Omniseal Solutions
SAINT-GOBAIN

OMNISEAL® POLYMERS

SPRING-ENERGIZED SEALS

BEYOND
the boundaries of possible

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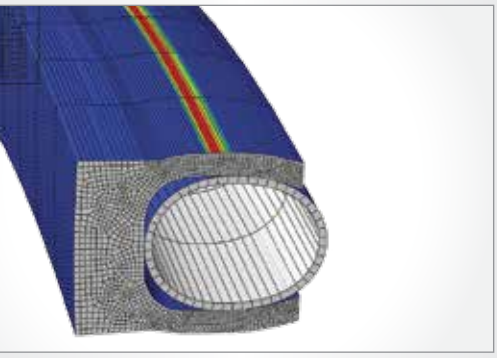
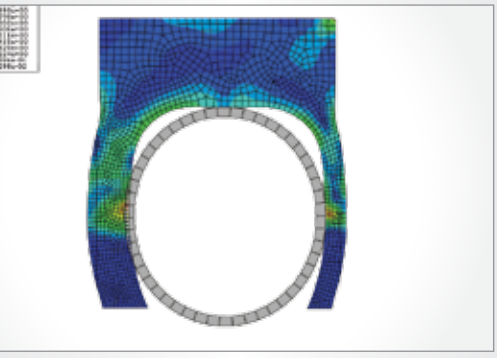
Welcome to the Omniseal Solutions' World: Experience You Can Rely On ... Time After Time





Saint-Gobain has a rich tradition of excellence that dates back more than 350 years. Today, it is among the world's top 100 industrial corporations and a leader in the development and production of engineered components and materials.

In 1665, King 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 more than 170,000 employees, operations in 67 countries and eight major cross-business research centers that serve all activities, Saint-Gobain provides complete and thorough service to our customers, beginning 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.

As a key ingredient in the wellbeing of each of us and the future of all, we 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 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, Omniseal Solutions is dedicated to providing the most technologically advanced products on the market today and finding solutions for the future.

Saint-Gobain Group Headquarters, France

help@omniseal-solutions.com

A Tour of Our Capabilities

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Omniseal Solutions' 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.

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 lead 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 and Bristol sites are certified for AS9100, the Kontich site for EN9100 and the Willich site for TS16949 and OHSAS 18001.

Design Engineering

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

R&D, Lab and 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

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

AS 9100 Rev.D
ISO 13485:2016
ISO 9001:2015
ISO 14001:2015
ISO 45001:2018


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 (SES) Journey Began

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What Is the Omniseal® Solution?

Omniseal® seals are the Omniseal Solutions' 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, Omniseal Solutions continues to develop its patented Omniseal® spring-energized seals product line, proven to be effective solutions in multiple industries.

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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 aviation industry, Omniseal Solutions looked to assist other industries such as oil and gas, automotive, electronics, industrial and Life Science. 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

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How Our Omniseal® Spring-Energized Seals Work

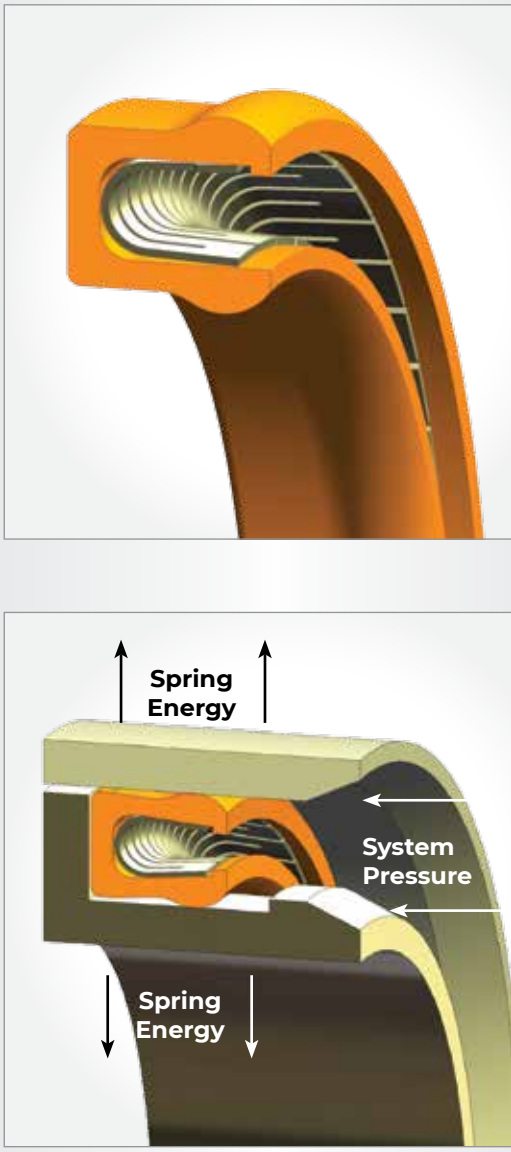
The Omniseal® spring-energized seal is a spring-actuated, pressure-assisted sealing device consisting of a PTFE (or other polymer) jacket partially encapsulating a corrosion-resistant metal spring energizer.

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 300°C (572°F) and is inert to virtually all chemicals except molten alkali metals, fluorine gas at high temperature and chlorine trifluoride (ClF_3).

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 a gland provides positive resistance to torsional or spiral failures often found in O-rings.



Omniseal® 400A seal in working conditions

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Our Seal Jacket Materials

Omniseal Solutions' high-performance polymer 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, Omniseal Solutions 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	Temperature Range °F	Coefficient of Friction	Wear Factor*	Tensile Strength (psi/MPa)	Elongation (%)	Hardness (Shore D)
A01	White	**Virgin PTFE.** 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	-346 to +500	0,09	7,500	4,000 (27.6)	300	58
A02	White	**Modified PTFE.** 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	-346 to +572	0,09	6,000	4.800 (33,1)	450	58
A05	Black	**Polymer Filled PTFE.** 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	-346 to +572	0,09	1	2.000 (13,8)	170	64
A08	Tan	**Polymer Filled PTFE.** 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	-346 to +572	0,5	2	3.000 (20,7)	230	60
A09	Gold	**Formulated UHMW-PE.** Extremely tough, long wearing but limited heat and chemical resistance. Particularly suitable for abrasive media. Recommended for long wear life under severe conditions.	-268 to +82	-450 to +180	0,11	9	4.500 (31,0)	230	61
A11	Clear	**Virgin PTFE.** Thermoplastic with superior resistance to nuclear radiation but limited heat and wear resistance. Not recommended for general purpose sealing.	-101 to +149	-150 to +300	0,50	150	5.600 (3,.6)	300	72

* Wear Factor: 1 = Excellent, 15,000 = Poor

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Our Seal Jacket Materials

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MATERIAL CODES AND PROPERTIES

Material Code	Color	Description and Recommended Use	Temperature Range °C	Temperature Range °F	Coefficient of Friction	Wear Factor*	Tensile Strength (psi/MPa)	Elongation (%)	Hardness (Shore D)
A12	Gold	**Polymer Filled PTFE.** Tough, long wearing, heat resistant. Very low friction. Excellent for dry running applications against soft surfaces. Excellent materials for reciprocating applications.	-210 to +300	-346 to +572	0,09	9	2.000 (13,8)	180	60
A15	Gray	**Lubricated Glass Filled PTFE.** Similar to A27 material but somewhat softer for improved sealing at low pressure. Can be abrasive running against soft metals.	-210 to +300	-346 to +572	0,09	5	3.400 (23,4)	230	58
A16	Gray	**Lubricated Organic Filled PTFE.** 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	-346 to +572	0,09	12	3.000 (20,7)	200	60
A17	White	**Formulated UHMW-PE.** Extremely good wear and abrasion resistance, but limited heat and chemical resistance. FDA compliant.	-150 to +82	-240 to +180	0,11	9	5.400 (37,2)	450	62
A21	Black	**Lubricated Organic Filled PTFE.** 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	-346 to +572	0,10	6	1.800 (12,4)	65	65
Meldin® 5301	Tan	**Virgin PEEK.** High modulus material with excellent high temperature resistance. Recommended for back-up rings and for special applications.	-210 to +300	-346 to +572	0,40	20	13.780 (95,0)	30	90
A27	Gray	**Lubricated Glass Filled PTFE.** 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	-346 to +572	0,09	9	3.300 (22,8)	280	58
A30	Yellow	**Glass Formulated PTFE.** Excellent heat, wear and chemical resistance. Good cryogenic properties. Can be abrasive running against soft metals at high speeds. Excellent material for back-up rings.	-210 to +300	-346 to +572	0,09	6	2,700 (18,6)	220	60

* Wear Factor: 1 = Excellent, 15,000 = Poor

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Our Seal Jacket Materials

MATERIAL CODES AND PROPERTIES

Material Code	Color	Description and Recommended Use	Temperature Range °C	Temperature Range °F	Coefficient of Friction	Wear Factor*	Tensile Strength (psi/MPa)	Elongation (%)	Hardness (Shore D)
A40	Tan	**Polymer Filled PTFE.** Good wear resistant material for medium hard counterfaces. Caution when used in wet applications. FDA compliant.	-210 to +300	-346 to +572	0,10	6	2.500 (17,2)	175	63
A41	Black	**Modified Filled PTFE.** Excellent all purpose high wear material. Best for dynamic applications running on moderate to hard surfaces.	-210 to +300	-346 to +572	0,09	30	2.600 (17,9)	135	60
A42	Black	**Lubricated Formulated PTFE.** Excellent general purpose material with good heat and weaar resistance. Non-abrasive. Compatible with all hydraulic fluids and most chemicals. Good in water and non-lubricating fluids.	-210 to +300	-346 to +572	0,09	30	1.800 (12,4)	90	60
A45	Brown	**Polymer Filled PTFE.** Excellent wear material for higher temperatures, pressures and speeds. Superior in dry or poor lubricated applications. FDA compliant.	-210 to +300	-346 to +572	0,09	1	1.900 (13,1)	300	55
A46	White	**Filled PTFE.** Good wear resistant material against all stainless steel counterfaces. May be used in contact with food. FDA compliant.	-210 to +300	-346 to +572	0,20	15	2.000 (13,8)	175	60
A47	White	**Filled PTFE.** Very good wear resistant material under wet or lubricated conditions. May be used in contact with food. FDA compliant.	-210 to +300	-346 to +572	0,11	9	1.200 (8,3)	90	63
A56	Black	**Proprietary PTFE.** Outstanding heat and chemical resistance. Highly conductive material.	-101 to +204	-150 to +400	0,21	32	3.500 (24,1)	250	65
A68	Black	**Filled PTFE.** Excellent for dynamic sealing in ceramic surfaces. Excellent wear resistance in water, dry and lubricated environments.	-210 to +300	-346 to +572	0,36	5	2.000 (13,8)	200	60
A90	Dim Gray	**Proprietary PTFE.** Good sealing capabilities at elevated temperatures and excellent for static or low dynamic service.	Cryo. to +350	Cryo. to +662	0,38	74,5	1.200 (8,3)	43	60

* Wear Factor: 1 = Excellent, 12.000 = Poor

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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. Omniseal Solutions' 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 or contact us at help@omniseal-solutions.com.

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

In the 1970s, Omniseal Solutions 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 aviation 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, Omniseal Solutions has more than 30 high-performance polymer materials available that are qualified to the 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, high-performance polymer materials were subjected to extreme temperature and high percentages of hydrogen sulfide up to 25% H_2S, 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 high-performance polymer 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 (392°F).

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Our Investment in Industry-Recognized Material and Qualification Standards

Material Compliance and Regulations for the Life Science Industry

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

All listed FDA compliant, high-performance polymer 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.

In addition, Omniseal Solutions offers high-performance polymer 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 and is the most challenging to pass.

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

DIRECT CONTACT MATERIAL PROPERTIES

Material Code	FDA Compliant	EU 1935/2004 10/2011	USP Class VI
A01	•		
A02	•		
A06	•		
A09	•		•
A12			•
A20	•		•
Meldin® 5301	•		
A23	•		
A40	•	Simulant A, B, D2	
A41			•
A45	•		
A46	•	Simulant A, D2	•
A47	•	Simulant D2	•
A66			•
A79	•		

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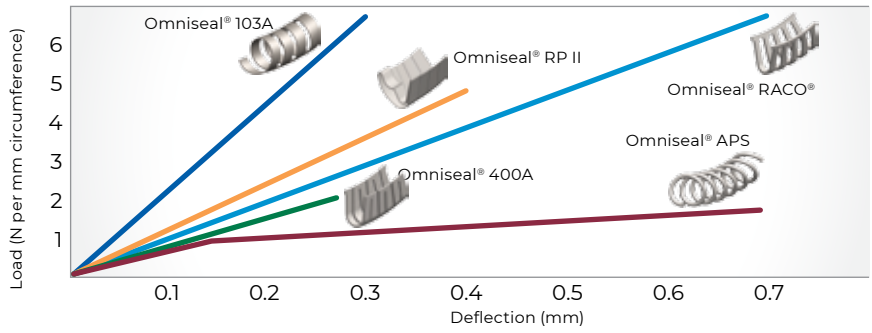
Our Spring-Energizer Materials

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 help@omniseal-solutions.com or refer to the back page for site contact information.

