# SERVICE & OPERATING MANUAL

**Original Instructions**

**Certified Quality**

CE

EAC

# Model F1f

## Non-Metallic

## Design Level 3


**FTA Pumps, Inc.**
A Unit of PRG Corporation
12251 Northwoods Park Dr.
Houston, TX 77041 USA
Telephone 281.654.6499
Fax 214.432.6173
FTAPUMP.COM

# Safety Information

## ⚠ IMPORTANT

*Read the safety warnings and instructions in this manual before pump installation and start-up. Failure to comply with the recommendations stated in this manual could damage the pump and void factory warranty.*

*When the pump is used for materials that tend to settle out or solidify, the pump should be flushed after each use to prevent damage. In freezing temperatures the pump should be completely drained between uses.*

## ⚠ CAUTION

*Before pump operation, inspect all fasteners for loosening caused by gasket creep. Retighten loose fasteners to prevent leakage. Follow recommended torques stated in this manual.*

*Nonmetallic pumps and plastic components are not UV stabilized. Ultraviolet radiation can damage these parts and negatively affect material properties. Do not expose to UV light for extended periods of time.*

*<u>WARNING</u>*
*Pump not designed, tested or certified to be powered by compressed natural gas. Powering the pump with natural gas will void the warranty.*

## ⚠ WARNING

*When used for toxic or aggressive fluids, the pump should always be flushed clean prior to disassembly.*

*Before maintenance or repair, shut off the compressed air line, bleed the pressure, and disconnect the air line from the pump. Be certain that approved eye protection and protective clothing are worn at all times. Failure to follow these recommendations may result in serious injury or death.*

*Airborne particles and loud noise hazards. Wear eye and ear protection.*

*In the event of diaphragm rupture, pumped material may enter the air end of the pump, and be discharged into the atmosphere. If pumping a product that is hazardous or toxic, the air exhaust must be piped to an appropriate area for safe containment.*

*Take action to prevent static sparking. Fire or explosion can result, especially when handling flammable liquids. The pump, piping, valves, containers and other miscellaneous equipment must be properly grounded.*

*This pump is pressurized internally with air pressure during operation. Make certain that all fasteners and piping connections are in good condition and are reinstalled properly during reassembly.*

*Use safe practices when lifting*

# ATEX Pumps - Conditions For Safe Use

1. Ambient temperature range is as specified in tables 1 to 3 on the next page *(per Annex I of DEKRA 18ATEX0094X)*

2. ATEX compliant pumps are suitable for use in explosive atmospheres when the equipment is properly grounded in accordance with local electrical codes

3. **Non-Metallic ATEX Pumps only — See Explanation of Pump Nomenclature / ATEX Details Page**
Conductive Polypropylene, conductive Acetal or conductive PVDF pumps are not to be installed in applications where the pumps may be subjected to oil, greases and hydraulic liquids.

4. The optionally provided solenoids shall be protected by a fuse corresponding to its rated current (max 3*Irat according to EN 60127) or by a motor protecting switch with short circuit and thermal instantaneous tripping (set to the rated current) as short circuit protection. For solenoids with a very low rated current, a fuse with the lowest current value according to the indicated standard will be sufficient. The fuse may be accommodated in the associated supply unit or shall be separately arranged. The rated voltage of the fuse shall be equal or greater than the stated rated voltage of the solenoid. The breaking capacity of the fuse shall be as high as or higher than the maximum expected short circuit current at the location of the installation (usually 1500 A). The maximum permissible ripple is 20% for all dc solenoids.
***Not applicable for all pump models — See Explanation of Pump Nomenclature / ATEX Details Page**

5. When operating pumps equipped with non-conductive diaphragms that exceed the maximum permissible projected area, as defined in EN ISO 80079-36 : 2016 section 6.7.5 table 8, the following protection methods must be applied
- Equipment is always used to transfer electrically conductive fluids or
- Explosive environment is prevented from entering the internal portions of the pump, i.e. dry running.

6. Pumps provided with the pulse output kit and used in the potentially explosive atmosphere caused by the presence of the combustible dust shall be installed in such a way that the pulse output kit is protected against impact
***Not applicable for all pump models — See Explanation of Pump Nomenclature / ATEX Details Page**

# Temperature Tables

## Table 1. Category 1 & Category 2 ATEX Rated Pumps

| Ambient Temperature Range [°C] | Process Temperature Range [°C][1] | Temperature Class | Maximum Surface Temperature [°C] |
|---|---|---|---|
| -20°C to +60°C | -20°C to +80°C | T5 | T100°C |
| | -20°C to +108°C | T4 | T135°C |
| | -20°C to + 160°C | T3 | T200°C |
| | -20°C to +177°C | (225°C) T2 | |

[1]Per CSA standards ANSI LC6-2018 US & Canadian Technical Letter R14, G-Series Natural Gas Models are restricted to (-20°C to + 80°C) process temperature

## Table 2. Category 2 ATEX Rated Pumps Equipped with Pulse Output Kit or Integral Solenoid:

| Ambient Temperature Range [°C] | Process Temperature Range [°C] | Temperature Class | Maximum Surface Temperature [°C] | Options | |
|---|---|---|---|---|---|
| | | | | Pulse Output Kit | Integral Solenoid |
| -20°C to +60°C | -20°C to +100°C | T5 | T100 | X | |
| -20°C to +50°C | -20°C to +100°C | T5 | T100 | | X |

[2]ATEX Pulse output or Intergral Solenoid Not Available For All Pump Models See Explanation of Pump Nomenclature / ATEX Details Page

## Table 3. Category M1 ATEX Rated Pumps for Mining

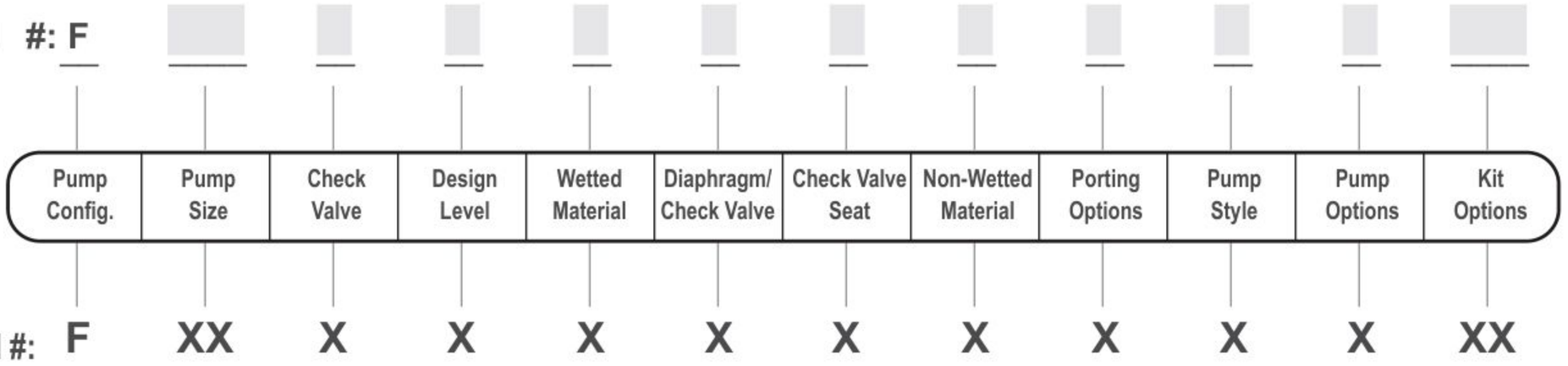
| Ambient Temperature Range [°C] | Process Temperature Range [°C] |
|---|---|
| -20°C to +60°C | -20°C to +150°C |

Note: The ambient temperature range and the process temperature range should not exceed the operating temperature range of the applied non-metallic parts as listed in the manuals of the pumps.

# Table of Contents

# EXPLANATION OF PUMP NOMENCLATURE

**Your Model #: F** *(fill in from pump nameplate)*




**PUMP BRAND**
**F** FTA®

**PUMP SIZE**
**1F** 1" Full Flow

**CHECK VALVE TYPE**
**B** Ball

**DESIGN LEVEL**
**3** Design Level

**WETTED MATERIAL**
**K** PVDF
**P** Polypropylene
**C** Conductive Polypropylene

**DIAPHRAGM/CHECK VALVE MATERIALS**
**1** Santoprene/Santoprene
**2** PTFE-Santoprene Backup/PTFE
**6** PTFE Pumping, PTFE-Neoprene Backup Driver/PTFE
**B** Nitrile/Nitrile
**C** FKM / PTFE
**G** PTFE-Neoprene Backup/PTFE
**M** Santoprene/PTFE
**N** Neoprene/Neoprene
**Z** One-Piece Bonded/PTFE

**CHECK VALVE SEAT**
**K** PVDF
**P** Polypropylene

**NON-WETTED MATERIAL OPTIONS**
**C** Carbon Filled Conductive Polypropylene
**P** 40%Glass Filled Polypropylene
**1** 40%Glass Filled Polypropylene w/PTFE Coated Hardware

**PORTING OPTIONS**
**U** Universal Flange (Fits ANSI & DIN)
**7** Dual Porting (ANSI)
**8** Top Dual Porting (ANSI)
**9** Bottom Dual Porting (ANSI)

**PUMP STYLE**
**D** with Electronic Leak Detection (12-32 VDC)
**E** with Electronic Leak Detection (110-120VAC / 220-240 VAC)
**M** with Mechanical Leak Detection
**S** Standard
**V** with Visual Leak Detection

**PUMP OPTIONS**
**0** None
**6** Metal Muffler

**KIT OPTIONS**
**00.** None
**P0.** 10.30VDC Pulse Output Kit
**P1.** Intrinsically-Safe 5.30VDC, 110/120VAC 220/240 VAC Pulse Output Kit
**P2.** 110/120 or 220/240VAC Pulse Output Kit
**E0.** Solenoid Kit with 24VDC Coil
**E1.** Solenoid Kit with 24VDC Explosion-Proof Coil
**E2.** Solenoid Kit with 24VAC/12VDC Coil
**E3.** Solenoid Kit with 12VDC Explosion-Proof Coil
**E4.** Solenoid Kit with 110VAC Coil
**E5.** Solenoid Kit with 110VAC Explosion-Proof Coil
**E6.** Solenoid Kit with 220VAC Coil
**E7.** Solenoid Kit with 220VAC Explosion-Proof Coil
**E8.** Solenoid Kit with 110VAC, 50 Hz Explosion-Proof Coil
**E9.** Solenoid Kit with 230VAC, 50 Hz Explosion-Proof Coil
**SP.** Stroke Indicator Pins
**A1.** Solenoid Kit with 12 VDC ATEX Compliant Coil
**A2.** Solenoid Kit with 24 VDC ATEX Compliant Coil
**A3.** Solenoid Kit with 110/120 VAC 50/60 Hz ATEX Compliant Coil
**A4.** Solenoid Kit with 220/240 VAC 50/60 Hz ATEX Compliant Coil

# MATERIALS

| **Material Profile:** ⚠ CAUTION! Operating temperature limitations are as follows: | Operating Temperatures: Max. | Min. |
|---|---|---|
| **CONDUCTIVE ACETAL:** Tough, impact resistant, ductile. Good abrasion resistance and low friction surface. Generally inert, with good chemical resistance except for strong acids and oxidizing agents. | 190°F 88°C | -20°F -29°C |
| **EPDM:** Shows very good water and chemical resistance. Has poor resistance to oils and solvents, but is fair in ketones and alcohols. | 280°F 138°C | -40°F -40°C |
| **FKM (FLUOROCARBON):** Shows good resistance to a wide range of oils and solvents; especially all aliphatic, aromatic and halogenated hydrocarbons, acids, animal and vegetable oils. Hot water or hot aqueous solutions (over 70°F(21°C)) will attack FKM. | 350°F 177°C | -40°F -40°C |
| **HYTREL®:** Good on acids, bases, amines and glycols at room temperatures only. | 220°F 104°C | -20°F -29°C |
| **NEOPRENE:** All purpose. Resistance to vegetable oils. Generally not affected by moderate chemicals, fats, greases and many oils and solvents. Generally attacked by strong oxidizing acids, ketones, esters and nitro hydrocarbons and chlorinated aromatic hydrocarbons. | 200°F 93°C | -10°F -23°C |
| **NITRILE:** General purpose, oil-resistant. Shows good solvent, oil, water and hydraulic fluid resistance. Should not be used with highly polar solvents like acetone and MEK, ozone, chlorinated hydrocarbons and nitro hydrocarbons. | 190°F 88°C | -10°F -23°C |
| **NYLON:** 6/6 High strength and toughness over a wide temperature range. Moderate to good resistance to fuels, oils and chemicals. | 180°F 82°C | 32°F 0°C |
| **POLYPROPYLENE:** A thermoplastic polymer. Moderate tensile and flex strength. Resists stong acids and alkali. Attacked by chlorine, fuming nitric acid and other strong oxidizing agents. | 180°F 82°C | 32°F 0°C |
| **PVDF:** (Polyvinylidene Fluoride) A durable fluoroplastic with excellent chemical resistance. Excellent for UV applications. High tensile strength and impact resistance. | 250°F 121°C | 0°F -18°C |
| **SANTOPRENE®:** Injection molded thermoplastic elastomer with no fabric layer. Long mechanical flex life. Excellent abrasion resistance. | 275°F 135°C | -40°F -40°C |
| **UHMW PE:** A thermoplastic that is highly resistant to a broad range of chemicals. Exhibits outstanding abrasion and impact resistance, along with environmental stress-cracking resistance. | 180°F 82°C | -35°F -37°C |
| **URETHANE:** Shows good resistance to abrasives. Has poor resistance to most solvents and oils. | 150°F 66°C | 32°F 0°C |
| **VIRGIN PTFE:** (PFA/TFE) Chemically inert, virtually impervious. Very few chemicals are known to chemically react with PTFE; molten alkali metals, turbulent liquid or gaseous fluorine and a few fluoro-chemicals such as chlorine trifluoride or oxygen difluoride which readily liberate free fluorine at elevated temperatures. | 220°F 104°C | -35°F -37°C |
| Maximum and Minimum Temperatures are the limits for which these materials can be operated. Temperatures coupled with pressure affect the longevity of diaphragm pump components. Maximum life should not be expected at the extreme limits of the temperature ranges. | | |
| **Metals:** | | |
| **ALLOY C:** Equal to ASTM494 CW-12M-1 specification for nickel and nickel alloy. | | |
| **STAINLESS STEEL:** Equal to or exceeding ASTM specification A743 CF-8M for corrosion resistant iron chromium, iron chromium nickel and nickel based alloy castings for general applications. Commonly referred to as 316 Stainless Steel in the pump industry. | | |

For specific applications, always consult the Chemical Resistance Chart.

