

# Instructions – Parts List



## 6:1 Fire-Ball<sup>®</sup> 425 Pump 308608 rev.K

**For pumping non-corrosive and non-abrasive oils and lubricants only.**

**Model 238108, Series D**

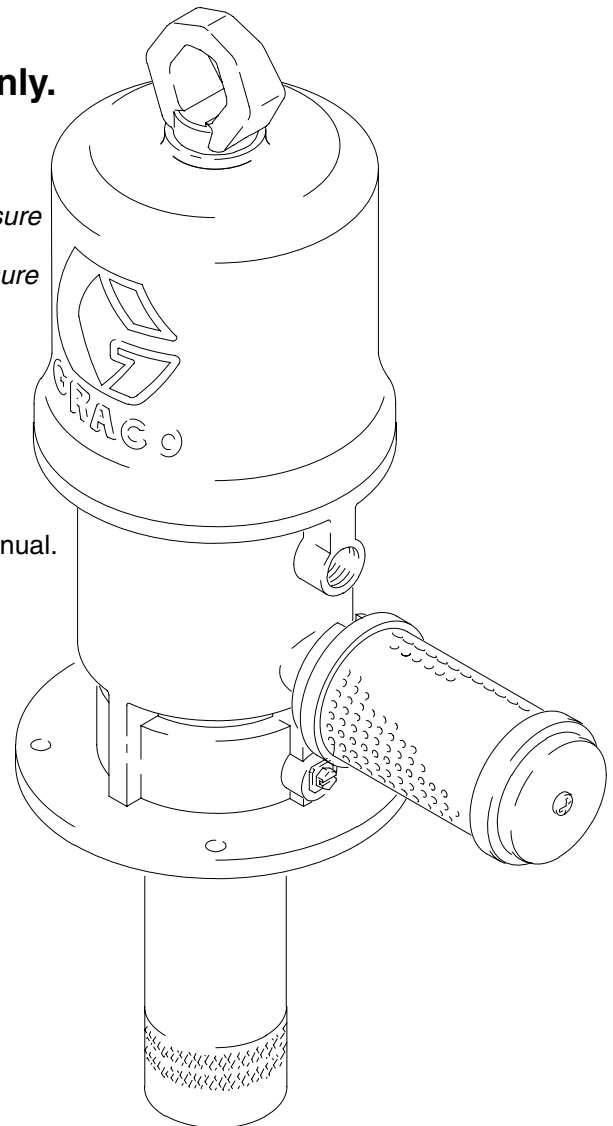
*1100 psi (7.6MPa, 76 bar) Maximum Working Pressure*

*180 psi (1.2 MPa, 12 bar) Maximum Air Input Pressure*



### **Important Safety instructions**

Read all warnings and instructions in this manual.  
Save these instructions.



06031

**PROVEN QUALITY. LEADING TECHNOLOGY.**

# Table of Contents

Warnings .....	2	Air Motor Parts Drawing .....	16
Installation .....	5	Air Motor Parts List .....	17
Operation .....	8	Mounting Hole Layout .....	18
Troubleshooting .....	9	Dimensions .....	18
Air Motor and Throat Service .....	10	Technical Data .....	18
Displacement Pump Service .....	14	Performance Charts .....	19
Displacement Pump Parts Drawing and List .....	15	Warranty .....	20

## Symbols

### Warning Symbol



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

### Caution Symbol



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

## 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 your Graco distributor.
- Do not alter or modify this equipment.
- Check equipment daily. Repair or replace worn or damaged parts immediately.
- Do not exceed the maximum working pressure stated on the equipment or in the **Technical Data** for your equipment. Do not exceed the maximum working pressure of the lowest rated component in your system.
- 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 1,1,1-trichloroethane, methylene chloride, other halogenated hydrocarbon solvents or fluids containing such solvents in pressurized aluminum equipment. Such use could result in a chemical reaction, with the possibility of explosion.
- Handle hoses carefully. Do not pull on hoses to move equipment.
- Route hoses away from traffic areas, sharp edges, moving parts, and hot surfaces. Do not expose Graco 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



### SKIN INJECTION HAZARD

Fluid from the dispensing valve, leaks or ruptured components can inject fluid into your body and cause extremely serious injury, including the need for amputation. Fluid splashed in the eyes or on the skin can also cause serious injury.

- Fluid injected into the skin may look like just a cut, but it is a serious injury. **Get immediate surgical treatment.**
- Do not point the dispensing valve at anyone or at any part of the body.
- Do not put your hand or fingers over the end of the dispensing valve.
- Do not stop or deflect leaks with your hand, body, glove or rag.
- Use only extensions and no-drip tips which are designed for use with your dispensing valve.
- Tighten all fluid connections before operating the equipment.
- Check the hoses, tubes, and couplings daily. Replace worn or damaged parts immediately. Do not repair high pressure couplings; you must replace the entire hose.



### HAZARDOUS FLUIDS

Improper handling of hazardous fluids or inhaling toxic fumes can cause extremely serious injury, even death, due to splashing in the eyes, ingestion, or bodily contamination.

- 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.
- Always wear protective eyewear, gloves, clothing and respirator as recommended by the fluid and solvent manufacturer.



## WARNING



### 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 7.
- If there is any static sparking or you feel an electric shock while using this equipment, **stop dispensing 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 dispensed.
- Do not smoke in the dispensing area.



### MOVING PARTS HAZARD

Moving parts can pinch or amputate your fingers.

