METAL BELLOWS SEALING SOLUTIONS

John Crane brings you the world's most complete selection of performance-proven bellows sealing products. Each and every one is backed by unparalleled John Crane customer service and technical support.

john crane
a smiths company

MARKETS/VERTICALS

- Oil & Gas Industry
  - *Extraction*
  - *Pipeline*
  - *Storage*
  - *Refining*
- Petrochemical
- Chemical
- Power Generation & Renewables
- Pharmaceutical
- Food Processing/Beverage
- Pulp & Paper
- Refrigeration/Compressor
- General Industries

TYPICAL APPLICATIONS

- Hydrocarbons
  - *Flashing and non-flashing*
- Aromatic fractionation products
- Crude oil fractionation products
- Caustics
- Acids
- Chemicals
- Aqueous solutions
- Heat transfer fluids
- Cryogenic
  - *Liquefied gases*
- Slurries
- Solvents
- Viscous fluids and polymers
- Thermo-sensitive fluids
- Lubricating fluids
- Water
- Compressor oil and refrigerant
- API 682

LEADER IN METAL BELLOWS SEALING TECHNOLOGY

Since the 1960s, our experience in diverse industries such as oil & gas, petrochemical, chemical processing, general industries and refrigeration has proven the soundness of John Crane's metal bellows design.

John crane is dedicated to design, develop and manufacture innovative sealing solutions that help keep your operations running smoother, longer and more cost-effectively, such as high-temperature corrosion-resistant seals and high-temperature non-contacting gas-lubricated seals.

WORLD-CLASS METAL BELLOWS MANUFACTURER

Our metal bellows production facilities have an outstanding manufacturing process with state-of-the-art stamping, welding and testing technology.

John Crane metal bellows can provide you with a competitive advantage that can help keep you on the leading edge.

- **» Reduced downtime and emissions**
- **» Increased mean time between repair (MTBR)**
- **» Increased plant safety**
- **» Reduced inventory**
- **» Reduced cost of ownership**
- **» Reduced operational costs**
- **» Increased productivity and return on investment**

MAKING ENVIRONMENTAL COMPLIANCE A REALITY

John Crane metal bellows seals can help you comply with all relevant air pollution and international environmental requirements. Many of these technologies provide 100% containment of fugitive emissions and eliminate the need for time-consuming emissions monitoring.

EDGE-WELDED METAL BELLOWS

The bellows assembly performs several functions. It acts as a spring to keep the faces together, it acts as a dynamic seal and it transmits torque from the drive collar to the seal's face.

Edge-welded metal bellows, consist of a series of stamped plates welded together at the inside and outside diameters. Although bellows plates can be produced from any weldable material, the most common are AM-350, Alloy 20, Alloy C-276 and Alloy 718.

The individual stamped plates are joined at their inside diameters to create a convolution. A bellows core is created by joining the convolutions at their outside diameters. The bellows core is then welded to end fittings to produce the desired seal head.

Due to the variety of bellows materials and secondary seals, welded metal bellows seals can be applied in just about any service that you may encounter.

» Superior Bellows Design
These seals are manufactured with a unique 45° tilt edge at the bellows inside diameter to disperse stresses and to maximize their operating life.

» Superior Plate Shape
The plate shape used by John Crane is called a nesting ripple. With a three-sweep radius, this plate design allows the bellows to be flexed repeatedly without the metal being stressed beyond its endurance limit. The nesting ripple plate shape is more effective in achieving maximum flexing, long (axial motion) stroke with short operating lengths and a low spring rate.

» Self-cleaning Design
Rotating bellows throw off suspended particles that can clog spring type seals. This self-cleaning action can eliminate the need for external flushing, filters or cyclone separators and their associated costs.

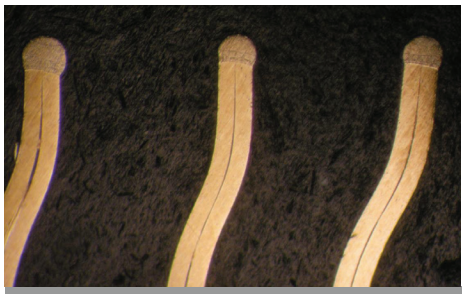
» One Moving Part...The Bellows
John Crane bellows have no sliding secondary seals. This eliminates the problem of seal face "hang-up", the major cause of failure with spring-loaded seals. Effective contact of sealing faces is maintained, and leakage to the atmosphere is minimized.

» Application Flexibility
A wide range of metallurgies, face combinations, and secondary seals/O-rings are used to seal a variety of demanding applications.

» Weld Integrity
State-of-the-art manufacturing processes ensure integrity of the weld by preventing excessive root gap with bead geometry, head thickness and roll-over control. John Crane bellows units are checked for leak tight performance with helium mass spectrometry ensuring excellent quality and dependable performance.

» Design Versatility
The low-temperature and high-temperature series seals are available in either shaft-mounted designs or fully-contained single- and dual-cartridge seals. Combined with secondary containment seals such as the ECS, they will also perform in applications where emission control is required. Metal bellows are also available in non-contacting gas-lubricated designs.

» API 682 Type B and C
John Crane offers the most extensive range of metal bellows seals that are fully qualified and comply API 682 technical design requirements.



DESIGN FEATURES

- **» Optimum 45° tilt angle**
- **» Three-sweep radius**
- **» Nesting ripple plate design**
- **» Static secondary seal**
- **» Light spring loads**

