

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



**D SERIES PUMP**

MODEL
<b>2D-E.50 1P</b>

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

[www.grpumps.com](http://www.grpumps.com)

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

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**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 is a D Series, positive displacement pump, utilizing a single-action diaphragm to produce a straight-through flow of liquid. The pump is flex-coupled to a 1/2 HP electric motor. 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 diaphragm.

Because pump installations are seldom identical, this manual cannot possibly provide detailed instructions and precautions for every aspect of each specific application. Therefore, it is the responsibility of the owner/installer of the pump to ensure that applications not addressed in this manual are performed **only** after establishing that neither operator safety nor pump integrity are compromised by the installation. Pumps and related equipment **must** be installed and operated according to all national, local and industry standards.

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

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 electric motor driven diaphragm pumps. Refer to the manual accompanying the motor before attempting to begin operation.



Before attempting to open or service the pump:

1. Familiarize yourself with this manual.
2. Lock out and tag out incoming power to the motor to ensure that the pump will remain inoperative.
3. Allow the pump to completely cool if overheated.
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.



All electrical connections must be in accordance with the National Electric Code. If there is a conflict between instructions provided and N.E.C. specifications, N.E.C. specifications shall take precedence. All electrical equipment supplied with this pump was in conformance with N.E.C. requirements in effect on the date of manufacture. Failure to follow applicable specifications, or substitution of electrical parts not supplied or approved by the manufacturer, can result in severe injury or death.



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.



The electrical power used to operate this pump is high enough to cause injury or death. Obtain the services of a qualified electrician to make all electrical connections. Make certain the pump and motor are properly grounded; never use gas pipe as an electrical ground. Be sure that the incoming power matches the voltage and phase of the motor before making motor connections. Do not run the pump if the voltage is not within limits.



**Do not install and operate a non-explosion proof motor in an explosive atmosphere. Install, connect, and operate the motor in accordance with The National Electric Code and all local codes. If there is a conflict between the instructions in the manual accompanying the unit and The National Electric Code or the applicable local code, The National or local code shall take precedence.**



