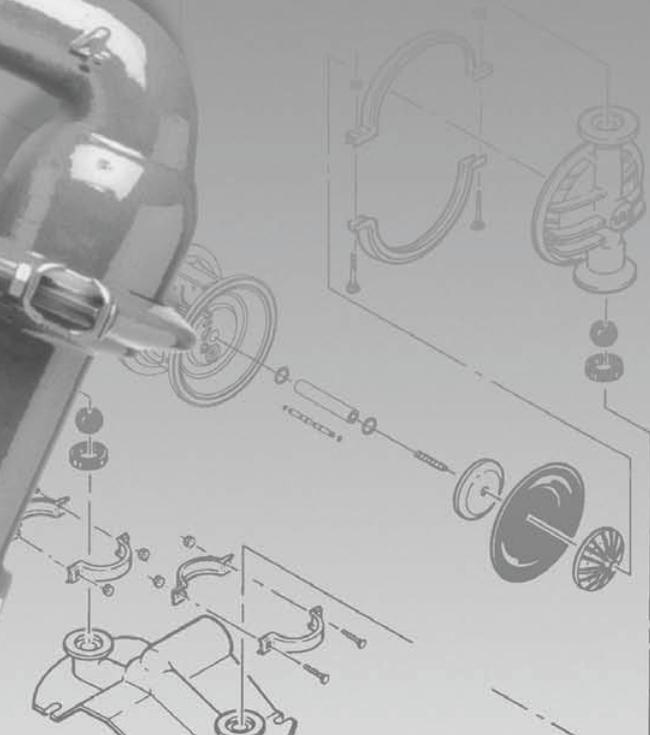
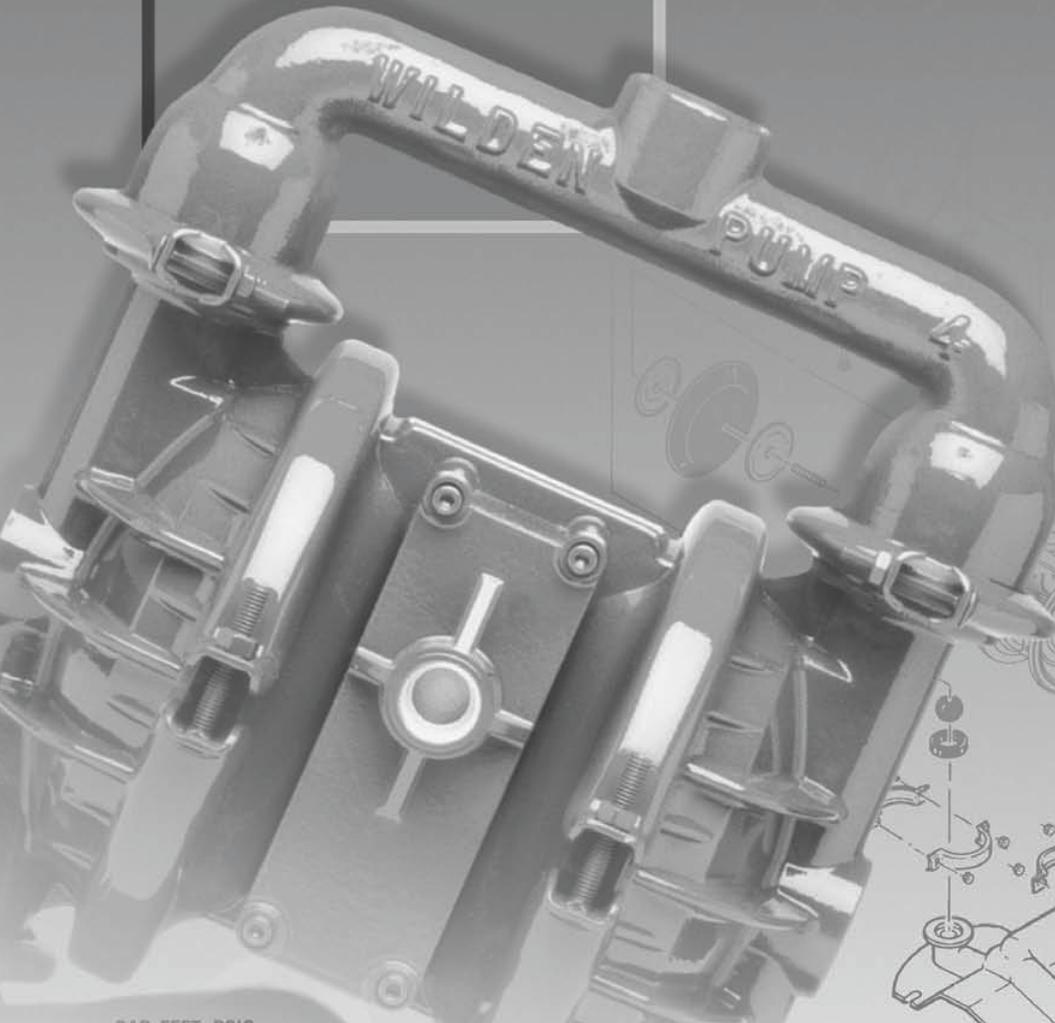


BIOPHARM™

P4

Engineering Operation & Maintenance

CE



BAR FEET PSIG



WILDEN®

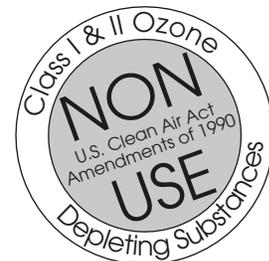
A DOVER COMPANY

PROFLO®
PROGRESSIVE PUMP TECHNOLOGY

**Metal
Pumps**

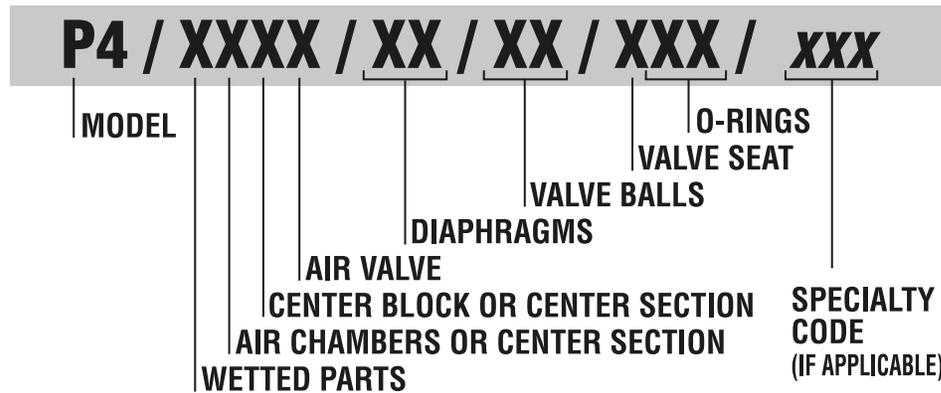
TABLE OF CONTENTS

	PAGE #
SECTION 1 – PUMP DESIGNATION SYSTEM	1
SECTION 2 – HOW IT WORKS (PUMP & AIR SYSTEM)	2
SECTION 3 – CAUTIONS	3
SECTION 4 – DIMENSIONAL DRAWINGS	
A. Model P4 METAL	4
B. Model P4 BIOPHARM	4
SECTION 5 – PERFORMANCE CURVES	
A. Model P4 METAL Teflon®-Fitted	5
SECTION 6 – SUCTION LIFT CURVE	6
SECTION 7 – INSTALLATION & OPERATION	
A. Installation	7
B. Operation & Maintenance	8
C. Troubleshooting	9
SECTION 8 – DIRECTIONS FOR DISASSEMBLY/REASSEMBLY	
A. Model P4 METAL	10
B. Pro-Flo™ Air Valve/Center Section – Disassembly, Cleaning, Inspection	13
C. Reassembly Hints & Tips, Torque Specs	15
SECTION 9 – EXPLODED VIEW/PARTS LISTING	
A. Model P4 METAL Teflon®-Fitted, 3-Piece Center Section	16
B. Material Code Designations	18



SECTION 1

WILDEN PUMP DESIGNATION SYSTEM



In the case where a center section is used instead of a center block and air chambers, the designation will be as follows: Acetal = LL

MODEL P4 METAL MATERIAL CODES

WETTED PARTS

H = HASTELLOY®
W = CAST IRON

AIR CHAMBERS/ CENTER SECTION

A = ALUMINUM
C = TEFLON® COATED ALUMINUM
L = ACETAL
S = STAINLESS STEEL
V = HALAR® COATED

CENTER SECTION/BLOCK

L = ACETAL
P = POLYPROPYLENE

AIR VALVE

L = ACETAL
P = POLYPROPYLENE

DIAPHRAGMS

TS = TEFLON® PTFE W/SANIFLEX™
BACK-UP (White)

VALVE BALL

TF = TEFLON® PTFE (White)

VALVE SEAT

H = HASTELLOY®
S = STAINLESS STEEL

VALVE SEAT O-RING

TF = TEFLON® PTFE

SPECIALTY CODE (AVAILABILITY VARIES BY MODEL.)

900 BioPharm
901 BioPharm, BSP
902 BioPharm, DIN
903 BioPharm, FDA (Tri-Clover® flanges & wing nuts)
904 BioPharm, USDA (Food Master)
905 BioPharm, 3A (CIP), Wil-Gard 110V
906 BioPharm, 3A (CIP), Wil-Gard 220V
907 BioPharm, LSH, side ported
908 BioPharm, FDA, Accu-Flo, 24V DC coil
909 BioPharm, FDA, Accu-Flo, 24V DC x-proof coil
910 BioPharm, FDA, Accu-Flo, 24V AC / 12V DC coil
911 BioPharm, FDA, Accu-Flo, 24V AC / 12V DC
x-proof coil
912 BioPharm, FDA, Accu-Flo, 110V AC coil
913 BioPharm, FDA, Accu-Flo, 110V AC x-proof coil
914 BioPharm, Accu-Flo, 24V DC coil
915 BioPharm, Accu-Flo, 24V DC x-proof coil
916 BioPharm, Accu-Flo, 24V AC / 12V DC coil
917 BioPharm, Accu-Flo, 24V AC / 12V DC x-proof coil
918 BioPharm, Accu-Flo, 110V AC coil
919 BioPharm, Accu-Flo, 110V AC x-proof coil

NOTE: MOST ELASTOMERIC MATERIALS USE COLORED DOTS FOR IDENTIFICATION.

