

## SERVICE & OPERATING MANUAL



# Model S05 Non-Metallic Design Level 2

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See page 2  
for ATEX ratings.

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



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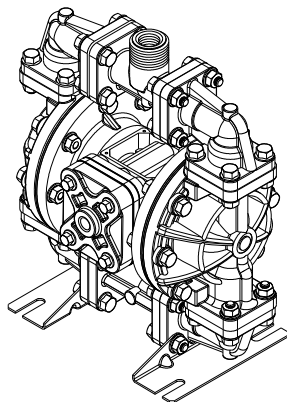
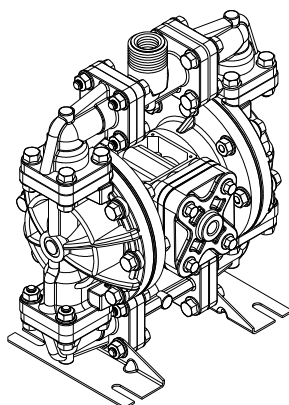


**WARREN  
RUPP®**

Quality System  
ISO9001 Certified

Environmental  
Management System  
ISO14001 Certified

**IDEX**  
FLUID & METERING



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



See page 2  
for ATEX ratings.

**SANDPIPER®**  
A WARREN RUPP PUMP BRAND

## **S05 Non-Metallic Design Level 2 Ball Valve**

### **Air-Operated Double Diaphragm Pump**

ENGINEERING, PERFORMANCE  
& CONSTRUCTION DATA

INTAKE/DISCHARGE PIPE SIZE 1/2" NPT (Internal) or 1/2" BSP (Tapered) 1" NPT (External) or 1" BSP (Tapered)	CAPACITY 0 to 14 gallons per minute (0 to 52 liters per minute)	AIR VALVE No-lube, no-stall design	SOLIDS-HANDLING Up to .125 in. (3mm)	HEADS UP TO 100 psi or 231 ft. of water (7 bar or 70 meters)	DISPLACEMENT/STROKE .026 Gallon / .098 liter
<b>CAUTION! Operating temperature limitations are as follows:</b>					
<b>MATERIALS</b>				<b>Operating Temperatures</b>	
				<b>Maximum</b>	<b>Minimum</b>
<b>Santoprene®:</b> Injection molded thermoplastic elastomer with no fabric layer. Long mechanical flex life. Excellent abrasion resistance.				275°F 135°C	-40°F -40°C
<b>Nylon</b>				180°F 82°C	32°F 0°C
<b>Virgin PTFE:</b> 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
<b>PVDF:</b> Generally reserved for applications requiring the highest purity, strength, and resistance to solvents, acids & bases				250°F 121°C	0°F -18°C
<b>Polypropylene:</b> Generally rugged and usually resistant to many chemicals solvents. Rugged and often stiffer than other plastics, economical.				180°F 82°C	32°F 0°C
<b>Nitrile:</b> 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

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




## S05 Non-Metallic · Design Level 2· 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)
S05B2P1TPNS000.	S	05	B	2	P	1	T	P	N	S	0	00.	16 (8)
S05B2P2TPNS000.	S	05	B	2	P	2	T	P	N	S	0	00.	16 (8)
S05B2PUTPNS000.	S	05	B	2	P	U	T	P	N	S	0	00.	16 (8)
S05B2K1TPNS000.	S	05	B	2	K	1	T	P	N	S	0	00.	18 (9)
S05B2K2TPNS000.	S	05	B	2	K	2	T	P	N	S	0	00.	18 (9)
S05B2KUTPNS000.	S	05	B	2	K	U	T	P	N	S	0	00.	18 (9)
S05B2N1TPNS000.	S	05	B	2	N	1	T	P	N	S	0	00.	16 (8)
S05B2N2TPNS000.	S	05	B	2	N	2	T	P	N	S	0	00.	16 (8)
S05B2NUTPNS000.	S	05	B	2	N	U	T	P	N	S	0	00.	16 (8)


**Note: Models listed in the table are for reference only. See nomenclature below for other models.**



<b>Pump Brand</b> S= SANDPIPER®	<b>Diaphragm/Check Valve Materials</b> 1= Santoprene/Santoprene 2= Virgin PTFE-Santoprene Backup/Virgin PTFE B= Nitrile/Nitrile U= Polyurethane/Polyurethane Z= One-Piece Bonded/PTFE	<b>Porting Options</b> N= NPT Threads B= BSP (Tapered) Threads 1= Dual Porting (NPT) 2= Top Dual Porting (NPT) 3= Bottom Dual Porting (NPT) 4= Dual Porting (BSP Tapered) 5= Top Dual Porting (BSP Tapered) 6= Bottom Dual Porting (BSP Tapered)	<b>Kit Options</b> ⚠ 00.= None ◇ P0.= 10-30VDC Pulse Output Kit ◇ P1.= Intrinsically-Safe 5-30VDC, 110/120VAC 220/240 VAC Pulse Output Kit 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 Explosion-Proof Coil E6.= Solenoid Kit with 220VAC Coil	<b>Kit Options continued</b> △ E7.= Solenoid Kit with 220VAC 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			
<b>Pump Size</b> 05=1/2"	<b>Check Valve Type</b> B= Solid Ball	<b>Design Level</b> 2= Design Level	<b>Wetted Material</b> K= PVDF N= Nylon P= Polypropylene ⚠ C= Conductive Polypropylene ⚠ V= Conductive PVDF	<b>Check Valve Seat</b> T= Virgin PTFE	<b>Non-Wetted Material Options</b> P= Polypropylene 1= Polypropylene w/PTFE Coated Hardware ⚠ C= Conductive Polypropylene	<b>Pump Style</b> S= Standard	<b>Pump Options</b> ⚠ 0= None 1= Sound Dampening Muffler 2= Mesh Muffler ⚠ 6= Metal Muffler ⚠ 7= Metal Muffler with Grounding Cable


- (1)  II 2GD T5

 Note: Pumps are only ATEX compliant when ordered with wetted material option C or V, non-wetted material option C, pump option 0, 6 or 7, and kit option 0.
- (2)  II 2G Ex ia c IIC T5  
 II 2D c iaD 20 IP67 T100°C

 Note: Pumps ordered with the options listed in (1) to the left are ATEX compliant when ordered with kit option P1.
- (3\*)  II 2G EEx m c T5  
 II 2D c IP65 T100°C

 Note: Pumps ordered with the options listed in (1) to the left are ATEX compliant when ordered with kit option A1, A2, A3, or A4.

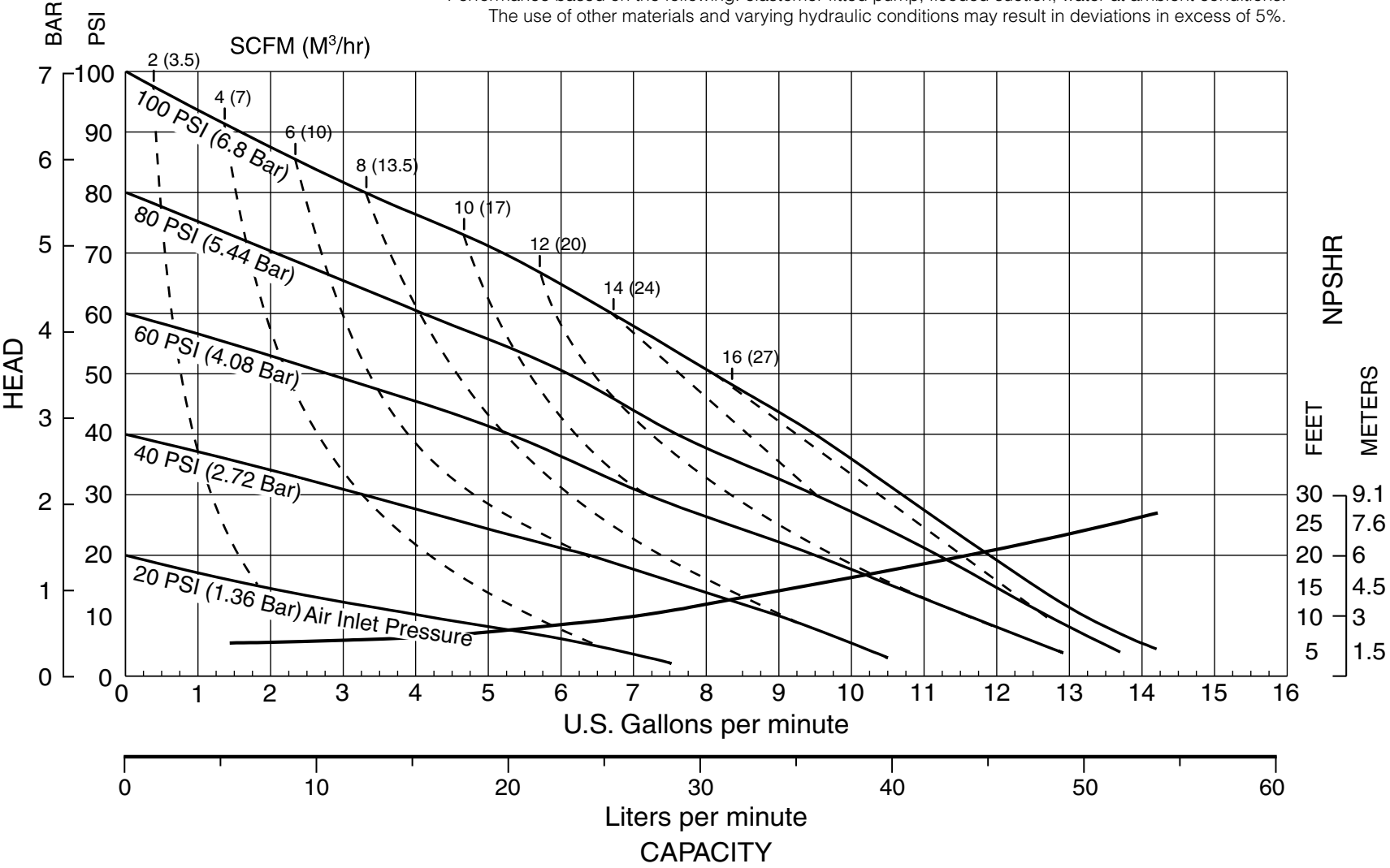
\*Note: See page 18 for **Special Conditions For Safe Use.**
- (4)  IEC EEx m T4 

 Note: Pump models equipped with these explosion-proof solenoid kit options E1, E3, E5, E7, E8 or E9, are certified and approved by the above agencies. They are NOT ATEX compliant.

# Performance Curve, S05 Non-Metallic Design Level 2

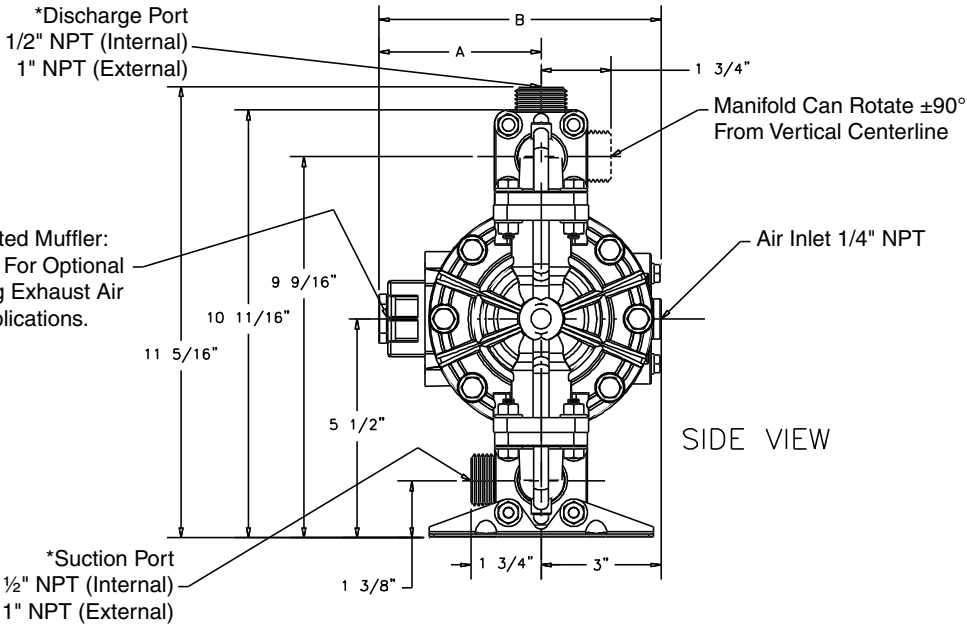
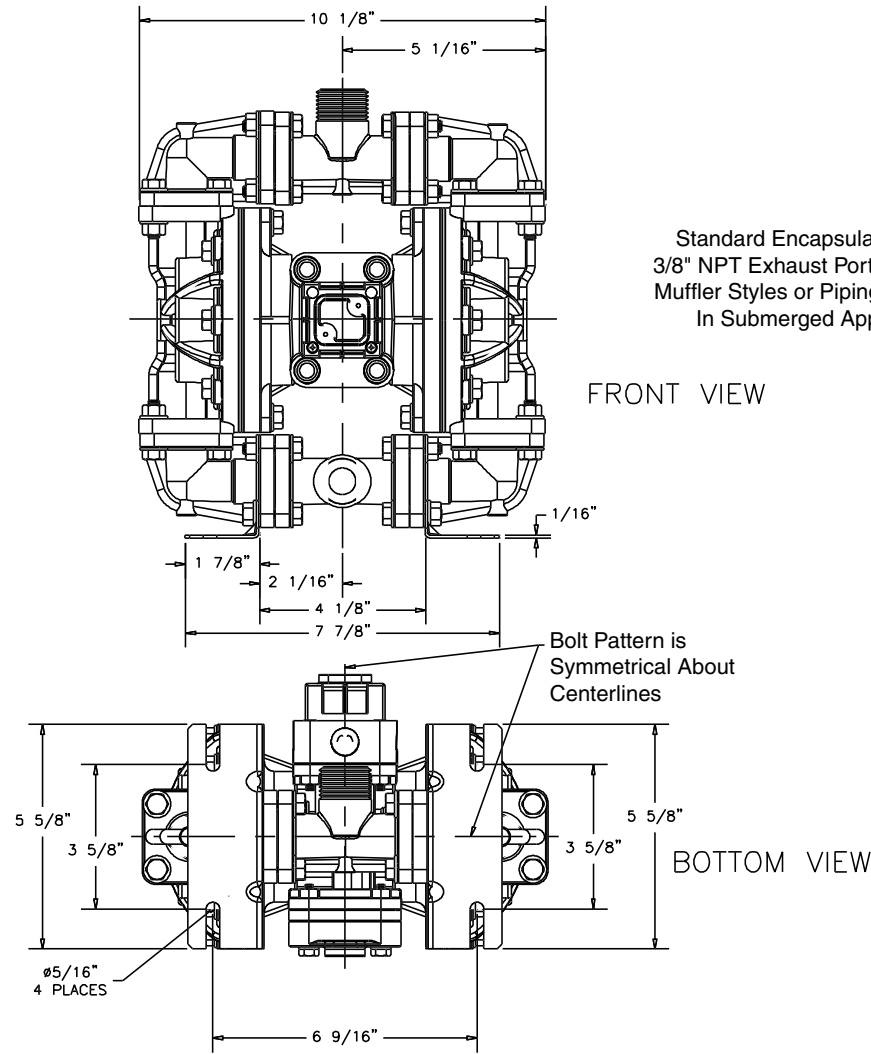
## MODEL S05 Non-Metallic Performance Curve

