

Endura-Flo™ 4D150 and 4D350

Diaphragm Pump

333015B
EN

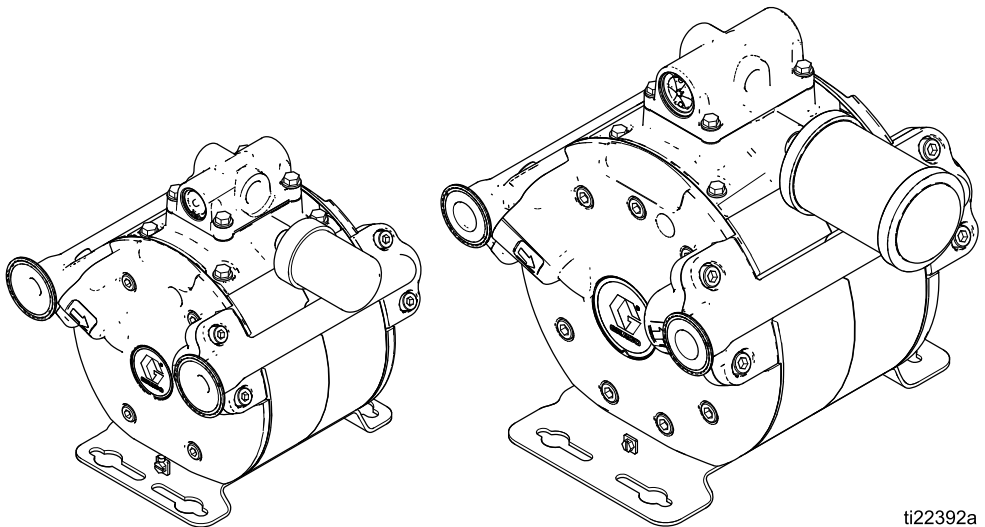
Used to pump waterborne and solvent-based paints and catalysts. For professional use only.



Important Safety Instructions

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

See page 3 for model information, including maximum pressures and approvals.



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Contents

Related Manuals	2	Preventive Maintenance Schedule	12
Models.....	3	Troubleshooting.....	13
Warnings	4	Repair/Service.....	15
Installation.....	6	Repair or Replace the Air Valve	15
General Information	6	DataTrak	18
Instructions Before First Use.....	6	Disassemble the Fluid Section	19
Mount the Pump	6	Disassemble the Center Section	21
Air Line.....	7	Reassemble the Center Section.....	22
Fluid Suction Line	7	Reassemble the Fluid Section.....	24
Fluid Outlet Line.....	7	Torque Instructions	27
Grounding	10	Parts.....	28
Operation.....	11	Repair Kits	33
Start and Adjust the Pump	11	Performance Charts.....	34
Pressure Relief Procedure.....	11	Mounting Dimensions	36
Pump Shutdown	11	Technical Data	38
Maintenance	12	Graco Standard Warranty.....	40
Lubrication.....	12		
Flushing and Storage	12		
Tighten Threaded Connections	12		

Related Manuals

Manual Number	Title
313840	DataTrak Kit Instructions

Models

All models have the following maximum pressures. See [Performance Charts, page 34](#), for actual working pressures and flow rates.

- 100 psi (0.7 MPa, 7 bar) Maximum Air Input Pressure
- 400 psi (2.8 MPa, 28 bar) Maximum Fluid Working Pressure
- 430 psi (3.0 MPa, 30 bar) Maximum Static Fluid Pressure

Model		Size	Porting	Air Valve
4D150	24W345	150 cc	Tri-clamp	Standard
	24W346	150 cc	npt	Standard
	24W347	150 cc	bspp	Standard
	24W348	150 cc	Tri-clamp	Advanced (with DataTrak monitoring and runaway protection)*
	24W349	150 cc	npt	Advanced (with DataTrak monitoring and runaway protection)*
	24W350	150 cc	bspp	Advanced (with DataTrak monitoring and runaway protection)*
4D350	24W351	350 cc	Tri-clamp	Standard
	24W352	350 cc	npt	Standard
	24W353	350 cc	bspp	Standard
	24W354	350 cc	Tri-clamp	Advanced (with DataTrak monitoring and runaway protection)*
	24W355	350 cc	npt	Advanced (with DataTrak monitoring and runaway protection)*
	24W356	350 cc	bspp	Advanced (with DataTrak monitoring and runaway protection)*

Standard pump models are certified:



Advanced pump models are certified











* DataTrak is certified:



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.

 WARNING	
   	FIRE AND EXPLOSION HAZARD <p>Flammable fumes, such as solvent and paint fumes, in work area can ignite or explode. Paint or solvent flowing through the equipment can cause static sparking. 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). • Ground all equipment in the work area. See Grounding instructions. • Never spray or flush solvent at high pressure. • 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. • 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.
  	PRESSURIZED EQUIPMENT HAZARD <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



EQUIPMENT MISUSE HAZARD

Misuse can cause death or serious injury.

- 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 Safety Data Sheet (SDS) 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.



TOXIC FLUID OR FUMES HAZARD

Toxic fluids or fumes can cause serious injury or death if splashed in the eyes or on skin, inhaled, or swallowed.

- Read Safety Data Sheet (SDS) 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.



PERSONAL PROTECTIVE EQUIPMENT

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. Protective equipment includes but is not limited to:

- Protective eyewear, and hearing protection.
- Respirators, protective clothing, and gloves as recommended by the fluid and solvent manufacturer.

Installation

General Information

- The Typical Installation shown on p. 8 is only a guide for installing system components and accessories. It is not an actual system design. Contact your Graco distributor for assistance in designing a system to suit your particular needs.
- Always use Genuine Graco Parts and Accessories, available from your Graco distributor. If you supply your own accessories, be sure they are adequately sized and pressure-rated for your system.
- Reference numbers and letters in parentheses refer to the reference numbers in the figures and in the Parts Lists.

Instructions Before First Use

Before using the pump:

1. Check that all fluid cover and fluid manifold fasteners are tight. Follow [Torque Instructions, page 27](#).
2. Install muffler.

Mount the Pump

- For ease of operation and service, mount the pump so the air inlet (T), fluid inlet (N), and fluid outlet (M) ports are easily accessible.

NOTE: The arrow labels on the pump show fluid inlet and outlet directions.

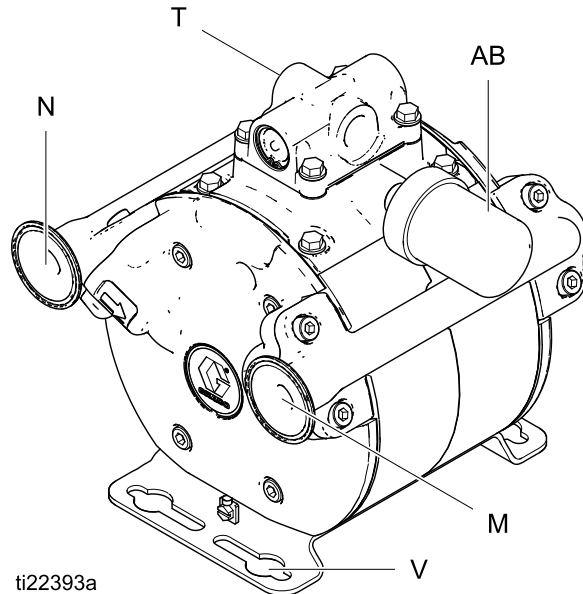
- Mount the pump in a well-ventilated area with sufficient clearance on all sides for operator access and servicing.
- The air inlet (T) must be on the opposite side of the pump from the muffler (AB).
- The pump can be mounted in any orientation. The fluid manifolds can be rotated to face either direction.

NOTE: Stand Kit 17H315 is available as a mounting option.

- Be sure the mounting can support the weight of the pump, hoses, and accessories as well as the



stress caused during operation. The pump has four mounting holes (V) for M10 (3/8 in.) bolts. See [Mounting Dimensions, page 36](#).

Triton Users Note: The mounting hole pattern is the same.



N	Fluid Inlet
	4D150: 1 in. tri-clamp flange, 1/2 in. npt, or 1/2 in. bspp
	4D350: 1 in. tri-clamp flange, 3/4 in. npt, or 3/4 in. bspp
M	Fluid Outlet
	4D150: 1 in. tri-clamp flange, 1/2 in. npt, or 1/2 in. bspp
	4D350: 1 in. tri-clamp flange, 3/4 in. npt, or 3/4 in. bspp
T	Compressed Air Connection; 1/2 npt
	4D150: 1/4 in. npt
	4D350: 1/2 in. npt
V	Mounting holes for M10 (3/8 in.) bolts (4 required)
AB	Muffler

Air Line

1. Install the air line accessories as shown in [Typical Installation](#), page 8. Use adaptors as needed. Be sure the air line supplying the accessories is grounded.
 - a. The fluid pressure can be controlled with either an air regulator (F) to control the air into the pump, or with a fluid regulator (H) to control the fluid out of the pump.
 - b. Install a bleed-type master air valve (B) close to the pump. This valve is required in your system to relieve air trapped between it and the pump when the valve is closed. Be sure the bleed valve is easily accessible from the pump, and is located downstream from the air regulator.
- | | | | |
|--|---|--|--|
|  |  | | |
| Trapped air can cause the pump to cycle unexpectedly, which could result in serious injury from splashing. | | | |
- c. Install a second air valve (E) upstream from all air line accessories to isolate them during cleaning and repair.
 - d. Install an air line filter (D) to remove contaminants such as dirt, moisture, and oil from the compressed air supply.
 2. The air valve on the pump does not require lubrication.
 3. Install a grounded, flexible air hose between the accessories and the pump air inlet (T). See [Technical Data](#), page 38, to determine the air inlet size of your pump. Use a minimum 1/2 in. (13 mm) ID air hose.





Fluid Suction Line




- See [Technical Data](#), page 38, to determine the fluid inlet size of your pump.
 - For maximum suction lift (wet and dry) information, see [Technical Data](#), page 38.
1. Use flexible, conductive hoses.
 2. Use a compatible liquid thread sealant on connections to prevent air from entering the fluid line.

3. Attach the suction line into the pump inlet (M) snugly.

Fluid Outlet Line

1. Use electrically conductive fluid hoses (P). Attach the fluid fitting onto the pump outlet (N) snugly while supporting the outlet with a wrench. See [Technical Data](#), page 38, to determine the fluid outlet size of your pump.
2. Install a fluid regulator (H) at the pump fluid outlet to control fluid pressure, if desired. See [Air Line](#), page 7, Step 1a, for an alternative method to control pressure.
3. Install a fluid drain valve (J) near the fluid outlet. To use the valve as a circulation valve, connect a tube (K) between the valve and pail.

			
A fluid drain (J) valve is required in your system to relieve pressure in the hose if it is plugged. The drain valve reduces the risk of serious injury, including splashing in the eyes or on the skin, or contamination from hazardous fluids when relieving pressure.			




			
Some systems may require installation of a pressure relief valve at the pump outlet to prevent overpressurization and rupture of the pump or hose.			
Thermal expansion of fluid in the outlet line can cause overpressurization. Thermal expansion can occur when using long fluid lines exposed to sunlight or ambient heat, or when pumping from a cool to a warm area (for example, from an underground tank).			
Overpressurization also can occur if the pump is used to feed fluid to a piston pump, and the intake valve of the piston pump does not close, causing fluid to back up in the outlet line.			

[illegible]

KEY

A	Pump	N	Pump fluid inlet
B	Bleed-type master air valve (required)	P	Fluid hose
C	Air supply line	R	Gun air hose
D	Air line filter	S	Spray gun
E	Air line shutoff valve	T	Pump air inlet
F	Pump air regulator	U	Agitator
G	Gun air regulator	W	Ground wire
H	Fluid pressure regulator	X	Fluid filter
J	Drain/circulation valve	Y	Fluid circulation line
K	Drain tube	Z	Back pressure regulator (BPR)
L	Fluid suction line	AA	BPR air regulator
M	Pump fluid outlet		

Grounding

				
<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 electric current.</p>				

- **Pump:** use a ground wire and clamp. Loosen the grounding screw (X). Insert one end of a 12 ga (1.5 mm²) minimum ground wire (W) under the clamp and tighten the screw securely. Connect the other end of the wire to a true earth ground. For a ground wire and clamp, order Part No. 222011.
- **Air and fluid hoses:** Use only electrically conductive hoses.
- **Air compressor:** Follow manufacturer's recommendations.

