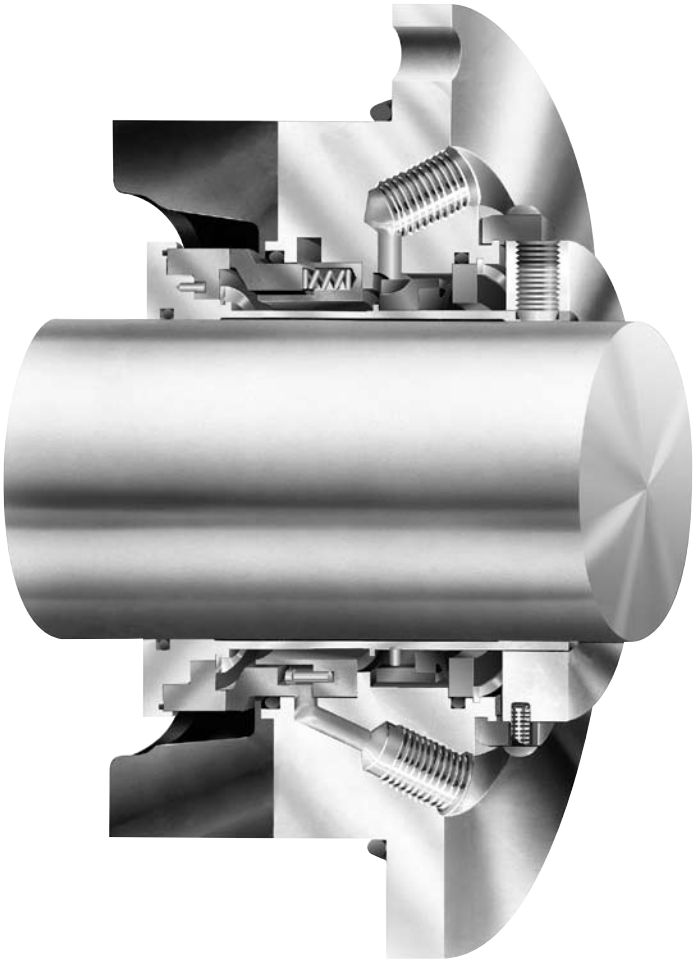
FLOWSERVE

Installation Instructions

Durametallic® SLM-6000, SLM-6100

Self contained cartridge
medium duty slurry seal



Experience In Motion

1 Cartridge Installation Instructions

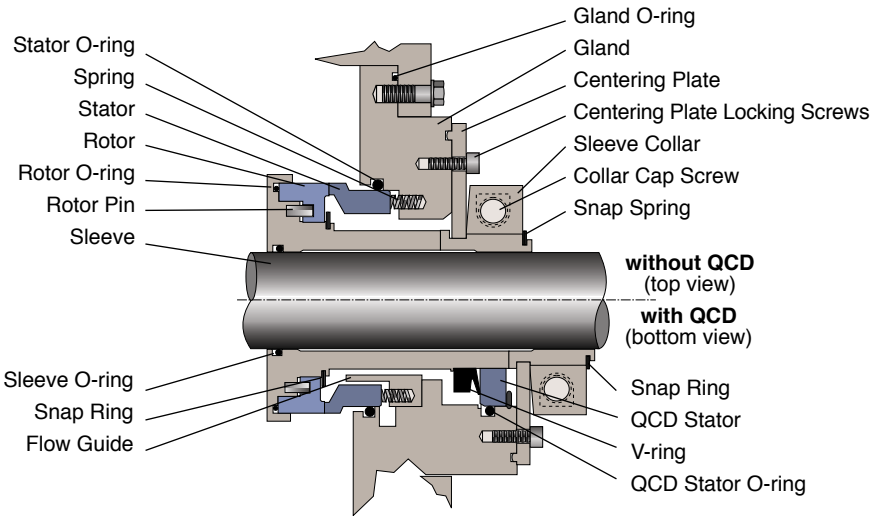
The following instruction manual is designed to simplify the installation of a typical SLM-6000 or SLM-6100 slurry seal. The SLM-6000 is a single seal with no quench port connections, the SLM-6000 QCD adds an elastomer type quench containment device (V-ring or lip seal) and 2 quench port connections to the single seal and the SLM-6100 adds a basic end face quench containment mechanical seal to make a tandem design with a circulating device and 2 quench port connections to the single seal.

