Instructions/Parts List

Husky™ Sanitary Series Diaphragm Pump

310622F

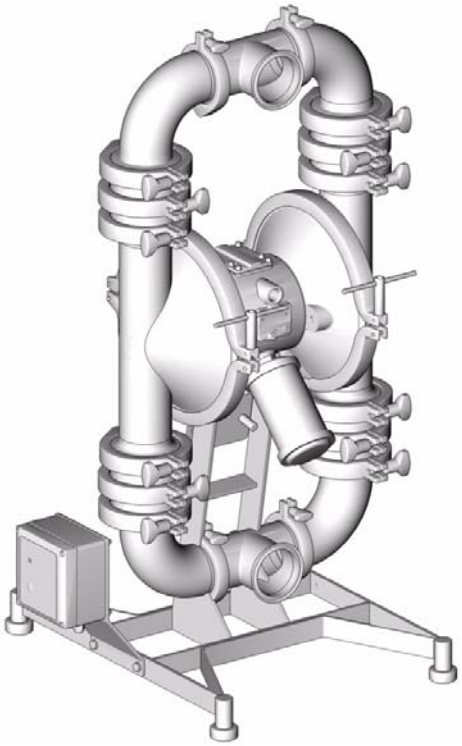
For use in sanitary applications.

Husky 3150 SA__ Sanitary Diaphragm Pump 3A 44-03

Husky 3150 SB__ Sanitary Ball Check Pump ⟨Ex⟩ II 2 G c T6

Husky 3150 SF__ Sanitary Flapper Check Pump ⟨Ex⟩ II 2 G c T6

120 psi (0.8 MPa, 8 bar) Maximum Fluid Working Pressure
120 psi (0.8 MPa, 8 bar) Maximum Air Input Pressure



Model SA3AAA Shown

TI7611A

US and Foreign Patents Pending
US Patent No. 5,368,452

Read warnings and instructions.
See page 2 for Table of Contents and List of Models.

PROVEN QUALITY. LEADING TECHNOLOGY.

Graco Inc. P.O. Box 1441 Minneapolis, MN 55440-1441

CE

Contents

Models

Refer to your Pump Matrix on page 26 to determine the model number of your pump.

Model No.	Description
SA_____	3A Sanitary Diaphragm Pump
SB_____	Sanitary Ball Check Pump
SF_____	Sanitary Flapper Check Pump

Warnings

The following general warnings are for the safe setup, use, grounding, maintenance, and repair of this equipment. The exclamation point symbols alert you to general warnings and the hazard symbols refer to procedure-specific risks. Refer back to these Warnings. Additional, product-specific warnings may be found 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. 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). • Keep work area free of debris, including solvent, rags and gasoline. • Do not plug or unplug power cords, or turn power or light switches on or off when flammable fumes are present. • Ground equipment and conductive objects in work area. See **Grounding** instructions. • Use only grounded hoses. • Hold gun firmly to side of grounded pail when triggering into pail. • If there is static sparking or you feel a shock, **stop operation immediately.** Do not use equipment until you identify and correct the problem.
	**PRESSURIZED EQUIPMENT HAZARD** Fluid from the gun/dispense valve, leaks, or ruptured components can splash in the eyes or on skin and cause serious injury. • Follow **Pressure Relief Procedure** in this manual, when you stop operating 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.
	**EQUIPMENT MISUSE HAZARD** Misuse can cause death or serious injury. • 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. • Check equipment daily. Repair or replace worn or damaged parts immediately with genuine Graco replacement parts only. • Do not alter or modify equipment. • For professional use only. • Use equipment only for its intended purpose. Call your Graco distributor for information. • Route hoses and cables away from traffic areas, sharp edges, moving parts, and hot surfaces. • Do not use hoses to pull equipment. • 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 MSDS's 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.

⚠ Warning

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. Wait until equipment/fluid has cooled completely.

PERSONAL PROTECTIVE EQUIPMENT

You must wear appropriate protective equipment when operating, servicing, or when in the operating area of the equipment to help protect you from serious injury, including eye injury, inhalation of toxic fumes, burns, and hearing loss. This equipment includes but is not limited to:

- Protective eyewear
- Clothing and respirator as recommended by the fluid and solvent manufacturer
- Gloves
- Hearing protection

Installation

General Information

- The Typical Installation shown in FIG. 3 is only a guide for selecting and installing system components. Contact your Graco distributor for assistance in planning a system to suit your needs.
- Always use Genuine Graco Parts and Accessories.
- Reference numbers and letters in parentheses refer to the callouts in the figures and the parts lists on page 28.

The pump is very heavy (see **Technical Data** on page 36 for specific weights). If the pump must be moved, follow the **Pressure Relief Procedure** on page 10 and have two people lift the pump by grasping the outlet manifold securely, or use appropriate lifting equipment. Never have one person move or lift the pump.

Leak Detection System

A leak detection system will be included with all 3A approved pumps. See manual 311200 included with leak detector for leak detector installation instructions.

Tighten Clamps Before First Use

After you unpack the pump, and before you use it for the first time, check the fluid and air connection clamps, and tighten as necessary.

Stand

- Locate the stand assembly on a level surface. The feet of the stand are adjustable for fine tuning.
- Insert the attached pins through the stand and into the underside of the pump center section to stabilize the assembly. Tighten the bolts. See FIG. 1.

Moving Parts Hazard

Keep clear of moving parts.

The pins are removable and the pump can be rotated for draining or servicing. Loosen the bolts to remove the pins and rotate the pump.

The pins must be in place during operation.

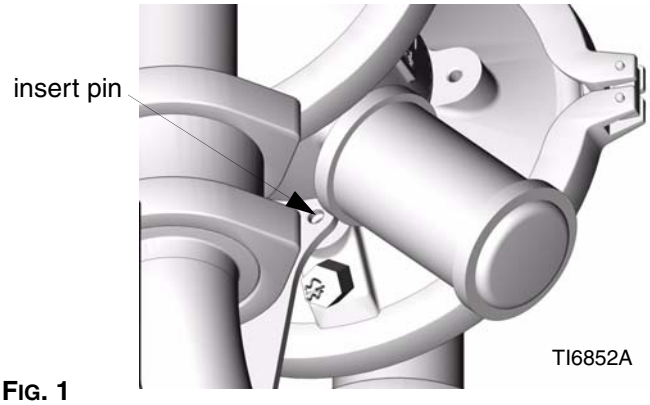
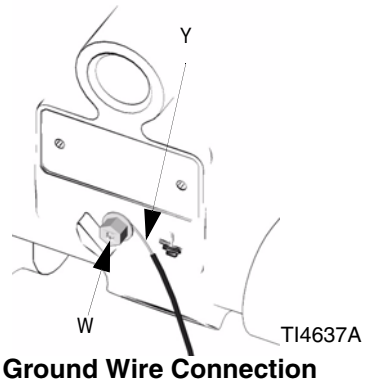


FIG. 1

Grounding

To reduce the risk of static sparking, ground the pump and all other equipment used or located in the pumping area. Check your local electrical code for detailed grounding instructions for your area and type of equipment.

- *Pump*: Connect a ground wire and clamp as shown in FIG. 2. Loosen the grounding screw (W). Insert one end of a 12 ga (1.5 mm^2) minimum ground wire (Y) behind the grounding screw and tighten the screw securely. Connect the clamp end of the ground wire to a true earth ground. To order a ground wire and clamp, order part number 222011.



Ground Wire Connection

FIG. 2

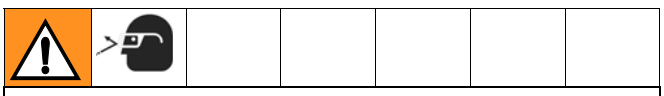
- *Air and fluid hoses*: Use only grounded hoses with a maximum of 500 ft (150 m) combined hose length to ensure grounding continuity.
- *Air compressor*: Follow the manufacturer's recommendations.
- *Fluid supply container:* Follow the local code.

Mountings

CAUTION
The pump exhaust air may contain contaminants. Ventilate to a remote area if the contaminants could affect your fluid supply. See **Air Exhaust Ventilation** on page 8.

- Be sure the mounting surface can support the weight of the pump, hoses, and accessories, as well as the stress caused during operation.
- For ease of operation and service, mount the pump so the air valve cover (2), air inlet, and fluid inlet and outlet ports are easily accessible.

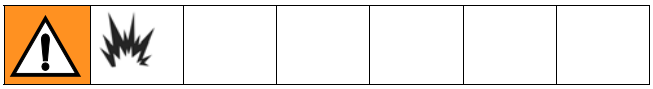
Air Line



A bleed-type master air valve (B) is required in the system to relieve air trapped between this valve and the pump. Trapped air can cause the pump to cycle unexpectedly, which could result in serious injury, including splashing in the eyes or on the skin, injury from moving parts, or contamination from hazardous fluids. See FIG. 3.

1. Install the air line accessories as shown in FIG. 3. Mount these accessories on the wall or on a bracket. Be sure the air line supplying the accessories is grounded.
   a. Install an air regulator (C) and gauge to control the fluid pressure. The fluid outlet pressure will be the same as the setting of the air regulator.
   b. Locate one bleed-type master air valve (B) close to the pump and use it to relieve trapped air. Locate the other master air valve (E) upstream from all air line accessories and use it to isolate them during cleaning and repair.
   c. The air line filter (F) removes harmful dirt and moisture from the compressed air supply.
2. Install a grounded, flexible air hose (A) between the accessories and the 1/2 npt(f) pump air inlet (M). Use a minimum 3/8" (9.5 mm) ID air hose. Screw an air line quick disconnect coupler (D) onto the end of the air hose (A), and screw the mating fitting into the pump air inlet snugly. Do not connect the coupler (D) to the fitting until you are ready to operate the pump.