- **Fluid supply drum:** Follow your local code.
- **All fluid pails used when flushing:** Follow your 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 the grounding continuity

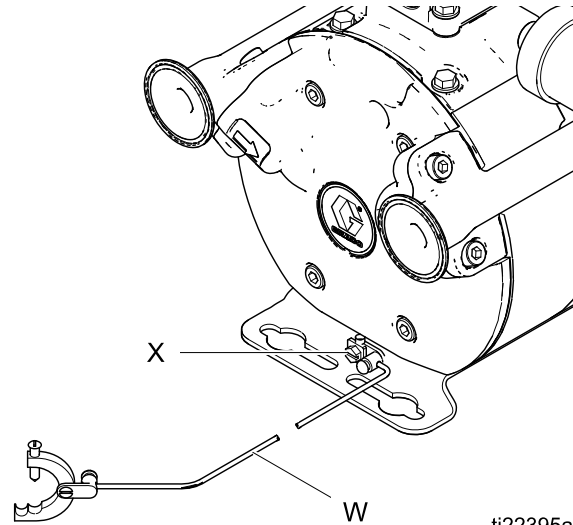


Figure 1

Operation

Start and Adjust the Pump

1. Be sure the pump is properly grounded. Refer to [Grounding, page 10](#).
2. Check all fittings to be sure they are tight. Be sure to use a compatible liquid thread sealant on all male threads.
3. Place the suction line (L) in the fluid to be pumped.
4. Place the end of the fluid outlet hose (P) into an appropriate container (if flushing) or connect to a gun or other dispensing device. See [Typical Installation, page 8](#).
5. Close the fluid drain valve (J).
6. With the pump air regulator (F) closed, open the bleed-type master air valve (B).
7. If the fluid hose has a dispensing device, hold it open while continuing with the following step.
8. Slowly open the air regulator (F) until the pump starts to cycle. Allow the pump to cycle slowly until all air is pushed out of the lines and the pump is primed.

If you are flushing, run the pump long enough to thoroughly clean the pump and hoses. Close the air regulator. Remove the suction line (L) from compatible flushing fluid and place it in the fluid to be pumped.

NOTICE

Operating the pump dry for extended periods or operating at pressures higher than the recommended maximum input air pressure may reduce diaphragm life.

Pressure Relief Procedure



Follow the Pressure Relief Procedure whenever you see this symbol.



This equipment stays pressurized until pressure is manually relieved. 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. Hold a metal part of the gun (if used) to a grounded metal pail. Trigger the gun to relieve the pressure.
3. Open all fluid drain valves in the system, having a waste container ready to catch drainage. Leave drain valve(s) open until you are ready to return to operation.

Pump Shutdown

Short Term Shutdown

For a short term shutdown, relieve the pressure (see procedure on this page).

Long-Term Shutdown

For a long term shutdown, such as several hours or overnight:

1. Flush the pump thoroughly.
2. Leave compatible flushing fluid in the pump.
3. Relieve the pressure (see procedure on this page).

Maintenance

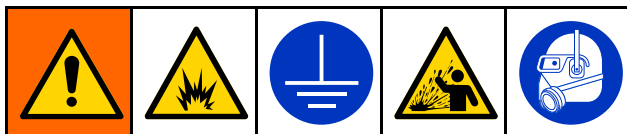
Lubrication

The pump is lubricated at the factory. It is designed to require no further lubrication for the life of the pump.

NOTICE

Do not over-lubricate the pump. Oil is exhausted through the muffler and could contaminate your fluid supply or other equipment. Excessive lubrication can also cause the pump to malfunction.

Flushing and Storage



To avoid fire and explosion, always ground equipment and waste container. To avoid injury from splashing and static buildup, always flush at the lowest possible pressure.

- Flush the pump often enough to prevent the fluid you are pumping from curing, drying, or freezing in the pump and damaging it.
- Flush with a fluid that is compatible with the fluid you are pumping and with the equipment wetted parts.

- Flush the pump and follow the [Pressure Relief Procedure, page 11](#), before storing the pump.

Flush procedures vary widely by system requirements. See [Start and Adjust the Pump, page 11](#), for one common method of flushing. If your system is different, or if you are unsure how to completely flush your system, contact your Graco distributor.

Tighten Threaded Connections

1. Before each use, check all hoses for wear or damage, and replace as necessary.
2. Check to be sure all threaded connections are tight and leak-free.

Preventive Maintenance Schedule

Establish a preventive maintenance schedule based on the service history of the pump. Scheduled maintenance is especially important to prevent spills or leakage due to diaphragm failure.

Troubleshooting



- Follow the [Pressure Relief Procedure, page 11](#), before checking or servicing the equipment.
- Check all possible problems and causes before disassembly.

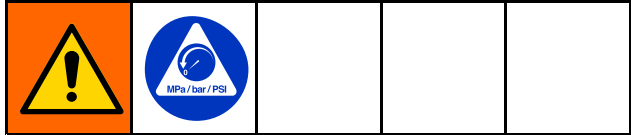
Problem	Cause	Solution
Pump cycles at stall or fails to hold pressure at stall.	Check valve cartridges (9) are worn.	Replace.
	Outlet fluid valve is worn.	Replace.
	Diaphragm (18) is worn.	Replace.
Pump will not cycle, or cycles once and stops.	Air valve is stuck or dirty.	Disassemble and clean air valve. Use filtered air.
	Check valve cartridges (9) are worn.	Replace.
	Fluid dispensing valve is clogged.	Relieve pressure and clear valve.
	Hose line is pinched.	Check lines.
	Diaphragm plate is installed backwards.	Follow installation directions in Install the Diaphragms, page 24 .
	Checks are not installed properly.	Follow installation directions in Install the Fluid Manifolds, page 26 .
Pump operates erratically.	Suction line is clogged.	Inspect; clear.
	Check valves are sticky or leaking.	Clean or replace check valve cartridges (9).
	Diaphragm (18) is ruptured.	Replace.
	Exhaust is restricted.	Remove restriction.
	Checks are not installed properly.	Follow installation directions in Install the Fluid Manifolds, page 26 .
Fluid contains air bubbles.	Suction line is loose.	Tighten.
	Diaphragm (18) is ruptured.	Replace.
Pump is running irregularly. Stroke frequency is dropping, coming to a standstill.	Diaphragm (18) is ruptured or pump has worn parts.	Replace worn parts. Check compressed air supply.
	Pump is icing. Possible causes include: compressed air too moist, stroke frequency too high, local temperature too low.	Remove ice by changing operating conditions.
Air escapes continually from the muffler.	Air valve cup (112) is damaged.	Replace damaged parts.
	Foreign matter is inside the pump.	Check air filter.
	Shaft seals (26) are worn.	Replace.

Troubleshooting

Problem	Cause	Solution
Pump does not start, or pressure fluctuates.	Check valve cartridges (9) are worn.	Replace.
	Inlet strainer is blocked. Maximum suction is exceeded. Hose or seal is defective.	Clean strainer. Replace defective parts.
	Fluid is contaminated. Pump was installed or operated incorrectly.	Check fluid supply. Follow installation and operation instructions in this manual.
	Checks are not installed properly.	Follow installation directions in Install the Fluid Manifolds, page 26 .

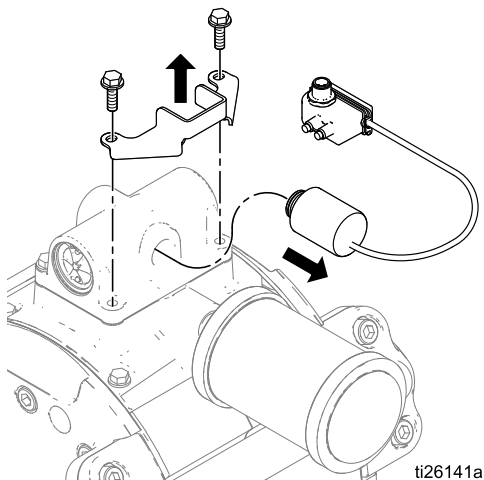
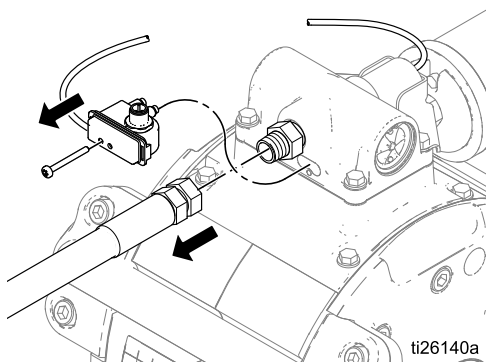
Repair/Service

Repair or Replace the Air Valve

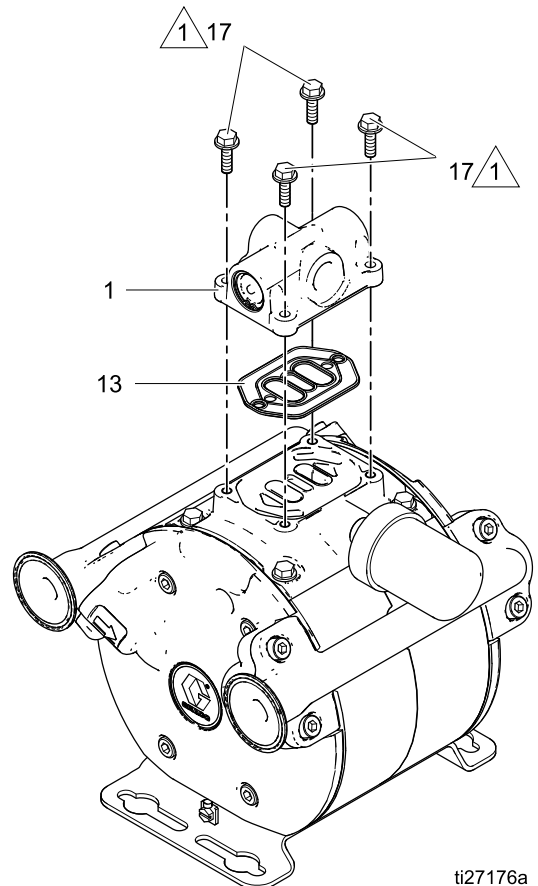


Replace Complete Air Valve

1. Stop the pump. Follow the [Pressure Relief Procedure, page 11](#).
2. Disconnect the air line.
3. **For models with DataTrak:**
Remove the screw to disconnect the reed switch assembly from the air valve. Then, remove two screws and the solenoid bracket. Pull the solenoid out of the air valve.



4. Remove screws (17). Remove the air valve (1) and the gasket (13).
5. To repair the air valve, go to [Replace Seals or Rebuild Air Valve, page 16](#), in next section.
6. Align the new air valve gasket (13) on the manifold, then attach the new or repaired air valve. See [Torque Instructions, page 27](#).
7. **For models with DataTrak:**
Remember to reattach the solenoid bracket and the solenoid. Then, use the screw to attach the reed switch assembly to the new air valve. Reconnect cable.
8. Reconnect the air line.



1 Torque to 1000–120 in-lb (11–14 N•m).

Replace Seals or Rebuild Air Valve

See [Repair Kits, page 33](#), to find the correct repair kits for your pump. Parts in Air Valve Seal Kits are marked †. Parts in Air Valve Repair Kits are marked ◆. Parts in End Cap Kits are marked ❖.

