

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 OPERATION

The SandPIPER pump is powered by hydraulic fluid which alternately pressurizes the inner sides of the two diaphragm chambers while simultaneously exhausting the opposite inner chambers causing the diaphragms, which are connected by a shaft, to move endwise. Since hydraulic pressure is applied over the entire surface of the diaphragm which is forcing liquid to be discharged by its other side, the diaphragm is operating under a balanced condition during the discharge stroke. This allows the unit to be operated at discharge heads over 200 feet (61 meters) of water head.

Since the diaphragms are connected by means of a shaft secured by plates to the center of the diaphragms, while one diaphragm is being pressurized to perform discharge stroke, the other diaphragm is being pulled to perform the suction stroke in the opposite chamber. The suction stroke becomes the only unbalanced load applied to diaphragms during operation, thereby providing much longer life than mechanical operated diaphragms under similar conditions. Since the suction lift portion of the operation is essentially the only load applied to diaphragms, it becomes obvious that the longest possible diaphragm life will be attained by the least amount of suction lift. ALWAYS KEEP THE UNIT AS CLOSE TO THE LIQUID BEING PUMPED AS POSSIBLE. POSITIVE SUCTION HEAD IN EXCESS OF 10 FEET (3.05 METERS) OF LIQUID SHOULD ALSO BE AVOIDED FOR GOOD DIAPHRAGM SERVICE LIFE.

Alternate pressurizing and exhausting of the diaphragm chamber is performed by means of an externally mounted, pilot operated, four way, spool type distribution valve. When the spool is at one end of the valve body, inlet hydraulic pressure is connected to one diaphragm chamber and the other diaphragm chamber is connected to the exhaust. When the spool is moved to the opposite end of the valve body, the porting of chambers is reversed. The distribution valve spool is moved from one end position to the other in the valve body by means of an internal pilot valve which alternately pressurizes one end of the distribution valve spool while simultaneously exhausting the other. The pilot valve is positively shifted at each end of the diaphragm stroke by the diaphragm plate coming in contact with the end of the pilot valve spool and pushing it into position for shifting of the air distribution valve. Chambers are manifolded together with a suction and discharge check valve for each chamber to maintain flow in one direction through the pump.

INSTALLATION

Locate the pump as close to liquid being pumped as is practical to keep suction line length and number of fittings to a minimum. DO NOT REDUCE SUCTION LINE SIZE except for very low rates or where higher velocities are required to keep pumped material in suspension in the carrying liquid. For installations involving the use of rigid piping, short flexible sections of hose are recommended between pump and piping. This reduces piping strains and vibrations.

OPERATION

Your SandPIPER pump has been tested prior to shipment and is ready for use as received.

The SandPIPER is completely self-priming from a dry start up to suction lifts of 15 feet (4.57 meters). For priming at suction lifts in excess of 15 feet (4.57 meters), fill the chambers with liquid prior to operation.

▲ IMPORTANT ▲

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

▲ 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.

▲ 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.

▲ DANGER ▲

Before doing any maintenance on the pump, be certain all hydraulic pressure is completely vented from the pump, suction, discharge, piping, and all other openings and connections. When used for toxic or aggressive fluids, the pump should always be flushed clean prior to disassembly. 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.

▲ 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.

PRESSURE SUPPLY

Do not connect the unit to a pressure supply in excess of 125 PSI (8.61 bars). Connect the pump inlet port, denoted by a P on the end cap, to a hydraulic supply of sufficient capacity and pressure as required for desired performance.

HYDRAULIC FLUID RETURN

The SandPIPER pump has two return ports. One is on the intermediate and the other is on the end cap, denoted by a T. Both ports must be connected to the hydraulic reservoir, either separately or manifolded into a common line. Piping for the return should not be smaller than 1" pipe size.

SUCTION STRAINER

When pumping liquids that may contain solids larger than 1/4" (.635 cm) in diameter, a suction strainer should be installed to avoid clogging of ball valves.