SECTION 2

THE WILDEN PUMP — HOW IT WORKS

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.

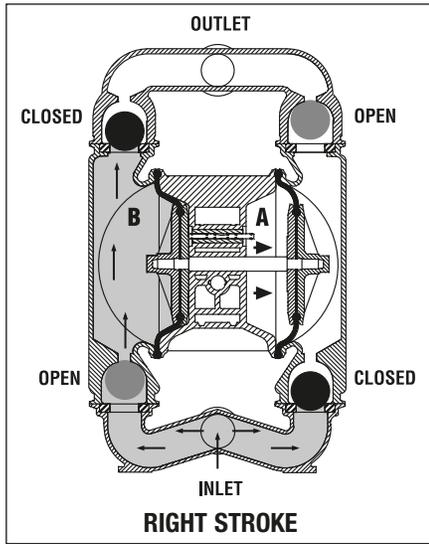


FIGURE 1 The air valve directs pressurized air to the back side of diaphragm A. The compressed air is applied directly to the liquid column separated by elastomeric diaphragms. The diaphragm acts as a separation membrane between the compressed air and liquid, balancing the load and removing mechanical stress from the diaphragm. The compressed air moves the diaphragm away from the center block 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 the atmosphere through the exhaust port of the pump. The movement of diaphragm B toward the center block 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).

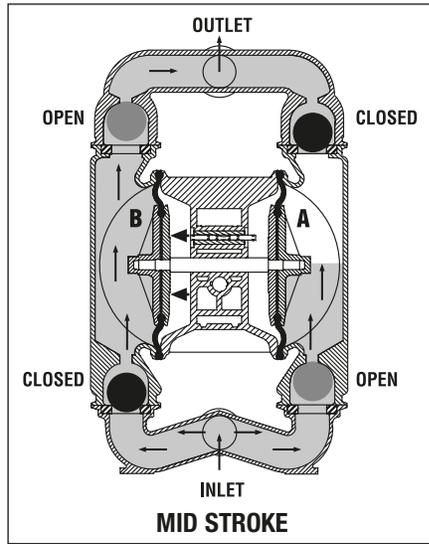


FIGURE 2 When the pressurized diaphragm, diaphragm A, reaches the limit of its discharge stroke, the air valve redirects pressurized air to the back side of diaphragm B. The pressurized air forces diaphragm B away from the center block while pulling diaphragm A to the center block. Diaphragm B is now 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 block 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.

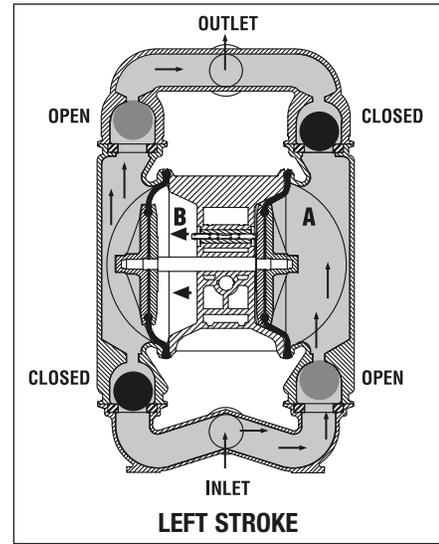


FIGURE 3 At completion of the stroke, the air valve again redirects air to the back side of diaphragm A, which starts diaphragm B on its exhaust stroke. As the pump reaches its original starting point, each diaphragm has gone through one exhaust and one discharge stroke. This constitutes one complete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

PRO-FLO™ AIR DISTRIBUTION SYSTEM OPERATION — HOW IT WORKS

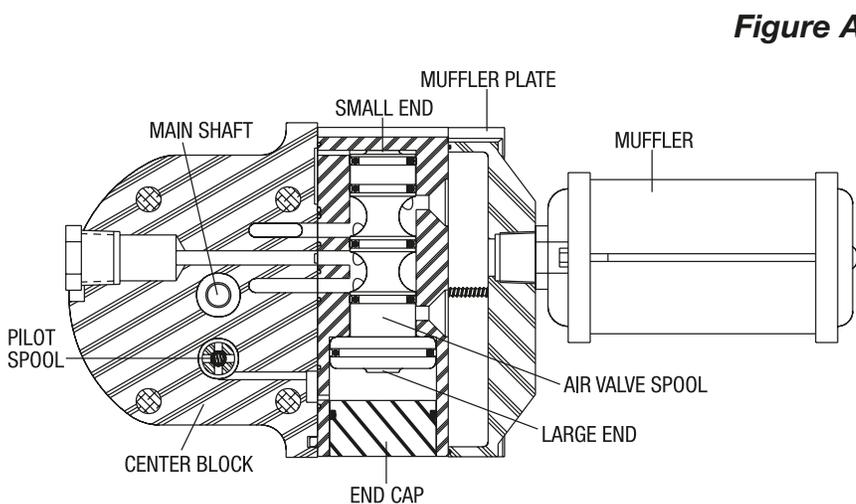


Figure A

The Pro-Flo™ patented air distribution system incorporates three moving parts: the air valve spool, the pilot spool, and the main shaft/diaphragm assembly. The heart of the system is the air valve spool and air valve. As shown in Figure A, this valve design incorporates an unbalanced spool. The smaller end of the spool is pressurized continuously, while the large end is alternately pressurized then exhausted to move the spool. The spool directs pressurized air to one air chamber while exhausting the other. The air causes the main shaft/diaphragm assembly to shift to one side — discharging liquid on that side and pulling liquid in on the other side. When the shaft reaches the end of its stroke, the inner piston actuates the pilot spool, which pressurizes and exhausts the large end of the air valve spool. The repositioning of the air valve spool routes the air to the other air chamber.

SECTION 3

WILDEN MODEL P4 METAL CAUTIONS – READ FIRST!



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



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

ELASTOMER TEMPERATURE LIMITS:

Saniflex™	-28.9°C to 104.4°C	-20°F to 220°F
Teflon® PTFE	4.4°C to 104.4°C	40°F to 220°F



CAUTION: When choosing pump materials, be sure to check the temperature limits for all wetted components. Example: Viton® has a maximum limit of 176.7°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 (E-4) 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 8.6 bar (125 psig) air supply pressure.



CAUTION: The process fluid and cleaning fluids must be chemically compatible with all wetted pump components (see E-4).



CAUTION: Pumps should be thoroughly flushed with water 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: When installing Teflon® diaphragms, it is important to tighten outer pistons simultaneously (turning in opposite directions) to ensure tight fit. (See torque specifications in Section 8C.)



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.



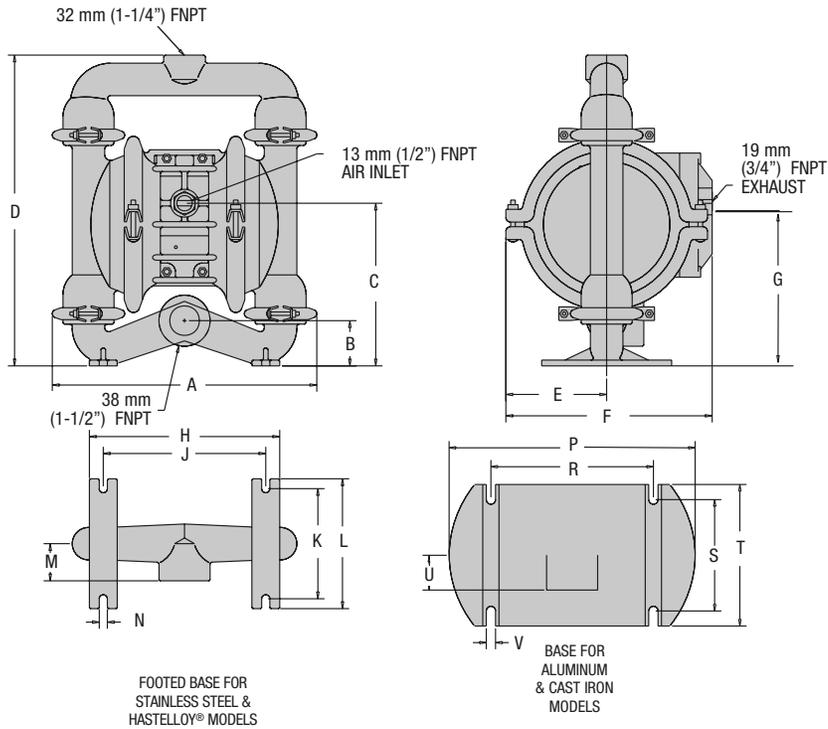
CAUTION: The P4 Pro-Flo™ is not submersible. If your application requires the pump to be submersed, the T4 model can be used.



CAUTION: Tighten all hardware prior to installation.