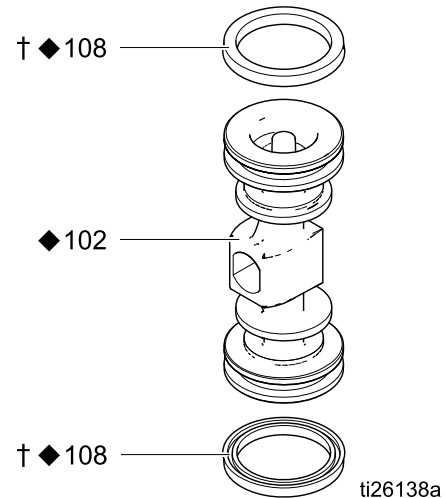
Disassemble the Air Valve

1. Perform steps 1–4 under [Replace Complete Air Valve, page 15](#).
2. Use a T8 Torx screwdriver to remove two screws (109). Remove the valve plate (105), the cup (112, 4D150 models) or the cup assembly (112–114, 4D350 Models), the spring (111), and the detent assembly (103).
3. **4D350 Models:** Pull the cup (112) off of the base (114). Remove the o-ring (113) from the cup.
4. Remove the retaining ring (110) from each end of the air valve. Use the piston (102) to push the end caps (107, 117) out of the ends. Remove the end cap o-rings (106). If the pump model is equipped with DataTrak, also remove the solenoid release button (118) and o-ring (119).
5. Remove the u-cup seals (108) from each end of the piston (102), then remove the piston. Remove the detent cam (104) from the air valve housing (101).

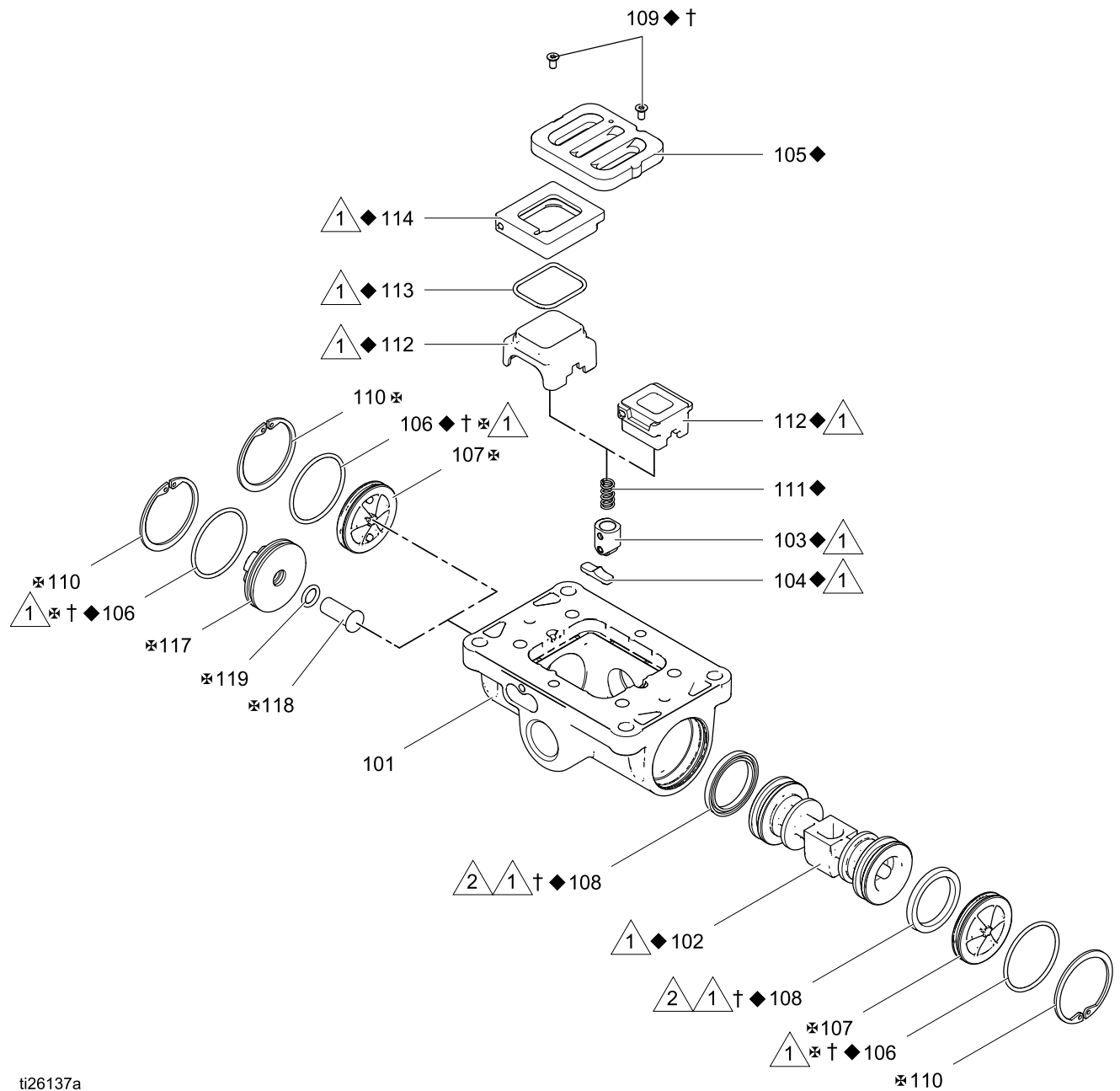
Reassemble the Air Valve

NOTE: Apply lithium-based grease whenever instructed to grease.

1. Use all parts in the repair kits. Clean other parts and inspect for damage. Replace as needed.
2. Grease the detent cam (104) and install it into the housing (101).
3. Grease the u-cups (108) and install on the piston with the lips facing toward the center of the piston.

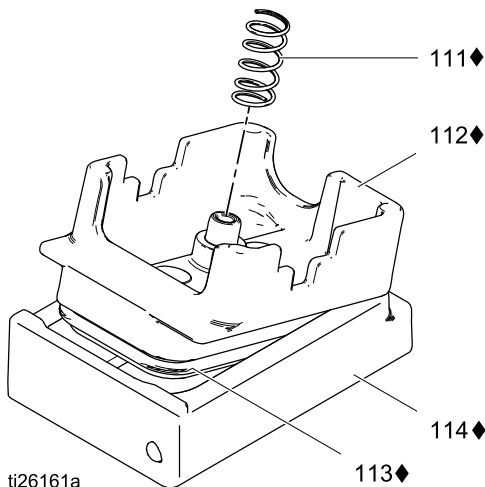


Air Valve Disassembly or Reassembly



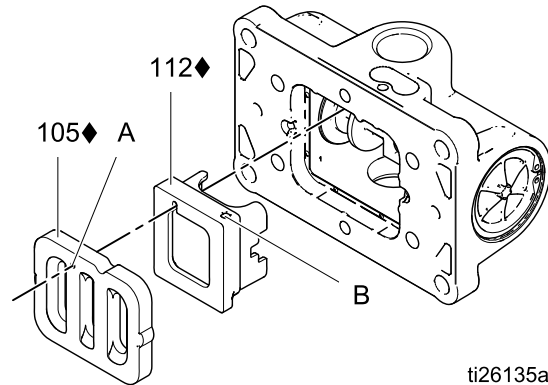
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4. Grease both ends of the piston (102) and install it in the housing (101), with the flat side toward the cup. Be careful not to tear u-cups (108) when sliding piston into housing.
5. **Standard Models:** Grease new o-rings (106) and install on the end caps (107). Install the end caps into the housing.
DataTrak Models: Orient the air valve so the air inlet faces forward. Grease and install new o-ring (106) on right-side end cap (107). Grease and install new o-ring (106) and the solenoid release button (118) and o-ring (119) on the left-side end cap (117). Install the end caps into the housing.
6. Install a retaining ring (110) on each end to hold caps in place.
7. Grease and install the detent assembly (103) into the piston.
8. **4D150 Models:** Install the spring (111). Grease the side of the air valve cup (112) that will contact the valve plate (105). Install the air valve cup (112). Align the small round magnet (B) with the air inlet.
4D350 Models: Install the o-ring (113) on the cup (112). Apply a light film of grease to the outside surface of the o-ring and the inside mating surface of the base (114). Orient the end of the base that has a magnet toward the end of the cup that has the larger cutout. Engage the opposite end of the parts. Leave the end with the magnet free. Tilt the base toward the cup and fully engage the parts, using care so that the o-ring remains in place. Install the spring (111) onto the protrusion on the cup. align the magnet in the base with the air inlet and install the cup assembly.



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9. Grease the cup side, and install the valve plate (105). Align the small hole (A) in the plate with the air inlet. Tighten the screws (109) to hold it in place.



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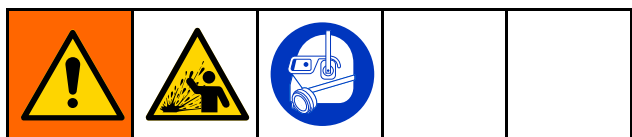
DataTrak

NOTE: See DataTrak manual, 313840, for all DataTrak service, repair and operation information.

Replace DataTrak Battery or Fuse

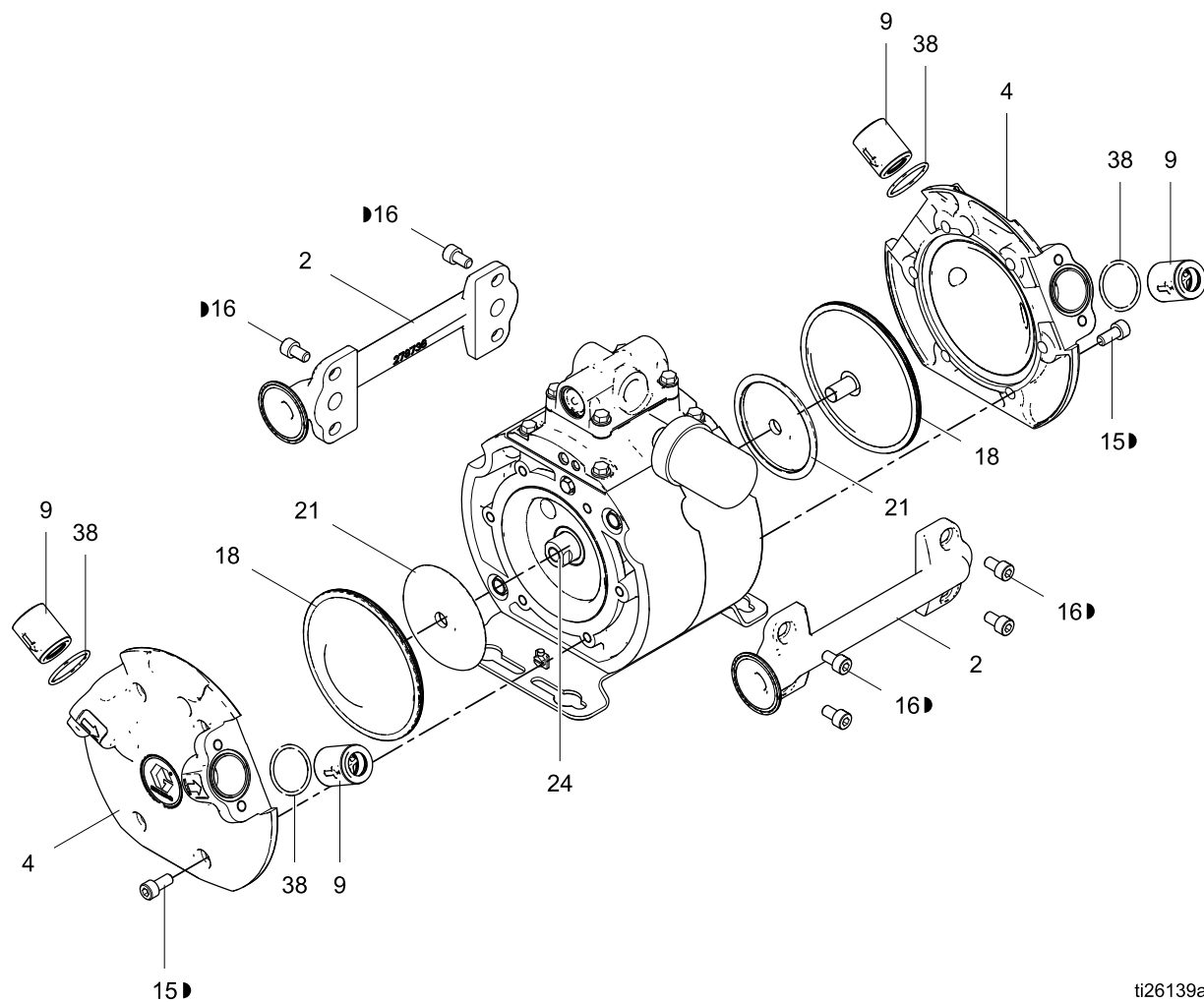
<p>To reduce the risk of fire and explosion, the battery and fuse must be replaced in a non-hazardous location. Follow all instructions in the DataTrak manual 313840.</p> <p>Use only an approved replacement battery, and an approved fuse (see DataTrak manual). Use of an unapproved battery or fuse will void Graco's warranty and Ex approvals.</p>				