Fluid Suction Line



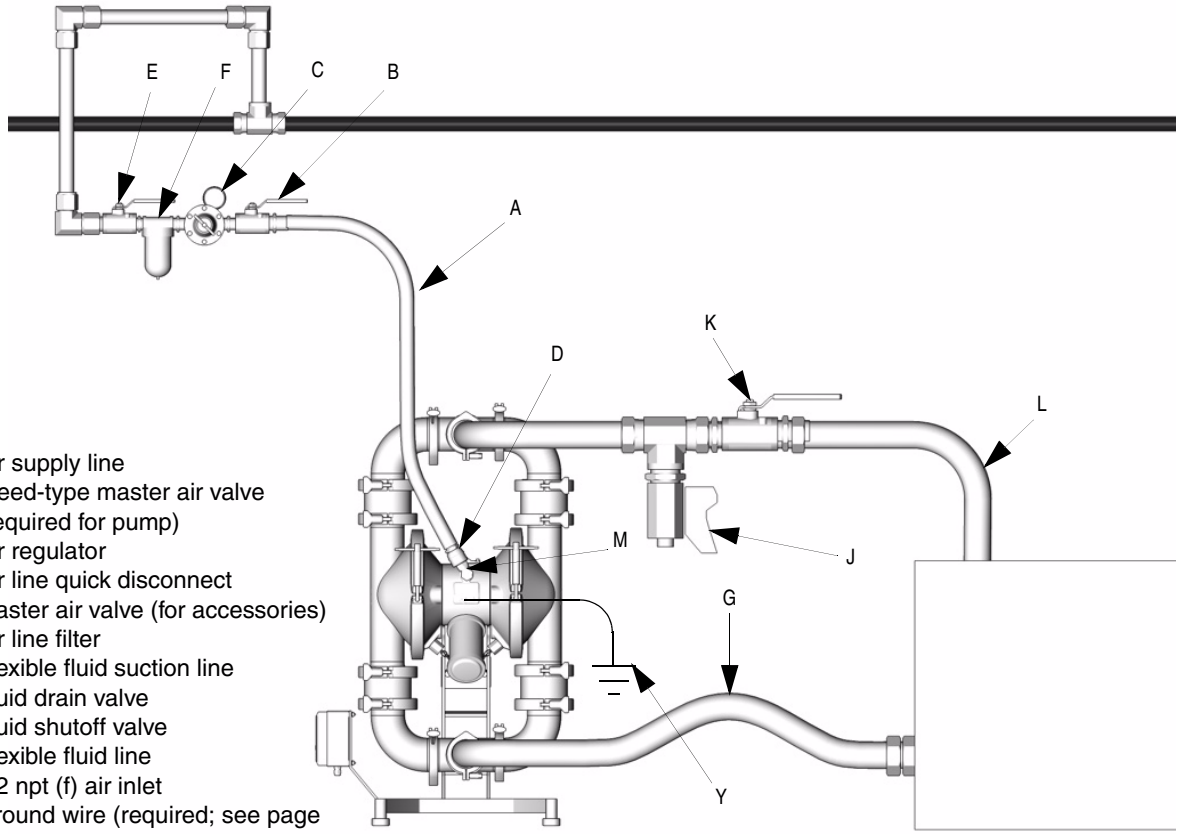
1. Use flexible, grounded fluid hoses (G) where possible.
2. For best sealing results, use a standard Tri-Clamp® style sanitary gasket of a flexible material such as Buna-N, Viton, or silicon.
3. If the fluid inlet pressure to the pump is more than 25% of the outlet working pressure, the ball check valves will not close fast enough, resulting in inefficient pump operation.
4. At inlet fluid pressures greater than 15 psi (0.1 MPa, 1 bar), diaphragm life will be shortened.
5. See the **Technical Data** on pages 36 for maximum suction lift (wet and dry).

Fluid Outlet Line

A fluid drain valve (J) is required 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. Install the valve close to the pump fluid outlet. See FIG. 3.

1. Use flexible, grounded fluid hoses (L) where possible.
2. For best sealing results, use a standard Tri-Clamp® style sanitary gasket of a flexible material such as Buna-N, Viton, or silicon
3. Install a fluid drain valve (J) near the fluid outlet. See FIG. 3.
4. Install a shutoff valve (K) in the fluid outlet line.

Typical Installation



Key:

A Air supply line
B Bleed-type master air valve (required for pump)
C Air regulator
D Air line quick disconnect
E Master air valve (for accessories)
F Air line filter
G Flexible fluid suction line
J Fluid drain valve
K Fluid shutoff valve
L Flexible fluid line
M 1/2 npt (f) air inlet
Y Ground wire (required; see page 5 for installation instructions)

TI4678B

FIG. 3 Typical Floor-Mount Installation

Changing the Orientation of the Fluid Inlet and Outlet Ports

The pump is shipped with the ports facing the same direction. To re-orientate the ports into any position:

1. Remove the clamps (130) holding the inlet and/or outlet manifold to the covers.
2. Rotate the manifold tee (339) and reattach. Install the clamps (130) and tighten handtight.

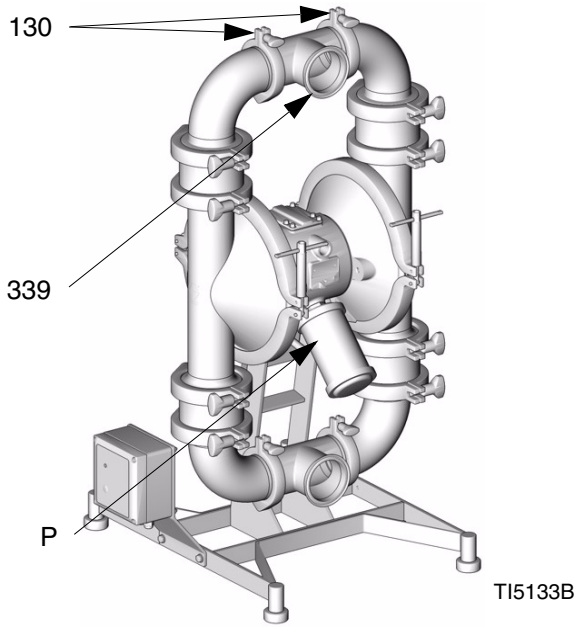
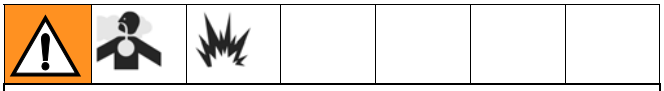


FIG. 4 Orientation of Fluid Ports

Air Exhaust Ventilation



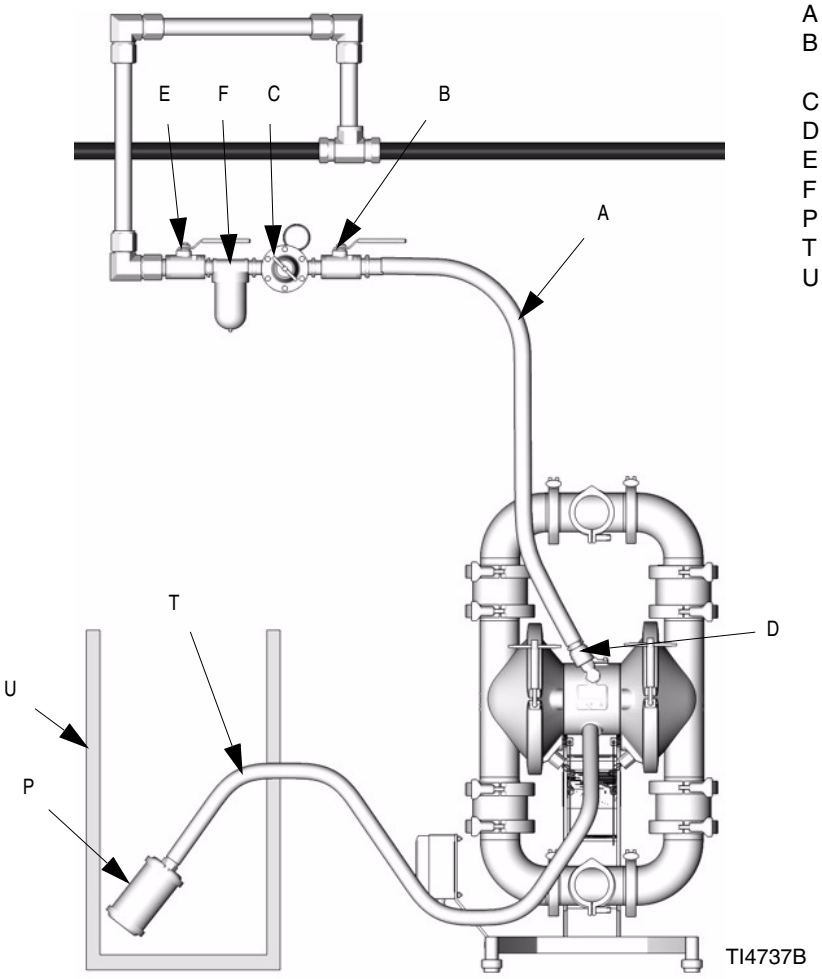
Be sure the system is properly ventilated for your type of installation. You must vent the exhaust to a safe place, away from people, animals, food handling areas, and all sources of ignition when pumping flammable or hazardous fluids.

Diaphragm failure can cause the fluid being pumped to exhaust with the air. Place an appropriate container at the end of the air exhaust line to catch the fluid. See FIG. 5.

The air exhaust port is 3/4 npt(f). Do not restrict the air exhaust port. Excessive exhaust restriction can cause erratic pump operation.

To provide a remote exhaust:

1. Remove the muffler (P) from the pump air exhaust port. See FIG. 5.
2. Install a grounded air exhaust hose (T) and connect the muffler (P) to the other end of the hose. The minimum size for the air exhaust hose is 3/4 in. (19 mm) ID. If a hose longer than 15 ft (4.57 m) is required, use a larger diameter hose. Avoid sharp bends or kinks in the hose.
3. Place a grounded container (U) at the end of the air exhaust line to catch fluid in case of a diaphragm rupture. See FIG. 5.



Key:

A Air supply line
B Bleed-type master air valve (required for pump)
C Air regulator
D Air line quick disconnect
E Master air valve (for accessories)
F Air line filter
P Muffler
T Grounded air exhaust hose
U Container for remote air exhaust

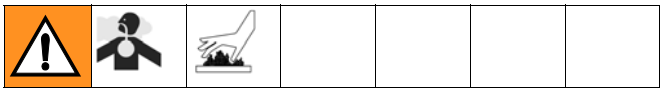
FIG. 5 Venting Exhaust Air

Operation

Pressure Relief Procedure

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.

Sanitize the Pump Before First Use



It is the user's responsibility to properly sanitize the pump before using. This may include disassembly and inspection of the wetted components. The pump was tested in an NSF registered lubricant with incidental food contact rating (H1). Remove compound by wiping or washing, leaving surfaces free of any substance that could be transferred to the product being processed. Flush the pump thoroughly with a compatible cleaning solution or disassemble and inspect. Follow the steps under **Starting and Adjusting the Pump** or the Service section**.**

Starting and Adjusting the Pump

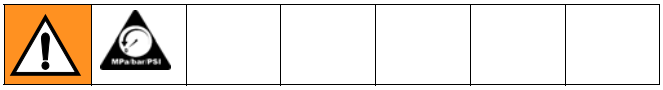
1. Be sure the pump is properly grounded. Refer to **Grounding** on page 5.
2. Check fittings to be sure they are tight. Use a compatible liquid thread sealant on male threads where applicable. Tighten fluid inlet and outlet fittings securely.
3. Place the suction tube (if used) in fluid to be pumped.

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

4. Place the end of fluid hose (L) into an appropriate container.
5. Close the fluid drain valve (J).
6. Back out the air regulator (C) knob, and open all bleed-type master air valves (B, E).
7. If the fluid hose has a dispensing device, hold it open while continuing with the following step.
8. Slowly increase air pressure with the air regulator (C) until the pump starts to cycle. Do not exceed the maximum operating air pressure as listed in the Technical Data section on page 36. Allow the pump to cycle slowly until all air is pushed out of the lines and the pump is primed.

When you are flushing, run the pump long enough to thoroughly clean the pump and hoses. Close the air regulator. Remove the suction tube from the cleaning solution, drain pump, and place it in the fluid to be pumped.

Pump Shutdown



At the end of the work shift, relieve the pressure.

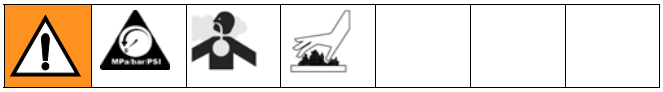
Maintenance

Lubrication

The air valve is designed to operate unlubricated, however if lubrication is desired, every 500 hours of operation (or monthly) remove the hose from the pump air inlet and add two drops of machine oil to the air inlet.

CAUTION
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



Flush the pump often enough to prevent the fluid you are pumping from drying or freezing in the pump and damaging it. Use a compatible cleaning solution. Always cycle the pump during the entire flushing process.

