

T1

Original™ Series **METAL** Pumps

EOM

Engineering
Operation &
Maintenance



Simplify your process

TURBO-FLO™
PROGRESSIVE PUMP TECHNOLOGY

WILDEN®

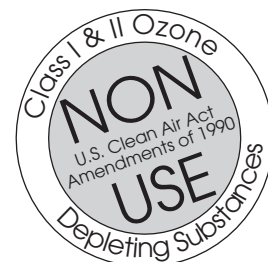
A **DOVER** COMPANY

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WIL-10190-E-03
REPLACES WIL-10190-E-02

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CAUTIONS—READ FIRST!



TEMPERATURE LIMITS:

| | | |
|--------------|--------------------|----------------|
| Nylon | -17.8°C to 93.3°C | 0°F to 200°F |
| Neoprene | -17.8°C to 93.3°C | 0°F to 200°F |
| Buna-N | -12.2°C to 82.2°C | 10°F to 180°F |
| EPDM | -51.1°C to 137.8°C | -60°F to 280°F |
| Viton® | -40°C to 176.7°C | -40°F to 350°F |
| Wil-Flex™ | -40°C to 107.2°C | -40°F to 225°F |
| Polyurethane | 12.2°C to 65.6°C | 10°F to 150°F |
| Saniflex™ | -28.9°C to 104.4°C | -20°F to 220°F |
| PTFE | -28.9°C to 148.9°C | -20°F to 300°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 engineering guide for chemical compatibility and temperature limits.



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



WARNING: Prevention of static sparking — If static sparking occurs, fire or explosion could result. Pump, valves, and containers must be properly grounded 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: 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 pipe line debris is clear. Use an in-line air filter. A 5 μ (micron) air filter is recommended.



NOTE: Tighten clamp bands and retainers prior to installation. Fittings may loosen during transportation.



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



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: Verify the chemical compatibility of the process and cleaning fluid to the pump's component materials in the Chemical Resistance Guide (see E4).



CAUTION: When removing the end cap using compressed air, the air valve end cap may come out with considerable force. Hand protection such as a padded glove or rag should be used to capture the end cap.



NOTE: All non lube-free air-operated pumps must be lubricated. Wilden suggests an arctic 5 weight oil (ISO grade 15). Do not over-lubricate air supply. Over-lubrication will reduce pump performance.

PUMP DESIGNATION SYSTEM

**T1 ORIGINAL™
METAL**

**13 mm (1/2") Pump
Maximum Flow Rate:
54.9 lpm (14.5 gpm)**

LEGEND

T1 / XXXXX / XXX / XX / XXX / XXXX

MODEL

WETTED PARTS & OUTER PISTON

CENTER SECTION

AIR VALVE

DIAPHRAGMS

VALVE BALLS

O-RINGS

VALVE SEAT

SPECIALTY
CODE

(if applicable)

MATERIAL CODES

MODEL

T1 = 13 MM (1/2")

**WETTED PARTS & OUTER
PISTON**

AA = ALUMINUM /
ALUMINUM
AZ = ALUMINUM / NO PISTON

CENTER SECTION

YY = NYLON

AIR VALVE

B = BRASS

DIAPHRAGMS

BNS = BUNA-N (Red Dot)
FSS = SANIFLEX™
[Hytre!® (Cream)]
PUS = POLYURETHANE (Clear)
THU = PTFE W/HIGH-TEMP
BUNA-N BACK-UP
(White)
TNL = PTFE W/NEOPRENE
BACK-UP O-RING,
IPD (White)
TNU = PTFE W/NEOPRENE
BACK-UP (White)
TSU = PTFE W/SANIFLEX™
BACK-UP (White)
VTS = VITON® (White Dot)
WFS = WIL-FLEX™ [Santoprene®
(Orange Dot)]
XBS = CONDUCTIVE BUNA-N
(Two Red Dots)

VALVE BALL

BN = BUNA-N (Red Dot)
FS = SANIFLEX™
[Hytre!® (Cream)]
PU = POLYURETHANE (Brown)
TF = PTFE (White)
VT = VITON® (White Dot)
WF = WIL-FLEX™ [Santoprene®
(Orange Dot)]

VALVE SEAT

A = ALUMINUM
H = ALLOY C
S = STAINLESS STEEL
VT = VITON® (White Dot)

VALVE SEAT O-RING

BN = BUNA-N
FS = SANIFLEX™
[Hytre!® (Cream)]
PU = POLYURETHANE (Brown)
TF = PTFE
WF = WIL-FLEX™ [Santoprene®]

SPECIALTY CODES

0014 BSPT

NOTE: MOST ELASTOMERIC MATERIALS USE COLORED DOTS FOR IDENTIFICATION.

Viton® is a registered trademarks of DuPont Dow Elastomers.

HOW IT WORKS—PUMP DISTRIBUTION SYSTEM

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

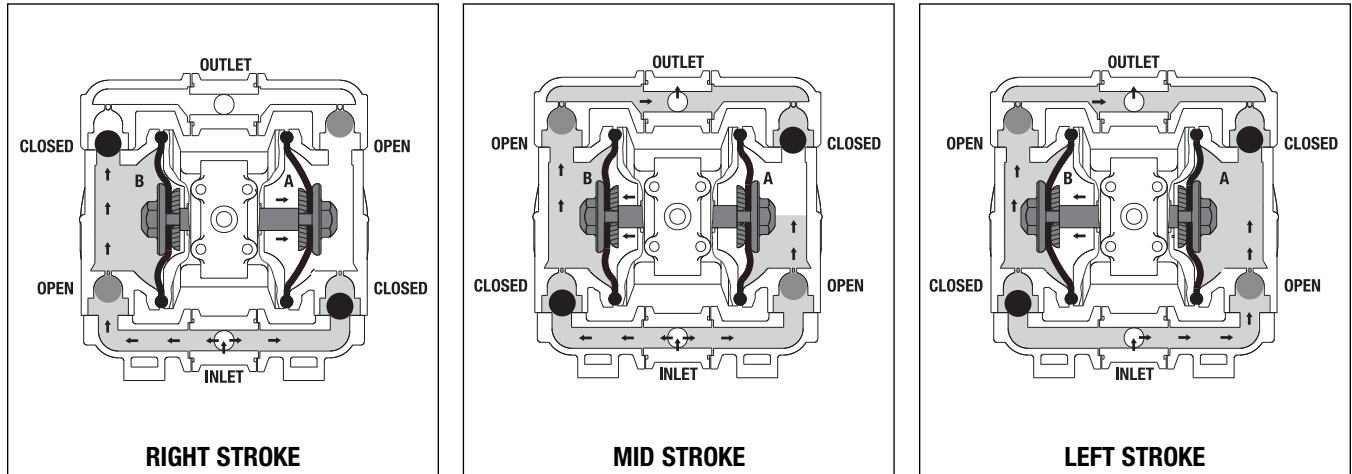
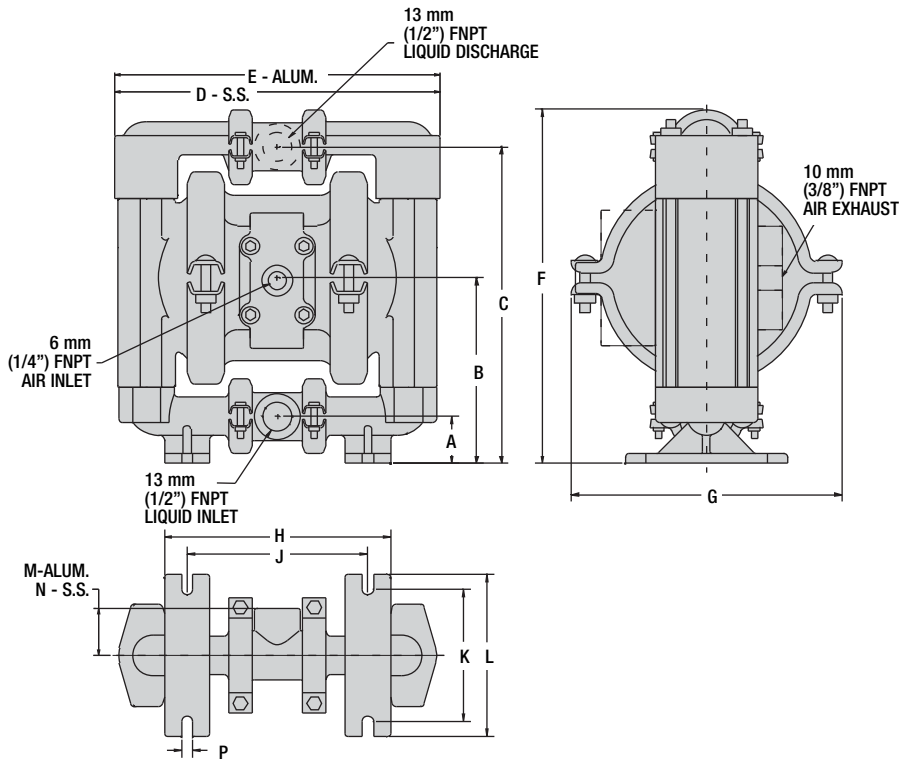


FIGURE 1 The air valve directs pressurized air to the back side of diaphragm A. The compressed air is applied directly to the liquid column separated by elastomeric diaphragms. The diaphragm acts as a separation membrane between the compressed air and liquid, balancing the load and removing mechanical 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.

