

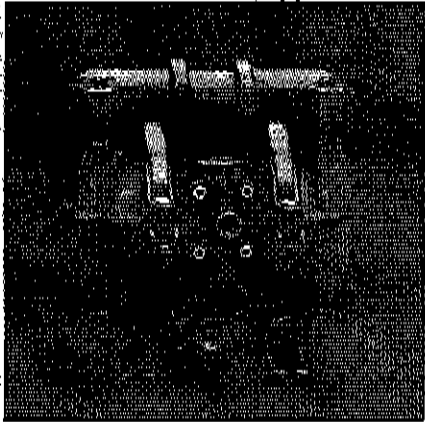


WILDEN®

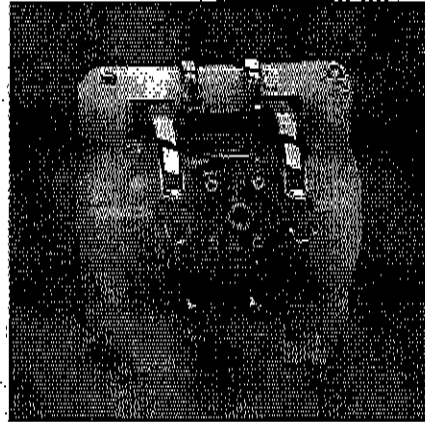
AIR OPERATED DOUBLE DIAPHRAGM PUMPS

M1 Engineering Operation and Maintenance

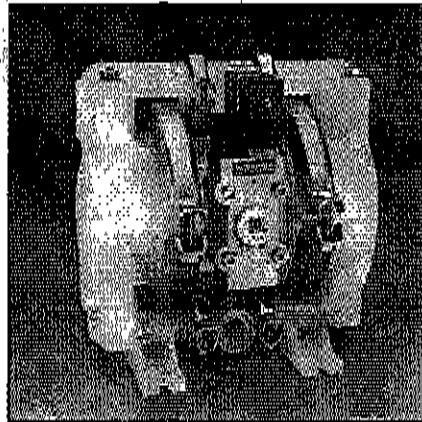
- MODEL M1 METAL
- MODEL M1 CHAMP
- MODEL M1 FOOD PROCESSING
- MODEL M1 SOLENOID-OPERATED
- MODEL M1 ULTRAPURE III



M1 METAL LUBED AND LUBE-FREE

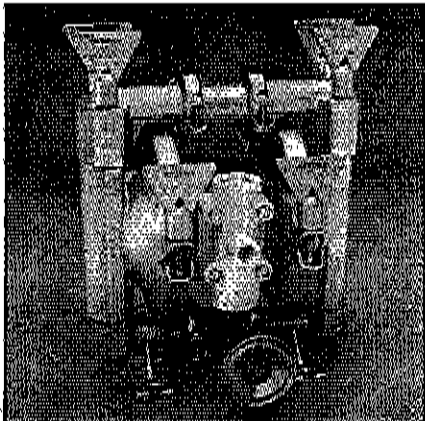


M1 CHAMP LUBED AND LUBE-FREE

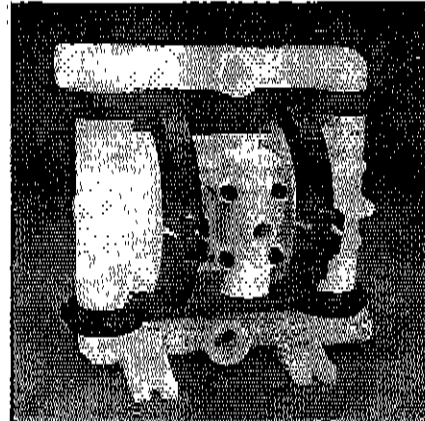


M1 SOLENOID-OPERATED CHAMP AND METAL

NEW U/
NPS



M1 FOOD PROCESSING LUBED AND LUBE-FREE



M1 ULTRAPURE III

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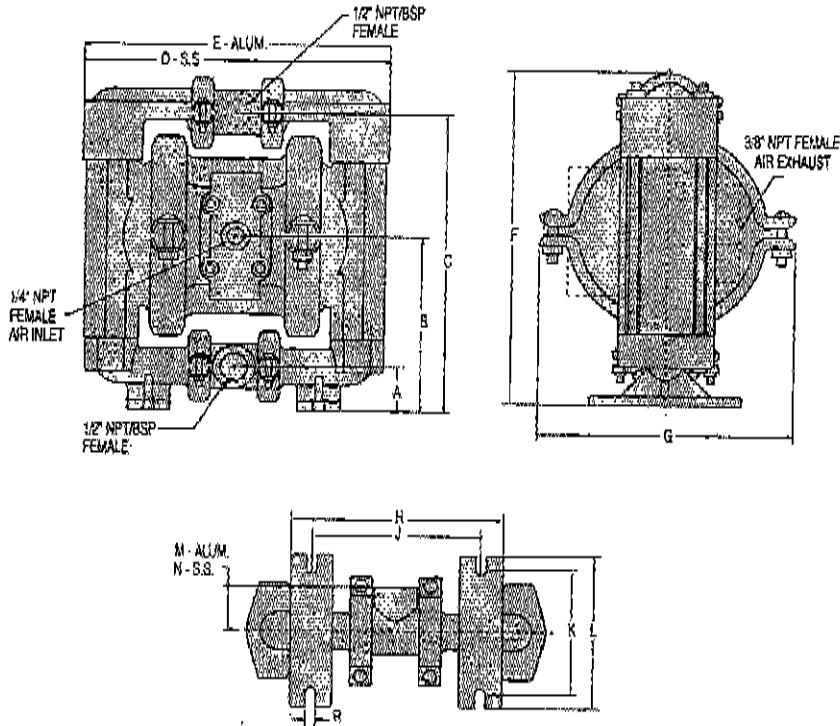
CAUTION: DO NOT EXCEED 125 PSIG AIR SUPPLY PRESSURE. BLOW OUT AIR LINE FOR 10 TO 20 SECONDS BEFORE ATTACHING TO PUMP TO MAKE SURE ALL PIPE LINE DEBRIS IS CLEAR. ALWAYS USE AN IN-LINE AIR FILTER.

WARNING: The solenoid valve should not be used in an area where explosion proof equipment is required unless Nema 7 valve is specified.

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

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.

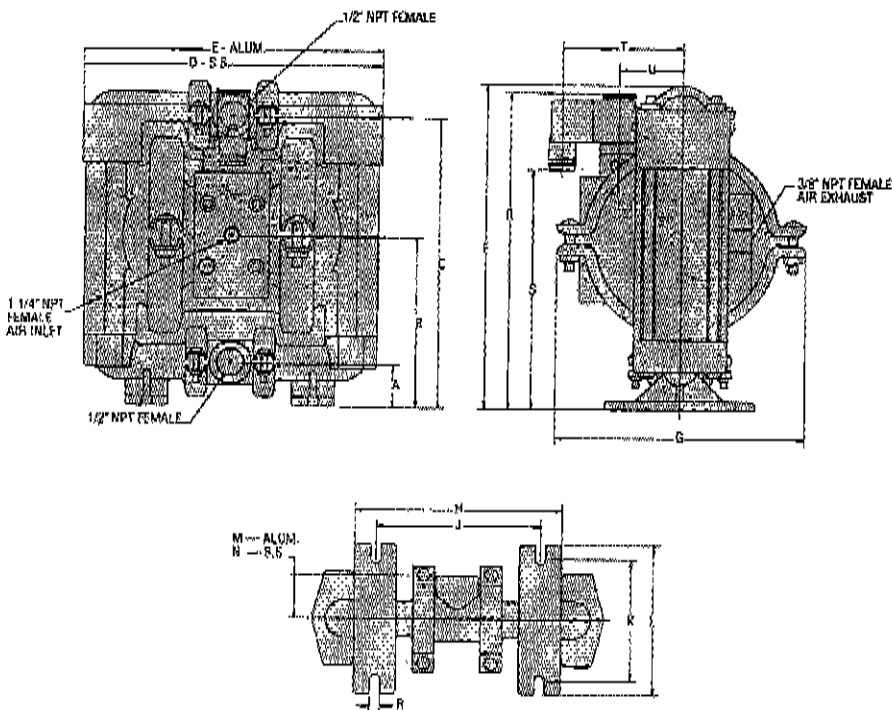
SECTION 1A — DIMENSIONAL DRAWING MODEL M1 METAL PUMP



DIMENSIONS - M1 (METAL)		
ITEM	STANDARD (inch)	METRIC (mm)
A	1 1/8	28.6
B	4 9/16	115.9
C	7 13/16	198.5
D	8	203.2
E	8 5/32	207.2
F	8 3/4	222.3
G	6 7/8	174.6
H	5 1/2	139.7
J	4 13/32	111.9
K	3 1/4	82.6
L	4	101.6
M	1 3/16	30.2
N	1 3/16	30.2
P	9/32	7.1

BSP threads available.

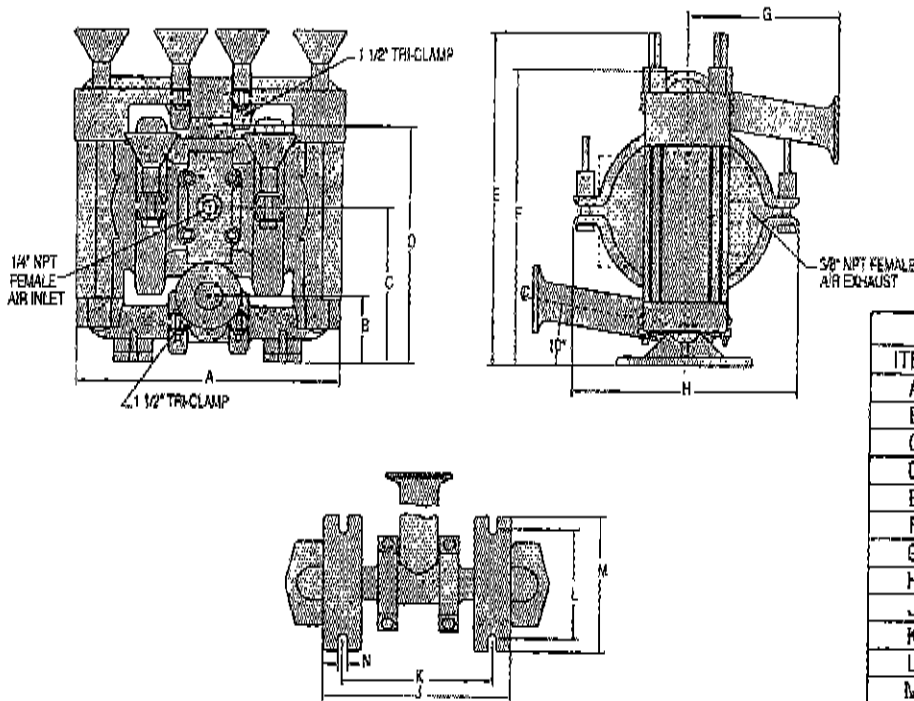
SECTION 1B — DIMENSIONAL DRAWING MODEL M1 METAL SOLENOID-OPERATED PUMP



DIMENSIONS - M1 SOLENOID OPERATED (METAL)		
ITEM	STANDARD (inch)	METRIC (mm)
A	1 1/8	28.6
B	4 5/16	115.9
C	7 13/16	198.5
D	8	203.2
E	8 5/32	207.2
F	8 3/4	222.3
G	6 7/8	174.6
H	5 1/2	139.7
J	4 13/32	111.9
K	3 1/4	82.6
L	4	101.6
M	1 3/16	30.2
N	1 3/16	30.2
P	9/32	7.1
R	8 7/8	225.4
S	6 3/8	161.9
T	3 7/32	81.8
U	1 3/4	44.5

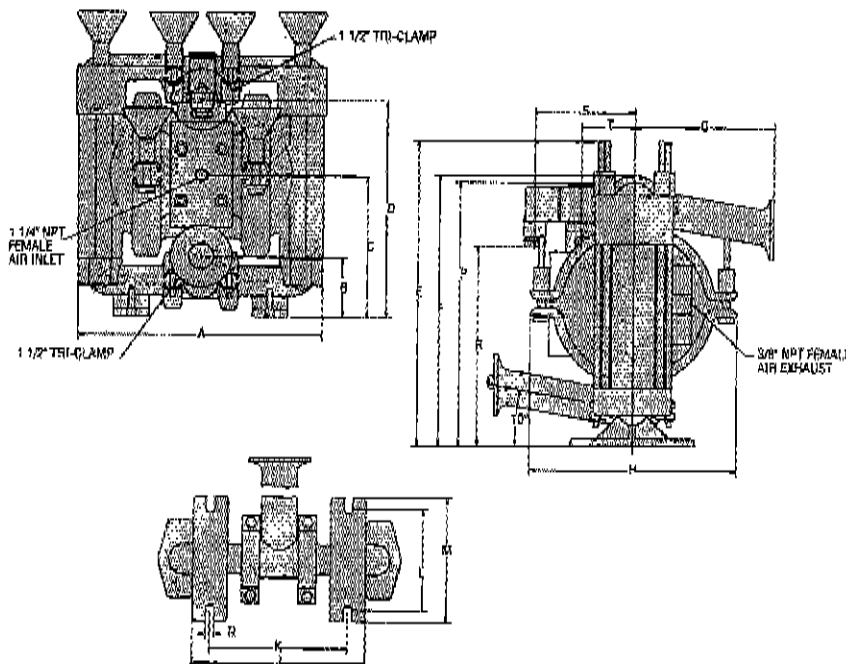
*BSP threads available.

SECTION 1C — DIMENSIONAL DRAWING MODEL M1 FOOD PROCESSING PUMP



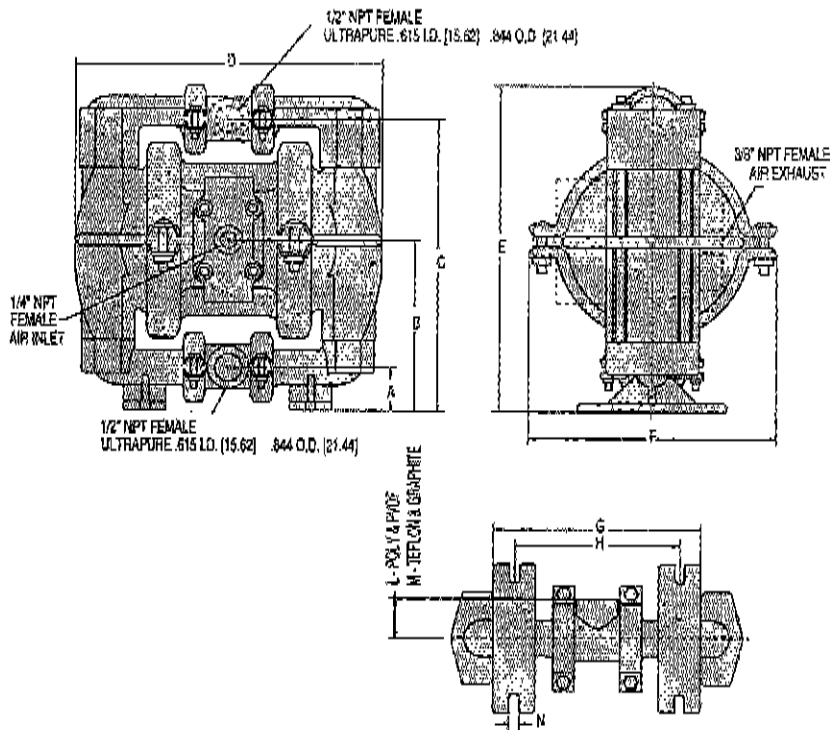
DIMENSIONS - M1 (FOOD PROCESSING)		
ITEM	STANDARD (inch)	METRIC (mm)
A	8 1/32	204.0
B	1 29/32	48.4
C	4 21/32	118.3
D	6 7/8	174.6
E	10 1/32	254.8
F	8 3/4	222.3
G	4 17/32	115.1
H	6 13/16	173.0
J	5 5/8	142.9
K	4 15/32	113.5
L	3 1/4	82.6
M	4	101.6
N	9/32	7.1

SECTION 1D — DIMENSIONAL DRAWING MODEL M1 FOOD PROCESSING SOLENOID-OPERATED PUMP



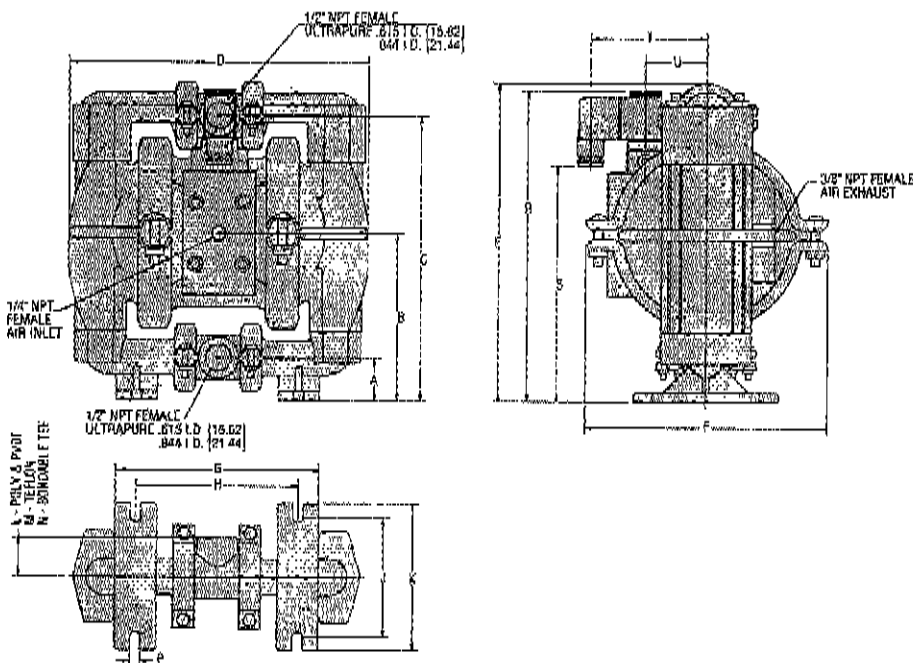
DIMENSIONS - M1 SOLENOID OPERATED (FOOD GRADE)		
ITEM	STANDARD (inch)	METRIC (mm)
A	8 1/32	204.0
B	1 29/32	48.4
C	4 21/32	118.3
D	6 7/8	174.6
E	10 1/32	254.8
F	8 3/4	222.3
G	4 17/32	115.1
H	6 13/16	173.0
J	5 5/8	142.9
K	4 15/32	113.5
L	3 1/4	82.6
M	4	101.6
N	9/32	7.1
P	8 15/32	215.1
R	6 13/32	162.7
S	3 7/32	81.8
T	1 3/4	44.5

SECTION 1E — DIMENSIONAL DRAWING MODEL M1 CHAMP PUMP (Plastic)



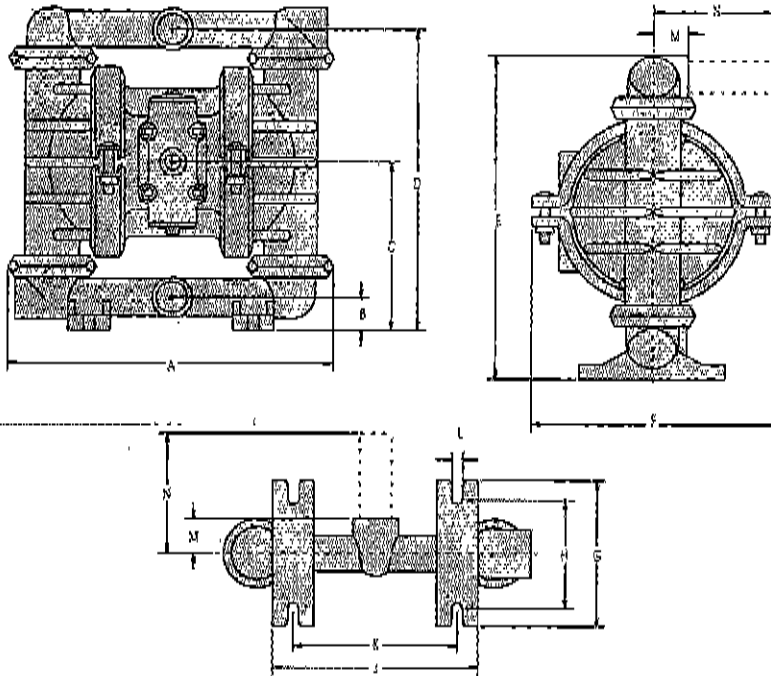
DIMENSIONS - M1 (PLASTIC)		
ITEM	STANDARD (inch)	METRIC (mm)
A	1 5/32	29.3
B	4 1/2	114.2
C	7 11/16	195.3
D	8 3/16	207.8
E	8 5/8	219.1
F	7	177.8
G	5 21/32	143.7
H	4 1/2	114.2
J	3 1/4	82.6
K	4	101.5
L	1 3/32	27.8
M	27/32	21.4
N	9/32	7.1

SECTION 1F — DIMENSIONAL DRAWING MODEL M1 CHAMP (Plastic) SOLENOID-OPERATED PUMP



DIMENSIONS - M1 SOLENOID OPERATED (PLASTIC)		
ITEM	STANDARD (inch)	METRIC (mm)
A	1 5/32	29.4
B	4 1/2	114.2
C	7 11/16	195.3
D	8 3/16	208.0
E	8 5/8	219.1
F	7	177.8
G	5 21/32	143.7
H	4 1/2	114.2
J	3 1/4	82.6
K	4	101.6
L	1 3/32	27.8
M	27/32	21.4
N	3 5/16	83.4
P	9/32	7.1
R	8 3/8	212.7
S	6 5/16	160.3
T	3 7/32	81.8
U	1 3/4	44.5

SECTION 1G — DIMENSIONAL DRAWING MODEL M1 ULTRAPURE III PUMP (Teflon® PFA)



DIMENSIONS - M1 (ULTRAPURE III)		
ITEM	STANDARD (inch)	METRIC (mm)
A	8 7/8	223.6
B	15/16	23.6
C	4 3/4	119.7
D	8 3/8	211
E	9	226.7
F	6 3/4	170.0
G	4	100.8
H	3	75.6
J	5 5/8	141.7
K	4 1/2	113.4
L	1/4	6.3
M	1	25.2
FOR BONDABLE TEE SECTION		
N	3 5/16	83.5

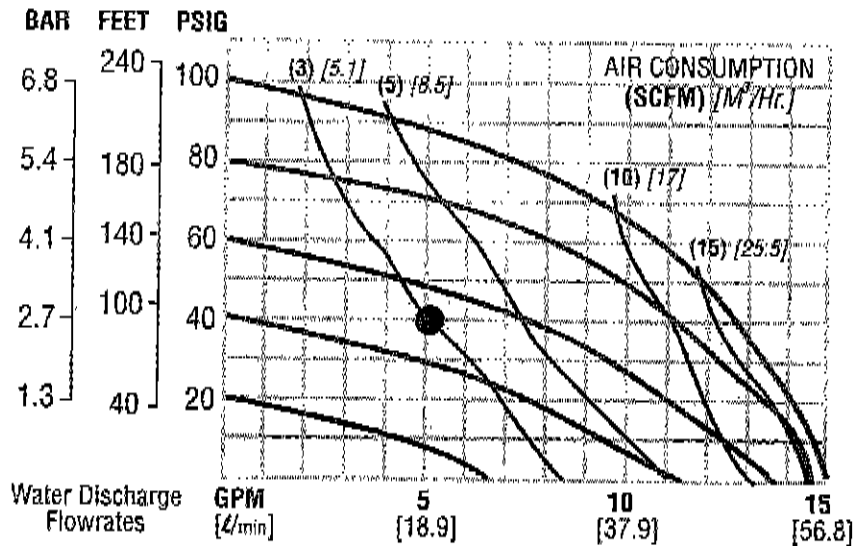
SECTION 2A — MODEL M1 METAL (Rubber/TPE-Fitted) Pump Performance Curve

Weight.....Aluminum 12 lbs.
 Stainless Steel 19.5 lbs.
 Air Inlet..... $\frac{1}{4}$ " Female NPT
 Inlet..... $\frac{1}{2}$ " Female NPT
 Outlet..... $\frac{1}{2}$ " Female NPT
 Suction Lift.....**Rubber 10' Dry**
 25' Wet
 TPE 7' Dry
 25' Wet
 Displacement per Stroke..... .026 gal.²
 Solenoid-operated .013 gal.
 Max. Size Solids..... $\frac{1}{16}$ " Dia.

