

SERVICE & OPERATING MANUAL



Model U1F Metallic Design Level 1

Table of Contents

Engineering Data and Temperature Limitations	1	Composite Repair Parts Drawing	12
Explanation of Pump Nomenclature	2	Available Service and Conversion Kits	12
Performance Curve	3	Composite Repair Parts List	13
Dimensions	4	Air Distribution Valve Assembly Drawing and Parts List	14
Metric Dimensions	5	Air Distribution Valve Servicing	15
Principle of Pump Operation	6	Pilot Valve Servicing, Assembly Drawing & Parts List	16
Installation and Start-Up	6	Diaphragm Service Drawing, with Overlay	17
Air Supply	6	Diaphragm Service Drawing, Non-Overlay	17
Air Valve Lubrication	6	Diaphragm Servicing	18
Air Line Moisture	6	Overlay Diaphragm Servicing	18
Air Inlet and Priming	6	Actuator Plunger Servicing	19
Between Uses	6	Check Valve Servicing	20
Installation Guide	7	Check Valve Drawing	20
Troubleshooting	8	Muffler Drawing and Provision for Piping Air Exhaust	21
Warranty	8	Pumping Hazardous Liquids	21
Recycling	9	Converting Pump for Piping Exhaust Air	21
Important Safety Information	9	Converted Exhaust Illustration	21
Material Codes	10	Grounding The Pump	22



II 2GD b T5



U.S. Patent #
5,996,627
Other U.S. Patents
Applied for

**WARREN
RUPP®**

Quality System
ISO9001 Certified

Environmental
Management System
ISO14001 Certified

IDEX
IDEX CORPORATION



U.S. Patent #
5,996,627
Other U.S. Patents
Applied for



II 2GD b T5



SANDPIPER®
A WARREN RUPP PUMP BRAND

U1F Metallic

**Air-Powered
Double-Diaphragm Pump**

ENGINEERING, PERFORMANCE
& CONSTRUCTION DATA

INTAKE/DISCHARGE PIPE SIZE 1" NPT (internal) 1" BSPT Tapered (internal)	CAPACITY 0 to 45 gallons per minute (0 to 170 liters per minute)	AIR VALVE No-lube, no-stall design	SOLIDS-HANDLING Up to .25 in. (6mm)	HEADS UP TO 125 psi or 289 ft. of water (8.6 Kg/cm ² or 86 meters)	DISPLACEMENT/STROKE .11 Gallon / .42 liter
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CAUTION! *Operating temperature limitations are as follows:*

Materials

Buna General purpose, oil-resistant. Shows good solvent, oil, water and hydraulic fluid resistance. Should not be used with highly polar solvents like acetone and MEK, ozone, chlorinated hydrocarbons and nitro hydrocarbons.

Neoprene All purpose. Resistant to vegetable 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.

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.

Polypropylene

Polyethylene

Operating Temperatures
Maximum Minimum

190°F
88°C -10°F
-23°C

170°F
77°C -10°F
-23°C

212°F
100°C -35°F
-37°C

150°F
65°C -40°F
-40°C

180°F
82°C -40°F
-40°C

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

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

Explanation of Pump Nomenclature

U1F UL79 Listed Metallic · Design Level 1· Ball Valve

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

Pump Brand

U=UL79 Listed SANDPIPER®

Pump Size

1F=1"

Check Valve Type

B= Ball

Design Level

1= Design Level

Wetted Material

X= Unpainted Aluminum

C= Conductive Painted

Aluminum

Diaphragm Check Valve Materials

B= Buna/Buna

G= PTFE-Neoprene/PTFE

Check Valve Seat

T= PTFE

Non-Wetted Material Options

X= Unpainted Aluminum

C= Conductive Painted

Aluminum

Porting Options

N=NPT Threads

B= BSPT (Tapered) Threads

Pump Style

S= Standard

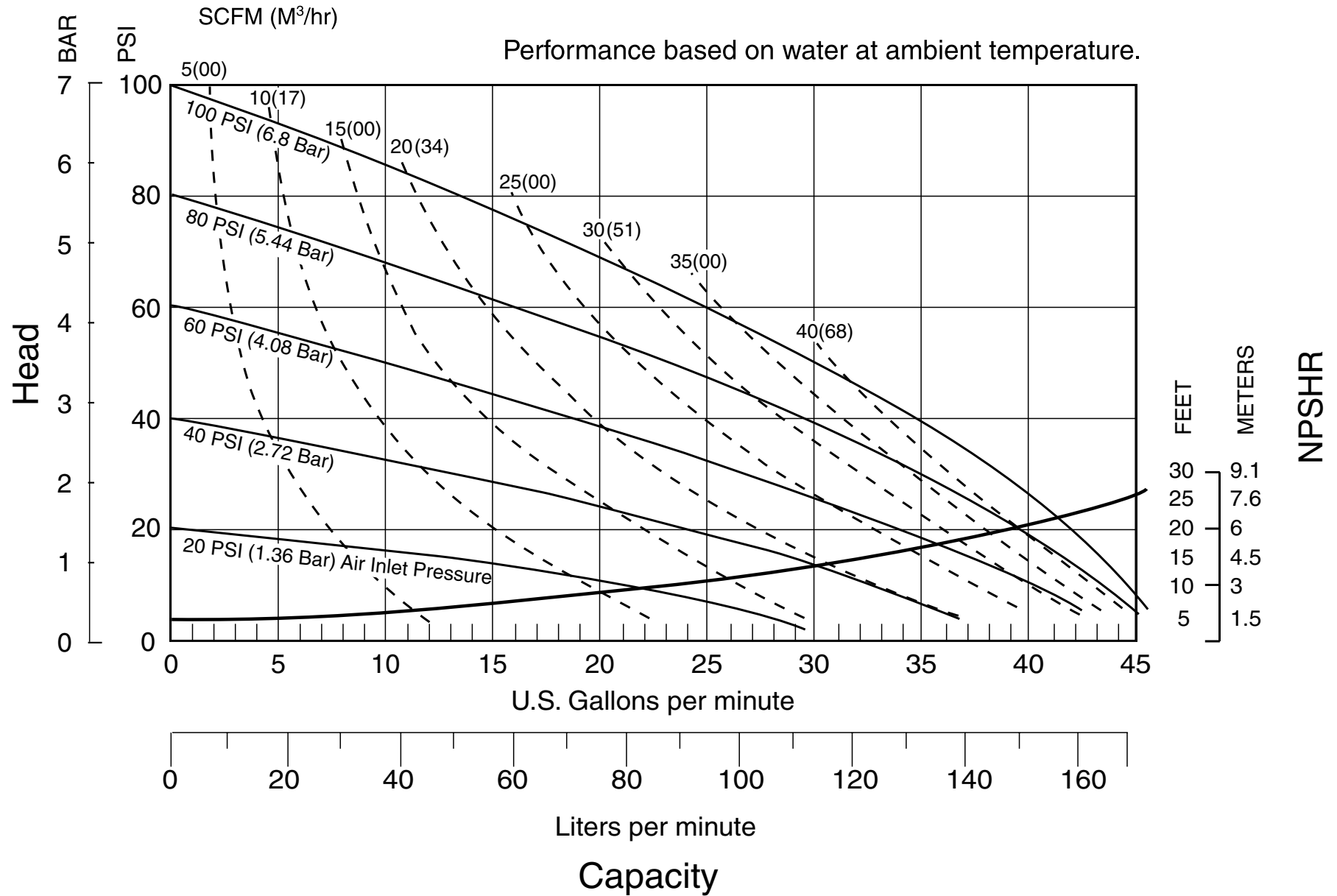
Pump Options

6= Metal Muffler

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

Model U1FB1XGTXNS600 is UL79 listed for pumping: Gasoline (Including Alcohol Blends), Diesel Fuel, Motor Oil, No. 4 Oil (or lighter), Kerosene, Aviation Fuel, Automatic Transmission Fluid, Alcohol, Water, Waste Oil, Ethyl Alcohol, Methyl Alcohol and Ethylene Glycol.

