Installation, Operation, & Maintainance Guide
Style 85/85M Split Cartridge Seal

OVERVIEW
This guide outlines the installation, operation and maintenance of the Flexaseal Style 85 and Style 85M Split Cartridge Seal. The Style 85M is a highly engineered heavy duty split cartridge seal designed specifically to meet the challenges of mixers and agitators. This guide, in addition to the manuals provided by the pump manufacturer and the manufacturer of any auxiliary equipment, should be read in its entirety prior to installation.

NOTICE
Flexaseal does not assume responsibility for misuse, or any damages incurred as a result of the misuse of the supplied sealing system. Contact a Flexaseal representative before making any changes to the provided system or design.

SAFETY

1. Read all instructions thoroughly prior to beginning installation. Review engineering prints for special notes and/or instructions.

2. Removal, installation, operation, and maintenance must only be carried out by qualified personnel who have thoroughly read all instructions.

3. The seal must only be used for its intended application. Flexaseal cannot be held liable for use outside the scope of the recommended application.

4. Inspect the replacement seal prior to removal of the old seal or installation of the new seal using the technical information provided in this document. Contact a Flexaseal representative if there are any questions.

5. Follow plant safety regulations and procedures throughout the disassembly/installation process including, but not limited to, the following:

- Lockout/tagout procedures
- SDS consultation for any hazardous materials involved
- Use of proper personal protective equipment
- Relief of any system pressure and mechanical energy

6. The following symbols have been used throughout the document to highlight important information:

- Instructions intended to prevent damage to the seal or equipment.
- Mandatory instructions intended to prevent personal injury or extensive damage to equipment.

NOTE: Information to note while installing, or for later use.

### Style 85/85M Split Cartridge Seal Maximum Operating Conditions

<table>
<thead>
<tr>
<th>Shaft Size Range</th>
<th>Temperature (°F)</th>
<th>Speed (RPM)</th>
<th>Pressure (psi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Style 85</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.750–3.000 in.</td>
<td>350</td>
<td>3600</td>
<td>250</td>
</tr>
<tr>
<td>3.125–3.750 in.</td>
<td>350</td>
<td>1800</td>
<td>200</td>
</tr>
<tr>
<td>3.875–4.750 in.</td>
<td>350</td>
<td>1800</td>
<td>150</td>
</tr>
<tr>
<td>≥ 5.000 in.</td>
<td>350</td>
<td>875</td>
<td>100</td>
</tr>
<tr>
<td>Style 85M</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.500–3.000 in.</td>
<td>350</td>
<td>3600</td>
<td>450</td>
</tr>
<tr>
<td>3.125–4.750 in.</td>
<td>350</td>
<td>1800</td>
<td>450</td>
</tr>
<tr>
<td>4.875–9.000 in.</td>
<td>350</td>
<td>875</td>
<td>450</td>
</tr>
</tbody>
</table>

NOTE: Maximum temperature, pressure, and speed indicate operating extremes independently and do not imply the seal will function at these extremes at the same time. Contact Flexaseal if in doubt.
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PREPARATION

Verify that equipment has been properly shut off and rendered inoperative according to plant safety protocol (e.g. lockout/tagout procedures).

1. Disassemble the pump seal chamber, in accordance with the pump OEM instructions, to expose the existing seal.

NOTE: Document how the seal chamber is disassembled for re-assembly.

2. Carefully remove the existing sealing device, taking care not to damage the shaft.

3. Clean the shaft, shaft sleeve (if present), and seal chamber face of rust, burrs, grit, sharp edges, and set screw damage using fine emery cloth. Wipe clean.

ATTENTION Avoid making flat spots or reducing the shaft diameter.

4. If the pump is equipped with a shaft sleeve, verify the condition of its O-ring or gasket and ensure that it is properly located (fully engaged against step/hook/snap ring).

5. Sealing surfaces and the shaft or shaft sleeve must have at least a 63 Ra-µin surface finish as seen in Figure 1.

Figure 1: Surface finish and chamfer locations. Fully assembled pump without seal.
VERIFICATION

Successful operation of a Style 85/85M Split Cartridge Seal is contingent on conforming equipment dimensions and alignment. Verify the following prior to continuing:

- Figure 2: Shaft Runout
- Figure 3: Bearing Fit
- Figure 4: Bearing Frame Perpendicularity
- Figure 5: Axial Shaft Movement
- Figure 6: Seal Chamber Bore Concentricity
- Figure 7: Seal Chamber Face Squareness

<table>
<thead>
<tr>
<th>Maximum Alignment Variation (TIR)</th>
<th>Style 85</th>
<th>Style 85M *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fig. 2  Radial shaft movement (shaft runout)</td>
<td>0.0015–0.003 in.</td>
<td>0.060 in.</td>
</tr>
<tr>
<td>Fig. 3  Radial bearing fit</td>
<td>0.002–0.003 in.</td>
<td>0.002–0.003 in.</td>
</tr>
<tr>
<td>Fig. 4  Bearing frame perpendicularity</td>
<td>0.0005 in./in.</td>
<td>0.0005 in./in.</td>
</tr>
<tr>
<td>Fig. 5  Axial shaft movement (end play)</td>
<td>0.003 in.</td>
<td>0.120 in.</td>
</tr>
<tr>
<td>Fig. 6  Seal chamber bore concentricity</td>
<td>0.005 in.</td>
<td>0.005 in.</td>
</tr>
<tr>
<td>Fig. 7  Seal chamber face squareness</td>
<td>0.0005 in./in.</td>
<td>0.0005 in./in.</td>
</tr>
</tbody>
</table>

For proper function and satisfactory operation of the seal it is imperative that connections, dimensions, finishes, and alignments are all acceptable based on the specified design. If measured values exceed the values given above, adjust the equipment to meet the specifications before installing the seal. These values are general guidelines and the pump OEM should be used to verify acceptable values whenever possible.

