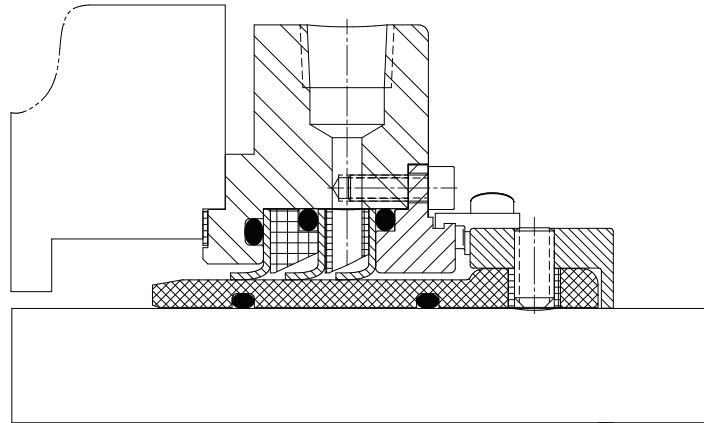


## PTFE MULTI-LIP CARTRIDGE SEAL

Installation, Operation &amp; Maintenance Instructions



### Foreword

These instructions are provided to familiarize the user with the seal and its designated use. The instructions must be read and applied whenever work is done on the seal, and must be kept available for future reference.

**ATTENTION** These instructions are for the installation and operation of the seal as used in rotating equipment and will help to avoid danger and maximize seal life. The information below may change with different models of the MLS or other types of equipment. These instructions must be read in conjunction with the instruction manuals for both the pump and any ancillary equipment.

If the seal is to be used for an application other than that originally intended or outside the recommended performance limits, John Crane must be contacted before its installation and use.

Any warranty may be affected by improper handling, installation, or use of this seal. Contact John Crane for information as to exclusive product warranty and limitations of liability.

If questions or problems arise, contact your local John Crane or the original equipment manufacturer, as appropriate.

**ATTENTION** John Crane seals are precision products and must be handled appropriately. Take particular care to avoid damage to the sealing elements and to the finish of the sleeve. Do not remove the sleeve before installation.

### Safety Instructions

1. The following designations are used in the installation instructions to highlight instructions of particular importance.

**NOTE** Refers to special information on how to install or operate the seal most efficiently.

**ATTENTION** Refers to special information or instructions directed towards the prevention of damage to the seal or its surroundings.



**Refers to mandatory instructions designed to prevent personal injury or extensive damage to the seal or its surroundings.**

2. Installation, removal and maintenance of the seal must be carried out only by qualified personnel who have read and understood these installation instructions.
3. The seal is designed exclusively for sealing rotating and static shafts. The manufacturer cannot be held liable for use of the seal for purposes other than this.
4. The seal must only be used in technically perfect condition, and must be operated within the recommended performance limits in accordance with its designated use set out in these installation instructions, unless otherwise specified by John Crane engineering.
5. If the pumped fluid is hazardous or toxic, appropriate precautions must be taken to ensure that any seal leakage is adequately contained. Further information on sealing hazardous or toxic fluids should be obtained from John Crane prior to seal installation. Be sure to have MSDS records accessible.
6. Fluorocarbon components should never be burned or incinerated as the fumes and residues are highly toxic. If fluorocarbons are accidentally heated above 750°F/400°C, they can decompose. Protective gloves should be worn as hydrofluoric acid may be present.
7. PTFE components should never be burned or incinerated as the fumes are highly toxic.

### Before Starting the Equipment

1. Check the pump at the coupling for proper alignment of the driver or motor.
2. Ensure that the gland plate nuts/bolts are securely tightened according to the pump manual instructions and all screws are securely fastened.
3. Complete the assembly of the pump and turn the shaft (by hand if possible) to ensure free rotation.
4. Consult all available equipment operating instructions to check for correctness of all piping and connections, particularly regarding seal recirculation/flush, heating or cooling requirement and services external to the seal.

