

# INSTRUCTIONS—PARTS LIST



# 308-051

Rev B  
Supersedes A

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

8.5:1 RATIO

## DYNAMITE™ 190 PUMP

60 bar (850 psi) MAXIMUM FLUID WORKING PRESSURE

7 bar (100 psi) MAXIMUM AIR INLET PRESSURE

### Model 223-847, Series A

Includes Pump, Ram, and 1 Gallon Wiper Plate

### Model 223-848, Series A

Includes Pump, Ram, and 3 Kilogram Wiper Plate

### Model 223-849, Series A

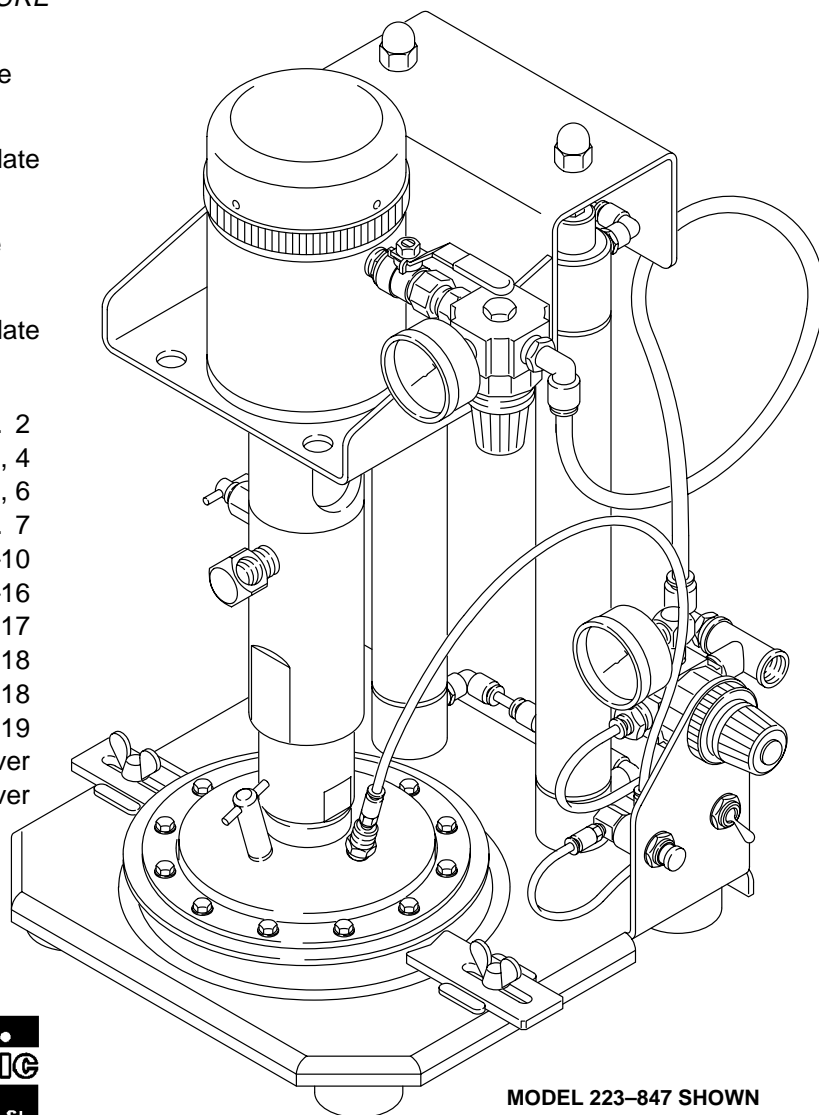
Includes Pump, Ram, and 1 Quart Wiper Plate

### Model 223-850, Series A

Includes Pump, Ram, and 1 Kilogram Wiper Plate

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MODEL 223-847 SHOWN



### WARNING

#### Hazard of Using Fluids Containing Halogenated Hydrocarbons

Never use 1,1,1-trichloroethane, methylene chloride, other halogenated hydrocarbon solvents or fluids containing such solvents in this equipment. Such use could result in a serious chemical reaction, with the possibility of explosion, which could cause death, serious bodily injury and/or substantial property damage.

Consult your fluid suppliers to ensure that the fluids used are compatible with aluminum and zinc parts.

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

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# SAFETY WARNINGS

**HIGH PRESSURE FLUID CAN CAUSE SERIOUS INJURY. FOR PROFESSIONAL USE ONLY.**  
**OBSERVE ALL WARNINGS. Read And Understand All Instruction Manuals Before Operating Equipment.**

## MOVING PARTS HAZARD

**KEEP HANDS AND FINGERS AWAY FROM THE PRIMING PISTON DURING OPERATION AND WHENEVER THE PUMP IS CHARGED WITH AIR to reduce the risk of injury!** On the pump downstroke the priming piston extends beyond the intake valve housing to pull the material into the pump. The priming piston works under extreme force. During operation and whenever the pump is charged with air, the priming piston can severely injure or amputate a hand or finger, or break a tool, caught between it and the intake valve housing. Always follow the **Pressure Relief Procedure**, below, before checking, clearing, cleaning, flushing or servicing any part of the pump.

The air motor piston and fluid piston (located inside the air motor cylinder and coupling) also move when air is supplied to the motor. Do not place your hand or fingers into the air motor coupling cavity while the pump is operating. Before servicing the pump, follow the **Pressure Relief Procedure** below to prevent the pump from starting accidentally.

As the ram is raised and lowered, the wiper plate, ram tubes, and pump mounting bracket move. To reduce the risk of pinching or amputation of fingers, keep your hands away from the wiper plate, lip of the fluid can, pump bracket and ram tubes while the ram is operating. Do not shut off the air supply to the ram while it is raised. Doing so will cause the pump to fall uncontrolled to the bottom.

## EQUIPMENT MISUSE HAZARD

### Pressure Relief Procedure

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

1. Shut off the dispensing valve.
2. Shut off the bleed-type master air valve (required in your system), on the main air line.
3. Close the bleed-type master air valve (supplied with your pump).
4. Trigger the dispensing valve to relieve pressure.

If you suspect that the dispensing valve, nozzle or hose is completely clogged, or that pressure has not been fully relieved after following the steps above, VERY SLOWLY open the pump bleeder valve, having a container ready to catch the drainage. Leave the pump bleeder valve open until you are ready to dispense again. VERY SLOWLY loosen the hose end coupling and relieve pressure gradually, then loosen completely. Now clear the nozzle or hose.

### General Safety

Any misuse of the dispensing equipment or accessories, such as overpressurizing, modifying parts, using incompatible chemicals and fluids, or using worn or damaged parts, can cause them to rupture and result in fluid splashing in the eyes or on the skin, or other serious bodily injury, or fire, explosion or property damage.

NEVER alter or modify any part of this equipment; doing so could cause it to malfunction.

CHECK all dispensing equipment regularly and repair or replace worn or damaged parts immediately.

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

### System Pressure

NEVER exceed the maximum fluid working pressure of 60 bar (850 psi) or the maximum air inlet pressure of 7 bar (100 psi). Refer to the **TECHNICAL DATA** on page 18.

Be sure that all dispensing equipment and accessories are rated to withstand the maximum working pressure of the pump. DO NOT exceed the maximum working pressure of any component or accessory used in the system.

### Fluid Compatibility

BE SURE that all fluids and solvents used are chemically compatible with the wetted parts shown in the **TECHNICAL DATA** on page 18. Always read the manufacturer's literature before using fluid or solvent in this pump.

## HOSE SAFETY

High pressure fluid in the hoses can be very dangerous. If the hose develops a leak, split or rupture due to any kind of wear, damage or misuse, the high pressure spray emitted from it can cause fluid to splash in the eyes or on the skin, or other serious bodily injury or property damage.

TIGHTEN all fluid connections securely before each use. High pressure fluid can dislodge a loose coupling or allow high pressure spray to be emitted from the coupling.

NEVER use a damaged hose. Before each use, check the entire hose for cuts, leaks, abrasion, bulging cover, or damage or movement of the hose couplings. If any of these conditions exist, replace the hose immediately. DO NOT try to recouple high pressure hose or mend it with tape or any other device. A repaired hose cannot safely contain the high pressure fluid.

**HANDLE AND ROUTE HOSES CAREFULLY.** Do not pull on hoses to move equipment. Do not use fluids which are not compatible with the inner tube and cover of the hose. DO NOT expose Graco hoses to temperatures above 82°C (180°F) or below -40°C (-40°F).