# Performance

## F1F NON-METALLIC

**SUCTION/DISCHARGE PORT SIZE**
1" ANSI Flange or
PN10 25mm DIN Flange

**CAPACITY**
• 0 to 53 gallons per minute
(0 to 200 liters per minute)

**AIR DISTRIBUTION VALVE**
• No-lube, no-stall design

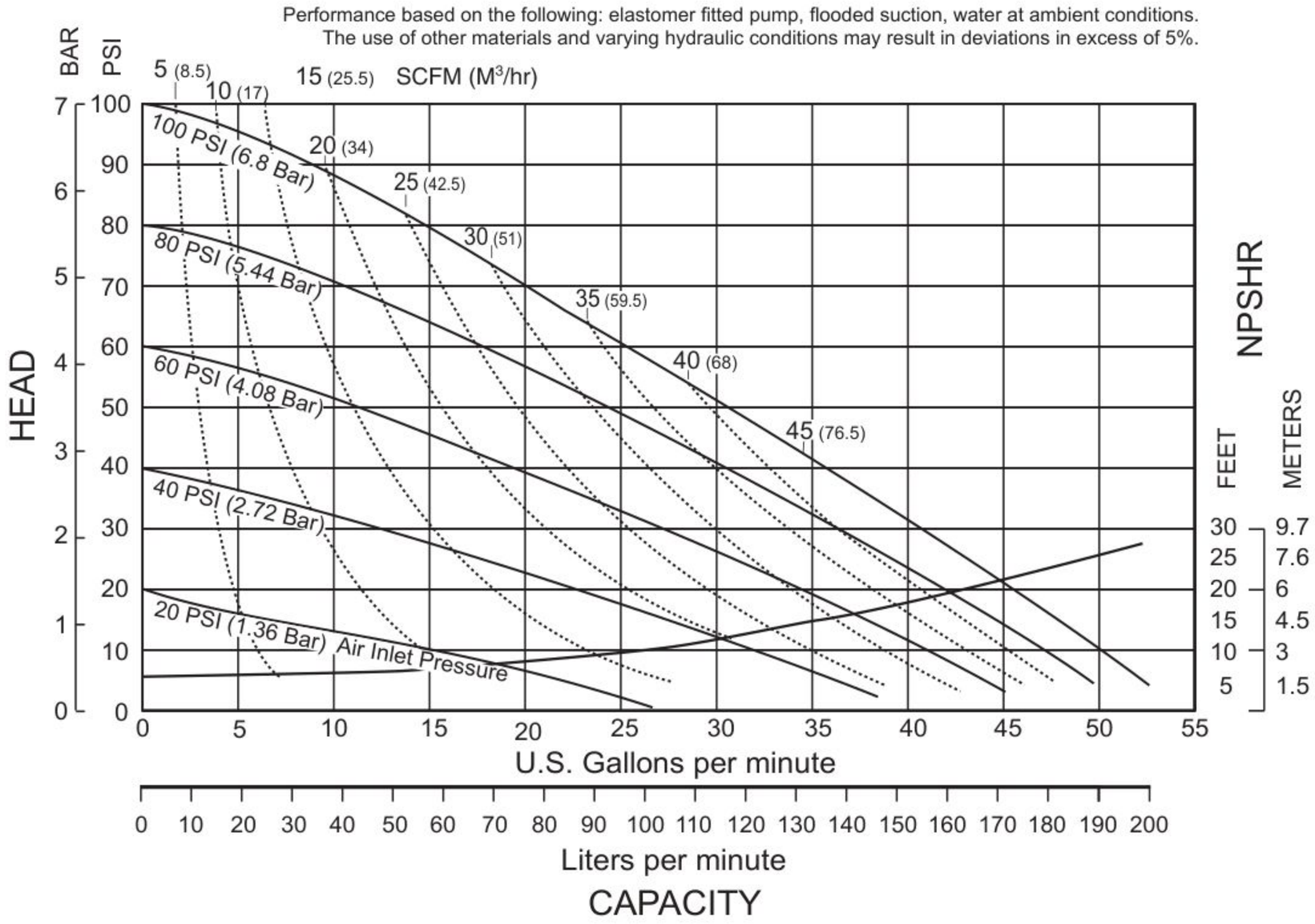
**SOLIDS-HANDLING**
• Up to .25 in. (6mm)

**HEADS UP TO**
• 100 psi or 231 ft. of water
(7 bar or 70 meters)

**DISPLACEMENT/STROKE**
• .19 Gallon / .72 liter

**MAXIMUM OPERATING PRESSURE**
• 100 psi (7 bar)

**SHIPPING WEIGHT**
Polypropylene 42 lbs. (19kg)
PVDF 54 lbs. (24kg)




# Materials

| Material Profile: ⚠ *CAUTION! Operating temperature limitations are as follows:* | Operating Temperatures: Max. | Min. |
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| **Conductive Acetal:** Tough, impact resistant, ductile. Good abrasion resistance and low friction surface. Generally inert, with good chemical resistance except for strong acids and oxidizing agents. | 190°F 88°C | -20°F -29°C |
| **EPDM:** Shows very good water and chemical resistance. Has poor resistance to oils and solvents, but is fair in ketones and alcohols. | 280°F 138°C | -40°F -40°C |
| **FKM:** (Fluorocarbon) Shows good resistance to a wide range of oils and solvents; especially all aliphatic, aromatic and halogenated hydrocarbons, acids, animal and vegetable oils. Hot water or hot aqueous solutions (over 70°F(21°C)) will attack FKM. | 350°F 177°C | -40°F -40°C |
| **Hytrel®:** Good on acids, bases, amines and glycols at room temperatures only. | 220°F 104°C | -20°F -29°C |
| **Neoprene:** All purpose. Resistance to vegetable oils. Generally not affected by moderate chemicals, fats, greases and many oils and solvents. Generally attacked by strong oxidizing acids, ketones, esters and nitro hydrocarbons and chlorinated aromatic hydrocarbons. | 200°F 93°C | -10°F -23°C |
| **Nitrile:** General purpose, oil-resistant. Shows good solvent, oil, water and hydraulic fluid resistance. Should not be used with highly polar solvents like acetone and MEK, ozone, chlorinated hydrocarbons and nitro hydrocarbons. | 190°F 88°C | -10°F -23°C |
| **Nylon:** 6/6 High strength and toughness over a wide temperature range. Moderate to good resistance to fuels, oils and chemicals. | 180°F 82°C | 32°F 0°C |
| **Polypropylene:** A thermoplastic polymer. Moderate tensile and flex strength. Resists stong acids and alkali. Attacked by chlorine, fuming nitric acid and other strong oxidizing agents. | 180°F 82°C | 32°F 0°C |
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## Metals:

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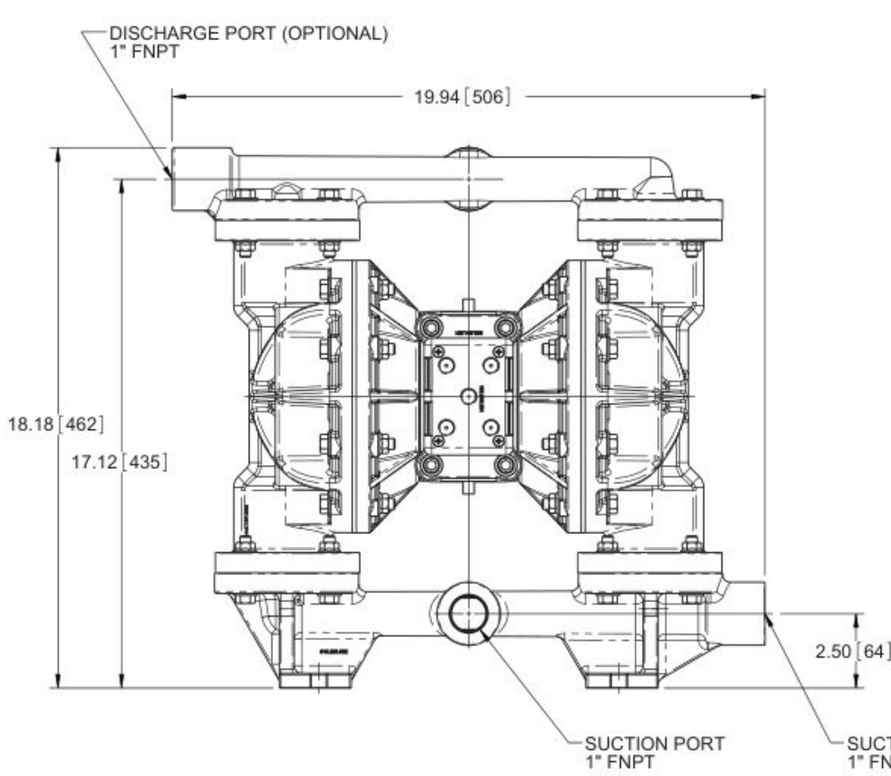
**Stainless Steel:** Equal to or exceeding ASTM specification A743 CF-8M for corrosion resistant iron chromium, iron chromium nickel and nickel based alloy castings for general applications. Commonly referred to as 316 Stainless Steel in the pump industry.

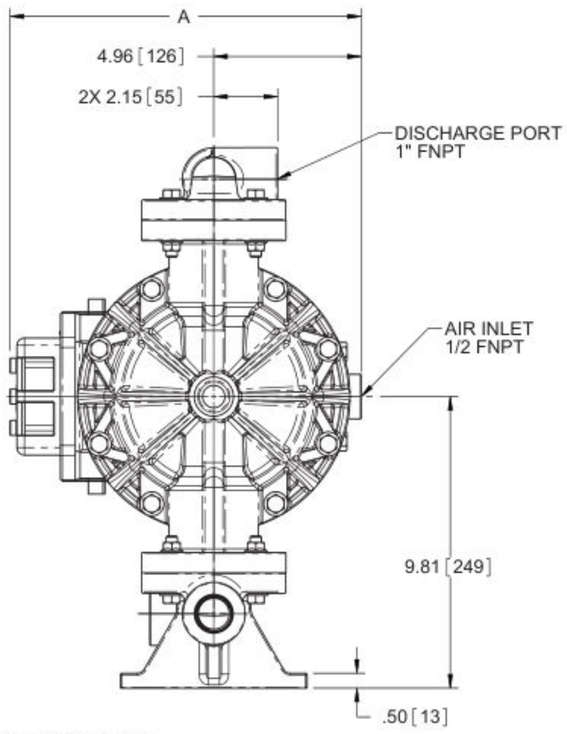
For specific applications, always consult the Chemical Resistance Chart.

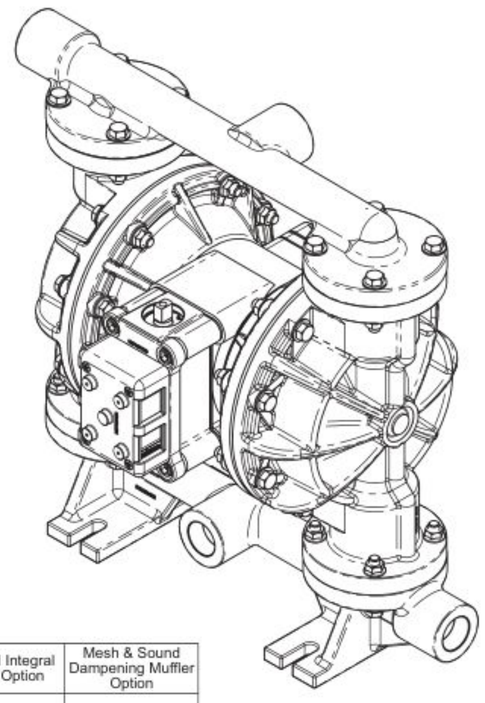
# Dimensional Drawings

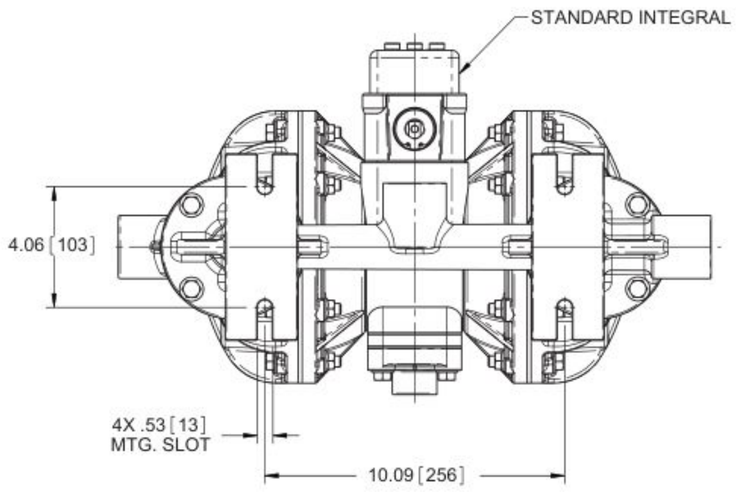
## F1F Non-Metallic Inline Ported Option- Polypropylene Wet End Models ONLY

Dimensions in inches (metric dimensions in brackets). Dimensional Tolerance .125" (3mm).






