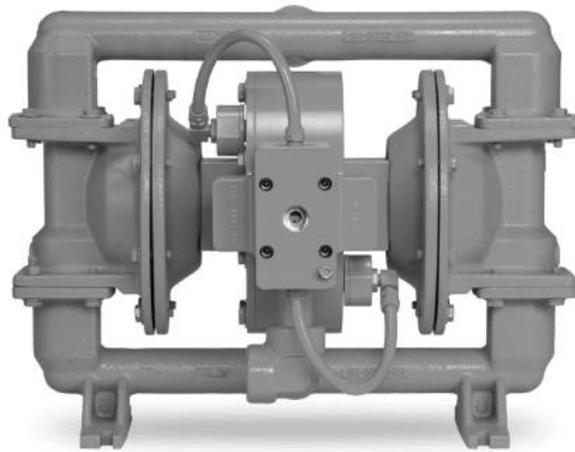


EOM

ENGINEERING OPERATION
& MAINTENANCE

H220

High Pressure Bolted Metal Pumps



Where Innovation Flows

WILDEN®

WIL-11114-E-03

Contents

Section 1: Precautions - Read First!	4
Section 2: Wilden Pump Designation System	5
Section 3: How It Works	6
Section 4: Dimensional Drawings	7
Section 5: Performance	8
H220 Metal TPE/Full-Stroke PTFE-Fitted.....	8
Suction-Lift Curves.....	9
Section 6: Suggested Installation, Operation, Maintenance and Troubleshooting	10
Section 7: Disassembly / Reassembly	13
Pump Disassembly.....	13
Single-Point Exhaust.....	18
Reassembly Hints & Tips.....	18
Bushing Seal Installation.....	19
Section 8: Exploded View and Parts List	20
H220 Metal Wetted Path.....	20
H220 Metal Center Section.....	22
Section 9: Elastomer Options	24

Copyright

Copyright 2018 PSG®, a Dover Company. All rights reserved.

PSG reserves the right to modify the information and illustrations in this document without prior notice. The product described in this document is furnished under a license agreement or nondisclosure agreement. No part of this document may be reproduced, stored in a retrieval system, or transmitted in any form or any means electronic or mechanical, including photocopying and recording, without the written permission of PSG, a Dover Company, except as described by the terms of those agreements.

This is a non-contractual document. 01-2019.

Trademarks

PSG and the PSG logo are registered trademarks of PSG. Wilden® is a registered trademark of PSG California LLC. Pro-Flo® SHIFT and Pro-Flo® are registered trademarks of PSG California LLC. Wil-Flex® is a trademark of PSG California LLC. Saniflex™ is a trademark of PSG California LLC.

All trademarks, names, logos and service marks (collectively "trademarks") in this document are registered and unregistered trademarks of their respective owners. Nothing contained in this document should be construed as granting any license or right to use any trademark without the prior written permission of the trademark owner.

Warranty

Each and every product manufactured by Wilden is built to meet the highest standards of quality. Every pump is functionally tested to insure 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



Section 1

Precautions - Read First!

 **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
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 1	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
Acetal	-29°C to 82°C	-20°F to 180°F

¹ 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. Refer to Section 2 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 upon mechanical stress only. Certain chemicals will significantly reduce maximum safe operating temperatures. Consult 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:** Do not exceed 6.9 bar (100 psi) air supply pressure.

 **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 chemically compatible with all wetted pump components. Consult Chemical Resistance Guide.

 **CAUTION:** Pumps should be thoroughly flushed before installing into process lines. FDA- and USDA-approved pumps should be cleaned and/ or sanitized before being used.

 **CAUTION:** Always wear safety glasses when operating pump. If diaphragm rupture occurs, material being pumped may be forced out air exhaust.

 **CAUTION:** Before any maintenance or repair is attempted, the compressed air line to the pump should be disconnected and all air pressure allowed to bleed from 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.

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

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

 **CAUTION:** Wilden® H220 High Pressure pumps cannot be used in submersible applications.

 **CAUTION:** Re-torque all hardware prior to installation.

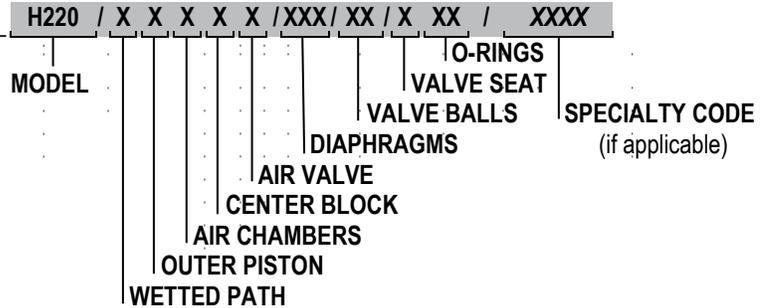
Section 2

WILDEN PUMP DESIGNATION SYSTEM

H220 METAL

25 mm (1") Pump
Maximum Flow Rate:
94 lpm (25 gpm)

LEGEND



MATERIAL CODES

MODEL

H220 = 25 mm (1") HIGH PRESSURE
XH220 = 25 mm (1") HIGH PRESSURE ATEX

WETTED PATH

S = STAINLESS STEEL
W = DUCTILE IRON

OUTER PISTON

S = STAINLESS STEEL
W = DUCTILE IRON

AIR CHAMBER

W = DUCTILE IRON
S = STAINLESS STEEL

CENTER SECTION

I = POWDER-COATED ALUMINUM

AIR VALVE

I = POWDER-COATED ALUMINUM

DIAPHRAGMS

FWS = WIL-FLEX™ Food-Grade [Santoprene® (Two Black Dots)]
TSS = FULL-STROKE PTFE W/SANIFLEX™ BACK-UP^{1,2,3}
TWS = FULL-STROKE PTFE w/WIL-FLEX™ BACKUP

VALVE BALLS

WF = WIL-FLEX™ [Santoprene® (Three Black Dots)]
TF = PTFE (White)

VALVE SEATS

M = MILD STEEL
S = STAINLESS STEEL

VALVE SEAT & MANIFOLD O-RINGS

WF = WIL-FLEX™ (Santoprene®)
TF = PTFE (White)

SPECIALTY CODES

- 0014 BSPT Connection
- 0320 Single-Point Exhaust

NOTE: Most elastomeric material use colored dots for identification.
NOTE: Not all models are available with all material options.