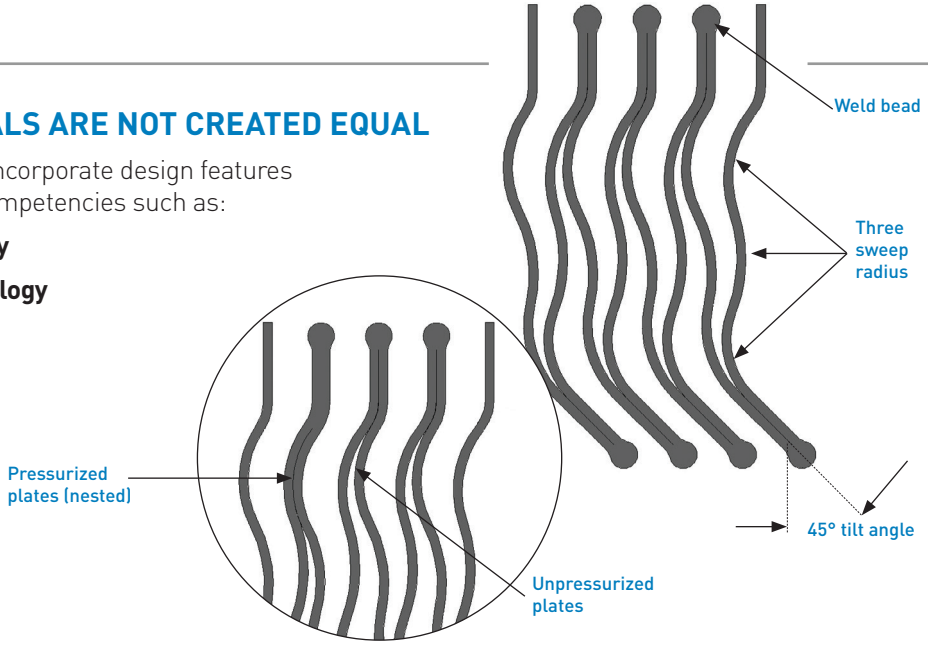
BENEFITS

- **» Uniform plate rigidity and stress distribution**
- **» Enhanced fatigue strength**
- **» Pressure-balanced by design**
- **» Less heat generated**
- **» Lower power consumption**

ALL METAL BELLOWS SEALS ARE NOT CREATED EQUAL

John Crane metal bellows seals incorporate design features resulting from key engineering competencies such as:

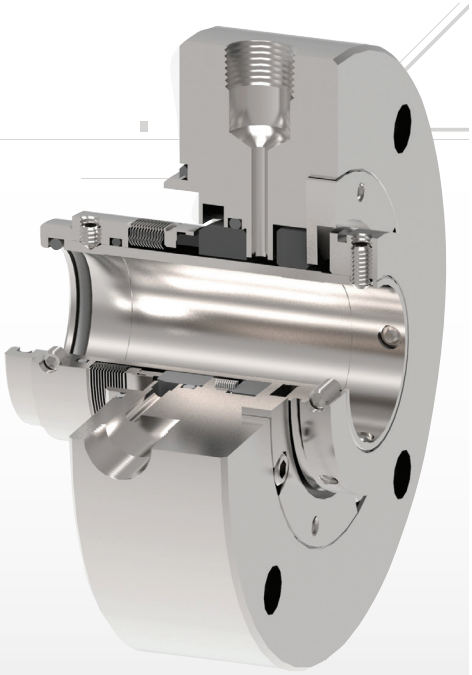
- **» Metallic thin shell methodology**
- **» Tribology and fluid seal technology**
- **» Thin film and fluid mechanics**



LOW-TEMPERATURE SERIES

Type 670, 675, 676 & 680

The low-temperature series are rotating seal heads that can be utilized in single or dual arrangements, shaft mounted or in a cartridge. The series is comprised of the most popular metallurgies, seal face materials and large selection of secondary seal O-ring materials that enable reliable sealing of a broad range of applications.



Type 1670
Type 1670 in API type cartridge seal

TYPE 670

The Type 670 is an all Alloy C-276 rotating bellows seal providing high strength and excellent corrosion resistance. It is extremely durable in applications where temperature and media (fluid) result in an aggressive environment such as crystallizing, caustic and acid services.

TYPE 675

The Type 675 provides the same benefits as the Type 670 and Type 676 but utilizes a titanium bellows. The titanium bellows is ideal for chlorine, chlorine dioxide and ferric chloride services.

TYPE 676

The Type 676, with an AM350 stainless steel bellows, is well suited for mild corrosive and abrasive applications, such as miscellaneous chemicals, water and paper stock.

TYPE 680

The Type 680 is ideal for general-purpose applications. Its Alloy-20 bellows provide corrosion resistance in a broad range of services. Its cost effective design, combined with reliable performance history, has made the Type 680 the standard for many low-temperature applications found in chemical, water and waste water, pulp and paper and power generation industries.

PERFORMANCE SPECIFICATIONS*

Seal Type	**Temperature: Carbon** *(Depending on materials used)*	**Temperature: Tungsten Carbide or Silicon Carbide** *(Depending on materials used)*	**Pressure** *(Consult basic pressure rating curves)*	**Speed**
Type 670	-100° to 550°F/-75° to 290°C	-100° to 400°F/-75° to 200°C	Vacuum to 360 psig/25 barg	Up to 5,000 fpm/25 ms^{-1}
Type 675	*Consult John Crane Engineering*		Vacuum to 150 psig/10 barg	
Type 676	-100° to 400°F/-75° to 200°C	-100° to 375°F/-75° to 190°C	Vacuum to 360 psig/25 barg	
Type 680	-100° to 500°F/-75° to 260°C	-100° to 300°F/-75° to 150°C	Vacuum to 360 psig/25 barg	

**Consult technical data sheets*

HIGH-TEMPERATURE SERIES

Type 604, 606 & 609

The high-temperature series seal heads are designed specifically for high-temperature liquid sealing applications, especially those found in oil & gas applications (refinery) such as flashing and non-flashing hydrocarbon services to 800°F/425°C. Other typical duties include: Fluid Catalytic Cracking Unit (FCCU), slurry and atmospheric or vacuum distillation pumps and coking applications.

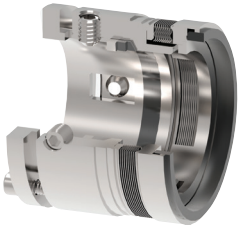
These seals are primarily utilized in both dual and single API 682 qualified Category II and Category III Type C cartridge arrangements. Materials of construction comply with API 682 design requirements making these seals the preferred choice for your hot oil & gas applications.

TYPE 604

The Type 604 is the preferred choice for single stationary bellows high-temperature applications. Available in either AM350 or Alloy 718, its high strength design is capable of handling high shaft speed applications and high shaft-to-seal chamber misalignment.

Unlike rotating seals that must flex on every revolution to accommodate shaft-to-seal chamber misalignment, the stationary Type 604 adapts to this condition by flexing only once during installation reducing seal movement resulting in increased seal life.

