

Operation



SaniForce[®] High Sanitation Diaphragm Pumps

Models 1040, 1590, 2150, 3150, 4150

3A5999D

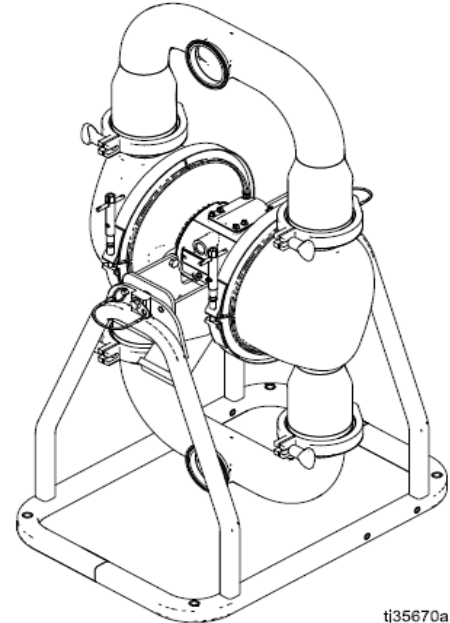
EN

For use in sanitary applications. For professional use only.

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



Important Safety Instructions. Read all warnings and instructions in this manual. Save these instructions.



tj35670a

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Related Manuals






Manual Number	Title
3A6780	SaniForce High Sanitation Diaphragm Pump, Model 1040, Repair/Parts
3A6781	SaniForce High Sanitation Diaphragm Pump, Model 1590, Repair/Parts
3A6782	SaniForce High Sanitation Diaphragm Pump, Models 2150, 3150, 4150, Repair/Parts
3A6976	Leak Detection System

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 symbol refers to procedure-specific risk. When these symbols appear in the body of this manual, refer back to these warnings. Additional, product-specific warnings may be found throughout the body of this manual where applicable.

 <h2 style="margin: 0;">WARNING</h2>	
	<p>FIRE AND EXPLOSION HAZARD</p> <p>Flammable fumes, such as solvent and paint fumes, in work area can ignite or explode. Paint or solvent flowing through the equipment can cause static sparking. To help prevent fire or explosion:</p> <ul style="list-style-type: none"> • Use equipment only in well ventilated area. • Eliminate all ignition sources; such as pilot lights, cigarettes, portable electric lamps, and plastic drop cloths (potential static sparking). • 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. • Hold gun firmly to side of grounded pail when triggering into pail. Do not use pail liners unless they are anti-static or conductive. • Stop operation immediately if static sparking occurs or you feel a shock. Do not use equipment until you identify and correct the problem. • Keep a working fire extinguisher in the work area. • Route exhaust away from all ignition sources. If diaphragm ruptures, fluid may be exhausted with air.
	<p>PRESSURIZED EQUIPMENT HAZARD</p> <p>Fluid from the equipment, leaks, or ruptured components can splash in the eyes or on skin and cause serious injury.</p> <ul style="list-style-type: none"> • Follow the Pressure Relief Procedure when you stop spraying/dispensing and before cleaning, checking, or servicing equipment. • Tighten all fluid connections before operating the equipment. • Check hoses, tubes, and couplings daily. Replace worn or damaged parts immediately.

WARNING

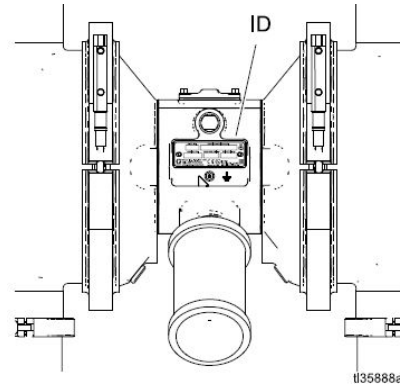
 	<p>EQUIPMENT MISUSE HAZARD Misuse can cause death or serious injury.</p> <ul style="list-style-type: none"> • Do not operate the unit when fatigued or under the influence of drugs or alcohol. • Do not exceed the maximum working pressure or temperature rating of the lowest rated system component. See Technical Data in all equipment manuals. • Use fluids and solvents that are compatible with equipment wetted parts. See Technical Data in all equipment manuals. Read fluid and solvent manufacturer’s warnings. For complete information about your material, request 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.
	<p>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.</p> <ul style="list-style-type: none"> • 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.
	<p>BURN HAZARD Equipment surfaces and fluid that is heated can become very hot during operation. To avoid severe burns:</p> <ul style="list-style-type: none"> • Do not touch hot fluid or equipment.
	<p>PERSONAL PROTECTIVE EQUIPMENT 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 equipment includes but is not limited to:</p> <ul style="list-style-type: none"> • Protective eyewear, and hearing protection. • Respirators, protective clothing, and gloves as recommended by the fluid and solvent manufacturer.

Configuration Number Matrix

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

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.PSP1ASSASSPTSEP21

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 Material		Drive Type		Center Section and Air Valve Material		Manifolds		
	1040	3A	3-A compliant	P	Pneumatic	S01A	Stainless Steel	SSA	Stainless steel, TriClamp, center ported
1590	HS	High Sanitation			S02A	Stainless Steel, leak detector	SSB	Stainless steel, DIN, center ported	
2150	PH	Pharmaceutical			S03A	Stainless Steel, PH	SSC	Stainless steel, TriClamp, unloader	
3150					SP1A	Stainless Steel, PS diaphragms	SSD	Stainless steel, DIN, unloader	
4150					SP2A	Stainless Steel, leak detector, PS diaphragms	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	EN 10204 type 2.1
SS	316 stainless steel, ball	CW	Polychloroprene Weighted Ball	FK	FKM Fluoroelastomer			31	EN 10204 type 3.1
		FK	FKM Fluoroelastomer Ball	PO	PTFE/EPDM Overmold				
		PT	PTFE Ball	PS	PTFE/Santoprene				
		SP	Santoprene Ball	SP	Santoprene				

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		

ATEX T-code rating is dependent on the temperature of the fluid being pumped. Fluid temperature is limited by the materials of the pump interior wetted parts. See **2150, 3150, 4150 Technical Data**, page 29, for the maximum fluid operating temperature for your specific pump model.

Material Temperature Range

Diaphragm/Ball/Seat Material	Stainless Steel Pump Fluid Temperature Range	
	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 (PT) 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.

Ordering Information

To Find Your Nearest Distributor

1. Visit www.graco.com.
2. Click on Where to Buy and use the Distributor Locator.

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.

Installation

General Information

- The typical installation shown in FIG. 2 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.

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The pump may be very heavy (see **Technical Data** for specific weights). If the pump must be moved, follow the **Pressure Relief Procedure** on page 11 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.

Tighten Clamps Before First Use

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

Stand

Stand sizes:

Pump Type	Part No.	Base Dimensions
Horiz. poultry, 4150 flapper	25N991 25P104	15.75 in x 14.0 in (40.00 cm x 35.56 cm)
Rotatable	24L978	17.3 in. x 23.8 in. (43.94 cm x 60.45 cm)
1040	25P103	10.5 in x 12.0in. (26.67 cm x 30.48 cm)

1. Mount the stand assembly on a level surface.
2. Mount the pump securely to the brackets using bolts provided.

Grounding



The equipment must be grounded to reduce the risk of static sparking. Static sparking can cause fumes to ignite or explode. Grounding provides an escape wire for the electric current.

- **Pump:** Connect a ground wire and clamp as shown in FIG. 1. Loosen the grounding screw (W). Insert one end of a 12 AWG (1.5 mm²) minimum ground wire (X) 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.

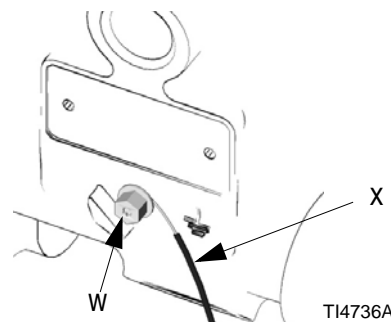


FIG. 1: Ground Wire Connection




- **Air and fluid hoses:** Use only grounded hoses with a maximum of 500 ft (150 m) combined hose length to ensure grounding continuity. Check electrical resistance of hoses. If total resistance to ground exceeds 29 megohms, replace hose immediately.
- **Fluid supply container:** Follow the local code.
- **Solvent pails used when flushing:** Follow local code. Use only conductive metal pails, placed on a grounded surface. Do not place the pail on a non-conductive surface, such as paper or cardboard, which interrupts grounding continuity.

Mountings

NOTE: 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 10.

- 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, air inlet, and fluid inlet and outlet ports are easily accessible.

Air Line




				
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A bleed-type master air valve (C) 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, or contamination from hazardous fluids. See FIG. 2.