Santoprene® is a registered trademark of Monsanto Company, licensed to Advanced Elastomer Systems, L.P.

Section 3

HOW IT WORKS — 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

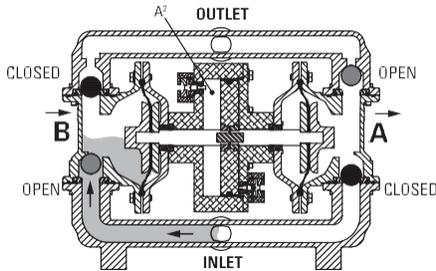


FIGURE 1 When air pressure is supplied to the pump, the air valve directs pressure to the back side of diaphragm (A). The compressed air moves the diaphragm away from the center section of the pump. Simultaneously, compressed air is also supplied to the back side of the power piston (A2); pressure on 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).

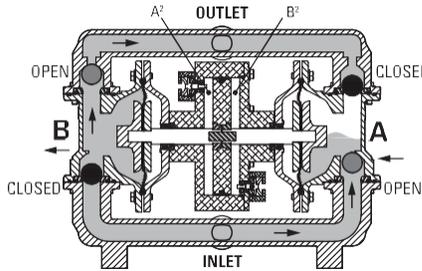


FIGURE 2 Once the power piston reaches the end of its stroke, the pressure relief valve opens. This causes the air valve to shift. This action redirects pressurized air to the back side (air side) of diaphragm (B) as well as the back side of the power piston (B2). This pressurized air forces diaphragm (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.

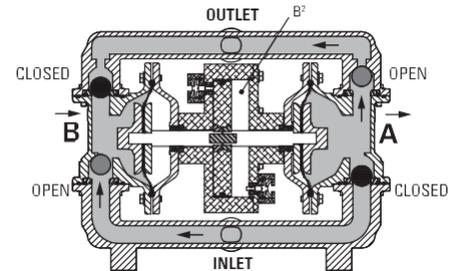


FIGURE 3 At the completion of the stroke, once again the pressure relief valve opens and shifts the air valve. The air valve redirects air to the back side of diaphragm (A) and the power piston (A2), the air behind diaphragm (B) and the power piston (B2) is now exhausted. As the pump reaches its original 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.

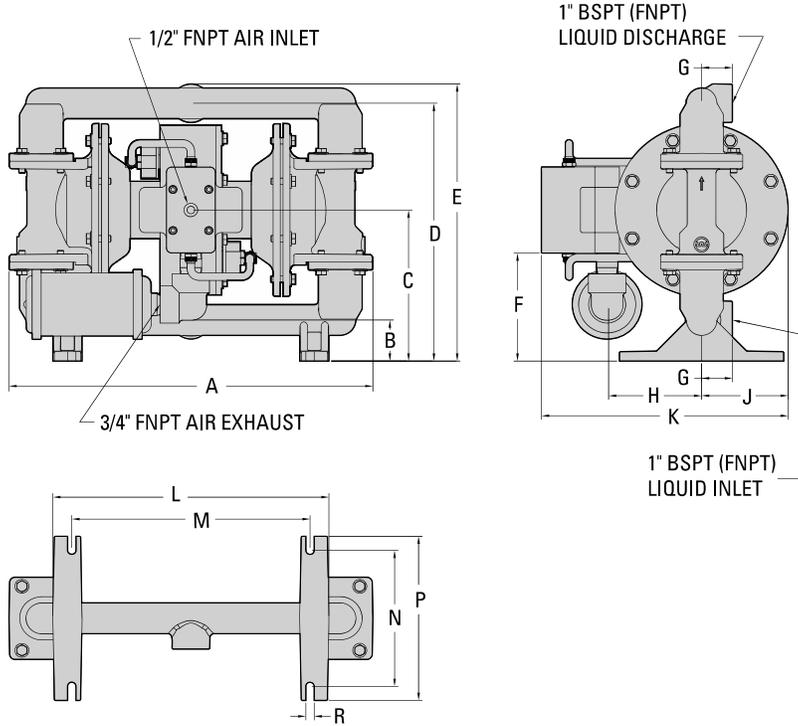


NOTE: The pump may take several cycles to completely prime depending on the condition of the application.

