SERVICE & OPERATING MANUAL

VERSA-MATIC®

Model E3 Non-Metallic
Design Level 2

CE

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

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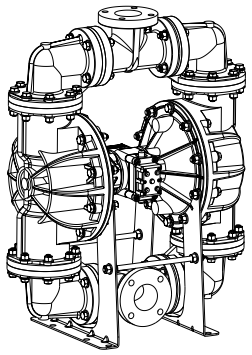
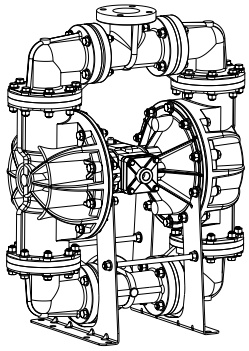
VERSA-MATIC PUMP

Quality System
ISO9001 Certified

IDEX CORPORATION





U.S. Patent #
400,210; 5,851,109;
5,996,627 and 6,241,487

CE

VERSA-MATIC®

E3 Non-Metallic Design Level 2 Ball Valve

Air-Powered Double-Diaphragm Pump

ENGINEERING, PERFORMANCE & CONSTRUCTION DATA

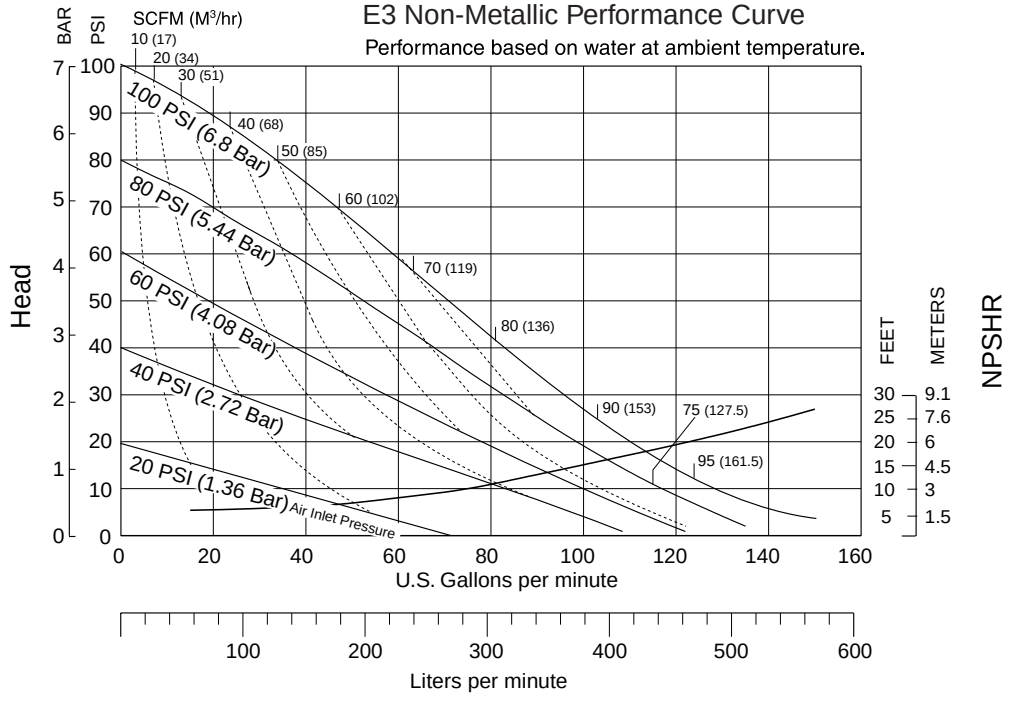
INTAKE/DISCHARGE PIPE SIZE	CAPACITY	AIR VALVE	SOLIDS-HANDLING	HEADS UP TO	DISPLACEMENT/STROKE
3" ANSI Flange or 80mm DIN Flange	0 to 23 US gallons per minute (0 to 901 liters per minute)	No-lube, no-stall design	Up to .71 in. (18mm)	100 psi or 231 ft. of water (7 bar or 70 meters)	.9 US Gallons / 3.41 liters

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° to 100°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.	212°F 100°C	-35°F -37°C	50° to 212°F 10° to 100°C
PVDF	200°F 93°C	10°F -23°C	
Polypropylene	150°F 65°C	40°F 5°C	

Performance Curve

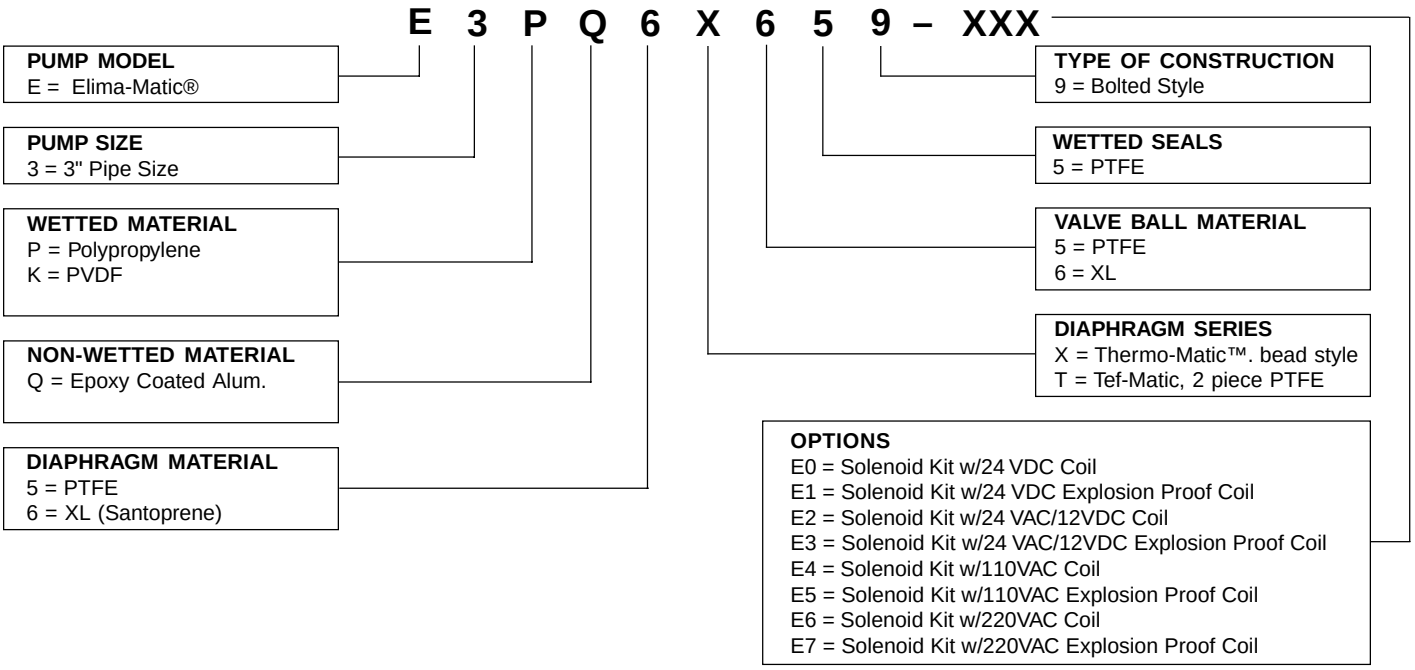
(Versa-Matic® pumps are designed to be powered only by compressed air)



