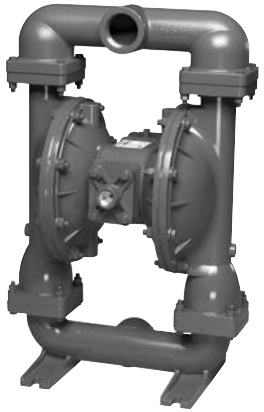
SERVICE & OPERATING MANUAL

SANDPIPER®
A WARREN RUPP PUMP BRAND

Model S20 Metallic Design Level 1

Table of Contents



Ex I M2 c T5
II 2GD T5

CE

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

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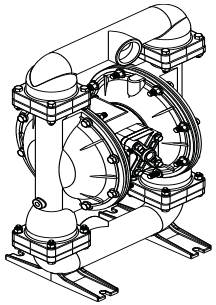
s20mdl1sm-REV0508

WARREN RUPP®

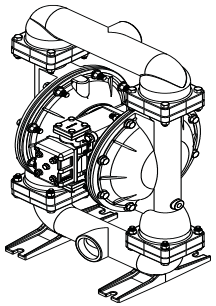
Quality System ISO9001 Certified

Environmental Management System ISO14001 Certified

IDEX FLUID & METERING



Air Inlet Side View



Air Exhaust Side View

Ex I M2 c T5
II 2GD T5

CE

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

SANDPIPER®
A WARREN RUPP PUMP BRAND

S20 Metallic Design Level 1 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
2" NPT (internal) 2" BSP Tapered (internal)	0 to 150 gallons per minute (0 to 567 liters per minute)	No-lube, no-stall design	Up to .25 in. (6mm)	125 psi or 289 ft. of water (8.6 Kg/cm² or 86 meters)	.42 Gallon / 1.59 liter

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

Materials	Operating Temperatures Maximum	Operating Temperatures Minimum
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
EPDM: Shows very good water and chemical resistance. Has poor resistance to oil and solvents, but is fair in ketones and alcohols.	280° F 138° C	-40° F -40° 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
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
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
Polypropylene:	180° F 82° C	32° F 0° C
UHMW Polyethylene:	180° F 82° C	32° F 0° 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, S20 Metallic • Design Level 1 • Ball Valve

Model	Pump Brand	Pump Size	Check Valve Type	Design Level	Wetted Material	Diaphragm/ Check Valve Materials	Check Valve Seat	Non-Wetted Material Options	Porting Options	Pump Style	Pump Options	Kit Options	Shipping Weight lbs. (kg)
S20B1ABBANS000.	S	20	B	1	A	B	B	A	N	S	0	00.	69 (31)
S20B1AEEANS000.	S	20	B	1	A	E	E	A	N	S	0	00.	69 (31)
S20B1AGTANS000.	S	20	B	1	A	G	T	A	N	S	0	00.	69 (31)
S20B1ANNANS000.	S	20	B	1	A	N	N	A	N	S	0	00.	69 (31)
S20B1A1EANS000.	S	20	B	1	A	1	E	A	N	S	0	00.	69 (31)
S20B1ACTANS000.	S	20	B	1	A	C	T	A	N	S	0	00.	69 (31)
S20B1IBBANS000.	S	20	B	1	I	B	B	A	N	S	0	00.	129 (59)
S20B1IEEANS000.	S	20	B	1	I	E	E	A	N	S	0	00.	129 (59)
S20B1IGTANS000.	S	20	B	1	I	G	T	A	N	S	0	00.	129 (59)
S20B1INNANS000.	S	20	B	1	I	N	N	A	N	S	0	00.	129 (59)
S20B1I1EANS000.	S	20	B	1	I	1	E	A	N	S	0	00.	129 (59)
S20B1ICTANS000.	S	20	B	1	I	C	T	A	N	S	0	00.	129 (59)
S20B1IEEANS000.	S	20	B	1	I	E	E	A	N	S	0	00.	129 (59)
S20B1SBBANS000.	S	20	B	1	S	B	B	A	N	S	0	00.	114 (52)
S20B1SGTANS000.	S	20	B	1	S	G	T	A	N	S	0	00.	114 (52)
S20B1SNNANS000.	S	20	B	1	S	N	N	A	N	S	0	00.	114 (52)
S20B1S1EANS000.	S	20	B	1	S	1	E	A	N	S	0	00.	114 (52)
S20B1SCTANS000.	S	20	B	1	S	C	T	A	N	S	0	00.	114 (52)

Pump Brand
S= SANDPIPER®

Pump Size
20= 2"

Check Valve Type
B= Ball

Design Level
1= Design Level

Wetted Material
A= Aluminum
I = Cast Iron
S= Stainless Steel
H= Alloy C

Diaphragm Check Valve Materials
1= Santoprene/Santoprene
2= PTFE-Santoprene/PTFE
B= Nitrile/Nitrile
C= FKM/PTFE
E= EPDM/EPDM
I = EPDM/Santoprene
G= PTFE-Neoprene/PTFE
N= Neoprene/Neoprene
Z= One-Piece Bonded/PTFE

Check Valve Seat
A= Aluminum
B= Nitrile
C= Carbon Steel
E= EPDM

Check Valve Seat Cont.
N= Neoprene
S= Stainless Steel
T= PTFE
V= FKM
W=UHMW Polyethylene

Non-Wetted Material Options
A= Painted Aluminum
I = Cast Iron
J= Painted Aluminum w/PTFE Coated Hardware
S= Stainless Steel with Stainless Steel Hardware
Y= Painted Aluminum with Stainless Steel Hardware
Z= Cast Iron with Stainless Steel Hardware

Porting Options
N= NPT Threads
B= BSP (Tapered) Threads
R= Raised Face 150# Threaded ANSI Flange

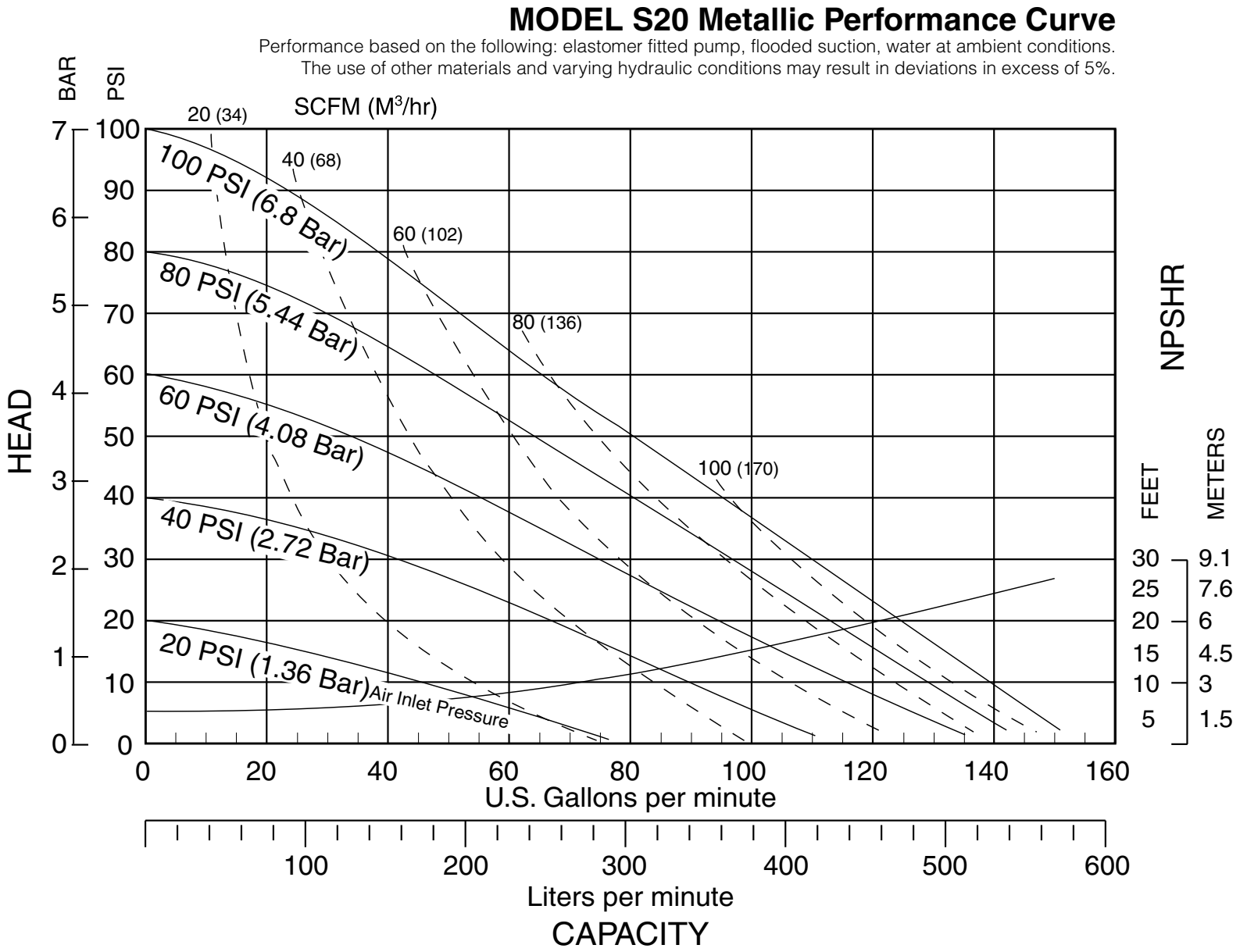
Pump Style
S= Standard

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 w/Grounding Cable

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

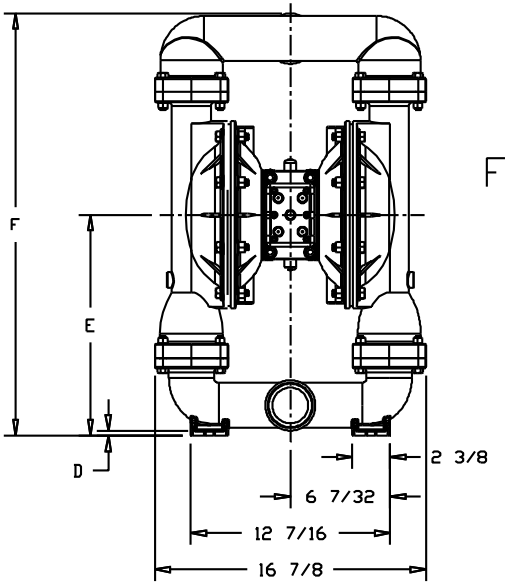
Note: Pumps are only ATEX compliant when ordered with pump options 6 or 7, and kit options 00, P1, E1, E3, E5, E7, E8 or E9.

