

SERVICE & OPERATING MANUAL

Original Instructions

Certified Quality



Quality System
ISO 9001 Certified



Environmental Management System
ISO 14001 Certified

Member of:
Hydraulic
INSTITUTE

EAC

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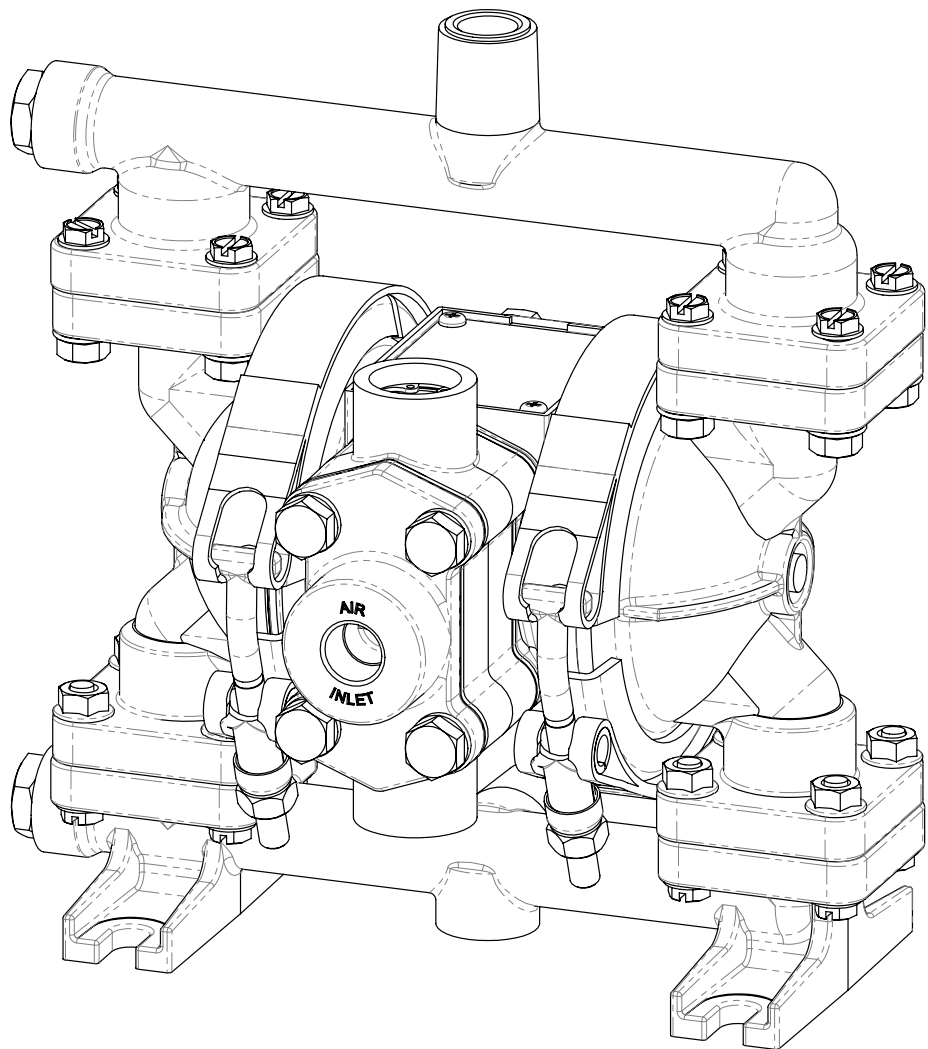


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Model PB $\frac{1}{4}$

Non-Metallic

Type 4



1: PUMP SPECS

2: INSTAL & OP

3: EXP VIEW

4: AIR END

5: WET END

6: WARRANTY

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A WARREN RUPP, INC. BRAND

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Safety Information

! IMPORTANT



Read the safety warnings and instructions in this manual before pump installation and start-up. Failure to comply with the recommendations stated in this manual could damage the pump and void factory warranty.



When the pump is used for materials that tend to settle out or solidify, the pump should be flushed after each use to prevent damage. In freezing temperatures the pump should be completely drained between uses.

! CAUTION



Before pump operation, inspect all fasteners for loosening caused by gasket creep. Retighten loose fasteners to prevent leakage. Follow recommended torques stated in this manual.



Nonmetallic pumps and plastic components are not UV stabilized. Ultraviolet radiation can damage these parts and negatively affect material properties. Do not expose to UV light for extended periods of time.



WARNING

Pump not designed, tested or certified to be powered by compressed natural gas. Powering the pump with natural gas will void the warranty.

! WARNING



When used for toxic or aggressive fluids, the pump should always be flushed clean prior to disassembly.



Before maintenance or repair, shut off the compressed air line, bleed the pressure, and disconnect the air line from the pump. Be certain that approved eye protection and protective clothing are worn at all times. Failure to follow these recommendations may result in serious injury or death.



Airborne particles and loud noise hazards. Wear eye and ear protection.



In the event of diaphragm rupture, pumped material may enter the air end of the pump, and be discharged into the atmosphere. If pumping a product that is hazardous or toxic, the air exhaust must be piped to an appropriate area for safe containment.



Take action to prevent static sparking. Fire or explosion can result, especially when handling flammable liquids. The pump, piping, valves, containers and other miscellaneous equipment must be properly grounded.



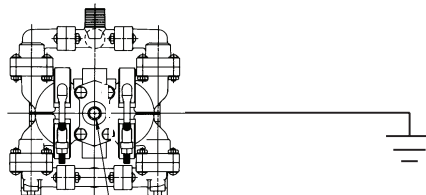
This pump is pressurized internally with air pressure during operation. Make certain that all fasteners and piping connections are in good condition and are reinstalled properly during reassembly.



Use safe practices when lifting

ATEX Pumps - Conditions For Safe Use

- Ambient temperature range is as specified in tables 1 to 3 on the next page (per Annex I of DEKRA 18ATEX0094X)
- ATEX compliant pumps are suitable for use in explosive atmospheres when the equipment is properly grounded in accordance with local electrical codes
- Non-Metallic ATEX Pumps only — See Explanation of Pump Nomenclature / ATEX Details Page**
Conductive Polypropylene, conductive Acetal or conductive PVDF pumps are not to be installed in applications where the pumps may be subjected to oil, greases and hydraulic liquids.
- The optionally provided solenoids shall be protected by a fuse corresponding to its rated current (max 3*I_{rat} according to EN 60127) or by a motor protecting switch with short circuit and thermal instantaneous tripping (set to the rated current) as short circuit protection. For solenoids with a very low rated current, a fuse with the lowest current value according to the indicated standard will be sufficient. The fuse may be accommodated in the associated supply unit or shall be separately arranged. The rated voltage of the fuse shall be equal or greater than the stated rated voltage of the solenoid. The breaking capacity of the fuse shall be as high as or higher than the maximum expected short circuit current at the location of the installation (usually 1500 A). The maximum permissible ripple is 20% for all dc solenoids.
***Not applicable for all pump models — See Explanation of Pump Nomenclature / ATEX Details Page**
- When operating pumps equipped with non-conductive diaphragms that exceed the maximum permissible projected area, as defined in EN ISO 80079-36 : 2016 section 6.7.5 table 8, the following protection methods must be applied
- Equipment is always used to transfer electrically conductive fluids or
- Explosive environment is prevented from entering the internal portions of the pump, i.e. dry running.
- Pumps provided with the pulse output kit and used in the potentially explosive atmosphere caused by the presence of the combustible dust shall be installed in such a way that the pulse output kit is protected against impact
***Not applicable for all pump models — See Explanation of Pump Nomenclature / ATEX Details Page**
- To reduce the risk of static electrical sparking, ATEX compliant pumps must be grounded. Each ATEX compliant pump will be shipped with grounding cable. Grounding cable should be fastened to pump hardware. Check the local electrical code for detailed grounding instruction and the type of equipment required.



Temperature Tables

Table 1. Category 1 & Category 2 ATEX Rated Pumps

Ambient Temperature Range [°C]	Process Temperature Range [°C] ¹	Temperature Class	Maximum Surface Temperature [°C]
-20°C to +60°C	-20°C to +80°C	T5	T100°C
	-20°C to +108°C	T4	T135°C
	-20°C to + 160°C	T3	T200°C
	-20°C to +177°C	(225°C) T2	

¹Per CSA standards ANSI LC6-2018 US & Canadian Technical Letter R14, G-Series Natural Gas Models are restricted to (-20°C to + 80°C) process temperature

Table 2. Category 2 ATEX Rated Pumps Equipped with Pulse Output Kit or Integral Solenoid:

Ambient Temperature Range [°C]	Process Temperature Range [°C]	Temperature Class	Maximum Surface Temperature [°C]	Options	
				Pulse Output Kit	Integral Solenoid
-20°C to +60°C	-20°C to +100°C	T5	T100	X	
-20°C to +50°C	-20°C to +100°C	T5	T100		X

²ATEX Pulse output or Integral Solenoid Not Available For All Pump Models See Explanation of Pump Nomenclature / ATEX Details Page

Table 3. Category M1 ATEX Rated Pumps for Mining

Ambient Temperature Range [°C]	Process Temperature Range [°C]
-20°C to +60°C	-20°C to +150°C

Note: The ambient temperature range and the process temperature range should not exceed the operating temperature range of the applied non-metallic parts as listed in the manuals of the pumps.