Example: To pump 5 gpm against a discharge pressure of 40 psig requires 50 psig and 3 scfm air consumption. (See dot on chart.)

¹BSP threads available.

²Displacement per stroke calculated at 70 psig air inlet against 30 psig discharge head pressure.



Volumes indicated on chart were determined by actually pumping water in calibrated tanks.

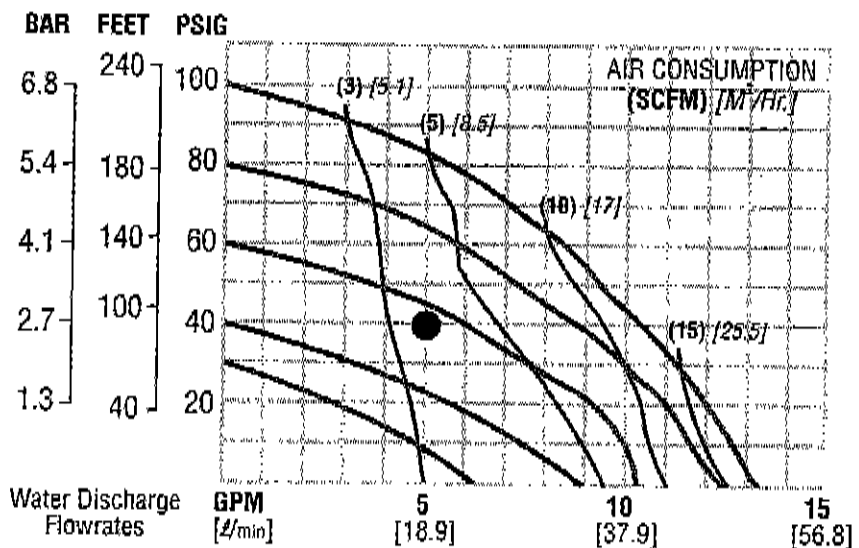
SECTION 2B — MODEL M1 METAL (Teflon®-Fitted) Pump Performance Curve

Weight.....Aluminum 12 lbs.
 Stainless Steel 19.5 lbs.
 Air Inlet..... $\frac{1}{4}$ " Female NPT
 Inlet..... $\frac{1}{2}$ " Female NPT
 Outlet..... $\frac{1}{2}$ " Female NPT
 Suction Lift.....**8' Dry**
 25' Wet
 Displacement per stroke..... .02 gal.²
 Solenoid-operated .011 gal.
 Max. Size Solids..... $\frac{1}{16}$ " Dia.

Example: To pump 5 gpm against a discharge pressure of 40 psig requires 57 psig and 3.8 scfm air consumption. (See dot on chart.)

¹BSP threads available.

²Displacement per stroke calculated at 70 psig air inlet against 30 psig discharge head pressure.



Volumes indicated on chart were determined by actually pumping water in calibrated tanks.

SECTION 3A

INSTALLATION — M1 AIR-OPERATED PUMPS

The Model M1 has a 1/2" inlet and 1/2" outlet and is designed for flows to 14 gpm. The **M1 Metal** pump is manufactured with wetted parts of aluminum or stainless steel. The center section of the **M1 Metal** pump is of nylon construction. The **M1 Champ** pump is manufactured with wetted parts of PVDF, polypropylene, graphite-filled polypropylene, or Teflon® PFA. The center section of the **M1 Champ** is constructed of polypropylene or carbon-filled Acetal. Two types of air distribution systems are available: **LUBED AND LUBE-FREE**. The Lubed air distribution system consists of a brass air valve body, aluminum air valve piston, Buna-N O-rings and a bronze center section bushing. The LUBE-FREE air distribution system is constructed solely of high-tech, engineered thermoplastics which function together without lubrication. The encircled letters "LF" stamped on the top of the pump's center section denotes that the pump is LUBE-FREE. The lube-free air valve body is off-white in color and also has "LF" molded into the valve body. 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 1/2" diameter or larger if highly viscous material is being pumped. The suction hose must be non-collapsible, reinforced type as the M1 is capable of pulling a high vacuum. Discharge piping should be at least 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.

SECTION 3B

INSTALLATION — M1 SOLENOID-OPERATED PUMPS

The solenoid-operated Model M1 has a 1/2" inlet and 1/2" outlet and is designed for flows to 8.5 gpm. This maximum flow rate was calculated at 550 strokes per minute with 100 psig air inlet against 0 psig discharge head. The **M1 Champ** pump is manufactured with wetted parts of pure, unpigmented PVDF, polypropylene or Teflon® PFA. The center section of the **M1 Champ** is constructed of polypropylene. The **M1 Metal** pump is manufactured with wetted parts of aluminum or 316 stainless steel. The center section of the **M1 Metal** pump is of nylon construction. A variety of diaphragms, valve balls, and O-rings are available to satisfy temperature, chemical compatibility, abrasion and flex concerns.

In the solenoid-operated pump models, the standard air valve is replaced with a two position, four-way solenoid valve that has a single operator and spring return.

When the solenoid is unpowered, one air chamber is pressurized with air, while the opposite chamber is exhausted. When electric power is applied, the solenoid shifts, and the pressurized air chamber is exhausted while the opposite chamber is pressurized. By alternately applying and removing power, the solenoid-operated pump runs like a standard Wilden pump.

The speed of the pump is controlled electrically. Since each stroke is controlled by an electrical signal, the pump is ideal for batching and other electrically controlled dispensing applications.

The M1 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 7-10 psig. Premature diaphragm failure may occur if positive suction is 11 psig and higher.

THE MODEL M1 WILL PASS 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 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.

Although the speed of the pump is controlled electrically, the air pressure is important. Air pressure displaces the fluid, and if the pressure is insufficient to complete the physical stroke before an electronic impulse signals the pump to shift, the stroke will not be completed, and the displacement per stroke will be reduced. This does not harm the unit in any way, but it may cause inaccuracy when attempting to batch specific quantities with high precision.

The suction pipe size should be at least 1/2" diameter or larger if highly viscous material is being pumped. The suction hose must be non-collapsible, reinforced type as the M1 is capable of pulling a high vacuum. Discharge piping should be at least 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.

All wiring used to operate the pump should be placed and connected according to the proper electrical codes. It is important that the wiring is of adequate gauge to carry the current required to operate the pump. In addition, it is necessary that the electrical power supply is large enough to supply the current required to operate the pump. Wiring should be above ground level if possible (in case of fluid spill or leakage), and all wiring and connections which could become wet or damp should be made watertight.

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 7-10 psig. Premature diaphragm failure may occur if positive suction head is 11 psig and higher.

The solenoid valve is rated for continuous duty; however, stopping on an even number stroke count insures that the electrical power is off when pump is stopped. This practice is safer and also eliminates unwanted strokes when the system is shut down and electrical power is off.

THE MODEL M1 WILL PASS 1/8" SOLIDS. WHENEVER THE POSSIBILITY EXISTS THAT LARGER SOLID OBJECTS MAY BE SUCKED INTO THE PUMP, A STRAINER SHOULD BE USED ON THE SUCTION LINE.

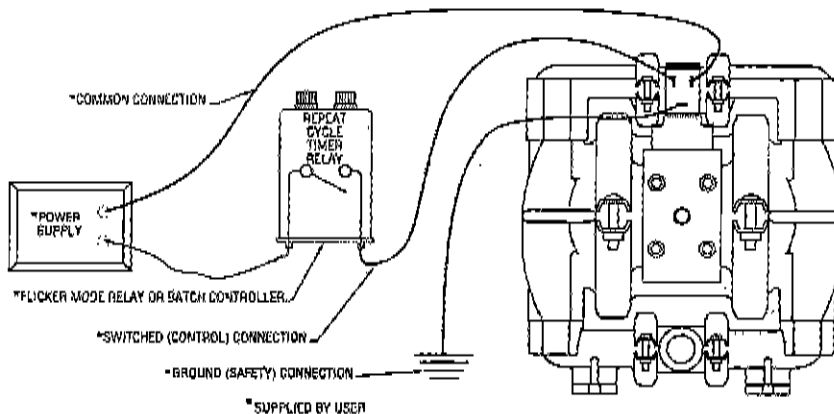
CAUTION: DO NOT EXCEED 125 PSIG AIR SUPPLY PRESSURE.

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.

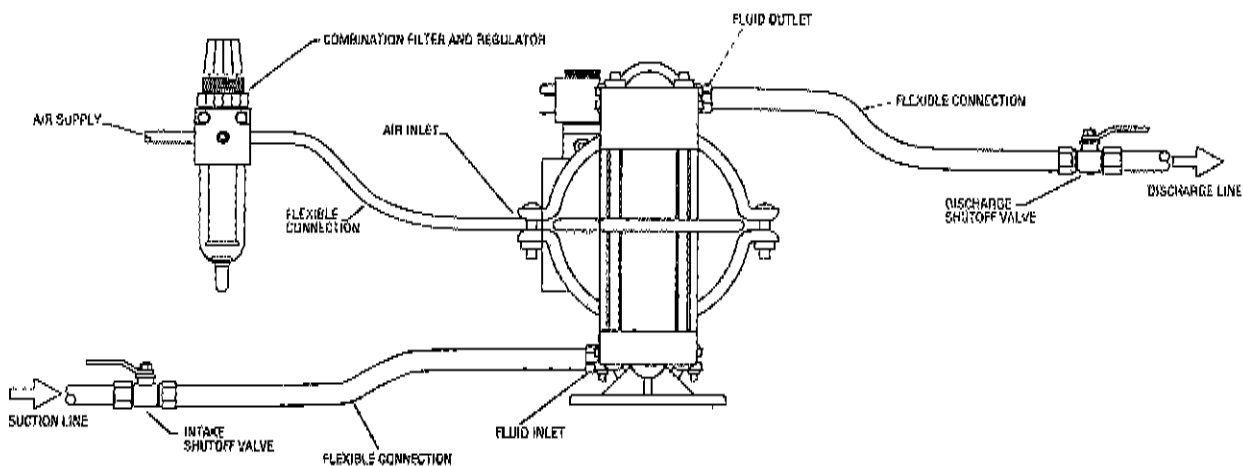
WARNING: The solenoid valve should not be used in an area where explosion proof equipment is required unless Nema 7 valve is specified.

There are three coil options available in both Nema 4 and Nema 7 ratings. One coil allows for 110V AC operation, one allows for 24V DC operation, and the third allows for either 24V AC or 12V DC operation.

ELECTRICAL CONNECTIONS



PLUMBING CONNECTIONS



SECTION 3C

WILDEN SOLENOID-OPERATED PUMPS

QUICK REFERENCE

SPECIFICATIONS	M1 PLASTIC		M1 METAL	
	RUBBER	TEFLON	RUBBER	TEFLON
Maximum Flow/ Rate at 0 Head	7.5 gpm	7 gpm	8 gpm	7.4 gpm
# of Strokes per Minute @ Maximum Flow ¹	600	600	600	600
Maximum Air Pressure	125 psi	125 psi	125 psi	125 psi
Minimum Air Pressure Required	45 psi	45 psi	45 psi	45 psi
Displacement per Stroke	.013 gal.	.011 gal.	.013 gal.	.011 gal.
Air Inlet Size (Female NPT)	1/4"	1/4"	1/4"	1/4"
Dry Suction Lift	10'	7'	10'	8'
Wet Suction Lift	25'	25'	25'	25'
Lubrication (Pre-Lube)	Buna Compatible NLGI Grade 2 Grease			
Inner Piston P/N	01-3710-01-150	01-3710-01-150	01-3710-01-150	01-3710-01-150
Terminal Connector P/N	00-2130-99	00-2130-99	00-2130-99	00-2130-99

¹Maximum flow based on full stroke completion.

²Displacement per stroke is dynamic. Above figures were calculated with 70 psi air pressure against 30 psi discharge head at 80 strokes per minute.

ELECTRICAL INFORMATION

VOLTAGE	PART NUMBER	RATING	AMPS (INRUSH)	AMPS (HOLDING)	RESISTIVITY (OHMS)
24V DC	00-2110-99-150	NEMA 4	.25	.25	96
24V DC	00-2110-99-154	NEMA 7	.25	.25	25
24V DC*	00-2110-99-157	—	.135	.135	177
12V DC	00-2110-99-151	NEMA 4	.445	.445	26
12V DC	00-2110-99-153	NEMA 7	.445	.445	26
24V AC*	00-2110-99-151	NEMA 4	.445	.34	26
24V AC*	00-2110-99-153	NEMA 7	.445	.34	26
110V AC*	00-2110-99-155	NEMA 4	.25	.166	156
110V AC*	00-2110-99-156	NEMA 7	.25	.166	156

*24 Volts @ 60 Hz., 22 Volts @ 50 Hz.

*120 Volts @ 60 Hz., 110 Volts @ 50 Hz.

*Meets European standards and regulations. Cenelec/PTB file # EX-91.C.2027

SECTION 3D

INSTALLATION — MODEL M1 ULTRAPURE III

The M1 Ultrapure III was engineered in response to your request for a reliable, lube-free, sealless pump constructed of the purest materials available to industry. This 1/2" pump is constructed of Teflon PFA[®] wetted parts, Teflon PTFE[®] primary and containment diaphragms, and Chemraz[®] O-rings. A specially engineered WIL-SEAL O-ring configuration, combined with "wrap-around" clamp bands apply uniform pressure to all sealing surfaces. The LUBE-FREE air valve constructed solely of plastic composites in conjunction with a newly designed center section, enhances reliability and pump performance. These selected plastic composites have the ability to function together without lubrication, which reduces contamination and fugitive emissions via the air exhaust port.

The suction pipe size should be at least 1/2" diameter or larger is highly viscous material is being pumped. The suction hose must be non-collapsible, reinforced type as the M1 is capable of pulling a high vacuum. Discharge piping should be at least 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.

The M1 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. The M1 Ultrapure III has a dry suction lift of 6 feet.

Pumps in service with a positive suction head are most efficient when inlet pressure is limited to 7–10 psig. Premature diaphragm failure may occur if positive suction is 11 psig and higher.

THE MODEL M1 WILL PASS 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 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.

TEMPERATURE LIMITS: +40°F to +300°F
(4.4°C to 148.9°C)

SECTION 4

SUGGESTED OPERATION AND MAINTENANCE INSTRUCTIONS — AIR-OPERATED M1 PUMPS

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 125 psi 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 LUBED PUMPS: For best results, the pumps should use an air filter, regulator, and lubricator system. The use of a lubricant, suitable for the application, helps perform a number of functions. Lubricants reduce friction to minimize required shifting forces and reduce wear. Lubricants provide a protective coating against some forms of corrosion and contaminants. **Wilden suggests a hydraulic oil with arctic characteristics (ISO 15-SWt). This oil is chemically compatible with the center block O-rings and has a low pour point to guard against problems associated with low temperatures.** The amount of lubrication required is directly related to the amount of oil introduced from the factory air system. We therefore suggest that the lowest setting on the lubricator be utilized and then increased as necessary.

FOR LUBE-FREE PUMPS: For best results, the pump should use an air filter and regulator. Lube-free pump models do not require lubrication during assembly or while in operation. Pump discharge rate can be controlled by limiting the volume and/or pressure of the air supply to the pump. The use of a needle valve installed at the air inlet to the pump is suggested for this purpose. Pump discharge rate can also be controlled by throttling the pump discharge by installing a valve in the discharge line of the pump when the need to control the pump from a remote location exists. When the pump discharge pressure equals or exceeds the air supply pressure, the pump will stall out; no bypass or pressure relief valve is needed, and pump damage will not occur. When operation is controlled by a solenoid valve in the air line, a three-way valve should be used. Pumping volume can be set by counting the number of strokes per minute.

A muffler installed on the pump's air exhaust will give quiet exhaust. Sound levels are reduced below OSHA specifications using a Wilden muffler.

FOR SOLENOID PUMPS: For best results, the pumps should use an air filter and a regulator. The use of an air filter before the pump inlet will ensure that the majority of pipeline contaminants will be eliminated. The solenoid operated pump is per-

manently lubricated during assembly, and requires no additional lubrication under normal operation. If the unit runs under extreme conditions (continuous operation at high speeds), it may be necessary to relubricate center block with a **buna compatible NLGI Grade 2 grease** every 50 million cycles. Continuous lubrication with a compatible oil is not harmful, and will provide longer seal life, but it may flush all grease out of the unit.

Pump discharge rate is controlled electrically by varying the rate of alternation of the stroke signals. The pump will continue to shift if the liquid discharge line is closed, however no media will be pumped. This will not harm the pump in any way, but it is wasteful of the pressurized air. The pump will not shift until the air inlet pressure exceeds the minimum supply pressure requirement of approximately 40 psig. A minimum of 45 psi is recommended to ensure reliable operation.

A muffler can be installed to reduce the amount of noise generated by the pump. Use of the specified Wilden muffler will reduce noise levels below OSHA specifications.

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 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.

INSPECTIONS: Periodic inspections have been found to offer the best means for preventing unscheduled pump downtime.

Individuals responsible for checking and maintaining lubrication levels in the pumps should also check for any abnormal noise or leakage. Personnel familiar with the pumps' construction and service should be informed of any abnormalities that are detected.

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 5A

TROUBLESHOOTING — AIR-OPERATED M1 PUMPS

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 checks. 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.

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.

SECTION 5B

TROUBLESHOOTING — SOLENOID-OPERATED M1 PUMPS

Pump will not run.

1. Check for pressurized air at the inlet. (Min. 45 psig.)
2. Check air inlet and filter for debris.
3. Connect a test lamp to the two wires which run to pump and ensure that the lamp cycles on and off.
4. Make sure that the air valve manual override (small red knob on front of valve) is switched to the "0" position.
5. Check pilot pressure vent at the top of the operator/coil assembly to ensure that it is not clogged.
6. Check for a worn out air valve. If air continually blows out the exhaust in very large quantities, the air valve seals may be worn beyond their ability to function. In this case, the valve must be replaced.

NOTE: Before the valve is scrapped, it is possible that it may be saved by completely disassembling the valve, cleaning all components and relubricating the valve.

Pump runs but little or no fluid comes out.

1. Check that the discharge isolation valve is not closed.
2. Check that the electronic signal is slow enough that the pump is able to complete each physical stroke before it is signaled to change direction. The time required to complete the stroke is determined by a variety of factors which include fluid viscosity and head pressure. The shaft can be viewed if the muffler is removed to verify that the pump is stroking.
3. Check for pump cavitation; slow pump speed down to match the thickness of the material being pumped.

4. Check for sticking ball check valves. If the material being pumped is not compatible with the pump elastomers, swelling may occur. Replace ball check valves and O-ring with the proper elastomers.
5. Check to make sure that all suction connections are air tight, and that the clamp bands are properly tightened.

Pump air passages blocked with ice.

Check for excessive moisture in compressed air line. As the air expands out the exhaust during the operation of the pump, water vapor entrapped in the compressed air can freeze and block the air passageways in the pump. If this occurs, it may be necessary to install a coalescing filter, an air dryer, or a hot air generator for the 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 of the air exhaust.

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

SECTION 6A

DIRECTIONS FOR DISASSEMBLY/REASSEMBLY AIR-OPERATED AND SOLENOID-OPERATED M1 METAL AND M1 CHAMP (PLASTIC)

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.

The Wilden® M1 has a 1/2" inlet and a 1/2" outlet and is designed for flows up to 14 gpm. The single-piece center section, consisting of center block and air chambers, is molded from glass-filled polypropylene or graphite-filled Acetal on the Champ and nylon on the Metal pump. All fasteners and hardware are stainless steel and the air valve is manufactured of brass or high-tech, engineered thermoplastics. 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 to perform maintenance on the Model M1 pumps are 3/16 inch Allen wrench, 7/16 inch, 5/16 inch, and 3/8 inch wrenches, two open end adjustable wrenches, and an O-ring pick.

PLEASE read all directions before starting disassembly.

NOTE: The following directions for disassembly and reassembly pertain to both metal and plastic constructed Wilden pumps. There are a few differences which are discussed in the text. The procedures for the solenoid-operated M1 are the same except for the air distribution system.

DISASSEMBLY

Step 1.

Before actual disassembly is started, turn pump upside down and drain all liquid trapped in the pump into a suitable container. Be sure to use proper caution if liquid is corrosive or toxic. Mark each liquid chamber to its respective air chamber for easy alignment during reassembly.

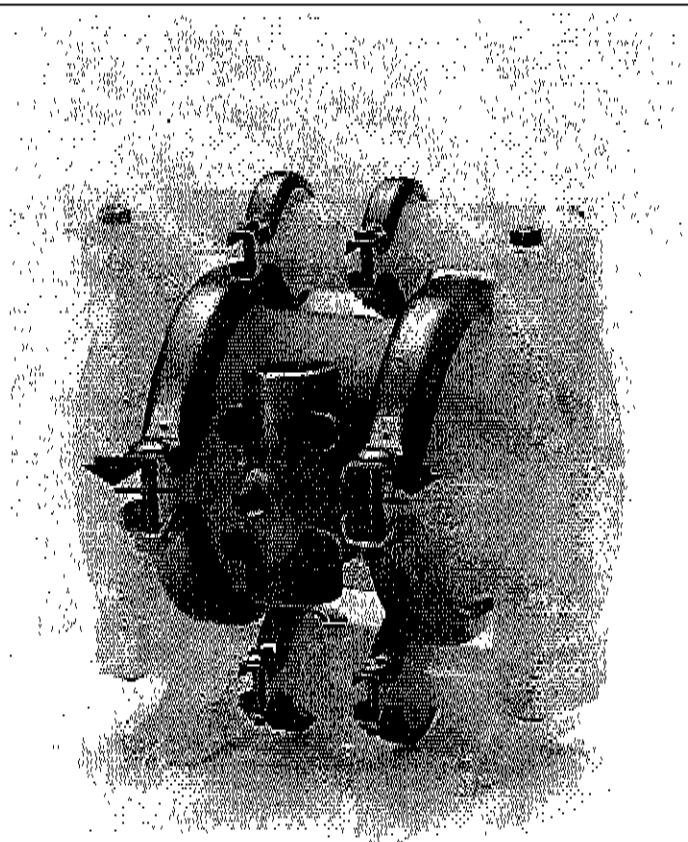


Figure 1

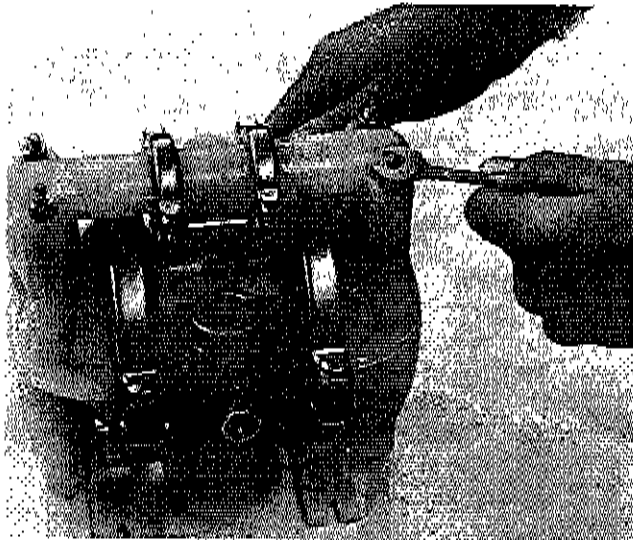


Figure 2

Start by removing the nuts from the four long bolts that hold the top and bottom manifold to the center section.

