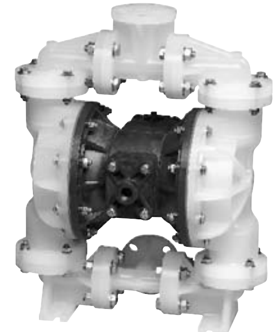
SERVICE & OPERATING MANUAL

SANDPIPER®

A WARREN RUPP PUMP BRAND



II 2GD T5

U.S. Patent #
400,210
5,996,627
6,241,487

Model S1F Non-Metallic Design Level 3

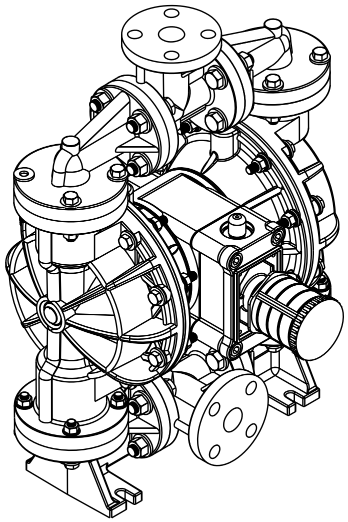
Table of Contents

WARREN RUPP®

Quality System ISO9001 Certified

Environmental Management System ISO14001 Certified

IDEX FLUID & METERING



II 2GD T5

CE

U.S. Patent #5,996,627; 400,210; 6,241,487
Other U.S. Patents Applied for

SANDPIPER®
A WARREN RUPP PUMP BRAND

S1F Non-Metallic Design Level 3 Ball Valve

Air-Operated Double Diaphragm Pump

ENGINEERING, PERFORMANCE & CONSTRUCTION DATA

INTAKE/DISCHARGE PIPE SIZE	CAPACITY	AIR VALVE	SOLIDS-HANDLING	HEADS UP TO	DISPLACEMENT/STROKE
1" ANSI Flange or PN10 25mm DIN Flange	0 to 45 gallons per minute (0 to 170 liters per minute)	No-lube, no-stall design	Up to .25 in. (6mm)	100 psi or 231 ft. of water (7 bar or 70 meters)	.17 gallon / .64 liter

CAUTION! ***Operating temperature limitations are as follows:***

Materials	Operating Temperatures Maximum*	Operating Temperatures 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
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
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
Neoprene: All purpose. Resistant to vegetable oil. 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.	200°F 93°C	-10°F -23°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

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

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

Explanation of Pump Nomenclature

S1F Non-Metallic · Design Level 3 · 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)
S1FB3P1PPUS000.	S	1F	B	3	P	1	P	P	U	S	0	00.	42 (19)
S1FB3P2PPUS000.	S	1F	B	3	P	2	P	P	U	S	0	00.	42 (19)
S1FB3PBPPUS000.	S	1F	B	3	P	B	P	P	U	S	0	00.	42 (19)
S1FB3PGPPUS000.	S	1F	B	3	P	G	P	P	U	S	0	00.	42 (19)
S1FB3PNPPUS000.	S	1F	B	3	P	N	P	P	U	S	0	00.	42 (19)
S1FB3K1KPUS000.	S	1F	B	3	K	1	K	P	U	S	0	00.	54 (24)
S1FB3K2KPUS000.	S	1F	B	3	K	2	K	P	U	S	0	00.	54 (24)
S1FB3P3PPUV000.	S	1F	B	3	P	3	P	P	U	V	0	00.	48 (22)
S1FB3K3KPUV000.	S	1F	B	3	K	3	K	P	U	V	0	00.	64 (29)
S1FB3P4PPUV000.	S	1F	B	3	P	4	P	P	U	V	0	00.	48 (22)
S1FB3K4KPUV000.	S	1F	B	3	K	4	K	P	U	V	0	00.	64 (29)

Pump Brand
S= SANDPIPER®

Pump Size
1F= 1" Full Flow

Check Valve Type
B= Ball

Design Level
3= Design Level 3

Wetted Material
K= PVDF
P= Polypropylene
⚠ C= Conductive Polypropylene
⚠ V= Conductive PVDF

Diaphragm Check Valve Materials
1= Santoprene/Santoprene
2= PTFE Santoprene Backup/PTFE
3= PTFE Pumping, PTFE-Santoprene Backup Driver/PTFE
4= Santoprene Pumping/Santoprene
B= Nitrile/Nitrile
G= PTFE-Neoprene Backup/PTFE
N= Neoprene/Neoprene
V= FKM/FKM

Diaphragm Check Valve Materials, Continued
Y= PTFE Pumping/One-Piece Bonded Driver/PTFE
Z= One-Piece Bonded/PTFE

Check Valve Seat
K= PVDF
P= Polypropylene

Non-Wetted Material Options
P= Polypropylene
1= 40% Glass Filled Polypropylene with PTFE hardware
⚠ C= Conductive Polypropylene

Porting Options
U= Universal (Fits ANSI and DIN)
7= Dual Porting (ANSI)
8= Top Dual Porting (ANSI)
9= Bottom Dual Porting (ANSI)

Pump Style
D= With Electronic Leak Detection (110 V)
E= With Electronic Leak Detection (220V)
M= With Mechanical Leak Detection
S= Standard
V= With Visual Leak Detection

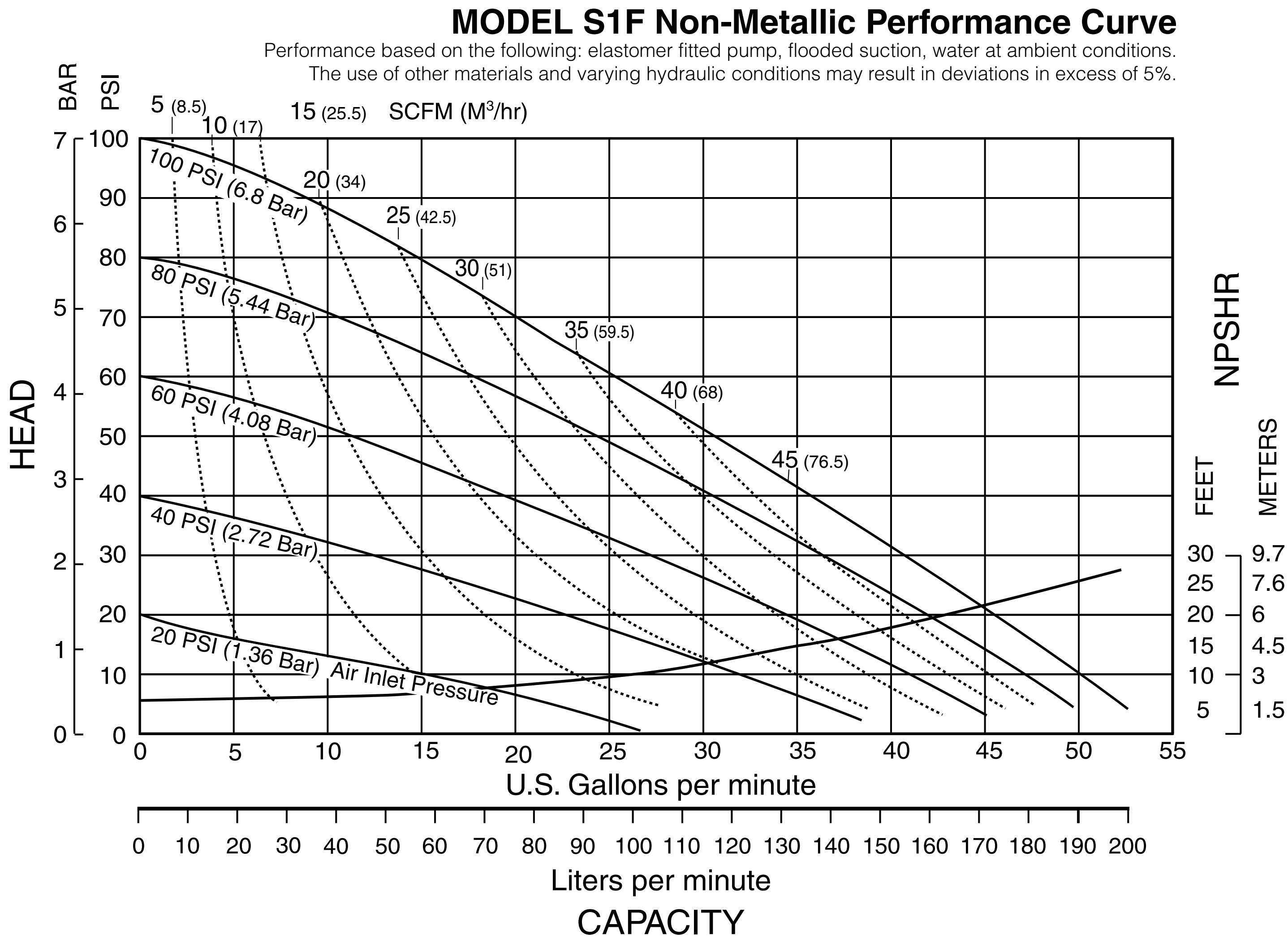
Pump Options
⚠ 0= None
1= Sound Dampening Muffler
2= Mesh Muffler
3= High temperature Air Valve w/Integral Muffler
4= High temperature Air Valve w/Sound Dampening Muffler
5= High temperature Air Valve w/Mesh Muffler
⚠ 6= Metal Muffler
⚠ 7= Metal Muffler with Grounding Cable

Kit Options
⚠ 00.= None
P0.= 10-30VDC Pulse Output Kit
⚠ P1.= Intrinsically-Safe 5-30VDC,110/120VAC, 220/240VAC Pulse Output Kit

Kit Options, Continued
P2.= 110/120 or 220/240VAC Pulse Output Kit
E0.= Solenoid Kit with 24VDC Coil
⚠ E1.= Solenoid Kit with 24VDC Explosion-Proof Coil
E2.= Solenoid Kit with 24VAC/12VDC Coil
⚠ E3.= Solenoid Kit with 12VDC Explosion-Proof Coil
E4.= Solenoid Kit with 110VAC Coil
⚠ E5.= Solenoid Kit with 110VAC, 60 Hz Explosion-Proof Coil
E6.= Solenoid Kit with 220VAC Coil
⚠ E7.= Solenoid Kit with 220VAC, 60 Hz Explosion-Proof Coil
⚠ E8.= Solenoid Kit with 110VAC, 50 Hz Explosion-Proof Coil
⚠ E9.= Solenoid Kit with 230VAC, 50 Hz Explosion-Proof Coil
SP.= Stroke Indicator Pins

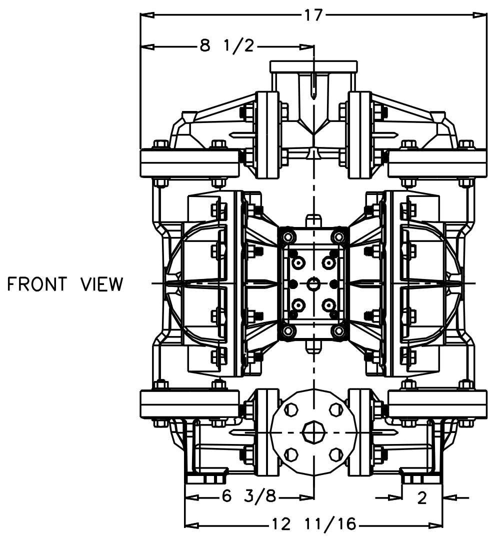
⚠ **Note: Pumps are only ATEX compliant when ordered with wetted options C or V, non-wetted option C, pump options 6 or 7, and kit options 00, P1, E1, E3, E5, E7, E8 or E9.**

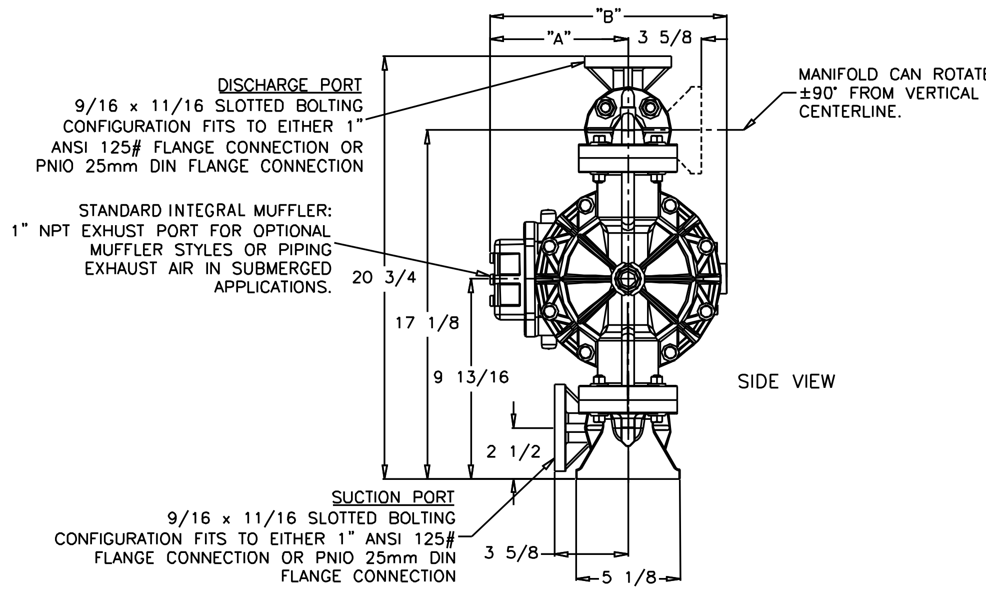
Performance Curve, Model S1F Non-Metallic
Design Level 3

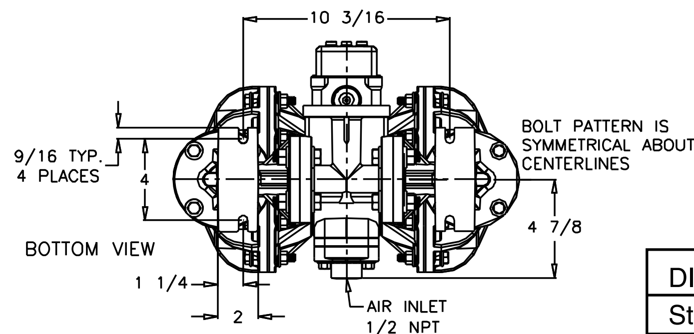


Dimensions: S1F Non-Metallic

Dimensions in Inches
Dimensional tolerance: ±1/8"