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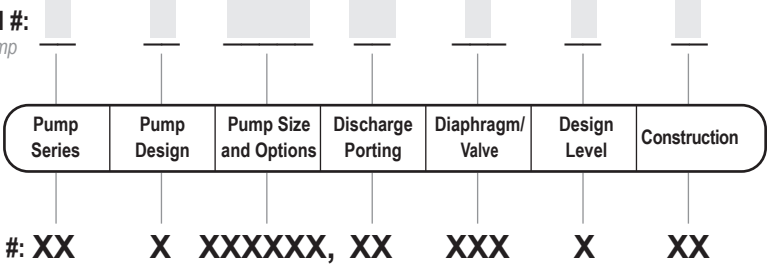
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Explanation of Pump Nomenclature

Your Model #: 
(fill in from pump nameplate)

Model #: **XX** **X** **XXXXXX**, **XX** **XXX** **X** **XX**

Pump Series

P Plastic

Pump Design

B Soild Ball

Pump Size and Options

1/4 1/4" NPT

P1 Intrinsically Safe ATEX Compliant
Pulse Output

P0 10-30VDC Pulse Output Option

P2 110/120 or 220/240VAC Pulse Output Option

E0 Integral Solenoid 24VDC Coil

E1 Integral Solenoid 24VDC Explosion-Proof Coil

E2 Integral Solenoid 24VAC/12VDC Coil

E3 Integral Solenoid 12VDC Explosion-Proof Coil

E4 Integral Solenoid 110VAC Coil

E5 Integral Solenoid 110VAC Explosion-Proof Coil

E6 Integral Solenoid 220VAC Coil

E7 Integral Solenoid 220VAC Explosion-Proof Coil

E8 Integral Solenoid 115VAC, 50Hz Explosion-Proof Coil

E9 Integral Solenoid 230VAC, 50Hz, Explosion-Proof Coil

Discharge Porting Position

T Horizontal Suction, Vertical Discharge

Diaphragm Check Valve Materials

R Hytrel

S Santoprene

T Virgin PTFE

U Santoprene Diaphragms/PTFE Ball

Design Level

4

Construction

P Polypropylene Wet End and Center

K PVDF Wet End and Polypropylene Center

△ **CA** Conductive Acetal Wet End and Center

Your Serial #: (fill in from pump nameplate) _____

ATEX Detail

	ATEX Details	Construction	Options
	II 2 G Ex h IIC T5...225°C (T2) Gb	CA	00
	II 2 D Ex h IIIC T100°C...T200°C Db		
	II 2 G Ex h ia IIC T5 Gb	CA	P1
	II 2 D Ex h ia IIIC T100°C Db		

1: PUMP SPECS

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Performance

PB $\frac{1}{4}$ NON-METALLIC

1: PUMP SPECS

SUCTION/DISCHARGE PORT SIZE

- $\frac{1}{4}$ " NPT (internal)
- $\frac{1}{2}$ " NPT (external)

CAPACITY

- 0 to 5 gallons per minute
(0 to 19 liters per minute)

AIR DISTRIBUTION VALVE

- No-lube, no-stall design

SOLIDS-HANDLING

- Up to 0.032 in. (1mm)

HEADS UP TO

- 100 psi or 231 ft. of water
(7 bar or 70 meters)

DISPLACEMENT/STROKE

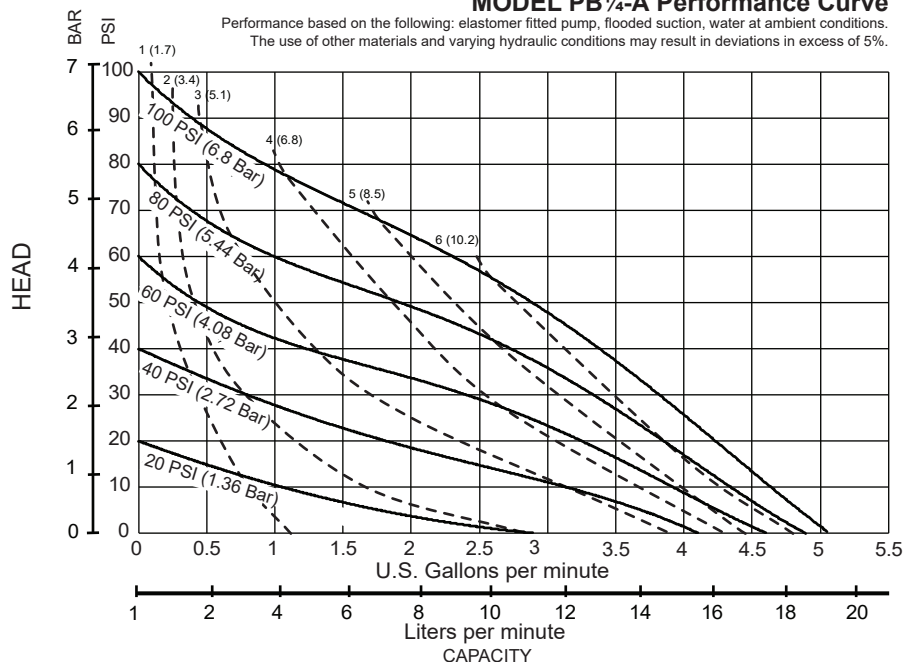
- .01 Gallon / .04 liter

SHIPPING WEIGHT

- Polypropylene 3.3 lbs. (1.5kg)
- PVDF 3.9 lbs. (1.8kg)
- Conductive Acetal 3.9 lbs. (1.8kg)

MODEL PB $\frac{1}{4}$ -A Performance Curve

Performance based on the following: elastomer fitted pump, flooded suction, water at ambient conditions.
The use of other materials and varying hydraulic conditions may result in deviations in excess of 5%.



Materials

Material Profile:

CAUTION! Operating temperature limitations are as follows:

	Operating Temperatures:	
	Max.	Min.
Conductive Acetal: Tough, impact resistant, ductile. Good abrasion resistance and low friction surface. Generally inert, with good chemical resistance except for strong acids and oxidizing agents.	190°F 88°C	-20°F -29°C
EPDM: Shows very good water and chemical resistance. Has poor resistance to oils and solvents, but is fair in ketones and alcohols.	280°F 138°C	-40°F -40°C
FKM: (Fluorocarbon) Shows good resistance to a wide range of oils and solvents; especially all aliphatic, aromatic and halogenated hydrocarbons, acids, animal and vegetable oils. Hot water or hot aqueous solutions (over 70°F) will attack FKM.	350°F 177°C	-40°F -40°C
Hytrel®: Good on acids, bases, amines and glycols at room temperatures only.	220°F 104°C	-20°F -29°C
Neoprene: All purpose. Resistance to vegetable oils. Generally not affected by moderate chemicals, fats, greases and many oils and solvents. Generally attacked by strong oxidizing acids, ketones, esters and nitro hydrocarbons and chlorinated aromatic hydrocarbons.	200°F 93°C	-10°F -23°C
Nitrile: General purpose, oil-resistant. Shows good solvent, oil, water and hydraulic fluid resistance. Should not be used with highly polar solvents like acetone and MEK, ozone, chlorinated hydrocarbons and nitro hydrocarbons.	190°F 88°C	-10°F -23°C
Nylon: 6/6 High strength and toughness over a wide temperature range. Moderate to good resistance to fuels, oils and chemicals.	180°F 82°C	32°F 0°C

Polypropylene: A thermoplastic polymer. Moderate tensile and flex strength. Resists strong acids and alkali. Attacked by chlorine, fuming nitric acid and other strong oxidizing agents.	180°F 82°C	32°F 0°C
PVDF: (Polyvinylidene Fluoride) A durable fluoroplastic with excellent chemical resistance. Excellent for UV applications. High tensile strength and impact resistance.	250°F 121°C	0°F -18°C
Santoprene®: Injection molded thermoplastic elastomer with no fabric layer. Long mechanical flex life. Excellent abrasion resistance.	275°F 135°C	-40°F -40°C
UHMW PE: A thermoplastic that is highly resistant to a broad range of chemicals. Exhibits outstanding abrasion and impact resistance, along with environmental stress-cracking resistance.	180°F 82°C	-35°F -37°C
Urethane: Shows good resistance to abrasives. Has poor resistance to most solvents and oils.	150°F 66°C	32°F 0°C
Virgin PTFE: (PFA/TFE) Chemically inert, virtually impervious. Very few chemicals are known to chemically react with PTFE; molten alkali metals, turbulent liquid or gaseous fluorine and a few fluoro-chemicals such as chlorine trifluoride or oxygen difluoride which readily liberate free fluorine at elevated temperatures.	220°F 104°C	-35°F -37°C

Maximum and Minimum Temperatures are the limits for which these materials can be operated. Temperatures coupled with pressure affect the longevity of diaphragm pump components. Maximum life should not be expected at the extreme limits of the temperature ranges.