MAINTENANCE AFTER USE

When SandPIPER is used to handle materials that settle out or transform from liquid to solid form, care must be taken after each use and during idle periods to remove and flush these materials as required.

To drain liquid from pump, turn the unit over on the suction and discharge manifold side. This position puts the chamber ports down and allows ball checks to fall away from the seats to permit complete drainage of the unit. This procedure is important to insure complete draining in freezing weather.

On permanent installations, chambers can be drained by removing the pipe plugs in the outer chambers.

CHECK VALVES

For best priming and most efficient pumping performance, it is important to maintain check valves and valve seats in good condition for proper sealing. Need for inspection or service of ball valves is usually indicated by poor priming, unstable cycling, reduced performance, or when the pump cycles but will not pump.

Inspection and service of check valves requires the removal of six bolts which provides access to all four ball valves and both suction and discharge valve seats. New rubber ball check valves are 2 1/4" (5.715cm) diameter and will require replacement when worn to approximately 2" (5.08 cm) diameter (Fig. 1).

DIAPHRAGMS

Need for inspection or service of a diaphragm is usually indicated when the unit pumps from one chamber only and hydraulic fluid is discharged out the pump discharge port or when liquid being pumped is discharged through the hydraulic return line. To service diaphragms, remove the V-Band clamp and two hex nuts which secure the chamber port to the manifold. To remove diaphragms, loosen the diaphragm assembly (outer plate, diaphragm, inner plate) by turning out of the shaft using a wrench. A 1" (2.54 cm) square lug is provided on the outer plate for this purpose. Removal of the opposite outer chamber will permit removal of the second diaphragm assembly and shaft as a unit. To disassemble the diaphragm assemblies, clamp the inner diaphragm plate around the outer diameter between the jaws of a vise while you turn the outer diaphragm plate loose using a wrench. Interior components consisting of shaft seals and sleeve bearings are now accessible for service if required.

All procedures for reassembling the diaphragms are in reverse of previous instructions for disassembly. The diaphragms are to be installed with their natural bulge outward or toward the outer diaphragm plate. Make sure the inner plate is installed with the flat face against the diaphragm (Fig. 2).

After all components are in position in the vise and hand tight, tighten with a wrench to approximately 40 ft. lbs. (5.53 kilograms/meters) torque. After each diaphragm assembly has been made, thread one assembly into the shaft (hold the shaft near the middle in a vise having soft jaws to protect finish). Install this sub assembly into the pump and secure by placing the outer chamber on the end with the diaphragm. This will hold the assembly in place while the opposite side is installed. Make sure the last diaphragm assembly is torqued to 30 ft. lbs. (4.147 kilograms/meters). This final torquing will lock the diaphragm assemblies together. Place the remaining outer chamber on the open end and secure. Snug the flange bolts of the chamber to port manifold to square the flanges before the final tightening of the V-

CAUTION

Should a diaphragm fail, the product and/or fumes from the product being pumped can enter the hydraulic side of the pump or the hydraulic fluid can enter the product side of the pump depending on which side offers the least resistance. The hydraulic fluid should be periodically checked for pumped product contaminants and/or a changing of the hydraulic fluid level in the reservoir. Shut off valves should be installed on all piping, hydraulic and product sides, to and from the pump. These valves should be closed when the unit is going to be idle for an extended time to ensure that a siphoning effect does not develop.

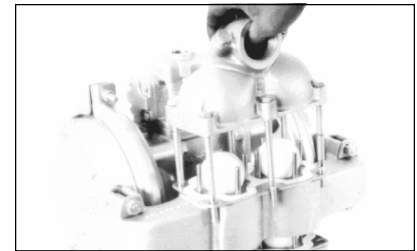


Figure 1: Inspection of check valves.



Figure 2: Torquing the diaphragm plate.