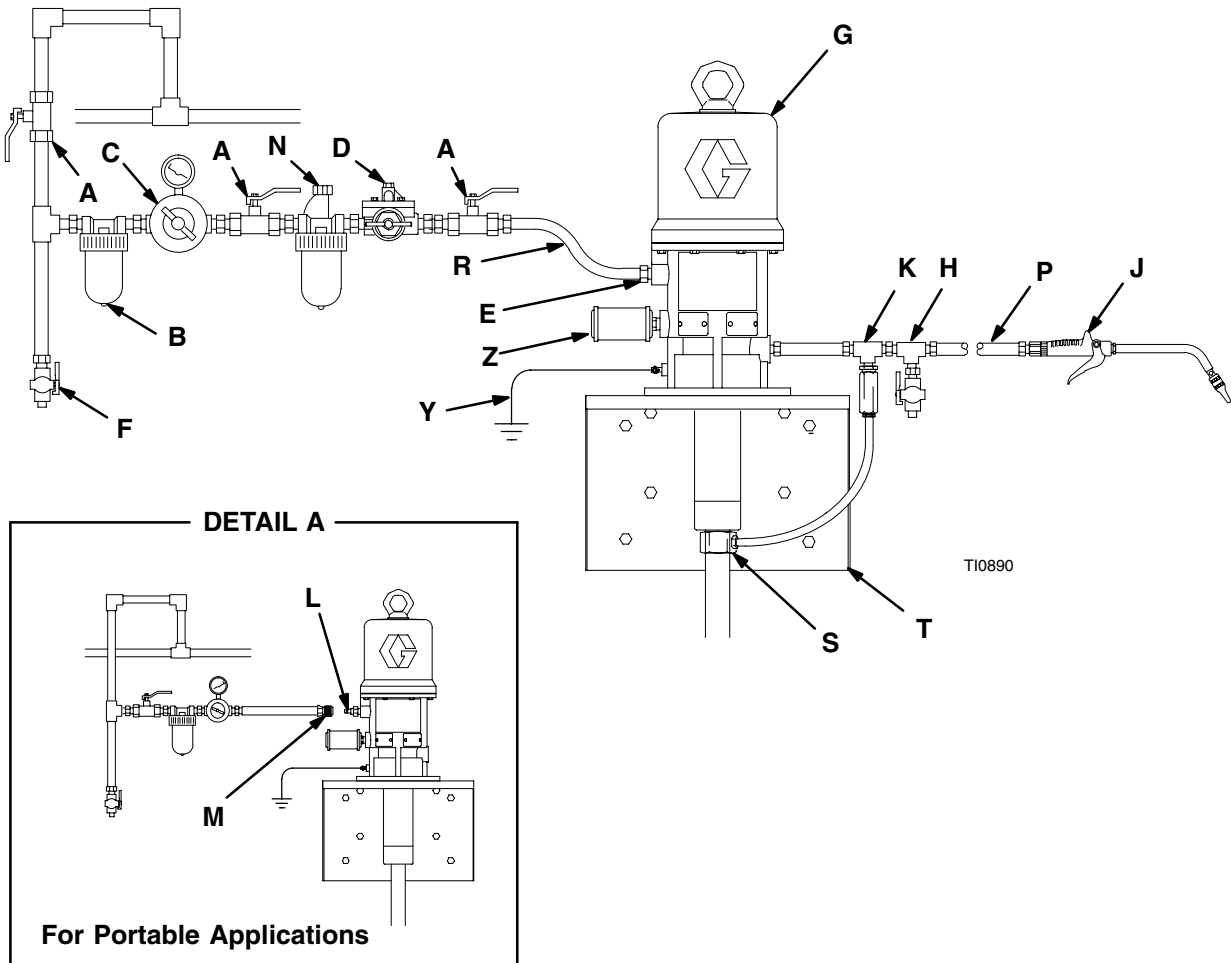
- Keep clear of all moving parts when starting or operating the pump.
- Before servicing the equipment, follow the **Pressure Relief Procedure** on page 8 to prevent the equipment from starting unexpectedly.

# Installation

The typical installation shown in Fig.1 is only a guide for selecting and installing a pump; it is not an actual system design. Contact your Graco representative or your Graco distributor for assistance in designing a system to suit your needs.

## ⚠ CAUTION

Always mount the pump firmly to a bracket or a tank cover. Never operate the pump while it is not mounted. Such use could damage the pump and fittings.



### KEY

- |  |  |
|--|--|
| <b>A</b> Bleed-type master air valve (required)  | <b>J</b> Dispensing valve (model 222411 shown)           |
| <b>B</b> Air line filter   | <b>K</b> Thermal relief kit (required), Part No. 240429  |
| <b>C</b> Air regulator and gauge   | <b>L</b> Male quick-disconnect fitting                   |
| <b>D</b> Pump runaway valve (shown for position) – not needed if you use a low level cut-off valve | <b>M</b> Female quick-disconnect coupler                 |
| <b>E</b> Air inlet   | <b>N</b> Air line lubricator                             |
| <b>F</b> Ball valve (for releasing collected moisture)   | <b>P</b> Fluid hose                                      |
| <b>G</b> Pump  | <b>R</b> Electrically conductive air hose (218093 shown) |
| <b>H</b> Drain valve (required)  | <b>S</b> Fluid inlet                                     |
|  | <b>T</b> Wall-mounting bracket                           |
|  | <b>Y</b> Ground wire (required)                          |
|  | <b>Z</b> Muffler   |

Fig. 1

05610

# Installation

## System Accessories

### CAUTION

Do not hang the air accessories directly on the air inlet (E). The fittings are not strong enough to support the accessories and may cause one or more to break. Provide a bracket on which to mount the accessories.

**NOTE:** Install the accessories in the order shown in Fig. 1.

### WARNING

Four accessories are **required** in your system: an air shut-off valve/air bleed device, fluid drain valve, thermal relief kit, and ground wire. These accessories help reduce the risk of serious bodily injury including fluid injection, splashing in the eyes or on the skin, injury from moving parts if you are adjusting or repairing the pump, and explosion from static sparking.

The air bleed device relieves air trapped between it and the air motor after the air supply is shut off. Trapped air can cause the air motor to cycle unexpectedly, causing serious bodily injury if you are adjusting or repairing the pump. Use either a bleed-type master air valve (A) or a quick-disconnect coupler (M) and fitting (L). Install near the pump air inlet, within easy reach of the pump.

The fluid drain valve (H) assists in relieving fluid pressure in the displacement pump, hoses and dispensing valve. Triggering the valve to relieve pressure may not be sufficient.

The thermal relief kit assists in relieving pressure in the pump, hose, and dispensing valve due to heat expansion.

The ground wire reduces the risk of static sparking.

1. Screw the muffler (5) into the 3/4-in. npt muffler port, and tighten it using a wrench on the flats of the muffler near the male threads.
2. Install an air line lubricator (N) for automatic air motor lubrication.
3. Install the air regulator (C) to control pump speed and pressure.
4. Install an air line filter (B) to remove harmful dirt and contaminants from your compressed air supply.
5. Install a bleed-type master air valve (A) to isolate the accessories for servicing. See Fig. 1. *To order a bleed-type master air valve, order Part No. 107142.*  
  
As an alternative to a bleed-type master air valve, you can install an air line quick disconnect coupler (M) and fitting (L) to serve as an air-bleed device. See Detail A in Fig. 1.
6. Install a drain valve (H) near the pump fluid outlet to relieve fluid pressure in the hoses and gun when opened. *To order a fluid drain valve, order Part No. 210658.*
7. Install a thermal relief kit (K) on the dispensing valve side of the pump. *To order a 1600 psi (110 bar, 11 MPa) thermal relief kit, order Part No. 240429.*
8. Install a suitable fluid hose (P) and dispensing valve (J).

### Cover Mount

For cover mounting, see the **Mounting Hole Layout** on page 18.

### Wall Mount

The pump shown in Fig. 1 is wall mounted. To order the wall-mounting bracket, order Part No. 238245.

# Installation

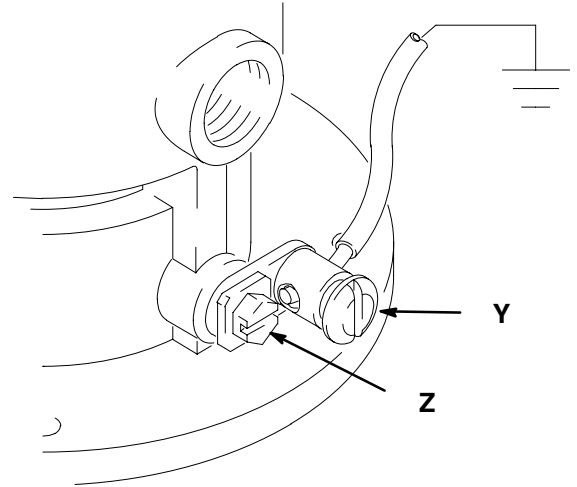
## Grounding

Proper grounding is an essential part of maintaining a safe system.