Metals:

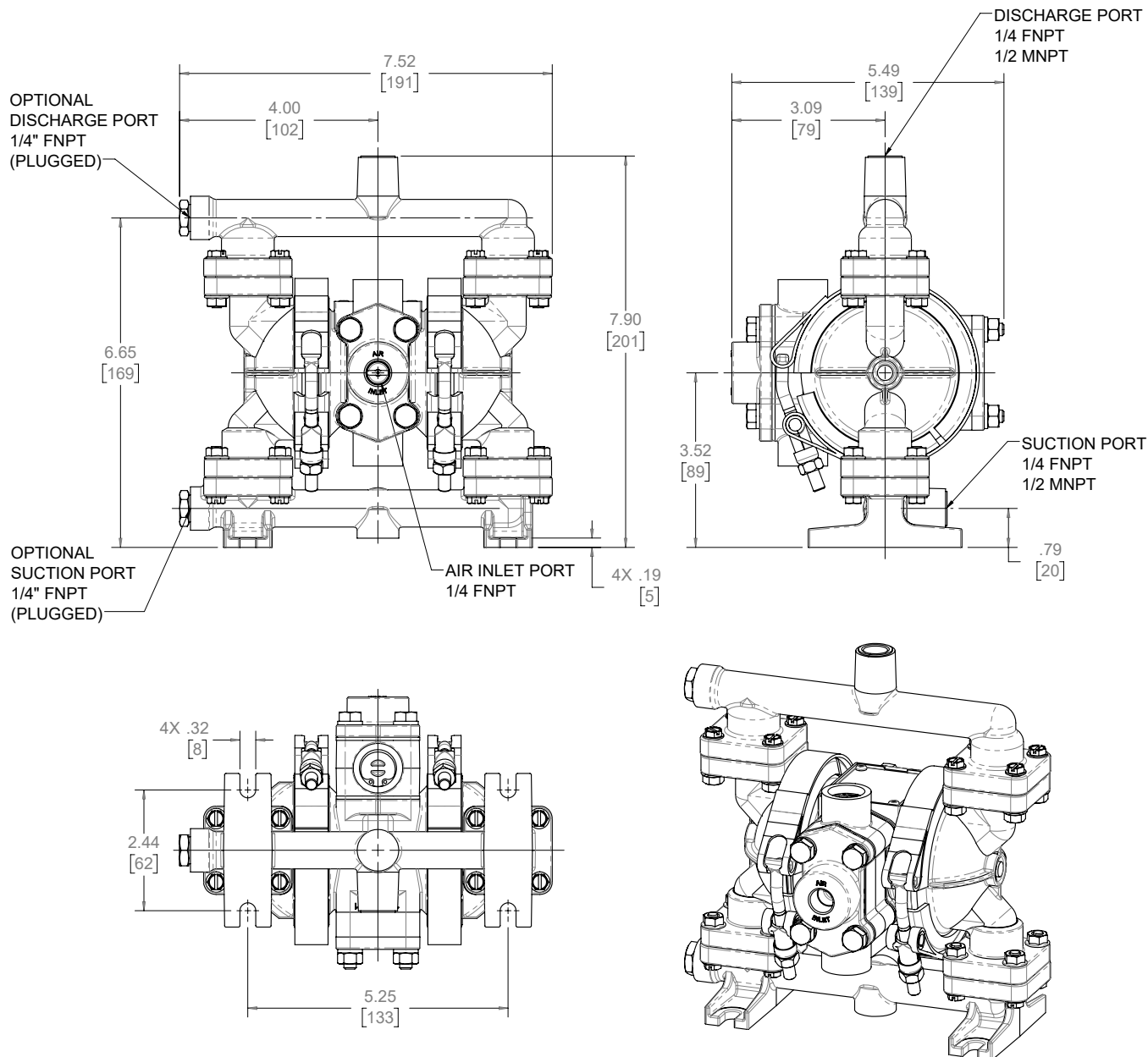
Alloy C: Equal to ASTM494 CW-12M-1 specification for nickel and nickel alloy.
Stainless Steel: Equal to or exceeding ASTM specification A743 CF-8M for corrosion resistant iron chromium, iron chromium nickel and nickel based alloy castings for general applications. Commonly referred to as 316 Stainless Steel in the pump industry.

For specific applications, always consult the Chemical Resistance Chart.

Dimensional Drawing

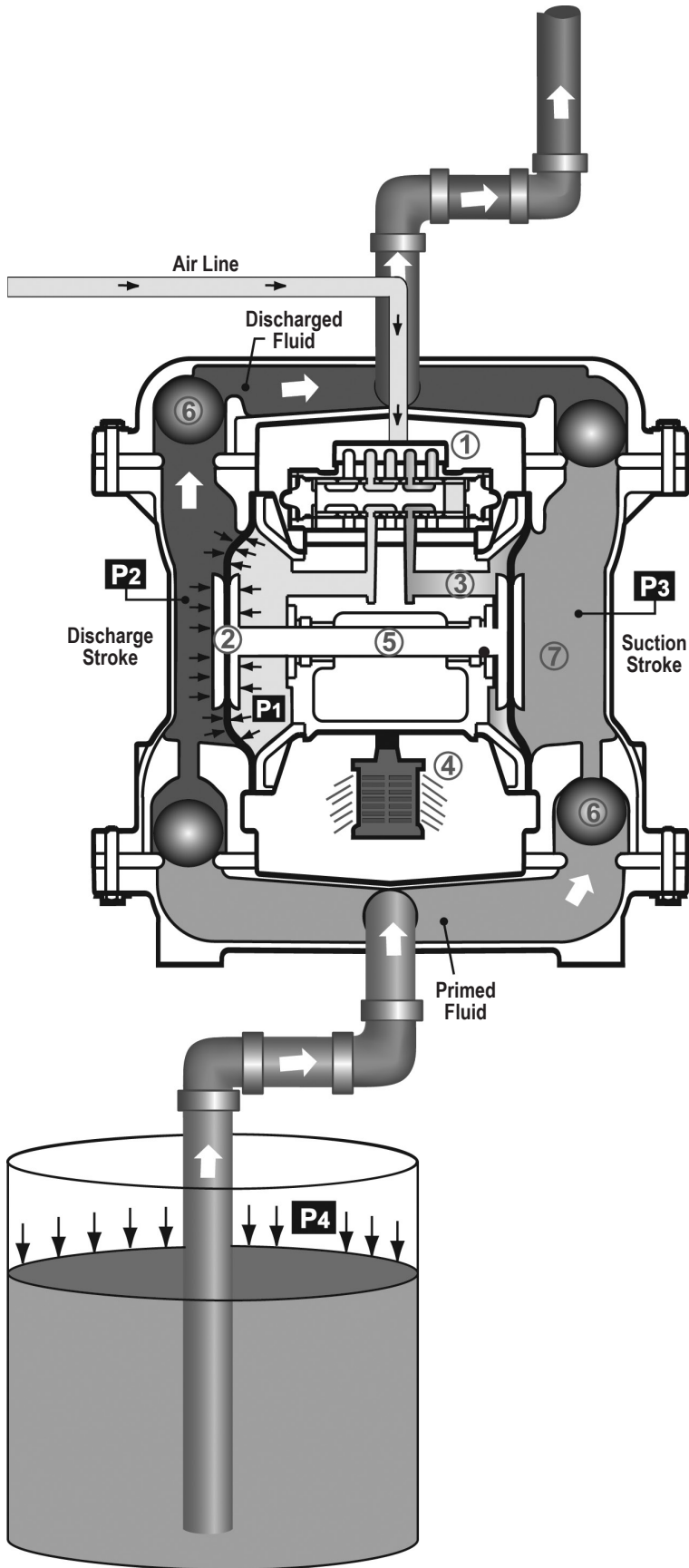
PB 1/4 Non-Metallic

Dimensions in inches (metric dimensions in brackets). Dimensional Tolerance .125" (3mm).



PB 1/4 NON-METALLIC
DESIGN LEVEL 4
DIMENSIONAL TOLERANCE = $\pm .125$ [3mm]

Principle of Pump Operation



Air-Operated Double Diaphragm (AODD) pumps are powered by compressed air or nitrogen.

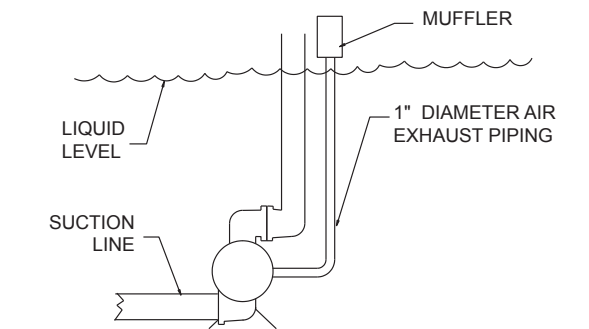
The main directional (air) control valve ① distributes compressed air to an air chamber, exerting uniform pressure over the inner surface of the diaphragm ②. At the same time, the exhausting air ③ from behind the opposite diaphragm is directed through the air valve assembly(s) to an exhaust port ④.

As inner chamber pressure (**P1**) exceeds liquid chamber pressure (**P2**), the rod ⑤ connected diaphragms shift together creating discharge on one side and suction on the opposite side. The discharged and primed liquid's directions are controlled by the check valves (ball or flap)⑥ orientation.

The pump primes as a result of the suction stroke. The suction stroke lowers the chamber pressure (**P3**) increasing the chamber volume. This results in a pressure differential necessary for atmospheric pressure (**P4**) to push the fluid through the suction piping and across the suction side check valve and into the outer fluid chamber ⑦.

Suction (side) stroking also initiates the reciprocating (shifting, stroking or cycling) action of the pump. The suction diaphragm's movement is mechanically pulled through its stroke. The diaphragm's inner plate makes contact with an actuator plunger aligned to shift the pilot signaling valve. Once actuated, the pilot valve sends a pressure signal to the opposite end of the main directional air valve, redirecting the compressed air to the opposite inner chamber.