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



# Dimensions: S05 Non-Metallic

Dimensions in Inches  
Dimensional tolerance:  $\pm 1/8$ "

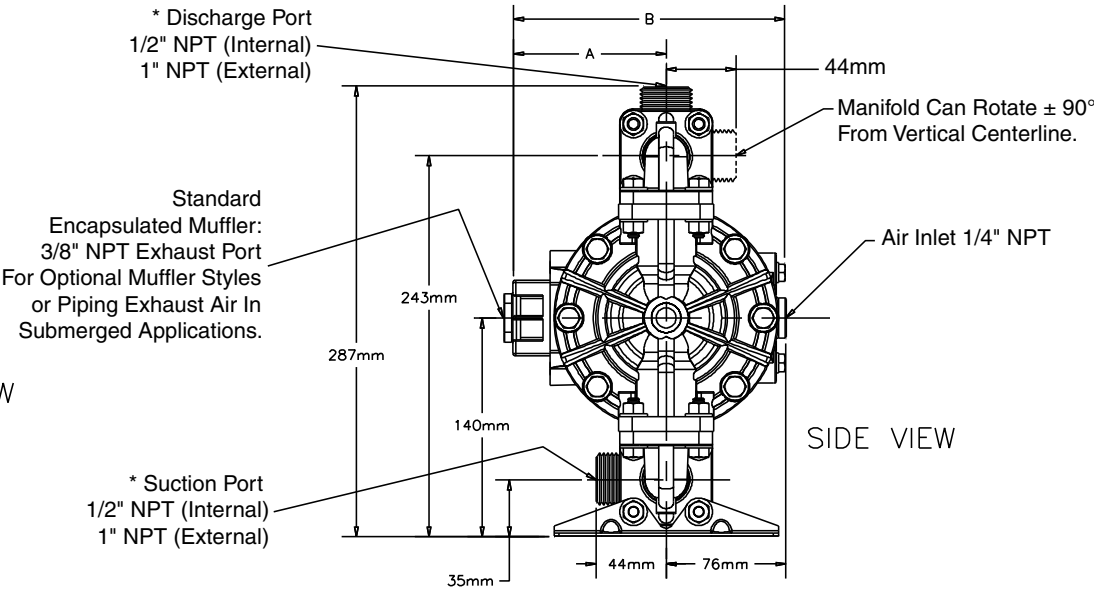
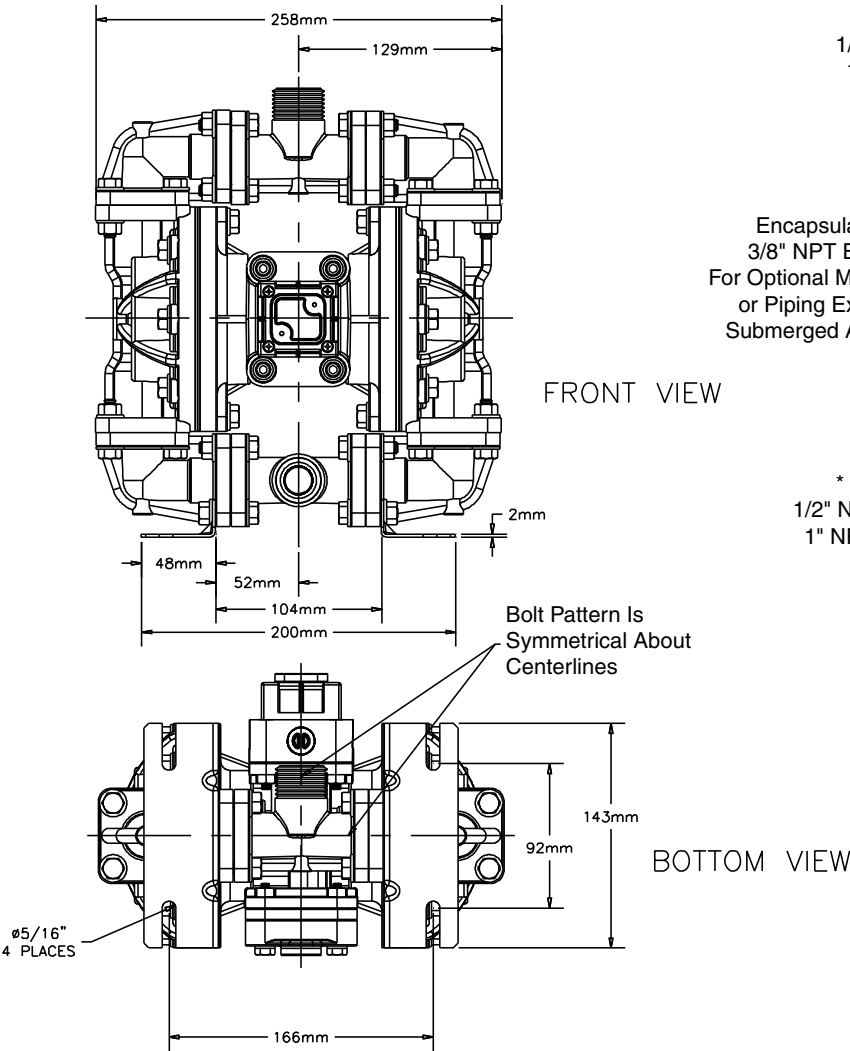


\*Both Suction And Discharge Ports are Available in  
1/2" BSP Tapered (Internal)  
1" BSP Tapered (External)

DIMENSION	A	B
Standard Pump	4 1/16"	7 1/16"
Pulse Output Kit	4 1/16"	7 1/16"
Mesh Muffler	5 3/4"	8 3/4"
Sound Dampening Muffler	5 3/4"	8 3/4"
Metal Muffler	5 1/4"	8 1/4"

# Metric Dimensions: S05 Non-Metallic

Dimensions in millimeters  
Dimensional tolerance: ±3mm



\*Both Suction And Discharge Ports are Available in  
1/2" BSP Tapered (Internal)  
1" BSP Tapered (External)

DIMENSION	A	B
Standard Pump	103mm	179mm
Pulse Output Kit	103mm	179mm
Mesh Muffler	146mm	222mm
Sound Dampening Muffler	146mm	222mm
Metal Muffler	133mm	210mm

## 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 Warren Rupp Tranquillizer® 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

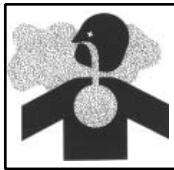
When the pump is used for materials that tend to settle out or solidify when not in motion, the pump should be flushed after each use to prevent damage. (Product remaining in the pump between uses could dry out or settle out. This could cause problems with the diaphragms and check valves at restart.)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



## INSTALLATION GUIDE Top Discharge Ball Valve Unit

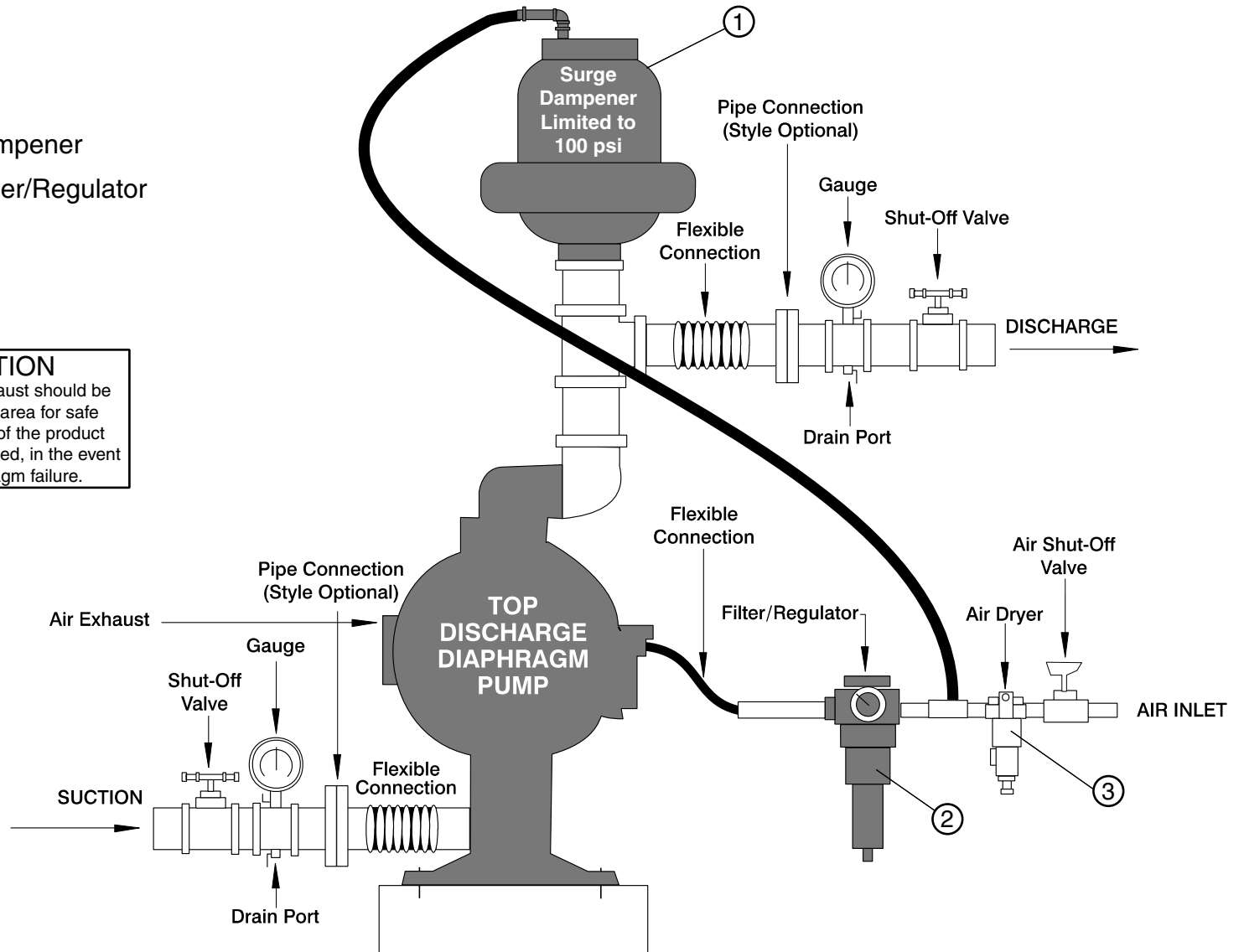
Available from  
Warren Rupp

- ① DA05 Surge Dampener
- ② 020-049-000 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.



