

INSTRUCTIONS-PARTS LIST



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

Corrosion-Resistant

CROWN IMPERIAL and

Standard

IMPERIAL CENTRIFUGAL PUMPS

Electric, Multi-Stage. Open Stand Mounted Centrifugal Pumps for Circulating Systems
250 psi (17 bar) MAXIMUM WORKING PRESSURE

U.S. Patent 4,621,975

PUMP MODEL CHART

No. of Stages	Crown Imperial Pump (Corrosion Resistant)		Imperial Pump (Standard)	
	Model No.	Series	Model No.	Series
4	218-004	F	217-404	B
5	218-005	F	217-405	B
6	218-006	F	217-406	B
7	218-007	F	217-407	B
8	218-008	F	217-408	B
10	218-009	F	217-409	B
	218-010	F	217-410	B
11	218-011	F	217-411	B
12	218-012	F	217-412	B

Pump Stand Part No. 217-347

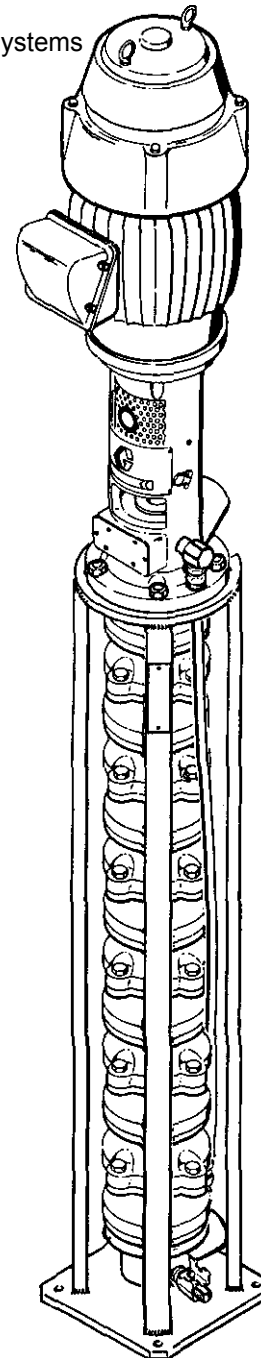
For mounting Crown Imperial and Imperial Pumps
 Must be ordered separately.

Standard U-Frame end Energy-Efficient Electric Motors are available. See page 15.

NOTE: These pumps contain no brass, aluminum or zinc.

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WARNING

GROUNDING AND ELECTRICAL WIRING

Be sure the pump, the object being sprayed, and all related equipment is properly grounded to reduce the risk of shock, fire or explosion caused by static sparking which can result in serious bodily injury and property damage.

Have a qualified, licensed electrician perform all wiring and grounding in accordance with all applicable safety codes in your area.

Consult the electric motor manufacturer for the proper heater-breaker requirements.

SYSTEM PRESSURE

Never operate the pump at more than **250 psi (17 bar) MAXIMUM WORKING PRESSURE** to reduce the risk of component rupture which could result in serious bodily injury and property damage, and cause premature bearing and seal failure.

Never run the pump for more than **10** seconds without fluid circulating through it to avoid overheating the pump and damaging it.

KEEP CLEAR OF MOVING OR HEATED PARTS

Keep your fingers and hands away from the moving parts in the pump housing while the pump is operating to reduce the risk of amputation.

Keep all tools, etc. away from the moving parts to reduce the risk of accidentally catching and breaking them in the moving parts, which could cause broken pieces to be projected into the air, and cause serious bodily injury as well as pump damage.

Do not touch the pump housing or pump shaft couplers, which **become** heated during operation, until they have cooled, to reduce the risk of burning yourself.

Always shut off all electric power to the pump before attempting to service or adjust the pump to reduce the risk of electric shock and serious injury from moving parts.

Before removing the pump for repair, shut off the electric power, relieve the system pressure, and drain the pump by opening the drain valve (Y) at the pump base, to **reduce** the risk of serious bodily injury from shock, moving parts, or pressurized fluid.

TYPICAL INSTALLATION

KEY

- A Supply Line to Solvent
- B Return Line
- C Back Pressure Valve
- D Flowmeter
- E Return Valve
- F Motor
- G Pressure Gauge
- H Check Valve
- J Filter Bypass Valve
- K Filter
- L Supply Line to Work Station
- M Filter Drain Valve
- N Agitator
- P Shutoff Valve
- Q Outlet Valve
- R Pump Stand
- S Pump Outlet
- T Tee
- U Shutoff Valve
- V Shutoff Valve
- W Elbow
- Y Mix Tanks
- Z Bag Filter
- 80 Pump Drain Valve

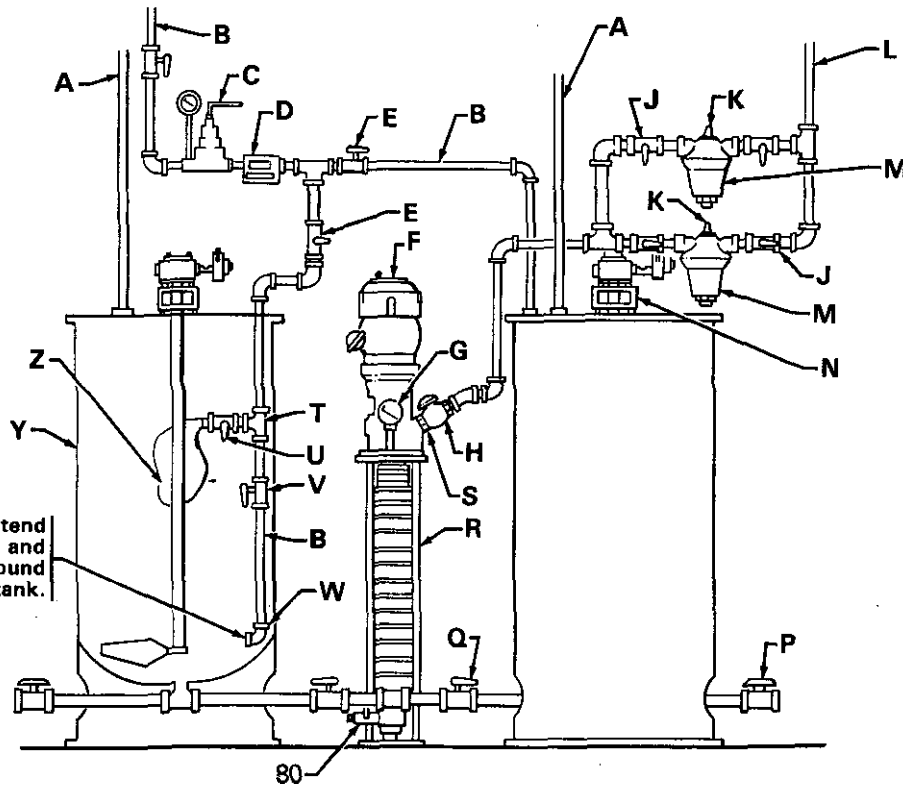


Fig 1

INSTALLATION

Grounding and Electrical Wiring

WARNING

Ground the pump in accordance with all applicable safety codes in your area. Proper grounding reduces the risk of shock, fire or explosion caused by static sparking, which can result in serious bodily injury and property damage.

1. Have a licensed electrician complete the electrical hookup and wiring.
2. Consult the electric motor manufacturer for proper heater-breaker requirements.
3. Before coupling the pump coupler to the motor shaft coupler, check to be sure the shaft rotates in the proper direction.

System Design

The Typical Installation shown above, and the following text, is only a guide to show the relationship of the pump to other system components. Due to the pressure characteristics of the pump, which vary widely with viscosity and specific gravity, professional systems design is essential. Contact an application engineer at one of the following locations for assistance:

Graco Detroit (313)471-0500
 Graco Chicago (312)678-7200
 Graco Minneapolis (612)623-6300

Pump dimensions and the mounting hole layout are shown on page 15. Accessories are shown on page 14. The Technical Data is given on the back cover.

A large bulk tank provides a pressure head for easy pump startup.

Fluid Lines

Line sizes depend on the flow requirements and calculated pressure drop due to the length of the run.

