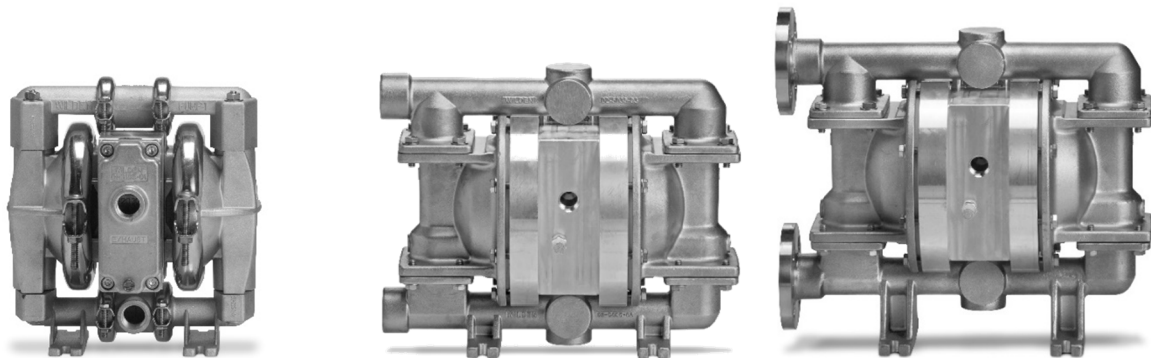


# EOM

ENGINEERING OPERATION  
& MAINTENANCE MANUAL

# GPS1 and GPS220/GPS230 CSA-Certified Metal Pumps



Where Innovation Flows



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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 pressurized gas 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:**

Buna-N	-12°C to 82°C	10°F to 180°F
PTFE*	4°C to 104°C	40°F to 220°F

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



**CAUTION:** Canadian Standards Association (CSA) configured pumps should not be used in temperatures lower than 0°C (32°F) or higher than 52°C (125°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:** Prevent 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. Pumps must be electrically grounded using the grounding conductor provided. Improper grounding can cause improper and dangerous operation.



**CAUTION:** Do not exceed 8.6 bar (125 psig) air supply pressure.



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



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



**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.



**CAUTION:** Ensure that the gas supply line is clear of debris. Use an in-line air filter. A 5µ (micron) air filter is recommended.



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



**CAUTION:** All CSA-Certified pumps are fitted with a single-point exhaust to route all exhaust gas through the muffler exhaust port. The gas outlet must be vented to a safe location in accordance with local codes or, in the absence of local codes, an industry or nationally recognized code having jurisdiction over the specified installation.



**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.



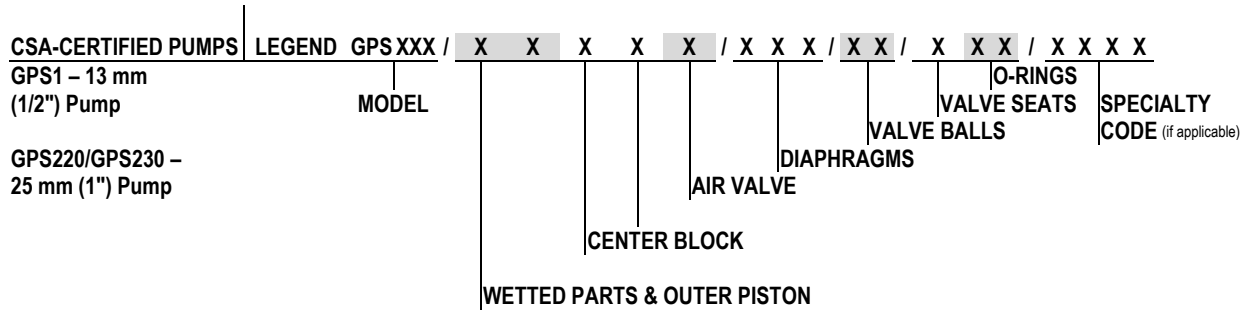
**NOTE:** The Safety Supplement document is a part of the manual. Please refer to the Safety Supplement document for a complete list of safety considerations including considerations for safe operation and maintenance of pumps marked for ATEX environments before starting the pump.



**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).

**SECTION 2**

**WILDEN PUMP DESIGNATION SYSTEM**



**MATERIAL CODES**

<b>MODEL</b>	<b>AIR VALVE</b>	<b>VALVE BALLS</b>
GPS1 = PRO-FLO® SHIFT ATEX	A = ALUMINUM	BN = BUNA-N (RED DOT) TF = PTFE (WHITE)
GPS220 = PRO-FLO® SHIFT ATEX THREADED PORTS	<b>DIAPHRAGMS</b>	<b>VALVE SEATS</b>
GPS230 = PRO-FLO® SHIFT ATEX FLANGED PORTS	BNS = BUNA-N (RED DOT) TXU = PTFE w/CONDUCTIVE BUNA-N BACKUP XBS = CONDUCTIVE BUNA-N (TWO RED DOTS)	A = ALUMINUM S = STAINLESS STEEL
<b>WETTED PARTS &amp; OUTER PISTON</b>		<b>VALVE SEAT O-RINGS</b>
AA = ALUMINUM/ALUMINUM SS = STAINLESS STEEL/STAINLESS STEEL		BN = BUNA-N (RED DOT) TF = PTFE (WHITE)
<b>CENTER BLOCK</b>		
AA = ALUMINUM		

**SPECIALTY CODES**

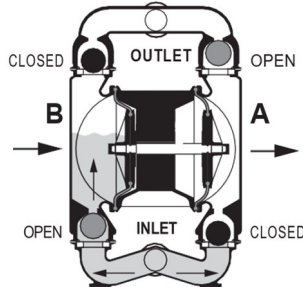
- 0014 BSPT (side-ported inlet and discharge on 1" models)
- 0504 DIN Flange
- 0677 NPT, center-ported inlet and discharge
- 0678 BSPT, center-ported inlet and discharge
- 0695 19 mm (3/4") NPT, center-ported discharge (inlet facing air inlet, discharge facing air exhaust)
- 0696 19 mm (3/4") BSPT, center-ported discharge (inlet facing air inlet, discharge facing air exhaust)
- 0697 19 mm (3/4") NPT, center-ported discharge (inlet facing air exhaust, discharge facing air inlet)
- 0698 19 mm (3/4") BSPT, center-ported discharge (inlet facing air exhaust, discharge facing air inlet)

- ! **NOTE:** Most elastomeric materials use colored dots for identification
- ! **NOTE:** Not all models are available with all material options

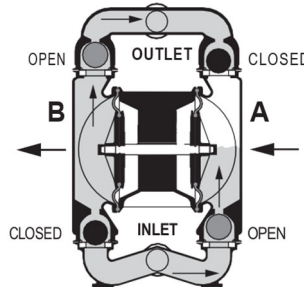
**SECTION 3**

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

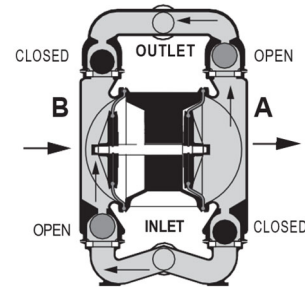
The Wilden diaphragm pump is an air-operated, positive displacement, self-priming pump. These drawings show flow pattern through the pump upon its initial stroke. It is assumed the pump has no fluid in it prior to its initial stroke.



**FIGURE 1** The air valve directs pressurized air to the back side of diaphragm A. The compressed air is applied directly to the liquid column separated by elastomeric diaphragms. The diaphragm acts as a separation membrane between the compressed air and liquid; a balanced load removes mechanical stress from the diaphragm. The compressed air moves the diaphragm away from the center of the pump. The opposite diaphragm is pulled in by the shaft connected to the pressurized diaphragm. Diaphragm B is on its suction stroke; air behind the diaphragm has been forced out to atmosphere through the exhaust port of the pump. The movement of diaphragm B toward the center 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).

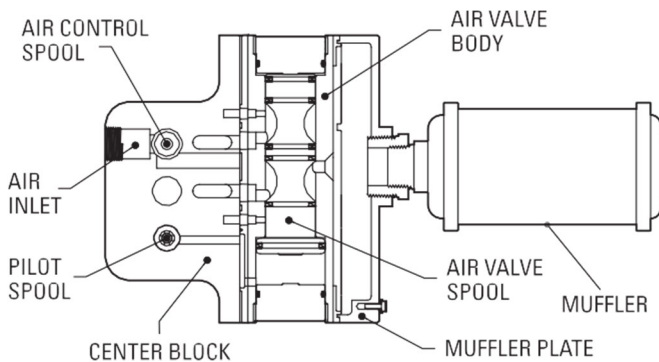


**FIGURE 2** When the pressurized diaphragm, diaphragm A, reaches the limit of its discharge stroke, the air valve redirects pressurized air to the back side of diaphragm B. The pressurized air forces diaphragm B away from the center while pulling diaphragm A to the center. Diaphragm B is now on its discharge stroke. Diaphragm B forces the inlet valve ball onto its seat due to the hydraulic forces developed in the liquid chamber and manifold of the pump. These same hydraulic forces lift the discharge valve ball off its seat, while the opposite discharge valve ball is forced onto its seat, forcing fluid to flow through the pump discharge. The movement of diaphragm A toward the center of the pump creates a vacuum within liquid chamber A. Atmospheric pressure forces fluid into the inlet manifold of the pump. The inlet valve ball is forced off its seat allowing the fluid being pumped to fill the liquid chamber.