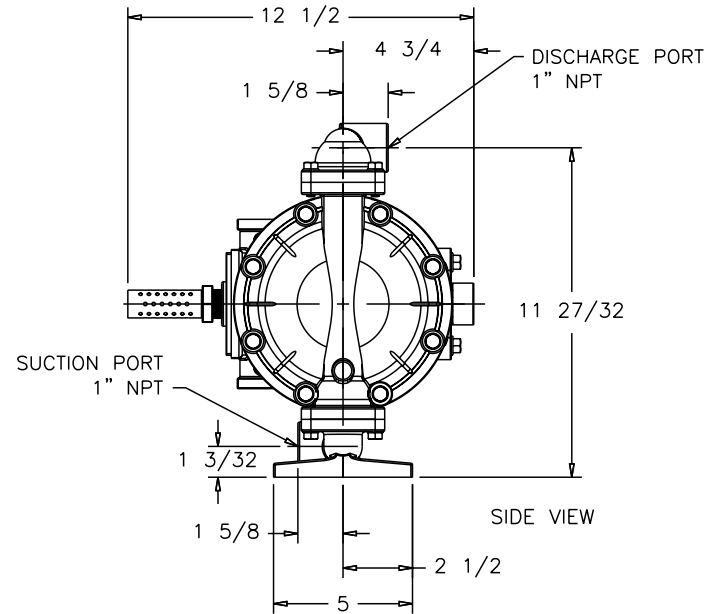
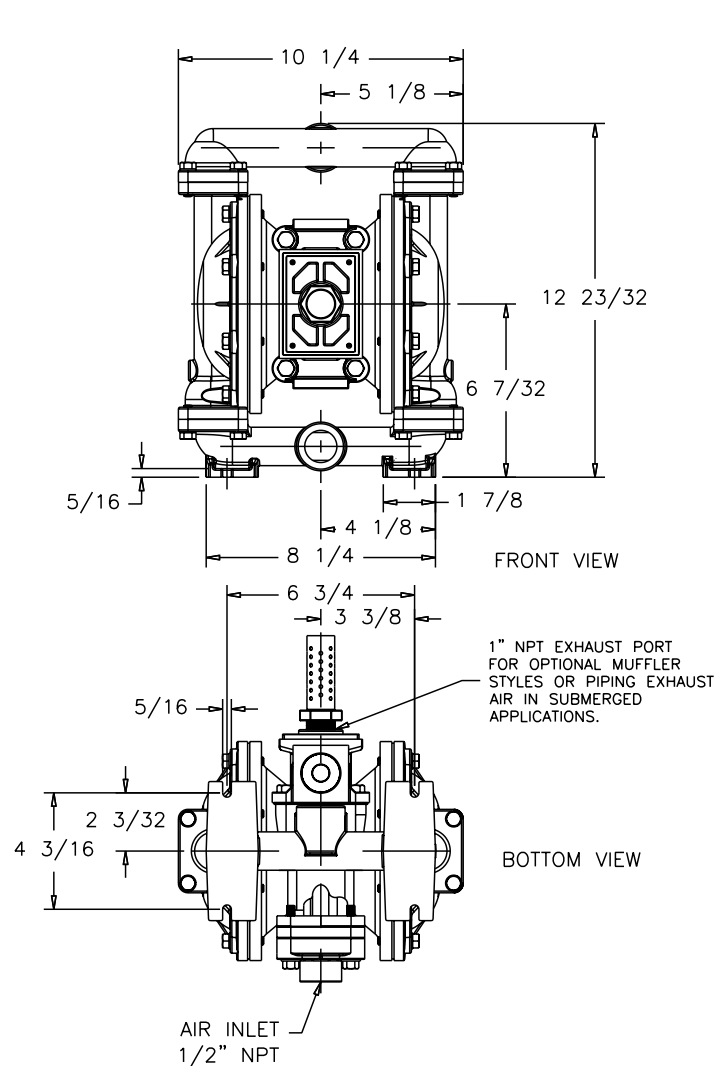
Performance Curve, U1F UL79 Listed Metallic Design Level 1



Dimensions: U1F UL79 LISTED Metallic

Dimensions in Inches

Dimensional Tolerance: $\pm 1/8$ "



