEX NUT W/FLANGE	21765-314	----	5		WARNING DECAL	2613FE	----	1
20	PLUNGER ROD ASSY	5685	----	1		TRADEMARK DECAL	38812-049	----	1
21	DRAW BAR	5438	15990	1	OPTIONAL:				
22	U-BOLT	5495	15991	2		STATIONARY BASE	8105	24000	1
23	HEX NUT W/FLANGE	21765-314	----	2					

* INDICATES PARTS RECOMMENDED FOR STOCK

SECTION DRAWING

NOTE:
FLAP VALVE ASSEMBLY;
SHOWN IN POSITION ON DISCHARGE SIDE
SUCTION SIDE TO OPEN IN SAME DIRECTION.

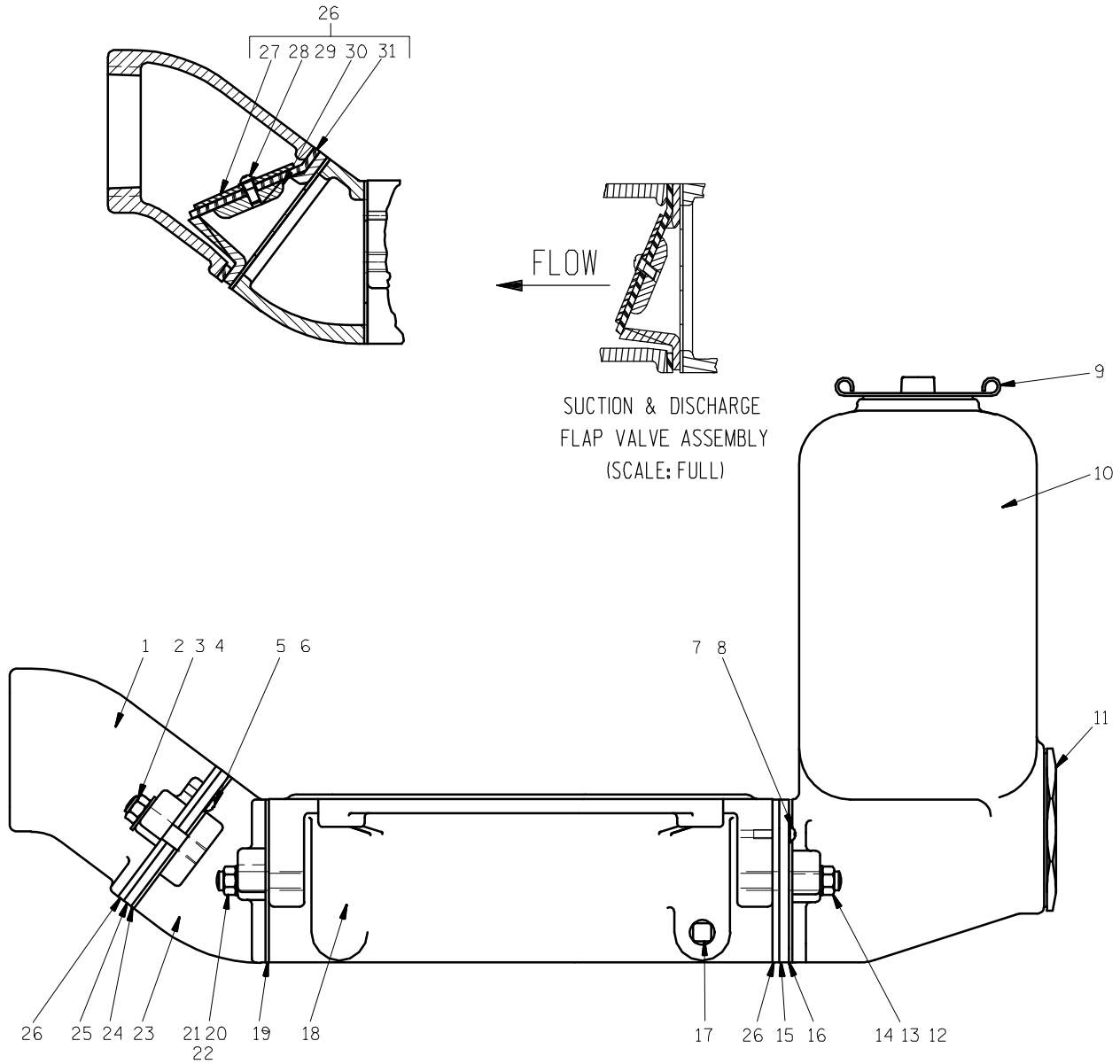


Figure 2. 46475-701 Diaphragm Pot Assembly

PARTS LIST
46475-701 Diaphragm Pot Assembly

ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY
1	DISCHARGE FLANGE	5658	13040	1
2	STUD	C0810	15991	2
3	HEX NUT	D08	15991	2
4	FLAT WASHER	KE08	15991	2
5	RD HD MACHINE SCREW	X0404	15991	2
6	LOCKWASHER	J04	15991	2