**F1F NON-METALLIC**
IN-LINE PORTED OPTION
DIMENSIONAL TOLERANCE = ±.125 [3mm]

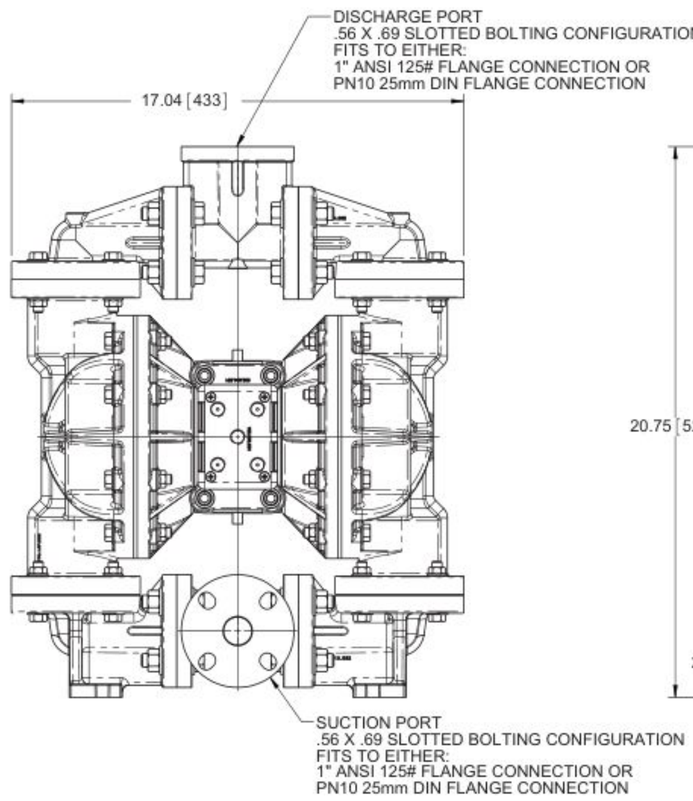
| | Standard Integral Muffler Option | Mesh & Sound Dampening Muffler Option |
|---|---|---|
| A | 11.81 [300] | 13.50 [343] |

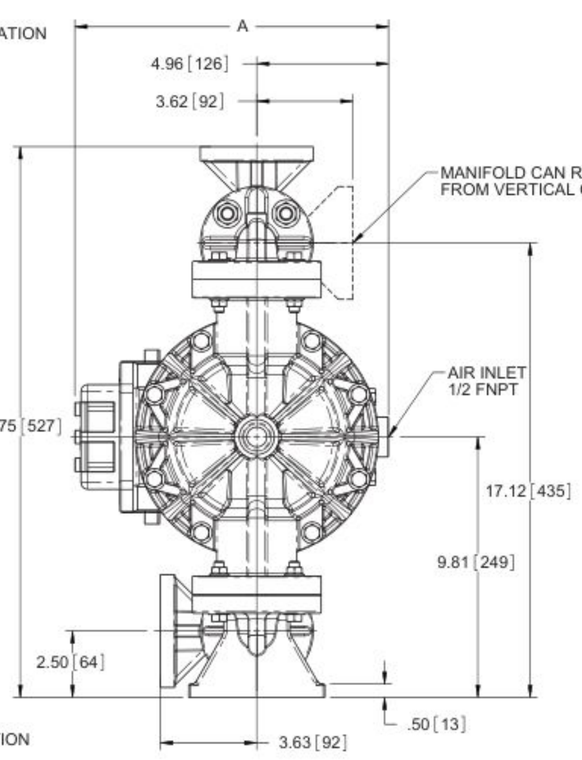
GENERAL NOTES

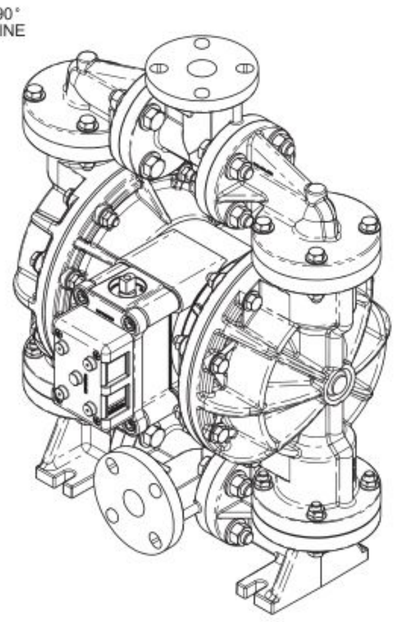
1. OPTIONAL SUCTION & DISCHARGE SIDE PORTS WILL BE PLUGGED AT FACTORY, NOT SHOWN
2. STANDARD INTEGRAL MUFFLER (SHOWN) COVERS 1" FNPT EXHAUST PORT FOR OPTIONAL MUFFLER STYLES OR PIPING EXHAUST AIR IN SUBMERGED APPLICATIONS

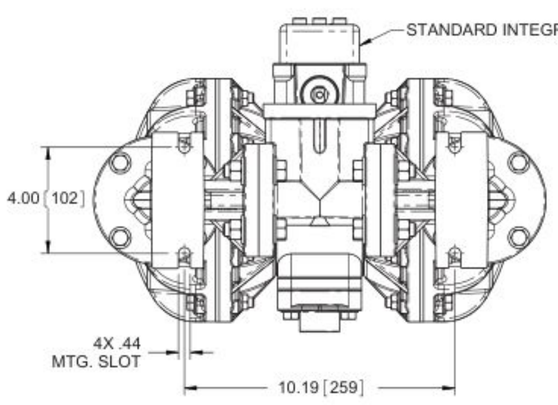
# F1F Non-Metallic Center Ported Options

Dimensions in inches (metric dimensions in brackets). Dimensional Tolerance .125" (3mm).





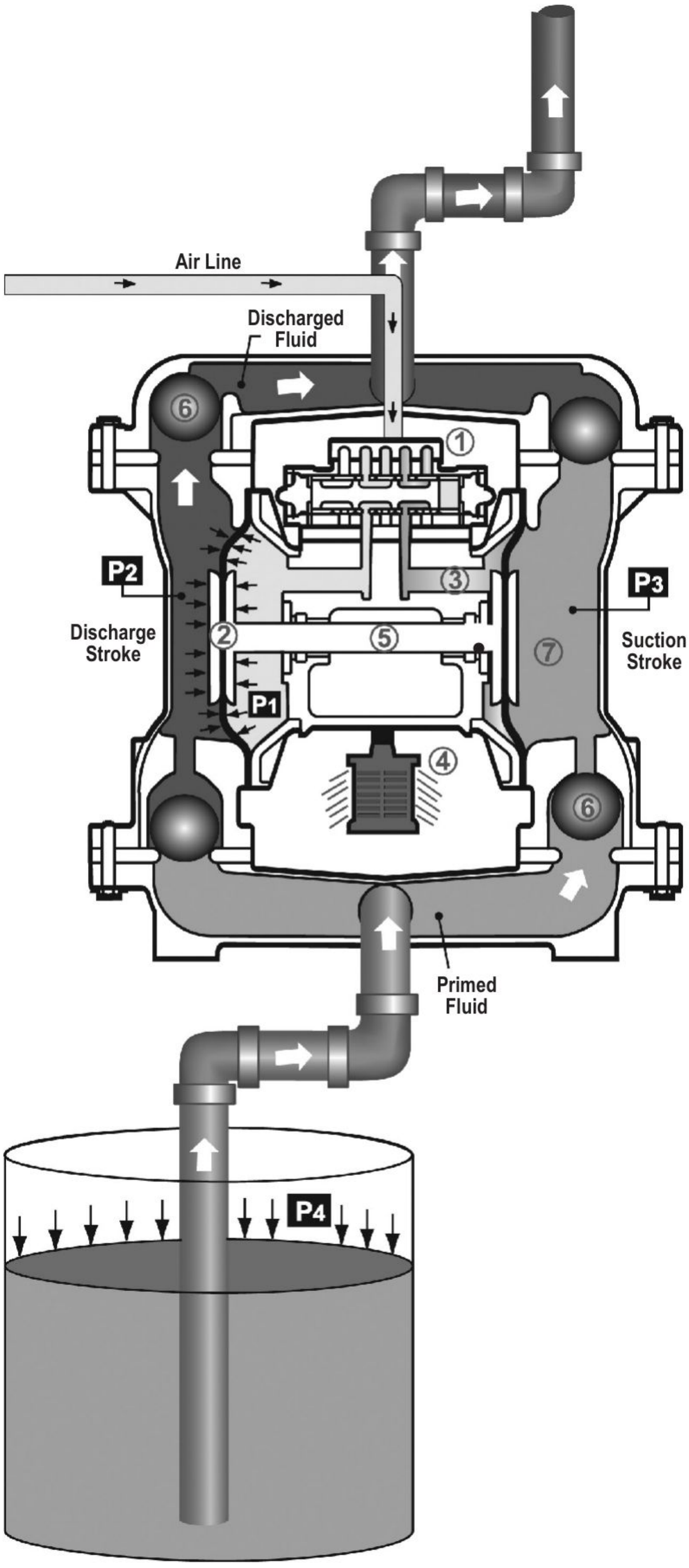

**F1F NON-METALLIC**
CENTER PORTED OPTION
DIMENSIONAL TOLERANCE = ±.125 [3mm]

| | Standard Integral Muffler Option | Threaded Muffler (Conductive) |
|---|---|---|
| A | 11.81 [300] | 15.02 [382] |

GENERAL NOTES

1. STANDARD INTEGRAL MUFFLER (SHOWN) COVERS 1" FNPT EXHAUST PORT FOR OPTIONAL MUFFLER STYLES OR PIPING EXHAUST AIR IN SUBMERGED APPLICATIONS

# Principle of Pump Operation




Air-Operated Double Diaphragm (AODD) pumps are powered by compressed air or nitrogen.

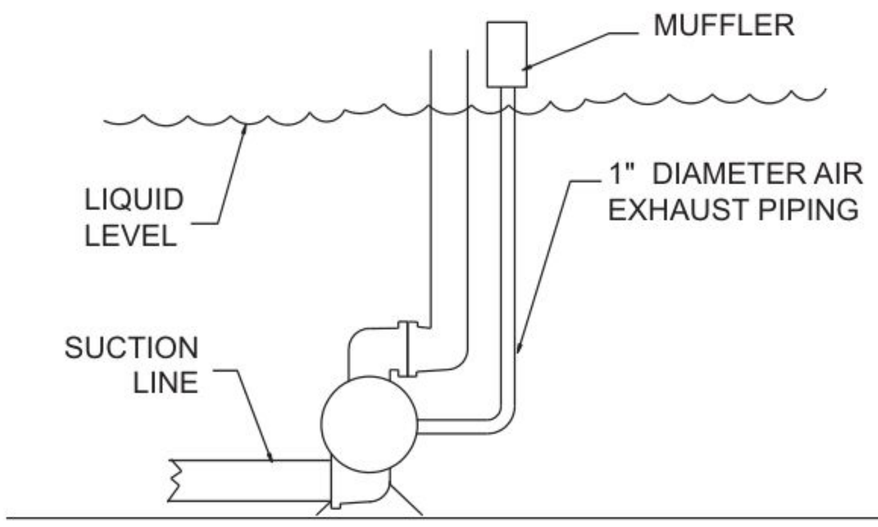
The main directional (air) control valve ① distributes compressed air to an air chamber, exerting uniform pressure over the inner surface of the diaphragm ②. At the same time, the exhausting air ③ from behind the opposite diaphragm is directed through the air valve assembly(s) to an exhaust port ④.

As inner chamber pressure **(P1)** exceeds liquid chamber pressure **(P2)**, the rod ⑤ connected diaphragms shift together creating discharge on one side and suction on the opposite side. The discharged and primed liquid's directions are controlled by the check valves (ball or flap)⑥ orientation.

The pump primes as a result of the suction stroke. The suction stroke lowers the chamber pressure **(P3)** increasing the chamber volume. This results in a pressure differential necessary for atmospheric pressure **(P4)** to push the fluid through the suction piping and across the suction side check valve and into the outer fluid chamber ⑦.

Suction (side) stroking also initiates the reciprocating (shifting, stroking or cycling) action of the pump. The suction diaphragm's movement is mechanically pulled through its stroke. The diaphragm's inner plate makes contact with an actuator plunger aligned to shift the pilot signaling valve. Once actuated, the pilot valve sends a pressure signal to the opposite end of the main directional air valve, redirecting the compressed air to the opposite inner chamber.

## SUBMERGED ILLUSTRATION



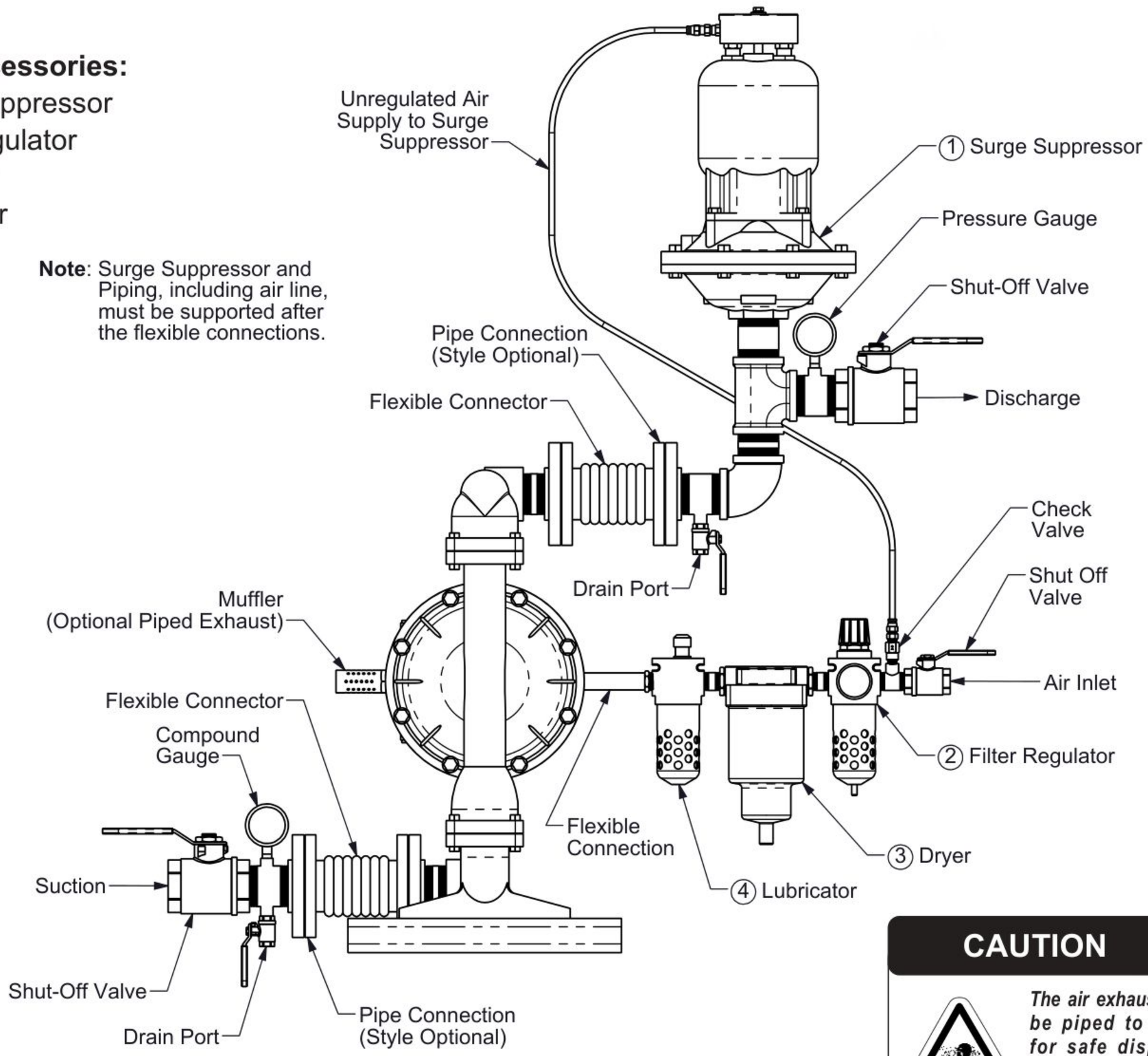

Pump can be submerged if the pump materials of construction are compatible with the liquid being pumped. The air exhaust must be piped above the liquid level. When the pumped product source is at a higher level than the pump (flooded suction condition), pipe the exhaust higher than the product source to prevent siphoning spills.

