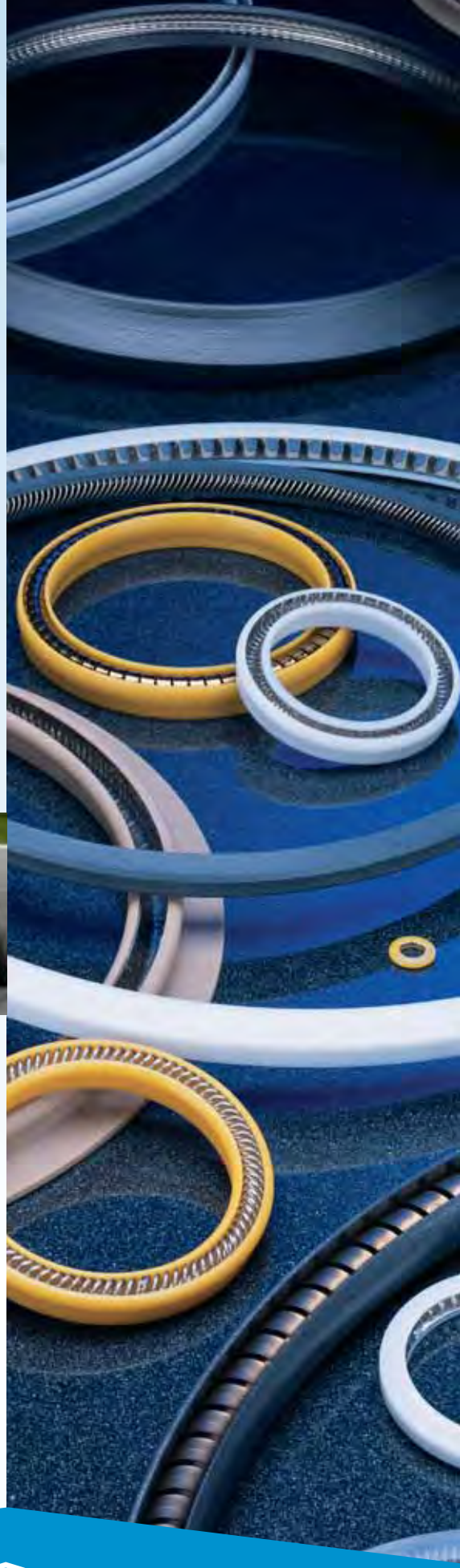
OmniSeal®

Handbook

Reliability That Withstands the Test of Time



SAINT-GOBAIN
PERFORMANCE PLASTICS

OmniSeal®

OmniSeal® has been one of the most recognized names in sealing for over 50 years. OmniSeal® has been used in a multitude of applications where durability, resistance to chemicals and functionality at extreme temperatures is crucial. OmniSeal® high-performance spring-actuated seals operate in harsh environments, reduce friction and downtime and extend equipment service life. Our seal designs are widely recognized and often copied throughout the industry.

OmniSeal® products are now manufactured by Saint-Gobain Performance Plastics, a business unit of Compagnie de Saint-Gobain. Saint-Gobain Performance Plastics acquired Furon® (formerly Fluorocarbon), the company that previously produced OmniSeal® several years ago.

Compagnie de Saint-Gobain has a rich tradition of excellence that dates back over 300 years. Today it is one of the world's top 100 industrial corporations and a leader in the development and production of engineered materials. Established in France in 1665 as a glass maker, Saint-Gobain continues through arduous research to develop new and innovative materials.

Compagnie de Saint-Gobain is a global leader in each of its businesses – flat glass, packaging, insulation, building materials, abrasives, reinforcements, and ceramics and plastics – including high-performance seals.

800.544.0080

A Worldwide Leader in High-Performance Seal Technology

▲ Sales and Marketing Offices

● Manufacturing and R&D Facilities

Garden Grove, CA USA

Vinhedo, Sao Paulo, Brazil

Northboro R&D Center, USA

Kontich, Belgium

Minhang, Shangai, China

Suwa, Japan

High-Performance Seals

Backed by a proud heritage of product innovation, technological expertise and market leadership, Saint-Gobain Performance Plastics is dedicated to working with our customers to solve today's tough seal application issues and the challenges that lie ahead. OmniSeals® are manufactured throughout the world, with sites located in the Americas, Europe and Asia.

The innovative seals were originally designed and developed in Southern California. Our spacious headquarters located in Garden Grove, California has both class 100 and class 10,000 clean rooms. This facility also maintains an experienced design engineering staff, a comprehensive testing laboratory, a PTFE custom polymer formulation and blending area, compression, injection and isostatic molding capabilities, and state-of-the-art manufacturing equipment.

From powder to product we have complete control over the process. Fifty years of experience in manufacturing plus our spirit of continuous improvement utilizing 5S, Kaizen and Six Sigma results in superior process control, high product quality and consistent performance. As a result of our dedication to excellence, our worldwide facilities are ISO 9001 Certified and our Garden Grove, California facility is AS9100 certified.

ISO 9001 Certified
Worldwide Facilities

AS9100 Certified
Garden Grove, California Facility

OmniSeal® in the Marketplace

Saint-Gobain Performance Plastics' proprietary blends of engineered polymers can be coupled with many spring geometries to offer a superior seal that operates in a variety of different applications in a range of markets, including:

- Aerospace and defense
- Transportation (heavy trucks, automotive, marine, rail)
- Construction equipment
- High-performance racing
- Medical instrumentation
- Liquid chromatography
- Semiconductor manufacturing equipment
- Petroleum and chemical process equipment
- Pumps, valves, compressors and mechanical seals

The acceptance of OmniSeal® across this wide range of market applications confirms their versatility and outstanding performance. Design engineers throughout the world benefit from the opportunity to specify both superior design and a multiplicity of materials with every OmniSeal® product.















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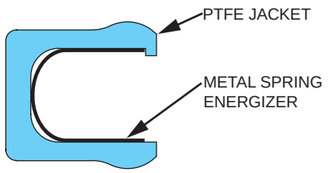
How OmniSeal® Works

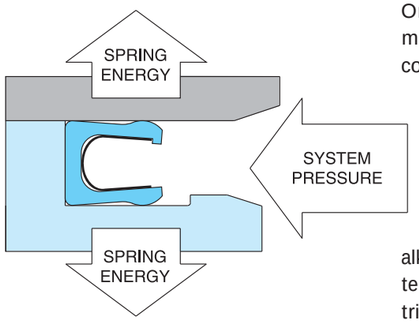
OmniSeal® Components



The OmniSeal® 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® 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® 400A in working conditions

OmniSeal® jackets are precision machined from PTFE, filled PTFE composites and other high performance polymers. OmniSeals® with PTFE jackets function at temperatures ranging from cryogenic to 600°F (316°C) and are inert to virtually all chemicals except molten alkali metals, fluorine gas at high temperature and chlorine trifluoride (ClF_3).

OmniSeals are available with a variety of spring energizers, each with characteristics that meet specific requirements. Spring loading can be tailored to meet critical low friction requirements in dynamic applications, or the 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®. OmniSeals with metal springs have unlimited shelf life and are not subject to age controls normally imposed on elastomeric seals.

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

Quality Assurance

The Saint-Gobain Seals quality system is AS9100 and Aerospace Standard accredited at our North American OmniSeal® manufacturing facilities. AS9100 exceeds all requirements included in the ISO-9001 standard. We chose AS9100 over other quality systems due to the more exacting requirements in the aerospace industry. We apply these quality system requirements to all OmniSeal® products, whether or not they are used in aerospace applications, resulting in the highest level of product reliability in the seals industry. Our Garden Grove, California, facility is fully staffed and equipped to perform all our design inspection, testing and engineering requirements.

Our Quality Team will represent the customers' interest in all areas of contract administration, documentation control and manufacturing functions.

AS9100 Certified

Seal Function and Motion

Selecting an OmniSeal® Design

Saint-Gobain Performance Plastics manufactures and markets a variety of basic styles of spring-actuated seals. Several of these designs can be used interchangeably in the same gland.

The recommendations that follow are intended as a general guide and should be used together with the tables and dimensional charts that appear on the following pages. Should you require additional assistance, please contact Technical Support at the factory; for complete contact information, see the inside back cover.

Static Seals and Dynamic Seals

The two basic types of sealing applications are **static seals** and **dynamic seals.** In static sealing there is essentially no relative motion between the seal and the hardware members. An example would be a seal clamped between bolted flanges.

In dynamic sealing there is relative motion between the two sealing surfaces. A typical example would be the rod and piston seals in a hydraulic cylinder.

There are two directions of motion in dynamic sealing: reciprocating or linear motion, and rotary (including oscillating) motion.

Occasionally there may be a combination of both static and dynamic applications. An additional factor to be considered is the orientation of the seal in the hardware. Seals that are compressed in a radial direction are called radial seals, again using rod and piston seals as examples.

Seals that are compressed in a direction parallel to the axis are called face seals, the flange gasket is a typical example. Face seals are usually, but not always, static.

Examples of these basic seal types are shown below. Typical installations are also shown on page 40.

Face Seals in Static Service

OmniSeal® 103A (page 16) is generally the first choice for most static face seal applications. This series utilizes a moderate to high spring load, and is capable of sealing effectively over a wide temperature and pressure range.

Because of its very high spring loading, the OmniSeal® RACO® 1100A (page 20) is particularly recommended for extreme sealing conditions, cryogenic temperatures, ultra-high vacuum and positive sealing of helium and other light gases.

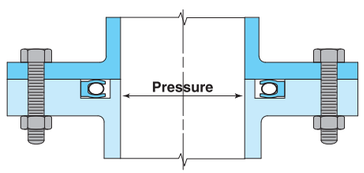
The OmniSeal® 400A (page 15) may also be used as a static face seal when light spring loading is essential. However, its sealing ability may not be as effective under extreme conditions as that of the 103A or the RACO® 1100A due to the 400A's relatively light spring load.

Face Seals in Dynamic Service

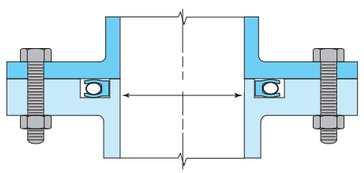
The OmniSeal® 400A (page 15) is recommended for rotary face seal applications at slow to moderate rotary speeds. Low spring loading keeps friction to a minimum. For ultra-low friction or high surface speed applications, contact the factory.

The OmniSeal® APS (page 18) is an ideal choice for use in dynamic reciprocating and rotary applications. Due to the flat load curve of the Advanced Pitch Spring (APS), it also provides excellent service in friction-sensitive applications.

In oscillatory or slow, intermittent rotary applications where high rotational torques are present, the OmniSeal® RACO® 1100A (page 20) is recommended. Such applications include swivels and loading arm pivot joints. Because of its exceptionally high spring load, the OmniSeal® RACO® 1100A is also an excellent choice when maximum sealability is mandatory: in applications involving liquids and gases with a low specific gravity and when sealing at cryogenic temperatures is required.



Inside face seal



Outside face seal

Radial Seals in Static Service

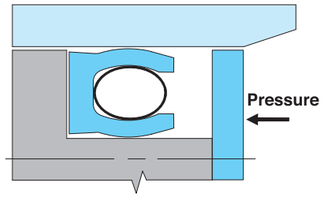
While most of the OmniSeal® designs can be used as static radial seals, the OmniSeal® 103A (page 16) is generally recommended for this service. Its moderate to high spring load provides positive sealing under most static sealing conditions.

Radial Seals in Reciprocating Motion

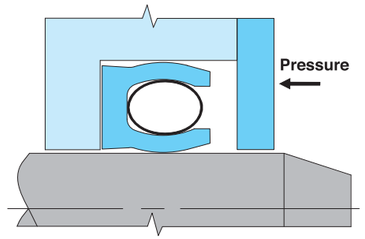
Reciprocating radial seals are the most common OmniSeal® applications. For rod and piston sealing and similar applications, the OmniSeal® 400A (page 15) is recommended for general purpose sealing at low to moderate pressures. This series has a low load, high deflection spring that provides low friction sealing and long wear life, and compensates for minor hardware eccentricity or misalignment.

The OmniSeal® APS (page 18) uses a round wire spring energizer, which has the advantage of producing an almost constant spring load over a wide deflection range. This type of seal accommodates variation in hardware dimensions (tolerances) and/or provides effective sealing loads over a large seal wear allowance. Also, it can be wound in very small coil diameters, which makes it particularly suitable for miniature seals and seals requiring low friction values.

For more severe dynamic conditions, the OmniSeal® 103A (page 16) is recommended. The higher spring load provides positive sealing with some increase in seal friction. Particularly suitable for medium to high pressure service, the 103A is also an excellent rod seal for positive sealing.



Piston seal



Rod seal

The OmniSeal® RP II (page 19) is a very rugged design for severe operating conditions. This seal utilizes a unique wrapped and formed stainless steel ribbon spring that is highly resilient with wide deflection capabilities. Its durable spring and rugged jacket design makes the OmniSeal® RP II an excellent choice for heavy-duty sealing applications and long wear life.

The Spring Ring II (page 17) is an economical alternative to the OmniSeal® 400A for high production applications requiring low cost, small size seals. It is manufactured by automated methods and is offered in a limited number of sizes: .125 I.D. to .875 I.D. Design and sealing characteristics are similar to those of the OmniSeal® 400A.

Radial Seals in Rotary Motion

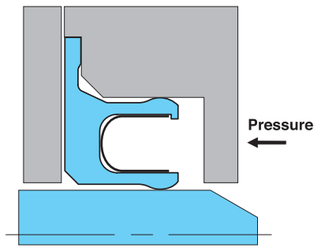
All of the OmniSeal® designs can be used in slow to moderate speed rotary or oscillatory applications at low pressure.

In rotary shaft applications the flanged design is recommended. The flange is clamped in the hardware to prevent the seal from rotating with the shaft. Rotation can occur with the standard designs due to thermal and other effects.

The flanged OmniSeal® APS (page 18), 400A (page 15) and Spring Ring II (page 17) are recommended for most rotary/oscillatory applications. The light spring load minimizes friction at pressures under 20 PSI, with surface speeds in the range of 200-300 ft./min. At higher pressures, reduced surface speeds are required to prolong seal wear life. The resilient U-shaped spring allows for minor shaft runout or misalignment.

For very slow speeds – under 50 ft./min. – and intermittent rotary/oscillatory motion at higher pressures, the flanged OmniSeal® 103A (page 16) and OmniSeal® RP II (page 19) are recommended. The OmniSeal® RP II has a very resilient spring that can tolerate above normal shaft run-out and misalignment.

For applications requiring ultra-low friction, high pressures or high surface speeds, we suggest that you contact Technical Support (see inside back cover).



Flanged 400A, typical flanged jacket

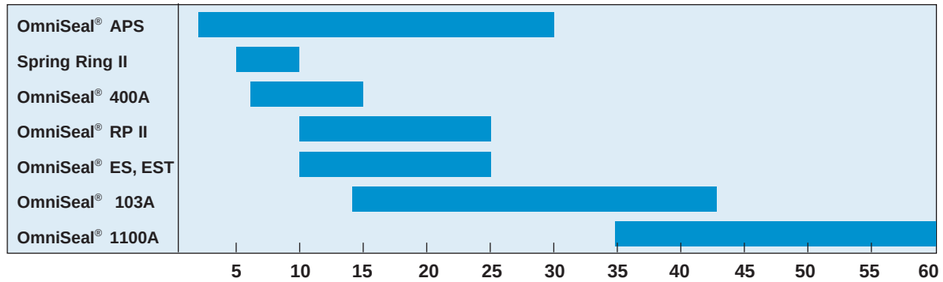
Friction

Friction, a measurement of the resistance to sliding between a seal and hardware surfaces, is directly related to seal material coefficient of friction and the normal load. Some other factors affecting friction are lubrication, temperature and hardware surface finishes. An approximate friction value for non-lubricated conditions can be calculated using the charts and formulas on this page. Lubrication provided by the media may produce lower friction results.

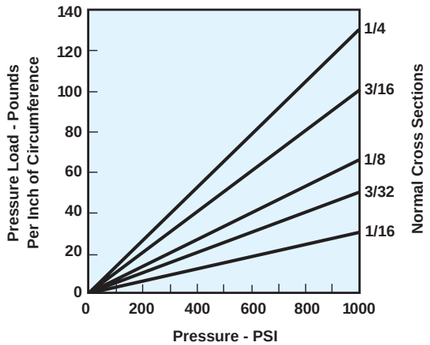
It is difficult to predict how the running and break-out friction values will differ without testing under actual existing conditions. SGPPL manufactures a variety of springs with lower or higher loads than shown on this page. Also, special springs can be developed when required.

For assistance with applications where friction is critical, contact Technical Support (see inside back cover).

Typical Spring Load Ranges – Pounds Per Inch of Seal Circumference

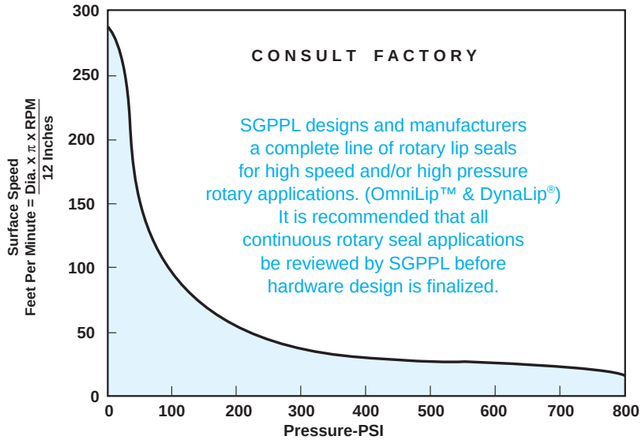


Note: The values above are for standard spring materials and thicknesses. Other materials and spring thicknesses may be substituted; consult Technical Support for availability.



F = Total unit load—Pounds per inch of circumference (pressure load + spring load)
D = Diameter of dynamic surface
R = D/2 (Radius)
μ = Material coefficient of friction (See Page 9)
Linear Friction (Pounds) = F x D x π x μ
Frictional Torque (Inch - Pounds) = F x D x π x μ x R

The approximate total load of an OmniSeal® can be calculated by adding the pressure load found in the chart above to the average spring load shown in the top chart.



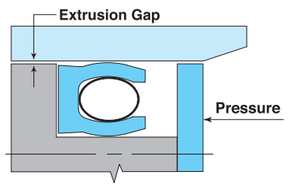
Rotary Motion

Use the chart above to qualify OmniSeals® for continuous rotary applications.

Temperature, Pressure and Extrusion Gap

When sealing high pressures and/or high temperatures, the size of the extrusion gap behind the seal becomes critical. ***This extrusion gap is the clearance between the hardware members. Hardware designs without bearing or centering devices must consider the diametral 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 (right). Increasing the heel thickness of the seal improves resistance to extrusion. Also, the extrusion gap can be bridged by the use of a separate back-up ring arrangement.



Generally, the back-up ring should be of a harder material than the seal material. A high filled PTFE compound, or a high modulus plastic such as A22, is recommended. See materials shown on page 9. Additional back-up ring details are shown on page 21.

Cryogenic Sealing

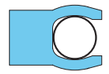
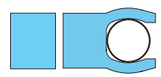
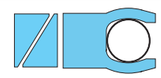
Cold temperatures below -40˚F (-40˚C) will cause PTFE and other polymer sealing materials to shrink and harden. These additional forces may compromise the spring load and frictional characteristics of the OmniSeal®.

Although face seals are less affected than radial seals, we recommend consulting our Technical Support team before selecting an OmniSeal® for any cryogenic application.

Seal Design vs. Temperature

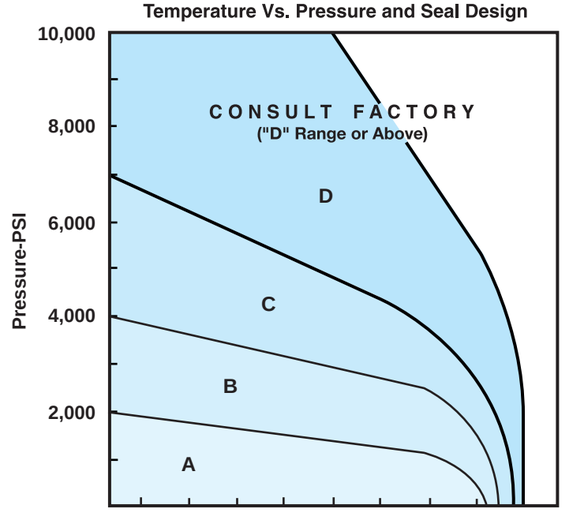
In general, seal jacket materials become somewhat harder at cold temperatures and tend to soften to some extent at high temperatures (see material list on page 9 for temperature ranges). The spring energizer compensates for these conditions. If your seal design selection does not agree with the graph (right), contact Technical Support (see inside back cover).