7	RD HD MACHINE SCREW	X0404	15990	2
8	LOCKWASHER	J04	15991	2
9	SUCT ACCUMULATOR PLUG AND GASKET	S591A	---	1
10	SUCTION ACCUMULATOR	5376	13010	1
11	REDUCER PIPE BUSHING	AP4832	11999	1
12	STUD	C0810	15991	2
13	FLAT WASHER	K07	15991	2
14	HEX NUT	D08	15991	2
15	VALVE SEAT	5374	10010	1
16	* SUCTION ACCUMULATOR GASKET	5374G	19100	1
17	DIAPHRAGM POT DRAIN PLUG	P06	15079	1
18	DIAPHRAGM POT	5375	13010	1
19	* DISCH FLANGE GASKET	5374G	19100	1
20	STUD	C0809	15991	2
21	FLAT WASHER	K07	15991	2
22	HEX NUT	D08	15991	2
23	DISCHARGE FLANGE	5377	13040	1
24	* DISCH FLANGE GASKET	5374G	19100	1
25	VALVE SEAT	5374	10010	1
26	FLAP VALVE VLV ASSY	46413-013	---	2
27	-VALVE WEIGHT	5428	15990	1
28	-RD HD MACHINE SCREW	X0403	17000	2
29	-LOCKWASHER	J04	17000	2
30	-VALVE WEIGHT	5426	13010	1
31	* -FLAP VALVE	5427	19100	1

