Installation, Operation & Maintenance Manual

Agitator Seals

SINCE 1973

Leak-Proof Engineering (I) Pvt. Ltd.

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Introduction:

This manual provides necessary instructions for installation, operation, and maintenance of the mechanical seal for agitator. These instructions will guide to increase the safety and reliability by avoiding the potential risks. Special instructions can be supplied with the supplementary leaflets. For instructions, situations, and/or events that are not considered in this manual, please contact the nearest Leak-Proof Engineering representative.

ATTENTION!
Failure to observe the instructions given in this manual could result in personal injury and/or property damage, and may void the warranty. Read this manual carefully before installation, operation and maintenance.

General Instructions:

- Leak-Proof Engineering manufactures high quality mechanical seals designed for intended purpose and prescribed parameters.
- Seal must be operated for supplied purpose and within prescribed parameters.
- User must ensure the material compatibility against the process media to prevent the possible premature failure.
- User must ensure that seal plan (Support System) must be as per approved General Arrangement drawing.
- User must seek a confirmation regarding safe operation from Leak-Proof Engineering for using a seal outside the purpose it is originally supplied.

ATTENTION!
Seal operated other than intended purpose or outside the prescribed parameters can cause the premature seal failure, environmental damage, personal injury and/or damage to property. Such scenario will be considered contrary to its designated purpose and excludes a liability of a manufacturer for possible consequences and voids the warranty.

Safety Instructions:

- Individual(s) involved in installation, maintenance, and/or removal of the mechanical seal must be qualified personnel and must be aware of the process fluid handled.
- Individual(s) must have read and understood this manual before carrying out any activity on mechanical seal.
- Individual(s) must wear necessary Personal Protective Equipment (PPE) and must follow plant and equipment/machine safety guidelines.
- Mechanical seal must not be operating or pressurised while carrying out any work on it. Equipment/Machine and mechanical seal support system must be in stopped condition and protected against the accidental start-up.
- Process and support system fluid must be drained out completely before maintenance or removal of the mechanical seal.
- In case of toxic, hazardous and/or inflammable process fluid, necessary steps must be taken to adequately the process fluid and safeguard people and environment from dangerous emissions.
- Splash guard on equipment/machine must be provided to protect the workers from escaped process fluid in case of seal failure. Appropriate steps must be taken for proper disposal of the leakage.

DANGER!

- Risk of serious personal injury, death and/or property damage poses while carrying out any work on a mechanical seal in operating condition.
- Risk of serious personal injury, severe health problem, death, and/or property & environmental damage poses in absence of appropriate precautions to be taken while handling the toxic, hazardous and/or inflammable fluid.

Transportation and Storage Instructions:

- Inspect the package upon delivery for any possible damage and/or missing items. In case, note the damage and/or missing item on the delivery receipt and file a claim with the shipping company.
- Remove the product from packing materials and inspect the product for any damage or missing part(s). Contact your sales representative if anything is out of order.
- In case of long-term storage or product return, use the packing materials for storage or transportation in which the product is

supplied. Otherwise dispose the packing materials in accordance with local regulations.

- In case of transportation of the equipment/machine installed with a mechanical seal, shaft must be protected from deflection, axial displacement and/or shock at all times.
- For long-term storage of the product, store the product at a room temperature in a dry, dust-free, corrosion-free environment. Ensure product is protected from vibration, heat and ultraviolet light.
- Elastomers used in the mechanical seal are subject to material-specific and time-bound replacement. In case of long-term storage, all elastomers are recommended for replacement according to their shelf life. Elastomers have minimum shelf life of 5 years except butyl rubber which has minimum shelf life of 2 years.
- In case of long-term storage of the equipment/machine is done with mechanical seal installed on it, seal must be removed, dismantled and inspected before putting the equipment/machine into operations.
- In case of used mechanical seal and/or part(s) are shipped, all components must be cleaned and decontaminated before shipping. User must ensure to attach safe-handling instructions to the package while shipping.

CAUTION!

