

Foreword

These instructions are provided to familiarize the user with the seal and its designated use. These 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 and will help to avoid danger and increase reliability. The information required may change with other types of equipment or installation arrangements. 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 Sales/Service Engineer 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.

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 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.
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.
6. 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.
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.

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ATTENTION This mechanical seal is designed to operate in a liquid so the heat energy it creates is adequately removed. Therefore, 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.

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.



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 John Crane for information as to exclusive product warranty and limitations of liability.

Operating Conditions

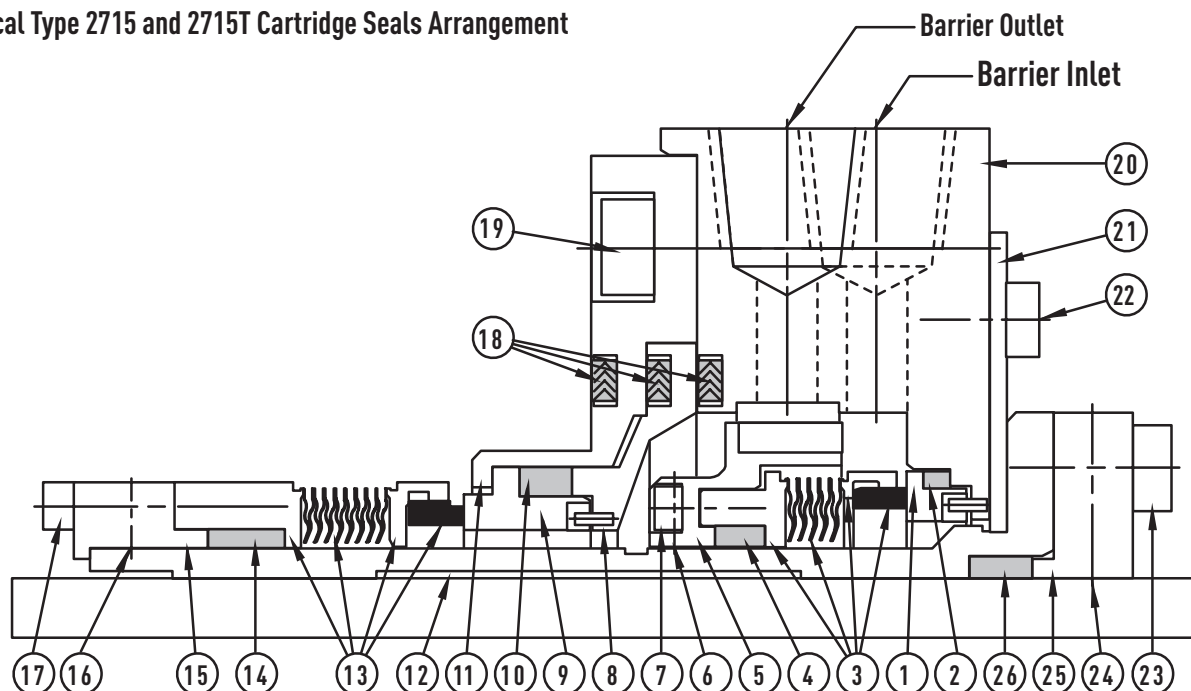
General Instructions

Examine the engineering layout drawing to confirm the proper seal arrangement for the pump being used. Be sure to read all instructions carefully before installing seal.

To assure satisfactory operation, handle seal with care. Take particular caution to see that the lapped sealing faces are not scratched or marred.

- | | |
|----------------------------------|-------------------------------|
| 1 – Mating ring | 14 – Crane-foil ring(s) |
| 2 – Crane-foil® ring | 15 – Drive collar |
| 3 – Bellows assembly | 16 – Set screws |
| 4 – Crane-foil ring | 17 – Socket head cap screws |
| 5 – Collar/pumping ring | 18 – Spiral wound gaskets |
| 6 – Set screws | 19 – Socket head cap screws |
| 7 – Socket head cap screws | 20 – Gland plate assembly |
| 8 – Mating ring adaptor assembly | 21 – Spacers |
| 9 – Mating ring | 22 – Hex head cap screws |
| 10 – Crane-foil ring | 23 – Hex head cap screws |
| 11 – Liner | 24 – Knurled point set screws |
| 12 – Shaft sleeve | 25 – Drive collar |
| 13 – Bellows assembly | 26 – Crane-foil ring |