MODELS U1F

DIMENSIONS IN INCHES

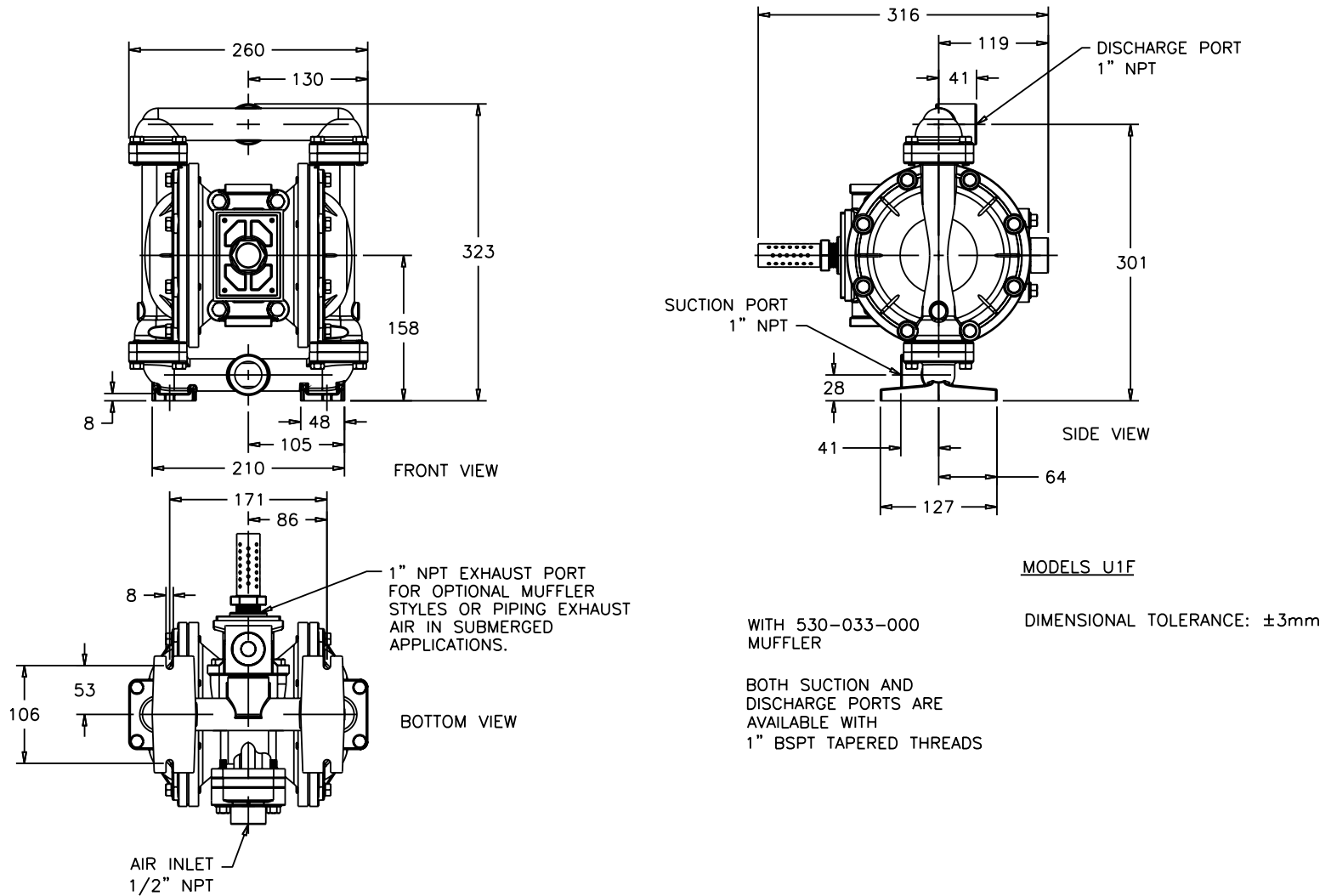
DIMENSIONAL TOLERANCE: $\pm 1/8$

WITH 530-033-000
MUFFLER

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

Metric Dimensions: U1F UL79 Listed Metallic

Dimensions in Millimeters
Dimensional Tolerance: ± 3mm



PRINCIPLE OF PUMP OPERATION

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

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

Alternate pressurizing and exhausting of the diaphragm chamber is performed by an externally mounted, pilot operated, four way spool type air distribution valve. When the spool shifts to one end of the valve body, inlet pressure is applied to one diaphragm chamber and the other diaphragm chamber exhausts. When the spool shifts to the opposite end of the valve

body, the pressure to the chambers is reversed. The air distribution valve spool is moved by a internal pilot valve which alternately pressurizes one end of the air distribution valve spool while exhausting the other end. The pilot valve is shifted at each end of the diaphragm stroke when a actuator plunger is contacted by the diaphragm plate. This actuator plunger then pushes the end of the pilot valve spool into position to activate the air distribution valve.

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

INSTALLATION AND START-UP

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

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

AIR SUPPLY

Air supply pressure cannot exceed 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 conductive hose not less than 1/2"

(13mm) in diameter between the pump and the piping to reduce strain to the piping. The weight of the air supply line, regulators and filters must be supported by some means other than the air inlet cap. Failure to provide support for the piping may result in damage to the pump. A pressure regulating valve should be installed to insure air supply pressure does not exceed recommended limits.

AIR VALVE LUBRICATION

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

AIR LINE MOISTURE

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

AIR INLET AND PRIMING

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

BETWEEN USES

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



INSTALLATION GUIDE

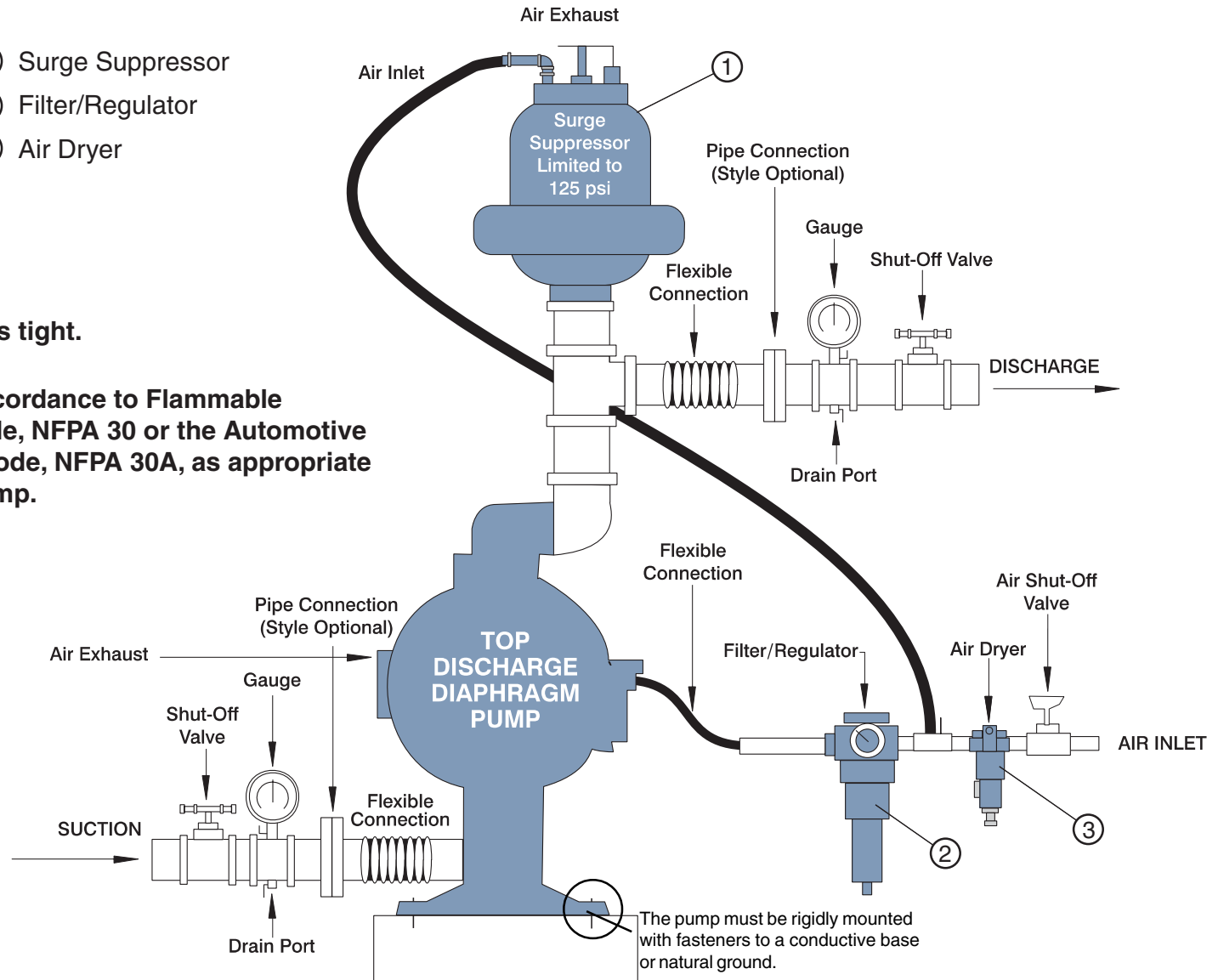
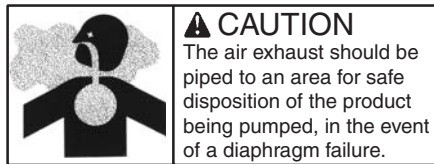
Top Discharge Ball Valve Pump

- ① Surge Suppressor
- ② Filter/Regulator
- ③ Air Dryer

CAUTION

Use a gasoline-resistant pipe compound to make pipe joints tight.