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**

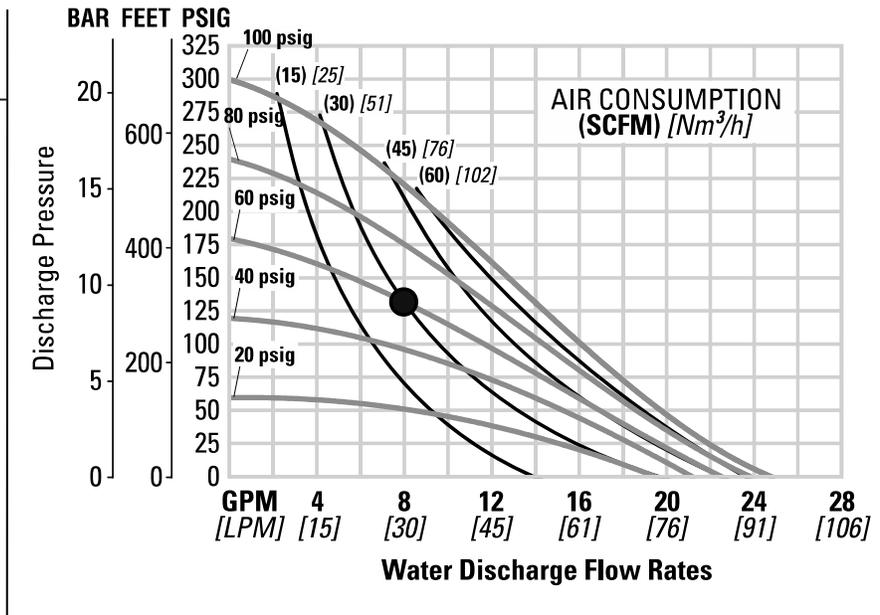
Ship Weight Weight.....38 kg (84 lb)
 Stainless Steel 37 kg (81 lb)

Air Inlet..... 13 mm (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 Stroke¹ 0.189 L (0.05 gal)
 Max. Flow Rate..... 93.9 lpm (24.8 gpm)
 Max. Size Solids..... 6.4 mm (1/4")

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. (See dot on chart.)

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



Flow rates indicated on chart were determined by pumping water.

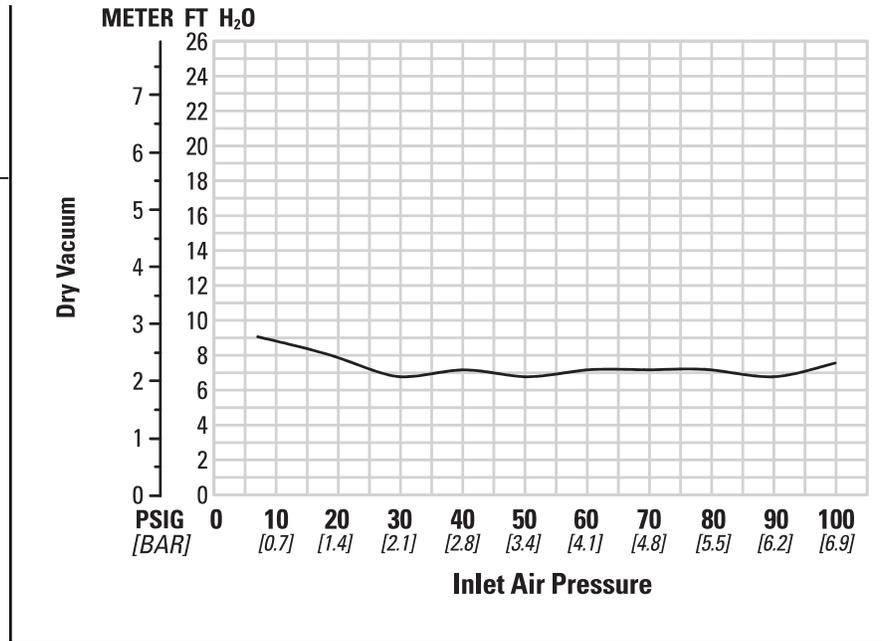
For optimum life and performance, pumps should be specified so that daily operation parameters will fall in the center of the pump's performance curve.

Air inlet pressure values are 50% of discharge pressure values shown on Y axis.

SUCTION LIFT CURVES

H220 METAL HIGH- PRESSURE 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 which 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 the performance section of this manual 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 the equivalent or larger than the diameter size of the suction inlet on your Wilden pump. The suction hose must be non-collapsible, reinforced type as these pumps are capable of pulling a high vacuum. Discharge piping should also be the equivalent or larger than the diameter of the pump discharge which will help reduce friction losses. It is critical that all fittings and connections are airtight or a reduction or loss of pump suction capability will result.



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. Premature failure and long-term dissatisfaction can be avoided if reasonable care is exercised 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, every pump should be located in such a way that six key factors are balanced against each other to maximum advantage:

- **Access:** First of all, the location should be accessible. If it's easy to reach the pump, maintenance personnel will have an easier time carrying out routine inspections and adjustments. Should 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 air pressure up to a maximum of 6.9 bar (100 psig) depending on pumping requirements.
For best results, the pumps should use a 5µ (micron) air filter, needle valve and regulator. The use of an air filter before the pump will ensure that the majority of any pipeline contaminants will be eliminated.
- **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. Pumping volume can be estimated by counting the number of strokes per minute and then multiplying the figure by the displacement per stroke.

- **Muffler:** Sound levels are reduced below OSHA specifications using the standard Wilden muffler. Other mufflers can be used to further reduce sound levels, 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 quick-closing valves are installed at any point in the discharge system, or if pulsation within a system becomes a problem, a surge suppressor (SD Equalizer®) should be installed to protect the pump, piping and gauges from surges and water hammer.

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 the performance section 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.