Performance Curve, S20 Metallic Design Level 1

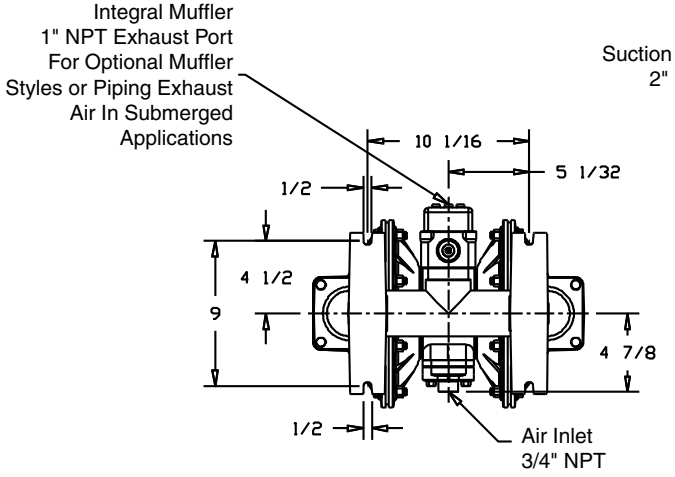


Dimensions: S20 Metallic

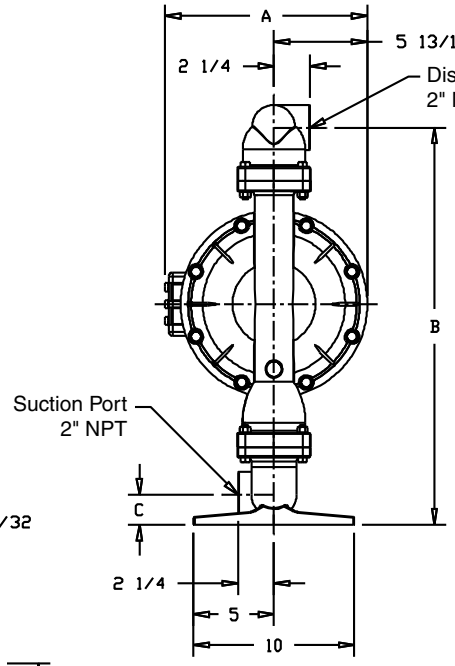
Dimensions in Inches
Dimensional Tolerance: ± 1/8"



FRONT VIEW



BOTTOM VIEW



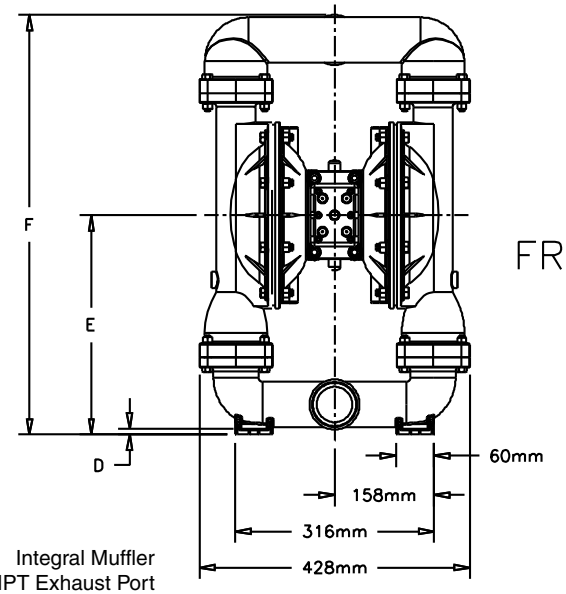
SIDE VIEW

Both Suction And
Discharge Ports Are
Available With
2" BSP Connection

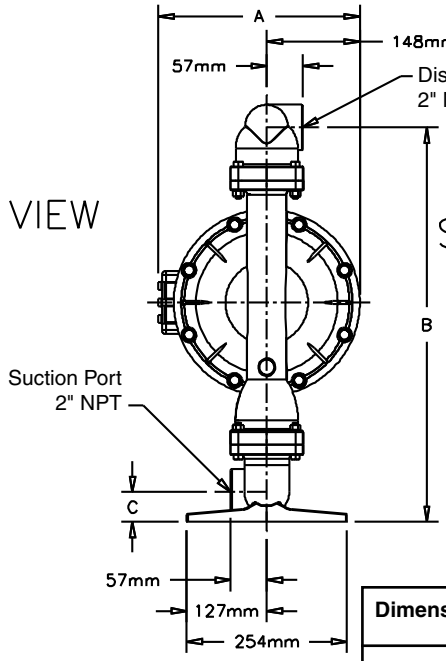
Dimension	A	B	C	D	E	F
Integral Muffler	12 19/32					
Pulse Output Kit	12 19/32					
Aluminum		24 5/8	1 7/8	5/16	13 11/16	26 3/16
Stainless Steel		24 3/4	2	7/16	13 13/16	26 5/16
Mesh Muffler	15 1/8					
Sound Dampening Muffler	15 1/8					
Metal Muffler	14 11/16					

Metric Dimensions: S20 Metallic

Dimensions in Millimeters
Dimensional Tolerance: ± 3mm

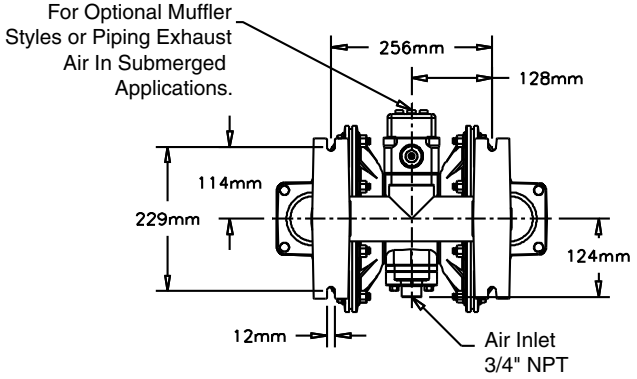


FRONT VIEW



SIDE VIEW

Both Suction and
Discharge Ports Are
Available With
2" BSP Tapered Connection



BOTTOM VIEW

Dimension	A	B	C	D	E	F
Integral Muffler	320					
Pulse Output Kit	320					
Aluminum		625	47	8	348	665
Stainless Steel		629	51	12	351	669
Mesh Muffler	384					
Sound Dampening Muffler	384					
Metal Muffler	373					

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 Tranquilizer® surge suppressor is recommended to further reduce pulsation in flow.

AIR SUPPLY

Air supply pressure cannot exceed 125 psi (8.6 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.

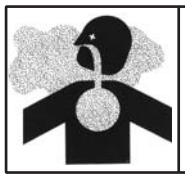
BETWEEN USES

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.

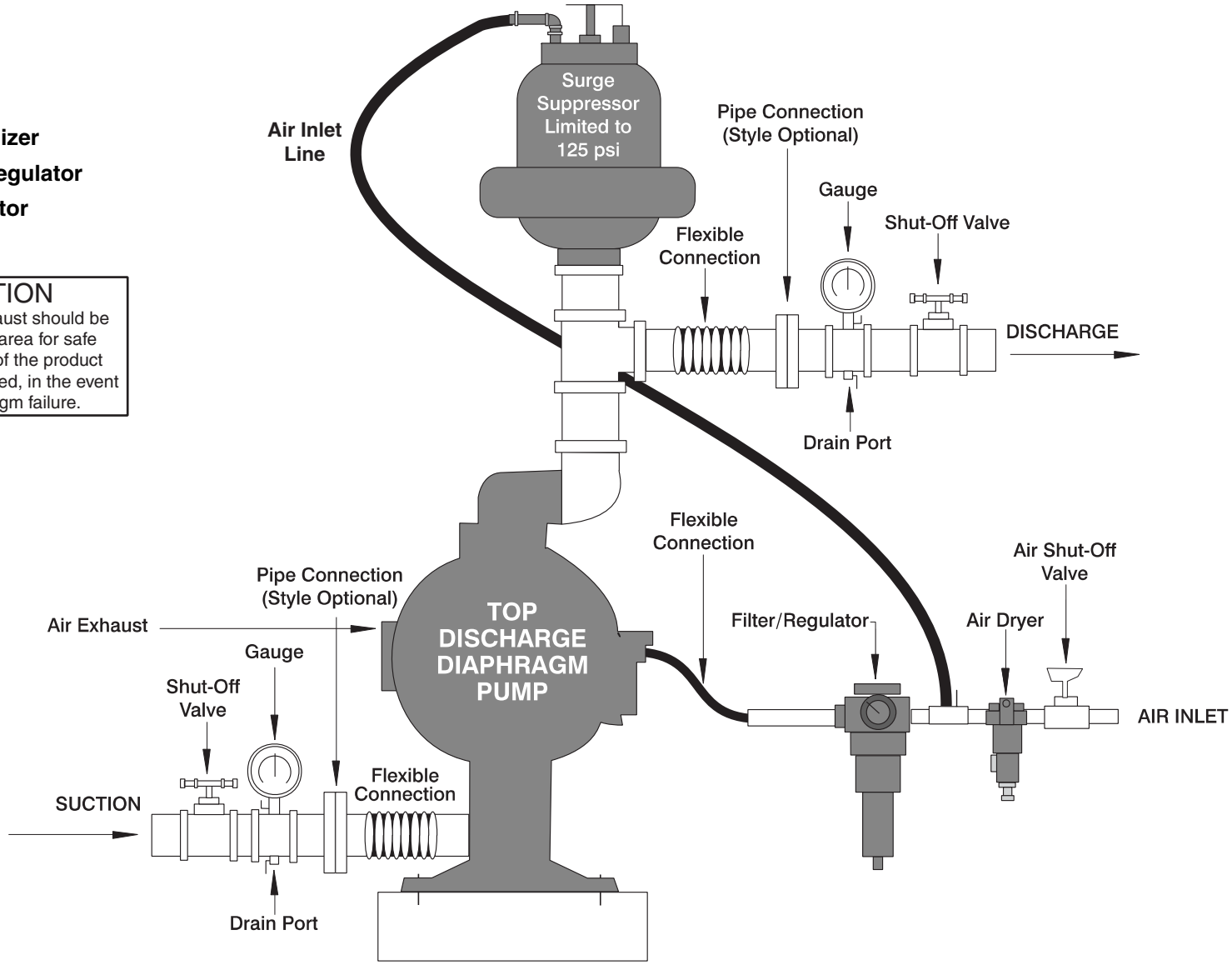
TYPICAL INSTALLATION GUIDE
For Metallic Pumps

Available from Warren Rupp

① **TA2 or TA50 Tranquilizer**
② **020-051-000 Filter/Regulator**
③ **020-051-001 Lubricator**
④ **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+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 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 Group 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® Metallic 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.