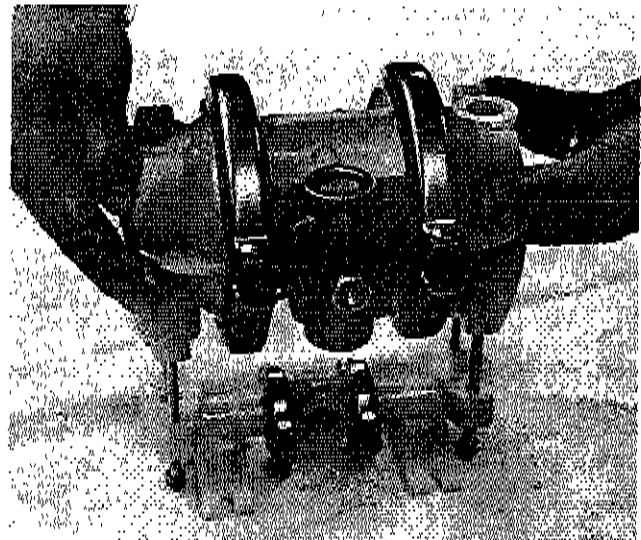
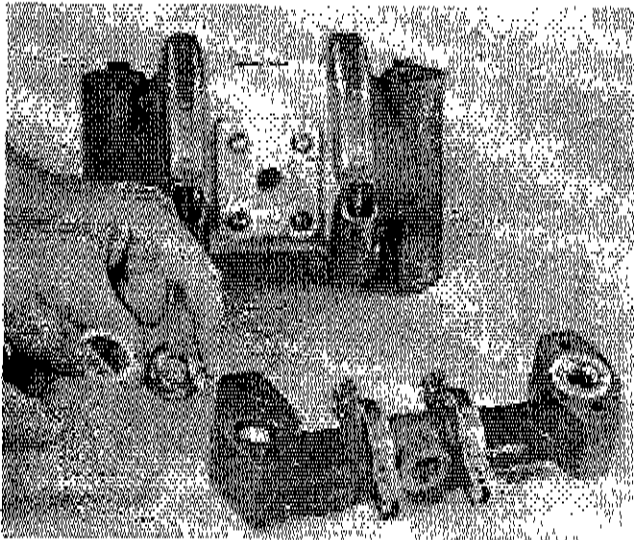


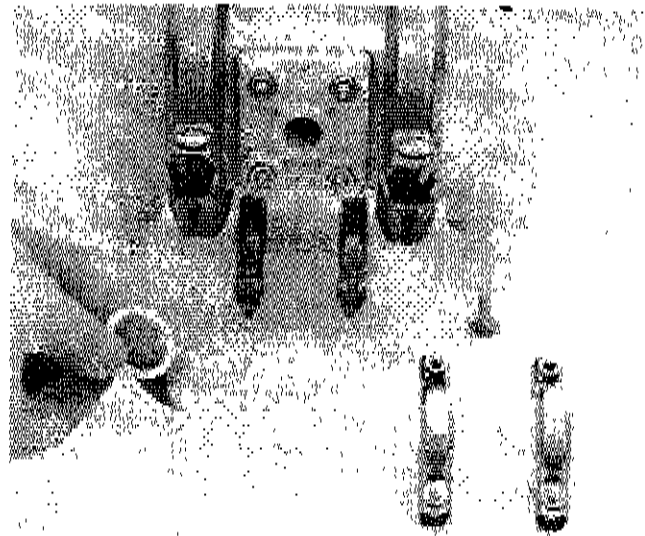
Figure 3

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



M1 METAL

Figure 4A



M1 PLASTIC

Figure 4B

Step 2.

Set the center section aside and inspect the discharge manifold. The discharge valve ball, seat, and sealing O-rings should now be inspected for wear and chemical attack. If the ball is round and not deeply scratched, it is still serviceable. Inspect the seat area where the ball valve rests. It should be smooth with no cuts. If this area is damaged, poor vacuum will result.

METAL PUMPS are constructed with a single valve seat O-ring configuration. Solid Teflon® PTFE O-rings are utilized when pump is Teflon®-fitted. These Teflon® O-rings should be replaced when reassembled. (Figure 4A.)

PLASTIC PUMPS are constructed with a double valve seat O-ring configuration. Teflon® encapsulated O-rings are utilized when pump is Teflon®-fitted. These O-rings may be reused. (Figure 4B.)

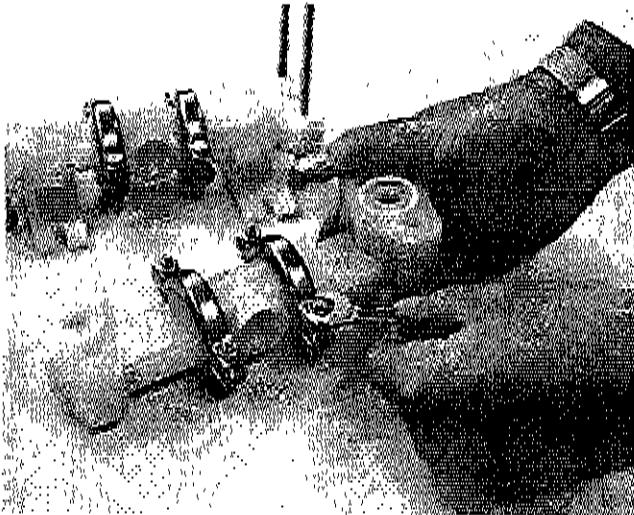


Figure 5

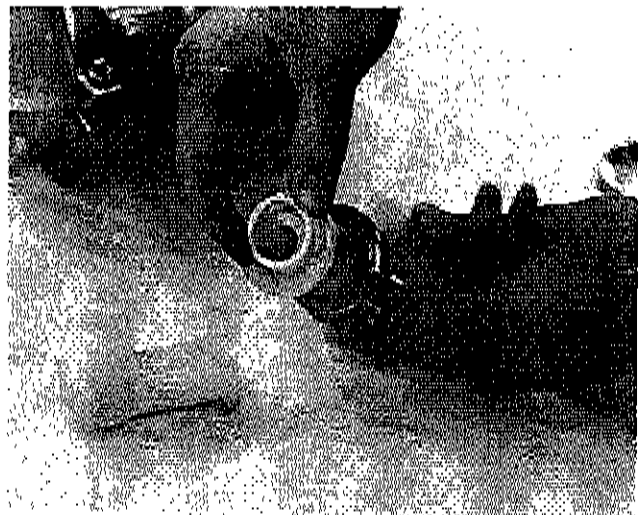
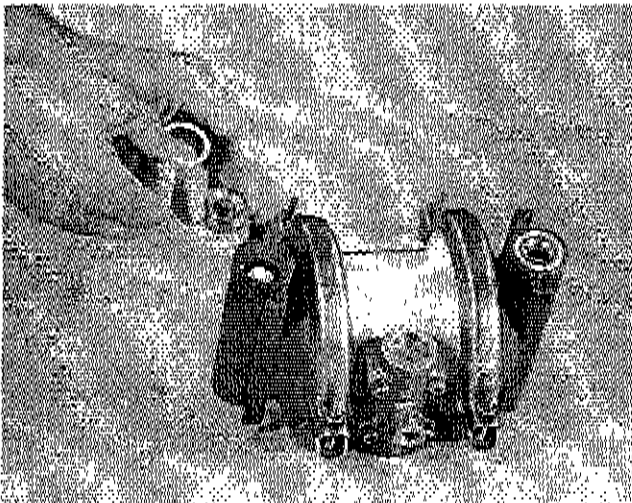


Figure 5A

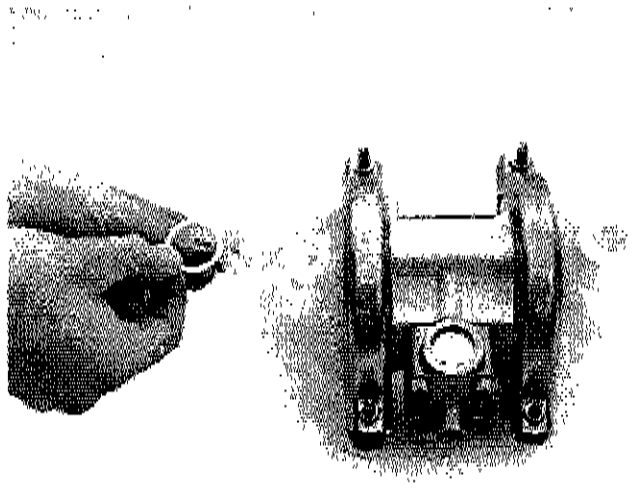
Step 3.

Normally the inlet or discharge manifold should not be disassembled during pump maintenance or repair. However, if this is necessary, or if the angle of the discharge or inlet opening needs to be changed, the clamp bands should be completely removed and the band itself should be disassembled. Taking the bands apart is necessary to simplify manifold reassembly. Set the manifold and bands aside.



M1 METAL

Figure 6A



M1 PLASTIC

Figure 6B

Step 4.

Turn the pump center section upside down and remove and inspect the inlet valve balls, seats, and sealing O-rings. If damage is apparent, or swelling or cracking of the valve balls is observed, these parts should be replaced upon pump reassembly.

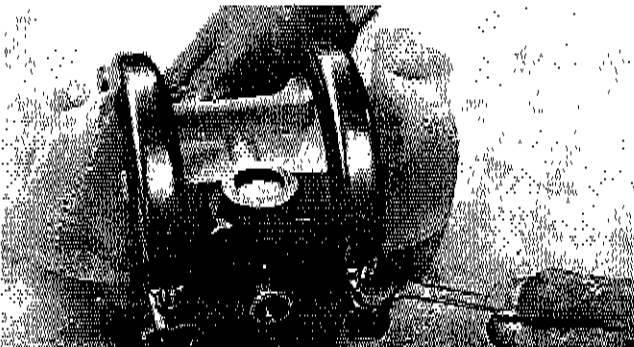


Figure 7

Use a 7/16-inch wrench to remove the clamp bands that hold the liquid chambers to the one-piece center section.

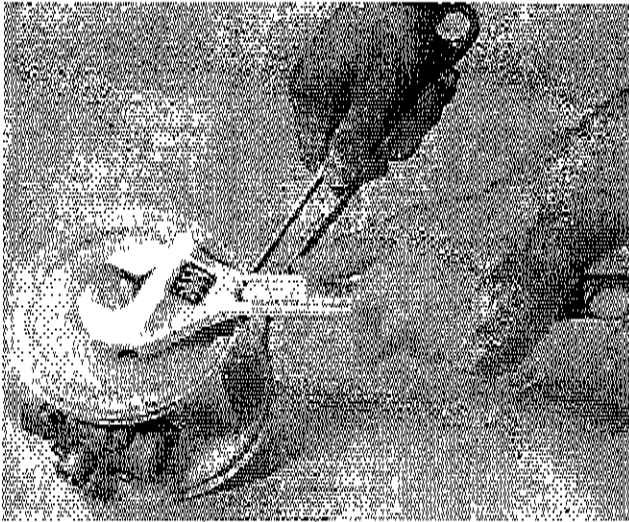


Figure 8A

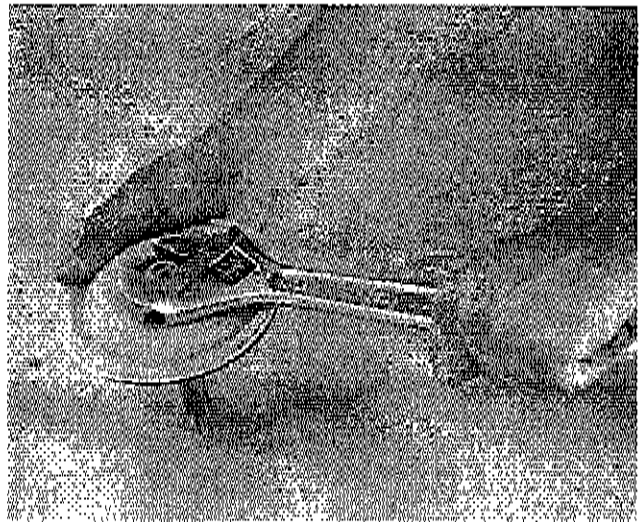


Figure 8B

Step 5.

Use the two adjustable wrenches to loosen the diaphragm piston plate from the connecting shaft. Only one piston plate will loosen. Remove it and the diaphragm. Remove the shaft and attached diaphragm from the center block. To remove the diaphragm from the shaft, hold the outer rim of the diaphragm and loosen the diaphragm piston plate with the adjustable wrench. If the plate will not loosen, the shaft must be placed in a vise. **Protect the shaft from damage by using wood blocks or soft jaws in the vise.** The plate can now be easily removed with the adjustable wrench.

At this point of disassembly, all wetted parts of the pump are available for inspection or repair.

If inspection, and/or servicing, of the non-wetted air section is necessary, please see Section 2.

REASSEMBLY

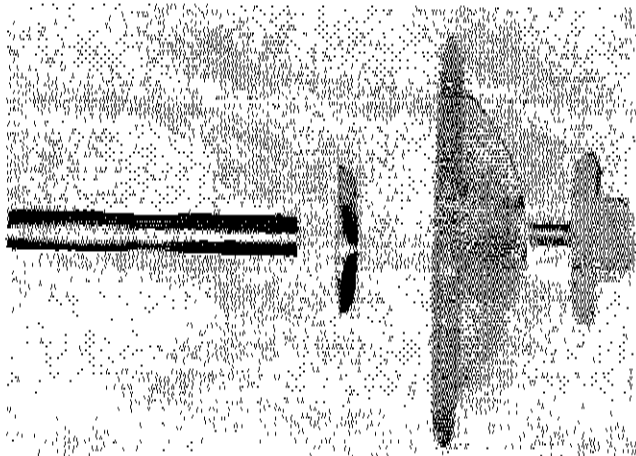


Figure 9A

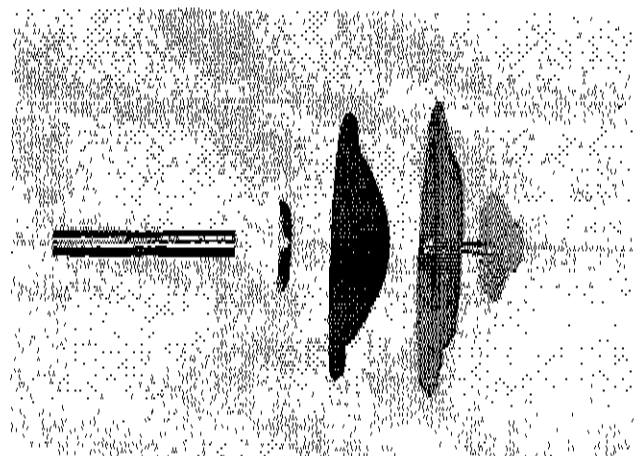


Figure 9B

Step 1.

First, install diaphragm and inner and outer piston on shaft. Observe **this side out** markings on diaphragm. Hand tighten only at this time, the outer piston to the shaft. Note: Pumps equipped with Teflon® diaphragms require that back-up diaphragm (P/N 01-1060-51) be used. See *Figure 9B*. O-rings and/or slipper seals may need to be replaced.

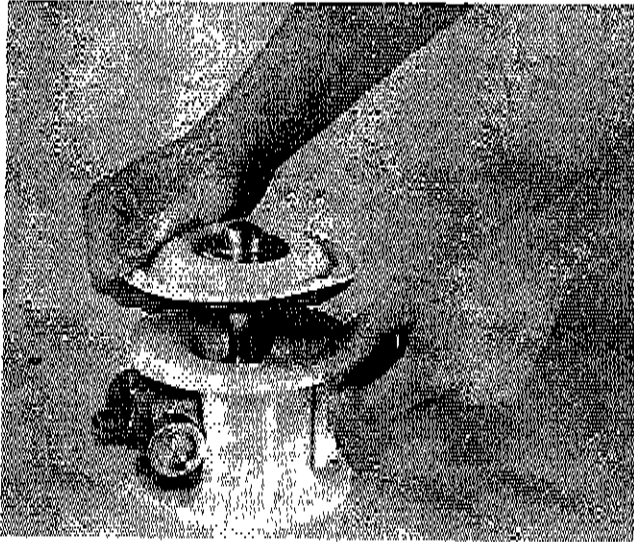


Figure 10A

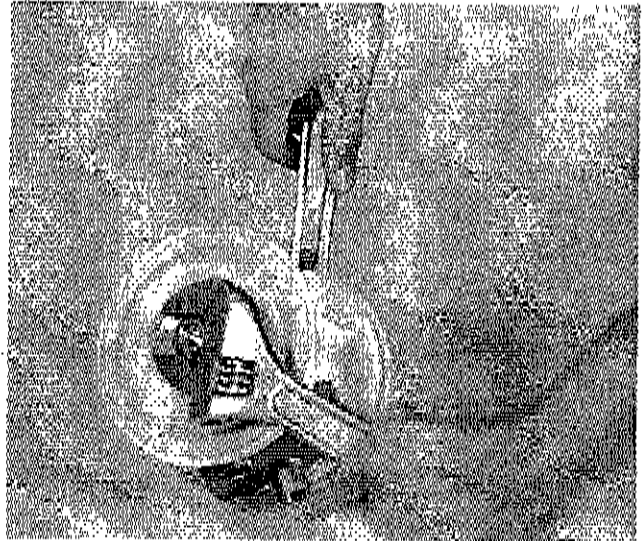


Figure 10B

Step 2.

Insert the shaft through the center block bushing. Install the opposite outer piston, diaphragm(s) and inner piston and tighten to the required torque specifications* (Item #2). **NOTE:** For lubed models, Wilden suggests an oil with arctic characteristics (ISO 15-5 wt.) to lubricate bushing prior to inserting shaft. Lube-free models do not require any lubrication during assembly or while in operation.

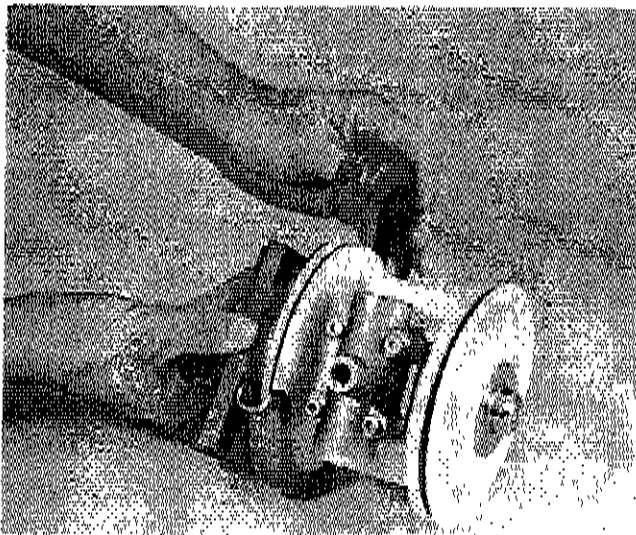


Figure 11A

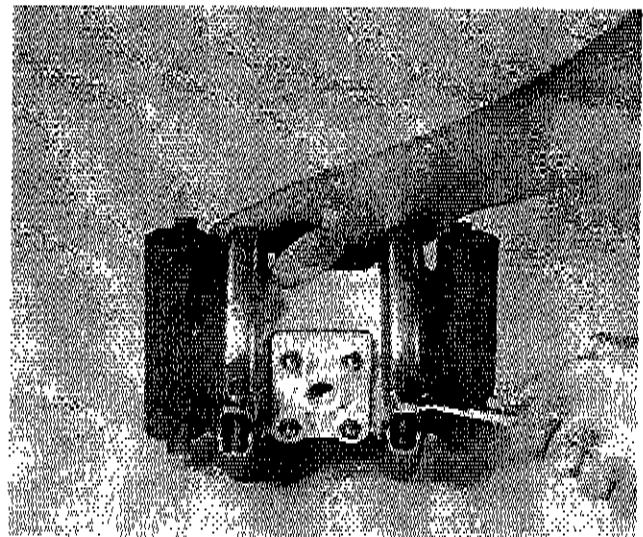


Figure 11B

Step 3.

Rubber/TPE Diaphragms. Locate one diaphragm so that its outer bead gently rests in the groove provided for it in the center section. Place the water chamber on the diaphragm using the alignment marks previously made during disassembly. Install and tighten the clamp band to the required torque specification*.

Install the second water chamber as above. Note: It may be necessary to adjust the diaphragm position slightly so that the bead gently rests in its groove in the center section.

*Refer to Section 8 for the required torque specifications.

Step 3A.

Teflon® Diaphragms. M1 Plastic Pumps fitted with Teflon® diaphragms require the use of a Teflon® gasket kit, P/N 01-9500-99. The Teflon® gasket material in this kit is an expanded type of Teflon® which is very strong but soft. Its use assures a positive seal between the Teflon® diaphragm outer bead and its corresponding groove in the water chamber. This gasket material should be replaced each time the pump is disassembled. No gasket material is needed in the assembly of metal pumps.

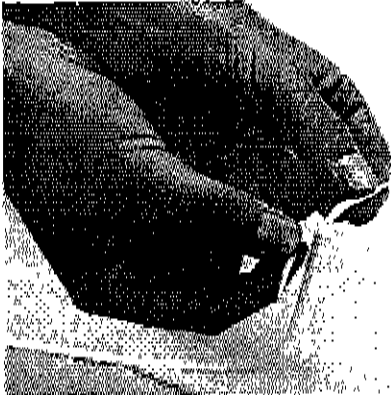


Figure 12A

Select a strip of 1/4" wide material approximately 15 inches in length and carefully remove the covering from the adhesive strip (see Figure 12A). Ensure that the adhesive remains attached to the gasket material.

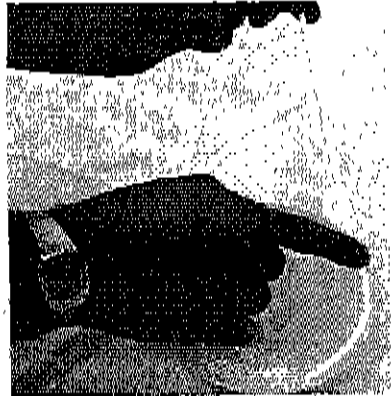


Figure 12B

Starting at any point, place the gasket strip in the center of the diaphragm bead groove on the water chamber and press lightly on the gasket to ensure that the adhesive holds it in place during assembly (see Figure 12B).



Figure 12C

The ends of the gasket strip should overlap approximately 1/2 inch (see Figure 12C).

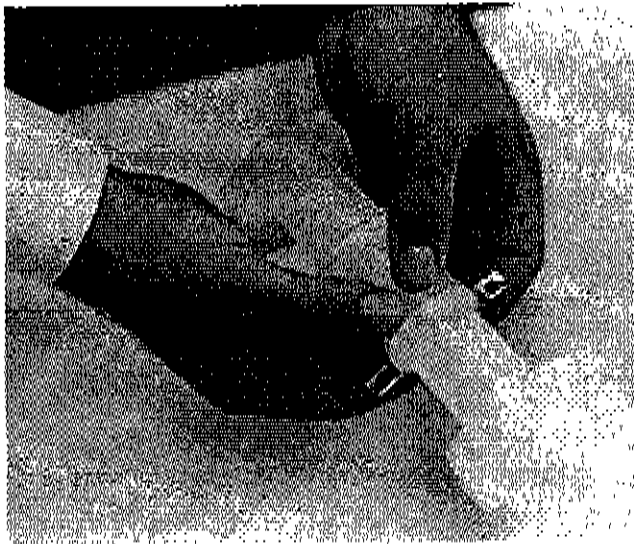


Figure 13A

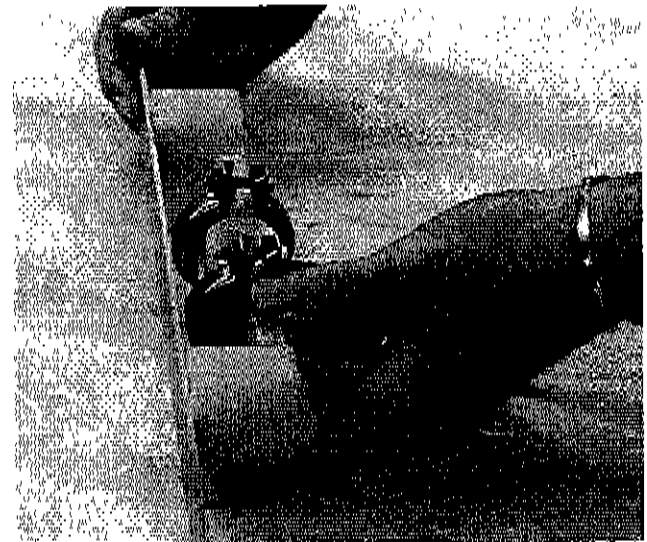


Figure 13B

Step 4.

Manifold Assembly. If the inlet and/or discharge manifold was taken apart, it should be reassembled now. The easiest way to do this is to take one half clamp band and wedge it onto the flanges of the elbow and center T-section. (See Figure 13A). This holds the two parts together while the second half band is installed and the bolts are hand-tightened. Attach the other elbow to the center T-section as above. Align the manifold parts as in Figure 13B, and tighten the clamps to the required torque specification*. Note: All PVDF and Teflon® pumps fitted with Teflon® elastomers, utilize gasket material around the seat area as well. If sealing is a concern, the gasket material can be used with the polypropylene pumps as well.

*Refer to Section 8 for the required torque specifications.

Step 5.

If the pump is equipped with optional Teflon® diaphragms, valve balls, and sealing rings around the valve seats, new Teflon® gaskets must be installed. The small flange manifold connections of the M1 "Champ" PVDF and Teflon® pumps are sealed with a Teflon® O-ring and a circular gasket. The gaskets are held in place during assembly by two adhesive strips. After installing the valve balls, valve seats and O-rings in the bottom of each water chamber and discharge manifold elbow place a circular gasket in position. No gasket material is needed for metal construction.

