Repair/Parts List

SaniForce® Air-Operated High Sanitation Diaphragm Pumps, Models 2150, 3150, 4150

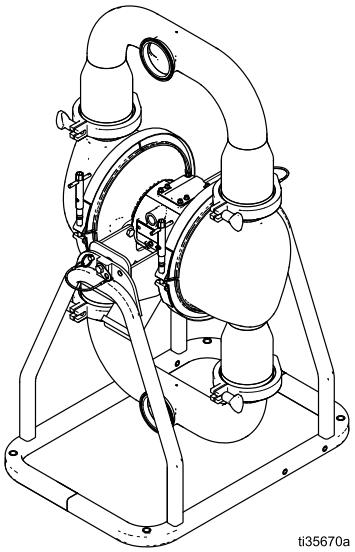
3A6782E EN

For use in sanitary applications.
For professional use only.

Important Safety Instructions
Read all warnings and instructions in this manual and related manuals before using the equipment. **Save all instructions.**

Maximum working pressure: 120 psi (0.8 MPa, 8 bar)

See page 6 for approvals.



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Contents

Related Manuals

Manual Number	Title
3A5999	SaniForce High Sanitation Diaphragm Pumps, Operation
3A6976	Leak Detection System, Instructions/Parts

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

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:

- 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.
- 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.
- **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.


PRESSURIZED EQUIPMENT HAZARD

Fluid from the equipment, leaks, or ruptured components can splash in the eyes or on skin and cause serious injury.

- 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.
- 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.
- Store hazardous fluid in approved containers, and dispose of it according to applicable guidelines.

BURN HAZARD

Equipment surfaces and fluid that's heated can become very hot during operation. To avoid severe burns:

- Do not touch hot fluid or equipment.

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. This 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.

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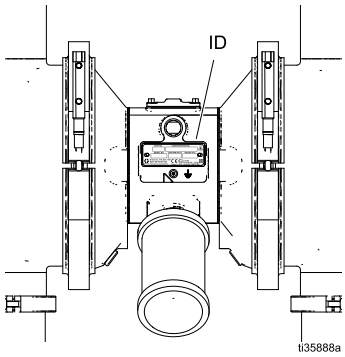
Configuration Number Matrix

Check the identification plate (ID) for the Configuration Number of your pump. Use the following matrix to define the components of your pump.
When you receive your pump, record the 9 character part number found on the shipping box (e.g., SP3F.0018): _____
Also record the configuration number on the pump ID plate to assist you when ordering replacement parts:

_____



Sample Configuration Number: 2150HS.PSP1ASSASSPTPSEP21

2150	HS	P	SP1A	SSA	SS	PT	PS	EP	21
Pump Model	Wetted Section Material	Drive	Center Section and Air Valve Material	Manifolds	Seats	Checks	Diaphragms	Seals	Certification

NOTE: Some combinations are not possible. Please check with your local supplier.

Pump	Wetted Section		Drive Type		Center Section and Air Valve		Manifolds	
2150	3A	3-A compliant	P	Pneumatic	S01A	Stainless Steel	SSA	Stainless steel, TriClamp, center port
3150	HS	High Sanitation			S02A	Stainless Steel, leak detector, 3-A	SSB	Stainless steel, DIN, center port
4150	PH	Pharmaceutical			S03A	Stainless Steel, PH	SSC	Stainless steel, TriClamp, unloader
					SP1A	Stainless Steel, PS diaphragms	SSD	Stainless steel, DIN, unloader
					SP2A	Stainless Steel, leak detector, PS diaphragms, 3-A	SSE	Stainless steel, TriClamp, horizontal, WYE manifold
					SP3A	Stainless Steel, PH, PS diaphragms	SSF	Stainless steel, DIN, horizontal, WYE manifold
							SSG	Horizontal, no manifolds

Seat Material		Checks		Diaphragm Material		Seals		Certification	
FL	316 Stainless Steel, Flapper	—	Stainless Steel Flapper	EO	EPDM Overmold	EP	EPDM	21	Type 2.1
SS	316 Stainless Steel, Ball	CW	Polychloroprene Weighted Ball	FK	FKM Fluoroelastomer			31	Type 3.1
		FK	FKM Fluoroelastomer Ball	PO	PTFE/EPDM Overmold				
		PT	PTFE Ball	PS	PTFE/ Santoprene				
		SP	Santoprene Ball	SP	Santoprene				

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Approvals		
Except for 3-A pumps, all pumps are certified to:		II 2 GD Ex h IIA T6...T3 Gb X Ex h IIIB T160°C Db
Diaphragm materials coded EO, PO or PS combined with flapper or PT ball checks are certified to:		EC 1935
All Models are certified to FDA standards and		

Ordering Information

To Find Your Nearest Distributor

1. Visit www.graco.com.
2. Click on **Where to Buy** and use **Find a Distributor**.

To Specify the Configuration of a New Pump

Please call your distributor.

OR

Use the **Online Diaphragm Pump Selector at www.graco.com.** Search for **Selector**

To Order Replacement Parts

Please call your distributor.

Troubleshooting

- Follow the Pressure Relief Procedure, page 9 , before checking or servicing the equipment.
- Check all possible problems and causes before disassembly.

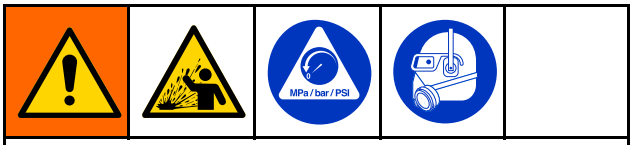
Problem	Cause	Solution
Pump cycles at stall or fails to hold pressure at stall.	Worn checks or seats.	Replace.
Pump will not cycle, or cycles once and stops.	Air valve is stuck or dirty.	Disassemble and clean air valve. Use filtered air.
	Check ball is severely worn and wedged in seat or manifold.	Replace ball and seat component.
	Check valve ball is severely wedged into seat due to overpressurization.	Follow Pressure Relief Procedure, page 9 . Disassemble ball check assembly and inspect for damage.
	Clogged dispensing valve.	Follow Pressure Relief Procedure, page 9 . Clear valve.
	Leak detector has activated a shut-down solenoid.	Investigate failure and reset leak detector.
Pump operates erratically.	Clogged suction line.	Inspect; clear.
	Sticky or leaking check balls or flap valves.	Clean or replace.
	Flap valves installed upside-down.	Install the flapper valve with the text side facing the seat.
	Ruptured diaphragm.	Replace. See standard or overmolded repair procedure.
	Restricted exhaust.	Remove restriction.
Air bubbles in fluid.	Loose suction line.	Tighten.
	Ruptured diaphragm.	Replace. See standard or overmolded repair procedure.
	Loose inlet manifold, damaged seal between manifold and fluid cover, damaged gaskets.	Tighten manifold clamps or replace gaskets or seating components .
Leak in inlet or outlet sanitary fitting.	Loose sanitary clamp.	Tighten clamp.
	Damaged or worn gasket.	Replace gasket.
	Misalignment of inlet/outlet hose or pipe.	Use flexible hoses at pump inlet and outlet.
Manifolds do not fit for installation onto fluid covers.	Use of incorrect air cover gaskets results in misalignment.	Install correct air cover gaskets for the type of diaphragms in use. See Parts list for correct gasket.

Problem	Cause	Solution
Fluid in exhaust air.	Diaphragm ruptured.	Replace. See standard or overmolded repair procedure.
	Loose diaphragm plate.	Tighten or replace. See standard or overmolded repair procedure.
Pump exhausts excessive air at stall.	Worn air valve block, plate, pilot block, u-cups, or pilot pin o-rings.	Repair or replace.
	Worn shaft seals.	Replace. See standard or overmolded repair procedure.
Pump leaks air externally.	Air valve cover is loose.	Tighten screws.
	Air valve gasket or air cover gasket is damaged.	Inspect; replace.
	Air cover clamps are loose	Tighten clamps.
Pump leaks fluid externally from ball check valves.	Loose manifolds, damaged seal between manifold and fluid cover, or damaged gaskets.	Tighten manifold clamps or replace seats or clamps.
Chattering.	Check valve balls not seating properly/cleanly due to imbalance between fluid inlet and outlet line sizing. Noise is accentuated with light viscosity fluids.	Reduce size/diameter of inlet line relative to outlet line. Outlet line size should not exceed pump size.

Repair

Pressure Relief Procedure

Follow the Pressure Relief Procedure whenever you see this symbol.



Trapped air can cause the pump to cycle unexpectedly, which could result in serious injury from splashing. Follow the **Pressure Relief Procedure** when you stop pumping and before cleaning, checking, or servicing equipment.

1. Shut off the air to the pump.
2. Open any available outbound fluid valve to relieve fluid pressure from the pump.
3. If fluid is still in the outbound fluid lines, isolate this fluid as follows:
   a. Close the outbound fluid valves.
   b. Slowly remove the fluid connections from the pump, and have a container ready to catch any fluid that runs out.

