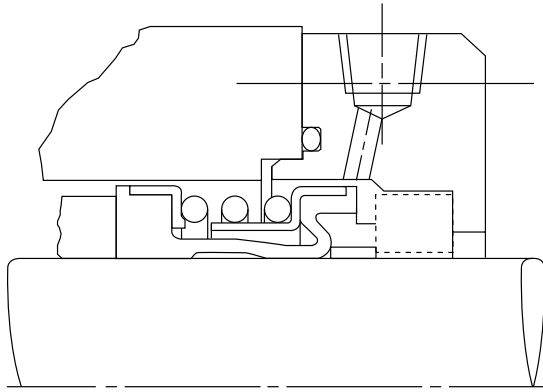


**Foreword**

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.

**Foreword continued**

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

**Safety Instructions**

- The following designations are used in this instruction manual 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 and removal of the seal must be carried out only by qualified personnel who have read and understood this instruction manual.

**Checking the Equipment**

Successful operation and life of this seal is dependent on acceptable equipment dimensions, alignments, and finishes. Before installation of the seal, the following checks should be made with respect to the seal housing and the shaft, especially (where marked †) at the seal position. The usual equipment to measure these features would include a micrometer and dial indicator.

Shaft/Sleeve Outside Diameter(OD)†	Refer to Dimension Tables
Seal Chamber Bore Diameter	Refer to Dimension Tables
Shaft/Sleeve Finish †	0.8 to 1.2 $\mu\text{m}$ Ra (Machined)
Shaft/Sleeve Ovality/ Out-of-Roundness †	<0.1 mm/0.004 in.
Shaft End Play/Axial Float	<0.08 mm/0.003 in. F.I.M.
Shaft/Sleeve Lead-On	Refer to Lead-On Chamfer
Shaft/Sleeve Run-Out †	<0.08 mm/0.003 in. F.I.M. $\leq$ 1800 rpm <0.05 mm/0.002 in. F.I.M. >1800 rpm
Seal Housing End Face Squareness to Shaft/Sleeve	Refer to Housing Squareness Graph to Shaft/Sleeve
Concentricity of the Seal Chamber to the Shaft/Sleeve	<0.15 mm/0.006 in. F.I.M.

**ATTENTION** These instructions are for the installation and operation of a single seal running against a seat/mating ring of appropriate material and design 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 arrangement, and this manual must be read in conjunction with the instruction manual supplied with the seat/mating ring and 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.

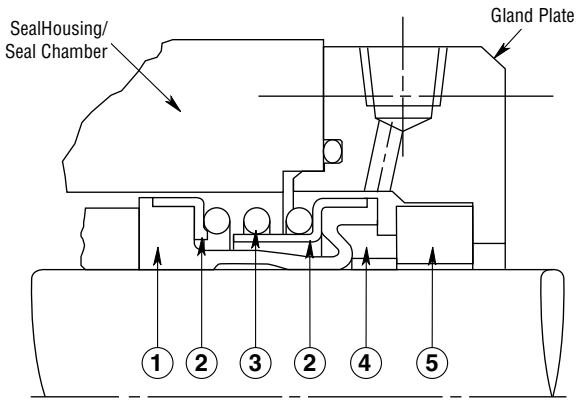
- The seal is designed exclusively for sealing rotating shafts. The manufacturer cannot be held liable for use of the seal for purposes other than this.
- The seal must only be used in technically perfect condition and in conjunction with a suitable seat/mating ring, and must be operated within the recommended 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 installation.
- PTFE and fluorocarbon components should never be burned or incinerated as the fumes are highly toxic. If fluorocarbons are accidentally heated above 400°C they can decompose, and protective gloves must be worn when handling as hydrofluoric acid may be present.

**Storage and Transport**

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

**NOTE:** If the measured dimensions exceed the values given, correct the equipment to meet the specifications before installing the seal. If the seal is installed on a sleeve, the sleeve must be liquid- and pressure-tight through its bore. The thickness of the gland plate must be sufficient to retain the service pressure without distortion.

