



This manual contains **IMPORTANT**
WARNINGS and INSTRUCTIONS
READ AND RETAIN FOR REFERENCE

DIVORCED DESIGN

1:1 Ratio Standard[®] Sanitary Pump

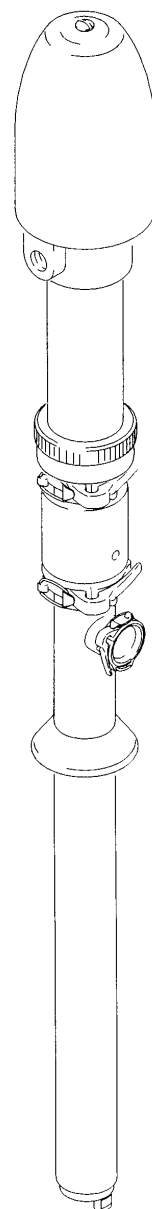
180 PSI (12.6 bar) MAXIMUM FLUID WORKING PRESSURE

180 PSI (12.6 bar) MAXIMUM AIR INPUT PRESSURE

Model: 946-964

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Symbols

Warning Symbol

WARNING

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

Caution Symbol

CAUTION

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

WARNING



EQUIPMENT MISUSE HAZARD

Equipment misuse can cause the equipment to rupture or malfunction and result in serious injury.

- This equipment is for professional use only.
- Read all instruction manuals, tags, and labels before operating the equipment
- Use the equipment only for its intended purpose. If you are not sure, call your Graco distributor.
- Do not alter or modify this equipment.
- Check equipment daily. Repair or replace worn or damaged parts immediately.
- Do not exceed the maximum working pressure of the lowest rated system component. Refer to the **Technical Data** for the maximum working pressure of this equipment.
- Use fluids and solvents which are compatible with the equipment wetted parts. Refer to the **Technical Data** section of all equipment manuals. Read the fluid and solvent manufacturer's warnings.
- Do not use hoses to pull equipment.
- Route hoses away from traffic areas, sharp edges, moving parts, and hot surfaces. Do not expose Graco hoses to temperatures above 180°F (82°C) or below -40°F (-40°C).
- Wear hearing protection when operating this equipment.
- Do not lift pressurized equipment.
- Comply with all applicable local, state, and national fire, electrical, and safety regulations.

WARNING



FIRE AND EXPLOSION HAZARD

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



- Ground the equipment. Refer to **Grounding**.
- If there is any static sparking or you feel an electric shock while using this equipment, **stop dispensing** immediately. Do not use the equipment until you identify and correct the problem.
- Provide fresh air ventilation to avoid the build up of flammable fumes from solvents or the fluid being dispensed.
- Keep the dispense area free of debris, including solvent, rags, and gasoline.
- Electrically disconnect all equipment in the dispense area.
- Extinguish all open flames or pilot lights in the dispense area.
- Do not smoke in the dispense area.
- Do not turn on or off any light switch in the dispense area while operating or if fumes are present.
- Do not operate a gasoline engine in the dispense 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.



MOVING PARTS HAZARD

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

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

Installation

Grounding

WARNING

FIRE AND EXPLOSION HAZARD

Before operating the pump, ground the system as explained below. Also read the section **FIRE AND EXPLOSION HAZARD**.

1. *Pump*: use a ground wire and clamp. See Figure 1. Loosen the grounding lug locknut (W) and washer (X). Insert one end of the ground wire (Y) into the slot in lug (Z) and tighten the locknut securely. Connect the other end of the wire to a true earth ground. Order Part No. 237-569 Ground Wire and Clamp.