I M2 c T5
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 28)

⚠ 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.

Composite Repair Parts Drawing

Available Service And Conversion Kits

476-227-000 **AIR END KIT** (Aluminum Center)
Seals, O-ring, Gaskets, Retaining Rings, Air Valve Sleeve and Spool Set and Pilot Valve Assembly.

476-170-000 **AIR END KIT** (Air Valve with Stroke Indicator Pin, Aluminum Center)
Seals, O-ring, Gaskets, Retaining Rings, Air Valve Sleeve and Spool Set, and Pilot Valve Assembly.

476-042-360 **WET END KIT**
Nitrile Diaphragms, Balls, and Seats.

476-042-656 **WET END KIT**
Santoprene Diaphragms, Balls and EPDM Seats.

476-042-365 **WET END KIT**
Neoprene Diaphragms, Balls and Seats.

476-042-633 **WET END KIT**
FKM Diaphragms, PTFE Balls and FKM Seats.

476-042-635 **WET END KIT**
Neoprene Diaphragms, PTFE Overlay, PTFE Balls and PTFE Seats.

476-042-364 **WET END KIT**
EPDM Diaphragms, Balls and Seats.

476-042-654 **WET END KIT**
Santoprene Diaphragm, PTFE Overlays, PTFE Balls, PTFE Seats.

476-042-659 **WETTED END KIT**
One-Piece Bonded PTFE/Nitrile Diaphragm, PTFE Balls, PTFE Seats.

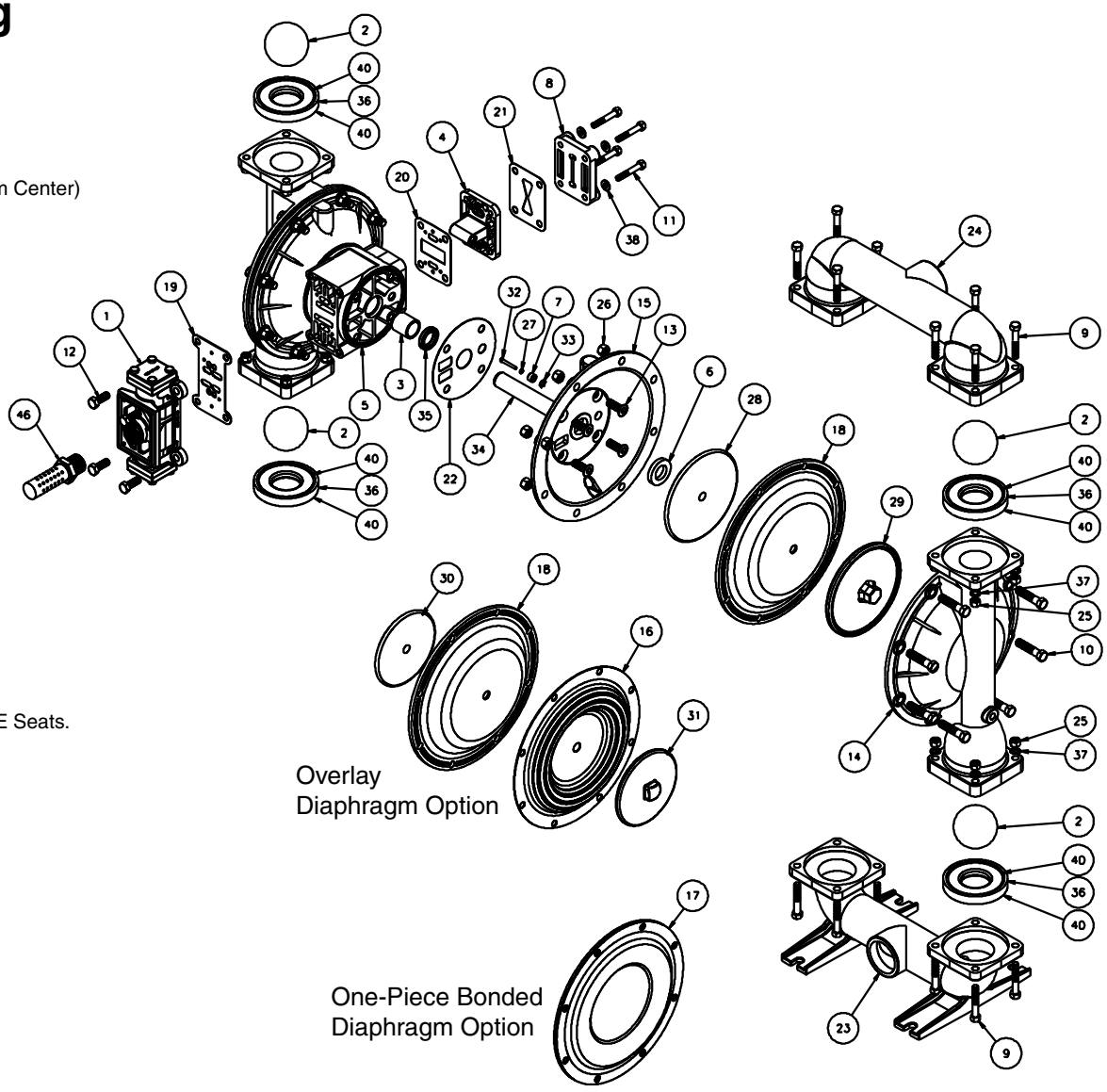
475-216-000 **MIDSECTION CONVERSION KIT**
(Replaces Aluminum Midsection With Cast Iron Components) Air Inlet Cap, Intermediate Bracket, Inner Chamber and Inner Diaphragm Plates.

Hardware Kits

475-200-330 Zinc Plated Capscrews, Washers, and Hex Nuts.
475-200-115 Stainless Steel Capscrews, Washers, and Hex Nuts.

****Electronic Leak Detector Kits**

032-037-000 100-120/220-290 VAC
032-045-000 12-32 VDC



****Note: Pumps equipped with these components are <u>not</u> ATEX compliant**

Composite Parts List

ATEX Compliant

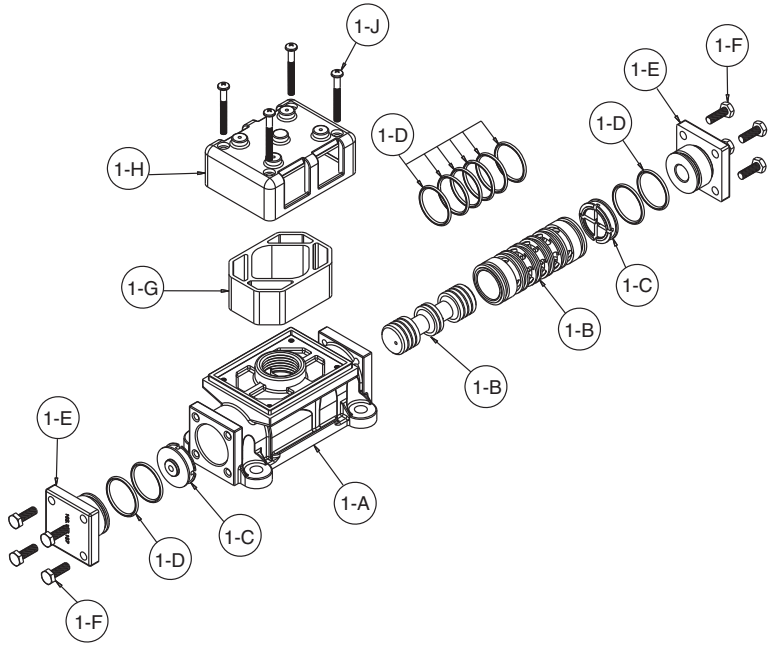
ITEM	PART NUMBER	DESCRIPTION	QTY
1	031-140-000	Air Valve Assembly w/Integral muffler (Cast Iron Centers Only)	1
	031-141-000	Air Valve Assembly (Cast Iron Centers Only)	1
⚠	031-146-000	Air Valve Assembly w/Integral muffler (Stroke Indicator Only)	1
⚠	031-147-000	Air Valve Assembly (Stroke Indicator Only)	1
	031-173-000	Air Valve Assembly w/Integral muffler	1
	031-173-001	Air Valve Assembly (with Stainless Steel Hardware)	1
⚠	031-183-000	Air Valve Assembly	1
⚠	031-179-000	Air Valve Assembly (Cast Iron or Stainless Steel Centers Only)	1
2	050-017-354	Ball, Check	4
	050-017-360	Ball, Check	4
	050-017-364	Ball, Check	4
	050-017-365	Ball, Check	4
	050-018-600	Ball, Check	4
3	070-006-170	Bushing	2
4	095-110-000	Pilot Valve Assembly	1
	095-095-110	Pilot Valve Assembly (Stainless Steel Centers Only)	1
	095-110-558	Pilot Valve Assembly (Cast Iron Centers Only)	1
5	114-024-157	Intermediate Bracket	1
	114-024-010	Intermediate Bracket	1
	114-024-110	Intermediate Bracket (Stainless Steel Centers Only)	1
6	132-035-360	Bumper, Diaphragm	2
7	135-034-506	Bushing, Plunger	2
8	165-116-157	Cap, Air Inlet Assembly	1
	165-116-010	Cap, Air Inlet Assembly	1
	165-116-110	Cap, Air Inlet Assembly (Stainless Steel Centers Only)	1
9	170-052-115	Capscrew, Hex Hd 3/8-16 X 2.25	16
	170-052-330	Capscrew, Hex Hd 3/8-16 X 2.25	16
10	170-060-115	Capscrew, Hex Hd 7/16-14 X 2.00	16
	170-060-330	Capscrew, Hex Hd 7/16-14 X 2.00	16
11	170-069-115	Capscrew, Hex Hd 5/16-18 X 1.75	4
	170-069-330	Capscrew, Hex Hd 5/16-18 X 1.75	4
12	171-053-115	Capscrew, Soc Hd 3/8-16 X 2.50 (Stroke Indicator Only)	4
	171-053-330	Capscrew, Soc Hd 3/8-16 X 2.50 (Stroke Indicator Only)	4
	170-006-115	Capscrew, Hex HD 3/8-16 X 1.00	4
	170-006-330	Capscrew, Hex HD 3/8-16 X 1.00	4
13	171-059-115	Capscrew, Soc Hd 7/16-14 X 1.25	8
	171-059-330	Capscrew, Soc Hd 7/16-14 X 1.25	8
	171-011-115	Capscrew, Soc Hd 1/2-13 x 1.00 (Stainless Steel Centers Only)	8
14	196-167-156/157	Chamber, Outer	2
	196-167-010	Chamber, Outer	2
	196-167-110	Chamber, Outer	2
15	196-168-157	Chamber, Inner	2
	196-168-010	Chamber, Inner	2
	196-168-110	Chamber, Inner (Stainless Steel Centers Only)	2
16	286-020-604	Diaphragm, Overlay	2
17	286-118-000	Diaphragm, One-Piece Bonded	2
18	286-007-354	Diaphragm	2
	286-007-360	Diaphragm	2
	286-007-363	Diaphragm	2
	286-007-364	Diaphragm	2
	286-007-365	Diaphragm	2
19	360-093-360	Gasket, Air Valve	1
20	360-103-360	Gasket, Pilot Valve	1
21	360-104-379	Gasket, Air Inlet	1
22	360-105-360	Gasket, Inner Chamber	2
23	518-145-156	Manifold, Suction	1
	518-145-156E	Manifold, Suction 2" BSP Tapered	1
	518-145-010	Manifold, Suction	1
	518-145-010E	Manifold, Suction 2" BSP Tapered	1
	518-145-110	Manifold, Suction	1
	518-145-110E	Manifold, Suction 2" BSP Tapered	1
24	518-146-156	Manifold, Discharge	1
	518-146-156E	Manifold, Discharge 2" BSP Tapered	1
	518-146-010	Manifold, Discharge	1
	518-146-010E	Manifold, Discharge 2" BSP Tapered	1
	518-146-110	Manifold, Discharge	1
	518-146-110E	Manifold, Discharge 2" BSP Tapered	1
25	545-005-115	Nut, Hex 3/8-16	16
	545-005-330	Nut, Hex 3/8-16	16
26	545-007-115	Nut, Hex 7/16-14	16
	545-007-330	Nut, Hex 7/16-14	16
27	560-001-379	O-Ring	2
28	612-192-157	Plate, Inner Diaphragm	2
	612-192-010	Plate, Inner Diaphragm	2
	612-214-150	Plate, Inner Diaphragm (use with one-piece bonded diaphragm 286-118-000)	2
29	612-194-157	Plate, Outer Diaphragm Assembly	2
	612-194-010	Plate, Outer Diaphragm Assembly	2
	612-194-110	Plate, Outer Diaphragm Assembly	2
30	612-195-157	Plate, Inner Diaphragm (used with 286-020-604)	2
	612-195-010	Plate, Inner Diaphragm (used with 286-020-604)	2
31	612-039-010	Plate, Outer Diaphragm Assembly (used with 286-020-604)	2
	612-097-110	Plate, Outer Diaphragm Assembly (used with 286-020-604)	2
	612-039-157	Plate, Outer Diaphragm Assembly (used with 286-020-604)	2
32	620-020-115	Plunger, Actuator	2
33	675-042-115	Ring, Retaining	2
34	685-058-120	Rod, Diaphragm	1
35	720-004-360	Seal, Diaphragm Rod	2
	722-040-550	Seat, Check Ball	4
36	722-040-360	Seat, Check Ball	4
	722-040-363	Seat, Check Ball	4
	722-040-364	Seat, Check Ball	4
	722-040-365	Seat, Check Ball	4
	722-040-080	Seat, Check Ball (seals required see item 40)	4
	722-040-110	Seat, Check Ball (seals required see item 40)	4
	722-040-150	Seat, Check Ball (seals required see item 40)	4
	722-040-600	Seat, Check Ball	4
37	900-005-115	Washer, Lock	16
	900-005-330	Washer, Lock	16
38	901-038-115	Washer, Flat 5/16	4
	901-038-330	Washer, Flat 5/16	4
39	901-048-115	Washer, Flat 3/8 (Stroke Indicator Only)	4
	901-048-330	Washer, Flat 3/8 (Stroke Indicator Only)	4
40	560-106-360	Seal (O-Ring) (See item 36)	8
	560-106-363	Seal (O-Ring) (See item 36)	8
	560-106-364	Seal (O-Ring) (See item 36)	8
	560-106-365	Seal (O-Ring) (See item 36)	8
	720-060-608	Seal (O-Ring) (See item 36)	8
⚠ 46	530-033-000	Metal Muffler (for other muffler options see pg. 24)	1