*The Style 85M is a special engineered split cartridge seal typically designed for specific applications with larger runouts than traditional installations. The maximum runout values indicated are highly dependent on the proposed installation and application data. Contact Flexaseal with any questions on allowable values for specific applications.
SEAL INSTALLATION

The advantage of a Style 85/85M Split Cartridge Seal over a typical cartridge seal is seen in the ease of installation and setup for service. When removing packing from an existing pump, a split seal does not require that the pump be taken apart. Ensure alignment verification of equipment has been completed prior to starting the installation procedure. Review engineering prints for special notes and/or instructions.

NOTE: It is essential to use a suitable lubricant when installing a seal, as different lubricants will work better with different elastomers.

1. Remove the seal from its packaging and inspect for damage to any components and seal faces.

NOTE: Split cartridge seals are shipped from Flexaseal as two complete halves and should not be disassembled further without cause. If a seal appears damaged prior to installation, contact a Flexaseal representative.

Grease, scratches, or nicks on the seal faces may cause leakage.

2. Ensure the shaft and seal housing have been properly cleaned as described in the preparation section.

3. Lightly lubricate the sleeve O-rings with a suitable and compatible lubricant. Do not get any lubricant on the end of the O-rings where they are split.

4. Hold the bottom half of the split cartridge up against the shaft. Carefully align the top half using the locating pins. Make sure to never release pressure from the bottom half. Start the large shoulder screws in the gland holes and the small shoulder screws in the sleeve holes until they are all finger tight.

5. Tighten all shoulder screws alternately and evenly so that the two halves come together parallel. Recommended torque values for the shoulder bolts are listed in the table below:

<table>
<thead>
<tr>
<th>Shoulder Bolt Part No.</th>
<th>Recommended Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>FS11680</td>
<td>50 in-lbs</td>
</tr>
<tr>
<td>FS10050-03</td>
<td>50 in-lbs</td>
</tr>
<tr>
<td>FS10050-08</td>
<td>80 in-lbs</td>
</tr>
<tr>
<td>FS10050-09</td>
<td>100 in-lbs</td>
</tr>
</tbody>
</table>

6. Move the seal forward until it contacts the stuffing box face. Lubricate the gland bolts/studs/nuts and tighten them using the Legacy Method (Star Pattern) until 80–100 in-lbs of torque is achieved. Do not over tighten gland bolts as this can distort the gland and internal components resulting in seal leakage.

7. Alternately tighten the provided set screws to the specified torque value according to the table below.

8. Remove the setting clips from the seal. Save these for future use in seal removal.

<table>
<thead>
<tr>
<th>Cup Point Set Screw Torque Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screw Size</td>
</tr>
<tr>
<td>#10</td>
</tr>
<tr>
<td>1/4</td>
</tr>
<tr>
<td>5/16</td>
</tr>
<tr>
<td>3/8</td>
</tr>
<tr>
<td>1/2</td>
</tr>
</tbody>
</table>
Figure 8: Exploded view of split cartridge

Figure 9: Installation of split cartridge
BEFORE STARTING THE EQUIPMENT

1. Ensure the pump shaft is properly aligned at the coupling with the motor.

2. Check that all gland plate bolts and all screws are securely fastened.

3. Once the pump is reassembled, turn the shaft by hand if possible to check for free rotation, if not, recheck installation.

4. Verify that all plumbing and piping plans for the seal are connected and configured according to best practice.

5. Flood the pump, vent all air from the seal chamber, and check the seal for leakage.

6. Ensure all plumbing and venting are free of obstruction and that the chamber is filled with liquid. Check that all alarms connected to auxiliary systems are properly functioning to alert personnel if any issues arise.

   **ATTENTION**
   
   Dry-running is a major cause for leakage and/or failure of mechanical seals. It is imperative that the seal chamber be completely vented prior to startup and that adequate lubrication is supplied to the seal.

7. Start the pump per the pump manufacturer's recommendations, observe for proper operation, and check for excessive heat at the seal gland.

   **ATTENTION** Check periodically during operation to ensure that the seal is not overheating.

OPERATION & MAINTENANCE

If leakage is detected, it should be addressed as soon as possible to prevent hazards and protect personnel. Leakage could come from a number of leak paths in the seal, or be caused by changes in the pump operation or condition. Although seals should be inspected regularly for signs of leakage, a properly selected and functioning mechanical seal will run for extended durations without need for extra attention and should not be disturbed unnecessarily (i.e. shut down and disassembled without cause). Below is an inexhaustive list of possible causes of leakage.

