

Instructions – Parts List



BULLDOG HYDRA-CAT[®] FIXED RATIO Proportioning Pumps

308225K

EN

3000 psi (21 MPa, 207 bar) Maximum Working Pressure

**Two or Three Displacement Pump Models
in Various Mix Ratios, Pressure Ratios
and Flow Volume**

**Available as Bare Pumps,
Wall-Mounted* or Free-Standing* Models**

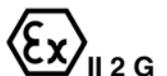
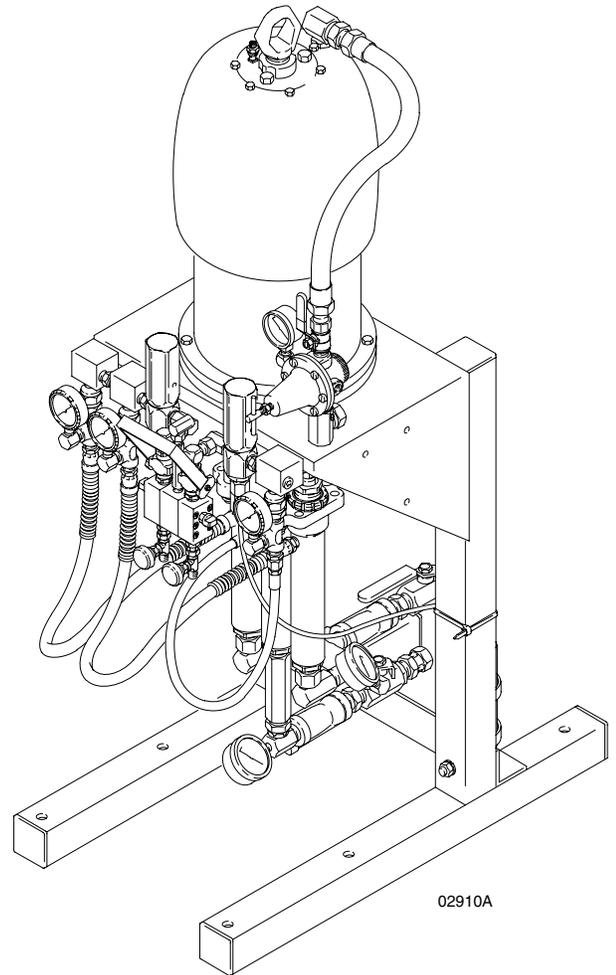
*Includes Mixing Manifolds, Automatic Pressure Relief Valves,
Check Valves, Pressure Gauges and Regulators



Read warnings and instructions.
For a list of models, see page 6.

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PROVEN QUALITY. LEADING TECHNOLOGY.

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



INJECTION HAZARD

Spray from the gun, hose leaks, or ruptured components can inject fluid into your body and cause extremely serious injury, including the need for amputation. Splashing fluid 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 medical attention.**
- Do not point the spray gun at anyone or at any part of the body.
- Do not put your hand or fingers over the spray tip/nozzle.
- 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.
- Check the gun diffuser operation weekly. Refer to the gun manual.
- Always have the trigger guard on the spray 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 19 if the spray tip/nozzle clogs and whenever you: are instructed to relieve pressure; stop spraying; clean, check, or service the equipment; and install or clean the spray tip/nozzle.
- Tighten all fluid connections before operating the equipment.
- Check the hoses, tubes, and couplings daily. Do not mend or repair any part of the hose assembly. If the hose is damaged, replace it immediately.



MOVING PARTS HAZARD

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

- Do not operate the equipment with the air motor plates removed.
- Keep your body and tools clear of any moving parts when starting or operating the equipment.

WARNING



FIRE, EXPLOSION, AND ELECTRIC SHOCK HAZARD

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

- Ground the equipment and the object being sprayed. See **Grounding** on page 10.
- Do not use the heater with flammable liquids, such as those having flash points below 200° F (93° C).
- All electrical wiring must be done by trained and qualified personnel and comply with all local codes and regulations.
- If there is any static sparking while using the equipment, **stop spraying immediately**. Identify and correct the problem.
- Provide fresh air ventilation to avoid the buildup of flammable fumes from solvents or the fluid being sprayed.
- Do not smoke within the spray area.
- Extinguish all the open flames or pilot lights within the spray area.
- Keep the spray area free of debris, including solvent, rags, and gasoline.
- Electrically disconnect all the equipment within the spray area.
- Do not turn on or off any light switch within the spray area while operating or if fumes are present.
- Do not operate a gasoline engine within 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.
- Graco does not manufacture or supply any of the reactive chemical components that may be used in this equipment and is not responsible for their effects. Graco assumes no responsibility for loss, damage, expense or claims for personal injury or property damage, direct or consequential, arising from the use of such chemical components.

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 uncertain about usage, call your Graco distributor.
- Do not alter or modify this equipment. Use only genuine Graco parts and accessories.
- Check equipment daily. Repair or replace worn or damaged parts immediately.
- See the chart on page 6 for important pressure rating information. The maximum working pressure of each model is also shown on the pump identification plate. Be sure that all dispensing equipment and accessories are rated to withstand the maximum working pressure of your pump. Do not exceed the maximum working pressure of the lowest rated system component.
- Never operate the pump without the automatic pressure relief valves and drainage kits installed. These valves relieve fluid pressure through a drain port at the bottom of the valve if the displacement pump pressure exceeds the working pressure.
- Do not lift pressurized equipment.
- Use only Graco approved hoses. Do not remove hose spring guards, which help protect the hose from rupture caused by kinks or bends near the couplings.
- Route the hoses away from the 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).
- Do not use the hoses to pull the equipment.
- Use fluids and solvents that are compatible with the equipment wetted parts. See the **Technical Data** section of all the equipment manuals. Read the fluid and solvent manufacturer's warnings.
- Comply with all applicable local, state and national fire, electrical and other safety regulations.

Model Charts

Pressure and Ratio Ratings for Bulldog Pumps

WARNING

COMPONENT RUPTURE HAZARD

To reduce the risk of over-pressurizing a component, which can result in an explosion and serious injury, never operate the system at a working pressure higher than the lowest rated component in the system. All fluid side components, such as dispensing valves; regulators; and hoses, must have a working pressure equal to or greater than the pressure given in Column B for each pump model.

Column A gives the maximum pump fluid output pressure.

Column B gives the minimum working pressure required for all system components, based on the automatic relief valve settings. Components included by Graco with the models listed meet or exceed this requirement.

Models with Two Displacement Pumps

Mix Ratio	Model No.			A				B		Normal Pressure Ratio (Fluid to Air)	Nominal Flow Volume @ 40 cpm	
				Maximum Pump Fluid Output Pressure*		At Maximum Air Pressure Of:		Minimum Component Working Pressure				
	Bare	Wall	Stand	psi	MPa, bar	psi	MPa, bar	psi	MPA, bar		gpm	lpm
1:1	231897	231836	231865	3000	21, 207	86	0.6, 6	3000	21, 207	34.7	1.8	6.8

Models with Three Displacement Pumps

Mix Ratio	Model No.			A				B		Normal Pressure Ratio (Fluid to Air)	Nominal Flow Volume @ 40 cpm	
				Maximum Pump Fluid Output Pressure*		At Maximum Air Pressure Of:		Minimum Component Working Pressure				
	Bare	Wall	Stand	psi	MPA, bar	psi	MPa, bar	psi	MPA, bar		gpm	lpm
2:1	231908	231847	231876	2320	16, 160	100	0.7, 7	2900	20, 200	23.2	2.7	10.1
2:1	231910	231849	231878	3000	21, 207	86	0.6, 6	3600	25, 248	34.7	1.8	6.7
3:1	231912	231851	231880	2610	18, 180	100	0.7, 7	2900	20, 200	26.1	2.4	8.9
4:1	231915	231854	231883	2780	19, 192	100	0.7, 7	2900	20, 200	27.8	2.2	8.4

Typical Installation

About the Typical Installations

These pumps are designed to be part of a Hydra-Cat dispensing system that will proportion, mix, and dispense two-component fluids. The typical installations shown below and on page 8 are only guidelines to setting up a complete proportioning system. For clarity, various components are shown in the correct order but may not be shown in the exact position of the installed system. For assistance in designing your system, contact your nearest Graco representative.

NOTE: When pressure feeding the proportioning pump, mount fluid pressure gauges (J) at the proportioning pump inlets to monitor proper adjustment of the feed pump pressures. Never exceed 25% of the Hydra-Cat pump outbound fluid pressure on the feed supply.

Light Viscosity System Two Displacement Pumps, 5:1 Ratio Feed Pumps

KEY

A	Bleed-type master air valve	H	Proportioning pump	P	Fluid drain valve
B	Air filter	J	Fluid pressure gauge	Q	Fluid shutoff valve
C	Air lubricator	K	Check valve	R	Static mixer
D	Pump runaway valve	L	Automatic pressure relief valve	S	Dispense valve
E	Pump air regulator	M	Fluid filter	T	Fluid regulator
F	Feed pump	N	Mixer manifold	U	Solvent pump
G	Ground wire	V	Fluid strainer	V	Fluid strainer

1 See note above

2 Connect to drain bottle.
See Fig. 5, page 11

* Included with wall or stand models

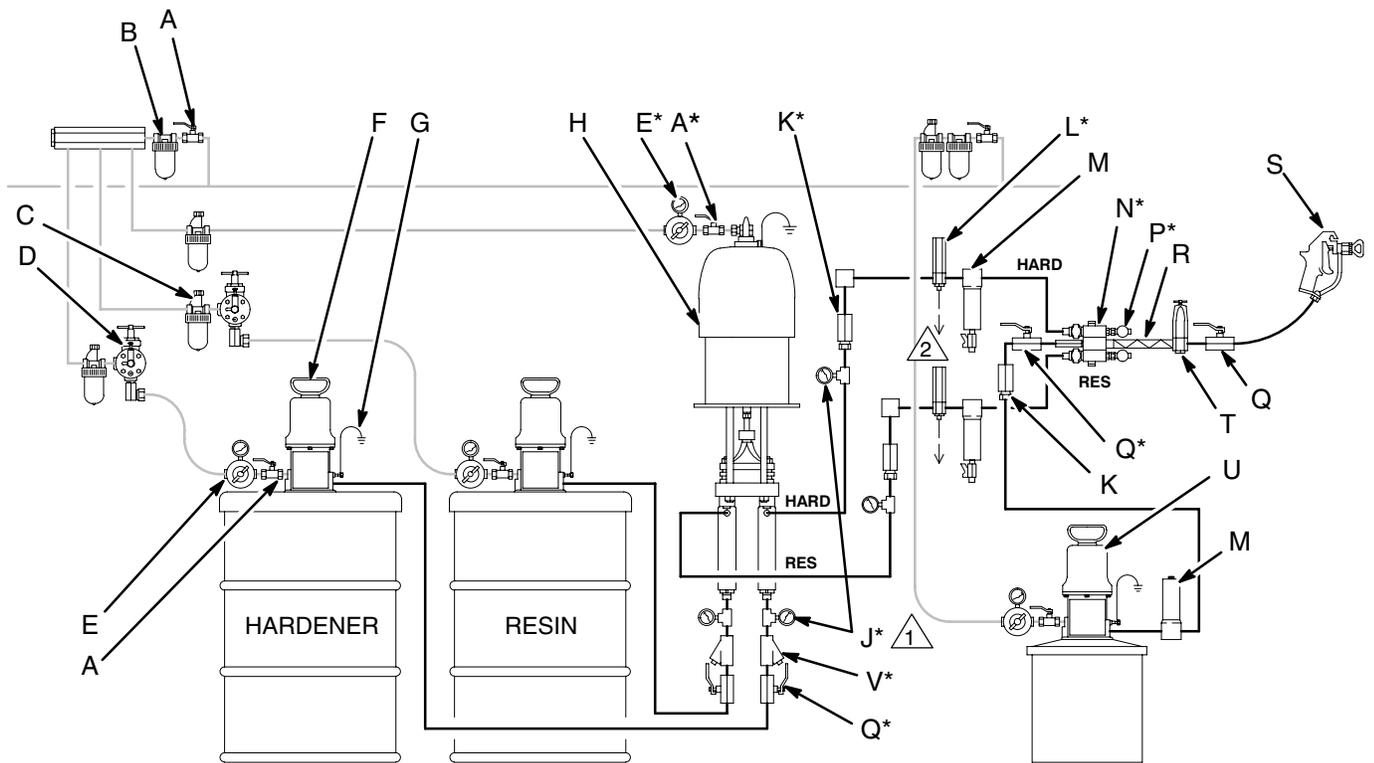


Fig. 1

02911

Typical Installation

About the Typical Installations

These pumps are designed to be part of a Hydra-Cat dispensing system that will proportion, mix, and dispense two-component fluids. The typical installation is shown below and on page 7 are only a guidelines to setting up a complete proportioning system. For clarity, various components are shown in the correct order but may not be shown in the exact position of the installed system. For assistance in designing your system, contact your nearest Graco representative.

NOTE: When pressure feeding the proportioning pump, mount fluid pressure gauges (J) at the proportioning pump inlets to monitor proper adjustment of the feed pump pressures. Never exceed 25% of the Hydra-Cat pump outbound fluid pressure on the feed supply.

Heavy Viscosity Heated System Three Displacement Pumps, 10:1 Ratio Feed Pumps

KEY

A	Bleed-type master air valve	J	Fluid pressure gauge	R	Static mixer
B	Air filter	K	Check valve	S	Dispense valve
C	Air lubricator	L	Automatic pressure relief valve	T	Fluid regulator
D	Pump runaway valve	M	Fluid filter	U	Solvent pump
E	Pump air regulator	N	Mixer manifold	V	Fluid strainer
F	Feed pump	P	Fluid drain valve	W	Fluid heater
G	Ground wire	Q	Fluid shutoff valve	X	Supply manifold
H	Proportioning pump				

- 1 See note above
2 Connect to drain bottle. See Fig. 5, page 11

* Included with wall or stand models

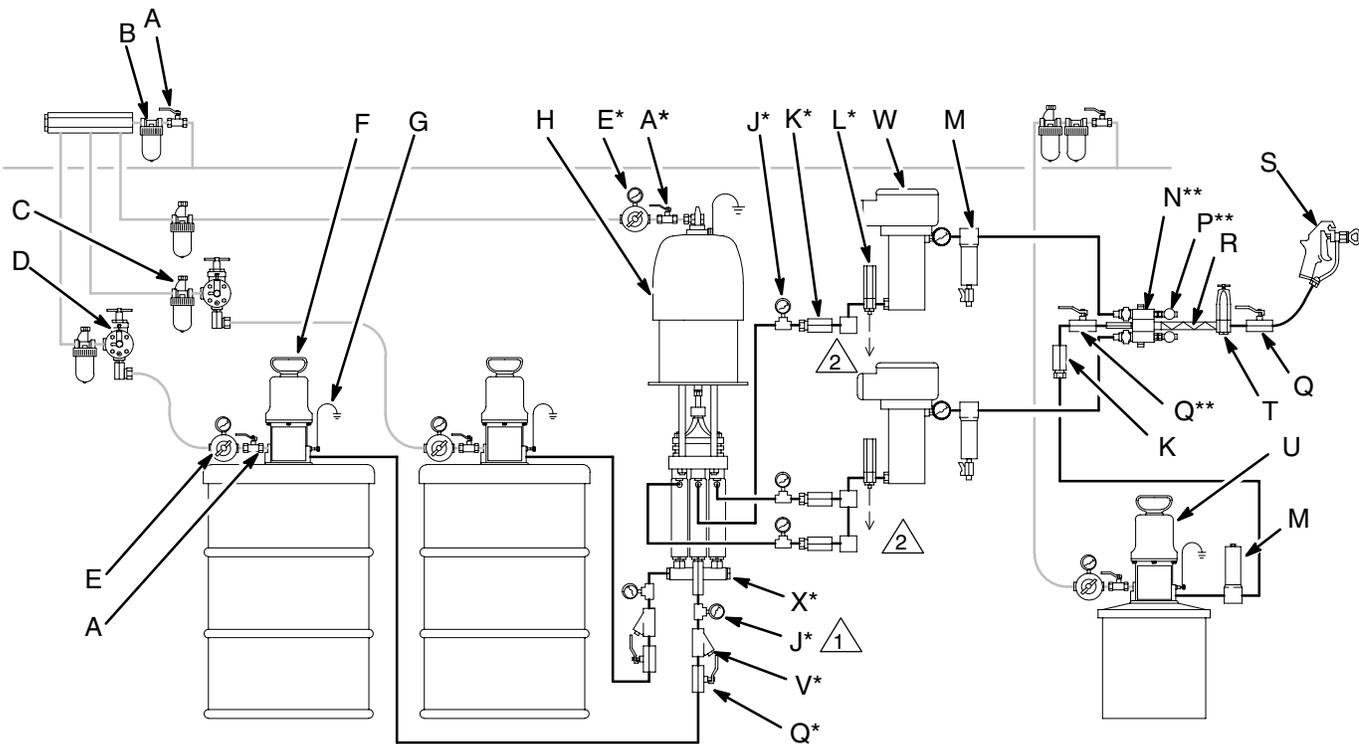


Fig. 2

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Installation

Bare Pumps

Bare pumps are available for those installations which require a highly customized system. For a safe and efficient system, Graco recommends that the air and fluid components supplied with the Wall Mount and Cart Mount models also be used in customized systems. Refer to the Parts Drawings starting on page 28 for part numbers. In addition, the accessories shown in the Typical Installation drawings and discussed in the following pages of this manual should be used.