By reading this manual and following its guidelines, seal performance can be improved by eliminating the chances of premature failure due to improper installation. In addition to these instructions, consult the seal assembly drawing included for your specific seal design, materials of construction, critical dimensions, and any auxiliary piping connections.

As you go through this manual you will find some of the instructions referenced with figure numbers. These illustrations are provided to help you visualize what the instruction is trying to explain. If these instructions are followed faithfully, the seal installation will be successful, and maintenance personnel will understand the proper procedures to follow when pump adjustment is necessary.

For special problems encountered during installation, contact your nearest Flowserve Sales and Service Representative or Authorized Distributor.

Typical Single SLM-6000 Cartridge Seal Figure 1



2 Recommendations

To ensure that your SLM-6000 Mechanical Seal will provide you with the longest possible life, we recommend the following:

2.1 New radial and thrust bearings be installed in the pump.

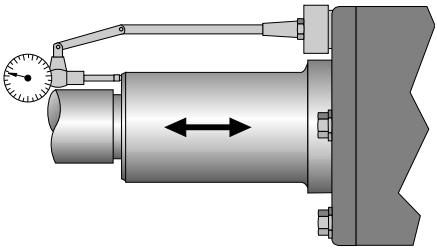
The images of parts shown in these instructions may differ visually from the actual parts due to manufacturing processes that do not affect the part function or quality.

2.2 The saddle fits of the bearing assembly should not be worn.
2.3 The axial end float of the pump shaft must not exceed 0.25 mm (0.010"). See Figure 2.

Check Axial Shaft Travel

Figure 2

0.25 mm (0.010") Maximum Acceptable Axial Movement

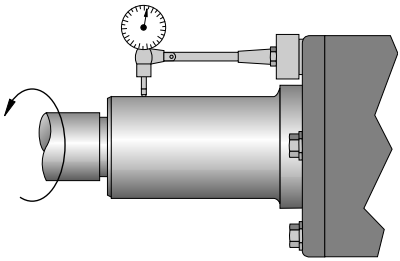


2.4 Shaft radial runout should be less than 0.0005 mm per mm (0.0005" per inch) of shaft/sleeve diameter. See Figure 3. Turn the shaft through 360° and observe the range of indicator movement.

Check Radial Shaft Runout

Figure 3

Maximum Acceptable Radial Run Out 0.0005 mm per mm (0.0005" per inch) of shaft diameter

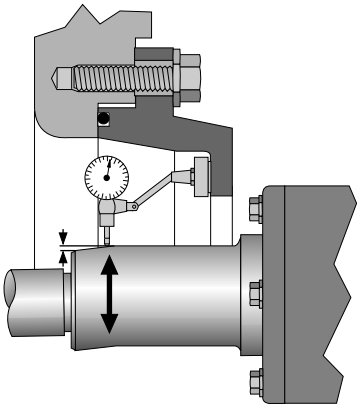


2.5 The shaft should deflect no more than 0.30 mm (0.012") at the seal chamber face. See Figure 4.

Check Radial Shaft Deflection

Figure 4

Shaft should Deflect no more than 0.30 mm (0.012")



2.6 Ensure that the shaft or shaft sleeve has a 1.6 mm (0.06") x 30° chamfer on the leading edge to prevent O-ring damage at seal installation.

2.7 Hardened shaft sleeves must not be used when cartridge sleeve locking is accomplished by set screws bearing directly into the shaft sleeve. Any of the sleeve collars that clamp the cartridge sleeve to the shaft sleeve may be used on hardened shaft sleeves.

