Liquiflo™
Chemical Processing Pumps

INSTALLATION, OPERATION & MAINTENANCE MANUAL

CENTRY® SERIES

DOUBLE-SEALED, CLOSE-COUPLED CENTRIFUGAL PUMPS

Model 620 with Double Mechanical Seal & Pedestal Mount

Document No.: 3.20.103

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Introduction

This manual provides instructions for the installation, operation and maintenance of the Centry® Series Centrifugal Pump, **Model 620 with Double Mechanical Seal & Pedestal Mount**. It is critical for any user to read and understand the information in this manual along with any documents this manual refers to prior to installation and start-up.

Liquiflo pumps shall not be liable for damage or delays caused by a failure to follow the instructions for installation, operation and maintenance as outlined in this manual.

Thank you for purchasing a Liquiflo product.

LIQUIFLO STANDARD TERMS AND CONDITIONS APPLY UNLESS OTHERWISE SPECIFIED IN WRITING BY LIQUIFLO.

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Section 1: General Information

This manual covers the Centry® Series Close-Coupled Centrifugal Pump, **Model 620 with Double Mechanical Seal (DMS) & Pedestal Mount**. (Note: Model 620 was formerly called Model 62.) The long-coupled mounting option using the Liquiflo Power Frame is also covered in this manual.

1.1 Pump Description

Model 620 Sealed is an end-suction centrifugal pump with the following features:

- Pedestal Mount design, configurable with **Type 9T double mechanical seal**
- Motor-supported Stainless Steel bracket design, configurable with Type 21 or Type 9T single mechanical seal (Not covered in this manual)
- Close-coupled or long-coupled mounting options
- Choice of threaded or flanged ports
- Back pullout design to simplify maintenance
- Driver-supported shaft that simplifies pump design
- Standard reduced impeller sizes to simplify pump selection

The pump *Model Number* and *Serial Number* are stamped on the *Stainless Steel Tag* that is attached to the pump's housing. The Serial Number is also permanently stamped on the pump's volute.

The Model Number completely describes the pump's construction and is required when ordering either a new pump or replacement parts for an existing pump. The Model Number for the sealed pump is based on a 7-position *Model Coding* system that is described in **Section 1.4** (see page 5).

1.2 General Instructions

The materials of construction of the pump are selected based upon the chemical compatibility of the fluid being pumped. The user must verify that the materials are suitable for the surrounding atmosphere.

If the fluid is non-conductive, methods are available to mechanically ground the isolated shaft. This is only necessary if the surrounding atmosphere is extremely explosive or stray static charges are present.

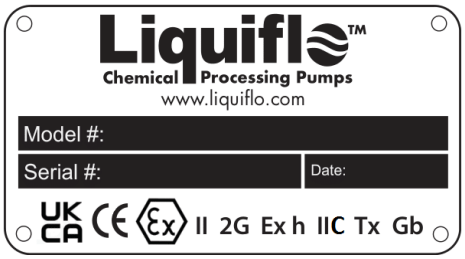
Upon receipt of your Liquiflo pump:

1) Inspect pump and verify that it was not damaged during transit.

2) Inspect tag and verify that the Model Number of the pump matches the Model Number of the pump that was ordered.

3) For UKCA, CE and ATEX certification, verify that the *Stainless Steel Tag* shown to the right is attached to the pump:

   Refer to **Appendix 6** for meaning of the Tag Certification Markings which are shown at the bottom of the tag.



4) Record the following information for future reference:

Model Number:
Serial Number:
Date Received:
Pump Location:
Pump Service:

1.3 Pump Specifications

Table 1: Dimensional Specifications

Specification		Value	Unit
Ports	Type	Threaded (NPT) or Flanged (ANSI 150# RF)	–
	Suction Size	1.00	in
	Discharge Size	0.75	in
Impeller	Diameter	3.75	in
	Standard Trims	3.50, 3.25, 3.00, 2.75	in
	Type	Open	–
Mounting Bracket		Close-Coupled, Pedestal [1]	–
Motor Frames (C-Face)		NEMA 56C thru 145TC [1]	–

1 Power Frame option is available for long-coupling pump mounting bracket to other motor frames.

Table 2: Performance Specifications

Specification	Value	Unit
Maximum Speed	3600	RPM
Maximum Flow Rate	45	GPM
Maximum Differential Head	65	ft

Table 3: Absolute Temperature & Pressure Ratings

Specification	Value	Unit
Minimum Operating Temperature	-40	°F
Maximum Operating Temperature	500	°F
Maximum Operating Pressure	300 [2]	PSIG

2 For flanged pumps, max rating is 275 PSIG @ -20 to 100°F; above 100°F, derate by 0.3 PSIG/°F.

Table 4: Pump & Power Frame Weights

Item	Weight	Unit
Pump with Threaded Ports [3]	21	lb
Pump with Flanged Ports [3]	25	lb
Power Frame	16	lb

3 Approximate weight (includes mounting bracket and excludes motor).

Table 5: Pump & Power Frame Materials

Components		Materials
Pump Housing & Impeller		316 Stainless Steel
Shaft		316 SS / 303 SS [4]
O-rings/Gaskets		Teflon (PTFE), Viton (Type A) or Graphoil
Dynamic Seal	Double Mechanical Seal (Type 9T)	Seal Faces: Carbon (graphite grade) Seal Seats: Silicon Carbide (α-SiC) Seal Wedges: Teflon or Graphoil [5] Seal Body: 316 SS
Mounting Bracket (Pedestal)		Cast Iron/Epoxy-Painted/304 SS (Closed-design)
Mounting Hardware		18-8 Stainless Steel
Power Frame		Frame: Cast Iron/Epoxy-Painted; Shaft: Carbon Steel

4 Part of pump shaft that attaches to motor or Power Frame shaft and does not contact pumped fluid.

5 Teflon for temperatures up to 350°F; Graphoil for temperatures over 350°F.

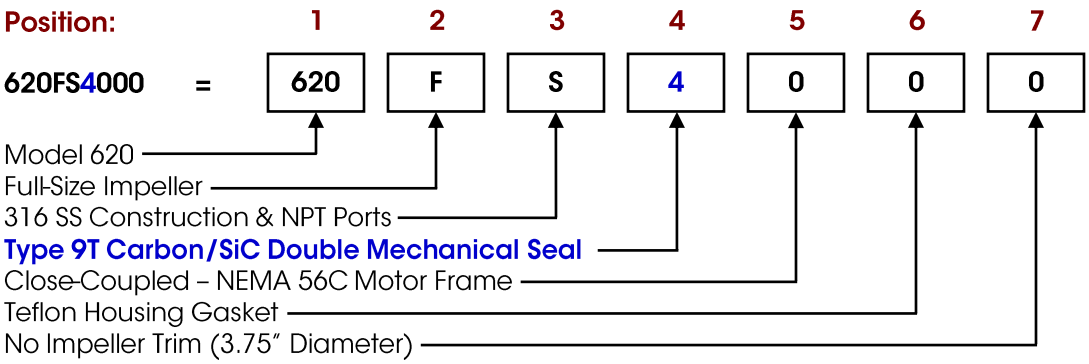
1.4 Model Coding

Table 6: Model Coding for Centry® Model 620 – Sealed

Position	Description	Code	Selection	
1	**Pump Model**	**620**	Model 620	
2	**Impeller Size**	**F**	Full-Size – 3.75″ Diameter	**Pos. 7 = 0**
		R	Reduced-Size	**Pos. 7 = 1, 2, 3 or 4**
3	**Basic Material of Construction & Port Type**	**S**	316 Stainless Steel & Threaded, NPT Ports	
		L	316 Stainless Steel & Flanged, ANSI 150# RF Ports	
4	**Seal Configuration**	**0**	Type 21 Carbon/SiC Single Internal Mech. Seal [1]	
		1	Type 9T Carbon/SiC Single Internal Mech. Seal [1]	
		2	Type 9A Carbon/SiC Single Internal Mech. Seal [2]	
		3	Type 9A Teflon/SiC Single Internal Mech. Seal [2]	
		4	**Type 9T Carbon/SiC Double Mechanical Seal**	
		5	Lantern Ring/Teflon Packing [2]	
		6	Type 9T Teflon/SiC Single Internal Mech. Seal [1]	
		7	Lantern Ring/Graphoil Packing [2]	
5	**Motor Frame (or Power Frame)**	**0**	Close-Coupled – NEMA 56C (Pedestal Mount)	
		1	Close-Coupled – NEMA 143/145TC (Pedestal Mount)	
		P	Power Frame (Pedestal Mount) [3]	
6	**O-Rings/Gaskets**	**0**	Teflon Housing Gasket [4]	
		V	Viton O-Rings	
		G	Graphoil Housing Gasket [4]	
7	**Impeller Trim (Standard)**	**0**	No Trim	**Pos. 2 = F**
		1	3.50″ Diameter	**Pos. 2 = R**
		2	3.25″ Diameter	
		3	3.00″ Diameter	
		4	2.75″ Diameter	

1 Model 620 available seal configurations that are not covered in this manual.
2 Obsolete seal configurations.
3 Power Frame requires Long-Coupled configuration. (See diagram on page 10.)
4 Seal Seats for Type 9T Double Mechanical Seal use Viton O-rings.

Model Coding Example:



1.5 General Operation

The successful and safe operation of a pump is not only dependent on the pump but also on each of the system components. It is therefore important to monitor the entire pumping system during operation and to perform the necessary maintenance to keep the system running smoothly.

A normally operating centrifugal pump will deliver a steady and pulse-less flow, be relatively quiet and have a predictable flow rate and power requirement based on the impeller size, operating speed, differential head and fluid specific gravity. Performance curves for centrifugal pumps are normally based on pumping water at room temperature. Centry Model 620 performance curves can be obtained from the Liquiflo website: www.liquiflo.com. For viscous liquid applications, a performance correction is required (see **Section 3.9**).

Pumps operating with mechanical seals should have no leakage of the process fluid. Pumps operating with a double mechanical seal must be supported with a pressurized fluid lubrication loop. For more information, see **Section 4.2**.

If a significant problem is observed during operation, the pump should be stopped so that corrective action can be taken. The observed problem could have several possible causes, and multiple remedies for each cause. For help with problem solving, refer to the Troubleshooting Guide given in **Appendix 5**.

1.6 Maintenance & Repair

Pumps with a double mechanical seal require maintenance of the fluid in the lubrication loop. Repair is necessary when the mechanical seal starts to leak or when a decrease in head is observed. O-rings and gaskets should always be replaced when rebuilding the pump.

The main factors affecting the physical wear of the pump are operating speed, differential head, fluid viscosity, duty cycle, starting and stopping frequency, abrasives in the fluid and the wear properties of the materials. These factors can cause pump lifetimes to vary significantly from one application to another, making it difficult to predict when the pump will require maintenance. Therefore, the maintenance schedule for the pump is typically based on the maintenance history of the specific application. The main indicators that a pump may require maintenance are the following: (1) decreased flow rate or head, (2) fluid leakage, (3) unusual noise or vibrations and (4) increased power consumption.

The common repair items of the pump due to erosion wear are the double mechanical seal and seats, and the shaft. Possibly, other pump parts, such as the impeller, volute and seal housing, may require replacement due to abrasion wear, corrosion wear or cavitation wear.

Before performing maintenance on the pump, review the safety precautions and follow the included instructions.

1.7 Replacement Parts

Replacement parts for the pumps can be purchased from your local Liquiflo distributor. Refer to **Appendices 3 & 4** for individual parts information.

1.8 Returned Merchandise Authorization (RMA)

If it is necessary to return the pump to the factory for service,

1) Contact your local Liquiflo distributor to discuss the return, obtain a Returned Merchandise Authorization Number (**RMA #**) and provide the distributor with the required information (see RMA Record below).

2) Clean and neutralize pump. Be sure no fluid remains in the seal housing. **Liquiflo is not equipped to handle dangerous fluids.**

3) Package the pump carefully and include the **RMA #** in a visible location on the outside surface of the box.

4) Ship pump to factory, freight prepaid.

Returned Merchandise Authorization (RMA) Record	
RMA #	(Supplied by Distributor)
Distributor Name	
Item(s) Returned	
Serial Number(s)	
Reasons for Return	
Fluid(s) Pumped	
Time in Service	

NOTE: The pump must be cleaned and neutralized prior to shipment to the factory.

Section 2: Safety Precautions

2.1 General Precautions

- **Always** lock out the power to the pump driver when performing maintenance on the pump
- **Always** lock out the suction and discharge valves when performing maintenance on the pump
- **Never** operate a long-coupled pump without the coupling guard installed
- **Never** operate the pump with suction and/or discharge valves closed
- **Never** start the pump without making sure that the pump is primed
- **Never** use heat to disassemble the pump
- Decontaminate pump using procedures in accordance with federal, state, local and company environmental regulations
- Before performing maintenance on the pump, check with appropriate personnel to determine if skin, eye or lung protection is required and how best to flush the pump

Caution!
Failure to observe safety precautions can result in personal injury, equipment damage or malfunction.

Section 3: Pump & Motor Installation

3.1 Installation of Pump, Motor & Base

Refer to the Hydraulic Institute Standards for proper installation procedures of the base, pump and motor.

1) **The pump inlet should be as close to the liquid source as practical and preferably below it.** Centrifugal pumps cannot be used in a suction lift arrangement unless the pump is primed before starting. Many issues can be avoided with a flooded suction arrangement.

2) For Close-Coupled Centry pumps, no alignment procedure between the pump and motor is required.

3) For Long-Coupled Pumps utilizing the Power Frame:

   (a) **The mechanical coupling between the motor and Power Frame has a flexible insert that must be free to move axially** – typically a distance of 1/16 to 1/8 inches – to prevent axial loads from being transmitted to the power frame.

   (b) **The motor and Power Frame shafts must be manually aligned to eliminate radial loads on the pump that will cause vibration and lead to premature pump failure.** Alignment of long-coupled pumps is critical and should be checked by taking measurements of angularity and parallelism at the coupling. If these are off by more than 0.015 inches (0.4 mm), the assembly should be realigned. Flexible couplings are not intended to compensate for severe misalignment. (NOTE: If the pump was delivered as a complete long-coupled assembly, it was properly aligned at the factory.)

   (c) **Install the coupling guard over the mechanical coupling and fasten to the base plate.** (NOTE: If the pump was delivered as a complete long-coupled assembly, the coupling guard was properly installed at the factory.)

