

# SaniForce™ Ram Packages

3A0591ZAD  
EN

**For use in sanitary applications to transfer medium to high viscosity fluids.  
For professional use only.**

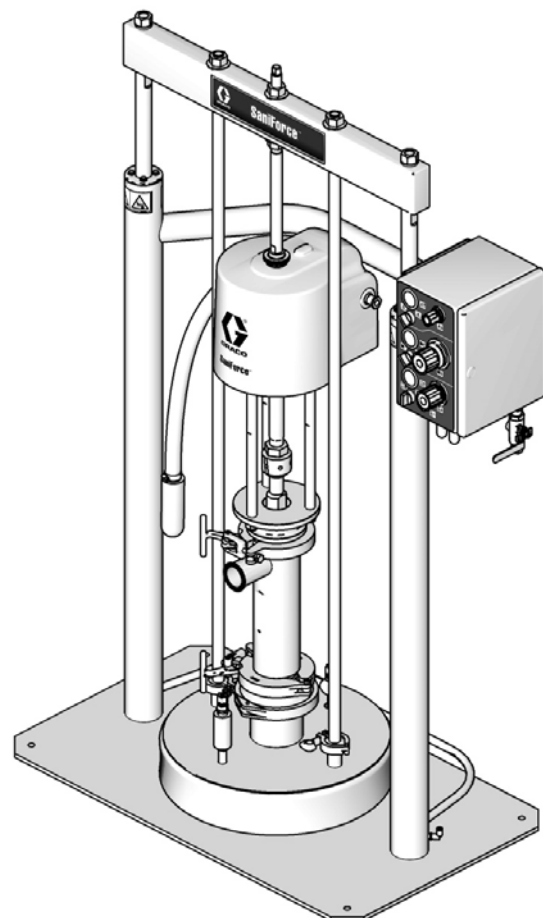
**Not for use in European Explosive Atmosphere locations.**

*See pages 3- 4 for model information, including maximum fluid working pressure.*



### **Important Safety Instructions**

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



T115713a



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# Models

## Piston Pumps

**Maximum Package Air Inlet Pressure: 100 psi (0.7 MPa, 6.9 bar)**

| Model, Series | Frame |     | Controls |     | Pump Description       | Ratio | Maximum Ram Air Inlet Pressure, psi (MPa, bar) | Maximum Pump Air Inlet Pressure, psi (MPa, bar) | Maximum Fluid Working Pressure, psi (MPa, bar) |
|---------------|-------|-----|----------|-----|------------------------|-------|--|---|--|
|               | SS*   | CS* | SS*      | CS* |                        |       |  |   |  |
| 24D708, B     | ✓     |     |          | ✓   | Priming Piston, Drum   | 5:1   | 100 (0.7, 6.9)                                 | 80 (0.6, 5.5)                                   | 410 (2.8, 28.3)                                |
| 24D712, B     |       | ✓   |          | ✓   | Priming Piston, Drum   | 5:1   | 100 (0.7, 6.9)                                 | 80 (0.6, 5.5)                                   | 410 (2.8, 28.3)                                |
| 24D714, B     | ✓     |     | ✓        |     | Priming Piston, Drum   | 5:1   | 100 (0.7, 6.9)                                 | 80 (0.6, 5.5)                                   | 410 (2.8, 28.3)                                |
| 24D720, B     | ✓     |     |          | ✓   | Double Ball, Drum      | 5:1   | 100 (0.7, 6.9)                                 | 80 (0.6, 5.5)                                   | 410 (2.8, 28.3)                                |
| 24D724, B     |       | ✓   |          | ✓   | Double Ball, Drum      | 5:1   | 100 (0.7, 6.9)                                 | 80 (0.6, 5.5)                                   | 410 (2.8, 28.3)                                |
| 24D726, B     | ✓     |     | ✓        |     | Double Ball, Drum      | 5:1   | 100 (0.7, 6.9)                                 | 80 (0.6, 5.5)                                   | 410 (2.8, 28.3)                                |
| 24V839†, A    | ✓     |     | ✓        |     | Priming Piston, Drum   | 5:1   | 100 (0.7, 6.9)                                 | 80 (0.6, 5.5)                                   | 410 (2.8, 28.3)                                |
| 24D776, B     | ✓     |     |          | ✓   | Priming Piston, Stubby | 6:1   | 100 (0.7, 6.9)                                 | 100 (0.7, 6.9)                                  | 650 (4.5, 44.8)                                |
| 24D780, B     |       | ✓   |          | ✓   | Priming Piston, Stubby | 6:1   | 100 (0.7, 6.9)                                 | 100 (0.7, 6.9)                                  | 650 (4.5, 44.8)                                |
| 24D782, B     | ✓     |     | ✓        |     | Priming Piston, Stubby | 6:1   | 100 (0.7, 6.9)                                 | 100 (0.7, 6.9)                                  | 650 (4.5, 44.8)                                |
| 24D788, B     | ✓     |     |          | ✓   | Double Ball, Drum      | 6:1   | 100 (0.7, 6.9)                                 | 100 (0.7, 6.9)                                  | 650 (4.5, 44.8)                                |
| 24D792, B     |       | ✓   |          | ✓   | Double Ball Drum       | 6:1   | 100 (0.7, 6.9)                                 | 100 (0.7, 6.9)                                  | 650 (4.5, 44.8)                                |
| 24D794, B     | ✓     |     | ✓        |     | Double Ball, Drum      | 6:1   | 100 (0.7, 6.9)                                 | 100 (0.7, 6.9)                                  | 650 (4.5, 44.8)                                |
| 24D647, B     | ✓     |     |          | ✓   | Priming Piston, Stubby | 12:1  | 100 (0.7, 6.9)                                 | 100 (0.7, 6.9)                                  | 1450 (10, 100.0)                               |
| 24D651, B     |       | ✓   |          | ✓   | Priming Piston, Stubby | 12:1  | 100 (0.7, 6.9)                                 | 100 (0.7, 6.9)                                  | 1450 (10, 100.0)                               |
| 24D653, B     | ✓     |     | ✓        |     | Priming Piston, Stubby | 12:1  | 100 (0.7, 6.9)                                 | 100 (0.7, 6.9)                                  | 1450 (10, 100.0)                               |
| 24F188**, B   | ✓     |     |          | ✓   | Priming Piston, Stubby | 12:1  | 100 (0.7, 6.9)                                 | 100 (0.7, 6.9)                                  | 1450 (10, 100.0)                               |
| 24F189**, B   |       | ✓   |          | ✓   | Priming Piston, Stubby | 12:1  | 100 (0.7, 6.9)                                 | 100 (0.7, 6.9)                                  | 1450 (10, 100.0)                               |
| 24F190**, B   | ✓     |     | ✓        |     | Priming Piston, Stubby | 12:1  | 100 (0.7, 6.9)                                 | 100 (0.7, 6.9)                                  | 1450 (10, 100.0)                               |
| 24P811†, B    | ✓     |     |          | ✓   | Priming Piston, Stubby | 12:1  | 100 (0.7, 6.9)                                 | 100 (0.7, 6.9)                                  | 1450 (10, 100.0)                               |
| 24U568†**, B  | ✓     |     |          | ✓   | Priming Piston, Stubby | 12:1  | 100 (0.7, 6.9)                                 | 100 (0.7, 6.9)                                  | 1450 (10, 100.0)                               |
| 24Y493†, A    | ✓     |     | ✓        |     | Priming Piston, Stubby | 12:1  | 100 (0.7, 6.9)                                 | 100 (0.7, 6.9)                                  | 1450 (10, 100.0)                               |

\* SS = Stainless Steel; CS = Carbon Steel

\*\* This model has an additional seal for viscous, sticky materials.

† This model has a conical platen.

## Air-Operated Diaphragm Pumps

**Maximum Package Air Inlet Pressure: 120 psi (0.8 MPa, 8 bar)**

| Model, Series | Frame |     | Controls |     | Pump Description   | Ratio | Maximum Ram Air Inlet Pressure, psi (MPa, bar) | Maximum Pump Air Inlet Pressure, psi (MPa, bar) | Maximum Fluid Working Pressure, psi (MPa, bar) |
|---------------|-------|-----|----------|-----|--|-------|--|---|--|
|               | SS*   | CS* | SS*      | CS* |  |       |  |   |  |
| 24G542, B     | ✓     |     |          | ✓   | SaniForce 2150, Air-Operated Double Diaphragm, Ball Check, PTFE          | 1:1   | 100 (0.7, 6.9)                                 | 120 (0.8, 8.2)                                  | 120 (0.8, 8.2)                                 |
| 24F191, B     |       | ✓   |          | ✓   | SaniForce 2150, Air-Operated Double Diaphragm, Ball Check, PTFE          | 1:1   | 100 (0.7, 6.9)                                 | 120 (0.8, 8.2)                                  | 120 (0.8, 8.2)                                 |
| 24G543, B     | ✓     |     | ✓        |     | SaniForce 2150, Air-Operated Double Diaphragm, Ball Check, PTFE          | 1:1   | 100 (0.7, 6.9)                                 | 120 (0.8, 8.2)                                  | 120 (0.8, 8.2)                                 |
| 24F192, B     | ✓     |     |          | ✓   | SaniForce 2150, Air-Operated Double Diaphragm, Ball Check, Santoprene    | 1:1   | 100 (0.7, 6.9)                                 | 120 (0.8, 8.2)                                  | 120 (0.8, 8.2)                                 |
| 24F193, B     |       | ✓   |          | ✓   | SaniForce 2150, Air-Operated Double Diaphragm, Ball Check, Santoprene    | 1:1   | 100 (0.7, 6.9)                                 | 120 (0.8, 8.2)                                  | 120 (0.8, 8.2)                                 |
| 24F194, B     | ✓     |     | ✓        |     | SaniForce 2150, Air-Operated Double Diaphragm, Ball Check, Santoprene    | 1:1   | 100 (0.7, 6.9)                                 | 120 (0.8, 8.2)                                  | 120 (0.8, 8.2)                                 |
| 24D922, B     | ✓     |     |          | ✓   | SaniForce 3150, Air-Operated Double Diaphragm, Ball Check, EPDM          | 1:1   | 100 (0.7, 6.9)                                 | 120 (0.8, 8.2)                                  | 120 (0.8, 8.2)                                 |
| 24D926, B     |       | ✓   |          | ✓   | SaniForce 3150, Air-Operated Double Diaphragm, Ball Check, EPDM          | 1:1   | 100 (0.7, 6.9)                                 | 120 (0.8, 8.2)                                  | 120 (0.8, 8.2)                                 |
| 24D928, B     | ✓     |     | ✓        |     | SaniForce 3150, Air-Operated Double Diaphragm, Ball Check, EPDM          | 1:1   | 100 (0.7, 6.9)                                 | 120 (0.8, 8.2)                                  | 120 (0.8, 8.2)                                 |
| 24J364, B     | ✓     |     |          | ✓   | SaniForce 3150, Air-Operated Double Diaphragm, Ball Check, PTFE          | 1:1   | 100 (0.7, 6.9)                                 | 120 (0.8, 8.2)                                  | 120 (0.8, 8.2)                                 |
| 24J365, B     |       | ✓   |          | ✓   | SaniForce 3150, Air-Operated Double Diaphragm, Ball Check, PTFE          | 1:1   | 100 (0.7, 6.9)                                 | 120 (0.8, 8.2)                                  | 120 (0.8, 8.2)                                 |
| 24J366, B     | ✓     |     | ✓        |     | SaniForce 3150, Air-Operated Double Diaphragm, Ball Check, PTFE          | 1:1   | 100 (0.7, 6.9)                                 | 120 (0.8, 8.2)                                  | 120 (0.8, 8.2)                                 |
| 24D932, B     |       | ✓   |          | ✓   | SaniForce 3150, Air-Operated Double Diaphragm, Ball Check, Santoprene    | 1:1   | 100 (0.7, 6.9)                                 | 120 (0.8, 8.2)                                  | 120 (0.8, 8.2)                                 |
| 24D936, B     | ✓     |     | ✓        |     | SaniForce 3150, Air-Operated Double Diaphragm, Ball Check, Santoprene    | 1:1   | 100 (0.7, 6.9)                                 | 120 (0.8, 8.2)                                  | 120 (0.8, 8.2)                                 |
| 24D940, B     | ✓     |     |          | ✓   | SaniForce 3150, Air-Operated Double Diaphragm, Ball Check, Santoprene    | 1:1   | 100 (0.7, 6.9)                                 | 120 (0.8, 8.2)                                  | 120 (0.8, 8.2)                                 |
| 24D944, B     | ✓     |     |          | ✓   | SaniForce 3150, Air-Operated Double Diaphragm, Flapper Check, Santoprene | 1:1   | 100 (0.7, 6.9)                                 | 120 (0.8, 8.2)                                  | 120 (0.8, 8.2)                                 |
| 24D948, B     |       | ✓   |          | ✓   | SaniForce 3150, Air-Operated Double Diaphragm, Flapper Check, Santoprene | 1:1   | 100 (0.7, 6.9)                                 | 120 (0.8, 8.2)                                  | 120 (0.8, 8.2)                                 |
| 24D952, B     | ✓     |     | ✓        |     | SaniForce 3150, Air-Operated Double Diaphragm, Flapper Check, Santoprene | 1:1   | 100 (0.7, 6.9)                                 | 120 (0.8, 8.2)                                  | 120 (0.8, 8.2)                                 |
| 24Y512, A     | ✓     |     | ✓        |     | No Pump  | ---   | 100 (0.7, 6.9)                                 | ---   | ---  |

\* SS = Stainless Steel; CS = Carbon Steel












## Inflatable Seal

| Part, Series | Description     | Normal Air Operating Pressure               | Maximum Air Operating Pressure |
|--------------|-----------------|---|--------------------------------|
| 16G242, C    | Inflatable Seal | 10-25 psi<br>(0.07- 0.17 MPa, 0.69-1.7 bar) | 25 psi<br>(0.17 MPa, 1.7 bar)  |