3 General Instructions

3.1 Ensure that the bearing assembly is mounted correctly (central and square) to the pump pedestal and securely fastened.

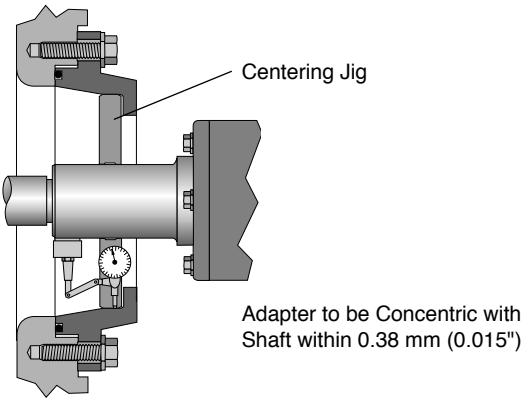
3.2 Ensure that all fit locations on the pedestal are clean and free of burrs.

3.3 Clean the pump shaft/sleeve surface, making sure it is clean of product and rust and has no burrs.

3.4 If the pump design requires it, bolt seal adapter plate to equipment case/pedestal (hand tighten only).

3.5 Locate the seal fit of the adapter to the shaft by use of a dial indicator or centering jig. The equipment shaft must be concentric to the seal adapter bore to within 0.38 mm (0.015"). See Figure 5.

Center Adapter Plate to Shaft Figure 5



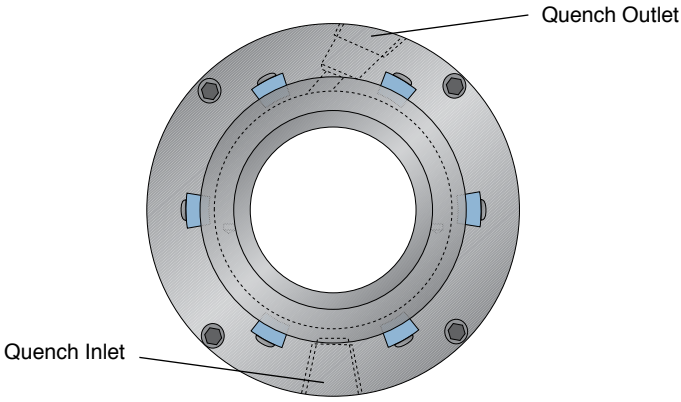
3.6 For adapters provided with a centering jig, simply insert the centering jig into the adapter and tighten adapter bolts alternately, adjusting the cover location until the centering jig can be removed by hand without binding.

3.7 Apply a light coat of O-ring lubricant to the seal sleeve O-ring. (Silicone grease must be used with EPDM gaskets.)

Warning: Do not apply anti-seize or other lubrication to the pump shaft/sleeve. Keep the shaft/sleeve clean and dry. The use of lubricants will cause improper clamping pressure by the clamp collar.

3.8 If the seal is fitted with quench ports, orient the ports as illustrated in Figure 6.

Quench Port Orientation Figure 6

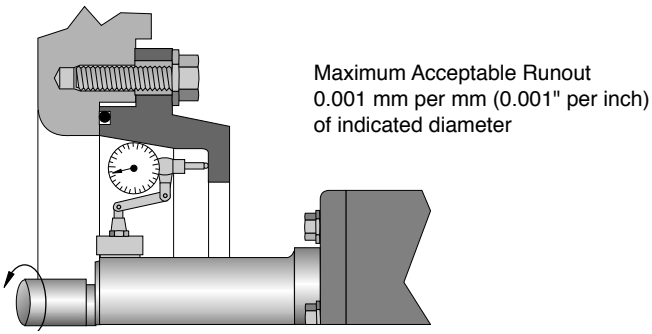


4 Wet-Side (Impeller-Side) Installation

The following steps describe installation of the seal cartridge mounted on the wet, or impeller, side of the equipment case. If your cartridge is designed to mount on the dry, or bearing, side of the equipment case, skip to section 5.

