



**Flow Solutions Division**

*Durametallic Seals*

---

**MSS**

**For Piloted and Non-Piloted Models**

---

# **Installation Instructions**

The **MSS seal** is a precision crafted split mechanical seal. While it has been designed for rugged industrial applications and ease of installation, it does require careful assembly in a clean environment according to the following installation steps.

The **MSS seal** is primarily designed to seal agitator shafts and can be run dry up to 350 rpm or wet up to 1750 rpm. Consult your local nearest Flowserve Sales and Service Representative, regarding other applications.

## 1 Equipment Check

---

1.1 **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.

1.2 **Remove existing mechanical seal and gland** or packing gland (follower flange) and the first few rings of compression packing down to the lantern ring.

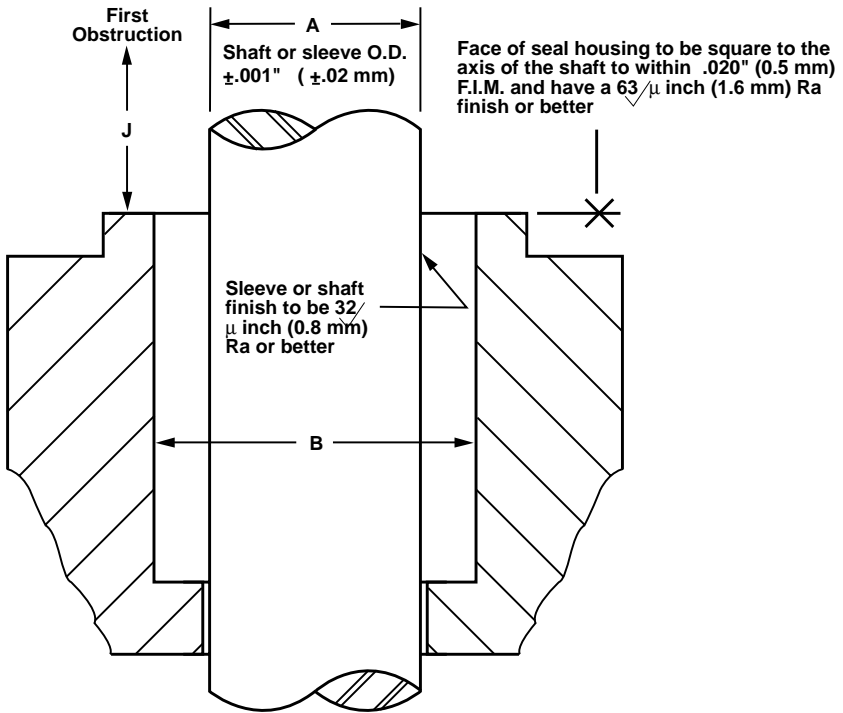
1.3 Make sure the **shaft or sleeve** in the seal shaft packing (P) area and the **seal housing bore (B) and face are clean** and free of burrs, cuts, dents, or corrosion that might cause leakage past the shaft packing or insert mounting O-rings.

1.4 **Check equipment dimensions** to ensure that they are within the dimensions shown in Figures 1 and 2 or 3. Critical dimensions include shaft or sleeve O.D. (A), seal housing bore (B), and the distance to the first obstruction (J).

1.5 **Check gland bolting** to ensure that bolt size (D) and bolt circle (F) conform to the dimensions shown in Figures 2 or 3.

## Tools Needed for Installation

- A 5/32" T-handle or right angle Allen wrench.
- An open end wrench for the gland bolts
- Two (2) 1/8" Allen wrenches.



- Bearings must be in good condition.
- Maximum axial movement of shaft (end play) =  $0.010$  inch ( $0.25$  mm) FIM
- Maximum combined shaft eccentricity and shaft deflection at face of housing total =  $0.150$  inch ( $3.8$  mm) FIM

