



Product Range

AEROSPACE SEALING SOLUTIONS



Serving the world's commercial and military aerospace industries

The extensive product portfolio, service capability, materials development and engineering expertise of Trelleborg Sealing Solutions, confirms their position as a leading sealing force in the aerospace market, bringing together the best of foremost global specialist aerospace sealing brands; Busak+Shamban, Shamban, Dowty Seals, Dowty Woodville Polymer, Impervia, Palmer-Chenard and Chase Walton.

Trelleborg Sealing Solutions products are used in virtually every major commercial and military aircraft programme and are commonly specified by leading aircraft manufacturers and OEM customers as sealing solutions on a wide range of critical applications, such as:

- airframes
- engines
- flight controls and actuation
- landing gears
- wheel and brakes

With a strong commitment to excellent customer service, Trelleborg Sealing Solutions offers round-the-clock product assistance, combined with direct line feed, kitting and subassembly capabilities.

World leading reputation

Trelleborg Sealing Solutions uses its 50-year experience as the basis for development and application of engineered dynamic sealing systems and world class customer support. As a principal manufacturer of airframe, hydraulic, fuel systems and engine seals, Trelleborg Sealing Solutions provides innovative and functional solutions for complex applications.

Specialist in the design, development and manufacture of reinforced elastomer components, Trelleborg Sealing Solutions is the sole source supplier of inflatable fuselage fairings to B1-B, Tornado and F-111.

Trelleborg Sealing Solutions are experts in elastomer materials, high performance O-Rings, gaskets and custom designed sealing solutions, as well as fabric reinforced elastomeric diaphragms for environmental control in valves and pumps.

The first company to realise the huge potential of PTFE in aerospace sealing applications, Trelleborg Sealing Solutions remains at the forefront of this technology with its unique Turcon® material range.

A large number of Fly-By-Wire and electro-hydraulic flight control actuators in the most modern aircraft are equipped with dynamic seals made from Turcon® materials.



The competitive edge

- A complete polymer sealing range for the aerospace industry
- Full service provision – design concept to aftermarket support
- 24-hour worldwide support
- Industry-leading design and materials expertise
- Best practice manufacturing
- Customised distribution capabilities – direct line feed, subassembly and kitting
- Aftermarket expertise
- Proven-engineering excellence – servicing all major aerospace programmes

Global manufacturing and customer support

Trelleborg Sealing Solutions is one of the world's leading experts in polymer sealing technology for the aerospace, industrial, and automotive industries. Its worldwide resources include:

- Over 80 facilities in Europe, Asia, North America and Latin America
- More than 30 manufacturing sites – ISO 9000, AS 9100, QS9000, ISO 14001, EASA21 subpart G
- 11 materials and development laboratories
- 17 design and application facilities



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The information in this brochure is based on many decades of experience in the manufacture and application of sealing and bearing systems. However, unknown parameters and conditions may restrict general statements during usage. It is vital that customers satisfy themselves as to the suitability of individual products through adequate testing. For this reason, and due to the wide range of applications or our products, Trelleborg AB can accept no liability as to the suitability or correctness of our recommendations in individual cases.

The application limits for pressure, temperature and speed given in this catalogue are maximum values determined in the laboratory.

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During practical applications it should be remembered that due to the interaction of the operating parameters, the maximum values must be set correspondingly lower. For exceptional operating conditions, please contact your Trelleborg Sealing Solutions representative.

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Key to Applications:



= Reciprocating



= Oscillating



= Static



= Single acting



= Rotary



= Helix



= Double acting

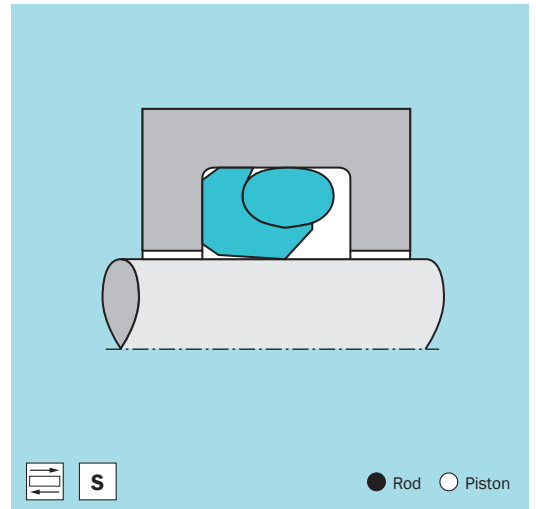
1. Seals for MIL-G-5514F AS 4716 Grooves