SUBMERGED ILLUSTRATION



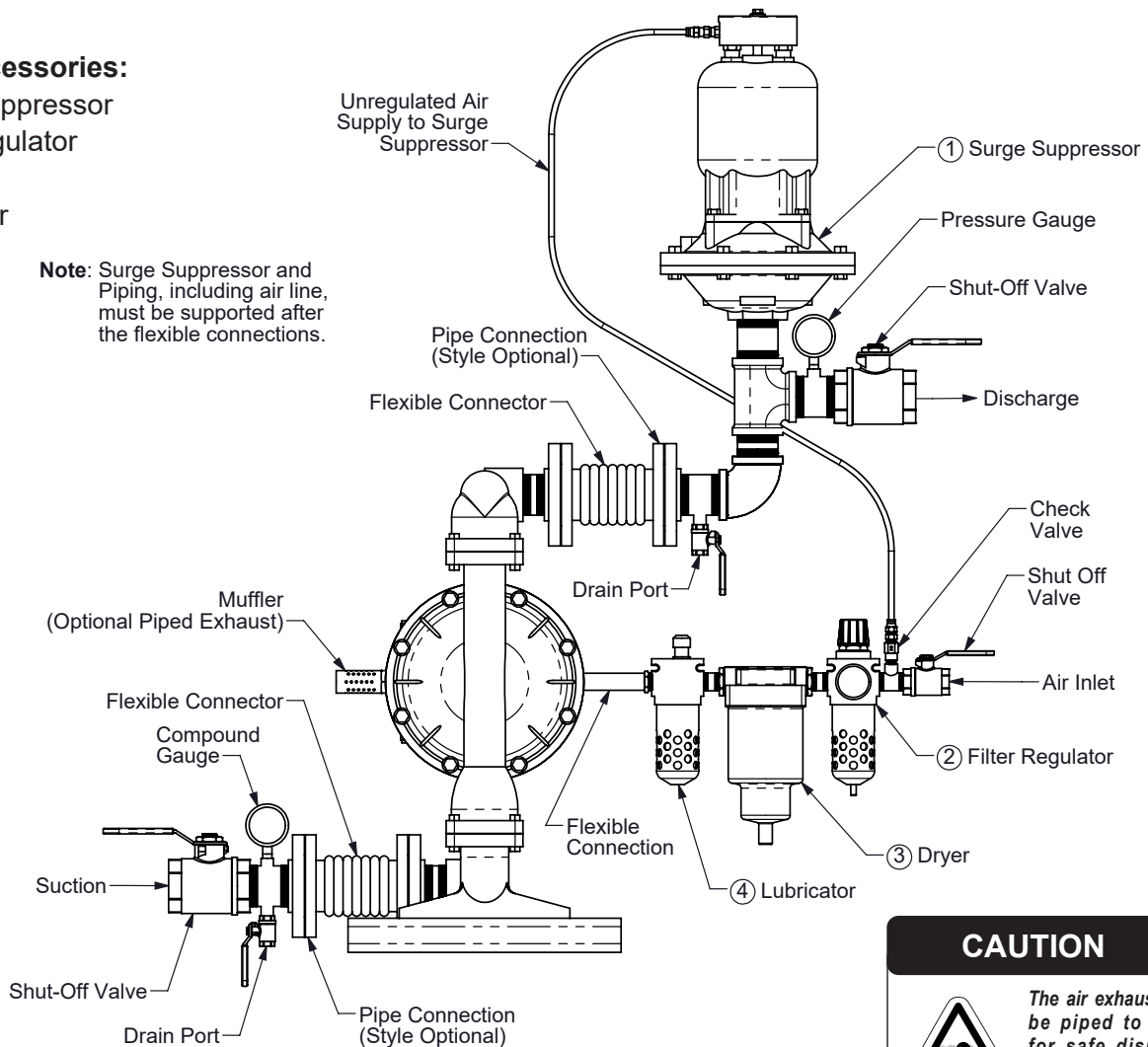
Pump can be submerged if the pump materials of construction are compatible with the liquid being pumped. The air exhaust must be piped above the liquid level. When the pumped product source is at a higher level than the pump (flooded suction condition), pipe the exhaust higher than the product source to prevent siphoning spills.

Recommended Installation Guide

Available Accessories:

1. Surge Suppressor
2. Filter/Regulator
3. Air Dryer
4. Lubricator

Note: Surge Suppressor and Piping, including air line, must be supported after the flexible connections.



CAUTION



The air exhaust should be piped to an area for safe disposition of the product being pumped, in the event of a diaphragm failure.

Installation And Start-Up

Locate the pump as close to the product being pumped as possible. Keep the suction line length and number of fittings to a minimum. Do not reduce the suction line diameter.

Air Supply

Connect the pump air inlet to an air supply with sufficient capacity and pressure to achieve desired performance. A pressure regulating valve should be installed to insure air supply pressure does not exceed recommended limits.

Air Valve Lubrication

The air distribution system is designed to operate WITHOUT lubrication. This is the standard mode of operation. If lubrication is desired, install an air line lubricator set to deliver one drop of SAE 10 non-detergent oil for every 20 SCFM (9.4 liters/sec.) of air the pump consumes. Consult the Performance Curve to determine air consumption.

Air Line Moisture

Water in the compressed air supply may cause icing or freezing of the exhaust air, causing the pump to cycle erratically or stop operating. Water in the air supply can be reduced by using a point-of-use air dryer.

Air Inlet And Priming

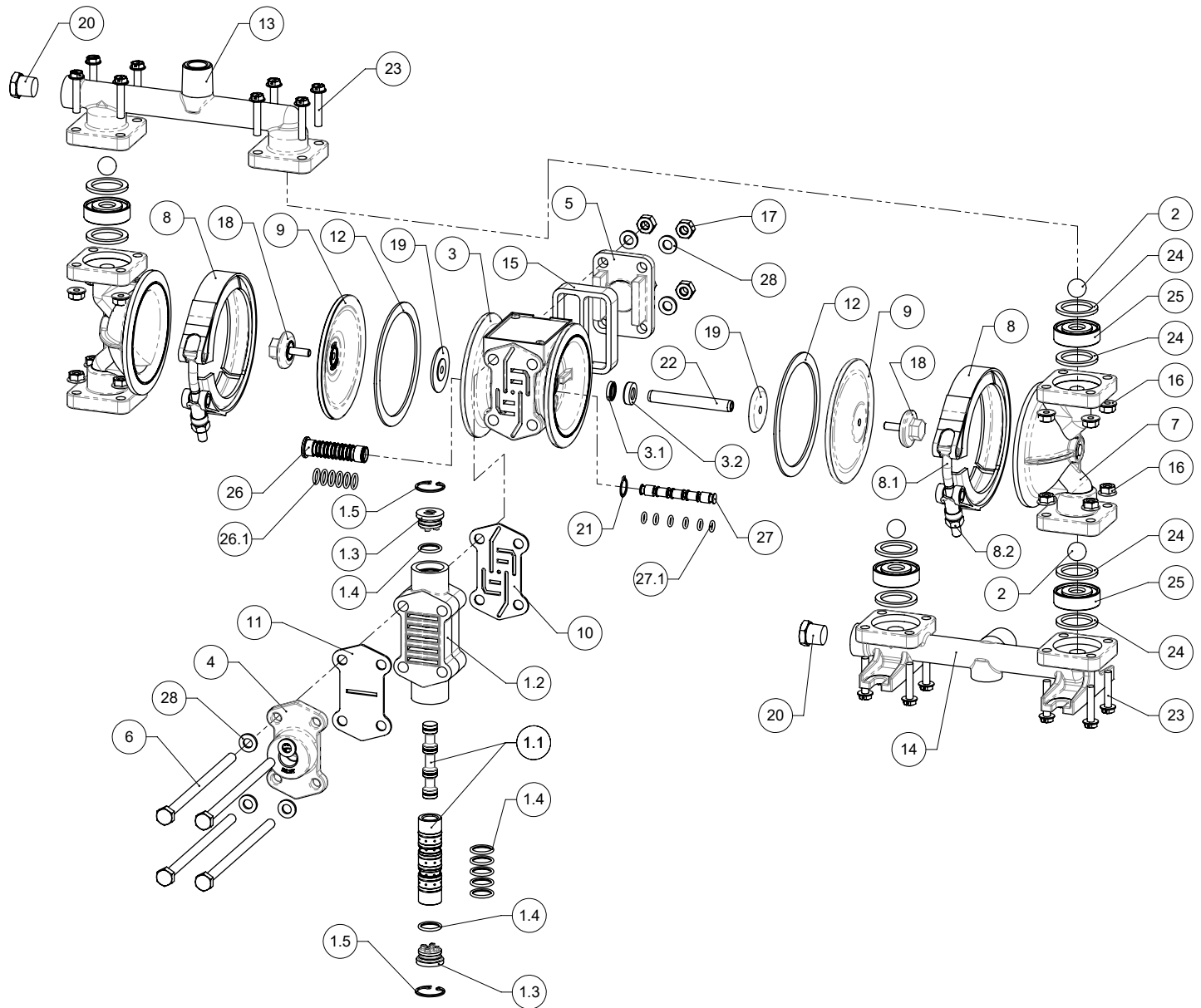
To start the pump, slightly open the air shut-off valve. After the pump primes, the air valve can be opened to increase air flow as desired. If opening the valve increases cycling rate, but does not increase the rate of flow, cavitation has occurred. The valve should be closed slightly to obtain the most efficient air flow to pump flow ratio.