Be sure all accessories are sized properly for the air and fluid requirements of your system.

Read all instructions in the Installation section for further details.

NOTES:

1. Models with three displacement pumps always use the two outer displacement pumps to supply the resin and the middle displacement pump to supply the hardener.
2. Label all pumps, hoses, fluid regulators, etc. to indicate whether they are for the resin side or hardener side of the system.

Mounting the Pump

Mount the pump to suit your installation. The bare pump can be mounted on a wall bracket or on a cart. See Dimensions on page 43. The Bulldog pump and accessories weigh approximately 115 lb (52 kg). The pump stand and accessories weigh 55 lb (25 kg).

For a wall mount, be sure the bracket and wall are strong enough to support the pump, accessories, plumbing and stress caused by pump operation. Locate the bracket about 5 ft (1.5 m) above the floor.

Installation

Grounding

⚠ WARNING



FIRE AND EXPLOSION HAZARD

Improper grounding could cause static sparking, which could cause a fire or explosion. To reduce the risk of property damage or serious injury, follow the grounding instructions below.



The following grounding instructions are minimum requirements for a system. Your system may include other equipment or objects which must be grounded. Check your local electrical code for detailed grounding instructions for your area and type of equipment. Your system must be connected to a true earth ground.

1. **Pump:**

- a. Loosen the grounding lug locknut (BB) and washer (AA).
- b. Insert one end of a 14 ga. (1.5 mm²) minimum ground wire (G) into the slot in lug (CC) and tighten the locknut securely. See Fig. 3.
- c. Connect the other end of the ground wire to a true earth ground. Order part number 237569 grounding clamp wire.

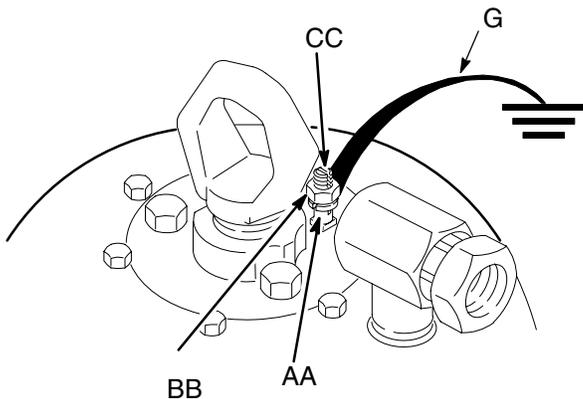


Fig. 3

2. **Air hoses:** use only grounded hoses with a maximum of 500 feet (150 m) combined hose length to ensure grounding continuity.
3. **Fluid hoses:** use only grounded fluid hoses.
4. **Air compressor:** follow manufacturer's recommendations.
5. **Spray gun or dispensing valve:** grounding is obtained through connection to a properly grounded fluid hose and pump.
6. **Fluid supply container:** according to local code.
7. **Object being sprayed:** according to your local code.
8. **All solvent pails used when flushing,** according to 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,** always hold a metal part of the dispensing unit firmly to the side of a grounded metal pail, then trigger the dispensing unit.

Installation

Air Control Accessories

Install the accessories in the order shown in Fig. 4. Mount only the air regulator (E) and a master air valve (A) at the pump. Mount all other accessories on separate wall brackets to reduce stress on the pump inlet. Note that one air filter (B) can serve multiple pumps by using an air manifold downstream from the air filter.

⚠ WARNING

INJECTION HAZARD
Bleed-type master air valves (A) are required in the system in the positions shown in the Typical Installation drawings. These valves are used during system pressure relief to relieve air trapped in the air line. Trapped air can cause the pump to cycle unexpectedly and result in serious injury from moving parts, fluid injection, or fluid splashing.

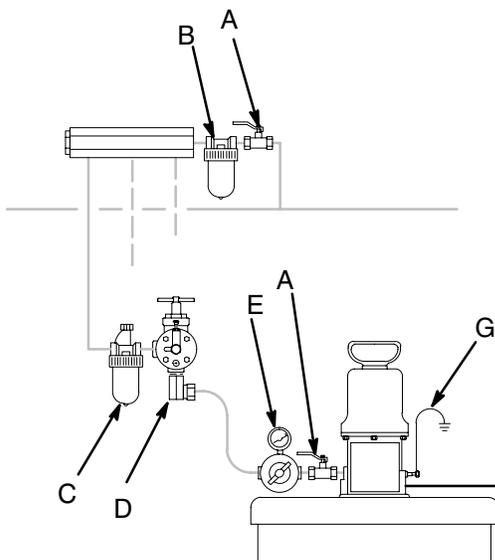


Fig. 4 02887

1. Install a bleed-type master air valve (A) in the pump air inlet.
2. Install an air regulator and gauge (E) to control pump outlet pressure.

3. Install a pump runaway valve (D) for each feed pump to automatically shut off the air to the pump if the pump accelerates beyond the pre-adjusted setting. A pump which runs too fast can be seriously damaged.
4. Install an air line lubricator (C) for automatic air motor lubrication.
5. Install an air filter (B) to remove harmful dirt and moisture from the compressed air supply.

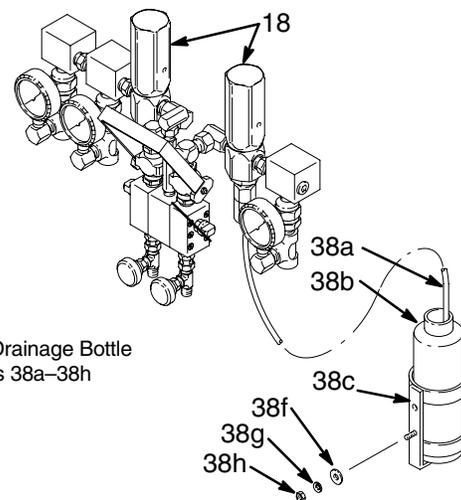
Automatic Pressure Relief Valves

⚠ WARNING

COMPONENT RUPTURE HAZARD
To reduce the risk of component rupture, which could cause serious injury and property damage, the appropriate automatic pressure relief valve (18) is **required** for each fluid on a plural component pump.

These valves automatically relieve fluid pressure if the pump output pressure exceeds the valve's preset pressure. Over-pressurization may occur if there is a fluid line clog upstream from the valve or if any other condition exists that causes one of the pumps to cavitate and direct all fluid pressure to the other pump(s).

See the Model Chart on page 6 to determine the preset pressure in your system.



NOTE: Item 38, Drainage Bottle Kit, includes items 38a–38h

Fig. 5 02888A

Installation

Automatic Pressure Relief Valves (continued)

Two drainage bottle kits (38) are included with wall models (unassembled) and stand mount models (assembled) to catch the drainage if the automatic pressure relief valves (18) open.

For the wall mount models, assemble the kit as shown in Fig. 5, page 11, and mount it securely to a wall or bracket. Use the tie wrap, supplied, to hold the hoses out of the way if necessary.

⚠ WARNING

INJECTION HAZARD

Fluid emitted from the automatic pressure drain valves may be at pressures over 3000 psi (21 MPa, 207 bar). To reduce the risk of serious injury from fluid injection or fluid splashing, make sure the drain bottles are securely fastened to the frame or wall so that they can handle a sudden spurt of pressurized fluid.

Connect Fluid Supply Hoses

NOTE: If you mount the pump on a wall, turn the displacement pump inlet assemblies (CC) to face forward, rather than backwards as shown in Fig. 76.

For Two Displacement Pump Models

1. Connect the resin supply hose (EE) to the 3/4 npt swivel inlet (37B) for the resin displacement pump. See Fig. 6.
2. Connect the hardener supply hose (DD) to the 3/4 npt swivel inlet (37A) for the hardener displacement pump. See Fig. 6.

For Three Displacement Pump Models

1. Connect the resin supply hose (EE) to the 3/4 npt swivel inlet (37B) for the resin displacement pumps. See Fig. 7.
2. Connect the hardener supply hose (DD) to the 3/4 npt swivel inlet (37) for the center (hardener) displacement pump. See Fig. 7.

Additional System Components

Install and connect the feed pumps, solvent pump, heaters, etc. Refer to the Typical Installations page 7 and Accessories on pages 40 and 41 for parts information.

Use a dry air kit or a nitrogen regulator kit to protect the fluid in the supply containers from moisture that can crystallize the fluid and cause the ball checks to malfunction. See Accessories on page 41.

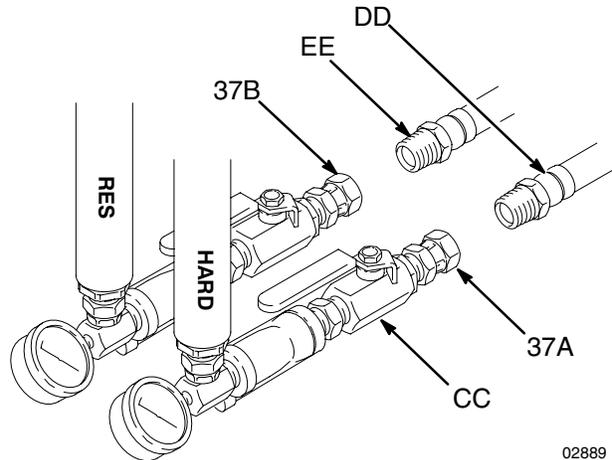


Fig. 6

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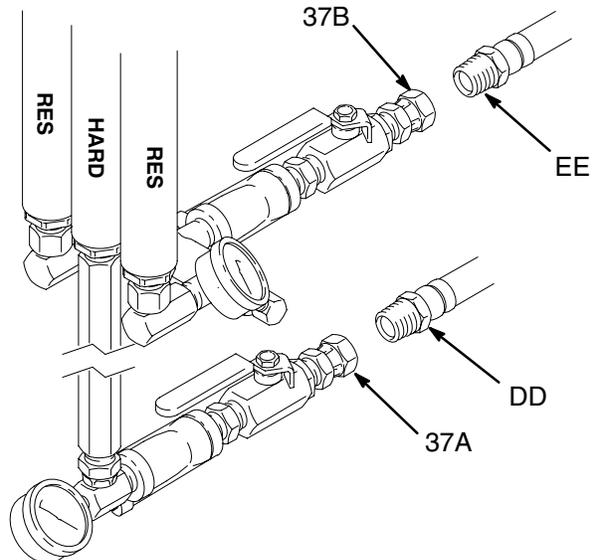


Fig. 7

02890

Installation – Optional Fluid Heaters

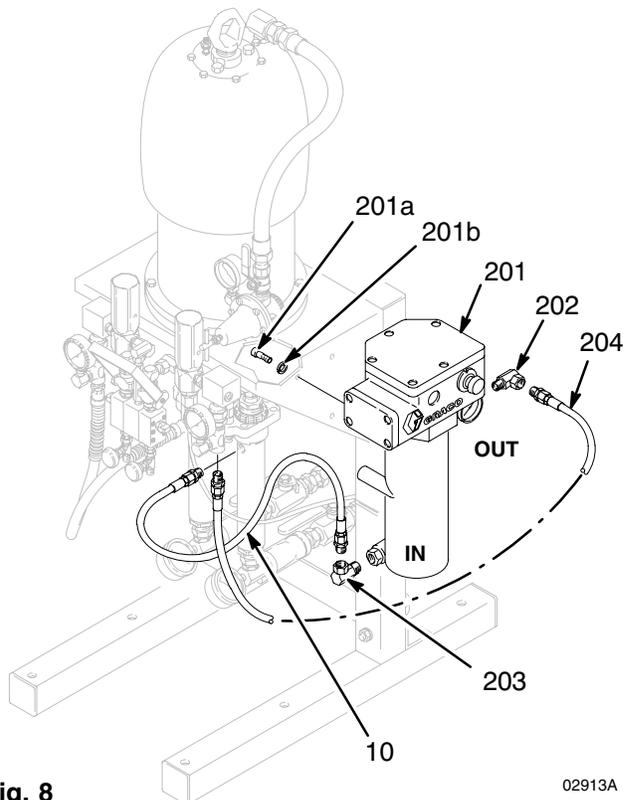


Fig. 8

02913A

⚠ WARNING

INJECTION HAZARD
 To reduce the risk of serious injury, follow the **Pressure Relief Procedure** on page 19 before installing the heaters.

All Models

NOTE: For systems requiring one heater for each fluid, see page 40 to order the heaters and required plumbing (items 201 to 205).

1. Mount a heater to each side of the mounting bracket using the three screws (201a) and lock washers (201b) supplied with each heater. See Fig. 8.
2. Connect a swivel union (202) to the outlet of each heater. See Fig. 8.
3. Connect a swivel union (203) to the inlet of each heater. See Fig. 8.

For Two Displacement Pump Models

1. Disconnect the existing hardener hose (10B) from the inlet of the mixer manifold (23). See Fig. 8. Connect the free end of the hose to the swivel (203) at the hardener heater inlet. See Fig. 9.
2. Install a new fluid hose (204B) between the hardener heater outlet (202B) and the hardener mixer manifold. See Fig. 8 and 9.
3. Repeat Steps 1 and 2 for the resin pump (the "A" side).

See Three Displacement Pump Models on next page.