* INDICATES PARTS RECOMMENDED FOR STOCK

SECTION DRAWING

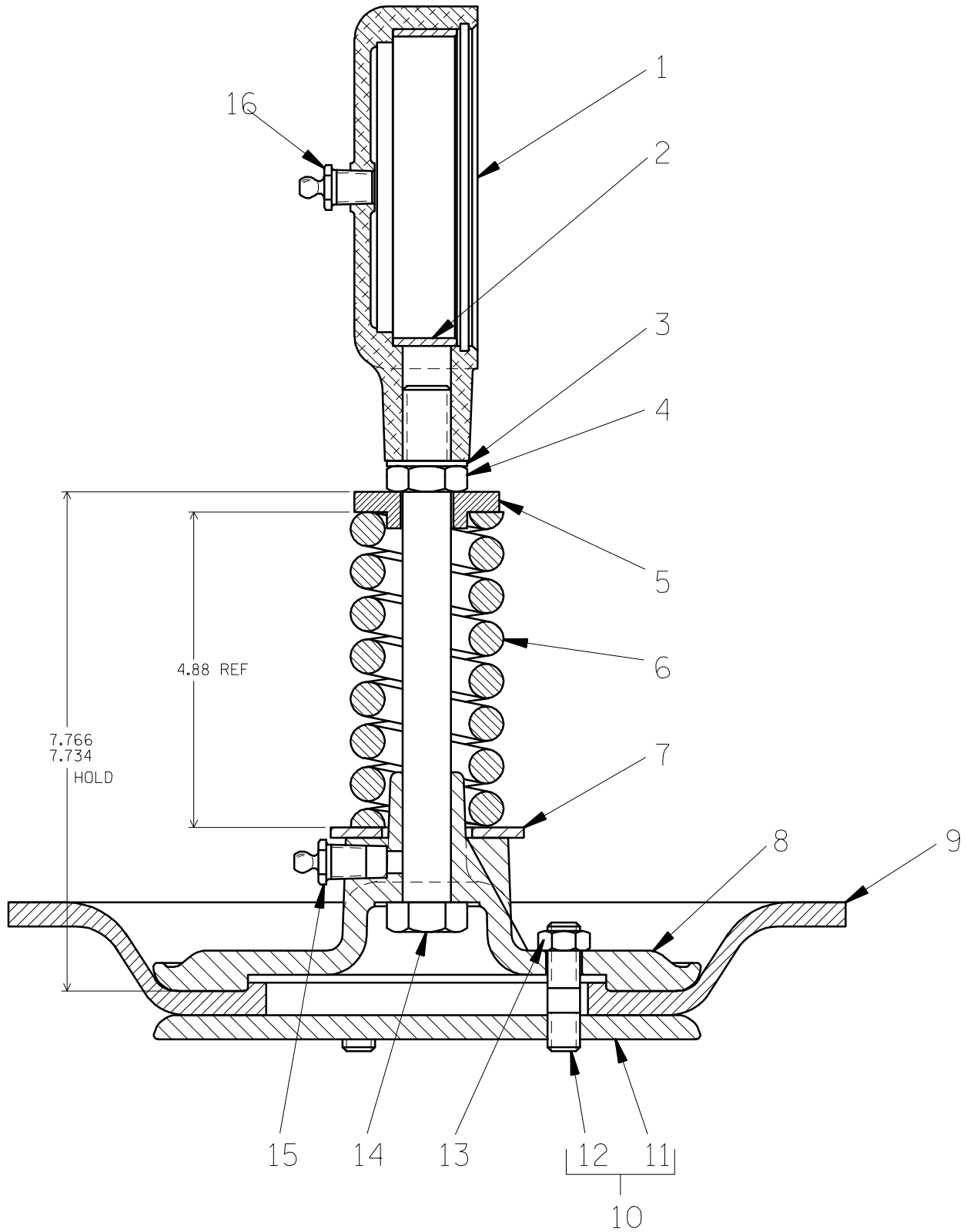


Figure 3. Standard 5685 And Optional 5685B Plunger Rod Assembly

PARTS LIST
5685 Standard Plunger Rod Assembly And
5685B Optional Plunger Rod Assembly

ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY
1	ECCENTRIC CAP	5373	13010	1
2	* ECCENTRIC BEARING	5610	14000	1
3	T-TYPE LOCKWASHER	AK12	15991	1
4	JAM NUT	AT12	15990	1
5	SPRING WASHER	5384	15991	1
6	* SPRING	5398	16081	1
7	FLAT WASHER	K20	15991	1
8	DIAPHRAGM PLATE	5381	10010	1
9	* STANDARD 'DURABLU 1000™' DIAPHRAGM	26844-041	----	1
	OPTIONAL 'BUNA-N' DIAPHRAGM	S1042	----	1
10	DIAPHRAGM PLATE ASSY	5394	----	1
11	-DIAPHRAGM PLATE	5394A	10030	1
12	-STUD	C0808	15991	3
13	HEX NUT	D08	15991	3
14	* PLUNGER ROD	21612-577	----	1
15	LUBRICATION FITTING	S191	----	1
16	LUBRICATION FITTING	S191	----	1
OPTIONAL:				
	OIL RESISTANT DIAPHRAGM	S701	----	1

