

**WARREN
RUPP®**

IDEX
FLUID & METERING

SANDPIPER®
A WARREN RUPP PUMP BRAND



SERVICE AND OPERATING MANUAL

Models HDB3-A/HDB4-A

Type 3

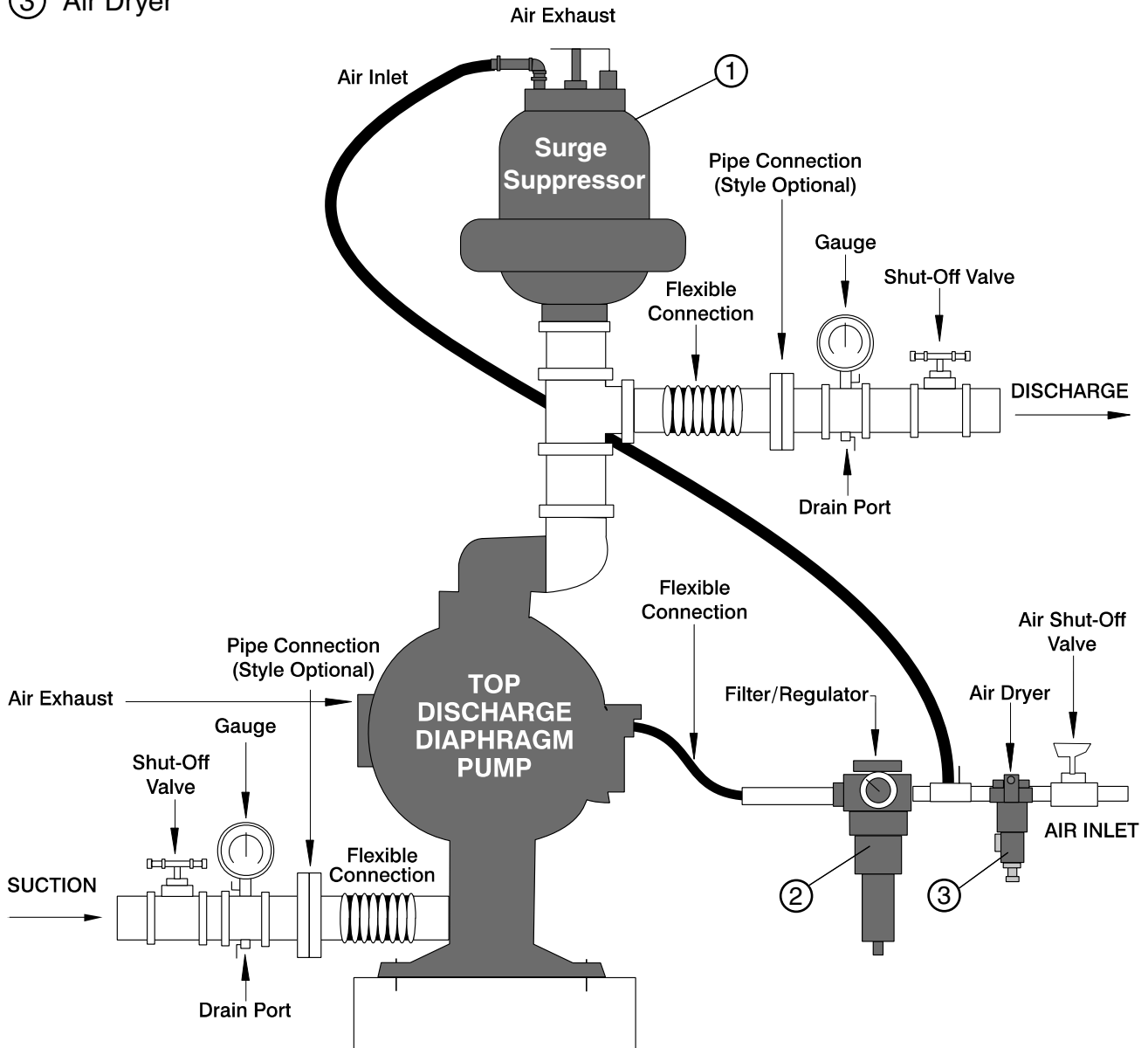
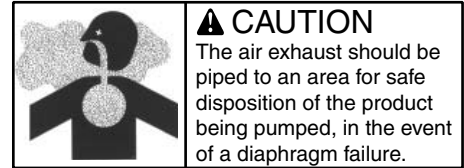
Table of Contents