**Primary Causes**
- Worn seal faces
- Damaged O-rings
- Damaged springs

**Secondary Causes**
- Change in duty conditions
- Dry-running
- Worn bearings
- Increased vibration

It is important to periodically inspect and maintain flush systems, shaft alignment, and consistent duty parameters to ensure the seal performs as designed. Often, there is a case of cause & effect with machinery and processing issues upstream that can cause a seal to leak. Check for the root cause of leakage when disassembling equipment for inspection or service.

DECOMMISSIONING EQUIPMENT

When decommissioning equipment it is important to ensure that the pump has been fully isolated from the process and power sources for personnel safety. Pressure and fluid should be fully released before disassembly of the equipment is to begin.

If the equipment has been used with toxic or hazardous fluids, ensure that it is decontaminated and neutralized before decommission begins. There is often residual fluid remaining from the draining process so consult the pump OEM for special cases.
REMOVING THE SEAL

Before opening the pump to remove the seal the warning stated above regarding toxins and hazardous products must be reiterated. Make note of all fluids contained in the pump, drain and decontaminate before opening the housing for seal service.

1. Ensure all fluid has been drained and vented. Equipment should be shut down and locked/tagged out according to OEM and plant specifications.

2. Dismantle equipment sufficiently so that the gland plate and seal housing are exposed and accessible for service.

3. Reset the setting clips that were saved from installation.

4. Back-out the cup point set screws.

5. Remove the gland bolts/nuts in an even manner.

6. While supporting the bottom half of the cartridge to ensure that it does not drop, remove the shoulder bolts holding the two halves together.

7. Carefully separate the halves and remove them from the pump.

If a part is going to be returned for service or to any third party, all shipments should have appropriate safe-handling instructions securely attached to the package.
### Style 85 Dimensional Data (Metric)

<table>
<thead>
<tr>
<th>Size</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>35.5</td>
<td>43.5</td>
<td>55.0</td>
<td>80.0</td>
<td>100.0</td>
</tr>
<tr>
<td>15</td>
<td>45.5</td>
<td>53.5</td>
<td>65.0</td>
<td>90.0</td>
<td>110.0</td>
</tr>
<tr>
<td>20</td>
<td>55.5</td>
<td>63.5</td>
<td>75.0</td>
<td>100.0</td>
<td>120.0</td>
</tr>
<tr>
<td>25</td>
<td>65.5</td>
<td>73.5</td>
<td>85.0</td>
<td>110.0</td>
<td>130.0</td>
</tr>
</tbody>
</table>

*Note: Size refers to the size of the seal in millimeters.*

### Diagram

- **Gland End View**
- **Shaft Dia.**
- **Bores**

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LIMITED WARRANTY AND LIMITATION OF LIABILITY:

SEAL PRODUCTS

Flexaseal Engineered Seals and Systems, LLC (hereinafter referred to as "FAS") warrants that new goods manufactured by FAS (with the exception of "wear parts" or consumables all of which are not warranted) will be free from defects in material and workmanship (the "Warranty"). The Warranty shall be in effect for a period of the earlier of three (3) months from the date of installation or six (6) months from the date of shipment from FAS's facility (which date of shipment shall not be greater than thirty (30) days after receipt of notice that the goods are ready to ship) (the "Warranty Period"). FAS shall, at its option and expense, either repair, replace, or refund amounts paid for any goods that fail to conform to the Warranty. In no case shall FAS be obligated to remove the defective goods or install the replaced or repaired goods, and the end user shall be responsible for providing ready access to the goods and areas for warranty work, and all other associated costs, including, but not limited to, service costs, shipping fees, and expenses. FAS shall have complete discretion as to the method or means of repair or replacement. The end user's failure to comply with FAS's repair or replacement directions shall constitute a waiver of its rights and render all warranties void. Any goods repaired or replaced under the Warranty are warranted only for the balance of the Warranty Period on the goods that were repaired or replaced. The Warranty is conditioned on the end user giving written notice to FAS of any goods that fail to meet the Warranty within ten (10) days of the date when any defects first become apparent. FAS shall have no warranty obligations to the end user with respect to any goods or parts of a good that: (a) have been repaired by parties other than FAS or without FAS’s written approval; (b) have been subject to misuse, misapplication, neglect, alteration, accident, or physical damage; (c) have been used in a manner contrary to FAS’s instructions for installation, operation and maintenance; (d) have been damaged from ordinary wear and tear, corrosion, or chemical attack; (e) have been damaged due to abnormal conditions, vibration, failure to properly prime, or operation without flow; (f) have been damaged due to a defective power supply or improper electrical protection; or (g) have been damaged resulting from the use of accessory Products not sold by FAS or not approved by FAS in connection with goods supplied by FAS.

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This warranty and limitation of liability shall be governed and construed in accordance with the laws of the State of Delaware, USA. Sole and exclusive venue for any claim or controversy arising out of or in any way related to this warranty and limitation of liability shall be in a state court located in Chittenden County, Vermont, USA.

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