SECTION 4A

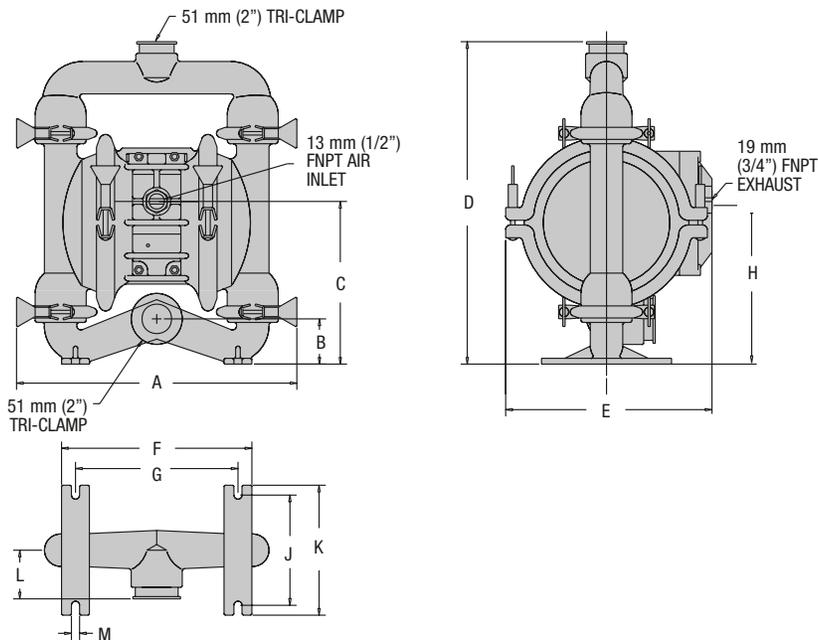
DIMENSIONAL DRAWING MODEL P4 METAL



DIMENSIONS – P4 METAL		
ITEM	METRIC (mm)	STANDARD (inch)
A	369	14.53
B	63	2.46
C	206	8.09
D	429	16.87
E	148	5.81
F	320	12.59
G	211	8.31
H	262	10.31
J	224	8.81
K	152	6.0
L	178	7.0
M	51	2.0
N	11	0.43
P	336	13.21
R	222	8.75
S	151	5.31
T	195	7.65
U	48	1.90
V	13	0.50

SECTION 4B

DIMENSIONAL DRAWING MODEL P4 METAL BIOPHARM



DIMENSIONS – P4 BIOPHARM		
ITEM	METRIC (mm)	STANDARD (inch)
A	389	15.3
B	64	2.5
C	206	8.1
D	442	17.4
E	320	12.6
F	262	10.3
G	224	8.8
H	211	8.3
J	152	6.0
K	178	7.0
L	66	2.6
M	11	0.4

SECTION 5A

PERFORMANCE CURVES MODEL P4 METAL TEFLON®-FITTED

Height..... 429 mm (16.9")
 Width..... 369 mm (14.5")
 Depth 320 mm (12.6")
 Est. Ship Weight ... 316 Stainless Steel 20 kg (45 lbs.)
 Hastelloy 23 kg (51 lbs.)

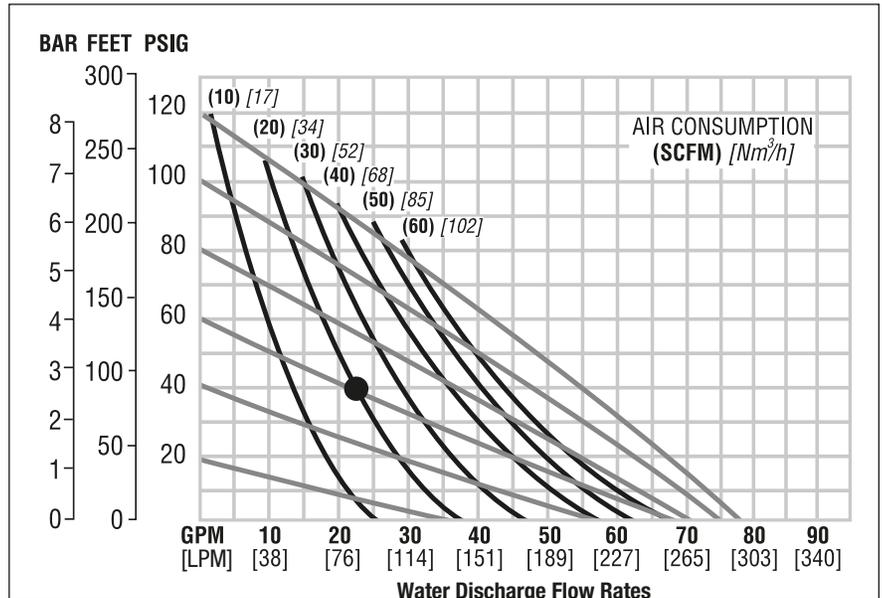
Air Inlet..... 13 mm (½")
 Inlet..... 38 mm (1½")
 Outlet 32 mm (1¼")
 Suction Lift 3.7 m Dry (12')
 8.5 m Wet (28')

Displacement per
 Stroke53 l (.14 gal.)
 Max. Flow Rate..... 295 lpm (78 gpm)
 Max. Size Solids 48 mm (¾")

Displacement per stroke was calculated at 4.8 bar (70 psig) air inlet pressure against a 2 bar (30 psig) head pressure.

Example: To pump 83 lpm (22 gpm) against a discharge pressure head of 2.7 bar (40 psig) requires 4.1 bar (60 psig) and 34 Nm³/h (20 scfm) air consumption.

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

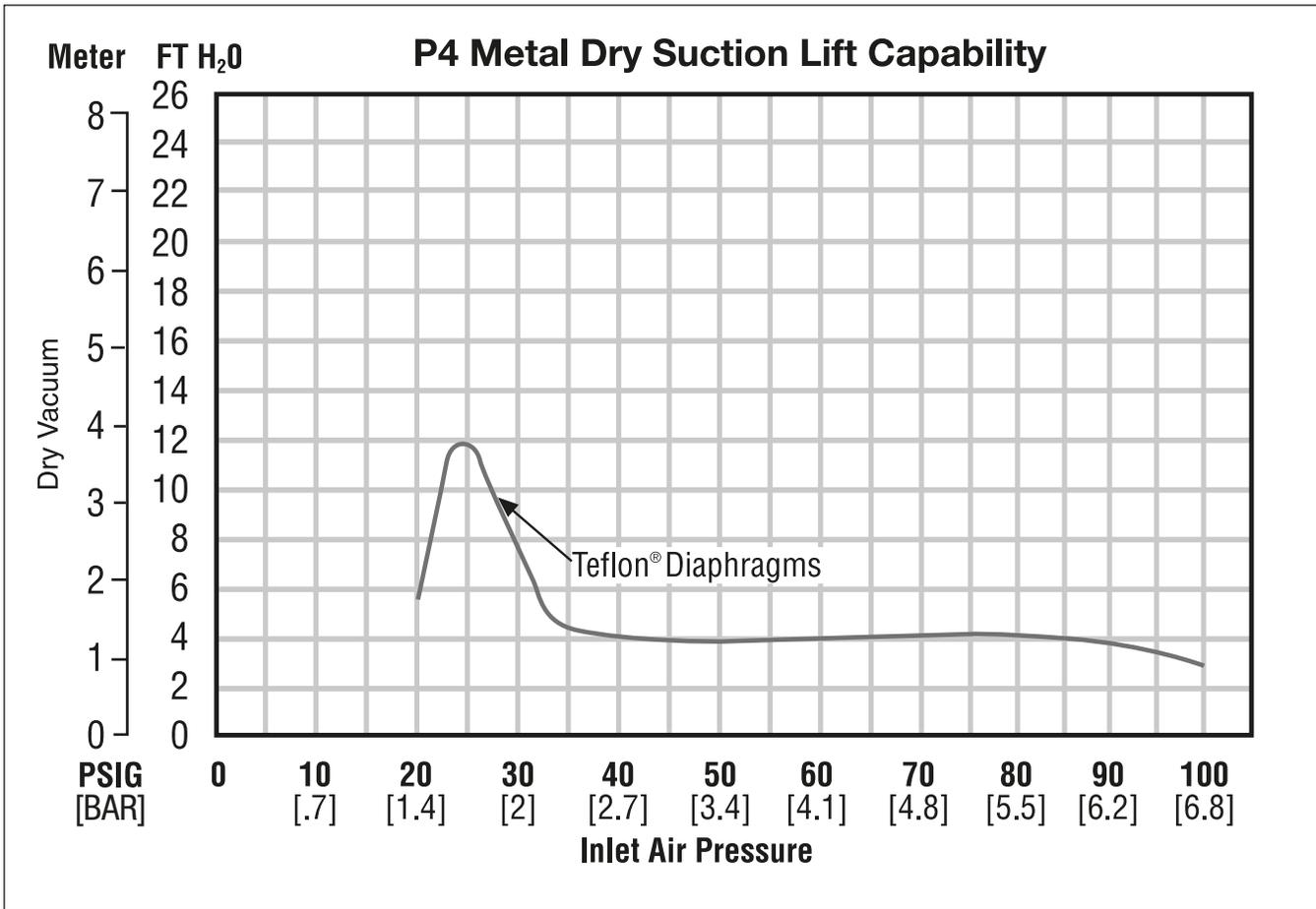


Flow rates indicated on chart were determined by pumping water.

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

SECTION 6

SUCTION LIFT CURVE



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 7A

INSTALLATION

The P4 Pro-Flo™ model has a 38 mm (1½") inlet and 38 mm (1½") outlet and is designed for flows to 295 lpm (78 gpm). Refer to Section 5 for performance characteristics. The **P4 Metal** pump is manufactured with wetted parts of 316 Stainless Steel, and Hastelloy®. The **P4** is available with a polypropylene air valve and center block with aluminum air chambers or a center section and air valve constructed of glass-filled Acetal. A variety of diaphragms, valve balls, valve seats and o-rings are available to satisfy temperature, chemical compatibility, abrasion and flex concerns.

The suction pipe size should be at least 38 mm (1½") diameter or larger if highly viscous material is being pumped. The suction hose must be non-collapsible, reinforced type as the P4 is capable of pulling a high vacuum. Discharge piping should be at least 32 mm (1¼"); larger diameter can be used to reduce friction losses. It is critical that all fittings and connections are airtight or a reduction or loss of pump suction capability will result.

INSTALLATION: 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 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 (see Section 5). Use air pressure up to a maximum of 8.6 bar (125 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 determined 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 troubles 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 problems 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 so as to keep friction losses within practical limits. All piping should be supported independently of the pump. In addition, the piping should be aligned so as 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 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, be 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 Section 6 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.