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



The pump must be rigidly mounted with fasteners to a conductive base or natural ground.

TROUBLESHOOTING

Possible Symptoms:

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

What to Check: Excessive suction lift in system.

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

What to Check: Excessive flooded suction in system.

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

What to Check: System head exceeds air supply pressure.

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

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

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

What to Check: Undersized suction line.

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

What to Check: Restricted or undersized air line.

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

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

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

What to Check: Rigid pipe connections to pump.

Corrective Action: Install flexible connectors and a surge suppressor.

What to Check: Blocked air exhaust muffler.

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

What to Check: Pumped fluid in air exhaust muffler.

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

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

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

What to Check: Obstructed check valve.

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

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

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

What to Check: Blocked suction line.

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

What to Check: Blocked discharge line.

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

What to Check: Blocked pumping chamber.

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

What to Check: Entrained air or vapor lock in one or both pumping chambers.

Corrective Action: Purge chambers through tapped chamber vent plugs. PURGING THE CHAMBERS OF AIR CAN BE DANGEROUS! Contact the Warren Rupp Technical Services Department before performing this procedure. Any model with top-ported discharge will reduce or eliminate problems with entrained air.

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

WARRANTY

Refer to the enclosed Warren Rupp Warranty Certificate.

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.

Pump complies with EN809 Pumping Directive and Directive 98/37/EC Safety of Machinery, and ATEX 100a Directive 94/9/EC Equipment for use in potentially Explosive Environments. For reference to the directive certificates visit: www.warrenrupp.com. The technical files are stored at KEMA, notified body 0344, under document #203040000.



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

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 21)



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	175 Die Cast Zinc	375 Fluorinated Nitrile	606 PTFE
010 Cast Iron	180 Copper Alloy	377 Conductive HNBR	607 Envelon
012 Powered Metal	305 Carbon Steel, Black Epoxy Coated	378 High Density Polypropylene	608 Conductive PTFE
015 Ductile Iron	306 Carbon Steel, Black PTFE Coated	379 Conductive Nitrile	610 PTFE Encapsulated Silicon
020 Ferritic Malleable Iron	307 Aluminum, Black Epoxy Coated	405 Cellulose Fibre	611 PTFE Encapsulated Viton
025 Music Wire	308 Stainless Steel, Black PTFE Coated	408 Cork and Neoprene	632 Neoprene/Hytrel
080 Carbon Steel, AISI B-1112	309 Aluminum, Black PTFE Coated	425 Compressed Fibre	633 Viton/PTFE
100 Alloy 20	310 Kynar Coated	426 Blue Gard	634 EPDM/PTFE
110 Alloy Type 316 Stainless Steel	330 Zinc Plated Steel	440 Vegetable Fibre	635 Neoprene/PTFE
111 Alloy Type 316 Stainless Steel (Electro Polished)	331 Chrome Plated Steel	465 Fibre	637 PTFE , Viton/PTFE
112 Alloy "C" (Hastelloy equivalent)	332 Aluminum, Electroless Nickel Plated	500 Delrin 500	638 PTFE , Hytrel/PTFE
113 Alloy Type 316 Stainless Steel (Hand Polished)	333 Carbon Steel, Electroless Nickel Plated	501 Delrin 570	639 Buna-N/TFE
114 303 Stainless Steel	335 Galvanized Steel	502 Conductive Acetal, ESD-800	643 Santoprene®/EPDM
115 302/304 Stainless Steel	336 Zinc Plated Yellow Brass	503 Conductive Acetal, Glass-Filled	644 Santoprene®/PTFE
117 440-C Stainless Steel (Martensitic)	337 Silver Plated Steel	505 Acrylic Resin Plastic	656 Santoprene Diaphragm and Check Balls/EPDM Seats
120 416 Stainless Steel (Wrought Martensitic)	340 Nickel Plated	506 Delrin 150	661 EPDM/Santoprene
123 410 Stainless Steel (Wrought Martensitic)	342 Filled Nylon	520 Injection Molded PVDF Natural color	760 UL Listed or Approved Nitrile Compounds
148 Hardcoat Anodized Aluminum	353 Geolast; Color: Black	540 Nylon	
149 2024-T4 Aluminum	354 Injection Molded #203-40 Santoprene- Duro 40D +/-5; Color: RED	541 Nylon	
150 6061-T6 Aluminum	355 Thermal Plastic	542 Nylon	
151 6063-T6 Aluminum	356 Hytrel	544 Nylon Injection Molded	
152 2024-T4 Aluminum (2023-T351)	357 Injection Molded Polyurethane	550 Polyethylene	
154 Almag 35 Aluminum	358 Urethane Rubber (Some Applications) (Compression Mold)	551 Glass Filled Polypropylene	
155 356-T6 Aluminum	359 Urethane Rubber	552 Unfilled Polypropylene	
156 356-T6 Aluminum	360 Buna-N Rubber. Color coded: RED	553 Unfilled Polypropylene	
157 Die Cast Aluminum Alloy #380	361 Buna-N	555 Polyvinyl Chloride	
158 Aluminum Alloy SR-319	363 Viton (Fluorel). Color coded: YELLOW	556 Black Vinyl	
159 Anodized Aluminum	364 E.P.D.M. Rubber. Color coded: BLUE	570 Rulon II	
162 Brass, Yellow, Screw Machine Stock	365 Neoprene Rubber. Color coded: GREEN	580 Ryton	
165 Cast Bronze, 85-5-5-5	366 Food Grade Nitrile	590 Valox	
166 Bronze, SAE 660	368 Food Grade EPDM	591 Nylatron G-S	
170 Bronze, Bearing Type, Oil Impregnated	370 Butyl Rubber. Color coded: BROWN	592 Nylatron NSB	
	371 Philthane (Tuftane)	600 PTFE (virgin material) Tetrafluorocarbon (TFE)	
	374 Carboxylated Nitrile	601 PTFE (Bronze and moly filled)	
		602 Filled PTFE	
		603 Blue Gylon	
		604 PTFE	

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

Composite Repair Parts Drawing

Add Kits:
476-230-000

AIR END KIT (Available Service Kits:)