Parts not shown used with Raised Face Flange Porting Option.

170-035-330	Hex Cap Screw	4
326-052-080	Mounting Bracket	2
334-115-110	2" Raised Face, 150# ANSI Flange	2
538-024-110	Pipe Nipple 2" NPT x 2½"	2
545-007-330	Hex Nut	4
900-006-330	Lock Washer	4
901-022-330	Flat Washer	8

Air Valve Servicing, Assembly Drawing & Parts List

(Use With Aluminum Centers Only)



AIR VALVE ASSEMBLY PARTS LIST

Item	Part Number	Description	Qty
1	**031-173-000**	**Air Valve Assembly**	**1**
1-A	095-109-157	Body, Air Valve	1
1-B	031-139-000	Sleeve and Spool Set	1
1-C	132-029-357	Bumper	2
1-D	560-020-360	O-Ring	10
1-E	165-127-157	Cap, End	2
1-F	170-032-330	Hex Head Capscrew 1/4-20 x .75	8
1-G	530-028-550	Muffler	1
1-H	165-096-551	Muffler Cap	1
1-J	706-026-330	Machine Screw	4

****AIR VALVE ASSEMBLY PARTS LIST**

1	031-173-001	Air Valve Assembly	1
Consists of all components above except:			
1-F	170-032-115	Hex Head Capscrew 1/4-20 x .75	8
1-J	706-026-115	Machine Screw	4

****Note: Pumps equipped with this valve assembly are <u>not</u> 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 9/16" wrench or socket, remove the four hex capscrews (items 12). Remove the air valve assembly from the pump.

Remove and inspect gasket (item 19) for cracks or damage. Replace gasket if needed.

Step #2: Disassembly of the air valve.

Using a 7/16" wrench or socket, remove the eight hex capscrews (items 1-F) that fasten the end caps to the valve body. Next remove the two end caps (items 1-E). Inspect the two o-rings (items 1-D) on each end cap for damage or wear. Replace the bumpers as needed.

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

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 cloth and inspect for scratches or 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).

Step #3: Reassembly of the air valve.

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

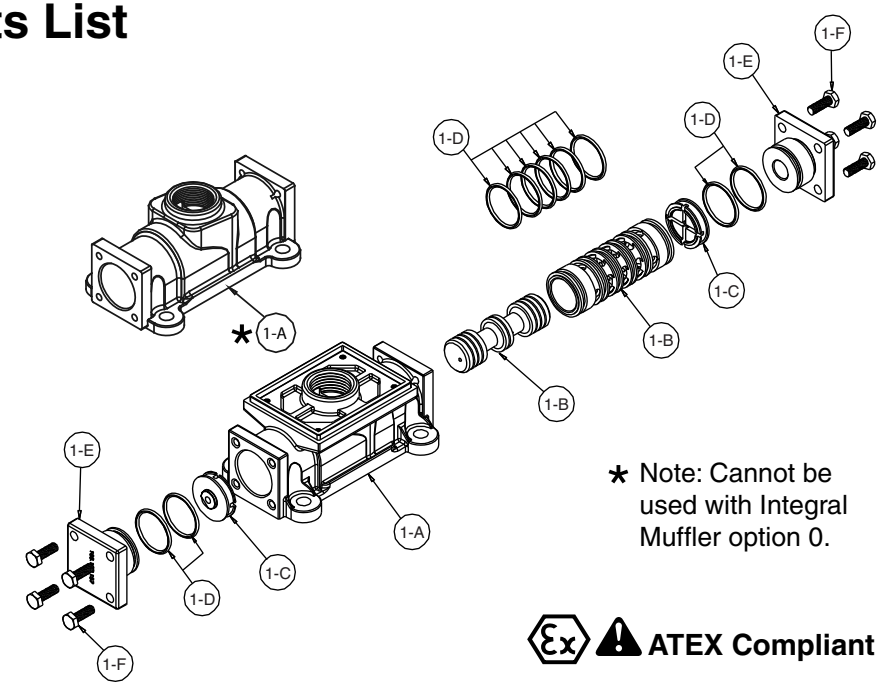
Remove the new sleeve an spool set (item 1-B) from the plastic bag. Carefully remove the spool from the sleeve. Install the six o-rings (item 1-D) into the six grooves on the sleeve. Apply a light coating of grease to the o-rings before installing the sleeve into the valve body (item 1-A), align the 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. Carefully insert the sleeve into the bumper and end cap (with o-rings) and fasten with the remaining hex capscrews.

Fasten the air valve assembly (item 1) and gasket 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 Servicing, Assembly Drawing & Parts List



* Note: Cannot be used with Integral Muffler option 0.

ATEX Compliant

AIR VALVE ASSEMBLY PARTS LIST (USE W/ALUMINUM CENTERS ONLY)

Item	Part Number	Description	Qty
1	**031-183-000**	**Air Valve Assembly**	**1**
1-A	095-109-157	Body, Air Valve	1
1-B	031-139-000	Sleeve and Spool Set	1
1-C	132-029-357	Bumper	2
1-D	560-020-360	O-Ring	10
1-E	165-127-157	Cap, End	2
1-F	170-032-330	Hex Head Capscrew 1/4-20 x .75	8

AIR VALVE ASSEMBLY PARTS LIST

1	031-183-001	Air Valve Assembly	1
Consists of all components above except:			
1-F	170-032-115	Hex Head Capscrew 1/4-20 x .75	8

AIR VALVE ASSEMBLY PARTS LIST
(Use w/Cast Iron and Stainless Steel centers)

Item	Part Number	Description	Qty
1	**031-179-000**	**Air Valve Assembly**	**1**
1-A	095-109-110 *	Body, Air Valve	1
1-B	031-139-000	Sleeve and Spool Set	1
1-C	132-029-357	Bumper	2
1-D	560-020-379	O-Ring	10
1-E	165-127-110	Cap, End	2
1-F	170-032-115	Hex Head Capscrew 1/4-20 x .75	8

AIR DISTRIBUTION VALVE SERVICING

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

Step #1: See COMPOSITE REPAIR PARTS DRAWING.

Using a 9/16" wrench or socket, remove the four hex capscrews (items 12). Remove the air valve assembly from the pump.

Remove and inspect gasket (item 19) for cracks or damage. Replace gasket if needed.

