

INNOVATIVE  
**SEALING & POLYMER**  
SOLUTIONS



**OmniSeal®**

**SPRING-ENERGIZED SEALS**



SAINT-GOBAIN  
SEALS

**PRODUCT  
HANDBOOK**



  
**SAINT-GOBAIN**

# Welcome to the Saint-Gobain Seals World: Experience You Can Rely On... Time After Time

Saint-Gobain has a rich tradition of excellence that dates back over 345 years. Today, it is one of the world's top 100 industrial corporations and a leader in the development and production of engineered components and materials.

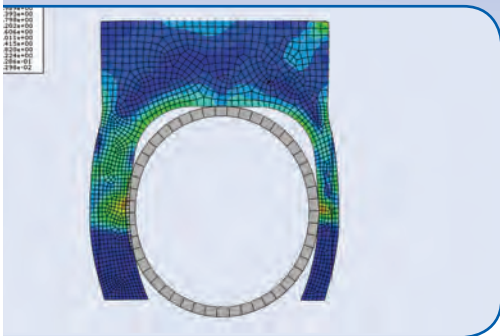
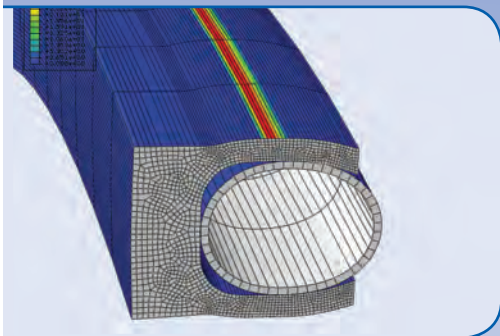
In 1665, Louis XIV signed the letters patent, leading to the creation of Saint-Gobain on an industrial basis. Among the company's earlier and more notable projects was the manufacturing of 357 mirrors for the Hall of Mirrors in the Palace of Versailles. From these glassmaking origins, Saint-Gobain continues its long history of developing new and innovative materials and products through arduous research.

With over 195,000 employees, operations in 64 countries and 20 research and development centers, Saint-Gobain provides complete and thorough service to our customers, starting with our experienced design engineering team, moving to our high-tech labs for testing and research and development, and continuing on to the manufacturing floor.

We believe that "the future is made of Saint-Gobain" and have devoted much of our resources to creating strong research and development centers and establishing partnerships with prestigious universities and laboratories. Our commitment to innovation has resulted in the rapid progression of new Saint-Gobain products that did not exist five years ago.

Saint-Gobain is among the global leaders in each of its businesses: construction products, building distribution, packaging and innovative materials, including high-performance seals. Our seals are manufactured throughout the world with sites located in the Americas, Europe and Asia.

With a strong history of innovation, Saint-Gobain Seals is dedicated to providing the most technologically advanced products on the market today and finding solutions for the future.



Saint-Gobain Group Headquarters, Les Miroirs, France



# A Tour of Our Capabilities

Saint-Gobain Seals' global presence allows us to manufacture OmniSeal® spring-energized seals throughout the world, with sites located in Garden Grove, California, USA; Kontich, Belgium; Kolo, Poland; Willich, Germany; Minhang, Shanghai, China; Suwa, Japan and Vinhedo, Brazil. To further support your needs we also have a technical office available in Agrate Brianza, Italy. The majority of our products are custom designed through careful and detailed collaboration with each customer, giving them access to the market-leading engineering, research and customer service expertise of our organization.

## Design Engineering

- › 3D modeling
- › Finite Element Analysis (FEA)
- › CAD drawings
- › FEA based spring force calculator

## R&D, Lab & Testing

- › DMA (Dynamic Mechanical Analyzer), TMA (Thermomechanical Analyzer), TGA (Thermogravimetric Analyzer) and DSC (Differential Scanning Calorimetry)
- › FTIR (Fourier Transform Infrared Spectroscopy) and SEM (Scanning Electron Microscopy), Malvern Particle Analyzer, Digital Microscopes and Surface Finish Profilometer
- › Tribological Material Testing; Mechanical, Electrical and Optical Testing; and EMI/RFI Testing
- › Blending and Molding, High-Speed Rotary Test Rigs and High Pressure Hydraulic Test Chamber

We are proud of our more than 50 years of experience in manufacturing, along with our spirit of continuous improvement utilizing WCM, 5S, Kaizen and Six Sigma, which leads to superior process control, high product quality and consistent performance. As a result of our dedication to excellence, our worldwide facilities are ISO 9001 certified. Our sites in Garden Grove, Kontich, Minhang, Kolo and Willich are also ISO 14001 certified. Additionally, our Garden Grove site is certified for AS9100, the Kontich site for EN9100 and the Willich site for TS16949 and OHSAS18001.

## Manufacturing

- › Metal fabrication
- › Multi-axis precision manufacturing
- › Injection and co-injection molding, liquid injection molding, hot and cold compression molding, automatic molding, hot and cold isostatic molding
- › Direct forming
- › Tool design and fabrication
- › Coiling/winding and punching
- › Casting and coating
- › Skiving and sintering
- › Rapid prototyping



Garden Grove,  
California, USA

Kontich, Belgium

Minhang,  
Shanghai, China

Kolo, Poland

Suwa, Japan

Willich, Germany

Vinhedo, Brazil

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# When Our Spring-Energized Seals Journey Began

OMNISEAL®

## What Is the OmniSeal® Product Line?

OmniSeal® seals are the Saint-Gobain Seals product family of spring-energized PTFE seals made from high-performance polymer materials.

In the early 1950s, OmniSeal® seals were first developed by three separate entrepreneurs in Southern California, each introducing a unique design: OmniSeal®, TEC Ring and RACO™ seals. These seals were developed to provide improved performance over soft elastomeric seals and hard metal gaskets in applications involving cryogenic liquid propellants in various rocket engine programs. OmniSeal® seals helped to solve sealing problems from highly aggressive chemicals at very low temperatures where conventional seals had failed.

In the 1960s and 1970s, the Fluorocarbon Company (which later became Furon) began to purchase OmniSeal® designs and firms that manufactured these seals. Furon continued to develop and improve these spring-energized seals in order to handle extreme sealing requirements for the commercial aircraft industry. In 1999, Compagnie de Saint-Gobain purchased Furon, giving our French industrial firm a leading role in the fast-growing high-performance plastics and sealing business. Already well known for its glass and ceramics, Saint-Gobain's acquisition of Furon gave it a more diversified portfolio of products.

Since this acquisition, Saint-Gobain Seals continues to develop its patented OmniSeal® spring-energized seals product line, proven to be effective solutions in multiple industries.







## Our Spring-Energized Seals and Their Part in History



Hardware that was built for space vehicles in the Apollo moon exploration program contained a variety of OmniSeal® products. The Lunar Lander at the Smithsonian National Air and Space Museum in Washington, D.C., displays our RACO™ seal (a design within the OmniSeal® product family), which was used to seal the triangular shaped window on the space vehicle.



OmniSeal® seals were designed and used in the first space shuttle launched in 1981 by NASA as part of their STS (Space Transportation System) program. Since that time, our seals have been launched into space in 132 shuttle missions and included in 25 critical applications in the main engine, life support systems, hypergolic fuels and external tank. Our seals have traveled more than 500 million miles.



As the first probe from Earth to land intact on Mars, the Viking Mars Lander's sampling chambers where mission critical experiments were conducted contained RACO™ seals. RACO™ seals were substituted for metal seals which failed leakage tests just months short of vehicle launch.

### Proven in the Past ...

Having proved that our OmniSeal® product line can handle the most extreme environments in the aerospace industry, Saint-Gobain Seals looked to assist other industries such as oil and gas, automotive, electronics, industrial and life sciences. Within those industries, we were also successful in addressing critical issues for our customers due to our custom designs, engineer-to-engineer collaboration, and research and development resources. In the past we have proven to be the right partner for sealing and polymer solutions, and we are prepared to assist our customers with their future goals.

**... Prepared for the Future**

## How Our OmniSeal® Spring-Energized Seals Work

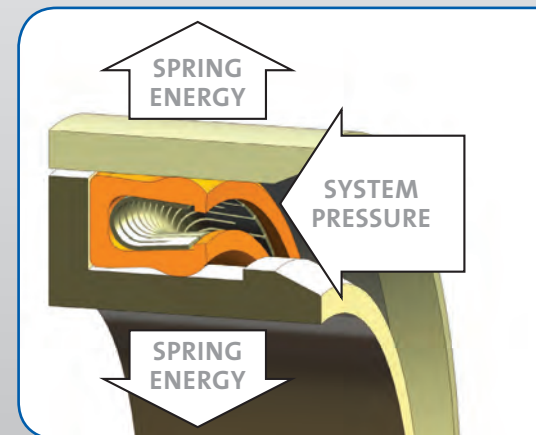
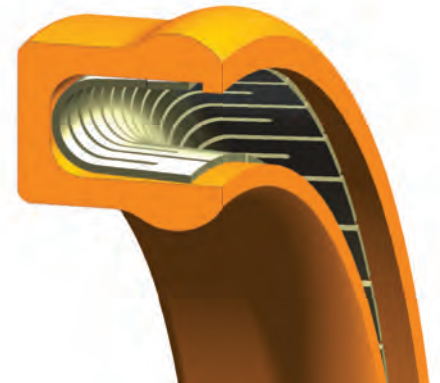
The OmniSeal® spring-energized seal is a spring-actuated, pressure-assisted sealing device consisting of a PTFE (or other polymer) jacket partially encapsulating a corrosion-resistant metal spring energizer.

When the OmniSeal® seal is seated in the gland, the spring is under compression, forcing the jacket lips against the gland walls and thereby creating a leak-tight seal. The spring provides permanent resilience to the seal jacket and compensates for material wear and hardware misalignment or eccentricity. System pressure also assists in energizing the seal jacket. Spring loading assisted by system pressure provides effective sealing in both low and high-pressure operating environments.

OmniSeal® jackets are precision machined from PTFE, filled PTFE composites and other high performance polymers. An OmniSeal® seal with a PTFE jacket functions at temperatures ranging from cryogenic to more than 300°C and is inert to virtually all chemicals except molten alkali metals, fluorine gas at high temperature and chlorine trifluoride (ClF<sub>3</sub>).

OmniSeal® products are available with a variety of spring energizers, each with characteristics that meet specific requirements. Spring loading can be engineered to meet critical low friction requirements in dynamic applications, or extremely high loading often required for cryogenic sealing. Springs are fabricated from corrosion-resistant metals such as 300 Series and 17-7 PH stainless steels, Elgiloy®, Hastelloy® and Inconel®. OmniSeal® products with metal springs have unlimited shelf life and are not subject to age controls normally imposed on elastomeric seals.

Seals with elastomer O-rings used as energizers – made from such materials as nitrile, silicone, FKM, and OmniFlex™ – are also available by contacting our manufacturing site. The geometry of the OmniSeal® seal installed in the gland provides positive resistance to torsional or spiral failures often found in O-rings.



*OmniSeal® 400A seal in working conditions*

## Our Seal Jacket Materials

Saint-Gobain Seals' Fluoroloy® compounds which make up the seal jackets are made from high-performance polymer resins that are compounded and processed for optimum performance in a wide variety of sealing environments. The materials listed below are our most commonly recommended compounds and are suitable for most applications. Over the years, Saint-Gobain Seals has developed more than 500 blends for use in unique sealing applications, and we are continually formulating and developing new materials.

### Material Codes and Properties

Material Code	Color	Description and Recommended Use	Temperature Range °C	Coefficient of Friction	Wear Factor 1 = Excellent 15,000 = Poor	Tensile Strength MPa	Elongation %	Hardness Shore D
A01	White	<b>Virgin PTFE.</b> Excellent for static and light to moderate dynamic service. Limited wear and heat resistance. Low gas permeability. Good cryogenic properties. Moderate to hard vacuum service. FDA compliant.	-210 to +260	0.09	7,500	27.6	300	58
A02	White	<b>Modified PTFE.</b> Excellent for light to moderate dynamic and static service. Limited wear and heat resistance. Low gas permeability. Good cryogenic properties. Moderate to hard vacuum service. FDA compliant. Improved creep and extrusion resistance.	-210 to +300	0.09	6,000	33.1	450	58
A05	Black	<b>Polymer Filled PTFE.</b> Excellent wear material for higher temperatures, pressures and speeds. Excellent in water and water-based solutions. Superior in dry or poor lubricated applications. Can be abrasive running against soft metals.	-210 to +300	0.09	1	13.8	170	64
A08	Tan	<b>Polymer Filled PTFE.</b> Superior heat and wear resistance. Non-abrasive. Recommended for moderate to high speed dynamic service running against soft metals. Not recommended for applications with steam.	-210 to +300	0.15	2	20.7	230	60
A09	Gold	<b>Formulated UHMW-PE.</b> Extremely tough, long wearing but limited heat and chemical resistance. Particularly suitable for abrasive media. Recommended for long wear life under severe conditions.	-150 to +82	0.11	9	31.0	230	61
A10	Yellow	<b>Glass Formulated PTFE.</b> Excellent heat, wear and chemical resistance. Excellent for cryogenic and hypergolic fluids. Unaffected by sunlight or ozone.	-210 to +300	0.09	6	15.2	240	65



## Our Seal Jacket Materials

### Material Codes and Properties

Material Code	Color	Description and Recommended Use	Temperature Range °C	Coefficient of Friction	Wear Factor 1 = Excellent 15,000 = Poor	Tensile Strength MPa	Elongation %	Hardness Shore D
A11	Clear	<b>Virgin ETFE.</b> Thermoplastic with superior resistance to nuclear radiation but limited heat and wear resistance. Not recommended for general purpose sealing.	-101 to +149	0.50	150	38.6	300	72
A12	Gold	<b>Polymer Filled PTFE.</b> Tough, long wearing, heat resistant. Very low friction. Excellent for dry running applications against soft surfaces. Excellent materials for reciprocating applications.	-210 to +300	0.09	9	13.8	180	60
A15	Gray	<b>Lubricated Glass Filled PTFE.</b> Similar to A27 material but somewhat softer for improved sealing at low pressure. Can be abrasive running against soft metals.	-210 to +300	0.09	5	23.4	230	58
A16	Gray	<b>Lubricated Organic Filled PTFE.</b> Excellent general purpose material for heat and wear resistance. Recommended for dry and poorly lubricated applications. Particularly suitable for water and steam service.	-210 to +300	0.09	12	20.7	200	60
A17	White	<b>Formulated UHMW-PE.</b> Extremely good wear and abrasion resistance, but limited heat and chemical resistance. FDA compliant.	-150 to +82	0.11	9	37.2	450	62
A21	Black	<b>Lubricated Organic Filled PTFE.</b> Similar to A16 material but increased hardness and wear resistance. Excellent in steam and water under severe conditions. Improved creep and extrusion resistance at higher temperature. Good for back-up rings.	-210 to +300	0.10	6	12.4	65	65
Meldin® 5301	Tan	<b>Virgin PEEK.</b> High modulus material with excellent high temperature resistance. Recommended for back-up rings and for special applications.	-210 to +300	0.40	20	95.0	30	90
A27	Gray	<b>Lubricated Glass Filled PTFE.</b> Tough, long wearing, heat resistant. Recommended for high pressure hydraulic service. Can be abrasive running against soft metals at high surface speeds.	-210 to +300	0.09	9	22.8	280	58

## Our Seal Jacket Materials

### Material Codes and Properties

Material Code	Color	Description and Recommended Use	Temperature Range °C	Coefficient of Friction	Wear Factor 1 = Excellent 15,000 = Poor	Tensile Strength MPa	Elongation %	Hardness Shore D
A40	Tan	<b>Polymer Filled PTFE.</b> Good wear resistant material for medium hard counterfaces. Caution when used in wet applications. FDA compliant.	-210 to +300	0.10	6	17.2	175	63
A41	Black	<b>Modified Filled PTFE.</b> Excellent all purpose high wear material. Best for dynamic applications running on moderate to hard surfaces.	-210 to +300	0.09	30	17.9	135	60
A42	Black	<b>Lubricated Formulated PTFE.</b> Excellent general purpose material with good heat and wear resistance. Non-abrasive. Compatible with all hydraulic fluids and most chemicals. Good in water and non-lubricating fluids.	-210 to +300	0.09	30	12.4	90	60
A45	Brown	<b>Polymer Filled PTFE.</b> Excellent wear material for higher temperatures, pressures and speeds. Superior in dry or poor lubricated applications. FDA compliant.	-210 to +300	0.09	1	13.1	300	55
A46	White	<b>Filled PTFE.</b> Good wear resistant material against all stainless steel counterfaces. May be used in contact with food. FDA compliant.	-210 to +300	0.20	15	13.8	175	60
A47	White	<b>Filled PTFE.</b> Very good wear resistant material under wet or lubricated conditions. May be used in contact with food. FDA compliant.	-210 to +300	0.11	9	8.3	90	63
A56	Black	<b>Proprietary PTFE.</b> Outstanding heat and chemical resistance. Highly conductive material.	-101 to +204	0.21	32	24.1	250	65
A83	Tan	<b>Proprietary PTFE.</b> Excellent conductive material. Excellent EMI/RFI Shielding.	-195 to +300	0.28	16	24.1	80	75
A84	Black	<b>Proprietary PTFE.</b> Excellent conductive material. Excellent EMI/RFI Shielding.	-195 to +320	0.42	3	15.8	90	70

# Our Investment in Industry-Recognized Material and Qualification Standards



## Material Properties and Qualifications

The demand for additional qualifications has been increasing over time due to stringent environmental requirements. Saint-Gobain Seals Research and Development department has been continuously working on the development of new materials and qualifications in order to meet the new industry standards of tomorrow. This has resulted in our materials being qualified according to international standards applicable for different industries, several of which are detailed below. For more information on our other qualifications, please view our website at [www.seals.saint-gobain.com](http://www.seals.saint-gobain.com) or contact us at [sealsmarketing@saint-gobain.com](mailto:sealsmarketing@saint-gobain.com).

## NORSOK M-710 and API 6A Requirements for the Oil and Gas Industry

In the 1970s, our Saint-Gobain Seals introduced OmniSeal® spring-energized seals to the oil and gas market in order to solve reliability and durability problems caused by the severe limitations of elastomeric seals. These seals, which had already proven themselves extensively in the aerospace industry, addressed critical issues including aggressive media, sour gas environment, resistance to rapid gas decompression and extreme operating conditions. Over the years, we have built unique expertise in designing high-performance polymer components that meet the most difficult challenges.

Today, Saint-Gobain Seals has more than 30 Fluoroloy® materials available that are qualified to NORSOK M-710 standard which describes the required physical tests for sealing materials. Most tests were undertaken at our R&D facilities while the aging tests were carried out by the Element Hitchin/MERL independent laboratory in the United Kingdom. The aging results can lead to an estimation of service life for materials in sour applications as well as a more general assessment of their suitability for sour service. In this qualification process, Fluoroloy® materials were subjected to extreme temperature and high percentages of hydrogen sulfide up to 15% H<sub>2</sub>S, providing new insights into the properties of these high performance compounds. This information will be used for the development of materials which can be used under even more demanding environments.

All of our Fluoroloy® and Meldin® materials that successfully passed the NORSOK qualification are available. The metal energizers are NACE-approved materials for use in sour gas service. In addition, we have materials qualified to API 6A F1.13.5.2 sour immersion testing of materials in fluid HH at 200°C.







