

# Instructions – Parts List



UHMWPE/NEOPRENE PACKED, FOR PRESSURE WASHING

## Stainless Steel Hydra-Clean® Pumps

308117K

**Part No. 224345, Series A**

**5:1 Ratio Monark® Pump**

*600 psi (42 bar) Maximum Fluid Working Pressure*

*120 psi (8.4 bar) Maximum Air Input Pressure*

**Part No. 224346, Series A**

**10:1 Ratio President® Pump**

*1800 psi (125 bar) Maximum Fluid Working Pressure*

*180 psi (12.5 bar) Maximum Air Input Pressure*

**Part No. 247146, Series A**

**Part No. 261631, Series A**

**10:1 Ratio President® Pump**

*1800 psi (125 bar) Maximum Fluid Working Pressure*

*180 psi (12.5 bar) Maximum Air Input Pressure*

**Part No. 224347, Series A**

**10:1 Ratio President® Pump, with riser tube**

*1800 psi (125 bar) Maximum Fluid Working Pressure*

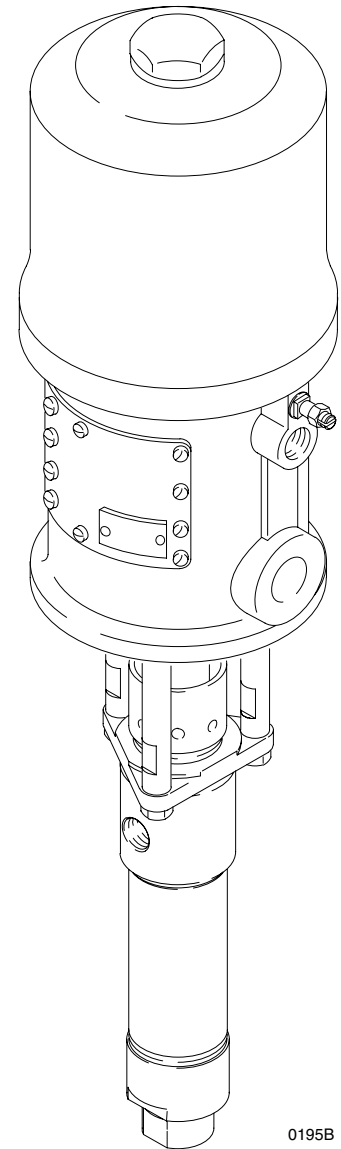
*180 psi (12.5 bar) Maximum Air Input Pressure*

**Part No. 903295, Series A**

**10:1 Ratio President® Pump, with riser tube**

*1800 psi (125 bar) Maximum Fluid Working Pressure*

*180 psi (12.5 bar) Maximum Air Input Pressure*



0195B

**Model 224346 Shown**



**Important Safety Instructions**

Read all warnings and instructions in this manual.

Save these instructions.



PROVEN QUALITY. LEADING TECHNOLOGY.

# Table of Contents

|                       |    |                               |    |
|-----------------------|----|-------------------------------|----|
| Symbols .....         | 2  | Parts .....                   | 16 |
| Warnings .....        | 2  | Technical Data .....          | 21 |
| Installation .....    | 5  | Dimensions .....              | 23 |
| Operation .....       | 8  | Mounting Hole Layout .....    | 23 |
| Troubleshooting ..... | 11 | Graco Standard Warranty ..... | 24 |
| Service .....         | 12 | Graco Information .....       | 24 |

## 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.

Use this pump only for pumping water and water-diluted cleaning solutions in a pressure washing system. Never use the pump for paint or any other coatings. Any misapplication of the pump may cause dangerous operating conditions which can result in serious injury and substantial property damage.

- 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 of the lowest rated system component. Refer to the **Technical Data** on pages 21–22 for the maximum working pressure of this equipment.
- 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 Graco hoses to temperatures above 180°F (82°C) or below -40°F (-40°C).
- Wear hearing protection when operating this equipment.
- Do not lift pressurized equipment.
- Comply with all applicable local, state, and national fire, electrical, and safety regulations.

# ! WARNING



## SKIN INJECTION HAZARD

Spray from the gun, 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 might look like just a cut, but it is a serious injury. **Get immediate surgical treatment.**
- Do not point the gun at anyone or at any part of the body.
- Do not put your hand or fingers over the spray tip.
- Do not stop or deflect leaks with your hand, body, glove or rag.
- Do not “blow back” fluid; this is not an air spray system.
- Always have the tip guard and the trigger guard on the gun when spraying.
- Check the gun diffuser operation weekly. Refer to the gun manual.
- Be sure the gun trigger safety operates before spraying.
- Lock the gun trigger safety when you stop spraying.
- Follow the **Pressure Relief Procedure** on page 8 if the spray tip clogs and before cleaning, checking or servicing the equipment.
- 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.
- Fluid hoses must have spring guards on both ends, to help protect them from rupture caused by kinks or bends near the couplings.



## MOVING PARTS HAZARD

Moving parts, such as the air motor piston, can pinch or amputate your fingers.

- Keep clear of all moving parts when starting or operating the pump.
- Never operate the pump with the air motor plates removed.
- Before servicing the equipment, follow the **Pressure Relief Procedure** on page 8 to prevent the equipment from starting unexpectedly.

# 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 and the object being sprayed. Refer to **Grounding** on page 5.
- If there is any static sparking or you feel an electric shock while using this equipment, **stop spraying 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 sprayed.
- Keep the spray area free of debris, including solvent, rags, and gasoline.
- Electrically disconnect all equipment in the spray area.
- Extinguish all open flames or pilot lights in the spray area.
- Do not smoke in the spray area.
- Do not turn on or off any light switch in the spray area while operating or if fumes are present.
- Do not operate a gasoline engine in the spray area.



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

# Installation


## General Information

**NOTE:** Reference numbers and letters in parentheses in the text refer to the callouts in the figures and the parts drawing.

**NOTE:** Always use Genuine Graco Parts and Accessories, available from your Graco distributor. If you supply your own accessories, be sure they are adequately sized and pressure rated for your system.

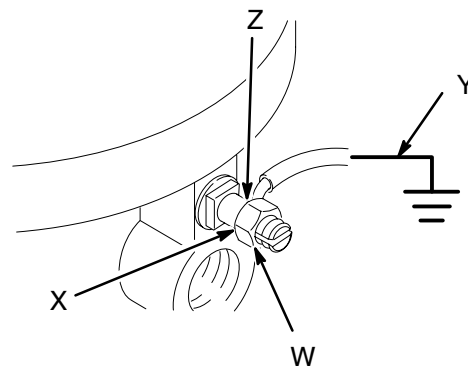
Fig. 2 is only a guide for selecting and installing system components and accessories. Contact your Graco distributor for assistance in designing a system to suit your particular needs.

## Grounding

|                                                                                   |                                                                                                                                                                        |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>⚠ WARNING</b>                                                                  |                                                                                                                                                                        |
|  | <b>FIRE AND EXPLOSION HAZARD</b><br>Before operating the pump, ground the system as explained below. Also read the section <b>FIRE AND EXPLOSION HAZARD</b> on page 4. |

Although water generally provides a natural electrical ground, the following equipment must be grounded if the cleaning chemicals are volatile.

1. *When cleaning in enclosed areas*, such as storage tanks, locate the pump and air compressor outside the area and well away from it. Provide adequate ventilation. If the area you are cleaning has stored flammable materials, take appropriate precautions to avoid static sparking. Consult your local codes.
2. *Pump*: use the ground wire and clamp (supplied). See Fig. 1. Loosen the grounding lug locknut (W) and washer (X). Insert one end of the ground wire (Y) into the slot in lug (Z) and tighten the locknut securely. Connect the other end of the wire to a true earth ground. Order Part No. 237569 Ground Wire and Clamp.



0720

**Fig. 1**

3. *Air and fluid hoses*: use only electrically conductive hoses.
4. *Air compressor*: follow manufacturer's recommendations and local codes.
5. *Spray gun*: ground through connection to a properly grounded fluid hose and pump.
6. *Fluid supply container*: follow your local code.
7. *Object being sprayed*: follow your local code.
8. *Solvent pails used when flushing*: follow your local code. Use only metal pails, which are conductive, placed on a grounded surface. Do not place the pail on a nonconductive surface, such as paper or cardboard, which interrupts the grounding continuity.
9. *To maintain grounding continuity when flushing or relieving pressure*, hold a metal part of the spray gun firmly to the side of a grounded *metal* pail, then trigger the gun.

## Mounting the Pump

Mount the pump (A) to suit the type of installation planned. The pump dimensions and mounting hole layout are shown on page 23.

# Installation

## System Accessories

### **WARNING**

A bleed-type master air valve (D) and a fluid drain valve (J) are required in your system. These accessories help reduce the risk of serious injury, including fluid injection and splashing of fluid in the eyes or on the skin, and injury from moving parts if you are adjusting or repairing the pump.

The bleed-type master air valve relieves air trapped between this valve and the pump after the air is shut off. Trapped air can cause the pump to cycle unexpectedly. Locate the valve close to the pump.