Typical Type 2715 and 2715T Cartridge Seals Arrangement

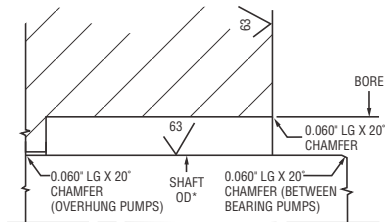


METAL BELLOWS CARTRIDGE SEAL

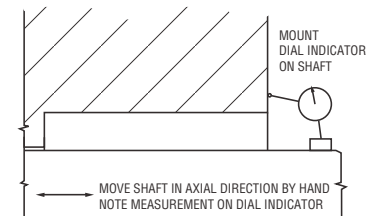
Installation, Operation & Maintenance Instructions

Preparing the Equipment

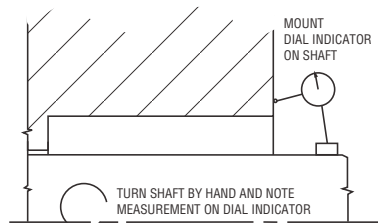
1. Check the shaft and seal chamber dimensions and finishes as noted. Check dimensions per specific John Crane layout drawing.



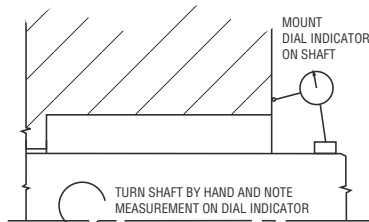
2. Measure the shaft end float/end play. The maximum value should not exceed 0.005" FIM. Remove all sharp edges and burrs over which the seal sleeve must pass.



3. Check the squareness or face runout of the seal chamber face to the shaft. The maximum value should not exceed 0.0005" per inch of seal chamber bore diameter, FIM.



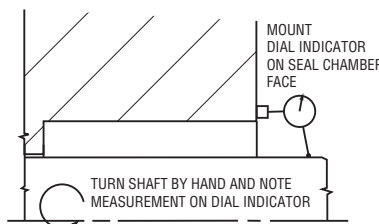
4. Measure the concentricity of the seal chamber bore to the shaft. This value should not exceed 0.005" FIM.



NOTE

It is recommended that the pump and its installation meet the requirements of the latest edition of API Standard 610. Equipment that meets these requirements will aid in extending mean time between planned maintenance (MTBPM).

5. Measure the shaft runout at the seal location. The maximum value should not exceed 0.001" FIM.



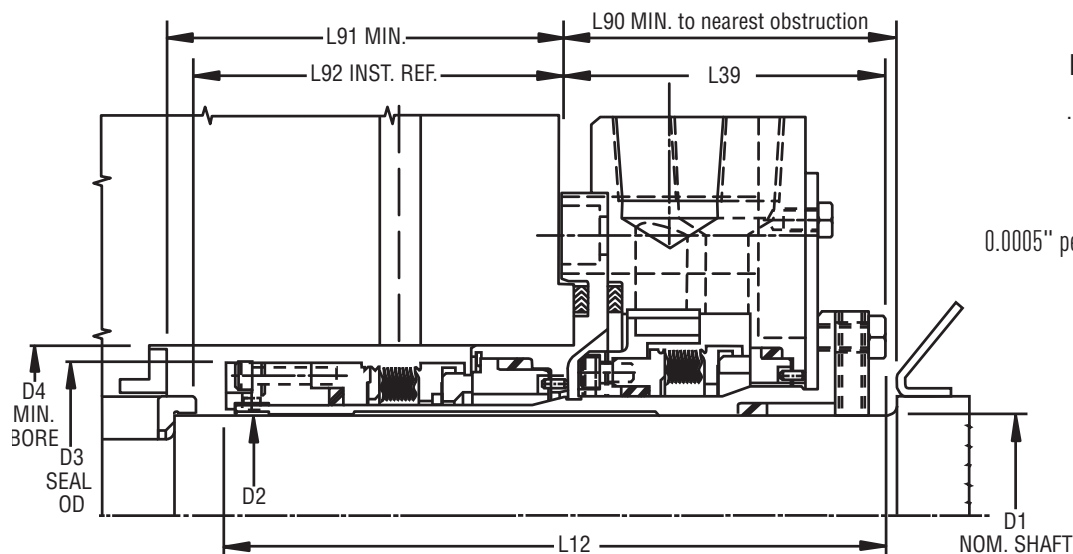
NOTE: If measured dimensions exceed those values given, correct the equipment to meet specifications prior to installing the cartridge seal.

Installation Dimensions

For dimensional data on the seal installation, please refer to the specific John Crane layout drawing.

Refer to applicable layout drawing to obtain actual seal dimensions.

