



**Pioneer Self Priming Series  
PT Series  
Operation & Maintenance Manual  
Manual #2501**

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## INTRODUCTION

Thank you for purchasing a Pioneer Self-Priming centrifugal pump, complete with integral suction check valve. The pump is designed for handling non-volatile, non-flammable, mild industrial corrosives, residues and slurries containing large entrained solids. The standard pump is constructed of ASTM A536 ductile iron casing with ductile iron impeller and 17-4 PH stainless steel shaft and steel and iron wear parts.

### **WARNING!!!**

This manual provides installation, operation and maintenance instructions for your Pioneer Self-Prime Pump and is intended to make your personnel aware of any procedure that requires special attention because of potential hazards to personnel or equipment. Read all instructions carefully and remember, pump installations are seldom identical. Therefore, this manual cannot possibly provide detailed instructions and precautions for each specific application. Thus, it is the owner/installer's responsibility to ensure that applications not addressed in this manual are performed only after establishing that neither operator safety nor pump integrity are compromised by the installation.

### **WARNING!!!**

Centrifugal Pumps are designed for specific service and may or may not be suited for any other service without loss of performance or potential damage to equipment/personnel. If there is ever any doubt about suitability for a specific purpose; contact your **Pioneer Pump, Inc.** representative or the factory for assistance.

**Remember:** Pump performance may be affected by changes in pumpage such as, specific gravity, viscosity, temperature, operating speed and NPSHA (net positive suction head available).

## INSPECTION

### PRE-INSTALLATION INSPECTION

The pump assembly was inspected and tested before shipment from the factory. Before installation, inspect the pump for damage that may have occurred during shipment. Check as follows:

- a. Inspect the pump for cracks, dents, damaged threads, and other obvious damage.
- b. Check for and tighten loose attaching hardware. Since gaskets tend to shrink after drying, check for loose hardware at mating surfaces.
- c. Carefully read all warnings and cautions contained in this manual or affixed to the pump, and perform all duties indicated. Note the direction of rotation indicated on the pump and check that the pump shaft rotates counter-clockwise when standing on the suction side of the pump and facing the impeller.

## **CAUTION!!!**

If equipment is stored more than twelve (12) months, some of the components or lubricants may have exceeded their maximum shelf life. These must be inspected and replaced as necessary prior to pump operation to ensure proper pump performance.

### **RECORDING MODEL & SERIAL NUMBERS**

Please record the model and serial number for your **Pioneer Pump** in the spaces provided below. The factory will need this information when you require parts or service.

**Pump Model:** \_\_\_\_\_  
**Pump Serial Number:** \_\_\_\_\_  
**Engine/Motor Serial #:** \_\_\_\_\_  
**Engine/Motor Mfg:** \_\_\_\_\_

### **WARRANTY INFORMATION**

**LIMITED WARRANTY:** Seller warrants for one year from the date of shipment Seller's manufactured products to the extent that Seller will replace those having defects in materials or workmanship when used for the purpose and in the manner which Seller recommends. If Seller's examination shall disclose to its satisfaction that the products are defective, and an adjustment is required, the amount of such adjustment shall not exceed the net sales price of the defective products and no allowance will be made for labor or expense of repairing or replacing defective products or workmanship or damage resulting from the same. Seller warrants the products which it sells of other manufacturers to the extent of the warranties of their respective makers. Where engineering design or fabrication work is supplied, buyer's acceptance of Seller's design or of delivery of work shall relieve Seller of all further obligation, other than as expressed in Seller's product warranty. **THIS IS SELLER'S SOLE WARRANTY. NO OTHER WARRANTIES, WRITTEN OR ORAL, EXPRESS OR IMPLIED, INCLUDING THE WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE AND MERCHANTABILITY, ARE MADE OR AUTHORIZED. NO AFFIRMATION OF FACT, PROMISE, DESCRIPTION OF PRODUCT OF USE OR SAMPLE OR MODEL SHALL CREATE ANY WARRANTY FROM MANUFACTURER, UNLESS SIGNED BY THE PRESIDENT OF THE MANUFACTURER.** Seller neither assumes, nor authorizes any person to assume for it, any other obligation in connection with the sale of its engineering designs or products. This warranty shall not apply to any products or parts of products which (a) have been repaired or altered outside of Seller's factory, in any manner; or (b) have been subjected to misuse, negligence or accidents; or (c) have been used in a manner contrary to Seller's instruction or recommendations. Seller shall not be responsible for design errors due to inaccurate or incomplete information supplied by Buyer or its representative.

## **SAFETY INFORMATION**

These warnings apply to **PT Series** basic pumps. In many cases, **Pioneer Pump, inc.** has no control over or particular knowledge of the power source that will be used. Therefore, refer to the manual accompanying the power source before attempting to begin operation.

### **WARNING!!!**

Before attempting to open or service the pump:

1. Familiarize yourself with this manual.
2. Disconnect or lock out the power source to ensure that the pump will remain inoperative.
3. Allow the pump to cool if overheated.
4. Check the temperature before opening any covers, plates or plugs.
5. Close the suction and discharge valves.
6. Vent the pump slowly and cautiously.
7. Drain the Pump.

### **WARNING!!!**

This pump is designed to handle mild industrial corrosives, residues and slurries containing large entrained solids. Do not attempt to pump volatile, corrosive, or flammable materials that may damage the pump or endanger personnel as a result of pump failure.

### **WARNING!!!**

After the pump has been positioned, make certain that the pump and all piping connections are tight, properly supported and secure before operation. (Refer to Installation section)

### **DANGER!!!**

Do not operate the pump without the guards in place over the rotating parts. Exposed rotating parts can catch clothing, fingers, or tools, causing severe injury to personnel.

### **WARNING!!!**

Do not remove plates, covers, gauges, pipe plugs, or fittings from an overheated pump. Vapor pressure within the pump can cause parts being disengaged to be ejected with great force. Allow the pump to cool before servicing.