SPRING COMPARISON: LOAD VS. DEFLECTION



ENERGIZER OPTIONS WITH SEALS

Code No.	Description	Omniseal® 103A p. 35	Omniseal® 400A p. 37	Omniseal® APS p. 39	Omniseal® RP II p. 41	Omniseal® RACO® 1100A p. 43
01	301 Stainless Steel		Standard		Standard	Standard
02	Inconel® 718					·
05	Colbalt/ Nickel Aloy[1]	·	·			
06	316 Stainless Steel	·	·	·		
07	17/7 PH Stainless Steel	Standard				
08	Hastelloy® C276		·			
09	302 Stainless Steel			Standard		

[1] 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

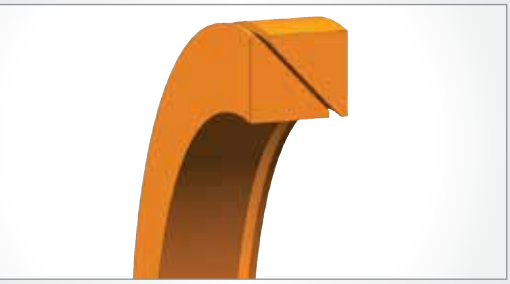
Omniseal® 400A seals can be supplied with an FDA-approved grade of RTV silicone filled into the spring cavity. The elastomer ensures that no contaminants become trapped in the spring cavity, allowing the seal to be used in food processing and clean-in-place applications. Other materials are also available.

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.

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Our Omniseal® Back-up Rings

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.

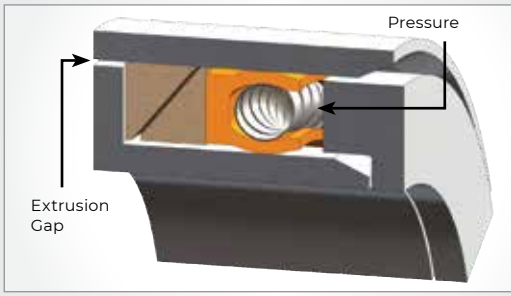
See materials shown on pages 8-10.

Back-up Ring Materials

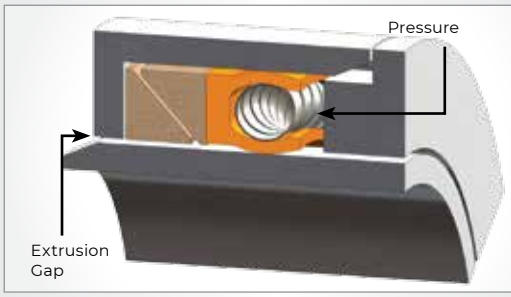
The back-up ring should consist of a harder material than the seal material. A high filled PTFE compound, or a high modulus plastic such as Meldin® 5301 is recommended. Polymeric materials such as filled PTFE, PEEK and reinforced PEEK prevent the softer seal material from extruding in the gap between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

L-SHAPED BACK-UP RING

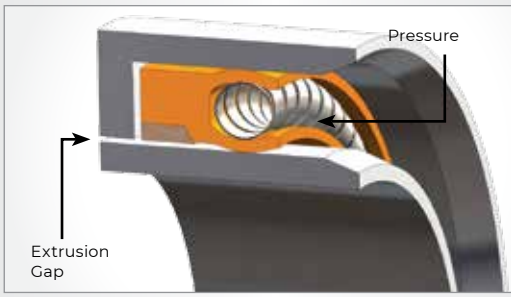
PISTON SEAL INSTALLATION WITH DUAL BACK-UP RINGS



ROD SEAL INSTALLATION WITH DUAL BACK-UP RINGS



HIGH MODULUS ANTI-EXTRUSION/WEAR RING



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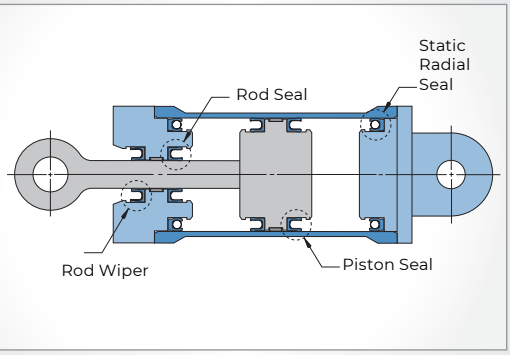
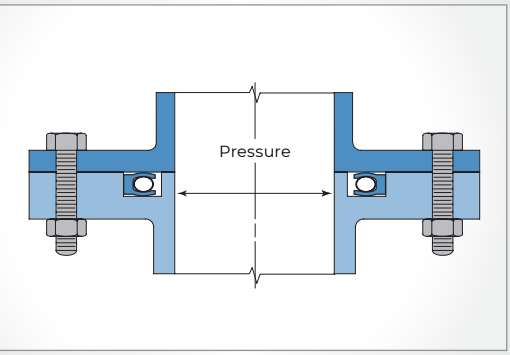
Seal Function and Motion

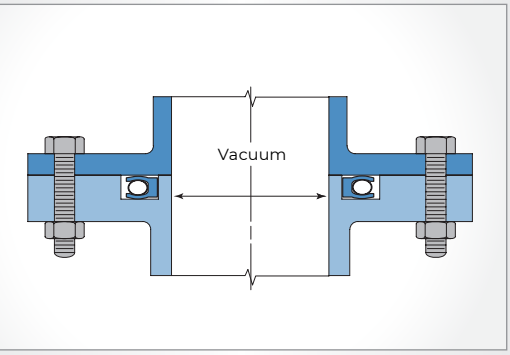
DYNAMIC RADIAL SEAL



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 into 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. Omniseal Solutions offers 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 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 help@omniseal-solutions.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 a radial direction. Male glands are machined in the shaft, while 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.

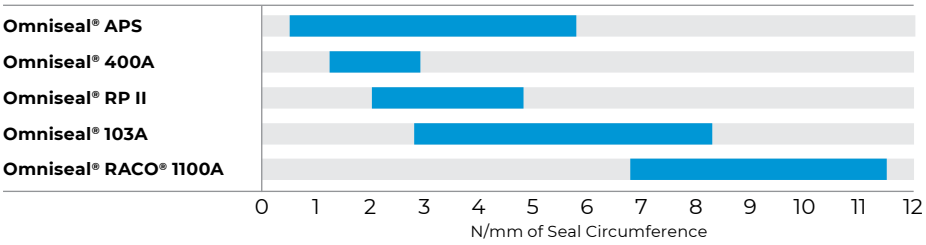
Axial sealing has glands that compress seals parallel to the axis of the seal. Glands are machined on the face of the hardware. Axial sealing is usually, but not always, static. We offer inside and outside face seals in such applications.

OMNISEAL® APPLICATION RECOMMENDATIONS

<table>
<tr><th></th><th colspan="3">Radial Sealing</th><th>Face Sealing</th></tr>
<tr><td>Static Application</td><td colspan="3">Omniseal® 103A</td><td>Omniseal® 103A / RACO® 1100A</td></tr>
<tr><td rowspan="3">Dynamic Application</td><td>Reciprocating</td><td>Omniseal® 400A / APS</td><td>Omniseal® 103A / RP II</td><td rowspan="3">Omniseal® 400A / APS / RACO® 1100A / 103A</td></tr>
<tr><td rowspan="2">Rotary</td><td>Moderate Speed</td><td>Flanged Omniseal® 400A / APS</td></tr>
<tr><td>Slow Speed</td><td>Flanged Omniseal® 103A</td></tr>
</table>

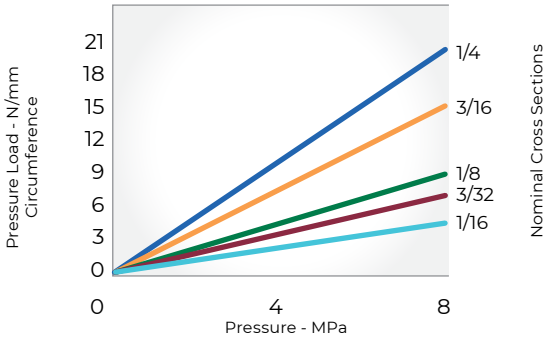
Friction and Rotary Motion

TYPICAL SPRING LOAD RANGES

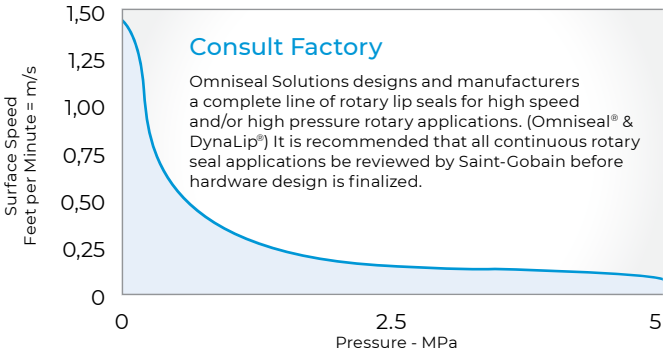


NOTE: The values above are for standard spring material and thicknesses. Other materials and spring thicknesses may be substituted; consult our Technical Support team for availability.

PRESSURE LOAD



SURFACE SPEED AND PRESSURE



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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 an 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. Omniseal Solutions manufactures a variety of springs with lower or higher loads than those 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 help@omniseal-solutions.com. You may also refer to the back page for specific site contact information.

The approximate total load of an Omniseal® seal can be calculated by adding the pressure load found in the “Pressure Load” chart shown at left to the average spring load shown in the “Typical Spring Load Ranges” chart above. For rotary motion, use the chart to the left to qualify Omniseal® products for continuous rotary applications.

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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 hardwares. 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_1 Width: Gland width for extended heel and flanged heel seals without any back-up ring

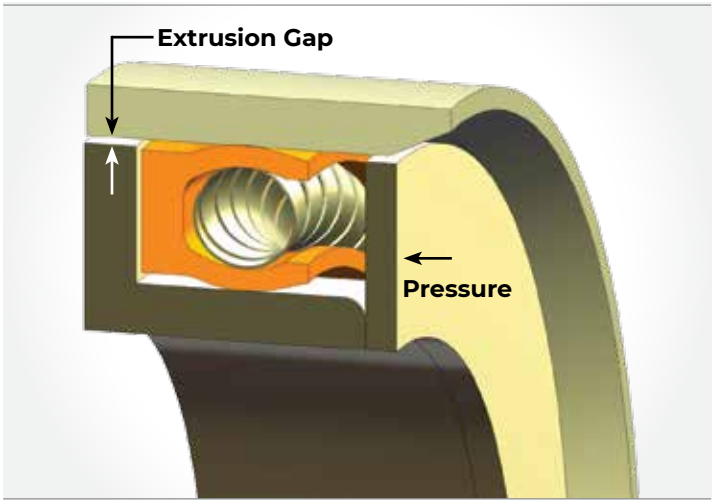
G_2 Width: Gland width for standard seals using a back-up ring

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_1 Width 	Unfilled	0,15	0,10	0,07	—
	Filled	0,20	0,15	0,10	0,07
G_2 Width 	Unfilled	0,20	0,15	0,10	0,07
	Filled	0,25	0,20	0,15	0,10
G_2 Width 	Unfilled	0,25	0,20	0,15	0,10
	Filled	0,35	0,25	0,20	0,15

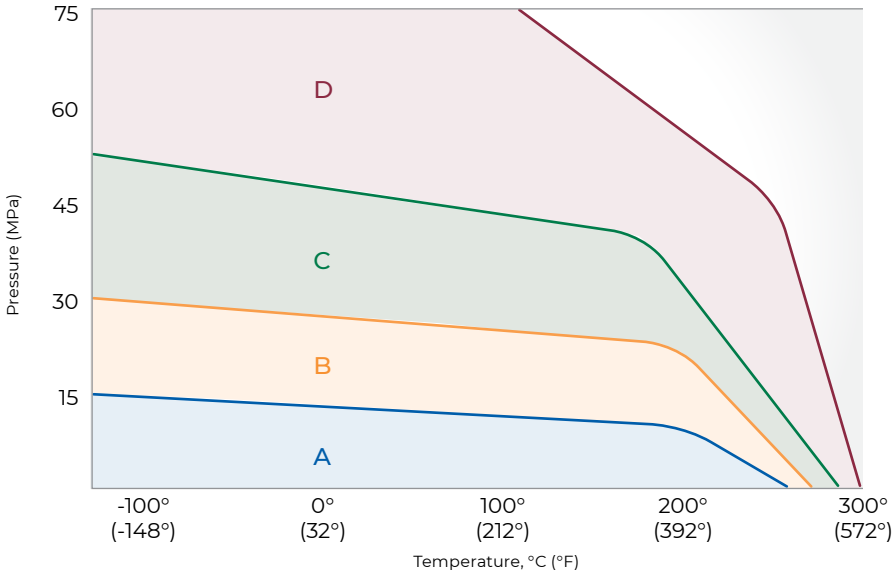
Note: Consult Technical Support for extrusion gap information regarding specific applications.
*Refer to page 19.

