

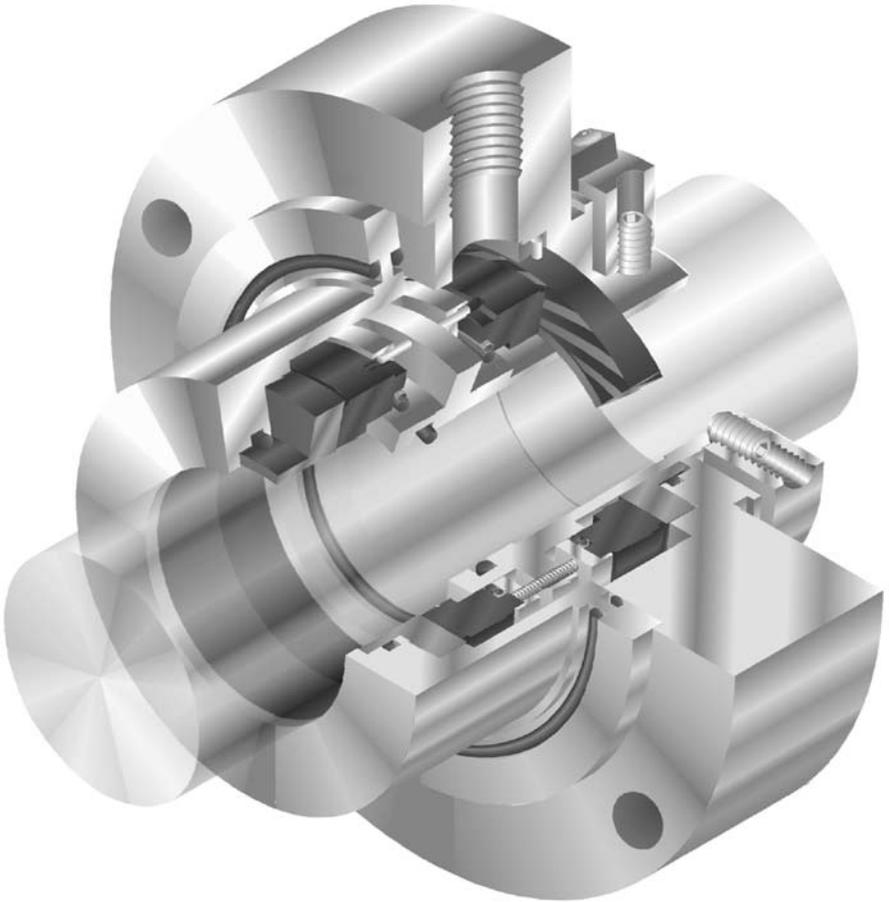


User Instructions -Original Instruction-

Dual Gas Barrier Seals

GB-200, GF-200, GX-200, and BufferPac

Installation and Maintenance Instructions for Machinery Components



1. Drawing, Brief Description, Explosion Protection, Functional Requirements

! This mechanical seal is designed to provide reliable performance under a wide range of operating conditions. The information and specifications presented in this product brochure are believed to be accurate, but are supplied for information purposes only and should not be considered certified or as a guarantee of satisfactory results by reliance thereon. Nothing contained herein is to be construed as a warranty or guarantee, express or implied, with respect to the product.

Although Flowserve Corporation can provide general application guidelines, it cannot provide specific information for all possible applications.

The purchaser/user must therefore assume the ultimate responsibility for the proper selection, installation, operation and maintenance of Flowserve products. Because Flowserve Corporation is continually improving and upgrading its product design, the specifications, dimensions and information contained herein are subject to change without notice.

1.1 Assembly Drawing

The assembly drawing is included in the shipping box with the mechanical seal.

1.2 Brief Description

A mechanical seal is a device designed to seal a rotating shaft against a stationary housing, e.g. a pump shaft against a pump casing. The stationary components will consist of a seal ring and (depending on the design) a spring-loaded element. The spring-loaded element can be a spring or a bellows. The seal ring is sealed against the housing with a secondary gasket, e.g. an O-ring. The rotating components will consist of a seal ring and (depending on the design) a spring-loaded element. The spring-loaded element can be a spring or a bellows.

The seal ring is sealed against the shaft with a secondary gasket, e.g. an O-ring.

A mechanical seal can be supplied as a pre-assembled cartridge or in separate components. Assembly is done in accordance with the assembly drawing.