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

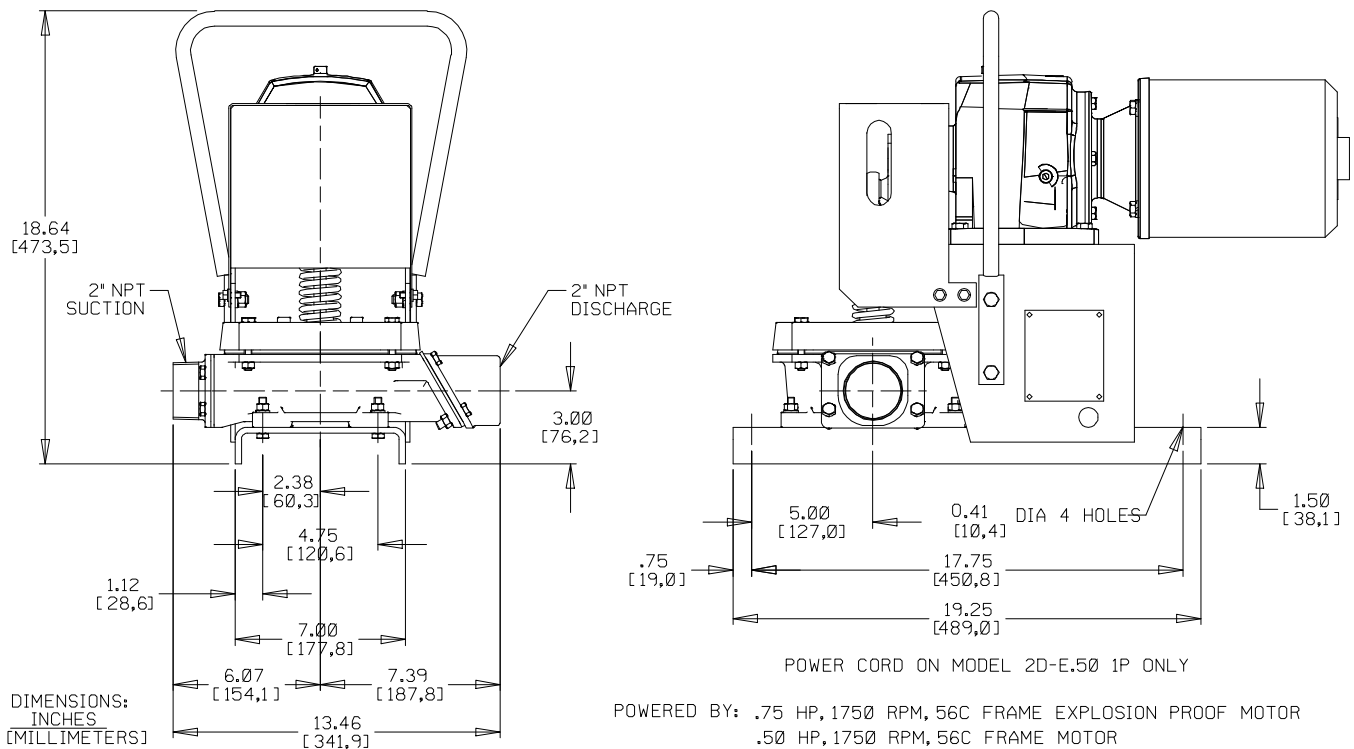


Figure 1. Pump Model 2D-E.50 1P

### 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. Remove the shipping plug from the top of the gear reducer and replace it with the vented plug shipped loose with the unit. Refer to **LUBRICATION** in the **MAINTENANCE AND REPAIR** section of this manual and perform duties as instructed.
- e. If the pump and motor have been stored for more than 12 months, some of the compo-



nents 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