Always flush the pump and relieve the pressure before storing it for any length of time.

Routine Cleaning of Product Contact Section of Pump

The pump and the system should be cleaned in accordance with your state sanitary standard codes and local regulations.

1. Flush the system. See **Flushing** above.
2. Relieve pressure in the system. See **Pressure Relief Procedure** on page 10.
3. Disassemble the fluid section of the pump and accessories. See **Check Valve Repair** on page 18 and **Diaphragm Repair** on page page 21.
4. Using a brush or other C.I.P. methods, wash all product contact pump parts with an alkaline detergent at the manufacturer's recommended temperature and concentration.
5. Rinse these parts again with water and allow parts to completely dry.
6. Inspect the parts and reclean any soiled parts.
7. Immerse all product contact parts in an approved sanitizer before assembly. Leave the parts in the sanitizer, taking them out only one by one as needed for assembly. See **Check Valve Repair** on page 18 and **Diaphragm Repair** on page page 21.
8. Lubricate the clamps, clamping surfaces, and gaskets with waterproof sanitary lubricant.
9. Circulate the sanitizing solution through the pump and the system prior to use. Cycle the pump as the sanitizing solution is circulated.

Tightening Connections

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

Preventive Maintenance Schedule

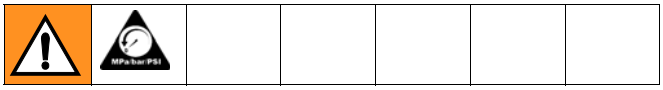
Establish a preventive maintenance schedule, based on the pump's service history. This is especially important for prevention of spills or leakage due to diaphragm failure.

The following is a list of recommended maintenance procedures and frequencies to operate your equipment safely. Maintenance must be performed by trained personnel per this schedule to assure safety and reliability of the equipment.

Operator	Maintenance Person

Task	Daily	Weekly	Monthly
Inspect system for leaks	✓		
Depressurize fluid, after operation	✓		
Remove heat from system, after operation	✓		
Inspect diaphragm for wear	✓		
Inspect check valves components for wear	✓		
Check hoses for wear		✓	
Check/tighten fluid connections		✓	
Check/tighten air connections		✓	
Lubricate air valves			✓

Troubleshooting



- Relieve the pressure before checking or servicing the equipment.
- Check all possible problems and causes before disassembling the pump.

PROBLEM	CAUSE	SOLUTION
Pump cycles at stall or fails to hold pressure at stall.	Worn check valve balls (541) or seats (233).	Replace. See page 18.
Pump will not cycle, or cycles once and stops.	Air valve is stuck or dirty.	Disassemble and clean air valve. See page 15. Use filtered air.
	Check valve ball (541) severely worn and wedged in seat (233) or manifold.	Replace ball and seat. See page 18.
	Check valve ball (541) is wedged into seat (233), due to overpressurization.	Follow **Pressure Relief Procedure**, page 10. Disassemble ball check assembly and inspect for damage, see page 18.
	Dispensing valve clogged.	Relieve pressure and 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 balls (541).	Clean or replace. See page 18.
	Diaphragm ruptured.	Replace. See page 21.
	Restricted exhaust.	Remove restriction.
Air bubbles in fluid.	Suction line is loose.	Tighten.
	Diaphragm ruptured.	Replace. See pages 21.
	Loose inlet manifold, damaged seal between manifold and seat, damaged gaskets.	Tighten manifold clamps or replace seats or gaskets. See page 18.

PROBLEM	CAUSE	SOLUTION
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.
	Gasket does not seal.	Use a standard sanitary gasket of flexible material such as Buna-N, Viton, or silicon.
Fluid in exhaust air.	Diaphragm ruptured.	Replace. See page 21.
	Loose diaphragm plate.	Tighten or replace. See page 21.
Pump exhausts excessive air at stall.	Worn air valve block, plate, pilot block, u-cups, or pilot pin o-rings.	Repair or replace. See page 15.
	Worn shaft seals.	Replace. See page 21.
Pump leaks air externally.	Air valve cover is loose.	Tighten screws. See page 15.
	Air valve gasket or air cover gasket is damaged.	Inspect; replace. See page 15.
	Air cover clamps are loose	Tighten clamps.
Pump leaks fluid externally from ball check valves.	Loose manifolds, damaged seal between manifold and seat, damaged gaskets.	Tighten manifold clamps or replace seats or clamps (32). See page 18.

Service

Repairing the Air Valve

Tool 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 248916 is available. Refer to **Parts** page 33. Parts included in the kit are marked with ◆ symbol. Use all the parts in the kit for the best results.

Disassembly

1. Relieve the pressure.
2. With a Torx (T20) screwdriver or 7 mm (9/32 in.) socket wrench, remove the six screws (103), air valve cover (102), and gasket (104). See FIG. 6.

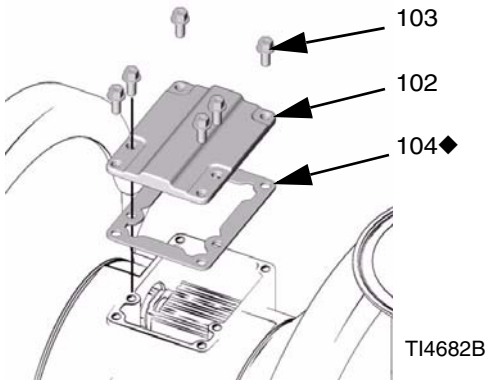


FIG. 6

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. See FIG. 7.

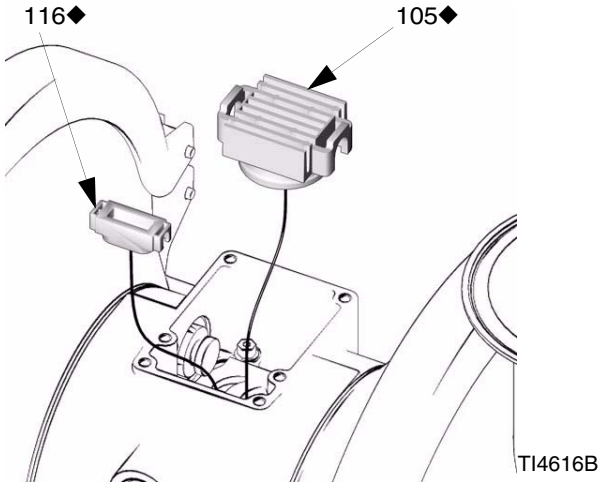


FIG. 7

4. Pull the two actuator pistons (111). Remove the u-cups (110) from the pistons. Pull the pilot pins (114). Remove the o-rings (115) from the pilot pins. See FIG. 8.

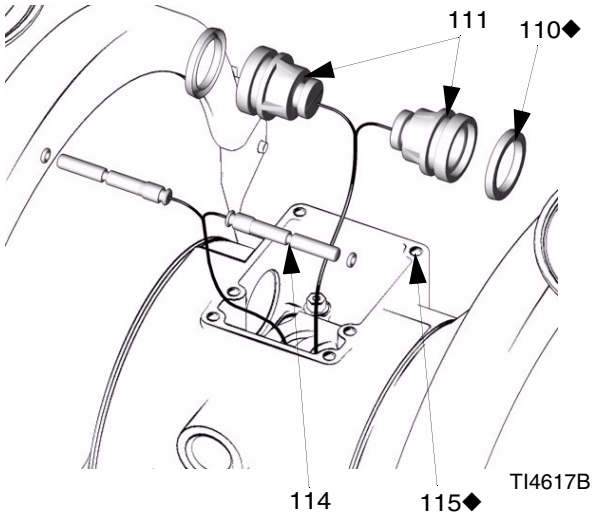


FIG. 8

5. Inspect the valve plate (108) in place. If damaged, use a Torx (T20) screwdriver or 7 mm (9/32”) socket wrench to remove the three screws (103). Remove the valve plate (108) and seal (109). See FIG. 9.

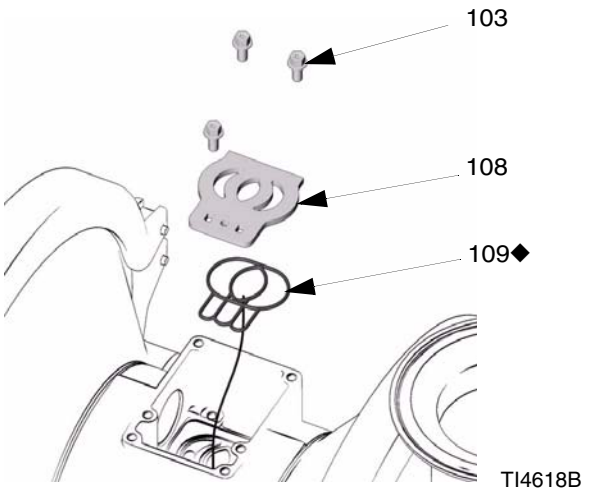


FIG. 9

6. Inspect the bearings (112, 117) in place. See **Parts** page 33. The bearings are tapered and, if damaged, must be removed from the outside. This requires disassembly of the fluid section. See page 24.

7. Clean all parts and inspect for wear or damage. Replace as needed. Reassemble, page 16.

Reassembly

1. *If you replaced the bearings (*112, 117*),* reinstall as explained on page 25. Reassemble the fluid section.

2. Install the valve plate seal (109) into the groove at the bottom of the valve cavity. The rounded side of the seal ***must face down*** into the groove. See FIG. 9.

3. Install the valve plate (108) in the cavity. The plate is reversible, so either side can face up. Install the three screws (103), using a Torx (T20) screwdriver or 7 mm (9/32 in.) socket wrench. Tighten until the screws bottom out on the housing. See FIG. 9.

4. Install an o-ring (115) on each pilot pin (114). Grease the pins and o-rings. Insert the pins into the bearings, ***narrow*** end first. See FIG. 10.

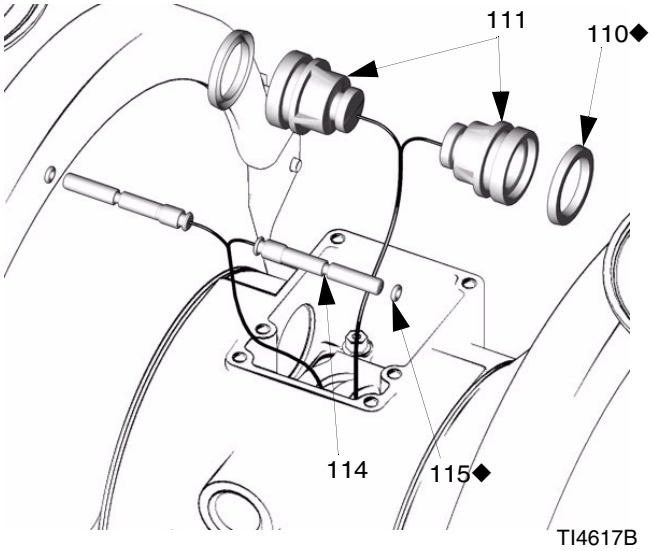


FIG. 10

5. Install u-cups (110) on each actuator piston (111), so the lips of the packings face the ***narrow*** end of the pistons. See FIG. 10.

6. Lubricate the u-cups (110) and actuator pistons (111). Insert the actuator pistons in the bearings, ***wide*** end first. Leave the narrow end of the pistons exposed. See FIG. 10.

7. 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 (114). See FIG. 11.