The fluid drain valve assists in relieving fluid pressure in the displacement pump, hose, and gun. Triggering the gun to relieve pressure may not be sufficient.

### **Air and Fluid Hoses**

Be sure all air and fluid hoses are properly sized and pressure-rated for your system. Use a 1/2 in. (13 mm) ID (minimum) air hose (H). Connect a fluid hose (K) to the pump's fluid outlet. Fluid hoses must have spring guards on both ends. Connect a fluid suction hose (M) to the pump's 3/4 npt(f) fluid intake.

### **Air Line Accessories**

Install the following accessories in the order shown in Fig. 2, using adapters as necessary:

- **An air line lubricator (C)** provides automatic air motor lubrication. For manual lubrication, see page 10.

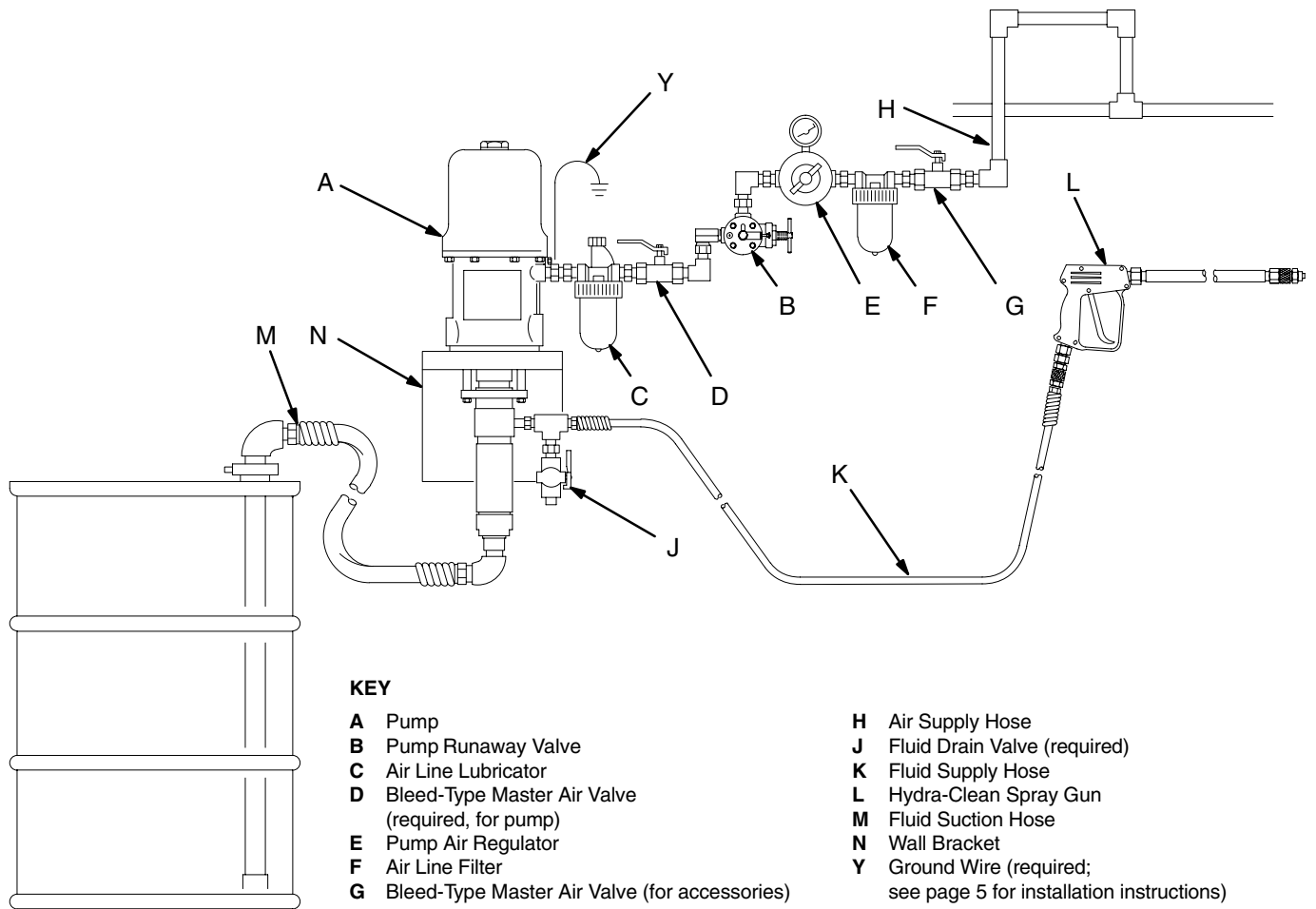
- **A bleed-type master air valve (D)** is required in your system to relieve air trapped between it and the air motor when the valve is closed (see the **WARNING** at left). Be sure the bleed valve is easily accessible from the pump, and is located **downstream** from the air regulator. Order Part No. 113333.
- **A pump runaway valve (B)** senses when the pump is running too fast and automatically shuts off the air to the motor. A pump which runs too fast can be seriously damaged.
- **An air regulator (E)** controls pump speed and outlet pressure by adjusting the air pressure to the pump. Locate the regulator close to the pump, but **upstream** from the bleed-type master air valve.
- **An air line filter (F)** removes harmful dirt and moisture from the compressed air supply.
- **A second bleed-type air valve (G)** isolates the air line accessories for servicing. Locate upstream from all other air line accessories.

### **Fluid Line Accessories**

Install the following accessories in the positions shown in Fig. 2, using adapters as necessary:

- **A fluid drain valve (J)** is required in your system to relieve fluid pressure in the hose and gun (see the **WARNING** at left). Install the drain valve pointing down, but so the handle points up when opened. Order Part No. 235992.
- **A Hydra-Clean spray gun (L)** dispenses the cleaning fluid.

# Installation



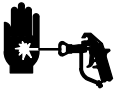
**Fig. 2**

0803A

# Operation

## Pressure Relief Procedure

### **WARNING**



#### **SKIN INJECTION HAZARD**

The system pressure must be manually relieved to prevent the system from starting or spraying accidentally. Fluid under high pressure can be injected through the skin and cause serious injury. To reduce the risk of an injury from injection, splashing fluid, or moving parts, follow the **Pressure Relief Procedure** whenever you:

- are instructed to relieve the pressure,
- stop spraying,
- check or service any of the system equipment,
- or install or clean the spray tips.

1. Lock the gun trigger safety.
2. Close the bleed-type master air valve (D, required in your system).
3. Unlock the gun trigger safety.
4. Hold a metal part of the gun firmly to the side of a grounded metal pail, and trigger the gun to relieve pressure.
5. Lock the gun trigger safety.
6. Open the drain valve (J, required in your system), having a container ready to catch the drainage.
7. Leave the drain valve open until you are ready to spray again.

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

## Packing Nut/Wet-Cup

### **WARNING**

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

Keep the packing nut/wet-cup (15) filled with Graco Throat Seal Liquid (TSL) or compatible solvent, to help prolong the packing life. Adjust the packing nut weekly so it is just tight enough to prevent leakage; do not overtighten. See Fig. 3. **Relieve the pressure** before adjusting the packing nut.

## Flush the Pump Before First Use

The pump is tested with lightweight oil, which is left in to protect the pump parts. To prevent contamination of the cleaning solution, flush the pump with a compatible solvent before using it. See **Flushing** on page 10.

## Mixing the Cleaning Solution

If you are adding a cleaning chemical to the water, mix it thoroughly with a few gallons of water in a separate container before adding to the drum. Be sure all particles are well dissolved. Read and follow the chemical manufacturer's recommendations on mixing and application of the solution.

Fill the drum with water and the desired, premixed cleaning solution.



# Operation

## Starting and Adjusting the Pump

### **⚠ WARNING**

Moving parts can pinch or amputate your fingers or other body parts. When air is supplied to the motor, the air motor piston (located behind the air motor plates) moves. See Fig. 3. Therefore, **never** operate the pump with the air motor plates (P) removed.

1. See Fig. 2 on page 7. Close the air regulator (E), bleed-type master air valve (D), and fluid drain valve (J). **Do not install the spray tip yet!**
2. Place the suction kit (M) into the fluid supply drum.
3. Hold a metal part of the spray gun (L) firmly to the side of the supply drum and hold the trigger open.
4. Open the pump's bleed-type master air valve (D).
5. Slowly open the air regulator (E) until the pump starts, about 40 psi (2.8 bar).
6. Cycle the pump slowly until all the air is pushed out and the pump and hoses are fully primed.
7. Release the spray gun trigger and lock the trigger safety. The pump should stall against pressure when the trigger is released.
8. With the pump and lines primed, and with adequate air pressure and volume supplied, the pump will start and stop as the spray gun is opened and closed.

### **⚠ WARNING**

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

9. **Relieve the pressure.** Install the tip guard and spray tip in the gun, as explained in the gun manual.

### **⚠ WARNING**

#### **COMPONENT RUPTURE HAZARD**



To reduce the risk of overpressurizing your system, which could cause component rupture and serious injury, **never exceed the specified Maximum Incoming Air Pressure to the pump** (see the **Technical Data**, on pages 21 and 22).