The pipe, tubing and fittings must be compatible with the fluid and solvent you plan to use.

Keep in mind that sharp corners and fittings between lengths of pipe or tubing may cause flow restrictions and fluid breakdown. Use the longest lengths of pipe or tubing available to minimize couplings. Use the most direct route to the spray stations, and whenever practical, use long sweeping bends. A "holsclaw" bender is recommended for making bends in tubing; a common electrician's or plumber's bender is not satisfactory.

Remove burrs, dirt and contaminants from the ends of the tubes before installing the fittings.

Return Line

Install a back pressure valve (C) to maintain proper line pressure to all outlets. Install a flowmeter (D) to visually check the fluid flow rate.

If using water-reducible paint, extend the return line (B) going into the mix tank (Y) to the bottom of the tank and end it with an elbow (W). The elbow directs fluid around the walls of the tank to help minimize air entrainment in the fluid.

Near the top of the mix tank, install a tee (T), a shutoff valve (U) and a bag filter (Z).

NOTE: The bag filters (Z) are used only while flushing the pump and must not be used during normal operation.

Supply Line

Install a line check valve (H) near the 2 in. npt(f) pump outlet.

CAUTION

The line check valve (B) is required to prevent fluid backflow into the pump in case of a power failure or incorrect operating procedure.

Install a pressure gauge (G) at the plugged 1/2 npt(f) port at the left of the pump outlet. Make sure the gauge is correctly sized for the operating pressure.

Install two fluid filters (K) with bypass valves (J) on each side. This allows the system to be used while cleaning a filter.

Mounting the Pump

Secure the pump, **without the motor**, in the pump stand (R), with the bolts provided.

Be sure the pump inlet and the plumbing to the mix tanks are at the same level. Install the necessary plumbing, **use** shims as necessary, and then bolt the pump stand and the tanks to the floor.

After All Lines Are Installed

Flush all lines with a compatible solvent and blow out with air, then clean the elements of the filters (K).

Installing the Motor

Remove the protective cover and the shipping dowel from the pump base (46). Remove the motor coupler (41 or 42).

Place the motor coupler on the motor shaft, pushing it up, well beyond the end of the shaft (50). Lightly snug the setscrew.

Lower the motor onto the pump base, making sure the motor locating flange seats properly on the pump base.

Loosen the motor coupler setscrew and pull the coupler down to engage with the pump coupler (86) and coupling insert (8).

Adjust the motor coupler to 0.094 in. (2.39 mm) clearance. **See** Fig 2. Tighten the pump coupler setscrew.

Remove the shaft holddown tool (85) and install the gasket (48) and plug (47) only after the pump is firmly mounted in its stand. **See** Fig 3.

CAUTION

The shaft holddown tool and bolt holds the shaft and impeller assembly firmly to prevent damage **to** the face seal (116) when the pump **is** moved. The gasket and plug are installed only when the pump is firmly mounted in its stand.

Whenever you move the pump, even a few feet, and whenever instructed in the repair section, remove the gasket and plug and install the shaft holddown tool and bolt.

CAUTION

1. Before operating the pump, turn the motor coupler by hand to be sure the shaft rotates freely. Then recheck the **0.094 in. (2.39mm)** coupler clearance.

2. The pump is factory-set to deliver maximum outlet pressure. **Do not** tamper with this adjustment which could cause damage to the impellers and bowls and void the warranty.

3. Never leave any contaminants, such as nuts, bolts, rags, etc., in the fluid tank or supply lines which could seriously damage the impellers or bowls.

0.094" (2.39 mm)

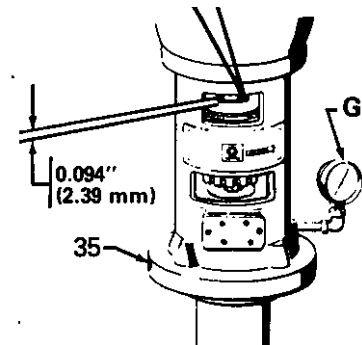


Fig 2

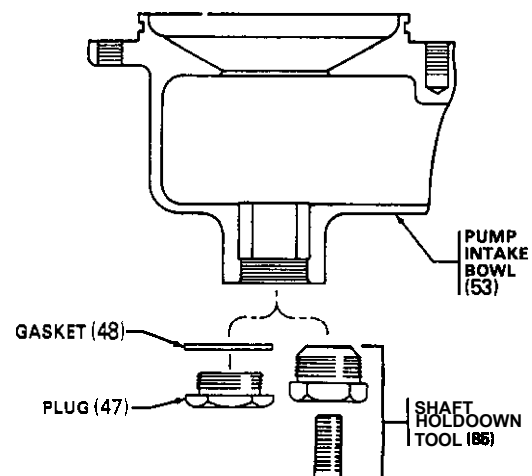


Fig 3

OPERATION

Cleaning, Flushing and Priming **System** (See Fig 1 and 2)

CAUTION

1. Don't let the pump run dry.
2. Be sure the motor rotates in the correct direction and the drive coupler clearance is set at 0.094 in. (2.39 mm). See Fig 2.
3. Be sure the circulating lines are flushed clean and primed with fluid as instructed below.
4. If the motor labors or the pump doesn't run smoothly, check the motor for high amp draw and the thrust bearing for overheating. The normal operating temperature is from 100° to 120° F (38° to 49° C). If the temperature is higher than 120° F (49° C), consult a qualified Graco representative after a repeat check of the drive coupler clearance.

The procedure given here is for an open stand-mounted pump, two mix tank system as shown in the TYPICAL INSTALLATION. Some specific instructions may not apply to other systems; consult your plant's flushing procedures. Flushing is important; it cleans all equipment and lines of impurities. Following these instructions will help assure satisfactory operation with quality control.

Clean the inside of the mix tanks. Close the outlet valves (Q) of both tanks. Pour about 100 gallons (380 liters) of your fluid's solvent into each tank. Open the outlet and return valves (Q & E) on one tank only.

Attach a cheese cloth bag (Z) of six layers minimum thickness to the return line in the tank as shown in Fig 1 on page 2. Open the valve (U) and close the valve (V).

Startup Procedure

CAUTION

This startup procedure must be integrated with your overall system startup procedure to avoid damage to system components. Contact Graco Detroit (313)471-0500, if you have any questions.

1. Open the inlet and outlet valves all the way to prime the pump.
2. Open the seal chamber needle valve (24) to vent the seal chamber air. When fluid is flowing freely through the tube (70), the pump is primed. Now close the needle valve.

NOTE: If fluid does not flow freely through the tube, leave the needle valve open, place a container under the valve, then start the pump. When fluid flows freely through the tube, close the needle valve.

CAUTION

If the pump is started without fluid flowing freely from the needle valve, the face seal (16) will be damaged and the warranty may be voided. Recheck step 2, above, if there is no fluid flow.

3. Start the pump motor.
4. Partially close the outlet valve to build approximately 100 psi (7 bar) pressure. Continue this until lines are full and pressure builds to pump capacity. Open outlet valve to full flow and adjust line pressure and flow to system requirements.

5. Recheck the fluid flow through the needle valve to be sure all air is purged from the pump. Then close the needle valve.
6. Shut off the pump, then recheck the coupler clearance (0.094 in./2.38 mm).

CAUTION

The pump coupler and bearing could move up during shipment and then, when the pump is operated, it could move down, leaving too much clearance. This could damage both the coupler insert and the coupler.

7. Start the pump again and reopen the needle valve. Close the needle valve when the fluid flows freely in a steady stream.
8. Recheck the system pressure, flow rate and motor amp draw.

CAUTION

All air must be bled from the pump before operating it to help keep the mechanical face seal (16) cool. Be sure to bleed the air whenever instructed in the startup procedure.

CAUTION

Never exceed 250 psi (17 bar) MAXIMUM WORKING PRESSURE to avoid premature wear of the pump thrust bearing.

Continue cleaning...

Restart the pump and check the entire system for leaks. Tighten leaking joints as necessary. Continue circulating, changing cheese cloth bags and solvent as needed until the system is thoroughly cleaned. Periodically check for leaks during flushing.