To reduce the risk of static sparking, ground the pump. Check your local electrical code for detailed grounding instructions for your area and type of equipment. Be sure to ground this equipment:

1. *Pump:* Use a ground wire and clamp as shown in Fig. 2.
2. *Air and Fluid hoses:* Use only electrically conductive hoses.
3. *Air compressor:* Follow manufacturer's recommendations.
4. *Fluid supply container:* Follow the local code.
5. *To maintain grounding continuity when flushing or relieving pressure,* always hold a metal part of the valve firmly to the side of a grounded metal pail, then trigger the valve.

**To ground the pump,** remove the ground screw (Z) and insert through the eye of the ring terminal at end of the ground wire (Y). Fasten the ground screw back onto the pump and tighten securely. Connect the other end of the ground wire to a true earth ground. See Fig. 2. *To order a ground wire and clamp, order Part No. 222011.*



**Fig. 2**

TI1052

# Operation

## Pressure Relief Procedure

### WARNING



#### SKIN INJECTION HAZARD

To reduce the risk of serious bodily injury, including fluid injection or splashing in the eyes or on the skin, always follow this procedure whenever you shut off the pump, when checking or servicing any part of the system, when installing or changing dispensing devices, and whenever you stop dispensing.

1. Close the bleed-type master air valve (required in your system).
2. Hold a metal part of the dispensing valve firmly to a grounded metal waste container and trigger the valve to relieve the fluid pressure, or open the drain valve (H).

*If you suspect that the dispensing valve or hose is completely clogged, or that pressure has not been fully relieved after following the steps above, very slowly loosen the hose end coupling and relieve pressure gradually, then loosen completely, then clear the valve or hose.*

## Startup and Adjustment

### WARNING



#### COMPONENT RUPTURE HAZARD

The maximum working pressure of each component in the system may not be the same. To reduce the risk of overpressurizing any component in the system, be sure you know the maximum working pressure of each component, including the air motor and pump. **Never** exceed the maximum working pressure of the lowest rated component in the system. Overpressurizing any component can result in rupture, fire, explosion, property damage, and serious injury.

To determine the fluid output pressure using the air regulator reading, multiply the ratio of the pump by the air pressure shown on the regulator gauge. For example:

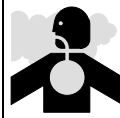
$$6 (:1) \text{ ratio} \times 180 \text{ psi air} = 1080 \text{ psi fluid output}$$

$$6 (:1) \text{ ratio} \times 7 \text{ bar air} = 42 \text{ bar fluid output}$$

$$6 (:1) \text{ ratio} \times 0.7 \text{ MPa air} = 4.2 \text{ MPa fluid output}$$

Limit the air to the pump so that no air line or fluid line component or accessory is overpressurized.

### WARNING



#### HAZARDOUS VAPORS

The air motor exhaust coming out of the muffler could contain harmful materials, such as oil, antifreeze, or some of the material being pumped.

1. With the air regulator (C) closed, open the bleed-type master air valves (A) or, if so equipped, join the quick disconnect coupler (M) to the male fitting (L).
2. Open the dispensing valve (J) into a grounded metal waste container, making firm metal-to-metal contact between the container and valve.
3. Open the pump air regulator (C) slowly, just until the pump is running. When the pump is primed and all air has been pushed out of the lines, close the dispensing valve.

**NOTE:** When the pump is primed, and with sufficient air supplied, the pump starts when the dispensing valve is opened and shuts off when it is closed.

4. If your system is equipped with a runaway valve (D in Fig. 1), set it for your system configuration. See manual 308201 for instructions on setting the pump runaway valve.
5. Adjust the air regulator until you get sufficient flow from the dispensing valve. Always run the pump at the lowest speed necessary to get the desired results. Do not exceed the maximum working pressure of any component in the system.
6. If your pump accelerates quickly or is running too fast, stop it immediately and check the fluid supply. If the supply container is empty and air has been pumped into the lines, prime the pump and lines with fluid, or flush it and leave it filled with a compatible solvent. Be sure to eliminate all air from the fluid lines. If your system has a runaway valve, reset it according to the instructions in manual 308201.

### CAUTION

Never allow the pump to run dry of the fluid being pumped. A dry pump will quickly accelerate to a high speed, possibly damaging itself, and it may get very hot.



# Operation

7. Read and follow the instructions supplied with each component in your system.

## WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** on page 8.

8. If the pump will be unattended for any period of time, if there is an air supply interruption, or to shut off the system at the end of the work shift, **always relieve the pressure.**

9. Check periodically to ensure that the pump's mounting is secure.

# Troubleshooting

## WARNING



### SKIN INJECTION HAZARD

To reduce the risk of serious bodily injury, including fluid injection or splashing in the eyes or on the skin, always follow the **Pressure Relief Procedure** on page 8 whenever you shut off the pump, when checking or servicing any part of the system, when installing or changing dispensing devices, and whenever you stop dispensing.

**NOTE:** Check all other possible problems and solutions before disassembling the pump.

Problem	Cause	Solution
Pump fails to operate	Inadequate air supply pressure or restricted air lines	Increase air supply; clear
	Closed or clogged dispensing valve	Open; clear
	Clogged fluid lines, hoses, valves, etc.	Clear*
	Damaged air motor	Service air motor
	Exhausted fluid supply	Refill and reprime or flush
Continuous air exhaust	Worn or damaged air motor gas-ket, packing, seal, etc.	Service air motor
Erratic pump operation	Exhausted fluid supply	Refill and reprime or flush
	Held open or worn intake valve or piston packings	Clear; service
Pump operates, but output low on up stroke	Held open or worn piston packings	Clear; service
Pump operates, but output low on down stroke	Held open or worn intake valve	Clear; service
Pump operates, but output low on both strokes	Inadequate air supply pressure or restricted air lines	Increase air supply; clear
	Closed or clogged valves	Open; clear
Fluid is coming out of the muffler.	Worn or damaged throat seal	Service

\* Follow the **Pressure Relief Procedure** on page 8 and disconnect the fluid line. If the pump starts when the air is turned on again, the line, hose, valve, etc., is clogged.

# Air Motor and Throat Service

## Before You Start

- Be sure you have all necessary parts on hand. **Air Motor Repair Kit 207385** includes repair parts for the motor. Use all the parts in the kit for the best results. Parts included in the kit are marked with one asterisk, for example (19\*), in the text and drawings. See the **Parts List** on page 17.
- Two accessory tools should be used: **Padded Pliers, 207579**, are used to grip the trip rod without damaging its surface, and a **0.125-in. (3.18 mm) Gauge, 171818**, is used to assure the proper clearance between the poppets and seat of the piston.

## Disassembly

1. Flush the pump.

### WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** on page 8.

2. **Relieve the pressure.**
3. Disconnect the hoses, remove the pump from its mounting, and clamp the air motor base (28) in a vise horizontally by closing the vice jaws on the flange.
4. Use a strap wrench on the displacement pump cylinder (110) to screw it out of the air motor base (28). See Fig. 3.
5. Remove the piston/valve seat (109) from the rod (29) with wrenches or with the vice and a wrench.
6. Remove the piston ball (103), u-cup packing (107†), and piston washer (113).
7. Remove the air motor base from the vice, and place the piston rod (29) flats in the vice with the air motor up.
8. Loosen the lift ring (24). Pull up the lift ring, grip the trip rod (31) with the padded pliers, and screw the lift ring off of the rod.