Turcon® VL-Seal™

The Turcon® VL-Seal™ is a new generation, unidirectional rod and piston seal. The design is based on the latest sealing theories and practical experience, tested both in-house and in conjunction with customers, to give optimised performance. The design features the Stepseal® back pumping effect.

The Turcon® VL-Seal™ uses standard sized O-Rings and are offered to suit MIL-G-5514F and AS4716 grooves. Since its launch in the year 2000, the Turcon® VL-Seal™ has rapidly become the state of the art for reliable rod sealing systems in military as well as civil aircraft. A large number of Fly-By-Wire and electro-hydraulic flight control actuators on the newest aircraft designs are equipped with this seal.

Ø Range	Max. Pressure	Temperature Range	Max. Velocity
9.47 - 405.75 mm	41.4 MPa	-54 °C +200 °C	15 m/s
-	414 bar	-	-
0.373" - 15.974"	6000 psi	-65 °F +392 °F	50 ft/s



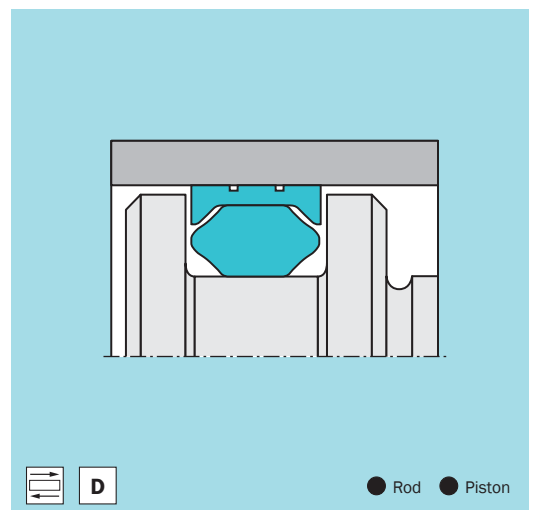
Grooved Turcon® Plus Seal II

The double-acting Grooved Turcon® Plus Seal II is a superior slipper seal design. The contoured seal cap is formed to match the lemon shaped elastomer ring, allowing more room for cap thickness, extending service life. Friction is reduced by activating the cap equally over its width and through the grooves in the cap. For maximum system pressures of 41.4 Mpa (6000 psi) we recommend the use of Turcon® Stakbaks®.

A full range of sizes are offered to suit all MIL-G-5514F and AS4716 grooves.

Custom designs available on request.

Ø Range	Max. Pressure	Temperature Range	Max. Velocity
1.93 - 405.75 mm	41.4 MPa	-54 °C +200 °C	15 m/s
-	414 bar	-	-
0.076" - 15.974"	6000 psi	-65 °F +392 °F	50 ft/s



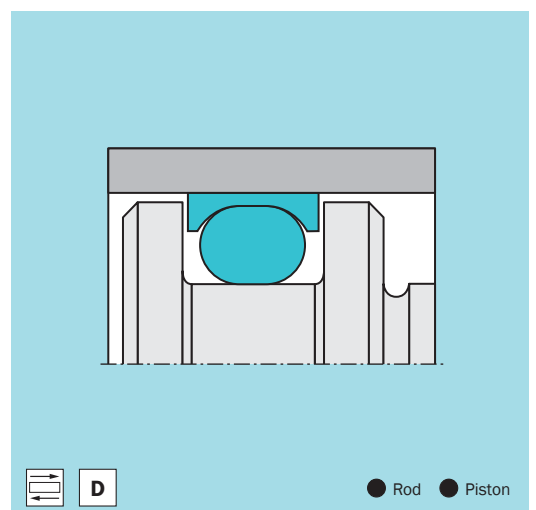
Turcon® Double Delta® II

The original seal design developed to improve the performance of the O-Ring and Back-up ring used in the MIL-G-5514F grooves. The Turcon® Double Delta® II is a double-acting sealing element which is energized by an elastomer O-Ring. The design demonstrates good friction properties, stick-slip free starting and excellent dry running.