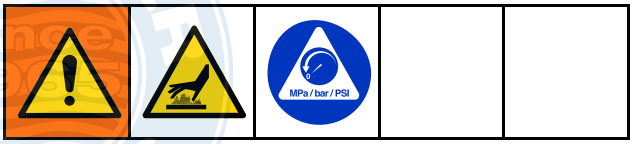
Air Valve Repair

Tools Required

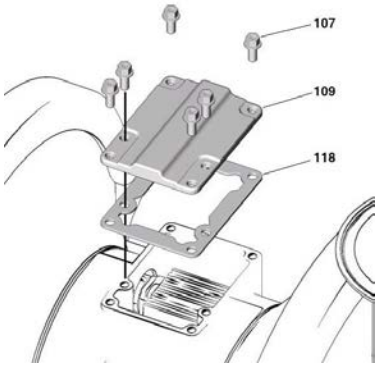
- Torque wrench
- Torx (T20) screwdriver or 7 mm (9/32 in.) socket wrench
- Needle-nose pliers
- O-ring pick
- Lithium base grease

Air valve repair kit 255122 is available. Use all parts in the kit for best results.

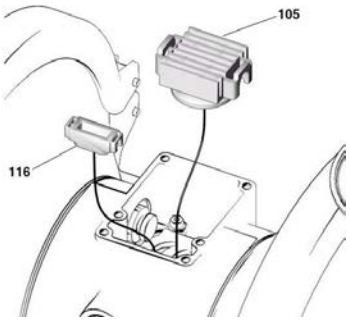
Disassemble Air Valve



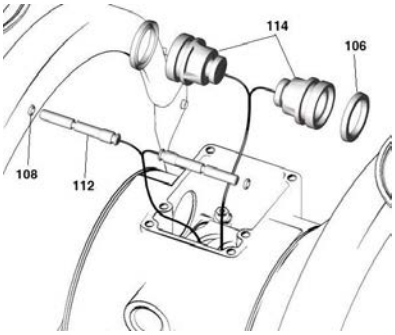
1. Follow the Pressure Relief Procedure, page 9 .
2. With a Torx (T20) screwdriver or 7 mm (9/32 in.) socket wrench, remove the six screws (107), air valve cover (109), and gasket (118).



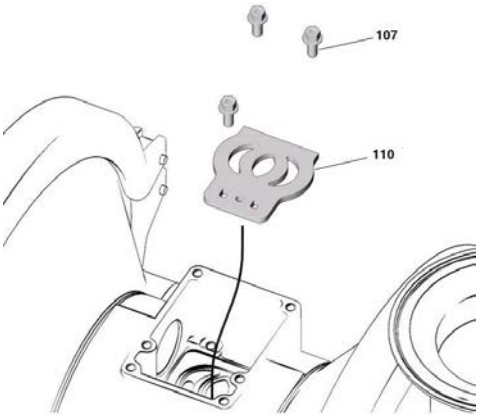
3. Move the valve carriage (105) to the center position and pull it out of the cavity. Using a needle-nose pliers, pull the pilot block (116) straight up and out of the cavity.



4. Pull the two actuator pistons (114). Remove the u-cups (106) from the pistons. Pull the pilot pins (112). Remove the o-rings (108) from the pilot pins.



5. Inspect the valve plate (110) in place. If damaged, use a Torx (T20) screwdriver or 7 mm (9/32) in.) socket wrench to remove the three screws (107). Remove the valve plate (110).



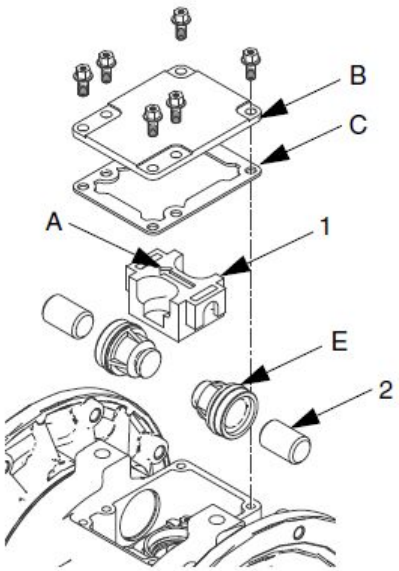
6. Inspect the bearings (113, 115) in place. See Parts, page 21. The bearings are tapered and, if damaged, must be removed from the outside. This requires disassembly of the fluid section. See Center Section Repair, page 18.
7. Clean all parts and inspect for wear or damage. Replace as needed.

Using Diaphragm Install Tool

If repairs involve removal of fluid covers, these steps will ease installation of fluid c overs. These steps should be performed prior to reassembly of the air valve because the air valve configuration will be modified to aid fluid cover installation.

The diaphragm install tool kit 24V543 is available separately.

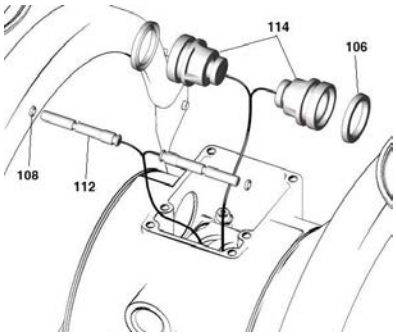
1. If the air valve assembly has not been disassembled:
   a. Remove the air valve cover (109) and gasket (118).
   b. Remove the valve cartridge (105) and both pistons (114).
   c. Insert the travel restrictors (2) from the diaphragm install tool kit into the actuator pistons (E). Lubricate the u-cups and insert the actuator pistons in the bearings (115), ***wide*** end first. Leave the narrow end of the pistons exposed.
   d. Proceed to step 4 below.
2. If the air valve assembly has been disassembled, perform step 1 through step 4 of the air valve reassembly procedure.
3. Install the u-cups (106) onto the actuator pistons (E) and insert the travel restrictors (2) from the diaphragm install tool kit into the actuator pistons (E). Lubricate the u-cups and insert the actuator pistons in the bearings (115), ***wide*** end first. Leave the narrow end of the pistons exposed.
4. Install the supplied diaphragm install tool (1) so that the arrow (A) points toward the side of the pump with the diaphragm against the air cover. Install the air valve gasket (C) and cover (B). Snug the air valve cover screws.



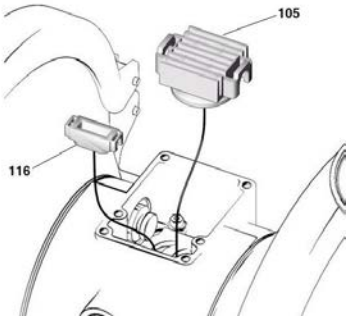
5. Lubricate the inner surface of both cover clamps with waterproof sanitary lubricant. Install the cover and clamp on the side of the pump with the diaphragm against the air cover. Leave the clamp slightly tightened but loose enough to allow minor cover rotation to allow for alignment with the inlet and outlet manifolds.
6. Supply the pump with low pressure air, just enough to move the diaphragm. Use about 10 to 20 psi (0.07 MPa, 0.7 to 1.4 bar). Shop air may be used. The diaphragm will shift so the second fluid cover will seat properly. Keep air pressure on.
7. Install the remaining fluid cover and clamp.
8. Remove air supply from pump.
9. Remove the air valve cover (B), gasket (C) and the tool (1).
10. Remove the pistons (E) and the travel restrictors (2).
11. Lubricate and install the pistons (E).
12. To complete assembly of the air valve assembly, proceed to step 6 of Reassemble Air Valve, page 11.

Reassemble Air Valve

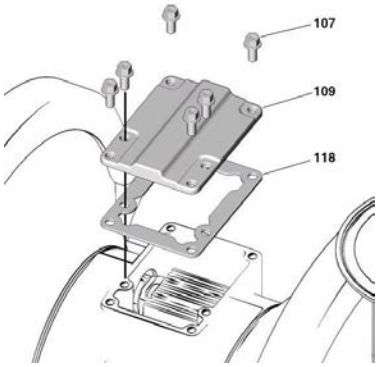
1. If the center section was disassembled to replace the bearings (113, 115), complete the center section repair before continuing with the air valve reassembly.
2. Install the valve plate (110) in the cavity, seal down. Install the three screws (107), using a Torx (T20) screwdriver or 7 mm (9/32 in.) socket wrench. Tighten until the screws bottom out on the housing.
3. Install an o-ring (108) on each pilot pin (112). Grease the pins and o-rings. Insert the pins into the bearings, ***narrow*** end first.



4. Install u-cups (106) on each actuator piston (114), so the lips of the packings face the ***narrow*** end of the pistons.
5. Grease the lower face of the pilot block (116) and install so its tabs snap into the grooves on the ends of the pilot pins (112).



6. Lubricate the u-cups (106) and actuator pistons (114). Insert the actuator pistons in the bearings (115), ***wide*** end first. Leave the narrow end of the pistons exposed.
7. Grease the lower face of the valve carriage (119).
8. Install the valve carriage (105) so its tabs slip into the grooves on the narrow end of the actuator pistons (114).
9. Align the valve gasket (118) and cover (109) with the six holes in the center housing (101). Secure with six screws (107), using a Torx (T20) screwdriver or 7 mm (9/32 in.) socket wrench. Torque to 50-60 in-lb (5.7-6.8 N•m).