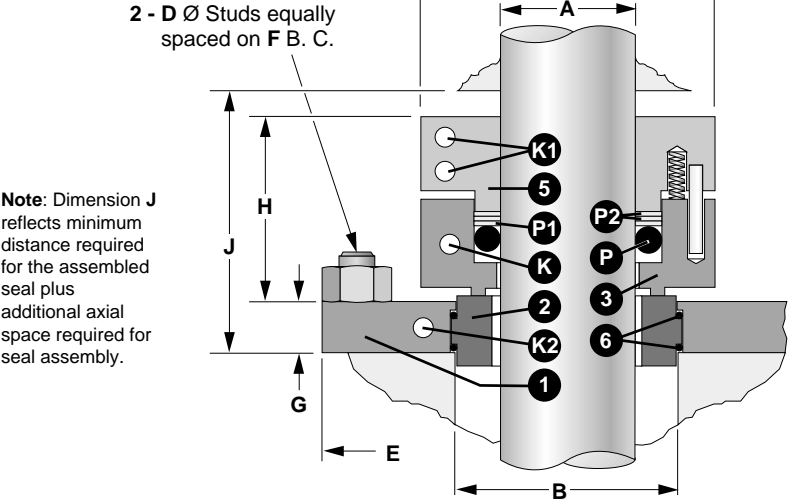
**Notice:** Cleanliness during installation is crucial to the satisfactory operation of the MSS seal.

**Caution:** Installation of this seal requires the use of an adhesive to bond the O-ring secondary seals together. **Do not allow the adhesive to come in contact with the skin.**

There are two basic models of the MSS seal, **Piloted**, see Figure 2, page 4, and **Non-Piloted**, see Figure 3, page 8.

MSS with Piloted Insert

Figure 2



Dimensional Data for MSS with Piloted Insert (Reference Figure 2)

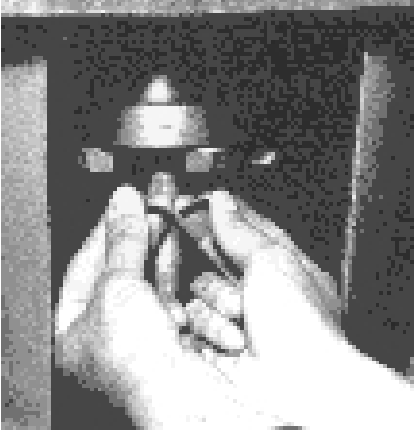
A	B	C	D	E	F	G	H	J
±.001"	±0.005"		Min.	Min.	Min.			Min.
1.000	2.250	3.38	0.500	5.75	4.75	0.75	3.44	4.44
1.125	2.375	3.50	0.500	5.88	4.88	0.75	3.44	4.44
1.250	2.500	3.62	0.500	6.00	5.00	0.75	3.44	4.44
1.375	2.625	3.75	0.500	6.12	5.12	0.75	3.44	4.44
1.500	2.750	3.88	0.500	6.25	5.25	0.75	3.44	4.44
1.625	2.875	4.00	0.500	6.38	5.38	0.75	3.44	4.44
1.750	3.000	4.12	0.500	6.50	5.50	0.75	3.44	4.44
1.875	3.125	4.25	0.500	6.62	5.62	0.75	3.44	4.44
2.000	3.250	4.38	0.500	6.75	5.75	0.75	3.44	4.44
2.125	3.375	4.50	0.500	6.88	5.88	0.75	3.44	4.44
2.250	3.500	4.62	0.500	7.00	6.00	0.75	3.44	4.44
2.375	3.625	4.75	0.500	7.12	6.12	0.75	3.44	4.44
2.500	3.750	4.88	0.500	7.25	6.25	0.75	3.44	4.44
2.625	3.875	5.00	0.500	7.38	6.38	0.75	3.44	4.44
2.750	4.000	5.12	0.500	7.50	6.50	0.75	3.44	4.44
2.875	4.125	5.25	0.500	7.62	6.62	0.75	3.44	4.44
3.000	4.250	5.38	0.500	7.75	6.75	0.75	3.44	4.44
3.125	4.375	5.50	0.500	7.88	6.88	0.75	3.44	4.44
3.250	4.500	5.62	0.500	8.00	7.00	0.75	3.44	4.44
3.375	4.625	5.75	0.500	8.12	7.12	0.75	3.44	4.44
3.500	4.750	5.88	0.500	8.25	7.25	0.75	3.44	4.44
3.625	4.875	6.00	0.500	8.38	7.38	0.75	3.44	4.44
3.750	5.000	6.12	0.500	8.50	7.50	0.75	3.44	4.44
3.875	5.125	6.25	0.500	8.62	7.62	0.75	3.44	4.44
4.000	5.250	6.38	0.500	8.75	7.75	0.75	3.44	4.44
4.125	5.375	6.50	0.500	8.88	7.88	0.75	3.44	4.44
4.250	5.500	6.62	0.500	9.00	8.00	0.75	3.44	4.44
4.375	5.625	6.75	0.500	9.12	8.12	0.75	3.44	4.44

