

SERVICE & OPERATING MANUAL
Original Instructions



Model U1F Metallic Design Level 1

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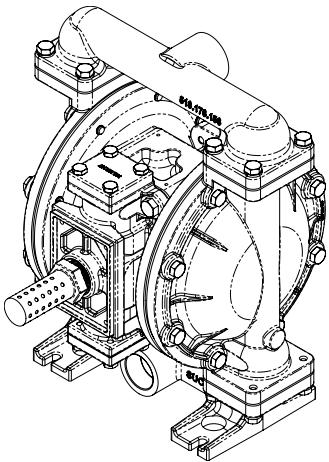
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Safety Information

! 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

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.

! 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



Underwriters Laboratories, Inc., an Internationally recognized independent organization for testing products to ensure public safety.

Recycling

Many components of SANDPIPER® Conductive Acetal AODD pumps are made of recyclable materials (see chart on page 10 for material specifications). We encourage pump users to recycle worn out parts and pumps whenever possible, after any hazardous pumped fluids are thoroughly flushed.

ATEX Pumps - Conditions For Safe Use

1. Ambient temperature range is as specified in tables 1 to 3 on the next page (per Annex I of DEKRA 18ATEX0094X)
2. ATEX compliant pumps are suitable for use in explosive atmospheres when the equipment is properly grounded in accordance with local electrical codes
3. **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.
4. 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**
5. 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.
6. 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**

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 Intergral 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 |

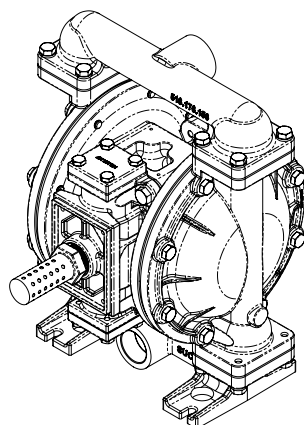
Note: The ambient temperature range and the process temperature range should not exceed the operating temperature range of the applied non-metallic parts as listed in the manuals of the pumps.

**WARREN
RUPP®**

Quality System
ISO 9001 Certified

Environmental
Management System
ISO 14001 Certified

IDEX



See pages 2, 24 and 25
for ATEX ratings.



SANDPIPER®
A WARREN RUPP PUMP BRAND

U1F Metallic

Air-Operated Double Diaphragm Pump

ENGINEERING, PERFORMANCE
& CONSTRUCTION DATA

| INTAKE/DISCHARGE PIPE SIZE 1" NPT (internal) 1" BSPT Tapered (internal) | CAPACITY 0 to 45 gallons per minute (0 to 170 liters per minute) | AIR VALVE No-lube, no-stall design | SOLIDS-HANDLING Up to .25 in. (6mm) | HEADS UP TO 100 psi or 230.7 ft. of water (7 Kg/cm ² or 70 meters) | DISPLACEMENT/STROKE .11 Gallon / .42 liter |
|--|--|--|--|---|---|
| ⚠ CAUTION! Operating temperature limitations are as follows: Materials 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. NEOPRENE All purpose. Resistant to vegetable oils. Generally not affected by moderate chemicals, fats, greases and many oils and solvents. Generally attacked by strong oxidizing acids, ketones, esters, nitro hydrocarbons and chlorinated aromatic hydrocarbons. 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. Polypropylene: A thermoplastic polymer. Moderate tensile and flex strength. Resists strong acids and alkalies. Attacked by chlorine, fuming nitric acid and other strong oxidizing agents. UHMW PE: A thermoplastic polymer that is highly resistant to a broad range of chemicals. Exhibits outstanding abrasion and impact resistance, along with environmental stress-cracking resistance. | | | | 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. Operating Temperatures Maximum Minimum | |
| | | | | 190°F 88°C | -10°F -23°C |
| | | | | 200°F 93°C | -10°F -23°C |
| | | | | 220°F 104°C | -35°F -37°C |
| | | | | 180°F 82°C | 32°F 0°C |
| | | | | 180°F 82°C | -35°F -37°C |

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

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

Explanation of Pump Nomenclature

U1F UL79 Listed Metallic · Design Level 1· Ball Valve

| MODEL | Pump Brand | Pump Size | Check Valve Type | Design Level | Wetted Material | Diaphragm/ Check Valve Materials | Check Valve Seat | Non-Wetted Material Options | Porting Options | Pump Style | Pump Options | Kit Options | Shipping Weight lbs. (kg) |
|------------------|------------|-----------|------------------|--------------|-----------------|----------------------------------|------------------|-----------------------------|-----------------|------------|--------------|-------------|---------------------------|
| U1F B1XBTXNS600. | U | 1F | B | 1 | X | B | T | X | N | S | 6 | 00. | 53 (24) |
| U1F B1XGTXNS600. | U | 1F | B | 1 | X | G | T | X | N | S | 6 | 00. | 53 (24) |
| U1F B1XGAXNS600. | U | 1F | B | 1 | X | G | A | X | N | S | 6 | 00. | 53 (24) |
| U1FB1CBTCNS600. | U | 1F | B | 1 | C | B | T | C | N | S | 6 | 00. | 53 (24) |
| U1FB1CGTCNS600. | U | 1F | B | 1 | C | G | T | C | N | S | 6 | 00. | 53 (24) |
| U1F B1XBTXSS600. | U | 1F | B | 1 | X | B | T | X | S | S | 6 | 00. | 53 (24) |
| U1F B1XGTXSS600. | U | 1F | B | 1 | X | G | T | X | S | S | 6 | 00. | 53 (24) |

Pump Brand

U=UL79 Listed SANDPIPER®

Pump Size

1F=1"

Check Valve Type

B= Ball

Design Level

1= Design Level

Wetted Material

X= Unpainted Aluminum

C= Conductive Painted Aluminum

Diaphragm Check Valve Materials

B= Nitrile/Nitrile

G= PTFE-Neoprene/PTFE

Check Valve Seat

A= Aluminum

T= PTFE

Non-Wetted Material Options

X= Unpainted Aluminum

C= Conductive Painted Aluminum

Porting Options

N=NPT Threads

B= BSPT (Tapered) Threads

S= NPT Suction Port Facing Air

Inlet, NPT Discharge Port

Facing Air Exhaust

Pump Style

S= Standard

Pump Options

6= Metal Muffler

Model U1FB1XBTXNS600 is UL79 listed for pumping: Gasoline, Diesel Fuel, No. 4 Fuel Oils (or lighter), Motor Oil, Kerosene, Aviation Fuel and Water

Model U1FB1XGTXNS600 and U1FB1XGAXNS600 are UL79 listed for pumping: Gasoline (Including Alcohol Blends up to 15%), Diesel Fuel, Motor Oil, No. 4 Oil (or lighter), Kerosene, Aviation Fuel, Automatic Transmission Fluid, Water, Waste Oil, and Ethylene Glycol.