4.1 Seal chamber face runout (perpendicularity) should be less than 0.001 mm per mm (0.001" per inch) of indicated diameter. See Figure 7.

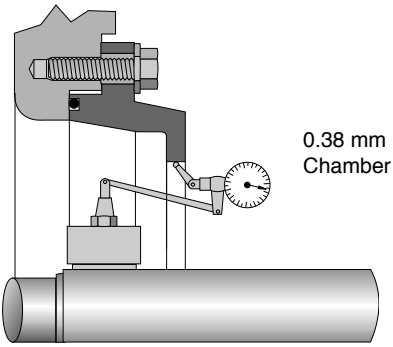
Check Seal Chamber Face Runout Figure 7



4.2 Seal chamber concentricity should be less than 0.38 mm (0.015"). See Figure 8. Seal life varies with alignment. Poor shaft alignment can reduce seal life.

Check Seal Chamber Concentricity

Figure 8

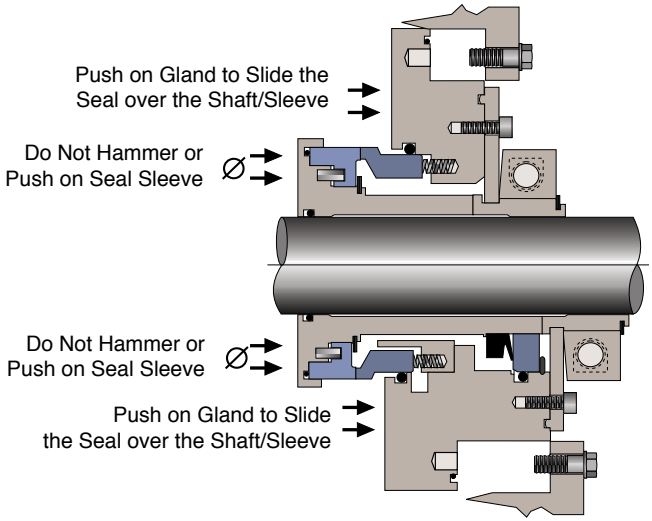


0.38 mm (0.015") Maximum Seal Chamber Concentricity Runout

4.3 It is advisable to hold the gland gasket in place in the gland groove with contact adhesive, #404 “super glue” (in spots only), or vacuum grease. With the seal clamp collar facing toward the bearing assembly, slide the complete cartridge over the pump shaft/sleeve and push back into the pump case. See Figure 9.
Warning: Do not hammer on or push against the cartridge sleeve.
Do not secure the gland retaining screws to the equipment casing at this time.

Inserting Cartridge

Figure 9



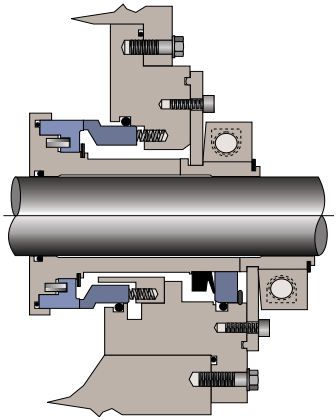
4.4 If the seal is mounted directly on the shaft, rather than on the equipment sleeve, install the impeller spacer sleeve (possibly modified).

4.5 Install the impeller and case.

4.6 Make any necessary impeller adjustments.
Warning: Loosen the bearing assembly and drive belts only enough to make the adjustments. Fully retighten the bearing assembly and belts after adjustment.

4.7 Insert the retaining screws through the rear face of the pump case and screw into the seal gland. Tighten the retaining screws evenly to pull the seal into the pump case. See Figure 10.

