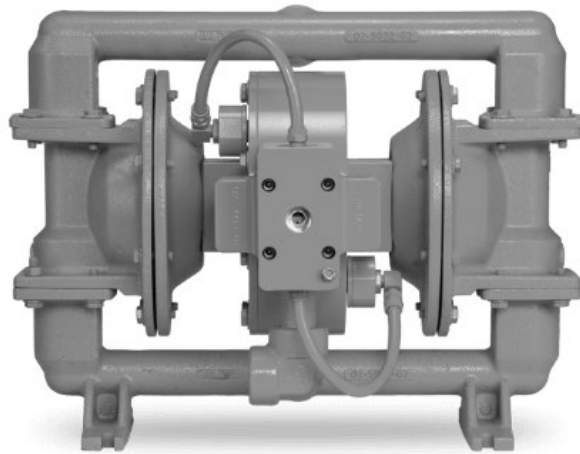


# EOM

ENGINEERING OPERATION  
& MAINTENANCE MANUAL

# H220 High Pressure Bolted Metal Pump



Where Innovation Flows

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**WILDEN®**

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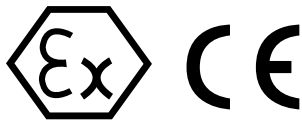
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**Warranty**

Each and every product manufactured by Wilden is built to meet the highest standards of quality. Every pump is functionally tested to ensure integrity of operation. Wilden warrants that pumps, accessories and parts manufactured or supplied by it to be free from defects in material and workmanship for a period of five (5) years from date of installation or six (6) years from date of manufacture, whichever comes first.

For more information, and to register your Wilden pump for warranty, please visit <https://www.psgdover.com/wilden/support/warranty-registration>.

**Certifications**

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## SECTION 1

## PRECAUTIONS – READ FIRST!



**WARNING:** Always wear safety glasses when operating a pump to avoid eye injury. If diaphragm rupture occurs, material being pumped may be forced out of the air exhaust.



**CAUTION:** Do not apply compressed air to the exhaust port – pump will not function.



**CAUTION:** Do not over-lubricate air supply– excess lubrication will reduce pump performance. Pump is pre-lubed.

**TEMPERATURE LIMITS:**

Acetal	-29°C to 82°C	-20°F to 180°F
Buna-N	-12°C to 82°C	10°F to 180°F
Bunalex™	-40°C to 130°C	-40°F to 266°F
Geolast®	-40°C to 82°C	-40°F to 180°F
Neoprene	-18°C to 93°C	0°F to 200°F
Nordel EPDM	-51°C to 138°C	-60°F to 280°F
Nylon	-18°C to 93°C	0°F to 200°F
PFA	-7°C to 107°C	45°F to 225°F
Polypropylene	0°C to 79°C	32°F to 175°F
Polyurethane	-12°C to 66°C	10°F to 150°F
PVDF	-12°C to 107°C	10°F to 225°F
Saniflex™	-29°C to 104°C	-20°F to 220°F
SIPD PTFE with EPDM-backed	4°C to 137°C	40°F to 280°F
SIPD PTFE with Neoprene-backed	4°C to 93°C	40°F to 200°F
PTFE*	4°C to 104°C	40°F to 220°F
FKM	-40°C to 177°C	-40°F to 350°F
Wil-Flex®	-40°C to 107°C	-40°F to 225°F

\*4°C to 149°C (40°F to 300°F) - 13 mm (1/2") and 25 mm (1") models only.

**NOTE:** Not all materials are available for all models. See "Wilden Pump Designation System" for material options for your pump.



**CAUTION:** When choosing pump materials, be sure to check the temperature limits for all wetted components. Example: FKM has a maximum limit of 177°C (350°F), but polypropylene has a maximum limit of only 79°C (175°F).



**CAUTION:** Maximum temperature limits are based on mechanical stress only. Certain chemicals will reduce maximum safe operating temperatures significantly. Consult the Chemical Resistance Guide for chemical compatibility and temperature limits.



**WARNING:** Prevention of static sparking — If static sparking occurs, fire or explosion could result. Pump, valves, and containers must be grounded to a proper grounding point when handling flammable fluids and whenever discharge of static electricity is a hazard.



**CAUTION:** All Wilden pumps are capable of passing solids. Use a strainer on the pump intake to ensure that the pump's rated solids capacity is not exceeded.



**CAUTION:** Do not exceed 6.9 bar (100 psig) air supply pressure.



**CAUTION:** Do not exceed 82°C (180°F) air inlet temperature for all models.



**CAUTION:** All piping, valves, gauges and other components installed on the liquid discharge must have a minimum pressure rating of 20 .7 bar (300 psig).



**CAUTION:** The discharge pressure generated by this pump is 3X the inlet pressure supplied.



**CAUTION:** The process fluid and cleaning fluids must be compatible chemically with all wetted pump components.



**CAUTION:** Before attempting any maintenance or repair, disconnect the compressed air line to the pump and allow all air pressure to bleed from the pump. Disconnect all intake, discharge, and air lines. Drain the pump by turning it upside down and allowing any fluid to flow into a suitable container. Be aware of any hazardous effects of contact with your process fluid.



**CAUTION:** Thoroughly flush pumps before installing them into process lines. Clean and/or sanitize FDA- and USDA-approved pumps before using them.



**CAUTION:** Before attaching the air line to the pump, blow out the air line for 10 to 20 seconds to make sure all pipeline debris is clear. Use an in-line air filter. A 5µ (micron) air filter is recommended.



**CAUTION:** Before installation, tighten all hardware.



**NOTE:** Materials of construction and elastomer material may influence suction lift parameters. Please refer to "Performance" for specifics.



**NOTE:** When installing PTFE diaphragms, it is important to tighten outer pistons simultaneously (turning in opposite directions) to ensure tight fit. (See "Maximum Torque Specifications").



**NOTE:** Some PTFE-fitted pumps come standard from the factory with expanded PTFE gaskets installed in the diaphragm bead of the liquid chamber. PTFE gaskets cannot be re-used.



**NOTE:** In the event of a power failure, close the shut-off valve if you do not want the pump to restart when the power returns.



**NOTE:** The Safety Supplement document is a part of the manual. Please refer to the Safety Supplement document for a complete list of safety considerations including considerations for safe operation and maintenance of pumps marked for ATEX environments before starting the pump.



**WARNING:** This product can expose you to chemicals including Nickel, Chromium, Cadmium, or Cobalt, which are known to the State of California to cause cancer and/or birth defects or other reproductive harm. For more information, go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

## WILDEN PUMP DESIGNATION SYSTEM

**Maximum Flow Rate:**  
94 lpm (25 gpm)

## MODEL

**WETTED PATH**  
S = STAINLESS STEEL  
W = DUCTILE IRON

**OUTER PISTON**  
S = STAINLESS STEEL  
W = DUCTILE IRON

**AIR CHAMBERS**  
S = STAINLESS STEEL  
W = DUCTILE IRON

**CENTER BLOCK**  
A = ALUMINUM

A = ALUMINUM

**DIAPHRAGMS**  
FWS = SANITARY WIL-FLEX®,  
[SANTOPRENE® (TWO  
BLACK DOTS)]  
TWS = FULL-STROKE PTFE  
W/WIL-FLEX® BACK-UP

TF = PTFE (WHITE)  
WF = WIL-FLEX® [SANTOPRENE®  
(THREE BLACK DOTS)]

**VALVE SEATS**  
M = MILD STEEL  
S = STAINLESS STEEL

**VALVE SEAT O-RINGS**  
TF = PTFE (WHITE)  
WF = WIL-FLEX® [SANTOPRENE®  
(THREE BLACK DOTS)]

0014 BSPT  
0320 Single-port exhaust

**! NOTE:** Most elastomeric materials use colored dots for identification

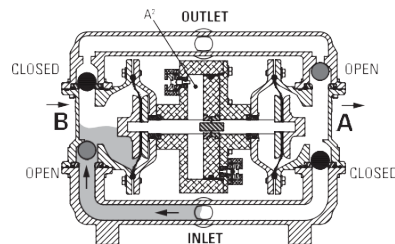
**! NOTE:** Not all models are available with all material options

## SECTION 3

## HOW IT WORKS – AIR-OPERATED DOUBLE-DIAPHRAGM PUMP

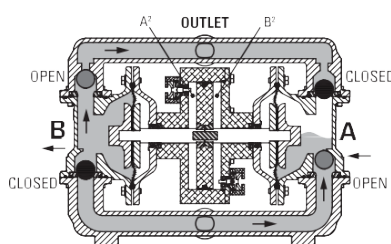
The Wilden diaphragm pump is an air-operated, positive displacement, self-priming pump. These drawings show flow pattern through the pump upon its initial stroke. It is assumed the pump has no fluid in it prior to its initial stroke.