8. Grease the lower face of the valve carriage (105). See FIG. 11.

9. Install the valve carriage (105) so its tabs slip into the grooves on the narrow end of the actuator pistons (111). See FIG. 11.

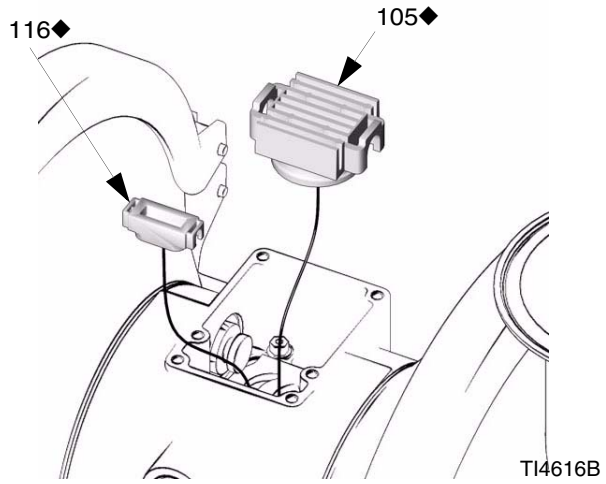


FIG. 11

10. Align the valve gasket (104) and cover (102) with the six holes in the center housing (101). Secure with six screws (103), 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). See FIG. 12.

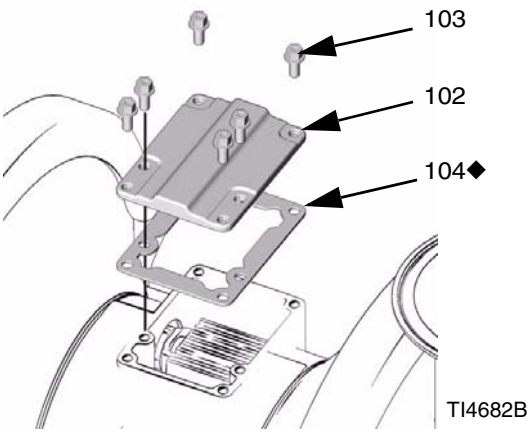


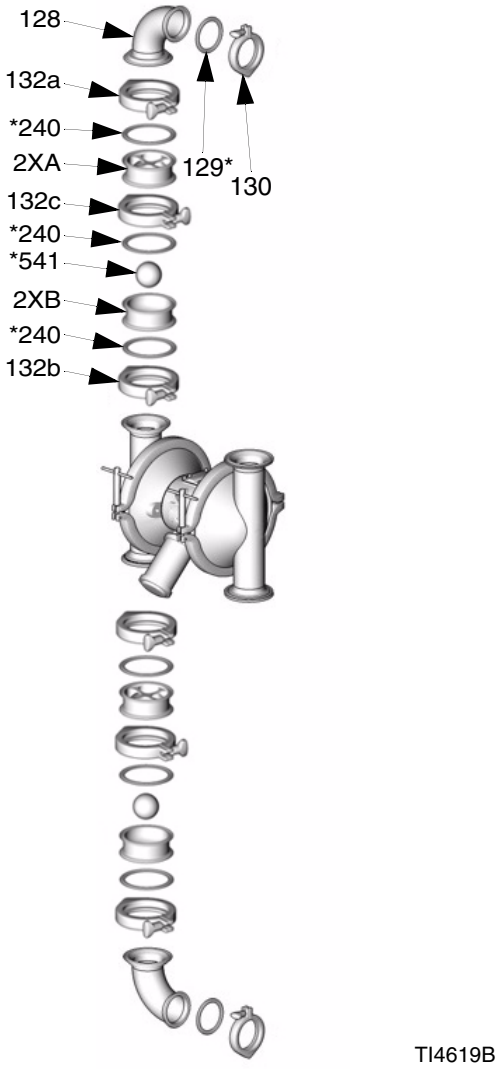
FIG. 12

Check Valve Repair

Disassembly

Reference numbers with an asterisk (*) are replacement parts. For a complete list of replacement parts see **Parts**, page 28.

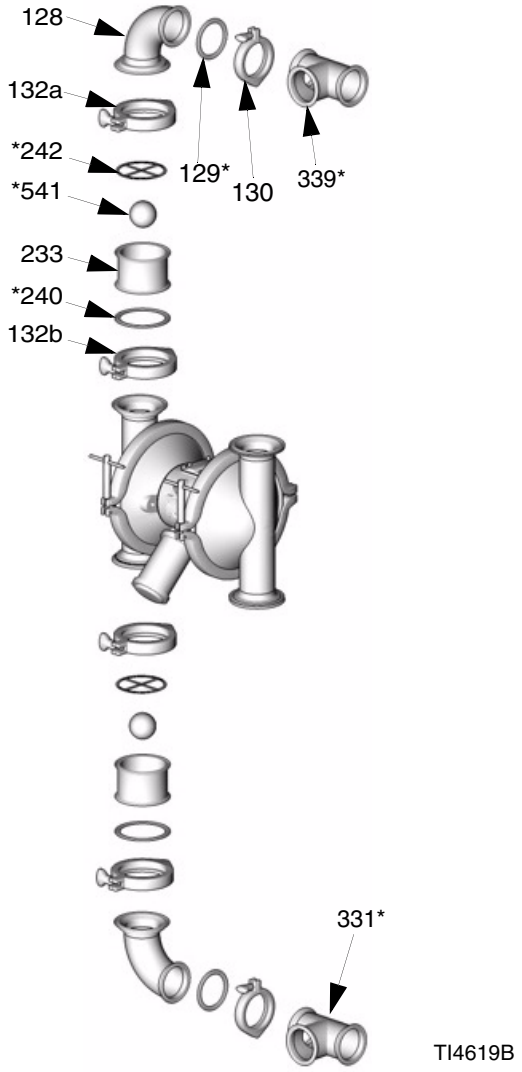
1. Relieve the pressure. Disconnect all hoses.
2. Remove the pump from its mounting. Drain.
3. From the outlet manifold, remove both upper clamps (132a).
4. Remove outlet manifold leaving elbows (128), gaskets (129), clamps (130), and tee (339) assembled.
5. *For 3A Ball Check pumps:* remove ball gasket (240). Remove middle clamp (132c) and ball stop housing (2XA). Remove middle gasket (240) and ball (541). Remove lower clamp (132b), seat (2XB), and gasket (240). Clean all parts and inspect for wear or damage. Replace parts as needed.



3A Ball Check Assembly

FIG. 13

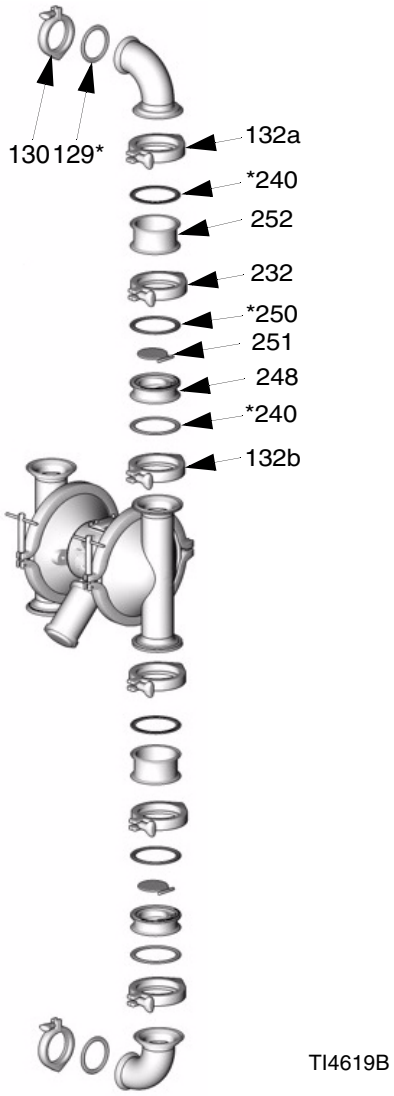
For Sanitary Ball Check pumps: remove ball gasket (242) and ball (541). Remove lower clamp (132b), seat (233), and gasket (240). Clean all parts and inspect for wear or damage. Replace parts as needed.



Sanitary Ball Check Assembly

FIG. 14

For Flapper Check pumps: remove gasket (240). Remove middle clamp (232), housing (252). Remove flapper retainer (250), and flapper check (251). Remove lower clamp (132b), flapper housing (248), and gasket (240). Clean all parts and inspect for wear or damage. Replace parts as needed.



Flapper Check Assembly

FIG. 15

6. Disassemble the outlet manifold. Remove clamps (130), tee (339), gasket (129), and elbow (128). Clean all parts and inspect for wear or damage. Replace parts as needed.

7. Repeat for inlet manifold.

Reassembly

Lubricate clamps, clamping surfaces, and gaskets with waterproof, sanitary lubricant.

1. Reassemble inlet and outlet fluid manifolds in reverse order. See step 6. Tighten clamps handtight.
2. Reassemble ball or flapper check assembly in reverse order. See step 5. Tighten clamps handtight.

For flapper check, make sure flapper check (251) is placed properly in housing (248) groove and flapper retainer (250) is aligned with housing groove. Ensure that the flapper check moves freely.

Diaphragm Repair

Tools Required

- Torque wrench
- 5/8 in. wrench
- 19 mm open end wrench
- O-ring pick
- Lithium-base grease
- Spanner wrench

Disassembly

1. Relieve the pressure.
2. Remove the manifolds and disassemble the ball check valves as explained on page 18.
3. Remove the clamps (135). Pull the fluid covers (234) off the pump.

Hold fluid covers in place until clamp is removed.

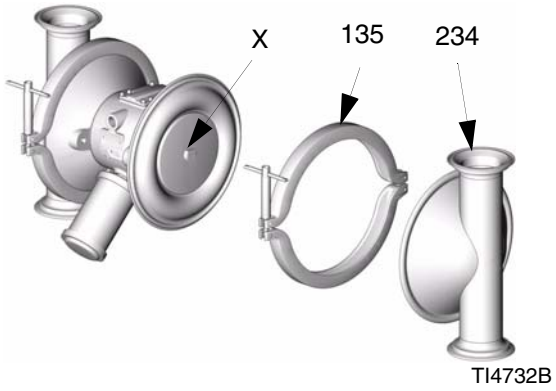


FIG. 16

4. With both fluid covers removed, using two 5/8 in. wrenches hold the wrench flats (X) on the plates of each diaphragm assembly and loosen. One diaphragm assembly will come free and the other will remain attached to the shaft.
   3A approved diaphragms: Diaphragms are assembled handtight. To loosen, grip both diaphragms securely around the outer edge and rotate counter clockwise. One diaphragm assembly will come free and the other will remain attached to the shaft. Continue to step 6.
5. Disassemble the free diaphragm assembly.
6. Remove plate (444) with bolt (143) installed, diaphragm (446), and plate (445).

