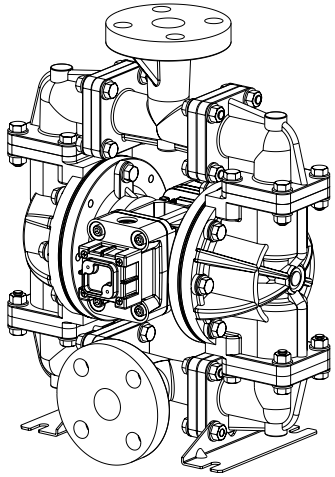
SERVICE & OPERATING MANUAL

SANDPIPER
A WARREN RUPP PUMP BRAND

Model S10 Non-Metallic Design Level 1

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

CE



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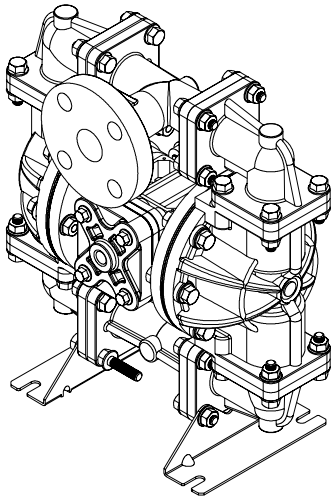
520-355-000 2/04 Rev B

WARREN RUPP®

Quality System ISO9001 Certified

Environmental Management System ISO14001 Certified

IDEX CORPORATION



U.S. Patent # 5,851,109; 5,996,627; 400,210 & 6,241,487 Other U.S. Patents Applied for

SANDPIPER
A WARREN RUPP PUMP BRAND

S10 Non-Metallic Design Level 1 Ball Valve

Air-Powered Double-Diaphragm Pump

ENGINEERING, PERFORMANCE & CONSTRUCTION DATA

INTAKE/DISCHARGE PIPE SIZE	CAPACITY	AIR VALVE	SOLIDS-HANDLING	HEADS UP TO	DISPLACEMENT/STROKE
1" ANSI Flange	0 to 23 US gallons per minute (0 to 87 liters per minute)	No-lube, no-stall design	Up to .15 in. (4mm)	100 psi or 231 ft. of water (7 bar or 70 meters)	.026 US gallon / .098 liter

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

Materials	Operating Temperatures Maximum*	Minimum*	Optimum**
Santoprene® Injection molded thermoplastic elastomer with no fabric layer. Long mechanical flex life. Excellent abrasion resistance.	212°F 100°C	-10°F -23°C	50° to 212°F 10°C to 100°C
PTFE Chemically inert, virtually impervious. Very few chemicals are known to react chemically with Teflon: 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.	212°F 100°C	-35°F -37°C	50°F to 212°F 10°C to 100°C
PVDF	200°F -93°C	-10°F -13°C	
Polypropylene			
Polyurethane	210°F 99°C	-40°F -40°C	-40°F to 210°F -40°C to 99°C
Nylon	120°F 48°C	32°F 0°C	

For specific applications, always consult "Chemical Resistance Chart" Technical Bulletin

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

*Definite reduction in service life.
**Minimal reduction in service life at ends of range.

S10 Non-Metallic · Design Level 1· Ball Valve

Type	Pump Brand	Pump Size	Check Valve Type	Design Level	Wetted Material	Diaphragm/ Check Valve Options	Check Valve Seat	Non-Wetted Material Options	Porting Options	Pump Style	Pump Options	Kit Options	Shipping Weight lbs (kg)
S10B1P1PPAS000.	S	10	B	1	P	1	P	P	A	S	0	00.	19 (9)
S10B1P2PPAS000.	S	10	B	1	P	2	P	P	A	S	0	00.	19 (9)
S10B1K1KPAS000.	S	10	B	1	K	1	K	P	A	S	0	00.	23 (10)
S10B1K2KPAS000.	S	10	B	1	K	2	K	P	A	S	0	00.	23 (10)
S10B1N1NPAS000.	S	10	B	1	N	1	N	P	A	S	0	00.	20 (9)
S10B1N2NPAS000.	S	10	B	1	N	2	N	P	A	S	0	00.	20 (9)

Pump Brand
S= SandPIPER®

Pump Size
10= 1"

Check Valve Type
B= Ball
T= Tihedral

Design Level
1= Design Level 1

Wetted Material
K= PVDF
N= Nylon
P= Polypropylene

Daiphragm/Check Valve Materials
1= Santoprene/Santoprene
2= Virgin PTFE-Santoprene Backup/Virgin PTFE
7= Santoprene/Buna
8= Virgin PTFE-Santoprene Backup/Viton