DIMENSIONAL DRAWING



DIMENSIONS

| ITEM | METRIC (mm) | STANDARD (inch) |
|------|-------------|-----------------|
| A | 28 | 1.1 |
| B | 117 | 4.6 |
| C | 198 | 7.8 |
| D | 203 | 8.0 |
| E | 208 | 8.2 |
| F | 224 | 8.8 |
| G | 175 | 6.9 |
| H | 140 | 5.5 |
| J | 112 | 4.4 |
| K | 84 | 3.3 |
| L | 102 | 4.0 |
| M | 30 | 1.2 |
| N | 30 | 1.2 |
| P | 8 | 0.3 |

BSP threads available for liquid inlet and discharge.

PERFORMANCE

**T1 METAL
RUBBER-FITTED**

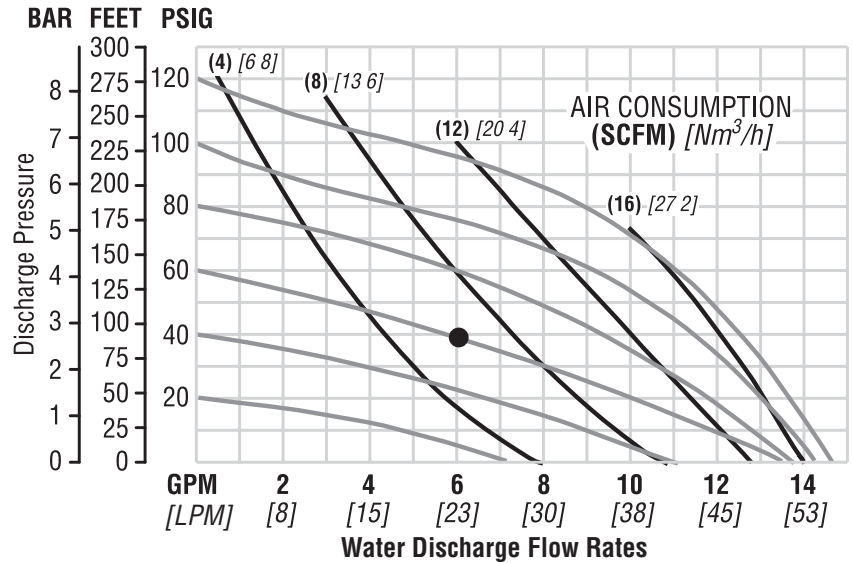
Height224 mm (8.8")
 Width208 mm (8.2")
 Depth178 mm (7.0")
 Est. Ship Weight Aluminum 6 kg (13 lbs)
 Stainless Steel 9 kg (20 lbs)
 Air Inlet 6 mm (1/4")
 Inlet 13 mm (1/2")
 Outlet 13 mm (1/2")
 Suction Lift 1.22 m Dry (4')
 9.14 m Wet (30')

Displacement per
 Stroke0.06 l (0.017 gal.)¹
 Max. Flow Rate 54.9 lpm (14.5 gpm)
 Max. Size Solids 1.6 mm (1/16")

¹Displacement per stroke was calculated at 4.8 bar (70 psig) air inlet pressure against a 2 bar (30 psig) head pressure.

Example: To pump 22.7 lpm (6.0 gpm) against a discharge pressure head of 2.7 bar (40 psig) requires 4 bar (60 psig) and 10.2 Nm³/h (6 scfm) air consumption. (See dot on chart.)

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.

**T1 METAL
TPE -FITTED**

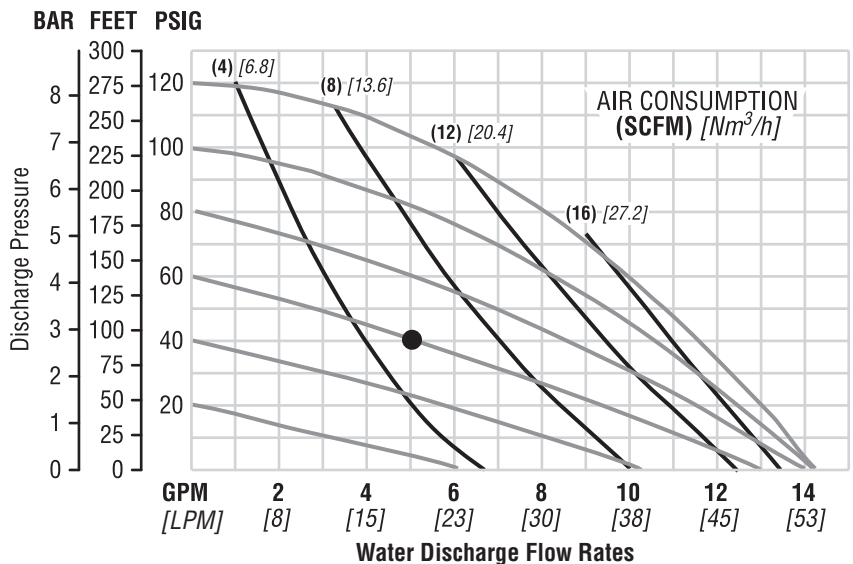
Height224 mm (8.8")
 Width208 mm (8.2")
 Depth178 mm (7.0")
 Est. Ship Weight Aluminum 6 kg (13 lbs)
 Stainless Steel 9 kg (20 lbs)
 Air Inlet 6 mm (1/4")
 Inlet 13 mm (1/2")
 Outlet 13 mm (1/2")
 Suction Lift 1.52 m Dry (5')
 9.45 m Wet (31')

Displacement per
 Stroke0.06 l (0.017 gal.)¹
 Max. Flow Rate 54.1 lpm (14.3 gpm)
 Max. Size Solids 1.6 mm (1/16")

¹Displacement per stroke was calculated at 4.8 bar (70 psig) air inlet pressure against a 2 bar (30 psig) head pressure.

Example: To pump 18.9 lpm (5.0 gpm) against a discharge pressure head of 2.7 bar (40 psig) requires 4 bar (60 psig) and 8.5 Nm³/h (5 scfm) air consumption. (See dot on chart.)

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.