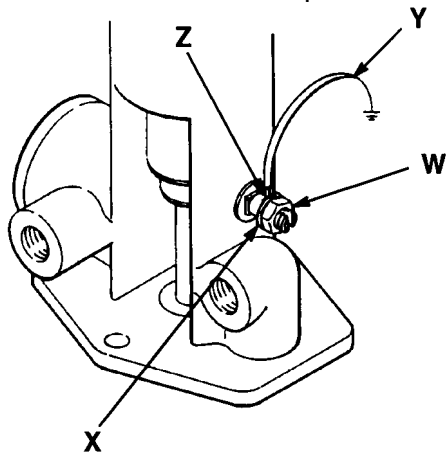


Figure 1

2. *Air and fluid hoses*: use only electrically conductive hoses.
3. *Air compressor*: follow manufacturer's recommendations.
4. *Dispense valve*: ground through connection to a properly grounded fluid hose and pump.
5. *Fluid supply container*: follow your local code.
6. *Container being dispensed into*: follow your local code.
7. *Solvent pails used when flushing*: follow your local code. Use only metal pails, which are conductive, placed on a grounded surface. Do not place the pail on a non-conductive surface, such as paper or cardboard, which interrupts the grounding continuity.

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

General Information

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

NOTE: Always use Genuine Graco Parts and Accessories, available from your Graco distributor. Refer to the Product Data Sheet for the pump, Form No. 304-410. If you supply your own accessories, be sure they are adequately sized and pressure rated for your system.

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

Mounting the Pump

Mount the pump to suit the type of installation planned.

When mounting the pump in a 2" bung type drum, use the accessory bung adapter 205-573. Remove the intake valve as explained in **Service**, slide the bung adapter onto the cylinder, and replace the intake valve. Screw the bung adapter tightly into the drum bung hole and tighten the thumbscrew to hold the pump about 0.5" (13 mm) off the bottom of the drum. Loosen the drum vent plug to prevent a vacuum from forming.

When mounting the pump in an open container, use the accessory pump clamp 204-858 and bung adapter 205-573.

Screw the air exhaust muffler (A) into the 3/4" npt (f) outlet (B) in the motor base.

WARNING

To avoid contaminating the fluid with lubricants, air line scale, rust, etc., pipe the exhaust air outside of the fluid product area. Vent the exhaust to a safe place, away from people, animals or food handling areas.

Installation

KEY

B 3/4 npt Exhaust Air Outlet

C Air Line Filter/Regulator

D Bleed-Type Master Air Valve
(required)

E Air Solenoid Valve

F 3/8 npt Air Inlet

G Air Line Drain Pipe and Valve

H 1-1/2" Tube Size Flanged Fluid Outlet

J Dispensing Valve

K Timer Control

L Air Regulator

M Bung-Mounted Sanitary Pump

N Dispensing Valve Air Exhaust Hose

P Sensing Device

Y Pump Ground Wire (required; see
page 4 for installation instructions)