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

476-213-760

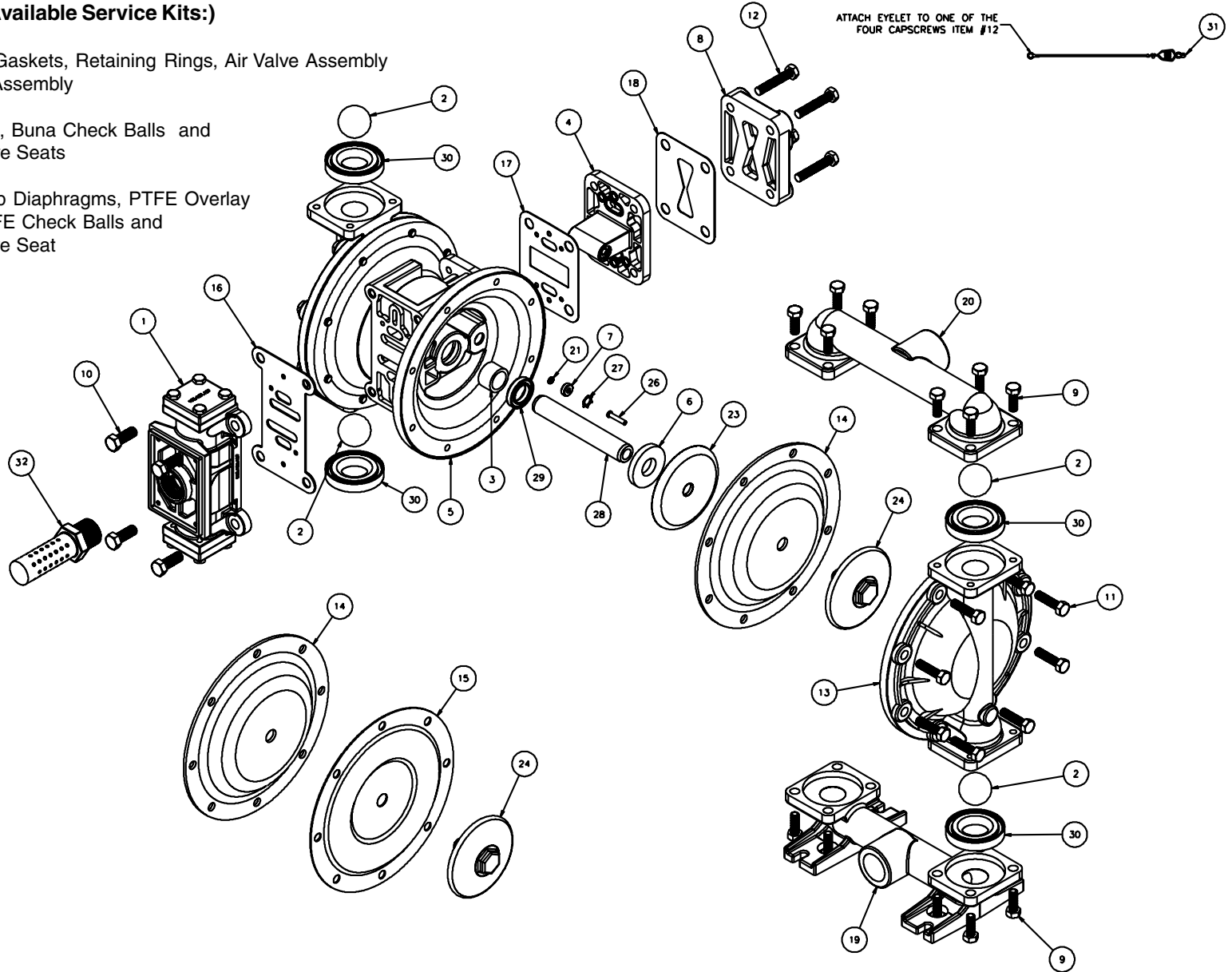
Wetted End Kit

Buna Diaphragms, Buna Check Balls and PTFE Check Valve Seats

476-213-635

Wetted End Kit

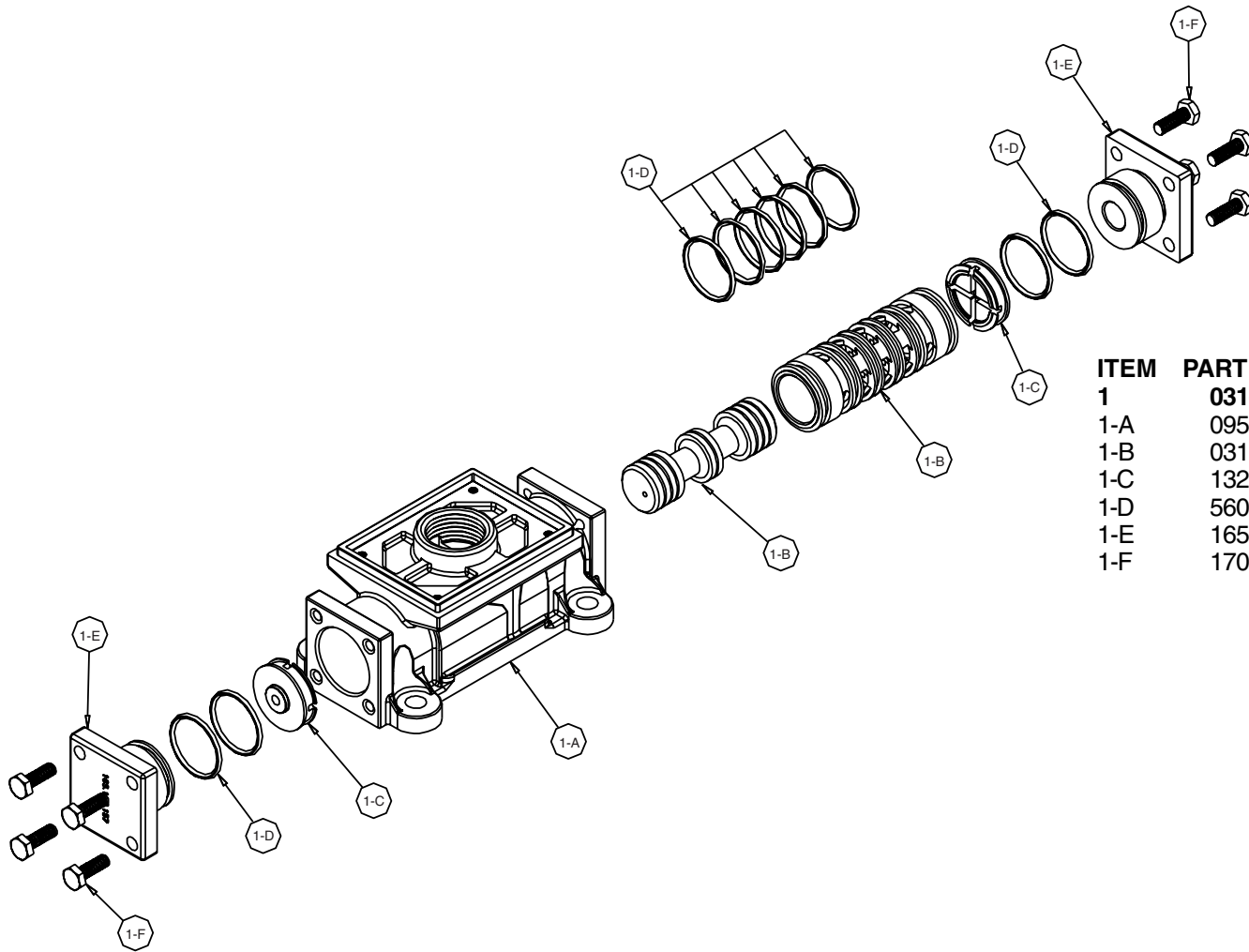
Neoprene Backup Diaphragms, PTFE Overlay Diaphragms, PTFE Check Balls and PTFE Check Valve Seat