# Warnings

The following warnings are for the setup, use, grounding, maintenance, and repair of this equipment. The exclamation point symbol alerts you to a general warning and the hazard symbols refer to procedure-specific risks. When these symbols appear in the body of this manual, refer back to these Warnings. Product-specific hazard symbols and warnings not covered in this section may appear throughout the body of this manual where applicable.

|  <b>WARNING</b>  |   |
|---|---|
|      | <p><b>SKIN INJECTION HAZARD</b></p> <p>High-pressure fluid from dispensing device, hose leaks, or ruptured components will pierce skin. This may look like just a cut, but it is a serious injury that can result in amputation. <b>Get immediate surgical treatment.</b></p> <ul style="list-style-type: none"> <li>• Do not point dispensing device at anyone or at any part of the body.</li> <li>• Do not put your hand over the fluid outlet.</li> <li>• Do not stop or deflect leaks with your hand, body, glove, or rag.</li> <li>• Follow the <b>Pressure Relief Procedure</b> when you stop dispensing and before cleaning, checking, or servicing equipment.</li> <li>• Tighten all fluid connections before operating the equipment.</li> <li>• Check hoses and couplings daily. Replace worn or damaged parts immediately.</li> </ul>   |
|     | <p><b>MOVING PARTS HAZARD</b></p> <p>Moving parts can pinch, cut or amputate fingers and other body parts.</p> <ul style="list-style-type: none"> <li>• Keep clear of moving parts.</li> <li>• Do not operate equipment with protective guards or covers removed.</li> <li>• Pressurized equipment can start without warning. Before checking, moving, or servicing equipment, follow the <b>Pressure Relief Procedure</b> and disconnect all power sources.</li> </ul>   |
|     | <p><b>FIRE AND EXPLOSION HAZARD</b></p> <p>Flammable fumes, such as solvent and paint fumes, in <b>work area</b> can ignite or explode. To help prevent fire and explosion:</p> <ul style="list-style-type: none"> <li>• Use equipment only in well ventilated area.</li> <li>• Eliminate all ignition sources; such as pilot lights, cigarettes, portable electric lamps, and plastic drop cloths (potential static arc).</li> <li>• Keep work area free of debris, including solvent, rags and gasoline.</li> <li>• Do not plug or unplug power cords, or turn power or light switches on or off when flammable fumes are present.</li> <li>• Ground all equipment in the work area. See <b>Grounding</b> instructions.</li> <li>• Use only grounded hoses.</li> <li>• Hold gun firmly to side of grounded pail when triggering into pail.</li> <li>• If there is static sparking or you feel a shock, <b>stop operation immediately</b>. Do not use equipment until you identify and correct the problem.</li> <li>• Keep a working fire extinguisher in the work area.</li> </ul> |

# ! WARNING



## EQUIPMENT MISUSE HAZARD

Misuse can cause death or serious injury.



- Do not operate the unit when fatigued or under the influence of drugs or alcohol.
- Do not exceed the maximum working pressure or temperature rating of the lowest rated system component. See **Technical Data** in all equipment manuals.
- Use fluids and solvents that are compatible with equipment wetted parts. See **Technical Data** in all equipment manuals. Read fluid and solvent manufacturer's warnings. For complete information about your material, request MSDS from distributor or retailer.
- Do not leave the work area while equipment is energized or under pressure. Turn off all equipment and follow the **Pressure Relief Procedure** when equipment is not in use.
- Check equipment daily. Repair or replace worn or damaged parts immediately with genuine manufacturer's replacement parts only.
- Do not alter or modify equipment.
- Use equipment only for its intended purpose. Call your distributor for information.
- Route hoses and cables away from traffic areas, sharp edges, moving parts, and hot surfaces.
- Do not kink or over bend hoses or use hoses to pull equipment.
- Keep children and animals away from work area.
- Comply with all applicable safety regulations.



## SPLATTER HAZARD

Hot or toxic fluid can cause serious injury if splashed in the eyes or on skin. During blow off of platen, splatter may occur.

- Use minimum air pressure when removing platen from drum.



## TOXIC FLUID OR FUMES HAZARD

Toxic fluids or fumes can cause serious injury or death if splashed in the eyes or on skin, inhaled, or swallowed.

- Read MSDSs to know the specific hazards of the fluids you are using.
- Route exhaust away from work area. If diaphragm ruptures, fluid may be exhausted into the air.
- Store hazardous fluid in approved containers, and dispose of it according to applicable guidelines.



## BURN HAZARD

Equipment surfaces and fluid that's heated can become very hot during operation. To avoid severe burns:

- Do not touch hot fluid or equipment.






## PERSONAL PROTECTIVE EQUIPMENT

You must wear appropriate protective equipment when operating, servicing, or when in the operating area of the equipment to help protect you from serious injury, including eye injury, hearing loss, inhalation of toxic fumes, and burns. This equipment includes but is not limited to:

- Protective eyewear, and hearing protection.
- Respirators, protective clothing, and gloves as recommended by the fluid and solvent manufacturer.

# Installation

## Grounding

|  |   |   |  |  |  |  |
|--|---|---|--|--|--|--|
|   |  |  |  |  |  |  |
| <p>The equipment must be grounded. Grounding reduces the risk of static and electric shock by providing an escape wire for the electrical current due to static build up or in the event of a short circuit.</p> |   |   |  |  |  |  |

**Pump:** Connect a ground wire (Graco PN 238909) to the ground screw on the bottom cover of the air motor, under the shield. Connect the other end of the ground wire to a true earth ground.

**Air and fluid hoses:** use only electrically conductive hoses with a maximum of 500 ft. (150 m) combined hose length to ensure grounding continuity. Check electrical resistance of hoses. If total resistance to ground exceeds 25 megohms, replace hose immediately.

**Air compressors:** follow manufacturer's recommendations.

**Dispense valve:** ground through connection to a properly grounded fluid hose and pump.

**Material supply container:** follow local code.

**Container(s) that receive material:** follow local code.

**Solvent pails used when flushing:** follow local code. Use only conductive metal pails, placed on a grounded surface. Do not place the pail on a nonconductive surface, such as paper or cardboard, which interrupts grounding continuity.

**To maintain grounding continuity when flushing or relieving pressure:** hold metal part of the dispense valve firmly to the side of a grounded metal pail, then trigger the valve.

## Location

Position the ram so the air controls are easily accessible. Ensure that there is sufficient overhead clearance when the ram is fully raised. See **Repair**, page 20.

Position the ram in an area with adequate access for servicing and cleaning the equipment and adjacent areas to maintain the required level of hygiene. Locate equipment away from sources of air currents, dust, or liquids derived from leakage, condensation, or aerosols.

Using the holes in the ram base as a guide, drill holes for 1/2 in. (13 mm) anchors.

Check that the ram base is level in all directions. If necessary, level the base using metal shims. Secure the base to the floor using 1/2 in. (13 mm) anchors that are long enough to prevent the ram from tipping.



## Setup

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

Accessories are available from Graco. Make certain all accessories are sized and pressure-rated to meet your system requirements

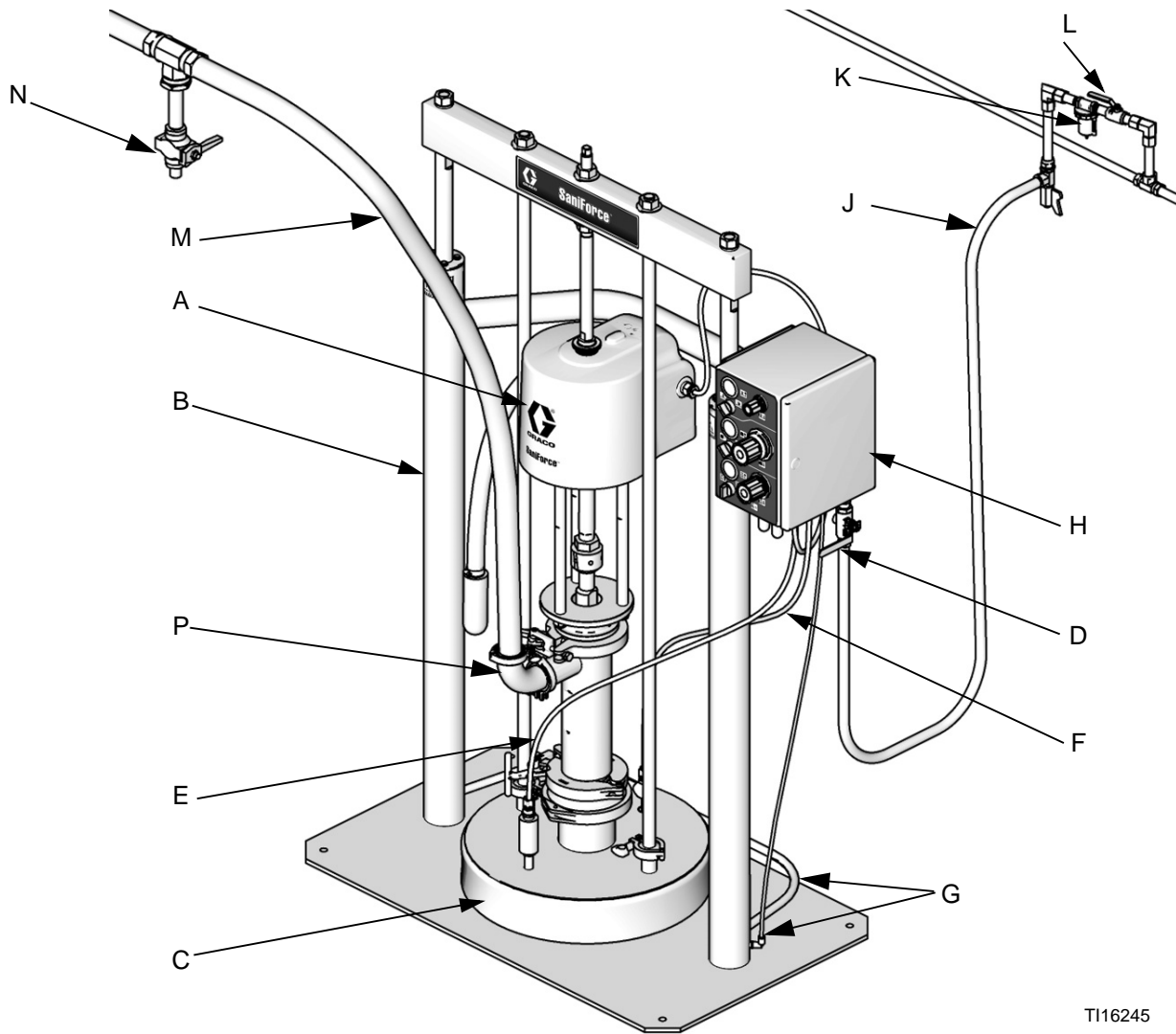
FIG. 1 and FIG. 2 are guides for selecting and installing system components and accessories. Contact your Graco distributor for assistance in designing a system to suit your particular needs.

- **Inflatable Seal (C):** Adjust inflation level so the seal fits snug against the drum. A properly inflated seal wipes the sides of the drum and prevents material from passing the plate, to minimize waste.
- **Main air bleed valve (D):** Required in your system to shut off the air supply to the pump and ram. When closed, the valve bleeds off all air in the ram and pump.

### Air and Fluid Accessories

The following accessories are recommended for your system, and are available from your Graco distributor. Make certain all accessories are sized and pressure-rated to meet your system requirements

- **Fluid Drain Valve (M):** Required in your system to relieve fluid pressure between the pump and the dispense device.
- **Fluid Outlet Elbow (P):** Recommended for ram packages with piston pumps. Connects the fluid outlet hose to the pump fluid outlet.
- **Air Line Filter (K):** Removes harmful dirt and moisture from the compressed air supply.
- **Second bleed-type air valve (L):** isolates air line accessories and supply system for servicing. Locate upstream from all other air line accessories.



TI16245

**Key:**

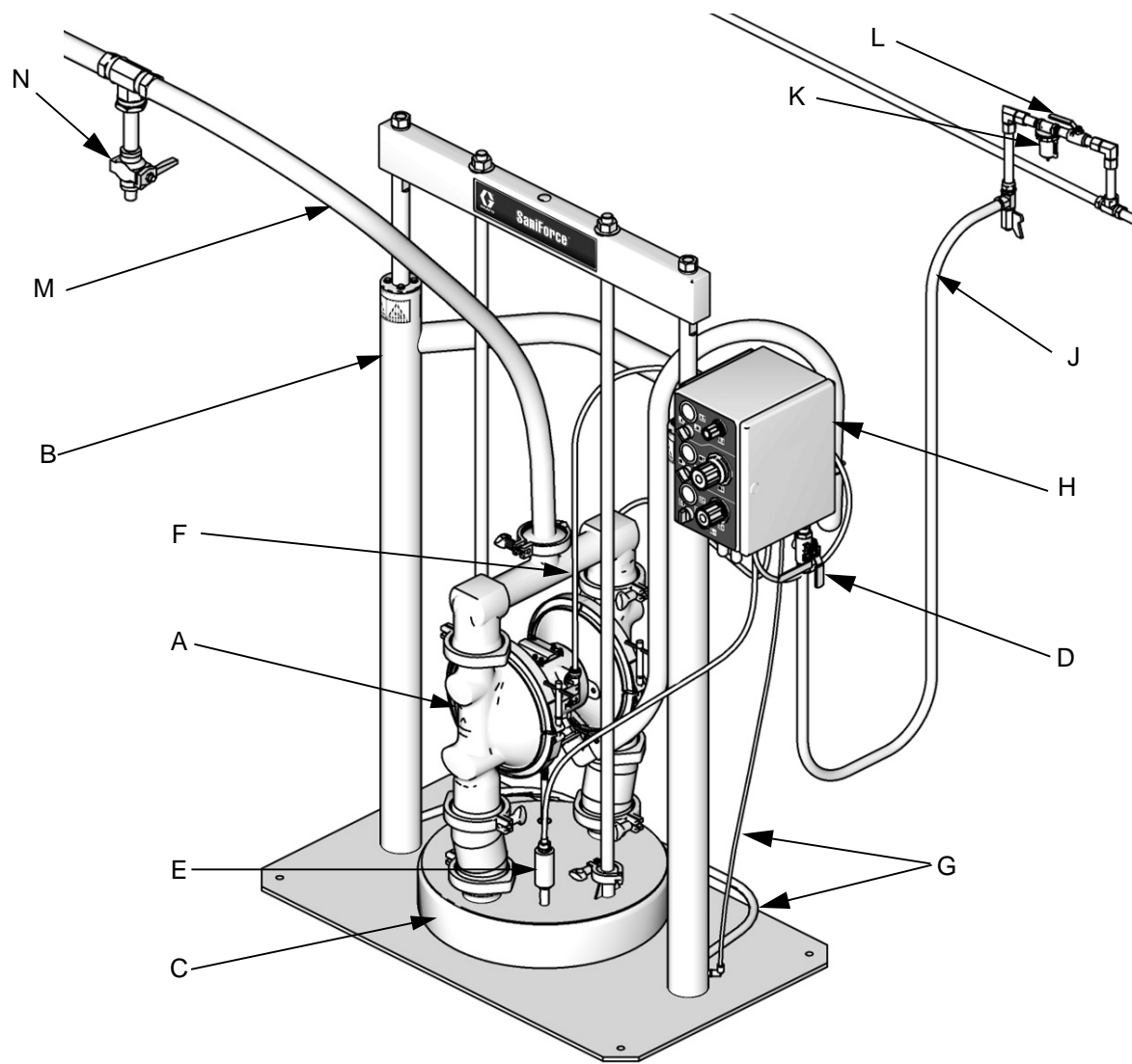
**Ram Package Components (Supplied)**

- A Pump
- B Ram
- C Inflatable Seal
- D Main Air Bleed Valve (required for pump and ram)
- E Air Assist Air Supply
- F Inflatable Seal Air Supply (partially visible)
- G Ram Director Air Supply
- H Enclosed Air Controls (see FIG. 3; exposed air controls also available.)