## IMPORTANT

United States Government safety standards have been adopted under the Occupational Safety and Health Act. These standards – particularly the General Standards, Part 1910, and the Construction Standards, Part 1926 – should be consulted.

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

See page 17 for accessories available from Graco. If you supply your own accessories, **BE SURE** they are adequately sized and pressure-rated to meet the system's requirements.

Contact your Graco representative or Graco Technical Assistance (**1-800-543-0339**) for assistance in designing a system to suit your particular needs.

## PUMP LOCATION AND SET-UP

Place the unit on a hard, level surface. Check that the unit is level in all directions.

Position the pump so the air regulators for the pump and the ram are easily accessible. Refer to the Dimensional Drawing on page 19 to ensure that there is sufficient overhead clearance for your pump when the ram is fully raised.

See Fig 1. Unpack the wiper plate assembly (300) and slide it up onto the pump's intake valve housing (111). Secure the wiper plate to the pump with the two capscrews supplied.

The 3 kg and 1 kg size wiper plate assemblies, Models 223-852 and 223-854, are shipped with an optional 1/4 PT-19 metric fluid outlet fitting. To use this fitting, remove the 1/4 npt fitting (128) supplied on the pump. Apply thread sealant to the male threads of the metric fitting and screw it into the pump fluid outlet.

See Fig 1. Connect the air line tube (276) from the air assist valve (218) to the wiper plate (300). Refer to **Connecting and Disconnecting Tubes**, below.

## CONNECTING AND DISCONNECTING TUBES

*To connect a tube to a fitting:*

1. Grasp the tube, then slowly push it straight into the fitting until it stops.
2. **BE SURE** that the tube is securely connected, and will not pull out when air pressure is applied. To check, pull back gently on the tube to ensure that it will not pull out.

*To disconnect a tube from a fitting:*

1. Follow the **Pressure Relief Procedure** on page 2.
2. Push evenly on the fitting's red release button.
3. While holding the release button in, pull the tube out of the fitting.
4. To reuse the tubing, cut off the previously connected portion at 90°, being careful not to damage the outer diameter of the tube. Use of a tube cutter is recommended. The fitting will leak if the tubing is not cut at 90°.

## SYSTEM COMPONENTS AND ACCESSORIES

Refer to Fig 1.

### WARNING

Two required safety devices are supplied with your pump: a bleed-type master air valve (208) and a pump bleeder valve (125). These devices help reduce the risk of serious bodily injury including splashing in the eyes or on the skin, and injury from moving parts if you are adjusting or repairing the pump.

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

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

## Supplied Components

The following components are supplied with your pump. See Fig 1.

**The bleed-type master air valve (208)** is supplied with your system to relieve air trapped between it and the air motor when the valve is closed (see the **WARNING** above).

**The pump air regulator (227a)** controls pump speed and outlet pressure by adjusting the air pressure to the pump. The regulator is located **upstream** from the bleed-type master air valve.

**The ram air regulator (227b)** controls ram speed by adjusting the air pressure to the ram, and also controls the pressure exerted by the wiper plate on the fluid.

**The pump bleeder valve (125)** is supplied in your system to relieve fluid pressure in the displacement pump, hose and dispensing valve (see the **WARNING** above). Be sure the drain hole in the valve is pointing down. This valve is also used to bleed air from the pump when priming.

## Air Line

Connect an air supply hose to the 1/4 npt(f) main air inlet fitting (257). Install an air line filter and lubricator in the main air line. In the main air line, upstream from all other air line accessories, install a second bleed-type master air valve to shut off all air to the system and to isolate the accessories for servicing. See Accessories on page 17 for further information.

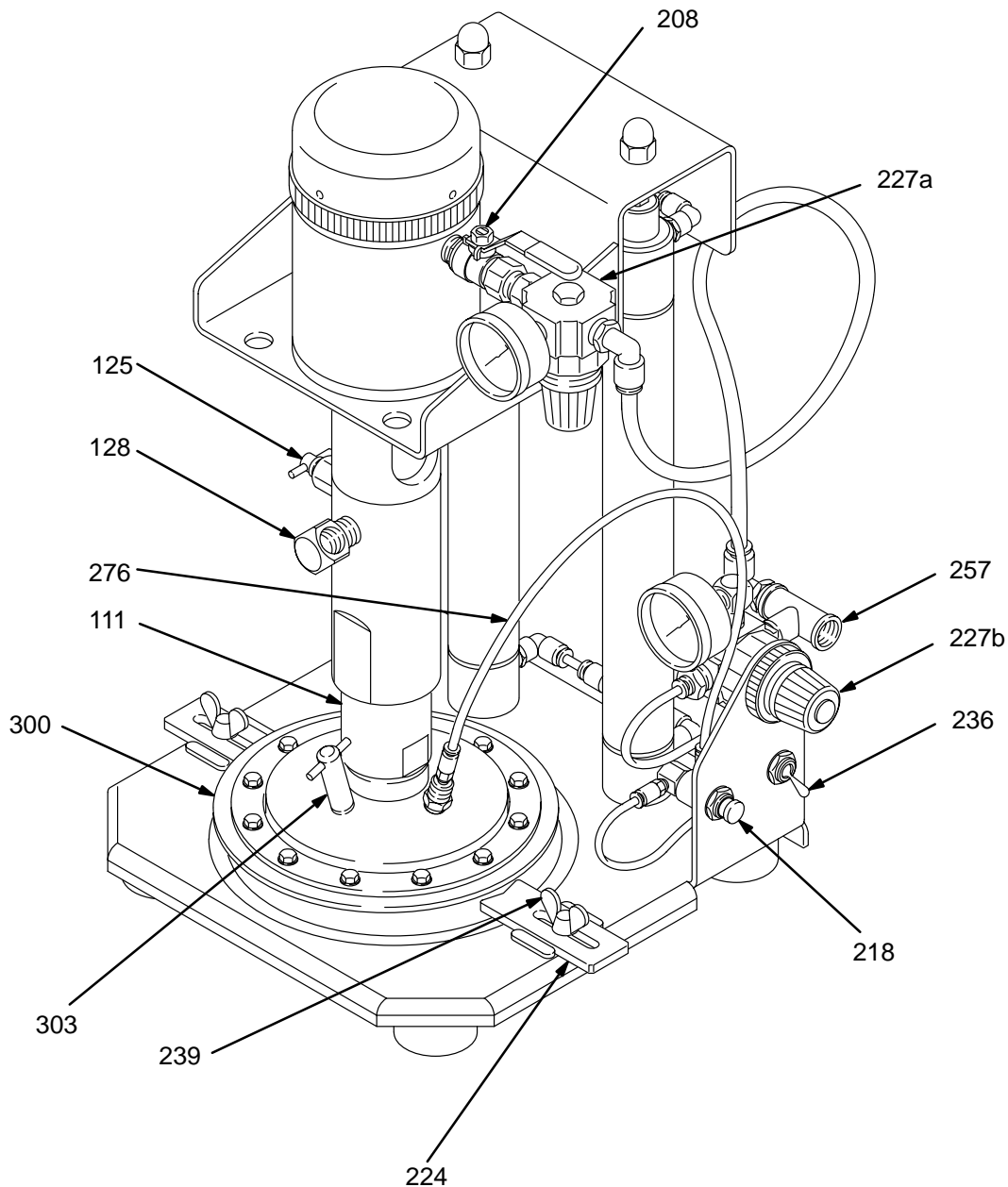
## Fluid Line

Connect a fluid hose to the fluid outlet fitting (128). Connect a suitable dispensing valve to the free end of the hose. Refer to the Accessories section on page 17 for further information.

# KEY

**111** Pump Fluid Intake Housing  
**125** Pump Bleeder Valve  
**128** Fluid Outlet Fitting  
**208** Bleed-Type Master Air Valve  
**218** Air Assist Valve (Pushbutton)  
**224** Clamps  
**227a** Pump Air Regulator

**227b** Ram Air Regulator  
**236** Ram Director Valve  
**239** Wing Screws  
**257** Air Inlet  
**276** Air Line to Wiper Plate  
**300** Wiper Plate Assembly  
**303** Wiper Bleed Valve



MODEL 223-847 SHOWN

Fig 1

## WARNING

### Pressure Relief Procedure

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

1. Shut off the dispensing valve.
2. Shut off the bleed-type master air valve (required in your system), on the main air line.
3. Close the bleed-type master air valve (supplied with your pump).
4. Trigger the dispensing valve to relieve pressure.