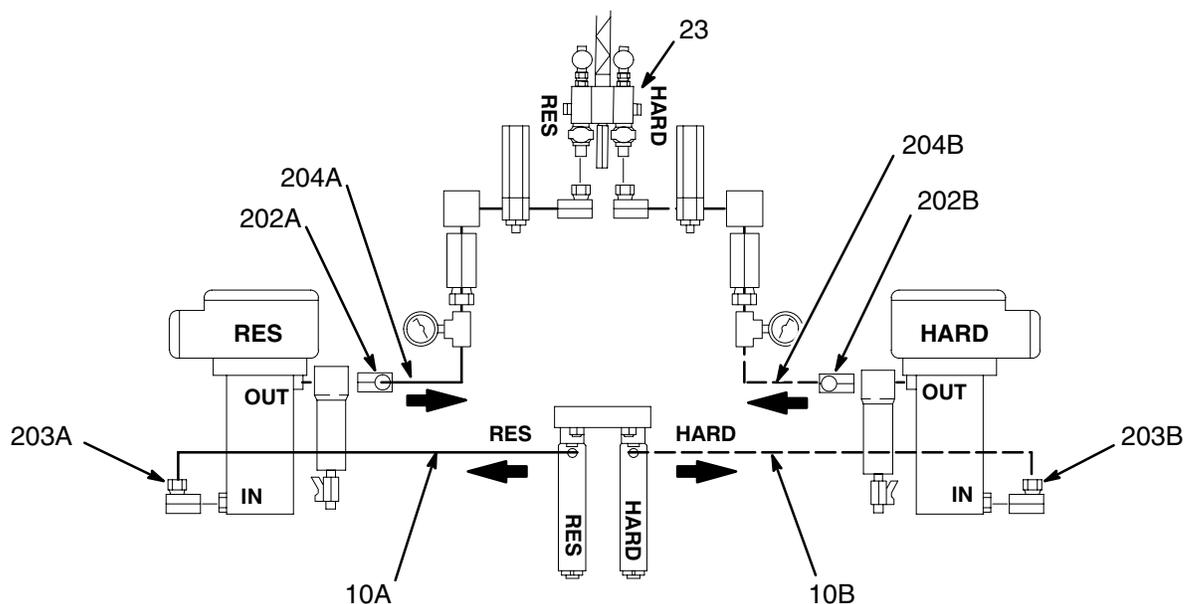


Fig. 9

02893

Installation – Optional Fluid Heaters

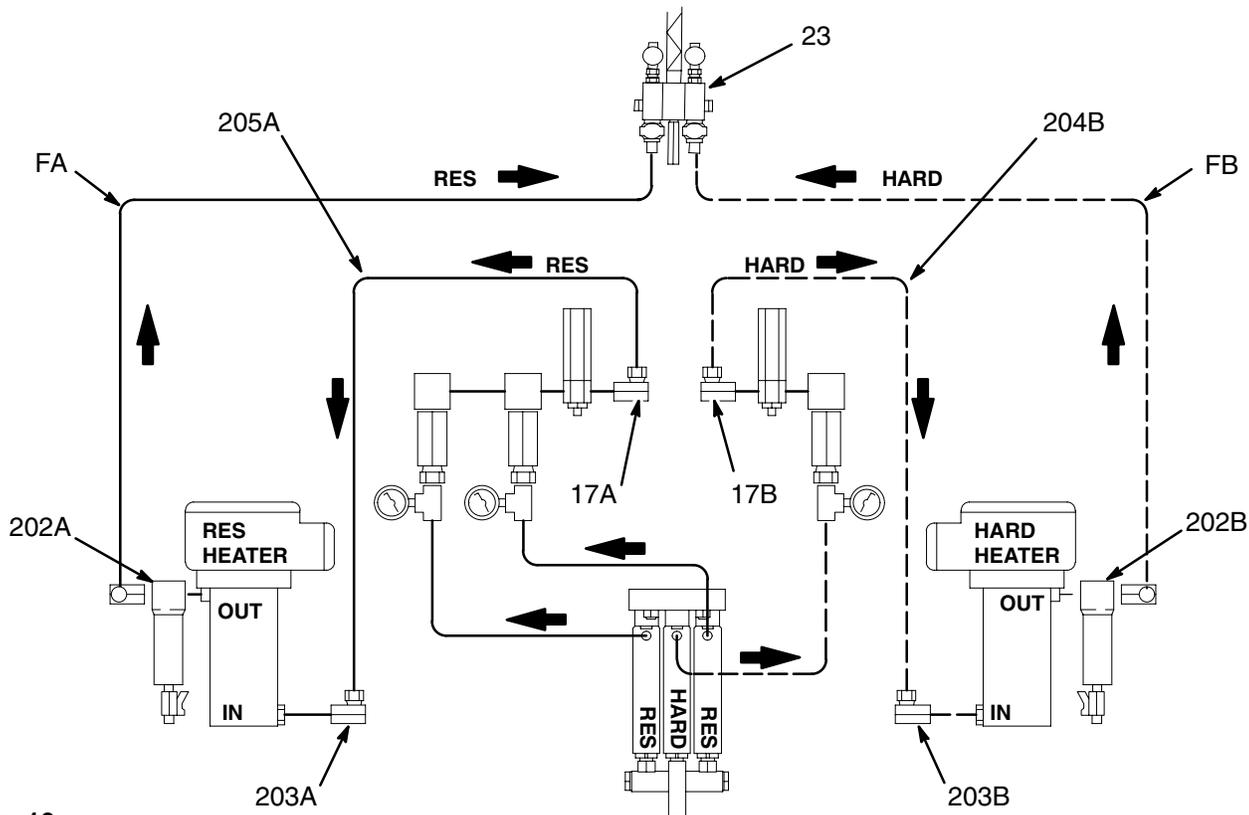


Fig. 10

02894

For Three Displacement Pump Models

NOTE: You must provide two hoses (FA, FB in Fig.10) and fittings to run from the heater outlets to the mixer manifold inlets.

NOTE: To accommodate two resin fluid hoses, the mixer manifold (23) must be disconnected from the bracket and mounted remotely.

1. Loosen the swivel of the unions (17A, 17B) to remove the elbow (16A, 16B) on each side of the mixer manifold (23). Turn the unions (17A, 17B) so the outlet faces up. See Fig. 10 and 11.
2. Connect a new hardener fluid hose (204B) between the union (17B) and the swivel (203B) at the heater inlet. See Fig. 10.
3. Install another hardener fluid hose (FB) between the heater outlet elbow (202B) and the hardener side of the mixer manifold (23). See Fig. 10.
4. Repeat Steps 1 to 3 for the resin side of the system (the "A" side).

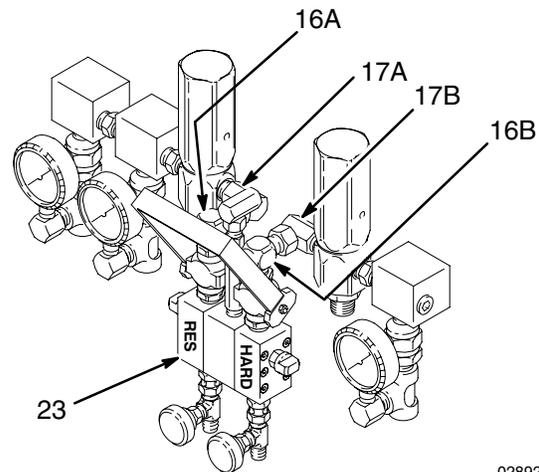


Fig. 11

02892A

Installation – Optional Solvent Pump

NOTE: The optional solvent pump is not offered as a kit; order parts as needed. The optional parts shown here are listed on page 41. These instructions assume that the pump is being mounted to the back of the stand offered in this manual. The Typical Installations on pages 7 and 8 shows an alternate installation. Adjust your installation according to your specific needs.

1. Mount the solvent pump bracket (310) on the back of the stand.
2. Mount the pump (306) to the bracket using the hardware supplied with the pump.
3. Use the existing proportioning pump air regulator (5) to supply air to the solvent pump. Remove the plug from the back of the swivel union (3) and install the adapter (301). Rotate the regulator gauge elbow (4) so the gauge is facing the operator.
4. Couple the hose (303) and couplings (302). Connect the hose (303) to the adapter (301).
5. Install the other adapter (301), needle valve (304) and adapter (305) to the pump inlet.
6. Connect the adapter (307), elbow (308) and fluid hose (309) to the pump outlet.
7. Install a fluid shutoff valve (311) at the mixer manifold swivel union (15). This valve is used to prevent resin or hardener from backing up into the solvent system, and to isolate the solvent system for service. Connect the solvent inlet hose (309).
8. Connect the suction hose assembly (312) to the pump intake.

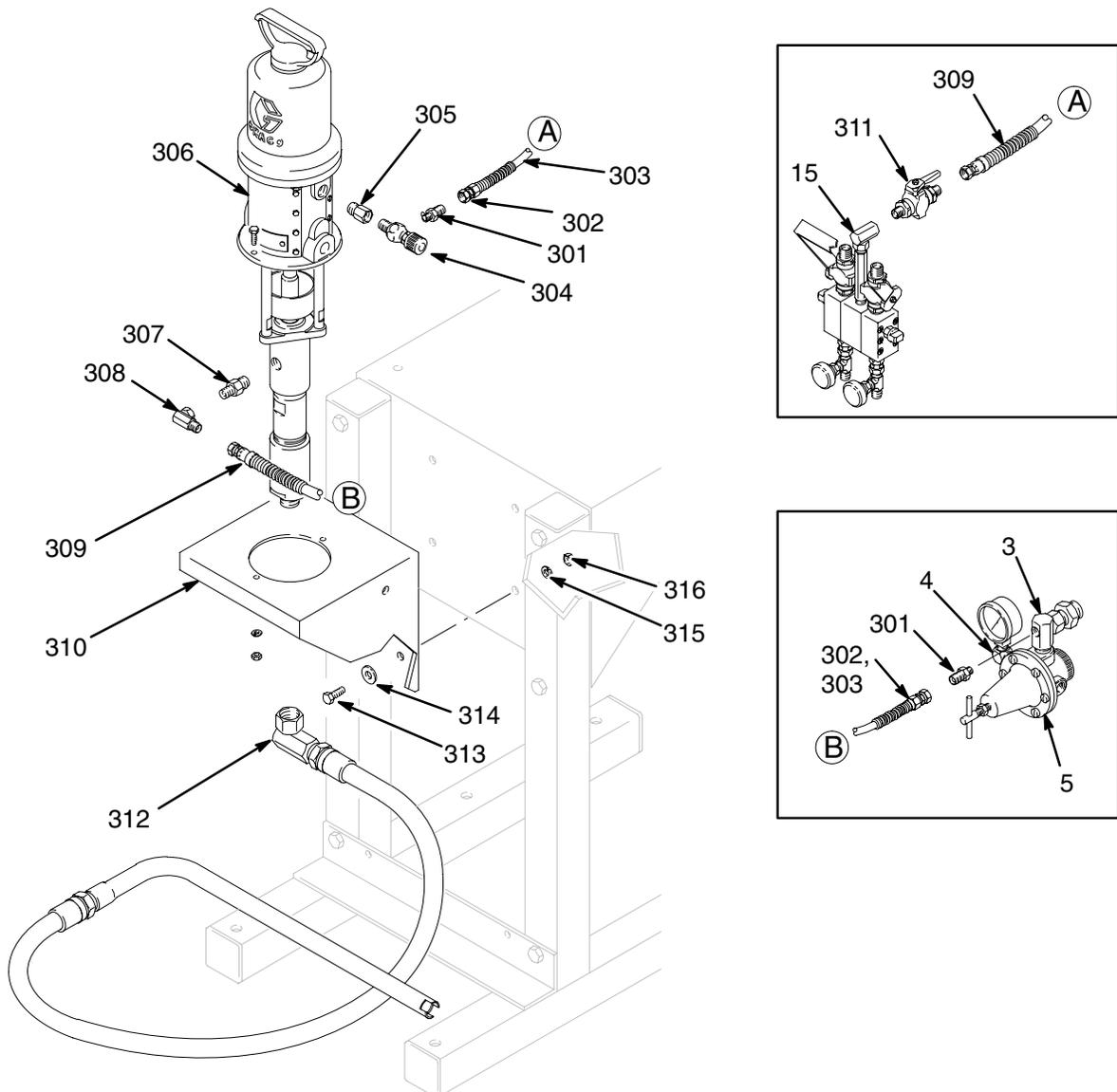


Fig. 12

Flushing

When to Flush the System

- Flush the system before its first use to remove the light oil which was left in after factory testing.
- Flush the manifold mixer (N), using the solvent pump, as frequently during the day as necessary to avoid exceeding the pot life limit of the material being pumped.
- Flush frequently enough during regular operation to prevent clogged passages due to material being overheated or dried out in any part of the system. Clogged passages in the heater can be very difficult to clean and can reduce heating efficiency, flow rate and pressure.
- Flush the entire system when the system is shut down for a long period of time. Keep in mind that some moisture may get into the lines, which could contaminate the hardener, so flush again before restarting the system.

How to Operate the Mixer Manifold

To open or close the mixer manifold fluid valves (LL) push the handle (KK) down to open and up to close. See Fig. 13.

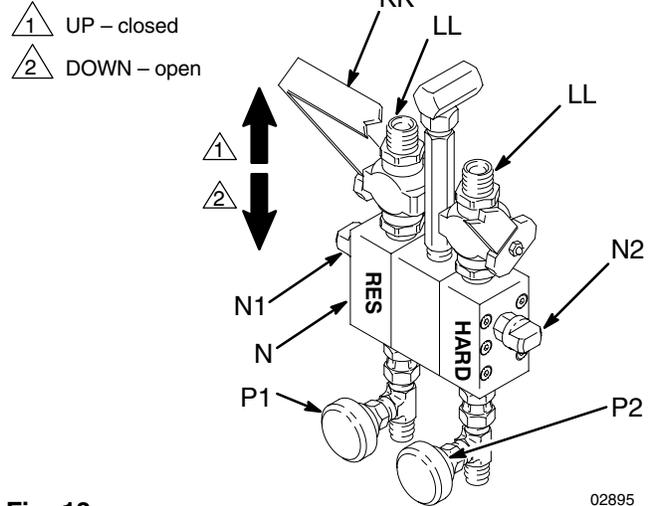


Fig. 13

02895

KEY

- | | | | | | |
|----|--|----|---------------------------|----|------------------------------|
| A | Bleed-type master air valve | E | Pump air regulator | H | Proportioning pump |
| A1 | Hardener feed pump | E1 | Hardener feed pump | N | Mixer manifold |
| A2 | Resin feed pump | E2 | Resin feed pump | Q | Fluid shutoff valve |
| A3 | Proportioning pump | E3 | Proportioning pump | Q1 | Proportioning pump intake |
| A4 | Solvent pump | E4 | Solvent pump | Q2 | Mixer manifold solvent inlet |
| A5 | Feed and Proportioning pump master air valve | J | Fluid pressure gauge | | |
| A6 | Solvent pump master air valve | J1 | Proportioning pump intake | | |
| | | J2 | Proportioning pump outlet | | |

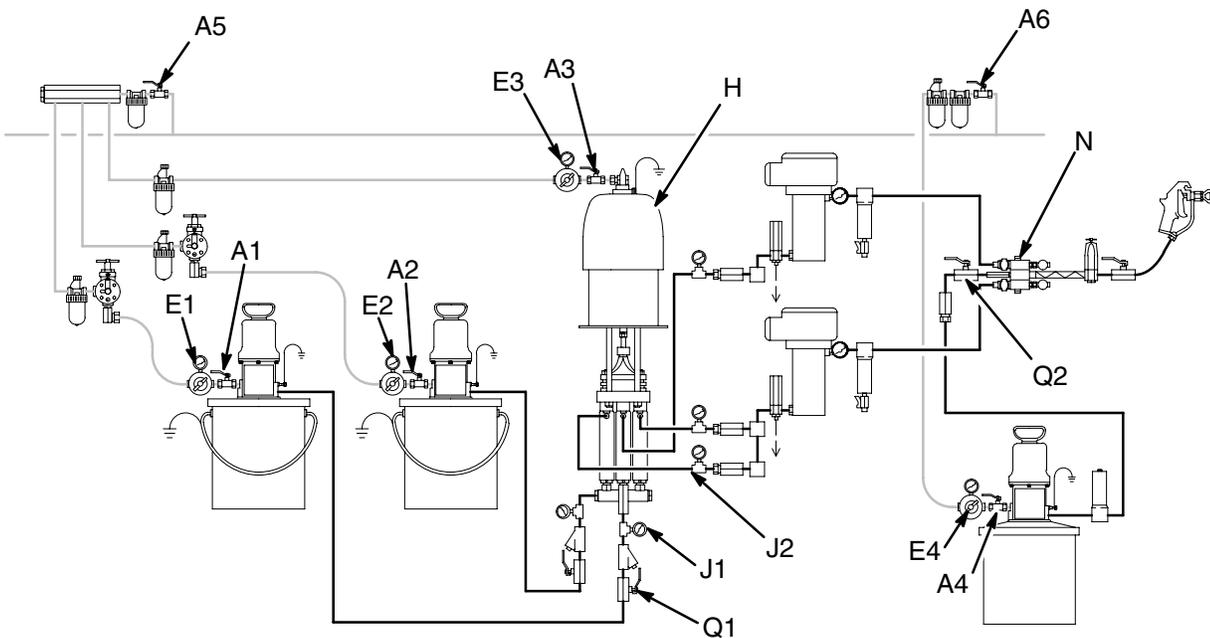


Fig. 14

02914

Flushing

How to Flush the System

 WARNING	
	HOT SURFACE HAZARD If your system is equipped with heaters, always shut off the main power to the heaters before flushing. Circulate the fluid through the system for at least 10 minutes to cool the fluid and the heater. This reduces the risk of serious injury from burns.

NOTE: For the first time flushing, we recommend using mineral spirits solvent (also called white spirit) to flush out the oil. Then flush again using a solvent that is compatible with the fluid you will be dispensing. However, be sure the mineral spirits solvent is compatible with the material you will be pumping. If it is not, check with your fluid supplier to determine an appropriate solvent for flushing out the light oil.

For flushing only . . .

NOTE: The proportioning pump is not operated during flushing. The solvent from the feed pumps will flush the proportioning pump displacement pumps.

1. Place each feed pump intake into a separate 5 gallon grounded pail, containing about 3 gallons (12 liters) of solvent.