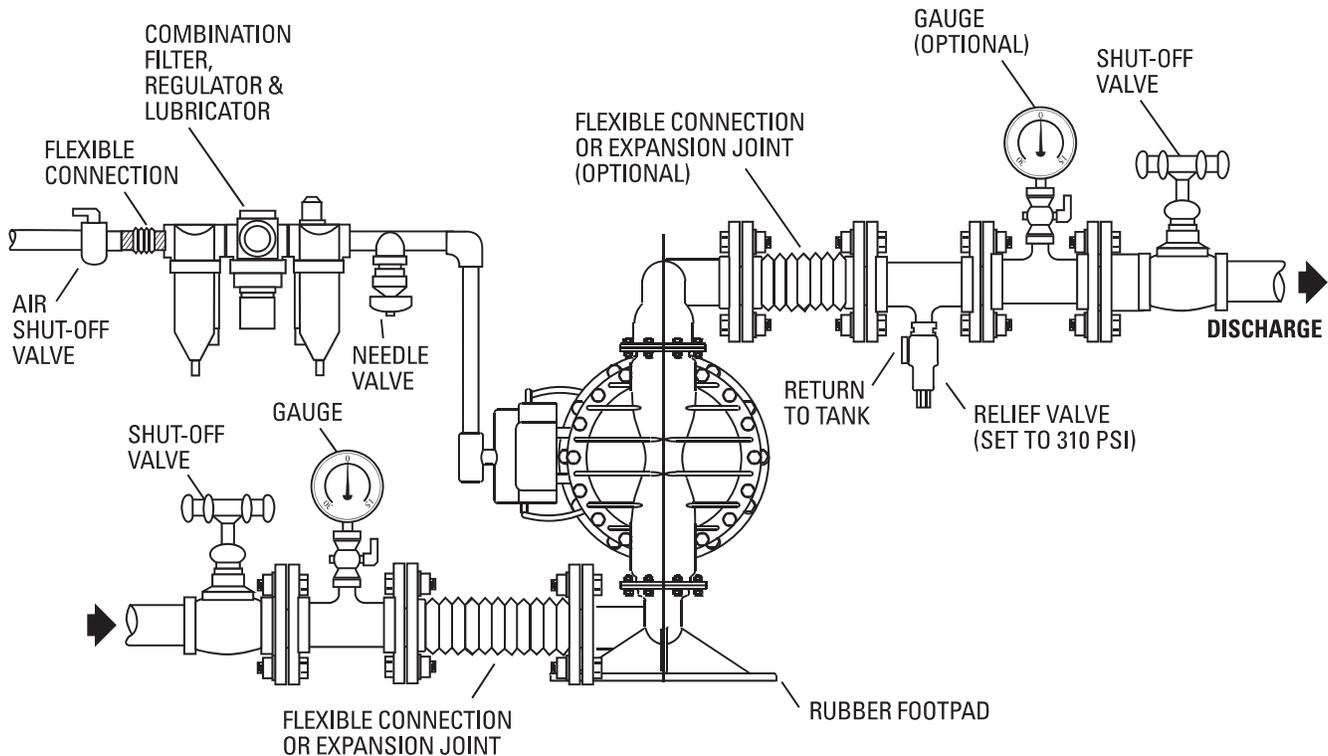


CAUTION: All Wilden pumps are capable of passing solids. A strainer should be used on the pump intake to ensure that the pump's rated solids capacity is not exceeded.



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, the shut-off valve should be closed, if the restarting of the pump is not desirable once power is regained.

Air-Operated Pumps: To stop the pump from operating in an emergency situation, 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 situation.

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 can also 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 Section 5.) 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 H220 pump runs solely on compressed air and does not generate heat, therefore your process fluid temperature will not be affected.

Maintenance and Inspections

Since 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. With the use of the flow curve located in the performance section of this EOM, verify air pressure and volume required for your application. If inlet air pressure is too low, the H220 pump will not operate.
2. Check air inlet filter for debris (see SUGGESTED INSTALLATION).
3. Disassemble pump and check for obstructions in the air passageways or objects that would obstruct the movement of internal parts.
4. Check for sticking ball check valves. If material being pumped is not compatible with pump elastomers, swelling may occur. Replace ball check valves and seals with proper elastomers. 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.
5. Inspect pressure relief valve for damage. Replace if necessary with genuine Wilden parts.
6. Inspect the center block seals for damage. Replace if necessary.

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. If material being pumped is not compatible with pump elastomers, swelling may occur. Replace ball check valves and seats with proper elastomers. 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.
4. Check tightness of inlet and discharge connections.
5. Check tightness of all fasteners.

Pump air valve freezes.

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

Air bubbles in pump discharge.

1. Check for ruptured diaphragm.
2. Check tightness of outer pistons (refer to Section 7).
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 diaphragm rupture.
2. Check tightness of outer pistons to shaft.
3. Check tightness of fasteners that connect the inner piston to the outer piston.

Section 7

Disassembly / Reassembly

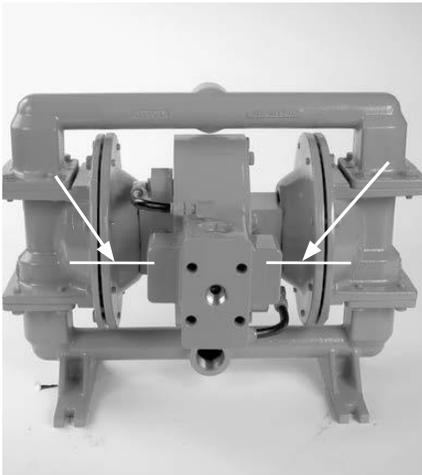
Pump Disassembly

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

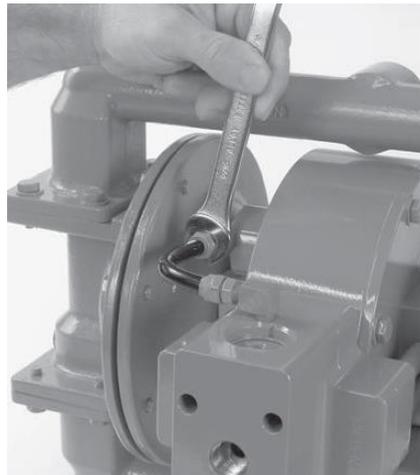


CAUTION: Before any maintenance or repair is attempted, the compressed air line to the pump should be disconnected and all air pressure allowed to bleed from the pump. Disconnect all intake, discharge, and air lines. Drain the pump by turning it upside down and allowing any fluid to flow into a suitable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