PERFORMANCE

T1 METAL PTFE-FITTED

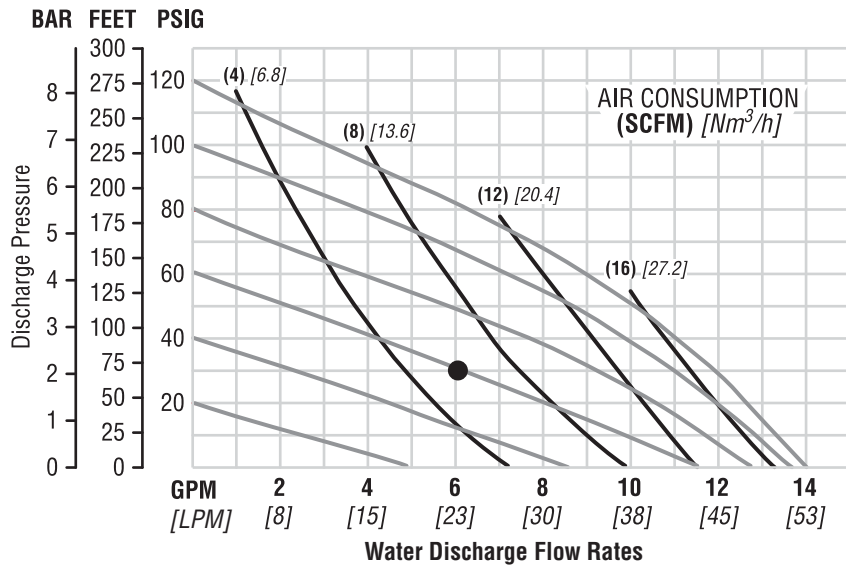
Height224 mm (8.8")
 Width208 mm (8.2")
 Depth178 mm (7.0")
 Est. Ship Weight Aluminum 6 kg (13 lbs)
 Stainless Steel 9 kg (20 lbs)
 Air Inlet 6 mm (1/4")
 Inlet 13 mm (1/2")
 Outlet 13 mm (1/2")
 Suction Lift2.74 m Dry (1')
 9.14 m Wet (30')

Displacement per
 Stroke0.05 l (0.014 gal.)¹
 Max. Flow Rate 53.0 lpm (14.0 gpm)
 Max. Size Solids 1.6 mm (1/16")

¹Displacement per stroke was calculated at 4.8 bar (70 psig) air inlet pressure against a 2 bar (30 psig) head pressure.

Example: To pump 22.7 lpm (6 gpm) against a discharge pressure head of 2 bar (30 psig) requires 4 bar (60 psig) and 10.2 Nm³/h (6 scfm) air consumption. (See dot on chart.)

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



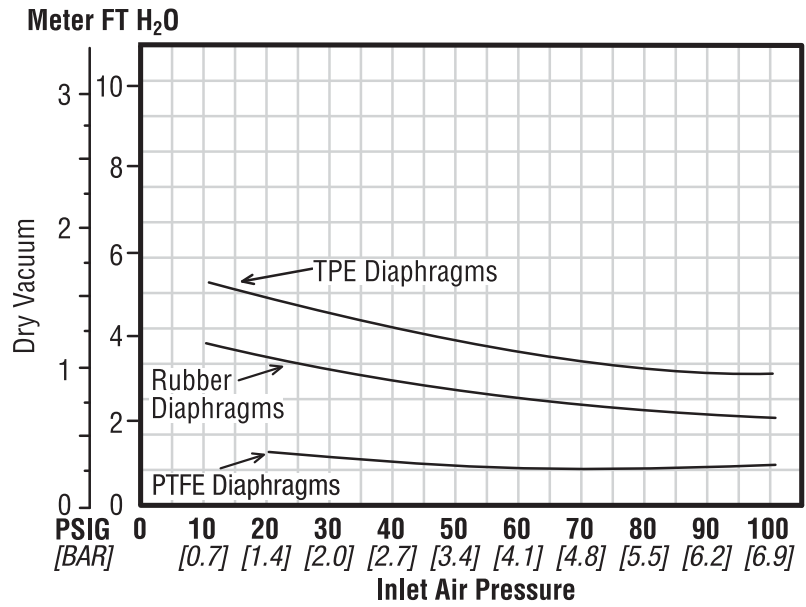
Flow rates indicated on chart were determined by pumping water.

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

SUCTION LIFT CURVE

T1 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 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.



These vacuum numbers will double when a small amount of back pressure is placed on the discharge.

SUGGESTED INSTALLATION

The Model T1 Metal pump has a 13 mm (1/2") inlet and 13 mm (1/2") outlet and is designed for flows to 54.9 lpm (14.5 gpm). The T1 Metal pump is manufactured with wetted parts of aluminum or stainless steel. The center section of the T1 Metal pump is of nylon construction. The air distribution system consists of a brass air valve body, aluminum air valve piston, Buna-N o-rings and a bronze center section bushing. 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 13 mm (1/2") diameter or larger if highly viscous material is being pumped. The suction hose must be non-collapsible, reinforced type as the T1 is capable of pulling a high vacuum. Discharge piping should be at least 13 mm (1/2"); 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 that "utility" equipment be situated away from the production floor. Multiple installations with conflicting requirements can result in congestion of utility areas, leaving few choices for siting of additional pumps.

Within the framework of these and other existing conditions, every pump should be located in such a way that four key factors are balanced against each other to maximum advantage.

1. **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.

2. **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 pump performance chart). Use air pressure up to a maximum of 8.6 bar (125 psig) depending upon pumping requirements. The use of an air filter before the pump will ensure that the majority of any pipeline contaminants will be eliminated. For best results, the pumps should use an air filter, regulator, and lubricator system.

3. **ELEVATION:** Selecting a site that is well within the pump's suction 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 elevation (see pump performance chart).

4. **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 the 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, it should line up without placing stress on the pump fittings.

Expansion joints 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 foundation, a mounting pad placed between the pump and 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.

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.

The T1 can be used in submersible applications only when both wetted and non-wetted portions are compatible with the material being pumped. If the pump is to be used in a submersible application, a hose should be attached to the pump's air exhaust and the exhaust air piped above the liquid level.

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 pump's ability. Note: Materials of construction and elastomer material have an effect on suction lift parameters. Please refer to pump performance data.

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 0.8 bar (11 psig) and higher.

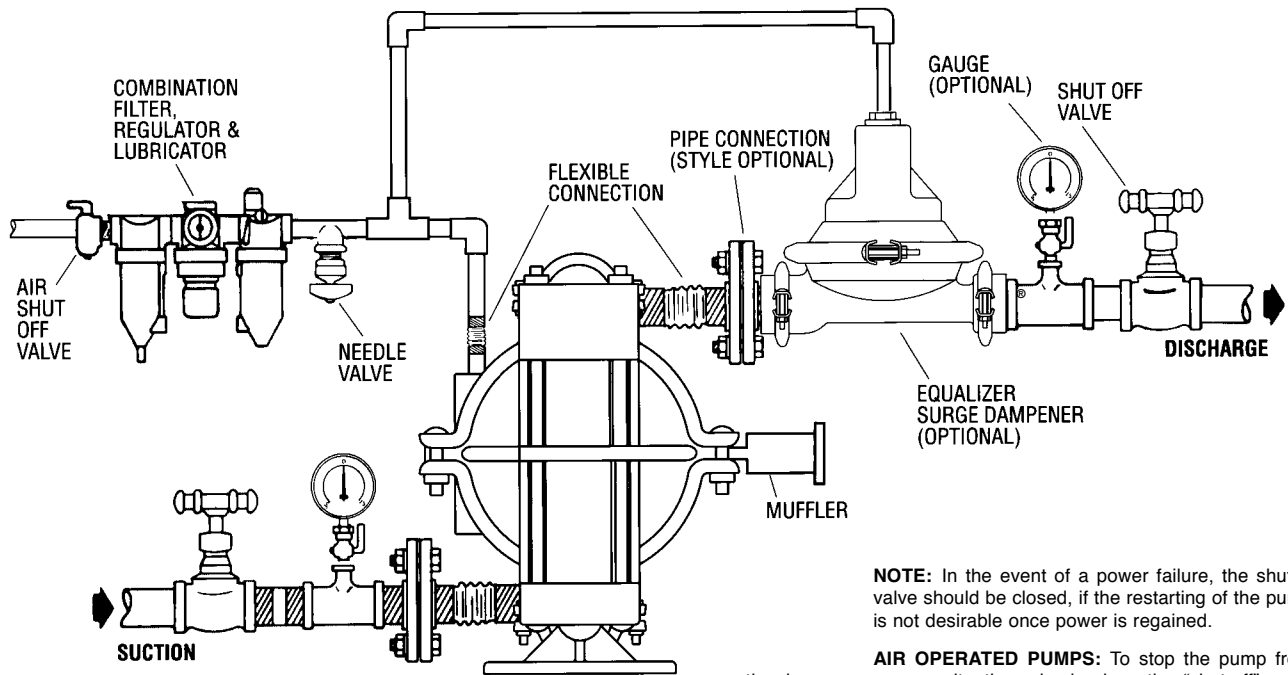
THE MODEL T1 WILL PASS 1.6 mm (1/16") SOLIDS. WHENEVER THE POSSIBILITY EXISTS THAT LARGER SOLID OBJECTS MAY BE SUCKED INTO THE PUMP, A STRAINER SHOULD BE USED ON THE SUCTION LINE.

