795–08692
GM 12–00

Graymills

POLYPROPYLENE

Air Operated 1” Double Diaphragm Pumps

Operations and Maintenance Instructions

WARNING/CAUTIONS
Read all these SAFETY INSTRUCTIONS BEFORE installing or using this equipment. Keep this manual handy for reference/training.

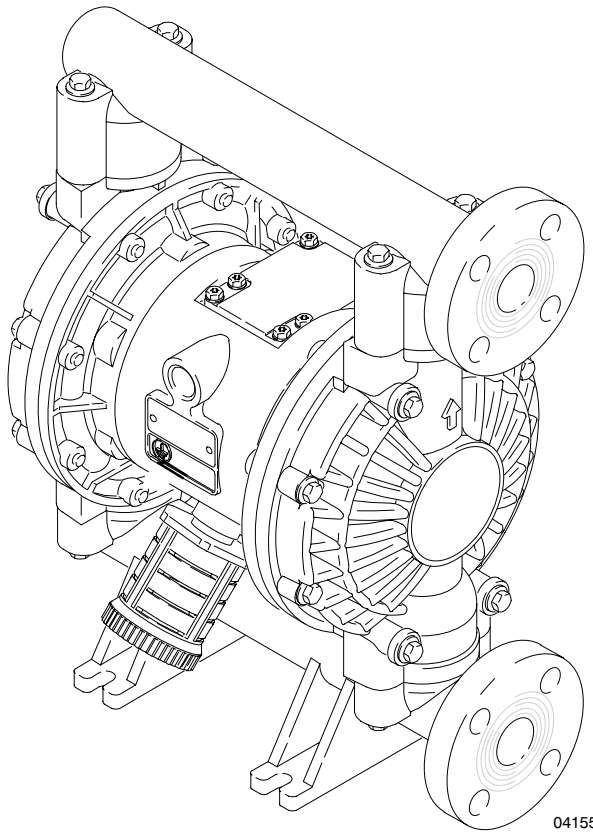

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Table of Contents

Symbols

Warning Symbol

⚠ WARNING

This symbol alerts you to the possibility of serious injury or death if you do not follow the instructions.

Caution Symbol

⚠ CAUTION

This symbol alerts you to the possibility of damage to or destruction of equipment if you do not follow the instructions.

Safety Alert Symbol

⚠ SAFETY ALERT

The safety Alert Symbol means ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED!

⚠ WARNING

INSTRUCTIONS

EQUIPMENT MISUSE HAZARD

Equipment misuse can cause the equipment to rupture or malfunction and result in serious injury.

- This equipment is for professional use only.
- Read all instruction manuals, tags, and labels before operating the equipment.
- Use the equipment only for its intended purpose. If you are not sure, call Graymills Corporation.
- Do not alter or modify this equipment. Use only genuine Graymills parts and accessories.
- Check equipment daily. Repair or replace worn or damaged parts immediately.
- Do not exceed the maximum working pressure of the lowest rated component in your system. This equipment has a **120 psi (0.8 MPa, 8 bar) maximum working pressure at 120 psi (0.8 MPa, 8 bar) maximum incoming air pressure.**
- Use fluids and solvents which are compatible with the equipment wetted parts. Refer to the **Technical Data** section of all equipment manuals. Read the fluid and solvent manufacturer's warnings.
- Do not use hoses to pull equipment.
- Route hoses away from traffic areas, sharp edges, moving parts, and hot surfaces. Do not expose Graymills hoses to temperatures above 82°C (180°F) or below –40°C (–40°F).
- Do not lift pressurized equipment.
- Comply with all applicable local, state, and national fire, electrical, and safety regulations.

⚠ WARNING

TOXIC FLUID HAZARD

Hazardous fluid or toxic fumes can cause serious injury or death if splashed in the eyes or on the skin, inhaled, or swallowed.

- Know the specific hazards of the fluid you are using.
- Store hazardous fluid in an approved container. Dispose of hazardous fluid according to all local, state and national guidelines.
- Keep containers closed when not in use.
- Always wear protective eyewear, gloves, clothing and respirator as recommended by the fluid and solvent manufacturer.
- Pipe and dispose of the exhaust air safely, away from people, animals, sources of ignition, and food handling areas. If the diaphragm fails, the fluid is exhausted along with the air. See **Air Exhaust Ventilation** on page 10.
- To pump acids, ***always*** use a polypropylene pump. Take precautions to avoid acid or acid fumes from contacting the pump housing exterior.
- Use static wire hoses when pumping flammables.

FIRE AND EXPLOSION HAZARD

Improper grounding, poor ventilation, open flames or sparks can cause a hazardous condition and result in a fire or explosion and serious injury.

- Ground the equipment. Refer to **Grounding** on page 5.
- ***Never*** use a polypropylene pump with non-conductive flammable fluids as specified by your local fire protection code. Refer to **Grounding** on page 5 for additional information. Consult your fluid supplier to determine the conductivity or resistivity of your fluid.
- If there is any static sparking or you feel an electric shock while using this equipment, **stop pumping immediately.** Do not use the equipment until you identify and correct the problem.
- Provide fresh air ventilation to avoid the buildup of flammable fumes from solvents or the fluid being pumped.
- Pipe and dispose of the exhaust air safely, away from all sources of ignition. If the diaphragm fails, the fluid is exhausted along with the air. See **Air Exhaust Ventilation** on page 10.
- Keep the work area free of debris, including solvent, rags, and gasoline.
- Electrically disconnect all equipment in the work area.
- Extinguish all open flames or pilot lights in the work area.
- Do not smoke in the work area.
- Do not turn on or off any light switch in the work area while operating or if fumes are present.
- Do not operate a gasoline engine in the work area.

Installation

General Information

- The Typical Installation shown in Fig. 2 is only a guide for selecting and installing system components. Contact Graymills for assistance in planning a system to suit your needs.
- Always use Genuine Graymills Parts and Accessories.
- Reference numbers and letters in parentheses refer to the callouts in the figures and the parts lists.

⚠ WARNING

TOXIC FLUID HAZARD
Hazardous fluid or toxic fumes can cause serious injury or death if splashed in the eyes or on the skin, inhaled, or swallowed.

- Read **TOXIC FLUID HAZARD** on page 3.
- Use fluids and solvents that are compatible with the equipment wetted parts. Refer to the **Technical Data** section of all equipment manuals. Read the fluid and solvent manufacturer's warnings.

Tightening Screws Before First Use

After you unpack the pump, and before you use it for the first time, check and retorque external fasteners. Retorque the fluid cover screws first, then the manifold screws. This keeps the manifolds from interfering with tightening the fluid covers. See the **Service** section for torque specifications.

After the first day of operation, check and retorque the fasteners again. Although the recommended frequency for retorquing fasteners varies with pump usage, a general guideline is to retorque fasteners every two months.

Grounding

⚠ WARNING

FIRE AND EXPLOSION HAZARD
This pump must be grounded. Before operating the pump, ground the system as explained below. Also read the section **FIRE AND EXPLOSION HAZARD** on page 3.

The polypropylene pump is ***not*** conductive. Attaching the ground wire to the grounding strip will ground only the air motor. When pumping conductive flammable fluids, ***always*** ground the entire fluid system by making sure the fluid system has an electrical path to a true earth ground (see Fig. 2). ***Never*** use a polypropylene pump with non-conductive flammable fluids as specified by your local fire protection code.

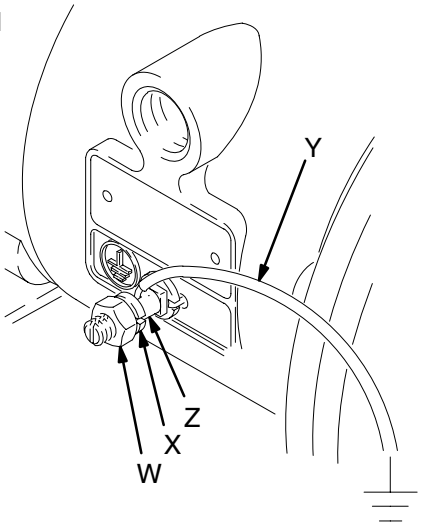
US Code (NFPA 77 Static Electricity) recommends a conductivity greater than 50 x 10^{-12} Siemans/meter (mhos/meter) over your operating temperature range to reduce the hazard of fire. Consult your fluid supplier to determine the conductivity or resistivity of your fluid. The resistivity must be less than 2 x 10^{12} ohm-centimeters.

NOTE: When pumping conductive flammable fluids with a polypropylene pump, ***always*** ground the fluid system. See the **WARNING** above. Fig. 2 shows a recommended method of grounding flammable fluid containers during filling. This is only a guide; call Graymills for assistance in grounding your system.

Ground all of this equipment:

- *Pump*: Connect a ground wire and clamp as shown in Fig. 1. Loosen the grounding lug locknut (W) and washer (X). Insert one end of a 12 ga (1.5 mm2) minimum ground wire (Y) into the slot in the lug (Z) and tighten the locknut securely. Connect the clamp end of the ground wire to a true earth ground.

Figure 1



- *Air and fluid hoses*: Use only grounded hoses with a maximum of 500 ft (150 m) combined hose length to ensure grounding continuity.
- *Air compressor*: Follow the manufacturer's recommendations.
- *All solvent pails used when flushing*: Follow the local code. Use only grounded metal pails, which are conductive. Do not place the pail on a non-conductive surface, such as paper or cardboard, which interrupts the grounding continuity.
- *Fluid supply container*: Follow the local code.

Air Line

⚠ WARNING

A bleed-type master air valve (B) is required in your system to relieve air trapped between this valve and the pump. Trapped air can cause the pump to cycle unexpectedly, which could result in serious injury, including splashing in the eyes or on the skin, injury from moving parts, or contamination from hazardous fluids. See Fig. 2.

1. Install the air line accessories as shown in Fig. 2. Mount these accessories on the wall or on a bracket. Be sure the air line supplying the accessories is grounded.

   a. Install an air regulator (C) and gauge to control the fluid pressure. The fluid outlet pressure will be the same as the setting of the air regulator.

