WARREN RUPP

IDEX CORPORATION

SERVICE AND OPERATING MANUAL

SandPIPER® Models PB1 ½-A & PB2-A

Type 3

PLEASE NOTE!

The photos shown in this manual are for general instruction only. YOUR SPECIFIC MODEL MAY NOT BE SHOWN. Always refer to the parts list and exploded view drawing for your specific model when installing, disassembling or servicing your pump.

PRINCIPLE OF PUMP OPERATION

This ball type check valve pump is powered by compressed air and is a 1:1 pressure ratio design. It alternately pressurizes the inner side of one diaphragm chamber, while simultaneously exhausting the other inner chamber. This causes the diaphragms, which are connected by a common rod, to move endwise. Air pressure is applied over the entire surface of the diaphragm, while liquid is discharged from the opposite side. The diaphragm operates under a balanced condition during the discharge stroke, which allows the unit to be operated at discharge heads over 200 feet (61 meters) of water head.

Since the diaphragms are connected by a common rod, secured by plates to the center of the diaphragms, one diaphragm performs the discharge stroke, while the other is pulled to perform the suction stroke in the opposite chamber.

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. This will maximize diaphragm life.

Alternate pressuring and exhausting of the diaphragm chamber is performed by means of an externally mounted, pilot operated, four-way spool type air distribution valve. When the spool shifts to one end of the valve body, inlet air 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 porting of chambers is reversed. The air distribution valve spool is moved by an internal pilot valve which alternately pressurizes one side of the air distribution valve spool, while exhausting the other side. The pilot valve is shifted at each end of the diaphragm stroke by the diaphragm plate coming in contact with the end of the pilot spool. This pushes it into position for shifting of the air distribution valve.

The chambers are manifolded together with a suction and discharge check valves for each chamber, maintaining flow in one direction through the pump.

INSTALLATION & START-UP

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

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

This pump was tested at the factory prior to shipment and is ready for operation. It is completely self-priming from a dry start for suction lifts of 15 feet (4.5 meters) or less. For suction lifts exceeding 15 feet of liquid, fill the chambers with liquid prior to priming.

AIR SUPPLY

Air supply pressures cannot exceed 100 psi (7.0 bar). Connect the pump air inlet (Fig. 1) to an air supply of sufficient capacity and pressure required for desired performance. When the air line is solid piping, use a short length of flexible hose not less than ½" (12.7mm) in diameter between pump and piping to eliminate strain to pipes. The weight of the air supply line and of the filter must be supported by some means other than the air valve cap. Failure to provide support may result in damage to the pump. A pressure regulating valve should be installed to prevent pressure from exceeding recommended limits.

⚠ 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.

⚠ HAZARD WARNING ⚠

POSSIBLE EXPLOSION HAZARD can result if 1, 1, 1,-Trichloroethane, Methylene Chloride or other Halogenated Hydrocarbon solvents are used in pressurized fluid systems having Aluminum or Galvanized wetted parts. Death, serious bodily injury and/or property damage could result. Consult with the factory if you have questions concerning Halogenated Hydrocarbon solvents.

⚠ DANGER ⚠

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 at all times in the vicinity of the pump. Failure to follow these recommendations may result in serious injury or death.

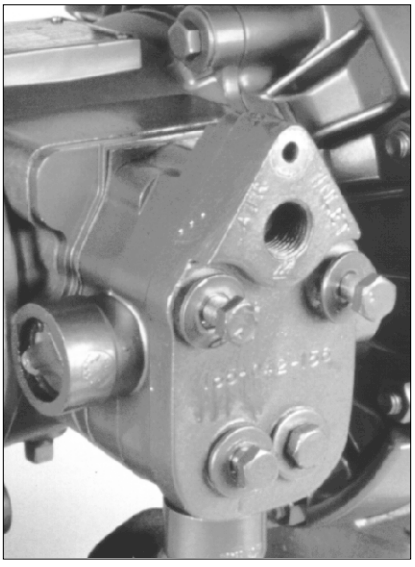

Fig. 1 *Air inlet*

AIR INLET & PRIMING

For start-up, open an air valve approximately 1/2 to 3/4 turn. After the unit primes, an air valve can be opened to increase flow as desired. If opening the valve increases cycling rate, but does not increase flow rate, cavitation has occurred, and the valve should be closed slightly.