EXTRUSION GAP DETAIL



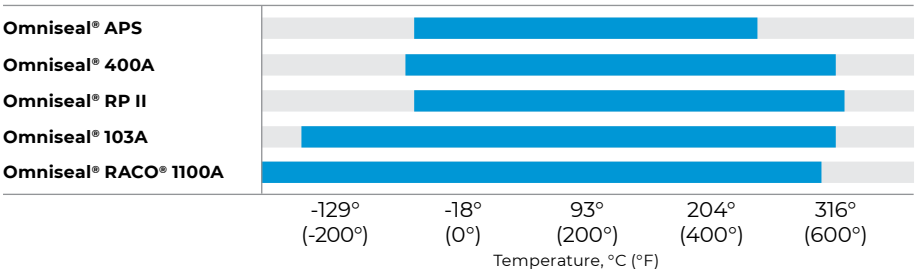
Temperature, Pressure and Extrusion Gap

TEMPERATURE VERSUS PRESSURE AND SEAL DESIGN



Consult Technical Support for "D" range or above.
Please also refer to the Maximum Recommended Extrusion Gap table on page 17, which shows the A, B, C and D values.

SEAL DESIGN VERSUS TEMPERATURE



For temperatures below -40°C, contact Technical Support.

Cryogenic Sealing

Cold temperatures below -40°C (-40°F) 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 help@omniseal-solutions.com before selecting an Omniseal® seal for any cryogenic application.

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 our Technical Support at help@omniseal-solutions.com.

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 on the left illustrates the effect of surface finish on seal wear.

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 32 µin (0.8 µm) Ra or better. The “lay” on surfaces for static face seals should be concentric. Polishing or machining surfaces should be circular.

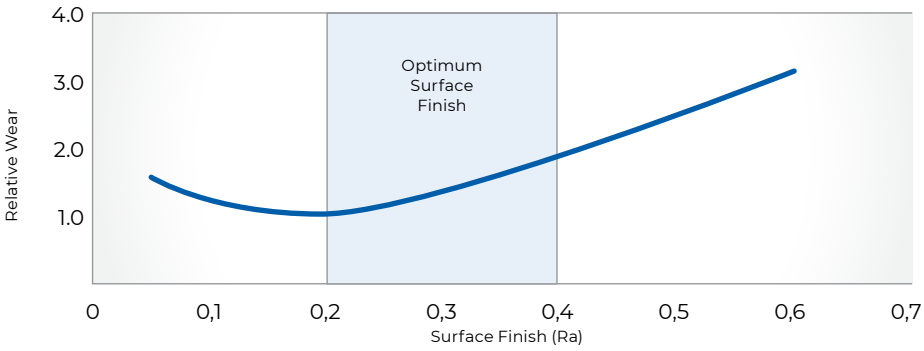
Surface Hardness

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 58 to 62 Rockwell C. Hard anodized surface finishes must be polished after anodizing.

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

SEAL WEAR IN DYNAMIC SURFACE



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Gland Design

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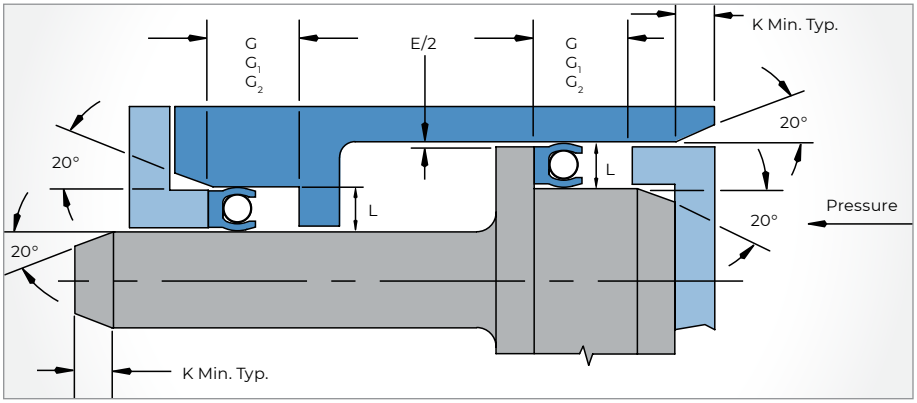
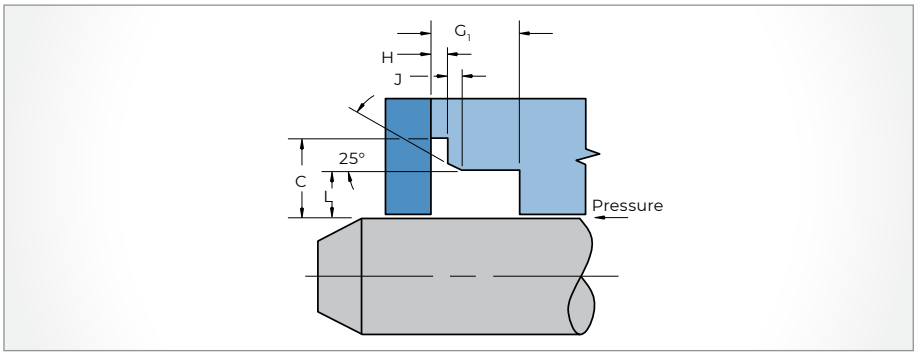
Proper gland geometry in the early stages of design can eliminate installation problems. Utilizing split or separable glands in piston and rod seal applications can eliminate the need for special tools and the need to stretch or compress the Omniseal® seal during installation into the gland.

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.

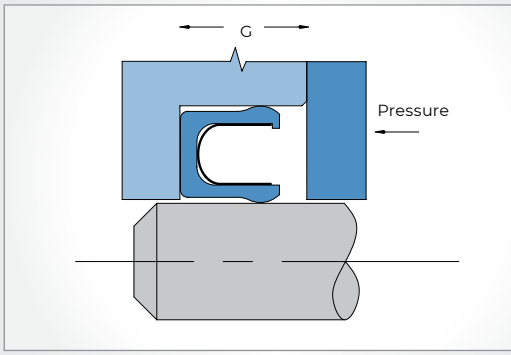
ROD SEAL AND PISTON SEAL GLAND



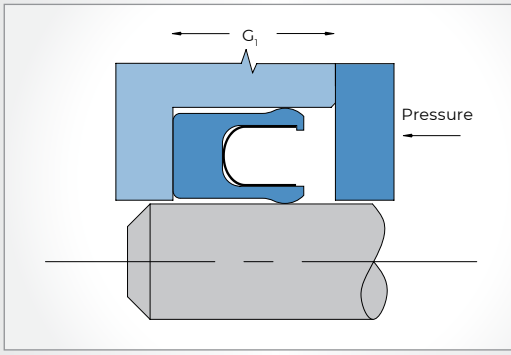
FLANGED SHAFT SEAL GLAND



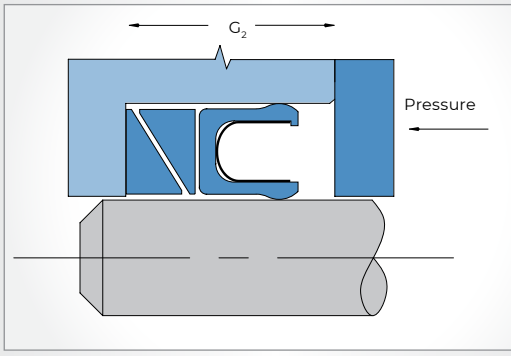
GLAND WIDTH FOR STANDARD OMNISEAL® SEAL



GLAND WIDTH FOR EXTENDED HEEL OMNISEAL® SEAL



GLAND WIDTH FOR STANDARD OMNISEAL® SEAL PLUS BACK-UP RING



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Gland Design

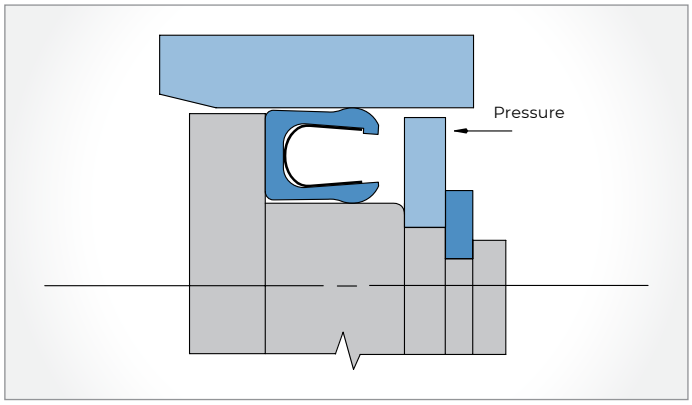
RADIAL SEAL GLAND DIMENSIONS (MM)

Cross-Section No.	Nominal Cross-Section	L Actual Cross-Section	G +0.30 -0.00	G_1 +0.30 -0.00	G_2 +0.30 -0.00	K Min.	C ±0.13	H ±0.05	J ±0.13	E Nominal[1]
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

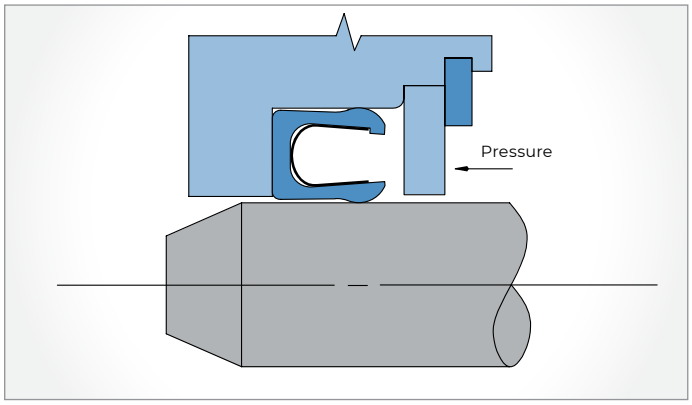
[1]See extrusion gap recommendations on page 18

Alternate Gland Designs

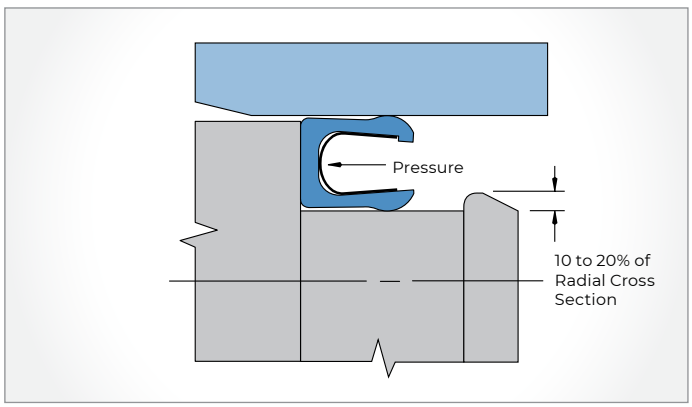
PISTON SEAL SNAP RING GLAND



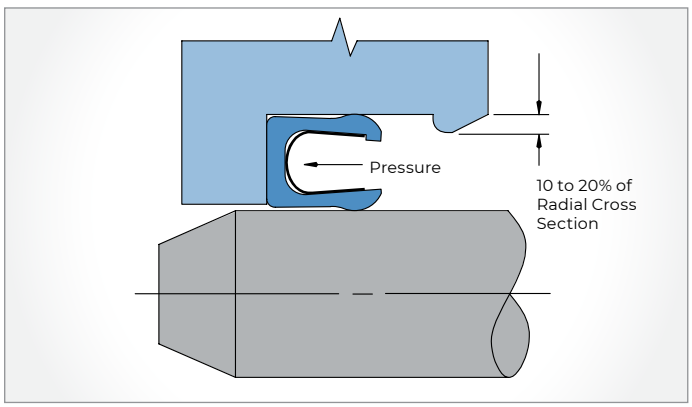
ROD SEAL SNAP RING GLAND



PISTON SEAL REDUCED GLAND



ROD SEAL REDUCED GLAND



Our Seal Design Variations

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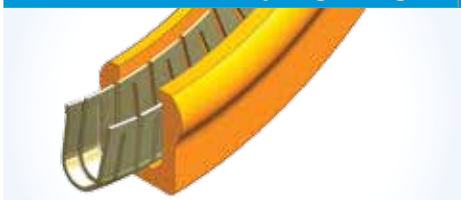
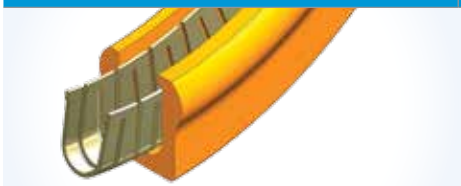
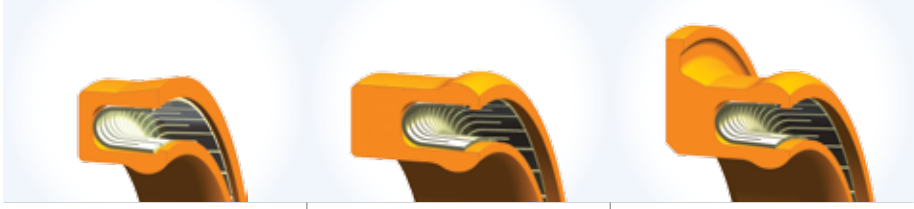
Omniseal® 400A Spring Design	Omniseal® 103A Spring Design
	
Omniseal® Spring Ring II Design	**Omniseal® APS Spring Design**
	
Omniseal® RP II Spring Design	**Omniseal® RACO® 1100A Spring Design**
	

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.

Omniseal Solutions offers the most complete line of spring-energizer configurations for various industries.