Check Valve Seat
K= PVDF
N= Nylon
P= Polypropylene

Non-Wetted Material Options
P= Polypropylene
I= Polypropylene with PTFE Hardware

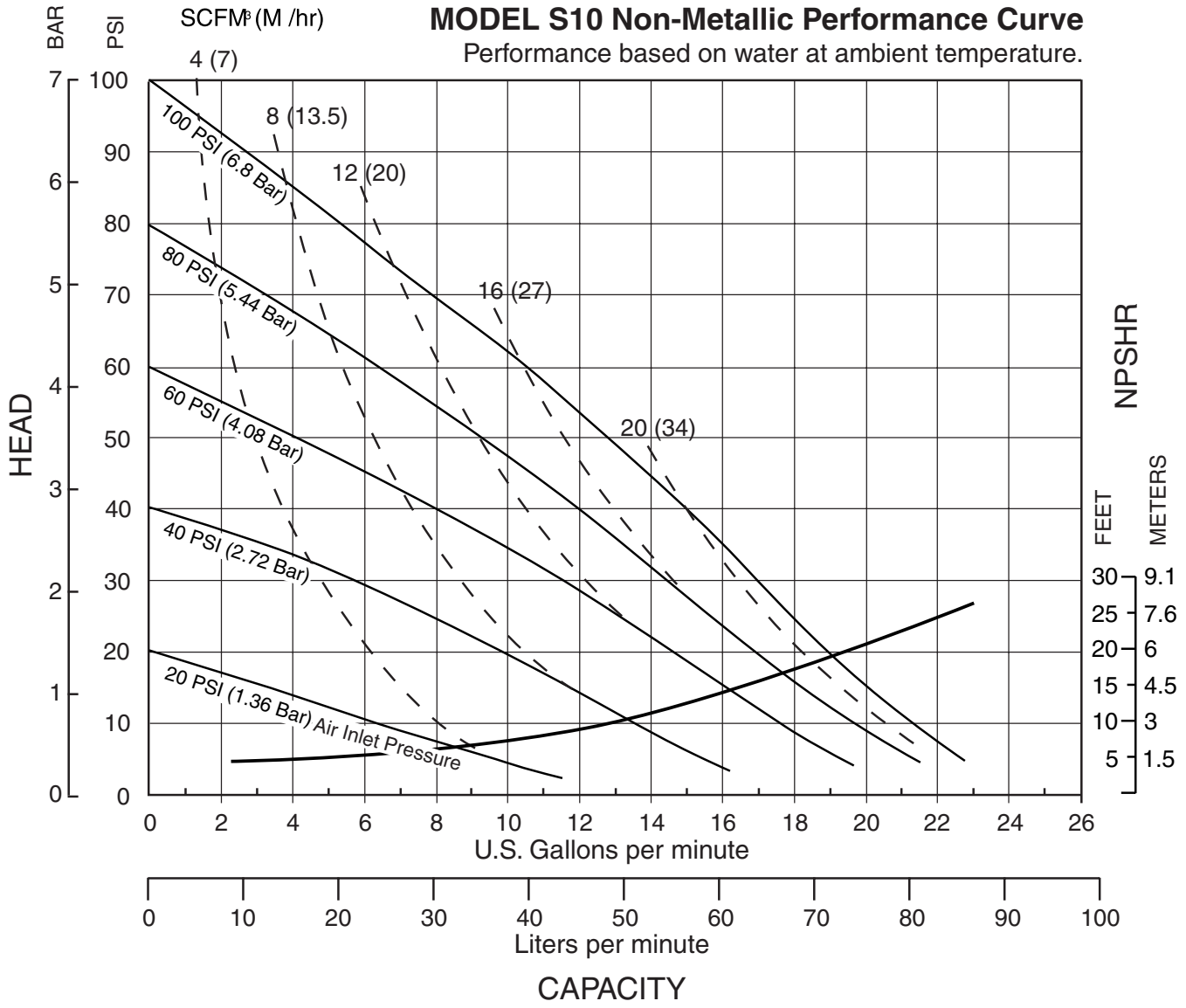
Porting Options
A= ANSI Flange

Pump Style
S= Standard

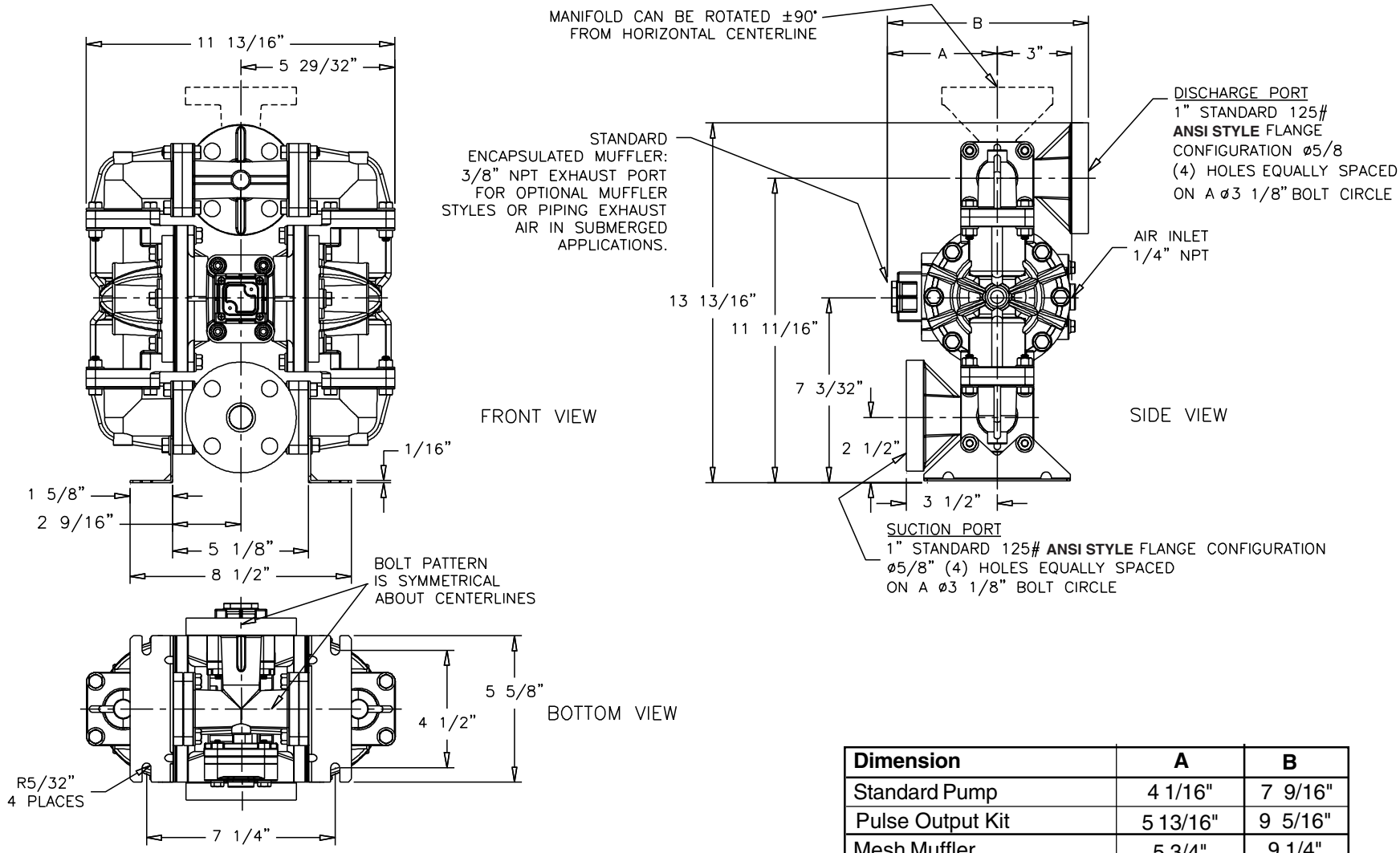
Pump Options
0= None
2= Mesh Muffler

Kit Options
A= ANSI Flange
N= NPT Threads
1= Dual Porting (NPT)
2= Top Dual Porting (NPT)
3= Bottom Dual Porting (NPT)
4= Dual Porting (BSPT) (tapered)
5= Top Dual Porting (BSPT) (tapered)
6= Bottom Dual Porting (BSPT) (tapered)
B= Bottom Dual Porting (tapered)

