

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.

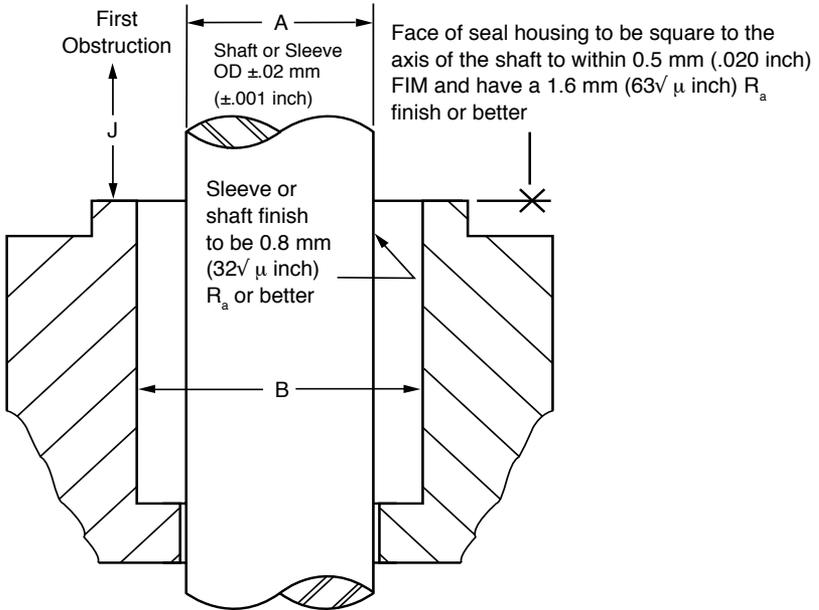
The **MSS seal** is primarily designed to seal agitator shafts and can be run dry up to 350 rpm or wet up to 1750 rpm. Consult your nearest Flowserve Sales and Service Representative, regarding other applications.

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 enough of the compression packing to allow the MSS stationary face to pilot in box bore.
- 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 rotating face gasket or stationary face 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 OD (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 or box end wrench of suitable size for the gland bolts.
- Two (2) 1/8" Allen wrenches.



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

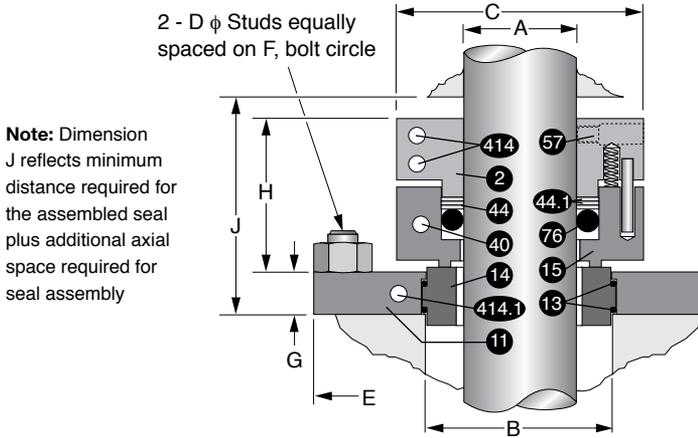
Notice: Cleanliness during installation is crucial to the satisfactory operation of the MSS seal.

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 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



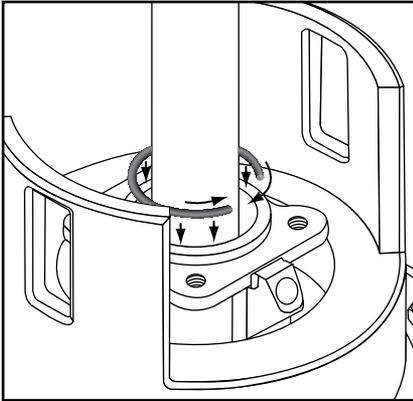
Dimensional Data for MSS with Piloted Insert (Reference Figure 2)