- Dropping the product or applying any shock load can cause damage to the product and personal injury. Ensure the product or parts are handled carefully.
- Lifting and handling heavy equipment poses a crush hazard. Be cautious while lifting and handling and wear appropriate Personal Protective Equipment (PPE, such as steel-toed shoes, gloves, etc.) at all times. Seek the assistance if necessary.

ATTENTION!

- Improper handling and/or storage of the product can cause the damage to the product. Such damages are not included in warranty.
- Inadequate protection to the mechanical seal during transportation in installed conditions can cause the damage. Such damages are not included in the warranty.

Preparational Instructions:

- Check the assembly drawing accompanying the seal assembly for specific seal design data, materials of construction, dimensions and recommended API Plans/ piping connections.
- Ensure that the shaft OD, pad plate (vessel flange) bolt size, pitch circle diameter, and distance to the coupling or drives matches with the seal assembly drawing provided.
- A thorough inspection of the equipment/machine should be carried out before starting the installation. The condition of the equipment/machine should fall within manufacturer's guidelines. Other parameters listed below and the checking process should be made as described. Variations in equipment/machine design may change the inspection requirements.
- Inspect and prepare the shaft and/or sleeve for installation:
    - Seal must be of the proper size to fit the shaft or shaft sleeve. In case of a mismatch, contact the Leak-Proof Engineering representative immediately.
    - Sharp edges and burrs must be removed especially in area where elastomer is going to slide.
    - Shaft or sleeve diameter should be within ±0.05mm (.002") of nominal.
    - Surface finish of the shaft or sleeve should be maximum of 0.8 microns (32 micro inches) Ra especially in the sliding area.
    - Shaft runout should be checked in assembled condition. Runout should not exceed 0.08mm TIR per 25mm (.003" TIR per inch) of the shaft diameter. If TIR value exceeds, determine the cause and try to correct the condition. If necessary, adjust the misalignment of bearings or machine the shaft to achieve the TIR readout within range.
    - Axial movement (end play) of the shaft should be checked by tapping a rubber mallet on the other side. Readout should not exceed 0.12mm (.005") TIR. If TIR value exceeds, determine the cause and try to correct the condition. If necessary, adjust or replace the thrust bearing to achieve the TIR readout within range. In such scenario, check equipment/machine manufacturer's specifications for tolerances.
    - To protect the O-Ring from damage, chamfer at the end of the shaft or sleeve step is necessary where O-Ring is going to enter.
    - Cover the edges of keyway slots and threads with thin tape (e.g. Teflon tape) and apply clean silicon-based

lubricant on shaft or sleeve to protect the O-Ring from possible damage.

- Inspect and prepare the pad plate for installation:
  - Pad plate face must be free from cracks, holes, damages, grooves and sharp edges.
  - Surface finish of the face must be a maximum of 1.6 micrometre (63 micro inch).
  - Face runout w.r.t. shaft should be checked in assembled condition. Runout should not be more than 0.07mm TIR per 25mm (0.003" TIR per inch) of the shaft diameter. If TIR value exceeds, determine the cause and try to correct the condition. If necessary, machine the face to achieve the TIR readout within range.
  - Equipment/Machine must have sufficient space between seal face and nearest obstruction (NO) to accommodate the seal assembly. Modification to the shaft should be avoided. In such scenario, seek equipment/machine manufacturer's guideline before applying any modifications.
  - Pad plate face must be properly cleaned. Presence of foreign particle(s) can reduce the sealing effect and also harm the seal if particles are in excess.
- Seal housing O-Ring or gasket must be of the proper size against the pad plate. It should not interfere with the pad plate studs.