**Preface:** The H220 uses an integral power amplifier piston together with two diaphragms to yield a pressure ratio of 3:1 [e.g., 6.9 bar (100 psig) air inlet will develop liquid discharge pressures up to 20.7 bar (300 psig)]. In the H220, air is simultaneously directed behind the amplifier piston as well as one of the diaphragms via specialized air manifold porting. The sum of the two surface areas is three times that of the diaphragm alone. Therefore, the discharge is amplified by a 3:1 pressure output ratio



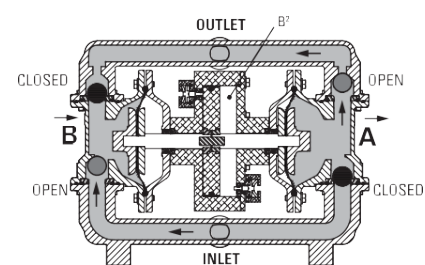
**FIGURE 1** When air pressure is supplied to the pump, the air valve directs pressure to the back side of diaphragm (A). The compressed air moves the diaphragm away from the center section of the pump. Simultaneously, compressed air is also supplied to the back side of the power piston (A2); pressure on Area A2 exerts force on the shaft communicated to diaphragm A. This force, when added to the force of pressure A is connected to the process fluid, thus providing the increase of liquid output pressure.

During this operation the opposite diaphragm (diaphragm B) is pulled in by a shaft connected to the power piston (A2) and pressurized diaphragm (A). Diaphragm (B) is now on its suction stroke; air behind diaphragm (B) and piston (B2) is being forced out to atmosphere through the exhaust port. The movement of diaphragm (B) towards the center section of the pump creates a vacuum within chamber (B). Atmospheric pressure forces fluid into the inlet manifold forcing the inlet valve ball off its seat. Liquid is free to move past the inlet valve ball and fill the liquid chamber (see shaded area).



**FIGURE 2** Once the power piston reaches the end of its stroke, the pressure relief valve opens. This causes the air valve to shift. This action redirects pressurized air to the back side (air side) of diaphragm (B) as well as the back side of the power piston (B2). This pressurized air forces diaphragm (B) away from the center section while also pulling diaphragm (A) towards the center section. Diaphragm (B) is now on its discharge stroke. Diaphragm (B) forces the inlet valve ball onto its seat due to the hydraulic forces developed in the liquid chamber and manifold. The same hydraulic force unseats the discharge valve ball off of its seat and forces fluid to flow through the pump discharge.

The pressure on the diaphragm (B) creates a force that is combined with the force of pressure applied to the power piston (B2). This total load is transferred to the liquid creating a liquid pressure that is 3 times the supplied air pressure.



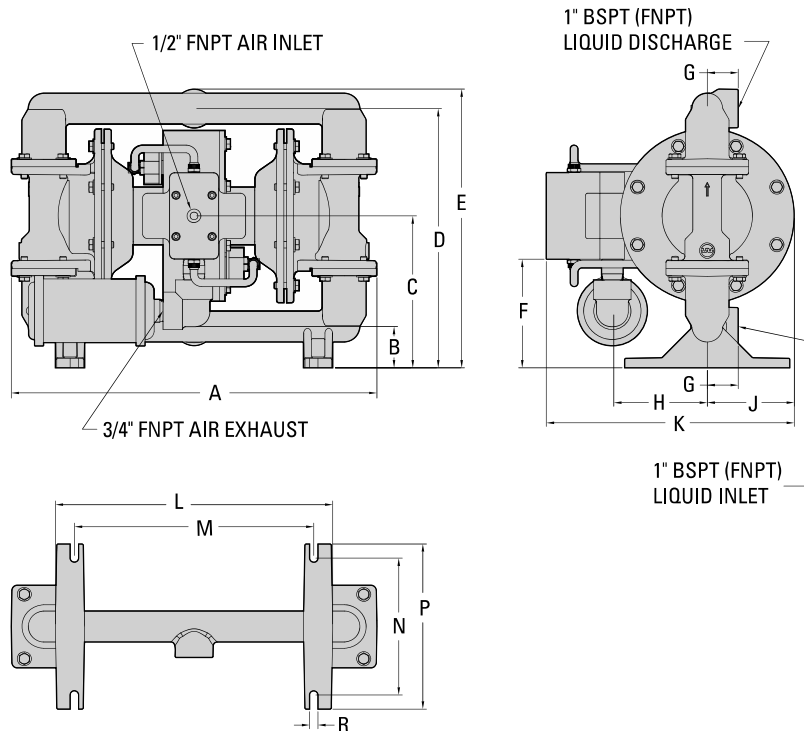
**FIGURE 3** At the completion of the stroke, once again the pressure relief valve opens and shifts the air valve. The air valve redirects air to the back side of diaphragm (A) and the power piston (A2), the air behind diaphragm (B) and the power piston (B2) is now exhausted. As the pump reaches its original starting position, each diaphragm has gone through one suction and one discharge stroke of the wetted path and one pressure and exhaust stroke of the air distribution system. This completes one cycle of the high pressure H220.

**NOTE:** The pump may take several cycles to completely prime depending on the condition of the application.

## SECTION 4

### DIMENSIONAL DRAWING

#### H220 METAL



#### DIMENSIONS

ITEM	METRIC (mm)	STANDARD (inch)
A	450	17.7
B	51	2.0
C	188	7.4
D	320	12.6
E	343	13.5
F	135	5.3
G	38	1.5
H	114	4.5
J	107	4.2
K	305	12.0
L	340	13.4
M	295	11.6
N	168	6.6
P	203	8.0
R	10	0.4

LW0440 REV. A

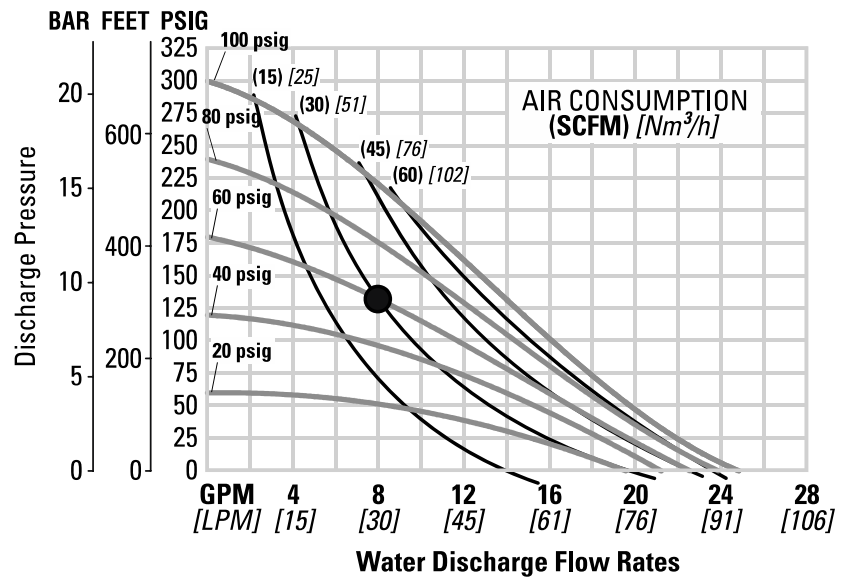
## SECTION 5

## PERFORMANCE

**H220 METAL  
TPE/FULL-STROKE  
PTFE-FITTED**

Ship Weight.....Ductile Iron 38 kg (84 lb)  
 Stainless Steel 37 kg (81 lb)  
 Air Inlet.....1/2"  
 Inlet.....25 mm (1")  
 Outlet.....25 mm (1")  
 Suction Lift.....2.8 m Dry (9.1')  
 9.0 m Wet (29.5')  
 Disp. Per Stroke<sup>1</sup>.....0.189 L (0.05 gal)  
 Max. Flow Rate.....93.9 lpm (24.8 gpm)  
 Max. Size Solids.....6.4 mm (1/4")

<sup>1</sup>Displacement per stroke was calculated at 4.8 bar (70 psig) air inlet pressure against a 2.1 bar (30 psig) head pressure.



**Example:** To pump 30 lpm (8 gpm) against a discharge pressure head of 9.0 bar (131 psig) requires 4.1 bar (60 psig) and 51.0 Nm³/h (30 scfm) air consumption.

Flow rates indicated on chart were determined by pumping water. For optimum life and performance, pumps should be specified so that daily operation parameters will fall in the center of the pump's performance curve.