> ***Caution!***
> *After performing alignment procedure, ensure that the Coupling Guard is replaced before operating pump. Do not wear loose clothing around rotating objects.*

NOTE: See pages 34-35 for diagrams of pump mounting options and **Section 3.2** for more information about the power frame.

3.2 Power Frame Option

If the Model Number of the pump contains the letter "**P**", the pump was ordered with the Liquiflo Power Frame option. The power frame allows the pump to be long-coupled to a motor. The power frame has the following uses and advantages:

1) The power frame allows motor frames that are not compatible with the pump mounting bracket to be coupled to the pump. (For example, motor frames larger than NEMA 145TC, IEC motors or frames without a C-face can be used.)

2) The power frame enables the motor to be isolated from the pump simply by removing the flexible coupling. (This is convenient for removing or replacing the motor, or when performing maintenance.)

3) The power frame thermally isolates the pump from the motor. (The power frame has an integral cooling jacket that keeps its bearing system cool even when the pump is operating at maximum temperature.)

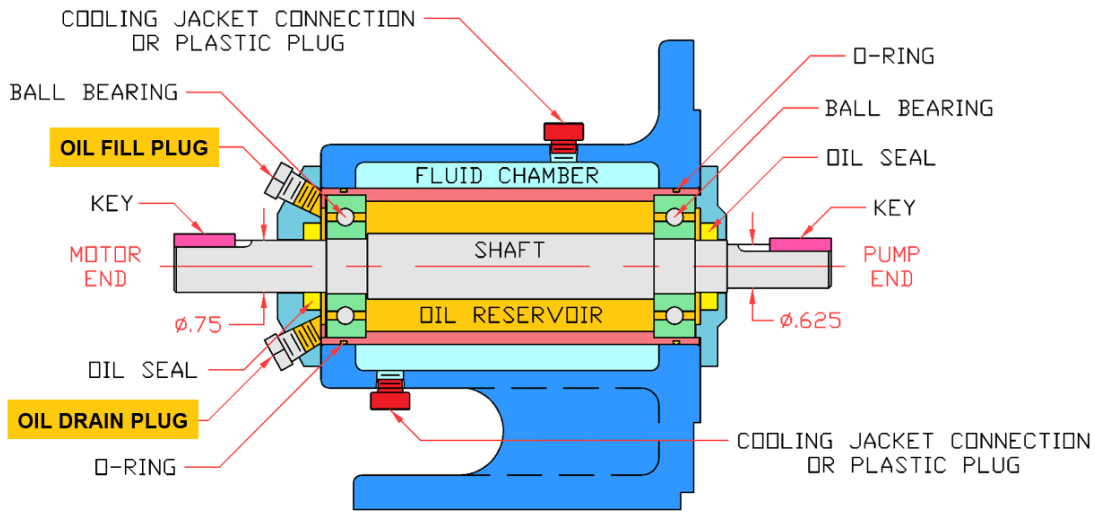
The power frame is shown in detail on page 10. The key power frame components are described below:

Bearings: The power frame shaft is supported by ball bearings on opposite ends of the pedestal. The *oil reservoir* is used to lubricate the bearings. This reservoir is accessible by removing the two 1/8" NPT plugs on the end of the casing.

Cooling Jacket: The pedestal's *integral cooling jacket* is used to keep the bearing system cool when the pump is operating at elevated temperatures. This is accomplished by circulating a *heat transfer fluid* thru the jacket. The cooling loop must be connected to the 1/8" NPT ports on the top and bottom of the casing. (Note: The ports come with red plastic plugs installed. These plugs should not be removed unless a cooling loop is used.)

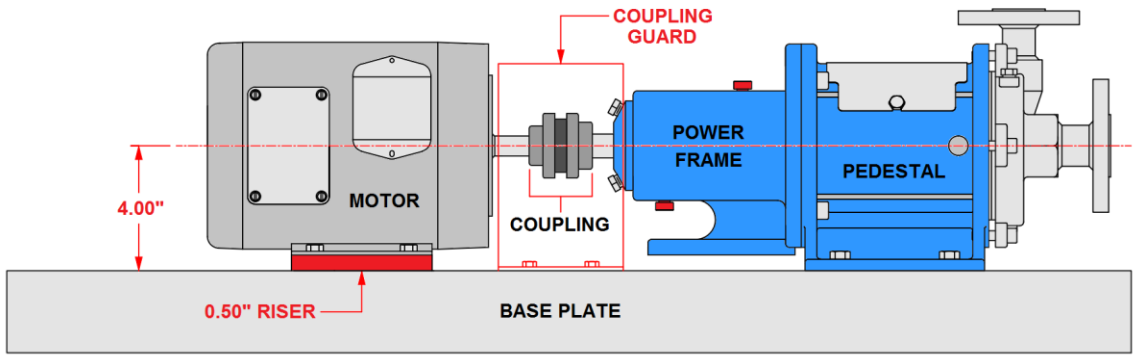
Shaft: The motor end (or driven end) of the shaft has a 3/4" diameter. The pump end (or driver end) has a 5/8" diameter. (Note: Additional dimensional data for the power frame are given on page 35.)

Power Frame Cross-Sectional View:



A typical long-coupled mounting of the pump and motor, using the **power frame** option, is shown below:

Long-Coupled Mounting with NEMA 56 thru 145T or NEMA 56C thru 145TC Motor Frames



Power Frame Maintenance:

The power frame is delivered from the factory with its oil reservoir empty. Before operating the power frame, fill the reservoir with **4 fluid ounces of #20 wt., non-detergent type oil**.

The oil in the reservoir should be replaced periodically, with use. To replace the oil: (1) Remove the fill and drain plugs and collect the used oil in a container, (2) Replace the drain plug, (3) Fill the reservoir with **4 fluid ounces** of clean oil, and (4) Replace the fill plug. (For more information, see the Liquiflo website for the power frame service manual.)

Caution!
Do not operate the Power Frame without oil in the reservoir. Before performing maintenance, ensure that the power to the motor is turned OFF and locked out. Do not overfill the reservoir.

3.3 General Piping Requirements

Refer to the Hydraulic Institute Standards for piping guidelines.

1) All piping must be supported independently and must line up naturally with pump ports.

2) Piping that handles both hot and cold liquids require proper installation of expansion loops and joints so that thermal expansion of the piping will not cause misalignment.

3) The piping should be arranged to allow the pump to be flushed and drained prior to the removal of the pump for servicing. Valves and unions should be installed to allow the pump to be isolated during maintenance. Valves which open to the full pipe diameter, such as ball valves, should be used.

4) **Suction and discharge piping should be the same size or larger than the inlet and outlet ports.** This is especially important for viscous services when the pipe diameter has a large effect on friction losses and NPSH available.

5) **Suction piping should be designed to minimize friction losses.** The length of the suction line should be as short as possible with no sharp turns or bends. Any elbows used should be long radius. There should be a minimum of five pipe diameters of straight pipe between the elbow and the suction inlet. Reducers, if used, should be eccentric at the pump suction port.

6) The **suction pipe** must be submerged sufficiently below the liquid surface to prevent vortices and air entrapment at the supply.

7) **Suction Head (Flooded Suction) Arrangement:** Piping should be level or slope gradually downward from the supply source to eliminate air pockets.

8) **Suction Lift Arrangement:** The suction pipe must slope continuously upward towards pump suction to eliminate air pockets. All connections must be air tight. A means of priming the pump must be provided.

9) Gasket materials used with flanged connections must be compatible with the fluid and operating temperature.

10) The piping system should be cleaned prior to installation of the pump.

3.4 Strainers & Solids Handling

1) Centry sealed pumps rely on the motor bearings and therefore can tolerate larger particle sizes compared with mag-drive pumps that use internal sleeve bearings. **These pumps can handle particle sizes up to 0.008 inches or 200 microns.** If small abrasive particles are present, they can accelerate wear of internal components and surfaces over an extended period of time. The specific wear rate depends on the solids concentration, the size, shape and hardness of the particles, the operating speed and the materials used to construct the pump. Since wear rate is proportional to the square of the speed, slower operating speeds will substantially increase pump life.

2) One of the purposes of utilizing a pump with a double mechanical seal is the capability of the seal to handle fluids containing a significant concentration of solids. **The properly supported double mechanical seal can handle solids concentrations up to 20% by volume.** The pressurized barrier fluid in the seal chamber prevents the solids from contacting and rapidly wearing the seal face of the inboard seal.

3) While small particles may not be catastrophic to the pump, **the use of a strainer on the inlet will prevent large particulates from entering the pump.** If the strainer clogs with material and is not properly maintained, the pump may be starved of liquid, causing a loss of flow and damaging the pump via dry-running. When a suction strainer is used, it should have a net open area of at least three times the suction pipe area.

3.5 NPSH Requirement

All pumps require sufficient NPSH (Net Positive Suction Head) to function properly. The NPSH available in the system is the difference between the available suction pressure at the pump inlet and the vapor pressure of the fluid (which depends on the fluid temperature). The NPSH required by the pump is a function of pump speed and impeller diameter, and is included with the Performance Curves of the pump. NPSH values are typically given in units of **ft H_2O (a)** (feet of water, absolute) or **m H_2O (a)** (meters of water, absolute).

The NPSH available in the system must be greater than the NPSH required by the pump or the pump will go into cavitation, resulting in decreased flow, increased vibration and noise emission, and potential damage to internal components.

3.6 Flow Requirements

The pump must be operated with a minimum flow rate to prevent overheating of the process fluid. A generally accepted industry practice for minimum flow rate is 15% of the flow rate at the Best Efficiency Point (BEP). Alternatively, the minimum flow rate can be calculated based on the service conditions, power dissipation and the allowable temperature rise of the fluid. Consult the Hydraulic Institute Handbook or Liquiflo Engineering.

Operating the pump at over 90% of the flow rate at runout should be avoided to prevent a system fluctuation from causing the pump to "run off the curve," which can increase the NPSH required by the pump, possibly going above the NPSH available in the system and causing cavitation.

3.7 Controlling the Flow

A centrifugal pump is a kinetic type pump, and **flow is typically controlled by throttling the discharge valve**. The operating point for a centrifugal pump is the intersection of its Head vs. Flow Performance Curve (for a specific impeller diameter) and the System Resistance Curve (which is a function of the flow rate). Increasing the flow area of the valve reduces the system resistance and causes the flow rate to increase (i.e., further opening of the valve moves the operating point to the right on the performance curve). Conversely, decreasing the flow area of the valve increases the system resistance and causes the flow rate to decrease (i.e., further closing of the valve moves the operating point to the left on the performance curve).

3.8 Affinity Laws

The performance of a centrifugal pump at **any operating speed and impeller diameter** can be closely approximated from the performance at a standard motor speed and impeller diameter by using the Affinity Laws:

Affinity Laws for Centrifugal Pumps

$$(1)\ \frac{Q_1}{Q_2} = \frac{n_1 D_1}{n_2 D_2} \qquad (2)\ \frac{H_1}{H_2} = \frac{{n_1}^2 {D_1}^2}{{n_2}^2 {D_2}^2} \qquad (3)\ \frac{P_1}{P_2} = \frac{{n_1}^3 {D_1}^3}{{n_2}^3 {D_2}^3}$$

Where, **Q** = Flow Rate, **H** = Head, **P** = Power, **n** = Speed and **D** = Impeller Diameter.

3.9 Viscous Fluids

Centry sub-ANSI pumps are generally applied at viscosities under 200 centipoise (cP). For fluid viscosities over 2 cP, a **Viscosity Correction per Standard ANSI/HI 9.6.7** is required to size the pump and motor. For sizing of viscous fluid applications or for more assistance in general selection, contact the local distributor or Liquiflo Engineering.

3.10 Motor Selection

1) For the **Close-Coupled** configuration, the motor frame size is part of the pump model coding and is selected at the time the pump is ordered. The motor frame must have a C-face for compatibility with the pump mounting bracket. Refer to **Position 5** of the pump model code (see Table 6 on page 5).

2) For the **Long-Coupled** configuration, the motor is mechanically-coupled to the **Power Frame** ancillary device. In this case, any suitable motor frame can be used.

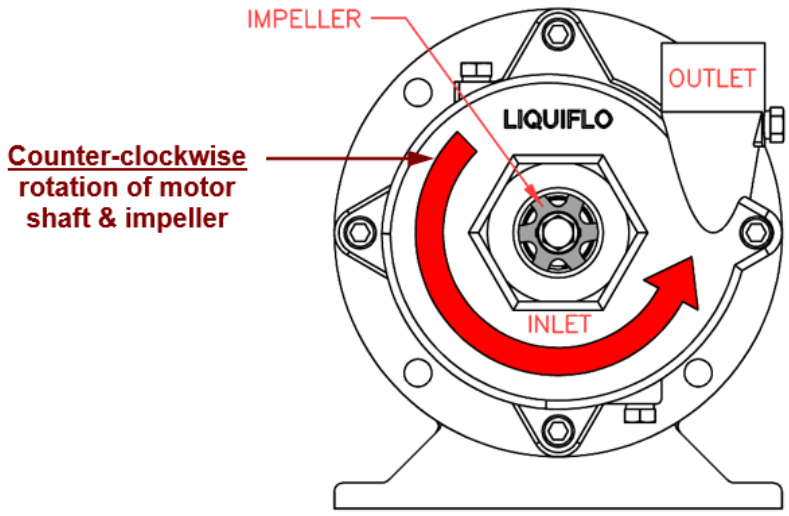
3) For **Close-Coupled** configurations, the pedestal supports the motor and therefore a footless motor can be used (see cover photo). For **Long-Coupled** configurations utilizing the **Power Frame**, a Foot-Mount motor is required for mounting to a base (see diagram on page 10).

4) The motor must have an **enclosure** that is compatible with the application conditions. If an explosion-proof motor is required, the *temperature code* of the motor must be acceptable for the process fluid.

5) The motor speed and power rating are usually determined at the time the pump is ordered to meet the specified conditions of service. For **thin liquids**, the Head vs. Flow Performance Curves can be used directly to determine the speed and brake horsepower (BHP) requirements, as well as the required impeller diameter. For **liquids heavier than water**, the BHP obtained from the Performance Curves must be multiplied by the Specific Gravity of the liquid to determine the BHP required. For **viscous fluids**, a viscosity correction is required (see **Section 3.9**). Additional power is required to overcome the friction losses due to viscosity.

3.11 Motor Shaft Direction

The motor shaft must turn in the direction required by the centrifugal pump. Looking at the pump end, the motor shaft must rotate counter-clockwise, as shown below.