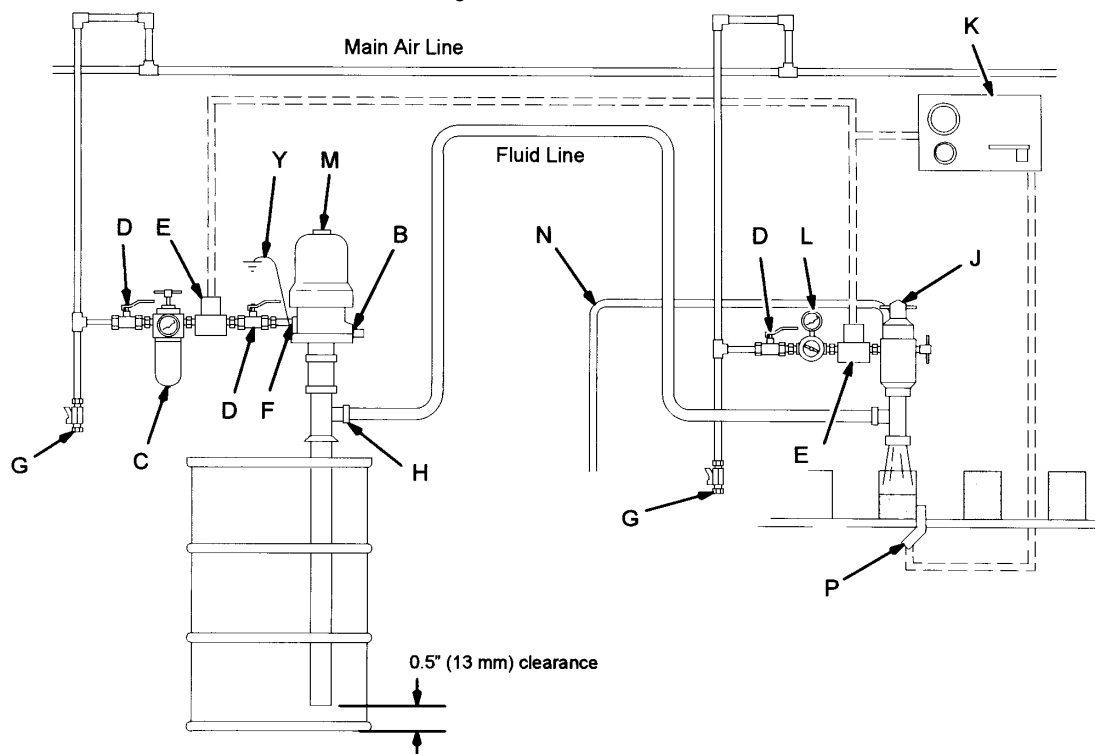


Figure 2

System Accessories

Install a bleed-type master air valve (D) close to the pump air inlet (F), to relieve air trapped between it and the air motor.

WARNING

The bleed-type master air valve (D) is required in your system to shut off and relieve air pressure that may be trapped in the air motor. This air could cause the pump to cycle unexpectedly, which could result in serious injury, including amputation or splashing of fluid in the eyes or on the skin.

Install an air filter/regulator (C) in the pump air line, *upstream from the bleed valve*, to control air inlet pressure and to remove harmful dirt and contaminants from your compressed air supply.

Install another bleed-type master air valve (D) upstream from all air line accessories and use it to isolate the accessories during cleaning and repair.

On the air drop to the dispensing valve (J), install an air regulator (L) to control air pressure to the valve. Install a bleed valve (D) to use as a shutoff when servicing the dispensing valve.

Connect air solenoid valve (D) to a timer control (K), and set so the dispensing valve (J) will dispense at proper intervals.

Connect the Hoses

Connect electrically conductive air supply hoses to the air inlets of the pump and dispensing valve.

Connect the fluid line between the pump's 1-1/2" flanged fluid outlet and the fluid inlet of the dispensing valve.

Note: *Be sure* to install the complete system in accordance with all state sanitary standard codes and local regulations.

Operation

Pressure Relief Procedure

WARNING

PRESSURIZED EQUIPMENT HAZARD

The system pressure must be manually relieved to prevent the system from starting or spraying accidentally. To reduce the risk of an injury from accidental spray from the dispense valve, splashing fluid, or moving parts, follow the Pressure Relief Procedure whenever you:

- air instructed to relieve the pressure,
- stop dispensing,
- check or service any of the system equipment,
- or install or clean the dispense valve nozzle.

1. Shut off the air supply to the pump.
2. Close the bleed-type master air valve (required in system).
3. Open the fluid ball valve and/or dispensing valve to relieve fluid pressure.

NOTE: The sanitary pump was assembled using sanitary lubricant on moving parts and was tested in water. Flush the pump thoroughly with an approved cleaning solution or disassemble and sanitize the parts before using the pump. Refer to the **Cleaning Procedure**. Check local and state codes for specific limitations.

Adjusting the Pump Speed and Pressure

WARNING



COMPONENT RUPTURE HAZARD

To reduce the risk of component rupture, which could cause serious injury, never exceed 120 psi (8 bar) air supply pressure to the pump. Read the warning section **EQUIPMENT MISUSE HAZARD**.

Open the bleed-type master air valve (D). Adjust the pump air regulator (C) until the pump is running smoothly.

Allow the pump to cycle slowly until all air is pushed out of the lines (the fluid will be flowing in a steady stream from the fluid outlet) and the pump is primed.

With the air supply turned on, the pump will start when the dispensing valve is opened, and stall against pressure when the valve is closed. In a circulating system, the pump operates until the air supply is turned off.

Pump Shutdown

WARNING

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

To shut off the pump, relieve the pressure.

Care of the Pump

CAUTION

Do not expose the air motor to temperatures higher than 200°F (93°C) or the immersed fluid pump to temperatures higher than 250°F (121°C). Excessive temperatures may damage the pump packings and seals.