## TROUBLESHOOTING

### Possible Symptoms:

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

**What to Check:** Excessive suction lift in system.

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

**What to Check:** Excessive flooded suction in system.

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

**What to Check:** System head exceeds air supply pressure.

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

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

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

**What to Check:** Undersized suction line.

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

**What to Check:** Restricted or undersized air line.

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

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

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

**What to Check:** Rigid pipe connections to pump.

**Corrective Action:** Install flexible connectors and a Warren Rupp Tranquilizer® Surge Suppressor.

**What to Check:** Blocked air exhaust muffler.

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

**What to Check:** Pumped fluid in air exhaust muffler.

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

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

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

**What to Check:** Obstructed check valve.

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

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

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

**What to Check:** Blocked suction line.

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

**What to Check:** Blocked discharge line.

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

**What to Check:** Blocked pumping chamber.

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

## RECYCLING

Many components of SANDPIPER® 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.



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](http://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. Retorque 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 31)*



### ! 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

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 Dixon Industries Corp.

Ryton is a registered tradename of Phillips Chemical Co.

Valox is a registered tradename of General Electric Co.

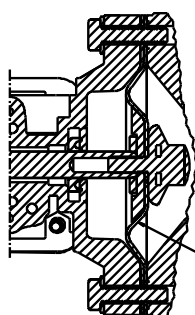
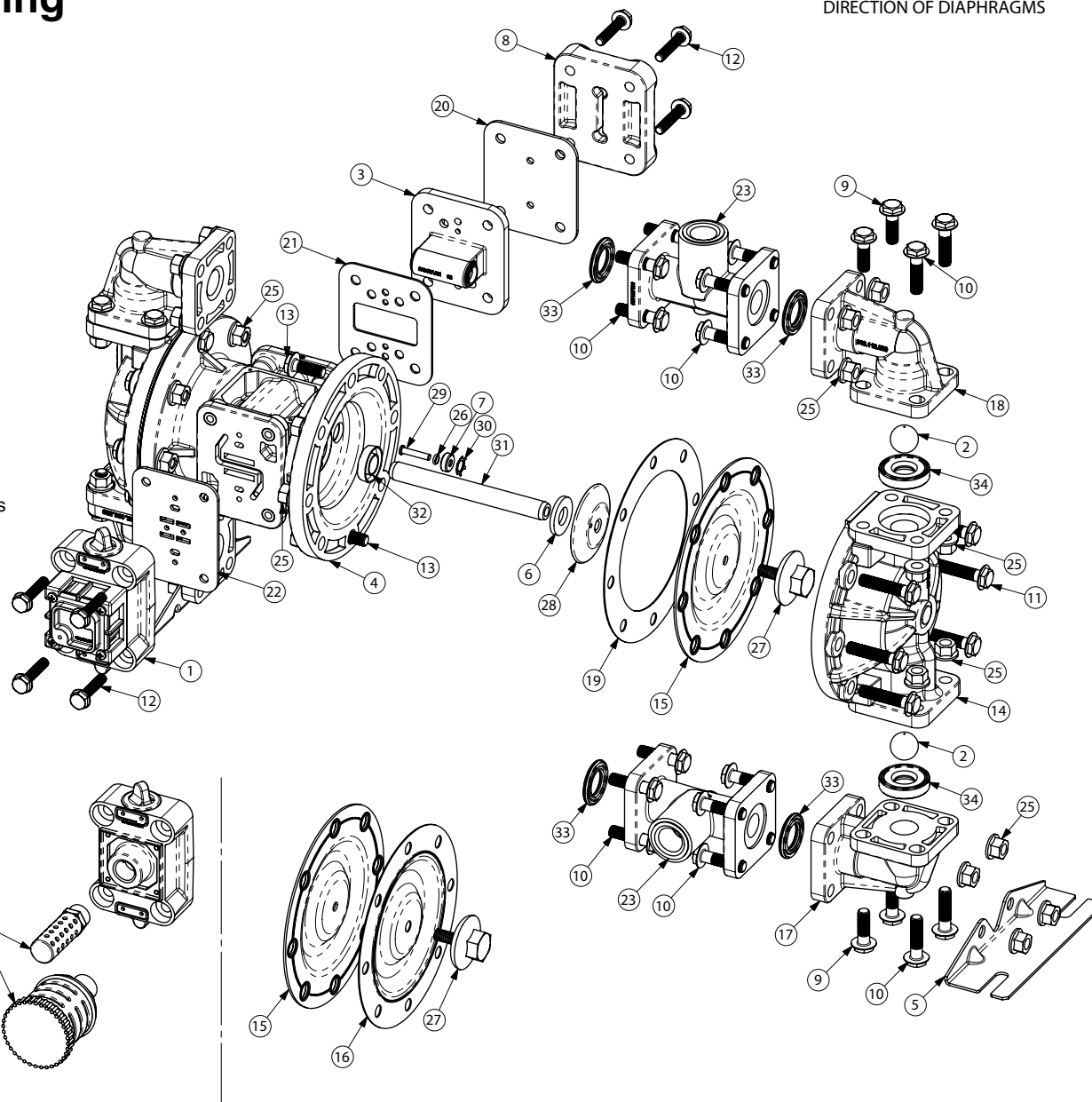
Warren Rupp, SANDPIPER, PortaPump, Tranquilizers and SludgeMaster are registered tradenames of Warren Rupp, Inc.

# Composite Repair Parts Drawing

ILLUSTRATION SHOWS  
DIRECTION OF DIAPHRAGMS

## Available Service And Conversion Kits

- 476-219-000 AIR END KIT**  
Seals, O-ring, Gaskets, Retaining Rings, Air Valve Assembly and Pilot Valve Assembly
- 476-220-000 AIR END KIT (Air Valve with Stroke Indicator Pin)**  
Seals, O-ring, Gaskets, Retaining Rings, Air Valve Assembly Pilot Valve Assembly
- 476-202-360 WET END KIT**  
Nitrile Diaphragms, Nitrile Check Balls, PTFE Seats and PTFE Seals
- 476-202-354 WET END KIT**  
Santoprene Diaphragms, Nitrile Spacer Gaskets, Santoprene Check Balls, PTFE Seats and PTFE Seals
- 476-202-357 WET END KIT**  
Polyurethane Diaphragms, Nitrile Spacer Gaskets, Santoprene Check Balls, PTFE Seats and PTFE Seals
- 476-202-654 WET END KIT**  
Santoprene Diaphragms, PTFE Overlay Diaphragm, PTFE Check Balls, PTFE Seats and PTFE Seals
- 476-202-659 WETTED END KIT**  
One-Piece Bonded PTFE/Nitrile Diaphragm, PTFE Balls, PTFE Seats



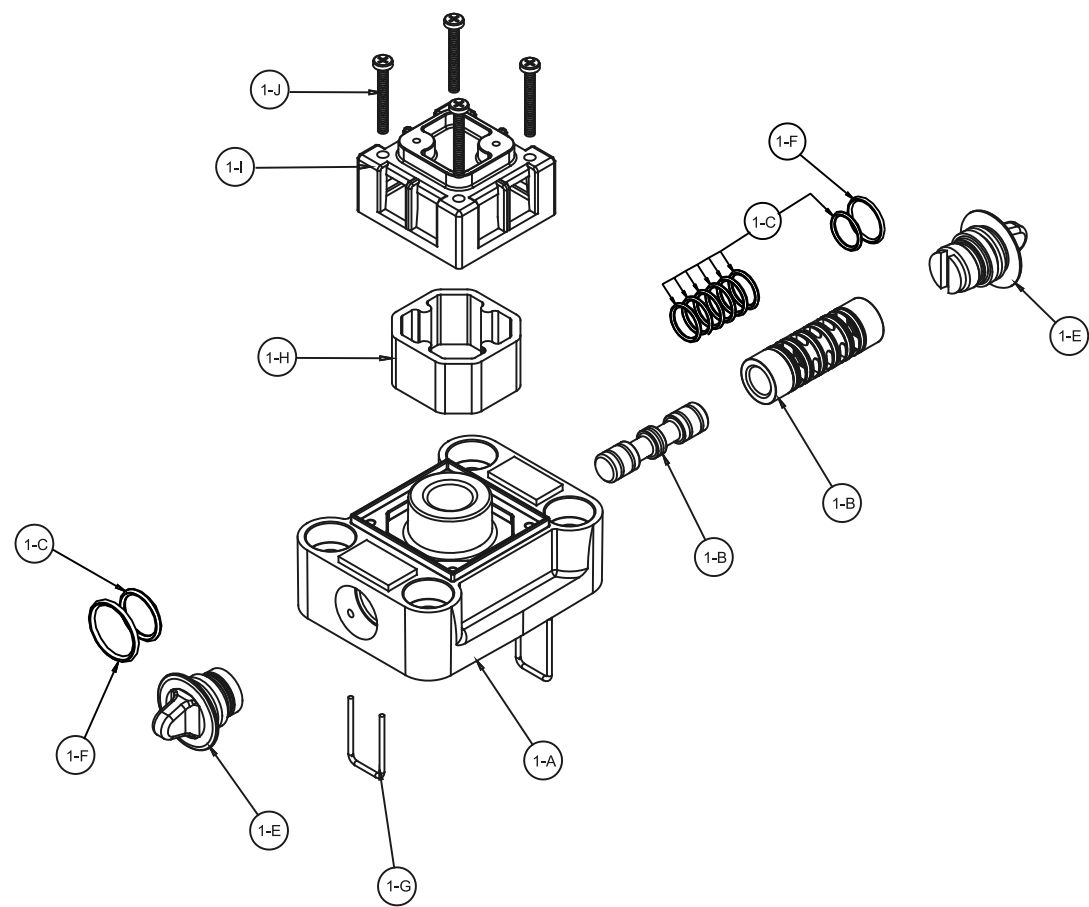
DIAPHRAGM CONFIGURATION  
DETAIL

**NOTE TO ASSEMBLY**  
THE DIAPHRAGMS FOR BOTH  
CONFIGURATIONS SHOWN ABOVE ARE TO BE  
INSTALLED WITH CONVOLUTIONS FACING  
TOWARDS CENTER OF PUMP

# Composite Repair Parts List

Item	Part Number	Description	Qty
1	031-166-000	Air Valve Assembly	1
	031-166-002	Air Valve Assembly (with PTFE Coated Hardware)	1
	⚠ 031-166-003	Air Valve Assembly (with Conductive Polypropylene)	1
	⚠ 031-167-000	Air Valve Assembly (with Stroke Indicator Pins)	1
	031-167-002	Air Valve Assembly (with Stroke Indicator Pins and PTFE Coated Hardware)	1
	031-168-000	Air Valve Assembly	1
	⚠ 031-168-002	Air Valve Assembly-Conductive Polypropylene	1
	⚠ 031-169-000	Air Valve Assembly (no muffler with Stroke Indicator Pins)	1
	031-194-000	High Temperature	1
	⚠ 031-194-002	High Temperature-Conductive Polypropylene	1
	031-195-000	High Temperature	1
	⚠ 031-195-003	High Temperature-Conductive Polypropylene	1
2	050-027-354	Ball, Check	4
	050-027-357	Ball, Check	4
	050-027-360	Ball, Check	4
	050-022-600	Ball, Check	4
3	095-091-000	Pilot Valve Assembly	1
4	114-023-551	Bracket, Intermediate	1
	⚠ 114-023-559	Bracket, Intermediate	1
5	115-140-115	Bracket, Mounting	2
	115-140-308	Bracket, Mounting	2
6	132-034-360	Bumper, Diaphragm	2
7	135-036-506	Bushing, Plunger	2
8	165-110-551	Cap, Air Inlet	1
	⚠ 165-110-559	Cap, Air Inlet	1
9	171-062-115	Capscrew, Flanged 5/16-18 X 1.00	12
	171-062-308	Capscrew, Flanged 5/16-18 X 1.00	12
10	171-063-115	Capscrew, Flanged 5/16-18 X 1.25	24
	171-063-308	Capscrew, Flanged 5/16-18 X 1.25	24
11	171-064-115	Capscrew, Flanged 5/16-18 X 1.50	12
	171-064-308	Capscrew, Flanged 5/16-18 X 1.50	12
12	171-066-115	Capscrew, Flanged 1/4-20 X 1.25	8
	171-066-308	Capscrew, Flanged 1/4-20 X 1.25	8
13	171-075-115	Capscrew, Flanged 5/16-18 X .88	4
	171-075-308	Capscrew, Flanged 5/16-18 X .88	4
14	196-178-520	Chamber, Outer	2
	⚠ 196-178-521	Chamber, Outer	2
	196-178-542	Chamber, Outer	2
	196-178-552	Chamber, Outer	2
	⚠ 196-178-557	Chamber, Outer	2
15	286-095-354	Diaphragm	2
	286-095-357	Diaphragm	2
15	286-095-360	Diaphragm	2
	286-116-000	Diaphragm, One-Piece	2
16	286-096-600	Diaphragm, Overlay	2
17	312-106-520	Elbow, Suction	2
	⚠ 312-106-521	Elbow, Suction	2
	312-106-542	Elbow, Suction	2
	312-106-552	Elbow, Suction	2
	⚠ 312-106-557	Elbow, Suction	2
18	312-112-520	Elbow, Discharge	2
	⚠ 312-112-521	Elbow, Discharge	2
	312-112-542	Elbow, Discharge	2
	312-112-552	Elbow, Discharge	2
	⚠ 312-112-557	Elbow, Discharge	2
19	360-099-360	Gasket, Spacer (use w/TPE Diaphragms Only)	2
20	360-100-379	Gasket, Air Inlet	1
21	360-101-360	Gasket, Pilot Valve	1
22	360-102-360	Gasket, Air Valve	1
23	518-138-520	Manifold, NPT	2
	518-138-520E	Manifold, BSP Tapered	2
	⚠ 518-138-521	Manifold, NPT	2
	⚠ 518-138-521E	Manifold, BSP Tapered	2
	518-138-542	Manifold, NPT	2
	518-138-542E	Manifold, BSP Tapered	2
	518-138-552	Manifold, NPT	2
	518-138-552E	Manifold, BSP Tapered	2
	⚠ 518-138-557	Manifold, NPT	2
	⚠ 518-138-557E	Manifold, BSP Tapered	2
24	530-023-000	Muffler with metal mesh element, (Not available for Conductive Polypropylene or PVDF)	1
	530-024-000	Muffler with porous plastic element, (Not available for Conductive Polypropylene or PVDF)	1
	⚠ 530-035-000	Muffler	1
25	544-005-115	Nut, Flanged 5/16-18	36
	544-005-308	Nut, Flanged 5/16-18	36
26	560-001-360	O-ring	2
27	612-091-520	Plate, Outer Diaphragm	2
	612-091-542	Plate, Outer Diaphragm	2
	612-091-552	Plate, Outer Diaphragm	2
28	612-177-330	Plate, Inner Diaphragm	2
	612-221-330	Plate, Inner Diaphragm (use with 286-116-000 )	2
29	620-019-115	Plunger, Actuator	2
30	675-042-115	Ring, Retaining	2
31	685-056-120	Rod, Diaphragm	1
32	720-012-360	Seal, Diaphragm Rod	2
33	720-045-600	Seal, Manifold	4
34	722-099-600	Seat, Check Valve	4

