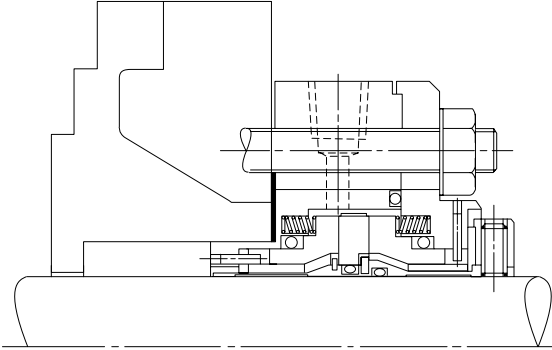


### Foreword

This instruction manual is 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 a seal as used in rotating equipment. The instructions will help to avoid danger and increase reliability. The information required may change with other types of equipment or installation arrangements. This manual 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 representative or the original equipment manufacturer, as appropriate.

**ATTENTION** John Crane mechanical seals are precision products and must be handled appropriately. Take particular care to avoid damage to lapped sealing faces and to flexible sealing rings. Do not excessively compress the seal before or during 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.**

- Installation, removal and maintenance of the seal must be carried out only by qualified personnel who have read and understood these installation instructions.
- The seal is designed exclusively for sealing rotating shafts. The manufacturer cannot be held liable for use of the seal for purposes other than this.
- 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 and the instructions set out in this manual.

- 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.
- PTFE and Fluorocarbon components should never be burned or incinerated as the fumes and residues are highly toxic. If fluorocarbons are accidentally heated above 400°C/750°F, they can decompose, therefore, protective gloves should be worn as hydrofluoric acid may be present.

### Operating Conditions

The Type 2800E is a direct drive, dry running, double seal cartridge, using non-contacting spiral groove technology, and available in metric and inch sizes.

Metric sizes conform to the DIN 24960 dimensional standard, and inch sizes comply with ASME B73.1M 1991.

These instructions apply to the cartridge seal as installed in accordance with the application information contained in the John Crane technical document S-2800E-E, and any John Crane seal selection literature or process. Typical operating limits are shown below.

The seal requires a dried and filtered barrier gas supply of plant nitrogen or instrument air maintained at a minimum of 2 bar/30 psig above the seal chamber process fluid pressure. The barrier gas pressure must never drop below the seal chamber pressure.

The selection of materials used in the construction of a seal should be made with regard to their temperature and chemical resistance/compatibility with the liquid being pumped.

Temperature limits: -40°F to +500°F/-40°C to +260°C  
(depending on the materials used)

Pressure limits: up to 230 psig/16 bar g (refer to pressure graph)

Speed limits: 5000 fpm

### Before Installing the Equipment

- Ensure that the cartridge drive collar set screws and the gland plate retaining nuts have been correctly tightened.

**ATTENTION** The seal unit must be turned only in the direction indicated by the arrow marked on the unit.

- Complete assembly of the equipment and turn the shaft by hand to ensure free rotation. Check the direction of rotation of the motor is correct.
- Check that all pipework is correctly connected and the fittings are leak-free, particularly for the barrier gas supply.
- Pressurize the seal with barrier gas to a min. of 30 psig above the seal chamber pressure. If the seal chamber pressure cannot be specified, the seal should be pressurized to a min. of 22 psig above discharge pressure.

**NOTE:** The min. barrier gas pressure required to ensure seal operation is 30 psig.

### Recommended Torques for Gland Plate Bolts

Seal Size Code	Metric Bolt Sizes			Inch Bolt Sizes		
	mm	Torque		Inches	Torque	
		Nm	lbf ft		Nm	lbf ft
0250	10	17	12	7/16	19	14
0280	10	18	13	7/16	20	15
0300	10	19	14	7/16	22	16
0330	10	19	14	7/16	22	16
0350	12	20	15	1/2	23	17
0380	12	22	16	1/2	26	19
0400	12	25	18	1/2	27	20
0430	12	27	20	1/2	29	21
0450	12	29	21	1/2	31	23
0500	12	32	24	1/2	32	24
0550	16	37	27	5/8	37	27
0600	16	52	38	5/8	48	35
0650	16	61	45	5/8	57	42
0800	16	86	63	5/8	90	66
1000	20	148	109	3/4	144	106

### Removing the Equipment

1. Ensure that the pump 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. Remember that fluid is often trapped during draining and may be present inside the seal chamber. The pump instruction manual should be consulted to check for any special precautions.

