

SERVICE & OPERATING MANUAL

Original Instructions



Model PB 1/4 Type 3

Air-Operated Double Diaphragm Pump



See pages 2, 13 and
for ATEX ratings.



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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.

RECYCLING

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.

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.

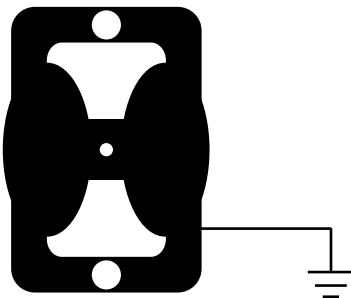


This pump is pressurized internally with air pressure during operation. Make certain that all fasteners are in good condition and are reinstalled properly during reassembly.



Use safe practices when lifting

Grounding ATEX Pumps



ATEX compliant pumps are suitable for use in explosive atmospheres when the equipment is properly grounded in accordance with local electrical codes. Pumps equipped with electrically conductive diaphragms are suitable for the transfer of conductive or non-conductive fluids of any explosion group. When operating pumps equipped with non-conductive diaphragms that exceed the maximum permissible projected area, as defined in EN 13461-1: 2009 section 6.7.5 table 9, 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

For further guidance on ATEX applications, please consult the factory.

Quality System
ISO 9001 Certified

Environmental Man-
agement System ISO
14001 Certified



See pages 2, 13 and 14
for ATEX ratings.



**Model PB^{1/4}
Type 3**

**Air-Operated
Double Diaphragm Pump**

Engineering, Performance
& Construction Data



| | | | | | |
|---|---|---|---|---|---|
| INTAKE/DISCHARGE PIPE SIZE 1/4" NPT (internal) 1/2" NPT (external) | CAPACITY 0 to 4 gallons per minute (0 to 15 liters per minute) | AIR VALVE No-lube, no-stall design | SOLIDS-HANDLING Up to 1/32" (1mm) | HEADS UP TO 100 psi or 231 ft. of water (7 bar or 70 meters) | DISPLACEMENT/STROKE .01 US Gallons / .04 liters |
|---|---|---|---|---|---|

CAUTION! Operating temperature limitations are as follows:

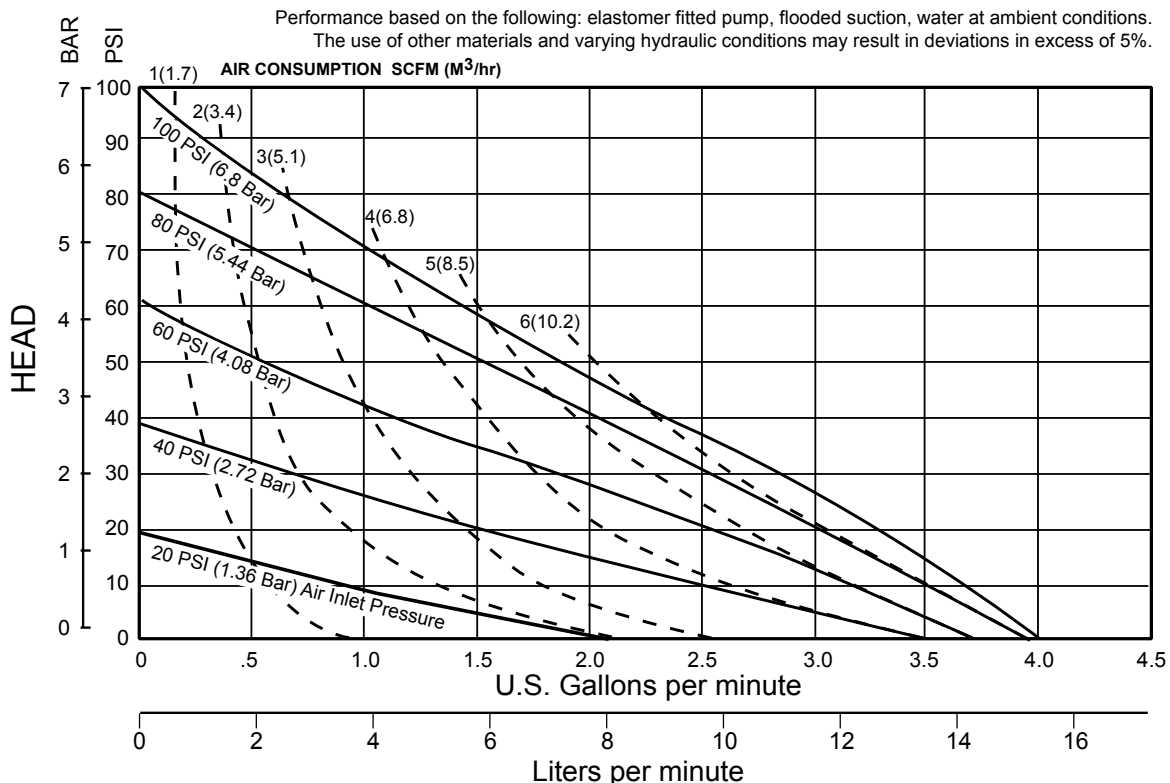
Materials

| | Operating Temperatures | |
|--|------------------------|----------------|
| | Maximum | Minimum |
| Santoprene® Injection molded thermoplastic elastomer with no fabric layer. Long mechanical flex life. Excellent abrasion resistance. | 275°F 135°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 |
| Virgin PTFE Chemically inert, virtually impervious. Very few chemicals are known to react chemically 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 |
| PVDF | 250°F 121°C | 0°F -18°C |
| Polypropylene | 180°F 82°C | 32°F 0°C |
| Conductive Acetal | 190°F 88°C | -20°F -29°C |

For specific applications, always consult the Warren Rupp "Chemical Resistance Chart"

CAUTION: 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.

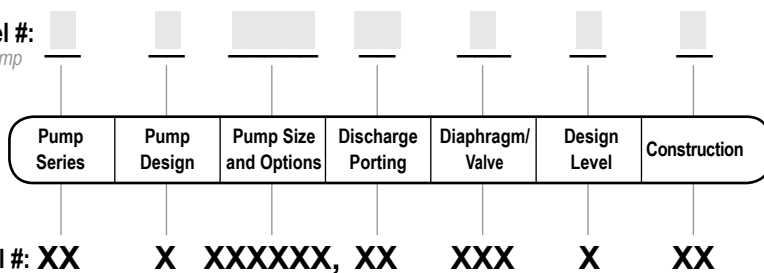
Maximum and Minimum Temperatures are the limits for which these materials can be operated. Temperatures coupled with pressure affect the longevity of diaphragm pump components. Maximum life should not be expected at the extreme limits of the temperature ranges.



(SANDPIPER® pumps are designed to be powered only by compressed air)