When the system is clean, stop the pump and disconnect the return line from the back pressure valve (C) and direct the line into an empty waste container. Drain all filtered residue from the filters. Reconnect the return line to the back pressure valve. Close the valve (U) and open the valve (V). Remove cheese cloth bag.

Close the outlet and return valves (Q & E) for the tank being used and open the outlet and return valves for the other tank. Start the pump and circulate the solvent for at least one hour, changing cheese cloth bags as needed. While circulating, open the spray gun at each drop and flush the hoses with about one gallon (4 liters) of solvent. Also open the filter drain valves (M) to flush out all filtered residue.

When flushing is complete, stop the pump and drain all solvent from the tanks and lines. Thoroughly blow out the entire system with clean, dry compressed air, or nitrogen, to remove all solvent from the system.

Fill a tank with paint and start the agitator (N). Start the pump. Use the bypass filter valve (J) to control the pump flow to 50 psi (3.5 bar) until the lines are full, and then open the valve completely. Circulate the paint until all air is removed from the fluid lines. While the paint is circulating, check and adjust the viscosity as necessary.

Fill the other mix tank with paint and start the agitator. Leave the agitator running so that paint in the standby tank will be ready for use when needed. To keep air out of the system, always switch to the standby tank before the paint supply in the tank you have been using is completely exhausted.

Consult the paint supplier for a compatible solvent for flushing paint from the system. Water reducible paints should use deionized water and a solvent which will keep resin in the solution. If water reducible paint has a 20% solvent content, the flush media should also contain approximately 20% solvent.

Adjusting System Pressure

Use the back pressure valve (C) to adjust the system pressure. Determine the line pressure required and, with paint circulating in the line loop only, set the back pressure valve so that the pressure at the last spray gun is 10 psi (10.7 bar) greater than needed. Refer to the "TYPICAL INSTALLATION" drawing on page 2 and the separate back pressure valve instructions.

The available pressure at the pump is shown by the gauge (G) installed at the pump base ahead of the main line shutoff valve and filters. See page 2. Normal return line fluid pressure is about 30 psi (2 bar).

CAUTION

The pump is set at the factory to deliver the maximum volume and outlet pressure. The pressure cannot be increased by any adjustment of the pump. Refer to Thrust Bearing Replacement Section, page 7, for proper adjustments.

NOTE: The drain valve (80) in the intake bowl (53) can be used to drain fluid from the pump. First close the outlet valves (Q) from the supply tanks, and provide a tube from the drain valve to a waste container. See the "TYPICAL INSTALLATION" on page 2.

LUBRICATION

NOTE: The bearing is factory-greased. Do not grease again until 30 days after startup.

Lubricate the thrust bearing once a month if the pump is operating continuously. To lubricate the bearing, pump one or two shots (about 0.1 oz/2.8 grams) of the specified grease through the fitting on the top of the seal retainer. See Fig 4.

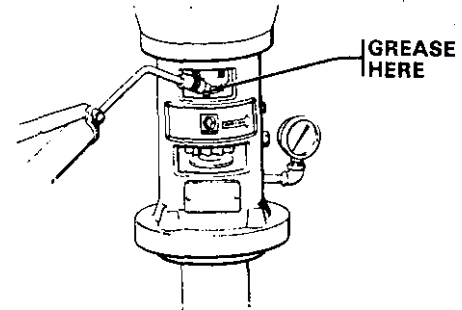


Fig 4

CAUTION

Use only Chevron SRI/No. 2 NLGI grade grease. This green-colored grease is used for the factory pack and must not be mixed with any other type of grease to prevent bearing overheating and premature bearing failure. See the ACCESSORIES section on page 14 for ordering this grease.

CAUTION

Do not overgrease the pump, which may cause the bearing to overheat. Remove any excess grease after lubricating.

REPAIR

NOTE: Graco offers a rebuilt program on all Imperial and Crown Imperial pumps. Contact your local sales representative for details.

WARNING

Before removing the pump for repair, shut off the electric power, relieve the system pressure, and drain the pump by opening the drain valve at the pump base, to reduce the risk of serious bodily injury from electric shock, moving parts, or splashing fluid in the eyes.

CAUTION

DO NOT leave the outlet valve closed for more than 10 seconds while the pump is operating to avoid damage to the seals and bearings caused by overheating.

Be sure to remove the gasket (48) and plug (47) from the intake bowl (53) and install the shaft holddown tool (85) in its place before moving the pump to, avoid damage to the face seal (16).

To avoid costly damage to the pump, follow this repair procedure carefully. Do not attempt to repair anything that is not mentioned in the repair section.

Troubleshooting Guide

PROBLEM	CAUSE	SOLUTION
Pump won't run	<ol style="list-style-type: none"> 1. Electric power out 2. Fuses blown 3. Motor inoperative 	<ol style="list-style-type: none"> 1. Check fuses, clean terminals and connections. 2. Check coupler clearance, replace fuses, repair pump (call Graco Detroit). 3. Repair or replace motor.
Pump runs but pressure drops slightly	<ol style="list-style-type: none"> 1. Clogged pump intake 2. Increased flow rate 3. Parts worn or damaged 4. Air entrainment in fluid 	<ol style="list-style-type: none"> 1. Remove and clean. 2. Adjust back pressure valve. 3. Repair pump. 4. *Purge air. See Startup Procedure on page 4.
Pump runs but pressure very low or unsteady	<ol style="list-style-type: none"> 1. Clogged pump inlet 2. Air entrainment in fluid 	<ol style="list-style-type: none"> 1. "Clean. 2. *Purge air. See Startup Procedure on page 4.
Fluid leaking	<ol style="list-style-type: none"> 1. Screws or fittings loose 2. Parts worn or damaged 3. Clogged bypass drain 	<ol style="list-style-type: none"> 1. Tighten. 2. Repair pump. 3. Clean.
Noisy pump	<ol style="list-style-type: none"> 1. Improper coupler clearance 2. Motor not seated properly to pump housing 3. Lack of grease in main thrust bearing. 	<ol style="list-style-type: none"> 1. Assure 0.094 in. (2.39 mm) clearance. See Fig 2, page 3. 2. Loosen motor mount nuts, clean flange, and rotate motor to seat properly. 3. See Lubrication on page 5; Check for worn shaft bearings.
Coupler insert (7) wears out prematurely	<ol style="list-style-type: none"> 1. Motor not seated properly to pump housing 	<ol style="list-style-type: none"> 1. Loosen motor mount nuts, clean flange, and rotate motor to seat properly; check seal for damage.

***Before removing the pump for cleaning**, close the outlet line valves and note the maximum pump pressure. The pressure should be steady. If pressure variations or pulsations are noted, the problem could be a clogged intake, too low a fluid level in the tanks, or restricted plumbing. Correct the clogged condition to obtain steady pressure. Low pressure can also be caused by air entrainment in water reducible fluids. All return lines in tanks with water reducible fluid must be routed to the bottom of the tank. **Be** careful to avoid allowing deteriorated pieces of bag filters into the pump which can result in serious damage to the pump. If the pump must be removed be sure to install the shaft hold-down tool.

13. If the pump is mounted in a repair stand, install the shah locating tool. See Fig 15, page 11.
14. Slide the new face seal (B) over the nipped end of tool 178-778 and leave it there for a couple of minutes to pre-form the O-ring in the seal. Refer to Fig 6.
15. Meanwhile, remove the setscrews from the seal, place medium-strength thread sealant on the threads, and screw them back into the seal.
16. Insert the face seal into the open end of tool 178-778 as shown in Fig 6. Use a hex key wrench to back out the setscrews just enough to engage them in the holes of the tool.

CAUTION

The special assembly tool 178-778 must be used to install the face seal (Z) to prevent compressing the bellows and permanently damaging the seal.