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

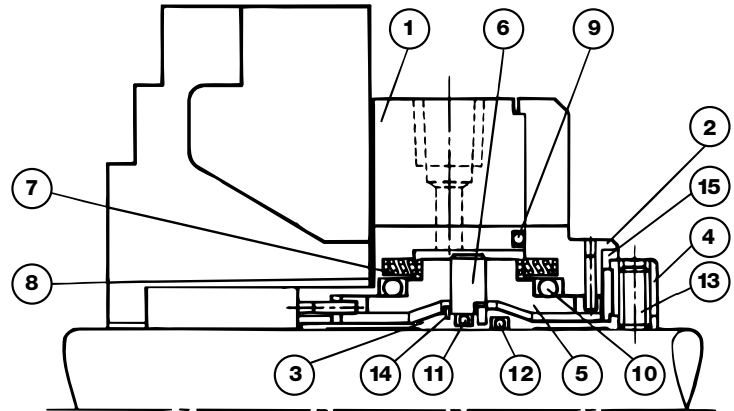
### Removing the Seal

1. Referring to the pump instruction manual, dismantle the equipment sufficiently to expose the cartridge seal and the seal housing.

2. Remove the seal unit in the reverse order to installation.

**NOTE:** If the cartridge is difficult to separate from the housing face, 'jack' the unit off the pump using suitable bolts in the two tapped extraction holes provided in the gland plate.

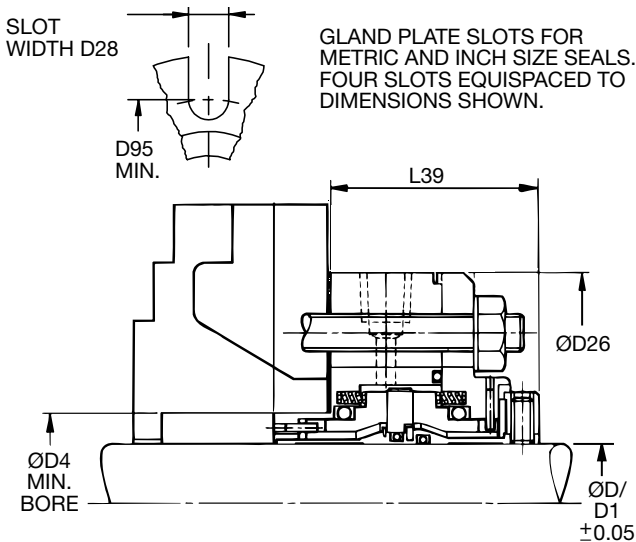
### Typical Type 2800E Seal Arrangement



#### Part Name

1 Inner Gland Plate Assy	6 Mating Ring	11 Mating Ring O-ring
2 Outer Gland Plate Assy	7 Springs	12 Sleeve O-ring
3 Sleeve	8 Spigot/Housing Gasket	13 Setscrews
4 Drive Collar	9 Gland Plate O-ring	14 Retaining/Snap Ring
5 Primary Ring	10 Primary Ring O-rings	15 Setting Ring

### Type 2800E Seal Installation Dimensions



### Type 2800E Inch Range Dimensional Data (mm)

Seal Size (inches)	Seal Size Code	D	D4	D26	D28	D95	L39
0.875	0222	22.23	38.10	95.2	11.10	58.3	51
1.000	0254	25.40	41.28	95.2	11.10	61.5	51
1.125	0285	28.58	44.45	108.0	11.10	62.7	51
1.250	0317	31.75	50.80	108.0	11.10	67.8	51
1.375	0349	34.93	53.98	107.8	11.10	71.0	51
1.500	0381	38.10	57.15	123.8	11.10	79.8	56
1.625	0412	41.28	60.33	114.3	11.10	83.0	56
1.750	0444	44.45	63.50	139.7	14.27	86.1	56
1.875	0476	47.63	66.68	139.7	14.27	84.7	56
2.000	0508	50.80	69.85	120.7	14.27	87.9	56
2.125	0539	53.98	73.03	152.5	17.45	95.7	56
2.250	0571	57.15	79.38	165.1	17.45	98.8	56
2.375	0603	60.33	82.55	158.7	17.45	102.0	56
2.500	0635	63.50	85.73	165.1	17.45	105.2	58
2.625	0666	66.68	92.08	165.1	17.45	108.4	58
2.750	0698	69.85	95.25	177.8	17.45	111.5	58
3.000	0762	76.20	101.60	177.8	17.45	117.9	58
3.500	0889	88.90	114.30	184.2	20.62	130.6	58
4.000	1016	101.60	127.00	184.2	20.62	143.3	58

### Checking the Equipment

Successful operation and life of this seal is dependent on acceptable equipment dimensions and alignments. Before installation of the seal the following dimensional checks should be made with respect to the seal housing/ shaft alignments, finish and lead-on. Normal equipment to measure these features would be a micrometer and dial indicator.