THE MODEL P4 WILL PASS 4.8 mm (3/16") SOLIDS. WHENEVER THE POSSIBILITY EXISTS THAT LARGER SOLID OBJECTS MAY BE SUCKED INTO THE PUMP, A STRAINER SHOULD BE USED ON THE SUCTION LINE.

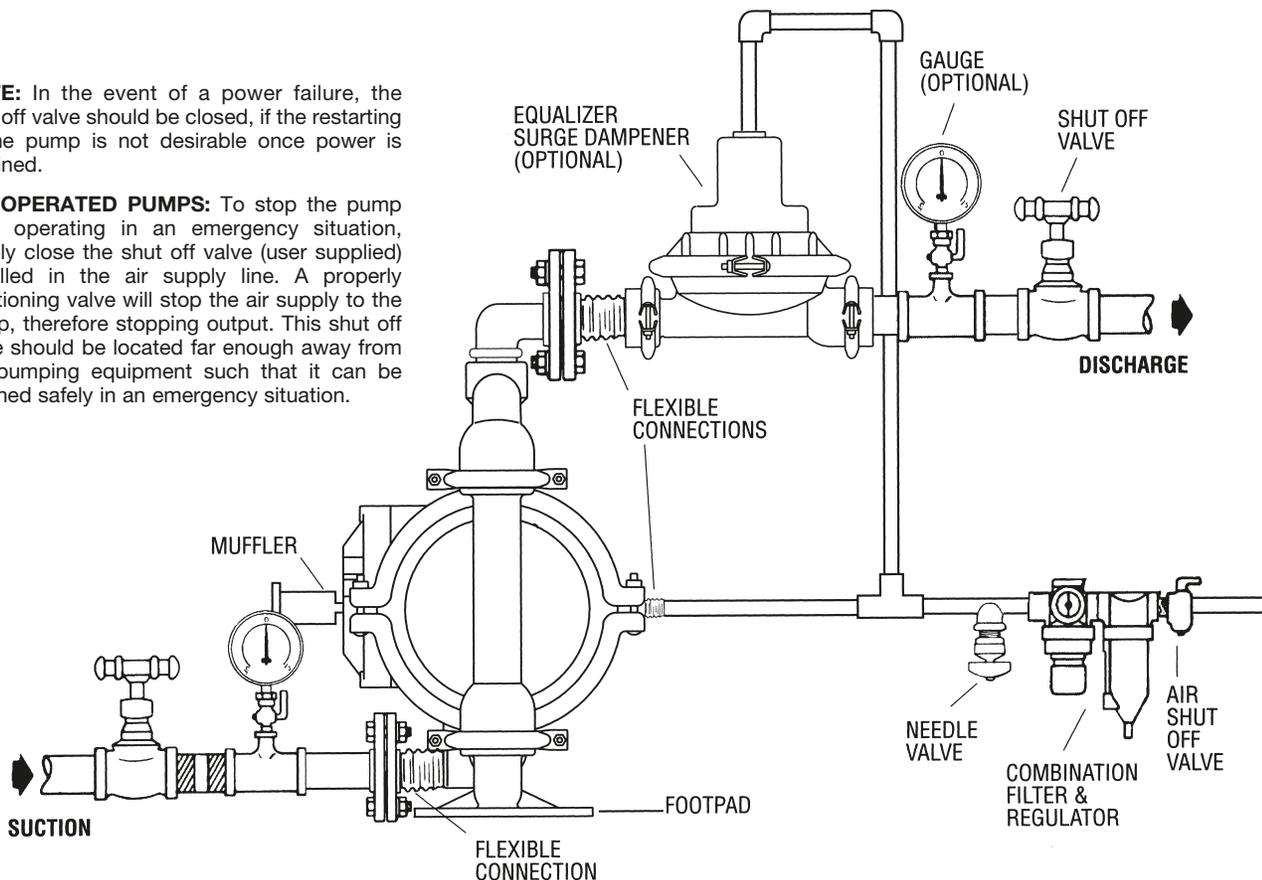
CAUTION: DO NOT EXCEED 8.6 BAR (125 PSIG) AIR SUPPLY PRESSURE.

P4 PUMPS CANNOT BE SUBMERGED. FOR SUBMERGED APPLICATIONS, USE A WILDEN T4 PUMP.

SUGGESTED INSTALLATION

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.



SECTION 7B – AIR OPERATION

SUGGESTED OPERATION AND MAINTENANCE INSTRUCTIONS

OPERATION: The P4 is pre-lubricated, and does 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 ASSEMBLY/DISASSEMBLY INSTRUCTIONS.

Pump discharge rate can be controlled by limiting the volume and/or pressure of the air supply to the pump (preferred method). A regulator is used to control air pressure while a needle valve is used to control 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 P4 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.

SECTION 7C

TROUBLESHOOTING

Pump will not run or runs slowly.

1. Ensure that the air inlet pressure is at least 0.3 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).
2. Check air inlet filter for debris (see recommended installation).
3. Check for extreme air leakage (blow by) which would indicate worn seals/bores in the air valve, pilot spool, main shaft.
4. Disassemble pump and check for obstructions in the air passageways or objects which would obstruct the movement of internal parts.
5. 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.
6. Check for broken inner piston which will cause the air valve spool to be unable to shift.
7. Remove plug from pilot spool exhaust.

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 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.

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 8C).
3. Check tightness of clamp bands 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.

SECTION 8A

MODEL P4 METAL

DIRECTIONS FOR DISASSEMBLY/REASSEMBLY

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.

The Wilden P4 metal pump has a 38 mm (1½") inlet and 32 mm (1¼") outlet and is designed for flows up to 295 lpm (78 gpm). Its air distribution system is based on a revolutionary design which increases reliability and performance. The model P4 is available in 316 Stainless Steel, or Hastelloy® wetted parts. For highly corrosive applications, polypropylene and PVDF models are available.

TOOLS REQUIRED:

⅞" Wrench

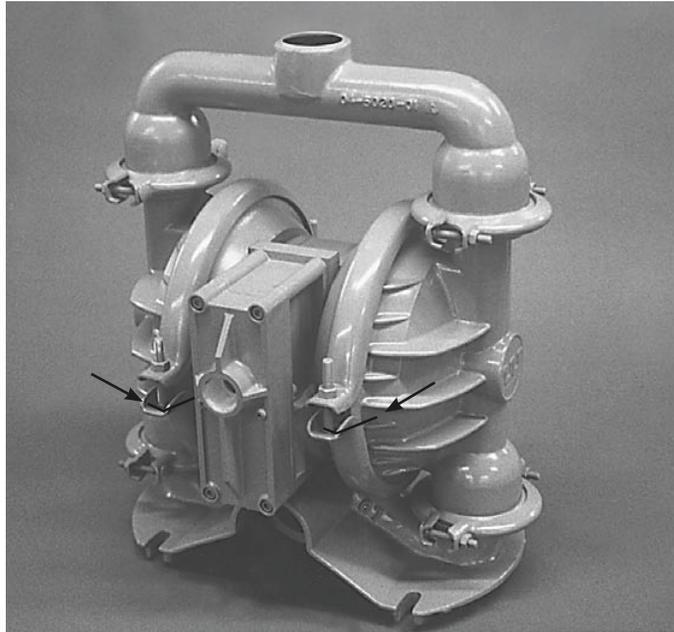
½" Wrench

Adjustable Wrench

Vise equipped w/soft jaws

(such as plywood, plastic or other suitable material)

NOTE: The model photographed for these instructions incorporates rubber diaphragms, balls, and seats. Models with Teflon® diaphragms, balls and seats are the same except where noted.

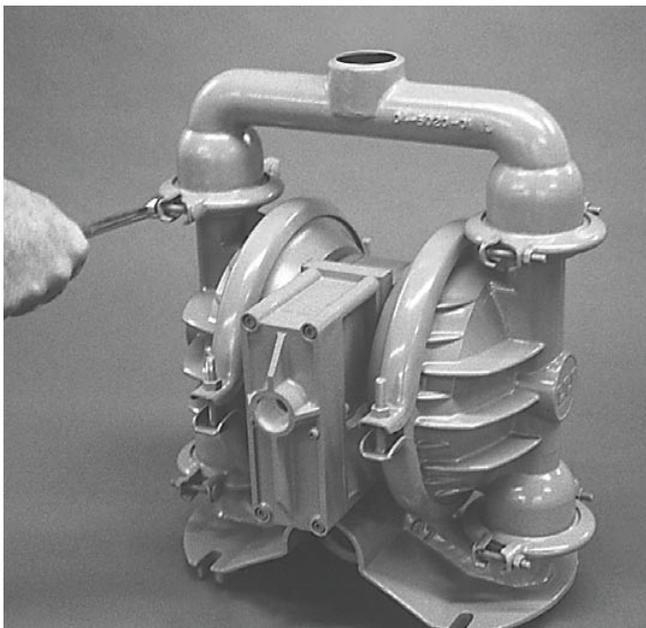


DISASSEMBLY:

Figure 1

Step 1.

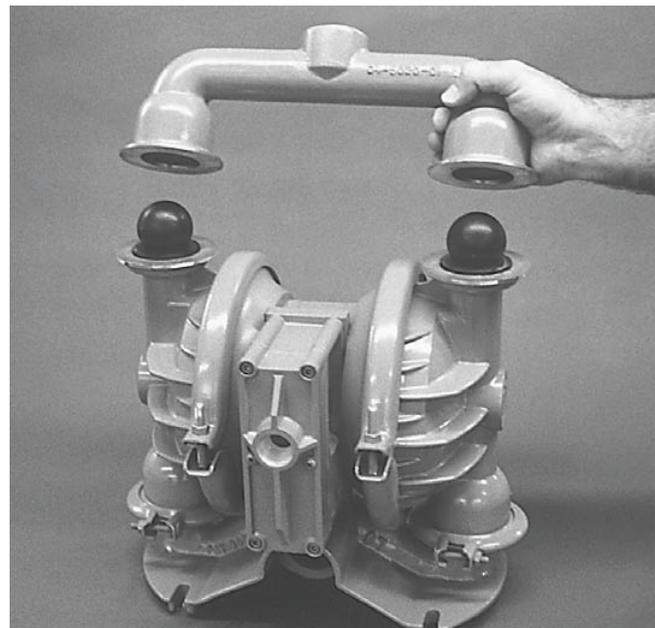
Before starting disassembly, mark a line from each liquid chamber to its corresponding air chamber. This line will assist in proper alignment during reassembly. (Figure 1)



Step 2.