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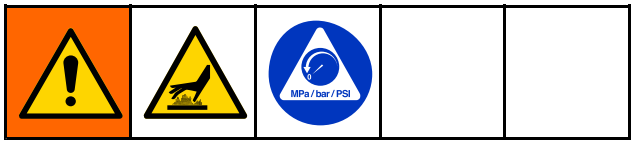
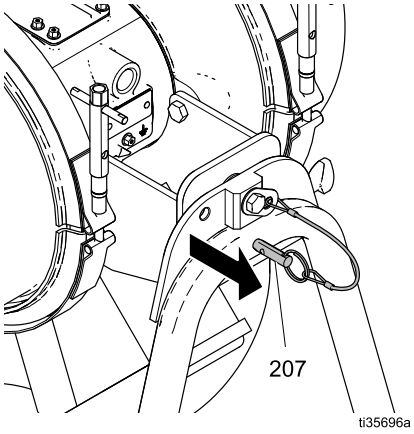
Check Valve Repair

NOTE: Kits are available for new check valve flappers, or check valve balls in a range of materials. Gasket kits also are available.

Disassemble the Check Valve



1. Follow the Pressure Relief Procedure, page 9 . Disconnect all hoses.
2. Drain the pump
   a. On rotatable stand, pull the frame quick-release pins (207) and rotate the pump.



   NOTE: After draining, rotate the pump to positions which will aid disassembly.

   b. On non-rotatable stand, partially disassemble the fluid section as noted below.

   NOTE: The vertical pumps can be drained by removing the inlet manifold and manually raising the inlet flappers. Horizontal pumps will require removal of the fluid covers.

3. Remove the clamps (23) on the outlet manifold (17) and remove the manifold.

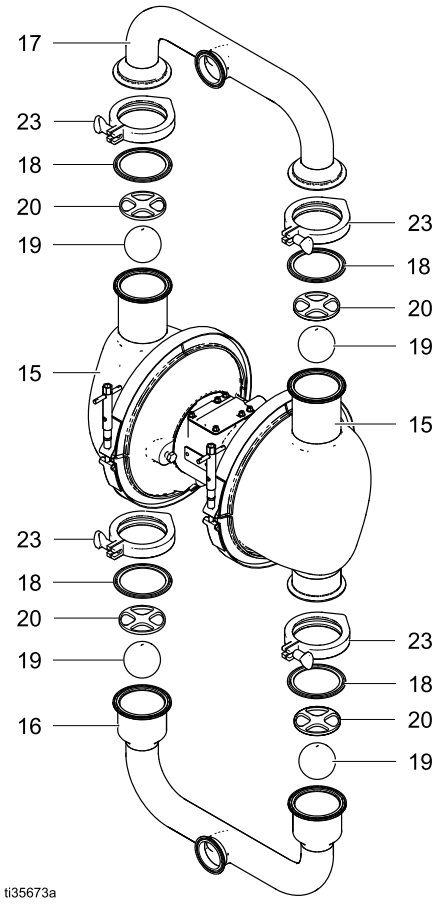
   NOTE: Use care while removing manifold to safely remove check valve components.

4. Remove remaining clamps, manifolds, gaskets and check valves.

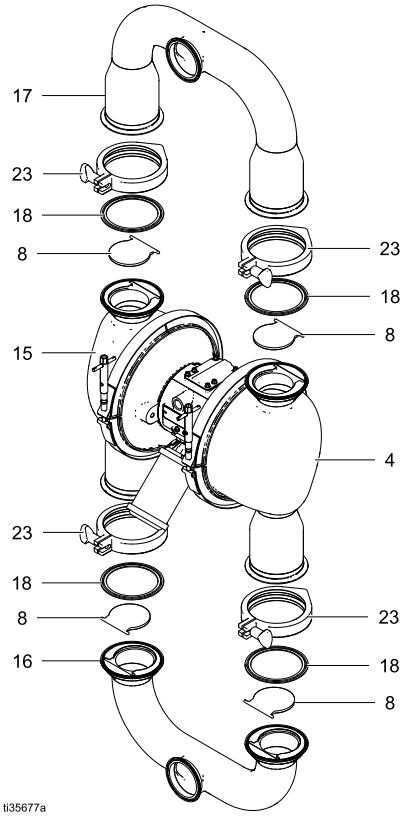
   NOTE: Inspect all components for any damage and replace as necessary.

5. To continue disassembly, see Disassemble the Standard Diaphragms, page 14.

Ball pump shown



Vertical flapper pump shown

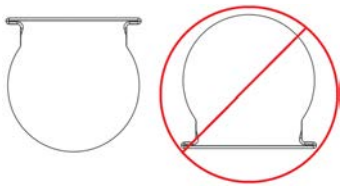


Reassemble the Check Valves

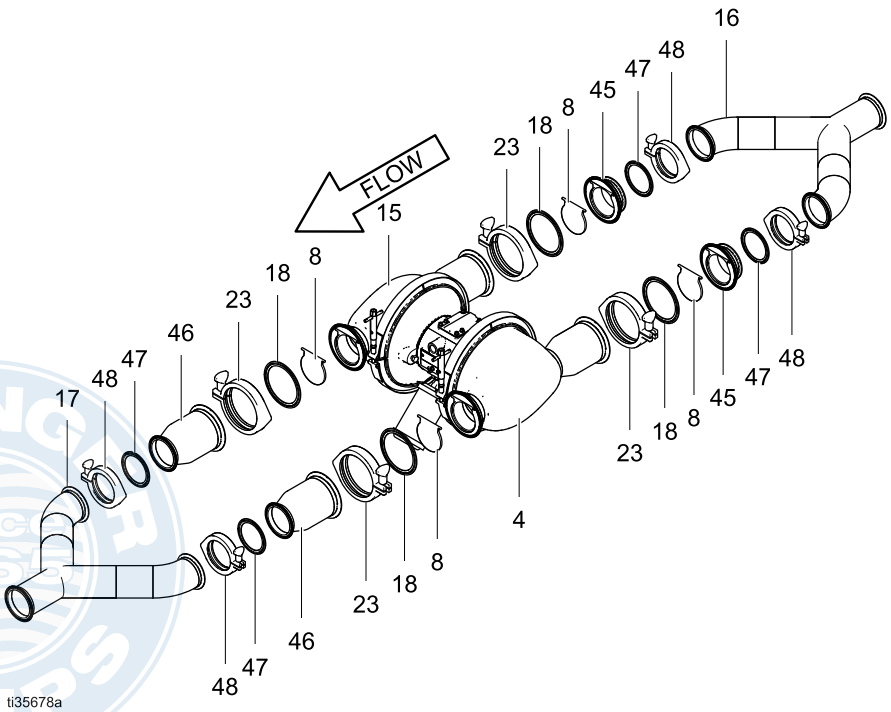
NOTE: Lubricate clamps and clamping surfaces with waterproof, sanitary lubricant.

1. Reassemble ball or flapper check assembly in reverse order.
2. Attach the manifolds to the fluid covers. Tighten clamps hand tight.

   NOTE: Install the flapper valve (8) with the text side facing the seat.



NOTE: Flapper fluid covers are not interchangeable and their orientation is critical on horizontal pumps. Horizontal pump fluid covers must be positioned so that the flappers hang down from the hinge pin when placed in the fluid cover. Install the flapper valves (8) with the text side facing the seat.



Horizontal flapper pump shown

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Standard Diaphragm Repair

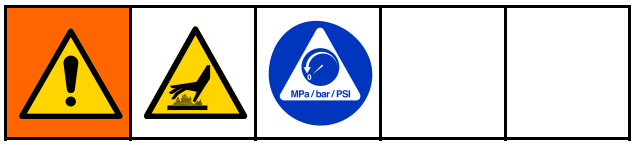
NOTE: Overmolded diaphragms are covered in Overmolded Diaphragm Repair, page 16.

Tools Required

- Torque wrench
- 5/8 in. wrench
- 19 mm open end wrench
- Diaphragm install tool (optional), kit 24V543
- O-ring pick
- Lithium base grease

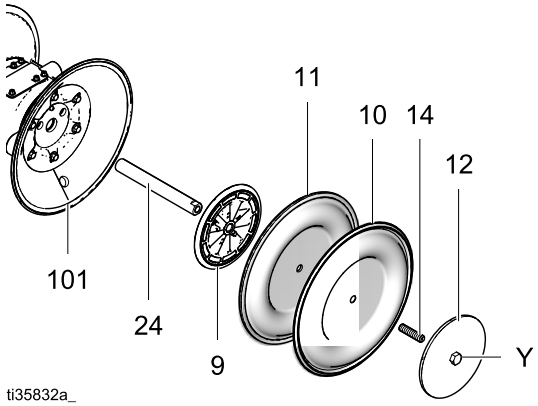
NOTE: Center section gasket is dependent on diaphragm material. If changing diaphragm material, it may be necessary to also replace the center section air cover gaskets. See Diaphragms for affected diaphragm/gasket concerns.

Disassemble the Standard Diaphragms



NOTE: Diaphragm kits are available in a range of materials and styles. See Parts section.

1. Follow the Pressure Relief Procedure, page 9 .
2. Remove the manifolds and disassemble the check valves as explained in Check Valve Repair, page 12.
3. Remove the clamps (21) from the fluid covers (4, 15), then pull the fluid covers off of the pump.
4. With both fluid covers removed, using two 5/8 in. wrenches, hold the wrench flats (Y) on the plates of each diaphragm assembly and loosen. One diaphragm assembly will come free and the other will remain attached to the shaft.
5. Disassemble the free diaphragm assembly.
6. Remove plate (12) with bolt (14) installed, diaphragm (10), backer (11) if present, and plate (9).