Installation Guide.....	1
Principle of Operation.....	2
Installation and Start-Up.....	2
Air Supply.....	2
Air Inlet & Priming.....	2
Air Exhaust.....	2
Between Uses.....	3
Check Valve Servicing.....	3
Diaphragm Servicing.....	3-4
Air Valve Lubrication.....	4
ESADS+Plus®: Externally Serviceable Air Distribution System.....	4-5
Pilot Valve.....	5
Pilot Valve Actuator.....	5
Troubleshooting.....	6
Warranty.....	6
Material Codes.....	6
Important Safety Information.....	7
Recycling.....	7
Grounding The Pump.....	8
Declaration of Conformity.....	9
Composite Repair Drawing.....	10
Composite Repair Parts List.....	11-12

INSTALLATION GUIDE Top Discharge Ball or Flap Valve Unit

Available from
Warren Rupp

- ① TA3/TA80 Tranquilizer®/Surge Suppressor
- ② 020-051-000 Filter/Regulator
- ③ Air Dryer



**WARREN
RUPP®****IDEX**
FLUID & METERING**SANDPIPER®**
A WARREN RUPP PUMP BRANDI M2 c T5
II 2GD T5

SERVICE AND OPERATING MANUAL

Models HDB3-A/HDB4-A**Type 3**

PRINCIPLE OF PUMP OPERATION

This ball 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 valve 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 Tranquillizer® 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 20 feet (6.096 meters) or less. For suction lifts exceeding 20 feet of liquid, fill the chambers with liquid prior to priming.

AIR SUPPLY

Air supply pressures cannot exceed 125 psi (8.61 bar). Connect the pump air inlet 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 3/4" (19mm) in diameter] between pump and piping to eliminate strain to pipes.

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.

WARNING

*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.*

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.

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-up of the air exhaust can occur under certain temperature and humidity conditions. Use of an 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.

CHECK VALVE SERVICING

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 pump cycles but will not pump.

Inspection and service of check valves requires the removal of five hex nuts and one capscrew for each set of check valves (i.e., suction & discharge), providing access to the two ball valves and their valve seats. New ball valves are $3\frac{5}{8}$ " (9.21 cm) in diameter and will require replacement when worn to approximately $3\frac{3}{8}$ " (8.57 cm) diameter.

DIAPHRAGM SERVICING

Need for inspection or service of diaphragm is usually indicated when unit pumps from one chamber only and air is discharged out pump discharge port or when liquid being pumped is discharged through air exhaust port.

To service diaphragms remove two capscrews which secure the chamber to the manifold assembly, and twelve hex nuts that secure the chamber to the main pump assembly. To remove diaphragms, loosen diaphragm assembly by turning it out of the diaphragm rod using a $1\frac{1}{8}$ " (2.857 cm) socket or wrench. Removal of opposite outer chamber will permit removal of second diaphragm assembly and diaphragm rod as a unit.

To remove the diaphragm from the diaphragm assembly, hold the diaphragm rod in a clamping device, making sure to protect the rod surface of shaft so as not to scratch or mar it in any way. With a wrench turn the diaphragm assembly out of the diaphragm rod. To disassemble the components, turn a 5/16-18 UNC capscrew by hand into the tapped hole in the inner diaphragm plate. This will keep the plate from turning while the capscrew is removed. To remove the capscrew, place the assembly in a vise so the two protruding ends of screws are loose in the vise jaws (approximately 7/8" apart). Turn the center screw loose from the back plate and the assembly will come apart.

REASSEMBLY

All procedures for reassembling the pump are the reverse of the disassembly instructions with further instructions as shown:

The diaphragm assemblies are to be installed with the natural bulge outward or toward the head of the center screw. Make sure both plates are installed with outer radii against the diaphragm. After all components are in position in a vise and hand tight, set a torque wrench for 40 ft. pounds (54.23 Newton meters) using a $1\frac{1}{8}$ " (2.857 cm) socket. After each diaphragm sub assembly has been completed, thread one assembly into the diaphragm rod. Make sure the 5/16-18 UNC capscrew has been removed from the inner plate and the diaphragm rod bumper is in place on the diaphragm rod.