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

BLOW OUT AIR LINE FOR 10 TO 20 SECONDS BEFORE ATTACHING TO PUMP TO MAKE SURE ALL PIPE LINE DEBRIS IS CLEAR. ALWAYS USE AN IN-LINE AIR FILTER.

PUMPS SHOULD BE THOROUGHLY FLUSHED WITH WATER BEFORE INSTALLING INTO PROCESS LINES. FDA AND USDA PUMPS SHOULD BE CLEANED AND/OR SANITIZED BEFORE USE ON EDIBLE PRODUCTS.

SUGGESTED INSTALLATION



NOTE: In the event of a power failure, the shutoff 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.

SUGGESTED OPERATION & MAINTENANCE

OPERATION: 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 regulate air pressure. A needle valve is used to regulate air 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. 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 T1 pump runs solely on compressed air and does not generate heat, therefore your process fluid temperature will not be affected.

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.

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.

TROUBLESHOOTING

Pump will not run or runs slowly.

1. Check air inlet screen and air filter for debris.
2. Check for sticking air valve, flush air valve in solvent.
3. Check for worn out air valve. If piston face in air valve is shiny instead of dull, air valve is probably worn beyond working tolerances and must be replaced.
4. Check center block o-rings. If worn excessively, they will not seal and air will simply flow through pump and out air exhaust. Use only Wilden o-rings as they are of special construction and ISO 15-5 wt oil with arctic characteristics.
5. Check for rotating piston in air valve.
6. Check for over-torquing of air valve (lube-free only). Over-torquing may cause air valve piston to stick.

Pump runs but little or no product flows.

1. Check for pump cavitation; slow pump speed down to match thickness of material being pumped.
2. Check for sticking ball check valves. If material being pumped is not compatible with pump elastomers, swelling may occur. Replace ball check valves and o-ring with the proper elastomers.

3. Check to make sure all suction connections are air tight, especially clamp bands around intake balls.

Pump air valve freezes.

1. Check for excessive moisture in compressed air. Either install dryer or hot air generator for compressed air.

Air bubbles in pump discharge.

1. Check for ruptured diaphragm.
2. Check tightness of clamp bands, and the integrity of the o-rings, especially at intake manifold.

Product comes out air exhaust.

1. Check for diaphragm rupture.
2. Check tightness of piston plates to shaft.

Pump rattles.

1. See E9 Troubleshooting Guide.
2. Create false discharge head or suction lift.

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 model T1 has a 13 mm (1/2") inlet and outlet and is designed for flows up to 54.9 lpm (14.5 gpm). The single-piece center section, consisting of center block and air chambers, is molded of nylon. All fasteners and hardware are stainless steel and the air valve is manufactured of brass or high-tech engineered thermoplastic. All o-rings used in the pump are of a special material and shore hardness which should only be replaced with factory-supplied parts.

TOOLS REQUIRED:

5/16" Wrench

3/8" Box Wrench

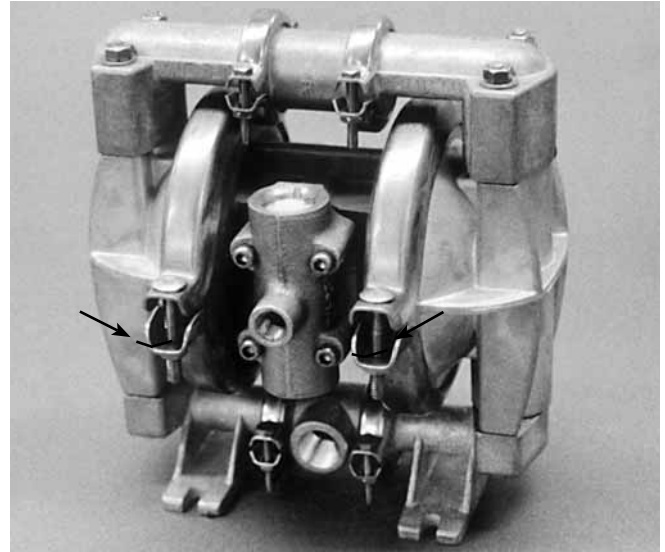
7/16" Wrench

3/16" Allen Wrench

Adjustable Wrench

Vise equipped with soft jaws (such as plywood, plastic or other suitable material)

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

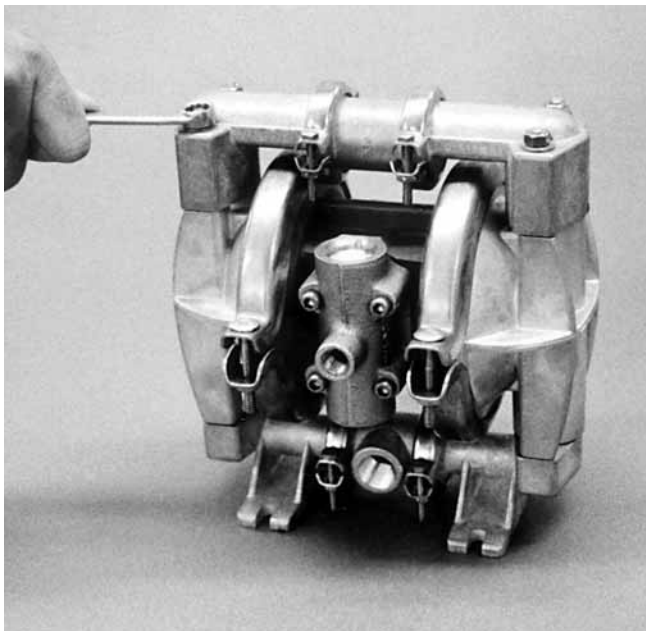


DISASSEMBLY:

Figure 1

Step 1.

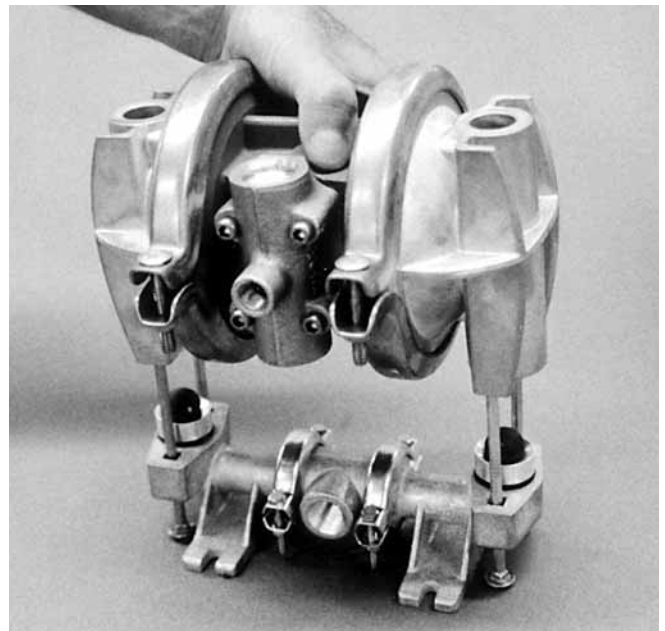
Before starting disassembly, mark a line from each liquid chamber to its corresponding air chamber. This line will assist in proper alignment during reassembly.



Step 2.

Figure 2

Utilizing the 3/8" box wrench, start by removing the four long carriage bolts that hold the top and bottom manifolds to the center section.

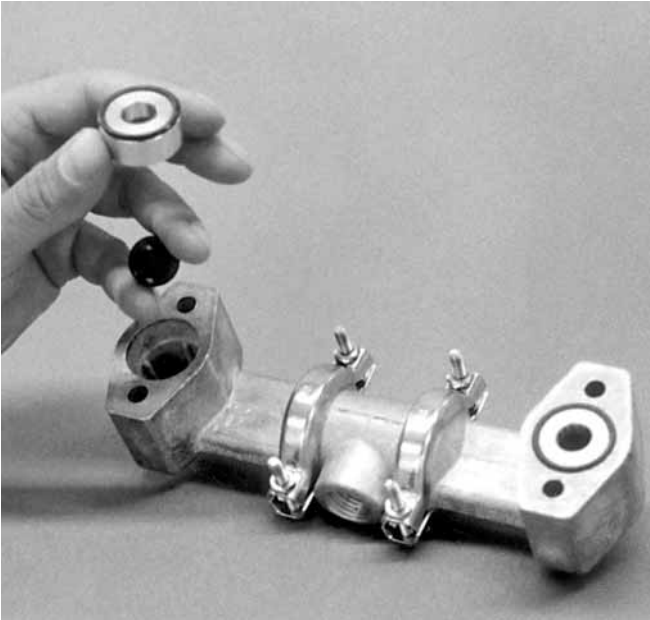


Step 3.