Troubleshooting Guide

Symptom:	Potential Cause(s):	Recommendation(s):
Pump Cycles Once	Deadhead (system pressure meets or exceeds air supply pressure).	Increase the inlet air pressure to the pump. Pump is designed for 1:1 pressure ratio at zero flow. (Does not apply to high pressure 2:1 units).
	Air valve or intermediate gaskets installed incorrectly.	Install gaskets with holes properly aligned.
	Bent or missing actuator plunger.	Remove pilot valve and inspect actuator plungers.
Pump Will Not Operate / Cycle	Pump is over lubricated.	Set lubricator on lowest possible setting or remove. Units are designed for lube free operation.
	Lack of air (line size, PSI, CFM).	Check the air line size and length, compressor capacity (HP vs. CFM required).
	Check air distribution system.	Disassemble and inspect main air distribution valve, pilot valve and pilot valve actuators.
	Discharge line is blocked or clogged manifolds.	Check for inadvertently closed discharge line valves. Clean discharge manifolds/piping.
	Deadhead (system pressure meets or exceeds air supply pressure).	Increase the inlet air pressure to the pump. Pump is designed for 1:1 pressure ratio at zero flow. (Does not apply to high pressure 2:1 units).
	Blocked air exhaust muffler.	Remove muffler screen, clean or de-ice, and re-install.
	Pumped fluid in air exhaust muffler.	Disassemble pump chambers. Inspect for diaphragm rupture or loose diaphragm plate assembly.
	Pump chamber is blocked.	Disassemble and inspect wetted chambers. Remove or flush any obstructions.
Pump Cycles and Will Not Prime or No Flow	Cavitation on suction side.	Check suction condition (move pump closer to product).
	Check valve obstructed. Valve ball(s) not seating properly or sticking.	Disassemble the wet end of the pump and manually dislodge obstruction in the check valve pocket. Clean out around valve ball cage and valve seat area. Replace valve ball or valve seat if damaged. Use heavier valve ball material.
	Valve ball(s) missing (pushed into chamber or manifold).	Worn valve ball or valve seat. Worn fingers in valve ball cage (replace part). Check Chemical Resistance Guide for compatibility.
	Valve ball(s)/seat(s) damaged or attacked by product.	Check Chemical Resistance Guide for compatibility.
	Check valve and/or seat is worn or needs adjusting.	Inspect check valves and seats for wear and proper setting. Replace if necessary.
	Suction line is blocked.	Remove or flush obstruction. Check and clear all suction screens or strainers.
	Excessive suction lift.	For lifts exceeding 20' of liquid, filling the chambers with liquid will prime the pump in most cases.
	Suction side air leakage or air in product.	Visually inspect all suction-side gaskets and pipe connections.
	Pumped fluid in air exhaust muffler.	Disassemble pump chambers. Inspect for diaphragm rupture or loose diaphragm plate assembly.
Pump Cycles Running Sluggish/Stalling, Flow Unsatisfactory	Over lubrication.	Set lubricator on lowest possible setting or remove. Units are designed for lube free operation.
	Icing.	Remove muffler screen, de-ice, and re-install. Install a point of use air drier.
	Clogged manifolds.	Clean manifolds to allow proper air flow
	Deadhead (system pressure meets or exceeds air supply pressure).	Increase the inlet air pressure to the pump. Pump is designed for 1:1 pressure ratio at zero flow. (Does not apply to high pressure 2:1 units).
	Cavitation on suction side.	Check suction (move pump closer to product).
	Lack of air (line size, PSI, CFM).	Check the air line size, length, compressor capacity.
	Excessive suction lift.	For lifts exceeding 20' of liquid, filling the chambers with liquid will prime the pump in most cases.
	Air supply pressure or volume exceeds system hd.	Decrease inlet air (press. and vol.) to the pump. Pump is cavitating the fluid by fast cycling.
	Undersized suction line.	Meet or exceed pump connections.
	Restrictive or undersized air line.	Install a larger air line and connection.
	Suction side air leakage or air in product.	Visually inspect all suction-side gaskets and pipe connections.
	Suction line is blocked.	Remove or flush obstruction. Check and clear all suction screens or strainers.
	Pumped fluid in air exhaust muffler.	Disassemble pump chambers. Inspect for diaphragm rupture or loose diaphragm plate assembly.
	Check valve obstructed.	Disassemble the wet end of the pump and manually dislodge obstruction in the check valve pocket.
	Check valve and/or seat is worn or needs adjusting.	Inspect check valves and seats for wear and proper setting. Replace if necessary.
	Entrained air or vapor lock in chamber(s).	Purge chambers through tapped chamber vent plugs. Purging the chambers of air can be dangerous.
Product Leaking Through Exhaust	Diaphragm failure, or diaphragm plates loose.	Replace diaphragms, check for damage and ensure diaphragm plates are tight.
	Diaphragm stretched around center hole or bolt holes.	Check for excessive inlet pressure or air pressure. Consult Chemical Resistance Chart for compatibility with products, cleaners, temperature limitations and lubrication.
Premature Diaphragm Failure	Cavitation.	Enlarge pipe diameter on suction side of pump.
	Excessive flooded suction pressure.	Move pump closer to product. Raise pump/place pump on top of tank to reduce inlet pressure. Install Back pressure device (Tech bulletin 41r). Add accumulation tank or pulsation dampener.
	Misapplication (chemical/physical incompatibility).	Consult Chemical Resistance Chart for compatibility with products, cleaners, temperature limitations and lubrication.
	Incorrect diaphragm plates or plates on backwards, installed incorrectly or worn.	Check Operating Manual to check for correct part and installation. Ensure outer plates have not been worn to a sharp edge.
Unbalanced Cycling	Excessive suction lift.	For lifts exceeding 20' of liquid, filling the chambers with liquid will prime the pump in most cases.
	Undersized suction line.	Meet or exceed pump connections.
	Pumped fluid in air exhaust muffler.	Disassemble pump chambers. Inspect for diaphragm rupture or loose diaphragm plate assembly.
	Suction side air leakage or air in product.	Visually inspect all suction-side gaskets and pipe connections.
	Check valve obstructed.	Disassemble the wet end of the pump and manually dislodge obstruction in the check valve pocket.
	Check valve and/or seat is worn or needs adjusting.	Inspect check valves and seats for wear and proper setting. Replace if necessary.
	Entrained air or vapor lock in chamber(s).	Purge chambers through tapped chamber vent plugs.

For additional troubleshooting tips contact After Sales Support at service.warrenrupp@idexcorp.com or 419-524-8388

Composite Repair Parts Drawing



3: EXP VIEW

Service & Repair Kits

- 031.107.551** Main Air Valve Body Assembly
- 031.107.503** Main Air Valve Body Assembly (Conductive Acetal only)
- 031.101.000** Pilot Valve Assembly
- 475.145.000** Air Exhaust Conversion Kit
- 476.388.354** Wetted End Kit Santoprene Diaphragms & Balls
- 476.388.356** Wetted End Kit Hytrel Diaphragms & Balls
- 476.388.600** Wetted End Kit PTFE Diaphragms & Balls
- 476.388.644** Wetted End Kit Santoprene Diaphragms & PTFE Balls
- 476.129.000** Air End Kit

Composite Repair Parts List

Item	Part Number	Description	Qty
1	031.107.551	Valve, Main Air	1
	⚠ 031.107.503	Valve, Main Air (Conductive Acetal)	1
1.1	031.106.000	Sleeve and Spool Set (Includes O-Rings)	1
1.2	095.077.551	Body, Air Valve	1
	⚠ 095.077.503	Body, Air Valve (Conductive Acetal)	1
1.3	165.074.551	Cap, End, Air Valve	1
	⚠ 165.074.503	Cap, End, Air Valve (Conductive Acetal)	2
1.4	560.101.360	O-Ring	8
1.5	675.051.115	Ring, Retaining	2
2	050.033.354	Ball, Check (Santoprene)	4
	050.033.356	Ball, Check (Hytrel)	4
	050.034.600	Ball, Check (PTFE)	4
3	114.019.551 F	Intermediate	1
	⚠ 114.019.503 F	Intermediate (Conductive Acetal)	1
3.1	720.031.359	Seal, Diaphragm Rod	2
3.2	449.021.551	Insert, Gland	2
	⚠ 449.021.503	Insert, Gland (Conductive Acetal)	2
4	165.072.551	Cap, Air Inlet	1
	⚠ 165.072.503	Cap, Air Inlet (Conductive Acetal)	1
5	165.073.551	Cap, Muffler	1
	⚠ 165.073.503	Cap, Muffler (Conductive Acetal)	1
6	170.103.115	Capscrew, Hex HD, 1/4-20 X 5"	4
7	196.145.552	Chamber, Outer (Polypropylene)	2
	196.145.520	Chamber, Outer (PVDF)	2
	⚠ 196.145.502	Chamber, Outer (Conductive Acetal)	2
8	200.057.115	Clamp (Includes 8.1 & 8.2)	2
8.1	100.002.115	T-Bolt	2
8.2	545.027.337	Nut, Hex, 1/4-28UNF	2
9	286.069.354	Diaphragm (Santoprene)	2
	286.069.356	Diaphragm (Hytrel)	2
	286.070.600	Diaphragm (PTFE)	2
10	360.084.360	Gasket, Intermediate	1
11	360.085.360	Gasket, Valve Body	1
12	360.086.360	Gasket, Spacer	2
13	518.210.552	Manifold, Discharge (Polypropylene) (Includes Plug)	1
	518.210.520	Manifold, Discharge (PVDF) (Includes Plug)	1
	⚠ 518.210.502	Manifold, Discharge (Conductive Acetal) (Includes Plug)	1
14	518.211.552	Manifold, Suction (Polypropylene) (Includes Plug)	1
	518.211.520	Manifold, Suction (PVDF) (Includes Plug)	1
	⚠ 518.211.502	Manifold, Suction (Conductive Acetal) (Includes Plug)	1
15	530.022.550	Muffler	1
16	544.004.115	Nut, Hex Flange, 10-32	16
17	545.003.330	Nut, Hex, 1/4-20	4
18	612.146.552	Plate, Outer Diaphragm (Polypropylene)	2
	612.146.520	Plate, Outer Diaphragm (PVDF)	2
	⚠ 612.146.502	Plate, Outer Diaphragm (Conductive Acetal)	2
19	612.147.150	Plate, Inner Diaphragm	2
20	618.056.552	Plug, Manifold (Polypropylene)	2
	618.056.520	Plug, Manifold (PVDF)	2
	⚠ 618.056.502	Plug, Manifold (Conductive Acetal)	2
21	675.047.115	Ring, Retaining	1
22	685.046.120	Rod, Diaphragm	1
23	706.023.115	Screw, Slotted Hex, Flange, 10-32 X 1.00	16
24	720.032.600	Seal, Check Valve	8
25	722.073.552	Seat, Check Valve (Polypropylene)	4
	⚠ 722.073.520	Seat, Check Valve (PVDF)	4
	722.073.506	Seat, Check Valve (Conductive Acetal)	4
26	755.038.000	Sleeve, Pilot Valve (Includes O-Ring)	1
26.1	560.066.360	O-Ring	6
27	775.038.000	Spool, Pilot Valve (Includes O-Ring)	1
27.1	560.029.374	O-Ring	6
28	901.037.115	Washer, Flat, 1/4	8
39	⚠ 920.025.000	Grounding Cable (Conductive Acetal) (Not Shown)	1