The Type 604 is used in the John Crane Type 1604 and Type 3604 API 682 Qualified cartridge seals.



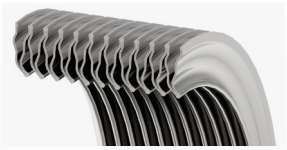
TYPE 606

The Type 606 is a rotating seal with the same high-strength features of the Type 609 but with the added feature of incorporating drive lugs under the bellows that provide extra rotational drive. This reduces torsional stress on the bellows providing maximum reliability and extended life in viscous or thermosetting applications.

TYPE 609

The Type 609 is intended for those demanding high-temperature applications where a dependable, high-strength, rotating seal is preferred. A narrow cross-section design enables the Type 609 to fit in the most popular pumps without expensive and time-consuming seal chamber modifications. This makes it the ideal choice for heat transfer, hydrocarbon and other hot applications that commonly use pumps with limited seal chamber clearances.

The Type 609 is used in the John Crane Type 2609HTL and 3609HTL API 682 qualified cartridge seals.



DOUBLE-PLY™ FOR HIGH-PRESSURE APPLICATIONS

The John Crane high-temperature series seals also are available with Double-ply bellows that are typically utilized in higher pressure applications and often used in services in which the fluid is thermosensitive or has a tendency to set-up and solidify on the seal faces where more start-up torque may be required. The Double-ply bellows provides strength and flexibility without thickness. John Crane combines this two-ply construction with our 45° tilt angle bellows plate.

FLEXIBLE GRAPHITE SECONDARY SEALS

This graphite-expanded material is formed into rings to provide a secondary static seal in high-temperature applications to 800°F/425°C or in chemical applications where an inert secondary seal is required. In addition, this material displays excellent corrosion resistance.

PERFORMANCE SPECIFICATIONS*

Seal Type	Temperature *(With flexible graphite static packing)*	Pressure *(Consult basic pressure rating curves)*	Speed
Type 604	-100° to 800°F/-75°C to 425°C	***Single-ply Bellows:*** Vacuum to 360 psig/25 barg ***Double-ply Bellows:*** Vacuum to 1,000 psig/69 barg	Up to 10,000 fpm/50 ms^{-1}
Type 606			Up to 5,000 fpm/25 ms^{-1}
Type 609			

**Consult technical data sheets*

HIGH-TEMPERATURE HTC TECHNOLOGY

Type 604HTC & 609HTC

The high-temperature corrosion-resistant (HTC) welded metal bellows seal is a unique advanced technology for reliably sealing fluids in harsh high-temperature corrosive environments and, at the same time, provides superior face stability at elevated temperatures.

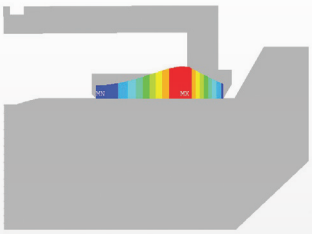
The exceptional face stability from this design results in reduced leakage and potentially longer seal life as the seal face flatness changes very little with changes in pressure and temperature.

Even if the application is not corrosive, the extra face stability provided by the seal can extend MTBR. This all-Inconel seal is ideally suited for applications that contain organic acids (naphthenic acid) and sulfur compounds that attack most other alloys at high temperatures.

The Types 604HTC and 609HTC are the solutions for high-temperature high-corrosive sealing environments for refineries utilizing high-sulfur (sour) crude that produce corrosive by-products such as naphthenic acid.

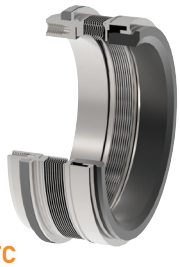
The Type 604HTC and Type 60HTC are available with double-ply bellows for higher pressure applications.

Type 604HTC



FEA HTC

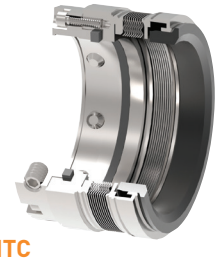
The HTC seal is a result of extensive research, development, engineering and testing effort to effectively provide you with an innovative solution in sealing applications involving corrosive fluids at elevated temperatures.



TYPE 604HTC

The Type 604HTC is a high-temperature corrosion resistant stationary metal bellows assembly that is capable of handling high shaft speed applications and high shaft-to-seal chamber misalignment.

The Type 604HTC is utilized in the API 682 qualified cartridge seals such as the Types 1604HTC and 3604HTC.



TYPE 609HTC

The Type 609HTC is a high-temperature metal bellows assembly intended for those demanding applications where a dependable, high-strength, rotating seal is preferred. Typical applications for these seals include hydrocarbons, aromatic fractionation products, crude oil fractionation products, heat transfer fluids as well as chemicals, caustics, some acids, aqueous solutions and lubricating fluids. The narrow radial cross-section fits most popular pump models without modification.

The Type 609HTC is utilized in API 682 qualified cartridge seals such as the Type 2609HTC and 3609HTC.

PERFORMANCE SPECIFICATIONS*

Seal Type	Temperature	Pressure *(Consult basic pressure rating curves)*	Speed
Type 604HTC	-100° to 800°F/-75° to 425°C	***Dynamic:*** Vacuum to 300 psig/20 barg ***Static:*** Up to 450 psig/31 barg ***Double-ply:*** Consult John Crane Engineering	Up to 10,000 fpm/50 ms^{-1}
Type 609HTC			Up to 5,000 fpm/25 ms^{-1}

**Consult technical data sheets*

API 682 CARTRIDGE SEALS

API 682 Seal Requirements

As the world leader in oil & gas and petrochemical process sealing, John Crane supplies American Petroleum Institute (API) standard bellows seal configurations that are fully qualified and comply with API 682 technical design requirements.

John Crane provides the most complete product offering of Category I, II and III Type B and Type C seals for all of your oil & gas and chemical applications. Seal arrangements include both high-temperature and low-temperature designs.

Dry-running secondary containment seals like the Type ECS and dry-running non-contacting gas-lubricated seals like the Type 2874NE help to complete the API 682 product offering.

John Crane API 682 Type B and C seals are your preferred choice for safe, reliable, single and dual arrangements for numerous HPI services.