If you suspect that the dispensing valve, nozzle or hose is completely clogged, or that pressure has not been fully relieved after following the steps above, **VERY SLOWLY** open the pump bleeder valve, having a container ready to catch the drainage. Leave the pump bleeder valve open until you are ready to dispense again. **VERY SLOWLY** loosen the hose end coupling and relieve pressure gradually, then loosen completely. Now clear the nozzle or hose.

## WARNING

Keep hands and fingers away from the priming piston and pump intake during operation and whenever the pump is charged with air. During operation, the priming piston extends beyond the intake housing to pull material into the pump, and can severely injure or amputate a hand or finger caught between it and the intake housing. Always follow the **Pressure Relief Procedure Warning** above before checking, clearing, cleaning, flushing or servicing any part of the pump.

The air motor piston and fluid piston (located inside the air motor cylinder and coupling) also move when air is supplied to the motor. Do not place your hand or fingers into the air motor coupling cavity while the pump is operating.

As the ram is raised and lowered, the wiper plate, ram tubes, and pump mounting bracket move. To reduce the risk of pinching or amputation of fingers, keep your hands away from the wiper plate, lip of the fluid can, pump bracket and ram tubes while the pump is operating.

To reduce the risk of serious injury and damage to equipment, **DO NOT** shut off the air supply to the ram when the ram is raised. Doing so will cause the pump to fall uncontrolled to the bottom.

### Starting and Adjusting the Ram

1. Refer to Fig 1. Be sure all air regulators and bleed-type air valves are closed.
2. Open the air valve in the main air line and set the ram air regulator (227b) to 2 bar (28 psi). Set the ram director valve switch (236) to the UP position and let the ram rise to its full height. To change the speed at

which the ram raises and lowers, adjust the air regulator to increase or decrease the air volume.

3. Check that the fluid can is not dented or out of shape, which will damage the wiper plate and cause leakage around the wiper. Cut off the top of the fluid can with the can opener, or remove the bottom of the can. Be sure that the edge is free of burrs, which will damage the wiper plate. If necessary, bend the edge back with a pliers so the wiper plate will enter the can easily. Lubricate the wiper ring (305) to help the plate enter the can easily.
4. Set a full can of fluid on the ram base, centering it under the wiper plate (300).
5. Loosen the wiper plate bleed valve (303) enough to allow air trapped under the wiper plate to escape. With your hands away from the lip of the can and the wiper plate, set the director valve switch (236) to the DOWN position and lower the ram until the wiper plate enters the can. Reduce the air pressure when the plate enters the can.

**NOTE:** If the wiper plate does not enter the can easily, increase the ram pressure; once it enters the can, immediately reduce the pressure.

6. Continue to lower the ram until fluid appears at the wiper plate vent hole. Tighten the wiper plate bleed valve (303) securely. See Fig 1.
7. Clamp the can in place with the clamps (224) and wing screws (239), being sure the clamp catches the lip of the can.

### Priming the Pump and Pumping Fluid

1. Be sure the pump air regulator (227a) is closed. Then set the ram air regulator (227b) to about 1.5 bar (22 psi). Set the director valve switch (236) to DOWN.
2. Open the bleed-type master air valve (208). Set the pump air regulator (227a) to 2.0 bar (28 psi).
3. Open the pump bleeder valve (125) to allow air to bleed from the pump. When the pump is fully primed, close the valve.
4. Keep the director valve switch (236) in the DOWN position while the pump is operating.

**NOTE:** Adjust the air pressure to the ram as needed, but **DO NOT** increase it to a level where fluid is forced past the wiper plate.

### Changing Fluid Cans

1. Stop the pump. Close the bleed-type master air valve (208), but leave air pressure on to the ram. Open the dispensing valve and relieve all fluid pressure in the system.
2. Set the director valve switch (236) to UP.
3. Push in the air assist valve (218) and hold it in until the wiper plate clears the top of the can.
4. Loosen the clamps (224) and remove the empty can. Set the full can on the ram base and position it under the wiper plate.
5. Lower the ram and adjust the position of the can relative to the wiper plate, as explained under **"Starting and Adjusting the Ram"**. Clamp the can in place.

### Shutdown and Care of the Pump

1. Always flush the pump with a compatible solvent before fluid dries in the pump.
2. Set the director valve switch (236) to DOWN. Allow the ram to go to the lowest position.

3. Shut off the air supply to the ram and pump and follow the **Pressure Relief Procedure Warning** on page 5.

3. Shut off the air supply to the ram and pump and follow the **Pressure Relief Procedure Warning** on page 5.

NOTES

## TROUBLESHOOTING CHART

PROBLEM	CAUSE	SOLUTION
Pump does not operate.	Restricted air line, clogged air passages, or inadequate air supply.	Clear; see <b>TECHNICAL DATA</b> on page 18.
	Main air valve is closed.	Open.
	Air regulator malfunction.	Replace.
	Dirty or worn air motor parts; air motor leak.	Clean and overhaul air motor. See page 8.
	Obstructed fluid hose or dispensing valve; fluid hose ID is too small.	Clear*; use hose with larger ID.
	Fluid is too heavy; pump is laboring.	Increase pump air regulator pressure.
	Fluid dried on the fluid piston.	Clean. See page 8.
Pump operates, but in small strokes.	Dirty or worn air motor parts; air motor leak.	Clean and overhaul air motor. See page 8.
Pump operates, but output is low.	Restricted air line, clogged air passages, or inadequate air supply.	Clear; see <b>TECHNICAL DATA</b> on page 18.
	Dirty or worn air motor parts; air motor leak.	Clean and overhaul air motor. See page 8.
	Obstructed fluid hose or dispensing valve; fluid hose ID is too small.	Clear*; use hose with larger ID.
	Fluid is too heavy; pump is laboring.	Increase pump air regulator pressure.
	Worn intake valve.	Service. See page 8.
Pump running too fast.	Exhausted fluid supply.	Replace or refill can.
	Worn intake valve.	Service. See page 8.
	Dirty or worn air motor parts; air motor leak.	Clean and overhaul air motor. See page 8.
Ram does not move up or down.	Restricted air line, clogged air passages, or inadequate air supply.	Clear; see <b>TECHNICAL DATA</b> on page 18.
	Main air valve is closed.	Open.
	Air regulator malfunction.	Replace.
	Wiper plate lodged in container.	Use air assist button.
Pump doesn't prime.	Fluid is too heavy.	Open pump bleeder valve.
Wiper plate leaks.	Ram pressure is too high.	Reduce air pressure to ram.
	Wiper plate ring is worn.	Replace.
Leakage past throat packing.	Worn u-cup packing.	Replace (wet-cup is not adjustable).

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

### WARNING

#### Pressure Relief Procedure

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

1. Shut off the dispensing valve.
2. Shut off the bleed-type master air valve (required in your system), on the main air line.

3. Close the bleed-type master air valve (supplied with your pump).

4. Trigger the dispensing valve to relieve pressure.

*If you suspect that the dispensing valve, nozzle or hose is completely clogged, or that pressure has not been fully relieved after following the steps above, VERY SLOWLY open the pump bleeder valve, having a container ready to catch the drainage. Leave the pump bleeder valve open until you are ready to dispense again. VERY SLOWLY loosen the hose end coupling and relieve pressure gradually, then loosen completely. Now clear the nozzle or hose.*

## DISASSEMBLY

**NOTE:** Repair Kit 223–895 is available to repair the air motor. Parts included in the kit are marked with an asterisk, for example (103a\*). For the best results, use all the new parts in the kit.

Repair Kit 223–894 is available to repair the fluid pump. Parts included in the kit are marked with a double asterisk, for example (114\*\*). For the best results, use all the new parts in the kit.

1. Follow the **Pressure Relief Procedure Warning** on page 7. Disconnect all hoses. Remove the wiper plate (300). Remove the fluid outlet fitting (128), noting its position relative to the air inlet. Remove **only** the three screws (138) and lockwashers (141) holding the pump to the mounting bracket (233). **DO NOT** remove the remaining screws (138) and lockwashers (141) at this time.
2. Rotate the pump so the bleeder valve (125) is aligned with the slot in the mounting bracket (233), and lift the pump straight up through the bracket.

**NOTE:** Perform step 3 **only** if the air valve (165) or gasket (166) need replacement. Otherwise, proceed to step 4.

3. **If it is necessary to replace the air valve (165) or gasket (166)**, unscrew the cylinder cap (101) from the air motor cylinder (102). Unscrew the two socket screws holding the air valve (165). Remove the air valve and gasket.