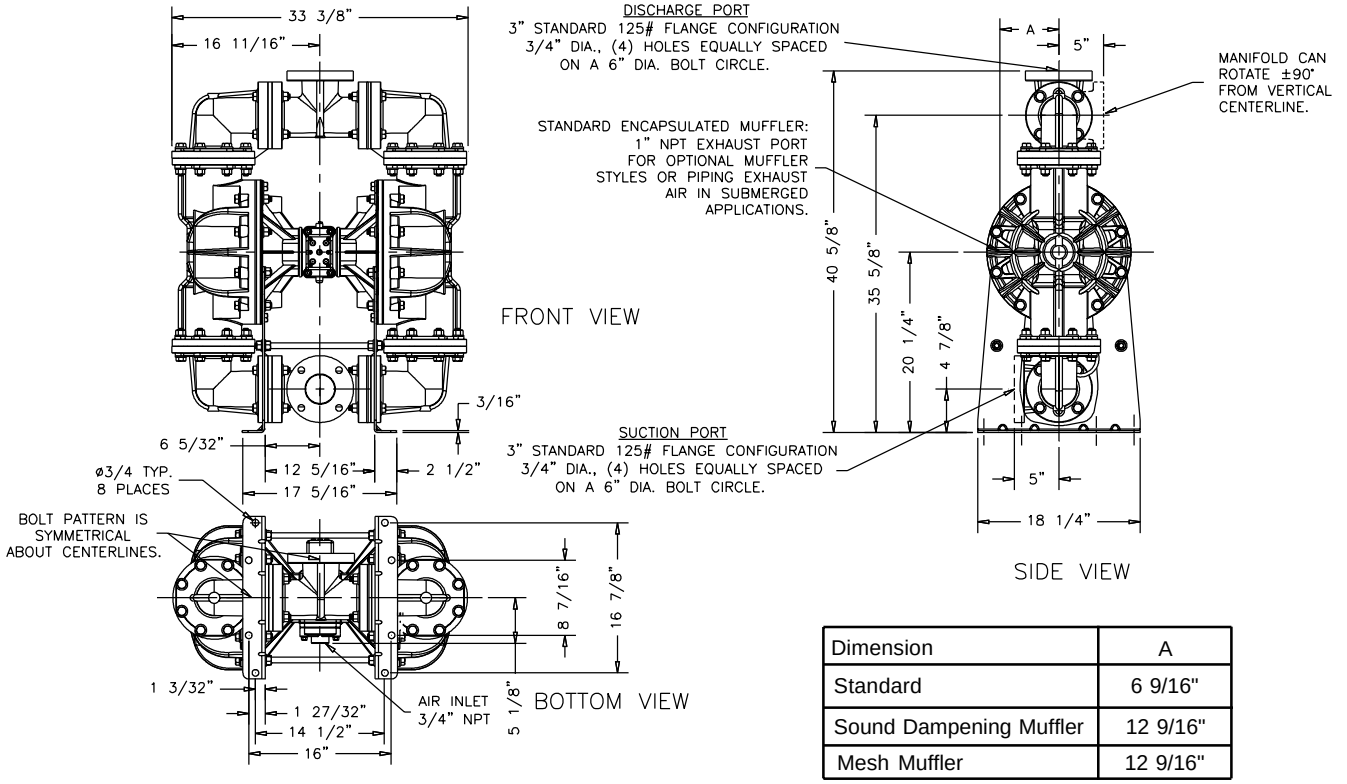
Available Pump Models
E3 Non-Metallic

MODEL TYPE	Pump Size	Wetted Material	Non-Wetted Material	Diaphragm Material	Diaphragm Series	Valve Ball Material	Wetted Seals	Type of Construction	Options
E3PQ6X659	3	P	Q	6	X	6	5	9	–
E3PQ5T559	3	P	Q	5	T	5	5	9	–
E3KQ6X659	3	K	Q	6	X	6	5	9	–
E3KQ5T559	3	K	Q	5	T	5	5	9	–
E3PQ6X659-E0	3	P	Q	6	X	6	5	9	E0
E3PQ5T559-E1	3	P	Q	5	T	5	5	9	E1
E3KQ6X659-E2	3	K	Q	6	X	6	5	9	E2
E3KQ5T559-E3	3	K	Q	5	T	5	5	9	E3

Explanation of Pump Nomenclature:

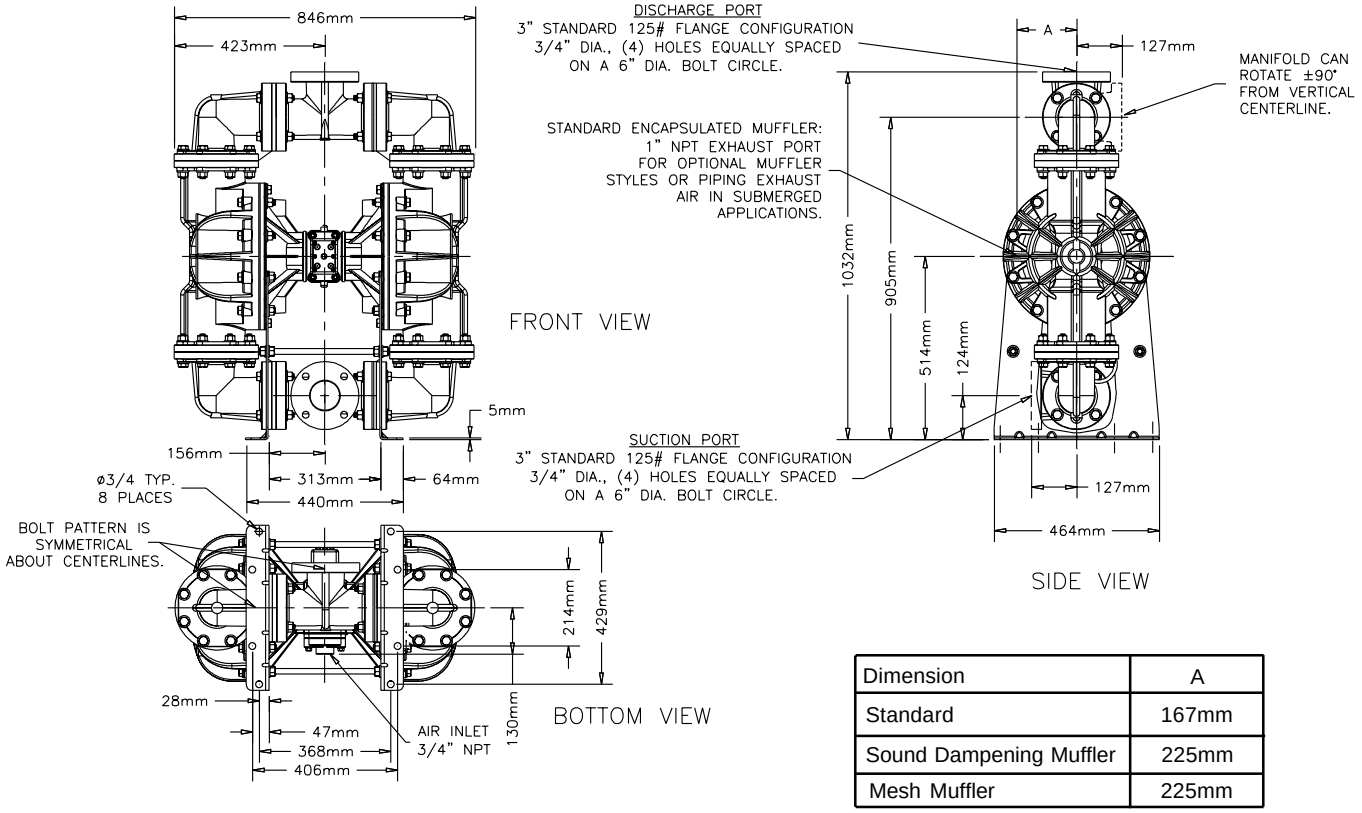


Dimensions: ± 1/8"
E3 Non-Metallic



Dimension	A
Standard	6 9/16"
Sound Dampening Muffler	12 9/16"
Mesh Muffler	12 9/16"

Metric Dimensions: ± 3mm



Dimension	A
Standard	167mm
Sound Dampening Muffler	225mm
Mesh Muffler	225mm

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 centres 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 (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 ½" (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 Versa-Matic) 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 ½ to ¾ 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.

VERSA-MATIC PUMP

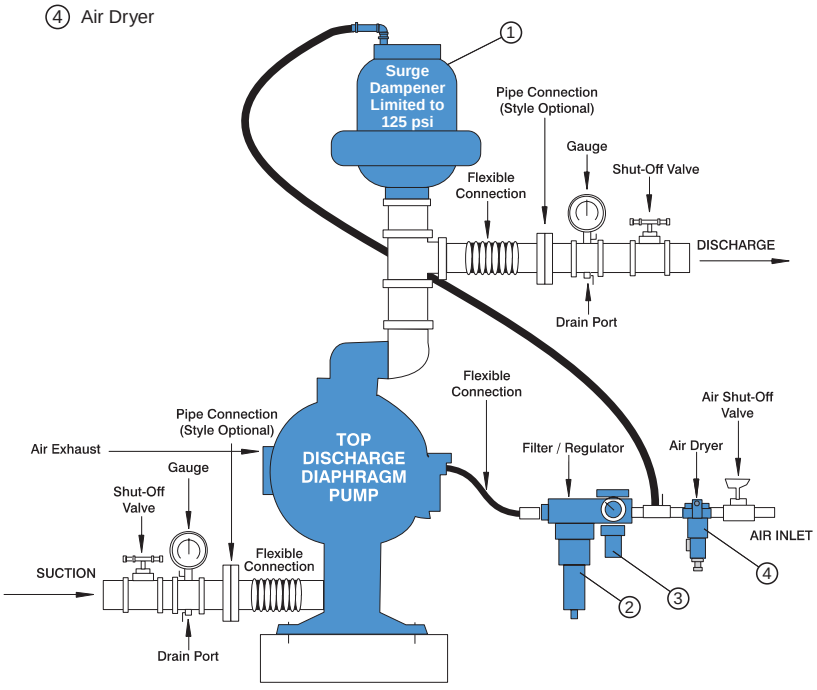
INSTALLATION GUIDE

Top Discharge Ball Unit

Available from Versa-Matic

① Surge Dampener
② Filter/Regulator
③ 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, 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.

