Parts

INSTRUCTIONS-PARTS LIST

308366

Rev. E

This manual contains important warnings and information.
READ AND KEEP FOR REFERENCE.

INSTRUCTIONS

GRACO

First choice when quality counts.™

ELECTRIC-POWERED

TRIUMPH™ Pumps

DESIGNED FOR LOW PRESSURE, MEDIUM VOLUME CIRCULATION OF FINISHING MATERIALS

Includes the TRIUMPH Electric Motor, which is CSA, FM, and ISSeP approved.

Refer to page 2 for the Table of Contents and List of Models.

US Patent No. 5,220,259.
Other US and Foreign Patents Pending.

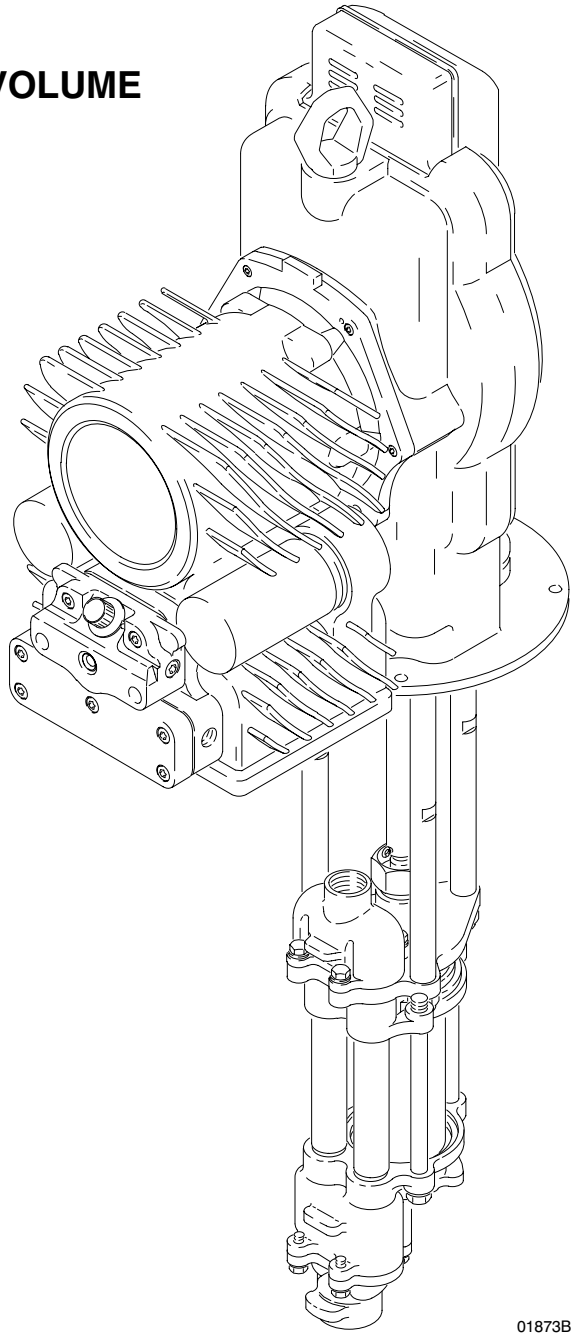

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Table of Contents

Pump Models

NOTE: These pumps are not suitable for metering. Contact your Graco distributor for more information.

CARBON STEEL MODELS

Pump Model No.	Series	Displacement Pump Part No. (refer to manual 308793)	Connection Kit Part No.	Operating Range, Voltage AC	Maximum Current Draw	Maximum Fluid Working Pressure MPa, bar (psi)
239485	A	239835	236717	100 to 240	15 Amperes	1.4, 14 (200)
239486	A	239834	236717	100 to 240	15 Amperes	1.7, 17 (250)
239487	A	239833	236717	100 to 240	15 Amperes	2.4, 24 (350)
239491	A	239835	236717	240 to 480	15 Amperes	1.4, 14 (200)
239492	A	239834	236717	240 to 480	15 Amperes	1.7, 17 (250)
239493	A	239833	236717	240 to 480	15 Amperes	2.4, 24 (350)

SEVERE-DUTY ELECTROPOLISHED STAINLESS STEEL MODELS

Pump Model No.	Series	Displacement Pump Part No. (refer to manual 308793)	Connection Kit Part No.	Operating Range, Voltage AC	Maximum Current Draw	Maximum Fluid Working Pressure MPa, bar (psi)
239482	A	239838	236717	100 to 240	15 Amperes	1.4, 14 (200)
239483	A	239837	236717	100 to 240	15 Amperes	1.7, 17 (250)
239484	A	239836	236717	100 to 240	15 Amperes	2.4, 24 (350)
239488	A	239838	236717	240 to 480	15 Amperes	1.4, 14 (200)
239489	A	239837	236717	240 to 480	15 Amperes	1.7, 17 (250)
239490	A	239836	236717	240 to 480	15 Amperes	2.4, 24 (350)
244177	A	686679	236717	240 to 480	15 Amperes	2.4, 24 (350)

Symbols

Warning Symbol

⚠ WARNING

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

Caution Symbol

⚠ CAUTION

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

⚠ WARNING

INSTRUCTIONS

EQUIPMENT MISUSE HAZARD

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

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

⚠ WARNING

FIRE, EXPLOSION, AND ELECTRIC SHOCK HAZARD

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

When installed and operated in accordance with its instructions, the TRIUMPH DC Motor is approved for operation in Class I, Division 1, Group C and D (ISSeP Group II B) hazardous locations.

- Electrical equipment must be installed, operated, and serviced only by trained, qualified personnel who fully understand the requirements stated in this instruction manual.
- Ground the equipment and all other electrically conductive objects in the spray area. Refer to **Ground the System** on page 7.
- Keep all covers tight while the motor is energized.
- *To reduce the risk of fire or explosion when the motor is located in a hazardous area,* disconnect the electric power and wait 60 minutes for the capacitors to discharge before removing any covers. *If the motor is located in a non-hazardous area,* disconnect electric power and wait 15 minutes, to reduce the risk of electric shock.
- If there is any static sparking or you feel an electric shock while using this equipment, **stop spraying/dispensing immediately.** Do not use the equipment until you identify and correct the problem.
- Provide fresh air ventilation to avoid the buildup of flammable fumes from solvents or the fluid being sprayed/dispensed.
- Keep the spray/dispense area free of debris, including solvent, rags, and gasoline.
- Electrically disconnect all equipment in the spray/dispense area.
- Extinguish all open flames or pilot lights in the spray/dispense area.
- Do not smoke in the spray/dispense area.
- Do not turn on or off any light switch in the spray/dispense area while operating or if fumes are present.
- Do not operate a gasoline engine in the spray/dispense area.

HOT SURFACE HAZARD

- The electric motor becomes hot during operation, and the heat may be transferred to other connected equipment. To reduce the risk of burning yourself, do not touch the motor surfaces while it is operating. Before servicing, allow the motor to cool.
- Keep flammable material and debris away from the equipment.

⚠ WARNING

PRESSURIZED EQUIPMENT HAZARD

Spray from the gun/valve, hose leaks, or ruptured components can splash fluid in the eyes or on the skin and cause serious injury.

- Do not point the gun/valve at anyone or at any part of the body.
- Do not stop or deflect leaks with your hand, body, glove or rag.
- Follow the **Pressure Relief Procedure** on page 14 whenever you: are instructed to relieve pressure; stop spraying/dispensing; clean, check, or service the equipment; and install or clean the spray tip/nozzle.
- Tighten all fluid connections before operating the equipment.
- Check the hoses, tubes, and couplings daily. Replace worn, damaged, or loose parts immediately. Permanently coupled hoses cannot be repaired; replace the entire hose.

TOXIC FLUID HAZARD

Hazardous fluid or toxic fumes can cause serious injury or death if splashed in the eyes or on the skin, inhaled, or swallowed.

- Know the specific hazards of the fluid you are using.
- Store hazardous fluid in an approved container. Dispose of hazardous fluid according to all local, state and national guidelines.
- Always wear protective eyewear, gloves, clothing and respirator as recommended by the fluid and solvent manufacturer.

MOVING PARTS HAZARD

Moving parts, such as the cam and drive mechanism, can pinch or amputate your fingers.

- Keep clear of all moving parts when starting or operating the pump.
- Never remove the drive section shield while operating the pump.
- Before servicing the equipment, follow the **Pressure Relief Procedure** on page 14 to prevent the equipment from starting unexpectedly.

Installation

Introduction

Read this manual and the manuals for all of the components in your system thoroughly before installing or operating the equipment.

Reference letters and numbers used in the text refer to the callouts in the illustrations and the parts lists on page 22.

Typical Installation

Figs. 2 and 3 are only guides to help you select system components and accessories. Contact your Graco distributor for assistance in designing a system to meet your particular needs. Also refer to manual 308254.

Startup Check List

Before installing and operating the pump, perform the following checks.

⚠ WARNING

FIRE, EXPLOSION, AND ELECTRIC SHOCK HAZARD

The electrical wiring shall be performed only by trained and qualified personnel to reduce the risk of serious injury and electric shock.

Observe all local codes and regulations regarding electrical wiring. Some localities require that certified hazardous location motor shops perform all maintenance and service.

1. When installing in a flammable atmosphere (hazardous location) refer to Article 500 of the US National Electric Code or other applicable agency standards to plan the work. See the **WARNING** above.
2. Mount the pump in the desired location. See **Mount the Pump** at right.
3. Ground the system. See page 7.
4. Connect the plumbing. See page 13.
5. Connect the electrical service. See page 10.
6. Flush the pump. See page 17.
7. Prime the pump and hose. See page 14.
8. Adjust the pressure to achieve the desired results. See the performance charts on pages 27 to 29.