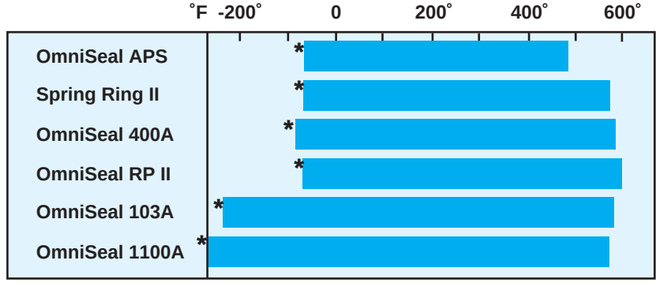
Maximum Recommended Extrusion Gap

(OmniSeal 103A Shown for Illustration Only)		A	B	C	D
 G Width	Unfilled	.004	.003	.002	—
	Filled	.006	.004	.003	—
 G_1 Width	Unfilled	.006	.004	.003	—
	Filled	.008	.006	.004	.003
 G_2 Width	Filled—Back-Up	.008	.006	.004	.003
	A22—Back-Up	.010	.008	.006	.004
 G_2 Width	Filled—Back-Up	.010	.008	.006	.004
	A22—Back-Up	.014	.010	.008	.006

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

Temperature Vs. Pressure and Seal Design





**For temperatures below 0° consult Technical Support.*

Seal Jacket Materials

SGPPL Seal Jacket Materials

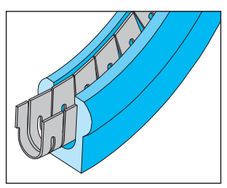
SGPPL seal jacket materials are compounded and processed for optimum performance in a wide variety of sealing environments. The materials listed below are our most commonly recommended compounds, and are suitable for most applications. Over the years SGPPL has developed more than 500 materials for seal use. These additional compounds are available should they be required in special applications. SGPPL is continually formulating and developing new materials. For more information, contact Technical Support (see inside back cover).

Fluoroloy Code No.	Color	Application All Formulated Materials are Proprietary to Saint-Gobain Performance Plastics	Temp. Range ˚F	Temp. Range ˚C	Coefficient of Friction - Normal	Wear K Factor 15000 = Poor 1 = Excellent
A01	White	**Virgin 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 approved.	+600˚ To -450˚	+316˚ To -268˚	.09	7500
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 approved. Improved creep and extrusion resistance.	+600˚ To -450˚	+316˚ To -268˚	.09	6000
A05	Black	**Polymer Filled PTFE** Excellent wear material for higher temperatures, pressures and speeds. Excellent in water and water base solutions. Superior in dry or poor lubricated applications. Can be abrasive running against soft metals.	+600˚ To -450˚	+316˚ To -268˚	.09	1
A08	Tan	**Polymer Filled PTFE** Superior heat and wear resistance. Non-abrasive. Recommended for moderate to high speed dynamic service running against soft metals.	+600˚ To -450˚	+316˚ To -268˚	.15	2
A09	Gold	**Formulated UHMW** Extremely tough, long wearing but limited heat and chemical resistance. Particularly suitable for abrasive media. Recommended for long wear life under severe conditions.	+180˚ To -450˚	+82˚ To -268˚	.11	9
A11	Clear	**Virgin ETFE** Thermoplastic with superior resistance to nuclear radiation, but limited heat and wear resistance. Not recommended for general purpose sealing.	+300˚ To -150˚	+149˚ To -101˚	.50	150
A15	Gray	**Lubricated Glass Filled PTFE** Similar to A27 material but some what softer for improved sealing at low pressure. Can be abrasive running against soft metals.	+600˚ To -450˚	+316˚ To -268˚	.09	5
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.	+600˚ To -450˚	+316˚ To -268˚	.09	12
A17	White	**Formulated UHMW** Extremely good wear and abrasion resistance, but limited heat and chemical resistance. Meets FDA requirements.	+180˚ To -450˚	+82˚ To -268˚	.11	9
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 temperatures. Good for back-up rings.	+600˚ To -450˚	+316˚ To -268˚	.10	6
A22	Tan	**Virgin Polyaryletherketone** A high modulus material with excellent high temperature resistance. Recommended for back-up rings and for special applications.	+600˚ To -100˚	+316˚ To -73˚	.40	20
A27	Gray	**Lubricated Glass Filled PTFE** Tough, long wearing, heat resistant. Recommended for high pressure hydraulic service. Caution: Can be abrasive running against soft metals at high surface speeds.	+600˚ To -450˚	+316˚ To -268˚	.09	9
A30	Yellow	**Glass Formulated PTFE** Excellent heat, wear and chemical resistance. Good cryogenic properties. Caution: Can be abrasive running against soft metals at high surface speeds. Excellent material for back-up rings.	+600˚ To -450˚	+316˚ To -268˚	.09	6
A41	Black	**Modified Filled PTFE** Excellent all purpose high wear material. Best for dynamic applications running on moderate to hard surfaces.	+600˚ To -450˚	+316˚ To -268˚	.09	30
A42	Black	**Lubricated Formulated PTFE** Excellent general purpose material with good heat and wear resistance. Non-abrasive. Compatible with all hydraulic fluids and most chemicals. Good in water and non-lubricating fluids.	+600˚ To -450˚	+316˚ To -268˚	.09	30

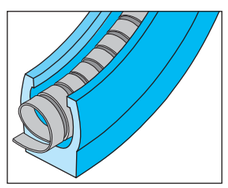
Seal Design Variations

Saint-Gobain Performance Plastics offers the industry's most complete line of spring energizer configurations.

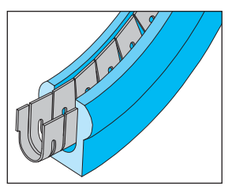
OmniSeal® 400A Spring Design



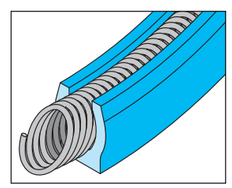
OmniSeal® 103A Spring Design



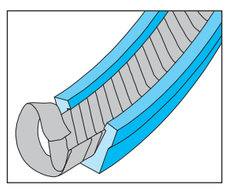
OmniSeal® Spring Ring II Design



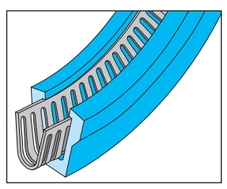
OmniSeal® APS Spring Design



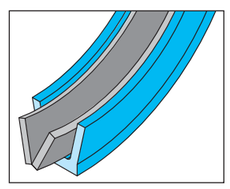
OmniSeal® RPII Spring Design



OmniSeal® RACO 1100A Spring Design



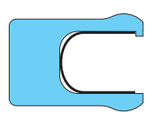
OmniSeal® Belleville Spring Design



Skived Lip

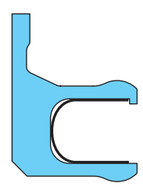
All OmniSeal® designs can be supplied with a sharp edge on either the I.D. or O.D. sealing lip. This edge provides a scraper/wiper action for sealing abrasive or viscous media. May also be used as an environmental excluder.

Extended Heel



OmniSeals can be supplied with an extended heel section for improved resistance to extrusion at high temperatures and/or high pressures. See page 9 for selection guidance.

Flanged Heel



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. See comments on page 6.

Spring Energizer Materials

The metallic spring and elastomeric energizers available with OmniSeals® are listed in the chart below. Because of the almost infinite variety of fluid media that may be encountered by the seals, no attempt is made to make specific recommendations. The various stainless steels listed are compatible with most fluids.

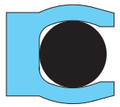
If you are in doubt about media compatibility, contact Technical Support, (for more information see inside back cover).

* Optional all sizes. Please contact Seals Technical Support		OmniSeal® APS	Spring Ring II	OmniSeal® 400A	OmniSeal 103A	OmniSeal® RP II	OmniSeal® RACO 1100A
							
Code No.	**Description**	**Page 18**	**Page 17**	**Page 15**	**Page 16**	**Page 19**	**Page 20**
01	301 Stainless Steel		Standard	*	*	Standard	Standard
02	Inconel 718						*
04	304 Stainless Steel			Standard	*	*	
05	Elgiloy®			*	*		*
06	316 Stainless Steel	*	*	*	*	*	
07	17/7 PH Stainless Steel				Standard		
08	Hastelloy® C276	*		*	*	*	
09	302 Stainless Steel	Standard				*	

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

Optional Energizers

Elastomer Energizers

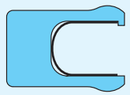


OmniSeal® 103A seals may be ordered with optional elastomeric O-Ring energizers in place of the metallic spring. A wide variety of elastomers such as OmniFlex™, nitrile, FKM and silicone are available. Contact Technical Support for more information.

RTV Silicone Filled

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

Seal Selection Guide

OmniSeal Design Profiles	Seal Designs	Temp Range °F	Temp Range °C	Pressure Capability (psi) Max	Application Service Ratings (Poor Fair Good Excellent) Static	Reciprocating	Rotary	Spring Materials Standard *Optional	Diameters Min-Max (inches)	Cross Sections (inch nom)	Standard Gland Sizes	Friction Rating	Recommended Applications	Page Locator
 Series 400A	Rod/Shaft Piston Face	+600° To -85°	+316° To -65°	3,000	G	E	G	304 SS *301 SS *316 SS *Elgiloy *Hastelloy C276	Rod Seals .185 - 60+ Piston Seals .297 - 60+	1/16 to 1/4**	Industrial Military AS-4716	Low Moderate	General purpose design for most applications. Best suited for dynamic rod and piston seals when pressure is under 3000 psi. Scraper designs can be used as wiper seals or in abrasive medias. Silicone filled spring cavities are available for food process and clean in place applications.	15
 Series 400A Extended	Rod/Shaft Piston Face	+600° To -85°	+316° To -65°	6,000	G	E	G	304 SS *301 SS *316 SS *Elgiloy *Hastelloy C276	Rod Seals .185 - 60+ Piston Seals .297 - 60+	1/16 to 1/4**	Industrial Military AS-4716	Low Moderate	Best suited for dynamic rod and piston seals when pressure is under 6000 psi/or when hardware extrusion gaps combined with high temperature are present. The extra material helps prevent seal failure by filling in the extrusion gap similar to a back up ring.	15
 Series 400A w/Back-Up	Rod/Shaft Piston	+600° To -85°	+316° To -65°	10,000 (Specials up to 50,000 psi)	G	E	F	304 SS *301 SS *316 SS *Elgiloy *Hastelloy C276	Rod Seals .185 - 60+ Piston Seals .297 - 60+	1/16 to 1/4**	Industrial Military AS-4716	Low Moderate	Best suited for dynamic rod and piston seals when pressure exceeds 6000 psi and excessive hardware extrusion gaps with high temperatures are present. A high modulus material like Fluoroloy A22 is recommended for the back up ring to reduce the gap and prevent seal extrusion.	15 & 21
 Series 400A Flanged	Rod/Shaft Piston	+575° To -320°	+301° To -196°	3,000	G	E	E	304 SS *301 SS *316 SS *Elgiloy *Hastelloy C276	Rod Seals .185 - 60+ Piston Seals .297 - 60+	1/16 to 1/4**	Industrial Military	Low Moderate	Designed for rotary shaft applications at less than 500 SFPM. The flange is an anti-rotation device when locked into the mating hardware. Also used as a cryogenic seal in applications such as quick disconnect couplings used in liquid oxygen and nitrogen. The flange prevents shrinkage.	15
 Series 103A	Rod/Shaft Piston Face Flanged	+575° To -320°	+301° To -196°	Standard = 3,000 Flanged = 3,000 Extended = 6,000 Back-Up = 10,000	E	F	P	17-7 PH SS *304 SS *316 SS *Elgiloy *Hastelloy C276	Rod Seals .076 - 60+ Piston Seals .190 - 60+	1/16 to 1/2**	Industrial Military AS-4716	Moderate High	Generally used for static applications when positive sealing is most critical. Best suited for use in sealing light gases and vacuum. Can be used in slow dynamic situations when friction is less of a concern. Also used as a cryogenic seal in applications such as quick disconnect couplings used in liquid oxygen and nitrogen.	16
 Spring Ring II	Rod/Shaft Piston Flanged	+550° To -65°	+288° To -54°	Standard = 3,000 Flanged = 3,000 Extended = 6,000 Back-Up = 10,000	F	G	G	301 SS *316 SS	Rod Seals .108 - .873 Piston Seals .221 - 1.116	1/16 to 1/8	-005 to -212 Industrial Military AS-4716	Low Moderate	Similar in design to the 400A listed above and intended for high volume, less critical applications. Available in fixed cross section sizes for diameters less than 1". Only available with 301 or 316 stainless steel springs. Custom sizes are available with a nominal set up cost.	17
 APS Series	Rod/Shaft Piston Face Flanged	+475° To -65°	+246° To -54°	Standard = 3,000 Flanged = 3,000 Extended = 6,000 Back-Up = 10,000	F	E	E	302 SS *316 SS *Hastelloy C276	Rod Seals .032 - 16.000 Piston Seals .094 - 16.000	1/16 to 1/4 (1/32"available)	Industrial Military AS-4716	Low Moderate	The near constant spring force Advanced Pitch Spring design is best suited for applications where consistent friction is important. Best when used for small diameters in rotary and reciprocating rod and piston applications at temps under 475° F (246° C) Optional spring loads available.	18
 RP II Series	Rod/Shaft Piston Flanged	+600° To -65°	+316° To -54°	Standard = 3,000 Flanged = 3,000 Extended = 6,000 Back-Up = 10,000	G	E	F	301 SS *302 SS *304 SS *316 SS	Rod Seals .250 - 60 Piston Seals .427 - 60	3/32 to 1/4**	Industrial Military AS-4716	Moderate	Flexible overlapped spring designed for use in static slow dynamic applications when excessive hardware tolerances exist. Spring design affords maximum spring deflection. Recommended for use in viscous applications, such as injection molding and liquid filling equipment.	19
 RACO® 1100 Series	Face	+550° To -425°	+288° To -254°	Standard = 3,000 Extended = 6,000 Back-Up = 10,000	E	P	F	301 SS *Inconel 718	.750 - 60+	3/32 to 1/4**	Industrial	High	High load spring designed for static internal and external pressure face seal applications. Excellent sealing in light gasses, vacuum and cryogenics. Also used in slow dynamic face seal applications such as swivels joints and marine loading arms.	20

*Consult factory

**Special cross-sections seals up to 1" are available

Part numbers listed in this handbook should not be used for source control drawings or when special handling is required. Such circumstances include special dimensional or material control requirements, inspection procedures or packaging not normally covered by standard part numbers. Custom part numbers are assigned by the factory to cover any out of the ordinary requirements. These custom numbers are assigned to your specific application and provide precise, permanent control of your parts. Contact Technical Support with any questions regarding part numbering.

Military/Industrial Glands

230	–	210	–	A01	–	01
Seal Design		**Seal Size**		**Jacket Material**		**Energizer Material**
APS–Page 18 400A–Page 15 103A–Page 16 RPII–Page 19 SRII–Page 17		Radial Seals–Page 18		Page 9		Page 11

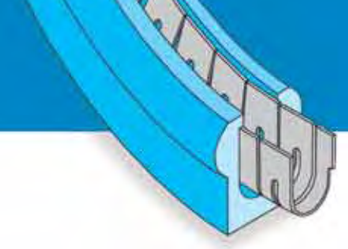
Example: 230-210-A01-01

AS4716 Glands

260	–	R*	–	210	–	A01	–	01
Seal Design		**Indicates**		**Seal Size**		**Jacket Material**		**Energizer Material**
APS–Page 18 400A–Page 15 103A–Page 16 RPII–Page 19 SRII–Page 17		R = Rod P = Piston		Radial Seals–Page 29		Page 9		Page 11

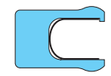
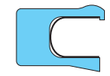
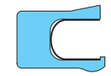
Example: 260-R-210-A01-01

*Only used when specifying AS4716 Seals



Radial Seal

The OmniSeal® 400A utilizes a cantilevered finger spring design. This unique spring design provides more dynamic runout and wider gland tolerances. Seal friction is reduced substantially, yet remains consistent with positive sealing in both low and high pressures. Available to fit all aerospace, military and industrial gland sizes. Larger cross sections up to 3/4" are also available.

Radial	Standard Lip	Skived I.D. Lip	Skived O.D. Lip
Standard Heel G Width			
Seal Design	AS 260, MIL 220, IND 240	AS 261, MIL 221, IND 241	AS 262, MIL 222, IND 242
Extended Heel G_1 Width			
Seal Design	AS 263, MIL 223, IND 243	AS 264, MIL 224, IND 244	AS 265, MIL 225, IND 245
Flanged Heel G_1 Width			
Seal Design	AS 266, MIL 226, IND 246	AS 267, MIL 227, IND 247	

NOTE: Complete rod and piston radial seal gland dimensional data for military/industrial and AS4716 1/16"– 1/8" cross sections available on pages 24 through 31.

Face Seal

The OmniSeal® 400A Face Seal is normally used as a dynamic seal. Due to its low spring loading it is recommended for slow to moderate rotary speeds, low friction and low hardware clamping forces. Optional ultra-light spring loads can be applied to critical friction applications. Larger cross sections and diameters are available.

Other SGPPL high-performance seal jacket materials and metallic spring energizers are available. For information regarding design requirements, specific seal designs, unique applications, additional data and specifications, contact Technical Support (see inside back cover).

Face Seal	Inside Face Seal (Internally Pressurized)	Outside Face Seal (Externally Pressurized)
		
Seal Design	228	229

NOTE: Complete face seal dimensional data for 1/16"– 1/4" cross sections available on pages 35 through 40.

Military/Industrial

220 - 210 - A01 - 04

- 220 – Seal Design
- 210 – Seal Size
- A01 – Jacket Material
- 04 – Energizer Material

AS4716

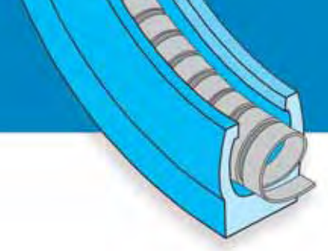
260 - R - 210 - A01 - 04

- 260 – Seal Design
- R – Rod Seal
- 210 – Seal Size
- A01 – Jacket Material
- 04 – Energizer Material

Face Seal

228 - 210 - A01 - 04

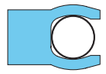
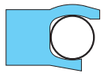
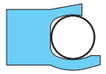
- 228 – Seal Design
- 210 – Seal Size
- A01 – Jacket Material
- 04 – Energizer Material



OmniSeal® 103A

Radial Seal

The OmniSeal® 103A is a refinement of the original spring energized seal design. The helical wound flat spring offers a moderate to high spring load for static and slow to moderate speed dynamic sealing. It has higher friction than the 400A Series, but better sealing of light liquids and gases. Available in all aerospace, military and industrial gland sizes.

Radial	Standard Lip	Skived I.D. Lip	Skived O.D. Lip
Standard Heel G Width			
Seal Design	AS 160, MIL 230, IND 250	AS 161, MIL 231, IND 251	AS 162, MIL 232, IND 252
Extended Heel G_1 Width			
Seal Design	AS 163, MIL 233, IND 253	AS 164, MIL 234, IND 254	AS 165, MIL 235, IND 255
Flanged Heel G_1 Width			
Seal Design	AS 166, MIL 236, IND 256	AS 167, MIL 237, IND 257	

NOTE: Complete rod and piston radial seal gland dimensional data for military/industrial and AS4716 1/16"– 1/4" cross sections available on pages 24 through 31.

Military/Industrial

230 - 210 - A01 - 07
- 230 — Seal Design
- 210 — Seal Size
- A01 — Jacket Material
- 07 — Energizer Material

AS4716

160 - R - 210 - A01 - 07
- 160 — Seal Design
- R — Rod Seal
- 210 — Seal Size
- A01 — Jacket Material
- 07 — Energizer Material

Face Seal

The OmniSeal® 103A Face Seal is recommended for most static sealing applications. The OmniSeal® 103A Face Seal may also be used in slow oscillatory or intermittent rotary service when seal friction is not as critical. Available in all cross sections and diameters.