Figure 2

Utilizing a ⅞" wrench, remove the two small clamp bands that fasten the discharge manifold to the liquid chambers. (Figure 2)



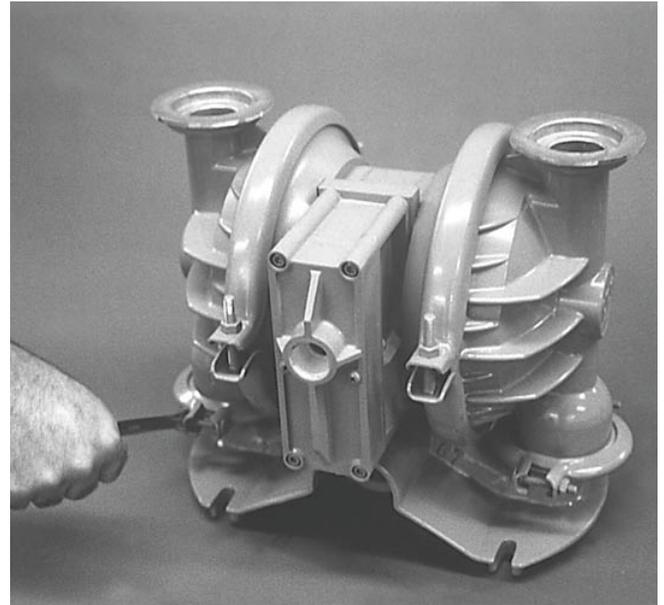
Step 3.

Figure 3

Remove the discharge manifold to expose the valve balls and seats. Inspect ball cage area of manifold for excessive wear or damage. (Figure 3)



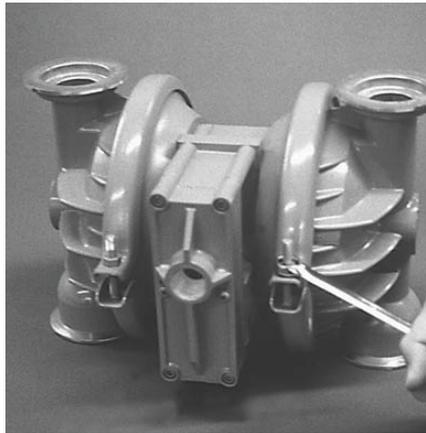
Step 4. *Figure 4*
 Remove the discharge valve balls and seats (*Figure 4*) from the liquid chambers and inspect for nicks, chemical attack or abrasive wear. Replace worn parts with genuine Wilden parts for reliable performance.



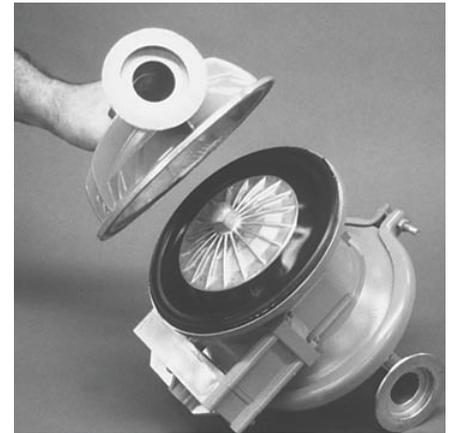
Step 5. *Figure 5*
 Remove the two small clamp bands which fasten the intake manifold to the liquid chambers. (*Figure 5*)



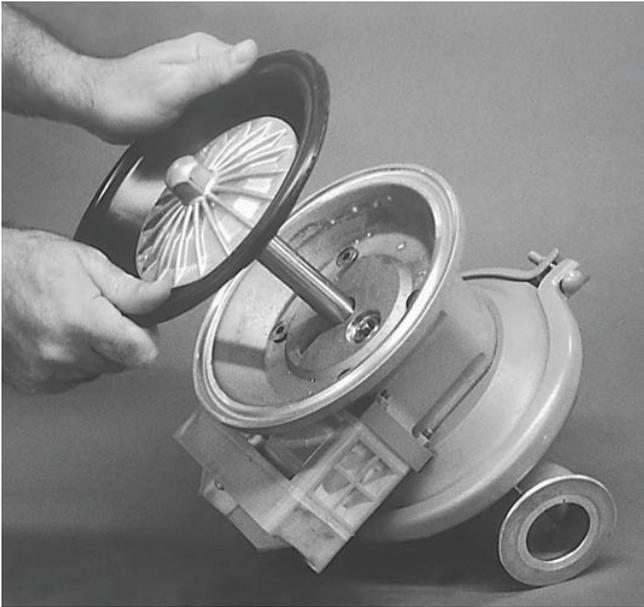
Step 6. *Figure 6*
 Lift liquid chambers and center section from intake manifold to expose intake valve balls and seats. Inspect ball cage area of liquid chamber for excessive wear or damage. (*Figure 6*)



Step 7. *Figure 7*
 Remove one set of large clamp bands which secure one liquid chamber to the center section. (*Figure 7*)



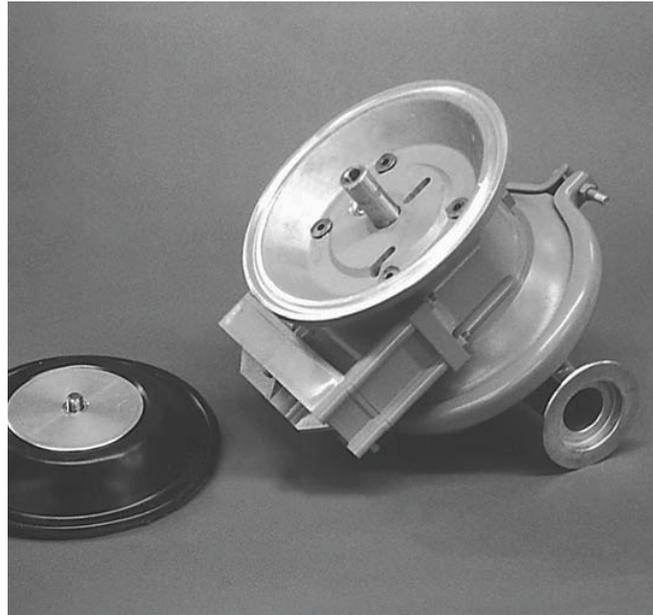
Step 8. *Figure 8*
 Lift liquid chamber away from center section to expose diaphragm and outer piston. (*Figure 8*)



Step 9A *Figure 9A*

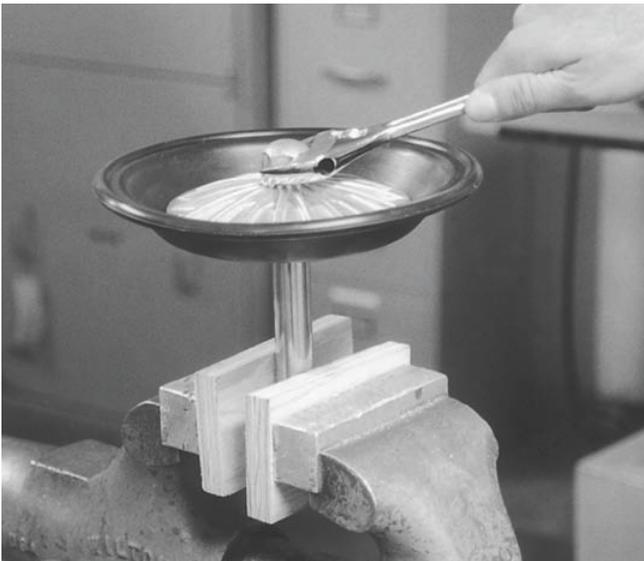
Using an adjustable wrench, or by rotating the diaphragm by hand, remove the diaphragm assembly.

NOTE: Due to varying torque values, one of the following two situations may occur: 1) The outer piston, diaphragm and inner piston remain attached to the shaft and the entire assembly can be removed from the center section (*Figure 9A*).



Step 9B *Figure 9B*

2) The outer piston, diaphragm and inner piston separate from the shaft which remains connected to the opposite side diaphragm assembly (*Figure 9B*). Repeat disassembly instructions for the opposite liquid chamber. Inspect diaphragm assembly and shaft for signs of wear or chemical attack. Replace all worn parts with genuine Wilden parts for reliable performance.



Step 10 *Figure 10*

To remove diaphragm assembly from shaft, secure shaft with soft jaws (a vise fitted with plywood, plastic or other suitable material) to ensure shaft is not nicked, scratched or gouged. Using an adjustable wrench, remove diaphragm assembly from shaft. (*Figure 10*)

SECTION 8B

PRO-FLO™ AIR VALVE/CENTER SECTION DISASSEMBLY, CLEANING, INSPECTION

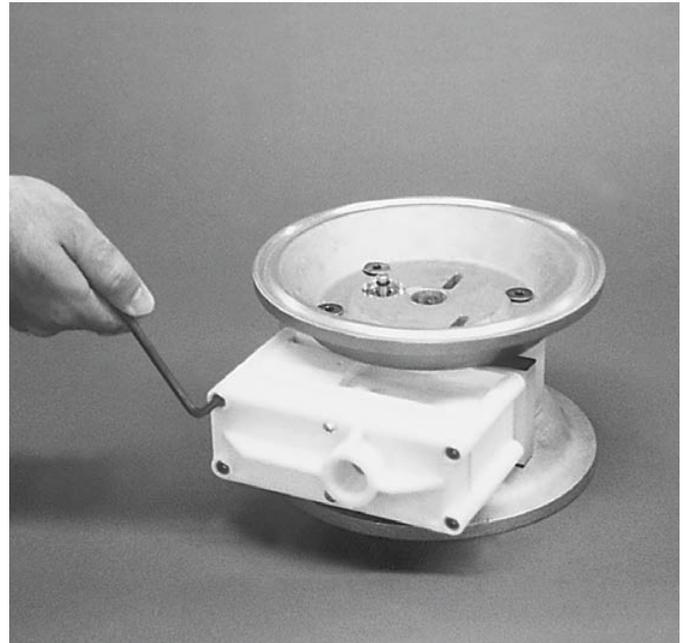
AIR VALVE DISASSEMBLY:

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 hazardous effects of contact with your process fluid.

