795–90653
GM 2–01

Graymills

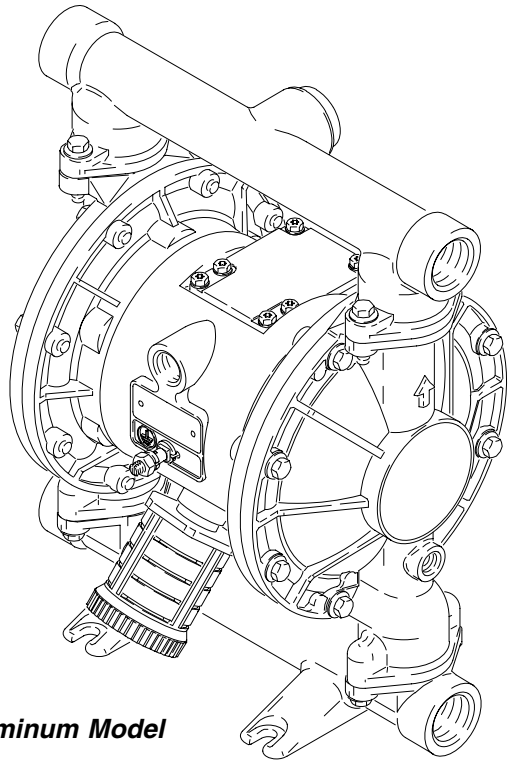
ALUMINUM

Air-Operated Double Diaphragm Pumps 1” Model

Operations and Maintenance Instructions

WARNING/CAUTIONS
Read all these SAFETY INSTRUCTIONS BEFORE installing or using this equip–ment. Keep this manual handy for refer–ence/training.

US and Foreign Patents Pending



1” Aluminum Model

02632

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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

HAZARDOUS FLUIDS

Improper handling of hazardous fluids or inhaling toxic vapors can cause extremely serious injury or death from splashing in the eyes, ingestion, or bodily contamination. Observe all the following precautions when you handle hazardous or potentially hazardous fluids.

- Know what fluid you are pumping and its specific hazards. Take precautions to avoid a toxic fluid spill.
- Always wear appropriate clothing and equipment, such as eye protection and breathing apparatus, to protect yourself.
- Store hazardous fluid in an appropriate, approved container. Dispose of it according to all Local, State, and Federal guidelines for hazardous fluids.
- Secure the fluid outlet hose tightly into the receiving container to prevent it from coming loose and improperly draining the fluid.
- Pipe and dispose of the exhaust air safely, away from people, animals, and food handling areas. If the diaphragm fails, the fluid is exhausted along with the air. See **Air Exhaust Ventilation** on page 10.
- Use static wire hoses when pumping flammables.
- Keep containers closed when not in use.

⚠ WARNING

EQUIPMENT MISUSE HAZARD

Any misuse of the equipment or accessories, such as overpressurizing, modifying parts, using incompatible chemicals and fluids, or using worn or damaged parts, can cause them to rupture and result in splashing in the eyes or on the skin, other serious injury, or fire, explosion or property damage.

- This equipment is for professional use only. Observe all warnings. Read and understand all instruction manuals, warning labels, and tags before you operate this equipment. If you are not sure, or if you have questions about installation or operation, call Graymills Corporation.
- Never alter or modify any part of this equipment; doing so could cause it to malfunction.
- Check all equipment regularly and repair or replace worn or damaged parts immediately.
- Never exceed the recommended working pressure or the maximum air inlet pressure stated on your pump or in the **Technical Data** on page 24.
- 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.**
- Be sure that all fluids and solvents used are chemically compatible with the wetted parts shown in the **Technical Data** on page 24. Always read the manufacturer's literature before you use fluid or solvent in the pump.
- Never move or lift a pump under pressure. If dropped, the fluid section may rupture. Always follow the **Pressure Relief Procedure** on page 11 before you move or lift the pump.

FIRE AND EXPLOSION HAZARD

Static electricity is created by the flow of fluid through the pump and hose. If the equipment is not properly grounded, sparking may occur. Sparks can ignite fumes from solvents and the fluid being pumped, dust particles, and other flammable substances, whether you are pumping indoors or outdoors, and can cause a fire or explosion and serious injury and property damage.

- To reduce the risk of static sparking, ground the pump and all other equipment used or located in the work area. Check your local electrical code for detailed grounding instructions for your area and type of equipment. See **Grounding** on page 5.
- If you experience any static sparking or even a slight shock while using this equipment, **stop pumping immediately.** Check the entire system for proper grounding. Do not use the system again until you have identified and corrected the problem.
- 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.
- Do not smoke in the work area. Do not operate the equipment near a source of ignition or an open flame, such as a pilot light.

⚠ SAFETY PRECAUTIONS

CAUTION

- Verify the chemical compatibility of the pump wetted parts and the substance being pumped, flushed or recirculated. Chemical compatibility may change with temperature and concentration of the chemical(s) within the substance being pumped, flushed or recirculated.
- The pump should not be used for the structural support of the piping system. Be certain system components are properly supported to prevent stress on the pump parts.
- Do not allow pump to operate dry for long periods of time; this may cause unnecessary wear or damage to the pump.
- Maximum temperature limits are based upon mechanical stress only. Certain chemicals will significantly reduce maximum safe operating temperatures. Consult Graymills for chemical compatibility and temperature limits.

United States Government safety standards have been adopted under the Occupational Safety and Health Act. You should consult these standards—particularly the General Standards, Part 1910, and the Construction Standards, Part 1926.

Installation

General Information

- The Typical Installations shown in Figs. 2–4 are only guides 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 list.

⚠ 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.

1. Read **HAZARDOUS FLUIDS** on page 2.
2. 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.

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

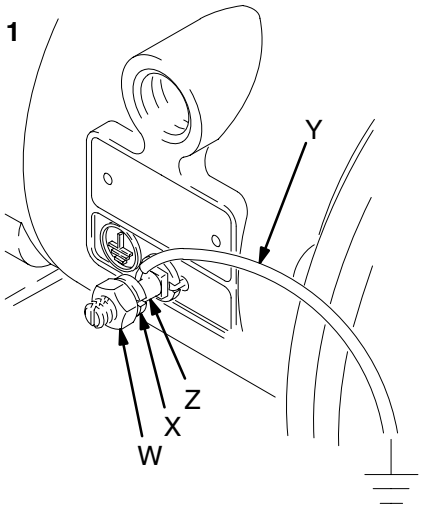
⚠ WARNING

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.

To reduce the risk of static sparking, ground the pump and all other equipment used or located in the pumping area. Check your local electrical code for detailed grounding instructions for your area and type of equipment. ***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



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- *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 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.

Installation

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.

- Be sure the mounting surface can support the weight of the pump, hoses, and accessories, as well as the stress caused during operation.
- For all mountings, be sure the pump is bolted directly to the mounting surface.
- 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.

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. 3.

1. Install the air line accessories as shown in Figs. 2–4 on pages 8 and 9. 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** above. 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. 5. Use a minimum 3/8” (9.5 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.

Installation of Remote Pilot Air Lines

1. Connect air line to pump as in preceding steps.
2. Connect 1/4 in. O.D. tubing to push type connectors (14) on air motor of pump.

NOTE: by replacing the push type connectors, other sizes or types of fittings may be used. The new fittings will require 1/8 in. npt threads.

NOTE: the air pressure at the connectors must be at least 30% of the air pressure to the air motor for the pump to operate.

Fluid Suction Line

1. Use grounded fluid hoses. The pump fluid inlet (R) is 1” npt(f). See Fig. 5. Screw the fluid fitting into the pump inlet securely.
2. 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.
3. At inlet fluid pressures greater than 15 psi (0.1 MPa, 1 bar), diaphragm life will be shortened.
4. See the **Technical Data** on page 24 for maximum suction lift (wet and dry).