Install this sub assembly into the pump and secure by installing the outer chamber in place and tightening the capscrews. This will hold the assembly in place while the opposite side is installed. Install the second diaphragm assembly into the diaphragm rod checking to see that the diaphragm rod bumper is in place. Tighten to 30 ft. lbs. (40.67 Newton meters) torque before installing the outer chamber in place. If the holes in the diaphragm flange do not align with the holes in the inner chamber flange, turn the diaphragm assembly in the direction of tightening to align the holes so that the capscrews can be inserted. This final torquing of the last diaphragm assembly will lock the two diaphragm assemblies together. Secure the last outer chamber by tightening down the securing nuts gradually and evenly. This tightening procedure should be done on both sides.

When reinstalling check valves, take care that the seat gaskets are aligned properly before securing porting flange in place.

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 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.

ESADS+Plus®: Externally Serviceable Air Distribution System

Please refer to the exploded view drawing and parts list in the Service Manual supplied with your pump. If you need replacement or additional copies, contact your local Warren Rupp Distributor, or the Warren Rupp factory Literature Department at the number shown below. To receive the correct manual, you must specify the MODEL and TYPE information found on the name plate of the pump.

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 four hex head capscrews (each end) on the end caps of the valve body assembly. With the end caps removed, slide the spool back and forth in the sleeve. The spool is closely sized 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, gasket and bumper 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. You may have to clean the surfaces of the valve body where the end caps mount. Material may remain from the old gasket. Old material not cleaned from this area may cause air leakage after reassembly. Take care that the bumper stays in place allowing the sleeve to press in all the way. Re-install the spool, the opposite end cap, gasket and bumper on the valve body. After inspecting and cleaning the gasket surfaces on the valve body and intermediate, re-install the valve body on the pump using new gaskets. Tighten the four hex head capscrews evenly and in an alternating cross pattern.

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.

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.

PILOT VALVE ACTUATOR

Bushings for the pilot valve actuators are threaded into the intermediate bracket from the outside. 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.

TROUBLESHOOTING

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

POSSIBLE CAUSES:

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

PROBLEM: Pump will not cycle. (Note: Always disconnect air supply to relieve air pressure before disassembling any portion of pump.)

POSSIBLE CAUSES:

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

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

POSSIBLE CAUSES:

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

MATERIAL CODES THE LAST 3 DIGITS OF PART NUMBER


000	Assembly, sub-assembly; and some purchased items	305	Carbon Steel, Black Epoxy Coated	Color coded: BROWN	603	Blue Gylon	
010	Cast Iron	306	Carbon Steel, Black PTFE Coated	371	Phlithane (Tuftane)	604	PTFE
012	Powered Metal	307	Aluminum, Black Epoxy Coated	374	Carboxylated Nitrile	606	PTFE
015	Ductile Iron	308	Stainless Steel, Black PTFE Coated	375	Fluorinated Nitrile	607	Envelon
020	Ferritic Malleable Iron	309	Aluminum, Black PTFE Coated	378	High Density Polypropylene	608	Conductive PTFE
025	Music Wire	310	PVDF Coated	379	Conductive Nitrile	610	PTFE Encapsulated Silicon
080	Carbon Steel, AISI B-1112	313	Aluminum, White Epoxy Coated	405	Cellulose Fibre	611	PTFE Encapsulated FKM
100	Alloy 20	330	Zinc Plated Steel	408	Cork and Neoprene	632	Neoprene/Hytrel
110	Alloy Type 316 Stainless Steel	331	Chrome Plated Steel	425	Compressed Fibre	633	FKM/PTFE
111	Alloy Type 316 Stainless Steel (Electro Polished)	332	Aluminum, Electroless Nickel Plated	426	Blue Gard	634	EPDM/PTFE
112	Alloy C	333	Carbon Steel, Electroless Nickel Plated	440	Vegetable Fibre	635	Neoprene/PTFE
113	Alloy Type 316 Stainless Steel (Hand Polished)	335	Galvanized Steel	465	Fibre	637	PTFE, FKM/PTFE
114	303 Stainless Steel	336	Zinc Plated Yellow Brass	500	Delrin 500	638	PTFE, Hytrel/PTFE
115	302/304 Stainless Steel	337	Silver Plated Steel	501	Delrin 570	639	Nitrile/TFE
117	440-C Stainless Steel (Martensitic)	340	Nickel Plated	502	Conductive Acetal, ESD-800	643	Santoprene®/EPDM
120	416 Stainless Steel (Wrought Martensitic)	342	Filled Nylon	503	Conductive Acetal, Glass-Filled	644	Santoprene®/PTFE
123	410 Stainless Steel (Wrought Martensitic)	342	Filled Nylon	505	Acrylic Resin Plastic	656	Santoprene Diaphragm and Check Balls/EPDM Seats
148	Hardcoat Anodized Aluminum	351	Food Grade Santoprene	506	Delrin 150	661	EPDM/Santoprene
149	2024-T4 Aluminum	353	Geolast; Color: Black	520	Injection Molded PVDF Natural color	666	FDA Nitrile Diaphragm, PTFE Overlay, Balls, and Seals
150	6061-T6 Aluminum	354	Injection Molded #203-40 Santoprene- Duro 40D +/-5; Color: RED	540	Nylon	668	PTFE, FDA Santoprene/PTFE
151	6063-T6 Aluminum	355	Thermal Plastic	541	Nylon		
152	2024-T4 Aluminum (2023-T351)	356	Hytrel	542	Nylon		
154	Almag 35 Aluminum	357	Injection Molded Polyurethane	544	Nylon Injection Molded		Delrin and Hytrel are registered tradenames of E.I. DuPont.
155	356-T6 Aluminum	358	Urethane Rubber	550	Polyethylene		Gylon is a registered trademark of Garlock, Inc.
156	356-T6 Aluminum	358	Urethane Rubber (Some Applications)	551	Glass Filled Polypropylene		Nylatron is a registered trademark of Polymer Corp.
157	Die Cast Aluminum Alloy #380	359	Urethane Rubber	552	Unfilled Polypropylene		Santoprene is a registered trademark of Monsanto Corp.
158	Aluminum Alloy SR-319	360	Nitrile Rubber Color coded: RED	553	Unfilled Polypropylene		Rulon II is a registered trademark of Dixon Industries Corp.
159	Anodized Aluminum	361	Nitrile	555	Polyvinyl Chloride		Ryton is a registered trademark of Phillips Chemical Co.
162	Brass, Yellow, Screw Machine Stock	363	FKM (Fluorocarbon). Color coded: YELLOW	556	Black Vinyl		Valox is a registered trademark of General Electric Co.
165	Cast Bronze, 85-5-5-5	364	E.P.D.M. Rubber. Color coded: BLUE	558	Conductive HDPE		PortaPump, Tranquilizer and SludgeMaster are regis- tered tradenames of Warren Rupp, Inc.
166	Bronze, SAE 660	365	Neoprene Rubber. Color coded: GREEN	570	Rulon II		
170	Bronze, Bearing Type, Oil Impregnated	366	Food Grade Nitrile	580	Ryton		
175	Die Cast Zinc	368	Food Grade EPDM	590	Valox		
180	Copper Alloy	370	Butyl Rubber	591	Nylatron G-S		
				592	Nylatron NSB		
				600	PTFE (virgin material)		
				601	Tetrafluorocarbon (TFE)		
				602	PTFE (Bronze and moly filled)		
					Filled PTFE		

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.



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 8)



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.




CAUTION

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




WARNING

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



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

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

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

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

RECYCLING

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

Pump complies with EN809 Pumping Directive, Directive 98/37/EC Safety of Machinery, and Directive 94/9/EC, EN13463-1 Equipment for use in Potentially Explosive Environments. For reference to the directive certificates visit: www.warrenrupp.com. The Technical File No. AX1 is stored at KEMA, Notified Body 0344, under Document #203040000.