Mount the Pump

⚠ CAUTION

To reduce the risk of injury or damage to the pump, be sure to use a lift or at least two people to move the pump. The pump is very heavy and cannot be lifted or positioned by one person.

Mount the pump to suit the type of installation planned. Part No. 220581 is available as a floor stand. See page 25 for dimensions.

Be sure the mounting is strong enough to support the weight of the pump, hoses, and accessories, and the stress caused by pump operation.

Use an accessory surge tank (G), Part No. 220157, to reduce fluid pressure surging and prevent backflow into the pump. Mounting instructions are supplied with the tank. Install a full-flow, non-restrictive fluid shut-off valve (E) before and after the surge tank to isolate it for servicing. Mount the surge tank on accessory stand 218742. See page 25 for dimensions.

Locate the pump so there is sufficient space around it for easy operating and service access, and for adequate ventilation to reduce buildup of heat in the motor.

Route all cables and electrical lines away from traffic areas.

Installation

Ground the System

To reduce the risk of static sparking, ground the pump, object being sprayed, and all other spray/dispensing equipment used or located in the spray/dispensing area. Check your local electrical code for detailed grounding instructions for your area and type of equipment. Be sure to ground all of this spray/dispensing equipment:

The electric motor is grounded through the electrical wiring. However, the drive section of the reciprocator and the displacement pump must also be grounded.

1. *Electric motor:* ground through the electrical wiring. Refer to motor manual 308254 for instructions.

2. *Displacement pump and reciprocator drive section:* Use a ground wire and clamp, as shown in Fig. 1. The power supply's ground wire to the electric motor ***does not*** provide grounding for the pump and drive section.

3. *Fluid hoses:* use only electrically conductive fluid hoses.

4. *Air hoses (if used for ram or other accessories):* use only electrically conductive air hoses.

5. *Spray gun/dispensing valve:* obtain grounding through connection to a properly grounded fluid hose and pump.

6. *Object being sprayed:* according to local code.

7. *Fluid supply container:* according to local code.

8. *All solvent pails used when flushing,* according to local code. Use only metal pails, which are conductive. Do not place the pail on a non-conductive surface, such as paper or cardboard, which interrupts the grounding continuity.

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

To ground the pump and reciprocator drive section:

Loosen the grounding lug locknut (W) and washer (X). Insert one end of a 1.5 mm^2 (12 ga) minimum ground wire (Y) into the slot in lug (Z) and tighten the locknut securely. See Fig. 1. Connect the other end of the wire to a true earth ground. Order Part No. 237569 Ground Wire and Clamp.

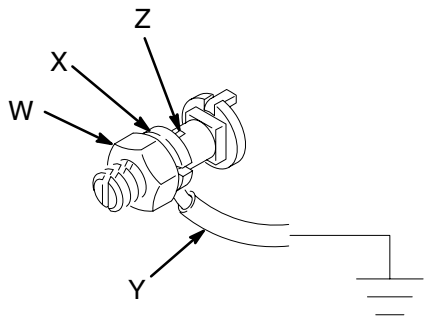

Fig. 1

Installation

Installation Using a Power Cord, for Non-Hazardous Areas Only

NOTE: When installing in a flammable atmosphere (hazardous location), refer to Article 500 of the US National Electric Code or other applicable agency standard. Use only components that are approved for use in hazardous locations.

NOTE: Refer to instruction manual 308254 for detailed Triumph Motor installation instructions.

KEY

A Flexible Power Cord
B Standard Electrical Plug (for use in non-hazardous areas only)
C EMI Line Filter (locate in non-hazardous area).
Refer to page 11 for specifications for different voltages.
Also refer to manual 308254.
D Fluid Drain Valves
E Fluid Shutoff Valves
F Pump Fluid Outlet
G Surge Tank
H Wall Outlet
J Fused Safety Switch, with lock (locate in non-hazardous area)
K Strain Relief (must be approved for use in hazardous locations)
L Fluid Supply Line; 38 mm (1–1/2 in.) minimum diameter
M Fluid Line; 25 mm (1 in.) minimum diameter
N Motor Starter Switch (locate in non-hazardous area).
Required for use with Model 239339 Triumph Motor.
Refer to page 11 for specifications for different voltages.
Also refer to manual 308254.
P Start/Emergency Stop Pushbutton (must be approved for use in hazardous locations)
Y Ground Wires for Pump and Surge Tank
Z Inrush Current Limiter
Required for use with Model 239339 Triumph Motor.
Refer to manual 308254.

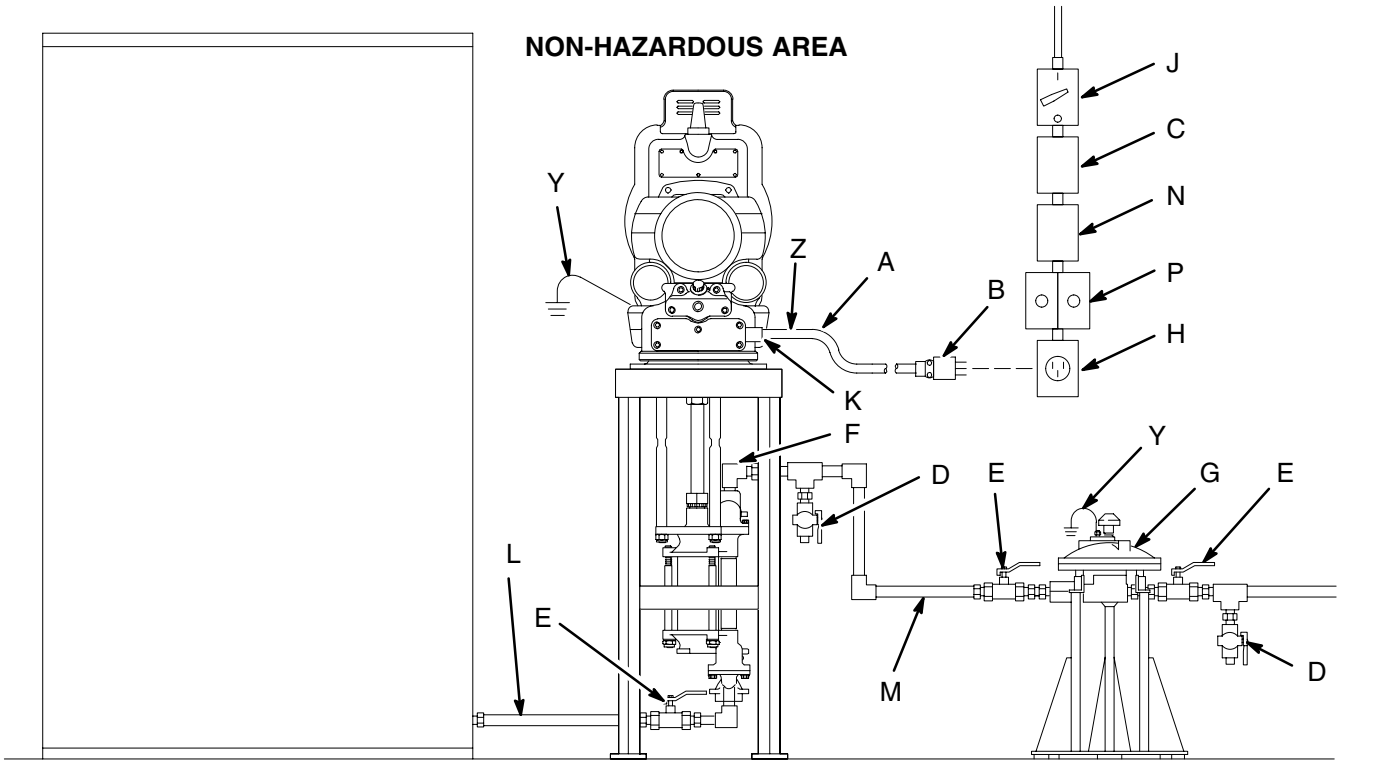

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Fig. 2

Installation

Hardwired Installation

NOTE: When installing in a flammable atmosphere (hazardous location), refer to Article 500 of the US National Electric Code or other applicable agency standard. Use only components that are approved for use in hazardous locations.

NOTE: Refer to instruction manual 308254 for detailed Triumph Motor installation instructions.

KEY

A Electrical Supply (must be sealed rigid conduit)
C EMI Line Filter (locate in non-hazardous area).
Refer to page 11 for specifications for different voltages.
Also refer to manual 308254.
D Fluid Drain Valves
E Fluid Shutoff Valves
F Pump Fluid Outlet
G Surge Tank
J Fused Safety Switch, with lock
K Strain Relief (must be approved for use in hazardous locations)
L Fluid Supply Line; 38 mm (1–1/2 in.) minimum diameter
M Fluid Line; 25 mm (1 in.) minimum diameter
N Motor Starter Switch (locate in non-hazardous area).
Required for use with Model 239339 Triumph Motor.
Refer to page 11 for specifications for different voltages.
Also refer to manual 308254.
P Start/Emergency Stop Pushbutton (must be approved for use in hazardous locations)
Y Ground Wires for Pump and Surge Tank
Z Inrush Current Limiter
Required for use with Model 239339 Triumph Motor.
Refer to manual 308254.