# Recommended Installation Guide

**Available Accessories:**

1. Surge Suppressor
2. Filter/Regulator
3. Air Dryer
4. Lubricator

**Note**: Surge Suppressor and Piping, including air line, must be supported after the flexible connections.




**CAUTION**



***The air exhaust should be piped to an area for safe disposition of the product being pumped, in the event of a diaphragm failure.***

**Installation And Start-Up**

Locate the pump as close to the product being pumped as possible. Keep the suction line length and number of fittings to a minimum. Do not reduce the suction line diameter.

**Air Supply**

Connect the pump air inlet to an air supply with sufficient capacity and pressure to achieve desired performance. A pressure regulating valve should be installed to insure air supply pressure does not exceed recommended limits.

**Air Valve Lubrication**

The air distribution system is designed to operate WITHOUT lubrication. This is the standard mode of operation. If lubrication is desired, install an air line lubricator set to deliver one drop of SAE 10 non-detergent oil for every 20 SCFM (9.4 liters/sec.) of air the pump consumes. Consult the Performance Curve to determine air consumption.

**Air Line Moisture**

Water in the compressed air supply may cause icing or freezing of the exhaust air, causing the pump to cycle erratically or stop operating. Water in the air supply can be reduced by using a point-of-use air dryer.

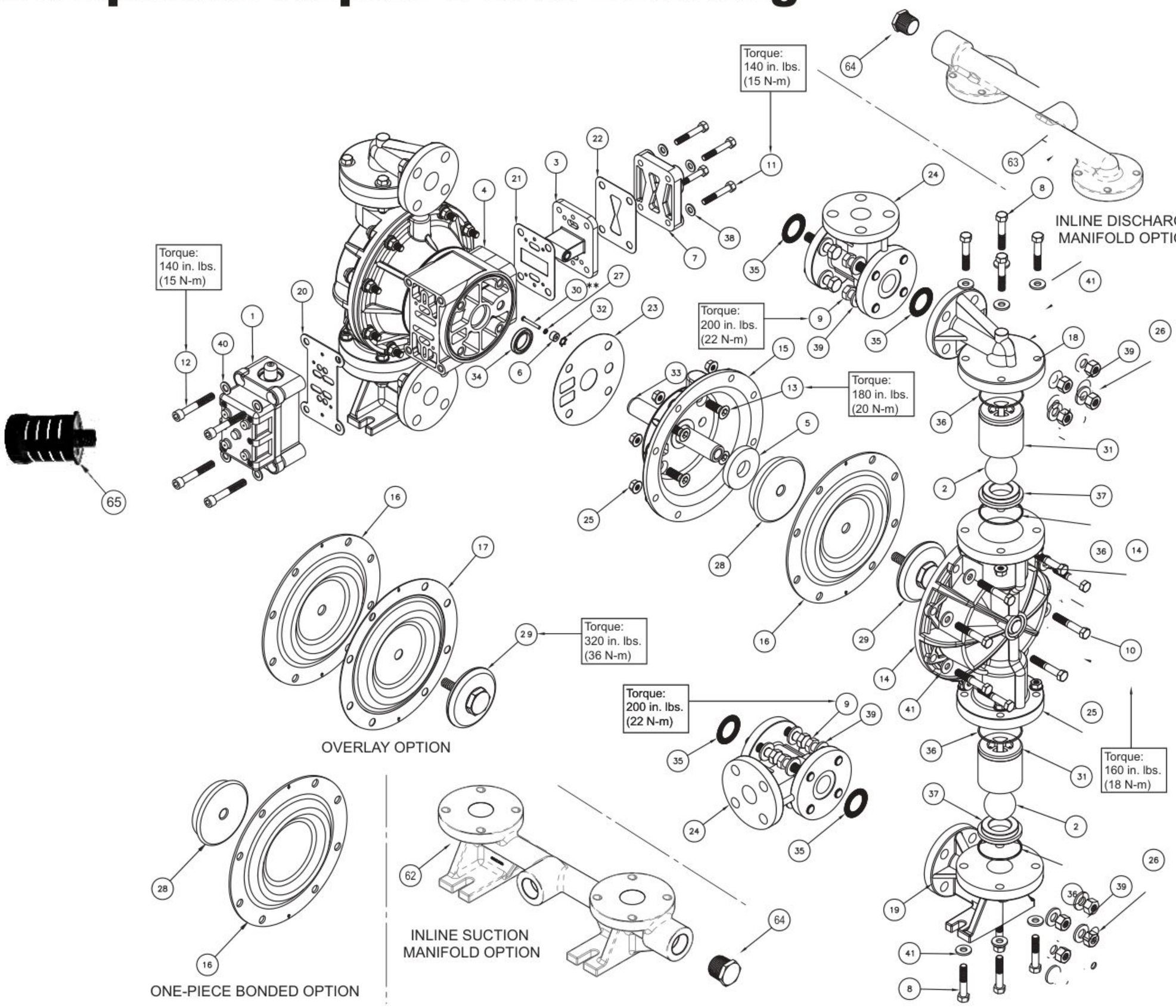
**Air Inlet And Priming**

To start the pump, slightly open the air shut-off valve. After the pump primes, the air valve can be opened to increase air flow as desired. If opening the valve increases cycling rate, but does not increase the rate of flow, cavitation has occurred. The valve should be closed slightly to obtain the most efficient air flow to pump flow ratio.

# Troubleshooting Guide

| Symptom: | Potential Cause(s): | Recommendation(s): |
|---|---|---|
| **Pump Cycles Once** | Deadhead (system pressure meets or exceeds air supply pressure). | Increase the inlet air pressure to the pump. Pump is designed for 1:1 pressure ratio at zero flow. (Does not apply to high pressure 2:1 units). |
| | Air valve or intermediate gaskets installed incorrectly. | Install gaskets with holes properly aligned. |
| | Bent or missing actuator plunger. | Remove pilot valve and inspect actuator plungers. |
| **Pump Will Not Operate / Cycle** | Pump is over lubricated. | Set lubricator on lowest possible setting or remove. Units are designed for lube free operation. |
| | Lack of air (line size, PSI, CFM). | Check the air line size and length, compressor capacity (HP vs. CFM required). |
| | Check air distribution system. | Disassemble and inspect main air distribution valve, pilot valve and pilot valve actuators. |
| | Discharge line is blocked or clogged manifolds. | Check for inadvertently closed discharge line valves. Clean discharge manifolds/piping. |
| | Deadhead (system pressure meets or exceeds air supply pressure). | Increase the inlet air pressure to the pump. Pump is designed for 1:1 pressure ratio at zero flow. (Does not apply to high pressure 2:1 units). |
| | Blocked air exhaust muffler. | Remove muffler screen, clean or de-ice, and re-install. |
| | Pumped fluid in air exhaust muffler. | Disassemble pump chambers. Inspect for diaphragm rupture or loose diaphragm plate assembly. |
| | Pump chamber is blocked. | Disassemble and inspect wetted chambers. Remove or flush any obstructions. |
| **Pump Cycles and Will Not Prime or No Flow** | Cavitation on suction side. | Check suction condition (move pump closer to product). |
| | Check valve obstructed. Valve ball(s) not seating properly or sticking. | Disassemble the wet end of the pump and manually dislodge obstruction in the check valve pocket. Clean out around valve ball cage and valve seat area. Replace valve ball or valve seat if damaged. Use heavier valve ball material. |
| | Valve ball(s) missing (pushed into chamber or manifold). | Worn valve ball or valve seat. Worn fingers in valve ball cage (replace part). Check Chemical Resistance Guide for compatibility. |
| | Valve ball(s) / seat(s) damaged or attacked by product. | Check Chemical Resistance Guide for compatibility. |
| | Check valve and/or seat is worn or needs adjusting. | Inspect check valves and seats for wear and proper setting. Replace if necessary. |
| | Suction line is blocked. | Remove or flush obstruction. Check and clear all suction screens or strainers. |
| | Excessive suction lift. | For lifts exceeding 20' of liquid, filling the chambers with liquid will prime the pump in most cases. |
| | Suction side air leakage or air in product. | Visually inspect all suction-side gaskets and pipe connections. |
| | Pumped fluid in air exhaust muffler. | Disassemble pump chambers. Inspect for diaphragm rupture or loose diaphragm plate assembly. |
| **Pump Cycles Running Sluggish / Stalling, Flow Unsatisfactory** | Over lubrication. | Set lubricator on lowest possible setting or remove. Units are designed for lube free operation. |
| | Icing. | Remove muffler screen, de-ice, and re-install. Install a point of use air drier. |
| | Clogged manifolds. | Clean manifolds to allow proper air flow. |
| | Deadhead (system pressure meets or exceeds air supply pressure). | Increase the inlet air pressure to the pump. Pump is designed for 1:1 pressure ratio at zero flow. (Does not apply to high pressure 2:1 units). |
| | Cavitation on suction side. | Check suction (move pump closer to product). |
| | Lack of air (line size, PSI, CFM). | Check the air line size, length, compressor capacity. |
| | Excessive suction lift. | For lifts exceeding 20' of liquid, filling the chambers with liquid will prime the pump in most cases. |
| | Air supply pressure or volume exceeds system hd. | Decrease inlet air (press. and vol.) to the pump. Pump is cavitating the fluid by fast cycling. |
| | Undersized suction line. | Meet or exceed pump connections. |
| | Restrictive or undersized air line. | Install a larger air line and connection. |
| | Suction side air leakage or air in product. | Visually inspect all suction-side gaskets and pipe connections. |
| | Suction line is blocked. | Remove or flush obstruction. Check and clear all suction screens or strainers. |
| | Pumped fluid in air exhaust muffler. | Disassemble pump chambers. Inspect for diaphragm rupture or loose diaphragm plate assembly. |
| | Check valve obstructed. | Disassemble the wet end of the pump and manually dislodge obstruction in the check valve pocket. |
| | Check valve and/or seat is worn or needs adjusting. | Inspect check valves and seats for wear and proper setting. Replace if necessary. |
| | Entrained air or vapor lock in chamber(s). | Purge chambers through tapped chamber vent plugs. Purging the chambers of air can be dangerous. |
| **Product Leaking Through Exhaust** | Diaphragm failure, or diaphragm plates loose. | Replace diaphragms, check for damage and ensure diaphragm plates are tight. |
| | Diaphragm stretched around center hole or bolt holes. | Check for excessive inlet pressure or air pressure. Consult Chemical Resistance Chart for compatibility with products, cleaners, temperature limitations and lubrication. |
| **Premature Diaphragm Failure** | Cavitation. | Enlarge pipe diameter on suction side of pump. |
| | Excessive flooded suction pressure. | Move pump closer to product. Raise pump/place pump on top of tank to reduce inlet pressure. Install Back pressure device (Tech bulletin 41r). Add accumulation tank or pulsation dampener. |
| | Misapplication (chemical/physical incompatibility). | Consult Chemical Resistance Chart for compatibility with products, cleaners, temperature limitations and lubrication. |
| | Incorrect diaphragm plates or plates on backwards, installed incorrectly or worn. | Check Operating Manual to check for correct part and installation. Ensure outer plates have not been worn to a sharp edge. |
| **Unbalanced Cycling** | Excessive suction lift. | For lifts exceeding 20' of liquid, filling the chambers with liquid will prime the pump in most cases. |
| | Undersized suction line. | Meet or exceed pump connections. |
| | Pumped fluid in air exhaust muffler. | Disassemble pump chambers. Inspect for diaphragm rupture or loose diaphragm plate assembly. |
| | Suction side air leakage or air in product. | Visually inspect all suction-side gaskets and pipe connections. |
| | Check valve obstructed. | Disassemble the wet end of the pump and manually dislodge obstruction in the check valve pocket. |
| | Check valve and/or seat is worn or needs adjusting. | Inspect check valves and seats for wear and proper setting. Replace if necessary. |
| | Entrained air or vapor lock in chamber(s). | Purge chambers through tapped chamber vent plugs. |

# Composite Repair Parts Drawing




# Service & Repair Kits

**476.217.000** **Air End Kit** (For Polypropylene Center Section)
Seals, O-Rings, Gaskets, Retaining Rings, Air Valve Sleeve & Spool Set and Pilot Valve Assembly

**476.218.000** **Air End Kit** (S-troke Indicator Option, For Polypropylene Center Section)
Seals, O-Rings, Gaskets, Retaining Rings, Air Valve, Sleeve & Spool Set and Pilot Valve Assembly

**476.197.354** **Wetted End Kit**
Santoprene Diaphragms, Santoprene Balls and PTFE Seals

**476.197.360** **Wetted End Kit**
Nitrile Diaphragms, Nitrile Balls and PTFE Seals

**476.197.363** **Wetted End Kit**
FKM Diaphragms, FKM Balls and PTFE Seals

**476.197.365** **Wetted End Kit**
Neoprene Diaphragms, Neoprene Balls and PTFE Seals

**476.197.635** **Wetted End Kit**
Neoprene Diaphragms, PTFE Overlay Diaphragms, PTFE Balls and PTFE Seals

**476.197.654** **Wetted End Kit**
Santoprene Diaphragms, PTFE Overlay Diaphragms, TFE Balls and TFE Seals

**476.197.659** **Wetted End Kit**
One-Piece Bonded Diaphragms, PTFE Balls, PTFE Seals

**476.198.655** **Wetted End Kit**
Santoprene Diaphragms, PTFE Overlay Diaphragms, PTFE Pumping Diaphragms, PTFE Balls and PTFE Seals

**476.198.354** **Wetted End Kit**
Santoprene Diaphragms, Santoprene Pumping Diaphragms, Santoprene Check Balls and PTFE Seals

**476.198.659** **Wetted End Kit**
One-Piece Bonded Diaphragms, PTFE Pumping Diaphragms, PTFE Balls, PTFE Seals

**Electronic Leak Detector Kits**

032.037.000 110 VAC / 220 VAC
032.045.000 12 - 32 VDC

**Note:** Polypropylene pumps are shipped with the 1" NPT Pipe Plug (Item 64) installed in the end ports of both suction and discharge one-piece manifolds. To convert to the Inline porting positions for pump installation and operation, first remove the pipe plugs and re-install in the center ports. Apply PTFE tape or pipe sealant to threads of the plug before installation.