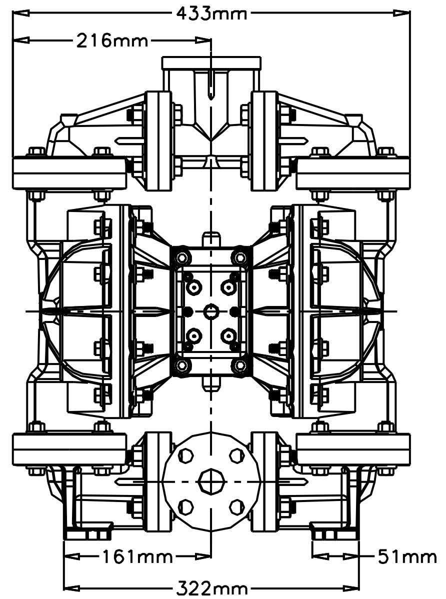




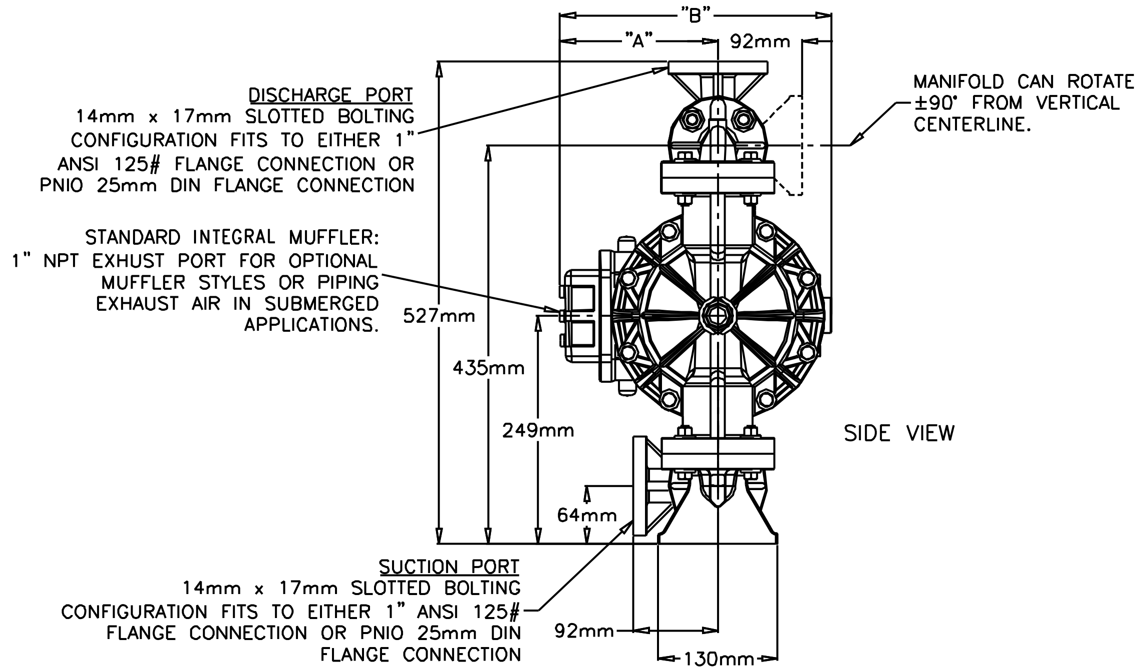
DIMENSION	A	B
Standard Pump	6 7/8"	11 3/4"
Pulse Output Kit	6 7/8"	11 3/4"
Mesh Muffler	8 9/16"	11 5/32"
Sound Dampening Muffler	8 9/16"	11 5/32"
Metal Muffler	9"	14"

Metric Dimensions: S1F Non-Metallic

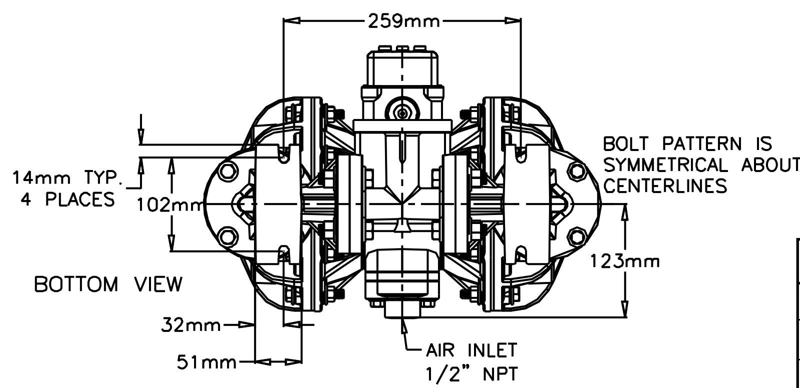
Dimensions in Millimeters
Dimensional tolerance: ±3mm



FRONT VIEW



SIDE VIEW

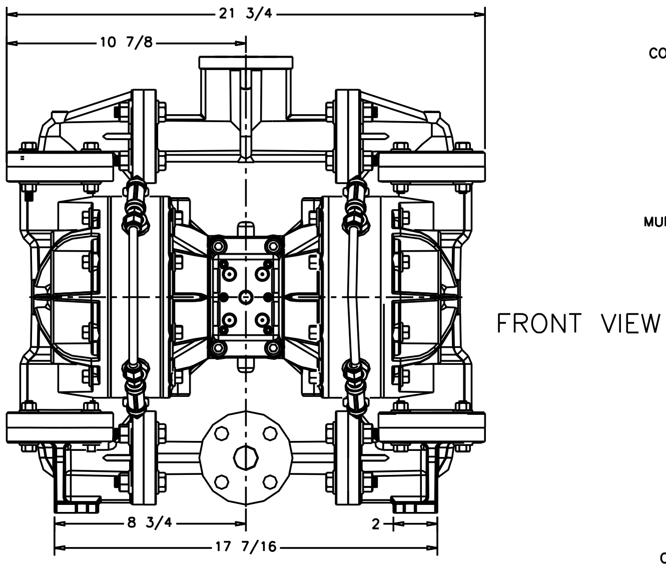


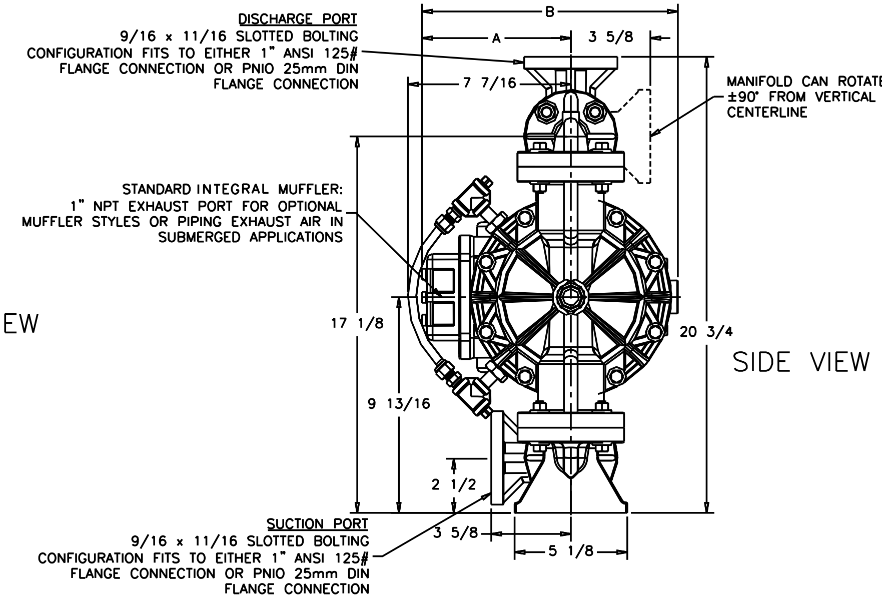
BOTTOM VIEW

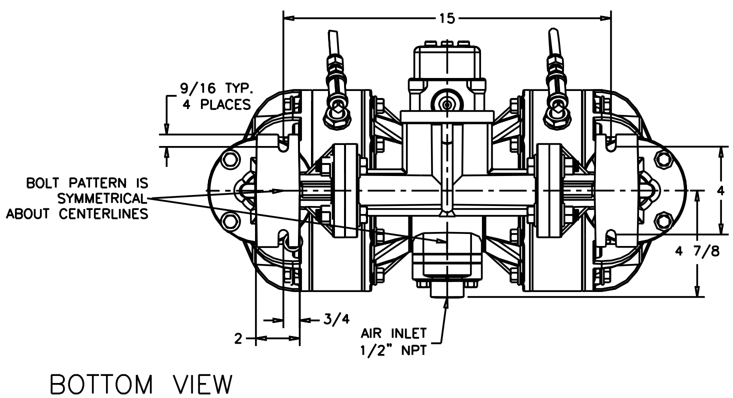
DIMENSION	A	B
Standard Pump	175mm	298mm
Pulse Output Kit	175mm	298mm
Mesh Muffler	167mm	283mm
Sound Dampening Muffler	167mm	283mm
Metal Muffler	229mm	356mm

Dimensions: S1F Non-Metallic
with Spill Containment Dimensions in Inches

Dimensions in Inches
Dimensional tolerance: ±1/8"



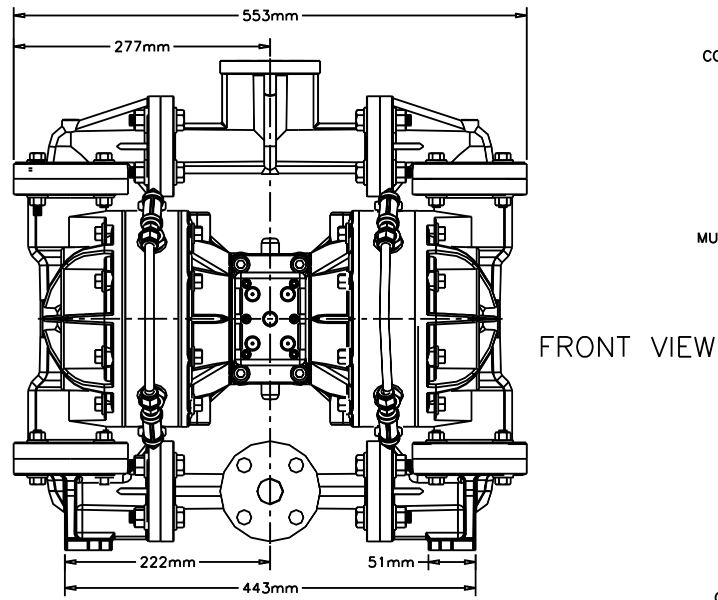


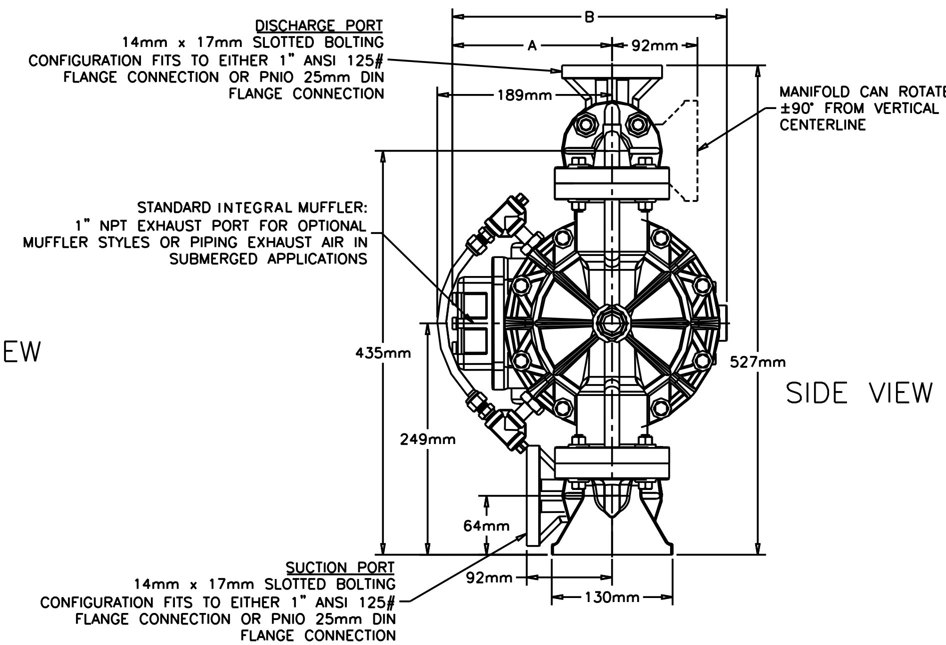


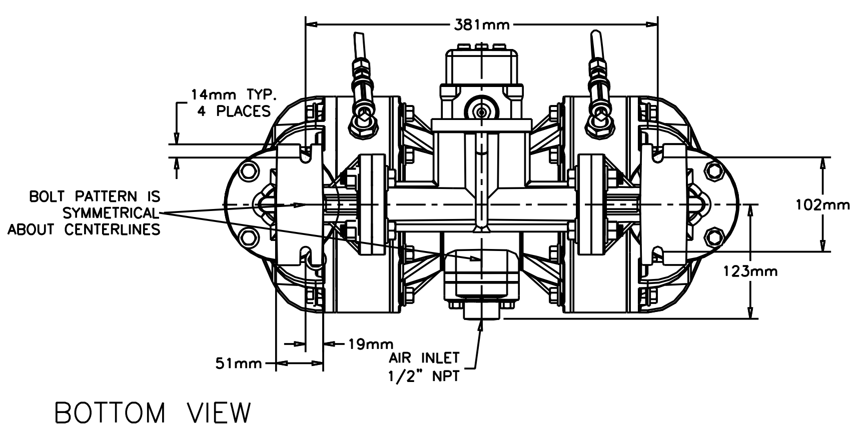
DIMENSION	A	B
Standard Pump	5 5/8"	10 1/4"
Pulse Output Kit	5 5/8"	10 1/4"
Mesh Muffler	8 9/16"	11 1/8"
Sound Dampening Muffler	8 9/16"	11 1/8"

Metric Dimensions: S1F Non-Metallic with Spill Containment

Dimensions in Millimeters
Dimensional tolerance: ±3mm







DIMENSION	A	B
Standard Pump	143mm	260mm
Pulse Output Kit	143mm	260mm
Mesh Muffler	167mm	283mm
Sound Dampening Muffler	167mm	283mm

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 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.

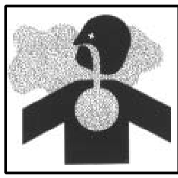
WARREN RUPP®

INSTALLATION GUIDE

Top Discharge Ball Valve Unit

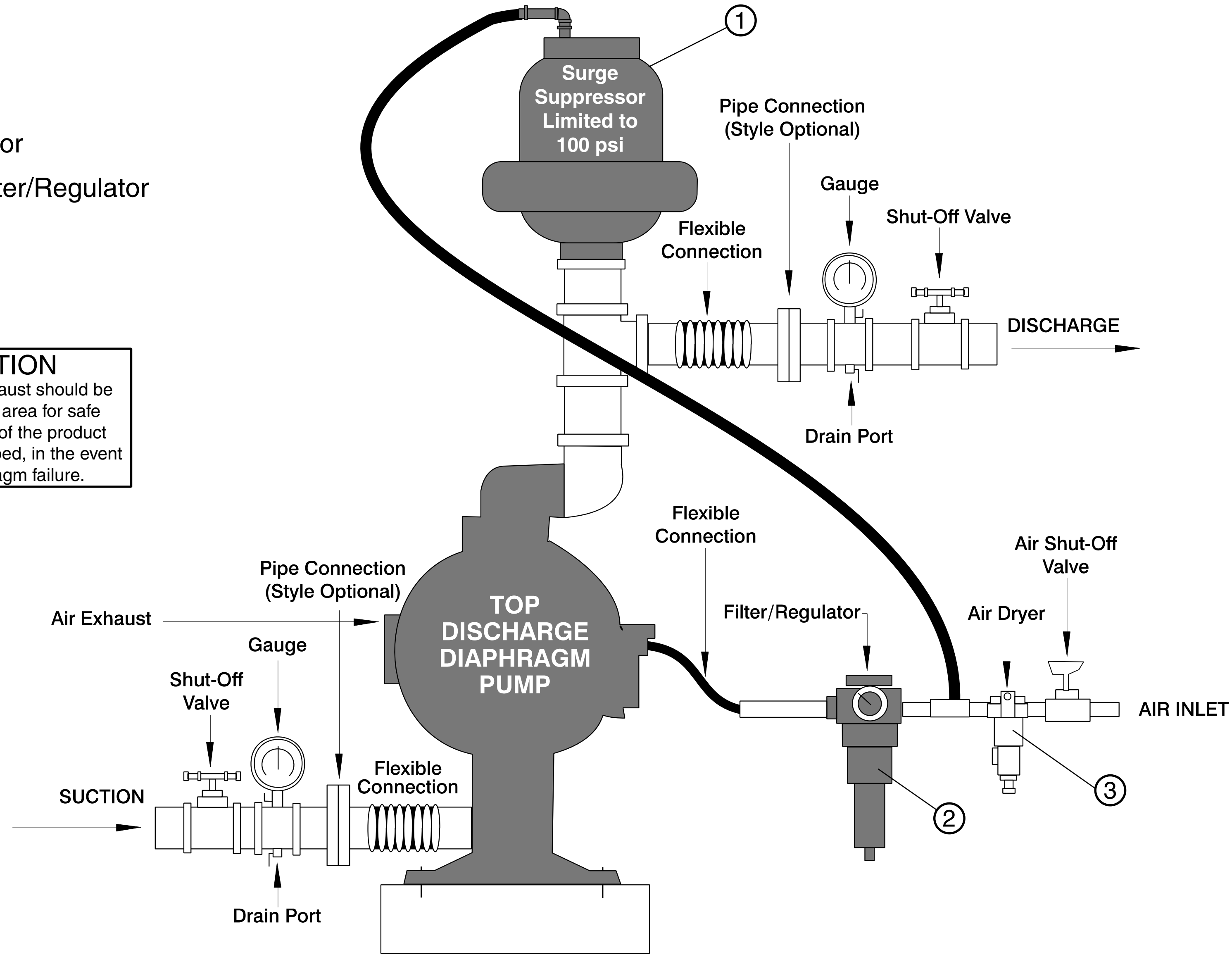
Available from Warren Rupp

1. Surge Suppressor
2. 020-050-000 Filter/Regulator
3. Air Dryer



⚠ 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.