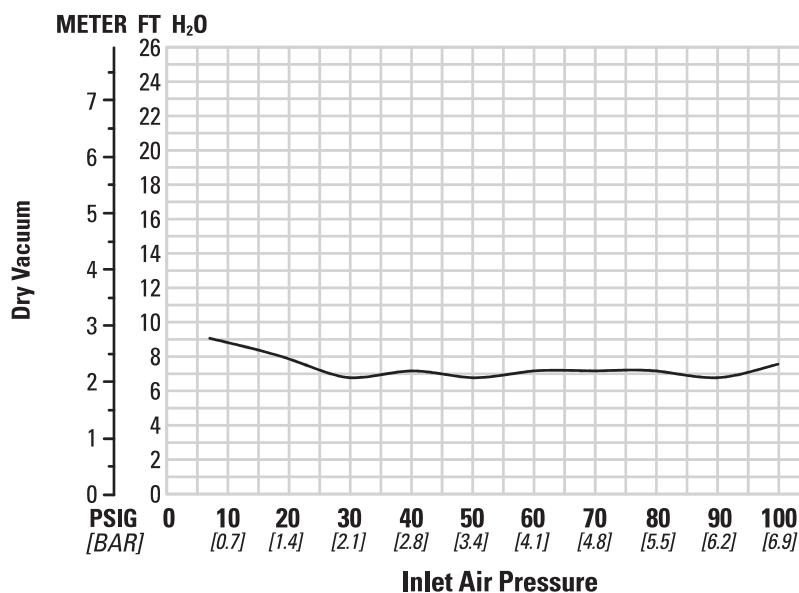
**Caution:** Do not exceed 6.9 bar (100 psig) air supply pressure.



## SUCTION LIFT CAPABILITY

### H220 METAL SUCTION LIFT CAPABILITY

Suction-lift curves are calibrated for pumps operating at 305 m (1,000') above sea level. This chart is meant to be a guide only. There are many variables that can affect your pump's operating characteristics. The number of intake and discharge elbows, viscosity of pumping fluid, elevation (atmospheric pressure) and pipe friction loss all affect the amount of suction lift your pump will attain.



## SECTION 6

SUGGESTED INSTALLATION, OPERATION, MAINTENANCE  
AND TROUBLESHOOTING

Wilden pumps are designed to meet the performance requirements of even the most demanding pumping applications. They have been designed and manufactured to the highest standards and are available in a variety of liquid path materials to meet your chemical resistance needs. Refer to "Performance" for an in-depth analysis of the performance characteristics of your pump. Wilden offers the widest variety of elastomer options in the industry to satisfy temperature, chemical compatibility, abrasion resistance and flex concerns.

The suction pipe size should be at least equal to or larger than the diameter size of the suction inlet on your Wilden pump. The suction hose must be a non-collapsible, reinforced type because these pumps are capable of pulling a high vacuum. Discharge piping should also be equal to or larger than the diameter of the pump discharge, which will help reduce friction losses.



**CAUTION:** All fittings and connections must be airtight. Otherwise, pump suction capability will be reduced or lost.

Months of careful planning, study and selection efforts can result in unsatisfactory pump performance if installation details are left to chance. You can avoid premature failure and long-term dissatisfaction by exercising reasonable care throughout the installation process.

**Location**

Noise, safety and other logistical factors usually dictate where equipment will be situated on the production floor. Multiple installations with conflicting requirements can result in congestion of utility areas, leaving few choices for additional pumps.

Within the framework of these and other existing conditions, locate every pump in such a way that the following six key factors are balanced against each other to maximum advantage:

- **Access:** First, the location should be accessible. If it's easy to reach the pump, maintenance personnel will be able to perform routine inspections and adjustments more easily. If major repairs become necessary, ease of access can play a key role in speeding the repair process and reducing total downtime.
- **Air Supply:** Every pump location should have an air line large enough to supply the volume of air necessary to achieve the desired pumping rate. Use up to a maximum of 6.9 bar (100 psig) air supply pressure.
- **Solenoid Operation:** When operation is controlled by a solenoid valve in the air line, three-way valves should be used. This valve allows trapped air between the valve and the pump to bleed off, which improves pump performance. You can estimate pumping volume by counting the number of strokes per minute, and then multiplying that figure by the displacement per stroke.
- **Muffler:** Using the standard Wilden muffler, sound levels are reduced below OSHA specifications. You can use other mufflers to reduce sound levels farther, but they usually reduce pump performance.
- **Elevation:** Selecting a site that is well within the pump's dynamic lift capability will assure that loss-of-prime issues will be eliminated. In addition, pump efficiency can be adversely affected if proper attention is not given to site location.
- **Piping:** Final determination of the pump site should not be made until the piping challenges of each possible location have been evaluated. The impact of current and future installations should be considered ahead of time to make sure that inadvertent restrictions are not created for any remaining sites.

The best choice possible will be a site involving the shortest and straightest hook-up of suction and discharge piping. Unnecessary elbows, bends and fittings should be avoided. Pipe sizes should be selected to keep friction losses within practical limits. All piping should be supported independently of the pump. In addition, the piping should be aligned to avoid placing stress on the pump fittings.

Flexible hose can be installed to aid in absorbing the forces created by the natural reciprocating action of the pump. If the pump is to be bolted down to a solid location, a mounting pad placed between the pump and the foundation will assist in minimizing pump vibration. Flexible connections between the pump and rigid piping will also assist in minimizing pump vibration.

If the pump is to be used in a self-priming application, make sure that all connections are airtight and that the suction lift is within the model's ability.



**NOTE:** Materials of construction and elastomer material have an effect on suction lift parameters. Please refer to "Performance" for specifics.

When pumps are installed in applications involving flooded suction or suction head pressures, a gate valve should be installed in the suction line to permit closing of the line for pump service.

Pumps in service with a positive suction head are most efficient when inlet pressure is limited to 0.5–0.7 bar (7–10 psig). Premature diaphragm failure may occur if positive suction is 0.7 bar (10 psig) and higher.

**Single-Point Exhaust**

Pro-Flo SHIFT pumps can be used for submersible applications when using the Pro-Flo SHIFT's single-point exhaust.

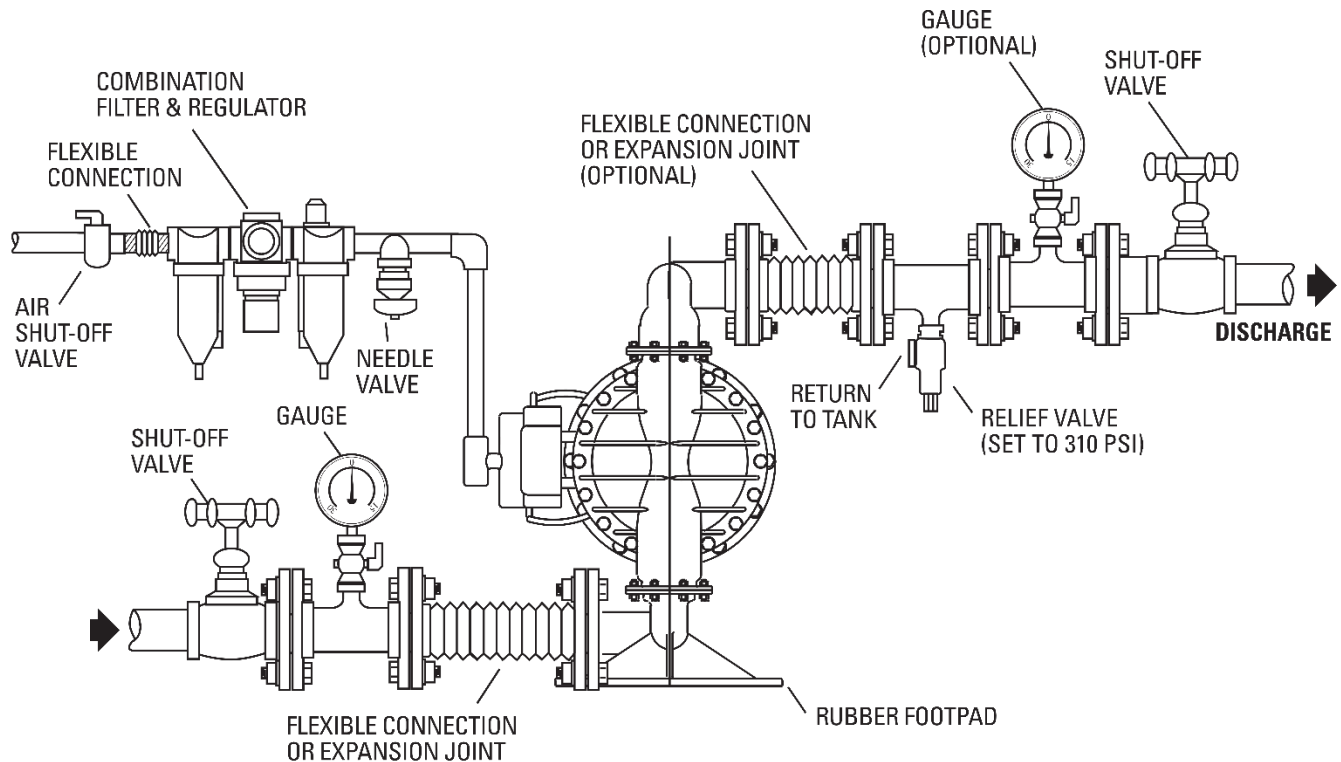


**CAUTION:** All Wilden pumps are capable of passing solids. Use a strainer on the pump intake to ensure that the pump's rated solids capacity is not exceeded.