# Composite Repair Parts List

| Item | Part Number | Description | Qty |
|---|---|---|---|
| ① | 031.140.000 | Air Valve Assembly | 1 |
| | ⚠ 031.140.001 | Air Valve Assembly | 1 |
| | 031.140.002 | Air Valve Assembly w/PTFE Coated Hardware | 1 |
| | 031.140.162 | Air Valve Assembly (Brass Spool - Stainless Sleeve) | 1 |
| | 031.141.000 | Air Valve Assembly (No Muffler) | 1 |
| | ⚠ 031.141.001 | Air Valve Assembly (No Muffler) | 1 |
| | 031.141.162 | Air Valve Assembly (No Muffler Brass Spool - Stainless Sleeve) | |
| | ⚠ 031.146.000 | Air Valve Assembly (With Stroke Indicator Option) | 1 |
| | ⚠ 031.147.000 | Air Valve Assembly (With Stroke Indicator Option) (No Muffler) | 1 |
| □ 2 | 050.042.354 | Ball, Check | 4 |
| | 050.042.360 | Ball, Check | 4 |
| | 050.042.363 | Ball, Check | 4 |
| | 050.042.365 | Ball, Check | 4 |
| | 050.042.600 | Ball, Check | 4 |
| ③ | 095.110.558 | Pilot Valve Assembly | 1 |
| 4 | 114.024.551 | Intermediate Assembly | 1 |
| | ⚠ 114.024.559 | Intermediate Assembly | 1 |
| ⑤ | 132.035.360 | Bumper, Diaphragm | 2 |
| ⑥ | 135.034.506 | Bushing, Plunger | 2 |
| 7 | 165.125.551 | Cap, Air Inlet | 1 |
| | ⚠ 165.125.559 | Cap, Air Inlet | 1 |
| 8 | 170.020.115 | Capscrew, Hex HD 3/8 - 16 x 2.00 | 16 |
| | 170.020.308 | Capscrew, Hex HD 3/8 - 16 x 2.00 | 16 |
| 9 | 170.030.115 | Capscrew, Hex HD 1/2 - 13 x 2.00 (not used with inline option) | 16 |
| | 170.030.308 | Capscrew, Hex HD 1/2 - 13 x 2.00 (not used with inline option) | 16 |
| 10 | 170.052.115 | Capscrew, Hex HD 3/8 - 16 x 2.25 | 16 |
| | 170.052.308 | Capscrew, Hex HD 3/8 - 16 x 2.25 | 16 |
| 11 | 170.069.115 | Capscrew, Hex HD 5/16 - 18 x 1.75 | 4 |
| | 170.069.308 | Capscrew, Hex HD 5/16 - 18 x 1.75 | 4 |
| 12 | 171.053.115 | Capscrew, Soc HD 3/8 - 16 x 2.50 | 4 |
| 13 | 171.015.115 | Capscrew, Soc HD 3/8 - 16 x .88 | 8 |
| | 171.015.308 | Capscrew, Soc HD 3/8 - 16 x .88 | 8 |
| 14 | 196-157.520 | Chamber, Outer | 2 |
| | ⚠ 196.157.521 | Chamber, Outer | 2 |
| | 196.157.552 | Chamber, Outer | 2 |
| | ⚠ 196.157.557 | Chamber, Outer | 2 |
| 15 | 196.177.551 | Chamber, Inner | 2 |
| | ⚠ 196.177.559 | Chamber, Inner | 2 |
| □ 16 | 286.107.354 | Diaphragm | 2 |
| | 286.107.360 | Diaphragm | 2 |
| | 286.115.000 | Diaphragm, One.Piece Bonded | 2 |
| | 286.107.363 | Diaphragm | 2 |
| | 286.107.365 | Diaphragm | 2 |
| □ 17 | 286.108.600 | Diaphragm, Overlay | 2 |
| 18 | 312.104.520 | Elbow | 2 |
| | 312.104.521 | Elbow | 2 |
| | ⚠ 312.104.557 | Elbow | 2 |
| | ⚠ 312.104.552 | Elbow (not used with inline option) | 2 |

| Item | Part Number | Description | Qty |
|---|---|---|---|
| 19 | 312.113.520 | Elbow, Suction | 2 |
| | ⚠ 312.113.521 | Elbow, Suction | 2 |
| | 312.113.552 | Elbow, Suction (not used with inline option) | 2 |
| | ⚠ 312.113.557 | Elbow, Suction | 1 |
| ○ 20 | 360.093.360 | Gasket, Air Valve | 1 |
| ○ 21 | 360.103.360 | Gasket, Pilot Valve | 1 |
| ○ 22 | 360.104.360 | Gasket, Air Inlet | 1 |
| | ⚠ 360.104.379 | Gasket, Air Inlet | 1 |
| □ 23 | 360.107.360 | Gasket, Inner Chamber | 2 |
| 24 | 518.179.520 | Manifold | 2 |
| | ⚠ 518.179.521 | Manifold | 2 |
| | 518.179.552 | Manifold | 2 |
| | ⚠ 518.179.557 | Manifold | 2 |
| 25 | 544.002.115 | Nut, Hex 3/8 - 16 | 32 |
| | 544.002.308 | Nut, Hex 3/8 - 16 | 32 |
| 26 | 545.008.110 | Nut, Hex 1/2 - 13 (not used with inline option) | 16 |
| | 545.008.308 | Nut, Hex 1/2 - 13 (not used with inline option) | 16 |
| ○ 27 | 560.001.360 | O-Ring | 2 |
| 28 | 612.200.157 | Inner Diaphragm Plate | 2 |
| | 612.200.082 | Inner Diaphragm Plate | 2 |
| | 612.220.150 | Inner Diaphragm Plate (One-Piece Bonded Option) | 2 |
| 29 | 612.204.520 | Outer Diaphragm Plate | 2 |
| | 612.204.552 | Outer Diaphragm Plate | 2 |
| ○ 30 | 620.020.115 | Plunger, Actuator | 2 |
| 31 | 670.048.520 | Retainer, Ball | 4 |
| | 670.048.552 | Retainer, Ball | 4 |
| ○ 32 | 675.042.115 | Ring, Retainer | 2 |
| 33 | 685.058.120 | Rod, Diaphragm | 1 |
| ○ 34 | 720.004.360 | Seal, Diaphragm Rod | 2 |
| □ 35 | 720.044.600 | Seal, Manifold Spacer (not used with inline option) | 4 |
| □ 36 | 720.047.600 | Seal, Check Valve | 8 |
| 37 | 722.079.520 | Seat, Check Valve | 4 |
| | 722.079.552 | Seat, Check Valve | 4 |
| 38 | 901.038.115 | Washer, Flat 5/16" | 4 |
| | 901.038.308 | Washer, Flat 5/16" | 4 |
| 39 | 901.046.115 | Washer, Flat 1/2" (not used with inline option) | 32 |
| | 901.046.308 | Washer, Flat 1/2" (not used with inline option) | 32 |
| 40 | 901.048.115 | Washer, Flat 3/8" | 4 |
| | 901.048.308 | Washer, Flat 3/8" | 4 |
| 41 | 901.049.115 | Washer, Flat 3/8" | 32 |
| | 901.049.308 | Washer, Flat 3/8" | 32 |
| 62 | 518.203.552 | Manifold, Suction (Inline Porting Option ONLY) | 1 |
| 63 | 518.204.552 | Manifold, Discharge (Inline Porting Option ONLY) | 1 |
| 64 | 618.057.552 | Plug, 1" NPT Pipe (Inline Porting Option ONLY) | 2 |
| 65 | 530.058.000 | Threaded Muffler | 1 |

**LEGEND:**

○ = Items contained within Air End Kits

□ = Items contianed within Wet End Kits

*Air End Kit does not include the complete air valve assembly

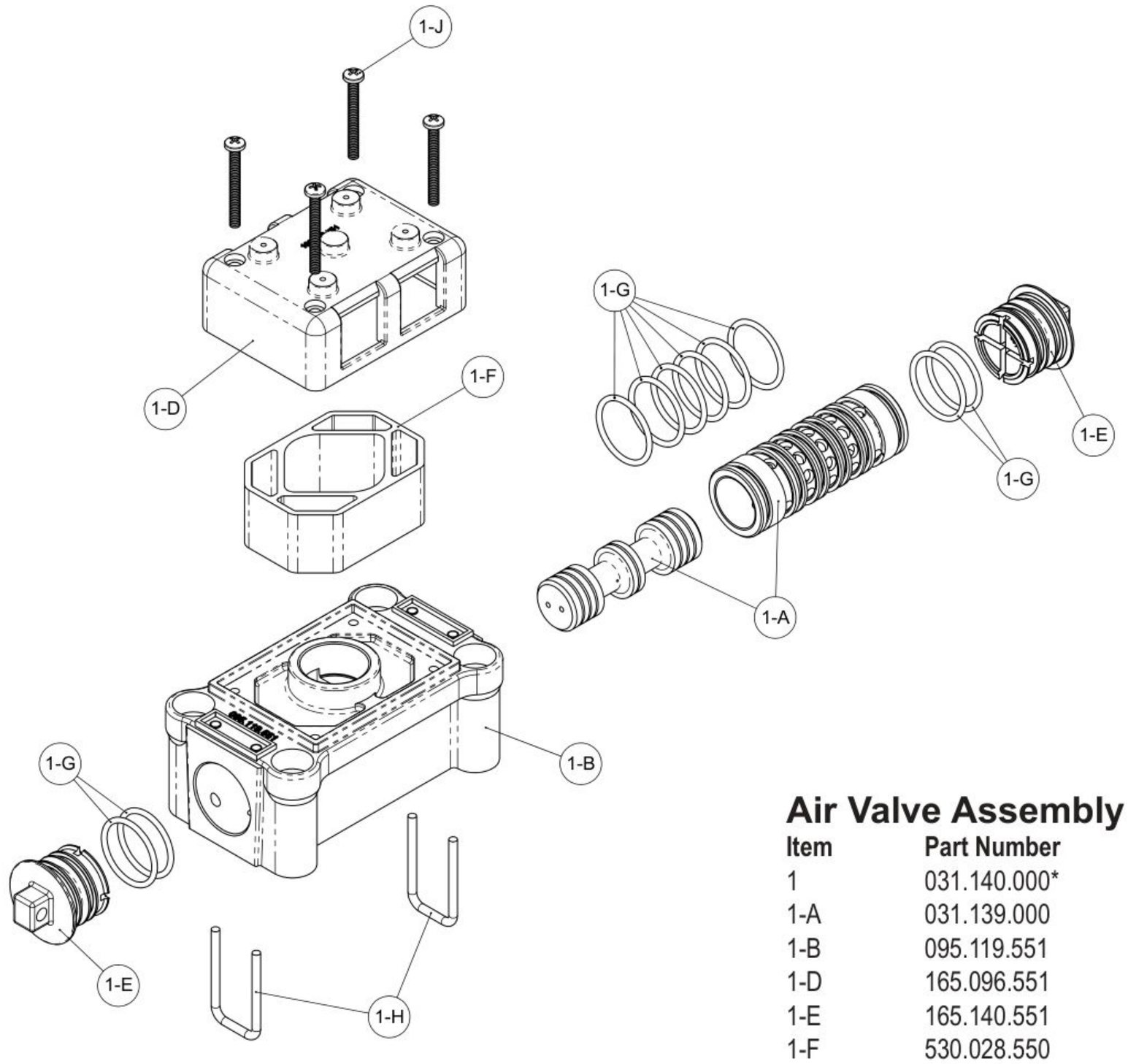
***Note:*** *Kits contain components specific to the material codes.*

# Material Codes - The Last 3 Digits of Part Number

000.....Assembly, sub-assembly;
and some purchased items
010.....Cast Iron
015.....Ductile Iron
020.....Ferritic Malleable Iron
080.....Carbon Steel, AISI B-1112
110.....Alloy Type 316 Stainless Steel
111.....Alloy Type 316 Stainless Steel
(Electro Polished)
112.....Alloy C
113.....Alloy Type 316 Stainless Steel
(Hand Polished)
114.....303 Stainless Steel
115.....302/304 Stainless Steel
117.....440-C Stainless Steel (Martensitic)
120.....416 Stainless Steel
(Wrought Martensitic)
148.....Hardcoat Anodized Aluminum
150.....6061-T6 Aluminum
152.....2024-T4 Aluminum (2023-T351)
155.....356-T6 Aluminum
156.....356-T6 Aluminum
157.....Die Cast Aluminum Alloy #380
158.....Aluminum Alloy SR-319
162.....Brass, Yellow, Screw Machine Stock
165.....Cast Bronze, 85-5-5-5
166.....Bronze, SAE 660
170.....Bronze, Bearing Type,
Oil Impregnated
180.....Copper Alloy
305.....Carbon Steel, Black Epoxy Coated
306.....Carbon Steel, Black PTFE Coated
307.....Aluminum, Black Epoxy Coated
308.....Stainless Steel, Black PTFE Coated
309.....Aluminum, Black PTFE Coated
313.....Aluminum, White Epoxy Coated
330.....Zinc Plated Steel
332.....Aluminum, Electroless Nickel Plated
333.....Carbon Steel, Electroless
Nickel Plated
335.....Galvanized Steel
337.....Silver Plated Steel
351.....Food Grade Santoprene®
353.....Geolast; Color: Black
354.....Injection Molded #203-40
Santoprene® Duro 40D +/-5;
Color: RED
356.....Hytrel®
357.....Injection Molded Polyurethane
358.....Urethane Rubber
(Some Applications)
(Compression Mold)
359.....Urethane Rubber
360.....Nitrile Rubber Color coded: RED
363.....FKM (Fluorocarbon)
Color coded: YELLOW
364.....EPDM Rubber
Color coded: BLUE
365.....Neoprene Rubber
Color coded: GREEN
366.....Food Grade Nitrile
368.....Food Grade EPDM
371.....Philthane (Tuftane)
374.....Carboxylated Nitrile
375.....Fluorinated Nitrile
378.....High Density Polypropylene
379.....Conductive Nitrile
408.....Cork and Neoprene
425.....Compressed Fibre
426.....Blue Gard
440.....Vegetable Fibre
500.....Delrin® 500
502.....Conductive Acetal, ESD-800
503.....Conductive Acetal, Glass-Filled
506.....Delrin® 150
520.....Injection Molded PVDF
Natural color
540.....Nylon
542.....Nylon
544.....Nylon Injection Molded
550.....Polyethylene
551.....Glass Filled Polypropylene
552.....Unfilled Polypropylene
555.....Polyvinyl Chloride
556.....Black Vinyl
557.....Unfilled Conductive Polypropylene
558.....Conductive HDPE
559.....Glass Filled - Conductive Polypropylene
570.....Rulon II®
580.....Ryton®
600.....PTFE (virgin material)
Tetrafluorocarbon (TFE)
603.....Blue Gylon®
604.....PTFE
606.....PTFE
607.....Envelon
608.....Conductive PTFE
610.....PTFE Encapsulated Silicon
611.....PTFE Encapsulated FKM
632.....Neoprene/Hytrel®
633.....FKM/PTFE
634.....EPDM/PTFE
635.....Neoprene/PTFE
637.....PTFE, FKM/PTFE
638.....PTFE, Hytrel®/PTFE
639.....Nitrile/TFE
643.....Santoprene®/EPDM
644.....Santoprene®/PTFE
656.....Santoprene® Diaphragm and
Check Balls/EPDM Seats
661.....EPDM/Santoprene®
666.....FDA Nitrile Diaphragm,
PTFE Overlay, Balls, and Seals
668.....PTFE, FDA Santoprene®/PTFE

- Delrin and Hytrel are registered tradenames of E.I. DuPont.
- Nylatron is a registered tradename of Polymer Corp.
- Gylon is a registered tradename of Garlock, Inc.
- Santoprene is a registered tradename of Exxon Mobil Corp.
- Rulon II is a registered tradename of Dixion Industries Corp.
- Ryton is a registered tradename of Phillips Chemical Co.
- Valox is a registered tradename of General Electric Co.