Band clamps. Tighten the flange bolts securely after tightening the V-Band clamp. **IMPORTANT:** Do not tighten the V-Band clamp without loosening the manifold flange bolts at the outer chamber ports. The chamber flange may be broken.

HYDRAULIC DISTRIBUTION VALVE

The spool is closely sized to the sleeve, but should slide freely. Accumulation of dirt and silting can prevent the spool from moving freely or stick in a position that will prevent the pump from cycling. Remove the hydraulic valve body from the adapter block, remove the end caps, and push out the spool. Wash the spool in cleaning solvent or lubricant. Coat the spool with a light oil and reassemble making sure the spool slides freely in the valve body.

PILOT VALVE

This assembly is reached by removing the adapter end cap and adapter block. The pilot valve body assembly is then free to be lifted out of the intermediate housing and inspected. The pilot valve spool can be pushed out of the sleeve exposing the o-rings.

To inspect the sleeve, remove the retaining ring and slide the sleeve out of the pilot valve body. The o-rings on the spool and sleeve should be replaced if worn and lubricated with an o-ring lubricant before re-assembly.

When reinserting an externally serviceable pilot valve, push both plungers out of the path of the pilot valve so that they and the pilot valve are not damaged.

PILOT VALVE ACTUATOR

The bushings for the pilot valve actuators thread into the intermediate bracket from the outside. The plunger may be removed for inspection or replacement from the inside by removing the adapter end cap, adapter block and the pilot valve body assembly from the pump. The plungers should be visible as you look down into the intermediate from the top. Depending on their position, you may find it necessary to use a fine piece of wire to pull them out.

Under rare circumstances, it may become necessary to replace the o-ring seal. If it cannot be removed in much the same manner as the plunger, the bushing can be turned out through the inner chamber by removing the manifold assembly and the outer chamber to reach the bushing.

TROUBLE SHOOTING

PROBLEM: Pump cycles but will not pump. (Note: higher suction lifts require faster cycling speed for priming.)

POSSIBLE CAUSES:

- A. Air leak in the suction line.
- B. Excessive suction lift.
- C. Check valve not seating properly.
- D. Leakage at joint of suction manifold or elbow flange.
- E. Suction line or strainer plugged.
- F. Diaphragm ruptured.

PROBLEM: Pump will not cycle.

POSSIBLE CAUSES:

- A. Discharge hose or line plugged, or discharge head requirement greater than supply pressure. (Disconnect discharge line to check.)
- B. Spool in distribution valve not shifting. (Remove end cap and check spool—must slide freely.)
- C. Diaphragm ruptured. (Hydraulic fluid will most often escape out discharge line in this case.)
- D. Blockage in diaphragm chamber preventing movement. (Shut off hydraulic supply and reopen after pressure is relieved.)

PROBLEM: Uneven discharge flow. (Indicates one chamber not operating properly.)

POSSIBLE CAUSES:

- A. Check valve not seating properly in one chamber.
- B. Diaphragm failure in one chamber.
- C. Air leak at suction manifold joint or elbow flange one side.

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

IMPORTANT

Do not tighten the V-Band clamp without loosening the manifold flange bolts at the outer chamber ports. The chamber flange may be broken.

CAUTION

This pump is pressurized internally during operation—always make certain all bolting is in good condition and that all correct bolting is reinstalled during assembly.

CAUTION

Always disconnect hydraulic supply to relieve pressure before disassembling any portion of pump.