A full range of sizes are offered to suit all MIL-G-5514F and AS4716 grooves.

Custom designs available on request.

Ø Range	Max. Pressure	Temperature Range	Max. Velocity
1.93 - 405.75 mm	41.4 MPa	-54 °C +200 °C	15 m/s
-	414 bar	-	-
0.076" - 15.974"	6000 psi	-65 °F +392 °F	50 ft/s



Turcon® CX(S) Seal

The Turcon® CX(S) is a single-acting sealing system combining a stepped elastomer energiser with a low friction Turcon® sealing element. Specifically manufactured to tight tolerances, the stepped elastomer energiser achieves controlled interference, exerting a constant and uniform loading on the Turcon® Cap.

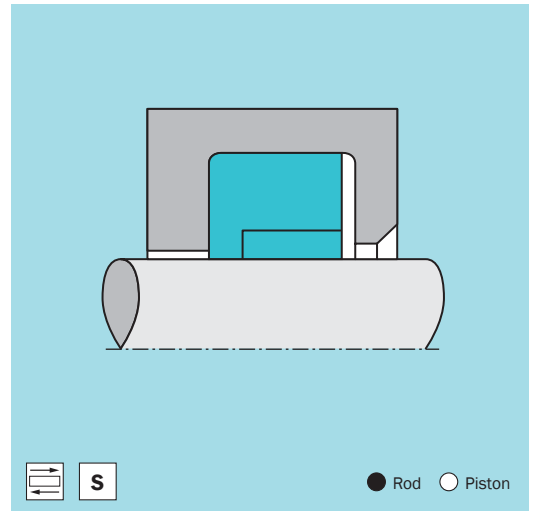
The small elastomer lip profile, affords excellent leakage control under static and low temperature dynamic conditions, while still maintaining low levels of breakout and running friction.

Turcon® CX(S) Seals have been used extensively in various aircraft applications as rod seals, where low friction, long service life and minimal leakage are requirements.

A full range of sizes are offered to suit all MIL-G-5514F and AS4716 grooves.

Custom designs available on request.

Ø Range	max. Pressure	Temperature Range	max. Velocity
1.93 - 405.75 mm	41.4 MPa	-54 °C +200 °C	3 m/s
AS4716	414 bar	-	-
0.076" - 15.974"	6000 psi	-65 °F +392 °F	9.8 ft/s



Turcon® CX(D) Seal

The Turcon® CX(D) is a double-acting sealing system combining a machined elastomer energiser with a low friction Turcon® sealing element.

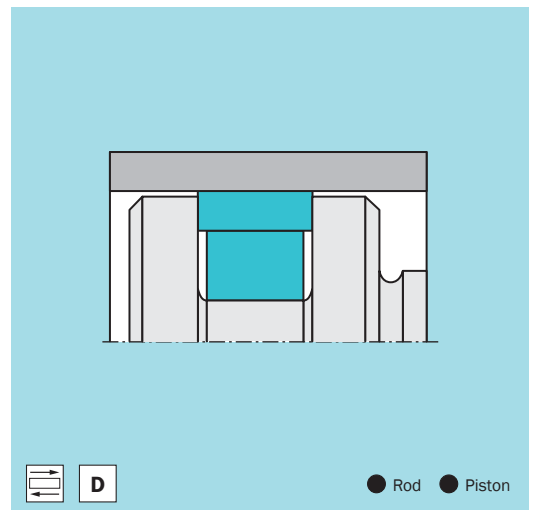
Specifically manufactured to tight tolerances to achieve controlled interference, it exerts a constant and uniform loading on the Turcon® Cap and provides constant positive sealing.