3: EXP VIEW

Material Codes - The Last 3 Digits of Part Number

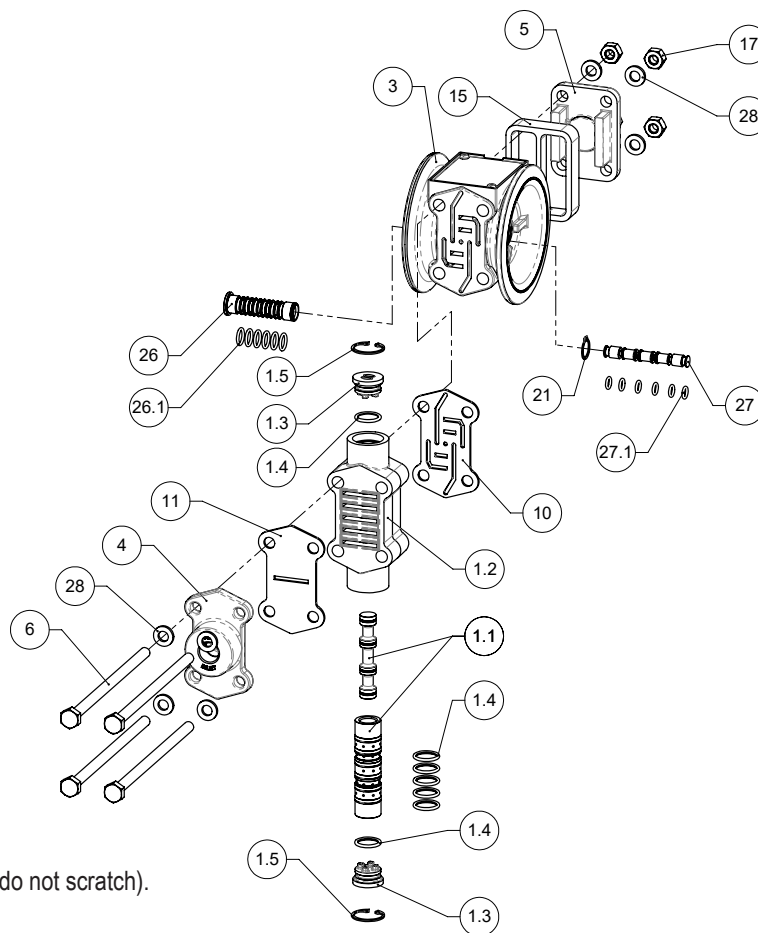
000	Assembly, sub-assembly; and some purchased items	364	E.P.D.M. Rubber Color coded: BLUE
010	Cast Iron	365	Neoprene Rubber Color coded: GREEN
015	Ductile Iron	366	Food Grade Nitrile
020	Ferritic Malleable Iron	368	Food Grade EPDM
080	Carbon Steel, AISI B-1112	371	Philthane (Tuftane)
110	Alloy Type 316 Stainless Steel	374	Carboxylated Nitrile
111	Alloy Type 316 Stainless Steel (Electro Polished)	375	Fluorinated Nitrile
112	Alloy C	378	High Density Polypropylene
113	Alloy Type 316 Stainless Steel (Hand Polished)	379	Conductive Nitrile
114	303 Stainless Steel	408	Cork and Neoprene
115	302/304 Stainless Steel	425	Compressed Fibre
117	440-C Stainless Steel (Martensitic)	426	Blue Gard
120	416 Stainless Steel (Wrought Martensitic)	440	Vegetable Fibre
148	Hardcoat Anodized Aluminum	500	Delrin® 500
150	6061-T6 Aluminum	502	Conductive Acetal, ESD-800
152	2024-T4 Aluminum (2023-T351)	503	Conductive Acetal, Glass-Filled
155	356-T6 Aluminum	506	Delrin® 150
156	356-T6 Aluminum	520	Injection Molded PVDF Natural color
157	Die Cast Aluminum Alloy #380	540	Nylon
158	Aluminum Alloy SR-319	542	Nylon
162	Brass, Yellow, Screw Machine Stock	544	Nylon Injection Molded
165	Cast Bronze, 85-5-5-5	550	Polyethylene
166	Bronze, SAE 660	551	Glass Filled Polypropylene
170	Bronze, Bearing Type, Oil Impregnated	552	Unfilled Polypropylene
180	Copper Alloy	555	Polyvinyl Chloride
305	Carbon Steel, Black Epoxy Coated	556	Black Vinyl
306	Carbon Steel, Black PTFE Coated	557	Unfilled Conductive Polypropylene
307	Aluminum, Black Epoxy Coated	558	Conductive HDPE
308	Stainless Steel, Black PTFE Coated	559	Glass-Filled Conductive Polypropylene
309	Aluminum, Black PTFE Coated	570	Rulon II®
313	Aluminum, White Epoxy Coated	580	Ryton®
330	Zinc Plated Steel	600	PTFE (virgin material) Tetrafluorocarbon (TFE)
332	Aluminum, Electroless Nickel Plated	603	Blue Gylon®
333	Carbon Steel, Electroless Nickel Plated	604	PTFE
335	Galvanized Steel	606	PTFE
337	Silver Plated Steel	607	Envelon
351	Food Grade Santoprene®	608	Conductive PTFE
353	Geolast; Color: Black	610	PTFE Encapsulated Silicon
354	Injection Molded #203-40 Santoprene® Duro 40D +/-5; Color: RED	611	PTFE Encapsulated FKM
356	Hytrel®	632	Neoprene/Hytrel®
357	Injection Molded Polyurethane	633	FKM/PTFE
358	Urethane Rubber (Some Applications) (Compression Mold)	634	EPDM/PTFE
359	Urethane Rubber	635	Neoprene/PTFE
360	Nitrile Rubber Color coded: RED	637	PTFE, FKM/PTFE
363	FKM (Fluorocarbon) Color coded: YELLOW	638	PTFE, Hytrel®/PTFE
		639	Nitrile/TFE
		643	Santoprene®/EPDM
		644	Santoprene®/PTFE
		656	Santoprene® Diaphragm and Check Balls/EPDM Seats
		661	EPDM/Santoprene®
		666	FDA Nitrile Diaphragm,

PTFE Overlay, Balls, and Seals
668 PTFE, FDA Santoprene®/PTFE
Delrin and Hytrel are registered
tradenames of E.I. DuPont.
Nylatron is a registered tradename
of Polymer Corp.
Gylon is a registered tradename
of Garlock, Inc.
Santoprene is a registered tradename
of Exxon Mobil Corp.
Rulon II is a registered tradename
of Dixon Industries Corp.
Ryton is a registered tradename
of Phillips Chemical Co.
Valox is a registered tradename
of General Electric Co.

RECYCLING

Warren Rupp is an ISO14001 registered company and is committed to minimizing the impact our products have on the environment. Many components of SANDPIPER® AODD pumps are made of recyclable materials. We encourage pump users to recycle worn out parts and pumps whenever possible, after any hazardous pumped fluids are thoroughly flushed. Pump users that recycle will gain the satisfaction to know that their discarded part(s) or pump will not end up in a landfill. The recyclability of SANDPIPER products is a vital part of Warren Rupp's commitment to environmental stewardship.

Main Air Distribution Valve and Pilot Valve



Air Distribution Valve Servicing

See repair parts drawing, remove screws.

Step 1: Remove end cap retainer (1.5).

Step 2: Remove end cap (1.3).

Step 3: Remove spool part of (1.1) (caution: do not scratch).

Step 4: Press sleeve (1.1) from body (1.2).

Step 5: Inspect O-Rings (1-4) and replace if necessary.

Step 6: Lightly lubricate O-Rings (1-4) on sleeve (1.1).

Step 7: Press sleeve (1.1) into body (1.2).

Step 8: Reassemble in reverse order, starting with step 4.

Note: Sleeve and spool (1-1) set is match ground to a specified clearance. Sleeve and spools (1-1) cannot be interchanged.

Pilot Valve Servicing

With Pilot Valve removed from pump.

Step 1: Remove snap ring (21).

Step 2: Remove sleeve (26), inspect O-Rings (26.1), replace if required.

Step 3: Remove spool (27) from sleeve (27.1), inspect O-Rings (3E), replace if required.

Step 4: Lightly lubricate O-Rings (26.1) and (27.1). Reassemble in reverse order.