**Do not install and operate a non-explosion proof motor in an explosive atmosphere.**

### 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

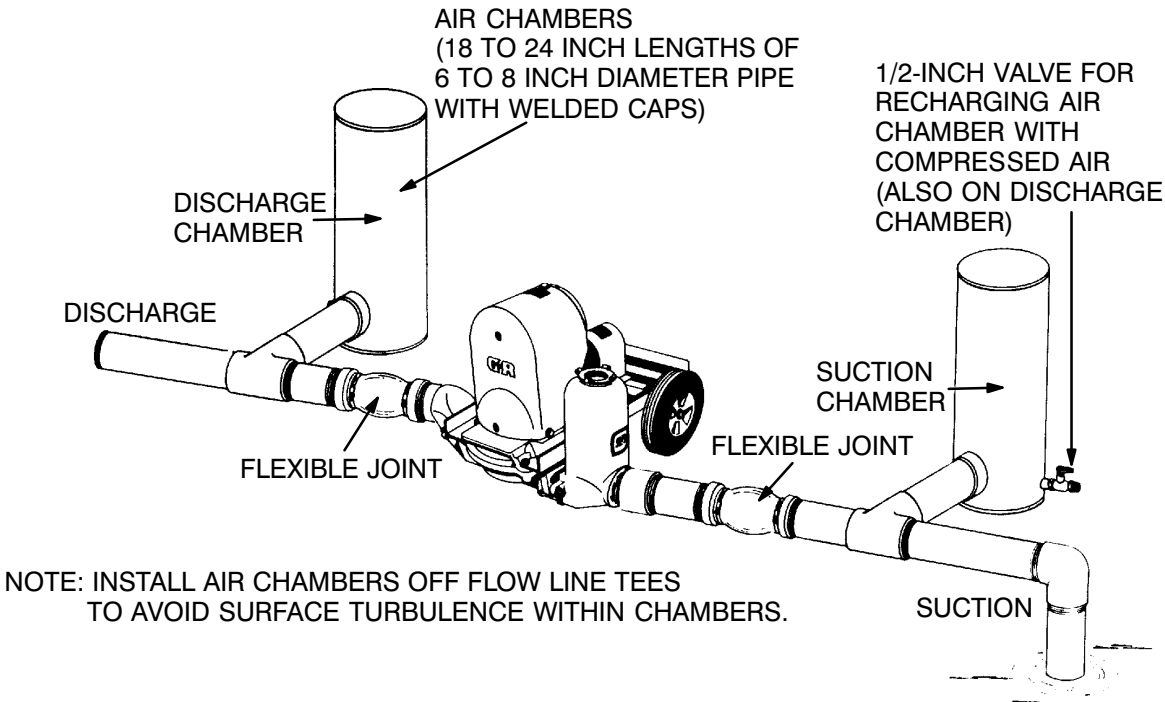
This pump is equipped with an integral suction accumulator chamber which promotes an efficient flow of liquid and acts as an air cushion against shock. Since the air in this chamber will leak away

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 connection be installed at or near the suction and dis-

charge 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 possi-*

ble 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 diaphragm 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 1-1/2 inch (38,1 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.