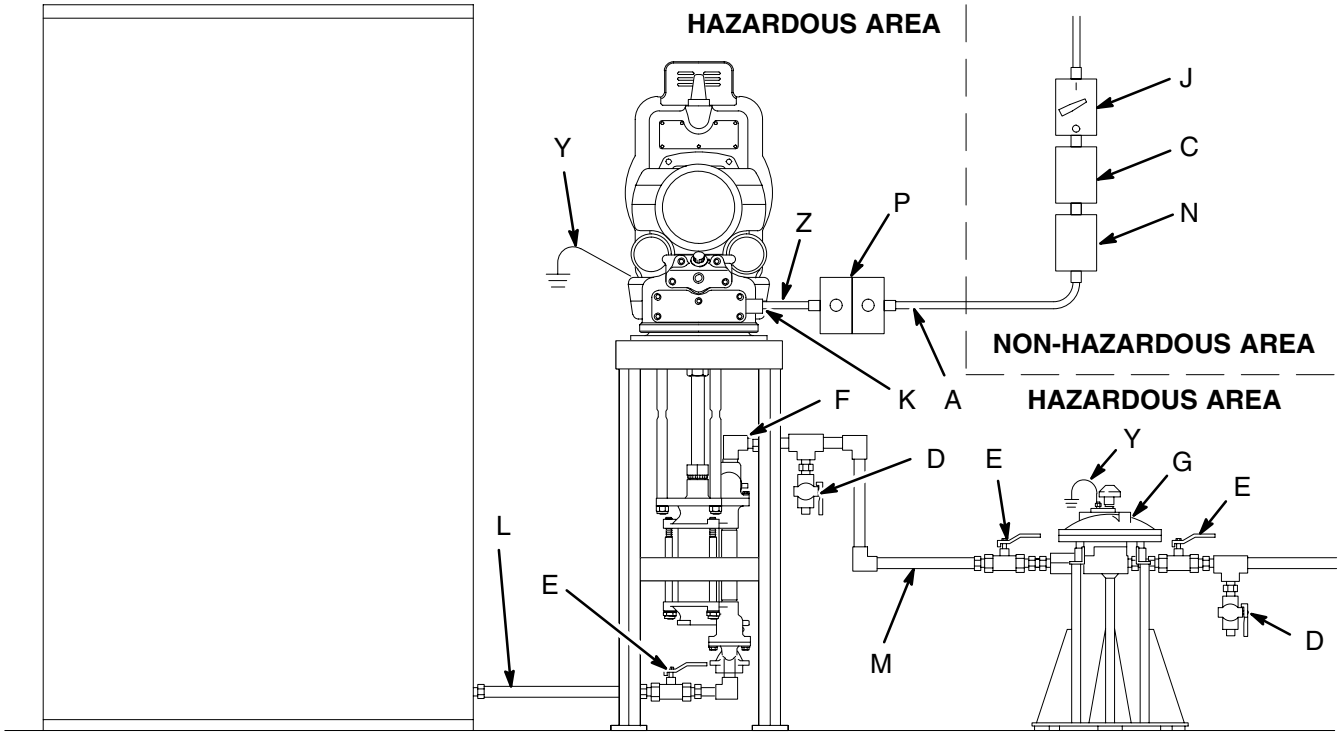


Fig. 3

Installation

Electrical Service

Electrical power to the pump may be supplied by a power cord (A, see Fig. 2) or it may be hardwired (A, see Fig. 3).

⚠ WARNING

FIRE, EXPLOSION, AND ELECTRIC SHOCK HAZARD

The electrical wiring shall be performed only by trained and qualified personnel to reduce the risk of serious injury and electric shock.

Observe all local codes and regulations regarding electrical wiring. Some localities require that certified hazardous location motor shops perform all maintenance and service.

When installing in a flammable atmosphere (hazardous location) refer to Article 500 of the US National Electric Code or other applicable agency standards to plan the work.

Conduit must be sealed off to prevent gases from escaping from the hazardous area into non-hazardous areas. Refer to Article 500 of the US National Electric Code or other applicable agency standards.

Install the following components on the motor circuit:

- Install a fused safety switch (J) on the circuit to the motor, to lock out power to the motor when it is being serviced or when it is shut down. This switch must be lockable and must be in a non-hazardous area.
- Install a start/emergency stop pushbutton (P) within reach of the motor. This pushbutton must be approved for use in a hazardous area.

Refer to page 11 for specifications for different voltages.

Installation

100 to 240VAC Pumps

The minimum operating voltage is 100VAC; the maximum operating voltage is 240VAC. This motor requires a 50/60 Hz, single-phase, 15 Ampere grounded power supply.

Use 14 gauge grounded 3–wire cable per the installation category to bring power to the motor. The electric motor is grounded through the cable.

⚠ WARNING

FIRE, EXPLOSION, AND ELECTRIC SHOCK HAZARD

If using a power cord plugged into a wall socket, a motor starter switch must be installed to control power to the plug. Use only a 3–terminal ground plug. Do not alter the plug by removing the grounding terminal. Do not use with an adapter or extension cord.

- Install a motor starter switch (N) on the circuit to the motor. This switch must be in a non-hazardous area. Use a 2–pole magnetic AC contactor, size NEMA 1, 30 Ampere. The switch is not required when Model 239338 Triumph Motor is hardwired.
- To comply with EMC directive EN 50081–2 (1994) for line-conducted noise, install an EMI line filter (C) in the system. Part No. F1760AA20 is available from Curtis Industries, P.O. Box 343925, Milwaukee, WI, 43234–3925, USA; telephone 414–649–4200.

  This filter is rated for 240VAC, 15 Ampere. See the following table for minimum insertion losses. If you use an equivalent filter, the limits on line-conducted emissions in EN5011 must be met and verified.

Minimum Insertion Losses

MHz					
0.15	**0.50**	**1.00**	**5.00**	**10.0**	**30.0**
15 dB	25 dB	31 dB	42 dB	47 dB	40 dB

240 to 480VAC Pumps

The minimum operating voltage is 240VAC; the maximum operating voltage is 480VAC. This motor requires a 50/60 Hz, 3–phase, 15 Ampere grounded power supply.

Use 14 gauge grounded 4–wire cable per the installation category to bring power to the motor. The electric motor is grounded through the cable.

⚠ WARNING

FIRE, EXPLOSION, AND ELECTRIC SHOCK HAZARD

If using a power cord plugged into a wall socket, a motor starter switch must be installed to control power to the plug. Use only a 4–terminal ground plug. Do not alter the plug by removing the grounding terminal. Do not use with an adapter or extension cord.

- Install a motor starter switch (N) on the circuit to the motor. This switch must be in a non-hazardous area. It is required for all installations of Model 239339 Triumph Motor. Use a 3–pole magnetic AC contactor, size NEMA 1, 30 Ampere.
- To comply with EMC directive EN 50081–2 (1994) for line-conducted noise, install an EMI line filter (C) in the system. Part No. 3V16F is available from Filter Concepts, Inc., 2624 S. Rousselle St., Santa Ana, CA, 92707, USA; telephone 714–545–7003.

  This filter is rated for 440VAC, 16 Ampere. See the following table for minimum insertion losses. If you use an equivalent filter, the limits on line-conducted emissions in EN5011 must be met and verified.

Minimum Insertion Losses

MHz					
0.05	**0.15**	**0.50**	**1.50**	**5.00**	**20.0**
40 dB	55 dB	60 dB	65 dB	50 dB	55 dB

Notes

Installation

Connect the Plumbing

Refer to Figs. 2 and 3.

⚠ WARNING

A fluid drain valve (D) is required in your system, to help reduce the risk of serious injury including splashing in the eyes or on the skin if the pump cycles unexpectedly.

Locate one valve downstream from the pump outlet and another valve downstream from the surge tank (G). These drain valves are used to relieve fluid pressure in the pump and surge tank during shutdown.

When using a stainless steel pump, use stainless steel plumbing to maintain a corrosion-resistant system.

The pump has a 1–1/2 in. npt(f) fluid inlet and a 1 in. npt(f) fluid outlet (F). Use a minimum 25 mm (1 in.) diameter pipe or hose between the pump outlet and any supply line accessories. Use a minimum 38 mm (1–1/2 in.) diameter pipe or hose between the mix tanks and pump inlet.

Install fluid shutoff valves (E) before and after the surge tank, and between each supply tank and the pump fluid inlet, to isolate these components for servicing.

Non-Circulating Systems

In non-circulating systems with a fluid outlet that can be closed off (causing the pump to stall), install a fluid pressure relief valve (R) and a return line (S) leading back to the fluid supply line (L). See Fig. 4.

⚠ WARNING

COMPONENT RUPTURE HAZARD
The pressure relief valve reduces the risk of the pump overpressurizing if the piston seal is worn and leaking, and the fluid outlet is closed off. Install the valve so the arrow on its body matches the direction of fluid flow.

Do not install a fluid shutoff valve in the fluid line between the pump outlet (F) and the pump inlet (T). Doing so defeats the purpose of the pressure relief valve if the shutoff valve is closed, resulting in pump overpressurization. Overpressurization can cause the pump or components to rupture, resulting in serious injury and property damage.

Pressure Relief Valve (for non-circulating systems)

KEY

- **E** Fluid Shutoff Valve
- **F** Pump Fluid Outlet
- **L** Fluid Supply Line; 38 mm (1–1/2 in.) minimum diameter
- **M** Fluid Line; 25 mm (1 in.) minimum diameter
- **R** External Pressure Relief Valve
- **S** Fluid Return Line
- **T** Pump Fluid Inlet

△1 Do not install a fluid shutoff valve in the fluid line between the pump outlet (F) and the pump inlet (T). See the **WARNING** above.