1. Install the air line accessories as shown in FIG. 2. 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 (B) and gauge to control the fluid pressure. The resultant fluid outlet pressure will be no higher than the setting of the air regulator.
 - b. Locate one bleed-type master air valve (C) close to the pump and use it to relieve trapped air. Locate the other master air valve (A) upstream from all air line accessories and use it to isolate them during cleaning and repair.
 - c. The air line filter (B) removes harmful dirt and moisture from the compressed air supply.
2. Install a grounded, flexible air hose (D) between the accessories and the 1/2 npt(f) pump air inlet (F). Use a minimum 3/8 in. (9.5 mm) ID air hose. Screw an air line quick disconnect coupler (E) onto the end of the air hose (D), and screw the mating fitting into the pump air inlet snugly.

3-A Pumps: If a leak sensor kit was supplied with your 3-A pump, see the provided kit manual for

information on installing the sensors. See **Related Manuals**, page 2.

				
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Do not connect the coupler (E) to the fitting until you are ready to operate the pump. Connecting the coupler too early can result in unintentional operation of the pump, leading to splashing fluid in the eyes or on the skin, and contact with hazardous fluids.

Fluid Suction Line

1. Use flexible, grounded fluid hoses (G).
2. For best sealing results, use a standard tri-clamp or DIN style sanitary gasket of a flexible material such as EPDM, Buna-N, fluoroelastomer, or silicone.

NOTE: Compliance with 3-A sanitary standards requires DIN connections to use certain gaskets. See CCE Coordination Bulletin Number 2011-3.

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. Excessive inlet fluid pressure also will shorten diaphragm life. Approximately 3-5 psi (0.02-0.03 MPA, 0.21-0.34 bar) should be adequate for most materials.
4. See the **Technical Data** for maximum suction lift (wet and dry). For best results, always install the pump as close as possible to the material source.

Fluid Outlet Line



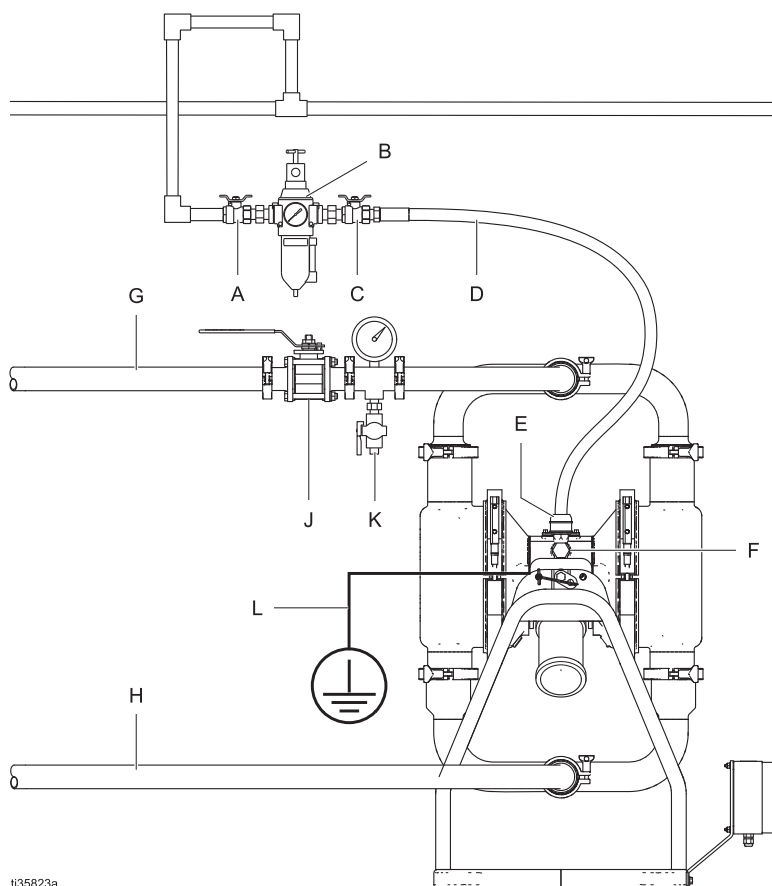
A fluid drain valve (K) is required to relieve pressure in the hose if it is plugged. The drain valve reduces the risk of serious injury, including splashing in the eyes or on the skin, or contamination from hazardous fluids when relieving pressure. Install the valve close to the pump fluid outlet. See FIG. 2.

1. Use flexible, grounded fluid hoses.
2. For best sealing results, use a standard tri-clamp or DIN style sanitary gasket of a flexible material such as EPDM, Buna-N, fluoroelastomer, or silicone.
3. Install a fluid drain valve (K) near the fluid outlet. See FIG. 2.
4. Install a shutoff valve (J) in the fluid outlet line.

Typical Installation

Key:

- A Master air valve (for accessories)
- B Air regulator and air line filter
- C Bleed-type master air valve (required for pump)
- D Air supply line
- E Air line quick disconnect
- F 1/2 npt (f) air inlet
- G Flexible fluid line
- H Flexible fluid suction line
- J Fluid shutoff valve (required, not supplied)
- K Fluid drain valve (required, not supplied)
- L Ground wire (required, not supplied; see page 7 for installation instructions)



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FIG. 2: Typical Floor-Mount Installation

Air Exhaust Ventilation



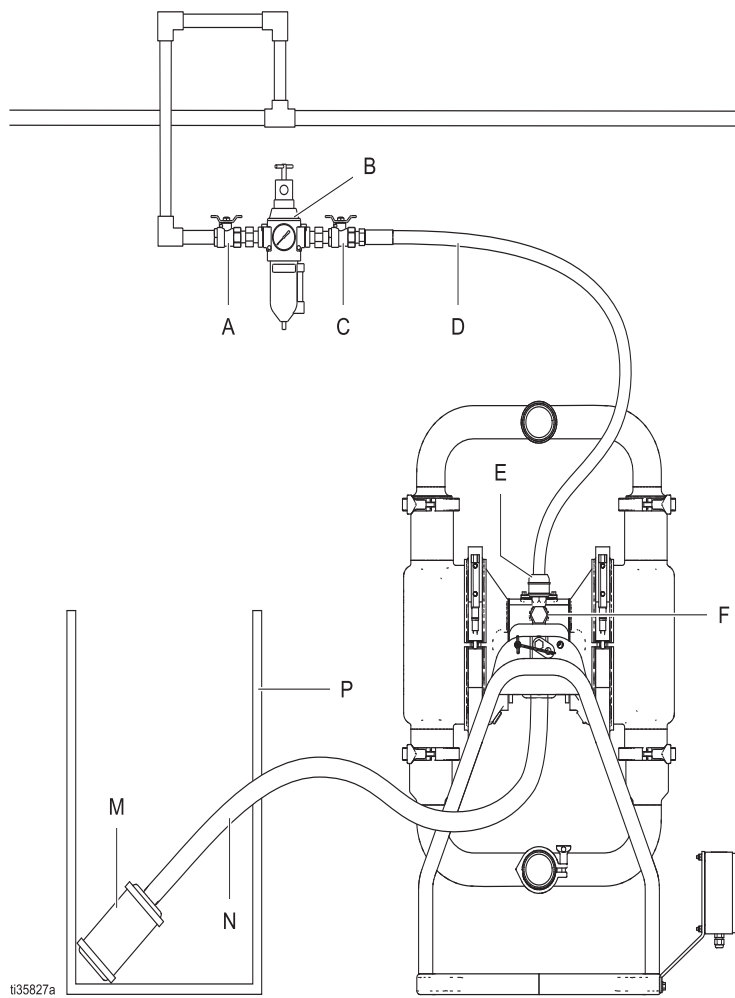
Be sure the system is properly ventilated for your type of installation. You must vent the exhaust to a safe place, away from people, animals, food handling areas, and all sources of ignition when pumping flammable or hazardous fluids.

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. 3.

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 (M) from the pump air exhaust port. See FIG. 3.
2. Install a grounded air exhaust hose (N) and connect the muffler (M) 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 (P) at the end of the air exhaust line to catch fluid in case of a diaphragm rupture. See FIG. 3.



Key:

- A Master air valve (for accessories)
- B Air line filter and air regulator
- C Bleed-type master air valve (required for pump)
- D Air supply line
- E Air line quick disconnect
- F 1/2 npt (f) air inlet
- M Muffler
- N Grounded air exhaust hose
- P Container for remote air exhaust

FIG. 3: Venting Exhaust Air

Operation

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 injection, or 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.

Sanitizing the Pump Before First Use



NOTE: The pump was built and tested using a food grade lubricant.

It is the user's responsibility to properly sanitize the pump before first use. It is up to the user whether this will include disassembling and cleaning individual parts or simply flushing pump with a sanitizing solution. As necessary, follow the steps under **Starting and**

Adjusting the Pump below, under **Flushing** on page 12, or refer to the appropriate repair manual.

Starting and Adjusting the Pump

1. Be sure the pump is properly grounded. See **Grounding**, page 7.
2. Check connections to be sure they are tight. Tighten fluid inlet and outlet connections securely.
3. Place the suction tube (if used) in fluid to be pumped.

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

4. Place the end of fluid hose (H) into an appropriate container.
5. Close the fluid drain valve (K).
6. Back out the air regulator (B) knob, and open the bleed-type master air valve (C).
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 (B) until the pump starts to cycle. Do not exceed the maximum operating air pressure as listed in the **Technical Data**. Allow the pump to cycle slowly until all air is pushed out of the lines and the pump is primed.