**CAUTION:** Do not exceed 6.9 bar (100 psig) air supply pressure.

## SUGGESTED INSTALLATION, OPERATION, MAINTENANCE AND TROUBLESHOOTING



**NOTE:** In the event of a power failure, close the shut-off valve if you do not want the pump to restart when the power returns.

**Air-Operated Pumps:** To stop the pump from operating in an emergency, simply close the shut-off valve (user-supplied) installed in the air supply line. A properly functioning valve will stop the air supply to the pump, therefore stopping output. This shut-off valve should be located far enough away from the pumping equipment such that it can be reached safely in an emergency.

### Operation

Pump discharge rate can be controlled by limiting the volume and/or pressure of the air supply to the pump. An air regulator is used to regulate air pressure. A needle valve is used to regulate volume. Pump discharge rate also can be controlled by throttling the pump discharge by partially closing a valve in the discharge line of the pump. This action increases friction loss, which reduces flow rate. (See "Performance") This is useful when the need exists to control the pump from a remote location. When the pump discharge pressure equals or exceeds the air supply pressure, the pump will stop. No bypass or pressure relief valve is needed, and pump damage will not occur. The pump has reached a "deadhead" situation and can be restarted by reducing the fluid discharge pressure or increasing the air inlet pressure. The Wilden High Pressure Pumps run solely on compressed air and does not generate heat, therefore your process fluid temperature will not be affected.

### Maintenance and Inspections

Because each application is unique, maintenance schedules may be different for every pump. Frequency of use, line pressure, viscosity and abrasiveness of process fluid all affect the parts life of a Wilden pump. Periodic inspections have been found to offer the best means for preventing unscheduled pump downtime. Personnel familiar with the pump's construction and service should be informed of any abnormalities that are detected during operation.

### Records

When service is required, a record should be made of all necessary repairs and replacements. Over a period of time, such records can become a valuable tool for predicting and preventing future maintenance problems and unscheduled downtime. In addition, accurate records make it possible to identify pumps that are poorly suited to their applications.

## SUGGESTED INSTALLATION, OPERATION, MAINTENANCE AND TROUBLESHOOTING

### Troubleshooting

#### *Pump will not run or runs slowly.*

1. Remove plug from pilot spool exhaust.
2. Ensure that the air inlet pressure is at least 0.4 bar (5 psig) above startup pressure and that the differential pressure (the difference between air inlet and liquid discharge pressures) is not less than 0.7 bar (10 psig).
3. Check air inlet filter for debris (see "Suggested Installation, Operation, Maintenance and Troubleshooting").
4. Check for extreme air leakage (blow by) that would indicate worn seals/bores in the air valve, pilot spool and main shaft.
5. Disassemble the pump and check for obstructions in the air passageways or objects that would obstruct the movement of internal parts.
6. Check for sticking ball check valves.
  - a. If material being pumped is not compatible with pump elastomers, swelling may occur. Replace ball check valves and seals with proper elastomers.
  - b. Also, as the check valve balls wear out, they become smaller and can become stuck in the seats. In this case, replace balls and seats.
7. Check for any broken inner piston that would cause the air valve spool to be unable to shift.

#### *Pump runs, but little or no product flows.*

1. Check for pump cavitation. Slow pump speed down to allow thick material to flow into liquid chambers.
2. Verify that vacuum required to lift liquid is not greater than the vapor pressure of the material being pumped (cavitation).
3. Check for sticking ball check valves.
  - a. If material being pumped is not compatible with pump elastomers, swelling may occur. Replace ball check valves and seals with proper elastomers.
  - b. Also, as the check valve balls wear out, they become smaller and can become stuck in the seats. In this case, replace balls and seats.

#### *Pump air valve freezes.*

1. Check for excessive moisture in the compressed air.
  - a. Either install a dryer or a hot air generator for compressed air.
  - b. Alternatively, you may use coalescing filter to remove the water from the compressed air in some applications.

#### *Air bubbles in pump discharge.*

1. Check for a ruptured diaphragm.
2. Check tightness of outer pistons (see "Disassembly/Reassembly").
3. Check tightness of fasteners and integrity of O-rings and seals, especially at intake manifold.
4. Ensure pipe connections are airtight.

#### *Product comes out air exhaust.*

1. Check for a diaphragm rupture.
2. Check the tightness of the outer pistons to the shaft.

## SECTION 7

## DISASSEMBLY / REASSEMBLY

## PUMP DISASSEMBLY

## Tools Required:

- 1/2" Wrench
- 9/16" Wrench
- 3/4" Wrench
- 1" Wrench
- 15/16" Wrench
- 5/64" Hex-Head Wrench
- 3/16" Hex-Head Wrench
- O-Ring Pick
- Adjustable Wrench
- Snap-Ring Pliers
- 5/8"-18 Jam Nut 1/2" Socket
- 1" Socket
- Torque Wrench



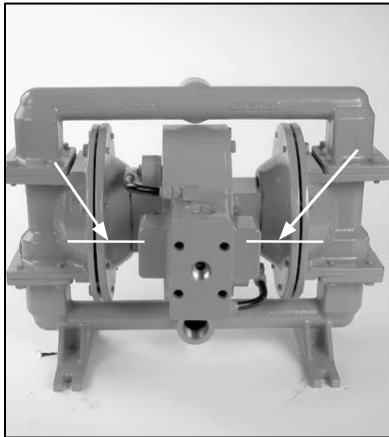
**CAUTION:** Before attempting any maintenance or repair, disconnect the compressed air line to the pump and allow all air pressure to bleed from the pump. Disconnect all intake, discharge, and air lines. Drain the pump by turning it upside down and allowing any fluid to flow into a suitable container. Be aware of any hazardous effects of contact with your process fluid.



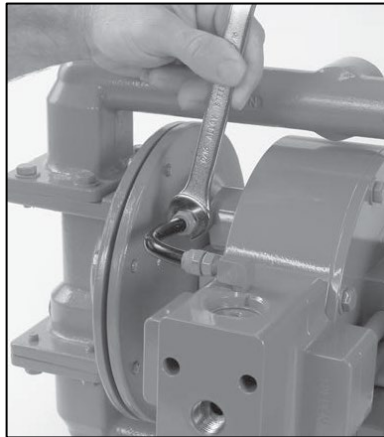
**NOTE:** Your specific pump model may vary from the configuration shown; however, pump disassembly procedure will be the same.



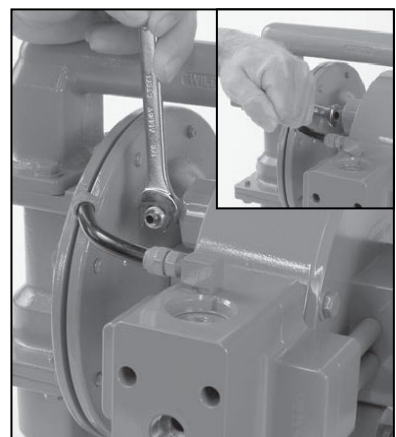
**NOTE:** Replace worn parts with genuine Wilden parts for reliable performance.

**Step 1**

Before starting disassembly, mark a line from each liquid chamber to its corresponding air chamber. This line will assist in proper alignment during reassembly.

**Step 2**

Using a 9/16" wrench, loosen the tubing compression nuts located at each pressure relief valve.

**Step 3**

Using a 1/2" wrench, loosen the pipe fittings and elbows to allow access to the pressure relief valve.

## DISASSEMBLY / REASSEMBLY



### Step 4

Using an adjustable wrench, remove each pressure relief valve.



### Step 5

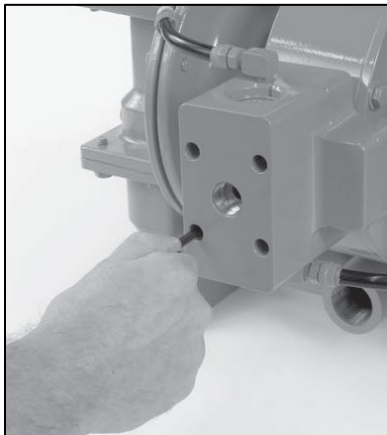
Using a 5/64" hex-head wrench, remove the four fasteners to disassemble the pressure relief valve.