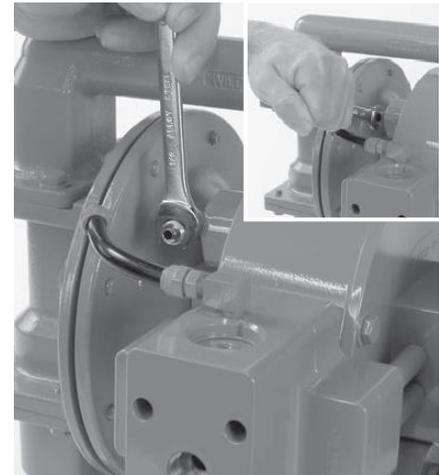
Step 1

Put alignment marks on liquid chambers and air chambers. Use these marks to properly align the liquid chambers (center section) to the air chambers 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 fitting 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.

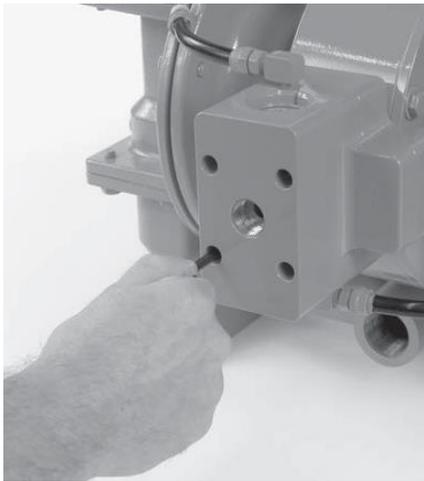


Step 6

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.

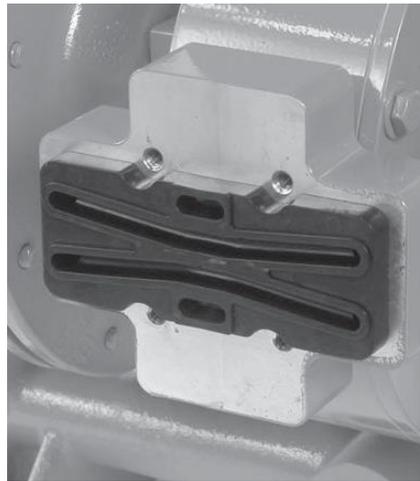


NOTE: Pressure relief valve is available as an assembly or a rebuild kit.



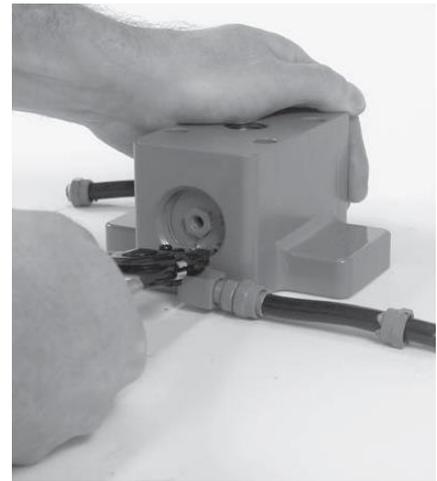
Step 7

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

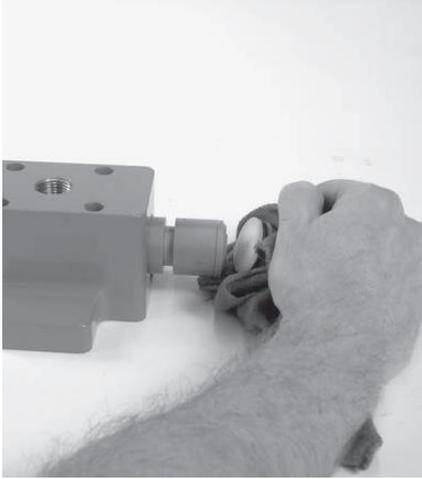
Be sure to note the orientation of the air valve gasket. (The flat side mates against the manifold and the grooved side faces the air valve.).



Step 9

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

Disassembly / Reassembly

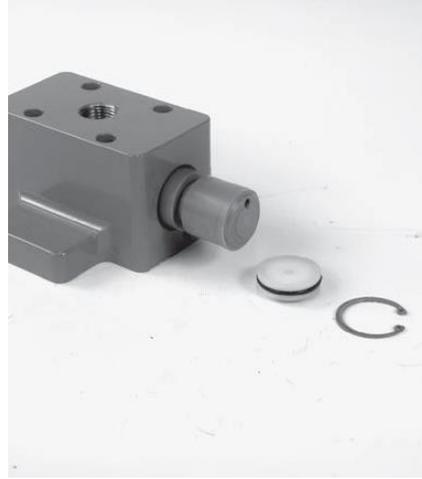


Step 10

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,

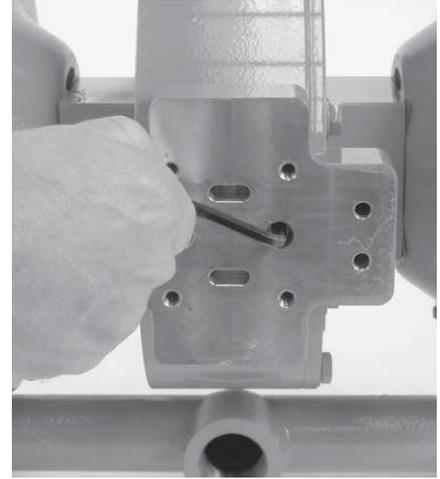


Caution: The end cap may come out with considerable force. Position a shop rag over the bottom end cap to ensure that the end cap doesn't harm the pump technician or anyone else in the immediate area.