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 Versa-Matic 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 Versa-Matic Distributor or factory Technical Services Group for a service evaluation.

Warranty: This pump is warranted for a period of five years against defects and workmanship.

Important Safety Information:

WARNING!

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.

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.

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!

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.

IMPORTANT!

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!

Airborne particles and loud noise hazards. Wear ear and eye protection.

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.

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 Aluminium
149 ..... 2024-T4 Aluminium
150 ..... 6061-T6 Aluminium
151 ..... 6063-T6 Aluminium
152 ..... 2024-T4 Aluminium (2023-T351)
154 ..... Almag 35 Aluminium
155 ..... 356-T6 Aluminium
156 ..... 356-T6 Aluminium
157 ..... Die Cast Aluminium Alloy #380
158 ..... Aluminium Alloy SR-319
159 ..... Anodized Aluminium
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, Gray Epoxy Coated
306 ..... Carbon Steel, Black PTFE Coated
307 ..... Aluminium, Gray Epoxy Coated
308 ..... Stainless Steel, Black PTFE Coated
309 ..... Aluminium, Black PTFE Coated
310 ..... Kynar Coated
330 ..... Zinc Plated Steel
331 ..... Chrome Plated Steel
332 ..... Aluminium, 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) (Compression Mold)
359 ..... Urethane Rubber
360 ..... Buna-N Rubber. Color coded: RED
361 ..... Buna-N
363 ..... Viton (Flurorel). Color coded: YELLOW
364 ..... EPDM 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.

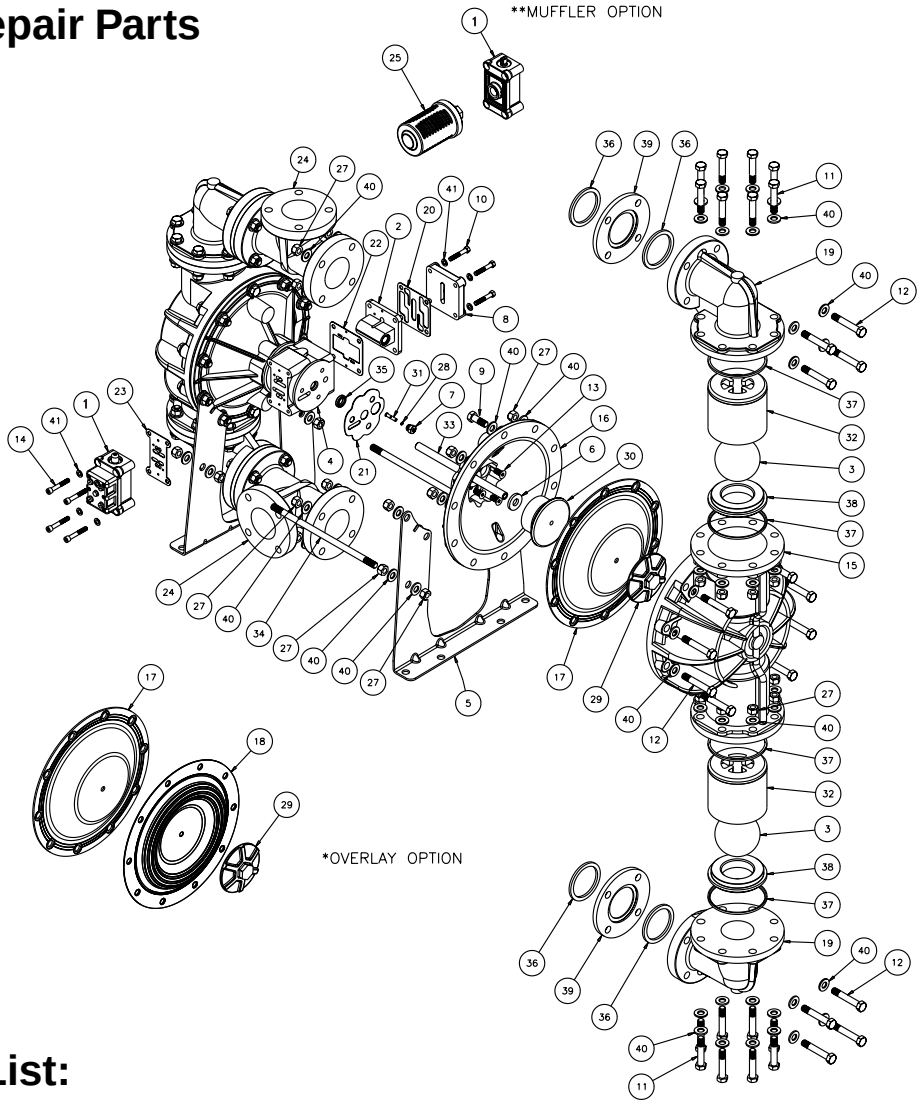
Rulon II is a registered tradename of Dixion Industries Corp.

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.

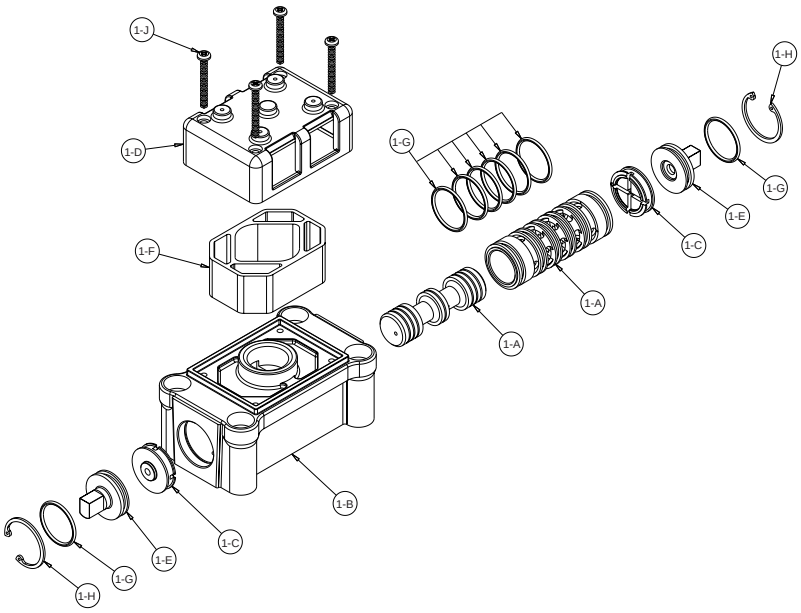
Composite Repair Parts Drawing



Repair Parts List:

1	031-140-000	Air Valve Assembly	1
	031-140-002	Air Valve Assembly w/PTFE coated Hardware	1
	031-141-000	Air Valve Assembly (No Encapsulated Muffler)	1
2	095-089-000	Pilot Valve Assembly	1
3	050-039-354	Ball, Check	4
	050-039-600	Ball, Check	4
4	114-021-307	Intermediate Assembly	1
	114-021-309	Intermediate Assembly	1
5	115-133-080	Bracket, Mounting	2
	115-133-115	Bracket, Mounting	2
	115-133-305	Bracket, Mounting	2
6	132-019-360	Bumper, Diaphragm	2
7	135-032-506	Bushing, Plunger	2
8	165-099-307	Cap, Air Inlet	1
	165-099-309	Cap, Air Inlet	1
9	170-017-115	Capscrew, Hex HD 5/8-11 x 1.75	4
	170-017-308	Capscrew, Hex HD 5/8-11 x 1.75	4
10	170-052-115	Capscrew, Hex HD 3/8-16 x 2.25	4
	170-052-308	Capscrew, Hex HD 3/8-16 x 2.25	4
11	170-111-115	Capscrew, Hex HD 5/8-11 x 3.25	32
	170-111-308	Capscrew, Hex HD 5/8-11 x 3.25	32
12	170-112-115	Capscrew, Hex HD 5/8-11 x 3.75	32
	170-112-308	Capscrew, Soc HD 5/8-11 x 3.75	32
13	170-171-004	Capscrew, Soc HD 1/2-13 x 1.25	6
14	171-053-115	Capscrew, Soc HD 3/8-16 x 2.75	4
	171-053-308	Capscrew, Soc HD 3/8-16 x 2.75	4
15	196-151-520	Chamber, Outer	2
	196-151-552	Chamber, Outer	2
16	196-152-307	Chamber, Inner	2
	196-152-309	Chamber, Inner	2
17	286-077-354	Diaphragm	2
18	286-078-600	Diaphragm, Overlay	2
19	312-103-520	Elbow	4
	312-103-552	Elbow	4
20	360-090-360	Gasket, Air Inlet	1
21	360-091-360	Gasket, Inner Chamber	2
22	360-092-360	Gasket, Pilot Valve	1
23	360-093-360	Gasket, Main Air Valve	1
24	518-133-520	Manifold	2
	518-133-520E	Manifold, 80mm DIN	2
	518-133-552	Manifold	2
	518-133-552E	Manifold, 80mm DIN	2
25	530-027-000	Muffler	1
	530-010-000	Muffler	1
27	545-009-110	Nut, Hex 5/8	72
	545-009-308	Nut, Hex 5/8	72
28	560-001-360	O-ring	2
29	612-161-520	Assembly, Outer Diaphragm Plate	2
	612-161-552	Assembly, Outer Diaphragm Plate	2
30	612-162-150	Assembly, Inner Diaphragm Plate	2
31	620-017-115	Plunger, Actuator	2
32	670-047-520	Retainer, Ball	4
	670-047-552	Retainer, Ball	4
33	685-051-120	Rod, Diaphragm	1
34	685-052-115	Rod, Support	2
	685-052-308	Rod, Support	2
35	720-010-375	Seal, Diaphragm Rod	2
36	720-039-600	Seal, Manifold Spacer	8
37	720-043-600	Seal, Check Valve Assembly	4
38	722-076-520	Seat, Check Valve	4
	722-076-552	Seat, Check Valve	4
39	770-055-520	Spacer, Manifold	4
	770-055-552	Spacer, Manifold	4
40	901-047-115	Washer, Flat 5/8"	140
	901-047-308	Washer, Flat 5/8"	140
41	901-048-115	Washer, Flat 3/8"	8
	901-048-308	Washer, Flat 3/8"	8

Air Distribution Valve Assembly Drawing
S30 Design Level 2



MAIN AIR VALVE ASSEMBLY PARTS LIST

ITEM	PART NUMBER	DESCRIPTION	QTY
1	031-140-000	Main Air Valve Assembly	1
1-A	031-139-000	Spool Assembly	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 equipped with PTFE Coated Hardware			
1	031-140-002	Air Valve Assembly	1
	(Includes all items used on 031-140-000 except:)		
1-J	710-015-308	Screw Self tapping	4
1-H	675-044-308	Ring, Retaining	2
For pumps equipped with PTFE coated hardware option:			
1	031-141-000	Air Valve Assembly	1
	(Includes all items used on 031-140-000 minus items 1-D, 1-F & 1-J)		
For pumps with alternate Mesh or Sound Dampening mufflers or piped exhaust:			
1	031-041-002	Air Valve Assembly	1
	(Includes all items used on 031-141-000 except:)		
1-H	675-044-308	Ring, Retaining	2

Air Distribution Valve Servicing

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

STEP #1: See Composite Repair and Parts Drawing.

Using a 5/16" Allen wrench, remove the four hex socket capscrews (item 14) and four flat washers (item 41). Remove the air valve assembly from the pump.

Remove and inspect gasket (item 23) 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-rings (item 1-G) for cuts or wear. Replace the o-rings if necessary.