### CAUTION

Do not damage the plated surface of the trip rod (31). Damaging the surface of the trip rod can result in erratic air motor operation. Use the special padded pliers, 207579, to grasp the rod.

9. Remove the eight screws (3) holding the cylinder (30) to the base (28). Carefully pull the cylinder straight up off of the piston assembly (27).

### CAUTION

To avoid damaging the cylinder wall, lift the cylinder straight up off of the piston. Never tilt the cylinder as it is being removed.

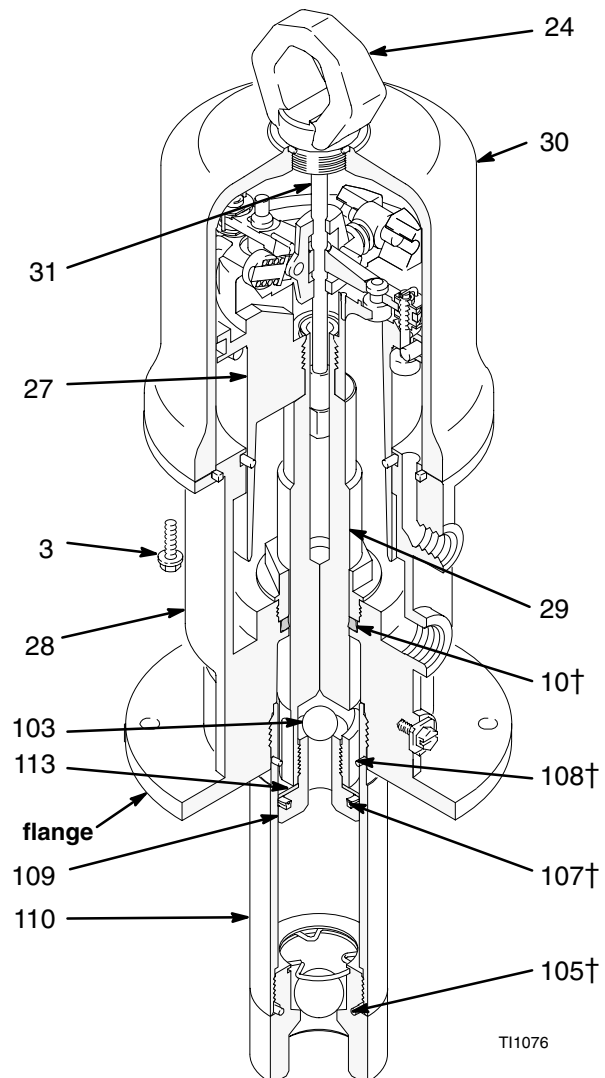


Fig. 3

06033

† Included in Pump Repair Kit 238225, which may be purchased separately.

# Air Motor and Throat Service

10. Pull the piston assembly from the air motor base (28), and set it aside.
11. Remove the throat bearing (36) with a 2-in. socket, remove the u-cup seal (10†), and wipe the seat clean with a cloth.
12. Remove the piston/base from the vise, and set it upright on the workbench.
13. Inspect the air motor for damaged or worn inlet valve grommets (17\*), o-rings (19\*, 20\*), valve nuts (21\*), lock wires (22\*), exhaust valve poppets (26\*), or inlet valve poppets (32\*). If any of these parts need to be replaced, continue with steps 14 to 20. Otherwise, see **Reassembly** on page 12.
14. Use a screwdriver to push down on the trip rod yoke (13), and snap the toggles down. See Fig. 4.
15. *In this step, while you are prying with the screwdriver with one hand, cover the toggle assemblies with your other hand so as to catch the spring-loaded toggle assemblies when they snap out of the lugs.* Place the tip of a screwdriver into the piston between the piston lugs (L) below the pivot pins (16) on the toggles, pry up with the screwdriver handle to compress the springs on the toggle assembly (M) up and away from the piston lugs, and remove the parts. See Fig. 4.
16. Straighten the lockwires (22\*) and remove them from the valve nuts (21\*). Screw the top nuts off. Remove the trip rod yoke (13), actuator (12), and trip rod (31). Unscrew the bottom nuts (21\*), and remove the poppets. Make sure the valve bar spring clips (14) are not worn or damaged and that they properly guide the actuator (12).
17. Remove the exhaust valve poppets (26) by cutting them with a side cutter, then pull them out of the actuator (12).
18. Clean all the parts carefully in a compatible solvent and inspect them for wear or damage. Use all the repair kit parts during reassembly, and replace other parts as necessary.
19. Check the surfaces of the piston, piston rod, and cylinder wall for scratches or wear. A scored rod will cause premature packing wear and leaking.
20. Lubricate all parts with a light, waterproof grease.

## **WARNING**



### **MOVING PARTS HAZARD**

To reduce the risk of pinching or amputating your fingers, keep your fingers clear of the toggle assemblies when you are snapping the toggles

(M in Fig. 4 ) up or down.