A	B	C	D	E	F	G	H	J
±.001"	±0.005"		Min.	Min.	Min.			Min.
4.500	5.750	6.88	0.500	9.25	8.25	0.75	3.44	4.44
4.625	5.875	7.00	0.500	9.38	8.38	0.75	3.44	4.44
4.750	6.000	7.12	0.500	9.50	8.50	0.75	3.44	4.44
4.875	6.250	7.25	0.500	9.62	8.62	0.75	3.44	4.44
5.000	6.500	7.75	0.625	10.75	9.50	0.94	4.00	5.00
5.250	6.750	8.00	0.625	11.00	9.75	0.94	4.00	5.00
5.500	7.000	8.25	0.625	11.25	10.00	0.94	4.00	5.00
5.750	7.250	8.50	0.625	11.50	10.25	0.94	4.00	5.00
6.000	7.500	8.75	0.625	11.75	10.50	0.94	4.00	5.00
6.250	7.750	9.00	0.625	12.00	10.75	0.94	4.00	5.00
6.500	8.000	9.25	0.625	12.25	11.00	0.94	4.00	5.00
6.750	8.250	9.50	0.625	12.50	11.25	0.94	4.00	5.00
7.000	8.500	9.75	0.625	12.75	11.50	0.94	4.00	5.00
7.250	8.750	10.00	0.625	13.00	11.75	0.94	4.00	5.00
7.500	9.000	10.25	0.625	13.25	12.00	0.94	4.00	5.00
7.750	9.250	10.50	0.625	13.50	12.25	0.94	4.00	5.00
8.000	9.500	10.75	0.625	13.75	12.50	0.94	4.00	5.00
8.250	9.750	11.00	0.625	14.00	12.75	0.94	4.00	5.00
8.500	10.000	11.25	0.625	14.25	13.00	0.94	4.00	5.00
8.750	10.500	11.50	0.625	14.50	13.25	0.94	4.00	5.00
9.000	11.000	12.25	0.750	16.00	14.50	1.25	4.81	5.81
9.500	11.500	12.75	0.750	16.50	15.00	1.25	4.81	5.81
10.000	12.000	13.25	0.750	17.00	15.50	1.25	4.81	5.81
10.500	12.500	13.75	0.750	17.50	16.00	1.25	4.81	5.81
11.000	13.000	14.25	0.750	18.00	16.50	1.25	4.81	5.81
11.500	13.500	14.75	0.750	18.50	17.00	1.25	4.81	5.81
12.000	14.000	15.25	0.750	19.00	17.50	1.25	4.81	5.81

## 2. Installation of Piloted MSS

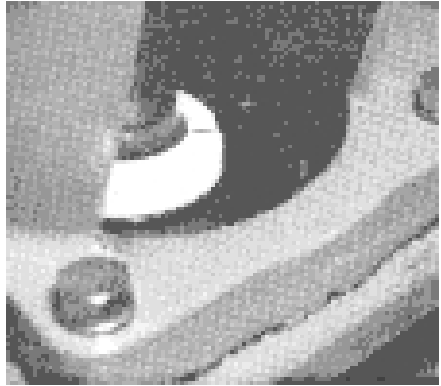
---

- 2.1 **Spray one end of one of the split insert mounting O-rings ⑥** with the adhesive accelerator provided. **Apply** one drop of the adhesive provided to the other end. **Position** the split O-ring around the shaft and **bond** the joint ends together. **Hold** for one minute to assure a suitable bond. **Lubricate** the O-ring with the silicone lubricant provided. **Place** the bonded O-ring on the seal chamber (stuffing box) face.