Disassemble the Fluid Section



1. Stop the pump. Follow the [Pressure Relief Procedure, page 11](#).
2. Use a hex socket wrench (6 mm for 4D150 models; 8 mm for 4D350 models) to remove the inlet and outlet manifold bolts (16). Remove the manifolds (2).
3. Remove the check valve cartridges (9).
4. Remove the manifold o-rings (38).
5. Use a hex socket wrench (6 mm for 4D150 models; 8 mm for 4D350 models) to remove the bolts (15) from one fluid cover (4). Remove the fluid cover.
6. Your replacement diaphragm kit includes two diaphragm tools (AC), two o-rings (AE), and a plug (AD). These parts are used to provide an air-assist to make it easier to remove the diaphragms. See [Install the Diaphragms, page 24](#), for an illustration.
7. Install an o-ring (AE) in the inlet and the outlet ports of the attached fluid cover.
8. Place a diaphragm tool (AC) on both the inlet and outlet ports. Install an air fitting on one tool. Install a plug (AD) on the other tool.
9. Supply shop air at about 20 psi (0.14 MPa, 1.4 bar). Do not use over 30 psi (0.21 MPa, 2.1 bar). The shaft will move to one side.
10. Grasp the exposed diaphragm (18) with both hands and turn to remove it. If the diaphragm is difficult to remove, wrap a paper towel or rag from the back to the front of the diaphragm to provide a better grip.
11. Remove the diaphragm plate (21) and the washer (40, used only on 4D350 models) from the diaphragm.
NOTE: Be sure to remove the diaphragm install tools (AC) and the o-rings (AE).
12. Use a 3/4 in. claw foot wrench to loosen the piston shaft (24) attached to the other diaphragm.
13. Use a hex socket wrench (6 mm for 4D150 models or 8 mm for 4D350 models) to remove the bolts (15) from the other fluid cover (4). Remove the cover.
14. The second diaphragm (18) will turn off by hand. Remove the diaphragm plate (21) and the washer (40, used only on 4D350 models).

Fluid Section Disassembly or Reassembly



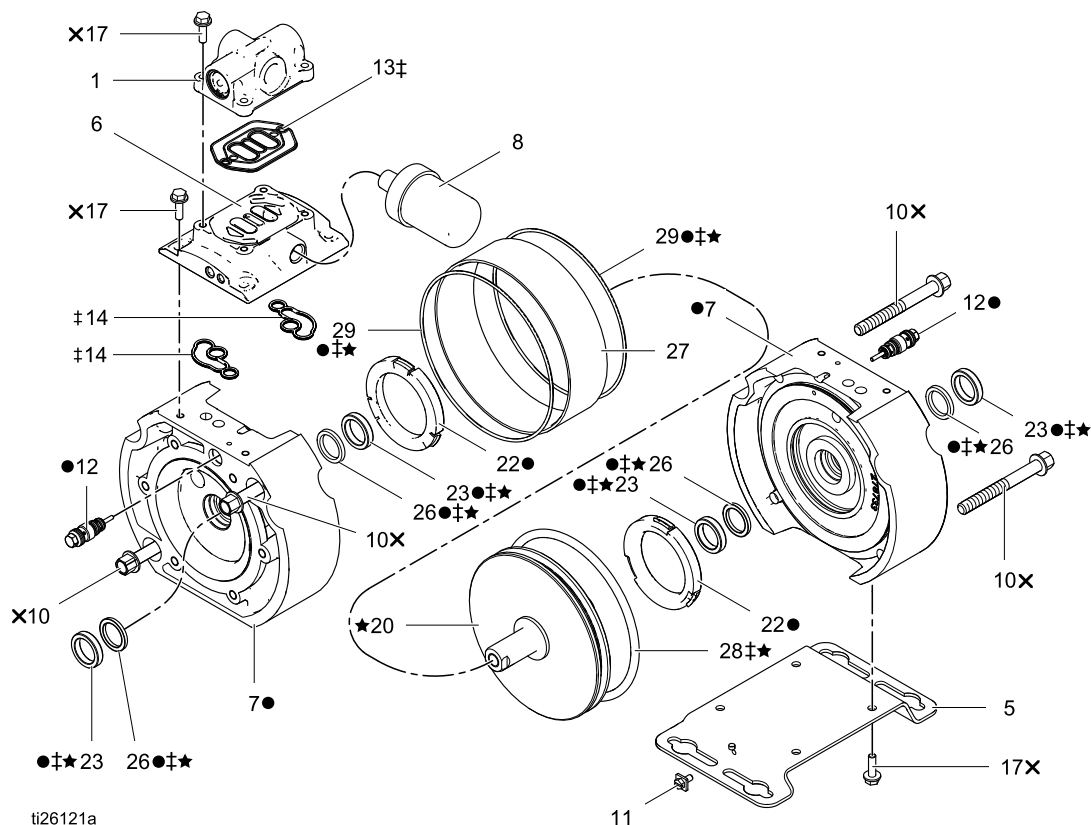
ti26139a

► Included in Fluid Section Fastener Kit 17H325.

Disassemble the Center Section

1. Use a 10 mm socket wrench to remove the four bolts (17), then remove the air manifold (6). If the air valve (1) doesn't need service, leave it attached to the manifold.
2. Inspect the manifold gaskets (13, 14) for damage. Remove if necessary.
3. Use a 10 mm socket wrench to remove the four bolts (17), then remove the mounting bracket (5).
4. The pilot valves (12) can remain in place unless they are damaged. If needed, use a 10 mm socket wrench to remove the pilot valves.
5. Use a 13 mm socket wrench to remove the four bolts (10), then remove the air covers (7).
6. Pull the piston (20) out of the cylinder (27). Remove the o-ring (28) from the piston.
7. Remove the cylinder (27) and inspect for damage.
8. Inspect the air cover o-rings (29). Remove if necessary.
9. Inspect the shaft u-cups (26). Remove if necessary. The shaft bearings (23) can remain in place. If the bearings are damaged and need to be removed, use a screwdriver or a large punch to push them out from the other side.
10. Inspect the bumpers (22) in place. If damaged, use a flathead screwdriver to pry up the three tabs of the bumper. The bumper should then pop out.

NOTE: The air covers should pop apart by hand. If necessary, pry them apart with a screwdriver.



● Included in Air Cover Replacement Kit 17H312.

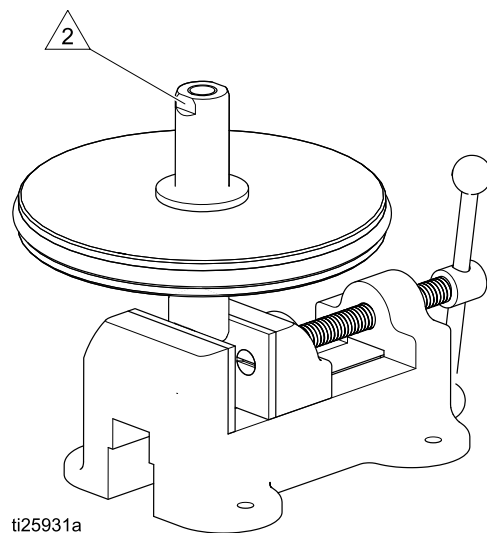
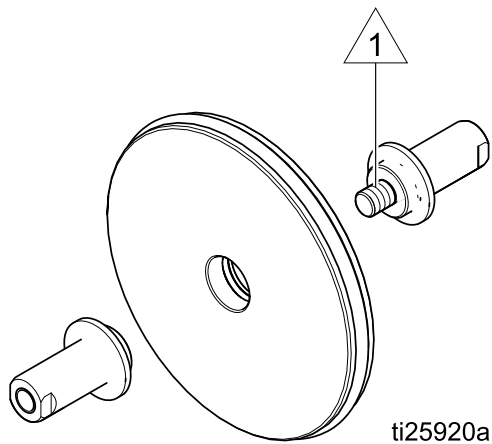
⊕ Included in Air Motor Repair Kit 17H305.

✕ Included in Air Section Fastener Kit 17H327.

★ Included in Piston Repair Kit 17H310. The kit also includes a bearing installation tool.

Reassemble the Center Section

1. Lubricate and install a u-cup (26) in each air cover (7). U-cup lips must face **out** of center housing.
2. If the shaft bearings (23) were removed, install new bearings. Use an arbor press or the bearing press tool supplied with the kits (PN 17H368).
3. Lubricate and install an o-ring (29) in each air cover.
4. The piston assembly should still be one piece. If the two shafts came apart during disassembly, follow these instructions to reassemble. The shaft stud will be attached to one shaft. Clean the threads and apply primerless, high-strength (red) thread locker (Loctite 263 or equivalent). Install the shafts in the center of the piston and hand tighten them together. Then, clamp the flats of one shaft in a vice, and torque the other shaft to 50–55 ft-lb (68–75 N•m).



Apply high-strength (red) thread locker (Loctite 263 or equivalent) to the threads.



Torque to 50–55 ft-lb (68–75 N•m).

5. Lubricate and install the large o-ring (28) on the outside of the piston.
6. Lubricate the mating surface and install the cylinder (27) on one of the covers.
7. Lubricate the outer o-ring (28), the inside of the cylinder (27), the shaft, and the shaft bearings (23). Then, install the piston assembly (20) in the cylinder (27). Add more lubricant on the inside of the cylinder, above the piston, so the piston moves freely back and forth.
8. Align the second air cover (7) and press it down over the cylinder and piston. Use a 13 mm socket

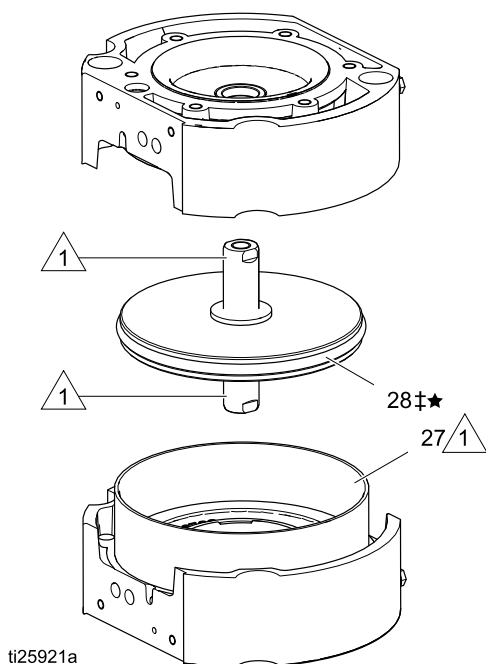
wrench to tighten the four bolts on each air cover. Torque to 28–33 ft-lb (38–45 N•m). Torque the first cover, then the second cover, then go back and torque the first cover again.

NOTE: Check the shaft to be sure it moves freely in both directions.

9. Lubricate and install new pilot valves (if removed). Torque to 100–120 in-lb (11–14 N•m).

NOTICE

To avoid damage to the pilot valve, do **not** overtorque.



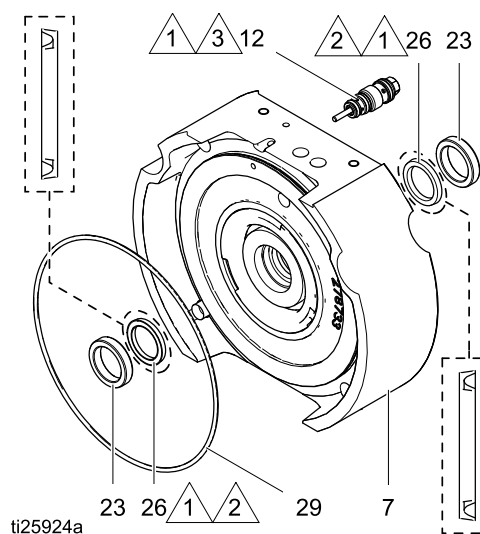
Apply lubricant.