Explanation of Pump Nomenclature

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



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 Top

H Horizontal Suction and Discharge

V Vertical Discharge

VV Vertical Suction and Discharge

Diaphragm Check Valve Materials

S Santoprene

T Virgin PTFE

U Santoprene Diaphragms/PTF E Ball

Design Level

3

Construction

P Polypropylene Wet End and Center

K PVDF Wet End and Polypropylene Center

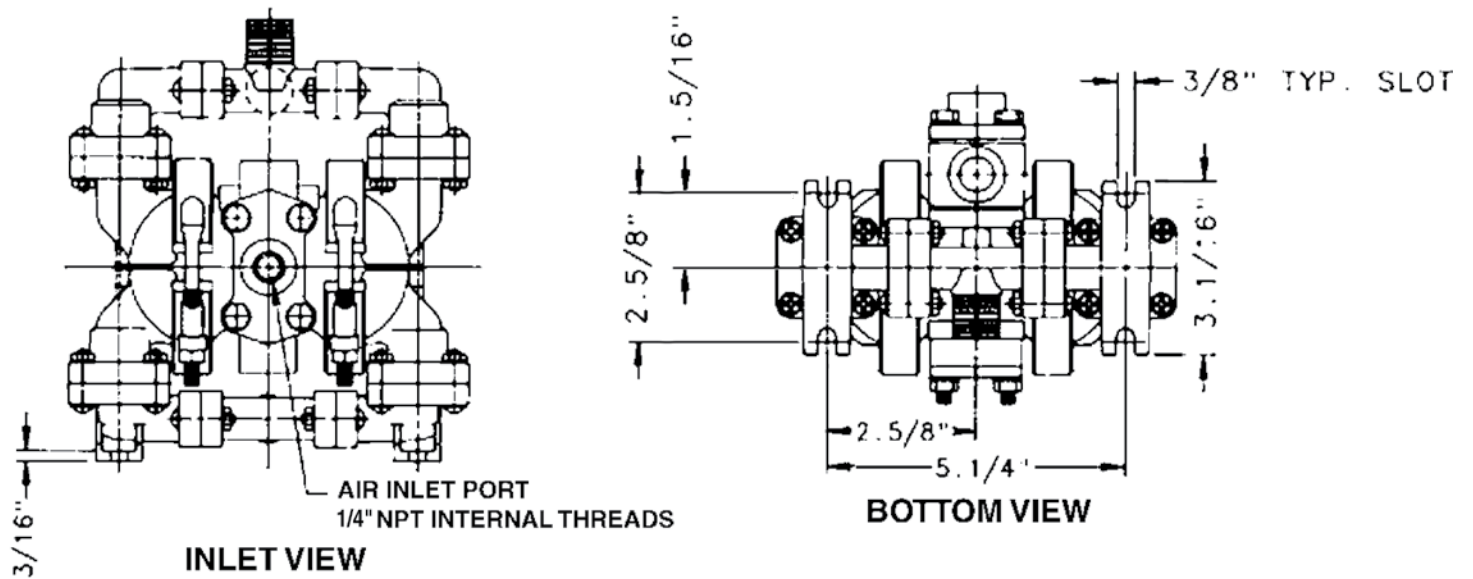
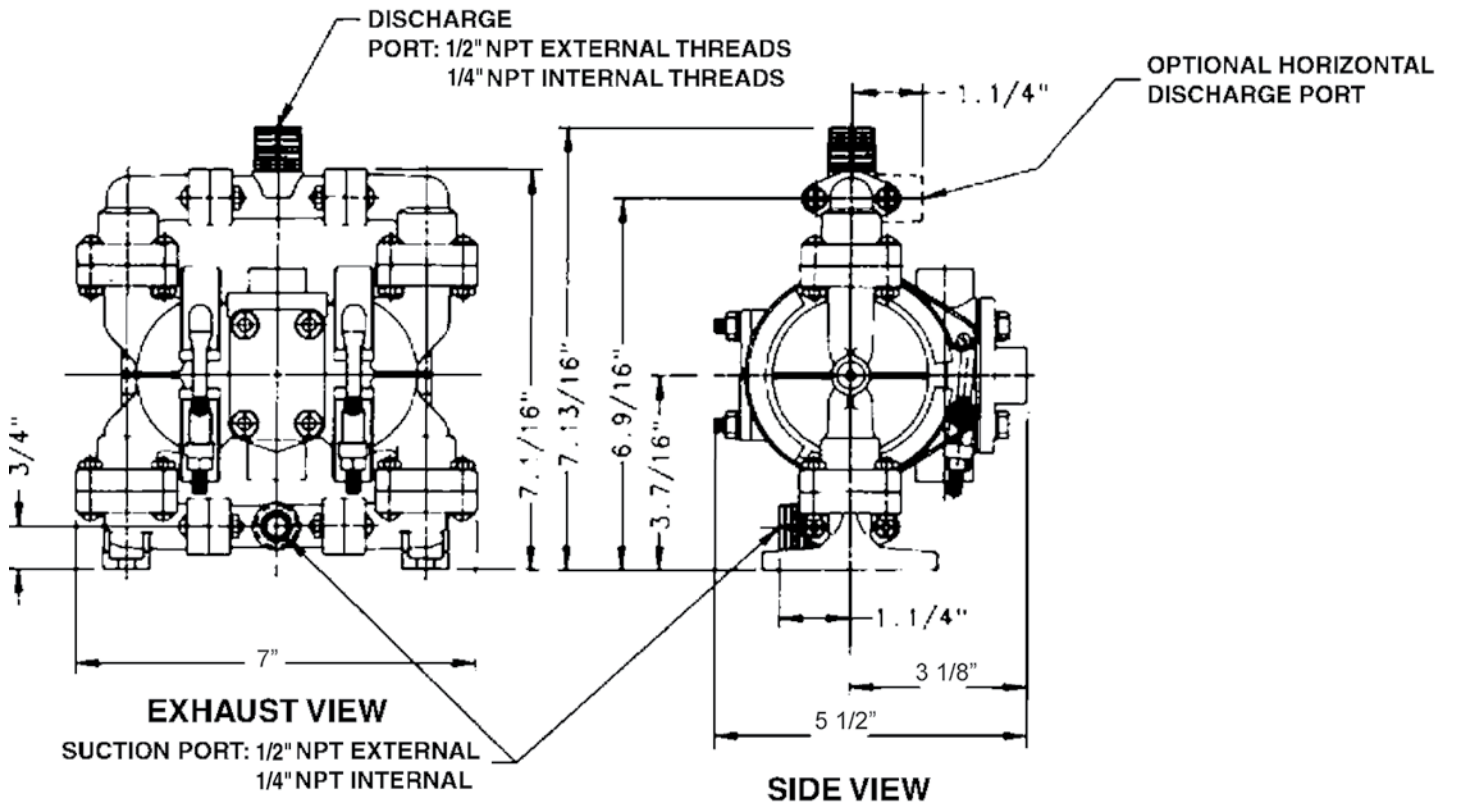
△ CA Conductive Acetal Wet End and Center