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Oil & Gas Market: 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 Omniseal Solutions 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 polymer compounds qualified to NORSOK M-710 and to API 6A F.1.13 specifications
- Cryogenic temperatures
- Design complaint 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

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Oil & Gas Market: Case Studies

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On/off Valves Fugitive Emission

Product:	Omniseal® 103A custom design and V-packings
Specifications:	Fugitive Emissions Standards SHELL MESC SPE 77-312 or ISO15848-1
Typical Temperature:	-50°C (-58°F) to 160°C (320°F)
Typical Pressure:	Pressure up to 1,035 BAR (15,011 PSI)
Leakage Rate:	Class B $<10^{-4}$ $mg.s^{-1}.m^{-1}$ circ
Endurance:	Class C03; 2,500 cycles
Media:	Oil

Our Added Value +

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

Swivel for Marine LNG Loading Arms

Product:	Omniseal® RACO® 1100A custom design
Specifications:	Primary and secondary dynamic face seal
Typical Temperature:	-165°C (-265°F)
Typical Pressure:	20 BAR (290 PSI)
Typical Speed:	Slow angular motion
Media:	Liquefied 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

Omniseal Solutions
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Oil & Gas Market: Case Studies

Subsea Valves; Ball and Gate Valves for Subsea Production Systems; PLETs, PLEMs, Manifolds and Xmas Trees

Product:	Omniseal® 103A custom design
Specifications:	API Spec 17D/ISO 13628, API Spec 6DSS/ISO 14723 API Spec 6A, Appendix F (PR2test)/ISO 10423
Typical Temperature:	Up to 250°C (482°F)
Typical Pressure:	Up to 1,035 BAR (15,011 PSI)

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

High-Pressure FPSO Turret Swivel

Product:	Omniseal® 400A and welded PEEK back-up ring
Specifications:	Primary and secondary dynamic face seals, static seals
Typical Temperature:	Up to 120°C (248°F)
Typical Pressure:	430 BAR (6,237 PSI)
Typical Speed:	Slow angular motion (24 in./min. or 0.6 m/min.)
Media:	Oil

Our Added Value +

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

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Aviation Market: Where Our Seals Rise to the Most Difficult Challenges

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

A growing requirement for commercial aircraft, military aircraft 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 aviation 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 Aviation Applications

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

Omniseal Solutions
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Aviation Market: Case Studies

Gear Box Shaft

Product:	Omniseal® 400A seal
Specifications:	Sealing of gear box actuator shaft
Typical Temperature:	-50°C (-58°F) to 160°C (320°F)
Typical Pressure:	Up to 1,305 BAR (18,927 PSI)
Leakage Rate:	None
Media:	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

Anti-icing Seal in Flight Actuator

Product:	Omniseal® RP II seal
Specifications:	Sealing at extreme temperature
Typical Temperature:	As low as -54°C (-65°F)
Typical Pressure:	Pressure from 1.7 to 5.2 BAR (-25 to 75 PSI)
Media:	Rainwater, deicing fluid, hydraulic oils

Our Added Value +

- Prevents ice and snow from moving inside the actuator mechanism
- Effective sealing at low temperature
- High performance in rugged applications

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Aviation Market: Case Studies

Omniseal Solutions
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Rocket Engine Check Valve

Product:	Omniseal® 103A anti-blowout seal
Specifications:	Retains pressurized fluid on the high pressure side while preventing blowout of the seal from the housing
Typical Temperature:	-184°C (-300°F) to 50°C (122°F)
Proof Pressure:	207 BAR (3,000 PSI)
Leakage Rate:	None over hundreds of cycles
Media:	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 320°C (575°F)

Secondary Seal in Aircraft APU

Product:	Omniseal® 400A seal
Specifications:	Sealing inside a mechanical carbon face seal. The seal performs secondary sealing as well as offers a very controlled drag to primary carbon face.
Typical Temperature:	-55°C (-67°F) up to 288°C (550°F)
Differential Pressure:	0.8 BAR (0.3 to 12 PSI)
Media:	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

Omniseal Solutions
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Life Science Market: How Our Seals Operate in Stringent Conditions

For more than 30 years, Omniseal Solutions 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- (450°F) to 316°C (600°F) and our seals offer pressure ratings from vacuum up to 3,448 BAR (50,000 PSI).

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 a wide range of PV applications

Successful Life Science Applications

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

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Life Science Market: Case Studies

Omniseal Solutions
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Autoclave Pump

Product:	Omniseal® seal with elastomer energizer
Specifications:	Sealing in saturated steam
Typical Temperature:	21°C (70°F) to 137°C (270°F)
Typical Pressure:	3.5 BAR (50 PSI)
Typical Speed	110 FPM (5,300 RPM)
Typical Motion:	Rotary
Media:	Saturated steam

Our Added Value +

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

HPLC Instrumentation

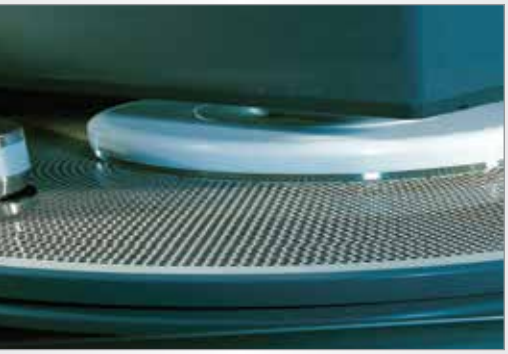
Product:	Custom Omniseal® seal with APS spring
Specifications:	Sealing at very high pressure
Typical Temperature:	20°C (68°F) to 40°C (104°F)
Typical Pressure:	1,034 BAR (15,000 PSI)
Typical Speed:	50 cm/min. (1.64 ft./min.)
Typical Stroke Length:	5 mm (0.2 in.)
Typical Motion:	Reciprocating
Media:	UHPLC solutions

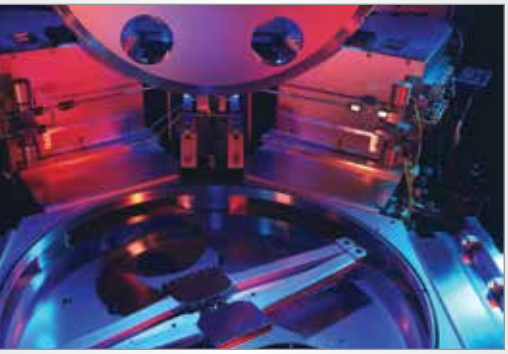
Our Added Value +

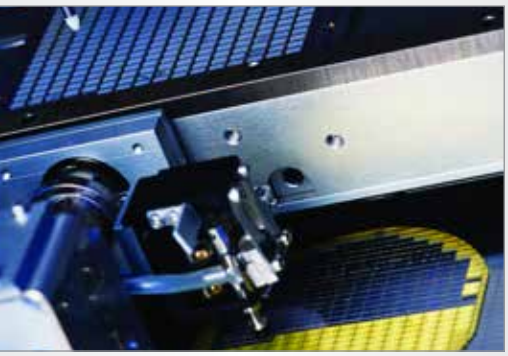
- Long-wearing jacket material
- Low friction
- Constant spring load

Omniseal Solutions
SAINT-GOBAIN

Electronics Market: When Our Seals Take Innovation and Technology to a New Level







At Omniseal Solutions, 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 (450°F)
- Functions well under high pressure in excess of 34 BAR (500 PSI)
- 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

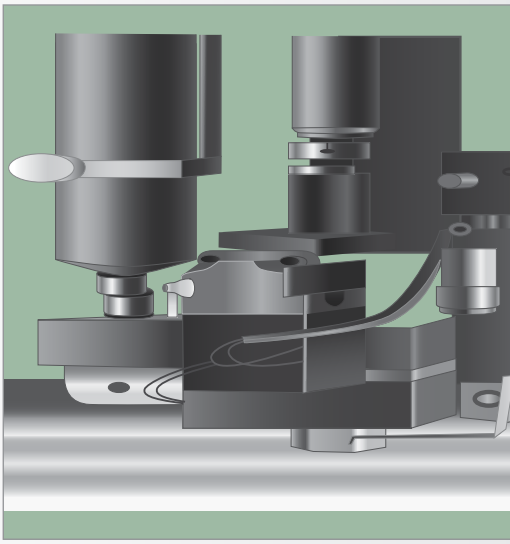
help@omniseal-solutions.com

Electronics Market: Case Studies

Omniseal Solutions
SAINT-GOBAIN

Micro-E Packaging Plunger Pump

Product:	Omniseal® 103A radial with skived I.D. lip
Specifications:	Chemically compatible with epoxy resin and installable in a closed groove
Typical Temperature:	Ambient
Typical Pressure:	197 BAR (2,860 PSI)
Media:	Epoxy resin

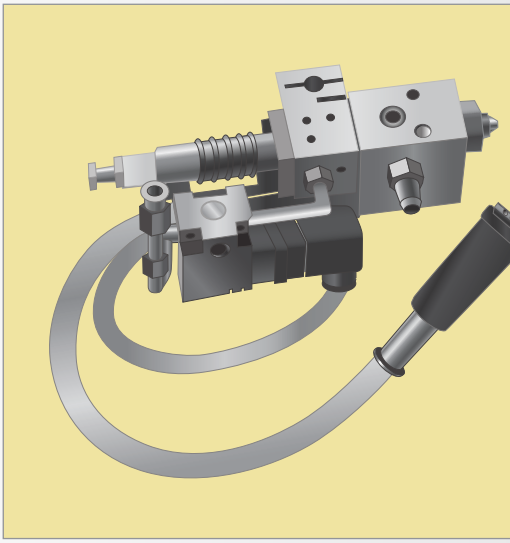


Our Added Value +

- Excellent wear performance
- Excellent fluid compatibility

Micro-E Packaging Hotmelt Dispenser

Product:	Omniseal® 400A radial
Specifications:	Chemically compatible with epoxy resin at high temperature working conditions
Typical Temperature:	200°C (392°F)
Typical Pressure:	200 BAR (2,900 PSI)
Media:	Epoxy resin



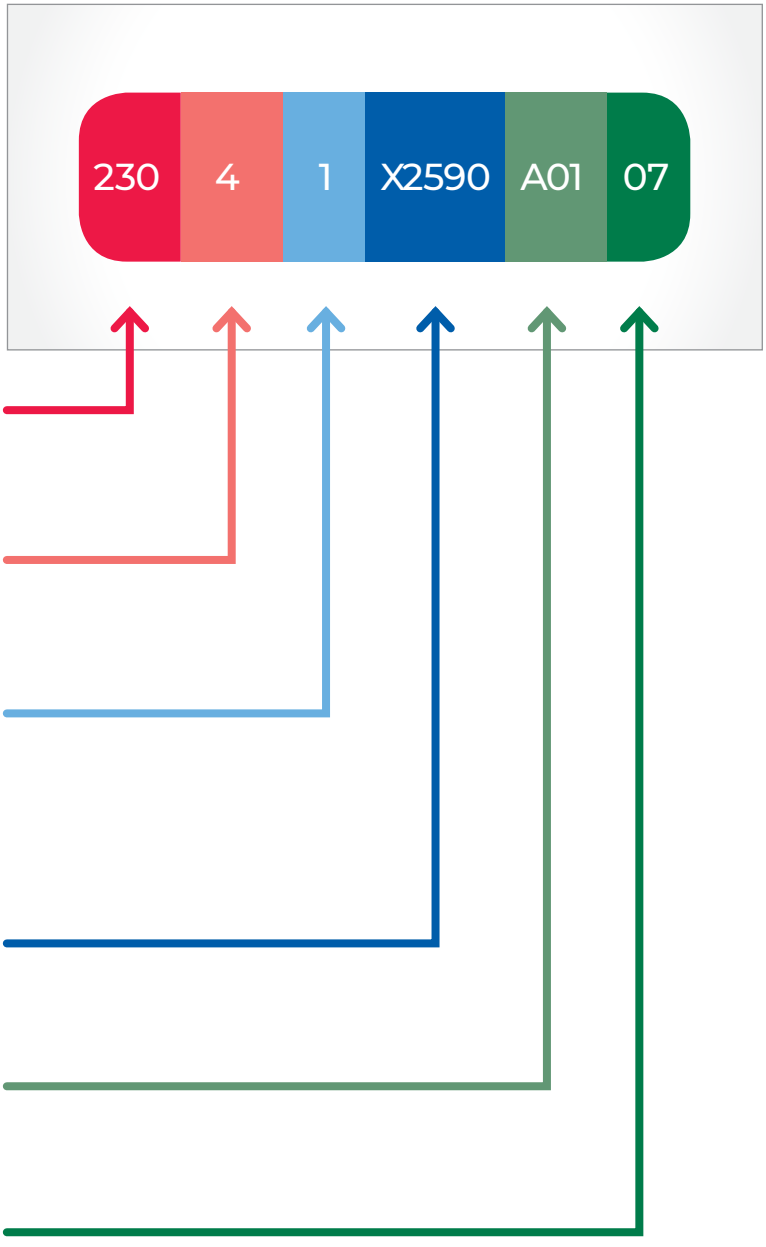
Our Added Value +

- 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)