Performance Curve, S10 Non-Metallic, Design Level 1



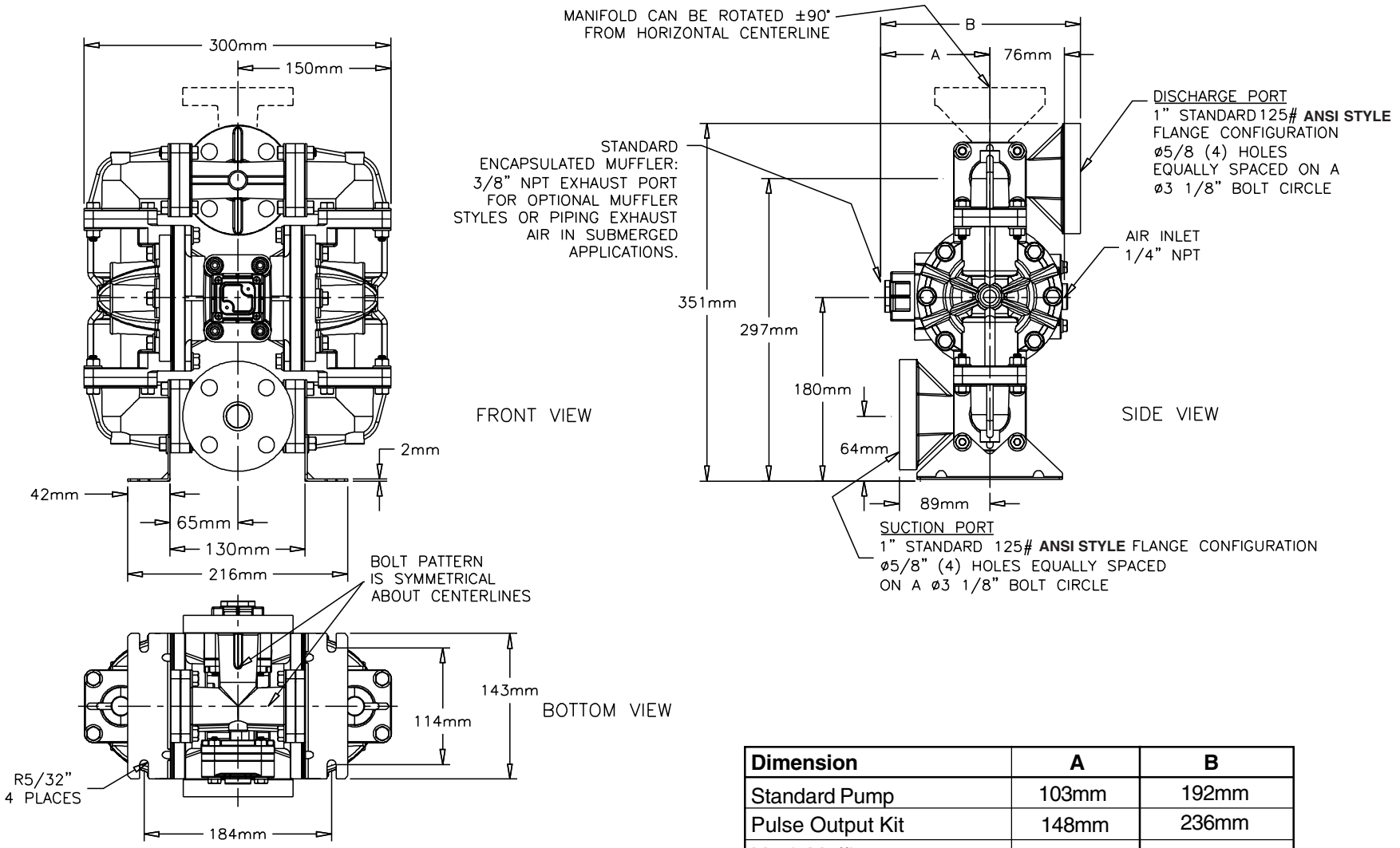
Dimensions: S10 Non-Metallic



Dimension	A	B
Standard Pump	4 1/16"	7 9/16"
Pulse Output Kit	5 13/16"	9 5/16"
Mesh Muffler	5 3/4"	9 1/4"

Metric Dimensions: S10 Non-Metallic

Dimensions in Millimeters



Dimension	A	B
Standard Pump	103mm	192mm
Pulse Output Kit	148mm	236mm
Mesh Muffler	146mm	235mm

PRINCIPLE OF PUMP OPERATION

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

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

Alternate pressurizing and exhausting of the diaphragm chamber is performed by an externally mounted, pilot operated, four way spool type air distribution valve. When the spool shifts to one end of the valve body, inlet pressure is applied to one diaphragm chamber and the other diaphragm chamber exhausts. When the spool shifts to the opposite end of the valve body, the pressure to the chambers is reversed. The air distribution valve spool is moved by a internal pilot valve which alternately pressurizes one end of the air distribution valve spool while exhausting the other end. The pilot valve is shifted at each end of the diaphragm stroke when a actuator plunger is contacted by the diaphragm plate. This actuator plunger then pushes the end of the pilot valve spool into position to activate the air distribution valve.

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

INSTALLATION AND START-UP

Locate the pump as close to the product being pumped as possible. Keep the suction line length and number of fittings to a minimum. Do not reduce the suction line diameter.

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

AIR SUPPLY

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

AIR VALVE LUBRICATION

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

AIR LINE MOISTURE

Water in the compressed air supply can create problems such as icing or freezing of the exhaust air, causing the pump to cycle erratically or stop operating. Water in the air supply can be reduced by using a point-of-use air dryer to supplement the user's air drying equipment. This device removes water from the compressed air supply and alleviates the icing or freezing problems.

AIR INLET AND PRIMING

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

BETWEEN USES

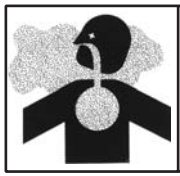
When the pump is used for materials that tend to settle out or solidify when not in motion, the pump should be flushed after each use to prevent damage. (Product remaining in the pump between uses could dry out or settle out. This could cause problems with the diaphragms and check valves at restart.)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

INSTALLATION GUIDE

Top Discharge Ball or Flap Valve Unit

Available from Warren Rupp

1. Surge Dampener
2. Filter/Regulator
3. Lubricator



⚠ 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 surge suppressor.

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

What to Check: Pumped fluid in air exhaust muffler.
Corrective Action: Disassemble pump chambers. Inspect for diaphragm rupture or loose diaphragm plate assembly. Refer to the Diaphragm Replacement section of your pump SERVICE MANUAL.
What to Check: Suction side air leakage or air in product.
Corrective Action: Visually inspect all suction side gaskets and pipe connections.

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

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

What to Check: Blocked suction line.
Corrective Action: Remove or flush obstruction. Check and clear all suction screens and strainers.

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

What to Check: Blocked pumping chamber.
Corrective Action: Disassemble and inspect the wetted chambers of the pump. Remove or flush any obstructions. Refer to the pump SERVICE MANUAL for disassembly instructions.

What to Check: Entrained air or vapor lock in one or both pumping chambers.
Corrective Action: Purge chambers through tapped chamber vent plugs. PURGING THE CHAMBERS OF AIR CAN BE DANGEROUS! Contact the Warren Rupp Technical Services Department before performing this procedure. A model with top-ported discharge will reduce or eliminate problems with entrained air.

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

WARRANTY

Refer to the enclosed Warren Rupp Warranty Certificate.

Recycling

Many components of SandPIPER® Metallic AODD pumps are made of recyclable materials (see chart on page 9 for material specifications). We encourage pump users to recycle worn out parts and pumps whenever possible, after any hazardous pumped fluids are thoroughly flushed.

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

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

⚠ 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.

⚠ 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

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

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" (Hastelloy equivalent)
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 ..... Kynar® 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 ..... Buna-N Rubber. Color coded: RED
361 ..... Buna-N
363 ..... Viton (Flurorel). 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
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
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
570 ..... Rulon II
580 ..... Ryton
590 ..... Valox
591 ..... Nylatron G-S
592 ..... Nylatron NSB
600 ..... PTFE (virgin material) Tetrafluorocarbon (TFE)
601 ..... PTFE (Bronze and moly filled)
602 ..... Filled PTFE
603 ..... Blue Gylon
604 ..... PTFE
607 ..... Envelon
606 ..... PTFE
610 ..... PTFE Encapsulated Silicon
611 ..... PTFE Encapsulated Viton
632 ..... Neoprene/Hytrel
633 ..... Viton/PTFE
634 ..... EPDM/PTFE
635 ..... Neoprene/PTFE
637 ..... PTFE , Viton/PTFE
638 ..... PTFE , Hytrel/PTFE
639 ..... Buna-N/TFE
643 ..... Santoprene®/EPDM
644 ..... Santoprene®/PTFE
656 ..... Santoprene Diaphragm and Check Balls/EPDM Seats

Delrin, Viton 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.

Hastelloy-C is a registered tradename of Cabot Corp.

Ryton is a registered tradename of Phillips Chemical Co.

Valox is a registered tradename of General Electric Co.

Kynar® is a registered tradename of ATOFINA Chemicals, Inc.

Warren Rupp, SandPIPER, Portapump, Tranquilizer and SludgeMaster are registered tradenames of Warren Rupp, Inc.