Installation

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. 3.

1. Use grounded fluid hoses (L). The pump fluid outlet (S) is 1” npt(f). See Fig. 5. Screw the fluid fitting into the pump outlet securely.

2. Install a fluid drain valve (J) near the fluid outlet. See the **WARNING** at left, and Figs. 2–4 on pages 8 and 9.

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

Installation

Figure 2

KEY FOR FIG. 2

- 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
- G Fluid suction line
- H Bung adapter
- J Fluid drain valve (required)
- K Fluid shutoff valve
- L Fluid line
- Y Ground wire (required; see page 5 for installation instructions)

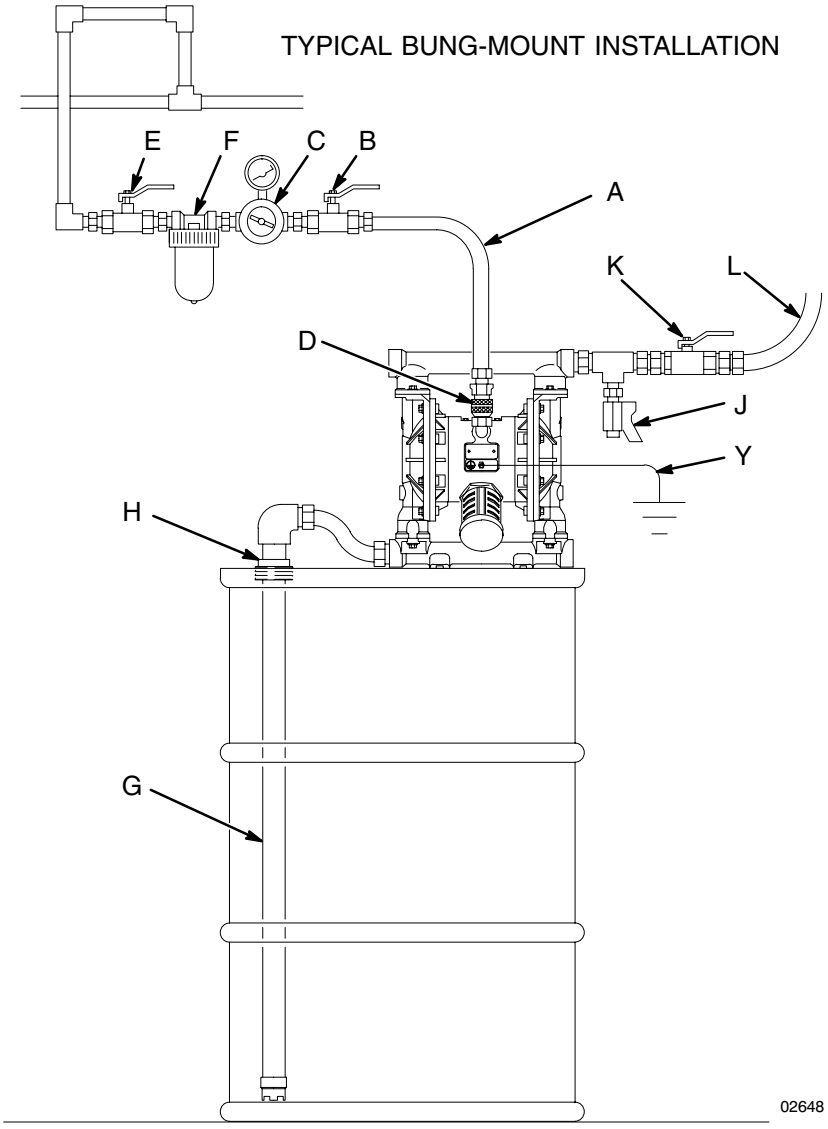
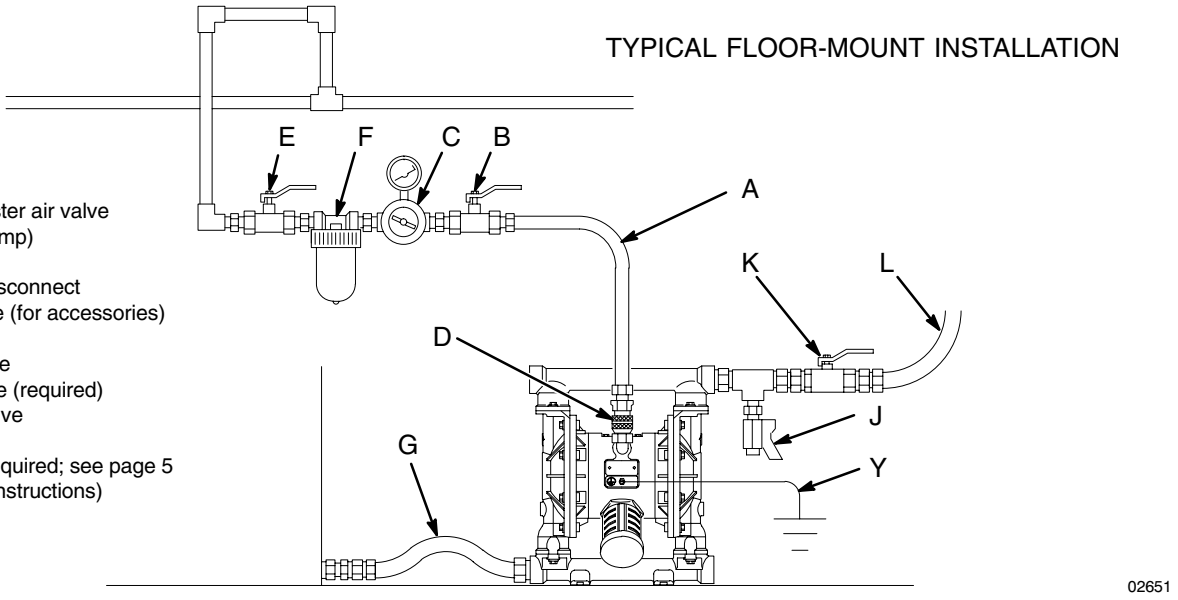


Figure 3

KEY FOR FIG. 3

- 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
- G Fluid suction line
- J Fluid drain valve (required)
- K Fluid shutoff valve
- L Fluid line
- Y Ground wire (required; see page 5 for installation instructions)