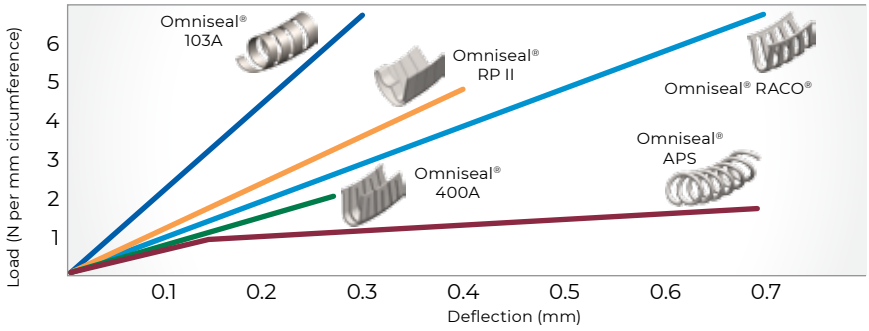
Omniseal® 103A

Omniseal Solutions
SAINT-GOBAIN

RADIAL SEAL

	Standard Lip	Skived I.D. Lip	Skived O.D. Lip
Standard Heel G Width			
Part No.	230	231	232
Extended Heel G_1 Width			
Part No.	233	234	235
Flanged Heel G_1 Width			Other shapes available on request
Part No.	236	237	

SPRING COMPARISON: LOAD VS. DEFLECTION



Features

- Helical wound flat spring 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 aviation, military and industrial gland sizes

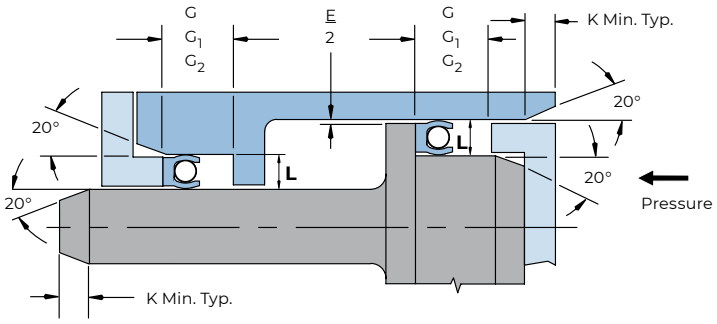
Benefits

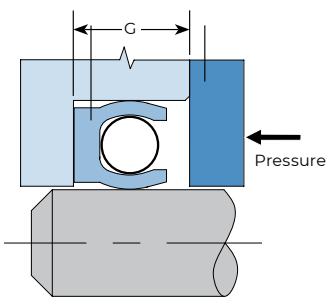
- Excellent for static, intermittent and slower dynamic applications
- Better sealing of light liquids and gases
- Excellent in static face sealing
- Excellent for applications that require extremely low leak rate
- Easily installed in closed grooves

Omniseal Solutions
SAINT-GOBAIN

Radial Seals – Omniseal® Series 103A Hardware

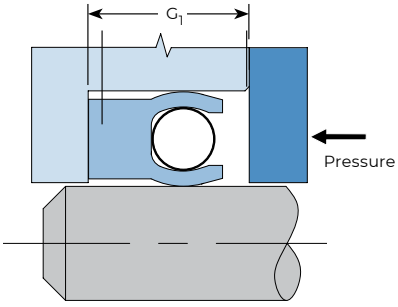
ROD SEAL GLAND





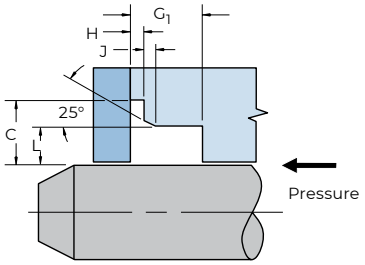
Gland Width for
Standard Omniseal® Seal

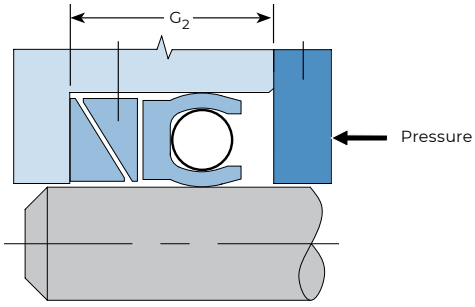
PISTON SEAL GLAND



Gland Width for
Extended Heel Omniseal® Seal

FLANGED SHAFT SEAL GLAND





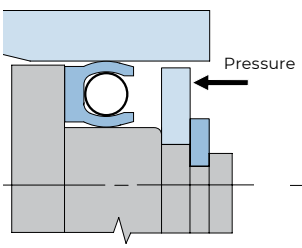
Gland Width for Standard
Omniseal® Seal Plus Back-up Ring

RADIAL SEAL GLAND DESIGNS

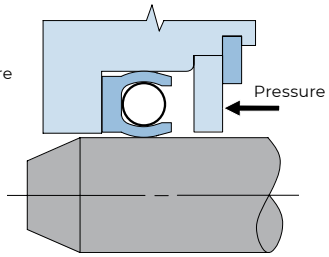
Cross-Section No.	Nominal Cross-Section	L Actual Cross-Section	G +0.30 -0.00	G_1 +0.30 -0.00	G_2 +0.30 -0.00	K Min.	C ±0.13	H ±0.05	J ±0.13	E Nominal[1]	R Max.	Shaft Tol.
1	1/16"	1,42 - 1,47	2,4	3,8	5,3	1,0	3,4	0,40	0,80	0,10	0,10	-0,05
2	3/32"	2,26 - 2,31	3,6	4,6	6,2	1,5	4,3	0,60	0,90	0,13	0,10	-0,05
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

[1]See extrusion gap recommendations on page 18

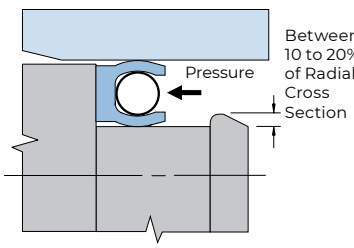
ALTERNATE GLAND DESIGNS



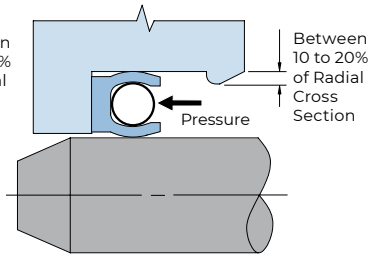
Piston Seal Snap Ring Gland



Rod Seal Snap Ring Gland



Piston Seal Reduced Gland



Rod Seal Reduced Gland

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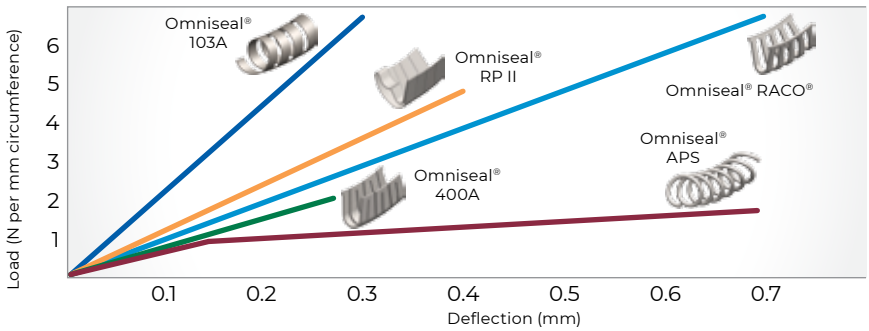
Omniseal® 400A

Omniseal Solutions
SAINT-GOBAIN

RADIAL SEAL

	Standard Lip	Skived I.D. Lip	Skived O.D. Lip
Standard Heel G Width			
Part No.	220	221	222
Extended Heel G_1 Width			
Part No.	223	224	225
Flanged Heel G_1 Width			Other shapes available on request
Part No.	226	227	

SPRING COMPARISON: LOAD VS. DEFLECTION



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 aviation, military and industrial gland sizes
- Available in larger cross sections up to 3/4"

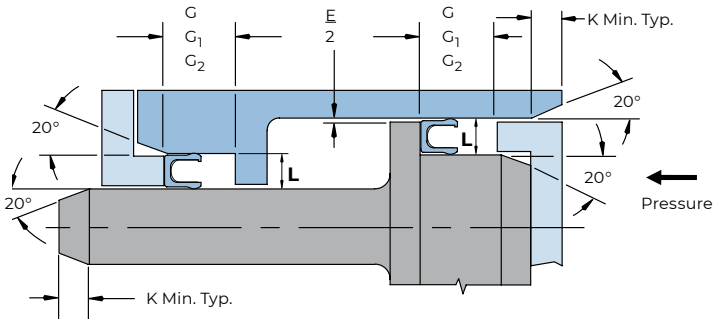
Benefits

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

Omniseal Solutions
SAINT-GOBAIN

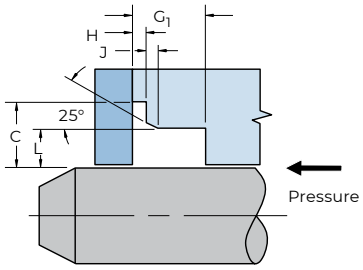
Radial Seals – Omniseal® Series 400A Hardware

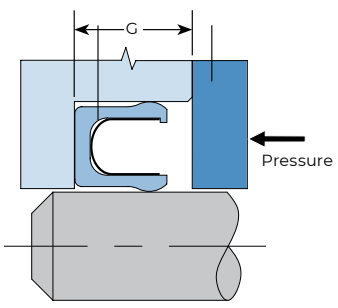
ROD SEAL GLAND



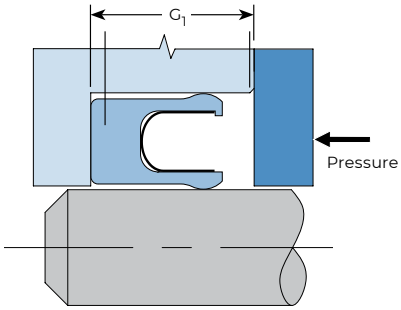
PISTON SEAL GLAND

FLANGED SHAFT SEAL GLAND

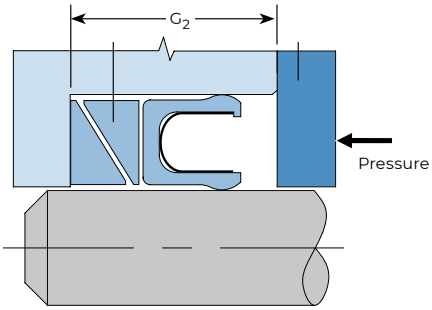




Gland Width for
Standard Omniseal® Seal



Gland Width for
Extended Heel Omniseal® Seal



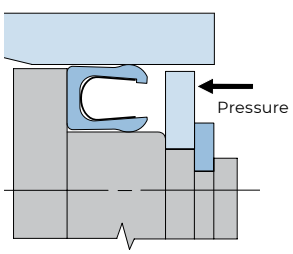
Gland Width for Standard
Omniseal® Seal Plus Back-up Ring

RADIAL SEAL GLAND DESIGNS

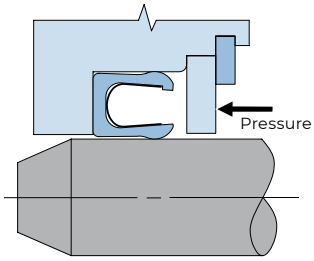
Cross-Section No.	Nominal Cross-Section	L Actual Cross-Section	G +0.30 -0.00	G_1 +0.30 -0.00	G_2 +0.30 -0.00	K Min.	C ±0.13	H ±0.05	J ±0.13	E Nominal[1]	R Max.	Shaft Tol.
1	1/16"	1,42 - 1,47	2,4	3,8	5,3	1,0	3,4	0,40	0,80	0,10	0,10	-0,05
2	3/32"	2,26 - 2,31	3,6	4,6	6,2	1,5	4,3	0,60	0,90	0,13	0,10	-0,05
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

[1]See extrusion gap recommendations on page 18

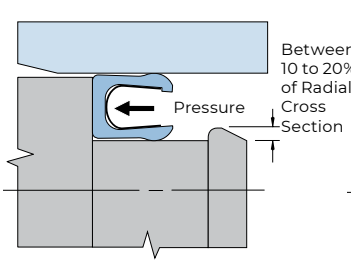
ALTERNATE GLAND DESIGNS



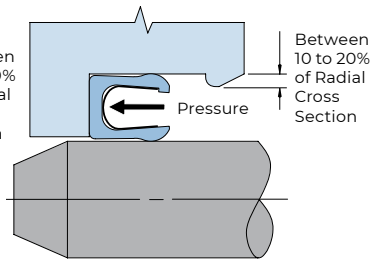
Piston Seal Snap Ring Gland



Rod Seal Snap Ring Gland



Piston Seal Reduced Gland



Rod Seal Reduced Gland

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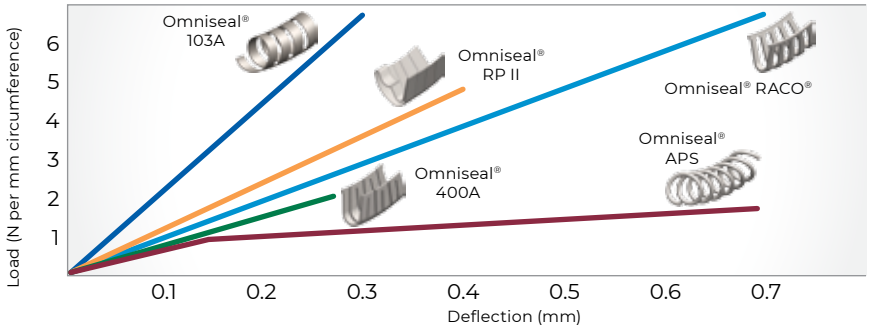
Omniseal® APS