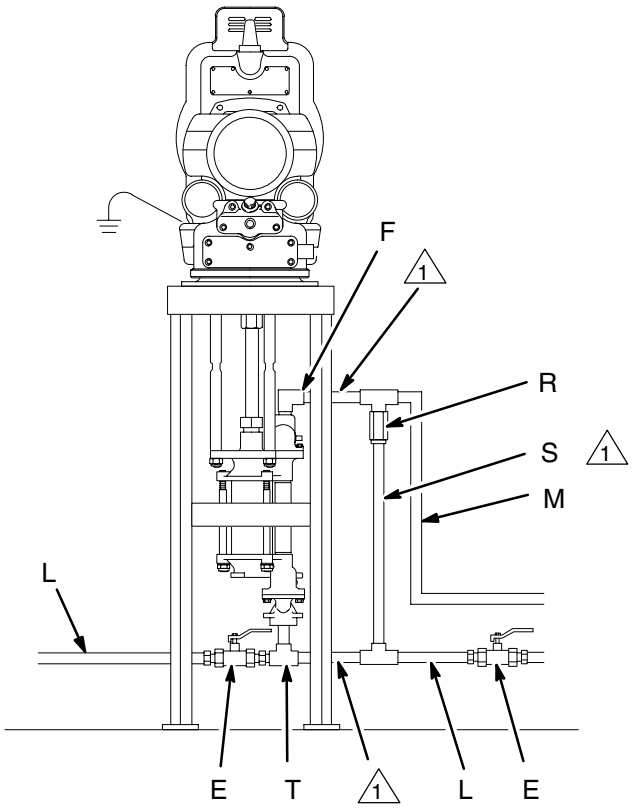


Fig. 4

Operation

Pressure Relief Procedure

⚠ WARNING

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

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

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

1. Lock the gun/valve trigger safety.
2. Set the motor torque control (V) to zero (0).
3. Shut off the electrical power source.
4. Unlock the gun/valve trigger safety.
5. Starting at the last gun/valve station, hold a metal part of the gun/valve firmly to the side of a grounded metal pail and trigger the gun/valve to relieve pressure. Repeat for each station.
6. Lock the gun/valve trigger safety.
7. Open the drain valve (required in your system), having a container ready to catch the drainage.
8. Leave the drain valve open until you are ready to spray/dispense again.

If you suspect that the spray tip/nozzle or hose is completely clogged, or that pressure has not been fully relieved after following the steps above, ***very slowly*** loosen the retaining nut or hose end coupling and relieve pressure gradually, then loosen completely. Now clear the tip/nozzle or hose.

Before You Start the Pump

Read and follow all instruction manuals, labels and tags supplied with this equipment and with all accessories in your system, before operating.

The pump was tested in lightweight oil. If the oil will contaminate the fluid you are pumping, flush it out with a compatible solvent. Refer to **Flushing** on page 17.

Starting and Adjusting the Pump

1. Set the torque control (V) to zero (0). See Fig. 5.
2. Turn on the power source to the motor. The power indicator (W) will light.

NOTE: The motor requires about 1 second to start after applying power, to allow the circuit boards to power up.

3. Hold a metal part of the spray gun/dispensing valve firmly to the side of a grounded metal pail and trigger the gun/valve.

NOTE: If you are using more than one gun/valve, prime the last gun/valve station first, then prime the remaining stations, one at a time.

4. Turn the torque control (V) slowly clockwise until the pump starts. Run the pump slowly until all the air is pushed out, and the pump and hoses are fully primed.

5. Release the spray gun/dispensing valve trigger and lock the trigger safety. The pump will stall against pressure when the trigger is released. When the system is primed and supplied with adequate power, the pump will start and stop as the gun/valve is opened and closed.

6. Use the torque control (V) to adjust the pump speed and fluid outlet pressure. Always use the lowest fluid pressure necessary to get the desired results. Higher pressures cause premature tip/nozzle and pump wear. During the first few cycles at higher pressure, the pump may stall during changeover. This is a normal occurrence caused by the motor adjusting itself to the fluid system.

NOTE: At speeds over 60 cycles per minute the motor will shut off automatically to prevent premature wear. To restart, shut off power to the motor, set the torque control to zero (0), turn on power to the motor, and turn the torque control slowly clockwise until the pump runs at less than 60 cycles per minute.

⚠ CAUTION

Do not allow the pump to run dry. It will quickly accelerate to a high speed, causing damage. If your pump is running too fast, stop it immediately and check the fluid supply. If the container is empty and air has been pumped into the lines, refill the container and prime the pump and the lines, or flush and leave it filled with a compatible solvent. Eliminate all air from the fluid system.

⚠ WARNING

COMPONENT RUPTURE HAZARD
To reduce the risk of overpressurizing your system, which could cause component rupture and serious injury, *never exceed the maximum fluid working pressure of the lowest rated component in your system* (see **Technical Data** on pages 26–28).

Shutdown

⚠ WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** on page 14.

Relieve the pressure.

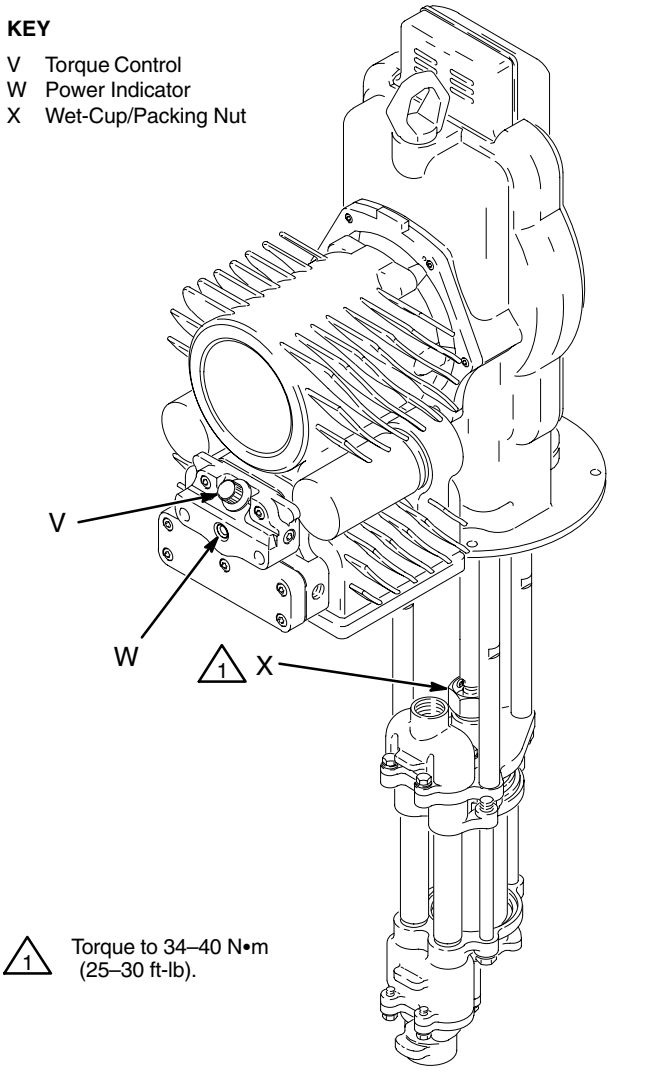


Fig. 5

Notes

Operation

Preventive Maintenance Schedule

The operating conditions of your particular system determine how often maintenance is required. Establish a preventive maintenance schedule by recording when and what kind of maintenance is needed, and then determine a regular schedule for checking your system. Your maintenance schedule should include the following:

Flushing

⚠ WARNING

FIRE, EXPLOSION, AND ELECTRIC SHOCK HAZARD
Before flushing, read the section **FIRE, EXPLOSION, AND ELECTRIC SHOCK HAZARD** on page 4. Be sure the entire system and flushing pails are properly grounded. Refer to **Grounding the System** on page 7.

1. Flush before shutting down the system for an extended period of time.
2. Flush before repairing the pump, if possible.
3. Flush before the fluid you are pumping can dry out, settle or set up in the pump and hoses.

Packing Nut Tightness

The packing nut (X) should be tight enough to stop leakage, but no tighter. Overtightening compresses and damages the packings, and may cause the pump to leak, reducing performance. See Fig. 5.

To check the adjustment of the packing nut, first relieve fluid pressure. If you have a torque wrench, tighten the packing nut to 34–40 N•m (25–30 ft-lb).

Excessive Leaking at Throat

If you see excessive leaking at the throat, and tightening the packing nut does not help, replace the throat packings. See page 21 and manual 308793.

Troubleshooting

⚠ WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** on page 14.

1. Relieve the pressure.
2. Check all possible problems and solutions before disassembling pump.

PROBLEM	CAUSE	SOLUTION
Motor does not run (green power indicator will not light)	Power source is shut off.	Turn power source on.
	Defective electronic control module.	Contact your Graco distributor for proper service.
	Power wires hooked up incorrectly.	Correct wiring. Refer to 308254 for proper installation.
Motor runs but green power indicator will not light	Bad signal cover.	Replace signal cover. See 308254.
Motor is vibrating.	Bad capacitor.	Replace capacitors. See 308254.
Motor running slow.	Motor has overheated and has automatically slowed down to reduce temperature.	Motor will return to normal speed when temperature drops to factory set level. You may shut off motor and allow it to cool, or reduce the ambient temperature in the operating area.
	Motor external surfaces are dirty.	Clean motor surfaces and cooling fins, for proper cooling.
Motor running slow or erratically.	Motor sensors (optos) are bad.	Contact your Graco distributor for proper service.
Drive section fails to operate	Electric motor is turned off.	Turn motor on.
	Power source is turned off.	Turn power on.
	Inadequate power supply to motor.	Supply correct power. See 308254.
	Wire size to motor is too small.	Use correct gauge wire. See 308254.
Loud squeaking noise in drive section.	Dry or worn cam followers.	Replace cam followers. See 308255.
Pump stops and will not move. Green indicator light is on and motor is warm.	Gear tooth is broken and has jammed gear.	Replace gear. See 308255.
Pump hesitates and pressure drops during the pump stroke.	Motor not properly timed with lower pump.	Disconnect power and turn torque control to 0. Reconnect power and slowly increase torque control to desired setting.
Motor does not run, and green power indicator is on.	Motor has shut off because pump speed exceeded 60 cycles per minute.	Correct system causes of excessive pump speed (exhausted fluid supply, broken supply line, worn seals, etc.). To restart, shut off power to the motor, set the torque control to zero (0), turn on power to the motor, and turn the torque control slowly clockwise until the pump runs at less than 60 cycles per minute.