RECYCLING

Many components of SANDPIPER® Metallic AODD pumps are made of recyclable materials (see chart on page 11 for material specifications). We encourage pump users to recycle worn out parts and pumps whenever possible, after any hazardous pumped fluids are thoroughly flushed.

II 2GD T5

Pump complies with EN809 Pumping Directive, Directive 98/37/EC Safety of Machinery, and Directive 94/9/EC, EN13463-1 Equipment for use in Potentially Explosive Environments. For reference to the directive certificates visit: www.warrenrupp.com. The Technical File No. AX1 is stored at KEMA, Notified Body 0344, under Document #203040000.

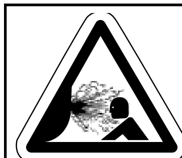
IMPORTANT SAFETY INFORMATION

⚠ IMPORTANT

Read these safety warnings and instructions in this manual completely, before installation and start-up of the pump. 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.

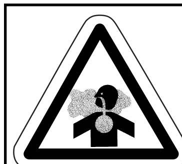
⚠ CAUTION

Before pump operation, inspect all gasketed fasteners for looseness caused by gasket creep. Re-torque loose fasteners to prevent leakage. Follow recommended torques stated in this manual.



⚠ WARNING

Before maintenance or repair, shut off the compressed air line, bleed the pressure, and disconnect the air line from the pump. The discharge line may be pressurized and must be bled of its pressure.



⚠ 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.

⚠ WARNING

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. (See page 36)

⚠ WARNING

This pump is pressurized internally with air pressure during operation. Always make certain that all bolting is in good condition and that all of the correct bolting is reinstalled during assembly.

⚠ WARNING

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

⚠ WARNING

Before doing any maintenance on the pump, be certain all pressure is completely vented from the pump, suction, discharge, piping, and all other openings and connections. Be certain the air supply is locked out or made non-operational, so that it cannot be started while work is being done on the pump. Be certain that approved eye protection and protective clothing are worn all times in the vicinity of the pump. Failure to follow these recommendations may result in serious injury or death.

⚠ WARNING

Airborne particles and loud noise hazards.

Wear ear and eye protection.

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 Aluminum
149 2024-T4 Aluminum
150 6061-T6 Aluminum
151 6063-T6 Aluminum
152 2024-T4 Aluminum (2023-T351)
154 Almag 35 Aluminum
155 356-T6 Aluminum
156 356-T6 Aluminum
157 Die Cast Aluminum Alloy #380
158 Aluminum Alloy SR-319
159 Anodized Aluminum
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, Black Epoxy Coated
306 Carbon Steel, Black PTFE Coated
307 Aluminum, Black Epoxy Coated
308 Stainless Steel, Black PTFE Coated
309 Aluminum, Black PTFE Coated
310 PVDF Coated
330 Zinc Plated Steel
331 Chrome Plated Steel
332 Aluminum, 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 Molded #203-40 Santoprene- Duro 40D +/-5; Color: RED
355 Thermal Plastic
356 Hytrel
357 Injection Molded Polyurethane
358 Urethane Rubber (Some Applications) (Compression Mold)
359 Urethane Rubber
360 Nitrile Rubber. Color coded: RED
361 FDA Accepted Nitrile
363 FKM (Fluorocarbon). Color coded: YELLOW
364 E.P.D.M. 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 Philthane (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 Molded PVDF Natural color
521 Conductive PVDF
540 Nylon
541 Nylon
542 Nylon
544 Nylon Injection Molded
550 Polyethylene
551 Glass Filled Polypropylene
552 Unfilled Polypropylene
553 Unfilled Polypropylene
555 Polyvinyl Chloride
556 Black Vinyl
557 Conductive Polypropylene
558 Conductive HDPE
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
606 PTFE
607 Envelon
608 Conductive PTFE
610 PTFE Integral Silicon
611 PTFE Integral FKM
632 Neoprene/Hytrel
633 FKM (Fluorocarbon)/PTFE
634 EPDM/PTFE
635 Neoprene/PTFE
637 PTFE, FKM (Fluorocarbon)/PTFE
638 PTFE, Hytrel/PTFE
639 Nitrile/TFE
643 Santoprene/EPDM
644 Santoprene/PTFE
650 Bonded Santoprene and PTFE
654 Santoprene Diaphragm, PTFE Overlay Balls and seals
656 Santoprene Diaphragm and Check Balls/EPDM Seats
661 EPDM/Santoprene

Delrin and Hytrel are registered tradenames of E.I. DuPont.

Gylon is a registered tradename of Garlock, Inc.

Nylatron is a registered tradename of Polymer Corp.

Santoprene is a registered tradename of Monsanto Corp.

Rulon II is a registered tradename of Dixion Industries Corp.

Ryton is a registered tradename of Phillips Chemical Co.

Valox is a registered tradename of General Electric Co.

Warren Rupp, SANDPIPER, PortaPump, Tranquilizers and SludgeMaster are registered tradenames of Warren Rupp, Inc.

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+Plus, 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. A 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.

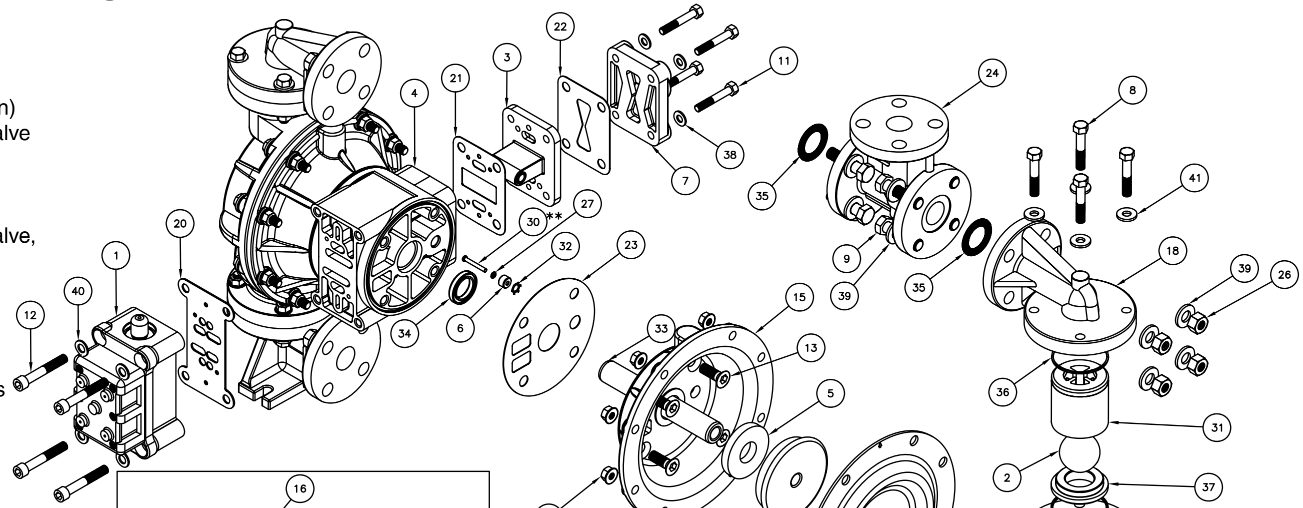
Composite Repair Parts Drawing

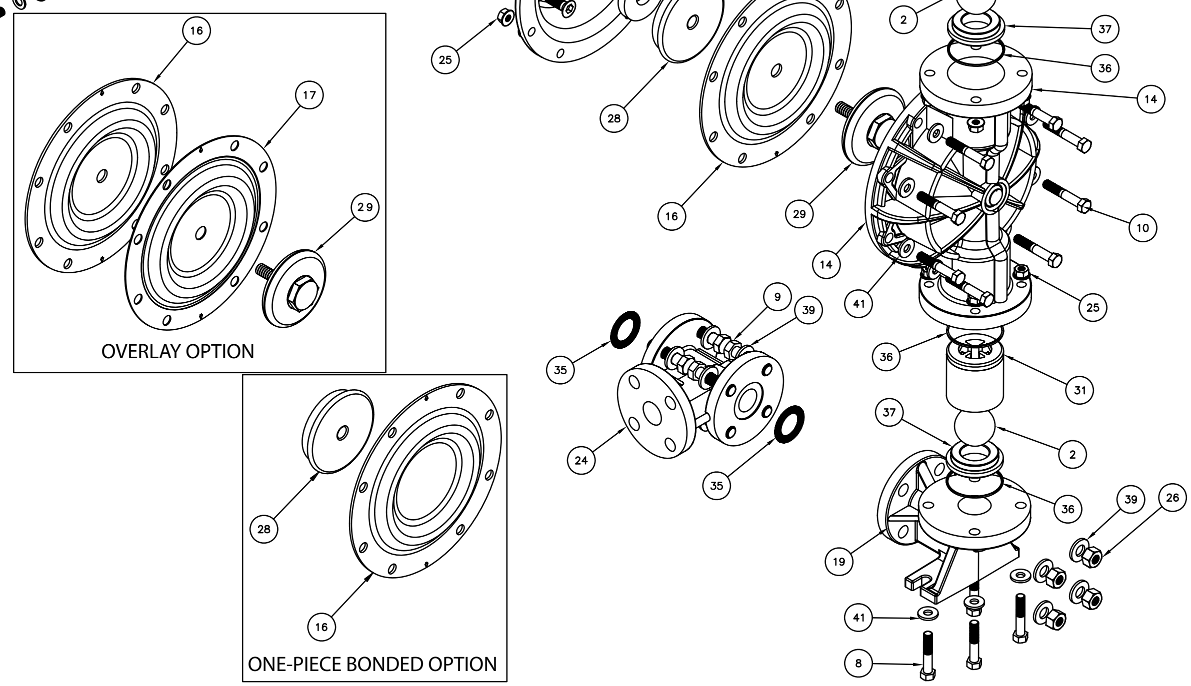
AVAILABLE SERVICE AND CONVERSION KITS

476-217-000	**AIR END KIT** (For Polypropylene Center Section) Seals, O-rings, Gaskets, Retaining Rings, Air Valve Sleeve & Spool Set and Pilot Valve Assembly
476-218-000	**AIR END KIT** (Stroke Indicator Option, For Polypropylene Center Section) Seals, O-rings, Gaskets, Retaining Rings, Air Valve, Sleeve & Spool Set and Pilot Valve Assembly
476-197-354	**WETTED END KIT** Santoprene Diaphragms, Santoprene Balls and PTFE Seals
476-197-360	**WETTED END KIT** Nitrile Diaphragms, Nitrile Balls and PTFE Seals
476-197-363	**WETTED END KIT** FKM Diaphragms, FKM Balls and PTFE Seals
476-197-365	**WETTED END KIT** Neoprene Diaphragms, Neoprene Balls and PTFE Seals
476-197-635	**WETTED END KIT** Neoprene Diaphragms, PTFE Overlay Diaphragms, PTFE Balls and PTFE Seals
476-197-654	**WETTED END KIT** Santoprene Diaphragms, PTFE Overlay Diaphragms, TFE Balls and TFE Seals
476-197-659	**WETTED END KIT** One-Piece Bonded Diaphragms, PTFE Balls, PTFE Seals
476-198-655	**WETTED END KIT** Santoprene Diaphragms, PTFE Overlay Diaphragms, PTFE Pumping Diaphragms, PTFE Balls and PTFE Seals
476-198-354	**WETTED END KIT** Santoprene Diaphragms, Santoprene Pumping Diaphragms, Santoprene Check Balls and PTFE Seals
476-198-659	**WETTED END KIT** One-Piece Bonded Diaphragms, PTFE Pumping Diaphragms, PTFE Balls, PTFE Seals