## Our Investment in Industry-Recognized Material and Qualification Standards

### Material Compliance and Regulations for the Life Sciences Industry

From material selection to clean room operations, Saint-Gobain Seals offers the technology and infrastructure to support today's life sciences customer. Our extensive material catalogue includes different materials such as PTFE, PEEK, PCTFE, UHMW-PE and PFA based compounds that are compliant to one or more life sciences regulations. Please refer to the table below.

All listed FDA compliant Fluoroloy® materials are approved for repeated contact with food or drugs for oral consumption under title 21 CFR of the United States Food and Drug Administration (FDA). The awareness for safe direct food contact has grown worldwide and therefore different regulations are available. As a global developer and manufacturer of sealing elements for the life science industry, it is imperative that we have materials available that comply not only with the FDA but also with Direct Food Contact Regulation 1935/2004 & 10/2011 in Europe. Materials are also available that comply to USDA (United States Department of Agriculture) and 3A Sanitary standard 20 (milk products).

In addition, our Saint-Gobain Seals offers Fluoroloy® materials with full USP Class VI certification that comply with stringent disposable and reusable medical device requirements. The United States Pharmacopeia (USP) is a voluntary, not-for-profit organization that promotes the public health by establishing and disseminating officially recognized standards of quality. Plastics are qualified into one of six classes, each requiring different levels of testing. Class VI requires the most extensive testing.

Many applications in different industries deal with extreme chemical environments. Whether the media is alkaline, acidic or a unique solvent, Saint-Gobain Seals offers a material compound to meet your specific chemical needs, including Fluoroloy® A02, A21 and Rulon® LR, which are BAM certified.

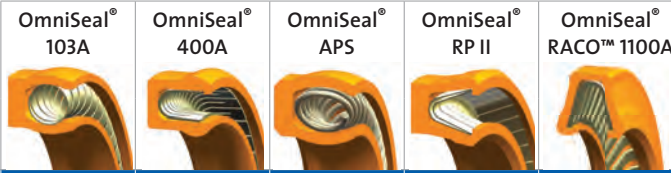


### Direct Contact Material Properties

Material Code	FDA Compliant	EU 1935/2004 10/2011	USDA	3-A Sanitary	USP Class VI
A01					
A02					
A06					
A12					
A17					
A20					
Meldin® 5301					
A23					
A29		Simulant A, B, C, D1, D2, E			
A40					
A45					
A46		Simulant D1, D2, E			
A47					
A66					
A79		Simulant C			

## Our Spring-Energizer Materials

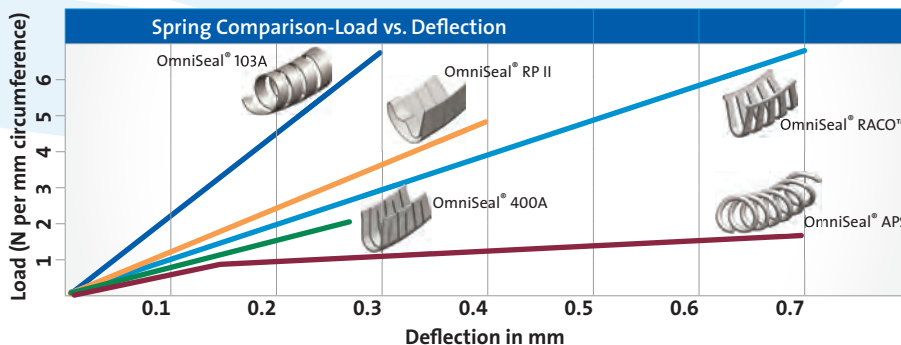
The metallic spring energizers available with OmniSeal® seals are listed in the chart below. Because of the nearly infinite variety of fluid media that may be encountered by the seals, no specific recommendations are made. The various stainless steels listed are compatible with most fluids. For questions or more information about media compatibility, please contact our Technical Support team at [sealsmarketing@saint-gobain.com](mailto:sealsmarketing@saint-gobain.com) or refer to the back page for site contact information.

Code No.	Description					
		Page 35	Page 37	Page 39	Page 41	Page 43
01	301 Stainless Steel		Standard		Standard	Standard
02	Inconel® 718					•
05	Cobalt/ Nickel Alloy <sup>1</sup>	•	•			
06	316 Stainless Steel	•	•	•		
07	17/7 PH Stainless Steel	Standard				
08	Hastelloy® C276		•			
09	302 Stainless Steel			Standard		

<sup>1</sup> HT (Heat Treatment) available

• Optional selections for all sizes. Please contact our Technical Support team for more information.

Note: Other metallic spring energizers are available. For information regarding design requirements, specific seal designs, unique applications and additional data specifications, contact our Technical Support team.



## Optional Energizers



### Elastomer Energizers

OmniSeal® 103A seals may be ordered with optional elastomeric O-ring energizers in place of the metallic spring. A wide variety of elastomers, such as OmniFlex™, nitrile, FKM and silicone are available.



### RTV Silicone Filled Energizers

OmniSeal® 400A seals can be supplied with an FDA-approved grade of RTV silicone filled into the spring cavity. The elastomer ensures that no contaminants become trapped in the spring cavity, allowing the seal to be used in food processing and clean-in-place applications. Other materials are also available.

## Our OmniSeal® Back-up Rings



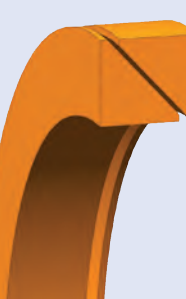
**Rectangular  
back-up ring**



**Triangular  
back-up ring**



**Double  
triangular  
back-up ring**



OmniSeal® back-up rings help to prevent seal extrusion at high temperature and pressure. Extrusion is a function of:

- › The size of extrusion gap
- › Temperature
- › Pressure
- › Surface speed (in reciprocating applications)

When under pressure, PTFE material in the seal tends to flow into the extrusion gap. Dynamic reciprocating movements increase extrusion. Under static conditions and when pressure, temperature and the extrusion gap are below certain limits, extrusion will stop as soon as the pressure created by friction in the extrusion gap equals the system pressure. Cyclic conditions can cause the extrusion to continue and result in premature failure of the seal.

### Back-up Rings

These back-up rings are specially designed to work in high pressure and high-temperature applications with radial OmniSeal® seals. They should also be considered for use at high pressure and high speed applications.

#### Rectangular Back-up Ring

In most applications with lower pressure and temperature below 250°C, a rectangular back-up ring will secure the seal from extrusion. These back-up rings are machined to fit securely in the radial groove width. The selected material should be a compound with a higher extrusion resistance than the seal material.

#### Triangular Back-up Ring

In some cases where high temperature precedes high pressure, a triangular back-up ring is recommended.

#### Double Triangular Back-up Ring

For extreme high pressure and temperature combinations, a set of two triangular back-up rings is recommended. This configuration is often used when the radial groove dimension changes as a result of the system pressure.



## Our OmniSeal® Back-up Rings



L-Shaped back-up ring

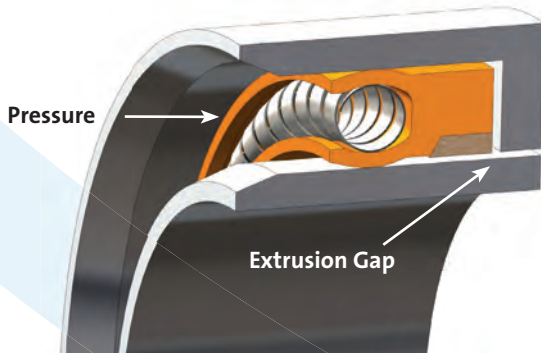
### L-shaped Back-up Ring

The L-shaped back-up ring is used to prevent extrusion in high pressure and high temperature combinations. It is capable of securing PTFE seals up to 300°C and pressures, up to 20 MPa with very large extrusion gaps.

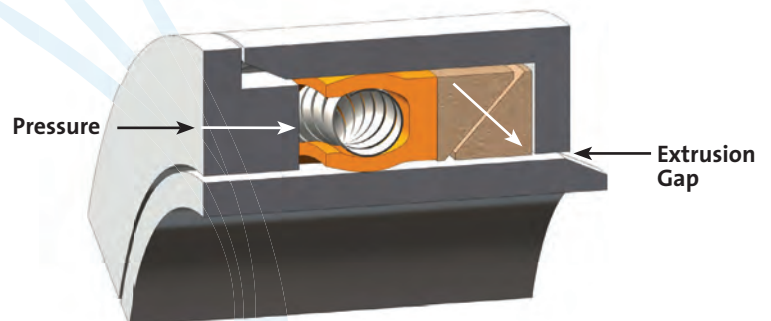
See materials shown on pages 8-10.

### Back-up Ring Materials

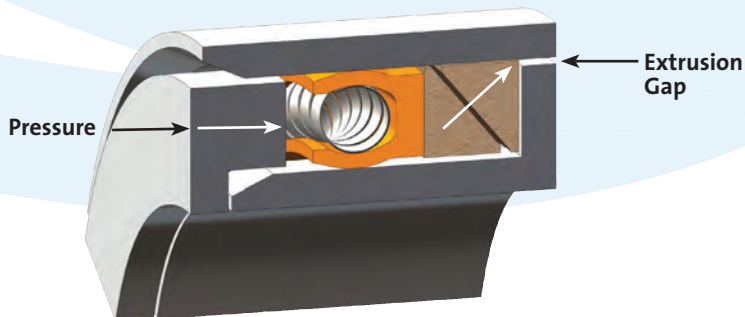
The back-up ring should consist of a harder material than the seal material. A high filled PTFE compound, or a high modulus plastic such as Meldin® 5301 is recommended. Polymeric materials such as filled PTFE, PEEK and reinforced PEEK prevent the softer seal material from extruding in the gap between adjacent hardware.



High modulus anti-extrusion/wear ring



Rod seal installation with dual back-up rings

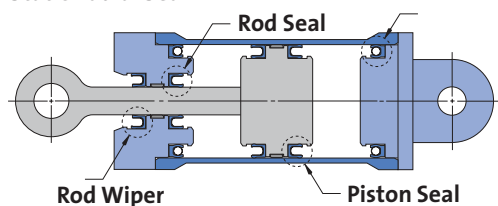


Piston seal installation with dual back-up rings

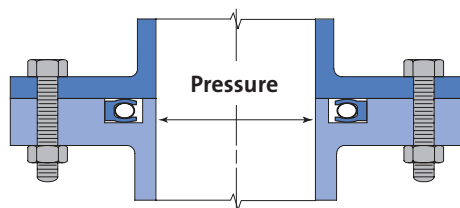
# Seal Function and Motion

## Dynamic Radial Seal

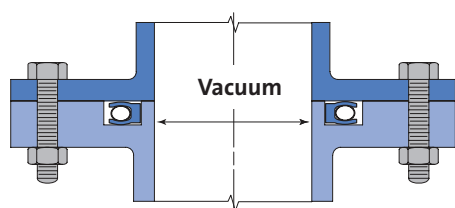
### Static Radial Seal



## Static Inside Face Seal



## Static Outside Face Seal



## Static and Dynamic Applications

There are two basic types of sealing applications: **static** and **dynamic**, in which at least two hardware surfaces come in contact with one another.

In static applications, there is essentially no relative motion between the hardware surfaces. A typical example is flanges that are bolted together. Saint-Gobain Seals offers mostly **face seals** in such applications.

In dynamic applications, at least one surface is in motion relative to the other. A typical example is a hydraulic cylinder with shaft and bore. Further, there are two directions of motion in dynamic application: reciprocating or linear motion, and rotary (including oscillating) motion. We offer mostly **radial seals (rod seals and piston seals)** in such applications.

Occasionally, the application may be a combination of both static and dynamic. Please see our application recommendations below or contact our Technical Support team at [sealsmarketing@saint-gobain.com](mailto:sealsmarketing@saint-gobain.com). You may also refer to the back page for specific site contact information.

## Radial and Face Sealing

Based on the hardware configuration and location of seal glands, sealing can be either radial or axial (face sealing).

Radial sealing has glands that compress seals in radial direction. Male glands are machined in the shaft, whereas female glands are machined in the bore. Radial sealing is usually, but not always, dynamic. We also offer **rod seals and piston seals** for these applications.

Axial sealing has glands that compress seals parallel to the axis of the seal. Glands are machined on the face of the hardware. Axial sealing is usually, but not always, static. Saint-Gobain Seals offers **inside and outside face seals** in such applications.

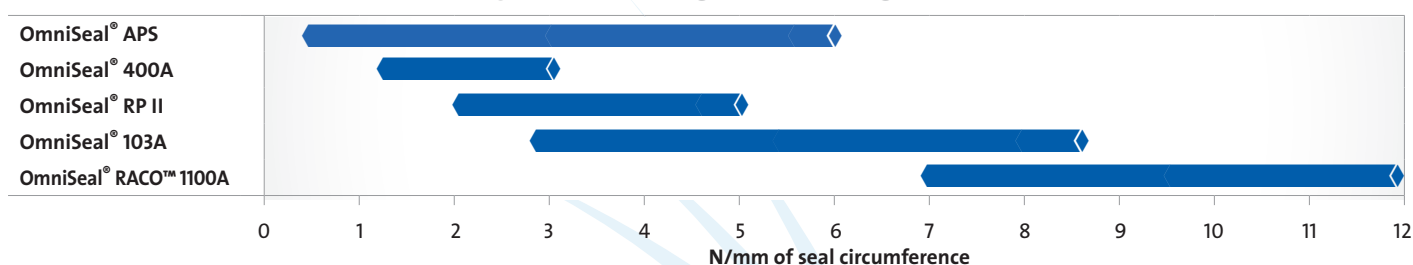
## OmniSeal® Application Recommendations

	Radial Sealing				Face Sealing
	OmniSeal® 103A				OmniSeal® 103A OmniSeal® RACO™ 1100A
Static Application	Reciprocating	OmniSeal® 400A OmniSeal® APS	OmniSeal® 103A OmniSeal® RP II		
Dynamic Application	Rotary	Moderate Speed	Flanged OmniSeal® 400A    Flanged OmniSeal® APS		OmniSeal® 400A OmniSeal® APS OmniSeal® RACO™ 1100A OmniSeal® 103A
		Slow Speed	Flanged OmniSeal® 103A    Flanged OmniSeal® RP II		

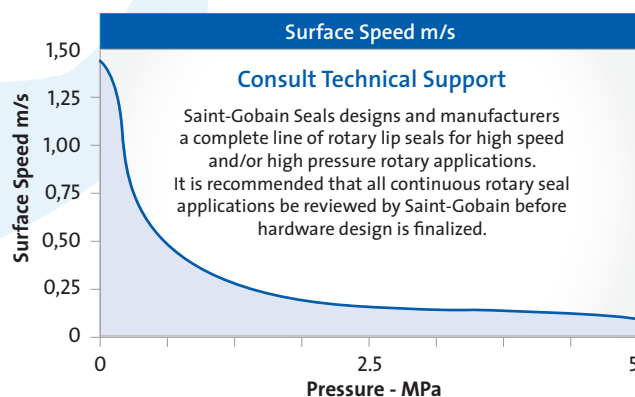
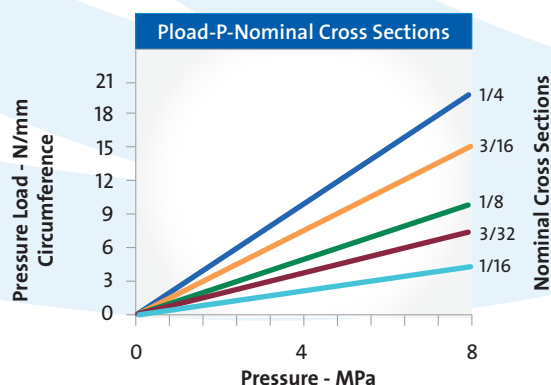
Friction, a measurement of the resistance to sliding between a seal and hardware surfaces, is directly related to the seal material's coefficient of friction and the normal load. Other factors that affect friction are lubrication, possible misalignment, pressure, temperature and hardware surface finishes. Information in the charts and formulas on this page can be used to calculate and approximate friction value for non-lubricated conditions. Lubrication provided by the media may produce lower frictional values.

It is difficult to predict how the running and break-out friction values will differ without testing under actual working conditions. Saint-Gobain Seals manufactures a variety of springs with lower or higher loads than shown on this page. In addition, we can develop special springs to meet other performance needs. For assistance with applications where friction is critical, please contact our Technical Support team at [sealsmarketing@saint-gobain.com](mailto:sealsmarketing@saint-gobain.com). You may also refer to the back page for specific site contact information.

### Typical Spring Load Ranges



The approximate total load of an OmniSeal® seal can be calculated by adding the pressure load found in the chart below left to the typical spring load as shown in the chart above. For rotary motion, use the chart below right to qualify OmniSeal® products for continuous rotary applications.





## Temperature, Pressure and Extrusion Gap

The size of the extrusion gap behind the seal is critical when sealing against high pressures and/or high temperatures. The extrusion gap is the clearance between the member hardware. Hardware designs without bearing or centering devices must take into consideration the diametrical clearance as the maximum extrusion gap. The combination of high pressures and/or high temperatures and excessive clearance can allow the seal jacket to extrude into the gap, causing premature failure.

The extrusion gap should be held to the minimum, and should not exceed the values shown in the table. Increasing the heel thickness of the seal improves resistance to extrusion. The extrusion gap can also be bridged using a separate back-up ring arrangement.

G Width: Gland width for standard seals without any back-up ring

G<sub>1</sub> Width: Gland width for extended heel and flanged heel seals without any back-up ring

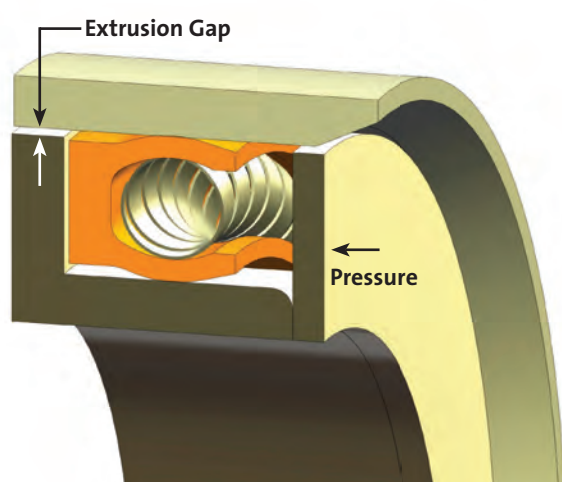
G<sub>2</sub> Width: Gland width for standard seals using a back-up ring

### Maximum Recommended Extrusion Gap

(OmniSeal® 103A shown for illustration only)		A*	B*	C*	D*
G Width 	Unfilled	0,10	0,07	0,05	—
	Filled	0,15	0,10	0,07	—
G <sub>1</sub> Width 	Unfilled	0,15	0,10	0,07	—
	Filled	0,20	0,15	0,10	0,07
G <sub>2</sub> Width 	Unfilled	0,20	0,15	0,10	0,07
	Filled	0,25	0,20	0,15	0,10
G <sub>2</sub> Width 	Unfilled	0,25	0,20	0,15	0,10
	Filled	0,35	0,25	0,20	0,15

Note: Consult Technical Support for extrusion gap information regarding specific applications.