7. Pull the other diaphragm assembly and the diaphragm shaft (24) out of the center housing (101). Hold the shaft flats with a 19 mm open end wrench, and remove the diaphragm assembly from the shaft. Disassemble the remaining diaphragm assembly.
8. Inspect the diaphragm shaft (24) for wear or scratches. If it is damaged, inspect the bearings (111) in place. If the bearings are damaged, refer to Center Section Repair, page 18.
9. Reach into the center housing (101) with an o-ring pick and hook the u-cups (106), then pull them out of the housing. This can be done with the bearings (111) in place.
10. Clean all parts and inspect for wear or damage. Replace parts as needed.

Reassemble the Standard Diaphragms

NOTICE

After reassembly, allow the thread locker to cure for 12 hours, or per manufacturer's instructions, prior to operating the pump. Damage to the pump will occur if the diaphragm shaft bolt loosens.

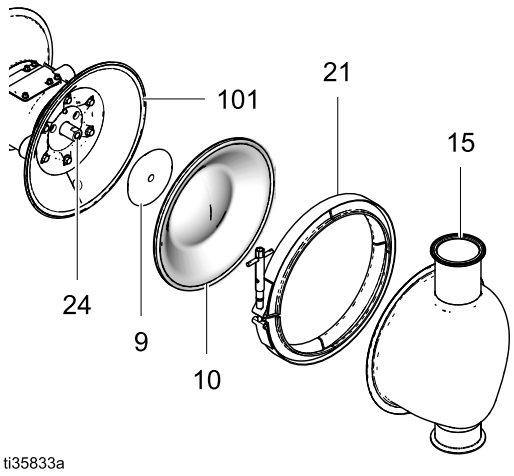
TIP: If you are also repairing or servicing the center section, see Center Section Repair, page 18, before you put the diaphragms back on.

1. Lubricate and install the shaft u-cups (110) so the lips face ***out*** of the housing (101).
2. Assemble plate (9) onto diaphragm (10), with screw (14). Rounded side of plate (9) should face diaphragm. Make sure the side marked AIR SIDE faces the center housing.

   NOTE: Thread locker must be applied to screw (14) as shown for all diaphragm assemblies.

   Apply a high-strength thread locker to attach the screw to the diaphragm plate, if needed.

   Apply a medium-strength thread locker to the shaft side of the screw.



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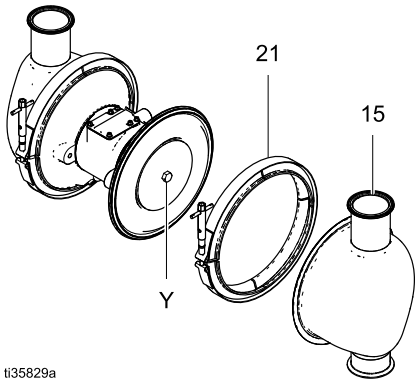
3. Screw assembled diaphragm assembly into shaft (24) and hand tighten.
4. Grease the length of the diaphragm shaft (24), and slide it through the housing (101).
5. Assemble the other diaphragm assembly to the shaft as explained in step 2.
6. Using a 5/8 in. wrench hold the wrench flats of one diaphragm assembly and torque the other diaphragm to 60-70 ft-lb (81-94 N•m).

   NOTE: Apply waterproof, sanitary lubricant to the clamp (21) and clamping surface of the cover (4, 15) to ease assembly.

7. Align the fluid covers (4, 15) and the center housing. Secure the covers with the clamps (21) and hand tighten. The opposing diaphragm may protrude away from the center housing after the first fluid cover is secured, leaving a gap between the center housing and the second fluid cover. Do not try to force the diaphragm into position. Instead, use the diaphragm install tool to position the diaphragm and allow fluid cover installation. Refer to Using Diaphragm Install Tool, page 10 for use of the diaphragm install tool to position the diaphragm and allow fluid cover installation.

   NOTE: Apply a food grade anti-seize lubricant on the clamp threads to aid assembly.



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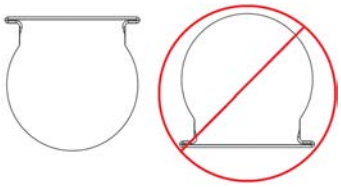
   a. Ball pump fluid covers are interchangeable.
   b. Flapper fluid covers are not interchangeable and their orientation is critical on horizontal pumps. Horizontal pump fluid covers must be positioned so that the flappers hang down from the hinge pin when placed in the fluid cover. Install the flapper valves (8) with the text side facing the seat.



8. Reassemble the ball check valves and manifolds as explained in Check Valve Repair, page 12

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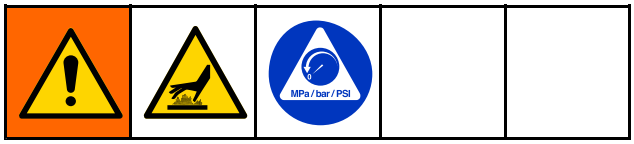
Overmolded Diaphragm Repair

Tools Required

- Torque wrench
- 19 mm open end wrench
- O-ring pick
- Diaphragm install tool, kit 24V543
- Lithium base grease

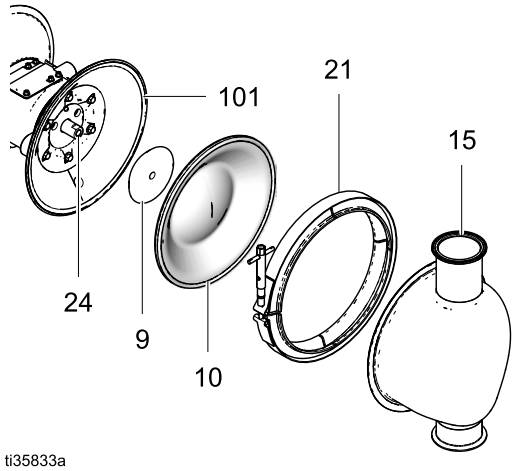
NOTE: Center section gasket is dependent on diaphragm material. If changing diaphragm material, it may be necessary to also replace the center section air cover gaskets. See Diaphragms for affected diaphragm/gasket concerns.

Disassemble the Overmolded Diaphragms



NOTE: Diaphragm kits are available in a range of materials and styles. See Parts section.

1. Follow the Pressure Relief Procedure, page 9 .
2. Remove the manifolds and disassemble the check valves as explained in Check Valve Repair, page 12.
3. Remove the clamps (21) from the fluid covers (4, 15), then pull the fluid covers off of the pump.
4. Once the fluid covers are removed, the diaphragm on the side of the pump which was last pressurized with air will be separated from the center section/air cover. This allows you to grip the diaphragms.
5. To loosen, grip both diaphragms securely around the outer edge and rotate counterclockwise. One diaphragm assembly will come free and the other will remain attached to the shaft. Remove the freed diaphragm (10) with screw (14) and air side plate (9).
6. Pull the opposite diaphragm assembly and shaft (24) out of the center housing (101). Hold the shaft flats with a 19 mm open end wrench and remove the diaphragm and air side plate from the shaft.
7. Inspect the diaphragm shaft (24) for wear or scratches. If it is damaged, inspect the bearings (111) in place. If the bearings are damaged, refer to Center Section Repair, page 18.
8. Reach into the center housing (101) with an o-ring pick and hook the u-cups (110), then pull them out of the housing. This can be done with the bearings (111) in place.
9. Clean all parts and inspect for wear or damage. Replace parts as needed.



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Reassemble the Overmolded Diaphragms

NOTICE

After reassembly, allow the thread locker to cure for 12 hours, or per manufacturer's instructions, prior to operating the pump. Damage to the pump will occur if the diaphragm shaft bolt loosens.

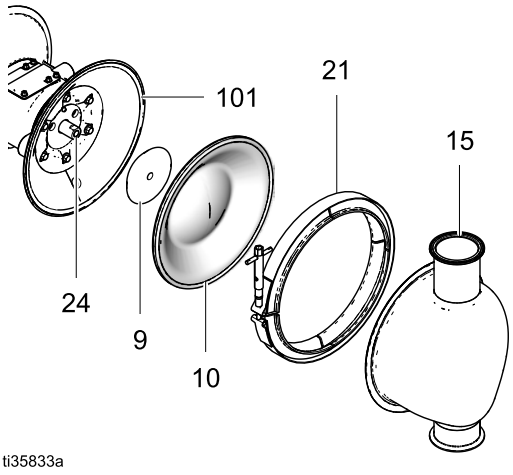
TIP: If you are also repairing or servicing the center section, see Center Section Repair, page 18, before you put the diaphragms back on.

1. Lubricate and install the shaft u-cups (110) so the lips face ***out*** of the housing (101).
2. Assemble plate (9) onto diaphragm (10), with screw (14). Rounded side of plate (9) should face diaphragm. Make sure the side marked AIR SIDE faces the center housing.

   NOTE: Thread locker must be applied to screw (14) as shown for all diaphragm assemblies.

   Apply a high-strength thread locker to attach the screw to the diaphragm plate.

   Apply a medium-strength thread locker to the shaft side of the screw.