Troubleshooting

PROBLEM	CAUSE	SOLUTION
Pump fails to operate	Electric motor is turned off.	Turn motor on.
	Power source is turned off.	Turn power on.
	Inadequate power supply to motor.	Supply correct power. See 308254.
	Obstructed fluid hose or gun/valve; fluid hose ID is too small.	Open, clear. Use hose with larger ID.
	Fluid dried on the piston rod.	Clean. Always stop pump at bottom of stroke; keep wet-cup 1/3 filled with compatible solvent.
	Dirty, worn, or damaged motor parts.	Clean or repair; see motor manual 308-254, supplied.
Pump operates, but output low on both strokes	Inadequate power supply to motor.	Supply correct power. See 308254.
	Obstructed fluid hose or gun/valve; fluid hose ID is too small.	Open, clear. Use hose with larger ID.
	Worn packings in displacement pump.	Replace packings. See page 21 and manual 308793.
Pump operates, but output low on only one stroke	Held open or worn ball check valves.	Check and repair. See 308793.
	Worn piston packing.	Replace. See 308793.
Erratic or accelerated pump speed	Exhausted fluid supply.	Refill and prime. To restart, shut off power to the motor, set the torque control to zero (0), turn on power to the motor, and turn the torque control slowly clockwise until the pump runs at less than 60 cycles per minute.
	Worn piston packing.	Replace. See 308793.
	Worn packings in displacement pump.	Replace packings. See page 21 and manual 308793.

Service

For the pump, follow the service procedures given in the separate displacement pump manual 308793.

For the reciprocator, follow the service procedures given in separate manual 308255.

For the motor, follow the service procedures given in separate manual 308254.

Connecting the Reciprocator to the Displacement Pump

NOTE: Connection Kit 236717 is available to connect the Triumph reciprocator to a High-Flo displacement pump. Parts included in the kit are marked with an asterisk, for example (103*).

1. Apply thread sealant (109*) to the top threads only of the adapter rod (104*) and screw the rod into the base of the reciprocator (101). Torque to 68–75 N•m (50–55 ft-lb). See Fig. 6.

2. Lubricate the threads of the tie rods (103*). Screw the tie rods into the base of the reciprocator (101). Torque to 68–75 N•m (50–55 ft-lb).

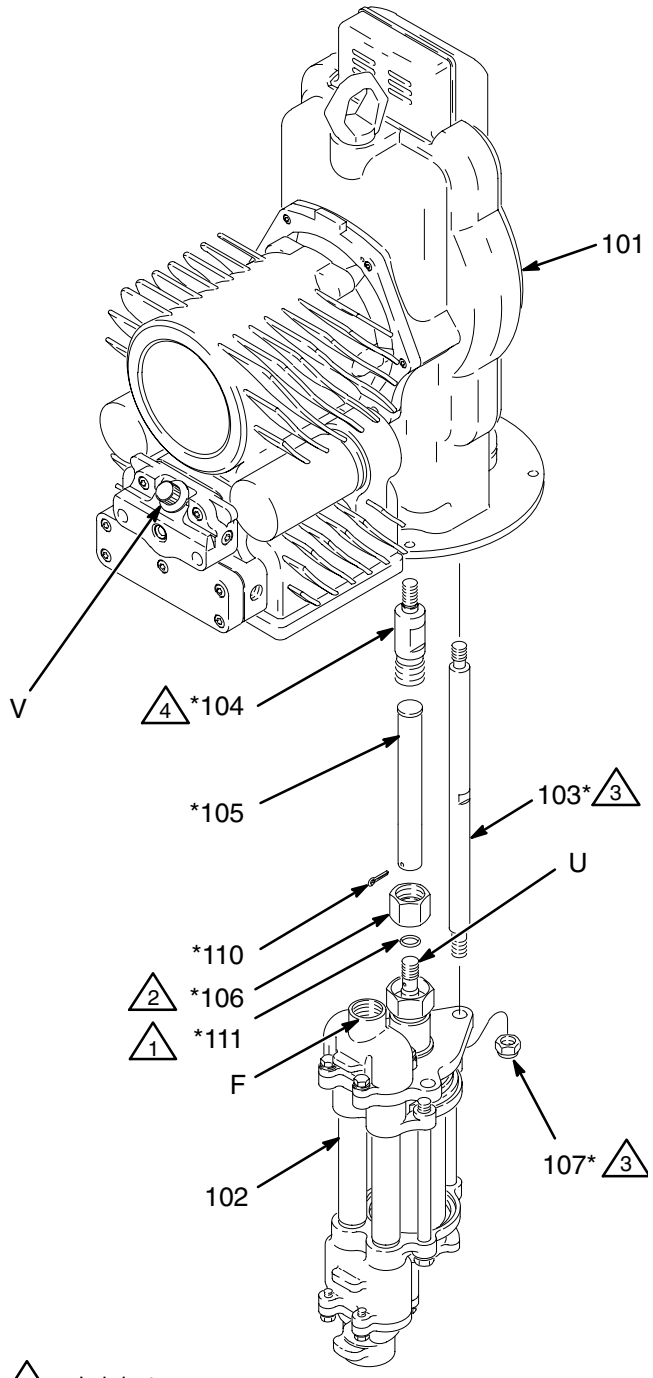
3. Lubricate the o-ring (111*) and install it on the rod (U) of the displacement pump (102).

4. Slide the coupling nut (106*) up onto the coupling (105*). Screw the coupling onto the rod (A) and install the pin (110*).

5. Orient the pump's fluid outlet (F) to the motor control panel (V) as shown. Position the displacement pump (102) on the tie rods (103*). Screw the locknuts (107*) onto the tie rods loosely.

6. Screw the coupling nut (106*) onto the adapter rod (104*). Torque to 102–109 N•m (75–80 ft-lb).

7. Torque the locknuts (107*) to 68–75 N•m (50–55 ft-lb).



1 Lubricate.

2 Torque to 102–109 N•m (75–80 ft-lb).

3 Lubricate threads and torque to 68–75 N•m (50–55 ft-lb).

4 Apply sealant (109*) to top threads only and torque to 68–75 N•m (50–55 ft-lb).

01872A

Fig. 6

Throat Seal Replacement (Stainless Steel Models only)

NOTE: On stainless steel pumps, use this procedure to supplement the procedure for replacing the throat packings, which is given in manual 308793.

NOTE: To replace throat seals in a carbon steel pump, continue to refer to manual 308793.

1. Flush the pump, if possible.
2. Stop the pump at the middle or top of its stroke.
3. Set the torque control (V) to zero (0). See Fig. 6.
4. Remove the cotter pin (110).
5. Cycle the pump slowly to the bottom of its stroke.

⚠ WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** on page 14.

6. Relieve the pressure.
7. Unscrew the coupling nut (106).
8. Unscrew and remove the coupling (105).
9. Shut off the fluid supply and outlet.
10. Loosen and remove the packing nut. See manual 308793.
11. Loosen and remove the throat cartridge.
12. Remove and replace the Teflon® o-ring.
13. Remove the packings from the throat cartridge.
14. Install the new packings in the throat cartridge. Refer to manual 308793 for packing order and orientation.
15. Loosely screw the packing nut into the throat cartridge.
16. Install the complete throat cartridge onto the pump housing.
17. Torque the throat cartridge to 135 N•m (100 ft-lb).
18. Torque the packing nut to 34–40 N•m (25–30 ft-lb).
19. Slide the coupling nut (106) up onto the coupling (105). Screw the coupling onto the rod (A) and install the pin (110).
20. Screw the coupling nut (106) onto the adapter rod (104). Torque to 102–109 N•m (75–80 ft-lb).

Parts

CARBON STEEL PUMPS

100 to 240V Models

Model 239485, Series A

Model 239486, Series A

Model 239487, Series A

240 to 480V Models

Model 239491, Series A

Model 239492, Series A

Model 239493, Series A

Ref No.	Part No.	Description	Qty
101	239658	RECIPROCATOR; for 100 to 240V Models only; See manual 308255 for parts	1
	239659	RECIPROCATOR; for 240 to 480V Models only; See manual 308255 for parts	1
102	239835	PUMP, displacement; cst; *for Models 239485 and 239491;* See manual 308793 for parts	1
	239834	PUMP, displacement; cst; *for Models 239486 and 239492;* See manual 308793 for parts	1
	239833	PUMP, displacement; cst; *for Models 239487 and 239493;* See manual 308793 for parts	1
103	183033	ROD, tie; 346 mm (13.625”) shoulder to shoulder	3
104*	187698	ROD, adapter	1
105	183041	COUPLING	1
106	183042	NUT, coupling	1
107	108527	NUT, lock, hex; 9/16–12 unc	3
109*	111368	SEALANT, anaerobic (not shown)	1
110	100103	PIN, cotter; 1/8” dia. x 1–1/2”	1
111*	108284	O-RING; buna-N	1