Main Air Valve Assembly Parts List

Item	Part Number	Description	Qty
1	031.107.551	Valve, Main Air	1
1.1	031.106.000	Sleeve and Spool Set (Includes O-Rings)	1
1.2	095.077.551	Body, Air Valve	1
1.3	165.074.551	Cap, End, Air Valve	2
1.4	560.101.360	O-Ring	8
1.5	675.051.115	Ring, Retaining	2

Main Air Valve Assembly Parts List

Item	Part Number	Description	Qty
1	031.107.503	Valve, Main Air (Conductive Acetal)	1
1.1	031.106.000	Sleeve and Spool Set (Includes O-Rings)	1
1.2	095.077.503	Body, Air Valve	1
1.3	165.074.503	Cap, End, Air Valve	2
1.4	560.101.360	O-Ring	8
1.5	675.051.115	Ring, Retaining	2

Pilot Valve Assembly Parts List

Item	Part Number	Description	Qty
21	675.047.115	Ring, Retaining	1
26	755.038.000	Sleeve, Pilot Valve (Includes O-Ring)	1
26.1	560.066.360	O-Ring	6
27	775.038.000	Spool, Pilot Valve (Includes O-Ring)	1
27.1	560.029.374	O-Ring	6

IMPORTANT



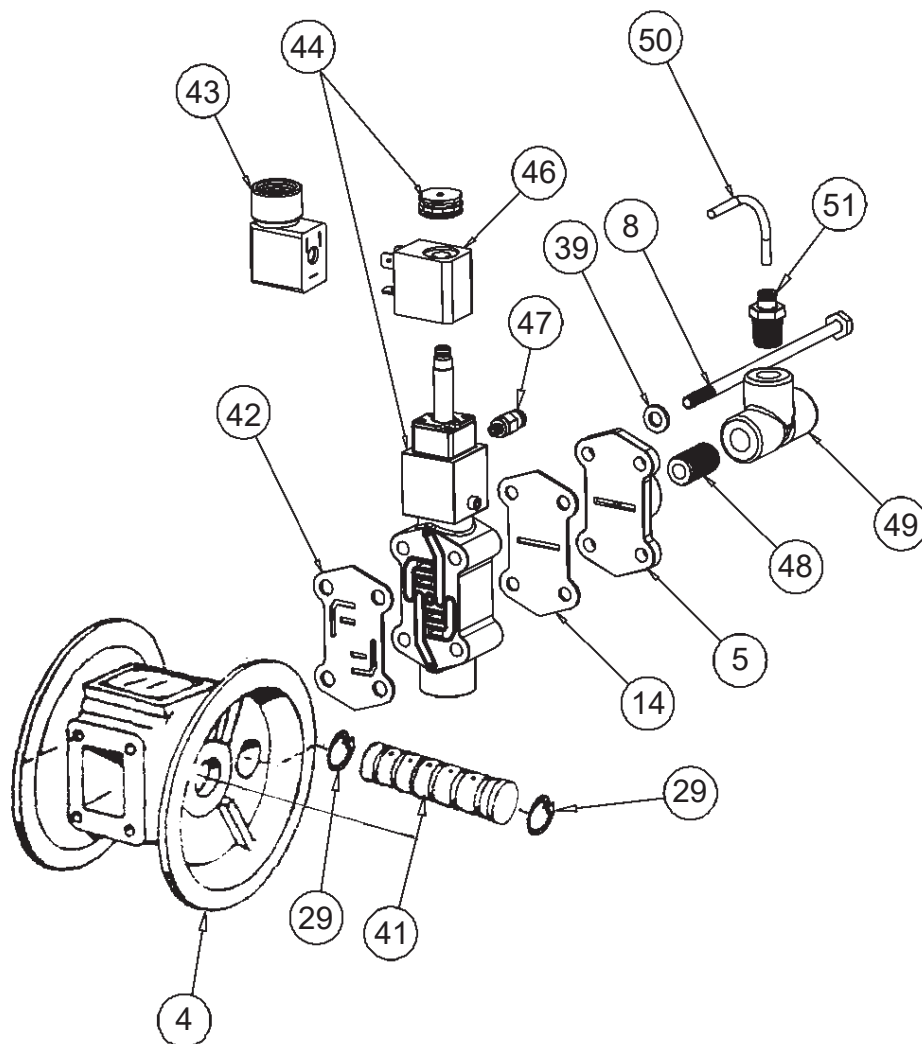
Read these instructions completely, before installation and start-up. It is the responsibility of the purchaser to retain this manual for reference. Failure to comply with the recommendations stated in this manual will damage the pump, and void factory warranty.



ATEX Compliant

Solenoid Shifted Option Drawing

ASSEMBLY INSTRUCTIONS: Must Be Performed Prior To Start-Up. The tee (item 49), nipple (item 48), fitting (item 51) and tubing (item 50) have been pre-assembled at the factory. Thread this assembly into the air inlet cap (item 5). Be careful not to over tighten. Push the free end of the tubing into the fitting (item 47) which is attached to the valve.



SOLENOID SHIFTED AIR VALVE PARTS LIST

(Includes all items used on Composite Repair Parts List except as shown)

Item	Part Number	Description	Qty
29	675.047.115	Ring, Retaining . Pilot Plug Sleeve	2
41	755.037.000	Pilot Plug Sleeve with O.rings	1
42	360.106.360	Gasket, Intermediate Bracket	1
43	241.001.000	Connector, conduit	1
44	893.095.000	Solenoid Valve, NEMA 4	1
46	219.001.000	Solenoid Coil, 24 VDC	1
	219.004.000	Solenoid Coil, 24 VAC/12 VDC	1
	219.002.000	Solenoid Coil, 120 VAC	1
	219.003.000	Solenoid Coil, 240 VAC	1
47	866.068.000	Tube Fitting	1
48	538.083.555	Nipple	1
49	835.009.555	Tee, Pipe	1
50	860.062.540	Tubing	1
51	866.069.000	Tube Fitting	1

FOR EXPLOSION PROOF SOLENOID VALVE

46	219.009.001	Solenoid Coil, 120VAC 60 Hz	1
	219.009.002	Solenoid Coil, 240VAC 60 Hz	1
	219.009.003	Solenoid Coil, 12VDC	1
	219.009.004	Solenoid Coil, 24VDC	1
	219.009.005	Solenoid Coil, 110VAC 50 Hz	1
	219.009.006	Solenoid Coil, 230VAC 50 Hz	1

Solenoid Shifted Air Distribution Valve Option

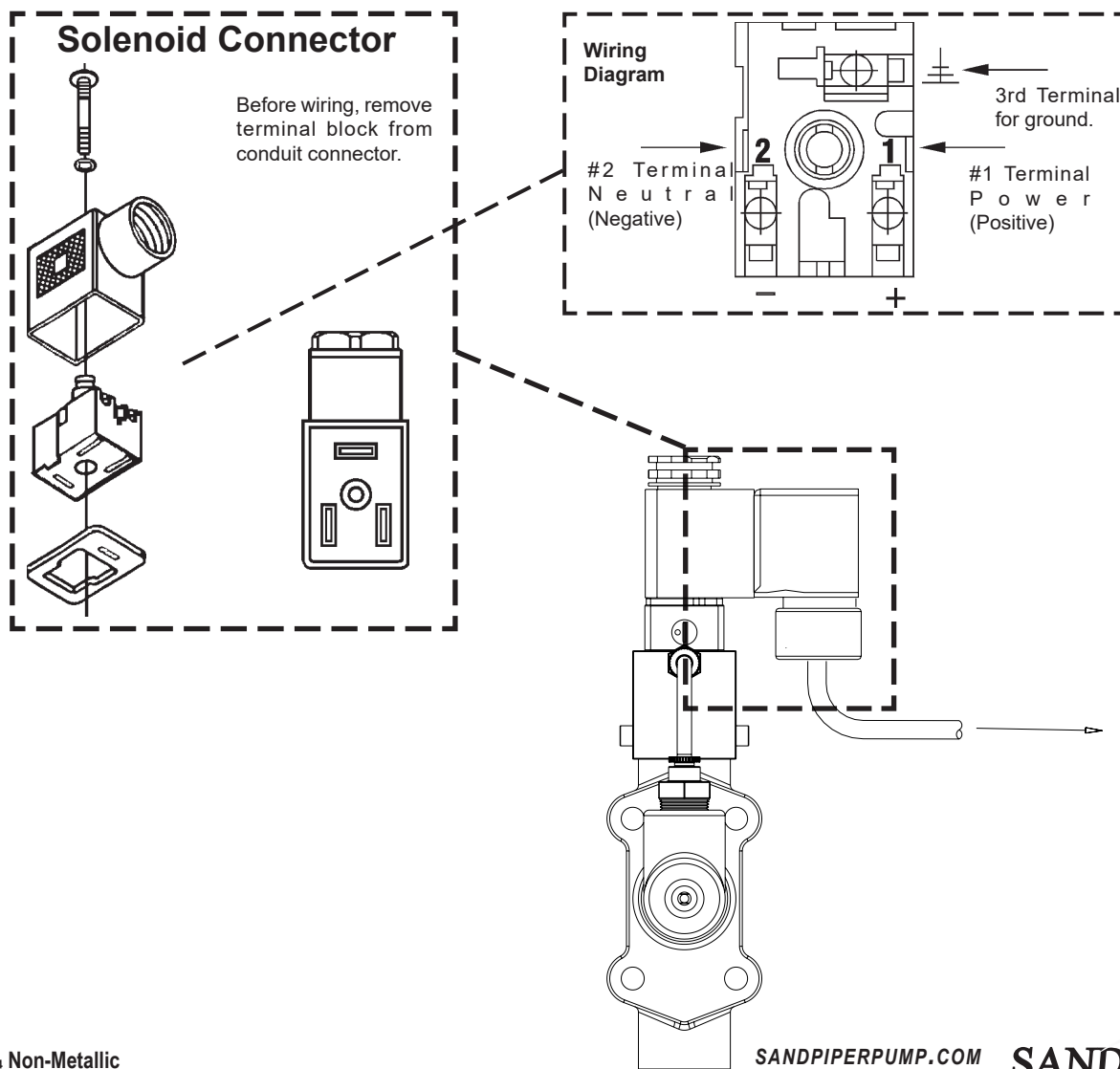
Warren Rupp's solenoid shifted, air distribution valve option utilizes electrical signals to precisely control your SANDPIPER's speed. The solenoid coil is connected to a customer - supplied control. Compressed air provides the pumping power, while electrical signals control pump speed (pumping rate).