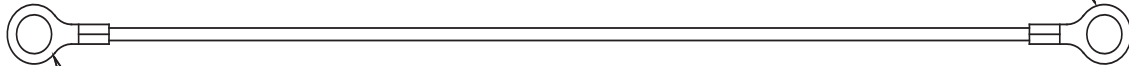
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II 2GD T5

Grounding The Pump

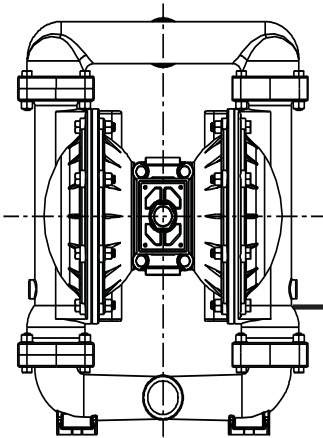
⚠ WARNING ⚠

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.

One eyelet is fastened to the pump hardware.



One eyelet is installed to a true earth ground.



This 8 foot long (244 centimeters) Ground Strap, part number 920-025-000 can be ordered as a service item.

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.

Declaration of Conformity

Declaration of Conformity

**WARREN
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Declaration of Conformity

Warren Rupp, Inc., 800 North Main Street, Mansfield, Ohio, certifies that Air-Operated Double Diaphragm Pumps Series: HDB, HDF, M Non-Metallic, S Non-Metallic, M Metallic, S Metallic, T series, G series, U series, EH and SH High Pressure, W series, SMA and SPA Submersibles, and Tranquilizer Surge Suppressors comply with the European Community Directive 98/37/EC, Safety of Machinery. This product has used Harmonized Standard EN 809, Pumps and Pump Units for Liquids - Common Safety Requirements, to verify conformance.