Shaft/Sleeve Outside Diameters (OD)	Refer to Dimension Tables
Seal Chamber Bore Diameter and Depth	Refer to Dimension Tables
Shaft/Sleeve Finish under the Seal Uni	63 Ra (Machined)
Shaft/Sleeve Ovality (out of round)	0.05 mm/0.002 in.
Shaft Axial End Float (End Play)	< 0.08 mm/0.003 in. F.I.M.
Seal Housing End Face Squareness to Shaft/Sleeve	Refer to Housing Squareness Graph
Concentricity of the Seal Chamber to the Shaft/Sleeve	0.15 mm/0.006 in. F.I.M.
Shaft/Sleeve Run-Out with Respect to the Seal Chamber	< 0.075 mm/0.003 in. F.I.M. < 1800 rpm < 0.05 mm/0.002 in. F.I.M. < 3600 rpm

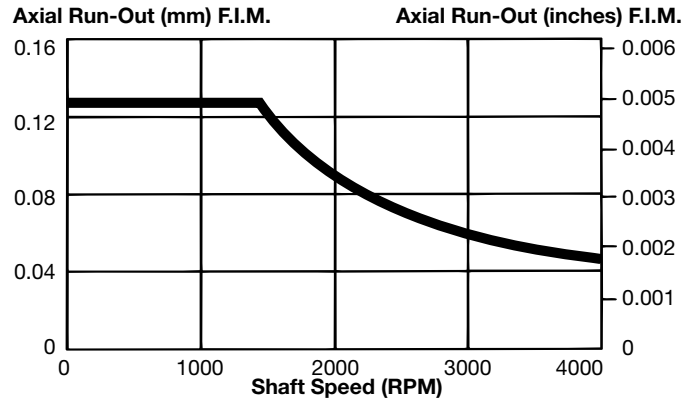
**NOTE:** If the measured dimensions exceed those values given, correct the equipment to meet the specifications prior to installing the seal. If the seal is installed on a shaft sleeve, the sleeve must be liquid and pressure tight through its bore.

### Lead-On Chamfer

For ease of installation, the lead-on edge of the shaft or sleeve should be chamfered as shown.

\* Above 0635 4.0mm

### Housing Squareness to Shaft



### Seal Support Systems

The seal requires a clean barrier gas supply at 30 psig/2 bar above seal chamber process pressure. This barrier gas pressure must never drop below the seal chamber pressure.

If shop air is to be used, or if the gas source is not clean and dry, a moisture trap and a 10-micron filter must be included in the line.

A gas control panel is recommended for optimal system performance and control, and John Crane can supply either a low pressure enclosed unit (0 to 10 bar), or panel-mounted systems (0 to 25 bar) for low to higher pressures- see system diagrams. Modified and custom panels are available.

These systems can be specified to serve the following functions:

- Barrier source regulation
- Barrier consumption measurement
- Detection of barrier pressure drop
- Maintenance of gas integrity
- Process containment on primary seal failure

For further information contact your local John Crane representative.

### Piping Connections

The gland plate is provided with two pipework connections, both tapped 1/4 in. NPT: if another size or threadform is required, a suitable adapter must be fitted.

One connection is for the barrier gas supply and is fitted with a plastic plug: the second connection is sealed with a metal plug and is for use only as a drain to check for the presence of liquid in the unlikely event of an inboard seal failure.

**ATTENTION** The inlet connection plastic plug is a temporary fitting for storage and transit only, and must not be used for any other purpose. The metal drain plug must not be removed before or during seal operation as barrier gas pressure will be lost.

### Checking the Seal

1. Remove the seal unit from the protective packaging, and visibly check the seal exterior generally for any signs of transit damage.
2. Check for free rotation of the seal unit as follows: Ensure the drive collar set screws are engaged in the sleeve; insert an allen wrench into any set screw socket, and use it as a lever to rotate the drive collar and sleeve assembly IN THE DIRECTION OF THE ARROW ONLY for one full turn. The assembly should rotate freely with the minimum of resistance.

**NOTE:** If the cartridge shows any evidence of damage, or if the seal does not rotate freely, the unit should be returned to John Crane for repair.

3. Check that the direction of the pump/equipment shaft rotation is the same as that marked on the seal (drive collar).

### Installing the Seal

Before starting the installation, read through the following instructions carefully, both to be aware of special information and because the fitting sequence may be different depending on the construction of the equipment.

1. Adjust the drive collar set screws until they are just clear of the sleeve bore, but remain engaged in the sleeve.
2. Using the silicone grease supplied with the cartridge, sparingly lubricate the sleeve O-ring, sleeve bore, and equipment shaft.