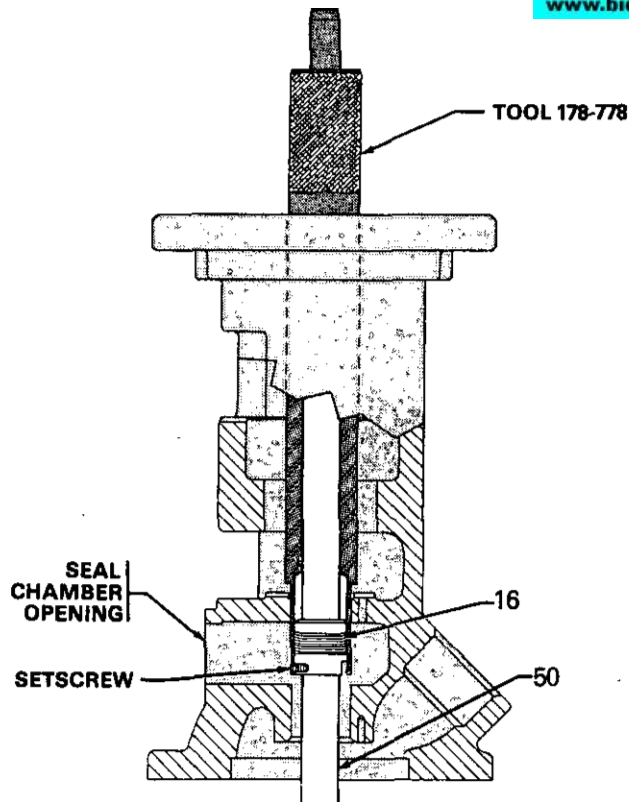


Fig 6

17. Use the Chevron** lubricating grease to lubricate the O-ring inside the face seal (Z). Slide tool 178-778, with the seal installed in it, over the pump shaft, pushing it down until the tool bottoms. Working through the seal chamber opening, use a hex key wrench to turn in the setscrews just enough to free and remove the tool. See Fig 6.

18. Assemble the gasket (Y) and seal support (X) and install in the pump base. Install the three screws (18). Refer to Fig 5, page 7.

19. Replace the shaft seal (12) in the adjusting nut (52). Install the adjusting nut, engaging just one thread in the pump base (146). See Fig 5.

20. Position the bearing support (32) on the adjusting nut (52) so the adjusting nut pin and the slot in the support align.

21. Screw the adjusting nut (52) down just until the bearing support (32) bottoms on the housing. Then turn the nut back 1 to 1-1/2 turns to re-engage the bearing support.

22. Slide the coupling assembly (86) over the shaft (50).

23. Align the keyway and insert the key (86d) between the coupling assembly and shaft.

24. Use the special tool, 178-779, to check the shaft location dimension. See Fig 7, page 8. Place the tool on the face of the coupler, between the coupler tabs as shown in the detail of Fig 7. The tabbed portion of the tool should touch the top of the shaft (50). Screw the adjusting nut (52) up until you attain the 0.25 in. (6.8mm) dimension.

25. Install the shaft nut (40) using a socket wrench and bottom it on the coupling assembly (86).

26. Align the hex of the nut retainer plate (86c) with the shaft nut (40) and secure the lockwire (86d).

27. Install the two holddown screws, washers, and springs (114, 15, 37). Bottom the screws and check the vertical travel of the retainer against the spring. If the shaft nut and bearing are properly installed, the retainer should lift 0.12 to 0.19 in. (3.2 to 3.8 mm) before the springs are solidly compressed.

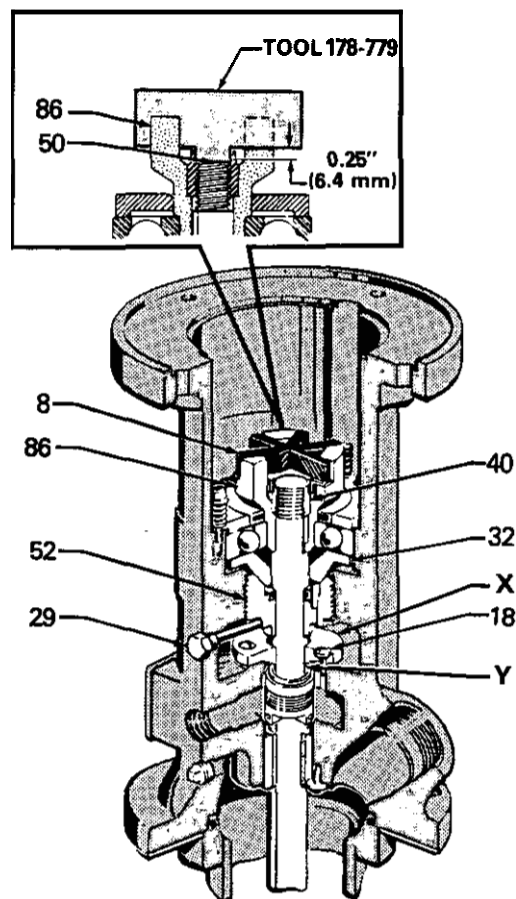


Fig 7

28. If the pump is mounted in an assembly stand, loosen the shaft holding tool. See Fig 15, page 9. Turn the bearing adjusting nut (52) seven notches to the right to raise the impellers off the bowls. See Fig 8. Now turn the pump coupler (56) to be sure the shaft rotates freely.

If the repair is being done in the stand, turn the bearing adjusting nut (52) up until the shaft rotates freely. Then raise it another seven notches to raise the impellers off the bowls. See Fig 8.

29. Insert the lock screw (29) through the pump base and into the hole in the adjusting nut without forcing it. Install the screw (39). If necessary, turn the nut a little in the same direction as pump rotation until the screw goes easily. Tighten the screw securely and reattach the lock wire (38) and crimp. Refer to Fig 8.

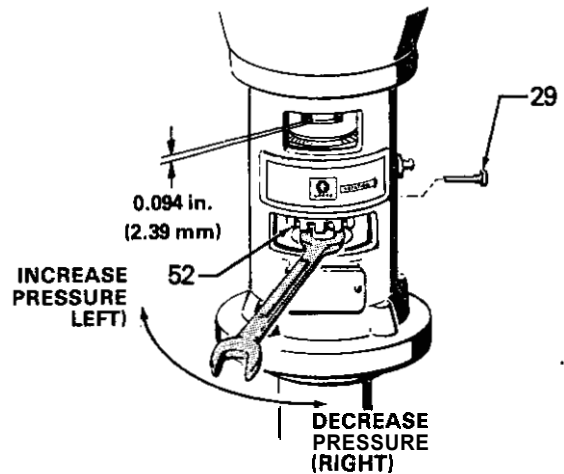


Fig 8

CAUTION
The face seal adjustment described in Step 30 below, is critical to proper operation. Be very careful while adjusting the face seal not to over-compress the bellows which will permanently damage the seal.

30. Insert a screwdriver through the seal chamber opening and gently lift the face seal (16) from the bottom until it contacts the seal housing. Use special tool 178-777 to check the face seal adjustment. The widest part of the tool is the 1.25 in. (31.8 mm) required face seal dimension.

Gently compress the bellows of the face seal, then place the wide end of the tool parallel to one side of the face seal. Be sure the tool measures from the top to the bottom of the seal. When the proper setting is attained, torque the setscrews in the seal to 20-25 in-lb (2.3-2.8 N·m). Then recheck the setting. Refer to Fig 9.

31. Install the gasket (30), seal chamber cover (31) and screws (3) on the front of the pump base.
32. Install the rubber coupling insert (8) and remount the motor. Refer to Fig 2, page 3.
33. Start the pump. Be sure to follow the **STARTUP PROCEDURE** on page 4.

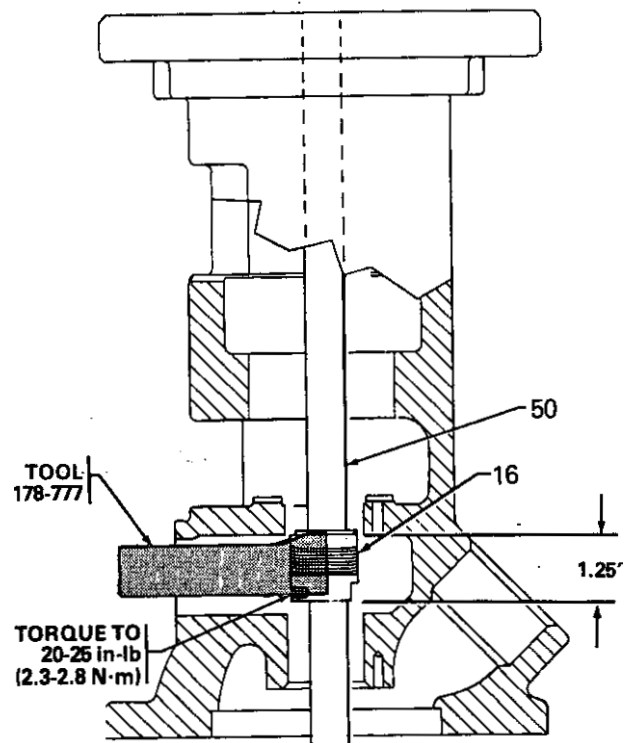


Fig 9

CAUTION
DO NOT leave the outlet valve closed for more than 10 seconds while adjusting the nut (52) to avoid damage to the seals and bearings caused by overheating.