**ATTENTION** This seal may be used in conjunction with an external barrier fluid in order to adequately remove the heat energy it creates. If so, the following check should be carried out not only after seal installation, but also after any period of equipment inactivity.

5. Check that the seal chamber fluid lines are open and free of any obstruction, and ensure that the seal chamber is properly vented and filled with liquid. Refer to the pump instruction manual.



**Before startup, ensure that all personnel and assembly equipment have been moved to a safe distance so there is no contact with rotating parts on the pump, seal, coupling or motor.**

**WARNING**

Seal installation should be handled only by qualified personnel. If questions arise, contact the local John Crane representative. Improper use and/or installation of this product could result in injury to the person and/or harmful emissions to the environment, and may affect any warranty on the product. Please contact the company for information as to exclusive product warranty and limitations of liability.

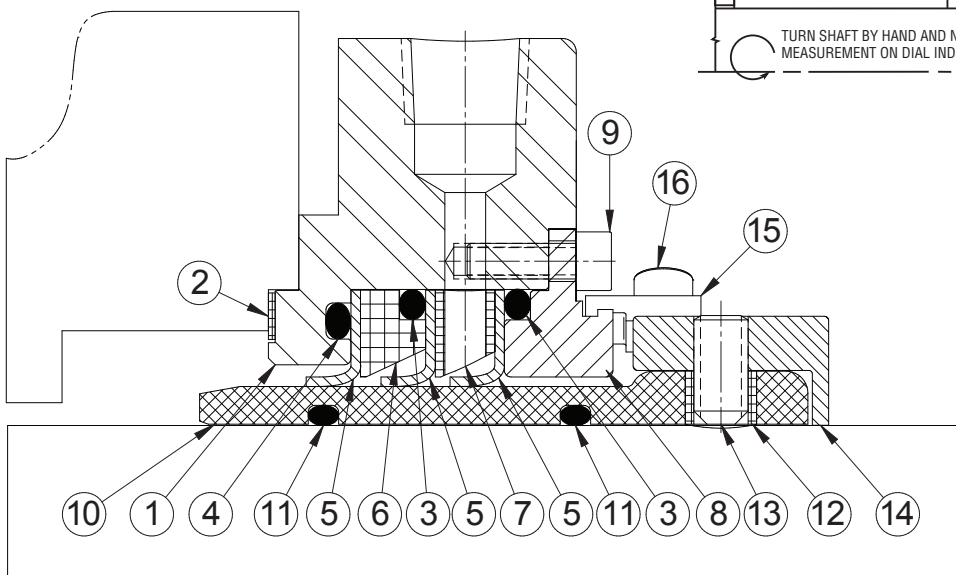
### Operating Conditions

#### General Instructions

Study the engineering layout drawing to confirm that the seal gasket and gland will mate successfully with the stuffing box. There are different seal configurations depending on the design of the stuffing box.

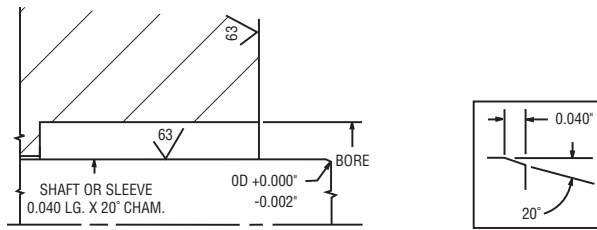
#### Typical Type MLS-1 Seal Arrangement

- |                      |                        |
|----------------------|------------------------|
| 1 – Cast gland plate | 9 – Cap screw          |
| 2 – Gasket           | 10 – Sleeve            |
| 3 – O-ring           | 11 – O-ring            |
| 4 – O-ring           | 12 – Set screw bushing |
| 5 – Lip seal         | 13 – Set screw         |
| 6 – O-ring spacer    | 14 – Drive collar      |
| 7 – Flush spacer     | 15 – Spacer            |
| 8 – Compression ring | 16 – Cap screw         |