10. Use an adequately sized air regulator (E) to control the pump speed and the fluid pressure. Always use the lowest air pressure necessary to get the desired results. Higher pressures waste fluid and cause premature wear of the pump packings and nozzle.

### **⚠ CAUTION**

Do not allow the pump to run dry. It will quickly accelerate to a high speed, causing damage. If your pump is running too fast, stop it immediately and check the fluid supply. If the container is empty and air has been pumped into the lines, refill the container and prime the pump and the lines, or flush and leave it filled with a compatible solvent. Eliminate all air from the fluid system.

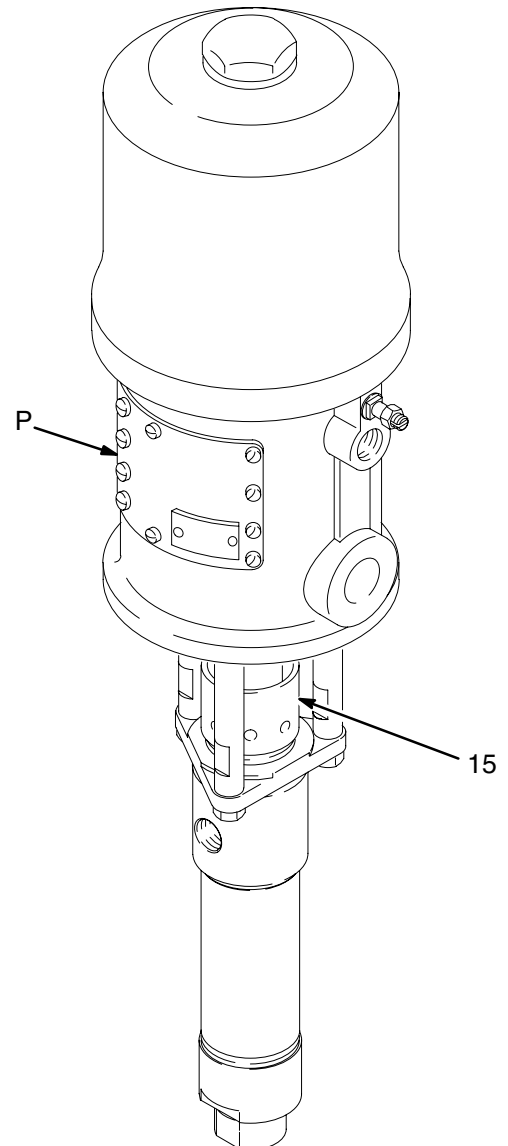


Fig. 3

0195B

# Operation

## Shutdown and Care of 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.

For overnight shutdown, stop the pump at the bottom of its stroke to prevent fluid from drying on the exposed displacement rod and damaging the throat packings. **Relieve the pressure.**

Always flush the pump before the fluid dries on the displacement rod. See **Flushing** below.

## Flushing

### **WARNING**



**FIRE AND EXPLOSION HAZARD**  
Before flushing, read the section **FIRE AND EXPLOSION HAZARD** on page 4. Be sure the entire system and flushing pails are properly grounded. Refer to **Grounding** on page 5.

Flush the pump:

- Before the first use
- When changing fluids or cleaning chemicals
- Before fluid can dry or settle out in a dormant pump
- Before storing the pump.

Flush with a fluid that is compatible with the fluid you are pumping and with the wetted parts in your system. Check with your fluid manufacturer or supplier for recommended flushing fluids and flushing frequency.

### **WARNING**

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

1. **Relieve the pressure.**
2. Remove the tip guard and spray tip from the gun. See the gun instruction manual.
3. Place the suction tube (M) in a container of solvent.
4. Hold a metal part of the gun firmly to the side of a grounded *metal* pail.
5. Start the pump. Always use the lowest possible fluid pressure when flushing.
6. Trigger the gun.
7. Flush the system until clear solvent flows from the gun.
8. **Relieve the pressure.**
9. Clean the tip guard and spray tip separately, then reinstall them.
10. Clean the inside and outside of the suction tube (M).

## Lubrication

Adjust the air line lubricator (C) to feed 1 to 3 drops of oil per hour. Check the lubricator sight glass regularly, and keep it filled to the level mark on the sight glass. Use high quality SAE 10 oil.

**To manually lubricate the motor**, disconnect the air line at the motor and place 10 to 15 drops of oil in the air inlet. Reconnect the air line and turn on the air to blow oil into the motor. This should be done daily.

# Troubleshooting

## WARNING

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

1. **Relieve the pressure.**
2. Check all possible problems and solutions before disassembling pump.

| Problem                                          | Cause                                                      | Solution                                                                                                                               |
|--------------------------------------------------|------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| Pump fails to operate.                           | Restricted line or inadequate air supply.                  | Clear; increase air supply.                                                                                                            |
|                                                  | Insufficient air pressure; closed or clogged air valves.   | Open; clean.                                                                                                                           |
|                                                  | Exhausted fluid supply.                                    | Refill; purge all air from pump and fluid lines.                                                                                       |
|                                                  | Damaged air valving mechanism; stalling.                   | Service air motor (see 306982 or 307043).                                                                                              |
|                                                  | Dried fluid seizure of displacement rod (7).               | Clean, check or replace throat packings (9, 19); always stop pump at bottom of stroke and keep wet-cup filled with compatible solvent. |
| Pump operates but output is low on both strokes. | Restricted line or inadequate air supply.                  | Clear; increase air supply.                                                                                                            |
|                                                  | Insufficient air pressure; closed or clogged air valves.   | Open; clean.                                                                                                                           |
|                                                  | Exhausted fluid supply.                                    | Refill; purge all air from pump and fluid lines.                                                                                       |
|                                                  | Clogged fluid line, valves, etc.                           | Clear.*                                                                                                                                |
|                                                  | Packing nut (15) is too tight.                             | Loosen (see page 8).                                                                                                                   |
|                                                  | Loose packing nut (15) or worn throat packings (9, 19).    | Tighten packing nut (see page 8); replace throat packings.                                                                             |
| Pump operates but output is low on downstroke.   | Held open or worn intake valve.                            | Clear; service. See page 14.                                                                                                           |
| Pump operates but output is low on upstroke.     | Held open or worn fluid piston valve or packings (25, 26). | Clear; service. See page 14.                                                                                                           |
| Erratic or accelerated operation.                | Exhausted fluid supply.                                    | Refill; purge all air from pump and fluid lines.                                                                                       |
|                                                  | Held open or worn intake valve.                            | Clear; service. See page 14.                                                                                                           |
|                                                  | Held open or worn fluid piston valve or packings (25, 26). | Clear; service. See page 14.                                                                                                           |

\* To determine if the fluid hose or gun is obstructed, follow the **Pressure Relief Procedure** on page 8. Disconnect the fluid hose and place a container at the pump fluid outlet to catch any fluid. Turn on the air just enough to start the pump (about 20–40 psi [1.4–2.8 bar]). If the pump starts when the air is turned on, the obstruction is in the fluid hose or gun.

# Service

## Disconnecting the Displacement 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.

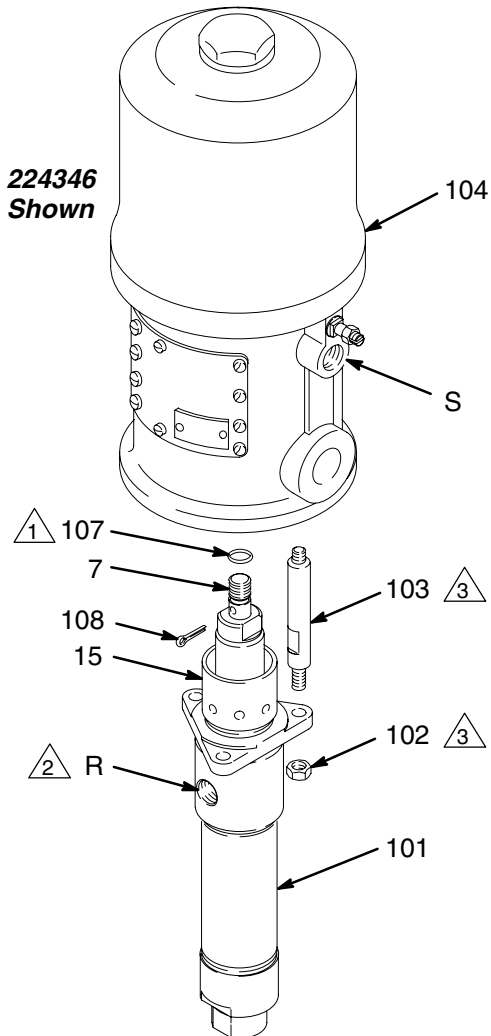
1. Flush the pump if possible. Stop the pump at the bottom of its stroke. **Relieve the pressure.**
2. Disconnect the air and fluid hoses. Remove the pump from its mounting. Note the relative position of the pump's fluid outlet (R) to the air motor's air inlet (S). See Fig. 4.
3. *On Models 224347 and 903295 only*, unscrew the riser tube (110) from the pump outlet elbow (109). Refer to the parts drawing on page 17.
4. Unscrew the locknuts (102) from the tie rods (103). Remove the cotter pin (108). Unscrew the displacement rod (7) from the air motor (104). Carefully pull the displacement pump (101) off the air motor. Inspect the o-ring (107).
5. Refer to page 14 for displacement pump service. To service the air motor, refer to the separate air motor manual (306982 or 307043), supplied.