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ITEM NO.	PART NUMBER	DESCRIPTION	TOTAL RQD.
1	095-049-000	Pilot Valve Body Assy., Consists of	1
1-1	095-048-156	Body, Pilot Valve	1
1-2	755-025-000	Sleeve, Pilot Valve	1
1-4	675-037-080	Ring, Retainer	1
1-5	171-014-000	Capscrew, Allen Hd.	2
1-6	612-078-156	Plate, Pilot Valve	1
1-7	775-026-000	Spool, Pilot Valve	1
2	893-059-000	Valve, Hydraulic	1
3	475-032-000	O-Ring Kit	1
4	360-052-425	Gasket, Pilot Valve	1
5	360-053-425	Gasket, Pilot Valve	1
6	360-054-425	Gasket, End Cap	1
7	086-005-156	Block, Adapter	1
8	165-035-156	Cap, Valve	1
9	170-074-330	Capscrew	1
10	171-023-000	Capscrew	4
11	900-003-330	Washer, Lock	4
12	196-025-157	Chamber, Inner	2
13	070-006-170	Bearing, Sleeve	2
14	720-004-360	Seal, U-Cup	2
15	200-009-330	Clamp, V-Band	2
15-1	475-028-000	Service Kit	1
16	685-007-120	Rod, Diaphragm	1
17	114-006-156	Bracket, Intermediate	1
18	132-002-360	Bumper	2
19	612-052-157	Plate, Inner	2
20	612-039-010	Plate, Assy., Outer	2
	612-039-157	Plate, Assy., Outer	2
	612-097-110	Plate, Ass'y. Outer	2
21	286-005-360	Diaphragm	2
	286-005-363	Diaphragm	2
	286-005-365	Diaphragm	2
	286-026-604	Diaphragm (Overlay)	2
22	196-007-010	Chamber, Diaphragm	2
	196-007-110	Chamber, Diaphragm	2
	196-007-156	Chamber, Diaphragm	2
23	560-022-360	O-Ring	2
24	901-023-330	Washer, Flat	1
25	690-006-080	Pin	4
26	115-046-080	Bracket, Foot	2
27	690-011-330	Pin	2
29	547-007-330	Nut, Lock	4
30	807-017-330	Stud	4
31	518-005-000	Manifold Ass'y., Consists of (Not Sold As Ass'y.)	1
31-1	050-005-360	Ball, Check Valve	4
	050-005-363	Ball, Check Valve	4
	050-005-365	Ball, Check Valve	4
	050-010-600	Ball, Check Valve	4

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
012...Powered Metal
015...Ductile Iron
020...Ferritic Malleable Iron
025...Music Wire
080...CarbonSteel AISI B-1112
100...Alloy 20
110...Alloy Type 316 Stainless Steel
111...Alloy Type 316 Stainless Steel (Electro Polished)
112...Alloy "C"
113...Alloy Type 316 Stainless Steel (Hand Polished)
114...303 Stainless Steel
115...302/304 Stainless Steel
117...440-C Stainless Steel (Martensitic)
120...416 Stainless Steel (Wrought Martensitic)
123...410 Stainless Steel (Wrought Martensitic)
148...Hardcoat Anodized Aluminum
149...2024-T4 Aluminum
150...6061-T6 Aluminum
151...6063-T6 Aluminum
152...2024-T4 Aluminum (2023-T351)
154...Almag 35 Aluminum
155 or 156...356-T6 Aluminum
157...Die Cast Aluminum Alloy #380
158...Aluminum Alloy SR-319
159...Anodized Aluminum
162...Brass, Yellow, Screw Machine Stock
165...Cast Bronze, 85-5-5-5
166...Bronze SAE 660
170...Bronze, Bearing Type, Oil Impregnated
180...Copper Alloy
310...Kynar Coated
330...Zinc Plated Steel
331...Chrome Plated Steel
332...Electroless Nickel Plated
335...Galvanized Steel
336...Zinc Plated Yellow Brass
337...Silver Plated Steel
340...Nickel Plated
342...Filled Nylon
354...Injection Molded #203-40 Santoprene
- Duro 40D ± 5; Color: RED
355...Thermoplastic Elastomer
356...Hytre
357...Rupplon (Urethane Rubber)
Color coded: PURPLE
358...Rupplon (Urethane Rubber)
Color coded: PURPLE
(Some Applications, Compression Mold)
359...Urethane Rubber
360...Buna-N Rubber Color coded: RED
361...Buna-N
363...Viton (Fluorel) Color coded: YELLOW
364...E.P.D.M. Rubber Color coded: BLUE
365...Neoprene Rubber Color coded: GREEN
370...Butyl Rubber Color coded: BROWN
371...Philtane (Tuftane)
List continued next page