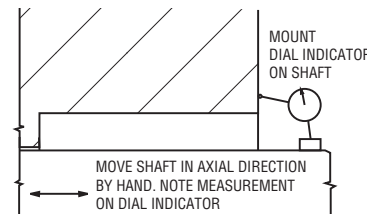


#### Preparing the equipment

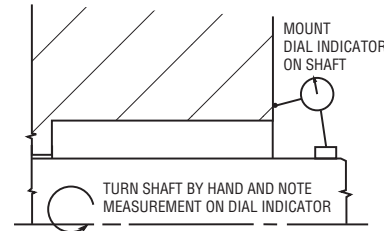
1. Check the stuffing box dimensions and finishes.



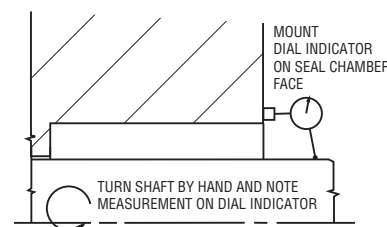
2. Measure axial end play ( $\pm 0.100''/2.54\text{mm}$  max.).



3. Measure shaft runout ( $\pm 0.005''/0.127\text{mm}$  max.).



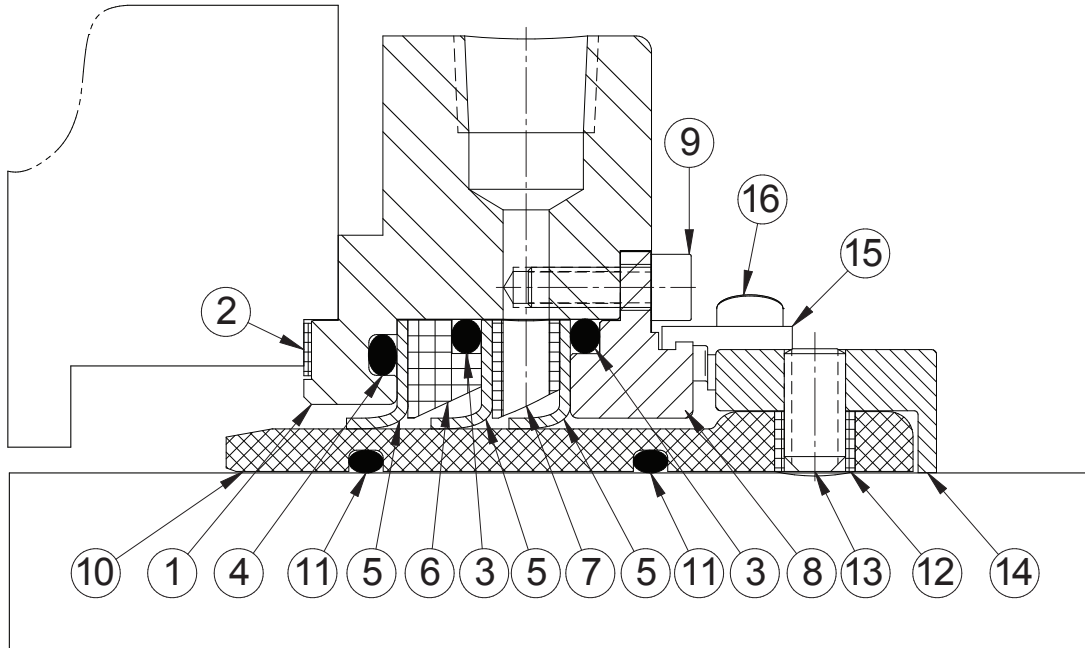
4. Measure squareness of the stuffing box to the shaft ( $\pm 0.002''/0.051\text{mm}$  max.).



**NOTE:** If measured dimensions exceed those values given, correct the equipment to meet specifications prior to seal installation.