Pump Shutdown



At the end of each work shift, perform the **Pressure Relief Procedure**, page 11.

Maintenance

Lubrication

The air valve is designed to operate unlubricated. 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.

NOTICE
<p>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.</p>

Flushing



1. Insert suction tube into cleaning solution.
2. Open air regulator to supply low pressure air to the pump.
3. Run the pump for enough time to thoroughly clean the pump and hoses.
4. Close the air regulator.
5. Remove the suction tube from the cleaning solution and drain pump.
6. Place suction tube in the fluid to be pumped.

Flush the pump often enough to prevent the fluid you are pumping from drying or freezing in the pump and damaging it. Flushing schedule will vary based on particular uses. Use a compatible cleaning solution and always cycle the pump during the entire flushing process.

Always perform the **Pressure Relief Procedure**, page 11 and flush the pump before storing it for any length of time.

Routine Cleaning of Product Contact Section of Pump



NOTE: The pump and the system should be cleaned in accordance with applicable sanitary standard codes and local regulations.

1. Flush the system. See **Flushing** above.
2. Follow the **Pressure Relief Procedure**, page 11.
3. If disassembly of the pump is required for cleaning, refer to the appropriate repair manual.
4. Using a brush or other C.O.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.
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

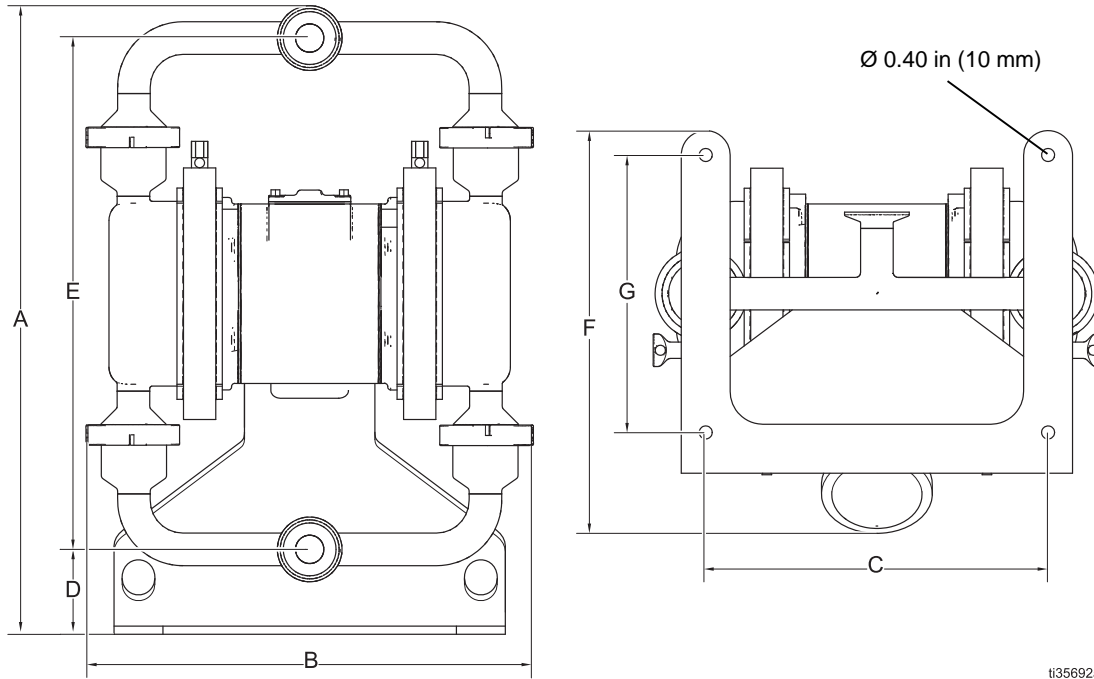
Establish a preventive maintenance schedule based on the pump's service history. This is especially important for prevention of spills or leakage due to diaphragm failure.

The following is a list of recommended maintenance procedures and frequencies. Maintenance must be performed by trained personnel per the established schedule.

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

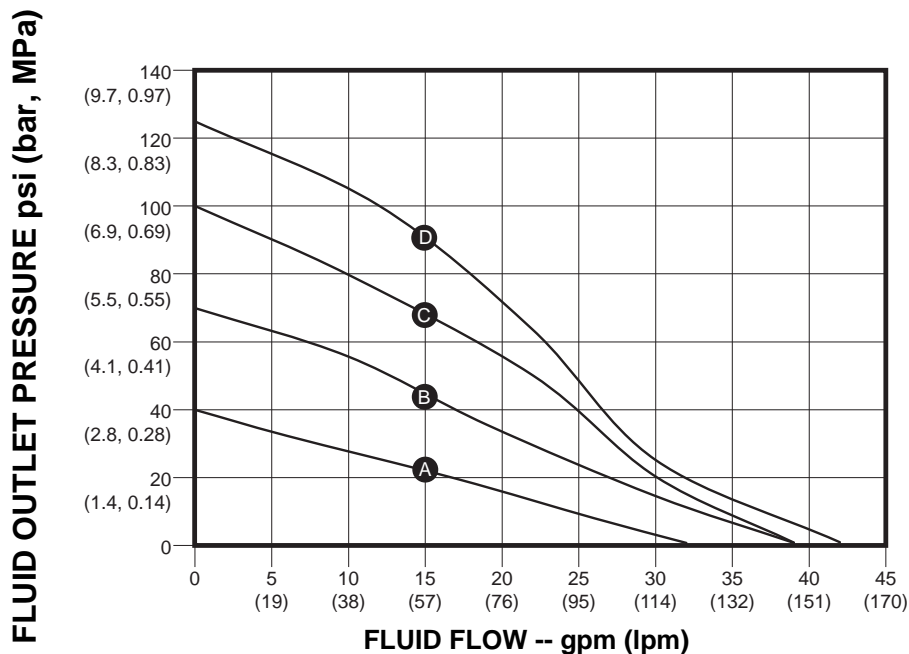
1040 Specifications

1040 Dimensions



- A 19.3 in (49.0 cm)
- B 13.7 in (34.8 cm)
- C 10.5 in (26.7 cm)
- D 2.6 in (6.6 cm)
- E 15.7 in (39.9 cm)
- F 12.3 in (31.2 cm)
- G 8.5 in (21.6 cm)

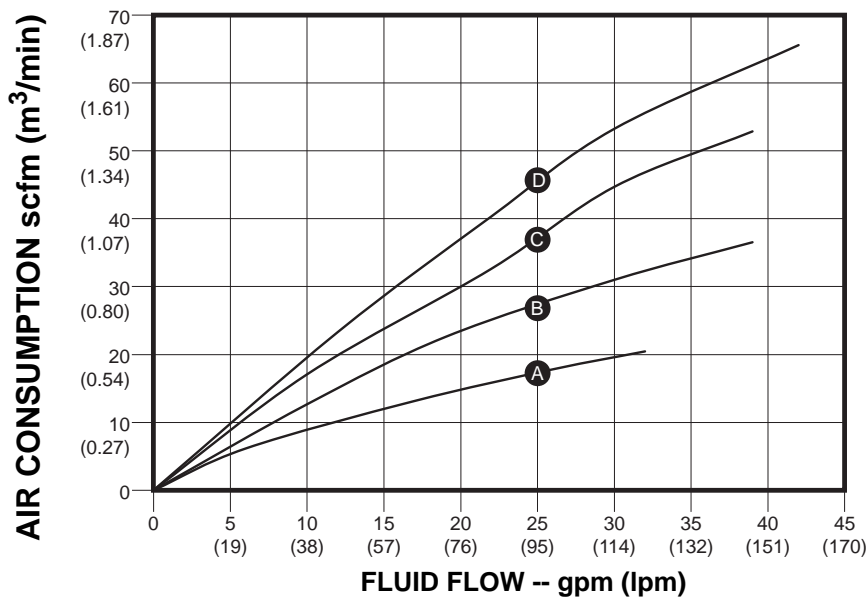
1040 Performance Chart



AIR PRESSURE

- D 120 psi air (8.4 bar, 0.84 MPa)
- C 100 psi air (7 bar, 0.7 MPa)
- B 70 psi air (4.8 bar, 0.48 MPa)
- A 40 psi air (2.8 bar, 0.28 MPa)

(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 m³/min) at a specific fluid flow (gpm/lpm) and operating air pressure (psi/MPa/bar):