Cartridge in Place (Wet Side) Figure 10

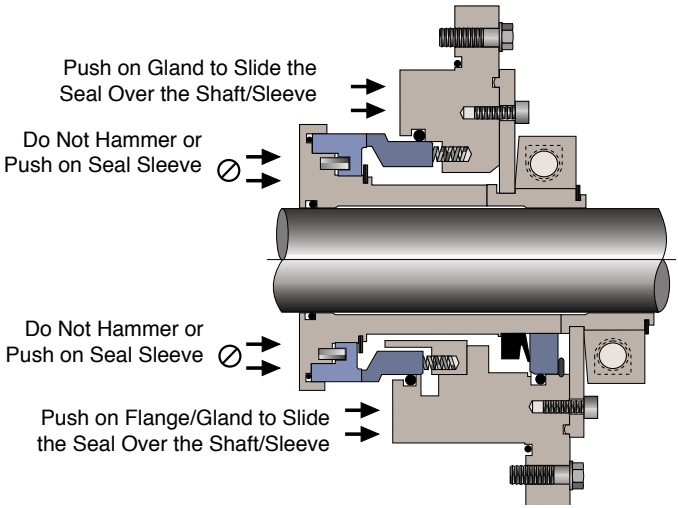


5 Dry-Side (Bearing-Side) Installation

The following steps describe installation of the seal cartridge mounted on the dry, or bearing, side of the equipment case. If your cartridge is designed to mount on the wet, or impeller, side of the equipment case, refer to section 4. If you have completed section 4, skip to section 6.

5.1 With the seal clamp collar facing toward the bearing assembly, slide the complete cartridge over the pump shaft/sleeve and push back toward the bearing housing. See Figure 11.
Warning: Do not hammer on or push against the cartridge sleeve.

Slide Cartridge onto Shaft Figure 11

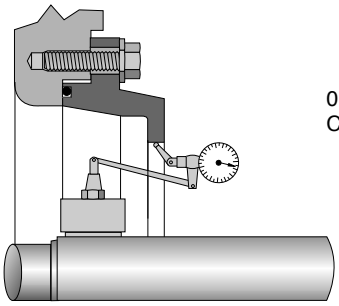


5.2 Position and lightly secure the equipment casing in place.

5.3 Seal chamber concentricity should be less than 0.38 mm (0.015"). Poor shaft alignment can reduce seal life. See Figure 12.

Check Seal Chamber Concentricity

Figure 12

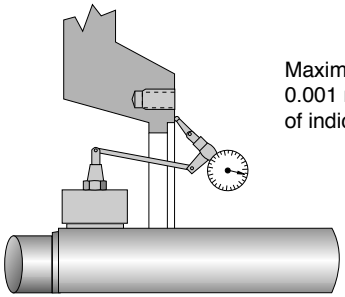


0.38 mm (0.015") Maximum Seal Chamber Concentricity Runout

5.4 Seal mounting runout (perpendicularity) should be less than 0.001 mm per mm (0.001" per inch) of indicated diameter. See Figure 13. When the equipment case and shaft are properly aligned, secure the case in place.

Check Seal Chamber Face Runout

Figure 13



Maximum Acceptable Runout
0.001 mm per mm (0.001" per inch)
of indicated diameter

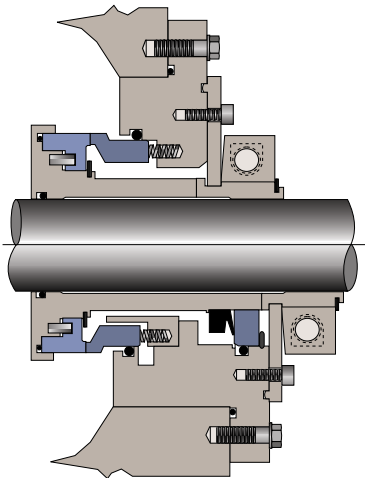
5.5 If the seal is mounted directly on the shaft, rather than on the equipment sleeve, install the impeller spacer sleeve (possibly modified).

5.6 Install the impeller and case.

5.7 Make any necessary impeller adjustments.
Warning: Loosen the bearing assembly and drive belts only enough to make the adjustments. Fully retighten the bearing assembly and belts after adjustment.