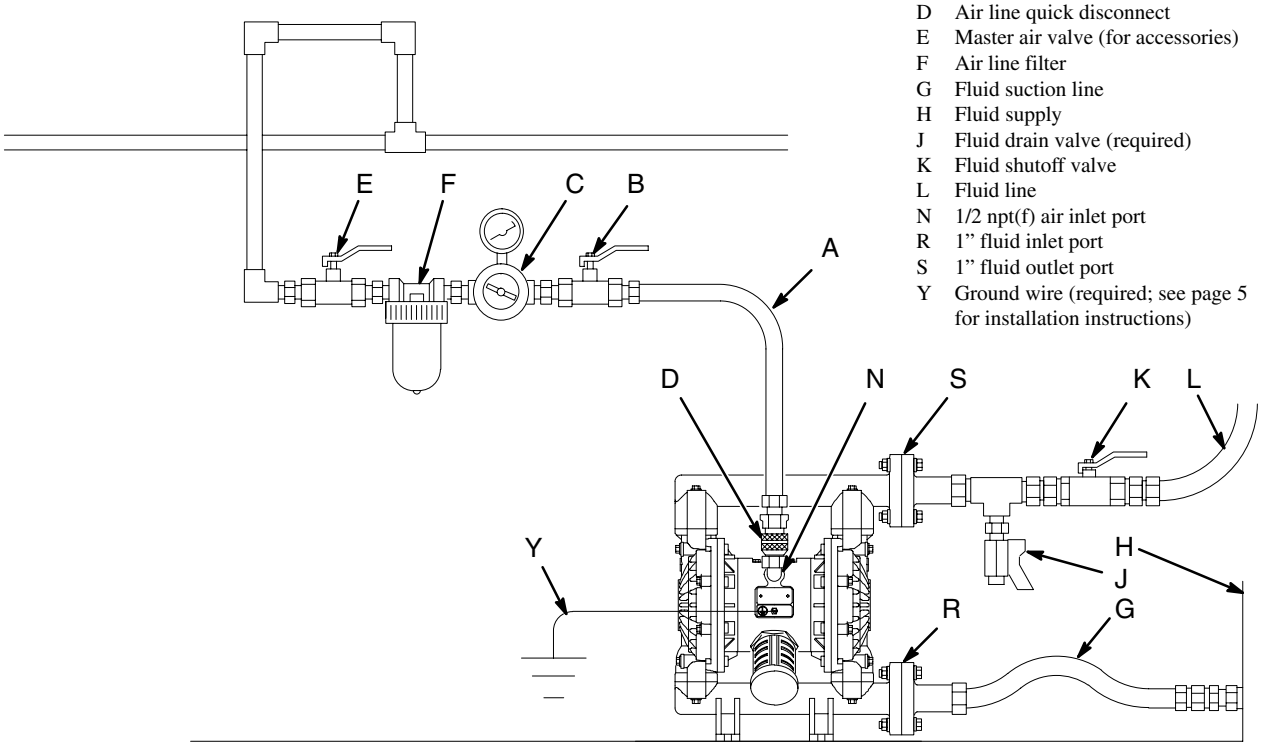
   b. Locate one bleed-type master air valve (B) close to the pump and use it to relieve trapped air. See the **WARNING** at left. Locate the other master air valve (E) upstream from all air line accessories and use it to isolate them during cleaning and repair.

   c. The air line filter (F) removes harmful dirt and moisture from the compressed air supply.

2. Install a grounded, flexible air hose (A) between the accessories and the 1/2 npt(f) pump air inlet (N). See Fig. 2. Use a minimum 3/8" (10 mm) ID air hose. Screw an air line quick disconnect coupler (D) onto the end of the air hose (A), and screw the mating fitting into the pump air inlet snugly. Do not connect the coupler (D) to the fitting until you are ready to operate the pump.

Figure 2

FLOOR MOUNT TYPICAL INSTALLATION



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KEY

A	Air supply hose
B	Bleed-type master air valve (required for pump)
C	Air regulator
D	Air line quick disconnect
E	Master air valve (for accessories)
F	Air line filter
G	Fluid suction line
H	Fluid supply
J	Fluid drain valve (required)
K	Fluid shutoff valve
L	Fluid line
N	1/2 npt(f) air inlet port
R	1" fluid inlet port
S	1" fluid outlet port
Y	Ground wire (required; see page 5 for installation instructions)

Mountings

⚠ CAUTION

The pump exhaust air may contain contaminants. Ventilate to a remote area if the contaminants could affect your fluid supply. See **Air Exhaust Ventilation** on page 10.

1. Be sure the mounting surface can support the weight of the pump, hoses, and accessories, as well as the stress caused during operation.

2. For all mountings, be sure the pump is bolted directly to the mounting surface.

3. For ease of operation and service, mount the pump so the air valve cover (2), air inlet, and fluid inlet and outlet ports are easily accessible.

4. Rubber Foot Mounting Kit 784–90658 is available to reduce noise and vibration during operation.

Fluid Suction Line

- Ground the fluid system. See **Grounding** on page 5.

- The pump fluid inlet (R) is a 1” raised face flange. See **Flange Connections** on page 8.

- If the fluid inlet pressure to the pump is more than 25% of the outlet working pressure, the ball check valves will not close fast enough, resulting in inefficient pump operation.

- At inlet fluid pressures greater than 15 psi (104 kPa, 1 bar), diaphragm life will be shortened.

- See the **Technical Data** on page 24 for maximum suction lift (wet and dry).

Fluid Outlet Line

⚠ WARNING

A fluid drain valve (J) is required to relieve pressure in the hose if it is plugged. The drain valve reduces the risk of serious injury, including splashing in the eyes or on the skin, or contamination from hazardous fluids when relieving pressure. Install the valve close to the pump fluid outlet. See Fig. 2.

1. **Use grounded fluid hoses (L).** The pump fluid outlet (S) is a 1” raised face flange. Refer to **Flange Connections** on page 8.

2. Install a fluid drain valve (J) near the fluid outlet. See the **WARNING** above.

3. Install a shutoff valve (K) in the fluid outlet line.

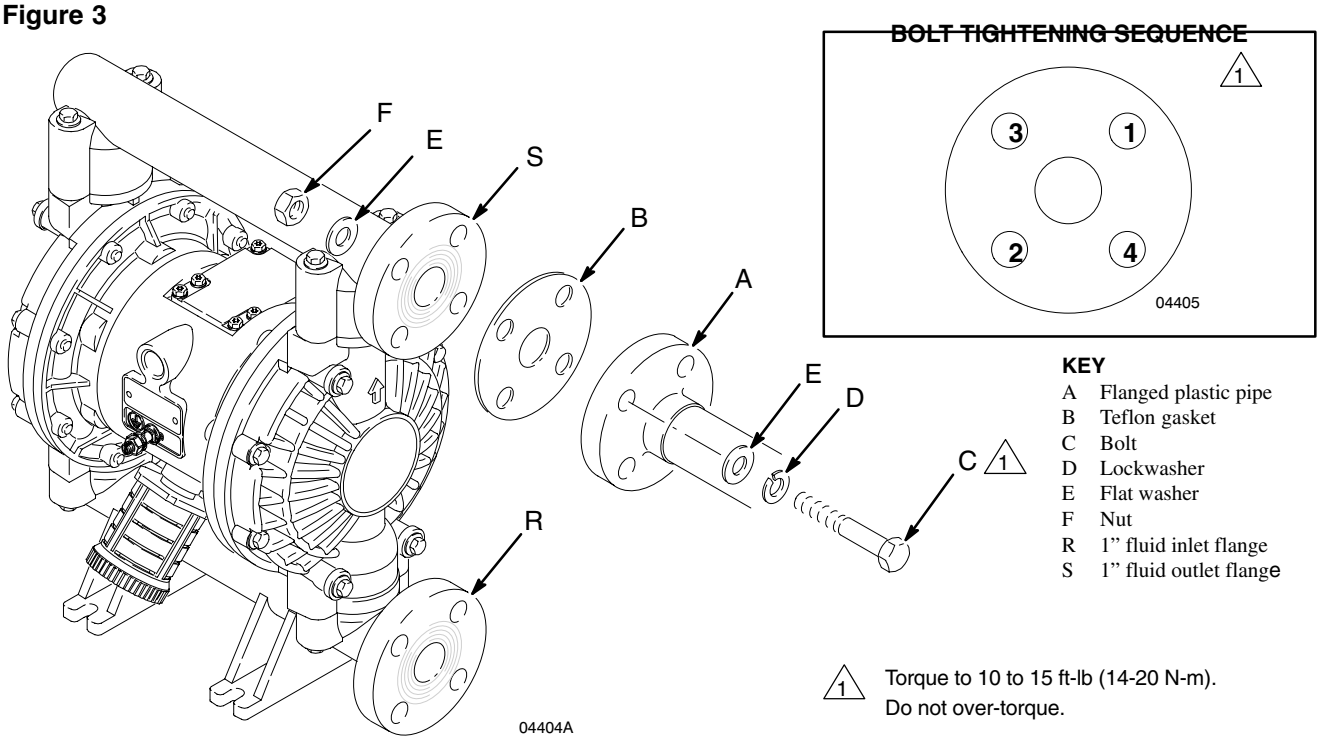
Flange Connections

The fluid inlet and outlet ports are 1” raised face flanges. Connect 1” flanged plastic pipe to the pump as follows. You will need:

- Torque wrench
- Adjustable wrench
- One 4.25” diameter, 1/8” thick Teflon® gasket, with four 0.62 diameter holes and a 1.15” diameter center
- Four 1/2” x 2.5” bolts
- Four 1/2” spring lockwashers
- Eight 1/2” flat washers
- Four 1/2” nuts.