A	B	C	D	E	F	G	H	J	A	B	C	D	E	F	G	H	J
±.001"	±0.005"		Min.	Min.	Min.			Min.	±.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	4.500	5.750	6.88	0.500	9.25	8.25	0.75	3.44	4.44
1.125	2.375	3.50	0.500	5.88	4.88	0.75	3.44	4.44	4.625	5.875	7.00	0.500	9.38	8.38	0.75	3.44	4.44
1.250	2.500	3.62	0.500	6.00	5.00	0.75	3.44	4.44	4.750	6.000	7.12	0.500	9.50	8.50	0.75	3.44	4.44
1.375	2.625	3.75	0.500	6.12	5.12	0.75	3.44	4.44	4.875	6.250	7.25	0.500	9.62	8.62	0.75	3.44	4.44
1.500	2.750	3.88	0.500	6.25	5.25	0.75	3.44	4.44	5.000	6.500	7.75	0.625	10.75	9.50	0.94	4.00	5.00
1.625	2.875	4.00	0.500	6.38	5.38	0.75	3.44	4.44	5.250	6.750	8.00	0.625	11.00	9.75	0.94	4.00	5.00
1.750	3.000	4.12	0.500	6.50	5.50	0.75	3.44	4.44	5.500	7.000	8.25	0.625	11.25	10.00	0.94	4.00	5.00
1.875	3.125	4.25	0.500	6.62	5.62	0.75	3.44	4.44	5.750	7.250	8.50	0.625	11.50	10.25	0.94	4.00	5.00
2.000	3.250	4.38	0.500	6.75	5.75	0.75	3.44	4.44	6.000	7.500	8.75	0.625	11.75	10.50	0.94	4.00	5.00
2.125	3.375	4.50	0.500	6.88	5.88	0.75	3.44	4.44	6.250	7.750	9.00	0.625	12.00	10.75	0.94	4.00	5.00
2.250	3.500	4.62	0.500	7.00	6.00	0.75	3.44	4.44	6.500	8.000	9.25	0.625	12.25	11.00	0.94	4.00	5.00
2.375	3.625	4.75	0.500	7.12	6.12	0.75	3.44	4.44	6.750	8.250	9.50	0.625	12.50	11.25	0.94	4.00	5.00
2.500	3.750	4.88	0.500	7.25	6.25	0.75	3.44	4.44	7.000	8.500	9.75	0.625	12.75	11.50	0.94	4.00	5.00
2.625	3.875	5.00	0.500	7.38	6.38	0.75	3.44	4.44	7.250	8.750	10.00	0.625	13.00	11.75	0.94	4.00	5.00
2.750	4.000	5.12	0.500	7.50	6.50	0.75	3.44	4.44	7.500	9.000	10.25	0.625	13.25	12.00	0.94	4.00	5.00
2.875	4.125	5.25	0.500	7.62	6.62	0.75	3.44	4.44	7.750	9.250	10.50	0.625	13.50	12.25	0.94	4.00	5.00
3.000	4.250	5.38	0.500	7.75	6.75	0.75	3.44	4.44	8.000	9.500	10.75	0.625	13.75	12.50	0.94	4.00	5.00
3.125	4.375	5.50	0.500	7.88	6.88	0.75	3.44	4.44	8.250	9.750	11.00	0.625	14.00	12.75	0.94	4.00	5.00
3.250	4.500	5.62	0.500	8.00	7.00	0.75	3.44	4.44	8.500	10.000	11.25	0.625	14.25	13.00	0.94	4.00	5.00
3.375	4.625	5.75	0.500	8.12	7.12	0.75	3.44	4.44	8.750	10.500	11.50	0.625	14.50	13.25	0.94	4.00	5.00
3.500	4.750	5.88	0.500	8.25	7.25	0.75	3.44	4.44	9.000	11.000	12.25	0.750	16.00	14.50	1.25	4.81	5.81
3.625	4.875	6.00	0.500	8.38	7.38	0.75	3.44	4.44	9.500	11.500	12.75	0.750	16.50	15.00	1.25	4.81	5.81
3.750	5.000	6.12	0.500	8.50	7.50	0.75	3.44	4.44	10.000	12.000	13.25	0.750	17.00	15.50	1.25	4.81	5.81
3.875	5.125	6.25	0.500	8.62	7.62	0.75	3.44	4.44	10.500	12.500	13.75	0.750	17.50	16.00	1.25	4.81	5.81
4.000	5.250	6.38	0.500	8.75	7.75	0.75	3.44	4.44	11.000	13.000	14.25	0.750	18.00	16.50	1.25	4.81	5.81
4.125	5.375	6.50	0.500	8.88	7.88	0.75	3.44	4.44	11.500	13.500	14.75	0.750	18.50	17.00	1.25	4.81	5.81
4.250	5.500	6.62	0.500	9.00	8.00	0.75	3.44	4.44	12.000	14.000	15.25	0.750	19.00	17.50	1.25	4.81	5.81
4.375	5.625	6.75	0.500	9.12	8.12	0.75	3.44	4.44									