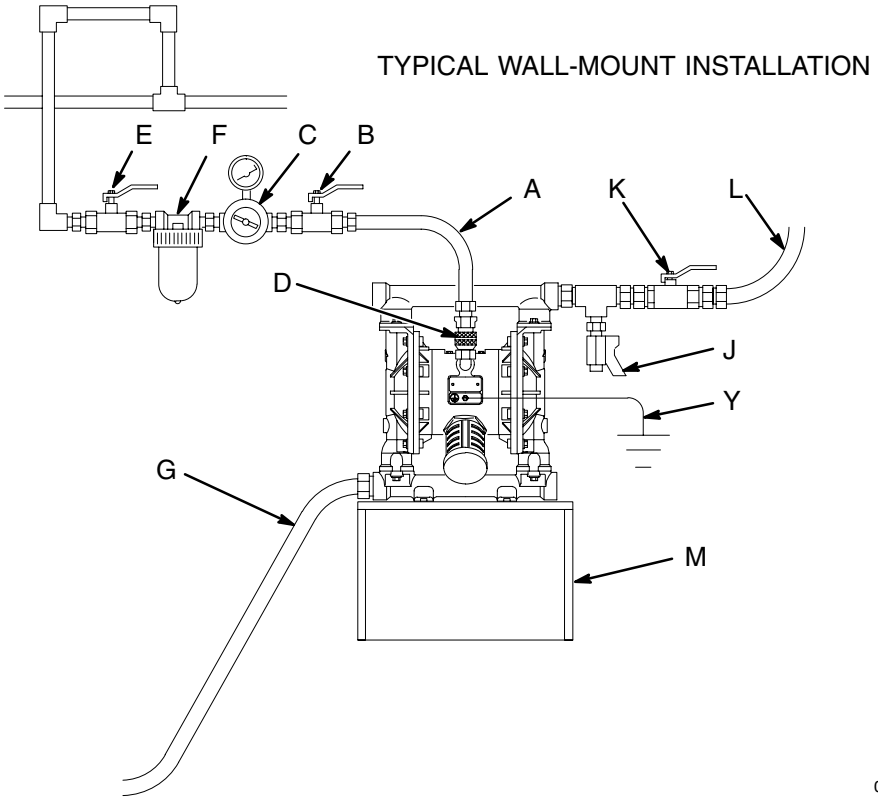


Installation

Figure 4

KEY FOR FIG. 4

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
G Fluid suction line
J Fluid drain valve (required)
K Fluid shutoff valve
L Fluid line
M Wall mounting bracket
Y Ground wire (required; see page 5 for installation instructions)



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Changing the Orientation of the Fluid Inlet and Outlet Ports

On aluminum pumps, the fluid inlet and outlet manifolds have threaded ports on both ends. The pump is shipped with a plug installed in one end of each manifold, and the opposite end open. See Fig. 5. To change the orientation of the inlet and/or outlet port, remove the plug from one end of a manifold and install it in the opposite end.

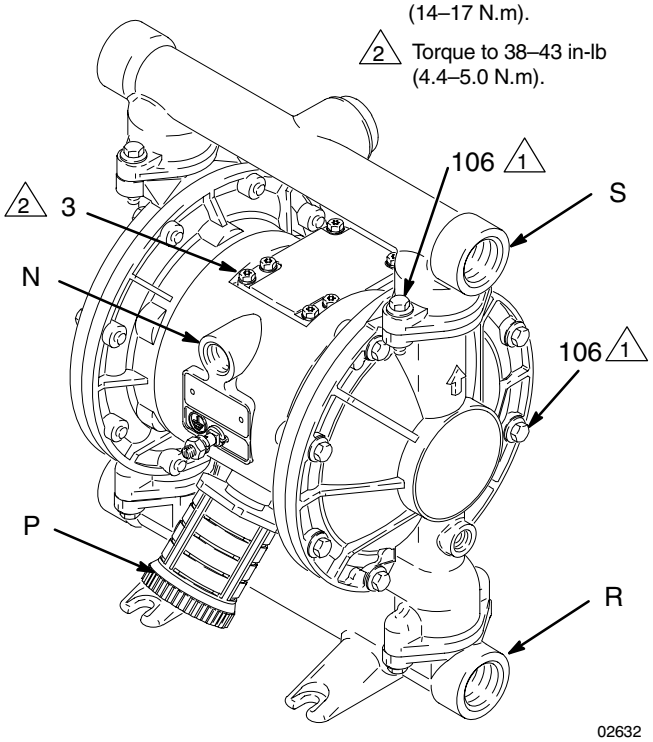
Figure 5

KEY

N 1/2 npt(f) air inlet port
P Muffler. Air exhaust port is 3/4 npt(f)
R 1 npt(f) fluid inlet port
S 1 npt(f) fluid outlet port
106 Manifold and cover screws
3 Air valve screws

1 Apply medium-strength (blue) Loctite® or equivalent to the threads, and torque to 120–150 in-lb (14–17 N.m).

2 Torque to 38–43 in-lb (4.4–5.0 N.m).



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Installation

Air Exhaust Ventilation

⚠ WARNING

FIRE AND EXPLOSION HAZARD
Be sure to read and follow the warnings and precautions regarding **HAZARDOUS FLUIDS,** and **FIRE OR EXPLOSION HAZARD** on pages 2 and 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.

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.

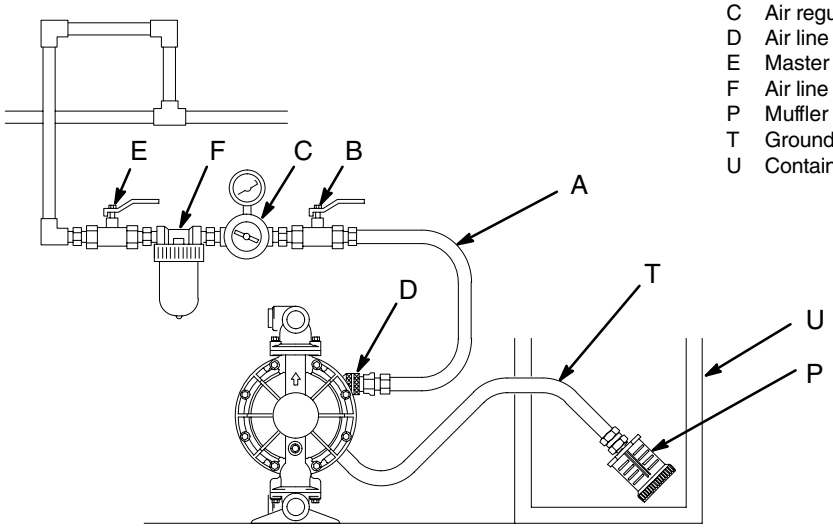
2. Install a grounded air exhaust hose (T) and connect the muffler (P) to the other end of the hose. The minimum size for the air exhaust hose is 3/4 in. (19 mm) ID. If a hose longer than 15 ft (4.57 m) is required, use a larger diameter hose. Avoid sharp bends or kinks in the hose.

3. Place a container (U) at the end of the air exhaust line to catch fluid in case a diaphragm ruptures. See Fig. 6.

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



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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 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

To reduce the risk of serious injury, splashing in the eyes or on the skin, and toxic fluid spills, **never** move or lift a pump under pressure. If dropped, the fluid section may rupture. Always follow the **Pressure Relief Procedure Warning** above before lifting the pump.

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

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

4. Place the end of fluid hose (L) into an appropriate container.
5. Close the fluid drain valve (J).
6. Back out the air regulator (C) knob, and 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 increase air pressure with 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 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 Procedure** at left.

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

⚠ WARNING

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

Flush the pump often enough to prevent the fluid you are pumping from drying or freezing in the pump and damaging it. Use a compatible solvent.

Always flush the pump and relieve the pressure before storing it for any length of time.

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.

- Relieve the pressure before checking or servicing the equipment.
- 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 page 15. 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.
	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 18–20.
	Restricted exhaust.	Remove restriction.
Air bubbles in fluid.	Suction line is loose.	Tighten.
	Diaphragm ruptured.	Replace. See pages 18–20.
	Loose inlet manifold (102), damaged seal between manifold and seat (201), damaged o-rings (202).	Tighten manifold bolts (106) or replace seats (201) or o-rings (202). See page 17.
	Loose diaphragm shaft bolt (107).	Tighten or replace (pages 18–20).
	Damaged o-ring (108).	Replace. See pages 18–20.

Troubleshooting

PROBLEM	CAUSE	SOLUTION
Fluid in exhaust air.	Diaphragm ruptured.	Replace. See pages 18–20.
	Loose diaphragm shaft bolt (107).	Tighten or replace (pages 18–20).
	Damaged o-ring (108).	Replace. See pages 18–20.
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 page 15.
	Worn shaft seals (402).	Replace. See pages 18–20.
Pump leaks air externally.	Air valve cover (2) or air valve cover screws (3) are loose.	Tighten screws. See page 15.
	Air valve gasket (4) or air cover gasket (22) is damaged.	Inspect; replace. See pages 15, 21–22.
	Air cover screws (25) are loose.	Tighten screws. See pages 21–22.
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 replace seats (201) or o-rings (202). See page 17.

