TYPE 1A IOM

MECHANICAL SEAL

Installation, operation and maintenance instructions

Foreword

This instruction manual is provided to familiarise 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 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 the Company for information as to exclusive product warranty and limitations of liability.

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

ATTENTION 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

1. 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.

2. Installation and removal of the seal must be carried out only by qualified personnel who have read and understood this instruction manual.
3. The seal is designed exclusively for sealing rotating shahs. 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 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.
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 installation.
6. PTFE and fluorocarbon components should never be burned or incinerated as the fumes are highly toxic. If fluorocarbons are accidentally heated above 400°C / 750°F 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 the John Crane Instruction Sheet ref. 1-Storage-E, available on request.

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Operating conditions

The Type 1A is a general service, single spring, elastomeric bellows seal supplied in metric and inch sizes for use in pumps and other rotary shaft equipment.

These instructions apply to the seal as installed in a pump and lubricated by the pumped fluid in accordance with the application information contained in the John Crane Seal Specification Sheet ref. S-1A/1M-E, and any John Crane seal selection literature or process. Typical operating limits are shown below.

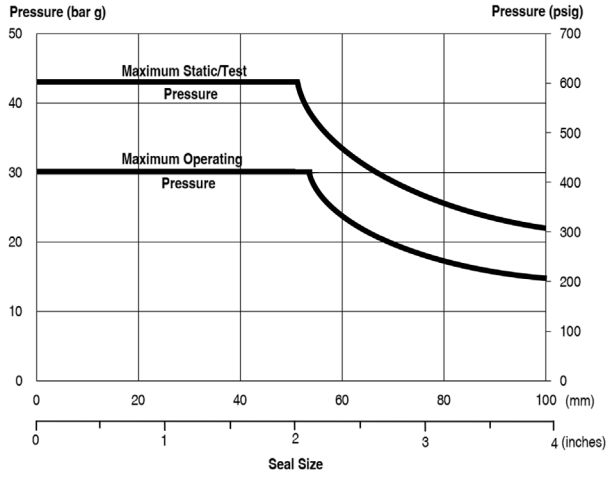
The selection of materials used in the construction of a seal should be made with regard to their temperature and chemical resistance/ compatibility with the liquid being pumped.

Temperature Limits: -40°C to +205°C / -40°F to +400°F depending on the materials used

Pressure Limits: Up to 28 bar g / 400 psig (refer to PV graph)

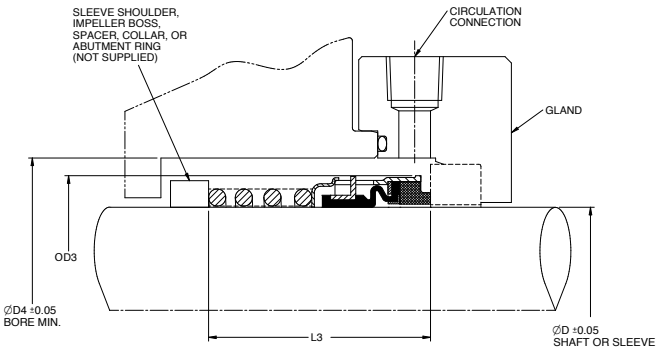
Speed Limits: Up to 13 m/s / 2500 fpm

PRESSURE/VELOCITY (PV) LIMITS

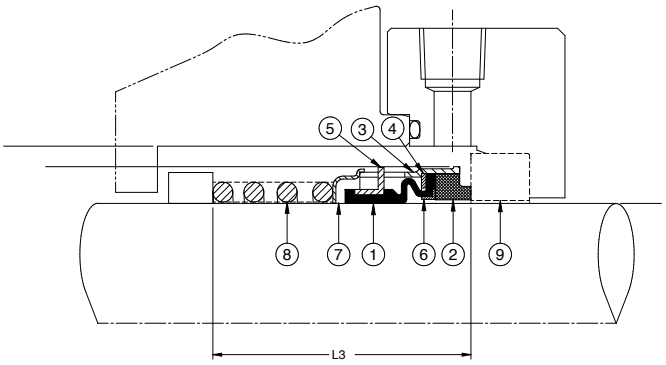


The maximum operating pressures shown apply under the following conditions: carbon graphite face/primary ring running against a silicon carbide or tungsten carbide seat/mating ring at 1800 rpm, with a lubricating sealed fluid at 80°C / 175°F.