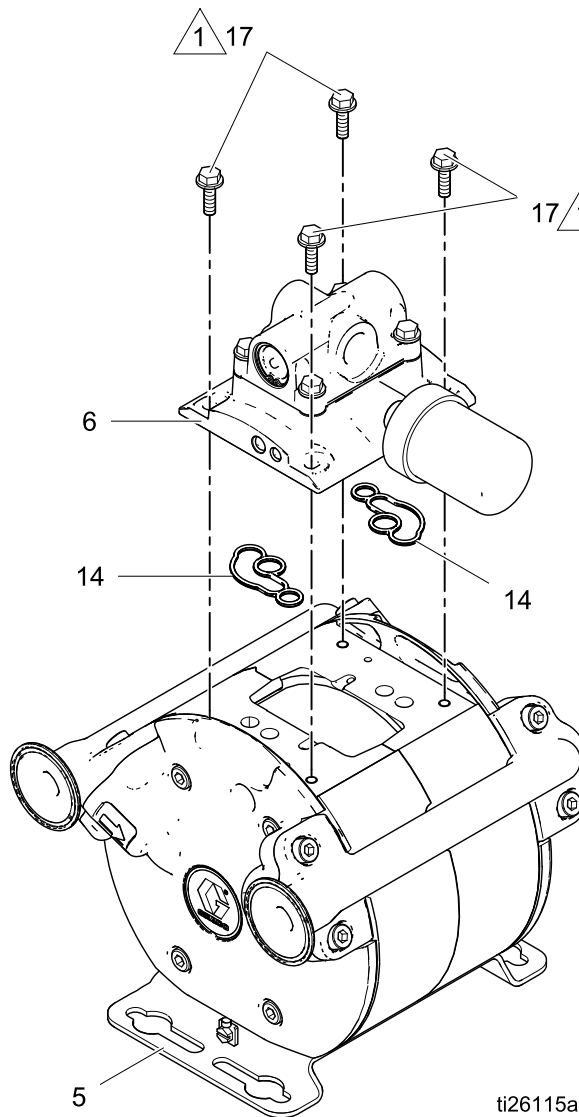
U-cup lips must face **out** of center housing.




Torque to 100–120 in-lb (11–14 N•m). Do not overtorque.



10. Use four bolts (17) to attach the mounting base (5) to the pump. It can be parallel to or perpendicular to the length of the pump. Torque the bolts to 100–120 in-lb (11–14 N•m).
11. Make sure the gaskets (14) are still in place, or lubricate and install them, then align and reinstall the air manifold (6). Torque the bolts (17) to 100–120 in-lb (11–14 N•m).



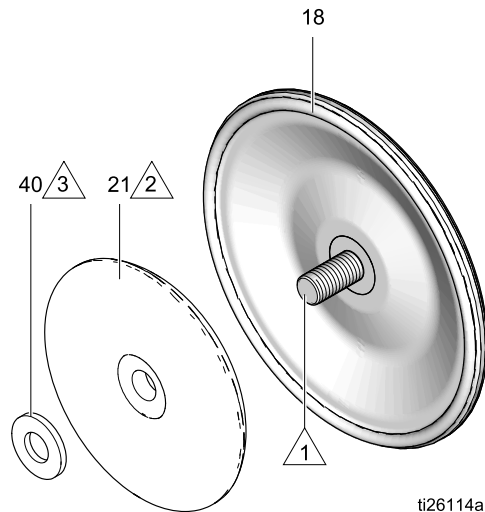
 Torque to 100–120 in-lbs (11–14 N•m).



Reassemble the Fluid Section

Follow all notes in the illustrations. These notes contain **important** information.

Install the Diaphragms

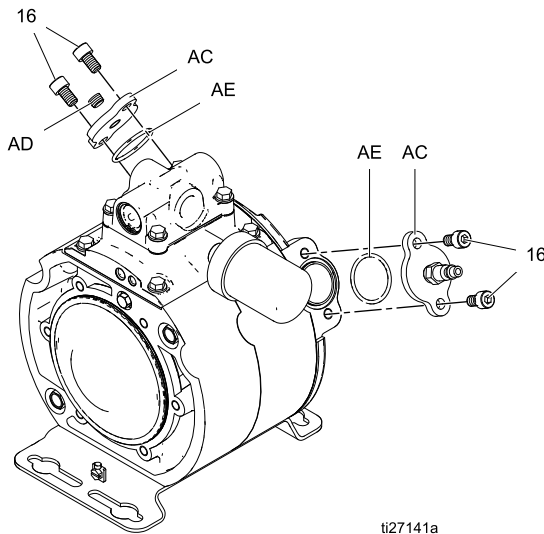
1. Assemble a diaphragm plate (21) onto each diaphragm (18). The rounded side of the plate must face the diaphragm.
2. **4D350 Models:** Install a washer (40) in each diaphragm plate.
3. Apply primerless, permanent (red) thread locker (Loctite 263 or equivalent) to the threads of one diaphragm assembly. Screw the assembly into the shaft as tight as possible by hand.



-  Apply permanent (red) thread locker to the threads.
-  Rounded side must face the diaphragm.

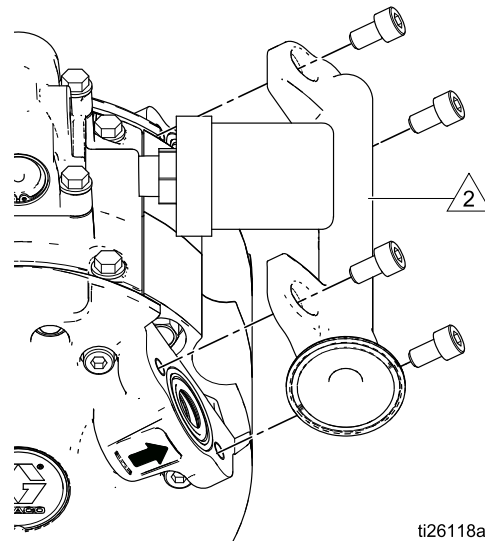
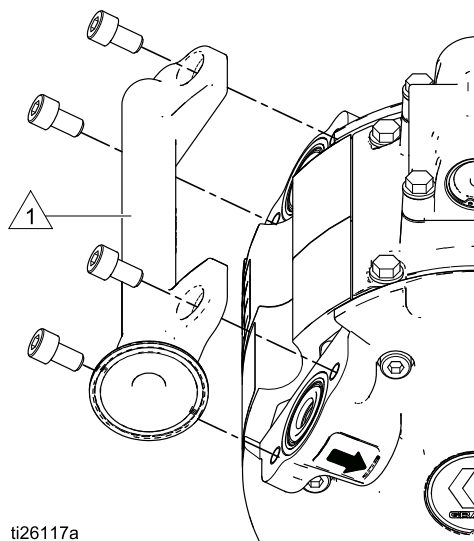
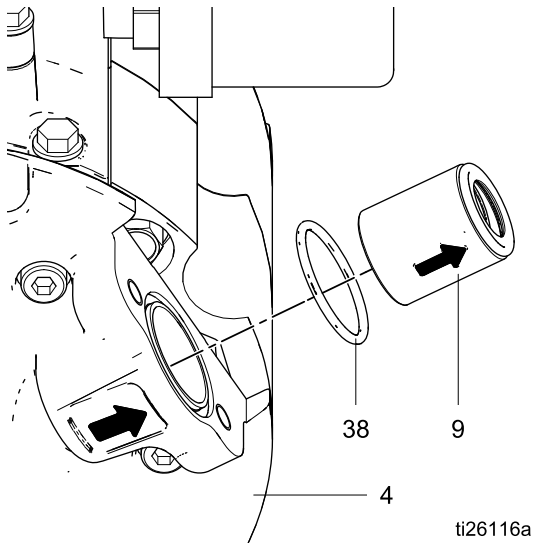
4. Align and attach the fluid cover to lock the diaphragm in place. To tighten the bolts, see [Torque Instructions, page 27](#).

5. Your replacement diaphragm kit includes two diaphragm tools (AC), two o-rings (AE), and a plug (AD). These parts are used to provide an air-assist to make it easier to install the diaphragms.
6. Install an o-ring (AE) in the inlet and the outlet ports of the installed fluid cover.
7. Place a diaphragm tool (AC) on both the inlet and outlet ports. Install an air fitting (1/8" npt) on one tool. Install a plug (AD) on the other tool.
8. Supply shop air at about 20 psi (0.14 MPa, 1.4 bar). Do not use over 30 psi (0.21 MPa, 2.1 bar). The shaft will move to one side.
9. Torque the exposed shaft to 100–120 in-lb (11–14 N•m) using a 3/4 in. claw foot wrench.
10. Leave the air on. Install the other diaphragm assembly (diaphragm, air plate, and washer, if used). Use both hands and install as tight as possible by hand.
11. Align and attach the second fluid cover. To tighten the bolts, see [Torque Instructions, page 27](#).
12. Remove the diaphragm tools (AC) and the o-rings (AE).



Install the Fluid Manifolds

1. Install new o-rings (38) on the two inlet and two outlet ports.
2. Align the arrow on the check cartridge (9) with the arrow on the port. Install a new check cartridge in each inlet and outlet port.
3. The manifolds are identical, but it is likely that the inlet and outlet manifold will have different fittings. Install the inlet manifold (2) on the ports that have the arrow facing in toward the pump. Install the outlet manifold (2) on the ports that have the arrow facing out away from the pump. Start all screws (16), then see [Torque Instructions, page 27](#).



Inlet manifold.



Outlet manifold.

Torque Instructions

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

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

1. Tighten all fluid cover screws in the specified crisscross pattern. Repeat the pattern to tighten to the specified torque.

4D150 Models: 20–25 ft-lb (27–34 N•m)

4D350 Models: 28–33 ft-lb (38–45 N•m)

2. Repeat for fluid manifolds. Torque to:

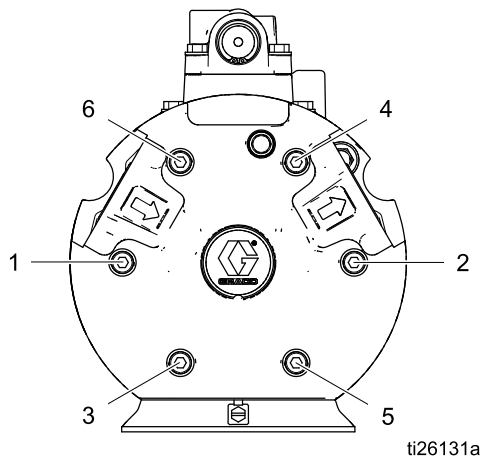
4D150 Models: 20–25 ft-lb (27–34 N•m)

4D350 Models: 28–33 ft-lb (38–45 N•m)

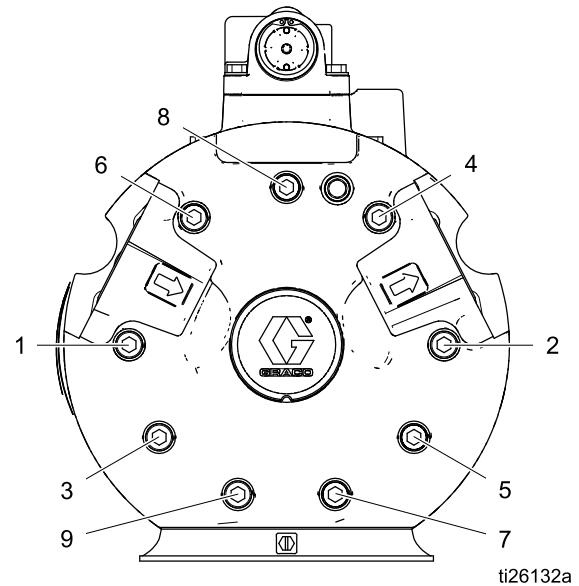
3. Retorque the air valve and air valve manifold fasteners in a crisscross pattern to 100–120 in-lb (11–14 N•m).
4. Retorque the pilot valves to 100–120 in-lb (11–14 N•m).

