

ChemSafe™ 205 Air-Operated Diaphragm Pump

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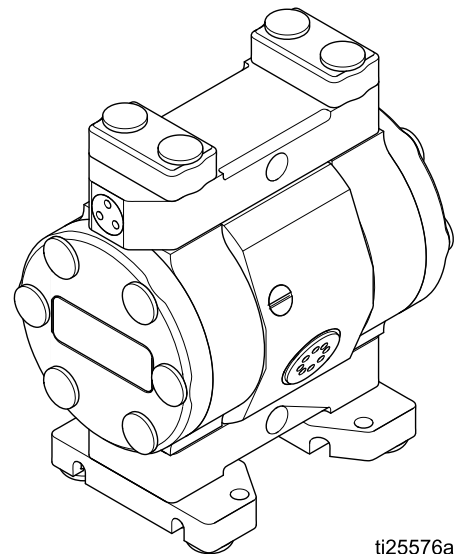
1/4-inch high purity pump for industrial applications.
For professional use only. Not approved for use in European explosive atmosphere locations.



Important Safety Instructions

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

*100 psi (0.7 MPa, 7.0 bar) Maximum Air
Supply Pressure
100 psi (0.7 MPa, 7.0 bar) Maximum
Fluid Working Pressure*











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Warnings





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

 <h2 style="margin: 0;">WARNING</h2>	
    	<p>FIRE AND EXPLOSION HAZARD</p> <p>Flammable fumes, such as solvent and paint fumes, in work area can ignite or explode. To help prevent fire and explosion:</p> <ul style="list-style-type: none"> • Use equipment only in well ventilated area. • Eliminate all ignition sources; such as pilot lights, cigarettes, portable electric lamps, and plastic drop cloths (potential static arc). • Keep work area free of debris, including solvent, rags and gasoline. • Do not plug or unplug power cords, or turn power or light switches on or off when flammable fumes are present. • Ground all equipment in the work area. See Grounding instructions. • Use only grounded hoses. • Hold gun firmly to side of grounded pail when triggering into pail. Do not use pail liners unless they are antistatic or conductive. • Stop operation immediately if static sparking occurs or you feel a shock. Do not use equipment until you identify and correct the problem. • Keep a working fire extinguisher in the work area. • Route exhaust away from all ignition sources. If diaphragm ruptures, fluid may be exhausted with air. <p>Static charge may build up on plastic parts during cleaning and could discharge and ignite flammable vapors. To help prevent fire and explosion:</p> <ul style="list-style-type: none"> • Clean plastic parts only in well ventilated area. • Do not clean with a dry cloth. • Do not operate electrostatic guns in equipment work area.
 	<p>PRESSURIZED EQUIPMENT HAZARD</p> <p>Fluid from the equipment, leaks, or ruptured components can splash in the eyes or on skin and cause serious injury.</p> <ul style="list-style-type: none"> • Follow the Pressure Relief Procedure when you stop spraying/dispensing and before cleaning, checking, or servicing equipment. • Tighten all fluid connections before operating the equipment. • Check hoses, tubes, and couplings daily. Replace worn or damaged parts immediately.



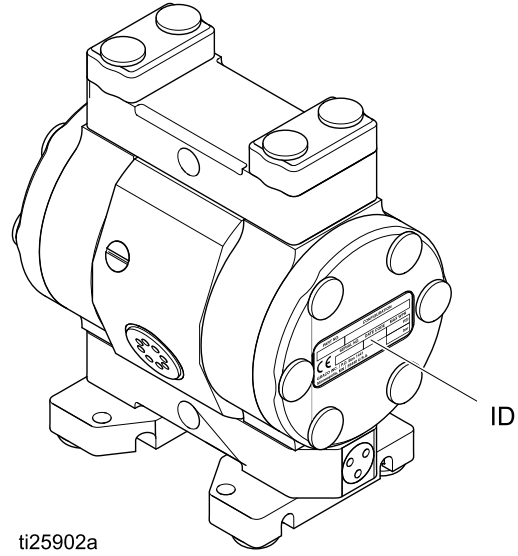
WARNING

 	<p>EQUIPMENT MISUSE HAZARD</p> <p>Misuse can cause death or serious injury.</p> <ul style="list-style-type: none"> • Do not operate the unit when fatigued or under the influence of drugs or alcohol. • Do not exceed the maximum working pressure or temperature rating of the lowest rated system component. See Technical Data in all equipment manuals. • Use fluids and solvents that are compatible with equipment wetted parts. See Technical Data in all equipment manuals. Read fluid and solvent manufacturer's warnings. For complete information about your material, request MSDS from distributor or retailer. • Do not leave the work area while equipment is energized or under pressure. • Turn off all equipment and follow the Pressure Relief Procedure when equipment is not in use. • Check equipment daily. Repair or replace worn or damaged parts immediately with genuine manufacturer's replacement parts only. • Do not alter or modify equipment. Alterations or modifications may void agency approvals and create safety hazards. • Make sure all equipment is rated and approved for the environment in which you are using it. • Use equipment only for its intended purpose. Call your distributor for information. • Route hoses and cables away from traffic areas, sharp edges, moving parts, and hot surfaces. • Do not kink or over bend hoses or use hoses to pull equipment. • Keep children and animals away from work area. • Comply with all applicable safety regulations.
  	<p>THERMAL EXPANSION HAZARD</p> <p>Fluids subjected to heat in confined spaces, including hoses, can create a rapid rise in pressure due to the thermal expansion. Over-pressurization can result in equipment rupture and serious injury.</p> <ul style="list-style-type: none"> • Open a valve to relieve the fluid expansion during heating. • Replace hoses proactively at regular intervals based on your operating conditions.
 	<p>PLASTIC PARTS CLEANING SOLVENT HAZARD</p> <p>Many solvents can degrade plastic parts and cause them to fail, which could cause serious injury or property damage.</p> <ul style="list-style-type: none"> • Use only compatible water-based solvents to clean plastic structural or pressure-containing parts. • See Technical Data in this and all other equipment instruction manuals. Read fluid and solvent manufacturer's MSDSs and recommendations.

 <h1 style="margin: 0;">WARNING</h1>	
	<p>TOXIC FLUID OR FUMES HAZARD</p> <p>Toxic fluids or fumes can cause serious injury or death if splashed in the eyes or on skin, inhaled, or swallowed.</p> <ul style="list-style-type: none"> • Read MSDSs to know the specific hazards of the fluids you are using. • Route exhaust away from work area. If diaphragm ruptures, fluid may be exhausted into the air. • Store hazardous fluid in approved containers, and dispose of it according to applicable guidelines.
	<p>BURN HAZARD</p> <p>Equipment surfaces and fluid that's heated can become very hot during operation. To avoid severe burns:</p> <ul style="list-style-type: none"> • Do not touch hot fluid or equipment.
	<p>PERSONAL PROTECTIVE EQUIPMENT</p> <p>Wear appropriate protective equipment when in the work area to help prevent serious injury, including eye injury, hearing loss, inhalation of toxic fumes, and burns. This protective equipment includes but is not limited to:</p> <ul style="list-style-type: none"> • Protective eyewear, and hearing protection. • Respirators, protective clothing, and gloves as recommended by the fluid and solvent manufacturer.

Configuration Number Matrix

Check the identification plate (ID) for the Configuration Number of your pump. Use the following matrix to define the components of your pump.