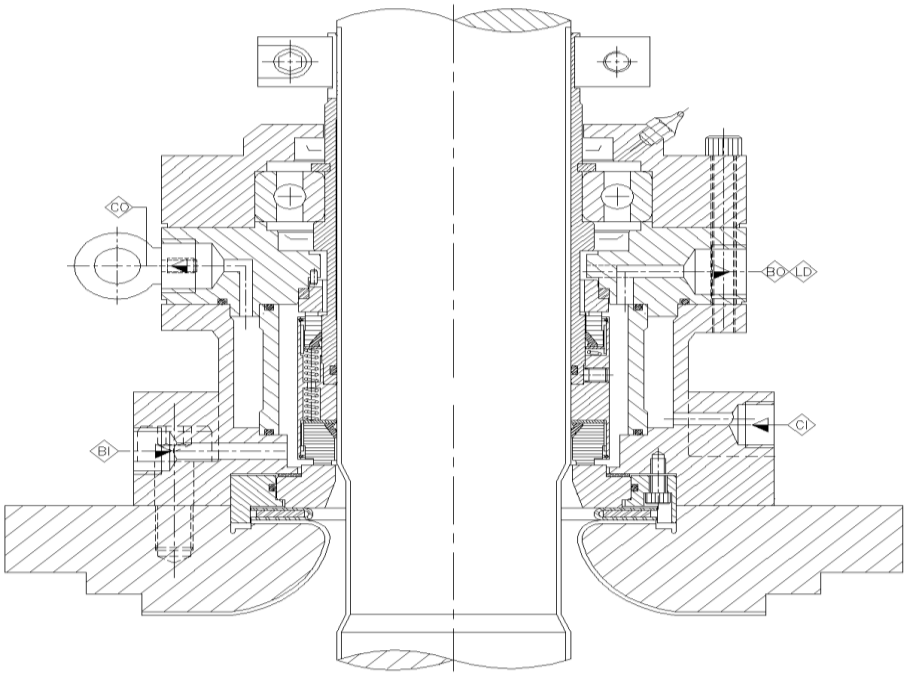
ATTENTION!

- Improper equipment/machine condition can cause the mechanical seal failure and damage to the equipment/machine. Such damages are not included in warranty.

Installation Instructions:

- Read the following instructions carefully before starting the installation. Seek the necessary assistance and Personal Protection Equipment (PPE) required for the installation.
- Ensure the equipment/machine must be as per given specifications in "Preparational Instructions" before starting the installation.
- Unpack the mechanical seal and remove the protective material and inspect for any possible damage.
- Get the correct general assembly (GA) drawing for installation. Read carefully all the instructions and notes given in the drawing. If necessary, contact Leak-Proof Engineering representative.

- In order to avoid stumbling, slipping, falling etc., hold the seal with proper handling devices.
- During installation never apply unwanted force as mechanical seal should get assembled smoothly and carefully. Unnecessary shaft rotation and knocking should be avoided as sliding faces may get damaged and performance of the mechanical seal can be affected.
- Lubricate the visible O-Rings with a clean compatible lubricant and put them to their correct position as shown in a GA drawing.
- Slide the seal on shaft.



- Assemble the mechanical seal on pad plate by applying the appropriate bolt-torque. See equipment manufacturer's instructions for torque value.
- Tighten the drive collar grub screw on shaft.
- Remove the locking plates and rotate the shaft and ensure the free movement of the seal. Seal should not hold-up or require excessive force to rotate the shaft.
- Make piping connection for the barrier/buffer fluid / cooling jacket as per drawing. A supply tank with a pressure source and pressure gauge are recommended. Install cooling water piping to the seal assembly / supply tank cooling coil, If necessary.
- Position the seal assembly so that fluid ports and any optional bearing lubrication fitting are easily accessible.

Start-up Instructions

- Ensure that proper alignment of the equipment/machine with the driver. Follow the equipment/machine manufacturer's instructions for proper alignment.
- Ensure that seal housing bolts/studs and drive collar grub screws are properly tightened according to equipment/machine manufacturer's instructions.
- Ensure that all locking/setting plates are removed from the mechanical seal and shaft should turn freely.
- Ensure the API plan and its connections are as per the provided GA drawing.
- Ensure that all the piping connections to mechanical seal are properly fitted and other opening holes are properly plugged.
- Ensure that all the piping connections on equipment/machine as per the manufacturer's instructions.
- Ensure that all assembly related tools and personnel belongings are at a safe distance and safe from coming into contact with rotating parts.