# Air Motor and Throat Service

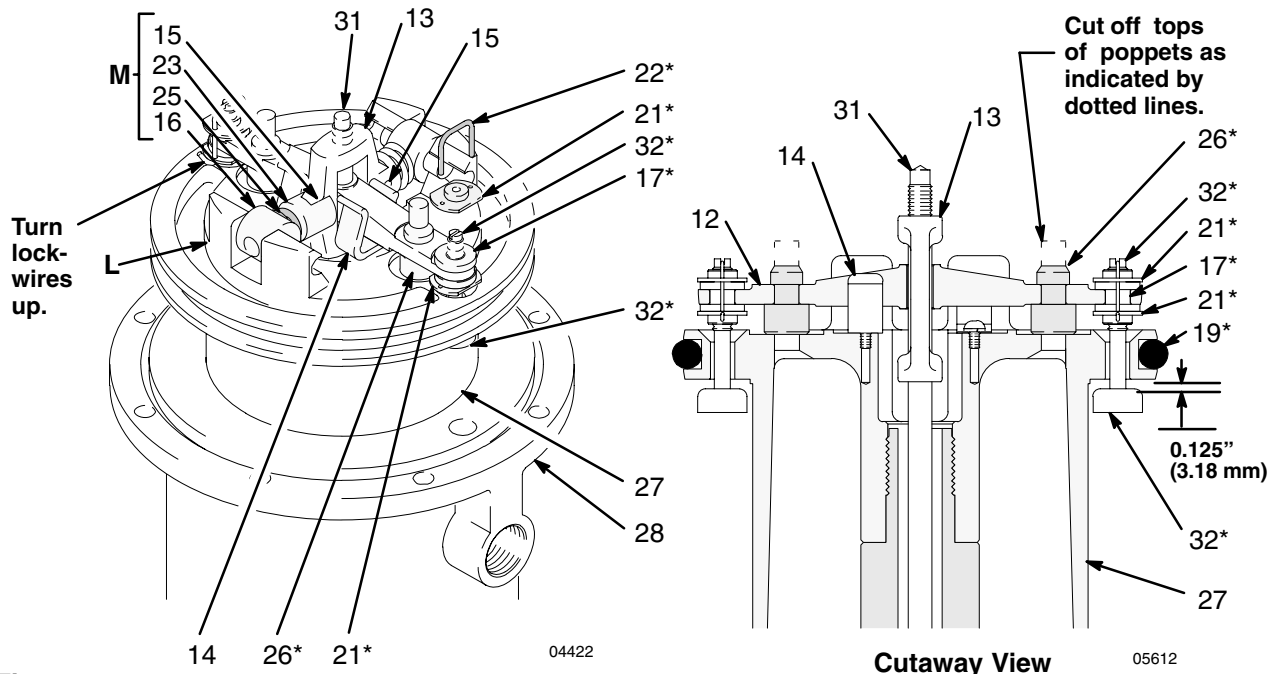


Fig. 4

## Reassembly

1. Place the piston rod (29) flats in the vice with the air motor up.
2. Pull the exhaust valve poppets (26\*) into the valve actuator (12), and clip off the top parts of the poppets (shown with dotted lines in the **Cutaway View** in Fig. 4).
3. Install the grommets (17\*) in the actuator (12), place the inlet valve poppets (32\*) in the piston, and thread the bottom valve nuts (21\*) onto the inlet valve poppets until there are a few threads left before the threads run out.

**NOTE:** If you thread the valve nuts too far down onto the poppets, they will run off of the threaded part of the poppets.

4. Grease heavily and place the trip rod (31) in the piston, place the actuator (12) in the yoke (13), and place the well-greased actuator/yoke assembly in the piston, with the trip rod going through the center holes of the actuator and yoke and the inlet valve poppets (32\*) going through the grommets (17\*).
5. Thread the top valve nuts (21\*) onto the inlet valve poppets (32\*) until one thread of the inlet valve poppets is exposed above the valve nuts.
6. Install the toggle pins (15) in the yoke (13), place the toggle arm (23) ends of the toggle assembly (M) onto the toggle pins, and snap the pivot pin (16) ends of the toggle assembly into the lugs (L).

7. Measuring with the gauge (Part No.171818), create 0.125-in. (3.18 mm) of clearance between the inlet valve poppets (32\*) and the piston seat when the inlet valve is open. See the **Cutaway View** Fig. 4.

**NOTE:** Adjust the distance between the inlet valve poppets and the piston seat by turning the top valve nuts (21\*).

8. Tighten the bottom valve nuts (21\*) securely by hand.
9. Align the holes in the valve nuts (21\*) and the slots on the tops of the inlet valve poppets (32\*), and drop the lock wires (22\*) through the holes in the valve nuts and into the slots in the inlet valve poppets. Pull the lock wires down tightly, and bend the ends with pliers so that they cannot be pulled back out of the holes.

## CAUTION

Never re-use the old lock wires. They will get brittle and break easily from too much bending.

10. Grease and install the new o-rings (19\* and 20\*) on the piston assembly (27) and in the groove in the air motor base (28).
11. Clamp the air motor base (28) in a vise horizontally by closing the vice jaws on the flange.

# Air Motor and Throat Service

12. Grease and reinstall the u-cup seal (10†), thread the throat bearing (36) into the air motor base (28), and torque the throat bearing to 30 to 40 ft-lb (41 to 54 N.m) using a 2-in. socket.
13. Slide the piston rod (29) down through the packing, and lower the piston assembly (27) into the air motor base (28).
14. Carefully lower the cylinder (30) straight down onto the piston assembly (27). Tighten the eight screws (3) holding the cylinder to the base (28).

## CAUTION

To avoid damaging the cylinder wall, lower the cylinder straight down onto the piston. Never tilt the cylinder as it is being lowered.

15. Grip the trip rod (31) with padded pliers, screw the lift ring (24) onto the trip rod, push the lift ring down, and screw it into the top of the cylinder.
16. Install the u-cup packing (107†) with the lips up, and place the piston washer (113) on the piston/valve seat (109). Make sure the lips of the u-cup packing face up. See Fig. 3.
17. Place the piston ball (103) in the piston rod (29).
18. Clean the threads of the piston/valve seat, Apply Loctite® to the threads, (109), and thread the assembly from Step 16 onto the piston rod (29).
19. Clamp the flats of the piston/valve seat (109) in a vice, and torque the piston rod (29) to the piston valve seat to 40 to 60 ft-lb (54 to 81 N.m).
20. Clamp the air motor base (28) in a vise horizontally by closing the vice jaws on the flange
21. Use a strap wrench to screw the displacement pump cylinder (110) to the air motor base (28), and torque to 95 to 105 ft-lb (129 to 142 N.m).
22. Before remounting the pump, connect an air hose and run the air motor slowly, starting with just enough air pressure to make the air motor run, and make sure that it operates smoothly.
23. Reconnect the ground wire before regular operation of the pump.

# Displacement Pump Service

## Disassembly

**NOTE:** Displacement Pump Repair Kit 238225 includes repair parts for the pump throat and piston. Use all the parts in the kit for the best results. Parts included in the kit are marked with a dagger, for example (7†), in the text and drawings. See the **Parts List** on page 15.

1. Flush the pump.

### **WARNING**

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** on page 8.

2. **Relieve the pressure.**
3. Disconnect the hoses, remove the pump from its mounting, and clamp the air motor base (28) in a vise horizontally by closing the vice jaws on the flange.

## Intake Valve. *See Fig 5.*

1. **Relieve the pressure.**
2. Unscrew the valve housing (111). Remove the o-ring (105†), retainer (112), and ball (104).
3. Inspect the parts for wear or damage. If the ball is nicked, replace it. Reassemble, using grease on the male threads.

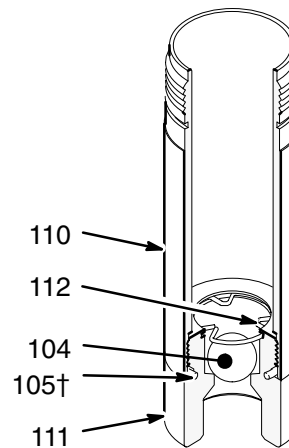
## Displacement Pump. *See Fig 5.*

**NOTE:** Clean and inspect all parts for wear or damage as you disassemble them. Replace parts as needed. For best results, always replace all the o-rings and packings when you disassemble the pump.

1. **Relieve the pressure.**
2. Follow steps 1 to 7 of **Disassembly** on page 10.
3. Carefully inspect the smooth inner surface of the cylinder (110) for scoring or irregular surfaces. Such damage causes premature seal wear and leaking. Replace the cylinder as needed.

## Reassembly

Do steps 16 through 23 in **Air Motor and Throat Service** on page 13.



**Fig. 5**

05617

† Included in Pump Repair Kit 238225, which may be purchased separately. The Parts List on page 15 includes all parts in kit.