Section 4: Start-Up & Operation

4.1 Starting the Pump

Before operating the pump, inspect the hydraulic system and verify the following:

1) **Pump Construction:** The materials of construction of the pump must be compatible with the process fluid.

2) **Pump Mounting:** The pump must be securely fastened to the base and ground using the basic installation procedures as outlined by the Hydraulic Institute.

3) **Alignment:** Pumps that are close-coupled to a motor do not require manual alignment. Those that are long-coupled to a motor, using the power frame option, will require alignment of the motor and power frame shafts (see **Section 3.1**).

4) **Piping Layout:** Process piping procedures are extremely important and must be performed in accordance with the Hydraulic Institute. As a minimum, inlet piping must be equal to or larger in diameter than the pump inlet size. Twists and bends of pump inlet piping should be kept to an absolute minimum. Ensure that adequate NPSH is available for the pump to operate properly.

5) **Motor Enclosure:** The motor enclosure must be suitable for the conditions of service.

6) **Electrical Hook-up:** Please refer to the motor manufacturer's instructions.

7) **Safety:** Never operate a long-coupled pump without the coupling guard installed. A power sensor should be installed to stop the motor in the event of a loss-of-load or overload condition.

> ***Caution!***
> *Do not wear loose clothing around rotating objects.*

8) **Support System for Double Mechanical Seal:** Refer to the information in **Section 4.2**.

9) **Valves:** Open all suction and discharge valves before operating the pump or damage or malfunction may result. (**Note:** Suction valves must be open to supply the pump with fluid and a method of priming the pump must be available to prevent dry-running. Fully closing a discharge valve when the pump is operating will cause circulation of fluid inside the pump's volute. Operating the pump continuously in this state will cause significant heating of the fluid.)

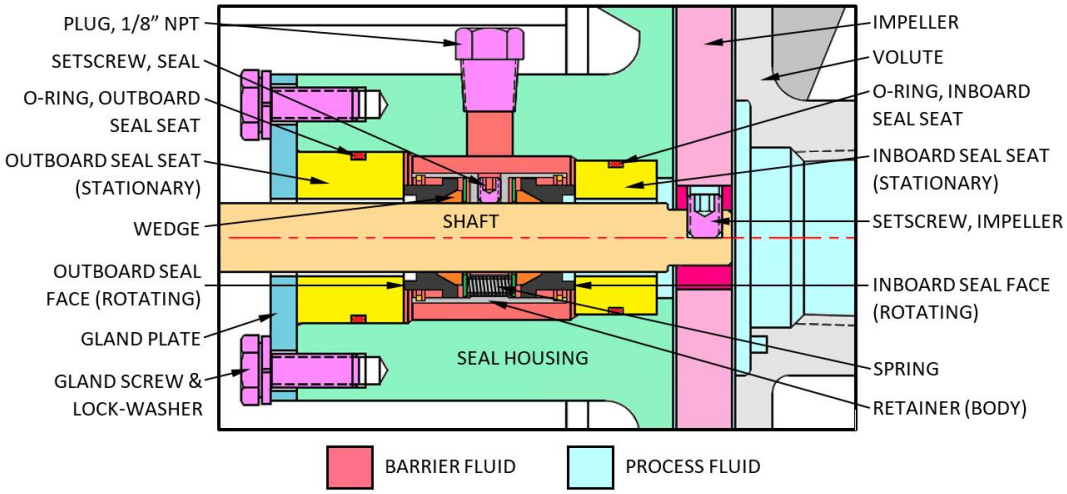
10) **Priming & Direction of Rotation:** Prime the pump and then briefly jog the motor to assure proper motor direction. Motor shaft direction must be counter-clockwise as seen from the pump end (see page 13). Remove the vent plug located at the top of the volute to purge any air trapped in the pump (see diagram on page 16 for location of volute plugs).

> ***Caution!***
> *Always prime pump before operating. Do not run the pump dry for more than 30 seconds or damage to the dynamic seal will result. Extended dry running can damage other internal parts.*

4.2 Double Mechanical Seal Requirements

The double mechanical seal requires a fluid lubrication loop to pressurize the seal chamber and to cool and flush the seal faces. The seal chamber should be kept at approximately 5 to 20 PSI higher than the discharge pressure. In addition, the flow rate through the seal chamber can be in either direction and should be approximately 1/8 GPM. For fluids with relative specific heat values other than 1.0 (i.e., water), the flow rate should be adjusted accordingly.

The double mechanical seal consists of an **inboard seal** and an **outboard seal**, as shown in the diagram below. The pressurized fluid in the seal chamber creates a barrier which allows the inboard seal to contain the **process fluid**. The outboard seal prevents leakage of the **barrier fluid** from the seal chamber to the outside environment. The barrier fluid should be non-hazardous, non-corrosive and compatible with the process fluid.



The fluid lubrication loop is connected to the side ports of the seal housing with **1/8" Schedule 40 pipes** installed through the holes on each side of the pedestal. (See diagrams on page 17.)

> ***Caution!***
> *The Double Mechanical Seal must be properly supported when operating the pump.*

4.3 Operation & Troubleshooting

Before starting the pump, review the steps in **Section 4.1**. The double mechanical seal must be properly supported as explained in **Section 4.2** above.

A normally operating centrifugal pump will deliver a steady and pulse-less flow, be relatively quiet and have a predictable flow rate based on the impeller size, operating speed and differential head across the pump. Refer to the performance curves for Centry Model 620, which are available on the Liquiflo website. (Note: If the fluid viscosity is significantly higher than the viscosity of water, a performance correction is required as explained in **Section 3.9**.)

The differential pressure can be measured with calibrated pressure gauges close to the suction and discharge ports. (Note: The true differential pressure must take into account the difference in gauge elevations and the velocity head (dynamic pressure) differential resulting from the increase in fluid velocity thru the centrifugal pump. Pressure is related to Head by the following formula: Pressure [PSI] = (Head [feet] x SG)/2.31, where SG is the Specific Gravity of the fluid.) The flow rate can be measured with a calibrated flowmeter in the discharge line.

After priming and start-up, monitor the pump for several minutes to ensure proper operation. If excessive noise is heard, or product leakage is observed, or performance is not as expected, stop the pump and refer to **Appendix 5** for troubleshooting.

Section 5: Maintenance & Repair

The major maintenance item for this sealed pump configuration is the maintenance of the barrier fluid in the double mechanical seal loop. When the mechanical seal starts to leak, or a decrease in head is observed, repair is necessary. O-rings and gaskets should always be replaced when rebuilding the pump.

5.1 Work Safety

Before performing maintenance, review the safety precautions given in **Section 2** (see page 8).

5.2 Removal from System

Before servicing, prepare the pump as follows:

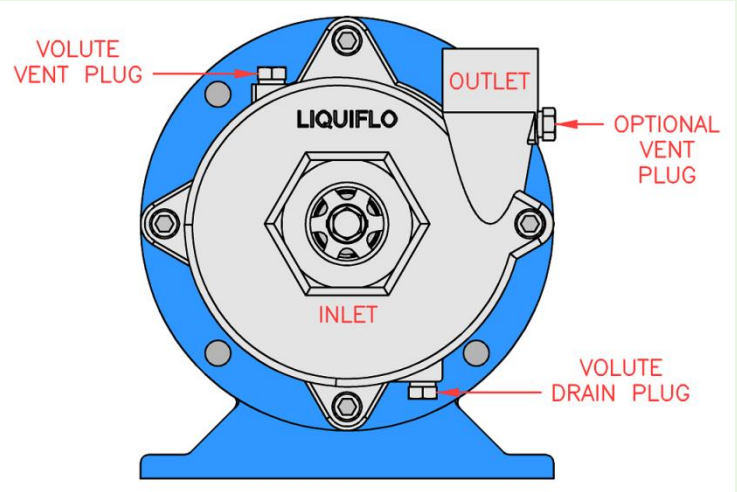
Caution!
If the pump was used on hazardous or toxic fluids, it must be flushed and decontaminated prior to removal from the system piping. Refer to the Material Safety Data Sheet (MSDS) for the liquid and follow all prescribed safety precautions and disposal procedures.

1. Flush the pump.
2. Stop the motor and lock out the electrical panel.
3. Close the suction and discharge isolation valves.
4. Drain the fluid from the pump by removing the vent and drain plugs (see diagram below).
5. Disconnect the pump from the system piping.

NOTE: The pump has a back pullout design. This feature makes it unnecessary to disconnect the volute from the system piping.

Location of Vent & Drain Plugs:

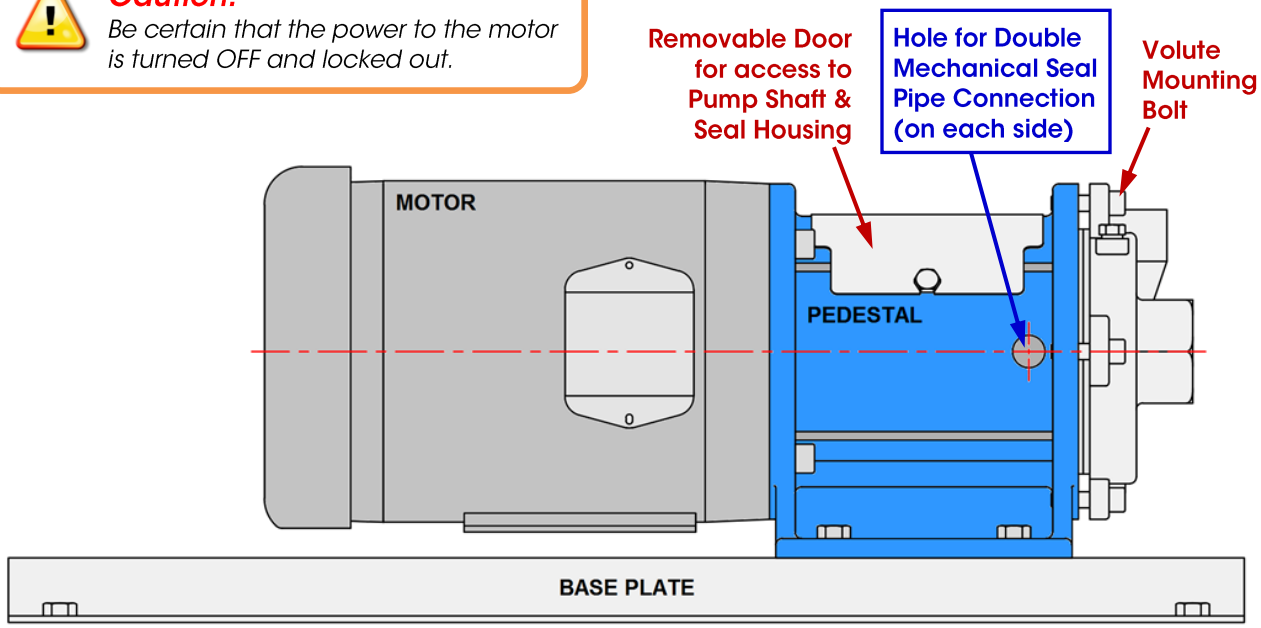
The pump has two **1/8" NPT plugs** but may contain an additional plug on the outlet port (see diagram at right).



5.3 PUMP DISASSEMBLY

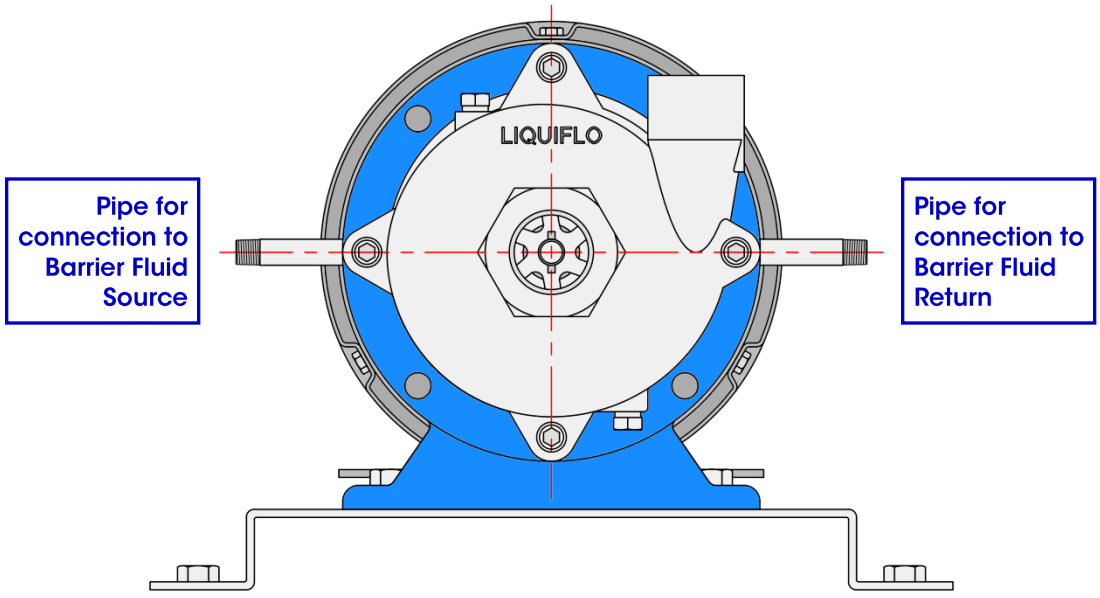
Follow the procedure below and refer to the Sectional and Exploded View drawings in **Appendix 4**. Drawing reference numbers are given in parentheses in the following procedure.

Caution!
Be certain that the power to the motor is turned OFF and locked out.



Location of Pipes for Barrier Fluid:

The pump should have **1/8" Schedule 40 pipes** installed to the seal housing (3) from each side of the pedestal (14) for the double mechanical seal barrier fluid loop, as shown below.