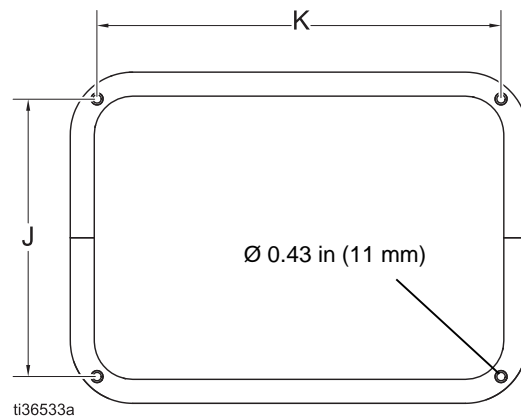
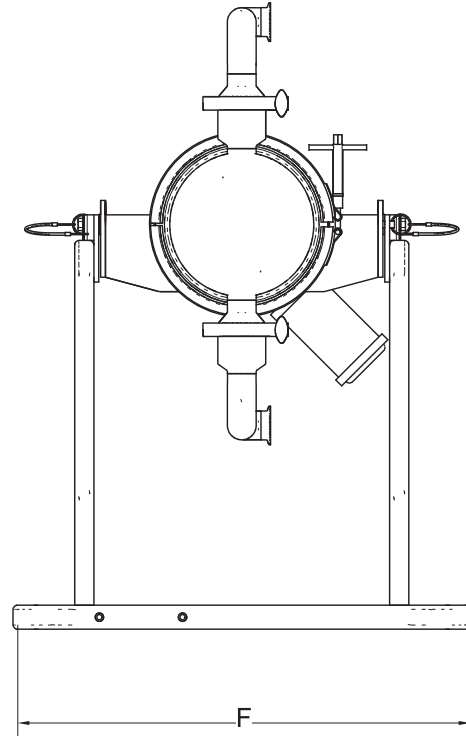
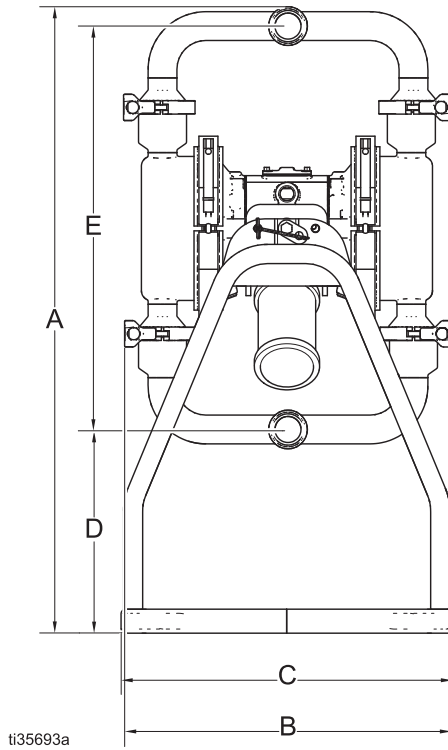
1. Locate fluid flow rate along bottom of chart.
2. Read vertical line up to intersection with selected air consumption curve.
3. Follow left to scale to read fluid outlet pressure.

1040 Technical Data

SaniForce 1040 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 Dry: 10 ft	Wet 9.1 m Dry: 3.0 m
Maximum size pumpable solids	0.27 in.	6.5 mm
Fluid displacement per cycle	0.17 gallons	0.64 liters
Maximum free-flow delivery	41 gpm	155.2 lpm
Maximum pump speed	240 cpm	
Weight	50.5 lb	22.9 kg
Fluid Inlet and Outlet Size		
Stainless Steel	1.0 in sanitary flange or RD52 x 1/6 DIN	
Noise Data		
Sound Power (measured per ISO-9614-1)		
at 100 psi 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, plus 316 Stainless Steel		
Non-wetted External Parts		
Non-wetted external parts include 300-series SST, Nickel plated aluminum, 17-4 PH SST, Santoprene, LDPE, VHB acrylic		

1590 Specifications

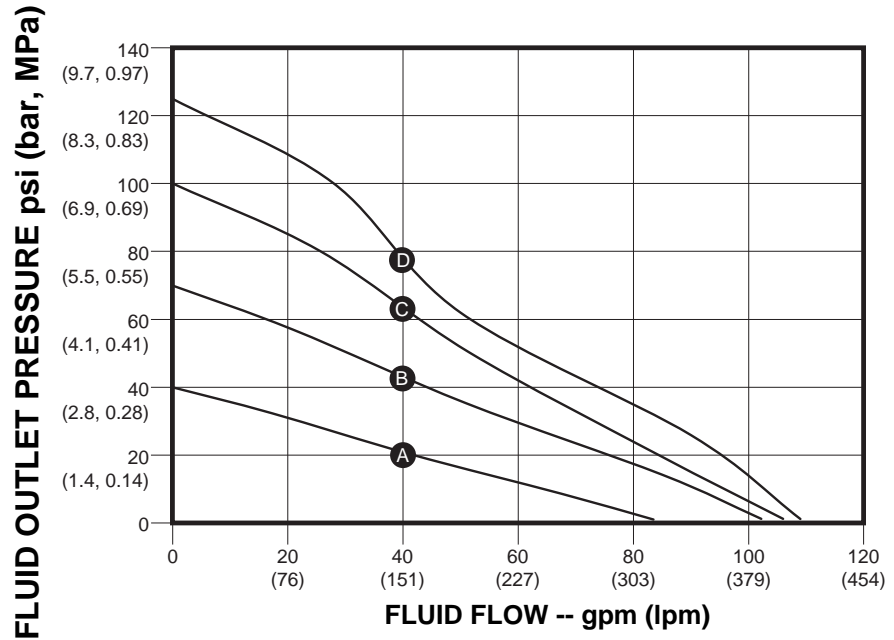
1590 Dimensions



- A 32.6 in (82.8 cm)
- B 17.0 in (43.2 cm)
- C 17.3 in (43.9 cm)
- D 10.6 in (26.9 cm)
- E 21.0 in (53.3 cm)
- F 23.8 in (60.5 cm)
- J 14.5 in (36.8 cm)
- K 21.0 in (53.3 cm)

1590 Performance Charts

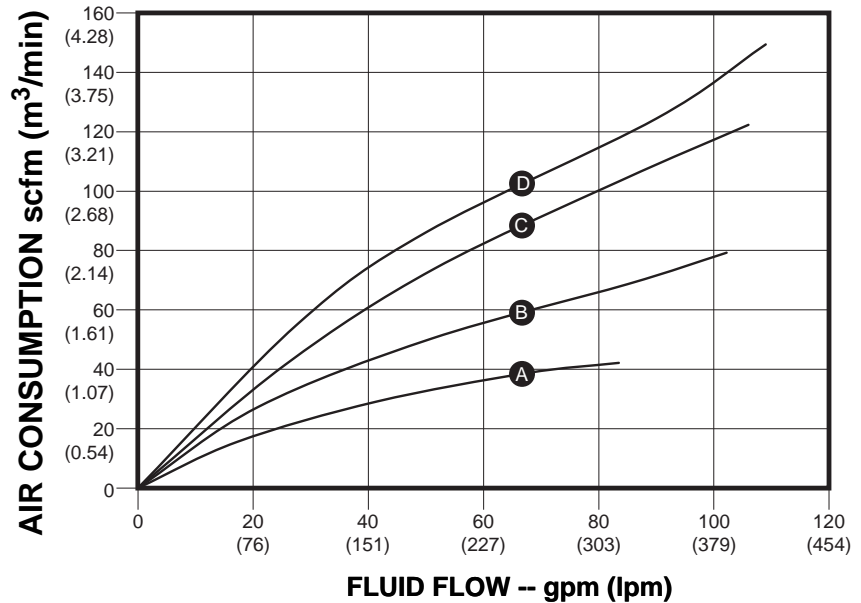
Ball Check pump



Pump tested in water with inlet submerged.

AIR PRESSURE

- D 120 psi air (8.4 bar, 0.84 MPa)
- C 100 psi air (7 bar, 0.7 MPa)
- B 70 psi air (4.8 bar, 0.48 MPa)
- A 40 psi air (2.8 bar, 0.28 MPa)



To find Fluid Outlet Pressure

(psi/MPa/bar) at a specific fluid flow (gpm/lpm) and operating air pressure (psi/MPa/bar):

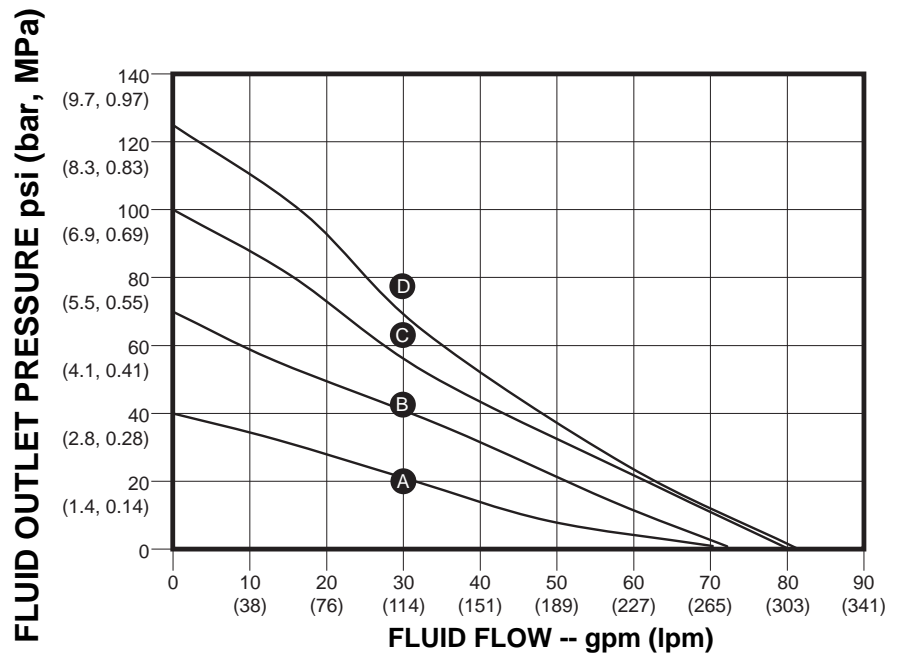
1. Locate fluid flow rate along bottom of chart.
2. Follow vertical line up to intersection with selected fluid outlet pressure curve.
3. Follow left to scale to read fluid outlet pressure.