5.8 Slide the seal cartridge up to the equipment case. Insert the retaining bolts through the gland holes and screw into the threaded holes on the face of the equipment case. Tighten the retaining bolts evenly in opposing pairs. See Figure 14.

Cartridge in Place (Dry Side) Figure 14



6 Completing Installation

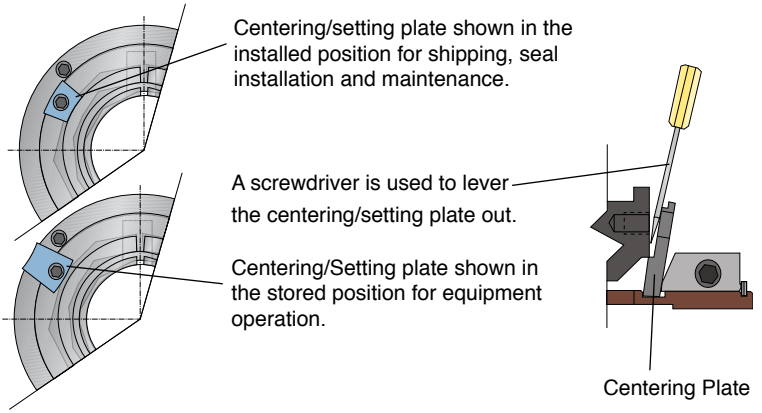
6.1 Evenly tighten the Socket Head Cap Screws of the 2-piece split clamp collar, the Hex Head Cap Screws of the 3-piece shrink disk collar, or the Set Screws of the 1-piece sleeve collar to the proper torque values listed below.

TORQUE VALUES
ft-lbs
(N-m)

	Split Clamp	Shrink Disk Clamp	Set Screw Clamping (Dog Point)	Set Screw Penetrating (Cup Point)	
Fastener Size	**Alloy Steel**	**Alloy Steel**	**Alloy Steel**	**Stainless Steel**	**Alloy Steel**
1/4”	_____	10-12 (14-16)	_____	4-6 (5-8)	7-8 (9-11)
5/16”	24-26 (33-35)	20-22 (27-30)	_____	10-12 (14-16)	13-15 (18-20)
3/8”	40-45 (54-61)	24-27 (33-37)	_____	18-20 (24-27)	22-25 (30-34)
1/2”	90-100 (122-136)	_____	50-55 (68-75)	_____	_____

6.2 Remove the setting plate locking screws. With a screwdriver, pry the setting plates clear of the gland and remove them. Keep the setting plates and locking screws with seal at all times. See Figure 15.

Remove Centering/Setting Plates Prior to Operation Figure 15

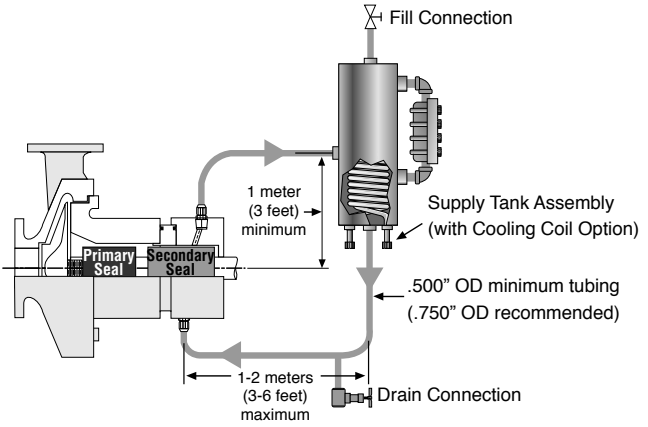


7 Support Systems

7.1 For seal fitted with quench ports and lip seal (**SLM-6000 QCD**):
- 7.1.1 Connect clean, low-pressure water to the quench inlet. See Figure 6. Water flow must be regulated to 1-2 liter/min (1/4-1/2 gpm) at 35 kPa (5 psi) maximum.
- 7.1.2 Quench outlet should be connected to plant drain.
- 7.1.3 Quench water must flow at all times when pump is in operation.