### Step 6

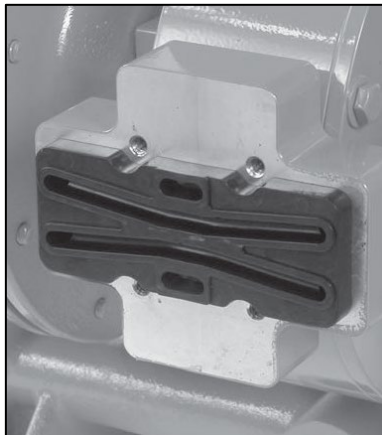
Inspect the pressure relief valve and components for nicks, gouges, chemical attack, or abrasive wear. Reassemble when complete. Replace if necessary with genuine Wilden parts.

**NOTE:** Pressure relief valve is available as an assembly or a rebuild kit.



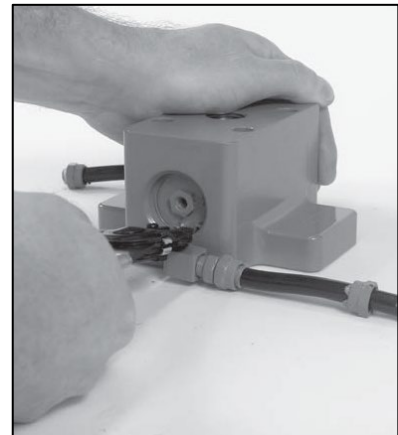
### Step 7

Using a 3/16" hex-head wrench, remove the four fasteners that connect the air valve and air valve gasket to the manifold and lift the air valve off the manifold.



### Step 8

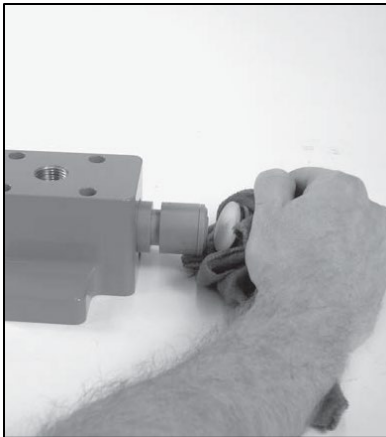
Be sure to note the orientation of the air valve gasket. (The flat side mates against the manifold and the grooved side faces the air valve.)



### Step 9

Using a pair of snap-ring pliers, remove the snap-ring from the bottom of the air valve body.

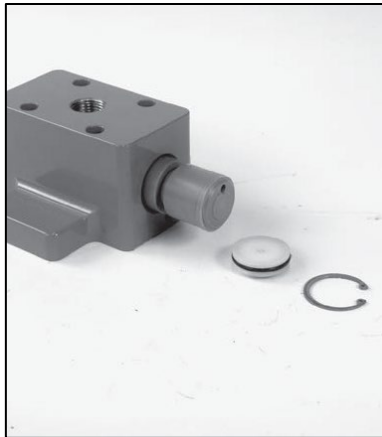
## DISASSEMBLY / REASSEMBLY



### Step 10

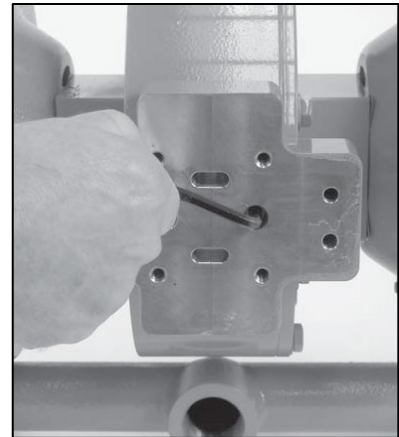
**Hints & Tips** – Using an air nozzle, alternately pressurize the 1/8" NPT ports, fittings or Pressure Relief Valve tubing until the bottom end cap is forced from the air valve body,

**CAUTION:** The end cap may come out with considerable force. Position a shop rag over the bottom end cap to ensure that the end cap doesn't harm the pump technician or anyone else in the immediate area.



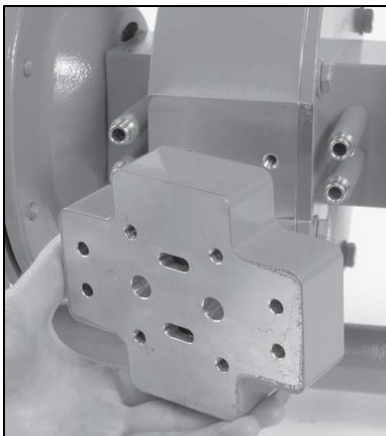
### Step 11

Inspect: air piston (including air valve rings), air valve body, and air valve end cap for nicks, gouges, chemical attack, or abrasive wear. Replace (if necessary) with genuine Wilden parts.



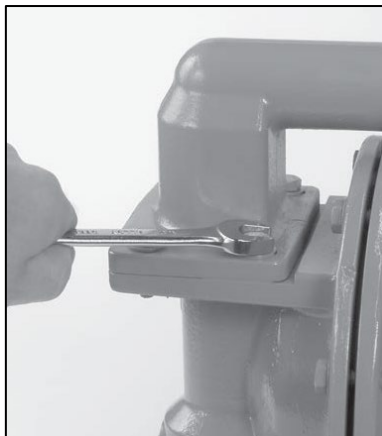
### Step 12

Using a 3/16" hex-head wrench, remove the two air valve manifold fasteners and remove the air valve manifold.



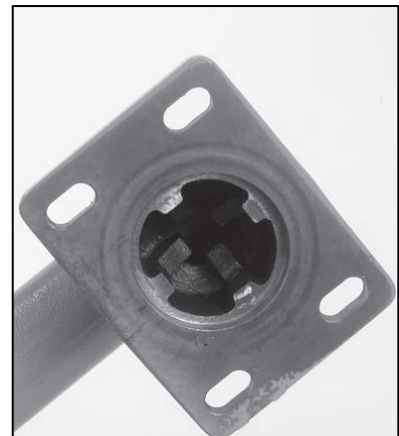
### Step 13

Located behind the air valve manifold are four tubes. Remove all four tubes.



### Step 14

Using a 1/2" wrench or socket, remove discharge manifold and fasteners.

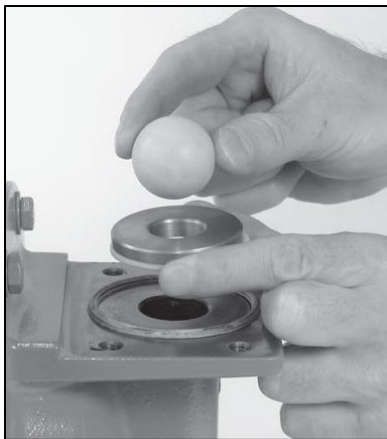


### Step 15

After removing discharge manifold, inspect for abrasion in the ball cage area.



## DISASSEMBLY / REASSEMBLY



### Step 16

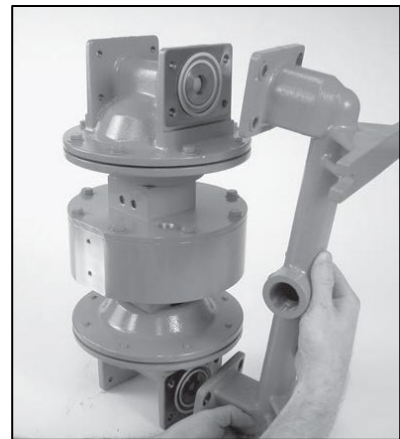
Remove valve ball, valve seat, valve seat O-ring and manifold O-ring and inspect.



### Step 17

Prior to disconnecting the inlet manifold from the liquid chambers, place the pump assembly on its side. Using a 1/2" wrench or socket, remove the inlet manifold fasteners.

**CAUTION:** The center assembly is very heavy and could cause injury to the pump technician or anyone else in the immediate area.



### Step 18

**Hints & Tips** – Due to the liquid chamber design, the pump can be positioned on one liquid chamber as shown; you can use the liquid chamber to assist with removal of the manifolds or opposite liquid chamber.



### Step 19 and 20

Remove the liquid chambers using a 1/2" wrench or socket.

Remove one outer piston, diaphragm, and inner piston using two 1" wrenches.