1 Lubricate.

2 Apply thread sealant, as required.

3 *Models 224346, 224347, & 903295:* Torque to 20–30 ft-lb (27–41 N.m). *Model 224345:* Torque to 10–15 ft-lb (14–20 N.m).

**Model 224346  
Shown**



0194C

**Fig. 4**

# Service

## Reconnecting the Displacement Pump

1. Lubricate the o-ring (107) and check that it is in place on the displacement rod (7). Orient the pump's fluid outlet (R) to the air motor's air inlet (S) as was noted in step 2 under **Disconnecting the Displacement Pump**. Position the displacement pump (101) on the tie rods (103). See Fig. 4. *On Models 224347 and 903295 only, be sure the fluid outlet of the displacement pump is aligned with the riser tube and fluid outlet of the air motor.*
2. Screw the locknuts (102) onto the tie rods (103) loosely. *On Models 224347 and 903295 only, make certain that the fluid outlet elbow (109) is installed in the fluid outlet. Apply thread sealant to the parts of the riser tube assembly. See the parts drawing on page 17. Screw the riser tube (110) all the way down into the pump outlet elbow (109).*
3. Screw the displacement rod (7) into the shaft of the air motor (104) until the pin holes in the displacement rod and motor shaft align. Install the cotter pin (108).
4. Apply thread sealant to the pump fluid outlet (R) and the threads of the fluid hose. Mount the pump and reconnect all hoses. Reconnect the ground wire if it was disconnected during repair. Tighten the packing nut/wet-cup (15) so it is just snug – no tighter. Fill the wet-cup with Graco Throat Seal Liquid or compatible solvent.
5. Tighten the tie rod locknuts (102) evenly, and torque as shown in Fig. 4.
6. Start the pump and run it at about 40 psi (2.8 bar) air pressure, to check that it is operating properly.

### **WARNING**

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

7. Check for fluid leakage at the packing nut/wet-cup (15). **Relieve the pressure** before tightening the packing nut/wet-cup.

# Service

## 224344 Displacement Pump Disassembly

**NOTE:** For repair and parts information for displacement pumps 254999, 15G976, and 224341, see manual 308116.

When disassembling the pump, lay out all removed parts in sequence, to ease reassembly. Refer to Fig. 5.

**NOTE:** Repair Kit 224402 (Neoprene/UHMWPE packings) is available. For the best results, use all the new parts in the kit. Parts included in the kit are marked with one asterisk, for example (1\*).

Conversion Kit 224404 is available to convert the pump throat packings to UHMWPE and PTFE. See page 19 for details.

Clean all the parts thoroughly when disassembling. Check them carefully for damage or wear, replacing parts as needed.

1. Remove the displacement pump from the air motor as explained on page 12.
2. Unscrew the locking ring (17) from the cylinder (11). See Fig. 5. Remove the intake valve housing (13).
3. Remove the o-ring (12), ball stop pin (5), ball guide (22) and ball (2) from the intake valve housing (13).
4. Loosen the packing nut (15). Push the displacement rod (7) down as far as possible, then pull it out the bottom of the cylinder (11).
5. Secure the flats of the displacement rod (7) in a vise. Using a wrench on the flats of the piston mounting stud (28), screw the piston off the rod. Remove one cotter pin (1) and the ball stop pin (10), taking note which set of holes it is in. Then remove the ball (2).
6. Place the flats of the piston mounting stud (28) in a vise, and unscrew the piston stud (14). Remove the piston packings (25, 26), glands (24, 27), shim (29), and washer (23).
7. Remove the packing nut (15), throat packings (9, 19) and glands (6, 8) from the outlet housing (16).
8. Inspect all parts for damage. Clean all parts and threads with a compatible solvent before reassembling. Replace any worn or damaged parts.
9. Inspect the polished surfaces of the displacement rod (7) and cylinder (11) for scratches, scoring or other damage, which can cause premature packing wear and leaking. To check, run a finger over the surface or hold the part up to the light at an angle.
10. Be sure the ball seats of the piston (14) and intake valve housing (13) are not chipped or nicked.

## Displacement Pump Reassembly

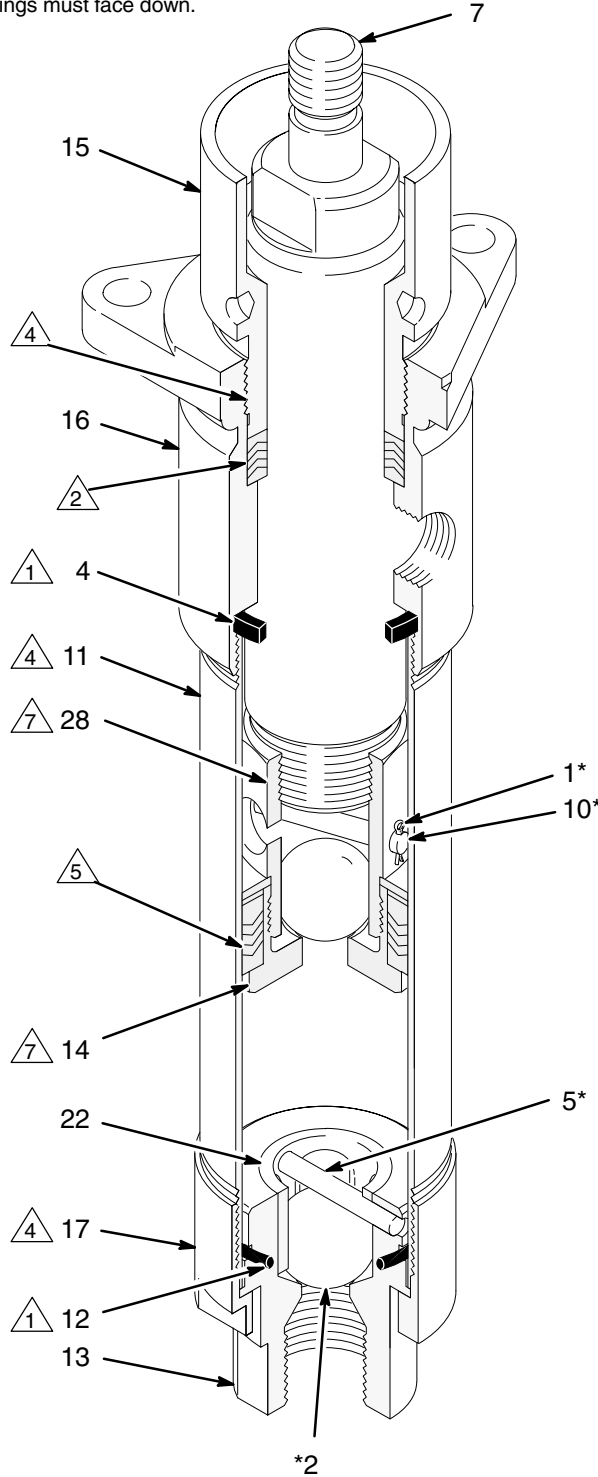
1. Lubricate the throat packings and install them in the outlet housing (16) one at a time as follows, *with the lips of the v-packings facing down*: the male gland (6\*), two neoprene v-packings (9\*), one UHMWPE v-packing (19\*), and the female gland (8\*). Apply thread lubricant and install the packing nut (15) loosely. See Detail A of Fig. 5.
2. If you removed the cylinder (11), be sure to replace the o-ring (4). Lubricate the o-ring and apply thread lubricant to the cylinder, then reinstall the cylinder in the outlet housing (16).
3. Lubricate the piston packings and install them onto the piston stud (14) one at a time in the following order, *with the lips of the v-packings facing up*: the female gland (27\*), one UHMWPE v-packing (25\*), one neoprene v-packing (26\*), one UHMWPE v-packing (25\*), the male gland (24\*), the shim (29\*), and the washer (23\*). See Detail B of Fig. 5.
4. Screw the piston stud (14) onto the piston mounting stud (28). Torque to 50–70 ft-lb (68–95 N.m). Install the piston ball (2\*) on the piston seat. Slide the ball stop pin (10\*) into the desired set of holes, and secure with the cotter pin (1\*).
5. Place the flats of the displacement rod (7) in a vise. Screw the piston assembly onto the displacement rod. Torque to 50–70 ft-lb (68–95 N.m).
6. Insert the displacement rod (7) into the bottom of the cylinder (11), being careful not to scratch the cylinder. Push the rod straight up until it protrudes from the packing nut (15).
7. Install the ball (2\*), guide (22), o-ring (12), and ball stop pin (5\*) in the intake valve housing (13). Place the intake valve assembly in the locking ring (17). Apply thread lubricant to the locking ring and cylinder (11), and screw the ring onto the cylinder.
8. Reconnect the displacement pump to the air motor as explained on page 13.