The Wilden Metal P4 utilizes a revolutionary Pro-Flo™ air distribution system. A 13 mm (½") air inlet connects the air supply to the center section. Proprietary composite seals reduce the coefficient of friction and allow the P4 to run lube-free. Constructed of Acetal or Polypropylene, the Pro-Flo™ air distribution system is designed to perform in on/off, non-freezing, non-stalling, tough duty applications.

TOOLS REQUIRED:

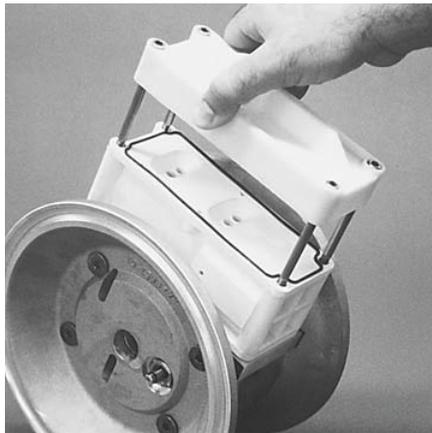
⅜" Hex Head Wrench
¼" Hex Head Wrench
Snap Ring Pliers
O-Ring Pick



Step 1.

Figure 1

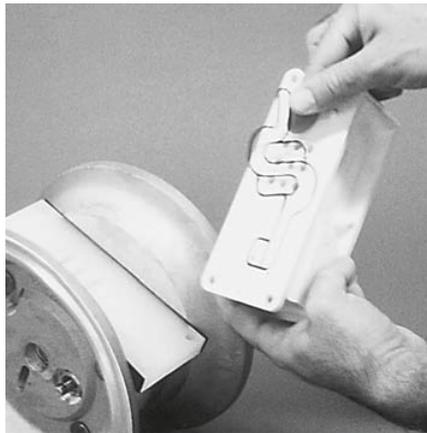
Loosen the air valve bolts utilizing a ⅜" hex head wrench and then remove muffer plate screws. (*Figure 1*)



Step 2.

Figure 2

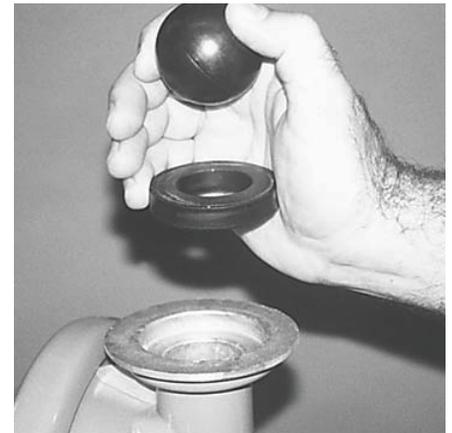
Remove muffer plate and air valve bolts from air valve assembly (*Figure 2*) exposing muffer gasket for inspection. Replace if necessary.



Step 3.

Figure 3

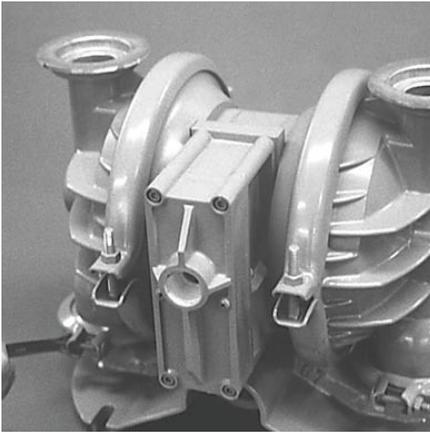
Lift away air valve assembly and remove air valve gasket for inspection (*Figure 3*). Replace if necessary.



Step 4.

Figure 4

Remove air valve end cap to expose air valve spool by simply lifting up on end cap once air valve bolts are removed. (*Figure 4*).

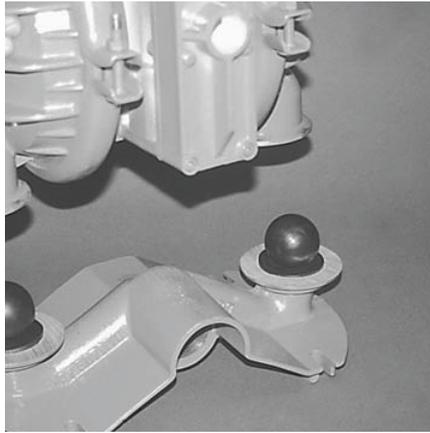


Step 5. *Figure 5*

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 (*Figure 5*). Inspect seals for signs of wear and replace entire assembly if necessary. Use caution when handling air valve spool to prevent damaging seals.

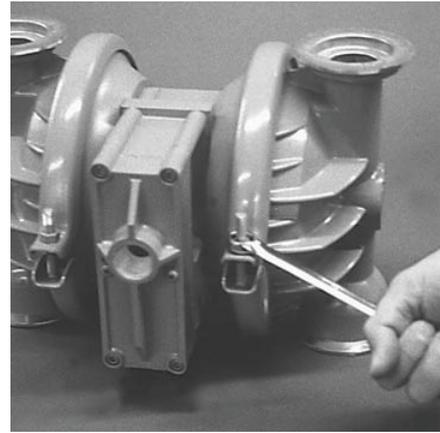
NOTE: Seals should not be removed from assembly.

Seals are not sold separately.



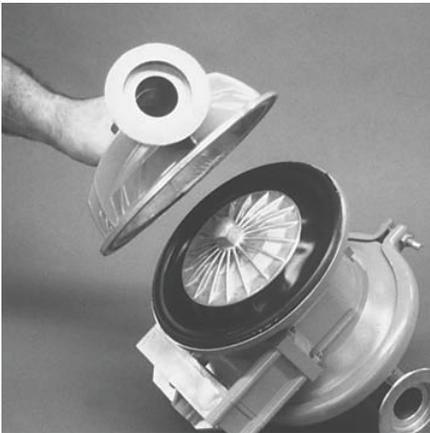
Step 6. *Figure 6*

Remove pilot spool retaining snap ring on both sides of center section with snap ring pliers (*Figure 6*).



Step 7. *Figure 7*

Remove air chamber bolts with $\frac{1}{2}$ " hex head wrench (*Figure 7*).



Step 8. *Figure 8*

Remove pilot spool bushing from center block (*Figure 8*).

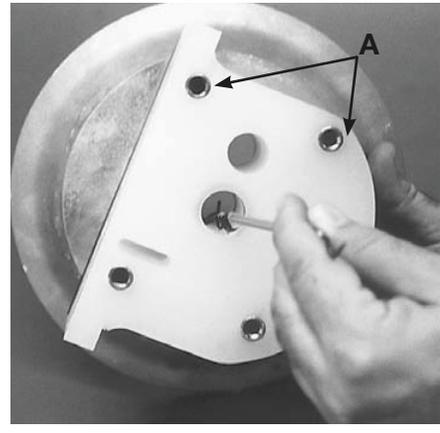


Step 9. *Figure 9*

With o-ring pick, gently remove pilot spool retaining o-ring (*Figure 9*). Replace if necessary. Gently remove pilot spool from bushing and inspect spool and seals for nicks, gouges or other signs of wear. Replace pilot sleeve assembly or outer bushing o-rings if necessary.

NOTE: Seals should not be removed from pilot spool.

Seals are not sold separately.



Step 10. *Figure 10*

Check center block Glyd™ rings for signs of wear. If necessary, remove Glyd™ rings with o-ring pick and replace. (*Figure 10*)

NOTE: Threaded sleeves (see A — *Figure 10*) are removable and can be replaced if necessary. Sleeves can be press fit by hand.

SECTION 8C

REASSEMBLY HINTS & TIPS

ASSEMBLY:

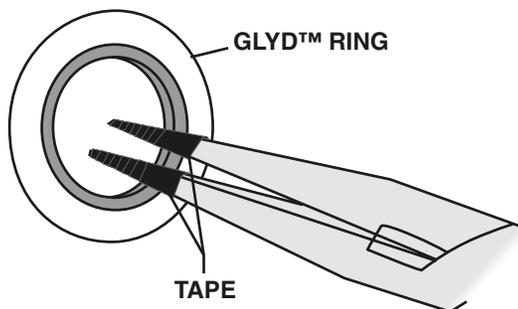
Upon performing applicable maintenance to the air distribution system, the pump can now be reassembled. Please refer to the disassembly instructions for photos and parts placement. To reassemble the pump, follow the disassembly instructions in reverse order. The air distribution system needs to be assembled 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 air valve bore, center section shaft and pilot spool bore with NLGI grade 2 molybdenum disulfide based grease or equivalent.
- Clean the inside of the center section shaft bushing to ensure no damage is done to new Glyd™ ring seals.
- A small amount NLGI grade 2 molybdenum disulfide based grease can be applied to the muffler and air valve gaskets to locate 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.
- Use a mallet to tamp lightly on the large clamp bands to seat the diaphragm before tightening.

MAXIMUM TORQUE SPECIFICATIONS

Description of Part	Metal Pumps
Air Valve	5.1 N•m [45 in.-lbs.]
Outer Piston	52 N•m [38 ft.-lbs.]
Small Clamp Band	3.4 N•m [30 in.-lbs.]
Large Clamp Band (Teflon®-Fitted)	13.6 N•m [120 in.-lbs.]
Air Chamber Screws (HSFHS 3/8"-16)	47.4 N•m [35 ft.-lbs.]