34. Shut the pump off and recheck the coupler clearance; Readjust if necessary to 0.094 in. (2.39 mm). Refer to Fig 5.

Repairing Shaft Bearings, Impellers and Seals

Disassembly

NOTE: Install the shaft holddown tool (85). Remove the pump from the standpipe before continuing.

1. Support the pump in a vertical position on the accessory assembly stand 953-912 **which should be bolted to the floor for stability**. Lock the pump in place. Refer to Fig 10.
2. Follow the disassembly procedure, Steps 1-12, on page 7.
3. Remove the capscrews (17) at the top flange of the impeller bowl (54). Refer to the Parts Drawing.
4. Lift the pump base (46) straight up, off the shaft (50). Avoid bending the shaft by unequal pulling with a hoist or pry bars.
5. Disassemble the impeller bowls, working from the top down.
 - a. Hold the first impeller with a spanner wrench 953-913 and use a close fitting wrench to loosen the impeller nut (49) one and a half turns. Refer to Fig 10.
 - b. Place a soft steel protecting bushing (0.75 in/19 mm) ID with a smooth turned end, on top of the hex nut. Use a sharp downward blow with a 1 foot (300 mm) length of pipe or tube over the shaft to loosen the collet (28). See Fig 11.
 - c. Remove the collet and impeller (33). Do not pry on the impeller.
 - d. Remove all of the impeller bowl assemblies in this way.
 - e. Remove the shaft holddown tool (85).
6. Inspect the shaft for signs of scoring or wear and replace it, if needed. Check all bowls and impellers for wear or damage and replace as needed. Install new O-rings (13) on all impeller bowls and the intake bowl, then lubricate the O-rings in place. Be sure the impeller nuts (49) rotate freely on the collets.

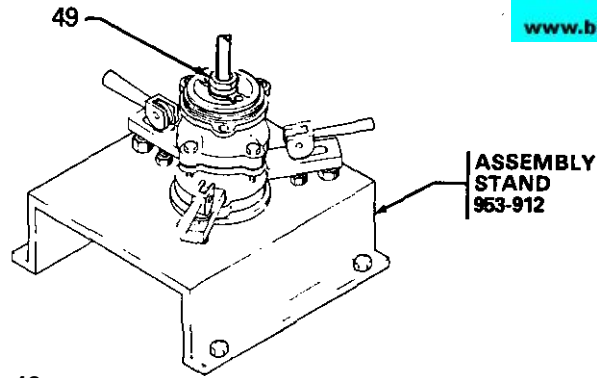


Fig 10

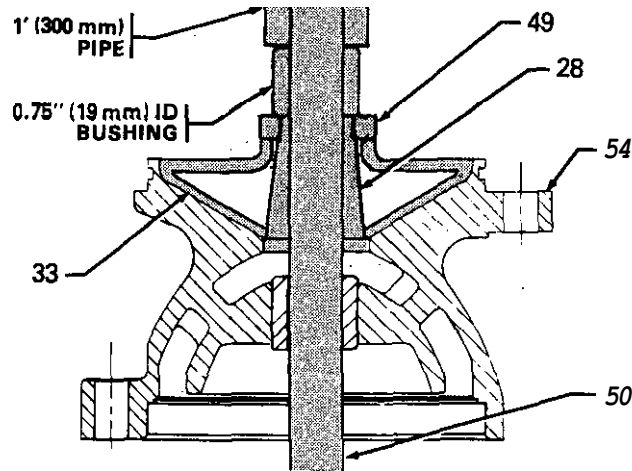


Fig 11

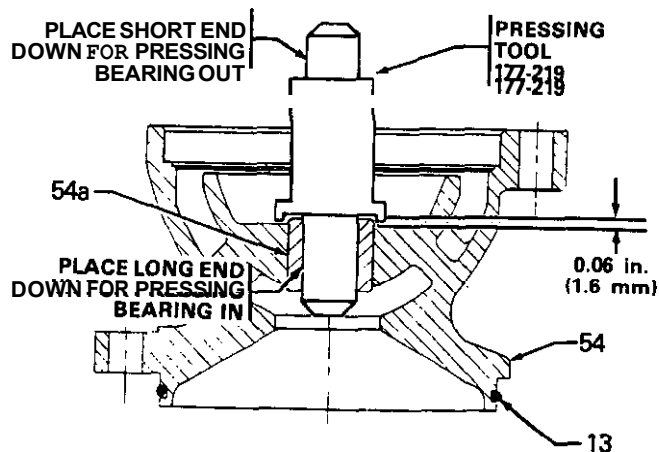


Fig 12

7. To replace the bearings:
 - a. Use the short-nippled end of tool 177-219 to press out the bearings (54a) from all bowls (54) and the intake bowl (53). See Fig 12.
 - b. Use the long-nippled end of the tool to press new bearings into the bowls. This tool maintains the required 0.06 in. (1.6 mm) dimensions of the impeller bowls as shown in Fig 9.
 - c. Thread the shaft holddown tool (85) into the bottom of the intake bowl as shown in Fig 13.
 - d. Use the short end of tool 177-219 to press the new bearing (54a) into the intake bowl until it bottoms against the shaft holddown tool. Refer to Fig 13.

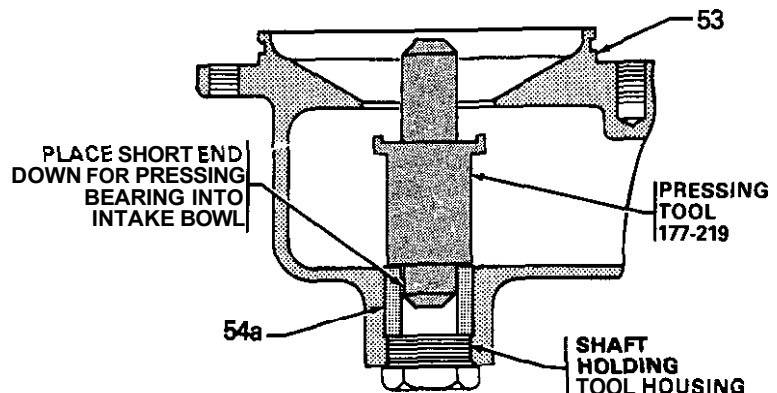


Fig 13

(bearing replacement continued on page 11)