Service

Repairing the Air Valve

Tools Required

- Torque wrench
- Torx screwdriver or 8 mm (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 (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 push pins. See Fig. 9.

5. Inspect the valve plate (8) in place. If damaged, use a torx screwdriver or 8 mm (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 15.

Reassembly

1. *If you replaced the bearings (12, 15),* reinstall 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 (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 (5/16”) socket wrench. Torque to 38–43 in-lb (4.3–4.9 N.m). See Fig. 7.

Figure 7

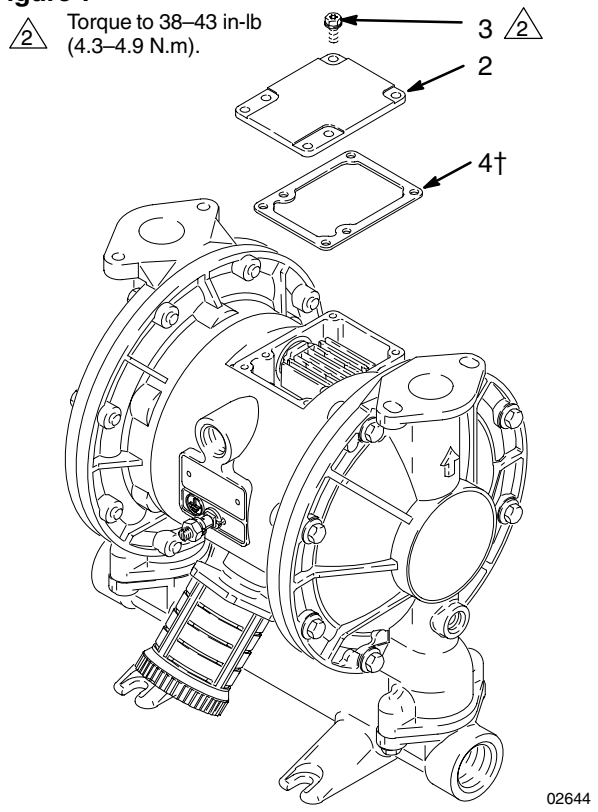


Figure 8

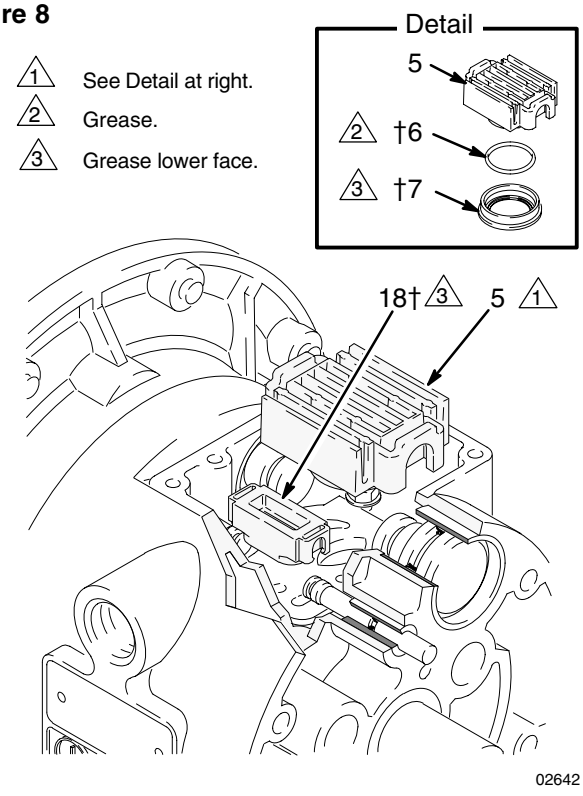


Figure 9

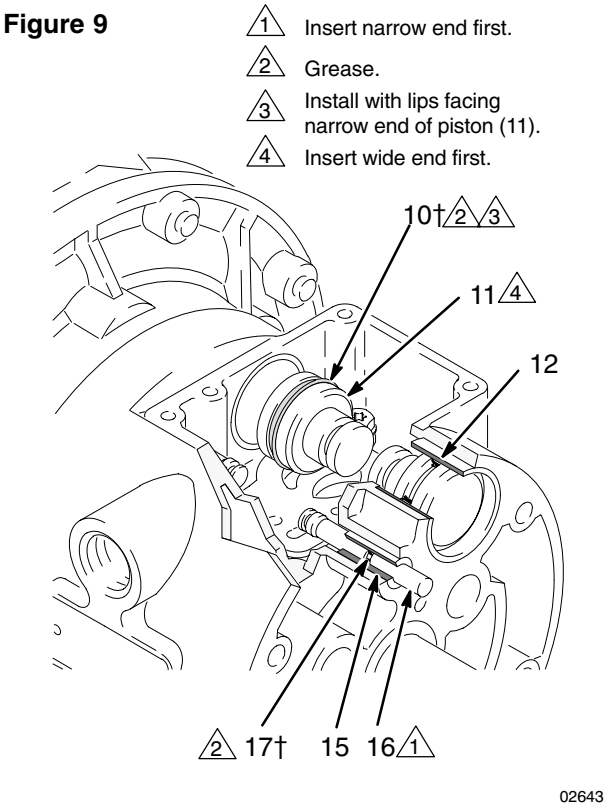
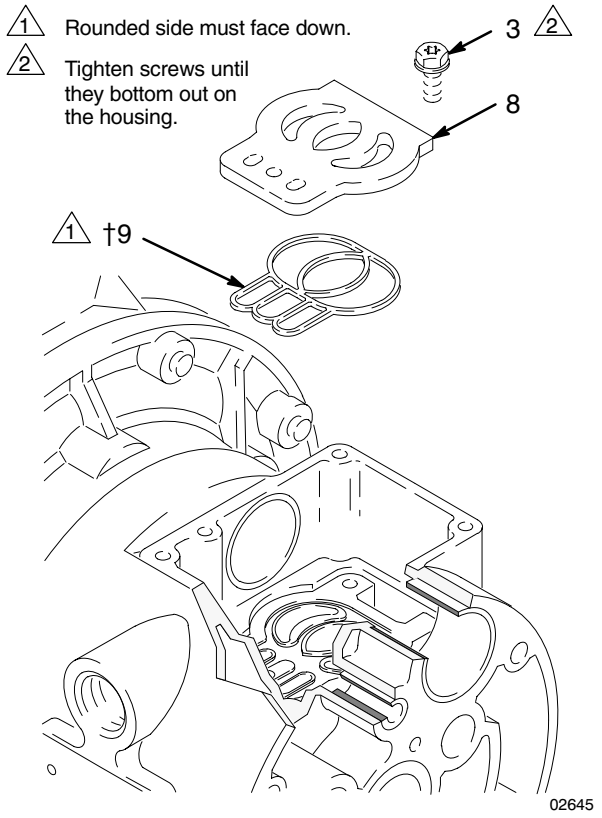


Figure 10



Service

Ball Check Valve Repair

Tools Required

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

Disassembly

NOTE: A Fluid Section Repair Kit is available. Use 784–90617 for Hytrel Diaphragm pumps and 784–90618 for Teflon Diaphragm pumps.

NOTE: To ensure proper seating of the balls (301), always replace the seats (201) when replacing the balls. Also replace the o-rings (202).