* INDICATES PARTS RECOMMENDED FOR STOCK

NOTE: ALL PARTS IDENTICAL BETWEEN STANDARD AND
 OPTIONAL PLUNGER ROD ASSEMBLIES EXCEPT DIAPHRAGM

SECTION DRAWING

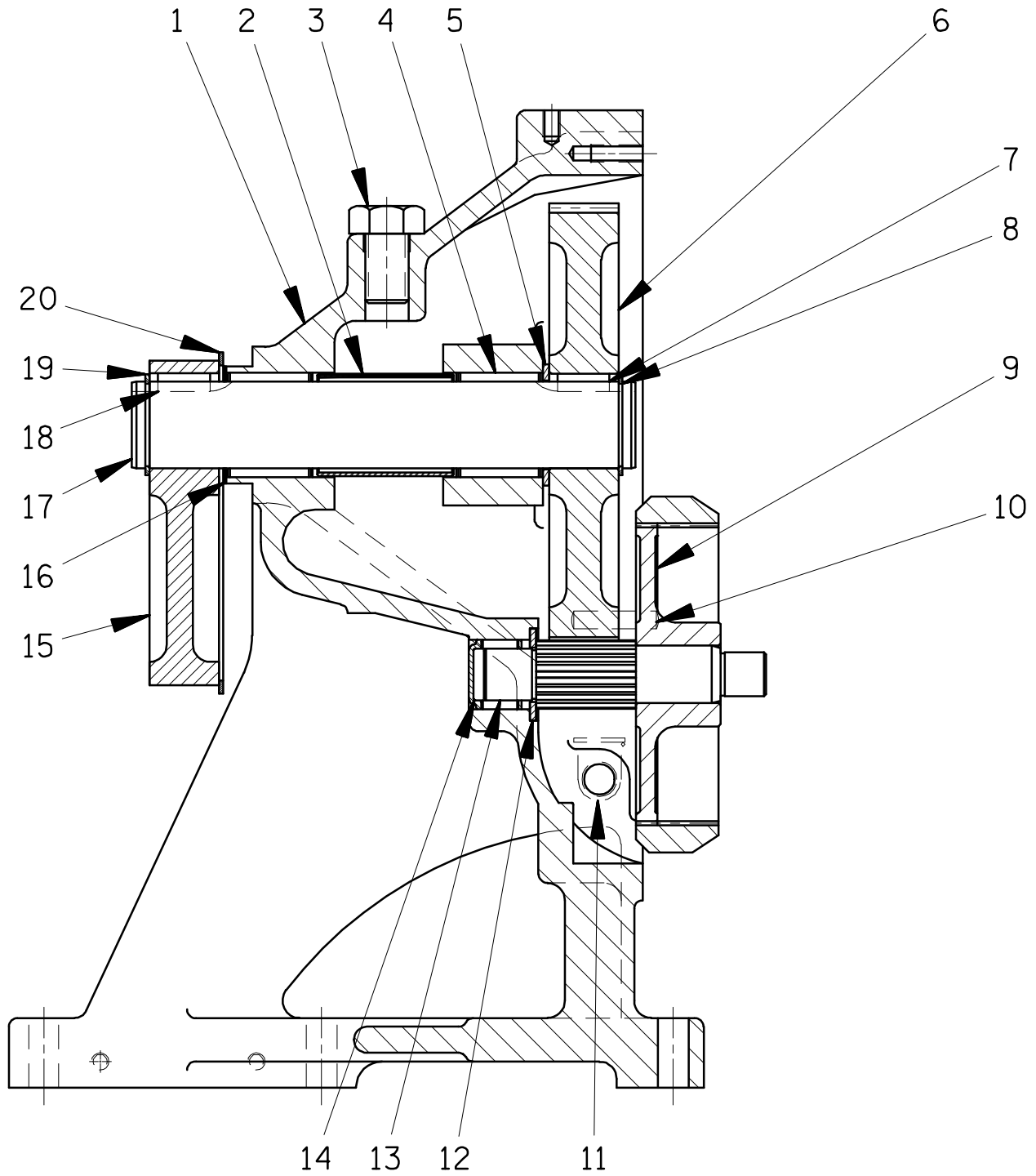


Figure 4. 44161-007 Gearbox Assembly

PARTS LIST
44161-007 Gearbox Assembly

ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY
1	GEAR HOUSING	5367	13010	1
2	SPACER SLEEVE	S952	---	1
3	HEX HD CAPSCREW	B1004	15991	1
4	* DRIVE SHAFT BEARING	S702	---	1
5	SPACER WASHER	5395	15990	1
6	DRIVE GEAR	5334	16060	1
7	* DRIVE SHAFT KEY	31811-040	15990	1
8	SNAP RING	S700	---	1
9	INTERNAL GEAR	S823	---	1
10	LOCATING PIN	AA0405	15990	2
11	OIL CUP	S617	---	1
12	SPACER WASHER	5382	15991	1
13	PINION SHAFT	5333	16020	1
14	* PINION SHAFT BEARING	S703	---	1
15	ECCENTRIC CAM	5378A	10080	1
16	ADJUSTING SHIM SET	13103A	15990	1
17	DRIVE SHAFT	5397	15020	1
18	* HARDENED DRIVE SHAFT KEY	31811-040	15990	1
19	SNAP RING	S700	---	1
20	WASHER	6531	18040	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, 3 and 4) and the accompanying parts lists.

Before attempting to service the pump, disconnect 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 engine representative.

Most service functions may be performed without separating the pump and gearbox from the engine. If major repair is required, the pump, gearbox and engine must be disconnected.



Before attempting to open or service the pump:

- 1. Familiarize yourself with this manual.**
- 2. Disconnect the engine spark plug wire to ensure that the pump will remain inoperative.**
- 3. Close the discharge valve (if used).**
- 4. Drain the pump.**

Before attempting to service the pump, drain the pump by removing the drain plug (18, Figure 2). Clean and reinstall the drain plug.