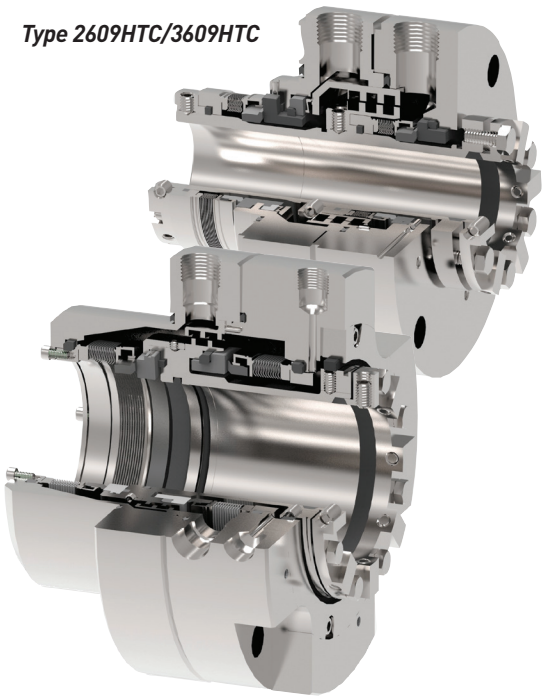
End-user Driven Seals Specification Standard

The standard was written by a select committee of end users, pump and seal manufacturers, including recognized seal industry experts from John Crane.

John Crane Technology Testing Center

All arrangements of John Crane's API 682 seals have been qualification tested in accordance with API 682 protocol for flashing and non-flashing hydrocarbon services. Testing is conducted in John Crane's state-of-the-art Technology Testing Center as well as in other testing facilities worldwide.

Type 2609HTC/3609HTC



Type 3604HTC

TYPE B CATEGORY I API 682 SEALS

Type 5615Q-1
Category I, heavy-duty single rotating bellows cartridge seal Type B, Arrangement 1.

Type 5625P-1
Category I, heavy-duty dual rotating unpressurized or pressurized Type B Arrangements 2 and 3.

Type 5625D-1
Category I, heavy-duty dual metal bellows primary seal Type B, Arrangement 2 utilizing a secondary containment outer seal.

TYPE B CATEGORY II AND III API 682 SEALS

Type 1670
Category II and III single rotating bellows cartridge seal Type B, Arrangement 1.

Type 2670
Category II and III dual unpressurized rotating bellows cartridge seal Type B, Arrangement 2.

Type 3670
Category II and III dual pressurized rotating bellows cartridge seal Type B, Arrangement 3.

PERFORMANCE SPECIFICATIONS*

Seal Type	Temperature	Pressure *(Consult basic pressure rating curves)*	Speed
Type B Category I	-20° to 500°F/-30° to 260°C	Up to 300 psig/20 barg	Up to 5,000 fpm 25 ms^{-1}
Type B Category II and III	-100° to 500°F/-75° to 260°C	Vacuum to 300 psig/20 barg	

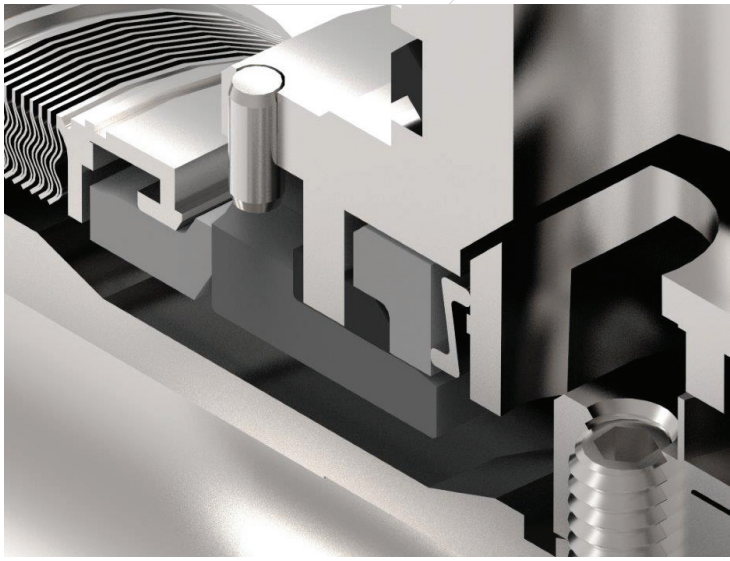
**Consult technical data sheets*

HTL TECHNOLOGY

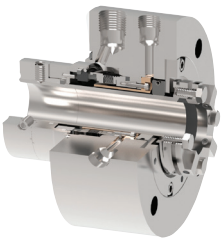
HTL technology uses a specially shaped mating ring, compression ring and energized Z-spring to "live load" the secondary flexible graphite packing and to control any radial and axial forces that may be imparted to the mating ring. By utilizing components with similar coefficients of thermal expansion, the HTL mating ring design minimizes and/or eliminates face distortion due to the relative differences in the thermal growth between components and by eliminating contact with metal surfaces. There are no forces transferred from the gland to the mating ring ensuring face stability and face flatness.

The mating ring has dual pressure capability which enables it to operate dependably with either a higher pressure process or barrier liquid at the outside or inside diameter location.

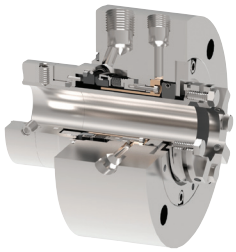
The HTL is used in conjunction with HTC metal bellows technology in API 682 qualified seals such as the 2609HTC, 3609HTC, 2609HTL and 3609HTL high-temperature Type C cartridge seals.



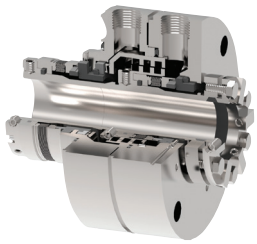
TYPE C CATEGORY II AND III API 682 SEALS



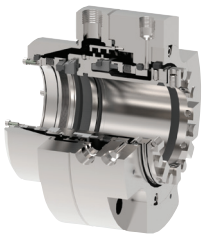
Type 1604
Category II and III single stationary bellows cartridge seal Type C, Arrangement 1



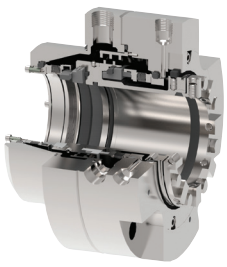
Type 1604HTC
Category II and III single stationary bellows cartridge seal Type C, Arrangement 1. HTC technology.