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

ATEX Detail

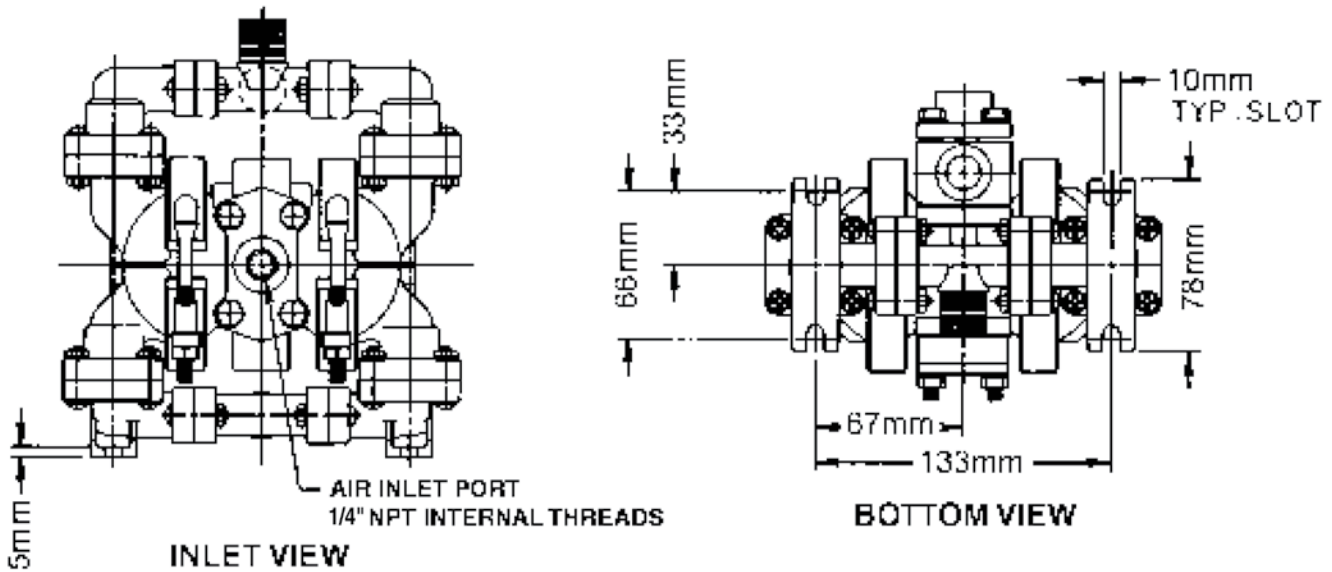
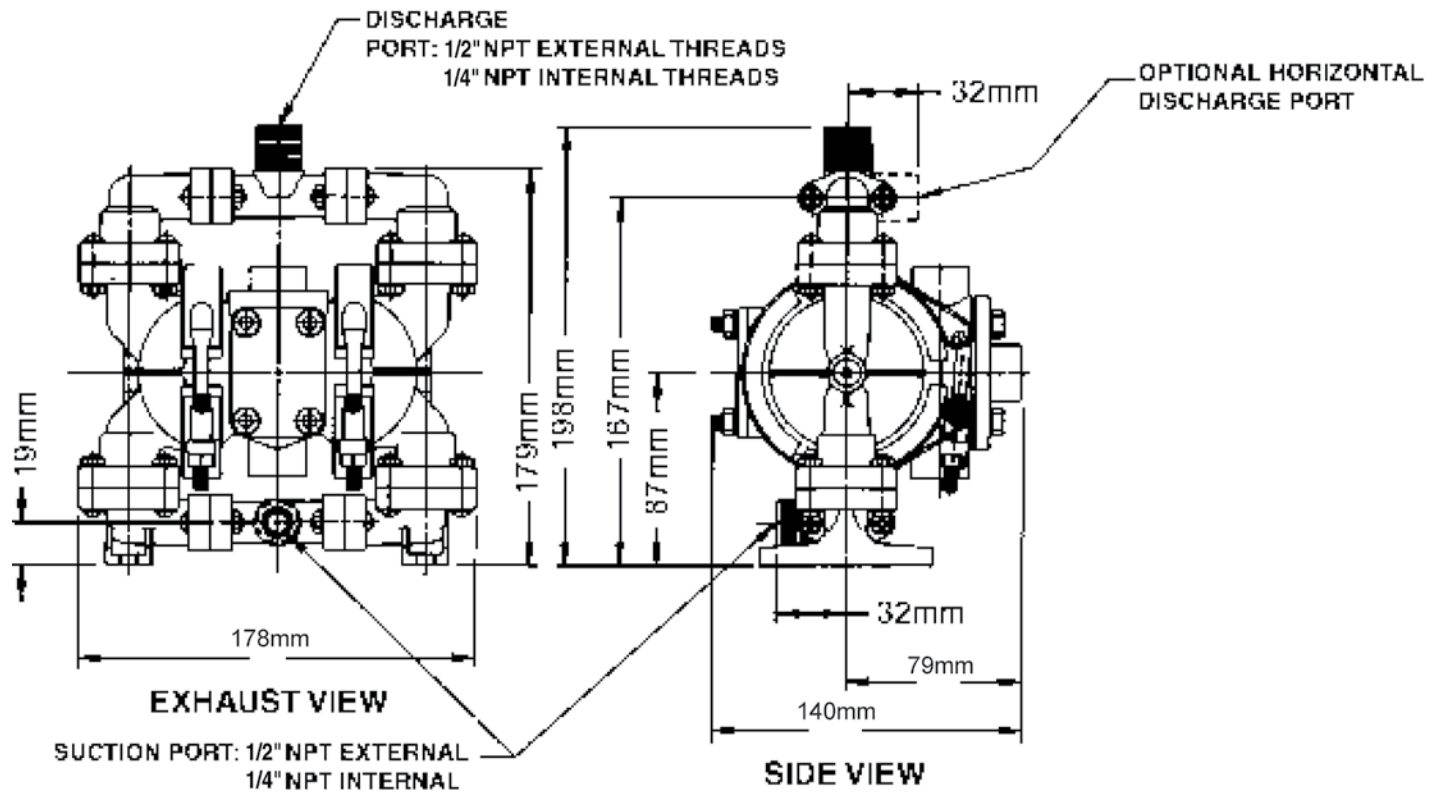
| | ATEX Detail | Construction | Muffler Options | Options |
|--|---|--------------|-----------------|---------|
| | II 1G c T5 II 1D c T100°C I M1 c I M2 c | CA | Metal | 00 |
| | II 2G c T5 II 2D c T100°C | CA | Integral | 00 |
| | II 2G Ex ia c II T5 II 2D Ex c iaD 20 IP67 T100°C | CA | Integral | P1 |

Dimensions: PB $\frac{1}{4}$ Non-Metallic



| Dimension | A | B | C |
|------------------|----|--------|--------|
| Standard | 7" | 3 1/8" | 5 1/2" |
| Pulse Output Kit | 7" | 3 1/8" | 5 1/2" |

Metric Dimensions: PB¹/₄ Non-Metallic



| Dimension | A | B | C |
|------------------|-----|----|-----|
| Standard | 178 | 79 | 140 |
| Pulse Output Kit | 178 | 79 | 140 |

PRINCIPLE OF PUMP OPERATION

This ball type check valve pump is powered by compressed air and is a 1:1 ratio design. The inner side of one diaphragm chamber is alternately pressurized while simultaneously exhausting the other inner chamber. This causes the diaphragms, which are connected by a common rod secured by plates to the centres of the diaphragms, to move in a reciprocating action. (As one diaphragm performs the discharge stroke the other diaphragm is pulled to perform the suction stroke in the opposite chamber.) Air pressure is applied over the entire inner surface of the diaphragm while liquid is discharged from the opposite side of the diaphragm. The diaphragm operates in a balanced condition during the discharge stroke which allows the pump to be operated at discharge heads over 200 feet (61 meters) of water.

For maximum diaphragm life, keep the pump as close to the liquid being pumped as possible. Positive suction head in excess of 10 feet of liquid (3.048 meters) may require a back pressure regulating device to maximize diaphragm life.

Alternate pressurizing and exhausting of the diaphragm chamber is performed by an externally mounted, pilot operated, four way spool type air distribution valve. When the spool shifts to one end of the valve body, inlet pressure is applied to one diaphragm chamber and the other diaphragm chamber exhausts. When the spool shifts to the opposite end of the valve body, the pressure to the chambers is reversed. The air distribution valve spool is moved by an internal pilot valve which alternately pressurizes one end of the air distribution valve spool while exhausting the other end. The pilot valve is shifted at each end of the dia-

phragm stroke when an actuator plunger is contacted by the diaphragm plate. This actuator plunger then pushes the end of the pilot valve spool into position to activate the air distribution valve.

The chambers are connected with manifolds with a suction and discharge check valve for each chamber, maintaining flow in one direction through the pump.

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.

For installations of rigid piping, short sections of flexible hose should be installed between the pump and the piping. The flexible hose reduces vibration and strain to the pumping system. A surge suppressor is recommended to further reduce pulsation in flow.

AIR SUPPLY

Air supply pressure cannot exceed 100 psi (7 bar). Connect the pump air inlet to an air supply of sufficient capacity and pressure required for desired performance. When the air supply line is solid piping, use a short length of flexible hose not less than 1/2" (13mm) in diameter between the pump and the piping to reduce strain to the piping. The weight of the air supply line, regulators and filters must be supported by some means other than the air inlet cap. Failure to provide support for the piping may result in damage to the pump. A pressure regulating valve should be installed to insure air supply pressure does not exceed recommended limits.

AIR VALVE LUBRICATION

The air distribution valve and the pilot valve are designed to operate WITHOUT lubrication. This is the preferred mode of operation. There may be instances of personal preference or poor quality air supplies when lubrication of the compressed air supply is required. The pump air system will operate with properly lubricated compressed air supply. Proper lubrication requires the use of an air line lubricator (available from Warren Rupp) set to deliver one drop of SAE 10 non-detergent oil for every 20 SCFM (9.4 liters/sec.) of air the pump consumes at the point of operation. Consult the pump's published Performance Curve to determine this.

AIR LINE MOISTURE

Water in the compressed air supply can create problems such as 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 to supplement the user's air drying equipment. This device removes water from the compressed air supply and alleviates the icing or freezing problems.

AIR INLET AND PRIMING

To start the pump, open the air valve approximately 1/2 to 3/4 turn. 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.