Face Seal	Inside Face Seal (Internally Pressurized)	Outside Face Seal (Externally Pressurized)
		
Seal Design	238	239

NOTE: Complete face seal dimensional data for 1/16"– 1/4" cross sections available on pages 35 through 40.

Face Seal

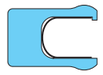
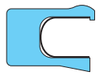
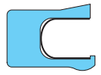
238 - 210 - A01 - 07
- 238 — Seal Design
- 210 — Seal Size
- A01 — Jacket Material
- 07 — Energizer Material

Other SGPPL high-performance seal jacket materials and metallic spring energizers are available. For information regarding design requirements, specific seal designs, unique applications, additional data and specifications, contact Technical Support (see inside back cover).

Spring Ring II

Radial Seal

The Spring Ring II is a specially designed version of the OmniSeal® 400A. It is available in selected sizes only and is intended for high volume, low cost production. Sizes are limited to diameters 1/8" to 7/8" and nominal cross sections of 1/16", 3/32" and 1/8". For larger sizes see OmniSeal® 400A. The Spring Ring II is available in stainless steel, and can be supplied to fit aerospace, military or industrial gland sizes.

Radial	Standard Lip	Skived I.D. Lip	Skived O.D. Lip
Standard Heel G Width			
Seal Design	AS 060, MIL 010, IND 080	AS 061, MIL 011, IND 081	AS 062, MIL 012, IND 082
Extended Heel G_1 Width			
Seal Design	AS 063, MIL 013, IND 083	AS 064, MIL 014, IND 084	AS 065, MIL 015, IND 085
Flanged Heel G_1 Width			
Seal Design	AS 066, MIL 016, IND 086	AS 067, MIL 017, IND 087	

NOTE: Complete Rod and piston radial seal gland dimensional data for Military/Industrial and AS4716 1/16"– 1/8" cross sections available on pages 24 through 31.

Military/Industrial

010 - 210 - A01 - 01
- 010 — Seal Design
- 210 — Seal Size
- A01 — Jacket Material
- 01 — Energizer Material

AS4716

060 - R - 210 - A01 - 01
- 060 — Seal Design
- R — Rod Seal
- 210 — Seal Size
- A01 — Jacket Material
- 01 — Energizer Material

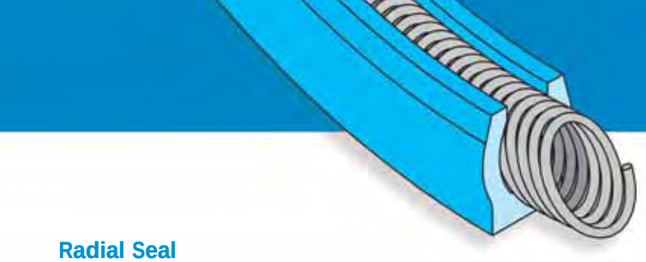
Other SGPPL high-performance seal jacket materials and metallic spring energizers are available. For information regarding design requirements, specific seal designs, unique applications, additional data and specifications, contact Technical Support (see inside back cover).

Special Designs

The Spring Ring II can be modified to meet particular requirements. The example shown is used to prevent seal rotation on a piston application. This design can also be applied to OmniSeal® APS, 400A, 103A, and RP II jacket designs.

Special Design

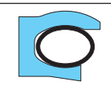
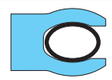
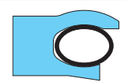
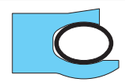
I.D. Flanged Heel



OmniSeal® APS

Radial Seal

OmniSeal® APS (Advanced Pitch Spring) utilizes a unique coiled wire spring design that has a light load and characteristics of a wide range of deflection while producing an almost constant spring load. This feature permits a large wear allowance in the seal jacket while maintaining an effective sealing load. Also, the spring can be wound in extremely small coil diameters, which makes this type of seal ideal for small cross section and small diameter seal applications. The low stressed spring makes it possible to deform the seal, allowing for assembly of rod seals into most closed glands without damaging the spring.

Radial	Standard Lip	Skived I.D. Lip	Skived O.D. Lip
Standard Heel G Width			
Seal Design	AS 760, MIL 730, IND 750	AS 761, MIL 731, IND 751	AS 762, MIL 732, IND 752
Extended Heel G_1 Width			
Seal Design	AS 763, MIL 733, IND 753	AS 764, MIL 734, IND 754	AS 765, MIL 735, IND 755
Flanged Heel G_1 Width			
Seal Design	AS 766, MIL 736, IND 756	AS 767, MIL 737, IND 757	

NOTE: Complete rod and piston radial seal gland dimensional data for military/industrial and AS4716 1/16"– 1/4" cross sections available on pages 24 through 31.

Military/Industrial

730 - 210 - A01 - 09 - M*

- 730: Seal Design
- 210: Seal Size
- A01: Jacket Material
- 09: Energizer Material
- M*: Spring Load (L-Low, M-Medium, H-High)

AS4716

760 - R - 210 - A01 - 09 - M*

- 760: Seal Design
- R: Rod Seal
- 210: Seal Size
- A01: Jacket Material
- 09: Energizer Material
- M*: Spring Load (L-Low, M-Medium, H-High)

**Medium load will be supplied when not specified.*

Face Seal

OmniSeal® APS Face seal is recommended for dynamic sealing applications when seal friction is critical.

Other SGPPL high-performance seal jacket materials and metallic spring energizers are available. For information regarding design requirements, specific seal designs, unique applications, additional data and specifications, contact Technical Support (see inside back cover).

Face Seal	Inside Face Seal (Internally Pressurized)	Outside Face Seal (Externally Pressurized)
		
Seal Design	738	739

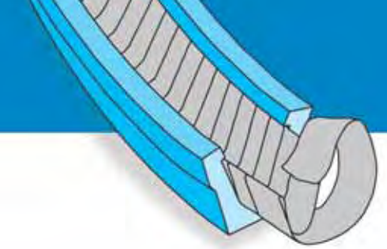
NOTE: Complete face seal dimensional data for 1/16"– 1/4 " cross sections available on pages 35 through 40.

Face Seal

738 - 210 - A09 - 09 - M*

- 738: Seal Design
- 210: Seal Size
- A09: Jacket Material
- 09: Energizer Material
- M*: Spring Load (L-Low, M-Medium, H-High)

**Medium load will be supplied when not specified.*

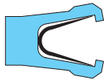
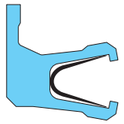


OmniSeal® RP II

Radial Seal

The OmniSeal® RP II utilizes a wrapped and formed ribbon spring. The design offers the utmost in spring deflection for otherwise difficult sealing applications, and may be used for reciprocating and slow rotary motion in dynamic as well as static sealing.

The OmniSeal® RP II seal is one of the most rugged of all Saint-Gobain Performance Plastics seals, and will often work under the most severe mechanical conditions when other designs fail. Available in most aerospace, military and industrial gland sizes, as well as larger cross sections.

Radial	Standard Lip
Standard Heel G Width	
Seal Design	AS 360, MIL 320, IND 340
Extended Heel G_1 Width	
Seal Design	AS 363, MIL 323, IND 343
Flanged Heel G_1 Width	
Seal Design	AS 366, MIL 326, IND 346

NOTE: Complete rod and piston radial seal gland dimensional data for military/industrial and AS4716 3/32"– 1/4" cross sections available on pages 24 through 31.

Military/Industrial

320 - 210 - A01 - 01

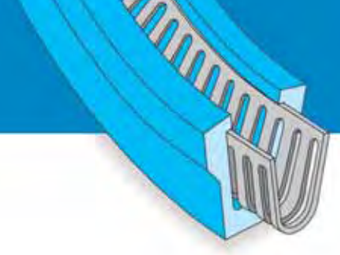
- 320: Seal Design
- 210: Seal Size
- A01: Jacket Material
- 01: Energizer Material

AS4716

360 - R - 210 - A01 - 01

- 360: Seal Design
- R: Rod Seal
- 210: Seal Size
- A01: Jacket Material
- 01: Energizer Material

Other SGPPL high-performance seal jacket materials and metallic spring energizers are available. For information regarding design requirements, specific seal designs, unique applications, additional data and specifications, contact Technical Support (see inside back cover).



Face Seal

The OmniSeal® RACO® 1100A Face Seal employs a heavy duty, high load RACO® spring with continuous spring contact along the entire sealing lip. This rugged seal is recommended for extreme static sealing conditions such as those involving cryogenic fluids, ultra high vacuum and positive sealing of light gases. The RACO® seal is also used dynamically in marine loading arm swivels and similar applications where high torque and clamping forces are employed. Larger cross sections and diameters are quite common with this seal design.

Face Seal	Inside Face Seal (Internally Pressurized)	Outside Face Seal (Externally Pressurized)
		
Seal Design	348	349

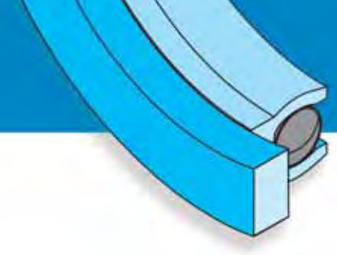
NOTE: Complete face seal dimensional data for 3/32"– 1/4" cross sections available on pages 35 through 40.

Face Seal

348 - 210 - A01 - 01

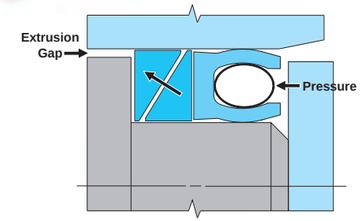
- 348 — Seal Design
- 210 — Seal Size
- A01 — Jacket Material
- 01 — Energizer Material

Other SGPPL high-performance seal jacket materials and metallic spring energizers are available. For information regarding design requirements, specific seal designs, unique applications, additional data and specifications, contact Technical Support (see inside back cover).

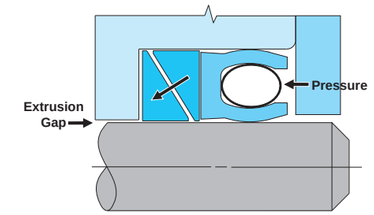


Back-Up Rings

These back-up rings are specially designed to work in high pressure, high temperature applications with the radial OmniSeals shown in this handbook. Conventional solid and split back-up rings, as well as custom designs, can also be supplied. See page 8 for complete information.

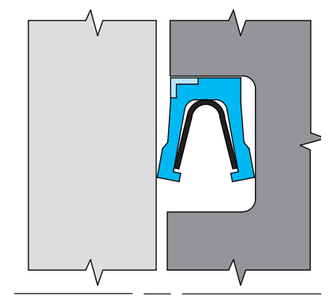


Piston seal installation with dual back-up rings

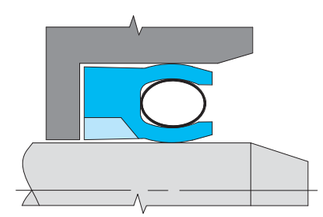


Rod seal installation with dual back-up rings

Special Designs



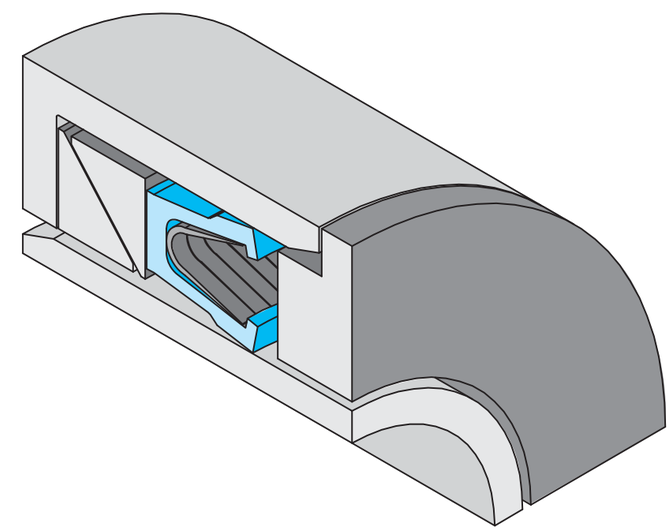
Metallic anti-extrusion ring for inside face seal



High modulus anti-extrusion/wear ring

	Basic Part No.	Basic Part No.	Basic Part No.
Military Mil-G-5514	035	036	037
Industrial	055	056	057
Aerospace AS4716	175	176	177

NOTE: Complete back-up ring gland dimensional data is available on pages 24 through 31.



Typical OmniSeal back-up ring installation

Other SGPPL high-performance seal jacket materials and metallic spring energizers are available. For information regarding design requirements, specific seal designs, unique applications, additional data and specifications, contact Technical Support (see inside back cover).

Hardware Surfaces

The finish of the surface over which the OmniSeal® must slide greatly influences the relative wear of the jacket material. Mating surfaces that are too rough can create leak paths and be abrasive to the seal.

The transfer of a thin film of PTFE from the OmniSeal® jacket to the mating dynamic surface will improve seal life. Dynamic surfaces with relatively rough finishes wear the jacket material too rapidly. Extremely smooth dynamic surfaces result in material transfer insufficient to form a thin film. The graph below illustrates the effect of surface finish on seal wear.

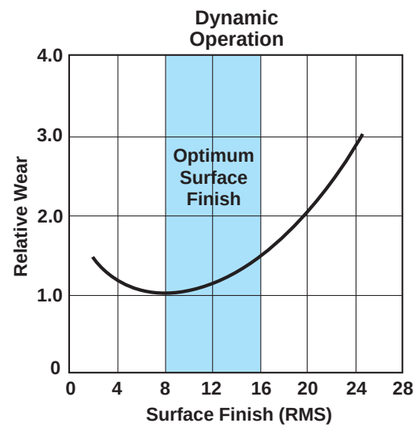
Static Hardware Surface Finish

In most static sealing applications, better overall sealing performance can be achieved with a smoother sealing surface finish. The recommended optimum surface finish for most static sealing applications is 32 RMS or better. The "lay" on surfaces for static face seals should be concentric. Polishing or machining surfaces should be circular.

Hardware Surface Finish Recommendations

Media Sealed	Surface Finish	
	Dynamic Surface	Static Surface
Cryogenics Helium Gas Hydrogen Gas Freon	4 to 8 RMS	8 RMS max
Air Nitrogen Gas Argon Gas Natural Gas Fuel	6 to 12 RMS	16 RMS max
Water Hydraulic Oil Crude Oil Sealants	8 to 16 RMS	32 RMS max

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



Dynamic Hardware Sealing Surface Finish Hardness

As a general rule, the lower the sealing surface finish, the better the overall seal performance that can be expected. Lower finish value reduces wear and increases seal life. A 40 Rockwell C hardness or greater is recommended for slow to moderate reciprocating motion.

The ideal hardness is 58 to 62 Rockwell C. Hardness in this range is recommended for moderate to high speed linear or rotary motion. Hard anodized surface finishes must be polished after anodizing.

Gland Design

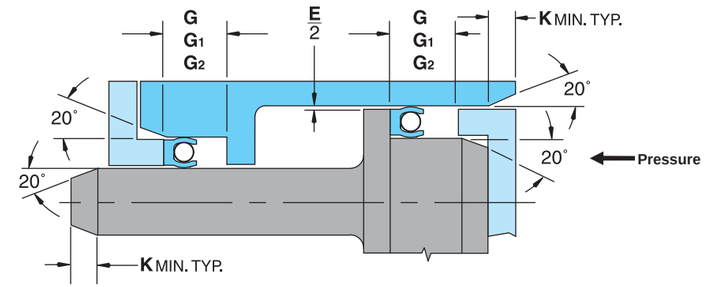
Consideration of proper gland geometry in the early stages of design can eliminate unnecessary installation problems.

The use of split or separable glands in piston and rod seal applications is always desirable to eliminate the need to stretch or compress the OmniSeal® during installation into the gland. Split glands also eliminate the need for special installation tools.

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 on page 23.

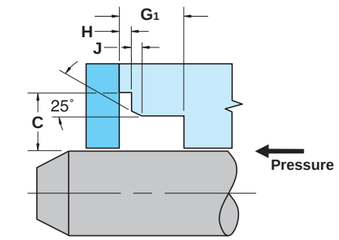
If stretching into a full groove is unavoidable, consult proper procedures and tools recommended on page 32. Assembly of the seal over sharp corners, threads, keyways, etc., should be avoided, or protective tooling should be used when these conditions exist.

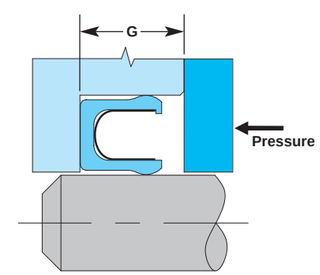
Rod Seal Gland



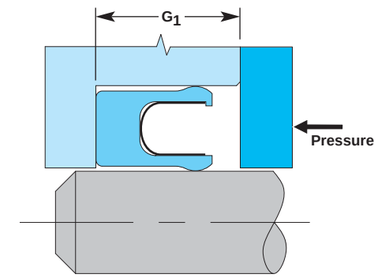
Piston Seal Gland

Flanged Shaft Seal Gland

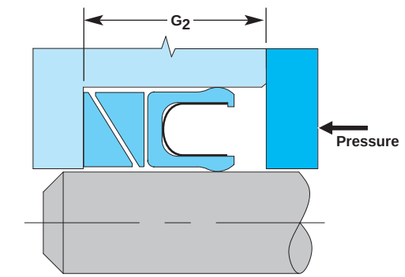




Gland width for standard OmniSeals®



Gland width for extended heel OmniSeals®



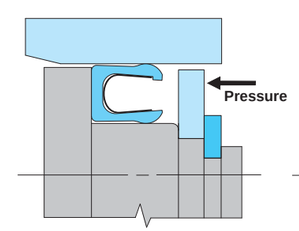
Gland width for standard OmniSeals® plus back-up ring

Radial Seal Gland Designs

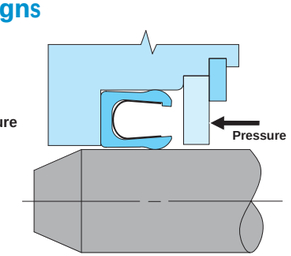
Size-Dash No.	Normal Cross Section	G +.010 -.000	G1 +.010 -.000	G2 +.010 -.000	K Min.	C ±.005	H ±.001	J ±.005	E NOM (1)
004 Thru 045	1/16	.094	.149	.207	.040	.135	.016	.030	.004
106 Thru 163	3/32	.141	.183	.245	.062	.168	.023	.035	.005
202 Thru 281	1/8	.188	.235	.304	.094	.217	.027	.050	.006
313 Thru 381	3/16	.281	.334	.424	.125	.331	.032	.070	.007
409 Thru 460	1/4	.375	.475	.579	.156	.456	.047	.090	.008

(1) See extrusion gap recommendations Page 8

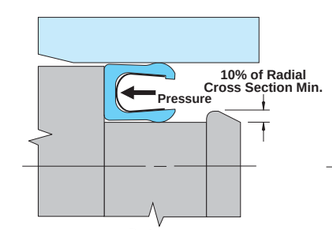
Alternate Gland Designs



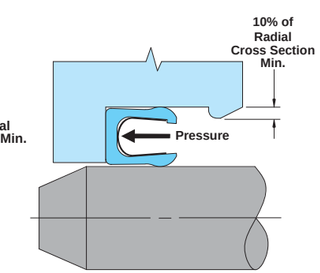
Piston seal snap ring gland



Rod seal snap ring gland

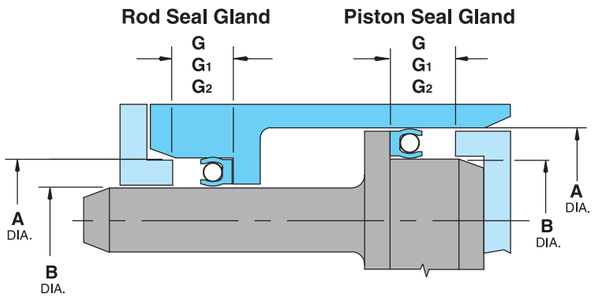


Piston seal reduced gland



Rod seal reduced gland

Radial Seal Gland Dimensions
Military/Industrial



1/16" Cross Section

G = 0.094/0.104 G_1 = 0.149/0.159 G_2 = 0.207/0.217

Gland Size Dash No.	Military A Dia. +0.001 -0.000	Military B Dia. +0.000 -0.001	APS	Spring Ring II	400A	103A	RP II	Back-Up Rings	Industrial A Dia. +0.001 -0.000	Industrial B Dia. +0.000 -0.001
001	0.095	0.033							Refer to Factory for Part Numbers	
002	0.128	0.048								
003	0.159	0.063								
004	0.190	0.076							0.203	0.078
005	0.221	0.108							0.234	0.109
006	0.235	0.123							0.250	0.125
007	0.266	0.154							0.281	0.156
008	0.297	0.185							0.312	0.187
009	0.329	0.217							0.343	0.218
010	0.360	0.248							0.375	0.250
011	0.422	0.310							0.437	0.312
012	0.485	0.373							0.500	0.375
	+0.002 -0.000	+0.000 -0.002							+0.002 -0.000	+0.000 -0.002
013	0.550	0.438							0.562	0.437
014	0.613	0.501							0.625	0.500
015	0.675	0.563							0.687	0.562
016	0.738	0.626							0.750	0.625
017	0.800	0.688							0.812	0.687
018	0.863	0.751							0.875	0.750
019	0.925	0.813							0.937	0.812
020	0.993	0.881							1.000	0.875
021	1.055	0.943							1.062	0.937
022	1.118	1.006							1.125	1.000
023	1.180	1.068							1.187	1.062
024	1.243	1.131							1.250	1.125
025	1.305	1.193							1.312	1.187
026	1.368	1.256							1.375	1.250
027	1.430	1.318							1.437	1.312
028	1.493	1.381							1.500	1.375
029	1.617	1.505							1.625	1.500
030	1.739	1.627							1.750	1.625
031	1.864	1.752							1.875	1.750
032	1.989	1.877							2.000	1.875