### **WARNING!!!**

Do not operate the pump against a closed discharge valve for long periods of time. If operated against a closed discharge valve, pump components will deteriorate, and the liquid could come to a boil, build pressure, and cause the pump casing to rupture or explode.

### **WARNING!!!**

Remove suction and discharge piping from pump prior to moving. Use lifting and moving equipment with adequate capacity and in good repair.

## **INSTALLATION**

### **WARNING!!!**

Review safety information in safety information section. This section is intended to outline general recommendations and practices required to position and arrange the pump and piping in static lift situations. If installing the unit in flooded suction applications some of the information will need to be tailored to the specific application. Never exceed the maximum permissible operating pressure of the pump as shown on the pump performance curve.

### **FOUNDATION/BASE PLATE/SKID**

If using a concrete foundation it should be rigid enough to inhibit vibration. Pour the foundation well in advance of installation of pump equipment to allow time for drying and curing.

If the pump is to be mounted on a steel frame, or similar structure, it should be set directly over the supporting beams. These beams and the structure must be rigid enough to prevent distortion and potential misalignment due to movement within the structure or base.

The location of this structure should be as close as possible to the pumpage source. Provide adequate space for operation, maintenance and inspection of the pump and equipment.

The concrete foundation should be provided with anchor bolts for attachment to the base plate. If required, provide adequate drainage to keep pump and motor dry and clean. Also, provide either leveling nuts or leveling wedges for mounting the base plate to the foundation.

### **LEVELING**

When mounting the base plate to the foundation use the leveling nuts or wedges to provide a level, flat base plate. Use a machinist's level on the mounting pads and make adjustments as necessary as the anchor bolts are tightened. This will provide the true alignment between the pump and motor.

### **GROUT**

If this base plate is to be grouted, ensure that you have the mounting surface flat and level for correct alignment of pump and motor. Build a dam around the base plate perimeter that is to be watertight. Use standard grouting practice and be sure to protect (cover) the leveling wedges with caulk or plastic tape if they are to be removed later. After the grout has thoroughly hardened, remove forms. If the wedges are removed, fill holes with grout. Seal grout by covering with a quality paint or sealer.

### **TRAILER MOUNTED UNITS**

See “**OPERATION**” section.

## **INSTALLING PUMP**

Ensure that all foreign material has been removed from the pump before mounting. Be sure to remove all shipping protection prior to operation.

NOTE: Many of the bare pumps are shipped with protective guards and coatings.

## **SUCTION PIPING**

For best performance the suction piping should be at least as large as the pump flange, never smaller. Use an eccentric reducer at the suction flange with the straight side up. The use of flow-retarding fittings is to be avoided and if necessary should never be placed closer to the pump suction than four (4) times the pipe diameter. The pump should be at the highest point of the piping. Slope the piping up to the pump to prevent air pockets and avoid changing pipe size with the exception of the eccentric reducer mentioned above. All suction piping and fittings are to be checked for any foreign material (rocks, bolts, wire, etc.) and also any sharp burrs that could disrupt the flow.

## **CAUTION!!!**

The suction and discharge pipe/hose material should be compatible with the liquid being pumped.

## **CAUTION!!!**

If hose is used on the suction line it should be of the reinforced type to prevent collapse under suction lift.

## **DANGER!!!**

If a manual shut-off valve is installed in the discharge line, it must not be left closed during operation, a closed manual shut off valve will cause overheating and possible explosive rupture of the pump casing. Personnel could be severely injured!

## **DISCHARGE PIPING**

Use a concentric taper on the discharge side to increase discharge pipe diameters. All valving and additional fittings should be the same size as the discharge main-line. The discharge size should be adequate to maintain reasonable velocities and reduce friction losses.

## **SUCTION & DISCHARGE PIPE FLANGES**

All piping is to be supported, braced and lined up square before connection to the pump flanges. A flexible fitting is recommended on both suction and discharge, to eliminate misalignment loads or stresses being transmitted to the pump.

NOTE: Flexible pipe couplings must be restrained so as not to transmit any strain to the pump flanges when expanding or contracting under pressure. Unrestrained expansion fittings can transmit enormous forces to the pump flanges.



## SCREENING

Make provisions for the installation of a suction screen or strainer to prevent any debris from clogging the impeller. The open area of the strainer should be equal to at least four (4) times the area of the pipe. The screen should be rigid enough to prevent collapse when flow is reduced due to clogging.

## SUMP DESIGN

The submergence of the suction pipe into the liquid should be at least four (4) to five (5) times the pipe diameter. If this is not possible then provide a baffle or a floating board. This is to prevent any vortex action allowing air into the pipe. For best performance a bell mouth fitting is recommended. Refer to the Hydraulic Institute Handbooks or other Hydraulic Data books for detailed sump design information.

## LIFTING

Any lifting equipment is to be rated for at least five (5) times the weight of the item being lifted. Use only established methods when lifting or moving any heavy components.

## ALIGNMENT OF PUMP AND MOTOR

Precise alignment is mandatory to achieve correct performance of the system. Every time a component is moved this alignment will have to be checked. The alignment can be checked with a straight edge and an outside caliper, taper thickness gauge, dial indicators, or for best results, use a laser alignment tool. Use the straight edge across the outside diameters of the coupling to ensure that the two halves are concentric and parallel. The outside calipers or the taper thickness gauge is to correct for any angular misalignment and to verify the correct gap between the coupling flanges. Use a laser alignment tool or dial indicators to adjust for concentric and angular displacement. With dial indicators, rotate shafts together and take readings every ninety (90) degrees. Make adjustments by placing shims under the driver, and be sure that the mounting bolts are properly tightened while taking readings and after final adjustment then install coupling guard.

## ROTATION

### **CAUTION!!**

When connecting a pump to an electric motor, it is common practice to “bump” the motor starter to check for correct rotation. **It is imperative that the PT pump inspection cover be removed prior to this rotation check!** The PT series pumps use threaded shafts and impellers; if the motor is “bumped” and rotation is backward, the impeller will unscrew and be forced against the wear plate. This will often apply enough force to the wear plate / inspection cover assembly to break the **inspection cover clamp.**

If, after removing the inspection cover and “bumping” the starter, it is found that the rotation is backward, then shut down and lock out the power to the pump and correct the wiring connection (reverse two leads for a three phase motor). Before reconnecting the power to the motor, retighten the impeller per instructions under the **SEAL INSTALLATION** section.