**Accessories (Not Supplied)**

- J Air Supply Hose (use 1/2 in. air hose, minimum)
- K Air Line Filter
- L Second Bleed-Type Air Valve
- M Fluid Outlet Hose
- N Fluid Drain Valve (required for pump)
- P Fluid Outlet Elbow

**FIG. 1: Typical Installation, Piston Pump**



T116247a

**FIG. 2. Typical Installation, Diaphragm Pump**

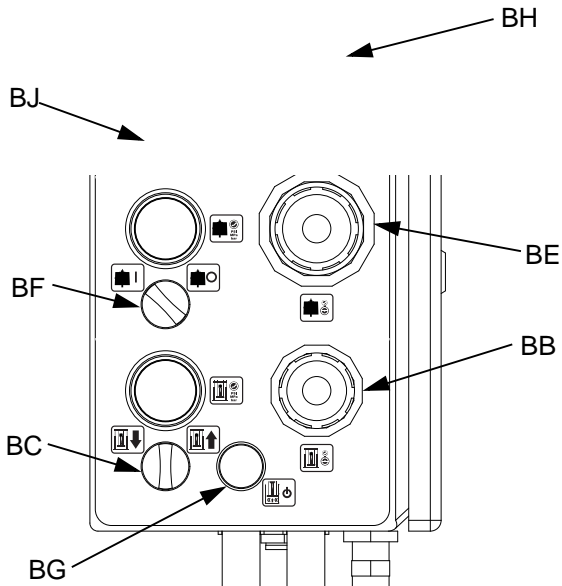
**Ram Package Components (Supplied)**

- A Pump
- B Ram
- C Inflatable Seal
- D Main Air Bleed Valve (required for pump and ram)
- E Air Assist Air Supply
- F Inflatable Seal Air Supply (partially visible)
- G Ram Director Air Supply
- H Enclosed Air Controls (see FIG. 3; exposed air controls also available.)

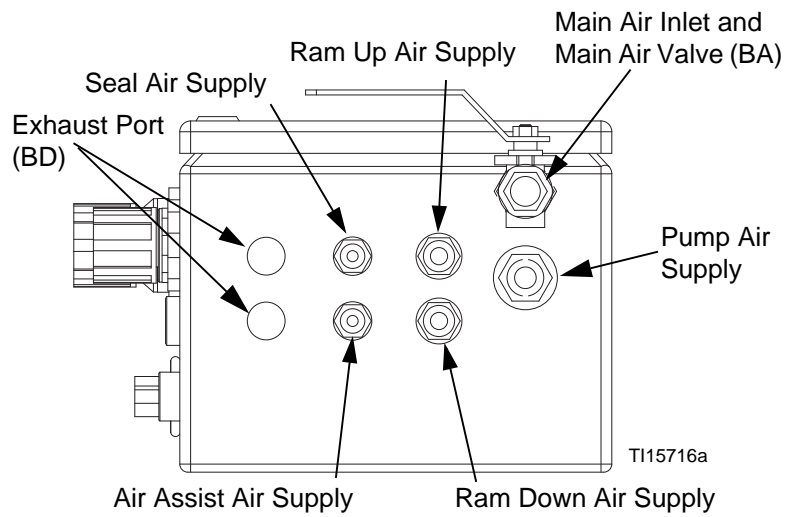
**Accessories (Not Supplied)**

- J Air Supply Hose (use 1/2 in. air hose, minimum)
- K Air Line Filter
- L Second Bleed-Type Air Valve
- M Fluid Outlet Hose
- N Fluid Drain Valve (required for pump)

**Enclosed Air Control Module  
(Side View)**

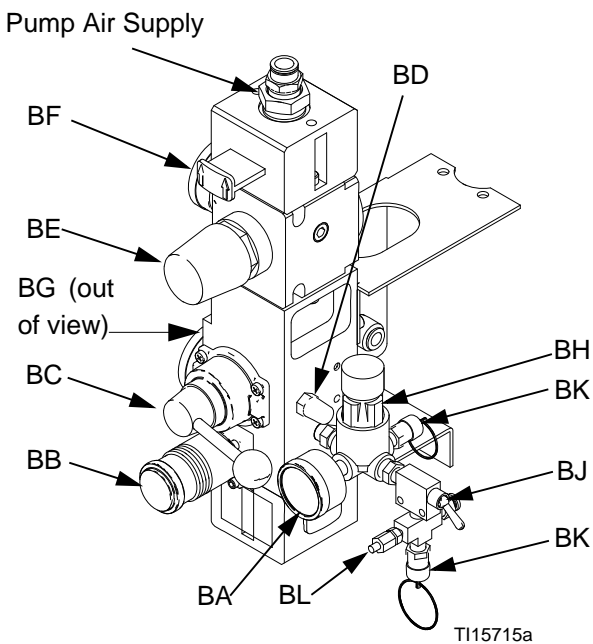


**Enclosed Air Control Module  
(Bottom View)**

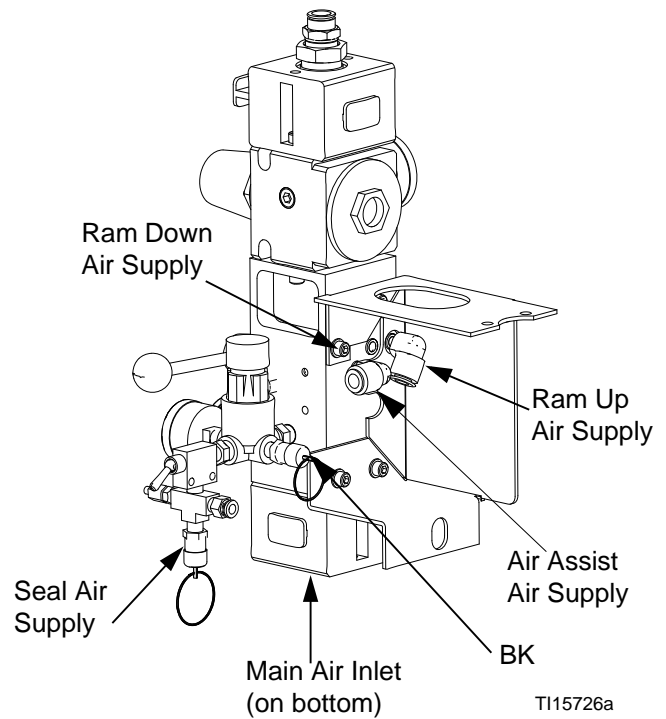


BA  
T115717b

**Exposed Air Control Module  
(Front View)**



**Exposed Air Control Module  
(Rear View)**



**FIG. 3: Air Control Modules**

## Integrated Air Controls

See FIG. 3. Air inlet size is 1/2 npt(f) on the Enclosed Air Controls and 3/4 npt(f) on the Exposed Air Controls. The integrated air controls include:

- **Main air valve (BA):** turns air on and off to the system. When closed, the valve relieves pressure downstream.
- **Ram air regulator (BB):** controls ram up and down pressure.
- **Ram director switch/valve (BC):** controls ram direction.
- **Exhaust port with muffler (BD)**
- **Air motor regulator (BE):** Controls air pressure to motor.
- **Air motor switch/slider valve (BF):** turns air on and off to the air motor. When closed, the valve relieves air trapped between it and the air motor.
- **Air assist valve (BG):** turns air on and off to push the ram plate out of an empty drum. Uses line air.
- **Inflatable seal air regulator (BH):** controls air pressure to the inflatable seal.
- **Inflatable seal switch (BJ):** controls the inflation and deflation of the ram plate seal.
- **Air relief valve (BK):** automatically relieves excessive pressure.
- **Seal bleed off valve (BL):** bleeds air from inflatable seal as needed for drum tapering. For Exposed Air Control Modules, See FIG. 3. For Enclosed Air Control Modules, the valve is located inside the box. See FIG. 4, page 16.
- **Muffler with needle valve (BN):** Allows adjustment of travel rate when lowering the ram plate. Located inside the box on the Enclosed Air Control Module. Not needed with the Exposed Air Control Module because ram rate can be adjusted with the director valve.

# Operation

## Pressure Relief Procedure



Trapped air can cause the pump to cycle unexpectedly, which could result in serious injury from injection, splashing or moving parts. Relieve pressure when you stop pumping and before cleaning, checking, or servicing equipment.

**NOTE:** Do not close the main air valve until Step 6. The Enclosed Air Controls will not operate when the main air supply is in the Off position.

1. **Enclosed Air Controls:** See FIG. 3. Turn the air motor switch (BF) to off.  
**Exposed Air Controls:** See FIG. 3. Close the air motor slider valve (BF).
2. Back the ram director air regulator down to zero. Set the ram director switch/valve (BC) to DOWN. The ram will slowly drop.
3. Jog the director valve up and down to bleed air from ram cylinders.
4. Turn the inflatable seal switch (BJ) to off.
5. Open the fluid ball valve and/or dispensing valve to relieve fluid pressure.
6. Close the main air valve (BA).

## Flush Before First Use

The sanitary pump was assembled using sanitary lubricant on moving parts and was tested in water. Flush the pump thoroughly with an appropriate cleaning solution or disassemble and sanitize the parts before using the pump. See your separate pump manual for complete flushing and cleaning procedures for a sanitary pump. Check national, state, and local codes for specific limitations.

## Setting Inflatable Seal Pressure

1. Set an empty drum on the ram base. Set the director valve (BC) to DOWN. Lower the seal into the drum to the point of the drum's largest inside diameter.
2. Set the inflatable seal switch (BJ) to On. Adjust the seal air regulator until the seal just touches the inside of the drum.
3. Leave regulator set at this setting for this style of drum.
4. Set the inflatable seal switch to Off to deflate seal before raising the ram. Set the director valve (BC) to UP and let the ram rise to its full height.
5. Remove the empty drum.

**NOTE:** Use the lowest seal pressure possible to achieve desired results. Excessive seal pressure may cause the seal to roll off of the follower plate. To prevent overpressurization, a relief valve limits seal pressure to 30 psi (2.1 bar, 0.21 MPa).

## Starting and Adjusting the Ram



- Do not inflate the seal when not installed on the follower plate. Wear safety glasses when operating the seal. Seal burst could result in injury.
- Keep hands and fingers away from the ram plate, pump fluid inlet, and lip of the fluid container when raising or lowering the ram to reduce risk of serious injury from moving parts.

1. Close all air regulators and air valves.
2. Turn on the main air supply.
3. Open the main air valve (BA), and set the ram director air regulator (BB) to 2.8 bar, 0.26 MPa (40 psi). Set the director valve (BC) to UP and let the ram rise to its full height.
4. Lubricate inflatable seal (C) with sanitary lubricant.
5. Set a full drum of fluid on the ram base, slide it back against the tube stop, and center it under the follower plate.
6. Remove the drum cover, and smooth the surface of the fluid with a straightedge.
7. Secure the bag liner to the drum with tape or a strap, to prevent it from sliding into the drum.

### NOTICE

Do not use drums that have side bungs or large dents with this ram. Rough bung openings or large dents will damage the inflatable seal or stop the ram plate, resulting in a runaway pump.

8. Set the director valve to DOWN. Set ram air regulator at about 40 psi (0.28 MPa, 2.8 bar). Lower the ram until the ram plate is about to enter the drum, and set the valve to neutral. Reposition the drum as necessary so the inflatable seal does not hit the drum lip.

**NOTE: Enclosed Controls:** To increase or decrease the speed of downward travel on the ram plate, adjust the valve on the muffler (BN) inside the control box. See FIG. 4, page 16.

**Exposed Controls:** To increase or decrease the speed of downward travel on the ram plate, adjust the director valve (BC).

9. Set the director valve to DOWN, and continue to lower the ram until the ram plate contacts the fluid.
10. Set seal air pressure regulator to pressure determined in **Setting Inflatable Seal Pressure**, page 14. Set the inflatable seal switch to On to inflate seal.