### CAUTION

DO NOT immerse the air valve (165) in solvent. To clean the valve, use a brush and compressed air.

4. Remove the three screws (138) and washers (141) holding the air motor coupling (105) to the cylinder (102). Pull the cylinder straight up off the coupling until the air valve housing assembly (103a) clears the air motor piston (104).
5. Unscrew the air valve housing assembly (103a) from the cylinder (102).
6. Unscrew the pilot setscrew (144) from the air motor piston (104) and the fluid piston (106). Unscrew the air motor piston from the fluid piston, and pull it straight up out of the air motor coupling (105). Remove the large o-ring (103d) from the outer diameter of the air motor piston, and the two small o-rings (103b) from the inner diameter.
7. Unscrew the air motor coupling (105) from the fluid housing (109). Pull the coupling straight up until it clears the fluid piston (106). Remove the o-rings (103c, 103e) from the coupling.
8. Hold the fluid piston (106) steady by inserting a small screwdriver or punch into the 4 mm diameter hole (A). Remove the screw (145) and lockwasher (135) holding the priming piston (115) to the priming piston rod (110).

9. Pull the priming piston rod (110) and fluid piston (106) straight up out of the fluid housing (109). Remove the pin (123), and unscrew the priming piston rod from the fluid piston.
10. Unscrew the intake valve housing (111) from the fluid housing (109). Remove the o-ring (161) from the intake valve housing.
11. Remove the intake valve (114) and valve stop (112) from the intake valve housing (111).
12. Unscrew the wet-cup/packing nut (107). Remove the u-cup packing (163) from the throat. Remove the o-ring (162) from the wet-cup/packing nut.
13. Clean all parts with a solvent compatible with the fluid you are pumping, and inspect for wear or damage.

## REASSEMBLY

**NOTE:** Lubricate all packings and o-rings with a compatible grease before reassembling.

1. Install the u-cup packing (163\*\*) in the throat of the fluid housing (109), *with the lips facing down*. Install the o-ring (162\*\*) into the groove above the bearing of the wet-cup/packing nut (107). Install the wet-cup/packing nut in the fluid housing (109), and torque to 35–37 N.m (298–314 in–lb).
2. Screw the priming piston rod (110) into the fluid piston (106) until the holes align. Install the pin (123) in the holes. Carefully slide the assembled piston and rod down through the wet-cup and fluid housing.
3. Place the intake valve (114\*\*) onto the seat of the intake valve housing (111). Insert the valve stop (112) into the intake valve housing, with the flat side facing up. Be sure the valve stop (112) seats on the lip of the intake housing. Lubricate the o-ring (161\*\*). Bend it into a kidney shape, then carefully push it into the inner groove of the intake valve housing (111), to avoid damaging it.
4. Apply thread lubricant to the lower threads of the fluid housing (109). Bring the fluid housing and intake valve housing (111) together, making sure the priming piston rod (110) passes straight through the valve stop (112) and intake valve (114) installed in the housing (111). Loosely screw the intake valve housing (111) onto the fluid housing (109), then torque to 35–37 N.m (298–314 in–lb).
5. Apply lubricant to the threads of the screw (145). Hold the fluid piston (106) steady by inserting a small screwdriver or punch into the 4 mm diameter hole (A). Install the priming piston (115) onto the end of the priming piston rod (110), using the screw (145) and lockwasher (135). Torque to 1.7–2.3 N.m (14–20 in–lb).
6. Apply lubricant to the top threads of the fluid housing (109). Screw the air motor coupling (105) onto the fluid housing, and torque to 35–37 N.m (298–314 in–lb).
7. Install the large o-ring (103e\*) on the outer diameter of the air motor coupling (105), and the small o-ring (103c\*) in the groove on the inner diameter of the coupling.



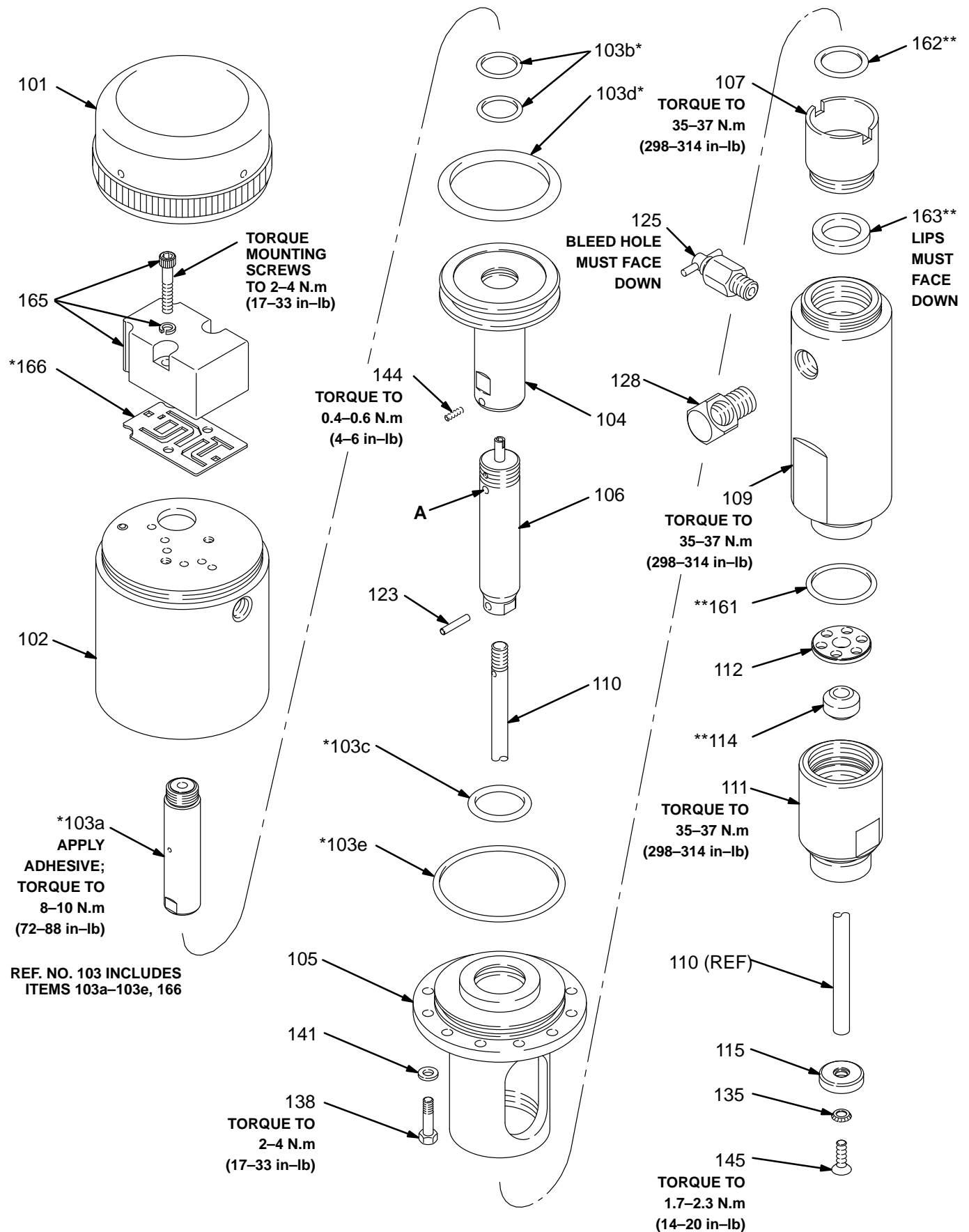


Fig 2

8. Install the two small o-rings (103b\*) in the grooves of the inner diameter of the air motor piston (104). Lower the piston through the air motor coupling (105) so it engages the threads of the fluid piston (106). Screw the air motor piston onto the fluid piston, aligning the holes to obtain maximum thread engagement. Insert the setscrew (144) in the holes and torque to 0.4–0.6 N.m (4–6 in-lb).
9. Install the large o-ring (103d\*) on the outer diameter of the air motor piston (104).
10. Apply adhesive to the threads of the housing assembly (103a\*) and screw the assembly into the air motor cylinder (102). Torque to 8–10 N.m (72–88 in-lb). Apply lubricant to the outer diameter of the air valve housing assembly (103a) and the inner diameter of the air motor cylinder (102).
11. Lower the air motor cylinder (102) onto the air motor coupling (105). Align the air inlet with the fluid outlet, as was noted in step 2 under **Disassembly**. The air valve housing assembly (103a) will slide down into the air motor piston (104). Secure the cylinder to the coupling with three screws (138) and washers (141). Torque the screws to 2–4 N.m (17–33 in-lb).
12. ***If it was necessary to replace the air valve (165) or gasket (166)***, align and install the new air valve and gasket on the top of the air motor cylinder (102), as shown in Fig 2. Install the two mounting screws and washers and torque to 2–4 N.m (17–33 in-lb). Lubricate the upper threads of the air motor cylinder (102). Screw the cylinder cap (101) onto the cylinder.
13. Lower the pump through the mounting bracket (233). Orient it in the correct direction and secure to the bracket using the three screws (138) and washers (141). Torque the screws to 2–4 N.m (17–33 in-lb). Reinstall the fluid outlet fitting (128).
14. Reinstall the wiper plate assembly (300) on the fluid intake housing (111). Secure with the two capscrews (302). Reconnect all hoses and return the pump to service.