## **OPERATION**

Review all safety information in the safety information section.

### **PRE-START**

- 1) Verify that rotation is correct and that the shaft rotates freely. **CAUTION** see “Rotation” section above.
- 2) Check all piping connections for tightness.
- 3) Inspect all accessories and make sure they are appropriate for your installation.
- 4) Verify that the driver and coupling are aligned correctly and that all guards are in place.
- 5) Ensure that all bearings and grease seals are lubricated.
- 6) Oil levels should be checked and also, maintained during pump operation.
- 7) Follow the instruction on all tags, labels and decals attached to the equipment.
- 8) Review the operations manual furnished with the power source. (Equipment driver)

### **WARNING!!!**

This pump is designed to handle most non-volatile, non-flammable liquids containing specified entrained solids and corrosives. Do not attempt to pump volatile, corrosive, or flammable liquids that may damage the pump or endanger personnel as a result of pump failure.

### **CAUTION!!!**

Pump speed and operating condition points must be within the continuous performance range shown on the Performance Curve in the separate Part List Manual for your specific pump model.

### **PRIMING**

This pump is self-priming, but the pump should never be operated unless there is liquid in the pump casing.

### **CAUTION!!!**

The pump will not prime when dry. Extended operation of a dry pump will destroy the seal assembly.

Add liquid to the pump casing when:

1. The liquid in the pump casing is low.
2. The pump has not been used to an extended period of time.
3. The pump is being put into service for the first time.

Once the pump casing has been filled, the pump will prime and reprime as necessary.

### **WARNING!!!**

Do not attempt to operate the pump unless all connecting piping, fill plug and other fittings are securely installed, failure to do so, could cause liquid pumped to be forced out under pressure causing injury to personnel.

## **WARNING!!!**

Never run the pump with the discharge valve closed for extended periods of time. Never use the suction valve to throttle the flow. Check all suction and discharge piping for leaks.

If a suction strainer is installed, check the pressure drop across the strainer. If the differential in pressure exceeds five (5) PSI have the strainer cleaned.

## **OPERATION OF ENGINE DRIVEN UNITS**

Review pre-start instructions in the beginning of the Operation section.

### **Before Starting**

Check the fuel level and oil levels in the engine.

## **CAUTION!!!**

Make sure the pump is level. Lower jack stands and chock the wheels. Use caution when positioning the skid-mounted unit to prevent damage to the fuel tank. Consult the engine operations manual before attempting to start the unit.

## **WARNING!!!**

Do not operate the pump without guards in place over the rotating parts. Exposed rotating parts can catch clothing, fingers or tools, causing severe injury to personnel.

## **STARTING**

Consult the operations manual furnished with the power source.

### **Rotation**

**CAUTION** see “rotation section” on preceding pages

The correct direction of pump rotation is counter-clockwise when standing on the suction side of the pump and facing the impeller. The pump could be damaged and performance adversely affected by incorrect rotation. If pump performance is not within the specified limits, verify rotation. If necessary, check the connection to the power source, and interchange two leads (three phase power) in order to change rotation.

If an electric motor is used to drive the pump, remove V-belts, couplings, or otherwise disconnect the pump from the motor before checking motor rotation. Operate the motor independently while observing the direction of the motor shaft, or cooling fan.

If rotation is incorrect consult the power source operation manual.

### **Operation**

Open all valves in the discharge line and start the power source. Priming is indicated by a positive reading on the discharge pressure gauge or by a quieter operation. The pump may not prime immediately because the suction line must first fill with liquid. If the pump fails to prime within five minutes, stop it and check the suction line for leaks.

### **Liquid Temperature and Overheating**

The maximum liquid temperature for this pump is 160° F (71° C). Do not apply it at a higher operating temperature.

Overheating can occur if operated with the valves in the suction and/or discharge lines closed. Operating against closed valves could bring the liquid to a boil, build pressure, and cause the pump to rupture or explode. If overheating occurs, stop the pump and allow it to cool before servicing it. Refill the pump casing with cool liquid.

### **Pump Vacuum Check**

With the pump inoperative, install a vacuum gauge in the system. Block the suction line and start the pump. At operating speed, the pump should pull a vacuum of 20 inches of mercury (508.0 mm) or more. If it does not, check for air leaks at the suction piping gaskets.

### **STOPPING**

Never halt the flow of liquid suddenly. If the liquid being pumped is stopped abruptly, damaging shock waves can be transmitted to the pump and piping system. Close all connecting valves slowly.

On engine driven pumps, reduce the throttle speed slowly and allow the engine to idle briefly before stopping.

### **Cold Weather Protection**

If the pump is to remain idle during below freezing conditions, drain the pump to prevent damage from freezing. Also, clean out any solids by flushing with a hose.

### **Bearing Temperature Check**

Bearings normally run at higher than ambient temperatures because of heat generated by friction. Temperatures up to 160° F (71° C) are considered normal for bearings, and they can operate safely to at least 180° F (82° C).

Measure bearing temperature with a contact type thermometer.

## **MAINTENANCE**

### **WARNING!!!**

Before attempting to service this pump, read this manual carefully. Operators and maintenance personnel should have a good understanding of all aspects of this pump and the pumping conditions. Failure of operating personnel to be familiar with all aspects of pump operation outlined in this manual could contribute to equipment damage, bodily injury or possible death.

### **WARNING!!!**

Before any servicing:

- 1) Read this manual carefully.
- 2) Shut down driver and lock out incoming power to ensure that the pump will remain inoperative.
- 3) If the pump or components are hot, allow adequate cooling prior to servicing the unit.
- 4) Close the suction and discharge valves.
- 5) Vent the pump slowly and drain completely.