Step #2: Disassembly of the air valve.

Using a 7/16" wrench or socket, remove the eight hex capscrews (items 1-F) that fasten the end caps to the valve body. Next remove the two end caps (items 1-E). Inspect the two o-rings (items 1-D) on each end cap for damage or wear. Replace the o-rings as needed.

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

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 cloth and inspect for scratches or 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).

Step #3: Reassembly of the air valve.

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

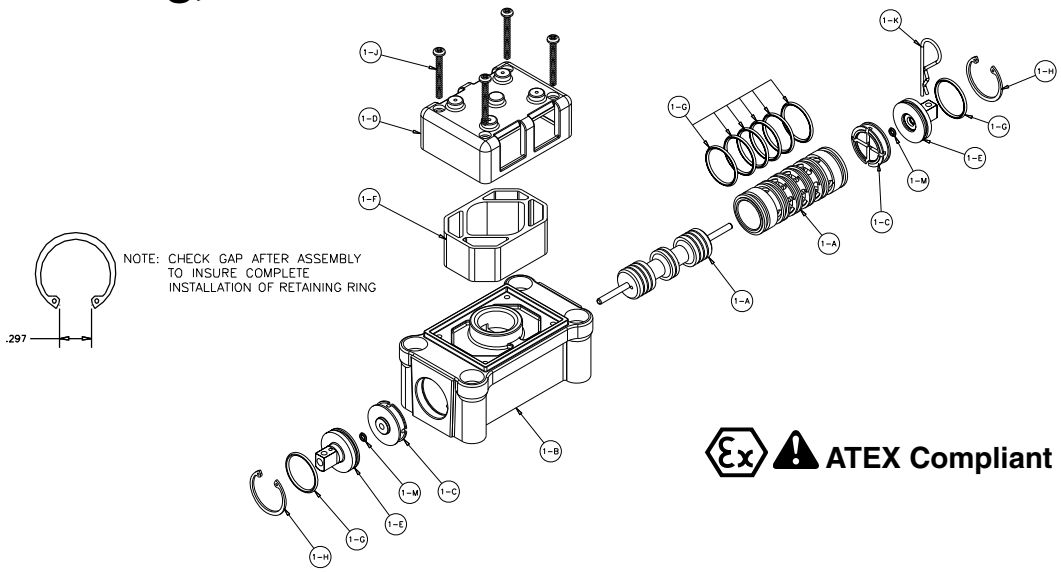
Remove the new sleeve an spool set (item 1-B) from the plastic bag. Carefully remove the spool from the sleeve. Install the six o-rings (item 1-D) into the six grooves on the sleeve. Apply a light coating of grease to the o-rings before installing the sleeve into the valve body (item 1-A), align the 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. Carefully insert the sleeve into the bumper and end cap (with o-rings) and fasten with the remaining hex capscrews.

Fasten the air valve assembly (item 1) and gasket 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 with Stroke Indicator Assembly Drawing, Parts List



ATEX Compliant

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, Sound Dampening Mufflers or Piped Exhaust:

1	031-147-000	Air Valve Assembly	1

(includes all items on 031-146-000 minus 1-D, 1-F, & 1-J).

AIR DISTRIBUTION VALVE WITH STROKE INDICATOR OPTION SERVICING

To service the air 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 COMPOSITE REPAIR PARTS DRAWING.

Using a 5/16" Allen wrench, remove the four hex socket capscrews (item 12) and four flat washers (item 39). Remove the air valve assembly from the pump.

Remove and inspect gasket (item 19) 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-H) from each end of the air valve assembly using clip ring pliers.

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

Remove the two bumpers (item 1-C). Inspect the bumpers for cut, wear or abrasion. Replace 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 contaminants. Remove the sleeve if needed and replace with a new sleeve and spool set (item 1-A).

Step #3: Reassembly of the air valve.

Install one bumper (item 1-C) and one end cap (item 1-E) with o-rings (item 1-G and 1-M) 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 smaller unthreaded hole in the endcap.

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

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

Fasten the air valve assembly (item 1) and gasket (item 19) to the pump.

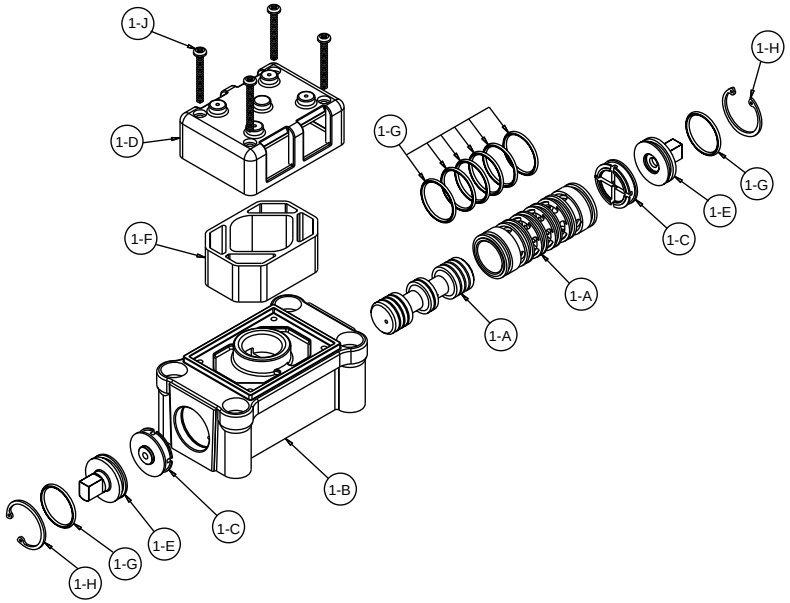
Connect the compressed air line to the pump. Remove the safety clip. The pump is now ready for operation.

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, Parts List

(Use With Cast Iron Centers Only)



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 or Piped Exhaust:			
**	1	031-141-000	Air Valve Assembly	1
		(includes all items on 031-140-000 minus 1-D, 1-F, & 1-J)		

****Note: Pumps equipped with this valve assembly are <u>not</u> ATEX compliant**

AIR DISTRIBUTION VALVE OPTION SERVICING

To service the air 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 COMPOSITE REPAIR PARTS DRAWING.

Using a 5/16" Allen wrench, remove the four hex socket capscrews (item 12) and four flat washers (item 39). Remove the air valve assembly from the pump.

Remove and inspect gasket (item 19) 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-H) from each end of the air valve assembly using clip ring pliers.

Next remove the two end caps (item 1-E). Inspect the o-ring (items 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 contaminants. Remove the sleeve if needed and replace with a new sleeve and spool set (item 1-A).

Step #3: Reassembly of the air valve.

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

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

Fasten the air valve assembly (item 1) and gasket (item 19) to the pump.

Connect the compressed air line to the pump. Remove the safety clip. 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

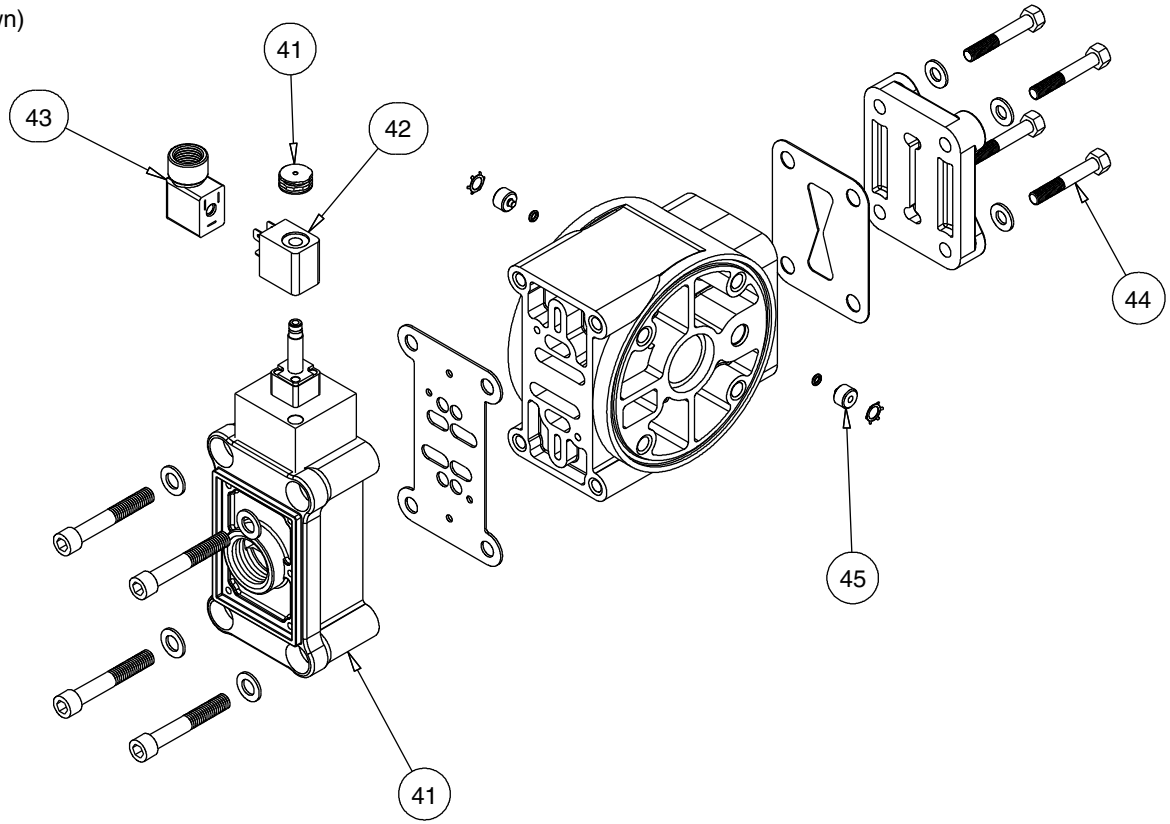
SOLENOID SHIFTED AIR VALVE PARTS LIST
(Includes all items used on Composite Repair Parts List except as shown)

Item	Part Number	Description	Qty
41	893-097-000	Solenoid Valve, NEMA4	1
42	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
43	241-001-000	Connector, conduit	1
	241-003-000	Conduit Connector with Suppression Diode (DC Only)	1
44	170-029-330	Capscrew, Hex HD 5/16-18 x 1.25	4
45	618-051-150	Plug	2