Separation of Volute:

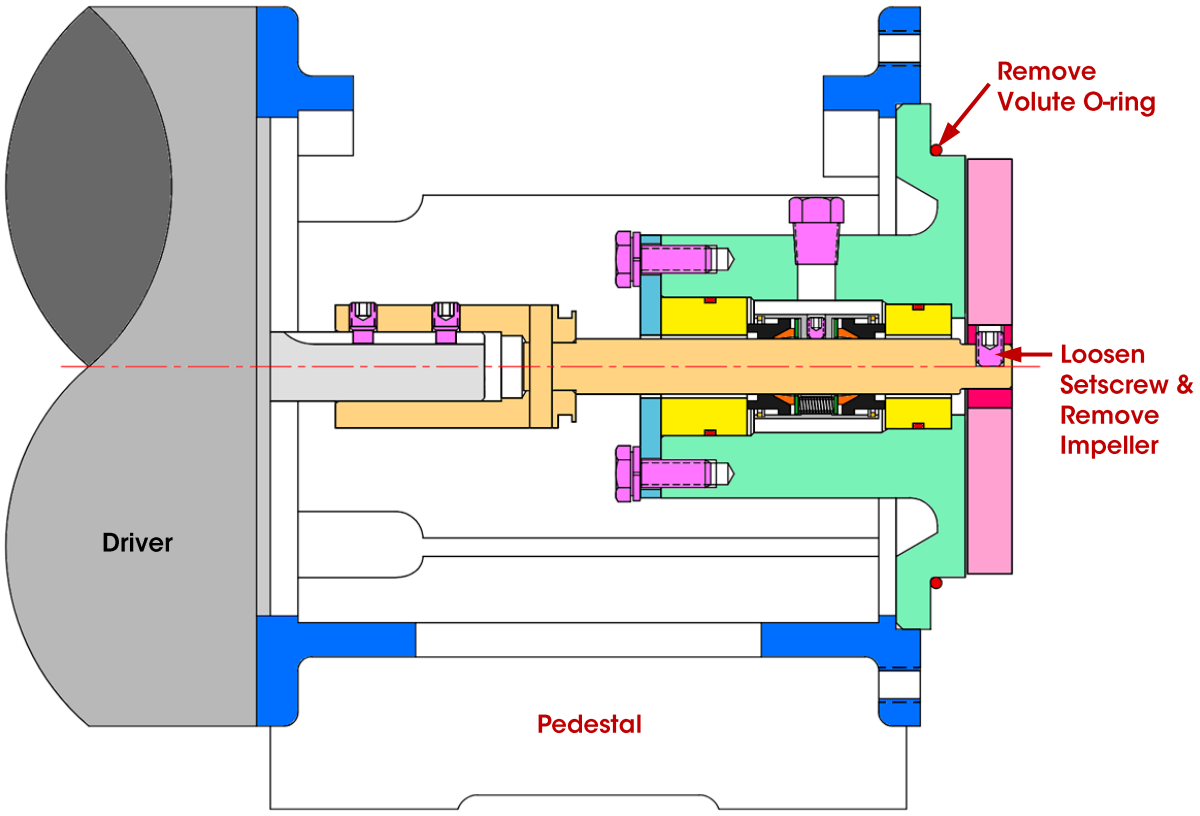
1 Remove the four sets of volute mounting bolts (6) and lock-washers (7); then separate the volute (2) from the assembly.

> **NOTE:** The pump has a back pullout design. This feature makes it unnecessary to disconnect the volute from the system piping.

2 Remove the two bolts (25) from top of pedestal (14) and then remove the stainless steel door (24).

Removal of Impeller:

3 Loosen the impeller setscrew (9) and then remove the impeller (1) from the pump shaft (4).



4 Remove the volute O-ring or gasket (5) and discard.

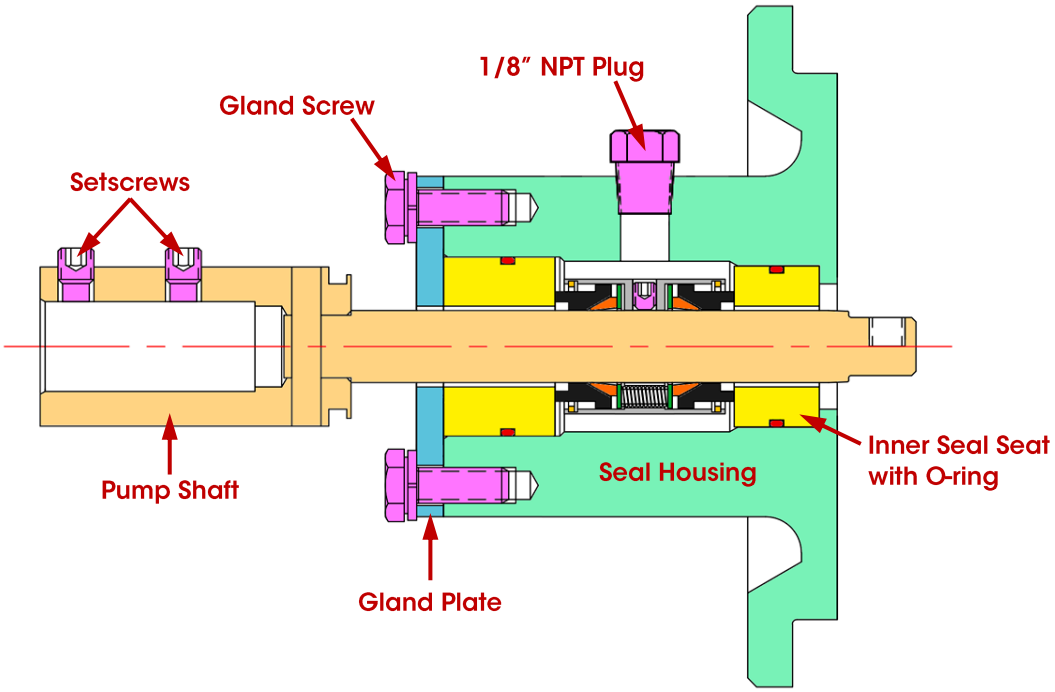
Removal of Seal Housing Assembly:

5 **Disconnect the 1/8" supply pipes** (for the double mechanical seal barrier fluid) from the sides of the seal housing (3).

6 Loosen the two setscrews (11) of the pump shaft (4) to detach it from the driver shaft.

> **NOTE:** The driver can be a C-Face Motor or the Power Frame ancillary device.

7 Remove the **seal housing assembly** from the pedestal (14) which consists of the pump shaft (4), gland plate (12), gland screws (20), plug (13), seal housing (3) and internal seal components.



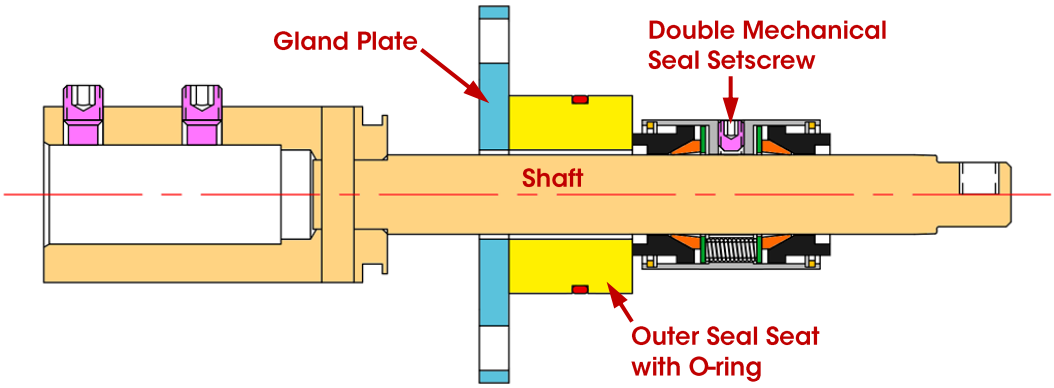
8 Drain the seal housing (3) of any remaining liquid thru one of the two open side ports. Remove the 1/8" NPT plug (13) from the seal housing.

Removal of Double Mechanical Seal:

> ***Caution!***
> *It's a good practice to have a new **Type 9T Double Mechanical Seal** available before removing the seal from the shaft. The Seal Wedges are often damaged upon removal due to scratches and burrs on the shaft caused by the seal retainer setscrews.*

9 Remove the two gland screws (20) with lock-washers (21) from the seal housing (3).

10 Withdraw the **shaft assembly** from the seal housing (3), which consists of the pump shaft (4), gland plate (12), outer seal seat and O-ring (22 & 23) and double mechanical seal (17).

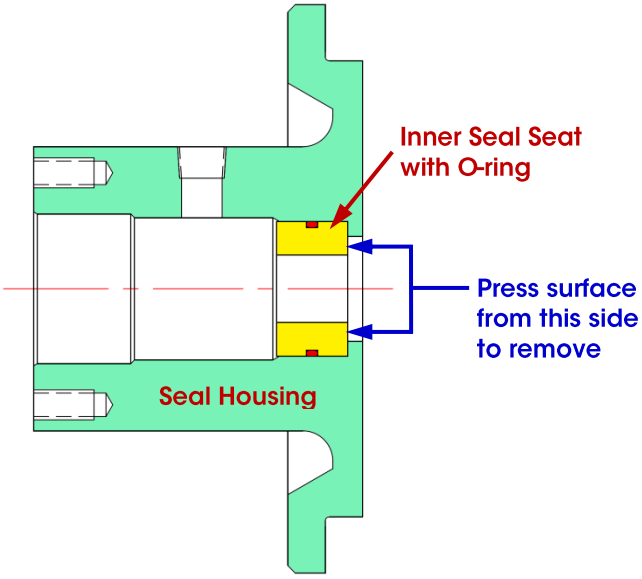


11 Loosen **all** setscrews on the body of the mechanical seal (17); then slide the seal off the shaft (4).

12 Remove the outer seal seat (22) from the shaft (4) and dispose of the O-ring (23).

13 Remove the gland plate (12) from the shaft (4).

14 Remove the inner seal seat (18) by pressing it out of the seal housing (3).



15 Remove the O-ring (19) from the inner seal seat (18) and dispose of the O-ring.

END OF DISASSEMBLY PROCEDURE

5.4 PUMP ASSEMBLY

Follow the procedure below and refer to the Sectional and Exploded View drawings in **Appendix 4**. Drawing reference numbers are given in parentheses in the following procedure.

Caution!
Be certain that the power to the motor is turned OFF and locked out.

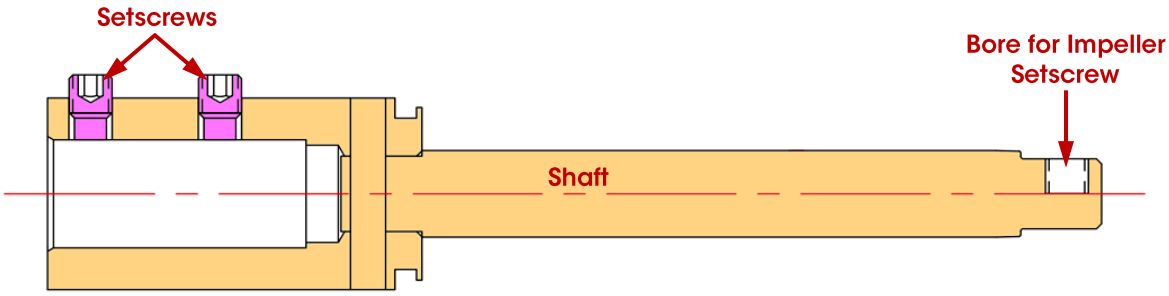
Shaft Inspection & Polishing:

1 Inspect the pump shaft (4) and verify that it has not been scored or worn from prior use.

Caution!
If the shaft exhibits excessive wear, it must be replaced.

2 Remove any burrs or scratches on shaft (4), by polishing, prior to reassembling pump.

Caution!
This step is important to ensure the proper fit of parts and to prevent scoring of the seal on reassembly.



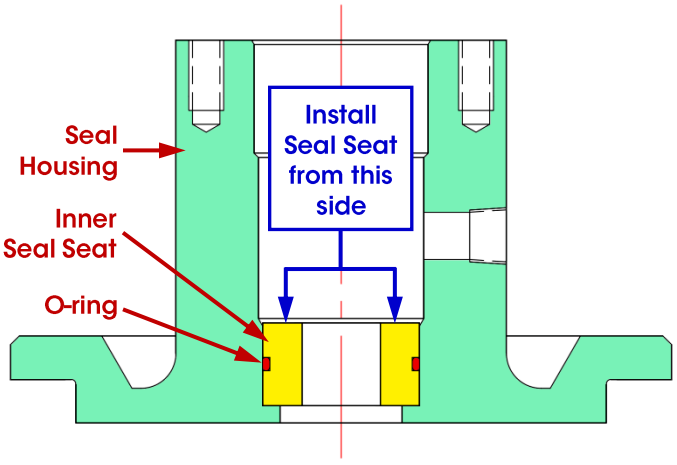
Installation of Inner Seal Seat:

3 Install O-ring (19) into the groove of the **inner seal seat** (18).

Caution!
Do not reuse O-rings.

4 Press the seal seat & O-ring assembly (18 & 19) into the seal housing (3).

NOTES: (1) Apply vegetable oil or other compatible fluid to outside surface of O-ring to facilitate installation of seal seat. (2) The working surface of the seal seat must be kept clean.



Installation of Double Mechanical Seal:

5 Install O-ring (23) into the groove of the **outer seal seat** (22).

> **NOTES:** (1) Apply vegetable oil or other compatible fluid to outside surface of O-ring to facilitate installation of seal seat into the seal housing. (2) The working surface of the seal seat must be kept clean.

> ***Caution!***
> *Do not reuse O-rings.*

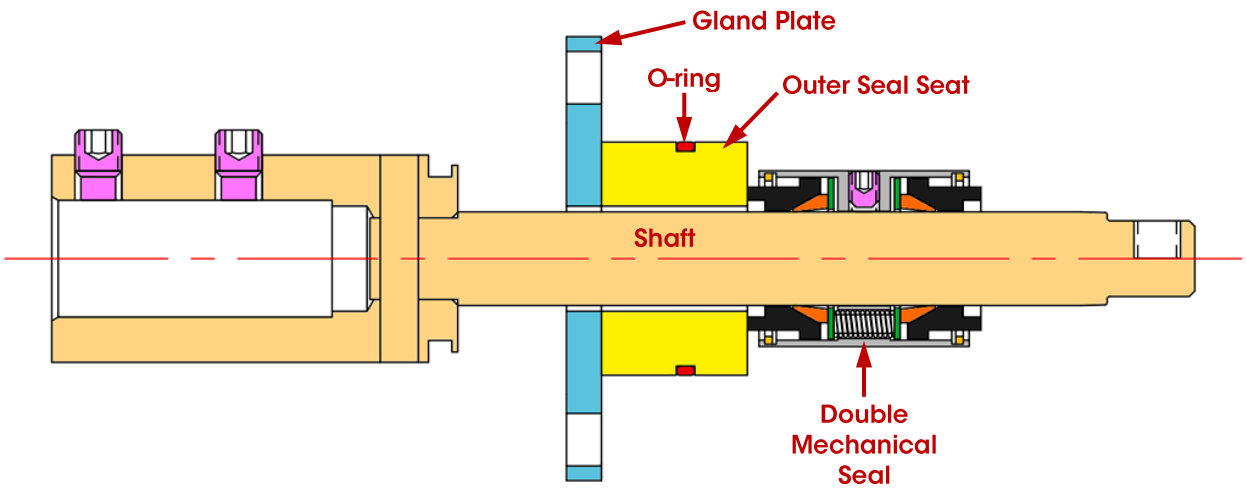
6 Place the gland plate (12) on the shaft (4), as shown below.