David Roseberry

Signature of authorized person

October 20, 2005

Date of issue

David Roseberry

Printed name of authorized person

Engineering Manager

Title

Revision level A

August 6, 2008

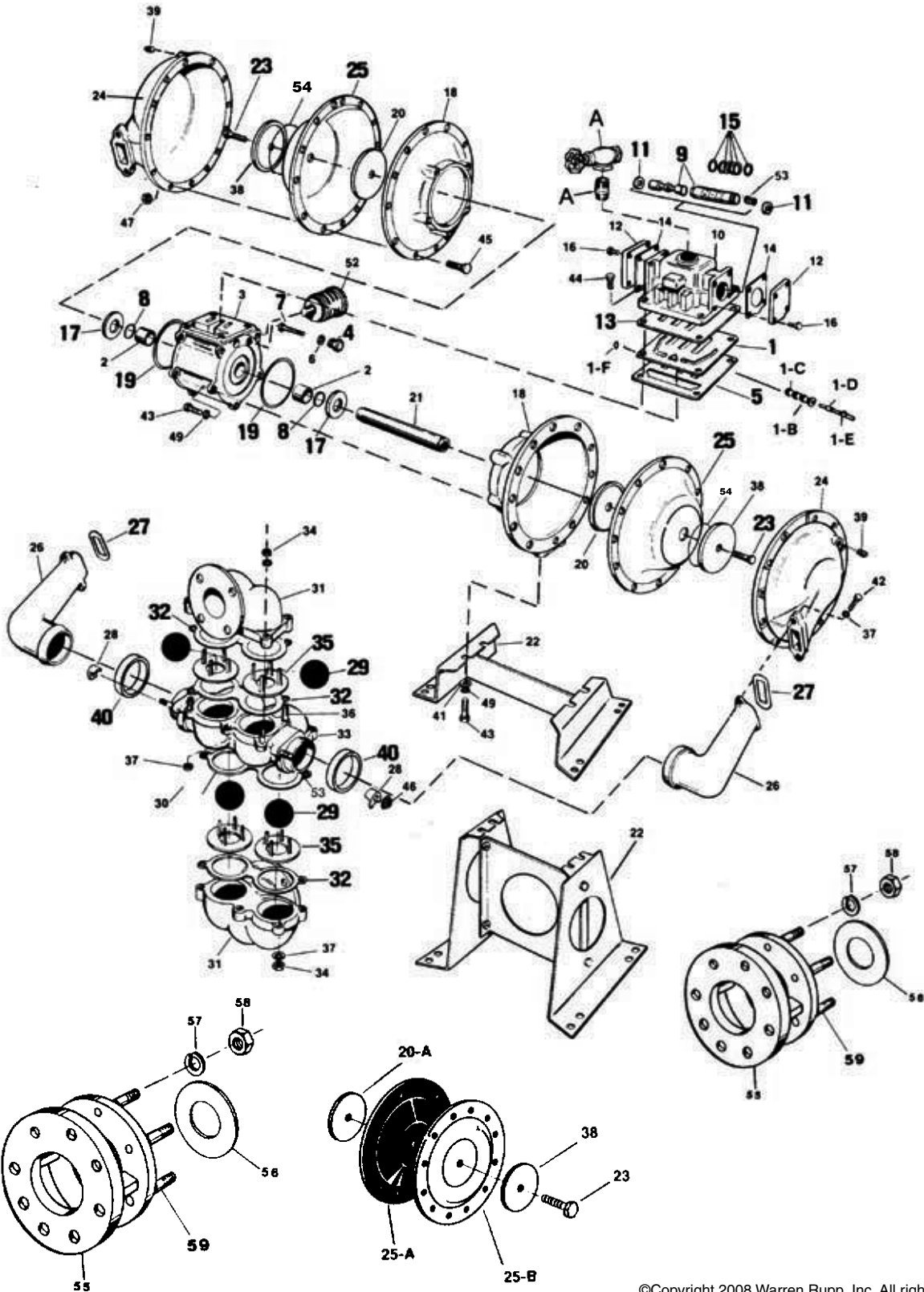
Date of revision

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Composite Repair Parts Drawing

BOTTOM PORTING is recommended for pumping material containing solids which could settle out in the pumping chambers. **TOP PORTING** is recommended if there is a possibility of entrapped air vapors inhibiting the pumping action.

Convert from one configuration to the other by rotating the outer chambers as indicated and substituting the proper pump base (low base for top porting, high base for bottom porting).



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**WARREN
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A WARREN RUPP PUMP BRANDI M2 c T5
II 2GD T5**SERVICE AND OPERATING MANUAL****Models HDB3-A/HDB4-A****Type 3**

ITEM NO.	PART NUMBER	DESCRIPTION	TOTAL RQD.
1	095.073.000	Pilot Valve Assembly	1
1-A	095-070-551	Pilot Valve Body	1
1-B	755-025-000	Sleeve, with O-Ring	1
1-C	560-033-360	O-Ring (Sleeve)	4
1-D	775-026-000	Spool, with O-Ring	1
1-E	560-023-360	O-Ring (Spool)	2
1-F	675-037-080	Retaining Ring	1
2	070.017.170.	Bearing, Sleeve	2
3	114.003.010.	Bracket, Intermediate	1
4	135.016.162.	Bushing, Threaded, with O-Ring	2
5	360.041.379.	Gasket, Valve Body	1
6	560.001.360.	O-Ring	2
7	620.011.114.	Plunger, Actuator	2
8	720.014.360.	Seal, HUVA Cup	2
9	031.018.000.	Sleeve & Spool Set	1
10	095.043.010.	Body, Valve	1
11	132.014.358.	Bumper, Valve Spool	2
12	165.011.010.	Cap, End	2
13	360.048.425.	Gasket, Valve Body	1
14	360.010.425.	Gasket, End Cap	2
15	560.020.360.	O-Ring	6
16	170.032.330.	Capscrew, Hex Head	8
17	132.012.360.	Bumper, Diaphragm	2
18	196.032.010.	Chamber, Diaphragm	2
19	560.045.360.	O-Ring	2
20	612.085.330.	Plate, Diaphragm	2
20-A	612.113.156.	Plate, Inner Diaphragm (Overlay Pumps Only)	2
21	685.030.120.	Rod, Diaphragm	1
22	060.012.000.	Base, Pump — Low (Top Ported)	1
22	060.013.000.	Base, Pump — High (Bottom Ported)	1
23	170.065.110.	Capscrew, Hex Head	2
23	170.065.330.	Capscrew, Hex Head	2
24	196.031.010.	Chamber, Diaphragm — Outer	2
24	196.031.110.	Chamber, Diaphragm — Outer	2
25	286.014.360.	Diaphragm	2
	286.014.363.	Diaphragm	2
	286.014.364.	Diaphragm	2
	286.014.365.	Diaphragm	2
	286.014.366.	Diaphragm	2
25-A	286.047.604.	Diaphragm (Overlay)	2
25-B	286.048.365.	Diaphragm (Use with Overlay)	2
26	312.031.010.	Elbow, Manifold	2
	312.031.110.	Elbow, Manifold	2
27	360.046.425.	Gasket, Flange	2
	360.046.603.	Gasket, Flange (Use with FKM and PTFE Diaphragms)	2
28	510.002.330.	Lug, Clamp	4
29	050.014.360W.	Ball, Check Valve	4
	050.014.364W.	Ball, Check Valve	4
	050.015.600.	Ball, Check Valve	4
	050.014.365W.	Ball, Check Valve	4
30	170.064.330.	Capscrew, Hex Head	2
31	334.023.010.	Flange, Suction & Discharge	2
	334.023.110.	Flange, Suction & Discharge	2