1. Place a lockwasher and a flat washer on each bolt. Refer to Fig. 3.
2. Align the holes in the gasket and the pipe flange with the holes in the pump flange.
3. Lubricate the threads of the four bolts. Install the bolts through the holes and secure with the washers and nuts.
4. Hold the nuts with a wrench. Refer to the tightening sequence in Fig. 3 and torque the bolts to 10 to 15 ft-lb (14 to 20 N-m). ***Do not over-torque.***

Figure 3



Changing the Orientation of the Fluid Inlet and Outlet Ports

The pump is shipped with the fluid inlet (R) and outlet (S) ports facing the same direction. See Fig. 4. To change the orientation of the inlet and/or outlet port:

1. Remove the screws (106 or 112) holding the inlet (102) and/or outlet (103) manifold to the covers (101).

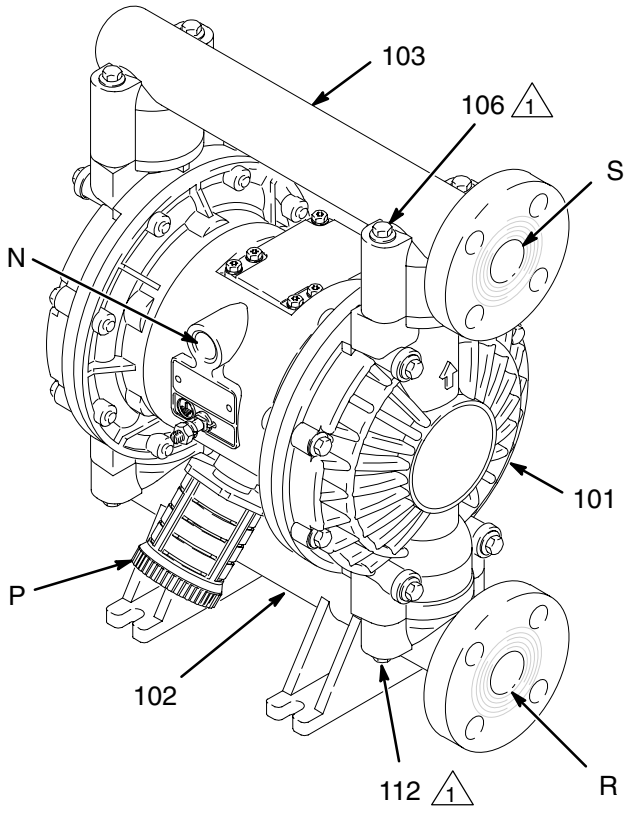
2. Reverse the manifold and reattach. Install the screws (106 or 112). Torque the manifold screws to 80 to 90 in-lb (9 to 10 N-m). See Fig. 4.

Figure 4

KEY

N	1/2 npt(f) air inlet port	101	Covers
P	Muffler; air exhaust port is 3/4 npt(f)	102	Fluid inlet manifold
		103	Fluid outlet manifold
R	1” fluid inlet port	106	Manifold screws
S	1” fluid outlet port	112	Manifold screws

1 Torque to 80 to 90 in-lb (9 to 10 N-m).



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Fluid Pressure Relief Valve

⚠ CAUTION

Some systems may require installation of a pressure relief valve at the pump outlet to prevent overpressurization and rupture of the pump or hose. See Fig. 5.

Thermal expansion of fluid in the outlet line can cause overpressurization. This can occur when using long fluid lines exposed to sunlight or ambient heat, or when pumping from a cool to a warm area (for example, from an underground tank).

Overpressurization can also occur if the pump is being used to feed fluid to a piston pump, and the intake valve of the piston pump does not close, causing fluid to back up in the outlet line.

Figure 5

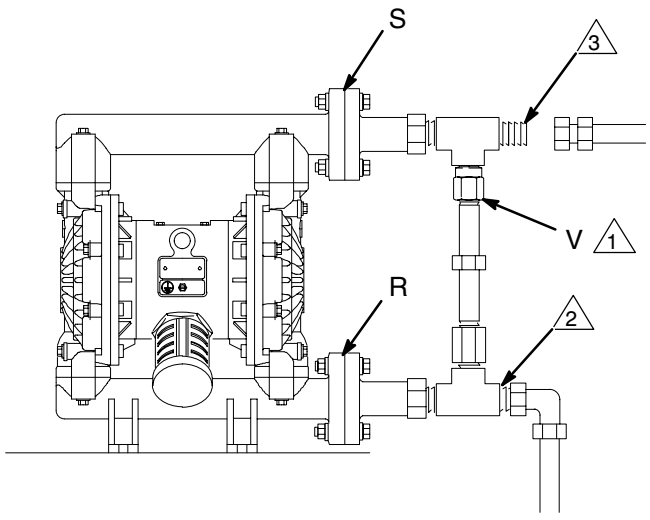
KEY

R 1” fluid inlet port
S 1” fluid outlet port
V Pressure relief valve

1 Install valve between fluid inlet and outlet ports.

2 Connect fluid inlet line here.

3 Connect fluid outlet line here.



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Air Exhaust Ventilation

⚠ WARNING

FIRE AND EXPLOSION HAZARD
Be sure to read **FIRE OR EXPLOSION HAZARD** and **TOXIC FLUID HAZARD** on page 3, before operating this pump.

Be sure the system is properly ventilated for your type of installation. You must vent the exhaust to a safe place, away from people, animals, food handling areas, and all sources of ignition when pumping flammable or hazardous fluids.

Never use polypropylene pumps with flammable fluids.

Diaphragm failure will cause the fluid being pumped to exhaust with the air. Place an appropriate container at the end of the air exhaust line to catch the fluid. See Fig. 6.

The air exhaust port is 3/4 npt(f). Do not restrict the air exhaust port. Excessive exhaust restriction can cause erratic pump operation.

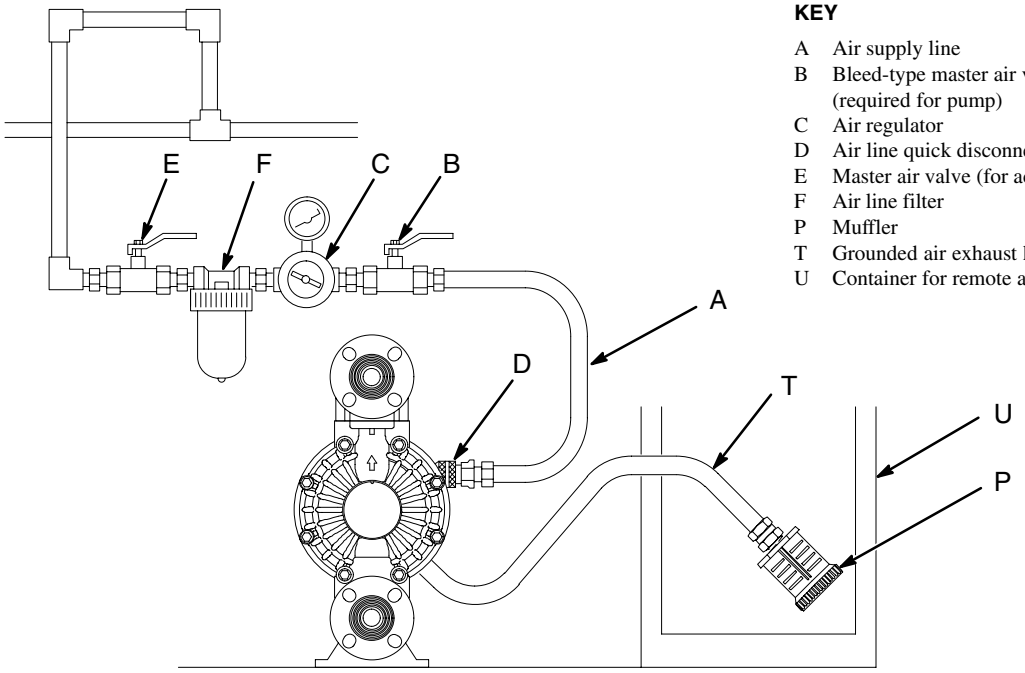
To provide a remote exhaust:

1. Remove the muffler (P) from the pump air exhaust port.

2. Install a grounded air exhaust hose (T) and connect the muffler (P) to the other end of the hose. The minimum size for the air exhaust hose is 3/4 in. (19 mm) ID. If a hose longer than 15 ft (4.57 m) is required, use a larger diameter hose. Avoid sharp bends or kinks in the hose. See Fig. 6.

3. Place a container (U) at the end of the air exhaust line to catch fluid in case a diaphragm ruptures.

Figure 6 **VENTING EXHAUST AIR**



KEY

A Air supply line
B Bleed-type master air valve (required for pump)
C Air regulator
D Air line quick disconnect
E Master air valve (for accessories)
F Air line filter
P Muffler
T Grounded air exhaust hose
U Container for remote air exhaust

04168A

Operation

Pressure Relief Procedure

⚠ WARNING

PRESSURIZED EQUIPMENT HAZARD
The equipment stays pressurized until pressure is manually relieved. To reduce the risk of serious injury from pressurized fluid, accidental spray from the gun or splashing fluid, follow this procedure whenever you

- Are instructed to relieve pressure
- Stop pumping
- Check, clean, or service any system equipment
- Install or clean fluid nozzles

1. Shut off the air to the pump.
2. Open the dispensing valve, if used.
3. Open the fluid drain valve to relieve all fluid pressure, having a container ready to catch the drainage.

Flush the Pump Before First Use

The pump was tested in water. If the water could contaminate the fluid you are pumping, flush the pump thoroughly with a compatible solvent. Follow the steps under **Starting and Adjusting the Pump.**

Starting and Adjusting the Pump

⚠ WARNING

TOXIC FLUID HAZARD
Hazardous fluid or toxic fumes can cause serious injury or death if splashed in the eyes or on the skin, inhaled, or swallowed.
Do not lift a pump under pressure. If dropped, the fluid section may rupture. Always follow the **Pressure Relief Procedure** above before lifting the pump.

1. Be sure the pump is properly grounded. Refer to **Grounding** on page 5.
2. Check all fittings to be sure they are tight. Be sure to use a compatible liquid thread sealant on all male threads. Tighten the fluid inlet and outlet fittings securely. Retorque all fasteners before startup.
3. Place the suction tube (if used) in the fluid to be pumped.

NOTE: If the fluid inlet pressure to the pump is more than 25% of the outlet working pressure, the ball check valves will not close fast enough, resulting in inefficient pump operation.