Suction And Discharge Check Valve Removal (Figure 2)

To service the suction and discharge check valves, remove the suction and discharge piping.

To service the suction check valve assembly (26), remove the suction accumulator (10) by loosening the hardware (13 and 14) securing it to the diaphragm pot (18). Remove the hardware (7 and 8) securing the valve seat (15) and check valve assembly to the diaphragm pot. Pull the check valve assembly from the suction port.

To service the discharge check valve assembly (26), loosen the hardware (3 and 4) and remove the assembled discharge flange (1), valve seat (25) and check valve assembly. Remove the gasket (24).

Remove the hardware (5 and 6) securing the valve seat and discharge check valve assembly to the discharge elbow.

To remove the discharge flange (23), loosen the hardware (21 and 22) securing the flange to the diaphragm pot. Remove the gasket (19).

The suction and discharge check valve assemblies are identical parts and operate in the same direction. For removal and/or replacement, remove the hardware (28 and 29) securing the check valve weights (27 and 30) to the check valve (31). Inspect and replace parts as required.

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

Diaphragm Removal

(Figure 1)

To remove the diaphragm (9, Figure 3), disengage the hardware (25, 26 and 27) and remove the diaphragm pot assembly (28). Inspect the diaphragm ring (17) for wear or damage. If replacement is required, the gearbox assembly (8) must be removed.

(Figure 3)

Remove the nuts (13). Separate the lower diaphragm plate assembly (10) from the diaphragm

(9) and the upper diaphragm plate (8). Inspect the diaphragm and replace a required.

If no further disassembly is required, see **Diaphragm Installation**.

Plunger Rod Removal And Disassembly

(Figure 1)

With the diaphragm pot assembly and diaphragm removed, disengage the hardware (2, 3, 4, 35, 36 and 37) and remove the eccentric guard (1).

Removing the snap ring (6) and slide the plunger rod assembly (20) off the eccentric cam drive shaft (17, Figure 4).

(Figure 3)

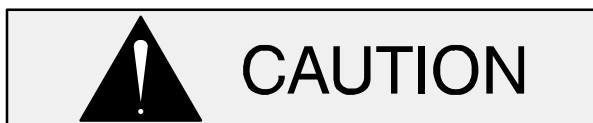
Use a socket wrench to hold the plunger rod (14) securely and unscrew the eccentric cap (1). Remove the T-type lockwasher (3), jam nut (4), spring washer (5) and spring (6). Remove the flat washer (7) and slide the plunger rod out of the upper diaphragm plate (8).

Inspect the eccentric bearing (2) for excessive wear. If replacement is necessary, use a suitable tool to cut the bearing and remove it from the eccentric cap. **Be careful** not to damage the eccentric cap.

Gearbox Removal And Disassembly

(Figure 1)

When properly operated and maintained, the gearbox assembly (8) should not require disassembly. Disassemble the gearbox **only** when there is evidence of wear or damage.



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

Support the diaphragm ring (17) with wooden blocks. Disengage the hardware (18 and 19) and remove the diaphragm ring. Inspect the dia-

phragm ring for wear or damage and replace as necessary. It is not necessary to remove the drawbar (21) from the diaphragm ring unless replacement is required. Disengage the hardware (23) from the U-bolts (22) to remove the drawbar.

Disengage the hardware (10, 11 and 12) securing the lower portion of the gearbox to the engine bellhousing. Remove the remaining hardware (10 and 11) securing the cover plate (13) to the gearbox assembly. Separate the gearbox from the cover plate and engine bellhousing by pulling straight away. Remove the housing gasket (9) and clean the mating surfaces.

It is not necessary to separate the cover plate from the engine bellhousing unless damage is apparent or the gasket (14) requires replacement. To remove the cover plate, disengage the two remaining capscrews (10 and 11). Remove the gasket and clean the mating surfaces. Replace the gasket as necessary.

(Figure 4)

Before attempting to disassemble the gearbox assembly, drain the lubricant by removing the oil cup (11) and turning the gearbox on its side. Clean and reinstall the oil cup.

Slide the internal gear and pinion shaft (9 and 13) out of the pinion bearing (14). Remove the spacer washer (12).

Inspect the pinion shaft and gear for wear or broken teeth. If replacement is required, use an arbor (or hydraulic) press to remove the shaft from the gear.