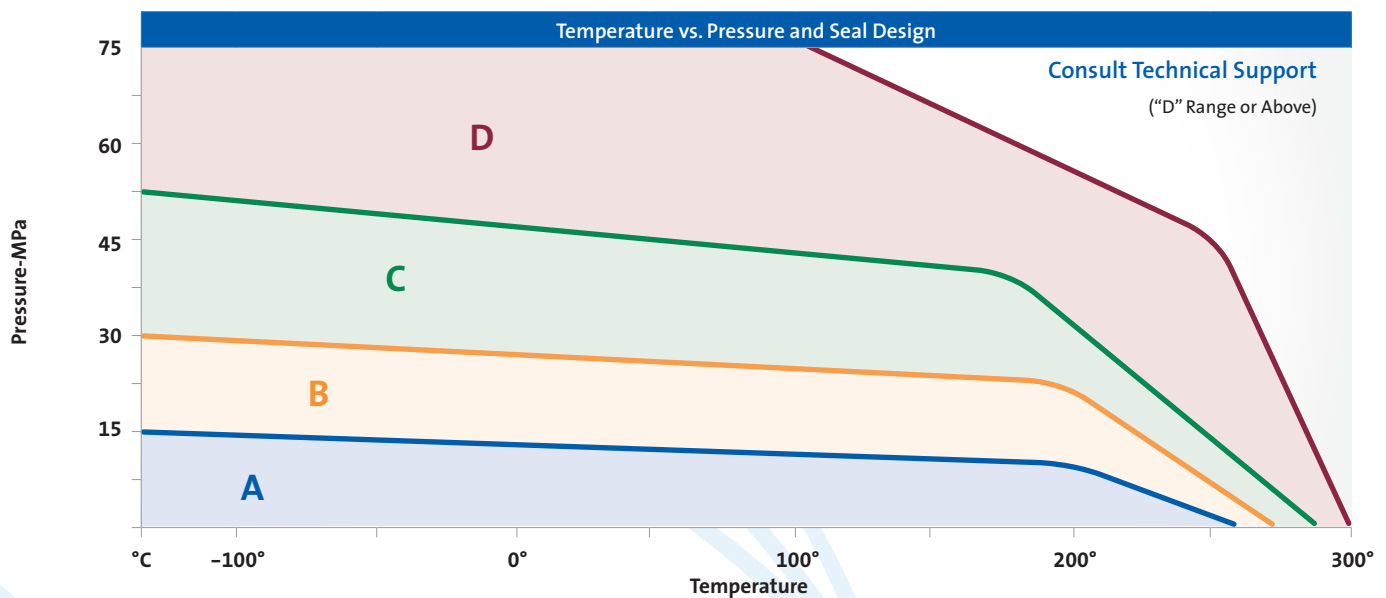
\*Refer to page 19.



# Temperature, Pressure and Extrusion Gap

## Cryogenic Sealing

Cold temperatures below -40°C will cause PTFE and other polymer sealing materials to shrink and harden, and may compromise the spring load and frictional characteristics of the OmniSeal® spring-energized seal. Although face seals are less affected than radial seals, please consult our Technical Support team at [sealsmarketing@saint-gobain.com](mailto:sealsmarketing@saint-gobain.com) before selecting an OmniSeal® seal for any cryogenic application.

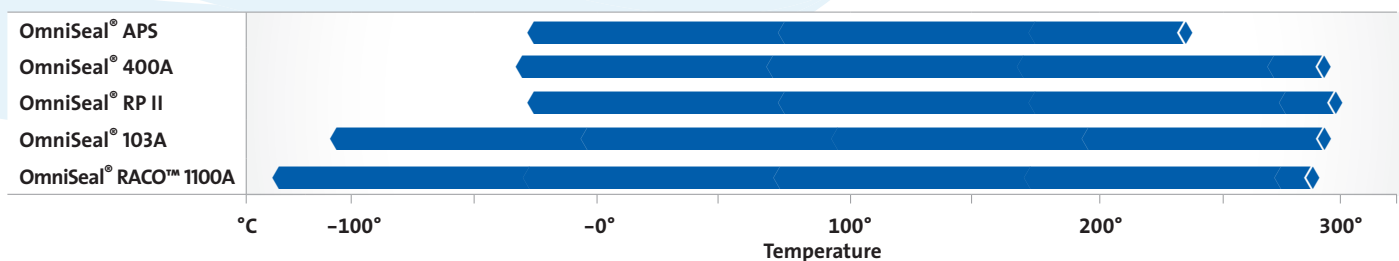


Please also refer to the Maximum Recommended Extrusion Gap table on page 18, which shows the A, B, C and D values.

## Seal Design Versus Temperature

Typically, seal jacket materials become somewhat harder at cold temperatures and may soften to some extent at high temperatures (see material list on pages 8-10 for temperature ranges). The spring energizer compensates for these conditions. If your seal design selection does not agree with the graph above, please consult Technical Support at [sealsmarketing@saint-gobain.com](mailto:sealsmarketing@saint-gobain.com).

## Seal Design vs. Temperature Chart



For Temperatures below -40°C, consult Technical Support.

## Hardware, Finish and Hardness

### Dynamic Hardware Surface Finish

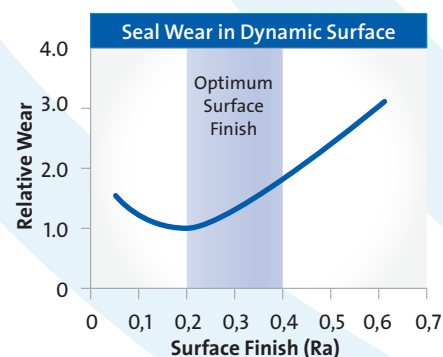
The surface finish of materials that come into contact with the OmniSeal® spring-energized seals influences wear and life expectancy of the jacket material. Mating surfaces that are too rough can create leak paths and may be abrasive to the seal. Generally, smoother surface finish (lower Ra value) corresponds to lower wear, extended seal life and improved overall seal performance.

The transfer of a thin film of PTFE from the OmniSeal® jacket to the mating dynamic surface will improve seal life. Although rough finishes wear the jacket material too rapidly, extremely smooth dynamic surfaces prohibit sufficient material transfer to form a thin film. The graph below illustrates the effect of surface finish on seal wear.

### Hardware Surface Finish Recommendations

Media Sealed	Surface Finish	
	Dynamic Surface	Static Surface
Cryogenics Helium gas Hydrogen gas Freon	0,1 - 0,2 Ra	0,1 - 0,2 Ra
		0,15 - 0,3 Ra
Air Nitrogen gas Argon gas Natural gas Fuel (aircraft, automotive)	0,15 - 0,3 Ra	0,3 - 0,8 Ra
Water Hydraulic oil Crude oil Sealants	0,2 - 0,4 Ra	0,4 - 0,8 Ra

Consult Technical Support for proper surface finish of gland and shaft and for media recommendations.



### Static Hardware Surface Finish

In most static sealing applications, better overall sealing performance is achieved with a smoother sealing surface finish. The optimum surface finish for most static sealing applications is 0.8 µm Ra or better. The “lay” on surfaces for static face seals should be concentric. Polishing or machining surfaces should be circular.

### Surface Hardness

A 40 Rockwell C hardness or greater is recommended for slow to moderate reciprocating motion. The ideal hardness for moderate to high speed linear or rotary motion is 60 to 70 Rockwell C. Hard anodized surface finishes must be polished after anodizing.



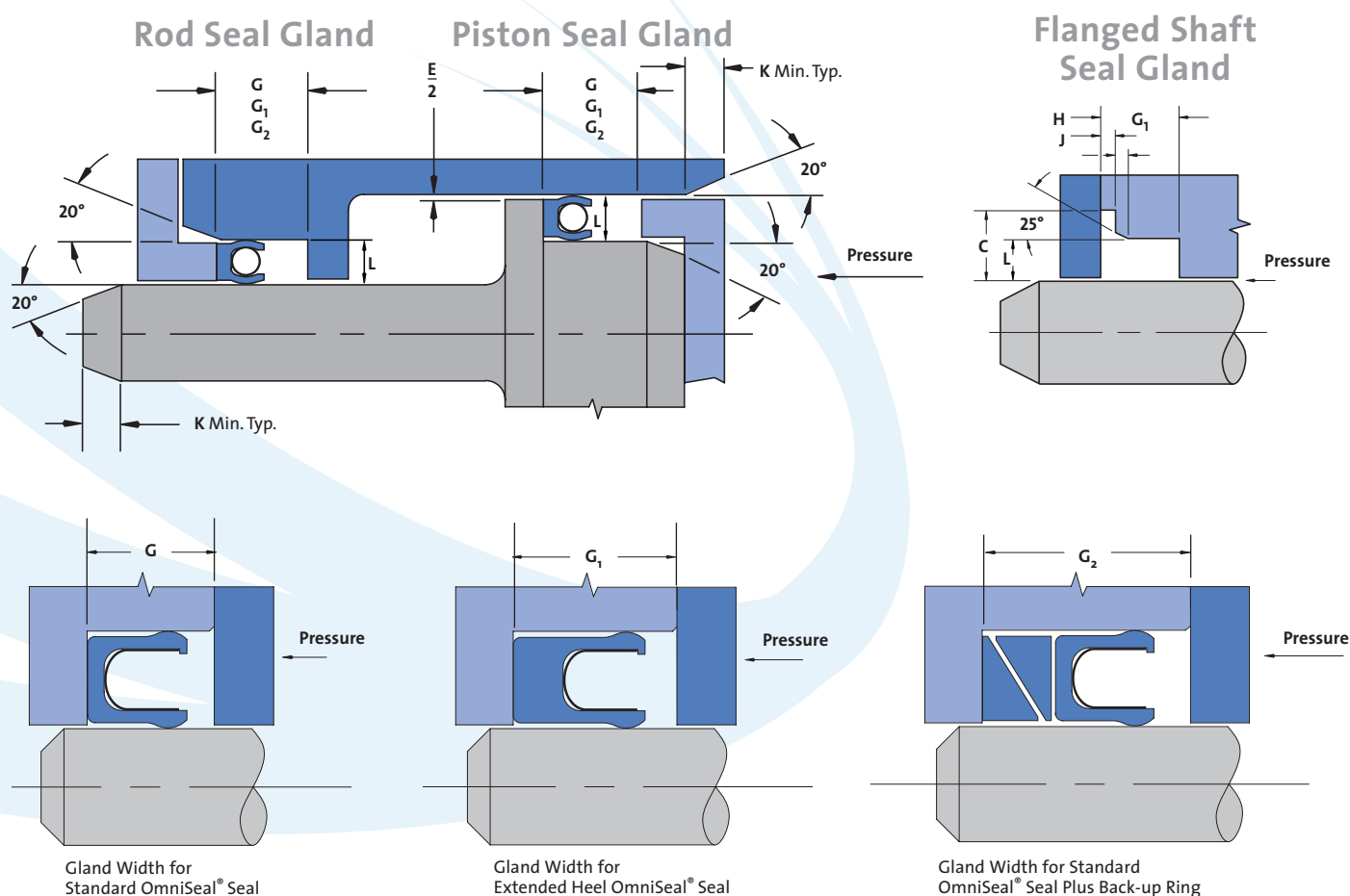
# Gland Design

Proper gland geometry in the early stages of design can eliminate installation problems.

Utilizing split or separable glands in piston and rod seal applications can eliminate the need for special tools and the need to stretch or compress the OmniSeal® seal during installation into the gland.

To minimize stretching or distortion during assembly in non-split glands, the gland side wall on the pressure side can be reduced to provide a partial shoulder to retain the seal. Examples of alternate gland designs, including flanged, are shown below.

If stretching into a full groove is unavoidable, consult proper procedures and tools recommended on page 45. Avoid assembling the seal over sharp corners, threads, keyways, etc. When these conditions exist, please use protective tooling.



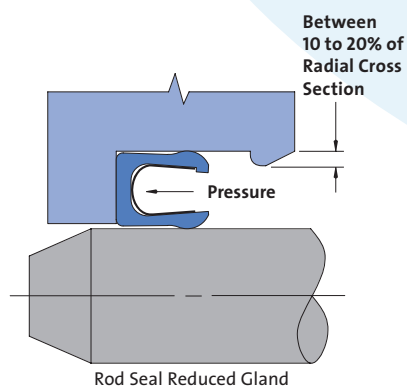
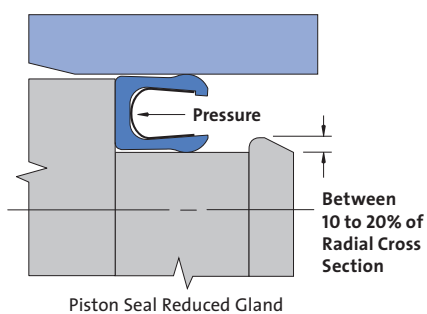
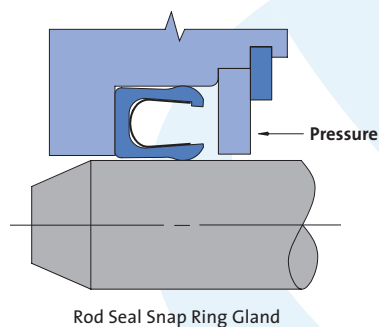
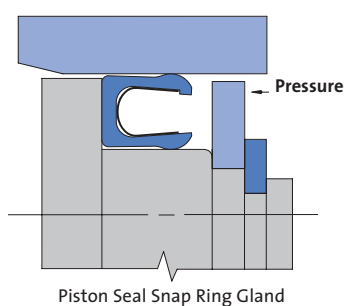
# Gland Design

## Radial Seal Gland Dimensions in mm

Cross-Section No.	Nominal Cross-Section	L Actual Cross-Section	G +0.30 -0.00	G <sub>1</sub> +0.30 -0.00	G <sub>2</sub> +0.30 -0.00	K Min.	C ±0.13	H ±0.05	J ±0.13	E Nominal <sup>1</sup>
1	1/16"	1.42 - 1.47	2.4	3.8	5.3	1.0	3.4	0.40	0.80	0.10
2	3/32"	2.26 - 2.31	3.6	4.6	6.2	1.5	4.3	0.60	0.90	0.13
3	1/8"	3.07 - 3.12	4.8	6.0	7.7	2.4	5.5	0.70	1.30	0.15
4	3/16"	4.72 - 4.78	7.1	8.5	10.8	3.0	8.4	0.80	1.80	0.18
5	1/4"	6.05 - 6.12	9.5	12.1	14.7	4.0	11.6	1.20	2.30	0.20

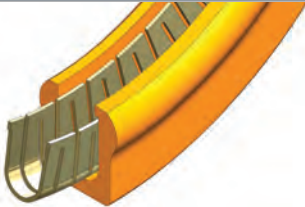
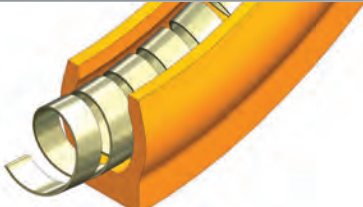
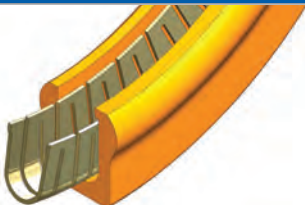
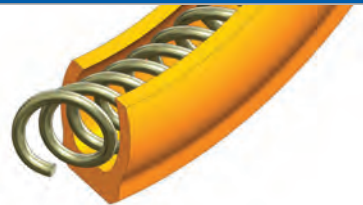
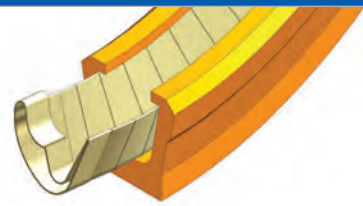

<sup>1</sup>See extrusion gap recommendations on Page 18

## Alternate Gland Designs

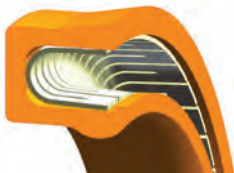
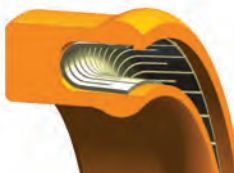
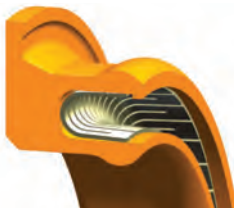




## Our Seal Design Variations

OmniSeal® 400A Spring Design	OmniSeal® 103A Spring Design
	
OmniSeal® Spring Ring II Design	OmniSeal® APS Spring Design
	
OmniSeal® RP II Spring Design	OmniSeal® RACO™ 1100A Spring Design
	

Saint-Gobain Seals offers the most complete line of spring-energizer configurations for various industries.

Skived lip	Extended heel	Flanged heel
		
All OmniSeal® designs except OmniSeal® RP II can be supplied with a sharp edge on either the I.D. or O.D. sealing lip. This edge provides a scraper/wiper action for sealing abrasive or viscous media. It may also be used as an environmental excluder.	OmniSeal® products can be supplied with an extended heel section for improved resistance to extrusion at high temperatures and/or high pressures.	The flanged heel design is recommended for rotary/oscillatory shaft applications. The flange is clamped in the seal housing to prevent the seal from turning with the shaft.



## Where Our Seals Thrive in Aggressive Operating Conditions



For major oil companies, finding the giant fields they need to make their economics viable tend to drive them offshore and into deep water. Therefore, extreme operating conditions arise from the more complex reservoirs. These new requirements inspired Saint-Gobain Seals to design a series of innovative sealing solutions that consistently and reliably meet the ever-increasing requirements of high-performance equipment manufacturers.

### Features/Benefits

- › Deep and ultra-deepwater production
- › High pressure and high temperature (HPHT)
- › Harsh chemicals
- › Rapid Gas Decompression resistance
- › Long durability at extreme temperature and sour gas concentrations
- › Proprietary Fluoroloy® fluoropolymer compounds qualified to NORSOK M-710 and to API 6A F.1.13 specifications
- › Cryogenic temperatures
- › Design compliant with Fugitive Emission international standards ISO15848 and Shell MESC SPE 77-312

### Successful Oil and Gas Applications

- › Engineered subsea and topside valves
- › Hydraulic couplings
- › FPSO turret swivels
- › Pumps and compressors
- › Gas turbines
- › Transfer systems
- › Subsea equipment





# Case Studies

## OMNISEAL® OIL & GAS

### Application: On/off Valves Fugitive Emission

<b>Product:</b>	OmniSeal® 103A custom design + V-packings
<b>Specifications:</b>	Fugitive Emission Standards SHELL MESG SPE 77-312 or ISO15848-1
<b>Typical Temperature:</b>	-50°C to 160°C
<b>Typical Pressure:</b>	Up to 1,035 BAR
<b>Leakage Rate:</b>	Class B $<10^{-4}$ mg.s <sup>-1</sup> .m <sup>-1</sup> circ
<b>Endurance:</b>	Class C03; 2,500 cycles
<b>Media:</b>	Oil

#### Our Added Value

- Self lubricating jacket material
- Non-abrasive sealing solution
- NORSOK M-710 materials
- High pressure and high temperature (HPHT) design



### Application: Swivel for Marine LNG Loading Arms

<b>Product:</b>	OmniSeal® RACO™ 1100A custom design
<b>Specifications:</b>	Primary and secondary dynamic face seal
<b>Typical Temperature:</b>	-165°C
<b>Typical Pressure:</b>	20 BAR maximum pressure
<b>Typical Speed:</b>	Slow angular motion
<b>Media:</b>	Liquified Natural Gas (LNG)

#### Our Added Value

- Self-lubricating jacket material
- Non-abrasive sealing solution
- High-load and high-resilient seal
- Excellent for cryogenic temperatures and uses



# Case Studies

## OMNISEAL® OIL & GAS

### Application: Subsea Valves Ball and Gate Valves for Subsea Production Systems PLETs, PLEMs, Manifolds and X-mas Trees

<b>Product:</b>	OmniSeal® 103A custom design
<b>Specifications:</b>	API Spec 17D/ISO 13628, API Spec 6DSS/ISO 14723 API Spec 6A, Appendix F (PR2test)/ISO 10423
<b>Typical Temperature:</b>	Up to 250°C
<b>Typical Pressure:</b>	Up to 1,035 BAR
<b>Media:</b>	Oil

#### Our Added Value

- Self-lubricating jacket material
- Non-abrasive sealing solution
- NORSOK M-710 materials
- High pressure and high temperature (HPHT) design
- Reliable and long service life



### Application: High-Pressure FPSO Turret Swivel

<b>Product:</b>	OmniSeal® 400A + welded PEEK back-up ring
<b>Specifications:</b>	Primary and secondary dynamic face seals, static seals
<b>Typical Temperature:</b>	Up to 120°C
<b>Typical Pressure:</b>	430 BAR
<b>Typical Speed:</b>	Slow angular motion (0.6 m/min)
<b>Media:</b>	Oil

#### Our Added Value

- Self-lubricating jacket material
- Non-abrasive sealing solution
- NORSOK M-710 materials
- High pressure and high temperature (HPHT) design



# Where Our Seals Rise to the Most Difficult Challenges

Saint-Gobain Seals has its richest and oldest history in the aerospace market, supplying innovative sealing solutions since 1955. From space programs such as Apollo, Viking and the Space Shuttle to present-day space launch vehicles, Saint-Gobain Seals has remained a leader in providing spring-energized seals for the aerospace industry for more than 50 years.