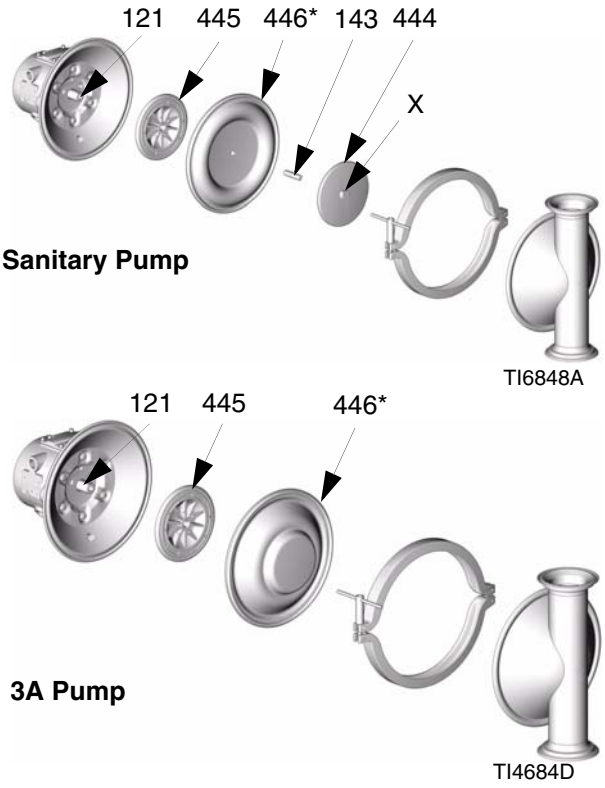


FIG. 17

7. Pull the other diaphragm assembly and the diaphragm shaft (121) 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.

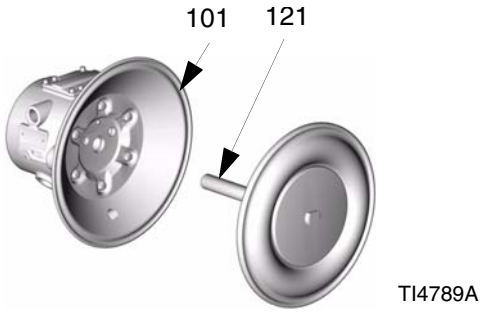


FIG. 18

8. Inspect the diaphragm shaft (121) for wear or scratches. If it is damaged, inspect the bearings (117) in place. If the bearings are damaged, refer to page 24.

9. 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 (117) in place. See FIG. 22.

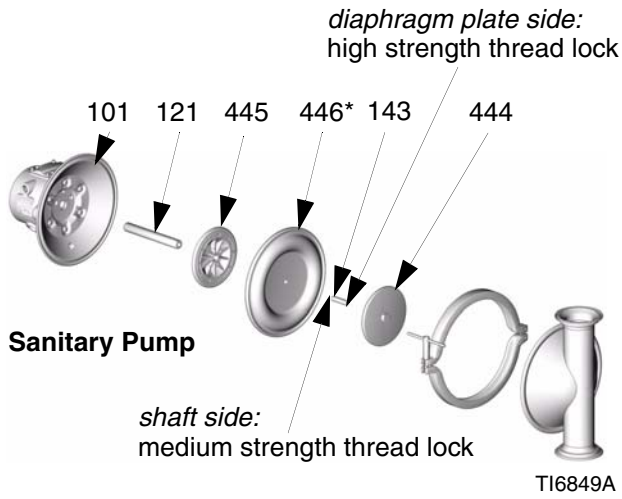
10. Clean all parts and inspect for wear or damage. Replace parts as needed.

Reassembly

1. Install the shaft u-cups (110) so the lips face ***out*** of the housing (101). Lubricate the u-cups. See reassembly of bearing and air gasket removal, page 25.

2. Assemble diaphragm (446) and plate (445) onto plate (444) with screw (143). Rounded side of plate (445) should face diaphragm. Make sure the side marked AIR SIDE faces the center housing.
3A approved diaphragms: Assembly plate (445) onto diaphragm assembly (446). Round side of plate should face diaphragm. Be sure that the side marked air side faces the center housing.

Thread locker must be applied to screw (143) as shown in FIG. 19 for all diaphragm assemblies.



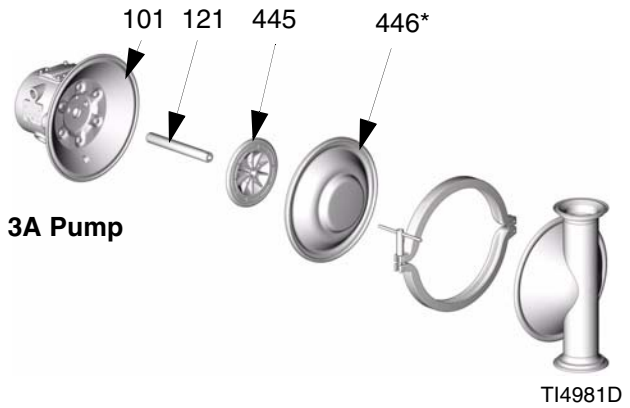


FIG. 19

3. Screw assembled diaphragm assembly into shaft (121) and hand tighten.

4. Grease the length of the diaphragm shaft (121), 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 20-25 ft-lb (27-34 N•m).
3A approved diaphragms: Grip both diaphragms securely around the outer edge and handtighten.

7. Align the fluid covers (234) and the center housing. Secure the covers with the clamps (135) and hand tighten.

Waterproof, sanitary lubricant may be applied to the clamp (135) and clamping surface of the cover (234) to ease assembly.

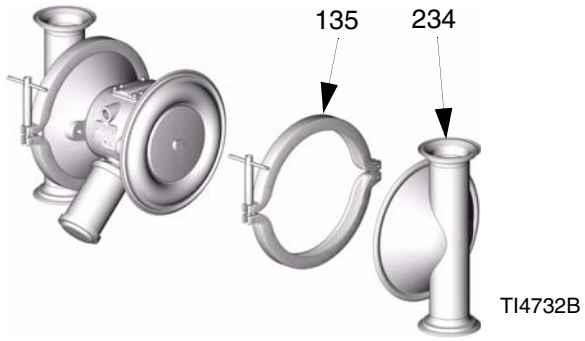


FIG. 20

8. Reassemble the ball check valves and manifolds as explained on page 18.

Bearing and Air Gasket Removal

Tools Required
3A Pump Shown

- Torque wrench
- 10 mm socket wrench
- Bearing puller
- O-ring pick
- Press, or block and mallet

Disassembly

Do not remove undamaged bearings.

1. Relieve the pressure.
2. Remove the manifolds and disassemble the ball check valves as explained on page 18.
3. Remove the fluid covers and diaphragm assemblies as explained on page 21.

If you are removing only the diaphragm shaft bearing (117), skip step 4.

4. Disassemble the air valve as explained on page 15.
5. Using a 10 mm socket wrench, remove the screws (122) holding the air covers (120) to the center housing (101).

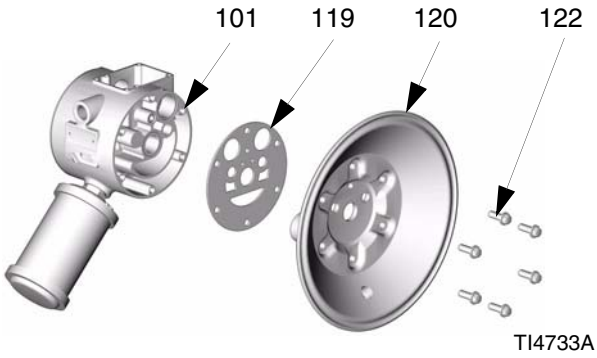


FIG. 21

6. Remove the air cover gaskets (119). Always replace the gaskets with new ones.
7. Use a bearing puller to remove the diaphragm shaft bearings (117), air valve bearings (112) or pilot pin bearings (113). Do not remove undamaged bearings.

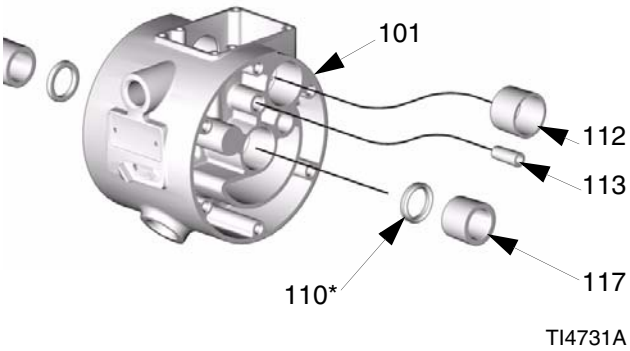


FIG. 22

8. If you removed the diaphragm shaft bearings (117) reach into the center housing (101) with an o-ring pick and hook the u-cups (110), then pull them out of the housing. Inspect the u-cups. See FIG. 22. Replace parts as needed.

Reassembly

1. Install the shaft u-cups (110) so the lips face ***out*** of the housing.

2. Insert new bearings (112, 113, and 117) 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.

Adhesive must be applied to the outside surface of the bearing (112) and the inside surface of bore (X) prior to assembly.

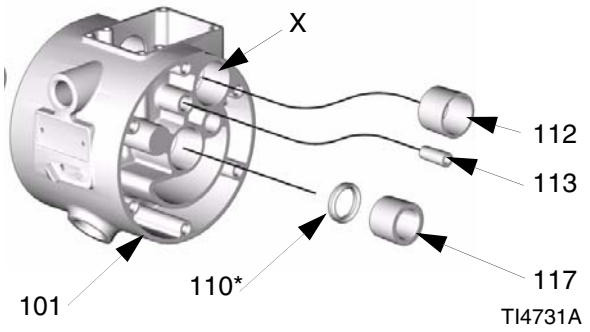


FIG. 23

3. Reassemble the air valve as explained on page 15.

4. Align the new air cover gasket (119) so the pilot pin (114) protruding from the center housing (101) fits through the proper hole in the gasket.

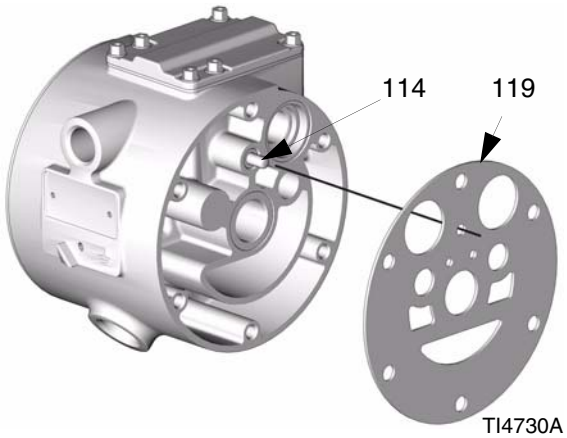


FIG. 24

5. Align the air cover (120) so the pilot pin (114) fits in the middle hole (M) of the three small holes near the center of the cover.

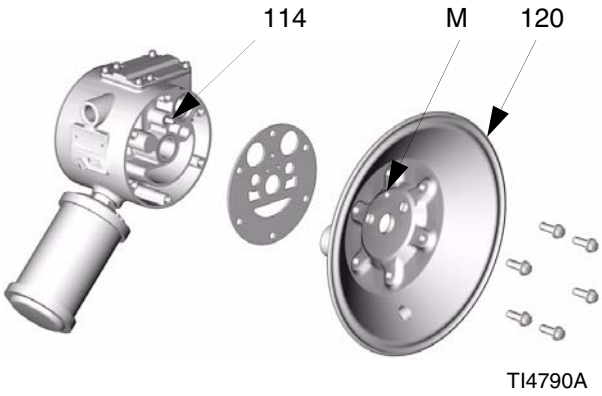


FIG. 25

6. Apply medium-strength (blue) Loctite® or equivalent to the threads of the screws (122). Install the screws (122), handtight. 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 on page 21.