Not available in 1/16 C/X

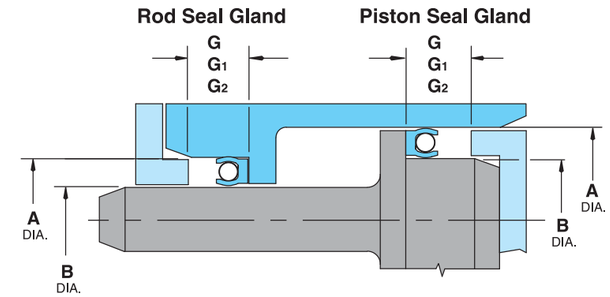
1/16" Cross Section

G = 0.094/0.104 G_1 = 0.149/0.159 G_2 = 0.207/0.217

Gland Size Dash No.	Military A Dia. +0.002 -0.000	Military B Dia. +0.000 -0.002	APS	Spring Ring II	400A	103A	RP II	Back-Up Rings	Industrial A Dia. +0.002 -0.000	Industrial B Dia. +0.000 -0.002
033	2.114	2.002							2.125	2.000
034	2.239	2.127							2.250	2.125
035	2.364	2.252							2.375	2.250
036	2.489	2.377							2.500	2.375
037	2.614	2.502							2.625	2.500
038	2.739	2.627							2.750	2.625
039	2.864	2.752							2.875	2.750
040	2.987	2.875							3.000	2.875
041	3.112	3.000							3.125	3.000
042	3.362	3.250							3.375	3.250
043	3.612	3.500							3.625	3.500
044	3.862	3.750							3.875	3.750
045	4.112	4.000							4.125	4.000

NOTE:
1. If space permits, use the larger cross sections listed in these tables.
2. Diameters between those listed and diameters larger than those listed are available on request.
3. In-between cross sections and larger cross sections are available.
4. Metric sizes are also available.

Radial Seal Gland Dimensions
Military/Industrial



3/32" Cross Section

G = 0.141/0.151 G_1 = 0.183/0.193 G_2 = 0.245/0.255

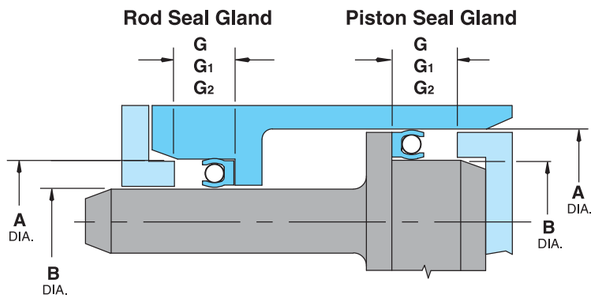
Gland Size Dash No.	Military A Dia. +0.002 -0.000	Military B Dia. +0.000 -0.002	APS	Spring Ring II	400A	103A	RP II	Back-Up Rings	Industrial A Dia. +0.002 -0.000	Industrial B Dia. +0.000 -0.002
106	0.302	0.124							0.312	0.125
107	0.364	0.186							0.375	0.187
108	0.427	0.249							0.437	0.250
109	0.489	0.311							0.500	0.312
110	0.551	0.373							0.562	0.375
111	0.613	0.435							0.625	0.437
112	0.676	0.498							0.687	0.500
113	0.738	0.560							0.750	0.562
114	0.801	0.623							0.812	0.625
115	0.863	0.685							0.875	0.687
116	0.926	0.748							0.937	0.750
117	0.993	0.815							1.000	0.812
118	1.056	0.878							1.062	0.875
119	1.118	0.940							1.125	0.937
120	1.181	1.003							1.187	1.000
121	1.243	1.065							1.250	1.062
122	1.306	1.128							1.312	1.125
123	1.368	1.190							1.375	1.187
124	1.431	1.253							1.437	1.250
125	1.493	1.315							1.500	1.312
126	1.558	1.380							1.562	1.375
127	1.620	1.442							1.625	1.437
128	1.683	1.505							1.687	1.500
129	1.742	1.564							1.750	1.562
130	1.805	1.627							1.812	1.625
131	1.867	1.689							1.875	1.687
132	1.930	1.752							1.937	1.750
133	1.992	1.814							2.000	1.812
134	2.055	1.877							2.062	1.875
135	2.118	1.940							2.125	1.937
136	2.180	2.002							2.187	2.000
137	2.243	2.065							2.250	2.062
138	2.305	2.127							2.312	2.125
139	2.368	2.190							2.375	2.187

3/32" Cross Section

G = 0.141/0.151 G_1 = 0.183/0.193 G_2 = 0.245/0.255

Gland Size Dash No.	Military A Dia. +0.002 -0.000	Military B Dia. +0.000 -0.002	APS	Spring Ring II	400A	103A	RP II	Back-Up Rings	Industrial A Dia. +0.002 -0.000	Industrial B Dia. +0.000 -0.002
140	2.430	2.252							2.437	2.250
141	2.493	2.315							2.500	2.312
142	2.555	2.377							2.562	2.375
143	2.618	2.440							2.625	2.437
144	2.680	2.502							2.687	2.500
145	2.743	2.565							2.750	2.562
146	2.805	2.627							2.812	2.625
147	2.868	2.690							2.875	2.687
148	2.930	2.752							2.937	2.750
149	2.993	2.815							3.000	2.812
150	3.053	2.875							3.062	2.875
151	3.178	3.000							3.187	3.000
152	3.428	3.250							3.437	3.250
153	3.678	3.500							3.687	3.500
154	3.928	3.750							3.937	3.750
155	4.178	4.000							4.187	4.000
156	4.428	4.250							4.437	4.250
157	4.678	4.500							4.687	4.500
158	4.928	4.750							4.937	4.750
159	5.178	5.000							5.187	5.000
160	5.428	5.250							5.437	5.250
161	5.678	5.500							5.687	5.500
162	5.928	5.750							5.937	5.750
163	6.178	6.000							6.187	6.000

Radial Seal Gland Dimensions
Military/Industrial



1/8" Cross Section

G = 0.188/0.198 G_1 = 0.234/0.245 G_2 = 0.304/0.314

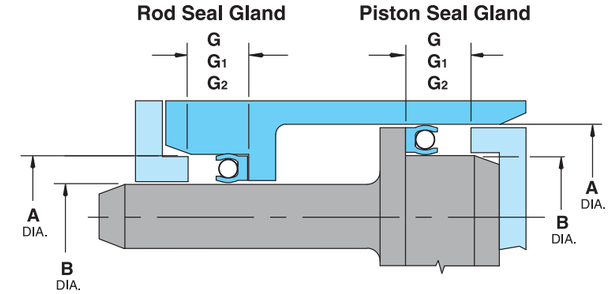
Gland Size Dash No.	Military A Dia. +0.002 -0.000	Military B Dia. +0.000 -0.002	APS	Spring Ring II	400A	103A	RP II	Back-Up Rings	Industrial A Dia. +0.002 -0.000	Industrial B Dia. +0.000 -0.002
202	0.491	0.249	■	■		■	■	■	0.500	0.250
203	0.553	0.311	■	■		■	■	■	0.562	0.312
204	0.615	0.373	■	■	■	■	■	■	0.625	0.375
205	0.677	0.435	■	■		■	■	■	0.687	0.437
206	0.740	0.498	■	■		■	■	■	0.750	0.500
207	0.802	0.560							0.812	0.562
208	0.865	0.623							0.875	0.625
209	0.927	0.685							0.937	0.687
210	0.991	0.748							1.000	0.750
211	1.053	0.810							1.062	0.812
212	1.116	0.873			■				1.125	0.875
213	1.178	0.935							1.187	0.937
214	1.241	0.998							1.250	1.000
215	1.303	1.060							1.312	1.062
216	1.366	1.123							1.375	1.125
217	1.428	1.185							1.437	1.187
218	1.491	1.248							1.500	1.250
219	1.553	1.310							1.562	1.312
220	1.616	1.373							1.625	1.375
221	1.678	1.435							1.687	1.437
222	1.741	1.498							1.750	1.500
223	1.868	1.625							1.875	1.625
224	1.993	1.750							2.000	1.750
225	2.118	1.875							2.125	1.875
226	2.243	2.000							2.250	2.000
227	2.368	2.125							2.375	2.125
228	2.493	2.250							2.500	2.250
229	2.618	2.375							2.625	2.375
230	2.743	2.500							2.750	2.500
231	2.868	2.625							2.875	2.625
232	2.993	2.750							3.000	2.750
233	3.118	2.875							3.125	2.875
234	3.243	3.000							3.250	3.000
235	3.368	3.125							3.375	3.125
236	3.493	3.250							3.500	3.250
237	3.618	3.375							3.625	3.375
238	3.743	3.500							3.750	3.500
239	3.868	3.625							3.875	3.625
240	3.993	3.750							4.000	3.750
241	4.118	3.875							4.125	3.875

1/8" Cross Section

G = 0.188/0.198 G_1 = 0.234/0.245 G_2 = 0.304/0.314

Gland Size Dash No.	Military A Dia. +0.002 -0.000	Military B Dia. +0.000 -0.002	APS	Spring Ring II	400A	103A	RP II	Back-Up Rings	Industrial A Dia. +0.002 -0.000	Industrial B Dia. +0.000 -0.002
242	4.243	4.000			■	■	■	■	4.250	4.000
243	4.368	4.125			■	■	■	■	4.375	4.125
244	4.493	4.250			■	■	■	■	4.500	4.250
245	4.618	4.375			■	■	■	■	4.625	4.375
246	4.743	4.500			■	■	■	■	4.750	4.500
247	4.868	4.625							4.875	4.625
248	4.992	4.750							5.000	4.750
249	5.117	4.875							5.125	4.875
250	5.242	5.000							5.250	5.000
251	5.367	5.125							5.375	5.125
252	5.492	5.250							5.500	5.250
253	5.617	5.375							5.625	5.375
254	5.742	5.500							5.750	5.500
255	5.867	5.625							5.875	5.625
256	5.992	5.750							6.000	5.750
257	6.117	5.875							6.125	5.875
258	6.242	6.000							6.250	6.000
259	6.492	6.250							6.500	6.250
260	6.742	6.500							6.750	6.500
261	6.992	6.750							7.000	6.750
262	7.242	7.000							7.250	7.000
263	7.492	7.250							7.500	7.250
264	7.742	7.500							7.750	7.500
265	7.992	7.750							8.000	7.750
266	8.242	8.000							8.250	8.000
267	8.492	8.250							8.500	8.250
268	8.742	8.500							8.750	8.500
269	8.992	8,750							9.000	8,750
270	9.242	9.000							9.250	9.000
271	9.492	9.250							9.500	9.250
272	9.742	9.500							9.750	9.500
273	9.992	9.750							10.000	9.750
274	10.242	10.000							10.250	10.000
275	10.742	10.500							10.750	10.500
276	11.242	11.000							11.250	11.000
277	11.742	11.500							11.750	11.500
278	12.242	12.000							12.250	12.000
279	12.742	12.500							12.750	12.500
280	13.242	13.000							13.250	13.000
281	13.742	13.500							13.750	13.500

Radial Seal Gland Dimensions
Military/Industrial



3/16" Cross Section

G = 0.281/0.291 G_1 = 0.334/0.344 G_2 = 0.424/0.434

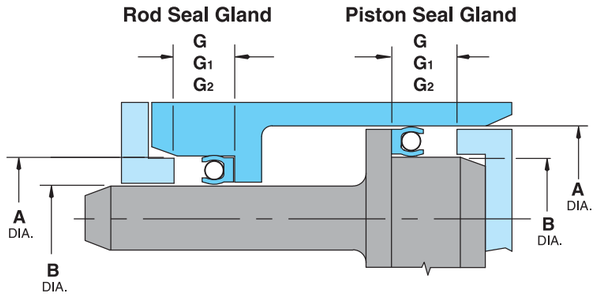
Gland Size Dash No.	Military A Dia. +0.002 -0.000	Military B Dia. +0.000 -0.002	APS	Spring Ring II	400A	103A	RP II	Back-Up Rings	Industrial A Dia. +0.002 -0.000	Industrial B Dia. +0.000 -0.002
313	0.870	0.498	■	Not Available in 3/16 Cross Section	■	■	■	■	0.875	0.500
314	0.932	0.560	■		■	■	■	■	0.937	0.562
315	0.995	0.623	■		■	■	■	■	1.000	0.625
316	1.057	0.685	■		■	■	■	■	1.062	0.687
317	1.120	0.748	■		■	■	■	■	1.125	0.750
318	1.182	0.810	■		■	■	■	■	1.187	0.812
319	1.245	0.873	■		■	■	■	■	1.250	0.875
320	1.307	0.935	■		■	■	■	■	1.312	0.937
321	1.370	0.998	■		■	■	■	■	1.375	1.000
322	1.495	1.123	■		■	■	■	■	1.500	1.125
323	1.620	1.248	■		■	■	■	■	1.625	1.250
324	1.745	1.373	■		■	■	■	■	1.750	1.375
325	1.870	1.498	■		■	■	■	■	1.875	1.500
326	1.995	1.623	■		■	■	■	■	2.000	1.625
327	2.120	1.748	■		■	■	■	■	2.125	1.750
328	2.245	1.873	■		■	■	■	■	2.250	1.875
329	2.370	1.998	■		■	■	■	■	2.375	2.000
330	2.495	2.123	■		■	■	■	■	2.500	2.125
331	2.620	2.248	■		■	■	■	■	2.625	2.250
332	2.745	2.373	■		■	■	■	■	2.750	2.375
333	2.870	2.498	■		■	■	■	■	2.875	2.500
334	2.995	2.623	■		■	■	■	■	3.000	2.625
335	3.120	2.748	■		■	■	■	■	3.125	2.750
336	3.245	2.873	■		■	■	■	■	3.250	2.875
337	3.369	2.997	■		■	■	■	■	3.375	3.000
338	3.494	3.122	■		■	■	■	■	3.500	3.125
339	3.619	3.247	■		■	■	■	■	3.625	3.250
340	3.744	3.372	■		■	■	■	■	3.750	3.375
341	3.869	3.497	■		■	■	■	■	3.875	3.500
342	3.994	3.622	■		■	■	■	■	4.000	3.625
343	4.119	3.747	■		■	■	■	■	4.125	3.750
344	4.244	3.872	■		■	■	■	■	4.250	3.875
345	4.369	3.997	■		■	■	■	■	4.375	4.000
346	4.494	4.122	■		■	■	■	■	4.500	4.125
347	4.619	4.247	■		■	■	■	■	4.625	4.250

3/16" Cross Section

G = 0.281/0.291 G_1 = 0.334/0.344 G_2 = 0.424/0.434

Gland Size Dash No.	Military A Dia. +0.002 -0.000	Military B Dia. +0.000 -0.002	APS	Spring Ring II	400A	103A	RP II	Back-Up Rings	Industrial A Dia. +0.002 -0.000	Industrial B Dia. +0.000 -0.002
348	4.744	4.372	■		■	■	■	■	4.750	4.375
349	4.869	4.497	■		■	■	■	■	4.875	4.500
350	4.997	4.625	■		■	■	■	■	5.000	4.625
351	5.122	4.750	■		■	■	■	■	5.125	4.750
352	5.247	4.875	■		■	■	■	■	5.250	4.875
353	5.372	5.000	■		■	■	■	■	5.375	5.000
354	5.497	5.125	■		■	■	■	■	5.500	5.125
355	5.622	5.250	■		■	■	■	■	5.625	5.250
356	5.747	5.375	■		■	■	■	■	5.750	5.375
357	5.872	5.500	■		■	■	■	■	5.875	5.500
358	5.997	5.625	■		■	■	■	■	6.000	5.625
359	6.122	5.750	■		■	■	■	■	6.125	5.750
360	6.247	5.875	■		■	■	■	■	6.250	5.875
361	6.372	6.000	■		■	■	■	■	6.375	6.000
362	6.622	6.250	■		■	■	■	■	6.625	6.250
363	6.872	6.500	■		■	■	■	■	6.875	6.500
364	7.122	6.750	■		■	■	■	■	7.125	6.750
365	7.372	7.000	■		■	■	■	■	7.375	7.000
366	7.622	7.250	■		■	■	■	■	7.625	7.250
367	7.872	7.500	■		■	■	■	■	7.875	7.500
368	8.122	7.750	■		■	■	■	■	8.125	7.750
369	8.372	8.000	■		■	■	■	■	8.375	8.000
370	8.622	8.250	■		■	■	■	■	8.625	8.250
371	8.872	8.500	■		■	■	■	■	8.875	8.500
372	9.122	8.750	■		■	■	■	■	9.125	8.750
373	9.372	9.000	■		■	■	■	■	9.375	9.000
374	9.622	9.250	■		■	■	■	■	9.625	9.250
375	9.872	9.500	■		■	■	■	■	9.875	9.500
376	10.122	9.750	■		■	■	■	■	10.125	9.750
377	10.372	10.000	■		■	■	■	■	10.375	10.000
378	10.872	10.500	■		■	■	■	■	10.875	10.500
379	11.372	11.000	■		■	■	■	■	11.375	11.000
380	11.872	11.500	■		■	■	■	■	11.875	11.500
381	12.372	12.000	■		■	■	■	■	12.375	12.000

Radial Seal Gland Dimensions
Military/Industrial



1/4" Cross Section

G = 0.375/0.385 G_1 = 0.475/0.485 G_2 = 0.579/0.589

Gland Size	Military A Dia.	Military B Dia.	APS Spring Ring II	400A	103A	RP II	Back-Up Rings	Industrial A Dia.	Industrial B Dia.
Dash No.	+0.003 -0.000	+0.000 -0.003						+0.003 -0.000	+0.000 -0.003
409	2.977	2.500	Not Available in 3/16 Cross Section					3.000	2.500
410	3.102	2.625						3.125	2.625
411	3.227	2.750						3.250	2.750
412	3.352	2.875						3.375	2.875
413	3.477	3.000						3.500	3.000
414	3.602	3.125						3.625	3.125
415	3.727	3.250						3.750	3.250
416	3.852	3.375						3.875	3.375
417	3.977	3.500						4.000	3.500
418	4.102	3.625						4.125	3.625
419	4.227	3.750						4.250	3.750
420	4.352	3.875						4.375	3.875
421	4.477	4.000						4.500	4.000
422	4.602	4.125						4.625	4.125
423	4.727	4.250						4.750	4.250
424	4.852	4.375						4.875	4.375
425	4.974	4.497						5.000	4.500
426	5.099	4.622						5.125	4.625
427	5.224	4.747						5.250	4.750
428	5.349	4.872						5.375	4.875
429	5.474	4.997						5.500	5.000
430	5.599	5.122						5.625	5.125
431	5.724	5.247						5.750	5.250
432	5.849	5.372						5.875	5.375
433	5.974	5.497						6.000	5.500
434	6.099	5.622						6.125	5.625
435	6.224	5.747						6.250	5.750
436	6.349	5.872						6.375	5.875
437	6.474	5.997						6.500	6.000
438	6.724	6.247						6.750	6.250
439	6.974	6.497						7.000	6.500
440	7.224	6.747						7.250	6.750
441	7.474	6.997						7.500	7.000

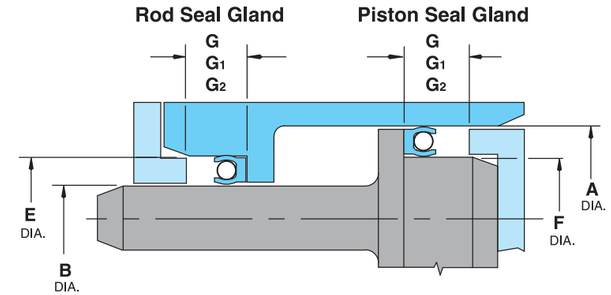
1/4" Cross Section

G = 0.375/0.385 G_1 = 0.475/0.485 G_2 = 0.579/0.589

Gland Size	Military A Dia.	Military B Dia.	APS Spring Ring II	400A	103A	RP II	Back-Up Rings	Industrial A Dia.	Industrial B Dia.
Dash No.	+0.003 -0.000	+0.000 -0.003						+0.003 -0.000	+0.000 -0.003
442	7.724	7.247						7.750	7.250
443	7.974	7.497						8.000	7.500
444	8.224	7.747						8.250	7.750
445	8.474	7.997						8.500	8.000
446	8.974	8.497						9.000	8.500
447	9.474	8.997						9.500	9.000
448	9.974	9.497						10.000	9.500
449	10.474	9.997						10.500	10.000
450	10.974	10.497						11.000	10.500
451	11.474	10.997						11.500	11.000
452	11.974	11.497						12.000	11.500
453	12.474	11.997						12.500	12.000
454	12.974	12.497						13.000	12.500
455	13.474	12.997						13.500	13.000
456	13.974	13.497						14.000	13.500
457	14.474	13.997						14.500	14.000
458	14.974	14.497						15.000	14.500
459	15.474	14.997						15.500	15.000
460	15.974	15.497						16.000	15.500

NOTE:
1. If space permits, use the larger cross sections listed in these tables.
2. Diameters between those listed and diameters larger than those listed are available on request.
3. In-between cross sections and larger cross sections are available.
4. Metric sizes are also available.