A growing requirement for commercial aircrafts, military aircrafts and launch vehicles is to use lighter weight materials in order to optimize fuel burn and increase payload capability. In addition, jet engines are being designed to operate at higher temperatures in order to increase thrust capabilities and operating efficiencies. We continue to lead the way in the aerospace industry by providing differentiated solutions for commercial aircraft, military aircraft and launch vehicle applications.

## Features/Benefits

- › Proven designs and tested solutions
- › Maintenance-free solutions
- › Lightweight components
- › Low and high-pressure sealing
- › Low and high-temperature resistance
- › Elastomer energizers also available

## Successful Aerospace Applications


- › Hydraulic/pneumatic linear actuators
- › Gearboxes
- › Turbine seals
- › Oil sumps
- › Landing gears
- › Jet engines
- › APUs
- › Rocket engines
- › Launch vehicles



# Case Studies

## OMNISEAL® AEROSPACE


### Application: Gear Box Shaft

<b>Product:</b>	OmniSeal® 400A seal	
<b>Specifications:</b>	Sealing of gear box actuator shaft	
<b>Typical Temperature:</b>	Temperature from -54°C to 121°C	
<b>Typical Pressure:</b>	Up to 1,305 BAR	
<b>Leakage Rate:</b>	None	
<b>Media:</b>	Various media including water, oil and grease	

**Our Added Value**

- Spring energizers perform better at low temperature compared to traditional elastomer energizers
- Sealing materials compatible with HVOF wear coatings
- Small seal envelope

### Application: Anti-icing Seal in Flight Actuator

	<b>Product:</b>	OmniSeal® RP II seal	<div><p><b>Our Added Value</b></p><ul style="list-style-type: none"><li>• Prevents ice and snow from moving inside the actuator mechanism</li><li>• Effective sealing at low temperature</li><li>• High performance in rugged applications</li></ul></div>
	<b>Specifications:</b>	Sealing at extreme temperature	
	<b>Temperature:</b>	As low as -54°C	
	<b>Typical Pressure:</b>	Pressure from 1.7 to 5.2 BAR	
	<b>Media:</b>	Rainwater, deicing fluid, hydraulic oils	



# Case Studies

## OMNISEAL® AEROSPACE

### Application: Rocket Engine Check Valve

<b>Product:</b>	OmniSeal® 103A anti-blowout seal
<b>Specifications:</b>	Retains pressurized fluid on the high pressure side while preventing blowout of the seal from the housing
<b>Typical Temperature:</b>	-184°C up to 50°C
<b>Proof Pressure:</b>	207 BAR
<b>Leakage Rate:</b>	None over hundreds of cycles
<b>Media:</b>	Pressurized and liquefied gas

**Our Added Value**

- Seal helps to prevent blowout in check valves.
- Unique seal design allows the seal to resist deformation resulting from rapid change of pressure across the seal surface.
- Seal can operate from cryogenic temperature up to 302°C.



### Application: Secondary Seal in Aircraft APU

<b>Product:</b>	OmniSeal® 400A seal
<b>Specifications:</b>	Sealing inside a mechanical carbon face seal. The seal performs secondary sealing as well as offers a very controlled drag to primary carbon face.
<b>Typical Temperature:</b>	-55°C up to 288°C
<b>Differential Pressure:</b>	0.8 BAR
<b>Media:</b>	Air and oil

**Our Added Value**

- The seal can operate effectively over a wide range of temperatures.
- Controlled spring force adjusts the carbon face of minor change in differential pressure.
- Very thin cross-section minimizes drag.



## How Our Seals Operate in Stringent Conditions



For more than 30 years, Saint-Gobain Seals has been a trusted manufacturing partner to the medical, dental, analytical and pharmaceutical markets. Whether the challenge is caustic chemical, high pressure or cleanliness, we offer a solution to meet your stringent requirements. Our sealing materials offer temperature capability from -268°C to 316°C and our seals offer pressure ratings from vacuum up to 3,448 BAR.

### Features/Benefits

- › FDA Title 21 CFR 177.1550 compliance materials
- › USP Class VI compliance materials
- › Broad chemical compatibility
- › Purity and cleanliness through Class 100 and 10K clean room manufacturing
- › Critical sealing
- › Frictional sealing across wide range of PV applications

### Successful Life Sciences Applications

- › HPLC/UHPLC
- › Surgical tools
- › Autoclave pumps
- › Hematology analyzers
- › Instrumentations
- › Portable oxygen concentrators
- › Pharmaceutical manufacturing equipment

# Case Studies

## OMNISEAL® LIFE SCIENCES

### Application: Autoclave Pump

<b>Product:</b>	OmniSeal® seal with elastomer energizer
<b>Specifications:</b>	Sealing in saturated steam
<b>Typical Temperature:</b>	From 21°C to 137°C
<b>Typical Pressure:</b>	3.5 BAR
<b>Typical Speed:</b>	5,300 RPM
<b>Typical Motion:</b>	Rotary
<b>Media:</b>	Saturated steam

#### Our Added Value

- Works well in dry and poorly lubricated applications
- Accommodates shaft with small diameters and very tight tolerances



### Application: HPLC Instrumentation

<b>Product:</b>	Custom OmniSeal® seal with APS spring
<b>Specifications:</b>	Sealing at very high pressure
<b>Typical Temperature:</b>	From 20°C to 40°C
<b>Typical Pressure:</b>	1,034 BAR
<b>Typical Speed:</b>	50 cm/min
<b>Typical Stroke Length:</b>	5 mm
<b>Typical Motion:</b>	Reciprocating
<b>Media:</b>	UHPLC solutions

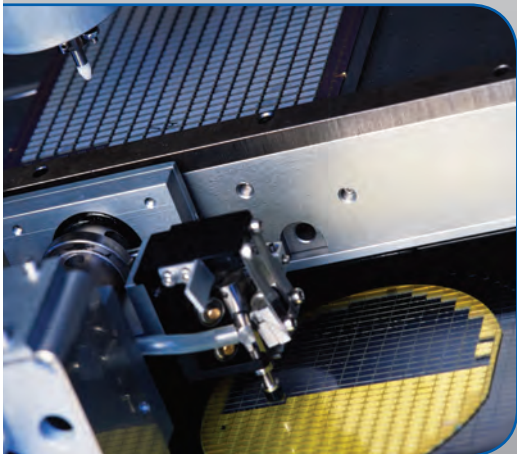
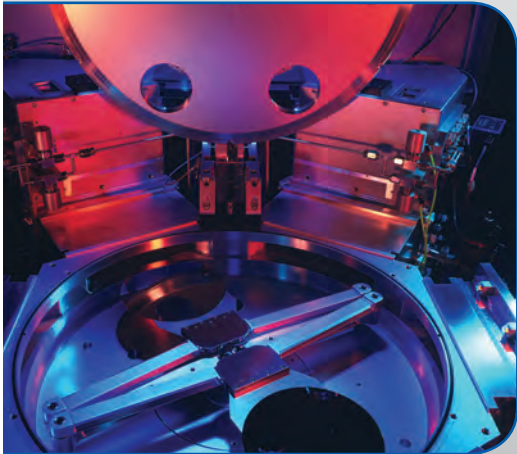
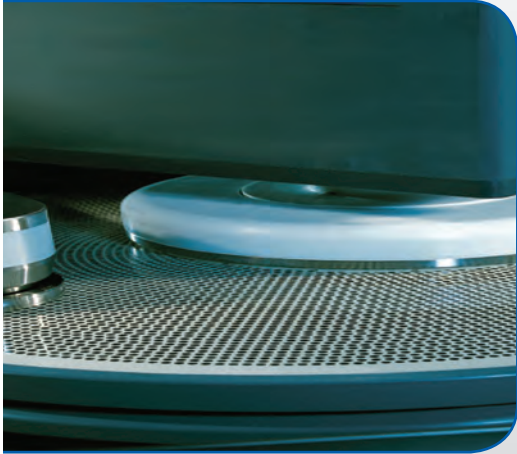
#### Our Added Value

- Long-wearing jacket material
- Low friction
- Constant spring load





## When Our Seals Take Innovation and Technology to a New Level



At Saint-Gobain Seals, quality and innovation are of the utmost importance. We have extensive experience in meeting sealing requirements for various electronics applications. We have seals in many different kinds of semiconductor processing equipment, including etch chambers, deposition chambers, pumps and boosters, cryogenic equipment, vacuum pumps and adhesive dispensing equipment. Our design engineering team and technical staff provide customized solutions that meet your needs. This process includes developing a prototype, testing the solution, manufacturing the part to specifications and delivering it on time.

Our product quality and capabilities are the reason we are the preferred supplier for many large electronics and semiconductor corporations.

### Features/Benefits

- › High purity and cleanliness
- › Wide range of sealing element sizes and materials
- › Provides low outgassing
- › Excellent dimensional stability under vacuum and pressure conditions
- › Excellent chemical resistance to a wide range of fluids and gases
- › Capable of handling wide temperature ranges: cryogenic to 232°C
- › Functions well under high pressure in excess of 34 BAR
- › Good resistance to both dry and wet process chemistries

### Successful Electronics Applications

- › Processing pumps and boosters
- › Etch, deposition and other chamber lids
- › Vacuum pumps
- › Cryogenic equipment
- › Packaging equipment
- › Adhesive dispensing equipment



# Case Studies

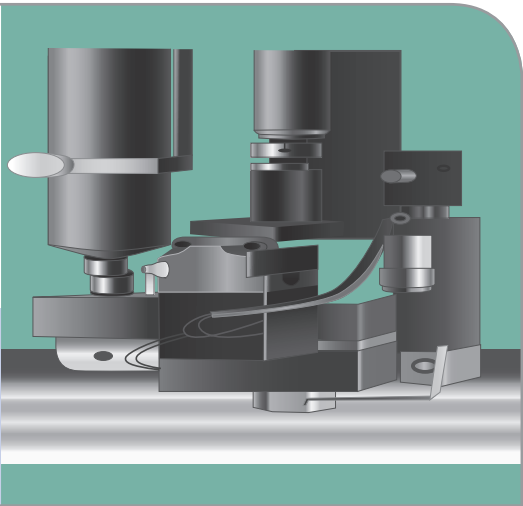
## OMNISEAL® ELECTRONICS

### Application: Micro-E Packaging Plunger Pump

<b>Product:</b>	OmniSeal® 103A radial with skived I.D. lip
<b>Specifications:</b>	Chemically compatible with epoxy resin and installable in a closed groove
<b>Typical Temperature:</b>	Ambient
<b>Typical Pressure:</b>	197 BAR
<b>Media:</b>	Epoxy resin

**Our Added Value**

- Excellent wear performance
- Excellent fluid compatibility

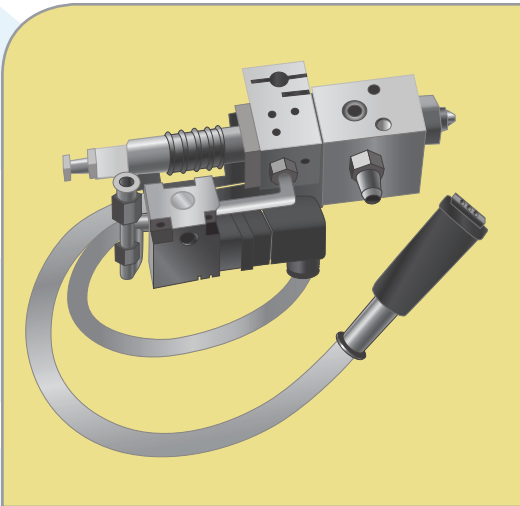


### Application: Micro-E Packaging Hotmelt Dispenser

<b>Product:</b>	OmniSeal® 400A radial
<b>Specifications:</b>	Chemically compatible with epoxy resin at high temperature working conditions
<b>Typical Temperature:</b>	200°C
<b>Typical Pressure:</b>	200 BAR
<b>Media:</b>	Epoxy resin

**Our Added Value**

- Excellent wear performance
- Excellent fluid compatibility
- Low friction seal design



# How to Order Our Standard OmniSeal® Products

## Part Numbering System

Example: 23041-X2590-A0107



### Seal Type

230 (see pages 35-44)

### Cross Section

4 (see pages 35-44)

### Hardware Indicator

1 (always 0 for face seals, 1 for ID, 2 for OD)  
For face seal – hardware diameter is OD for  
inside pressure – hardware diameter is ID for  
outside pressure

### Hardware Diameter

X2590 (in example = 259,0 mm)

### Jacket Material

A01 (see pages 8-10)

### Spring Material

07 (see page 13)

Should you require assistance on our seal designs, please fax or email a copy of the completed Application Data Form on page 53 to Saint-Gobain Seals at +32 (0)3 458 2669 or [is.kontich@saint-gobain.com](mailto:is.kontich@saint-gobain.com)

# Radial Seals – OmniSeal® Series 103A

## Features









- › Helical wound flat springs design
- › High spring load with small deflection range
- › Standard spring force can be tailored to higher and lower loads
- › Available in standard heel, extended heel and flanged heel designs
- › Available to fit in all aerospace, military and industrial gland sizes

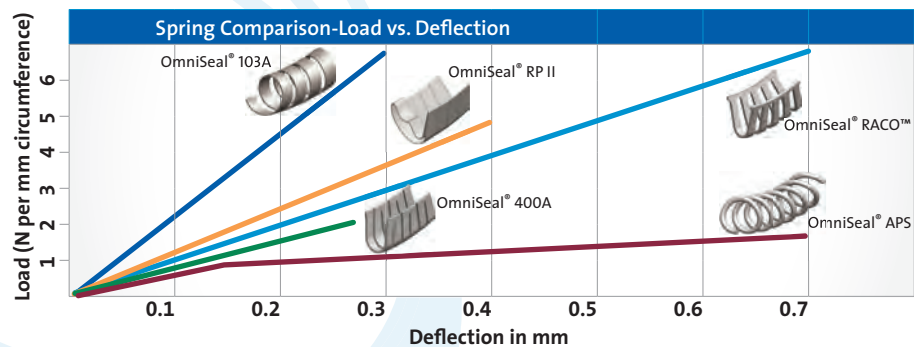
## Benefits

- › Excellent for static, intermittent and slower dynamic applications
- › Better sealing of light liquids and gases
- › Excellent in static face sealing
- › Excellent for applications that require extremely low leak rate
- › Easily installed in closed grooves

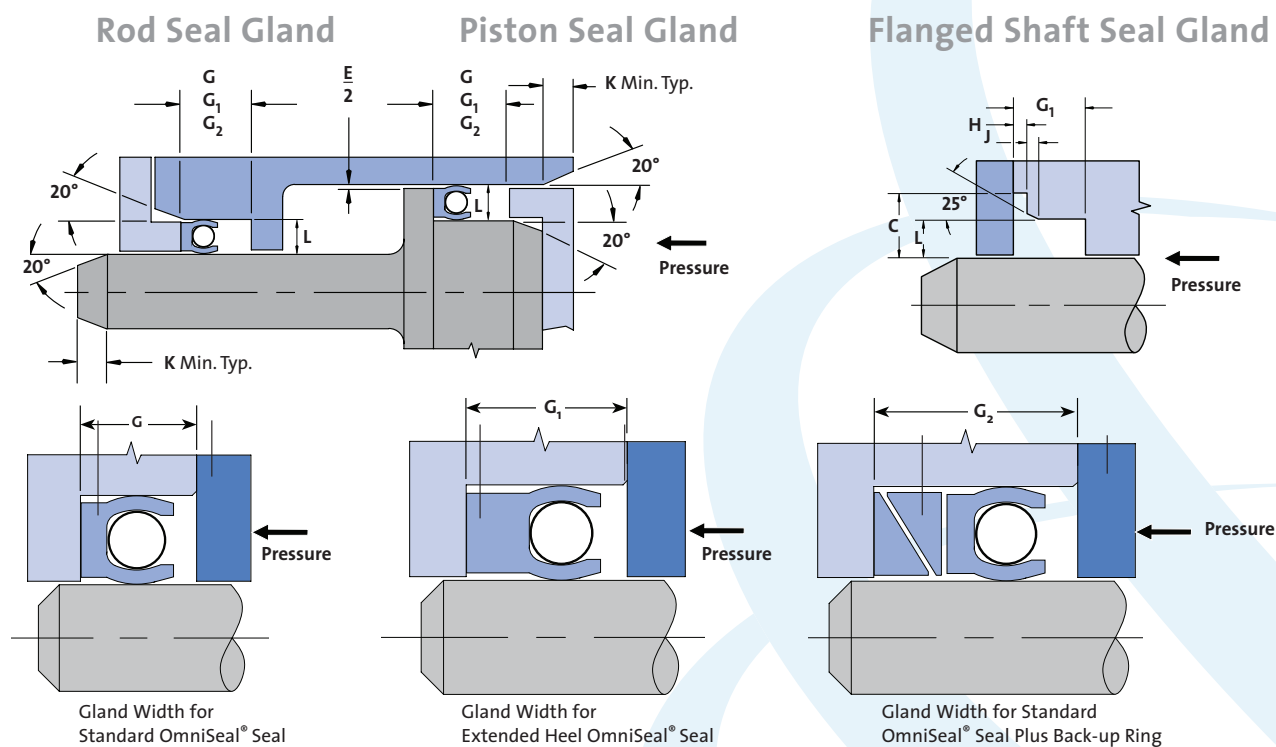
For more information, please contact our Technical Support team or fill out the Application Data Form on page 53.