To flush or prime . . .

2. Be sure both of the fluid shutoff valves (Q1) are open. See Fig. 14.
3. Place a container under the drain valves (P1,P2) of the mixer manifold (N). See Fig. 13.
4. Be sure the feed pump air regulators (E1,E2) are at minimum pressure. See Fig. 14.
5. Open the main master air valve (A5). See Fig.14.
6. Open the hardener pump master air valve (A1). See Fig. 14.

7. Slowly increase the air regulator (E1) setting until the pump is running slowly.
8. Open the hardener side drain valve (P1). Open the mixer manifold handle (KK). See Fig. 13.
9. When the hardener lines are flushed, close the mixer manifold handle and close the drain valve (P1). Close the air valve (A1). See Fig.14.
10. Repeat Steps 6 to 9 for the resin feed pump. The resin sides uses these parts: regulator (E2), air valve (A2), drain valve (P2).

To flush the solvent valves . . .

11. Open the hardener solvent flush valve (N1) on the mixer manifold (N). See Fig. 13.
 - a. Be sure the solvent pump air regulator (E4) is at minimum pressure. See Fig.14.
 - b. Open the solvent pump main master air valve (A6) and then open the pump air valve (A4). See Fig. 14.
 - c. Release the dispensing valve safety latch. Hold the dispensing valve firmly against a grounded pail and trigger it while slowly opening the solvent pump air regulator (E4). Operate the pump slowly until the dispense line is flushed. Release the dispensing valve trigger and engage its safety latch. Close the hardener solvent flush valve (N1).
 - d. Open the resin solvent flush valve (N2) and repeat Step c, above. See Fig. 13.
 - e. Close the solvent line shutoff valve (Q2). See Fig.14.

 CAUTION
Always close the solvent line fluid shutoff valve (Q2) after the flushing procedure has been completed. This will prevent the other fluids from leaking into the flushing line.

Flushing

If this is a first time flush . . .

12. Repeat the flushing procedure using a solvent compatible with the fluid you are going to dispense.

When you are done flushing . . .

13. Remove the solvent supply from the feed pumps. Operate the pumps slowly to push all the solvent out of the lines, then stop the pumps.

If you are not going to use the system . . .

14. Close all air regulators, master air valves and fluid shutoff valves. Follow the **Pressure Relief Procedure** on page 19.

WARNING

INJECTION HAZARD

To reduce the risk of serious injury from fluid injection or fluid splashing, always close the air valve (A4) to the solvent pump before opening the fluid drain valves (P2) to relieve system pressure. This will reduce the risk of excessive pressure buildup in the opposite component hose and fittings.

Operation

Pressure Relief Procedure

WARNING



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** if the spray tip/nozzle clogs and whenever you:

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

1. Engage the dispensing valve safety latch.
2. Shut off the feed pump and proportioning pump air regulators and bleed-type master air valves.
3. If the system has heaters, circulate the fluid for at least 10 minutes to cool the heated fluid and heater.
4. Disengage the dispensing valve safety latch.
5. Hold a metal part of the dispensing valve firmly to the side of a grounded metal pail, and trigger the dispensing valve to relieve pressure.
6. Engage the safety latch.
7. Open the mixer manifold drain valves (required in your system), having a container ready to catch the drainage. Close the valves immediately.
8. Use the solvent pump to flush the mixer manifold solvent valves.
9. If you suspect that the nozzle or hose is completely clogged, or that pressure has not been fully relieved after following the steps above, very slowly loosen the nozzle or hose end coupling and relieve pressure gradually, then loosen completely. Now clear the nozzle or hose.

Handling Plural Component Fluid

WARNING



PLURAL COMPONENT FLUID HAZARD

Be extremely cautious when handling plural component materials and solvents used with them. Some are extremely toxic. See the **Toxic Fluid Hazard** warnings on page 3. Read and follow the coating and solvent manufacturer's safety precautions and warnings.

Wear the proper protective clothing, eye protection, gloves, and clean air breathing apparatus as prescribed by the fluid manufacturers recommendations, O.S.H.A. regulations and as approved by N.O.I.S.H. for the chemicals being used.

Observe the Pot Life Limit

Flush the mixed fluid out of the mixer, dispensing lines and equipment before it hardens. Flush the complete system when necessary to prevent the fluids from hardening in the equipment and hoses. Check the fluid manufacturer's instructions for fluid shelf life, and flush the entire system before this time is reached. Flush the system with a compatible solvent as explained on page 17.

Fill the Throat Packing Nuts

Keep each displacement pump throat packing nut (JJ) filled with Graco ISO Pump Oil to help prevent fluid from drying on the displacement rod and damaging the pump packings. See Fig. 15.

Verify compatibility of the pump oil with the fluids being used in the pumps. During operation very small amounts of this fluid are dragged past the seals and into the pump.

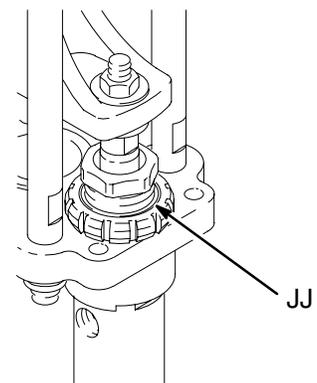


Fig. 15

02897

Operation

Check the Drainage Bottles and Hoses

⚠ WARNING

INJECTION HAZARD

To reduce the risk of serious injury and property damage, regularly check and clean the drain hose and bottle for the automatic pressure relief valve.

If material is allowed to dry in and clog the drain hose, the automatic pressure relief valve may not fully release the fluid pressure if it opens or may cause the drain hose to burst.

Check the drain hose and bottle (38) at the start of each shift, and whenever there is an imbalance of material, to see if the automatic pressure drain valve has released material into the bottles. Clean the hose and bottle as needed. Regularly check the drain hose for cuts, leaks, or bulges and replace damaged components before using the system. See Fig. 16.

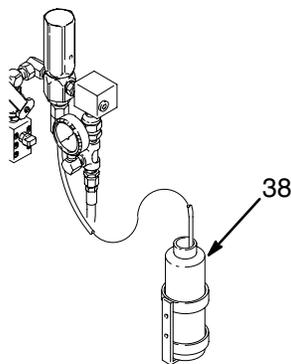


Fig. 16

02948A

Monitor the Material Supply

⚠ CAUTION

Establish a rigid system for monitoring the material supply to prevent the pumps from running dry. A sudden lack of material in one pump may cause many system problems, including air entrapment, spitting of the fluids, fluid “crossovers”, pump damage, downtime, and added system stresses.

Never allow the feed pump or solvent pump containers to run dry. A dry container allows air to be pumped into the system and causes incorrect proportioning. A dry pump will quickly accelerate to a high speed, and may damage itself and the other displacement pump because it causes a pressure rise in the other pump. If a supply container becomes dry, stop the pump immediately, refill the container, and prime the system. Be sure to eliminate all the air from the system.

NOTE: The pump runaway valve mentioned on page 11 of the Installation section shuts off the pump if the pump speed accelerates quickly.

Operation

Startup

⚠ **WARNING**



INJECTION HAZARD
To reduce the risk of serious injury, follow the **Pressure Relief Procedure** on page 19 whenever you are instructed to relieve the pressure.

Never exceed the maximum air and fluid working pressure of the lowest rated component in your system. See **Equipment Misuse Hazard**, page 4.

1. Install full containers of resin and hardener at the feed pumps.
2. To prime the system, follow Steps 2 to 11 of the Flushing procedure on page 17.
3. Turn on the heaters, if used, and allow them to warm up for 10 minutes.
4. Open the feed pump air valves (A1,A2). Adjust the air regulators (E1,E2) just enough to start the pumps operating slowly.
5. Open the proportioning pump air valve (A3) and slowly open the regulator (E3) to start the proportioning pump.

6. Open the mixer manifold (N) and trigger the dispense valve (S).
7. Set the air pressure to the feed pumps at 88 psi (605 kPa, 6 bar) or 25% of proportional pressure at the fluid outlets, whichever is less. Use the gauges (J1) to monitor this pressure. Higher pressures may prevent the proportioning pump inlet ball checks from setting properly.
8. Set the air pressure to the proportioning pump (H) to obtain the required fluid pressure. Refer to the proportioning pump chart on page 6 for the fluid to air pressure.
9. While triggering the dispensing valve, check the fluid outlet pressure gauges (J2) and make note of the pressures indicated. Check the gauges frequently during operation. These notes will help to analyze any problems that may occur since a change in displacement pump performance will be indicated by a change in pressure gauge readings.

NOTE: A pressure drop does occur during pump stroke changeover.

NOTE: Flush the mixer manifold frequently during the day's operation. Follow Step 11 on page 17.

KEY

<p>A Bleed-type master air valve A1 Hardener feed pump A2 Resin feed pump A3 Proportioning pump E Pump air regulator E1 Hardener feed pump</p>	<p>E2 Resin feed pump E3 Proportioning pump J Fluid pressure gauge J1 Proportioning pump intake J2 Proportioning pump outlet</p>	<p>H Proportioning pump N Mixer manifold S Dispensing valve V Fluid strainer</p>
--	--	--

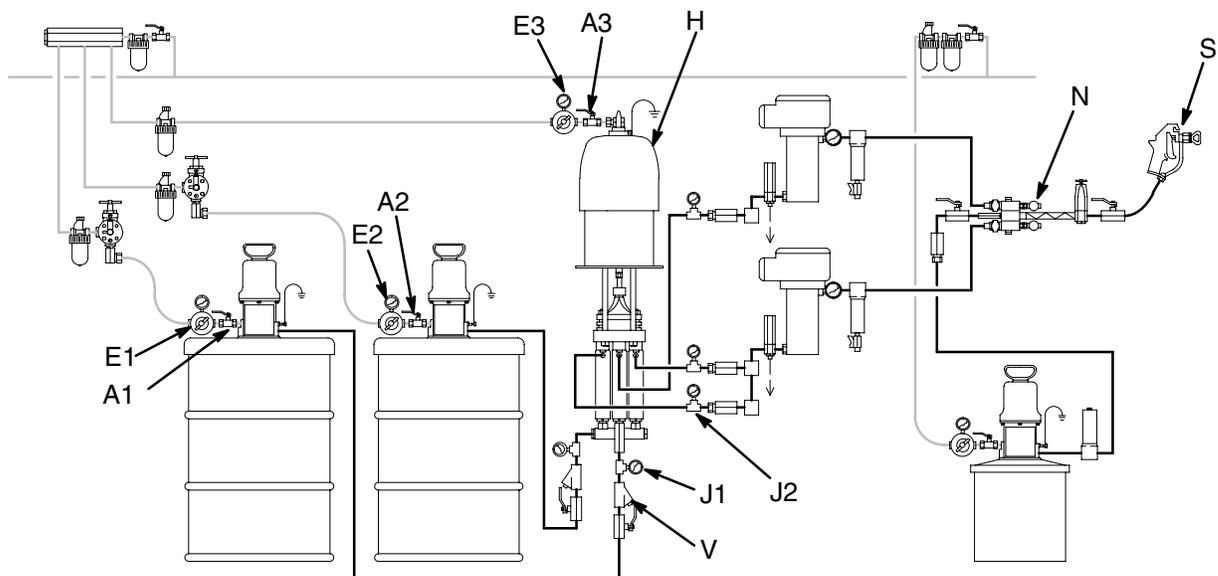


Fig. 17

02913

Operation

Checking the Mix Ratio

WARNING



INJECTION HAZARD

To reduce the risk of serious injury, follow the **Pressure Relief Procedure** on page 19 whenever you are instructed to relieve the pressure.

NOTE: Since this is a fixed ratio system, you typically do not have to check the mix ratio.

If the mixed fluid does not cure or harden properly, check the ratio of resin to hardener.

1. Flush the mixer manifold; see Step 11, page 17.
2. Follow the **Pressure Relief Procedure**, page 19.
3. Open the mixer manifold (N).
4. Set the operating pressure for the pumps. See Steps 7 and 8 on page 21.
5. Release the dispensing valve trigger and engage the safety latch.
6. Close the mixer manifold (N).
7. Open the hardener side drain valve (P2) about three turns. Open the resin side drain valve (P1) about 1 turn. This prevents the pressure from building up on the hardener pump, which would cause the automatic pressure relief valve to open.
8. Place a grounded metal pail under the drain valves.
9. Open the mixer manifold.
10. While observing the pump outlet gauges (J2), adjust the resin and hardener drain valves (P1,P2) until the gauges show your normal operating pressure.

NOTE: The pressure must be within 20% of the original spraying pressure to get a usable test.

11. Close the mixer manifold. Put a separate sampling container under each drain valve.
12. Open the mixer manifold to draw a sufficient sample.
13. As you close the mixer manifold, check the pump outlet gauges (J2) again to make sure they are at your normal operating pressure.

NOTE: If the fluid pressure is not within 20% of the normal operating pressure, flush the mixer manifold again and take another sample. If the sample ratio is incorrect, refer to the Troubleshooting chart on page 24. If the ratio is correct, the problem is with one of the other system components.

14. Compare the volume of the sampling containers. If the ratio is not correct, refer to the Troubleshooting chart on page 24. If the ratio is correct the problem is one of the other components.
15. Close the drain valves (P1,P2).

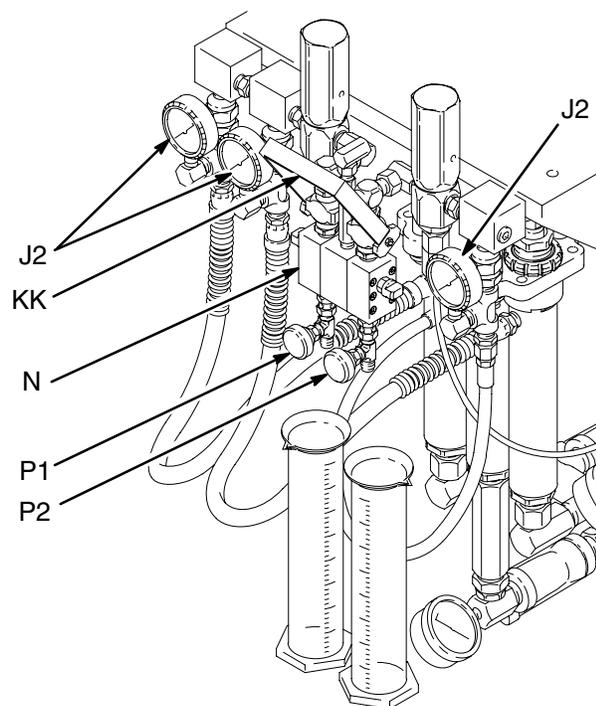


Fig. 18

02898A

Shutdown and Care of the System

WARNING



INJECTION HAZARD

To reduce the risk of serious injury, follow the **Pressure Relief Procedure** on page 19 whenever you are instructed to relieve the pressure.

System Shutdown

To shut the system down, shut off the air to all pumps, trigger the dispensing valve into a grounded metal waste container. Close the mixer manifold valves. Flush all the mixed fluid out of the mixer manifold, hoses and dispensing equipment. See page 17. Then follow the **Pressure Relief Procedure**, page 19.

Cleaning the Pump Inlet Strainer

If the fluid pressure from the feed pump to the proportioning pump cannot be maintained on the proportioning pump intake gauge (J1), check and clean the strainer (V). See Fig. 17, page 21.

Care of the Pump Throat Packing Nuts

Keep the throat packing nuts (JJ) filled with appropriate lubricant and check the tightness of the packing nut weekly. See Fig. 19.

Always follow the **Pressure Relief Procedure**, page 19, before adjusting the packing nut. The packing nut should be tight enough to prevent leakage; no tighter. Too tight an adjustment causes the packings to bind or wear prematurely and leak.

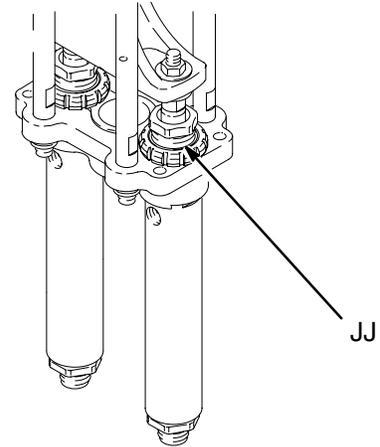


Fig. 19

Troubleshooting

⚠ WARNING



INJECTION HAZARD

To reduce the risk of an injury from injection, splashing fluid, or moving parts, follow the **Pressure Relief Procedure** on page 19 if the spray tip/nozzle clogs and whenever you:

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

⚠ WARNING



MOVING PARTS HAZARD

To reduce the risk of serious injury, including amputation, from moving parts inside the air motor housing, never operate the pump with the air motor plate removed.