# Service

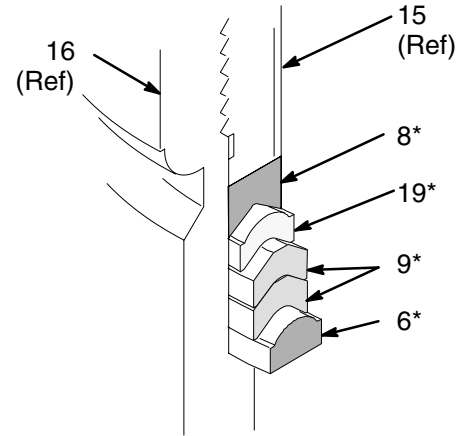
- △1 Lubricate.
- △2 See Detail A.
- △3 Lips of v-packings must face down.

- △4 Apply thread lubricant.
- △5 See Detail B.

- △6 Lips of v-packings must face up.
- △7 Torque to 50–70 ft-lb (68–95 N.m).



## Detail A: Throat Packings △1 △3



## Detail B: Piston Packings △1 △6

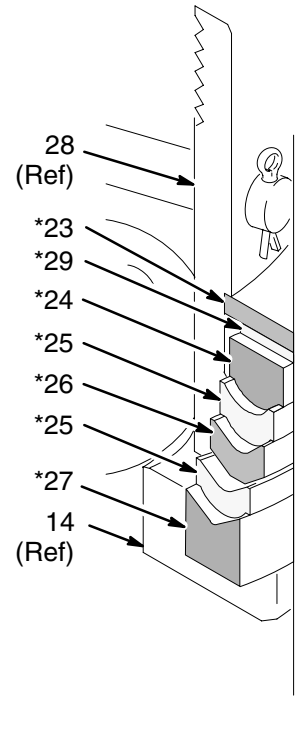
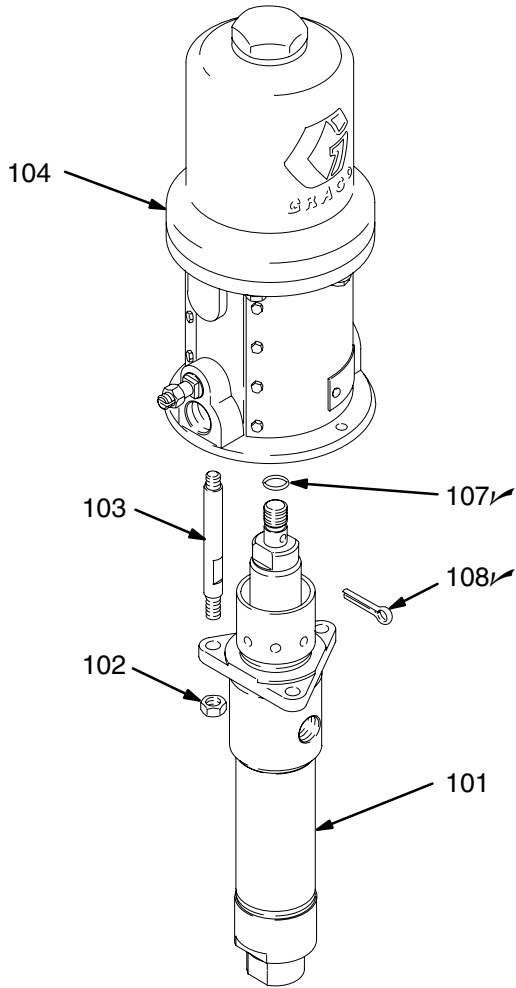


Fig. 5

0777A

# Parts

## Model 224345, Series A 5:1 Ratio Monark® Hydra-Clean® Pump

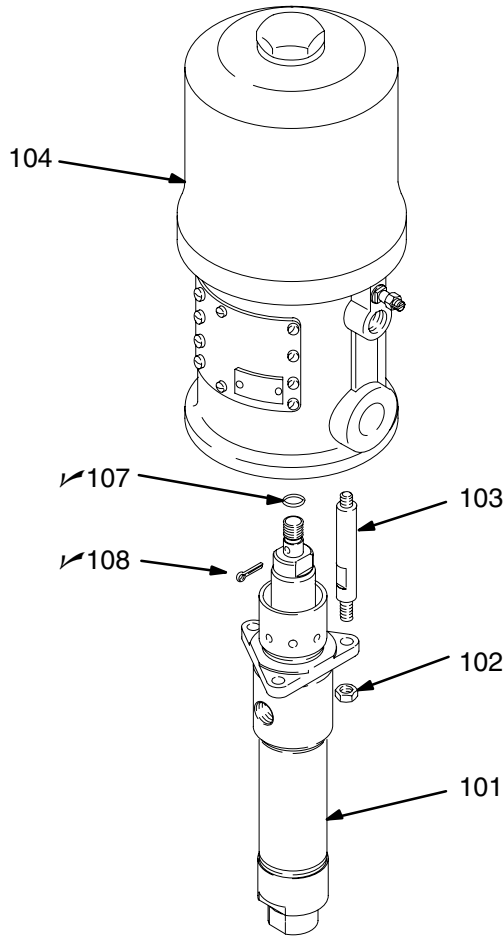


0196A

## Model 224346, Series A 10:1 Ratio President® Hydra-Clean® Pump

## Model 247146, Series A 10:1 Ratio President® Hydra-Clean® Pump

## Model 261631 Series A 10:1 Ratio President® Pump



0194C

| Ref No. | Part No. | Description                                                           | Qty |
|---------|----------|-----------------------------------------------------------------------|-----|
| 101     | 224344   | DISPLACEMENT PUMP ASSY<br>See pages 18 and 19 for parts               | 1   |
| 102     | 102021   | NUT, lock; 3/8-16; stainless steel                                    | 3   |
| 103     | 24B189   | KIT, tie rod                                                          | 3   |
| 104     | 205997   | AIR MOTOR<br>See 307043 for parts                                     | 1   |
| 107✓    | 156082   | SEAL, o-ring; nitrile rubber                                          | 1   |
| 108✓    | 101946   | PIN, cotter; stainless steel;<br>0.12 in. (3.2 mm) x 1.5 in. (3.8 mm) | 1   |

| Ref No. | Part No. | Description                                                            | Qty |
|---------|----------|------------------------------------------------------------------------|-----|
| 101     | 224344   | DISPLACEMENT PUMP ASSY<br>(224346 only; see pages 18 and 19 for parts) | 1   |
|         | 254999   | DISPLACEMENT PUMP ASSY<br>(261631 only; see 308116 for parts)          | 1   |
|         | 15G976   | DISPLACEMENT PUMP ASSY<br>(247146 only; see 308116 for parts)          | 1   |
| 102     | 102021   | NUT, lock; 3/8-16; stainless steel                                     | 3   |
| 103     | 166237   | ROD, tie; stainless steel;<br>3.5 in. (89 mm) shoulder-to-shoulder     | 3   |
| 104     | 207352   | AIR MOTOR<br>See 306982 for parts                                      | 1   |
| 107✓    | 156082   | SEAL, o-ring; nitrile rubber                                           | 1   |
| 108✓    | 101946   | PIN, cotter; stainless steel;<br>0.12 in. (3.2 mm) x 1.5 in. (3.8 mm)  | 1   |

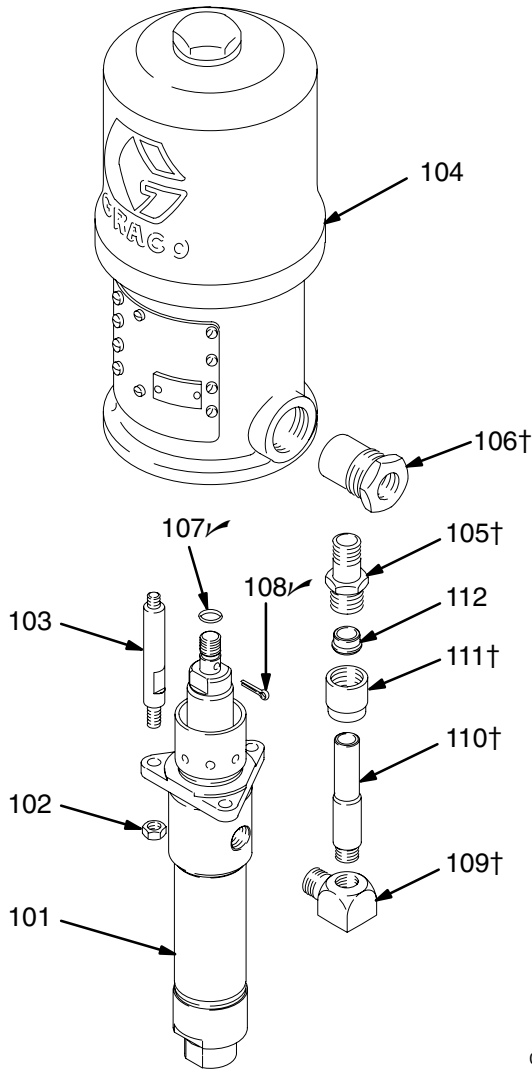
✓ Keep these spare parts on hand to reduce down time.