To find Pump Air Pressure

(scfm or m³/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.

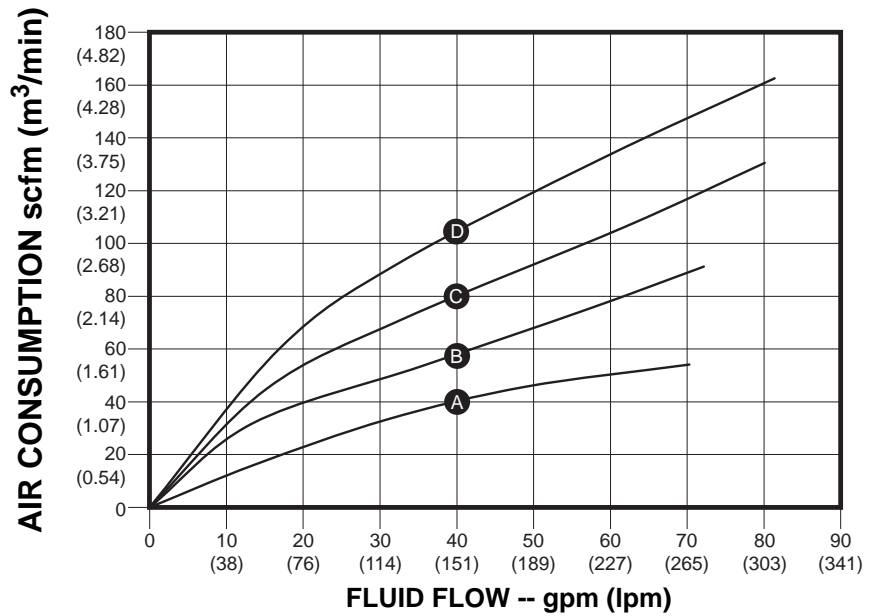
Flapper Check pump



Pump tested in water with inlet submerged.

AIR PRESSURE

- D 120 psi air (8.4 bar, 0.84 MPa)
- C 100 psi air (7 bar, 0.7 MPa)
- B 70 psi air (4.8 bar, 0.48 MPa)
- A 40 psi air (2.8 bar, 0.28 MPa)



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 m³/min) at a specific fluid flow (gpm/lpm) and operating air pressure (psi/MPa/bar):

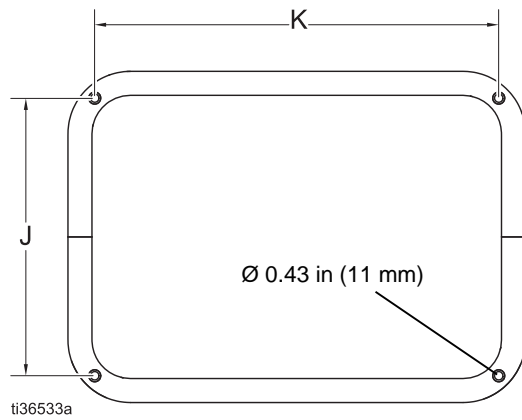
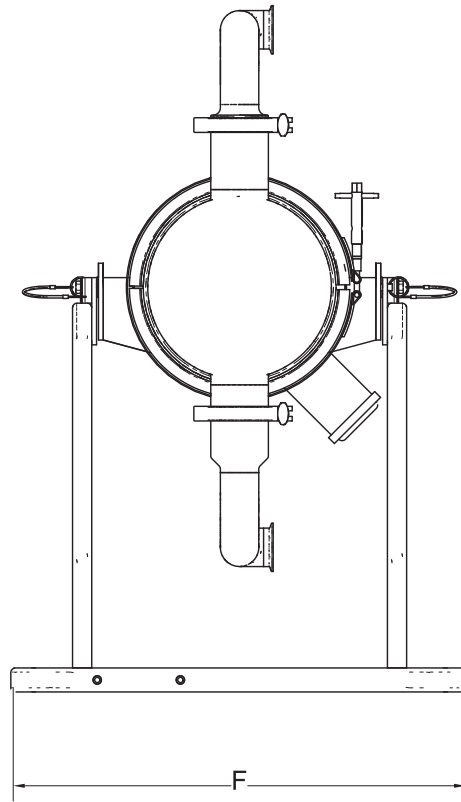
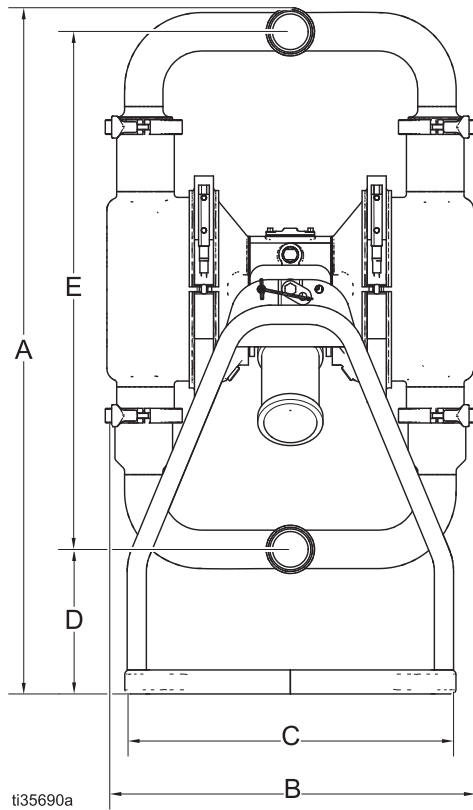
1. Locate fluid flow rate along bottom of chart.
2. Read vertical line up to intersection with selected air consumption curve.
3. Follow left to scale to read fluid outlet pressure.

1590 Technical Data

SaniForce 1590 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 Dry: 10 ft	Wet: 9.1 m Dry: 3.0 m
Maximum size pumpable solids		
ball	3/16 in.	4.8 mm
flapper	1.2 in.	30.5 mm
Fluid displacement per cycle		
ball	0.65 gallons	2.46 liters
flapper	0.31 gallons	1.17 liters
Maximum free-flow delivery		
ball	105 gpm	397.5 lpm
flapper	80 gpm	302.8 lpm
Maximum pump speed		
ball	165 cpm	
flapper	260 cpm	
Weight		
ball	89 lb	40.4 kg
flapper	83 lb	37.6
Fluid Inlet and Outlet Size		
Stainless Steel	1.5 in sanitary flange or 40 mm DIN 11851 male thread	
Noise Data		
Sound Power (measured per ISO-9614-1)		
at 100 psi 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		

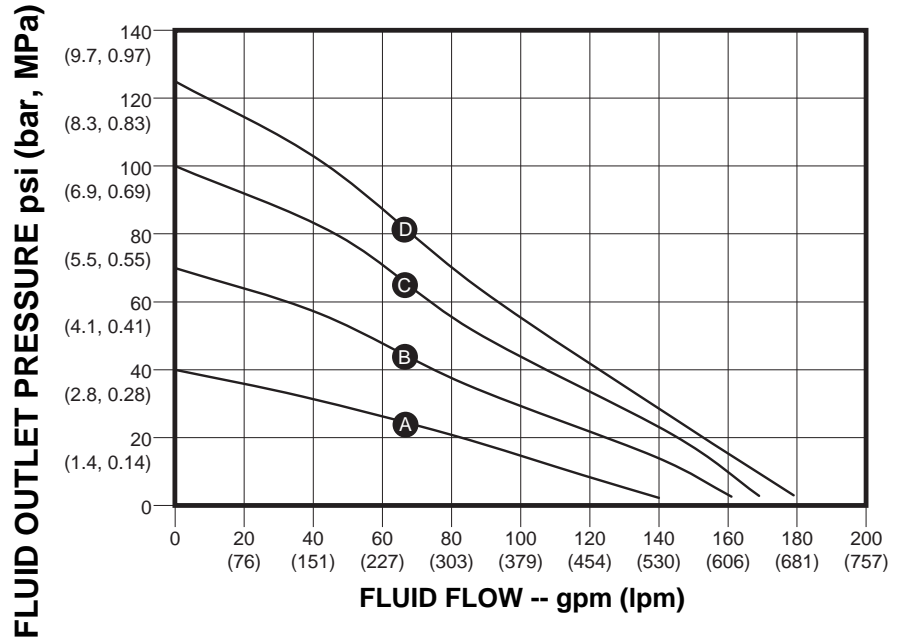
2150 Specifications

2150 Dimensions



- A 35.7 in (90.7 cm)
- B 19.3 in (49.0 cm)
- C 17.3 in (43.9 cm)
- D 7.5 in (19.1 cm)
- E 27.0 in (68.6 cm)
- F 23.8 in (60.5 cm)
- J 14.5 in (36.8 cm)
- K 21.0 in (53.3 cm)