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

NOTE: See page 25 for ATEX Explanation of Type Examination Certificate

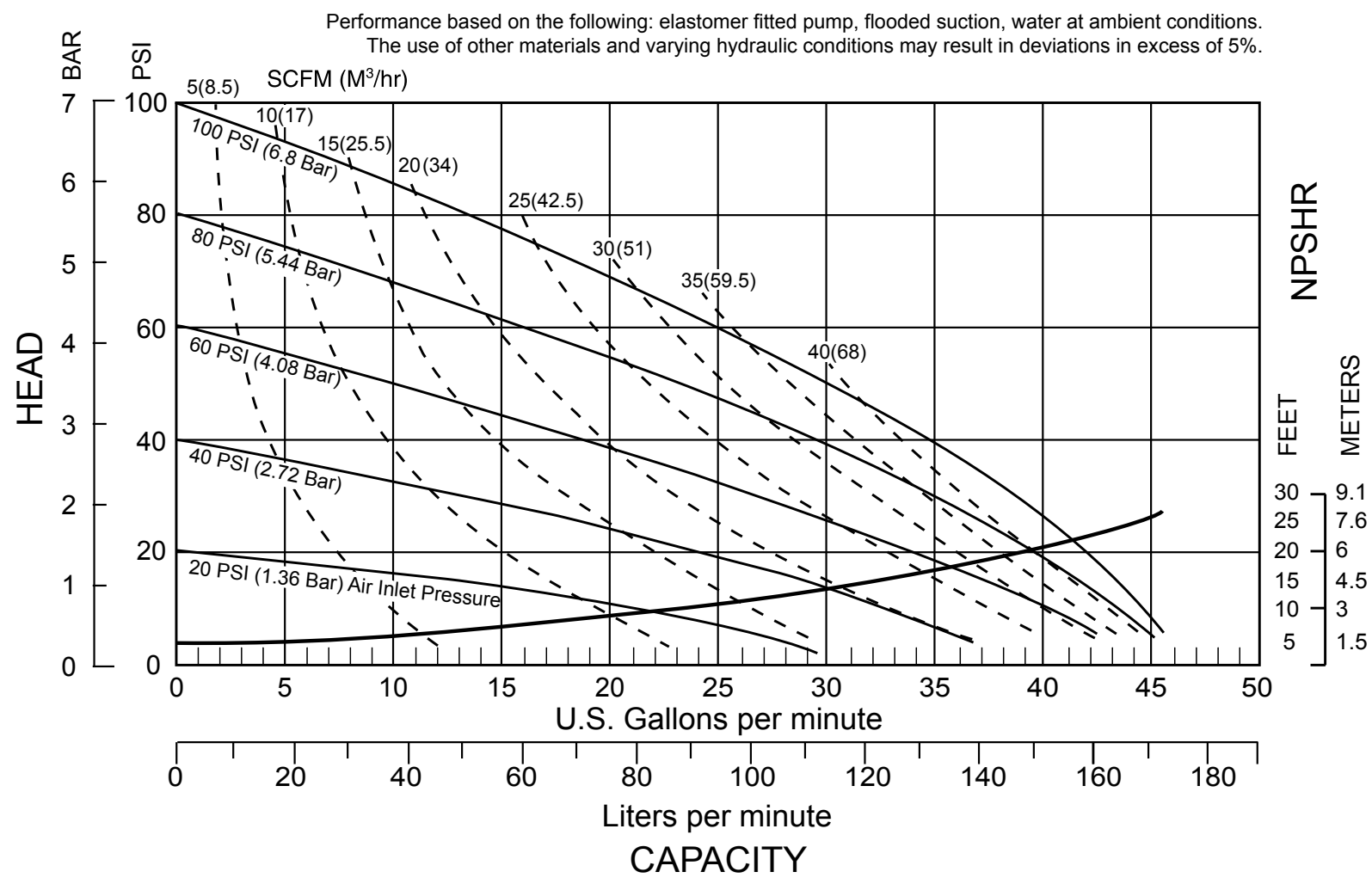


⚠ WARNING

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 which is hazardous or toxic, the air exhaust must be piped to an appropriate area for safe disposition.

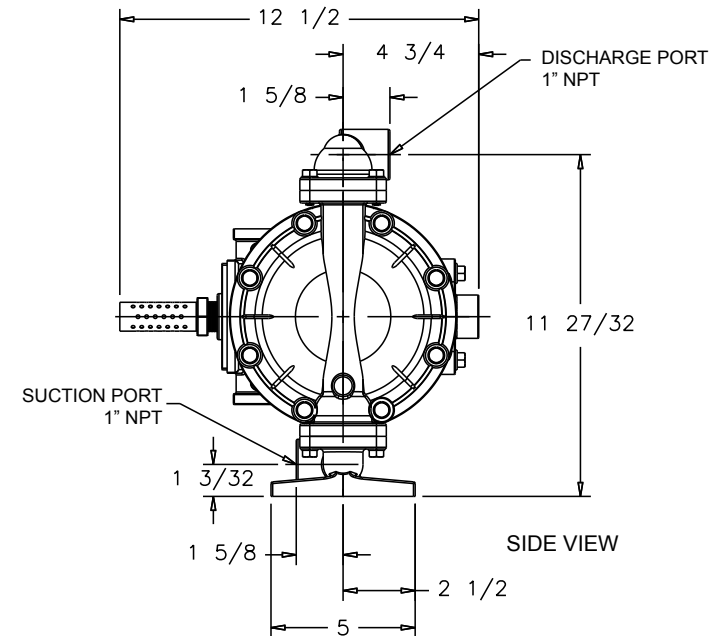
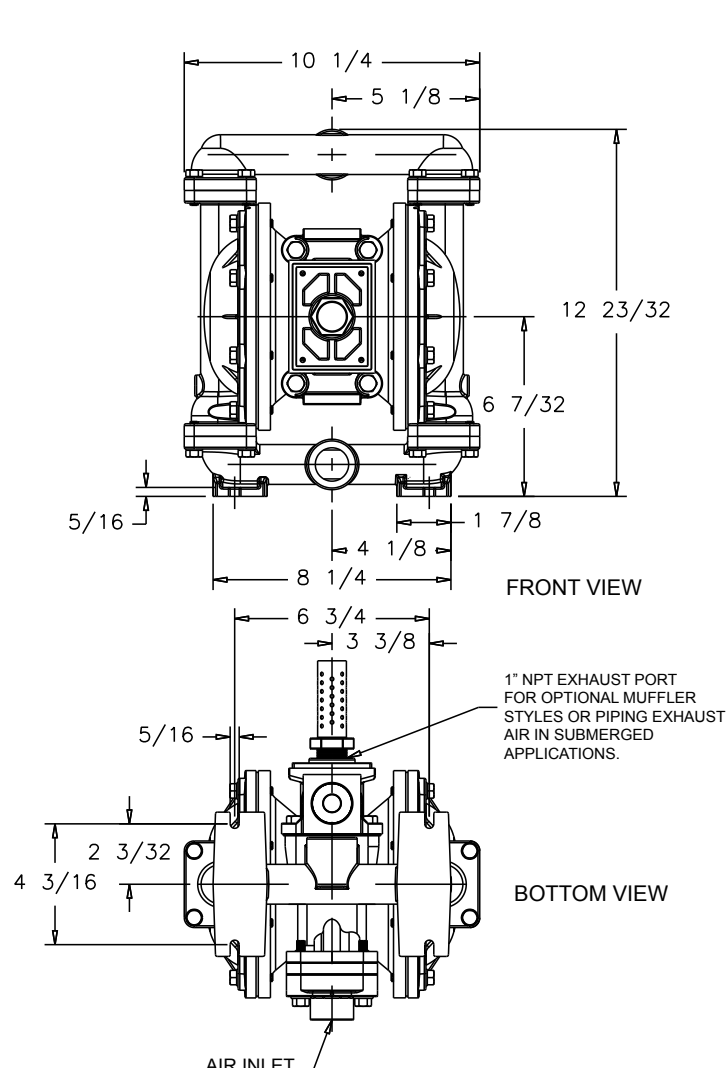
Performance Curve, U1F UL79 Listed Metallic Design Level 1