For the most efficient use of compressed air and the longest diaphragm life, throttle the air inlet to the lowest cycling rate that does not reduce flow.

A NOTE ABOUT AIR VALVE LUBRICATION

The SandPiper pump's pilot valve and main air valve assemblies 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 supplies. Proper lubrication of the compressed air supply would entail the use of an air line lubricator (available from Warren Rupp) set to deliver one drop of 10 wt., non-detergent oil for every 20 SCFM of air the pump consumed at its point of operation. Consult the pump's published Performance Curve to determine this.

It is important to remember to inspect the sleeve and spool set routinely. It should move back and forth freely. This is most important when the air supply is lubricated. If a lubricator is used, oil accumulation will, over time, collect any debris from the compressed air. This can prevent the pump from operating properly.

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. This can be addressed by using a point of use air dryer (available from Warren Rupp) to supplement a plant's air drying equipment. This device will remove excess water from the compressed air supply and alleviate the icing or freezing problem.

MODELS WITH 1" SUCTION/DISCHARGE OR LARGER, AND NON-METAL CENTER SECTIONS

The main air valve sleeve and spool set is located in the valve body mounted on the pump with four hex head capscrews. The valve body assembly is removed from the pump by removing these four hex head capscrews.

With the valve body assembly off the pump, access to the sleeve and spool set is made by removing a retaining ring (each end) securing the end cap on the valve body assembly. With the end caps removed, slide the spool back and forth in the sleeve. The spool is closely sizes to the sleeve and must move freely to allow for proper pump operation. An accumulation of oil, dirt or other contaminants from the pump's air supply, or from a failed diaphragm, may prevent the spool from moving freely. This can cause the spool to stick in a position that prevents the pump from operating. If this is the case, the sleeve and spool set should be removed from the valve body for cleaning and further inspection.

Remove the spool from the sleeve. Using an arbor press or bench vise (with an improvised mandrel), press the sleeve from the valve body. Take care not to damage the sleeve. At this point, inspect the o-rings on the sleeve for nicks, tears or abrasions. Damage of this sort could happen during assembly or servicing. A sheared or cut o-ring can allow the pump's compressed air supply to leak or bypass within the air valve assembly, causing the pump to leak compressed air from the pump air exhaust or not cycle properly. This is most noticeable at pump dead head or high discharge pressure conditions. Replace any of these o-rings as required or set up a routine, preventive maintenance schedule to do so on a regular basis. This practice should include cleaning the spool and sleeve components with a safety solvent or equivalent, inspecting for signs of wear or damage, and replacing worn components.

To re-install the sleeve and spool set, lightly lubricate the o-rings on the sleeve with an o-ring assembly lubricant or lightweight oil such as 10 wt. air line lubricant). Re-install one end cap, and retaining ring on the valve body. Using the arbor press or bench vise that was used in disassembly, carefully press the sleeve back into the valve body, without shearing the o-rings. Re-install the spool, opposite end cap and retaining ring on the valve body. After inspecting and cleaning the gasket surfaces on the valve body and intermediate, reinstall the valve body on the pump using new gaskets. Tighten the four hex head capscrews evenly and in an alternating cross pattern, at 150 in./lbs. (16.94 Newton meters).

⚠ CAUTION ⚠

Hydrofluoric acid above 40% concentrate should not be pumped with the polypropylene unit. Check chemical compatibility chart for other fluids.

⚠ CAUTION ⚠

Operating temperature limitations are as follows:

PVDF: 200°F (93.3°C) Max. to 10°F (-12.2°C) Min.
Polypro.: 150°F (65°C) Max. to 40°F (4.4°C) Min.