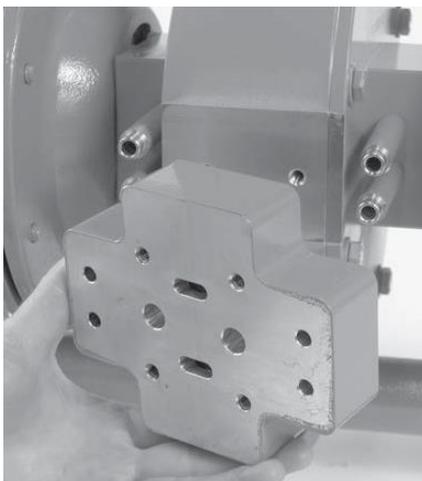
Step 11

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.



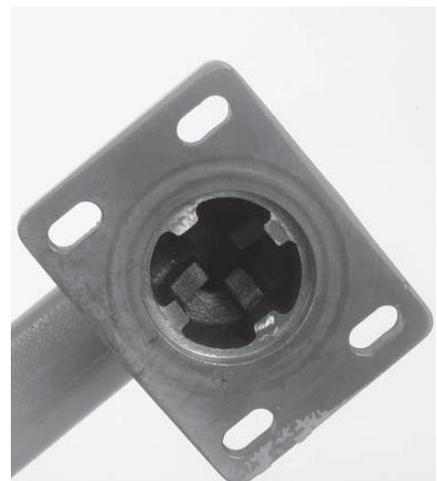
Step 13

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



Step 14

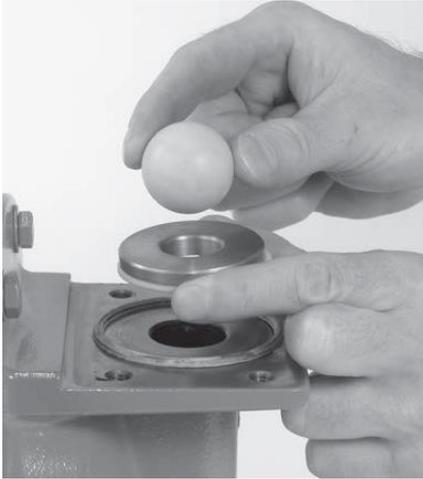
Using a 1/2" wrench or socket, remove discharge manifold and fasteners.



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,

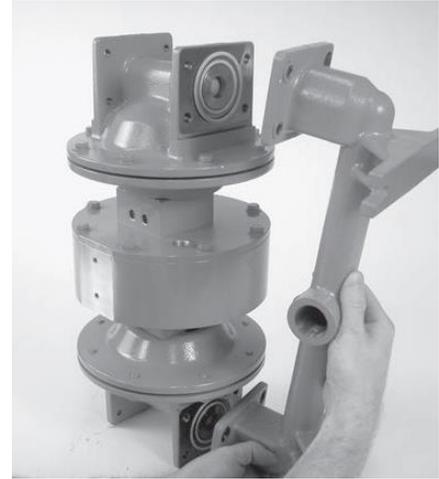


Step 17

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

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



Step 20

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



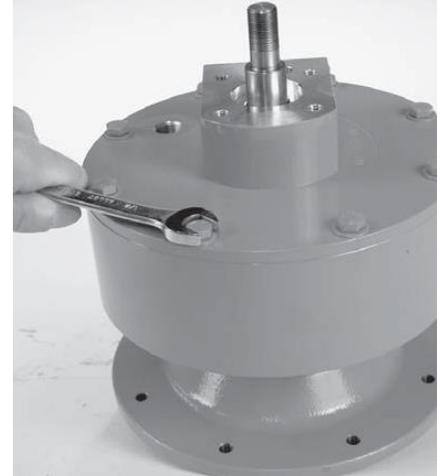
Step 22

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



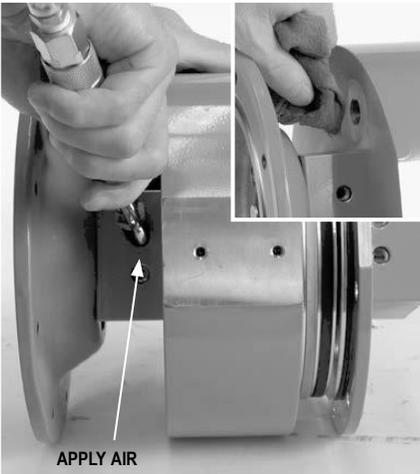
Step 23

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.



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 & 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. Please find the applicable torque specifications on this page.

The following tips will assist in the assembly process:

- Lubricate the center section shaft 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 seals.
- A small amount of NLGI grade 2 white EP bearing grease can be applied to the muffler and air valve gaskets to locate gaskets during assembly.