4. Place the end of the fluid hose (L) into an appropriate container.
5. Close the fluid drain valve (J). See Fig. 2.
6. With the pump air regulator (C) closed, open all bleed-type master air valves (B, E).
7. If the fluid hose has a dispensing device, hold it open while continuing with the following step.
8. Slowly open the air regulator (C) until the pump starts to cycle. Allow the pump to cycle slowly until all air is pushed out of the lines and the pump is primed.

   If you are flushing, run the pump long enough to thoroughly clean the pump and hoses. Close the air regulator. Remove the suction tube from the solvent and place it in the fluid to be pumped.

Operation

Operation of Remote Piloted Pumps

1. Follow preceding steps 1 through 7 of **Starting and Adjusting Pump**.

2. Open air regulator (C).

⚠ WARNING

The pump may cycle once before the external signal is applied. Injury is possible. If pump cycles, wait until end before proceeding.

3. Pump will operate when air pressure is alternately applied and relieved to push type connectors (14).

NOTE: Leaving air pressure applied to the air motor for extended periods when the pump is not running may shorten the diaphragm life. Using a 3–way solenoid valve to automatically relieve the pressure on the air motor when the metering cycle is complete prevents this from occurring.

Pump Shutdown

⚠ WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedureon page 11.**

At the end of the work shift, relieve the pressure.

Maintenance

Lubrication

The air valve is designed to operate unlubricated, however if lubrication is desired, every 500 hours of operation (or monthly) remove the hose from the pump air inlet and add two drops of machine oil to the air inlet.

⚠ CAUTION

Do not over-lubricate the pump. Oil is exhausted through the muffler, which could contaminate your fluid supply or other equipment. Excessive lubrication can also cause the pump to malfunction.

Flushing and Storage

Flush the pump often enough to prevent the fluid you are pumping from drying or freezing in the pump and damaging it. Always flush the pump and follow the **Pressure Relief Procedure** on page 11 before storing it for any length of time. Use a compatible solvent.

Tightening Threaded Connections

Before each use, check all hoses for wear or damage, and replace as necessary. Check to be sure all threaded connections are tight and leak-free. Check and retorque all threaded connections at least every two months. Retorque the fluid cover screws first, followed by the manifold screws.

The recommended frequency for retorquing of fasteners varies with pump usage; a general guideline is to retorque fasteners every two months.

Preventive Maintenance Schedule

Establish a preventive maintenance schedule, based on the pump's service history. This is especially important for prevention of spills or leakage due to diaphragm failure.

Troubleshooting

⚠ WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** on page 11.

1. Relieve the pressure before checking or servicing the equipment.

2. Check all possible problems and causes before disassembling the pump.

PROBLEM	CAUSE	SOLUTION
Pump cycles at stall or fails to hold pressure at stall.	Worn check valve balls (301), seats (201) or o-rings (202).	Replace. See page 17.
Pump will not cycle, or cycles once and stops.	Air valve is stuck or dirty.	Disassemble and clean air valve. See pages 15 to 16. Use filtered air.
	Check valve ball (301) severely worn and wedged in seat (201) or manifold (102 or 103).	Replace ball and seat. See page 17.
	Check valve ball (301) is wedged into seat (201), due to overpressurization.	Install Pressure Relief Valve (see page 9).
	Dispensing valve clogged.	Relieve pressure and clear valve.
Pump operates erratically.	Clogged suction line.	Inspect; clear.
	Sticky or leaking balls (301).	Clean or replace. See page 17.
	Diaphragm ruptured.	Replace. See pages 18 to 20.
	Restricted exhaust.	Remove restriction.
Air bubbles in fluid.	Suction line is loose.	Tighten.
	Diaphragm ruptured.	Replace. See pages 18 to 20.
	Loose inlet manifold (102), damaged seal between manifold and seat (201), damaged o-rings (202).	Tighten manifold bolts (106 or 112) or replace seats (201) or o-rings (202). See page 17.
	Loose fluid side plate (105).	Tighten or replace (pages 18 to 20).
	Damaged o-ring (108).	Replace. See pages 18 to 20.
Fluid in exhaust air.	Diaphragm ruptured.	Replace. See pages 18 to 20.
	Loose fluid side plate (105).	Tighten or replace (pages 18 to 20).
Pump exhausts excessive air at stall.	Worn air valve block (7), o-ring (6), plate (8), pilot block (18), u-cups (10), or pilot pin o-rings (17).	Repair or replace. See pages 15 to 16.
	Worn shaft seals (402).	Replace. See pages 18 to 20.
Pump leaks air externally.	Air valve cover (2) or air valve cover screws (3) are loose.	Tighten screws. See page 16.
	Air valve gasket (4) or air cover gasket (22) is damaged.	Inspect; replace. See pages 15 to 16 and 21 to 22.
	Air cover screws (25) are loose.	Tighten screws. See pages 21 to 22.
Pump leaks fluid externally from ball check valves.	Loose manifolds (102, 103), damaged seal between manifold and seat (201), damaged o-rings (202).	Tighten manifold bolts (106 or 112) or replace seats (201) or o-rings (202). See page 17.

Service

Repairing the Air Valve

Tools Required

- Torque wrench
- Torx screwdriver or 8 mm (or 5/16”) socket wrench
- Needle-nose pliers
- O-ring pick
- Lithium base grease

NOTE: Air Valve Repair Kit 784–90616 is available.

Disassembly

⚠ WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** on page 11.

1. Relieve the pressure.

2. With a torx screwdriver or 8 mm (or 5/16”) socket wrench, remove the six screws (3), air valve cover (2), and gasket (4). See Fig. 7.

3. Move the valve carriage (5) to the center position and pull it out of the cavity. Remove the valve block (7) and o-ring (6) from the carriage. Using a needle-nose pliers, pull the pilot block (18) straight up and out of the cavity. See Fig. 8.

4. Pull the two actuator pistons (11) out of the bearings (12). Remove the u-cup packings (10) from the pistons. Pull the pilot pins (16) out of the bearings (15). Remove the o-rings (17) from the pilot pins. See Fig. 9.

5. Inspect the valve plate (8) in place. If damaged, use a torx screwdriver or 8 mm (or 5/16”) socket wrench to remove the three screws (3). Remove the valve plate (8) and seal (9). See Fig. 10.

6. Inspect the bearings (12, 15) in place. See Fig. 9. The bearings are tapered and, if damaged, must be removed from the outside. This requires disassembly of the fluid section. See page 21.

7. Clean all parts and inspect for wear or damage. Replace as needed. Reassemble as explained on page 16.

Figure 7

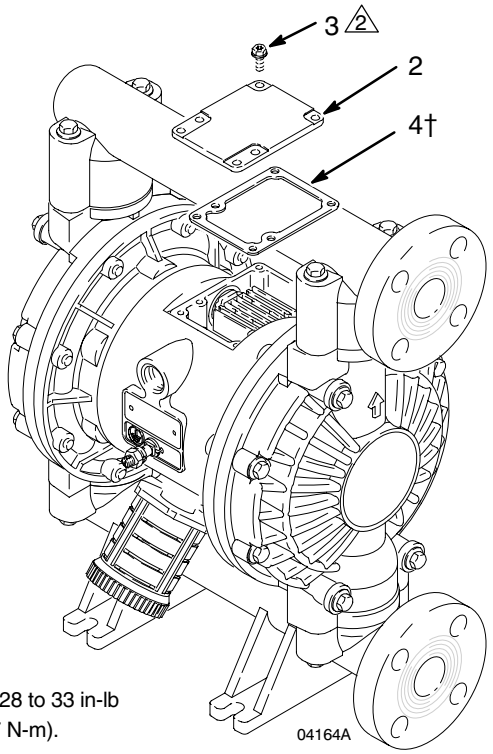
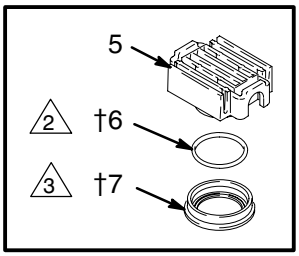


Figure 8

△1 See Detail at right.
△2 Grease.
△3 Grease lower face.



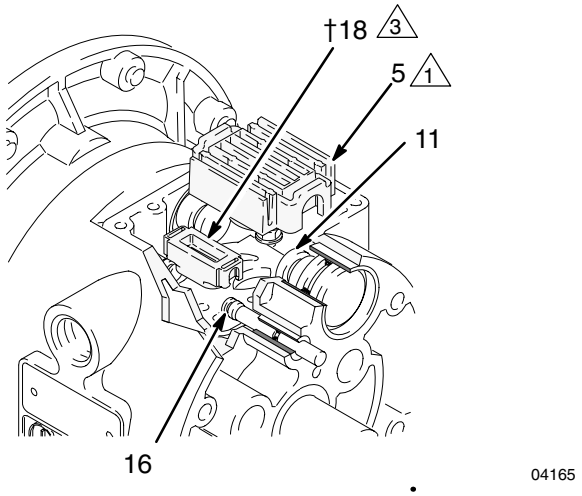


Figure 9

△1 Insert narrow end first.

△2 Grease.

△3 Install with lips facing narrow end of piston (11).

△4 Insert wide end first.

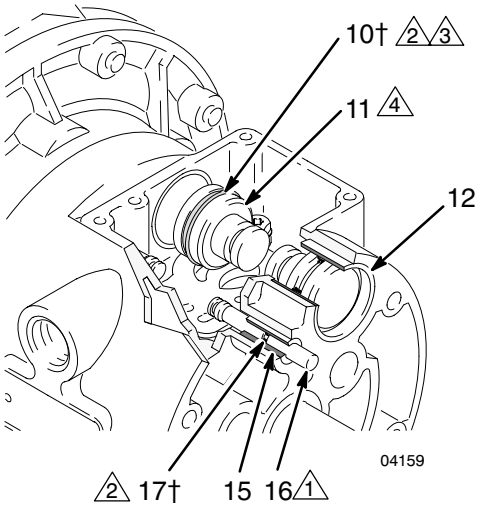
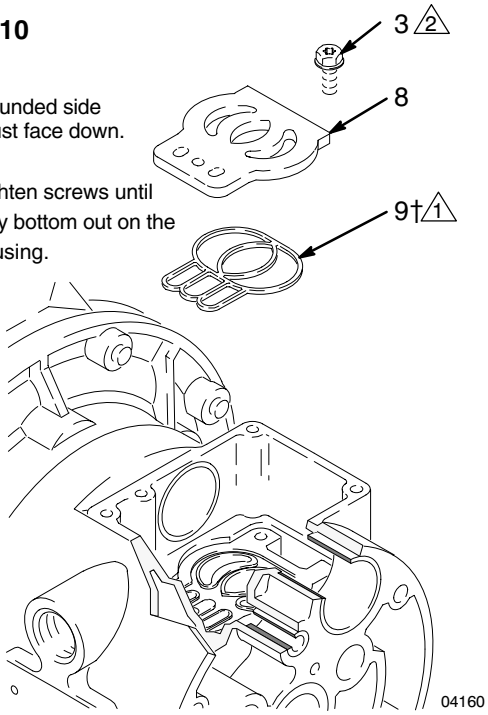


Figure 10

△1 Rounded side must face down.