# Air Distribution Valve Assembly Drawing



## MAIN AIR VALVE ASSEMBLY PARTS LIST

Item	Part Number	Description	Qty
1	031-166-000	Air Valve Assembly	1
1-A	095-106-551	Body, Air Valve	1
1-B	031-132-000	Sleeve and Spool Set	1
1-C	560-101-360	O-Ring	8
1-E	165-122-551	End Cap	2
1-F	560-026-360	O-Ring	2
1-G	675-062-115	End Cap Retainer	2
1-H	530-031-550	Muffler	1
1-I	165-109-551	Muffler Cap	1
1-J	710-011-115	Self-Tapping Screw	4

### For Pumps with Virgin PTFE coated hardware:

1	031-166-002	Air Valve Assembly	1
1-G	675-062-308	End Cap Retainer	2
1-J	710-011-308	Self Tapping Screw	4

(Includes all other items used on 031-166-000 above)

### For Pumps with alternate Mesh or Sound Dampening Mufflers or Piped Exhaust:

1	031-168-000	Air Valve Assembly	1
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(Includes all items used on 031-166-000 above minus 1-H, 1-I and 1-J)

## MAIN AIR VALVE ASSEMBLY PARTS LIST

Item	Part Number	Description	Qty
1	031-166-003	Air Valve Assembly	1
1-A	095-106-559	Body, Air Valve	1
1-B	031-132-000	Sleeve and Spool Set	1
1-C	560-101-360	O-Ring	8
1-E	165-122-551	End Cap	2
1-F	560-026-360	O-Ring	2
1-G	675-062-115	End Cap Retainer	2
1-H	530-031-550	Muffler	1
1-I	165-109-559	Muffler Cap	1
1-J	710-011-115	Self-Tapping Screw	4

### For Pumps with alternate Mesh Muffler or Piped Exhaust:

1	031-168-002	Air Valve Assembly	1
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(Includes all items used on 031-166-003 above minus 1-H, 1-I and 1-J)

### For pumps with High Temperature Options:

1	031-194-000	Air Valve Assembly	1
1-B	031-175-000	Sleeve and Spool Set	1

(Includes all the other items on 031-168-000 above)

1	031-195-000	Air Valve Assembly	1
1	031-175-000	Sleeve and Spool Set	1

(Includes on other items on 031-166-000 above)



ATEX Compliant

## 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 3/8" wrench or socket, remove the four hex flanged capscrews (item 12). Remove the air valve assembly from the pump.

### STEP #2: Disassembly of the air valve.

To access the internal air valve components first remove the two end cap retainers (item 1-G) by inserting a small flat screwdriver into the two slotted grooves on the valve body and gently lifting the retainers out.

Next remove the two end caps (item 1-E) by grasping the pull tab with finger and thumb or pliers and tugging. Inspect the two o-rings (items 1-C and 1-F) on each end cap for wear or cuts. Replace the o-rings if necessary.

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

Inspect the inner diameter of the sleeve (part of item 1-B) for dirt, scratches, or other contaminants. Remove the sleeve if needed and replace with a new sleeve and spool set (item 1-B). **Note:** The sleeve and spool set is match-ground to a specified clearance. Sleeves and spools cannot be interchanged.

### STEP #3: Reassembly of the air distribution valve.

Install one end cap with o-rings (items 1-E, 1-C, and 1-F) into one end of the air valve body (item 1-A). Insert one end cap retainer (item 1-G) into the two smaller holes, align with groove in the end cap, and push until the closed end of the retainer is below the flat surface of the valve body.

Remove the new sleeve and spool set (item 1-B) from the plastic bag. Carefully remove the spool from the sleeve. Install the six o-rings (item 1-C) 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. 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 end cap on the opposite end.

Install the remaining end cap with o-rings and retainer.

Fasten the air valve assembly (item 1) and gasket (item 23) to the pump, using the four hex flanged capscrews (item 12).

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

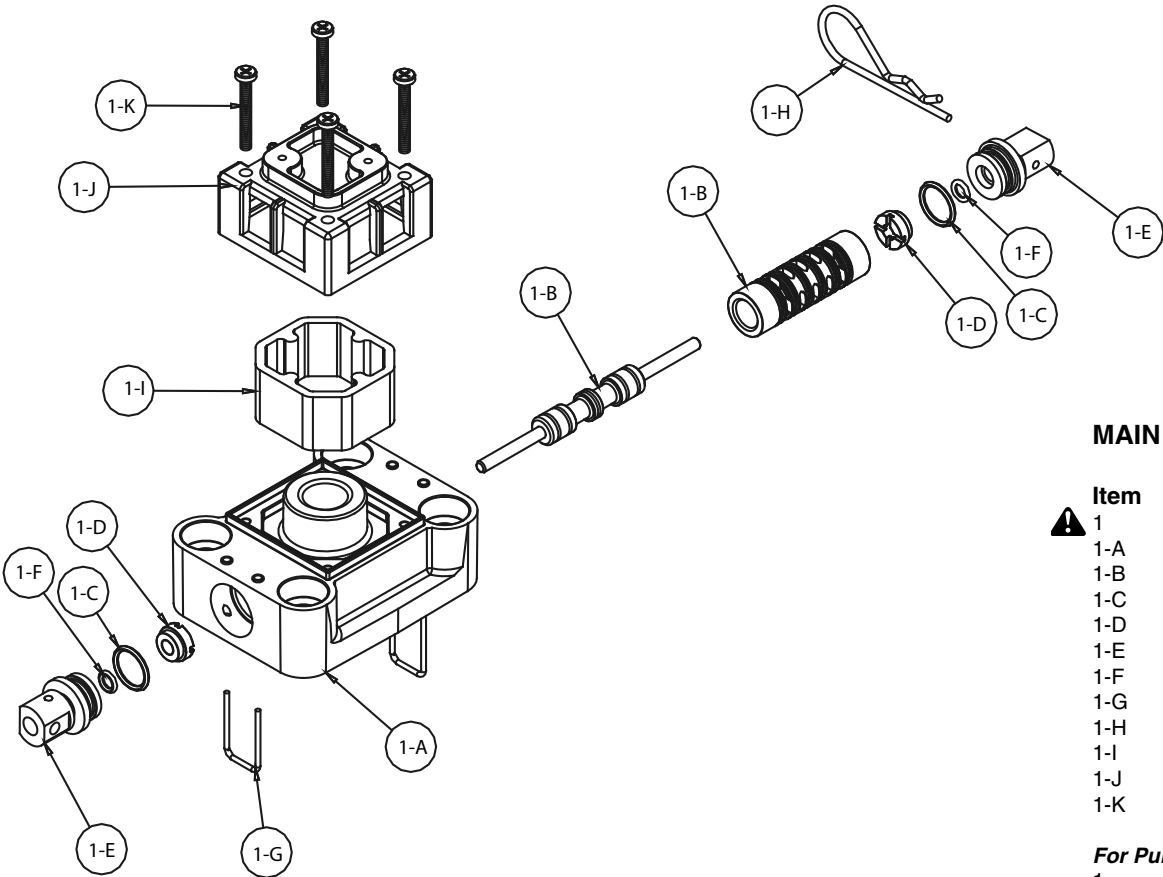


## ! IMPORTANT

*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 with Stroke Indicator Assembly Drawing, Parts List



## MAIN AIR VALVE ASSEMBLY PARTS LIST

Item	Part Number	Description	Qty
⚠ 1	031-167-000	Air Valve Assembly	1
1-A	095-106-559	Body, Air Valve	1
1-B	031-134-000	Sleeve and Spool Set	1
1-C	560-101-360	O-Ring	8
1-D	132.030.552	Bumper	2
1-E	165-123-147	End Cap	2
1-F	560-029-360	O-Ring	2
1-G	675-062-115	End Cap Retainer	2
1-H	210-008-330	Safety Clip	1
1-I	530-031-550	Muffler	1
1-J	165-109-559	Muffler Cap	1
1-K	710-011-115	Self-Tapping Screw	4

### For Pumps with Virgin PTFE coated hardware:

1	031-167-002	Air Valve Assembly	1
1-G	675-062-308	End Cap Retainer	2
1-J	710-011-308	Self Tapping Screw	4

(Includes all other items used on 031-166-000 above)

### For Pumps with alternate Mesh Muffler or Piped Exhaust:

⚠ 1	031-169-000	Air Valve Assembly	1
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(Includes all items used on 031-167-000 above minus 1-H, 1-I and 1-J)



## AIR DISTRIBUTION VALVE WITH STROKE INDICATOR OPTION 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 3/8" wrench or socket, remove the four hex flanged capscrews (item 12). Remove the air valve assembly from the pump.

### STEP #2: Disassembly of the air valve.

To access the internal air valve components first remove the two end cap retainers (item 1-G) by inserting a small flat screwdriver into the two slotted grooves on the valve body and gently lifting the retainers out.

Next remove the two end caps (item 1-E) by grasping the pull tab with finger and thumb or pliers and tugging. Inspect the two o-rings (items 1-C and 1-F) on each end cap for wear or cuts. Replace the o-rings if necessary.

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

Inspect the inner diameter of the sleeve (part of item 1-B) for dirt, scratches, or other contaminants. Remove the sleeve if needed and replace with a new sleeve and spool set (item 1-B). **Note:** The sleeve and spool set is match-ground to a specified clearance. Sleeves and spools cannot be interchanged.

### STEP #3: Reassembly of the air distribution valve.

Install one end cap with o-rings (items 1-E, 1-C, and 1-F) into one end of the air valve body (item 1-A). Insert one end cap retainer (item 1-G) into the two smaller holes, align with groove in the end cap, and push until the closed end of the retainer is below the flat surface of the valve body.

Remove the new sleeve and spool set (item 1-B) from the plastic bag. Carefully remove the spool from the sleeve. Install the six o-rings (item 1-C) 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. 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 end cap on the opposite end.

Install the remaining end cap with o-rings and retainer.

Fasten the air valve assembly (item 1) and gasket (item 23) to the pump, using the four hex flanged capscrews (item 12).

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

**IMPORTANT:** Remove the safety clip. The pump will not function properly until it is removed. The pump is now ready for operation.



## ! IMPORTANT

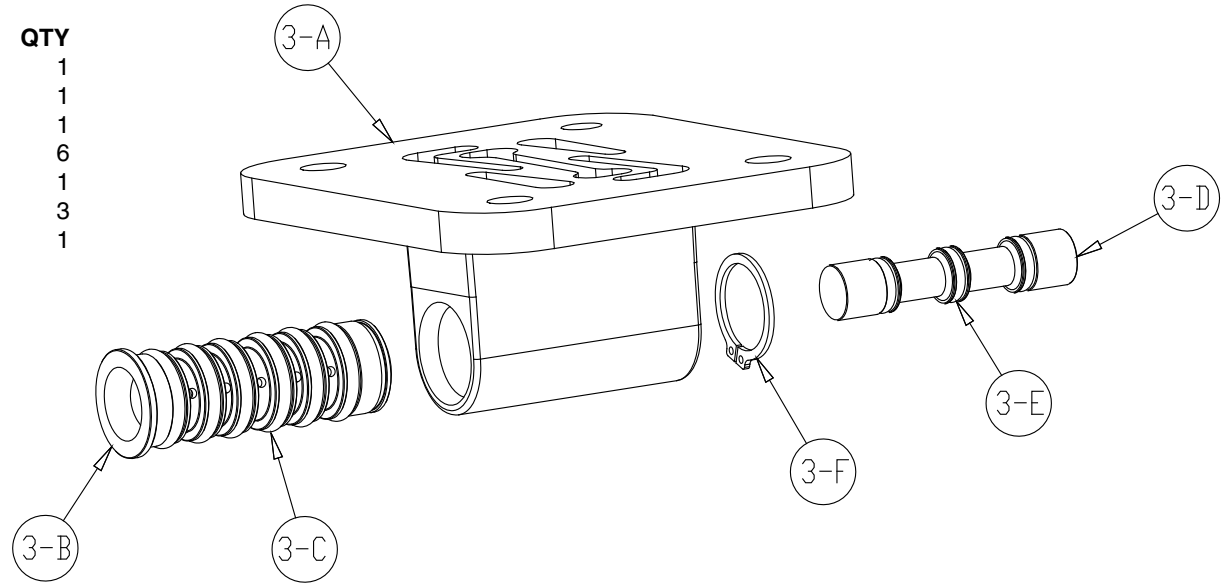
*Read these instructions completely, before installation and start-up. It is the responsibility of the purchaser to retain*

*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
3	095-091-000	Pilot Valve Assembly	1
3-A	095-087-551	Valve Body	1
3-B	755-051-000	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 7/16" wrench or socket, remove the four capscrews (item 12). Remove the air inlet cap (item 8) and air inlet gasket (item 20). 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.