A mechanical seal will run in the pumped product or external source fluid. A gas seal must always have a film of gas present between the seal faces. The sealing surfaces are separated from each other by a gas fluid film during shaft rotation and in principle run without contact and thus minimal wear under these conditions.

1.3 Explosion Protection



The mechanical seal is regarded as a machine element. Machine elements do not need to comply with Directive 94/9/EC (ATEX 95 product guide) as these are regarded as an integral part of a larger piece of machinery (pump, agitator). This has been confirmed by both the EC ATEX standing committee as well as the European Sealing Association (ESA). Reference is made to following web-sites:

EC ATEX standing committee: <http://ec.europa.eu/enterprise/atex/rotating.htm>

ESA position statement: <http://www.europeansealing.com/statements.html>

For applications which require information on expected surface temperatures of the mechanical seal faces, Flowserve document "ATEX 137 information declaration" is available upon request. This document allows users to determine typical surface temperatures based upon seal design, operating conditions and face materials and may be used by the users to comply with ATEX 1999/92/EC (ATEX 137).

1.4 Functional requirements

The proper functioning of a mechanical seal is only achieved once the following conditions have been met:

- The sealing surfaces are lapped within specification
- Perpendicularity and concentricity between the shaft and the seal chamber face and bore respectively
- Freedom of movement of the spring loaded components in axial direction
- Axial and radial shaft movements within Flowserve or OEM tolerances whichever is the tightest.
- The seal is run under the conditions for which it was selected.
- The equipment in which the seal(s) is (are) installed is operated within normal parameters (no cavitation, excess vibration etc.)
- Prevention of sedimentation on shaft or sleeve surfaces caused by for instance crystallisation or polymerisation
- Permanent gas fluid film between the sealing surfaces



If these function conditions are not fulfilled, the consumption of product, for example, is increased and parts of the product can escape into the atmosphere. Other effects can include high component temperatures.



See the directive 94/9/EC, 1999/92/EC and EN 13463-5.

Failure to meet these requirements will result in excessive leakage and/or shortened seal life.

2. Safety



DANGER: This means that personal danger or major material damage can occur when no attention is paid to this.



ATTENTION: This means that important information is pointed out that may also be overlooked by skilled personnel. The information can be important to avoid personal injury or material damage.

Please read these instructions carefully. Installation in accordance with the following instructions will contribute to long and trouble free running of the mechanical seal.

For related mechanical seal auxiliary equipment (reservoirs, coolers, etc.), separate instructions will be provided.

The ultimate user must ensure that personnel assigned to handle, install and run the mechanical seal and related equipment is well acquainted with the design and operating requirements of such equipment.



For this personnel it may be required to wear protective clothing as per the plant's safety regulations.



Damage to any of the seal components and in particular the faces may cause (excessive) leakage in liquid or gas form. The degree of hazard depends on the sealed product and may have an effect on people and/or the environment. Components coming into contact with leakage must be corrosion resistant or suitably protected.



EXPLOSION PROTECTION – This means that failure to observe these instructions will involve the risk of explosion in potentially explosive environments which can cause harm to persons and / or considerable damage to property.

Plant regulations concerning work safety, accident prevention and pollution must be strictly adhered to.

This mechanical seal has been designed and built to seal rotating equipment. Damages resulting from use in other applications are the responsibility of the user.



Failure, recovery or fluctuation in power supply to the machine and/or supply system may not expose persons or environment to dangerous situations or harm the functionality of the mechanical seal.



Guards that are provided by the equipment manufacturer have to be in accor-

dance with plant regulations, but should not create additional danger. These guards have to ensure proper access to the working area required for maintenance to the mechanical seal.



The electricity supply of the equipment must be in accordance with directive 2006/95/EC. When machinery is powered by a source of energy other than electricity this may not cause dangerous situations for persons and environment.

3. General

All illustrations and details in these installation instructions are subject to changes that are necessary to improve product performance without prior notice.

The copyright of these instructions is the property of Flowserve. These instructions are intended for Maintenance, Operating and Supervisory personnel and contain regulations and drawings of a technical character that may not, in full or in part, be copied, distributed, used without authorisation for competitive purposes, or given to others.

- ! It should be understood that Flowserve does not accept any liability for instances of damage and/or malfunctioning incurred through non-adherence to these installation instructions.

4. Transport, Storage

The mechanical seal and related equipment must be transported and stored in the unopened, original shipping box. The warehouse in which the mechanical seals and related equipment are stored must be dry and free of dust. Avoid exposing equipment to large temperature fluctuations and radiation.