△2 Tighten screws until they bottom out on the housing.



Reassembly

1. *If you removed the bearings (12, 15),* install new ones as explained on page 21. Reassemble the fluid section.

2. Install the valve plate seal (9†) into the groove at the bottom of the valve cavity. The rounded side of the seal ***must face down*** into the groove. See Fig. 10.

3. Install the valve plate (8) in the cavity. The plate is reversible, so either side can face up. Install the three screws (3), using a torx screwdriver or 8 mm (or 5/16") socket wrench. Tighten until the screws bottom out on the housing. See Fig. 10.

4. Install an o-ring (17†) on each pilot pin (16). Grease the pins and o-rings. Insert the pins into the bearings (15), ***narrow*** end first. See Fig. 9.

5. Install a u-cup packing (10†) on each actuator piston (11), so the lips of the packings face the ***narrow*** end of the pistons. See Fig. 9.

6. Lubricate the u-cup packings (10†) and actuator pistons (11). Insert the actuator pistons in the bearings (12), ***wide*** end first. Leave the narrow end of the pistons exposed. See Fig. 9.

7. Grease the lower face of the pilot block (18†) and install so its tabs snap into the grooves on the ends of the pilot pins (16). See Fig. 8.

8. Grease the o-ring (6†) and install it in the valve block (7†). Push the block onto the valve carriage (5). Grease the lower face of the valve block. See Fig. 8.

9. Install the valve carriage (5) so its tabs slip into the grooves on the narrow end of the actuator pistons (11). See Fig. 8.

10. Align the valve gasket (4†) and cover (2) with the six holes in the center housing (1). Secure with six screws (3), using a torx screwdriver or 8 mm (or 5/16") socket wrench. Torque to 28 to 33 in-lb (3.2 to 3.7 N.m). See Fig. 7.

Ball Check Valve Repair

Tools Required

- Torque wrench
- 10 mm socket wrench
- O-ring pick

Disassembly

NOTE: Fluid Section Repair Kit 784–90617 for Hytrel and 784–90618 for Teflon Diaphragms are available. Parts included in the kit are marked with an asterisk, for example (201*). Use all the parts in the kit for the best results.

NOTE: To ensure proper seating of the balls (301), always replace the seats (201) when replacing the balls.

⚠ WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** on page 11.

1. Relieve the pressure. Disconnect all hoses.
2. Remove the pump from its mounting.
3. Using a 10 mm socket wrench, remove the four bolts (106) holding the outlet manifold (103) to the fluid covers (101). See Fig. 11.
4. Remove the seats (201), balls (301), and o-rings (202) from the manifold.

NOTE: Some models use two o-rings (202), some models use four o-rings (202), and some models do not use o-rings.

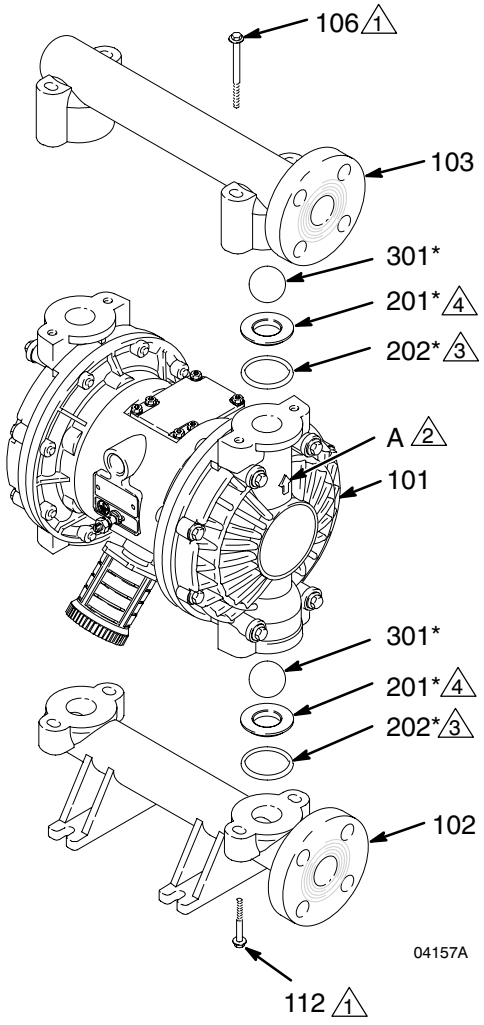
5. Turn the pump over and remove the inlet manifold (102). Remove the seats (201), balls (301), and o-rings (202) from the fluid covers (101).

Reassembly

1. Clean all parts and inspect for wear or damage. Replace parts as needed.
2. Reassemble in the reverse order, following all notes in Fig. 11. Assemble the ball checks **exactly** as shown. The arrows (A) on the fluid covers (101) **must** point toward the outlet manifold (103).

Figure 11

1 Torque to 80 to 90 in-lb (9 to 10 N-m).
2 Arrow (A) must point toward outlet manifold (103).
3 Not used on some models.
4 Beveled seating surface must face ball (301).



Diaphragm Repair

Tools Required

- Torque wrench
- 10 mm socket wrench
- 19 mm socket wrench
- Adjustable wrench
- O-ring pick
- Lithium-base grease

Disassembly

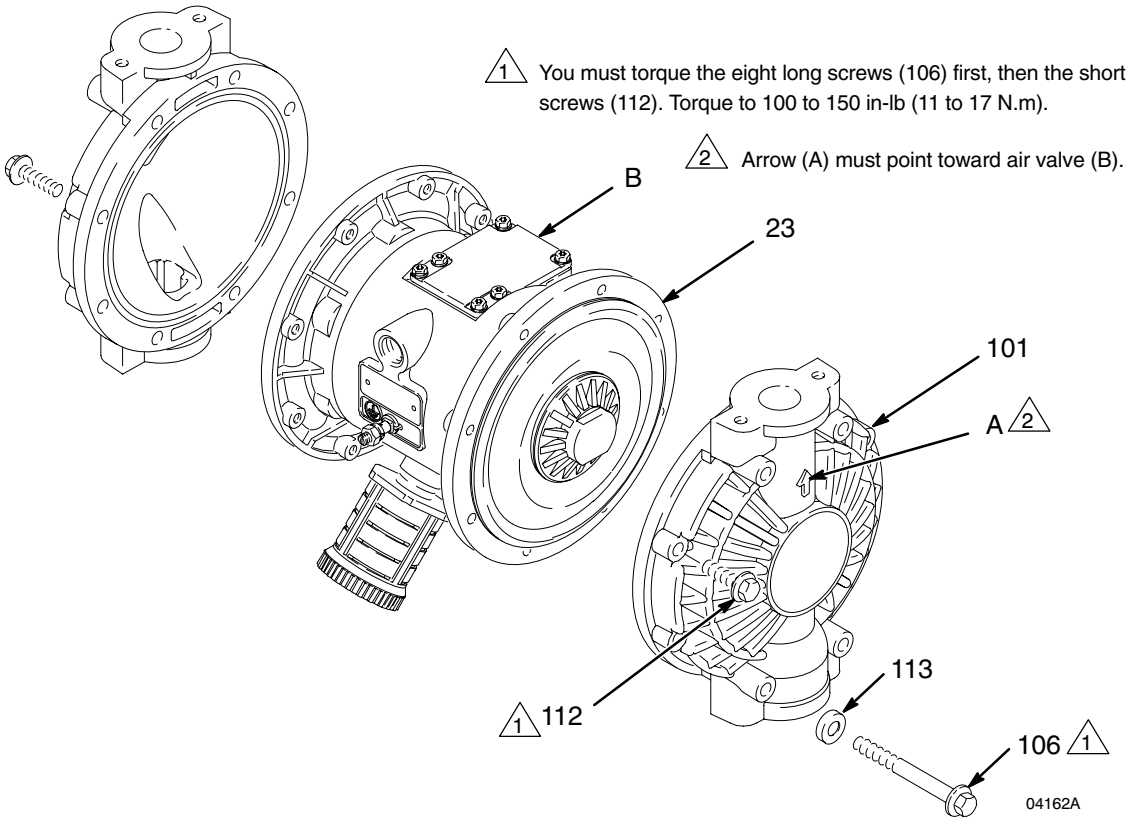
NOTE: A Fluid Section Repair Kit is available. Order Kit 784–90617 for Hytrel Diaphragm Pumps and kit 784–90618 for pumps with Teflon diaphragms.

⚠ WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** on page 11.

1. Relieve the pressure.
2. Remove the manifolds and disassemble the ball check valves as explained on page 17.
3. Using a 10 mm socket wrench, remove the screws (106 and 112) holding the fluid covers (101) to the air covers (23). Pull the fluid covers (101) off the pump. See Fig. 12.

Figure 12



4. Unscrew one outer plate (105) from the diaphragm shaft (24). Remove one diaphragm (401), and the inner plate (104). See Fig. 13.

NOTE: Teflon® models include a Teflon® diaphragm (403) in addition to the backup diaphragm (401).

5. Pull the other diaphragm assembly and the diaphragm shaft (24) out of the center housing (1). Hold the shaft flats with a 19 mm socket wrench, and remove the outer plate (105) from the shaft. Disassemble the remaining diaphragm assembly.