Figure A



GLYD™ RING 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.

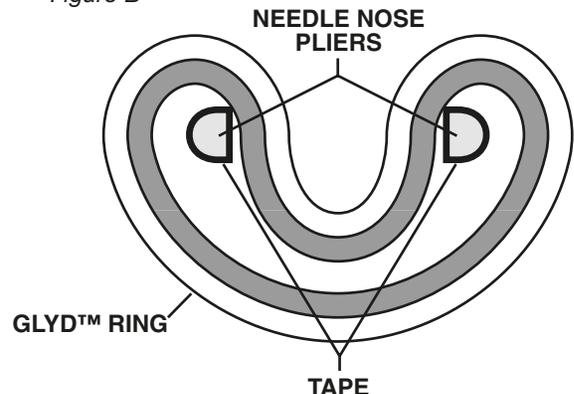
INSTALLATION

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

Needle Nose Pliers
Phillips Screwdriver
Electrical Tape

- 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.
- With a new seal in hand, place the two legs of the needle nose pliers inside the seal ring. (See Figure A.)
- 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 kidney bean shape. (See Figure B.)
- 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 easier.
- 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. 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.
- 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.
- Lubricate the edge of the shaft with NLGI grade 2 molybdenum disulfide based grease.
- Slowly insert the center shaft with a rotating motion. This will complete the resizing of the seal.
- Perform these steps for the remaining seal.

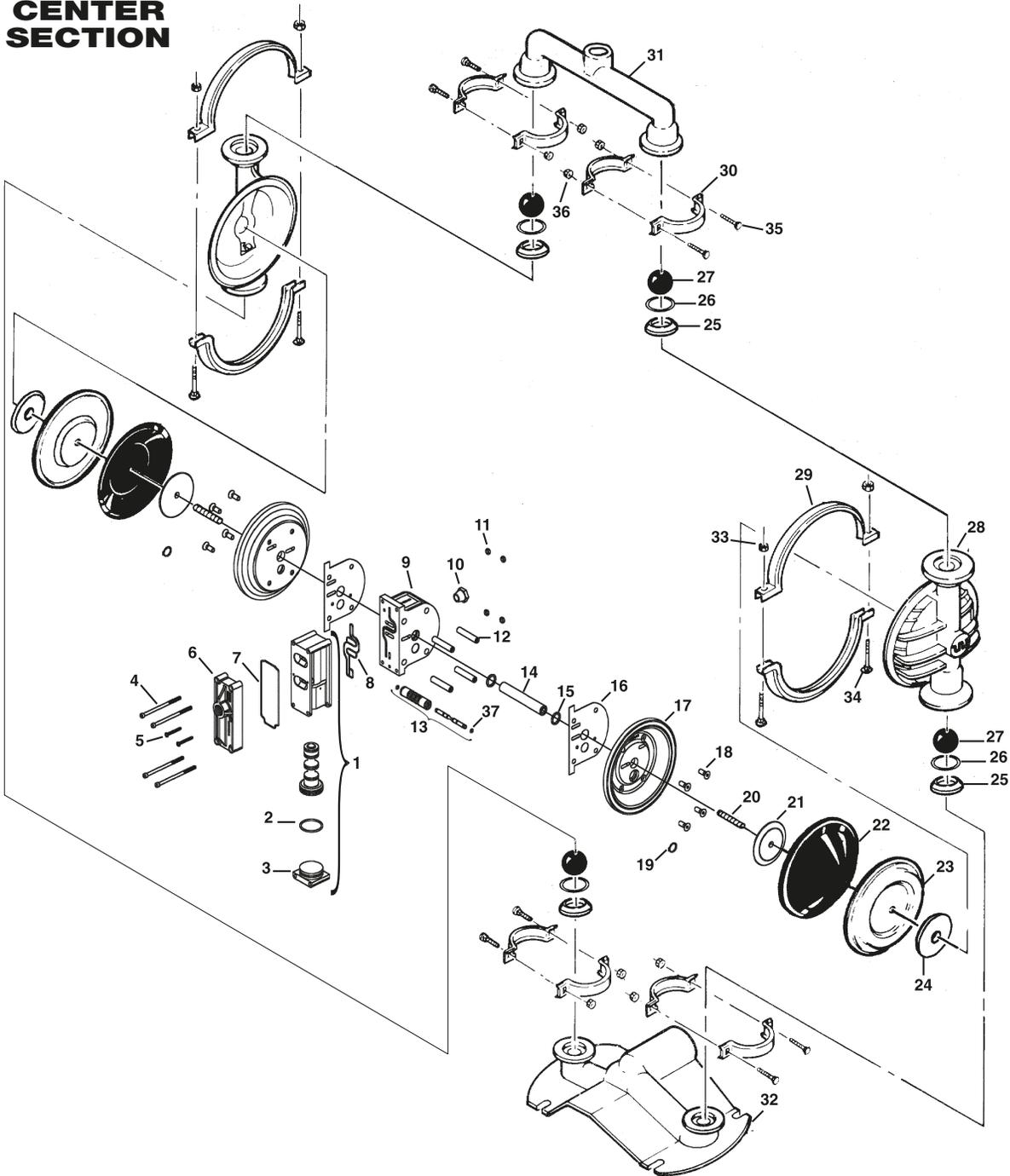
Figure B



SECTION 9A

EXPLODED VIEW/PARTS LISTING

P4 METAL TEFLON®- FITTED, 3-PIECE CENTER SECTION



P4 METAL, TEFLON®-FITTED

Item #	Part Description	Qty. per Pump	P4/SAPP/900 P/N	P4/HAPP/900 P/N	P4/SAPP/903 P/N	P4/SLLL/903 P/N	P4/SLLL/900 P/N
1	Pro-Flo™ Air Valve Assembly	1	04-2000-20-700	04-2000-20-700	04-2000-20-700	04-2000-13-700	04-2000-13-700
2	O-Ring (-225), End Cap (1.859 x .139)	1	04-2390-52-700	04-2390-52-700	04-2390-52-700	04-2390-52-700	04-2390-52-700
3	End Cap, Pro-Flo™	1	04-2330-20-700	04-2330-20-700	04-2330-20-700	04-2330-13-700	04-2330-13-700
4	Screw, HHC, Air Valve (1/4" x 4.5")	4	01-6000-03	01-6000-03	01-6000-03	01-6000-03	01-6000-03
5	Screw, SHCS, 10-16 x 1 3/4"	2	04-6351-03	04-6351-03	04-6351-03	04-6351-03	04-6351-03
6	Muffler Plate, Pro-Flo™	1	04-3180-20-700	04-3180-20-700	04-3180-20-700	04-3180-13-700	04-3180-13-700
7	Gasket, Muffler Plate	1	04-3500-52-700	04-3500-52-700	04-3500-52-700	04-3500-52-700	04-3500-52-700
8	Gasket, Air Valve	1	04-2600-52-700	04-2600-52-700	04-2600-52-700	04-2600-52-700	04-2600-52-700
9	Center Section Assembly	1	04-3110-20	04-3110-20	04-3110-20	04-3110-13	04-3110-13
10	Bushing, Reducer, NPT/BSP Combo	1	04-6950-23-700	04-6950-23-700	04-6950-23-700	04-6950-23-700	04-6950-23-700
11	Nut, Square, 1/4"-20	4	00-6505-07	00-6505-07	00-6505-07	00-6505-07	00-6505-07
12	Sleeve, Threaded, Pro-Flo™ Center Block	4	04-7710-08	04-7710-08	04-7710-08	N/A	N/A
13	Removable Pilot Sleeve Assembly	1	04-3880-99	04-3880-99	04-3880-99	04-3880-99	04-3880-99
14	Shaft, Pro-Flo™	1	04-3820-03-700	04-3820-03-700	04-3820-03-700	04-3820-03-700	04-3820-03-700
15	Glyd™ Ring	2	08-3210-55-225	08-3210-55-225	08-3210-55-225	08-3210-55-225	08-3210-55-225
16	Gasket, Center Block, Pro-Flo™	2	04-3526-52	04-3526-52	04-3526-52	N/A	N/A
17	Air Chamber, Pro-Flo™	2	04-3651-01	04-3651-01	04-3651-01	N/A	N/A
18	Screw, HSFHS, 3/8"-16 x 1"	8	71-6250-08	71-6250-08	71-6250-08	N/A	N/A
19	Retaining Ring	2	04-3890-03	04-3890-03	04-3890-03	04-3890-03	04-3890-03
20	Stud, Shaft	2	08-6150-08	08-6150-08	08-6150-08	08-6150-08	08-6150-08
21	Inner Piston	2	04-3750-01-700	04-3750-01-700	04-3750-01-700	04-3750-01-700	04-3750-01-700
22	Back-up Diaphragm	2	04-1060-51	04-1060-51	04-1060-51	04-1060-51	04-1060-51
23	Diaphragm	2	04-1010-55	04-1010-55	04-1010-55	04-1010-55	04-1010-55
24	Outer Piston	2	04-4600-03	04-4600-04	04-4600-03	04-4600-03	04-4600-03
25	Valve Seat	4	04-1121-03	04-1121-04	04-1121-03	04-1121-03	04-1121-03
26	Valve Seat, O-Ring (2.609" x .139")	4	04-1200-55	04-1200-55	04-1200-55	04-1200-55	04-1200-55
27	Valve Ball	4	04-1080-55	04-1080-55	04-1080-55	04-1080-55	04-1080-55
28	Liquid Chamber	2	04-5000-03	04-5000-04	04-5000-03	04-5000-03	04-5000-03
29	Large Clamp Band Assy.	2	04-7330-03	04-7330-03	04-7330-03-70	04-7330-03-70	04-7330-03
30	Small Clamp Band Assy.	4	04-7100-03	04-7100-03	04-7100-03-70	04-7100-03-70	04-7100-03
31	Manifold, Discharge	1	04-5020-03	04-5020-04	04-5020-03-70	04-5020-03-70	04-5020-03
32	Manifold, Footed Inlet	1	04-5080-03	04-5080-04	04-5080-03-70	04-5080-03-70	04-5080-03
33	Carriage Bolt, Large Clamp Band (5/16"-18 RHSN)	4	04-6070-03	04-6070-03	04-6070-03	04-6070-03	04-6070-03
34	Hex Nut, Large Clamp Band (5/16"-18)	4	08-6400-03	08-6400-03	08-6660-03-72	08-6660-03-72	08-6400-03
35	Carriage Bolt, Small Clamp Band (1/4"-20 RHSN)	8	01-6070-03	01-6070-03	01-6070-03	01-6070-03	01-6070-03
36	Hex Nut, Small Clamp Band (1/4"-20)	8	04-6400-03	04-6400-03	04-6650-03-70	04-6650-03-70	04-6400-03
37	Pilot Spool Retaining O-Ring	2	04-2650-49-700	04-2650-49-700	04-2650-49-700	04-2650-49-700	04-2650-49-700
	Muffler (Not Shown)	1	04-3510-99	04-3510-99	04-3510-99	04-3510-99	04-3510-99
	Washer, Flat 1/4" (Not Shown)	8	N/A	N/A	04-6700-07-70	04-6700-07-70	N/A
	Washer, Flat 5/16" (Not Shown)	4	N/A	N/A	08-6700-07-70	08-6700-07-70	N/A

*Air Valve Assembly includes item numbers 2 and 3.

