



I-10T/10R(SM)-E

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 Type 10T or 10R seal up to 75 mm or 3 inches, running against a seat/mating ring of appropriate material and design as used in rotating equipment. The information required may change with different 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 the PTFE bellows. Do not excessively compress the seal before or during installation.

John Crane Type 10T and 10R Mechanical Seal Instruction Manual

Sizes up to 75 mm
and 3.000 inches

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 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 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. Spray leakage is a particular risk, and it is essential that a splash guard is securely fitted around the seal, the guard must be provided with a transparent window with an easily removable

protective cover. Never inspect an unguarded seal while the pump is running. Further information on sealing hazardous or toxic fluids should be obtained from John Crane prior to installation.

6. PTFE components should never be burned or incinerated as the fumes are highly toxic.

7. Type 10 seals are designed for internal pressure and can operate only against a seal also designed for continuous internal pressure.

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. I-Storage-E, available on request.

Operating Conditions

The above sizes of the Type 10T and 10R are single spring, PTFE bellows seals designed for aggressive chemical services, and are mounted outside the seal chamber. Type 10T seals have an integral PTFE face and, with some sizes, higher duty and transient pressure ratings than the replaceable face Type 10R.

These instructions apply to the seals 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-10T/10R(SM)-E, and any other John Crane seal selection literature or process. Typical operating limits are shown below.

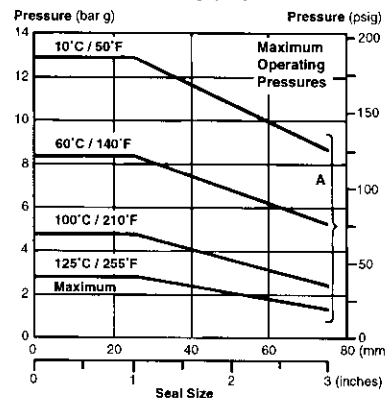
Selection of the seal face/primary ring material should be made with regard to its temperature and chemical resistance/compatibility with the liquid being pumped.

Temperature Limits: -45°C to +125°C / -50°F to +255°F (refer to PV graphs)

Pressure Limits: Up to 13 bar g / 185 psig (refer to PV graphs)

Speed Limits: Up to 16 m/s / 3150 fpm and 4000 rpm maximum

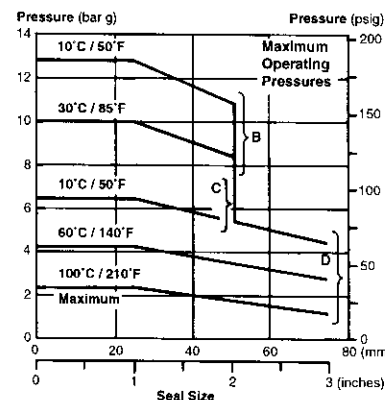
Type 10T Pressure/Velocity (PV) Limits



The maximum operating pressures shown are valid for the specified face/primary ring and seat/mating ring material combinations at 1500 rpm, with a lubricating sealed fluid at the temperatures given.