## PARTS DRAWING AND PARTS LIST

### Model 223–847, Series A

#### 1 Gallon Size

Includes items 100, 200 and 300

### Model 223–848, Series A

#### 3 Kilogram Size

Includes items 100, 200 and 300

### Model 223–849, Series A

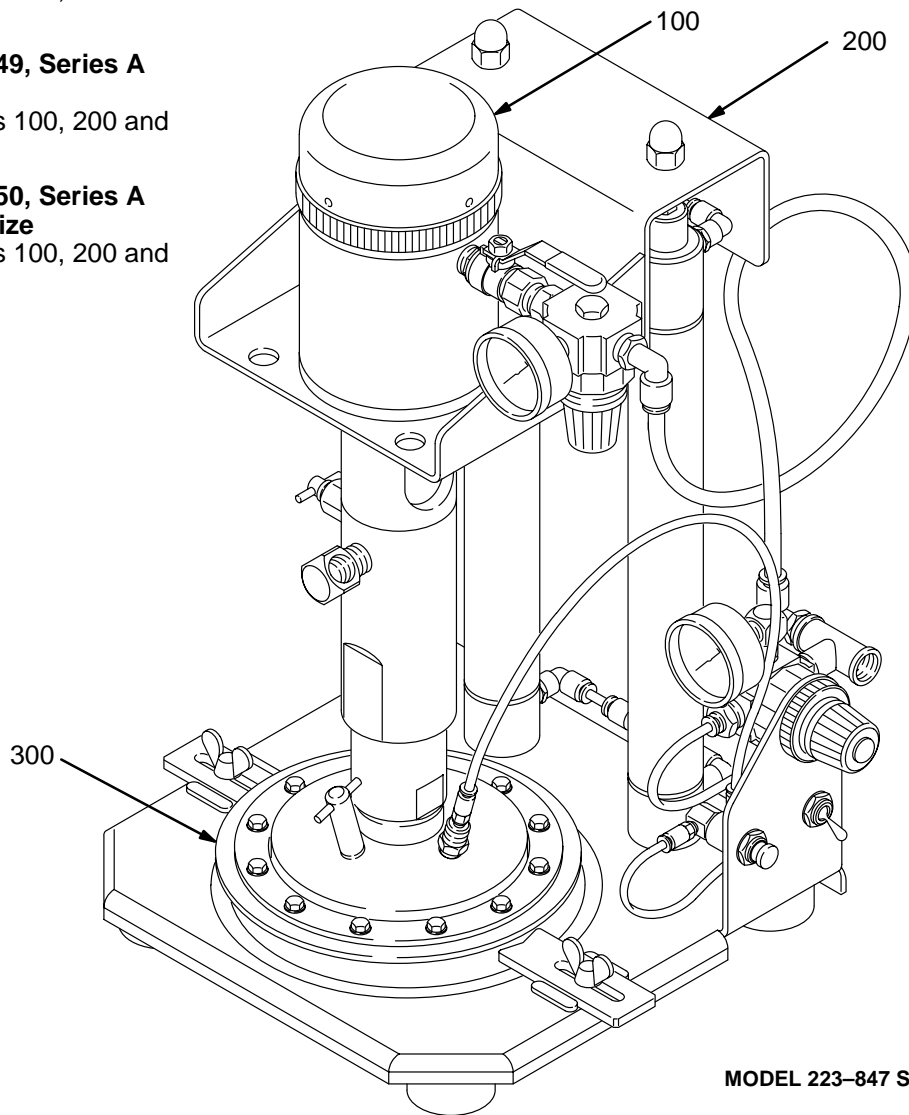
#### 1 Quart Size

Includes items 100, 200 and 300

### Model 223–850, Series A

#### 1 Kilogram Size

Includes items 100, 200 and 300



MODEL 223–847 SHOWN

REF NO.	PART NO.	DESCRIPTION	QTY
100		PUMP ASSY (not sold separately) See pages 12 and 13 for parts	1
200		RAM ASSY (not sold separately) See pages 14 and 15 for parts	1
300	223–851	WIPER PLATE ASSY, 1 gallon size (Used on Model 223–847)	1
	223–852	See page 16 for parts WIPER PLATE ASSY, 3 kg size (Used on Model 223–848)	1
	223–853	See page 16 for parts WIPER PLATE ASSY, 1 quart size (Used on Model 223–849)	1
	223–854	See page 16 for parts WIPER PLATE ASSY, 1 kg size (Used on Model 223–850)	1
		See page 16 for parts	1

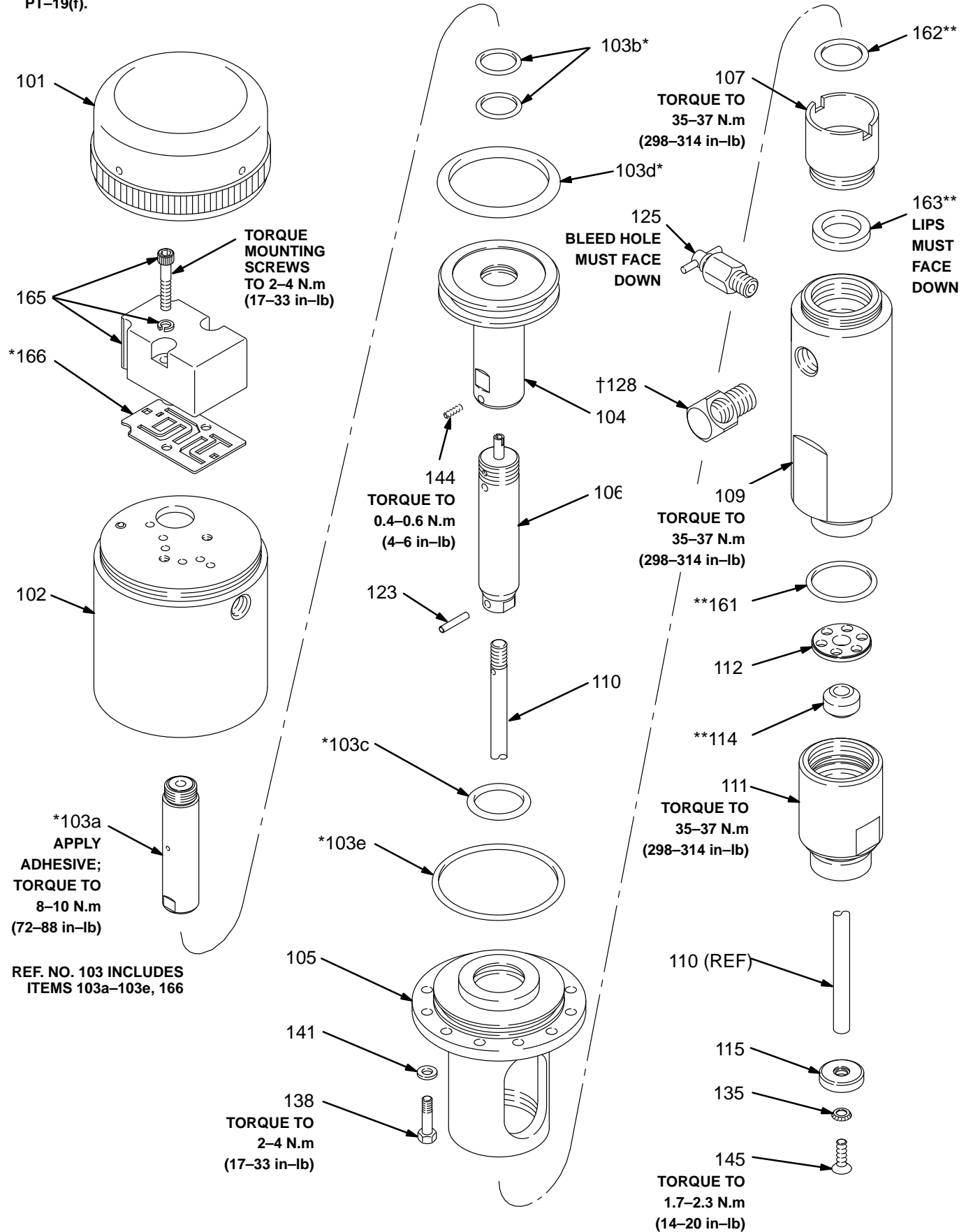
## HOW TO ORDER PARTS

- 1 To be sure you receive the correct replacement parts, kits or accessories, always give all of the information requested in the chart below.
- 2 Check the parts list to identify the correct part number; do not use the ref. no. when ordering.
- 3 Order all parts from your nearest Graco distributor.