## SOLENOID SHIFTED AIR VALVE PARTS LIST

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

Item	Part Number	Description	Qty
4	114-023-551	Bracket, Intermediate	1
35	893-099-000	Solenoid Valve, NEMA4	1
36	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
37	241-001-000	Connector, conduit	1
	241-003-000	Conduit Connector with Suppression Diode (DC Only)	1
38	171-065-115	Capscrew, Flanged 1/4-20 x 1.00	4
39	618-050-150	Plug (Replaces Item 7)	2



IEC EEX m T4



***For Explosion Proof Solenoid Coils used in North America and outside the European Union.***

36	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

*Item 37 (Conduit Conductor) is not required*



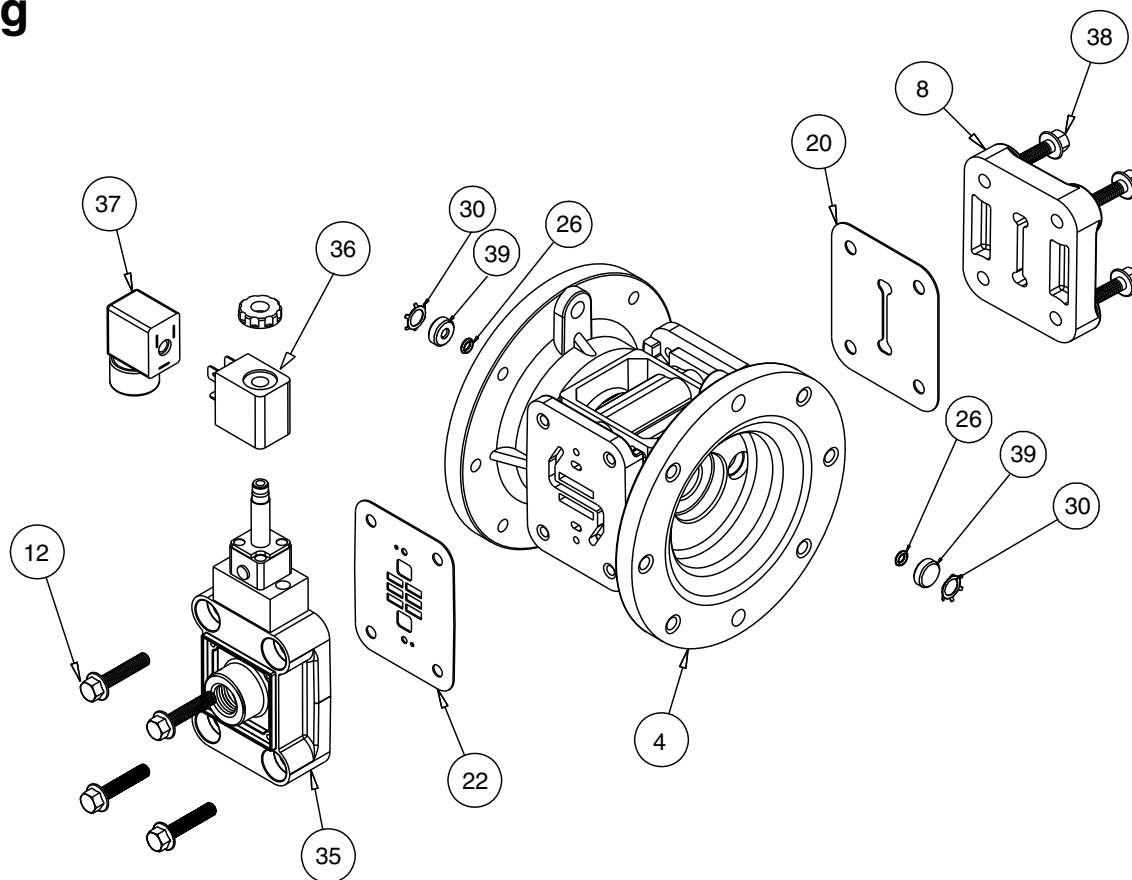
II 2G EEx m c T5  
II 2D c IP65 T100°C



***For Explosion Proof Solenoid Coils used in the European Union***

36	219-011-001	Solenoid Coil, 12 VDC, 3.3W / 0, 531A...0, 014A	1
	219-011-002	Solenoid Coil, 24 VDC, 3.3W / 0, 531A...0, 014A	1
	219-011-003	Solenoid Coil, 110/120 VAC, 3.4W / 0, 212A...0, 015A	1
	219-011-004	Solenoid Coil, 220/240 VAC, 3.4W / 0, 212A...0, 015A	1

Item 37 (Conduit Conductor) is not required



### \*Special Conditions For Safe Use

A fuse corresponding to its rated current (max.  $3 \cdot I_{\text{rat}}$  according IEC 60127-2-1) or a motor protecting switch with short-circuit and thermal instantaneous tripping (set to rated current) shall be connected in series to each solenoid as short circuit protection. For very low rated currents of the solenoid the fuse of lowest current value according to the indicated IEC standard will be sufficient. The fuse may be accommodated in the associated supply unit or shall be separately arranged. The rated voltage to the fuse shall be equal to or greater than the stated rated voltage of the magnet coil. The breakage capacity of the fuse-link shall be as high as or higher than the maximum expected short circuit current at the location of the installation (usually 1500 A). A maximum permissible ripple of 20% is valid for all magnets of direct-current design.

## SOLENOID SHIFTED AIR DISTRIBUTION VALVE OPTION

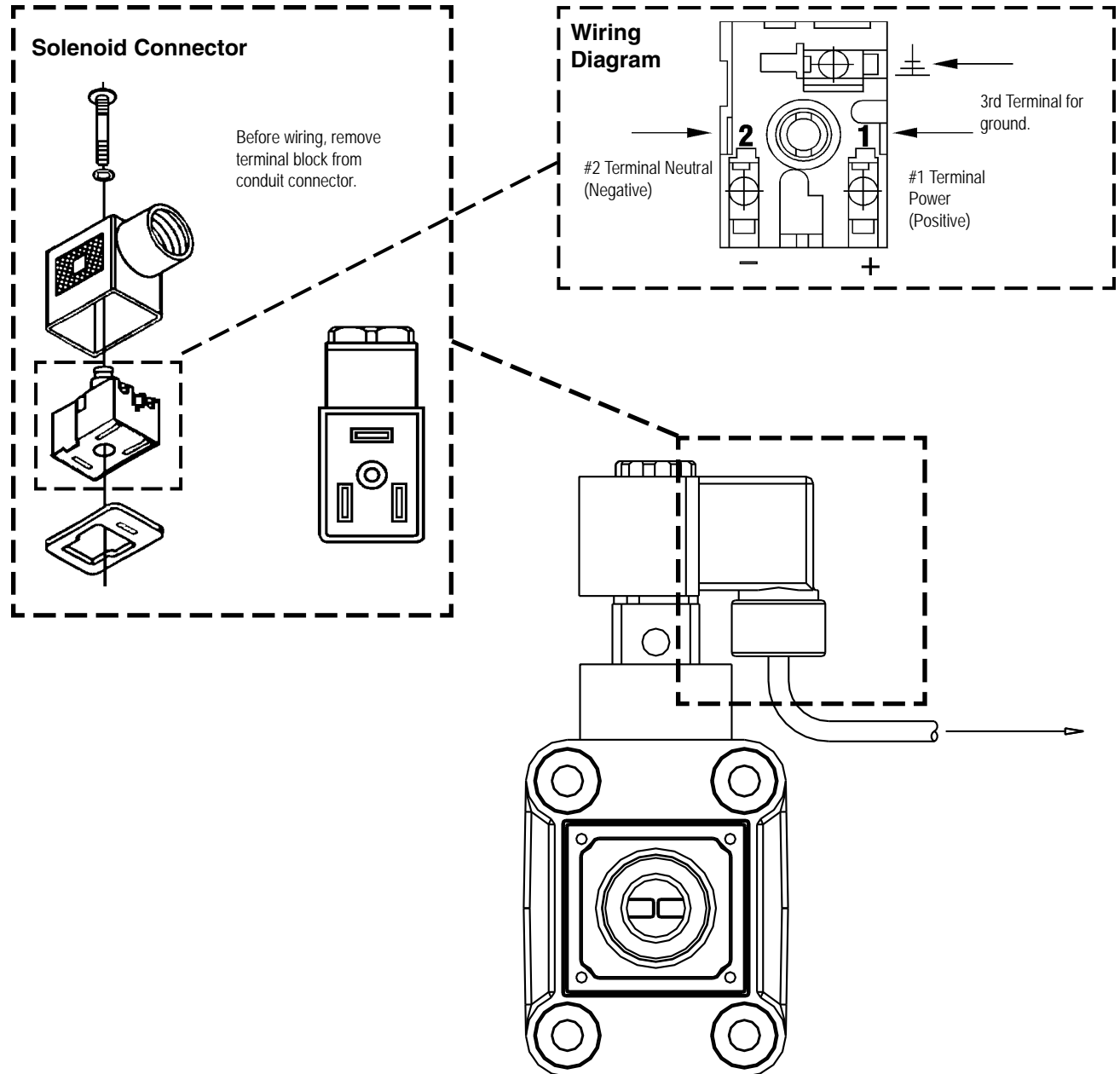
Warren Rupp's solenoid shifted, air distribution valve option utilizes electrical signals to precisely control your SANDPIPER's speed. The solenoid coil is connected to a customer - supplied control. Compressed air provides the pumping power, while electrical signals control pump speed (pumping rate).

### OPERATION

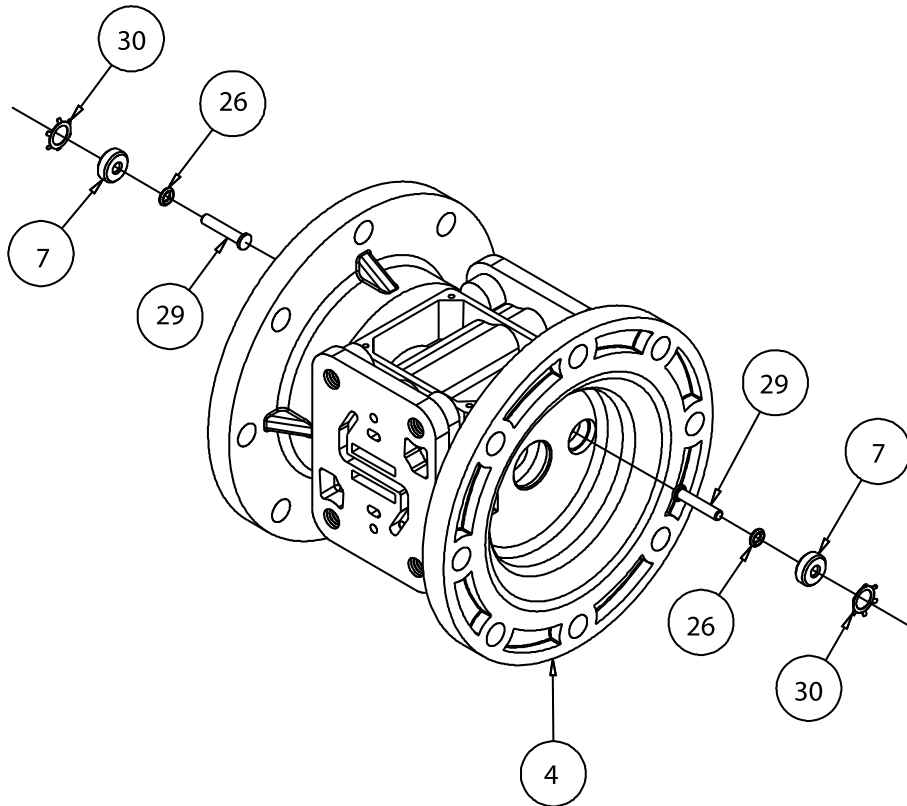
The Solenoid Shifted SANDPIPER has a solenoid operated, air distribution valve in place of the standard SANDPIPER's pilot operated, air distribution valve. Where a pilot valve is normally utilized to cycle the pump's air distribution valve, an electric solenoid is utilized. As the solenoid is powered,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



## Intermediate Assembly Drawing



### INTERMEDIATE REPAIR PARTS LIST

Item	Part Number	Description	Qty
4	114-023-551	Bracket, Intermediate	1
	114-023-559	Bracket, Intermediate	1
7	135-036-506	Bushing, Plunger	2
26	560-001-360	O-Ring	2
29	620-019-115	Plunger, Actuator	2
30	675-042-115	Ring, Retaining*	2

**\*Note:** It is recommended that when plunger components are serviced, new retaining rings be installed.

## Intermediate Assembly Servicing

### 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 3/8" wrench or socket, remove the four capscrews (items 12). Remove the air inlet cap (item 8) and air inlet gasket (item 20). The pilot valve assembly (item 3) can now be removed.