## **WARNING!!!**

If this pump is used to handle any hazardous materials that can cause illness, either directly or indirectly, take precautions by wearing approved protective clothing and use appropriate safety equipment.

## **WARNING!!!**

Use lifting and moving equipment in good repair and with adequate capacity to prevent injuries to personnel or damage to equipment. When lifting the pump with chains or cable wrapped around the pump, make certain that they are positioned so as not to damage the pump, and so that the load will be balanced. The bail on trailer or skid mounted units is intended for use in lifting the pump assembly only. Suction and discharge hoses and piping must be removed from the pump before lifting.

## **CAUTION!!!**

When servicing this pump, use only components provided by **Pioneer Pump, Inc.** Any use of non-authorized parts could result in sub-standard performance, damage to equipment and possible injury to personnel. **Non-authorized parts will also void the warranty.**

When using this manual any reference to part names will be directed to the cross-section drawing. These parts will also be called out in the bill of materials for full description.

Drain volute case of pumpage when pumping unit is idle to avoid freezing and possible thermal cracking of pump case.

This manual also provides a troubleshooting section to diagnose many operational or performance problems. The equipment covered in this section is limited to the pump and drive components only. Refer to the applicable vendor's manual for motors, engines and other accessory equipment. Use the troubleshooting section to help determine the cause of any problems, and only disassemble the pump components required to remedy the problem condition.

## **WARNING!!!**

Select a clean suitable location for any required maintenance, and note that all work must be performed by qualified personnel.

An ongoing record of performance will assist in any troubleshooting and/or analysis of problems. A pressure gauge can be installed on the suction and discharge side of the pump to monitor any changes in differential pressure. Differential pressure is useful in monitoring and diagnosing any possible degradation in pump performance.

## **DISASSEMBLY**

Verify the following:

1. Driver is shut down and power is **locked out**.
2. If pump components are hot, **allow to adequately cool**.
3. Suction and discharge valves are shut.
4. Drain pump after it has adequately cooled.
5. For power source maintenance refer to power source O & M manual

## **DISASSEMBLY CONT'D**

Review all safety information and follow the instructions in this manual, as well as, all tags, labels and decals attached to the pump or related equipment.

Under normal conditions this pump is designed to run maintenance free, because of its rugged construction, for extended periods of time. However, all centrifugal pumps contain wear parts that will gradually deteriorate, affecting pump performance. This pump does contain wear parts and these parts should be replaced as required to maintain optimum performance.

General maintenance can be performed without removing the pump from the driver. The following instructions assume a complete disassembly of the pump is required.

### **SUCTION COVER AND WEAR PLATE**

Before attempting to service the pump allow unit to cool and then remove the casing drain plug, and drain the pump. Once drained, clean the plug and reinstall in suction cover. Turn the **T-handle screw** on the **cover clamp bar** to loosen the cover clamp bar, and remove the cover clamp bar. The **inspection cover / wear plate** assembly can now be removed from the suction-side of the **pump case**. Inspect the **wear plate** and replace if badly worn or scored. To remove the wear plate, loosen and remove the two nuts and washers from the **wear plate studs**. Inspect the suction cover o-ring and replace if necessary.

### **ROTATING ASSEMBLY**

The power source must be removed prior to removing the rotating assembly. Drain the oil in the **seal plate** cavity and **seal oil reservoir** by removing the **seal plate drain plug**. Clean and replace the drain plug after draining seal cavity of oil.

Remove the inspection cover and wear plate from the suction side of the pump. Immobilize the impeller by wedging a block of wood between the impeller vanes and the pump casing. Attach a strap wrench to the drive-end of the shaft or to the shaft-end coupling half. With the impeller rotation still blocked pry in a counter-clockwise direction (when facing drive end of shaft) until the impeller becomes loose. Remove the wrench and the four (4) bolts on the drive end of the **bearing housing**.

### **SUCTION CHECK VALVE**

To service the **suction flapper valve** assembly, remove the **suction flapper pin** (model PT2.0). Remove the four capscrews and washers or four nuts (depending on model), and pull the **suction piece** off the **pump case**. The suction flapper valve and **suction flapper retainer** can now be disassembled (PT2.0). For the PT1.5 the suction flapper valve is integral with the **suction piece gasket** and does not require further disassembly for replacement. If the suction flapper valve is damaged in any way, it should be replaced. Replacement is simply the reverse of disassembly.

### **IMPELLER**

After loosening impeller per previous instructions, it can be unscrewed by hand and removed from the pump case.

## **PUMP CASE REMOVAL**

Use a wrench on the hex section under the **seal oil reservoir** to remove the reservoir and **oil reservoir nipple**. Remove the four nuts that secure the **pump case** and **seal plate** to the **bearing housing**. The pump case can now be removed from the seal plate register.

**CAUTION!** At this point the seal plate will no longer be bolted to the bearing housing register and should be supported so that it does not fall against the shaft. A bolt can be placed through the bearing housing flange and seal plate flange and secured with a nut until the seal plate is to be removed.

## **MECHANICAL SEAL REMOVAL**

The **pump shaft**, **mechanical seal rotating element** and **shaft sleeve** will now be accessible. It should be possible to pull the shaft sleeve and mechanical seal rotating element off the shaft as an assembly. Now the seal plate can be pulled straight off. Take care to support the seal plate while sliding it off of the shaft so that the **mechanical seal stationary seat** does not make contact with the shaft. The stationary seat is very brittle and could break if bumped against the shaft. If the mechanical seal is to be replaced, then this is not a concern.

Insert a screwdriver (blade-type) through the backside of the seal plate and against the backside of the **stationary seat retainer** (if used) or the **mechanical seal stationary seat**. Tap the end of the screwdriver handle with the heel of the hand to push it out. If the stationary seat is to be reused, a towel or cushion of some type should be placed under the seal plate for the stationary seat to fall onto.

Press the **seal plate lip seal** out from the impeller-side of the seal plate.