## Radial Seals

Radial	Standard Lip	Skived I.D. Lip	Skived O.D. Lip
Standard Heel G <sub>1</sub> Width			
Part No.	230	231	232
Extended Heel G <sub>1</sub> Width			
Part No.	233	234	235
Flanged Heel G <sub>1</sub> Width			Other shapes available on request
Part No.	236	237	



# Radial Seals – OmniSeal® Series 103A Hardware

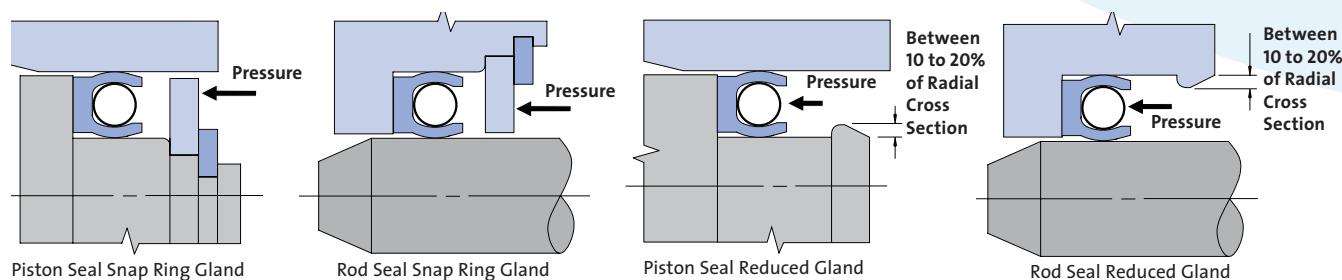


## Radial Seal Gland Designs

X-Section No.	Nominal X-Section	L X-Section in mm	G +0,30 -0,00	$G_1$ +0,30 -0,00	$G_2$ +0,30 -0,00	K Min.	C $\pm 0,13$	H $\pm 0,05$	J $\pm 0,13$	E NOM (I)	R MAX	Shaft Tol.
1	1/16"	1,42 - 1,47	2,4	3,8	5,3	1,0	3,4	0,40	0,80	0,10	0,10	-0,05
2	3/32"	2,26 - 2,31	3,6	4,6	6,2	1,5	4,3	0,60	0,90	0,13	0,10	-0,05
3	1/8"	3,07 - 3,12	4,8	6,0	7,7	2,4	5,5	0,70	1,30	0,15	0,20	-0,05
4	3/16"	4,72 - 4,78	7,1	8,5	10,8	3,0	8,4	0,80	1,80	0,18	0,25	-0,06
5	1/4"	6,05 - 6,12	9,5	12,1	14,7	4,0	11,6	1,20	2,30	0,20	0,50	-0,07

<sup>1</sup>See Extrusion Gap Recommendations on page 18.

## Alternate Gland Designs





# Radial Seals – OmniSeal® Series 400A

## Features

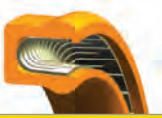


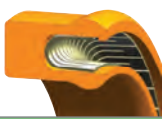




- › Cantilevered finger spring design
- › Low spring loading
- › Standard spring force can be tailored to higher and lower loads
- › Available in standard heel, extended heel and flanged heel designs
- › Available to fit in all aerospace, military and industrial gland sizes
- › Available in larger cross sections up to 3/4"

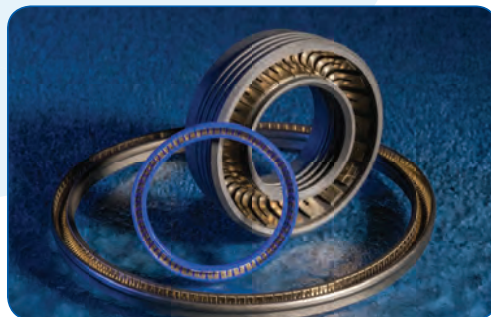
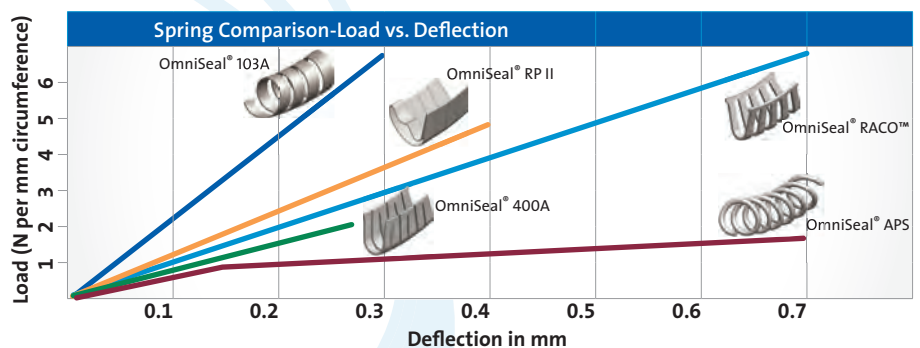
## Benefits

- › Provides more dynamic run-out
- › Accommodates wider gland tolerances
- › Provides very low friction
- › High- and low-pressure sealing
- › Excellent in slow to moderate rotary speeds
- › Low hardware clamping force required
- › High temperature sealing
- › Excellent in rotary face seal applications

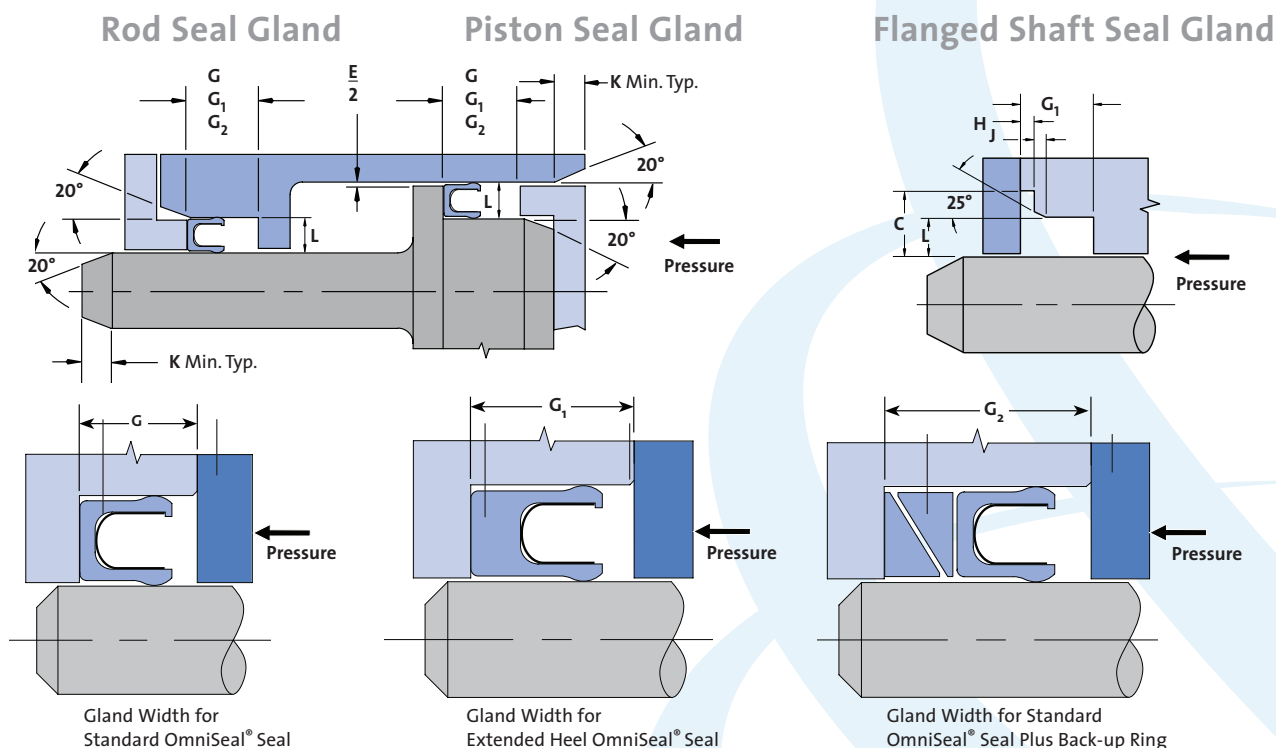
For more information, please contact our Technical Support team or fill out the Application Data Form on page 53.

## Radial Seals

Radial	Standard Lip	Skived I.D. Lip	Skived O.D. Lip
Standard Heel G <sub>1</sub> Width			
Part No.	220	221	222
Extended Heel G <sub>1</sub> Width			
Part No.	223	224	225
Flanged Heel G <sub>1</sub> Width			Other shapes available on request
Part No.	226	227	



# Radial Seals – OmniSeal® Series 400A Hardware

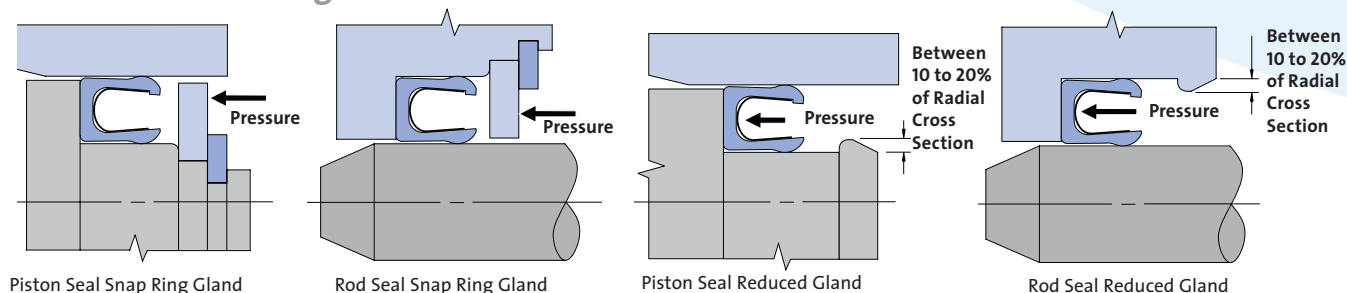


## Radial Seal Gland Designs

X-Section No.	Nominal X-Section	L X-Section in mm	G +0,30 -0,00	G <sub>1</sub> +0,30 -0,00	G <sub>2</sub> +0,30 -0,00	K Min.	C ±0,13	H ±0,05	J ±0,13	E NOM (I)	R MAX	Shaft Tol.
1	1/16"	1,42 - 1,47	2,4	3,8	5,3	1,0	3,4	0,40	0,80	0,10	0,10	-0,05
2	3/32"	2,26 - 2,31	3,6	4,6	6,2	1,5	4,3	0,60	0,90	0,13	0,10	-0,05
3	1/8"	3,07 - 3,12	4,8	6,0	7,7	2,4	5,5	0,70	1,30	0,15	0,20	-0,05
4	3/16"	4,72 - 4,78	7,1	8,5	10,8	3,0	8,4	0,80	1,80	0,18	0,25	-0,06
5	1/4"	6,05 - 6,12	9,5	12,1	14,7	4,0	11,6	1,20	2,30	0,20	0,50	-0,07

<sup>1</sup>See Extrusion Gap Recommendations on page 18.

## Alternate Gland Designs



# Radial Seals – OmniSeal® Series APS

## Features









- › Coiled wire spring design
- › Very low spring loading
- › Very low stress on spring
- › Constant spring loading over a wide range of deflection
- › The standard spring load can be increased or decreased

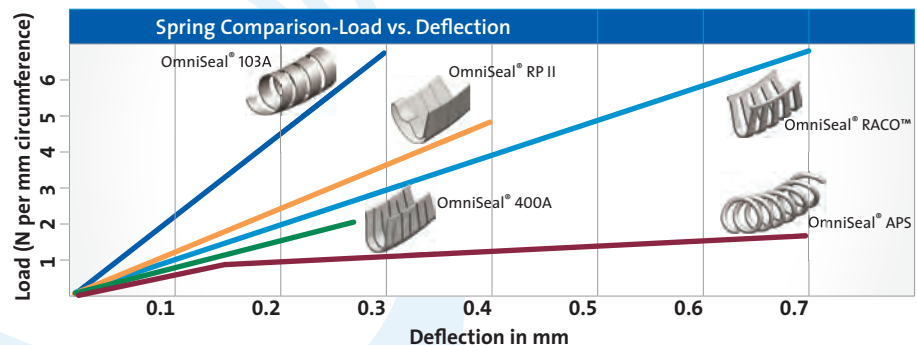
## Benefits

- › Permits large wear allowance in the seal jacket
- › Great in small diameter and smaller cross section sealing housing
- › Can be installed in closed glands without damaging the seal
- › Very good for applications that require low friction in dynamic condition

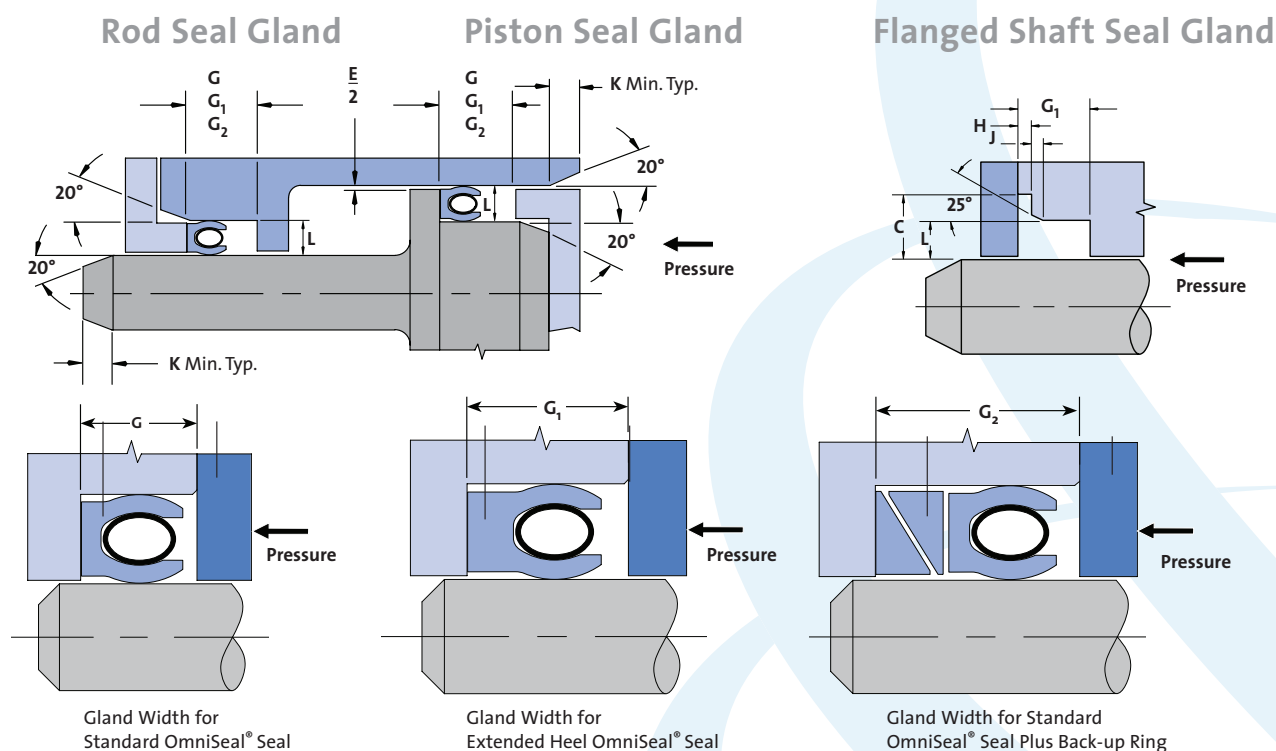
For more information, please contact our Technical Support team or fill out the Application Data Form on page 53.

## Radial Seals

Radial	Standard Lip	Skived I.D. Lip	Skived O.D. Lip
Standard Heel G <sub>1</sub> Width			
Part No.	730	731	732
Extended Heel G <sub>1</sub> Width			
Part No.	733	734	735
Flanged Heel G <sub>1</sub> Width			Other shapes available on request
Part No.	736	737	



# Radial Seals – OmniSeal® Series APS Hardware

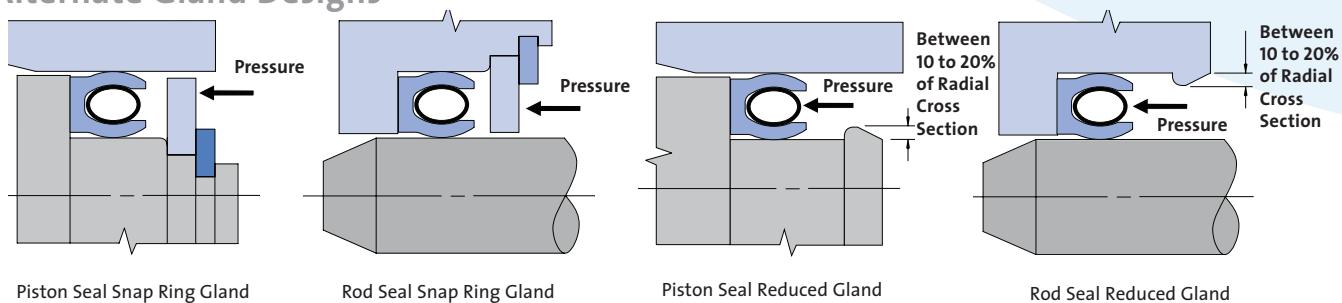


## Radial Seal Gland Designs

X-Section No.	Nominal X-Section	L X-Section in mm	G +0,30 -0,00	G <sub>1</sub> +0,30 -0,00	G <sub>2</sub> +0,30 -0,00	K Min.	C ±0,13	H ±0,05	J ±0,13	E NOM (1)	R MAX	Shaft Tol.
1	1/16"	1,42 - 1,47	2,4	3,8	5,3	1,0	3,4	0,40	0,80	0,10	0,10	-0,05
2	3/32"	2,26 - 2,31	3,6	4,6	6,2	1,5	4,3	0,60	0,90	0,13	0,10	-0,05
3	1/8"	3,07 - 3,12	4,8	6,0	7,7	2,4	5,5	0,70	1,30	0,15	0,20	-0,05
4	3/16"	4,72 - 4,78	7,1	8,5	10,8	3,0	8,4	0,80	1,80	0,18	0,25	-0,06
5	1/4"	6,05 - 6,12	9,5	12,1	14,7	4,0	11,6	1,20	2,30	0,20	0,50	-0,07

<sup>1</sup>See Extrusion Gap Recommendations on page 18.