## 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.

## ELECTRICAL CONNECTIONS

Before connecting the motor to the incoming power, check that the electrical service available

matches the pump motor requirements stamped on the motor nameplate.



The electrical power used to operate this pump is high enough to cause injury or death. Obtain the services of a qualified electrician to make all electrical connections. Make certain the pump and motor are properly grounded; never use gas pipe as an electrical ground. Be sure that the incoming power matches the voltage and phase of the motor before making motor connections. Do not run the pump if the voltage is not within limits.



Do not install and operate a non-explosion proof motor in an explosive atmosphere. Install, connect, and operate the motor in accordance with The National Electric Code and all local codes. If there is a conflict between the instructions in the manual accompanying the unit and The National Electric Code or the applicable local code, The National or local code shall take precedence.

Refer to the following motor data before making electrical connections.

Motor Data

MODEL	VOLTAGE	PHASE	HP	Hz	RPM
2D-E.50 1P	115/230	1	.50	60	1750

## 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.**



**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.**

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 short-

ened diaphragm life. No positive shut-off valve should be installed in the discharge line.

### STARTING

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

### OPERATION

#### 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

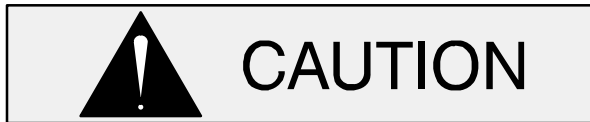
If a suction strainer has been installed, check and clean it as necessary. It should be cleaned if pump flow begins to drop. If a vacuum suction gauge has been installed, monitor and record the readings regularly to detect strainer blockage.

## STOPPING

After stopping the pump, lock out and tag out incoming power to the motor 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 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 op-

eration. 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. Lock out and tag out incoming power to ensure that the pump will remain inoperative.**
- 3. Allow the pump to completely cool if overheated.**
- 4. Drain the pump.**

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

TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
PUMP REQUIRES TOO MUCH POWER	Liquid solution too thick. Integral discharge check valve clogged or binding. Bearings in motor or gearbox worn or binding.	Dilute if possible. 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 motor not securely mounted. Gearbox or motor not properly lubricated.	Check and tighten mounting bolts. See <b>LUBRICATION</b> in <b>MAINTENANCE AND REPAIR</b> .
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				
	0	5	10	15	20
5	27	26	24	22	20
10	25	24	21	20	19
15	22	21	20	19	18
20	21	20	19	18	17

IN LITERS PER MINUTE AT 60 STROKES PER MINUTE					
STATIC LIFT IN METERS	STATIC DISCHARGE HEAD IN METERS				
	0	1,5	3,0	4,6	6,1
1,5	102,2	98,4	90,8	83,3	75,7
3,0	94,6	90,8	79,5	75,7	71,9
4,6	83,3	79,5	75,7	71,9	68,1
6,1	79,5	75,7	71,9	68,1	64,3

### \* STANDARD PERFORMANCE TEST DATA FOR 2D ELECTRIC MOTOR DRIVEN PUMP

\* Based on 70° F (21° C) clear water at sea level with minimum suction lift, using 2 inch (50 mm) suction hose and 2 inch (50 mm) non-collapsible discharge hose. Since pump installations are seldom identical, your performance may be difference due to such factors as specific gravity, eleva-