Composite Repair Parts Drawing

AVAILABLE SERVICE AND CONVERSION KITS

476-219-000 AIR END KIT
Seals, O-rings, Gaskets, Bumpers, Retaining Rings, Air Valve Assembly and Pilot Valve Assembly.

476-220-000 AIR END KIT for pumps equipped with Stroke Indicator (same components as above, except Valve Assembly with pins replaces Standard Air Valve).

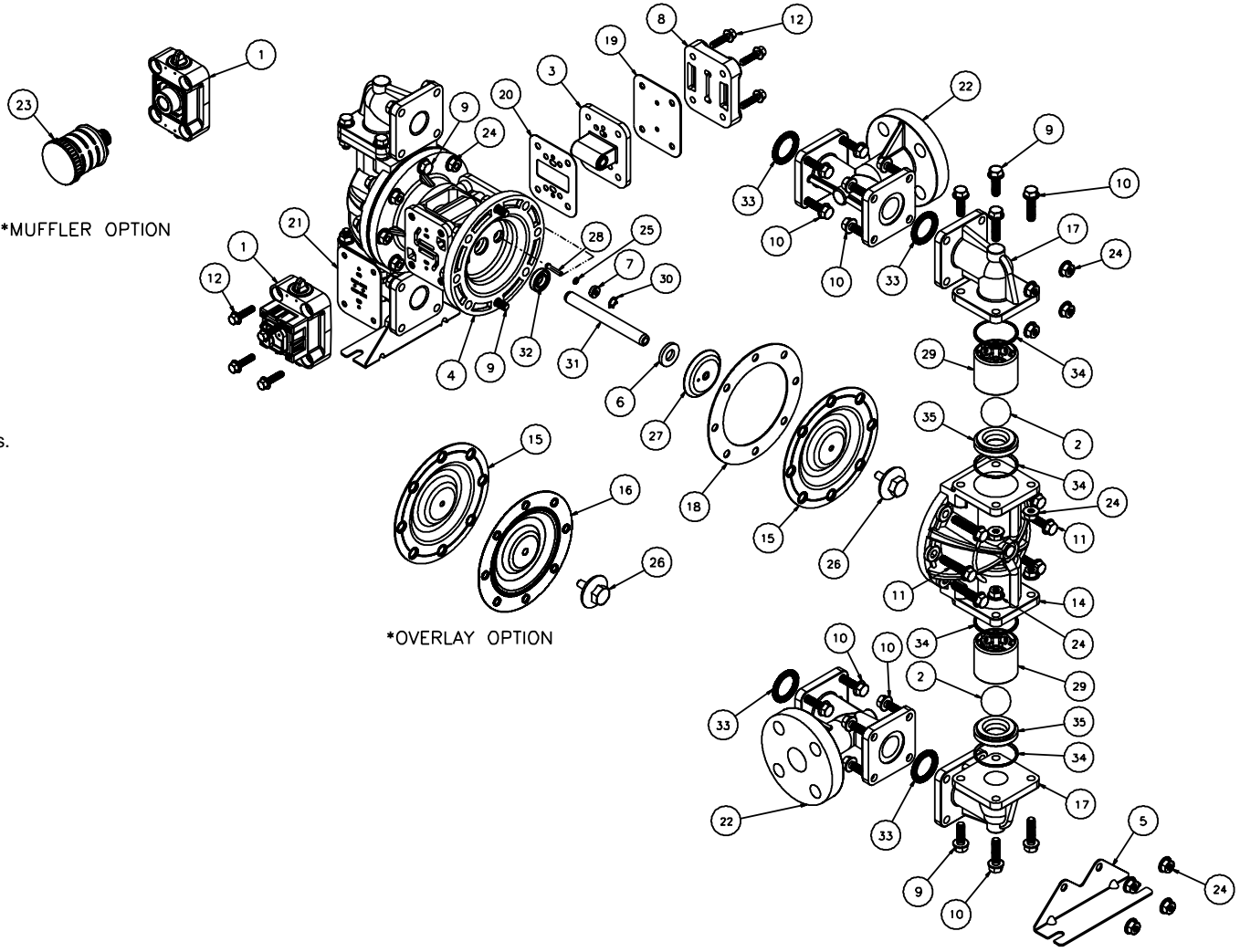
476-166-354 WETTED END KIT
Santoprene Diaphragms, Nitrile Spacer Gaskets, Santoprene Check Balls and TFE Seals.

476-166-650 WETTED END KIT
uniRupp® PTFE/Santoprene Bond Diaphragm, PTFE Check Balls and PTFE Seals.

476-166-654 WETTED END KIT
Santoprene Diaphragms, TFE Overlay Diaphragm, TFE Check Balls and TFE Seals.

476-180-657 WETTED END KIT (S07T)
Santoprene Diaphragms, Buna Trihedral Valve Components, Buna Spacer Gaskets, and TFE Manifold Seals.

476-180-658 WETTED END KIT (S07T)
Santoprene Backup Diaphragms, TFE Overlay Diaphragms, Viton Trihedral Valve Components, and TFE Manifold Seals.



PULSE OUTPUT KITS

(For use with 530-031-550 encapsulated muffler)
475-198-021 DC Kit
475-198-022 DC Intrinsically Safe Kit
475-198-023 110/120VAC or 220/240VAC Kit
475-198-024 110/120VAC Intrinsically Safe Kit
475-198-025 220/240VAC Intrinsically Safe Kit
(For use with 530-024-000 muffler or piped exhaust)
475-198-026 DC Kit
475-198-027 DC Intrinsically Safe Kit
475-198-028 110/120VAC or 220/240VAC Kit
475-198-029 110/120VAC Intrinsically Safe Kit
475-198-030 220/240VAC Intrinsically Safe Kit

NOTE: For Trihedral Parts, see Modular Trihedral Check Valve page.

Composite Repair Parts List

NOTE: See Pages 14 and 16 For Full Explanation of Air Valve Options.

ITEM	PART NUMBER	DESCRIPTION	QTY
1	031-166-000	Air Valve Assembly (Integral Muffler)	1
	031-166-002	Air Valve Assembly (with PTFE Coated Hardware)	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 (Optional Mufflers)	1
	031-168-000	Air Valve Assembly (Stroke Indicator & Optional Mufflers)	1
	031-176-000	Air Valve (High Temperture)	1
	031-177-000	Air Valve (High Temperture With Mufflers)	1
2	050-028-354	Ball, Check Valve	4
	050-028-600	Ball, Check Valve	4
3	095-091-000	Pilot Valve Assembly	1
	095-091-558	Pilot Valve Assembly (Conductive Acetal)	1
4	114-023-551	Bracket, Intermediate	1
5	115-142-115	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
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
14	196-162-520	Chamber, Outer	2
	196-162-542	Chamber, Outer	2
	196-162-552	Chamber, Outer	2
15	286-095-354	Diaphragm	2
	286-095-650	Diaphragm, uniRupp	2
16	286-096-600	Diaphragm, Overlay	2
17	312-107-520	Elbow	4
	312-107-542	Elbow	4
	312-107-552	Elbow	4
18	360-099-360	Gasket, Spacer	2
19	360-100-360	Gasket, Air Inlet	1
20	360-101-379	Gasket, Pilot Valve	1
21	360-102-360	Gasket, Air Valve	1
22	518-140-520	Manifold (ANSI)	2
	518-140-542	Manifold (ANSI)	2
	518-140-552	Manifold (ANSI)	2
23	530-023-600	Muffler	1
	530-024-000	Muffler	1
24	544-005-115	Nut, Flanged 5/16-18	36
	544-005-308	Nut, Flanged 5/16-18	36
25	560-001-360	O-ring	2
26	612-091-520	Plate, Outer Diaphragm	2
	612-091-542	Plate, Outer Diaphragm	2
	612-091-552	Plate, Outer Diaphragm	2
27	612-177-150	Plate, Inner Diaphragm	2
28	620-019-115	Plunger, Actuator	2
29	670-050-520	Retainer, Ball	4
	670-050-542	Retainer, Ball	4
	670-050-552	Retainer, Ball	4
30	675-042-115	Ring, Retaining	2
31	685-056-120	Rod, Diaphragm	1
32	720-012-375	Seal, Diaphragm Rod	2
33	720-046-600	Seal, Manifold	4
34	720-051-600	Seal, Check Valve Retainer	8
35	722-081-520	Seat, Check Valve	4
	722-081-542	Seat, Check Valve	4
	722-081-552	Seat, Check Valve	4
NOT SHOWN:			
	535-069-000	Nameplate	