## Alternate Gland Designs





# Radial Seals – OmniSeal® Series RP II

## Features

- › Wrapped and formed ribbon spring
- › Very high spring loading
- › Most resilient spring
- › Only available in radial type seal design
- › The standard spring load can be increased or decreased

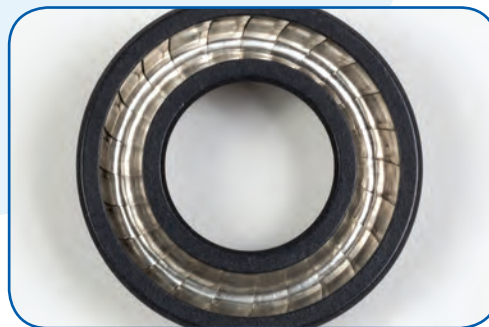
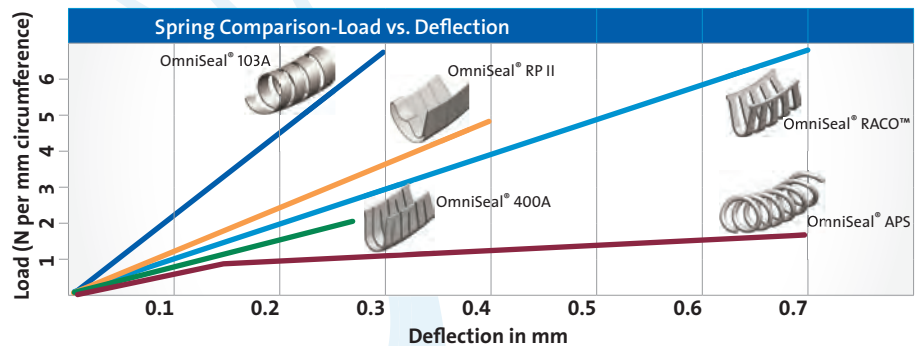
## Benefits

- › Rugged, durable seal ideal for the most severe mechanical conditions where other seals fail

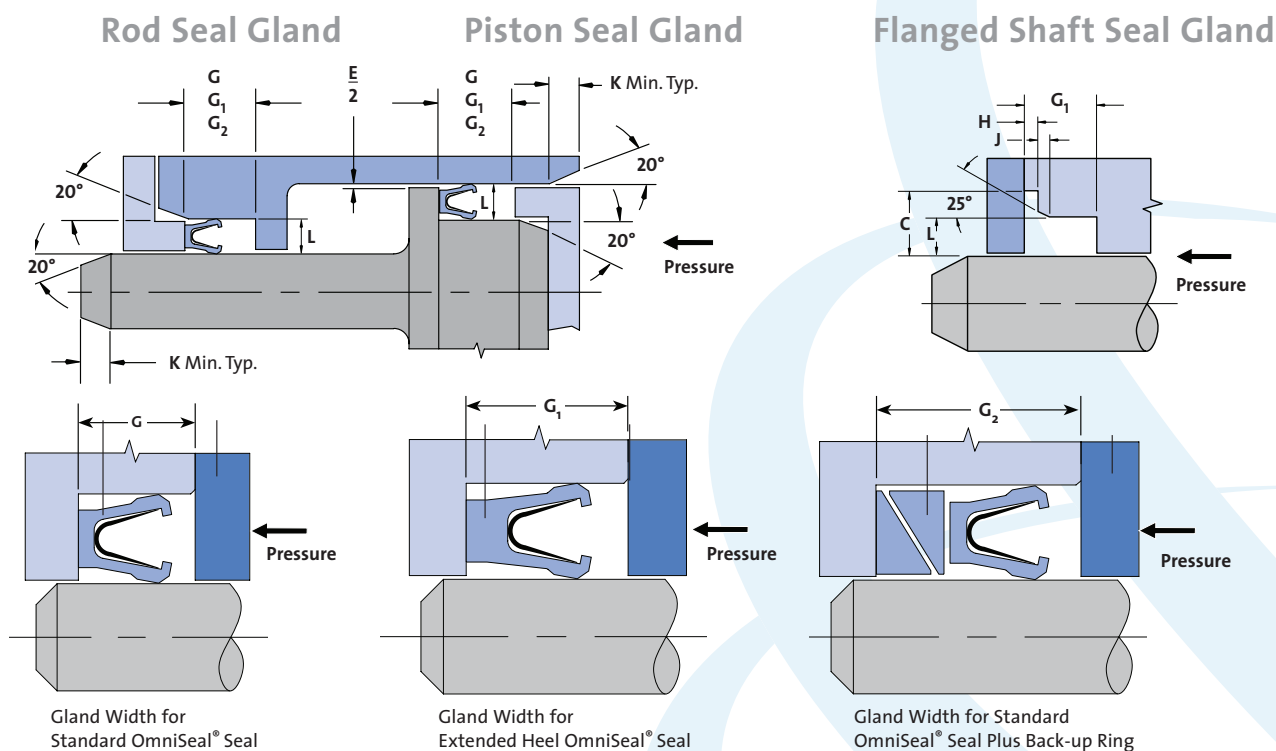
For more information, please contact our Technical Support team or fill out the Application Data Form on page 53.

## Radial Seals

Radial	Standard Lip
Standard Heel G Width	
Part No.	320
Extended Heel G <sub>1</sub> Width	
Part No.	323
Flanged Heel G <sub>1</sub> Width	
Part No.	326



# Radial Seals – OmniSeal® Series RP II Hardware

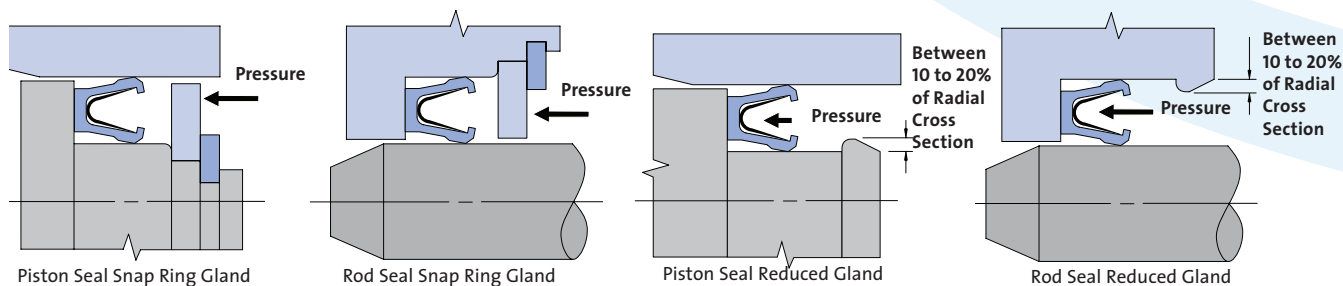


## Radial Seal Gland Designs

X-Section No.	Nominal X-Section	L X-Section in mm	G +0,30 -0,00	G <sub>1</sub> +0,30 -0,00	G <sub>2</sub> +0,30 -0,00	K Min.	C ±0,13	H ±0,05	J ±0,13	E NOM (1)	R MAX	Shaft Tol.
3	1/8"	3,07 - 3,12	4,8	6,0	7,7	2,4	5,5	0,70	1,30	0,15	0,20	-0,05
4	3/16"	4,72 - 4,78	7,1	8,5	10,8	3,0	8,4	0,80	1,80	0,18	0,25	-0,06
5	1/4"	6,05 - 6,12	9,5	12,1	14,7	4,0	11,6	1,20	2,30	0,20	0,50	-0,07

<sup>1</sup>See Extrusion Gap Recommendations on page 18.

## Alternate Gland Designs



# Face Seals – OmniSeal® Series 103A, 400A, APS & RACO™









## Features

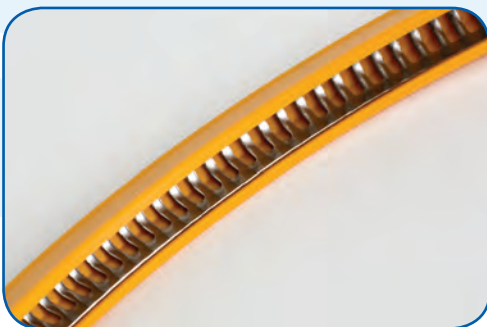
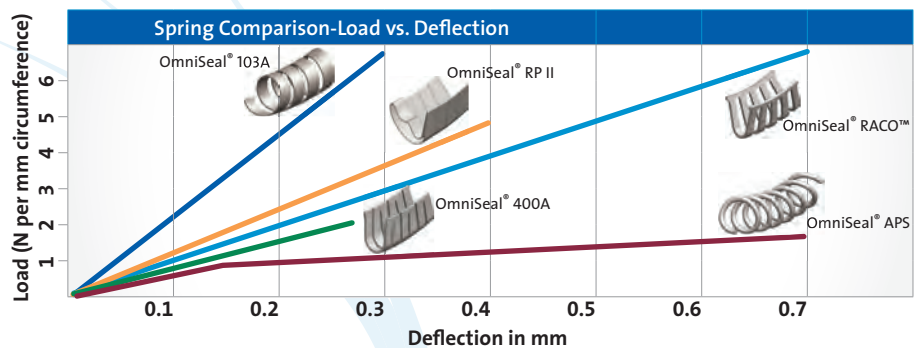
- › Heavy duty, high load RACO™ spring design
- › Available in large cross sections and diameters

## Benefits

- › Continuous spring contact along the entire sealing lip
- › Excellent in extreme static sealing conditions involving cryogenic fluids, ultra high vacuum and light gases
- › Withstands high torque and clamping force
- › Resists permanent set
- › Excellent in marine loading arms

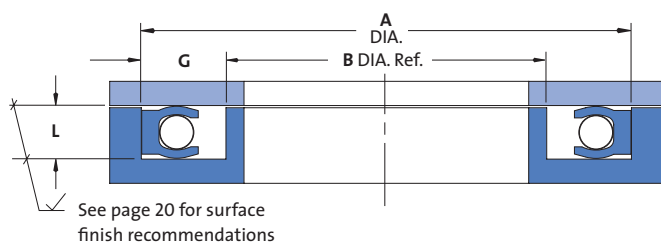
## Face Seals

	Inside Face Seal (Internally Pressurized)		Outside Face Seal (Externally Pressurized)	
Shape				
Series Part No.	103A 238	400A 228	103A 239	400A 229
Shape				
Series Part No.	APS 738	RACO™ 348	APS 739	RACO™ 349

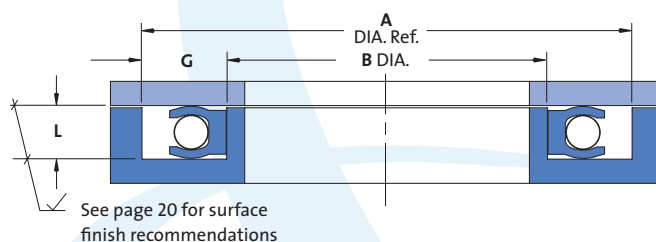


# Face Seals – OmniSeal® Series Hardware

## Inside Face Seals



## Outside Face Seals



## Face Seal Gland Designs

Section No.	Nominal X-Section	L X-Section in mm	G MIN.	R MAX
1	1/16"	1,42 - 1,47	2,4	0,10
2	3/32"	2,26 - 2,31	3,6	0,10
3	1/8"	3,07 - 3,12	4,8	0,20
4	3/16"	4,72 - 4,78	7,1	0,25
5	1/4"	6,05 - 6,12	9,5	0,50

<sup>1</sup>See Extrusion Gap Recommendations on page 18.

## Minimal Seal Diameters

### OmniSeal® RACO™ 1100A

Contact our Technical Support for information on sizes smaller than in the table below.

Cross Section	Min. I.D.	Min. O.D.
2	14,5	19,0
3	19,0	25,5
4	35,0	38,0
5	95,0	102,0

### OmniSeal® 103A, 400A & APS

Contact our Technical Support for information on sizes smaller than in the table below.

#### For Face Seal Designs

Cross Section	Min. I.D.
1	20
2	20
3	25
4	35
5	50

#### For Radial Seal Designs

Cross Section	Min. I.D.
1	5
2	6
3	7.5
4	13
5	17

### OmniSeal® RP II

Contact our Technical Support for information on sizes smaller than in the table below.

Cross Section	Min. I.D.
3	30
4	30
5	50



## OmniSeal® Installation

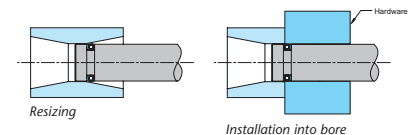
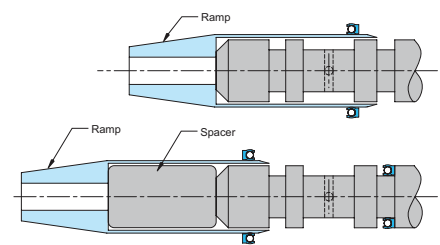
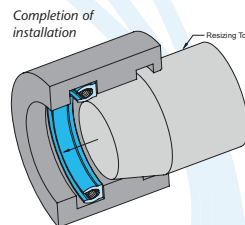
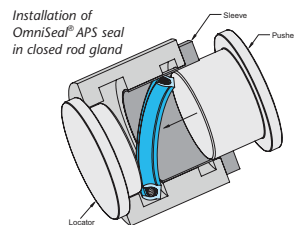
Unlike elastomeric and polyurethane seals, OmniSeal® spring-energized seals resist stretching. Similarly, our seals can scratch and take a permanent set much more easily. Care should be taken while installing OmniSeal® seals to avoid seal damage. The seals should be installed in open or split groove designs to avoid stretching or compressing the seal.

To avoid seal damage when installing OmniSeal® seals in closed (non-split) or partially open grooves, please use special installation tools. Saint-Gobain Seals can design installation tools for your specific needs. The hardware surface should be free of scratches and sharp edges that can cause permanent damage to the seal.

If the OmniSeal® seal is installed in a piston housing, the seal must be stretched. An installation tool with a ramp and sleeve is recommended for this type of application. The seal is easily transferred to the sleeve by loading from the ramp side and moved from the sleeve onto the gland using a pusher. During the process, the seal will expand and normally will require recovery time to return to its nominal diameter. If the installation has to be done immediately, a mechanical compression tool is recommended. The ramp in the tool will compress the seal to its original diameter. The tool should be allowed to remain in place on top of the OmniSeal® seal for approximately one minute to allow the seal to return to its original diameter.

For installation in a bore housing, the OmniSeal® seal must be compressed. This can be done by loading the seal inside the sleeve of the installation tool. Position the sleeve adjacent to the housing and transfer the seal onto the housing using a pusher. Use a resizing tool with a ramp to return the seal to its original dimension

**Note:** To install two or more OmniSeal® products into closed glands on a common shaft, install the farthest seal first. Use a simple spacer to adjust the ramp and position the next seal and gland for installation.

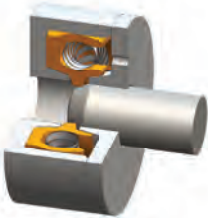


Larger diameter seals may not require a special installation tool if the seal can be pushed onto the housing with minimal force. When allowed, lubricants (grease, oil, etc.) compatible with the media to be sealed can ease assembly.

OmniSeal® 400A, APS and 103A seals can be installed into closed glands if needed. Spring Ring II and RP II seals are not recommended for closed gland installation because of possible damage to the spring. Similarly, small diameter 400A type seals are not recommended for installation in closed grooves. Seals with larger diameters are typically easier to install in closed grooves. For seals that have a diameter to cross-section ratio smaller than 20:1, please consult our Technical Support team at [sealsmarketing@saint-gobain.com](mailto:sealsmarketing@saint-gobain.com) or refer to the back page for site contact information.

**Warning:** To avoid damage to the jacket and spring, do not use hand tools such as screwdrivers to force OmniSeal® seals into closed glands. Please contact our Technical Support team when working with a closed gland design. Refer to the back cover for specific site contact information.

## Special Seal Designs



### Anti-Blowout Rod Seals

This unique design has been used in the valve industry for more than 50 years. In applications requiring the rod to disengage from the seal, the anti-blowout design prevents the dynamic sealing lip from deforming under pressure.



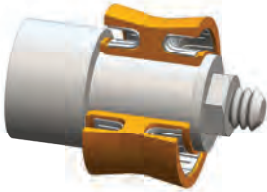
### Anti-Blowout Ball Valve Seals

Ball valve seals are machined to the exact tolerances called for by manufacturers. A highly successful example of this type of seal is the anti-blowout design, which is used in petrochemical valves. Our engineers assist customers in designing a captive anti-blowout feature into hardware.



### Integral Piston Seals

For small diameter applications at moderate pressures, the integral piston seal is an innovative approach to reducing the number of precision machined metal parts and components. In addition to allowing easy assembly, this design serves as a seal and as a guide bearing.



### Bidirectional Seals

This versatile design combines two seals and a guide bearing into a one-piece component. The bidirectional seal is recommended for moderate temperature/pressure applications where simple assembly and quick replacement are required. When designed without an inside diameter it also serves as a floating piston.



### Sanitary Seals

The JS design shields the spring from the media, prevents entrapment in the spring and allows easier cleaning. This design is excellent in food filling and other dispensing equipment.



### OmniGasket™ Seals

OmniGasket™ seals are spring-energized seals retained in a metal plate designed to customer specifications. This seal saves hardware design and machining costs and offer easy change out of the seals in the field. These advantages have made OmniGasket™ seals preferred for use in gas turbine engine and aerospace hydraulic applications.

## Special Seal Designs



### Formed Seals

Our formed seals are a unique specialty sealing product. Saint-Gobain Seals has the ability to manufacture most of the major seal cross sections in special shapes to fit the customer's hardware. Successful applications of formed seals include aerospace access doors and liquid heat exchangers.



### High-Pressure Seals with Back-up Rings

A number of design options are available for high-pressure sealing problems. Back-up rings can be configured into most seal types to prevent extrusion of the jacket material. Pressure actuated back-up rings are often recommended for closing multiple gaps or for dealing with hardware side loads.



### Belleville Spring Seals

Face seals energized with Belleville washers provide high deflection without risk of the spring collapsing. Another advantage of a Belleville seal is that they can be manufactured in smaller diameters than most spring-energized seals.



### LFE and HPHT Seals with V-Packings and T-Spacers

In response to the critical need for low fugitive emissions (LFE) from valves, Saint-Gobain Seals developed a range of high-performance stem sealing systems that protect the environment and adhere to the most stringent standards of the oil and gas industry. OmniSeal® LFE designs that comply with ISO-15848 and Shell SPE 77-312 are available. In some applications, the back pressure can reach levels high enough to damage the seal. A T-Spacer can prevent damage to the lips of the OmniSeal® seal.



### Multiple Energizers

If the cross section of the seal is too big compared to the other seal dimensions, a multiple spring design may be preferred.