A - PTFE v. Aluminium Oxide Ceramic

Type 10R Pressure/Velocity (PV) Limits

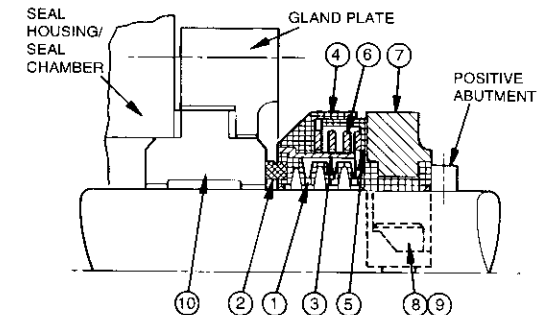


B - Carbon Graphite v. Aluminium Oxide Ceramic

C - PTFE or Silicon Carbide v. Aluminium Oxide Ceramic

D - Carbon Graphite, PTFE, or Silicon Carbide v. Aluminium Oxide Ceramic

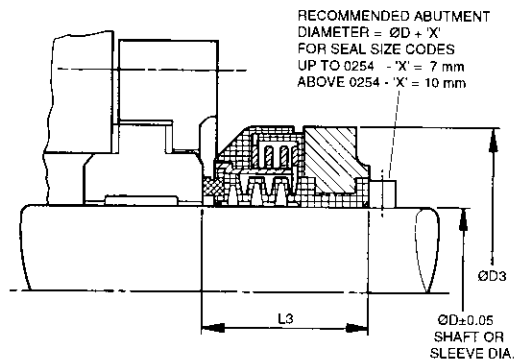
Typical Type 10T/10R Seal Arrangement



Part Name	Part Name	Part Name
1 Bellows	4 Thrust Ring	9 Self-Locking Nut
2 Face/Primary Ring (Integral Face - 10T)	5 Spring Shroud	10 Seat/Mating Ring and Gaskets*
3 Support Sleeve	6 Spring (Face Insert - 10R)	
	7 Half-Clamp	
	8 Cap Head Screw	

*Refer to seat/mating ring instruction manual

Type 10T/10R Seal Installation Dimensions



Type 10T/10R Metric Range Dimensional Data (mm)

Seal Size (mm)	Seal Size Code	D	D3	L3
16	0160	16	54	31
18	0180	18	54	31
20	0200	20	57	31
22	0220	22	57	31
24	0240	24	61	33
25	0250	25	61	33
28	0280	28	67	36
30	0300	30	70	37
32	0320	32	70	37
33	0330	33	73	38
35	0350	35	73	38
38	0380	38	76	38
40	0400	40	80	40
43	0430	43	83	40
45	0450	45	83	40
48	0480	48	89	43

Type 10T/10R Metric Range Dimensional Data (mm) (Cont.)

Seal Size (mm)	Seal Size Code	D	D3	L3
50	0500	50	89	43
53	0530	53	103	53
55	0550	55	107	53
58	0580	58	110	53
60	0600	60	110	53
63	0630	63	113	53
65	0650	65	116	53
68	0680	68	118	53
70	0700	70	118	53
75	0750	75	126	53

Type 10T/10R Inch Range Dimensional Data (mm)

Seal Size (Inches)	Seal Size Code	D	D3	L3
0.750	0190	19.05	54	31
0.875	0222	22.22	57	31
1.000	0254	25.40	61	33
1.125	0285	28.57	67	36
1.250	0317	31.75	70	37
1.375	0349	34.92	73	38
1.500	0381	38.10	76	38
1.625	0412	41.27	80	40
1.750	0444	44.45	83	40
1.875	0476	47.62	86	43
2.000	0508	50.80	89	43
2.125	0539	53.97	103	53
2.250	0571	57.15	107	53
2.375	0603	60.32	110	53
2.500	0635	63.50	113	53
2.625	0666	66.67	116	53
2.750	0698	69.85	118	53
2.875	0730	73.02	122	53
3.000	0762	76.20	126	53

Checking the Equipment

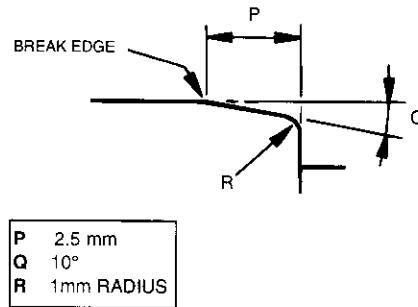
Successful operation and life of this seal is dependent on acceptable equipment dimensions, alignments, and finishes. Before installation of the seal, the following checks should be made with respect to the seal housing and the shaft, especially (where marked †) at the seal position. The usual equipment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

Shaft/Sleeve Outside Diameter †	Refer to Dimension Tables
Shaft/Sleeve Finish †	0.8 to 1.2 µm Ra (Machined)
Shaft/Sleeve Ovality/Out-of-Roundness †	< 0.025 mm / 0.001 in.
Shaft End Play/Axial Float	< 0.08 mm / 0.003 in. F.I.M.
Shaft/Sleeve Run-Out †	< 0.08 mm / 0.003 in. F.I.M. < 1800 rpm < 0.05 mm / 0.002 in. F.I.M. > 1800 rpm
Shaft/Sleeve Lead-On	Refer to Lead-On Chamfer
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.