## Typical Type 2100 Seal Arrangement

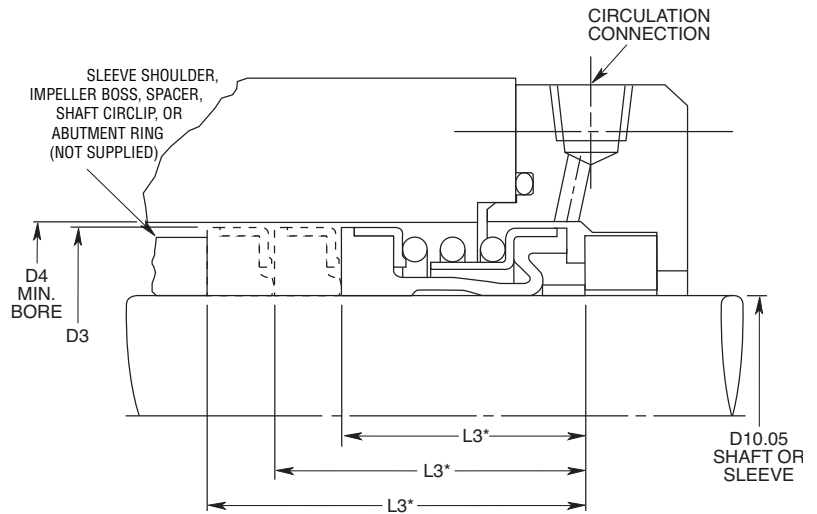


### Part Name

<b>1</b> Bellows	<b>4</b> Face/Primary Ring
<b>2</b> Drive Band	<b>5</b> Seat/Mating Ring and Seat Ring*
<b>3</b> Spring	

\* Refer to seat/mating ring instruction manual

## Type 2100 Seal Installation Dimensions



\*WORKING LENGTH TOLERANCES:  
SEAL SIZE CODES 0095 TO 0160 - L31.0  
0180 TO 0430 - L31.5

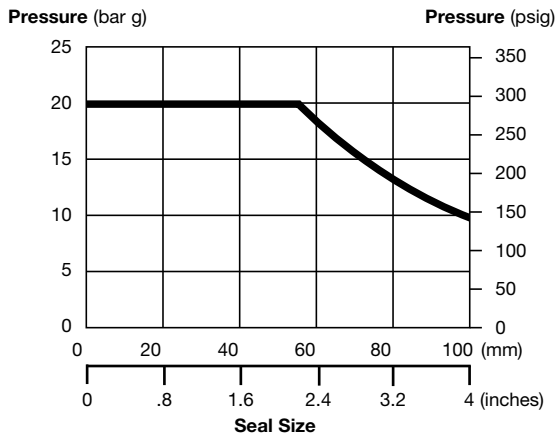
## Type 2100 Inch Range Dimensional Data

Seal Size	Seal Size Code	D1	D3	D4	L3
0.375	0095	0.375	0.787	0.866	0.591
0.500	0127	0.500	0.945	1.024	0.591
0.625	0158	0.625	1.024	1.102	0.591
0.750	0190	0.750	1.260	1.339	0.787
0.875	0222	0.875	1.417	1.496	0.787
1.000	0254	1.000	1.535	1.614	0.787
1.125	0285	1.125	1.654	1.732	1.024
1.250	0317	1.250	1.811	1.890	1.024
1.375	0349	1.375	1.929	2.008	1.024
1.500	0381	1.500	2.126	2.283	1.181
1.625	0412	1.625	2.205	2.362	1.181
1.750	0444	1.750	2.402	2.559	1.181
1.875	0476	1.875	2.520	2.677	1.181
2.000	0508	2.000	2.598	2.756	1.181
2.125	0539	2.125	2.717	2.874	1.181