Use an arbor (or hydraulic) press, to remove the pinion bearing from the gear housing (1) .

NOTE

It is not necessary to remove the drive shaft (17), drive gear (6), shaft bearings (4) or eccentric cam (15) unless wear or damage is obvious. Inspect the parts, and if replacement is necessary, proceed as follows.

Remove the snap ring (19) from the drive shaft (17). Using a bearing puller, remove the eccentric cam (15) and key (18) from the drive shaft. Remove the washer (20) and eccentric cam shim set (16). Tie

and tag the shims or measure and record their thickness for ease of reassembly.

Slide the drive shaft and gear out of the gear housing. Slide the spacer washer (5) off the drive shaft.

Remove the snap ring (8). Use an arbor (or hydraulic) press to remove the gear (6) and key (7) from the shaft.

To remove the drive shaft bearings (4), the spacer sleeve (2) must be coiled into a smaller diameter to allow passage through the I.D. of the bearings.

NOTE

After the spacer sleeve is compressed, it will be permanently damaged and require replacement.

To remove the spacer sleeve, remove the capscrew (3) and use a pointed tool to rotate the perforated steel sleeve until the seam is visible through the tapped hole. Apply pressure on one side of the seam until one edge overlaps the other. Reach through the I.D. of the bearings and continue to coil the spacer sleeve until it can be removed. Reinstall the capscrew (3).

Use an arbor (or hydraulic) press and a suitably sized dowel to remove the bearings (4) from the gear housing.

Clean the bearing bores and all component parts (except bearings) with a soft cloth soaked in cleaning solvent. Inspect the parts for wear and replace as necessary.



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

Gearbox Reassembly And Installation

(Figure 4)

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

NOTE

*The needle bearings (4 and 14) should **not** be heated. These bearings are designed to be pressed into the gear housing, not onto their respective shafts (13 and 17).*

Clean the bearings thoroughly in **fresh** cleaning solvent, agitating to remove the old lubricant. Dry the bearings with filtered compressed air and coat with light oil.

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



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.

Install one of the bearings (4) in the bearing bore in the gear housing. Install a new spacer sleeve (2) through the open bearing bore, and then press the remaining bearing (4) into the bore until it is seated against the spacer sleeve. Make sure that the ends of the bearings do not protrude from the machined faces of the gearbox housing.

Install the snap ring (8) in the groove in the drive shaft. Install the gear key (7) in the keyway in the drive shaft (17). Align the slot in the drive gear (6) with the keyway and press the drive gear (6) onto the drive shaft until fully seated against the snap ring (8).

Install the spacer washer (5) on the drive shaft and slide the assembled drive shaft and gear through the bearings in the gear housing. Install the same

thickness of shims (16) as previously removed. Install the washer (20) and eccentric cam key (18). Align the slot in the eccentric cam (15) with the key and press the eccentric cam onto the shaft until fully seated against the washer (20). Secure with the snap ring (19).

Press the pinion bearing (14) into the gear housing until the closed end is flush with the outer face of the bore.

Press the internal gear (9) onto the pinion shaft until it seats squarely against the pinion shoulder. Position the spacer washer (12) in the gear housing and slide the pinion shaft (13) through the washer into the pinion bearing.

(Figure 1)

Install the gasket (14) and secure the cover plate (13) to the engine bellhousing with two of the capscrews and lockwashers (10 and 11).

Install the housing gasket (9). Position the gearbox assembly so the locating pins (10, Figure 4) align with the holes in the cover plate and secure with the remaining hardware (10 and 11). Secure the gearbox and cover plate to the engine bellhousing with the hardware (11 and 12).

NOTE

The two longer capscrews (12) must be installed in the two lower holes in the gear housing.

Secure the gearbox assembly (8) to the diaphragm ring (17) with the hardware (18 and 19).

Lubricate the gearbox as described in **LUBRICATION**.

Plunger Rod Reassembly And Installation

(Figure 3)

If the eccentric bearing (2) was removed, clean the bore of the eccentric cap (1) with a cloth soaked in cleaning solvent.



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

Use a suitably sized dowel and an arbor (or hydraulic) press to install the eccentric bearing (2) into the eccentric cap until fully seated.

Slide the plunger rod (14) through the upper diaphragm plate (8). Install the flat washer (7), spring (6), spring washer (5) and jam nut (4). Compress the spring to the dimension shown in Figure 3) by tightening the jam nut.