Fig. 2 *Exhaust muffler*

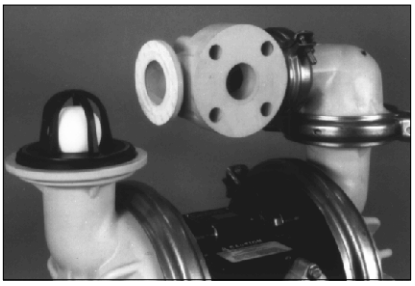

Fig. 3 *Check balls exposed*

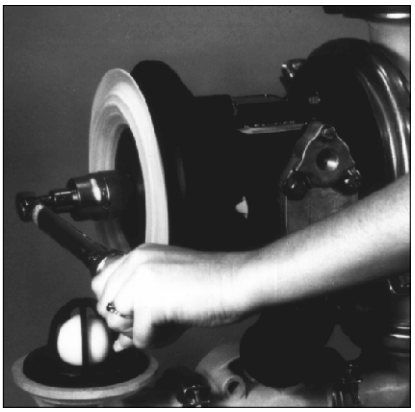

Fig. 4 *Torquing the diaphragm plate*

Fig. 5 *Torque of diaphragms*

PILOT VALVE

The pilot valve assembly is accessed by removing the main air distribution valve body from the pump and lifting the pilot valve body out of the intermediate housing (See Fig. 10).

Most problems with the pilot valve can be corrected by replacing the o-rings. Always grease the spool prior to inserting it into the sleeve. If the sleeve is removed from the body, reinsertion must be at the chamfered side. Grease the o-rings to slide the sleeve into the valve body. Securely insert the retaining ring around the sleeve. When reinserting the pilot valve, push both plungers (located inside the intermediate bracket) out of the path of the pilot valve spool ends to avoid damage.

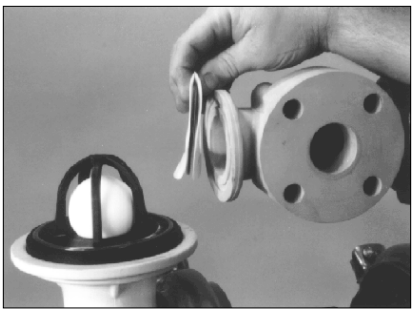

Fig. 6 *Gaskets / o-rings*

PILOT VALVE ACTUATOR

Bushings for the pilot valve actuators are held in the inner chambers behind the diaphragms. The plunger may be removed for inspection or replacement. First remove the air distribution valve body and the pilot valve body from the pump. The plungers can be located by looking into the intermediate. It may be necessary to use a fine piece of wire to pull them out. The bushing can be turned out through the inner chamber by removing the outer chamber assembly. Replace the bushings if pins have bent.

Fig. 7 *Gaskets / o-rings*

AIR EXHAUST

If a diaphragm fails, the pumped liquid or fumes can enter the air end of the pump, and be exhausted into the atmosphere. When pumping hazardous or toxic materials, pipe the exhaust to an appropriate area for safe disposition (see Fig. 2).

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

Freezing or icing of the air exhaust can occur under certain temperature and humidity conditions. Use of a Warren Rupp Air Dryer unit should eliminate most icing problems.

BETWEEN USES

When used for materials that tend to settle out or transform to solid form, the pump should be completely 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 valves and diaphragms at re-start. In freezing temperatures, the pump must be drained between uses in all cases.

Fig. 8 *Gasket, item 63, used only on polypropylene models.*

CHECK VALVE SERVICING

Need for inspection or service is usually indicated by poor priming, unstable cycling, reduced performance or the pump's cycling but not pumping.

Remove the four V-Band clamps securing the manifold assemblies to the outer chambers. Inspect the surfaces of both check valve and seat for wear or damage that could prevent proper sealing. If pump is to prime properly, valves must seat air tight (see Fig. 3).

DIAPHRAGM SERVICING

Remove the four V-Band clamps securing the manifold assemblies to the outer chambers. Remove the two V-Band clamps securing the outer chambers to the inner chambers. Remove the diaphragm assembly (outer plate, diaphragm, inner plate) by turning the assembly counterclockwise using a $1^{3}/_{8}$" (3.492 cm) wrench on the outer plate lugs. For the PB2, use a 1½" (3.8 cm) wrench. To disassemble the diaphragm assemblies, lock the inner plate in a soft jaws vice and turn the outer plate counterclockwise from the inner plate using the same wrench. Be sure inner plate is free of burrs. The interior components consisting of shaft seals, sleeve bearings and bearing retainers are now accessible for service.