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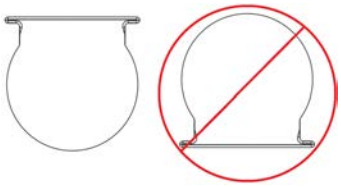
3. Screw assembled diaphragm assembly into shaft (24) and hand tighten.
4. Grease the length of the diaphragm shaft (24), and slide it through the housing (101).
5. Assemble the other diaphragm assembly to the shaft as explained in step 2.
6. Grip both diaphragms securely around their outer edges and rotate clockwise until bottomed on the shaft.

   NOTE: Apply waterproof, sanitary lubricant to the clamp (21) and clamping surface of the cover (4, 15) to ease assembly.
7. Align the fluid covers (4, 15) and the center housing. Secure the covers with the clamps (21) and hand tighten. The opposing diaphragm may protrude away from the center housing after the first fluid cover is secured, leaving a gap between the center housing and the second fluid cover. Do not try to force the diaphragm into position. Instead, use the diaphragm install tool to position the diaphragm and allow fluid cover installation. Refer to Using Diaphragm Install Tool, page 10 for use of the diaphragm install tool to position the diaphragm and allow fluid cover installation.

   NOTE: Use a food grade anti-seize lubricant on the clamp threads to aid assembly.

   a. Ball pump fluid covers are interchangeable.

   b. Flapper fluid covers are not interchangeable and their orientation is critical on horizontal pumps. Horizontal pump fluid covers must be positioned so that the flappers hang down from the hinge pin when placed in the fluid cover. Install the flapper valves (8) with the text side facing the seat.



8. Reassemble the ball check valves and manifolds as explained in Check Valve Repair, page 12

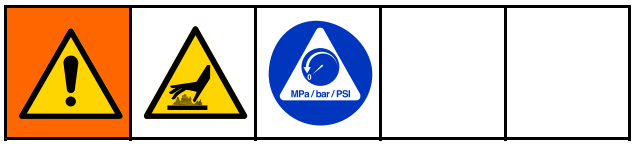
Center Section Repair

Tools Required

- Torque wrench
- 10 mm socket wrench
- 9/16 in. socket wrench
- Bearing puller
- O-ring pick
- Press, or block and mallet

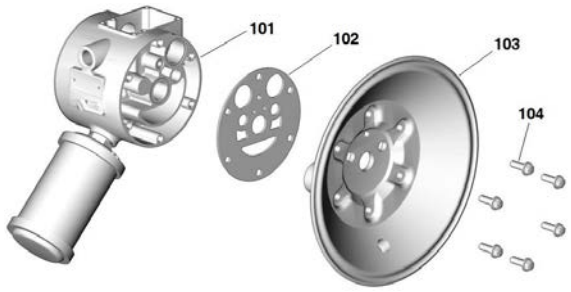
Disassemble the Center Section

NOTE: Do not remove undamaged bearings.



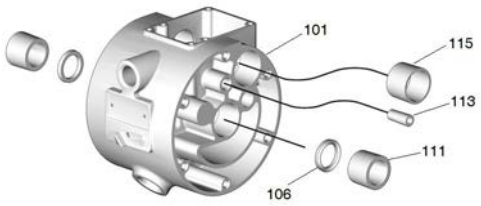
1. Follow the Pressure Relief Procedure, page 9 . Remove power from the motor. Disconnect all hoses.
2. Remove the manifolds and check valve parts as directed in Disassemble the Check Valve, page 12.
3. Remove the fluid covers and diaphragms as directed in Disassemble the Standard Diaphragms, page 14 or Disassemble the Overmolded Diaphragms, page 16.

   NOTE: If you are removing only the diaphragm shaft bearing (111), skip step 4.
4. Disassemble the air valve as explained in Air Valve Repair, page 9 .
5. Use a 9/16 in. socket wrench to remove the screws (3) and nuts (105) holding the air covers to the frame.
6. Use a 10 mm socket wrench to remove the screws (104) holding the air covers (103) to the center housing (101).



7. Remove the air cover gaskets (102). Always replace the gaskets with new ones.

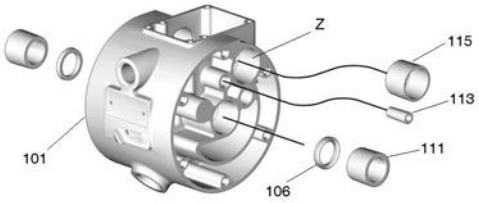
   NOTE: If removing the diaphragm shaft bearings (111), use an o-ring pick to remove the u-cups (106) first.
8. Use a bearing puller to remove the diaphragm shaft bearings (111), air valve bearings (115) or pilot pin bearings (113). Do not remove undamaged bearings.



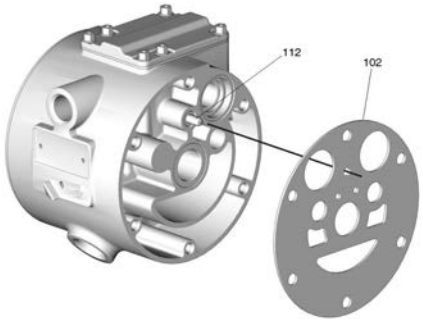
9. Inspect the u-cups. Replace as needed.

Reassemble the Center Section

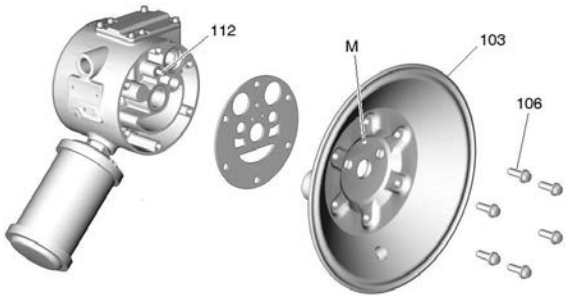
1. Install the shaft u-cups (106) so the lips face ***out*** of the housing.
2. Insert new bearings (111, 113, and 115) into the center housing (101), ***tapered end first***. Using a press or a block and rubber mallet, press-fit the bearing so it is flush with the surface of the center housing.



3. Reassemble the air valve as explained in Reassemble Air Valve, page 11
4. Align the new air cover gasket (102) so the pilot pin (112) protruding from the center housing (101) fits through the proper hole in the gasket.



5. Align the air cover (103) so the pilot pin (112) fits in the middle hole (M) of the three small holes near the center of the cover.



6. Apply a medium-strength thread locker to the threads of the screws (106). Install the screws (106), hand tight. Using a 10 mm socket wrench, torque the screws oppositely and evenly to 130-150 in-lb (15-17 N•m). Install the diaphragm assemblies and fluid covers as explained in Diaphragms
.
7. See Reassemble the Check Valves, page 13.

Leak Detectors

Leak detectors are sensors that are mounted in the air covers of the pump to monitor for fluid leakage caused by a diaphragm rupture. Leak detectors are provided with 3-A pumps and can be ordered separately for other pumps. For leak sensor electrical and configuration information, refer to the leak detection system manual (3A6976).

Available leak detection kits:

Kit	Description
17Z666	Kit, Standard, non-ATEX, 2 sensors, 2 bushings; provided with 3-A pumps
17Z667	Kit, ATEX, 2 sensors, 2 bushings, 2 o-rings
25P303	Kit, Leak detection control box; not approved for use in an ATEX environment
25P305	Kit, Leak detection control box mounting bracket and mounting hardware

Leak Detector Testing

1. Obtain a small container of the product being pumped to test the leak detectors.
2. Perform the Pressure Relief Procedure, page 9 .
3. Unscrew the leak detector bushing from the air side cover.
4. Dip the bushing, with the leak detector still installed in it, into the product container in an orientation that mimics how it would be oriented in the air side diaphragm cover. Observe whether the leak detector senses the presence of the product.
5. If the leak detector successfully detected the product, clean the bushing and leak detector and re-install the leak detector and bushing into the air side diaphragm cover.

   NOTE: If the leak detector fails to sense the product, troubleshoot the leak detector to see if the leak sensor has failed or the leak detector is unable to detect the product.
6. Repeat steps 3–5 for the other leak detector.