**Step #2:** Servicing the actuator plungers. See PUMP ASSEMBLY DRAWING.

The actuator plungers (items 29) can be reached through the stem cavity of the pilot valve in the intermediate bracket (item 4). To service bushings, o-rings and retaining rings, see Intermediate Drawing.

Remove the plungers (items 29) from the bushings (item 7) in each end of the intermediate cavity. Inspect for wear or damage. Replace plunger as needed. 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.

**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 20), air inlet cap (item 8) and capscrews (items 12).

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

### PLUNGER BUSHING, O-RING, AND RETAINING RING SERVICING

To service the plunger components first remove the two retaining rings (items 30) using a small flat screwdriver. **\*Note:** It is recommended that new retaining rings be installed.

Next remove the two plunger bushings (items 7). Inspect the bushings for wear or scratches. Replace the bushings as necessary.

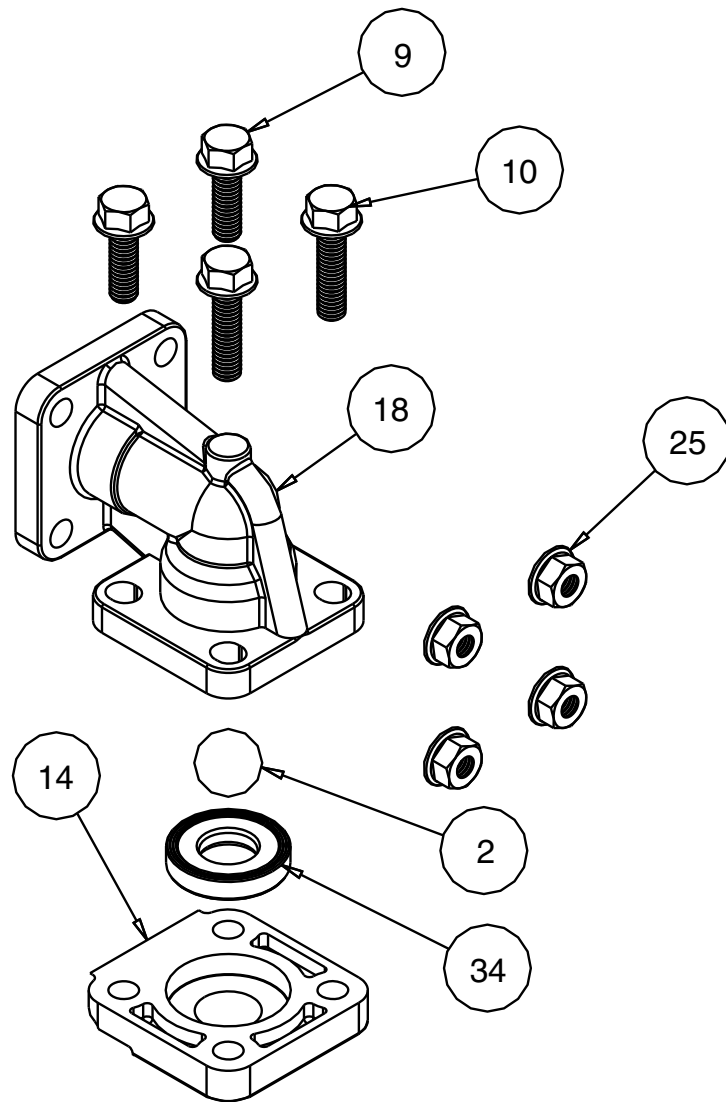
Inspect the two o-rings (26) for cuts and/or wear.



### ! IMPORTANT

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# Check Ball Valve Drawing



## MODULAR CHECK BALL 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 17 and 18 from pump composite repair parts drawing). Use a 1/2" 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).

Inspect the check balls (items 2) for wear, abrasion, or cuts on the spherical surface. The check valve seats (items 34) 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.

## RE-ASSEMBLE THE CHECK VALVE

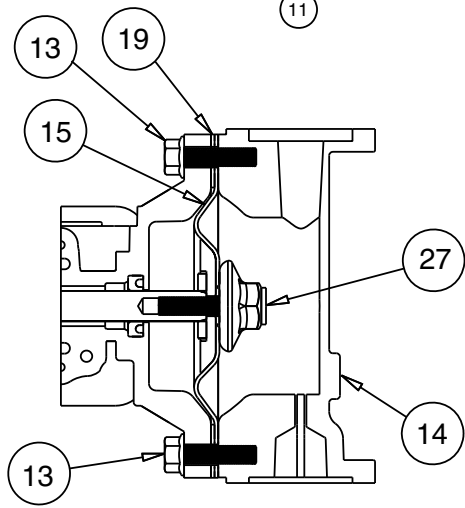
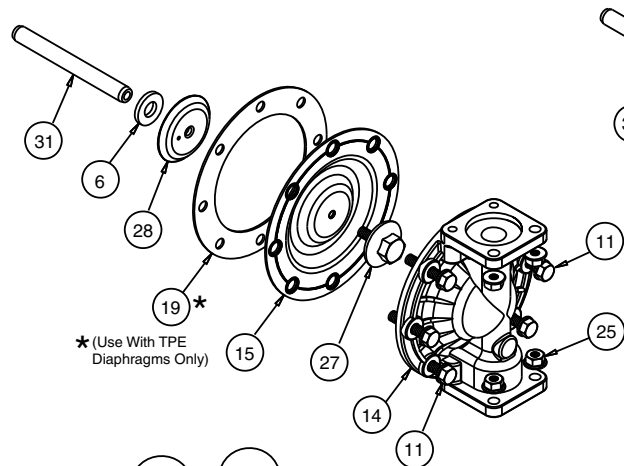
Place a check ball (item 2) in the ball cage of either the discharge elbow or the outer chamber. Install a check valve seat in the counter on each end of the chamber. Refasten the elbows to the chamber.



## ! IMPORTANT

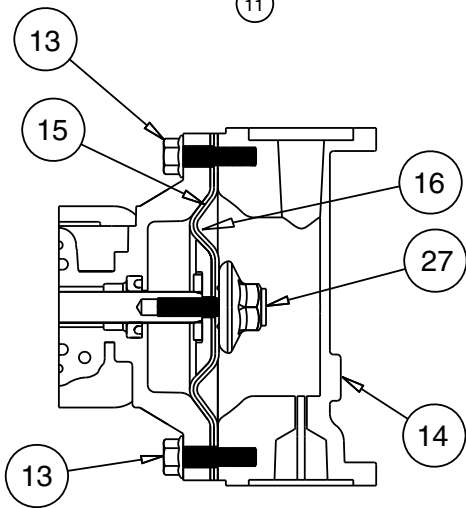
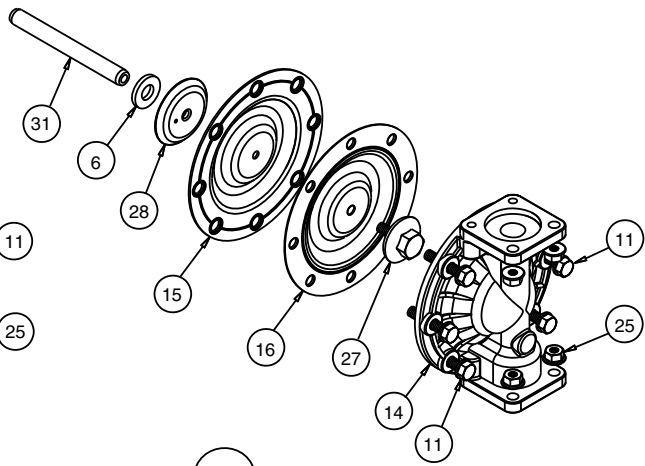
*Read these instructions completely, before installation and start-up. It is the responsibility of the purchaser to retain this manual for reference. Failure to comply with the recommendations stated in this manual will damage the pump, and void factory warranty.*

Diaphragm Service Drawing



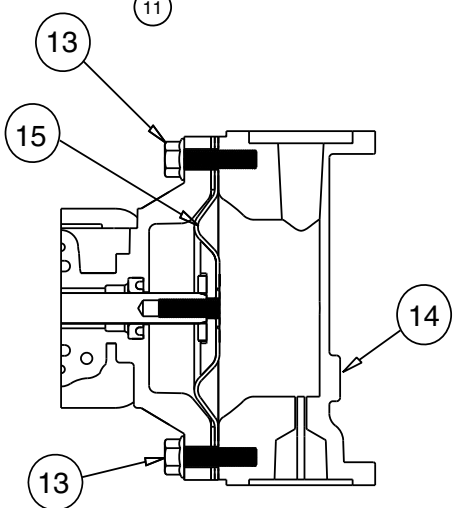
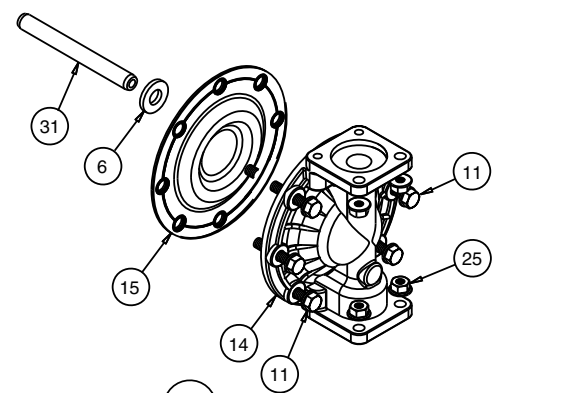
Diaphragm Orientation  
Install diaphragm and spacer  
as shown above.

Diaphragm Service Drawing,  
with Overlay



Diaphragm Orientation  
Install diaphragm and overlay  
as shown above.

Diaphragm Service Drawing  
with One-Piece Bonded



Diaphragm Orientation  
Install diaphragm (286-116-000 only)  
as shown above.



## 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 1/2" wrench or socket, remove the 16 capscrews (items 9 & 10), and flanged nuts that fasten the elbows (items 17 and 18) to the outer chambers (items 14). Remove the elbows with the manifolds and spacers attached.

**Step #2:** Removing the outer chambers.

Using a 1/2" wrench or socket, remove the 16 capscrews (items 11 and 13), and flanged nuts that fasten the outer chambers, diaphragms, and intermediate (item 4) together.

**Step #3:** Removing the diaphragm assemblies.

Use a 3/4" (19mm) wrench or six pointed socket to remove the diaphragm assemblies (outer plate, diaphragm, and inner plate) from the diaphragm rod (item 32) by turning counterclockwise.

Insert a 6-32 set screw into the smaller tapped hole in the inner diaphragm plate (item 28). Insert the protruding stud and the 6-32 fastener loosely into a vise. Use a

3/4" wrench or socket to remove the outer diaphragm plate (item 27) by turning counterclockwise. Inspect the diaphragm (item 15) 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. Insert the loose assembly with the above 6-32 fastener back into the vise. Use a torque wrench to tighten the diaphragm assembly together to 90 in lbs. (10.17 Newton meters) 120 in lbs. Santoprene (13.56 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 6) 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 31) 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 intermediate (item 4).

Fasten the outer chamber (item 14) to the pump, using the capscrews (items 11 and 13) and flanged nuts.

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 31) as far as possible and still allow for alignment of the bolt holes in the diaphragm with the bolt pattern in the inner chamber. Install diaphragms with convolutions facing towards center of pump. See sectional view on previous page.

Fasten the remaining outer chamber (item 14) to the pump, using the capscrews (items 11 and 13) and flanged nuts.

**Step #6:** Re-install the elbow/spacer/manifold assemblies to the pump, using the capscrews (items 9 & 10) and flanged nuts.

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

## OVERLAY DIAPHRAGM SERVICING

The overlay diaphragm (item 16) is designed to fit snugly over the exterior of the standard TPE diaphragm (item 15).