2 Installation of Piloted MSS

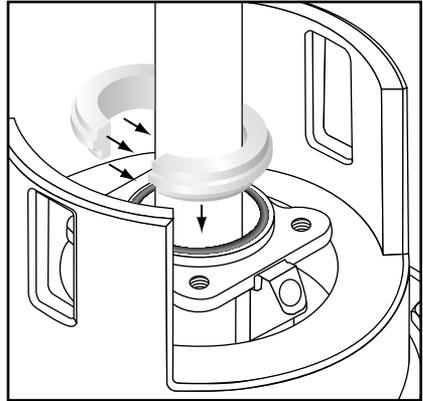
- 2.1 **Spray one end of one of the split stationary face seat gasket O-rings (13)** with the adhesive accelerator provided. **Apply** one drop of the adhesive provided to the other end. **Position** the split O-ring around the shaft carefully aligning the two ends and **bond** the joint ends together. **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.

Note: Be careful not to let O-ring fall into the bore.



Bond O-ring joint ends together

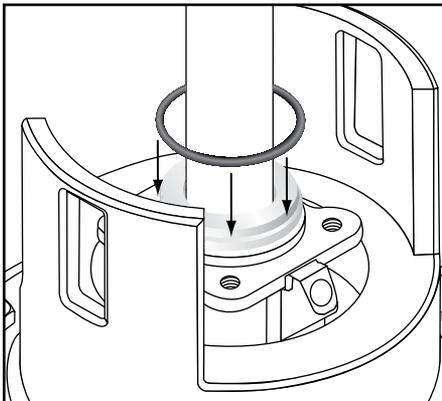
Step 2.1



Install stationary face halves

Step 2.2

- 2.2 **Install the stationary face halves (14)** around the shaft with the lapped face outward (non-lapped face is identified with a groove or part marking) away from the seal chamber face. Hold the stationary face up and **place** the bonded O-ring over the stationary face shoulder closest to the seal chamber face. **Pilot** the inner stationary face shoulder into the seal chamber bore.



O-ring over the stationary face outer shoulder

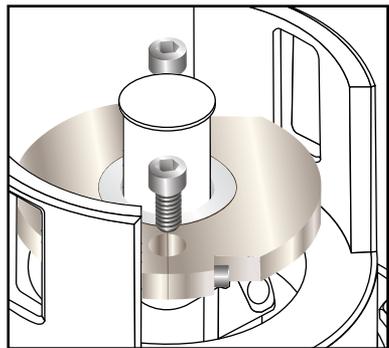
Step 2.3

- 2.3 **Bond and lubricate the second stationary face seat gasket O-ring (13)** around the shaft as in Step 2.1 and **place** it over the outer stationary face shoulder.

- 2.4 **Position the gland ring halves** (11) around the shaft with the counter-bore facing the stationary face. **Place** the gland halves around the stationary face and **fasten** them together using the shoulder screws (414.1) provided. Be sure the **gland ring joints are in line with the stationary face joints** and the **two bolt holes are in line with the bolt holes or studs in the seal chamber face**. While tightening the shoulder screws, feel for sealing face mismatch at the stationary face joints. If any mismatch occurs loosen shoulder screws (414.1) and shift the stationary face halves until no mismatch is felt and continue with tightening shoulder screws.

Note: Do not attempt to remove sealing face mismatch with the gland joint shoulder screws (414.1) fully tightened. Doing so may damage the stationary face.

- 2.5 Carefully **fasten the gland to the seal chamber** by tightening the gland fasteners to a 3.4 N-m (30 lb-in) maximum torque while feeling for sealing face mismatch at the stationary face joints. If any mismatch occurs, loosen the gland fasteners and shoulder screws (414.1) and repeat steps in 2.4 to remove sealing face mismatch. Then proceed with tightening gland fasteners while again checking for sealing face mismatch.