# Air Distribution Valve Assembly






## Air Distribution Valve Servicing

See repair parts drawing, remove screws.

**Step 1:** Remove staple retainer (1-H).

**Step 2:** Remove end cap (1-E).

**Step 3:** Remove spool part of (1-A) (caution: do not scratch).

**Step 4:** Press sleeve (1-A) from body (1-B).

**Step 5:** Inspect O-Ring (1-H) and replace if necessary.

**Step 6:** Lightly lubricate O-Rings (1-H) on sleeve (1-A).

**Step 7:** Press sleeve (1-A) into body (1-B).

**Step 8:** Reassemble in reverse order, starting with step 3.

**Note:** Sleeve and spool (1-A) set is match ground to a specified clearance sleeve and spools (1-A) cannot be interchanged.

**⚠ IMPORTANT**

***Read these instructions completely, before installation and start-up. It is the responsibility of the purchaser to retain this manual for reference. Failure to comply with the recommendations stated in this manual will damage the pump, and void factory warranty.***

## Air Valve Assembly Parts List

| Item | Part Number | Description | Qty |
|---|---|---|---|
| 1 | 031.140.000* | Air Valve Assembly | 1 |
| 1-A | 031.139.000 | Sleeve and Spool Set | 1 |
| 1-B | 095.119.551 | Body, Air Valve | 1 |
| 1-D | 165.096.551 | Cap, Muffler | 1 |
| 1-E | 165.140.551 | Cap, End | 2 |
| 1-F | 530.028.550 | Muffler | 1 |
| 1-G | 560.020.360 | O-Ring | 10 |
| 1-H | 675.068.115 | Staple | 2 |
| 1-J | 710.015.115 | Screw, Self-tapping | 4 |

**For Pumps with Piped Exhaust:**

| | | | |
|---|---|---|---|
| 1 | 031.141.000* | Air Valve Assembly | 1 |

**(Includes all items used on 031.140.000 minus items 1-D, 1-F & 1-J)**

## Air Valve Assembly Parts List

⚠

| Item | Part Number | Description | Qty |
|---|---|---|---|
| 1 | 031.140.001 | Air Valve Assembly | 1 |
| 1-A | 031.139.000 | Sleeve and Spool Set | 1 |
| 1-C | 095.119.559 | Body, Air Valve | 1 |
| 1-D | 165.096.559 | Cap, Muffler | 1 |
| 1-E | 165.140.559 | Cap, End | 2 |
| 1-F | 530.028.550 | Muffler | 1 |
| 1-G | 560.020.360 | O-Ring | 10 |
| 1-H | 675.068.115 | Staple | 2 |
| 1-J | 710.015.115 | Screw, Self-tapping | 4 |

**For Pumps with Metal Mesh Muffler or Piped Exhaust:**

⚠

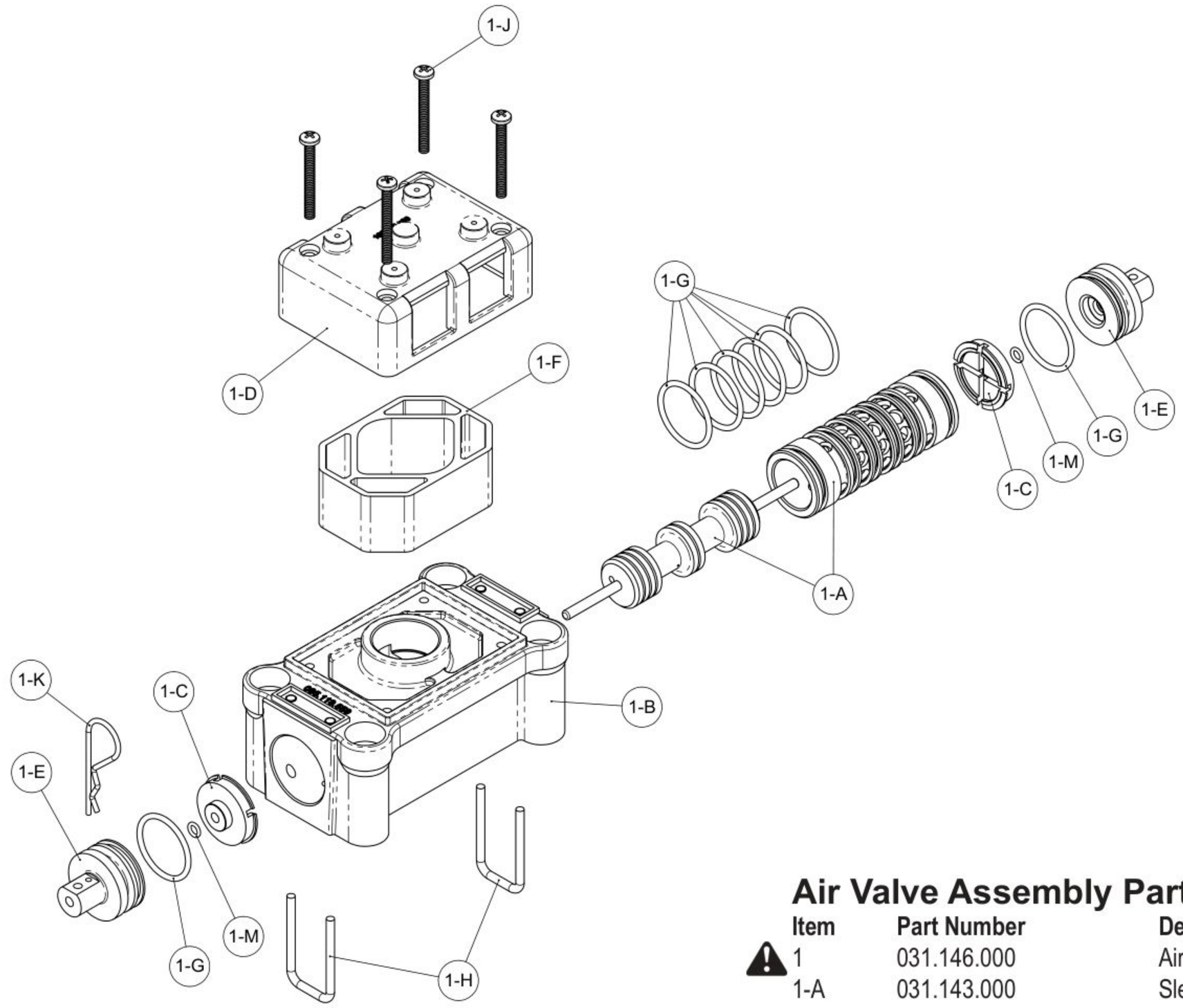
| | | | |
|---|---|---|---|
| 1 | 031.141.001 | Air Valve Assembly | 1 |

**(Includes all items used on 031.140.001 minus items 1-D, 1-F & 1-J)**

* For pumps with stainless brass sleeve and spool set use replace last three digits with 162

# Air Valve with Stroke Indicator Assembly

**Note:** Stroke Indicator is standard on Spill Containment models




## Air Distribution Valve Servicing

See repair parts drawing, remove screws.

**Step 1:** Remove staple retainer (1-H).

**Step 2:** Remove end cap (1-E), bumper (1-C).

**Step 3:** Remove spool part of (1-A) (caution, do not scratch).

**Step 4:** Press sleeve (1-A) from body (1-B).

**Step 5:** Inspect O-Ring (1-G) and replace if necessary.

**Step 6:** Lightly lubricate O-Rings (1-G) on sleeve (1-A).

**Step 7:** Press sleeve (1-A) into body (1-B).

**Step 8:** Reassemble in reverse order.

**Note:** Sleeve and spool (1-A) set is match ground to a specified clearance sleeve and spools (1-A) cannot be interchanged.

## Air Valve Assembly Parts List

| Item | Part Number | Description | Qty |
|---|---|---|---|
| ⚠ 1 | 031.146.000 | Air Valve Assembly | 1 |
| 1-A | 031.143.000 | Sleeve and Spool Set w/Pins | 1 |
| 1-B | 095.119.559 | Body, Air Valve | 1 |
| 1-C | 132.039.551 | Bumper | 2 |
| 1-D | 165.096.559 | Cap, Muffler | 1 |
| 1-E | 165.156.147 | Cap, End | 2 |
| 1-F | 530.028.550 | Muffler | 1 |
| 1-G | 560.020.360 | O-Ring | 8 |
| 1-H | 675.068.115 | Staple | 2 |
| 1-J | 710.015.115 | Screw, Self-Tapping | 4 |
| 1-K | 210.008.330 | Clip, Safety | 1 |
| 1-M | 560.029.360 | O-Ring | 2 |

**For Pumps with PTFE Coated Hardware:**

| | | | |
|---|---|---|---|
| 1 | 031.146.002 | Air Valve Assembly | 1 |
| 1-J | 710.015.308 | Screw, Self Tapping | 4 |

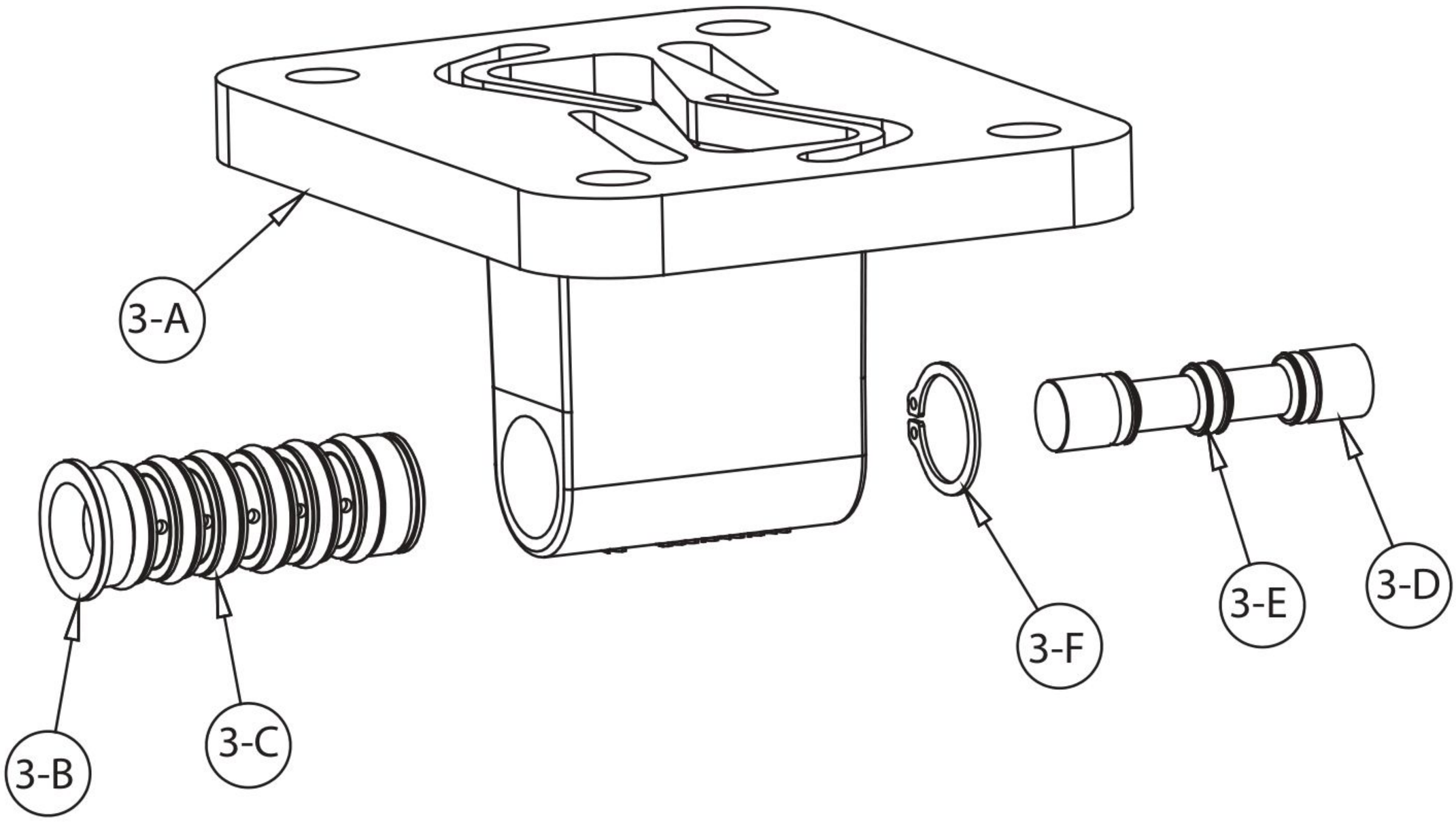
**(includes all other items on 031.146.000 above)**

**For Pumps with Piped Exhaust:**

| | | | |
|---|---|---|---|
| ⚠ 1 | 031.147.000 | Air Valve Assembly | 1 |

(includes all items on 031.146.000 minus 1-D, 1-F, & 1-J)

# Pilot Valve Assembly






## Pilot Valve Servicing

With Pilot Valve removed from pump.

