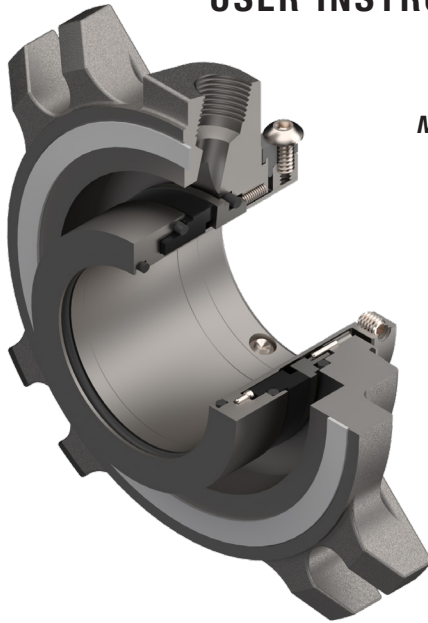


KeyPS™ Seal

Cartridge pusher single seal for general purpose applications



1 Equipment Check

- 1.1 Follow plant safety regulations prior to equipment disassembly:
 - 1.1.1 Wear designated personal safety equipment.
 - 1.1.2 Isolate equipment and relieve any pressure in the system.
 - 1.1.3 Lock out equipment driver and valves.
 - 1.1.4 Consult plant safety data sheet (SDS) files for hazardous material regulations.
- 1.2 Disassemble equipment in accordance with the equipment manufacturer's instructions to allow access to seal installation area.
- 1.3 Remove existing sealing arrangement (mechanical seal or otherwise). Clean seal chamber and shaft thoroughly.
- 1.4 Inspect surfaces under gaskets to ensure they are free from pits or scratches. Break all sharp corners on shaft steps, threads, reliefs, shoulders, key ways, etc. over which gasket(s) must pass and/or seal against.
- 1.5 Check shaft or sleeve outer diameter (OD), seal chamber bore, seal chamber depth, gland pilot, stud diameter, stud bolt pattern and distance to first obstruction to ensure they are dimensionally the same as shown in the seal assembly drawing.
- 1.6 Check seal assembly drawings for any modifications (reworks) to be made to the equipment for mechanical seal installation and act accordingly.
- 1.7 The equipment must be earthed to prevent sparks due to static electricity discharge.

KeyPS™ Seal

Shaft runout should be checked against the equipment manufacturer's specifications. See Figure 1. Generally, shaft runout should not exceed 0.05 mm (0.002 in.) total indicator reading (TIR) at any point along the shaft for ball or roller type bearings. For sleeve type bearings, refer to manufacturer instructions. If the equipment is not completely dismantled, verify runout near seal location.

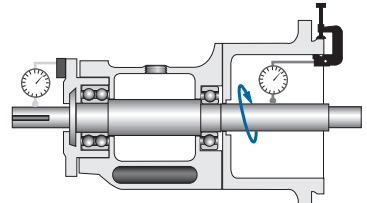


Figure 1

Shaft endplay should not exceed 0.25 mm (0.010 in.) TIR, regardless of thrust bearing type. See Figure 2.

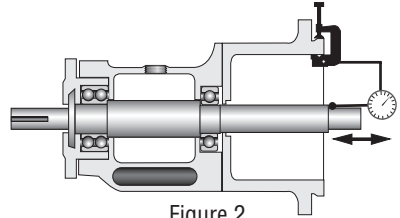


Figure 2

Radial bearing play at seal chamber face should be checked against the equipment manufacturer's specifications. Generally, 0.05 to 0.10 mm (0.002 to 0.004 in.) will be applicable for ball or roller type bearings. For sleeve or journal type bearings, values will generally be in the order of 0.10 to 0.15 mm (0.004 to 0.006 in.). If equipment is found outside the general range, contact the equipment manufacturer and your Flowsolve representative to verify the equipment's suitability for the seal.

Seal chamber squareness to the shaft centerline should be within 0.0005 mm/mm (0.0005 in./in.) of seal chamber bore TIR.

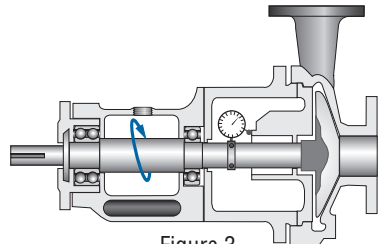


Figure 3

Note: Make sure that shaft endplay does not affect the reading. See Figure 3.

Concentricity of the shaft to the seal chamber bore or gland pilot register should be within 0.025 mm per 25 mm shaft diameter (0.001 in. per 1 in. shaft diameter) to a maximum of 0.125 mm (0.005 in.) TIR. See Figure 4.

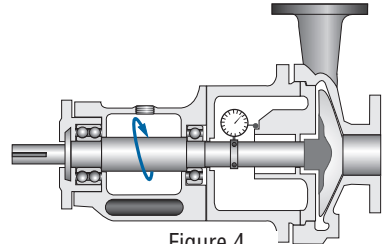
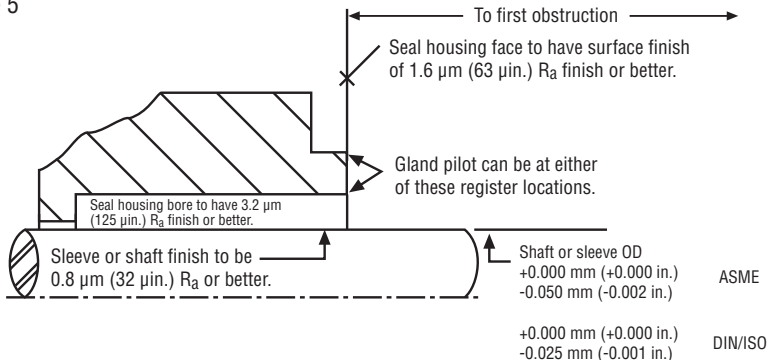


Figure 4

Surface finish requirements

Figure 5



2 Seal Installation

Note: No seal setting measurements are needed to install the seal. Instructions are for end-suction back pull-out pumps. Modification of these procedures may be required for other pump styles. Consult Flowserve for installation support.