FIG. 26

7. Reassemble the ball check valves and manifolds as explained on page 18.

Pump Matrix

3A Pump Shown

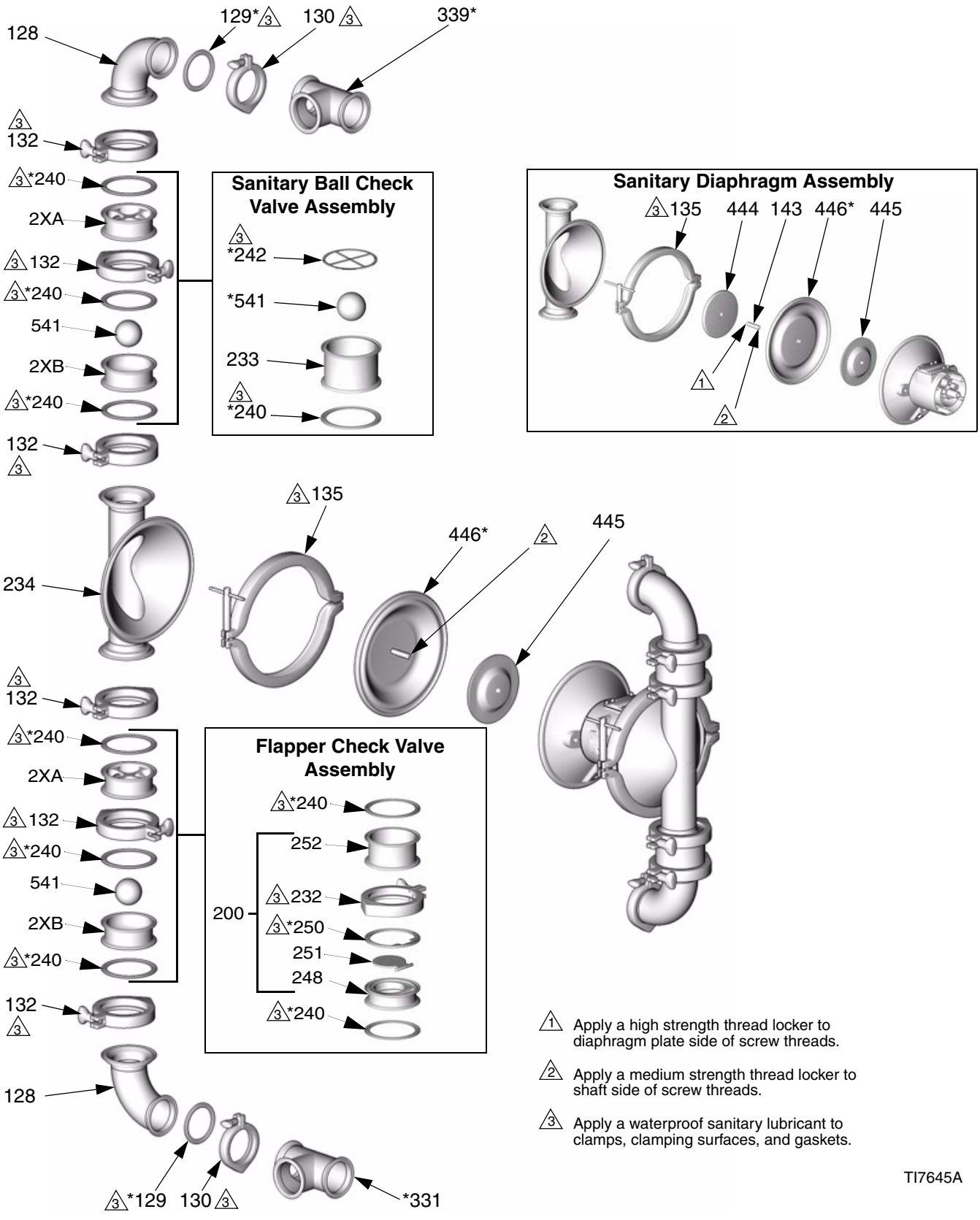
Husky 3150 Stainless Steel Sanitary Pumps

Your Model No. is marked on the pump's serial plate. To determine the Model No. of your pump from the following matrix, select the six digits which describe your pump, working from left to right. The first digit is always **S**, designating Husky Sanitary diaphragm pumps. The remaining five digits define the pump configuration, size, and materials of construction. For example, a sanitary ball check pump with a 3 in. inlet and outlet, Santoprene balls and diaphragms, a pump stand, and no leak detector is model **SB3661.** To order replacement parts, refer to the part lists on page 28. *The digits in the matrix **do not** correspond to the reference numbers in the parts drawing and lists.*

Sanitary Pump	Pump Configuration	Inlet and Outlet	-	Diaphragm	Check Valve Material	Leak Detector, Pump Stand
S - (for all pumps)	A 3A Approved	1 1 1/2 x 1 1/2 in.	-	A 3A Approved (EPDM)	A 3A Approved (PTFE)	A Leak Detector and Pump Stand
	B Ball Check	2 2 x 2 in.	-	6 Santoprene®	6 Santoprene®	1 Pump Stand
	F Flapper Check	3 3 x 3 in.	-	7 Buna-N	7 Buna-N	3 None
		4 4 x 4 in.	-	8 Viton®	8 Viton®	
		5 3 x 2 in.	-		F Flapper	

Parts

3A Pump Shown



1 Apply a high strength thread locker to diaphragm plate side of screw threads.

2 Apply a medium strength thread locker to shaft side of screw threads.

3 Apply a waterproof sanitary lubricant to clamps, clamping surfaces, and gaskets.

TI7645A

Pump Configuration Parts List (Matrix Column 2)

Digit	Ref. No.	Part No.	Description	Qty
A			3A Approved Ball Check	
	132	510490	CLAMP, 4 in.	4
	2XB	15H406	SEAT	4
	234	249533	COVER, fluid	2
	240*	15H460	GASKET, 4 in., EPDM	12
	2XA†	15H407	STOP, ball	4
B			Ball Check	
	233	15D026	SEAT	4
	234	234530	COVER, fluid	2
	240*	15H460	GASKET, 4 in., EPDM	4
	242*†	15D346	GASKET, ball	4
F			Flapper Check	
	234	234530	COVER, fluid	2
	240*	15H460	GASKET, 4 in., EPDM	8
	200	249535	MODULE, flapper; includes items 232, 248, 250, 251, 252	4
	232	510490	CLAMP, 4 in.	4
	248		HOUSING, lower flapper	4
	250*	15D367	GASKET, flapper	4
	251	15D091	WELDMENT, flapper	4
	252		HOUSING, upper flapper	4

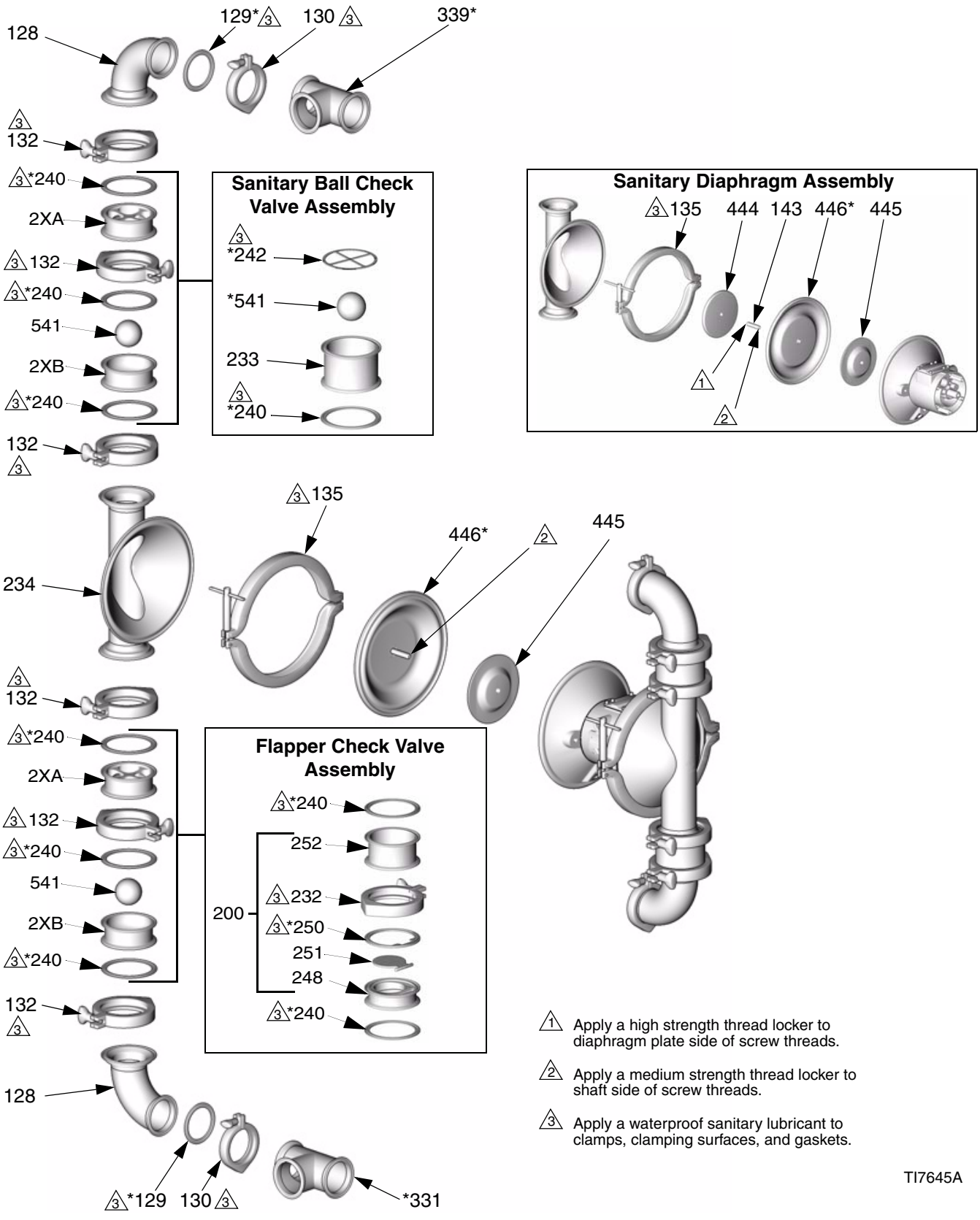
* Indicates replacement parts.
† Indicates a recommended spare part.