ITEM NO.	PART NUMBER	DESCRIPTION	TOTAL RQD.
31-2	334-008-010	Flange, Threaded	2
	334-008-110	Flange, Threaded	2
	334-008-156	Flange, Threaded	2
31-3	334-006-010	Flange, Discharge	1
	334-006-110	Flange, Discharge	1
	334-006-156	Flange, Discharge	1
31-4	722-010-110	Seat Ass'y.	2
		(Qty (1) Used w/Teflon Check Balls)	
	722-031-110	Seat, Ass'y. Discharge	1
		(Use w/Teflon Check Balls)	
31-5	360-017-425	Gasket, Manifold/Seat	4
	360-017-600	Gasket, Manifold/Seat	4
31-6	518-003-010	Manifold, Suct./Disch.	1
	518-003-110	Manifold, Suct./Disch.	1
	518-003-156	Manifold, Suct./Disch.	1
31-7	545-005-330	Nut, Hex	6
31-8	334-007-010	Flange, Suction	1
	334-007-110	Flange, Suction	1
	334-007-156	Flange, Suction	1
31-9	170-023-330	Capscrew	4
31-10	560-028-360	O-Ring	2
	560-028-610	O-Ring	2
31-11	900-005-330	Washer, Lock	6
31-12	900-006-330	Washer, Lock	4
31-13	170-040-330	Capscrew, Hex Hd.	6
32	165-049-080	Cap, End	1
33	560-075-360	O-Ring	1
34	780-028-025	Spring	1
35	170-024-330	Capscrew, Hex Hd.	4
36	900-006-330	Washer, Lock	8
37	135-016-162	Bushing, Threaded	2
38	905-001-330	Washer, Taper	4
39	170-058-330	Capscrew, Hex Head	4
40	620-011-114	Plunger, Actuator	2
41	560-001-360	O-Ring	2
42	360-022-425	Gasket, Manifold	2
	360-022-600	Gasket, Manifold	2
		(Use w/Teflon & Viton Check Balls)	
43	670-036-080	Retainer, Spring	1
44	618-003-330	Pipe Plug	6

REPAIR PARTS NOT SHOWN:
690-012-080 Pin

Wet End Kits Available:

- 476-036-360 (Buna-N)
- 476-036-633 (Viton®/Teflon®)
- 476-036-635 (Teflon, Neoprene/Teflon)
- 476-036-365 (Neoprene)
- 476-036-363 (Viton)

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MATERIAL CODES
The Last 3 Digits of Part Number

Continued from previous page

- 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
- 505...Acrylic Resin Plastic
- 520...Injection Molded PVDF Natural Color
- 540...Nylon
- 541...Nylon
- 542...Nylon
- 544...Nylon Injection Molded
- 550...Polyethylene
- 551...Polypropylene
- 552...Unfilled Polypropylene
- 553...Unfilled Polypropylene
- 555...Polyvinyl Chloride
- 570...Rulon II
- 580...Ryton
- 590...Valox
- 591...Nylatron G-S
- 592...Nylatron NSB
- 600...Teflon (virgin material)
- Tetrafluoroethylene (TFE)
- 601...Teflon (Bronze and moly filled)
- 602...Filled Teflon
- 603...Blue Gylon
- 604...Teflon
- 606...Teflon
- 610...Teflon Encapsulated Silicon
- 611...Teflon Encapsulated Viton

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Gylon is a registered tradename of Garlock, Inc.

Nylatron is a registered tradename of Polymer Corp.