The chart below is specific to the air motor and pump. Refer to the other instruction manuals included with the system to troubleshoot individual components.

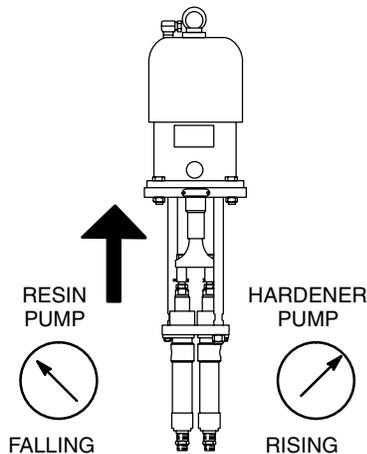
This chart uses the proportioner gauges to determine pump malfunctions.

Faulty manifold check valves can mask pump cylinder problems. Always keep these valves operating properly.

Observe the gauge readings during the stroke direction indicated by the bold arrow, and immediately after closing the manifold.

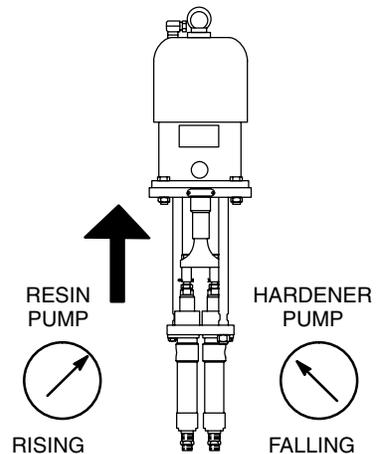
TROUBLE AREA: RESIN PUMP LEAKAGE

1. THROAT PACKING
2. PISTON PACKING
3. PISTON BALL CHECK



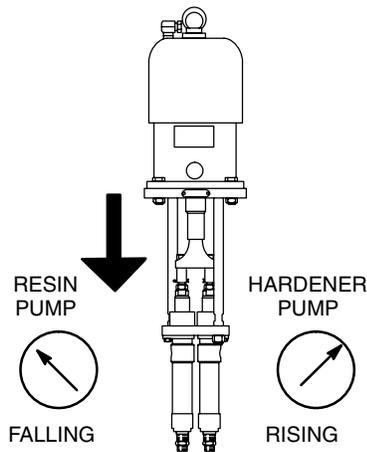
TROUBLE AREA: HARDENER PUMP LEAKAGE

1. THROAT PACKING
2. PISTON PACKING
3. PISTON BALL CHECK



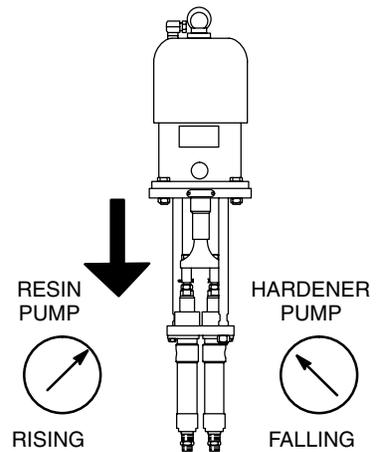
TROUBLE AREA: RESIN PUMP LEAKAGE

1. THROAT PACKING
2. FOOT VALVE BALL CHECK



TROUBLE AREA: HARDENER PUMP LEAKAGE

1. THROAT PACKING
2. FOOT VALVE BALL CHECK



Troubleshooting

Problem	Cause	Solution
System will not run or stops while running.	Air pressure or volume too low. Closed or restricted air line or air valve. Fluid valves closed. Clogged fluid hose. Air motor worn or damaged. Displacement pump stuck.	Increase, check air compressor. Open or clean as required. Open fluid valves. Replace fluid hose. Service air motor. <i>See instructions in separate manual 306982.</i> Service pump. <i>See instructions in separate manual 307944 or 684004.</i>
System speeds up or runs erratically.	Fluid containers are empty.** Air in fluid lines.** Displacement pump parts worn or damaged.	Check often – keep filled. Purge, check connections. Service pump. <i>See instructions in separate manual 307944 or 684004.</i>
Pump operates but resin output pressure drops during upstroke.*	Dirty, worn or damaged resin pump piston valve. Worn or damaged resin pump piston packings.	Clean, service pump. <i>See instructions in separate manual.</i> Replace.
Pump operates but resin output pressure drops during downstroke.	Dirty, worn or damaged resin pump intake valve.	Clean, service pump. <i>See instructions in separate manual 307944 or 684004.</i>
Pump operates but resin output pressure drops during both strokes.*	Dirty, worn or damaged resin pump piston valve. Fluid supply low.**	Clean, service pump. <i>See instructions in separate manual 307944 or 684004.</i> Refill or change container.
Pump operates but hardener output pressure drops during upstroke.*	Dirty, worn or damaged resin pump intake valve. Worn or damaged hardener pump piston packings.	Clean, service pump. <i>See instructions in separate manual 307944 or 684004.</i> Replace.
Pump operates but hardener output pressure drops during downstroke.*	Dirty, worn or damaged hardener pump intake valve.	Clean, service pump. <i>See instructions in separate manual 307944 or 684004.</i>
Pump operates but hardener output pressure drops during both strokes.	Dirty, worn or damaged hardener pump intake valve. Fluid supply low.**	Clean, service pump. <i>See instructions in separate manual 307944 or 684004.</i> Refill or change container.
Fluid leaks around fluid pump packing nut.	Loose packing nut or worn throat packings.	Tighten, replace.
Relief valve opens too soon or will not close.	Relief valve needs adjusting or is damaged.	Adjust, service pump. <i>See instructions in separate manual 307944 or 684004.</i>

* Fluid ratio will be wrong.

** Purge all air out of the system before proportioning the fluids.

Service – Displacement Pump

⚠ WARNING



INJECTION HAZARD

To reduce the risk of serious injury, follow the **Pressure Relief Procedure** on page 19 whenever you are instructed to relieve the pressure.

Removal and Replacement

Thoroughly flush the system with a solvent which is compatible to the fluid being pumped, then follow the **Pressure Relief Procedure** on page 19. The Flushing procedure is on page 17.

Stop the pump at the bottom of its stroke.

⚠ CAUTION

If you are changing to a different type of fluid, completely clean all of the equipment and hoses, making sure that no fluid remains in any part of the system.

Remove the fluid outlet hoses from the displacement pumps.

1. *For Two Displacement Pump Models Only*
Unscrew the swivel unions (33) from the bottom of the displacement pumps. See Fig. 20.
2. *For Three Displacement Pump Models Only*
Unscrew the swivel union (33) from the bottom of the center displacement pump. Unscrew the swivel unions (126) from the outer displacement pumps. Remove the supply manifold (125) from the outer pumps. Unscrew the straight union (39) from the center displacement pump. See Fig. 21.

1. Unscrew the swivel union (33) from the bottom of the center displacement pump. Unscrew the swivel unions (126) from the outer displacement pumps. Remove the supply manifold (125) from the outer pumps. Unscrew the straight union (39) from the center displacement pump. See Fig. 21.

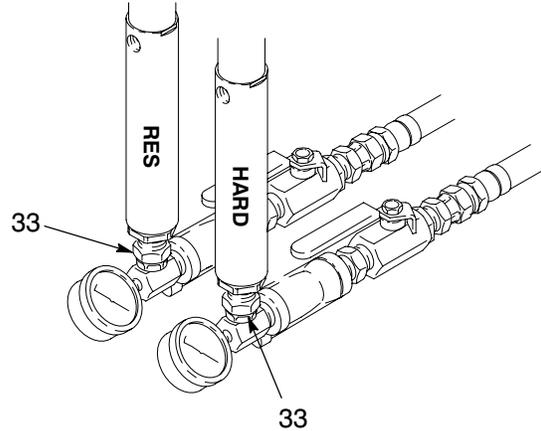


Fig. 20

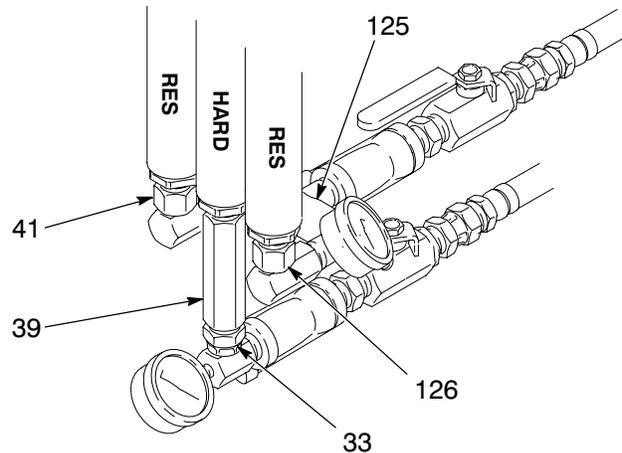


Fig. 21

Service – Displacement Pump

Disassembly

1. Remove the locknuts (113) from the top of the yoke (114) of the two outer displacement rods. See Fig. 22. Unscrew the outer locknuts (122) from the top of the tie plate (121) on the two displacement pumps. Use a screwdriver and hammer to loosen.

NOTE: The tie rods (111) shown in Fig. 22 are removed from the tie plate (121) for clarity only and do not require removal.

2. Remove the two outer pumps from the tie plate. Remove the washers (115) from the rods of each pump.
3. *Three Displacement Pump Models Only.* Using a wrench on the flats of the center pump's displacement rod, screw the rod out of the yoke (114). See Detail B in Fig. 22. Remove the pump from the yoke (114) then the washer (115) from the rod on the pump.
4. Refer to the appropriate instruction manual for servicing the displacement pump.

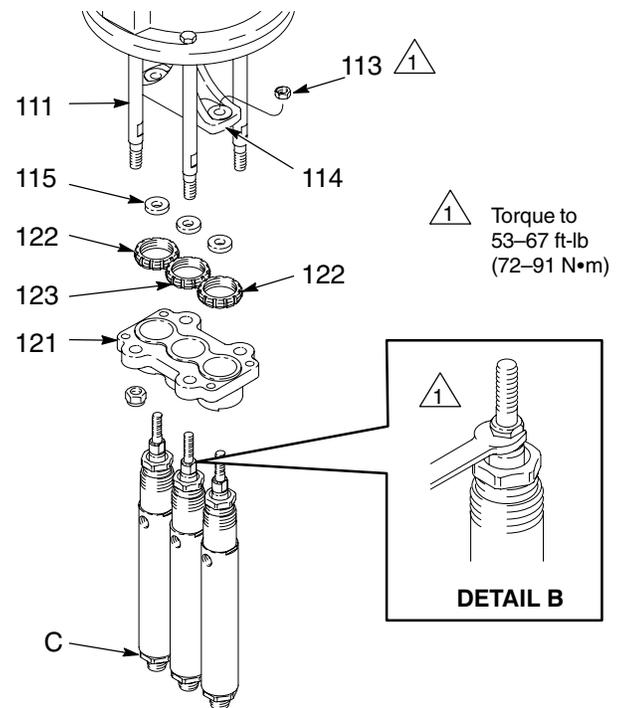


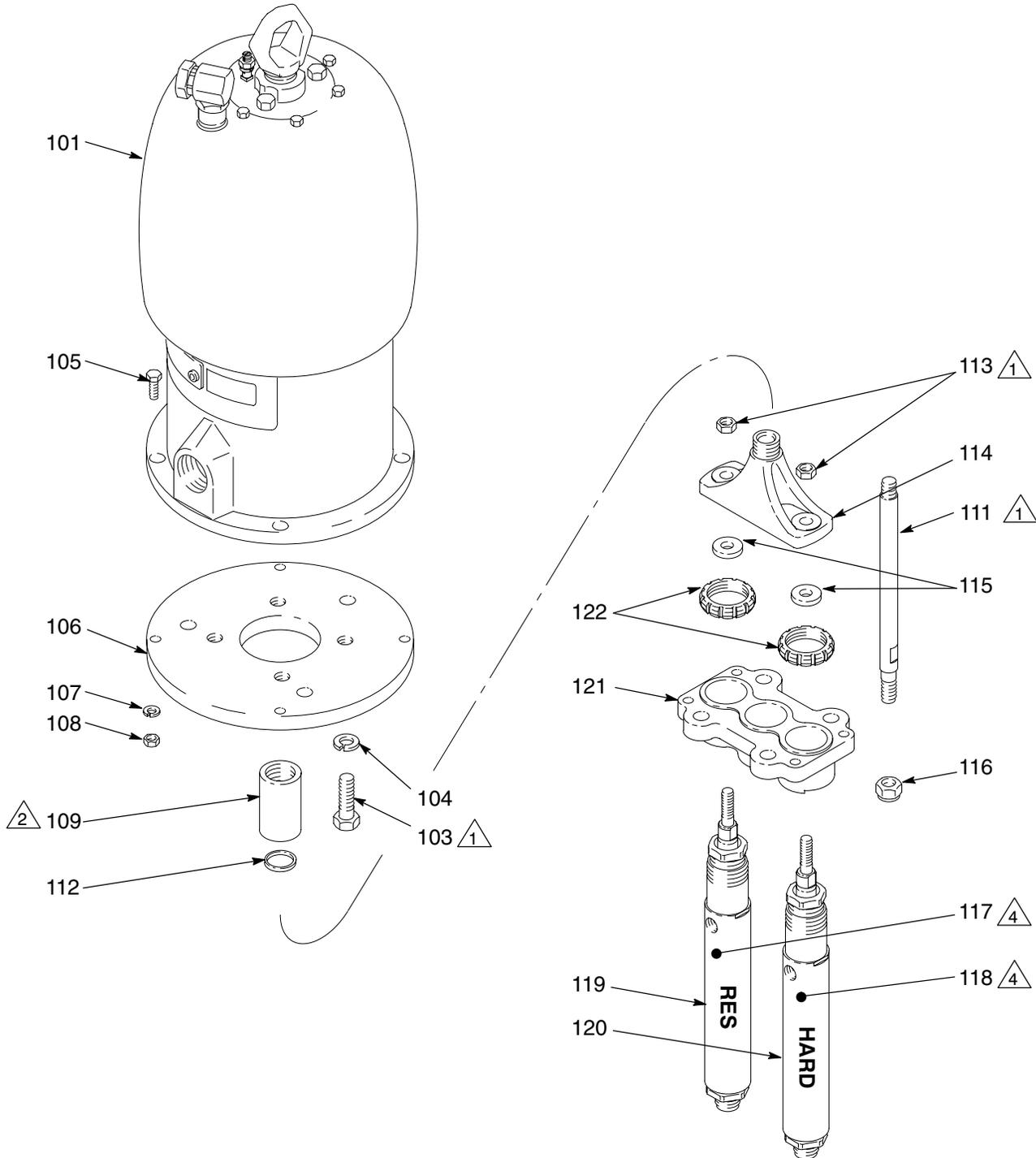
Fig. 22

Reassembly

1. *Three Displacement Pump Models Only*
Slide the center displacement pump rod through the tie plate (121), center locknut (123), and washer (115). Thread the displacement rod into the yoke (114) by turning the complete cylinder. Use a wrench on the flats of the displacement rod for final tightening. Torque to 53–67 ft-lb (72–91 N•m). Push the cylinder up into place in the tie plate and install the center locknut (123).
2. *All pumps*
Slide the outer two displacement pump rods through the tie plate (121), outer locknuts (122), and washers (115). Install the locknuts (113) loosely on the displacement rods. Push the cylinders up into place in the tie plate and install the outer locknuts (122).
3. Move the air motor to the bottom of its stroke. Check for movement of the air motor yoke at each displacement rod. With the rods centered, tighten the locknuts (113) securely and torque to 53–67 ft-lbs (72–91 N•m).
4. Tighten the throat packing nut just enough to prevent leakage, no tighter.
5. Reconnect the swivel unions to the pumps. Hold the intake valve (C) steady with a wrench to prevent it from turning.