**Bond O-Ring Joint Ends Together**

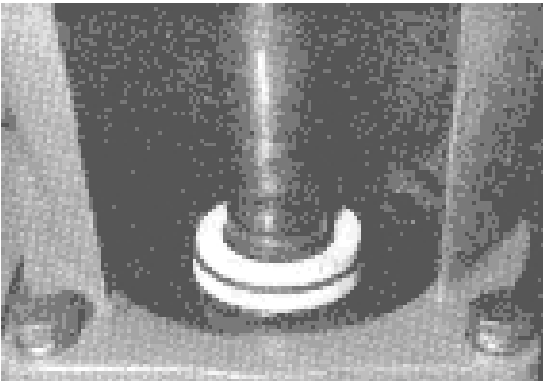
Step 2.1



**Install Insert Halves**

Step 2.2

- 2.2 **Install the stationary insert halves ②** around the shaft with the lapped face outward (non-lapped face has groove) away from the seal chamber face. Hold the insert up and **place** the bonded O-ring over the insert shoulder closest to the seal chamber face. **Pilot** the inner insert shoulder into the seal chamber bore.



**O-Ring Over the Insert Outer Shoulder**

Step 2.3

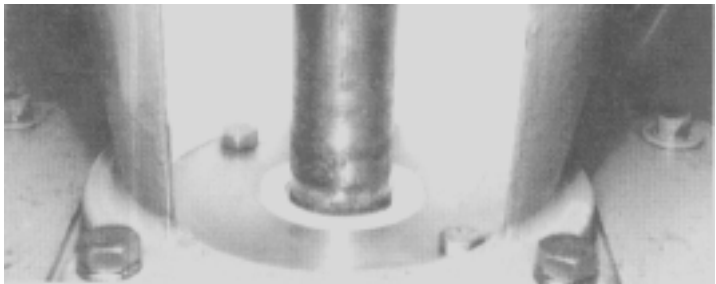
- 2.3 **Bond and lubricate the second insert O-ring ⑥** around the shaft as in Step 2.1 and **place** it over the insert outer shoulder.

2.4 **Position the gland ring halves** ① around the shaft with the counterbore facing the insert. **Place** the gland halves around the insert and **fasten** them together using the shoulder screws (K2) provided.

**Important:** Be sure the **gland ring joints are in line with insert joints** and the **two bolt holes are in line with the bolt holes or studs in the seal chamber face**.

2.5 Carefully **fasten the gland to the seal chamber** by tightening the nuts or bolts to a 30 lb-in (3.4 N-m) maximum torque while feeling for seal face mismatch at the insert joints. If any mismatch exists, loosen the nuts or bolts and shift the insert halves until no mismatch is felt. Retighten the nuts or bolts.

**Important:** **Do not overtighten the gland nuts or bolts** as overtightening on some equipment may cause the insert face to distort which may result in leakage at the seal faces. It is not necessary for the gland to have metal-to-metal contact with the seal chamber face for the inner insert O-ring to form a seal. The gland face must, however, be square with the axis of the shaft to within 0.020" FIM



**Fasten the Gland Ring to the Seal Housing**  
Step 2.5

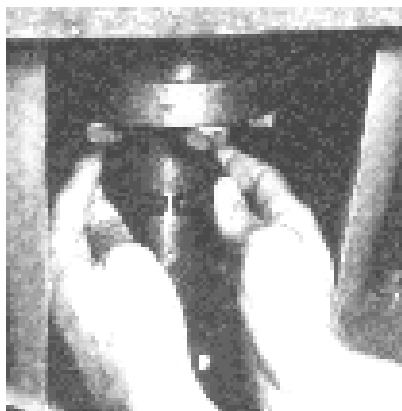
2.6 **Mount the rotary seal ring halves** ③ around the shaft and **fasten** them together using the cap screws (K) provided, to a 30 lb-in (3.4 N-m) torque maximum. Check for seal face joint mismatch. If any mismatch exists, loosen the cap screws and shift the seal ring halves until no mismatch is felt. Retighten the cap screws.

**Note:** There are threads on both halves of the rotary seal rings. Align halves carefully.

2.7 **Clean the rubbing faces** of the insert and seal ring with alcohol and **place** the seal ring so that its rubbing face is against the insert rubbing face.



Step 2.7



Step 2.8

2.8 **Position the split shaft packing O-ring (P) around the shaft, bond and lubricate** as in Step 2.1, and **push** the O-ring into the seal ring bore.

2.9 **Install the white split backup ring (P1) into the seal ring bore next to the O-ring. Install the two black elastomer backup rings (P2).** Be sure to **stagger** the backup ring joints by 120° F.