OPERATION

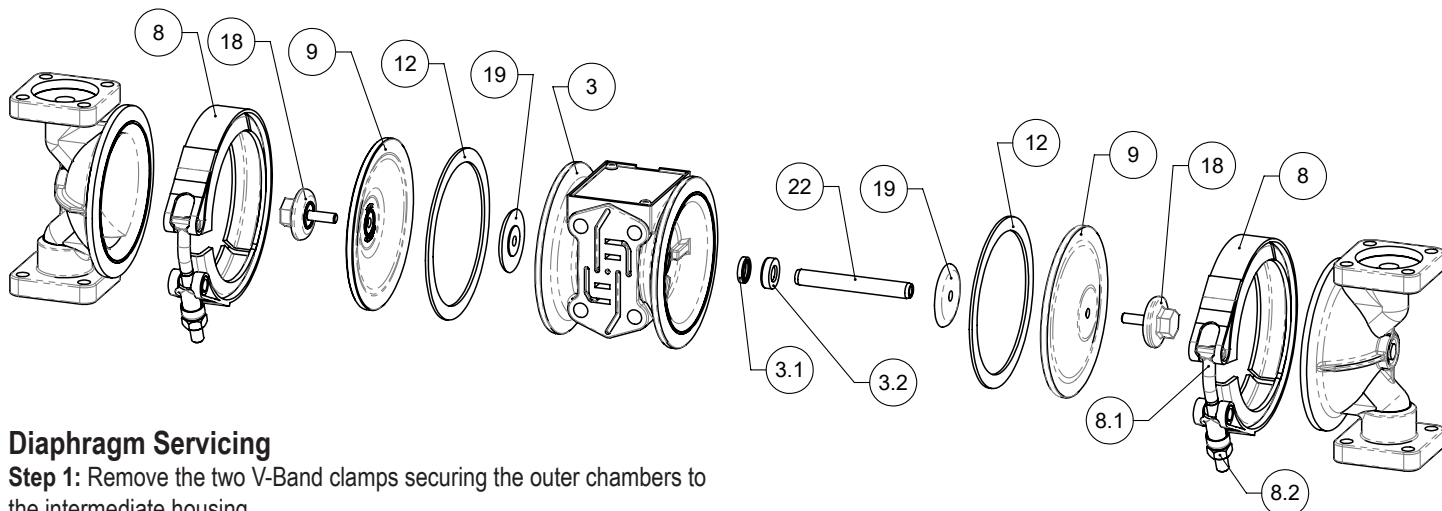
The Solenoid Shifted SANDPIPER has a solenoid operated, air distribution valve in place of the standard SANDPIPER's pilot operated, air distribution valve. Where a pilot valve is normally utilized to cycle the pump's air distribution valve, an electric solenoid is utilized. As the solenoid is powered, one of the pump's air chambers is pressurized while the other chamber is exhausted. When electric power is turned off, the solenoid shifts and the pressurized chamber is exhausted while the other chamber is pressurized. By alternately applying and removing power to the solenoid, the pump cycles much like a standard SANDPIPER pump, with one exception. This option provides a way to precisely control and monitor pump speed.

BEFORE INSTALLATION

Before wiring the solenoid, make certain it is compatible with your system voltage.



Diaphragm and Rod Servicing



Diaphragm Servicing

Step 1: Remove the two V-Band clamps securing the outer chambers to the intermediate housing.

Step 2: Remove the diaphragm assembly (outer plate, diaphragm, spacer gasket (for PTFE units only, inner plate) by turning the assembly counterclockwise using a 1/2" (1.27 cm) wrench on the outer plate lugs. (If a socket is used, it must be a six-point socket.) The interior components consisting of the shaft seal and pilot valve assembly are now accessible for service.

Step 3: Procedures for reassembling the diaphragms are the reverse of the above. Install the diaphragm with the natural bulge outward.

Step 4: Install the outer diaphragm plate on the outside of the diaphragm and make certain that the large radius side of the inner plate is toward the diaphragm.

Step 5: Tighten the outer diaphragm plate to approximately 30 in./lbs. (3.39 Newton meters). Torque while allowing the diaphragm to turn freely with plates. Use a wrench on the outer diaphragm plate of the opposite side to keep rod from rotating. If the opposite chamber is assembled, the rod need not be held.

Diaphragm Rod Seals Servicing

Step 1: To service the rod seals first remove pilot valve, then remove the inserts on each of the intermediate brackets by prying them out with a small flat screwdriver.

Step 2: After removing the inserts take the K-R rod seals out of the inserts and replace.

Step 3: When reinstalling the seals, make sure the open side of the seals face into the counterbore in the inserts.

Step 4: To install the inserts into intermediate bracket, simply press the insert into the counterbore in each of the intermediate bracket, making sure that the closed side of insert faces out. The inserts should be flush to the surface of the intermediate bracket or slightly below the surface when fully installed.

Item	Part Number	Description	Qty
3	114.019.551 F	Intermediate	1
	▲ 114.019.503 F	Intermediate (Conductive Acetal)	1
3.1	720.031.359	Seal, Diaphragm Rod	2
3.2	449.021.551	Insert, Gland	2
	449.021.503	Insert, Gland (Conductive Acetal)	2
8	200.057.115	Clamp (Includes 81 & 82)	2
8.1	100.002.115	T-Bolt	2
8.2	545.027.337	Nut, Hex, 1/4-28UNF	2
9	286.069.354	Diaphragm (Santoprene)	4
	286.069.356	Diaphragm (Hytrel)	4
	286.070.600	Diaphragm (PTFE)	4
12	360.086.360	Gasket, Spacer (PTFE Configuration Only)	2
18	612.146.552	Plate, Outer Diaphragm (Polypropylene)	2
	612.146.520	Plate, Outer Diaphragm (PVDF)	2
	612.146.502	Plate, Outer Diaphragm (Conductive Acetal)	2
19	612.147.150	Plate, Inner Diaphragm	2
22	685.046.120	Rod, Diaphragm	1

IMPORTANT



Read these instructions completely, before installation and start-up. It is the responsibility of the purchaser to retain this manual for reference. Failure to comply with the recommendations stated in this manual will damage the pump, and void factory warranty.



ATEX Compliant

5 - YEAR Limited Product Warranty

Warren Rupp, Inc. ("Warren Rupp") warrants to the original end-use purchaser that no product sold by Warren Rupp that bears a Warren Rupp brand shall fail under normal use and service due to a defect in material or workmanship within five years from the date of shipment from Warren Rupp's factory. Warren Rupp brands include Warren Rupp®, SANDPIPER®, SANDPIPER Signature Series™, MARATHON®, Porta-Pump®, SludgeMaster™ and Tranquilizer®.

The use of non-OEM replacement parts will void (or negate) agency certifications, including CE, ATEX, CSA, 3A and EC1935 compliance (Food Contact Materials). Warren Rupp, Inc. cannot ensure nor warrant non-OEM parts to meet the stringent requirements of the certifying agencies.

**WARREN
RUPP, INC.**

Declaration of Conformity

**Manufacturer: Warren Rupp, Inc., 800 N. Main Street
Mansfield, Ohio, 44902 USA**

Certifies that Air-Operated Double Diaphragm Pump Series: HDB, HDF, M Non-Metallic, S Non-Metallic, M Metallic, S Metallic, T Series, G Series, U Series, EH and SH High Pressure, RS Series, W Series, F Series, SMA and SPA Submersibles, and Tranquilizer® Surge Suppressors comply with the European Community Directive 2006/42/EC on Machinery, according to Annex VIII.

This product has used Harmonized Standard EN809:2012, Pumps and Pump Units for Liquids - Common Safety Requirements, to verify conformance.

David Roseberry
Signature of authorized person

October 20, 2005
Date of issue

Authorised Representative:
IDEX Pump Technologies
R79 Shannon Industrial Estate
Shannon, Co. Clare, Ireland

Director of Engineering
Title

February 27, 2017
Date of revision

Attn: Barry McMahon



Revision Level: F



EU Declaration of Conformity

Manufacturer:

Warren Rupp, Inc.
A Unit of IDEX Corporation
800 North Main Street
Mansfield, OH 44902 USA

Warren Rupp, Inc. declares that Air Operated Double Diaphragm Pumps (AODD) and Surge Suppressors listed below comply with the requirements of **Directive 2014/34/EU** and all applicable standards.

Applicable Standards

- EN ISO 80079-36: 2016
- EN ISO 80079-37: 2016
- EN ISO 60079-25: 2010

1. AODD Pumps and Surge Suppressors - Technical File No.: 20310400-1410/MERHazardous Location Applied:

II 2 G Ex h IIC T5...225°C (T2) Gb
 II 2 D Ex h IIIC T100°C...T200°C Db
II 2 G Ex h IIB T5...225°C (T2) Gb
II 2 D Ex h IIIB T100°C...T200°C Db

- Metallic pump models with external aluminum components (S Series, HD Series, G Series, DMF Series, MSA Series, U Series, F Series, T Series, EH Series, SH Series, GH Series)
- Conductive plastic pump models with integral muffler (S Series, PB Series)
- Tranquilizer® surge suppressors

2. AODD Pumps - EU Type Examination Certificate No.: DEKRA 18ATEX0094X - DEKRA Certification B.V. (0344)Hazardous Location Applied:

I M1 Ex h I Ma
II 1 G Ex h IIC T5...225°C (T2) Ga
II 1 D Ex h IIIC T100°C...T200°C Da
 II 2 G Ex h ia IIC T5 Gb
II 2 D Ex h ia IIIC T100°C Db
II 2 G Ex h mb IIC T5 Gb
II 2 D Ex mb tb IIIC T100° Db

Meander 1051
6825 MJ Arnhem
The Netherlands

- Metallic pump models with no external aluminum (S series, HD Series, G series)
- Conductive plastic pumps equipped with metal muffler (S series, PB Series)
- ATEX pump models equipped with ATEX rated pulse output kit or solenoid kit

➤ See "ATEX Details" page in user's manual for more information
➤ See "Safety Information" page for conditions of safe use

DATE/APPROVAL/TITLE:
26 SEP 2018


David Roseberry, Director of Engineering