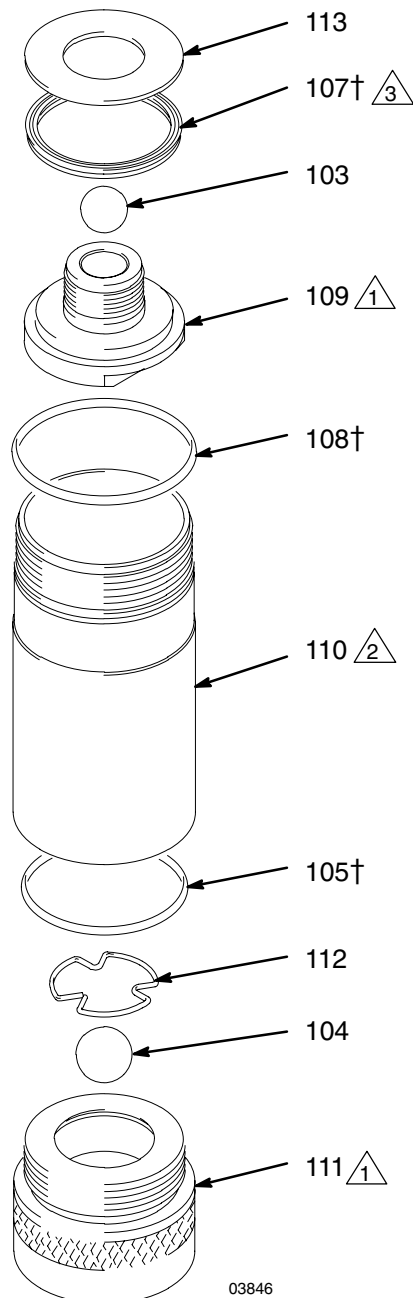
# Displacement Pump Parts Drawing and List

## Model 238108, Series D

Air motor not listed or shown here. See pages 16 and 17.

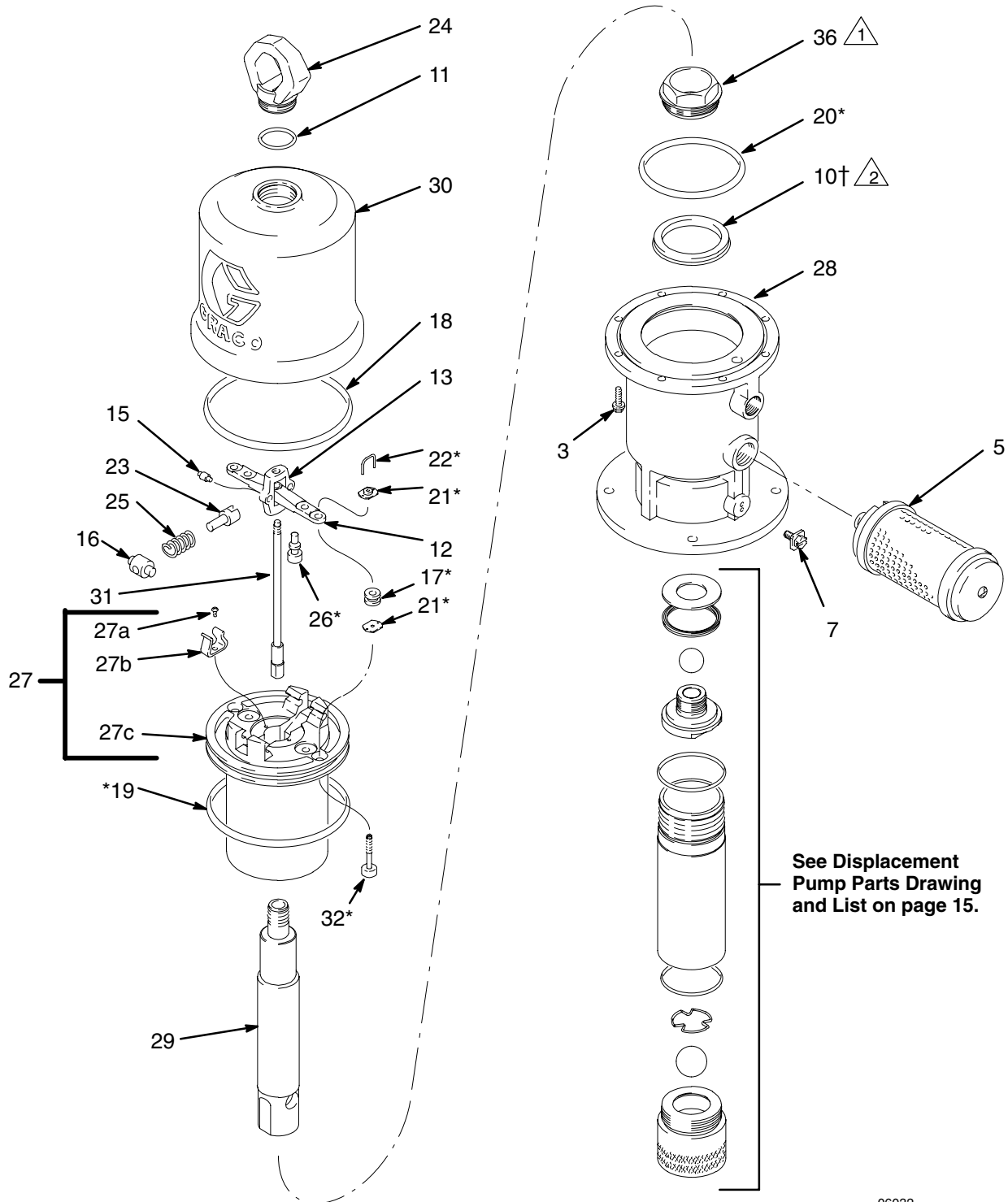
Ref No.	Part No.	Description	Qty.	Ref No.	Part No.	Description	Qty.
10†	113345	SEAL, u-cup (shown on page 16)	1	109	194016	PISTON	1
103	101190	BALL, piston; metallic	1	110	190922	CYLINDER, pump	1
104	101178	BALL; sst	1	111	190926	VALVE HOUSING	1
105†	113347	PACKING, o-ring	1	112	190928	RETAINER, ball	1
107†	113346	PACKING, u-cup	1	113	190924	WASHER, piston	1
108†	112349	PACKING, o-ring	1				

† Included in Pump Repair Kit 238225, which may be purchased separately.



- △1 Torque to 40 to 60 ft-lb (54 to 81 N.m)
- △2 Torque to 95 to 105 ft-lb (129 to 142 N.m)
- △3 Lips face up

# Air Motor Parts Drawing



1 Torque to 30 to 40 ft-lb (41 to 54 N.m).

2 Lips must face down.

06032



# Air Motor Parts List

Ref No.	Part No.	Description	Qty.	Ref No.	Part No.	Description	Qty.
3	101578	SCREW, cap, hex hd	8	24	190929	RING, lift	1
5	102656	MUFFLER, air exhaust	1	25	167585	SPRING, helical compression	2
7	116343	SCREW, ground	1	26*	170709	POPPET, exhaust valve	2
10†	113345	SEAL, u-cup	1	27	207391	PISTON, includes items 27a to 27c (also includes 207385 repair kit when ordered as a replacement part)	1
11	156698	PACKING, o-ring	1	27a	102975	SCREW, rd hd mach; 6-32 x 1/4"	2
12	158359	ACTUATOR, air valve	1	27b	158361	CLIP, Spring	2
13	158360	YOKE, trip rod	1	27c		BARE PISTON <i>(not sold separately)</i>	1
15	158362	PIN, toggle	2	28	190927	BASE, air motor	1
16	158364	PIN, pivot	2	29	193799	ROD, piston	1
17*	158367	GROMMET, inlet valve	2	30	15E954	CYLINDER, air motor	1
18	158377	PACKING, ring seal	1	31	207150	ROD, trip	1
19*	158378	PACKING, o-ring	1	32*	236079	POPPET, inlet valve	2
20*	158379	PACKING, o-ring	1	33	119344	LABEL, designation	1
21*	160261	NUT, valve	4	35▲	290259	LABEL, warning	1
22*	160618	WIRE, lock	2	36	190930	BEARING, throat	1
23	160623	ARM, toggle	2				

† Included in Pump Repair Kit 238225,  
which may be purchased separately.