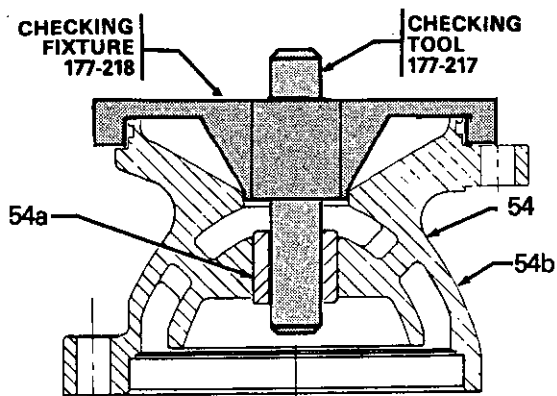


Fig 14

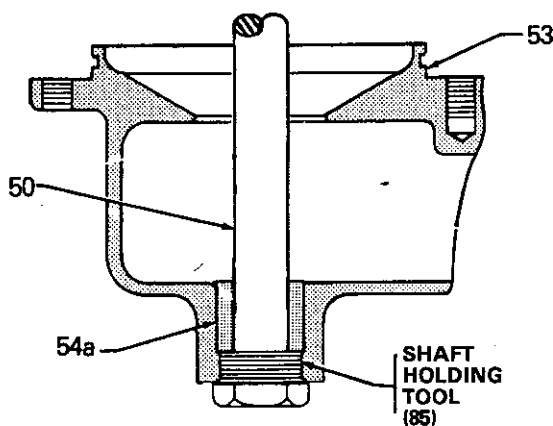


Fig 15

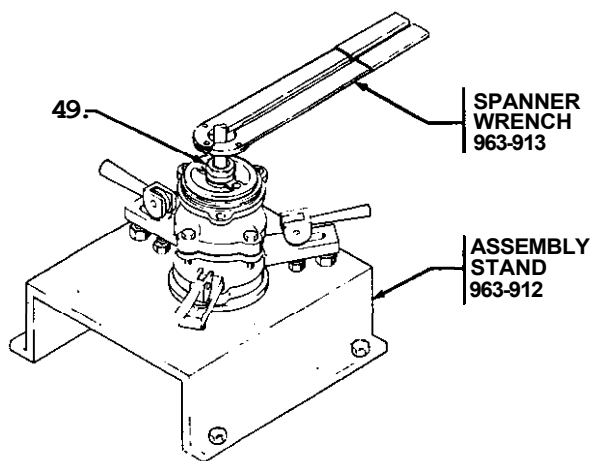


Fig 13

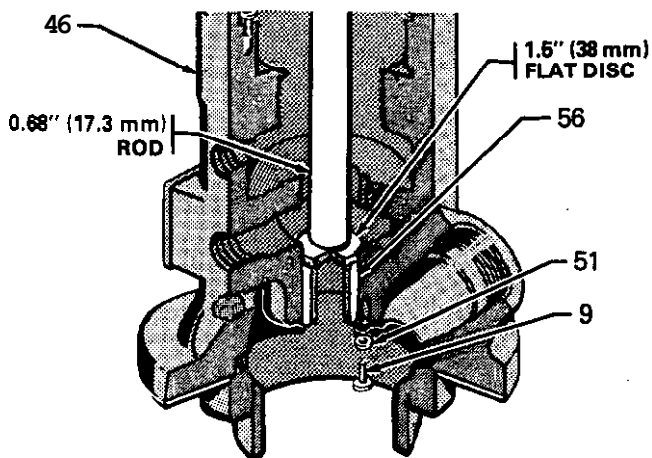


Fig 14

- e. Check the bearings for concentricity. Place the checking fixture 177-218 on the bowl as shown in Fig 14. Drop the long end of the checking tool 177-217 into the center hole of the fixture. The tool should turn freely without binding. If the tool binds, the bearings must be replaced.

Reassembly

8. Slide the shaft (50) into the bearing (54a) in the intake bowl (53) and lock it in place with the shaft holddown tool (85). See Fig 15.
9. Clamp the intake bowl in a vise.
10. Assemble the first impeller (44), collet (28) and nut (49) onto the shaft. Push downward on the impeller and hold it with the spanner wrench, 953-913, while tightening the impeller nut. See Fig 16.
11. Install the first impeller bowl (54) and bolt it to the intake bowl (53) with screws (17) and lockwashers (23) and nuts (17).

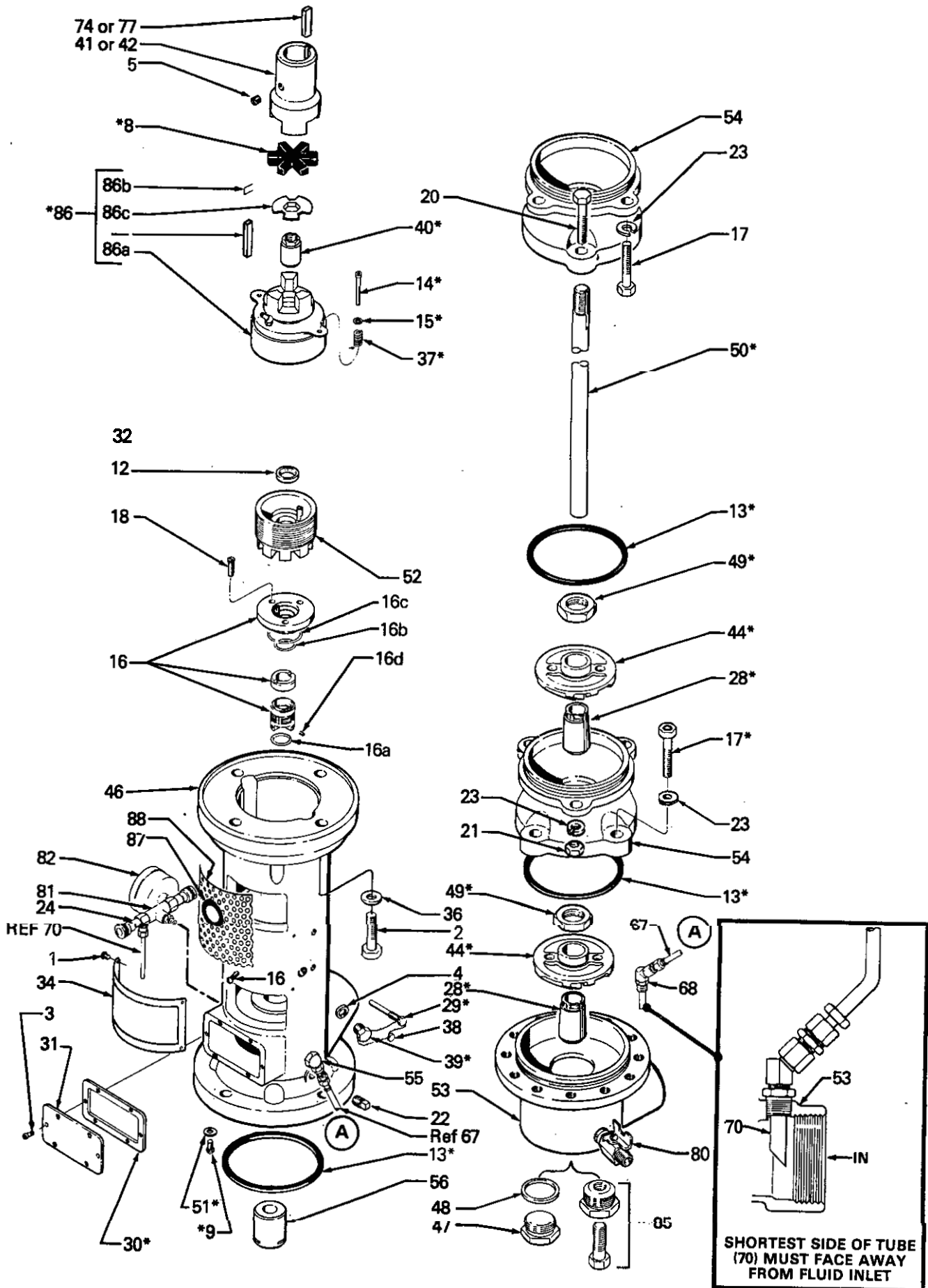
NOTE: Each impeller must be pushed down tightly into the bowl while tightening the impeller to assure contact with the machined face of the bowl which will ensure maximum pump performance.

12. Remove the assembly from the vise and mount it in the assembly stand 953-912. Refer to Fig 16.
13. Continue assembling the bowls and impellers as in Steps 10 and 11.
15. *To replace the bearing (56) in the pump base (35),* remove the three screws and washers (9, 51), holding the bearing from below. Press the bearing out using a 1.5 in. (38 mm) disc laid on the bearing, and a 0.68 in. (17.3 mm) rod inserted from the top to push it out. See Fig 17. This bearing has a medium-tight fit. Replace it when replacing the impeller bearings.

Assembling Lower Pump Section to Base

NOTE: Be sure the pump base is clean, and that a new base bearing (56) has been installed.

1. Carefully lower the base (46) over the shaft, passing the shaft through the bearing. Install the four capscrews (17) and lockwashers (36). Torque to 30-35 ft-lb (41-47 N·m).
2. Continue assembling the pump as described in Steps 13 to 35 on pages 8 and 9.