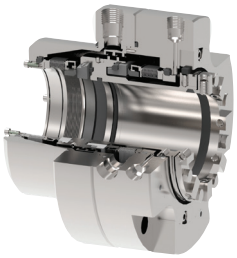
Type 2609HTC
Category II and III dual unpressurized rotating bellows cartridge seal Type C, Arrangement 2. HTC and HTL technology.



Type 3604
Category II and III dual pressurized stationary bellows cartridge seal Type C, Arrangement 3. Type 604 stationary inner and outer seal. Single-ply metal bellows.



Type 3604HTC
Category II and III dual pressurized stationary bellows cartridge seal Type C, Arrangement 3. Type 604HTC single or 604HTCDP Double-ply inner seal with 604 or 604DP outer seal. Single-ply metal bellows

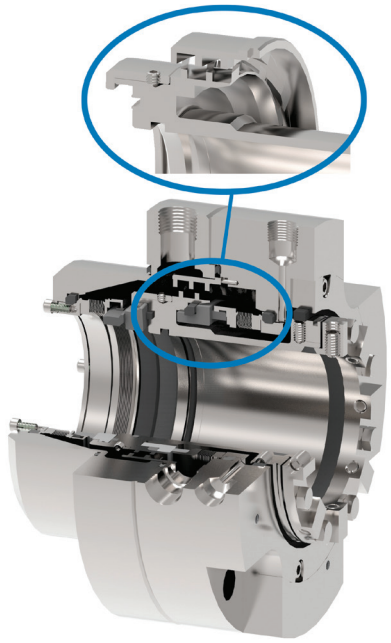


Type 3604HTCDP
Category II and III dual pressurized stationary bellows cartridge seal Type C, Arrangement 3. Type 604HTC single or 604HTCDP Double-ply inner seal with 604HTC or 604HTCDP outer seal.

DUAL SCROLL PUMPING DEVICE

John Crane's optimized Dual Scroll Pumping Device used within the Types 2609HTL, 3609HTL, 2609HTC, 3609HTC, 3604, 3604HTC, and 3604HTCDP API 682 qualified cartridge seals provides a performance advantage of producing significantly more flow over single scroll and other pumping devices, especially in high temperature applications with high heat loads or low shaft speeds.

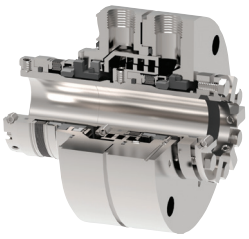
Flow enhancements are achieved with the addition of helical grooves in the cylindrical bore of the seal housing to create a "dual scroll" pumping device that delivers the highest flow performance. Extensive analysis and testing of key design parameters was employed to determine the best pumping configuration over a wide range of shaft speeds.



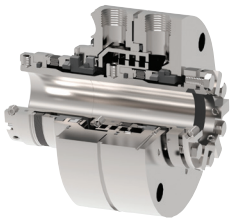
Type 3604HTC

KEY ADVANTAGES:

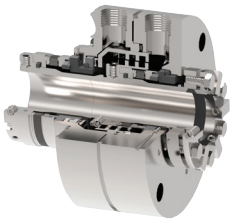
- **Increased pumping capability of up to 200% more flow than single scroll and other pumping devices.**
- **Improves seal performance:**
  - **More flow removes more heat**
  - **Seals can operate with lower temperature gradients and barrier fluid life is improved.**
  - **Reduced bulk temperature helps reduce coking in hot hydrocarbon fluids.**
  - **Can effectively provide cooling in large-shaft sized slower speed equipment.**



Type 3609HTC
Category II and III dual pressurized rotating bellows cartridge seal Type C, Arrangement 3. HTC and HTL technology.



TYPE 2609HTL
Category II and III dual unpressurized rotating bellows cartridge seal Type C, Arrangement 2. HTL technology.



Type 3609HTL
Category II and III dual pressurized rotating bellows cartridge seal Type C, Arrangement 3. HTL technology.

PERFORMANCE SPECIFICATIONS*

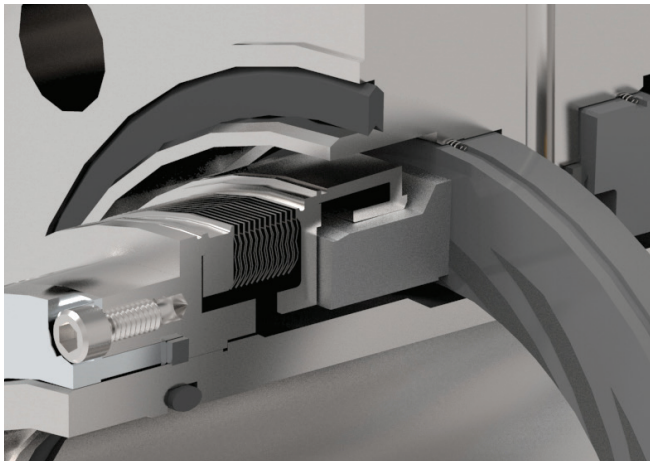
Seal Type	Temperature	Pressure	Speed
Type 1604 and Type 1604HTC	-100° to 800°F/-75° to 425°C	Vacuum to 300 psig/20 barg *(Consult John Crane Engineering for I.D. pressure limits)*	Up to 10,000 fpm/50 ms^{-1}
Type 2609HTC, Type 3609HTC, Type 2609HTL and Type 3609HTL			Up to 5,000 fpm/25 ms^{-1}
Type 3604, Type 3604HTC and Type 3604HTCDP		***Single ply:*** Vacuum to 300 psig/20 barg ***Double ply:*** Vacuum to 600 psig/42 barg *(Consult John Crane Engineering for max. double-ply pressure rating for your application)*	Up to 10,000 fpm/50 ms^{-1}

**Consult technical data sheets*

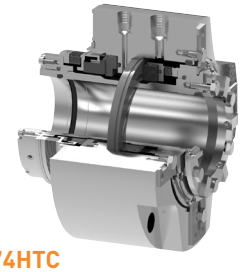
NON-CONTACTING GAS-LUBRICATED TECHNOLOGY

Type 2874HTC, 2800MB & 285

John Crane has been successfully demonstrating highly reliable gas sealing performance for several decades in a wide range of applications and across many process industries. The Type 2874HTC, Type 2800MB and Type 285 products combine the benefits of John Crane welded metal bellows seal technology with performance-proven non-contacting technology to help you effectively seal high-temperature, cryogenic and volatile fluids. These gas-lubricated non-contacting seals can help to lower maintenance costs and increase mean time between repair (MTBR).