Leak Detector Removal

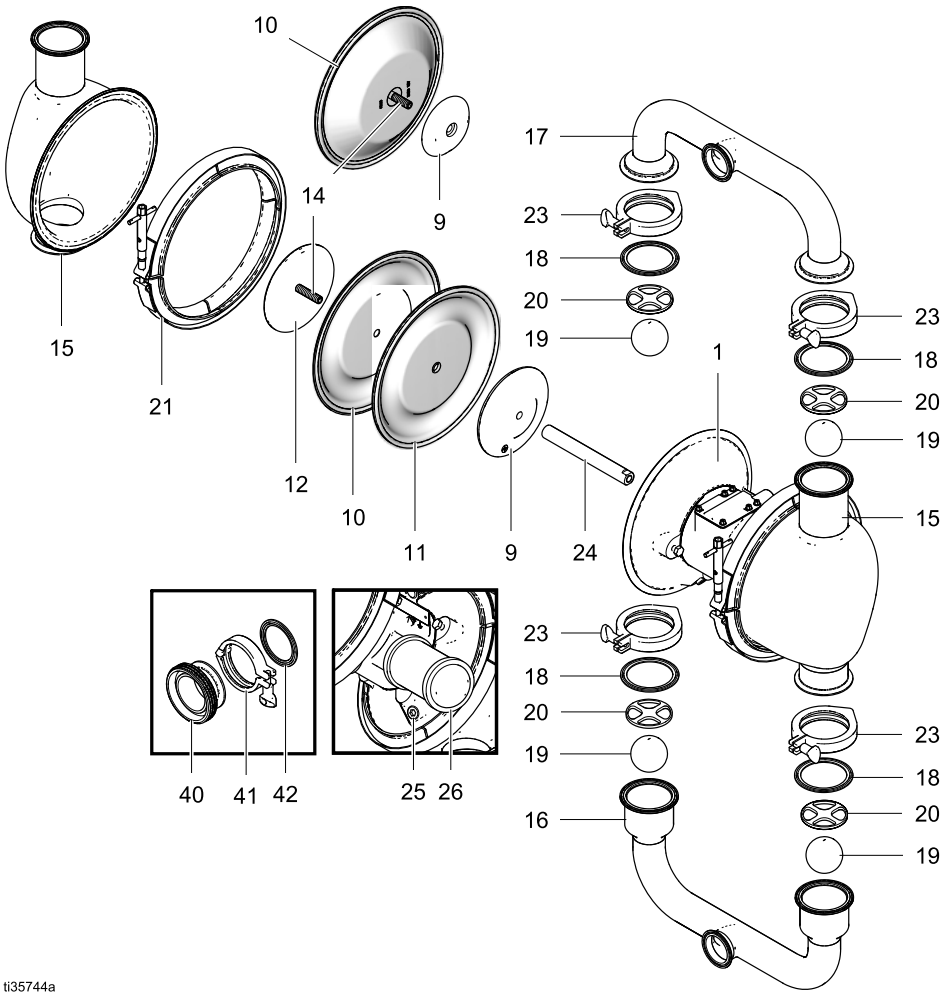
1. Follow the Pressure Relief Procedure, page 9 .
2. Note the connection locations of the leak detector wires within the monitoring device, then disconnect the leak detector wires.
3. Remove the leak detector from the bushing in the air side diaphragm cover.
4. If desired, repeat to remove the other leak detector from the other air side diaphragm cover.

Leak Detector Installation

1. If the leak detector needs to be installed in the bushing, simply screw the leak detector in just past finger tight.

   NOTE: If using the ATEX leak detector, install the o-ring onto the leak detector before installation into the bushing.
2. If the bushing is not installed in the air side diaphragm cover, screw the bushing into the air side diaphragm cover.
3. Wire the leak detector to the monitoring device.

Parts



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SP2B.xxxx model shown

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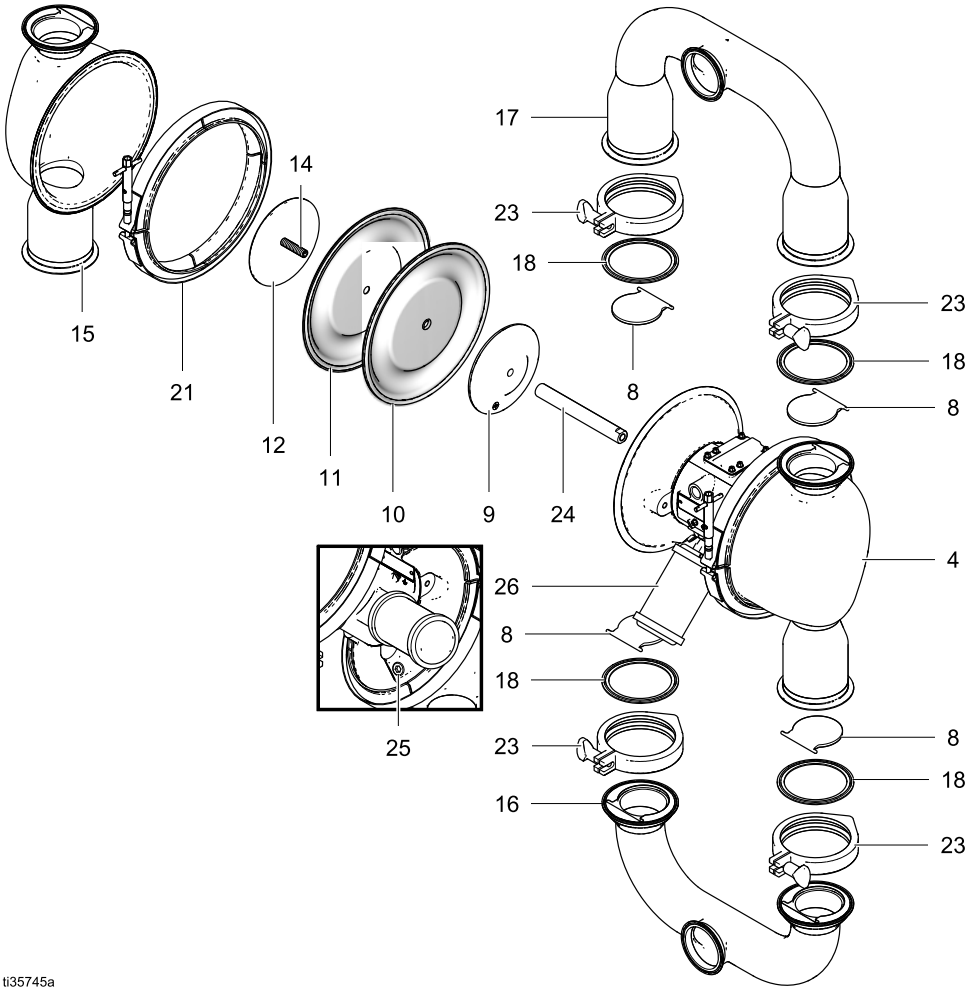


SP3F.xxxx model shown

Replacement Unloader Pumps

To order a replacement pump for use in a drum or tote unloader, obtain the six digit number from the pump being replaced and refer to the table below to determine the part number to order.

2 inch Ball		3 inch Flapper	
Tag Marking	**Order Pump p/n**	**Tag Marking**	**Order Pump p/n**
25P220	SP2B.0042	25P216	SP3F.0024
25P221	SP2B.0046	25P217	SP3F.0028
25P222	SP2B.0048	25P218	SP3F.0030
25P223	SP2B.0052	25P219	SP3F.0032

Parts/Kits Quick Reference

Use this table as a quick reference for parts/kits. Go to the pages indicated in the table for a full description of kit contents.

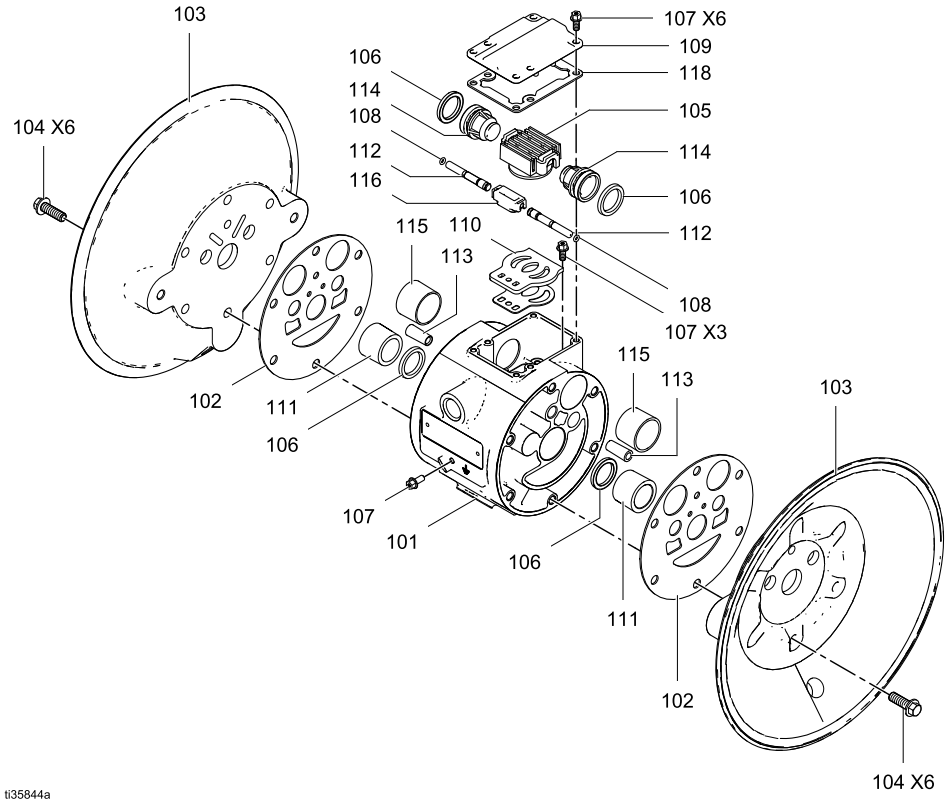
Ref.	Part/Kit	Description	Qty.
1	— — —	MODULE, motor; *See pages 25-26*	1
2		FRAME; *See page 29*	1
	24L978	vertical, rotateable (SP2B, SP3F)	
	25P104	vertical, non-rotateable (SP4F)	
	25N991	horizontal (SP3F, SP4F)	
3	15D008	BOLT, frame attachment	4
4		COVER, fluid, flapper	
	25E577	SP3F	1
	25N999	SP4F	
8		FLAPPER, check valve	4
	25E582	SP3F	
	25P086	SP4F	
9*		PLATE, air side	2
	189298	EO, FK, SP, PS	
	15H811	PO	
10*	— — —	DIAPHRAGM, kit; *See page 28*	1 kit
11	— — —	DIAPHRAGM, backup, *included with Ref. 10 where needed*	2
12	15D018	PLATE, fluid side, FK, SP, PS only	2
14	15D021	SCREW, manifold	2
15		COVER, fluid	
	25E575	SP2B	2
	25E576	SP3F	1
	25N998	SP4F	1
16	— — —	MANIFOLD, inlet; *See pages 27-28*	1
17	— — —	MANIFOLD, outlet; *See pages 27-28*	1
18		GASKET, EPDM, pkg of 4	
	25P063	SP2B	1
	25P064	SP3F	
	25P066	SP4F	
19*		BALLS, check valve	4
	112359	PTFE	
	112361	Santoprene	
	15B491	Fluoroelastomer	
	15H834	Polychloroprene weighted	
20	25E584	STOP, ball, SP2B	4
21*	25P107	CLAMP, fluid cover	2
22	— — —	HANDLE, tee *Included with Ref. 21*	2
23		CLAMP, sanitary	4
	15D475	SP2B	
	510490	SP3F	
	16D245	SP4F	
24	189304	SHAFT, diaphragm	1
25	103778	PLUG, pipe	2
26	15G332	MUFFLER	1
27	17Z666	DETECTOR, leak, 3-A only	2
40		ADAPTER, DIN, includes Ref. 41, 42	2
	25P110	SP2B HS, 3-A	
	25P120	SP2B PH	
	25P111	SP3F	
	25P112	SP4F	
41		CLAMP, DIN adapter	2
	— — —	SP2B	
	— — —	SP3F	
	— — —	SP4F	
42		GASKET, DIN adapter	2
	— — —	SP2B	
	— — —	SP3F	
	— — —	SP4F	
45		SEAT, flapper, horizontal only	
	25P084	SP3F	2
	25P085	SP4F	2
46		CHAMBER, flapper, horizontal only	
	25P082	SP3F	2
	25P083	SP4F	2
47		GASKET, EPDM, horizontal only	4
	25P065	SP3F	
	25P067	SP4F	
48		CLAMP, flapper, horizontal only	
	15D475	SP3F	4
	510490	SP4F	4
49	25P457†	LABEL, kit; includes Ref. 50 & 51	1
50	— — —	TAG	1
51	— — —	TIE	1