32	360.045.608.	Gasket, Manifold (Use with FKM & PTFE Diaphragms)	4
	360.045.379.	Gasket, Manifold	4
	360.045.384.	Gasket, Manifold	4
33	518.023.010.	Manifold	1
	518.023.110.	Manifold	1
34	545.009.330.	Nut, Hex	10
35	722.028.010.	Seat, Ball Check Valve	4
	722.028.110.	Seat, Ball Check Valve	4
37	900.007.330.	Washer, Lock	16
38	612.063.110.	Plate, Diaphragm — Outer	2
	612.063.330.	Plate, Diaphragm — Outer	2
39	618.003.110.	Plug, Pipe	2
	618.003.330.	Plug, Pipe	2
40	675.021.360.	Ring, Sealing	2
	675.021.363.	Ring, Sealing	2
	675.021.364.	Ring, Sealing	2
	675.021.365.	Ring, Sealing	2
	675.021.366.	Ring, Sealing	2
	675.021.600.	Ring, Sealing	2
41	901.006.330.	Washer, Flat	4
42	170.015.330.	Capscrew, Hex Head	4
43	170.034.330.	Capscrew, Hex Head	18
44	170.045.330.	Capscrew, Hex Head	4
45	170.066.330.	Capscrew, Hex Head	24
46	544.003.330.	Nut, Flange	4
47	545.008.330.	Nut, Hex	24
49	900.003.330.	Washer, Lock	14
52	530.033.000.	Muffler, Exhaust	1
	031.021.010.	Valve Body Assembly (Inc. Items 9, 10, 11, 12, 14, 15, 16)	1
53	807.085.330.	Stud	14
54	570.010.360.	Pad, Wear	2
	570.010.363.	Pad, Wear	2
	570.010.364.	Pad, Wear	2
	570.010.365.	Pad, Wear (Not used on PTFE overlay units)	2
HDB4-A:			
55	334.037.010.	Flange, Adapter	2
56	360.036.425.	Gasket, Flange	2
57	900.007.330.	Washer, Lock	8
58	545.009.330.	Nut, Hex	8
59	807.005.330.	Stud	8

AVAILABLE SERVICE AND CONVERSION KITS:

476.101.000.	AIR END KIT Seals, O-Rings, Gaskets, Air Valve Sleeve and Spool, Pilot Valve Assembly
476.046.360.	WETTED END KIT Nitrile Check Balls, Diaphragms, Sealing Rings, Gaskets
476.046.364.	WETTED END KIT EPDM Check Balls, Diaphragms, Sealing Rings, Gaskets
476.046.365.	WETTED END KIT Neoprene Check Balls, Diaphragms, Sealing Rings, Gaskets
476.046.633.	WETTED END KIT FKM Diaphragms, Sealing Rings, PTFE Check Balls, Gaskets
476.046.635.	WETTED END KIT PTFE Check Balls, Overlay Diaphragms and Sealing Rings, Neoprene Backup Diaphragms, Gaskets
476.046.636.	WETTED END KIT Food Grade Nitrile Diaphragms and Sealing Rings, PTFE Check Balls, Gaskets