Sample Configuration Number: **205PT-P01APT3PTPTPOPT**

205PT	P01A	PT3	PT	PT	PO	PT
Pump Model	Center Section and Air Valve	Fluid Covers and Manifolds	Seats	Balls	Diaphragms	Manifold and Seat Seals

Pump	Center Section and Air Valve Material		Fluid Covers and Manifolds	
205PT 1/4 in. PTFE	P01A	Polypropylene center with npt air inlet	PT3	PTFE, npt
205 UH 1/4 in. UHMWPE	P03A	Polypropylene center with bspt air inlet	PT4	PTFE, bspt
			UH3	UHMWPE, npt
			UH4	UHMWPE, bspt

Seat Material		Ball Material		Diaphragm Material		Manifold and Seat Seal Material	
PT	PTFE	PT	PTFE	BN	Buna N	PT	PTFE
				EP	EPDM		
				PO	PTFE Overmolded		

Models

Model	Pump	Air & Fluid Connection Threads	Fluid Covers & Manifolds	Balls & Seats	Diaphragm	Manifold Seal
24X430‡	1/4 in. PTFE	bspt	PTFE	PTFE	PTFE/EPDM Overmolded	PTFE
24X429‡		npt				
24X511	1/4 in. UHMWPE	bspt	UHMW			
24X509		npt				
24X532		bspt			EPDM	
24X533		npt				
24X508		bspt			Buna N	
24X507		npt				

‡ These models are FDA compliant

Installation

General Information

The Typical Installation shown is only a guide for selecting and installing system components. Contact your Graco distributor for assistance in planning a system to suit your needs. Always use Genuine Graco Parts and accessories. Be sure all accessories are adequately sized and pressure rated to meet the system's requirements.

Reference letters in the text, for example (A), refer to the callouts in the figures.

Variations in color between the plastic components of this pump are normal. Color variation does not affect the performance of the pump.

Storage: Pumps that are not put into operation upon delivery must be stored appropriately. See [Flushing and Storage, page 15](#).

Tighten Fasteners

Before mounting and using the pump for the first time, check and retorque all external bolts. Remove all protective bolt covers (37). Follow [Torque Instructions, page 22](#), to tighten all bolts. Replace the bolt covers (37). After the first day of operation, retorque the bolts. Retorque the bolts if the pump has been idle for an extended time, been used in thermal cycling applications, been disassembled, or if there is a large difference between environmental temperatures and fluid temperatures.

Tips to Reduce Cavitation

Cavitation in an AODD pump is the formation and collapse of bubbles in the pumped liquid. Frequent or excessive cavitation can cause serious damage, including pitting and early wear of fluid chambers, balls, and seats. It may result in reduced efficiency of the pump. Cavitation damage and reduced efficiency both result in increased operating costs.

Cavitation depends on the vapor pressure of the pumped liquid, the system suction pressure, and the velocity pressure. It can be reduced by changing any of these factors.

1. Reduce vapor pressure: Decrease the temperature of the pumped liquid.
2. Increase suction pressure:
 - a. Lower the installed position of the pump relative to the liquid level in the supply.
 - b. Reduce the friction length of the suction piping. Remember that fittings add friction length to the piping. Reduce the number of fittings to reduce the friction length.
 - c. Increase the size of the suction piping.
3. Reduce liquid velocity: Slow the cyclic rate of the pump.

Pumped liquid viscosity is also very important but normally is controlled by factors that are process dependent and cannot be changed to reduce cavitation. Viscous liquids are more difficult to pump and more prone to cavitation.

Graco recommends taking all the above factors into account in system design. To maintain pump efficiency, supply only enough air pressure to the pump to achieve the required flow.

Graco distributors can supply site specific suggestions to improve pump performance and reduce operating costs.

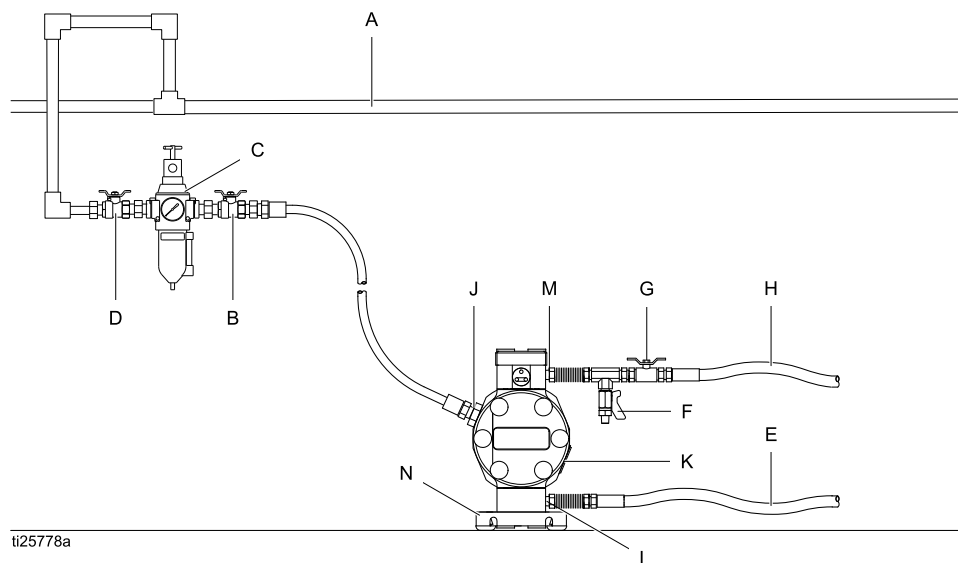
Mount The Pump



To avoid serious injury from toxic fluid or fumes:

- Ventilate to a remote area. The pump exhaust air may contain contaminants. See [Air Exhaust Ventilation, page 11](#).
- Never move or lift a pump under pressure. If dropped, the fluid section may rupture. Always follow the [Pressure Relief Procedure, page 14](#), before moving or lifting the pump.
- Prolonged exposure to UV radiation will degrade natural polypropylene components of the pumps. To prevent potential injury or equipment damage, do not expose pump or the plastic components to direct sunlight for prolonged periods.

1. Mount the pump so the exhaust port remains clear of the production area. Exhaust air may contain debris and condensation from the air supply and air chamber.
2. Be sure the mounting surface can support the weight of the pump, hoses, and accessories, as well as the stress caused during operation.
3. For all mountings, be sure the pump is secured with screws through the mounting feet. Always mount the pump upright.
4. Make sure the surface is flat and that the pump doesn't wobble.
5. For ease of operation and service, mount the pump so air inlet, fluid inlet and fluid outlet ports are easily accessible.



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Accessories/Components Not Supplied

- | | |
|---|--|
| A | Air supply line |
| B | Bleed-type master air valve (required for your pump) |
| C | Air filter/regulator assembly |
| D | Master air valve (to isolate the filter/regulator for service) |
| E | Grounded flexible fluid supply line |
| F | Fluid drain valve (required for your pump) |
| G | Fluid shutoff valve |
| H | Grounded, flexible fluid outlet line |

System Components

- | | |
|---|--------------------------|
| J | Air inlet port |
| K | Exhaust port and muffler |
| L | Fluid inlet port |
| M | Fluid outlet port |
| N | Mounting feet |

Ground The System

				
<p>The equipment must be grounded to reduce the risk of static sparking. Static sparking can cause fumes to ignite or explode. Grounding provides an escape wire for the electrical current.</p> <ul style="list-style-type: none"> • Always ground the entire fluid system as described below. • The pumps are not conductive. Any system used to pump flammable fluids must be properly grounded. • Follow your local fire codes. 				




Before operating the pump, ground the system as explained below.

- **Pump:** **Always** ground the entire fluid system by making sure the fluid has an electrical path to a true earth ground.
- **Air and fluid hoses:** Use only flexible grounded hoses with a maximum of 500 ft. (150 m) combined hose length to ensure grounding continuity.
- **Air compressor:** Follow manufacturer's recommendations.
- **Fluid supply container:** Follow local code.
- **Solvent pails used when flushing:** Follow local code. Use only conductive metal pails, placed on a grounded surface. Do not place the pail on a nonconductive surface, such as paper or cardboard, which interrupts grounding continuity.

Check your system electrical continuity after the initial installation, and then set up a regular schedule for checking continuity to be sure proper grounding is maintained.






Air Lines

1. Install an air regulator and gauge (C) to control the fluid pressure. The fluid stall pressure will be the same as the setting of the air regulator.
2. Locate a bleed-type master air valve (B) close to the pump and use it to relieve trapped air. Be sure the valve is easily accessible from the pump and located downstream from the regulator.