**Do not bond the backup ring joints together.**

2.10 **Mount the collar halves (5) around the shaft and loosely fasten** them together with the shoulder screws (K1) provided. Line up the collar drive pins with the seal ring holes and **slide** the collar towards the seal ring until a 0.12" (3 mm) spring gap is achieved using the two 1/8" Allen wrenches as spacers. **Tighten the shoulder screws completely.**

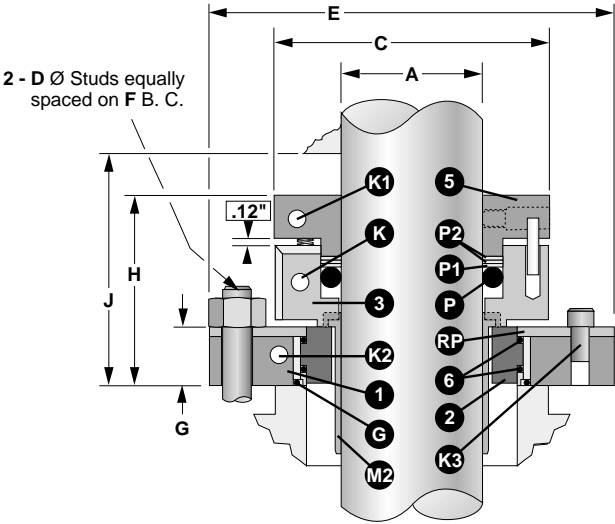
The seal is now ready for operation, see Operational Recommendations before start-up, paragraph 4.



**Mount Collar Halves & Set Spring Gap**  
Step 2.10

MSS with Non-Piloted Insert

Figure 3



Dimensional Data for MSS with Non-Piloted Insert (Reference Figure 3)

A ±.001"	C	D Min.	E Min.	F Min.	G	H	J Min.
1.000	3.38	0.500	5.75	4.75	1.06	3.38	4.38
1.125	3.50	0.500	5.88	4.88	1.06	3.38	4.38
1.250	3.62	0.500	6.00	5.00	1.06	3.38	4.38
1.375	3.75	0.500	6.12	5.12	1.06	3.38	4.38
1.500	3.88	0.500	6.25	5.25	1.06	3.38	4.38
1.625	4.00	0.500	6.38	5.38	1.06	3.38	4.38
1.750	4.12	0.500	6.50	5.50	1.06	3.38	4.38
1.875	4.25	0.500	6.62	5.62	1.06	3.38	4.38
2.000	4.38	0.500	6.75	5.75	1.06	3.38	4.38
2.125	4.50	0.500	6.88	5.88	1.06	3.38	4.38
2.250	4.62	0.500	7.00	6.00	1.06	3.38	4.38
2.375	4.75	0.500	7.12	6.12	1.06	3.38	4.38
2.500	4.88	0.500	7.25	6.25	1.06	3.38	4.38
2.625	5.00	0.500	7.38	6.38	1.06	3.38	4.38
2.750	5.12	0.500	7.50	6.50	1.06	3.38	4.38
2.875	5.25	0.500	7.62	6.62	1.06	3.38	4.38
3.000	5.38	0.500	7.75	6.75	1.06	3.38	4.38
3.125	5.50	0.500	7.88	6.88	1.06	3.38	4.38
3.250	5.62	0.500	8.00	7.00	1.06	3.38	4.38
3.375	5.75	0.500	8.12	7.12	1.06	3.38	4.38
3.500	5.88	0.500	8.25	7.25	1.06	3.38	4.38
3.625	6.00	0.500	8.38	7.38	1.06	3.38	4.38
3.750	6.12	0.500	8.50	7.50	1.06	3.38	4.38
3.875	6.25	0.500	8.62	7.62	1.06	3.38	4.38
4.000	6.38	0.500	8.75	7.75	1.06	3.38	4.38
4.125	6.50	0.500	8.88	7.88	1.06	3.38	4.38
4.250	6.62	0.500	9.00	8.00	1.06	3.38	4.38
4.375	6.75	0.500	9.12	8.12	1.06	3.38	4.38