Typical Type 2715/2715T



Inch/Metric conversions

.060" x 20° = 1.6 mm x 20°

63V (µin) = 1.6V (µm)

0.005" = 125 micrometer

0.0005" per inch bore = 6 micrometer/cm bore

0.001" = 25 micrometer

Type 2715 Dimensional Data

Seal Size D1	D2	D3	D4	L12	L39	L90	L91	L92
1.250	1.500	2.125	2.375	5.237	2.605	2.730	2.757	2.632
1.500	1.750	2.375	2.625	5.252	2.620	2.745	2.757	2.632
2.000	2.250	2.875	3.125	5.299	2.667	2.792	2.757	2.632
2.250	2.500	3.125	3.375	5.315	2.683	2.808	2.757	2.632
2.625	2.875	3.750	3.875	5.958	2.925	3.050	3.158	3.033
2.750	3.000	3.875	4.000	5.958	2.925	3.050	3.158	3.033

Type 2715T Dimensional Data

Seal Size D1	D2	D3	D4	L12	L39	L90	L91	L92
1.500*	1.625	2.250	2.500	5.017	2.293	2.375	3.000	2.724
2.000**	2.250	2.875	3.250	5.307	2.675	2.812	3.875	2.632
2.687***	3.000	3.875	4.000	5.864	2.831	3.312	4.125	3.033

Dean Pump Model: *R434 **R454 ***R484

Cartridge Seal Assembly

The Type 2715 and Type 2715T are typically supplied as fully-assembled and tested cartridge seals. If this is the case, proceed to the "Installing the Seal" section. Otherwise, follow the assembly instructions below.

Outboard mating ring/gland plate assembly

1. Slide Crane-foil ring (Item 2) over mating ring (Item 1) shoulder, ensuring that lead chamfer on ID of Crane-foil ring is installed first. Take care to avoid damaging Crane-foil ring ID.
2. Using an arbor press if necessary, push mating ring (with Crane-foil ring) into gland plate assembly (item 20), making sure that slot of mating ring is aligned with pin of gland plate assembly. Use extreme caution to avoid damaging mating ring face and Crane-foil ring, and press mating ring into gland plate assembly until Crane-foil ring is fully seated but not compressed (with ends of Crane-foil ring touching mating ring and gland plate assembly shoulders). Check squareness of mating ring face using a drop indicator, ensuring that face of mating ring is parallel within 0.002"/50 micrometer to back of gland plate assembly.
3. Clean faces of gland plate mating ring and outboard primary ring with alcohol and a lint-free cloth.

Shaft sleeve/outboard mating ring/gland plate assembly

With shaft sleeve (item 12) standing on its large end (i.e. the end with the screw taps), slide mating ring/gland plate assembly over shaft sleeve, so that mating ring face is positioned upward.

Outboard seal head/shaft sleeve assembly

1. Slide outboard bellows assembly (item 3) over cartridge sleeve until faces of bellows assembly primary ring and mating ring contact.
2. Slide Crane-foil ring (item 4) over cartridge sleeve and into bellows assembly seal adapter bore, being careful not to damage the Crane-foil ring.
3. Slide collar/pumping ring (item 5) over cartridge sleeve, aligning through holes of collar/pumping ring with screw taps of bellows assembly. Engage two of the cap screws (item 7), 180° apart, but do not fully tighten.
4. Place the two spacers (item 21) onto back (top) of collar/pumping ring, perpendicular from where the two cap screws are located, with the "V" portions of spacers facing inward, toward shaft sleeve. Make sure that sharp edge of "V" is facing upward, away from collar/pumping ring. Press downward and inward toward shaft sleeve, putting load on bellows assembly until spacers are engaged with groove on cartridge sleeve. Do not over-compress bellows.
5. Install set screws (item 6) into collar/pumping ring, and secure onto shaft sleeve by tightening screws evenly (1/4 turns, 180° apart). Carefully remove spacers.
6. Install remaining cap screws (item 7) into collar/pumping ring, tightening all screws evenly (1/4 turns, 180° apart) until metal-to-metal contact between bellows assembly and collar/pumping ring is achieved. Metal-to-metal contact may be verified by looking through collar/pumping ring slots. Do not over-tighten.
7. Place spiral wound gasket (item 18) into gasket groove of gland plate assembly.