Parts – Bare, Two Pumps

Model 231897



-  Torque to 53–67 ft-lb (72–91 N•m)
-  Apply anaerobic sealant and torque to 100–200 ft-lb (135–270 N•m)
-  Label

02915

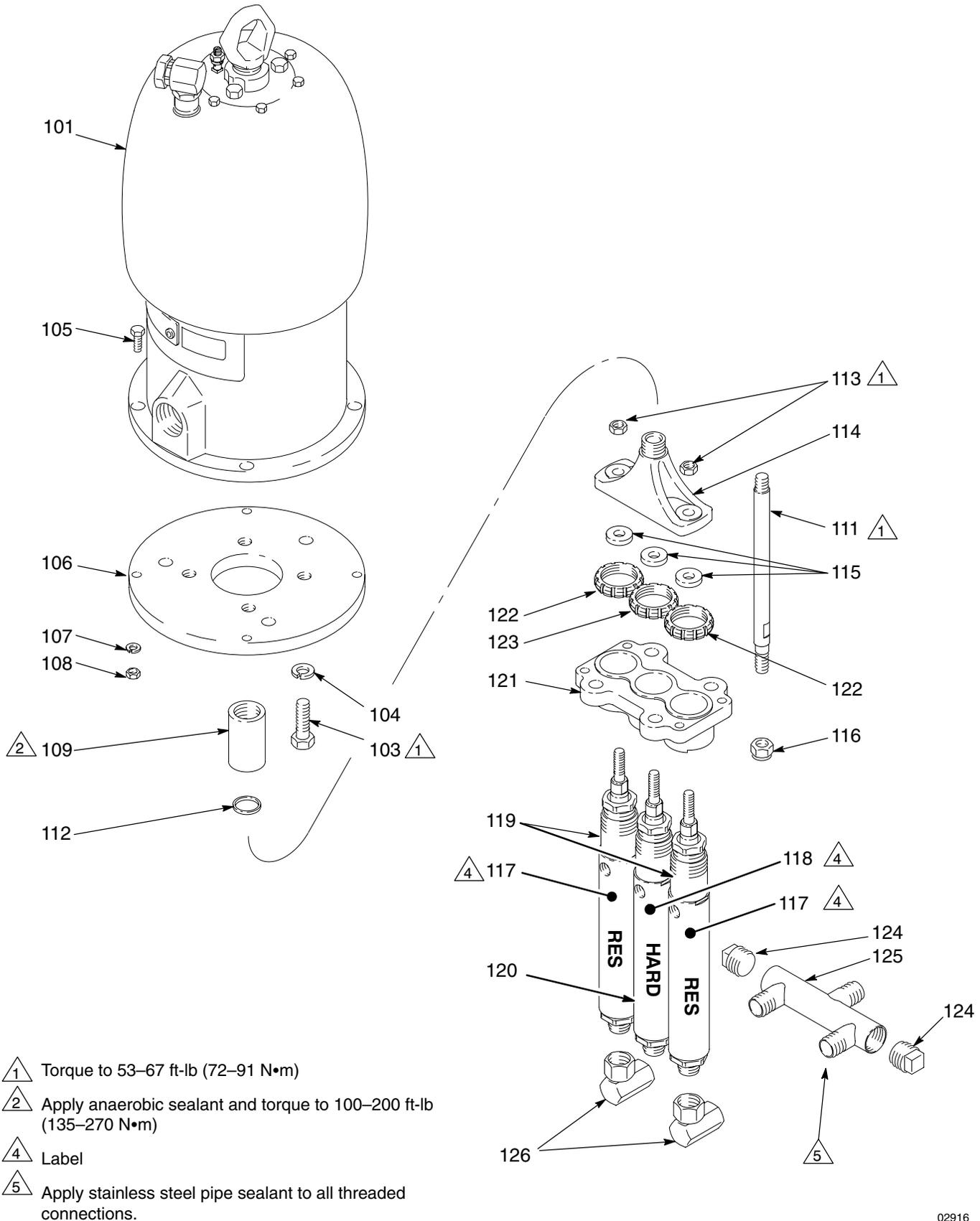
Parts – Bare, Two Pumps

Model 231897

Ref. No.	Part No.	Description	Qty.	Ref. No.	Part No.	Description	Qty.
101	208356	BULLDOG AIR MOTOR, <i>see manual 307049</i>	1	113	101926	LOCKNUT, 1/2–20 unf with nylon insert	2
103	100428	SCREW, hex cap head, 5/8–11 unc (2a) x 2"	3	114	164414	YOKE, connector tube	1
104	100128	LOCKWASHER, 5/8"	3	115	164416	WASHER, flat, 1/2"	2
105	100468	SCREW, hex cap head, 3/8–16 unc (2a) x 1"	4	116	101712	LOCKNUT, 5/8–11 unc (2b) with nylon insert	4
106	171122	PLATE, mounting	1	117	188975	LABEL, resin	1
107	100133	LOCKWASHER, 3/8"	4	118	188974	LABEL, hardener	1
108	100307	NUT, hex, 3/8–16 unc (2b)	4	119	222012	RESIN DISPLACEMENT PUMP (see manual 307944 for parts)	1
109	172726	COUPLER	1				
111	168455	TIE ROD, 8.937" (227 mm) long shoulder to shoulder	4	120	222012	HARDENER DISPLACEMENT PUMP (see manual 307944 for parts)	1
112	150429	GASKET	1				
				121	164413	TIE PLATE	1
				122	164417	LOCKNUT, outer	2

Parts – Bare, Three Pumps

Models 231908, 231910, 231912, and 231915



02916

Parts – Bare, Three Pumps

Models 231908, 231910, 231912, and 231915

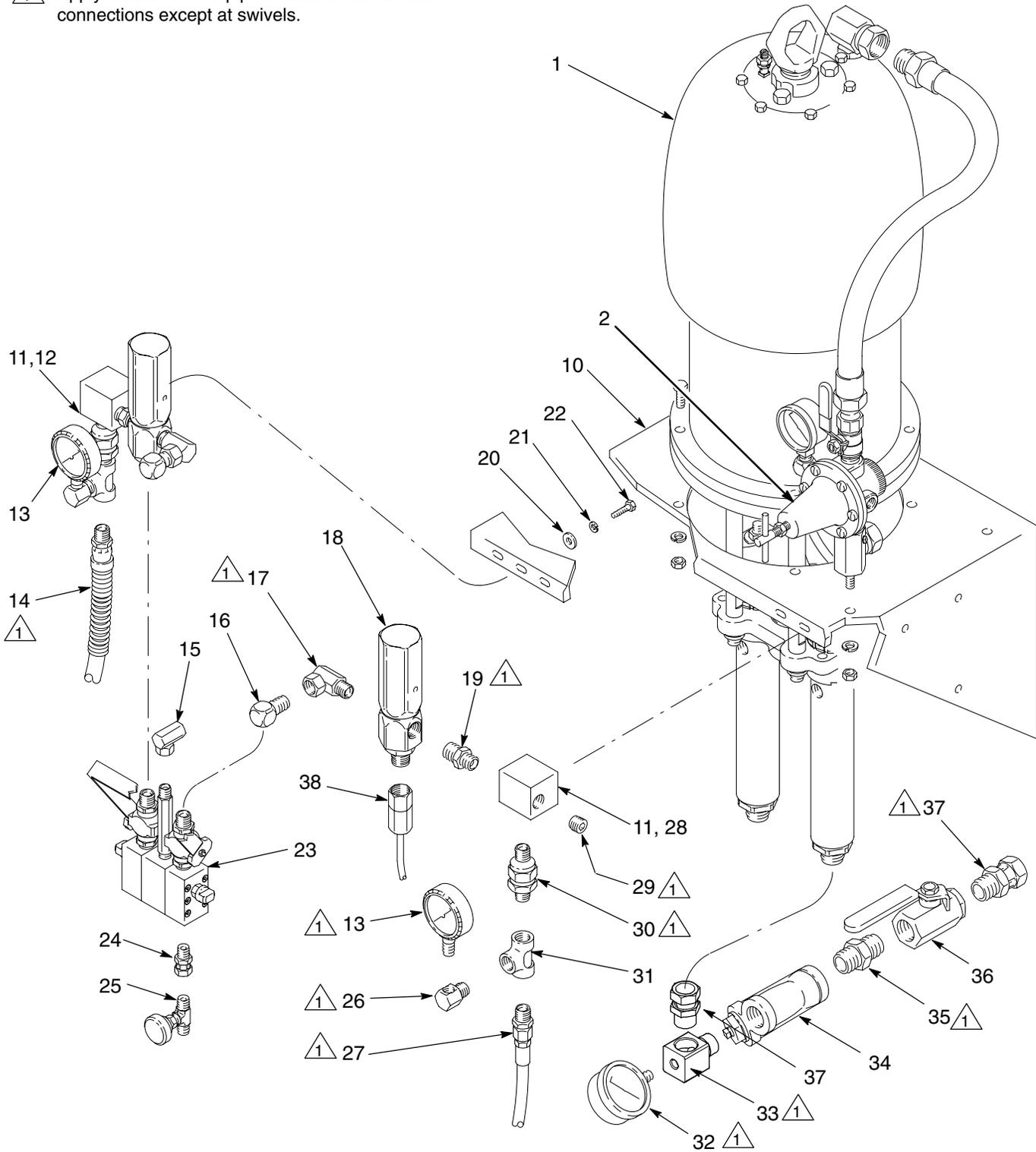
Ref. No.	Part No.	Description	Qty.	Ref. No.	Part No.	Description	Qty.
101	208356	BULLDOG AIR MOTOR, <i>see manual 307049</i>	1	114	164414	YOKE, connector tube	1
103	100128	SCREW, hex cap head, 5/8–11 unc (2a) x 2"	3	115	164416	WASHER, flat, 1/2"	3
104	100428	LOCKWASHER, 5/8"	3	116	101712	LOCKNUT, 5/8–11 unc (2b) with nylon insert	4
105	100468	SCREW, hex cap head, 3/8–16 unc (2a) x 1"	4	117	188975	LABEL, resin	2
106	171122	PLATE, mounting	1	118	188974	LABEL, hardener	1
107	100133	LOCKWASHER, 3/8"	4	119	<i>see table</i>	RESIN DISPLACEMENT PUMP	2
108	100307	NUT, hex, 3/8–16 unc (2b)	4	120	<i>see table</i>	HARDENER DISPLACE- MENT PUMP	1
109	172726	COUPLER	1	121	<i>see table</i>	TIE PLATE	1
111	168455	TIE ROD, 8.937" (227 mm) long shoulder to shoulder	4	122	<i>see table</i>	OUTER LOCKNUT	2
112	150429	GASKET	1	123	<i>see table</i>	CENTER LOCKNUT	1
113	101926	LOCKNUT, 1/2–20 unf with nylon insert	2	124	100345	PLUG, pipe, 11–1/2 npt(f)	2
				125	208334	SUPPLY MANIFOLD	1
				126	156589	SWIVEL UNION, 90°, 3/4 npt (m x f)	2

MODEL	Ref. No. 119		Ref. No. 120		Ref. No. 121	Ref. No. 122	Ref. No. 123
	RESIN PUMP Qty 2	<i>See this manual for parts</i>	HARDENER PUMP	<i>See this manual for parts</i>	TIE PLATE	OUTER LOCKNUT	CENTER LOCKNUT
231908	222012	<i>307944</i>	222012	<i>307944</i>	164413	164417	164417
231910	222017	<i>307944</i>	222017	<i>307944</i>	164413	164417	164417
231912	222012	<i>307944</i>	222017	<i>307944</i>	164413	164417	164417
231915	222012	<i>307944</i>	222019	<i>307944</i>	164413	164417	164417

Parts – Wall Mount, Two Pumps

Model 231836

1 Apply stainless steel pipe sealant to all threaded connections except at swivels.



02917A

Parts – Wall Mount, Two Pumps

Models 231836

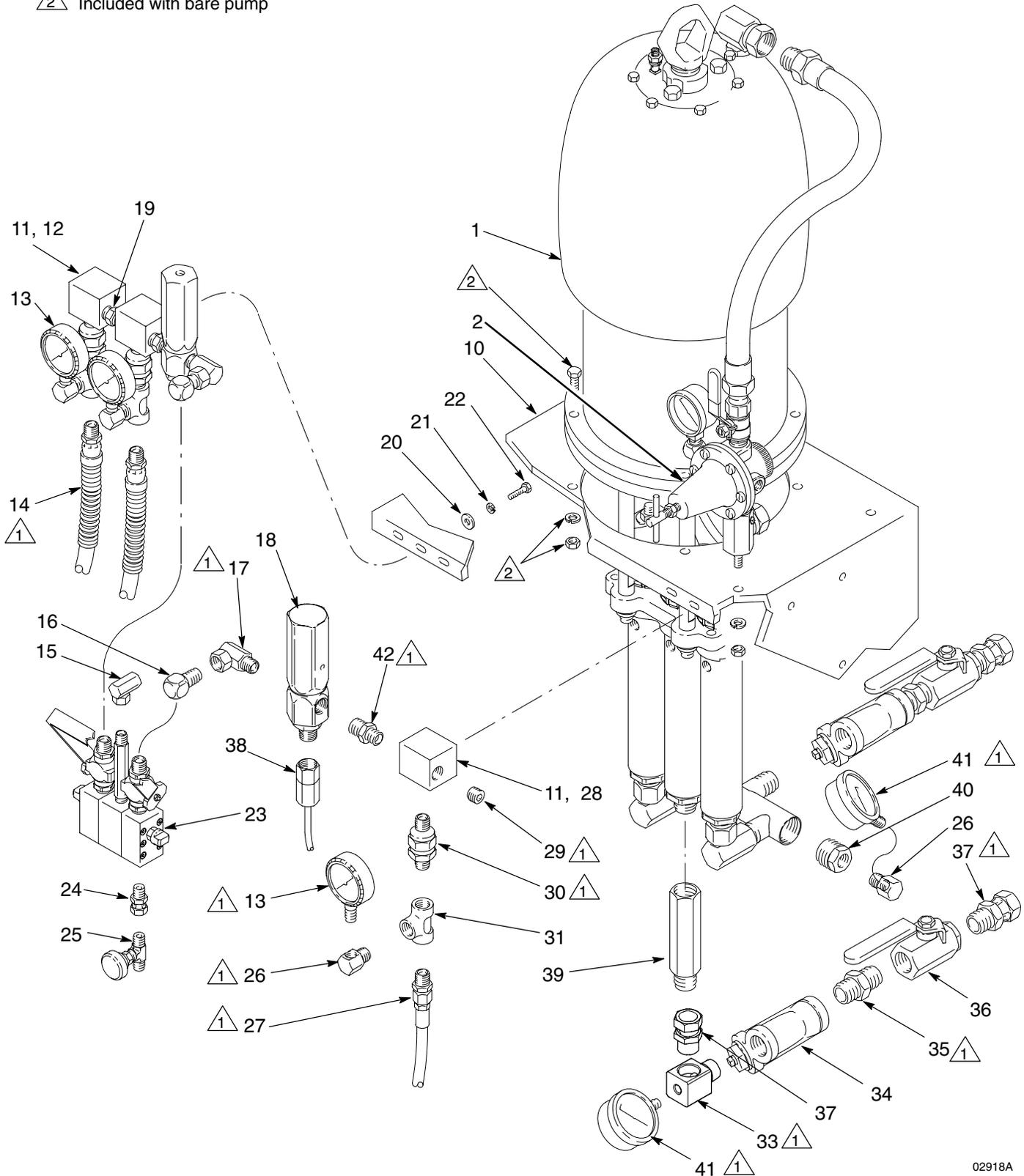
Ref. No.	Part No.	Description	Qty.	Ref. No.	Part No.	Description	Qty.
1	231897	BARE PROPORTIONAL PUMP, <i>see parts on page 29</i>	1	28	188974	LABEL, hardener	1
2	205712	AIR REGULATOR KIT, <i>see parts in manual 306972</i>	1	29	101748	PLUG, pipe, 3/8–18 npt(f), sst	2
10	236061	BRACKET, mounting	1	30	206962	CHECK VALVE, 3/8 npt (mbe)	2
11	188596	MANIFOLD BLOCK	3	31	100483	TEE, pipe, 3/8–18 npt (f)	2
12	188975	LABEL, resin	1	32	105770	FLUID PRESSURE GAUGE, 0–1000 psi (7, MPa, 69 bar) 1/4 npt	2
13	102814	PRESSURE GAUGE, used for hardener and resin; 0–5000 psi (34 MPa, 345 bar), 1/4–18 npt	2	33	16X233	ELBOW, street, 90°, 1/4–18 npt(f) x 3/4–14 npt (m x f)	1
14	217378	HOSE, nylon, with spring guards, cpld 3/8–18 npt (mbe) x 30", 3/8" ID	1	34	101078	FLUID STRAINER, 3/4 npt <i>Includes item 34a</i>	2
15	157676	SWIVEL UNION, 90°, 1/4–18 npt (m x f)	1	34a	187758	• GASKET, PTFE	1
16	155699	ELBOW, street, 3/8–18 npt (m x f), carbon steel	2	35	160032	NIPPLE, 3/4 npt	2
17	161037	90° SWIVEL, 1/2 npte x 3/8 npsmi	2	36	108537	BALL VALVE, 3/4–14 npt (f)	2
18	237063	PRESSURE RELIEF VALVE	2	37	157785	SWIVEL UNION, 3/4 nps (f) x 3/4 npt (m)	3
19	159239	NIPPLE, 1/2 x 3/8 npte	2	38	236249	DRAIN KIT ASSEMBLY, <i>see parts on page 39</i>	2
20	111591	WASHER, flat, 1/4"	4				
21	100016	LOCKWASHER, 1/4"	4				
22	100270	SCREW, cap hex head, 1/4–20 x 5/8"	4				
23	215626	MIXER MANIFOLD, <i>see manual 307400</i>	1				
24	156823	SWIVEL UNION, 1/4 npt(m) x 1/4 npt(f)	2				
25	108233	NEEDLE (DRAIN) VALVE	2				
26	164259	ELBOW, street, 3/8–18 npt (m) 1/4–18 npt (f)	2				
27	235905	HOSE, cpld, 3/8–18 npt x 30" mbe, 0.318 ID, PTFE	1				