⚠ 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 o-rings (202), seats (201), and balls (301) from the manifold (103).
5. Turn the pump over and remove the inlet manifold (102). Remove the o-rings (202), seats (201), and balls (301) 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. Be sure the ball checks and manifolds are assembled **exactly** as shown. The arrows (A) on the fluid covers (101) **must** point toward the outlet manifold (103).

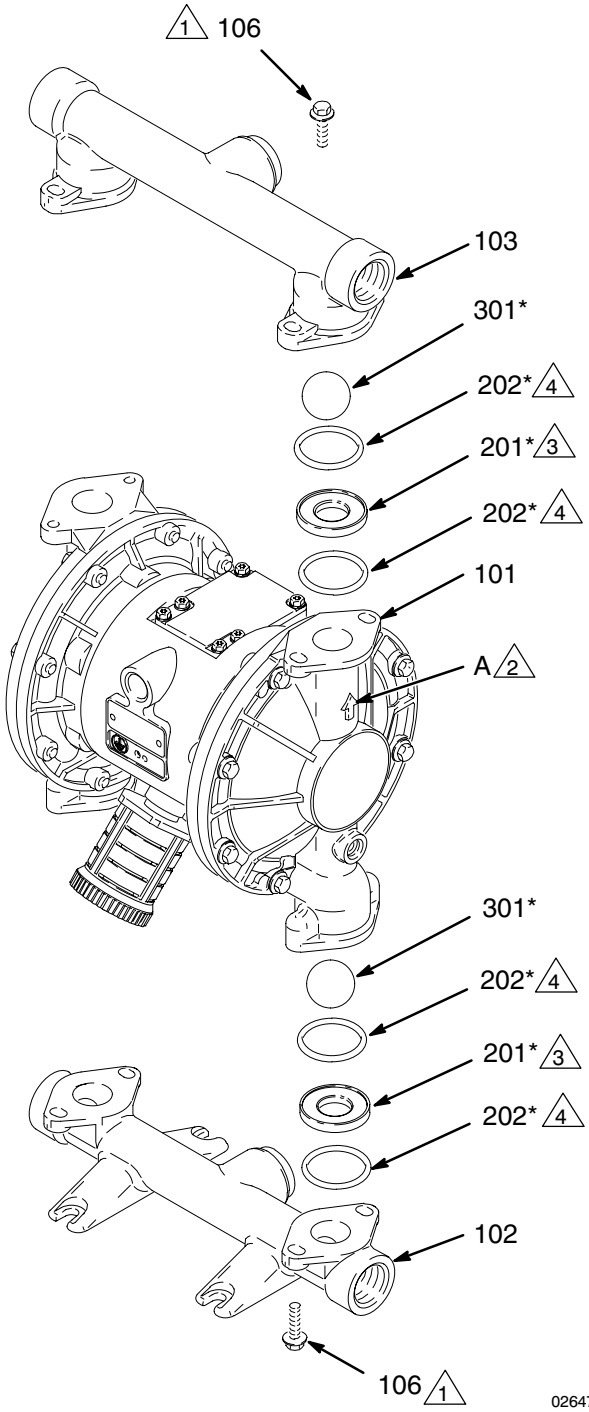
Figure 11

1 Apply medium-strength (blue) Loctite® or equivalent to the threads, and torque to 120–150 in-lb (14–17 N.m).

2 Arrow (A) must point toward outlet manifold (103).

3 Beveled seating surface must face the ball (301).

4 Not used on some models.



Service

Diaphragm Repair

Tools Required

- Torque wrench
- 10 mm socket wrench
- 15 mm socket wrench (aluminum models) or 1” socket wrench (stainless steel models)
- 19 mm socket wrench
- O-ring pick
- Lithium-base grease

Disassembly

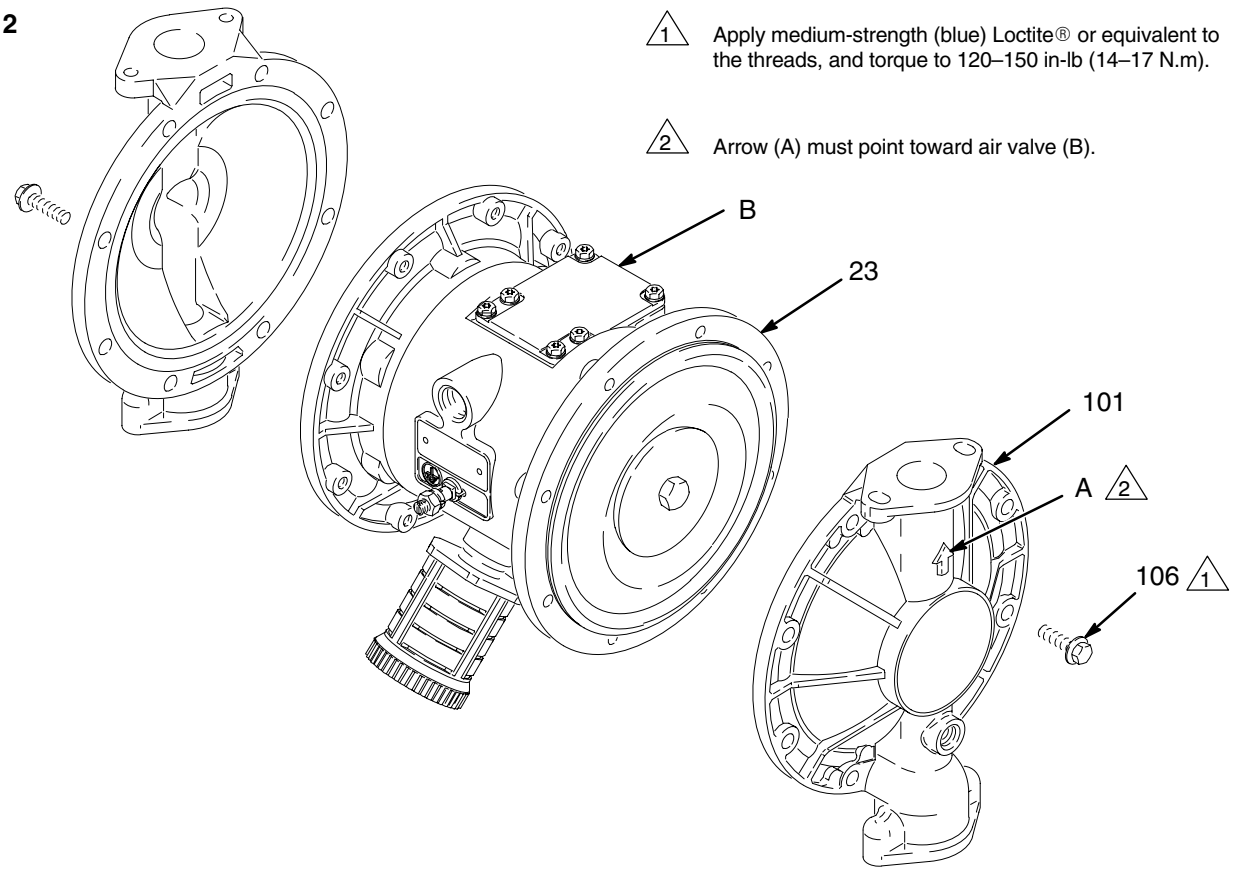
NOTE: A Fluid Section Repair Kit is available. Use 784–90617 for Hytrel pumps and 784–90618 for Teflon pumps.

⚠ 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) holding the fluid covers (101) to the air covers (23). Pull the fluid covers (101) off the pump. See Fig. 12.

Figure 12



4. Loosen but do not remove the diaphragm shaft bolts (107), using a 15 mm socket wrench (1" on stainless steel models) on both bolts.