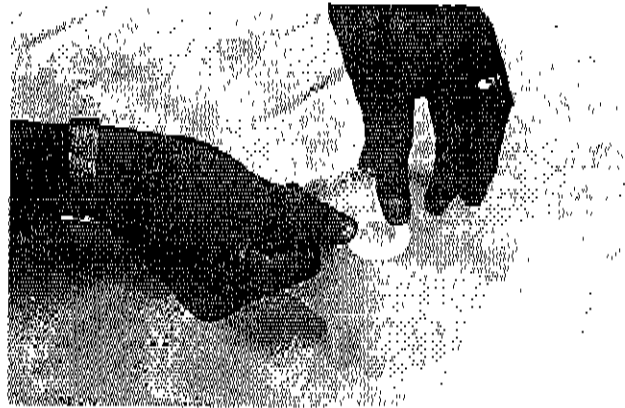


Figure 13B

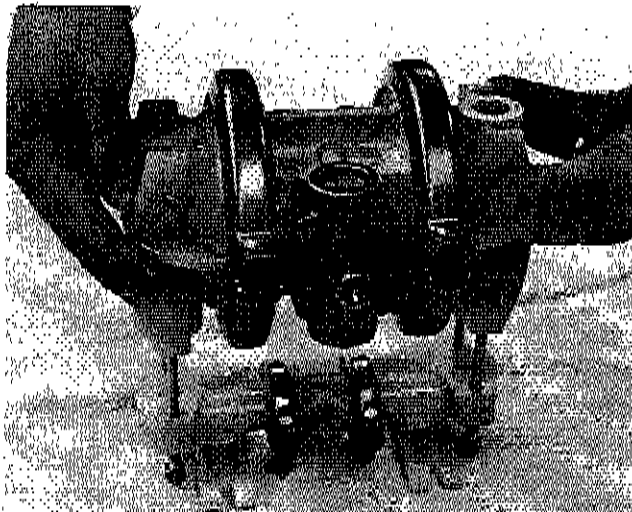


Figure 14A

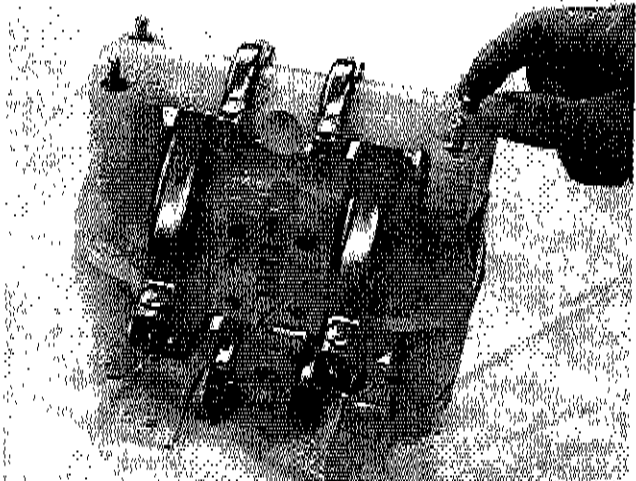


Figure 14B

Step 6.

Make sure the valve balls, valve seats, sealing O-rings, and Teflon® gaskets, if needed, are installed. Install the four long body bolts into the inlet manifold and place the main body of the pump onto the inlet housing. Place the discharge manifold on the center section. Put the washers and nuts on the bolts and tighten to the required torque specification*.

Step 7.

Retighten all clamp bands. When all maintenance and/or repairs are accomplished, an air line should be connected to the pump's air valve and the pump run dry. Be sure to blow out air line for 10 to 20 seconds before reinstalling pump in service. Good suction should be observed at the pump inlet. Approximately 10 inches of vacuum, should be observed with pumps fitted with rubber diaphragms and 7 inches with pumps fitted with Teflon® diaphragms. If pump does not operate or pull sufficient vacuum, refer to troubleshooting section.

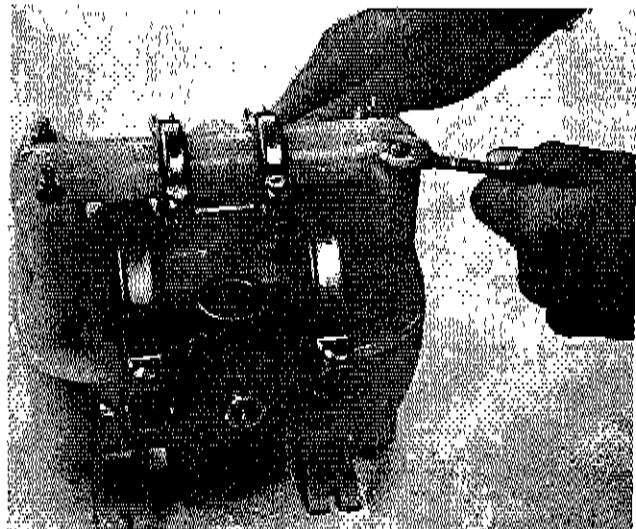


Figure 15B

*Refer to Section 8 for the required torque specifications.

SECTION 6B

DIRECTIONS FOR DISASSEMBLY/REASSEMBLY M1 ULTRAPURE II, III AND CARBON-FILLED ACETAL

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.

The Wilden® Ultrapure II and III pump model is an air-operated, double-diaphragm pump with all wetted parts molded in pure Teflon® PFA. The single-piece center section, consisting of center block and air chambers, is molded from glass-filled Polypropylene. All fasteners and hardware are Teflon®-coated stainless steel. The primary diaphragm is constructed of Teflon® PTFE. All wetted sealing O-rings are Teflon® encapsulated Viton on the UPII and Chemraz® on the UPIII. The standard air distribution system is used on UPII. The UPIII and carbon-filled Acetal air distribution system is made solely of plastic composites and is lube-free. All O-rings used in the pump are of a special material, and should only be replaced with Wilden factory-supplied parts.

Tools required to perform maintenance on the Model M1 pump are: 3/16-inch and 9/64-inch Allen wrench, 7/16-inch wrench, two open end adjustable wrenches, and an O-ring pick.

PLEASE read all directions before starting disassembly.

DISASSEMBLY

Step 1.

Before actual disassembly is started, turn pump upside down and drain all liquid trapped in the pump into a suitable container. Be sure to use proper caution if liquid is corrosive or toxic. Mark each liquid chamber to its respective air chamber for easy alignment during reassembly.

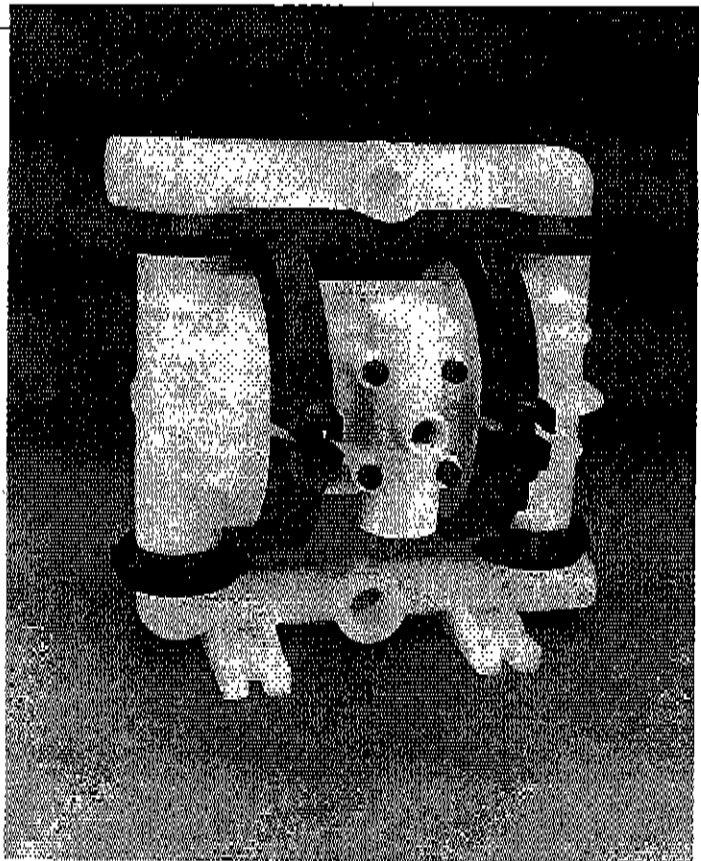


Figure 1

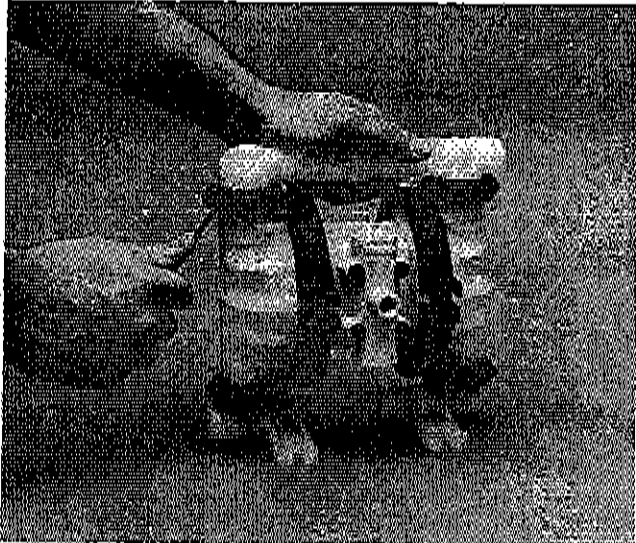


Figure 2

Step 1.

Using a 9/64-inch Allen wrench, remove clamp bands that hold the discharge manifold to the water chambers.

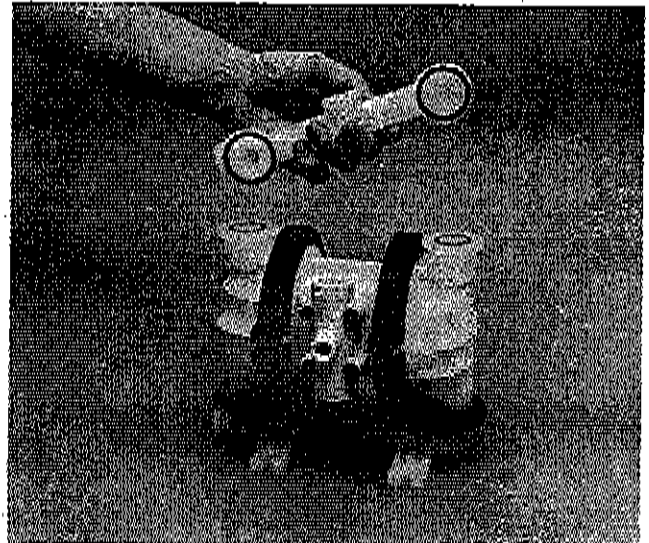


Figure 3

Step 2.

Remove discharge manifold, it is now possible to inspect the outboard O-rings.

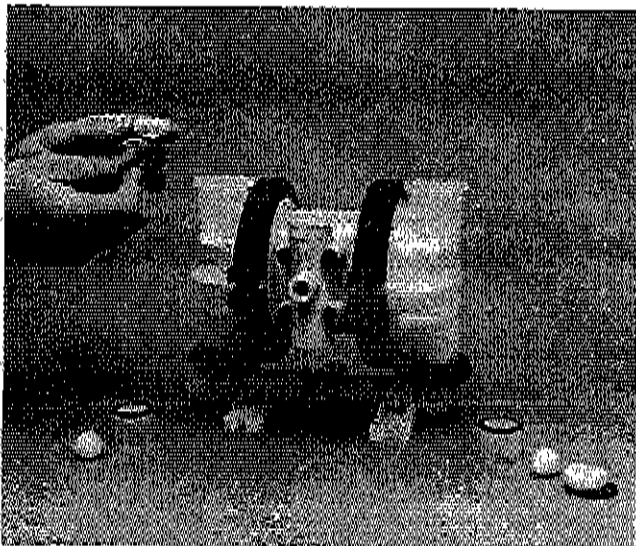


Figure 4

Step 3.

Remove the O-ring, ball cage and ball valve from the water chamber. It is now possible to inspect these parts (see Figure 4). Using the O-ring pick, remove the seat and seat O-ring from the water chamber for further inspection. If swelling, cracking or other damage is apparent, these parts must be replaced.

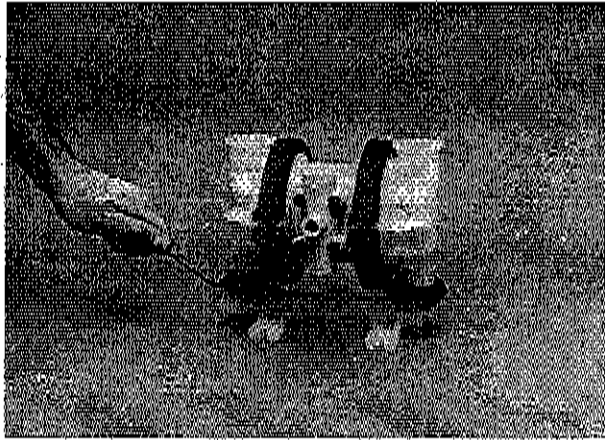


Figure 5

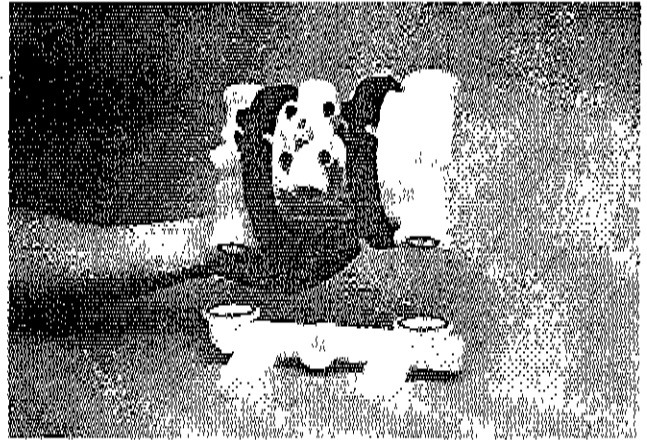


Figure 6

Step 4.

Loosen and remove clamp bands from around the Inlet manifold (see *Figure 5*). Lift center section off of the inlet manifold (see *Figure 6*). It is now possible to inspect the outboard O-rings on the inlet manifold.

Step 5.

Place center section upside-down on a flat surface. Remove the O-ring, seat and valve ball from the bottom of the water chamber. It is now possible to inspect these parts. If swelling, cracking or other damage is apparent these parts must be replaced (see *Figure 7*).

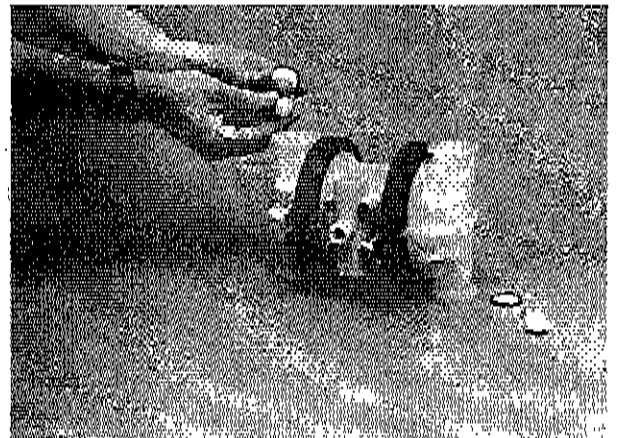


Figure 7



Figure 8

Step 6.

Loosen and remove clamp bands from around the water chambers (see *Figure 8*). This allows for inspection of the primary and containment diaphragms. Use the six point box wrench to loosen the diaphragm outer piston plate from the connecting shaft.

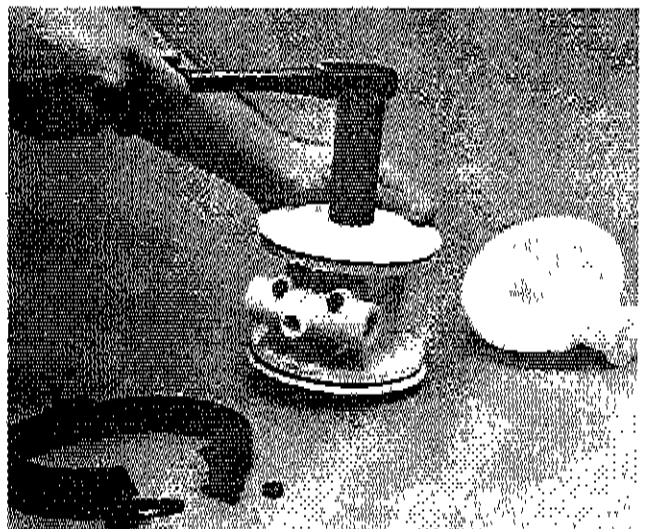


Figure 9

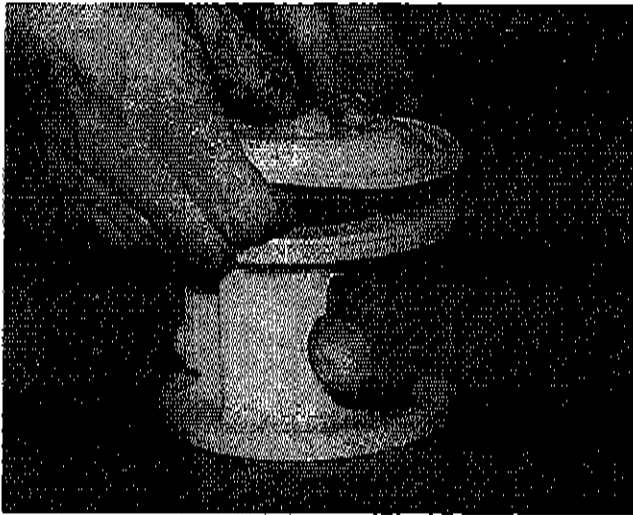


Figure 10

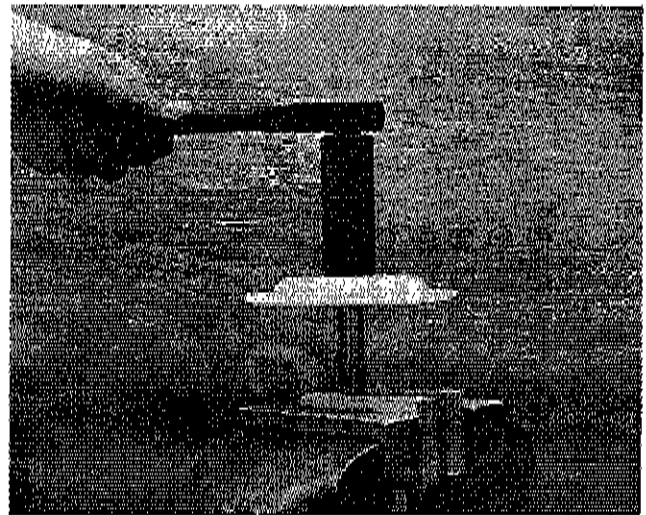


Figure 11

Step 7.

Only one piston plate will loosen in Step 6. Remove it and the diaphragms. Remove the shaft and attached diaphragms from the center block. To remove the diaphragms from the shaft, hold the outer rim of the diaphragm and loosen the diaphragm piston plate with the box wrench. If the plate will not loosen, the shaft must be placed in a vise. **Protect the shaft from damage by using wood blocks or soft jaws in the vise.** The plate can now be easily removed with the box wrench.

At this point of disassembly, all wetted parts of the pump are available for inspection or repair.

If inspection and/or servicing of the non-wetted air section is necessary, please see Section 6C and 6D.

REASSEMBLY

Step 1.

Insert the outer piston stud through the Teflon® diaphragm, containment diaphragm and inner piston. Hand-tighten this assembly onto the shaft. The back-up diaphragm is utilized for sealing purposes. It is installed between the containment diaphragm and bead area of the center section. (See Figure 12).

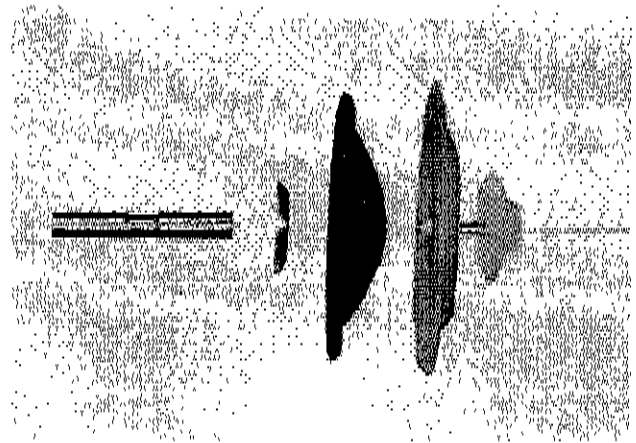


Figure 12

Step 2.

Insert the shaft through the center section bushing. Install the opposite back-up O-ring, inner piston, diaphragms, and outer piston and tighten to the required torque specifications*. (See Figure 13.)

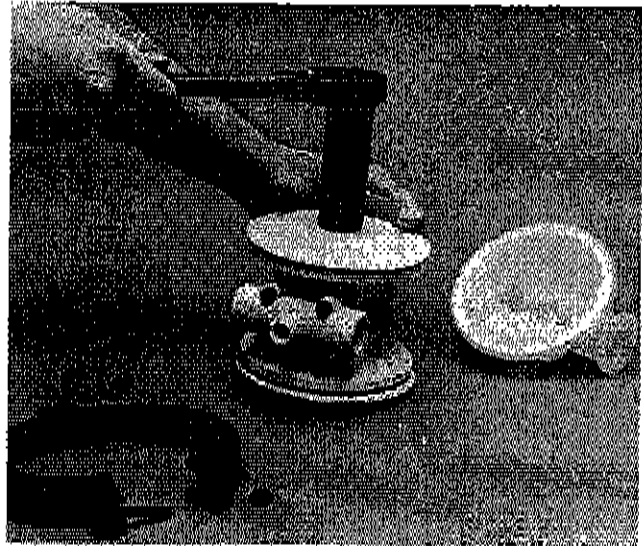


Figure 13

*Refer to Section 8 for the required torque specifications.

Step 3.

Teflon® Diaphragms. M1 pumps fitted with Teflon® diaphragms require the use of a Teflon® gasket kit, P/N 01-9500-99. The Teflon® gasket material in this kit is an expanded type of Teflon® which is very strong but soft. Its use assures a positive seal between the Teflon® diaphragm outer bead and its corresponding groove in the water chamber. This gasket material should be replaced each time the pump is disassembled.

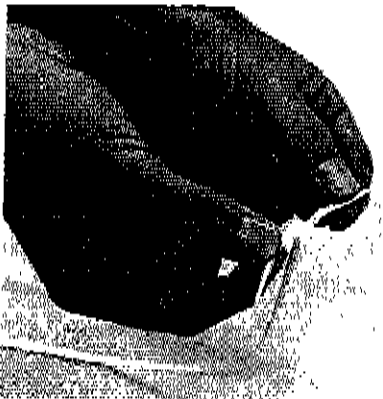


Figure 14



Figure 15

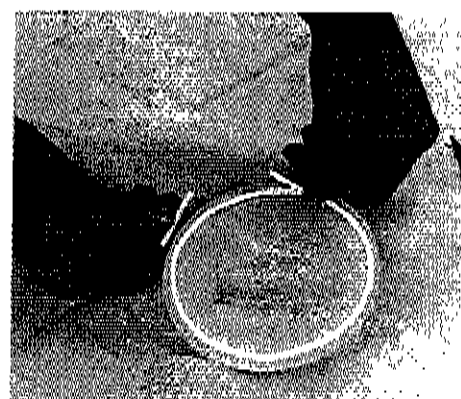


Figure 16

Select a strip of 1/4" wide material approximately 15 inches in length and carefully remove the covering from the adhesive strip (see Figure 14). Ensure that the adhesive remains attached to the gasket material.

Starting at any point, place the gasket strip in the center of the diaphragm bead groove on the water chamber and press lightly on the gasket to ensure that the adhesive holds it in place during assembly (see Figure 15).

The ends of the gasket strip should overlap approximately 1/2 inch (see Figure 16).



Figure 17

Step 4.

Attach water chambers to the center block making certain to realign your marks (see Figure 17). Replace large clamp bands and tighten to the required torque specification*.