PARTS LIST

Crown Imperial Stainless Steel
Models 217-404 through 217-412, Series E

Imperial Carbon Steel
Models 218-004 through 218-012, Series A

REF NO.	PART NO.	DESCRIPTION	QTY
1	100-055	SCREW, drive; type 'U', self-tap; No. 6 x 1 1/4	4
2	100-060	CAPSCREW, hex hd; 1/2-13 x 1-3/4"	4
3	108-425	CAPSCREW, sch; No. 10-24 unc-2a x 1/2"	7
4	100-214	LOCKWASHER, spring; 5116'	1
5	100-640	SETSCREW, cup pt. slotted hd; 5/16 x 3/8"	1
8	102-211	INSERT, coupler, rubber	1
9	102-234	SCREW, machine, rd hd; 1/4-20 x 3/8"	3
12	102-776	SEAL, shaft	1
13	106-524	PACKING, O-ring, Viton"	13
14	102-795	CAPSCREW, soc hd; No. 8-32 x 1-5/8"	2
15	102-796	WASHER, flat; No. 8	2
16	218-204	FACE SEAL ASSEMBLY Includes it 16a-16d	1
16a	107-230	.O-RING, PTFE, shaft	1
16b	107-313	.O-RING, PTFE, seat	1
16c	107-582	.O-RING, PTFE, housing	1
16d	107-232	SETSCREW, face seal	1
17	107-225	CAPSCREW, hex hd; 7/16 x 1.5" lg;	6
18	100-036	SCREW, machine, pan hd; No. 10-24 x 0.75" lg	3
20	102-789	SCREW, hex hd; 7/16 x 1-3/4"; for 217-404 to 217-412	33
	104-347	SCREW, hex hd; 7/16 x 1-3/4"; for 218-004 to 218-012	33
21	104-348	NUT, hex; 7/16	33
22	103-778	PLUG, pipe, hdls; 112 x 1/2" long	1
23	100-052	LOCKWASHER, spring; 7/16	39
24	202-233	VALVE, needle	2
28	168-349	COLLET, impeller	See chart
29	168-352	SCREW, lo adjusting nut	1
30	178-550	GASKET, PTFE	1
31	178-549	COVER, inspection port	1
32	168-363	SUPPORT, bearing	1
34	176-647	PLATE, instruction	1
36	168-381	WASHER, plain	4
37	168-410	SPRING, compression	2
38	104-274	LOCK, wire	1
39	171-711	PLUG	1
40	168-500	NUT, shaft	1
41	169-445	COUPLING, motor; 1.125" ID for 5 and 7.5 HP motors	1

REF NO.	PART NO.	DESCRIPTION	QTY
42	170-067	COUPLING, motor; 1.375" ID for 10 and 15 HP motors	See chart
44	170-748	IMPELLER, pump	See chart
45	205-437	COUPLING, hose, 1/8 npt(m)	1
46	178-544	BASE, pump	1
47	178-552	PLUG, 1-1/4 NF	1
48	178-553	GASKET, plug, Delrin®	1
49	170-770	NUT, impeller	See chart
50	178-551	SHAFT, impeller	1
51	170-772	WASHER, plain	3
52	207-769	NUT, adjusting	1
53	218-097	INTAKE BOWL ASSEMBLY	1
54	218-092	IMPELLER BOWL ASSY. for stainless steel pumps includes items 54a and 54b	12
	217-464	IMPELLER BOWL ASSY. for carbon steel pumps Includes items 54a and 54c	12
54a	176-851	.BEARING	1
54b	179-774	.HOUSING, impeller, sst	1
54c	178-739	.HOUSING, impeller, cst	1
55	209-029	ELBOW, 90°; 3/8 x 1/4 npt(fbe)	1
56	220-298	REARING, throttle	1
67	220-299	HOSE, coupled	1
68	166-469	ADAPTER; 114 npt x 114 npsm	1
69	218-108	ADAPTER, flo	1
70	061-132	HOSE, nylon	1.3 ft.
74	107-055	KEY; 5/16	See chart
77	160-906	KEY) 1/4" x 2"	See chart
80	210-071	VALVE, ball; 3/8 npt(mxf) See 307-068 for parts	1
81	100-547	ADAPTER, tee; 114 npt(f)	1
82	103-909	GAUGE, pressure, air; 0-160 psi (0-11 psi)	1
84	166-863	NIPPLE, reducing; 3/8 npt x 1/4 npt	1
85	207-727	SHAFT HOLODOWN TOOL	1
86	210-308	COUPLING ASSEMBLY Includes items 86a, 86b, 86c	1
86a		.BEARING, thrust	1
86b	166-007	.PLATE, shaft nut retaining	1
86c	068-067	.LOCKWIRE, 3.75 in.	3.75"
X7	108-027	GROMMET	1
88	180-666	SHIELD	1
90	160-127	UNION, adapter, 45°; 1/4 npt(m) x 1/4 nps(f) swivel	1

*Recommended "tool box" spare parts. Keep on hand to reduce down time.

CARBON STEEL MODEL NO.	STAINLESS STEEL MODEL NO.	REFERENCE NO.						QUANTITY
		28	41	42	44	49	74	
218-004	217-404	4	1	—	4	4	—	1
218-005	217-405	5	1	—	5	5	—	1
218-006	217-406	6	1	—	6	6	—	1
218-007	217-407	7	—	1	7	7	1	—
218-008	217-408	8	—	1	8	8	1	—
218-009	217-409	9	—	1	9	9	1	—
218-010	217-410	10	—	1	10	10	1	—
218-011	217-411	11	—	1	11	11	1	—
218-012	217-412	12	—	1	12	12	1	—

HOW TO ORDER REPLACEMENT PARTS

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

6 digit PART NUMBER	QTY	PART DESCRIPTION

ACCESSORIES (Must be purchased separately).

WARNING

Be sure the valves, plumbing and accessories used in your system have a working pressure rating at least as high as the maximum working pressure rating of the pump.

SERVICE TOOLS

FACE SEAL INSTALLATION TOOL 178-778

Required for removing and installing face seal in pump base.

FACE SEAL ADJUSTMENT TOOL 178-777

Required for setting face seal dimension.

COUPLER CHECKING TOOL 178-779

Required for setting coupler gap.

PRESSING TOOL 177-219

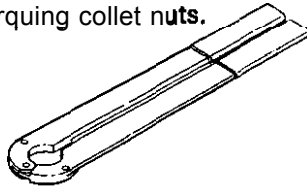
Used for pressing new bearings into bowls to maintain proper clearance of bearings.

CHECK FIXTURE 177-218

Used with checking tool 177-217 to check concentricity of new bearings pressed into impeller bowls.

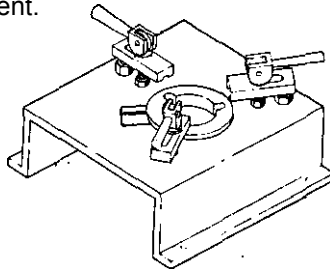
SPANNER WRENCH 953-913

For holding impellers while torquing collet nuts.



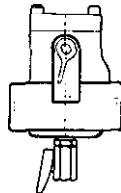
ASSEMBLY STAND 953-912

Must be used to assemble pump in proper upright position, maintaining alignment.



SILENT SENTRY FILTER 103-984

300 psi (21 bar) MAXIMUM WORKING PRESSURE
Electroless nickel plated. 1-1/4 in. npt inlet and outlet. 3/4 in. drain at bottom, 100 mesh (149 micron) element, Buna-N seals.



CHEVRON SRI® /No. 2 NLGI 107-411

Graco-approved grease for lubricating thrust bearing in 14.6 oz cartridge.

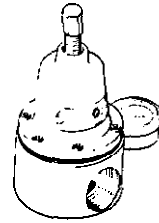
HIGH CAPACITY BAG FILTERS

300 psi (21 bar) MAXIMUM WORKING PRESSURE
For effective filtering of large volumes of industrial paints and related liquids. The filter housing is permanently piped into the paint line and has easy accessibility for cleaning. Contact your sales representative for ordering information, or write to Graco and request literature form no. 300-081 and 304-139.