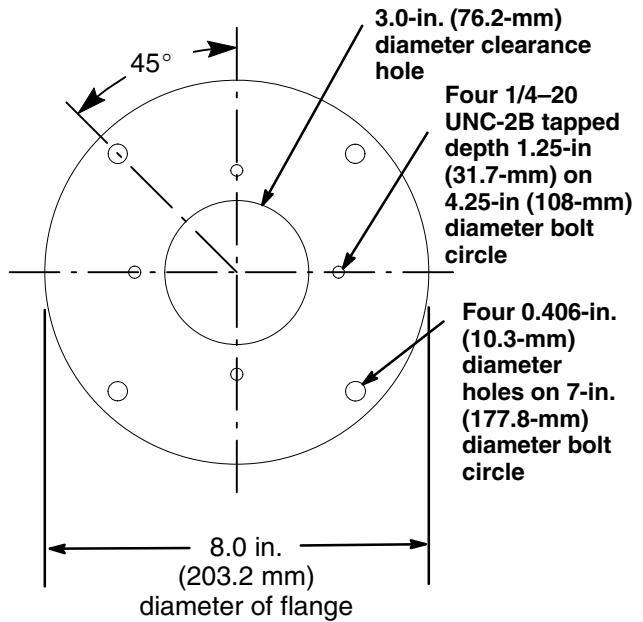
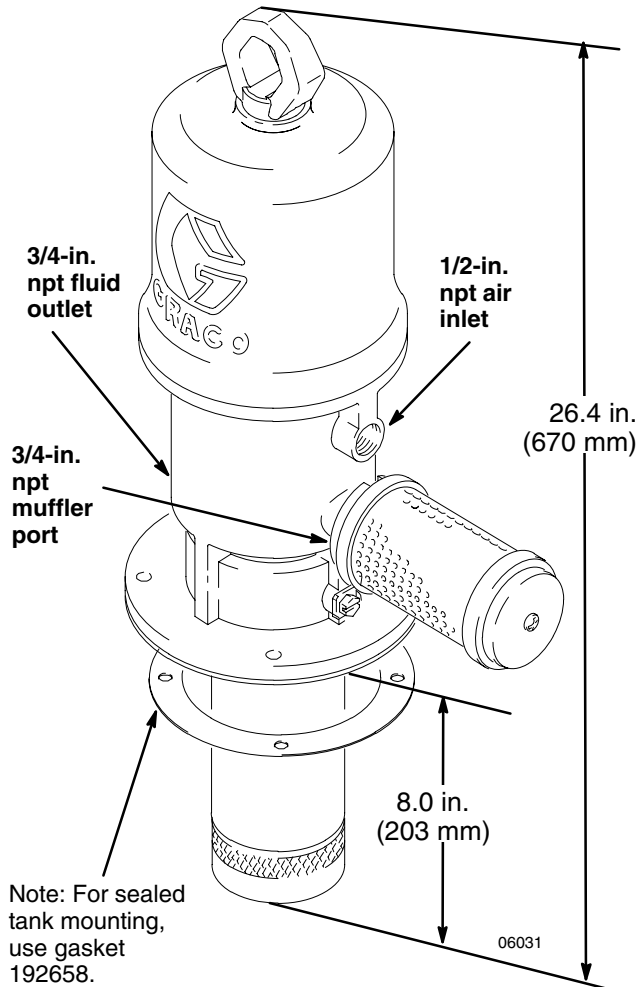
\* Included in Air Motor Repair Kit 207385,  
which may be purchased separately.

▲ Extra warning labels are available at no cost.

# Dimensions

MODEL 238108 Pump, Series D

# Mounting Hole Layout



# Technical Data

Maximum working pressure	1100 psi (76 bar, 7.6 MPa)
Fluid pressure ratio	6:1
Air operating range	40 to 180 psi (3 to 12 bar, 0.3 to 1.2 MPa)
Air consumption	7 ft <sup>3</sup> /min per gallon pumped, (0.051 m <sup>3</sup> /min per liter pumped) at 100 psi (7 bar, 0.7 MPa)
Pump cycles per gallon (liter)	14.5 (3.8)
Maximum recommended pump speed	78 cycles/min; 6 gpm (23 liter/min)
Recommended speed for optimum pump life	15 to 25 cycles per min
Piston seals	polyurethane with nitrile spreader
Rod seals	polyurethane with nitrile spreader
Wetted parts	aluminum, steel, polyurethane, nitrile
Approximate weight	35 lb (21 kg)
* Sound pressure level	79.5 dB(A)

\* Sound pressure measured at 30 cycles per minute at 100 psi (7 bar, 0.7 MPa) air inlet pressure per ISO Standard 3744.

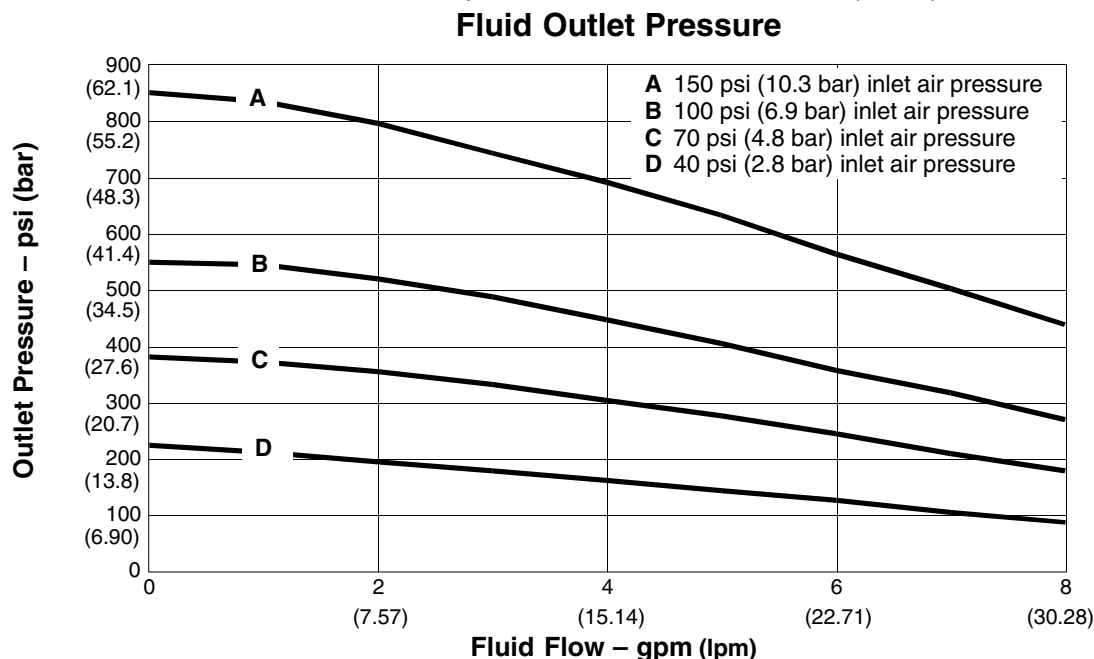
Loctite® is a registered trademark of the Loctite Corporation.