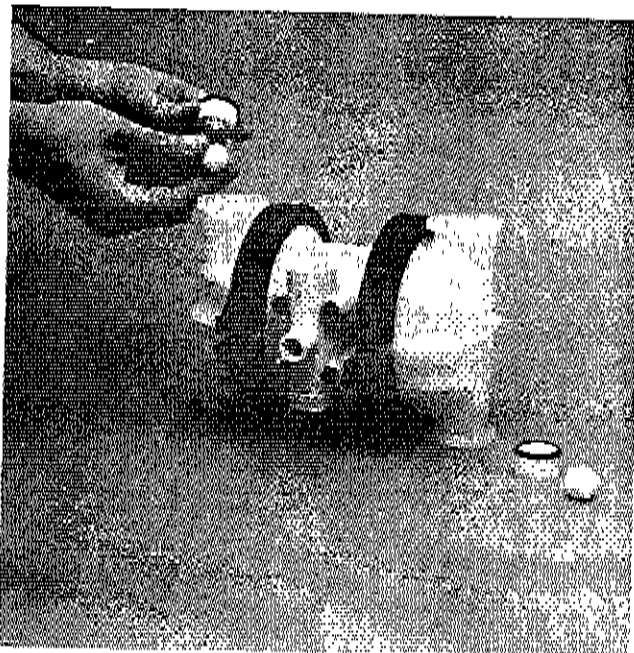


Figure 18

Step 5.

With center section upside-down, insert valve balls, seat and O-rings into the bottom of the water chambers. Install outboard Chemraz® O-rings in inlet manifold. Realign the inlet manifold (see Figure 18) and attach clamp bands. Tighten to the required torque specification*. The inlet should be facing the same direction as the air valve.

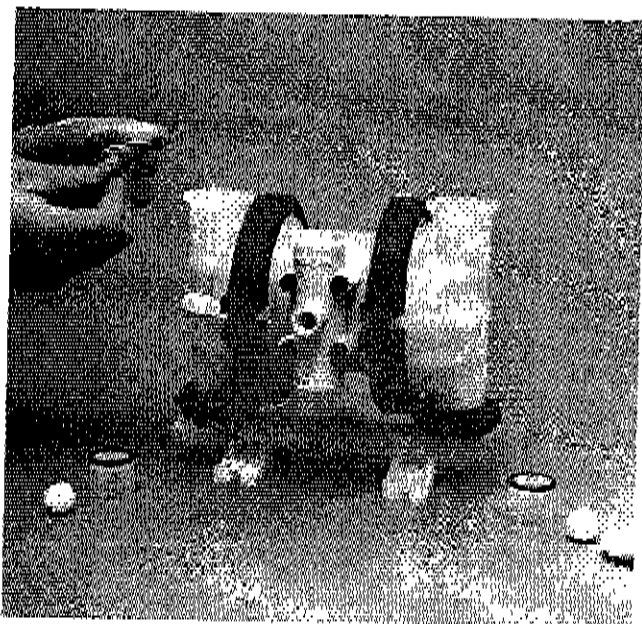


Figure 19

Step 6.

Turn the pump right-side-up. Insert the seat with O-ring installed in bottom groove, ball valve, ball cage and O-ring in the top of the water chamber. Install outboard Chemraz® O-rings in discharge manifold. Realign the discharge manifold with the discharge facing toward the air valve. Attach clamp bands (see Figure 20). Tighten to the required torque specification*.

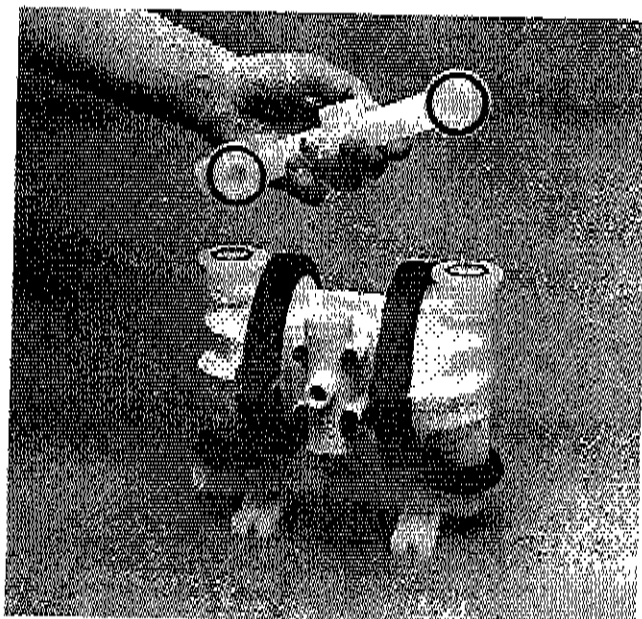


Figure 20

*Refer to Section 8 for the required torque specifications.

SECTION 6C

LUBED PUMPS AIR VALVE / CENTER SECTION REPAIR / MAINTENANCE

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.

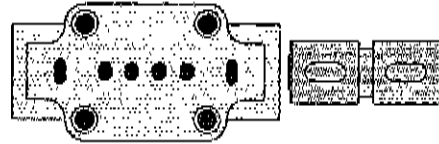


Figure A

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 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 1/8-inch 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 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. (Bushings are 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 and ENHANCED. 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 (01-3800-09-07) 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).

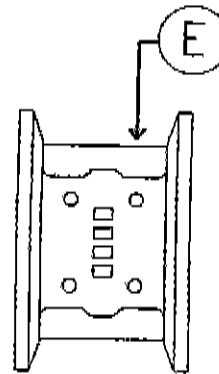
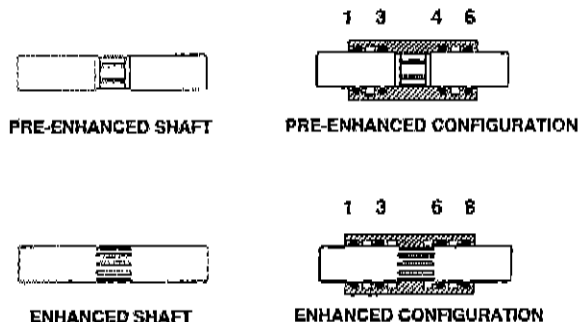


Figure C



*Refer to Section 8 for the required torque specifications.

SECTION 6D

LUBE-FREE PUMPS AIR VALVE / CENTER SECTION REPAIR / MAINTENANCE

AIR VALVE/CENTER SECTION REPAIR/MAINTENANCE

The center section assembly consists of both the air valve body and piston, and the center section. The lube-free design utilizes high-tech, engineered thermoplastics in place of the brass air valve, aluminum piston, and bronze bushing. This new system also includes slipper seals to reduce the coefficient of friction between the shaft and center section. This lube-free design includes the straight shaft and altered exhaust port configuration utilized in the enhanced M1 air distribution system. Low start-up pressure, on/off reliability, and increased sealing in a dead-head condition are a few of the advantages of the lube-free air distribution system. The selected thermoplastics have the ability to function together without lubrication making the M1 Wilden pump truly lube-free. *The M1 lube-free pumps are not pre-lubed with oil or grease.*

AIR VALVE BODY AND PISTON ASSEMBLY AND DISASSEMBLY

The air valve body and piston (P/N 01-2000-65-200) is externally serviceable by removing the four socket-head cap screws which attach it to the center section. The lube-free air valve body is off-white in color and has an encircled "LF" molded into the exterior. The thermoplastic air valve piston is gray color like the aluminum lubed style, but is differentiated by a "D-shaped hole" in the top of the piston, and two small holes in the annular groove. (See *Figure B*.)

The piston should move freely and the ports in the piston must line-up with the ports on the face of the air valve body (see *Figure B*). If the piston does not move freely in the valve body, the entire air valve assembly should be immersed in a mild soap solution to remove any accumulation of sludge and/or grit. If the air valve does not move freely after the above cleaning, the air valve should be disassembled as follows: Remove the snap ring from the top of the air valve cylinder and apply an air jet to the 1/8" hole on the opposite end of the air valve face. Caution: The end cap may come out with considerable force. Verify that the guide pin molded into one of the end caps (P/N 01-2300-23-200) is straight and smooth to allow the piston to shift properly. Inspect the piston and cylinder bore for nicks and scoring. Small nicks can be dressed with fine sandpaper and the piston returned to service. Clean and re-assemble. **Install air valve to center section and tighten to the required torque specifications.**

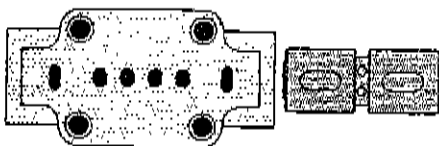


Figure B

O-RING REPLACEMENT/CENTER SECTION

The M1 lube-free Champ series pumps are constructed with a glass-filled polypropylene center section with a thermoplastic bushing. The M1 lube-free Metal pumps are constructed with a nylon center section with a thermoplastic bushing. These center sections are easily distinguished by the encircled letter "LF" stamped on the top of the center section. These bushings are not removable. This bushing has grooves cut into the inside diameter where back-up O-rings and slipper seals are installed. It is important that the correct O-ring is utilized. The back-up O-ring for the lube-free model has a bigger diameter and smaller cross-section in comparison to the "Lubed" model. The straight shaft (P/N 01-3800-09-07) must be utilized in the lube-free pump.

The back-up O-ring is installed first. This is most easily accomplished by using a tool called an O-ring pick, available through most industrial supply companies. The O-rings must be installed in the appropriate grooves as shown in *Figure C* (1, 3, 6, 8). Upon completion of the O-ring installation, the slipper seals (P/N 01-3210-55-200) must be installed in the same grooves (1, 3, 6, 8). This task is accomplished by utilizing long nose pliers and a flat head screw driver. Please see *Figures D, E, and F*.

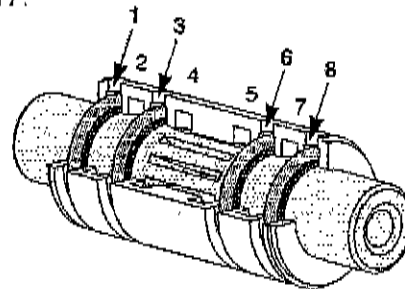


Figure C

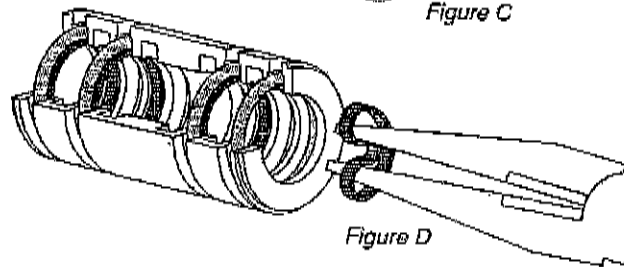


Figure D

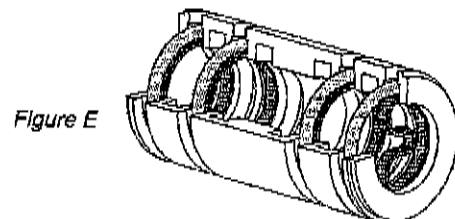


Figure E

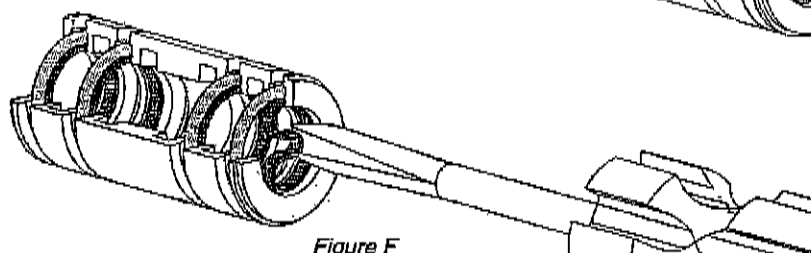
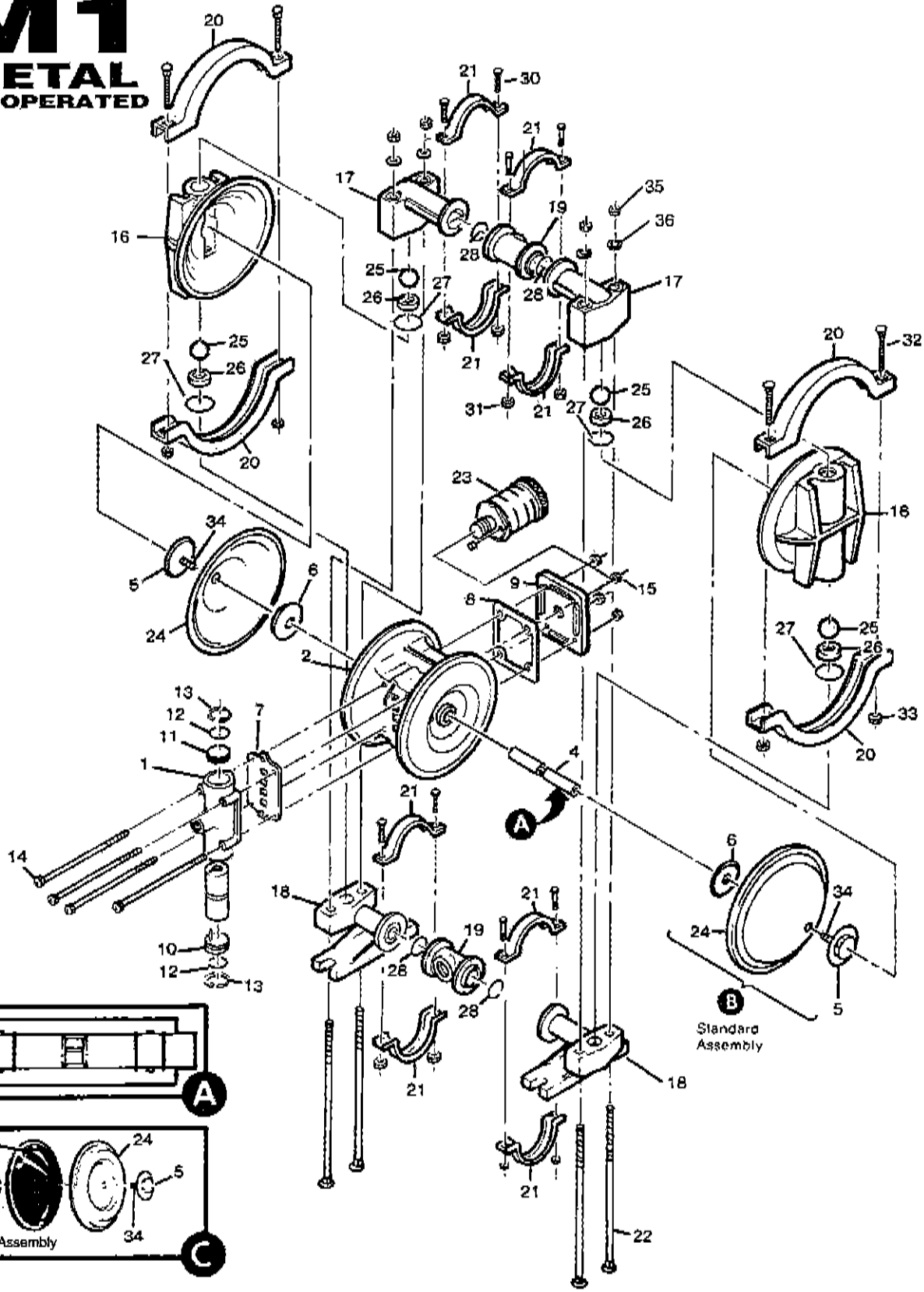


Figure F

SECTION 7A

M1 METAL AIR-OPERATED



MODEL M1 METAL

Item	Part Description	Qty. Per Pump	Rubber-Fitted		Teflon®-Fitted		Food Processing	
			M1/ AYYB	M1/ SYYP	M1/ AYYB	M1/ SYYP	M1-70/ SYYN	M1-70 SYYN
			P/N	P/N	P/N	P/N	Saniflex™ P/N	Teflon® P/N
1	Air Valve Assembly	1	01-2000-07	01-2000-07	01-2000-07	01-2000-07	01-2000-06	01-2000-06
2	Corner Section*	1	01-3152-23†	01-3152-23†	01-3152-23†	01-3152-23†	01-3152-23†	01-3152-23†
3	Center Block O-Ring	4	01-3200-52	01-3200-52	01-3200-52	01-3200-52	01-3200-52	01-3200-52
4	Shaft‡	1	01-3800-09-07†	01-3800-09-07†	01-3800-09-07†	01-3800-09-07†	01-3800-09-07†	01-3800-09-07†
5	Pistons/Outer	2	01-4570-01	01-4570-03	01-4570-01	01-4570-03	01-4570-03	01-4570-03
6	Pistons/Inner	2	01-3710-01	01-3710-01	01-3710-01	01-3710-01	01-3710-01	01-3710-01
7	Air Valve Gasket	1	01-2600-52	01-2600-52	01-2600-52	01-2600-52	01-2600-52	01-2600-52
8	Muffler Plate Gasket	1	01-3500-52	01-3500-52	01-3500-52	01-3500-52	01-3500-52	01-3500-52
9	Muffler Plate	1	01-3180-23	01-3180-23	01-3180-23	01-3180-23	01-3180-23	01-3180-23
10	End Cap w/Guide	1	01-2300-23	01-2300-23	01-2300-23	01-2300-23	01-2300-23	01-2300-23
11	End Cap w/o Guide	1	01-2330-23	01-2330-23	01-2330-23	01-2330-23	01-2330-23	01-2330-23
12	Buna O-Ring - 115 70 Shore	2	01-2390-52	01-2390-52	01-2390-52	01-2390-52	01-2390-52	01-2390-52
13	End Cap Snap Ring	2	01-2650-03	01-2650-03	01-2650-03	01-2650-03	01-2650-03	01-2650-03
14	Air Valve Cap Screw	4	01-6000-03	01-6000-03	01-6000-03	01-6000-03	01-6000-03	01-6000-03
15	Air Valve Cap Screw Nut	4	04-6400-03	04-6400-03	04-6400-03	04-6400-03	04-6400-03	04-6400-03
16	Water Chamber	2	01-5000-01	01-5000-03	01-5000-01	01-5000-03	01-5000-03	01-5000-03
17	Discharge Manifold Elbow	2	01-5230-01	01-5230-03	01-5230-01	01-5230-03	01-5230-03	01-5230-03
18	Inlet Manifold Elbow	2	01-5220-01	01-5220-03	01-5220-01	01-5220-03	01-5220-03	01-5220-03
19	Manifold "T" Section	2	01-5160-01	01-5160-03	01-5160-01	01-5160-03	01-5160-03-70	01-5160-03-70
20	Clamp Band (Large)	2	01-7300-03	01-7300-03	01-7300-03	01-7300-03	01-7300-03	01-7300-03
21	Clamp Band (Small)	4	01-7100-03	01-7100-03	01-7100-03	01-7100-03	01-7100-03	01-7100-03
22	Vertical Bolt	4	01-6080-03	01-6080-03	01-6080-03	01-6080-03	01-6080-03	01-6080-03
23	Muffler	1	01-3510-99	01-3510-99	01-3510-99	01-3510-99	01-3510-99	01-3510-99
24	Diaphragm	2			01-1010-55	01-1010-55	01-1010-55	01-1010-55
25	Valve Ball	4			01-1080-55	01-1080-55	01-1080-55	01-1080-55
26	Valve Seat	4	01-1120-01	01-1120-03	01-1120-01	01-1120-03	01-1120-03	01-1120-03
27	Valve Seat O-Ring	4			01-1200-55	01-1200-55	01-1200-55	01-1200-55
28	Manifold O-Ring	4			01-1300-55	01-1300-55	01-1300-55	01-1300-55
29	Back-up Diaphragm	2	N/R	N/R	01-1060-51	01-1060-51	N/R	01-1060-51
30	Small Clamp Band Bolt	8	01-6100-03	01-6100-03	01-6100-03	01-6100-03	01-6100-03	01-6100-03
31	Small Clamp Band Nut	8	01-6400-03	01-6400-03	01-6400-03	01-6400-03	01-6400-03	01-6400-03
32	Large Clamp Band Bolt	4	01-6070-03	01-6070-03	01-6070-03	01-6070-03	01-6070-03	01-6070-03
33	Large Clamp Band Nut	4	04-6400-03	04-6400-03	04-6400-03	04-6400-03	04-6650-03-70	04-6650-03-70
34	Shaft Stud	2	01-6150-08	01-6150-08	01-6150-08	01-6150-08	01-6150-08	01-6150-08
35	Vertical Bolt Nut	4	04-6400-03	04-6400-03	04-6400-03	04-6400-03	04-6400-03	04-6400-03
36	Vertical Bolt Washer	4	01-6730-03	01-6730-03	01-6730-03	01-6730-03	01-6730-03	01-6730-03