7 Place the outer seal seat & O-ring assembly (22 & 23) on the shaft (4), as shown below.

8 Install the double mechanical seal (17), **with retaining clips**, onto the shaft (4), being careful not to damage the seal's wedges, and position approximately as shown below.

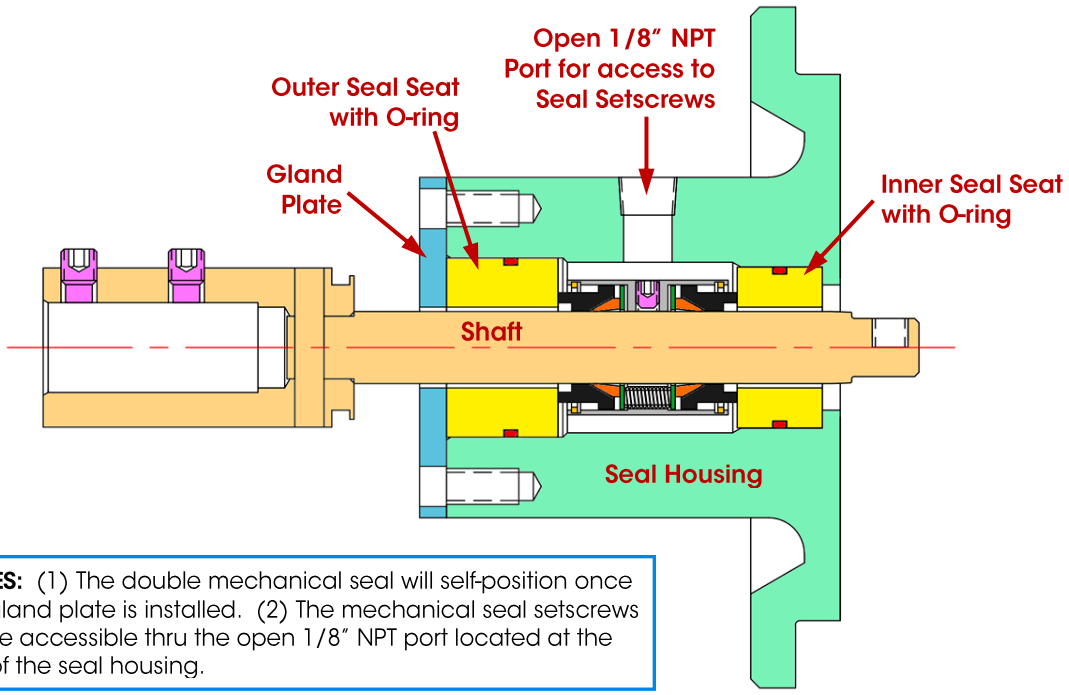
> ***Caution!***
> *Do not handle or scratch the lapped faces of the double mechanical seal. Do not remove the retaining clips from the seal until after the seal is placed on the shaft.*

> **NOTES:** (1) A new Type 9T double mechanical seal comes with four retaining clips installed on the seal body. The retaining clips compress the seal springs, eliminating spring pressure on the seal's wedges. Once the retaining clips are removed, the spring pressure will cause the wedges to seal against the shaft. (2) The Type 9T double mechanical seal is symmetrical, so orientation of the seal on the shaft can be in either direction.



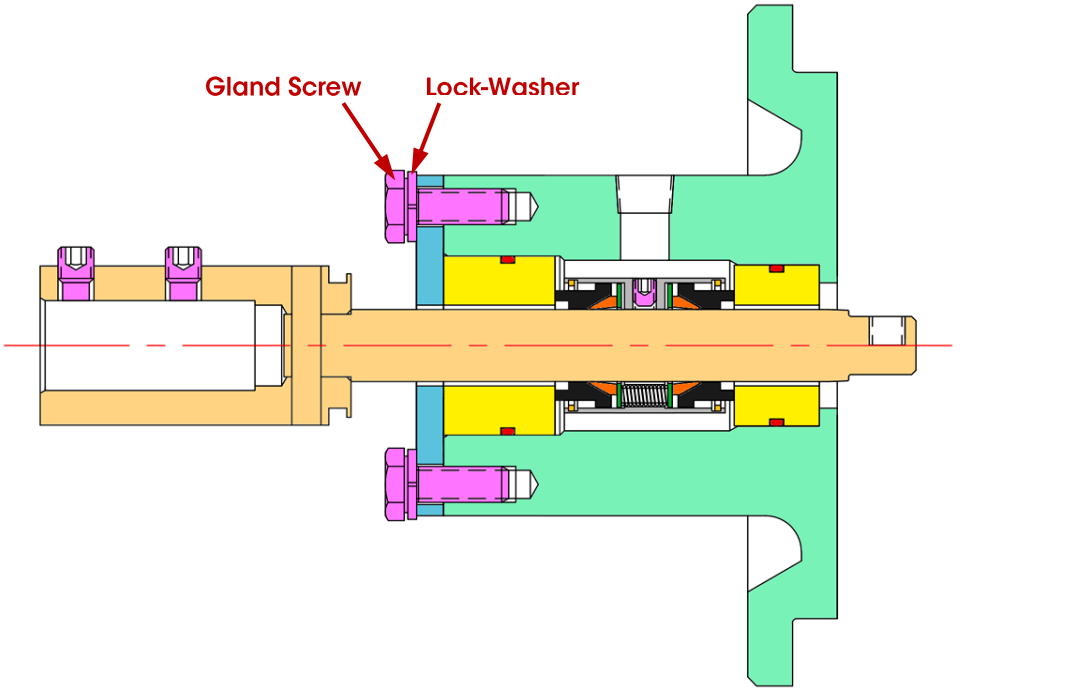
9 Carefully **remove the retaining clips** from the seal body with a small flat screwdriver.

10 Install the shaft (4), containing the gland plate (12), outer seal seat & O-ring assembly (22 & 23) and mechanical seal (17), into the seal housing (3), as shown below.



NOTES: (1) The double mechanical seal will self-position once the gland plate is installed. (2) The mechanical seal setscrews will be accessible thru the open 1/8" NPT port located at the top of the seal housing.

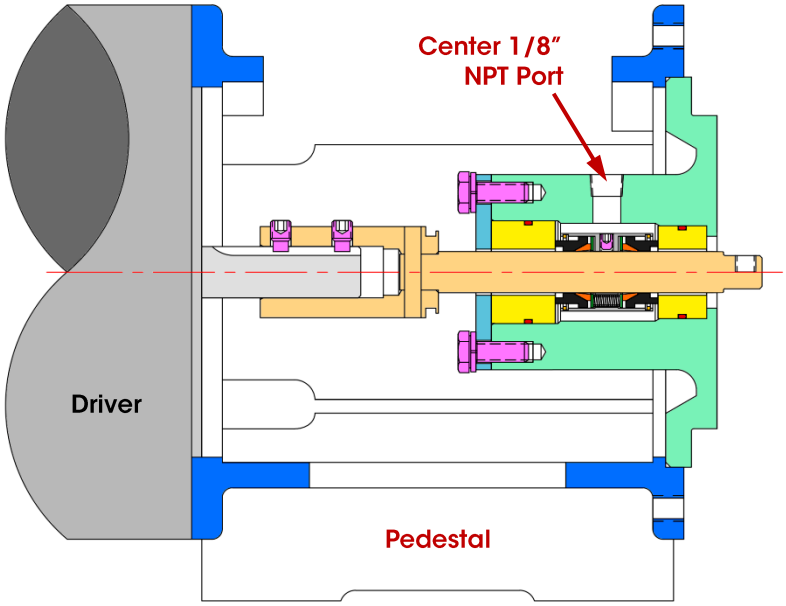
11 Install the gland screws (20) with lock-washers (21).



NOTE: Refer to **Appendix 1** for the torque specifications of the gland screws.

12 Remove the **red plastic thread protectors** from the side ports of the seal housing (3).

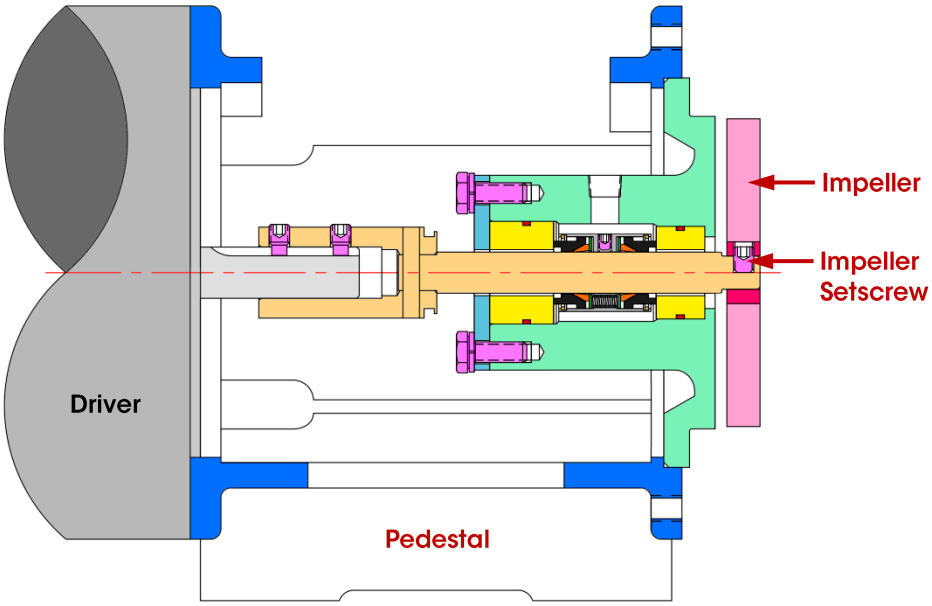
13 Mount the **pump shaft & seal housing assembly** to the driver shaft and pedestal (14) so that the center 1/8" NPT port in the seal housing (3) is oriented upwards, as shown below.



NOTE: The seal housing should be fully seated into the pedestal counter-bore, as shown above.

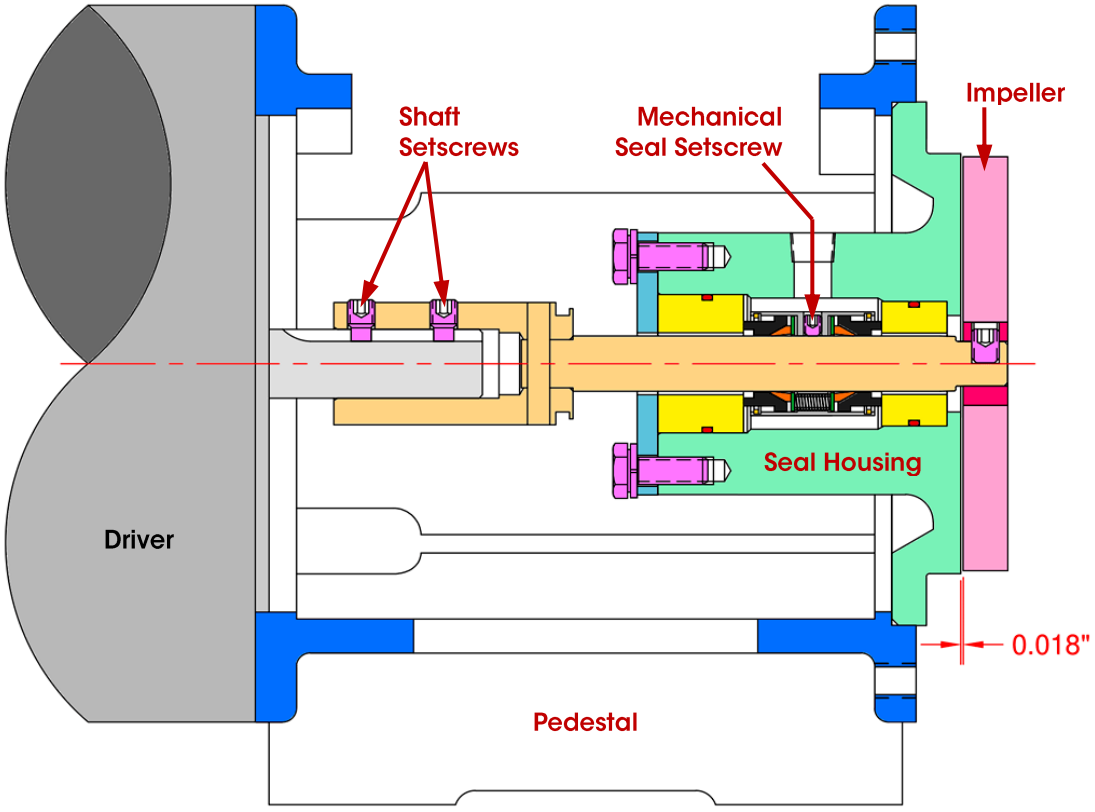
Installation of Impeller:

14 Temporarily tighten the shaft setscrews (11) to prevent the shaft from moving axially. Place the impeller (1) on the end of the pump shaft (4) and align the setscrew bores; then attach the impeller to the shaft by tightening the impeller setscrew (9).



Adjusting Impeller Clearance:

15 Verify that the seal housing (3) is fully seated into the pedestal (14) counter-bore. **A gap of .018 +/- 0.002 in. (16 to 20 mils) between the rear of the impeller and the face of the seal housing will center the impeller inside the pump housing**. Loosen the shaft setscrews (11) and position the impeller-shaft assembly on the driver shaft to attain the proper clearance; then tighten the two setscrews to lock the assembly in place.



NOTES: (1) Shims can be used to position the impeller to the specified clearance. (2) Tighten the dog-point setscrews into the keyway of the driver shaft, as shown above.

Tightening Seal Setscrews:

16 Rotate the pump shaft in steps and tighten **all** setscrews on the body of the mechanical seal (17) using an Allen wrench thru the top 1/8" NPT port of the seal housing (3).

Checking Impeller Rotation:

17 Turn the impeller (1) by hand to ensure that it rotates freely.

NOTE: The impeller should not rub against the seal housing but some drag from the seal will be felt.