Torque Sequence Fluid Cover Screws

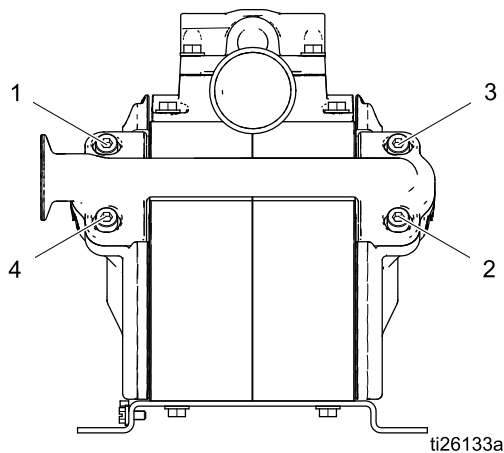
4D150 Models



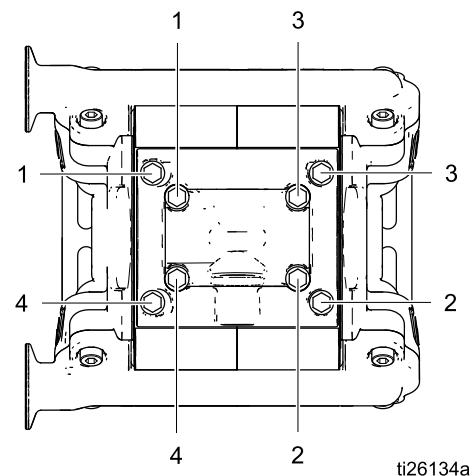
4D350 Models



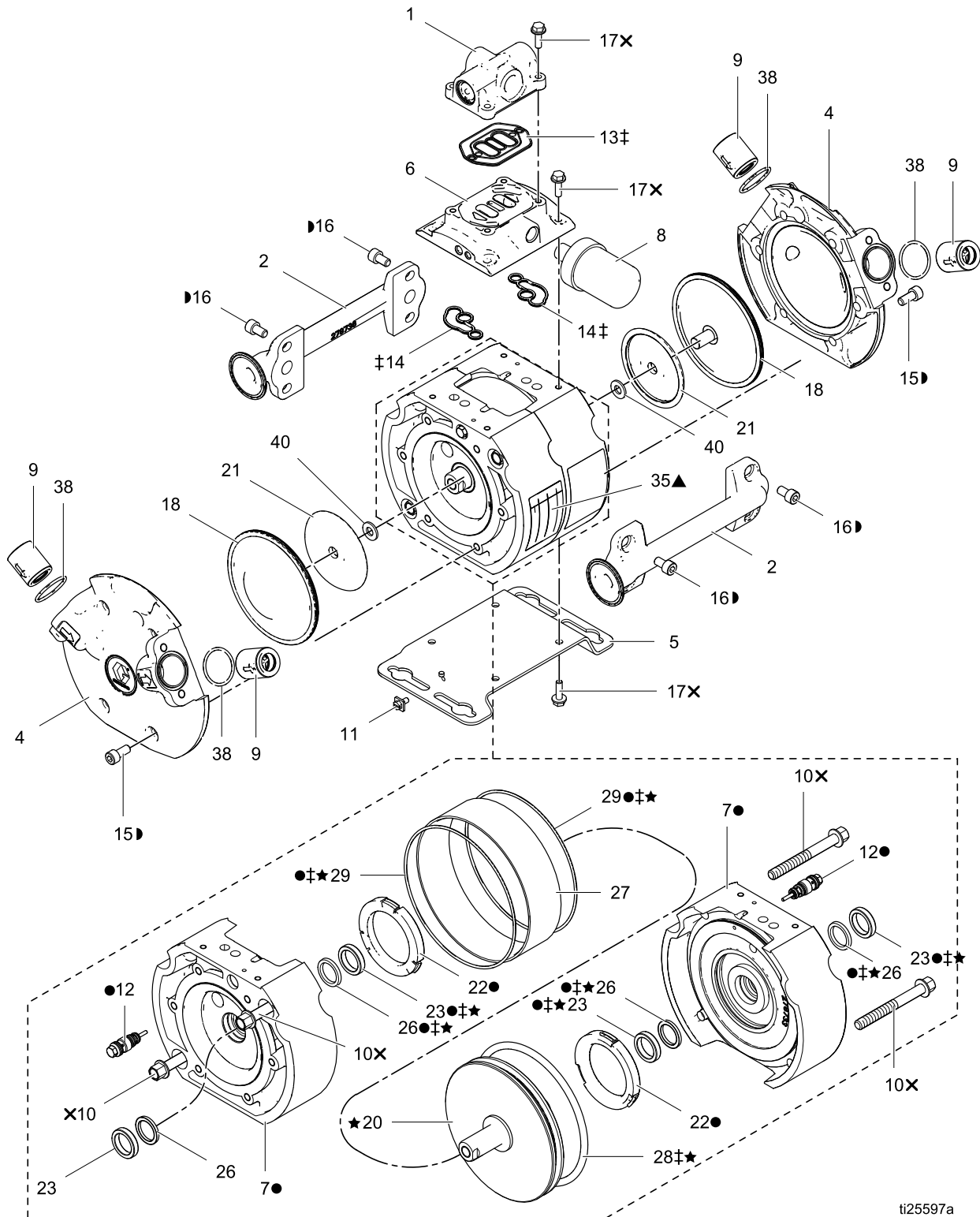
Manifold Fasteners



Air Valve and Air Valve Manifold Fasteners



Parts



4D150 Models

Ref	Part	Description	Qty
1		VALVE, air; small; includes gasket (ref. 13) and screws (ref. 17)	1
	17H318	Smart (for use with DataTrak)	
	17H319	Standard	
2		MANIFOLD, fluid	2
	16X052	Tri-Clamp	
	16X100	npt	
	17C115	bspp	
3	24X308	DATATRAK KIT; used for Models 24W348, 24W349, and 24W350	1
4	17H408	COVER, fluid	2
5	17H313	BRACKET, mounting, kit; includes , ground screw (ref. 11) and screws (ref. 17)	1
6	24W363	MANIFOLD, air	1
7●	17H311	AIR COVER KIT, includes parts marked ●.	2
8	17B922	MUFFLER	1
9	17H306	CARTRIDGE, check valve; includes o-rings (ref. 38)	4
10✖	— — —	SCREW, hex head, M10–1.5 x 90 mm	4
11	116343	SCREW, ground	1
12●	24A366	VALVE, pilot	2
13‡	— — —	GASKET, air valve, buna-n; also included with air valve (ref. 1)	1
14‡	— — —	GASKET, air manifold, buna-n	2
15▶	— — —	SCREW, socket head, M8–1.25 x 18 mm	12
16▶	— — —	SCREW, socket head, M8–1.25 x 14 mm	8

Ref	Part	Description	Qty
17✖	— — —	SCREW, hex flange, M6–1.0 x 20 mm; also included with air valve (ref. 1), mounting bracket (ref. 5), and DataTrak (ref. 3)	12
18	17H302	DIAPHRAGM, overmolded, kit	2
20★	17H308	PISTON ASSEMBLY KIT; includes parts marked ★	1
21	16W972	PLATE, diaphragm	2
22●	24A914	BUMPER	2
23● ‡ ★	— — —	BEARING, shaft	4
26● ‡ ★	— — —	U-CUP, shaft	4
27	16W969	CYLINDER, piston	1
28‡ ★	— — —	O-RING, piston, buna-n, 6 in. (152 mm) OD	1
29● ‡ ★	— — —	O-RING, air covers	2
35▲	188621	LABEL, warning	1
38	17H322	O-RING, manifold, 4-pack; PTFE, also Included with check valve cartridge (ref 9) and with diaphragm (ref. 18).	4

— — — *Not sold separately.*

† *Included in Air Cover Replacement Kit 17H311.*

‡ *Included in Air Motor Repair Kit 17H304.*

▶ *Included in Fluid Section Fastener Kit 17H324.*

✖ *Included in Air Section Fastener Kit 17H326.*

★ *Included in Piston Repair Kit 17H308. The kit also includes a bearing installation tool.*

▲ *Replacement Danger and Warning labels, tags, and cards are available at no cost.*

4D350 Models

Ref	Part	Description	Qty
1		VALVE, air; small; includes gasket (ref. 13) and screws (ref. 17)	1
	17H316	Smart (for use with DataTrak)	
	17H317	Standard	
2		MANIFOLD, fluid	2
	16X314	Tri-Clamp	
	16X403	npt	
	17C116	bspp	
3	24Y306	DATATRAK KIT; used for Models 24W348, 24W349, and 24W350	1
4	17H409	COVER, fluid	2
5	17H314	BRACKET, mounting, kit; includes , ground screw (ref. 11) and screws (ref. 17)	1
6	24W364	MANIFOLD, air	1
7●	17H312	AIR COVER KIT, includes parts marked ●	2
8	117237	MUFFLER	1
9	17H307	CARTRIDGE, check valve; includes o-rings (ref. 38)	4
10✖	— — —	SCREW, hex head, M10–1.5 x 90 mm	6
11	116343	SCREW, ground	1
12●	24A366	VALVE, pilot	2
13‡	— — —	GASKET, air valve, buna-n; also included with air valve (ref. 1)	1
14‡	— — —	GASKET, air manifold, buna-n	2
15►	— — —	SCREW, socket head, M10–1.5 x 30 mm	18
16►	— — —	SCREW, socket head, M10–1.5 x 16 mm	8
17✖	— — —	SCREW, hex flange, M6–1.0 x 20 mm; also included with air valve (ref. 1), mounting bracket (ref. 5), and DataTrak (ref. 3)	12

Ref	Part	Description	Qty
18	17H303	DIAPHRAGM, overmolded, kit	2
20★	17H310	PISTON ASSEMBLY, includes all parts marked ★	1
21	16X307	PLATE, diaphragm	2
22●	24A915	BUMPER	2
23● ‡ ★	— — —	BEARING, shaft	4
26● ‡ ★	— — —	U-CUP, shaft	4
27	16X305	CYLINDER, piston	1
28 ‡ ★		O-RING, piston, buna-n, 6 in. (152 mm) OD	1
29 ●‡ ★		O-RING, air covers	2
35▲	188621	LABEL, warning	1
38	17H323	O-RING, manifold, 4-pack; PTFE, also Included with check valve cartridge (ref 9) and with diaphragm (ref. 18).	4
40	17B546	WASHER	2

— — — Not sold separately.

● Included in Air Cover Replacement Kit 17H312.

‡ Included in Air Motor Repair Kit 17H305.