ELECTRONIC LEAK DETECTOR KITS

032-037-000	110 VAC / 220 VAC
032-045-000	12 - 32 VDC





Composite Repair Parts List

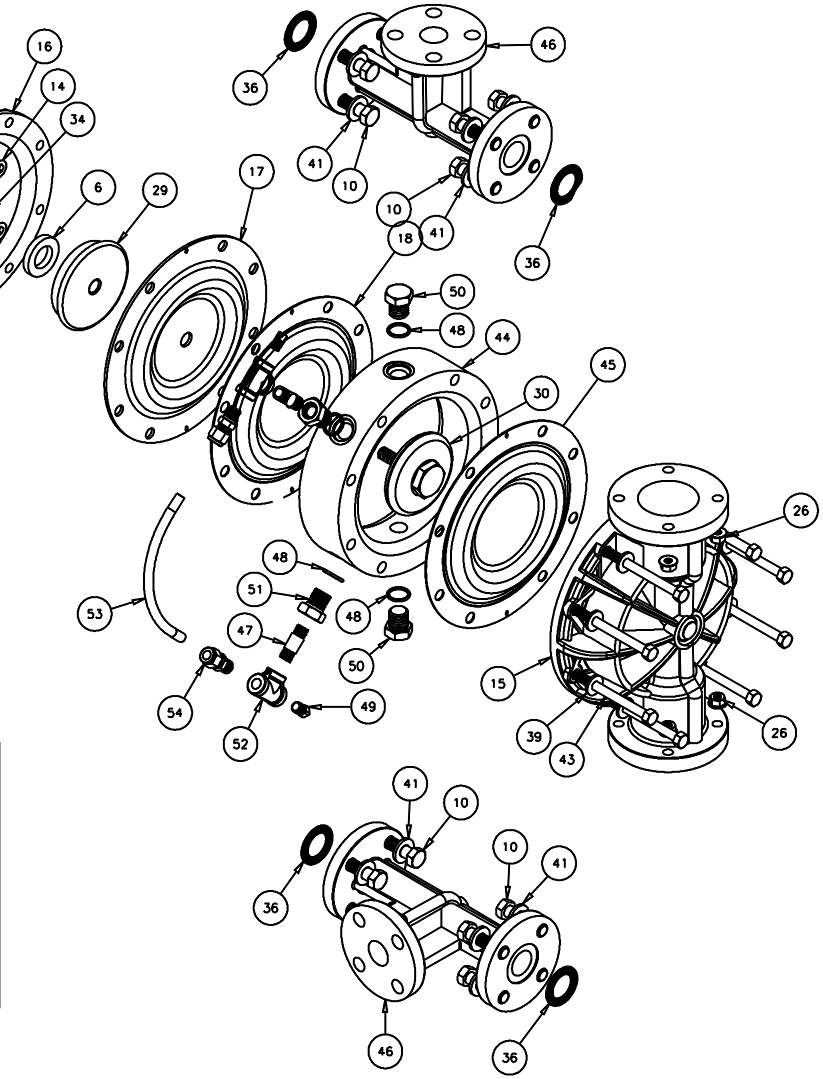
ITEM	PART NUMBER	DESCRIPTION	QTY
1	031-140-000	Air Valve Assembly	1
	⚠ 031-140-001	Air Valve Assembly (No Muffler)	1
	031-140-002	Air Valve Assembly w/PTFE Coated Hardware	1
	031-141-000	Air Valve Assembly (No Muffler)	1
	⚠ 031-141-001	Air Valve Assembly (No Muffler)	1
	031-141-002	Air Valve Assembly (No Muffler / PTFE Hardware)	1
	⚠ 031-146-000	Air Valve Assembly (With Stroke Indicator Option)	1
	⚠ 031-147-000	Air Valve Assembly (No Muffler w/Stroke Indicator)	1
2	050-042-354	Ball, Check	4
	050-042-360	Ball, Check	4
	050-042-363	Ball, Check	4
	050-042-365	Ball, Check	4
	050-042-600	Ball, Check	4
3	095-110-558	Pilot Valve Assembly	1
4	114-024-551	Intermediate Assembly	1
	⚠ 114-024-559	Intermediate Assembly	1
5	132-035-360	Bumper, Diaphragm	2
6	135-034-506	Bushing, Plunger	2
7	165-125-551	Cap, Air Inlet	1
	⚠ 165-125-559	Cap, Air Inlet	1
8	170-020-115	Capscrew, Hex HD 3/8 - 16 x 2.00	16
	170-020-308	Capscrew, Hex HD 3/8 - 16 x 2.00	16
9	170-030-115	Capscrew, Hex HD 1/2 - 13 x 2.00	16
	170-030-308	Capscrew, Hex HD 1/2 - 13 x 2.00	16
10	170-052-115	Capscrew, Hex HD 3/8 - 16 x 2.25	16
	170-052-308	Capscrew, Hex HD 3/8 - 16 x 2.25	16
11	170-069-115	Capscrew, Hex HD 5/16 - 18 x 1.75	4
	170-069-308	Capscrew, Hex HD 5/16 - 18 x 1.75	4
12	171-053-115	Capscrew, Soc HD 3/8 - 16 x 2.50	4
13	171-015-115	Capscrew, Soc HD 3/8 - 16 x .88	8
	171-015-308	Capscrew, Soc HD 3/8 - 16 x .88	8
14	196-157-520	Chamber, Outer	2
	⚠ 196-157-521	Chamber, Outer	2
	196-157-552	Chamber, Outer	2
	⚠ 196-157-557	Chamber, Outer	2
15	196-177-551	Chamber, Inner	2
	⚠ 196-177-559	Chamber, Inner	2
16	286-107-354	Diaphragm	2
	286-107-360	Diaphragm	2
	289-115-000	Diaphragm, One-Piece Bonded	2
	286-107-363	Diaphragm	2
	286-107-365	Diaphragm	2
17	286-108-600	Diaphragm, Overlay	2
18	312-104-520	Elbow	2
	⚠ 312-104-521	Elbow	2
	⚠ 312-104-557	Elbow	2
	312-104-552	Elbow	2
19	312-113-520	Elbow, Suction	2
	⚠ 312-113-521	Elbow, Suction	2
	312-113-552	Elbow, Suction	2
	⚠ 312-113-557	Elbow, Suction	1
20	360-093-360	Gasket, Air Valve	1
21	360-103-360	Gasket, Pilot Valve	1
22	360-104-360	Gasket, Air Inlet	1
	⚠ 360-104-379	Gasket, Air Inlet	1
23	360-107-360	Gasket, Inner Chamber	2
24	518-179-520	Manifold	2
	⚠ 518-179-521	Manifold	2
	518-179-552	Manifold	2
	⚠ 518-179-557	Manifold	2
25	544-002-115	Nut, Hex 3/8 - 16	32
	544-002-308	Nut, Hex 3/8 - 16	32
26	545-008-115	Nut, Hex 1/2 - 13	16
	545-008-308	Nut, Hex 1/2 - 13	16
27	560-001-360	O-ring	2
28	612-200-157	Inner Diaphragm Plate	2
	612-200-082	Inner Diaphragm Plate	2
	612-220-150	Inner Diaphragm Plate (One-Piece Bonded Option)	2
29	612-204-520	Outer Diaphragm Plate	2
	612-204-552	Outer Diaphragm Plate	2
30	620-020-115	Plunger, Actuator	2
31	670-048-520	Retainer, Ball	4
	670-048-552	Retainer, Ball	4
32	675-042-115	Ring, Retainer	2
33	685-058-120	Rod, Diaphragm	1
34	720-004-360	Seal, Diaphragm Rod	2
35	720-044-600	Seal, Manifold Spacer	4
36	720-047-600	Seal, Check Valve	8
37	722-079-520	Seat, Check Valve	4
	722-079-552	Seat, Check Valve	4
38	901-038-115	Washer, Flat 5/16"	4
	901-038-308	Washer, Flat 5/16"	4
39	901-046-115	Washer, Flat 1/2"	32
	901-046-308	Washer, Flat 1/2"	32
40	901-048-115	Washer, Flat 3/8"	4
	901-048-308	Washer, Flat 3/8"	4
41	901-049-115	Washer, Flat 3/8"	32
	901-049-308	Washer, Flat 3/8"	32

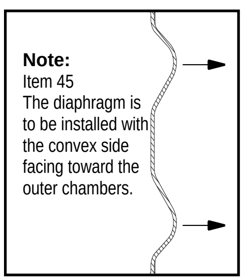
Not Shown:

	535-069-000	Nameplate	

⚠ Note: ATEX Compliant

Option For Virgin PTFE Equipped Pumps Drawing





S1F SPILL CONTAINMENT REPAIR PARTS LIST FOR VIRGIN PTFE EQUIPPED PUMPS

Item	Part Number	Description	Qty
43	170-114-115	Capscrew, Hex HD 3/8 - 16 x 4.50 (Replace 170-052-115)	16
	170-114-308	Capscrew, Hex HD 3/8 - 16 x 4.50 (Replace 170-052-115)	16
44	196-159-552	Chamber, Spill Containment	2
	196-159-520	Chamber, Spill Containment	2
45	286-094-600	Diaphragm, Pumping	2
46	518-180-520	Manifold, Spill Containment (Replace 518-179-520)	2
	518-180-552	Manifold, Spill Containment (Replace 518-179-520)	2
47	538-022-110	Nipple, Pipe	4
	538-022-308	Nipple, Pipe	4
48	560-078-611	O-ring	8
49	618-003-110	Plug, Pipe	4
	618-003-308	Plug, Pipe	4
50	618-025-110	Plug, Boss	4
	618-025-308	Plug, Boss	4
51	618-031-110	Threaded Bushing	4
	618-031-308	Threaded Bushing	4
52	835-005-110	Tee, Pipe	4
	835-005-308	Tee, Pipe	4
53	860-056-606	Tube, Sight	2
54	866-060-110	Connector, Tube	4

*Note: The Diaphragm is to be installed with the convex side facing toward the outer chamber. See drawing.

Note: Pump units with One-Piece Bonded Diaphragm option will not include Overlay Diaphragms (Items 18) and Outer Diaphragm Plate (Item 30).

OPTIONS FOR VIRGIN PTFE EQUIPPED PUMPS CONCEPT

The spill containment option prevents the air end components from being contaminated or damaged when a pumping diaphragm ruptures while pumping caustic or toxic materials. It also helps to protect the environment. With the installation of optional leak detectors (either mechanical or electronic) the diaphragm rupture can be detected. The pump can then be shut down and repaired before any caustic or toxic materials can enter the air end and be exhausted into the surrounding environment.

OPTION DIAPHRAGM SERVICING

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

Next, drain the fluid from the spill prevention chambers. This can be done by removing the bottom plug (item 50) from each spill prevention chamber.

After the fluid from the spill prevention chambers has been drained, the wet end components can now be removed. See diaphragm servicing section for detailed instructions. The spill prevention option has two additional virgin PTFE pumping diaphragms (item 45). These diaphragms are installed with the natural **convex** curve toward the outer chamber (items 14 from the pump assembly drawing). The molded directional arrows on the diaphragms must point vertically.

FILLING CHAMBERS WITH LIQUID

The chambers are filled with water at the factory.

If you prefer to substitute another liquid, to prevent system contamination consult the factory first to determine compatibility of the substitute with pump construction.

Follow the steps listed here to replace the liquid in the pump after disassembly or liquid loss:

1. Drain the fluid in the spill prevention chambers by removing the bottom two boss plugs (items 50). Replace the bottom two boss plugs after the fluid is drained.

2. Remove the eight capscrews (item 10) fastening the discharge manifold and elbows to the outer chambers (items 15). The discharge manifolds and elbows can now be removed.

3. Remove the top two boss plugs (items 50). The spill prevention chambers are filled through the exposed ports.

4. Apply air pressure to the air distribution valve. Install safety clip (item 1-K) into the smaller unthreaded hole in one end cap (item 1-E). This locks the valve spool to one side, keeping the pump from shifting.

5. Face the side of the pump with the installed safety clip. If the safety clip is installed in the top end cap, fill the left spill containment chamber. If the safety clip is installed on the bottom end cap, fill the right spill prevention chamber. The volume of fluid is 1198 ml (40.49 fl. oz.). It is important that the exact amount of fluid is used. Too little or too much fluid causes premature diaphragm failure and erratic pumping.

6. Loosely reinstall one boss plug (item 50) to the filled spill prevention chamber.

7. Shut off air supply. Remove safety clip. Adjust the air line regulator so that air pressure slowly fills the pump. The diaphragm expands, forcing the fluid in the chamber to be slowly displaced. When the pump shifts to the opposite side, quickly install the safety clip.

8. Loosen the top boss plug on the filled chambers. This allows fluid in the chamber to purge trapped air from the chamber. This can be seen by watching the column of fluid in the sight tube. When fluid appears at the top of the port, quickly tighten the boss plug. Fluid loss of 1 to 2ml is acceptable.

9. Tilt the pump so the uppermost pipe tee (item 52) is in the vertical position. Loosen the pipe plug (item 49). This will allow trapped air to purge through the pipe tee. When fluid appears at the tee opening, reinstall the pipe plug.

NOTE: If all air is not purged using this procedure, remove the check valve components from the top port of the outer chamber (item 15). Apply manual pressure to the pumping diaphragm by inserting a blunt instrument into the top port of the outer chamber and applying pressure to the diaphragm. Loosen the pipe plug (item 49) allowing the fluid to purge any remaining trapped air. Reinstall the plug.

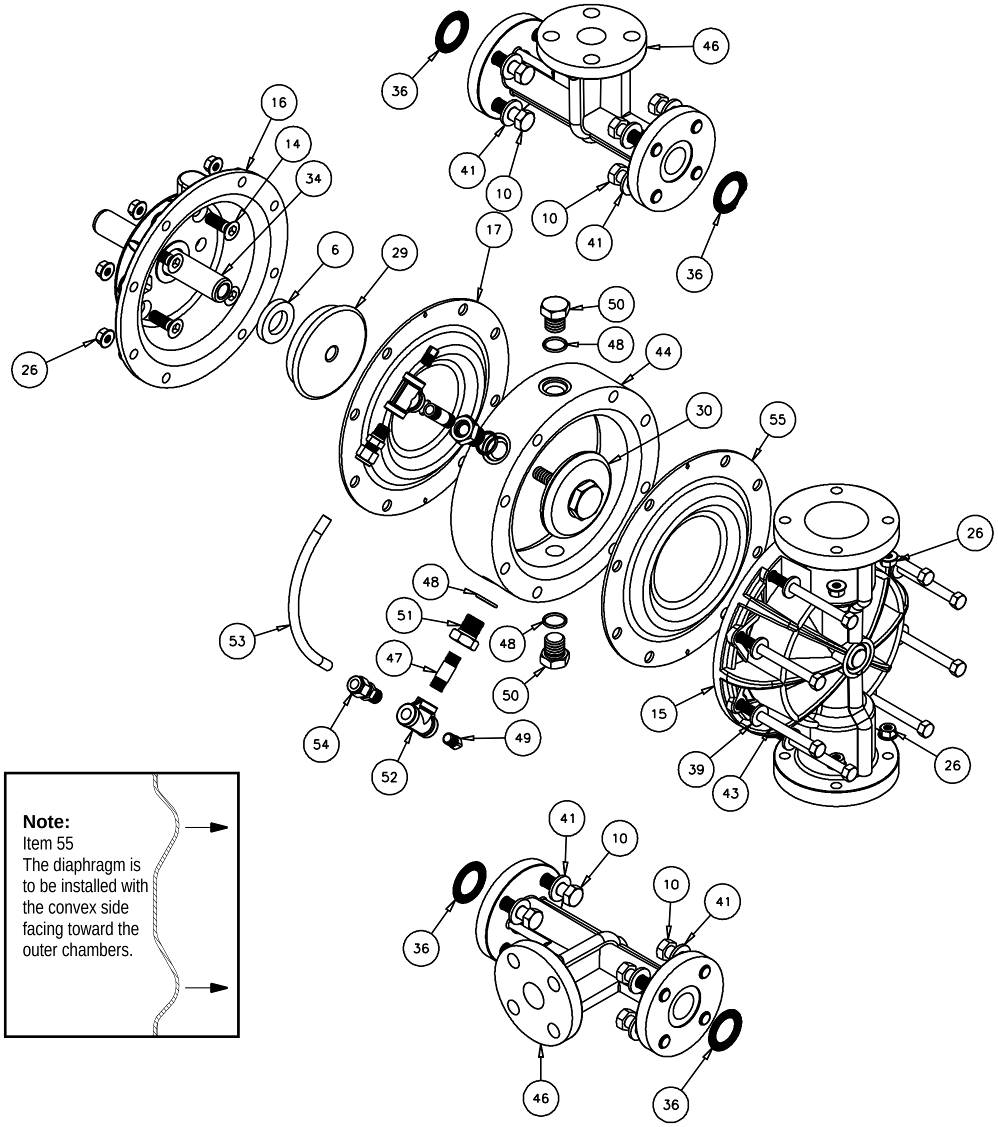
10. Repeat steps 5 through 9 to fill opposite spill prevention chamber.

11. Reinstall the check valve components, discharge manifold and elbows 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.

Option For TPE Equipped Pumps Drawing



Note:
Item 55
The diaphragm is to be installed with the convex side facing toward the outer chambers.

S1F SPILL CONTAINMENT REPAIR PARTS LIST FOR TPE EQUIPPED PUMPS

Item	Part Number	Description	Qty
43	170-114-115	Capscrew, Hex HD 3/8 - 16 x 4.50 (Replace 170-052-115)	16
	170-114-308	Capscrew, Hex HD 3/8 - 16 x 4.50 (Replace 170-052-115)	16
44	196-159-552	Chamber, Spill Containment	2
	196-159-520	Chamber, Spill Containment	2
46	518-180-520	Manifold, Spill Containment (Replace 518-179-520)	2
	518-180-552	Manifold, Spill Containment (Replace 518-179-552)	2
47	538-022-110	Nipple, Pipe	4
	538-022-308	Nipple, Pipe	4
48	560-078-611	O-ring	8
49	618-003-110	Plug, Pipe	4
	618-003-308	Plug, Pipe	4
50	618-025-110	Plug, Boss	4
	618-025-308	Plug, Boss	4
51	618-031-110	Threaded Bushing	4
	618-031-308	Threaded Bushing	4
52	835-005-110	Tee, Pipe	4
	835-005-308	Tee, Pipe	4
53	860-056-606	Tube, Sight	2
54	866-060-110	Connector, Tube	4
55	286-092-354*	Diaphragm, Pumping	2
18	286-108-600	Diaphragm, Overlay is not used	2

*Note: The Diaphragm is to be installed with the convex side facing toward the outer chamber. See drawing.

OPTION FOR TPE EQUIPPED PUMPS CONCEPT

The spill containment option prevents the air end components from being contaminated or damaged when a pumping diaphragm ruptures while pumping caustic or toxic materials. It also helps to protect the environment. With the installation of optional leak detectors (either mechanical or electronic) the diaphragm rupture can be detected. The pump can then be shut down and repaired before any caustic or toxic materials can enter the air end and be exhausted into the surrounding environment.