- 2.1 **Lubricate the shaft** or pump sleeve lightly with provided lubricant, unless otherwise specified.
- 2.2 **Tighten the setting device cap screws** to ensure they are tight before installation.
- 2.3 **Slide the KeyPS seal cartridge** onto the shaft or pump sleeve with the setting devices toward the bearing housing. See Figure 6.
- 2.4 **Install the seal chamber** and bolt it in place on the bearing frame. See Figure 7.
- 2.5 **Position the KeyPS seal** with the gland tight against the seal chamber.
- 2.6 **Orient the KeyPS seal** with the flush port aiming up, unless required otherwise. See Section 3 for Piping Recommendations.
- 2.7 **Tighten the gland nuts evenly in a diagonal sequence.** Do not over-tighten the gland nuts, as this can warp seal parts and cause leakage. Confirm adequate thread engagement before final torque setting.

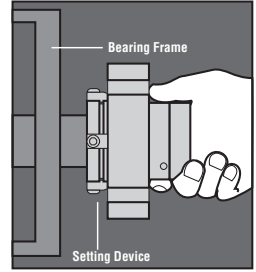


Figure 6

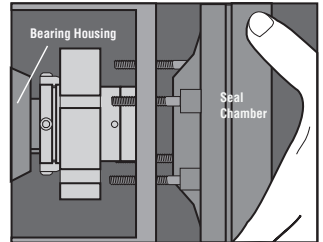


Figure 7

Recommended KeyPS seal **minimum gland nut torque** by size range:

Seal Size:	33 to 50 mm (1.125 to 2.000 in.)	53 to 70 mm (2.125 to 2.750 in.)
Torque:	20 N-m (15 ft-lbs)	27 N-m (20 ft-lbs)

Note: Some equipment with small bore seal chambers provide limited access to the gland bolting and setting device cap screws. In some situations, the gland fasteners interfere with the setting devices and window access may require deviation from the standard fastening sequence.

- 2.8 Assemble the equipment per manufacturer specifications. Avoid pipe strain. Align the coupling per manufacturer specifications.
- 2.9 With the impeller, shaft, coupling and bearings in their final operating positions, tighten the drive collar set screws. See Figure 8.

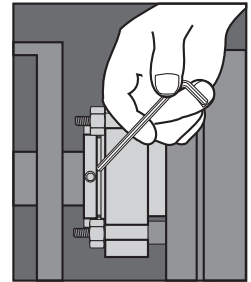


Figure 8

Note: The collar includes quarter dog screws to hold the collar to the sleeve and should not be tightened. A hex key was provided for the set screws, not for the quarter dog screws.

Recommended KeyPS seal **minimum set screw torque** by size range:

Seal Size:	33 to 63 mm (1.125 to 2.500 in.)	65 to 70 mm (2.625 to 2.750 in.)
Torque:	4.5 N-m (3.3 ft-lbs)	13.5 N-m (10 ft-lbs)

- 2.10 **Remove the setting devices** from the drive collar by loosening the cap screws. See Figure 9. Save the setting devices and fasteners for future use when the pump impeller is reset or the seal is removed for repairs.
- 2.11 **Turn the shaft** by hand to ensure unobstructed rotation.
- 2.12 See **Operational Recommendations** before start-up.

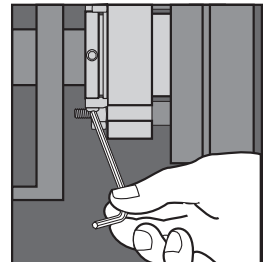


Figure 9



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

3 Piping Recommendations

3.1 Install and maintain an adequate piping plan for maximum seal life. Typical piping plans are listed below. Contact Flowserve for additional piping plan information or technical support.

Important: All red plastic caps/thread guards are for shipping protection only and should be replaced with either a piping connection or a metal plug in the same metallurgy as the gland.

Plan 02: dead-ended seal chamber with no flush (always plug flush port)

Plan 03: circulation created by the design of the seal chamber (always plug flush port)

Plan 11: default seal flush from pump discharge on horizontal pumps

Plan 13: default seal flush and vent from pump suction on vertical pumps

Plan 21: seal flush from pump discharge through a cooler for use with hot products

Plan 32: clean external flush for use with abrasive products

4 Operational Recommendations

4.1 **Remove lock outs** on equipment and valves.

4.2 **Do not start up the pump dry** to check motor rotation or for any other reason. Open valves to flood pump with product fluid. Ensure that the seal flush or support system is operating. Vent air from the casing of the pump and the seal chamber before start-up.

4.3 **Observe the start-up.** If the seal runs hot or squeals, check the seal flush system. Do not allow the pump to run for any extended time if the seal gets hot or squeals.

4.4 **Do not exceed corrosion limits.** The KeyPS seal is designed to resist corrosion through proper material selection. Do not expose the KeyPS seal materials of construction to products outside of their corrosion limits. Consult Flowserve for chemical resistance recommendations.

4.5 **Do not exceed pressure, temperature and speed limits** of the KeyPS seal.

5 Repairs

This product is a precision sealing device. The design and dimension tolerances are critical to seal performance. Only repair kits supplied by Flowserve should be used to repair a seal. A spare backup seal should be stocked to reduce repair time.

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.