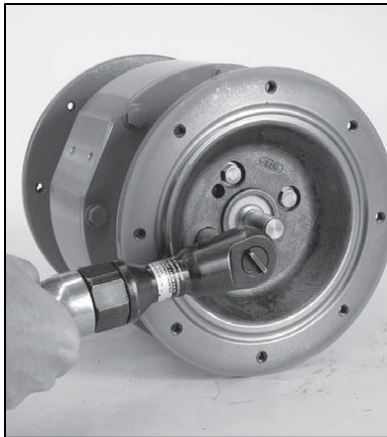
### Step 21

**Hints & Tips** – To remove the opposite diaphragm assembly, use the following steps: First, install a 5/8"-18 jam nut on the pump shaft. With a 15/16" wrench positioned on the jam nut, lock the outer piston against the jam nut using a 1" wrench on the outer piston. Holding the jam nut with the 15/16" wrench, you can now remove the opposite diaphragm assembly by turning in a counterclockwise direction.

**NOTE:** 5/8"-16 jam nut not included. Available thru McMaster-Carr# 91078A235.\

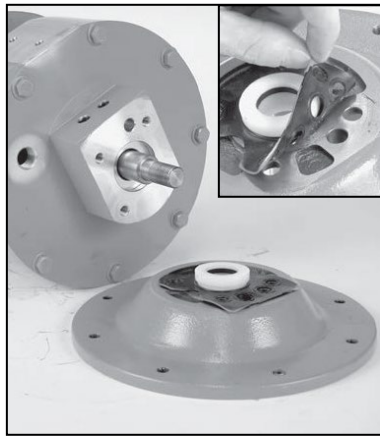


## DISASSEMBLY / REASSEMBLY



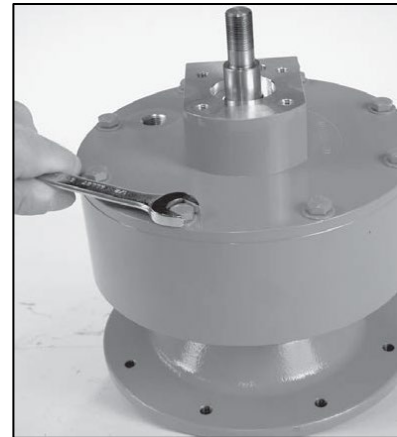
### Step 22

Using a 1/2" socket, remove the air chamber fasteners.



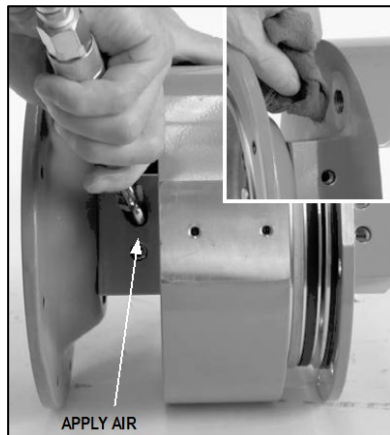
### Step 23

With the air chamber removed, note the orientation of the bushing and center section gasket.



### Step 24

Using a 1/2" wrench, remove the fasteners that connect the power piston cylinder cover to the power cylinder body.



### Step 25

By blocking the pressure relief port and using an air nozzle with a rubber tip, blow air through the port shown in the corresponding picture (upper left) to force the cylinder piston and center section cover from the center section. Continue to supply air to the port until the power cylinder piston is moved out of the power cylinder body.

**CAUTION:** The center section cover may come out with considerable force. Position the pump in a manner to ensure that the center section cover and related parts do not harm the pump technician or anyone else in the immediate area.



### Step 26

Remove the center section cover and piston assembly by hand. Inspect shaft bushings, seals, and O-ring on power cylinder cover for damage.

### DISASSEMBLY / REASSEMBLY



#### **Step 27**

Using two 3/4" wrenches, break loose the two shafts from the power piston in a counter clockwise manner. Inspect the shafts and cylinder piston bushings for wear and replace as necessary.

**NOTE:** Step 27 would only be required in the case of damage to the pump shaft(s).

## DISASSEMBLY / REASSEMBLY

## REASSEMBLY HINTS AND TIPS

Upon performing applicable maintenance to the air distribution system, the pump can now be reassembled. Please refer to the disassembly instructions for photos and parts placement.

To reassemble the pump, follow the disassembly instructions in reverse order. The air distribution system needs to be assembled first, then the diaphragms and finally the wetted path. The applicable torque specifications are on this page.

The following tips will assist in the assembly process:

- Lubricate the air valve bore, center section shaft and pilot spool bore with NLGI grade 2 white EP bearing grease or equivalent.
- Clean the inside of the center section shaft bore to ensure no damage is done to new shaft seals.
- A small amount of NLGI grade 2 white EP bearing grease can be applied to the muffler and air valve gaskets to lubricate gaskets during assembly.

**\*NOTE:** Use of Loctite® adhesive is recommended for this connection.

Torque all hardware in an opposing torque sequence. Liquid chamber bolts may require periodic re-tightening. If liquid chamber pre-load torque values fall below 136 N•m (100 ft-lb), retighten both liquid chambers to a maximum of 13.6 N•m (120 in-lb). Liquid chamber torque loading must be even. If any of the liquid chamber bolts require retightening, it is suggested that all liquid chamber bolts be retightened to ensure even distribution.

Maximum Torque Specifications	
Description	Torque
Air Valve	6.8 N•m (60 in-lb)
Outer Piston	136 N•m (100 ft-lb)
Liquid Chambers to Air Chamber Bolts	13.6 N•m (120 in-lb)
Inlet and Discharge Manifolds to Liquid Chamber Bolts	13.6 N•m (120 in-lb)
Center Section Cover Bolts	13.6 N•m (120 in-lb)
Air Chamber to Center Section Bolts	13.6 N•m (120 in-lb)
Air Valve Manifold Bolts	6.8 N•m (60 in-lb)
*Shaft to Shaft	115.2 N•m (85 ft-lb)

## DISASSEMBLY / REASSEMBLY

## BUSHING SEAL INSTALLATION

## Pre-Installation

After all the old seals have been removed, the inside of the bushing should be cleaned to ensure no debris is left that may cause premature damage to the new seals.

## Installation

1. To prevent damaging the inside surface of the new seal, wrap electrical tape around each leg of the needle-nose pliers. (Heat shrink tubing may also be used.)
2. With a new seal in hand, place the two legs of the needle-nose pliers inside the seal ring. (See Figure A.)
3. Open the pliers as wide as the seal diameter will allow, then with two fingers pull down on the top portion of the seal to form a kidney bean shape. (See Figure B.)
4. Lightly clamp the pliers together to hold the seal into the kidney shape. Be sure to pull the seal into as tight of a kidney shape as possible. This will allow the seal to travel down the bushing bore with greater ease.
5. With the seal clamped in the pliers, insert the seal into the bushing bore and position the bottom of the seal into the correct groove. When the bottom of the seal is seated in the groove, release the clamp pressure on the pliers. This will allow the seal to partially snap back to its original shape.
6. After removing the pliers, you will notice a slight bump in the seal shape. Before the seal can be resized properly, the bump in the seal should be removed as much as possible. This can be done with either a Phillips screwdriver or your finger. With the side of the screwdriver or your finger, apply light pressure to the peak of the bump. This pressure will cause the bump to be eliminated almost completely.
7. Lubricate the edge of the shaft with NLGI grade 2 white EP bearing grease.
8. Slowly insert the center shaft with a rotating motion. This will complete the resizing of the seal.
9. Repeat these steps for the remaining seals.

## Tools

The following tools can be used to aid in the installation of the new seals:

- Needle-Nose Pliers
- Phillips Screwdriver
- Electrical Tape

Figure A

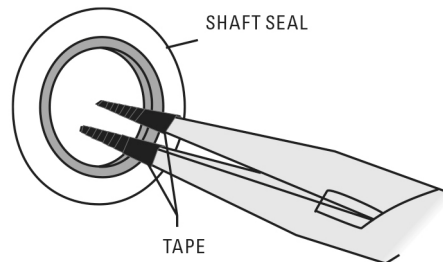
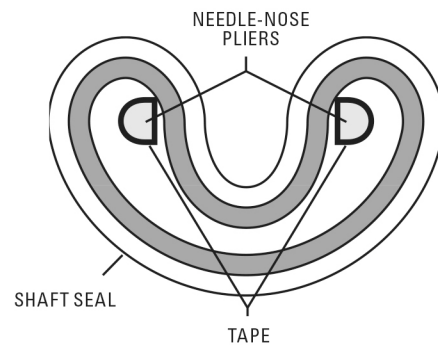