## ONE PIECE DIAPHRAGM SERVICING

(Bonded PTFE with integral plate)

The One Piece diaphragm 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 diaphragm 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.**



## ! 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.*

# Dual Port Option Drawing

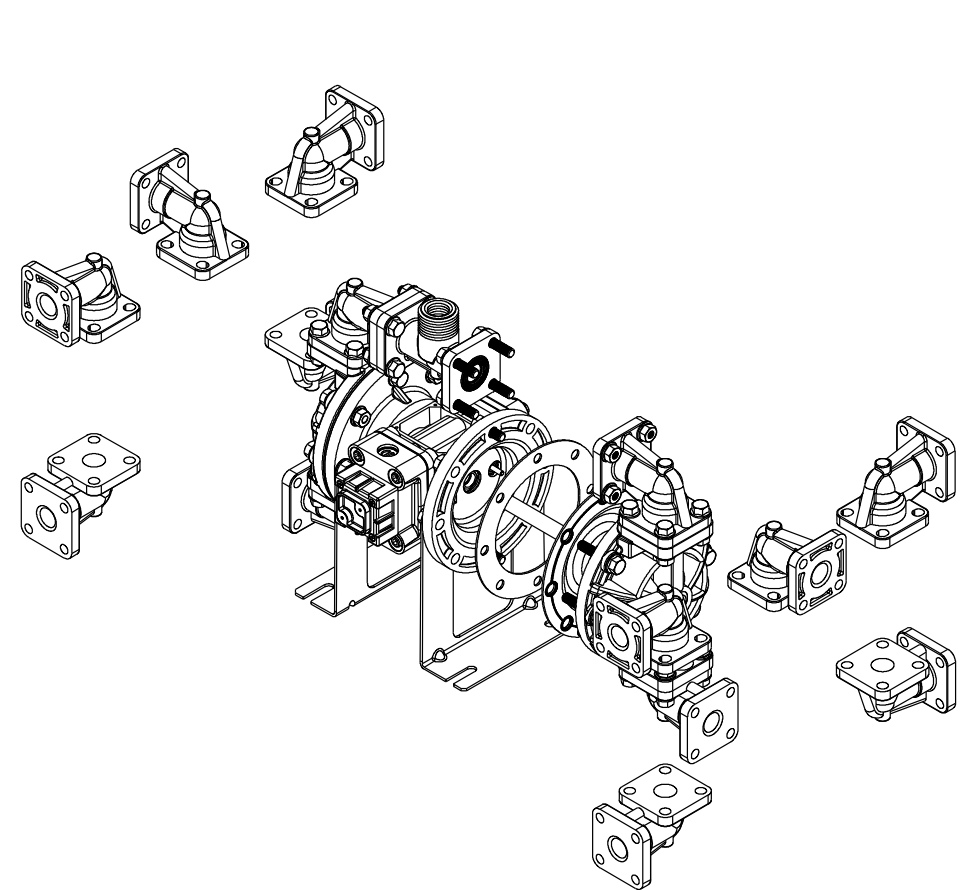


Illustration for Single Port Suction  
with Dual Port Discharge

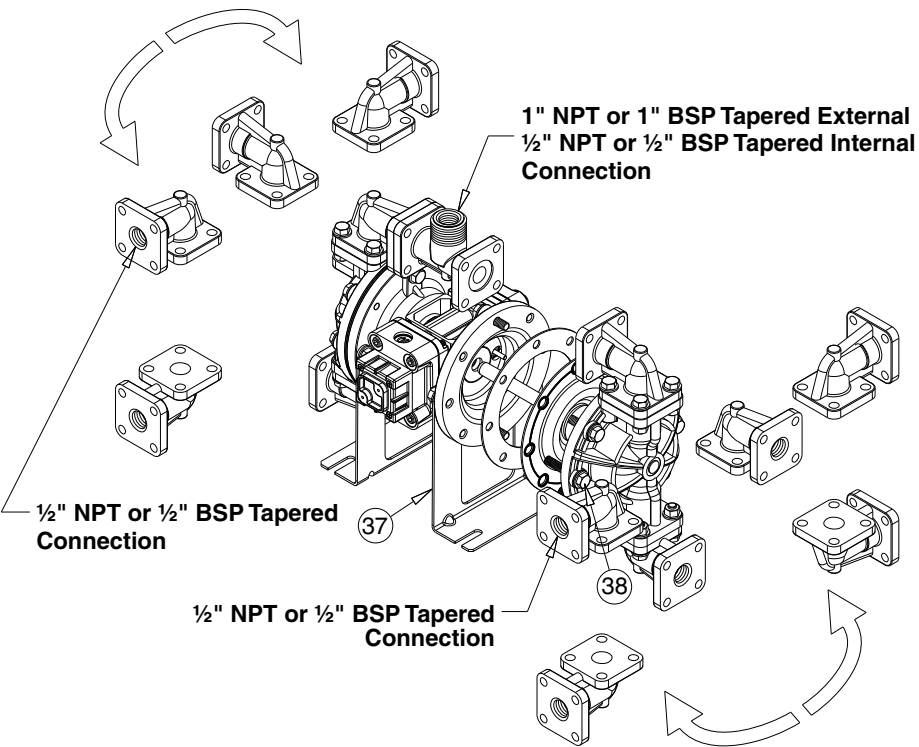


Illustration for Dual Port Suction  
and Single or Dual Port Discharge

### 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 17 & 18) are designed to mate with 1/2" NPT or 1/2" BSP (Tapered) connection.

### DUAL PORTING OF BOTH SUCTION AND DISCHARGE ENDS OF THE PUMP

Converting the pump from the standard single suction and single discharge porting configuration to dual porting at each end is easy. Simply remove the manifold seals and manifolds (items 33 and 23 from pump assembly drawing) from the pump.

The discharge elbows and suction elbows can be rotated 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 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 and manifold seals.

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

**NOTE: See Repair Parts List on next page.**



### **! 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.*

**SINGLE PORT SUCTION REPAIR PARTS LIST**

Item	Part Number	Description	Qty
10*	171-063-115	Capscrew, Flanged 5/16-18 x 1.25	16
	171-063-308	Capscrew, Flanged 5/16-18 x 1.25	16
18	312-112-520N	Elbow, ½" NPT (replaces 312-112-520)	2
	▲312-112-521N	Elbow, ½" NPT (replaces 312-112-521)	2
	312-112-542N	Elbow, ½" NPT (replaces 312-112-542)	2
	312-112-552N	Elbow, ½" NPT (replaces 312-112-552)	2
	▲312-112-557N	Elbow, ½" NPT (replaces 312-112-557)	2
23	518-138-520	Manifold (installed in bottom position) NPT	1
	518-138-520E	Manifold (installed in bottom position) BSP Tapered	1
	▲518-138-521	Manifold (installed in bottom position) NPT	1
	▲518-138-521E	Manifold (installed in bottom position) BSP Tapered	1
	518-138-542	Manifold (installed in bottom position) NPT	1
	518-138-542E	Manifold (installed in bottom position) BSP Tapered	1
	518-138-552	Manifold (installed in bottom position) NPT	1
	518-138-552E	Manifold (installed in bottom position) BSP Tapered	1
	▲518-138-557	Manifold (installed in bottom position) NPT	1
	▲518-138-557E	Manifold (installed in bottom position) BSP Tapered	1
25*	544-005-115	Nut, Flanged 5/16-18	28
	544-005-308	Nut, Flanged 5/16-18	28

**SINGLE PORT DISCHARGE REPAIR PARTS LIST**

10*	171-063-115	Capscrew, Flanged 5/16-18 x 1.25	16
	171-063-308	Capscrew, Flanged 5/16-18 x 1.25	16
11*	171-064-115	Capscrew, Flanged HD 5/16-18 X 1.50	4
	171-064-308	Capscrew, Flanged HD 5/16-18 X 1.50	4
17*	312-106-520N	Elbow, ½" NPT (replaces 312-106-520)	2
	▲312-106-521N	Elbow, ½" NPT (replaces 312-106-521)	2
	312-106-542N	Elbow, ½" NPT (replaces 312-106-542)	2
	312-106-552N	Elbow, ½" NPT (replaces 312-106-552)	2
	▲312-106-557N	Elbow, ½" NPT (replaces 312-106-557)	2
23*	518-138-520	Manifold (installed in top position) NPT	1
	518-138-520E	Manifold (installed in top position) BSP Tapered	1
	▲518-138-521	Manifold (installed in top position) NPT	1
	▲518-138-521E	Manifold (installed in top position) BSP Tapered	1
	518-138-542	Manifold (installed in top position) NPT	1
	518-138-542E	Manifold (installed in top position) BSP Tapered	1
	518-138-552	Manifold (installed in top position) NPT	1
	518-138-552E	Manifold (installed in top position) BSP Tapered	1
	▲518-138-557	Manifold (installed in top position) NPT	1
	▲518-138-557E	Manifold (installed in top position) BSP Tapered	1

25*	544-005-115	Nut, Flanged 5/16-18	28
	544-005-308	Nut, Flanged 5/16-18	28
37	115-144-305	Bracket, Free Standing (replaces 115-140-115)	2
	115-144-306	Bracket, Free Standing (replaces 115-140-115)	2
38	171-068-115	Capscrew, Flanged 5/16-18 X 1.63	8
	171-068-308	Capscrew, Flanged 5/16-18 X 1.63	8

**DUAL PORT SUCTION AND DISCHARGE REPAIR PARTS LIST**

Item	Part Number	Description	Qty
10*	171-063-115	Capscrew, Flanged 5/16-18 x 1.25	8
	171-063-308	Capscrew, Flanged 5/16-18 x 1.25	8
11*	171-064-115	Capscrew, Flanged HD 5/16-18 X 1.50	4
	171-064-308	Capscrew, Flanged HD 5/16-18 X 1.50	4
17	312-106-520N	Elbow, ½" NPT (replaces 312-106-520)	2
	▲312-106-521N	Elbow, ½" NPT (replaces 312-106-521)	2
	312-106-542N	Elbow, ½" NPT (replaces 312-106-542)	2
	312-106-552N	Elbow, ½" NPT (replaces 312-106-552)	2
	▲312-106-557N	Elbow, ½" NPT (replaces 312-106-557)	2
18	312-112-520N	Elbow, ½" NPT (replaces 312-112-520)	2
	▲312-112-521N	Elbow, ½" NPT (replaces 312-112-521)	2
	312-112-542N	Elbow, ½" NPT (replaces 312-112-542)	2
	312-112-552N	Elbow, ½" NPT (replaces 312-112-552)	2
	▲312-112-557N	Elbow, ½" NPT (replaces 312-112-557)	2
23*	518-138-520	Manifold (none required)	
	518-138-520E	Manifold (none required)	
	▲518-138-521	Manifold (none required)	
	▲518-138-521E	Manifold (none required)	
	518-138-542	Manifold (none required)	
	518-138-542E	Manifold (none required)	
	518-138-552	Manifold (none required)	
	518-138-552E	Manifold (none required)	
	▲518-138-557	Manifold (none required)	
	▲518-138-557E	Manifold (none required)	
25*	544-005-115	Nut, Flanged 5/16-18	20
	544-005-308	Nut, Flanged 5/16-18	20
37	115-144-305	Bracket, Free Standing (replaces 115-140-115)	2
	115-144-306	Bracket, Free Standing (replaces 115-140-115)	2
38	171-068-115	Capscrew, Flanged 5/16-18 X 1.63	8
	171-068-308	Capscrew, Flanged 5/16-18 X 1.63	8



ATEX Compliant

\*Quantities change from Composite Repair Parts List.

## 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 3/8" 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.

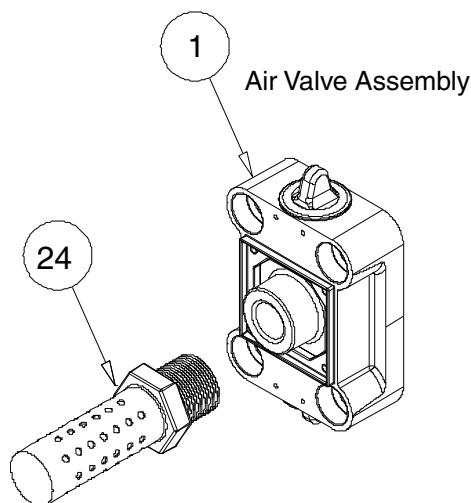
Use a #8 Torx or flat screwdriver to remove the four self-tapping screws (item 1-J) (Plastic Valves). Use a Phillips screwdriver to remove four machine screws (item 1-I) (Aluminum Valves).

Remove the muffler cap and muffler. The air distribution valve body has 3/8" NPT threads for installation of alternate mesh or sound dampening mufflers or piped exhaust.