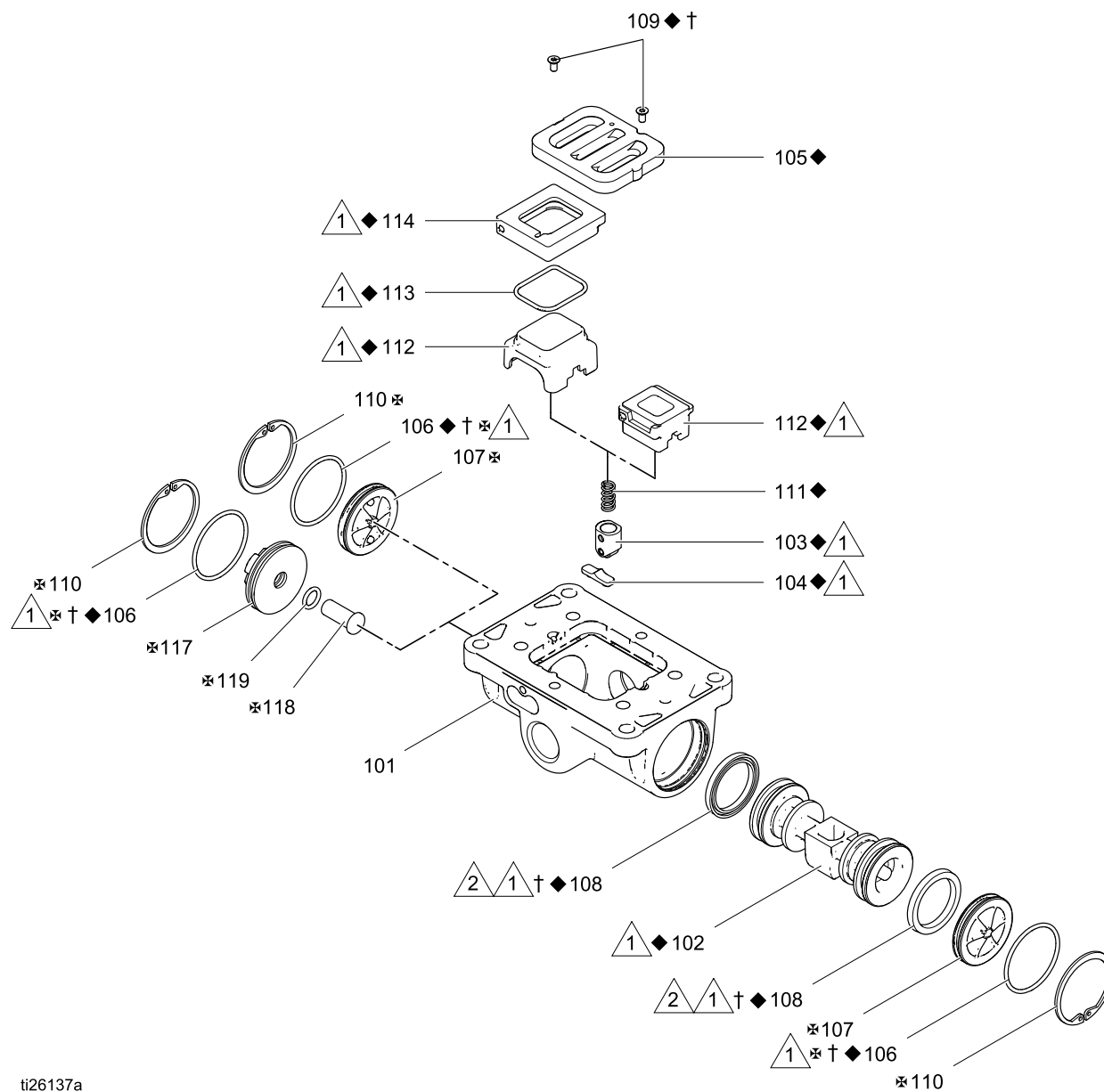
► Included in Fluid Section Fastener Kit 17H325.

✖ Included in Air Section Fastener Kit 17H327.

★ Included in Piston Repair Kit 17H310. The kit also includes a bearing installation tool.

▲ Replacement Danger and Warning labels, tags, and cards are available at no cost.

Air Valve Parts



ti26137a

Figure 2

Air Valve Parts

Ref	Description	Qty
101	HOUSING	1
102 ◆	AIR VALVE PISTON	1
103 ◆	DETENT PISTON ASSEMBLY	1
104 ◆	DETENT CAM	1
105 ◆	PLATE, air valve	1
106 ◆†❖	O-RING	2
107 ❖	CAP	
	Standard	2
	Compatible with DataTrak with runaway protection	1
108 ◆†	U-CUP	2
109 ◆†	SCREW	2
110 ◆❖	SNAP RING	2
111 ◆	DETENT SPRING	1

Ref	Description	Qty
112 ◆	CUP	1
	One-Piece (for 4D150 Models)	
	Three-Piece, with refs. 113 and 114 (for 4D350 Models)	
113 ◆	O-RING (for cup, ref. 112))	1
114 ◆	BASE (for cup, ref. 112)	1
117 ❖	CAP (for DataTrak models with runaway protection)	1
118 ❖	BUTTON (for DataTrak models with runaway protection)	1
119 ◆†❖	O-RING (for DataTrak models with runaway protection)	1
13 ◆†	GASKET, air valve	1

◆ Included in Air Valve Repair Kit 24A537 (4D150 Models) and 24A538 (4D350 Models)

† Included in Air Valve Seal Kit 24A535 (4D150 Models) and 24A536 (4D350 Models)

❖ Included in Air Valve End Cap Kit. See [Repair Kits, page 33](#).

Repair Kits

Kit Description	4D150	4D350
Complete Air Valve Replacement Kits — Standard (No DataTrak)	17H319	17H317
Complete Air Valve Replacement Kits — Compatible with DataTrak with Runaway Protection	17H318	17H316
◆ Air Valve Repair Kits	24A537	24A538
† Air Valve Seal Kits	24A535	24A536
❖ Air Valve End Cap Kit — Standard (No DataTrak) Air Valve	24A360	24A361
❖ Air Valve End Cap Kit — Compatible with DataTrak with Runaway Protection	24A362	24A363
● Air Cover Replacement Kit	17H311	17H312
‡ Air Motor Repair Kit	17H304	17H305
► Fluid Section Fastener Kit	17H324	17H325
✕ Air Section Fastener Kit	17H326	17H327
★ Piston Repair Kit	17H308	17H310
DataTrak Conversion Kit	24Y304	24Y306
Diaphragm Kits	17H302	17H303
Floor Stand Kit	17H315	17H315
Solenoid Replacement Kits	17H320	17H321

Performance Charts

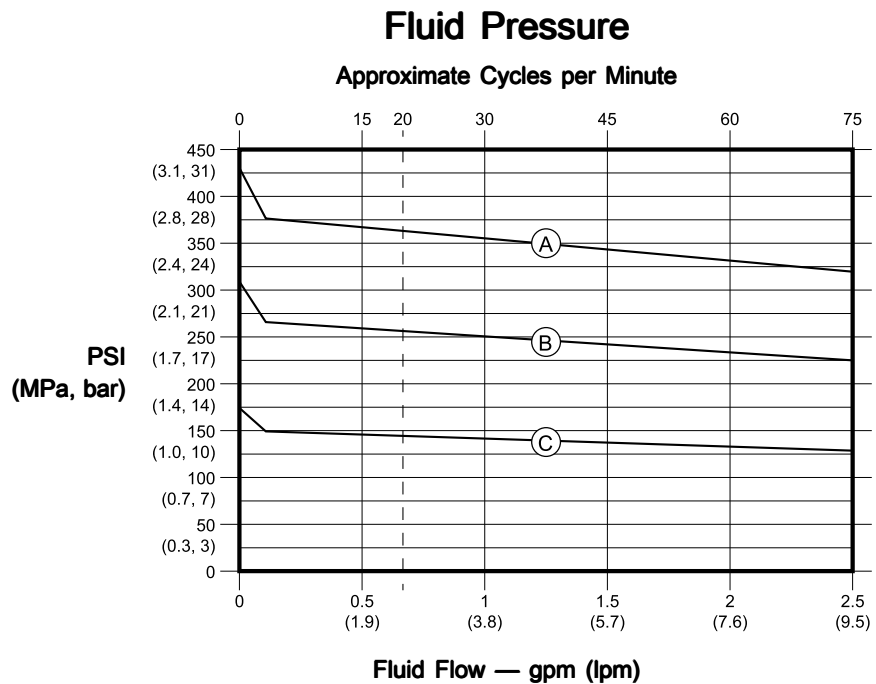
4D150 Models

Operating Air Pressure

A
100 psi (0.7 MPa, 7.0 bar)

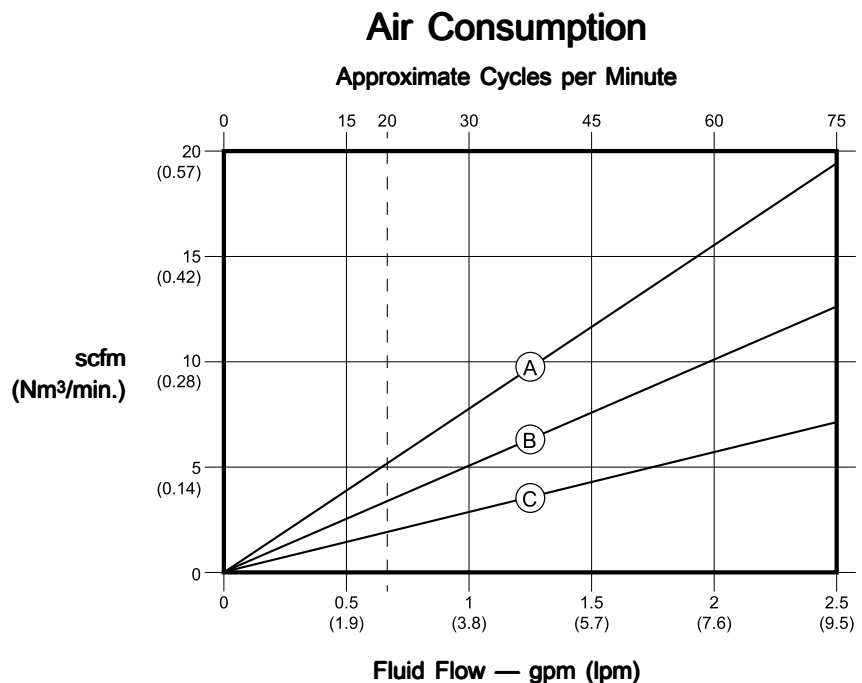
B
70 psi (0.48 MPa, 4.8 bar)

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)



4D350 Models

Operating Air Pressure

A

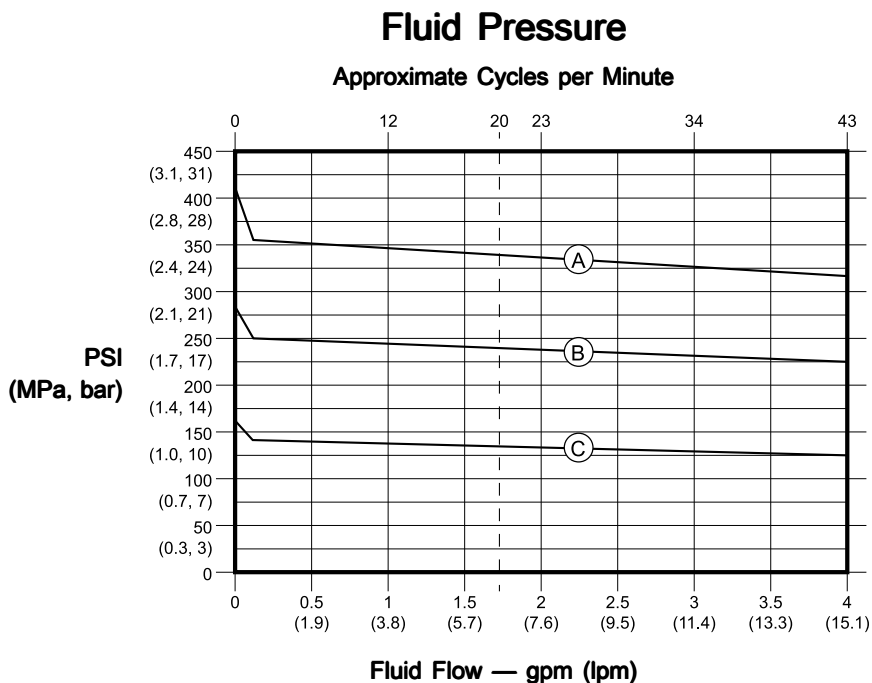
100 psi (0.7 MPa, 7.0 bar)

B

70 psi (0.48 MPa, 4.8 bar)