BETWEEN USES

When the pump is used for materials that tend to settle out or solidify when not in motion, the pump should be flushed after each use to prevent damage. (Product remaining in the pump between uses could dry out or settle out. This could cause problems with the diaphragms and check valves at restart.) In freezing temperatures the pump must be completely drained between uses in all cases.

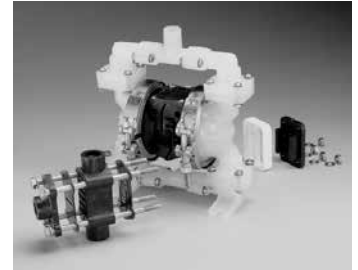


Figure 1



Figure 2

CHECK VALVE SERVICING

Need for inspection or service is usually indicated by poor priming, unstable cycling, reduced performance or the pump's cycling but not pumping.

Remove the sixteen machine screws securing the manifold assemblies to the outer chambers. Inspect the surfaces of both check valve and seat for wear or damage that could prevent proper sealing. If pump is to prime properly, valves must seat air tight.

DIAPHRAGM SERVICING

Remove the two V-Band clamps securing the outer chambers to the intermediate housing. Remove the diaphragm assembly (outer plate, diaphragm, 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.

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

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. 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.

EXTERNALLY SERVICEABLE MAIN AIR DISTRIBUTION VALVE

To service the main air distribution, first shut-off and disconnect the air supply to the pump. Remove the four long hex cap screws and hex nuts (on opposite side of pump) which fasten the main air valve body (item 1), gaskets (item 8 and 11), muffler (item 14), and caps (item 6 and 15) to the pump.

Once the main air valve body is off the pump remove the retaining rings (items 7) that hold the end caps in place. Remove the end caps (items 6) to inspect the spool and sleeve. Remove the main air spool (part of item 2) and inspect for damage or wear. Inspect the inside diameter of the main air valve (item 2) for dirt, scratches, or other contaminants. Remove and replace the sleeve if needed. When reinstalling the sleeve, apply a light coating of grease to the six o-rings (item 3) before inserting the sleeve into the main air valve body. Align the holes in the sleeve with the slots in main valve body, making sure the sleeve is centered in the bore. Clean the main air valve spool, lightly grease the o-rings, and insert into the sleeve flush to one end. Reinstall the end caps and retaining rings. The main air valve body is now ready to put back on the pump.

Assemble the air inlet cap (item 9), valve body gasket (item 8), to the main air valve body (making sure the five rectangular slots face the air inlet cap), and the intermediate gasket onto the four hex

capscrews and install onto the pump. Slide the muffler (item 14) and the exhaust cap (item 15) over the capscrews. Re-install the washers (item 10) and hex nuts (items 16) onto the four hex capscrews and torque to 30 in./lbs. (3.39 Newton meters).

SERVICING THE PILOT VALVE

To remove the pilot valve spool (item 23) first remove the end o-ring (item 24) from one end of spool. Slide the spool out of the sleeve and inspect the five remaining o-rings (items 24) for damage or wear. If necessary, replace damaged o-rings. Inspect the inner diameter of pilot valve sleeve (item 20) for scratches, dirt, or other contaminants. Replace the sleeve if necessary. To remove the sleeve first remove the retaining ring from one end. When installing a pilot valve sleeve first lightly grease the six o-rings (items 21). Insert the sleeve into the chamfered end of bore on the intermediate bracket (item 13). Push the sleeve in until the shoulder is flush to intermediate bracket surface and install the retaining ring (item 22). To install the pilot valve spool first lightly grease the four interior o-rings and insert into the pilot valve sleeve. After inserting the spool into the sleeve install the remaining loose o-rings onto spool.

SERVICING DIAPHRAGM ROD SEALS

To service the rod seals (item 18) first remove pilot valve, then remove the inserts on each of the intermediate brackets (item 17) by prying them out with a small flat screwdriver. After removing the inserts take the K-R rod seals out of the inserts and replace. When reinstalling the seals, make sure

the open side of the seals face into the counterbore in the inserts. 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.



Figure 3



Figure 4

TROUBLESHOOTING

Possible Symptoms:

- Pump will not cycle.
- Pump cycles, but produces no flow.
- Pump cycles, but flow rate is unsatisfactory.
- Pump cycle seems unbalanced.
- Pump cycle seems to produce excessive vibration.

What to Check: Excessive suction lift in system.

Corrective Action: For lifts exceeding 20 feet (6 meters), filling the pumping chambers with liquid will prime the pump in most cases.

What to Check: Excessive flooded suction in system.

Corrective Action: For flooded conditions exceeding 10 feet (3 meters) of liquid, install a back pressure device.

What to Check: System head exceeds air supply pressure.

Corrective Action: Increase the inlet air pressure to the pump. Most diaphragm pumps are designed for 1:1 pressure ratio at zero flow.

What to Check: Air supply pressure or volume exceeds system head.

Corrective Action: Decrease inlet air pressure and volume to the pump as calculated on the published PERFORMANCE CURVE. Pump is cavitating the fluid by fast cycling.

What to Check: Undersized suction line.

Corrective Action: Meet or exceed pump connection recommendations shown on the DIMENSIONAL DRAWING.

What to Check: Restricted or undersized air line.

Corrective Action: Install a larger air line and connection. Refer to air inlet recommendations shown in your pump's SERVICE MANUAL.

What to Check: Check ESADS, the Externally Serviceable Air Distribution System of the pump.

Corrective Action: Disassemble and inspect the main air distribution valve, pilot valve and pilot valve actuators. Refer to the parts drawing and air valve section of the SERVICE MANUAL. Check for clogged discharge or closed valve before reassembly.

What to Check: Rigid pipe connections to pump.

Corrective Action: Install flexible connectors and a Warren Rupp® Tranquilizer® surge suppressor.

What to Check: Blocked air exhaust muffler.

Corrective Action: Remove muffler screen, clean or de-ice and reinstall. Refer to the Air Exhaust section of your pump SERVICE MANUAL.

What to Check: Pumped fluid in air exhaust muffler.

Corrective Action: Disassemble pump chambers. Inspect for diaphragm rupture or loose diaphragm plate assembly. Refer to the Diaphragm Replacement section of your pump SERVICE MANUAL.

What to Check: Suction side air leakage or air in product.

Corrective Action: Visually inspect all suction side gaskets and pipe connections.

What to Check: Obstructed check valve.

Corrective Action: Disassemble the wet end of the pump and manually dislodge obstruction in the check valve pocket. Refer to the Check Valve section of the pump SERVICE MANUAL for disassembly instructions.

What to Check: Worn or misaligned check valve or check valve seat.

Corrective Action: Inspect check valves and seats for wear and proper seating. Replace if necessary. Refer to Check Valve section of the pump SERVICE MANUAL for disassembly instructions.

What to Check: Blocked suction line.

Corrective Action: Remove or flush obstruction. Check and clear all suction screens and strainers.

What to Check: Blocked discharge line.

Corrective Action: Check for obstruction or closed discharge line valves.

What to Check: Blocked pumping chamber.

Corrective Action: Disassemble and inspect the wetted chambers of the pump. Remove or flush any obstructions.

What to Check: Entrained air or vapor lock in one or both pumping chambers.

Corrective Action: Purge chambers through tapped chamber vent plugs. PURGING THE CHAMBERS OF AIR CAN BE DANGEROUS! Contact the Warren Rupp Technical Services Department before performing this procedure. Any model with top-ported discharge will reduce or eliminate problems with entrained air.

If your pump continues to perform below your expectations, contact your local Warren Rupp Distributor or factory Technical Services Group for a service evaluation.

WARRANTY

This pump is warranted for a period of five years against defective material and workmanship. Failure to comply with the recommendations stated in this manual voids all factory warranty.