BACK PRESSURE VALVE.208-997
180 psi (12 bar) CONTROLLED WORKING PRESSURE
200 psi (14 bar) MAXIMUM WORKING PRESSURE

Stainless Steel. 0.5in. (12.7mm) dia. orifice. 1-1/4 in. npt inlet and outlet. Includes 200 psi (14 bar) pressure gauge.



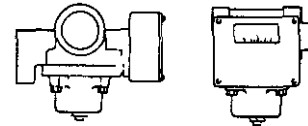
FLOWMETERS

300 psi (21 bar) MAXIMUM WORKING PRESSURE
1-1/4 in. npt inlet and outlet; inline. Flow rating; 20 GPM (75 l/min). Calibrated at 100 centipoise, specific gravity 0.85.

103-998 Stainless Steel: left to right flow

104-025 Nickel Plated: left to right flow

104-138 Nickel Plated: right to left flow



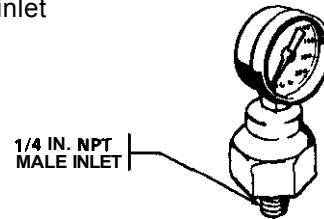
ADAPTER KIT 213-049

For 502-250 and 501-251 Electric Motors. Includes: Adapter Plate, Coupling, Coupling Insert, Screws and Washers

FLUID PRESSURE GAUGE & PULSATION DAMPENERS

208-855 For use with corrosive fluids.
300 psi (21 bar) MAXIMUM WORKING PRESSURE
114 npt (m) inlet

206-171 For use with non-corrosive fluids.
200 psi (14 bar) MAXIMUM WORKING PRESSURE
114 npt (f) inlet



PUMP STAND 217-347

Shown with pump head (46) installed

ELECTRIC MOTORS:
3 Phase, **230/460 V, 60 Hz, 3600 RPM** (no load), "U" Frame

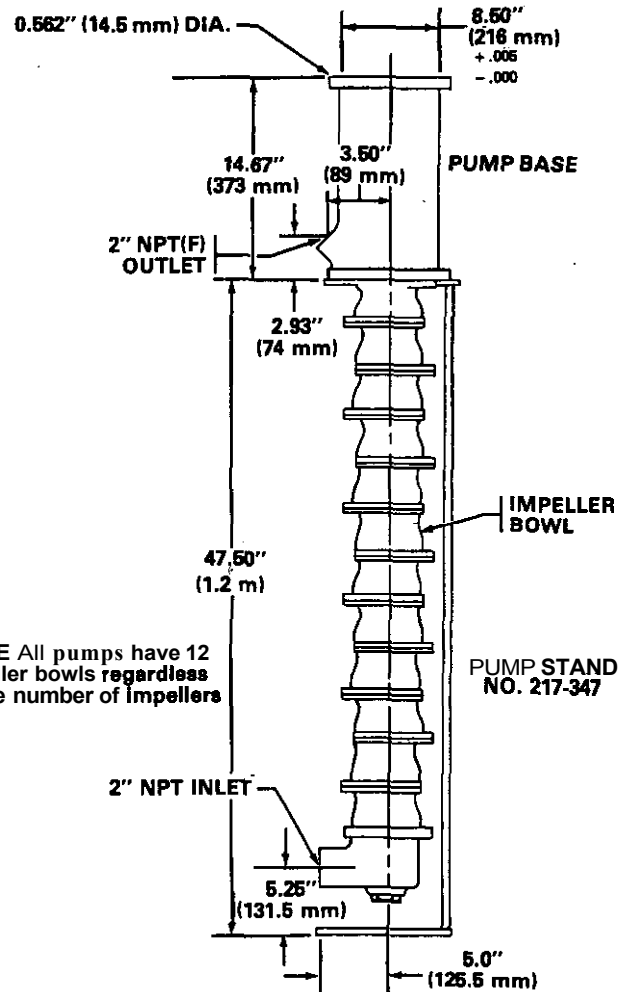
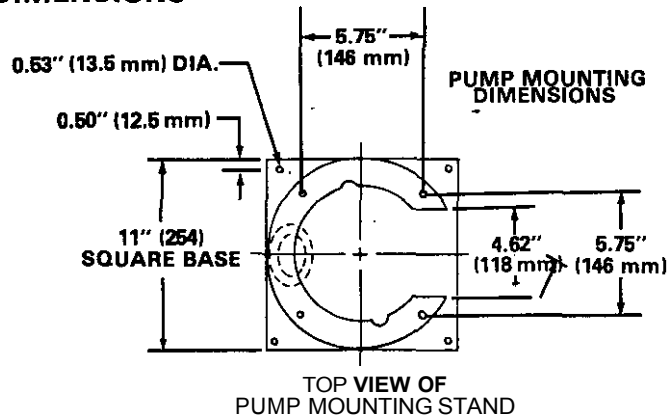
Motor Part No.		H.P.	Shaft dia.	Coupling Supplied W/Pump	Adapter Kit**
Standard	Energy Efficient*				
502-248	178-850	5	1.125 in.	169-445	none req'd
502-249	178-851	7.5	1.125 in.	169-445	none req'd
502-250	178-852	10	1.375 in.	170-067	213-049
502-251	178-853	15	1.375 in.	170-067	213-049

NOTE: The size of pump and motor required depends on the viscosity and specific gravity of the fluid to be pumped, and upon the flow volume and pressure required in the user's system. Users should contact a Graco branch or factory office for recommendations.

*These energy-efficient motors meet GM, Ford and Chrysler specifications.

**See ACCESSORIES page for ordering adapter kit.

DIMENSIONS



SERVICE INFORMATION NOTES:

Listed below by the assembly changed are OLD, NEW, ADDED and DELETED parts.

ASSEMBLY PART CHANGED	STATUS	REF PART NO.	PART NO.	NAME
All Pumps	OLD	3	100-261	Screw
	NEW	3	108-425	Capscrew
	OLD (1)	24	203-743	Valve
	NEW (2)	24	220-233	Valve
	DELETED	25	100-721	Plug
	DELETED	45	205-435	Coupling
	ADDED	46	205-437	Coupling
	OLD	55	179-919	Elbow
	NEW	55	209-029	Elbow
	OLD	56	218-313	Bearing
	NEW	56	220-298	Bearing
	DELETED	67	218-107	Hose
	ADDED	67	220-299	Hose
	DELETED (2)	69	166-846	Adapter
	ADDED (1)	68	166-469	Adapter
	DELETED	70	061-135	Hose
	ADDED	70	061-132	Hose
	DELETED	81	164-815	Adapter
	ADDED	81	100-547	Adapter
	OLD	82	102-730	Gauge
	NEW	82	103-909	Gauge
	DELETED	83	205-528	Valve
	ADDED	84	166-863	Nipple
	ADDED	90	160-127	Union
	ADDED	91	151-519	Nipple

NOTE All pumps have 12 impeller bowls regardless of the number of impellers

QUANTITY CHANGE NOTICE: Number in parentheses in the status column indicate quantity changed.

INFORMATION NOTE: NEW parts replace OLD parts listed directly above them. ADDED parts are not interchangeable with DELETED parts.

TECHNICAL DATA

Power Supply Required : 230/460 Volt AC; 3 phase, 60 cycle
Fluid Outlet Size : 2 in. npt(f)
Fluid Inlet Size : 2 in. npt(f)
Wetted Parts
Models 217-404—217-412 : Stainless steel, PTFE Viton? Delrin®
PTFE -Coated Iron
Models 218-004—218-012 : PTFE -Coated Iron, PTFE Viton? Delrin®

PTFE Viton® and Delrin® are registered trademarks of the Du Pont Company.

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 for examination by Graco to verify the claimed defect. If the claimed defect is verified, Graco will repair or replace free of charge any defective parts. The equipment will be returned to the original purchaser transportation prepaid. If inspection of the equipment does not disclose any defect in material or workmanship, repairs will be made at a reasonable charge, which charges may include the costs of parts, labor and transportation.

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.

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Subsidiary and Affiliate Companies: Canada; England; Switzerland; France; Germany; Hong Kong; Japan
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