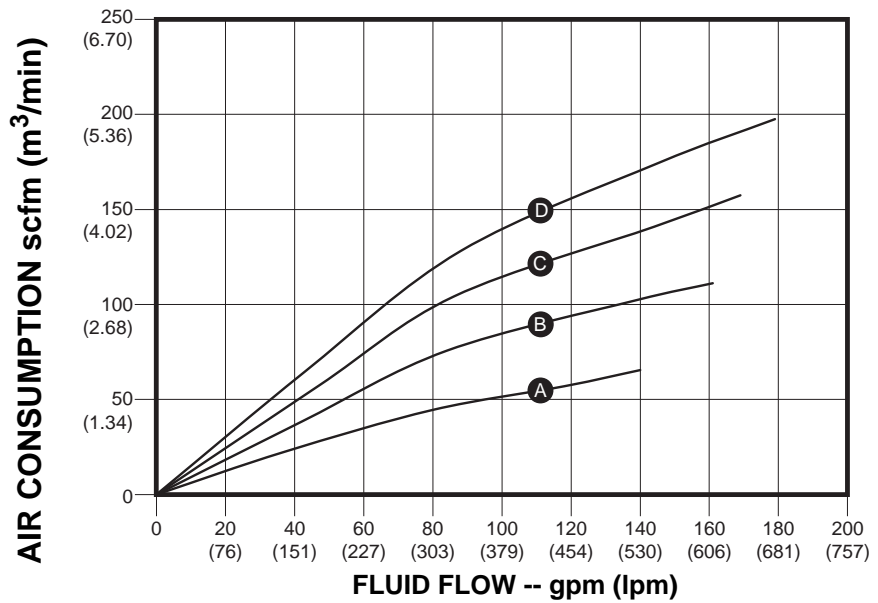
2150 Performance Chart



(Pump tested in water with inlet submerged)

AIR PRESSURE

- D 120 psi air (8.4 bar, 0.84 MPa)
- C 100 psi air (7 bar, 0.7 MPa)
- B 70 psi air (4.8 bar, 0.48 MPa)
- A 40 psi air (2.8 bar, 0.28 MPa)



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.

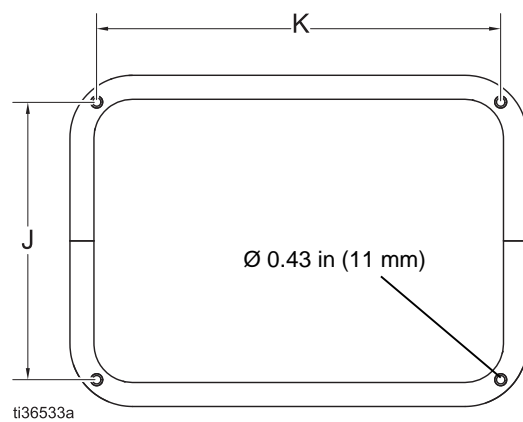
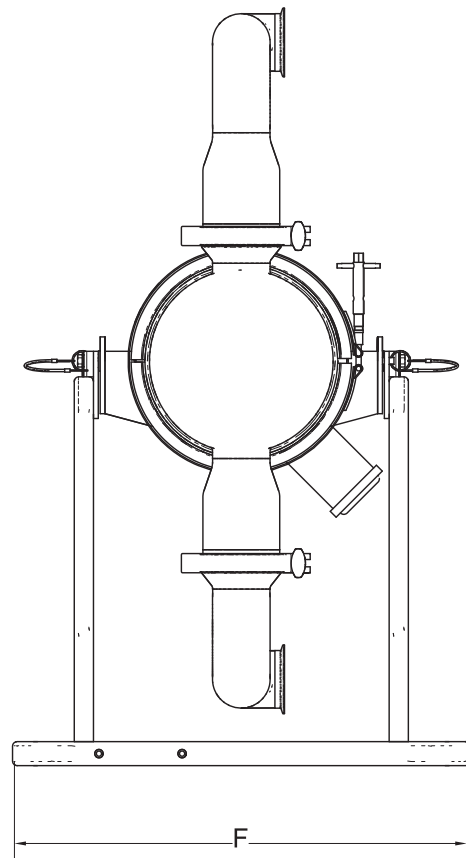
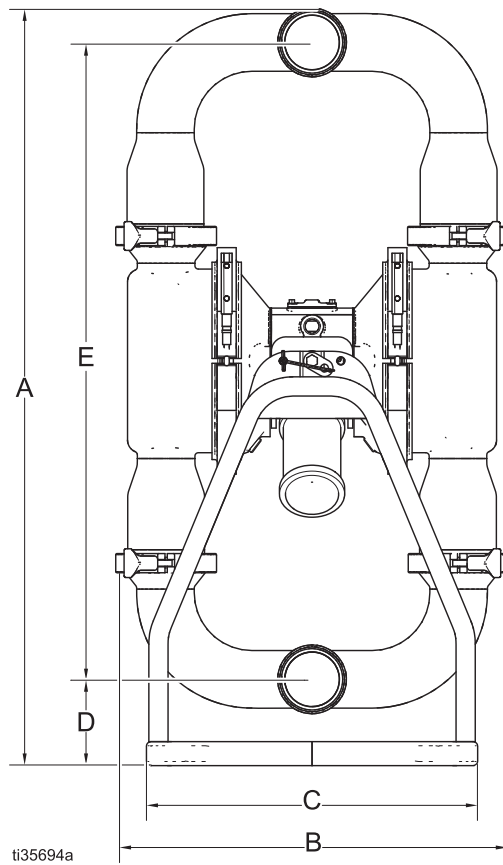
To find Pump Air Pressure

(scfm or m³/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.