* *These parts are included in Connection Kit 236717.*

SEVERE-DUTY ELECTROPOLISHED STAINLESS STEEL PUMPS

100 to 240V Models

Model 239482, Series A

Model 239483, Series A

Model 239484, Series A

240 to 480V Models

Model 239488, Series A

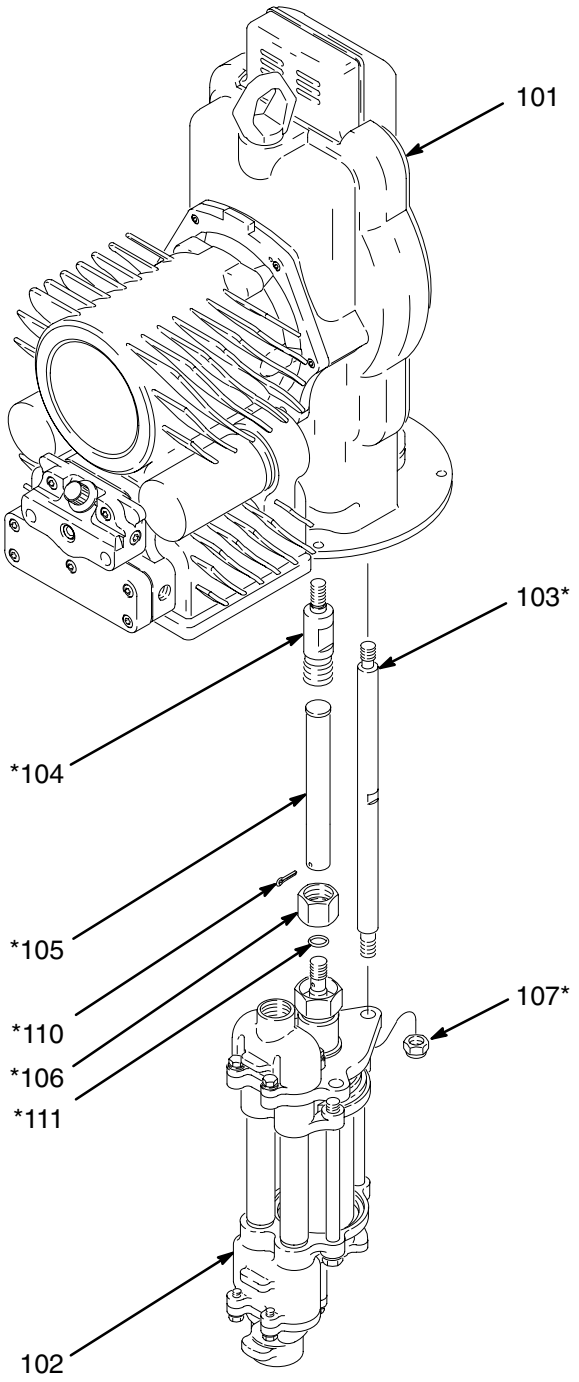
Model 239489, Series A

Model 239490, Series A
Model 244177, Series A

Ref No.	Part No.	Description	Qty
101	239658	RECIPROCATOR; for 100 to 240V Models only; See manual 308255 for parts	1
	239659	RECIPROCATOR; for 240 to 480V Models only; See manual 308255 for parts	1
102	239838	PUMP, displacement; sst; *for Models 239482 and 239488;* See manual 308793 for parts	1
	239837	PUMP, displacement; sst; *for Models 239483 and 239489;* See manual 308793 for parts	1
	239836	PUMP, displacement; sst; *for Models 239484 and 239490;* See manual 308793 for parts	1
	686679	PUMP, displacement; sst; *for Model 244177;* See manual 308793 for parts	1
103*	183089	ROD, tie; 346 mm (13.625”) shoulder to shoulder; sst	3
104*	187698	ROD, adapter	1
105*	183084	COUPLING; sst	1
106*	183079	NUT, coupling; sst	1
107*	108683	NUT, lock, hex; 9/16–12 unc	3
109*	111368	SEALANT, anaerobic (not shown)	1
110*	101946	PIN, cotter; 1/8” dia. x 1–1/2”	1
111*	108284	O-RING; buna-N	1

* *These parts are included in Connection Kit 236717.*

Parts

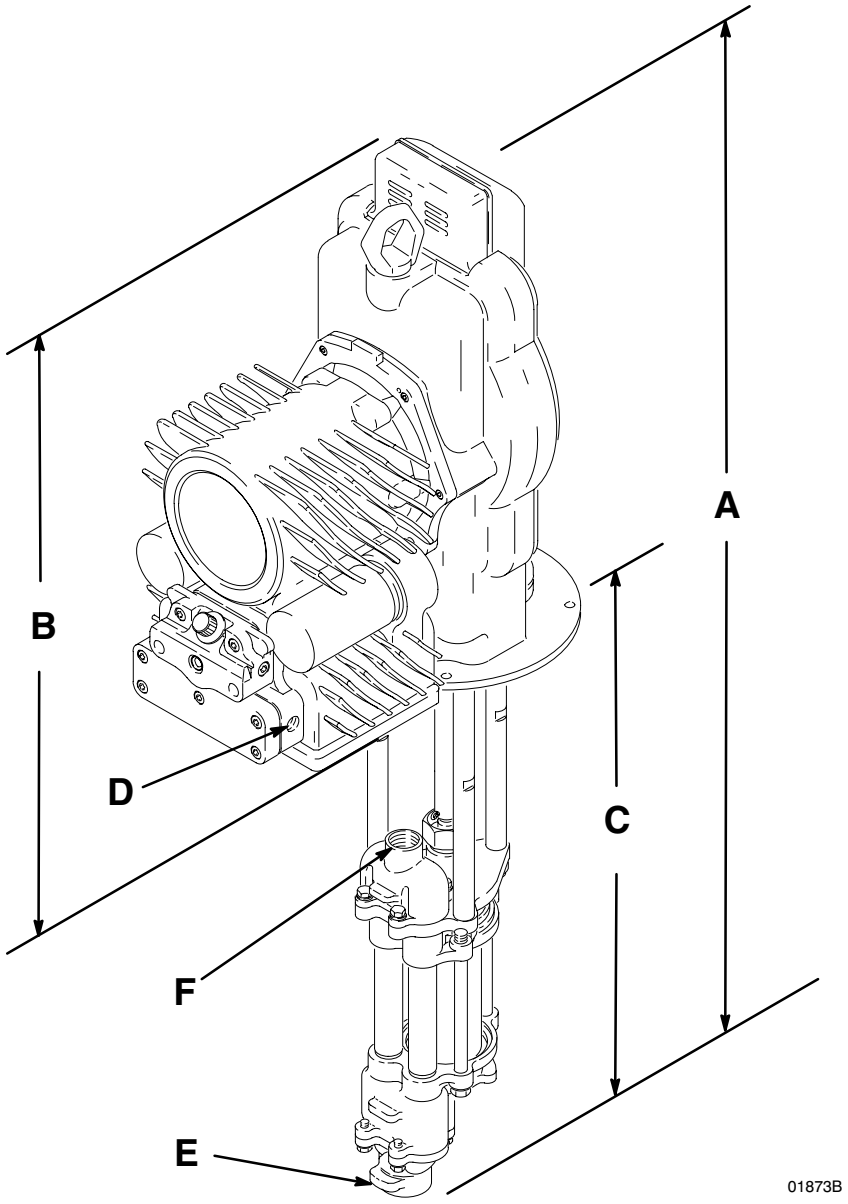


Dimensions

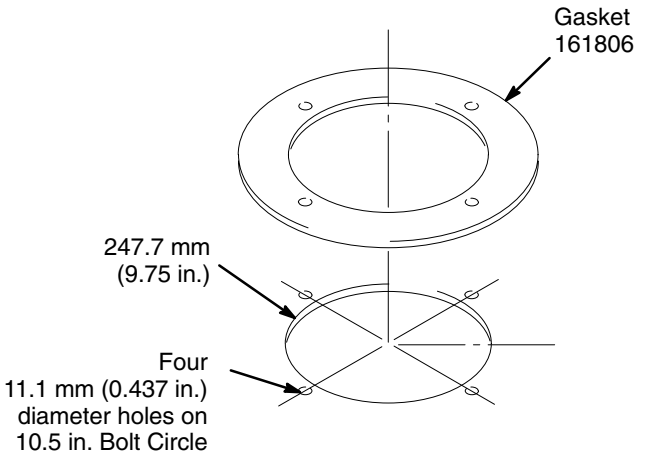
A 1301 mm (51.22 in.)
B 587 mm (23.11 in.)
C 714 mm (28.11 in.)

Port Sizes
D 1/2 npt(f) Power Supply Inlet
E 1-1/2” npt(f) Fluid Inlet
F 1” npt(f) Fluid Outlet

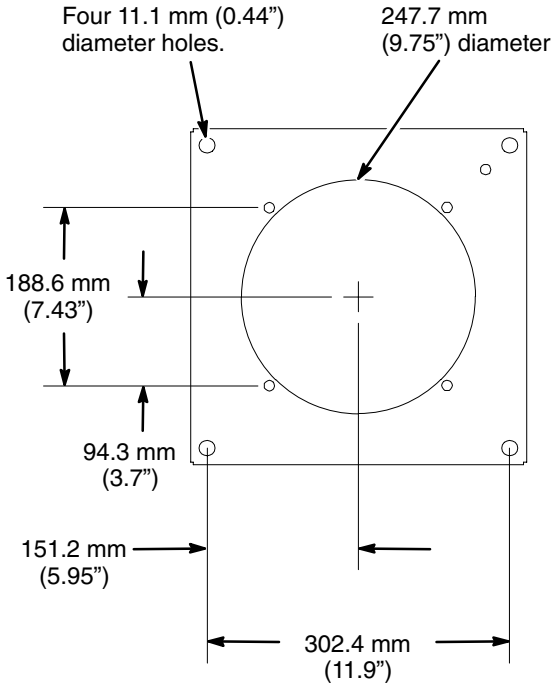
Weight: 90 kg (198 lb)