**Step 1:** Remove snap ring (3-F).

**Step 2:** Remove sleeve (3-B), inspect O-Rings (3-C), replace if required.

**Step 3:** Remove spool (3-D) from sleeve (3-B), inspect O-Rings (3E), replace if required.

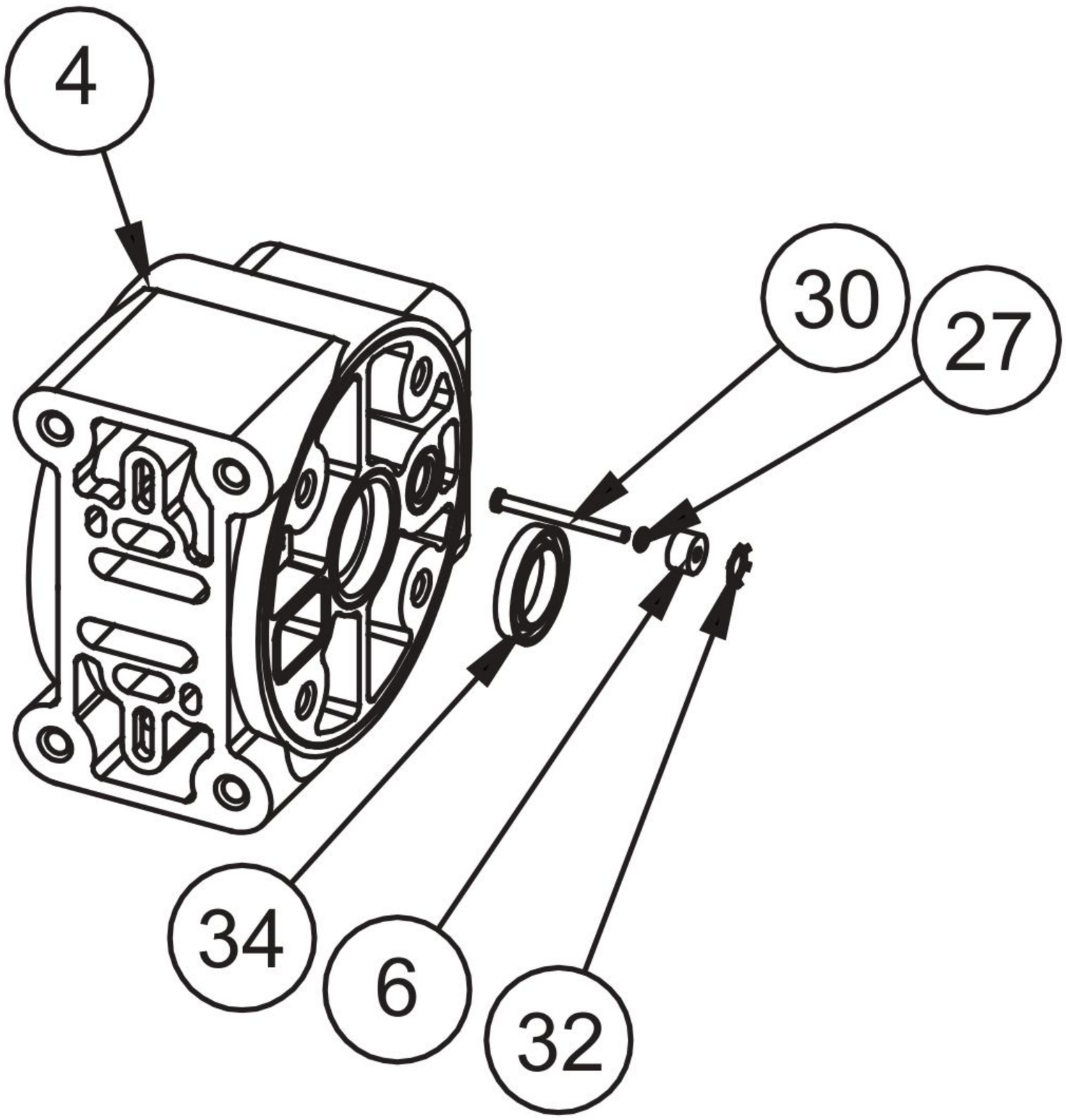
**Step 4:** Lightly lubricate O-Rings (3-C) and (3-E).

Reassemble in reverse order.

## Pilot Valve Assembly Parts List

| Item | Part Number | Description | Qty |
|---|---|---|---|
| 3 | 095.110.558 | Pilot Valve Assembly | 1 |
| 3-A | 095.095.558 | Valve Body | 1 |
| 3-B | 755.052.000 | Sleeve (With O-Rings) | 1 |
| 3-C | 560.033.360 | O-Ring (Sleeve) | 6 |
| 3-D | 775.055.000 | Spool (With O-Rings) | 1 |
| 3-E | 560.023.360 | O-Ring (Spool) | 3 |
| 3-F | 675.037.080 | Retaining Ring | 1 |

# Intermediate Assembly Drawing






## Intermediate Assembly Drawing

**Step 1:** Remove plunger, actuator (30) from center of intermediate pilot valve cavity.

**Step 2:** Remove Ring, Retaining (32), discard.

**Step 3:** Remove bushing, plunger (6), inspect for wear and replace if necessary with genuine parts.

**Step 4:** Remove O-Ring (27), inspect for wear and replace if necessary with genuine parts.

**Step 5:** Lightly lubricate O-Ring (27) and insert into intermediate.

**Step 6:** Reassemble in reverse order.

**Step 7:** Remove Seal, Diaphragm Rod (34).

**Step 8:** Clean seal area, lightly lubricate and install new Seal, Diaphragm Rod (34).

## INTERMEDIATE REPAIR PARTS LIST

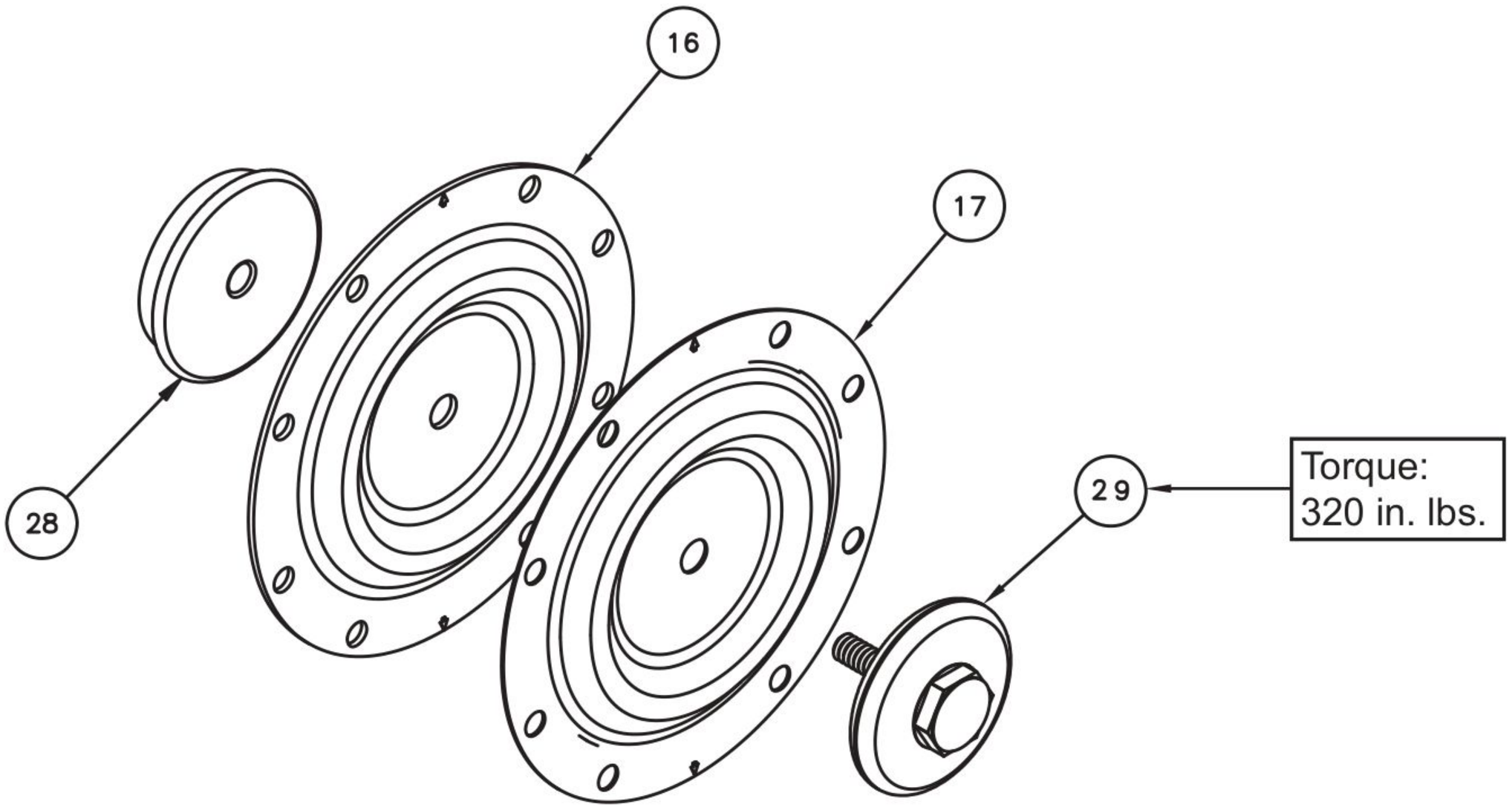
| Item | Part Number | Description | Qty |
|---|---|---|---|
| 4 | 114.024.551 | Bracket, Intermediate | 1 |
| | 114.024.559 | Bracket, Intermediate | 1 |
| 6 | 135.034.506 | Bushing, Plunger | 2 |
| 27 | 560.001.360 | O-Ring | 2 |
| 30 | 620.020.115 | Plunger, Actuator | 2 |
| 32 | 675.042.115 | Ring, Retaining* | 2 |
| 34 | 720.004.360 | Seal, Diaphragm Rod | 2 |

***Note:** It is recommended that when plunger components are serviced, new retaining rings be installed.

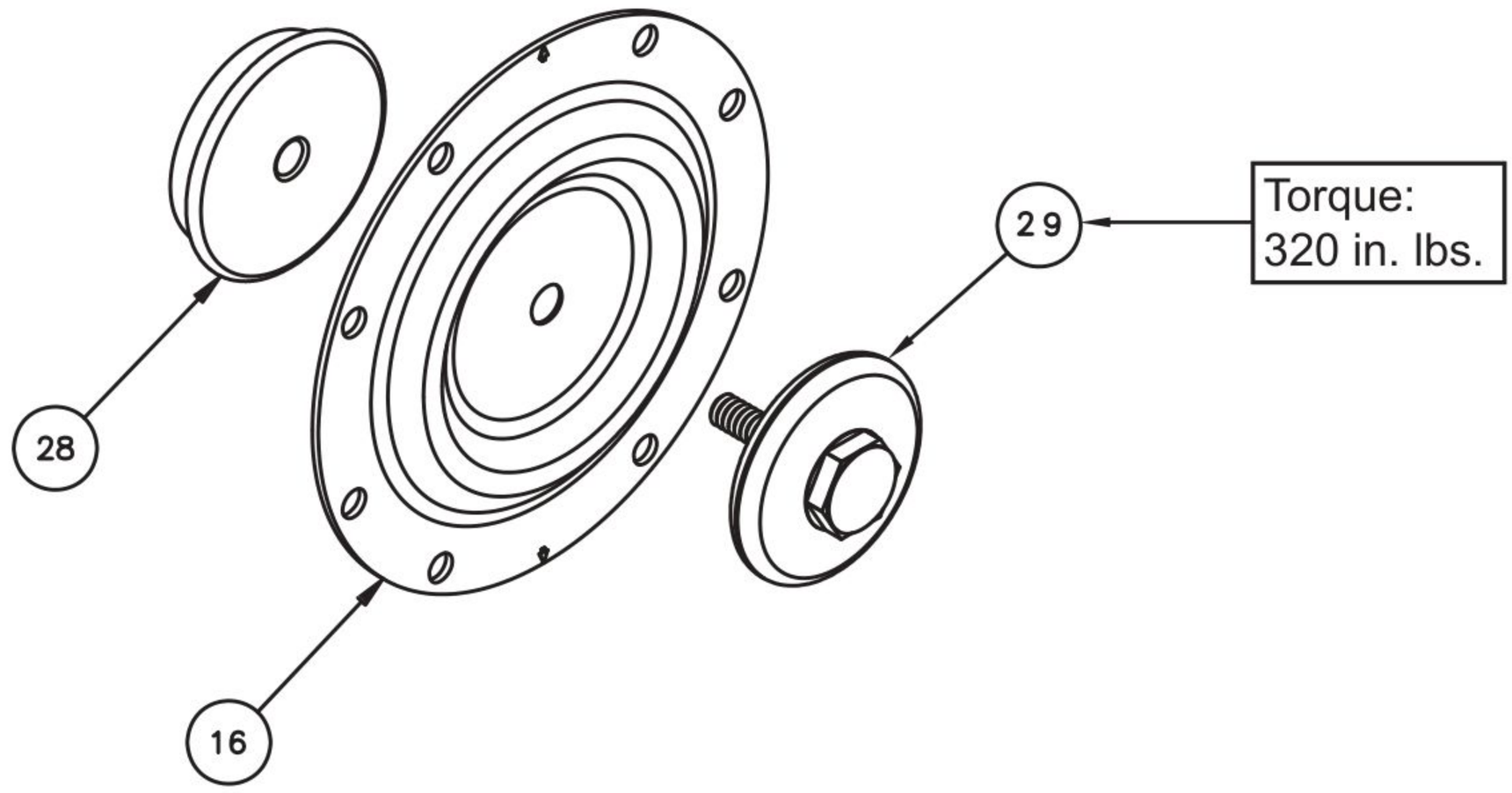
**⚠ IMPORTANT**

*When the pumped product source is at a higher level than the pump (flooded suction condition), pipe the exhaust higher than the product source to prevent siphoning spills. In the event of a diaphragm failure a complete rebuild of the center section is recommended.*

# Diaphragm Service Drawing with Overlay




# Diaphragm Service Drawing, Non-Overlay




Field conversion kit 475.258.000 available for conversion from PTFE Overlay to One-Piece bonded Diaphragm

| Part | Description | Qty |
|---|---|---|
| 286.115.000 | One-Piece Diaphragm | 2 |
| 612.220.150 | Plate, Inner Diaphragm | 2 |

# Diaphragm Servicing

**Step 1:** With manifolds and outer chambers removed, remove diaphragm assemblies from diaphragm rod. **DO NOT** use a pipe wrench or similar tool to remove assembly from rod. Flaws in the rod surface may damage bearings and seal. Soft jaws in a vise are recommended to prevent diaphragm rod damage.

**Step 1.A: NOTE:** Not all inner diaphragm plates are threaded. Some models utilize a through hole in the inner diaphragm plate. If required to separate diaphragm assembly, place assembly in a vise, gripping on the exterior cast diameter of the inner plate. Turn the outer plate clockwise to separate the assembly.

Always inspect diaphragms for wear cracks or chemical attack. Inspect inner and outer plates for deformities, rust scale and wear. Inspect intermediate bearings for elongation and wear. Inspect diaphragm rod for wear or marks.
Clean or repair if appropriate. Replace as required.

**Step 2:** Reassembly: There are two different types of diaphragm plate assemblies utilized throughout the F T A product line: Outer plate with a threaded stud, diaphragm, and a threaded inner plate.

Outer plate with a threaded stud, diaphragm, and an inner plate with through hole. Secure threaded inner plate in a vise. Ensure that the plates are being installed with the outer radius against the diaphragm.

**Step 3:** Lightly lubricate, with a compatible material, the inner faces of both outer and inner diaphragm plates when using on non Overlay diaphragms (For EPDM water is recommended). No lubrication is required.

**Step 4:** Push the threaded outer diaphragm plate through the center hole of the diaphragm. **Note:** Most diaphragms are installed with the natural bulge out towards the fluid side. F05, F07, and F10 non–metallic units are installed with the natural bulge in towards the air side.

**Step 5:** Thread or place, outer plate stud into the inner plate. For threaded inner plates, use a torque wrench to tighten the assembly together. Torque values are called out on the exploded view.

Repeat procedure for second side assembly. Allow a minimum of 15 minutes to elapse after torquing, then re-torque the assembly to compensate for stress relaxation in the clamped assembly.