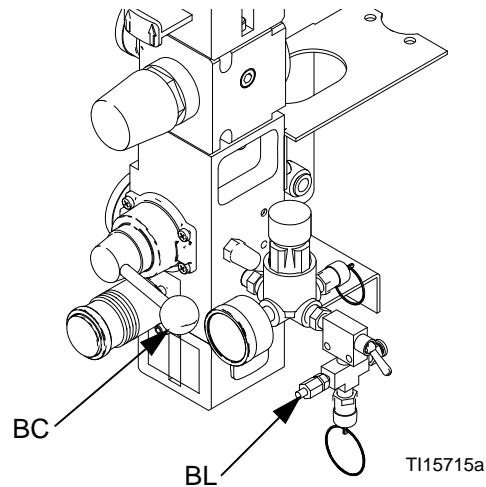
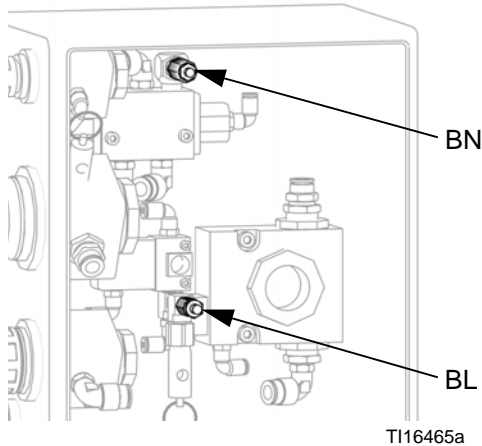
**NOTE:** If fluid leaks past the seal, increase the air pressure to the seal gradually until leaking stops. To prevent overpressurization, a relief valve limits seal pressure to 30 psi (2.1 bar, 0.21 MPa).

## Starting and Adjusting the Pump



See FIG. 3, page 12.

1. Be sure the pump air regulator (BE) is closed. Set the ram air regulator (BB) to about 3.5 bar, 0.35 MPa (50 psi). Set the director valve (BC) to DOWN.
2. Start the pump as explained in the separate pump instruction manual.
3. Keep the director valve (BC) set to DOWN while the pump is operating.



**FIG. 4. Seal Bleed Valve and Muffler with Valve**

### NOTES ON ADJUSTING PRESSURE:

Different combinations of seal and ram pressure may be necessary for proper seal and pump operation.

- If the pump does not prime properly with heavier fluids, increase air pressure to the ram.
- If fluid is forced out around the inflatable seal, decrease pressure to the ram.
- For diaphragm pump models, adjust DOWN pressure to the minimum level, to ensure that the pump inlet balls seat properly.

**NOTE:** If seal pressure builds when the seal enters a tapered portion of the drum, the relieve valve will activate. Turn the seal bleed-off valve (BL) counterclockwise to open it.



## Changing Drums



Moving parts can pinch, cut, or amputate fingers and other body parts. Keep your hands and fingers away from the priming piston, ram plate, and lip of drum during operation and whenever the pump or ram is charged with air.

1. Stop the pump. Close the air motor valve (BF).
2. Set the inflatable seal valve (BJ) to deflate.
3. Set the director valve (BC) to UP to raise the ram plate.
4. Raise the ram plate until it is completely out of drum.
5. If needed, use air assist (BG) to help lift the ram plate.



Excessive air pressure in the material drum could cause the drum to rupture, causing serious injury and equipment damage. The platen must be free to move out of the drum.

- Never use drum blowoff air assist with a damaged drum.
- Always deflate the seal prior to lifting ram plate or engaging air assist.

6. Remove the empty drum.
7. Inspect the ram plate and, if necessary, remove any remaining material or buildup.
8. Place a full drum on ram base.
9. Lower the ram, and adjust the position of the drum relative to the ram plate, as explained under **Setting Inflatable Seal Pressure** on page 14.

## Shutdown

1. Set the director valve (BC) to neutral.
2. Follow **Pressure Relief Procedure**, page 14.
3. Follow the pump shutdown instructions in your separate pump manual.

## Cleaning Procedure



**NOTE:** The following instructions are a basic procedure for cleaning a sanitary ram.

- **Be sure** to follow your national and state sanitary standard codes and local regulations.
  - Use appropriate cleaning and disinfecting agents, at intervals appropriate for product processed.
  - Follow cleaning product manufacturer's instructions.
1. Remove the pump from the fluid container. Operate it to pump out as much fluid as possible.
  2. Flush the system thoroughly with an appropriate cleaning solution.
  3. Set the inflatable seal valve (BJ) to deflate.
  4. Set the director valve (BC) to UP to raise the ram plate.
  5. If needed, use air assist (BG) to help lift the ram plate.
  6. Raise the ram plate until it is completely out of the drum. Remove the empty drum.
  7. Disconnect inflatable seal supply air.

8. Pull the inflatable seal down to remove. Clean and sanitize the seal.

**NOTE:** Discoloration of the inflatable seal is normal. Replace the inflatable seal if the surface is compromised due to excessive wear, tears, cuts, or gouges.

9. Set the director valve to DOWN. Lower the ram plate.
10. Follow the **Pressure Relief Procedure**, page 14.
11. Disconnect all remaining air and fluid hoses, and remove air inlet and exhaust fittings.
12. Remove and clean the pump.

**NOTE:** The pump **must be disassembled** to thoroughly clean it. See your separate pump manual for complete flushing and cleaning procedures for a sanitary pump. Any damaged rubber parts **must** be replaced as they could harbor microorganisms that can contaminate the fluid.

13. Remove, clean, and sanitize the clamps (12, 13), ram plate (5) and seal (8).
14. Remove the air motor cover. Open the control box door. Wipe out any residual cleaning fluid or moisture.
15. Clean external surfaces of all parts before reassembly.

# Troubleshooting



1. Follow **Pressure Relief Procedure**, page 14.
2. Check all possible remedies in the Troubleshooting Chart before disassembling the pump.

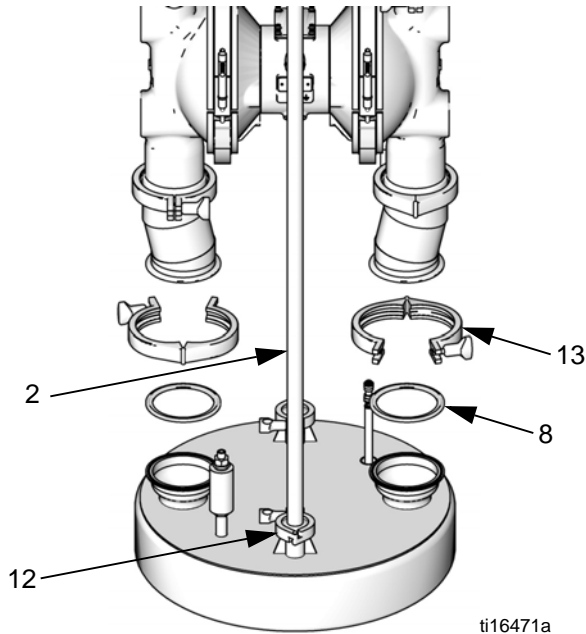
| Problem  | Cause                                  | Solution   |
|--|--|--|
| Ram will not raise or lower.   | Closed air valve or clogged air line.  | Open, clear.   |
|  | Not enough ram air pressure.           | Increase.  |
|  | Worn or damaged piston.                | Replace.   |
|  | Hand valve closed or clogged.          | Open, clear.   |
| Ram raises and lowers too fast.  | Air pressure is too high.              | Decrease.  |
|  | Travel rate is not properly adjusted.  | Exposed Air Controls - open the director valve less for slower travel, more for faster travel.<br>Enclosed Air Controls - open the needle valve on the muffler more for slower downward travel, less for faster downward travel. |
| Air leaks around cylinder rod.   | Worn rod seal.                         | Replace.   |
| Fluid squeezes past ram plate wipers.  | Ram air pressure too high.             | Decrease ram pressure.   |
|  | Worn or damaged wipers.                | Replace.   |
|  | Inflatable seal pressure too low.      | Increase seal pressure   |
| Pump will not prime properly or pumps air.                                       | Closed air valve or clogged air line.  | Open, clear.   |
|  | Not enough air pressure.               | Increase.  |
|  | Worn or damaged piston.                | Replace. See pump manual.  |
|  | Hand valve closed or clogged.          | Open, clear.   |
|  | Hand valve is dirty, worn, or damaged. | Clean, service.  |
| Air assist valve will not hold drum down or push plate up.                       | Closed air valve or clogged air line.  | Open, clear.   |
|  | Not enough air pressure.               | Increase.  |
|  | Valve passage clogged.                 | Clean.   |
| Seal pressure builds when drum tapers, activating the automatic pressure relief. | Seal bleed-off valve (BL) is closed    | Open. See <b>Integrated Air Controls</b> , page 13.  |

# Repair



## Disconnect Diaphragm Pump

1. Follow **Pressure Relief Procedure**, page 14.
2. Disconnect inflatable seal supply air and air assist supply air.
3. Remove two clamps (13) holding the pump to the ram plate. Remove gaskets (8).
4. Lift pump carefully up and away from ram plate.
5. Remove two clamps (12) holding the tie rods (2) to the ram plate. Remove gaskets (7).
6. Open main air valve (BA). Set the director valve (BC) to UP to raise the ram. Set the director valve to neutral. Close main air valve (BA).
7. Pull the inflatable seal down to remove.



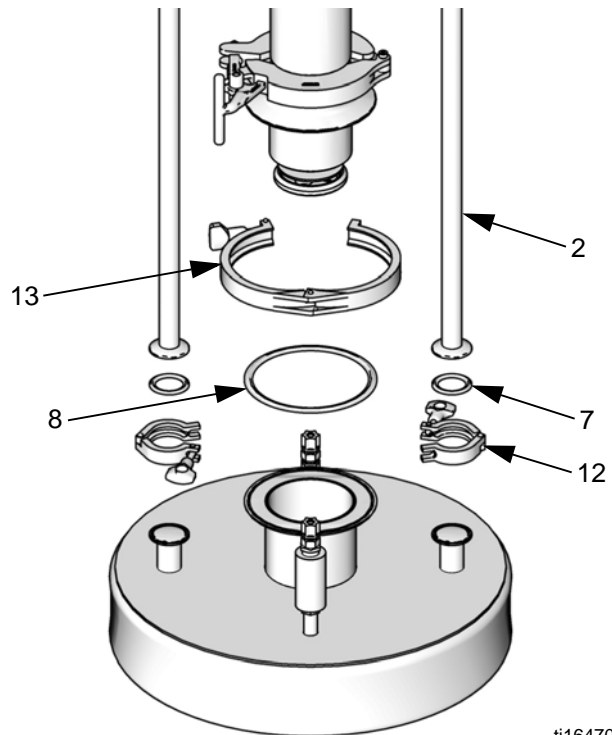
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**FIG. 5. Disconnect Diaphragm Pump**

**NOTE:** See your diaphragm pump manual for cleaning, repair, and parts information.

## Disconnect Piston Pump

1. Follow **Pressure Relief Procedure**, page 14.
2. Disconnect inflatable seal supply air and air assist supply air.
3. Remove two clamps (12) holding the tie rods (2) to the ram plate. Remove gaskets (7).
4. Remove nut (4) and washer (3) holding the air motor connecting rod (10) to the tie beam (114).
5. Open main air valve (BA). Set the director valve (BC) to UP to raise the ram. Set the director valve to neutral. Close main air valve (BA).
6. To remove the pump from the ram plate, remove clamp (13) and gasket (8). Carefully lift the pump up and away from the plate, using two people if needed.



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**FIG. 6. Remove piston pump**

**NOTE:** See your piston pump manual and air motor manual for cleaning, repair, and parts information.



9. Carefully lay piston (107) and rod (102) down so rod will not be bent. Remove nut (108), washer (109), and piston (107). Remove outer o-ring (105) and inner o-ring (110).
10. Inspect parts for wear or damage. Replace as necessary.

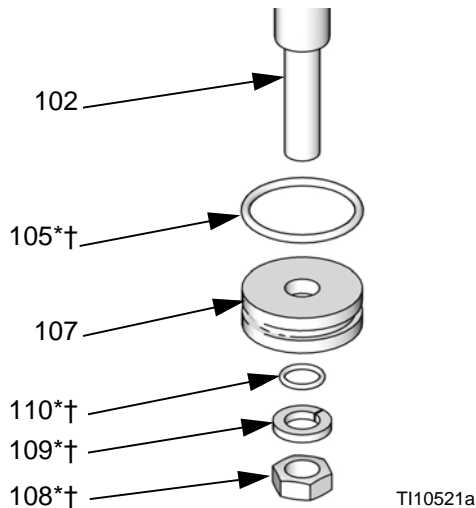


FIG. 8. Ram Piston.