Parts – Wall Mount, Three Pumps

Models 231847, 231849, 231851, and 231854

1 Apply stainless steel pipe sealant to all threaded connections except at swivels

2 Included with bare pump



02918A

Parts – Wall Mount, Three Pumps

Models 231847, 231849, 231851, and 231854

Ref. No.	Part No.	Description	Qty.	Ref. No.	Part No.	Description	Qty.
1	<i>see table</i>	BARE PROPORTIONAL PUMP, <i>see parts on page 31</i>	1	35	160032	NIPPLE, 3/4 npt	2
2	207651	AIR REGULATOR KIT, <i>see parts in manual 306972</i>	1	36	102735	BALL VALVE, 3/4–14 npt(f)	2
10	236061	BRACKET, mounting	1	37	157785	SWIVEL UNION, 3/4 nps(f) x 3/4 npt (m)	3
11	188596	MANIFOLD BLOCK	3	38	236249	DRAIN KIT ASSEMBLY, <i>see parts on page 39</i>	2
12	188975	LABEL, resin	1	39	188597	ADAPTER, 3/4–14 npt(f) x 3/4–14 npsm	1
13	<i>see table</i>	PRESSURE GAUGE, used for hardener and resin	3	40	101742	BUSHING, 3/8 npt x 1"	1
14	217378	HOSE, nylon, with spring guards, cpld 3/8–18 npt (mbe) x 30", 3/8" ID	2	41	105770	PRESSURE GAUGE, 0–1000 psi (7 MPa, 69 bar), 1/4–18 npt	2
15	157676	SWIVEL UNION, 90°, 1/4–18 npt (m x f)	1	42	159239	NIPPLE, 1/2 x 3/8 npte	2
16	155699	ELBOW, street, 3/8–18 npt (m x f), carbon steel	2				
17	161037	90°, SWIVEL, 1/2 npte x 3/8 npsmi	2				
18	<i>see table</i>	PRESSURE RELIEF VALVE	2				
19	166469	NIPPLE, 3/4 hex, 3/8–18 npt mbe, sst	1				
20	111591	WASHER, flat, 1/4"	6				
21	100016	LOCKWASHER, 1/4"	6				
22	100270	SCREW, hex cap head, 1/4–20 x 5/8"	4				
23	215626	MIXER MANIFOLD, <i>see manual 307400</i>	1				
24	156823	NIPPLE	2				
25	108233	NEEDLE (DRAIN) VALVE	2				
26	164259	ELBOW, street, 3/8–18 npt(m) 1/4–18 npt(f)	4				
27	235905	HOSE, cpld, 3/8–18 npt x 30" mbe, 0.318 ID, PTFE	1				
28	188974	LABEL, hardener	1				
29	101748	PLUG, pipe, 3/8–18 npt(f), sst	2				
30	206962	CHECK VALVE, 3/8 npt (mbe)	3				
31	100483	TEE, pipe, 3/8–18 npt(f)	3				
33	16X233	ELBOW, street, 90°, 1/4–18 npt(f) x 3/4–14 npt (m x f)	1				
34	101078	FLUID STRAINER, 3/4 npt <i>Includes item 34a</i>	2				
34a	187758	• GASKET, PTFE	1				

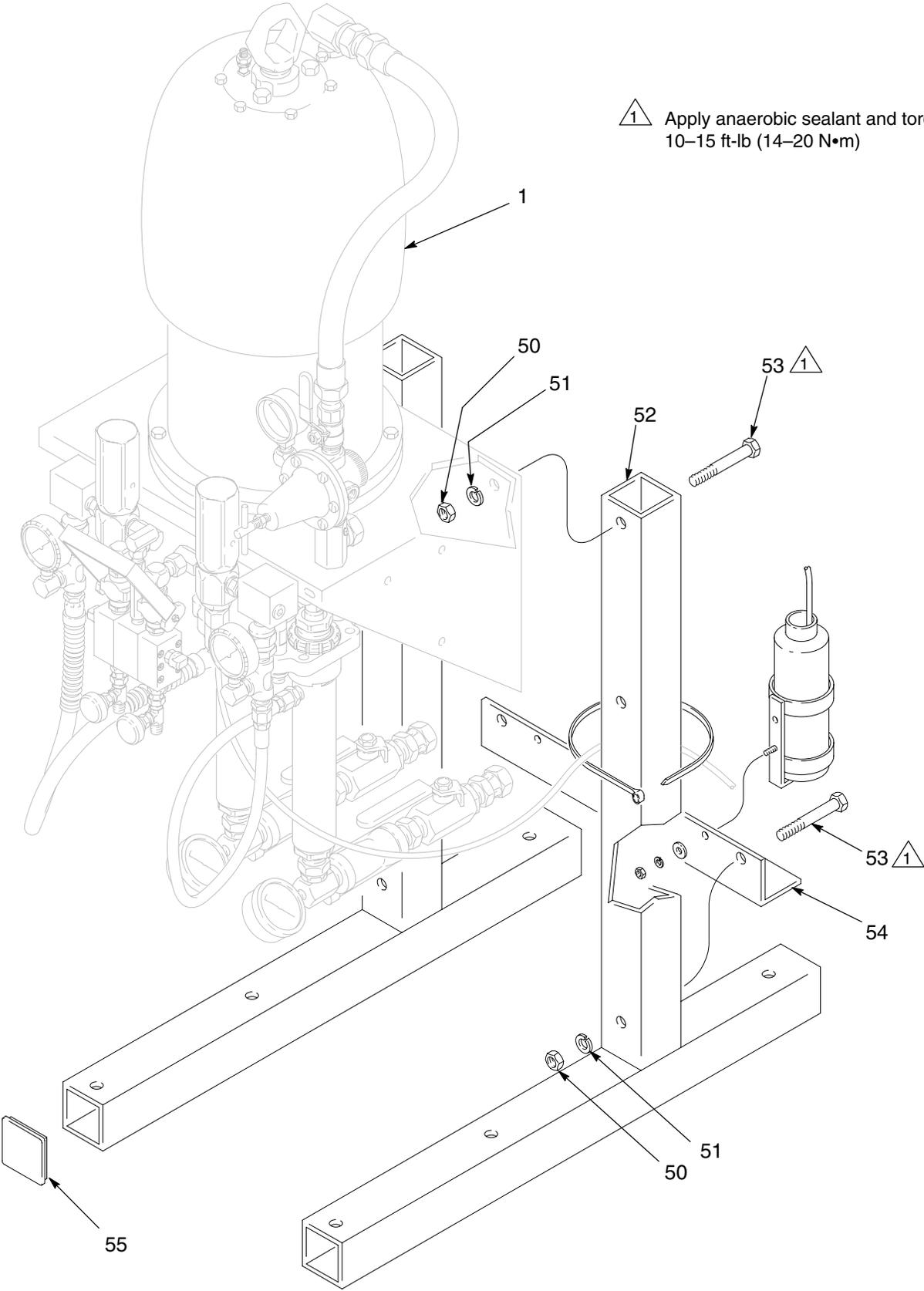
Model	Ref. No. 1	Ref. No. 13	Ref. No. 18
	Bare Pump	Pressure Gauge*	Pressure Relief Valve
231847	231908	102814	237073
231849	231910	102814	237063
231851	231912	102814	237073
231854	231915	102814	237073

* Pressure Gauge Description:
102814 0–5000 psi (34 MPa, 345 bar), 1/4–18 npt

Parts – Stand Mount, Two Pumps

Model 231865

1 Apply anaerobic sealant and torque to 10–15 ft-lb (14–20 N•m)



02919A

Parts– Stand Mount, Two Pumps

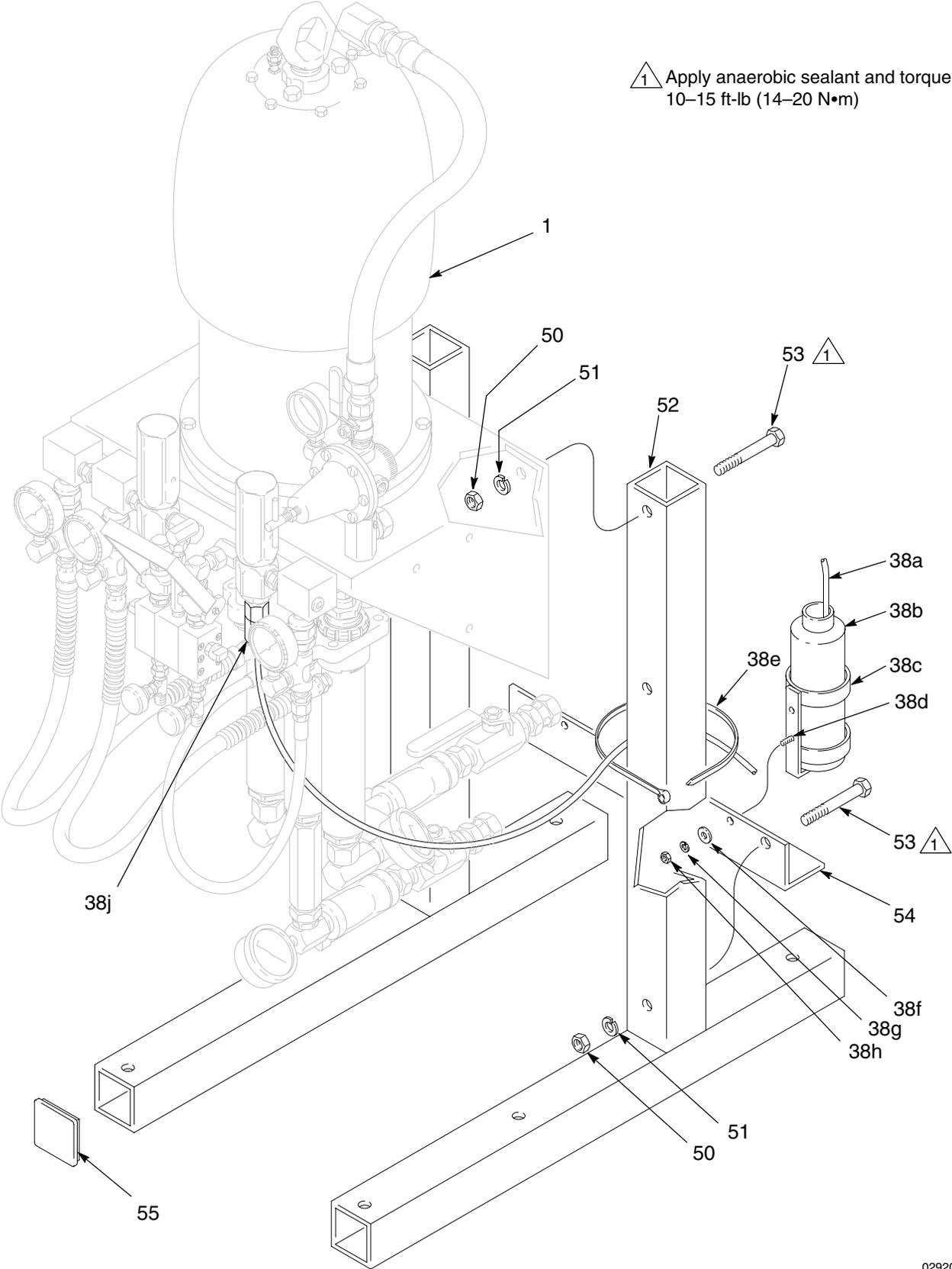
Models 231865

Ref. No.	Part No.	Description	Qty.	Ref. No.	Part No.	Description	Qty.
1	231836	WALL MOUNT PUMP, <i>see parts on page 33</i>	1	52	217297	LEG, frame	2
50	100321	NUT, hex, 1/2–13 unc	6	53	100679	SCREW, hex cap head, 1/2–13 unc (2a) x 3-1/2"	6
51	100018	LOCKWASHER, 1/2"	6	54	178473	BRACE, frame	1
				55	168422	CAP, square tube	6

Parts— Stand Mount, Three Pumps

Models 231876, 231878, 231880, and 231883

1 Apply anaerobic sealant and torque to 10–15 ft-lb (14–20 N•m)



02920A

Parts – Stand Mount, Three Pumps

Models 231876 through 231883

Ref. No.	Part No.	Description	Qty.
1	<i>see table</i>	WALL MOUNT PUMP, <i>see parts on page 35</i>	1
50	100321	NUT, hex, 1/2–13 unc	6
51	100018	LOCKWASHER, 1/2"	6
52	217297	LEG, frame	2
53	100679	SCREW, hex cap head, 1/2–13 unc (2a) x 3-1/2"	6
54	178473	BRACE, frame	1
55	168422	CAP, square tube	6

Model	Ref. No. 1
	Wall Pump
231876	231847
231878	231849
231880	231851
231883	231854

Ref No. 38

Drain Valve Kit

Supplied with the Wall Mount units and Stand Mount units

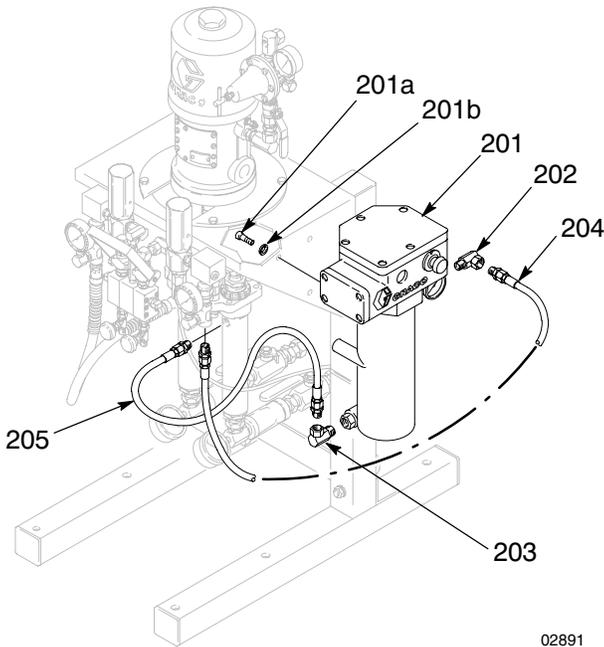
Ref. No.	Part No.	Description	Qty.
38a	190738	• TUBE, nylon, 36" x 1/2" OD	1
38b	112279	• BOTTLE	1
38c	236272	• HOLDER, bottle	1
38d	100022	• SCREW, hex cap head, 1/4–20 unc (2a)	1
38e	112278	• TIE WRAP	1
38f	100016	• LOCKWASHER, 1/4"	1
38g	111591	• WASHER, flat, 1/4"	1
38h	100015	• NUT HEX, 1/4–20 unc (2b)	1
38j	113187	• CONNECTOR, female, tube	1

Accessories

Parts for Installing Optional Heaters

The following components are recommended to install the heaters as instructed on page 13. Two displacement pump models need Items 201 to 204. Three displacement pump models need Items 201 to 205 and an additional resin and hardener hose of an appropriate length.