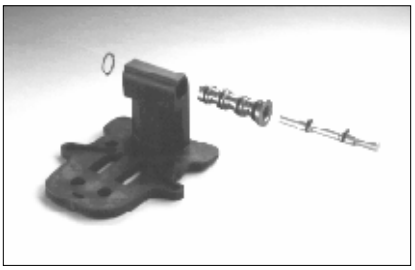

Fig. 9 *Sleeve & spool exposed.*

REASSEMBLY

Procedures for reassembling the diaphragms are the reverse of the above. The diaphragms must be installed with their natural bulge to the outside, toward the outer diaphragm plate. Install the inner plate with the flat face against the diaphragm.

After all components are in position in a vise and hand tight, tighten with a wrench to approximately 35 ft. lbs. (420 in./lbs.) (47.45 Newton meters) torque (See Fig. 4). After both diaphragm assemblies have been assembled, thread one assembly into the shaft (hold the shaft near the middle in a vise with soft jaws, to protect the finish). Install this sub assembly into the pump and secure by placing the outer chamber on the end with the diaphragm. This holds the assembly in place while the opposite side is installed. Torque the last diaphragm assembly to 25 ft. lbs. (33.90 Newton meters) (see Fig. 5). This final torquing will lock the diaphragm assemblies together. Place the remaining outer chamber on the open end and loosely tighten the V-Band clamps. Replace the manifold assemblies to square the flanges before final tightening of the V-Band clamps. Make sure necessary gaskets and o-rings are in place (see Figs. 6, 7 & 8).

TROUBLESHOOTING

1. Pump will not cycle

A. Check to make sure the unit has enough pressure to operate and that the air inlet valve is open.

B. Check the discharge line to insure that the discharge line is neither closed nor blocked.

C. If the spool in the air distribution valve is not shifting, check the main spool. It must slide freely.

D. Excessive air leakage in the pump can prevent cycling. This condition will be evident. Air leakage into the discharge line indicates a ruptured diaphragm. Air leakage from the exhaust port indicates leakage in the air distribution valve. See further service instructions.

E. Blockage in the liquid chamber can impede movements of diaphragm.

F. Blockage in exhaust muffler.

2. Pump cycles but will not pump

A. Suction side of pump pulling in air. Check the suction line for air leaks and be sure that the end of the suction line is submerged. Check flange bolting. Check valve flanges and manifold to chamber flange joints.

B. Make certain the suction line or strainer is not plugged. Restriction at the suction is indicated by a high vacuum reading when a vacuum gauge is installed in the suction line.

C. Check valves may not be seating properly. To check, remove the suction line and cover the suction port with your hand. If the unit does not pull a good suction (vacuum), the check valves should be inspected for proper seating.

D. Static suction lift may be too high. Priming can be improved by elevating the suction and discharge lines higher than the check valves and pouring liquid into the unit through the suction inlet. When priming at high suction lifts or with long suction lines operate the pump at maximum cycle rate.

3. Low performance

A. Capacity is reduced as the discharge pressure increases, as indicated on the performance curve. Performance capability varies with available inlet air supply. Check air pressure at the pump inlet when the pump is operating to make certain that adequate air supply is maintained.

B. Check vacuum at the pump suction. Capacity is reduced as vacuum increases. Reduced flow rate due to starved suction will be evident when cycle rate can be varied without change in capacity. This condition will be more prevalent when pumping viscous liquids. When pumping thick, heavy materials the suction line must be kept as large in diameter and as short as possible, to keep suction loss minimal.

C. Low flow rate and slow cycling rate indicate restricted flow through the discharge line. Low flow rate and fast cycling rate indicate restriction in the suction line or air leakage into suction.

D. Unstable cycling indicates improper check valve seating on one chamber. This condition is confirmed when unstable cycling repeats consistently on alternate exhausts. Cycling that is not consistently unstable may indicate partial exhaust

⚠ IMPORTANT ⚠

Before pump operation, all external gasketed fasteners must be inspected for looseness caused by gasket creep after leaving the factory. Retorque loose fasteners to insure against leakage. Follow recommended torques where called out. (A card is attached to each new pump stating this fact.)