Material Codes

The Last 3 Digits of Part Number

| | |
|-----|---|
| 000 | Assembly, sub-assembly; and some purchased items |
| 010 | Cast Iron |
| 012 | Powered Metal |
| 015 | Ductile Iron |
| 020 | Ferritic Malleable Iron |
| 025 | Music Wire |
| 080 | Carbon Steel, AISI B-1112 |
| 100 | Alloy 20 |
| 110 | Alloy Type 316 Stainless Steel |
| 111 | Alloy Type 316 Stainless Steel (Electro Polished) |
| 112 | Alloy C |
| 113 | Alloy Type 316 Stainless Steel (Hand Polished) |
| 114 | 303 Stainless Steel |
| 115 | 302/304 Stainless Steel |
| 117 | 440-C Stainless Steel (Martensitic) |
| 120 | 416 Stainless Steel (Wrought Martensitic) |
| 123 | 410 Stainless Steel (Wrought Martensitic) |
| 148 | Hardcoat Anodized Aluminium |
| 149 | 2024-T4 Aluminium |
| 150 | 6061-T6 Aluminium |
| 151 | 6063-T6 Aluminium |
| 152 | 2024-T4 Aluminium (2023-T351) |
| 154 | Almag 35 Aluminium |
| 155 | 356-T6 Aluminium |
| 156 | 356-T6 Aluminium |
| 157 | Die Cast Aluminium Alloy #380 |
| 158 | Aluminium Alloy SR-319 |
| 159 | Anodized Aluminium |
| 162 | Brass, Yellow, Screw Machine Stock |
| 165 | Cast Bronze, 85-5-5-5 |
| 166 | Bronze, SAE 660 |
| 170 | Bronze, Bearing Type, Oil Impregnated |
| 175 | Die Cast Zinc |
| 180 | Copper Alloy |
| 305 | Carbon Steel, Gray Epoxy Coated |
| 306 | Carbon Steel, Black PTFE Coated |
| 307 | Aluminium, Gray Epoxy Coated |
| 308 | Stainless Steel, Black PTFE Coated |
| 309 | Aluminium, Black PTFE Coated |
| 310 | PVDF Coated |
| 330 | Zinc Plated Steel |
| 331 | Chrome Plated Steel |
| 332 | Aluminium, Electroless Nickel Plated |

| | |
|-----|---|
| 333 | Carbon Steel, Electroless Nickel Plated |
| 335 | Galvanized Steel |
| 336 | Zinc Plated Yellow Brass |
| 337 | Silver Plated Steel |
| 340 | Nickel Plated |
| 342 | Filled Nylon |
| 353 | Geolast; Color: Black |
| 354 | Injection Molding #203-40 Santoprene- Duro 40D +/-5; Color: RED |
| 355 | Thermal Plastic |
| 356 | Hytrek |
| 357 | Injection Molding Polyurethane (Urethane Rubber) (Compression Mold) |
| 359 | Urethane Rubber |
| 360 | Nitrile Rubber. Color coded: RED |
| 361 | Nitrile |
| 363 | FKM (Fluorocarbon). Color coded: YELLOW |
| 364 | EPDM Rubber. Color coded: BLUE |
| 365 | Neoprene Rubber. Color coded: GREEN |
| 366 | Food Grade Nitrile |
| 368 | Food Grade EPDM |
| 370 | Butyl Rubber. Color coded: BROWN |
| 371 | Phlthane (Tuftane) |
| 374 | Carboxylated Nitrile |
| 375 | Fluorinated Nitrile |
| 378 | High Density Polypropylene |
| 379 | Conductive Nitrile |
| 405 | Cellulose Fibre |
| 408 | Cork and Neoprene |
| 425 | Compressed Fibre |
| 426 | Blue Gard |
| 440 | Vegetable Fibre |
| 465 | Fibre |
| 500 | Delrin 500 |
| 501 | Delrin 570 |
| 502 | Conductive Acetal, ESD-800 |
| 503 | Conductive Acetal, Glass-Filled |
| 505 | Acrylic Resin Plastic |
| 506 | Delrin 150 |
| 520 | Injection Molding PVDF Natural color |
| 540 | Nylon |
| 541 | Nylon |
| 542 | Nylon |
| 544 | Nylon Injection Molding |
| 550 | Polyethylene |
| 551 | Glass Filled Polypropylene |
| 552 | Unfilled Polypropylene |

| | |
|-----|---|
| 553 | Unfilled Polypropylene |
| 555 | Polyvinyl Chloride |
| 556 | Black Vinyl |
| 557 | Unfilled Conductive Polypropylene |
| 559 | Glass Filled - Conductive Polypropylene |
| 570 | Rulon II |
| 580 | Ryton |
| 590 | Valox |
| 591 | Nylatron G-S |
| 592 | Nylatron NSB |
| 600 | PTFE (virgin material) |
| | Tetrafluorocarbon (TFE) |
| 601 | PTFE (Bronze and moly filled) |
| 602 | Filled PTFE |
| 603 | Blue Gylon |
| 604 | PTFE |
| 607 | Envelon |
| 606 | PTFE |
| 610 | PTFE Encapsulated Silicon |
| 611 | PTFE Encapsulated FKM |
| 632 | Neoprene/Hytrek |
| 633 | FKM/PTFE |
| 634 | EPDM/PTFE |
| 635 | Neoprene/PTFE |
| 637 | PTFE, FKM/PTFE |
| 638 | PTFE, Hytrek/PTFE |
| 639 | Nitrile/TFE |
| 643 | Santoprene®/EPDM |
| 644 | Santoprene®/PTFE |
| 656 | Santoprene Diaphragm and Check Balls/EPDM Seats |

Delrin and Hytrek are registered trademarks of E.I. DuPont.

Gylon is a registered trademark of Garlock, Inc.

Nylatron is a registered trademark of Polymer Corp.

Santoprene is a registered trademark of Exxon Mobil Corp.

Rulon II is a registered trademark of Dixon Industries Corp.

Ryton is a registered trademark of Phillips Chemical Co.

Valox is a registered trademark of General Electric Co.

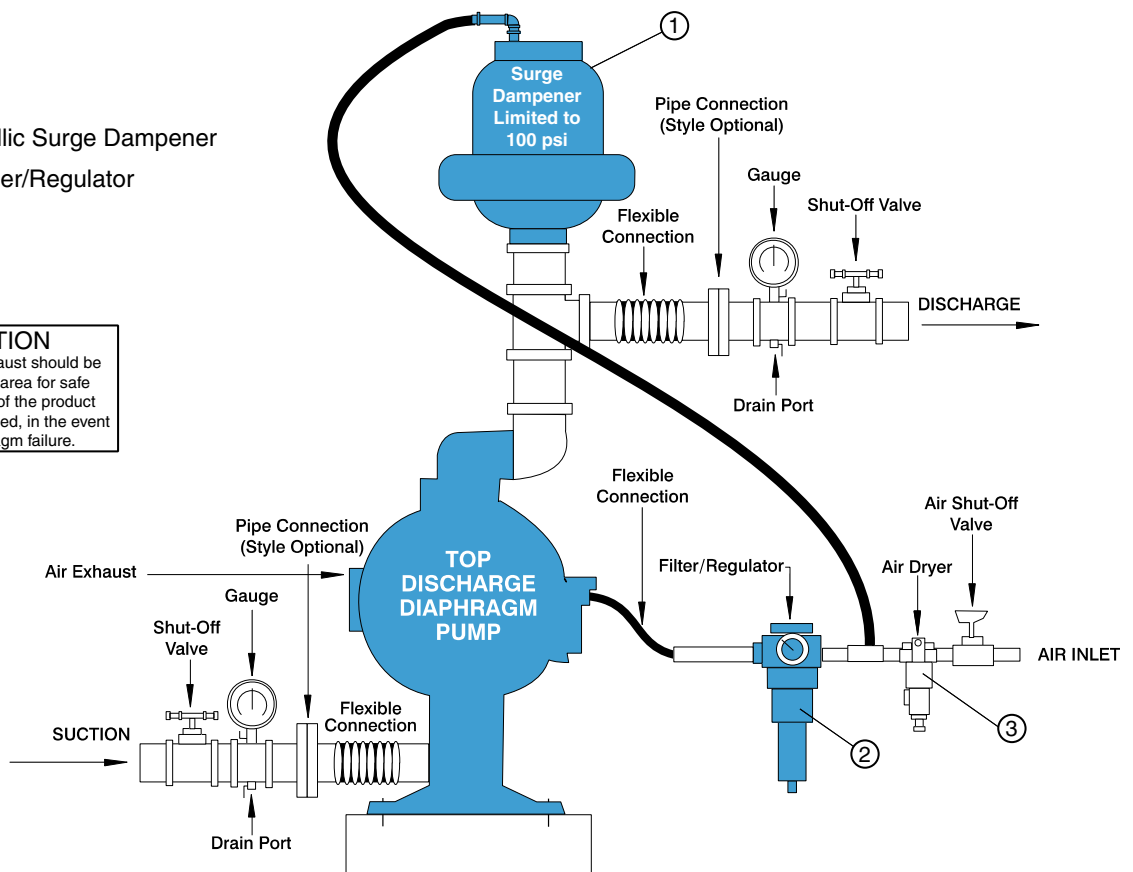
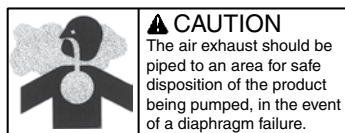
Rupplon, SANDPIPER, PortaPump, Tranquilizer and SludgeMaster are registered trademarks of Warren Rupp, Inc.