Omniseal Solutions
SAINT-GOBAIN

RADIAL SEAL

	Standard Lip	Skived I.D. Lip	Skived O.D. Lip
Standard Heel G Width			
Part No.	730	731	732
Extended Heel G_1 Width			
Part No.	733	734	735
Flanged Heel G_1 Width			Other shapes available on request
Part No.	736	737	

SPRING COMPARISON: LOAD VS. DEFLECTION



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

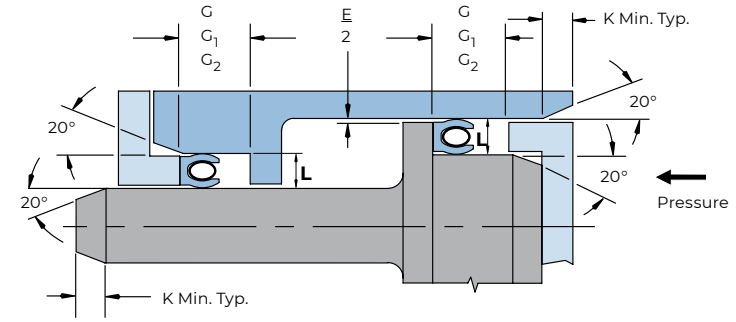
Benefits

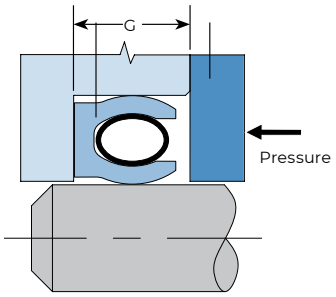
- Permits large wear allowance in the seal jacket
- Great in small diameter and smaller cross section sealing housing
- Can be installed in closed glands without damaging the seal
- Very good for applications that require low friction in dynamic conditions

Omniseal Solutions
SAINT-GOBAIN

Radial Seals – Omniseal® Series APS Hardware

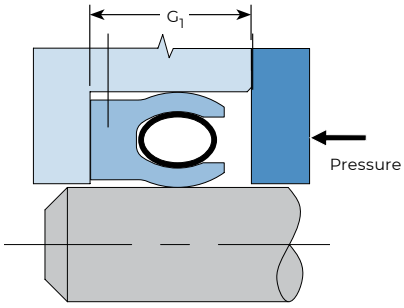
ROD SEAL GLAND





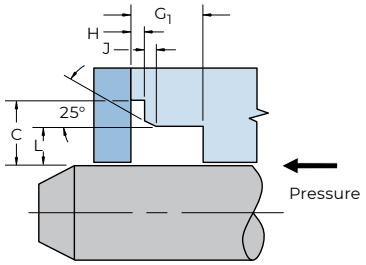
Gland Width for
Standard Omniseal® Seal

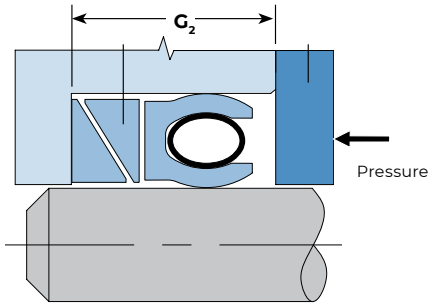
PISTON SEAL GLAND



Gland Width for
Extended Heel Omniseal® Seal

FLANGED SHAFT SEAL GLAND





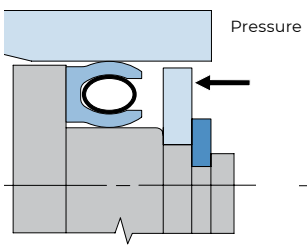
Gland Width for Standard
Omniseal® Seal Plus Back-up Ring

RADIAL SEAL GLAND DESIGNS

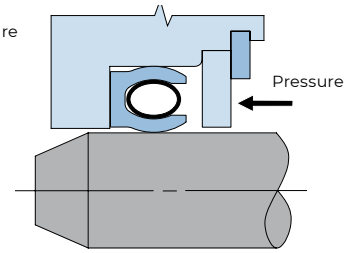
Cross-Section No.	Nominal Cross-Section	L Actual Cross-Section	G +0.30 -0.00	G_1 +0.30 -0.00	G_2 +0.30 -0.00	K Min.	C ±0.13	H ±0.05	J ±0.13	E Nominal[1]	R Max.	Shaft Tol.
1	1/16"	1,42 - 1,47	2,4	3,8	5,3	1,0	3,4	0,40	0,80	0,10	0,10	-0,05
2	3/32"	2,26 - 2,31	3,6	4,6	6,2	1,5	4,3	0,60	0,90	0,13	0,10	-0,05
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

[1]See extrusion gap recommendations on page 18

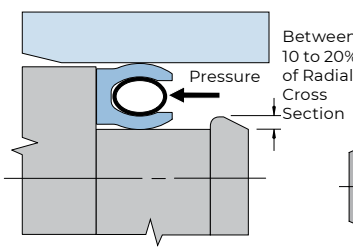
ALTERNATE GLAND DESIGNS



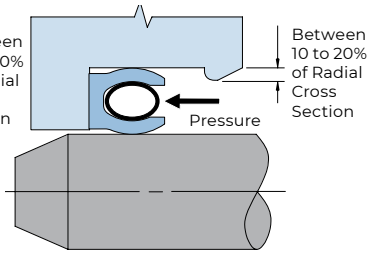
Piston Seal Snap Ring Gland



Rod Seal Snap Ring Gland



Piston Seal Reduced Gland



Rod Seal Reduced Gland

help@omniseal-solutions.com

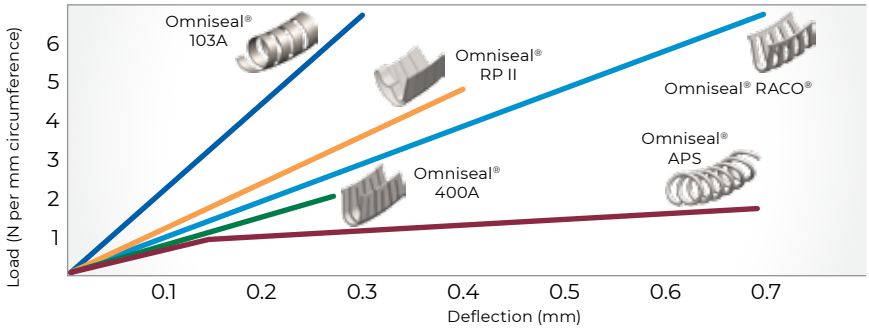
Omniseal® RP II

Omniseal Solutions
SAINT-GOBAIN

RADIAL SEAL

	Standard Lip
Standard Heel G Width	
Part No.	320
Extended Heel G_1 Width	
Part No.	323
Flanged Heel G_1 Width	
Part No.	326

SPRING COMPARISON: LOAD VS. DEFLECTION



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

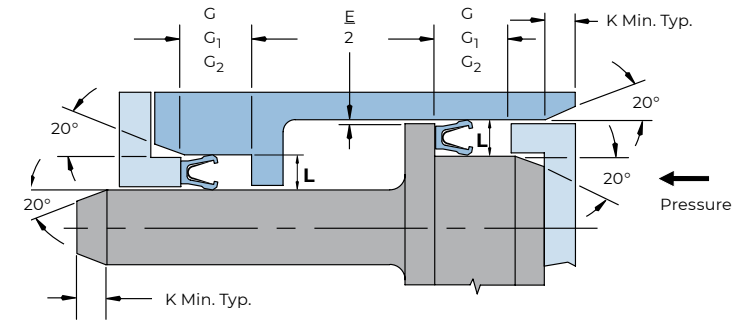
Benefits

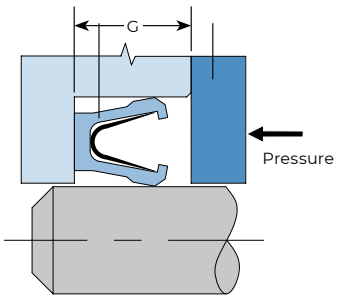
- Rugged, durable seal ideal for the most severe mechanical conditions where other seals fail

Omniseal Solutions
SAINT-GOBAIN

Radial Seals – Omniseal® Series RP II Hardware

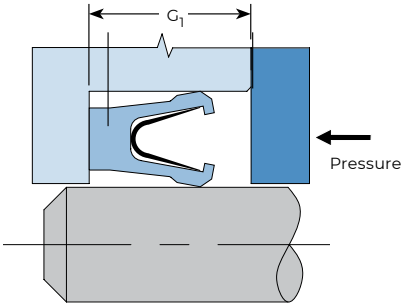
ROD SEAL GLAND





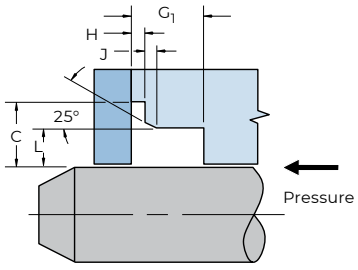
Gland Width for
Standard Omniseal® Seal

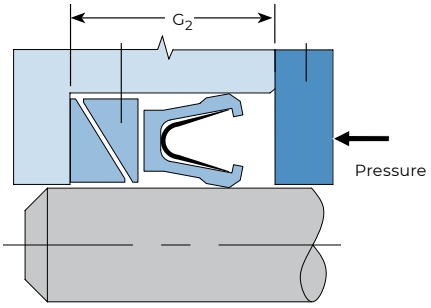
PISTON SEAL GLAND



Gland Width for
Extended Heel Omniseal® Seal

FLANGED SHAFT SEAL GLAND





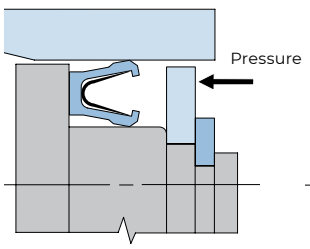
Gland Width for Standard
Omniseal® Seal Plus Back-up Ring

RADIAL SEAL GLAND DESIGNS

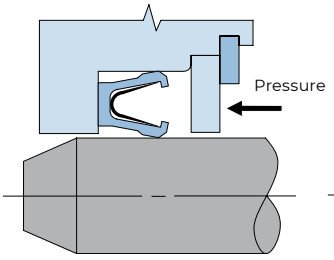
Cross-Section No.	Nominal Cross-Section	L Actual Cross-Section	G +0.30 -0.00	G_1 +0.30 -0.00	G_2 +0.30 -0.00	K Min.	C ±0.13	H ±0.05	J ±0.13	E Nominal[1]	R Max.	Shaft Tol.
3	1/8"	3,07 - 3,12	4,8	6,0	7,7	2,4	5,5	0,70	1,30	0,15	0,20	-0,05
4	3/16"	4,72 - 4,78	7,1	8,5	10,8	3,0	8,4	0,80	1,80	0,18	0,25	-0,06
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

[1]See extrusion gap recommendations on page 18

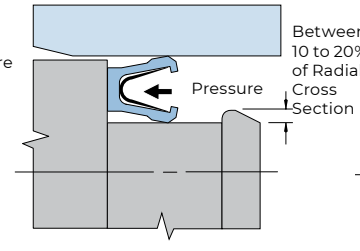
ALTERNATE GLAND DESIGNS



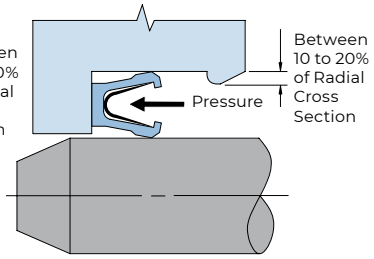
Piston Seal Snap Ring Gland



Rod Seal Snap Ring Gland



Piston Seal Reduced Gland



Rod Seal Reduced Gland

Omniseal® 103A, 400A, APS & RACO®

Omniseal Solutions
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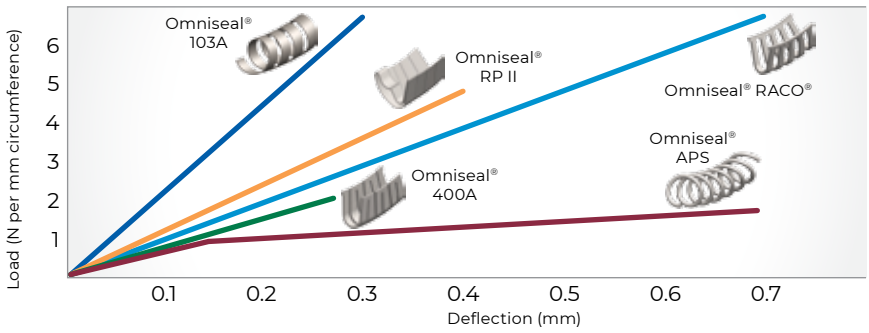
FACE SEAL

	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

SPRING COMPARISON: LOAD VS. DEFLECTION



Features

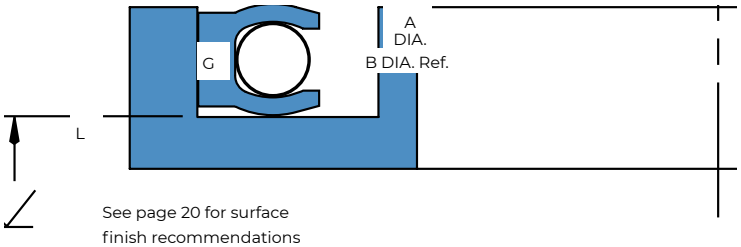
- Heavy duty, high load RACO® spring design
- Available in large cross sections and diameters

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

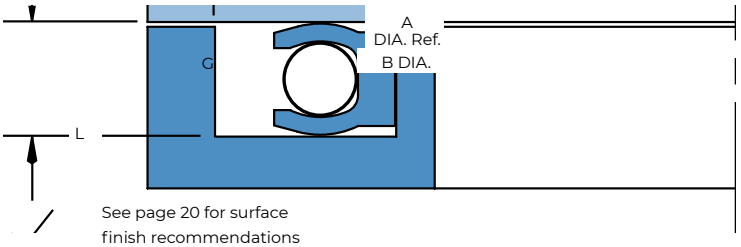
Face Seals – Omniseal® Series Hardware

INSIDE FACE SEALS



See page 20 for surface finish recommendations

OUTSIDE FACE SEALS



See page 20 for surface finish recommendations

FACE SEAL GLAND DESIGNS

Section No.	Nominal Cross-Section	L Cross-Section	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

[1]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. 0.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

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Omniseal® Seal Installation

Omniseal Solutions
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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. Omniseal Solutions 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.