tion 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

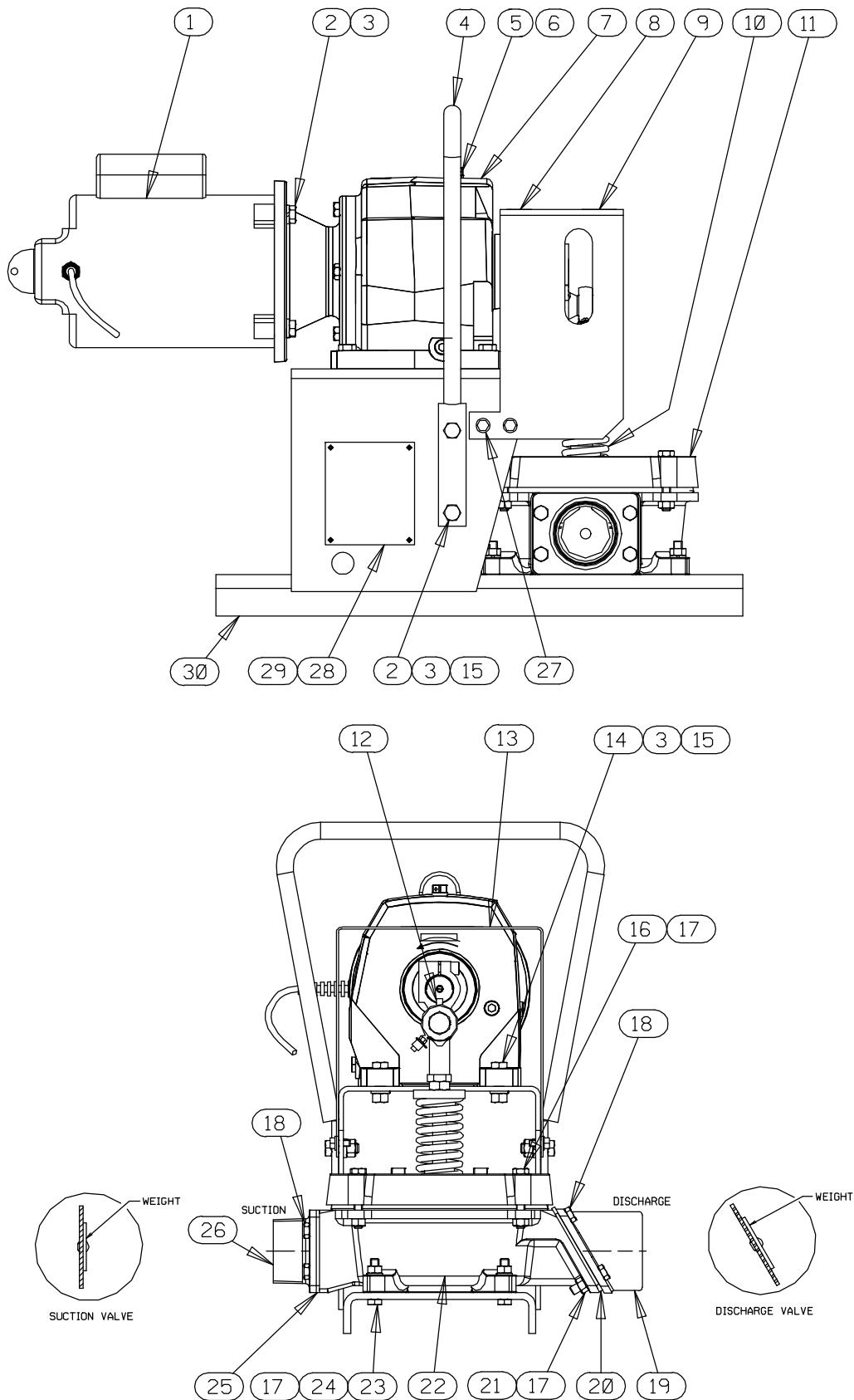


Figure 1. 2D-E.50 1P Pump Model

**PARTS LIST**  
**2D-E.50 1P Pump Model**  
 (From S/N 1485341 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	MOTOR .50 HP 1 PH	28211-050	---	1
2	HEX HEAD CAP SCREW	B0604	15991	8
3	LOCK WASHER	J06	15991	12
4	CARRYING HANDLE ASSY	44724-007	24150	1
5	VENTED PIPE PLUG	4823	15079	1
6	SHIPPING PLUG	11495	15079	1
7	GEAR HEAD REDUCER	24572-011	---	1
8	ROTATION DECAL	2613BM	---	1
9	PLUNGER ROD LUBRICATION DECAL	38816-085	---	1
10	PLUNGER ROD ASSEMBLY	46181-004	---	1
11	RETAINER RING	26812-702	---	1
12	KEY	N0403	15990	1
13	ECCENTRIC GUARD ASSY	42381-140	24150	1
14	HEX HEAD CAP SCREW	B0605	15991	4
15	HEX NUT	D06	15991	8
16	HEX HEAD CAP SCREW	B0508	15991	4
17	HEX NUT	D05	15991	10
18	HEX HEAD CAP SCREW	B0503	15991	6
19	DISCHARGE FLANGE	26812-707	---	1
20	* DISCH VALVE ASSY	26812-708	---	1
21	HEX HEAD CAP SCREW	B0505	15991	2
22	DIAPHRAGM POT	38234-006	10010	1
23	HEX HEAD CAP SCREW	B0506	15991	4
24	LOCK WASHER	J05	15991	4
25	* SUCT VALVE ASSY	26812-705	---	1
26	SUCTION FLANGE	26812-704	---	1
27	TAPSCREW	21281-472	---	4
28	NAMEPLATE	38818-004	13990	1
29	DRIVE SCREW	BM#04-03	17000	4
30	BASE ASSEMBLY	41547-026	24150	1
NOT SHOWN:				
	SUCTION STICKER	6588AG	---	1
	G-R DECAL	GR-03	---	1
	INSTRUCTION TAG	38817-030	---	1
	STRAINER	9026D	24001	1
	KEY	N0303	15990	REF
	WARNING DECAL	2613FE	---	1
	WARNING DECAL	2613FF	---	1
	DISCHARGE STICKER	6588BJ	---	1
OPTIONAL:				
	WHEEL LKIT	GRP30-41	---	1