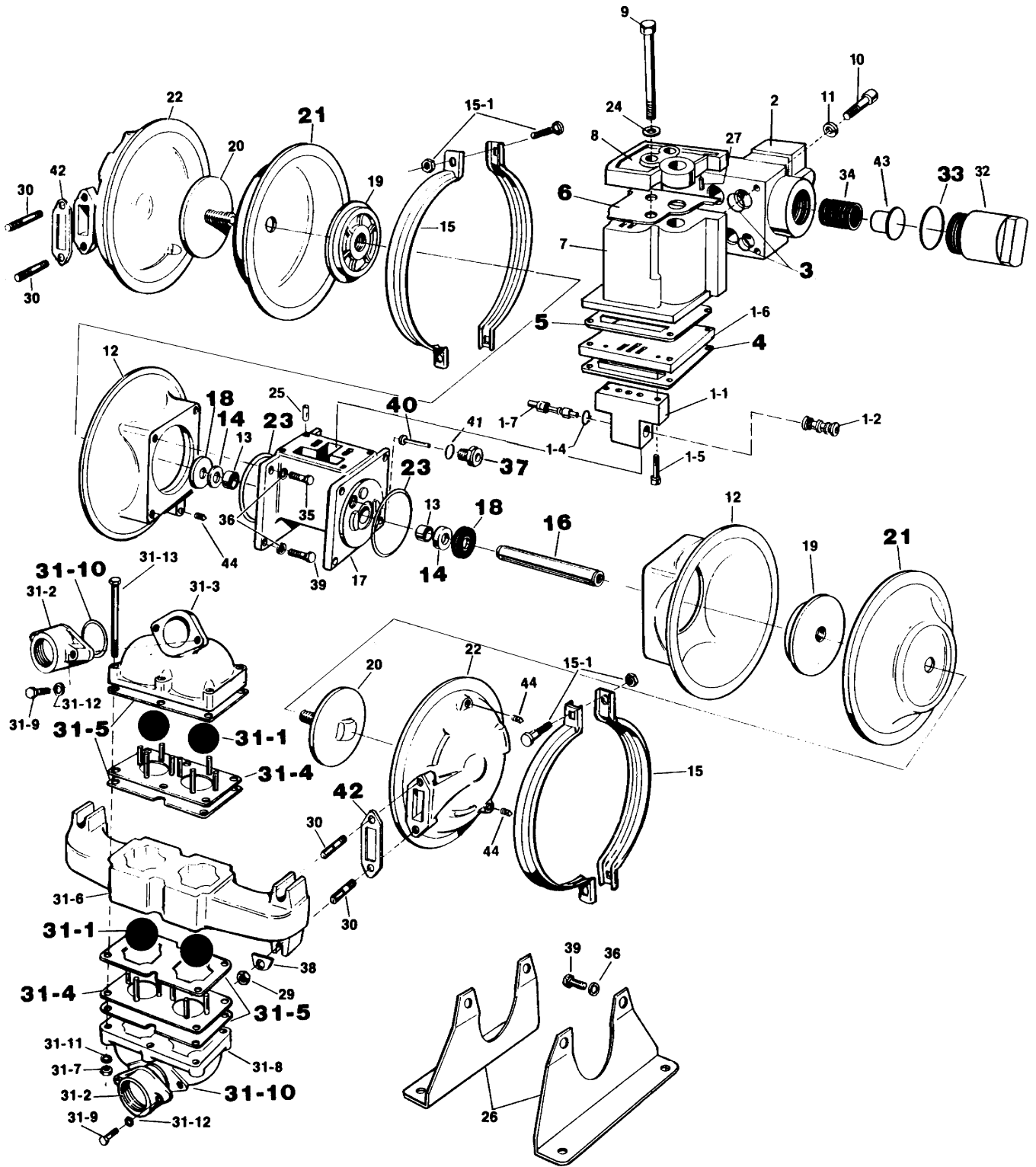
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Hastelloy-C is a registered tradename of Cabot Corp.

Ryton is a registered tradename of Phillips Chemical Company.

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