## **SHAFT AND BEARINGS**

Remove the bearing housing drain plug and drain the oil. Clean plug and reinstall in housing. Remove fasteners, and slide the **bearing cover** and **bearing cover lip seal** off the shaft. Press the lip seal from the bearing cover. Remove the **deflector** from the pump-end of the shaft. Place a block of wood against the impeller end of the shaft and gently tap the shaft and bearings out of the housing. Alternately, a press can be used to remove the shaft and bearing assembly.

Clean the housing and components with appropriate cleaning solvent and use compressed air to dry components. If bearings need replacement, use appropriate bearing puller to remove bearings from shaft, or a press can be used to push the shaft out of the bearing.

## **RE-ASSEMBLY OF COMPONENTS**

### **SHAFT AND BEARINGS**

Clean all components with appropriate solvent. Inspect shaft and replace if distorted, nicked or scratched beyond repair.

## **REASSEMBLY CONT'D**

If bearings are to be replaced:

The bearings may be heated to 250° F for ease of installation. An induction heater, electric oven or hot plate may be used to heat the bearings. A direct flame should never be used. After heating the bearings slide the bearings on the appropriate shaft end. If the bearings are shielded on one side, the **inboard bearing** should be installed with the shielded side toward the impeller, and the **outboard bearing** should be installed with the shield facing the bearing cover. After installation of bearing, ensure that bearings are tight against shaft shoulders. When installing the bearings onto the shaft press against the inner bearing race only.

Press a new **bearing housing pump-end lip seal** into the bearing housing. Make sure that the open side of the lip seal case faces the bearing. Press the lip seal in until the closed side of the case is flush with the pump-end face of the bearing housing. Use your finger to apply a coat of grease to the seal lip. Apply a coat of grease to the shoulder of the shaft where the shaft sleeve abuts. This will help the shaft pass through the lip seal during shaft installation.

Slide the shaft and assembled bearings into the bearing housing until pump-end bearing rests against the bottom of the bearing housing. Take care not to cut or fold the bearing housing pump-end lip seal when installing the shaft.

Press a new **bearing cover lip seal** into the bearing cover from the open side. Make sure that the open side of the lip seal case is facing the bearing. Press the lip seal in until it bottoms in the bearing cover. Apply a coat of grease to the lip of the seal. Slide the bearing cover over the shaft, taking care not to cut the lip seal on the shaft keyway. Install bearing cover capscrews and tighten.

## **SEAL INSTALLATION**

Press a new **seal plate lip seal** into the seal plate with the open side of the lip seal case toward the seal plate. Press the lip seal in until it bottoms in the bore. This pump may be equipped with a “rubber bellows” type mechanical seal or a “pusher” type seal. Installation methods are slightly different for each. The rubber bellows seal can be identified by the elastomer on the inside diameter of the seal and by the separate, single spring. The pusher-type seal will have no visible spring and only an o-ring on the inside diameter.

### **For the rubber bellows seal**

Remove the old **mechanical seal stationary seat** from the **stationary seat retainer**. Clean the stationary seat retainer, then lubricate the inside diameter with 30 wt motor oil or similar (do not use silicone based lubricants or grease). Lubricate the stationary seat o-ring, and press the seat into the retainer using your thumbs. Clean the seat bore in the seal plate and lubricate with 30 wt. motor oil. Lubricate the o-ring of the seat retainer, and press the retainer into the seal plate bore. Make certain that the seat retainer is seated squarely against the bottom of the seal plate bore and that the stationary seat is seated squarely against the bottom of the seat retainer. Using a clean rag, wipe the face of the stationary seat. Apply a few drops of 30 wt. motor oil to the stationary seat face.



## SEAL INSTALLATION CONT'D

Very carefully slide the seal plate over the shaft and up against the bearing housing register. This requires caution to prevent bumping the mechanical seal stationary seat against the shaft. The silicon carbide stationary seat is very brittle and will chip easily. Once the seal plate is positioned against the bearing housing register it should be secured with a bolt and nut or a c-clamp until you're ready to install the case. Alternately the reassembly can be performed with the pump positioned vertically – pump-end of the shaft pointing upward.

Now lubricate the entire service of the **shaft sleeve** with liberal amounts of 30 wt motor oil or a very thin film of STP® or heavy gear oil. Likewise, lubricate the inside diameter of the mechanical seal bellows. Place the **mechanical seal spring guide** over the sleeve and up against the flange at end of the sleeve. Make sure that the open side of the spring guide facing the non-flanged end of the sleeve. Place the **mechanical seal spring** over the sleeve and up against the spring guide. Push the mechanical seal onto the sleeve with the polished face away from the spring. Push the seal up the sleeve until the spring rests against the back of the mechanical seal. The remainder of the seal and impeller installation must occur right away so that the mechanical seal does not “set-up” in the wrong position on the sleeve.

Place the shaft sleeve o-ring over the end of the shaft and up against the shaft shoulder (where the sleeve abuts). Apply a little grease or oil to the o-ring. Slide the mechanical seal / sleeve assembly over the shaft with the flanged end of the sleeve toward the end of the shaft. Slide the assembly as far as the seal spring will allow.

Apply a small amount of Loctite 262® (red) or equivalent to the shaft threads, and install the impeller. As with impeller removal, attach a strap wrench or bearing nut spanner to the drive-end of the pump shaft. Have an assistant hold this wrench to immobilize the shaft. Tighten the impeller as much as possible by hand by rotating it clockwise.

A new seal assembly should be installed anytime the old seal is removed. The wear pattern on the old seal can cause premature failure if reused.

### For pusher-type seal

Clean the seat bore in the seal plate and lubricate with 30 wt. motor oil. Lubricate the o-ring of the stationary seat, and press the seat into the seal plate bore using your fingers (tools may break the seat). Make certain that the seat is seated squarely against the bottom of the seal plate bore. Using a clean rag, wipe the face of the stationary seat. Apply a few drops of 30 wt motor oil to the stationary seat face.