Parts or complete mechanical seals that have been dropped or otherwise have been subjected to heavy impacts during transport must not be installed.

An inspection by Flowserve or its appointed representative is strongly advised.

After a storage period of 3 years the mechanical seal must be inspected for its “as new” properties. This applies in particular to the seal faces and secondary sealing elements. An inspection by Flowserve becomes necessary.

- ! If the machine is to be preserved with integrated mechanical seals the preserving medium must not impair the functions of the mechanical seals by e.g. fouling of the seal faces, hardening, or swelling the secondary seals.

- ! The mechanical seal can in principle be transported with suitable means like lifting accessories.

5. Equipment Check

- ! 5.1 **Follow plant safety regulations** prior to equipment disassembly:
 - lock out motor and valves.
 - wear designated personal safety equipment.
 - relieve any pressure in the system.
 - consult plant MSDS files for hazardous material regulations.
- 5.2 **Disassemble pump** in accordance with equipment manufacturer's instructions and remove existing mechanical seal and gland or compression packing and packing gland (follower flange).
- ! 5.3 **Check seal documentation** for seal design and materials of construction. Verify that the seal is designed for the equipment being repaired.
- ! 5.4 **Check seal assembly drawing** for any modifications required to the equipment before installation and act accordingly.
- ! 5.5 **Check shaft or pump sleeve OD, seal chamber depth, seal chamber bore, distance to the first obstruction, gland pilot and gland bolting** to ensure they are dimensionally within the tolerances shown on the seal assembly drawing. Dual gas seal configurations are designed for both standard bore and enlarged bore seal chambers.
- ! 5.6 **Check gland bolting** to ensure that bolt diameter and bolt circle conform to the dimensions shown in the assembly drawing.
- ! 5.7 **Check backplate stud length** to ensure that they conform to the dimensions shown in the assembly drawing. Assembly may require longer studs or use of bolts or cap screws if existing studs are not long enough.
- ! 5.8 **Check rotation direction** of the equipment. Uni-directional seal designs must be operated only in the direction shown on the seal gland.
- ! 5.9 **Thoroughly inspect and clean** the seal chamber and shaft or pump sleeve. Inspect for corrosion or any defects. Remove all burrs, cuts, dents or defects that might damage gaskets or allow a leak path. Replace worn shaft or pump

sleeve. Remove sharp edges from keyways and threads.

5.10 **Check equipment requirements** as described in **Figure 1**. Any reading greater than what is allowed must be brought within specifications.

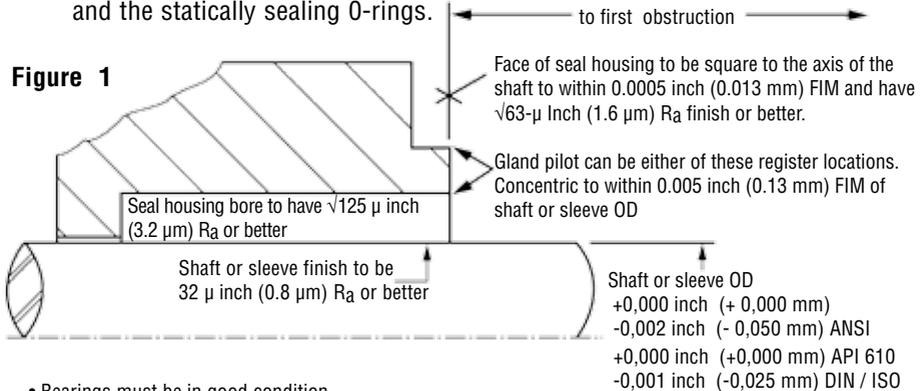
! 5.11 **Handle the seal with care**; it is manufactured to precise tolerances. The seal faces are of special importance and should be kept perfectly clean at all times. Oil, silicone lubrication, or type of grease should not be applied to these seal faces.

Seal Chamber Requirements



The mechanical seal may be installed when there are no visible signs of damage to the mechanical seal. This applies in particular to the seats, centrings, and the statically sealing O-rings.

Figure 1



- Bearings must be in good condition.
- Maximum lateral or axial movement of shaft (end play) = 0.010 inch (0.25 mm) FIM
- Maximum shaft runout at face of seal housing = 0.002 inch (0.05 mm) FIM
- Maximum dynamic shaft deflection at seal housing = 0.002 inch (0.05 mm) FIM

6. Dual Gas Barrier 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 style pumps. Consult Flowserve for installation support.