				
<p>Trapped air can cause the pump to cycle unexpectedly, which could result in serious injury from splashing.</p>				

3. Locate another master air valve (D) upstream from all air line accessories and use it to isolate them during cleaning and repair.
4. An air line filter (C) removes harmful dirt and moisture from the compressed air supply.
5. Install a grounded, flexible air hose (A) between the accessories and the 1/8 npt(f) or 1/8 bspt pump air inlet. Use a hose with a minimum 1/4 in. ID. If a hose longer than 10 ft. (3 m) is required, use a larger diameter hose.

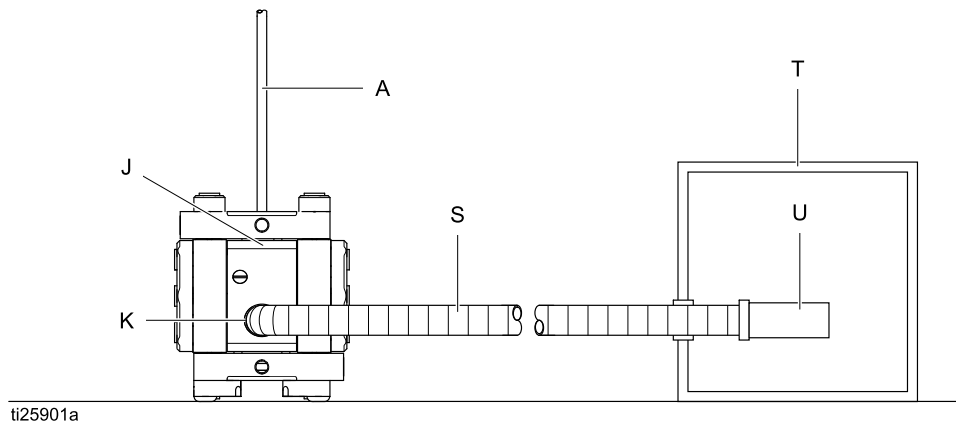
Air Exhaust Ventilation

				
<p>If pumping toxic fluids, you must vent the exhaust away from people, animals, food handling areas, and all sources of ignition. Follow all applicable codes.</p>				

NOTE: Do not restrict the air exhaust port. Excessive exhaust restriction can cause erratic pump operation.

To provide a remote exhaust:

1. Use Kit 17F610 (NPT) or 17F611 (BSPT), sold separately.
2. Remove the muffler (U) from the pump air exhaust port (K).
3. Install the adaptor from the kit.
4. Install a grounded air exhaust hose (S). If a hose longer than 10 ft. (3 m) is required, use a larger diameter hose. Avoid sharp bends or kinks in the hose.
5. Place a container (T) at the end of the air exhaust line to catch fluid in case a diaphragm ruptures. If the diaphragm ruptures, the fluid being pumped will exhaust with the air.



- | | | | |
|---|------------------------------|---|----------------------------------|
| A | Air supply line | S | Grounded air exhaust hose |
| J | Air inlet port (not visible) | T | Container for remote air exhaust |
| K | Exhaust port | U | Muffler |

Fluid Supply Line

1. Use grounded, flexible fluid hoses (E). See [Ground The System, page 10](#).
2. If the inlet fluid pressure to the pump is more than 25% of the outlet working pressure, the ball check valves will not close fast enough, resulting in inefficient pump operation. Excessive inlet fluid pressure also will shorten diaphragm life. Approximately 3–5 psi (0.02–0.03 MPa, 0.21–0.34 bar) should be adequate for most materials.
3. For maximum suction lift (wet and dry), see [Technical Data, page 29](#). For best results, always install the pump as close as possible to the material source. Minimize suction requirements to maximize pump performance.

Fluid Outlet Line

1. Use grounded, flexible fluid hoses. See [Ground The System, page 10](#),
2. Install a fluid drain valve (F) near the fluid outlet.
3. Install a shutoff valve (G) in the fluid outlet line.

Operation

Tighten Fasteners

Before mounting and using the pump for the first time, check and retorque all external bolts. Remove all protective bolt covers (37). Follow [Torque Instructions, page 22](#), to tighten all bolts. Replace the bolt covers (37). After the first day of operation, retorque the bolts. Retorque the bolts if the pump has been idle for an extended time, been used in thermal cycling applications, been disassembled, or if there is a large difference between environmental temperatures and fluid temperatures.

Flush the Pump Before First Use

The pump was tested in water. If water could contaminate the fluid you are pumping, flush the pump thoroughly with a compatible solvent. See [Flushing and Storage, page 15](#).

Start and Adjust the Pump

NOTICE

To avoid damage to your pump, be certain that all pumped fluids are compatible with wetted parts. See [Technical Data, page 29](#).

1. Be sure the pump is properly grounded. See [Ground The System, page 10](#).
2. Check fittings to be sure they are tight. Use a compatible liquid thread sealant on male threads.

NOTICE

Do not overtighten fluid inlet and outlet fittings. The soft plastic threads can be stripped easily.

3. Place the suction tube (if used) in fluid to be pumped.

NOTE: If fluid inlet pressure to the pump is more than 25% of outlet working pressure, the ball check valves will not close fast enough, resulting in inefficient pump operation.

NOTICE

Excessive fluid inlet pressure can reduce diaphragm life.

4. Place the end of the fluid hose into an appropriate container.
5. Close the fluid drain valve (F).
6. Back out the air regulator knob and open all bleed-type master air valves.
7. If the fluid hose has a dispensing device, hold it open.
8. Slowly increase air pressure with the air regulator until the pump just starts to cycle. Allow the pump to cycle slowly until all air is pushed out of the lines and the pump is primed.

NOTE: Use lowest possible air pressure to prime, just enough to cycle the pump. If the pump does not prime as expected, turn air pressure **DOWN**.
9. If you are flushing, run the pump long enough to thoroughly clean the pump and hoses.
10. Close the bleed-type master air valve.

Pressure Relief Procedure



Follow the Pressure Relief Procedure whenever you see this symbol.

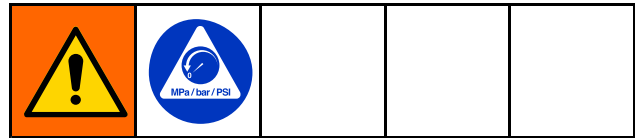


This equipment stays pressurized until pressure is relieved manually. To help prevent serious injury from pressurized fluid, such as splashing in the eyes or on skin, follow the Pressure Relief Procedure when you stop pumping and before you clean, check, or service the equipment.

1. Shut off the air supply to the pump.

2. Open the dispensing valve, if used.
3. Open the fluid drain valve to relieve fluid pressure. Have a container ready to catch the drainage.

Pump Shutdown



At the end of the work shift and before you check, adjust, clean, or repair the system, follow the [Pressure Relief Procedure, page 14](#).

Maintenance

Maintenance Schedule

Establish a preventive maintenance schedule based on the pump's service history. Scheduled maintenance is especially important to prevent spills or leakage due to diaphragm failure. A clogged muffler may restrict pump performance. Inspect air lines and muffler media regularly to maintain performance.

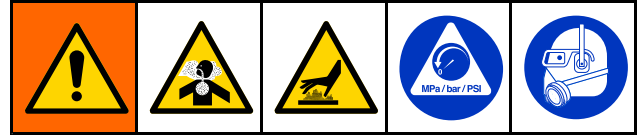
Lubrication

The pump is lubricated at the factory. It is designed to require no further lubrication for the life of the packings. There is no need to add an inline lubricator under normal operating conditions.

Tighten Threaded Connections

Before each use, check all hoses for wear or damage and replace as necessary. Check to be sure all threaded connections are tight and leak-free. Check mounting bolts. Check bolts. Tighten or retorque as necessary. Although pump use varies, a general guideline is to retorque bolts every two months. See [Torque Instructions, page 22](#).