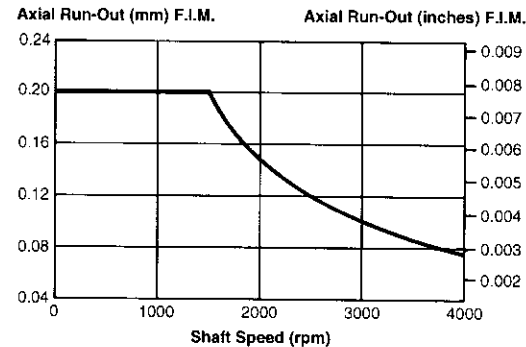
NOTE: If the measured dimensions exceed the values given, correct the equipment to meet the specifications before installing the seal. If the seal is installed on a sleeve, the sleeve must be liquid- and pressure-tight through its bore. The thickness of the gland plate must be sufficient to retain the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

Lead-On Chamfer

For ease of installation, the lead-on edge of the shaft or sleeve should be chamfered as shown. Remove any burrs and sharp edges that could damage the seal during fitting.



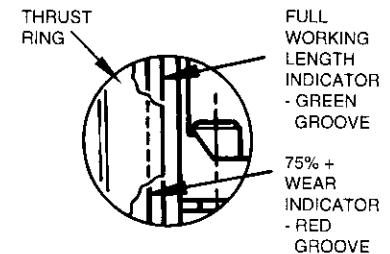
Housing Squareness to Shaft



Setting the Seal

The seal must be installed to its correct working length L3. Visual setting and wear indicators are incorporated in the seal design, and the simple setting procedure is described as part of the installation sequence - refer to the diagram below. Note that, should the direct method of seal compression and setting be found difficult, an alternative method is included in the installation procedure.

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.



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 the use of an abutment ring, and fitting onto a plain shaft from the impeller end of a dismantled pump.

ATTENTION It is recommended that a positive abutment is always provided at the back of the bellows.

- Remove the protective packaging from the seal; check for any damage, and wipe clean. Save package labels for future reference.
- Fit the seat/mating ring and the gland plate to the seal housing as described in the appropriate seal instruction manual.
- Clean and lightly lubricate the shaft.
- Slide the positive abutment ring onto the shaft with the set screws clear of the ring bore.

ATTENTION Check that the half-clamp screws are fitted with their heads positioned diagonally opposite each other, i.e., facing in the same rotary direction, to maintain the dynamic balance of the seal.

- Loosen the screws connecting the seal half-clamps, sparingly lubricate the inside diameter of the bellows, and then carefully slide the seal unit clamp-end first onto the shaft and beyond its final position.
- Carefully fit the seal housing/seat assembly over the shaft and secure in position. Turn the shaft by hand to check for free rotation.

ATTENTION The shaft should not be allowed to impact the seat/mating ring bore during assembly, and must be clear of the seat bore when in operation.

- Wipe the lapped surfaces of the seat and seal face perfectly clean and dry, and then slide the seal unit along the shaft until the face touches the seat.
- Lightly tighten the half-clamp screws, ensuring that the ends of the clamps are equally spaced.
- Using hand pressure on opposite sides of the two half-clamps, compress the unit against the seat until the rear edge of the thrust ring is aligned with the green indicator line in the spring shroud - refer to the Setting the Seal diagram. This sets the seal to its correct working length, although the visual setting can be checked against the appropriate L3 dimension if required.
- Holding the seal in its working position, tighten the clamp screws evenly and progressively to the torque recommended in the torque table. Ensure that the ends of the half-clamps remain equally spaced while tightening.