**FIGURE 3** At completion of the stroke, the air valve again redirects air to the back side of diaphragm A, which starts diaphragm B on its exhaust stroke. As the pump reaches its original starting point, each diaphragm has gone through one exhaust and one discharge stroke. This constitutes one complete pumping cycle. The pump may take several cycles to completely prime depending on the conditions of the application.

**HOW IT WORKS – AIR DISTRIBUTION SYSTEM**

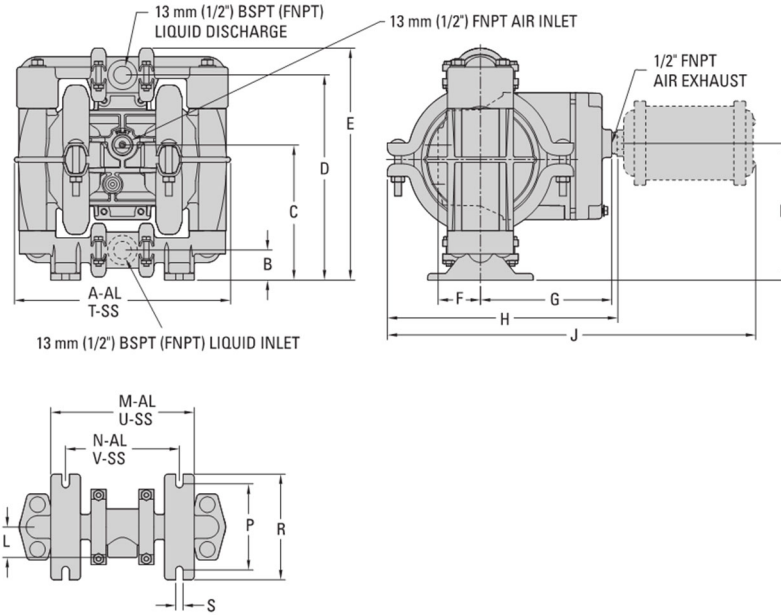


The heart of the patented Pro-Flo® SHIFT Air Distribution System (ADS) is the air valve assembly. The air valve design incorporates an unbalanced spool with the small end of the spool being pressurized continuously while the large end of the spool is alternately pressurized, then exhausted to move the spool. The air valve spool directs pressurized air to one chamber while exhausting the other. The air forces the main shaft/diaphragm assembly to move to one side – discharging liquid on that side and pulling liquid in on the other side. When the shaft reaches the end of the stroke, the inner piston actuates the pilot spool, which controls the air to the large end of the air valve spool. The repositioning of the air valve spool routes the air to the other air chamber. The air control spool allows air to flow freely into the air chamber for the majority of each pump stroke, but it significantly restricts the flow of air into the air chamber when activated by the inner piston near the end of each stroke.

**SECTION 4**

**DIMENSIONAL DRAWING**

**GPS1 METAL**

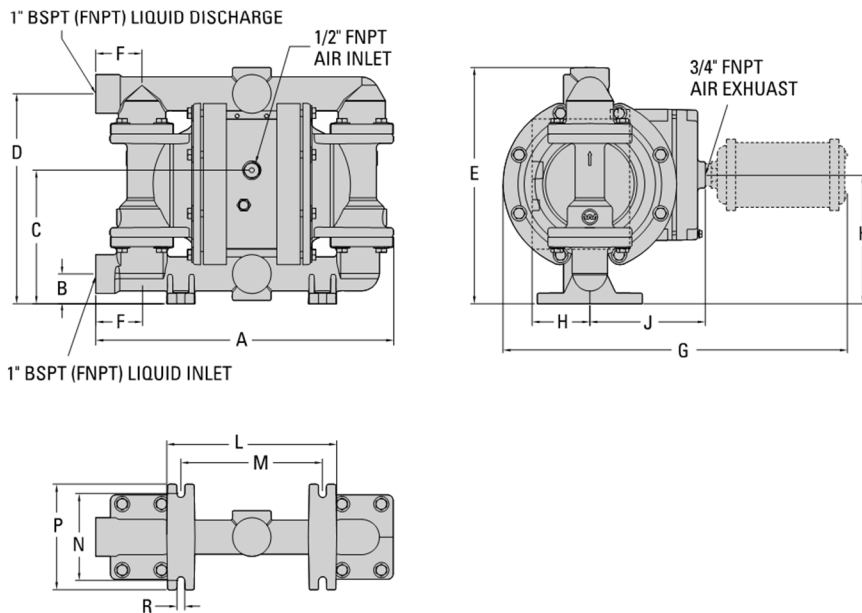


**DIMENSIONS**

ITEM	METRIC (mm)	STANDARD (inch)
A	208	8.2
B	28	1.1
C	130	5.1
D	198	7.8
E	224	8.8
F	41	1.6
G	126	5.0
H	216	8.5
J	354	14.0
K	131	5.2
L	30	1.2
M	137	5.4
N	109	4.3
P	84	3.3
R	102	4.0
S	8	0.3
T	203	8.0
U	142	5.6
V	112	4.4

LW0361 REV. A

**GPS220 METAL**



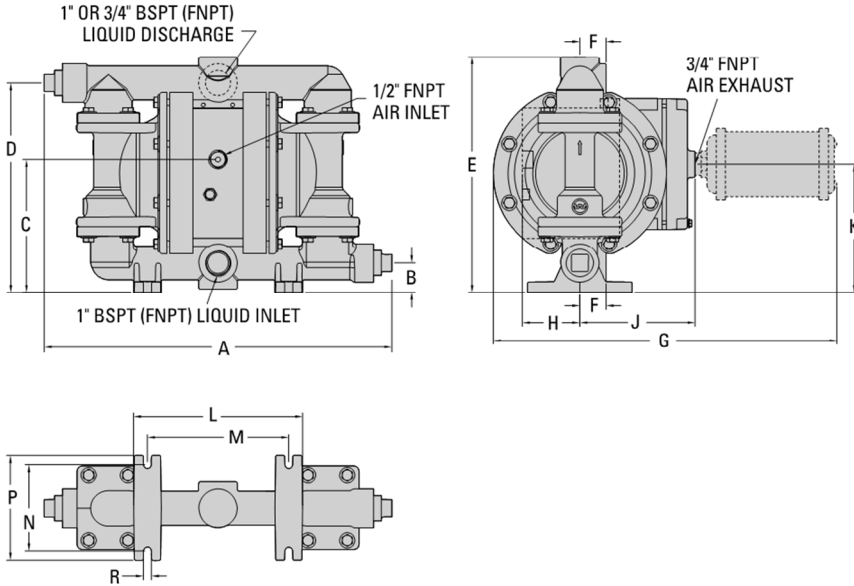
**DIMENSIONS**

ITEM	METRIC (mm)	STANDARD (inch)
A	361	14.2
B	36	1.4
C	163	6.4
D	254	10.0
E	287	11.3
F	56	2.2
G	417	16.4
H	71	2.8
J	140	5.5
K	155	6.1
L	206	8.1
M	173	6.8
N	104	4.1
P	127	5.0
R	10	0.4

LW0364 REV. A

**DIMENSIONAL DRAWING**

**GPS220 METAL – CENTER PORT**

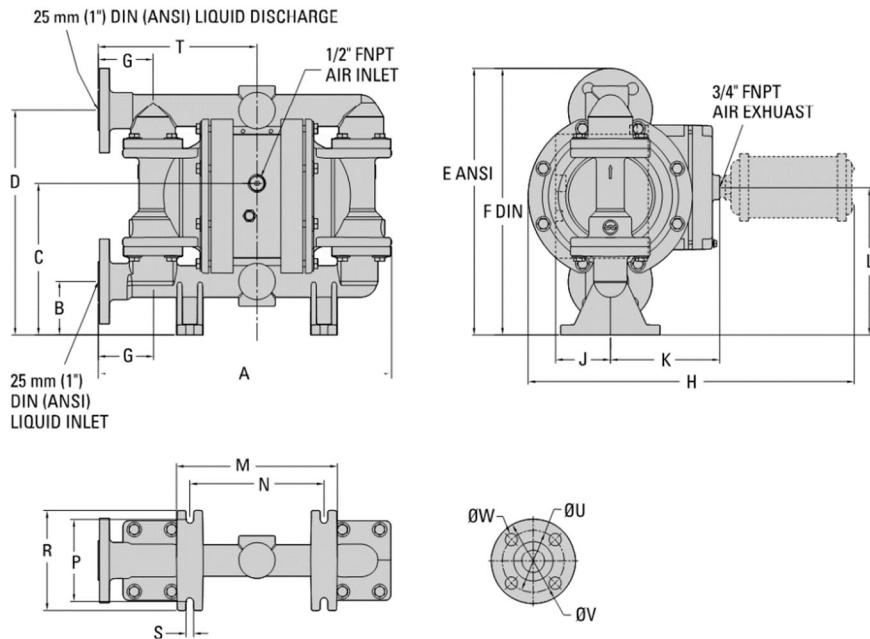


**DIMENSIONS**

ITEM	METRIC (mm)	STANDARD (inch)
A	422	16.6
B	36	1.4
C	163	6.4
D	254	10.0
E	287	11.3
F	33	1.3
G	417	16.4
H	71	2.8
J	140	5.5
K	155	6.1
L	206	8.1
M	173	6.8
N	104	4.1
P	127	5.0
R	10	0.4