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Installation, Operation & Maintenance Instructions

Inboard mating ring/liner/mating ring adapter assembly

1. Stand mating ring adapter assembly (item 8) upright on its large end. Place spiral wound gasket (item 18) into gasket groove of mating ring adapter assembly.
2. Slide Crane-foil ring (item 10) over mating ring (item 9) shoulder, ensuring that lead chamfer on ID of Crane-foil ring is installed first. Take care to avoid damaging Crane-foil ring ID.
3. Place mating ring (with Crane-foil ring) into mating ring adapter assembly, making sure that slot of mating ring is aligned with pin of mating ring adapter assembly. Use extreme caution to avoid damaging mating ring face and Crane-foil ring.
4. Push liner (item 11) over mating ring/mating ring adapter assembly until metal-to-metal contact between liner and mating ring adapter assembly is achieved. Use extreme caution to avoid damaging mating ring face and Crane-foil ring.
5. Slide assembled unit (liner, mating ring, Crane-foil ring, and mating ring adapter assembly) over shaft sleeve until bottom surfaces of mating ring adapter assembly and liner rest snugly against gland plate assembly. Ensure that mating ring face is positioned upward, and that cap screw through holes of liner are aligned with screw taps of gland plate assembly.
6. Install cap screws (item 19), tightening evenly (1/4 turns, 180° apart) until metal-to-metal contact between liner and gland plate assembly is achieved. **Do not over-tighten.**
7. Check squareness of mating ring face using a drop indicator, ensuring that face of mating ring is parallel within 0.002"/50 micrometer to adjoining liner surface.

Inboard seal head/shaft sleeve assembly

1. Clean faces of inboard mating ring and inboard primary ring with alcohol and a lint-free cloth.
2. Slide inboard bellows assembly (item 13) over cartridge sleeve until faces of primary ring and mating ring contact.
3. Slide Crane-foil ring (item 14) over cartridge sleeve and into bellows assembly seal adapter bore, being careful not to damage flexible graphite packing.
4. Slide drive collar (item 15) over shaft sleeve, aligning through holes of drive collar with screw taps of bellows assembly. Engage two of the cap screws (item 17), 180° apart, but do not fully tighten.
5. Push down on drive collar until drive collar lip contacts end of cartridge sleeve. Install set screws (item 16) into drive collar, and secure onto cartridge sleeve by tightening screws evenly (1/4 turns, 180° apart).
6. Install remaining cap screws (item 17) into drive collar, tightening all screws evenly (1/4 turns, 180° apart) until metal-to-metal contact between bellows assembly and drive collar is achieved. **Do not over-tighten.**

Final assembly

1. Turn assembled unit over so that cartridge is now standing on its opposite (inboard seal) end. Position spacers (item 21) onto back surface of gland plate assembly so slots of spacers line up with screw

taps of gland plate assembly. Press downward and inward toward cartridge sleeve, putting load on bellows assemblies until spacers are engaged with groove on cartridge sleeve. Do not over-compress bellows.

2. Install cap screws (item 22), tightening until metal-to-metal contact between spacers and gland plate assembly is achieved. **Do not over-tighten.**
3. Place Crane-foil ring (item 26) into shaft sleeve bore. Take care to avoid damaging Crane-foil ring.
4. Position drive collar (item 25) against shaft sleeve and flexible graphite packing, aligning through holes of drive collar with screw taps of shaft sleeve. Install cap screws (item 23), tightening only until screws are engaged in shaft sleeve. Do not compress Crane-foil ring by fully tightening cap screws.
5. Install set screws (item 24), tightening until set screws approach (but do not pass) drive collar ID.
6. Rest cartridge seal on gland plate assembly OD surface. Place spiral wound gasket (item 18) into gasket groove of liner.

Installing the Seal

1. Before starting the installation, read the following instructions carefully, as the sequence may be different depending on the construction of the pump.
2. Remove the seal from its packaging, inspect for any damage, and wipe clean.
3. The equipment should be clean and meet the specifications noted in the "Preparing the Equipment" section. Lubricate shaft sparingly. Lubricate gland plate bolts/nuts as required.
4. **For Overhung Pumps** – Make sure that spiral wound gasket (item 18) is properly positioned in liner gasket groove, and that drive collar set screws do not extend past drive collar ID. Slide cartridge seal onto shaft as close to nearest obstruction as possible. Position gland plate so barrier outlet connection, marked "B0", is at or near top dead center. Install seal chamber onto pump and tighten bolts to bearing frame. Slide cartridge seal onto studs (if applicable) until liner is against face of seal chamber. Hand tighten gland plate bolts/nuts.
5. **For Between Bearing Pumps** – Make sure that spiral wound gasket (item 18) is properly positioned in liner gasket groove, and that drive collar set screws do not extend past drive collar ID. Slide cartridge seal onto shaft. Position gland plate so barrier outlet connection, marked "B0", is at or near top dead center. Slide cartridge seal onto studs (if applicable) until liner is against face of seal chamber. Hand tighten gland plate bolts/nuts.
6. Reassemble pump and make all necessary impeller adjustments.
7. Continue tightening gland plate bolts/nuts in an alternating pattern until secure (1/4 turns, 180° apart), with liner and face of pump seal chamber metal-to-metal. **Do not over-stress or distort liner or gland plate.**
8. Tighten drive collar cap screws (item 23) evenly (1/4 turns, 180° apart) until drive collar and shaft/sleeve are metal-to-metal and flexible graphite packing (item 26) is compressed. **Do not over-tighten.**