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

For Explosion Proof Solenoid Valve

42	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



Note: Pumps equipped with Integral Solenoid Valves are <u>not</u> ATEX compliant

SOLENOID SHIFTED AIR DISTRIBUTION VALVE OPTION

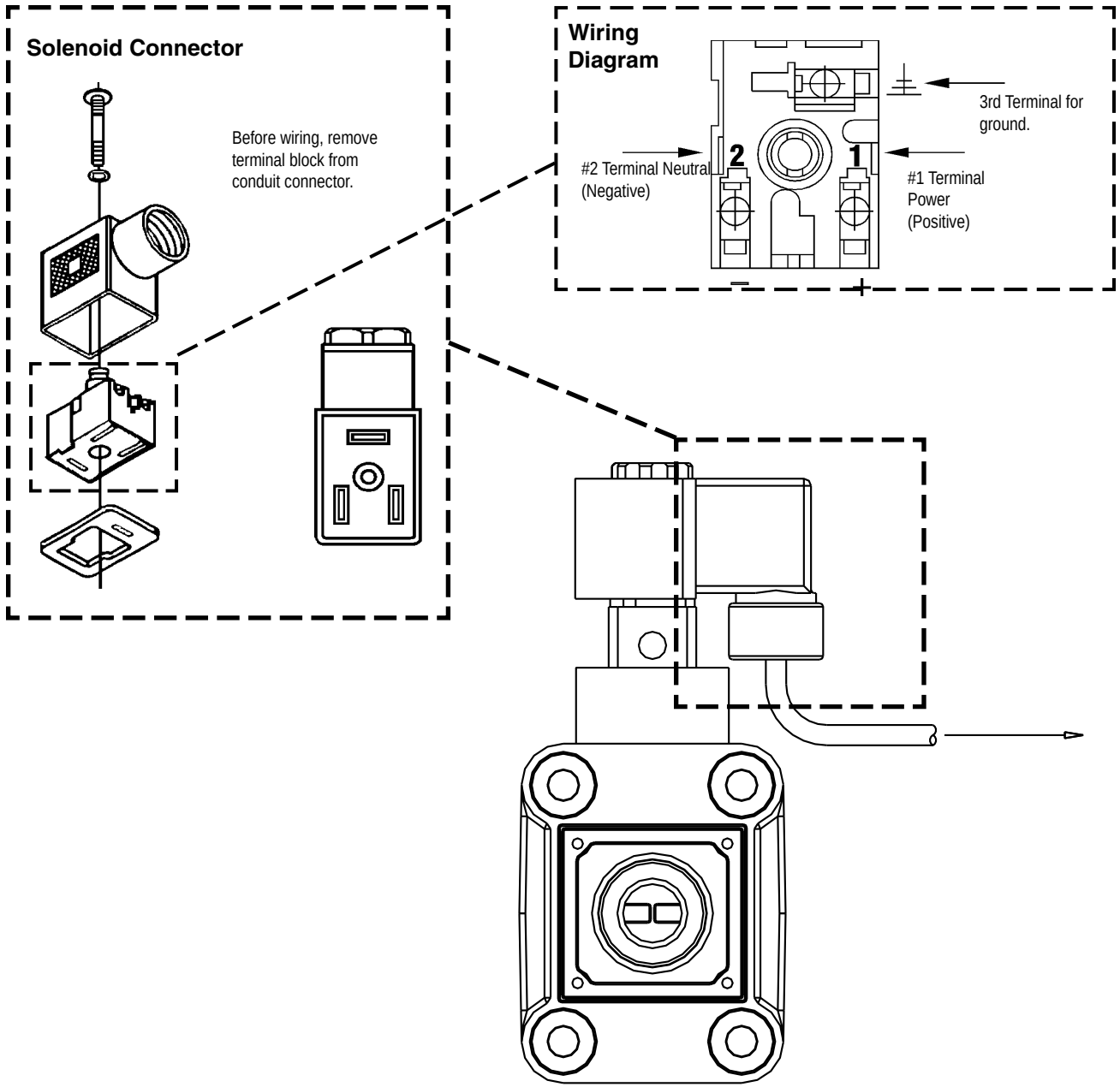
Warren Rupp's solenoid shifted, air distribution valve option utilizes electrical signals to precisely control your SANDPIPER's speed. The solenoid coil is connected to the Warren Rupp Solenoid Rate Controller/Batch Control, or a customer - supplied control. Compressed air provides the pumping power,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

OPERATION

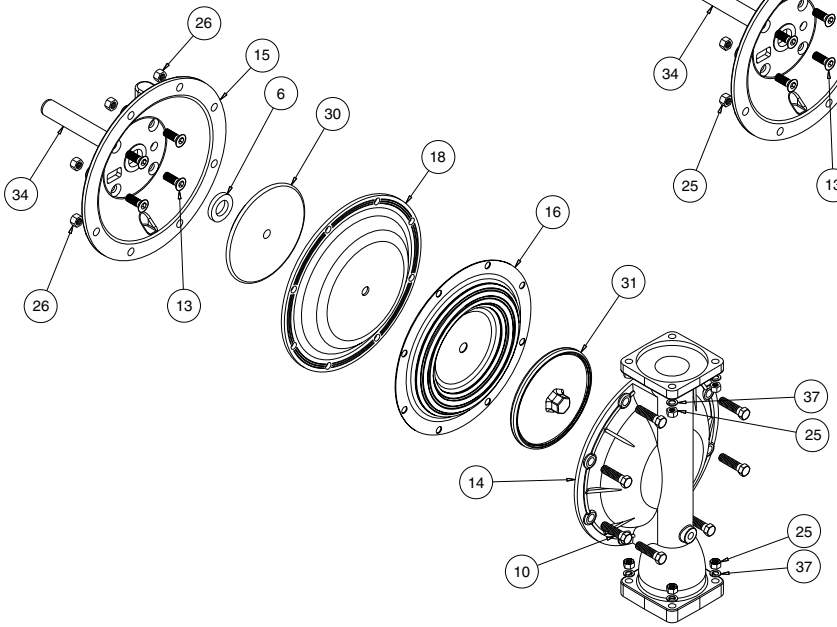
The Solenoid Shifted SANDPIPER has a solenoid operated, air distribution valve in place of the standard SANDPIPER's pilot operated, air distribution valve. Where a pilot valve is normally utilized to cycle the pump's air distribution valve, an electric solenoid is utilized. As the solenoid is powered,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

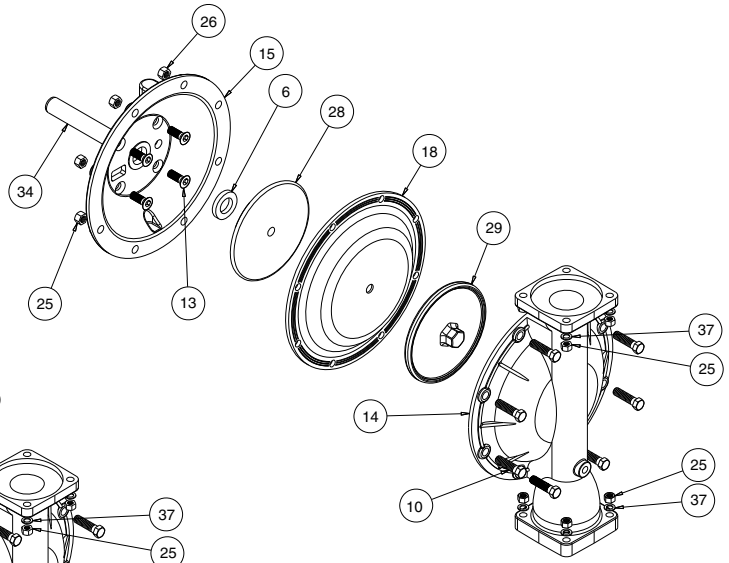
Before wiring the solenoid, make certain it is compatible with your system voltage.



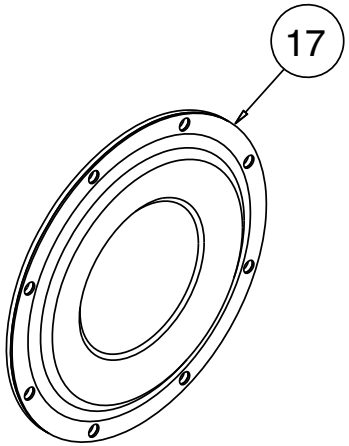
Diaphragm Service Drawing, with Overlay



Diaphragm Service Drawing, Non-Overlay



One-Piece Bonded *Diaphragm Service Drawing



***AVAILABLE FOR FIELD CONVERSION FROM OVERLAY TO ONE-PIECE BONDED DIAPHRAGM KITS:**

Kit:	**475-253-000**	
2	286-118-000	One-Piece Diaphragm
2	612-214-150	Inner Plates

DIAPHRAGM SERVICING

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

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

Using a 9/16" wrench or socket, remove the 16 capscrews (item 9), hex nuts, and lockwashers that fasten the manifolds (items 23 & 24) to the outer chambers (item 14).

Step #2: Removing the outer chambers.

Using a 11/16" and a 5/8" wrench or socket, remove the 16 capscrews (item 10), and hex nuts that fasten the outer chambers, diaphragms, and inner chambers together.

Step #3: Removing the diaphragm assemblies.

Use a $1^{1}/_{16}$" (27mm) wrench or six pointed socket to remove the diaphragm assemblies (outer plate, diaphragm, and inner plate) from the diaphragm rod (item 34) by turning counterclockwise.

Insert a 1/4-20 capscrew or set screw into the smaller tapped hole in the inner diaphragm plate (item 28 or 30). Insert the protruding stud and the 1/4-20 fastener loosely into a vise. Use a $1^{1}/_{16}$" wrench or socket to remove the outer diaphragm plate (item 29 or 31) by turning counter-clockwise. Inspect the diaphragm (item 16) 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 1/4-20 fastener back into the vise. Use a torque wrench to tighten the diaphragm assembly together to 480 in. lbs. (54.23 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 34) 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).

Fasten the outer chamber (item 14) to the pump, using the capscrews (item 9), and hex 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 34) as far as possible and still allow for alignment of the bolt holes in the diaphragm with the bolt pattern in the inner chamber (item 15).

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

Step #6: Re-install the manifolds to the pump, using the capscrews (item 10), hex nuts and flat washers.

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 over the exterior of the standard TPE diaphragm (item 18).

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 diaphragms 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 diaphragms 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.