BSP-fitted pumps are available. Contact your distributor for part numbers.

BSP to NPT Air Line Reducer Bushing (P/N 04-6950-23-702) is available upon request.

Fluoro-Seal™ o-rings available upon request.

NOTE: Muffler (P/N 04-3510-99) (not shown) is standard on all pumps. (Comes equipped with P/N 08-3250-08 3/4" 45 degree street elbow for metal center section only.)

Back-up Diaphragm for Teflon®-fitted pump: P/N 04-1060-56. Neoprene Back-up Diaphragm, P/N 04-1060-51, is available upon request for Teflon®-fitted pumps. Please consult your local distributor.

All boldface items are primary wear parts.

SECTION 9B

MATERIAL CODE DESIGNATIONS

Material Code	Material Description	Material Code	Material Description
01	Aluminum	51	Neoprene
02	Cast Iron	52	Buna-N / Nitrile
03	Stainless Steel	53	Viton® / FKM
04	Hastelloy®	54	Nordel® / EPDM
05	Teflon® coated	55	Teflon® / PTFE
06	Electroless, nickel plated	56	Saniflex™ / Hytrel
07	Brass	57	FDA Wil-Flex™
08	Alloy Steel	58	Wil-Flex™
09	Mild steel, chrome plated	59	Teflon® encapsulated silicone
10	Stainless steel, polished	60	Teflon® encapsulated Viton®
11	Aluminum, anodized	61	Buna-N high temp.
12	Cardboard	62	Polyurethane - ether
13	Acetal	63	50/50 Wil-Flex™
14	Plexiglass®	64	PTFE/Neoprene laminate
16	Acetal, carbon filled	65	Isoplast®
17	Polyvinyl Chloride (PVC)	66	Delrin® AF
20	Polypropylene	67	R.T.P.
21	Kynar®/PVDF	68	FDA Viton®
22	Teflon®/PFA	69	FDA Buna-N
23	Nylon	70	Isoplast®, SS filled
24	Phenolic	71	Verton®
26	Polyethylene	72	PTFE/EPDM laminate
28	Nylon, graphite filled	73	HALAR® coated aluminum
29	Nylon, clear	74	FDA EPDM
30	Cellulose fiber	75	Polyetheretherketone (PEEK), carbon filled
31	Armstrong N8090	76	Polyetherimide (PEI)
32	UHMW Polyethylene	77	Polyphenylene sulfide (PPS), glass filled
33	Chemraz®	78	Vinyl ester, glass filled
34	Fluoro-Seal™	79	G-10 fiberglass
37	Turcite®	81	EPDM/PTFE laminate
48	Expanded PTFE	82	Viton/PTFE laminate
49	Polyurethane	99	Multiple materials/Assemblies
50	Polyurethane - ester		

WARRANTY

Each and every product manufactured by Wilden Pump and Engineering, LLC is built to meet the highest standards of quality. Every pump is functionally tested to insure integrity of operation.

Wilden Pump and Engineering, LLC 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. Failure due to normal wear, misapplication, or abuse is, of course, excluded from this warranty.

Since the use of Wilden pumps and parts is beyond our control, we cannot guarantee the suitability of any pump or part for a particular application and Wilden Pump and Engineering, LLC shall not be liable for any consequential damage or expense arising from the use or misuse of its products on any application. Responsibility is limited solely to replacement or repair of defective Wilden pumps and parts.

All decisions as to the cause of failure are the sole determination of Wilden Pump and Engineering, LLC.

Prior approval must be obtained from Wilden for return of any items for warranty consideration and must be accompanied by the appropriate MSDS for the product(s) involved. A Return Goods Tag, obtained from an authorized Wilden distributor, must be included with the items which must be shipped freight prepaid.

The foregoing warranty is exclusive and in lieu of all other warranties expressed or implied (whether written or oral) including all implied warranties of merchantability and fitness for any particular purpose. No distributor or other person is authorized to assume any liability or obligation for Wilden Pump and Engineering, LLC other than expressly provided herein.

PLEASE PRINT OR TYPE AND FAX TO WILDEN

PUMP INFORMATION			
Item # _____		Serial # _____	
Company Where Purchased _____			
YOUR INFORMATION			
Company Name _____			
Industry _____			
Name _____		Title _____	
Street Address _____			
City _____	State _____	Postal Code _____	Country _____
Telephone _____	Fax _____	E-mail _____	Web Address _____
Number of pumps in facility? _____		Number of Wilden pumps? _____	
Types of pumps in facility (check all that apply): <input type="checkbox"/> Diaphragm <input type="checkbox"/> Centrifugal <input type="checkbox"/> Gear <input type="checkbox"/> Submersible <input type="checkbox"/> Lobe			
<input type="checkbox"/> Other _____			
Media being pumped? _____			
How did you hear of Wilden Pump? <input type="checkbox"/> Trade Journal <input type="checkbox"/> Trade Show <input type="checkbox"/> Internet/E-mail <input type="checkbox"/> Distributor			
<input type="checkbox"/> Other _____			

ONCE COMPLETE, FAX TO (909) 783-3440

NOTE: WARRANTY VOID IF PAGE IS NOT FAXED TO WILDEN

WILDEN PUMP & ENGINEERING, LLC



ADVANCED SERIES

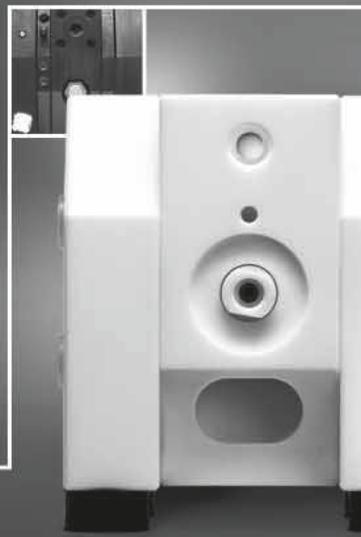
Advance Your Process

- Advanced wetted path designs
- Lower the cost of operation
- Maximize product containment
- Longer MTBF (Mean Time Between Failures)
- Enhanced internal clearance
- The result of advanced thought

UNITEC™ SERIES

Enrich Your Process

- Simplicity of design
- Unique Technology
- Reliable, leak-free & quiet
- Validated & certified
- Intrinsically safe
- The result of unique thought



SANIFLO™ SANITARY PUMP TECHNOLOGY

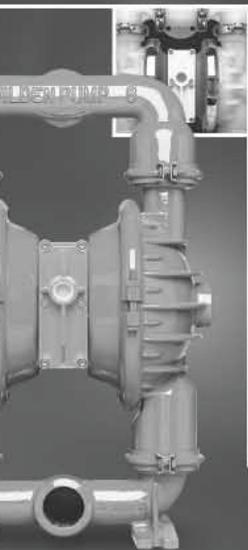
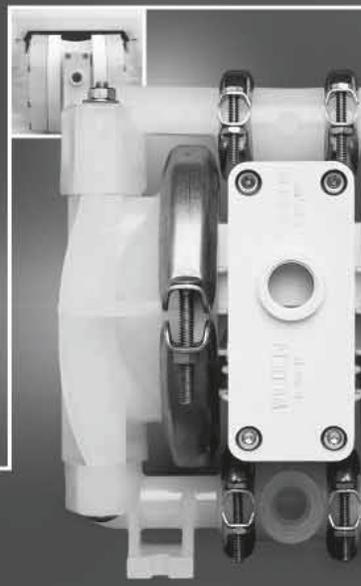
Refine Your Process

- Designed for sanitary applications
- Minimize product degradation
- Improved production yields
- Easy to inspect, clean & assemble
- Minimized water requirements
- The result of progressive thought

ULTRAPURE™ TEFLON PROCESS PUMPS

Optimize Your Process

- Validated & certified
- Clean room assembled
- Low particle count
- Compact, efficient & quiet
- Runs on clean-dry air
- The result of pure thought



ORIGINAL SERIES

Simplify Your Process

- Long standing design simplicity
- Portable & submersible
- Variable connection options
- Fewest parts in industry
- Solutions since 1955
- The result of original thought

ACCESSORIES

Maximize Your Process

- Electronic control & monitoring
- Level control & containment
- Pulsation dampening
- Drum unloading systems
- Complete system solutions
- The result of innovative thought



Your Local Authorized Distributor:

WILDEN®

A DOVER COMPANY

22069 VAN BUREN STREET • GRAND TERRACE, CA 92313-5607
(909) 422-1730 • FAX (909) 783-3440
www.wildenpump.com

Printed in the U.S.A.

Copyright 2005, Wilden Pump & Engineering, LLC