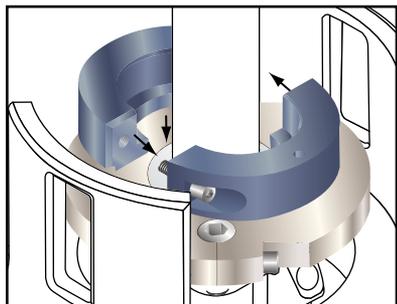


Fasten the gland ring to the seal housing Step 2.5

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

- 2.6 **Mount the rotating seal face halves** (15) around the shaft and **fasten** them together using the cap screws (40) provided, tighten to a 3.4 N-m (30 lb-in) torque maximum. Check for seal face joint mismatch. If any mismatch exists, loosen the cap screws and shift the rotating seal face halves until no mismatch is felt. Retighten the cap screws.

Note: There are threads on both halves of the rotating seal face. Align halves carefully so as to not allow a gap between halves during tightening.



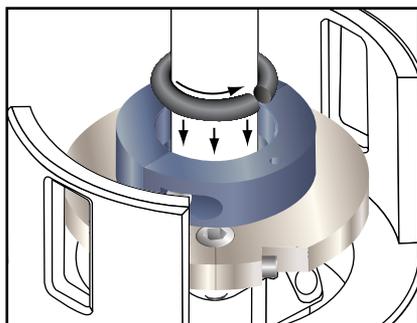
Step 2.6

2.7 **Clean the rubbing faces** of the rotating and stationary face with alcohol and **place** the rotating face so that its rubbing face is against the stationary rubbing face.

2.8 **Position the split rotating face gasket O-ring (76)** around the shaft, **bond and lubricate** as in Step 2.1, and **push** the O-ring into the rotating face bore.

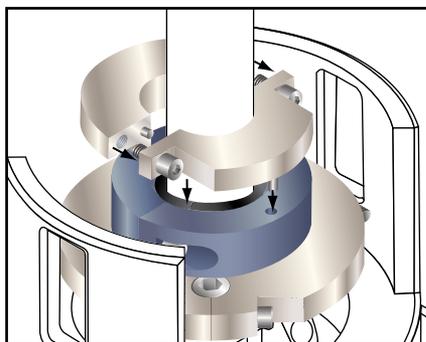
2.9 **Install the white split backing ring (44)** into the rotating face bore next to the O-ring. **Install the two black elastomer backing rings (44.1)**. Be sure to **stagger** the backing ring joints by 120°.

Do not bond the backing ring joints together or with each other.



Step 2.8

2.10 **Mount the seal drive halves (2)** around the shaft and loosely **fasten** them together with the shoulder screws (414) provided. Line up the pins in the seal drive with the holes in the rotating face and **slide** the seal drive towards the rotating face until a 3 mm (0.12 inch) spring gap is achieved using the two 1/8" Allen wrenches as spacers. **Tighten the shoulder screws completely and lock seal drive to shaft.**

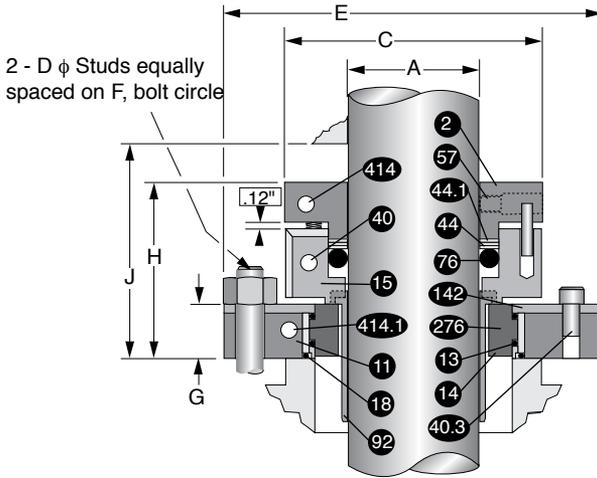


Mount seal drive halves and set spring gap Step 2.10

On designs that incorporate set screws (57) in the seal drive, after tightening shoulder screws (414), tighten the set screws (57) to lock the seal drive to the shaft.