Dimensions: U1F UL79 LISTED Metallic

Dimensions in Inches

Dimensional Tolerance: $\pm 1/8"$

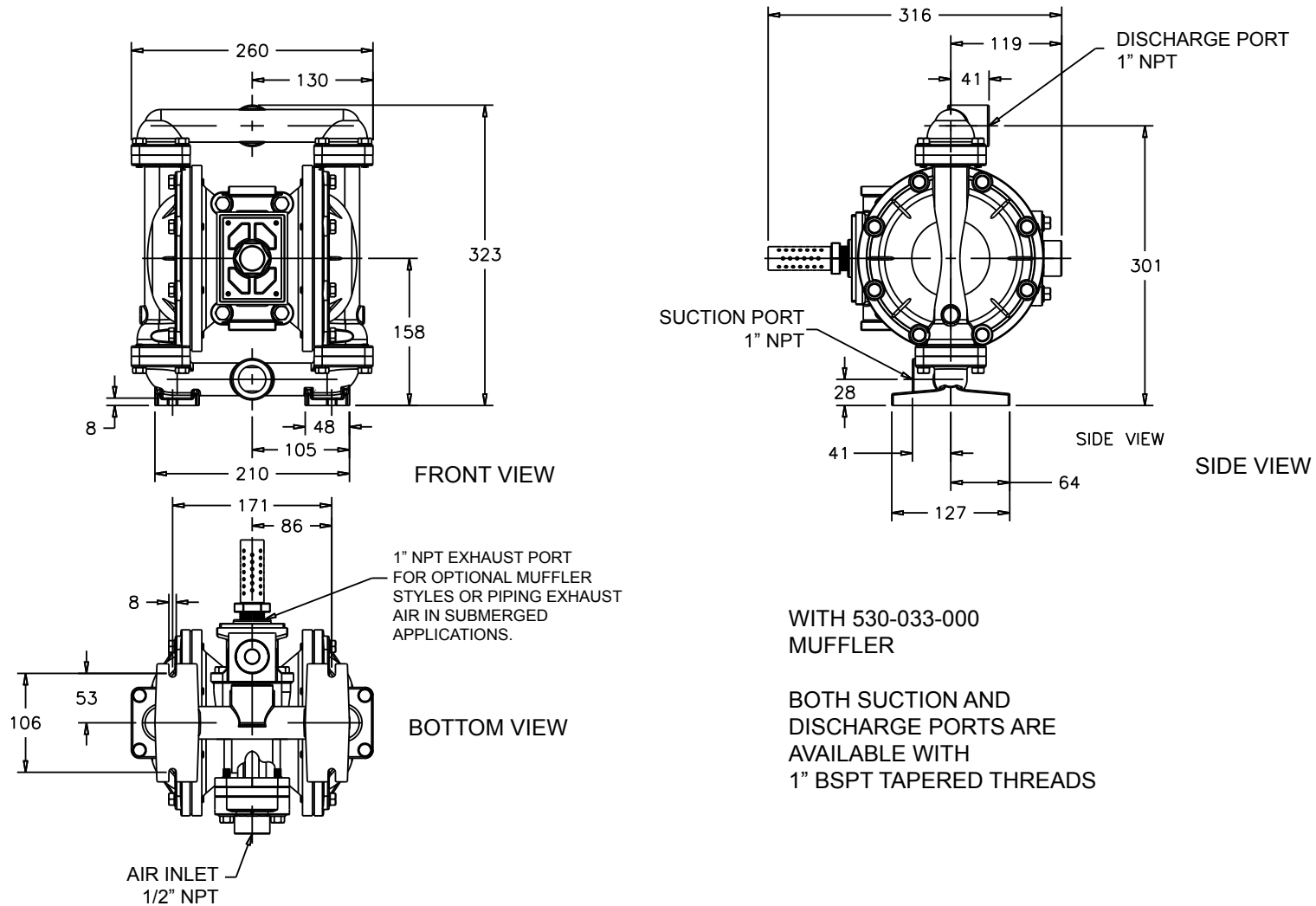


WITH 530-033-000
MUFFLER

BOTH SUCTION AND
DISCHARGE PORTS ARE
AVAILABLE WITH
1" BSPT TAPERED THREADS

Metric Dimensions: U1F UL79 Listed Metallic

Dimensions in Millimeters
Dimensional Tolerance: ± 3 mm



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 centers 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 a 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 diaphragm stroke when a 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 conductive hose should be installed between the pump and the piping. The flexible conductive 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 conductive 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

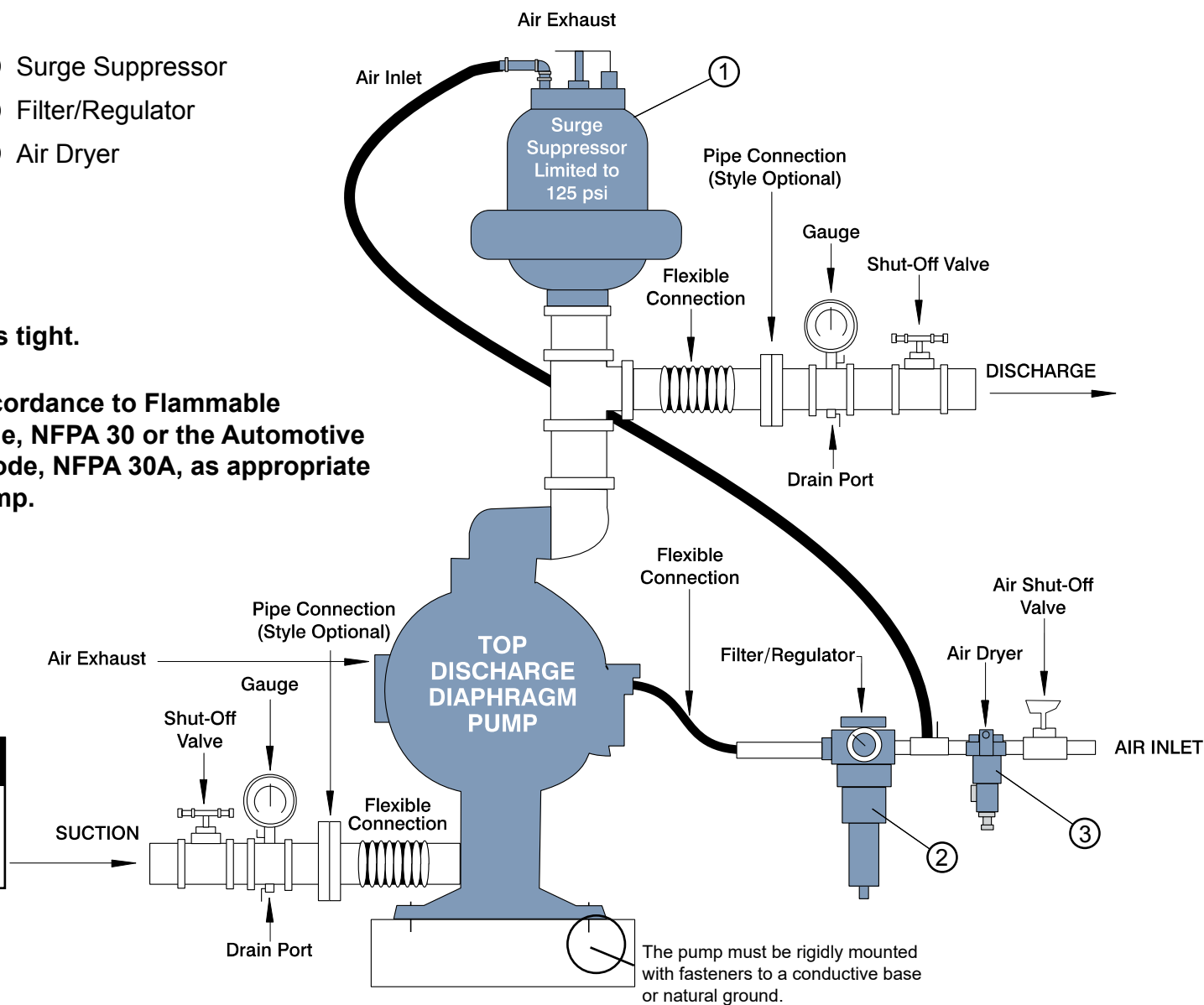
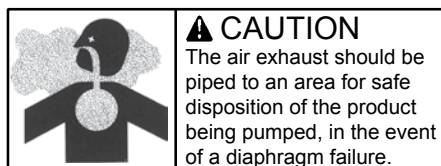
To start the pump, open the air valve approximately 1/2" to 3/4" turn. After the pump primes, the air valve can be opened to increase air flow as desired. If opening the valve increases cycling rate, but does not increase the rate of flow, cavitation has occurred. The valve should be closed slightly 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.

- CAUTION**

Pump shall be installed in accordance to Flammable and Combustible Liquids Code, NFPA 30 or the Automotive and Marine Service Station Code, NFPA 30A, as appropriate to the intended use of the pump.



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 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. Refer to the pump SERVICE MANUAL for disassembly instructions.

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

Refer to the enclosed Warren Rupp Warranty Certificate.