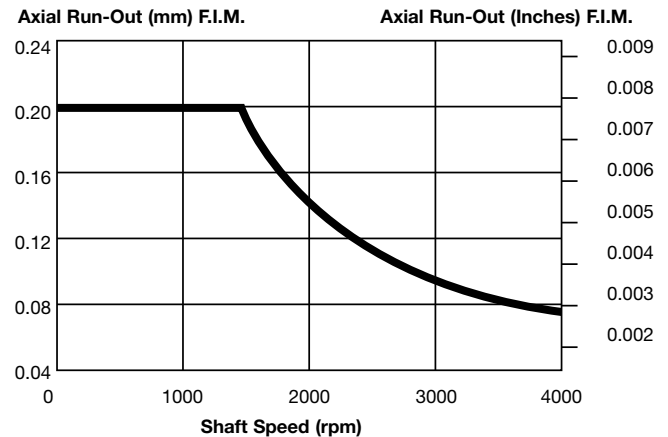
## Type 2100 Metric Range Dimensional Data

Seal Size	Seal Size Code	D1	D3	D4	L3
2.250	0571	2.250	3.031	3.189	1.299
2.375	0603	2.375	3.150	3.346	1.299
2.500	0635	2.500	3.268	3.465	1.299
2.750	0698	2.750	3.504	3.740	1.299
3.000	0762	3.000	3.898	4.094	1.575
3.250	0825	3.250	4.094	4.291	1.575
3.500	0889	3.500	4.409	4.606	1.575
3.750	0952	3.750	4.646	4.882	1.575

## Pressure/Velocity (PV) Limits



## Housing Squareness to Shaft



The maximum operating pressures shown apply under the following conditions: carbon graphite face/primary ring running against a silicon carbide or tungsten carbide seat/mating ring, with a lubricating sealed fluid at 80°C/175°F.

Maximum static/test pressures should be taken as the relevant maximum operating pressure multiplied by a factor of 1.5.

## Setting the Seal

The seal must be installed to its correct working length L3. Setting procedure is described with respect to the shaft, but is equally applicable to a fitted sleeve.

**ATTENTION** If L3 is overlength, the seal will be undercompressed and will leak; if L3 is underlength, the seal will be overcompressed and this will cause dry running and high wear of the seal faces.

Find the true seal abutment position as follows:

1. Refer to the appropriate seat/mating ring instruction manual to obtain dimension 'X' from the face of the gland plate to the seat mating surface (Figure 1).
2. With the shaft in its working position, mark the surface at 'Y' in line with the seal housing end face, and mark the shaft again at 'Z' the obtained distance away from the face position (Figure 2). This second mark is a datum for the seal working length L3.
3. From the dimension tables, find the dimension L3 for the size of seal being fitted, and measure the distance back from position 'Z' (Figure 3). The new marked position is the point on the shaft where the back of the seal is to be located.

Figure 1

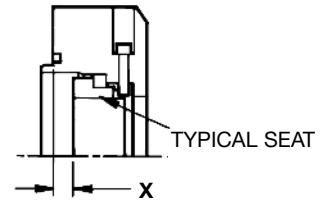


Figure 2

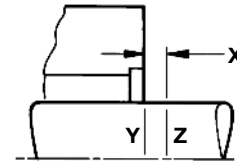
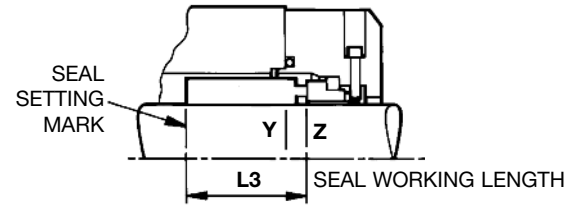
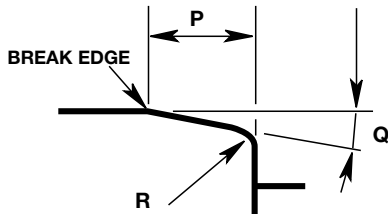


Figure 3



## Lead-On Chamfer

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



<b>P</b>	Seal sizes up to 25 mm /1.000"	5.0 mm
	Above 25 mm to 63 mm/ 1.000" to 2.500"	6.5 mm
	Above 63 mm /2.500"	8.0 mm
<b>Q</b>	10°	
<b>R</b>	1mm Radius	

## Installing the Seal

Before starting the installation, read 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 pump.