Pump Mounting Hole Diagram



Bolt Pattern for 220581 Pump Stand



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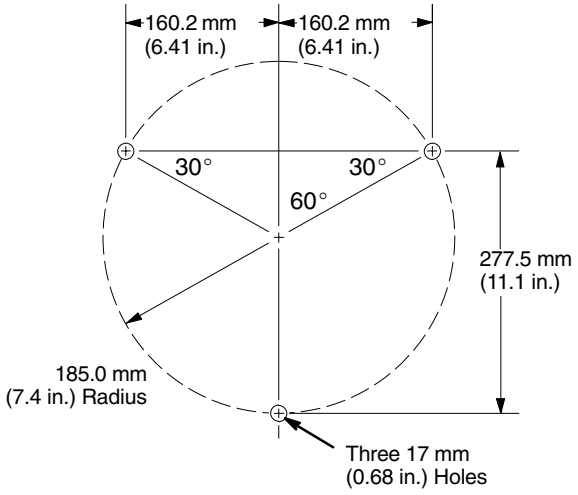
Bolt Pattern for 218742 Surge Tank Stand



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Technical Data

Category	Data
Maximum Fluid Working Pressure	*Models 239482, 239485, 239488, 239491:* 1.4 MPa, 14 bar (200 psi) *Models 239483, 239486, 239489, 239492:* 1.7 MPa, 17 bar (250 psi) *Models 239484, 239487, 239490, 239493, 244177:* 2.4 MPa, 24 bar (350 psi)
Fluid Flow at 32 cycles per minute	*Models 239482, 239485, 239488, 239491:* 10 gpm (38 liters/min) *Models 239483, 239486, 239489, 239492:* 8 gpm (30 liters/min) *Models 239484, 239487, 239490, 239493, 244177:* 5 gpm (19 liters/min)
Operating Voltage Range	*Models 239482, 239483, 239484, 239485, 239486, 239487:* 100 to 240 VAC *Models 239488, 239489, 239490, 239491, 239492, 239493, 244177:* 240 to 480 VAC
Cycles	*Models 239482, 239483, 239484, 239485, 239486, 239487:* 50/60 Hz, single-phase *Models 239488, 239489, 239490, 239491, 239492, 239493, 244177:* 50/60 Hz, three-phase
Maximum Current Draw	15 Amperes rms
Power Output at 2500 rpm, 25°C ambient	2.7 H.P. (2 kW) out
Power Output at 2500 rpm, 40°C ambient	1.7 H.P. (1.3 kW) out
Ambient Temperature Range	–40 to 40°C (–40 to 104°F)
Maximum Operating Temperature	85°C (185°F) (motor automatically slows down to cool down, then returns to speed)
Maximum Fluid Temperature Rating	66°C (150°F)
Wetted Parts	Refer to manual 308793

Sound Pressure Levels (dBa)

measured at 1 meter from unit, at 1.4 MPa, 14 bar (200 psi) fluid pressure

	Motor Torque Control Setting and Cycles per Minute		
Motor	**9, 15 cycles per minute**	**9, 24 cycles per minute**	**9.5, 32 cycles per minute**
Triumph	66.4 dB(A)	70.8 dB(A)	74.5 dB(A)

Sound Power Levels (dBa)

tested in accordance with ISO 9614–2, at 1.4 MPa, 14 bar (200 psi) fluid pressure

	Motor Torque Control Setting and Cycles per Minute		
Motor	**9, 15 cycles per minute**	**9, 24 cycles per minute**	**9.5, 32 cycles per minute**
Triumph	75.0 dB(A)	79.2 dB(A)	82.8 dB(A)

Technical Data

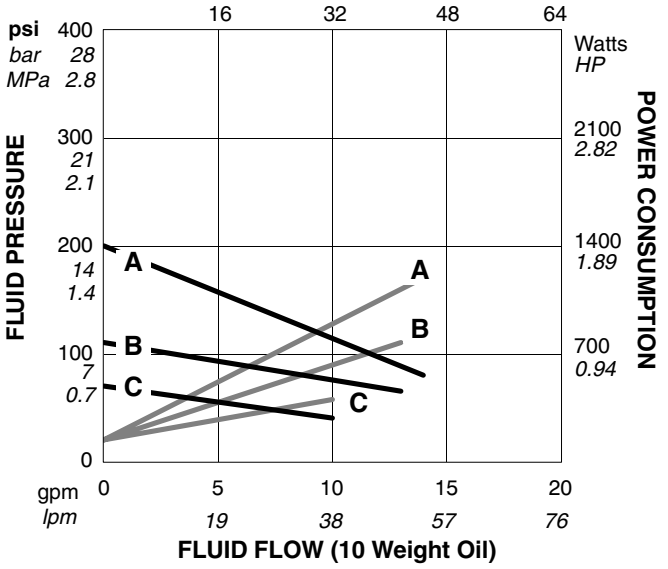
PERFORMANCE WHEN OPERATED AT 120VAC INPUT

(For 100 to 240VAC Pump Models 239482, 239483, 239484, 239485, 239486, and 239487 only)

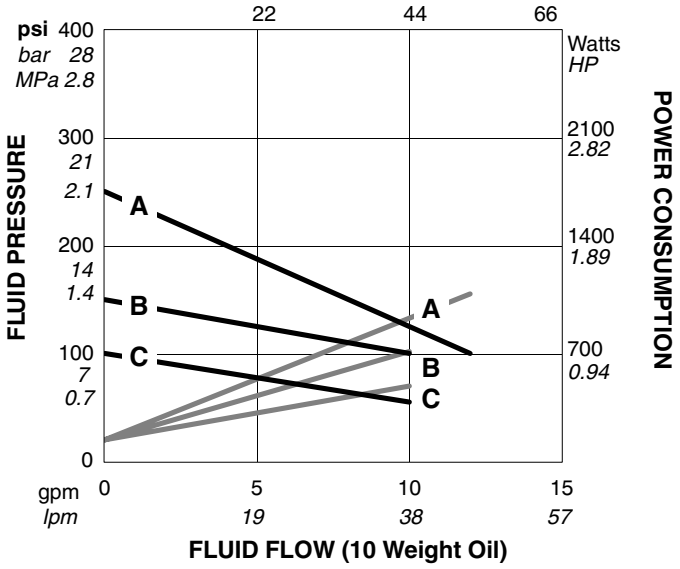
KEY

A Motor Torque Control set to 10.
B Motor Torque Control set to 7.
C Motor Torque Control set to 5.

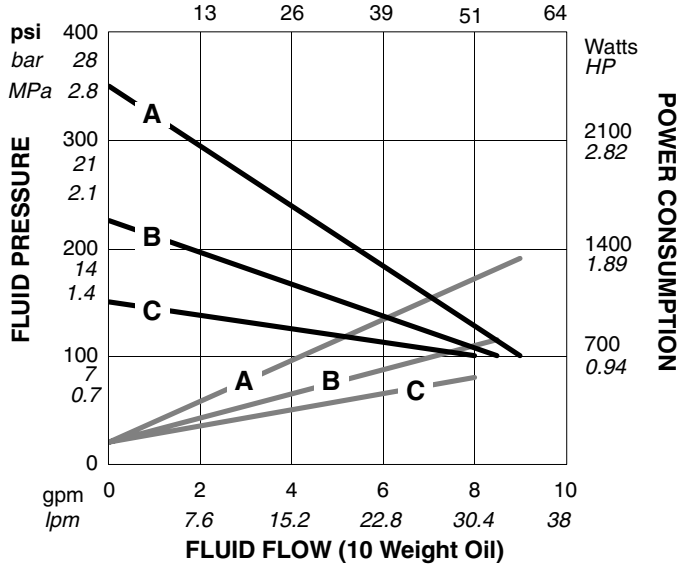
MODELS 239482 and 239485



MODELS 239483 and 239486



MODELS 239484 and 239487



To find Outlet Pressure (bar/MPa/psi) at a specific delivery (lpm or gpm) and torque control setting:

1. Located desired delivery along bottom of chart.
2. Read vertical line up to intersection with selected fluid outlet pressure curve. Curve slopes from left to right. Follow left to scale and read outlet pressure.

To find Pump Power Consumption (watts or horsepower) at a specific delivery (lpm or gpm) and torque control setting:

1. Located desired delivery along bottom of chart.
2. Read vertical line up to intersection with selected power consumption curve. Curve slopes from right to left. Follow right to scale and read power consumption.