## PTFE MULTI-LIP CARTRIDGE SEAL

Installation, Operation &amp; Maintenance Instructions



### Type MLS-1 Seal Assembly (Repair Kit)

#### Removing Old Parts

- Remove the sleeve (10) and drive collar (14) assembly from the gland
  - Remove the 4 cap screws (16) and spacers (15). Set aside and save for reassembly.
  - Remove the sleeve (10) and drive collar (14) assembly from the gland (1). Set aside and save for reassembly.
- Place the gland (1) on the table with the gasket (2) side facing down
- Remove the 4 cap screws (9) that secure the compression ring (8) to the gland (1). Set aside and save for reassembly.
- Remove the compression ring (8). Set aside and save for reassembly.
- Remove the O-ring (3) from the compression ring (8) and discard.
- Remove the internal lip seals (5), spacers (6 & 7) and O-rings (3 & 4).
- Once disassembled, clean and dry all parts which will be reused. Discard all O-rings and lip seals. They will be replaced.

#### Reassembly

- Ensure that the gland (1) is set with the gasket (2) facing down.
- Install the O-ring (4) into the gland (1).
- Place one new lip seal (5) into the gland (1) with the curved surface of the lip seal (5) facing down.
- Place an O-ring (3) on the O-ring spacer (6) and install in the gland (1) with the O-ring (3) side up.
- Place the second lip seal (5) into the gland (1) with the curved surface of the lip seal (5) facing down.

- Install the flush spacer (7) into the gland (1) ensuring that the port holes in the flush spacer (7) are aligned with those in the gland (1).
- Place the third lip seal (5) into the gland (1) with the curved surface of the lip seal (5) facing down.
- Install the O-ring (3) onto the compression ring (8) and place the compression ring (8) with the O-ring (3) into the gland (1). Ensure that the screw holes align with the gland (1).
- Hand tighten the 4 cap screws (16), alternating between the screws until the compression ring (8) is secure.
- Check again to ensure that the flush spacer (7) ports align with the flush holes of the gland (1).
- Fully tighten the 4 cap screws (16) on the compression ring (8) with a 1/8" Allen wrench.
- Lightly lubricate the inner diameter of the 3 lip seals (5). Use vegetable oil, animal oil, mineral-hydrocarbon oils, soap solution, Parker Super-O-Lube® or silicone grease.