OPTION DIAPHRAGM SERVICING

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

Next, drain the fluid from the spill prevention chambers. This can be done by removing the bottom plug (item 50) from each spill prevention chamber.

After the fluid from the spill prevention chambers has been drained, the wet end components can now be removed. See diaphragm servicing section for detailed instructions. The spill prevention option has two additional TPE pumping diaphragms (item 55). These diaphragms are installed with the natural **concave** curve toward the outer chamber (items 15 from the pump assembly drawing). The molded directional arrows on the diaphragms must point vertically.

FILLING CHAMBERS WITH LIQUID

THE CHAMBERS ARE FILLED WITH WATER AT THE FACTORY.

If you prefer to substitute another liquid, to prevent system contamination consult the factory first to determine compatibility of the substitute with pump construction.

Follow the steps listed here to replace the liquid in the pump after disassembly or liquid loss:

1. Drain the fluid in the spill prevention chambers by removing the bottom two boss plugs (items 50). Replace the bottom two boss plugs after the fluid is drained.

2. Remove the eight capscrews (item 10) fastening the discharge manifold and elbows to the outer chambers (items 15). The discharge manifolds and elbows can now be removed.

3. Remove the top two boss plugs (items 50). The spill prevention chambers are filled through the exposed ports.

4. Apply air pressure to the air distribution valve. Install safety clip (item 1-K) into the smaller unthreaded hole in one end cap (item 1-E). This locks the valve spool to one side, keeping the pump from shifting.

5. Face the side of the pump with the installed safety clip. If the safety clip is installed in the top end cap, fill the left spill prevention chamber. If the safety clip is installed on the bottom end cap, fill the right spill prevention chamber.

6. Loosely reinstall one boss plug (item 50) to the filled spill prevention chamber.

7. Shut off air supply. Remove safety clip. Adjust the air line regulator so that air pressure slowly fills the pump. The diaphragm expands, forcing the fluid in the chamber to be slowly displaced. When the pump shifts to the opposite side, quickly install the safety clip.

8. Loosen the top boss plug on the filled chambers. This allows fluid in the chamber to purge trapped air from the chamber. This can be seen by watching the column of fluid in the sight tube. When fluid appears at the top of the port, quickly tighten the boss plug. Fluid loss of 1 to 2ml is acceptable.

9. Tilt the pump so the uppermost pipe tee (item 52) is in the vertical position. Loosen the pipe plug (item 49). This will allow trapped air to purge through the pipe tee. When fluid appears at the tee opening, reinstall the pipe plug.

NOTE: If all air is not purged using this procedure, remove the check valve components from the top port of the outer chamber (item 15). Apply manual pressure to the pumping diaphragm by inserting a blunt instrument into the top port of the outer chamber and applying pressure to the diaphragm. Loosen the pipe plug (item 49) allowing the fluid to purge any remaining trapped air. Reinstall the plug.

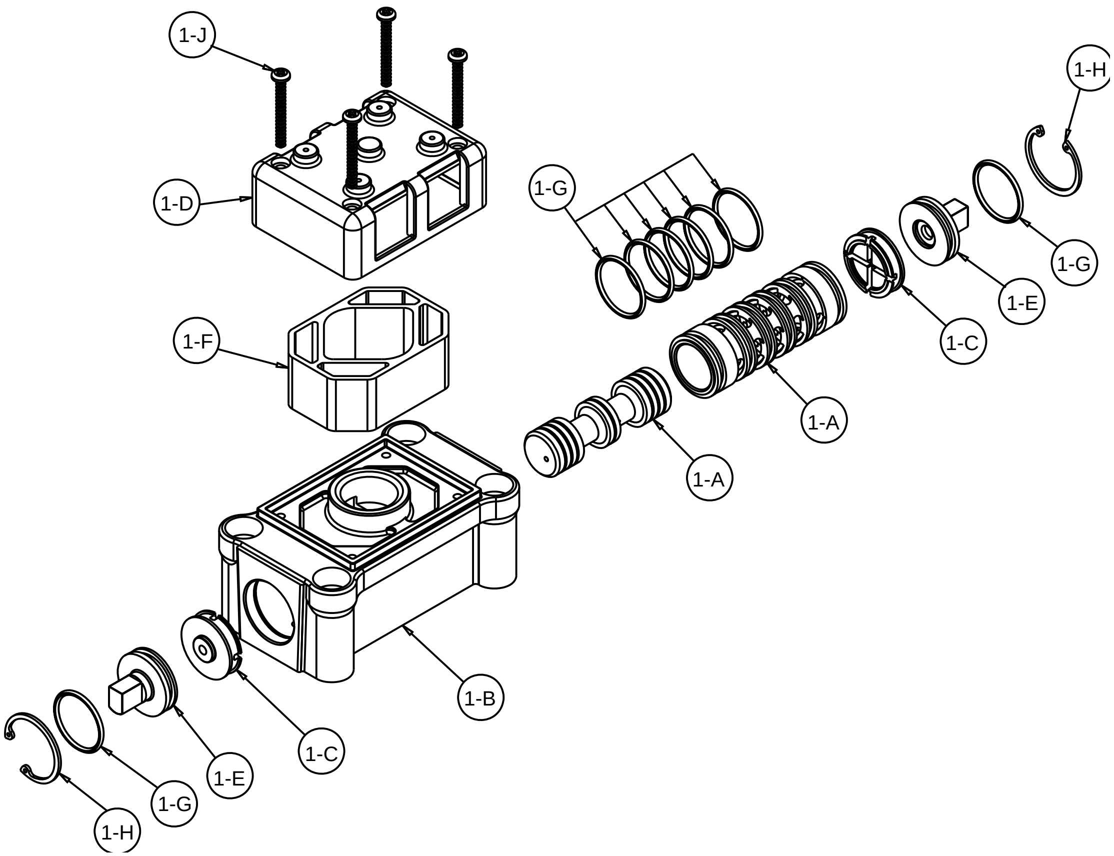
10. Repeat steps 5 through 9 to fill opposite spill prevention chamber.

11. Reinstall the check valve components, discharge manifold and elbows 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.

Air Distribution Valve Assembly Drawing



AIR VALVE ASSEMBLY PARTS LIST

Item	Part Number	Description	Qty
1	**031-140-000**	**Air Valve Assembly**	**1**
1-A	031-139-000	Sleeve and Spool Set	1
1-B	095-094-551	Body, Air Valve	1
1-C	132-029-552	Bumper	2
1-D	165-096-551	Cap, Muffler	1
1-E	165-115-552	Cap, End	2
1-F	530-028-550	Muffler	1
1-G	560-020-360	O-ring	8
1-H	675-044-115	Ring, Retaining	2
1-J	710-015-115	Screw, Self-tapping	4

For Pumps with Alternate Mesh, Sound Dampening Mufflers or Piped Exhaust:

1	031-141-000	Air Valve Assembly	1

(Includes all items used on 031-140-000 minus items 1-D, 1-F & 1-J)

⚠ AIR VALVE ASSEMBLY PARTS LIST

Item	Part Number	Description	Qty
1	**031-140-001**	**Air Valve Assembly**	**1**
1-A	031-139-000	Sleeve and Spool Set	1
1-B	095-094-559	Body, Air Valve	1
1-C	132-029-552	Bumper	2
1-D	165-096-559	Cap, Muffler	1
1-E	165-115-552	Cap, End	2
1-F	530-028-550	Muffler	1
1-G	560-020-360	O-ring	8
1-H	675-044-115	Ring, Retaining	2
1-J	710-015-115	Screw, Self-tapping	4

For Pumps with Alternate Mesh, Muffler or Piped Exhaust:

⚠ 1	031-141-001	Air Valve Assembly	1

(Includes all items used on 031-140-001 minus items 1-D, 1-F & 1-J)

Ex ⚠ ***Note: ATEX Compliant***

AIR DISTRIBUTION VALVE SERVICING

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

Step #1: See Composite Repair and Parts Drawing.

Using a 5/16" Allen wrench, remove the four hex socket capscrews (item 12) and four flat washers (item 38). Remove the air valve assembly (item 1) from the pump.

Remove and inspect gasket (item 20) for cracks or damage. Replace gasket if needed.

Step #2: Disassembly of the air valve.

To access the internal air valve components first remove the two retaining rings (item 1-K) from each end of the air valve assembly using clip ring pliers.

Next remove the two end caps (item 1-E). Inspect the o-rings (item 1-G) for cuts or wear. Replace the o-rings if necessary.

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 contaminates. Remove the sleeve if needed and replace both the sleeve and spool 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 an o-ring (item 1-G) into one end of the air valve body (item 1-B). Install one retaining ring (item 1-H) into the groove on the same end.

Remove the new sleeve an 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-ring, and retaining ring.

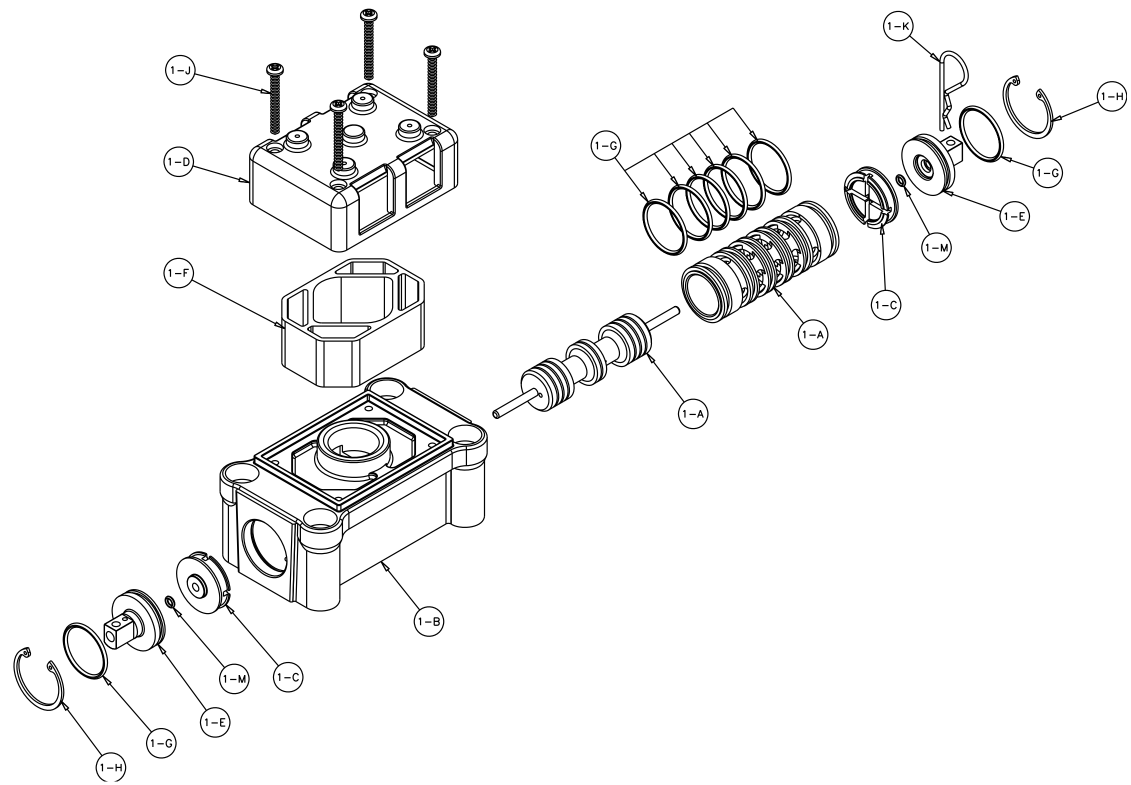
Fasten the air valve assembly (item 1) and gasket (item 20) to the pump.

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.

Air Valve Assembly Drawing With Stroke Indicator Option



AIR VALVE ASSEMBLY PARTS LIST

Item	Part Number	Description	Qty
1	**031-146-000**	**Air Valve Assembly**	**1**
1-A	031-143-000	Sleeve and Spool Set	1
1-B	095-094-559	Body, Air Valve	1
1-C	132-029-552	Bumper	2
1-D	165-096-559	Cap, Muffler	1
1-E	165-098-147	Cap, End	2
1-F	530-028-550	Muffler	1
1-G	560-020-360	O-ring	8
1-H	675-044-115	Ring, Retaining	2
1-J	710-015-115	Screw, Self-tapping	4
1-K	210-008-330	Clip, Safety	1
1-M	560-029-360	O-ring	2

For Pumps with Alternate Mesh, Muffler or Piped Exhaust:

Item	Part Number	Description	Qty
1	031-147-000	Air Valve Assembly	1
	(Includes all items used on 031-140-000 minus items 1-D, 1-F & 1-J)		

Note: ATEX Compliant

AIR DISTRIBUTION VALVE WITH STROKE INDICATOR OPTION SERVICING

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

Step #1: See Composite Repair and Parts Drawing.

Using a 5/16" Allen wrench, remove the four hex socket capscrews (item 12) and four flat washers (item 38). Remove the air valve assembly (item 1) from the pump.

Remove and inspect gasket (item 20) for cracks or damage. Replace gasket if needed.

Step #2: Disassembly of the air valve.

To access the internal air valve components first remove the two retaining rings (item 1-K) from each end of the air valve assembly using clip ring pliers.

Next remove the two end caps (item 1-E). Inspect the o-rings (item 1-G) for cuts or wear. Replace the o-rings if necessary.

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 contaminates. Remove the sleeve if needed and replace both the sleeve and spool 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 an o-ring (item 1-G) into one end of the air valve body (item 1-B). Install one retaining ring (item 1-H) into the groove on the same end. Insert the safety clip (item 1-K) through the small unthreaded hole in the end cap.

Remove the new sleeve an 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 the pin touches the safety clip on the opposite end.

Install the remaining bumper, end cap with o-ring, and retaining ring.

Fasten the air valve assembly (item 1) and gasket (item 20) 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.

Solenoid Shifted Air Valve Drawing

SOLENOID SHIFTED AIR VALVE PARTS LIST

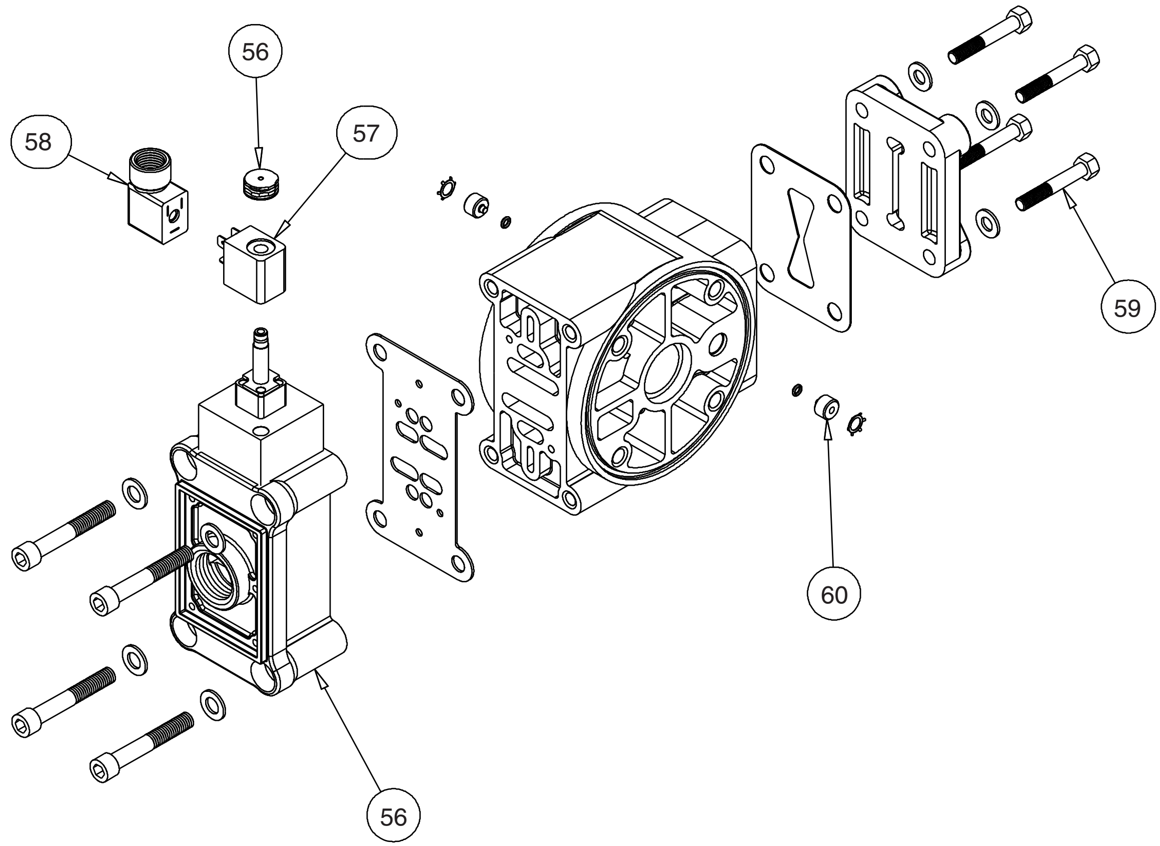
(Includes All Items Used on Composite Repair Parts List Except as Shown)

Item	Part Number	Description	Qty
56	893-097-000	Solenoid Valve, NEMA4	1
57	219-001-000	Solenoid Coil, 24VDC	1
	219-004-000	Solenoid Coil, 24VAC/12VDC	1
	219-002-000	Solenoid Coil, 120VAC	1
	219-003-000	Solenoid Coil, 240VAC	1
58	241-001-000	Connector, conduit	1
59	170-029-330	Capscrew, Hex HD 5/16 - 18 x 1.50	4
60	618-051-150	Plug	2

Note: Pumps equipped with Explosion-Proof Solenoid Coils are ATEX compliant.