# Chemical Compatibility Guide

Chemicals	PTFE	UHMWPE	TPE	Type 304 SS	Hastelloy® C-276	Elgiloy®
Acetaldehyde	A	C	—	A	A	A
Acetamide	A	A	—	A	—	—
Acetate Solvent	A	A	—	A	A	A
Acetic Acid	A	A <sup>2</sup>	A	D	A	A
Acetic Acid, 20%	A	A	A	B	A	A
Acetic Acid, 80%	A	A	—	D	A	A
Acetic Acid, Glacial	A	D	—	C	A	A
Acetic Anhydride	A	D	B	B	A	A
Acetone	A	B	B	A	A	A
Acetyl Chloride (dry)	A	D	—	A	A	A
Acetylene	A	D	A	A	—	A
Acrylonitrile	A	A	—	A <sup>1</sup>	B	—
Adipic Acid	A	A	—	A <sup>1</sup>	—	—
Alcohols:						
Amnol	A	B <sup>2</sup>	A	A	A	A
Benzyl	A	D	—	A	A	A
Butyl	A	A	—	A	A	A
Discertone	A	B <sup>1</sup>	—	A	A	A
Ethyl	A	B	A	A	A	A
Hexyl	A	A	—	A	A	A
Isobutyl	A <sup>2</sup>	A <sup>2</sup>	—	A	A	A
Isopropyl	A <sup>2</sup>	A <sup>2</sup>	A	B	A	A
Methyl	A	A <sup>1</sup>	B	A	A	A
Octyl	—	A	—	A	C	A
Propyl	A	A <sup>2</sup>	—	A	A	A
Aluminum Chloride	A	B <sup>2</sup>	C	B	A	B
Aluminum Chloride, 20%	A	B <sup>2</sup>	—	D	A	C
Aluminum Fluoride	A	A <sup>2</sup>	—	D	B	C
Aluminum Hydroxide	A	A <sup>2</sup>	—	A <sup>1</sup>	B	—
Aluminum Nitrate	A	A <sup>2</sup>	—	A	—	—
Alum. Potassium Sulfate	A	A <sup>2</sup>	—	D	C	—
Aluminum Sulfate	A	A <sup>2</sup>	B <sup>1</sup>	B	B	—
Alums	A	A	D	—	B	—
Amines	A <sup>2</sup>	C <sup>1</sup>	A <sup>1</sup>	A	B	A
Ammonia 10%	A	C <sup>1</sup>	—	A	A	A
Ammonia Nitrate	A	A	—	A	—	A
Ammonia, Anhydrous	A	B <sup>2</sup>	D	A	B	A
Ammonia, Liquid	A	C <sup>1</sup>	—	B <sup>2</sup>	B	B
Ammonium Acetate	A	A	—	B	—	—
Ammonium Bifluoride	A	A <sup>2</sup>	—	D	B	C
Ammonium Carbonate	A	B <sup>2</sup>	—	B	B	—
Ammonium Chloride	A	A <sup>2</sup>	A <sup>1</sup>	C	D	A
Ammonium Hydroxide	A	A <sup>1</sup>	C	A <sup>1</sup>	B	A

Chemicals	PTFE	UHMWPE	TPE	Type 304 SS	Hastelloy® C-276	Elgiloy®
Ammonium Nitrate	A	A <sup>1</sup>	B <sup>1</sup>	A <sup>1</sup>	B	—
Ammonium Persulfate	A <sup>1</sup>	A <sup>2</sup>	—	A	B	—
Ammonium Phosphate:						
Dibasic	A <sup>2</sup>	A <sup>2</sup>	—	B	B	—
Monobasic	A	A	B <sup>1</sup>	B	B	—
Tribasic	A	C	—	B	B	—
Ammonium Sulfate	—	A <sup>1</sup>	B <sup>1</sup>	B	B	A
Amyl Acetate	A	C <sup>1</sup>	C <sup>1</sup>	A	A	—
Amyl Alcohol	A <sup>2</sup>	B <sup>1</sup>	A	A	A	A
Amyl Chloride	A	D	—	A <sup>2</sup>	A <sup>1</sup>	—
Aniline	A	C	D	A	B	—
Aniline Hydrochloride	A	D	—	D	D	—
Antimony Trichloride	A	B <sup>2</sup>	—	B	A <sup>2</sup>	B <sup>1</sup>
Aqua Regia	A	B <sup>1</sup>	C <sup>1</sup>	D	C	D
Aroclor 1248	A	C <sup>1</sup>	C <sup>1</sup>	B	A	—
Aromatic Hydrocarbons	—	C	C <sup>1</sup>	—	—	—
Arsenic Acid	A	B <sup>2</sup>	—	A <sup>2</sup>	B	—
Asphalt	A <sup>1</sup>	A <sup>1</sup>	B <sup>1</sup>	B	—	—
Barium Carbonate	A	B <sup>2</sup>	—	B <sup>1</sup>	B	—
Barium Chloride	A	A <sup>1</sup>	B <sup>1</sup>	A <sup>1</sup>	B	—
Barium Cyanide	A <sup>1</sup>	B	—	A <sup>1</sup>	A	—
Barium Hydroxide	A	B <sup>2</sup>	B <sup>1</sup>	B	B	—
Barium Nitrate	A	B <sup>2</sup>	A	A	A	A
Barium Sulfate	A	B <sup>2</sup>	D	B	A	—
Barium Sulfide	A	B <sup>2</sup>	—	B	—	—
Benzaldehyde	A <sup>1</sup>	A <sup>1</sup>	B	B	A	—
Benzene	A	C <sup>1</sup>	C	B	B	—
Benzene Sulfonic Acid	A	A <sup>1</sup>	B	B	B	—
Benzoic Acid	A <sup>1</sup>	A <sup>1</sup>	D	B	B <sup>1</sup>	—
Benzol	A	C <sup>1</sup>	C	A <sup>1</sup>	B	—
Boric Acid	A	A <sup>2</sup>	A <sup>1</sup>	B <sup>2</sup>	A	—
Bromine	A	D	D	D	A	C
Butadiene	D	—	A	C	—	—
Butane	A	C <sup>1</sup>	—	A <sup>2</sup>	A	A
Butylacetate	A	C <sup>1</sup>	B	B	A	—
Butylene	A	B <sup>1</sup>	—	A	—	—
Butyric Acid	D	B <sup>1</sup>	B <sup>2</sup>	A <sup>1</sup>	—	—
Calcium Bisulfide	A	B <sup>1</sup>	B <sup>1</sup>	B	A	—
Calcium Carbonate	A	B <sup>1</sup>	—	A <sup>1</sup>	B	—
Calcium Chloride	A	B <sup>2</sup>	A <sup>1</sup>	C <sup>2</sup>	A	C
Calcium Hydroxide	A	A <sup>2</sup>	B <sup>1</sup>	B <sup>1</sup>	A	A
Calcium Hypochlorite	A	A <sup>1</sup>	C <sup>1</sup>	C <sup>1</sup>	B	C

## Key

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- <sup>1</sup>Satisfactory up to 22°C
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# Chemical Compatibility Guide

Chemicals	PTFE	UHMWPE	TPE	Type 304 SS	Hastelloy® C-276	Elgiloy®
Calcium Oxide	A	B <sup>1</sup>	A	A	A	A
Calcium Sulfate	A	B <sup>1</sup>	—	B	B	—
Carbon Bisulfide	—	—	C <sup>1</sup>	A	—	—
Carbon Dioxide	A	A <sup>1</sup>	A	A	A	A
Carbon Dioxide (Dry)	A	A <sup>1</sup>	A <sup>1</sup>	A	A	A
Carbon Dioxide (Wet)	A	A <sup>1</sup>	—	A	A	A
Carbon Disulfide	A	C <sup>1</sup>	—	A <sup>1</sup>	B	—
Carbon Monoxide	A	A <sup>2</sup>	A	A	B	A
Carbon Tetrachloride	A	D	D	B	A <sup>1</sup>	A
Carbonic Acid	A	B <sup>2</sup>	D	A <sup>1</sup>	A <sup>2</sup>	—
Catsup	—	—	—	A	—	A
Chlorinated Glue	—	—	—	—	—	—
Chlorine Water	A	B <sup>1</sup>	—	C <sup>2</sup>	A	A
Chlorine, Anhydrous Liquid	A	D	—	C <sup>1</sup>	D	—
Chlorine, Dry	A	D	D	A <sup>1</sup>	A <sup>2</sup>	A
Chlorobenzene (Mono)	B	C <sup>1</sup>	D	A	A	—
Chloroform	A <sup>1</sup>	C <sup>1</sup>	D	A	A <sup>1</sup>	A
Chlorosulfonic Acid	A	D	D	D	A <sup>1</sup>	—
Chromic acid 5%	A	D	D	B	B	B
Chromic Acid 10%	A	D	D	B	A	B
Chromic Acid 30%	A	D	D	B <sup>2</sup>	D	B
Chromic Acid 50%	A	D	D	C	B	C
Cider	—	B	B <sup>1</sup>	A	—	A
Citric Acid	A	D	A <sup>1</sup>	B <sup>1</sup>	A	A
Clorox (Bleach)	A	—	—	A	A	A
Coffee	—	—	—	A	A	A
Copper Chloride	A	—	A <sup>1</sup>	D	—	—
Copper Cyanide	A	B <sup>2</sup>	—	B	A <sup>1</sup>	—
Copper Fluoborate	—	—	—	D	B	—
Copper Nitrate	A	A <sup>2</sup>	—	A	B <sup>2</sup>	—
Copper Sulfate 5%	A	A <sup>2</sup>	A <sup>1</sup>	B	A	—
Copper Sulfate >5%	A	A <sup>2</sup>	A <sup>1</sup>	B	A	—
Cream	A	—	—	A	—	A
Cresola	—	C <sup>1</sup>	D	A <sup>2</sup>	B <sup>2</sup>	—
Cresylic Acid	A	B <sup>1</sup>	—	A <sup>1</sup>	B <sup>1</sup>	—
Cyclohexane	A	B <sup>1</sup>	A <sup>1</sup>	A <sup>1</sup>	B	—
Cyclohexanone	A	D	—	A <sup>1</sup>	A <sup>1</sup>	—
Detergents	A	D	—	A <sup>2</sup>	B	A
Diacetone Alcohol	A	A	—	B <sup>1</sup>	—	—
Dichloroethane	A <sup>1</sup>	C <sup>1</sup>	—	C <sup>1</sup>	A	—
Diesel Fuel	A	C <sup>1</sup>	—	A <sup>1</sup>	B	A
Diethyl Ether	A	—	C	B <sup>1</sup>	B <sup>1</sup>	A

Chemicals	PTFE	UHMWPE	TPE	Type 304 SS	Hastelloy® C-276	Elgiloy®
Disthylamine	D	D	—	A	A	A
Diethylene Glycol	A <sup>2</sup>	B <sup>2</sup>	—	A <sup>1</sup>	B <sup>1</sup>	A
Dimethyl Formamide	D	A	—	A	—	—
Diphenyl Oxide	A <sup>1</sup>	—	—	B <sup>1</sup>	B <sup>1</sup>	—
Epsom Salts	A	A <sup>2</sup>	—	A	B	A
Ethane	A	—	—	A	—	A
Ethanol	A	B	—	A	A	A
Ethanolamine	A <sup>1</sup>	—	—	A	B	—
Ether	A	D	—	A	B <sup>1</sup>	A
Ethyl Acetate	A	D	B	B	A	A
Ethyl Benzoate	A	C <sup>2</sup>	—	—	—	—
Ethyl Chloride	A	C <sup>1</sup>	C	A	B <sup>1</sup>	—
Ethylene Bromide	A	D	—	A	B	—
Ethylene Chloride	A	D	—	B	—	—
Ethylene Chlorohydrin	A	D	—	B	B	—
Ethylene Diamine	A	A <sup>1</sup>	—	B <sup>1</sup>	C	—
Ethylene Dichloride	A	D	C	B	B	—
Ethylene Glycol	A	D	A	B	B <sup>1</sup>	A
Ethylene Oxide	A	A	A	B	A	A
Fatty Acids	A	D	—	B	A	A
Ferric Chloride	A	A <sup>1</sup>	C	D	B <sup>2</sup>	C
Ferric Nitrate	A	A <sup>2</sup>	—	B	B <sup>1</sup>	B
Ferric Sulfate	A	A <sup>2</sup>	—	B <sup>1</sup>	A <sup>1</sup>	B
Ferrous Chloride	A	A <sup>2</sup>	—	D	B <sup>1</sup>	C
Ferrous Sulfate	A	A <sup>2</sup>	—	B	B	B
Fluoboric Acid	A	A <sup>2</sup>	—	B	A <sup>1</sup>	—
Fluorine	D	D	—	C	B <sup>1</sup>	C
Fluosilicic Acid	A	A <sup>2</sup>	—	C	B	—
Formaldehyde 40%	A	D	B	A <sup>1</sup>	B	A
Formaldehyde 100%	A	B	—	C	A	A
Formic Acid	A	D	B	B <sup>1</sup>	A	A
Freon 11	A	C	A	A	A	A
Freon 12	A	A <sup>1</sup>	A	B <sup>1</sup>	A	A
Freon 22	A	—	—	A	A	A
Freon 113	A	—	A	—	A	A
Freon TF	A	—	A	A	A	A
Fruit Juice	A	A	—	A	A	A
Fuel Oils	B	B	—	A	A <sup>1</sup>	A
Furan Resin	A	D	—	A <sup>1</sup>	B	—
Furfural	A	D	—	A	B	—
Galic Acid	B	A	—	A	B <sup>1</sup>	—
Gasoline	B	A	A	A	A	A

## Key

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# Chemical Compatibility Guide

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Gelatin	A	A <sup>2</sup>	—	A <sup>2</sup>	A	A
Glucose	A	A <sup>2</sup>	—	A <sup>1</sup>	A	A
Glue, PVA	A	A <sup>2</sup>	A	A <sup>1</sup>	A	A
Glycerin	A	A <sup>1</sup>	A	A <sup>2</sup>	A	A
Glycolic Acid	A	A <sup>2</sup>	—	A	A	A
Grape Juice	A	B	—	A	—	A
Grease	A	—	—	—	A	A
Heptane	A	B <sup>1</sup>	—	A	A	A
Hexane	A	D	A	A	A	A
Honey	A	B	—	A	A	A
Hydraulic Oil (Petro)	A	C	—	A	A	A
Hydraulic Oil (Synthetic)	A	A	—	A	A	A
Hydrazine	C	—	C	A	—	—
Hydrobromic Acid 20%	—	B <sup>2</sup>	—	D	A	C
Hydrobromic Acid 100%	A	B <sup>1</sup>	—	D	C	D
Hydrochloric Acid 20%	A	A <sup>2</sup>	B	D	A <sup>1</sup>	B
Hydrochloric Acid 37%	A	B <sup>2</sup>	C	D	B	C
Hydrochloric Acid 100%	A	—	—	D	A	B
Hydrocyanic Acid	A	A <sup>2</sup>	C	B <sup>1</sup>	A	—
Hydrocyanic Acid Gas 10%	A	—	—	—	—	—
Hydrofluoric Acid 20%	A	A <sup>2</sup>	—	D	B	C
Hydrofluoric Acid 50%	A	A <sup>1</sup>	D	D	B	C
Hydrofluoric Acid 75%	A	C <sup>1</sup>	D	D	B	C
Hydrofluoric Acid 100%	A	—	D	B <sup>1</sup>	B	C
Hydrofluosilicic Acid 20%	A	B <sup>2</sup>	—	C <sup>2</sup>	B	C
Hydrofluosilicic Acid 100%	A	B <sup>1</sup>	—	D	B	C
Hydrogen Gas	A	A <sup>2</sup>	A	A	A	A
Hydrogen Peroxide 10%	A	A	—	B <sup>2</sup>	A	D
Hydrogen Peroxide 30%	A	C <sup>2</sup>	—	B <sup>2</sup>	A	D
Hydrogen Peroxide 50%	A	C <sup>2</sup>	—	B <sup>2</sup>	A	D
Hydrogen Peroxide 100%	A	C <sup>2</sup>	—	B <sup>2</sup>	A	D
Hydrogen Sulfide (Aqua)	A	A	—	C	A	A
Hydrogen Sulfide (Dry)	A	A	A	C <sup>1</sup>	A	A
Hydroquinone	A	A	—	B	B	—
Hydroxyacetic Acid 70%	A	A	—	—	—	—
Iodine	A	A <sup>1</sup>	B	D	A	D
Isopropyl Acetate	A	B <sup>2</sup>	C	C	B	—
Isopropyl Ether	A <sup>1</sup>	B	—	A	A	A
Jet Fuel (JP3,4,5,6,8)	A	D	—	A	A	A
Jet fuel (JP9, 10)	A	D	—	A	A	A
Kerosene	A	C <sup>1</sup>	C	A	B	A
Ketones	A	C <sup>1</sup>	—	A	A	A

Chemicals	PTFE	UHMWPE	TPE	Type 304 SS	Hastelloy® C-276	Elgiloy®
Lacquer Thinners	A	A <sup>2</sup>	D	A <sup>1</sup>	A	A
Lacquers	A	A <sup>2</sup>	—	A <sup>1</sup>	A	A
Lactic Acid	A	A <sup>1</sup>	D	B <sup>1</sup>	B <sup>1</sup>	—
Lard	A	A	—	A	A	A
Latex	A	—	—	A <sup>2</sup>	A	A
Lead Acetate	A	A <sup>2</sup>	—	B <sup>1</sup>	B <sup>1</sup>	—
Lead Sulfamate	B	A <sup>1</sup>	—	C	—	—
Ligroin	A	A	—	—	—	—
Lime	A <sup>1</sup>	A	—	A	—	A
Lubricants	A	D	A	A <sup>2</sup>	A	A
Magnesium Carbonate	A <sup>1</sup>	B	—	B <sup>1</sup>	B <sup>1</sup>	—
Magnesium Chloride	A	A <sup>1</sup>	C	D	A <sup>2</sup>	—
Magnesium Hydroxide	A	A <sup>2</sup>	C	B <sup>1</sup>	A	A
Magnesium Nitrate	A	A <sup>2</sup>	—	B <sup>1</sup>	A	A
Magnesium Sulfate	A	A <sup>2</sup>	—	A	B	—
Maleic Acid	A	B <sup>2</sup>	—	A	B	—
Malic Acid	A	B <sup>2</sup>	—	A	B	—
Mayonnaise	A	D	—	C	A	A
Melamine	A	—	—	—	—	—
Mercuric Chloride (Dilute)	A	A	B	C	C	D
Mercuric Cyanide	B	A	—	A	A	—
Mercury	A	A	B	A	A <sup>2</sup>	A
Methane	A	—	—	A	A	A
Methanol	A	A <sup>1</sup>	B	A	A	A
Methyl Acetate	A	B <sup>1</sup>	—	A	A	A
Methyl Acrylate	—	—	—	A	—	—
Methyl Alcohol 10%	A	A <sup>1</sup>	B	A	A	A
Methyl Bromide	A	C <sup>1</sup>	—	B <sup>1</sup>	—	—
Methyl Cellosolve	A	—	—	A	—	—
Methyl Chloride	A	C <sup>1</sup>	—	—	B	B
Methyl Dichloride	—	—	—	B <sup>1</sup>	—	—
Methyl Ethyl Ketone (MEK)	A	B <sup>2</sup>	B	A	A	A
Methyl Isobutyl Ketone	A	C	B	A	A	A
Methyl Isopropyl Ketone	A	D	—	B <sup>1</sup>	—	A
Methylamine	A	A <sup>1</sup>	—	A	—	—
Methylene Chloride	A	C	D	A	B	—
MIL-H-5606	A	—	—	A	—	—
MIL-L-7808	A	—	—	A	—	—
MIL-L-23699	A	—	—	A	—	—
MIL-H-46170	A	—	—	A	—	—
Milk	A	A	—	A	A	A
Mineral Spirits	A	B	—	A	B	A

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# Chemical Compatibility Guide

Chemicals	PTFE	UHMWPE	TPE	Type 304 SS	Hastelloy® C-276	Elgiloy®
Molasses	A	A	—	A	A	A
Monoethanolamine	A	C	—	A	—	A
Mustard	A	A	—	A	A	A
Naphtha	B	A¹	B	A	B	A
Naphthalene	A	C	B	A	A	A
Nickel Chloride	A	A	—	D	B	C
Nickel Sulfate	A²	A	—	B¹	B	—
Nitric Acid (5-10%)	A	B	C	A	A¹	A
Nitric Acid (20%)	A	C	D	A	A¹	A
Nitric Acid (50%)	A	B¹	D	A²	A¹	A
Nitric Acid (Concentrated)	A	C¹	D	A¹	B¹	A
Nitrobenzene	A	C¹	D	B	D	—
Nitrous Acid	A	—	—	B	D	—
Nitrous Oxide	A	C	—	B	B	—
OILS:						
Aniline	A	—	D	A	B	A
Castor	A	—	B¹	A	—	A
Cocoa Nut	A	A	—	A	A	A
Cod Liver	A	—	—	A	A	A
Corn	A	A	A	A	A	A
Cotton Seed	A	A	A¹	A	A	A
Creosote	A	C	D	B	B	A
Diesel Fuel	A	A	A¹	A	B	A
Fuel	A	B	A	A	A¹	A
Ginger	A	—	—	D	—	A
Lemon	A	—	—	A	—	A
Linseed	A	A	B¹	A	B	A
Mineral	A	B¹	A	A	A	A
Olive	A¹	A¹	—	A	A	A
Orange	—	C¹	—	A	A	A
Palm	A	A	—	A	—	A
Peanut	A	A	—	A	—	A
Peppermint	A	—	—	A	—	A
Pine	A	D	—	A	—	A
Rapeseed	A	D	—	A	—	A
Rosin	A	B²	—	A¹	A	A
Sesame Seed	A	—	—	A	—	A
Silicone	A	A	A	A	A	A
Soybean	A	A¹	B	A	A	A
Tanning	—	—	—	A	—	A
Transformer	A	C¹	—	A	—	A
Turbine	A	C	—	A	—	A