LW0365 REV. A

**GPS230 STAINLESS STEEL**



**DIMENSIONS**

ITEM	METRIC (mm)	STANDARD (inch)
A	373	14.7
B	69	2.7
C	195	7.6
D	287	11.3
E	340	13.4
F	343	13.5
G	71	2.8
H	417	16.4
J	71	2.8
K	140	5.5
L	188	7.4
M	206	8.1
N	173	6.8
P	104	4.1
R	127	5.0
S	10	0.4
T	203	8.0
	<b>DIN (mm)</b>	<b>ANSI (Inch)</b>
U	85 DIA.	3.1 DIA.
V	115 DIA.	4.3 DIA.
W	14 DIA.	0.6 DIA.

LW0366 REV. A

**SECTION 5**

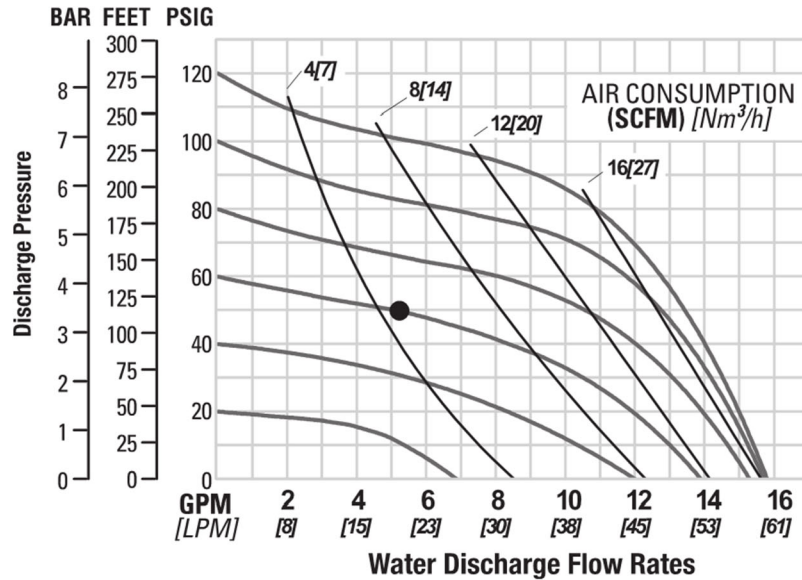
**PERFORMANCE**

**GPS1 METAL  
RUBBER-FITTED**

Ship Weight.....Aluminum 6 kg (13 lb)  
316 Stainless Steel 9 kg (20 lb)  
Air Inlet.....1/2"  
Inlet.....13 mm (1/2")  
Outlet.....13 mm (1/2")  
Suction Lift.....5.9 m Dry (19.3')  
9.8 m Wet (32.3')  
Disp. Per Stroke<sup>1</sup>.....0.10 L (0.027 gal)  
Max. Flow Rate.....60.2 lpm (15.9 gpm)  
Max. Size Solids.....1.6 mm (1/16")

<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 20.1 lpm (5.3 gpm) against a discharge head of 3.4 bar (50 psig) requires 4.1 bar (60 psig) and 7.7 Nm<sup>3</sup>/h (4.8 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.

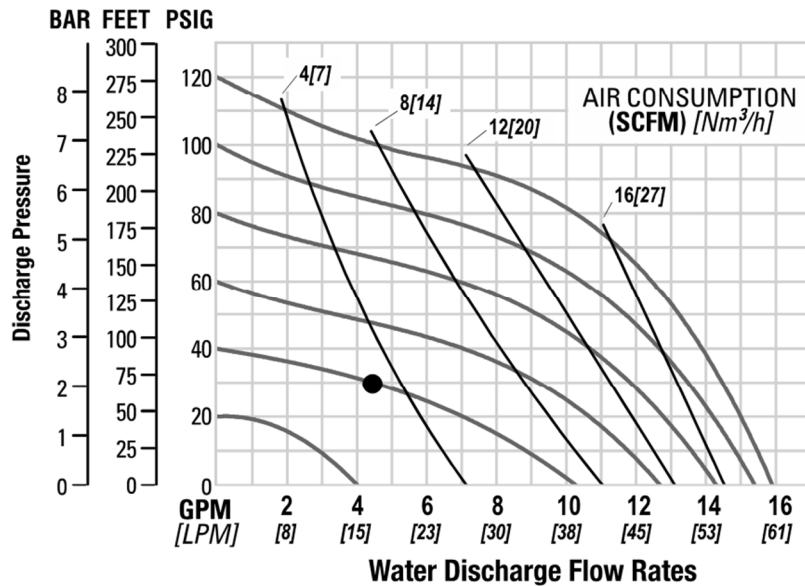
**Caution:** Do not exceed 8.6 bar (125 psig) air supply pressure.

**GPS1 METAL  
PTFE-FITTED**

Ship Weight.....Aluminum 6 kg (13 lb)  
316 Stainless Steel 9 kg (20 lb)  
Air Inlet.....1/2"  
Inlet.....13 mm (1/2")  
Outlet.....13 mm (1/2")  
Suction Lift.....4.3 m Dry (14.2')  
9.7 m Wet (31.7')  
Disp. Per Stroke<sup>1</sup>.....0.10 L (0.026 gal)  
Max. Flow Rate.....59.8 lpm (15.8 gpm)  
Max. Size Solids.....1.6 mm (1/16")

<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 17.4 lpm (4.6 gpm) against a discharge head of 2.1 bar (30 psig) requires 2.8 bar (40 psig) and 5.9 Nm<sup>3</sup>/h (3.5 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.

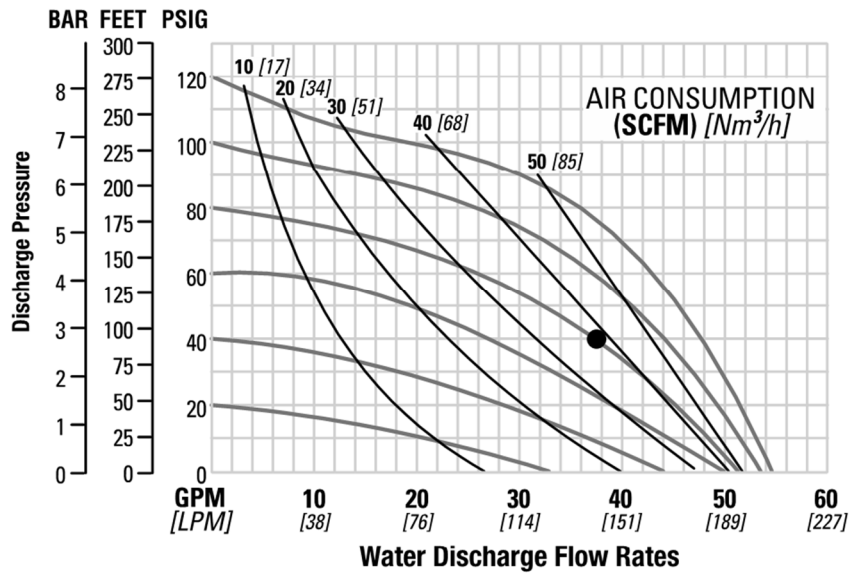
**Caution:** Do not exceed 8.6 bar (125 psig) air supply pressure.

**PERFORMANCE**

**GPS220/GPS230 METAL RUBBER-FITTED**

Ship Weight.....Aluminum 19 kg (41 lb)  
316 Stainless Steel 31 kg (68 lb)  
Air Inlet.....1/2"  
Inlet.....25 mm (1")  
Outlet.....25 mm (1")  
Suction Lift.....6.9 m Dry (22.7')  
9.0 m Wet (29.5')  
Disp. Per Stroke<sup>1</sup>.....0.30 L (0.08 gal)  
Max. Flow Rate.....204 lpm (54 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 140 lpm (37 gpm) against a discharge pressure head of 2.8 bar (40 psig) requires 5.5 bar (80 psig) and 60 Nm<sup>3</sup>/h (38 scfm) air consumption.