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.



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

A ±.001"	C	D Min.	E Min.	F Min.	G	H	J Min.	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	4.500	6.88	0.500	9.25	8.25	1.06	3.38	4.38
1.125	3.50	0.500	5.88	4.88	1.06	3.38	4.38	4.625	7.00	0.500	9.38	8.38	1.06	3.38	4.38
1.250	3.62	0.500	6.00	5.00	1.06	3.38	4.38	4.750	7.12	0.500	9.50	8.50	1.06	3.38	4.38
1.375	3.75	0.500	6.12	5.12	1.06	3.38	4.38	4.875	7.25	0.500	9.62	8.62	1.06	3.38	4.38
1.500	3.88	0.500	6.25	5.25	1.06	3.38	4.38	5.000	7.75	0.625	10.75	9.50	1.31	3.88	4.88
1.625	4.00	0.500	6.38	5.38	1.06	3.38	4.38	5.250	8.00	0.625	11.00	9.75	1.31	3.88	4.88
1.750	4.12	0.500	6.50	5.50	1.06	3.38	4.38	5.500	8.25	0.625	11.25	10.00	1.31	3.88	4.88
1.875	4.25	0.500	6.62	5.62	1.06	3.38	4.38	5.750	8.50	0.625	11.50	10.25	1.31	3.88	4.88
2.000	4.38	0.500	6.75	5.75	1.06	3.38	4.38	6.000	8.75	0.625	11.75	10.50	1.31	3.88	4.88
2.125	4.50	0.500	6.88	5.88	1.06	3.38	4.38	6.250	9.00	0.625	12.00	10.75	1.31	3.88	4.88
2.250	4.62	0.500	7.00	6.00	1.06	3.38	4.38	6.500	9.25	0.625	12.25	11.00	1.31	3.88	4.88
2.375	4.75	0.500	7.12	6.12	1.06	3.38	4.38	6.750	9.50	0.625	12.50	11.25	1.31	3.88	4.88
2.500	4.88	0.500	7.25	6.25	1.06	3.38	4.38	7.000	9.75	0.625	12.75	11.50	1.31	3.88	4.88
2.625	5.00	0.500	7.38	6.38	1.06	3.38	4.38	7.250	10.00	0.625	13.00	11.75	1.31	3.88	4.88
2.750	5.12	0.500	7.50	6.50	1.06	3.38	4.38	7.500	10.25	0.625	13.25	12.00	1.31	3.88	4.88
2.875	5.25	0.500	7.62	6.62	1.06	3.38	4.38	7.750	10.50	0.625	13.50	12.25	1.31	3.88	4.88
3.000	5.38	0.500	7.75	6.75	1.06	3.38	4.38	8.000	10.75	0.625	13.75	12.50	1.31	3.88	4.88
3.125	5.50	0.500	7.88	6.88	1.06	3.38	4.38	8.250	11.00	0.625	14.00	12.75	1.31	3.88	4.88
3.250	5.62	0.500	8.00	7.00	1.06	3.38	4.38	8.500	11.25	0.625	14.25	13.00	1.31	3.88	4.88
3.375	5.75	0.500	8.12	7.12	1.06	3.38	4.38	8.750	11.50	0.625	14.50	13.25	1.31	3.88	4.88
3.500	5.88	0.500	8.25	7.25	1.06	3.38	4.38	9.000	12.25	0.750	16.00	14.50	1.69	4.62	5.62
3.625	6.00	0.500	8.38	7.38	1.06	3.38	4.38	9.500	12.75	0.750	16.50	15.00	1.69	4.62	5.62
3.750	6.12	0.500	8.50	7.50	1.06	3.38	4.38	10.000	13.25	0.750	17.00	15.50	1.69	4.62	5.62
3.875	6.25	0.500	8.62	7.62	1.06	3.38	4.38	10.500	13.75	0.750	17.50	16.00	1.69	4.62	5.62
4.000	6.38	0.500	8.75	7.75	1.06	3.38	4.38	11.000	14.25	0.750	18.00	16.50	1.69	4.62	5.62
4.125	6.50	0.500	8.88	7.88	1.06	3.38	4.38	11.500	14.75	0.750	18.50	17.00	1.69	4.62	5.62
4.250	6.62	0.500	9.00	8.00	1.06	3.38	4.38	12.000	15.25	0.750	19.00	17.50	1.69	4.62	5.62
4.375	6.75	0.500	9.12	8.12	1.06	3.38	4.38								