Chemicals	PTFE	UHMWPE	TPE	Type 304 SS	Hastelloy® C-276	Elgiloy®
Oleic Acid	A	C²	A	A	A²	A
Oleum 25%	A	D	C	B²	A	—
Oleum 100%	A	D	—	A	D	—
Oxalic Acid (Cold)	A¹	A²	D	B	B	B
Ozone	A	A	C	B	—	A
Paraffin	A	B	—	A	B	A
Pentane	A	D	—	C	A	A
Pentane	A	D	—	C	A	A
Perchloric Acid	A	B	—	C	B	—
Perchloroethylene	A	D	C	B	B	—
Petroleum	C	B	—	A	A	—
Phenol (10%)	A	B	—	B	B	—
Phosphoric Acid (<40%)	A	A	—	D	A²	C
Phosphoric Acid (>40%)	A	B¹	—	D	A²	C
Phosphoric Acid (Crude)	A	B¹	—	D	A²	—
Photographic Developer	A	A	—	A	B	—
Phthalic Anhydride	A	—	—	A	A	—
Picric Acid	A	A	—	B	B	—
Potash	—	A¹	D	B	B	A
Potassium Bicarbonate	A	A	—	B	B	—
Potassium Bromide	A	A	—	B	B	—
Potassium Chlorate	A	A¹	—	B¹	B	—
Potassium Chloride	A	A¹	B	B¹	A	B
Potassium Chromate	A¹	A	—	B¹	A	—
Potassium Cyanide Sols.	A	A	B	B¹	B	—
Potassium Dichromate	A	A	C	B	B	B
Potassium Ferrocyanide	A	A¹	—	B	B	—
Potassium Hydroxide	A	A	D	B	B¹	B
Potassium Nitrate	A	B	B	B	B¹	—
Potassium Permanganate	A	A	D	B¹	A¹	—
Potassium Sulfate	A	A²	B	B¹	B¹	—
Potassium Sulfide	A	A²	—	B	—	—
Propane (liquefied)	A	C¹	A	A	A	A
Propylene Glycol	A	B²	—	B	B	B
Pyridine	A	C	—	B	B	—
Pyrogalllic Acid	A	B¹	C	A	B	—
Rosins	A	B¹	—	A¹	—	A
Rum	—	—	—	A	—	A
Rust Inhibitors	—	—	—	A²	A¹	—
Salad Dressings	—	—	—	A	—	A
Sea Water	A	A²	A	C	A	A
Shellac (bleached)	A	A¹	—	A	—	A

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# Chemical Compatibility Guide

Chemicals	PTFE	UHMWPE	TPE	Type 304 SS	Hastelloy® C-276	Elgiloy®
Silicone	A	—	A	A	—	A
Silver Bromide	A	A	—	D	A	—
Silver Nitrate	A	A	—	B	A	—
Skydrol 500B	A	—	D	A	—	—
Soap Solutions	A	D	A	A	A	A
Sodium Acetate	A	A	—	B	A	A
Sodium Aluminate	A	—	—	A	B	—
Sodium Bicarbonate	A	A <sup>2</sup>	—	A	B <sup>1</sup>	—
Sodium Bisulfate	A	A <sup>2</sup>	C	D	B <sup>2</sup>	—
Sodium Bisulfide	A	A <sup>2</sup>	B	B <sup>1</sup>	B	—
Sodium Borate	A	A <sup>2</sup>	B	B <sup>2</sup>	A	—
Sodium Carbonate	A	B <sup>2</sup>	—	A	A	—
Sodium Chlorate	A	B <sup>2</sup>	—	A	B <sup>1</sup>	—
Sodium Chloride	A	A <sup>2</sup>	A	B	A	A
Sodium Chromate	A	—	—	B <sup>1</sup>	A	—
Sodium Cyanide	A	A <sup>2</sup>	B	A <sup>1</sup>	A	A
Sodium Fluoride	A <sup>1</sup>	A <sup>2</sup>	—	D	A	B
Sodium Hydroxide (20%)	A	D	B	B	B	B
Sodium Hydroxide (50%)	A	D	C	B	C	B
Sodium Hydroxide (80%)	A <sup>1</sup>	D	—	C	A <sup>1</sup>	B
Sodium Hypochlorite (100%)	A	B <sup>2</sup>	D	D	B	C
Sodium Hypochlorite (<20%)	A	A	A	C	A	B
Sodium Hyposulfate	A	—	—	A	—	—
Sodium Metaphosphate	A	A <sup>1</sup>	—	A	—	—
Sodium Metasilicate	A	—	—	A	A	—
Sodium Nitrate	A	A <sup>2</sup>	—	B <sup>1</sup>	B	—
Sodium Perborate	A	A <sup>1</sup>	—	B	B	B
Sodium Peroxide	A	A	—	A	B	A
Sodium Polyphosphate	A	A	—	B	A	—
Sodium Silicate	A	A <sup>2</sup>	—	A	B	—
Sodium Sulfate	A	A <sup>2</sup>	—	B	B	—
Sodium Sulfite	A	B <sup>1</sup>	—	B	B <sup>1</sup>	—
Sodium Tetraborate	A	A <sup>2</sup>	—	B	B	—
Sodium Thiosulfate (hypo)	A	A <sup>1</sup>	—	A <sup>2</sup>	—	—
Stannic Chloride	A	A <sup>2</sup>	—	D	B	C
Stannous Chloride	A	B <sup>2</sup>	C	C <sup>2</sup>	B	B
Starch	A	B	—	A	—	A
Stearic Acid	A	B <sup>1</sup>	C	B	B	—
Stoddard Solvent	A	C <sup>1</sup>	—	A	A	—
Styrene	A	—	D	A	D	—
Sugar (liquids)	A	—	—	A	A	A
Sulfate (liquors)	A	A <sup>2</sup>	—	B	B	B

Chemicals	PTFE	UHMWPE	TPE	Type 304 SS	Hastelloy® C-276	Elgiloy®
Sulfur Chloride	A	C <sup>1</sup>	—	D	A	A
Sulfur Dioxide	A	B <sup>1</sup>	C	D	C	—
Sulfur Dioxide (dry)	A	A <sup>1</sup>	C	D	B	B
Sulfur Hexafluoride	—	B	—	—	—	A
Sulfur Trioxide	A	—	—	A	—	—
Sulfur Trioxide (dry)	A	C <sup>1</sup>	—	D	B	—
Sulfuric Acid (10-75%)	A	A <sup>1</sup>	—	D	B <sup>1</sup>	D
Sulfuric Acid (75-100%)	A	B <sup>1</sup>	C	C	B <sup>1</sup>	C
Sulfuric Acid (<10%)	A	A <sup>1</sup>	A	D	B <sup>1</sup>	D
Sulfuric Acid (cold conc)	A	C	B	C	A <sup>1</sup>	C
Sulfuric Acid (hot conc)	A	D	—	B <sup>1</sup>	A	A
Sulfurous Acid	A	B <sup>2</sup>	—	B <sup>2</sup>	B	—
Tallow	A	C	—	A	—	A
Tannic Acid	A	B <sup>2</sup>	A	B <sup>1</sup>	B <sup>1</sup>	—
Tanning Liquors	A	A <sup>1</sup>	—	A <sup>2</sup>	B	B
Tartaric Acid	A	A <sup>1</sup>	C	C <sup>2</sup>	B	—
Tetrachloroethane	A	—	—	B	A	A
Tetrachloroethylene	A	B	—	—	—	A
Tetrahydrofuran	A	C <sup>1</sup>	B	A	A	A
Tin Salts	A	—	—	—	C	—
Toluene (toluol)	A	C <sup>1</sup>	B	A	A	A
Trichloroacetic Acid	A	A	—	D	B	—
Trichloroethane	A	—	—	B	A	A
Trichloroethylene	A	D	—	B	A	A
Trichloropropane	A <sup>1</sup>	—	—	A	A	A
Tricresylphosphate	A	B <sup>1</sup>	—	B	A	—
Triethylamine	A	—	—	A	—	A
Trisodium Phosphate	A	A	A	B	A	—
Turpentine	A	D	—	A	B	A
Urea	A	A	—	B	B	B
Uric Acid	A	B	—	B	B	—
Varnish	A	A	—	A	A	A
Vegetable Juice	A	—	—	A	—	A
Vinegar	A	A	—	A	A	A
Water Acid, Mine	A	A <sup>2</sup>	—	B	A	A
Water, Distilled	A	A <sup>2</sup>	—	A	A	A
Water, Fresh	A <sup>1</sup>	A <sup>2</sup>	A	A	A	A
Water, Salt	A	A <sup>2</sup>	A	B	A	A
Whiskey & Wines	A	C	—	A	—	A
White Liquor (pulp mill)	A	A <sup>2</sup>	—	A	A	A
Xylene	A	B	B	B	A	A
Zinc Chloride	A	A <sup>1</sup>	A	B	B	—

## Key

A: No Effect/Excellent  
 B: Minor Effect  
 C: Moderate Effect/Fair  
 D: Severe Effect/Not Recommended  
<sup>1</sup>Satisfactory up to 22°C  
<sup>2</sup>Satisfactory up to 48°C



# Application Data Form

## Company Information

Company: \_\_\_\_\_ Tel: \_\_\_\_\_  
 Contact: \_\_\_\_\_ Fax: \_\_\_\_\_  
 Email: \_\_\_\_\_

## Operating Conditions

Amount in seal area: ☐ Full Head ☐ Half Shaft ☐ Splash Media/Fluid: \_\_\_\_\_  
☐ Rotary RPM: \_\_\_\_\_ Direction (from air or low pressure side of seal):  
☐ CW ☐ CCW  
 Oscillatory Rate: \_\_\_\_\_ Oscillatory Degree: \_\_\_\_\_  
☐ Linear/Reciprocating Stroke (Units): \_\_\_\_\_ Rate/Speed: \_\_\_\_\_  
☐ Static Safety Requirements: \_\_\_\_\_  
 Friction Breakout: \_\_\_\_\_ Running: \_\_\_\_\_  
 Pressure (Units) Operating: \_\_\_\_\_ Proof: \_\_\_\_\_ Burst: \_\_\_\_\_  
 Temperature (Units) Operating: \_\_\_\_\_ High: \_\_\_\_\_ Low: \_\_\_\_\_  
 Bore/Shaft Misalignment (T.I.R.): \_\_\_\_\_ Shaft Runout (T.I.R.): \_\_\_\_\_  
 Life Requirement: \_\_\_\_\_ Allowable Leakage: \_\_\_\_\_ Goal: ☐ Cost Reduction  
☐ Performance

Is seal installation tool required? ☐ Yes ☐ No ☐ SGPPL to design ☐ SGPPL to supply

## Hardware

### Static Surface

### Dynamic Surface

Material: _____	Shaft Dia.: _____ + _____ - _____
Hardness: _____	Bore Dia.: _____ + _____ - _____
Coating: _____	Width: _____ + _____ - _____
Finish _____	Extrusion Gap: _____ + _____ - _____

Can gland be changed? ☐ Yes ☐ No Shaft enters element from: Air Side ☐ Media Side ☐

Will sealing element make contact with keyway, spline, etc. ? ☐ Yes ☐ No

## Additional Information:

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## Terms and Conditions

### 1. General

- 1.1. All contracts of sale concluded with Saint-Gobain are governed exclusively by the present general conditions.
- 1.2. Clauses departing from the present general conditions shall only be valid if they have been accepted in writing by Saint-Gobain and shall only apply to the contract within which they have been taken.

### 2. Orders

Cancellation of an order for any reasons whatsoever shall be valid only if accepted by Saint-Gobain expressly and in writing. In the absence of such an agreement, Saint-Gobain reserves the right either to require specific performance of the contract, or to record a unilateral cancellation thereof by the purchaser, keeping the deposit paid and demanding an indemnity of 20% of the value of the order, without prejudice to Saint-Gobain losses and damages suffered by it.

### 3. Delivery

- 3.1. The purchaser may take delivery of the products himself from the premises of Saint-Gobain or have them delivered. If the purchaser wishes to take delivery of the products himself, those which have not been collected within 15 days of their availability will automatically be sent to the purchaser at his own expense and he will be billed for them. Saint-Gobain may also consider that the sale has been cancelled unilaterally by the purchaser and in that case, may enact article 2 above.
- 3.2. The purchaser may have the products delivered. In this case, the transportation and delivery will be at the expense and risk of the purchaser.
- 3.3. The delivery date indicated by Saint-Gobain will be considered as being purely indicative and shall not be binding thereupon. Late delivery may under no circumstances allow the purchaser to claim damages or cancellation of sale.

### 4. Conditions of payment

- 4.1. Invoices from Saint-Gobain are – unless indicated to the contrary on the invoice – payable in Belgium, net without discount or deduction, and without costs for Saint-Gobain, by the due date appearing on said invoices.
- 4.2. Without prejudice to Saint-Gobain, lack of payment, whether partial or total, for an invoice on its due date will incur late payment interest charges without further notice at a rate of 12% per annum, as well as an indemnity equal to 15% of the amount invoiced with a minimum of €125 (hundred-twenty-five Euros).
- 4.3. In the case of non-payment, Saint-Gobain may cancel the sale ipso jure by mail sent eight days after a reminder has been sent and not acted upon, without prejudice to its right to claim reimbursement for the costs incurred and compensation for losses and damages suffered.
- 4.4. The products delivered shall remain the property of Saint-Gobain until complete payment of the price, interest, costs and taxes. However, the risks shall be borne by the purchaser from the moment the products leave the stores of Saint-Gobain.
- 4.5. The issue of negotiable securities in payment shall not entail any novation (substitution of a new obligation for an old one).

### 5. Acceptance of products

- 5.1. The purchaser is responsible for verifying the conformity to standard of the products within 8 (eight) days from the delivery date and to inform Saint-Gobain in writing of any non-conformity or problem within the same period. At the end of this period, the products will be considered to have been accepted and to be devoid of any defect. Without prejudice to article 8 below, any claim reaching Saint-Gobain after this period has elapsed will not be accepted and may not involve Saint-Gobain's liability in any way whatsoever.
- 5.2. If the products delivered do not conform to the order or if they have been sent to the purchaser in error by Saint-Gobain, Saint-Gobain shall in any case be limited to the replacement of the defective products. The costs incurred in returning the products to Saint-Gobain, as well as the costs of a new delivery to the purchaser will be borne by the latter.
- 5.3. If it appears that the purchaser has wrongly invoked non-conformity or error on the part of Saint-Gobain, the purchaser shall be liable, ipso jure and without notice, for an indemnity for administrative costs equal to 20% of the price of the products in dispute, without prejudice to Saint-Gobain to claim compensation for the losses or damages suffered by it.

# Terms and Conditions

## 6. Guarantee

- 6.1. The products are guaranteed by Saint-Gobain against hidden defects in accordance with articles 1641 to 1649 of the Civil Code and within the limits specified below.
- 6.2. Claims under the guarantee for hidden defects must, in order to be valid, be made within one month, starting from the moment when the defect was discovered by the purchaser or might have been.
- 6.3. Saint-Gobain shall under no circumstances be liable in the following cases:
  - (a) when Saint-Gobain was not reasonably in a position to know about the hidden defect (invincible ignorance);
  - (b) when the damage results wholly or in part from the fact that the products were not kept or used in accordance with the indications appearing on the prospectuses, instructions for use and packaging accompanying the products, through the fault of any person whatsoever (the purchaser or a third party);
  - (c) when the product was used after a defect was noted.
- 6.4. If it is demonstrated that certain products are affected by a hidden defect, the guarantee offered by Saint-Gobain shall mean exclusively that Saint-Gobain may, at its choice, repair and/or replace the defective products with identical or equivalent products and/or reimburse them wholly or in part. If no serious or intentional fault can be proved to be attributable to Saint-Gobain, the latter may under no circumstances be held liable for damages suffered by the purchaser and which could be linked to the delivery of the products or be the result thereof.

## 7. Export Control Law

- 7.1. The buyer hereby undertakes to refrain from carrying out under any circumstances any of the following transactions:
  - transactions with persons, organisations or institutions listed on the sanctions list under EC Regulations or US export provisions;
  - transactions with embargo states prohibited;
  - transactions for which an essential permit is lacking;
  - transactions possibly relating to NBC weapons or military end-use.The buyer shall be liable for all expenditure and loss incurred by the seller as a result of any violation.
- 7.2. The seller's contractual obligations shall cease to apply, if and in so far as national or international foreign trade legislation and/or embargos and/or other sanctions conflict therewith.

## 8. Applicable law and jurisdiction

- 8.1. The contracts concluded between Saint-Gobain and the purchaser are governed by Belgian law.
- 8.2. If the purchaser has not bought the products for professional purposes, jurisdiction will be determined in accordance with article 624, paras. 1,2 and 4 of the Judicial Code. If the purchaser has bought the products for professional purposes, any dispute arising from the contract shall be submitted to the exclusive jurisdiction of the Court of Brussels (Belgium).

## Product Line and Market Summary

As a business unit under Saint-Gobain Performance Plastics' Engineered Components division, Saint-Gobain Seals not only offers the spring-energized seals that you see in this product handbook, but a wide range of other innovative sealing and polymer solutions.

### Our main family of products includes:

- › OmniSeal® (Spring-Energized Seals)
- › OmniLip™ (PTFE Rotary Shaft Seals)
- › OmniFlex™ (Fluoroelastomer Seals)
- › Rulon® (High-Performance Fluoropolymer Compounds)
- › Meldin® 7000 (Thermoset Polyimide Materials)
- › Meldin® HT (High-Performance Thermoplastic Materials)

Other products in our portfolio include Fluoroloy® (high-performance custom-formulated compounds), cup seals, hydraulic seals, metal boss seals, v-packings, piston rings, Marathon® (valves and vacuum pump diaphragms), Transband® (PTFE creepage band), custom parts, polymer bearings and stock shapes.





## Product Line and Market Summary

The majority of the seals and polymer components we manufacture are custom designed and matched with the best materials to optimize their performance in various applications and markets, and under the most extreme and critical conditions.

Saint-Gobain Seals products are extensively used in key markets such as Oil & Gas, Automotive, Life Sciences and Aerospace. We have also been instrumental in the Electronics and Industrial industries, providing energy-efficient and environmentally friendly designs. Our solutions reflect our business model, which focuses on co-development relationships and engineer-to-engineer direct collaboration. More than 93% of our products are custom engineered to the customer's application. Please feel free to contact us at [sealsmarketing@saint-gobain.com](mailto:sealsmarketing@saint-gobain.com) to request one of our catalogs, handbooks or brochures, or if you have any questions. Our global team is happy to assist you with your sealing and polymer needs.





## Notes














## Notes






For more information please call us, email us at [sealsmarketing@saint-gobain.com](mailto:sealsmarketing@saint-gobain.com),  
or visit our website at [www.seals.saint-gobain.com](http://www.seals.saint-gobain.com).



#### Manufacturing and sales locations

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