### Reassemble Piston and Seal

1. Install new o-rings (105 and 110) and lubricate piston (107) and o-rings.
2. Apply medium strength thread sealant. Install piston (107), washer (109), and nut (108) on piston rod (102).
3. Carefully insert piston into cylinder and push piston rod straight down into cylinder.
4. Lubricate o-ring (106) and bearing (111). Install o-ring (106), bearing (111), and retaining ring (112) into piston seal housing (103).
5. Install new o-ring (105) on piston seal housing (103).
6. **Carbon Steel Rams:** Install new pin (113) if necessary, or be sure it is in place.
7. Lubricate o-ring (105) and piston seal housing (103).
8. Slide spring (104) and piston seal housing (103) on the rod (102). **Carbon Steel Rams:** orient the pin to the slot in the cylinder. **Stainless Steel Rams:** be

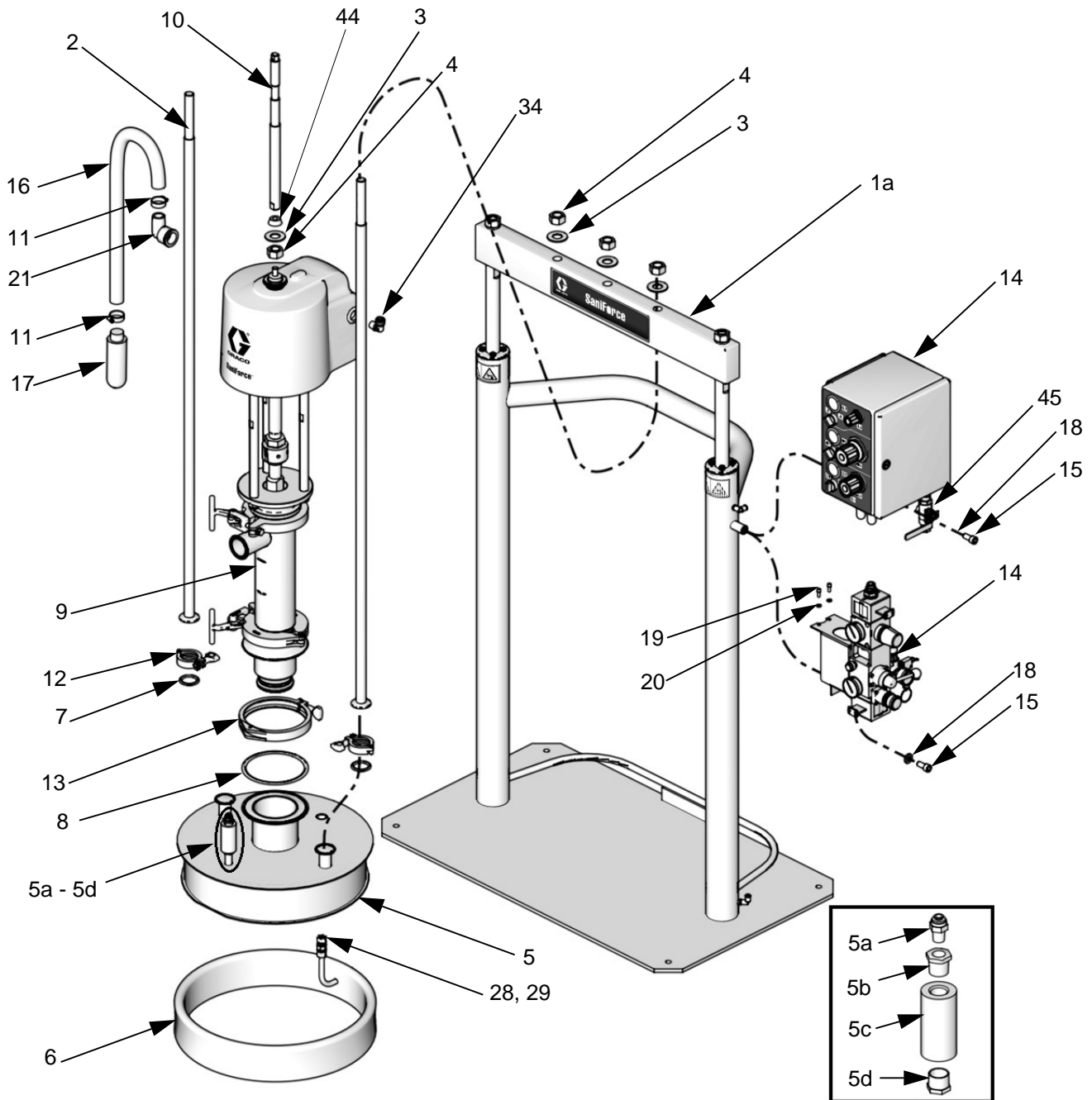
careful not to push the piston seal housing down into cylinder.

9. Install retaining ring (115).
10. **Stainless Steel Rams:** Lubricate and install inner o-ring (122) into piston cap (120). Install outer o-ring (121) onto piston cap. Then install piston cap (120) onto the cylinder with screws (124) and washers (123).
11. Reattach the tie bar (114), washers (116, 3), and nuts (117, 4).



# Parts

## Piston Pump Ram Packages



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**Table 1. Common Parts, All Piston Pump Ram Packages (5:1, 6:1, and 12:1)**

| Ref. | Part             | Description  | Qty |
|------|------------------|--|-----|
| 1    | See Table 2      | RAM, kit, includes Parts 1a, 14, 15, and 18; see pages 30-33                     | 1   |
| 1a   | -----            | FRAME, ram, assembly, includes piston assembly                                   | 1   |
| 2    | 16G477           | TIE ROD  | 2   |
| 3    | 512743           | WASHER, flat 18-8 sst 7/8 in.  | 4   |
| 4    | 510221           | NUT, hex st sst 7/8-9  | 4   |
| 5    | 16G240           | PLATE, sanitary ram<br>Standard design, used on most models                      | 1   |
|      | 16K938           | Conical design, used on model 24P811, 24Y493, and 24U568                         |     |
|      | 17B191           | Conical design, used on model 24V839   |     |
| 5a   | 25M452           | FITTING 1/4 in. PTC  | 1   |
| 5b   | 114475           | BUSHING, pipe  | 1   |
| 5c   | 512491           | VALVE, check   | 1   |
| 5d   | 504285           | BUSHING, pipe SST  | 1   |
| 6    | 16G242           | SEAL, inflatable, 18.0 id; includes Refs. 28 and 29.                             | 1   |
| 7    | 16D169           | GASKET, sanitary 1.5   | 2   |
| 8    | 16D246           | GASKET, 6" sanitary  | 1   |
| 9    | See Table 2      | PUMP   | 1   |
| 10   | See Table 2      | ROD, air motor connecting  | 1   |
| 11   | 101818           | CLAMP, exhaust hose; see page 33   | 2   |
| 12   | 118598           | CLAMP, sanitary, 1.5 in  | 2   |
| 13   | 16D245           | CLAMP, 6" sanitary   | 1   |
| 14   | 16G393<br>16G396 | CONTROLS, air; see page 35<br>Enclosed, stainless steel<br>Exposed, carbon steel | 1   |
| 15   | -----            | SCREW, shdc,ss,.500x1.00   | 1   |
| 16   | -----            | HOSE, exhaust; see page 33   | 1   |
| 17   | 512914           | MUFFLER, polyethylene, see page 33   | 1   |
| 18   | -----            | WASHER, back-up piston sst   | 1   |
| 19   | 101682           | SCREW, cap, sch  | 2   |
| 20   | 100016           | WASHER, lock   | 2   |
| 21   | 16A942           | FITTING, exhaust hose  | 1   |
| 23   | 16G391           | HOSE, drain, 2 ft, includes Part 24, shipped loose, not shown                    | 1   |
| 24   | -----            | CLAMP, hose, included with Part 23, not shown                                    | 1   |
| 28   | -----            | FITTING, 1/4 ptc to 1/4 ptc, FDA, included with Ref. 6; see page 33              | 1   |
| 29   | -----            | FITTING, 1/4 pcm to 1/4 barb, FDA, included with Ref. 6; see page 33             | 1   |
| 34   | -----            | FITTING, 1/2 npt x 1/2 ptc, FDA; see page 33                                     | 1   |

| Ref. | Part             | Description  | Qty |
|------|------------------|--|-----|
| 36   | 120306<br>103347 | VALVE, safety; shown on page 34<br>80 psi, Models with 5:1 pumps<br>100 psi, Models with 6:1 or 12:1 pumps | 1   |
| 44   | 16V033           | SPACER, sleeve; used on model 24P811 and 24U568  | 1   |
| 45   | 16Y861           | VALVE, ball, vented  | 1   |
| 125▲ | 15J074           | LABEL, warning, ram, not shown   | 1   |
| 126▲ | 280574           | LABEL, warning, pump, not shown  | 1   |

----- Not available separately.

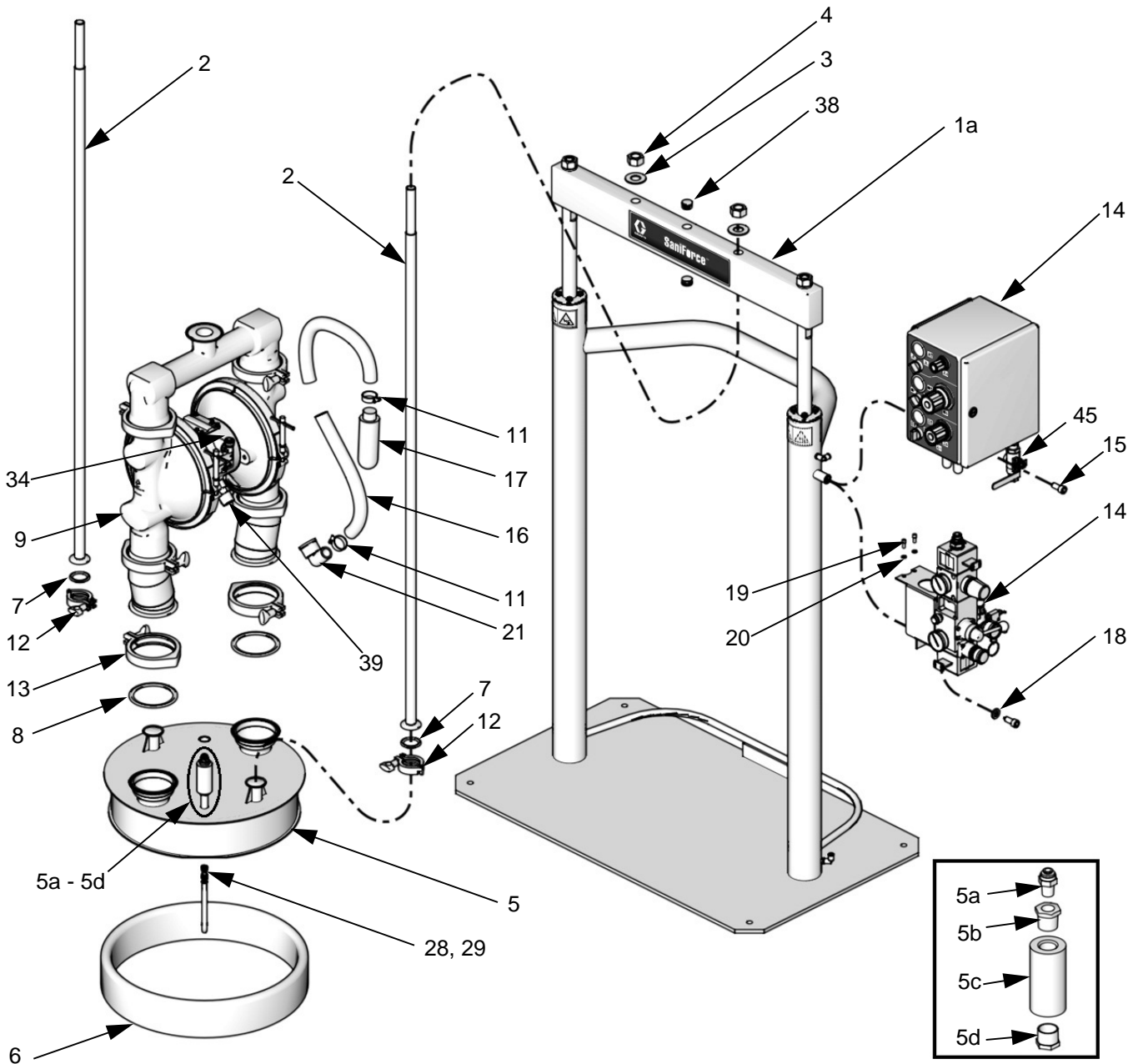
▲ Replacement Danger and Warning labels, tags, and cards are available at no cost.

**Table 2. Parts that Vary by Model**

| Model  | Ram Kit (1) | Pump (9)* | Rod (10) | Sleeve (44) |
|--------|-------------|-----------|----------|-------------|
| 24D708 | 24G861      | 24G741    | 16E169   |             |
| 24D712 | 24G860      | 24G741    | 16E169   |             |
| 24D714 | 24G859      | 24G741    | 16E169   |             |
| 24D720 | 24G861      | 24G742    | 16C303   |             |
| 24D724 | 24G860      | 24G742    | 16C303   |             |
| 24D726 | 24G859      | 24G742    | 16C303   |             |
| 24V839 | 24G859      | 24G741    | 16E169   |             |
| 24D776 | 24G861      | 24G739    | 16E168   |             |
| 24D780 | 24G860      | 24G739    | 16E168   |             |
| 24D782 | 24G859      | 24G739    | 16E168   |             |
| 24D788 | 24G861      | 24G740    | 16E169   |             |
| 24D792 | 24G860      | 24G740    | 16E169   |             |
| 24D794 | 24G859      | 24G740    | 16E169   |             |
| 24D647 | 24G861      | 24F625    | 16C303   |             |
| 24D651 | 24G860      | 24F625    | 16C303   |             |
| 24D653 | 24G859      | 24F625    | 16C303   |             |
| 24F188 | 24G861      | 24F626    | 16C303   |             |
| 24F189 | 24G860      | 24F626    | 16C303   |             |
| 24F190 | 24G859      | 24F626    | 16C303   |             |
| 24P811 | 24G861      | 24F625    | 16C303   | 16V033      |
| 24U568 | 24G861      | 24F626    | 16C303   | 16V033      |
| 24Y493 | 24G861      | 24D658    | 16C303   |             |

\* See your pump manual for parts information.