Inlet and Outlet Sizes (Matrix Column 3)

Digit	Ref. No.	Part No.	Description	Qty
1			1 1/2 x 1 1/2 in. tee	
	331*	234536	TEE, inlet	1
	339*	234536	TEE, outlet	1
2			2 x 2 in. tee	
	331*	234534	TEE, inlet	1
	339*	234534	TEE, outlet	1
3			3 x 3 in. tee	
	331*	234532	TEE, inlet	1
	339*	234532	TEE, outlet	1
4			4 x 4 in. tee	
	331*	234535	TEE , inlet	1
	339*	234535	TEE, outlet	1
5			3 x 2 in. tee	
	331*	234532	TEE , inlet	1
	339*	234534	TEE, outlet	1

Parts

3A Pump Shown



1 Apply a high strength thread locker to diaphragm plate side of screw threads.

2 Apply a medium strength thread locker to shaft side of screw threads.

3 Apply a waterproof sanitary lubricant to clamps, clamping surfaces, and gaskets.

TI7645A

Diaphragm Material (Matrix Column 4)

Digit	Ref. No.	Part No.	Description	Qty
A	253224 3A Approved, EPDM, Overmolded; includes 110 and 446			
	110	112181	U-CUP	2
	446*†		DIAPHRAGM ASSY	2
	445	189298	PLATE, diaphragm (air side)	2
6	253225 Santoprene; includes 110, 446			
	110	112181	U-CUP	2
	143	15D021	BOLT	2
	446*†		DIAPHRAGM	2
	444	15D018	PLATE, diaphragm	2
	445	189298	PLATE, diaphragm	2
7	253223 Buna-N; includes 110, 446			
	110	112181	U-CUP	2
	143	15D021	BOLT	2
	446*†		DIAPHRAGM	2
	444	15D018	PLATE, diaphragm	2
	445	189298	PLATE, diaphragm	2
8	253222 Viton; includes 110, 446			
	110	112181	U-CUP	2
	143	15D021	BOLT	2
	446*†		DIAPHRAGM	2
	444	15D018	PLATE, diaphragm	2
	445	189298	PLATE, diaphragm	2

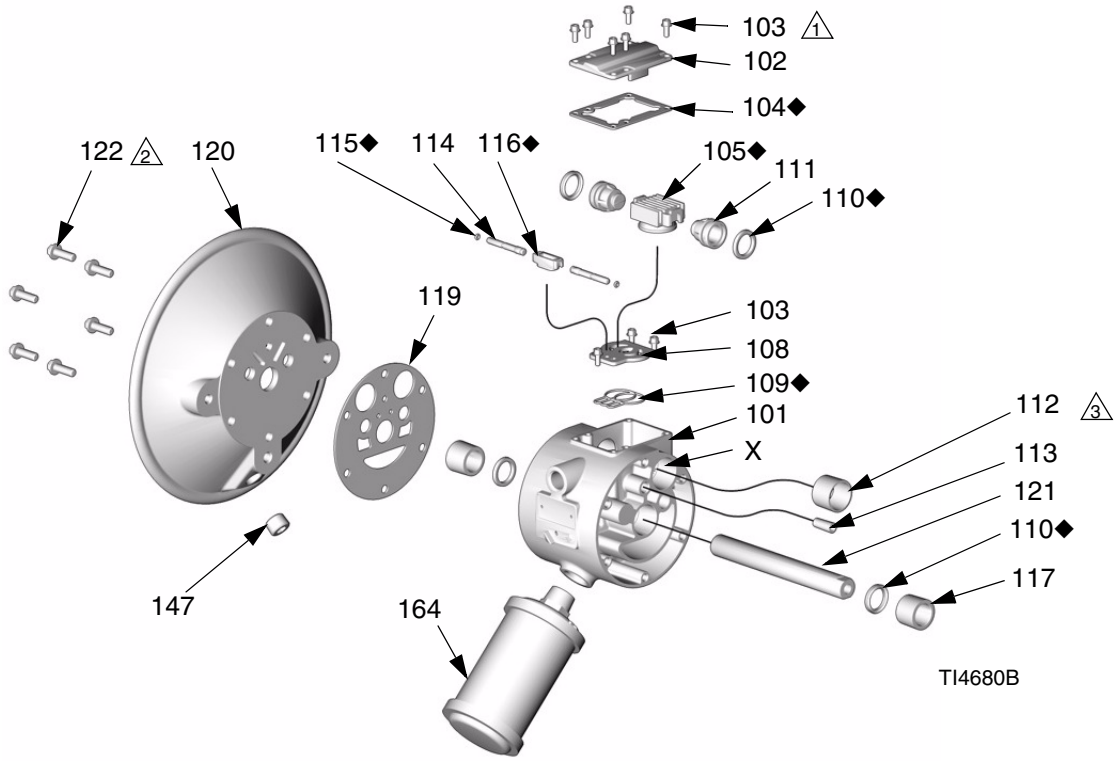
All diaphragm modules above include 2 u-cups (110) to replace seals around shaft. See page 32.

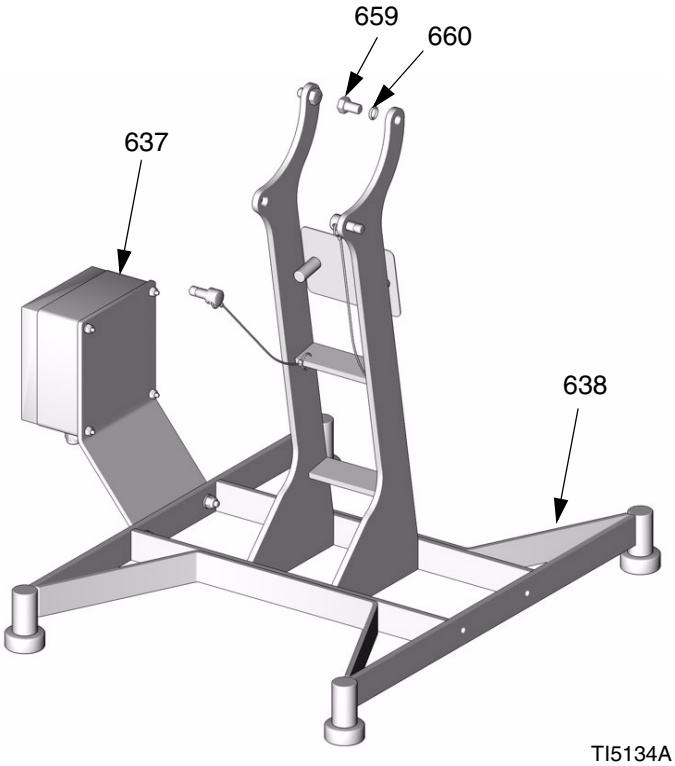
Ball Material (Matrix Column 5)

Digit	Ref. No.	Part No.	Description	Qty
A	3A Approved, PTFE			
	541*†	112359	BALL	4
F	Flapper check			
		NONE		
6	Santoprene			
	541*†	112361	BALL	4
7	BUNA-N			
	541*†	15B492	BALL	4
8	VITON			
	541*†	15B491	BALL	4

* Indicates replacement parts.
† Indicates a recommended spare part.

Parts





⚠1 Apply a medium strength thread locker to diaphragm plate side of screw threads.

⚠2 Apply a high strength thread locker to shaft side of screw threads.

⚠3 Torque to 50-60 in-lb (5.7-6.8 N•m).

Shared Parts List

Air Section Parts

Ref. No	Part No.	Description	Qty.
101	15G304	HOUSING, center	1
102	15G305	HOUSING, cover	1
103	116344	SCREW, mach, torx	10
104◆	188618	GASKET, cover	1
105◆	248904	CARRIAGE, manifold assy	1
108	188615	VALVE, plate	1
109◆	188617	GASKET	1
110◆	112181	U-CUP, packing	4
111	188612	PISTON, actuator	2
112	188613	BEARING, piston	2
113	188611	BEARING, pin	2
114	188610	PIN, push	2
115◆	157628	O-RING	2
116◆	188614	BLOCK, pilot	1
117	188609	BEARING, shaft	2
119	188603	GASKET air cover	2
120	15D016	COVER, machined air	2
121	189304	SHAFT	1
122	115643	SCREW	12
147	103778	PLUG	2
162▲	188621	TAG, warning	1
164	15G332	MUFFLER	1

◆ Parts included in Air Valve Repair Kit 248916 (purchase separately).

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

Fluid Section Parts

Ref. No	Part No.	Description	Qty.
128	234531	ELBOW	4
129	15H459	GASKET, sanitary, EPDM	4
130	15D475	CLAMP, sanitary	4
132	510490	CLAMP	8
135	15G323	CLAMP, sanitary	2

Pump Stand (Matrix Column 6)

Digit	Ref. No.	Part No.	Description	Qty
A	3A Approved, Leak Detector and Pump Stand			
	637	15D990	LEAK DETECTOR	1
	638	15D001	FRAME; includes 659 and 660	1
	659	15D008	BOLT, sst	2
	660	118515	WASHER, acetal	2
1	Pump Stand Only			
	638	15D001	FRAME includes 659 and 660	1
	659	15D008	BOLT, sst	2
	660	118515	WASHER, acetal	2
3	Bare Pump			
			none	

* Indicates replacement parts.
† Indicates a recommended spare part.

Accessories

15D990 Leak Detector

Sensor and control package that monitors the diaphragm condition. In case of diaphragm failure, the control will provide an audible alarm and relay contacts for remote alarms or solenoids. See Leak Detector manual 311200.

To be  approved, a leak detection system must be used on the pump. Any pump with a leak detector installed is NOT Atex approved.

15H461 3A Approved Ball Check Conversion Kit

Converts flapper check valve to 3A ball check valve. Includes four seats and four ball stops. Balls need to be ordered separately.

Part No.	Description	Qty.
15B406	SEAT, ball	4
15H460	GASKET, 4 in.	12
510490	CLAMP, 4 in.	4
15H407	STOP, ball	4

15D989 Flapper Valve Conversion Kit

Converts ball check valve to flapper check valve. Includes four flapper assemblies. See **Flapper Valve Assembly**, page 28.

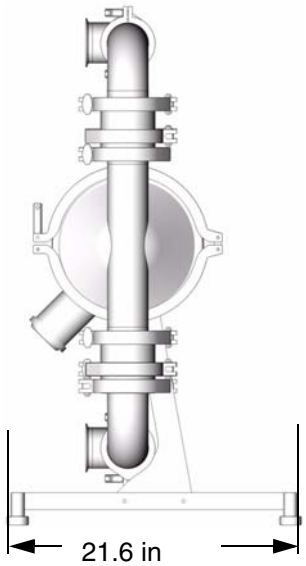
Part No.	Description	Qty.
513548	GASKET, 4 in.	8
249535	MODULE, flapper	4

15E285 Sanitary Ball Check Conversion Kit

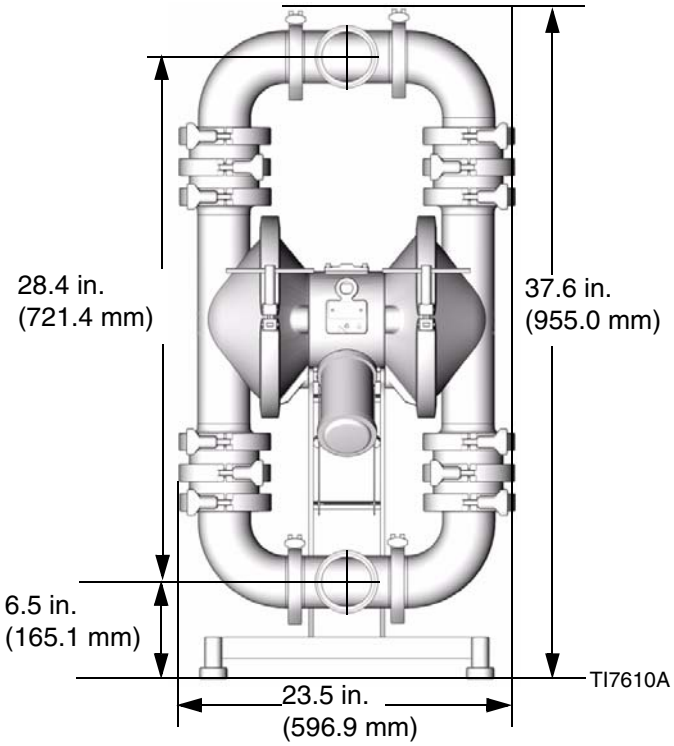
Converts flapper check valve to sanitary ball check valve. Includes four seats and four ball stops. Balls need to be ordered separately.