6 digit Part Number	Qty	Part Description

# PARTS DRAWING (PUMP ASSEMBLY)

† STANDARD FLUID OUTLET FITTING 166–866 IS 1/4 npt(f).  
 OPTIONAL FITTING 186–475, SUPPLIED WITH 3 kg AND 1 kg  
 WIPER PLATE ASSEMBLIES 223–852 AND 223–854, IS 1/4  
 PT–19(f).



## PARTS LIST (PUMP ASSEMBLY)

REF NO.	PART NO.	DESCRIPTION	QTY	REF NO.	PART NO.	DESCRIPTION	QTY
101	186-273	CAP, cylinder; aluminum	1	135	110-895	WASHER, lock, serrated; 5.3 mm I.D.	1
102	223-949	CYLINDER, air motor	1	138	110-873	SCREW, cap, hex hd; M5 x 0.8;	6
103	223-895	AIR MOTOR REPAIR KIT				20 mm long	6
		Includes items 103a-103e, 166	1	141	110-874	WASHER, flat; no. 5	6
103a	—	* HOUSING ASSEMBLY, air valve		144	110-887	SCREW, set, socket hd; M3 x 0.5;	1
		(not sold separately)	1			10 mm long	1
103b	110-852*	. O-RING; polyurethane	2	145	110-881	SCREW, socket, flat-head;	1
103c	110-853*	. O-RING; buna-N	1			M5 x 0.8; 16 mm (5/8") long	1
103d	110-854*	. O-RING; buna-N	1	161	110-966**	O-RING; Teflon®	1
103e	110-855*	. O-RING; buna-N	1	162	110-955**	O-RING; Viton®	1
104	186-276	PISTON, air motor; aluminum	1	163	110-946**	PACKING, u-cup; glass-filled Teflon®	1
105	186-277	COUPLING, air motor; aluminum	1			and 304 stainless steel	1
106	186-279	PISTON, fluid; alloy steel	1	165	110-942	VALVE, air; includes item 166	1
107	223-744	WET-CUP/PACKING NUT;				and mounting hardware	1
		carbon steel, acetal	1	166	110-972*	. GASKET; fiber	1
109	186-305	HOUSING, fluid; aluminum	1	167	111-002	OPENER, can; plated carbon steel	1
110	186-304	ROD, priming piston; sst	1			(not shown)	
111	186-283	HOUSING, valve, intake; sst	1				
112	186-285	STOP; sst	1				
114	186-296**	VALVE, intake; acetal	1				
115	186-286	PISTON, priming; sst	1				
123	110-893	PIN, spring; 3.3 mm dia. x 16 mm long	1				
125	223-730	VALVE, bleeder, pump	1				
128	166-866	ELBOW, street; 1/4 npt (m x f)	1				
	186-475†	ELBOW, street;					
		1/4 npt (m) x 1/4 PT-19(f)	1				

\* Supplied in Air Motor Repair Kit 223-895.

\*\* Supplied in Pump Repair Kit 223-894. Kit also includes two Part No. 110-954 Teflon O-Rings, for use with wiper plate.

† Optional 1/4 PT-19 fitting is supplied with 3kg and 1 kg Wiper Plate Assemblies 223-852 and 223-854.

### HOW TO ORDER PARTS

- 1 To be sure you receive the correct replacement parts, kits or accessories, always give all of the information requested in the chart below.
2. Check the parts list to identify the correct part number; do not use the ref. no. when ordering.
3. Order all parts from your nearest Graco distributor.

6 digit Part Number	Qty	Part Description

**REFERENCE LETTERS A, B, C AND D  
REFER TO HOSE CONNECTIONS**



## PARTS LIST (RAM ASSEMBLY)

REF NO.	PART NO.	DESCRIPTION	QTY	REF NO.	PART NO.	DESCRIPTION	QTY
208	110-922	VALVE, ball; 1/4 npt(f) inlet x 1/4 npt(m) outlet	1	246	100-071	NUT; 3/4-16 nfs	2
213	156-971	NIPPLE; 1/4 npt	1	247	110-911	NUT, hex; M5 x 0.8	4
218	110-914	VALVE, air assist, pushbutton; normally closed	1	252	110-910	CYLINDER, air	2
224	186-291	CLAMP, pail	2	254	109-193	FITTING, tube, elbow; 5/32" (4 mm) O.D. tube x 10-32 unf(m)	3
226	110-931	TEE, union; 5/32" (4 mm) O.D. tube	2	255	110-552	FITTING, elbow; 0.156" (4 mm) O.D. tube x 1/8-27 npt(m)	4
227	110-318	REGULATOR, air; 0-180 psi (0-12.5 bar) regulated pressure range; 1/4 npt(f) inlet and outlet	2	256	110-930	BUMPER	4
230	108-190	GAUGE, air pressure; 0-100 psi (0-7 bar)	2	257	110-936	TEE, pipe; 1/4 npt(m) branch x 1/4 npt(f) run	1
231	100-839	ELBOW, street; 1/8 npt (m x f)	1	258	110-937	ELBOW; 1/4 O.D. tube x 1/4 npt(m)	2
232	110-209	NUT, panel	1	259	110-940	FITTING, tee, adjustable; 10-32 unf-2a (m) branch x 10-32 unf-2b (f) run	1
233	186-354	BRACKET, pump	1	264	110-947	WASHER, plain; 3/4"	2
234	223-779	BASE ASSEMBLY, elevator; carbon steel	1	275	186-532	TUBE, air; nylon; 0.180" (4.6 mm) I.D.; 570 mm (22.44") long	1
236	110-859	SWITCH, valve, air director	1	276	186-533	TUBE, air; nylon; 0.106" (2.7 mm) I.D.; 660 mm (26") long	1
237	110-932	CONNECTOR, male; 5/32" (4 mm) O.D. tube x 10-32 unf(m)	3	277	186-534	TUBE, air; nylon; 0.106" (2.7 mm) I.D.; 125 mm (4.92") long	2
239	110-888	SCREW, wing; M6 x 1.0; 16 mm (5/8") long	2	278	186-535	TUBE, air; nylon; 0.106" (2.7 mm) I.D.; 175 mm (6.89") long	1
240	186-361	RETAINER, nut; 3/8-24 unf-2b	2	279	186-536	TUBE, air; nylon; 0.106" (2.7 mm) I.D.; 350 mm (13.78") long	1
242	110-933	CONNECTOR, male; 5/32" O.D. tube x 1/4-18 npt(m)	1	280	186-537	TUBE, air; nylon; 0.106" (2.7 mm) I.D.; 45 mm (1.77") long	4
243	110-889	NUT, crown; 3/8-24 unf-2b	2	281	158-019	WASHER, plain; 0.442" size	2

### HOW TO ORDER PARTS

- 1 To be sure you receive the correct replacement parts, kits or accessories, always give all of the information requested in the chart below.
- 2 Check the parts list to identify the correct part number; do not use the ref. no. when ordering.
- 3 Order all parts from your nearest Graco distributor.