**NOTE:** It is essential to use a suitable lubricant when fitting the seal. The recommended lubricants for elastomeric bellows are soft hand soap and water, or glycerine; do not use washing-up liquid, liquid soaps, or hand cleaning gels. Light mineral oil may be used sparingly with nitrile and fluorocarbon.

**ATTENTION** Do not use hydrocarbon-based liquids on ethylene propylene bellows, and do not use grease (including silicone grease) on any elastomer bellows.

1. Remove the protective packaging from the seal; check for any damage, and wipe clean.
2. Fit the seat/mating ring into the gland plate as described in the appropriate seat instruction manual. Check that the gland plate O-ring or gasket is in position and will not be displaced during fitting, and then position the gland plate on the shaft clear of the seal location.

**ATTENTION**

Installation of the seal unit to its working length should be complete within 15 minutes to ensure that the elastomer bellows is correctly positioned before the neck of the bellows permanently grips the shaft.

3. Clean the shaft, and lightly lubricate the shaft and the neck of the bellows.

**NOTE:** Fit the seal by applying a steady pressure directly to the tail of the bellows, preferably using a close-fitting shaft sleeve.

4. Wipe the lapped surface of the seal face perfectly clean. Install the pump casing/seal housing; locate the gland plate squarely on the seal housing studs, and pull on the plate to compress the seal spring as necessary to fit the retaining nuts.
5. Tighten the nuts in the manner recommended by the pump instruction manual and to its recommended torque.

## Before Commissioning the Equipment

1. Ensure that the gland plate nuts are evenly tightened according to the pump manual torque setting.
2. Complete the assembly of the pump, and turn the shaft (by hand, if possible) to ensure free rotation. Check for correct alignment of the coupling and driver.
3. Consult all available equipment instruction manuals to check for correctness of all piping and connections, particularly seal recirculation/flush, heating or cooling requirements, and services external to the seal.

**ATTENTION** This mechanical seal is designed to operate in a liquid so that the heat energy it creates is adequately removed, and therefore the following check should be carried out, not only after seal installation, but also following a period of shut-down.

4. Check that the seal chamber fluid lines are open and free of any obstruction, and ensure that the seal chamber is filled with fluid and fully vented.

**ATTENTION** Dry running—often indicated by a squealing noise from the seal area—will cause overheating and scoring or other damage to the sealing surfaces, resulting in excessive leakage or a much shortened seal life.

## After Unit has Run

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, fluid is often trapped during draining and may exist outside the seal. 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 is fully released.

## Maintenance

No maintenance of a seal is possible while installed. It is recommended that a spare seal unit and mating ring be held in stock to allow immediate replacement of a removed seal.

It is recommended that used seals are 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 parts being sent to a third party have appropriate safe handling instructions externally attached to the package.

## 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 and seat/mating ring are held in stock to allow immediate replacement of a removed seal.

## Decommissioning 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 gland plate and seal housing.
2. Evenly slacken and remove the gland plate nuts, and carefully slide the plate off the studs.
3. Remove the seal housing, clean and oil the shaft, and then complete the removal of the seal and the gland plate assembly in the reverse order to installation.

**NOTE:** Although the original seal position may be marked on the shaft or sleeve as a reference point before seal removal, the location must be checked even if the same seal and seat/mating ring specification is intended as a replacement.

A seal unit should 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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