# Diaphragm Pump Ram Packages



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**Table 1. Common Parts, All Diaphragm Pump Ram Packages (2150 and 3150)**

| Ref. | Part             | Description  | Qty |
|------|------------------|--|-----|
| 1    | See Table 2      | RAM, kit, includes Parts 1a, 14, 15, and 18; see pages 30-33                     | 1   |
| 1a   | -----            | FRAME, ram, assembly, includes piston assembly                                   | 1   |
| 2    | 16G477           | TIE ROD  | 2   |
| 3    | 512743           | WASHER, flat 18-8 sst 7/8 in.  | 2   |
| 4    | 510221           | NUT, hex st sst 7/8-9  | 2   |
| 5    | 16G241           | PLATE, ram   | 1   |
| 5a   | 25M452           | FITTING 1/4 in. PTC  | 1   |
| 5b   | 114475           | BUSHING, pipe  | 1   |
| 5c   | 512491           | VALVE, check   | 1   |
| 5d   | 504285           | BUSHING, pipe SST  | 1   |
| 6    | 16G242           | SEAL, inflatable, FDA, neoprene, 18 in. (46 cm)                                  | 1   |
| 7    | 16D169           | GASKET, sanitary 1.5 in.   | 2   |
| 8    | 15D346           | GASKET, sanitary   | 2   |
| 9    | See Table 2      | PUMP   | 1   |
| 11   | 101818           | CLAMP, exhaust hose; see page 33   | 2   |
| 12   | 118598           | CLAMP, 1.5 in  | 2   |
| 13   | 510490           | CLAMP, 4 in.   | 2   |
| 14   | 16G393<br>16G396 | CONTROLS, air; see page 35<br>Enclosed, stainless steel<br>Exposed, carbon steel | 1   |
| 15   | -----            | SCREW, 1/2-13 unc, sst   | 1   |
| 16   | -----            | HOSE, exhaust; see page 33   | 1   |
| 17   | 512914           | MUFFLER, polyethylene, see page 33   | 1   |
| 18   | -----            | WASHER, sst  | 1   |
| 19   | 101682           | SCREW, cap, 1/4-20, carbon steel   | 2   |
| 20   | 100016           | WASHER, lock   | 2   |
| 21   | 16A942           | FITTING, exhaust hose  | 1   |
| 28   | -----            | FITTING, 1/4 ptc to 1/4 ptc, FDA; see page 33                                    | 1   |
| 29   | -----            | FITTING, 1/4 ptc to 1/4 barb, FDA; see page 33                                   | 1   |
| 34   | -----            | FITTING, 1/2 npt x 1/2 ptc, FDA; see page 33                                     | 1   |
| 36   | 114003           | VALVE, safety, 130 psi, shown on page 34   | 1   |
| 38   | 16D049           | PLUG, Models 24D651 and 24F189 only  | 2   |
| 39   | 16C946           | FITTING, air   | 1   |
| 45   | 16Y861           | VALVE, ball, vented  | 1   |
| 125▲ | 15J074           | LABEL, warning, ram, not shown   | 1   |
| 127▲ | 188621           | LABEL, warning, pump, not shown  | 1   |
| 128▲ | 198382           | LABEL, warning, pump, not shown  | 1   |

----- Not available separately.

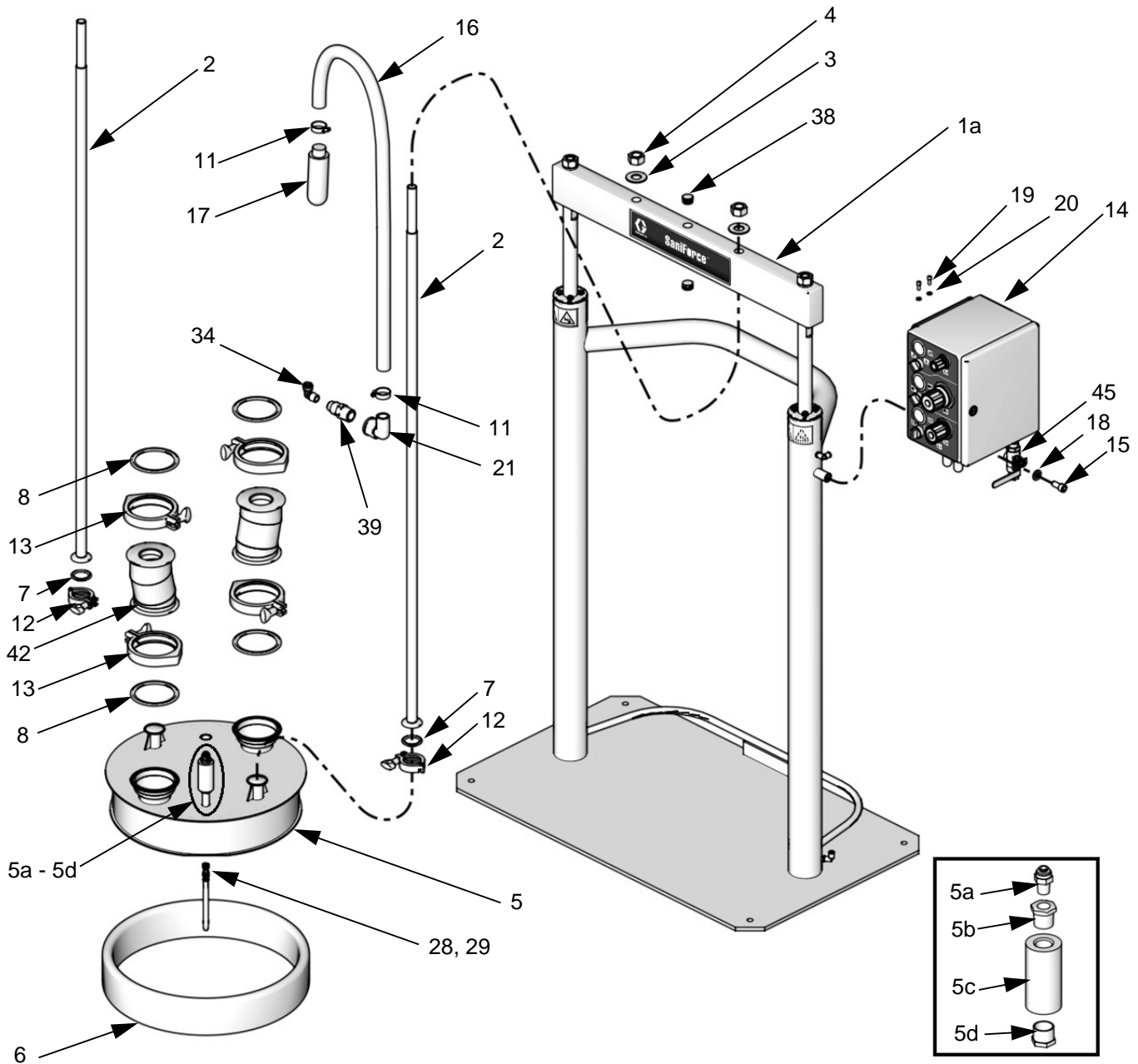
▲ Replacement Danger and Warning labels, tags, and cards are available at no cost.

**Table 2. Parts that Vary by Model**

| Model  | Ram Kit (1) | Pump (9)* |
|--------|-------------|-----------|
| 24G542 | 24G861      | 24G743    |
| 24F191 | 24G860      | 24G743    |
| 24G543 | 24G859      | 24G743    |
| 24F192 | 24G861      | 24G744    |
| 24F193 | 24G860      | 24G744    |
| 24F194 | 24G859      | 24G744    |
| 24D922 | 24G861      | 24C124    |
| 24D926 | 24G860      | 24C124    |
| 24D928 | 24G859      | 24C124    |
| 24D932 | 24G860      | 24J388    |
| 24D936 | 24G859      | 24J388    |
| 24D940 | 24G861      | 24J388    |
| 24D944 | 24G861      | 248274    |
| 24D948 | 24G860      | 248274    |
| 24D952 | 24G859      | 248274    |
| 24J364 | 24G861      | 24J389    |
| 24J365 | 24G860      | 24J389    |
| 24J366 | 24G859      | 24J389    |
| 24Y512 | 24G859      | None      |

\* See your pump manual for parts information.

### Model 24Y512 (No Pump)



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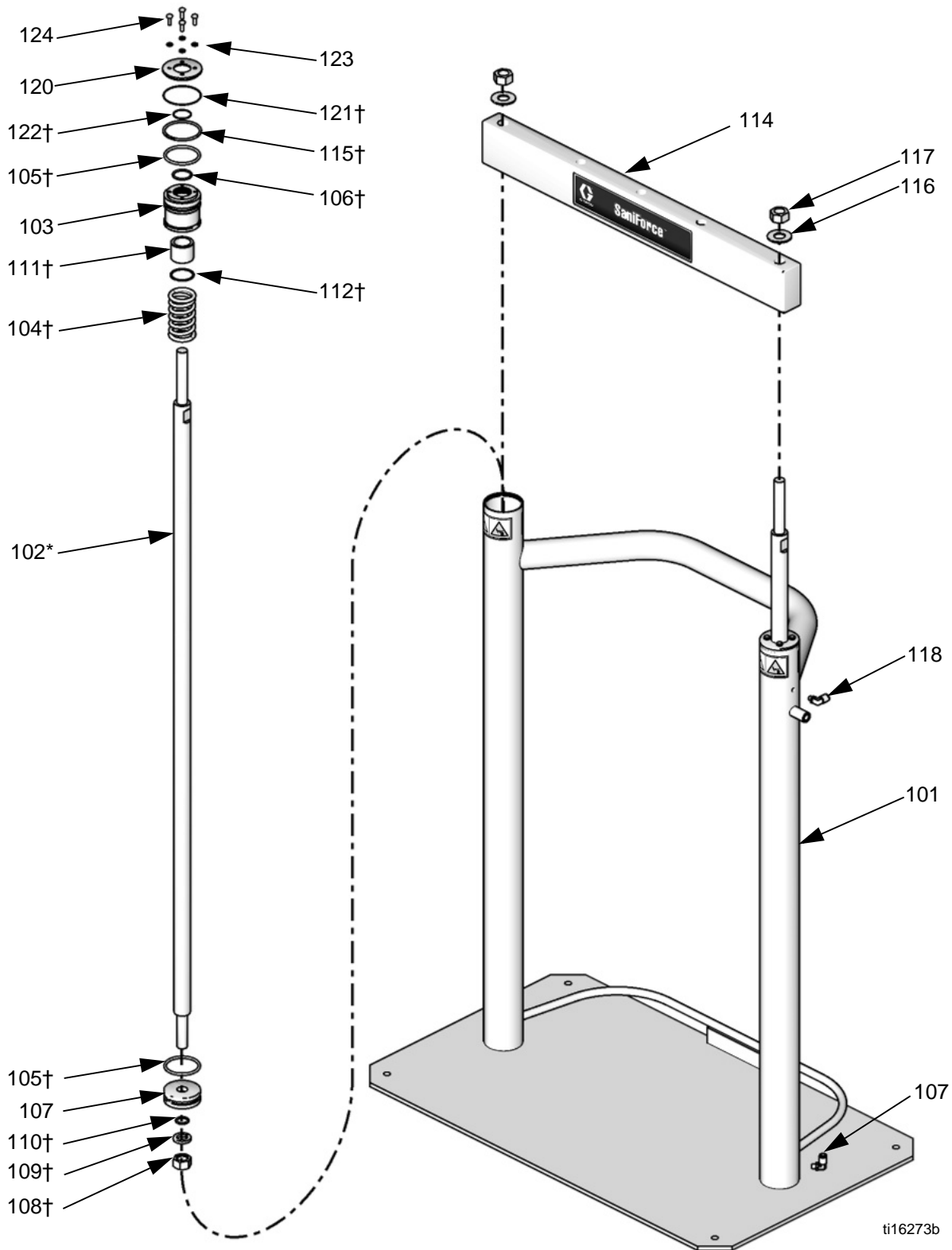
| Ref. | Part   | Description  | Qty |
|------|--------|--|-----|
| 1    | 24G859 | RAM, kit, includes Parts 1a, 14, 15, and 18; see pages 30-33 | 1   |
| 1a   | -----  | FRAME, ram, assembly, includes piston assembly               | 1   |
| 2    | 16G477 | TIE ROD  | 2   |
| 3    | 512743 | WASHER, flat 18-8 sst 7/8 in.                                | 2   |
| 4    | 510221 | NUT, hex st sst 7/8-9  | 2   |
| 5    | 16G241 | PLATE, ram   | 1   |
| 5a   | 25M452 | FITTING 1/4 in. PTC  | 1   |
| 5b   | 114475 | BUSHING, pipe  | 1   |
| 5c   | 512491 | VALVE, check   | 1   |
| 5d   | 504285 | BUSHING, pipe SST  | 1   |
| 6    | 16G242 | SEAL, inflatable, FDA, neoprene, 18 in. (46 cm)              | 1   |
| 7    | 16D169 | GASKET, sanitary 1.5 in.                                     | 2   |
| 8    | 15D346 | GASKET, sanitary   | 4   |
| 11   | 101818 | CLAMP, exhaust hose; see page 33                             | 2   |
| 12   | 118598 | CLAMP, 1.5 in  | 2   |
| 13   | 510490 | CLAMP, 4 in.   | 4   |
| 14   | 16G393 | CONTROLS, air; Enclosed, stainless steel; see page 35        | 1   |
| 15   | -----  | SCREW, 1/2-13 unc, sst                                       | 1   |
| 16   | -----  | HOSE, exhaust; see page 33                                   | 1   |
| 17   | 512914 | MUFFLER, polyethylene, see page 33                           | 1   |
| 18   | -----  | WASHER, sst  | 1   |
| 19   | 102023 | SCREW, cap, 1/4-20, stainless steel                          | 2   |
| 20   | 104123 | WASHER, lock   | 2   |
| 21   | 16A942 | FITTING, exhaust hose  | 1   |
| 28   | -----  | FITTING, 1/4 ptc to 1/4 ptc, FDA; see page 33                | 1   |
| 29   | -----  | FITTING, 1/4 ptc to 1/4 barb, FDA; see page 33               | 1   |
| 34   | -----  | FITTING, 1/2 npt x 1/2 ptc, FDA; see page 33                 |     |
| 36   | 114003 | VALVE, safety, 130 psi, shown on page 34                     | 1   |
| 38   | 16D049 | PLUG   | 2   |
| 39   | 16C946 | FITTING, air   | 1   |
| 42   | -----  | ADAPTER, 2150 to 3150  | 2   |
| 45   | 16Y861 | VALVE, ball, vented  | 1   |
| 125▲ | 15J074 | LABEL, warning, ram, not shown                               | 1   |

----- Not available separately.

▲ Replacement Danger and Warning labels, tags, and cards are available at no cost.