✓ Keep these spare parts on hand to reduce down time.



# Parts

## Model 224347, Series A 10:1 Ratio President® Hydra-Clean® Pump, with riser tube

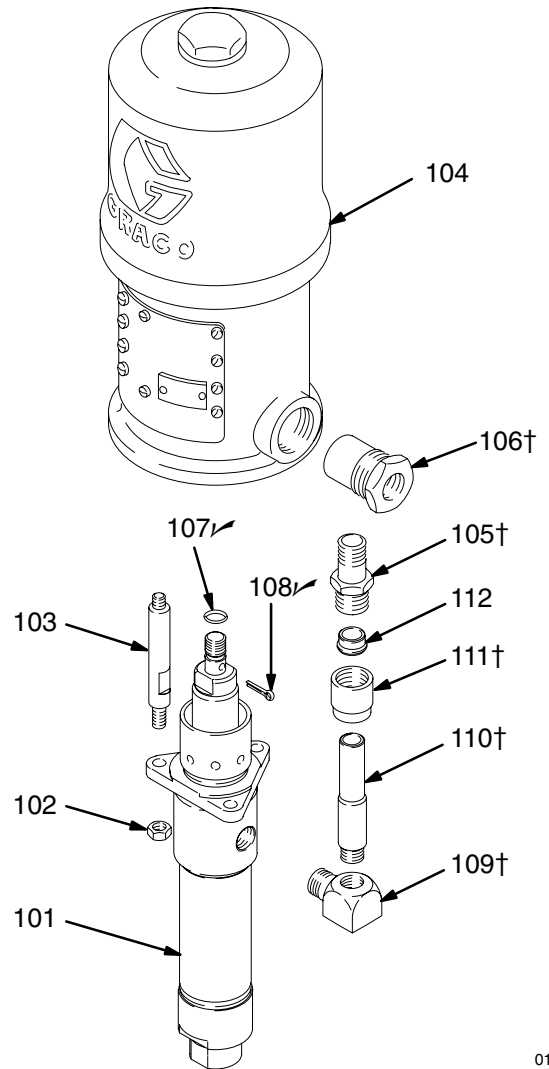


0198A

| Ref No. | Part No. | Description                                                              | Qty |
|---------|----------|--------------------------------------------------------------------------|-----|
| 101     | 224344   | DISPLACEMENT PUMP ASSY<br>See pages 18 and 19 for parts                  | 1   |
| 102     | 102021   | NUT, lock; 3/8–16; stainless steel                                       | 3   |
| 103     | 166237   | ROD, tie; stainless steel;<br>3.5 in. (89 mm) shoulder-to-shoulder       | 3   |
| 104     | 207352   | AIR MOTOR; See 306982 for parts                                          | 1   |
| 105†    | 166241   | ADAPTER, tube; stainless steel                                           | 1   |
| 106†    | 166240   | ELBOW, outlet; 1/2 npt(f) x 3/4 npt(f) x<br>1–1/2–20(m); stainless steel | 1   |
| 107✓    | 156082   | SEAL, o-ring; nitrile rubber                                             | 1   |
| 108✓    | 101946   | PIN, cotter; stainless steel;<br>0.12 in. (3.2 mm) x 1.5 in. (3.8 mm)    | 1   |
| 109†    | 166242   | ELBOW, street, 90°; 1/2 npt(m) x<br>1/2 npt(f); stainless steel          | 1   |
| 110†    | 166719   | TUBE, riser; stainless steel                                             | 1   |
| 111†    | 166029   | NUT, flareless tube; stainless steel                                     | 1   |
| 112     | 102186   | FERRULE, for 3/4 in. OD tube;<br>stainless steel                         | 1   |

✓ Keep these spare parts on hand to reduce down time.  
† Apply thread sealant to these parts.

## Model 903295, Series A 10:1 Ratio President® Hydra-Clean® Pump, with riser tube



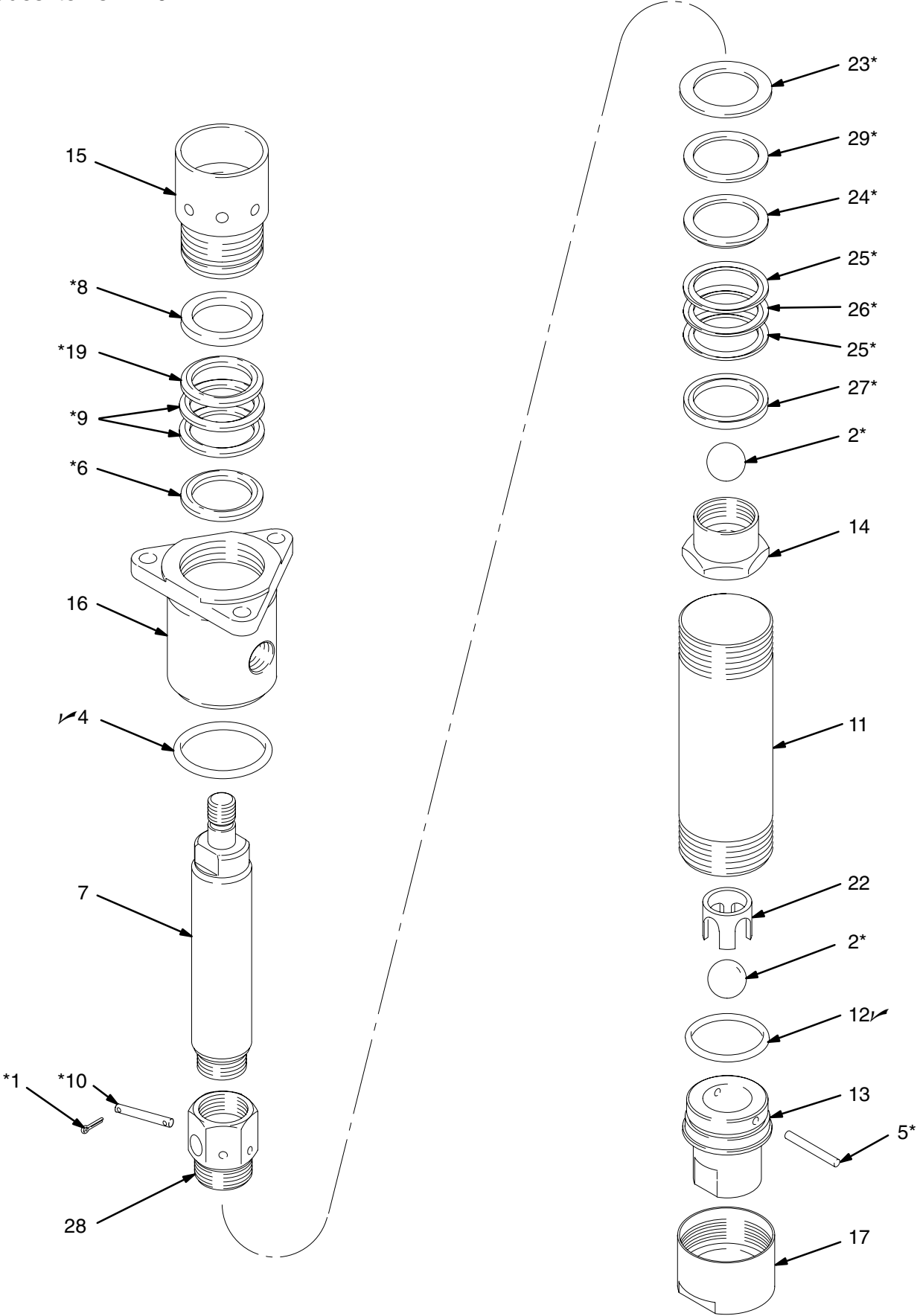
0198A

| Ref No. | Part No. | Description                                                              | Qty |
|---------|----------|--------------------------------------------------------------------------|-----|
| 101     | 224341   | DISPLACEMENT PUMP ASSY<br>See 308116 for parts                           | 1   |
| 102     | 102021   | NUT, lock; 3/8–16; stainless steel                                       | 3   |
| 103     | 166237   | ROD, tie; stainless steel;<br>3.5 in. (89 mm) shoulder-to-shoulder       | 3   |
| 104     | 207352   | AIR MOTOR; See 306982 for parts                                          | 1   |
| 105†    | 166241   | ADAPTER, tube; stainless steel                                           | 1   |
| 106†    | 166240   | ELBOW, outlet; 1/2 npt(f) x 3/4 npt(f) x<br>1–1/2–20(m); stainless steel | 1   |
| 107✓    | 156082   | SEAL, o-ring; nitrile rubber                                             | 1   |
| 108✓    | 101946   | PIN, cotter; stainless steel;<br>0.12 in. (3.2 mm) x 1.5 in. (3.8 mm)    | 1   |
| 109†    | 166242   | ELBOW, street, 90°; 1/2 npt(m) x<br>1/2 npt(f); stainless steel          | 1   |
| 110†    | 166719   | TUBE, riser; stainless steel                                             | 1   |
| 111†    | 166029   | NUT, flareless tube; stainless steel                                     | 1   |
| 112     | 102186   | FERRULE, for 3/4 in. OD tube;<br>stainless steel                         | 1   |

✓ Keep these spare parts on hand to reduce down time.  
† Apply thread sealant to these parts.