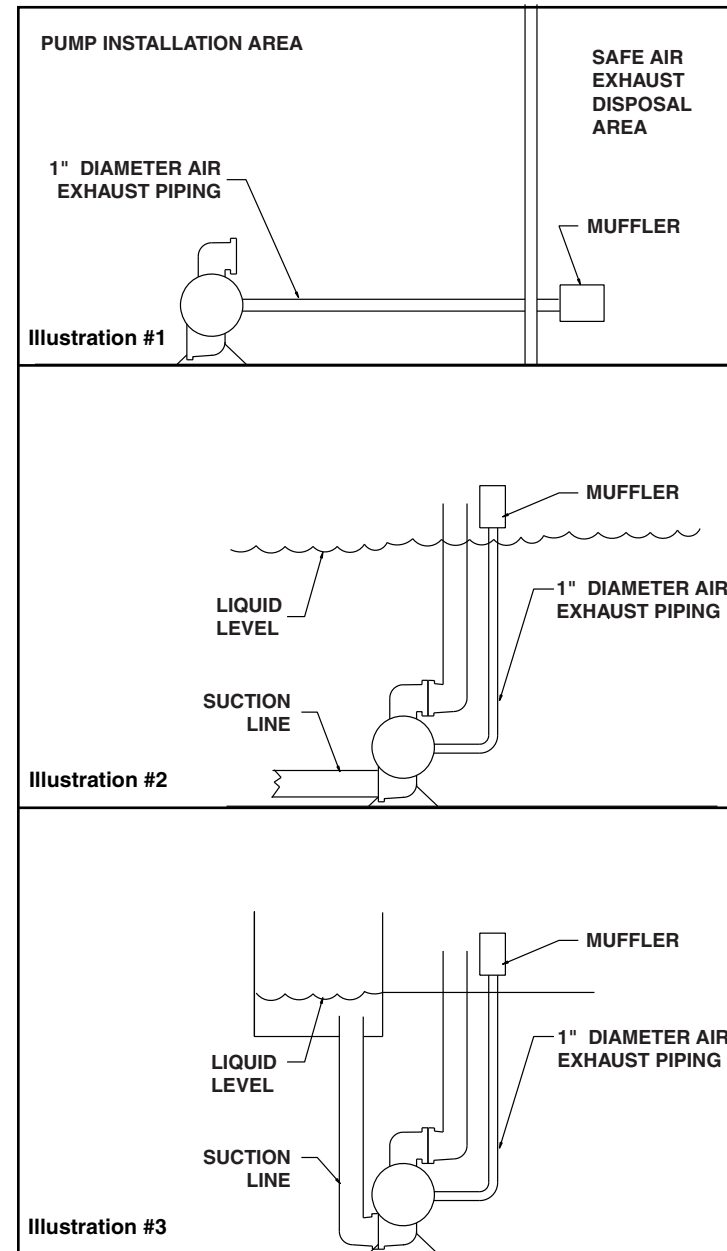
## IMPORTANT INSTALLATION NOTE:

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.



## CONVERTED EXHAUST ILLUSTRATION

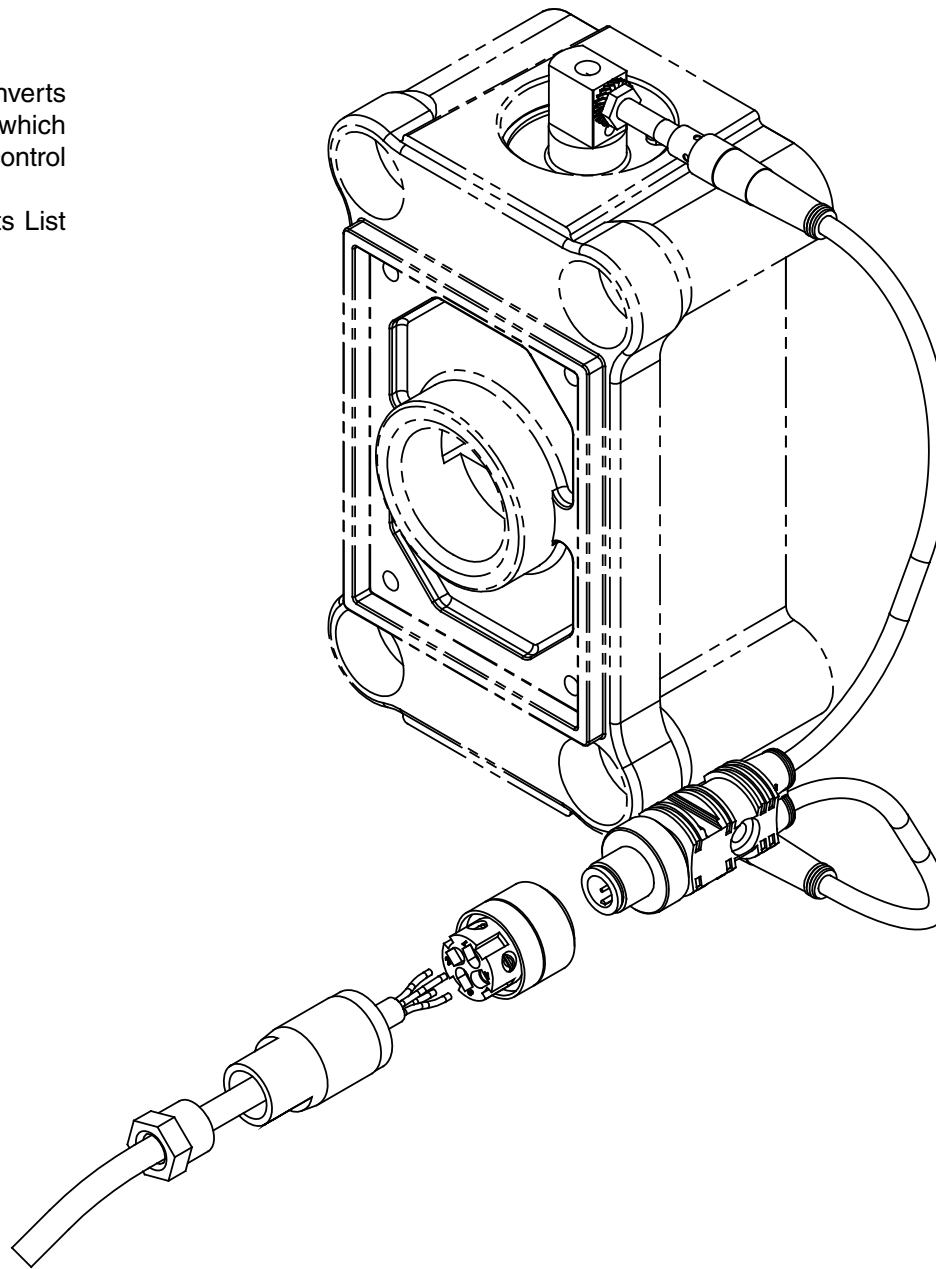


# Pulse Output Kit Drawing

## 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.

See the individual kits listed on the Pump Repair Parts List for further information.



## Optional Muffler Configurations, Drawing



### OPTION 0

530-031-550 Integral Muffler uses (1) Cap and (4) 706-027-115 Machine Screw to hold it in place.

### OPTION 1

530-024-000 Sound Dampening Muffler screws directly into the Air Valve body. This muffler is equipped with a porous plastic element.

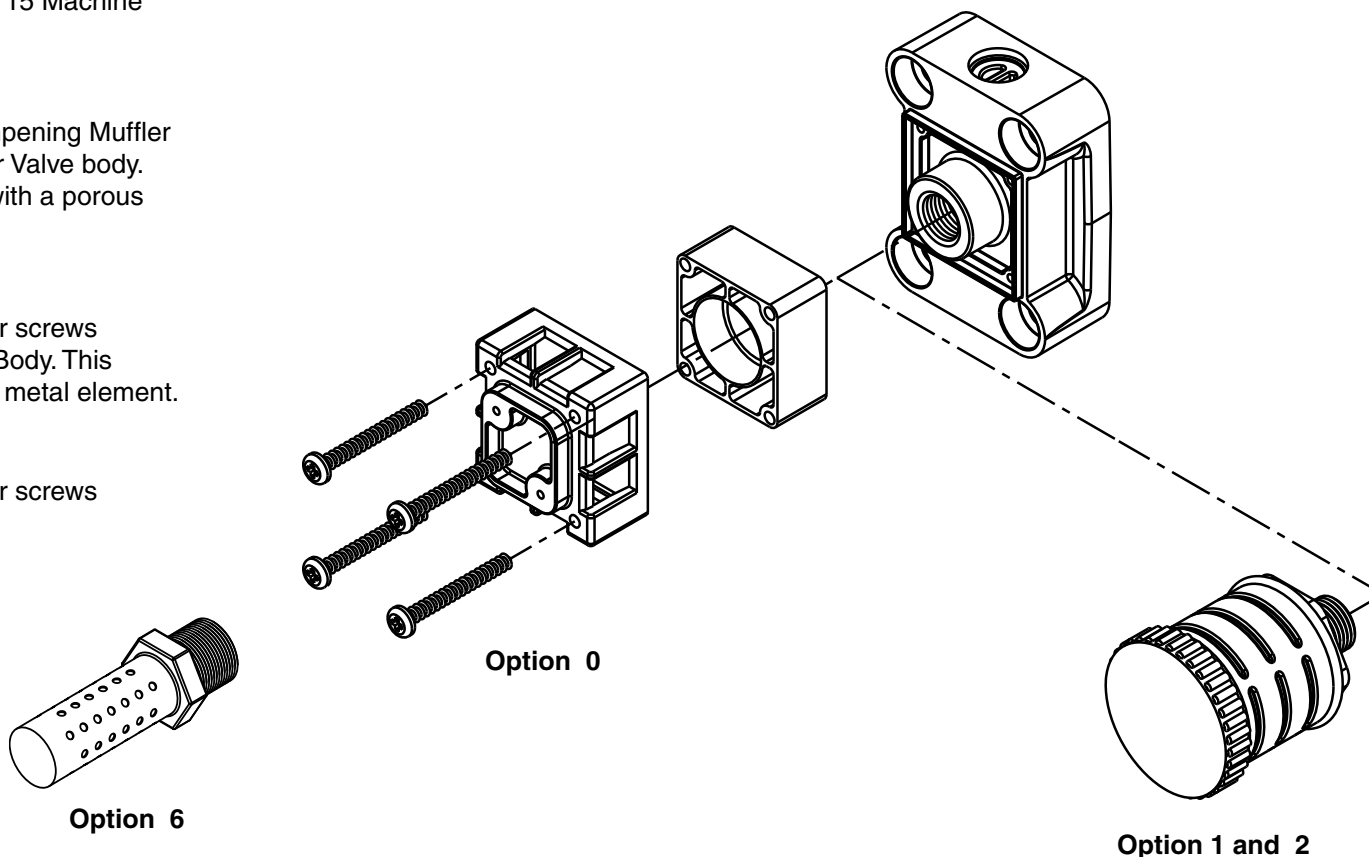
### OPTION 2

530-023-000 Mesh Muffler screws directly into the Air Valve Body. This muffler is equipped with a metal element.



### OPTION 6

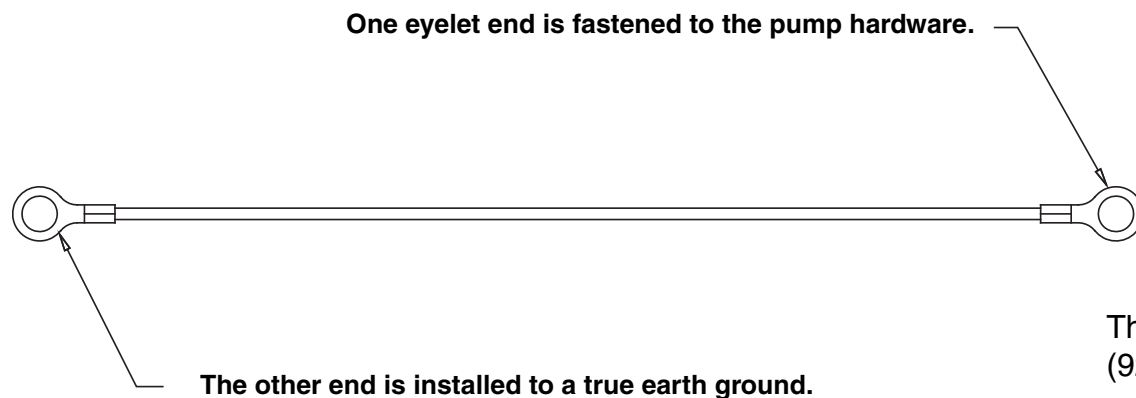
530-035-000 Metal Muffler screws directly into the Air Body.



**Note:** Pumps are only ATEX compliant when ordered with wetted material options C or V, non-wetted material option C, pump options 0, 6 or 7 and Kit options 00 or P1.

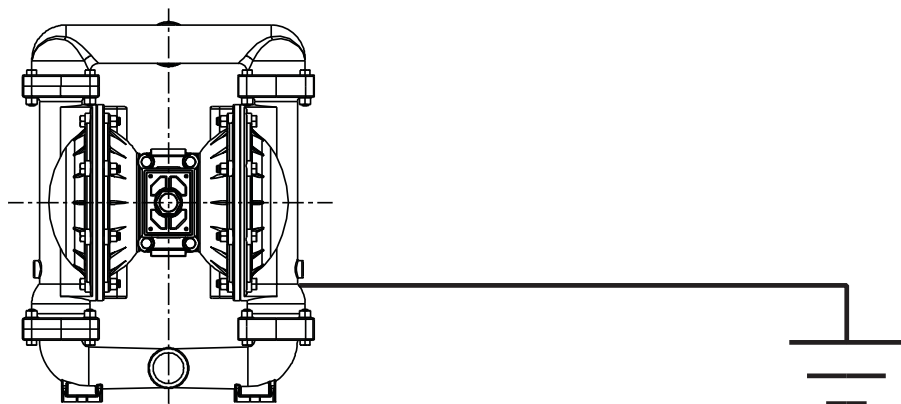
# Grounding The Pump


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.



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

Signature of authorized person

October 20, 2005

Date of issue

David Roseberry

Printed name of authorized person

Engineering Manager

Title

CE

Declaration of Conformity