Pilot Valve Servicing, Assembly Drawing & Parts List

PILOT VALVE ASSEMBLY PARTS LIST

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

FOR PUMPS WITH CAST IRON CENTER SECTION

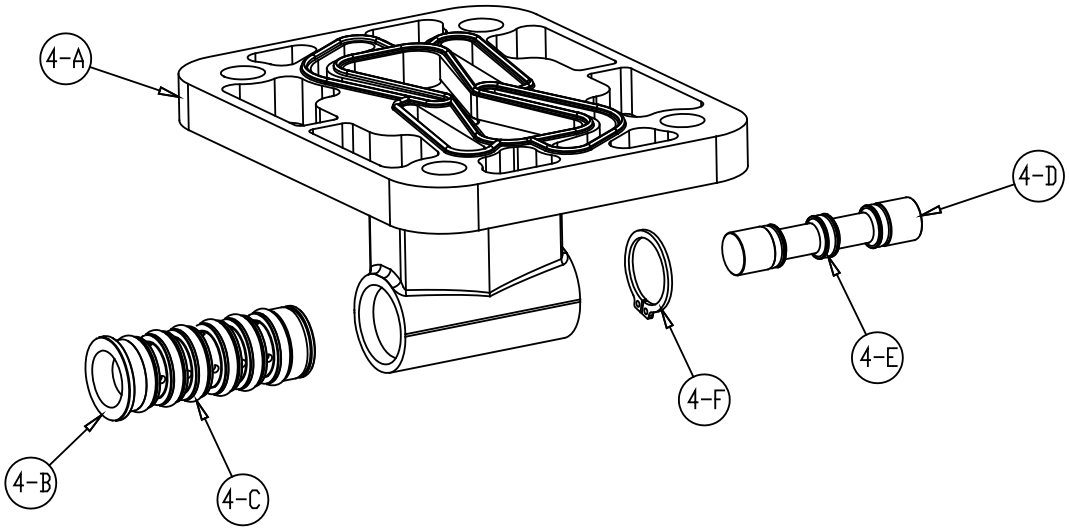
ITEM	PART NUMBER	DESCRIPTION	QTY
4	095-110-558	Pilot Valve Assembly	1
4-A	095-095-558	Valve Body	1

(includes all other items used on 095-110-000)

FOR PUMPS WITH STAINLESS STEEL CENTER SECTION

ITEM	PART NUMBER	DESCRIPTION	QTY
4	095-110-110	Pilot Valve Assembly	1
4-A	095-095-110	Valve Body	1

(includes all other items used on 095-110-000)



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 8) and air inlet gasket (item 21). The pilot valve assembly (item 4) can now be removed for inspection and service.

STEP #2: Disassembly of the pilot valve.

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

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

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

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

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

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

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

ACTUATOR PLUNGER SERVICING

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

Step #1: See PUMP ASSEMBLY DRAWING.

Using a 1/2" wrench or socket, remove the four capscrews (items 11). Remove the air inlet cap (item 8) and air inlet gasket (item 21). The pilot valve assembly (item 4) can now be removed.

Step #2: Inspect the actuator plungers.

See ILLUSTRATION AT RIGHT.

The actuator plungers (items 32) can be reached through the pilot valve cavity in the intermediate assembly (item 5).

Remove the plungers (item 32) from the bushings (item 7) in each end of the cavity. Inspect the installed o-ring (items 27) for cuts and/or wear. Replace the o-rings if necessary. Apply a light coating of grease to each o-ring and re-install the plungers in to the bushings. Push the plungers in as far as they will go.

To remove the bushings (item 7), first remove the retaining rings (item 33) by using a flat screwdriver.

NOTE: It is recommended that new retaining rings be installed.

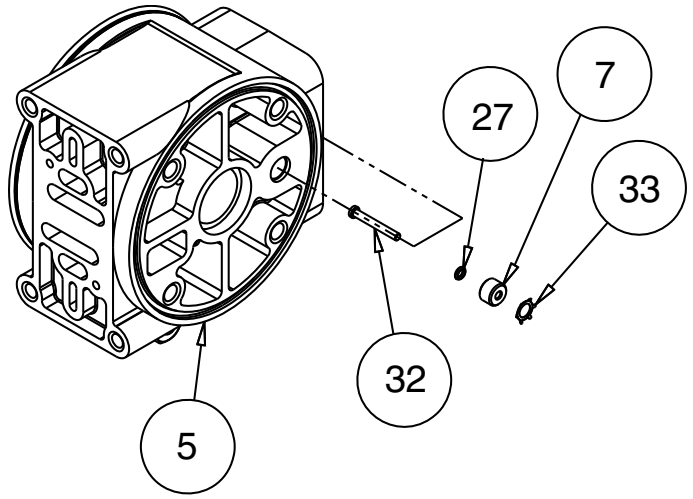
Step #3: Re-install the pilot valve assembly into the intermediate assembly.

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

Re-install the gasket (item 21), air inlet cap (item 8) and capscrews (item 11).

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

Actuator Plunger 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.

CHECK VALVE SERVICING

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

To access the check valve components, remove the manifold (item 23 or item 24 not shown). Use a 9/16" wrench or socket to remove the fasteners. Once the manifold is removed, the check valve components can be seen.

Inspect the check balls (items 2) for wear, abrasion, or cuts on the spherical surface. The check valve seats (item 36) should be inspected for cuts, abrasive wear, or embedded material on the surfaces of both the external and internal chambers. The spherical surface of the check balls must seat flush to the surface of the check valve seats for the pump to operate to peak efficiency. Replace any worn or damaged parts as necessary.

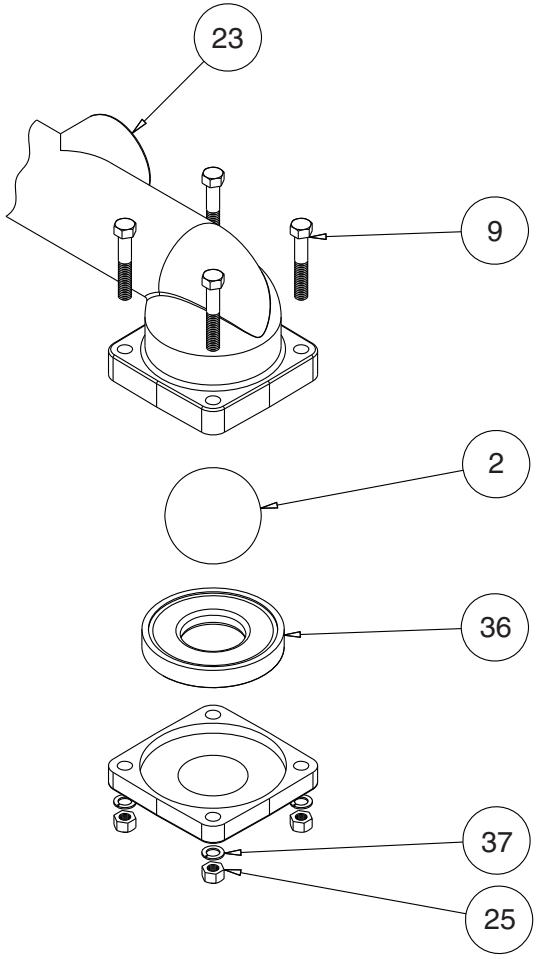
Re-assemble the check valve components. The seat should fit into the counter bore of the outer chamber.

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

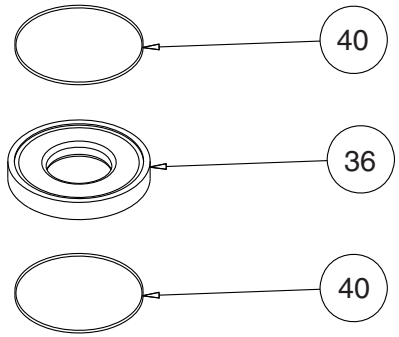
METALLIC SEATS

Two o-rings (or conductive PTFE seals) (item 40) are required for metallic seats.

Check Valve Drawing



with Non-Metallic Seats



with Metallic Seats

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.

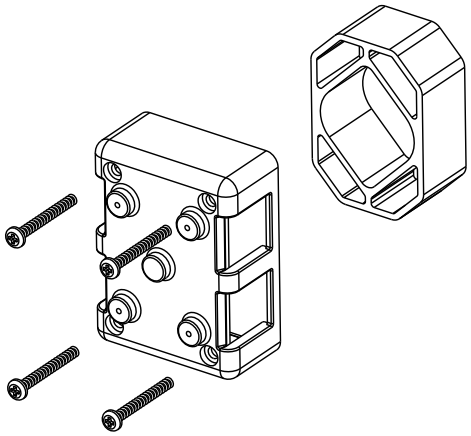
OPTION 1
530-027-000 Sound Dampening Muffler screws directly into the Air Valve body. This muffler is equipped with a porous plastic element.

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

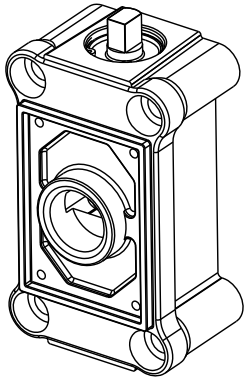
OPTION 6
530-033-000 Metal Muffler screws directly into the Air Body.

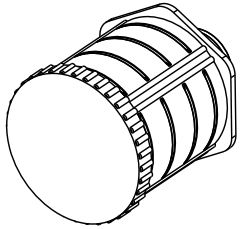
ATEX Compliant

* Note: Cannot be used with Air Valve Assembly 031-179-000 used on models equipped with cast iron or stainless steel centers.

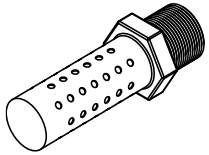


Option 0





Option 1 and 2



Option 6

PUMPING HAZARDOUS LIQUIDS

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

This pump can be submerged if the pump materials of construction are compatible with the liquid being pumped. The air exhaust must be piped above the liquid level. See illustration #2 at right. Piping used for the air exhaust must not be smaller than 1" (2.54 cm) diameter. Reducing the pipe size will restrict air flow and reduce pump performance. When the pumped product source is at a higher level than the pump (flooded suction condition), pipe the exhaust higher than the product source to prevent siphoning spills. See illustration #3 at right.

CONVERTING THE PUMP FOR PIPING THE EXHAUST AIR

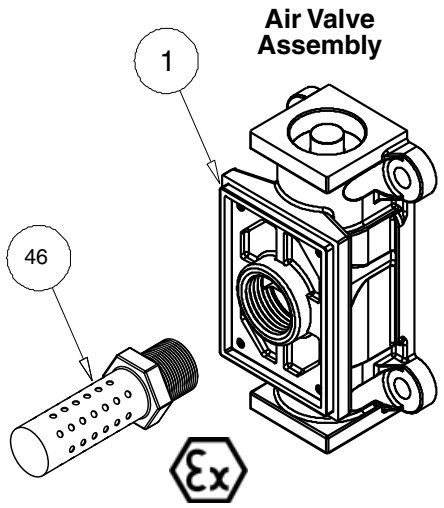
The following steps are necessary to convert the pump to pipe the exhaust air away from the pump.