MATERIAL CODES

THE LAST 3 DIGITS OF PART NUMBER

| | | | | | | | |
|-----|--|-----|--|-----|---|-----|---|
| 000 | Assembly, sub-assembly; and some purchased items | 306 | Carbon Steel, Black PTFE Coated | 374 | Carboxylated Nitrile | 607 | Envelon |
| 010 | Cast Iron | 307 | Aluminum, Black Epoxy Coated | 375 | Fluorinated Nitrile | 608 | Conductive PTFE |
| 012 | Powered Metal | 308 | Stainless Steel, Black PTFE Coated | 378 | High Density Polypropylene | 610 | PTFE Encapsulated Silicon |
| 015 | Ductile Iron | 309 | Aluminum, Black PTFE Coated | 379 | Conductive Nitrile | 611 | PTFE Encapsulated FKM |
| 020 | Ferritic Malleable Iron | 310 | PVDF Coated | 405 | Cellulose Fibre | 632 | Neoprene/Hytrel |
| 025 | Music Wire | 313 | Aluminum, White Epoxy Coated | 408 | Cork and Neoprene | 633 | FKM/PTFE |
| 080 | Carbon Steel, AISI B-1112 | 330 | Zinc Plated Steel | 425 | Compressed Fibre | 634 | EPDM/PTFE |
| 100 | Alloy 20 | 331 | Chrome Plated Steel | 426 | Blue Gard | 635 | Neoprene/PTFE |
| 110 | Alloy Type 316 Stainless Steel | 332 | Aluminum, Electroless Nickel Plated | 440 | Vegetable Fibre | 637 | PTFE, FKM/PTFE |
| 111 | Alloy Type 316 Stainless Steel (Electro Polished) | 333 | Carbon Steel, Electroless Nickel Plated | 465 | Fibre | 638 | PTFE, Hytrel/PTFE |
| 112 | Alloy C | 335 | Galvanized Steel | 500 | Delrin 500 | 639 | Nitrile/TFE |
| 113 | Alloy Type 316 Stainless Steel (Hand Polished) | 336 | Zinc Plated Yellow Brass | 501 | Delrin 570 | 643 | Santoprene®/EPDM |
| 114 | 303 Stainless Steel | 337 | Silver Plated Steel | 502 | Conductive Acetal, ESD-800 | 644 | Santoprene®/PTFE |
| 115 | 302/304 Stainless Steel | 340 | Nickel Plated | 503 | Conductive Acetal, Glass-Filled | 656 | Santoprene Diaphragm and Check Balls/EPDM Seats |
| 117 | 440-C Stainless Steel (Martensitic) | 342 | Filled Nylon | 505 | Acrylic Resin Plastic | 661 | EPDM/Santoprene |
| 120 | 416 Stainless Steel (Wrought Martensitic) | 351 | Food Grade Santoprene | 506 | Delrin 150 | 666 | FDA Nitrile Diaphragm, PTFE Overlay, Balls, and Seals |
| 123 | 410 Stainless Steel (Wrought Martensitic) | 353 | Geolast; Color: Black | 520 | Injection Molded PVDF Natural color | 668 | PTFE, FDA Santoprene/PTFE |
| 148 | Hardcoat Anodized Aluminum | 354 | Injection Molded #203-40 Santoprene- Duro 40D +/-5; Color: RED | 540 | Nylon | | |
| 149 | 2024-T4 Aluminum | 355 | Thermal Plastic | 541 | Nylon | | Delrin and Hytrel are registered tradenames of E.I. DuPont. |
| 150 | 6061-T6 Aluminum | 356 | Hytrel | 542 | Nylon | | |
| 151 | 6063-T6 Aluminum | 357 | Injection Molded Polyurethane | 544 | Nylon Injection Molded | | Gylon is a registered tradename of Garlock, Inc. |
| 152 | 2024-T4 Aluminum (2023-T351) | 358 | Urethane Rubber (Some Applications) (Compression Mold) | 550 | Polyethylene | | Nylatron is a registered tradename of Polymer Corp. |
| 154 | Almag 35 Aluminum | 359 | Urethane Rubber | 551 | Glass Filled Polypropylene | | Santoprene is a registered tradename of Exxon Mobil Corp. |
| 155 | 356-T6 Aluminum | 360 | Nitrile Rubber Color coded: RED | 552 | Unfilled Polypropylene | | |
| 156 | 356-T6 Aluminum | 361 | Nitrile | 553 | Unfilled Polypropylene | | |
| 157 | Die Cast Aluminum Alloy #380 | 363 | FKM (Fluorocarbon). Color coded: YELLOW | 555 | Polyvinyl Chloride | | |
| 158 | Aluminum Alloy SR-319 | 364 | E.P.D.M. Rubber. Color coded: BLUE | 556 | Black Vinyl | | |
| 159 | Anodized Aluminum | 365 | Neoprene Rubber. Color coded: GREEN | 558 | Conductive HDPE | | |
| 162 | Brass, Yellow, Screw Machine Stock | 366 | Food Grade Nitrile | 570 | Rulon II | | Rulon II is a registered tradename of Dixon Industries Corp. |
| 165 | Cast Bronze, 85-5-5-5 | 368 | Food Grade EPDM | 580 | Ryton | | Ryton is a registered tradename of Phillips Chemical Co. |
| 166 | Bronze, SAE 660 | 370 | Butyl Rubber Color coded: BROWN | 590 | Valox | | Valox is a registered tradename of General Electric Co. |
| 170 | Bronze, Bearing Type, Oil Impregnated | 371 | Phlthane (Tuftane) | 591 | Nylatron G-S | | |
| 175 | Die Cast Zinc | | | 592 | Nylatron NSB | | |
| 180 | Copper Alloy | | | 600 | PTFE (virgin material) Tetrafluorocarbon (TFE) | | PortaPump, Tranquilizer and SludgeMaster are registered tradenames of Warren Rupp, Inc. |
| 305 | Carbon Steel, Black Epoxy Coated | | | 601 | PTFE (Bronze and moly filled) | | |
| | | | | 602 | Filled PTFE | | |
| | | | | 603 | Blue Gylon | | |
| | | | | 604 | PTFE | | |
| | | | | 606 | PTFE | | |

Composite Repair Parts Drawing

Add Kits:
476-230-000

AIR END KIT (Available Service Kits:)

Air End Kit
Seals, O-Rings, Gaskets, Retaining Rings, Air Valve Assembly and Pilot Valve Assembly

476-213-760

Wetted End Kit

Nitrile Diaphragms, Nitrile Check Balls and PTFE Check Valve Seats

476-213-635

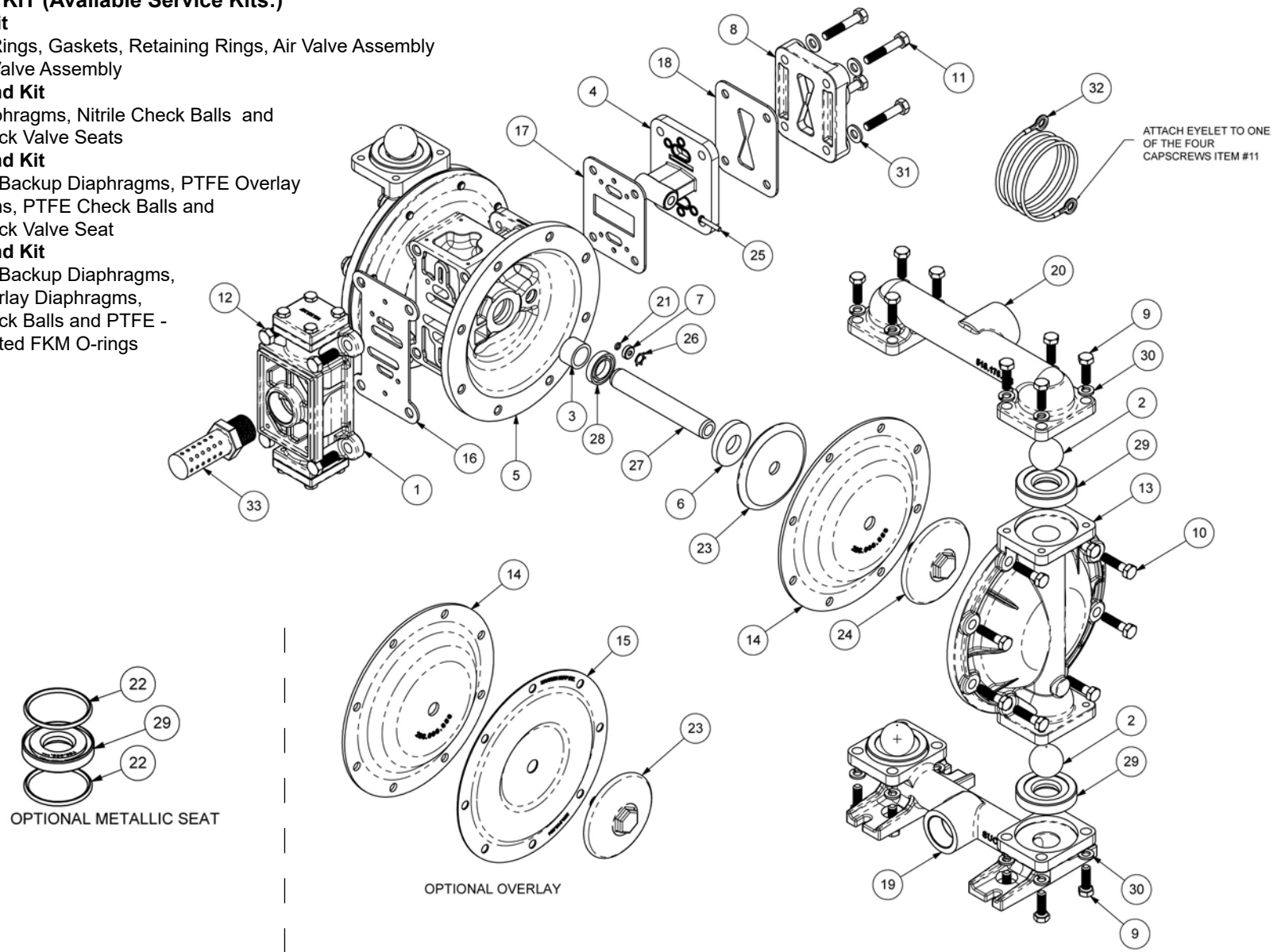
Wetted End Kit

Neoprene Backup Diaphragms, PTFE Overlay Diaphragms, PTFE Check Balls and PTFE Check Valve Seat