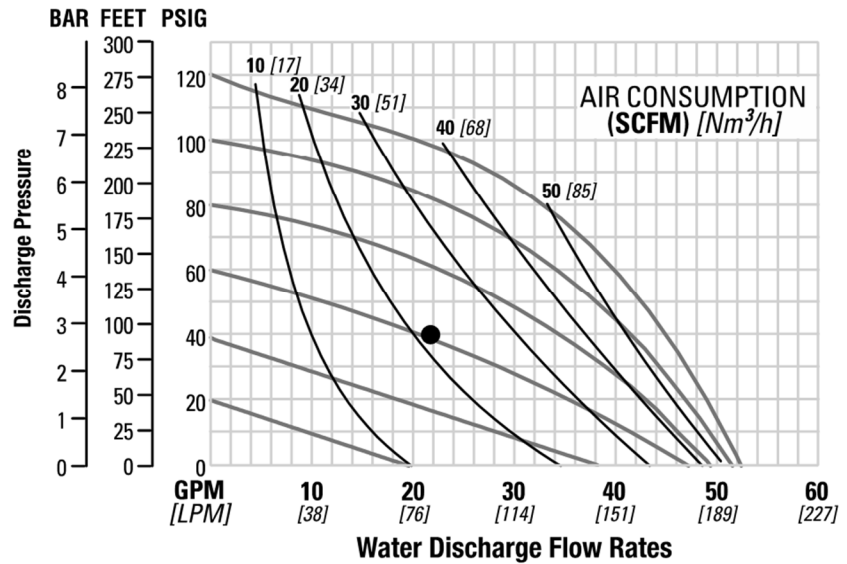
Flow rates indicated on chart were determined by pumping water. For optimum life and performance, pumps should be specified so that daily operation parameters will fall in the center of the pump's performance curve.

**Caution:** Do not exceed 8.6 bar (125 psig) air supply pressure.

**GPS220/GPS230 METAL FULL-STROKE PTFE-FITTED**

Ship Weight.....Aluminum 19 kg (41 lb)  
316 Stainless Steel 31 kg (68 lb)  
Air Inlet.....1/2"  
Inlet.....25 mm (1")  
Outlet.....25 mm (1")  
Suction Lift.....5.2 m Dry (17.0')  
9.0 m Wet (29.5')  
Disp. Per Stroke<sup>1</sup>.....0.30 L (0.08 gal)  
Max. Flow Rate.....197 lpm (52 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 83.3 lpm (22 gpm) against a discharge head of 2.8 bar (40 psig) requires 4.1 bar (60 psig) and 36 Nm<sup>3</sup>/h (23 scfm) air consumption.

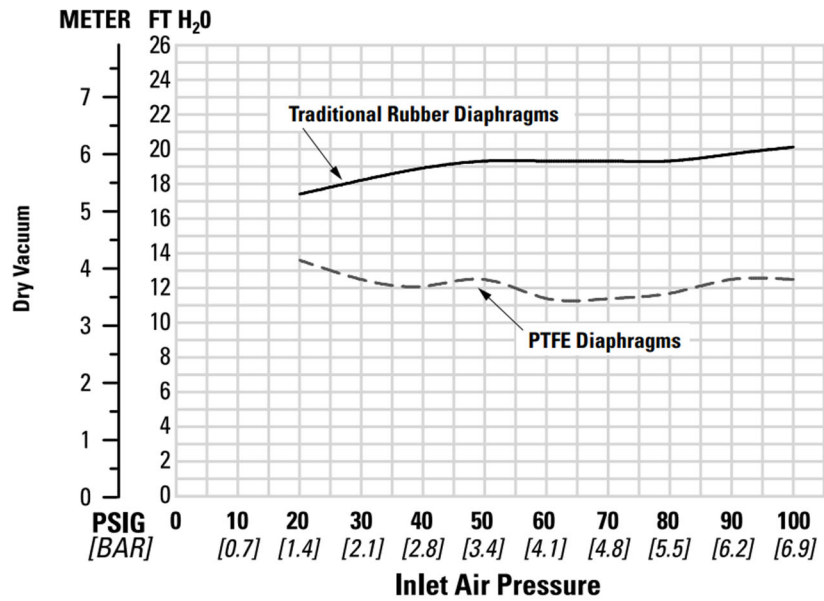
Flow rates indicated on chart were determined by pumping water. For optimum life and performance, pumps should be specified so that daily operation parameters will fall in the center of the pump's performance curve.

**Caution:** Do not exceed 8.6 bar (125 psig) air supply pressure.

**SUCTION LIFT CAPABILITY**

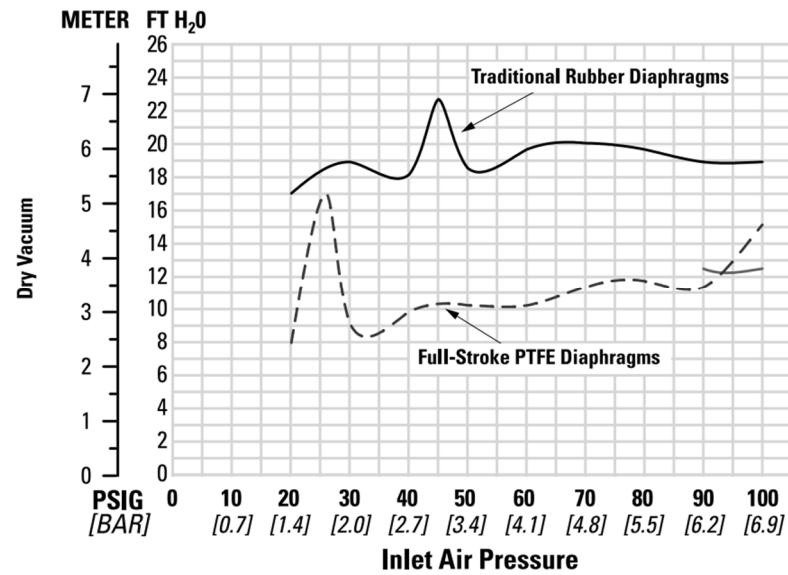
**GPS1 METAL SUCTION LIFT CAPABILITY**

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.



**GPS220/GPS230 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**

Prior to pump installation, ensure that the flow and suction lift requirements are within the pump model's capabilities. Refer to the Section 5, Performance of the Engineering, Operation and Maintenance (EOM) Manual for specific flow and suction-lift capabilities.

Before installation confirm that the pump materials of construction are compatible with pumping application. Refer to the Wilden Chemical Resistance Guide for assistance with wetted path and elastomer options.

**Piping**

The pump should be located so that the length and complexity of the suction and discharge piping is minimized. Unnecessary elbows, bends and fittings can increase friction losses and should be avoided.

Pipe sizes should be selected to keep friction losses within practical limits. The suction pipe diameter should be equivalent or larger than the diameter 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 to help reduce friction losses.

All piping should be supported independently of the pump. In addition, the piping should be correctly aligned with the inlet and discharge connection of the pump 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 and will also assist in minimizing pump vibration.

**Gas Supply**

The pump should have a supply line large enough (a 3/4" supply line is recommended for 1-1/2" and larger pumps) to supply the volume of air necessary to achieve the desired pumping rate. Gas pressure to the pump should be controlled by a pressure-regulating valve and should not exceed a maximum of 6.9 bar (100 psig). It is suggested that a needle valve be placed in the supply line to control the flow of gas to the pump. For best results, a 5µ (micron) filter should be installed before the gas inlet of the pump to eliminate the majority of compressed gas line contaminants.

**Type of Gas**

Sweet gas is required for natural gaspowered pumps. Please consult the factory if considering using sour gas as levels of hydrogen sulfide (H2S) may cause unacceptable corrosion and chemical attack.

**Pump Mounting and Installation**

For simple installation and removal of the pump shut-off valves should be installed in the inlet and discharge plumbing. If the pump is to be mounted in a fixed location, a mounting pad placed between the pump and the foundation will 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 should be installed to protect the pump, piping and gauges from surges and water hammer.

**Solids Passage**

All Wilden pumps are capable of passing solids. A strainer should be used at the inlet of the pump to ensure that the pump's rated solids capabilities are not exceeded. Refer to the Section 5 of this EOM manual for specific solids-passage capabilities.

**Flooded Suction**

Pumps in service with a positive suction head are most efficient when the 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) or higher.

**Suction Lift**

When used in self-priming applications, it is critical that all fittings and connections are airtight, or a reduction or loss of pump suction capability will result.

**Gas Outlet**

All CSA-certified pumps are fitted with the single point exhaust option so that all exhaust gases are routed through the muffler plate exhaust port. The gas outlet must be recaptured or vented to a safe location in accordance with locally, nationally and/or industry recognized codes.

**Grounding**

Pumps and accessories must be electrically grounded to a proper grounding point to prevent an accumulation of electro-static charge when used in potentially explosive areas. CSA-certified pumps come with a grounding strap and are fitted with a grounding screw for the purpose of electrically grounding the pump. Periodic inspection of the ground connection should be performed to ensure the equipment is properly grounded. Refer to the Wilden CE Safety Supplement and Safety Manual for additional ATEX-certified pump considerations.