6 digit Part Number	Qty	Part Description

## PARTS DRAWING AND LIST (WIPER PLATE ASSEMBLY)

### Model 223-851 1 Gallon Size

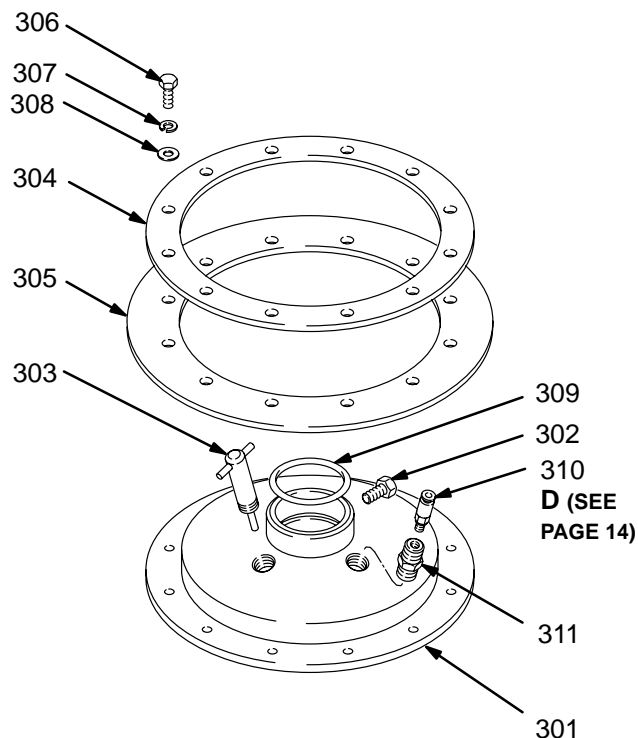
Includes items 301-311

### Model 223-852 3 Kg Size

Includes items 301-311

(also item 128, see pages 12, 13)

REF NO.	PART NO.	DESCRIPTION	QTY
301	186-306	PLATE, wiper; aluminum	1
302	110-880	SCREW, cap, hex hd; M5 x 0.8; 10 mm long	2
303	223-746	VALVE, bleed, wiper plate	1
304	186-307	RING, backup; carbon steel	1
305	186-362	RING, wiper; rubber (Used on Model 223-851)	1
	186-459	RING, wiper; rubber (Used on Model 223-852)	1
306	110-875	SCREW, cap, hex hd; M4 x 0.7; 12 mm long	12
307	110-919	LOCKWASHER, plain; no. 4	12
308	110-918	WASHER, flat; no. 4	12
309	110-954	O-RING; Teflon®	1
310	110-932	CONNECTOR, male; 5/32" O.D. tube x 10-32 unf-2a(m)	1
311	110-908	VALVE, check; 10-32 unf-2b(mbe) x 1/8-27 npt(f)	1



MODEL 223-851 SHOWN

### Model 223-853 1 Quart Size

Includes items 301-311

### Model 223-854 1 Kg Size

Includes items 301-311

(also item 128, see pages 12, 13)

REF NO.	PART NO.	DESCRIPTION	QTY
301	186-287	PLATE, wiper; aluminum	1
302	110-880	SCREW, cap, hex hd; M5 x 0.8; 10 mm long	2
303	223-746	VALVE, bleed, wiper plate	1
304	186-546	RING, backup; carbon steel	1
305	186-457	RING, wiper; rubber (Used on Model 223-853)	1
	186-458	RING, wiper; rubber (Used on Model 223-854)	1
306	110-875	SCREW, cap, hex hd; M4 x 0.7; 12 mm long	8
307	110-919	LOCKWASHER, plain; no. 4	8
308	110-918	WASHER, flat; no. 4	8
309	110-954	O-RING; Teflon®	1
310	110-932	CONNECTOR, male; 5/32" O.D. tube x 10-32 unf-2a(m)	1
311	110-908	VALVE, check; 10-32 unf-2b(mbe) x 1/8-27 npt(f)	1

### HOW TO ORDER PARTS

- 1 To be sure you receive the correct replacement parts, kits or accessories, always give all of the information requested in the chart below.
- 2 Check the parts list to identify the correct part number; do not use the ref. no. when ordering.
- 3 Order all parts from your nearest Graco distributor.

6 digit Part Number	Qty	Part Description



## ACCESSORIES

### USE GENUINE GRACO PARTS AND ACCESSORIES

*Must be purchased separately.*

#### **POLYURETHANE CONVERSION KIT 223–939**

Converts u-cup throat packing to polyurethane.  
Consists of:

Part No.	Description	Qty
110–945	PACKING, u-cup; polyurethane and Viton®	1
186–296	VALVE, intake; acetal	1
110–954	O-RING; Teflon® (for use with wiper plate)	1
110–955	O-RING; Viton®	1
110–966	O-RING; Teflon®	1

#### **GROUND 6.3 mm (1/4 in.) NEOPRENE AIR HOSE**

*18 bar (250 psi) MAXIMUM WORKING PRESSURE*

Part No.	ID	Length	Thd. Size
200–033	6.3 mm (1/4")	1.8 m (6 ft)	1/4 npt(m)
200–991	6.3 mm (1/4")	3.1 m (10 ft)	1/4 npt(m)

#### **BLEED-TYPE MASTER AIR VALVE**

*18 bar (250 psi) MAXIMUM WORKING PRESSURE*

**110–223** 1/4 npt(fbe)

**110–224** 3/8 npt(fbe)

For use as a pressure-relieving main air valve, and to isolate the air line accessories for servicing.

#### **AIR LINE FILTER 110–146**

*21 bar (300 psi) MAXIMUM WORKING PRESSURE*

1/4 npt(f) inlet and outlet; .030 liter (1 oz) bowl capacity;  
20 micron polypropylene element

#### **AIR LINE LUBRICATOR 110–148**

*21 bar (300 psi) MAXIMUM WORKING PRESSURE*  
.030 liter (1 oz) bowl capacity; 1/4 npt(f) inlet and outlet

#### **AIR REGULATOR 110–318**

*21 bar (300 psi) MAXIMUM WORKING PRESSURE*  
0–14 bar (0–180 psi) Regulated Pressure Range;  
1/4 npt(f) inlet and outlet.

#### **AIR FILTER/REGULATOR/LUBRICATOR 110–320**

*21 bar (300 psi) MAXIMUM WORKING PRESSURE*  
Includes 110–146 Filter, 110–148 Lubricator, and  
110–318 Regulator. 1/4 npt(f) inlet and outlet.

#### **FLUID HOSE 186–578**

*110 bar (1600 psi) MAXIMUM WORKING PRESSURE*  
6.3 mm (1/4 in.) I.D. polyethylene hose, coupled 1/4 npt  
(mbe), 0.9 m (3 ft) long.

#### **WIPER PLATE SHIELD KIT**

Covers the wiper plate to keep it clean. Kit includes 10  
polyethylene shields.