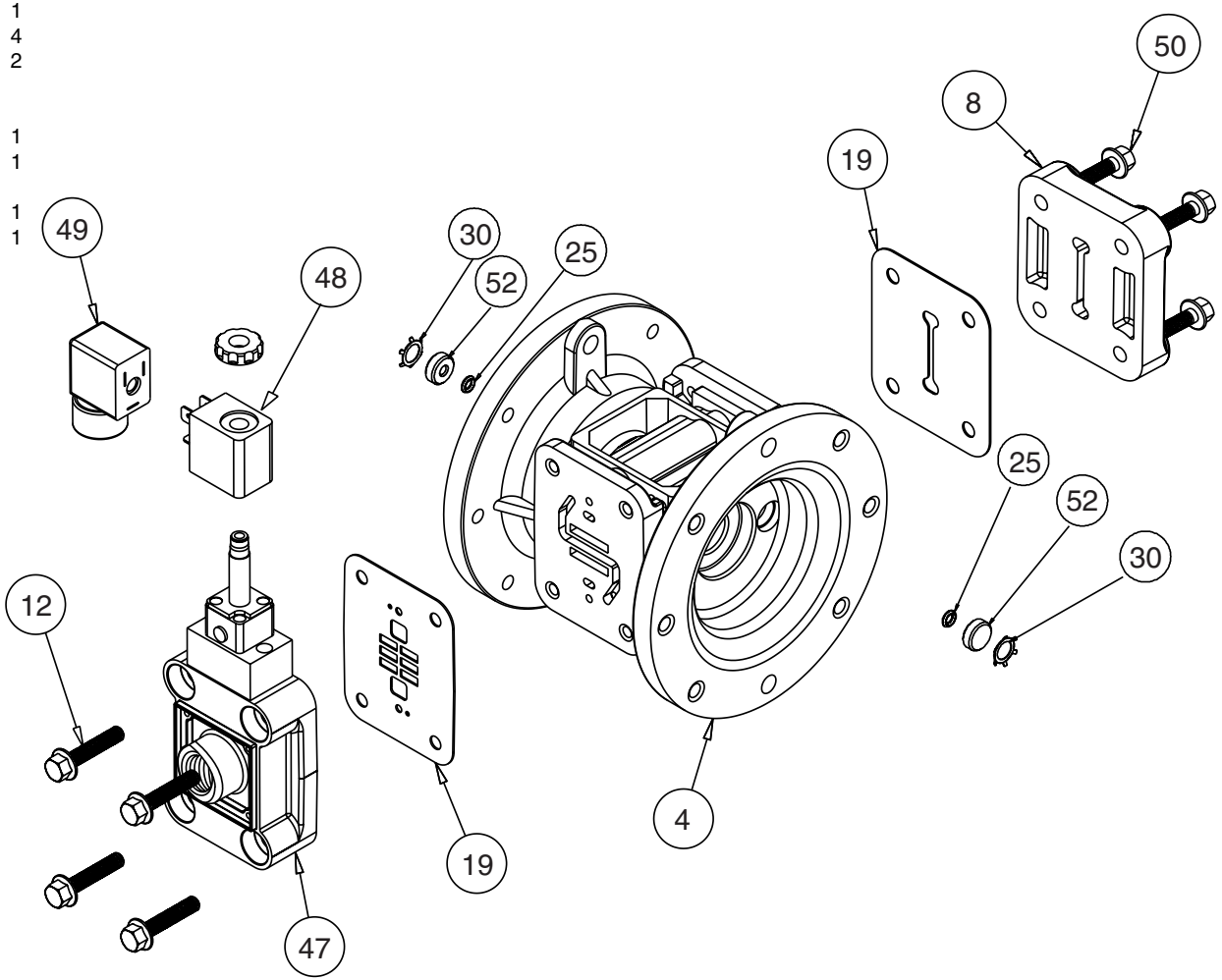
Solenoid Shifted Air Valve Drawing

Solenoid Shifted Air Valve Parts List

Item	Part Number	Description	Qty
4	114-023-551	Bracket, Intermediate	1
19	360-100-379	Gasket, Air Inlet	1
47	893-093-000	Solenoid Valve, NEMA4	1
48	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
49	241-001-000	Connector, Conduit	1
50	171-065-115	Capscrew, Flanged 1/4-20 x 1.00	4
52	618-050-150	Plug (Replaces item 7)	2

For Explosion Proof Solenoid Valve:

47	893-094-001	Solenoid Valve, NEMA 7/9, 24VDC	1
	893-094-002	Solenoid Valve, NEMA 7/9, 24VAC/ 12VDC	1
	893-094-003	Solenoid Valve, NEMA 7/9, 120VAC	1
	893-094-004	Solenoid Valve, NEMA 7/9, 240VAC	1