Remove the muffler (item 46). The air distribution valve (item 1) has 1" NPT threads for piped exhaust.

IMPORTANT INSTALLATION

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

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



On ATEX compliant units the pump comes equipped with a standard metal muffler

CONVERTED EXHAUST ILLUSTRATION

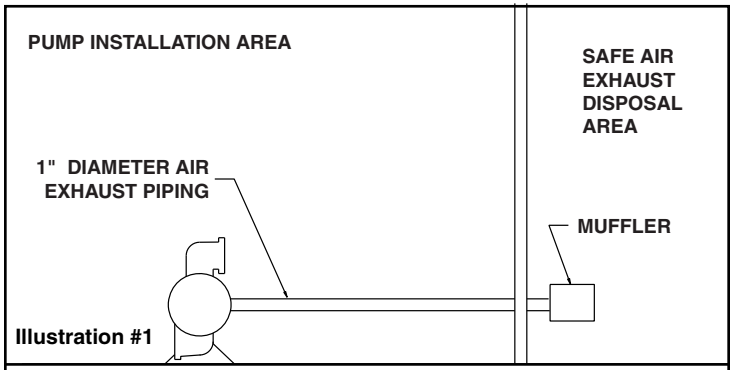


Illustration #1

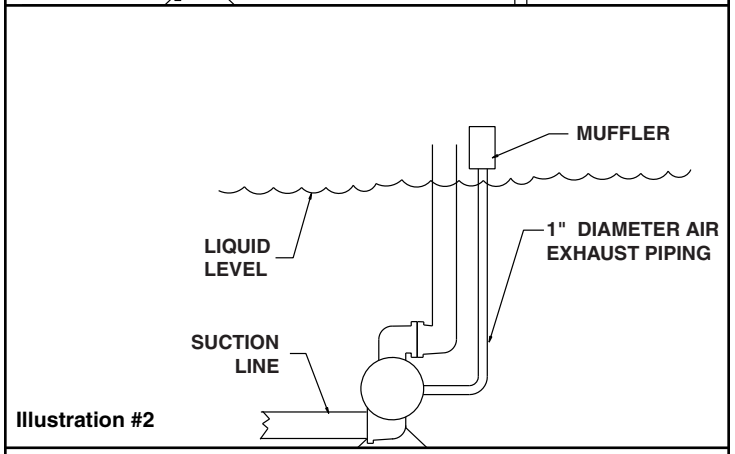


Illustration #2

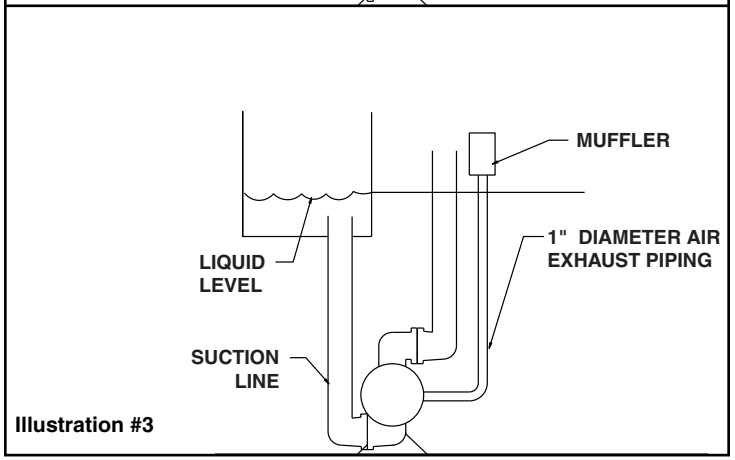


Illustration #3

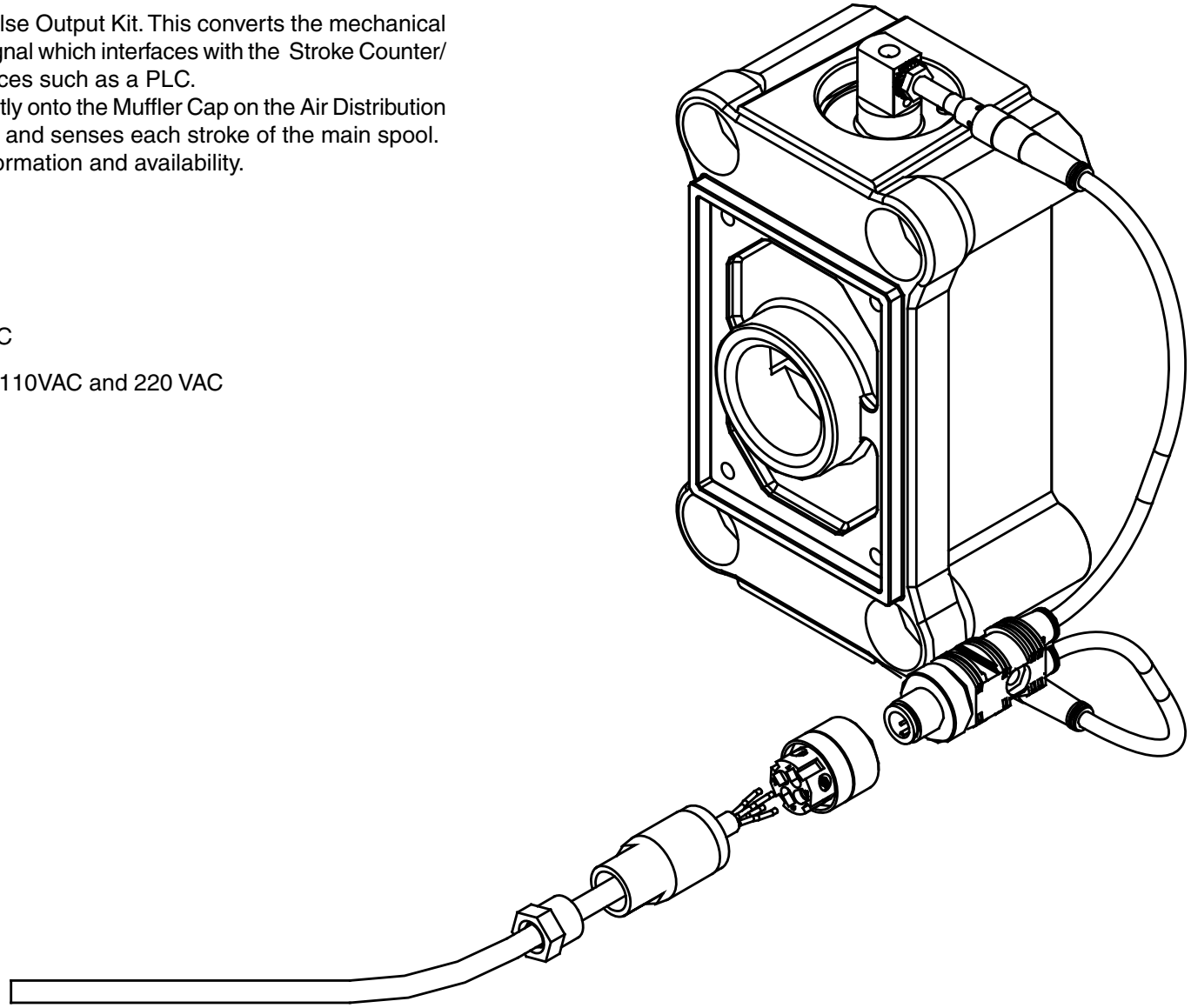
Pulse Output Kit Drawing

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.

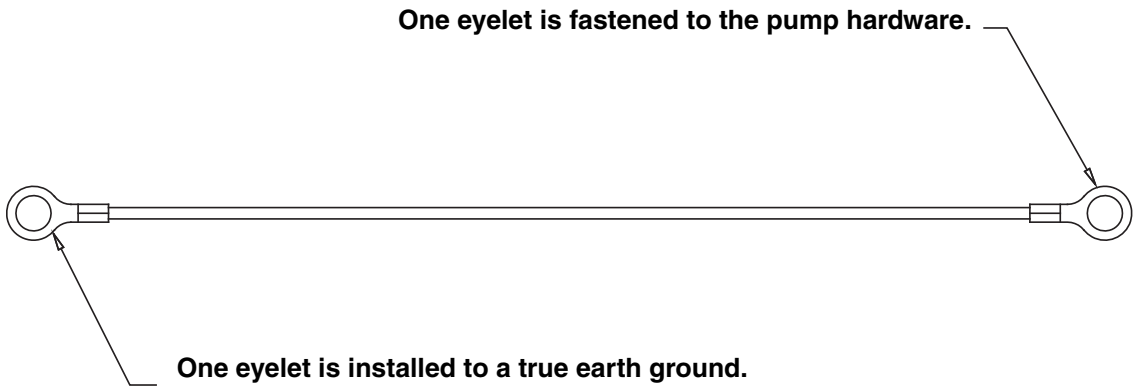


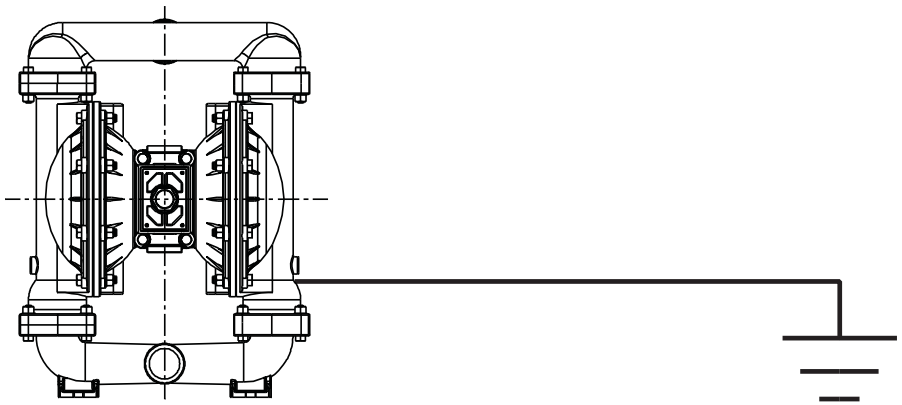
Pulse Output Kits

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

Grounding The Pump

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





This 8 foot long (244 centimeters) Ground Strap, part number 920-025-000, can be ordered as a service item.

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

Signature of authorized person

October 20, 2005

Date of issue

David Roseberry

Printed name of authorized person

Engineering Manager

Title

CE

Declaration of Conformity