TYPE 1A SEAL INSTALLATION DIMENSIONS



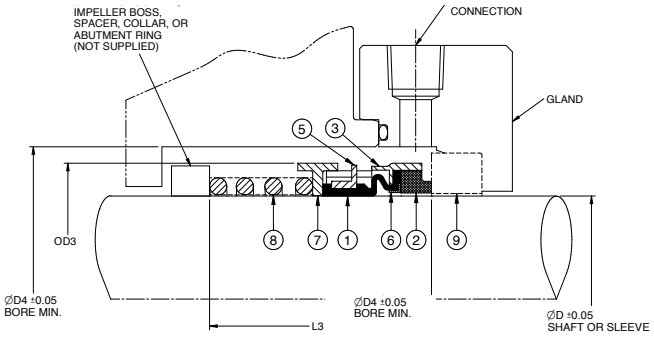
TYPICAL TYPE 1A SEAL ARRANGEMENT (STAMPED)



Part Name		Part Name	
1	Bellows	6	Ferrule
2	Face/Primary Ring	7	Spring Adaptor
3	Drive Sleeve	8	Spring
4	Thrust Ring	9	Seat/Mating Ring and Seat Ring'
5	Drive Ring		

*Refer to seat/mating ring instruction manual

TYPICAL TYPE 1A SEAL ARRANGEMENT (MACHINED)



Part Name		Part Name	
1	Bellows	6	Ferrule
2	Face/Primary Ring	7	Spring Adaptor
3	Drive Sleeve	8	Spring
5	Drive Ring	9	Seat/Mating Ring and Seat Ring

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TYPE 1A METRIC RANGE DIMENSIONAL DATA (MM)

Seal Size (mm)	Seal Size Code	D	D3	D4	L3
14	0140	14	29	32	44
16	0160	16	29	32	44
	0180	18	32	35	44
19	0190	19	32	35	44
20	0200	20	33	37	44
24	0240	24	38	42	44
25	0250	25	38	42	44
27	0270	27	46	50	60
28	0280	28	46	50	60
29	0290	29	46	50	60
30	0300	30	49	53	60
32	0320	32	49	53	60
34	0340	34	52	56	60
35	0350	35	52	56	60
38	0380	38	56	59	60
40	0400	40	59	62	60
42	0420	42	62	65	71
45	0450	45	62	65	71
48	0480	48	65	69	71
50	0500	50	68	72	71
54	0540	54	71	75	71
55	0550	55	75	78	71
60	0600	60	78	81	71
65	0650	65	86	89	70
70	0700	70	89	92	70
73	0730	73	92	96	73
75	0750	75	95	99	73
80	0800	80	105	108	79
90	0900	90	114	118	83
95	0950	95	118	121	83
100	0100	100	124	127	86

TYPE 1A INCH RANGE DIMENSIONAL DATA (MM)

Seal Size (Inches)	Seal Size Code	D	D3	D4	L3
0.375	0095	9.52	22	26	44
0.500	0127	12.70	25	29	44
0.625	0158	15.87	29	32	44
0.750	0190	19.05	32	35	44
0.813	0206	20.63	33	37	44
0.875	0222	22.22	35	38	44
1.000	0254	25.40	38	42	44
1.125	0285	28.57	46	50	60
1.250	0317	31.75	49	53	60
1.375	0349	34.92	52	56	60
1.500	0381	38.10	56	59	60
1.625	0412	41.27	59	62	60
1.750	0444	44.45	62	65	71
1.875	0476	47.62	65	69	71
2.000	0508	50.80	68	72	71
2.125	0539	53.97	71	75	71
2.250	0571	57.15	75	78	71
2.375	0603	60.32	78	81	71
2.500	0635	63.50	81	84	71
2.625	0666	66.67	86	89	70
2.750	0698	69.85	89	92	70
2.875	0730	73.02	92	96	73
3.000	0762	76.20	95	99	73
3.125	0793	79.37	102	105	79
3.250	0825	82.55	105	108	79
3.375	0857	85.72	108	111	79
3.500	0889	88.90	111	115	79
3.625	0920	92.07	114	118	83
3.750	0952	95.25	118	121	83
3.875	0984	98.42	121	124	86
4.000	1016	101.60	124	127	86

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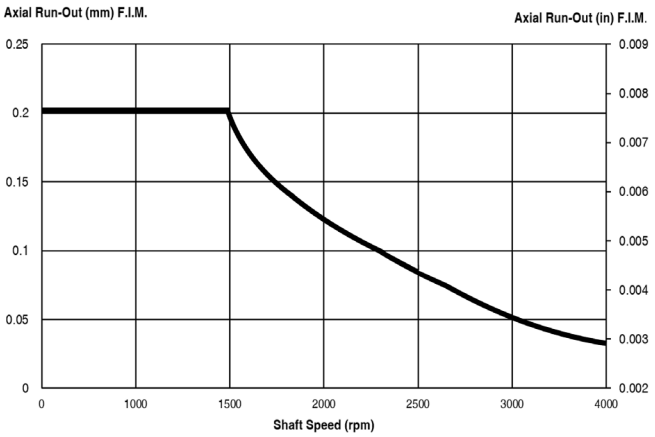
Checking the equipment