476-213-671

Wetted End Kit

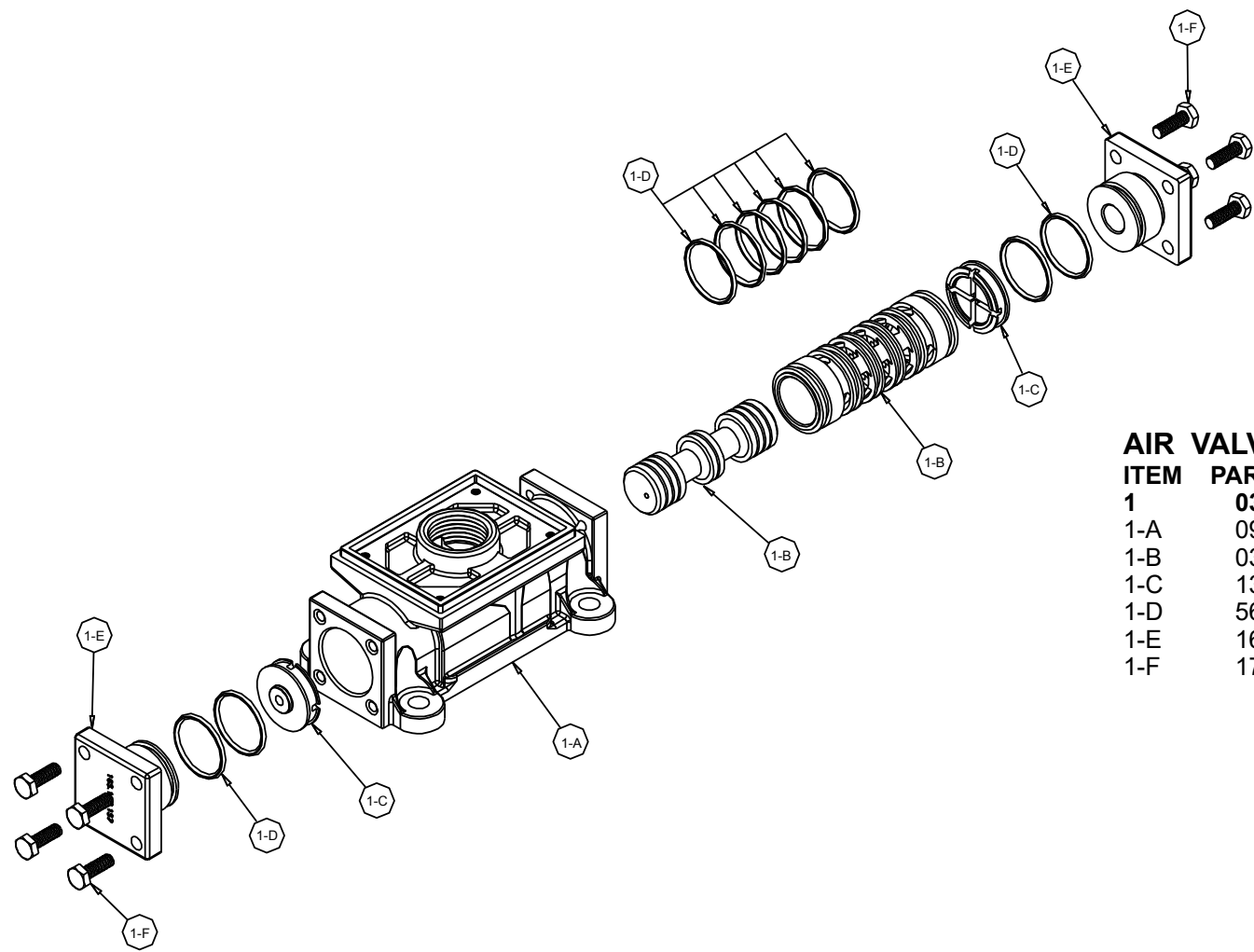
Neoprene Backup Diaphragms, PTFE Overlay Diaphragms, PTFE Check Balls and PTFE - Encapsulated FKM O-rings



Composite Repair Parts List

| ITEM | PART NUMBER | DESCRIPTION | QTY | ITEM | PART NUMBER | DESCRIPTION | QTY |
|------|-------------|---------------------------------|-----|------|--------------|--------------------------------------|-----|
| 1 | 031-183-000 | Air Valve Assembly | 1 | 17 | 360-114-360 | Gasket, Pilot Valve | 1 |
| 2 | 050-028-760 | Ball, Check | 4 | 18 | 360-104-379 | Gasket, Air Inlet | 1 |
| | 050-028-600 | Ball, Check | 4 | 19 | 518-175-156 | Manifold, Suction | 1 |
| 3 | 070-012-170 | Bushing | 2 | | 518-175-156E | Manifold, Suction 1" BSP Tapered | 1 |
| 4 | 095-110-000 | Pilot Valve Assembly | 1 | 20 | 518-176-156 | Manifold, Discharge | 1 |
| 5 | 114-025-157 | Intermediate | 1 | | 518-176-156E | Manifold, Discharge 1" BSP Tapered | 1 |
| 6 | 132-019-360 | Bumper | 2 | 21 | 560-001-379 | O-Ring | 2 |
| 7 | 135-036-506 | Bushing | 2 | 22 | 560-091-611 | O-Ring (used with seat #722.098.150) | 8 |
| 8 | 165-120-157 | Cap, Air Inlet Assembly | 1 | 23 | 612-022-330 | Plate, Inner Diaphragm | 2 |
| 9 | 170-044-330 | Capscrew, Hex Hd 5/16-18 X 1.00 | 16 | 24 | 612-108-157 | Plate, Outer Diaphragm Assembly | 2 |
| 10 | 170-045-330 | Capscrew, Hex Hd 5/16-18 X 1.25 | 16 | 25 | 620-022-115 | Pin, Actuator | 2 |
| 11 | 170-069-330 | Capscrew, Hex Hd 5/16-18 X 1.75 | 4 | 26 | 675-042-115 | Ring, Retaining | 2 |
| 12 | 170-006-330 | Capscrew, Hex Hd 3/8-16 X 1.00 | 4 | 27 | 685-060-120 | Rod, Diaphragm | 1 |
| 13 | 196-173-157 | Chamber, Outer | 2 | 28 | 720-010-375 | Seal, U-Cup | 2 |
| 14 | 286-008-760 | Diaphragm | 2 | 29 | 722-098-600 | Seat, Check Ball | 4 |
| | 286-008-365 | Diaphragm | 2 | | 722.098.150 | Seat, Check Ball | 4 |
| 15 | 286-015-604 | Diaphragm, Overlay | 2 | 30 | 900-004-330 | Lockwasher | 16 |
| 16 | 360-093-360 | Gasket, Air Valve | 1 | 31 | 901-038-330 | Flatwasher | 4 |
| | | | | 32 | 920-025-000 | Ground Strap | 1 |
| | | | | 33 | 530-033-000 | Metal Muffler | 1 |

Air Valve Assembly Drawing, Parts List



AIR VALVE ASSEMBLY PARTS LIST

| ITEM | PART NUMBER | DESCRIPTION | QTY |
|------|-------------|----------------------|-----|
| 1 | 031-183-000 | Gas Valve Assembly | 1 |
| 1-A | 095-109-157 | Valve Body | 1 |
| 1-B | 031-139-000 | Sleeve and Spool Set | 1 |
| 1-C | 132-029-357 | Bumper | 2 |
| 1-D | 560-020-360 | O-Ring | 10 |
| 1-E | 165-127-157 | Cap, End | 2 |
| 1-F | 170-032-330 | Capscrew | 8 |

AIR DISTRIBUTION VALVE SERVICING

To service the air valve first shut off the compressed air, bleed pressure from the pump, and disconnect the air supply line from the pump.

STEP #1: See COMPOSITE REPAIR PARTS DRAWING.

Using a 9/16" wrench or socket, remove the four hex head capscrews (item 10). Remove the air valve assembly from the pump.

Remove and inspect gasket (item 16) for cracks or damage. Replace gasket if needed.

STEP #2: Disassembly of the air valve.

Using a 7/16" wrench or socket, remove the eight hex capscrews (item 1-F) that fasten the end caps to the valve body.

Next remove the two end caps (items 1-E). Inspect two o-rings (items 1-D) on each end cap for damage or wear. Replace the o-rings as needed.

Remove the bumpers (items 1-C). Inspect the bumpers for damage or wear.

Remove the spool (part of item 1-A) from the sleeve. Be careful not to scratch or damage the outer diameter of the spool. Wipe spool with a soft cloth and inspect for scratches or wear.

Inspect the inner diameter of the sleeve (part of item 1-A) for dirt, scratches, or other contaminants. Remove the sleeve if needed and replace with a new sleeve and spool set (item 1-A).

STEP #3: Reassembly of the air valve.

Install one bumper (item 1-C) and one end cap (item 1-E) with two o-rings (item 1-D) and fasten with four hex capscrews (items 1-F) to the valve body (items 1-A).

Remove the new sleeve and spool set (item 1-A) from the plastic bag. Carefully remove the spool from the sleeve. Install the six o-rings (item 1-G) into the six grooves on the sleeve. Apply a light coating of grease to the o-rings before installing the sleeve into the valve body (item 1-B), align the slots in the sleeve with the slots in the valve body. Insert the spool into the sleeve. Be careful not to scratch or damage the spool during installation. Push the spool in until it touches the bumper on the opposite end.

Install the remaining bumper, end cap (with o-rings), and fasten with the remaining hex capscrews.

Fasten the air valve assembly (item 1) and gasket (item 16) to the pump.

Connect the compressed air line to the pump. The pump is now ready for operation.