Composite Repair Parts List

ITEM	PART NUMBER	DESCRIPTION	QTY	ITEM	PART NUMBER	DESCRIPTION	QTY
1	031-178-000	Air Valve Assembly	1	17	360-103-360	Gasket, Pilot Valve	1
2	050-028-760	Ball, Check	4	18	360-104-379	Gasket, Air Inlet	1
	050-028-600	Ball, Check	4	19	518-175-156	Manifold, Suction	1
3	070-012-170	Bushing	2		518-175-156E	Manifold, Suction 1" BSPT (Tapered)	1
4	095-110-000	Pilot Valve Assembly	1	20	518-176-156	Manifold, Discharge	1
5	114-025-157	Intermediate	1		518-176-156E	Manifold, Discharge 1" BSPT (Tapered)	1
6	132-019-360	Bumper	2	21	560-001-379	O-Ring	2
7	135-036-506	Bushing	2	23	612-022-330	Plate, Inner Diaphragm	2
8	165-120-157	Cap, Air Inlet Assembly	1	24	612-108-157	Plate, Outer Diaphragm Assembly	2
9	170-005-330	Capscrew, Hex Hd 5/16-18 X .88	16	26	620-022-115	Pin, Actuator	2
10	170-006-330	Capscrew, Hex Hd 3/8-16 X 1.00	4	27	675-042-115	Ring, Retaining	2
11	170-045-330	Capscrew, Hex Hd 5/16-18 X 1.25	16	28	685-060-120	Rod, Diaphragm	1
12	170-069-330	Capscrew, Hex Hd 5/16-18 X 1.75	4	29	720-010-375	Seal, U-Cup	2
13	196-173-156	Chamber, Outer	2	30	722-098-600	Seat, Check Ball	4
14	286-008-760	Diaphragm	2	31	920-025-000	Ground Strap	1
	286-008-365	Diaphragm	2	32	530-033-000	Metal Muffler	1
15	286-015-604	Diaphragm, Overlay	2				
16	360-093-360	Gasket, Air Valve	1				

Air Valve Assembly Drawing, Parts List



AIR VALVE ASSEMBLY PARTS LIST

ITEM	PART NUMBER	DESCRIPTION	QTY
1	031-178-000	Gas Valve Assembly	1
1-A	095-109-157	Valve Body	1
1-B	031-139-000	Sleeve and Spool Set	1
1-C	132-029-357	Bumper	2
1-D	560-020-379	O-Ring	10
1-E	165-127-157	Cap, End	2
1-F	170-032-330	Capscrew	8

AIR DISTRIBUTION VALVE SERVICING

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

STEP #1: See COMPOSITE REPAIR PARTS DRAWING.

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

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

STEP #2: Disassembly of the air valve.

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

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

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

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

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

STEP #3: Reassembly of the air valve.

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

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

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

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

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



! IMPORTANT

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

Pilot Valve Servicing, Assembly Drawing & Parts List

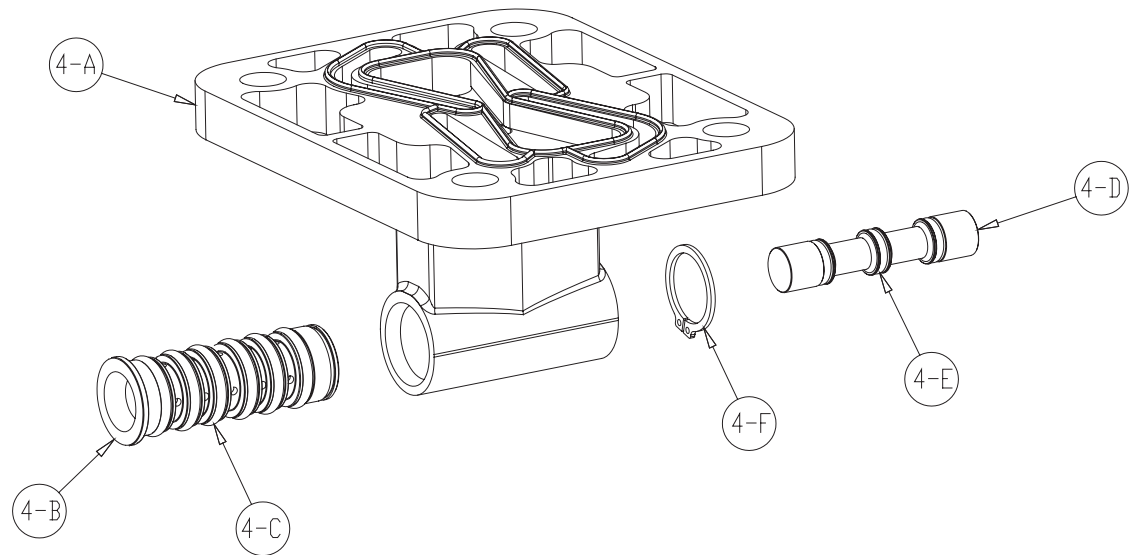
PILOT VALVE ASSEMBLY PARTS LIST

ITEM	PART NUMBER	DESCRIPTION	QTY
4	095-110-000	Pilot Valve Assembly	1
4-A	095-095-157	Valve Body	1
4-B	755-051-000	Sleeve (With O-rings)	1
4-C	560-033-379	O-ring (Sleeve)	6
4-D	775-055-000	Spool (With O-rings)	1
4-E	560-023-379	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)



PILOT VALVE SERVICING

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

STEP #1: See pump assembly drawing.

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

STEP #2: Disassembly of the pilot valve.

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

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

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

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

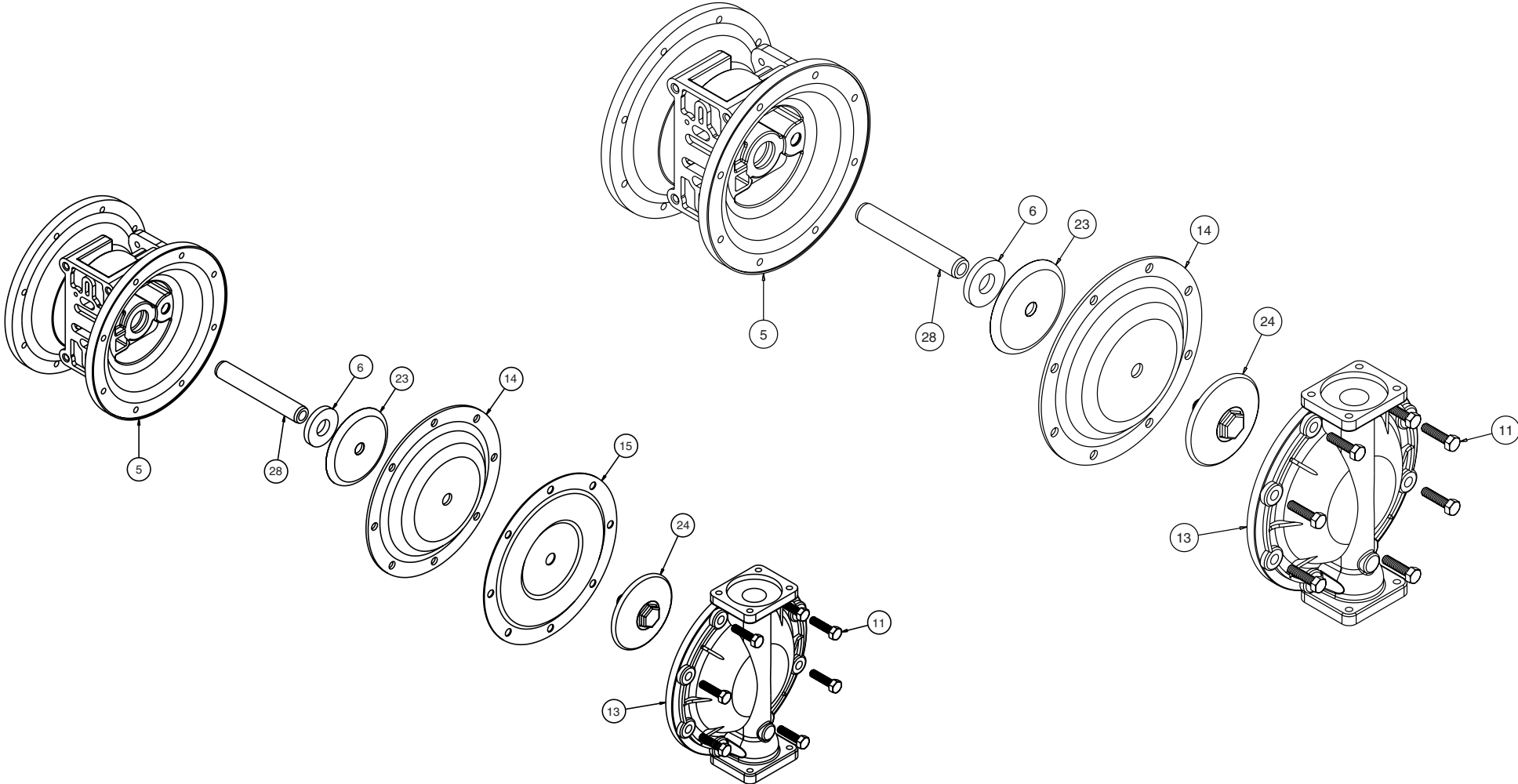
STEP #4: Re-install the pilot valve assembly into the intermediate.