Very carefully slide the seal plate over the shaft and up against the bearing housing register. This requires caution to prevent bumping the mechanical seal stationary seat against the shaft. The silicon carbide stationary seat is very brittle and will chip easily. Once the seal plate is positioned against the bearing housing register it should be secured with a bolt and nut or a c-clamp until you're ready to install the case. Alternately the reassembly can be performed with the pump positioned vertically – pump-end of the shaft pointing upward.

Now lubricate the entire service of the **shaft sleeve** with 30 wt motor oil or a very thin film of STP® or heavy gear oil. Likewise, lubricate the inside diameter of the mechanical seal o-ring. Push the mechanical seal onto the sleeve with the polished face away from the spring. Push the seal up the sleeve until the seal spring rests against the sleeve flange.

## **SEAL INSTALLATION CONT'D**

Place the shaft sleeve o-ring over the end of the shaft and up against the shaft shoulder (where the sleeve abuts). Apply a little grease or oil to the o-ring. Slide the mechanical seal / sleeve assembly over the shaft with the flanged end of the sleeve toward the end of the shaft. Slide the assembly as far as the seal spring will allow.

## **IMPELLER**

Apply a small amount of Loctite 262® (red) or equivalent to the shaft threads, and install the impeller. As with impeller removal, attach a strap wrench or bearing nut spanner to the drive-end of the pump shaft. Have an assistant hold this wrench to immobilize the shaft. Tighten the impeller as much as possible by hand by rotating it clockwise.

The shaft and impeller threads must be completely clean before re-installing the impeller. **Do not use anti-seize compounds on the shaft threads!** Screw the impeller onto the shaft until tight.

## **SUCTION COVER AND WEAR PLATE**

The impeller should be adjusted to within .010 to .020 of wear plate. With the pump resting horizontally on its feet push the pump so that the drive-end of the shaft is against a stop (back of the workbench). This will ensure that the shaft and impeller are as far toward the wear plate as possible. Now loosen the **inspection cover clamp T-handle**. Back each of the **inspection cover adjustment set screws** until the wear plate makes contact with the impeller. Now tighten each adjustment set screw ¼ turn at a time, and slightly tighten the T-handle screw. If the impeller and wear plate are still rubbing, repeat the procedure until the wear plate no longer rubs against the impeller.

## **LUBRICATION**

### **Seal Assembly**

Prior to starting the pump, fill the transparent seal oil reservoir. Use an ISO viscosity grade 32 Turbine oil.

### **Bearings**

The bearing housing was lubricated at the factory and the oil level should be maintained at the middle of the sight gauge. Use an ISO viscosity grade 32 Turbine oil, and fill through the air vent hole.

## **CAUTION!!!**

Over-filling of oil can result in premature failure of bearings. Under normal use drain and refill bearing housing at least once every 12 months.

## **PARTS ORDER**

When ordering parts from **Pioneer Pump, Inc.** please provide the following information:

- 1) Pump serial number
- 2) Pump model
- 3) Cross section drawing number
- 4) Part number from cross section drawing (or part name if no number is noted)
- 5) Description of part
- 6) Quantity required
- 7) Package VIN (Vehicle Identification Number for skid or trailer mounted units)

## **SPARE PARTS**

Spare parts should be kept on hand to reduce downtime. At a minimum the following parts should be stocked.

Wear Plate  
All O-rings  
Set of bearings  
Mechanical seal  
Set of grease seals

If you have unusual pumping conditions, consult **Pioneer Pump, Inc.** for additional recommended spare parts.

## **STORAGE**

Pumps are adequately prepared for outside storage prior to shipment, but use the following list of additional suggestions for extended storage.

- 1) Store the unit off the ground so no water will accumulate around the equipment.
- 2) Protect unit from blowing sand and dirt.
- 3) Stack no other items on top of pump/equipment.
- 4) Protect unit from the entry of any animals.
- 5) Periodically rotate shaft to lubricate bearings and protect bearings from brinelling.
- 6) Protect unit with approved drying agents.
- 7) Ensure all bare metal areas are coated with rust preventative.
- 8) Inspect unit every four (4) weeks and replace drying agents (Silica Gel) as required or a minimum of every six (6) months.
- 9) Keep an inspection record showing dates of inspection with any maintenance performed and condition of drying agents.
- 10) Before installation ensure that all rust protection has been removed. Also, remove any foreign material that may have accumulated during storage.
- 11) Before installation remove all drying agents (Silica Gel).

## TROUBLE SHOOTING

Symptom	Possible Causes	Symptom	Possible Causes
No Discharge	1,2,3,4,5,7,8,9,10,17,18,19,20,37,49	Vibration and noise	2,4,9,10,14,15,17,26,27,28,29,30,31,32,33,34,35,36,39,40,41,42,43,44,48,49
Reduced Capacity	2,3,4,5,7,8,9,10,11,17,19,20,21,38,39,40,47,49	Seal: excessive leakage, short life, seal housing overheating	22,23,25,33,34,35,36,41,44,45,46
Reduced Pressure	5,7,8,11,13,18,19,38,39,40,47,49	Bearings: over heating, short life, noise	26,27,28,29,30,31,32,33,34,35,36,41,42,43,44
Loss of Prime	2,3,4,7,10,11,20,21,22,23,49	Pump overheating, seizes	1,8,9,14,33,34,35,36,41,42,43,44
Power consumption excessive, driver runs hot	6,12,13,17,18,19,24,33,34,35,36,37,38,41,42,43,44	Corrosion, erosion, pitting, oxidation or other loss of material	7,8,11,14,15,16
Pump Fails Prime	1,4,5,10,20,21,49,50,51		