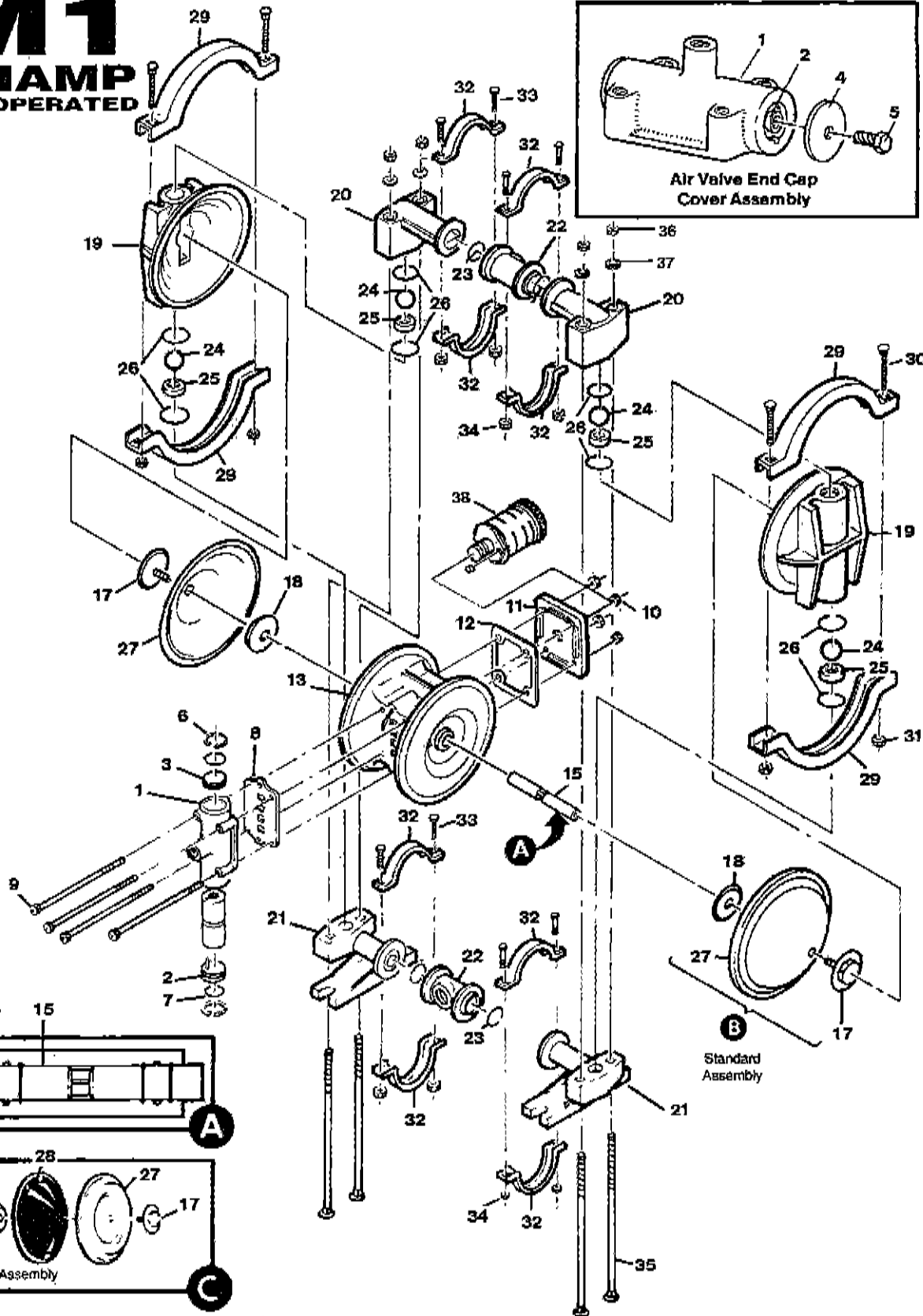
LUBE-FREE MODEL M1 METAL

Item	Part Description	Qty. Per Pump	Rubber-Fitted		Teflon®-Fitted		Food Processing	
			M1/ AYYZ	M1/ SYYZ	M1/ AYYZ	M1/ SYYZ	M1-73/ SYYZ	M1-73/ SYYZ
			LF P/N	LF P/N	LF P/N	LF P/N	LF-Saniflex™ P/N	LF-Teflon® P/N
1	Air Valve Assembly — Lube-Free	1	01-2000-65-200	01-2000-65-200	01-2000-65-200	01-2000-65-200	01-2000-65-200	01-2000-65-200
2	Nylon Corner Section — Lube-Free†	1	01-3150-23-200	01-3150-23-200	01-3150-23-200	01-3150-23-200	01-3150-23-200	01-3150-23-200
3	Buna O-Ring - 115 70 Shore	4	01-2390-52	01-2390-52	01-2390-52	01-2390-52	01-2390-52	01-2390-52
4	Slipper Seat (Not shown)	4	01-3210-55-200	01-3210-55-200	01-3210-55-200	01-3210-55-200	01-3210-55-200	01-3210-55-200
5	Shaft‡	1	01-3800-09-07†	01-3800-09-07†	01-3800-09-07†	01-3800-09-07†	01-3800-09-07†	01-3800-09-07†
5	Pistons/Outer	2	01-4570-01	01-4570-03	01-4570-01	01-4570-03	01-4570-03	01-4570-03
6	Pistons/Inner	2	01-3710-01	01-3710-01	01-3710-01	01-3710-01	01-3710-01	01-3710-01
7	Air Valve Gasket	1	01-2600-52	01-2600-52	01-2600-52	01-2600-52	01-2600-52	01-2600-52
8	Muffler Plate Gasket	1	01-3500-52	01-3500-52	01-3500-52	01-3500-52	01-3500-52	01-3500-52
9	Muffler Plate	1	01-3180-23	01-3180-23	01-3180-23	01-3180-23	01-3180-23	01-3180-23
10	End Cap w/Plastic Guide	1	01-2300-23-200	01-2300-23-200	01-2300-23-200	01-2300-23-200	01-2300-23-200	01-2300-23-200
11	End Cap w/o Guide	1	01-2330-23	01-2330-23	01-2330-23	01-2330-23	01-2330-23	01-2330-23
12	Buna O-Ring - 115 70 Shore	2	01-2390-52	01-2390-52	01-2390-52	01-2390-52	01-2390-52	01-2390-52
13	End Cap Snap Ring	2	01-2650-03	01-2650-03	01-2650-03	01-2650-03	01-2650-03	01-2650-03
14	Air Valve Cap Screw	4	01-6000-03	01-6000-03	01-6000-03	01-6000-03	01-6000-03	01-6000-03
15	Air Valve Cap Screw Nut	4	04-6400-03	04-6400-03	04-6400-03	04-6400-03	04-6400-03	04-6400-03
16	Water Chamber	2	01-5000-01	01-5000-03	01-5000-01	01-5000-03	01-5000-03	01-5000-03
17	Discharge Manifold Elbow	2	01-5230-01	01-5230-03	01-5230-01	01-5230-03	01-5230-03	01-5230-03
18	Inlet Manifold Elbow	2	01-5220-01	01-5220-03	01-5220-01	01-5220-03	01-5220-03	01-5220-03
19	Manifold "T" Section	2	01-5160-01	01-5160-03	01-5160-01	01-5160-03	01-5160-03-70	01-5160-03-70
20	Clamp Band (Large)	2	01-7300-03	01-7300-03	01-7300-03	01-7300-03	01-7300-03	01-7300-03
21	Clamp Band (Small)	4	01-7100-03	01-7100-03	01-7100-03	01-7100-03	01-7100-03	01-7100-03
22	Vertical Bolt	4	01-6080-03	01-6080-03	01-6080-03	01-6080-03	01-6080-03	01-6080-03
23	Muffler	1	01-3510-99	01-3510-99	01-3510-99	01-3510-99	01-3510-99	01-3510-99
24	Diaphragm	2			01-1010-55	01-1010-55	01-1010-55	01-1010-55
25	Valve Ball	4			01-1080-55	01-1080-55	01-1080-55	01-1080-55
26	Valve Seat	4	01-1120-01	01-1120-03	01-1120-01	01-1120-03	01-1120-03	01-1120-03
27	Valve Seat O-Ring	4			01-1200-55	01-1200-55	01-1200-55	01-1200-55
28	Manifold O-Ring	4			01-1300-55	01-1300-55	01-1300-55	01-1300-55
29	Back-up Diaphragm	2	N/R	N/R	01-1060-51	01-1060-51	N/R	01-1060-51
30	Small Clamp Band Bolt	8	01-6100-03	01-6100-03	01-6100-03	01-6100-03	01-6100-03	01-6100-03
31	Small Clamp Band Nut	8	01-6400-03	01-6400-03	01-6400-03	01-6400-03	01-6400-03	01-6400-03
32	Large Clamp Band Bolt	4	01-6070-03	01-6070-03	01-6070-03	01-6070-03	01-6070-03	01-6070-03
33	Large Clamp Band Nut	4	04-6400-03	04-6400-03	04-6400-03	04-6400-03	04-6650-03-70	04-6650-03-70
34	Shaft Stud	2	01-6150-08	01-6150-08	01-6150-08	01-6150-08	01-6150-08	01-6150-08
35	Vertical Bolt Nut	4	04-6400-03	04-6400-03	04-6400-03	04-6400-03	04-6400-03	04-6400-03
36	Vertical Bolt Washer	4	01-6730-03	01-6730-03	01-6730-03	01-6730-03	01-6730-03	01-6730-03

*Air Valve Assembly Includes Items 10, 11, 12, 13.
 †Refer to Section 6C or 6D prior to ordering these parts.
 ‡Refer to corresponding elastomer chart in Section 8.

SECTION 7B

M1 CHAMP AIR-OPERATED



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

MODEL M1 CHAMP RUBBER/TPE-FITTED

Item	Part Description	Qty. Per Pump	M1/PPPB	M1/KPPB	M1-502/PPPC	M1-502/KPPC
			P/N	P/N	P/N	P/N
1	Air Valve Assembly ¹	1	01-2000-07	01-2000-07	01-2000-05	01-2000-05
2	Air Valve End Cap w/Guide (Top)	1	01-2300-23	01-2300-23	01-2300-23	01-2300-23
3	Air Valve End Cap w/o Guide (Bottom)	1	01-2330-23	01-2330-23	01-2330-23	01-2330-23
4	Air Valve End Cap Cover	2	N/A	N/A	01-2420-55	01-2420-55
5	Air Valve End Cap Bolt	2	N/A	N/A	01-2450-22	01-2450-22
6	Snap Ring	2	01-2650-03	01-2650-03	01-2650-03	01-2650-03
7	Buna O-Ring - 115 70 Shore	2	01-2390-52	01-2390-52	01-2390-52	01-2390-52
8	Air Valve Gasket	1	01-2600-52	01-2600-52	01-2600-52	01-2600-52
9	Air Valve Screw	4	01-6000-03	01-6000-03	01-6000-05	01-6000-05
10	Air Valve Screw Nut	4	04-6400-03	04-6400-03	04-6400-05	04-6400-05
11	Muffler Plate	1	01-3180-20	01-3180-20	01-3180-20	01-3180-20
12	Muffler Plate Gasket	1	01-3500-30	01-3500-30	01-3500-30	01-3500-30
13	Center Section	1	01-3151-20 ²	01-3151-20 ²	01-3151-20 ²	01-3151-20 ²
14	Center Block O-Ring	4	01-3200-52	01-3200-52	01-3200-52	01-3200-52
15	Shaft ³	1	01-3800-09-07 ²	01-3800-09-07 ²	01-3800-09-07 ²	01-3800-09-07 ²
16	Shaft Stud ¹	2	N/A	N/A	N/A	N/A
17	Piston, Outer	2	01-4570-20-500	01-4570-20-500	01-4570-20-500	01-4570-20-500
18	Piston, Inner	2	01-3710-01	01-3710-01	01-3710-01	01-3710-01
19	Liquid Chamber	2	01-5000-20	01-5000-21	01-5000-20	01-5000-21
20	Discharge Manifold Elbow	2	01-5230-20	01-5230-21	01-5230-20	01-5230-21
21	Inlet Manifold Elbow	2	01-5220-20	01-5220-21	01-5220-20	01-5220-21
22	Manifold Tee Section (Female, Threaded)	2	01-5160-20	01-5160-21	01-5160-20	01-5160-21
23	Manifold O-Ring	4				
24	Valve Ball	4				
25	Valve Seats	4	01-1120-21-500	01-1120-21-500	01-1120-21-500	01-1120-21-500
26	Valve Seat O-Ring	8				
27	Diaphragm	2				
28	Back-up Diaphragm	2	N/A	N/A	N/A	N/A
29	Large Clamp Band	2	01-7300-03	01-7300-03	01-7300-05	01-7300-05
30	Large Clamp Band Bolt	4	01-6070-03	01-6070-03	01-6070-05	01-6070-05
31	Large Clamp Band Nut	4	04-6400-03	04-6400-03	04-6400-05	04-6400-05
32	Small Clamp Band	4	01-7100-03	01-7100-03	01-7100-05	01-7100-05
33	Small Clamp Band Bolt	8	01-6100-03	01-6100-03	01-6100-05	01-6100-05
34	Small Clamp Band Nut	8	01-6400-03	01-6400-03	01-6400-05	01-6400-05
35	Vertical Bolt	4	01-6080-03	01-6080-03	01-6080-05	01-6080-05
36	Vertical Bolt Nut	4	04-6400-03	04-6400-03	04-6400-05	04-6400-05
37	Vertical Bolt Washer	4	01-6730-03	01-6730-03	01-6730-05	01-6730-05
38	Muffler	1	01-3510-99	01-3510-99	01-3510-99	01-3510-99

LUBE-FREE MODEL M1 CHAMP RUBBER/TPE-FITTED

Item	Part Description	Qty. Per Pump	M1-200/PPPZ	M1-200/KPPZ	M1-201/PPPZ	M1-201/PPPZ
			LF P/N	LF P/N	LF P/N	LF P/N
1	Air Valve Assembly ¹ — Lube-free	1	01-2000-65-200	01-2000-65-200	01-2000-65-200	01-2000-65-200
2	Air Valve End Cap w/Plastic Guide (Top)	1	01-2300-23-200	01-2300-23-200	01-2300-23-200	01-2300-23-200
3	Air Valve End Cap w/o Guide (Bottom)	1	01-2330-23	01-2330-23	01-2330-23	01-2330-23
4	Air Valve End Cap Cover	2	N/A	N/A	01-2420-55	01-2420-55
5	Air Valve End Cap Bolt — Lube-free	2	N/A	N/A	01-2450-22-200	01-2450-22-200
6	Snap Ring	2	01-2650-03	01-2650-03	01-2650-03	01-2650-03
7	Buna O-Ring - 115 70 Shore	2	01-2390-52	01-2390-52	01-2390-52	01-2390-52
8	Air Valve Gasket	1	01-2600-52	01-2600-52	01-2600-52	01-2600-52
9	Air Valve Screw	4	01-6000-03	01-6000-03	01-6000-05	01-6000-05
10	Air Valve Screw Nut	4	04-6400-03	04-6400-03	04-6400-05	04-6400-05
11	Muffler Plate	1	01-3180-20	01-3180-20	01-3180-20	01-3180-20
12	Muffler Plate Gasket	1	01-3500-52	01-3500-52	01-3500-52	01-3500-52
13	Polypropylene Center Section ¹ — Lube-free	1	01-3152-20-200	01-3152-20-200	01-3152-20-200	01-3152-20-200
14	Buna O-Ring - 115 70 Shore	4	01-2390-52	01-2390-52	01-2390-52	01-2390-52
15	Slipper Seal (Not shown)	4	01-3210-55-200	01-3210-55-200	01-3210-55-200	01-3210-55-200
16	Shaft ³	1	01-3800-09-07 ²	01-3800-09-07 ²	01-3800-09-07 ²	01-3800-09-07 ²
17	Shaft Stud ¹	2	N/A	N/A	N/A	N/A
18	Piston, Outer	2	01-4570-20-500	01-4570-20-500	01-4570-20-500	01-4570-20-500
19	Piston, Inner	2	01-3710-01	01-3710-01	01-3710-01	01-3710-01
20	Liquid Chamber	2	01-5000-20	01-5000-21	01-5000-20	01-5000-21
21	Discharge Manifold Elbow	2	01-5230-20	01-5230-21	01-5230-20	01-5230-21
22	Inlet Manifold Elbow	2	01-5220-20	01-5220-21	01-5220-20	01-5220-21
23	Manifold Tee Section (Female, Threaded)	2	01-5160-20	01-5160-21	01-5160-20	01-5160-21
24	Manifold O-Ring	4				
25	Valve Ball	4				
26	Valve Seats	4	01-1120-21-500	01-1120-21-500	01-1120-21-500	01-1120-21-500
27	Valve Seat O-Ring	8				
28	Diaphragm	2				
29	Back-up Diaphragm	2	N/A	N/A	N/A	N/A
30	Large Clamp Band	2	01-7300-03	01-7300-03	01-7300-05	01-7300-05
31	Large Clamp Band Bolt	4	01-6070-03	01-6070-03	01-6070-05	01-6070-05
32	Large Clamp Band Nut	4	04-6400-03	04-6400-03	04-6400-05	04-6400-05
33	Small Clamp Band	4	01-7100-03	01-7100-03	01-7100-05	01-7100-05
34	Small Clamp Band Bolt	8	01-6100-03	01-6100-03	01-6100-05	01-6100-05
35	Small Clamp Band Nut	8	01-6400-03	01-6400-03	01-6400-05	01-6400-05
36	Vertical Bolt	4	01-6080-03	01-6080-03	01-6080-05	01-6080-05
37	Vertical Bolt Nut	4	04-6400-03	04-6400-03	04-6400-05	04-6400-05
38	Vertical Bolt Washer	4	01-6730-03	01-6730-03	01-6730-05	01-6730-05
39	Muffler	1	01-3510-99	01-3510-99	01-3510-99	01-3510-99

¹Shaft stud is molded into outer piston on all plastic pumps.

²Refer to Section 6C or 6D prior to ordering these parts.

³Refer to corresponding elastomer chart in Section B.

MODEL M1 CHAMP TEFLON®-FITTED

Item	Part Description	Qty. Per Pump	M1-PPPZ	M1-KPPZ	M1-50Z/PPPZ	M1-50Z/KPPZ	M1-50Z/TPPB	M1-50Z/TPPC	M1-52Z/TPPB	M1-62Z/TPPC
			P/N	P/N	P/N	P/N	P/N	P/N	P/N	P/N
1	Air Valve Assembly	1	01-2300-07	01-2300-07	01-2300-05	01-2300-05	01-2300-07	01-2300-05	01-2300-07	01-2300-05
2	Air Valve End Cap w/ Guide (Top)	1	01-2300-23	01-2300-23	01-2300-23	01-2300-23	01-2300-23	01-2300-23	01-2300-23	01-2300-23
3	Air Valve End Cap w/ Guide (Bottom)	1	01-2300-23	01-2300-23	01-2300-23	01-2300-23	01-2300-23	01-2300-23	01-2300-23	01-2300-23
4	Air Valve End Cap Cover	2	N/A	N/A	01-2420-55	01-2420-55	N/A	01-2420-55	N/A	01-2420-55
5	Air Valve End Cap Bolt	2	N/A	N/A	01-2450-22	01-2450-22	N/A	01-2450-22	N/A	01-2450-22
6	Snap Ring	2	01-2650-03	01-2650-03	01-2650-03	01-2650-03	01-2650-03	01-2650-03	01-2650-03	01-2650-03
7	Buna O-Ring - 115 70 Shore	2	01-2390-52	01-2390-52	01-2390-52	01-2390-52	01-2390-52	01-2390-52	01-2390-52	01-2390-52
8	Air Valve Gasket	1	01-2600-52	01-2600-52	01-2600-52	01-2600-52	01-2600-52	01-2600-52	01-2600-52	01-2600-52
9	Air Valve Screw	4	01-6000-03	01-6000-03	01-6000-05	01-6000-05	01-6000-03	01-6000-05	01-6000-03	01-6000-05
10	Air Valve Screw Nut	4	04-6400-03	04-6400-03	04-6400-05	04-6400-05	04-6400-03	04-6400-05	04-6400-03	04-6400-05
11	Muffler Plate	1	01-3180-20	01-3180-20	01-3180-20	01-3180-20	01-3180-20	01-3180-20	01-3180-20	01-3180-20
12	Muffler Plate Gasket	1	01-3500-52	01-3500-52	01-3500-52	01-3500-52	01-3500-52	01-3500-52	01-3500-52	01-3500-52
13	Center Section	1	01-3151-20	01-3151-20	01-3151-20	01-3151-20	01-3151-20	01-3151-20	01-3151-20	01-3151-20
14	Center Block O-Ring	4	01-3200-52	01-3200-52	01-3200-52	01-3200-52	01-3200-52	01-3200-52	01-3200-52	01-3200-52
15	Shaft	1	01-3800-09-07	01-3800-09-07	01-3800-09-07	01-3800-09-07	01-3800-09-07	01-3800-09-07	01-3800-09-07	01-3800-09-07
16	Shaft Stud	2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
17	Piston, Outer	2	01-4570-20-500	01-4570-21-500	01-4570-20-500	01-4570-21-500	01-4570-20-500	01-4570-21-500	01-4570-20-500	01-4570-21-500
18	Piston, Inner	2	01-3710-01	01-3710-01	01-3710-01	01-3710-01	01-3710-01	01-3710-01	01-3710-01	01-3710-01
19	Liquid Chamber	2	01-5000-20	01-5000-21	01-5000-20	01-5000-21	01-5000-20	01-5000-21	01-5000-20	01-5000-21
20	Discharge Manifold Elbow	2	01-5230-20	01-5230-21	01-5230-20	01-5230-21	01-5230-20	01-5230-21	01-5230-20	01-5230-21
21	Inlet Manifold Elbow	2	01-5220-20	01-5220-21	01-5220-20	01-5220-21	01-5220-20	01-5220-21	01-5220-20	01-5220-21
22	Manifold Tee Section	2	01-5160-20	01-5160-21	01-5160-20	01-5160-21	01-5160-20	01-5160-21	01-5160-20	01-5160-21
23	Manifold O-Ring	4	01-1300-60-500	01-1300-60-500	01-1300-60-500	01-1300-60-500	01-1300-60-500	01-1300-60-500	01-1300-60-500	01-1300-60-500
24	Valve Ball	4	01-1080-55	01-1080-55	01-1080-55	01-1080-55	01-1080-55	01-1080-55	01-1080-55	01-1080-55
25	Valve Seats	4	01-1230-59	01-1230-59	01-1230-59	01-1230-59	01-1230-59	01-1230-59	01-1230-59	01-1230-59
26	Valve Seat O-Ring	8	00-1230-60	00-1230-60	00-1230-60	00-1230-60	00-1230-60	00-1230-60	00-1230-60	00-1230-60
27	Diaphragm	2	01-1010-55	01-1010-55	01-1010-55	01-1010-55	01-1010-55	01-1010-55	01-1010-55	01-1010-55
28	Back-up Diaphragm	2	01-1060-51	01-1060-51	01-1060-51	01-1060-51	01-1060-51	01-1060-51	01-1060-51	01-1060-51
29	Large Clamp Band	2	01-7300-03	01-7300-03	01-7300-05	01-7300-05	01-7300-03	01-7300-05	01-7300-03	01-7300-05
30	Large Clamp Band Bolt	4	01-6070-03	01-6070-03	01-6070-05	01-6070-05	01-6070-03	01-6070-05	01-6070-03	01-6070-05
31	Large Clamp Band Nut	4	04-6400-03	04-6400-03	04-6400-05	04-6400-05	04-6400-03	04-6400-05	04-6400-03	04-6400-05
32	Small Clamp Band	4	01-7100-03	01-7100-03	01-7100-05	01-7100-05	01-7100-03	01-7100-05	01-7100-03	01-7100-05
33	Small Clamp Band Bolt	8	01-6100-03	01-6100-03	01-6100-05	01-6100-05	01-6100-03	01-6100-05	01-6100-03	01-6100-05
34	Small Clamp Band Nut	8	01-6400-03	01-6400-03	01-6400-05	01-6400-05	01-6400-03	01-6400-05	01-6400-03	01-6400-05
35	Vertical Bolt	4	01-6080-03	01-6080-03	01-6080-05	01-6080-05	01-6080-03	01-6080-05	01-6080-03	01-6080-05
36	Vertical Bolt Nut	4	04-6400-03	04-6400-03	04-6400-05	04-6400-05	04-6400-03	04-6400-05	04-6400-03	04-6400-05
37	Vertical Bolt Washer	4	01-6730-03	01-6730-03	01-6730-05	01-6730-05	01-6730-03	01-6730-05	01-6730-03	01-6730-05
38	Muffler	1	01-3510-99	01-3510-99	01-3510-99	01-3510-99	01-3510-99	01-3510-99	01-3510-99	01-3510-99

LUBE-FREE MODEL M1 CHAMP TEFLON®-FITTED

Item	Part Description	Qty. Per Pump	M1-200/PPPZ	M1-200/KPPZ	M1-201/PPPZ	M1-201/KPPZ	M1-200/TPPB	M1-201/TPPB	M1-62S/TPPB	M1-61S/TPPB
			LF P/N	LF P/N	LF P/N	LF P/N	LF P/N	LF P/N	LF P/N	LF P/N
1	Air Valve Assembly — Lube-free	1	01-2000-65-200	01-2000-65-200	01-2000-65-200	01-2000-65-200	01-2000-65-200	01-2000-65-200	01-2000-65-200	01-2000-65-200
2	Air Valve End Cap w/ Plastic Guide (Top)	1	01-2310-23-200	01-2300-23-200	01-2300-23-200	01-2300-23-200	01-2300-23-200	01-2300-23-200	01-2300-23-200	01-2300-23-200
3	Air Valve End Cap w/ Guide (Bottom)	1	01-2330-23	01-2330-23	01-2330-23	01-2330-23	01-2330-23	01-2330-23	01-2330-23	01-2330-23
4	Air Valve End Cap Cover	2	N/A	N/A	01-2420-55	01-2420-55	N/A	01-2420-55	N/A	01-2420-55
5	Air Valve End Cap Bolt — Lube-free	2	N/A	N/A	01-2450-22-200	01-2450-22-200	N/A	01-2450-22-200	N/A	01-2450-22-200
6	Snap Ring	2	01-2650-03	01-2650-03	01-2650-03	01-2650-03	01-2650-03	01-2650-03	01-2650-03	01-2650-03
7	Buna O-Ring - 115 70 Shore	2	01-2390-52	01-2390-52	01-2390-52	01-2390-52	01-2390-52	01-2390-52	01-2390-52	01-2390-52
8	Air Valve Gasket	1	01-2600-52	01-2600-52	01-2600-52	01-2600-52	01-2600-52	01-2600-52	01-2600-52	01-2600-52
9	Air Valve Screw	4	01-6000-03	01-6000-03	01-6000-05	01-6000-05	01-6000-03	01-6000-05	01-6000-03	01-6000-05
10	Air Valve Screw Nut	4	04-6400-03	04-6400-03	04-6400-05	04-6400-05	04-6400-03	04-6400-05	04-6400-03	04-6400-05
11	Muffler Plate	1	01-3180-20	01-3180-20	01-3180-20	01-3180-20	01-3180-20	01-3180-20	01-3180-20	01-3180-20
12	Muffler Plate Gasket	1	01-3500-52	01-3500-52	01-3500-52	01-3500-52	01-3500-52	01-3500-52	01-3500-52	01-3500-52
13	Polypropylene Center Section — Lube-free	1	01-3152-20-200	01-3152-20-200	01-3152-20-200	01-3152-20-200	01-3152-20-200	01-3152-20-200	01-3152-20-200	01-3152-20-200
14	Buna O-Ring - 115 70 Shore	4	01-2390-52	01-2390-52	01-2390-52	01-2390-52	01-2390-52	01-2390-52	01-2390-52	01-2390-52
15	Shaft	1	01-3210-55-200	01-3210-55-200	01-3210-55-200	01-3210-55-200	01-3210-55-200	01-3210-55-200	01-3210-55-200	01-3210-55-200
16	Shaft Stud	2	01-3800-09-07	01-3800-09-07	01-3800-09-07	01-3800-09-07	01-3800-09-07	01-3800-09-07	01-3800-09-07	01-3800-09-07
17	Piston, Outer	2	01-4570-20-500	01-4570-21-500	01-4570-20-500	01-4570-21-500	01-4570-20-500	01-4570-21-500	01-4570-20-500	01-4570-21-500
18	Piston, Inner	2	01-3710-01	01-3710-01	01-3710-01	01-3710-01	01-3710-01	01-3710-01	01-3710-01	01-3710-01
19	Liquid Chamber	2	01-5000-20	01-5000-21	01-5000-20	01-5000-21	01-5000-20	01-5000-21	01-5000-20	01-5000-21
20	Discharge Manifold Elbow	2	01-5230-20	01-5230-21	01-5230-20	01-5230-21	01-5230-20	01-5230-21	01-5230-20	01-5230-21
21	Inlet Manifold Elbow	2	01-5220-20	01-5220-21	01-5220-20	01-5220-21	01-5220-20	01-5220-21	01-5220-20	01-5220-21
22	Manifold Tee Section (Female, Threaded)	2	01-5160-20	01-5160-21	01-5160-20	01-5160-21	01-5160-20	01-5160-21	01-5160-20	01-5160-21
23	Manifold O-Ring	4	01-1300-60-500	01-1300-60-500	01-1300-60-500	01-1300-60-500	01-1300-60-500	01-1300-60-500	01-1300-60-500	01-1300-60-500
24	Valve Ball	4	01-1080-55	01-1080-55	01-1080-55	01-1080-55	01-1080-55	01-1080-55	01-1080-55	01-1080-55
25	Valve Seats	4	01-1230-59	01-1230-59	01-1230-59	01-1230-59	01-1230-59	01-1230-59	01-1230-59	01-1230-59
26	Valve Seat O-Ring	8	00-1230-60	00-1230-60	00-1230-60	00-1230-60	00-1230-60	00-1230-60	00-1230-60	00-1230-60
27	Diaphragm	2	01-1010-55	01-1010-55	01-1010-55	01-1010-55	01-1010-55	01-1010-55	01-1010-55	01-1010-55
28	Back-up Diaphragm	2	01-1060-51	01-1060-51	01-1060-51	01-1060-51	01-1060-51	01-1060-51	01-1060-51	01-1060-51
29	Large Clamp Band	2	01-7300-03	01-7300-03	01-7300-05	01-7300-05	01-7300-03	01-7300-05	01-7300-03	01-7300-05
30	Large Clamp Band Bolt	4	01-6070-03	01-6070-03	01-6070-05	01-6070-05	01-6070-03	01-6070-05	01-6070-03	01-6070-05
31	Large Clamp Band Nut	4	04-6400-03	04-6400-03	04-6400-05	04-6400-05	04-6400-03	04-6400-05	04-6400-03	04-6400-05
32	Small Clamp Band	4	01-7100-03	01-7100-03	01-7100-05	01-7100-05	01-7100-03	01-7100-05	01-7100-03	01-7100-05
33	Small Clamp Band Bolt	8	01-6100-03	01-6100-03	01-6100-05	01-6100-05	01-6100-03	01-6100-05	01-6100-03	01-6100-05
34	Small Clamp Band Nut	8	01-6400-03	01-6400-03	01-6400-05	01-6400-05	01-6400-03	01-6400-05	01-6400-03	01-6400-05
35	Vertical Bolt	4	01-6080-03	01-6080-03	01-6080-05	01-6080-05	01-6080-03	01-6080-05	01-6080-03	01-6080-05
36	Vertical Bolt Nut	4	04-6400-03	04-6400-03	04-6400-05	04-6400-05	04-6400-03	04-6400-05	04-6400-03	04-6400-05
37	Vertical Bolt Washer	4	01-6730-03	01-6730-03	01-6730-05	01-6730-05	01-6730-03	01-6730-05	01-6730-03	01-6730-05
38	Muffler	1	01-3510-99	01-3510-99	01-3510-99	01-3510-99	01-3510-99	01-3510-99	01-3510-99	01-3510-99

*Refer to corresponding elastomer chart for correct part numbers.
 †Shaft stud is mated into outer piston on all plastic pumps.
 ‡Refer to Section 6C or 6D prior to ordering these parts.