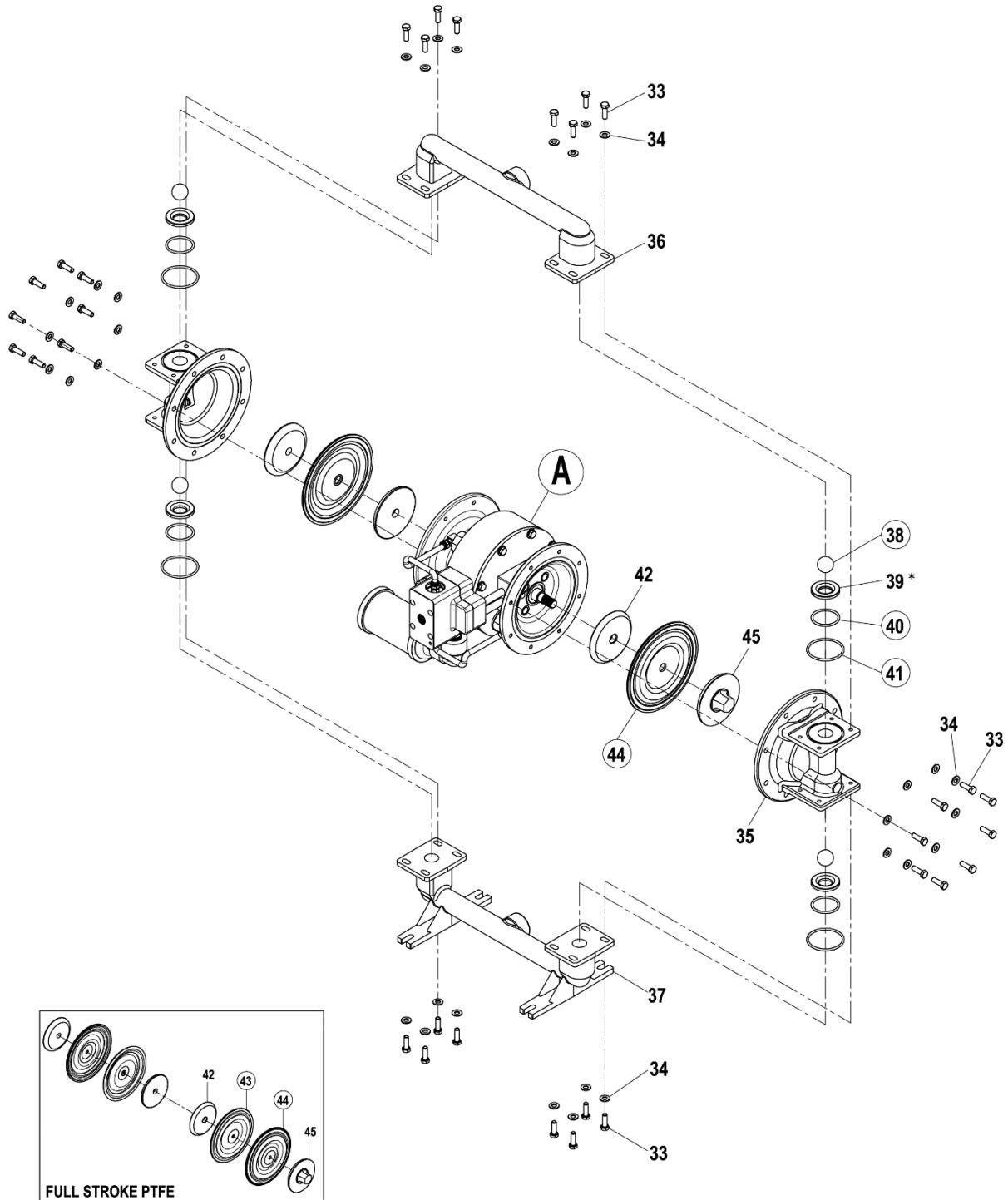
Figure B



## SECTION 8

### EXPLODED VIEW AND PARTS LIST

#### H220 METAL – WETTED PATH

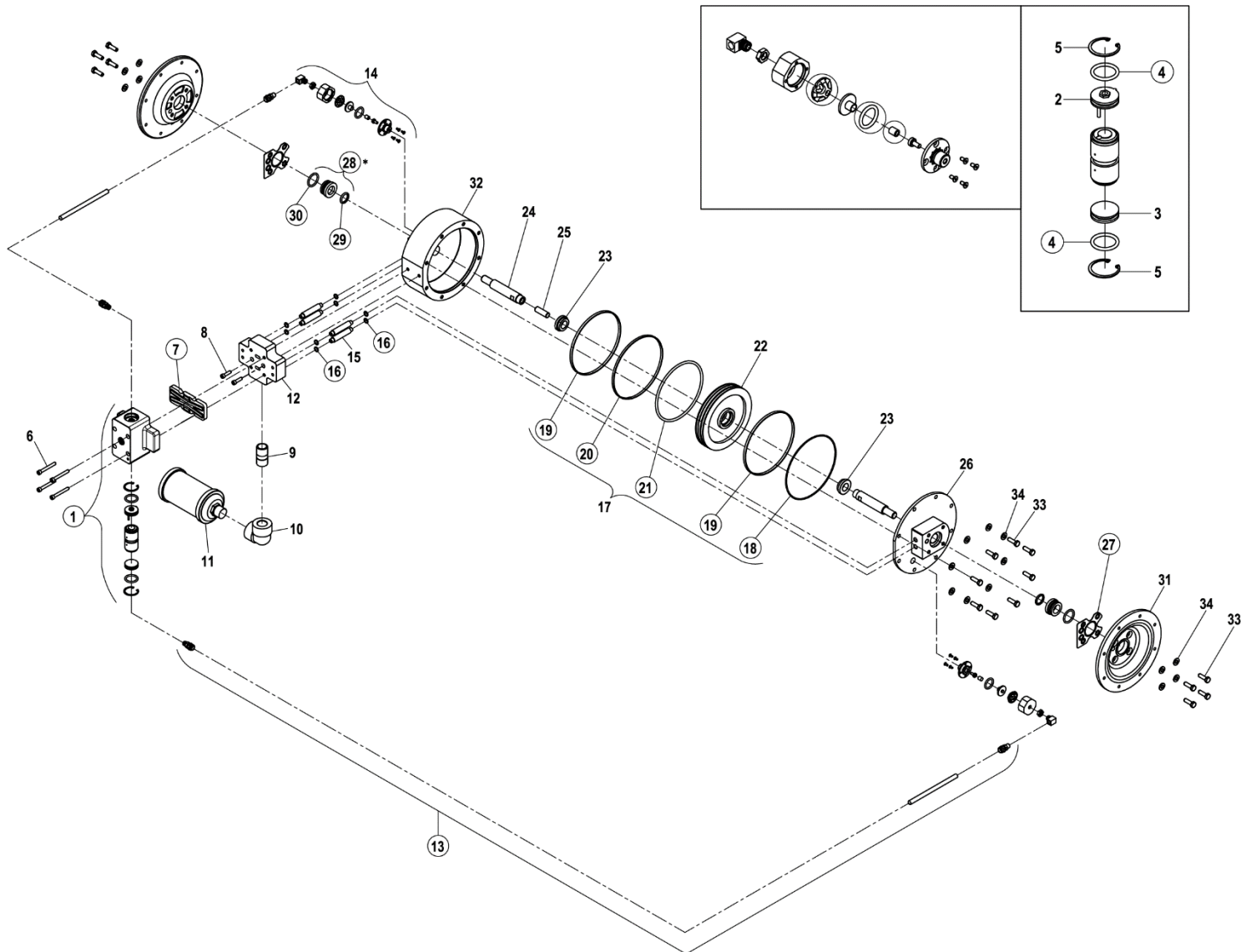


ALL CIRCLED PART IDENTIFIERS ARE INCLUDED IN REPAIR KITS

LW0441 REV. B

## EXPLODED VIEW AND PARTS LIST

## H220 METAL – CENTER SECTION



ALL CIRCLED PART IDENTIFIERS ARE INCLUDED IN REPAIR KITS

LW0441 REV. B

## EXPLODED VIEW AND PARTS LIST

Model Description			H220/WWWAA <sup>4</sup>	H220/SSSAA
Item	Part Description	Qty.	P/N	P/N
Air Distribution Components				
1	<b>Air Valve Assembly<sup>1</sup></b>	1	02-2003-01	
2	End Cap w/Guide	1	04-2300-23	
3	End Cap w/o Guide	1	04-2330-23	
4	<b>O-Ring (.984 x .139)</b>	2	04-2390-52	
5	Retaining Ring	2	04-2650-03	
6	Screw, SHC, Air Valve (1/14"-20 x 2")	4	04-6000-03	
7	<b>Air Valve Gasket</b>	1	02-2603-52	
8	Screw, SHC, Manifold (1/4"-20 x 7/8")	2	70-6250-03	
9	Nipple, 3/4" NPT	1	02-7430-08	
10	Elbow, 90°, 3/4" NPT	1	02-3250-08	
11	Muffler	1	08-3510-99	
12	Manifold, Air Valve	1	02-2700-01	
13	Relief Tube Assembly	2	02-9232-99	
14	<b>Pressure Relief Valve Assembly</b>	2	08-2740-99-60	
	<b>Rebuild Pressure Relief Seal Kit</b>	1	99-9346-99	
15	Pipe	4	02-7521-01	
16	<b>O-Ring Pipe (.364 x .070)</b>	8	00-2286-52	
17	<b>Power Piston Seal Kit<sup>2</sup></b>	1	02-9210-99	
18	<b>O-Ring, Cover (6.487 x .103)</b>	1	-	
19	Guide Ring	2	-	
20	<b>Slipper Seal/O-ring Combo</b>	1	-	
21	<b>O-Ring, Piston (5.975 x .210)</b>	1	-	
22	Piston, Cylinder	1	02-3720-01	
23	Bushing, Cylinder Piston	2	02-3730-03	
24	Shaft	2	02-3845-03	
25	Stud, Shaft	1	08-6150-08	
26	Cover, Center Section	1	02-3000-01	
27	<b>Gasket, Center Section</b>	2	02-3260-52	
28	<b>Bushing Assembly, Center Section<sup>3</sup></b>	2	02-3307-99	
29	<b>Glyd Ring</b>	2	08-3210-55-225	
30	<b>O-Ring (1.109 x .139)</b>	2	02-1200-52	
31	Chamber, Air	2	02-3692-02	02-3692-03
32	Section, Center	1	02-3154-01	
33	Screw, HHC (5/16"-18 x 1")	48	08-6180-03-42	
34	Washer (5/16")	48	02-6731-03	
Wetted Path Components				
35	Liquid Chamber	2	02-5012-02	02-5012-03
36	Discharge Manifold, NPT	1	02-5032-02	02-5032-03
	Discharge Manifold, BSPT	1	02-5033-02	02-5033-03
37	Inlet Manifold, NPT	1	02-5092-02	02-5092-03
	Inlet Manifold, BSPT	1	02-5093-02	02-5093-03
33	Screw, HHC (5/16"-18 x 1")	48	08-6180-03-42	
34	Washer (5/16")	48	02-6731-03	
Valve Balls/Valve Seats/Valve O-Rings				
38	<b>Ball, Valve</b>	4	*	
39	<b>Seat, Valve</b>	4	02-1129-08	02-1129-03
40	<b>O-Ring, Seat (2.359 x .139)</b>	4	*	
41	<b>O-Ring, (2.539 x .139)</b>	4	*	
Full Stroke TPE/PTFE Components				
42	Piston, Inner	2	02-3702-02	02-3702-03
43	<b>Diaphragm, Full Stroke PTFE, Back-up</b>	2	*	
44	<b>Diaphragm, Primary</b>	2	*	
	<b>Diaphragm, Full Stroke PTFE, Primary</b>	2	*	
45	Piston, Outer	2	02-4565-02	02-4565-03

LW0442 REV. E

\* See elastomer chart - Section 9

<sup>1</sup> Air Valve Assembly includes items 2, 3, 4, and 5.<sup>2</sup> Power Piston Seal Kit includes item numbers 18, 19, 20, and 21.<sup>3</sup> Bushing Assembly, Center Section, includes qty. 1 of item 29 and 30.<sup>4</sup> Pumps with PTFE Diaphragms receive Stainless Steel hardware

All boldface items are primary wear parts.

0014 Specialty Code = BSPT