7.2 For seal fitted with quench ports and basic end face seal (**SLM-6100 with Plan 52**):
- 7.2.1 Supply tank inlet should be located vertically 1 meter (3 feet) above centerline of equipment shaft and the outlet horizontally within 1-2 meters (3-6 feet) of seal quench inlet port. See Figure 16.
- 7.2.2 Connect lower supply tank outlet port to seal quench inlet port. See Figure 16.
- 7.2.3 Seal quench outlet port should be connected to upper supply tank inlet port. See Figure 16.

API Plan 52 (ANSI Plan 7352) Figure 16



7.2.4 Supply tank “Buffer” fluid level must be maintained at all times when equipment is pressurized and in operation. Fresh buffer fluid should be used when it becomes cloudy or contaminated with process fluid. Quench supply tank should have a drain connection located on the bottom and a fill connection on the top that can be used when adding or exchanging buffer fluid. Supply tanks may or may not also have cooling coil connections. Buffer fluid flow is a function of the seal circulation device and thermosyphoning created by proper location of supply tank. Buffer fluid must always be kept at 0-69 kPa maximum (0-1 psig maximum).

7.3 Your SLM-6000 Mechanical Seal is now ready for operation.
Warning: To ensure that the mechanical seal does not run dry, leave motor v-belts or drive coupling off the pump until the motor has been tested for rotation.
Note: For any subsequent impeller or bearing adjustment, reverse steps 6.1, and 6.2.

8 Start Up and Shut Down Procedures for the SLM-6000 Slurry Seal

Because the seal has no flush and relies on the product for seal face lubrication, the pump cavity must be completely full of liquid before start up. Take the following steps to ensure dry running does not occur:

8.1 Pump Start-Up

8.1.1 Open the suction valve.

8.1.2 Open the discharge washout/bleed valve to release any air that may be trapped in the piping. Close the valve after a steady stream of liquid flows from it. If little or no liquid appears, do not start the pump. This means that part of the piping system is blocked with product.

8.1.3 Partially open the discharge valve to ensure that water hammer or cavitation does not occur at start up.

8.1.4 After start up, slowly open the discharge valve. This will keep a false head on the pump until the line fills.

8.2 Pump Shut-Down

8.2.1 Stop the pump.

8.2.2 Close the discharge valve.

8.2.3 Close the suction valve.

8.2.4 Drain all product from the pump seal chamber or flush with clean water or process fluid to prevent solids in the slurry (either free solids or dissolved solids that will precipitate out when temperature is reduced during standby) from setting in the seal chamber or volate.

9 Normal Operation

Never allow equipment to run dry during operation, as this will certainly result in premature seal failure.

9.1 Do not allow equipment to cavitate, as this will shorten seal life.

9.2 Do not induce water hammer in the pipeline, as this can place undo strain on the seal components.

9.3 Do not allow the seal chamber pressure to drop below 5 psi while equipment is in operation as this may prevent lubrication from reaching the seal faces.

TO REORDER REFER TO
B/M #_____
F.O. _____

10 Repair

This product is a precision sealing device. The design and dimension tolerances are critical to seal performance. Only parts supplied by Flowserve should be used to repair a seal. To order replacement parts, refer to the part code and B/M number. A spare backup seal should be stocked to reduce repair time.

When seals are returned to Flowserve for repair, **decontaminate the seal assembly** and include an order marked **"Repair or Replace." A signed certificate of decontamination** must be attached. **A Material Safety Data Sheet (MSDS) must be enclosed** for any product that came in contact with the seal. The seal assembly will be inspected and, if repairable, it will be rebuilt, tested, and returned.

For technical assistance or additional seal sizes and conditions not listed, contact your local Flowserve Sales and Service Representative or Authorized Distributor.

FIS134eng REV 08/12 Printed in USA

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