Flushing and Storage



- Flush before fluid can dry in the equipment, at the end of the day, before storing, and before repairing equipment.
- Flush at the lowest pressure possible. Check connectors for leaks and tighten as necessary.
- Use solvent that is compatible with the equipment wetted parts and the material being dispensed.
- Always flush the pump and relieve the pressure before storing it for any length of time.

NOTICE

Flush the pump often enough to prevent the fluid you are pumping from drying or freezing in the pump and damaging it.

Storage: Pumps must be stored in an environment where they are clean, dry, and protected from extreme temperatures, UV radiation, and vibration. Graco recommends an ambient temperature range of 60°F-80°F (15°C-25°C), with a humidity level below 65%.

Troubleshooting

Problem	Cause	Solution
Pump cycles but will not prime.	Pump is running too fast, causing cavitation before prime.	Lower inlet pressure.
	Check valve ball is severely worn or wedged in seat or manifold.	Replace ball and seat.
	Seat is severely worn.	Replace ball and seat.
	Outlet or inlet is clogged.	Unclog.
	Inlet or outlet valve is closed.	Open.
	Inlet fittings or manifolds are loose.	Tighten.
	Manifold o-rings are damaged.	Replace o-rings.
Pump cycles at stall or fails to hold pressure at stall.	Check valve balls, seats or o-rings are worn.	Replace.
Pump will not cycle, or cycles once and stops.	Spool valve is stuck or dirty.	Disassemble and clean air valve. Use clean dry air.
	Air supply pressure too low.	Increase air supply pressure.
	Spool valve is worn or damaged.	Replace spool valve.
	Check valve ball is severely worn or wedged in seat or manifold.	Replace ball and seat.
	Dispensing valve is clogged.	Relieve pressure and clear valve.
	Diaphragm is ruptured.	Replace.
Pump operates erratically.	Suction line is clogged.	Inspect; clear.
	Check valve balls are sticky or leaking.	Clean or replace.
	Diaphragm is ruptured.	Replace.
	Exhaust is restricted.	Remove restriction.
	Spool valve is damaged or worn.	Replace spool valve.
	Air supply is erratic.	Repair air supply.
	Exhaust muffler is icing.	Use drier air supply.
Air bubbles in fluid.	Suction line is loose.	Tighten.
	Diaphragm is ruptured.	Replace.
	Manifolds are loose, or seats or manifold o-rings are damaged.	Tighten manifold bolts or replace seats and/or o-rings.
	Diaphragm glide seals or o-rings are damaged.	Replace.
	Pump is cavitating.	Reduce pump speed, increase suction hose diameter, or increase inlet head.
Exhaust air contains fluid being pumped.	Diaphragm is ruptured.	Replace.
Moisture in exhaust air.	Inlet air has high humidity.	Use drier air supply.

Problem	Cause	Solution
Pump exhausts excessive air at stall.	Spool valve seals are worn or damaged.	Replace.
Pump leaks air externally.	Fluid covers are loose.	Retorque.
	Diaphragm is damaged.	Replace.
	Manifold fittings are loose	Retorque.
Pump leaks fluid externally.	Fluid covers are loose.	Retorque.
	Diaphragms are damaged.	Replace.

Repair



NOTE: Before repairing the pump, follow the [Pressure Relief Procedure, page 14](#).

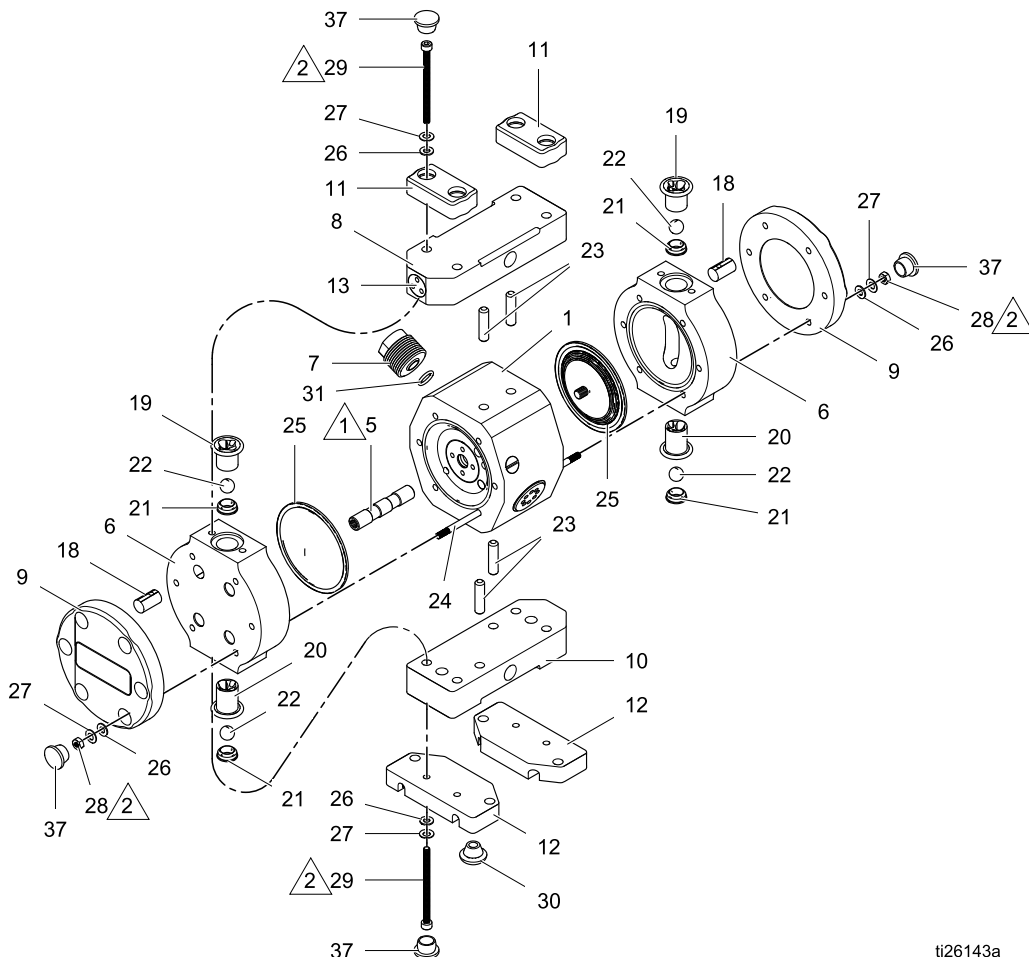
Disassemble the Fluid Section

1. Remove all bolt covers (37).
2. Use a 3 mm Allen wrench to remove the base plates (12) and the inlet manifold (10).
3. Remove the check seat (21) and ball (22). Without scratching the inner bore, use a hook to remove the inlet check cage (20).

4. Turn over the pump.
5. Use a 3 mm Allen wrench to remove the outlet manifold (8) and retainer (11).
6. Without scratching the inner bore, use a hook to remove the outlet ball retainer (19). Remove the ball (22) and check seat (21).
7. Reattach the manifold bolts (29) to keep the fluid cover nuts (18) aligned.
8. Remove the nuts (28) and bolts (24) using two 7 mm sockets, to hold on one side and to turn the other. The nuts (28) will come off of one side. Remove the bolts (24).

NOTE: The nuts are permanently affixed to one end of the bolts.

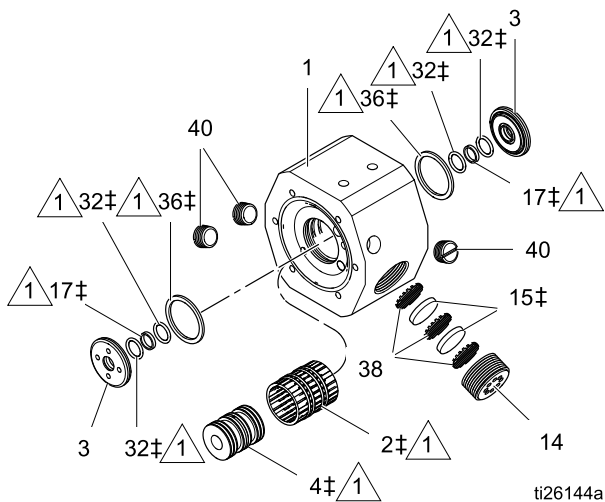
9. Remove the fluid cover retainers (9) and the fluid covers (6) from the body (1).