— — — Not sold separately.
† Replacement labels available free of charge.
** Valid for all pump sizes.*

Center Section

Sample Configuration Number

Pump Model	Wetted Section Material	Drive	Center Section and Air Valve Material	Manifolds	Seats	Checks	Di-aphragms	Seals	Certifica-tion
2150	HS	P	**SP1A**	SSA	SS	PT	PS	EP	21



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Ref	Part	Description	Qty
101		HOUSING, center, assembly; *includes plugs*	1
	— — —	Aluminum (**Axxx**)	
	15K009	Stainless Steel (S01A, S02A)	
	15K010	Stainless Steel (S03A)	
102		GASKET, air cover kit; pkg of 2	1
	25P113	use with PS diaphragms	
	25P114	use with all diaphragms except PS diaphragms	
103		COVER, air	2
	15H859	S01A, S02A	
	15D016	S03A	
104	25P125	SCREW, pkg of 12	1
105†	248904	CARRIAGE ASSY	1
106†	112181	U-CUP	4

Ref	Part	Description	Qty
107	116344	SCREW	10
108†	157628	O-RING	2
109		COVER	1
	25P128	S01A, S02A	
	25P129	S03A	
110†	15H178	PLATE, valve	1
111	188609	BEARING, shaft	2
112	188610	PIN, push	2
113	188611	BEARING, push	2
114	188612	PISTON	2
115	188613	BEARING, piston	2
116†	188614	BLOCK, pilot	1
118†	188618	GASKET, cover	1

† *Included in Air Valve Repair Kit 255122.*

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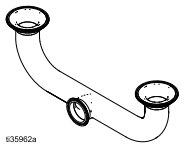
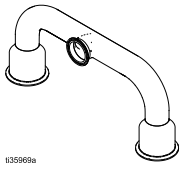
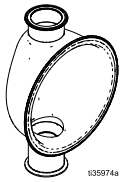
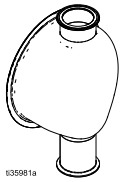
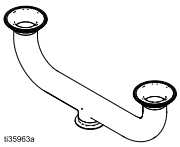
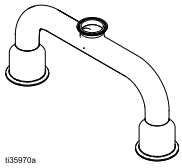
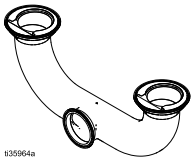
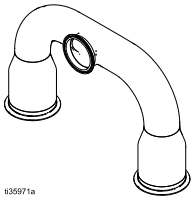
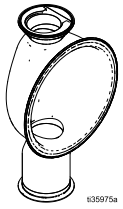
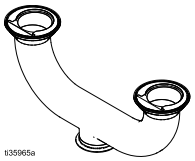
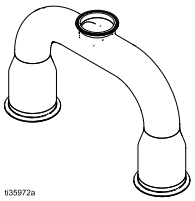
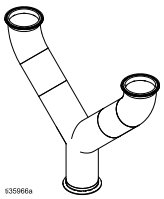
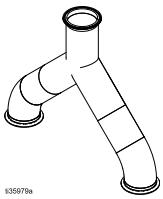
Fluid Covers and Manifolds

Sample Configuration Number

Pump Model	Wetted Section Material	Drive	Center Section and Air Valve Material	Manifolds	Seats	Checks	Diaphragms	Seals	Certification
2150	HS	P	S01A	SSA	SS	PT	PS	EP	21

			Manifold*		Fluid Cover	
Pump PN prefix	Manifold	Wetted Section	Inlet	Outlet	Left (Ref 15)	Right (Ref 4, 15)
SP2B	SSA	HS, 3-A PH	 25E580 (HS, 3-A) 25P052 (PH)	 25E578 (HS, 3-A) 25P053 (PH)	 25E575 (HS, 3-A) 25P042 (PH)	 25E575 (HS, 3-A) 25P042 (PH)
	SSC, SSD	HS, 3-A	 25P050	 25P051		
SP3F	SSA, SSB	HS	 25E581	 25E579	 25E576	 25E577
	SSC, SSD	HS	 25P054	 25P055		
	SSE, SSF	HS WYE	 25P028	 25P028		

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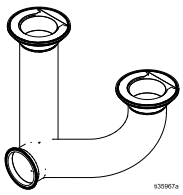
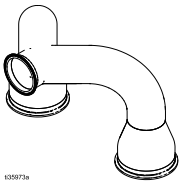
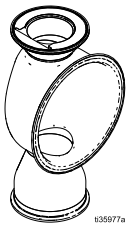
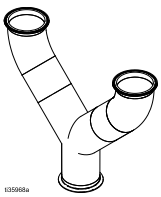
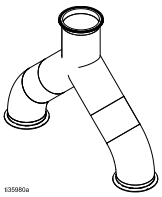
SP4F	SSA, SSB	HS	 25P024	 25P025	 25N998	 25N999
	SSE, SSF	HS WYE	 25P029	 25P029		

* Requires DIN adapter fitting, DIN adapter gasket, and clamp on each manifold for manifold type SSB, SSD, SSF.

Dual Inlet and Dual Outlet
To convert to a dual inlet or outlet, the following parts are required:

Dual Inlet:			
Ref.	**Part/Kit**	**Description**	**Qty.**
45	25P084	SEAT, flapper, SP3F	2
	25P085	SEAT, flapper, SP4F	2
47	25P065	GASKET, EPDM, SP3R	2
	25P067	GASKET, EPDM, SP4F	2
48	15D475	CLAMP, flapper, SP3F	2
	510490	CLAMP, flapper, SP4F	2
Dual Outlet:			
46	25P082	CHAMBER, flapper, SP3F	2
	25P083	CHAMBER, flapper, SP4F	2
47	25P065	GASKET, EPDM, SP3R	2
	25P067	GASKET, EPDM, SP4F	2
48	15D475	CLAMP, flapper, SP3F	2
	510490	CLAMP, flapper, SP4F	2

Diaphragms

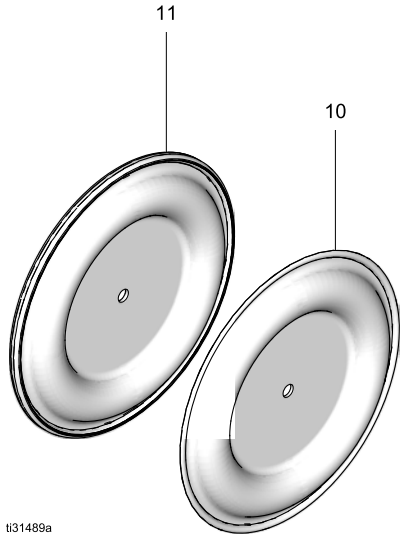
Sample Configuration Number

Pump Model	Wetted Section Material	Drive	Center Section and Air Valve Material	Manifolds	Seats	Checks	Diaphragms	Seals	Certification
2150	HS	P	SP1A	SSA	SS	PT	PS	EP	21