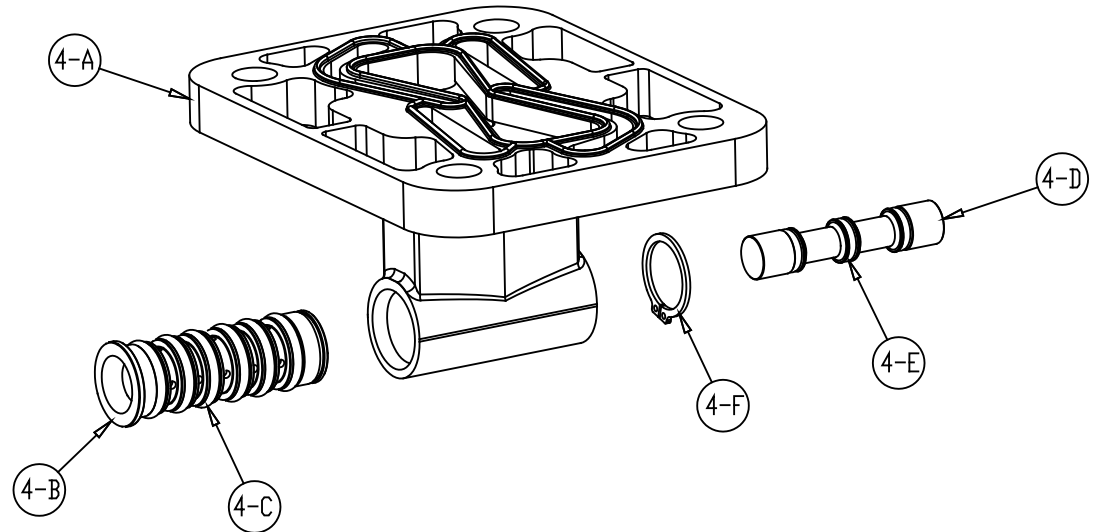
! IMPORTANT

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.

Pilot Valve Servicing, Assembly Drawing & Parts List

PILOT VALVE ASSEMBLY PARTS LIST

| ITEM | PART NUMBER | DESCRIPTION | QTY |
|------|-------------|-----------------------|-----|
| 4 | 095-110-000 | Pilot Valve Assembly | 1 |
| 4-A | 095-095-157 | Valve Body | 1 |
| 4-B | 755-052-000 | Sleeve (With O-rings) | 1 |
| 4-C | 560-033-360 | O-ring (Sleeve) | 6 |
| 4-D | 775-055-000 | Spool (With O-rings) | 1 |
| 4-E | 560-023-360 | O-ring (Spool) | 3 |
| 4-F | 675-037-080 | Retaining Ring | 1 |



PILOT VALVE SERVICING

To service the pilot valve first shut off the compressed air supply, bleed the pressure from the pump, and disconnect the air supply line from the pump.

STEP #1: See pump assembly drawing.

Using a 1/2" wrench or socket, remove the four capscrews (item 12). Remove the air inlet cap (item 8) and air inlet gasket (item 18). The pilot valve assembly (item 4) can now be removed for inspection and service.

STEP #2: Disassembly of the pilot valve.

Remove the pilot valve spool (item 4-D). Wipe clean and inspect spool and o-rings for dirt, cuts or wear. Replace the o-rings and spool if necessary.

Remove the retaining ring (item 4-F) from the end of the sleeve (item 4-B) and remove the sleeve from the valve body (item 4-A). Wipe clean and inspect sleeve and o-rings for dirt, cuts or wear. Replace the o-rings and sleeve if necessary.

STEP #3: Re-assembly of the pilot valve.

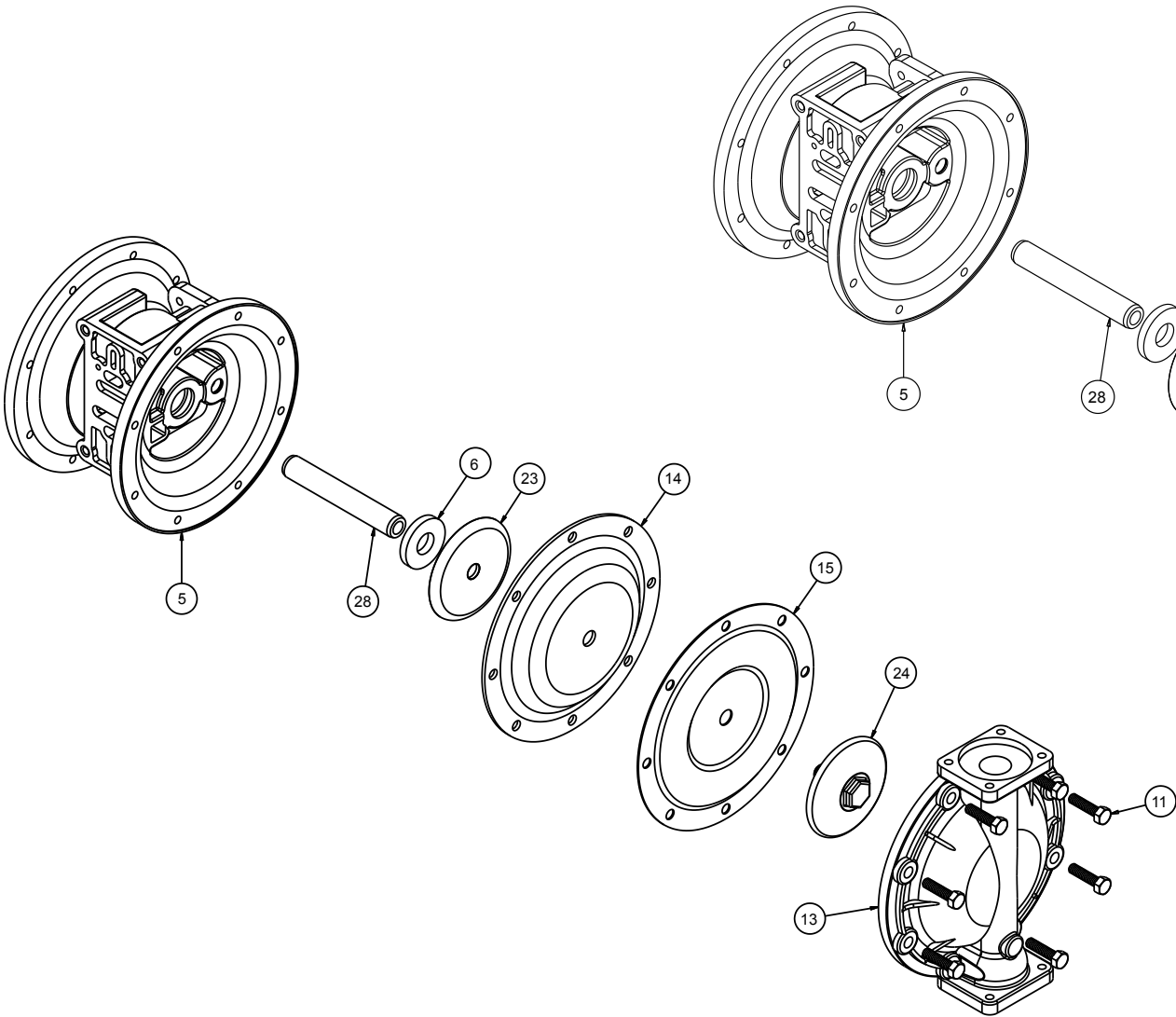
Generously lubricate outside diameter of the sleeve and o-rings. Then carefully insert sleeve into valve body. Take CAUTION when inserting sleeve, not to shear any o-rings. Install retaining ring to sleeve. Generously lubricate outside diameter of spool and o-rings. Then carefully insert spool into sleeve. Take CAUTION when inserting spool, not to shear any o-rings. Use BP-LS-EP-2 multipurpose grease, or equivalent.

STEP #4: Re-install the pilot valve assembly into the intermediate.