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Disassemble the Center Section

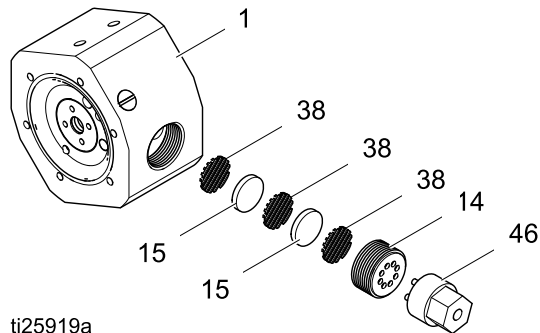
1. One diaphragm (25) should screw off by hand. Slide the second diaphragm out with the shaft (5) still attached.
2. Use the supplied tool (46) to remove the muffler (14) from the body. Remove all muffler parts. Inspect the mesh baffle spacers (38) and felt mufflers (15). Replace as needed.
3. Use the supplied tool (45) to remove the sleeve caps (3). Remove the shaft glide seal (17) and o-ring (32) from the ID of the caps. Remove o-ring (32) from the face of each cap. Remove the EPDM ring (36) from the seat for each sleeve cap (3).
4. Use an appropriate-sized socket to press out the main and center sleeve assemblies (2 & 4).



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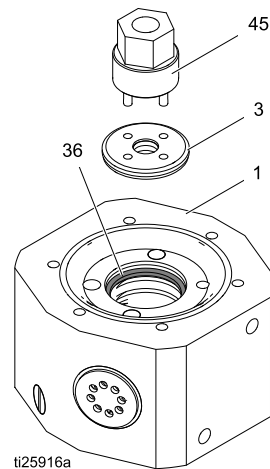
Reassemble the Center Section

1. Install a plug (40) in each of the three unused ports.
2. Install the muffler media (15 & 38) into the muffler. Use the new felt mufflers (15) supplied in the rebuild kit. Muffler parts must be placed in the exact order shown in the illustration. Use the supplied tool (46) to screw the muffler (14) into the exhaust port (the port with 2 holes on the bottom).



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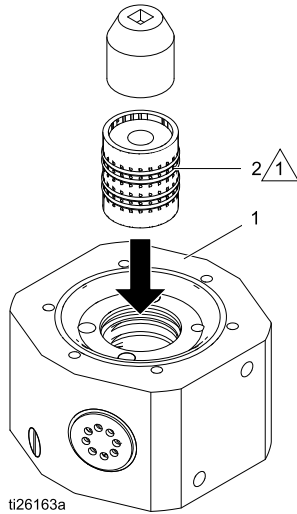
3. Lubricate and install an o-ring (32) and then the shaft glide seal (17) in the ID of each sleeve cap (3). Lubricate and install an o-ring (32) on the face of each sleeve cap (3).
4. Lubricate and install an EPDM ring (36) into the seat for the sleeve cap (3), in the center of the body (1).
5. Apply medium-strength thread locker to the threads of a sleeve cap (3). Use the tool (45) to install it into one side of the body just until it is flush with the surface. Do not overtighten.



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Repair

- Turn the center section over. Spread a thin film of lubricant evenly across the o-rings on the main and center sleeve assemblies (2 & 4). Be careful not to plug the air holes. Put the center assembly (4) inside the main assembly (2), and use an appropriate-sized socket to press the sleeve assemblies into the body.

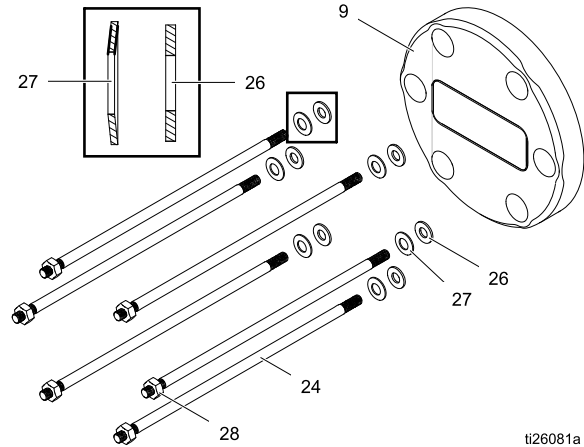


- Lubricate and install an EPDM ring (36±) into the seat for the sleeve cap (3), in the center of the body (1).
- Apply medium-strength thread locker to the threads of the second sleeve cap (3). Use the tool (45) to install the second sleeve cap (3) into the body. Tighten just until the cap is flush with the surface. Do not overtighten.
- If using new diaphragms, remove the thread cover on each diaphragm (25±).
- Tighten the pump shaft (5) onto one diaphragm, hand tight only. Do not use any tools on the shaft.
- Lubricate the shaft, then install it in the body. Turn the diaphragm as you push it in. Then, tighten the other diaphragm onto the shaft, hand tight only.

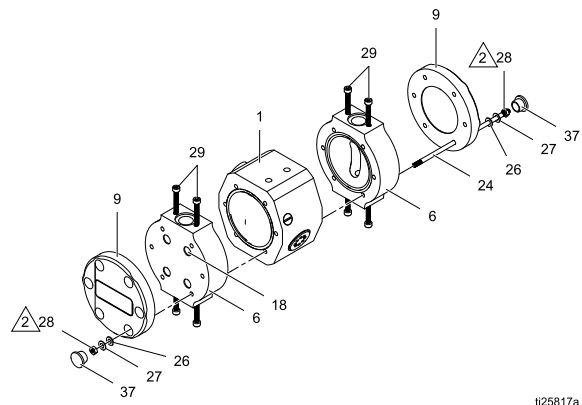
Reassemble the Fluid Section

- Insert the top two fluid cover nuts (18), threaded end first.
- Thread the manifold bolts (29) a few turns into the nuts (18), just to keep the nuts from rotating.
- Repeat steps 1 and 2 for the other fluid cover.
- Install the fluid covers with the top checks toward the air inlet.

- Place a belleville washer (27) with the rounded side toward the nut, then a flat washer (26) on each tie bolt (24). Thread the first tie bolt (24) through one fluid cover retainer (9), and then the second tie bolt (24) through the other fluid cover retainer (9). This necessary so that the first two tie bolts come in from opposite sides to help keep everything together before clamping.

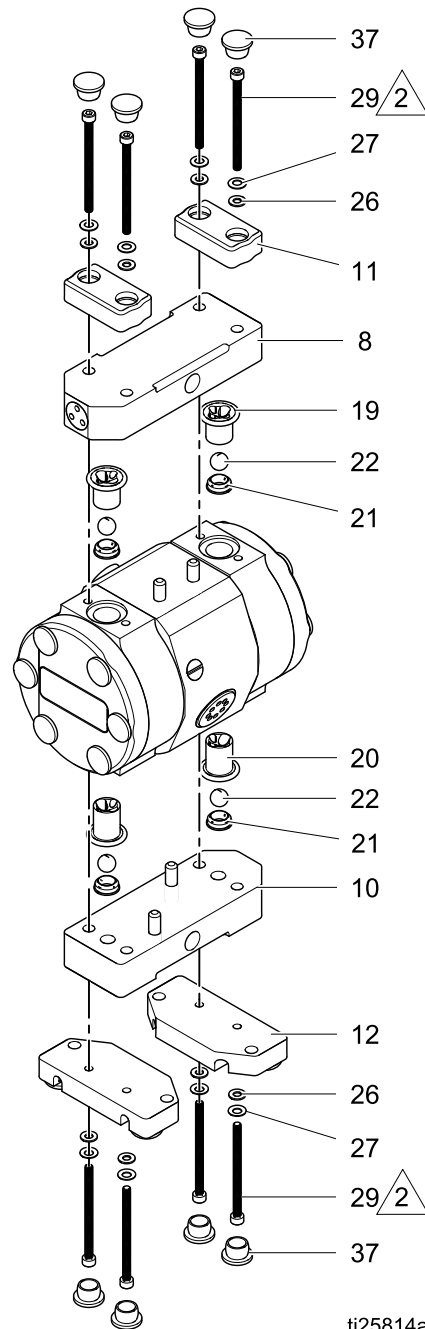


- Thread a fluid cover (6), the center section assembly, the other fluid cover (6) onto the first two tie bolts (24) and between the fluid cover retainers (9).