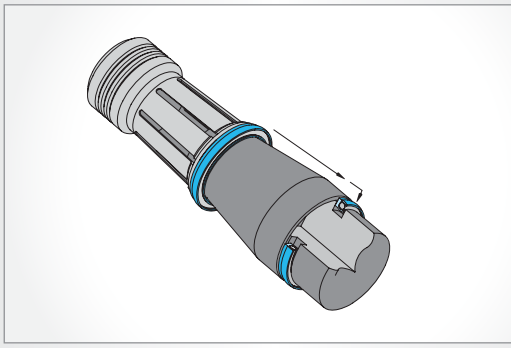
For installation in a bore housing, the Omniseal® seal must be compressed. This can be done by loading the seal inside the sleeve of the installation tool. Position the sleeve adjacent to the housing and transfer the seal onto the housing using a pusher. Use a resizing tool with a ramp to return the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

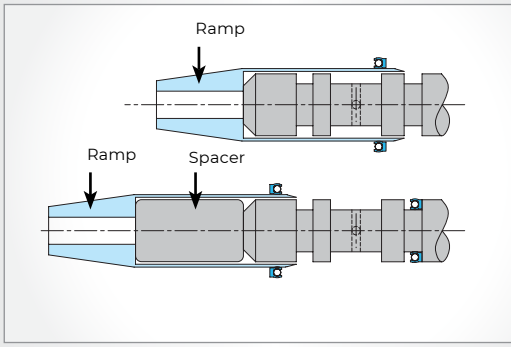
Note: To install two or more Omniseal® products into closed glands on a common shaft, install the farthest seal first. Use a simple spacer to adjust the ramp and position the next seal and gland for installation.

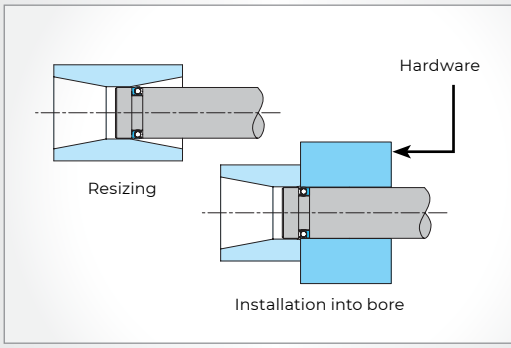
Larger diameter seals may not require a special installation tool if the seal can be pushed onto the housing with minimal force. When allowed, lubricants (grease, oil, etc.) compatible with the media to be sealed can ease assembly.

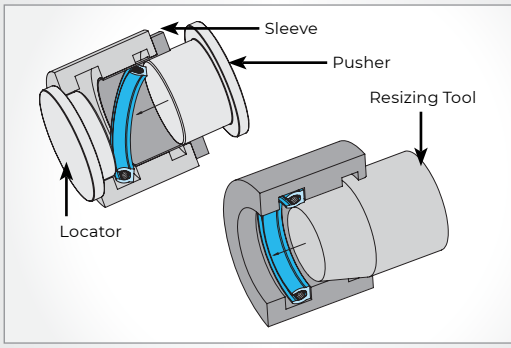
Omniseal® 400A, APS and 103A seals can be installed into closed glands if needed. Spring Ring II and RP II seals are not recommended for closed gland installation because of possible damage to the spring. Similarly, small diameter 400A type seals are not recommended for installation in closed grooves. 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 help@omniseal-solutions.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.









Installation of Omniseal® APS seal in closed rod gland (left); Completion of installation (right)

Omniseal Solutions
SAINT-GOBAIN

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 aviation hydraulic applications.

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Special Seal Designs

Omniseal Solutions
SAINT-GOBAIN

Formed Seals

Our formed seals are a unique specialty sealing product. Omniseal Solutions 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 aviation 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, Omniseal Solutions 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.

Omniseal Solutions
SAINT-GOBAIN

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[2]	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[1]	B	—
Adipic Acid	A	A	—	A[1]	—	—
Alcohols:						
Arnyl	A	B[2]	A	A	A	A
Benzyl	A	D	—	A	A	A
Butyl	A	A	—	A	A	A
Discertone	A	B[1]	—	A	A	A
Ethyl	A	B	A	A	A	A
Hexyl	A	A	—	A	A	A
Isobutyl	A[2]	A[2]	—	A	A	A
Isopropyl	A[2]	A[2]	A	B	A	A
Methyl	A	A[1]	B	A	A	A
Octyl	—	A	—	A	C	A
Propyl	A	A[2]	—	A	A	A
Aluminum Chloride	A	B[2]	C	B	A	B
Aluminum Chloride, 20%	A	B[2]	—	D	A	C
Aluminum Fluoride	A	A[2]	—	D	B	C
Aluminum Hydroxide	A	A[2]	—	A[1]	B	—
Aluminum Nitrate	A	A[2]	—	A	—	—
Alum. Potassium Sulfate	A	A[2]		D	C	—
Aluminum Sulfate	A	A[2]	B[1]	B	B	—
Alums	A	A	D	—	B	—
Amines	A[2]	C[1]	A[1]	A	B	A
Ammonia 10%	A	C[1]	—	A	A	A
Ammonia Nitrate	A	A	—	A	—	A
Ammonia, Anhydrous	A	B[2]	D	A	B	A
Ammonia, Liquid	A	C[1]	—	B[2]	B	B
Ammonium Acetate	A	A	—	B	—	—
Ammonium Bifluoride	A	A[2]	—	D	B	C
Ammonium Carbonate	A	B[2]	—	B	B	—
Ammonium Chloride	A	A[2]	A[1]	C	D	A
Ammonium Hydroxide	A	A[1]	C	A[1]	B	A

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

Key
A: No Effect/Excellent
B: Minor Effect
C: Moderate Effect/Fair
D: Severe Effect/Not Recommended
[1]Satisfactory up to 72°F (22°C)
[2]Satisfactory up to 120°F (48°C)

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Chemical Compatibility Guide

Omniseal Solutions
SAINT-GOBAIN

Chemicals	PTFE	UHMWPE	TPE	Type 304 SS	Hastelloy® C-276	Elgiloy®
Calcium Oxide	A	B[1]	A	A	A	A
Calcium Sulfate	A	B[1]	—	B	B	—
Carbon Bisulfide	—	—	C[1]	A	—	—
Carbon Dioxide	A	A[1]	A	A	A	A
Carbon Dioxide (Dry)	A	A[1]	A[1]	A	A	A
Carbon Dioxide (Wet)	A	A[1]	—	A	A	A
Carbon Disulfide	A	C[1]	—	A[1]	B	—
Carbon Monoxide	A	A[2]	A	A	B	A
Carbon Tetrachloride	A	D	D	B	A[1]	A
Carbonic Acid	A	B[2]	D	A[1]	A[2]	—
Catsup	—	—	—	A	—	A
Chlorinated Glue	—	—	—	—	—	—
Chlorine Water	A	B[1]	—	C[2]	A	A
Chlorine, Anhydrous Liquid	A	D	—	C[1]	D	—
Chlorine, Dry	A	D	D	A[1]	A[2]	A
Chlorobenzene (Mono)	B	C1	D	A	A	—
Chloroform	A[1]	C[1]	D	A	A[1]	A
Chlorosulfonic Acid	A	D	D	D	A[1]	—
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[2]	D	B
Chromic Acid 50%	A	D	D	C	B	C
Cider	—	B	B[1]	A	—	A
Citric Acid	A	D	A[1]	B[1]	A	A
Clorox (Bleach)	A	—	—	A	A	A
Coffee	—	—	—	A	A	A
Copper Chloride	A	—	A[1]	D	—	—
Copper Cyanide	A	B[2]	—	B	A[1]	—
Copper Fluoborate	—	—	—	D	B	—
Copper Nitrate	A	A[2]	—	A	B[2]	—
Copper Sulfate 5%	A	A[2]	A[1]	B	A	—
Copper Sulfate >5%	A	A[2]	A[1]	B	A	—
Cream	A	—	—	A	—	A
Cresola	—	C[1]	D	A[2]	B[2]	—
Cresylic Acid	A	B[1]	—	A[1]	B[1]	—
Cyclohexane	A	B[1]	A[1]	A[1]	B	—
Cyclohexanone	A	D	—	A[1]	A[1]	—
Detergents	A	D	—	A[2]	B	A
Diacetone Alcohol	A	A	—	B[1]	—	—
Dichloroethane	A[1]	C[1]	—	C[1]	A	—
Diesel Fuel	A	C[1]		A[1]	B	A
Diethyl Ether	A	—	C	B[1]	B[1]	A

Chemicals	PTFE	UHMWPE	TPE	Type 304 SS	Hastelloy® C-276	Elgiloy®
Disthylamine	D	D	—	A	A	A
Diethylene Glycol	A[2]	B[2]	—	A[1]	B[1]	A
Dimethyl Formamide	D	A	—	A	—	—
Diphenyl Oxide	A[1]	—	—	B[1]	B[1]	—
Epsom Salts	A	A[2]	—	A	B	A
Ethane	A	—	—	A	—	A
Ethanol	A	B	—	A	A	A
Ethanolamine	A[1]	—	—	A	B	—
Ether	A	D	—	A	B[1]	A
Ethyl Acetate	A	D	B	B	A	A
Ethyl Benzoate	A	C[2]	—	—	—	—
Ethyl Chloride	A	C[1]	C	A	B[1]	—
Ethylene Bromide	A	D	—	A	B	—
Ethylene Chloride	A	D	—	B	—	—
Ethylene Chlorohydrin	A	D	—	B	B	—
Ethylene Diamine	A	A[1]	—	B[1]	C	—
Ethylene Dichloride	A	D	C	B	B	—
Ethylene Glycol	A	D	A	B	B[1]	A
Ethylene Oxide	A	A	A	B	A	A
Patty Acids	A	D	—	B	A	A
Ferric Chloride	A	A[1]	C	D	B[2]	C
Ferric Nitrate	A	A[2]	—	B	B[1]	B
Ferric Sulfate	A	A[2]	—	B[1]	A[1]	B
Ferrous Chloride	A	A[2]	—	D	B[1]	C
Ferrous Sulfate	A	A[2]	—	B	B	B
Fluboric Acid	A	A[2]	—	B	A[1]	—
Fluorine	D	D	—	C	B[1]	C
Fluosilcic Acid	A	A[2]	—	C	B	—
Formaldehyde 40%	A	D	B	A[1]	B	A
Formaldehyde 100%	A	B	—	C	A	A
Formic Acid	A	D	B	B[1]	A	A
Freon 11	A	C	A	A	A	A
Freon 12	A	A[1]	A	B[1]	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[1]	A
Furan Resin	A	D	—	A[1]	B	—
Furfural	A	D	—	A	B	—
Galic Acid	B	A	—	A	B[1]	—
Gasoline	B	A	A	A	A	A

Key
A: No Effect/Excellent
B: Minor Effect
C: Moderate Effect/Fair
D: Severe Effect/Not Recommended
[1]Satisfactory up to 72°F (22°C)
[2]Satisfactory up to 120°F (48°C)