**Step 6:** Thread one assembly onto the diaphragm rod with sealing washer (when used) and bumper.

**Step 7:** Install diaphragm rod assembly into pump and secure by installing the outer chamber in place and tightening the capscrews.

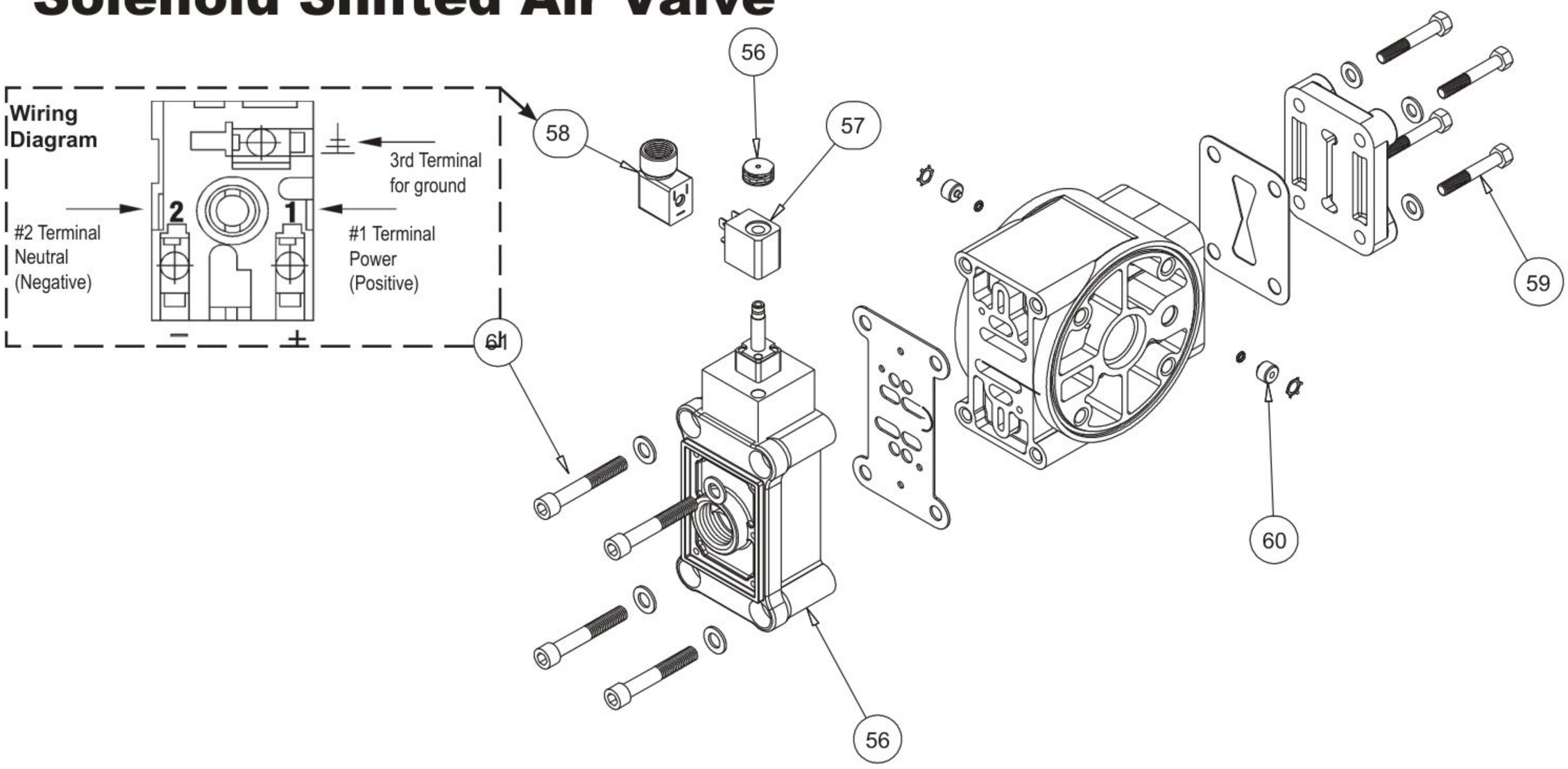
**Step 8:** On opposite side of pump, thread the remaining assembly onto the diaphragm rod. Using a torque wrench, tighten the assembly to the diaphragm rod. Align diaphragm through bolt holes, always going forward past the recommended torque. Torque values are called out on the exploded view. **NEVER** reverse to align holes, if alignment cannot be achieved without damage to diaphragm, loosen complete assemblies, rotate diaphragm and reassemble as described above.

**Step 9:** Complete assembly of entire unit.
One Piece Diaphragm Servicing (Bonded PTFE with integral plate) The One Piece diaphragm has a threaded stud installed in the integral plate at the factory. The inner diaphragm plate has a through hole instead of a threaded hole. Place the inner plate over the diaphragm stud and thread the first diaphragm / inner plate onto the diaphragm rod only until the inner plate contacts the rod. Do not tighten. A small amount of grease may be applied between the inner plate and the diaphragm to facilitate assembly. Insert the diaphragm / rod assembly into the pump and install the outer chamber. Turn the pump over and thread the second diaphragm / inner plate onto the diaphragm rod. Turn the diaphragm until the inner plate contacts the rod and hand tighten the assembly. Continue tightening until the bolt holes align with the inner chamber holes. **DO NOT LEAVE THE ASSEMBLY LOOSE.**

**⚠ IMPORTANT**

***Read these instructions completely, before installation and start-up. It is the responsibility of the purchaser to retain this manual for reference. Failure to comply with the recommendations stated in this manual will damage the pump, and void factory warranty.***

# Solenoid Shifted Air Valve




## Solenoid Shifted Operation

The Solenoid Shifted FTA PUMP has a solenoid operated, ai r distribution valve in place of the standard FTA PUMP's pilot operated, air distribution valve. Where a pilot valve is normally utilized to cycle the pump's air distribution valve, an electric solenoid is utilized. As the solenoid is powered, one of the pump's air chambers is pressurized while the other chamber is exhausted. When electric power is turned off, the solenoid shifts and the pressurized chamber is exhausted while the other chamber is pressurized. By alternately applying and removing power to the solenoid, the pump cycles much like a standard FTA PUMP pump, with one exception. This option provides a way to precisely control and monitor pump speed.

## Before Installation

Before wiring the solenoid, make certain it is compatible with your system voltage.

## Solenoid Shifted Air Valve Parts List

(Includes All Items Used on Composite Repair Parts List Except as Shown)

| Item | Part Number | Description | Qty |
|---|---|---|---|
| 56 | 893.097.000 | Solenoid Valve, NEMA4 | 1 |
| 57 | 219.001.000 | Solenoid Coil, 24VDC | 1 |
| | 219.004.000 | Solenoid Coil, 24VAC/12VDC | 1 |
| | 219.002.000 | Solenoid Coil, 120VAC | 1 |
| | 219.003.000 | Solenoid Coil, 240VAC | 1 |
| 58 | 241.001.000 | Connector, conduit | 1 |
| 59 | 170.045.115 | Capscrew, Hex HD 5/16 - 18 x 1.25 | 4 |
| 60 | 618.051.150 | Plug | 2 |
| 61 | 171.053.115 | Capscrew, Socket Head | 4 |

FM APPROVED IEC EEX m T4 CSA®

***For Explosion Proof Solenoid Coils used in North America and outside the European Union.***

| | | | |
|---|---|---|---|
| 57 △ | 219.009.001 | Solenoid Coil, 120VAC 60 Hz | 1 |
| | 219.009.002 | Solenoid Coil, 240VAC 60 HZ | 1 |
| | 219.009.003 | Solenoid Coil, 12VDC | 1 |
| | 219.009.004 | Solenoid Coil, 24VDC | 1 |
| | 219.009.005 | Solenoid Coil, 110VAC 50 Hz | 1 |
| | 219.009.006 | Solenoid Coil, 230VAC 50 Hz | 1 |

Note: Item 58 (Conduit Connector) is not required

## *Special Conditions For Safe Use

A fuse corresponding to its rated current (max. $3*I_{rat}$ according IEC 60127-2-1) or a motor protecting switch with short-circuit and thermal instantaneous tripping (set to rated current) shall be connected in series to each solenoid as short circuit protection. For very low rated currents of the solenoid the fuse of lowest current value according to the indicated IEC standard will be sufficient. The fuse may be accommodated in the associated supply unit or shall be separately arranged. The rated voltage to the fuse shall be equal to or greater than the stated rated voltage of the magnet coil. The breakage capacity of the fuse-link shall be as high as or higher than the maximum expected short circuit current at the location of the installation (usually 1500 A). A maximum permissible ripple of 20% is valid for all magnets of direct-current design.

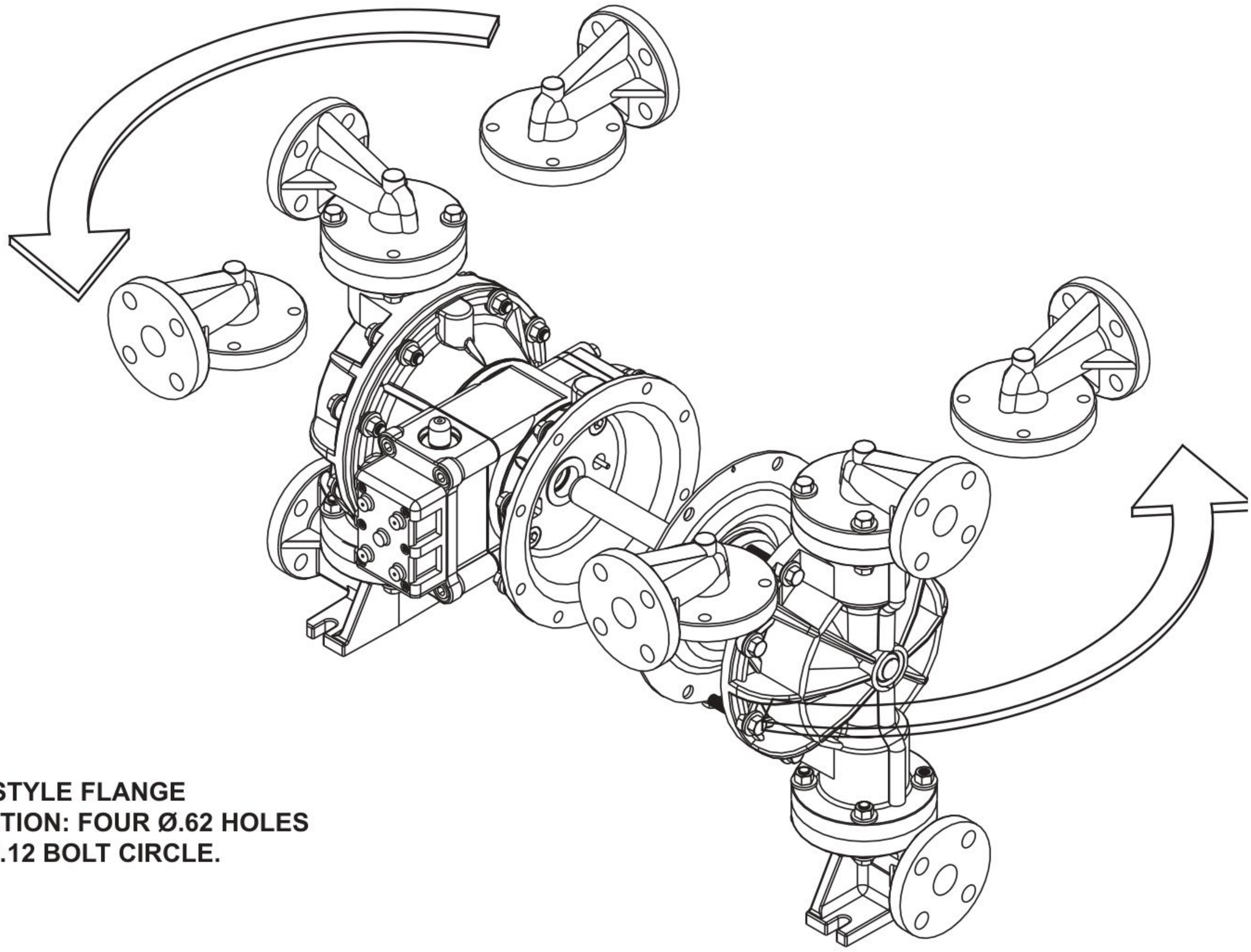
***◆ *For ATEX Compliant Solenoid Coils used in the European Union***

| | | | |
|---|---|---|---|
| 57 | 219.011.001 | Solenoid Coil, Single mounting 12 VDC, 3.3W / 267mA | 1 |
| | 219.011.002 | Solenoid Coil, Single mounting 24 VDC, 3.3W / 136mA | 1 |
| | 219.011.003 | Solenoid Coil, Single mounting 110/120 VAC, 3.4W / 29mA | 1 |
| | 219.011.004 | Solenoid Coil, Single mounting 220/240 VAC, 3.4W / 15mA | 1 |

Note: Item 37 (Conduit Connector) is not required

**Compressed Air Temperature Range:** Maximum Ambient Temperature to plus 50°C

# Dual Port Option



**1" ANSI STYLE FLANGE CONNECTION: FOUR Ø.62 HOLES ON A Ø 3.12 BOLT CIRCLE.**

### DUAL PORTING OPTIONS

Several dual porting options are possible. The pump can be converted to a dual port arrangement on both the suction and the discharge ends. The porting can be configured to a single suction and a dual discharge. The porting can be changed to a dual suction and a single discharge.

The above changes are possible because the porting flange of the elbows (items 18 and 19) are designed to mate with standard 125# ANSI style 4-bolt, 1" pipe flanges.

### DUAL PORTING OF BOTH SUCTION AND DISCHARGE ENDS OF THE PUMP

Converting the pump from the standard single suction and discharge porting configuration to dual porting at each end is easy. Simply remove the manifold seals, spacers, and manifolds (items 35 and 23 from pump assembly drawing) from the pump.

The discharge and suction elbows can be rotated at 90° increments (see arrows and optional positioning in the Dual Porting Drawing.

### SINGLE PORTING OF THE SUCTION AND DUAL PORTING OF THE PUMP DISCHARGE

To convert the pump from the standard single suction and single discharge porting configuration to a dual discharge porting arrangement remove the only the discharge manifolds, spacers, and manifold seals. Position the discharge elbows in the desired direction at 90° increments. (See arrows and optional positioning in the Dual Porting Drawing.)

### DUAL PORTING OF THE SUCTION AND SINGLE PORTING OF THE PUMP DISCHARGE

To convert the pump from the standard single suction and single discharge porting configuration to a dual suction porting arrangement remove the only the suction (bottom) manifolds, spacers, and manifold seals.

Position the suction elbows in the desired direction at 90° increments. (See arrows and optional positioning in the Dual Porting Drawing.)