5. Unscrew one bolt from the diaphragm shaft (24) and remove the o-ring (108), fluid side diaphragm plate (105), Teflon® diaphragm (403, *used on Teflon® models only*), diaphragm (401), and air side diaphragm plate (104). See Fig. 13.

6. 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 bolt (107) from the shaft. Disassemble the remaining diaphragm assembly.

7. 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.

8. 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.

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

Reassembly

1. Install the shaft u-cup packings (402*) so the lips face ***out*** of the housing (1). Lubricate the packings. See Fig. 13.

2. Install the diaphragm assembly on one end of the shaft (24) as follows:

   a. Install the o-ring (108*) on the shaft bolt (107).

   b. Install the fluid side diaphragm plate (105) on the bolt so the rounded side faces the diaphragm (401).

   c. *On Teflon® models only,* install the Teflon® diaphragm (403*). Make certain the side marked AIR SIDE faces the center housing (1).

   d. Install the diaphragm (401*) on the bolt. Make certain the side marked AIR SIDE faces the center housing (1).

   e. Install the air side diaphragm plate (104) so the rounded side faces the diaphragm (401). This plate is used on all models, and is stamped with its part number.

   f. Apply medium-strength (blue) Loctite® or equivalent to the bolt (107) threads. Screw the bolt into the shaft (24) hand tight.

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

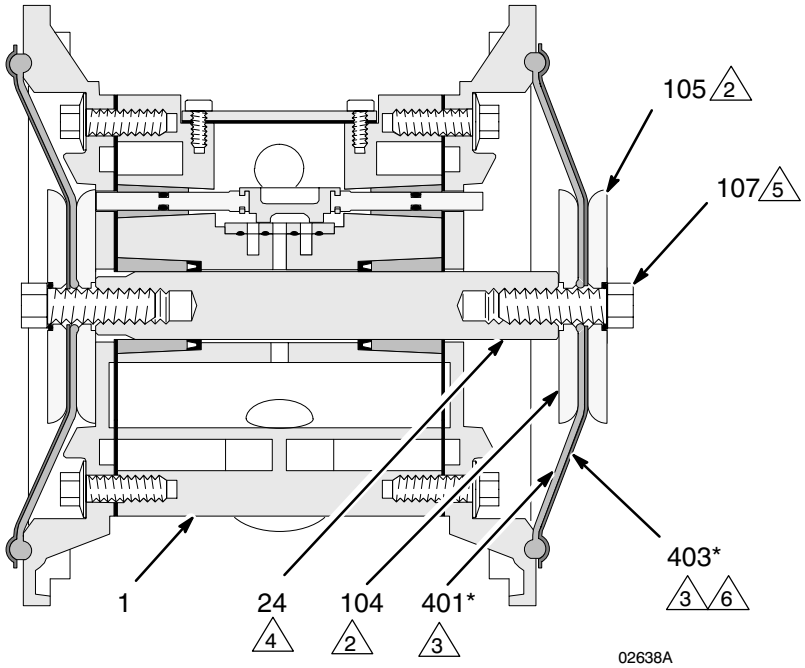
4. Assemble the other diaphragm assembly to the shaft as explained in step 2.

5. Hold one shaft bolt (107) with a wrench and torque the other bolt to 20–25 ft-lb (27–34 N.m) at 100 rpm maximum.

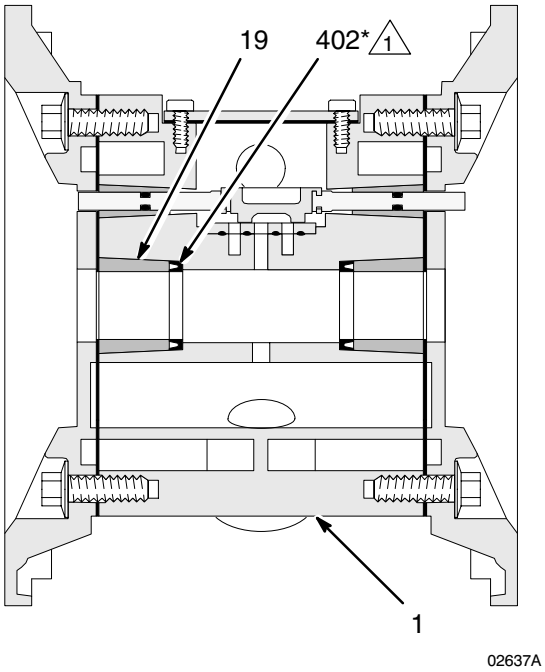
6. Align the fluid covers (101) and the center housing (1) so the arrows (A) on the covers face the same direction as the air valve (B). Apply medium-strength (blue) Loctite® or equivalent to the threads of the screws (106). Secure the covers with the screws handtight. See Fig. 12. Using a 10 mm socket wrench, torque the screws oppositely and evenly to 120–150 in-lb (14–17 N.m).

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

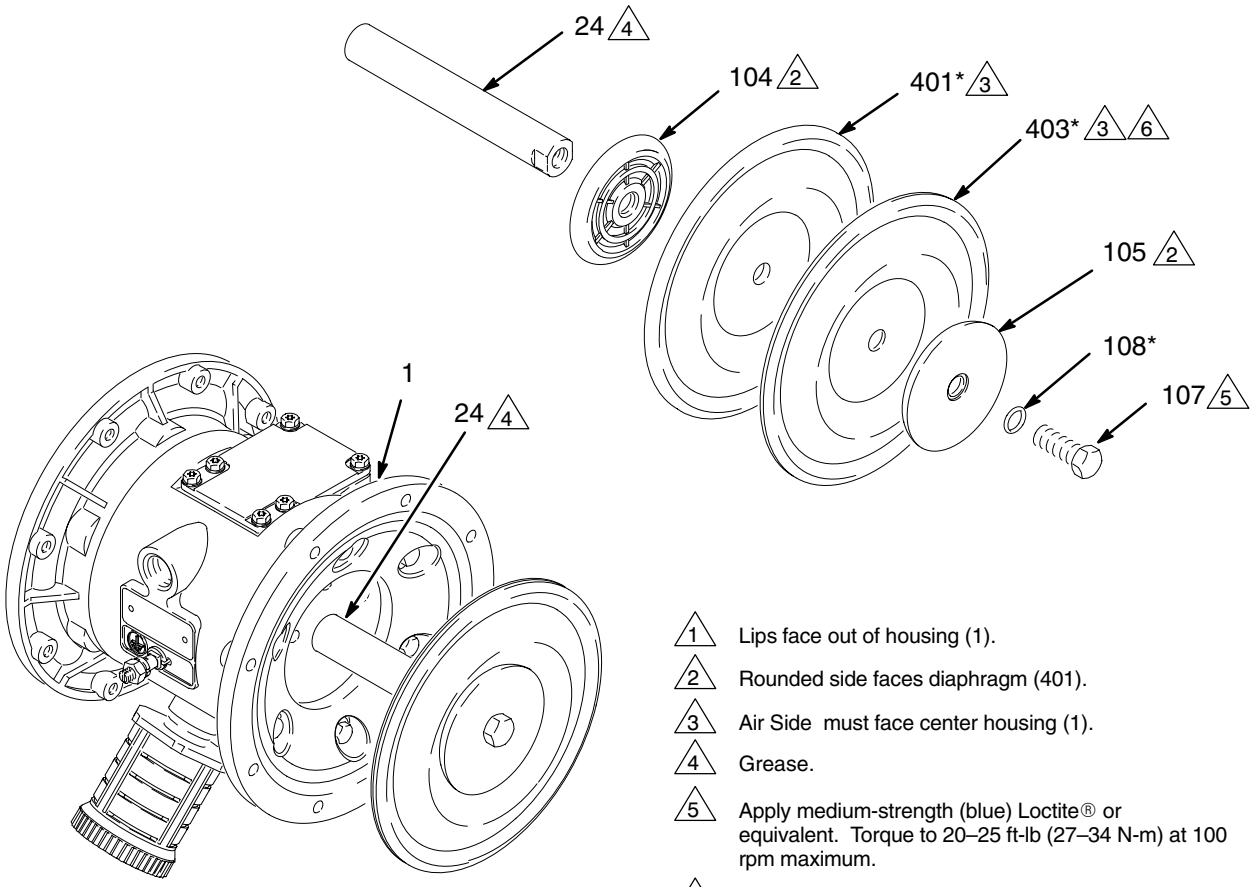
Figure 13



Cutaway View, with Diaphragms in Place



Cutaway View, with Diaphragms Removed



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 20–25 ft-lb (27–34 N-m) at 100 rpm maximum.
6. Used on pumps with Teflon® diaphragms only.