**Functional Testing**

1. Tighten all hardware prior to initial start-up. Refer to Section 7, Reassembly Hints & Tips in the EOM manual for torque specifications.
2. Prior to pump installation connect compressed gas line [do not exceed rated pressure of 6.9 bar (100 psig)] to gas inlet of pump to ensure that pump cycles consistently.
3. Cycle pump for 2-3 minutes.
4. After pump installation, check piping connections for leaks.

**Pump Operation**

1. To avoid damage to the pump new installations should be checked for any debris in tank or piping system.
2. Once installation is complete, pump operation can be started. Confirm the shut-off valves in the inlet and discharge plumbing are open. Do not exceed the pump's maximum rated pressure of 6.9 bar (100 psig). A pressure regulating valve and needle valve can be used to adjust the speed of the pump.
3. Retighten all exposed fasteners after two (2) hours of operation. Refer to Section 7, Reassembly Hints & Tips in the EOM manual for torque specifications.

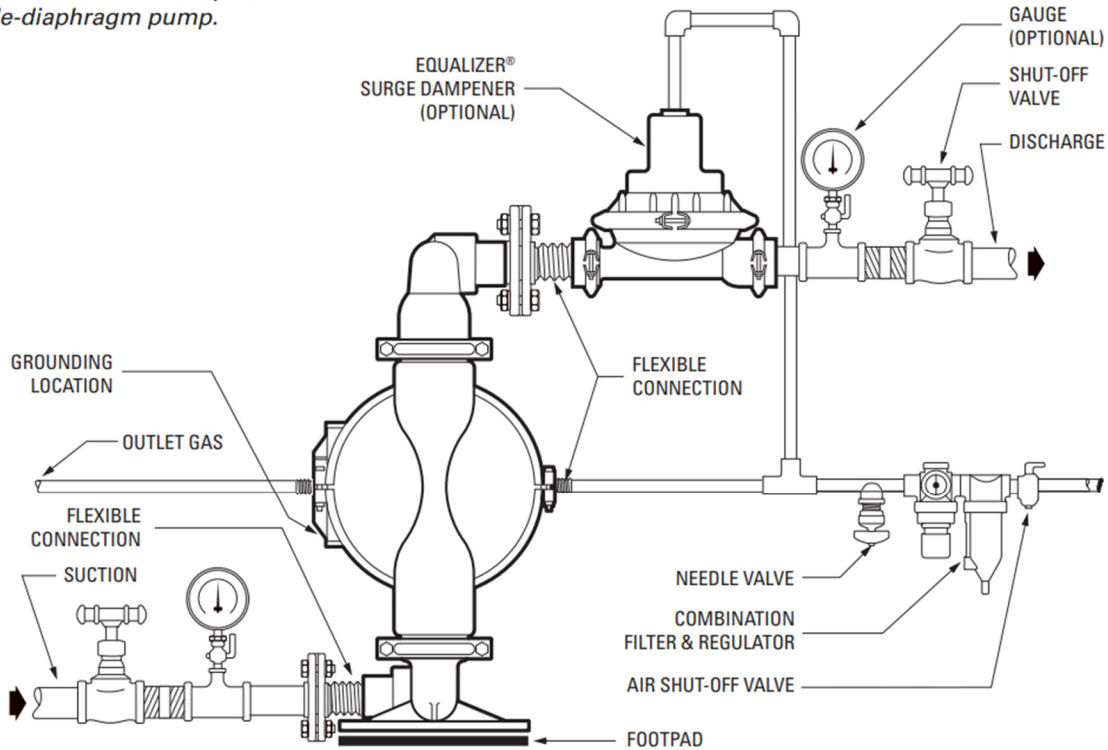
**Emergency Shut-Down Procedure**

In the case of an emergency situation, the pump should be stopped immediately. To stop the pump's operation, close the gas shut-off valve (user-supplied). A properly functioning valve will cut-off the gas supply, stopping the pump. The shut-off valve should be located far enough away from the pumping equipment such that it can be reached safely in an emergency situation. In the event of pump or diaphragm failure, close shut-off valves at the inlet and discharge of pump to eliminate the possibility of medium leakage. In the event of a power failure, the gas shut-off valve should be closed, if restarting of the pump is not desirable once power is regained.

Refer to the Wilden CE Safety Supplement, Safety Manual and EOM Manual for additional information.

## SUGGESTED INSTALLATION, OPERATION, MAINTENANCE AND TROUBLESHOOTING

*This illustration is a generic representation of an air-operated double-diaphragm pump.*



### Prior to Maintenance

Before any maintenance is performed, confirm pump is completely de-energized by shutting off the pump and disconnecting the gas supply line to the pump. Refer to Section 7, Reassembly Hints & Tips and Section 8, Exploded View & Parts Listings in the EOM manual for maintenance and spare parts information

### Operation

CSA-certified pumps are pre-lubricated, and do not require in-line lubrication. Additional lubrication will not damage the pump, however if the pump is heavily lubricated by an external source, the pump's internal lubrication may be washed away. If the pump is then moved to a non-lubricated location, it may need to be disassembled and re-lubricated as described in the "Disassembly/Reassembly". 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. CSA-certified pumps run on pressurized sweet gas and do 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:**

- 3/8" Box Wrench (GPS1)
- 1/2" Box Wrench (GPS220/GPS230)
- 7/16" Socket Wrench (GPS1)
- Two 1" Socket Wrench (GPS220/GPS230)
- Adjustable Wrench
- Vise equipped with soft jaws (such as plywood, plastic or other suitable material)



**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 an appropriately-sized wrench, remove the discharge manifold from the liquid chambers.



**Step 3**

Inspect ball cage area of manifold for excessive wear or damage. Remove the discharge valve balls and valve seats from the liquid chambers, and inspect for nicks, gouges, chemical attack or abrasive wear. Replace worn parts with genuine Wilden parts for reliable performance.

**DISASSEMBLY / REASSEMBLY**



**Step 4**

Using an appropriately-sized wrench, remove the inlet manifold from the liquid chambers.

**NOTE:** Inverting the pump will facilitate removal of the inlet manifold.



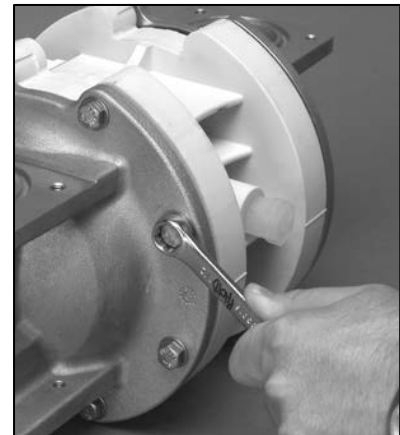
**Step 5**

Inspect ball cage area of manifold for excessive wear or damage. Remove the inlet valve balls, seats and valve seat O-rings from the liquid chamber and inlet manifold, inspect for nicks, gouges, chemical attack or abrasive wear. Replace worn parts with genuine Wilden parts for reliable performance.



**Step 6 – for GPS1 Pumps Only**

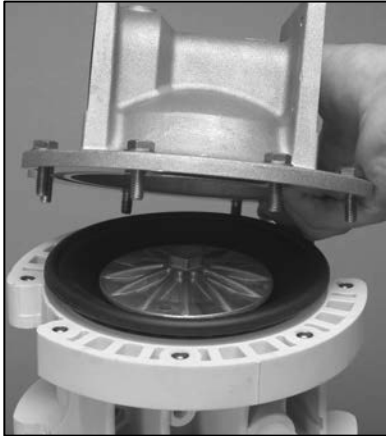
Using an appropriate-sized wrench, remove the small clamp band that connects the manifold elbows to the tee section. Remove the tee section O-rings and inspect for signs of wear and/or chemical attack. Replace, if necessary.



**Step 7**

Using an appropriately-sized wrench, remove the liquid chambers from the center section.

**DISASSEMBLY / REASSEMBLY**



**Step 8**

The liquid chamber should be removed to expose the diaphragm and outer piston. Rotate center section and remove the opposite liquid chamber.



**Step 9**

Using two adjustable wrenches or 1" sockets, remove diaphragm assembly from center section assembly.



**Step 10**

After loosening and removing the outer piston the diaphragm assembly can be disassembled.



**Step 11**

To remove the diaphragm assembly from shaft, secure shaft with soft jaws (aluminum, plastic, or plywood) to ensure the shaft is not damaged. Using an adjustable wrench, remove the diaphragm assembly from the shaft.