ATTENTION Accurate torque settings will avoid cap screw damage and prevent seal movement in operation.

NOTE: If the above direct method of seal compression and setting is found to be difficult, use the following procedure.

With the seat and seal housing assembly installed in its working position, mark the shaft in line with the seat face.

From the dimension tables find the L3 dimension for the size of seal being fitted. Measure this distance along the shaft from the first mark, and mark the shaft again. This new mark is the location for the back of the seal.

Slacken the seal housing mounting bolts (not the gland plate bolts) and move the housing back sufficiently to allow the seal to be moved freely and accurately onto its location mark. Secure the seal as in step 10, and then evenly re-tighten the housing bolts to compress the seal against the seat.

- Position the positive abutment ring firmly against the tail of the bellows and secure.
- Fit the splash guard and drain - refer to Before Commissioning the Equipment.

Maintenance

! Do not closely examine the seal for leakage when operating, without using suitable protection.

During operation, periodic inspection of the seal should be carried out. A measure of seal operating condition is the level of leakage, and as no maintenance of the seal is possible while installed, the seal should be replaced either when leakage becomes unacceptable or when the external indicator shows more than 75% face/primary ring wear - refer to Setting the Seal. It is recommended that a spare seal unit and seat/mating ring are held in stock to allow immediate replacement of a removed seal.

Recommended Torques for Clamp Screws

Seal Size Code	Screw Size	Torque	
		Nm	lbf ft
0160 to 0222	M6	3	2.2
0240 to 0254	M6	4	3.0
0280 to 0285	M6	5	4.0
0300 to 0350	M6	6	4.5
0380 to 0412	M6	7	5.0
0430 to 0476	M6	8	6.0
0480 to 0508	M6	9	6.5
0530 to 0539	M8	17	12.5
0550 to 0603	M8	18	13.0
0630 to 0635	M8	19	14.0
0650 to 0666	M8	20	15.0
0680 to 0700	M8	21	15.5
0730	M8	22	16.0
0750 to 0762	M8	23	17.0

Before Commissioning the Equipment

ATTENTION Allow at least 15 minutes to elapse between seal installation and pump commissioning to enable the seal to adjust to its working position.

- Ensure that the gland plate nuts are evenly tightened according to the pump instruction manual.
- Complete the assembly of the pump, and turn the shaft (by hand, if possible) to ensure free rotation. Confirm that the splash guard is fitted.
- Consult all available equipment instruction manuals to check for correctness of all piping and connections, particularly regarding the splash guard drain, seat cooling/flush (if required), and any other services external to the seal.

ATTENTION This mechanical seal is designed to operate with a liquid at the faces, and therefore the following check should be carried out, not only after seal installation, but also after any period of equipment shut-down.

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

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

ATTENTION The pump must not be run with the suction and delivery valves closed. All valves - particularly quick acting ball valves - should be operated as slowly as possible to minimise pressure surges, which can be the cause of rapid seal failure.

Decommissioning the Equipment

- 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.

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

Removing the Seal

NOTE: Dismantle with care: components may be suitable for reuse after duty if otherwise undamaged.

- Referring to the pump instruction manual, dismantle the equipment sufficiently to expose the seal housing and seal.
- Remove the seal housing complete with the gland plate and seat/mating ring, and carefully dismantle the seal.
- Clean and oil the shaft; slacken the clamp ring screws, and remove the seal from the shaft. If necessary, an extraction tool may be applied to the clamp ring. Remove the abutment ring, if fitted.

A seal unit should always be serviced after removal from duty. 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.

ATTENTION If part-worn seals are reinstalled after local reconditioning, the wear indicator cannot be safely used, and the seal should be set to the appropriate working length dimension L3.

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