6. Inspect the diaphragm shaft (24) for wear or scratches. If it is damaged, inspect the bearings (19) in place. If the bearings are damaged, refer to page 21.

7. Reach into the center housing (1) with an o-ring pick and hook the u-cup packings (402), then pull them out of the housing. This can be done with the bearings (19) in place.

8. Clean all parts and inspect for wear or damage. Replace parts as needed.

Reassembly

1. Grease the shaft u-cup packings (402*) and install them so the lips face ***out*** of the housing (1). See Fig. 13.

2. Grease the length and ends of the diaphragm shaft (24), and slide it through the housing (1).

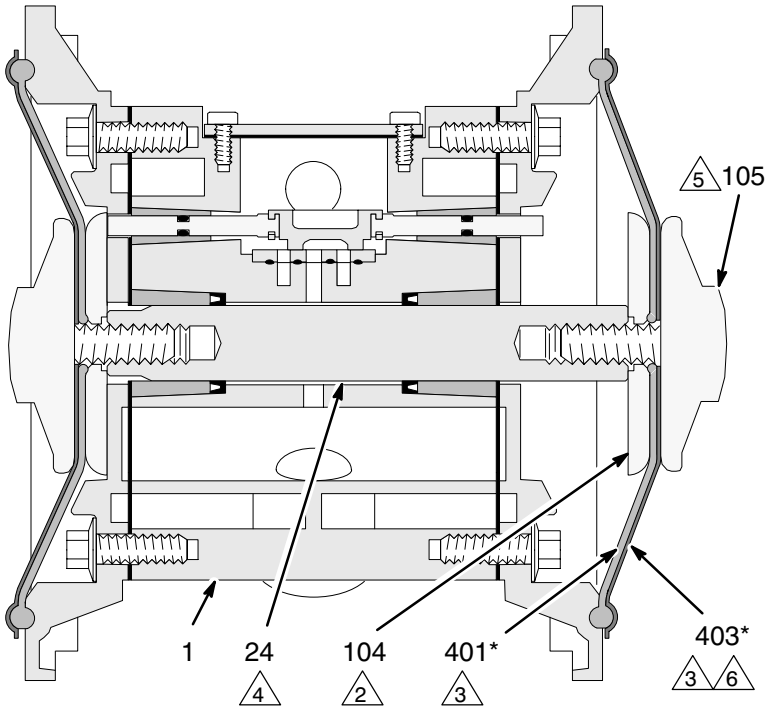
3. Assemble the inner diaphragm plates (104), diaphragms (401*), Teflon® diaphragms (403*, if present), and outer diaphragm plates (105) *exactly* as shown in Fig. 13. These parts ***must*** be assembled correctly.

4. Apply medium-strength (blue) Loctite® or equivalent to the threads of the fluid-side plates (105). Hold one of the outer plates (105) with a wrench, and torque the other outer plate to 20 to 25 ft-lb (27 to 34 N-m) at 100 rpm maximum. ***Do not over-torque.***

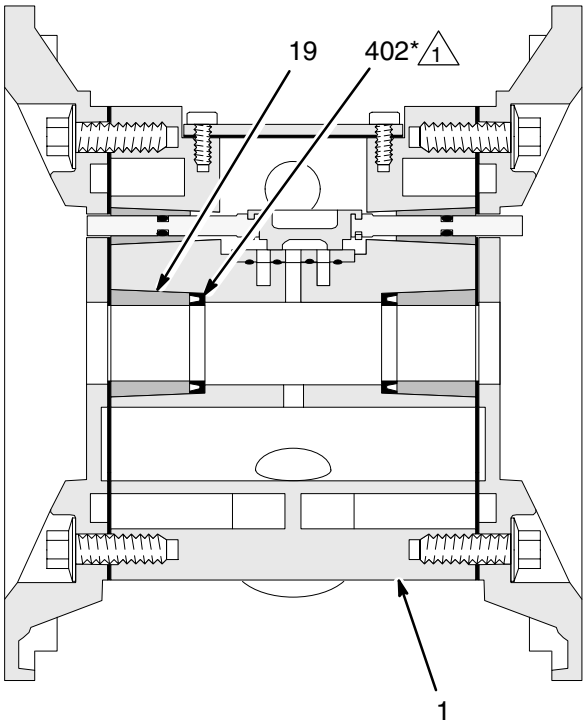
5. Align the fluid covers (101) and the center housing (1) so the arrows (A) on the covers face the same direction as the air valve (B). Secure the covers with the screws (106 and 112), handtight. Place the bolt caps (113*) on the longer screws (106), and install the longer screws in the top and bottom holes of the covers. See Fig. 12.

6. First, torque the longer screws (106) oppositely and evenly to 100 to 150 in-lb (11 to 17 N-m), using a 10 mm socket wrench. Then torque the shorter screws (112).

7. Reassemble the ball check valves and manifolds as explained on page 17.

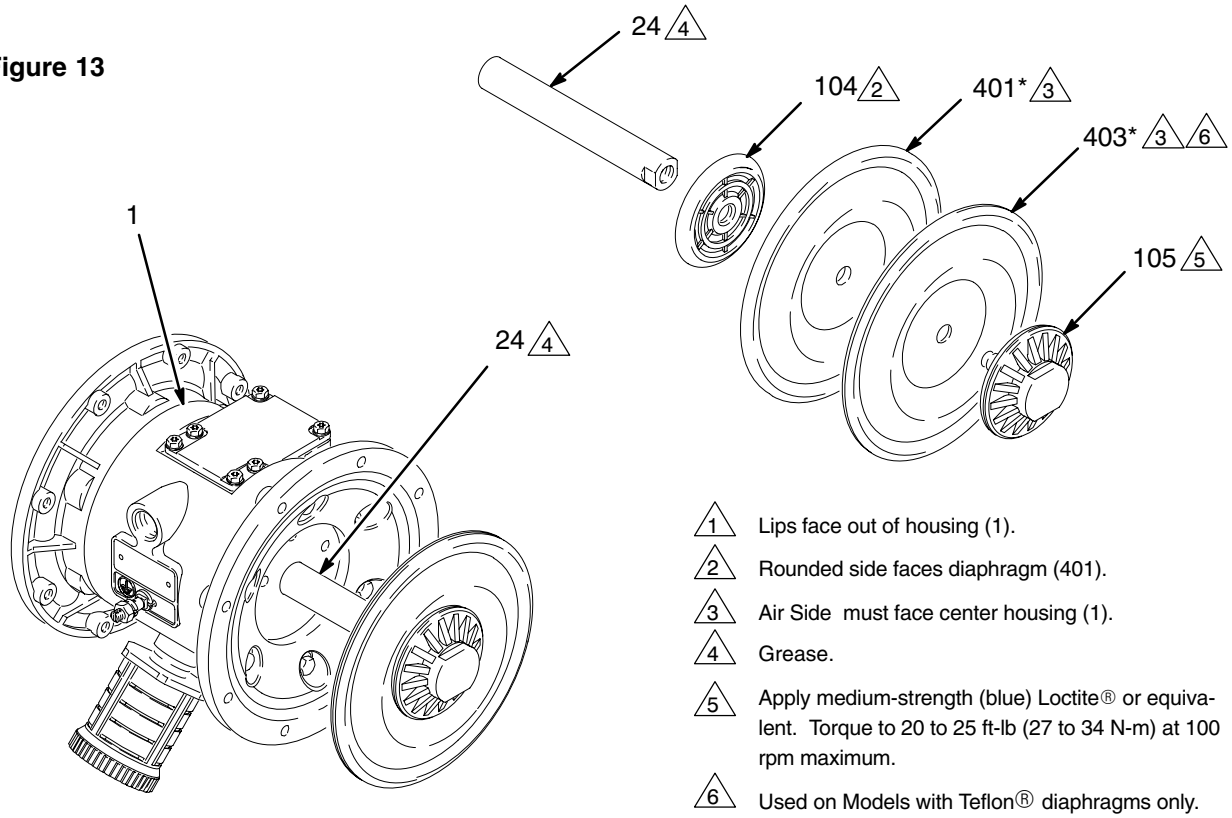


Cutaway View, with Diaphragms in Place



Cutaway View, with Diaphragms Removed

Figure 13



1 Lips face out of housing (1).

2 Rounded side faces diaphragm (401).

3 Air Side must face center housing (1).

4 Grease.

5 Apply medium-strength (blue) Loctite® or equivalent. Torque to 20 to 25 ft-lb (27 to 34 N-m) at 100 rpm maximum.

6 Used on Models with Teflon® diaphragms only.

04161

Bearing and Air Gasket Removal

Tools Required

- Torque wrench
- 10 mm socket wrench
- Bearing puller
- O-ring pick
- Press, or block and mallet

Disassembly

NOTE: Do not remove undamaged bearings.

⚠ WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** on page 11.

1. Relieve the pressure.
2. Remove the manifolds and disassemble the ball check valves as explained on page 17.
3. Remove the fluid covers and diaphragm assemblies as explained on page 18.

NOTE: If you are removing only the diaphragm shaft bearing (19), skip step 4.

4. Disassemble the air valve as explained on page 15.
5. Using a 10 mm socket wrench, remove the screws (25) holding the air covers (23) to the center housing (1). See Fig. 14.
6. Remove the air cover gaskets (22). Always replace the gaskets with new ones.
7. Use a bearing puller to remove the diaphragm shaft bearings (19), air valve bearings (12) or pilot pin bearings (15). Do not remove undamaged bearings.
8. If you removed the diaphragm shaft bearings (19), reach into the center housing (1) with an o-ring pick and hook the u-cup packings (402), then pull them out of the housing. Inspect the packings. See Fig. 13.