If the pump accelerates quickly, or is running too fast, stop the pump immediately and check the fluid supply. If the supply is empty and air has been pumped into the lines, refill the container and prime the pump and lines with fluid. Be sure to eliminate all air from the system.

CAUTION

Never allow the pump to run dry of fluid. A dry pump will accelerate to a high speed, possibly damaging itself.

Always stop the pump at the bottom of its stroke to prevent fluid from drying on the displacement rod (the air motor will exhaust at the bottom of the stroke).

Maintenance

IMPORTANT NOTE:

The following instructions show a basic procedure for cleaning a sanitary system. However, be sure to clean the pump and system in accordance with your state sanitary standard codes and local regulations.

Be sure to disassemble the pump in order to thoroughly clean it.

Cleaning Procedure

1. Remove the pump from the fluid container and operate it until as much of the fluid as possible has been pumped out.
2. Flush the system thoroughly with an approved cleaning solution.

WARNING

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

3. Relieve the pressure. Remove the air and fluid hoses from the pump. Disassemble the fluid pump and accessories. See **Service** to disassemble the pump.

4. Wash all the pump parts with an alkaline detergent at the manufacturer's recommended temperature and concentration, using either a brush or other C.O.P. methods.
5. Rinse all the pump parts again with water and allow them to dry.
6. Inspect all the pump parts and reclean any parts that are still soiled.

WARNING

Any damaged rubber parts **must** be replaced as they will harbor microorganisms that can contaminate the fluid.

7. Immerse all pump parts and the lubricant tube in an approved sanitizer before assembly. Take the pump parts out of the sanitizer one-by-one as needed.
8. Lubricate the moving pump parts and o-rings, packings, and seals with approved waterproof sanitary lubricant.
9. Circulate the sanitizing solution through the pump and the system prior to use.

Troubleshooting

WARNING

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

1. Relieve the pressure.
2. Check all possible remedies in the Troubleshooting Chart before disassembling the pump.

Problem	Cause	Solution
Pump fails to operate	Restricted air line or inadequate air supply Insufficient air pressure; closed or clogged air valves, etc. Exhausted fluid supply Damaged air motor	Clean air line or increase air supply. Open or clean air valve, etc. Refill fluid supply. Service, see manual 307-043.
Pump operates but output low on both strokes	Restricted air line or inadequate air supply Insufficient air pressure; closed or clogged air valves, etc. Exhausted fluid supply Obstructed fluid line, valves, dispensing valve, etc. Worn throat packing (8) Damaged cylinder o-rings (13)	Clean air line or increase air supply. Open or clean air valves, etc. Refill fluid supply. Clear. (Relieve pressures and disconnect fluid line. Turn on air; if pump starts, the line, etc. is clogged). Replace throat packing. Replace o-rings.
Pump operates but output low on down stroke	Held open or worn fluid intake valve Damaged cylinder o-rings (13)	Clear or service fluid intake valve. Replace o-rings.
Pump operates but output low on up stroke	Held open or worn fluid piston or seal (19)	Clear or service fluid piston or seal.
Erratic or accelerated operation	Exhausted fluid supply Held open or worn fluid intake valve Held open or worn fluid piston or seal (19)	Refill fluid supply. Clear or service fluid intake valve. Clear or service fluid piston or seal.

Service

Displacement Pump Disassembly

NOTE: Repair Kit 218-741 is available. Use all parts in the kit for the best results.

1. Remove the pump from the fluid container. Operate it until as much of the fluid has been pumped out as possible.

WARNING

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

2. Relieve the pressure and remove the air and fluid hoses from the pump.
3. Remove the intake valve housing (26) by removing the retaining pin (24) and the o-rings (28) and pulling the valve out of the cylinder (34). Disassemble the valve. Clean and inspect the parts. See Print 946-964.
4. Release the clamp (16) holding the retainer housing (29) to the air motor base. Slide the displacement cylinder (34) down from the air motor and pull the displacement rod (35) out of the connecting rod (5).
5. Push the displacement rod out through the bottom of the cylinder. Remove the piston housing (33) by removing the retaining pin (32) and the o-ring (28) and pulling the piston from the displacement rod. Disassemble, clean and inspect the parts.
6. Take the retainer housing (29) off of the cylinder (34) and remove the packing housing (31), bearing (25) and packing (18).
7. Clean and inspect all the parts. Refer to the **Cleaning Procedure**. Replace the parts as necessary.