Radial Seal Gland Dimensions
AS 4716



1/16" Nominal Cross Section

G = 0.094/0.103 G_1 = 0.150/0.164 G_2 = 0.207/0.220

Gland Size	AS4716 Piston Seal A Cylinder Bore Dia.	AS4716 Piston Seal F Piston Groove Dia.	AS4716 Rod Seal E Rod Gland Groove Dia.	AS4716 Rod Seal B Rod Dia.	APS Spring Ring II	400A	103A	RP II	Back-Up Rings
Dash No.	Tol. +0.001 -0.000	Tol. +0.000 -0.001	Tol. +0.001 -0.000	Tol. +0.000 -0.001					
004	0.190	0.076	0.190	0.076					
005	0.221	0.108	0.221	0.108					
006	0.235	0.123	0.235	0.123					
007	0.266	0.154	0.266	0.154					
008	0.297	0.189	0.294	0.185					
009	0.329	0.220	0.327	0.217					
010	0.360	0.250	0.359	0.248					
011	0.422	0.312	0.421	0.310					
012	0.485	0.375	0.484	0.373					
	Tol. +0.002 -0.000	Tol. +0.000 -0.002	Tol. +0.002 -0.000	Tol. +0.000 -0.002					
013	0.550	0.441	0.545	0.435					
014	0.613	0.504	0.608	0.498					
015	0.675	0.566	0.670	0.560					
016	0.738	0.629	0.733	0.623					
017	0.800	0.691	0.795	0.685					
018	0.863	0.753	0.858	0.748					
019	0.925	0.815	0.920	0.810					
020	0.991	0.881	0.983	0.873					
021	1.053	0.943	1.045	0.935					
022	1.116	1.006	1.108	0.998					
023	1.178	1.068	1.170	1.060					
024	1.241	1.131	1.233	1.123					
025	1.303	1.193	1.295	1.185					
026	1.366	1.256	1.358	1.248					
027	1.428	1.318	1.420	1.310					
028	1.491	1.381	1.483	1.373					

NOTE: Aerospace Standard AS4716 gland dimensions are designed for elastomeric seal glands for static and dynamic applications. They are closed one-piece grooves that will not provide the necessary access for most radial OmniSeals. The information on these pages conforms to the specification for dimensioning purposes only. Complete gland design information for OmniSeals can be found on page 23.

3/32" Nominal Cross Section

G = 0.141/0.151 G_1 = 0.183/0.193 G_2 = 0.245/0.255

Gland Size	AS4716 Piston Seal A Cylinder Bore Dia.	AS4716 Piston Seal F Piston Groove Dia.	AS4716 Rod Seal E Rod Gland Groove Dia.	AS4716 Rod Seal B Rod Dia.	APS Spring Ring II	400A	103A	RP II	Back-Up Rings
Dash No.	Tol. +0.002 -0.000	Tol. +0.000 -0.002	Tol. +0.002 -0.000	Tol. +0.000 -0.002					
110	0.550	0.379	0.546	0.373					
111	0.613	0.441	0.609	0.435					
112	0.675	0.502	0.672	0.498					
113	0.738	0.565	0.734	0.560					
114	0.800	0.627	0.797	0.623					
115	0.863	0.689	0.859	0.685					
116	0.925	0.751	0.923	0.748					
117	0.991	0.817	0.985	0.810					
118	1.053	0.879	1.048	0.873					
119	1.116	0.942	1.110	0.935					
120	1.178	1.003	1.173	0.998					
121	1.241	1.066	1.235	1.060					
122	1.303	1.128	1.298	1.123					
123	1.366	1.191	1.360	1.185					
124	1.428	1.253	1.423	1.248					
125	1.491	1.316	1.485	1.310					
126	1.553	1.378	1.548	1.373					
127	1.616	1.441	1.610	1.435					
128	1.678	1.503	1.673	1.498					
129	1.741	1.566	1.735	1.560					
130	1.805	1.631	1.798	1.623					
131	1.867	1.693	1.860	1.685					
132	1.930	1.756	1.923	1.748					
133	1.992	1.818	1.984	1.810					
134	2.055	1.881	2.047	1.873					
135	2.118	1.944	2.110	1.936					
136	2.180	2.006	2.172	1.998					
137	2.243	2.069	2.235	2.061					
138	2.305	2.131	2.297	2.123					
139	2.368	2.194	2.360	2.186					
140	2.430	2.256	2.422	2.248					
141	2.493	2.319	2.485	2.311					
142	2.555	2.381	2.547	2.373					

3/32" Nominal Cross Section

G = 0.141/0.151 G_1 = 0.183/0.193 G_2 = 0.245/0.255

Gland Size	AS4716 Piston Seal A Cylinder Bore Dia.	AS4716 Piston Seal F Piston Groove Dia.	AS4716 Rod Seal E Rod Gland Groove Dia.	AS4716 Rod Seal B Rod Dia.	APS	Spring Ring II	400A	103A	RP II	Back-Up Rings
Dash No.	Tol. +0.002 -0.000	Tol. +0.000 -0.002	Tol. +0.002 -0.000	Tol. +0.000 -0.002						
143	2.618	2.444	2.610	2.436	■		■	■	■	■
144	2.680	2.506	2.672	2.498	■		■	■	■	■
145	2.743	2.569	2.735	2.561	■		■	■	■	■
146	2.805	2.631	2.797	2.623	■		■	■	■	■
147	2.868	2.694	2.860	2.686	■		■	■	■	■
148	2.930	2.756	2.922	2.748	■		■	■	■	■
149	2.993	2.819	2.985	2.811	■		■	■	■	■

1/8" Nominal Cross Section

G = 0.188/0.198 G_1 = 0.235/0.245 G_2 = 0.304/0.314

Gland Size	AS4716 Piston Seal A Cylinder Bore Dia.	AS4716 Piston Seal F Piston Groove Dia.	AS4716 Rod Seal E Rod Gland Groove Dia.	AS4716 Rod Seal B Rod Dia.	APS	Spring Ring II	400A	103A	RP II	Back-Up Rings
Dash No.	Tol. +0.002 -0.000	Tol. +0.000 -0.002	Tol. +0.002 -0.000	Tol. +0.000 -0.002						
210	0.991	0.750	0.989	0.748	■	■	■	■	■	■
211	1.053	0.812	1.051	0.810	■	■	■	■	■	■
212	1.116	0.874	1.115	0.873	■	■	■	■	■	■
213	1.178	0.936	1.177	0.935	■		■	■	■	■
214	1.241	0.999	1.240	0.998	■		■	■	■	■
215	1.303	1.064	1.302	1.060	■		■	■	■	■
216	1.366	1.124	1.365	1.123	■		■	■	■	■
217	1.428	1.186	1.427	1.185	■		■	■	■	■
218	1.491	1.249	1.490	1.248	■		■	■	■	■
219	1.553	1.311	1.552	1.310	■		■	■	■	■
220	1.616	1.374	1.615	1.373	■		■	■	■	■
221	1.678	1.436	1.677	1.435	■		■	■	■	■
222	1.741	1.499	1.740	1.498	■		■	■	■	■
223	1.867	1.625	1.865	1.623	■		■	■	■	■
224	1.992	1.750	1.990	1.748	■		■	■	■	■
225	2.118	1.876	2.115	1.873	■		■	■	■	■
226	2.243	2.001	2.240	1.998	■		■	■	■	■
227	2.368	2.126	2.365	2.123	■		■	■	■	■
228	2.493	2.251	2.490	2.248	■		■	■	■	■
229	2.618	2.376	2.615	2.373	■		■	■	■	■
230	2.743	2.501	2.740	2.498	■		■	■	■	■
231	2.868	2.626	2.865	2.623	■		■	■	■	■
232	2.993	2.751	2.990	2.748	■		■	■	■	■
233	3.118	2.876	3.115	2.873	■		■	■	■	■
234	3.243	3.001	3.239	2.997	■		■	■	■	■
235	3.368	3.126	3.364	3.122	■		■	■	■	■
236	3.493	3.251	3.489	3.247	■		■	■	■	■
237	3.618	3.376	3.614	3.372	■		■	■	■	■
238	3.743	3.501	3.739	3.497	■		■	■	■	■

1/8" Nominal Cross Section

G = 0.188/0.198 G_1 = 0.235/0.245 G_2 = 0.304/0.314

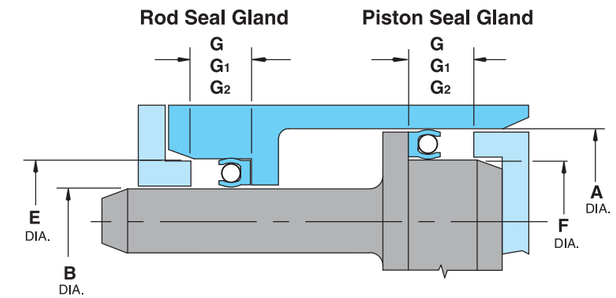
Gland Size	AS4716 Piston Seal A Cylinder Bore Dia.	AS4716 Piston Seal F Piston Groove Dia.	AS4716 Rod Seal E Rod Gland Groove Dia.	AS4716 Rod Seal B Rod Dia.	APS	Spring Ring II	400A	103A	RP II	Back-Up Rings
Dash No.	Tol. +0.002 -0.000	Tol. +0.000 -0.002	Tol. +0.002 -0.000	Tol. +0.000 -0.002						
239	3.868	3.626	3.864	3.622	■		■	■	■	■
240	3.993	3.751	3.989	3.747	■		■	■	■	■
241	4.118	3.876	4.114	3.872	■		■	■	■	■
242	4.243	4.001	4.239	3.997	■		■	■	■	■
243	4.368	4.126	4.364	4.122	■		■	■	■	■
244	4.493	4.251	4.489	4.247	■		■	■	■	■
245	4.618	4.376	4.614	4.372	■		■	■	■	■
246	4.743	4.501	4.739	4.497	■		■	■	■	■
247	4.868	4.626	4.864	4.622	■		■	■	■	■

3/16" Nominal Cross Section

G = 0.281/0.291 G_1 = 0.334/0.344 G_2 = 0.424/0.434

Gland Size	AS4716 Piston Seal A Cylinder Bore Dia.	AS4716 Piston Seal F Piston Groove Dia.	AS4716 Rod Seal E Rod Gland Groove Dia.	AS4716 Rod Seal B Rod Dia.	APS	Spring Ring II	400A	103A	RP II	Back-Up Rings
Dash No.	Tol. +0.002 -0.000	Tol. +0.000 -0.002	Tol. +0.002 -0.000	Tol. +0.000 -0.002						
325	1.867	1.495	1.870	1.498	■	Not Available in 3/16 Cross Section	■	■	■	■
326	1.992	1.620	1.995	1.623	■		■	■	■	■
327	2.118	1.746	2.120	1.748	■		■	■	■	■
328	2.243	1.871	2.245	1.873	■		■	■	■	■
329	2.368	1.996	2.370	1.998	■		■	■	■	■
330	2.493	2.121	2.495	2.123	■		■	■	■	■
331	2.618	2.246	2.620	2.248	■		■	■	■	■
332	2.743	2.371	2.745	2.373	■		■	■	■	■
333	2.868	2.496	2.870	2.498	■		■	■	■	■
334	2.993	2.621	2.995	2.623	■		■	■	■	■
335	3.118	2.746	3.120	2.748	■		■	■	■	■
336	3.243	2.871	3.245	2.873	■		■	■	■	■
337	3.368	2.996	3.369	2.997	■		■	■	■	■
338	3.493	3.121	3.494	3.122	■		■	■	■	■
339	3.618	3.246	3.619	3.247	■		■	■	■	■
340	3.743	3.371	3.744	3.372	■		■	■	■	■
341	3.868	3.496	3.869	3.497	■		■	■	■	■
342	3.993	3.621	3.994	3.622	■		■	■	■	■
343	4.118	3.746	4.119	3.747	■		■	■	■	■
344	4.243	3.871	4.244	3.872	■		■	■	■	■
345	4.368	3.996	4.369	3.997	■		■	■	■	■
346	4.493	4.121	4.494	4.122	■		■	■	■	■
347	4.618	4.246	4.619	4.247	■		■	■	■	■
348	4.743	4.371	4.744	4.372	■		■	■	■	■
349	4.868	4.496	4.869	4.497	■		■	■	■	■

Radial Seal Gland Dimensions
AS 4716



1/4" Nominal Cross Section

G = 0.375/0.385 G_1 = 0.475/0.485 G_2 = 0.579/0.589

Gland Size	AS4716 Piston Seal A Cylinder Bore Dia.	AS4716 Piston Seal F Piston Groove Dia.	AS4716 Rod Seal E Rod Gland Groove Dia.	AS4716 Rod Seal B Rod Dia.	APS	Spring Ring II	400A	103A	RP II	Back-Up Rings
Dash No.	Tol. +0.003 -0.000	Tol. +0.000 -0.003	Tol. +0.003 -0.000	Tol. +0.000 -0.003						
425	4.974	4.497	4.974	4.497	■	Not Available in 1/4 Cross Section	■	■	■	■
426	5.099	4.622	5.099	4.622	■		■	■	■	■
427	5.224	4.747	5.224	4.747	■		■	■	■	■
428	5.349	4.872	5.349	4.872	■		■	■	■	■
429	5.474	4.997	5.474	4.997	■		■	■	■	■
430	5.599	5.122	5.599	5.122	■		■	■	■	■
431	5.724	5.247	5.724	5.247	■		■	■	■	■
432	5.849	5.372	5.849	5.372	■		■	■	■	■
433	5.974	5.497	5.974	5.497	■		■	■	■	■
434	6.099	5.622	6.099	5.622	■		■	■	■	■
435	6.224	5.747	6.224	5.747	■		■	■	■	■
436	6.349	5.872	6.349	5.872	■		■	■	■	■
437	6.474	5.997	6.474	5.997	■		■	■	■	■
438	6.724	6.247	6.724	6.247	■		■	■	■	■
439	6.974	6.497	6.974	6.497	■		■	■	■	■
440	7.224	6.747	7.224	6.747	■		■	■	■	■
441	7.474	6.997	7.474	6.997	■		■	■	■	■
442	7.724	7.247	7.724	7.247	■		■	■	■	■
443	7.974	7.497	7.974	7.497	■		■	■	■	■
444	8.224	7.747	8.224	7.747	■		■	■	■	■
445	8.474	7.997	8.474	7.997	■		■	■	■	■
446	8.974	8.497	8.974	8.497	■		■	■	■	■
	Tol. +0.004 -0.000	Tol. +0.000 -0.003	Tol. +0.004 -0.000	Tol. +0.000 -0.003						
447	9.474	8.997	9.474	8.997	■		■	■	■	■
448	9.974	9.497	9.974	9.497	■		■	■	■	■
449	10.474	9.997	10.474	9.997	■		■	■	■	■
450	10.974	10.497	10.974	10.497	■		■	■	■	■
451	11.474	10.997	11.474	10.997	■		■	■	■	■
452	11.974	11.497	11.974	11.497	■		■	■	■	■
453	12.474	11.997	12.474	11.997	■		■	■	■	■
454	12.974	12.497	12.974	12.497	■		■	■	■	■
455	13.474	12.997	13.474	12.997	■		■	■	■	■
456	13.974	13.497	13.974	13.497	■		■	■	■	■

1/4" Nominal Cross Section

G = 0.375/0.385 G_1 = 0.475/0.485 G_2 = 0.579/0.589

Gland Size	AS4716 Piston Seal A Cylinder Bore Dia.	AS4716 Piston Seal F Piston Groove Dia.	AS4716 Rod Seal E Rod Gland Groove Dia.	AS4716 Rod Seal B Rod Dia.	APS	Spring Ring II	400A	103A	RP II	Back-Up Rings
Dash No.	Tol. +0.004 -0.000	Tol. +0.000 -0.003	Tol. +0.004 -0.000	Tol. +0.000 -0.003						
457	14.474	13.997	14.474	13.997	■		■	■	■	■
458	14.974	14.497	14.974	14.497	■		■	■	■	■
459	15.474	14.997	15.474	14.997	■		■	■	■	■
460	15.974	15.497	15.974	15.497	■		■	■	■	■

Installation of OmniSeals into Closed Glands

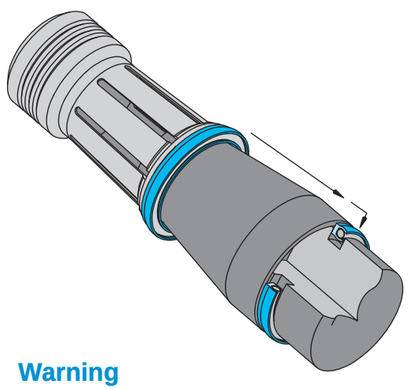
SGPPL can be of assistance in recommending the proper procedures for installation of OmniSeal®. For any questions concerning installation, consult Technical Support.

It is strongly recommended to avoid closed (non-split) glands when designing hardware for OmniSeals® (see page 23 for gland design options). When necessary, the OmniSeal® APS, 103A and 400A, with their unique spring designs, can be installed into closed glands. However, *installing Spring Ring II and OmniSeal® RP II seals into closed glands is not recommended because of possible damage to the spring.*

Installing OmniSeals into closed glands requires precautions and special tools not normally associated with the installation of rubber O-rings or U-cups.

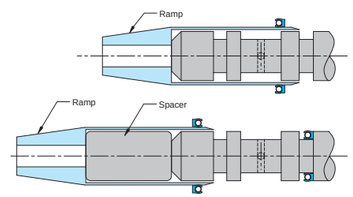
Larger seal diameters may not require a pusher tool if the seal can be pushed up the ramp with finger pressure.

Lubricants (grease, oil, etc.) compatible with the media to be sealed can make assembly easier. Installation tools are available for purchase from SGPPL.



Note:

When installing two or more OmniSeal® 103A seals into closed glands on a common shaft, the seal farthest away from the end should be installed first. By using a simple spacer the ramp can be adjusted to position the next seal and gland.



Warning

The use of common hand tools such as screwdrivers to force the OmniSeal® 103A into the closed gland will most likely damage the jacket and spring. When confronted with a closed gland design, we recommend that you to contact Technical Support (see inside back cover).