Omniseal Solutions
SAINT-GOBAIN

Chemical Compatibility Guide

Chemicals	PTFE	UHMWPE	TPE	Type 304 SS	Hastelloy® C-276	Elgiloy®
Gelatin	A	A[2]	—	A[2]	A	A
Glucose	A	A[2]	—	A[1]	A	A
Glue, PVA	A	A[2]	A	A[1]	A	A
Glycerin	A	A[1]	A	A[2]	A	A
Glycolic Acid	A	A[2]	—	A	A	A
Grape Juice	A	B	—	A	—	A
Grease	A	—	—	—	A	A
Heptane	A	B[1]	—	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[2]	—	D	A	C
Hydrobromic Acid 100%	A	B[1]	—	D	C	D
Hydrochloric Acid 20%	A	A[2]	B	D	A[1]	B
Hydrochloric Acid 37%	A	B[2]	C	D	B	C
Hydrochloric Acid 100%	A	—	—	D	A	B
Hydrocyanic Acid	A	A[2]	C	B[1]	A	—
Hydrocyanic Acid Gas 10%	A	—	—	—	—	—
Hydrofluoric Acid 20%	A	A[2]	—	D	B	C
Hydrofluoric Acid 50%	A	A[1]	D	D	B	C
Hydrofluoric Acid 75%	A	C[1]	D	D	B	C
Hydrofluoric Acid 100%	A	—	D	B[1]	B	C
Hydrofluosilicic Acid 20%	A	B[2]	—	C[2]	B	C
Hydrofluosilicic Acid 100%	A	B[1]	—	D	B	C
Hydrogen Gas	A	A[2]	A	A	A	A
Hydrogen Peroxide 10%	A	A	—	B[2]	A	D
Hydrogen Peroxide 30%	A	C[2]	—	B[2]	A	D
Hydrogen Peroxide 50%	A	C[2]	—	B[2]	A	D
Hydrogen Peroxide 100%	A	C[2]	—	B[2]	A	D
Hydrogen Sulfide (Aqua)	A	A	—	C	A	A
Hydrogen Sulfide (Dry)	A	A	A	C[1]	A	A
Hydroquinone	A	A	—	B	B	—
Hydroxyacetic Acid 70%	A	A	—	—	—	—

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[2]Satisfactory up to 120°F (48°C)

Chemicals	PTFE	UHMWPE	TPE	Type 304 SS	Hastelloy® C-276	Elgiloy®
Iodine	A	A[1]	B	D	A	D
Isopropyl Acetate	A	B[2]	C	C	B	—
Isopropyl Ether	A[1]	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[1]	C	A	B	A
Ketones	A	C[1]	—	A	A	A
Lacquer Thinners	A	A[2]	D	A[1]	A	A
Lacquers	A	A[2]	—	A[1]	A	A
Lactic Acid	A	A[1]	D	B[1]	B[1]	—
Lard	A	A	—	A	A	A
Latex	A	—	—	A[2]	A	A
Lead Acetate	A	A[2]	—	B[1]	B[1]	—
Lead Sulfamate	B	A1	—	C	—	—
Ligroin	A	A	—	—	—	—
Lime	A[1]	A	—	A	—	A
Lubricants	A	D	A	A[2]	A	A
Magnesium Carbonate	A[1]	B	—	B[1]	B[1]	—
Magnesium Chloride	A	A[1]	C	D	A[2]	—
Magnesium Hydroxide	A	A[2]	C	B[1]	A	A
Magnesium Nitrate	A	A[2]	—	B[1]	A	A
Magnesium Sulfate	A	A[2]	—	A	B	—
Maleic Acid	A	B[2]	—	A	B	—
Malic Acid	A	B[2]	—	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[2]	A
Methane	A	—	—	A	A	A
Methanol	A	A[1]	B	A	A	A
Methyl Acetate	A	B[1]	—	A	A	A
Methyl Acrylate	—	—	—	A	—	—
Methyl Alcohol 10%	A	A[1]	B	A	A	A
Methyl Bromide	A	C[1]	—	B[1]	—	—
Methyl Cellosoive	A	—	—	A	—	—
Methyl Chloride	A	C[1]	—	—	B	B
Methyl Dichloride	—	—	—	B[1]	—	—
Methyl Ethyl Ketone (MEK)	A	B[2]	B	A	A	A
Methyl Isobutyl Ketone	A	C	B	A	A	A
Methyl Isopropyl Ketone	A	D	—	B[1]	—	A
Methylamine	A	A[1]	—	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

Omniseal Solutions
SAINT-GOBAIN

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	A[1]	B	A	B	A
Nephthanlene	A	C	B	A	A	A
Nickel Chloride	A	A	—	D	B	C
Nickel Sulfate	A[2]	A	—	B[1]	B	—
Nitric Acid (5-10%)	A	B	C	A	A[1]	A
Nitric Acid (20%)	A	C	D	A	A[1]	A
Nitric Acid (50%)	A	B[1]	D	A[2]	A[1]	A
Nitric Acid (Concentrated)	A	C[1]	D	A[1]	B[1]	A
Nitrobenzene	A	C[1]	D	B	D	—
Nitrous Acid	A	—	—	B	D	—
Nitrous Oxide	A	C	—	B	B	—
Oils:						
Aniline	A	—	D	A	B	A
Castor	A	—	B[1]	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	A[1]	A	A	A
Creosote	A	C	D	B	B	A
Diesel Fuel	A	A	A[1]	A	B	A
Fuel	A	B	A	A	A[1]	A
Ginger	A	—	—	D	—	A
Lemon	A	—	—	A	—	A
Linseed	A	A	B[1]	A	B	A
Mineral	A	B[1]	A	A	A	A
Olive	A[1]	A[1]	—	A	A	A
Orange	—	C[1]	—	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	B[2]	—	A[1]	A	A
Sesame Seed	A	—	—	A	—	A
Silicone	A	A	A	A	A	A
Soybean	A	A[1]	B	A	A	A
Tanning	—	—	—	A	—	A
Transformer	A	C[1]	—	A	—	A
Turbine	A	C	—	A	—	A

Chemicals	PTFE	UHMWPE	TPE	Type 304 SS	Hastelloy® C-276	Elgiloy®
Oleic Acid	A	C[2]	A	A	A[2]	A
Oleum 25%	A	D	C	B[2]	A	—
Oleum 100%	A	D	—	A	D	—
Oxalic Acid (Cold)	A[1]	A[2]	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	—
Petroletum	C	B	—	A	A	—
Phenol (10%)	A	B	—	B	B	—
Phosphoric Acid (<40%)	A	A	—	D	A[2]	C
Phosphoric Acid (>40%)	A	B[1]	—	D	A[2]	C
Phosphoric Acid (Crude)	A	B[1]	—	D	A[2]	—
Photographic Developer	A	A	—	A	B	—
Phthalic Anhydride	A	—	—	A	A	—
Picric Acid	A	A	—	B	B	—
Potash	—	A[1]	D	B	B	A
Potassium Bicarbonate	A	A	—	B	B	—
Potassium Bromide	A	A	—	B	B	—
Potassium Chlorate	A	A[1]	—	B[1]	B	—
Potassium Chloride	A	A[1]	B	B[1]	A	B
Potassium Chromate	A[1]	A	—	B[1]	A	—
Potassium Cyanide Sols.	A	A	B	B[1]	B	—
Potassium Dichromate	A	A	C	B	B	B
Potassium Ferrocyanide	A	A[1]	—	B	B	—
Potassium Hydroxide	A	A	D	B	B[1]	B
Potassium Nitrate	A	B	B	B	B[1]	—
Potassium Permanganate	A	A	D	B[1]	A[1]	—
Potassium Sulfate	A	A[2]	B	B[1]	B[1]	—
Potassium Sulfide	A	A[2]	—	B	—	—
Propane (liquefied)	A	C[1]	A	A	A	A
Propylene Glycor	A	B[2]	—	B	B	B
Pyridine	A	C	—	B	B	—
Pyrogallic Acid	A	B[1]	C	A	B	—
Rosins	A	B[1]	—	A[1]	—	A
Rum	—	—	—	A	—	A
Rust Inhibitors	—	—	—	A[2]	A[1]	—
Salad Dressings	—	—	—	A	—	A
Sea Water	A	A[2]	A	C	A	A
Shellac (bleached)	A	A[1]	—	A	—	A

Key
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[1]Satisfactory up to 72°F (22°C)
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Omniseal Solutions
SAINT-GOBAIN

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[2]	—	A	B[1]	—
Sodium Bisulfate	A	A[2]	C	D	B[2]	—
Sodium Bisulfide	A	A[2]	B	B[1]	B	—
Sodium Borate	A	A[2]	B	B[2]	A	—
Sodium Carbonate	A	B[2]	—	A	A	—
Sodium Chlorate	A	B[2]	—	A	B[1]	—
Sodium Chloride	A	A[2]	A	B	A	A
Sodium Chromate	A	—	—	B[1]	A	—
Sodium Cyanide	A	A[2]	B	A[1]	A	A
Sodium Fluoride	A[1]	A[2]	—	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[1]	D	—	C	A[1]	B
Sodium Hypochlorite (100%)	A	B[2]	D	D	B	C
Sodium Hypochlorite (<20%)	A	A	A	C	A	B
Sodium Hyposulfate	A	—	—	A	—	—
Sodium Metaphosphate	A	A[1]	—	A	—	—
Sodium Metasilicate	A	—	—	A	A	—
Sodium Nitrate	A	A[2]	—	B[1]	B	—
Sodium Perborate	A	A[1]	—	B	B	B
Sodium Peroxide	A	A	—	A	B	A
Sodium Polyphosphate	A	A	—	B	A	—
Sodium Silicate	A	A[2]	—	A	B	—
Sodium Sulfate	A	A[2]	—	B	B	—
Sodium Sulfite	A	B[1]	—	B	B[1]	—
Sodium Tetraborate	A	A[2]	—	B	B	—
Sodium Thiosulfate (hypo)	A	A[1]	—	A[2]	—	—
Stannic Chloride	A	A[2]	—	D	B	C
Stannous Chloride	A	B[2]	C	C[2]	B	B
Starch	A	B	—	A	—	A
Stearic Acid	A	B[1]	C	B	B	—
Stoddard Solvent	A	C[1]	—	A	A	—
Styrene	A	—	D	A	D	—
Sugar (liquids)	A	—	—	A	A	A
Sulfate (liquors)	A	A[2]	—	B	B	B

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

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help@omniseal-solutions.com

Application Data Form

Omniseal Solutions
SAINT-GOBAIN

Name _____

Title _____

Company _____

Address _____

_____

City _____

State _____

Zip _____

Phone number _____

Fax _____

Email address _____

Date _____

Device/Application _____

Fluid/Gas to be Sealed _____

Temperature (Max./Op./Min.) _____

Pressure (Max./Op./Min.) _____

Seal Application:
[ ] Static [ ] Rotary/Oscillatory [ ] Linear/Reciprocating Motion

Rotary/Oscillatory–RPM _____

Life Requirement _____

Allowable Leakage _____

Linear/Reciprocating–Stroke Length _____

Strokes per Min _____

Seal is: [ ] Radial/Rod [ ] Radial/Piston
[ ] Face/Internal Press. [ ] Face/External Press.

A Diameter _____Tolerance _____

B Diameter _____Tolerance _____

Can gland be changed?: [ ] Yes [ ] No

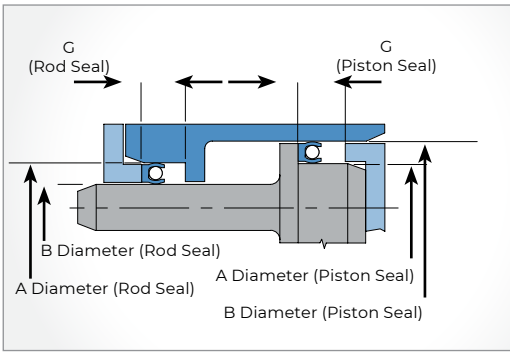
G Dimension _Tolerance _____

Hardware:
Dynamic Surface Static Surface

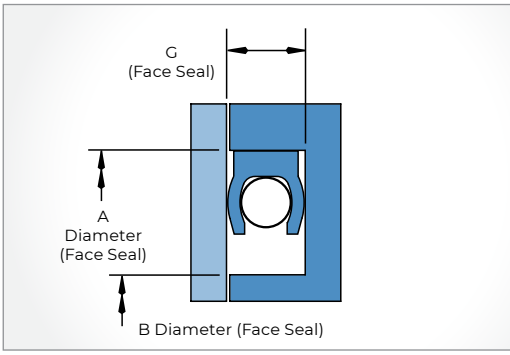
Material _____HRC _____HRC

Hardness _____Ra _____Ra

RADIAL SEAL GROOVES
(ROD/PISTON)



FACE SEAL GROOVE



Please email a copy of the completed Application Data Form to:

Omniseal Solutions

Email:
help@omniseal-solutions.com

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.

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Terms and Conditions

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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).

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Notes

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Notes

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Notes

A Global Network of Expertise and Service

Manufacturing and sales locations Sales only locations R&D Centers

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Limited Warranty: For a period of 6 months from the date of first sale, Saint-Gobain Performance Plastics Corporation warrants this product(s) to be free from defects in manufacturing. Our only obligation will be to provide replacement product for any portion proving defective, or at our option, to refund the purchase price thereof. User assumes all other risks, if any, including the risk of injury, loss or damage, whether direct or consequential, arising out of the use, misuse, or inability to use this product(s). SAINT-GOBAIN PERFORMANCE PLASTICS DISCLAIMS ANY AND ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

NOTE: Saint-Gobain Performance Plastics Corporation does not assume any responsibility or liability for any advice furnished by it, or for the performance or results of any installation or use of the product(s) or of any final product into which the product(s) may be incorporated by the purchaser and/or user. The purchaser and/or user should perform its own tests to determine the suitability and fitness of the product(s) for the particular purpose desired in any given situation.

BST-4193-OMNISEAL-SES-EU-1225