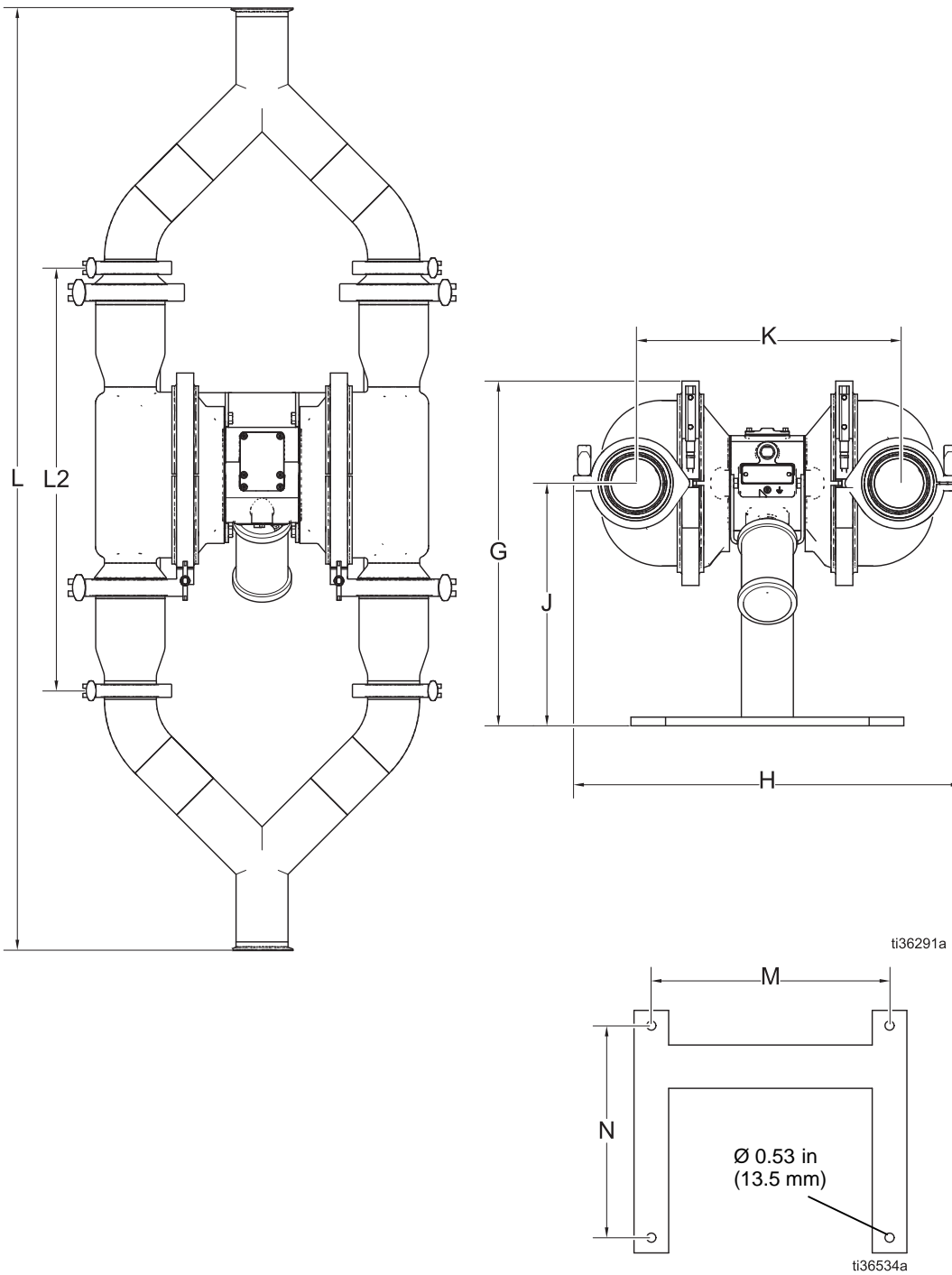
3150 Specifications

3150 Dimensions



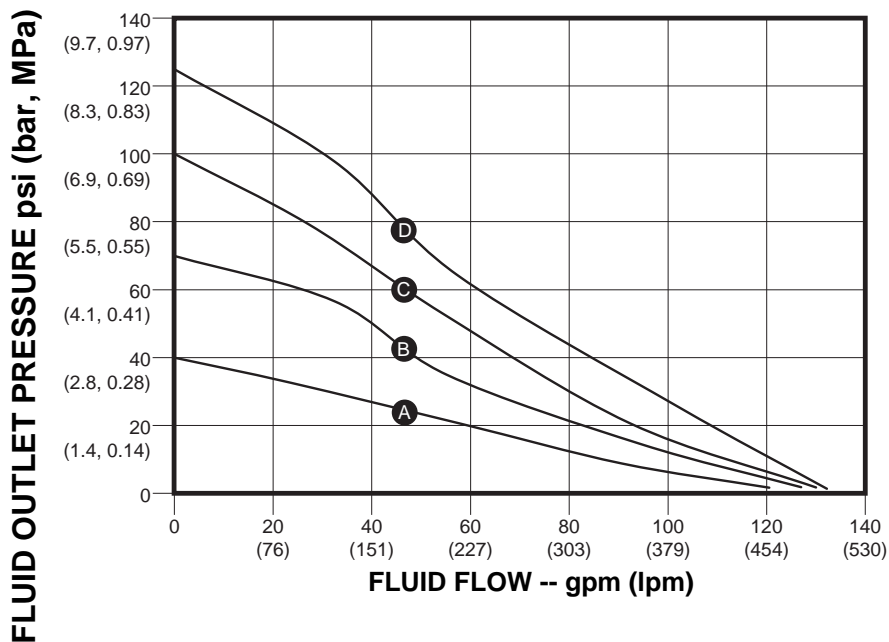
- A 39.5 in (100.3 cm)
- B 20.5 in (52.1 cm)
- C 17.3 in (43.9 cm)
- D 4.5 in (11.4 cm)
- E 33.2 in (84.3 cm)
- F 23.8 in (60.5 cm)
- J 14.5 in (36.8 cm)
- K 21.0 in (53.3 cm)

3150 Horizontal Mount



- G 19.9 in (50.5 cm)
- H 22.4 in (56.9 cm)
- J 14.0 in (35.6 cm)
- K 15.2 in (38.6 cm)
- L 54.5 in (138.4 cm)
- L2 23.0 in (58.4 cm)
- M 13.8 in (35.1 cm)
- N 12.2 in (31.0 cm)

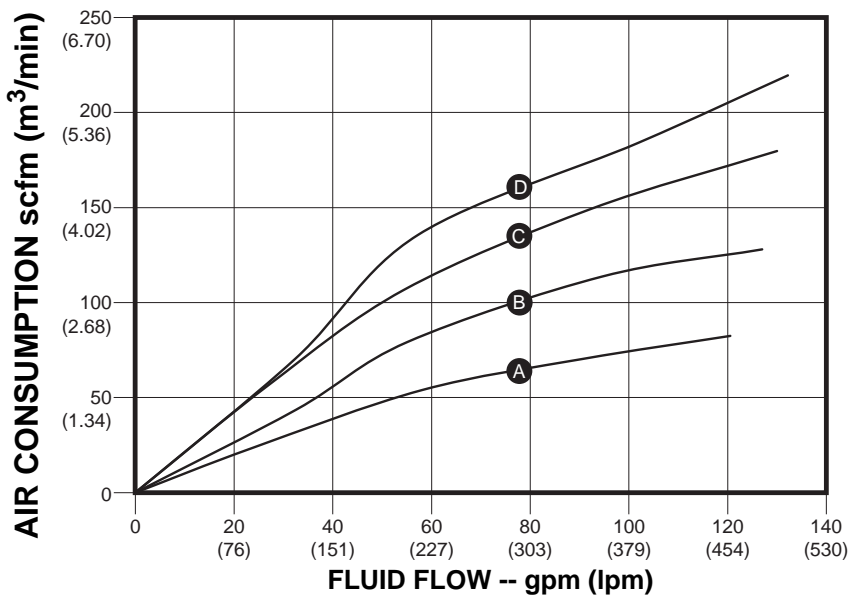
3150 Performance Chart



Pump tested in water with inlet submerged

AIR PRESSURE

- D 120 psi air (8.4 bar, 0.84 MPa)
- C 100 psi air (7 bar, 0.7 MPa)
- B 70 psi air (4.8 bar, 0.48 MPa)
- A 40 psi air (2.8 bar, 0.28 MPa)



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.

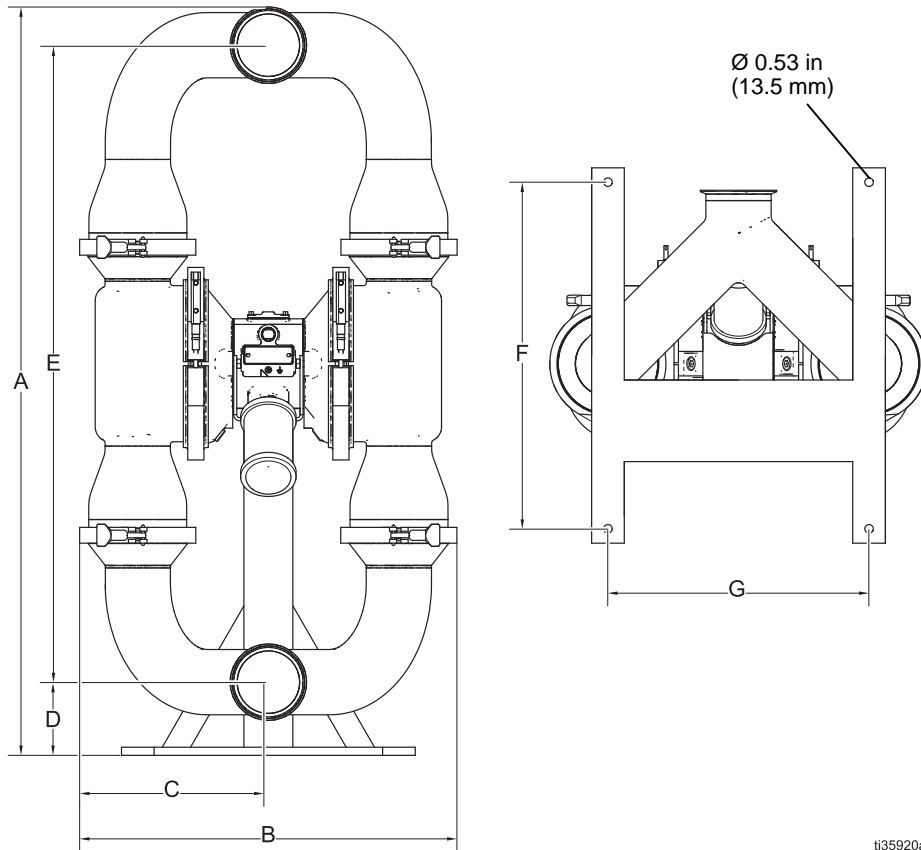
To find Pump Air Pressure

(scfm or m³/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.