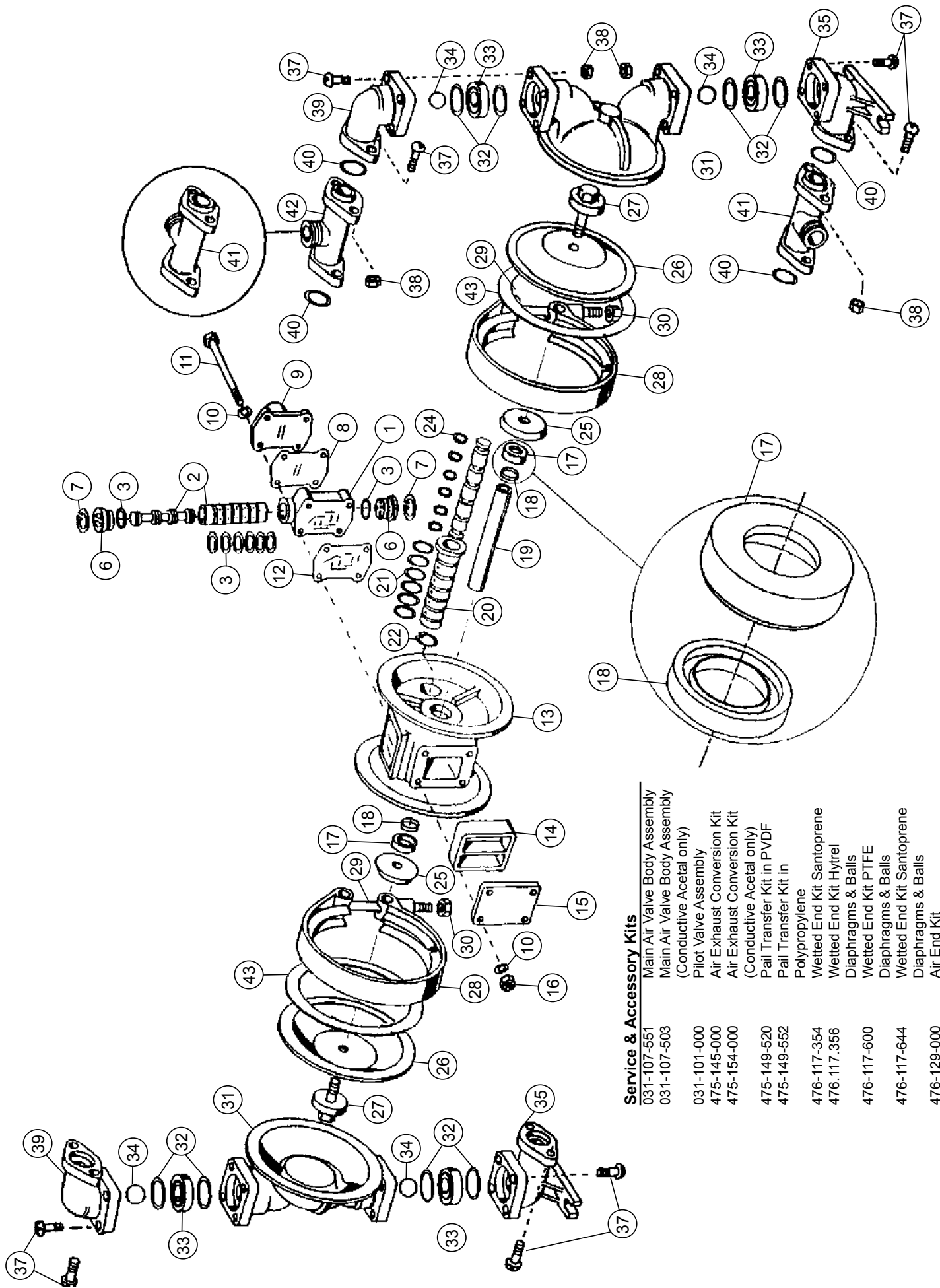


INSTALLATION GUIDE Top Discharge Ball Valve Unit

Available from
Warren Rupp

- ① DA05 Non-Metallic Surge Dampener
- ② 020-049-000 Filter/Regulator
- ③ Air Dryer





Service & Accessory 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 |
| 475-154-000 | Air Exhaust Conversion Kit (Conductive Acetal only) |
| 475-149-520 | Pail Transfer Kit in PVDF |
| 475-149-552 | Pail Transfer Kit in Polypropylene |
| 476-117-354 | Wetted End Kit Santoprene |
| 476-117-356 | Wetted End Kit Hytrel |
| 476-117-600 | Diaphragms & Balls Wetted End Kit PTFE |
| 476-117-644 | Diaphragms & Balls Wetted End Kit Santoprene |
| 476-129-000 | Diaphragms & Balls Air End Kit |