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

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

Diaphragm Service Drawing, with Overlay

Diaphragm Service Drawing, Non-Overlay



DIAPHRAGM SERVICING

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

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

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

Step #2: Removing outer chambers.

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

Step #3: Removing the diaphragms and diaphragm plates.

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

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

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

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

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

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

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

Align one diaphragm with the intermediate and install the outer chamber to the pump using the 8

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

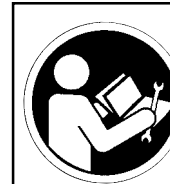
Step #6: Reinstall the manifolds to the pump using the 16 capscrews.

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

OVERLAY DIAPHRAGM SERVICING

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

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



! IMPORTANT

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ACTUATOR PLUNGER SERVICING

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

Step #1: See PUMP ASSEMBLY DRAWING.

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

Step #2: Inspect the actuator plungers.

See ILLUSTRATION AT RIGHT.

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

Remove the plungers (item 25) from the bushings (item 7) in each end of the cavity. Inspect the installed o-ring (items 21) for cuts and/or wear. Replace the o-rings if necessary. Apply a light coating of grease to each o-ring and re-install the plungers in to the bushings. Push the plungers in as far as they will go.

To remove the bushings (item 7), first remove the retaining rings (item 26) by using a flat screwdriver.

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

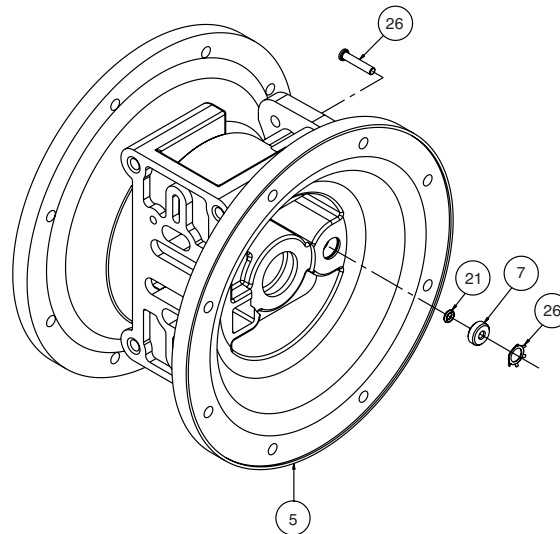
Step #3: Re-install the pilot valve assembly into the intermediate assembly.


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

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

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

ACTUATOR PLUNGER SERVICING





! IMPORTANT

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CHECK VALVE SERVICING

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

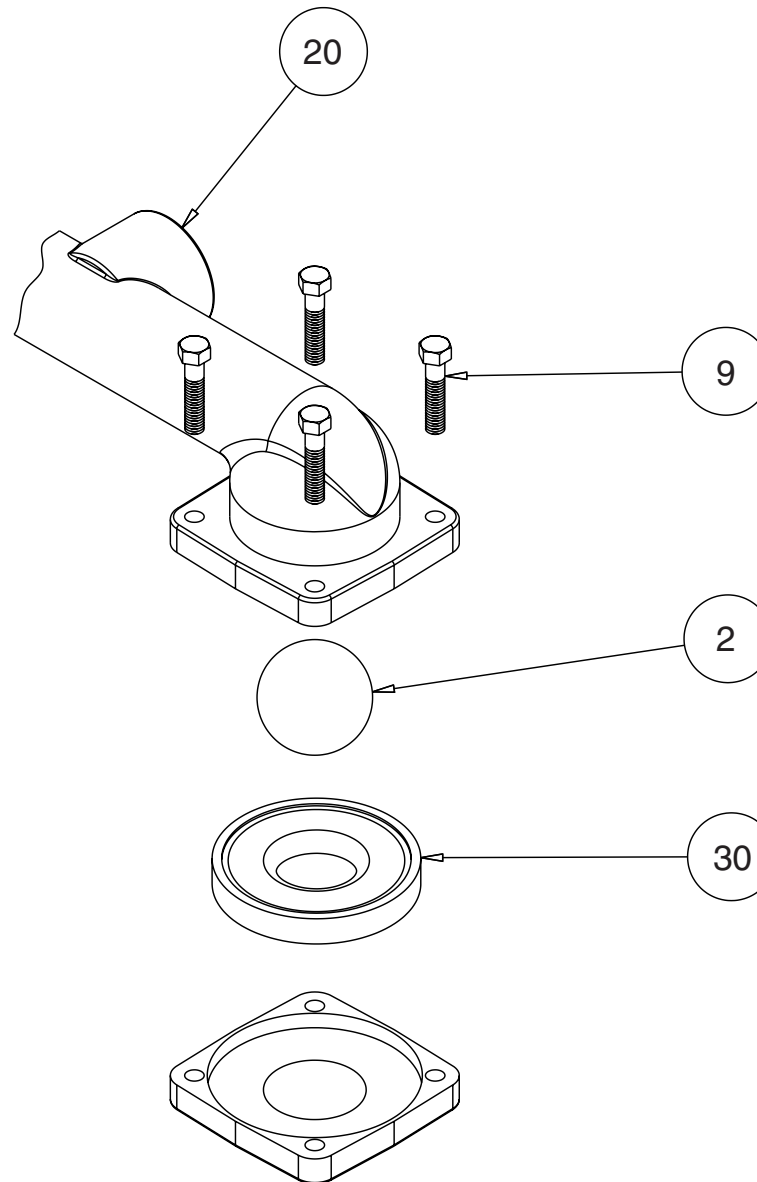
To access the check valve components, remove the manifold (item 20 or item 19 not shown). Use a 1/2" wrench or socket to remove the fasteners. Once the manifold is removed, the check valve components can be seen.