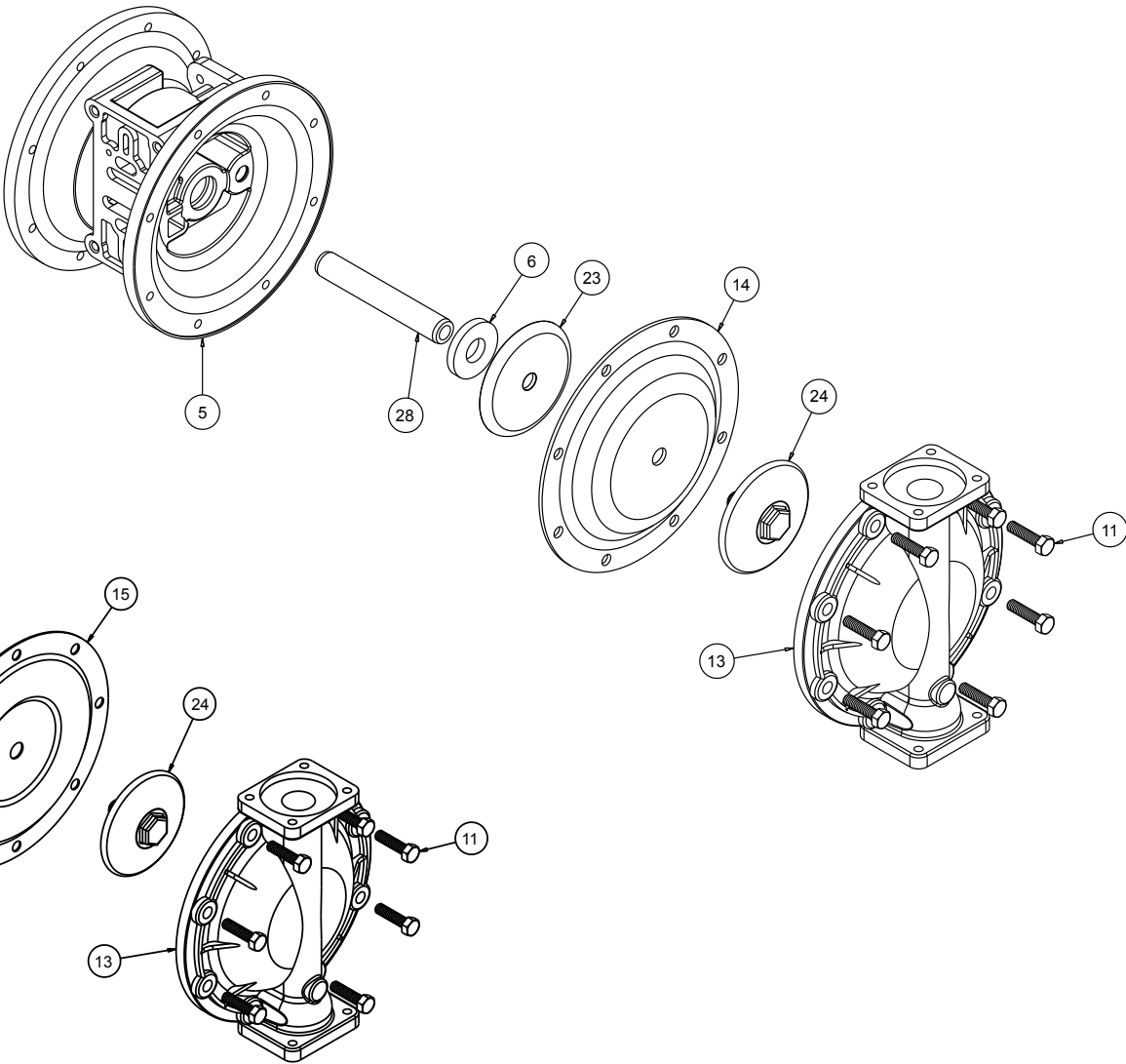
Be careful to align the ends of the pilot valve stem between the plunger pins when inserting the pilot valve into the cavity of the intermediate.

Re-install the gasket, air inlet cap and capscrews. Connect the air supply to the pump. The pump is now ready for operation.

Diaphragm Service Drawing, with Overlay



Diaphragm Service Drawing, Non-Overlay



DIAPHRAGM SERVICING

To service the diaphragms first shut off the suction, then shut off the discharge lines to the pump. Shut off the compressed air supply, bleed the pressure from the pump and disconnect the air supply line from the pump. Drain any remaining liquid from the pump.

Step #1: See the pump assembly drawing and the diaphragm servicing illustration.

Using a 1/2" wrench or socket, remove the 16 capscrews (item 9) that fasten the manifolds (items 19 & 20) to the outer chambers (item 13).

Step #2: Removing outer chambers.

Using a 1/2" wrench or socket, remove the 16 capscrews (item 11), that fasten the outer chambers (item 13), diaphragms (item 14) and intermediate (item 5) together.

Step #3: Removing the diaphragms and diaphragm plates.

Use a 7/8" wrench or six point socket to remove the outer diaphragm plate assemblies (item 24), diaphragms (item 14) and inner diaphragm plates (item 23) from the diaphragm rod (item 28) by turning counterclockwise. Inspect the diaphragm for cuts, punctures, abrasive wear or chemical attack. Replace the diaphragms if necessary. **DO NOT USE A WRENCH ON THE DIAPHRAGM ROD. FLAWS ON THE SURFACE MAY DAMAGE BEARINGS AND SEALS.**

Step #4: Assembling the diaphragm and diaphragm plates to the diaphragm rod.

Push the threaded stud of one outer diaphragm plate assembly through the center of one diaphragm and through one inner diaphragm plate. Install the diaphragm with the natural bulge facing away from the diaphragm rod and make sure the radius on the inner diaphragm plate is towards the diaphragm, as indicated on the diaphragm servicing illustration. Thread the assembly onto the diaphragm rod, leaving loose.

Step #5: Installing the diaphragm and rod assembly to the pump.

Make sure the bumper (item 6) is installed over the diaphragm rod. Insert rod into pump.

On the opposite side of the pump, pull the diaphragm rod out as far as possible. Make sure the second bumper is installed over the diaphragm rod.

Push the threaded stud of the other outer diaphragm plate assembly through the center of the other diaphragm and through the other inner diaphragm plate. Make sure the radius on the inner diaphragm plate is towards the diaphragm. Thread the assembly onto the diaphragm rod. Use a 7/8" wrench or socket to hold one outer diaphragm plate. Then, use a torque wrench to tighten the other outer diaphragm plate to the diaphragm rod to 350 in. lbs. (39.5 Newton meters).

Align one diaphragm with the intermediate and install the outer chamber to the pump using the 8 capscrews. Tighten the opposite diaphragm plate until the holes in the diaphragm align with the holes in the intermediate. Then, install the other outer chamber using the 8 capscrews.

Step #6: Reinstall the manifolds to the pump using the 16 capscrews.

The pump is now ready to be reinstalled, connected and returned to operation.

OVERLAY DIAPHRAGM SERVICING

The overlay diaphragm (item 15) is designed to fit over the exterior of the standard diaphragm (item 14).

Follow the same procedures described for the standard diaphragm for removal and installation, except tighten the outer diaphragm plate assembly, diaphragms and inner diaphragm plate to the diaphragm rod to 350 in. lbs. (39.5 Newton meters).



! 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.

ACTUATOR PLUNGER SERVICING

To service the actuator plunger first shut off the compressed air supply, bleed the pressure from the pump, and disconnect the air supply line from the pump.

Step #1: See PUMP ASSEMBLY DRAWING.

Using a 1/2" wrench or socket, remove the four capscrews (items 11). Remove the air inlet cap (item 8) and air inlet gasket (item 18). The pilot valve assembly (item 4) can now be removed.

Step #2: Inspect the actuator plungers.

See ILLUSTRATION AT RIGHT.

The actuator plungers (items 25) can be reached through the pilot valve cavity in the intermediate assembly (item 5).

Remove the plungers (item 25) from the bushings (item 7) in each end of the cavity. Inspect the installed o-ring (items 22) for cuts and/or wear. Replace the o-rings if necessary. Apply a light coating of grease to each o-ring and re-install the plungers in to the bushings. Push the plungers in as far as they will go.

To remove the bushings (item 7), first remove the retaining rings (item 26) by using a flat screwdriver. **NOTE:** It is recommended that new retaining rings be installed.

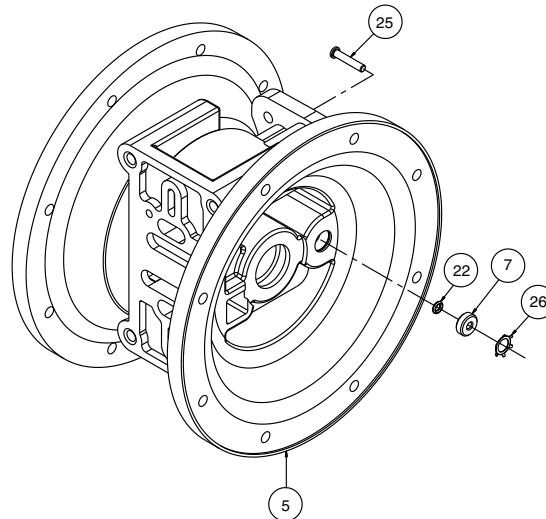
Step #3: Re-install the pilot valve assembly into the intermediate assembly.

Be careful to align the ends of the stem between the plungers when inserting the stem of the pilot valve into the cavity of the intermediate.

Re-install the gasket (item 18), air inlet cap (item 8) and capscrews (item 11).

Connect the air supply to the pump. The pump is now ready for operation.

ACTUATOR PLUNGER SERVICING



! 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.

CHECK VALVE SERVICING

Before servicing the check valve components, first shut off the suction line and then the discharge line to the pump. Next, shut off the compressed air supply, bleed air pressure from the pump, and disconnect the air supply line from the pump. Drain any remaining fluid from the pump. The pump can now be removed for service.

To access the check valve components, remove the manifold (item 20 or item 19 not shown). Use a 1/2" wrench or socket to remove the fasteners. Once the manifold is removed, the check valve components can be seen.

Inspect the check balls (items 2) for wear, abrasion, or cuts on the spherical surface. The check valve seats (item 30) should be inspected for cuts, abrasive wear, or embedded material on the surfaces of both the external and internal chambers. The spherical surface of the check balls must seat flush to the surface of the check valve seats for the pump to operate to peak efficiency. Replace any worn or damaged parts as necessary.