Type 2874HTC



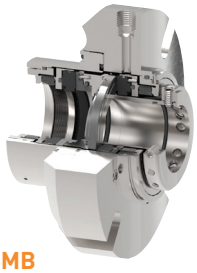
TYPE 2874HTC

The Type 2874HTC is a non-contacting, outward-pumping, metal bellows, dual-pressurized gas seal that permits reliable operation in high-temperature services up to 800°F/425°C and low-temperature process fluids.

The Type 2874HTC combines unique HTC (high-temperature, corrosion-resistant) metal bellows technology with non-contacting, gas-lubricated technologies.

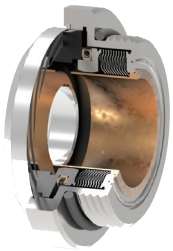
The 2874HTC is a cost-effective alternative to conventional wet contacting seals supported by various piping plans that provide liquid barriers, buffers or quenches to the seal. Instead of using a wet support system, the advantages of non-contacting, gas-lubricated technology can be used for reliable operation with either nitrogen, argon or steam barrier gas significantly reducing your lifecycle costs.

The Type 2874HTC is API 682-qualified with high-temperature features such as Inconel®-welded metal bellows and non-elastomeric carbon graphite secondary seals. This rugged seal with pressure-balanced design ensures full reverse pressure containment capability in the event of a temporary loss of barrier gas.



TYPE 2800MB

The Type 2800MB is a state-of-the-art welded metal bellows, gas-lubricated, non-contacting seal that is perfect for applications where a dynamic O-ring is prone to attack from a sealing environment that could affect the proper function of a conventional dynamic elastomer.



TYPE 285

The Type 285 seal is the first non-contacting welded metal bellows seal to be applied to cryogenic applications. John Crane's expertise in non-contacting technology combined with specially designed bellows, ensures high-performance, even in the toughest cryogenic applications.

The Type 285's compact design fits the most popular cryogenic pumps without modification: both site-based and road tanker pumps. It is available in various seal cartridge arrangements: flanged and left- or right-hand threaded.

The design and material of construction meet the industry safety requirements, allowing the Type 285 to seal all of the common industrial liquid gases including: oxygen, nitrogen and argon.

PERFORMANCE SPECIFICATIONS*

Seal Type	Temperature	Pressure	Speed
Type 2874HTC	-100° to 800°F/-75° to 425°C	Vacuum to 230 psig/16 barg	1,450 rpm minimum/3,600 rpm max.
Type 2800MB	-40° to 500°F/-40° to 260°C		
Type 285	-320°F/-196°C to Ambient	Up to 100 psig/7 barg	Up to 10,000 rpm

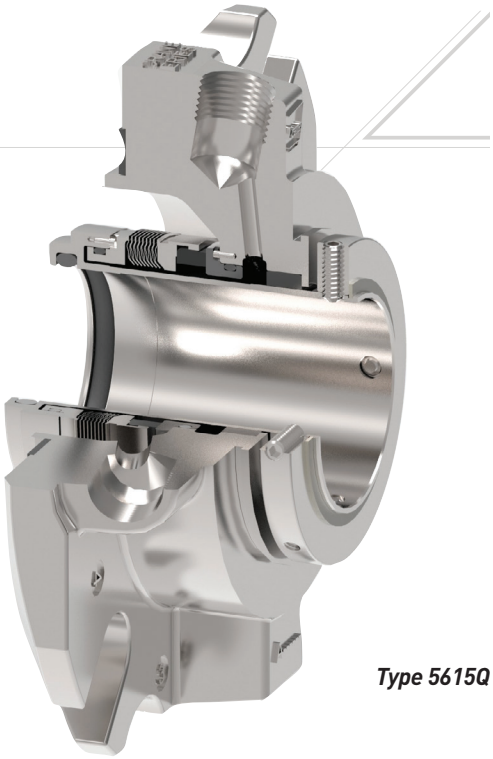
**Consult technical data sheets*

UNIVERSAL CARTRIDGE™

Type 5615/5615Q & 5625/5625P/4615

This is a modular cartridge seal family that includes interchangeable elastomer bellows, metal bellows and elastomer O-ring pusher designs. The 5600 Series is available with multiple metallurgies such as Alloy 20 and Alloy C-276 and hard faces such as silicon carbide or tungsten carbide.

The 5600 Series is ANSI B73.1 and DIN 24960 pump-compliant and is applied in a variety process industries such as HPI, CPI, petrochemical, pharmaceutical, food and beverage, power generation and other general industries.



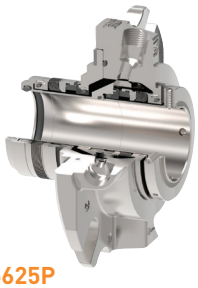
Type 5615Q

TYPE 5615/5615Q

Universal cartridge metal bellows single seal arrangements that incorporates the John Crane edge-welded metal bellows seal head.

A common seal head mating ring set, utilized throughout all versions, is reversible to allow rotating mating ring or rotating seal head operation, and is interchangeable with O-ring seal heads.

The Type 5615Q has an optional quench gland available for use on crystallizing services when outside injection is not available or product dilution is not permissible.



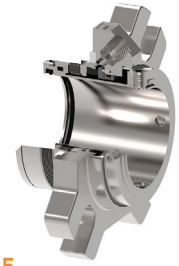
TYPE 5625/5625P

The Type 5625 and Type 5625P are dual metal bellows cartridge seal arrangements.

Primary and mating ring reverse balance designs allow for ID (inside diameter) or OD (outside diameter) pressurization which permits the dual seal to operate as a tandem or double seal. Positive seal face closing forces are maintained in an upset pressure reversal situation.