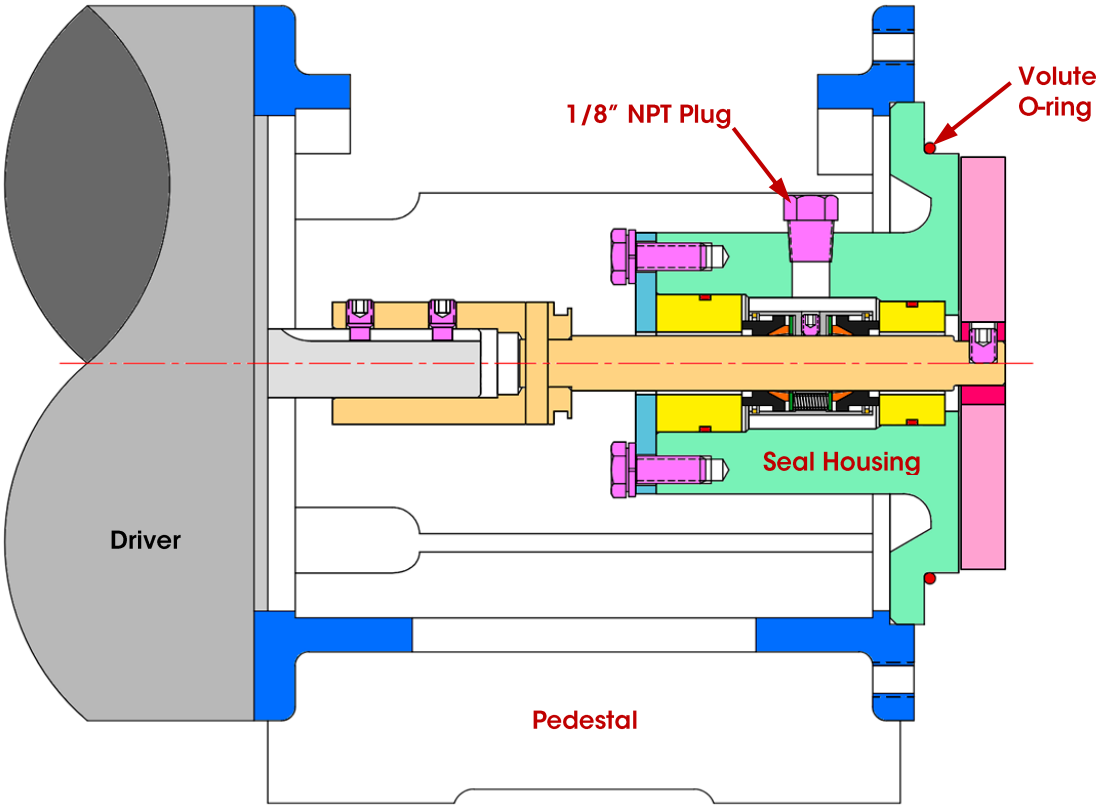
Installation of Housing Plug & O-Ring:

18 Install the 1/8″ NPT plug (13) into the top port of the seal housing (3).

> **NOTE:** Apply Teflon tape to the threads of the plug to prevent leakage and galling.

19 Place the volute O-ring or gasket (5) in position on the seal housing (3).

> ***Caution!***
> *Do not reuse O-rings or gaskets.*



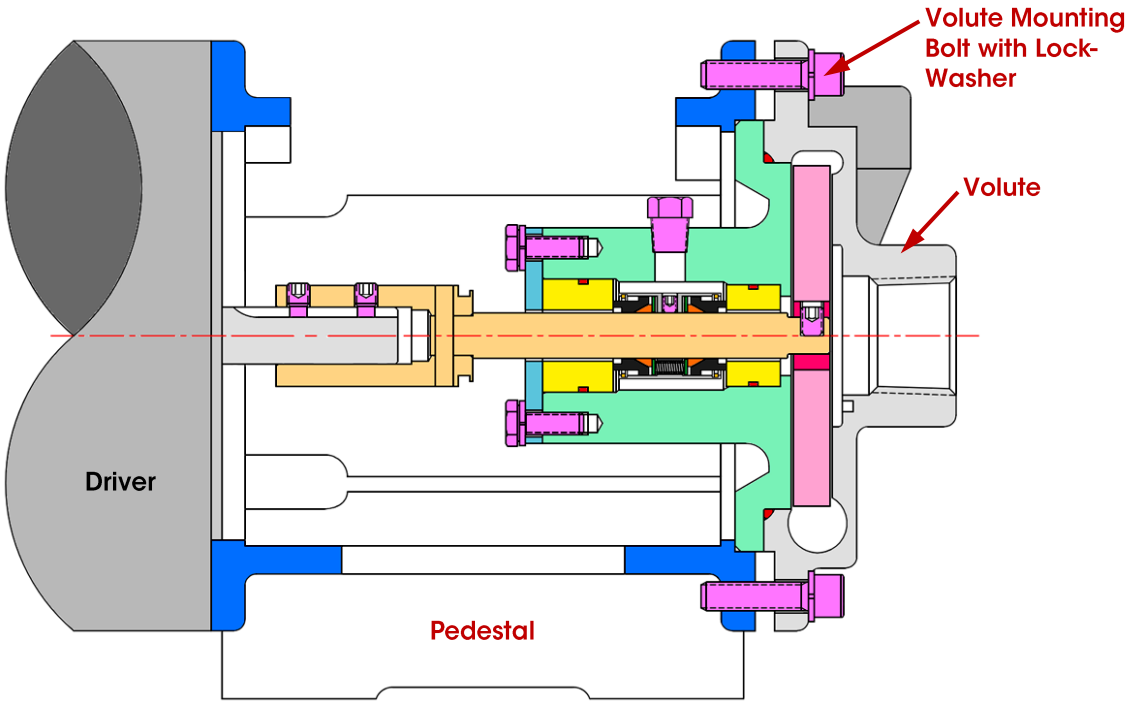
Installation of Volute Plugs:

20 Install the 1/8″ NPT plugs (13) into the volute (2).

> **NOTES:** (1) Refer to the drawing on **page 16** for the location of the volute plugs. (2) Apply Teflon tape to the threads of the plugs to prevent leakage and galling.

Volute-Pedestal Assembly:

21 Install the volute (2) to the seal housing (3) and pedestal (14) using four sets of bolts (6) and lock-washers (7).



NOTES: (1) Apply anti-seize compound to the bolts. (2) Refer to **Appendix 1** for the torque specifications of the fasteners. (3) When tightening the bolts, use a star pattern torque sequence on the fasteners to ensure even compression on the O-ring's surface. With Teflon (PTFE) O-rings, repeat this process several times, waiting between retightening. This is necessary because Teflon will cold flow and require a certain amount of time to properly seat. Continue the process until the bolts no longer require retightening.

Installation of Pipes for Barrier Fluid:

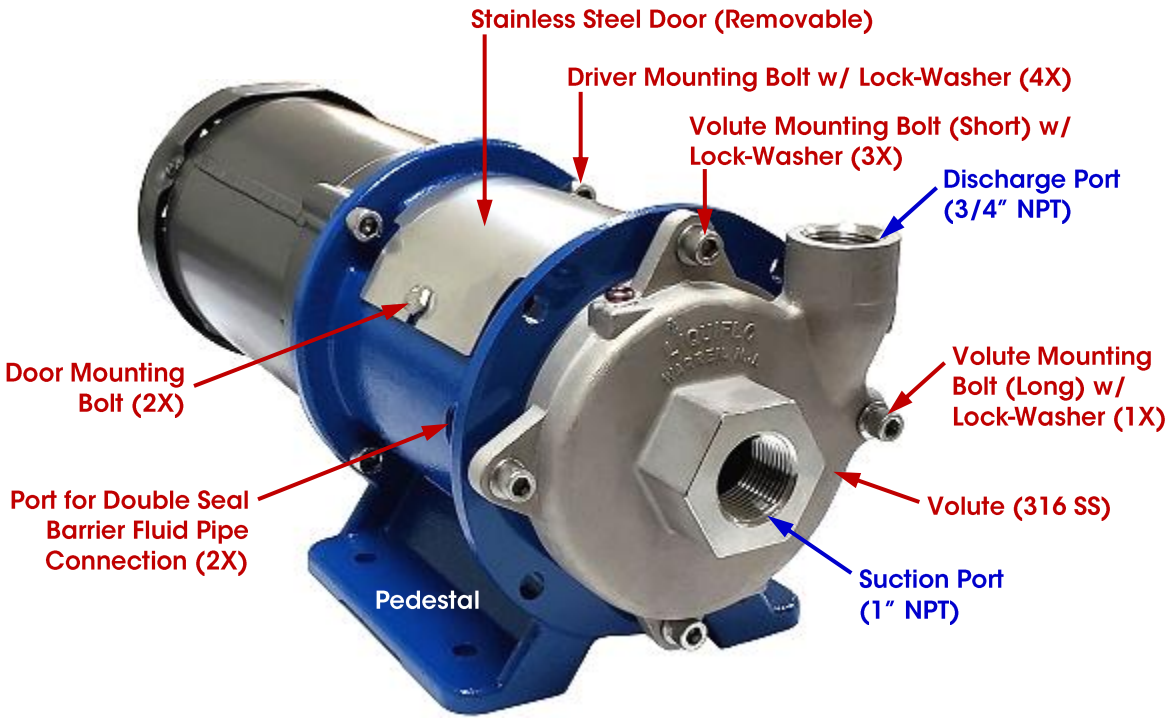
22 Install **1/8" Schedule 40 pipes** thru the side holes of the pedestal (14) and into the open 1/8" NPT ports of the seal housing (3).

NOTE: The 1/8" NPT pipes must be connected to the *fluid lubrication loop* for supporting the double mechanical seal during operation of the pump. Refer to the information in **Section 4.2** and the drawings on **page 17**.

Caution!
Failure to properly support the Double Mechanical Seal when operating the pump will cause premature seal wear and leakage.

Installation of Door to Pedestal:

23 Install the stainless steel door (24) to the pedestal (14) with two bolts (25), as shown below.



Model 620 with Double Mechanical Seal & Pedestal Mount shown with NPT Ports & Close-Coupled to C-Face Motor

END OF ASSEMBLY PROCEDURE

Appendix 1: Fastener Torque Specifications

Maximum Torque Values for 18-8 Stainless Steel Bolts

Function	Model Code Position 4 – Seal Type	Bolt Size	Bolt Type	Quantity (per Pump)	Max Torque Specifications	
					(in-lb)	(N-m)
Volute – Pedestal Assembly	4	5/16-18 UNC x 1	SHCS	3	132	14.9
		5/16-18 UNC x 1-3/4	SHCS	1		
Gland - Seal Housing Assembly – DMS	4	1/4-28 UNF x 5/8	HHCS	2	94	10.6
BOLTS for MOTOR or POWER FRAME to PEDESTAL ASSEMBLY:						
Driver*- Pedestal Assembly	4	3/8-16 UNC x 1-1/8	SHCS	4	236	26.7

* Motor (NEMA 56C, 143TC or 145TC frame) or Power Frame

DMS = Double Mechanical Seal

HHCS = Hex Head Cap Screw
SHCS = Socket Head Cap Screw

Seal Code:
4 Type 9T Carbon/SiC Double Mechanical

Appendix 2: Maintenance Tool List

The following tools (or equivalents) are required when performing maintenance on the pumps:

Tools for Model 620 with DOUBLE MECHANICAL SEAL, Type 9T

Tool #	Tool	Function	Photo
1	**Allen Wrench, 1/4" Hex**	For volute mounting bolts.	
2	**Allen Wrench, 1/8" Hex**	For impeller and shaft setscrews.	
3	**Allen Wrench, 3/32" Hex**	For double mechanical seal setscrews.	
4	**Wrench, 7/16"**	For gland plate bolts and 1/8" NPT plugs.	
5	**Allen Wrench, 5/16" Hex**	For motor or power frame mounting bolts.	

Appendix 3: Pump Bill of Materials (BOM)

BOM for Model 620 with DOUBLE MECHANICAL SEAL, Type 9T

Drwg. Ref. #	Part Description		316 SS Pump		Qty.
			Part #	Material	
1	Impeller	3.75" Dia. (Full Size)	620301	316 SS	1
		3.50" Dia. (Reduced Size)	620305	316 SS	
		3.25" Dia. (Reduced Size)	620306	316 SS	
		3.00" Dia. (Reduced Size)	620307	316 SS	
		2.75" Dia. (Reduced Size)	620308	316 SS	
2	Volute	Threaded (NPT)	620003	316 SS	1
		Flanged (ANSI 150# RF)	620005	316 SS	
3	Seal Housing, DMS		620117	316 SS	1
4	Shaft	5/8" Bore (NEMA 56C or PF)	620411	316 SS/303 SS	1
		7/8" Bore (NEMA 143TC/145TC)	620431		
5	**O-ring/Gasket, Volute** *	Gasket	620601	Teflon	1
		O-ring (2-154)	620621	Viton	
		Gasket	620603	Graphoil	
6	Bolt, Volute	5/16-18 x 1 SHCS	621105	18-8 SS	3
		5/16-18 x 1-3/4 SHCS	621101	18-8 SS	1
7	Lock-Washer, Volute (5/16)		3126341	18-8 SS	4
9	Setscrew, Impeller (1/4-28 x 3/8 SHSS-HD)		S620000	316 SS/Teflon	1
11	Setscrew, Shaft (1/4-28 x 3/8 SHSS-FD)		621104	18-8 SS	2
12	Gland Plate		621209	316 SS	1
13	Plug, 1/8" NPT (Volute (2) [1] & Seal Housing)		362304	316 SS	3
14	Pedestal (for NEMA 56C-145TC Motor or Power Frame)		SP009	CI/Epoxy	1
15	Bolt, Motor or Power Frame (3/8-16 x 1-1/8 SHCS)		621111	18-8 SS	4
16	Lock-Washer, Motor or Power Frame (3/8)		S1004	18-8 SS	4
17	**Double Mechanical Seal, Type 9T** *		A-867031	316 SS/Carbon	1
18	**Seal Seat, Inner** *		376103	SiC	1
19	**O-ring, Seal Seat, Inner (2-022)** *		620613	Viton	1
20	Screw, Gland Plate (1/4-28 x 5/8 HHCS)		S620013	18-8 SS	2
21	Lock-Washer, Gland Plate (1/4)		863701	18-8 SS	2
22	**Seal Seat, Outer** *		621018	SiC	1
23	**O-ring, Seal Seat, Outer (2-024)** *		620614	Viton	1
24	Door, Pedestal (Removable)		865078	304 SS	1
25	Bolt, Door (1/4-20 x 5/8 HHCS)		620008	18-8 SS	2
–	Power Frame [2]		A-620804	CI/CS/Epoxy	1

* Primary repair components.