WARNING

Any damaged rubber parts **must** be replaced as they will harbor microorganisms that can contaminate the fluid.

Displacement Pump Assembly

NOTE: Lubricate the o-rings, throat packings, and piston seals with waterproof approved sanitary lubricant when reassembling.

1. Install the u-cup packing (18) and throat bearing (25) in the throat packing housing (31). The lips of the u-cup must face down into the housing, and the lip of the bearing must face up. Install the o-ring (21) on the outside of the housing.
2. Place the throat packing housing (31) on the top of the cylinder (34). Make sure the gasket (20) is in place on the top of the cylinder (34). Install the retainer housing (29) on the cylinder so the hole (A) in the housing is slanting downward toward the cylinder. Secure with the clamp (16).
3. Install the piston seal (27) on the piston housing (33). Place the ball (14) on the seat of the housing. Install the piston housing in the displacement rod (35) so the holes in both parts align. Secure with the retaining pin (32) and one o-ring (28).
4. Slide the displacement rod (35) up through the cylinder (34) so it protrudes from the retainer housing (29). Install the gasket (20) on the top of the retainer housing. Make sure the drip shield (19) is in place on the connecting (5), then reconnect the displacement rod to the connecting rod.
5. Slide the retainer housing (29) and cylinder (34) up to the base of the air motor (1), and secure with the clamp (16). Make sure the drip shield (22) is in place on the cylinder.
6. Install the o-ring (21) on the intake valve housing (26). Place the ball (13) on the seat of the housing (26), and install the ball stop pin (30) in the top holes of the housing.
7. Slide the intake valve housing (26) up into the cylinder (34) until the bottom holes of the housing align with the holes in the cylinder. Secure using the retaining pin (24) and two o-rings (28).
8. Install the gasket (23) and clamp 917) when reconnecting the fluid line to the pump fluid outlet.
9. Reconnect the ground wire if it was disconnected during service.

Technical Data

Category	Data
Maximum fluid working pressure	180 psi (12.6 bar)
Maximum air input pressure	180 psi (12.6 bar)
Ratio	1:1
Pump cycles per gallon (3.8 liters)	28
Fluid flow at 60 cycles per minute	2.3 gallons (8.7 liters)
Air consumption	approximately 8 scfm (0.224 m ³ /minute) per gallon (3.8 liters) at 100 psi (7 bar) air
Minimum air hose size	0.5 in. (13 mm) ID
Maximum operating temperature for displacement pump	250°F (121°C)
Maximum operating temperature for air motor	200°F (93°C)
Weight	30 lb (15 kg)
Wetted parts	Stainless steel, buna-N, neoprene (USDA approved)

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The Graco Warranty and Disclaimers

WARRANTY

Graco warrants all equipment manufactured by it 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. As purchaser's sole remedy for breach of this warranty, Graco will, for a period of twelve months or two thousand hours of operation from time of sale, repair or replace any part of the equipment proven defective. This warranty applies only when the equipment is installed, operated and maintained in accordance with Graco's written recommendations.

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

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

DISCLAIMERS AND LIMITATIONS

The terms of this warranty constitute purchaser's sole and exclusive remedy and are in lieu of any other warranties (express or implied), **including warranty of merchantability or warranty of fitness for a particular purpose**, and of any non-contractual liabilities, including production liabilities, based on negligence or strict liability. Every form of liability for direct, special or consequential damages or loss is expressly excluded and denied. In no case shall Graco's liability exceed the amount of the purchase price. Any action for breach of warranty must be brought within two (2) years of the date of sale.

EQUIPMENT NOT COVERED BY GRACO WARRANTY

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

Sales Offices: Detroit, Los Angeles

Foreign Offices: Canada; England; Switzerland; France; Germany; Hong Kong; Japan; Korea

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