Operational Instructions

- To assure reliable operation of this sealing product, the following guidelines should be followed.
- Do not exceed the maximum vessel pressure/temperature specified for the operation. This could adversely affect seal performance.
- Maintain the barrier fluid pressure both while the seal is operating and when the equipment is on standby.
- Do not exceed the maximum barrier pressure specified for the seal design. The barrier pressure should be 1 to 1.5 Kg/cm^2 (1 to 1.5 bar) above the operating vessel pressure.
- For any problem encountered during operation of this product, contact your nearest Leak-Proof Sales and Service representatives or Authorized distributor.

Maintenance Instructions

- Follow the "Safety Instructions" given in this manual before carrying out any maintenance work.
- Remove mechanical seal while carrying out any maintenance work on equipment/machine especially in case of maintenance work which involves radial, axial or transverse movement of the shaft.
- Periodic inspection of the mechanical seal is necessary for any unacceptable conditions such as leakage (emission beyond acceptable limit), unreasonable rise in temperature or noise level, reduced lubrication of bearing etc. In case of any such

unacceptable condition, equipment/machine needs to be stopped immediately for the maintenance of the mechanical seal.

- While removing the mechanical seal, follow the equipment/machine manual for proper dismantling procedure.
- In case of cartridge seal, ensure that locking/setting plates are fitted before starting any dismantling sequence for mechanical seal.
- In case of requirement for reconditioning, return the mechanical seal to Leak-Proof Engineering. Refer "Transportation and Storage Instructions" before dispatching the seal.
- Follow "Installation Instructions" while refitting the mechanical seal on equipment/machine.

ATTENTION!

- Take appropriate care while removing the mechanical seal from equipment/machine as mechanical seal can be suitable for reuse after repair/reconditioning.

Dismantling Instructions

- Refer GA drawing in order to initiate with the dismantling process.
- Follow the "Safety Instructions" given in this manual before carrying out dismantling of the seal.
- Follow the equipment/machine manufacturer's instructions to expose the mechanical seal for dismantling.
- In case of side entry and bottom entry agitators, engage the shut-off device at the time of dismantling the seal.
- Properly install the locking plates in their respective position as per GA drawing.
- Loosen the driver's grub screws/bolts.
- Separate the seal housing from pad plate to separate the cartridge from equipment/machine. In case of difficulty to separate the housing, use the appropriate bolts in tapped extraction holes on the seal for "jacking".

CAUTION!

- Do not drop or apply shock load on seal or parts while dismantling the seal as it can cause the damage to the seal and/or personal injury.

ATTENTION!
- Product damaged while dismantling will void the warranty. Take precautions while dismantling the seal and handle the product or parts carefully.

Disposal Instructions

- In case of a mechanical seal is unfit for repair or reuse, it is recommended to dispose the mechanical seal.
- Perform thorough cleaning of the seal before commencing the disposal of the seal. There may be a possibility of harmful residues available which needs to be removed.
- Individual(s) disposing the seal must wear necessary Personal Protective Equipment (PPE).
- Disposal of different parts of mechanical seal:
  - Metal parts needs to be scrapped as metal waste. Parts can be divided into respective groups (e.g. ferrous, non-ferrous, etc.) and should be sent for recycling.
  - Recyclable non-metallic parts (e.g. rubber, Teflon, plastic, etc.) should be divided into respective groups and sent to recyclable waste.
  - Other non-metallic and ceramic parts (e.g. synthetic carbons, carbides, etc) should be disposed as common waste.
- Follow local regulations/guidelines while disposing the waste.

CAUTION!
- Materials containing Fluorine (Elastomers, PTFE, etc) must not be burnt or incinerated as the fumes and residues are highly toxic. Use Personal Protective Equipment (PPE) while disposing such materials.

ATTENTION!
- In case of absence of proper disposal practices and/or trained manpower, return the seal or seal components to mentioned below address of Leak-Proof Engineering for disposal.

  Address:
  Leak-Proof Engineering (I) Pvt. Ltd.
  Block B & C, EDR Industrial Estate,
  Pirojpura, Near Chaapi, Taluka: Vadgam,
  Dist.: Banaskantha PIN: 385210 Gujarat – India.

- Perform thorough cleaning of the seal or components before dispatching for the disposal.
- Mark the parcel with bold and large note "**FOR DISPOSAL**"