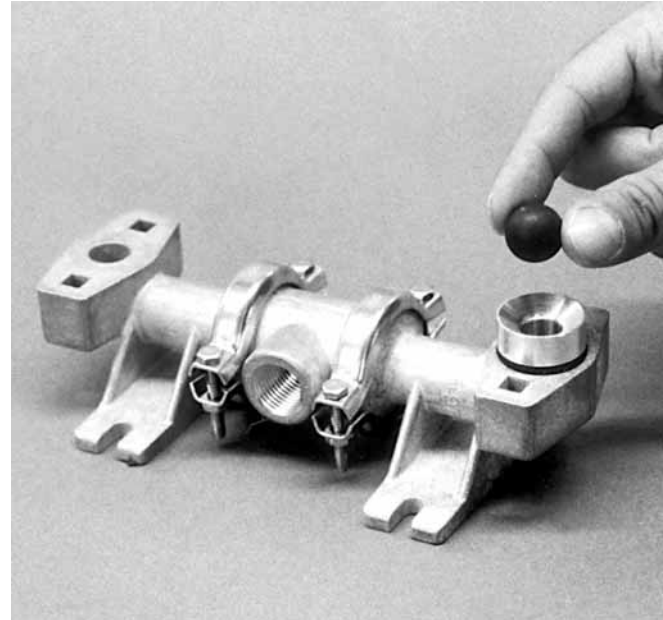
Figure 3

Remove the top manifold and lift the center section off the inlet manifold.

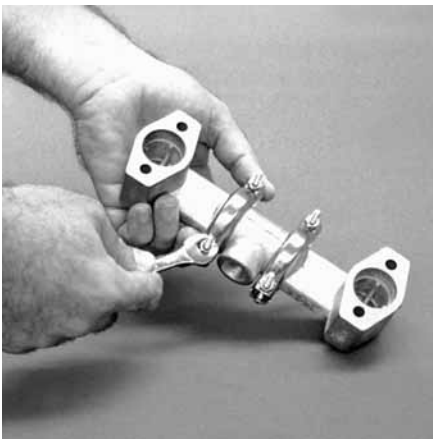
PUMP DISASSEMBLY



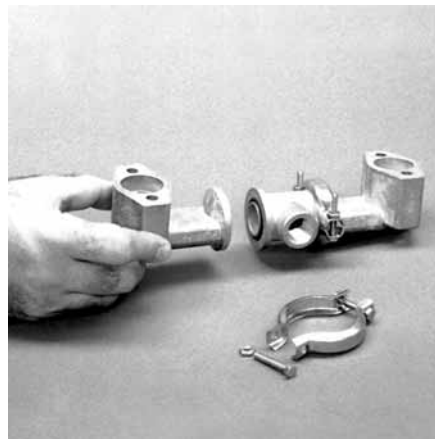
Step 4. *Figure 4*
Remove the discharge valve balls, seats and o-rings from the discharge manifold and inspect for nicks, gouges, chemical attack or abrasive wear. Replace worn parts with genuine Wilden parts for reliable performance. PTFE o-rings should be replaced when reassembled.



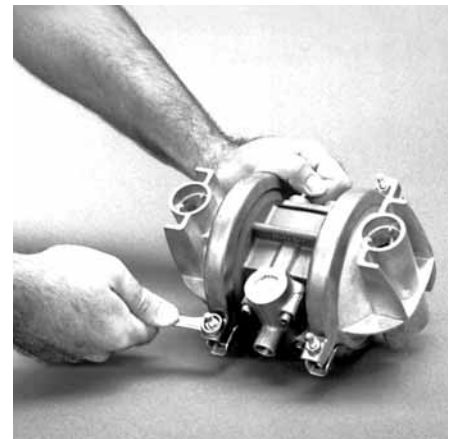
Step 5. *Figure 5*
Inspect the ball retainer, retainer o-ring, and valve ball from intake manifold. Check for nicks, gouges, chemical attack or abrasive wear. Replace worn parts with genuine Wilden parts for reliable performance. PTFE o-rings should be replaced when reassembled.



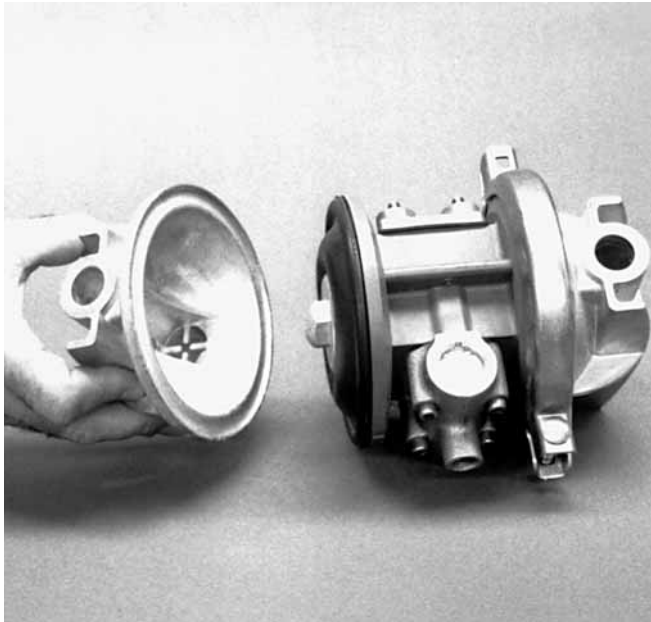
Step 6. *Figure 6*
Normally the inlet and discharge manifold should not be disassembled during regular pump maintenance. Should this be necessary completely remove and disassemble manifold clamp bands.



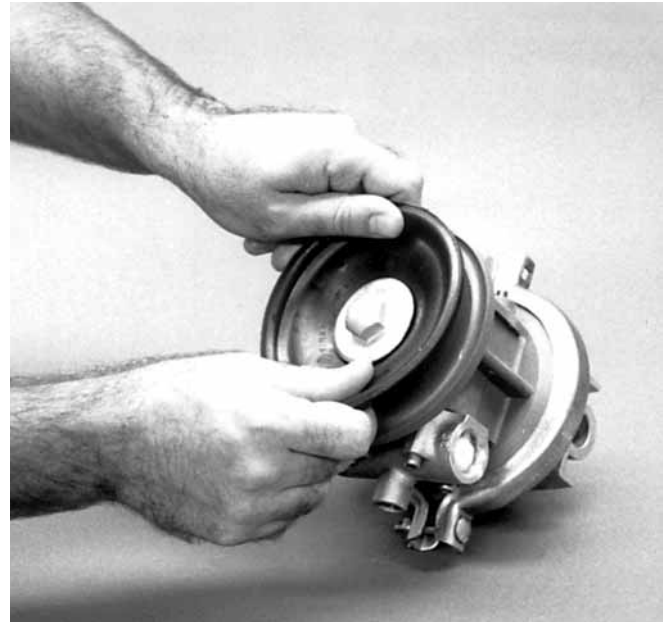
Step 7. *Figure 7*
Inspect o-rings for wear or damage and replace if necessary. PTFE o-rings should be replaced when reassembled.



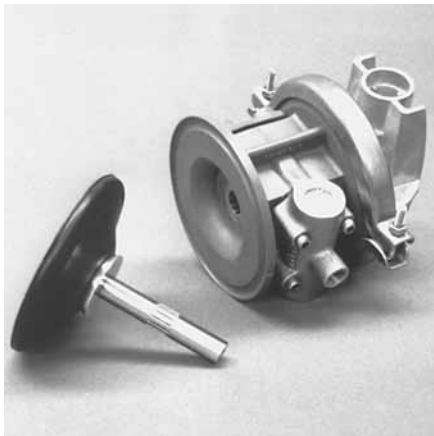
Step 8. *Figure 8*
Use a 7/16" wrench to remove one set of clamp bands that secure one liquid chamber to the one-piece center section



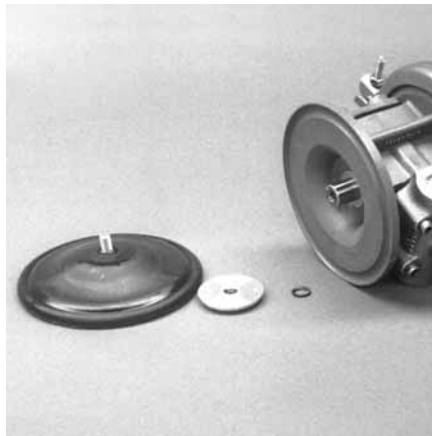
Step 9. *Figure 9*
Lift the liquid chamber away from the center section to expose the diaphragm and outer piston.