OD pressurization of the outer seal avoids subjecting components to high tensile stresses and achieves improved cooling. On vertical applications it allows for venting of entrapped air.

The Type 5625P utilizes a pumping ring for efficient circulation of barrier fluids and is designed with tangential inlet and outlet pipe connections.



TYPE 4615

The 4615 is the metal bellows member of the 4600 family of cartridge seals. Like other Type 4600 series cartridge seals, the 4615 design provides reduced installation times, lower maintenance costs and optimal equipment performance; and is ideal for the chemical, pulp and paper, wastewater, food processing and power generation industries. The abrasion- and corrosion-resistant Alloy 20CB3 SS bellows enhance reliability by eliminating dynamic O-ring hang-up caused by process contamination, thermal gradients and material deficiencies.

PERFORMANCE SPECIFICATIONS*

Seal Type	Temperature	Pressure	Speed
Type 5615/5615Q, Type 5625/5625P	20° to 400°F/-30° to 205°C	Up to 300 psig/21 barg	Up to 5,000 fpm/25 ms^{-1}
Type 4615	-20° to 266°F/-30° to 130°C	Up to 220 psig/15 barg	Up to 3,600 rpm

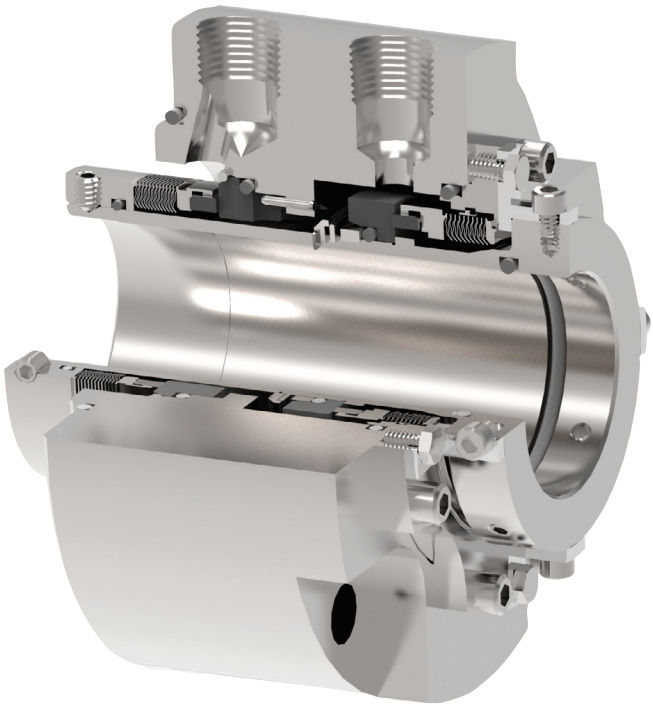
**Consult technical data sheets*

DRY-RUNNING SECONDARY CONTAINMENT SEAL

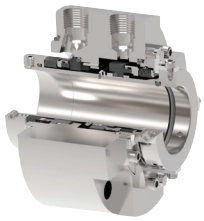
TYPE ECS™ (Emission Containment Seal)

Available in low- and high-temperature designs, the ECS is a dry-running seal for emission containment and/or can act as a safety backup that successfully controls volatile organic compounds (VOC) and volatile hazardous air pollutant (VHAP) emissions. The ECS provides an economical alternative to dual seals with liquid barrier systems.

Specially designed, uniformly-loaded bellows plates combined with optimal seal face materials provide extended and reliable performance. The ECS is an effective solution in meeting emission requirements while eliminating the need for liquid barrier systems.

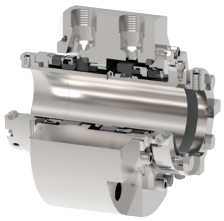


Type ECS Low-temperature



TYPE ECS LOW-TEMPERATURE

As a self-contained cartridge, the outer ECS is used with either a rotating or stationary John Crane primary seal and will successfully contain any nominal leakage from the primary seal. The seal also acts as a backup providing additional level of safety during process or system upsets.



TYPE ECS HIGH-TEMPERATURE

The high-temperature ECS has all of the design features and performance benefits of the low-temperature ECS but incorporates a flexible graphite secondary seal with positive drive mechanism. The ECS utilizes Inconel bellows for high-temperature service.

These features along with the use of a steam quench enable the high-temperature ECS to be reliably used as a safety/backup seal in high-temperature applications such as gasoline, gas oils and heat transfer fluids.

PERFORMANCE SPECIFICATIONS*

Seal Type	Temperature	Pressure	Speed
Type ECS Low-temperature	Up to 400°F/204°C *(Depending on elastomer specified)*	***Dynamic Containment Wet:*** Up to 300 psig/20 barg ***Static Containment Wet & Dry:*** Up to 450 psig/31 barg ***Dynamic Dry:*** Up to 15 psig/1 barg (Check basic pressure rating and performance capabilities of your appropriate primary seal selection)	Up to 5000 fpm/25 ms^{-1}
Type ECS High-temperature	Up to 800°F/425°C		

**Consult technical data sheets*

SPECIALIZED APPLICATIONS

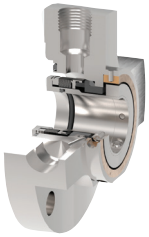
SUNDYNE®, UNILIGN®/UNICHEM®, Type 2715T and Refrigeration Compressor

SUNDYNE®

Welded Metal Bellows for SUNSTRAND® SUNDYNE® Pumps

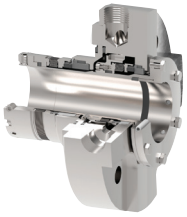
This cost-effective John Crane seal fits Sundyne pump models LMV-311, 322, 331, 801, 802 and can be installed without pump modifications.

This rugged high-speed seal features a high-strength, heat-treated AM350, Alloy 718 or Alloy C-276 Double-ply bellows for superior durability and an integral vibration dampener for high-speed stability. Sundyne seals are available in single or dual arrangements.



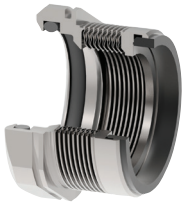
UNILIGN®/UNICHEM®

Self-contained pre-set single cartridge seal designed specifically for Unilign and Unichem pumps that is installed without pump modification or motor removal. The gland is equipped with circulation, vent and drain connections with a bronze throttle bushing. Hard faces are also available for handling abrasive applications.