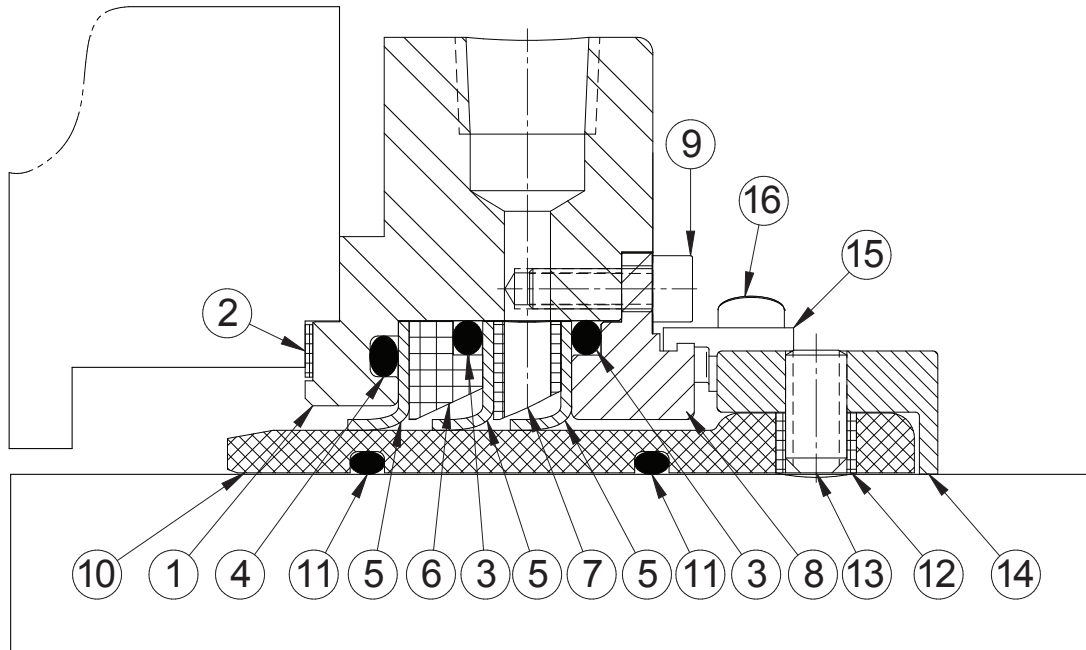
#### NOTE

Always use a lubricant that is compatible with your machinery and product. Use the lubricant sparingly, only enough to install seal with ease.

- Insert 2 O-rings (11) inside the sleeve (12) and ensure that they fully seat into the grooves.
- Insert the sleeve (12) into the gland (1) using a rotating motion.
- Install the 4 spacers (15) onto the compression ring (8) using the 4 cap screws (16).
- This completes the reassembly of the MLS multi-lip seal. The next step is to reinstall on the equipment from which it was removed.

## PTFE MULTI-LIP CARTRIDGE SEAL

Installation, Operation &amp; Maintenance Instructions



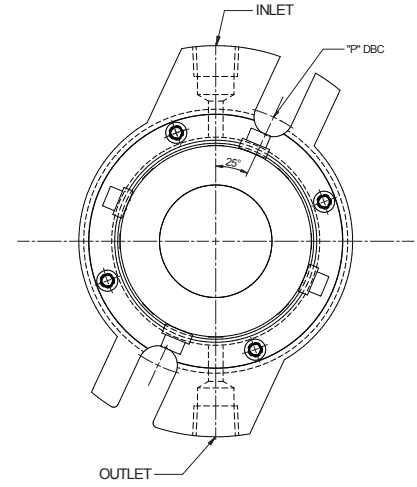
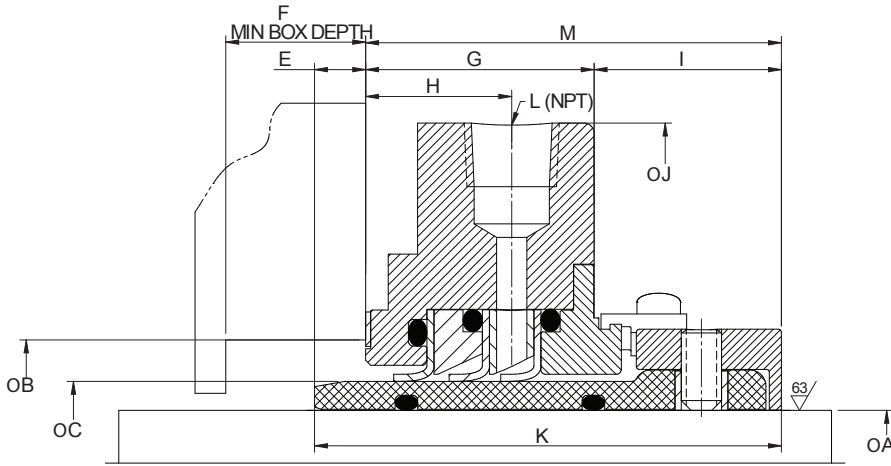
### Install the Seal