Step 10. *Figure 10*
Using an adjustable wrench, or by rotating the diaphragm by hand, remove the diaphragm assembly from the center section.



Step 11A. *Figure 11A*
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.



Step 11B. *Figure 11B*
2) The outer piston, diaphragm, inner piston, and disc spring separate from the shaft which remains connected to the opposite side diaphragm assembly. PTFE-fitted pumps come standard with back-up diaphragms (not shown).



Step 12. *Figure 12*
To remove the diaphragm assembly from the shaft, secure shaft with soft jaws (a vise fitted with plywood or other suitable material) to ensure shaft is not nicked, scratched, or gouged. Using an adjustable wrench, remove diaphragm assembly from shaft. Inspect all parts for wear and replace with genuine Wilden parts if necessary.

AIR VALVE / CENTER SECTION REPAIR/MAINT.

The center section assembly consists of both the air valve body and piston and the center section. The unique design of the air valve relies only on differential pressure to cause the air valve to shift. It is reliable and simple to maintain. The bushing in the center block, along with the diaphragm shaft, provides the signal to tell the air valve to shift. The following procedure will ensure that the air valve on your Wilden pump will provide long trouble-free service.

AIR VALVE BODY AND PISTON ASSEMBLY AND DISASSEMBLY

The air valve body and piston (P/N 01-2000-07) can be disconnected from the pump by removing the four socket-head cap screws which attach it to the center section. The piston in the air valve is aluminum with a dark gray anodized coating. The piston should move freely and the ports in the piston should line up with the ports on the face of the air valve body. The piston should also appear to be a dull, dark gray color. If the piston appears to be a shiny aluminum color, the air valve is probably worn beyond working tolerances and should be replaced.

If the piston does not move freely in the air valve, the entire air valve should be immersed in a cleaning solution. (NOTE: Do not force the piston by inserting a metal object.) This soaking should remove any accumulation of sludge and grit which is preventing the air valve piston from moving freely. If the air

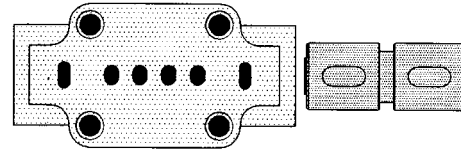


Figure A

valve piston does not move freely after the above cleaning, the air valve should be disassembled as follows: Remove the snap ring from the top end of the air valve cylinder and apply an air jet to the 3.175mm (1/8") hole on the opposite end of the air valve face. [CAUTION: The air valve end cap (P/N 01-2330-23 may come out with considerable force. Hand protection such as a padded glove or a rag should be used to capture the end cap.] Inspect the piston and cylinder bore for nicks and scoring.

Inspect the air valve side of the center section for flatness and to insure no nicks or other damage exists that would prevent the air valve from sealing when installed. Inspect the two channels and their ports to make sure they are clean and the ports are open to the bushing. The air valve will not shift if these ports are plugged or an o-ring is in the wrong groove of the center section closing off a port. Inspect the anti-centering pin holes found at the ends of the air valve piston and ensure they are free of debris. Inspect the air valve gasket and muffler plate gasket and replace if damaged. **Attach the air valve to the center section and tighten to the required torque specifications*.**

O-RING REPLACEMENT/CENTER SECTION

The pump's center section consists of a molded housing with a bronze bushing. (Bushing is not removable.) This bushing has grooves cut into the inside diameter. o-rings are installed in these grooves. When the o-rings become worn or flat, they will no longer seal and must be replaced. This is most easily accomplished by using a tool called an o-ring pick, available through most industrial supply companies.

There are two versions of center sections: PRE-ENHANCED (pumps manufactured before March 1, 1992) and ENHANCED (pumps manufactured since March 1, 1992). An encircled letter "E" stamped on the top of the center section denotes the ENHANCED type center section (Figure C).

If the encircled "E" is not present, a pre-enhanced shaft (01-3800-09) must be utilized. An enhanced (non-dented) shaft will not function correctly in the pre-enhanced center section. The center section o-rings (01-3200-52) must be installed in the appropriate grooves as shown (1, 3, 4, 6).

If the encircled "E" is present, an enhanced (01-3800-03-07) shaft should be utilized to maximize performance. The center section o-rings (01-3200-52) must be installed in the appropriate grooves as shown (1, 3, 6, 8).

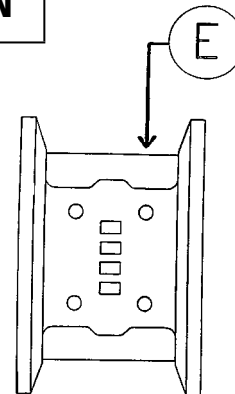
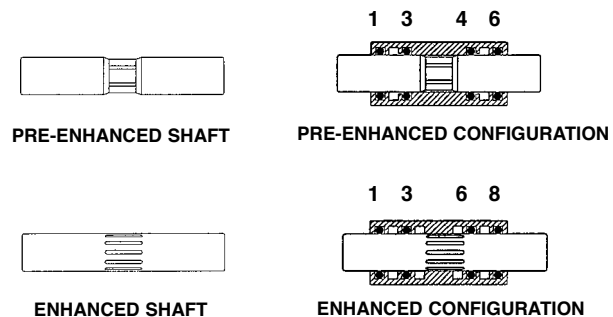


Figure C



*Refer to Section 8D for the required torque specifications.

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.

- Clean the inside of the center section shaft bushing to ensure no damage is done to new seals.
- Stainless bolts should be lubed to reduce the possibility of seizing during tightening.
- Level the water chamber side of the intake/discharge manifold to ensure a proper sealing surface. This is most easily accomplished by placing them on a flat surface prior to tightening their clamp bands to the desired torque (see this page for torque specs).
- Be sure to tighten outer pistons simultaneously on PTFE-fitted pumps to ensure proper torque values.
- Ensure proper mating of liquid chambers to manifolds prior to tightening vertical bolts. Overhang should be equal on both sides.
- Apply a small amount of Loctite 242 to the steel bore of the shaft from the diaphragm assembly.