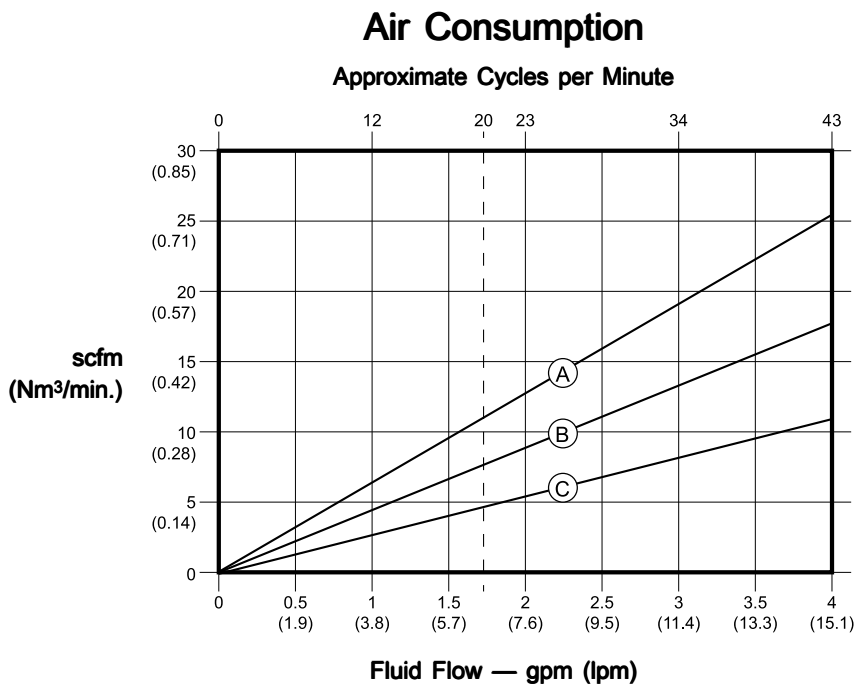
C

40 psi (0.28 MPa, 2.8 bar)



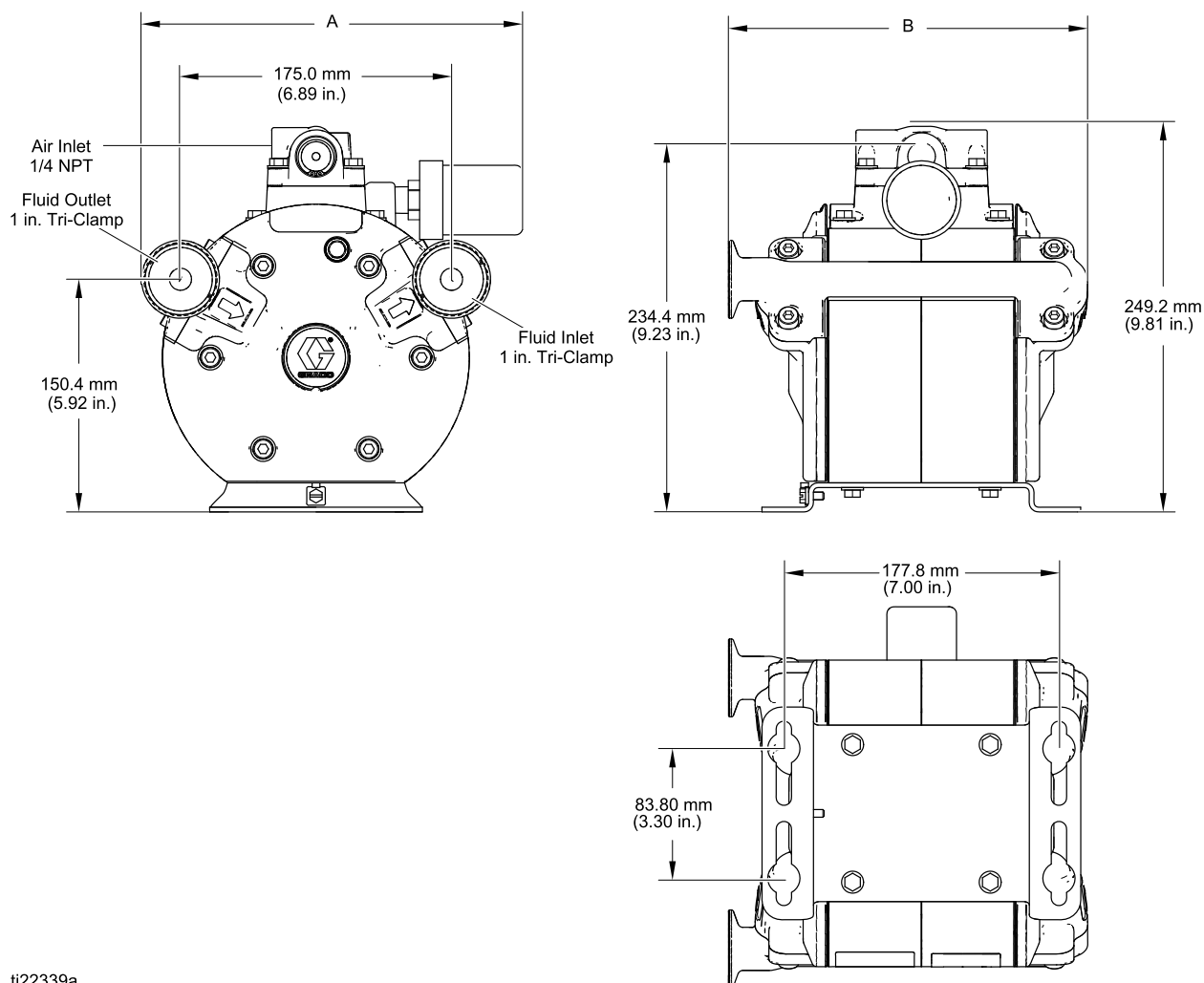
How to Read the Charts

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)



Mounting Dimensions

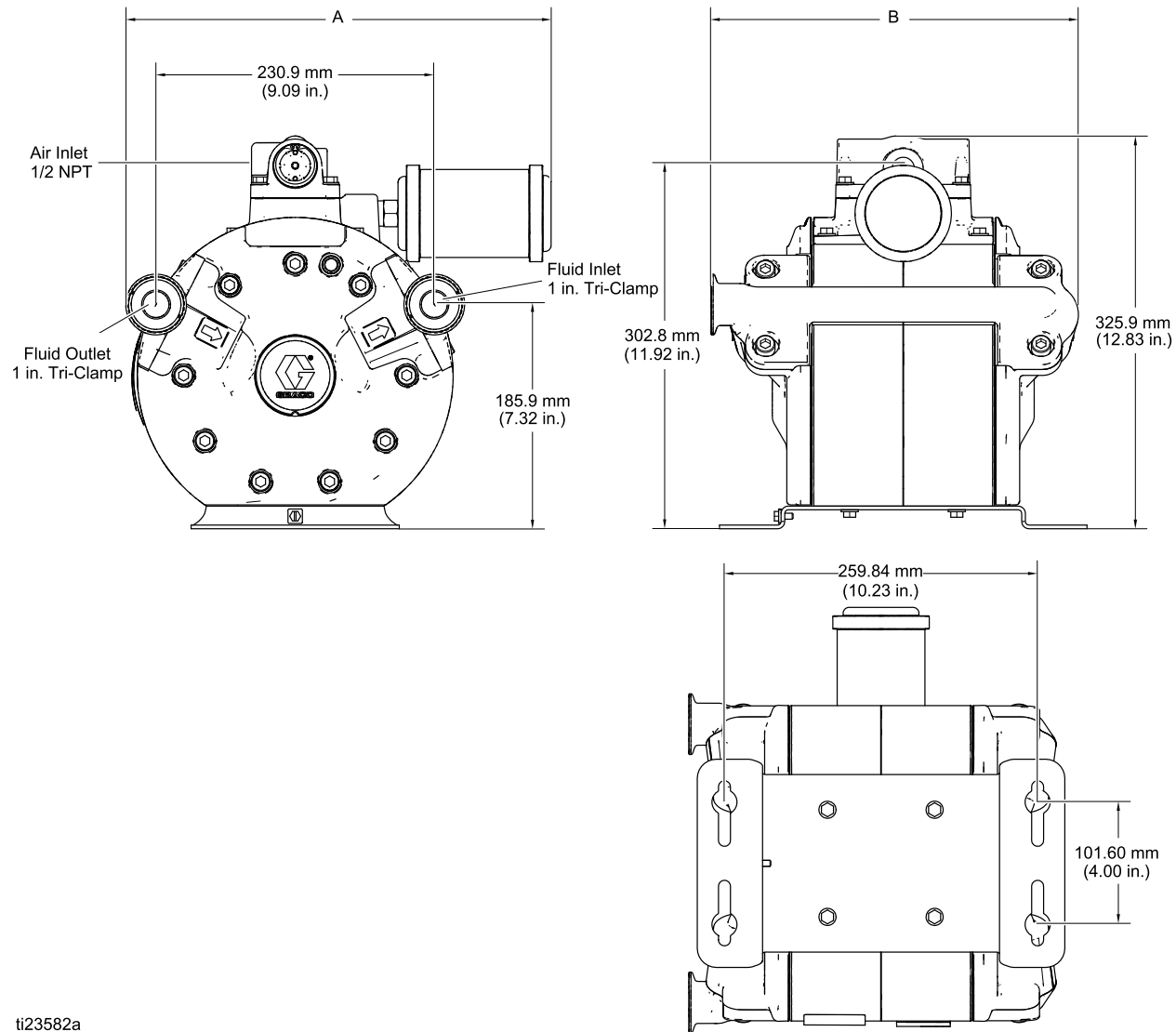
150cc Model



ti22339a

Ref.	Flange Connections	Threaded Pipe Connections
A	246.2 mm (9.69 in.)	235.0 mm (9.25 in.)
B	231.9 mm (9.13 in.)	221.8 mm (8.73 in.)

350cc Model



ti23582a

Ref.	Flange Connections	Threaded Pipe Connections
A	353.0 mm (13.9 in.)	345.2 mm (13.59 in.)
B	305.1 mm (12.01 in.)	296.2 mm (11.66 in.)

Technical Data

	US	Metric
Maximum air input pressure	100 psi	7 bar, 0.7 MPa
Maximum fluid working pressure	400 psi	28 bar, 2.8 MPa
Maximum static fluid pressure	430 psi	30 bar, 3.0 MPa
Ratio	4:1	
Maximum recommended continuous cycle rate	20 cycles per minute	
Volume per cycle (double stroke)		
4D150	5 oz per cycle	150 cc per cycle
4D350	12 oz per cycle	350 cc per cycle
Ambient and operating temperature range. Use dry compressed air when operating at low temperatures.	32 to 122°F	0 to 50°C
Dry suction lift	23 ft	7.0 m
Wet suction lift	29 ft	8.8 m
Air inlet size		
4D150	1/4 npt	
4D350	1/2 npt	
Fluid inlet size		
4D150	1 in. Tri-Clamp Flange, 1/2 in npt, or 1/2 in bspp	
4D350	1 in. Tri-Clamp Flange, 3/4 in npt, or 3/4 in bspp	
Fluid outlet size		
4D150	1 in. Tri-Clamp Flange, 1/2 in npt, or 1/2 in. bspp	
4D350	1 in. Tri-Clamp Flange, 3/4 in npt, or 3/4 in. bspp	
Weight (approximate)		
4D150	31 lb	14 kg
4D350	72 lb	33 kg
Wetted parts	stainless steel, perfluoroelastomer (FFKM), PTFE, Polyphenylene Sulfide (PPS)	

Noise Data	
Average Sound Pressure Levels in dBA at 20 cpm (measured at 1 meter (3.28 ft) horizontal, 1.5 meter (4.9 ft) above the equipment)	
At 70 psi (0.5 MPa, 5.0 bar)	
4D150	62.3 dBA
4D350	65.1 dBA
At 100 psi (0.7 MPa, 7.0 bar)	
4D150	62.9 dBA
4D350	66.0 dBA
Sound Power measured per ISO 9614–2.	
At 70 psi (0.5 MPa, 5.0 bar)	
4D150	70.8 dBA
4D350	74.1 dBA
At 100 psi (0.7 MPa, 7.0 bar)	
4D150	71.6 dBA
4D350	75.7 dBA

Graco Standard 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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For the latest information about Graco products, visit www.graco.com.
For patent information, see www.graco.com/patents.

To place an order, contact your Graco Distributor or call to identify the nearest distributor.

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

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Original Instructions. This manual contains English. MM 333015

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