Reassembly

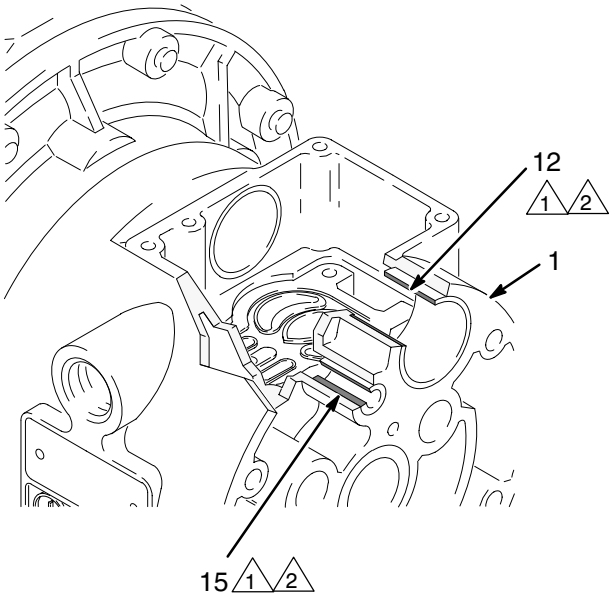
1. If removed, install the shaft u-cup packings (402*) so the lips face ***out*** of the housing (1).
2. The bearings (19, 12, and 15) are tapered and can only be installed one way. Insert the bearings into the center housing (1), ***tapered end first***. Using a press or a block and rubber mallet, press-fit the bearing so it is flush with the surface of the center housing.
3. Reassemble the air valve as explained on page 16.
4. Align the new air cover gasket (22) so the pilot pin (16) protruding from the center housing (1) fits through the proper hole (H) in the gasket.
5. Align the air cover (23) so the pilot pin (16) fits in the middle hole (M) of the three small holes near the center of the cover. Apply medium-strength (blue) Loctite® or equivalent to the threads of screws (25), and install the screws handtight. See Fig. 14. Using a 10 mm socket wrench, torque the screws oppositely and evenly to 130 to 150 in-lb (14.7 to 16.9 N-m).
6. Install the diaphragm assemblies and fluid covers as explained on page 18.
7. Reassemble the ball check valves and manifolds as explained on page 17.

Figure 14

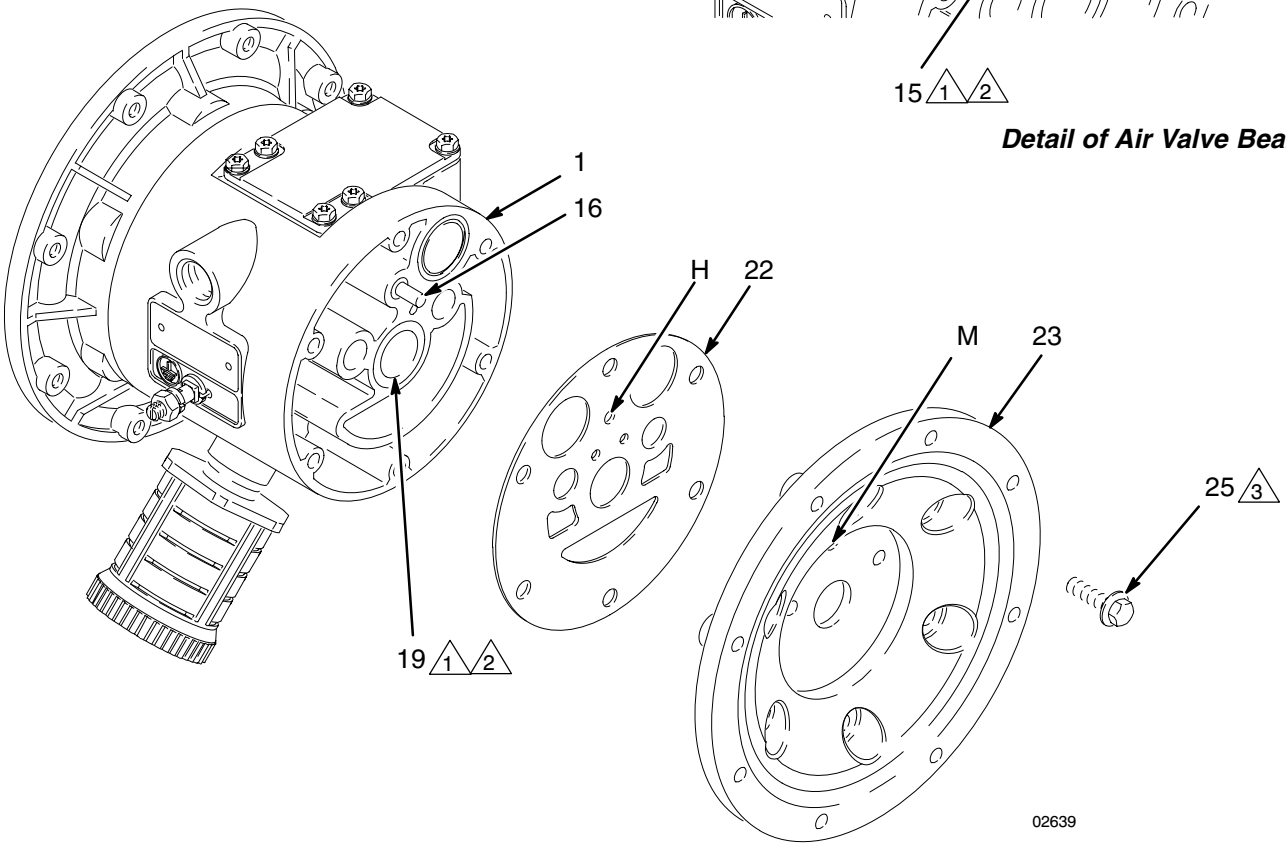
△1 Insert bearings tapered end first.

△2 Press-fit bearings flush with surface of center housing (1).

△3 Apply medium-strength (blue) Loctite® or equivalent. Torque to 130 to 150 in-lb (14.7 to 16.9 N-m).