Technical Data

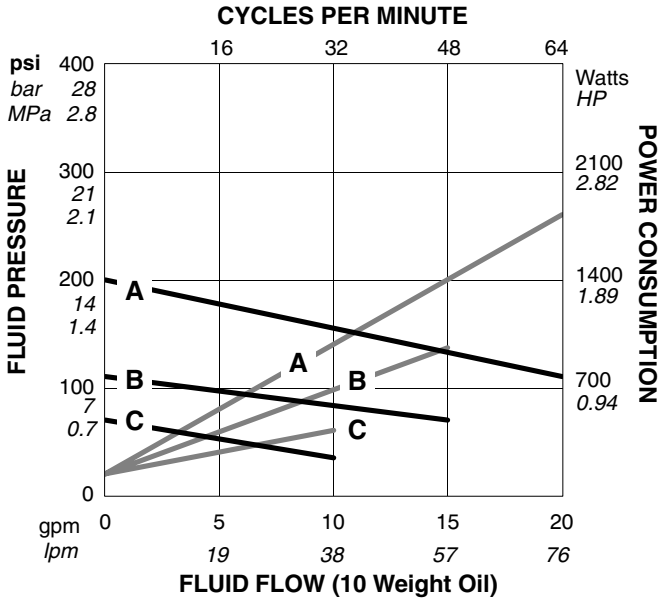
PERFORMANCE WHEN OPERATED AT 240VAC INPUT

(For All Pump Models)

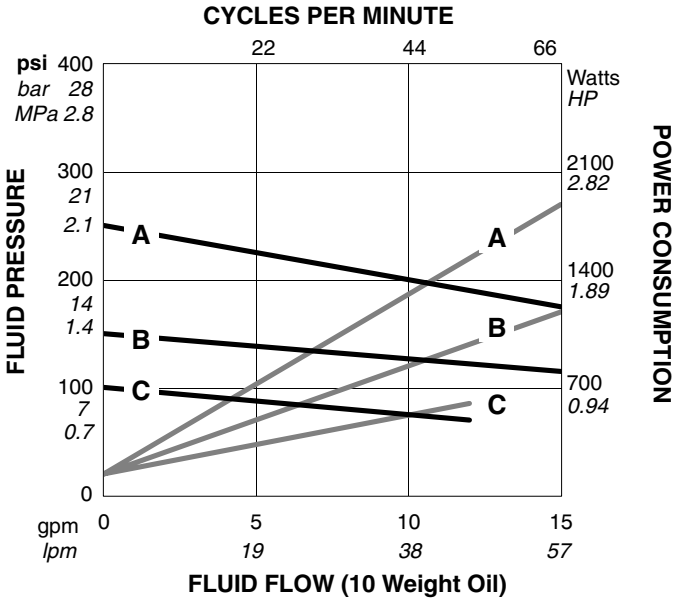
KEY

A Motor Torque Control set to 10.
B Motor Torque Control set to 7.
C Motor Torque Control set to 5.

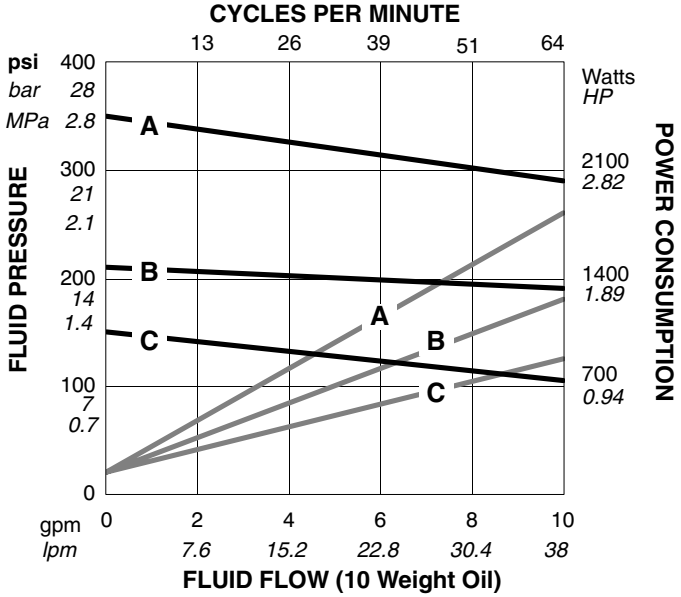
MODELS 239482, 239485, 239488, 239491



MODELS 239483, 239486, 239489, 239492



MODELS 239484, 239487, 239490, 239493, and 244177



To find Outlet Pressure (bar/MPa/psi) at a specific delivery (lpm or gpm) and torque control setting:

1. Located desired delivery along bottom of chart.
2. Read vertical line up to intersection with selected fluid outlet pressure curve. Curve slopes from left to right. Follow left to scale and read outlet pressure.

To find Pump Power Consumption (watts or horsepower) at a specific delivery (lpm or gpm) and torque control setting:

1. Located desired delivery along bottom of chart.
2. Read vertical line up to intersection with selected power consumption curve. Curve slopes from right to left. Follow right to scale and read power consumption.

Technical Data

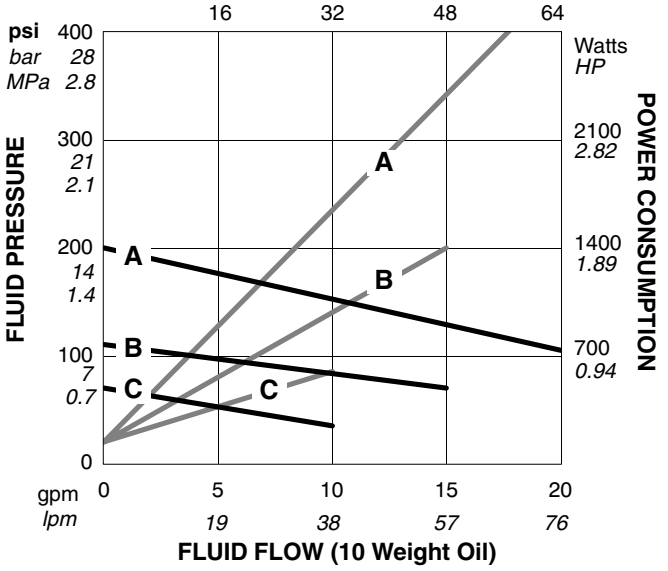
PERFORMANCE WHEN OPERATED AT 480VAC INPUT

(For 240 to 480VAC Pump Models 239488, 239489, 239490, 239491, 239492, and 239493 only)

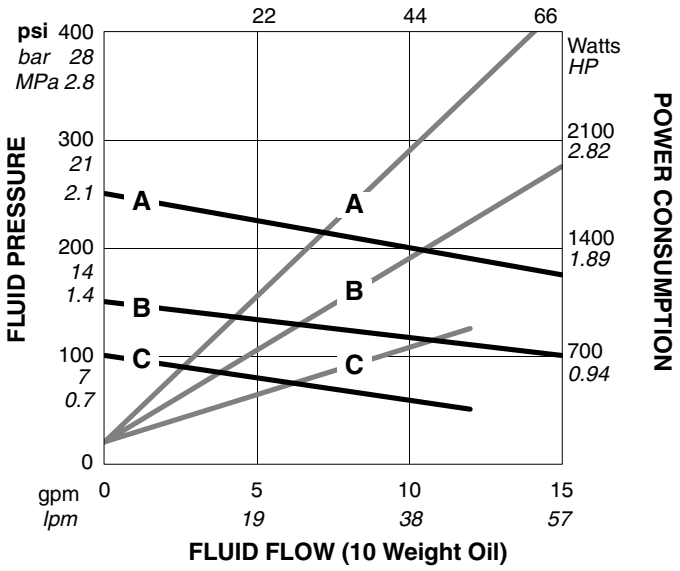
KEY

A Motor Torque Control set to 10.
B Motor Torque Control set to 7.
C Motor Torque Control set to 5.

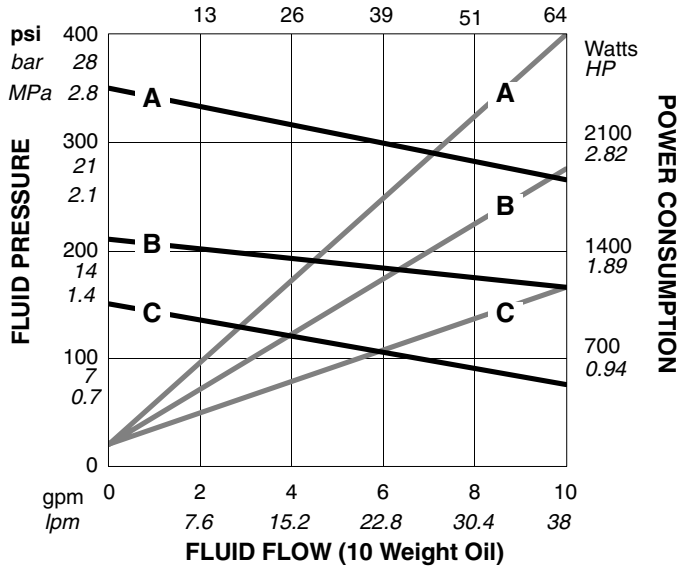
MODELS 239488 and 239491



MODELS 239489, 239492 and 244177



MODELS 239490, 239493 and 244177



To find Outlet Pressure (bar/MPa/psi) at a specific delivery (lpm or gpm) and torque control setting:

1. Located desired delivery along bottom of chart.
2. Read vertical line up to intersection with selected fluid outlet pressure curve. Curve slopes from left to right. Follow left to scale and read outlet pressure.

To find Pump Power Consumption (watts or horsepower) at a specific delivery (lpm or gpm) and torque control setting:

1. Located desired delivery along bottom of chart.
2. Read vertical line up to intersection with selected power consumption curve. Curve slopes from right to left. Follow right to scale and read power consumption.

Graco Standard Warranty

Graco warrants all equipment manufactured by Graco and bearing its name to be free from defects in material and workmanship on the date of sale by an authorized Graco distributor to the original purchaser for use. With the exception of any special, extended, or limited warranty published by Graco, Graco will, for a period of twelve months from the date of sale, repair or replace any part of the equipment determined by Graco to be defective. This warranty applies only when the equipment is installed, operated and maintained in accordance with Graco's written recommendations.

This warranty does not cover, and Graco shall not be liable for general wear and tear, or 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 of Graco equipment with 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 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.

THIS WARRANTY IS EXCLUSIVE, AND IS IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO WARRANTY OF MERCHANTABILITY OR WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.

Graco's sole obligation and buyer's sole remedy for any breach of warranty shall be as set forth above. The buyer agrees that no other remedy (including, but not limited to, incidental or consequential damages for lost profits, lost sales, injury to person or property, or any other incidental or consequential loss) shall be available. Any action for breach of warranty must be brought within two (2) years of the date of sale.

Graco makes no warranty, and disclaims all implied warranties of merchantability and fitness for a particular purpose in connection with accessories, equipment, materials or components sold but not manufactured by Graco. These items sold, but not manufactured by Graco (such as electric motors, 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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612–623–6921
612–378–3505 Fax

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