# Parts

**Model 224344, Series A**  
**Severe-Duty, Stainless Steel Displacement Pump**  
 Includes items 1–29



# Parts

## Model 224344, Series A Severe-Duty, Stainless Steel Displacement Pump Includes items 1–29

| Ref No. | Part No. | Description                                      | Qty | Ref No.                                                                                                                                                                            | Part No.                               | Description                             | Qty |
|---------|----------|--------------------------------------------------|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|-----------------------------------------|-----|
| 1*      | 100063   | PIN, cotter; 1/16 in. x 1/2 in.; stainless steel | 2   | 26*                                                                                                                                                                                | 111293                                 | V-PACKING, piston; neoprene             | 1   |
| 2*      | 101917   | BALL; stainless steel; 0.875 in. (22 mm) dia.    | 2   | 27*                                                                                                                                                                                | 186989                                 | GLAND, piston, female; stainless steel  | 1   |
| 4✓      | 164782   | O-RING; PTFE                                     | 1   | 28                                                                                                                                                                                 | 176644                                 | STUD, mounting, piston; stainless steel | 1   |
| 5*      | 162947   | PIN, ball stop, intake; stainless steel          | 1   | 29*                                                                                                                                                                                | 111790                                 | SHIM; stainless steel                   | 1   |
| 6*      | 186987   | GLAND, throat, male; stainless steel             | 1   | * These parts are included in Repair Kit 224402 (Neoprene/UHMWPE packings), which may be purchased separately.                                                                     |                                        |                                         |     |
| 7       | 186997   | ROD, displacement; stainless steel               | 1   |                                                                                                                                                                                    |                                        |                                         |     |
| 8*      | 186988   | GLAND, throat, female; stainless steel           | 1   | ✓ Keep these spare parts on hand to reduce down time.                                                                                                                              |                                        |                                         |     |
| 9*      | 166133   | V-PACKING, throat; neoprene                      | 2   |                                                                                                                                                                                    |                                        |                                         |     |
| 10*     | 176637   | PIN, ball stop, piston; stainless steel          | 1   | <b>Optional UHMWPE/PTFE Throat Packing Conversion Kit 224404</b><br>Use to convert the pump throat packings to UHMWPE and PTFE. Kit must be purchased separately.<br>Kit includes: |                                        |                                         |     |
| 11      | 186994   | CYLINDER; stainless steel                        | 1   |                                                                                                                                                                                    |                                        |                                         |     |
| 12✓     | 164846   | O-RING; PTFE                                     | 1   | <b>Part No.</b> <b>Description</b> <b>Qty</b>                                                                                                                                      |                                        |                                         |     |
| 13      | 186992   | HOUSING, valve, intake; stainless steel          | 1   |                                                                                                                                                                                    |                                        |                                         |     |
| 14      | 186993   | STUD, piston; stainless steel                    | 1   | 162866                                                                                                                                                                             | V-PACKING, throat; PTFE                |                                         | 2   |
| 15      | 186995   | PACKING NUT/WET-CUP; stainless steel             | 1   | 186987                                                                                                                                                                             | GLAND, throat, male; stainless steel   |                                         | 1   |
| 16      | 205999   | HOUSING, outlet; stainless steel                 | 1   | 186988                                                                                                                                                                             | GLAND, throat, female; stainless steel |                                         | 1   |
| 17      | 164630   | RING, locking; stainless steel                   | 1   | 176639                                                                                                                                                                             | V-PACKING, throat; UHMWPE              |                                         | 2   |
| 19*     | 170625   | V-PACKING, throat; UHMWPE                        | 1   |                                                                                                                                                                                    |                                        |                                         |     |
| 22      | 164679   | GUIDE, ball, intake; stainless steel             | 1   |                                                                                                                                                                                    |                                        |                                         |     |
| 23*     | 176634   | WASHER, piston; stainless steel                  | 1   |                                                                                                                                                                                    |                                        |                                         |     |
| 24*     | 186990   | GLAND, piston, male; stainless steel             | 1   |                                                                                                                                                                                    |                                        |                                         |     |
| 25*     | 176638   | V-PACKING, piston; UHMWPE                        | 2   |                                                                                                                                                                                    |                                        |                                         |     |



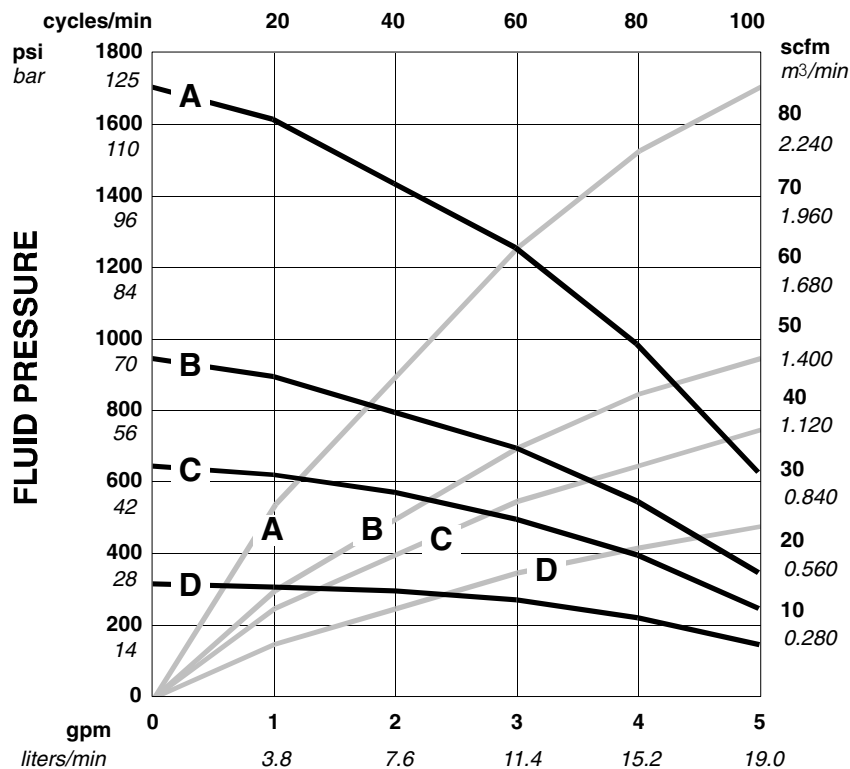
# Technical Data (10:1 President)

| Category                                             | Data                                                                                                                                                                                                                                                   |
|------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Maximum fluid working pressure                       | 1800 psi (125 bar)                                                                                                                                                                                                                                     |
| Maximum air input pressure                           | 180 psi (12.5 bar)                                                                                                                                                                                                                                     |
| Pump cycles per 1 gallon (3.8 liters)                | 20                                                                                                                                                                                                                                                     |
| Fluid flow at 60 cycles per minute                   | 3 gallons (11.4 liters)                                                                                                                                                                                                                                |
| Recommended speed for optimum pump life              | 15–25 cycles/min; 0.75 to 1.25 gpm (2.84 to 4.73 liters/min)                                                                                                                                                                                           |
| Maximum operating temperature                        | 180°F (82°C)                                                                                                                                                                                                                                           |
| * Sound level at 100 psi, 60 cycles per minute       | 94 dBa                                                                                                                                                                                                                                                 |
| * Sound power level at 100 psi, 60 cycles per minute | 109 dBa                                                                                                                                                                                                                                                |
| Weight                                               | approx. 31 lb (14 kg)                                                                                                                                                                                                                                  |
| Wetted parts                                         | AISI 302, 303, 304, 316, and 17–4 PH grades of Stainless Steel; Chrome-Plating; Ultra-High Molecular Weight Polyethylene; PTFE; Nitrile Rubber; Neoprene.<br><i>Riser Tube (Models 224347 and 903295 only):</i> 303 and 304 grades of Stainless Steel. |

\* Tested in accordance with ISO 3744.

**KEY:** Fluid Outlet Pressure – Black Curves  
Air Consumption – Gray Curves

**A** 180 psi (12.5 bar) air pressure  
**B** 100 psi (7 bar) air pressure  
**C** 70 psi (4.9 bar) air pressure  
**D** 40 psi (2.8 bar) air pressure



## FLUID FLOW (TEST FLUID: NO. 10 WEIGHT OIL)

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

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

**To find Pump Air Consumption (m³/min or scfm)** at a specific fluid flow (lpm/gpm) and air pressure (bar/psi):

1. Locate desired flow along bottom of chart.
2. Read vertical line up to intersection with selected air consumption curve (gray). Follow right to scale to read air consumption.