Bolt-Through Diaphragm Kits	
FK	25P268
PS	25P266
SP	25P265

Kits include:

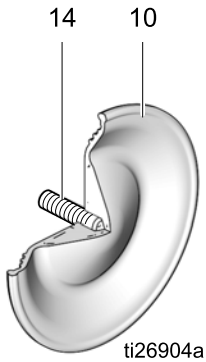
- 2 diaphragms (10)
- 2 diaphragm backers (11), if applicable
- 1 packet anaerobic adhesive



Overmolded Diaphragm Kit	
EO	25P270
PO	25P267

Kits include:

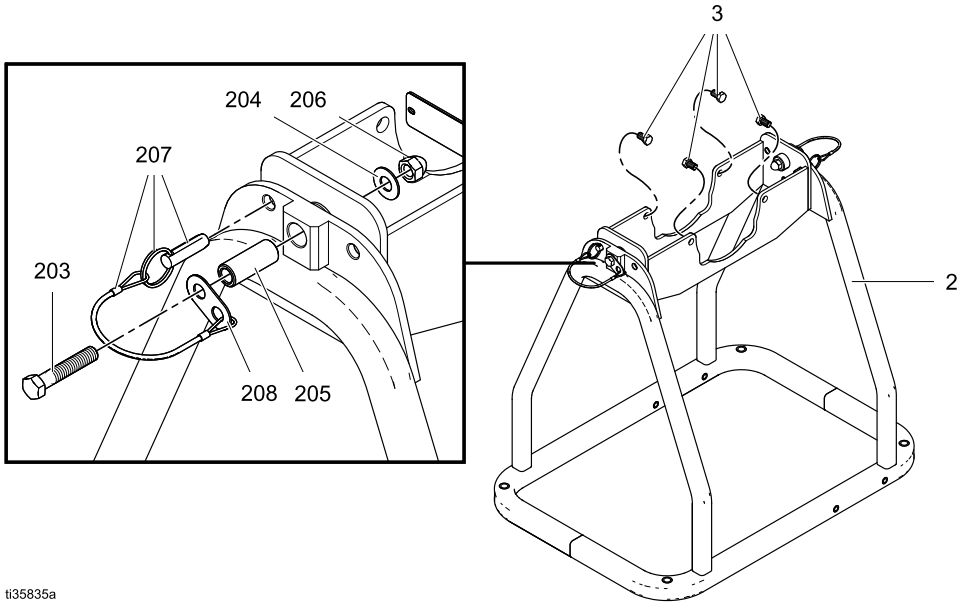
- 2 overmolded diaphragms (10)
- 2 diaphragm set screws (14)
- 1 packet anaerobic adhesive
- 1 packet sealant



Optional Sanitary Gasket Kits

Size	Part No.	Material
2150	26A892	FKM
2150	26A915	PTFE/EPDM Bonded
3150	26A893	FKM
3150	26A916	PTFE/EPDM Bonded
3150 Dual/Horizontal	26A894	FKM
3150 Dual/Horizontal	26A917	PTFE/EPDM Bonded
4150	26A895	FKM
4150	26A918	PTFE/EPDM Bonded
4150 Dual/Horizontal	26A896	FKM
4150 Dual/Horizontal	26A919	PTFE/EPDM Bonded

Frames

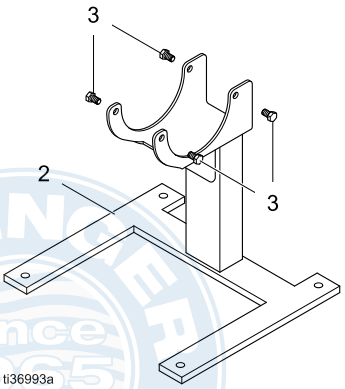


ti35835a

24L978 shown (includes items 2 and 3)

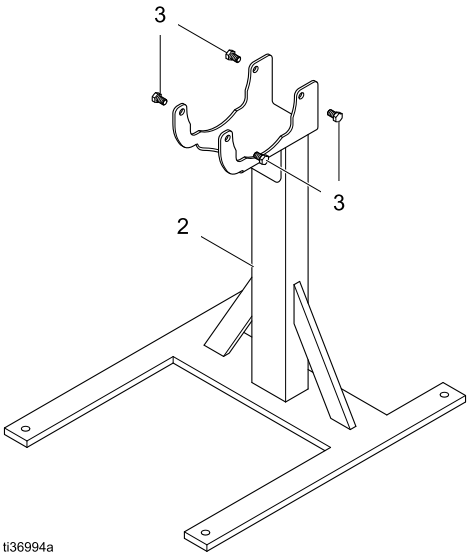
Ref.	Part/Kit	Description	Qty.
203†	— — —	SCREW, 3/8-16 UNC	2
204†	111743	WASHER, flat	2
205†	— — —	BUSHING	2
206†	— — —	NUT, acorn	2
207*	— — —	PIN, quick release	2
208*	— — —	RETAINER	2

† Included in hinge repair kit 24N798.
* Included in release pin kit 24N799.



ti36993a

25P104 shown (includes items 2 and 3)



ti36994a

25N991 shown (includes items 2 and 3)

Technical Data

SaniForce 2150, 3150, 4150 Air-Operated Double Diaphragm Pump			
		US	**Metric**
Maximum fluid working pressure		120 psi	0.8 MPa, 8 bar
Air pressure operating range		20 to 120 psi	0.14 to 0.8 MPa, 1.4 to 8 bar
Air inlet size		1/2 in. (npt(f)	
Maximum suction lift (reduced if balls don't seat well due to damaged balls or seats, lightweight balls, or extreme speed of cycling)			
	Wet:	30 ft	9.1 m
	Dry:	10 ft (2150)	3.0 m (2150)
		6 ft (3150)	1.8 m (3150)
		5 ft (4150)	1.5 m (4150)
Maximum size pumpable solids	2150 ball	1/4 in.	6.3 mm
	3150 flapper	2.46 in.	62.5 mm
	4150 flapper	3.8 in.	96.5 mm
Fluid displacement per cycle	2150 ball	1.3 gallons	4.9 liters
	3150 flapper	0.7 gallons	2.65 liters
	4150 flapper	0.4 gallons	1.5 liters
Maximum free-flow delivery	2150 ball	180 gpm	681 lpm
	3150 flapper	130 gpm	492 lpm
	4150 flapper	90 gpm	340 lpm
Maximum pump speed	2150 ball	135 cpm	
	3150 flapper	180 cpm	
	4150 flapper	225 cpm	
Weights Values are for vertical pumps, horizontal pumps slightly lower			
2150 ball 3150 flapper 4150 flapper		111 lb	50.3 kg
		118 lb	53.5 kg
		168 lb	76.2 kg
Fluid Inlet and Outlet Size , stainless steel			
2150 3150 4150		2 in sanitary flange or 50 mm DIN 11851 male thread	
		3 in sanitary flange or 80 mm DIN 11851 male thread	
		4 in sanitary flange or 100 mm DIN 11851 male thread	
Noise Data			
Sound Power (measured per ISO-9614–1)			
at 10psi fluid pressure, full flow		103 dBa	
Sound Pressure			
at 70 psi fluid pressure and 50 cpm		85 dBa	
at 100 psi fluid pressure, full flow		90 dBa	
Wetted Parts			
Wetted parts include material(s) chosen for seat, ball, and diaphragm options, stainless steel			
Non-wetted parts			
Non-wetted external parts include 300-series SST, Nickel plated aluminum, 17-4 PH SST, Santoprene, LDPE, VHB acrylic			

Fluid Temperature Range

NOTICE

Temperature limits are based on mechanical stress only. Certain chemicals will further limit the fluid temperature range. Stay within the temperature range of the most-restricted wetted component. Operating at a fluid temperature that is too high or too low for the components of your pump may cause equipment damage.

	Stainless Steel Pump Fluid Temperature Range	
Diaphragm/Ball/Seat Material	**Fahrenheit**	**Celsius**
FKM Fluoroelastomer (FK)	-40° to 275°F	-40° to 135°C
Polychloroprene check balls (CW)	0° to 180°F	-18° to 82°C
EPDM overmolded diaphragm (EO)	-40° to 275°F	-40° to 135°C
PTFE overmolded diaphragm (PO)	40° to 180°F	4° to 82°C
PTFE check balls or two-piece PTFE/Santoprene diaphragm (PS)	40° to 220°F	4° to 104°C
Santoprene (SP)	-40° to 180°F	-40° to 82°C

The maximum temperature listed is based on the ATEX standard for T4 temperature classification.

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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.

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

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

GRACO MAKES NO WARRANTY, AND DISCLAIMS ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, IN CONNECTION WITH ACCESSORIES, EQUIPMENT, MATERIALS OR COMPONENTS SOLD BUT NOT MANUFACTURED BY GRACO. These items sold, but not manufactured by Graco (such as electric motors, switches, hose, etc.), are subject to the warranty, if any, of their manufacturer. Graco will provide purchaser with reasonable assistance in making any claim for breach of these warranties.

In no event will Graco be liable for indirect, incidental, special or consequential damages resulting from Graco supplying equipment hereunder, or the furnishing, performance, or use of any products or other goods sold hereto, whether due to a breach of contract, breach of warranty, the negligence of Graco, or otherwise.

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Original Instructions. This manual contains English. MM 3A6782

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