**223–947** Fits 1 quart and 1 kg size plates.

**223–948** Fits 1 gal. and 3 kg size plates.

#### **THROAT SEAL LIQUID (TSL)**

Non-evaporating solvent for wet-cup

**206–995** 1 quart (0.9 liter)

**206–996** 1 gallon (3.8 liter)

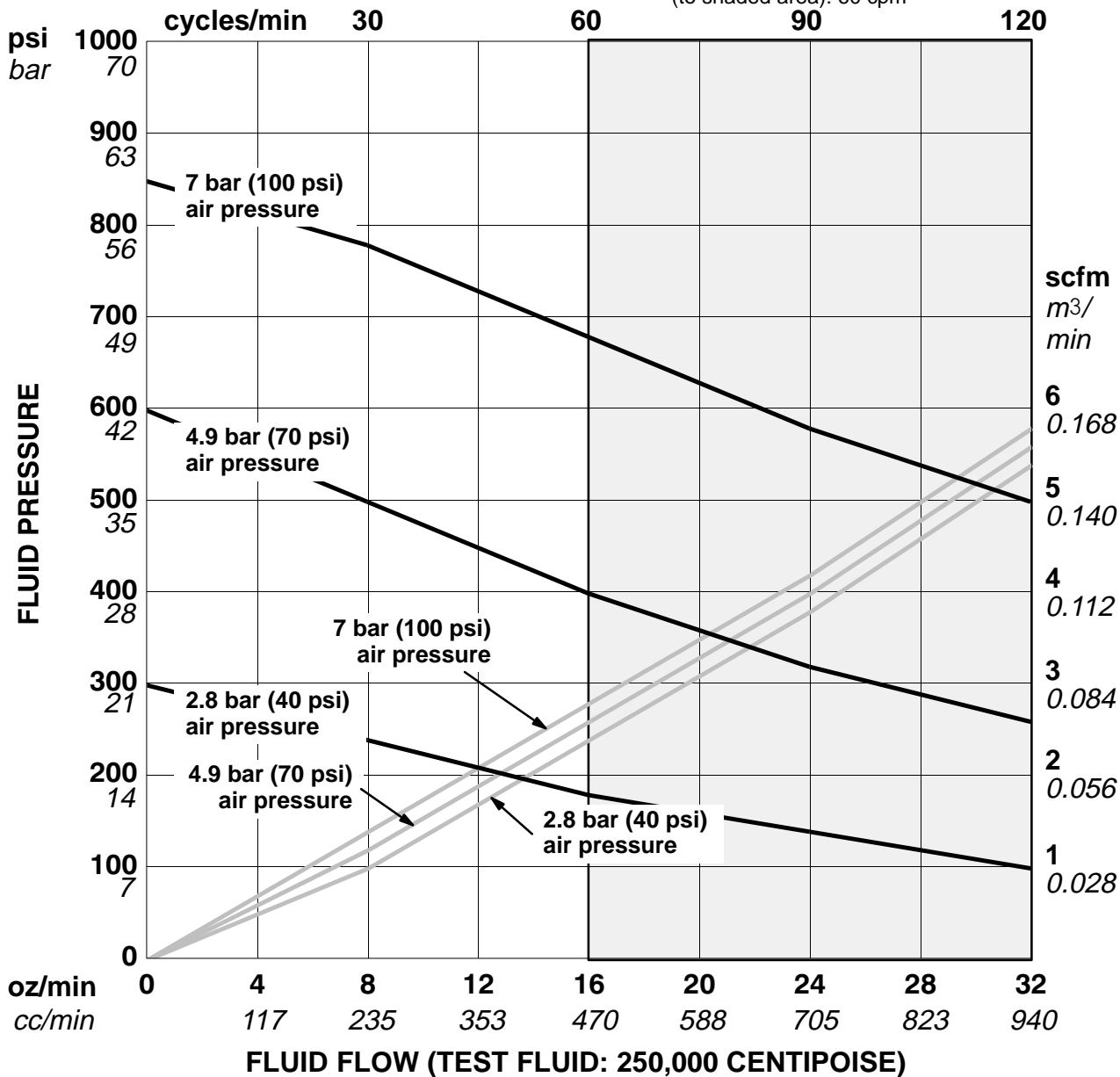
## TECHNICAL AND PERFORMANCE DATA

Maximum fluid working pressure	60 bar (850 psi)
Air input pressure range	1.8–7.0 bar (25–100 psi)
Maximum fluid viscosity	600,000 cps
Volume per stroke (dispenses on downstroke only)	5.0 cc (0.17 oz)
Recommended pump speed for continuous operation	40 cpm
Maximum recommended pump speed	60 cpm
Maximum flow (250,000 cps fluid)	940 cc/min (32 oz/min); 0.162 m <sup>3</sup> /min (5.8 scfm) air consumption at 7 bar (100 psi)
Stroke length	19 mm (3/4 in.)
Maximum pump operating temperature	60°C (140°F)
Air inlet size	1/4 npt(f)
Fluid outlet size	1/4 npt(f) standard; 1/4 PT-19(f) optional
Weight	7.25 kg (16 lb)
Wetted parts	Aluminum, alloy steel, carbon steel, stainless steel Teflon®, Viton®, acetal

Teflon® and Viton® are registered trademarks of the DuPont Co.

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

**NOTE:** Recommended pump speed for continuous operation: 40 cpm  
Maximum recommended pump speed (to shaded area): 60 cpm



### FLUID FLOW (TEST FLUID: 250,000 CENTIPOISE)

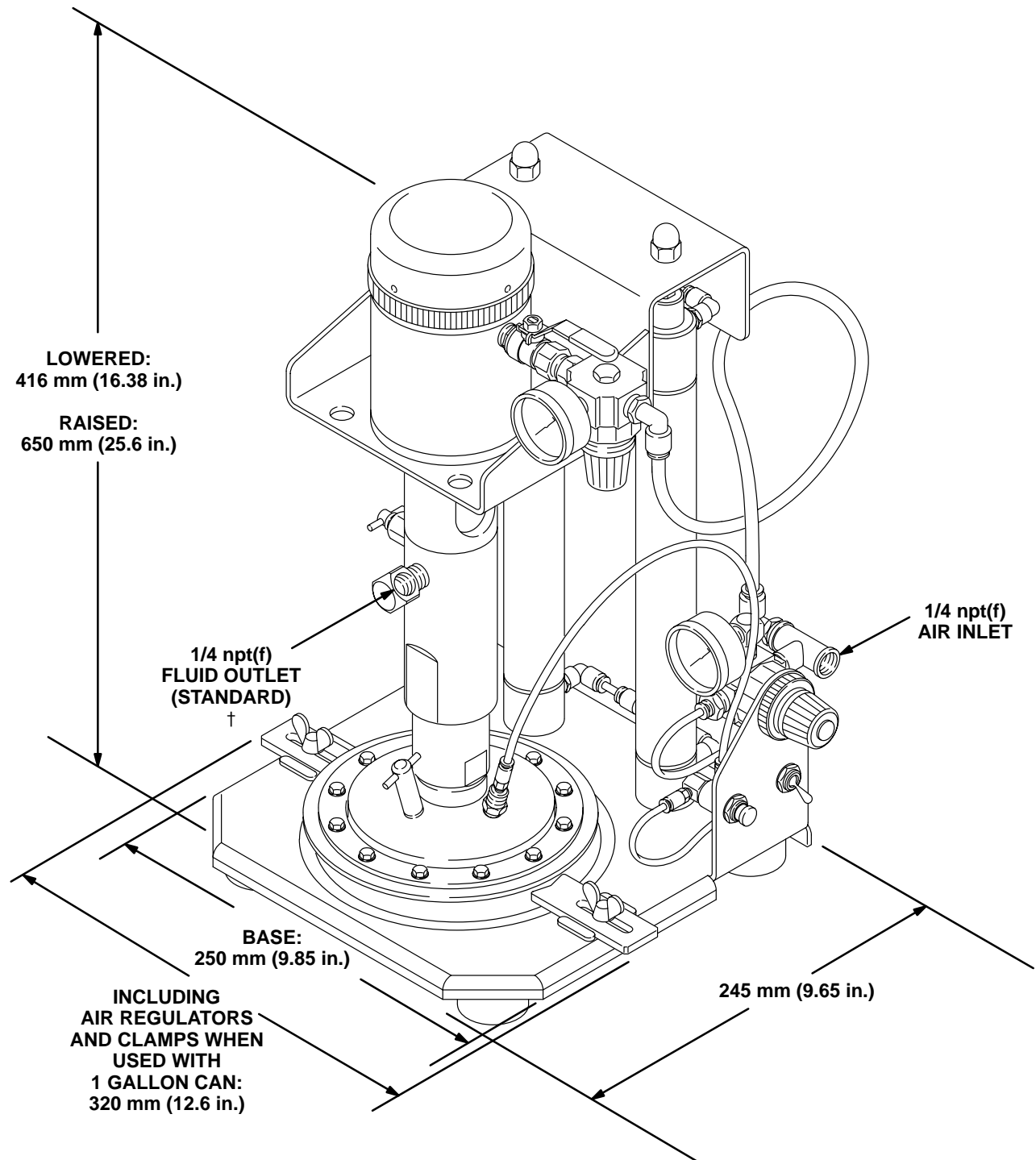
**To find Fluid Outlet Pressure** (bar/psi) at a specific fluid flow (ccm or oz/min) and operating air pressure (bar/psi):

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

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

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

## DIMENSIONAL DRAWING



† OPTIONAL FLUID OUTLET FITTING SUPPLIED  
WITH 3 kg AND 1 kg WIPER PLATE ASSEMBLIES  
223-852 AND 223-854 IS 1/4 PT- 19(f).

## 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 from the date 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 PRODUCT 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.

## IMPORTANT PHONE NUMBERS

**TO PLACE AN ORDER**, contact your Graco distributor, or call this number to identify the distributor closest to you: **1-800-328-0211 Toll Free**

**FOR TECHNICAL ASSISTANCE**, service repair information or assistance regarding the application of Graco equipment: **1-800-543-0339 Toll Free**

**Factory Branches:** Atlanta, Chicago, Dallas, Detroit, Los Angeles, West Caldwell (N.J.)  
**Subsidiary and Affiliate Companies:** Canada; England; Switzerland; France; Germany; Hong Kong; Japan  
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