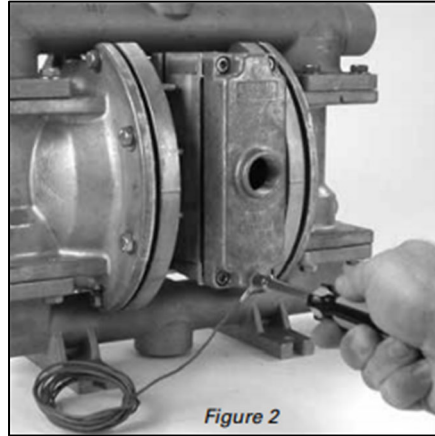
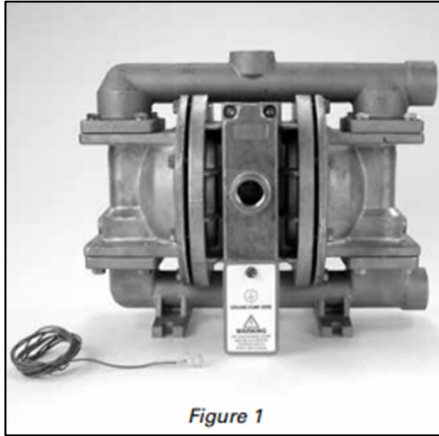


**Step 12**

Inspect diaphragms, outer and inner pistons for signs of wear. Replace with genuine Wilden parts if necessary.

**DISASSEMBLY / REASSEMBLY**

**GROUNDING STRAP FOR CSA PUMPS**



Canadian Standards Association (CSA) configured pumps must be electrically grounded using the grounding strap provided (Figure 1). Improper grounding can cause improper and dangerous operation. To properly attach the grounding strap to a CSA-configured pump, identify the designated grounding location on the muffer plate; using the provided self-tapping screw and grounding wire, thread the grounding screw through the grounding wire lug, into the muffer plate and tighten securely (Figure 2). Completion of the pump grounding procedure must be done in accordance with local codes, or in the absence of local codes, an industrial or nationally recognized code having jurisdiction over the specified installation.

## DISASSEMBLY / REASSEMBLY

### AIR VALVE / CENTER SECTION DISASSEMBLY

**Tools Required:**

- 3/16" Hex-Head Wrench
- 7/32"
- Snap-Ring Pliers
- O-Ring Pick



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



#### Step 1

Using the appropriate-sized wrench, loosen the air valve bolts.



#### Step 2

Remove the air valve and muffler plate from the center section.

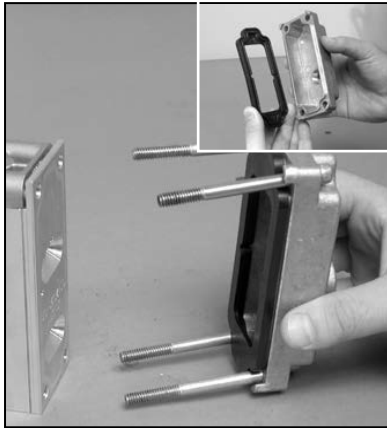


#### Step 3

Remove the air valve gasket and inspect for nicks, gouges and chemical attack. Replace if necessary, with genuine Wilden parts.

**NOTE:** When installing the air valve gasket onto the center section assembly, position gasket with the grooved side facing away from the center section.

**DISASSEMBLY / REASSEMBLY**



**Step 4**

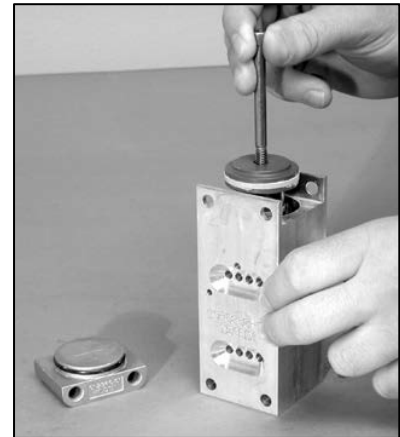
Remove muffer plate gasket and inspect. Replace if necessary.



**Step 5**

Remove air valve end cap to expose air valve spool.

**NOTE:** The end cap cannot be removed until removing air valve bolts.



**Step 6**

Remove air valve spool from air valve body by threading one air valve bolt into the end of the spool and gently sliding the spool out of the air valve body. Inspect seals for signs of wear and replace entire assembly if necessary. Use caution when handling air valve spool to prevent damaging seals.

**NOTE:** Seals should not be removed from assembly. Seals are not sold separately.



**Step 7**

Remove pilot spool retaining snap-ring on both sides of center section with snap-ring pliers.



**Step 8**

Remove pilot spool assembly from center section.

**DISASSEMBLY / REASSEMBLY**



**Step 9**

Using an O-ring pick, gently remove the pilot spool retaining O-ring from the opposite side of the notched end of the spool. Gently remove the pilot spool from pilot spool sleeve and inspect for nicks, gouges and other signs of wear. Replace pilot spool assembly or outer sleeve O-rings if necessary. During re-assembly never insert the pilot spool into the sleeve with the "notched" end side first, this end incorporates the urethane O-ring and will be damaged as it slides over the ports cut in the pilot spool sleeve.

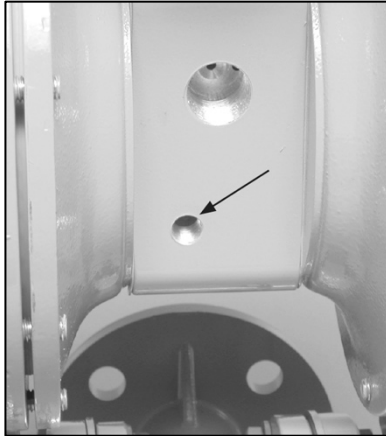


**Step 10**

Check center section shaft seals for signs of wear. If necessary, remove the shaft seals with an O-ring pick and replace.

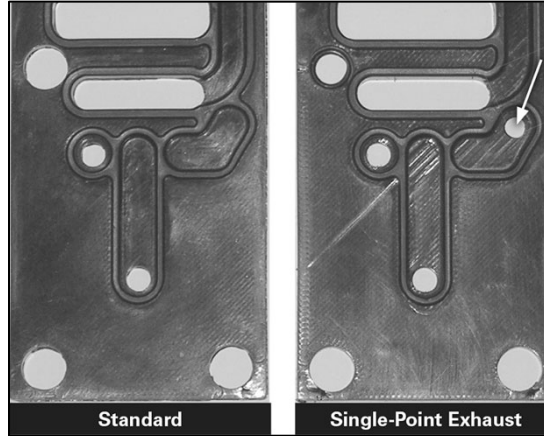
**DISASSEMBLY / REASSEMBLY**

**SINGLE-POINT EXHAUST**



**Step 1**

Remove the pilot exhaust muffler in the pilot bleed port located at the front of the center block. Install 1/4" NPT pipe plug (00-7010-08) into the bleed port.



**Step 2**

**Optional:** Install a single-point exhaust gasket (02-2621-52). The single-point air valve gasket can be purchased as a spare part or included with the purchase of a new Pro-Flo SHIFT pump.

**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.
- Make sure that the exhaust port on the muffler plate is centered between the two exhaust ports on the center section.
- Stainless bolts should be lubed to reduce the possibility of seizing during tightening.

<b>Maximum Torque Specifications</b>	
<b>Description</b>	<b>Torque</b>
Air Valve	11.3 N·m (100 in-lb)
Outer Piston (GPS1)	14.1 N·m (125 in-lb)
Outer Piston (GPS220/GPS230)	47.1 N·m (30 ft-lb)
Small Clamp Band (GPS1)	1.7 N·m (15 in-lb)
Large Clamp Band (Rubber-Fitted) (GPS1)	9.0 N·m (80 in-lb)
Large Clamp Band (PTFE-Fitted) (GPS1)	13.6 N·m (120 in-lb)
Vertical Bolts (GPS1)	14.1 N·m (125 in-lb)
Top and Bottom Manifold (GPS220/GPS230)	8.5 N·m (75 in-lb)
Liquid Chambers to Center Section (GPS220/GPS230)	8.5 N·m (75 in-lb)

## DISASSEMBLY / REASSEMBLY

### SHAFT 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

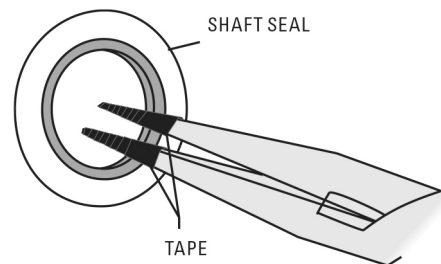
1. To prevent damaging the inside surface of the new seal, wrap electrical tape around each leg of the needle-nose pliers. (Heat shrink tubing may also be used.)
2. With a new seal in hand, place the two legs of the needle-nose pliers inside the seal ring. (See Figure A.)
3. Open the pliers as wide as 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

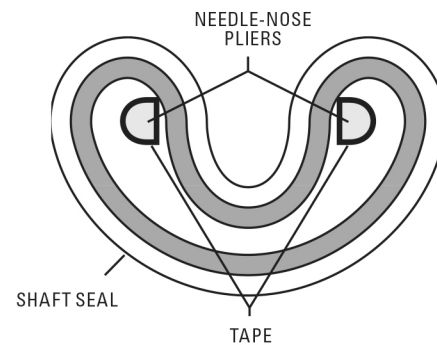
The following tools can be used to aid in the installation of the new seals:

- Needle-Nose Pliers
- Phillips Screwdriver
- Electrical Tape

**Figure A**



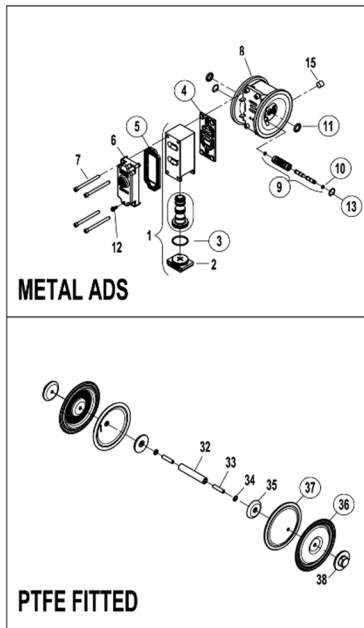
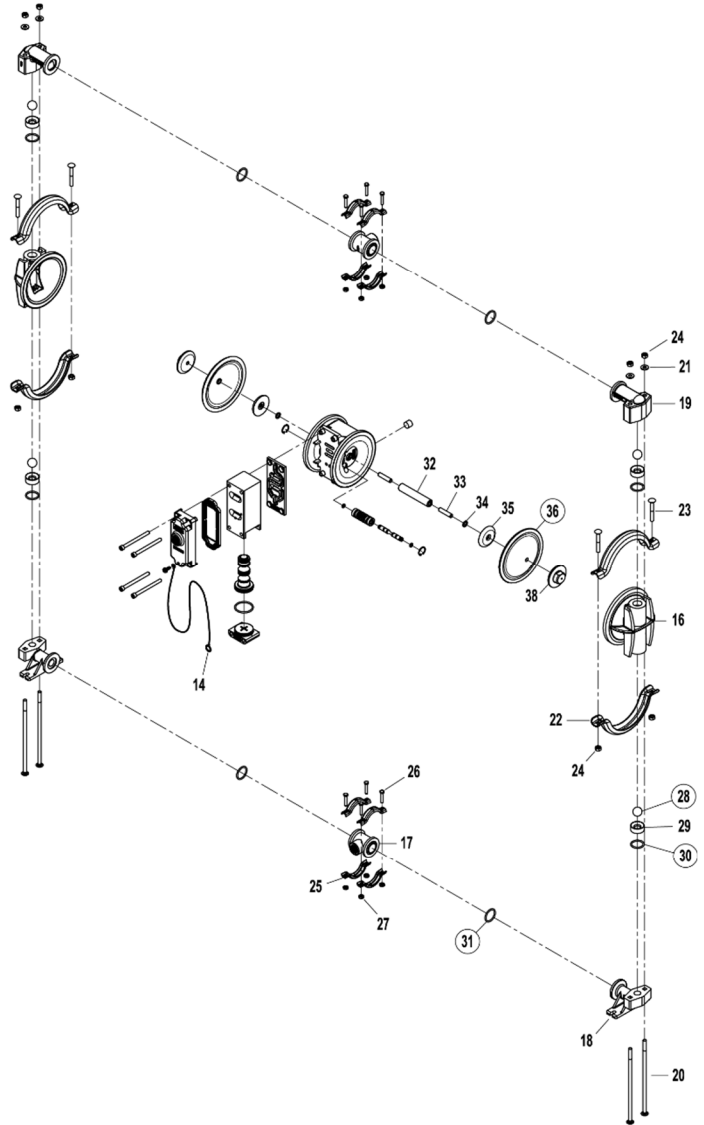
**Figure B**



**SECTION 8**

**EXPLODED VIEW AND PARTS LIST**

**GPS1 METAL**



ALL CIRCLED PART IDENTIFIERS ARE INCLUDED IN REPAIR KITS

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### EXPLODED VIEW AND PARTS LIST

Item	Description	Model Description	Qty	GPS1/AAAAA	
				P/N	GPS1/SSAAA
<b>Air Distribution Components</b>					
<b>1</b>	<b>Pro-Flo X® Air Valve Assembly<sup>1</sup></b>		1	01-2030-01	
2	End Cap		1	01-2340-01	
<b>3</b>	<b>O-Ring (-126), End Cap (Ø1.362 x Ø.103)</b>		1	01-2395-52	
<b>4</b>	<b>Gasket, Air Valve, Pro-Flo X®</b>		1	01-2621-52	
<b>5</b>	<b>Gasket, Muffler Plate, Pro-Flo X®</b>		1	01-3502-52	
6	Muffler Plate, Pro-Flo X®		1	01-3185-01	
7	Screw, SHC, Air Valve (1/4"-20 x 3")		4	01-6001-03	
8	Center Block Assembly, Pro-Flo Shift™ <sup>2</sup>		1	01-3139-01	
<b>9</b>	<b>Pilot Sleeve Assembly</b>		1	01-3880-99	
<b>10</b>	<b>O-Ring (-009), Pilot Spool Retaining (Ø.208" x .070")</b>		2	04-2650-49-700	
<b>11</b>	<b>Shaft Seal</b>		2	01-3220-55	
12	Screw, 10-32 x .50 Self-Tapping Grounding		1	04-6345-08	
13	Retaining Ring		1	00-2650-03	
14	Grounding Strap, CSA		1	01-8303-99	
15	Plug, Pipe, 1/4" MNPT		1	00-7010-03	
<b>Wetted Path Components</b>					
16	Liquid Chamber		2	01-5000-01	01-5000-03
17	Manifold Tee Section		2	01-5160-01	01-5160-03
18	Inlet Manifold Elbow		2	01-5220-01	01-5220-03
19	Discharge Manifold Elbow		2	01-5230-01	01-5230-03
20	RHSN Bolt, Liquid Chamber (1/4"-20 x 7-1/2")		4	01-6080-03	
21	Washer, Flat (Ø.281 x Ø.625 x .065)		4	01-6730-03	
22	Large Clamp Band Assembly		4	01-7300-03	
23	RHSN Bolt, Large Clamp Band (1/4"-20 x 2-1/4")		4	01-6070-03	
24	Hex Nut (1/4"-20)		8	04-6400-03	
25	Small Clamp Band Assembly		8	01-7100-03	
26	Screw, HHC (#10-24 x 1")		8	01-6101-03	
27	Hex Nut (#10-24)		8	01-6400-03	
<b>Valve Balls/ Valve Seats/Valve O-Rings</b>					
<b>28</b>	<b>Ball, Valve</b>		4	01-1080-52	
	<b>Ball, Valve, PTFE Fitted</b>		4	01-1080-55	
<b>29</b>	<b>Seat, Valve</b>		4	01-1120-01	01-1120-03
<b>30</b>	<b>O-Ring (-119), Valve Seat (Ø.924 x Ø.103)</b>		4	00-1260-52	
	<b>O-Ring (-119), Valve Seat (Ø.924 x Ø.103) PTFE Fitted</b>		4	01-1200-55	
<b>31</b>	<b>O-Ring, Manifold (-120), (Ø.987 x Ø.103)</b>		4	01-1300-52	
	<b>O-Ring, Manifold (-120), (Ø.987 x Ø.103) PTFE Fitted</b>		4	01-1300-55	
<b>Rubber/PTFE Components</b>					
32	Shaft		1	01-3810-03	
33	Stud, Shaft (5/16"-18 x 1-3/8")		2	01-6150-03	
34	Spring, Disc (Ø.331 x Ø.512)		2	01-6802-08	
35	Inner Piston		2	01-3711-08	
<b>36</b>	<b>Diaphragm, Primary</b>		2	01-1010-52	
	<b>Diaphragm, Primary</b>		2	01-1010-86	
	<b>Diaphragm, Primary, PTFE Fitted</b>		2	01-1010-55	
<b>37</b>	<b>Diaphragm, Backup, PTFE Fitted</b>		2	01-1060-86	
38	Outer Piston		2	01-4570-01	01-4570-03