MAXIMUM TORQUE SPECIFICATIONS

Part Description		
Outer Piston	136 N•m	100 ft-lb
Air Valve Bolts	6.8 N•m	60 in-lb
Liquid Chamber 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

***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.

Disassembly / Reassembly

Bushing Seal Installation

Pre-Installation

Once all of 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. Wrap electrical tape around each leg of the needle-nose pliers (heat shrink tubing may also be used). This is done to prevent damaging the inside surface of the new seal.
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 bean shape. Be sure to pull the seal into as tight of a kidney bean shape as possible, this will allow the seal to travel down the bushing bore easier.
5. With the seal clamped in the pliers, insert the seal into the bushing bore and position the bottom of the seal into the bushing groove. Once 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 the pliers are removed, you will notice a slight bump in the seal shape. Before the seal can be properly resized, the bump in the seal should be removed as much as possible. This can be done with either the Phillips screwdriver or your finger. With either 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 almost completely eliminated.
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. Perform these steps for the remaining seal.

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

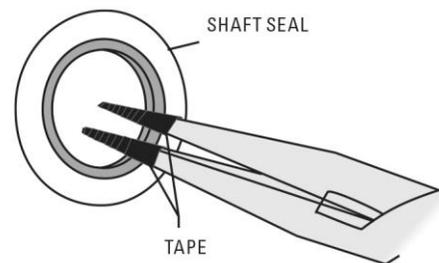
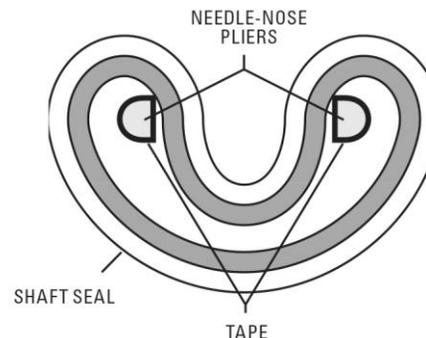


Figure B



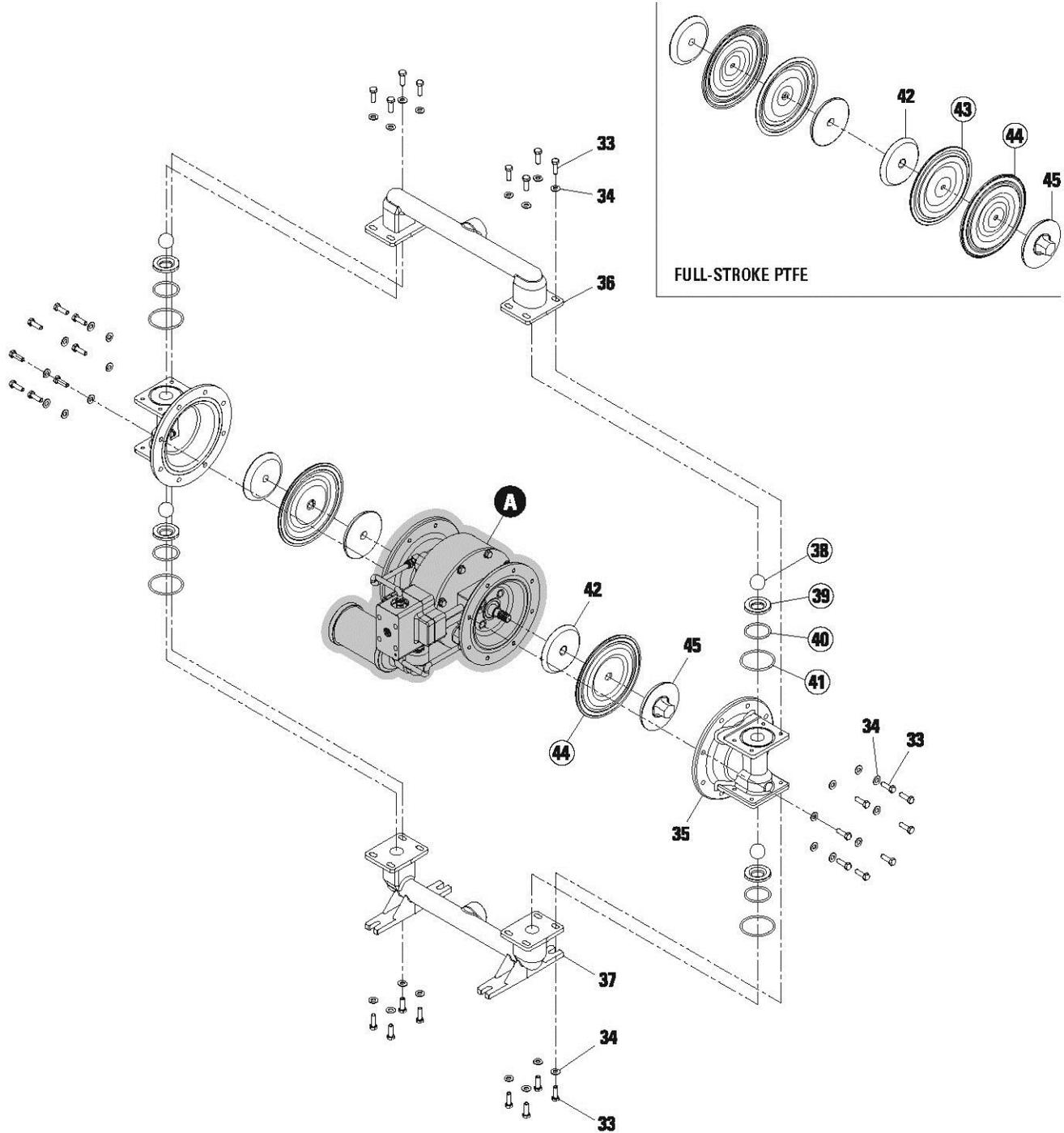
Section 9

EXPLODED VIEW AND PARTS LISTING

H220 METAL

Wetted Path

EXPLODED VIEW



LW0441 REV. A

ALL CIRCLED PART IDENTIFIERS ARE INCLUDED IN REPAIR KITS

Exploded View and Parts List

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

* Refer to Elastomer Chart

LW0442 REV. B

¹ Air Valve Assembly includes Item Numbers 2, 3, 4, and 5.