For Explosion Proof Solenoid Valve

57	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

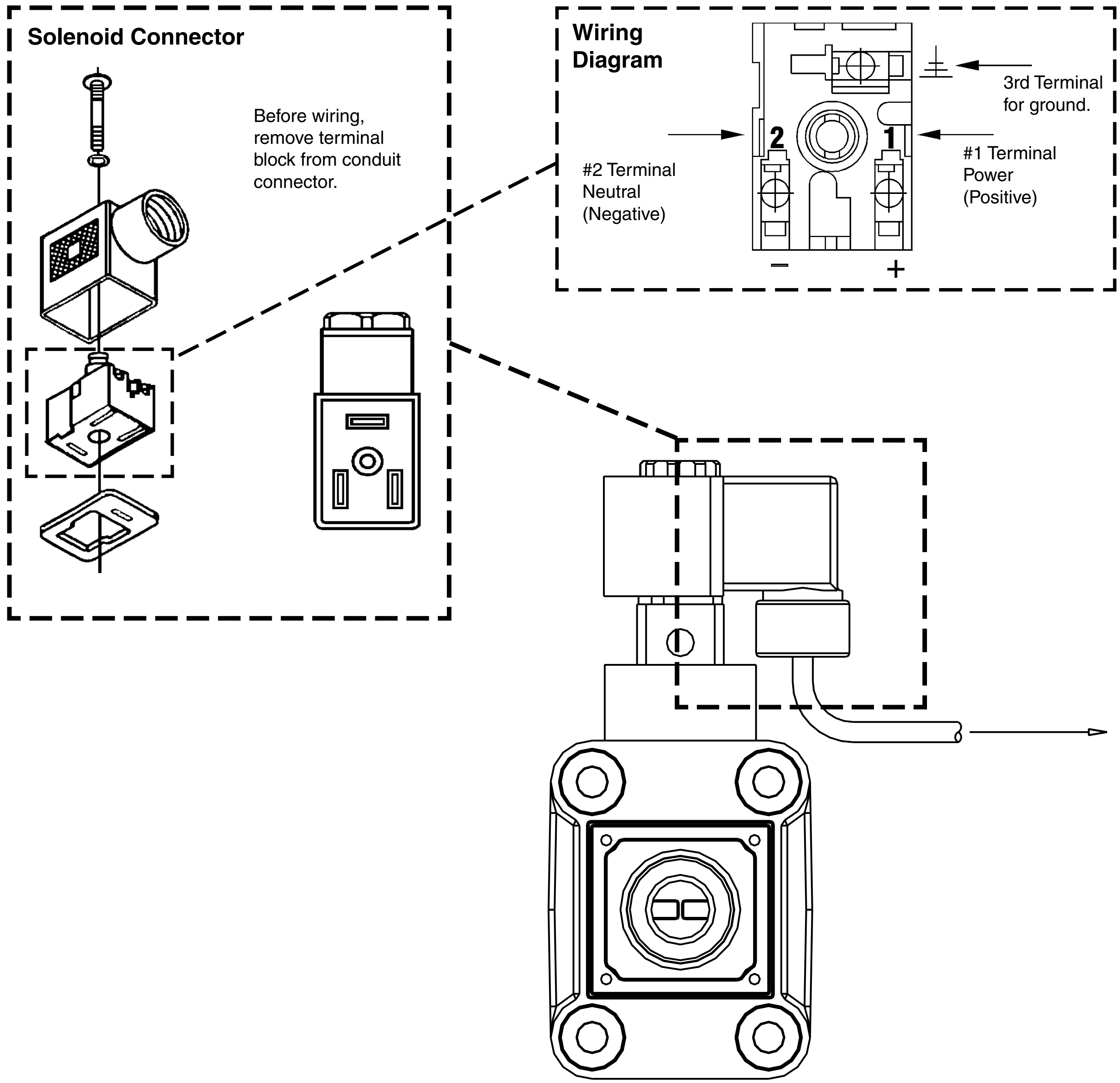
Warren Rupp's solenoid shifted, air distribution valve option utilizes electrical signals to precisely control your SANDPIPER's speed. The solenoid coil is connected to a customer - supplied control. Compressed air provides the pumping power, while electrical signals control pump speed (pumping rate).

OPERATION

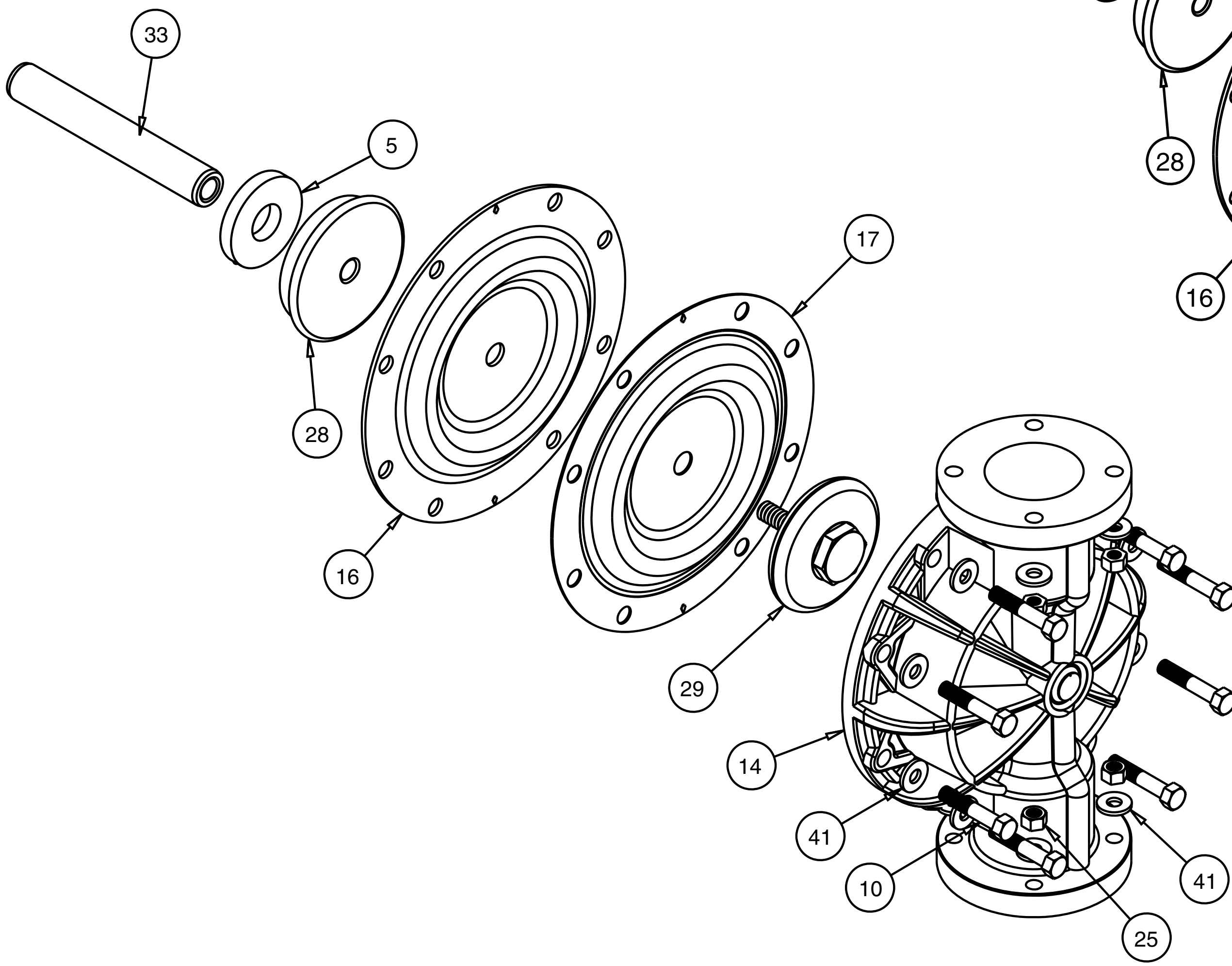
The Solenoid Shifted SANDPIPER has a solenoid operated, air distribution valve in place of the standard SANDPIPER's pilot operated, air distribution valve. Where a pilot valve is normally utilized to cycle the pump's air distribution valve, an electric solenoid is utilized. As the solenoid is powered, 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

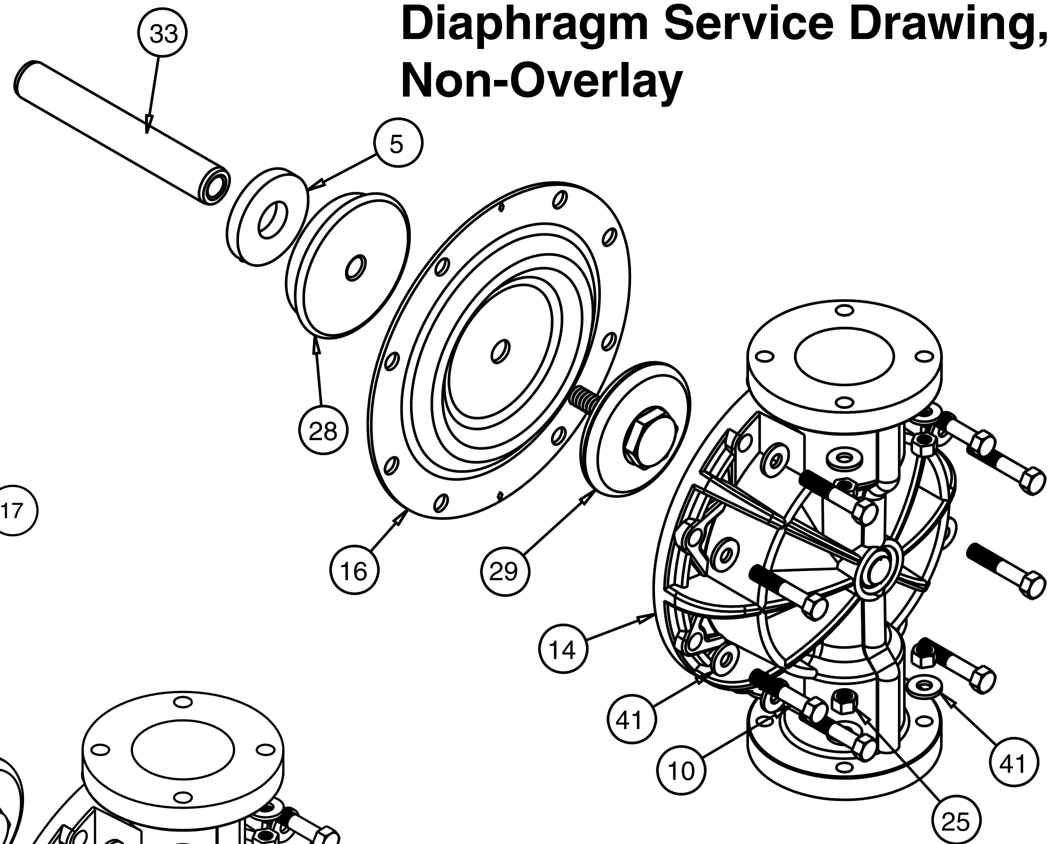
Before wiring the solenoid, make certain it is compatible with your system voltage.



Diaphragm Service Drawing, with Overlay



Diaphragm Service Drawing, Non-Overlay



Field conversion kit 475-258-000 available for conversion from PTFE Overlay to One-Piece bonded Diaphragm

Part	Description	Qty
286-115-000	One-Piece Diaphragm	2
612-220-150	Plate, Inner Diaphragm	2

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 composite repair parts drawing, and the diaphragm servicing illustration.

Using a 9/16" wrench or socket, remove the 16 capscrews (items 8), hex flange nuts and washers that fasten the elbows (items 18 and 19) to the outer chambers (items 14). Remove the elbows with the manifolds and spacers attached.

Step #2: Removing the outer chambers.

Using a 9/16" wrench or socket, remove the 16 capscrews (items 10), hex flange nuts and washers that fasten the outer chambers, diaphragms, and inner chambers (items 15) together.

Step #3: Removing the diaphragm assemblies.

Use a $1^{3}/_{8}$" (35mm) wrench or six pointed socket to remove the diaphragm assemblies (outer plate, diaphragm, and inner plate) from the diaphragm rod (item 33) by turning counterclockwise.

Insert a 1/4-20 capscrew or set screw into the smaller tapped hole in the inner diaphragm plate (item 28). Insert the protruding stud and the 1/4-20 fastener loosely into a vise. Use a $1^{3}/_{8}$" wrench or socket to remove the outer diaphragm plate (item 29) by turning counter-clockwise. Inspect the diaphragm (item 116) for cuts, punctures, abrasive wear or chemical attack. Replace the diaphragms if necessary.

Step #4: Installing the diaphragms. Push the threaded stud of the outer diaphragm plate through the center hole of the diaphragm. Thread the inner plate clockwise onto the stud. Use a torque wrench to tighten the diaphragm assembly together to 27 ft. Lbs. (36.61 Newton meters). Allow a minimum of 15 minutes to elapse after torquing, then re-torque the assembly to compensate for stress relaxation in the clamped assembly.

Step #5: Installing the diaphragm assemblies to the pump.

Make sure the bumper (item 5) is installed over the diaphragm rod.

Thread the stud of the one diaphragm assembly clockwise into the tapped hole at the end of the diaphragm rod (item 33) until the inner diaphragm plate is flush to the end of the rod. Insert rod into pump.

Align the bolt holes in the diaphragm with the bolt pattern in the inner chamber (item 15). Make sure the molded directional arrows on the diaphragm point vertically.

Fasten the outer chamber (item 14) to the pump, using the capscrews (items 10), hex flange nuts and flat washers.

On the opposite side of the pump, pull the diaphragm rod out as far as possible. Make sure the bumper (item 6) is installed over the diaphragm rod.

Thread the stud of the remaining diaphragm assembly clockwise into the tapped hole at the end of the diaphragm rod (item 33) as far as possible and still allow for alignment of the bolt holes in the diaphragm with the bolt pattern in the inner chamber. The molded directional arrows on the diaphragm must point vertically.