## EXPLODED VIEW AND PARTS LIST

Model Description			H220/WWWAA <sup>4</sup>	H220/SSSAA
Item	Part Description	Qty.	P/N	P/N
Air Distribution Components				
1	<b>Air Valve Assembly<sup>1</sup></b>	1	<b>02-2003-01</b>	
2	End Cap w/Guide	1	04-2300-23	
3	End Cap w/o Guide	1	04-2330-23	
4	<b>O-Ring (.984 x .139)</b>	2	<b>04-2390-52</b>	
5	Retaining Ring	2	04-2650-03	
6	Screw, SHC, Air Valve (1/14"-20 x 2")	4	04-6000-03	
7	<b>Air Valve Gasket</b>	1	<b>02-2603-52</b>	
8	Screw, SHC, Manifold (1/4"-20 x 7/8")	2	70-6250-03	
9	Nipple, 3/4" NPT	1	02-7430-08	
10	Elbow, 90°, 3/4" NPT	1	02-3250-08	
11	Muffler	1	08-3510-99	
12	Manifold, Air Valve	1	02-2700-01	
13	Relief Tube Assembly	2	02-9232-99	
14	<b>Pressure Relief Valve Assembly</b>	2	<b>08-2740-99-60</b>	
	<b>Rebuild Pressure Relief Seal Kit</b>	1	<b>99-9346-99</b>	
15	Pipe	4	02-7521-01	
16	<b>O-Ring Pipe (.364 x .070)</b>	8	<b>00-2286-52</b>	
17	<b>Power Piston Seal Kit<sup>2</sup></b>	1	<b>02-9210-99</b>	
18	<b>O-Ring, Cover (6.487 x .103)</b>	1	-	
19	Guide Ring	2	-	
20	<b>Slipper Seal/O-ring Combo</b>	1	-	
21	<b>O-Ring, Piston (5.975 x .210)</b>	1	-	
22	Piston, Cylinder	1	02-3720-01	
23	Bushing, Cylinder Piston	2	02-3730-03	
24	Shaft	2	02-3845-03	
25	Stud, Shaft	1	08-6150-08	
26	Cover, Center Section	1	02-3000-01	
27	<b>Gasket, Center Section</b>	2	<b>02-3260-52</b>	
28	<b>Bushing Assembly, Center Section<sup>3</sup></b>	2	<b>02-3307-99</b>	
29	<b>Glyd Ring</b>	2	<b>08-3210-55-225</b>	
30	<b>O-Ring (1.109 x .139)</b>	2	<b>02-1200-52</b>	
31	Chamber, Air	2	02-3692-02	02-3692-03
32	Section, Center	1	02-3154-01	
33	Screw, HHC (5/16"-18 x 1")	48	08-6180-03-42	
34	Washer (5/16")	48	02-6731-03	
Wetted Path Components				
35	Liquid Chamber	2	02-5012-02	02-5012-03
36	Discharge Manifold, NPT	1	02-5032-02	02-5032-03
	Discharge Manifold, BSPT	1	02-5033-02	02-5033-03
37	Inlet Manifold, NPT	1	02-5092-02	02-5092-03
	Inlet Manifold, BSPT	1	02-5093-02	02-5093-03
33	Screw, HHC (5/16"-18 x 1")	48	08-6180-03-42	
34	Washer (5/16")	48	02-6731-03	
Valve Balls/Valve Seats/Valve O-Rings				
38	<b>Ball, Valve</b>	4	*	
39	<b>Seat, Valve</b>	4	<b>02-1129-08</b>	<b>02-1129-03</b>
40	<b>O-Ring, Seat (2.359 x .139)</b>	4	*	
41	<b>O-Ring, (2.539 x .139)</b>	4	*	
Full Stroke TPE/PTFE Components				
42	Piston, Inner	2	02-3702-02	02-3702-03
43	<b>Diaphragm, Full Stroke PTFE, Back-up</b>	2	*	
44	<b>Diaphragm, Primary</b>	2	*	
	<b>Diaphragm, Full Stroke PTFE, Primary</b>	2	*	
45	Piston, Outer	2	02-4565-02	02-4565-03

LW0442 REV. E

\* See elastomer chart - Section 9

<sup>1</sup> Air Valve Assembly includes items 2, 3, 4, and 5.<sup>2</sup> Power Piston Seal Kit includes item numbers 18, 19, 20, and 21.<sup>3</sup> Bushing Assembly, Center Section, includes qty. 1 of item 29 and 30.<sup>4</sup> Pumps with PTFE Diaphragms receive Stainless Steel hardware**ALL BOLDFACE ITEMS ARE PRIMARY WEAR PARTS.**

0014 Specialty Code = BSPT



**SECTION 9****ELASTOMER OPTIONS**

MATERIAL	DIAPHRAGMS (2)	BACK UP DIAPHRAGMS FULL-STROKE (2)	VALVE BALL (4)	MANIFOLD O-RING (4)	VALVE SEAT O-RING (4)
FULL STROKE PTFE	02-1011-55		02-1085-55	70-1280-55	02-1205-55
FDA WIL-FLEX™	02-1011-57	02-1067-57	02-1085-58	02-1372-58	02-1205-58

LW0442 REV. E

**NOTES**

**NOTES**

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