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.

⚠ CAUTION ⚠

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.

⚠ CAUTION ⚠

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. 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.

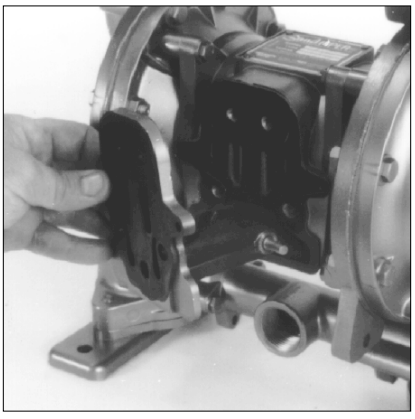

Fig. 10 *Pilot valve being removed*

restriction due to freezing and thawing of exhaust air. Use of an anti-freeze lubricant in an air line lubricator should solve this problem.
E. Blockage in exhaust muffler.

For additional information, see the Warren Rupp Troubleshooting Guide.

WARRANTY:

This unit is guaranteed for a period of five years against defective material and workmanship.

⚠ BEFORE OPERATION ⚠

Before pump operation, inspect all gasketed fasteners for looseness caused by gasket creep. Retorque loose fasteners to prevent leakage. Follow recommended torques stated in the card attached to the new pump.

RECOMMENDED WARREN RUPP ACCESSORIES TO MAXIMIZE PUMP PERFORMANCE:

- **Tranquilizer® Surge Suppressor: For nearly pulse-free flow.**
- **Warren Rupp Filter/Regulator: For modular installation and service convenience.**
- **Warren Rupp Speed Control: For manual or programmable process control. Manual adjustment or 4-20mA reception.**

For more detailed information on these accessories, contact your local Warren Rupp Factory-Authorized Distributor, or Warren Rupp corporate headquarters.

ITEM NO.	PART NUMBER	DESCRIPTION	TOTAL RQD.
1	114-008-551	Intermediate Bracket	1
2	618-003-110	Pipe Plug	1
3	170-018-115	Capscrew, Hex Head	6
4	**560-062-360**	**O-Ring**	**2**
5	**360-056-360**	**Gasket**	**1**
6	710-009-115	Screw, Self-Tapping	6
7	**095-075-000**	**Pilot Valve Body Assembly***	**1**
7-A	**095-072-551**	**Pilot Valve Body**	**1**
7-B	**755-025-000**	**Sleeve (with O-Ring)**	**1**
7-C	**560-033-360**	**O-Ring (Sleeve)**	**4**
7-D	**775-014-000**	**Spool (with O-Ring)**	**1**
7-E	**560-023-360**	**O-Ring (Spool)**	**4**
7-F	**675-037-080**	**Retaining Ring**	**1**
8	**360-059-360**	**Gasket**	**1**
9	**675-043-115**	**Ring, Retaining**	**2**
10	170-033-115	Capscrew, Hex Head	4
11	165-042-551	Cap, Valve Body	1
12	**360-058-360**	**Gasket**	**1**
13	095-051-551	Body, Spool Valve	1
14	**031-040-000**	**Sleeve & Spool Set**	**1**
15	**560-058-360**	**O-Ring**	**8**
16	165-038-356	Cap, End	2
17	901-005-115	Washer	10
18	170-063-115	Capscrew, Hex Head	1
19	901-035-115	Washer, Flat	1
20	542-001-115	Nut, Square	1
21	196-044-551	Chamber, Inner	1
22	196-046-551	Chamber, Inner	1
23	**620-008-114**	**Plunger, Actuator**	**2**
24	**675-041-360**	**Ring, Sealing**	**2**
25	**360-055-360**	**Gasket, Bearing**	**2**
26	**070-026-501**	**Bearing, Sleeve**	**2**
27	**670-029-551**	**Retainer, Bearing**	**2**
28	**135-013-162**	**Bushing**	**2**
29	**560-001-360**	**O-Ring**	**2**
30	**675-042-115**	**Ring, Retaining**	**2**
31	**720-004-360**	**Seal, U-Cup**	**2**
32	685-040-120	Rod, Diaphragm	1
33	**132-020-358**	**Bumper**	**2**
34	612-080-330	Plate, Inner Diaphragm	2
35	**286-005-365**	**Diaphragm**	**2**
	286-005-360	Diaphragm	2
	286-005-363	Diaphragm	2
	286-005-364	Diaphragm	2
36	286-026-604	Overlay, Diaphragm	2