² Power Piston Seal Kit includes Item Numbers 18, 19, 20, and 21.

³ Bushing Assembly, Center Section, includes qty. 1 of Item Numbers 29 and 30

All bold face items are primary wear items.

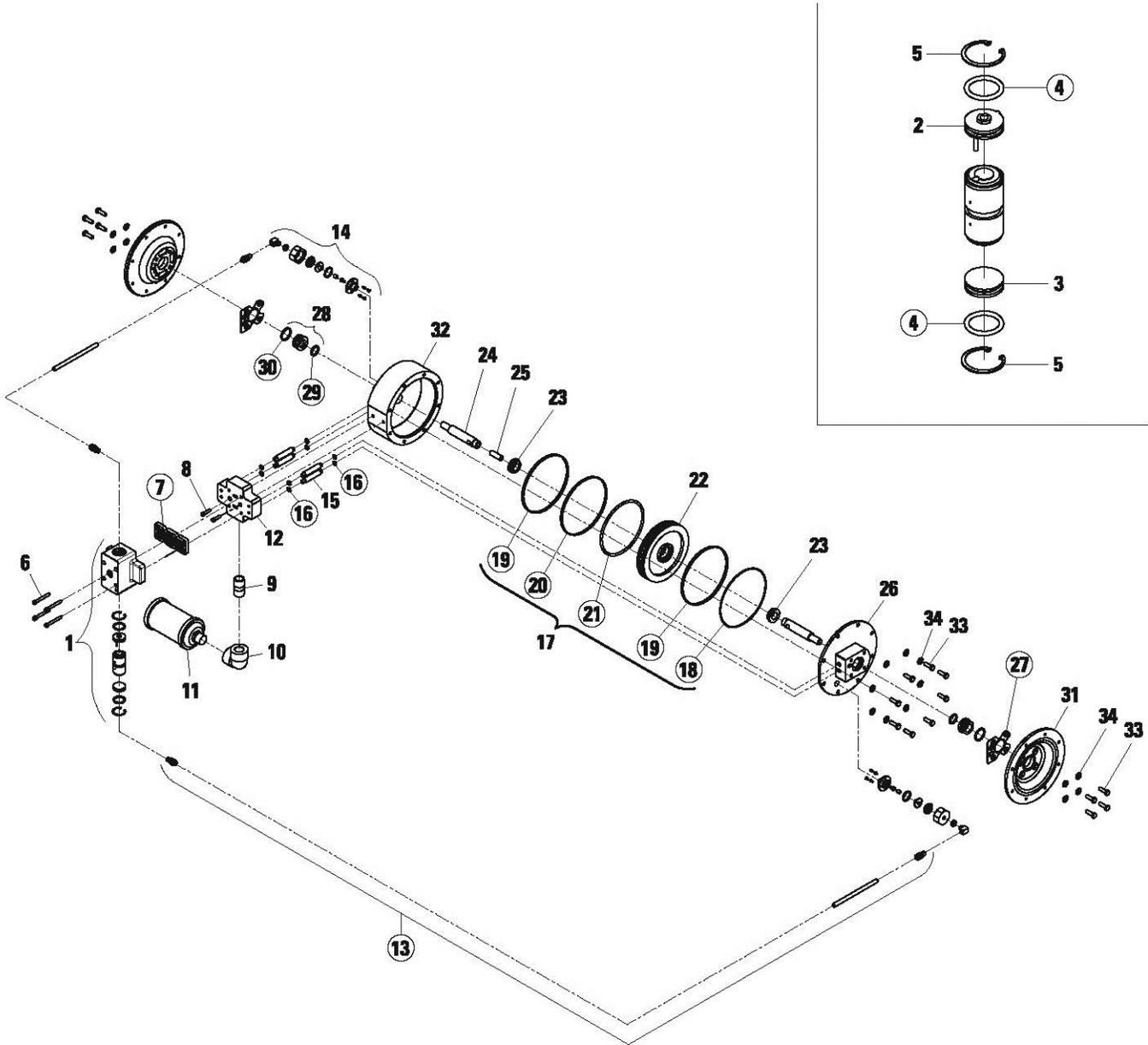
0014 Specialty Code = BSPT

EXPLODED VIEW AND PARTS LISTING

H220 METAL

Center Section

EXPLODED VIEW



LW0441 REV. A

ALL CIRCLED PART IDENTIFIERS ARE INCLUDED IN REPAIR KITS

Exploded View and Parts List

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

LW0442 REV. B

* Refer TO Elastomer Chart

¹ Air Valve Assembly includes item numbers 2, 3, 4, and 5.

² Power Piston Seal Kit includes item numbers 18, 19, 20, and 21.

³ Bushing Assembly, Center Section, includes qty. 1 of item numbers 29 and 30.

All bold face items are primary wear items.

0014 Specialty Code = BSPT

Section 9**Elastomer Options****H220 Metal**

Material	Diaphragms (2)	Full-Stroke Backup Diaphragms (2)	Valve Balls (4)	Manifold O-Rings (4)	Valve Seat O-Rings (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. B

Notes

Notes

Notes

PSG
22069 Van Buren Street
Grand Terrace, CA 92313-5651 USA
P: +1 (909) 422-1730 • F: +1 (909) 783-3440
psgdover.com



Where Innovation Flows

PSG® reserves the right to modify the information and illustrations contained in this document without prior notice. This is a non-contractual document. 05-2018