Take care that seal cartridge or components of the seal are handled and carried safely during installation of mechanical seal and that the ergonomic principles are followed. In order to prevent personal injuries the operator should also wear protective clothing as per the plant's safety regulations.



Precautions must be taken for parts of the mechanical seal that will be used as support to step on during assembly operations. These parts must be protected against slipping, stumbling or falling (for example by using a strut).

6.1 Tools needed:

6.1.1 Provided

- Krytox* lubricant for sleeve O-rings

6.1.2 Not provided

- Open end wrench for gland nuts
- Allen wrenches for setting devices and set screws
- Allen wrenches for gland cap screws if they are required in place of gland nuts or bolts.

6.2 **Lubricate the shaft** or sleeve lightly with Krytox lubricant provided. If bolts or cap screws are required in place of the seal chamber studs, insert them through the gland bolt holes before sliding the assembly onto the shaft. **Slide the complete seal cartridge onto the shaft**, Figure 2, with the end with the setting devices toward the bearing housing.

Install Seal Cartridge

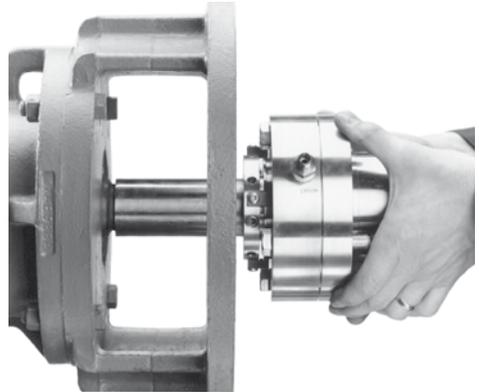


Figure 2

Note: Check for rotation direction requirements on the seal gland or assembly drawing before continuing.

6.2.1 **Optional:** TARSEx Bushing Installation

- Slide seal assembly against the bearing frame.
- Clean lubrication off pump shaft.
- Install the friction drive TARSEx bushing with O-ring, positioning them against the retaining plate with the bushing grooves oriented toward the seal. See Figure 3.

Install TARSEx Bushing (optional)

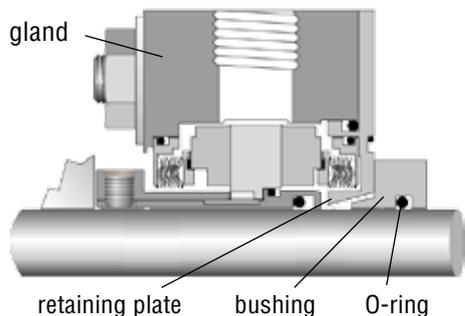


Figure 3

6.2 **Tighten the setting device cap screws** to ensure they are tight before installation.

6.3 **Install the pump seal chamber**, Figure 4. **Position the seal gland barrier inlet**, port **A** shown in Figure 5, in the 9:00 o'clock position and the plugged drain, port **B**, in the 6:00 o'clock position for normal installations. Alternate positioning of the gland may be necessary with some pumps, where the bearing housing interferes with piping.

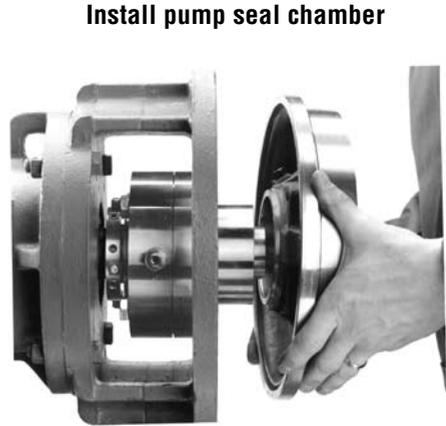


Figure 4

Bolt the seal chamber in place on the bearing housing.

6.4 **Assemble the pump, adjust the bearings, set the impeller**, connect pump piping. Allow no pipe strain on the pump casing. **Connect the coupling** so that the shaft is in its operating axial position.

6.5 **Position the seal** with housing O-ring gasket in place against the seal chamber face and **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.