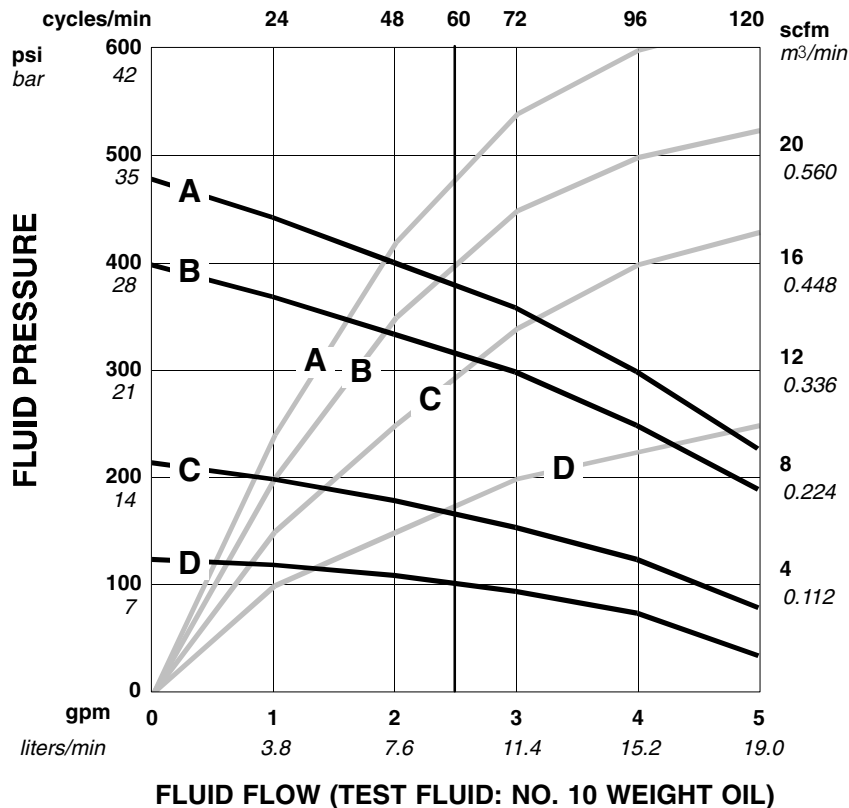
# Technical Data (5:1 Monark)

| Category                                             | Data                                                                                                                                                      |
|------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Maximum fluid working pressure                       | 600 psi (42 bar)                                                                                                                                          |
| Maximum air input pressure                           | 120 psi (8.4 bar)                                                                                                                                         |
| Pump cycles per 1 gallon (3.8 liters)                | 24                                                                                                                                                        |
| Fluid flow at 60 cycles per minute                   | 2.5 gallons (9.46 liters)                                                                                                                                 |
| Recommended speed for optimum pump life              | 15–25 cycles/min; 0.63 to 1.04 gpm (2.38 to 3.94 liters/min)                                                                                              |
| Maximum operating temperature                        | 180°F (82°C)                                                                                                                                              |
| * Sound level at 100 psi, 60 cycles per minute       | 88 dBa                                                                                                                                                    |
| * Sound power level at 100 psi, 60 cycles per minute | 95 dBa                                                                                                                                                    |
| Weight                                               | approx. 20 lb (9 kg)                                                                                                                                      |
| Wetted parts                                         | AISI 302, 303, 304, 316, and 17–4 PH grades of Stainless Steel; Chrome-Plating; Ultra-High Molecular Weight Polyethylene; PTFE; Nitrile Rubber; Neoprene. |

\* Tested in accordance with ISO 3744.

**KEY:** Fluid Outlet Pressure – Black Curves  
Air Consumption – Gray Curves

**A** 120 psi (8.4 bar) air pressure  
**B** 100 psi (7 bar) air pressure  
**C** 70 psi (4.9 bar) air pressure  
**D** 40 psi (2.8 bar) air pressure



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

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

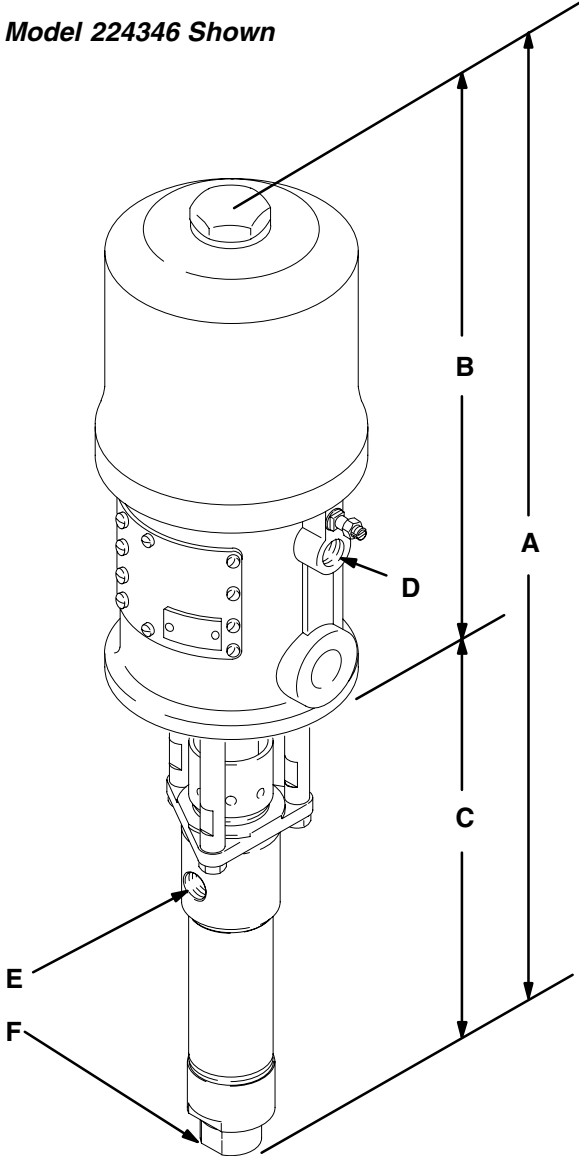
**To find Pump Air Consumption (m<sup>3</sup>/min or scfm)** at a specific fluid flow (lpm/gpm) and air pressure (bar/psi):

1. Locate desired flow along bottom of chart.
2. Read vertical line up to intersection with selected air consumption curve (gray). Follow right to scale to read air consumption.

# Dimensions

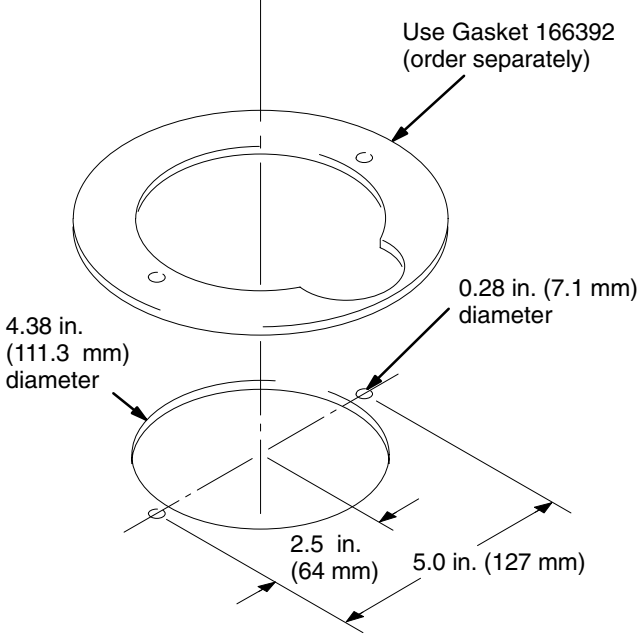
| Pump Model                                         | A                     | B                            | C                     |
|----------------------------------------------------|-----------------------|------------------------------|-----------------------|
| 224346,<br>247146,<br>224347,<br>903295,<br>254999 | 28.38 in.<br>(721 mm) | 14.63 in.<br>(372 mm)        | 13.75 in.<br>(349 mm) |
| 224345                                             | 25.25 in.<br>(641 mm) | 11.5 in.<br>(292 mm)         | 13.75 in.<br>(349 mm) |
| Pump Model                                         | D<br>Air Inlet        | E<br>Fluid Outlet            | F<br>Fluid Inlet      |
| 224346                                             | 1/2 npt(f)            | 1/2 npt(f)                   | 3/4 npt(f)            |
| 224347,<br>903295                                  | 1/2 npt(f)            | 3/4 npt(f)<br>(w/riser tube) | 3/4 npt(f)            |
| 224345                                             | 3/8 npt(f)            | 1/2 npt(f)                   | 3/4 npt(f)            |

Model 224346 Shown



0195B

# Mounting Hole Layout



0775

# 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 Information

**TO PLACE AN ORDER**, contact your Graco distributor, or call one of the following numbers to identify the distributor closest to you:

**1-800-328-0211 Toll Free**

**612-623-6921**

**612-378-3505 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 308117

**Graco Headquarters:** Minneapolis

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

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

Copyright 1991, Graco Inc. is registered to ISO 9001

**www.graco.com**

Revised 12/2008