Turcon® CX(D) Seals have been used extensively in various aircraft applications as both rod and piston seals, where low friction, long service life and minimal leakage are requirements.

A full range of sizes are offered to suit all MIL-G-5514F and AS4716 grooves.

Custom designs available on request.

Ø Range	max. Pressure	Temperature Range	max. Velocity
1.93 - 405.75 mm	41.4 MPa	-54 °C +200 °C	15 m/s
AS4716	414 bar	-	-
0.076" - 15.974"	6000 psi	-65 °F +392 °F	50 ft/s



Turcon® Variseal® M2

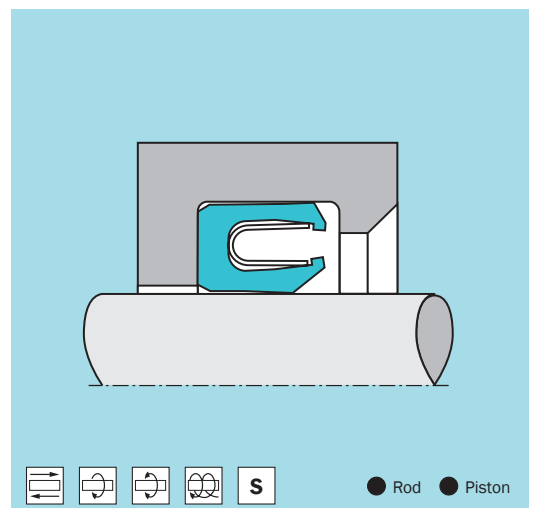
The Turcon® Variseal® M2 is a single acting sealing element optimised for medium to high-pressure fluid sealing.

Ideally suited to high speed reciprocating, dither cycles, it is also suitable for slow rotary applications.

Available in both piston and rod configurations, metric and AS4716 sizes.

The chemical resistance of the Turcon® material and metallic V-spring gives almost universal compatibility with fluids or chemicals and its wide temperature range allows it to be used under extreme conditions. In addition, the Turcon® Variseal® M2 has unlimited shelf life.

Ø Range	Max. Pressure	Temperature Range	Max. Velocity
6 - 2500 mm	41.4 MPa	-70 °C +260 °C	15 m/s
-	414 bar	-	-
0.236" - 98.425"	6000 psi	-94 °F +500 °F	50 ft/s



1. Seals for MIL-G-5514F and AS 4716 Grooves

Turcon® Variseal® W

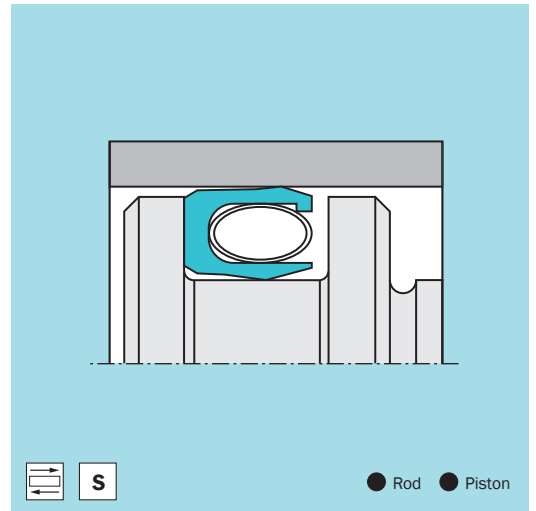
The Turcon® Variseal® W is a single acting sealing element optimised for low to medium pressure fluid sealing.

Available in both piston and rod configurations, metric and AS4716 sizes.

The unique characteristic of the slant coil spring, means the spring force is relatively constant over a wide deformation range, giving a controllable and constant friction.

The chemical resistance of the Turcon® material and metallic slant coil spring gives almost universal compatibility with fluids or chemicals and its wide temperature range allows it to be used under extreme conditions. In addition, the Turcon® Variseal® M2 has unlimited shelf life.