A ±.001"	C	D Min.	E Min.	F Min.	G	H	J Min.
4.500	6.88	0.500	9.25	8.25	1.06	3.38	4.38
4.625	7.00	0.500	9.38	8.38	1.06	3.38	4.38
4.750	7.12	0.500	9.50	8.50	1.06	3.38	4.38
4.875	7.25	0.500	9.62	8.62	1.06	3.38	4.38
5.000	7.75	0.625	10.75	9.50	1.31	3.88	4.88
5.250	8.00	0.625	11.00	9.75	1.31	3.88	4.88
5.500	8.25	0.625	11.25	10.00	1.31	3.88	4.88
5.750	8.50	0.625	11.50	10.25	1.31	3.88	4.88
6.000	8.75	0.625	11.75	10.50	1.31	3.88	4.88
6.250	9.00	0.625	12.00	10.75	1.31	3.88	4.88
6.500	9.25	0.625	12.25	11.00	1.31	3.88	4.88
6.750	9.50	0.625	12.50	11.25	1.31	3.88	4.88
7.000	9.75	0.625	12.75	11.50	1.31	3.88	4.88
7.250	10.00	0.625	13.00	11.75	1.31	3.88	4.88
7.500	10.25	0.625	13.25	12.00	1.31	3.88	4.88
7.750	10.50	0.625	13.50	12.25	1.31	3.88	4.88
8.000	10.75	0.625	13.75	12.50	1.31	3.88	4.88
8.250	11.00	0.625	14.00	12.75	1.31	3.88	4.88
8.500	11.25	0.625	14.25	13.00	1.31	3.88	4.88
8.750	11.50	0.625	14.50	13.25	1.31	3.88	4.88
9.000	12.25	0.750	16.00	14.50	1.69	4.62	5.62
9.500	12.75	0.750	16.50	15.00	1.69	4.62	5.62
10.000	13.25	0.750	17.00	15.50	1.69	4.62	5.62
10.500	13.75	0.750	17.50	16.00	1.69	4.62	5.62
11.000	14.25	0.750	18.00	16.50	1.69	4.62	5.62
11.500	14.75	0.750	18.50	17.00	1.69	4.62	5.62
12.000	15.25	0.750	19.00	17.50	1.69	4.62	5.62



### 3. Installation of Non-Piloted MSS

---

- 3.1 **Spray one end of the split gland gasket O-ring** (G) with the adhesive accelerator provided. **Apply** one drop of the adhesive provided to the other end. **Position** the split O-ring around the shaft and **bond** the joint ends together. **Hold** for one minute to assure a suitable bond. **Lubricate** the O-ring with the silicone lubricant provided. **Place** the bonded O-ring on the seal chamber (stuffing box) face.
  - 3.2 **Remove the retaining plates** (RP) from the face of the gland plates (1) and save the plates and cap screws (K3) for Step 3.6.
  - 3.3 **Position the gland ring halves (1) around the shaft and fasten** them loosely together using the shoulder screws (K2) provided.
  - 3.4 Use some silicone lubricant provided to hold the gland O-ring in its groove and **position the gland** on the seal chamber face by loosely tightening the nuts or bolts.
  - 3.5 **Bond one of the split insert mounting O-rings** (6) and lubricate as in Step 3.1. Place the bonded O-ring in the gland counterbore.
  - 3.6 **Install the stationary insert halves** (2) around the shaft with the lapped face outward away from the seal chamber face. **Pilot** the insert into the gland bore and nest it in the O-ring.
- Important: Be sure the insert joints are in line with the gland ring joints.**
- 3.7 **Bond and lubricate the second insert O-ring** (6) around the shaft as in Step 3.1 and **place** it over the stationary insert outer shoulder.
  - 3.8 **Attach the retaining plates** (RP) to the face of the gland using cap screws (K3) while positioning the plates over the outer insert O-ring.
  - 3.9 **Insert the plastic centering device** (M2) between the insert I.D. and the shaft.
  - 3.10 **Tighten the shoulder screws** (K2) in the gland ring halves (1) .
  - 3.11 **Tighten the gland fastening nuts or bolts** holding the gland to the seal chamber to 30 lb-in (3.4 N-m) maximum torque while feeling for seal face mismatch at the insert joints. If any mismatch exists, loosen the nuts or bolts and shift the insert halves until no mismatch is felt. Retighten the nuts or bolts.

**Important:** Do not overtighten the gland nuts or bolts as overtightening on some equipment may cause the insert face to distort which may result in leakage at the seal faces. It is not necessary for the gland to have metal-to-metal contact with the seal chamber face for the inner insert O-ring to form a seal. The gland face must, however, be square with the axis of the shaft to within 0.020" FIM

3.12 **Remove the centering device (M2).** Retain it for use with the spare parts kit.