Resizing OmniSeal®

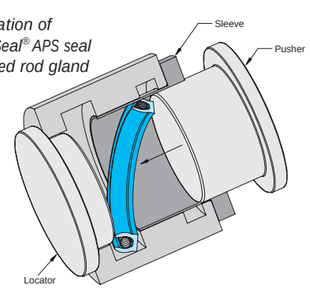
In the process of installing the OmniSeal® in the gland, the seal is expanded and normally will not recover to its nominal I.D. for some period of time. For immediate installation of the unit, it is recommended that a mechanical compression tool be used for smaller sizes. This technique will mechanically compress the seal to its original diameter.

The compression tool should be allowed to remain in place on the OmniSeal® for approximately one minute to allow time for the cover material to recover.

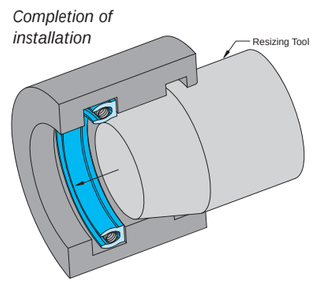
If it is not feasible to utilize the mechanical compression tool, sufficient recovery may be achieved by heating the component containing the OmniSeal®. Contact Technical Support for recommended temperatures.

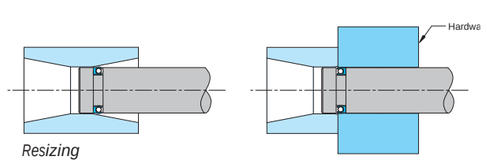
A modified compression tool can also be used as an assembly tool. After the OmniSeal® is mechanically sized, the rod with the OmniSeal® installed is inserted into the compression tool and rod housing. As the rod is pushed or pulled into the housing, the compression tool butts up against the end of the housing, providing a smooth transition for the OmniSeal® as it leaves the compression tool and enters the rod housing. This technique is especially effective when a chamfer cannot be machined on the housing I.D.

Installation of OmniSeal® APS seal in closed rod gland



Completion of installation





Resizing

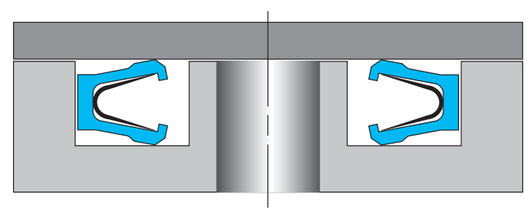
Installation into bore

Face Seals

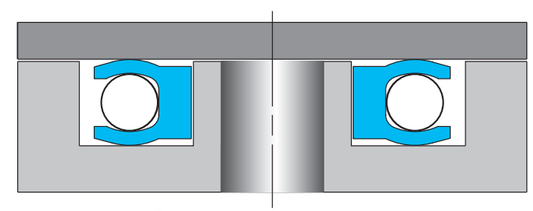
The OmniSeal® 400A, 103A, and APS series are also available in internal or external pressure face seal versions. In addition to the previously mentioned OmniSeal® designs, the OmniSeal® RACO 1100A Face Seal Series remains in a class of its own in terms of application versatility.

OmniSeal® face seals offer many advantages over radial rod or piston seal arrangements. Since an OmniSeal® does not have to be stretched or compressed into a face seal groove, standard elastomer O-ring seal grooves can be utilized. A face seal groove design generally accommodates a "zero extrusion gap" (see page 21) arrangement, allowing for high pressure sealing without the need for back-up rings.

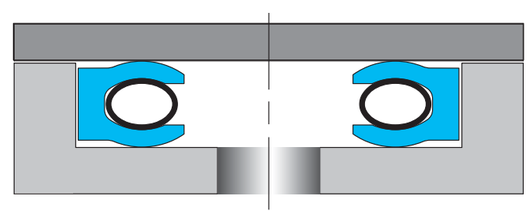
OmniSeal® face seal arrangements greatly reduce the effect of thermal expansion during temperature cycling in dynamic seal applications where precise frictional drag of the OmniSeal® must be maintained. OmniSeal® face seals are also preferable to radial seals for cryogenic sealing, as OmniSeal® diameter shrinkage does not significantly affect seal contact integrity. The OmniSeal® RACO 1100A face seal (page 20) was designed specifically for cryogenic service.



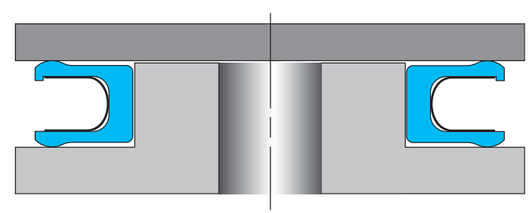
Internal pressure/closed groove



External pressure/closed groove

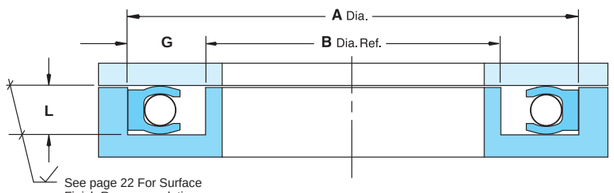


Internal pressure/open groove



External pressure/open groove

Inside Face Seal Gland Dimensions



See page 22 For Surface Finish Recommendations.

1/16" Nominal Cross Section

L = .056/.058 G = .094/.104

Gland Size Dash No.	A Dia. +.005 -.000	B Dia. Max. (Ref.)	400A	103A	1100A	APS
008	0.312	0.125		Not Available in 1/16 cross section		
009	0.343	0.156				
010	0.375	0.187				
011	0.437	0.250				
012	0.500	0.312				
013	0.562	0.375				
014	0.625	0.437				
015	0.687	0.500				
016	0.750	0.562				
017	0.812	0.625				
018	0.875	0.687				
019	0.937	0.750				
020	1.000	0.812				
021	1.062	0.875				
022	1.125	0.937				
023	1.187	1.000				
024	1.250	1.062				
025	1.312	1.125				
026	1.375	1.187				
027	1.437	1.250				
028	1.500	1.312				
029	1.625	1.437				
030	1.750	1.562				
031	1.875	1.687				
032	2.000	1.812				
033	2.125	1.937				
034	2.250	2.062				
035	2.375	2.187				
036	2.500	2.312				
037	2.625	2.437				
038	2.750	2.562				
039	2.875	2.687				
040	3.000	2.812				
041	3.125	2.937				
042	3.375	3.187				
043	3.625	3.437				
044	3.875	3.687				
045	4.125	3.937				

3/32" Nominal Cross Section

L = .089/.091 G = .141/.151

Gland Size Dash No.	A Dia. +.005 -.000	B Dia. Max. (Ref.)	400A	103A	1100A	APS
110	0.562	0.280				
111	0.625	0.343				
112	0.687	0.405				
113	0.750	0.468				
114	0.812	0.530				
115	0.875	0.593				
116	0.937	0.655				
117	1.000	0.718				
118	1.062	0.780				
119	1.125	0.843				
120	1.187	0.905				
121	1.250	0.968				
122	1.312	1.030				
123	1.375	1.093				
124	1.437	1.155				
125	1.500	1.218				
126	1.562	1.280				
127	1.625	1.343				
128	1.687	1.405				
129	1.750	1.468				
130	1.812	1.530				
131	1.875	1.593				
132	1.937	1.655				
133	2.000	1.718				
134	2.062	1.780				
135	2.125	1.843				
136	2.187	1.905				
137	2.250	1.968				
138	2.312	2.030				
139	2.375	2.093				
140	2.437	2.155				
141	2.500	2.218				
142	2.562	2.280				
143	2.625	2.343				
144	2.687	2.405				
145	2.750	2.468				
146	2.812	2.530				
147	2.875	2.593				

3/32" Nominal Cross Section

L = .089/.091 G = .141/.151

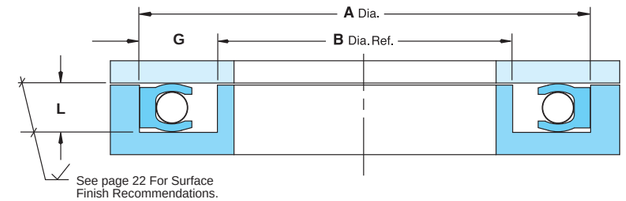
Gland Size Dash No.	A Dia. +.005 -.000	B Dia. Max. (Ref.)	400A	103A	1100A	APS
148	2.937	2.655				
149	3.000	2.718				
150	3.062	2.780				
151	3.187	2.905				
152	3.437	3.155				
153	3.687	3.405				
154	3.937	3.655				
155	4.187	3.905				
156	4.437	4.155				
157	4.687	4.405				
158	4.937	4.655				
159	5.187	4.905				
160	5.437	5.155				
161	5.687	5.405				
162	5.937	5.655				
163	6.187	5.905				

1/8" Nominal Cross Section

L = .121/.123 G = .188/.198

Gland Size Dash No.	A Dia. +.005 -.000	B Dia. Max. (Ref.)	400A	103A	1100A	APS
210	1.000	0.625				
211	1.062	0.687				
212	1.125	0.750				
213	1.187	0.812				
214	1.250	0.875				
215	1.312	0.937				
216	1.375	1.000				
217	1.437	1.062				
218	1.500	1.125				
219	1.562	1.187				
220	1.625	1.250				
221	1.687	1.312				
222	1.750	1.375				
223	1.875	1.500				
224	2.000	1.625				
225	2.125	1.750				
226	2.250	1.875				
227	2.375	2.000				
228	2.500	2.125				
229	2.625	2.250				
230	2.750	2.375				
231	2.875	2.500				
232	3.000	2.625				

Inside Face Seal Gland Dimensions



See page 22 For Surface Finish Recommendations.

1/8" Nominal Cross Section

L = .121/.123 G = .188/.198

Gland Size Dash No.	A Dia. +.005 -.000	B Dia. Max. (Ref.)	400A	103A	1100A	APS
233	3.125	2.750				
234	3.250	2.875				
235	3.375	3.000				
236	3.500	3.125				
237	3.625	3.250				
238	3.750	3.375				
239	3.875	3.500				
240	4.000	3.625				
241	4.125	3.750				
242	4.250	3.875				
243	4.375	4.000				
244	4.500	4.125				
245	4.625	4.250				
246	4.750	4.375				
247	4.875	4.500				
248	5.000	4.625				
249	5.125	4.750				
250	5.250	4.875				
251	5.375	5.000				
252	5.500	5.125				
253	5.625	5.250				
254	5.750	5.375				
255	5.875	5.500				
256	6.000	5.625				
257	6.125	5.750				
258	6.250	5.875				
259	6.500	6.125				
260	6.750	6.375				
261	7.000	6.625				
262	7.250	6.875				
263	7.500	7.125				
264	7.750	7.375				
265	8.000	7.625				
266	8.250	7.875				
267	8.500	8.125				
268	8.750	8.375				
269	9.000	8.625				
270	9.250	8.875				
271	9.500	9.125				

1/8" Nominal Cross Section

L = .121/.123 G = .188/.198

Gland Size Dash No.	A Dia. +.005 -.000	B Dia. Max. (Ref.)	400A	103A	1100A	APS
272	9.750	9.375				
273	10.000	9.625				
274	10.250	9.875				
275	10.750	10.375				
276	11.250	10.875				
277	11.750	11.375				
278	12.250	11.875				
279	12.750	12.375				
280	13.250	12.875				
281	13.750	13.375				

3/16" Nominal Cross Section

L = .186/.188 G = .281/.291

Gland Size Dash No.	A Dia. +.005 -.000	B Dia. Max. (Ref.)	400A	103A	1100A	APS
322	1.500	0.937				
323	1.625	1.062				
324	1.750	1.187				
325	1.875	1.312				
326	2.000	1.437				
327	2.125	1.562				
328	2.250	1.687				
329	2.375	1.812				
330	2.500	1.937				
331	2.625	2.062				
332	2.750	2.187				
333	2.875	2.312				
334	3.000	2.437				
335	3.125	2.562				
336	3.250	2.687				
337	3.375	2.812				
338	3.500	2.937				
339	3.625	3.062				
340	3.750	3.187				
341	3.875	3.312				
342	4.000	3.437				

3/16" Nominal Cross Section

L = .186/.188 G = .281/.291

Gland Size Dash No.	A Dia. +.005 -.000	B Dia. Max. (Ref.)	400A	103A	1100A	APS
343	4.125	3.562				
344	4.250	3.687				
345	4.375	3.812				
346	4.500	3.937				
347	4.625	4.062				
348	4.750	4.187				
349	4.875	4.312				
350	5.000	4.437				
351	5.125	4.562				
352	5.250	4.687				
353	5.375	4.812				
354	5.500	4.937				
355	5.625	5.062				
356	5.750	5.187				
357	5.875	5.312				
358	6.000	5.437				
359	6.125	5.562				
360	6.250	5.687				
361	6.500	5.937				
362	6.750	6.187				
363	7.000	6.437				
364	7.250	6.687				
365	7.500	6.937				
366	7.750	7.187				
367	8.000	7.437				
368	8.250	7.687				
369	8.500	7.937				
370	8.750	8.187				
371	9.000	8.437				
372	9.250	8.687				
373	9.500	8.937				
374	9.750	9.187				
375	10.000	9.437				
376	10.250	9.687				
377	10.500	9.937				
378	10.750	10.187				
379	11.000	10.437				
380	11.500	10.973				
381	12.000	11.437				
382	12.500	11.937				
383	13.000	12.437				
384	13.500	12.937				

Inside Face Seal Gland Dimensions

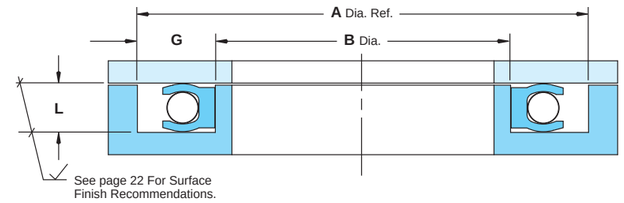
1/4" Nominal Cross Section						
L = .238/.241		G = .375/.385				
Gland Size Dash No.	A Dia. +.005 -.000	B Dia. Max. (Ref.)	400A	103A	1100A	APS
409	3.000	2.250	■	■	■	■
410	3.125	2.375	■	■	■	■
411	3.250	2.500	■	■	■	■
412	3.375	2.625	■	■	■	■
413	3.500	2.750	■	■	■	■
414	3.625	2.875	■	■	■	■
415	3.750	3.000	■	■	■	■
416	3.875	3.125	■	■	■	■
417	4.000	3.250	■	■	■	■
418	4.125	3.375	■	■	■	■
419	4.250	3.500	■	■	■	■
420	4.375	3.625	■	■	■	■
421	4.500	3.750	■	■	■	■
422	4.625	3.875	■	■	■	■
423	4.750	4.000	■	■	■	■
424	4.875	4.125	■	■	■	■
425	5.000	4.250	■	■	■	■
426	5.125	4.375	■	■	■	■
427	5.250	4.500	■	■	■	■
428	5.375	4.625	■	■	■	■
429	5.500	4.750	■	■	■	■
430	5.625	4.875	■	■	■	■
431	5.750	5.000	■	■	■	■
432	5.875	5.125	■	■	■	■
433	6.000	5.250	■	■	■	■
434	6.125	5.375	■	■	■	■
435	6.250	5.500	■	■	■	■
436	6.375	5.625	■	■	■	■
437	6.500	5.750	■	■	■	■
438	6.750	6.000	■	■	■	■
439	7.000	6.250	■	■	■	■
440	7.250	6.500	■	■	■	■
441	7.500	6.750	■	■	■	■
442	7.750	7.000	■	■	■	■
443	8.000	7.250	■	■	■	■
444	8.250	7.500	■	■	■	■
445	8.500	7.750	■	■	■	■
446	9.000	8.250	■	■	■	■
447	9.500	8.750	■	■	■	■
448	10.000	9.250	■	■	■	■
449	10.500	9.750	■	■	■	■
450	11.000	10.250	■	■	■	■
451	11.500	10.750	■	■	■	■
452	12.000	11.250	■	■	■	■
453	12.500	11.750	■	■	■	■
454	13.000	12.250	■	■	■	■
455	13.500	12.750	■	■	■	■
456	14.000	13.250	■	■	■	■

1/4" Nominal Cross Section						
L = .238/.241		G = .375/.385				
Gland Size Dash No.	A Dia. +.005 -.000	B Dia. Max. (Ref.)	400A	103A	1100A	APS
457	14.500	13.750	■	■	■	■
458	15.000	14.250	■	■	■	■
459	15.500	14.750	■	■	■	■
460	16.000	15.250	■	■	■	■

NOTE:

1. *If space permits, use the larger cross sections listed in these tables.*
2. *Diameters between those listed and diameters larger than those listed are available on request.*
3. *In-between cross sections and larger cross sections are available.*
4. *Metric sizes are also available.*

Outside Face Seal Gland Dimensions



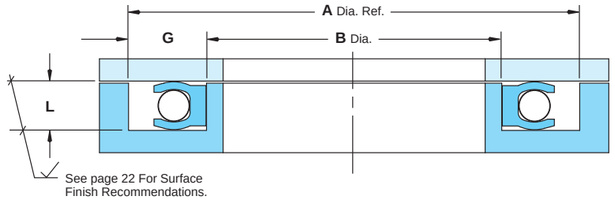
1/16" Nominal Cross Section						
L = .056/.058		G = .094/.104				
Gland Size Dash No.	A Dia. Min. (Ref.)	B Dia. +.000 -.005	400A	103A	1100A	APS
008	0.375	0.187			Not Available in 1/16 cross section	
009	0.406	0.218				
010	0.437	0.250				
011	0.500	0.312				
012	0.562	0.375				
013	0.625	0.437				
014	0.687	0.500				
015	0.750	0.562				
016	0.812	0.625				
017	0.875	0.687				
018	0.937	0.750				
019	1.000	0.812				
020	1.062	0.875				
021	1.125	0.937				
022	1.187	1.000				
023	1.250	1.062				
024	1.312	1.125				
025	1.375	1.187				
026	1.437	1.250				
027	1.500	1.312				
028	1.562	1.375				
029	1.687	1.500				
030	1.812	1.625				
031	1.937	1.750				
032	2.062	1.875				
033	2.187	2.000				
034	2.312	2.125				
035	2.437	2.250				
036	2.562	2.375				
037	2.687	2.500				
038	2.812	2.625				
039	2.937	2.750				
040	3.062	2.875				
041	3.187	3.000				
042	3.437	3.250				
043	3.687	3.500				
044	3.937	3.750				
045	4.187	4.000				

3/32" Nominal Cross Section						
L = .089/.091		G = .141/.151				
Gland Size Dash No.	A Dia. Min. (Ref.)	B Dia. +.000 -.005	400A	103A	1100A	APS
110	0.657	0.375	■	■	■	■
111	0.719	0.437	■	■	■	■
112	0.782	0.500	■	■	■	■
113	0.844	0.562	■	■	■	■
114	0.907	0.625	■	■	■	■
115	0.969	0.687	■	■	■	■
116	1.032	0.750	■	■	■	■
117	1.094	0.812	■	■	■	■
118	1.157	0.875	■	■	■	■
119	1.219	0.937	■	■	■	■
120	1.282	1.000	■	■	■	■
121	1.344	1.062	■	■	■	■
122	1.407	1.125	■	■	■	■
123	1.469	1.187	■	■	■	■
124	1.532	1.250	■	■	■	■
125	1.594	1.312	■	■	■	■
126	1.657	1.375	■	■	■	■
127	1.719	1.437	■	■	■	■
128	1.782	1.500	■	■	■	■
129	1.844	1.562	■	■	■	■
130	1.907	1.625	■	■	■	■
131	1.969	1.687	■	■	■	■
132	2.032	1.750	■	■	■	■
133	2.094	1.812	■	■	■	■
134	2.157	1.875	■	■	■	■
135	2.219	1.937	■	■	■	■
136	2.282	2.000	■	■	■	■
137	2.344	2.062	■	■	■	■
138	2.407	2.125	■	■	■	■
139	2.469	2.187	■	■	■	■
140	2.532	2.250	■	■	■	■
141	2.594	2.312	■	■	■	■
142	2.657	2.375	■	■	■	■
143	2.719	2.437	■	■	■	■
144	2.782	2.500	■	■	■	■
145	2.844	2.562	■	■	■	■
146	2.907	2.625	■	■	■	■
147	2.969	2.687	■	■	■	■
148	3.032	2.750	■	■	■	■