Remove the two bumpers (item 1-C). Inspect the bumpers for cuts, wear or abrasion. Replace if necessary.

Remove the spool (part of item 1-A) from the sleeve. Be careful not to stratch or damage the outer diameter of the spool. Wipe spool with a soft cloth and inspect for scratches or wear. Inspect the inner diameter of the sleeve (part of item 1-A) for dirt, scratches, or other contaminates. Remove the sleeve if needed and replace both the sleeve and spool with a new sleeve and spool set (item 1-A).

STEP #3: Reassembly of the air valve.

Install one end cap (item 1-E) with an o-ring (item 1-G) and one bumper (item 1-C) 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 bumper, end cap with o-ring, and retaining ring.

Fasten the air valve assembly (item 1) and gasket (item 23) to the pump.

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

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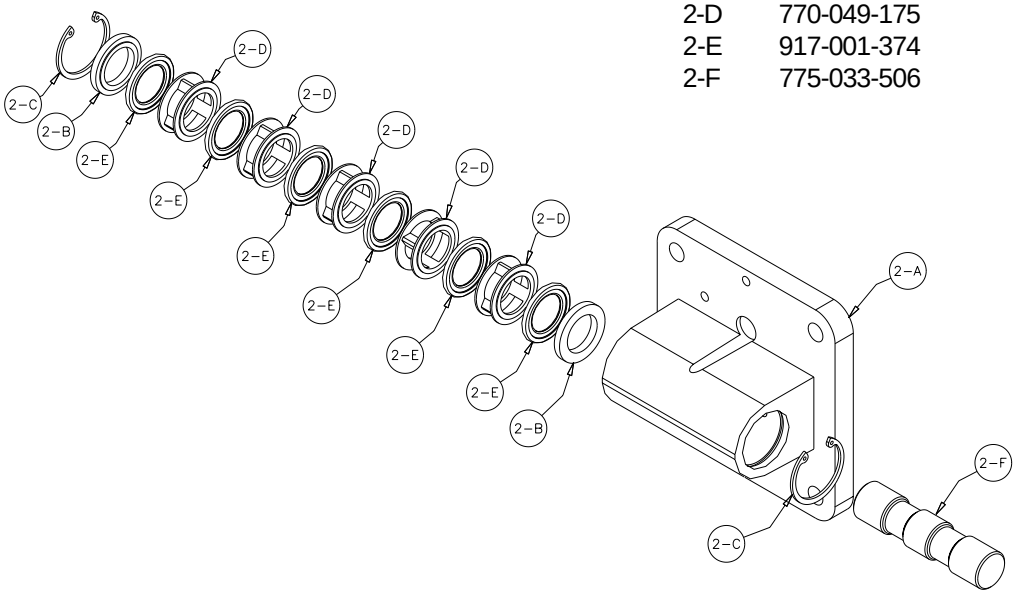
Pilot Valve Assembly Drawing

PILOT VALVE ASSEMBLY PARTS LIST

ITEM	PART NUMBER	DESCRIPTION	QTY
2	095-089-000	Pilot Valve Assembly	1
2-A	095-081-551	Body, Pilot Valve	1
2-B	135-033-506	Bushing	2
2-C	675-055-115	Ring, Retaining	2
2-D	770-049-175	Spacer	5
2-E	917-001-374	Wiper	6
2-F	775-033-506	Spool, Pilot	1



Pilot Valve Servicing

To service the pilot valve first shut off the compressed air supply, bleed the pressure from the pump, and disconnect the air supply line from the pump. Insert the safety clip (item 1-F from Air Distribution Valve assembly drawing) into the smaller unthreaded holes in the end cap (item 1-E from air distribution valve assembly drawing).

Step #1: See PUMP ASSEMBLY DRAWING.

Using a $^{9}/_{16}$" wrench or socket, remove the four capscrews (items 10) and four flat washers (items 41). Remove the air inlet cap (item 8) and air inlet gasket (item 20). The pilot valve assembly (item 2) can now be removed for inspection or service.

Step #2: Disassembly of the pilot valve.

Remove the pilot valve spool (item 2-F). Wipe clean, and inspect for dirt, scratches or wear. Replace the spool if necessary.

Remove the two retaining rings (items 2-C) from each end of the pilot valve body using clip ring pilers.

Remove the two pilot valve bushings (items 2-B), five spacers (items 2-D), and six spool wipers (items 2-E) by pushing gently from other end of the pilot valve body. Inspect the wipers for cuts and/or wear. Replace any wipers as necessary.

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

First install a spiral retaining ring to one end of the pilot valve body. Install one bushing making sure the step side faces toward the wiper. Apply a light coating of grease to the outside diameter of each wiper. Next, gently push in the wipers and spacers until they are against the installed retaining ring in the opposite end of the pilot valve body. Install the remaining bushing making sure the step side faces the wiper. Install the remaining retaining ring using clip ring pilers.

Apply a light coating of grease to the inner diameter of each wiper. Also apply a light coating of grease to the outer diameter of the pilot valve spool and gently push the spool through each wiper.

Step #4: Inspect the actuator plungers.

See PUMP ASSEMBLY DRAWING.

The actuator plungers (items 31) can be reached through the stem cavity of the pilot valve in the intermediate assembly (item 4).

Remove the plungers (items 31) from the bushings (item 7) in each end of the cavity. Inspect the installed o-ring (items 28) 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.

Step #5: Re-install the pilot valve ssembly 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), capscrews and washers (items 10 and 39).

Connect the air supply to the pump. Remove the safety clip (item 1-F) from the end cap (item 1-E). The pump is now ready for operation.