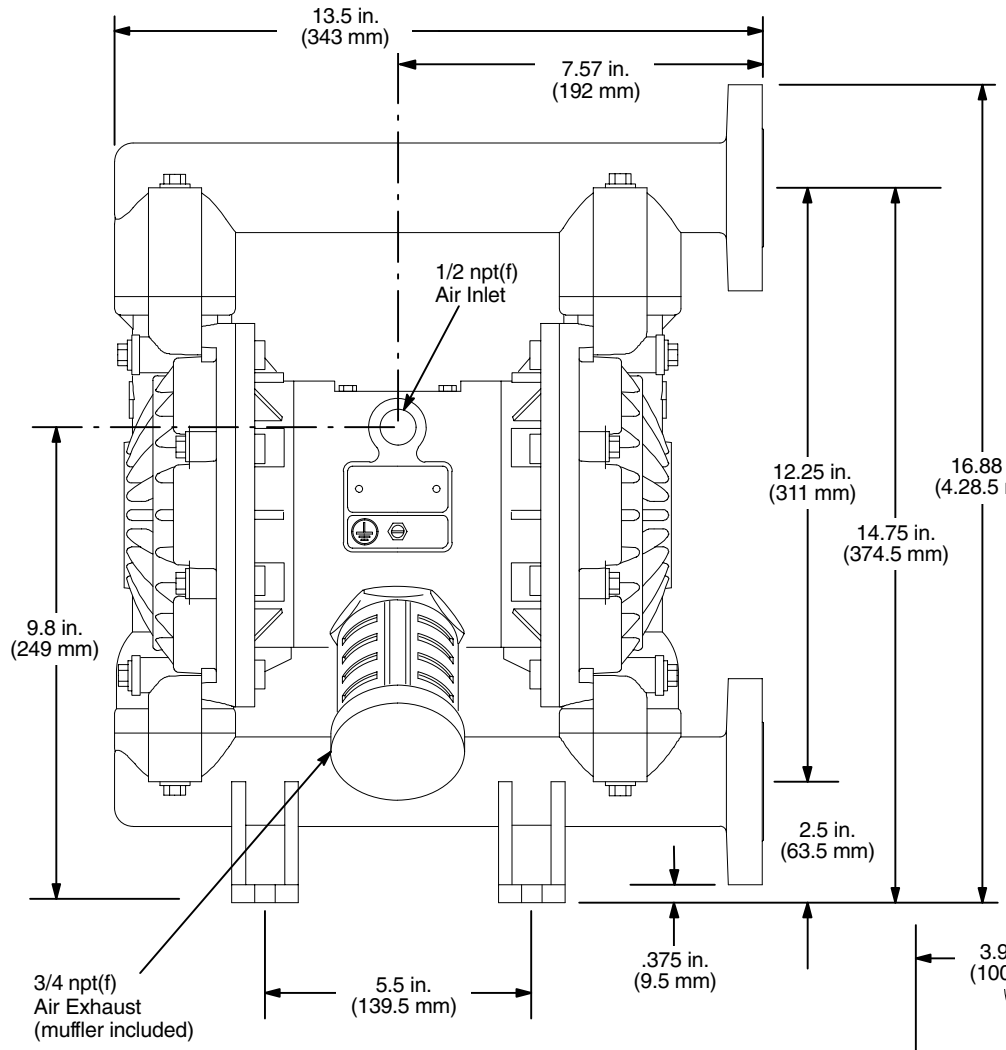


Detail of Air Valve Bearings

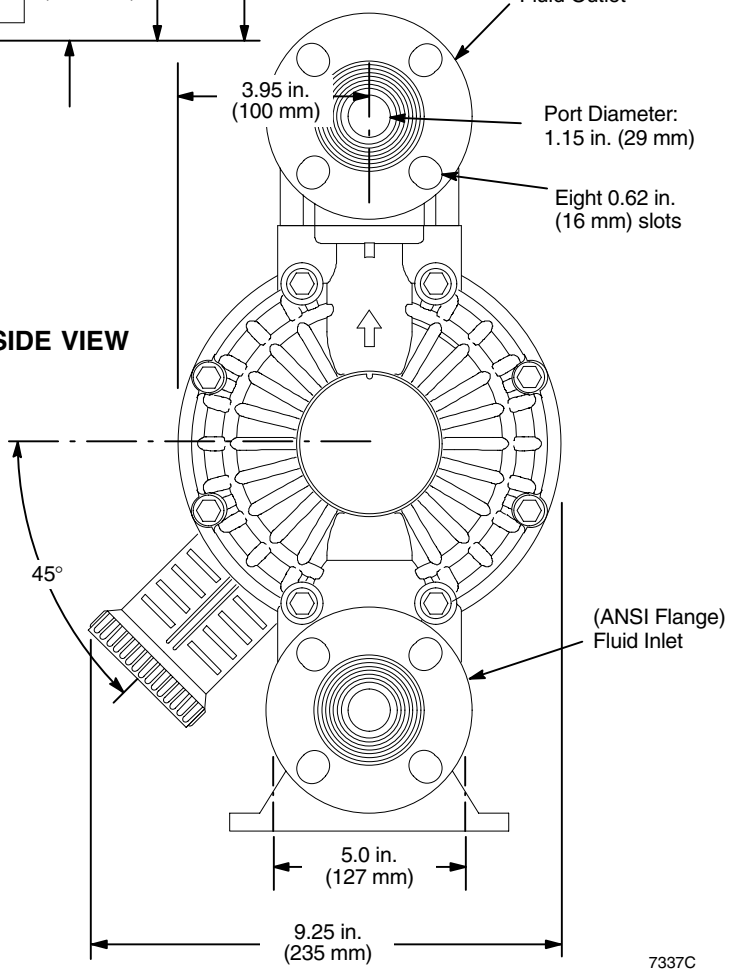


Dimensional Drawings

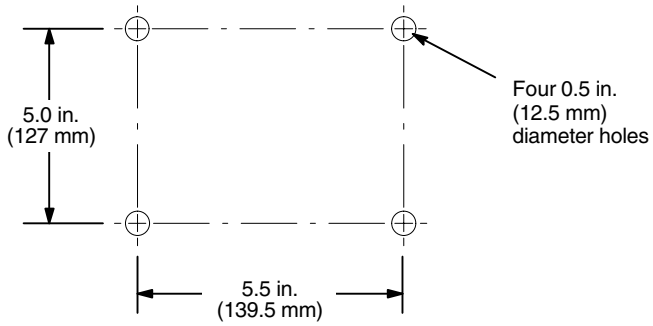
FRONT VIEW



SIDE VIEW



PUMP MOUNTING HOLE PATTERN



7337C

Technical Data

Maximum fluid working pressure . . . . . 120 psi (0.8 MPa, 8 bar)
Air pressure operating range . . . . . 20 to 120 psi (0.14 to 0.8 MPa, 1.4 to 8 bar)
Maximum air consumption . . . . . 60 scfm
Air consumption at 70 psi/20 gpm . . . . . 20 scfm (see chart)
Maximum free-flow delivery . . . . . 42 gpm (159 l/min)
Maximum pump speed . . . . . 276 cpm
Gallons (Liters) per cycle 0.15 (0.57)
Maximum suction lift . . . . . 18 ft (5.48 m) wet or dry
Maximum Size pumpable solids . . . . . 1/8 in. (3.2 mm)
* Maximum noise level at 100 psi, 50 cpm . . . . . 89 dBa
Sound power level . . . . . 100 dBa
* Noise level at 70 psi, 50 cycles/min: . . . . . 78 dBa

Maximum operating temperature . . . . . 150_F (65.5_C)
Air inlet size . . . . . 1/2 npt(f)
Fluid inlet size. . . . . 1" Raised Face Flange
Fluid outlet size. . . . . 1" Raised Face Flange
Non-wetted external parts . . . . . aluminum, 302 stainless steel polyester (labels)
Weight (approximate) . . . . . *Polypropylene Models:* 19 lb (8.6 kg)

Teflon™, and Hytrel™ are registered trademarks of the DuPont Co.

Loctite™ is a registered trademark of the Loctite Corporation.

* Noise levels measured with the pump mounted on the floor. Sound power measured per ISO Standard 9216.

Performance Charts

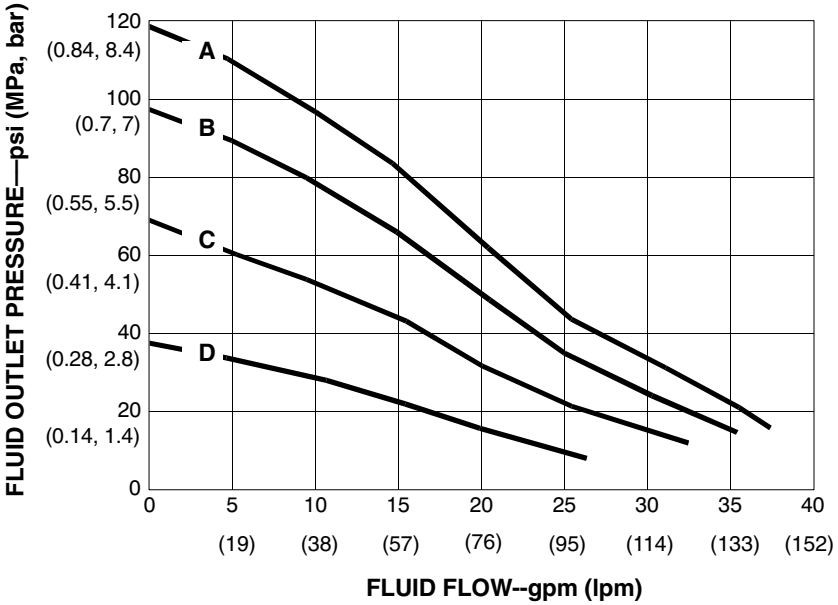
Test Conditions: Pump tested in water with inlet submerged.

Fluid Pressure Curves

- **A** at 120 psi (0.7 MPa, 7 bar) air pressure
- **B** at 100 psi (0.7 MPa, 7 bar) air pressure
- **C** at 70 psi (0.48 MPa, 4.8 bar) air pressure
- **D** at 40 psi (0.28 MPa, 2.8 bar) air pressure

To find Fluid Outlet Pressure (psi/MPa/bar) at a specific fluid flow (gpm/lpm) and operating air pressure (psi/MPa/bar):

1. Locate fluid flow rate along bottom of chart.
2. Follow vertical line up to intersection with selected fluid outlet pressure curve.
3. Follow left to scale to read fluid outlet pressure.

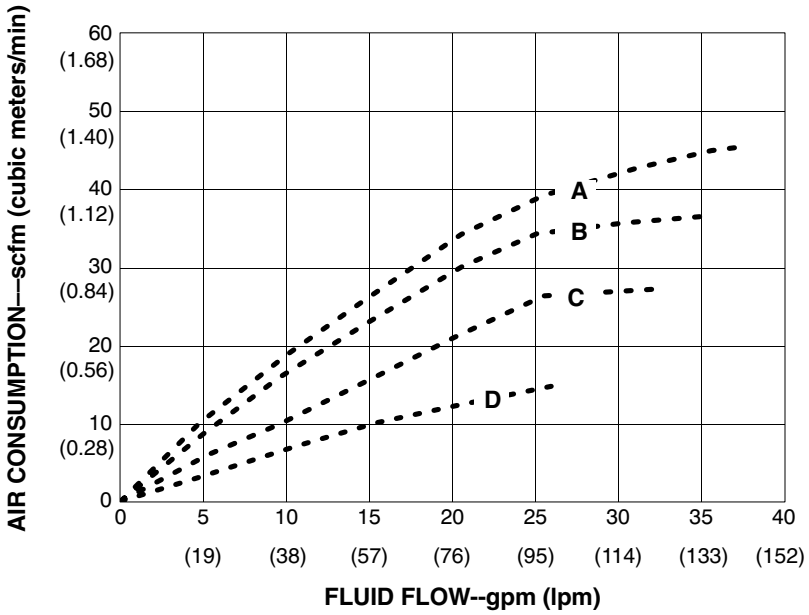


Air Consumption Curves

- **A** at 120 psi (0.7 MPa, 7 bar) air pressure
- **B** at 100 psi (0.7 MPa, 7 bar) air pressure
- **C** at 70 psi (0.48 MPa, 4.8 bar) air pressure
- **D** at 40 psi (0.28 MPa, 2.8 bar) air pressure

To find Pump Air Consumption (scfm or m^3/min) at a specific fluid flow (gpm/lpm) and air pressure (psi/MPa/bar):

1. Locate fluid flow rate along bottom of chart.
2. Read vertical line up to intersection with selected air consumption curve.
3. Follow left to scale to read air consumption.



WARRANTY

Graymills Corporation warrants that the equipment manufactured and delivered, when properly installed and maintained , shall be free from defects in workmanship and will function as quoted in the published specification. **Graymills** does not warrant process performance, nor assume any liability for equipment selection, adaptation, or installation.

Warranty does not apply to damages or defects caused by shipping, operator carelessness, mis–use, improper application or installation, abnormal use, use of add–on parts or equipment which damages or impairs the proper function of the unit and modifications made to the unit. Warranty does not apply to expendable parts needing replacement periodically due to normal wear and tear.

A new Warranty period shall not be established for repaired or replaced materials or products. Such items shall remain under Warranty for only the remainder of the Warranty period of the original materials or product.

THE FOREGOING WARRANTIES ARE IN LIEU OF ALL OTHER WARRANTIES, WHETHER ORAL, WRITTEN, EXPRESSED, IMPLIED OR STATUTORY. **GRAYMILLS CORPORATION** MAKES NO OTHER WARRANTY OF ANY KIND EXPRESS OR IMPLIED. ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE WHICH EXCEED THE A FORESTATED OBLIGATION ARE HEREBY DISCLAIMED BY **GRAYMILLS CORPORATION** AND EXCLUDED FROM THIS SALE. **Graymills** warranty obligations and Buyer remedies (except to title) are solely and exclusively stated herein. In no case will **Graymills** be liable for consequential damages, loss of production, or any other loss incurred due to interruption of service.

Graymills' obligation under this Warranty shall be limited to:

a) Repairing or replacing (at **Graymills** sole discretion) any non–conforming or defective component within one year from the date of shipment from **Graymills**.

b) Repairing or replacing (at **Graymills** sole discretion), components supplied by, but not manufactured by **Graymills**, to the extent of the warranty given by the original manufacturer.

Buyer must give **Graymills** prompt notice of any defect or failure.

If you believe that you have a Warranty claim, contact **Graymills** at (773)248–6825. Any return material must have an RMA number on the outside of the package and must be shipped prepaid or shipment will be refused. **Graymills** will promptly examine the material and determine if it is defective and within the Warranty period.

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