1. Before installing the MLS, read the instructions carefully.
2. Remove the seal from its packaging and inspect for cleanliness and damage.
3. The equipment should be clean and meet the specifications noted in the "Preparing the equipment" section. Lubricate sleeve O-ring with lubricant recommended in step 12 on page 3. Lubricate shaft sparingly. Lubricate gland plate bolts/nuts as required.
4. Make sure the gland (1) is oriented correctly and slide the complete cartridge seal onto the shaft. Hand tighten the two bolts through the gland (1). Reassemble the pump and make all necessary impeller adjustments.
5. Continue tightening gland (1) bolts/nuts in an alternating pattern until secure (1/4 turns, 180° apart), with gland (1) and face of the stuffing box metal to metal. Do not overstress or distort the gland (1).
6. Verify that the gland (1) is square with the stuffing box. Firmly press the sleeve (10) against the gland (1) until the spacers (15) rest against the compression ring (8). This ensures that the sleeve (10) is centered properly both axially and radially.
7. Tighten the 8 set screws (13) to the shaft until they lightly touch the shaft. Alternate 180° for each one.
8. Rotating the shaft by hand, visually assess the centering of the gland (1). Make any adjustments to yield a centered seal. Adjustments may not be necessary.
9. Tighten the 8 set screws (13) to the shaft. Tighten each with final setting torque. Alternate 180° for each set screw (13) in order to ensure cylindricity of the sleeve (1) with the shaft.
10. Make appropriate piping connections for external flush system if necessary. Refer to john crane for flush system setup.



**A seal installed out of center can result in shortened seal life.**

### Type MLS-1 Installation Dimensions



**NOTE:** Inlet and outlet are independent of direction, view, and shaft rotation

### (Inches)

A Seal Size	B (Bore)		C	E	F (Min Box Depth)	G (Gland Length)	H	I	J (Gland OD)	K	L (NPT)	M (Out of Box)	N	O (slot diam)	P (DBC gland)
	Min.	Max.													
1.125	1.825	2.25	1.625	0.351	0.601	1.383	0.872	1.162	4	2.896	1/4 - 18	2.545	3.5	0.375	3.125
1.375	2	2.25	1.796	0.317	0.567	1.417	0.906	1.162	5	2.896	1/4 - 18	2.579	3.5	0.5	3.5
1.437	2	2.5	1.796	0.14	0.39	1.277	0.766	1.162	5	2.896	1/4 - 18	2.439	3.5	0.5	3.5
1.625	2.25	2.7	2.04	0.316	0.566	1.418	0.907	1.162	5	2.896	1/4 - 18	2.58	3.5	0.5	3.5
1.750	2.365	3.75	2.165	0.401	0.651	1.333	0.822	1.162	6	2.896	1/4 - 18	2.495	4.5	0.687	5.187
1.875	2.25	3.75	2.29	0.401	0.651	1.333	0.822	1.162	6	2.896	1/4 - 18	2.495	4.5	0.687	5.187
2.250	3	3.75	2.625	0.401	0.651	1.333	0.822	1.162	6	2.896	1/4 - 18	2.495	4.5	0.687	5.187
2.437	3.1	3.8	2.812	0.325	0.575	1.408	0.897	1.162	6.73	2.896	1/4 - 18	2.57	4.812	0.687	5.5
2.500	3.2	3.8	2.875	0.326	0.576	1.408	0.897	1.162	6.73	2.896	1/4 - 18	2.57	4.812	0.687	5.5
3.437	4.69	5.5	3.812	0.214	0.464	1.52	0.906	1.162	8.75	2.896	1/4 - 18	2.682	5.938	0.812	6.75