Composite Repair Parts List

| ITEM | PART NO. | DESCRIPTION | QTY | ITEM | PART NO. | DESCRIPTION | QTY |
|------|--------------|---|-----|------|--------------|--|-----|
| 1 | 095-077-551 | Body, Main Air Valve | 1 | 27 | 612-146-520 | Plate, Outer Diaphragm | 2 |
| | ⚠095-077-503 | Body, Main Air Valve | 1 | | ⚠612-146-502 | Plate, Outer Diaphragm | 2 |
| 2 | 031-106-000 | Sleeve & Spool Set | 1 | | 612-146-552 | Plate, Outer Diaphragm | 2 |
| 3 | 560-101-360 | O-Rings | 8 | 28 | 200-057-115 | Clamp, V-Band | 2 |
| 6 | 165-074-551 | Cap, End with O-Ring | 2 | 29 | 100-002-115 | T-Bolt | 2 |
| | ⚠165-074-503 | Cap, End with O-Ring | 2 | 30 | 545-027-337 | Nut, Hex 1/4-28UNF | 2 |
| 7 | 675-051-115 | Ring, Retaining | 2 | 31 | 196-145-520 | Chamber, Outer | 2 |
| 8 | 360-085-360 | Gasket, Valve Body | 1 | | ⚠196-145-502 | Chamber, Outer | 2 |
| | ⚠360-085-379 | Gasket, Valve Body (Conductive Acetal Only) | 1 | | 196-145-552 | Chamber, Outer | 2 |
| 9 | 165-072-551 | Cap, Air Inlet | 1 | 32 | 720-032-600 | Seal, Check Valve | 8 |
| | ⚠165-072-503 | Cap, Air Inlet | 1 | 33 | 722-073-520 | Seat, Check Valve | 4 |
| 10 | 901-037-115 | Washer, Flat 1/4" | 8 | | 722-073-506 | Seat, Check Valve | 4 |
| 11 | 170-103-115 | Capscrew, Hex Head 1/4-20 5" Long | 4 | | 722-073-552 | Seat, Check Valve | 4 |
| 12 | 360-084-360 | Gasket, Intermediate Bracket | 1 | 34 | 050-033-354 | Ball, Check | 4 |
| | ⚠360-084-379 | Gasket, Intermediate Bracket (Conductive Acetal Only) | 1 | | 050-033-356 | Ball, Check | 4 |
| 13 | 114-019-551 | Intermediate, Bracket | 1 | 35 | ⚠312-095-520 | Elbow, Suction | 2 |
| | ⚠114-019-503 | Intermediate, Bracket | 1 | | 312-095-502 | Elbow, Suction | 2 |
| 14 | 530-022-550 | Muffler | 1 | | 312-095-552 | Elbow, Suction | 2 |
| 15 | 165-073-551 | Cap, Air Exhaust | 1 | 37 | 706-023-115 | Screw, Machine 10-32UNF x 1" Long | 32 |
| | ⚠165-073-503 | Cap, Air Exhaust | 1 | 38 | 544-004-115 | Nut, Hex Flange 10-32UNF | 16 |
| 16 | 545-003-115 | Nut, Hex 1/4-20UNC | 4 | 39 | ⚠312-096-520 | Elbow, Discharge | 2 |
| 17 | 449-021-551 | Insert, Gland | 2 | | 312-096-502 | Elbow, Discharge | 2 |
| | ⚠449-021-503 | Insert, Gland | 2 | | 312-096-552 | Elbow, Discharge | 2 |
| 18 | 720-031-359 | Seal, K-R | 2 | 40 | 720-033-600 | Seal, Manifold | 4 |
| 19 | 685-046-120 | Rod, Diaphragm | 1 | 41 | ⚠518-127-520 | Manifold, Horizontal (Optional Discharge) | 1/2 |
| 20 | 755-038-000 | Sleeve, Pilot Valve with O-rings | 1 | | 518-127-502 | Manifold, Horizontal (Optional Discharge) | 1/2 |
| 21 | 560-066-360 | O-rings | 6 | | 518-127-552 | Manifold, Horizontal (Optional Discharge) | 1/2 |
| 22 | 675-047-115 | Ring, Retaining - Pilot Valve Sleeve | 1 | 42 | ⚠518-128-520 | Manifold, Vertical | 1 |
| 23 | 775-038-000 | Spool, Pilot Valve with O-rings | 1 | | 518-128-502 | Manifold, Vertical | 1 |
| 24 | 560-029-374 | O-rings | 6 | | 518-128-552 | Manifold, Vertical | 1 |
| 25 | 612-147-150 | Plate, Inner Diaphragm | 2 | 43 | ⚠360-086-360 | Gasket, Sealing | 2 |
| 26 | 286-069-354 | Diaphragm | 2 | 54 | 920-025-000 | Grounding Cable (Conductive Acetal Units Only) | 1 |
| | 286-069-356 | Diaphragm | 2 | | | | |
| | 286-070-600 | Diaphragm | 2 | | | | |

Item not shown:

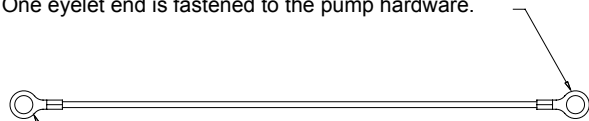
**706-025-115 Screw, Machine 10-32UNF x .88" Long

** (use in place of four 706-023-115 machine screws with horizontal manifold (item 41) on port side only when a pipe couple is installed on external 1/2" NPT porting threads.

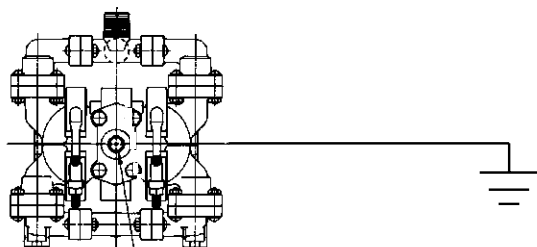
⚠ Grounding The Pump (for Conductive Acetal Pumps only)



One eyelet end is fastened to the pump hardware.



One eyelet is installed to a true earth ground.
(Requires a 5/16 or 8mm maximum diameter bolt)



To be fully groundable, the pumps must be ATEX Compliant. Refer to pump data sheet for ordering.

This 8 foot long (244 centimeters) Grounding Cable (Item 54) is shipped with the eyelet fastened to the pump hardware.

To reduce the risk of static electrical sparking, this pump must be grounded. Check the local electrical code for detailed grounding instruction and the type of equipment required.

| | |
|--|---|
| | ⚠ WARNING |
| | <p><i>Take action to prevent static sparking. Fire or explosion can result, especially when handling flammable liquids. The pump, piping, valves, containers or other miscellaneous equipment must be grounded.</i></p> |

Solenoid Shifted Option Drawing

SOLENOID SHIFTED AIR VALVE PARTS LIST

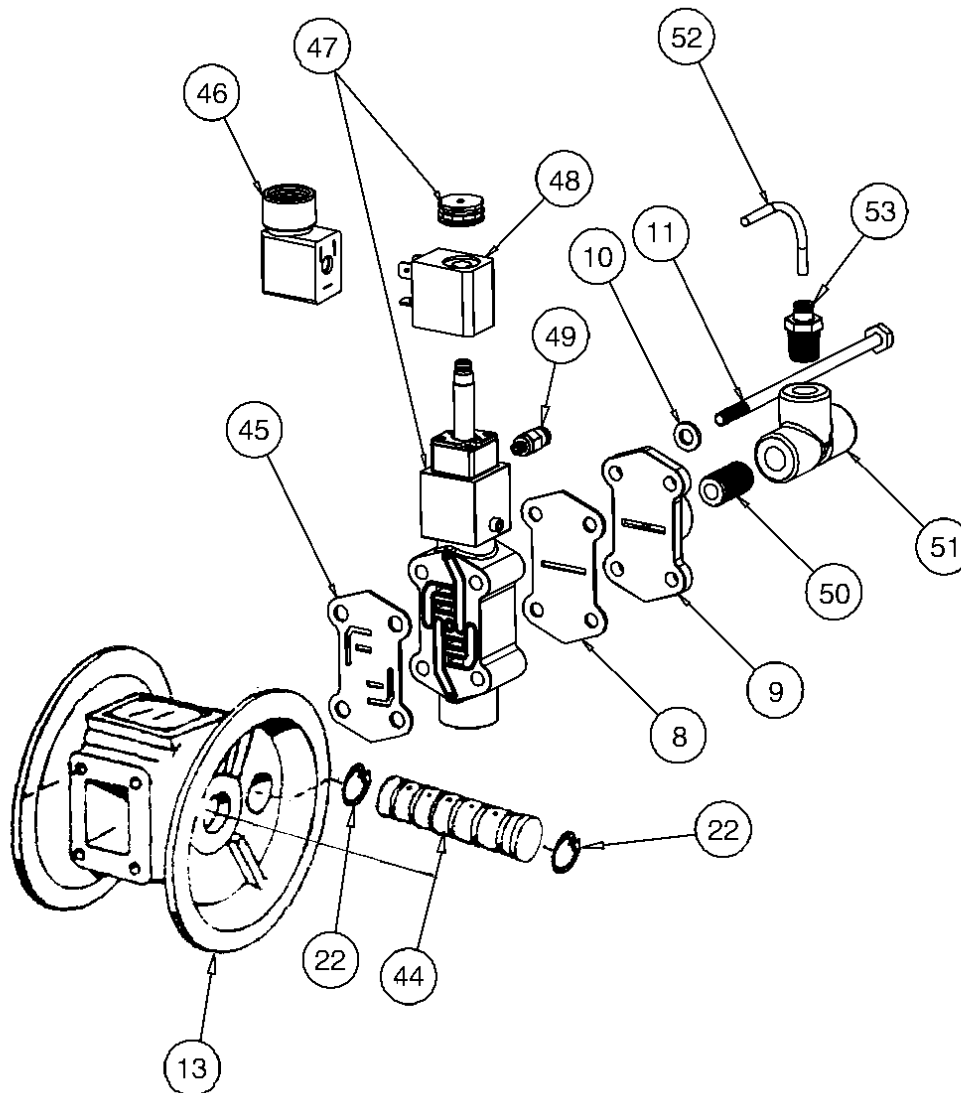
(Includes all items used on Composite Repair Parts List except as shown)

| ITEM | PART NUMBER | DESCRIPTION | QTY |
|------|-------------|-------------------------------------|-----|
| 22 | 675-047-115 | Ring, Retaining - Pilot Plug Sleeve | 2 |
| 44 | 755-037-000 | Pilot Plug Sleeve with O-rings | 1 |
| 45 | 360-106-360 | Gasket, Intermediate Bracket | 1 |
| 46 | 241-001-000 | Connector, conduit | 1 |
| 47 | 893-095-000 | Solenoid Valve, NEMA 4 | 1 |
| 48 | 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 |
| 49 | 866-068-000 | Tube Fitting | 1 |
| 50 | 538-083-555 | Nipple | 1 |
| 51 | 835-009-555 | Tee, Pipe | 1 |
| 52 | 860-062-540 | Tubing | 1 |
| 53 | 866-069-000 | Tube Fitting | 1 |