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 †	Refer to Dimension Tables
Seal Chamber Bore Diameter	Refer to Dimension Tables
Shaft/Sleeve Finish †	0.8 to 1.2 pm Ra (Machined)
Shaft/Sleeve Ovalily/ Out-of-Roundness †	< 0.1 mm 10.004 in
Shaft End Play/Axial Float	< 0.08 mm / 0.003 in. FI.M
Shaft/Sleeve Lead-On	Refer to Lead-On Chamfer
Shaft/Sleeve Run-Out †	< 0.08 mm / 0.003 in. FI.M. < 1800 rpm < 0,05 trim / 0.002 in. F.I.M. > 1800 rpm
Seal Housing End Face Squareness to Shaft/ Sleeve	Refer to Housing Squareness Graph
Concentricity of the Seal Chamber to the Shaft/ Steeve	< 0.15 mm / 0.006 in. F.I.M.

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.

HOUSING SQUARENESS TO SHAFT



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 filled sleeve.

ATTENTION If L3 is overlength, the seal will be undercompressed and wit/ leak: If 1_3 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 (Figure 3). The new marked position is the point on the shaft where the back of the seal is to be located.

Figure 1

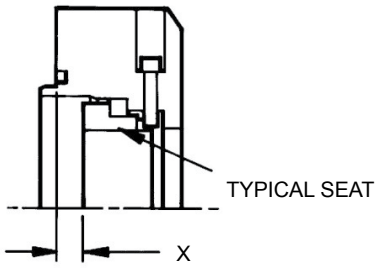


Figure 2

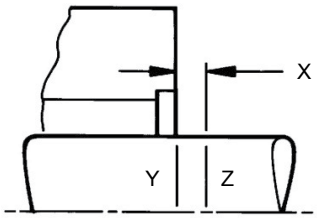
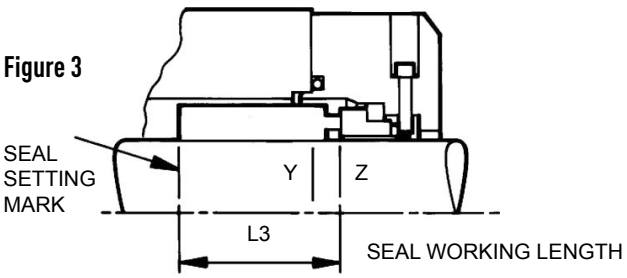


Figure 3

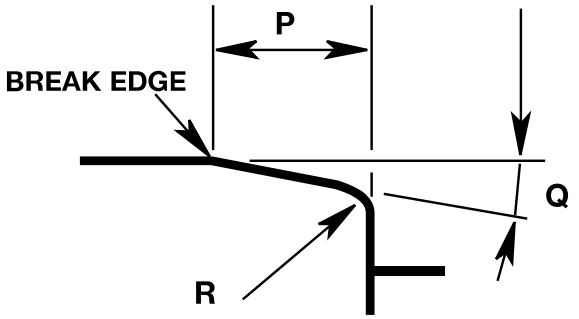


TYPE 1A IOM

MECHANICAL SEAL

Lead-on chamfer

For ease of installation, the lead-on edge of the shaft or sleeve should be chamfered as shown. Remove all burrs and sharp edges that might damage the bellows.



P	Seal sizes up to 25 mm / 1.000 in.	5.0 mm
	Above 25 mm to 60 mm / 1.000 in. to 2.500 in.	6.5 mm
	Above 60 mm 12.500 in.	8.0 mm
Q	10°	-
R	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. These instructions assume fitting onto a plain shaft from the impeller and 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 nitrite, fluorocarbon, and chloroprene only.

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.

ATTENTION Check that the seal face/primary ring is located in the drive sleeve with the lapped face outwards, and take care that the face does not drop out of the sleeve when handling and fitting the seal

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 place, and then position the gland plate on the shaft, clear of the seal location: avoid impact between the seat and shaft.

ATTENTION Installation of the seal unit to its working length should be completed 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.
4. Carefully slide the seal along the shaft beyond the seal location mark; position and secure the abutment, then slide the seal unit back against the abutment. Check that the drive ring dogs are positively engaged, and that the spring and spring adaptor are correctly located.

NOTE Fit the seal by applying a steady pressure directly to the tail of the bellows, preferably using a close-fitting shaft sleeve with the seal spring and spring adaptor temporarily removed.

5. Wipe the lapped surface of the seal face/primary ring perfectly clean and dry. 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.
6. Recheck that the gland plate O-ring or gasket is in position, then tighten the nuts in accordance with the pump manual instructions. Do not overtighten.

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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 before connection.
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.

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 to rest on the shaft.
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 duly. It is recommended that used seals are returned to a John Crane Service Centre, 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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