SOLENOID SHIFTED AIR DISTRIBUTION VALVE OPTION

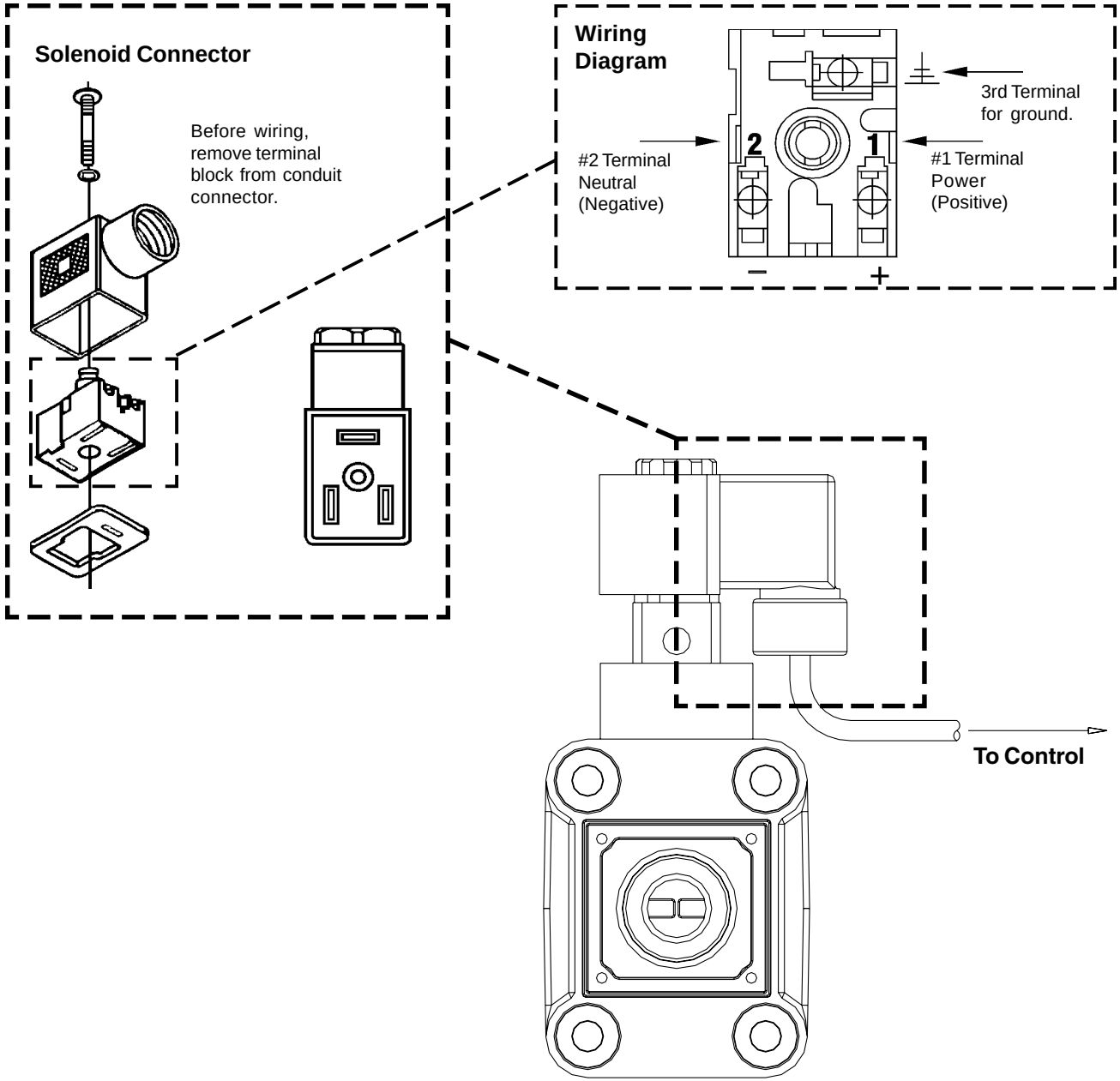
Warren Rupp's solenoid shifted, air distribution valve option utilizes electrical signals to precisely control your SandPIPER's speed. The solenoid coil is connected to a customer - supplied control. Compressed air provides the pumping power, while electrical signals control pump speed (pumping rate).

OPERATION

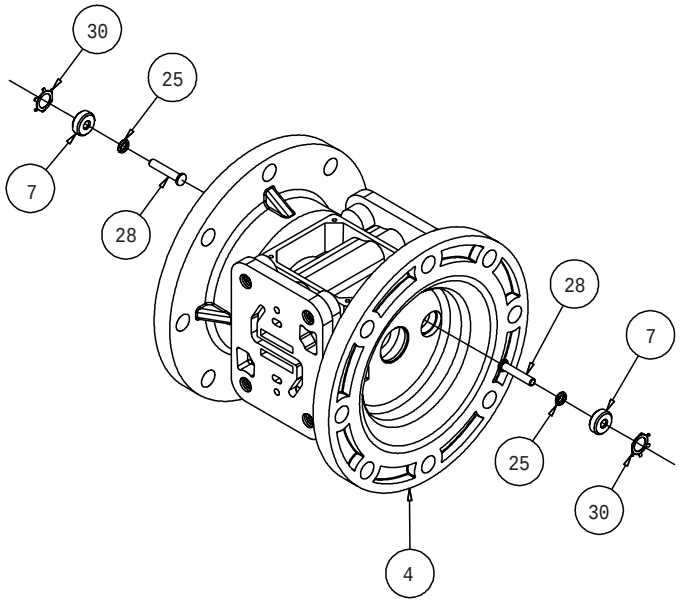
The Solenoid Shifted SandPIPER has a solenoid operated, air distribution valve in place of the standard SandPIPER's pilot operated, air distribution valve. Where a pilot valve is normally utilized to cycle the pump's air distribution valve, an electric solenoid is utilized. As the solenoid is powered, one of the pump's air chambers is pressurized while the other chamber is exhausted. When electric power is turned off, the solenoid shifts and the pressurized chamber is exhausted while the other chamber is pressurized. By alternately applying and removing power to the solenoid, the pump cycles much like a standard SandPIPER pump, with one exception. This option provides a way to precisely control and monitor pump speed.

BEFORE INSTALLATION

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



Intermediate Drawing



INTERMEDIATE ASSEMBLY REPAIR PARTS LIST

Item	Part Number	Description	Qty
4	114-023-551	Bracket, Intermediate	1
7	135-036-506	Bushing, Plunger	2
25	560-001-360	O-Ring	2
28	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 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 28) 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 28) 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 bushing components first remove the two retaining rings (items 30) using a small flat screwdriver. ***Note:** It is recommended that new retaining rings be installed.

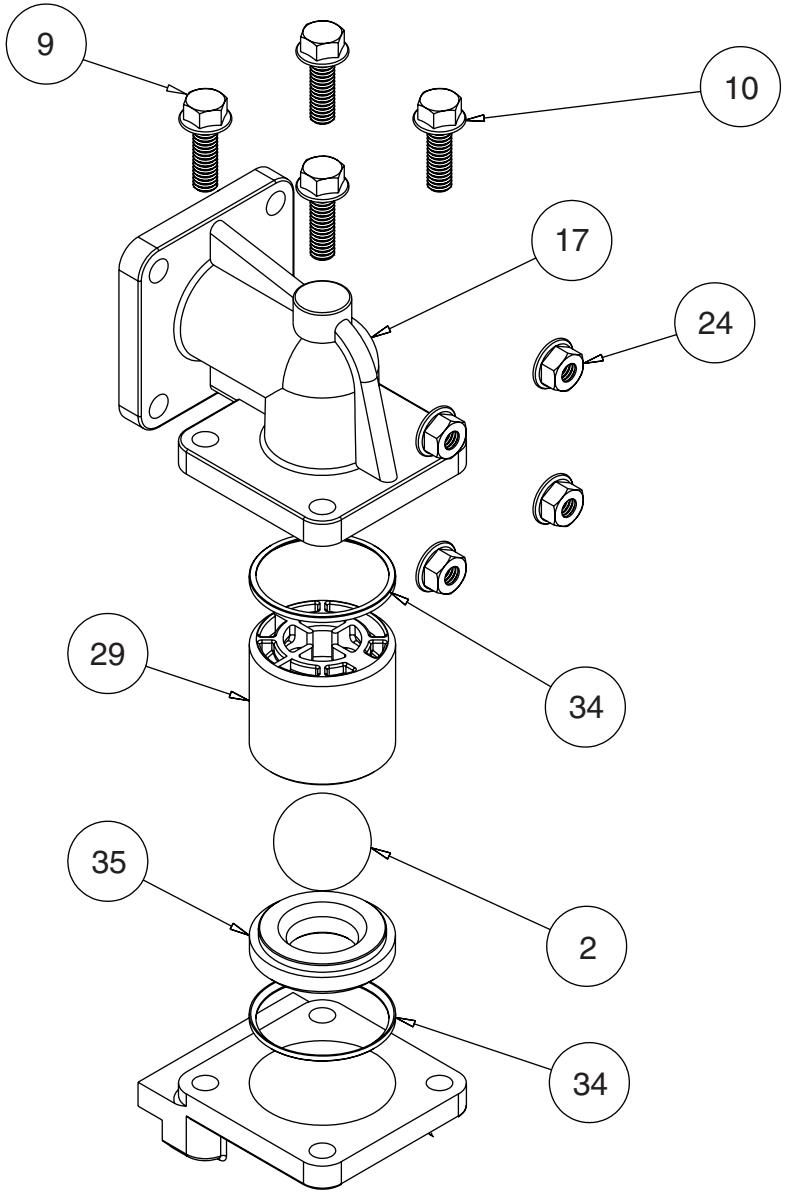
Next remove the two plunger bushings (items 7). Inspect the bushings for wear or scratches. Replace the bushings as necessary.