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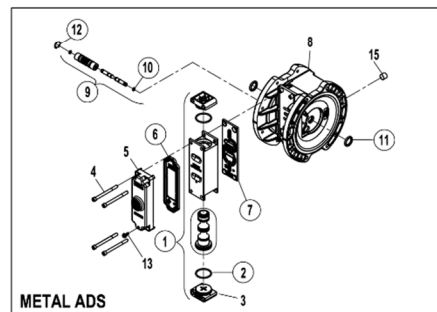
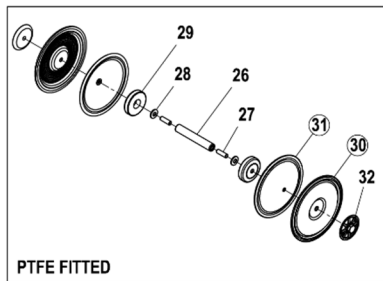
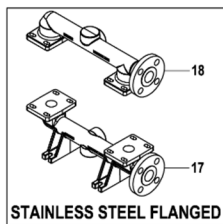
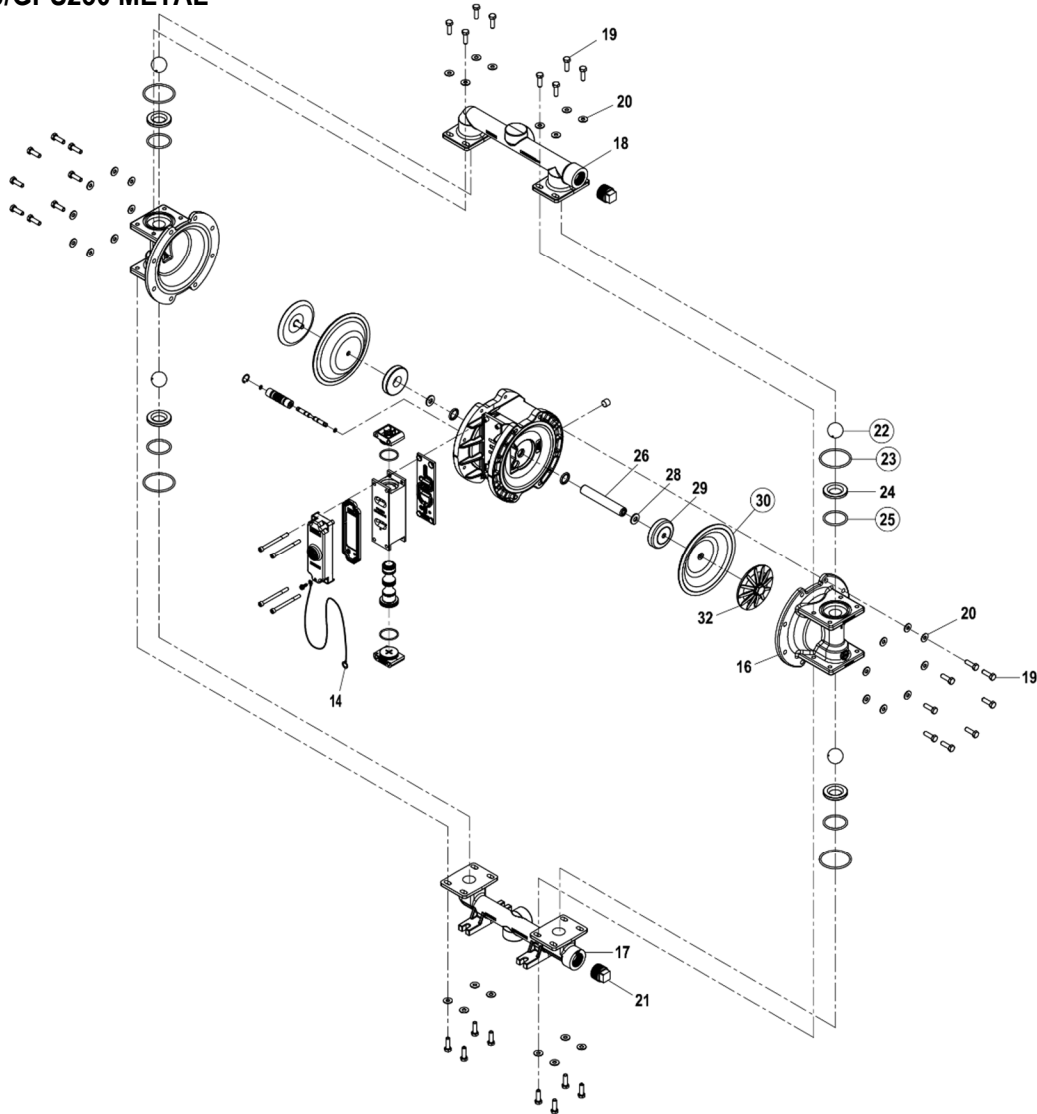
<sup>1</sup> Air Valve Assembly includes item numbers 2 and 3.

<sup>2</sup> Center Section Assembly includes item 11.

All boldface items are primary wear parts.

**EXPLODED VIEW AND PARTS LIST**

**GPS220/GPS230 METAL**



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ALL CIRCLED PART IDENTIFIERS ARE INCLUDED IN REPAIR KITS

### EXPLODED VIEW AND PARTS LIST

Model Description		GPS/220/230/AAAA	GPS220/230/SSAA
Item	Description	Qty	P/N
<b>Air Distribution Components</b>			
1	<b>Pro-Flo X® Air Valve Assembly<sup>1</sup></b>	1	02-2030-01
2	<b>O-Ring, End Cap (-126, Ø1.362 x Ø.103)</b>	2	01-2395-52
3	End Cap	2	01-2340-01
4	Screw, SHC, Air Valve (1/4"-20 x 3")	4	01-6001-03
5	Muffler Plate, Pro-Flo X®	1	02-3185-01
6	<b>Gasket, Muffler Plate, Pro-Flo X®</b>	1	02-3502-52
7	<b>Gasket, Air Valve, Pro-Flo X®</b>	1	02-2621-52
8	Center Section Assembly, Pro-Flo SHIFT <sup>2</sup>	1	02-3138-01
9	<b>Pilot Sleeve Assembly</b>	1	02-3880-99
10	<b>Pilot Spool Retaining O-Ring (-009, Ø.208 x Ø.070)</b>	1	04-2650-49-700
11	<b>Shaft Seal</b>	2	02-3210-55-225
12	Retaining Ring	1	00-2650-03
13	Grounding Screw, (10-32 x 1/2") Self-Tapping	1	04-6345-08
14	Grounding Strap, CSA	1	01-8303-99
15	Plug, Pipe, 1/4" MNPT	1	00-7010-03
<b>Wetted Path Components</b>			
16	Liquid Chamber	2	02-5015-01
17	Inlet Manifold, Side Ported, 1" NPT	1	02-5095-01
	Inlet Manifold, Side Ported, 1" BSPT	1	02-5096-01
	Inlet Manifold, Center Ported, 1" NPT	1	02-5095-01-677
	Inlet Manifold, Center Ported, 1" BSPT	1	02-5096-01-678
	Inlet Manifold, ANSI Flange	1	02-5090-03
	Inlet Manifold, DIN Flange	1	02-5091-03
18	Discharge Manifold, Side Ported, 1" NPT	1	02-5035-01
	Discharge Manifold, Side Ported, 1" BSPT	1	02-5036-01
	Discharge Manifold, Center Ported, 3/4" NPT	1	02-5035-01-697
	Discharge Manifold, Center Ported, 3/4" BSPT	1	02-5036-01-698
	Discharge Manifold, Center Ported, 1" NPT	1	02-5035-01-677
	Discharge Manifold, Center Ported, 1" BSPT	1	02-5036-01-678
	Discharge Manifold, ANSI Flange	1	02-5030-03
	Discharge Manifold, DIN Flange	1	02-5031-03
19	Screw, HHC, 5/16"-18 x 1"	32	08-6180-03-42
20	Washer, 5/16"	32	02-6731-03
21	Pipe Plug, 1" NPT	2	02-7010-01
	Pipe Plug, 1" BSPT	2	02-7011-01
<b>Valve Balls/Valve Seats/Valve O-rings/Manifold O-ring</b>			
22	<b>Ball, Valve</b>	4	02-1085-52
	<b>Ball, Valve, PTFE Fitted</b>	4	02-1085-55
23	<b>O-ring, Manifold (-229, Ø2.359 x Ø.139)</b>	4	70-1280-52
	<b>O-ring, Manifold (-229, Ø2.359 x Ø.139) PTFE Fitted</b>	4	70-1280-55
24	<b>Valve Seat</b>	4	02-1125-01
	<b>O-ring, Valve Seat (-224, Ø1.734 x Ø.139)</b>	4	02-1205-52
25	<b>O-ring, Valve Seat (-224, Ø1.734 x Ø.139) PTFE Fitted</b>	4	02-1205-55
<b>Rubber/PTFE Components</b>			
26	Shaft	1	02-3810-03
	Shaft, PTFE Fitted	1	02-3840-03
27	Stud, 3/8"-16 x 1 1/4"	2	02-6150-08
28	Disc Spring	2	02-6802-08
29	Inner Piston	2	02-3701-01
	Inner Piston, PTFE Fitted	2	02-3751-01
30	<b>Diaphragm, Primary</b>	2	02-1010-52
	<b>Diaphragm, Primary</b>	2	02-1010-86
	<b>Diaphragm, Primary, PTFE Fitted</b>	2	02-1010-55
31	<b>Diaphragm, Back-Up, PTFE Fitted</b>	2	02-1060-86
32	Outer Piston	2	02-4550-01
	Outer Piston, PTFE Fitted	2	02-4601-01

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<sup>1</sup> Air Valve Assembly includes item numbers 2 and 3.

<sup>2</sup> Center Section Assembly includes items 9, 10, 11 and 12.

All boldface items are primary wear parts.

**WILDEN®**

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