Ref. No.	Part No.	Description	Qty.
201	—	FLUID HEATER, <i>select from list to the right</i>	2
202	155494	SWIVEL UNION, 90°, 3/8-18 npt (m x f)	2
203	161037	SWIVEL UNION, 90°, 1/2 npt(f) x 3/8-18 nps(m)	2
204	235905	HOSE, cpld, hardener, 3/8-18 npt x 30" mbe 0.318 ID PTFE	1
205	217378	HOSE, nylon, with spring guards, resin, cpld 3/8-18 npt x 30" (mbe) 3/8" ID	1



02891

Viscon HP Fluid Heaters

Style A

Model 245848, 120 Volt, Stainless Steel

4000 psi (28 MPa, 276 bar) Maximum Working Pressure
85° – 220° F (29° – 104° C) Temperature Range

Model 245863, 240 Volt, Stainless Steel

4000 psi (28 MPa, 276 bar) Maximum Working Pressure
85° – 220° F (29° – 104° C) Temperature Range

Model 245864, 480 Volt, Stainless Steel

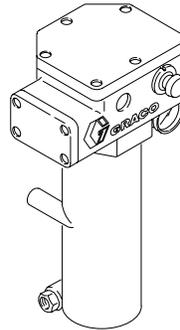
4000 psi (28 MPa, 276 bar) Maximum Working Pressure
85° – 220° F (29° – 104° C) Temperature Range

Style B

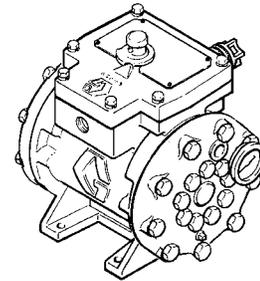
Model 226819, 240 Volt Aluminum and Zinc

3000 psi (21 MPa, 207 bar) Maximum Working Pressure
80° – 190° F (26° – 88° C) Temperature Range

Style A
Model 220522 shown



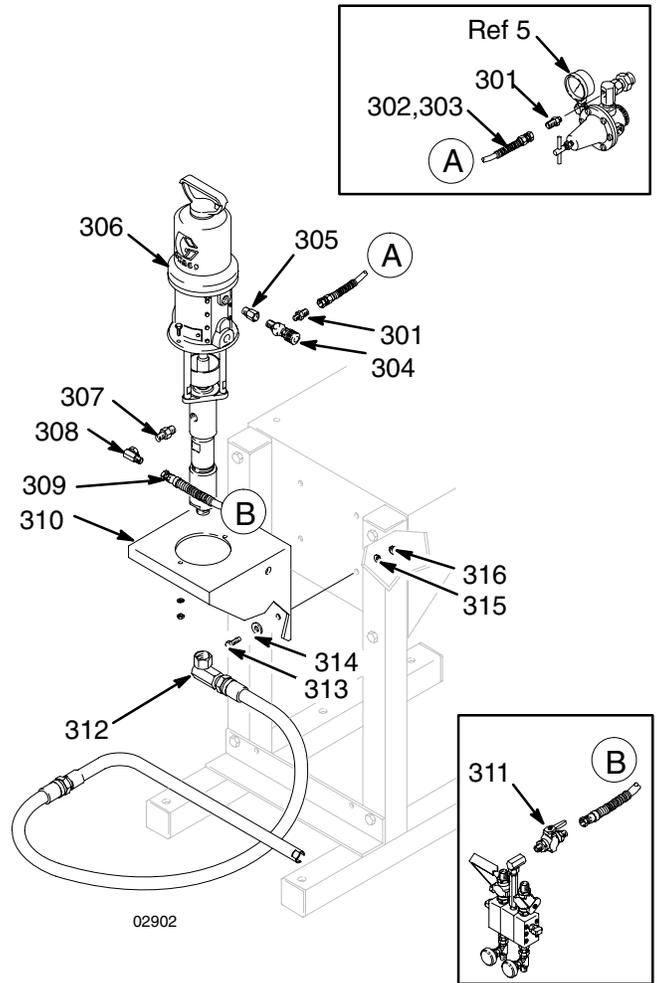
Style B
Model 226819 shown



Accessories

Parts for Installing Optional Solvent Pump

Ref. No.	Part No.	Description	Qty.
301	151519	NIPPLE, reducing, 1/4–19 nptm x 1/8–27 nptm	2
302	111913	COUPLING, hose, 1/4–18 npsm, with spring guard, stainless steel	2
303	061132	HOSE, nylon 1/4" ID x 36" long	1
304	206264	VALVE, needle, 1/4–18 npt (m)	1
305	158841	ADAPTER, 1/4–18 unc (f) x 3/8–18 npt (m), carbon steel	1
306	217523	10:1 RATIO MONARK PUMP, for heavy viscosity system	1
OR	208470	5:1 RATIO MONARK PUMP for light viscosity system	1
307	157350	ADAPTER, 3/8–18 npt x 1/4–18 npt (mbe)	1
308	155541	SWIVEL UNION, 90°, 1/4 npt (f x m)	1
309	<i>as needed</i>	FLUID HOSE	1
310	207365	BRACKET, mounting	1
311	241037	BALL VALVE	1
312	207484	SUCTION TUBE ASSEMBLY, 3/4 npt	1
313	100101	SCREW, hex cap head, 3/8–16 unc (2a) x 1"	4
314	100133	LOCK WASHER, 3/8"	4
315	100307	NUT, hex, 3/8–16 unc (2b)	4
316	100132	WASHER, flat, 7/16"	4



Miscellaneous Accessories

Nitrogen Regulator Kit, 207638

Maintains a nitrogen head on the supply drum to protect materials from moisture. Kit includes two 6' x 1/4" (1.8 m x 6 mm) hoses, control box with gauge, regulator, and relief valve.

Inlet: 1/4" npt(m). Outlet: 3/4" npt(m).

Graco Throat Seal Liquid

Non-evaporating liquid for wet-cup

206995 0.95 liter (1 quart)

206996 3.8 liter (1 gallon)

ISO Pump Oil

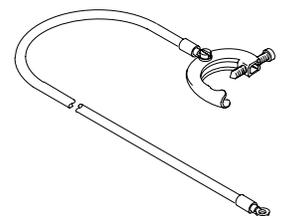
A highly refined, special purpose throat seal lubricant the minimal reaction with Isocyanates.

217374 16 ounce (0.13 liter) container

218656 4 gallon (18.14 liter) container

Grounding Wire and Clamp, 222011

7.6 m (25 ft) long,
1.5 mm² (12 gauge)



Accessories

Air Control Accessories

Bleed-Type Master Air Valve

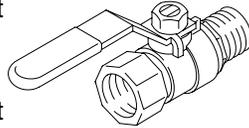
300 psi (2.1 MPa, 21 bar) Maximum Working Pressure
Relieves air trapped in the air line between the pump air inlet and this valve when closed.

107141

3/4 npt(m) inlet x 3/4 npt(f) outlet

107142

1/2 npt(m) inlet x 1/2 npt(f) outlet



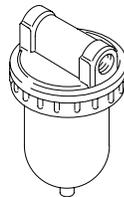
Air Line Filter 106149

250 psi (1.7 MPa, 17 bar) Maximum Working Pressure

Filters harmful dirt and moisture from the compressed air supply.

1/2 npt(f) inlet and outlet.

See instruction manual 308169.



Air Line Lubricator 214848

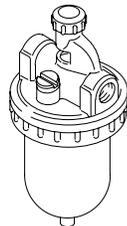
250 psi (1.7 MPa, 17 bar) Maximum Working Pressure

Provides automatic lubrication for the air motor.

0.48 liter (16 oz) bowl capacity.

1/2 npt(f) inlet and outlet.

See instruction manual 308169.



Pump Runaway Valve 224040

120 psi (0.8 MPa, 8 bar) Maximum Working Pressure

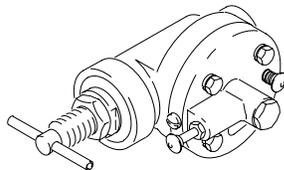
Shuts off air supply to the pump if the pump accelerates beyond the pre-adjusted setting due to an empty supply container, interrupted fluid supply to the pump, or excessive cavitation.

3/4 npt(f) inlet and outlet.

Includes optional 90°,

3/4 npsm swivel outlet fitting.

See instruction manual 308201.



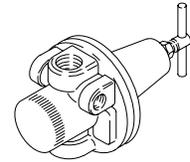
Air Regulator 206197

300 psi (2.1 MPa, 21 bar) Maximum Working Pressure

Controls air pressure to feed, solvent, or proportioning pumps.

1/2 npt inlets and outlets, with (2)

1/4 npt pressure gauge outlets.



Fluid Control Accessories

Fluid Filter

5000 psi (34 MPa, 345 bar) Maximum Working Pressure

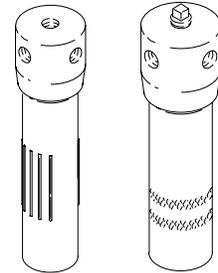
60 mesh (250 micron) screen.

Model 218029

Carbon steel bowl and support

Model 223160

Stainless steel bowl and polyethylene support



Fluid Shutoff Valve

5000 psi (34 MPa, 345 bar) Maximum Working Pressure

Model 235992

stainless steel with PTFE seals

1/4 x 3/8 nps (mbe)

Model 223960

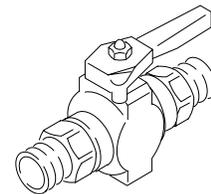
carbon steel with PTFE seals

3/8 npt (mbe)

Model 214037

carbon steel with PTFE seals

1/4 npt (mbe)



Static Mixing Units

3000 psi (21 MPa, 207 bar) Maximum Working Pressure

These units consist of a tube with helical interior elements which thoroughly blend base and catalyst materials into the proper mix.

Model 500639

14" (356 mm) long, 5/16" (8 mm) ID, 27 Elements

3/8 npt order fittings separately

Model 500586

25" (635 mm) long, 0.44" (11 mm) ID, 32 Elements

1/2 npt order fittings separately

Model 502028

29" (736 mm) long, 0.8" (20 mm) ID, 24 Elements

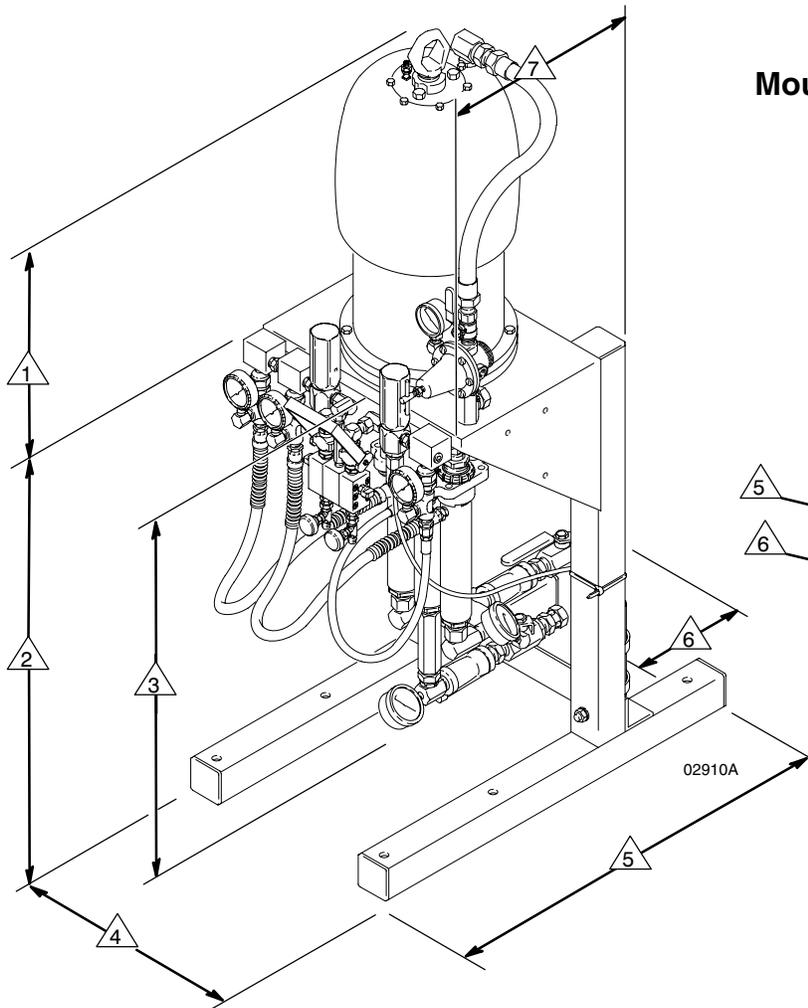
3/4 npt

Model 945917

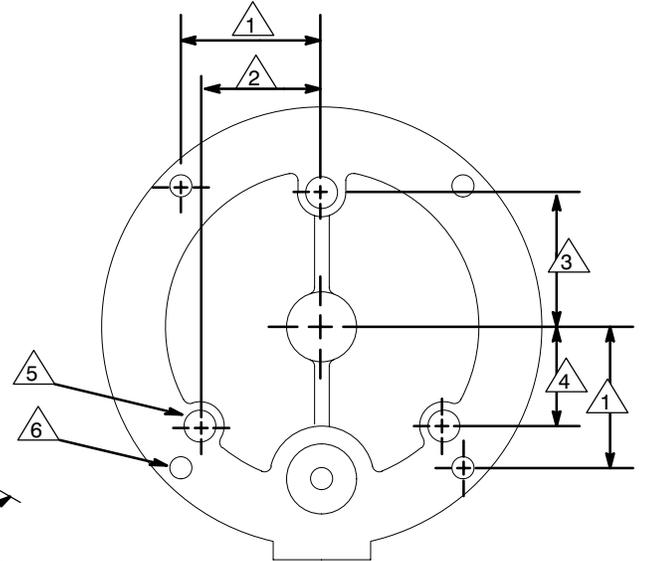
25" (635 mm) long, 2-1/2" (64 mm) OD, 10 Elements

1" npt (m x f)

Dimensions



Mounting Hole Layout for Air Motor



01154

- | | |
|----------------------|----------------------|
| △ 1 21-1/4" (540 mm) | △ 5 30-1/4" (768 mm) |
| △ 2 32-3/4" (832 mm) | △ 6 11" (279 mm) |
| △ 3 28-1/4" (718 mm) | △ 7 12-1/2" (318 mm) |
| △ 4 17-3/4" (451 mm) | |

- | | |
|-----|----------------------------------|
| △ 1 | 3.712" (94 mm) |
| △ 2 | 3.46" (88 mm) |
| △ 3 | 4" (102 mm) |
| △ 4 | 2" (51 mm) |
| △ 5 | 5/8-11 UNC (3) for pump mounting |
| △ 6 | 0.44" (11.1 mm) diameter (4) |

Technical Data

Pumps

Air operating range	40–100 psi (280–700 kPa, 2.8–6.37 bar)
Air consumption	See example below
Fluid inlet size	3/4 npt
Fluid outlet size	3/8 npt
Air inlet size	3/4 npt
Maximum fluid outlet pressure	3000 psi (21 MPa, 207 bar)
Maximum fluid inlet pressure	250 psi (1.7 MPa, 17 bar)
Wetted parts	Stainless steel, tungsten carbide, chrome plating, carbon steel, PTFE, ultra-high molecular weight polyethylene

Air consumption example:

When the air pressure to the pump is 60 psi (410 kPa, 4.1 bar) and you are dispensing 1 gal. (3.8 liter) of mixed fluid per minute, air volume used, in cfm, will be about the same as the larger pressure ratio figure of your pump. See page 6 for pressure ratios of pumps.

Manifold assemblies

Manifold outlets	3/8 npt
Hoses	3/8 in. ID, PTFE, cpld 3/8 npt(m) 4000 psi (28 MPa, 276 bar) maximum working pressure
Hoses	3/8 in. ID, nylon, cpld 3/8 npt(m) 3000 psi (21 MPa, 207 bar) maximum working pressure
Automatic pressure relief valves wetted parts	303 stainless steel, tungsten carbide, fluoroelastomer

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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 by an authorized Graco distributor 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.

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Original instructions. This manual contains English. MM 308225

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