- Place the assembly in a clamp or vice. Tighten so the first two tie bolts (24) are exposed on each side. Thread the remaining tie bolts (24) through the assembly.
- Place a flat washer (26), a belleville washer (27), and a nut (28) on each tie bolt. Tighten the bolts hand-tight. Do not tighten to torque specification yet.
- Assemble the bottom checks. Insert the inlet ball retainer (20±), the ball (22±), and the seat (21±), with the chamfered side down (toward the ball).
- Carefully remove the manifold bolts (29) from the bottom of the fluid covers (6), keeping nuts (18) aligned.

11. Align the inlet manifold (10) on the assembly. Orient the manifold so the inlet port is facing the correct direction for your application (either the same as, or the opposite from, the exhaust port).
12. Align the inlet manifold retainers (12). Place a belleville washer (27), then a washer (26) on each bolt. The rounded side of the belleville washer must face toward the head of the fastener. Install the bolts (29), just hand-tight for now, then flip the pump over.
13. Assemble the top checks. Insert the seat (21†) with the chamfered side up, the ball (22†), and the outlet ball retainer (19†).
14. Carefully remove the manifold bolts (29) from the top of the fluid covers (6), keeping nuts (18) aligned.
15. Align the outlet manifold (8) with the dowels on the top of the body.
16. Align the outlet manifold retainers (11). Place a belleville washer (27), then a washer (26) on each bolt. Install the bolts (29) hand-tight.
17. Follow [Torque Instructions, page 22](#).
18. Replace all bolt covers (37†).



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Figure 1

Torque Instructions

If fluid cover or manifold bolts have been loosened, it is important to torque them using the following procedure to improve sealing.

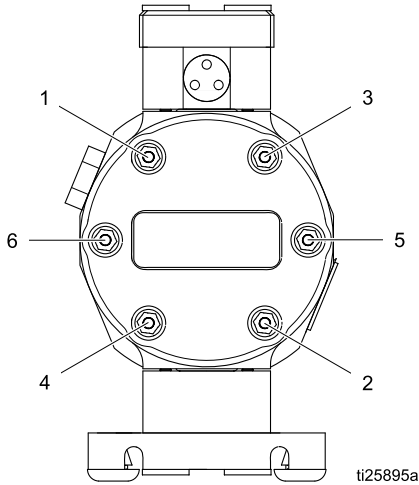
NOTICE

Do not over-torque. Tightening the bolts too tight will damage the pump.

NOTE: Always completely torque fluid covers before torquing fluid manifolds.

1. Remove the protective bolt covers (37) with a screwdriver. Carefully work the screwdriver under the lip of each cap and gently pry it off.
2. Start all fluid cover screws a few turns. Then, turn down each screw just until head contacts cover.

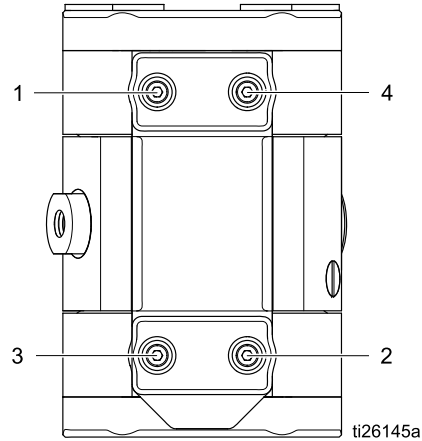
Fluid Cover Screws



3. Turn each screw by 1/2 turn or less working in a crisscross pattern to specified torque.
4. Repeat for fluid manifolds.

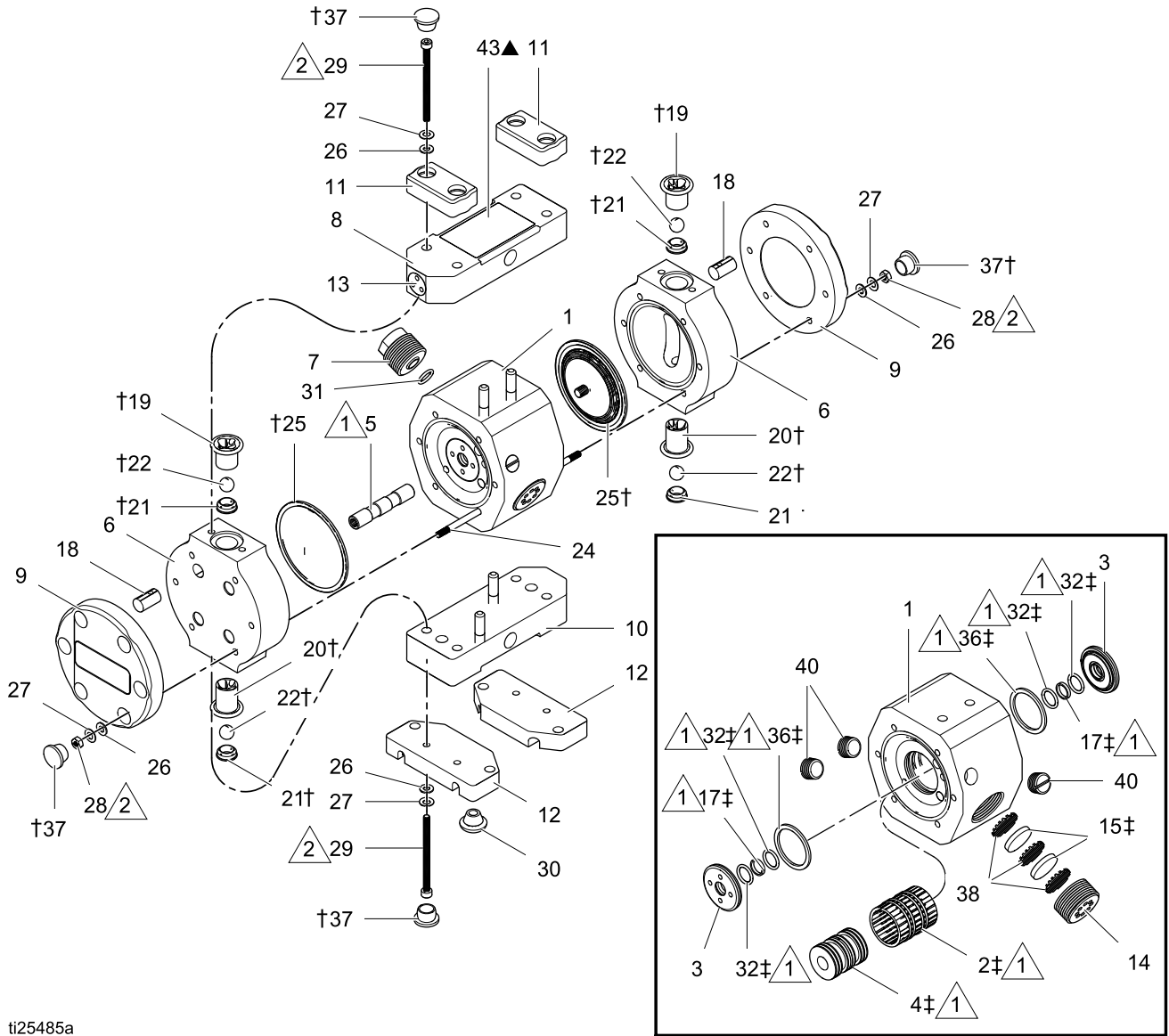
	Assembly Torque	Re-Torque
Fluid Covers	20 in-lb (2.3 N•m)	15 in-lb (1.7 N•m)
Fluid Manifolds	15 in-lb (1.7 N•m)	10 in-lb (1.1 N•m)

Fluid Manifold Screws




Notes

Parts



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 Lubricate using PFPE grease (17G558); included in all Center and Fluid Section Rebuild kits.