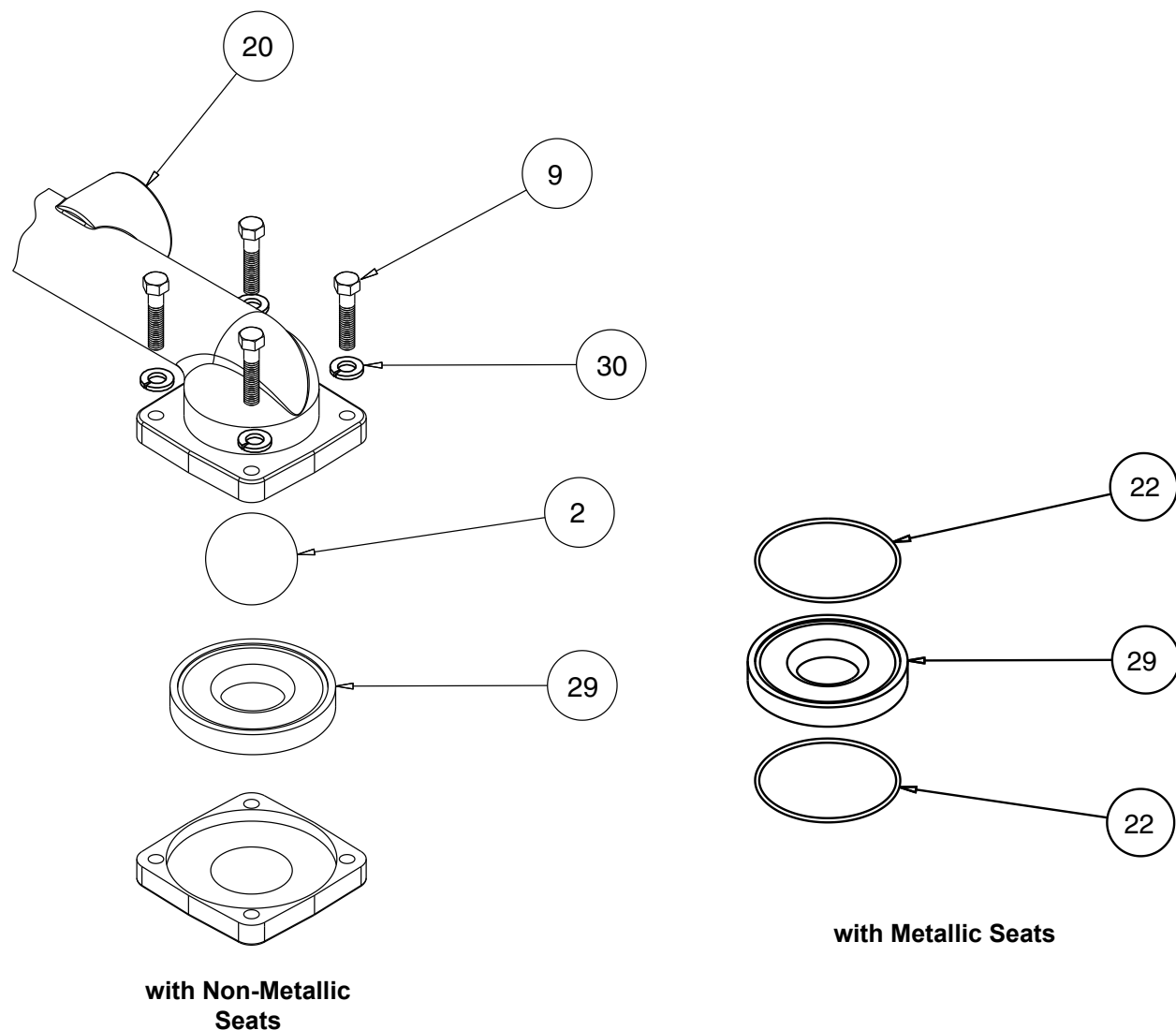
Re-assemble the check valve components. The seat should fit into the counter bore of the outer chamber.

The pump can now be reassembled, reconnected and returned to operation.

METALLIC SEATS

Two o-rings (item 22) are required for each metallic seats.

Check Valve Drawing



PUMPING HAZARDOUS LIQUIDS

When a diaphragm fails, the pumped liquid or fumes enter the air end of the pump. Fumes are exhausted into the surrounding environment. When pumping hazardous or toxic materials, the exhaust air must be piped to an appropriate area for safe disposal. See illustration #1 at right.

This 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. See illustration #2 at right. Piping used for the air exhaust must not be smaller than 1" (2.54 cm) diameter. Reducing the pipe size will restrict air flow and reduce pump performance. 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. See illustration #3 at right.

CONVERTING THE PUMP FOR PIPING THE EXHAUST AIR

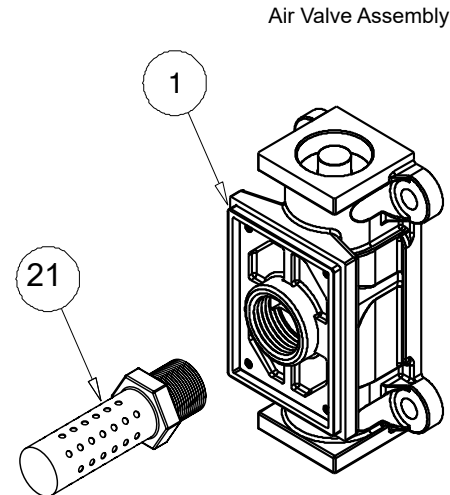
The following steps are necessary to convert the pump to pipe the exhaust air away from the pump.

Remove the muffler (item 21). The air distribution valve (item 1) has 1" NPT threads for piped exhaust.

IMPORTANT INSTALLATION

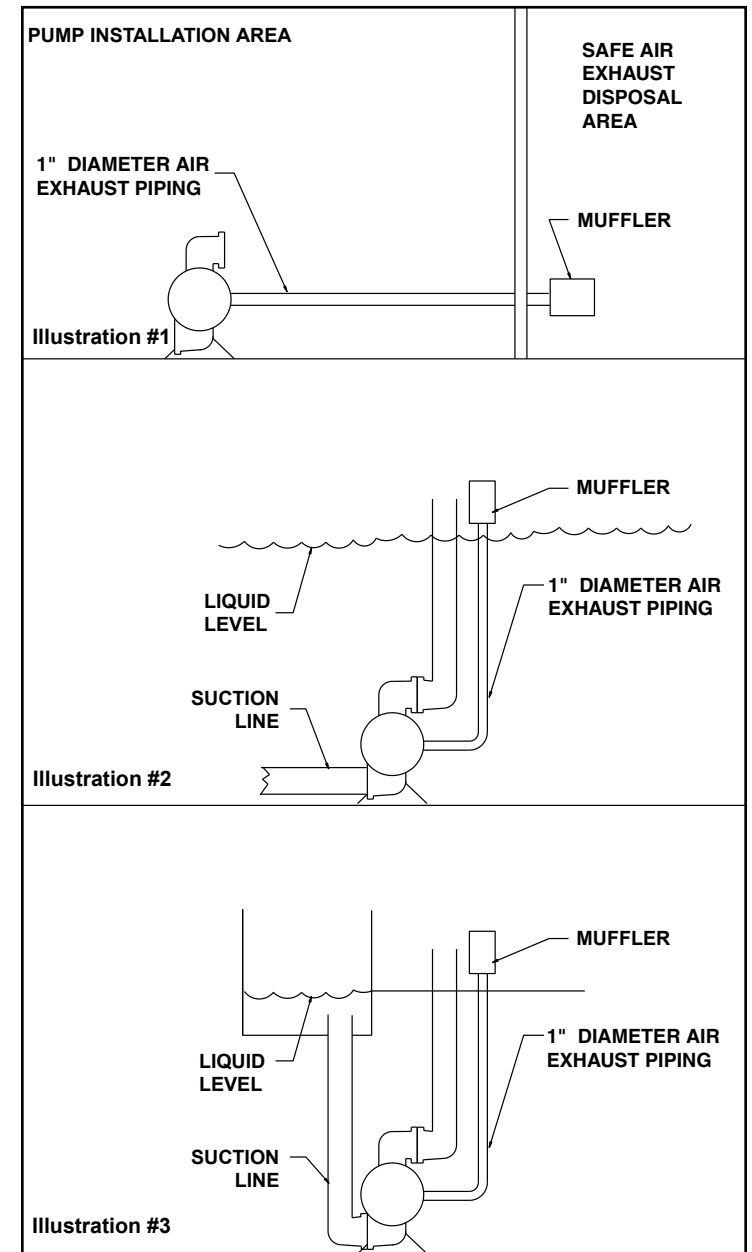
NOTE: The manufacturer recommends installing a flexible conductive hose or connection between the pump and any rigid plumbing. This reduces stresses on the molded threads of the air exhaust port. Failure to do so may result in damage to the air distribution valve body.

Any piping or hose connected to the pump's air exhaust port must be conductive and physically supported. Failure to support these connections could also result in damage to the air distribution valve body.



The pump comes equipped with a standard metal muffler

CONVERTED EXHAUST ILLUSTRATION



**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

Director of Engineering

Title

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

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)
- 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:

Meander 1051
6825 MJ Amhem
The Netherlands

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°C Db

- 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