***Available in kit form. Order P/N 031-058-000 which also includes items 5, 8, 12, 23 & 60.

Repair Parts shown in **bold face (darker)** type are more likely to need replacement after extended periods of normal use. They are readily available from most Warren Rupp distributors. The pump owner may prefer to maintain a limited inventory of these parts in his own stock to reduce repair downtime to a minimum.

IMPORTANT: When ordering repair parts always furnish pump model number, serial number and type number.

MATERIAL CODES
The Last 3 Digits of Part Number

000... Assembly, sub-assembly; and some purchased items
010... Cast Iron
015... Ductile Iron
025... Music Wire
080... Carbon Steel, AISI B-1112
110... Alloy Type 316 Stainless Steel
112... Alloy "C"
114... 303 Stainless Steel
115... 301/302/304 Stainless Steel
120... 416 Stainless Steel (Wrought Martensitic)
148... Hardcoat Anodized Aluminum
150... 6061-T6 Aluminum
151... 6063-T6 Aluminum
154... Almag 35 Aluminum
155 or 156...356-T6 Aluminum
157... Die Cast Aluminum Alloy #380
159... Anodized Aluminum
162... Brass, Yellow, Screw Machine Stock
170... Bronze, Bearing Type, Oil Impregnated
180... Copper Alloy
330... Plated Steel
331... Chrome Plated Steel
332... Electroless Nickel Plated
335... Galvanized Steel
354... Injection Molded #203-40 Santoprene — Duro 40D +/-5; Color: RED
356... Hytrel
357... Rupplon (Urethane Rubber)
360... Buna-N Rubber. Color coded: RED
363... Viton (Fluorel). Color coded: YELLOW
364... E.P.D.M. Rubber. Color coded: BLUE
365... Neoprene Rubber. Color coded: GREEN
366... Food Grade Nitrile. Color coded: WHITE
375... Fluorinated Nitrile
405... Cellulose Fibre
408... Cork and Neoprene
425... Compressed Fibre
440... Vegetable Fibre
500... Delrin 500
501... Delrin 570
520... Injection Molded PVDF, Natural Color, Food Grade/USDA Acceptable
540... Nylon
550... Polyethylene
551... Polypropylene
555... PVC (Polyvinyl Chloride)
580... Ryton
600... Teflon (virgin material) Tetrafluoroethylene (TFE)
603... Blue Gylon
604... Teflon — Diaphragm
610... Encapsulated Silicon
611... Teflon Encapsulated Viton

Delrin, Teflon, Hytrel, and Viton are registered tradenames of E.I. DuPont.

Gylon is a registered tradename of Garlock, Inc.

Rupplon and SandPIPER are registered tradenames of Warren Rupp, Inc.

Ryton is a registered tradename of Phillips Chemical Company.

Loctite is a registered tradename of Loctite Corporation.