TYPE 2715T

The Type 2715T is available as a single or dual high-temperature cartridge seal for Dean Bros. Pumps. These cartridge seals fit the Dean Pump Model R434, R454, and are optimum sealing arrangements for hot heat transfer fluids. The seal is available with hard faces for handling carbonizing heat transfer fluids and an integral pumping ring in dual arrangements for effective circulation of a barrier fluid.



REFRIGERATION COMPRESSORS

John Crane pioneered the development of metal bellows seals for refrigeration compressors to meet the demands imposed by new refrigerants and strict leakage controls on ozone-depleting gases. Today, our seals are fitted on the majority of newly manufactured compressors.

John Crane metal bellows seals are successfully applied to refrigeration applications in centrifugal, screw and reciprocating compressors. These seals are available in cartridge or component style and in single or dual arrangements for varying refrigerants, process gases and compressor oils.

PERFORMANCE SPECIFICATIONS*

Seal Type	Temperature	Pressure	Speed
SUNDYNE®	***AM350 and Alloy 718:*** -100° to 800°F/-75° to 425°C ***Alloy C-276:*** -40° to 675°F/-40° to 360°C ***Alloy 718:*** Consult John Crane Engineering	***AM350:*** 900 psig/60 barg max. ***Alloy C-276:*** Up to 800 psig/55 barg max *(Depending on materials specified)*	Up to 25,000 rpm
UNILIGN®/UNICHEM®	-20° to 500°F/-30° to 260°C (Depending on materials specified)	Vacuum to 300 psig/20 barg	Up to 5000 fpm/25 ms^{-1}
Type 2715T	-100° to 800°F/-75° to 425°C	Up to 300 psig/20 barg	Up to 5000 fpm/25 ms^{-1}
Refrigeration Compressors	-100° to 550°F/-75° to 290°C	Vacuum to 360 psig/25 barg	Up to 5,000 fpm/25 ms^{-1}

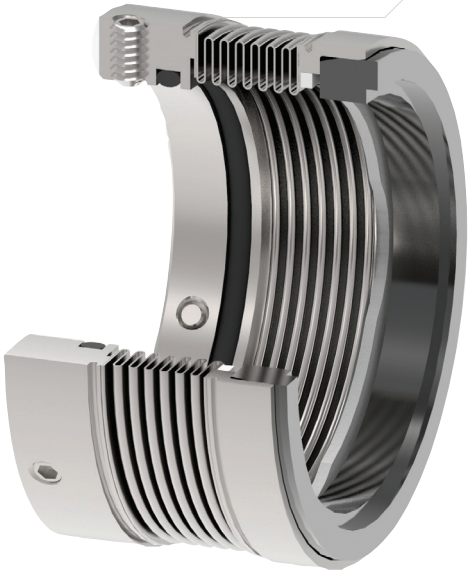
**Consult technical data sheets*

ROLLED/FORMED METAL BELLOWS

Type GL1B, Type 515E, 515C & 515W

The Type 515E, 515C and 515W are asymmetric, formed metal bellows seals with an optimized asymmetric bellows profile to minimize stress loads. A static O-ring provides the secondary seal to the equipment shaft or sleeve surface while face wear is compensated by the extension of the bellows. The smooth open profile of the formed bellows leads to greater reliability in many areas of application, especially where hygiene and purity are essential, such as food preparation and the pharmaceutical industry.

The Type GL1B seal is the first double-ply formed bellows seal to meet the dimensional requirements of DIN 24960 L1K. The double-ply design results in an axially flexible, yet extremely strong construction.



Type GL1B

TYPE GL1B

The Type GLlB is a double-ply lnconel 625 rolled metal bellows seal. The open profile of the bellows allows easy cleaning making it particularly suitable for Pharmaceuticals and Food Processing Industries. The combination of rolled bellows design and materials of construction make it suitable for a variety of abrasive applications. With compliance to DIN 24960 LlK, ISO 3069 and ANSI B73 it can be fitted to most process pump designs.

TYPE 515E, 515C & 515W

Alloy 718 formed metal bellows for general sealing duties including refineries and chemical process plants, food processing, beverage and the pharmaceutical industries. Computer-optimized Alloy 718 asymmetric bellows profile makes this the most versatile formed metal bellows seal available. The even stress distribution in the bellows, reduction in weld length and smooth profile lead to greater reliability in a variety of applications.

The Type 515C and Type 515W are cartridge seals that are designed for easy installation and maintenance and fit most popular DIN and ANSI pump sizes without modification.

PERFORMANCE SPECIFICATIONS*

Seal Type	Temperature *(Depending on materials used)*	Pressure	Speed
Type GL1B	-40° to 500°F/-40° to 260°C	***Dynamic/Static:*** Vacuum to 230 psig/16 barg ***Special design Available:*** Up to 435 psig/30 barg	Up to 5,000 fpm/25 ms^{-1}
Type 515E, Type 515C and Type 515W	-40° to 390°F/-40° to 200°C	Up to 290 psig/20 barg	

**Consult technical data sheets*

SEALING SUPPORT SYSTEM

John Crane is your complete source for mechanical seal support systems. Providing unrivaled expertise, innovation and reliability, John Crane is the solution. John Crane is the leader in the design and manufacturing of standardized and engineered seal support systems such as closed loop barrier fluid circulators, multiple seal systems and compressor gas seal panels, all of which focus on the specific mechanical seal application. John Crane also supplies heat exchangers, reservoirs and filtration systems.

GAS SEAL CONTROL PANELS

Used on non-contacting, dual-pressurized seals, this system filters, regulates and monitors the gas supply, typically nitrogen, used to lubricate the seals.

Plan 54

Global Service Network

- Over 200 facilities in more than 50 countries
- Close proximity to customers' operations
- Local service and expert global support

North America
United States of America
Tel: 1-847-967-2400

Europe
United Kingdom
Tel: 44-1753-224000

Latin America
Brazil
Tel: 55-11-3371-2500

Middle East & Africa
United Arab Emirates
Tel: 971-481-27800

Asia Pacific
Singapore
Tel: 65-6518-1800

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B-MetalBellows/Eng