\* INDICATES PARTS RECOMMENDED FOR STOCK

SECTION DRAWING

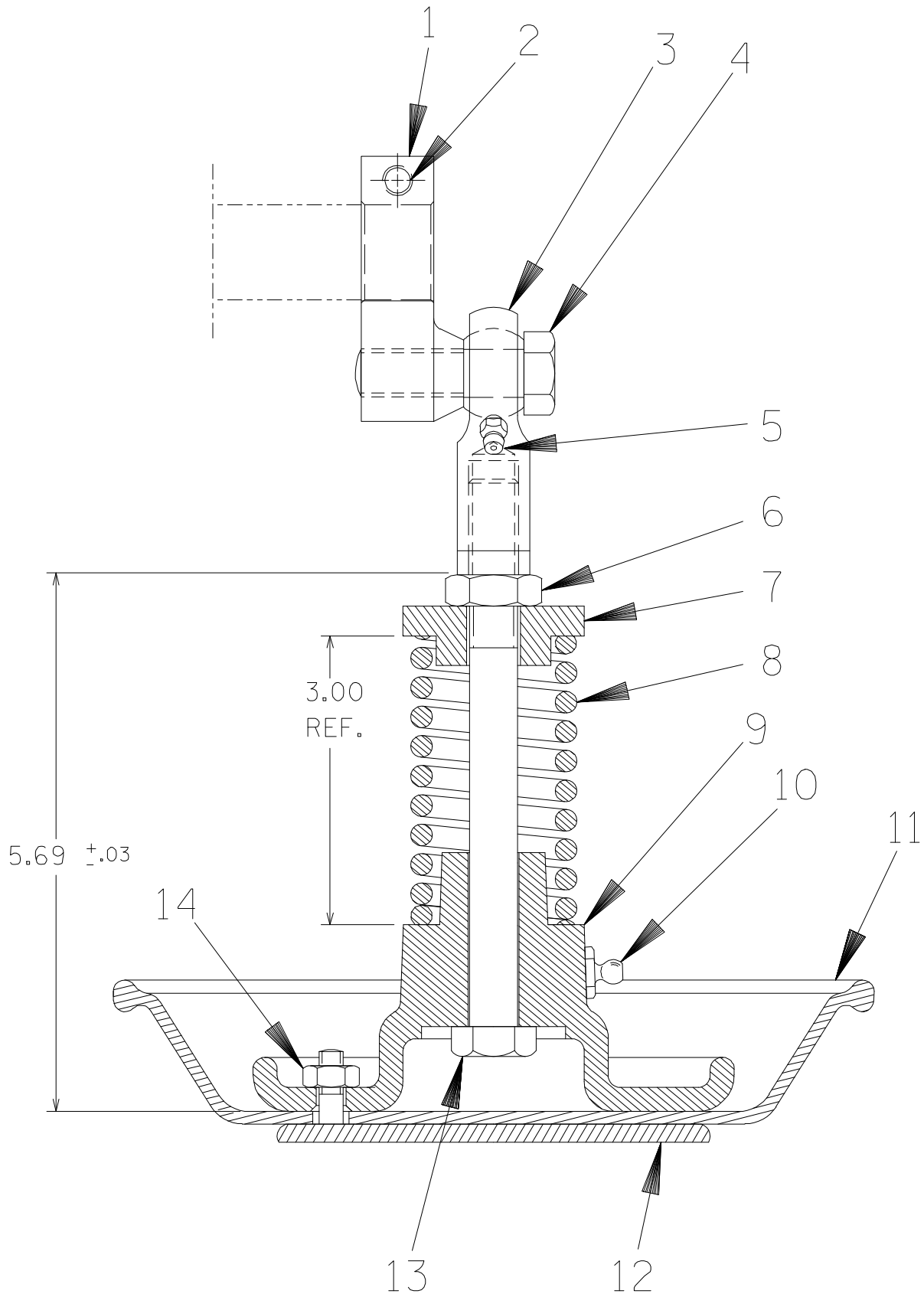


Figure 2. 46181-004 Plunger Rod Assembly

**PARTS LIST**  
**46181-004 Plunger Rod Assembly**

ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY
1	ECCENTRIC	38555-505	11060	1
2	SOCKET HD CAPSCREW	BD0504	15990	1
3	ROD END	23924-005	---	1
4	HEX HD CAPSCREW	B0807	15991	1
5	CAP PLUG	25141-151	---	1
6	JAM NUT	AT08S	15991	1
7	SPRING CENTERING WASHER	31513-001	15030	1
8	* COMPRESSION SPRING	38571-603	17110	1
9	DIAPHRAGM PLATE	38583-003	10010	1
10	LUBE FITTING	S186	---	1
11	* DIAPHRAGM	26812-711	---	1
12	DIAPHRAGM PLATE ASSY	42111-314	24150	1
13	PLUNGER ROD	46181-003	24150	1
14	HEX NUT	D04	15991	3
NOT SHOWN:				
	CAP PLUG	25141-151	---	2

\* INDICATES PARTS RECOMMENDED FOR STOCK

## PUMP 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 and 2) and the accompanying parts lists.

### NOTE

*The gear reducer used on this pump is a model F842B-28K-B5, manufactured by Boston Gear. A complete gear reducer can be ordered from Gorman-Rupp using the part number shown in the parts list on Page E-3. Gorman-Rupp does not, however, stock or furnish any component parts for the gear reducer. Replacement parts may be obtained by contacting Boston Gear at [www.bostongear.com](http://www.bostongear.com).*

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 may be performed without separating the pump and gearbox from the motor. If major repair is required, the pump, gearbox and motor must be disconnected.

Before attempting to service the pump, lock out and tag out incoming power to the motor to ensure that it will remain inoperative. Close all valves in the suction and discharge lines.

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



**Before attempting to open or service the pump:**

1. **Familiarize yourself with this manual.**
2. **Lock out and tag out incoming power to the motor to ensure that the pump will remain inoperative.**
3. **Allow the pump to completely cool if overheated.**
4. **Drain the pump.**

### Suction and Discharge Check Valve Removal

(Figure 1)

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

To service the suction check valve assembly (25), remove the hardware (18) securing the suction flange (26) and check valve assembly to the diaphragm pot (22). Pull the check valve assembly from the suction port.

To service the discharge check valve assembly (20), remove the hardware (17,18 and 21) securing the discharge flange (19) and check valve assembly to the diaphragm pot. Pull the check valve assembly from the suction port.