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Service

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.

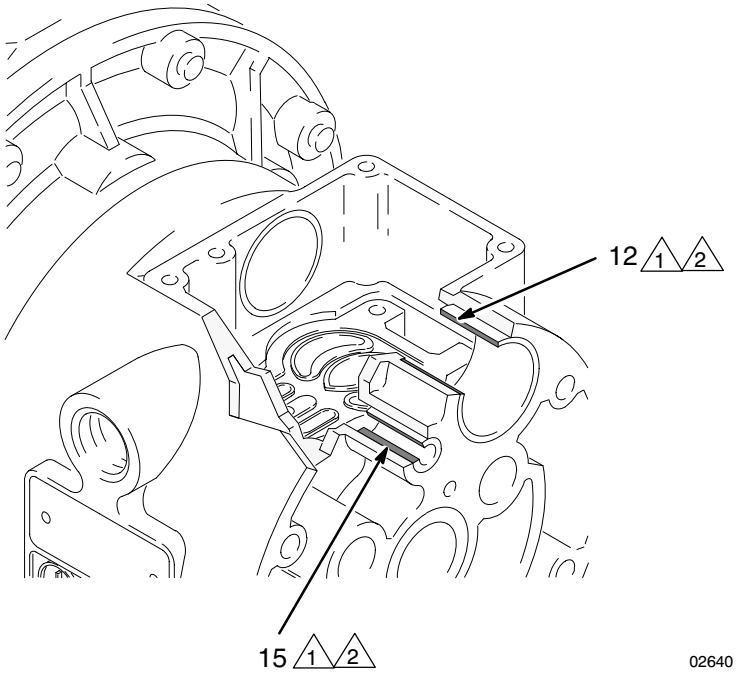
4. Disassemble the air valve as explained on page 15.
5. Using a 10 mm socket wrench, remove the screws (25) holding the air covers (23) to the center housing (1). See Fig. 14.
6. Remove the air cover gaskets (22). Always replace the gaskets with new ones.
7. Use a bearing puller to remove the diaphragm 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 (12, 15, and 19) 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 15.
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. Install the screws (25), handtight. Apply medium-strength (blue) Loctite® or equivalent to the threads of the screws (25). See Fig. 14. Using a 10 mm socket wrench, torque the screws oppositely and evenly to 130–150 in-lb (15–17 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.

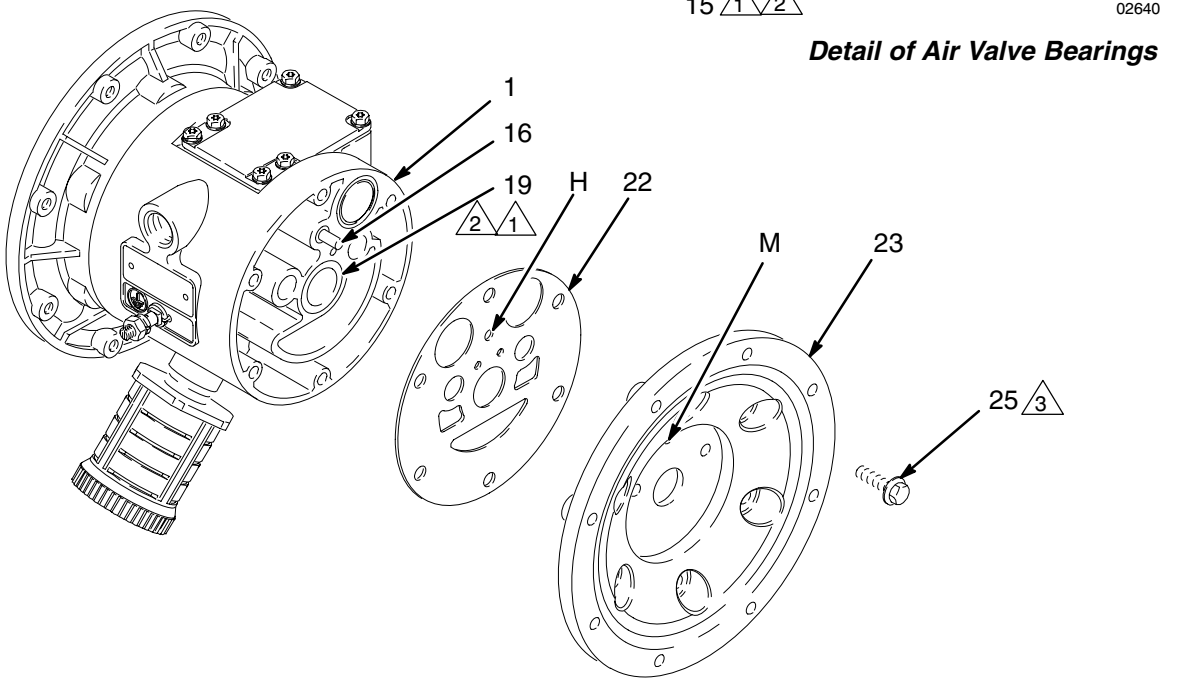
Service

Figure 14



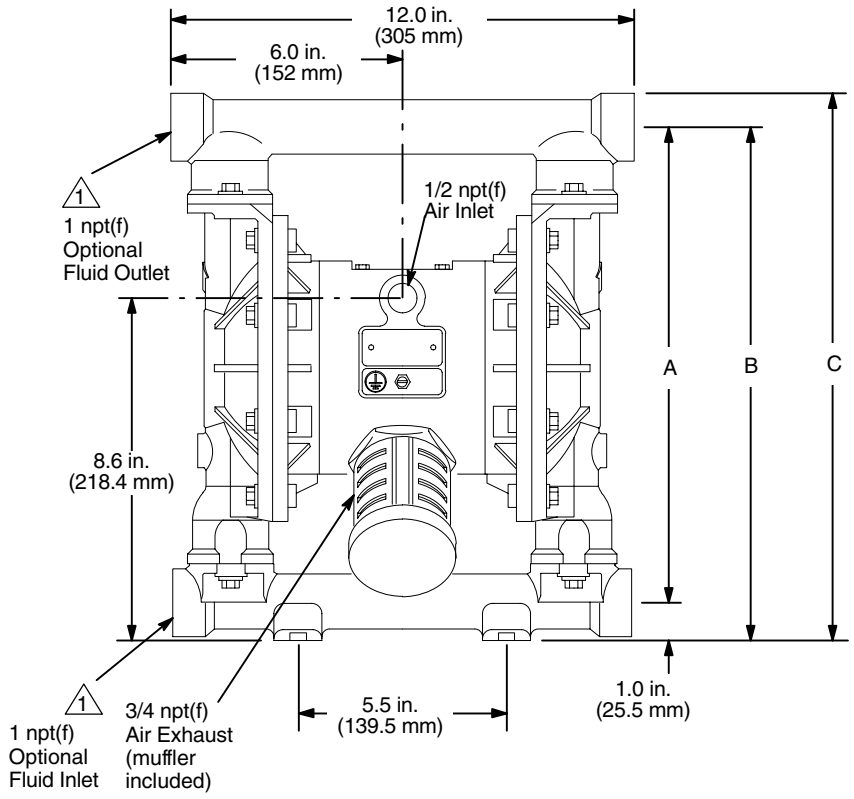
Detail of Air Valve Bearings

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 130–150 in-lb (15–17 N.m).