Inspect the two o-rings (25) for cuts and/or wear.

⚠ 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.

Modular 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 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).

Next remove the check valve seal (item 34). Inspect the seal for cuts or pinched areas. Replace seal as needed.

Disassemble the component parts of each modular check valve. Inspect the check valve retainer (item 29) for cuts, abrasive wear, or embedded materials. Replace as needed.

Inspect the check balls (items 2) for wear, abrasion, or cuts on the spherical surface. The check valve seats (items 35) 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 inner chamfer on the check valve seats for the pump to operate to peak efficiency. Replace any worn or damaged parts as necessary.

Remove the check valve seal (item 34). Inspect the seal for cuts or pinched areas. Replace seal as needed.

RE-ASSEMBLE THE MODULAR CHECK VALVES.

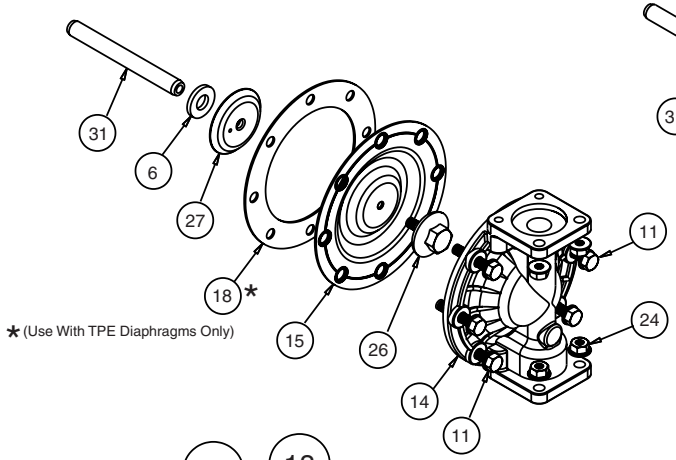
Place a check valve seal (item 34) into the cavity of the outer chamber (item 14). Make sure the chamfer side of the seal faces out. Insert the modular check valve into the outer chamber with the retainer facing up. Install a check valve seal (item 34). Make sure the chamfer side of the seals face the chamfer on the check valve seat or retainer.

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

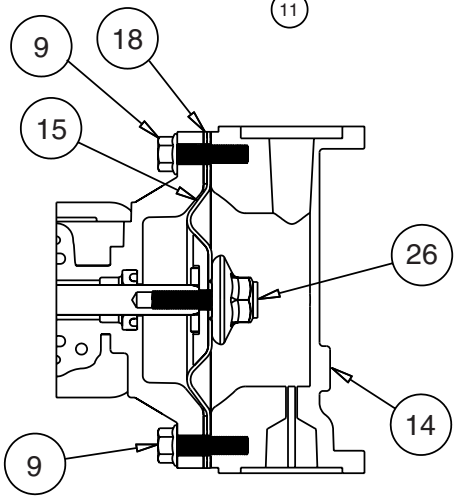
⚠ IMPORTANT

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.

Diaphragm Service Drawing



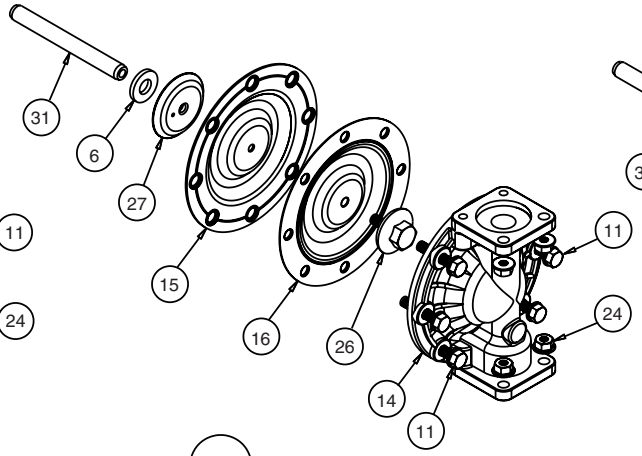
* (Use With TPE Diaphragms Only)

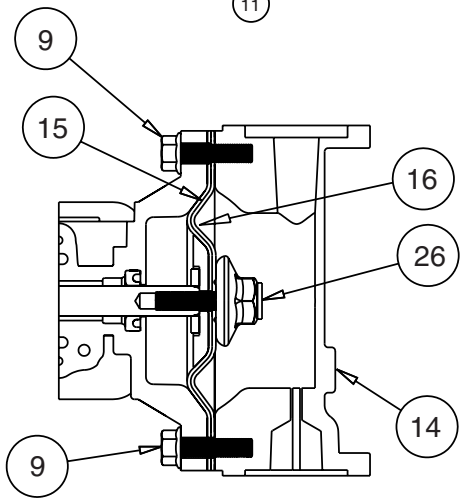


Diaphragm Orientation

Install diaphragm and spacer as shown above.

Diaphragm Service Drawing, with Overlay

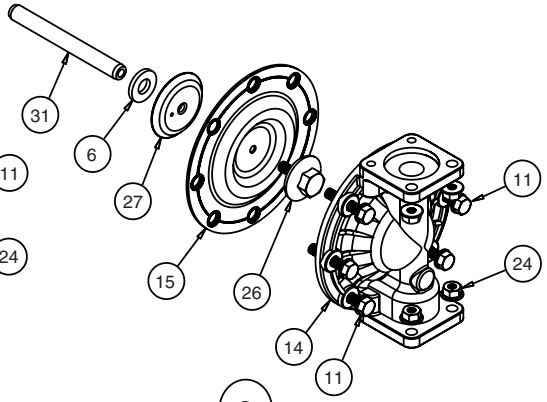


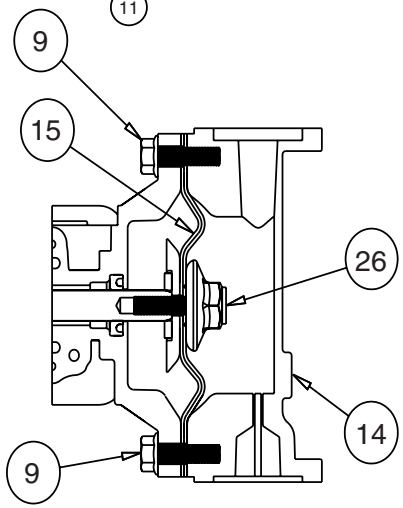


Diaphragm Orientation

Install diaphragm and overlay as shown above.

Diaphragm Service Drawing with uniRupp®





Diaphragm Orientation

Install diaphragm (286-095-650 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 nuts that fasten the elbows (items 17) 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 9 & 11), and nuts that fasten the outer chambers, diaphragms, and intermediate bracket (items 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 31) by turning counterclockwise.