## Ram Kits

### Kits 24G859 and 24G861, Stainless Steel Frame



ti16273b

## Kits 24G859 and 24G861, Stainless Steel Frame

Each side contains the following parts.

| Ref. | Part             | Description  | Qty. |
|------|------------------|--|------|
| 14   | 16G393<br>16G396 | CONTROLS, air; see page 35<br>Enclosed, stainless steel<br>Exposed, carbon steel | 1    |
| 15   | -----            | SCREW, 1/2-13 unc, sst   | 1    |
| 18   | -----            | WASHER, sst  | 1    |
| 101  | -----            | RAM, frame   | 1    |
| 102* | 16G478           | ROD, piston, nickel-plated   | 2    |
| 103  | 16E383           | BEARING  | 1    |
| 104† | 160138           | SPRING, compression  | 1    |
| 105† | 160258           | O-RING   | 2    |
| 106† | 156698           | O-RING   | 1    |
| 107  | 16E384           | PISTON   | 1    |
| 108† | 101535           | NUT  | 1    |
| 109† | 101533           | WASHER   | 1    |
| 110† | 156401           | O-RING   | 1    |
| 111† | -----            | BEARING  | 1    |
| 112† | 15F453           | RING, retaining  | 1    |
| 114  | 16G480           | BAR, tie   | 1    |
| 115† | -----            | RING, retaining, 3.06 dia  | 2    |
| 116  | 512743           | WASHER, flat 18-8 sst 7/8 in.  | 2    |
| 117  | 510221           | NUT, hex st sst 7/8-9  | 2    |
| 118  | 24G857           | FITTING, 1/8 npt to 3/8 ptc  | 2    |
| 120  | 16E648           | CAP, piston  | 2    |
| 121† | -----            | O-RING   | 2    |
| 122† | 111098           | PACKING, o-ring, cylinder  | 2    |
| 123  | 104123           | WASHER, lock, spring   | 8    |
| 124  | 102023           | SCREW, cap, hex hd   | 8    |
| 125▲ | 15J074           | LABEL, warning, not shown  | 1    |

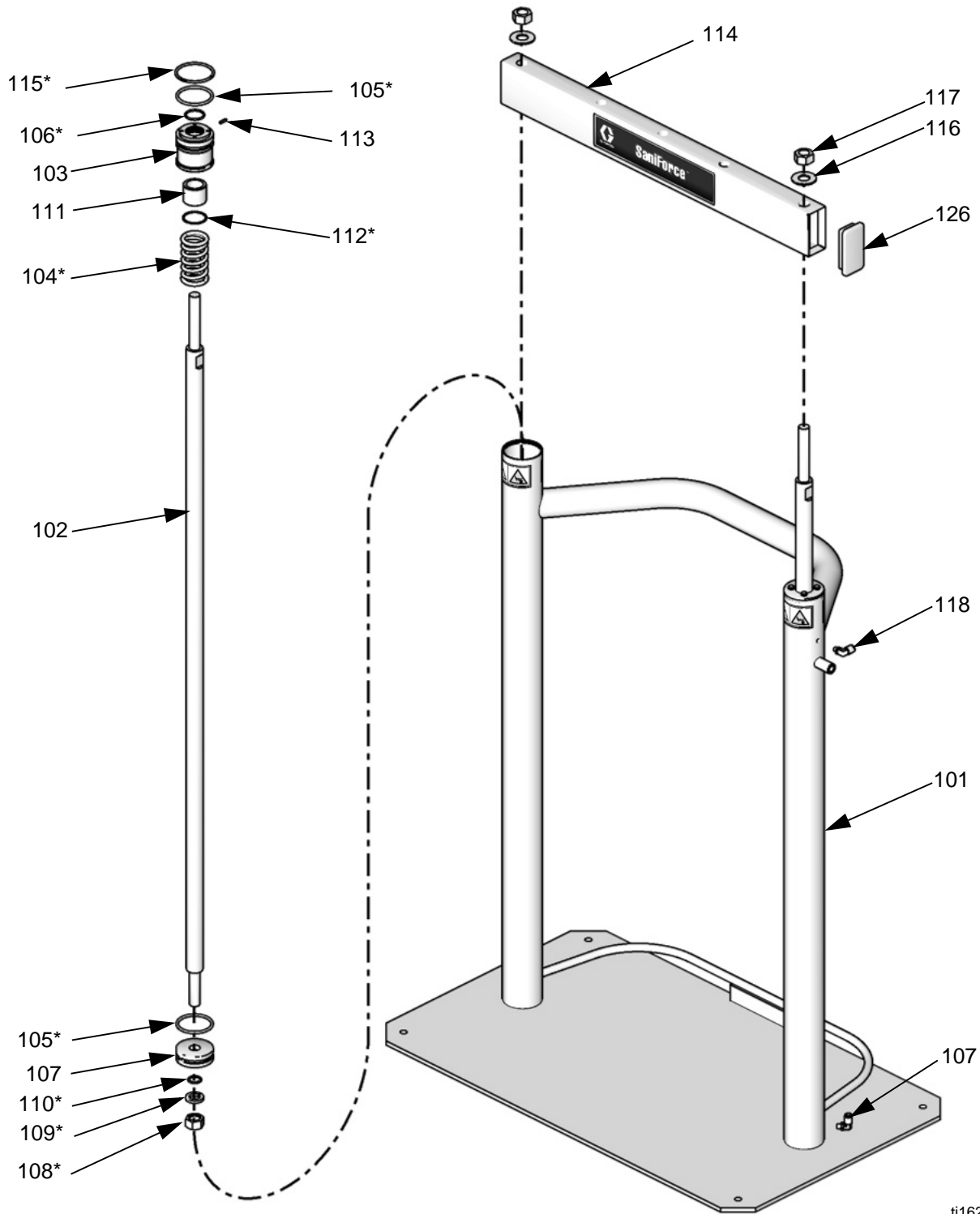
----- Not available separately.

▲ Replacement Danger and Warning labels, tags, and cards are available at no cost.

† Parts included in stainless steel Piston Repair Kit 24G853 (2 kits required to repair both sides).

\* 316 stainless steel Ram Piston Rod Kit 24W822 is available.

### Ram Kit 24G860, Carbon Steel Frame



ti16273c



## Ram Kit 24G860, Carbon Steel Frame

Each side contains the following parts.

| Ref. | Part             | Description  | Qty. |
|------|------------------|--|------|
| 14   | 16G393<br>16G396 | CONTROLS, air; see page 35<br>Enclosed, stainless steel<br>Exposed, carbon steel | 1    |
| 15   | -----            | SCREW, 1/2-13 unc, sst   | 1    |
| 18   | -----            | WASHER, sst  | 1    |
| 101  | -----            | RAM, frame   | 1    |
| 102  | 16G478           | ROD, piston  | 2    |
| 103  | 15M295           | BEARING  | 1    |
| 104* | 160138           | SPRING, compression  | 1    |
| 105* | 160258           | O-RING   | 2    |
| 106* | 156698           | O-RING   | 1    |
| 107  | 183943           | PISTON   | 1    |
| 108* | 101535           | NUT  | 1    |
| 109* | 101533           | WASHER   | 1    |
| 110* | 156401           | O-RING   | 1    |
| 111* | -----            | BEARING  | 1    |
| 112* | 15F453           | RING, retaining  | 1    |
| 113  | 15U979           | PIN, spring  | 1    |
| 114  | 16G479           | BAR, tie   | 1    |
| 115* | -----            | RING, retaining, 3.06 dia  | 2    |
| 116  | 512743           | WASHER, flat 18-8 sst 7/8 in.  | 2    |
| 117  | 510221           | NUT, hex st sst 7/8-9  | 2    |
| 119  | 24G856           | FITTING, Connector tube  | 2    |
| 125▲ | 15J074           | LABEL, warning   | 4    |
| 126  | 189559           | CAP, end   | 2    |

----- Not available separately.

▲ Replacement Danger and Warning labels, tags, and cards are available at no cost.

\* Parts included in carbon steel Piston Repair Kit 24G854 (2 kits required to repair both sides).

## Muffler Kit 16G390

| Ref. | Part   | Description           | Qty. |
|------|--------|-----------------------|------|
| 17   | 512914 | MUFFLER, polyethylene | 2    |

## Exhaust Assembly Kit 16G389

| Ref. | Part   | Description           | Qty. |
|------|--------|-----------------------|------|
| 17   | 512914 | MUFFLER, polyethylene | 1    |
| 16   | -----  | HOSE, exhaust, 6 ft.  | 1    |
| 11   | 101818 | CLAMP, hose           | 2    |

## PTC Fittings Kit 16G392

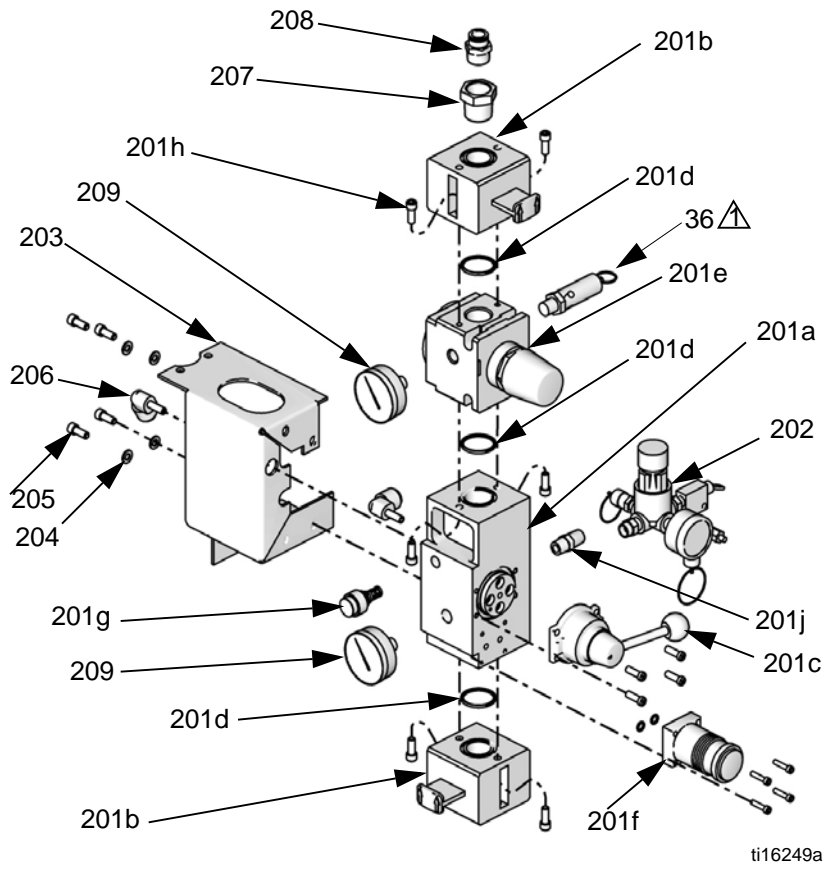
| Ref. | Description                       | Qty. |
|------|-----------------------------------|------|
| 28   | FITTING, 1/4 ptc to 1/4 ptc, FDA  | 1    |
| 29   | FITTING, 1/4 ptc to 1/4 barb, FDA | 1    |
| 34   | FITTING, 1/2 npt x 1/2 ptc, FDA   | 1    |

## Conversion Kit 24H370

Order this kit to convert a ram with a 12:1 piston pump to a ram with a 3150 diaphragm pump.


| Ref. | Description                                     | Qty. |
|------|---|------|
| 5    | PLATE, ram                                      | 1    |
| 6    | SEAL, inflatable, FDA, neoprene, 18 in. (46 cm) | 1    |
| 8    | GASKET, sanitary                                | 1    |
| 9    | PUMP, 3150, Model 24C124                        | 1    |
| 13   | CLAMP, 4 in.                                    | 2    |
| 21   | FITTING, exhaust hose                           | 1    |
| 28   | FITTING, 1/4 ptc to 1/4 ptc, FDA                | 1    |
| 29   | FITTING, 1/4 ptc to 1/4 barb, FDA               | 1    |
| 34   | FITTING, 1/2 npt x 1/2 ptc, FDA                 | 1    |
| 39   | FITTING, air                                    | 1    |
| 40   | CONNECTOR, union, 1/2 to 1/2 PTC                | 1    |

# Air Controls Kits



## Kit 16G396 Air Controls Carbon Steel, Exposed

| Ref. | Part   | Description                      | Qty |
|------|--------|----------------------------------|-----|
| 201  | -----  | CONTROL, air, includes 201a-201m | 1   |
| 201a | -----  | MANIFOLD                         | 1   |
| 201b | 121108 | VALVE, shutoff                   | 2   |
| 201c | 121107 | VALVE, control                   | 1   |
| 201d | 121110 | O-RING                           | 3   |
| 201e | -----  | REGULATOR                        | 1   |
| 201f | 121106 | REGULATOR                        | 1   |
| 201g | 121109 | VALVE, blow-off                  | 1   |
| 201h | 121112 | SCREW, cap                       | 6   |
| 201j | 517449 | MUFFLER, 1/4 npt                 | 1   |
| 201k | 100721 | PLUG, pipe                       | 1   |
| 201m | 120602 | FITTING, cartridge, not shown    | 3   |
| 202  | 16E534 | CONTROL, air assist option       | 1   |
| 203  | -----  | BRACKET, air control             | 1   |
| 204  | 100016 | WASHER, lock                     | 4   |
| 205  | 101682 | SCREW, cap, sch                  | 4   |
| 206  | 16A943 | ELBOW, plug-in                   | 2   |
| 207  | 100896 | BUSHING, pipe                    | 1   |
| 208  | 114111 | CONNECTOR, male                  | 1   |
| 209  | C36260 | GAUGE, pressure, air             | 2   |

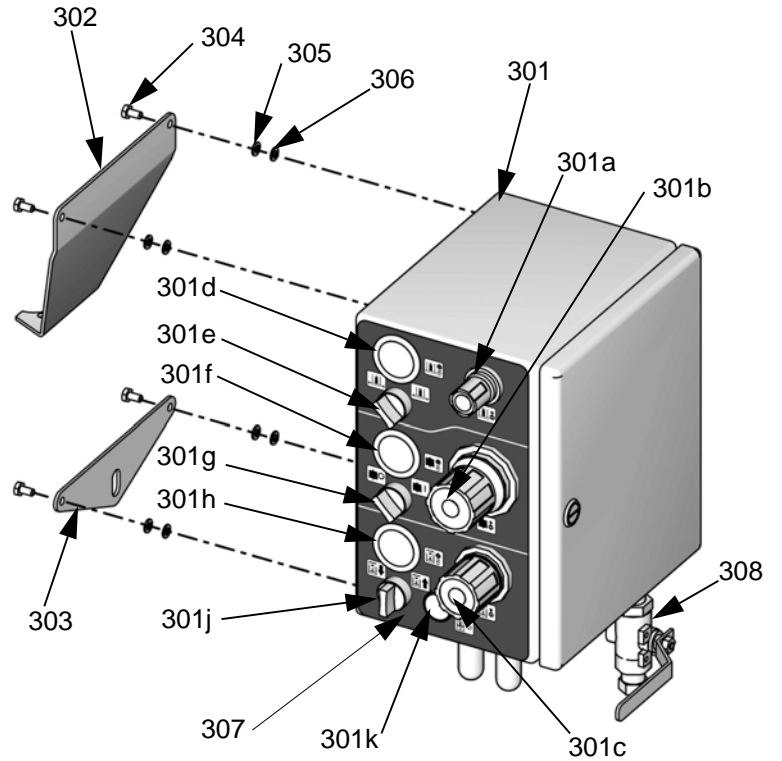
 The safety valve is part of the ram package. See Table 1 on page 25 (piston pump packages) or page 27 (diaphragm pump packages).