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9. Tighten drive collar set screws (item 24) evenly (1/4 turns, 180° apart), securing cartridge seal to shaft.
10. Loosen spacer cap screws (item 22), but do not remove. Slide spacers toward OD of gland plate assembly, so that spacers are clear of top (OD) of shaft sleeve. Re-tighten spacer cap screws.
11. Make appropriate piping connections to seal assembly.

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 pump instruction manual should be consulted 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. Therefore, 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 be returned to a John Crane Seal Rebuilding Center, 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.

Quality Assurance

This seal has been assembled in accordance with John Crane quality assurance standards and with proper maintenance and use will give safe and reliable operation to the maximum recommended performance as shown in any relevant approved John Crane publication.

Ordering Information

1. Select seal size.
2. Determine materials of construction. Select seal drawing number.
3. For Type 2715 cartridge seal hardware/components and materials, see typical drawing F-SD-3156.

Materials of Construction – Standard

Description	Materials
Bellows	Alloy 718
Metal parts	316 stainless steel with an Alloy 42 (low expansion alloy) front adapter
Primary ring	Carbon graphite, tungsten carbide
Secondary seal	Crane-foil and flexible graphite

Operating (non-concurrent) Limits

Temperature:	-73° to 427°C/-100° to 800°F
Pressure:	21 barg/300 psig (operating) 31 barg/450 psig (static) 6 barg/90 psig (inboard seal ID/reverse)
Speed:	Up to 25 m/s/5,000 fpm

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Type 2715 Cartridge Seal Drawing and UBM Numbers

Cartridge Seal Size (inches)	Seal Head Size	Drawing Number	M# (9310)	Drawing Number	M# (9998)
			072/039 F3 066		072/039 015 066
Type 715 (Inboard) Seal Assembly					
1.250	1.500	A715-1500-143	M37800	A715-1500-145	M37802
1.500	1.750	A715-1750-265	M37808	A715-1750-267	M37810
2.000	2.250	A715-2250-237	M37812	A715-2250-239	M37814
2.250	2.500	A715-2500-104	M37816	A715-2500-106	M37818
2.625	2.875	A715-2875-076	M37820	A715-2875-078	M37822
2.750	3.000	A715-3000-073	M37824	A715-3000-075	M37826

Type 715S (Outboard) Seal Assembly

1.250	1.500	A715-1500-129	M37443		
1.500	1.750	A715-1750-261	M37389		
2.000	2.250	A715-2250-228	M37393		
2.250	2.500	A715-2500-100	M37447		
2.625	2.875	A715-2875-073	M37445		
2.750	3.000	A715-3000-065	M37396		

Type 2715T Cartridge Seal Drawing and UBM Numbers

Cartridge Seal Size (inches)	Drawing Number	M#	Drawing Number	M#
		072/039 F3 066 095 072/039 F3 066 095		072/039 015 066 095 072/039 F3 066 095
Type 2715T Cartridge Seal				
1.500*	H-SP-30522-1	M37358	H-SP-30522-4	M37491
2.000**	H-SP-30791-1	M37398	H-SP-30791-3	M37492
2.687***	H-SP-30792-1	M37399	H-SP-30792-3	M37493



TYPE 2715/2715T

METAL BELLOWS CARTRIDGE SEAL

Installation, Operation & Maintenance Instructions



North America	Europe	Latin America	Middle East & Africa	Asia Pacific
United States of America	United Kingdom	Brazil	United Arab Emirates	Singapore
Tel: 1-847-967-2400	Tel: 44-1753-224000	Tel: 55-11-3371-2500	Tel: 971-481-27800	Tel: 65-6518-1800
Fax: 1-847-967-3915	Fax: 44-1753-224224	Fax: 55-11-3371-2599	Fax: 971-488-62830	Fax: 65-6518-1803

If the products featured will be used in a potentially dangerous and/or hazardous process, your John Crane representative should be consulted prior to their selection and use. In the interest of continuous development, John Crane Companies reserve the right to alter designs and specifications without prior notice. It is dangerous to smoke while handling products made from PTFE. Old and new PTFE products must not be incinerated. ISO 9001 and ISO14001 Certified, details available on request.