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

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

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

Check Valve Drawing



PUMPING HAZARDOUS LIQUIDS

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

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

CONVERTING THE PUMP FOR PIPING THE EXHAUST AIR

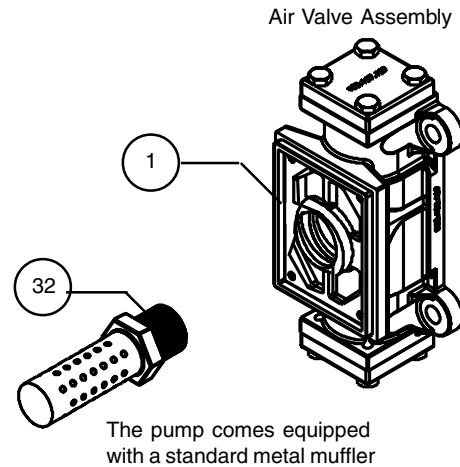
The following steps are necessary to convert the pump to pipe the exhaust air away from the pump.

Remove the muffler (item 32). The air distribution valve (item 1) has 1" NPT threads for piped exhaust.

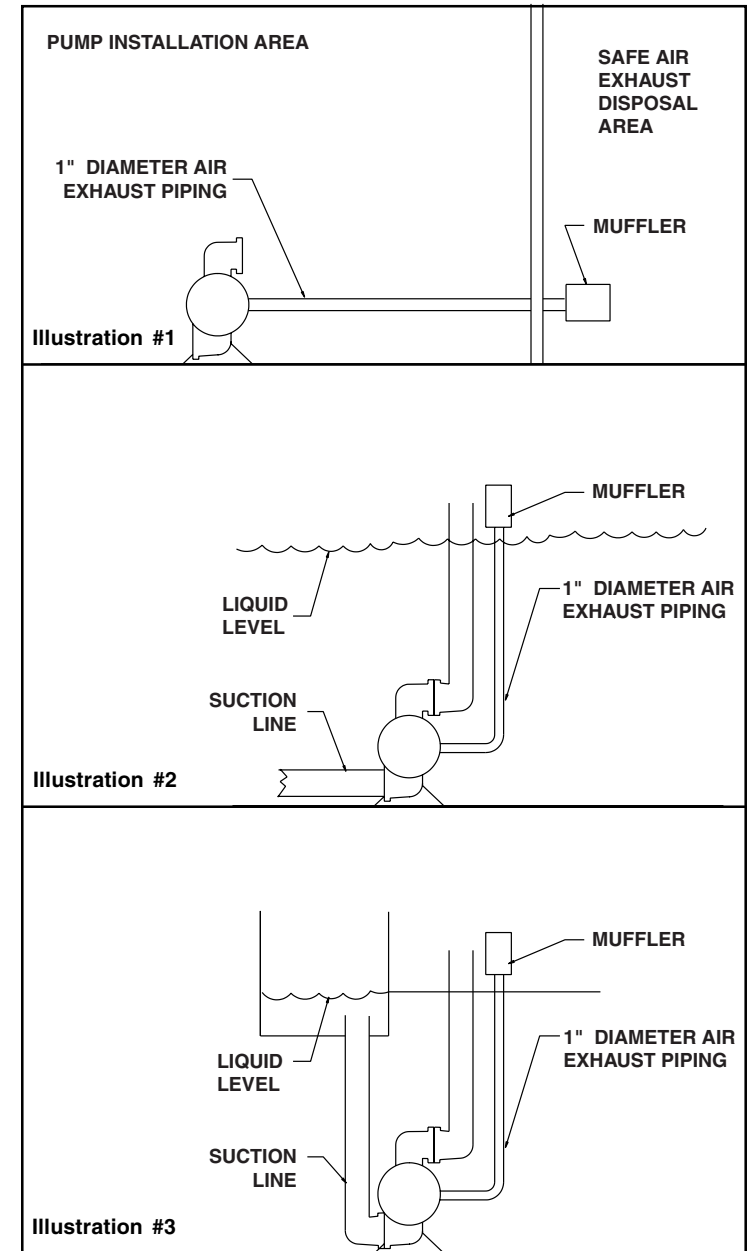
IMPORTANT INSTALLATION

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.

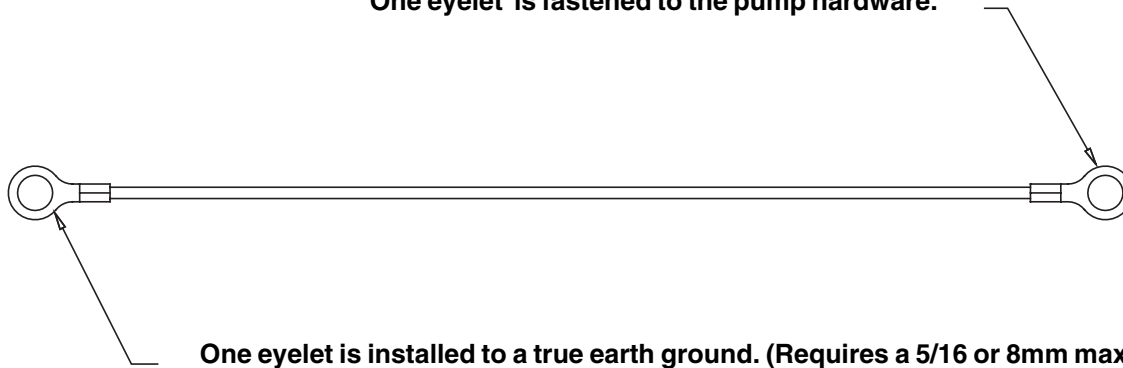


CONVERTED EXHAUST ILLUSTRATION

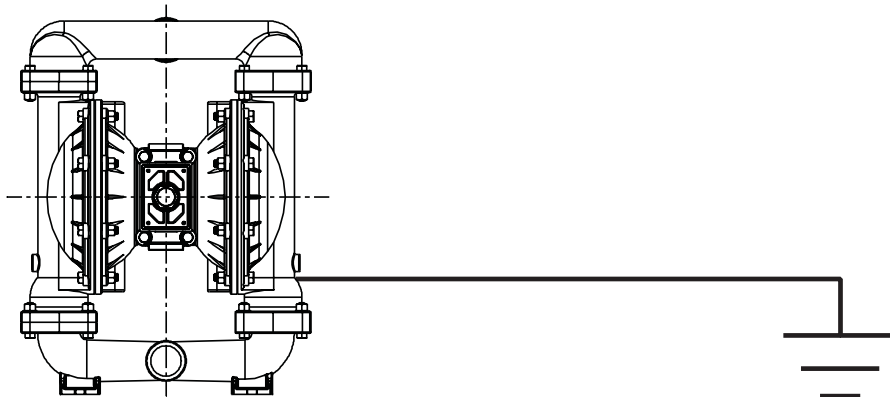


Grounding The Pump

One eyelet is fastened to the pump hardware.



One eyelet is installed to a true earth ground. (Requires a 5/16 or 8mm maximum diameter bolt)



This 8 foot long (244 centimeters) Ground Strap (Item 31) is shipped with the eyelet end fastened to the pump hardware.

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, or in the absence of local codes, an industry or nationally recognized code having jurisdiction over specific installations, and/or CAN/CGA B149, installation codes.

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