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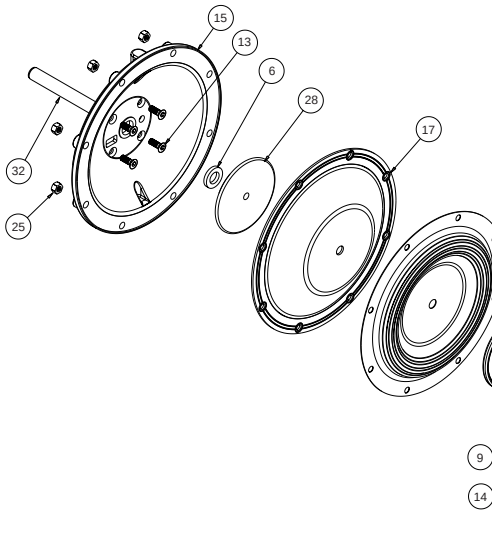
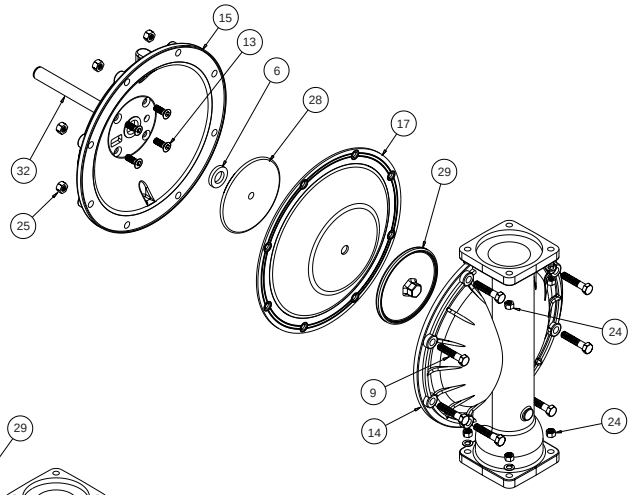
Diaphragm Service Drawing, Non-Overlay



Diaphragm Service Drawing, with 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 composite repair parts drawing, and the diaphragm servicing illustration.

Using a $^{9}/_{16}$" wrench or socket, remove the 16 capscrews (items 11), hex nuts and washers that fasten the elbows (items 19) to the outer chambers (items 15). Remove the elbows with the manifolds and spacers attached.

Step #2: Removing the outer chambers.

Using a $^{9}/_{16}$" wrench or socket, remove the 20 capscrews (items 9 & 12), hex nuts and washers that fasten the outer chambers, diaphragms, and inner chambers (items 16) together.

Step #3: Removing the diaphragm assemblies.

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

Insert a 1/4-20 capscrew or set screw into the smaller tapped hole in the inner diaphragm plate (item 30). Insert the protruding stud and the 1/4-20 fastener loosely into a vise. Use a $1^{3}/_{8}$" wrench or socket to remove the outer diaphragm plate (item 29) by turning counterclockwise. Inspect the diaphragm (item 17) 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 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 33) until the inner diaphragm plate is flush to the end of the rod. Insert rod into pump.

Align the bolt holes in the diaphragm with the bolt pattern in the inner chamber (item 16). Make sure the molded directional arrows on the diaphragm point vertically.

Fasten the outer chamber (item 15) to the pump, using the capscrews (items 9 & 12), 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 33) as far as possible and still allow for alignment of the bolt holes in the diaphragm with the bolt pattern in the inner chamber. The molded directional arrows on the diaphragm must point vertically.

Fasten the remaining outer chamber (item 15) to the pump, using the capscrews (items 9 & 12), hex nuts and flat washers.

Step #6: Re-install the elbow/spacer/manifold assemblies to the pump, using the capscrews (items 11)hex nuts and flat washers.

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

OVERLAY DIAPHRAGM SERVICING

The PTFE overlay diaphragm (item 18) is designed to fit snugly over the exterior of the standard TPE diaphragm (item 17).

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

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

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Pumping Hazardous Liquids

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

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

Converting The Pump For Piping The Exhaust Air

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

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

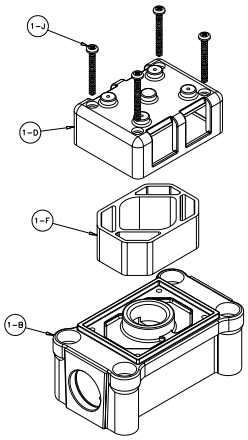
Remove the muffler cap and muffler (items 1-D and 1-F). The 1" NPT molded threads in the air distribution valve body (item 1-B). Piping or hose may now beinstalled.

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

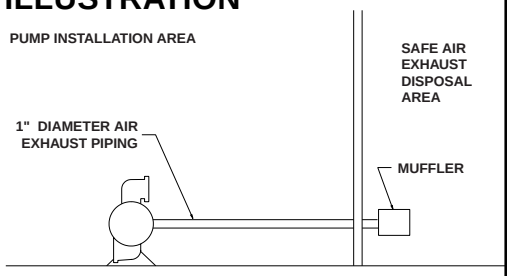


Illustration #1

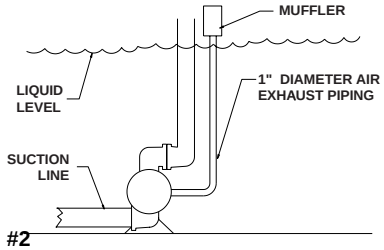


Illustration #2

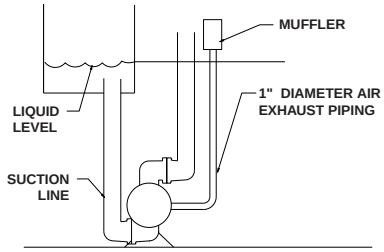


Illustration #3

Modular Check Valve Servicing

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

To access the modular check valve, remove the elbows (items 19 from pump composite repair parts drawing). Use a $^{9}/_{16}$" wrench or socket to remove the fasteners. Once the elbows are removed, the modular check valves can be seen in the cavities of the outer chamber (items 15).

Next remove the check valve seal (item 37). 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 32) for cuts, abrasive wear, or embedded materials. Replace as needed.