**ATTENTION** Do not use hydrocarbon or mineral-based lubricants on ethylene propylene O-rings.

3. Check that the gasket is clean, undamaged, and in position, then carefully slide the cartridge fully onto the shaft.

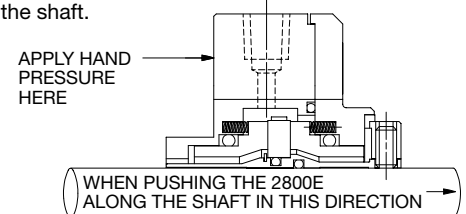


Diagram 1

### Installing the Seal (continued)

**ATTENTION** When positioning the cartridge on the shaft, apply hand pressure only as shown in Diagram 1: pressure must not be applied to the outboard gland plate. Do not allow the cartridge to rest while only partially supported by the shaft.

4. Rotate the cartridge so that the barrier gas inlet connection is correctly positioned.
5. Reassemble the equipment, slide the cartridge along the shaft to engage the studs (or align the bolt holes) and push the seal in the housing.
6. Place suitably sized washers on the gland plate studs/bolts, and then screw down the nuts/bolts hand-tight only. Installing the Seal

7. Lightly and evenly screw down the drive collar set screws to centralize the cartridge on the shaft, then fully tighten the screws to a torque of 4.5 lbf ft.

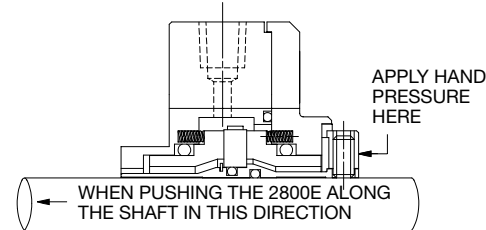
**NOTE:** Where a torque measuring device is not available, tighten the set screws with the allen wrench until a torsional twist of 60°-90° is achieved (see Diagram 2). The torque thus applied will approximate to that recommended.

8. Tighten the gland plate nuts/bolts one nut at a time, alternately, to the recommended torque - see table. Do not overtighten.

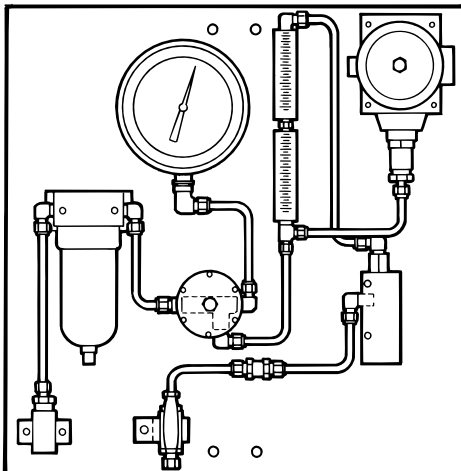
**ATTENTION** The torque values given in the table are the recommended maximum for each of four bolts of the diameter shown: if smaller bolts are used, refer to John Crane for advice. The values given are invalid for re-used or sealant-coated gaskets.

9. Connect the barrier gas supply pipework - refer to Piping Connections.

Diagram 1



### Barrier Gas Enclosure



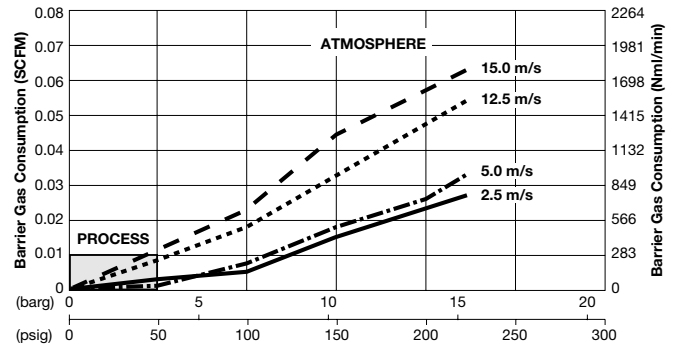
#### Standard Components

- Check Valve
- Pressure Regulator
- Pressure Gauge
- Flow Meter (High)
- Flow Meter (Low)
- Isolating Valve
- Coalescing Filter
- Panel/Enclosure

#### Additional Options

- Pressure Switch
- Flow Switch
- Customer Specific Instrumentation
- Alternative Material

### Barrier Gas Consumption



\* Curves are to be used as a guide only. Actual consumption rates may vary. Consult John Crane if specific application gas consumption data is required.

### Storage and Transport

Instructions for the handling, packaging, storage and transport of seal units and mating rings are given in I-Storage-E, available on request.

### Maintenance

During operation, periodic inspection of the seal should be carried out. A measure of seal condition is the level of leakage, and as no maintenance is possible while installed, the seal should be replaced when leakage becomes unacceptable. It is recommended that a spare seal unit is held in stock to allow immediate replacement of a removed seal.

A cartridge seal must always be serviced after removal from duty. It is recommended that used seals are returned to a John Crane service location, since rebuilding to as-new specification must be carried out by qualified personnel.



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



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United Arab Emirates  
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**Asia Pacific**  
Singapore  
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Fax: 65-6518-1803

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