Fasten the remaining outer chamber (item 14) to the pump, using the capscrews (items 10), hex flange nuts and flat washers.

Step #6: Re-install the elbow/ spacer/manifold assemblies to the pump, using the capscrews (items 8), hex flange nuts and flat washers.

The pump is now ready to be re-installed, connected and returned to operation.

OVERLAY DIAPHRAGM SERVICING

The PTFE overlay diaphragm (item 17) is designed to fit snugly over the exterior of the standard TPE diaphragm (item 16).

The molded directional arrows on the overlay diaphragm must point vertically.

Follow the same procedures described for the standard diaphragm for removal and installation.

⚠ 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.

One-Piece Bonded DIAPHRAGM SERVICING (Bonded PTFE with integral plate)

The one-piece bonded diaphragm (item 17) has a threaded stud installed in the integral plate at the factory. The inner diaphragm plate has a through hole instead of a threaded hole.

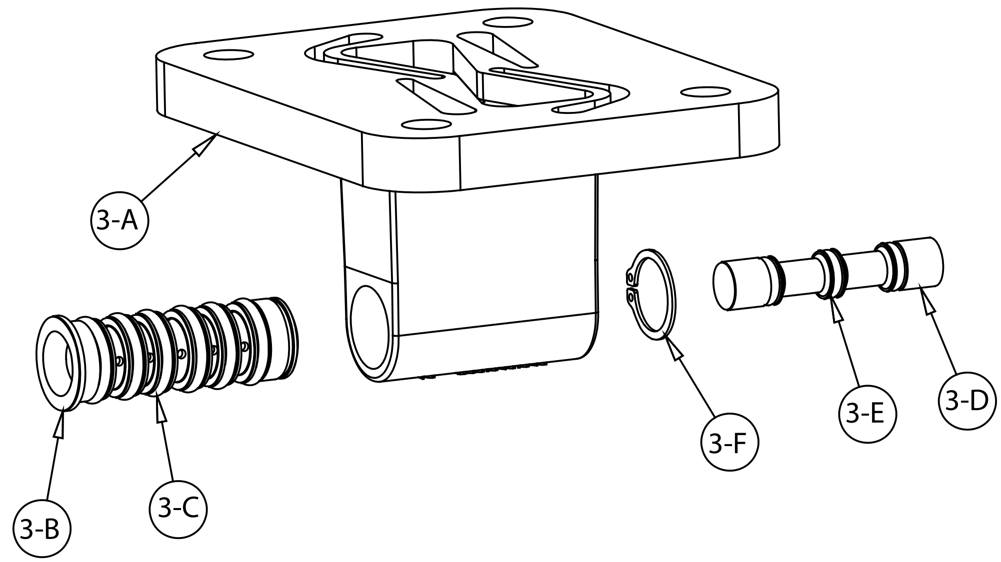
Place the inner plate over the diaphragm stud and thread the first diaphragm/inner plate onto the diaphragm rod only until the inner plate contacts the rod. Do not tighten. A small amount of grease may be applied between the inner plate and the diaphragm to facilitate assembly.

Insert the diaphragm/rod assembly into the pump and install the outer chamber. Turn the pump over and thread the second diaphragm / inner plate onto the diaphragm rod. Turn the diaphwwragm until the inner plate contacts the rod and hand tighten the assembly. Continue tightening until the bolt holes align with the inner chamber holes. DO NOT LEAVE THE ASSEMBLY LOOSE.

Pilot Valve Servicing, Assembly Drawing & Parts List

PILOT VALVE ASSEMBLY PARTS LIST

ITEM	PART NUMBER	DESCRIPTION	QTY
3	095-110-558	Pilot Valve Assembly	1
3-A	095-095-558	Valve Body	1
3-B	755-052-000	Sleeve (With O-rings)	1
3-C	560-033-360	O-ring (Sleeve)	6
3-D	775-055-000	Spool (With O-rings)	1
3-E	560-023-360	O-ring (Spool)	3
3-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 11). Remove the air inlet cap (item 7) and air inlet gasket (item 22). The pilot valve assembly (item 3) can now be removed for inspection and service.

STEP #2: Disassembly of the pilot valve.

Remove the pilot valve spool (item 3-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 3-F) from the end of the sleeve (item 3-B) and remove the sleeve from the valve body (item 3-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.

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.

Use a #8 Torx or flat screwdriver to remove the four self-tapping screws (item 1-L).

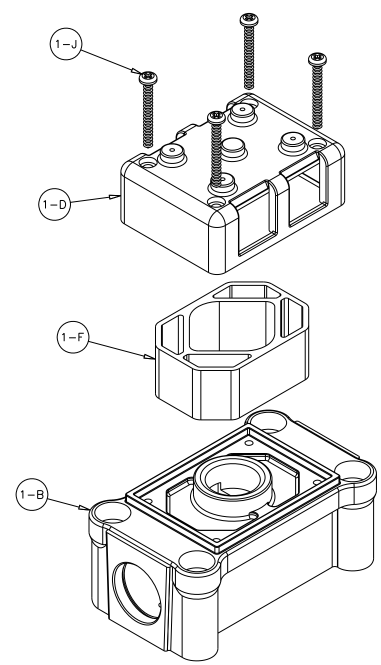
Remove the muffler cap and muffler (items 1-E and 1-G). The 1" NPT molded threads in the air distribution valve body (item 1-B).

Piping or hose may now be installed.

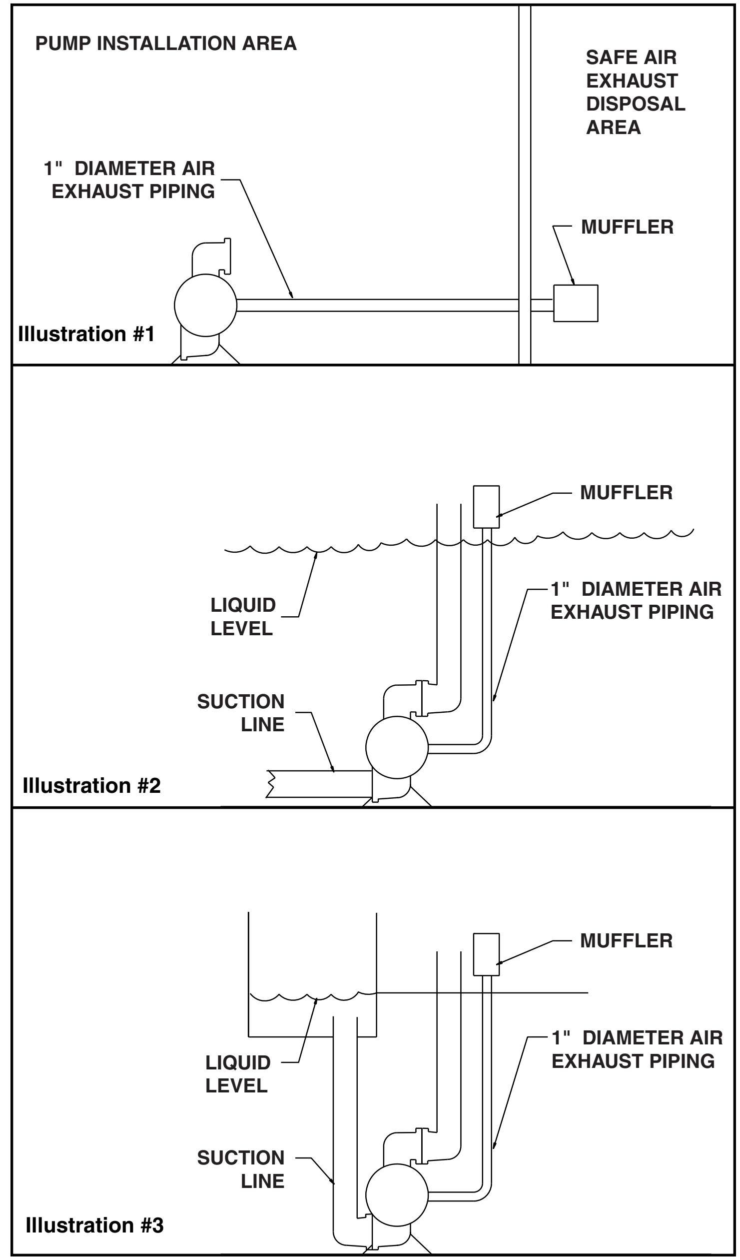
IMPORTANT INSTALLATION NOTE:
The manufacturer recommends installing a flexible hose or connection between the pump and any rigid plumbing. This reduces stresses on the molded plastic threads of the air exhaust port. Failure to do so may result in damage to the air distribution valve body.

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

Exhaust Conversion Drawing



CONVERTED EXHAUST ILLUSTRATION



MODULAR CHECK VALVE SERVICING

Before servicing the check valves, 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 modular check valve, remove the elbows (items 18 and 19 from pump composite repair parts drawing). Use a 9/16" wrench or socket to remove the fasteners. Once the elbows are removed, the modular check valves can be seen in the cavities of the outer chamber (items 14).

Next remove the check valve seal (item 36). Inspect the seal for cuts or pinched areas. Replace seal as needed.

Disassemble the component parts of each modular check valve. Inspect the check valve retainer (item 31) for cuts, abrasive wear, or embedded materials. Replace as needed.

Inspect the check balls (items 2) for wear, abrasion, or cuts on the spherical surface. The check valve seats (items 37) should be inspected for cuts, abrasive wear, or embedded material on the surfaces of both the external and internal chamfers. The spherical surface of the check balls must seat flush to the surface of the inner chamfer on the check valve seats for the pump to operate to peak efficiency. Replace any worn or damaged parts as necessary.

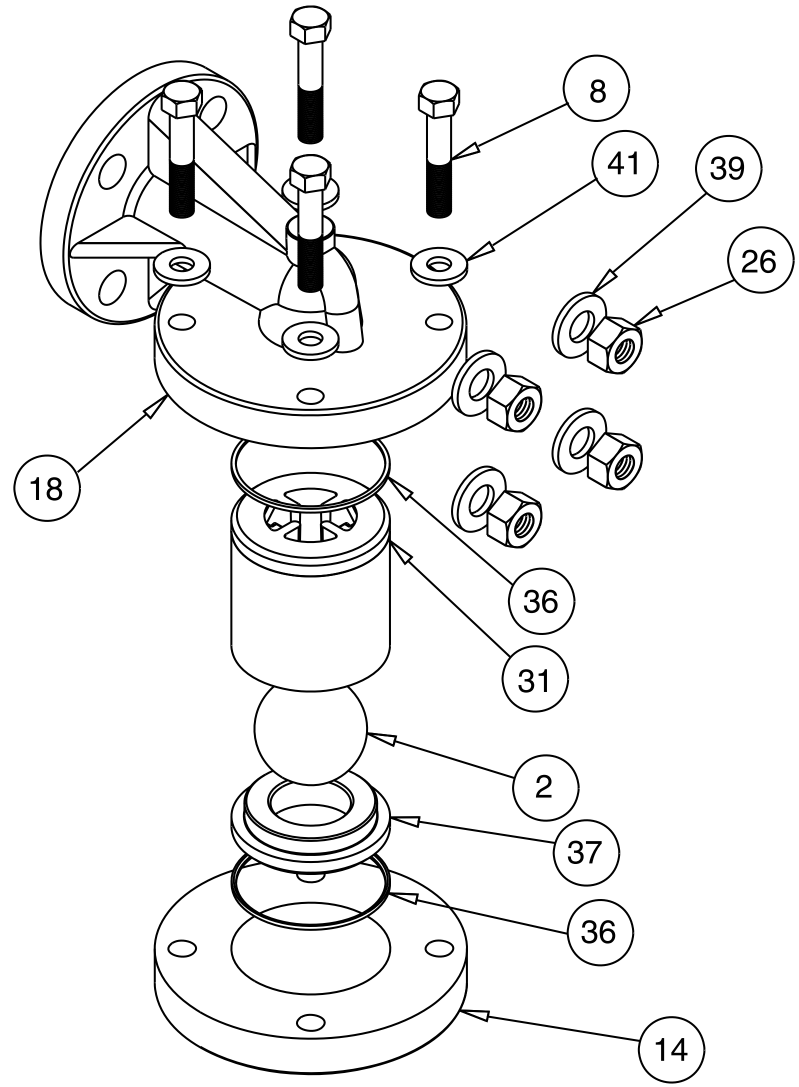
Remove the remaining check valve seal (item 36). Inspect the seal for cuts or pinched areas. Replace seal as needed.

Re-assemble the modular check valve. The seat should fit snugly into the retainer.

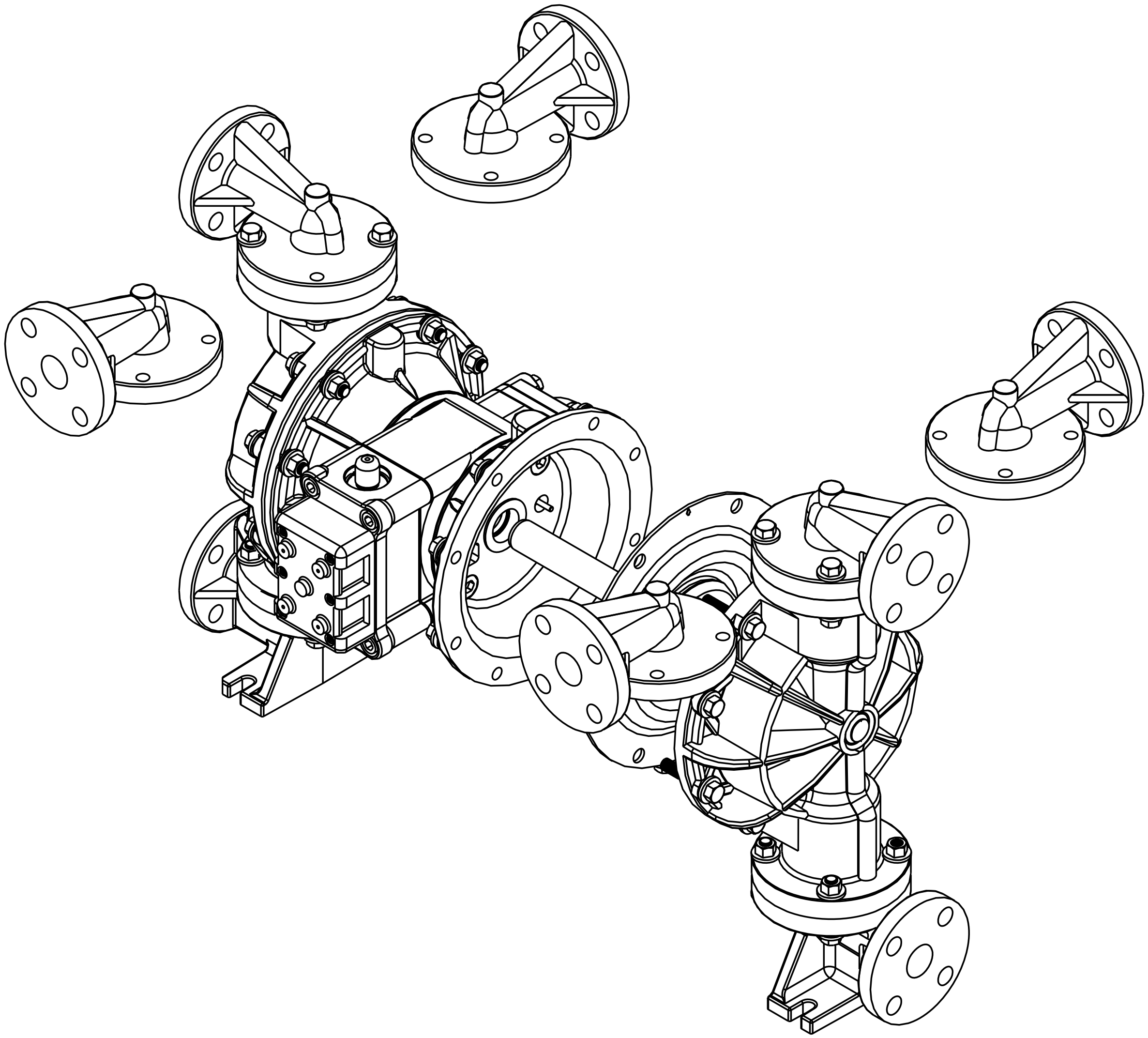
Place a check valve seal (item 36) into the cavity of the outer chamber (item 14). Make sure the chamfer side of the seal faces out. Insert the modular check valve into the outer chamber with the retainer facing up. Install a check valve seal (item 36). Make sure the chamfer side of the seal faces the chamfer on the check valve seat or retainer.