 Follow [Torque Instructions, page 22](#).

NOTE: Many parts are included in one or more kits. Please see [Kits, page 26](#), for the complete list of available kits and their contents.

Ref	Part	Description	Qty
1	17F203	BODY	1
2‡	17F590	SLEEVE, main; assembly	1
3	17F063	CAP, sleeve	2
4‡	17F589	SLEEVE, center; assembly	1
5‡	17F095	SHAFT, diaphragm	1
6		COVER, fluid	2
	17F157	PTFE	
	17F163	UHMWPE	
7		ADAPTER, inlet, 1/8 in.	1
	17F089	BSPT	
	17F088	NPT	
8		MANIFOLD, outlet	1
	17F042	PTFE, BSPT	
	17F019	UHMWPE, BSPT	
	17F062	PTFE, NPT	
	17F021	UHMWPE, NPT	
9	17F205	RETAINER, fluid cover	2
10		MANIFOLD, inlet	1
	17F043	PTFE, BSPT	
	17F020	UHMWPE, BSPT	
	17F044	PTFE, NPT	
	17F022	UHMWPE, NPT	
11	17F206	RETAINER, manifold	2
12	17F204	PLATE, base	2
13	17F192	PLUG, 1/4 in. (6 mm), PTFE	2
14	17F077	CAP, muffler	1
15‡	17F080	MUFFLER, felt; 4-pack	1
17‡	17F196	SEAL, shaft; 4-pack	1
18	17F187	NUT, fluid cover, stainless steel	8
19†	17F101	RETAINER, ball, outlet (top); PTFE	2
20†	17F105	RETAINER, ball, inlet (bottom); PTFE	2

Ref	Part	Description	Qty
21†	--	SEAT	4
22†	17F214	BALL, check, 3/8 in., 4-pack, PTFE	1
24	17F178	BOLT, tie	6
25†		DIAPHRAGM, 2-pack	1
	17F207	Buna-n	
	17F208	EPDM	
	17F209	PTFE Overmolded	
26	17F193	WASHER, 4 mm, stainless steel, 20-pack	1
27	17F194	WASHER, belleville, 0.375 in. diameter; 50-pack	1
28	17F179	NUT, hex, M4 x 0.7	12
29	17F180	SCREW, cap, socket head, M4 x 0.7 x 60 mm	8
30	17F190	FEET, rubber, 4-pack	1
31	17F197	O-RING, #12, EPDM, 2-pack	1
32‡	17F198	O-RING, #13, EPDM, 6-pack	1
35	17F201	O-RING, #21, EPDM, 3-pack	2
36‡	--	EPDM RING, 0.06 in.	2
37†	17F225	PLUG, cap, 0.47 diameter, 20-pack	1
38	17F079	SPACER, baffle, mesh; 3-pack	1
40	17F191	PLUG, 1/4 in. npt	3
41	17F188	PIN, 0.26 x 0.27	3
43▲	17F418	LABEL, warning	1
44▲	17F419	LABEL, warning, multilingual	1
45	17F796	TOOL, wrench, sleeve cap	1
46	17F795	TOOL, wrench, muffler cap	1
47†‡	17G558	LUBRICANT, PFPE	1

Kits

- ▲ Replacement Warning labels, signs, tags, and cards are available at no cost.
- † Parts included in Fluid Section Rebuild Kit, sold separately. See [Kits, page 26](#), for the correct kit for your pump.
- ‡ Parts included in Center Section Rebuild Kit 17F112, sold separately.

Kits

Center Section Rebuild Kit 17F112

Kit Includes:

Ref.	Description	Qty
2	Main Sleeve Assembly	1
4	Center Sleeve Assembly	1
5	Diaphragm Shaft	1
15	Felt Muffler	2
17	Shaft Seal	2
32	#13 O-ring	4
36	EPDM ring	2
47	PFPE Lubricant	1

Fluid Section Rebuild Kits 17F113, 17F114, and 17F118

Kits Include:

Ref.	Description	Qty
19	Outlet Ball Retainer	2
20	Inlet Ball Retainer	2
21	Seat	4
22	Check Ball	4
25	Diaphragm	2
	PTFE Overmolded (Kit 17F113)	
	EPDM (Kit 17F114)	
	Buna-n (Kit 17F118)	
37	Cap Plug	20
47	PFPE Lubricant	1

Air Motor Assembly Kit 17F596

Kit Includes:

Ref.	Description	Qty
2	Main Sleeve Assembly	1
3	Sleeve Cap	2
4	Center Sleeve Assembly	1
17	Shaft Seal	6
32	#13 O-ring	6

Main Cap Assembly 17F591

Kit Includes:

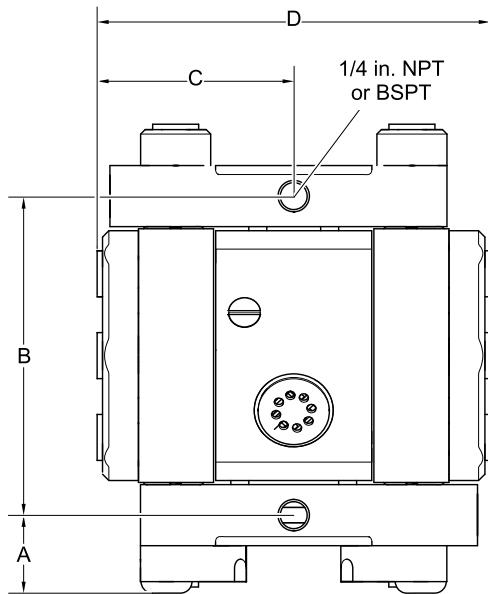
Ref.	Description	Qty
3	Sleeve Cap	1
17	Shaft Seal	1
32	#13 O-ring	2
36	EPDM ring	2

Body Assembly Kit 17F605

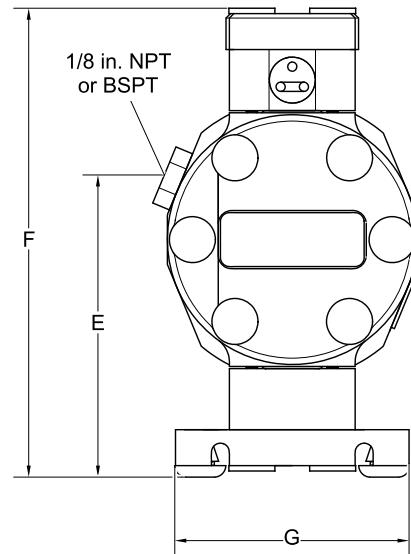
Kit Includes:

Ref.	Description	Qty
1	Body	1
2	Main Sleeve Assembly	1
3	Sleeve Cap	2
4	Center Sleeve Assembly	1
14	Muffler Cap	1
15	Felt Muffler	2
17	Shaft Seal	2
32	#13 O-ring	4
38	Mesh Baffle Spacer	3
40	Plug	3
41	Pin	3