Dimensional Drawings

FRONT VIEW



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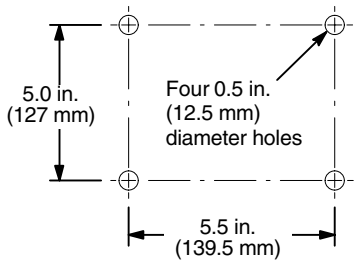
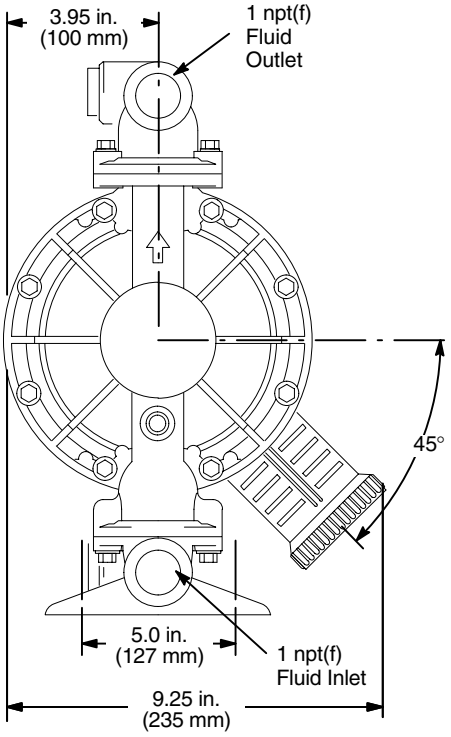
PUMP MOUNTING HOLE PATTERN

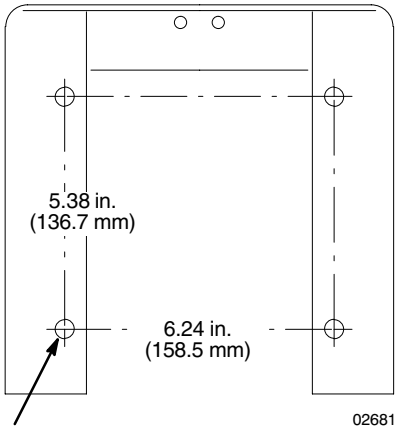


1 On aluminum pumps only.

SIDE VIEW



WALL BRACKET MOUNTING HOLE PATTERN (Viewed from Wall)



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Four 0.437 in. (11.1 mm)
diameter holes

Dim.	Alum. Pumps
A	12.58 in. (319.5 mm)
B	13.58 in. (345.0 mm)
C	14.48 in. (367.8 mm)

Technical Data

Maximum fluid working pressure	120 psi (0.8 MPa, 8 bar)
Air pressure operating range	20–120 psi (0.14–0.8 MPa, 1.4–8 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, full flow	89 dBa
* Sound Power Level	100 dBa
* Noise Level at 70 psi and 50 cpm	78 dBa
Maximum operating temperature	150°F (65.5°C); 200°F (93.3°C) for models with Teflon® diaphragms
Air inlet size	1/2 npt(f)
Fluid inlet size	1” npt(f)
Fluid outlet size	1” npt(f)
Wetted parts	Vary by Model.
Non-wetted external parts	aluminum, 302 stainless steel, polyester (labels)
Weight	
Aluminum pumps	18 lb (8.2 kg)

Teflon® and Hytrel® are registered trademarks of the DuPont Co.

Loctite® is a registered trademark of the Loctite Corporation.

Performance Chart

Test Conditions: Pump tested in water with inlet submerged.

Fluid Pressure Curves

A at 120 psi (0.7 MPa, 7 bar) air pressure

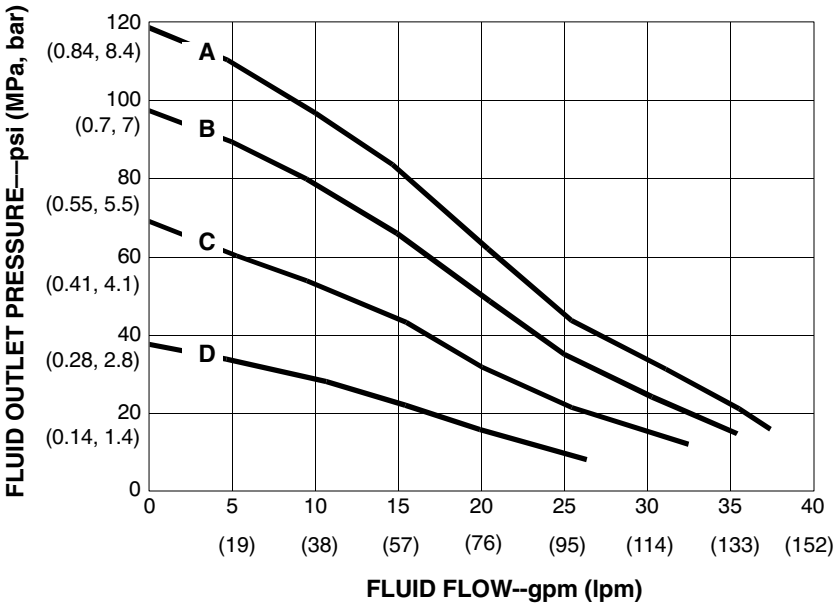
B at 100 psi (0.7 MPa, 7 bar) air pressure

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

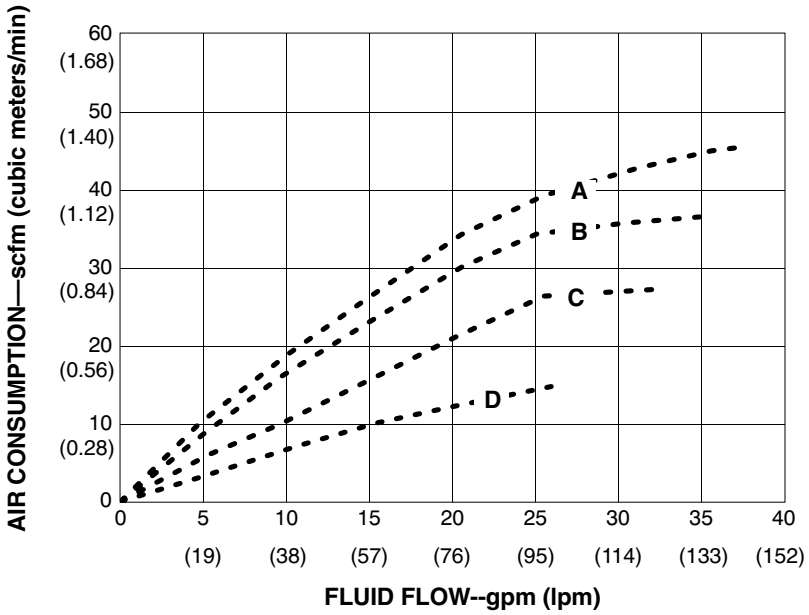
B at 100 psi (0.7 MPa, 7 bar) air pressure

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 m3/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.

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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.

Graymills Corporation 3705 N. Lincoln Avenue Chicago, Illinois 60613 773/248–6825 FAX 773/477–8673 www.graymills.com