4150 Specifications

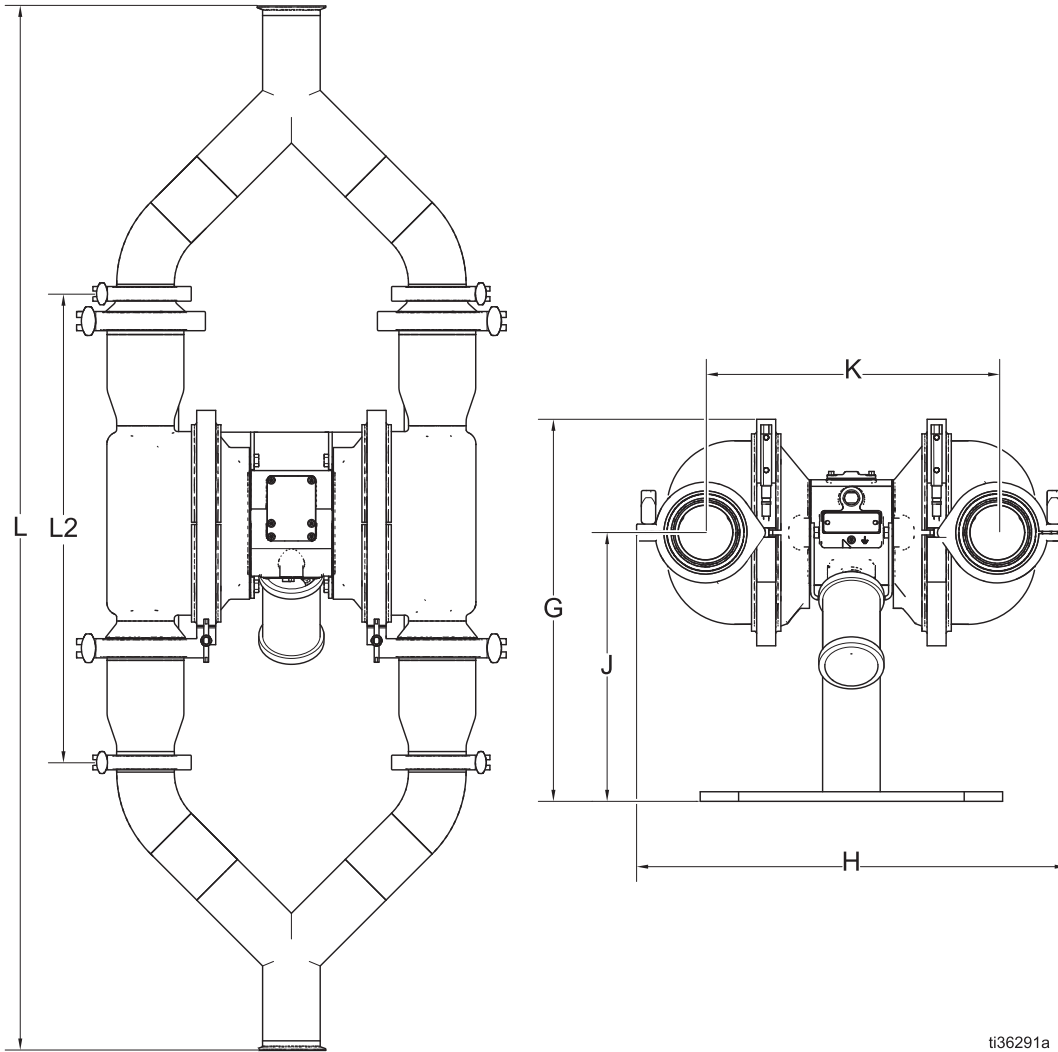
4150 Dimensions



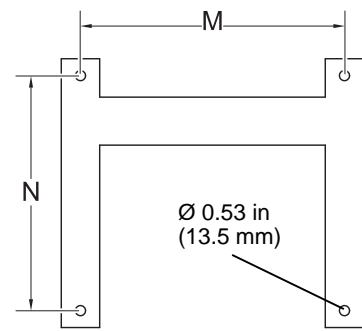
ti35920a

- A 45.9 in (116.6 cm)
- B 23.1 in (58.7 cm)
- C 11.6 in (29.5 cm)
- D 4.5 in (11.4 cm)
- E 39.0 in (99.1 cm)
- F 21.2 in (53.8 cm)
- G 16.0 in (40.6 cm)

4150 Horizontal Mount



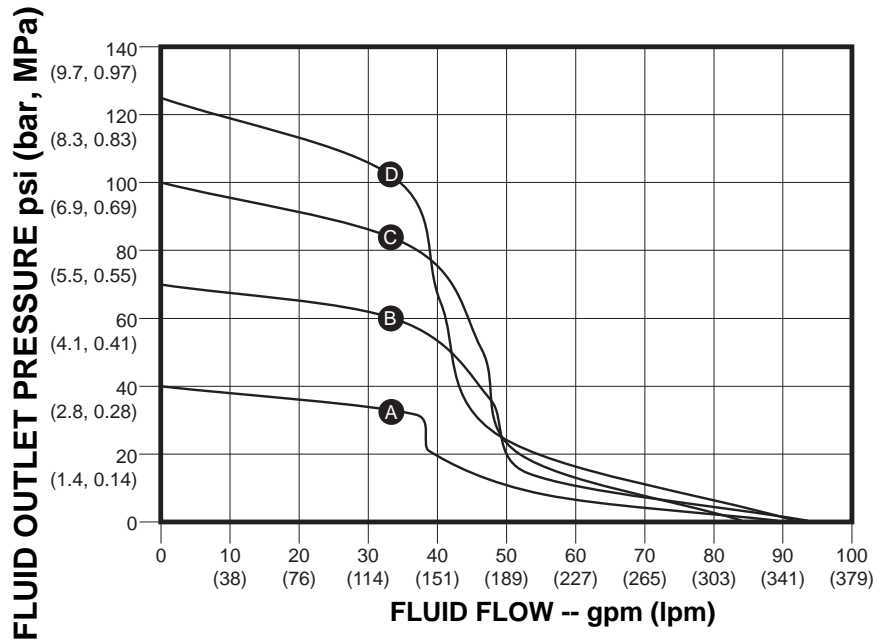
ti36291a



ti36534a

- G 19.9 in (50.5 cm)
- H 24.4 in (62.0 cm)
- J 14.0 in (35.6 cm)
- K 16.0 in (40.6 cm)
- L 58.5 in (148.6 cm)
- L2 23.7 in (60.2 cm)
- M 13.8 in (35.1 cm)
- N 12.2 in (31.0 cm)

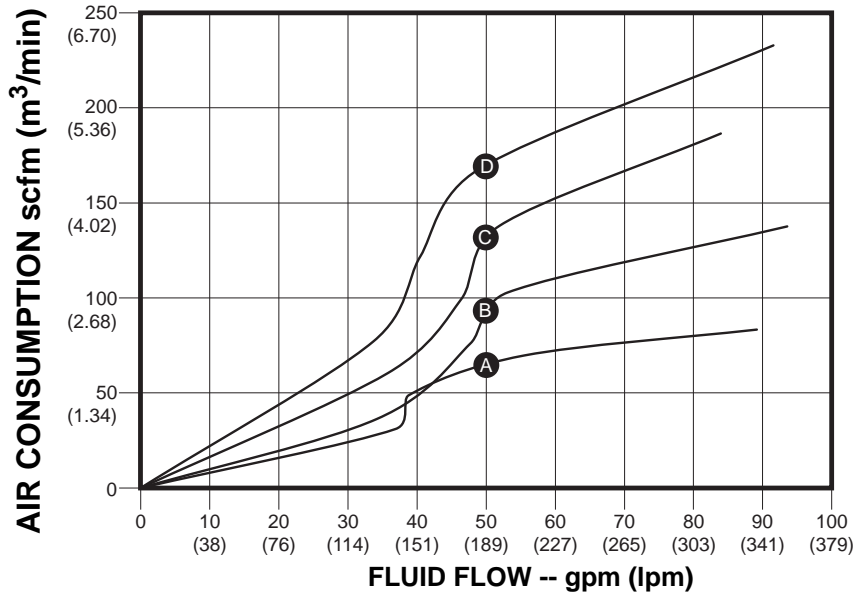
4150 Performance Chart



Pump tested in water with inlet submerged

AIR PRESSURE

- D 120 psi air (8.4 bar, 0.84 MPa)
- C 100 psi air (7 bar, 0.7 MPa)
- B 70 psi air (4.8 bar, 0.48 MPa)
- A 40 psi air (2.8 bar, 0.28 MPa)



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 m³/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.

2150, 3150, 4150 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 Dry: 10 ft (2150) 6 ft (3150) 5 ft (4150)	9.1 m 3.0 m (2150) 1.8 m (3150) 1.5 m (4150)
Maximum size pumpable solids	2150 ball 3150 flapper 4150 flapper	0.5 in. 2.46 in. 3.8 in.
Fluid displacement per cycle	2150 ball 3150 flapper 4150 flapper	1.3 gallons 0.7 gallons 0.4 gallons
Maximum free-flow delivery	2150 ball 3150 flapper 4150 flapper	180 gpm 130 gpm 90 gpm
Maximum pump speed	2150 ball 3150 flapper 4150 flapper	135 cpm 180 cpm 225 cpm
Weights Values are for vertical pumps, horizontal pumps slightly lower		
	2150 ball 3150 flapper 4150 flapper	111 lb 118 lb 168 lb
		50.3 kg 53.5 kg 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		

California Proposition 65

CALIFORNIA RESIDENTS

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

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Original instructions. This manual contains English. MM 3A5999

Graco Headquarters: Minneapolis

International Offices: Belgium, China, Japan, Korea

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