Inspect the check balls (items 3) for wear, abrasion, or cuts on the spherical surface. The check valve seats (items 38) should be inspected for cuts, abrasive wear, or embedded material on the surfaces of both the external and internal chamfers. The spherical surface of the check balls must seat flush to the surface of the inner chamfer on the check valve seats for the pump to operate to peak efficiency. Replace any worn or damaged parts as necessary.

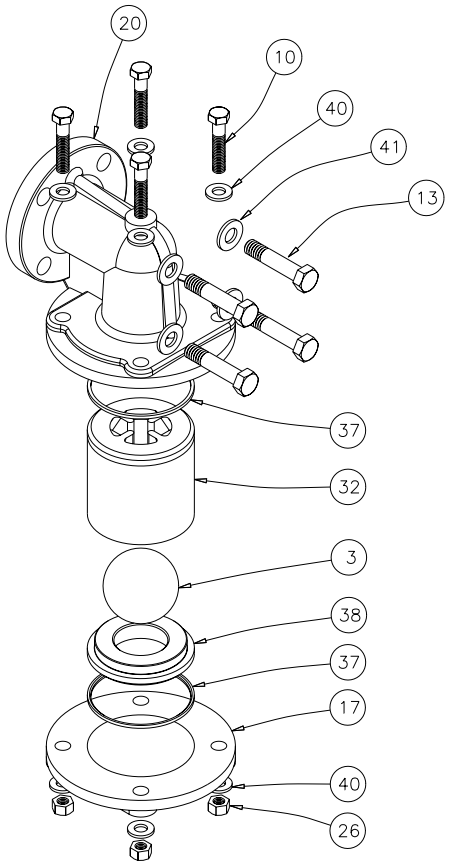
Remove the remaining check valve seal (item 37). Inspect the seal for cuts or pinched areas. Replace seal as needed.

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

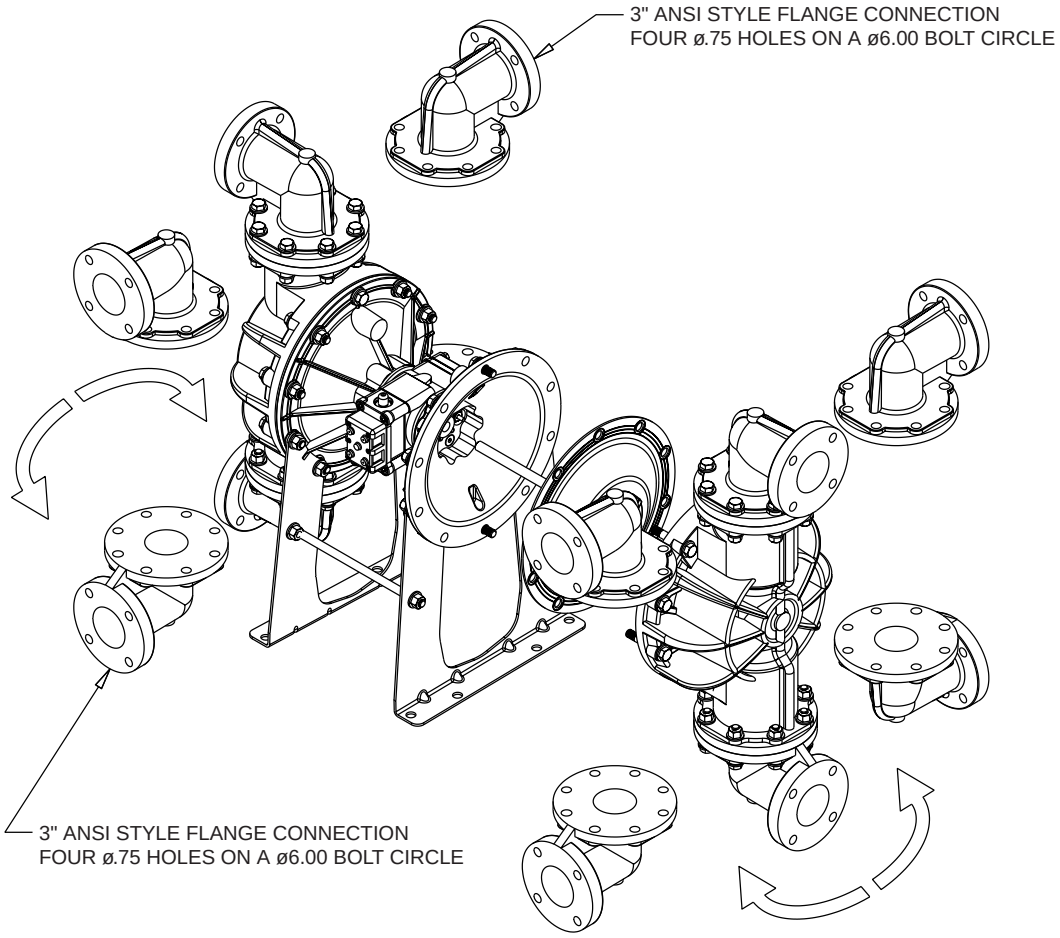
Place a check valve seal (item 37) into the cavity of the outer chamber (item 15). Make sure the chamber side of the seal faces out. Insert the modular check valve into the outer chamber with the retainer facing up. Install a check valve seal (item 37). Make sure the chamber side of the seal faces the chamber on the check valve seat or retainer.

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

Modular Check Valve Drawing



Dual Port Option Drawing



DUAL PORTING OPTIONS

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

The above changes are possible because the porting flange of the elbows (items 19) are designed to mate with standard 125# ANSI style 4-bolt, 3" pipe flanges.

Dual porting of both suction and discharge ends of the pump

Converting the pump from the standard single suction and discharge porting configuration to dual porting at each end is easy. Simply remove the manifold seals, spacers, and manifolds (items 36, 39, and 24 from pump assembly drawing) from the pump.

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

Single porting of the suction and dual porting of the pump discharge

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

Dual porting of the suction and single porting of the pump discharge

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

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

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