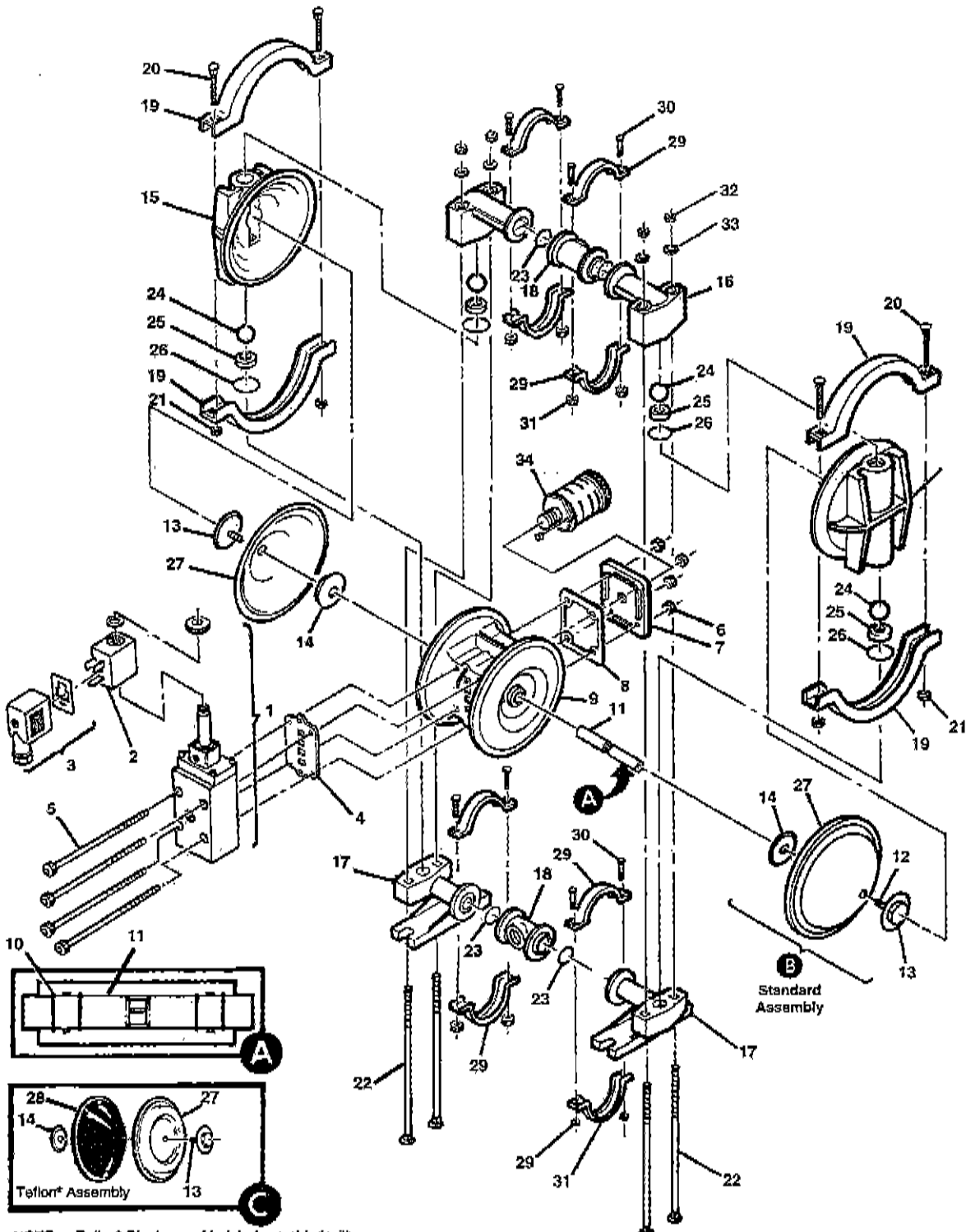
SECTIONS 7C, 7D, 7E, 7F, 7G

EXPLODED VIEWS

M1 METAL — SOLENOID-OPERATED
M1 CHAMP — SOLENOID-OPERATED
M1 ELASTOMER OPTIONS
M1 ULTRAPURE III
M1 CARBON-FILLED ACETAL

SECTION 7C

M1 METAL SOLENOID- OPERATED



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

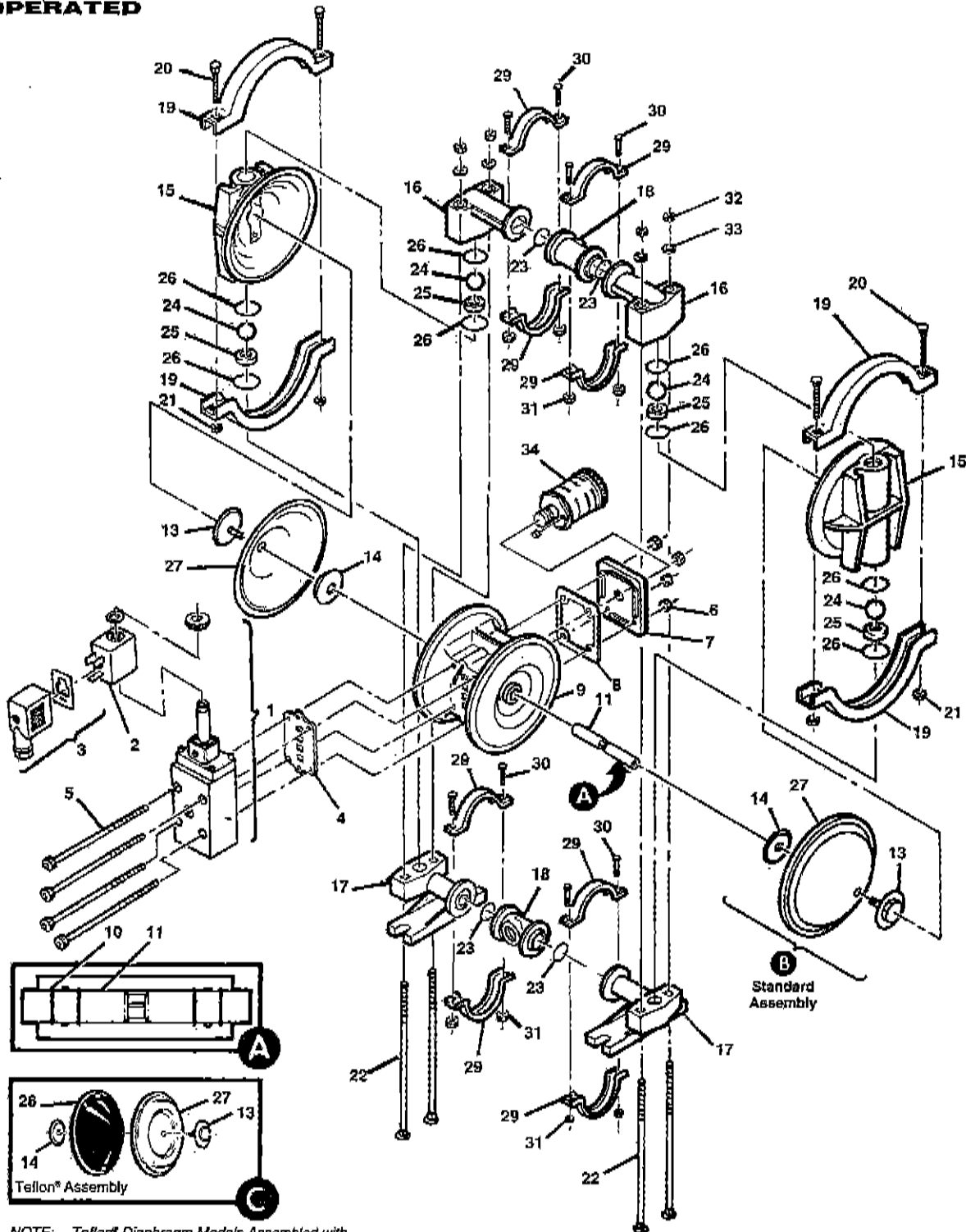
METAL MODEL M1 SOLENOID-OPERATED — DC

Item	Part Description	Qty. Per Pump	Rubber-Fitted		Teflon®-Fitted		Food Processing	
			M1-150/AYYE	M1-150/SYVE	M1-150/AYYE	M1-150/SYVE	M1-125/SYVE	M1-125/SYVE
			P/N	P/N	P/N	P/N	Rubber P/N	Teflon® P/N
	24 Volt DC Valve Assembly	1	01-2000-99-150	01-2000-99-150	01-2000-99-150	01-2000-99-150	01-2000-99-150	01-2000-99-150
1	Main Valve Body	1	01-2000-01-150	01-2000-01-150	01-2000-01-150	01-2000-01-150	01-2000-01-150	01-2000-01-150
2	24 Volt DC Coil	1	00-2110-99-150	00-2110-99-150	00-2110-99-150	00-2110-99-150	00-2110-99-150	00-2110-99-150
3	Terminal Connector	1	00-2130-99	00-2130-99	00-2130-99	00-2130-99	00-2130-99	00-2130-99
4	Air Valve Gasket	1	01-2600-52	01-2600-52	01-2600-52	01-2600-52	01-2600-52	01-2600-52
5	Air Valve Cap Screw	4	01-6000-03	01-6000-03	01-6000-03	01-6000-03	01-6000-03	01-6000-03
6	Air Valve Cap Screw Nut	4	04-6400-03	04-6400-03	04-6400-03	04-6400-03	04-6400-03	04-6400-03
7	Muffler Plate	1	01-3180-23	01-3180-23	01-3180-23	01-3180-23	01-3180-23	01-3180-23
8	Muffler Plate Gasket	1	01-3500-52	01-3500-52	01-3500-52	01-3500-52	01-3500-52	01-3500-52
9	Center Section	1	01-3152-23	01-3152-23	01-3152-23	01-3152-23	01-3152-23	01-3152-23
10	Center Block O-Ring	4	01-3200-52	01-3200-52	01-3200-52	01-3200-52	01-3200-52	01-3200-52
11	Shaft	1	01-3800-09-07	01-3800-09-07	01-3800-09-07	01-3800-09-07	01-3800-09-07	01-3800-09-07
12	Shaft Stud	2	01-6150-08	01-6150-08	01-6150-08	01-6150-08	01-6150-08	01-6150-08
13	Pistons/Outer	2	01-4570-01	01-4570-03	01-4570-01	01-4570-03	01-4570-03	01-4570-03
14	Pistons/Inner	2	01-3710-01-150	01-3710-01-150	01-3710-01-150	01-3710-01-150	01-3710-01-150	01-3710-01-150
15	Water Chamber	2	01-5000-01	01-5000-03	01-5000-01	01-5000-03	01-5000-03	01-5000-03
16	Discharge Manifold Elbow	2	01-5230-01	01-5230-03	01-5230-01	01-5230-03	01-5230-03	01-5230-03
17	Inlet Manifold Elbow	2	01-5220-01	01-5220-03	01-5220-01	01-5220-03	01-5220-03	01-5220-03
18	Manifold "T" Section	2	01-5160-01	01-5160-03	01-5160-01	01-5160-03	01-5160-03-70	01-5160-03-70
19	Clamp Band (Large)	2	01-7300-03	01-7300-03	01-7300-03	01-7300-03	01-7300-03-70	01-7300-03-70
20	Large Clamp Band Bolt	4	01-6070-03	01-6070-03	01-6070-03	01-6070-03	01-6070-03	01-6070-03
21	Large Clamp Band Nut	4	04-6400-03	04-6400-03	04-6400-03	04-6400-03	04-6650-03-70	04-6650-03-70
22	Vertical Bolt	4	01-6080-03	01-6080-03	01-6080-03	01-6080-03	01-6080-03	01-6080-03
23	Manifold O-Ring	4			01-1300-55	01-1300-55	01-1300-55	01-1300-55
24	Valve Ball	4			01-1080-55	01-1080-55	01-1080-55	01-1080-55
25	Valve Seat	4	01-1120-01	01-1120-03	01-1120-01	01-1120-03	01-1120-03	01-1120-03
26	Valve Seat O-Ring	4			01-1200-55	01-1200-55	01-1200-55	01-1200-55
27	Diaphragm	2			01-1010-55	01-1010-55	01-1010-55	01-1010-55
28	Back-up Diaphragm	2	N/R	N/R	01-1080-51	01-1080-51	N/R	01-1080-51
29	Clamp Band (Small)	4	01-7100-03	01-7100-03	01-7100-03	01-7100-03	01-7100-03	01-7100-03
30	Small Clamp Band Bolt	8	01-6100-03	01-6100-03	01-6100-03	01-6100-03	01-6100-03	01-6100-03
31	Small Clamp Band Nut	8	01-6400-03	01-6400-03	01-6400-03	01-6400-03	01-6400-03	01-6400-03
32	Vertical Bolt Nut	4	04-6400-03	04-6400-03	04-6400-03	04-6400-03	04-6400-03	04-6400-03
33	Vertical Bolt Washer	4	01-6730-03	01-6730-03	01-6730-03	01-6730-03	01-6730-03	01-6730-03
34	Muffler	1	01-3510-99	01-3510-99	01-3510-99	01-3510-99	01-3510-99	01-3510-99

*Refer to Section 8 for elastomer options.
Air valve assembly includes items 1, 2 and 3.

SECTION 7D

M1 CHAMP SOLENOID- OPERATED



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

PLASTIC MODEL M1 SOLENOID-OPERATED — DC (RUBBER/TPE-FITTED)

Item	Part Description	Qty. Per Pump	Rubber-Fitted		Teflon®-Fitted			
			M1-150/PPPE P/N	M1-150/KPPE P/N	M1-150/PPPE P/N	M1-150/KPPE P/N	M1-150/TPPE P/N	M1-184/TPPE P/N
	24 Volt DC Valve Assembly¹	1	01-2000-99-150	01-2000-99-150	01-2000-99-150	01-2000-99-150	01-2000-99-150	01-2000-99-150
1	Main Valve Body	1	01-2000-01-150	01-2000-01-150	01-2000-01-150	01-2000-01-150	01-2000-01-150	01-2000-01-150
2	24 Volt DC Coil	1	00-2110-99-150	00-2110-99-150	00-2110-99-150	00-2110-99-150	00-2110-99-150	00-2110-99-150
3	Terminal Connector	1	00-2130-99	00-2130-99	00-2130-99	00-2130-99	00-2130-99	00-2130-99
4	Air Valve Gasket	1	01-2600-52	01-2600-52	01-2600-52	01-2600-52	01-2600-52	01-2600-52
5	Air Valve Screw	4	01-6000-03	01-6000-03	01-6000-03	01-6000-03	01-6000-03	01-6000-03
6	Air Valve Screw Nut	4	04-6400-03	04-6400-03	04-6400-03	04-6400-03	04-6400-03	04-6400-03
7	Muffler Plate	1	01-3180-20	01-3180-20	01-3180-20	01-3180-20	01-3180-20	01-3180-20
8	Muffler Plate Gasket	1	01-3500-52	01-3500-52	01-3500-52	01-3500-52	01-3500-52	01-3500-52
9	Center Section	1	01-3151-20	01-3151-20	01-3151-20	01-3151-20	01-3151-20	01-3151-20
10	Center Block O-Ring	4	01-3200-52	01-3200-52	01-3200-52	01-3200-52	01-3200-52	01-3200-52
11	Shaft	1	01-3800-09-07	01-3800-09-07	01-3800-09-07	01-3800-09-07	01-3800-09-07	01-3800-09-07
12	Shaft Stud	2	N/A	N/A	N/A	N/A	N/A	N/A
13	Piston, Outer	2	01-4570-20-500	01-4570-21-300	01-4570-20-500	01-4570-21-500	01-4570-22-500	01-4570-22-500
14	Piston, Inner	2	01-3710-01-150	01-3710-01-150	01-3710-01-150	01-3710-01-150	01-3710-01-150	01-3710-01-150
15	Liquid Chamber	2	01-5000-20	01-5000-21	01-5000-20	01-5000-21	01-5000-22	01-5000-22
16	Discharge Manifold Elbow	2	01-5230-20	01-5230-21	01-5230-20	01-5230-21	01-5230-22	01-5230-22
17	Inlet Manifold Elbow	2	01-5220-20	01-5220-21	01-5220-20	01-5220-21	01-5220-22	01-5220-22
18	Manifold Tee Section (Female, Threaded)	2	01-5160-20	01-5160-21	01-5160-20	01-5160-21	01-5160-22	01-5160-22
19	Large Clamp Band	2	01-7300-03	01-7300-03	01-7300-03	01-7300-03	01-7300-03	01-7300-03
20	Large Clamp Band Bolt	4	01-6070-03	01-6070-03	01-6070-03	01-6070-03	01-6070-03	01-6070-03
21	Large Clamp Band Nut	4	04-6400-03	04-6400-03	04-6400-03	04-6400-03	04-6400-03	04-6400-03
22	Vertical Bolt	4	01-6080-03	01-6080-03	01-6080-03	01-6080-03	01-6080-03	01-6080-03
23	Manifold O-Ring	4			01-1300-60-500	01-1300-60-500	01-1300-60-500	01-1300-60-500
24	Valve Ball	4			01-1080-55	01-1080-55	01-1080-55	01-1080-55
25	Valve Seats	4	01-1120-21-500	01-1120-21-500	01-1120-21-500	01-1120-21-500	01-1120-22-500	01-1120-22-500
26	Valve Seat O-Ring	8			00-1230-59	00-1230-59	00-1230-59	00-1230-59
27	Diaphragm	2			01-1010-55	01-1010-55	01-1010-55	01-1010-55
28	Back-up Diaphragm	2	N/A	N/A	01-1060-51	01-1060-51	01-1060-51	01-1060-51
29	Small Clamp Band	4	01-7100-03	01-7100-03	01-7100-03	01-7100-03	01-7100-03	01-7100-03
30	Small Clamp Band Bolt	8	01-6100-03	01-6100-03	01-6100-03	01-6100-03	01-6100-03	01-6100-03
31	Small Clamp Band Nut	6	01-6400-03	01-6400-03	01-6400-03	01-6400-03	01-6400-03	01-6400-03
32	Vertical Bolt Nut	4	04-6400-03	04-6400-03	04-6400-03	04-6400-03	04-6400-03	04-6400-03
33	Vertical Bolt Washer	4	01-6730-03	01-6730-03	01-6730-03	01-6730-03	01-6730-03	01-6730-03
34	Muffler	1	01-3510-99	01-3510-99	01-3510-99	01-3510-99	01-3510-99	01-3510-99

¹Air valve assembly includes Items 1, 2 and 3.

*Refer to Section 8 for elastomer options.