- |   |  |   |
|---|--|---|
| 1. Pump not primed  | 19. Low speed                                    | 39. Impeller damage   |
| 2. Suction line not filled  | 20. Air leak into suction line.                  | 40. Improper balance (after repair)                               |
| 3. Air pocket in suction line   | 21. Air leak through mechanical seal             | 41. Bent shaft  |
| 4. Suction inlet or foot valve obstructed, insufficiently submerged, or too small | 22. Seal fluid contaminated, hot or insufficient | 42. Excessive thrust  |
| 5. System head higher than pump design head                                       | 23. Seal fluid system not vented                 | 43. Rotational element dragging                                   |
| 6. System head lower than pump design head  | 24. High speed                                   | 44. Worn or incorrectly installed bearings                        |
| 7. Insufficient NPSH  | 25. Mechanical seal insufficient                 | 45. Mechanical seal not properly set, O-rings damaged or hardened |
| 8. Parallel pump application is incorrect   | 26. Bearing housing excessively cooled           | 46. Shaft scored at seal  |
| 9. Suction pressure to vapor pressure Below minimum.                              | 27. Low oil pressure (oil lube bearings)         | 47. Volute O-ring   |
| 10. Suction lift too high   | 28. Improper or poor lubrication                 | 48. Foundation not rigid or settle                                |
| 11. Excess vapor in pumpage   | 29. Lubrication defective                        | 49. Suction line collapsed  |
| 12. Specific gravity of pumpage different than design                             | 30. Dirt in lubrication/bearings                 | 50. Not enough liquid in casing                                   |
| 13. Viscosity of pumpage different than design                                    | 31. Moisture in lubricant/bearing housing        | 51. Suction check valve contaminated or damaged                   |
| 14. Operation at below rated capacity   | 32. Lubricant excess                             |   |
| 15. Cavitation  | 33. Pipe strain                                  |   |
| 16. Electrolysis  | 34. Temperature growth                           |   |
| 17. Impeller obstructed   | 35. Misalignment                                 |   |
| 18. Wrong-Rotation direction  | 36. Coupling improperly installed                |   |
|   | 37. Impeller installed backwards                 |   |
|   | 38. Wear rings-worn                              |   |

## Conditions and terms of sale

**CONTROLLING PROVISIONS:** These terms and conditions shall control with respect to any purchase order or sale of Seller's products. No waiver, alteration or modification of these terms and conditions whether on Buyer's purchase order or otherwise shall be valid unless the waiver, alteration or modification is specifically accepted in writing and signed by an authorized representative of Seller.

**DELIVERY:** Seller will make every effort to complete delivery of products as indicated on Seller's acceptance of an order, but Seller assumes no responsibility or liability, and will accept no backcharge, for loss or damage due to delay or inability to deliver caused by acts of God, war, labor difficulties, accident, delays of carriers, by contractors or suppliers inability to obtain materials, shortages of fuel and energy, or any other causes of any kind whatever beyond the control of Seller. Seller may terminate any contract of sale of its products without liability of any nature, by written notice to Buyer, in the event that the delay in delivery or performance resulting from any of the aforesaid causes shall continue for a period of sixty (60) days. Under no circumstances shall Seller be liable for any special or consequential damages or for loss, damage, or expense (whether or not based on negligence) directly or indirectly arising from delays or failure to give notice of delay.

**SELLER'S LIABILITY:** Seller will not be liable for any loss, damage, cost of repairs, incidental or consequential damages of any kind, whether based upon warranty (except for the obligation accepted by Seller under "Warranty" above), contract or negligence arising in connection with the design, manufacture, sale, use or repair of the products or of the engineering designs supplied to Buyer.

**RETURNS:** Seller cannot accept return of any products unless its written permission has been first obtained, in which case same will be credited subject to the following: (a) All material returned must, on its arrival at Seller's plant, be found to be in first-class condition; if not, cost of putting in saleable condition will be deducted from credit memoranda. (b) A handling charge deduction of twenty percent (20%) will be made for all credit memoranda issued for material returned. (c) Transportation charges, if not prepaid, will be deducted from credit memoranda.

**CANCELLATION OR ALTERATION:** Cancellation or alteration of an order by Buyer may not be made without advance written consent of Seller and shall be subject to a cancellation charge. The cancellation charge will be a minimum of fifteen percent (15%) or actual cost incurred by Seller at the time of cancellation or alteration, whichever is greater.

**SHIPMENTS:** All products sent out will be carefully examined, counted and packed. The cost of any special packing or special handling caused by Buyer's requirements or requests shall be added to the amount of the order. No claim for shortages will be allowed unless made in writing within (10) days of receipt of a Shipment. Claims for products damaged or lost in transit should be made on the carrier, as Seller's responsibility ceases, and title passes, on delivery to the carrier.

**SPECIAL PRODUCTS:** Orders covering special or non-standard products are not subject to cancellation except on such terms as Seller may specify on application.

**QUOTATIONS:** All quotations are subject to approval, acceptance and correction at the home office. Any errors in quotations resulting in orders will be corrected and re-submitted to the customer for their acceptance or refusal. All quotations are valid for 45 days from the date on the quotation.

**PRICES AND DESIGNS:** Prices and designs are subject to change without notice. All prices are **F.O.B. Point of Shipment**, unless otherwise stated.