Individual parts for the suction and discharge check valve assemblies are not available. Replace the complete assemblies if they are excessively worn or damaged.

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

### Diaphragm and Plunger Rod Removal and Disassembly

(Figure 1)

Before attempting to remove the diaphragm (11, Figure 2), rotate the motor shaft until the eccentric

(1, Figure 2) is at the top of its stroke and the spring (8, Figure 2) is decompressed.

Remove the tap screws (27) and eccentric guard assembly (13).

Remove the hardware (16 and 17) securing the retaining ring (11) to the diaphragm pot (22).

### (Figure 2)

Loosen the socket head cap screw (2) and slide the eccentric (1) off the motor shaft. Lift the assembled plunger rod assembly and diaphragm out of the diaphragm pot.

Inspect the diaphragm for excessive wear or tears. To replace the diaphragm, disengage the nuts (14) and remove the diaphragm plate (12) and diaphragm (11).

If the eccentric (1) requires replacement, remove the capscrew (4) and separate the eccentric from the rod end (3).

If the rod end or spring (8) requires replacement, use a socket wrench to hold the plunger rod (13) securely and unscrew the rod end.

To remove the spring, remove the jam nut (6), spring centering washer (7) and spring (8).

### Plunger Rod and Diaphragm Reassembly and Installation

#### (Figure 2)

Slide the plunger rod (13) through the diaphragm plate (9). Install the spring (8), spring centering washer (7) and jam nut (6). Compress the spring to the dimension shown in Figure 2 by tightening the jam nut.

Screw the rod end (3) onto the plunger rod until tight.

Position the eccentric (1) against the rod end. Apply “Loctite Threadlocker No. 242” or equivalent compound to the threads of the capscrew (4) and secure the eccentric to the rod end with the capscrew.

Position the diaphragm (11) on the diaphragm plate (12). Slide the studs in the diaphragm plate

through the holes in the upper diaphragm plate and secure with the nuts (14).

### (Figure 1)

Position the retainer ring (11) over the diaphragm. Position the diaphragm and plunger rod in the diaphragm pot (22) with the grease fitting (10, Figure 2) facing away from the gear reducer (7).

If removed, secure the key (12) in the gear reducer keyway with “Loctite Retaining Compound No. 680” or equivalent and slide the eccentric over the gear reducer shaft. Secure it by tightening the socket head capscrew (2, Figure 2).

Secure the diaphragm and retainer ring to the diaphragm pot by tightening the hardware (16 and 17) in an alternating sequence.

Install the guard (13) over the plunger rod and secure it with the tapscrews (27).

### Suction And Discharge Check Valve Installation

#### (Figure 1)

Inspect the check valves and replace as required. Individual parts for the suction and discharge check valve assemblies are not available. Replace the complete assemblies if they are excessively worn or damaged.

Position the discharge check valve (28) against the diaphragm pot with the weight positioned as shown in Figure 1. Secure the discharge flange (20) and diaphragm to the diaphragm pot with the hardware (17, 18 and 21).

Position the suction check valve (21) against the diaphragm pot with the weight positioned as shown in Figure 1. Secure the suction flange (30) and diaphragm to the diaphragm pot with the hardware (29).

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

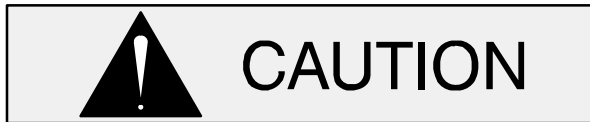
Connect the suction and discharge piping as described in **INSTALLATION**, Section B.

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

## LUBRICATION

### Plunger Rod Assembly

(Figure 2)



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

Before attempting to lubricate the plunger rod assembly, rotate the eccentric cam until the upper grease fitting (5) can be accessed through the slotted hole in the eccentric guard (13, 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 (10) until grease escapes from the top of the upper diaphragm plate inside the spring.

### Gear Reducer

(Figure 1)

The gear reducer used on this unit is lubricated for life from the manufacturer. No additional lubrication is required. If the gear reducer has been disassembled for maintenance, follow the lubrication instructions provided by the gear reducer manufacturer for the recommended type and quantity of lubricant.



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