3/32" Nominal Cross Section						
L = .089/.091		G = .141/.151				
Gland Size Dash No.	A Dia. Min. (Ref.)	B Dia. +.000 -.005	400A	103A	1100A	APS
149	3.094	2.812	■	■	■	■
150	3.157	2.875	■	■	■	■
151	3.282	3.000	■	■	■	■
152	3.532	3.250	■	■	■	■
153	3.782	3.500	■	■	■	■
154	4.032	3.750	■	■	■	■
155	4.282	4.000	■	■	■	■
156	4.532	4.250	■	■	■	■
157	4.782	4.500	■	■	■	■
158	5.032	4.750	■	■	■	■
159	5.282	5.000	■	■	■	■
160	5.532	5.250	■	■	■	■
161	5.782	5.500	■	■	■	■
162	6.032	5.750	■	■	■	■
163	6.282	6.000	■	■	■	■

1/8" Nominal Cross Section						
L = .121/.123		G = .188/.198				
Gland Size Dash No.	A Dia. Min. (Ref.)	B Dia. +.000 -.005	400A	103A	1100A	APS
208	1.000	0.625		■	■	■
209	1.063	0.687		■	■	■
210	1.125	0.750	■	■	■	■
211	1.188	0.812	■	■	■	■
212	1.250	0.875	■	■	■	■
213	1.313	0.937	■	■	■	■
214	1.375	1.000	■	■	■	■
215	1.438	1.062	■	■	■	■
216	1.500	1.125	■	■	■	■
217	1.563	1.187	■	■	■	■
218	1.625	1.250	■	■	■	■
219	1.688	1.312	■	■	■	■
220	1.750	1.375	■	■	■	■
221	1.813	1.437	■	■	■	■
222	1.875	1.500	■	■	■	■
223	2.000	1.625	■	■	■	■
224	2.125	1.750	■	■	■	■
225	2.250	1.875	■	■	■	■
226	2.375	2.000	■	■	■	■
227	2.500	2.125	■	■	■	■
228	2.625	2.250	■	■	■	■
229	2.750	2.375	■	■	■	■
230	2.875	2.500	■	■	■	■
231	3.000	2.625	■	■	■	■
232	3.125	2.750	■	■	■	■

Outside Face Seal Gland Dimensions



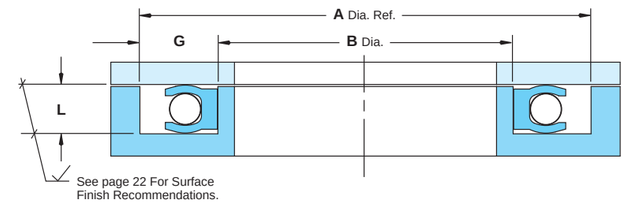
1/8" Nominal Cross Section						
L = .121/.123		G = .188/.198				
Gland Size Dash No.	A Dia. Min. (Ref.)	B Dia. +.000 -.005	400A	103A	1100A	APS
233	3.325	2.875				
234	3.375	3.000				
235	3.500	3.125				
236	3.625	3.250				
237	3.750	3.375				
238	3.875	3.500				
239	4.000	3.625				
240	4.125	3.750				
241	4.250	3.875				
242	4.375	4.000				
243	4.500	4.125				
244	4.625	4.250				
245	4.750	4.375				
246	4.875	4.500				
247	5.000	4.625				
248	5.125	4.750				
249	5.250	4.875				
250	5.375	5.000				
251	5.500	5.125				
252	5.625	5.250				
253	5.750	5.375				
254	5.875	5.500				
255	6.000	5.625				
256	6.125	5.750				
257	6.250	5.875				
258	6.375	6.000				
259	6.625	6.250				
260	6.875	6.500				
261	7.125	6.750				
262	7.375	7.000				
263	7.625	7.250				
264	7.875	7.500				
265	8.125	7.750				
266	8.375	8.000				
267	8.625	8.250				
268	8.875	8.500				
269	9.125	8.750				
270	9.375	9.000				
271	9.625	9.250				

1/8" Nominal Cross Section						
L = .121/.123		G = .188/.198				
Gland Size Dash No.	A Dia. Min. (Ref.)	B Dia. +.000 -.005	400A	103A	1100A	APS
272	9.875	9.500				
273	10.125	9.750				
274	10.375	10.000				
275	10.875	10.500				
276	11.375	11.000				
277	11.875	11.500				
278	12.375	12.000				
279	13.375	13.000				
280	14.375	14.000				
281	15.375	15.000				

3/16" Nominal Cross Section						
L = .186/.188		G = .281/.291				
Gland Size Dash No.	A Dia. Min. (Ref.)	B Dia. +.000 -.005	400A	103A	1100A	APS
325	2.062	1.500				
326	2.187	1.625				
327	2.312	1.750				
328	2.437	1.875				
329	2.562	2.000				
330	2.687	2.125				
331	2.812	2.250				
332	2.937	2.375				
333	3.062	2.500				
334	3.187	2.625				
335	3.312	2.750				
336	3.437	2.875				
337	3.562	3.000				
338	3.687	3.125				
339	3.812	3.250				
340	3.937	3.375				
341	4.062	3.500				
342	4.187	3.625				
343	4.312	3.750				
344	4.437	3.875				
345	4.562	4.000				

3/16" Nominal Cross Section						
L = .186/.188		G = .281/.291				
Gland Size Dash No.	A Dia. Min. (Ref.)	B Dia. +.000 -.005	400A	103A	1100A	APS
346	4.687	4.125				
347	4.812	4.250				
348	4.937	4.375				
349	5.062	4.500				
350	5.187	4.625				
351	5.312	4.750				
352	5.437	4.875				
353	5.562	5.000				
354	5.687	5.125				
355	5.812	5.250				
356	5.937	5.375				
357	6.062	5.500				
358	6.187	5.625				
359	6.312	5.750				
360	6.437	5.875				
361	6.562	6.000				
362	6.687	6.125				
363	6.812	6.250				
364	7.062	6.500				
365	7.312	6.750				
366	7.562	7.000				
367	7.812	7.250				
368	8.062	7.500				
369	8.312	7.750				
370	8.562	8.000				
371	8.812	8.250				
372	9.062	8.500				
373	9.312	8.750				
374	9.562	9.000				
375	9.812	9.250				
376	10.062	9.500				
377	10.312	9.750				
378	10.562	10.000				
379	10.812	10.250				
380	11.062	10.500				
381	11.312	10.750				
382	12.562	11.000				
383	12.062	11.500				
384	12.562	12.000				

Outside Face Seal Gland Dimensions



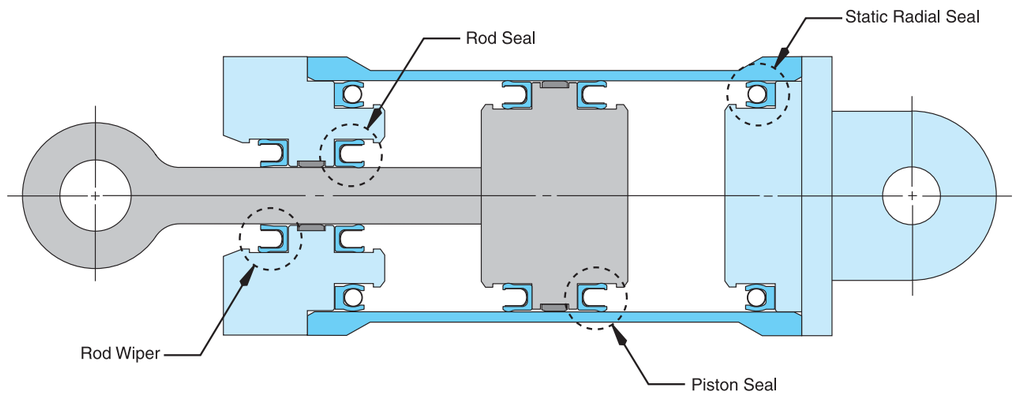
1/4" Nominal Cross Section						
L = .238/.241		G = .375/.385				
Gland Size Dash No.	A Dia. Min. (Ref.)	B Dia. +.000 -.005	400A	103A	1100A	APS
409	3.250	2.500				
410	3.375	2.625				
411	3.500	2.750				
412	3.625	2.875				
413	3.750	3.000				
414	3.875	3.125				
415	4.000	3.250				
416	4.125	3.375				
417	4.250	3.500				
418	4.375	3.625				
419	4.500	3.750				
420	4.625	3.875				
421	4.750	4.000				
422	4.875	4.125				
423	5.000	4.250				
424	5.125	4.375				
425	5.250	4.500				
426	5.375	4.625				
427	5.500	4.750				
428	5.625	4.875				
429	5.750	5.000				
430	5.875	5.125				
431	6.000	5.250				
432	6.125	5.375				
433	6.250	5.500				
434	6.375	5.625				
435	6.500	5.750				
436	6.625	5.875				
437	6.750	6.000				
438	7.000	6.250				
439	7.250	6.500				
440	7.500	6.750				
441	7.750	7.000				
442	8.000	7.250				
443	8.250	7.500				
444	8.500	7.750				
445	8.750	8.000				
446	9.250	8.500				
447	9.750	9.000				

1/4" Nominal Cross Section						
L = .238/.241		G = .375/.385				
Gland Size Dash No.	A Dia. Min. (Ref.)	B Dia. +.000 -.005	400A	103A	1100A	APS
448	10.250	9.500				
449	10.750	10.000				
450	11.250	10.500				
451	11.750	11.000				
452	12.250	11.500				
453	12.750	12.000				
454	13.250	12.500				
455	13.750	13.000				
456	14.250	13.500				
457	14.750	14.000				
458	15.250	14.500				
459	15.750	15.000				
460	16.250	15.500				

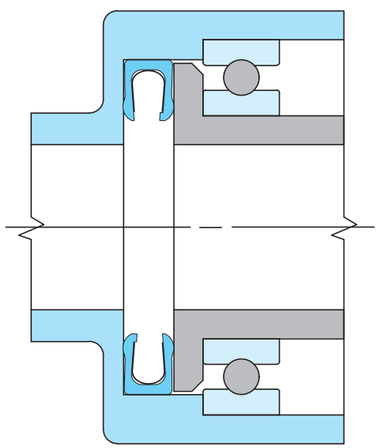
NOTE:

1. *If space permits, use the larger cross sections listed in these tables.*
2. *Diameters between those listed and diameters larger than those listed are available on request.*
3. *In-between cross sections and larger cross sections are available.*
4. *Metric sizes are also available.*

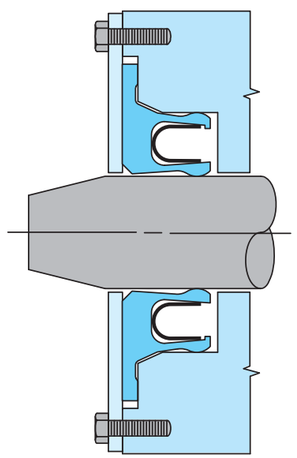
Typical Installations



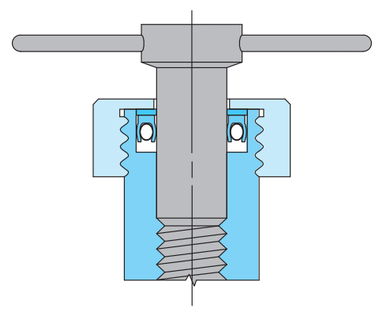
Rotary Face Seal



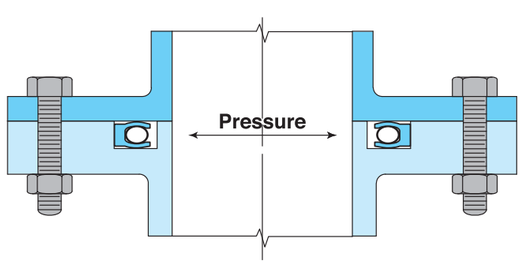
Rotary Shaft Seal



Valve Stem Seal

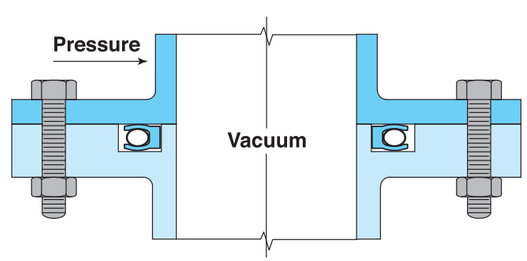


Static Face Seal (Internal Pressure)



Inside face seal

Static Face Seal (External Pressure & Internal Vacuum)



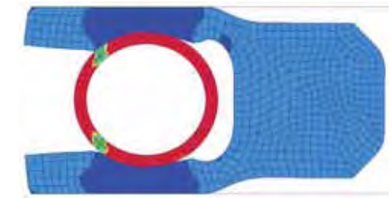
Outside face seal

Special Seal Designs

Design Capabilities

For more than 30 years SGPPL has dedicated its engineering efforts to solving difficult and unique sealing problems. With each challenge we gain greater insight into the science of specialized sealing.

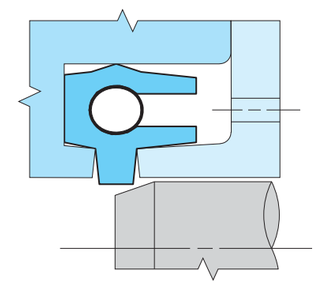
Today, aided by advanced 3-D modeling software and the latest visualizing innovations, our team of skilled design engineers is exploring the next generation of sealing applications. Utilization of Finite Element Analysis (FEA) as a viable design and production tool facilitates higher productivity, design confidence, reduction in testing time and resultant cost savings.



Finite Element Analysis stress plot simulating seal jacket deflection.

Anti-Blowout Seal

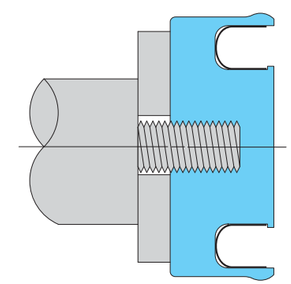
This unique design has been used in the valve industry for over 40 years. In applications requiring the rod to disengage from the seal, the anti-blowout design prevents the dynamic sealing lip from deforming under pressure.



Anti-blowout seal

Integral Piston Seal

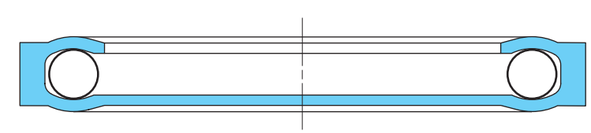
For small diameter applications at moderate pressures, the integral piston seal is an innovative approach to reducing the number of precision machined metal parts and components. In addition to being easy to assemble, this design serves as a seal and as a guide bearing.



Integral piston seal

Diaphragm Seals

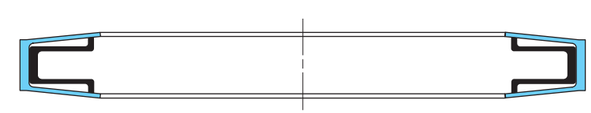
This design combines a flexible disk and static face seal in a single unit. Diaphragm seals offer chemical equipment designers a simple yet advanced method for handling corrosive fluids in actuating valves and small metering pumps.



Diaphragm seals

Machined Spring Face Seal

The machined spring seal is a solid ring of metal covered by a thin PTFE jacket. The solid spring is impermeable to light gases like hydrogen and helium, and provides extremely low leak rate sealing. It is also an excellent face seal for sealing hard vacuums.

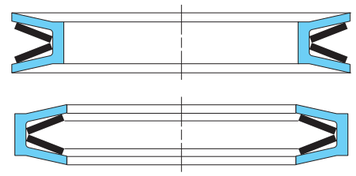


Machined spring face seal

Belleville spring seal

Belleville Spring Seals

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

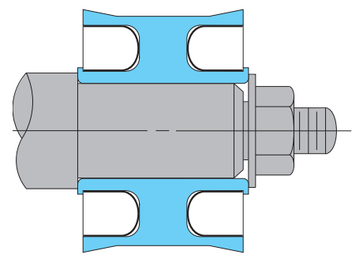


Belleville spring seals

Bi-directional seals

Bi-Directional Seals

This versatile design combines two seals and a guide bearing into a one-piece component. The bi-directional seal is found in 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.

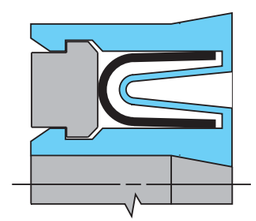


Bi-directional seals

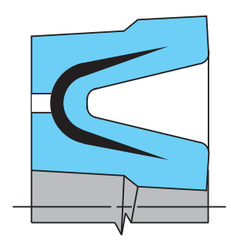
Sanitary seals

Sanitary Seals

The RS and JS designs shield the spring from the media to prevent entrapment in the spring and allow easier cleaning. Excellent in food filling and other dispensing equipment.



JS seal



RS seal

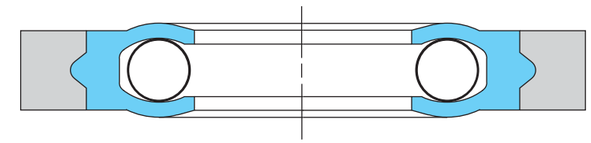
Special Seal Designs

OmniGasket®

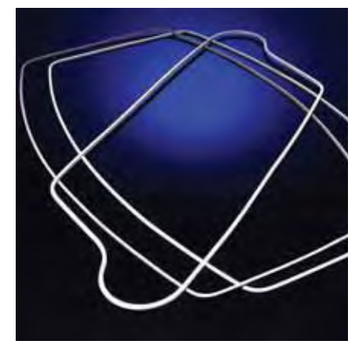
OmniGasket®

OmniGaskets are spring energized face seals retained in a metal gasket designed to customer specifications. They offer the advantages of a ready-made seal groove (saving hardware design and machining cost), and easy changeout of the seals in the field.

These are two reasons why OmniGasket® is gaining wide acceptance in gas turbine engine and aerospace hydraulic applications.



OmniGasket



Formed seals

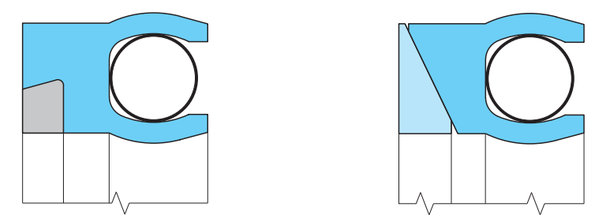
Formed Seals

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

High pressure seals

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 sideloads.

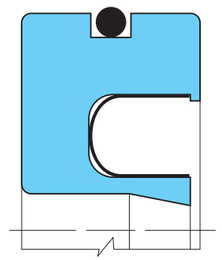


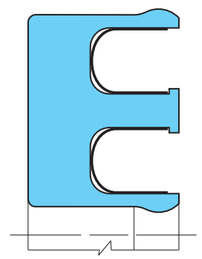
High pressure seals with back-up rings

Multiple energizers

Multiple Energizers

Seals with more than one energizer are recommended for retrofitting large cross section glands to maintain adequate sealing on both the I.D. and O.D.



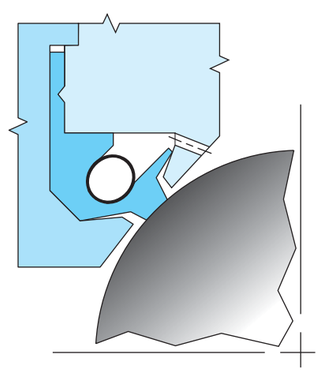


Multiple energizers

Ball valve seals

Anti-Blowout Ball Valve Seals

Ball valve seals are machined to the exacting 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. SGPPL engineers will assist in designing a captive anti-blowout feature into hardware, as shown in the diagram on the right.