# Performance Charts

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

1. Locate desired fluid flow along bottom of chart.
2. Follow vertical line up to point of intersection with selected fluid outlet pressure curve.
2. Align point on curve with vertical scale on left side of chart to read fluid outlet pressure.

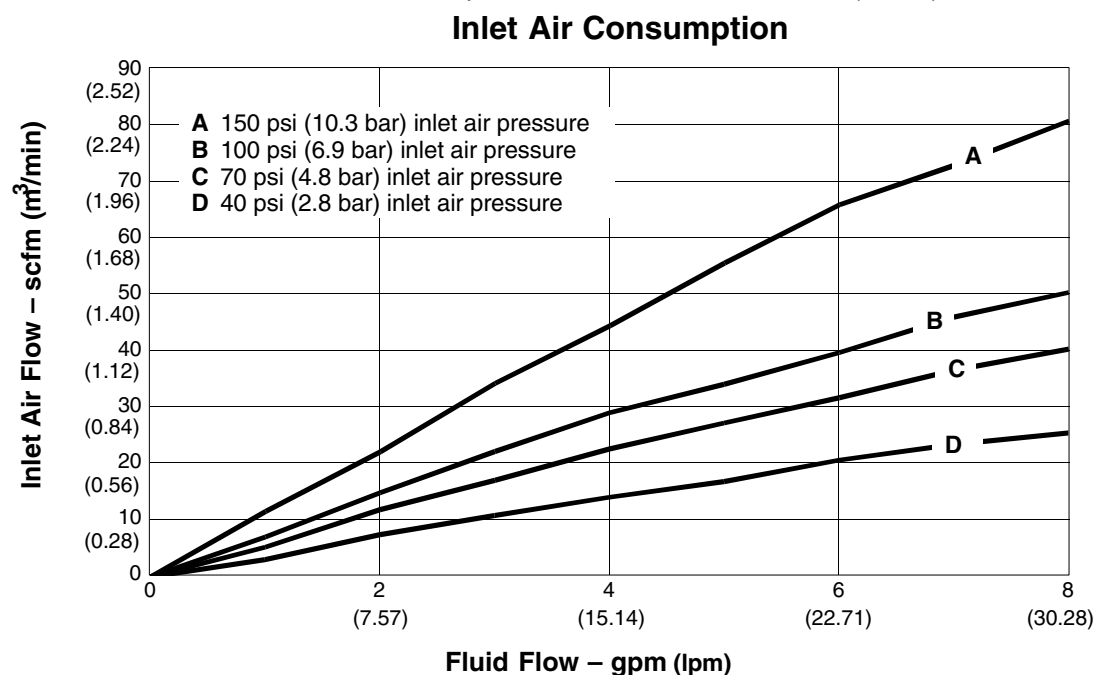
**Test Conditions:** Pump tested with AW-32 oil at 75° F (24° C)



**To find Pump Air Consumption** (scfm or m<sup>3</sup>/min) at a specific fluid flow (gpm/lpm) and operating air pressure (bar/psi):

1. Locate desired fluid flow along bottom of chart.
2. Follow vertical line up to point of intersection with selected air consumption curve.
2. Align point on curve with vertical scale on left side of chart to read air consumption.

**Test Conditions:** Pump tested with AW-32 oil at 75° F (24° C)



# Graco Standard Warranty

Graco warrants all equipment manufactured by Graco and bearing its name to be free from defects in material and workmanship on the date of sale to the original purchaser for use. With the exception of any special, extended, or limited warranty published by Graco, Graco will, for a period of twelve months from the date of sale, repair or replace any part of the equipment determined by Graco to be defective. This warranty applies only when the equipment is installed, operated and maintained in accordance with Graco's written recommendations.

This warranty does not cover, and Graco shall not be liable for general wear and tear, or any malfunction, damage or wear caused by faulty installation, misapplication, abrasion, corrosion, inadequate or improper maintenance, negligence, accident, tampering, or substitution of non-Graco component parts. Nor shall Graco be liable for malfunction, damage or wear caused by the incompatibility of Graco equipment with structures, accessories, equipment or materials not supplied by Graco, or the improper design, manufacture, installation, operation or maintenance of structures, accessories, equipment or materials not supplied by Graco.

This warranty is conditioned upon the prepaid return of the equipment claimed to be defective to an authorized Graco distributor for verification of the claimed defect. If the claimed defect is verified, Graco will repair or replace free of charge any defective parts. The equipment will be returned to the original purchaser transportation prepaid. If inspection of the equipment does not disclose any defect in material or workmanship, repairs will be made at a reasonable charge, which charges may include the costs of parts, labor, and transportation.

**THIS WARRANTY IS EXCLUSIVE, AND IS IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO WARRANTY OF MERCHANTABILITY OR WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.**

Graco's sole obligation and buyer's sole remedy for any breach of warranty shall be as set forth above. The buyer agrees that no other remedy (including, but not limited to, incidental or consequential damages for lost profits, lost sales, injury to person or property, or any other incidental or consequential loss) shall be available. Any action for breach of warranty must be brought within two (2) years of the date of sale.

Graco makes no warranty, and disclaims all implied warranties of merchantability and fitness for a particular purpose in connection with accessories, equipment, materials or components sold but not manufactured by Graco. These items sold, but not manufactured by Graco (such as electric motors, switches, hose, etc.), are subject to the warranty, if any, of their manufacturer. Graco will provide purchaser with reasonable assistance in making any claim for breach of these warranties.

In no event will Graco be liable for indirect, incidental, special or consequential damages resulting from Graco supplying equipment hereunder, or the furnishing, performance, or use of any products or other goods sold hereto, whether due to a breach of contract, breach of warranty, the negligence of Graco, or otherwise.

## **FOR GRACO CANADA CUSTOMERS**

The parties acknowledge that they have required that the present document, as well as all documents, notices and legal proceedings entered into, given or instituted pursuant hereto or relating directly or indirectly hereto, be drawn up in English. Les parties reconnaissent avoir convenu que la rédaction du présente document sera en Anglais, ainsi que tous documents, avis et procédures judiciaires exécutés, donnés ou intentés à la suite de ou en rapport, directement ou indirectement, avec les procédures concernées.

# Graco Phone Number

**TO PLACE AN ORDER**, contact your Graco distributor, or call this number to identify the distributor closest to you:

**1-800-533-9655 Toll Free**

**612-623-6928**

**612-378-3590 Fax**

*All written and visual data contained in this document reflects the latest product information available at the time of publication.  
Graco reserves the right to make changes at any time without notice.*

This manual contains English. MM 308608

**Graco Headquarters:** Minneapolis

**International Offices:** Belgium, Korea, China, Japan

**GRACO INC. P.O. BOX 1441 MINNEAPOLIS, MN 55440-1441**

308608 10/1995, Revised 03/2007