MAXIMUM TORQUE SPECIFICATIONS

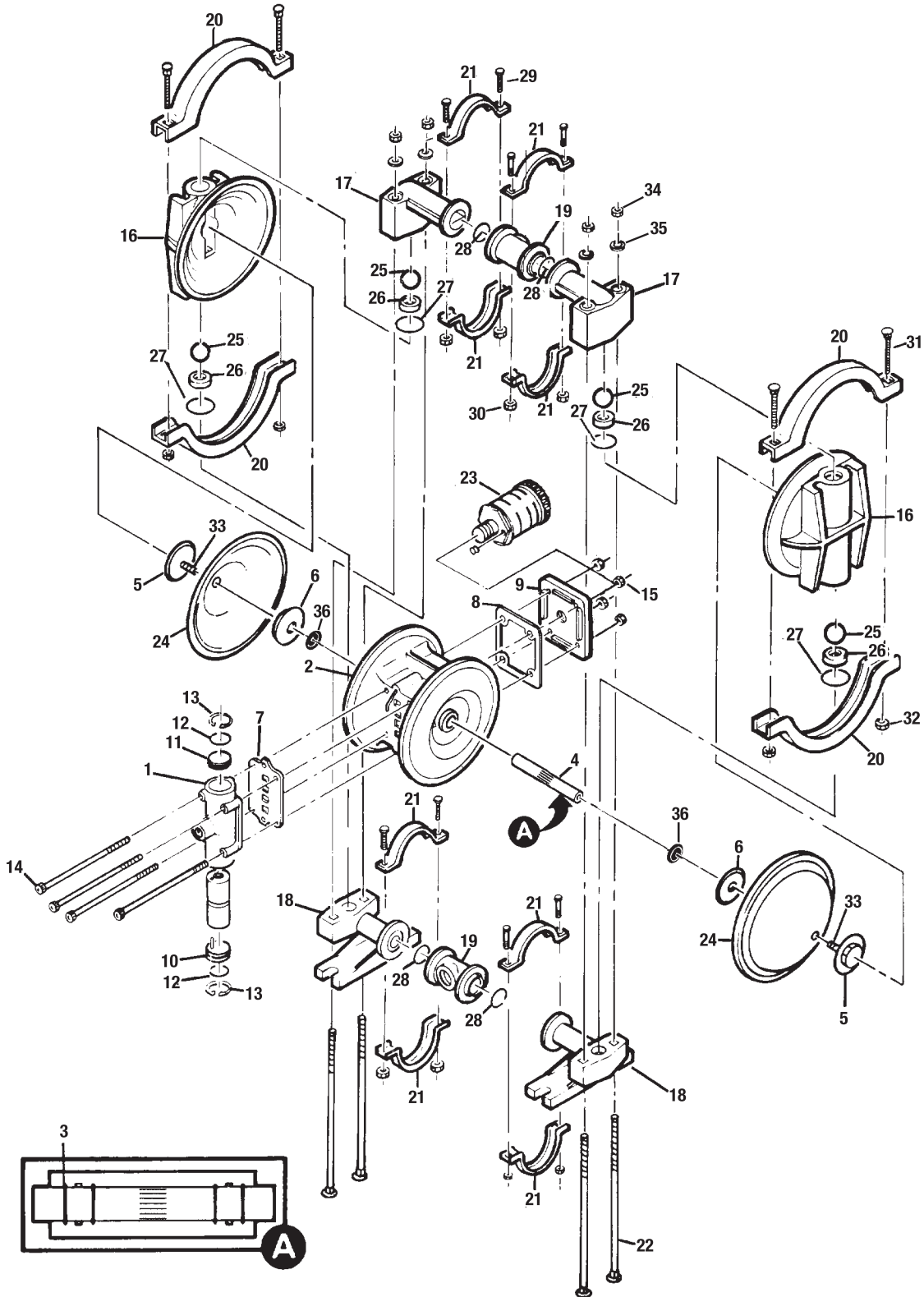
| Description of Part | Metal Pumps |
|-----------------------------------|-----------------------|
| Air Valve | 2.3 N•m (20 in-lbs) |
| Outer Piston | 14.1 N•m (125 in-lbs) |
| Small Clamp Band | 1.7 N•m (15 in-lbs) |
| Large Clamp Band (Rubber-Fitted) | 7.4 N•m (65 in-lbs) |
| Large Clamp Band (Teflon®-Fitted) | 9.6 N•m (85 in-lbs) |
| Vertical Bolts | 14.1 N•m (125 in-lbs) |

EXPLODED VIEW & PARTS LISTING

T1 METAL

Rubber/TPE-Fitted

EXPLODED VIEW



EXPLODED VIEW & PARTS LISTING

T1 METAL

Rubber/TPE-Fitted

PARTS LISTING

| Item | Part Description | Qty. Per Pump | Rubber-Fitted | |
|-----------|--|---------------|-------------------|-------------------|
| | | | T1/AAYB P/N | T1/SSYYB P/N |
| 1 | Air Valve Assembly¹ | 1 | 01-2000-07 | 01-2000-07 |
| 2 | Center Section | 1 | 01-3153-23 | 01-3153-23 |
| 3 | Center Block Glyd™ Ring | 4 | 01-3220-55 | 01-3220-55 |
| 4 | Shaft | 1 | 01-3800-03-07 | 01-3800-03-07 |
| 5 | Pistons/Outer | 2 | 01-4570-01 | 01-4570-03 |
| 6 | Pistons/Inner | 2 | 01-3710-01 | 01-3710-01 |
| 7 | Air Valve Gasket | 1 | 01-2600-52 | 01-2600-52 |
| 8 | Muffler Plate Gasket | 1 | 01-3500-52 | 01-3500-52 |
| 9 | Muffler Plate | 1 | 01-3180-23 | 01-3180-23 |
| 10 | End Cap w/Guide | 1 | 01-2300-23 | 01-2300-23 |
| 11 | End Cap w/o Guide | 1 | 01-2330-23 | 01-2330-23 |
| 12 | Buna-N O-Ring - 115 70 Shore | 2 | 01-2390-52 | 01-2390-52 |
| 13 | End Cap Snap Ring | 2 | 01-2650-03 | 01-2650-03 |
| 14 | Air Valve Cap Screw 1/4"-20 x 4-1/2" | 4 | 01-6000-03 | 01-6000-03 |
| 15 | Air Valve Cap Screw Nut 1/4"-20 | 4 | 04-6400-03 | 04-6400-03 |
| 16 | Liquid Chamber | 2 | 01-5000-01 | 01-5000-03 |
| 17 | Discharge Manifold Elbow | 2 | 01-5230-01 | 01-5230-03 |
| 18 | Inlet Manifold Elbow | 2 | 01-5220-01 | 01-5220-03 |
| 19 | Manifold "T" Section | 2 | 01-5160-01 | 01-5160-03 |
| 20 | Clamp Band (Large) Assy. | 2 | 01-7300-03 | 01-7300-03 |
| 21 | Clamp Band (Small) Assy. | 4 | 01-7100-03 | 01-7100-03 |
| 22 | Vertical Bolt 1/4"-20 x 7-3/8" | 4 | 01-6080-03 | 01-6080-03 |
| 23 | Muffler | 1 | 01-3510-99 | 01-3510-99 |
| 24 | Diaphragm | 2 | * | * |
| 25 | Valve Ball | 4 | * | * |
| 26 | Valve Seat | 4 | 01-1120-01 | 01-1120-03 |
| 27 | Valve Seat O-Ring | 4 | * | * |
| 28 | Manifold O-Ring | 4 | * | * |
| 29 | Small Clamp Band Bolt #10-24 x 1" | 8 | 01-6101-03 | 01-6101-03 |
| 30 | Small Clamp Band Nut #10-24 | 8 | 01-6400-03 | 01-6400-03 |
| 31 | Large Clamp Band Bolt 1/4"-20 x 1-3/4" | 4 | 01-6070-03 | 01-6070-03 |
| 32 | Large Clamp Band Nut 1/4"-20 | 4 | 04-6400-03 | 04-6400-03 |
| 33 | Shaft Stud | 2 | N/A | 01-6150-03 |
| 34 | Vertical Bolt Nut 1/4"-20 | 4 | 04-6400-03 | 04-6400-03 |
| 35 | Vertical Bolt Washer | 4 | 01-6730-03 | 01-6730-03 |
| 36 | Disc Spring | 2 | 01-6802-08 | 01-6802-08 |

¹Air Valve Assembly includes items 10, 11, 12, 13.

*Refer to corresponding elastomer chart in Section 9.