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**Kit 16G393 Air Controls**  
**Stainless Steel, Enclosed**

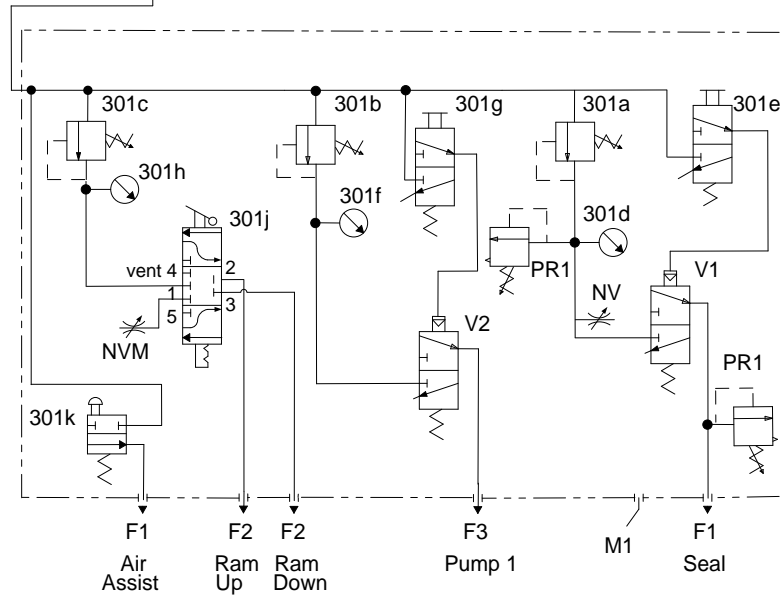
| Ref. | Part   | Description                               | Qty. |
|------|--------|---|------|
| 301  | -----  | CONTROL, air; includes 301a-301k          | 1    |
| 301a | 16T411 | REGULATOR, seal                           | 1    |
| 301b | 16T409 | REGULATOR, pump                           | 1    |
| 301c | 16T410 | REGULATOR, ram                            | 1    |
| 301d | 16V725 | GAUGE, pressure, inflatable seal          | 1    |
| 301e | 16V728 | SWITCH, pressure, inflatable seal         | 1    |
| 301f | 16V727 | GAUGE, pressure, air motor                | 1    |
| 301g | 16V728 | SWITCH, pressure, air motor               | 1    |
| 301h | 16V726 | GAUGE, pressure, ram direction            | 1    |
| 301j | 16V729 | SWITCH, pressure, ram direction           | 1    |
| 301k | 16V730 | SWITCH, push button, air assist ram plate | 1    |
| 302  | 16F486 | BRACKET, control module                   | 1    |
| 303  | 16F485 | BRACKET, control module                   | 1    |
| 304  | 102235 | SCREW, cap, hex hd                        | 4    |
| 305  | 104123 | WASHER, lock, spring                      | 4    |
| 306  | 102025 | NUT, full, hex, regular                   | 4    |
| 307  | 16N855 | LABEL, overlay                            | 1    |
| 308  | 16Y861 | VALVE, ball, vented                       | 1    |
| 309* | 17T215 | O-RING, gauge, not shown                  | AR   |

\* Order separately. Not in kit



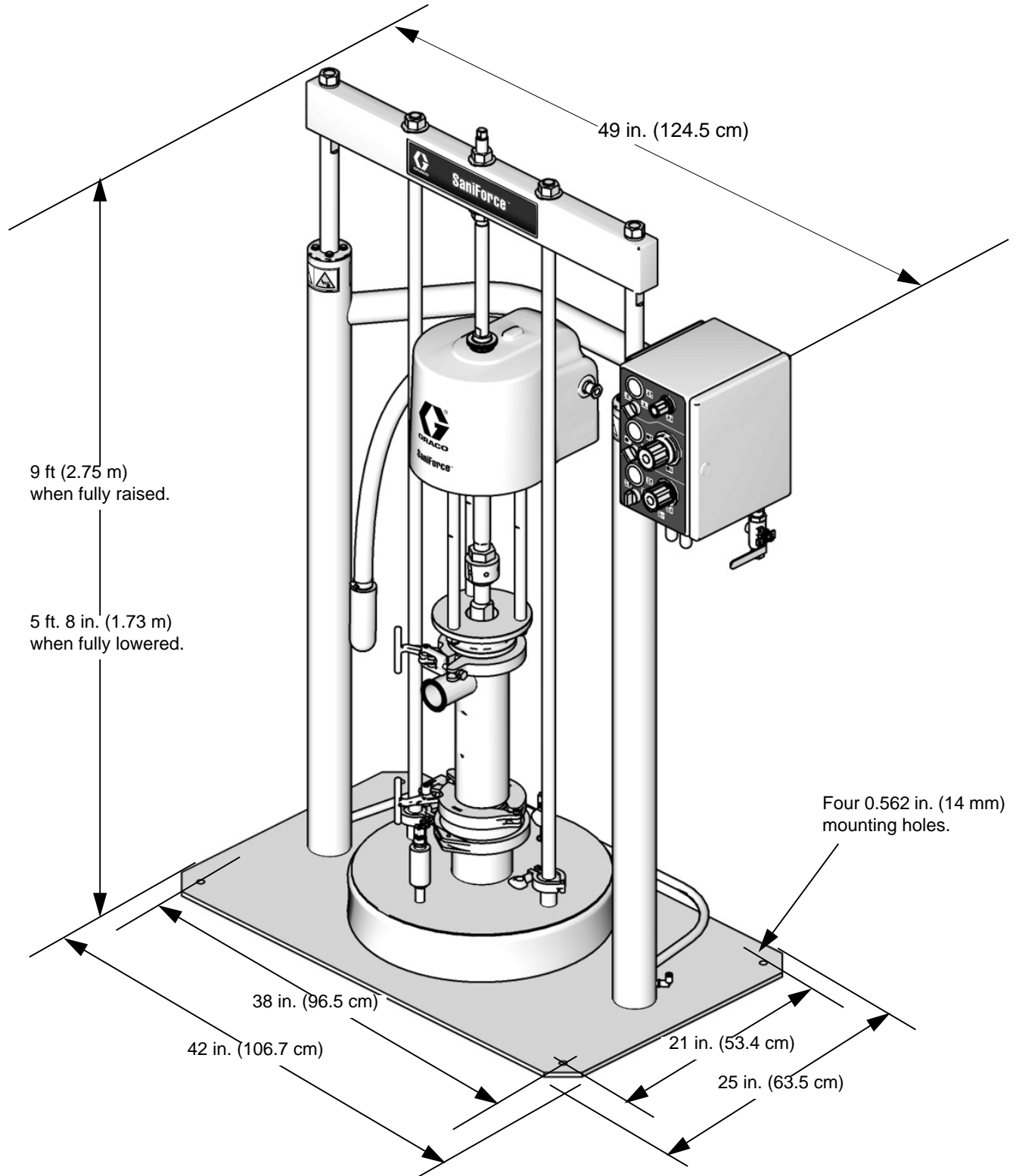
ti16250a

**Part No. 16G393 Pneumatic Control Panel, Pneumatic Diagram**





# Dimensions



T115713a

# Technical Data

## Maximum Fluid Working Pressure

|                                   |                          |
|-----------------------------------|--------------------------|
| 5:1 Ratio Piston Pumps . . . . .  | 410 (2.8 MPa, 28.3 bar)  |
| 6:1 Ratio Piston Pumps . . . . .  | 650 (4.5 MPa, 44.8 bar)  |
| 12:1 Ratio Piston Pumps . . . . . | 1450 (10 MPa, 100.0 bar) |
| Diaphragm Pumps . . . . .         | 120 (0.8 MPa, 8.2 bar)   |

## Maximum Package Air Inlet Pressure

|                                       |                            |
|---------------------------------------|----------------------------|
| Piston Pump Ram Packages . . . . .    | 100 psi (0.7 MPa, 6.9 bar) |
| Diaphragm Pump Ram Packages . . . . . | 120 psi (0.8 MPa, 8 bar)   |

## Maximum Ram Air Inlet Pressure . . . . . 100 psi (0.7 MPa, 6.9 bar)

## Maximum Pump Air Inlet Pressure

|  |                            |
|--|----------------------------|
| 6:1 and 12:1 Ratio Piston Pumps. . . . . | 100 psi (0.7 MPa, 6.9 bar) |
| 5:1 Ratio Piston Pumps . . . . .         | 80 psi (0.6 MPa, 5.5 bar)  |

## Maximum size pumpable solids

|  |                  |
|--|------------------|
| 5:1 and 12:1 Ratio Piston Pumps. . . . . | 1/4 in. (6.4 mm) |
| 6:1 Ratio Piston Pumps . . . . .         | 1/8 in. (3.2 mm) |

## Diaphragm Pumps . . . . . 120 psi (0.8 MPa, 8 bar)

## Air Inlet Size

|                             |            |
|-----------------------------|------------|
| Enclosed Controls . . . . . | 1/2 npt(f) |
| Exposed Controls. . . . .   | 3/4 npt(f) |

## Maximum Ram Package Operating Temperature

|  |              |
|--|--------------|
| 5:1 Ratio Piston Pump Ram Packages . . . . . | 140°F (60°C) |
| All Other Ram Packages . . . . .             | 150°F (66°C) |

## Maximum Drum ID. . . . . 24 in. (61 cm)

## Minimum Drum ID

|                              |                  |
|------------------------------|------------------|
| Straight-Sided Drum. . . . . | 19.4 in. (49 cm) |
| Tapered Drum . . . . .       | 19.0 in. (48 cm) |

## Maximum Drum Height . . . . . 40.75 in. (104 cm)

## Sound Data . . . . . See your pump manual.

## Wetted Parts

|   |  |
|---|--|
| Inflatable Seal . . . . .                           | Neoprene   |
| Ram (plate, fittings, gaskets) . . . . .            | 300-Series Stainless steel, Buna-N, and Polypropylene  |
| 5:1 Ratio Piston Pumps (see pump manual) . . . . .  | Stainless steel, Buna-N, FKM, PTFE and UHMWPE. Priming piston pumps also have Polychloroprene and Nylon. Model 24F197 also has Silicone. |
| 6:1 Ratio Piston Pumps (see pump manual) . . . . .  | Stainless steel, Buna-N, Polychloroprene, Nitrile, Nylon, and UHMWPE. Certain models have PTFE packings.                                 |
| 12:1 Ratio Piston Pumps (see pump manual) . . . . . | Stainless steel, Acetal, Nitrile, PTFE, UHMWPE   |
| Diaphragm Pumps (see pump manual) . . . . .         | 316 Stainless steel, Santoprene®, Buna-N, Fluoroelastomer, EPDM, Weighted CR, Weighted Polychloroprene, and PTFE                         |

## Package Weights

| Piston Pump<br>Ram Packages |        |     | Diaphragm Pump<br>Ram Packages |        |     |
|-----------------------------|--------|-----|--------------------------------|--------|-----|
| Model                       | Weight |     | Model                          | Weight |     |
|                             | lb     | kg  |                                | lb     | kg  |
| 24D708                      | 413    | 187 | 24G542                         | 450    | 204 |
| 24D712                      | 433    | 196 | 24F191                         | 464    | 210 |
| 24D714                      | 428    | 194 | 24G543                         | 464    | 210 |
| 24D720                      | 417    | 189 | 24F192                         | 450    | 204 |
| 24D724                      | 437    | 198 | 24F193                         | 464    | 210 |
| 24D726                      | 432    | 196 | 24F194                         | 464    | 210 |
| 24D776                      | 353    | 160 | 24D922                         | 428    | 194 |
| 24D780                      | 372    | 169 | 24D926                         | 443    | 201 |
| 24D782                      | 367    | 166 | 24D928                         | 443    | 201 |
| 24D788                      | 356    | 161 | 24D932                         | 443    | 201 |
| 24D792                      | 375    | 170 | 24D936                         | 442    | 200 |
| 24D794                      | 370    | 168 | 24D940                         | 428    | 194 |
| 24D647                      | 440    | 200 | 24D944                         | 428    | 194 |
| 24D651                      | 459    | 208 | 24D948                         | 443    | 201 |
| 24D653                      | 454    | 206 | 24D952                         | 442    | 200 |
| 24F188                      | 440    | 200 | 24J364                         | 428    | 194 |
| 24F189                      | 459    | 208 | 24J365                         | 443    | 201 |
| 24F190                      | 454    | 206 | 24J366                         | 443    | 201 |
| 24P811                      | 460    | 209 |                                |        |     |
| 24U568                      | 460    | 209 |                                |        |     |

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**Graco Headquarters:** Minneapolis

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

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