FOR EXPLOSION PROOF SOLENOID VALVE

| | | | |
|----|-------------|-----------------------------|---|
| 48 | 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 |

ASSEMBLY INSTRUCTIONS: Must Be Performed Prior To Start-Up. The tee (item 51), nipple (item 50), fitting (item 53) and tubing (item 52) have been pre-assembled at the factory. Thread this assembly into the air inlet cap (item 9). Be careful not to over tighten. Push the free end of the tubing into the fitting (item 49) which is attached to the valve.



SOLENOID SHIFTED AIR DISTRIBUTION VALVE OPTION

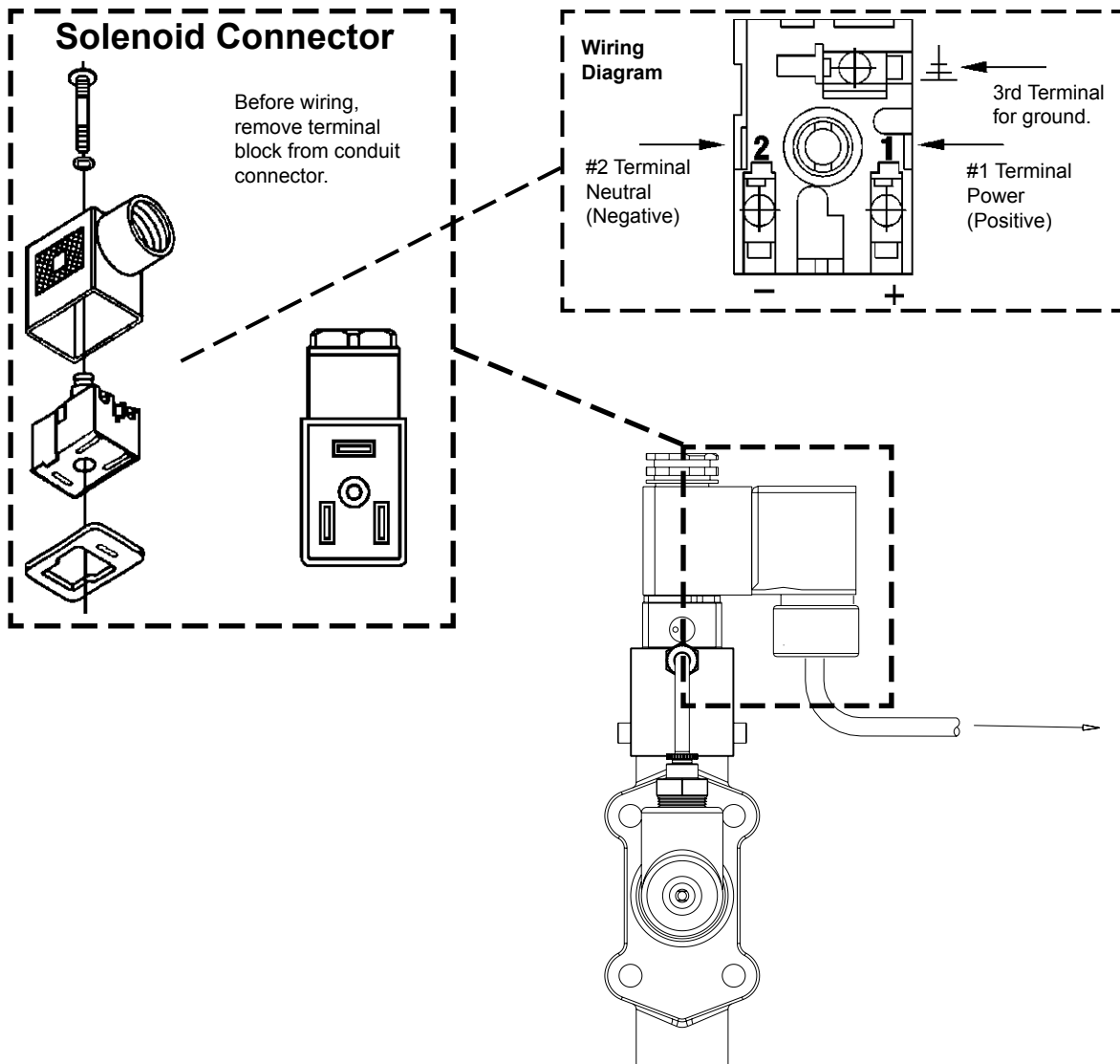
Warren Rupp's solenoid shifted, air distribution valve option utilizes electrical signals to precisely control your SANDPIPER's speed. The solenoid coil is connected to a customer - supplied control. Compressed air provides the pumping power, while electrical signals control pump speed (pumping rate).

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.



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®, MARATHON®, PortaPump®, SludgeMaster™ and Tranquilizer®.

~ See sandpiperpump.com/content/warranty-certifications for complete warranty, including terms and conditions, limitations and exclusions. ~

**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, 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 EN809:1998+A1:2009, Pumps and Pump Units for Liquids - Common Safety Requirements, to verify conformance.

David Roseberry
Signature of authorized person

David Roseberry
Printed name of authorized person

Revision Level: F

October 20, 2005
Date of issue

Engineering Manager
Title

August 23, 2012
Date of revision

IBEX

CE

WARREN RUPP, INC.

EC / EU Declaration of Conformity

The objective of the declaration described is in conformity with the relevant Union harmonisation legislation: Directive 94/9/EC (until April 19, 2016) and Directive 2014/34/EU (from April 20, 2016).

Manufacturer:

Warren Rupp, Inc.
A Unit of IDEX Corporation
800 North Main Street
P.O. Box 1568
Mansfield, OH 44902 USA

Applicable Standard:

EN13463-1: 2001
EN13463-5: 2003
EN60079-25: 2004

Harmonised Standard:

EN13463-1: 2009
EN13463-5: 2011
EN60079-25:2010

The harmonised standards have been compared to the applicable standards used for certification purposes and no changes in the state of the art technical knowledge apply to the listed equipment.

AODD Pumps and Surge Suppressors

Technical File No.: 203104000-1410/MER

AODD (Air-Operated Double Diaphragm) Pumps

EC Type Examination Certificate No. Pumps: KEMA 09ATEX0071 X

DEKRA Certification B.V. (0344)
Meander 1051
6825 MJ Arnhem
The Netherlands

Hazardous Locations Applied:

| | |
|--------------------------------|-----------------|
| I M1 c | II 1 G c T5 |
| II 2 G Ex ia c IIC T5 | II 1 D c T100°C |
| II 2 D Ex c iaD 20 IP67 T100°C | II 2 G c T5 |
| II 2 G Eex m c II T5 | II 2 D c T100°C |
| II 2 D c IP65 T100°C | |

SANDPIPER[®]
A WARREN RUPP, INC. BRAND

Tranquilizer[®]

DATE/APPROVAL/TITLE:
18 March 2016

David Roseberry
David Roseberry, Director of Engineering

IDEX