Components provided by the customer for installing the mechanical seal, e.g. the pump cover or fastening screws, must exhibit adequate properties and

Position gland inlet

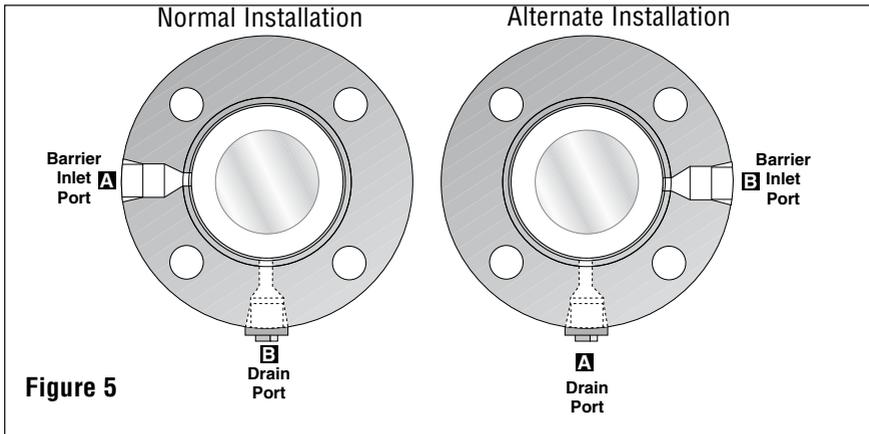


Figure 5

dimensions. It must not be possible to overstress these components, e.g. the max permitted tightening torque must not be exceeded.

6.6 **Using a cross-tightening method tighten the set screws** on the seal cartridge drive collar, Figure 6.

! Inaccurate tightening of these screws can lead to unsafe situation as mechanical seal may move out of the seal chamber when pressure is applied.

6.7 **Remove setting devices** by removing the screws with an Allen wrench, Figure 7. Save the setting devices and screws for future use in either removing the seal from service or to reset the pump impeller, see section 9.



Vibrations must be prevented from transferring to the installed seal during operation, e.g. through structural measures implemented on the machine.



The machine to take the seal must be earthed in accordance with the applicable regulations for electrical installations (e.g. VDE rules) to conduct away any electrostatic build-up and so prevent spark formation.

6.8 **Turn the shaft** by hand to ensure free operation.

6.9 **Pipe up** the gland connections to the seal, see section 7.

6.10 **See Functional Recommendations**, section 8, before starting pump.



Conduct a static pressure test. Do not exceed the max. pressures.

Tighten drive collar set screws



Figure 6

Remove setting devices



Figure 7

7. Piping Recommendations

The Dual Gas Barrier Seal is designed to be run in a normally dry running mode with a pressurized clean inert gas (nitrogen) or air between the two seals.

The gland is equipped with a gas barrier inlet and a drain connection.

- 7.1 **Vent out the gas barrier line** prior to connecting to the seal gland to ensure that foreign material has not collected in the piping.
- 7.2 **Connect gas barrier Plan 74 shown in Figure 8 to the barrier inlet port** (refer to Figure 5). The pressure gage and regulator are required to set the barrier gas pressure 25 to 50 psig (2 to 4 bar) higher than that of the product being sealed (seal chamber pressure).

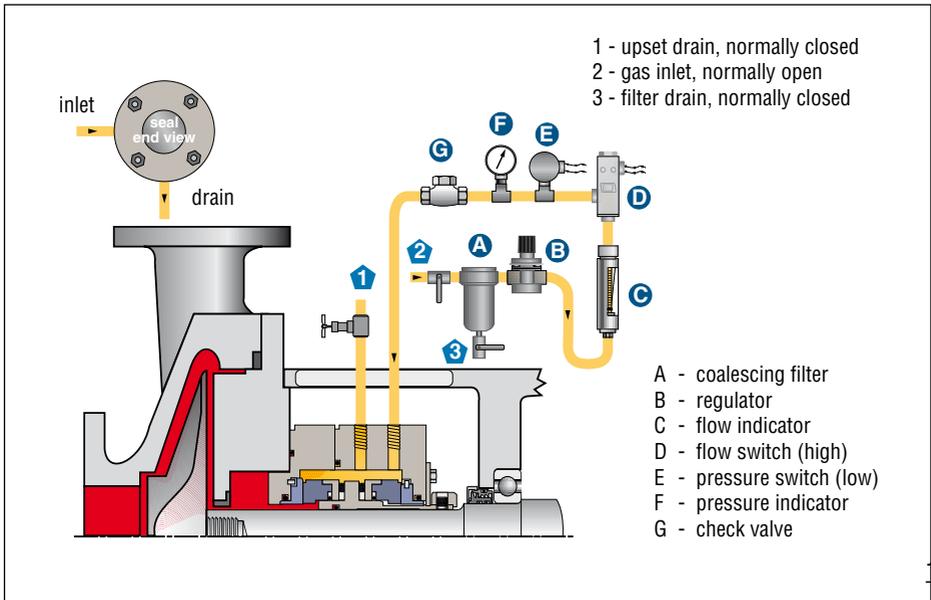
NOTE: It is important that the pressure gage and the low pressure alarm be installed close to the gland port for accurate values.