Insert a 6-32 set screw into the smaller tapped hole in the inner diaphragm plate (item 27). 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 26) 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. 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 inner chamber (item 4). Make sure the molded directional arrows on the diaphragm point vertically.

Fasten the outer chamber (item 14) to the pump, using the capscrews (items 9 & 11), hex nuts and flat washers.

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

Thread the stud of the remaining diaphragm assembly clockwise into the tapped hole at the end of the diaphragm rod (item 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. The molded directional arrows on the diaphragm must point vertically.

Fasten the remaining outer chamber (item 14) to the pump, using the capscrews (items 9 & 11) and nuts.

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

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

OVERLAY DIAPHRAGM SERVICING

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

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

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

uniRupp® DIAPHRAGM SERVICING

Follow the same procedures described for the standard diaphragm for removal and installation. **Note:** The uniRupp diaphragm is installed in the direction as shown in the lower right illustration above.

⚠ 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.

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" (1.27 cm) diameter. Reducing the pipe size will restrict air flow and reduce pump performance. When the pumped product source is at a higher level than the pump (flooded suction condition), pipe the exhaust higher than the product source to prevent siphoning spills. See illustration #3 at right.

CONVERTING THE PUMP FOR PIPING THE EXHAUST AIR

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

Use a Phillips screwdriver to remove the four self-tapping screws (item 1-H).

Remove the muffler cap and muffler (items 1-G and 1-F). The 3/8" NPT molded threads in the air distribution valve body (item 1-A).

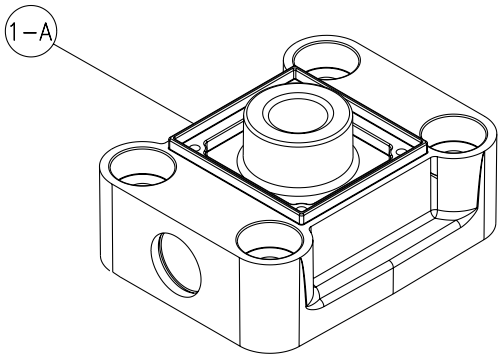
Piping or hose may now be installed.

IMPORTANT INSTALLATION NOTE:

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

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

Exhaust Conversion Drawing



CONVERTED EXHAUST ILLUSTRATION

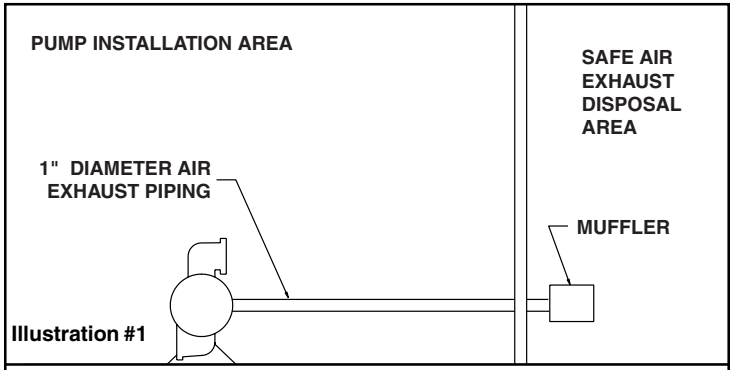


Illustration #1

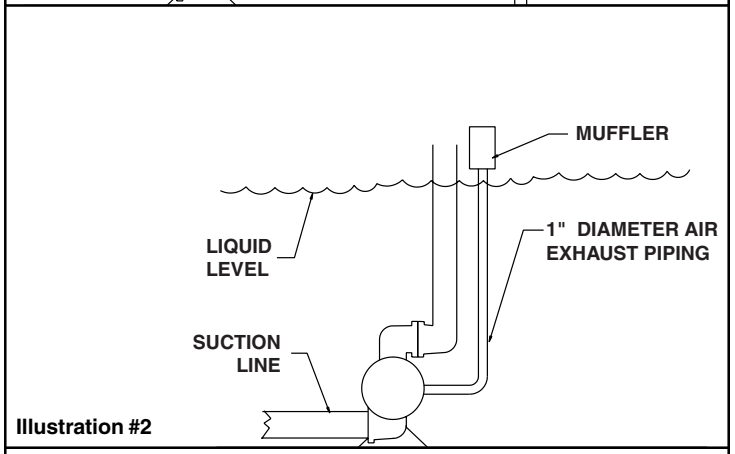


Illustration #2

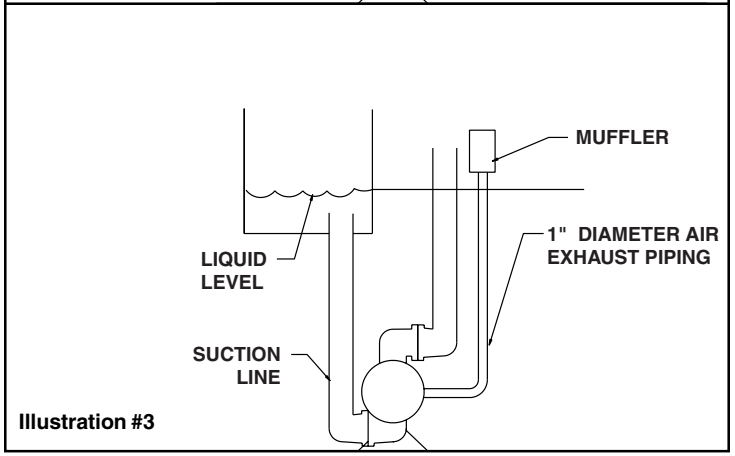


Illustration #3

Pulse Output Kit Drawing

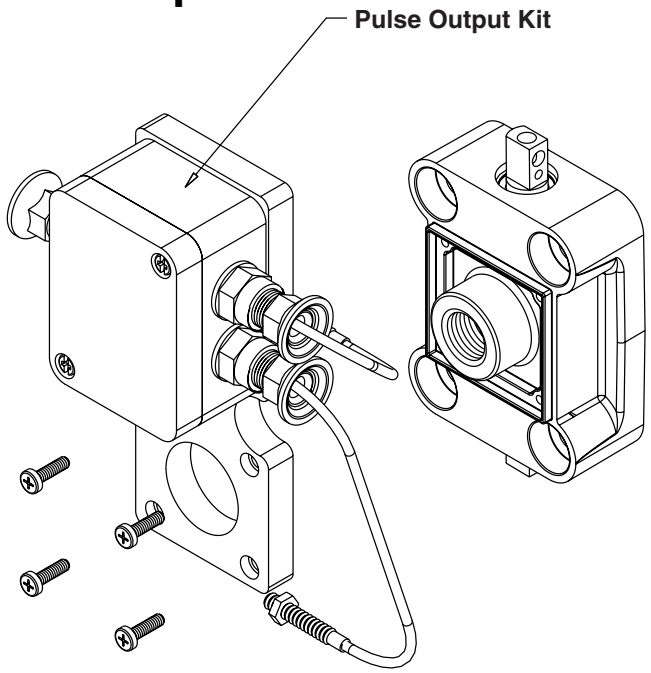
PULSE OUTPUT KIT OPTION

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 RuppTech™ 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 Distribution Valve Assembly when the threaded exhaust port or an auxiliary muffler is being used.

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

Exhaust Port or Auxiliary Muffler Setup



Integral Muffler Setup