Part No.	Description	Qty.
15D026	SEAT, ball	4
15D346	GASKET, ball stop	4

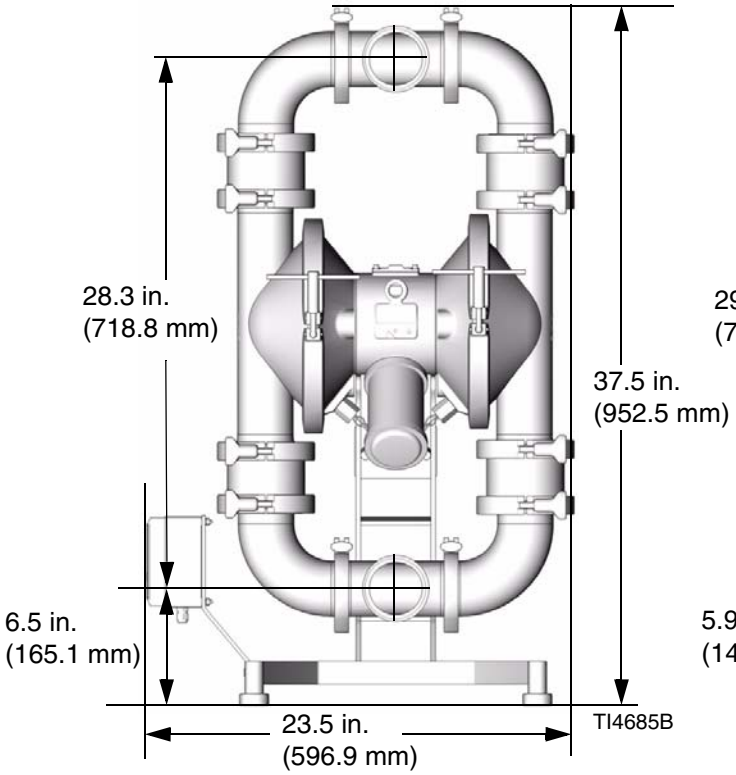
Dimensional Drawing



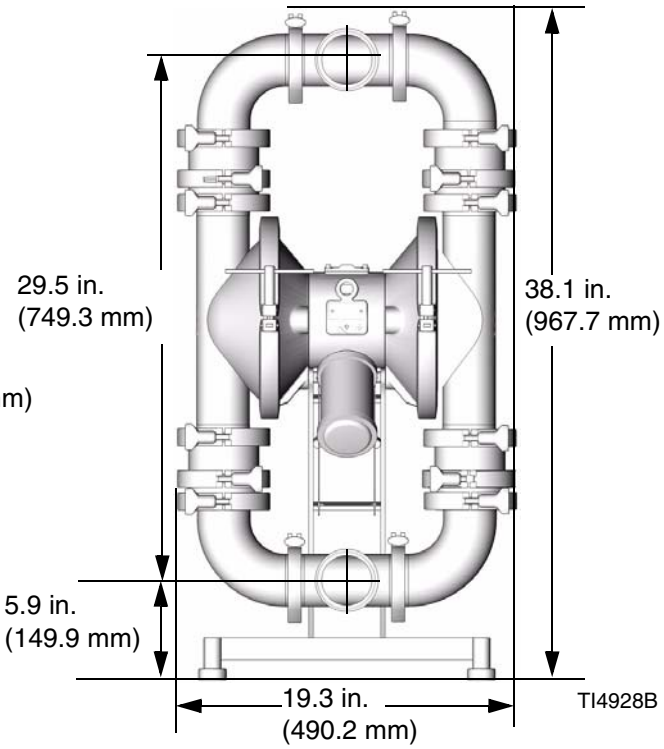
3A Ball Check Valve Pumps



Sanitary Ball Check Valve Pumps



Flapper Check Valve Pumps



Technical Data

Maximum fluid working pressure	120 psi (0.8 MPa, 8 bar)
Air pressure operating range	20-120 psi (0.14-0.8 MPa, 1.4-8 bar)
Maximum air consumption	175 scfm
Air consumption at 70 psi/60 gpm	60 scfm (see chart)
Maximum free-flow delivery	150 gpm (570 l/min)
Maximum pump speed	145 cpm
* Gallons (Liters) per cycle	1.03 (3.90)
Maximum suction lift	Flapper 10 ft (3.5 m) wet, 5 ft (1.75 m) dry Ball 18 ft (5.5 m) wet, 9 ft (2.75 m) dry
Maximum size pumpable solids	Flapper 2.5 in. (63.5 mm) Ball 1.0 in. (25.4 mm)
** Maximum Noise Level at 100 psi, full flow	90 dBa
** Sound Power Level	103 dBa
** Noise Level at 70 psi and 50 cpm	85 dBa
Maximum fluid operating temperature is based on the following maximum diaphragm, ball, and seat temperature ratings.	PTFE 220°F (104.4°C) Santoprene® 180°F (82.2°C) Buna-N 180°F (82.2°C) Viton® 250°F (121.1°C) 3A Approved EPDM 275°F (135°C)
Air inlet size	0.5 in.npt(f)

Wetted parts
***All fluid contact materials are FDA-compliant and meet the United States Code of Federal Regulations (CFR) Title 21, Section 177.

All fluid contact materials are FDA-compliant.

Wetted materials on all models	316 SST, 3A Approved EPDM
Wetted material depending on model	316 SST, Santoprene®, Buna-N (Nitrile), Viton®, 3A Approved EPDM, PTFE

Note: Santoprene® may be used only with non-fatty, non-oily foods or alcohols up to 15%.

Non-wetted external parts	300 series stainless steel, polyester (labels), LDPE foam (gasket)
Weight	145 lb (66 kg)

Viton®

Santoprene® is a registered trademark of the Monsanto Co.

Loctite® is a registered trademark of the Loctite Corporation.

**Displacement per cycle may vary based on suction condition, discharge head, air pressure, and fluid type.*

***Noise levels measured with the pump mounted on the floor, using rubber feet. Sound power measured per ISO Standard 9614-1.*

****The pump user must verify that the construction materials meet their specific application requirements.*

Performance Chart

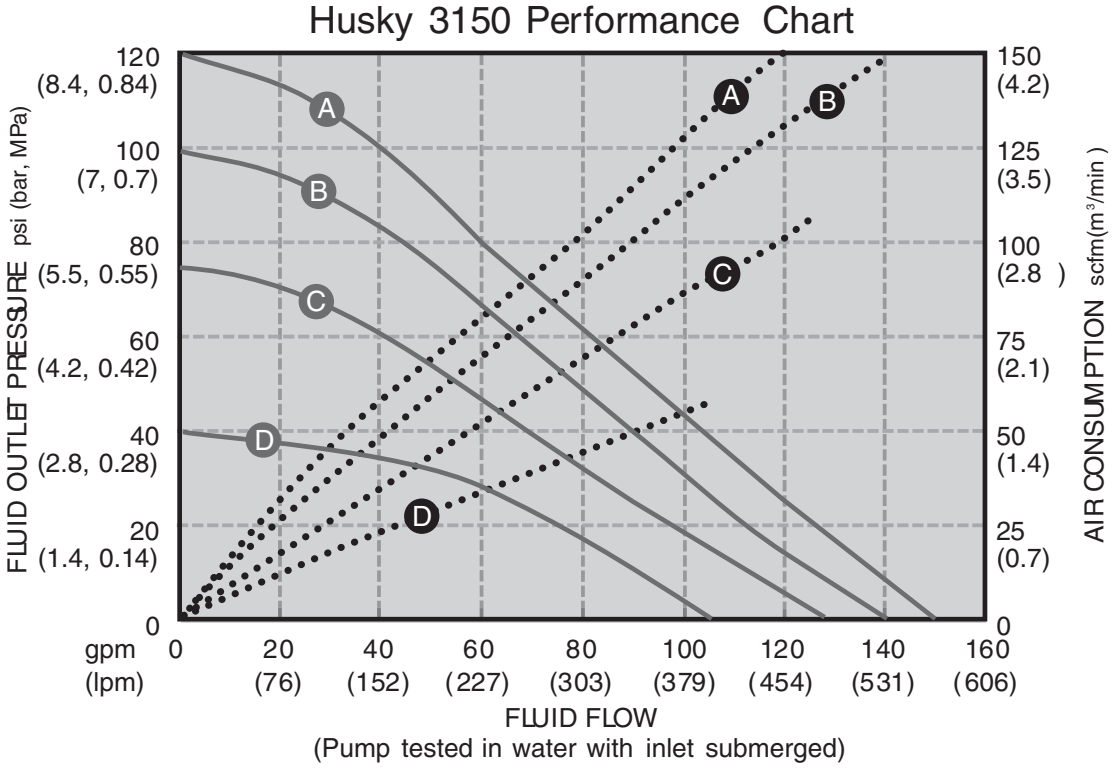
Test Conditions: Pump tested in water with inlet submerged

To find Fluid Outlet Pressure
(psi/MPa/bar) at a specific fluid flow (gpm/lpm) and operating air pressure (psi/MPa/bar):

1. Locate fluid flow rate along bottom of chart.
2. Follow vertical line up to intersection with selected fluid outlet pressure curve.
3. Follow left to scale to read fluid outlet pressure.

To find Pump Air Pressure
(scfm or m^3/min) at a specific fluid flow (gpm/lpm) and operating air pressure (psi/MPa/bar):

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



AIR PRESSURES	LEGEND
Ⓐ = @ 120 psi (8.4 bar, 0.84 MPa)	Air Consumption .....
Ⓑ = @ 100 psi (7.0 bar, 0.7 MPa)	Fluid Flow _____
Ⓒ = @ 70 psi (4.8 bar, 0.5 MPa)	
Ⓓ = @ 40 psi (2.8 bar, 0.3 MPa)	

Graco Warranties

Graco Standard Husky Pump Warranty

Graco warrants all equipment manufactured by Graco and bearing its name to be free from defects in material and workmanship on the date of sale 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 five years 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 the 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 six 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.

FOR GRACO CANADA CUSTOMERS

The parties acknowledge that they have required that the present document, as well as all documents, notices and legal proceedings entered into, given or instituted pursuant hereto or relating directly or indirectly hereto, be drawn up in English. Les parties reconnaissent avoir convenu que la rédaction du présente document sera en Anglais, ainsi que tous documents, avis et procédures judiciaires exécutés, donnés ou intentés, à la suite de ou en rapport, directement ou indirectement, avec les procédures concernées.

Extended Product Warranty

Graco warrants all Husky 205, 307, 515, 716, 1040, 1590, 2150, 3150, and 3275 air valve center sections to be free from defects in material and workmanship for a period of fifteen years from date installed in service by the original purchaser. Normal wear of items such as packings or seals are not considered to be defects in material and workmanship.

Five years	Graco will provide parts and labor.
Six to Fifteen years	Graco will replace defective parts only.

Graco Information

TO PLACE AN ORDER, contact your Graco distributor, or call this number to identify the distributor closest to you.

1-800-328-0211 Toll Free
612-623-6921
612-378-3505 Fax

All written and visual data contained in this document reflects the latest product information available at the time of publication.
Graco reserves the right to make changes at any time without notice.

MM 310622

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Printed in USA 310622F
2/2006