ITEM NO.	PART NUMBER	DESCRIPTION	TOTAL RQD.
37	612-086-551	Plate, Outer Diaphragm (includes item #51, Stud)	2
	612-086-520	Plate, Outer Diaphragm	2
38	196-045-551	Chamber, Outer	2
	196-045-520	Chamber, Outer	2
39	670-030-551	Retainer, Ball	4
	670-030-520	Retainer, Ball	4
40	**722-039-551**	**Seat, Ball**	**4**
	722-039-520	Seat, Ball	4
41	**050-005-365**	**Ball, Check Valve**	**4**
	050-010-600	Ball, Check Valve	4
	050-005-360	Ball, Check Valve	4
	050-005-363	Ball, Check Valve	4
	050-005-364	Ball, Check Valve	4
42	**560-061-611**	**O-Ring (Polypro. only)**	**8**
	560-061-360	O-Ring (Polypro. only)	8
	560-089-611	O-Ring (PVDF only)	8
43	312-036-551	Elbow, Suction	2
	312-036-520	Elbow, Suction	2
44	312-035-551	Elbow, Discharge	2
	312-035-520	Elbow, Discharge	2
45	518-031-551	Manifold (PB1½)	2
	518-031-520	Manifold (PB1½)	2
	518-088-520	Manifold (PB2)	2
46	**560-060-611**	**O-Ring**	**4**
	560-047-360	O-Ring	4
47	200-019-115	Clamp, V-Band Assembly	2
48	200-020-115	Clamp, V-Band Assembly	4
49	200-021-115	Clamp, V-Band Assembly	4
50	901-001-330	Washer, Flat	6
51	807-026-330	Stud	2
52	530-008-000	Muffler	1
53	312-044-555	Elbow, 45°	1
54	171-025-332	Capscrew	4
55	545-005-115	Hex Nut	4
56	171-045-332	Carriage Bolt	16
57	545-004-115	Hex Nut	16
60	**132-022-360**	**Bumper**	**2**
61	**360-071-600**	**Gasket (Polypro. only)**	**8**
62	**360-072-600**	**Gasket (Polypro. only)**	**4**
63	**360-073-600**	**Gasket (Polypro. only)**	**2**
NOT SHOWN:			
	535-015-000	Name Plate	1
	535-019-115	Name Plate	2
	710-010-115	Self-Tapping Screw	8
	031-031-000	Valve Body Assembly (includes items 9, 13, 14, 15, 16)	1

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MATERIAL CODES
The Last 3 Digits of Part Number

000... Assembly, sub-assembly; and some purchased items
010... Cast Iron
015... Ductile Iron
025... Music Wire
080... Carbon Steel, AISI B-1112
110... Alloy Type 316 Stainless Steel
112... Alloy "C"
114... 303 Stainless Steel
115... 301/302/304 Stainless Steel
120... 416 Stainless Steel (Wrought Martensitic)
148... Hardcoat Anodized Aluminum
150... 6061-T6 Aluminum
151... 6063-T6 Aluminum
154... Almag 35 Aluminum
155 or 156...356-T6 Aluminum
157... Die Cast Aluminum Alloy #380
159... Anodized Aluminum
162... Brass, Yellow, Screw Machine Stock
170... Bronze, Bearing Type, Oil Impregnated
180... Copper Alloy
330... Plated Steel
331... Chrome Plated Steel
332... Electroless Nickel Plated
335... Galvanized Steel
354... Injection Molded #203-40 Santoprene — Duro 40D +/-5; Color: RED
356... Hytrel
357... Rupplon (Urethane Rubber)
360... Buna-N Rubber. Color coded: RED
363... Viton (Fluorel). Color coded: YELLOW
364... E.P.D.M. Rubber. Color coded: BLUE
365... Neoprene Rubber. Color coded: GREEN
366... Food Grade Nitrile. Color coded: WHITE
375... Fluorinated Nitrile
405... Cellulose Fibre
408... Cork and Neoprene
425... Compressed Fibre
440... Vegetable Fibre
500... Delrin 500
501... Delrin 570
520... Injection Molded PVDF, Natural Color, Food Grade/USDA Acceptable
540... Nylon
550... Polyethylene
551... Polypropylene
555... PVC (Polyvinyl Chloride)
580... Ryton
600... Teflon (virgin material) Tetrafluoroethylene (TFE)
603... Blue Gylon
604... Teflon — Diaphragm
610... Encapsulated Silicon
611... Teflon Encapsulated Viton

Delrin, Teflon, Hytrel, and Viton are registered tradenames of E.I. DuPont.

Gylon is a registered tradename of Garlock, Inc.

Rupplon and SandPIPER are registered tradenames of Warren Rupp, Inc.

Ryton is a registered tradename of Phillips Chemical Company.

Loctite is a registered tradename of Loctite Corporation.