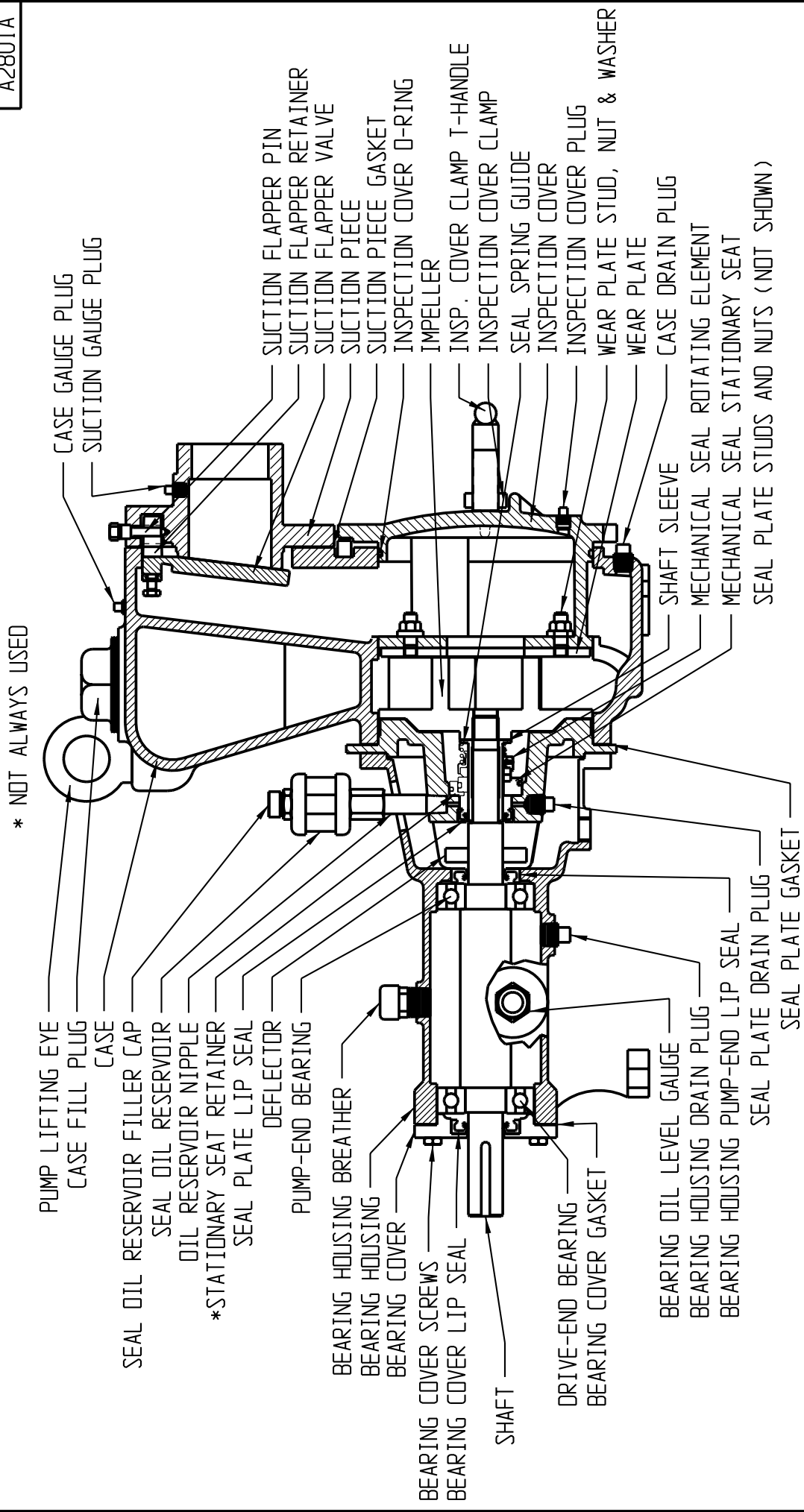
**TAXES:** The amount of any sales, excise or other taxes, if any, applicable to the products covered by this order, shall be added to the purchase price and shall be paid by Buyer unless Buyer provides Seller with an exemption certificate acceptable to the taxing authorities.

**TERMS OF SALE:** For value received, Buyer agrees to honor all terms of the sale, as outlined on the reverse hereof, including, but not limited to the following:

- ◆ 3% 10, net 30 days unless otherwise specified in writing.
- ◆ Buyer agrees and understands that payments will be considered past due if payment is not received within thirty (30) days of the invoice date.
- ◆ Buyer agrees that all past due payments shall bear interest at the rate of 1.5% per month (18% per annum) until paid in full.
- ◆ Buyer agrees that it is the intention of Buyer and Seller to conform strictly to all usury laws now in force and effect in the state of purchase.
- ◆ Buyer further agrees not to suffer or permit any charge, lien, security interest, adverse claim or encumbrance of any and every nature whatsoever against the equipment until the indebtedness secured thereby is satisfied in full.
- ◆ Minimum invoice amount will be no less than \$25.00 plus transportation.

**USE OF EQUIPMENT:** Buyer agrees to maintain and use the equipment solely in the conduct of its own business, in a careful and proper manner, and in conformity with all applicable permits, licenses, statutes, ordinances, regulations and laws.

**INSURANCE:** Buyer shall have and maintain at all times with respect to all equipment insuring against risk of fire, theft and other risks as Seller may require, until the indebtedness secured thereby is satisfied in full.



\* NOT ALWAYS USED

PUMP LIFTING EYE  
CASE FILL PLUG  
CASE  
SEAL OIL RESERVOIR FILLER CAP  
SEAL OIL RESERVOIR  
OIL RESERVOIR NIPPLE  
OIL RESERVOIR NIPPLE  
\*STATIONARY SEAT RETAINER  
SEAL PLATE LIP SEAL  
DEFLECTOR  
PUMP-END BEARING  
BEARING HOUSING BREATHER  
BEARING HOUSING  
BEARING COVER  
BEARING COVER LIP SEAL  
SHAFT  
DRIVE-END BEARING  
BEARING COVER GASKET  
BEARING OIL LEVEL GAUGE  
BEARING HOUSING DRAIN PLUG  
BEARING HOUSING PUMP-END LIP SEAL  
SEAL PLATE DRAIN PLUG  
SEAL PLATE GASKET

CASE GAUGE PLUG  
SUCTION GAUGE PLUG  
SUCTION FLAPPER PIN  
SUCTION FLAPPER RETAINER  
SUCTION FLAPPER VALVE  
SUCTION PIECE  
SUCTION PIECE GASKET  
INSPECTION COVER O-RING  
IMPELLER  
INSP. COVER CLAMP T-HANDLE  
INSPECTION COVER CLAMP  
SEAL SPRING GUIDE  
INSPECTION COVER  
INSPECTION COVER PLUG  
WEAR PLATE STUD, NUT & WASHER  
WEAR PLATE  
CASE DRAIN PLUG  
SHAFT SLEEVE  
MECHANICAL SEAL ROTATING ELEMENT  
MECHANICAL SEAL STATIONARY SEAT  
SEAL PLATE STUDS AND NUTS (NOT SHOWN)