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

Modular Check Valve Drawing



Dual Port Option Drawing



DUAL PORTING OPTIONS

Several dual porting options are possible. The pump can be converted to a dual port arrangement on both the suction and the discharge ends. The porting can be configured to a single suction and a dual discharge. The porting can be changed to a dual suction and a single discharge.

The above changes are possible because the porting flange of the elbows (items 18 and 19) are designed to mate with standard 125# ANSI style 4-bolt, 1" pipe flanges.

DUAL PORTING OF BOTH SUCTION AND DISCHARGE ENDS OF THE PUMP

Converting the pump from the standard single suction and discharge porting configuration to dual porting at each end is easy. Simply remove the manifold seals, spacers, and manifolds (items 35 and 23 from pump assembly drawing) from the pump.

The discharge and suction elbows can be rotated at 90° increments (see arrows and optional positioning in the Dual Porting Drawing.

SINGLE PORTING OF THE SUCTION AND DUAL PORTING OF THE PUMP DISCHARGE

To convert the pump from the standard single suction and single discharge porting configuration to a dual discharge porting arrangement remove the only the discharge manifolds, spacers, and manifold seals. Position the discharge elbows in the desired direction at 90° increments. (See arrows and optional positioning in the Dual Porting Drawing.)

DUAL PORTING OF THE SUCTION AND SINGLE PORTING OF THE PUMP DISCHARGE

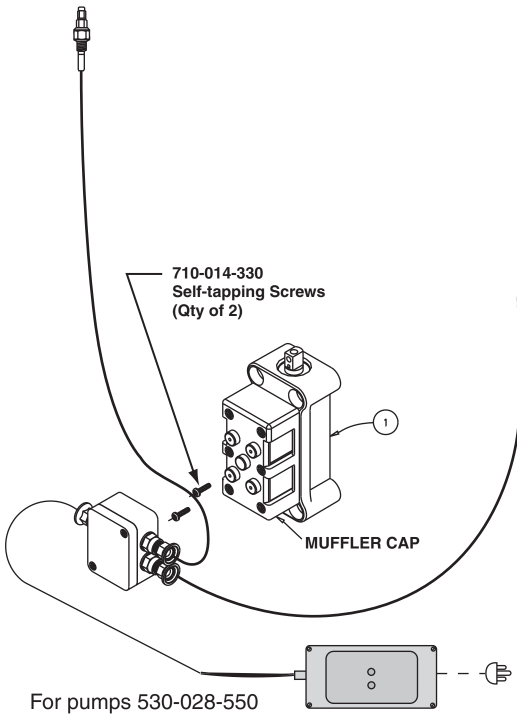
To convert the pump from the standard single suction and single discharge porting configuration to a dual suction porting arrangement remove the only the suction (bottom) manifolds, spacers, and manifold seals.

Position the suction elbows in the desired direction at 90° increments. (See arrows and optional positioning in the Dual Porting Drawing.)

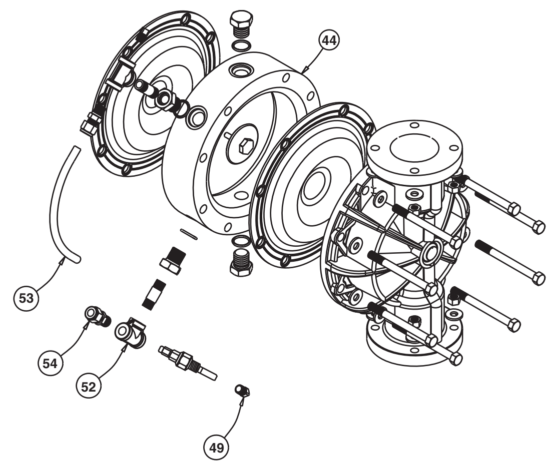
⚠ IMPORTANT

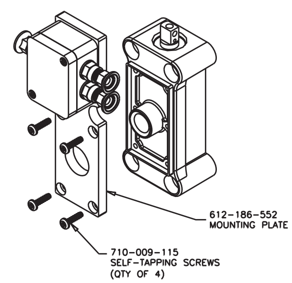
Read these instructions completely, before installation and start-up. It is the responsibility of the purchaser to retain this manual for reference. Failure to comply with the recommendations stated in this manual will damage the pump, and void factory warranty.

Leak Detection Options Drawing



For pumps 530-028-550
Enclosed Muffler





For pumps with Alternate Mufflers

LEAK DETECTION OPTION A (ELECTRONIC)

Follow instructions found elsewhere in this manual, “Filling the Spill Containment Chambers” when installing leak detectors.

Electronic Leak Detector Installation

Kit 032-037-000	100VAC	50Hz
	or 110-120VAC	50 / 60Hz
	or 220-240VAC	50 / 60Hz
Kit 032-045-000	12-32VDC	

To install electronic leak detectors, remove the bottom ¼" NPT pipe plug on the visual sight tube (item 53). Insert leak detector into the ¼" pipe tee (item 52).

Leak Detection Option B (Mechanical)

Follow instructions found elsewhere in this manual, “Filling the Spill Containment Chambers” when installing leak detectors.

Mechanical Leak Detector Installation

Kit 031-023-110

To install mechanical leak detectors, remove the bottom ¼" NPT pipe plug on the visual sight tube (item 53). Insert leak detector into the ¼" pipe tee (item 52).

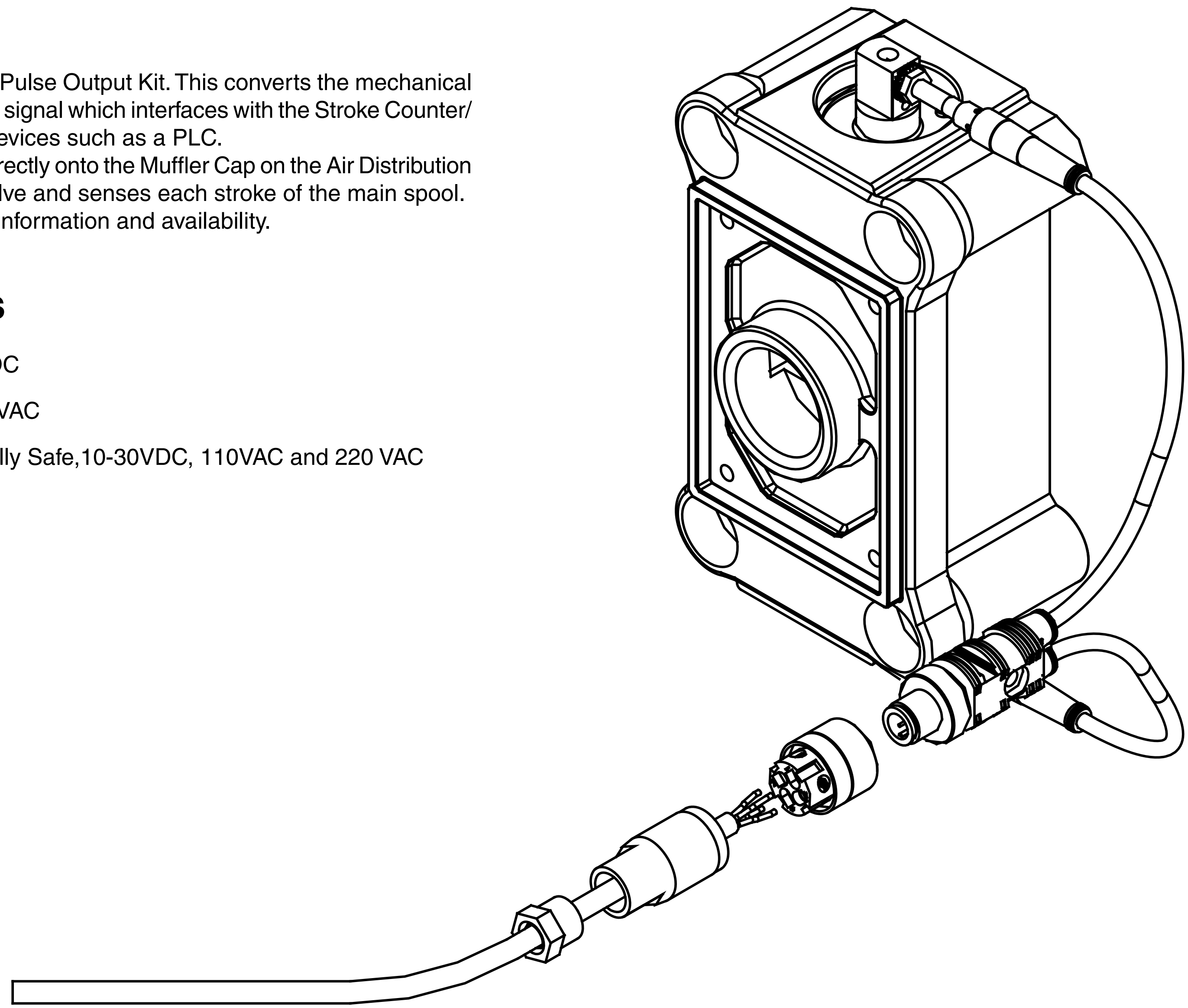
Pulse Output Kit Drawing

PULSE OUTPUT KIT OPTION

This pump can be fitted with a Pulse Output Kit. This converts the mechanical strokes of the pump to an electrical signal which interfaces with the Stroke Counter/ Batch Controller or user control devices such as a PLC.

The Pulse Output Kits mount directly onto the Muffler Cap on the Air Distribution Valve Assembly or onto the air valve and senses each stroke of the main spool.

Consult the factory for further information and availability.



Pulse Output Kits

475-244-001	10-30 VDC
475-244-002	110/220 VAC
475-244-003	Intrinsically Safe,10-30VDC, 110VAC and 220 VAC

Optional Muffler Configurations, Drawing

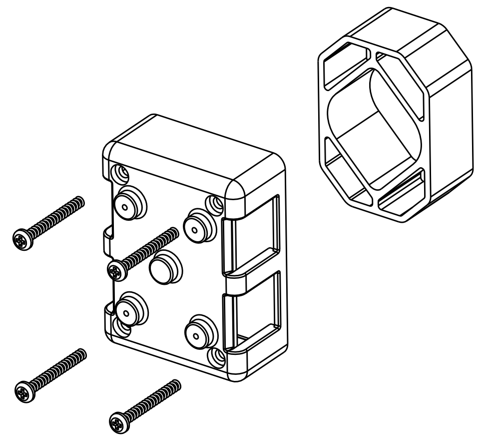
OPTION 0
530-028-550 Integral Muffler uses (1) Cap and (4) 710-015-115 Self Tapping Screw to hold it in place.

OPTION 1
530-027-000 Sound Dampening Muffler screws directly into the Air Valve body. This muffler is equipped with a porous plastic element.

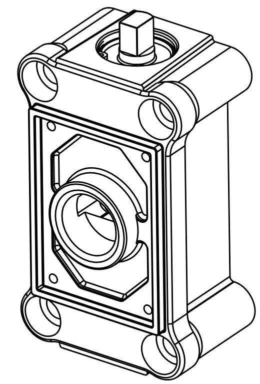
OPTION 2
530-010-000 Mesh Muffler screws directly into the Air Valve Body. This muffler is equipped with a metal element.

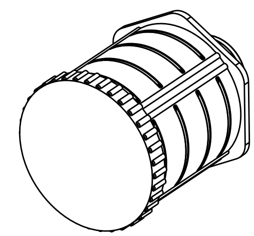
OPTION 6
530-033-000 Metal Muffler screws directly into the Air Body.

ATEX Compliant

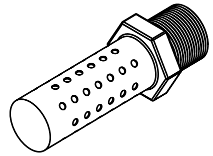


Option 0





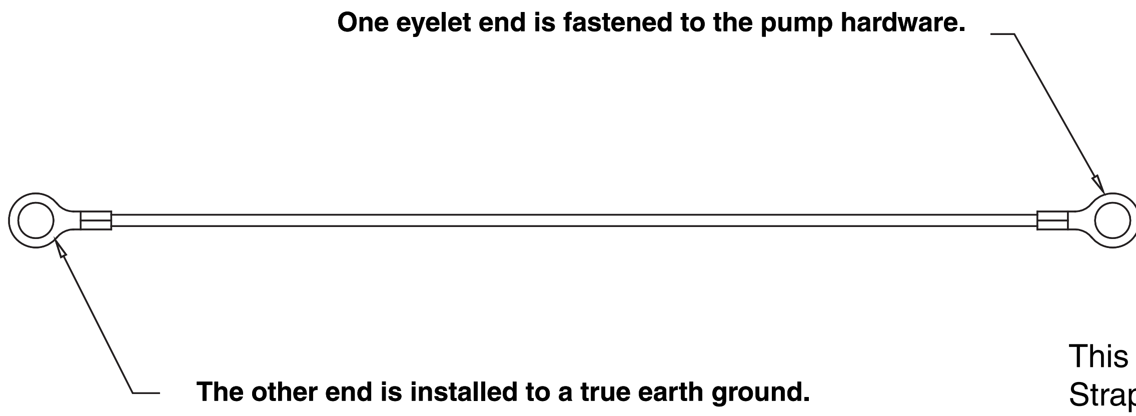
Option 1 and 2



Option 6

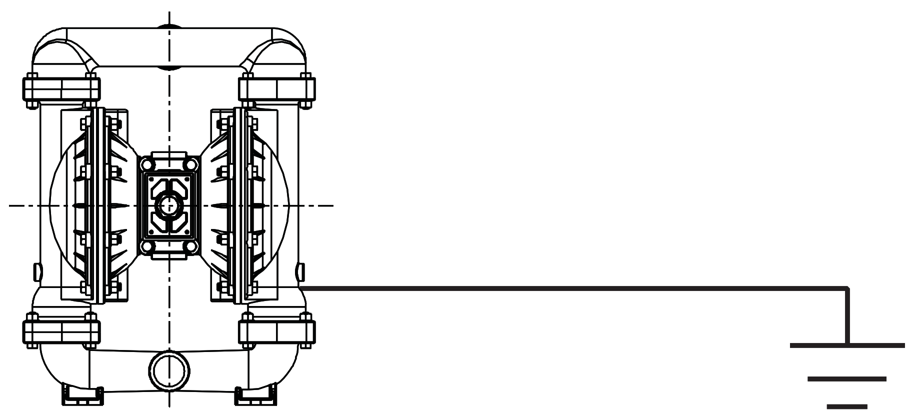
Grounding The Pump

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



This optional 8 foot long (244 centimeters) Ground Strap (920-025-000) is available for easy ground connection.

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

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.

Declaration of Conformity

WARREN RUPP®

IDEX FLUID & METERING

Declaration of Conformity

Warren Rupp, Inc., 800 North Main Street, Mansfield, Ohio, certifies that Air-Operated Double Diaphragm Pumps Series: HDB, HDF, M Non-Metallic, S Non-Metallic, M Metallic, S Metallic, Containment Duty, Gas, UL, High Pressure, W, Submersible and Tranquilizers comply with the European Community Directive 98/37/EC, Safety of Machinery. This product has used EN 809, Pumps and Pump Units for Liquids - Common Safety Requirements harmonized standard to verify conformance.

David Roseberry	October 20, 2005
Signature of authorized person	Date of issue
David Roseberry	Engineering Manager
Printed name of authorized person	Title

CE

Declaration of Conformity