### (Millimeters)

A Seal Size	B (Bore)		C	E	F (Min Box Depth)	G (Gland Length)	H	I	J (Gland OD)	K	L (NPT)	M (Out of Box)	N	O (slot diam)	P (DBC gland)
	Min.	Max.													
28.575	46.355	57.150	41.275	8.915	15.265	35.128	22.149	29.515	101.600	73.558	1/4 - 18	64.643	88.900	9.525	79.375
34.925	50.800	57.150	45.618	8.052	14.402	35.992	23.012	29.515	127.000	73.558	1/4 - 18	65.507	88.900	12.700	88.900
36.500	50.800	63.500	45.618	3.556	9.906	32.436	19.456	29.515	127.000	73.558	1/4 - 18	61.951	88.900	12.700	88.900
41.275	57.150	68.580	51.816	8.026	14.376	36.017	23.038	29.515	127.000	73.558	1/4 - 18	65.532	88.900	12.700	88.900
44.450	60.071	95.250	54.991	10.185	16.535	33.858	20.879	29.515	152.400	73.558	1/4 - 18	63.373	114.300	17.450	131.750
47.625	57.150	95.250	58.166	10.185	16.535	33.858	20.879	29.515	152.400	73.558	1/4 - 18	63.373	114.300	17.450	131.750
57.150	76.200	95.250	66.675	10.185	16.535	33.858	20.879	29.515	152.400	73.558	1/4 - 18	63.373	114.300	17.450	131.750
61.900	78.740	96.520	71.425	8.255	14.605	35.763	22.784	29.515	170.942	73.558	1/4 - 18	65.278	122.225	17.450	139.700
63.500	81.280	96.520	73.025	8.280	14.630	35.763	22.784	29.515	170.942	73.558	1/4 - 18	65.278	122.225	17.450	139.700
87.300	119.126	139.700	96.825	5.436	11.786	38.608	23.012	29.515	222.250	73.558	1/4 - 18	68.123	150.825	20.625	171.450

## PTFE MULTI-LIP CARTRIDGE SEAL

Installation, Operation &amp; Maintenance Instructions

### Decommissioning the Equipment

1. Ensure that the equipment is electrically isolated.



**If the equipment has been used on toxic or hazardous fluids, ensure that the equipment is correctly decontaminated and made safe prior to commencing work. Fluid is often trapped during draining and may exist outside the seal. The equipment instruction manual should be consulted for any special precautions.**

2. Ensure that the equipment is isolated by the appropriate valves. Check that the fluid is drained and pressure is fully released.

### Maintenance

No maintenance of a seal is possible while installed. It is recommended that a spare seal or repair kit (specific to shaft size and MLS model) be held in stock to allow immediate replacement/repair of a removed seal. All maintenance of this seal can take place in the field via the Repair Kit. See the "MLS-1 Seal Assembly" section. It is recommended that used seals be returned to a John Crane service location, as rebuilding to as-new specifications must be carried out by qualified personnel.



**It is the responsibility of the equipment user to ensure that any used parts sent to John Crane or a third party have appropriate safe handling instructions externally attached to the package.**

### Ordering Information

1. Seal size = shaft OD.
2. Verify that operating parameters do not exceed MLS performance capabilities.
3. Determine the dimensions of the stuffing box as well as the nearest obstruction both axially and radially.
4. For unique applications, consult John Crane.

### Materials of Construction

Description	Materials
Gland, screws, compression ring, spacers:	316 SS
Sleeve:	Silicon carbide
Gland/sleeve O-ring:	Fluoroelastomer
Gasket:	100% virgin PTFE (FDA)
Setting spacer, O-ring spacer, flush spacer:	Glass-filled PTFE (FDA)
Lip seals:	Graphite-filled PTFE

### Performance Capabilities

Temperature:	Up to 325°F / 163°C
Pressure:	Up to 200 psig/13.8 barg
Speed:	Up to 900 fpm / 4.6 m/s and to 2,500 fpm / 12.7 m/s with lubrication
Viscosity:	20 to 500,000 cP
End play/axial float allowance:	±0.100" / 2.54mm
Runout/out of squareness:	±0.005" / 0.127mm
Size range:	1.125" to 3.437" / 28.58mm to 87.30mm

(Contact John Crane for additional sizes.)

### Quality Assurance

A static pressure test has been performed to verify functionality of the sealing elements. This seal has been inspected for component arrangement and assembly completion in accordance with John Crane quality assurance standards. With proper maintenance and use, this seal will give safe and reliable operation to the maximum recommended performance as shown in any relevant approved John Crane publication.



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Singapore  
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Fax: 65-6518-1803

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