3.13 **Mount the rotary seal ring halves (3)** around the shaft and fasten them together using the cap screws (K) provided, to a 30 lb-in (3.4 N-m) torque maximum. Check for seal face joint mismatch. If any mismatch exists, loosen the cap screws and shift the seal ring halves until no mismatch is felt. Retighten the cap screws.

Note: There are threads on both halves of the rotary seal ring. Align halves carefully.

3.14 **Clean the rubbing faces** of the insert and seal ring with alcohol and **place** the seal ring so that its rubbing face is against the insert rubbing face. See Step 2.7.

3.15 **Position the split shaft packing O-ring (P)** around the shaft and bond the joint ends together as in Step 3.1. **Lubricate** the O-ring with the silicone lubricant provided and **push** the O-ring into the seal ring bore. See Step 2.8.

3.16 **Install the white split backup ring (P1)** into the seal ring bore next to the O-ring. **Install the two black elastomer backup rings (P2).** Be sure to stagger the backup ring joints by 120° F. **Do not bond the backup ring joints together.**

3.17 **Mount the collar halves (5)** around the shaft and loosely **fasten** them together with the shoulder screws (K1) provided. Line up the collar drive pins with the seal ring holes and **slide** the collar towards the seal ring until a 0.12" (3 mm) spring gap is achieved using the two 1/8" Allen wrenches as spacers. **Tighten the shoulder screws completely.**

The seal is now ready for operation. See Operational Recommendations before start-up, paragraph 4.

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

## 4. Operational Recommendations

---

The MSS seal is designed to run dry at speeds of up to 350 rpm. If operated dry, no special environmental controls are necessary. For wet operation of up to 1750 rpm, make sure that the seal water flush, API Piping Plan 32, is adequate to remove seal generated heat and that the flush is on before start-up of the equipment. Contact your nearest Flowserve Sales and Service Representative or Authorized Distributor, for seal flush requirements.

## Repairs

---

This 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. These are available from the numerous Flowserve stocking locations. To order replacement parts, refer to the part code number and B/M number. A complete spare back-up seal should be stocked to reduce repair time. A repair kit containing the following parts can also be stocked for emergency needs.

<b>2</b>	Insert	<b>C</b>	Springs
<b>P</b>	Shaft Packing	<b>3</b>	Seal Ring
<b>G, G1</b>	Gaskets	<b>P1, P2</b>	Back-up Rings
<b>6</b>	Insert Mounting	<b>K, K1, K2, K3</b>	Screws
<b>S</b>	Set Screws		

When repairs are not conducted at the customer's location, **decontaminate the seal assembly** and return it to Flowserve, with 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 in its original condition.

TO REORDER REFER TO  
B/M # \_\_\_\_\_  
F.O. \_\_\_\_\_

All Flowserve Corporation, Flow Solutions Division, 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.

## Flowserve Corporation

## Flow Solutions Division

### *Primary Worldwide Flow Solutions Division Locations*

*Licensees, authorized agents, and affiliated companies located worldwide*

United States		Canada		Netherlands	Argentina
Kalamazoo, MI Phone 616-381-2650 Fax 616-381-8368	Temecula, CA Phone 909-676-5662 Fax 909-308-4495	Edmonton, Alberta Phone 403-463-7958 Fax 403-450-1241	St. Thomas, Ontario Phone 519-631-9946 Fax 519-633-6164	Roosendaal Phone 31-165-581-400 Fax 31-165-552-622	Mendoza Phone 54-261-427-2300 Fax 54-261-427-2524
Singapore	Mexico	Brazil	Japan	Germany	Australia
Phone 65-755-2475 Fax 65-755-7326	Mexico City Phone 52-5-360-5209 Fax 52-5-560-1692	Sao Paulo Phone 55-11-746-77 Fax 55-11-746-7014	Osaka Phone 81-720-85-5571 Fax 81-720-85-5575	Dortmund Phone 49-231-6964-0 Fax 49-231-6964-248	Marayong NSW Phone 61-2-8822-7100 Fax 61-2-9679-7511

[www.flowserve.com](http://www.flowserve.com)

Printed in U.S.A.

**ISO 9000**  
**Certified**

FIS130  
REV 03/92 USA