Dimensions

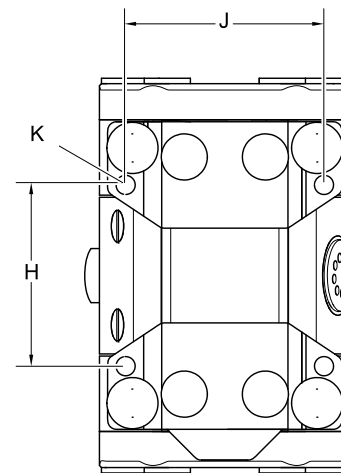


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Ref.	US	Metric
A	1.1 in.	28 mm
B	4.3 in.	113 mm
C	2.7 in.	69 mm
D	5.5 in.	139 mm
E	4.2 in.	107 mm
F	6.5 in.	166 mm
G	3.3 in.	83 mm
H	2.5 in.	64 mm
J	2.8 in.	70 mm
K (hole diameter)	0.3 in.	7 mm

Mounting Layout



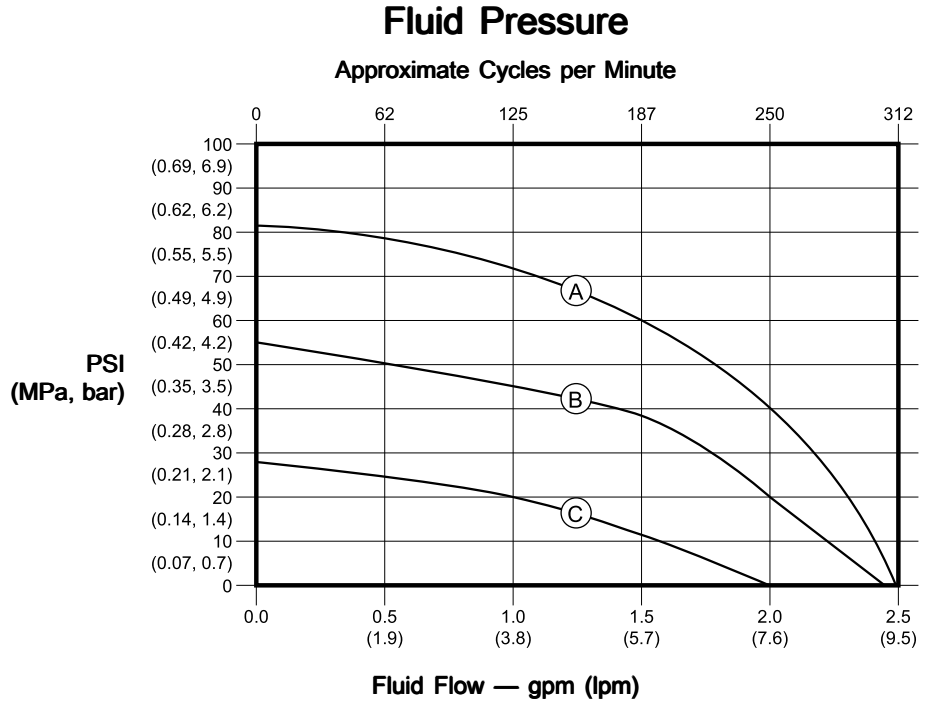
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Performance Charts

Test Conditions: The pump was tested in water with the inlet submerged.

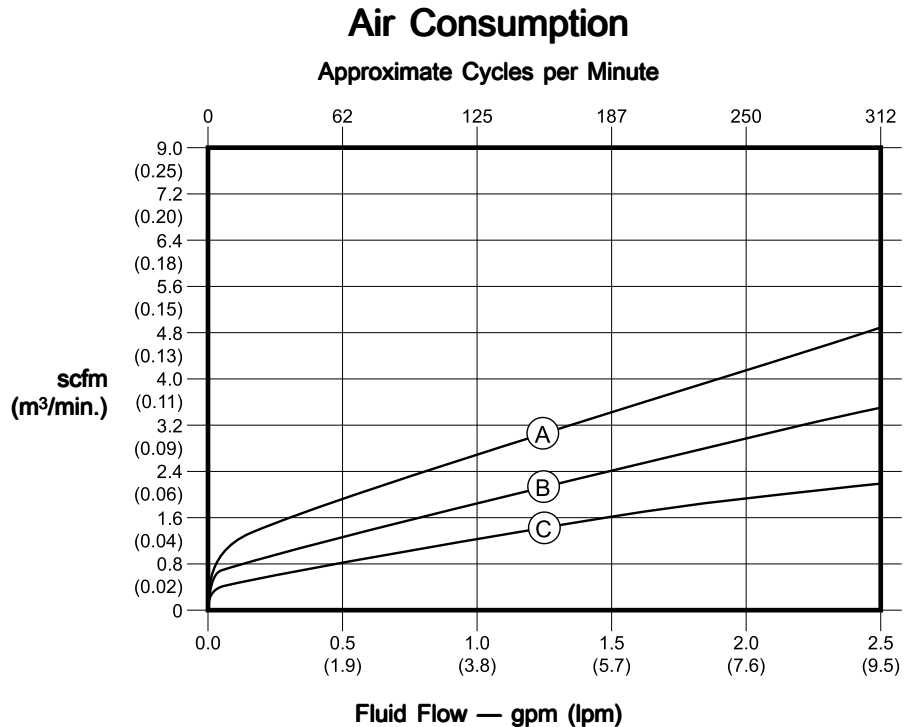
Operating Air Pressure

- A**
100 psi (0.7 MPa, 7.0 bar)
- B**
70 psi (0.48 MPa, 4.8 bar)
- C**
40 psi (0.28 MPa, 2.8 bar)



How to Read the Charts

1. Locate fluid flow rate along bottom of chart.
2. Follow vertical line up to intersection with selected operating air pressure curve.
3. Follow left to scale to read **fluid outlet pressure** (top chart) or **air consumption** (bottom chart)



Technical Data

ChemSafe 205 Diaphragm Pump		
	US	Metric
Maximum fluid working pressure	100 psi	0.69 MPa, 6.9 bar
Minimum air startup pressure	30 psi	0.21 MPa, 2.1 bar
Fluid inlet and outlet size	1/4 npt	1/4 bspt
Maximum suction lift (reduced if balls don't seat well due to damaged balls or seats, lightweight balls, or extreme speed of cycling)	Wet: 31.2 ft. Dry: 6.5 ft.	Wet: 9.5 m Dry: 2 m
Maximum size pumpable solids	0.06 in.	1.5 mm
Minimum recommended ambient air temperature for operation and storage. NOTE: ChemSafe pumps may be operated in low temperature environments. Take care to avoid freezing or crystallization of the fluid inside or outside of the pump. Running the pump at temperatures below freezing may accelerate the wear of the elastomer components in the pump.	32° F	0° C
Air consumption at maximum flow	4.8 scfm	0.14 scmm
Fluid flow per cycle	0.008 gallons	0.03 liters
Maximum free-flow delivery	2.5 gpm	9.5 lpm
Maximum pump speed	375 cycles per minute	
Weight; PTFE [UHMW]	4.1 lb [3.0 lb]	1.9 kg [1.4 kg]
Wetted Parts	PTFE, EPDM, NBR, UHMWPE	
Maximum fluid temperature		
PTFE Pumps	212° F	100° C
UHMWPE Pumps	158° F	70° C
Noise (dBa) <i>Sound power was measured per ISO-9614-2: 1997. Sound pressure was tested 3.28 ft (1 m) from the equipment.</i>		
Sound Power		
At 100 cycles per minute	61 dBa	
At 375 cycles per minute	64 dBa	
Sound Pressure		
At 100 cycles per minute	70 dBa	
At 375 cycles per minute	74 dBa	

California Proposition 65

CALIFORNIA RESIDENTS

 **WARNING:** Cancer and reproductive harm — www.P65warnings.ca.gov.

Graco Standard ChemSafe Pump Warranty

Graco warrants all equipment referenced in this document which is manufactured by Graco and bearing its name to be free from defects in material and workmanship on the date of sale 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.

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Phone: 612-623-6921 **or Toll Free:** 1-800-328-0211 **Fax:** 612-378-3505

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Graco reserves the right to make changes at any time without notice.

Original Instructions. This manual contains English. MM 334792

Graco Headquarters: Minneapolis

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