3 Installation of Non-Piloted MSS

- 3.1 **Spray one end of the split gland gasket O-ring (18)** with the adhesive accelerator provided. **Apply** one drop of the adhesive provided to the other end. **Position** the split O-ring around the shaft carefully aligning the two ends 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 retainer halves (142)** from the face of the gland halves and save the retainer halves and cap screws (40.3) for Step 3.8.
- 3.3 **Position the gland ring halves (1) around the shaft and fasten** them loosely together using the shoulder screws (414.1) provided.
- 3.4 Use some silicone lubricant provided to hold the gland gasket O-ring (18) 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 stationary face seat gasket O-rings (13)** and lubricate as in Step 3.1. Place the bonded O-ring in the gland counter-bore.
- 3.6 **Install the stationary face halves (14)** around the shaft with the lapped face outward (non-lapped face is identified with a groove or part marking) away from the seal chamber face. **Insert** the stationary face into the gland bore and nest it in the O-ring (13) while making sure there is no sealing face mismatch at joints. If mismatch is present, gently remove it.
Important: Be sure the stationary face joints are in line with the gland ring joints.
- 3.7 **Bond and lubricate the second stationary face mounting O-ring (13)** around the shaft as in Step 3.1 and **place** it over the stationary face outer shoulder.
- 3.8 **Securely attach the retainer halves (142)** to the face of the gland using cap screws (40.3) while positioning the retainer over the outer stationary face mounting O-ring.
- 3.9 **Tighten the shoulder screws (414.1)** in the gland ring halves while feeling for sealing face mismatch at the stationary face joints. If any mismatch occurs, loosen the shoulder screws (414.1) and shift the stationary face halves to remove the mismatch then continue with tightening the shoulder screws.

Note: Do not attempt to remove sealing face mismatch with the gland joint shoulder screws (414.1) fully tightened. Doing so may damage the stationary face.

- 3.10 **Insert the plastic centering device (92)** between the insert ID and the shaft.
- 3.11 **Carefully fasten the gland to the seal chamber by** tightening the gland fasteners to a 3.4 N-m (30 lb-in) maximum torque while feeling for seal face mismatch at stationary face joints. If any mismatch exists, loosen gland fastenings and shoulder screws (414.1), repeat step 3.9 and 3.10. Then proceed with tightening gland fasteners while again checking for sealing face mismatch.

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

- 3.12 **Remove the centering device (92).** Retain it for re-use with the spare parts kit.
- 3.13 **Mount the rotating seal face halves (15)** around the shaft and fasten them together using the cap screws (40) provided, tighten to a 3.4 N-m (30 lb-in) torque maximum. Check for seal face joint mismatch. If any mismatch exists, loosen the cap screws and shift the rotating face halves until no mismatch is felt. Retighten the cap screws.

Note: There are threads on both halves of the rotating seal face. Align halves carefully; do not allow a gap between halves during tightening.

- 3.14 **Clean the rubbing faces** of the rotating and stationary face with alcohol and **place** the rotating face so that its rubbing face is against the stationary rubbing face. See Step 2.7.
- 3.15 **Position the split shaft packing O-ring (76)** 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 backing ring (44)** into the seal ring bore next to the O-ring. **Install the two black elastomer backing rings (44.1).** Be sure to stagger the backing ring joints by 120°. **Do not bond the backing ring joints together.**

3.17 **Mount the seal drive halves** (2) around the shaft and loosely **fasten** them together with the shoulder screws (414) provided. Line up the pins in the seal drive with the holes in the rotating face and **slide** the seal drive towards the rotating face until a 3 mm (0.12 inch) spring gap is achieved using the two 1/8" Allen wrenches as spacers.

Tighten the shoulder screws completely and lock seal drive to the shaft.

On designs that incorporate set screws (57) in the seal drive, after tightening shoulder screws (414), tighten the set screws (57) to lock the seal drive to the shaft.

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, 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.

5 Repair

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.



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

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