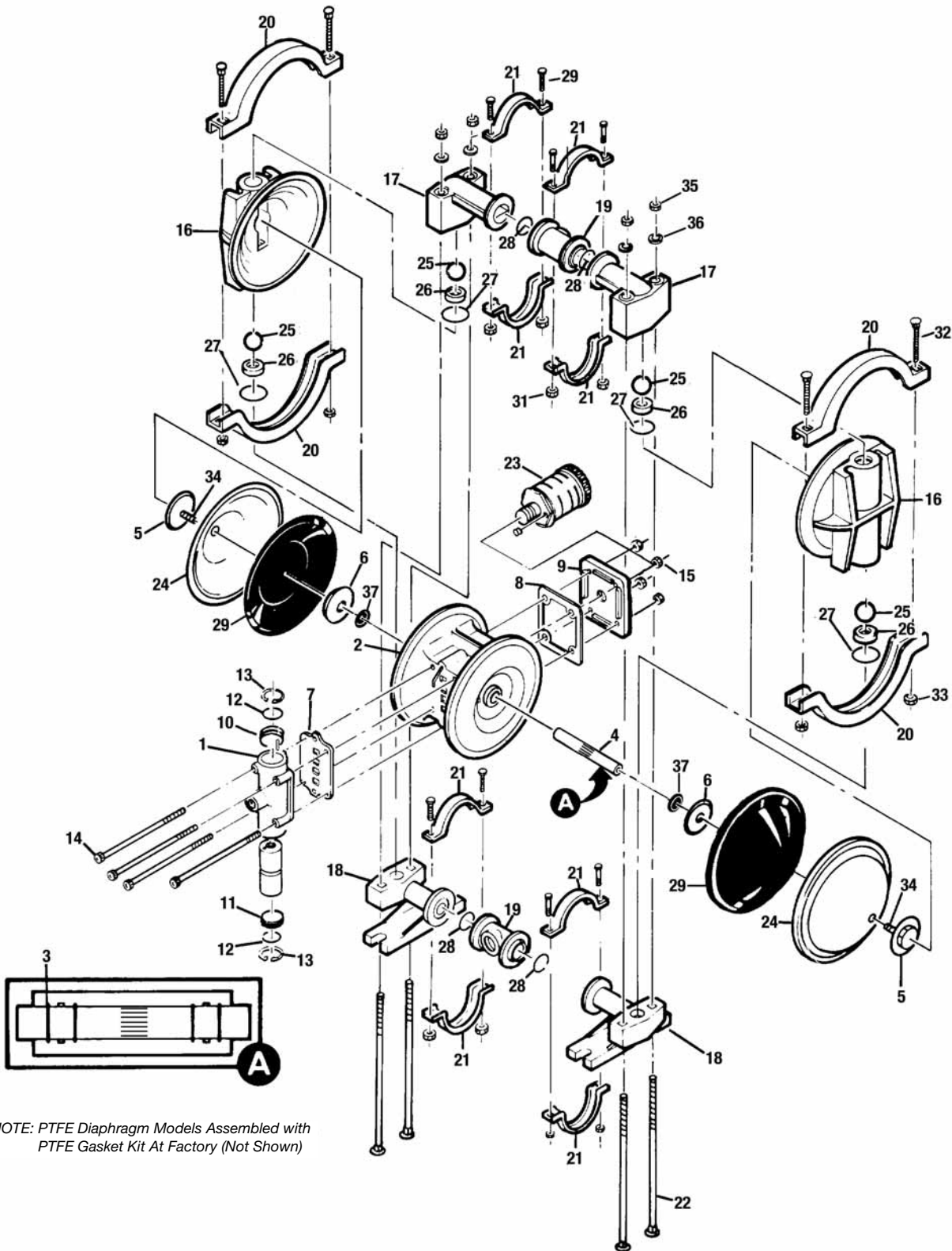
All boldface items are primary wear parts.

EXPLODED VIEW & PARTS LISTING

T1 METAL

PTFE-Fitted

EXPLODED VIEW



NOTE: PTFE Diaphragm Models Assembled with PTFE Gasket Kit At Factory (Not Shown)

EXPLODED VIEW & PARTS LISTING
T1 METAL
PTFE-Fitted
PARTS LISTING

| Item | Part Description | Qty. Per Pump | T1/AAYB P/N | T1/SSYYB P/N |
|-----------|--|---------------|-------------------|-------------------|
| 1 | Air Valve Assembly¹ | 1 | 01-2000-07 | 01-2000-07 |
| 2 | Center Section | 1 | 01-3153-23 | 01-3153-23 |
| 3 | Center Block Glyd™ Ring | 4 | 01-3220-55 | 01-3220-55 |
| 4 | Shaft | 1 | 01-3800-03-07 | 01-3800-03-07 |
| 5 | Pistons/Outer | 2 | 01-4570-01 | 01-4570-03 |
| 6 | Pistons/Inner | 2 | 01-3710-01 | 01-3710-01 |
| 7 | Air Valve Gasket | 1 | 01-2600-52 | 01-2600-52 |
| 8 | Muffler Plate Gasket | 1 | 01-3500-52 | 01-3500-52 |
| 9 | Muffler Plate | 1 | 01-3180-23 | 01-3180-23 |
| 10 | End Cap w/Guide | 1 | 01-2300-23 | 01-2300-23 |
| 11 | End Cap w/o Guide | 1 | 01-2330-23 | 01-2330-23 |
| 12 | Buna-N O-Ring - 115 70 Shore | 2 | 01-2390-52 | 01-2390-52 |
| 13 | End Cap Snap Ring | 2 | 01-2650-03 | 01-2650-03 |
| 14 | Air Valve Cap Screw 1/4"-20 x 4-1/2" | 4 | 01-6000-03 | 01-6000-03 |
| 15 | Air Valve Cap Screw Nut 1/4"-20 | 4 | 04-6400-03 | 04-6400-03 |
| 16 | Liquid Chamber | 2 | 01-5000-01 | 01-5000-03 |
| 17 | Discharge Manifold Elbow | 2 | 01-5230-01 | 01-5230-03 |
| 18 | Inlet Manifold Elbow | 2 | 01-5220-01 | 01-5220-03 |
| 19 | Manifold "T" Section | 2 | 01-5160-01 | 01-5160-03 |
| 20 | Clamp Band (Large) Assy. | 2 | 01-7300-03 | 01-7300-03 |
| 21 | Clamp Band (Small) Assy. | 4 | 01-7100-03 | 01-7100-03 |
| 22 | Vertical Bolt 1/4"-20 x 7-3/8" | 4 | 01-6080-03 | 01-6080-03 |
| 23 | Muffler | 1 | 01-3510-99 | 01-3510-99 |
| 24 | Diaphragm | 2 | 01-1010-55 | 01-1010-55 |
| 25 | Valve Ball | 4 | 01-1080-55 | 01-1080-55 |
| 26 | Valve Seat | 4 | 01-1120-01 | 01-1120-03 |
| 27 | Valve Seat O-Ring | 4 | 01-1200-55 | 01-1200-55 |
| 28 | Manifold O-Ring | 4 | 01-1300-55 | 01-1300-55 |
| 29 | Back-up Diaphragm | 2 | 01-1060-51 | 01-1060-51 |
| 30 | Small Clamp Band Bolt #10-24 x 1" | 8 | 01-6101-03 | 01-6101-03 |
| 31 | Small Clamp Band Nut #10-24 | 8 | 01-6400-03 | 01-6400-03 |
| 32 | Large Clamp Band Bolt 1/4"-20 x 1-3/4" | 4 | 01-6070-03 | 01-6070-03 |
| 33 | Large Clamp Band Nut 1/4"-20 | 4 | 04-6400-03 | 04-6400-03 |
| 34 | Shaft Stud | 2 | N/A | 01-6150-03 |
| 35 | Vertical Bolt Nut 1/4"-20 | 4 | 04-6400-03 | 04-6400-03 |
| 36 | Vertical Bolt Washer | 4 | 01-6730-03 | 01-6730-03 |
| 37 | Disc Spring | 2 | 01-6802-08 | 01-6802-08 |

¹Air Valve Assembly includes items 10 through 13.

All boldface items are primary wear parts.

ELASTOMER OPTIONS

T1 Metal Pumps

| Material | Diaphragm P/N | Valve Ball P/N | Valve Seat P/N | Valve Seat O-Ring P/N | Manifold O-Ring P/N |
|---------------------------|---------------|----------------|----------------|-----------------------|---------------------|
| Polyurethane | 01-1010-50 | 01-1080-50 | N/A | 01-1200-50 | 01-1300-50 |
| Buna-N | 01-1010-52 | 01-1080-52 | N/A | 00-1260-52 | 01-1300-52 |
| Viton® | 01-1010-53 | 01-1080-53 | N/A | N/A | N/A |
| Wil-Flex™ | 01-1010-58 | 01-1080-58 | N/A | 00-1260-58 | 01-1300-58 |
| Saniflex™ | 01-1010-56 | 01-1080-56 | N/A | 01-1200-56 | 01-1300-56 |
| PTFE | 01-1010-55 | 01-1080-55 | N/A | 01-1200-55 | 01-1300-55 |
| PTFE with integral piston | 01-1030-55 | N/A | N/A | N/A | N/A |
| Stainless Steel | N/A | N/A | 01-1120-03 | N/A | N/A |
| Aluminum | N/A | N/A | 01-1120-01 | N/A | N/A |

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 _____ | | | |

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NOTE: WARRANTY VOID IF PAGE IS NOT FAXED TO WILDEN

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