An optional control panel that incorporates all the equipment in a plan 74 for a Dual Gas Barrier Seal is available from Flowserve.

- 7.3 Plug the drain port, (refer to Figure 5), or connect to a block valve.

Plan 74 for Dual Gas Barrier Seal

Figure 8



8. Functional recommendations

To assure reliable, long-life operation of your Dual Gas Barrier Seal, the following guidelines should be observed.



It must be ensured that the machine is protected against penetration by dust and / or that dust deposits are removed at regular intervals so that they cannot exceed a thickness of 5 mm on the surfaces of the faces.

- 8.1 **Observe the start-up.** The seal barrier cavity must be pressurized before pump start-up and at all times during pump operation. For best performance, do not cavitate or run the pump dry. Open valves to flood pump with product fluid before start-up. Maintain the seal barrier gas pressure even when the pump is not running.
- 8.2 **Do not exceed corrosion limits.** Your Flowserve seal is designed to resist corrosion by most chemicals. However, do not expose the seal materials of construction to products outside of their corrosion limits. The seal assembly drawing lists the materials of construction. Consult Flowserve for chemical resistance ratings.
- 8.3 **Do not exceed the pressure limits** of the seal design. **Do not let the barrier gas pressure fall** below 25 psi (2 bar) above the seal chamber pressure.
- 8.4 **Do not exceed the maximum temperature** limits of the seal design.
- 8.5 **Do not operate at speeds lower** than the seal's minimum speed, if applicable.
- 8.6 **For uni-directional designs,** do not turn the shaft opposite to the direction arrow indicated on the gland.

9. Reset pump impeller

To reset the pump impeller, follow plant safety procedures, etc., see 5.1.

- 9.1 Reinstall the setting devices.
- 9.2 Loosen the cartridge drive collar set screws.
- 9.3 Adjust the impeller clearance following pump manufacturer's instructions.
- 9.4 Tighten the set screws on the cartridge drive collar using a cross-tightening method, see Figure 6 .

! Inaccurate tightening of these screws can lead to unsafe situation as mechanical seal may move out of the seal chamber when pressure is applied..

9.5 Remove the setting devices. Save the setting devices and screws.



The machine to take the seal must be earthed in accordance with the applicable regulations for electrical installations (e.g. VDE rules) to conduct away any electrostatic build-up and so prevent spark formation.

9.6 Perform steps 6.8 to 6.10.

10. Shut down, disassembly

The equipment can be shut down at any time. Before the mechanical seal can be removed the equipment must be de-pressurized and drained. Barrier pressure must be relieved after the equipment has been de-pressurized.



Operator must persuade himself before starting disassembling of mechanical seal that the external of the equipment is cool enough to be handled without risk.

Product may be released during removal of the mechanical seal. Safety measures and protective clothing may be required as per the plant's safety regulations.



Dismantling of the mechanical seal is only allowed after machine has been stopped. Further disassembly of the mechanical seal must be done according to the supplier's specifications.

11. System check

Checking of the system, limits itself to monitoring pressure, temperature, leakage and consumption of barrier fluid.



Routine maintenance of the mechanical seal extends to the monitoring of the set values for pressure, temperature, and leakage quantity.



Maintenance to the mechanical seal is only allowed after machine has been stopped.



The required area for operating the machine or doing maintenance to the mechanical seal must be easy accessible.

12. Repairs

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.

All Flowserve Corporation, Flow Solutions, products must be installed in accordance with Flowserve installation instructions. Failing to do so or attempting to change or modify Flowserve products will void Flowserve's limited warranty. Flowserve's limited warranty is described fully in Flowserve's Standard Terms and Conditions of Sale. Flowserve makes no warranty of merchantability or fitness for a particular purpose and in no event shall Flowserve be liable for consequential or incidental damages.



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