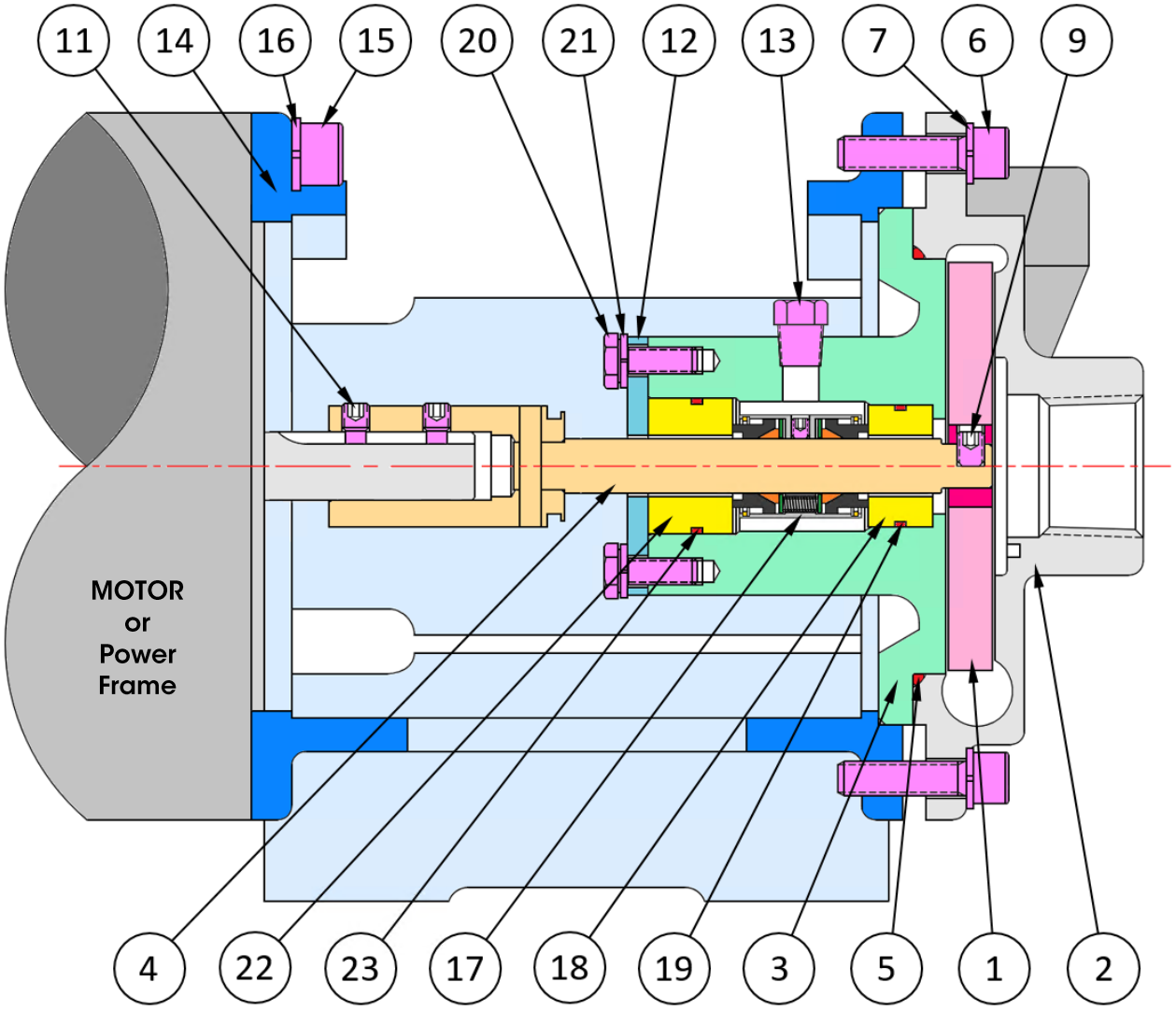
1 - Volute may contain an additional plug on the outlet port (see pages 16 & 33). **2** - Optional Item

NOTE: Drawing Reference Numbers above correspond to Sectional and Exploded View Drawings in **Appendix 4**.

HHCS = Hex Head Cap Screw
SHCS = Socket Head Cap Screw
SHSS-FD = Socket Head Set Screw, Full Dog
SHSS-HD = Socket Head Set Screw, Half Dog
CI = Cast Iron
CS = Carbon Steel
SS = Stainless Steel
SiC = Silicon Carbide
DMS = Double Mechanical Seal
RF = Raised Face
PF = Power Frame

Appendix 4: Reference Drawings

Sectional Drawing – Model 620 with DOUBLE MECHANICAL SEAL, Type 9T

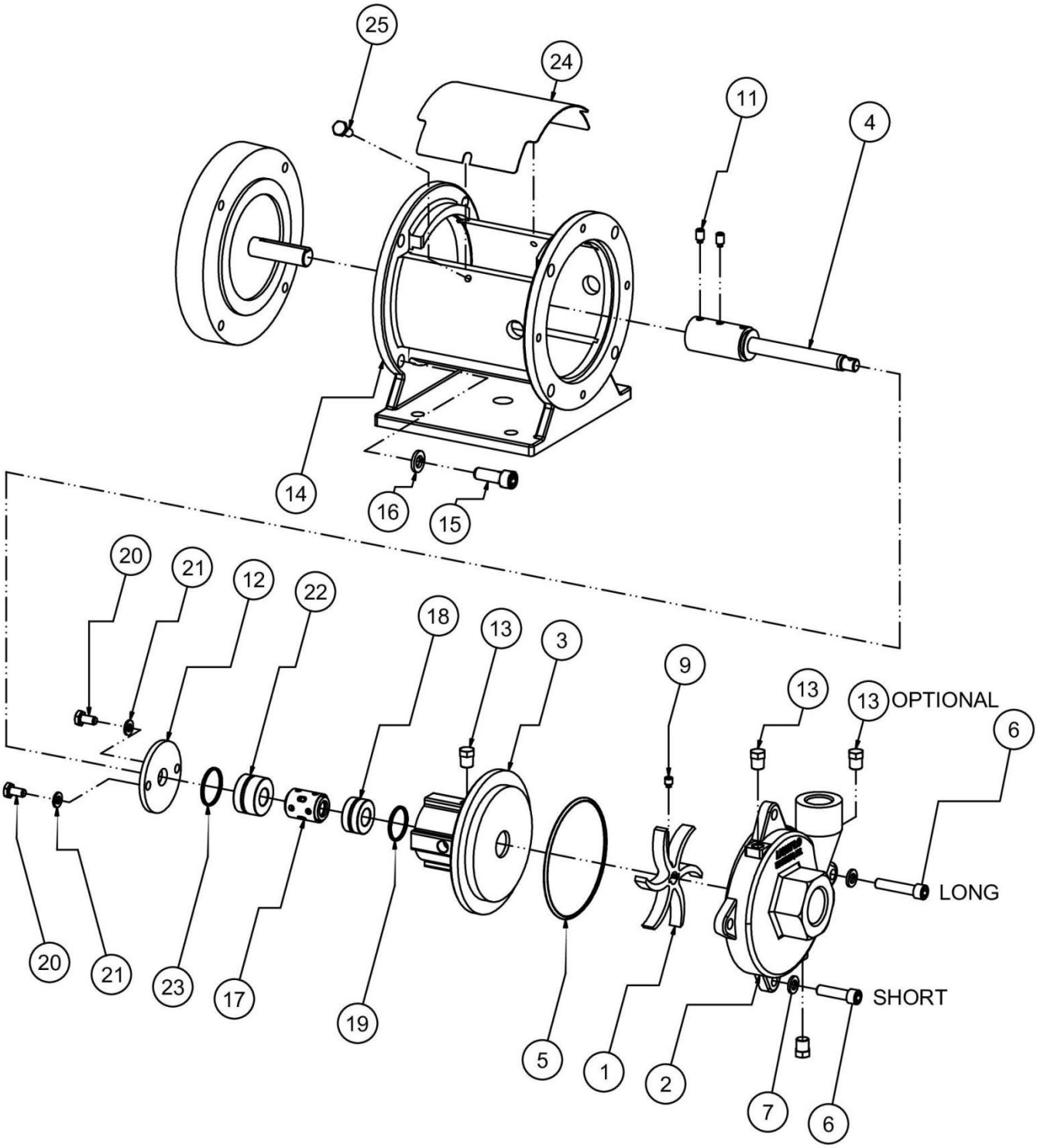


Ref. #	Description		Qty.	Ref. #	Description	Qty.
1	Impeller		1	13	Plug, 1/8 NPT	3 *
2	Volute		1	14	Pedestal	1
3	Seal Housing		1	15	Bolt, Driver (3/8-16 x 1-1/8 SHCS)	4
4	Shaft		1	16	Lock Washer, Driver (3/8)	4
5	O-ring/Gasket, Volute		1	17	Double Mechanical Seal, Type 9T	1
6	Bolt, Volute	5/16-18 x 1 SHCS	3	18	Seal Seat, Inner	1
		5/16-18 x 1-3/4 SHCS	1	19	O-ring, Seal Seat, Inner	1
7	Lock Washer, Volute (5/16)		4	20	Screw, Gland (1/4-28 x 5/8 HHCS)	2
8	NA		–	21	Lock Washer, Gland (1/4)	2
9	Setscrew, Impeller (1/4-28 x 3/8 SHSS)		1	22	Seal Seat, Outer	1
10	NA		–	23	O-ring, Seal Seat, Outer	1
11	Setscrew, Shaft (1/4-28 x 3/8 SHSS)		2	24	Door, Pedestal (Removable)**	1
12	Gland Plate		1	25	Bolt, Door (1/4-20 x 5/8 HHCS)**	2

* Two volute plugs are not shown. Additional volute plug is optional (see next page). ** Item not shown.

Appendix 4: Reference Drawings (Continued)

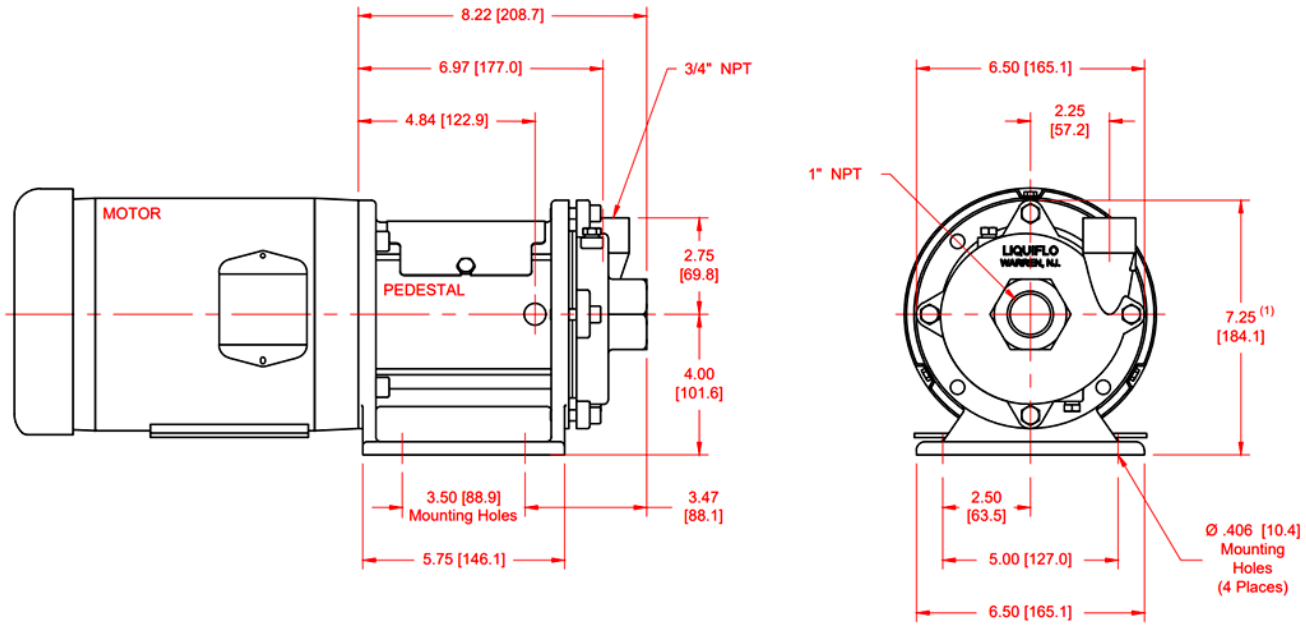
Exploded View Drawing – Model 620 with DOUBLE MECHANICAL SEAL, Type 9T



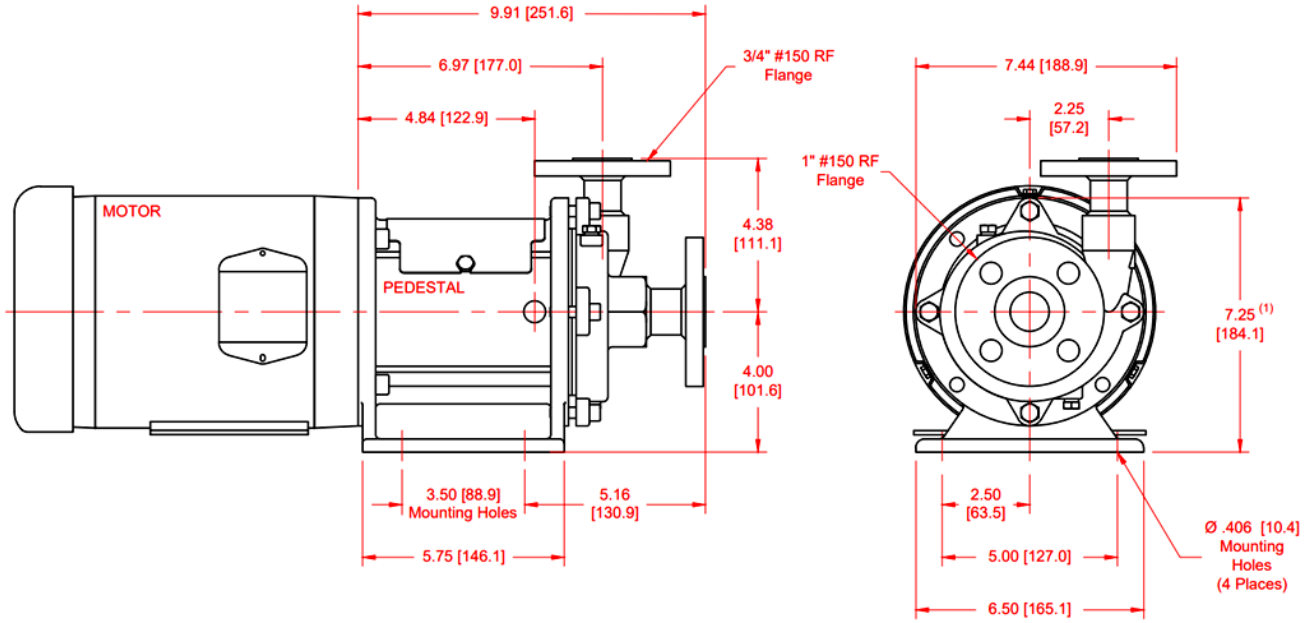
Appendix 4: Reference Drawings (Continued)