SOLENOID-OPERATED VALVE ASSEMBLY OPTIONS (CONSISTS OF VALVE BODY, COIL AND CONNECTOR)

Pump Models Designating Specialty Code #	Part Number	Description
151	01-2000-99-151	24V AC / 12V DC Valve Assembly
153	01-2000-99-153	24V AC / 12V DC Valve Assembly (Nema 7)
150	01-2000-99-150	24V DC Valve Assembly
154	01-2000-99-154	24V DC Valve Assembly (Nema 7)
157	01-2000-99-157	24V DC Valve Assembly¹
155	01-2000-99-155	110V AC Valve Assembly
156	01-2000-99-156	110V AC Valve Assembly (Nema 7)

ITEM 1 MAIN VALVE BODY OPTIONS

Part Number	Description
02-2040-01	Main Valve Body
02-2040-01-154	Main Valve Body (Nema 7)

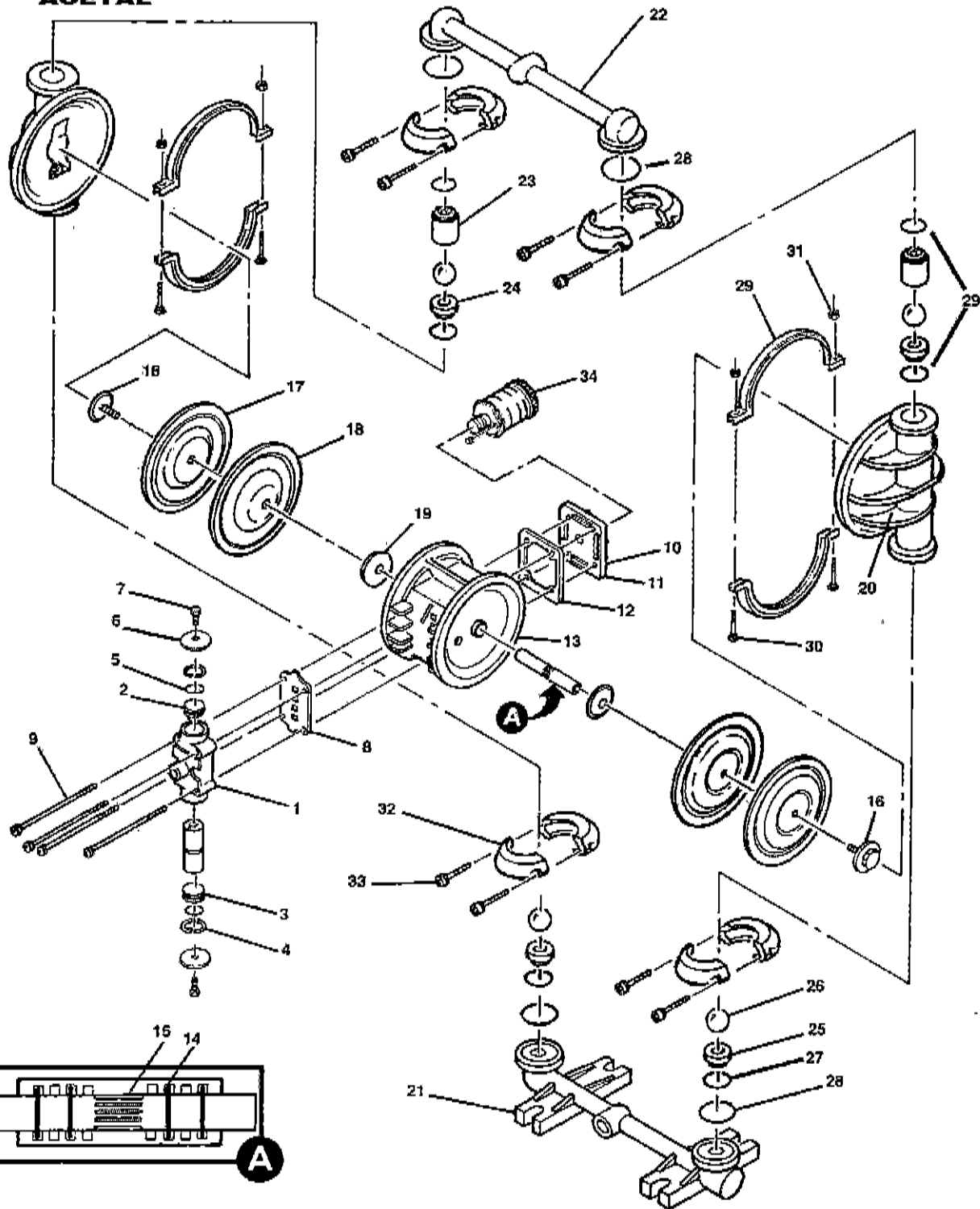
ITEM 2 COIL OPTIONS

Pump Models Designating Specialty Code #	Part Number	Description
151	00-2110-99-151	24V AC / 12V DC Coil
153	00-2110-99-153	24V AC / 12V DC Coil (Nema 7)
150	00-2110-99-150	24V DC Coil
154	00-2110-99-154	24V DC Coil (Nema 7)
155	00-2110-99-155	110V AC Coil
156	00-2110-99-156	110V AC Coil (Nema 7)

SECTION 7E

M1

ULTRAPURE II,
ULTRAPURE III
AND
CARBON-FILLED
ACETAL



MODEL M1 ULTRAPURE III TEFLON[®]-FITTED, LUBE-FREE

Item	Part Description	Qty. Per Pump	M1-520/	M1-521/	M1-522/	M1-523/
			TPPZ	TPPZ	TPPZ	TPPZ
			LF P/N	LF P/N	LF P/N	LF P/N
1	Air Valve Assembly — Lube-free	1	01-2000-55-200	01-2000-55-200	01-2000-55-200	01-2000-55-200
2	Air Valve End Cap w/Plastic Guide	1	01-2300-23-200	01-2300-23-200	01-2300-23-200	01-2300-23-200
3	Air Valve End Cap w/o Guide	1	01-2330-23	01-2330-23	01-2330-23	01-2330-23
4	Snap Ring	2	01-2650-03	01-2650-03	01-2650-03	01-2650-03
5	Buna O-Ring - 115 70 Shore	2	01-2390-52	01-2390-52	01-2390-52	01-2390-52
6	End Cap Cover	2	N/A	01-2420-55	N/A	01-2420-55
7	End Cap Bolt	2	N/A	01-2450-22-200	N/A	01-2450-22-200
8	Air Valve Gasket	1	01-2600-48	01-2600-48	01-2600-48	01-2600-48
9	Air Valve Cap Screws	4	01-6000-03	01-6000-05	01-6000-03	01-6000-05
10	Air Valve Nut	4	04-6400-03	04-6400-05	04-6400-03	04-6400-05
11	Muffler Plate	1	01-3180-20	01-3180-20	01-3180-20	01-3180-20
12	Muffler Plate Gasket	1	01-3500-55	01-3500-55	01-3500-55	01-3500-55
13	Polypropylene Center Section — Lube-free	1	01-3152-20-200	01-3152-20-200	01-3152-20-200	01-3152-20-200
	Slipper Seal (Not shown)	4	01-3210-55-200	01-3210-55-200	01-3210-55-200	01-3210-55-200
14	Buna O-Ring - 115 70 Shore	4	01-2390-52	01-2390-52	01-2390-52	01-2390-52
15	Shaft	1	01-3800-09-07	01-3800-09-07	01-3800-09-07	01-3800-09-07
16	Outer Piston	2	01-4570-22-500	01-4570-22-500	01-4570-22-500	01-4570-22-500
17	Teflon [®] PTFE Primary Diaphragm	2	01-1010-55	01-1010-55	01-1010-55	01-1010-55
18	Containment Diaphragm	2	01-1060-61	01-1060-61	01-1060-61	01-1060-61
19	Inner Piston	2	01-3710-01	01-3710-01	01-3710-01	01-3710-01
20	Water Chamber	2	01-5000-22	01-5000-22	01-5000-22	01-5000-22
21	Inlet Manifold	1	01-5080-22-520	01-5080-22-520	01-5080-22-522	01-5080-22-522
22	Discharge Manifold	1	01-5020-22-520	01-5020-22-520	01-5020-22-522	01-5020-22-522
23	Ball Cage	2	01-5350-22-520	01-5350-22-520	01-5350-22-520	01-5350-22-520
24	Valve Seat (Top)	2	01-1140-55	01-1140-55	01-1140-55	01-1140-55
25	Valve Seat (Bottom)	2	01-1160-55	01-1160-55	01-1160-55	01-1160-55
26	Valve Ball	4	01-1080-55	01-1080-55	01-1080-55	01-1080-55
27	Chemraz [®] Valve Seat O-Ring	6	01-1200-33-540	01-1200-33-540	01-1200-33-540	01-1200-33-540
28	Chemraz [®] Outboard O-Ring	4	01-1370-33	01-1370-33	01-1370-33	01-1370-33
29	Large Clamp Band	2	01-7300-03-520	01-7300-03-521	01-7300-03-520	01-7300-03-521
30	Large Carriage Bolt	4	01-6070-03	01-6070-05	01-6070-03	01-6070-05
31	Large Hex Nut	4	04-6400-03	04-6400-05	04-6400-03	04-6400-05
32	Small Clamp Band	4	01-7100-03-520	01-7100-03-521	01-7100-03-520	01-7100-03-521
33	Small Clamp Band Bolt*	8	01-6040-03-520	01-6040-03-521	01-6040-03-520	01-6040-03-521
34	Muffler	1	01-3510-99	01-3510-99	01-3510-99	01-3510-99

M1-520/TPPZ — Teflon[®] PFA with Teflon[®] PTFE elastomers, female threaded inlet/discharge connections and standard hardware.

M1-521/TPPZ — Teflon[®] PFA with Teflon[®] PTFE elastomers, female threaded inlet/discharge connections and Teflon[®]-coated hardware.

M1-522/TPPZ — Teflon[®] PFA with Teflon[®] PTFE elastomers, male non-threaded inlet/discharge connections and standard hardware.

M1-523/TPPZ — Teflon[®] PFA with Teflon[®] PTFE elastomers, male non-threaded inlet/discharge connections and Teflon[®]-coated hardware.

MODEL M1 CARBON-FILLED ACETAL, LUBE-FREE

Item	Part Description	Qty. Per Pump	M1-200/	M1-200/
			GGGQ Rubber P/N	GGGQ Teflon [®] P/N
1	Air Valve Assembly — Lube-free	1	01-2000-70	01-2000-70
2	Air Valve End Cap w/Guide	1	01-2300-23-200	01-2300-23-200
3	Air Valve End Cap w/o Guide	1	01-2330-23	01-2330-23
4	Snap Ring	2	01-2650-03	01-2650-03
5	Buna O-Ring - 115 70 Shore	2	01-2390-52	01-2390-52
6	End Cap Cover	2	N/A	N/A
7	End Cap Bolt	2	N/A	N/A
8	Air Valve Gasket	1	01-2800-52	01-2800-52
9	Air Valve Screw	4	01-6000-03	01-6000-03
10	Air Valve Nut	4	04-6400-03	04-6400-03
11	Muffler Plate	1	01-3180-16	01-3180-16
12	Muffler Plate Gasket	1	01-3500-52	01-3500-52
13	Carbon-filled Acetal Center Section	1	01-3152-16-200	01-3152-25
	Slipper Seal (Not shown)	4	01-3210-55-200	01-3210-55-200
14	O-Ring	4	01-2390-52	01-2390-52
15	Shaft	1	01-3800-09-07	01-3800-09-07
16	Outer Piston	2	01-4570-16	01-4570-16
17	Primary Diaphragm	2	N/A	01-1010-55
18	Containment Diaphragm	2	N/A	01-1060-51
19	Inner Piston	2	01-3710-01	01-3710-01
20	Water Chamber	2	01-5000-16	01-5000-16
21	Inlet Manifold	2	01-5080-16	01-5080-16
22	Discharge Manifold	2	01-5020-16	01-5020-16
23	Ball Cage	2	01-5350-16	01-5350-16
24	Valve Seat (Top)	2	01-1140-16	01-1140-16
25	Valve Seat (Bottom)	2	01-1160-16	01-1160-16
26	Valve Ball	4	—	01-1080-55
27	Valve Seat O-Ring	6	—	00-7230-59
28	Outboard O-Ring	4	01-1370-60	01-1370-60
29	Large Clamp Band	2	01-7300-03	01-7300-03
30	Large Carriage Bolt	4	01-6070-03	01-6070-03
31	Large Hex Nut	4	04-6400-03	04-6400-03
32	Small Clamp Band	4	01-7100-03	01-7100-03
33	Small Clamp Band Bolt*	8	01-6100-03	01-6100-03
34	Muffler	1	01-3510-99	01-3510-99
35	Plug (Not shown)	1	01-7010-16	01-7010-16
36	Strap (Not shown)	1	00-8300-99	00-8300-99

*Comes with nut, P/N 01-6100-03 (not shown).

SECTION 8

ELASTOMERS FOR M1 CHAMP MODELS

MATERIAL	MANIFOLD O-RINGS (4)	VALVE BALLS (4)	VALVE SEATS (4)	VALVE SEAT O-RINGS (8)	DIAPHRAGMS (2)
Polyurethane	01-1300-50	01-1080-50	N/A	01-1200-50	01-1010-50
Buna N	01-1300-52	01-1080-52	N/A	01-1200-52	01-1010-52
Viton	N/A	01-1080-53	01-1120-53*	N/A	01-1010-53
WII-Flex™	01-1300-58	01-1080-58	N/A	01-1200-58	01-1010-58
Saniflex	01-1300-56	01-1080-56	N/A	01-1200-56	01-1010-56
Teflon® PTFE	N/A	01-1080-55	01-1120-22-500	N/A	01-1010-55
PVDF	N/A	N/A	01-1120-21-500	N/A	N/A
Teflon® Encapsulated/ Silicon	01-1300-59-500	N/A	N/A	00-1230-59	N/A
Teflon® Encapsulated/ Viton	01-1300-60-500	N/A	N/A	00-1230-60	N/A

*Must be used with part number 01-5010-21-500.

ELASTOMERS FOR M1 METAL MODELS

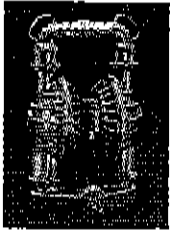
MATERIAL	MANIFOLD O-RINGS (4)	VALVE BALLS (4)	VALVE SEATS (4)	VALVE SEAT O-RINGS (8)	DIAPHRAGMS (2)
Polyurethane	01-1300-50	01-1080-50	N/A	01-1200-50	01-1010-50
Buna N	01-1300-52	01-1080-52	N/A	01-1200-52	01-1010-52
Viton	N/A	01-1080-53	N/A	N/A	01-1010-53
WII-Flex™	01-1300-58	01-1080-58	N/A	01-1200-58	01-1010-58
Saniflex	01-1300-56	01-1080-56	N/A	01-1200-56	01-1010-56
Teflon® PTFE	01-1300-55	01-1080-55	N/A	01-1200-55	01-1010-55
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

TORQUE SPECIFICATIONS FOR MODEL M1 (PLASTIC AND METAL)

ITEM #	DESCRIPTION OF PART	REQUIRED TORQUE
1	Air Valve, Standard & Solenoid	20 in.-lbs. [2.3 m-N]
2	Outer Pliston	75 in.-lbs. [8.7 m-N]
3	Small Clamp Band	15 in.-lbs. [1.7 m-N]
4	Large Clamp Band (Rubber-Fitted)	65 in.-lbs. [7.4 m-N]
5	Large Clamp Band (Teflon-Fitted)	85 in.-lbs. [9.6 m-N]
6	Vertical Bolts (Metal Pump)	125 in.-lbs. [14.1 m-N]
7	Vertical Bolts (Kynar [rubber only], all poly)	50 in.-lbs. [5.6 m-N]
8	Vertical Bolts (Kynar and PFA — Teflon-Fitted)	25 in.-lbs. [2.8 m-N]
9	Air Valve (All PFA pumps)	30 in.-lbs. [3.4 m-N]
10	Small Clamp Bands (All PFA pumps)	30 in.-lbs. [3.4 m-N]
11	Air Valve — Lube-Free	10 in.-lbs. [1.1 m-N]

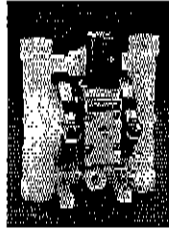
WILDEN'S SPECIALTY PUMPS

M8 STALLION



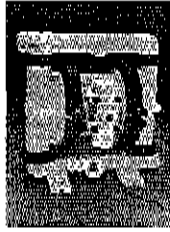
2" inlet. Solids clearance up to 3/4". Built to handle rough treatment; cast-in handles for easy portability, reinforced shell and high impact polyurethane base.

SOLENOID-OPERATED



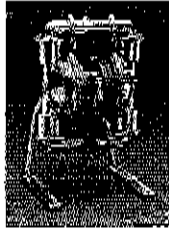
Each stroke of this pump is controlled by electrical impulses making it ideal for batching, metering, and other electrically controlled dispensing applications.

M1 ULTRAPURE III



1/2" inlet. Teflon® PFA construction, temperatures to 300°F. Up to 14 GPM. Materials of construction have been selected to reduce contamination while providing a safer work environment.

FOOD PROCESSING



Constructed with FDA approved materials; bead blasted 316 Stainless Steel construction with tri-clamp porting and wing-nut fasteners. Foodmaster™ (pictured) is USDA accepted.

THE WILDEN PUMP LINE



M.025
(CHAMP SERIES)

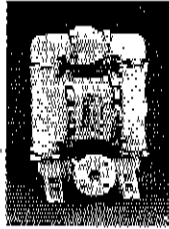
MODEL M.025

- 1/2" Inlet
- Up To 4.5 GPM
- 125 Max. PSIG
- Max. Particle Size: 1/4"

Materials of Construction:
PVDF, Acetal, Polypropylene, Carbon-filled Acetal

Suction Lift:

(Rubber)	Dry: 4.5'
	Wet: 25'
(Teflon®)	Dry: 4.5'
	Wet: 25'



M4 PLASTIC
(CHAMP SERIES)

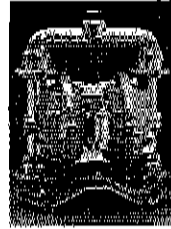
MODEL M4

- 1 1/2" Inlet
- Up To 73 GPM
- 125 Max. PSIG
- Max. Particle Size: 1/4"

Materials of Construction:
Aluminum, Cast Iron, Stainless Steel, Hastelloy, Polypropylene, PVDF, Teflon® PFA

Suction Lift:

(Rubber)	Plastic	Metal
	Dry: 17'	21'
	Wet: 25'	25'
(Teflon®)	Dry: 7'	7'
	Wet: 25'	25'



M4 METAL

LUBE-FREE AVAILABLE



M1 PLASTIC
(CHAMP SERIES)

MODEL M1

- 1/2" Inlet
- Up To 14 GPM
- 110 Max. PSIG
- Max. Particle Size: 1/4"

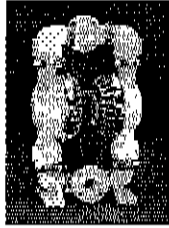
Materials of Construction:
Polypropylene, PVDF, Teflon®, Graphite-filled Polypropylene, Aluminum, Stainless Steel

Suction Lift:

(Rubber)	Plastic	Metal
	Dry: 10'	10'
	Wet: 25'	25'
(Teflon®)	Dry: 7'	8'
	Wet: 25'	25'



M1 METAL



M8 PLASTIC
(CHAMP SERIES)

MODEL M8

- 2" Inlet
- Up To 155 GPM
- 125 Max. PSIG
- Max. Particle Size: 1/4"

Materials of Construction:
Aluminum, Cast Iron, Stainless Steel, Hastelloy, PVDF, Polypropylene

Suction Lift:

(Rubber)	Plastic	Metal
	Dry: 17'	20'
	Wet: 25'	25'
(Teflon®)	Dry: 8'	8'
	Wet: 25'	25'



M8 METAL



M2R PLASTIC
(CHAMP SERIES)

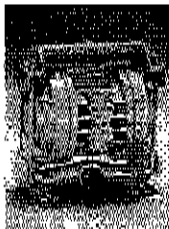
MODEL M2

- 1" Inlet
- Up To 37 GPM
- 125 Max. PSIG
- Max. Particle Size: 1/4"

Materials of Construction:
Aluminum, Stainless Steel, Hastelloy, Polypropylene, PVDF

Suction Lift:

(Rubber)	Plastic	Metal
	Dry: 17'	19'
	Wet: 25'	25'
(Teflon®)	Dry: 7'	8'
	Wet: 25'	25'



M2 METAL



M15

MODEL M15

- 3" Inlet
- Up To 230 GPM
- 125 Max. PSIG
- Max. Particle Size: 1/4"

Materials of Construction:
Aluminum, Cast Iron, Stainless Steel, Hastelloy

Suction Lift:

(Rubber)	Dry: 17'
	Wet: 25'
(Teflon®)	Dry: 14'
	Wet: 25'

For further information contact your local Wilden distributor:

WILDEN PUMP & ENGINEERING COMPANY

22069 Van Buren St., Grand Terrace, CA 92313-5651
(909) 422-1730 • FAX (909) 783-3440



M20

MODEL M20

- 4" Inlet
- Up To 304 GPM
- 125 Max. PSIG
- Max. Particle Size: 1 1/4"

Materials of Construction:
Cast Iron

Suction Lift:

Dry: 13'
Wet: 25'

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.

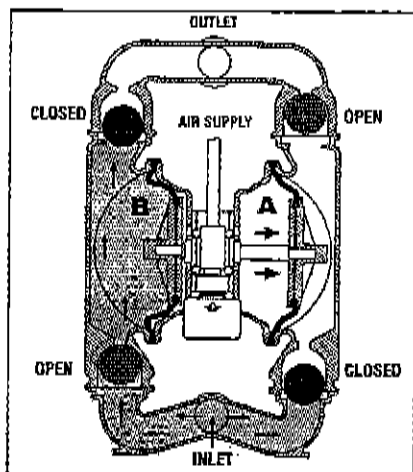


FIGURE 1 - The air valve directs pressurized air to the back side of diaphragm A. The compressed air is applied directly to the liquid column separated by elastomer diaphragms. The diaphragm acts as a separation membrane between the compressed air and liquid, balancing the load and removing mechanical stress from the diaphragm which allows for millions of flex cycles. 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 now on its suction stroke; air behind the diaphragm has been forced out to the atmosphere through the exhaust port of the pump. Diaphragm A is working against atmospheric air pressure. 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.

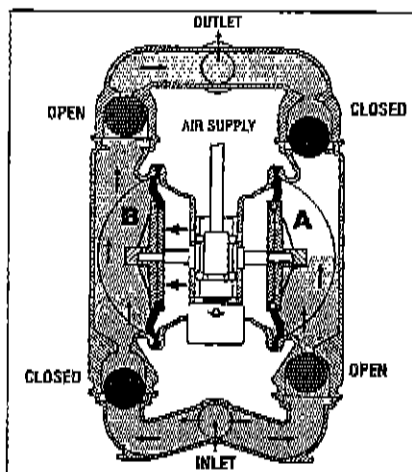


FIGURE 2 - When the pressurized diaphragm, diaphragm A, reaches the limit of its discharge stroke, the air valve redirects pressurized air to the back side of diaphragm B. The pressurized air forces diaphragm B away from the center block while pulling diaphragm A to the center block. Diaphragm B is now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

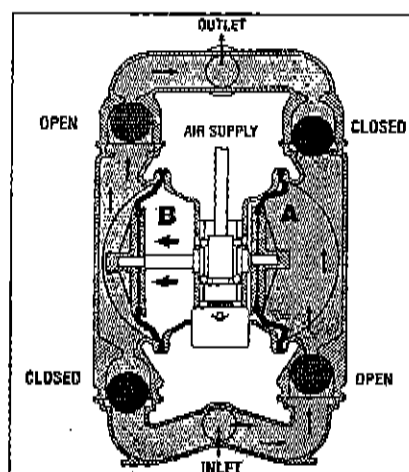
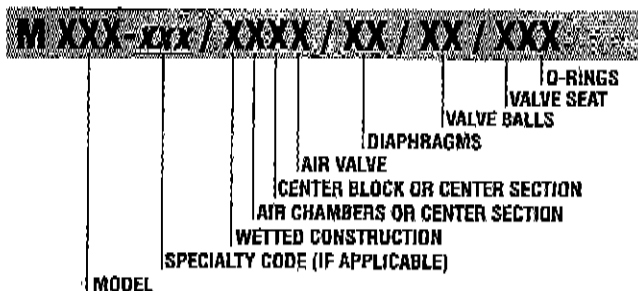


FIGURE 3 - At completion of the stroke, the air valve again redirects air to the back side of diaphragm A, which starts diaphragm B on its exhaust stroke. As the pump reaches its original starting point, each diaphragm has gone through one exhaust and one discharge stroke. This constitutes one complete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

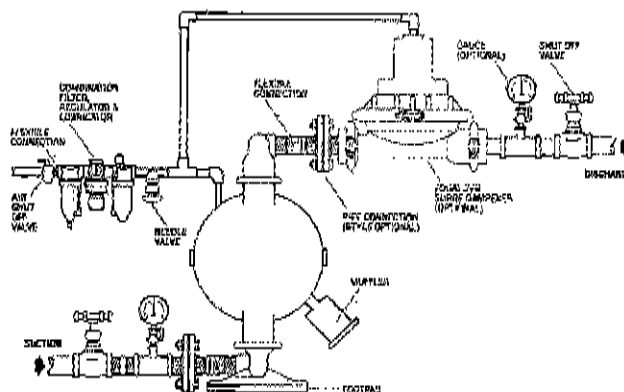


WILDEN PUMP DESIGNATION SYSTEM



In the case where a center section is used instead of a center block and air chambers, the designation will be as follows:
 Aluminum = AA, Polypropylene = PP, Carbon-Loaded Acetal = BG, Nylon = NY, Acetal = CL

SUGGESTED INSTALLATION



CAUTIONS! READ FIRST

Temperature Limits:		
Polypropylene	+32°F to 175°F	(0°C to 79.4°C)
PVDF	+10°F to +225°F	(-12.2°C to 107.2°C)
Teflon® PFA	-20°F to 300°F	(-28.9°C to 148.9°C)

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. WHEN DIAPHRAGM RUPTURE OCCURS, MATERIAL BEING PUMPED MAY BE FORCED OUT AIR EXHAUST.

"Champ" series pumps are made of virgin plastic and are not UV stabilized. Direct sunlight for prolonged periods can cause deterioration of plastics.

NOTE: Standard pumps must be lubricated. Wilden suggests an arctic 5 weight oil (ISO grade 15). Unless is present pump must be lubricated.

WARNING: Prevention of static sparking — If static sparking occurs, fire or explosion could result. Pump, valves, and containers must be grounded when handling flammable fluids and whenever discharge of static electricity is a hazard. To ground the Wilden "Champ," all clamp bands must be grounded to a proper grounding point.