Anti-blowout ball valve seals

Name: _____ **Title:** _____

Company: _____ **Date:** _____

Address: _____

City: _____ **State:** _____ **Zip:** _____

Phone: _____ **Fax:** _____ **E-mail:** _____

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:** _____

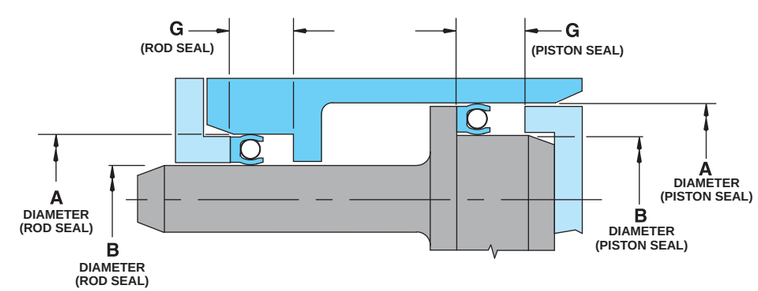
B Diameter: _____ **Tolerance:** _____

Can gland be changed ☐ **Yes** ☐ **No**

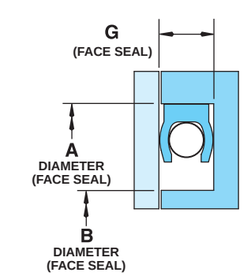
G Dimension: _____ **Tolerance:** _____

	Dynamic Surface	Static Surface
Hardware Material	_____	_____
Hardness	_____HRC	_____HRC
Finish	_____Ra	_____Ra

Radial Seal Grooves (Rod/Piston)



Face Seal Groove



Please Fax or E-mail a copy of the completed Application Data Form to:
Saint-Gobain Performance Plastics
Fax: 714-688-2702
E-Mail: sealsmarketing@saint-gobain.com

Warranty

WARNING: BEFORE USE OR INCORPORATION INTO A FINISHED GOOD, EACH PRODUCT MANUFACTURED OR SOLD BY SAINT-GOBAIN PERFORMANCE PLASTICS CORPORATION (EACH HEREINAFTER REFERRED TO AS A "PRODUCT") MUST BE TESTED AND EVALUATED BY THE END-USER UNDER ACTUAL SERVICE CONDITIONS WITH SUFFICIENT SAFETY FACTORS TO DETERMINE IF SUCH PRODUCT IS SUITABLE FOR THE INTENDED USE. THE END-USER, THROUGH ITS OWN ANALYSIS AND TESTING, IS SOLELY RESPONSIBLE FOR THE SUITABILITY OF THE PRODUCT FOR ITS INTENDED USE AND FOR COMPLIANCE OF THE PRODUCT WITH ALL APPLICABLE PERFORMANCE, SAFETY AND WARNING REQUIREMENTS. THE END-USER ASSUMES ALL RISK AND LIABILITY WHATSOEVER IN CONNECTION WITH THE USE OF THE PRODUCTS IN ANY FINISHED GOOD MANUFACTURED BY END-USER.

FAILURE OF A PRODUCT CAN CAUSE EQUIPMENT FAILURE, PROPERTY DAMAGE, PERSONAL INJURY, AND/OR DEATH. FINISHED GOODS INCORPORATING OR USING A PRODUCT MUST BE DESIGNED WITH SAFETY FEATURES TO PREVENT PROPERTY DAMAGE, PERSONAL INJURY, AND/OR DEATH THAT CAN RESULT IN THE EVENT OF A PARTIAL OR TOTAL FAILURE OF THE PRODUCTS.

Any statements, technical information, and recommendations in this publication are believed to be reliable, but the accuracy or completeness thereof is not guaranteed. The statements, technical information, and recommendations in this publication shall not be the basis of buyer's decision to purchase the Product and should not be relied upon to establish specification limits or as the basis of design. Saint-Gobain Performance Plastics Corporation makes no warranties, express or implied, and assumes no liability in connection with the use of the statements, technical information, and recommendations in this publication. Saint-Gobain Performance Plastics Corporation reserves the right to make any changes without notice to the Products and to the information and contents of this or any other publication, including, without limitation, materials, dimensional attributes,performance characteristics and other properties.

Nothing contained herein or in any of our literature shall be considered a license or recommendation to use any process or to manufacture or to use any product in a manner which otherwise infringes any patent or other intellectual product right of Saint-Gobain Performance Plastics Corporation or of any third party.

IF ANY PRODUCT IS RESOLD BY BUYER, A COPY OF THIS NOTICE MUST BE PROVIDED TO THE SUBSEQUENT PURCHASER/END-USER.

Terms and Conditions

1. Acceptance Of Orders/Terms: All orders are subject to acceptance by Saint-Gobain Performance Plastics Corporation ("SGPPL") at its Wayne, New Jersey headquarters. SGPPL reserves the right to reject any order. Possession of a price list does not constitute an offer to sell. Acceptance of any order by SGPPL is expressly conditioned on Customer's assent to the terms and conditions set forth herein ("Terms") and the waiver by Customer of any terms and conditions contained in any order form, confirmation, or any other communication of Customer, whether previously or hereafter delivered to SGPPL, which either add to, differ from, modify, conflict with or are otherwise inconsistent with any term or condition herein. SGPPL hereby gives notice of its objection to any additional or different terms or conditions in any such order form, confirmation or communication. Customer's failure to object in writing to these Terms prior to the earlier of Customer's acceptance of the products ordered or fifteen (15) days after delivery thereof to Customer will constitute agreement by Customer to these Terms.

2. Product Changes: SGPPL reserves the right to discontinue the manufacture or sale of any product at any time or to alter, modify or redesign its products.

3. Price: All prices are subject to change without notice. Should any governmental action or request prevent SGPPL from implementing any price or continuing any price already in effect, SGPPL may at its option cancel Customer's order or any part thereof.

4. Taxes/Duties: All federal, state or local sales, use or other taxes, and all duties, import fees or other assessments imposed on materials sold hereunder, or on the manufacture, sale or delivery thereof, shall be for Customer's account.

5. Credit Approval: Customer credit approval is required prior to any shipment. If SGPPL determines at any time that Customer's financial condition does not justify the extension of credit to Customer, then SGPPL may at its option require cash payments in advance or other satisfactory security prior to delivery.

6. Cancellation/Change Orders: Orders for standard products may only be revised or canceled by Customer prior to the date of loading at the place of shipment, and only with SGPPL's prior consent. Orders for nonstandard or custom products may only be revised or canceled by Customer prior to the commencement of production, and only with SGPPL's prior consent. Any product which SGPPL has the capability of producing but does not inventory, or does not have the capability of producing, is considered a nonstandard or custom product.

7. Packaging/Shipping/Risk of Loss: Unless otherwise agreed to by SGPPL in writing (i) SGPPL shall select the method of shipment, (ii) SGPPL shall ship materials FOB (SGPPL's point of shipment), and (iii) costs for special packaging and/or handling requested by Customer shall be the responsibility of Customer. In the event of any general freight increase or any governmental ruling or regulation that results in increased freight costs, such additional costs shall be for Customer's account. Title to, and the risk of loss, damage or shortage of, such materials shall pass to Customer upon delivery to the carrier regardless of notice to Customer. SGPPL assumes no responsibility for insuring shipments unless specifically agreed to in writing by SGPPL, in which case the cost of insurance shall be for Customer's account.

8. Delivery: Quoted shipping and/or delivery dates are based on estimates at the time of quotation. SGPPL shall use reasonable commercial efforts to meet such shipping and/or delivery dates, but SGPPL shall not be liable for any direct or indirect costs or damages, including without limitation incidental or consequential damages, resulting from late deliveries. For orders with indefinite delivery dates, SGPPL shall have the right to manufacture or procure the materials covered thereby and hold such materials for Customer's account pending receipt of definite shipping instructions. Except as expressly provided otherwise herein, Customer agrees to purchase and pay for all material ordered.

9. Claims for Loss, Damage or Shortage: Upon delivery, shipments must be inspected by Customer for damage, loss or shortage prior to acceptance from the carrier. If damage, loss or shortage exists with respect to any shipment and it is not concealed, Customer shall secure a notation of such damage, loss or shortage from the carrier on the freight bill or delivery receipt. If damage, loss or shortage is concealed, Customer must notify the carrier within 15 days, hold the merchandise for its inspection and secure a signed report from the carrier acknowledging the damage, loss or shortage. No claims for damage, loss or shortage will be allowed unless they are accompanied by an inspection report or signed delivery receipt noting such damage, loss or shortage signed by a representative of the carrier and forwarded to SGPPL within 30 days of the invoice date. Any claims for damage, loss or shortage should also be filed by Customer with the carrier in writing immediately upon receipt of the materials. In no event shall SGPPL be liable for damage or loss to a shipment caused by a carrier.

10. Payment: All invoices, whether partial or in full, shall be due and payable in full by Customer net 30 days from the date of shipment unless otherwise agreed to in writing by SGPPL. All past due, unpaid balances will bear a service charge of the lesser of one and one-half percent (1 1/2%) per month or the maximum interest rate permitted by applicable law. If Customer (i) becomes insolvent, files or has filed against it a petition in bankruptcy, makes any assignment for the benefit of creditors, or has a receiver or trustee appointed for it or its property, (ii) takes action to liquidate or otherwise cease doing business as a going concern, (iii) undergoes a change in ownership, (iv) fails to provide adequate assurance or security for credit extended, or (v) takes any other action that SGPPL determines in its sole discretion adversely impacts the conditions under which credit was extended, then all amounts outstanding from Customer hereunder shall at SGPPL's option become immediately due and payable. ALL PAYMENTS, WHETHER UNDER THE STANDARD PAYMENT TERMS OR OTHERWISE, SHALL BE CONSIDERED RECEIVED BY SGPPL AS FOLLOWS: (A) FOR PAYMENTS BY CHECK, WHEN THE CHECK IS RECEIVED AT SGPPL'S DESIGNATED PAYMENT LOCATION, AND (B) FOR PAYMENTS BY ELECTRONIC FUNDS TRANSFER, THE BUSINESS DAY IMMEDIATELY PRECEDING THE DAY ON WHICH THE FUNDS ARE IMMEDIATELY AVAILABLE TO SGPPL. Customer shall pay all undisputed invoices regardless of any dispute that may exist as to other delivered or undelivered goods. With respect to any disputed invoice, Customer shall pay all amounts not in dispute. Customer expressly waives the right to assert any offset or counterclaim with respect to amounts due under any invoice issued by SGPPL hereunder.

11. Returned Materials: Material may only be returned with the prior approval of SGPPL. Material returned without such approval will not be accepted and such approval may be conditioned upon customer paying a restocking charge of up to 25% and freight costs of returned material (and out-freight if applicable). All returned materials must arrive at the point of return designated by SGPPL in salable condition, as determined by SGPPL's Quality Control Department, before any credit will be issued.

Terms and Conditions

12. Warranty/Limitation of Liability: EXCEPT FOR PRODUCTS FOR WHICH SGPPL HAS ESTABLISHED A SPECIFIC WRITTEN WARRANTY, THE GOODS DELIVERED HEREUNDER ARE SOLD BY SGPPL WITHOUT ANY GUARANTY AND/OR WARRANTY, ORAL OR WRITTEN (WHETHER OR NOT SUCH GOODS REMAIN IN THE FORM IN WHICH THEY ARE ORIGINALLY DELIVERED TO CUSTOMER OR ARE FABRICATED BY CUSTOMER OR ANY OTHER PARTY TO PRODUCE A FINISHED PRODUCT). THE PRODUCT-SPECIFIC WRITTEN WARRANTIES REFERENCED ABOVE AND HEREBY INCORPORATED HEREIN ARE IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, ORAL OR WRITTEN, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL SGPPL BE RESPONSIBLE FOR CONSEQUENTIAL, INCIDENTAL, INDIRECT OR SPECIAL DAMAGES OF ANY KIND, INCLUDING, WITHOUT LIMITATION, ANY EXPENSE FOR REMOVAL OR REINSTALLATION RESULTING FROM ANY DEFECT, INCLUDING ANY DIMENSIONAL DEFECT INVOLVING NONSTANDARD PRODUCTS. SOME JURISDICTIONS DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, OR OF ANY EXPRESS OR IMPLIED WARRANTIES, SO THE ABOVE EXCLUSION MAY NOT APPLY TO CUSTOMER. THE WARRANTY PROVIDED BY SGPPL GIVES CUSTOMER SPECIFIC LEGAL RIGHTS, AND CUSTOMER MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM JURISDICTION TO JURISDICTION. NO FIELD REPRESENTATIVE, DISTRIBUTOR OR DEALER OF SGPPL IS AUTHORIZED TO MAKE ANY CHANGE OR MODIFICATION TO THESE WARRANTIES.

13. Remedies For Non-Warranty Claims: THE SOLE AND EXCLUSIVE REMEDY OF CUSTOMER AND THE SOLE AND EXCLUSIVE OBLIGATION OF SGPPL IN CONNECTION WITH CLAIMS RELATING TO MANUFACTURING DEFECTS ARE SET FORTH IN SECTION 12. THE SOLE AND EXCLUSIVE REMEDY OF CUSTOMER AND THE SOLE AND EXCLUSIVE OBLIGATION OF SGPPL FOR ANY BREACH OF CONTRACT CLAIM THAT MATERIALS DELIVERED DO NOT OTHERWISE CONFORM TO THE ACCEPTED ORDER SHALL BE EITHER THE RETURN OF CONSIDERATION PAID BY CUSTOMER TO SGPPL RELATED TO THE BREACH, OR UPON SGPPL'S ELECTION, THE DELIVERY OF CONFORMING PRODUCTS TO CUSTOMER. WITH RESPECT TO SGPPL'S NONCOMPLIANCE WITH ANY OTHER OBLIGATION OF SGPPL HEREUNDER, THE SOLE AND EXCLUSIVE REMEDY OF CUSTOMER AND THE SOLE AND EXCLUSIVE OBLIGATION OF SGPPL WILL BE AS SGPPL IN ITS DISCRETION WILL DETERMINE AS FOLLOWS: (1) SGPPL MAY ELECT TO CURE SUCH NONCOMPLIANCE WITHIN A REASONABLE PERIOD OF TIME, OR (2) IF SGPPL FAILS TO CURE SUCH NONCOMPLIANCE, CUSTOMER MAY RECOVER AN EQUITABLE AMOUNT NOT TO EXCEED SUCH CHARGES AS WERE PREVIOUSLY PAID TO SGPPL BY CUSTOMER HEREUNDER. CUSTOMER WAIVES ALL OTHER REMEDIES, STATUTORY OR OTHERWISE, INCLUDING, WITHOUT LIMITATION, THE REMEDIES OF SPECIFIC PERFORMANCE AND REPLEVIN. ANY ACTION BROUGHT BY CUSTOMER IN CONNECTION WITH SGPPL'S PERFORMANCE HEREUNDER MUST BE COMMENCED WITHIN SIX (6) MONTHS AFTER SUCH CAUSE OF ACTION ACCRUES OR IT WILL BE DEEMED WAIVED. SGPPL'S LIABILITY TO CUSTOMER, REGARDLESS OF WHETHER SUCH LIABILITY ARISES IN CONTRACT, TORT (INCLUDING, WITHOUT LIMITATION, NEGLIGENCE OR STRICT LIABILITY) OR OTHERWISE, SHALL IN NO EVENT EXCEED AMOUNTS PAID BY CUSTOMER TO SGPPL FOR THE PRODUCTS INVOLVED, AND CUSTOMER RELEASES SGPPL FROM ALL CLAIMS AND LIABILITIES IN EXCESS OF THIS LIMITATION. IN NO EVENT SHALL SGPPL BE RESPONSIBLE FOR CONSEQUENTIAL, INCIDENTAL, INDIRECT OR SPECIAL DAMAGES OF ANY KIND.

14. Excused Performance: SGPPL shall not be liable for nor be deemed to be in default of these Terms on account of any failure to perform its obligations or attempt to cure any breach thereof if SGPPL has been delayed or prevented from doing so by any cause or condition beyond SGPPL's reasonable control. If SGPPL determines that its ability to supply the total demand for the products, or obtain any or a sufficient quantity of any material used directly or indirectly in the manufacture of the products, is hindered, limited or made impracticable, SGPPL may allocate its available supply of the products or such material (without obligation to require other supplies of any such products or material) among itself and its customers as SGPPL determines in its sole discretion without liability for any failure of performance which may result therefrom. Delivery suspended or not made by reason of this action shall be canceled without liability, but these Terms shall otherwise remain unaffected.

15. Fair Labor Standards Act: SGPPL hereby certifies that the materials sold hereunder that were produced in the United States were produced in compliance with all applicable requirements of Sections 6, 7 and 12 of the Fair Labor Standards Act, as amended, and of regulations and orders of the United States Department of Labor issued under Section 14 thereof.

16. Change In Terms And Conditions Of Sale: The terms and conditions contained herein constitute the entire agreement between SGPPL and Customer and supersede any and all prior representations, agreements or understandings, whether oral or written, relative to the materials delivered hereunder. No course of dealing or usage of trade shall be relevant to supplement or explain any of these terms or conditions. No modification of these terms and conditions shall be effective unless made in writing and executed by SGPPL.

17. General: This agreement shall not be assigned by Customer without the prior written consent of SGPPL, and any assignment made without such consent shall be null and void. This agreement shall inure to the benefit of and be binding upon the parties hereto and their respective successors and permitted assigns. This agreement shall be governed by and construed in accordance with the laws of the State of New Jersey, without giving effect to its conflicts of law provisions. The courts located in New Jersey shall have exclusive jurisdiction of all matters relating to or arising out of any sale of materials by SGPPL to Customer hereunder, and Customer hereby consents to the jurisdiction of such courts.

Other Products

Boss seals

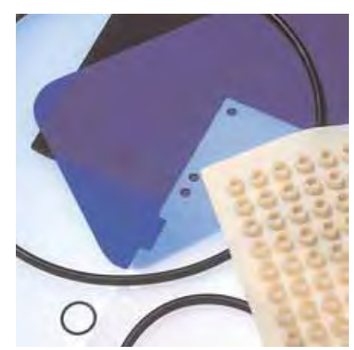
Boss Seals

The metal Boss Seal is a pressure loaded, positive sealing device designed for service in port-to-tube fitting applications beyond the capabilities of elastomer O-rings.

OmniLip™ seals

OmniLip™ Seals

Saint-Gobain Performance Plastics designs and manufacturers a complete line of rotary lip seals for high speed and/or high pressure rotary applications.



OmniFlex™ seals

OmniFlex™ Seals

A proprietary fluoroelastomer material with performance factors that exceed perfluoroelastomer materials. Available in O-rings and standard and custom shapes.

Custom Applications

Custom Applications

A team of professionals is available to assist with complex and unique sealing requirements. From customer service to engineering design, Saint-Gobain Performance Plastics is committed to the success of the toughest sealing applications in the world.

For complete information on these seal products, contact the nearest High-Performance Seal location.

SAINT-GOBAIN
PERFORMANCE PLASTICS

High-Performance Seals Worldwide

Saint-Gobain
Performance Plastics
High-Performance Seals
7301 Orangewood Avenue
Garden Grove, CA 92841-1411
Tel.: (714) 995-1818
Fax: (714) 688-2702

Saint-Gobain
Performance Plastics
22, Heiveldekens
B-2550 Kontich
Belgium
Tel.: (+32) 3 458-2828
Fax: (+32) 3 458-2669

Saint-Gobain
Performance Plastics
Saint-Gobain Norton KK
10801-5, Haramura
Suwa-gun, Nagano, 391-0106
Japan
Tel.: (+81) 266-79-6400
Fax: (+81) 266-70-1001

		INJECTION MOLDING	AGRICULTURAL PLASTICS	NORGLIDE® BEARINGS	NORSLIDE®	OMNILIP™	OMNISEAL®	MELDIN®	RULON®	RAM EXTRUSION	MACHINED & MOLDED COMPONENTS
NORTH AMERICA											
* Saint-Gobain Performance Plastics Corporation Wayne, New Jersey • USA	Phone: (1) 973-696-4700 Fax: (1) 973-696-4056			•	•					•	
* Saint-Gobain Performance Plastics Corporation Bristol, Rhode Island • USA	Phone: (1) 401-253-2000 Fax: (1) 401-253-1755	•						•	•	•	•
* Saint-Gobain Performance Plastics Corporation Mundelein, Illinois • USA	Phone: (1) 847-949-0850 Fax: (1) 847-949-0198								•		•
* Saint-Gobain Performance Plastics Corporation Garden Grove, California • USA	Phone: (1) 714-995-1818 Fax: (1) 714-688-2701					•	•				•
Saint-Gobain Performance Plastics Corporation Iztapalapa • Mexico	Phone: (5) 256-132-814	•		•	•			•	•		
EUROPE											
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Saint-Gobain Performance Plastics Asti Nanterre • France	Phone: (33) 1490 70205 Fax: (33) 1490 69762			•	•						
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* Saint-Gobain Performance Plastics Shanghai Co., Ltd. Shanghai • China	Phone: (86) 21 64 62 2800 Fax: (86) 21 64 62 27 81	•	•	•	•	•	•	•	•		
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