Dimensional Drawing #1 – Model 620 with DMS & Pedestal Mount, Close-Coupled

Model 620 with Double Mechanical Seal, NPT Ports & C-Face Motor



Model 620 with Double Mechanical Seal, Flanged Ports & C-Face Motor



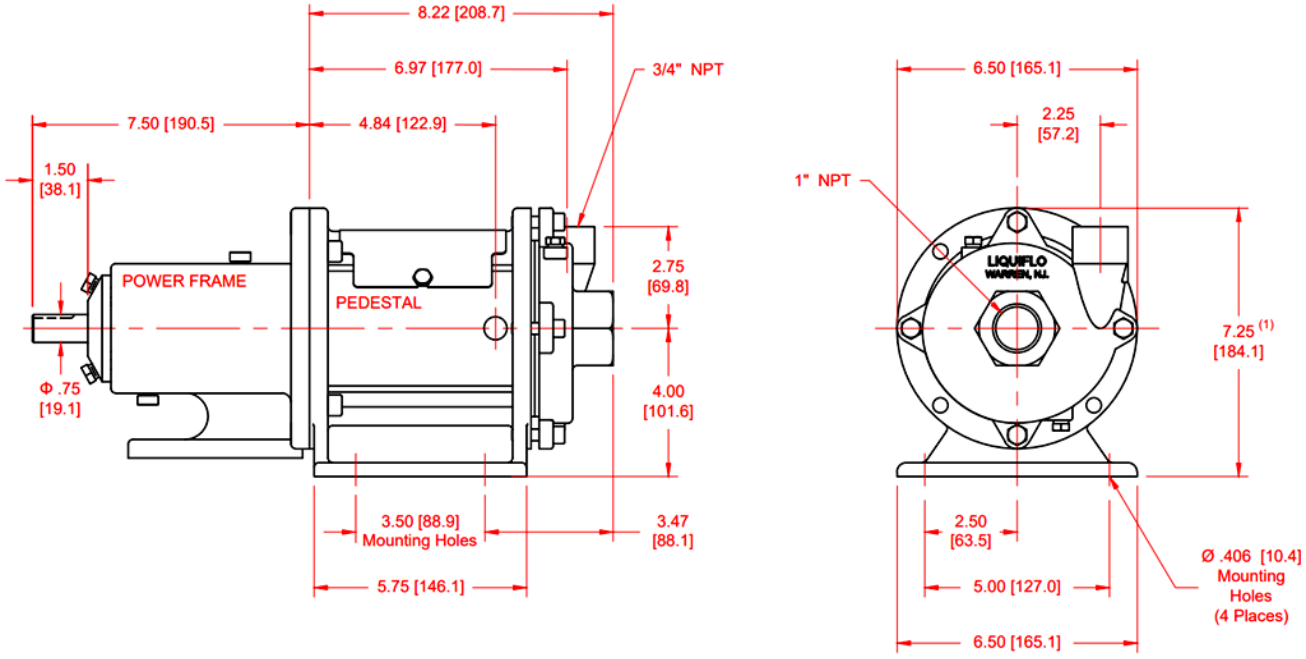
Units: inches [mm]

(1) Dimension to top of Pedestal (Bracket).

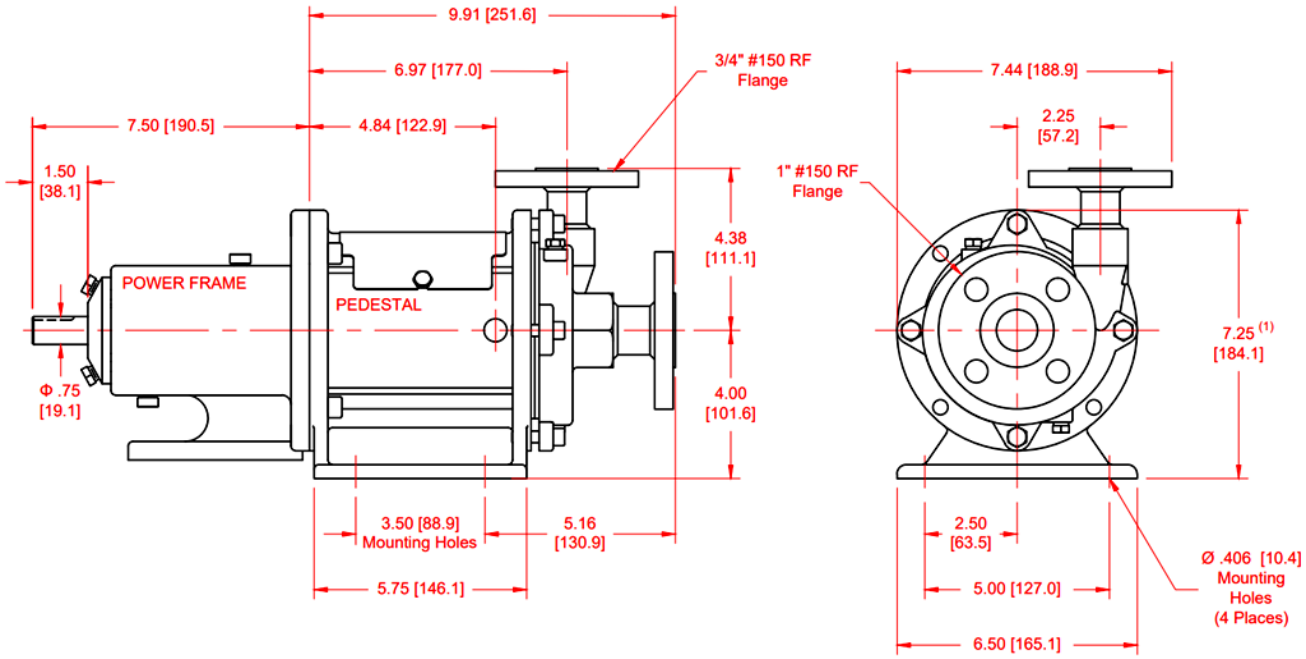
Appendix 4: Reference Drawings (Continued)

Dimensional Drawing #2 – Model 620 with DMS & Pedestal Mount, Long-Coupled

Model 620 with Double Mechanical Seal, NPT Ports & Power Frame



Model 620 with Double Mechanical Seal, Flanged Ports & Power Frame



Units: inches [mm]

(1) Dimension to top of Pedestal (Bracket).

Appendix 5: Troubleshooting Guide

Troubleshooting Guide – Part 1

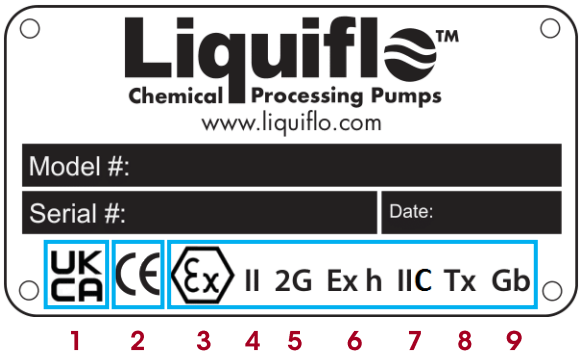
Problem	Possible Cause	Corrective Action
No discharge	Pump not primed	Verify suction pipe is submerged. Increase suction pressure. Open suction valve.
	Wrong direction of rotation	Reverse motor leads.
	Valves closed	Open all suction and discharge valves.
	Bypass valve open	Close bypass valve.
	Air leak in suction line	Tighten connections. Apply sealant to all threads. Verify suction pipe is submerged.
	Clogged strainer	Clean strainer.
	Clogged impeller	Disassemble and remove blockage.
	Impeller greatly worn or damaged	Disassemble and replace impeller.
Insufficient discharge	Suction pressure too low	Increase suction pressure. Verify suction piping is not too long. Fully open any suction valves.
	Bypass valve open	Close bypass valve.
	Partly clogged strainer	Clean strainer.
	Partly clogged impeller	Disassemble and remove blockage.
	Speed too low	Increase driver speed, if possible. Use larger size pump, if required.
	Impeller worn or damaged	Disassemble and replace impeller.
Loss of suction after satisfactory operation	Pump not properly primed	Reprime pump.
	Air leaks in suction line	Tighten connections. Apply sealant to all threads. Verify suction pipe is submerged.
	Air or vapor pockets in suction line	Rearrange piping as necessary.
	Increase in fluid viscosity	Heat fluid to reduce viscosity. Reduce pump speed.
Excessive power consumption	Fluid viscosity higher than specified	Heat fluid to reduce viscosity. Reduce pump speed. Increase driver horsepower.
	Liquid specific gravity higher than expected	Reduce pump speed. Increase driver horsepower.
	Total head greater than specified	Increase pipe diameter. Decrease pipe run.
	Total head lower than specified, pumping higher flow than expected	Install throttle valve.
	Total head higher than rating with flow at rating	Install impeller with correct diameter.
	Rotating parts binding or severely worn	Disassemble and replace worn parts.

Appendix 5: Troubleshooting Guide (Continued)

Troubleshooting Guide – Part 2

Problem	Possible Cause	Corrective Action
Rapid pump wear	Abrasives in fluid	Install suction strainer. Limit solids concentration. Reduce pump speed or use larger pump running at lower speed.
	Corrosion wear	Use materials of construction that are acceptable for fluid being pumped.
	Extended dry running	Install power sensor to stop pump.
	Discharge pressure too high	Increase pipe diameter. Decrease pipe run.
Excessive noise and vibration	Partly clogged impeller causing imbalance	Disassemble and remove blockage.
	Damaged impeller and/or shaft	Disassemble and replace damaged parts.
	Suction and/or discharge piping not anchored or properly supported	Anchor per Hydraulic Institute Standards.
	Base not rigid enough	Tighten hold-down bolts on pump and motor or adjust stilts. Inspect grout and regrout if necessary.
	Worn motor bearings	Replace bearings or motor.
	Pump cavitation	Increase NPSH available.
Excessive product leakage	Static seal failure caused by chemical incompatibility or thermal breakdown	Use O-rings or gaskets made of material compatible with fluid and temperature of the application.
	Static seal failure caused by improper installation	Install O-rings or gaskets without twisting, bending or pinching. Use star-pattern torque sequence on housing bolts during assembly. Allow Teflon O-rings to cold flow and seat during tightening. Torque bolts to specification.
	Mechanical seal worn or damaged	Disassemble and replace mechanical seal. Prime pump and avoid dry running.
	Pump port connections not properly sealed	Use Teflon tape or other suitable sealant. Use gaskets compatible with fluid and temperature of the application.
	Crevice corrosion of pump housing material	Only pump chemicals that are compatible with the pump housing material. Decrease temperature to reduce corrosion rate to acceptable value. Flush idle pumps that are used to pump corrosive chemicals. Eliminate contaminants in the fluid that can accelerate corrosion wear.

Appendix 6: Tag Certification Markings



The Liquiflo tag provides important information about the pump's use in potentially explosive atmospheres. Markings 3 to 9 comprise the complete ATEX marking. **NOTE: The tag does not provide information about the motor or other devices used with the pump.** It is the responsibility of the user to confirm that all equipment is safe for use in the intended environment.

No.	Marking	Meaning
1	UK CA	This marking confirms that this pump meets the requirements of the UK Regulation **SI 2016/1107** – The Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 2016. **UK Conformity Assessed (UKCA) marking** is a certification mark that indicates conformity with the applicable requirements for products sold within Great Britain. The UKCA marking became part of UK law on EU exit day, January 31, 2020.
2	CE	This marking confirms that this pump is compliant with the European Union's **Machinery Directive 2006/42/EC**. **Conformitè Europëenne (CE) marking** (French for "European Conformity") indicates that a product has been assessed by the manufacturer and certified to meet EU safety, health and environmental protection requirements. The CE marking originated in 1985 and is mandatory for any products marketed in the EU and the European Economic Area (EEA).
3	Ex	This marking confirms that this pump meets the requirements of **ATEX 114 "equipment" Directive 2014/34/EU** – Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres (published on March 29, 2014 by the European Parliament). **ATEX** is a codeword which comes from the French description – "Appareils destinés à être utilisés en **AT**mosphères **EX**plosives." The English translation is: "Devices intended for use in explosive atmospheres."
4	II	**Equipment Group II** indicates that this pump is suitable for surface (non-mining) applications and can be used in areas having explosive gases or liquids.
5	2G	**Equipment Category 2 – Gases/Vapors (G)**: This indicates that the pump is suitable for use in Zones 1 & 2: **Zone 1 (gases):** An area in which an explosive mixture is likely to occur in normal operation **Zone 2 (gases):** An area in which an explosive mixture is not likely to occur in normal operation and if it occurs it will only exist for a short time
6	Ex h	This marking indicates **Explosion Protection** of the pump as defined in standard **EN ISO 80079-37**. Protection type is Constructional Design Safety (**c**).
7	IIC	This marking indicates that the pump is suitable for use in atmospheres containing **Ignitable Gases: Group IIC** (e.g., hydrogen, acetylene, CS_2 or gases of similar hazard).
8	Tx	This marking indicates the **Temperature Class** (Maximum Allowable Surface Temperature) of the pump which depends on the materials of construction. **It is the responsibility of the operator to ensure that the fluid temperature does not exceed the maximum use temperature of the pump's materials.** Refer to ATEX document on Liquiflo website.
9	Gb	This marking indicates the **Equipment Protection Level** of the pump as defined in standard **EN ISO 80079-36**. **Gb** = High protection level for Zone 1 gases and vapors; the equipment remains safe in normal operation and also when single faults occur.

NOTES