Install the T-type lockwasher (3). Apply 'Loctite No. 242 Threadlocker' or equivalent compound on the plunger rod threads and screw the eccentric cap on until tight.

NOTE

The lubrication fitting (15) in the diaphragm plate must face the same direction as the lubrication fitting (16) in the eccentric cap.

Lubricate the eccentric bearing (2) with a thin coating of No.2 lithium base grease.

Diaphragm Installation

(Figure 3)

Position the diaphragm (9) on the upper diaphragm plate, making sure the lip is properly seated. Slide the studs (12) in the lower diaphragm plate (11) through the holes in the upper plate and secure with the nuts (13).

(Figure 1)

Install the plunger rod assembly (20) onto the eccentric cam (15, Figure 4). Secure with the snap ring (6).

Install the eccentric guard (1) and secure with the hardware (2, 3, 4, 35, 36 and 37).

Lubricate the plunger rod assembly as described in **LUBRICATION**, Section E.

Secure the diaphragm pot assembly (28) to the diaphragm ring (18) with the hardware (26 and 27).

Suction And Discharge Check Valve Installation

(Figure 2)

Inspect the check valve components and replace as required. Subassemble the check valve weights (27 and 30) and check valves (31) with the hardware (28 and 29).

If the inboard discharge flange (23) was removed, clean the mating surfaces and install the gasket (19). Secure the flange to the diaphragm pot with the hardware (21 and 22).

Subassemble the valve seat (25) and discharge check valve (26) to the discharge elbow (1) with the weights positioned as shown in Figure 2. Secure with the hardware (3 and 4).

Clean the mating surfaces of the valve seat and discharge flange (23). Install the gasket (24) and secure the outboard discharge flange, check valve, and seat to the inboard discharge flange with the hardware (5 and 6).

Check the operation of the check valve to ensure proper seating and free movement.

Clean the mating surfaces of the valve seat (5) and suction accumulator (10). Position the suction check valve, valve seat (15) and gasket (16) against the diaphragm pot (19) with the weights positioned as shown in Figure 2. Secure with the hardware (7 and 8).

Check the operation of the check valve to ensure proper seating and free movement.

Secure the suction accumulator (10) to the diaphragm pot with the hardware (13 and 14).

Connect the suction and discharge piping as described in **INSTALLATION**, Section B.

Refer to **OPERATION**, Section C before starting the pump.

LUBRICATION

Plunger Rod Assembly

(Figure 3)



The eccentric bearing should be lubricated thoroughly after each 8 hours of operation. Failure to do so may cause the bearing to overheat and fail.

Before attempting to lubricate the plunger rod assembly, rotate the eccentric cam until the grease fittings (15 and 16) can be accessed through the holes in the eccentric guard (1, Figure 1).

Use a grease gun to apply No. 2 lithium base grease to the upper lubrication fitting until grease escapes from the eccentric cap. Lubricate the lower fitting until grease escapes from the top of the upper diaphragm plate inside the spring.

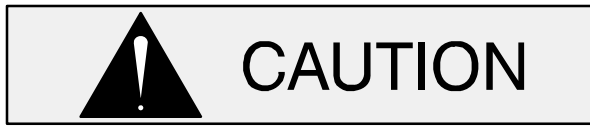
Gearbox

(Figure 4)

The gearbox was fully lubricated when shipped from the factory. Change the oil in a new gearbox at operating temperature after 100 hours of operation or four weeks which ever comes first. To drain the oil, remove the oil drain plug at the bottom of the gear housing cover and the vented plug at the top of the gear housing cover. Flush the case thoroughly with a light oil. Clean and reinstall the oil drain plug.

To fill the gearbox, remove the oil level plug in the side of the gear housing cover and add either SAE 20 or SAE 30 weight oil through the vented plug hole until it flows out the oil level hole. Clean and reinstall the vented plug and the oil level plug.

Under normal conditions, drain the gearbox every 500 hours of operation or every six months. Change the oil more frequently if the pump is operated under severe conditions, continuously or installed in an environment with rapid temperature change.



Monitor the condition of the bearing lubricant regularly for evidence of rust or moisture condensation. This is especially im-

portant in areas where variable hot and cold temperatures are common.

Engine

(Figure 1)

Refer to the engine manufacturer's recommendations or contact your local engine representative.

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

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