∅ Range	Max. Pressure	Temperature Range	Max. Velocity
6 - 2500 mm	20 MPa	-70°C +260°C	15 m/s
-	200 bar	-	-
0.236" - 98.425"	2900 psi	-94°F +500°F	50 ft/s



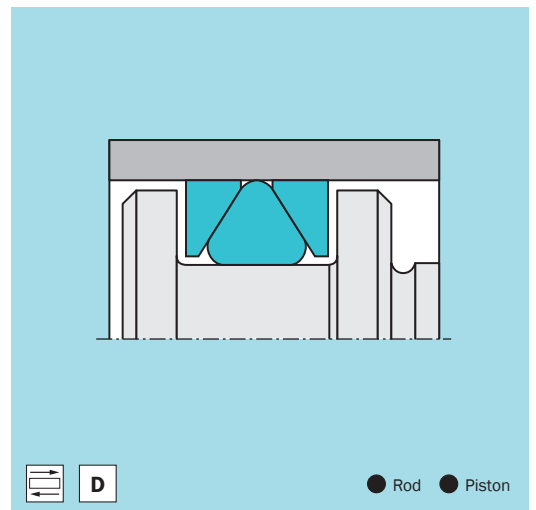
Turcon® Wedgpak®

The Turcon® Wedgpak® consists of a proprietary triangular elastomer sealing element, supported by two Delta shaped Back-up Rings, that prevent the elastomer sealing element from spiralling or rolling under severe working conditions. The small elastomer contact area of the Wedgpak® design, results in a slipper seal type performance, with low static and dynamic friction. At the same time, the elastomer wipes the surface efficiently, providing excellent leakage control. The Wedgpak® Back-up Ring provides support and extrusion protection for the elastomer sealing element.

A full range of sizes are offered to suit all MIL-G-5514F and AS4716 grooves.

Custom designs available on request.

∅ Range	Max. Pressure	Temperature Range	Max. Velocity
1.93 - 405.75 mm	35 MPa	-54°C +200°C	3 m/s
-	350 bar	-	-
0.076" - 15.974"	5000 psi	-65°F +392°F	9.8 ft/s



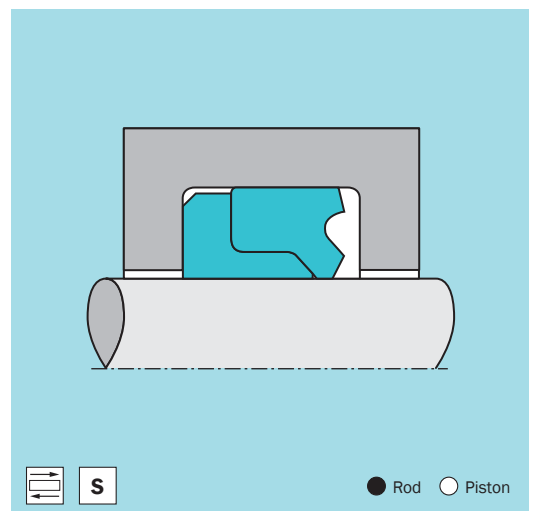
Turcon® Hatseal® II

The Turcon® Hatseal® II is one of the original high performance seals developed for the aircraft industry. Designed for demanding aerospace applications, it is operating successfully in both military and commercial hydraulic components. The Turcon® Hatseal® II combines the low leakage advantages of an elastomer contact seal and the long life characteristics of Turcon® contact seals.

A full range of sizes are offered to suit all MIL-G-5514F and AS4716 grooves.

Custom designs available on request.

∅ Range	Max. Pressure	Temperature Range	Max. Velocity
9.47 - 405.75 mm	35 MPa	-54°C +200°C	3 m/s
-	350 bar	-	-
0.373" - 15.974"	5000 psi	-65°F +392°F	9.8 ft/s



Turcon® T-Seal

The Turcon® T-Seal consists of a T-shaped elastomeric sealing element supported by a Turcon® Back-up ring on both sides.

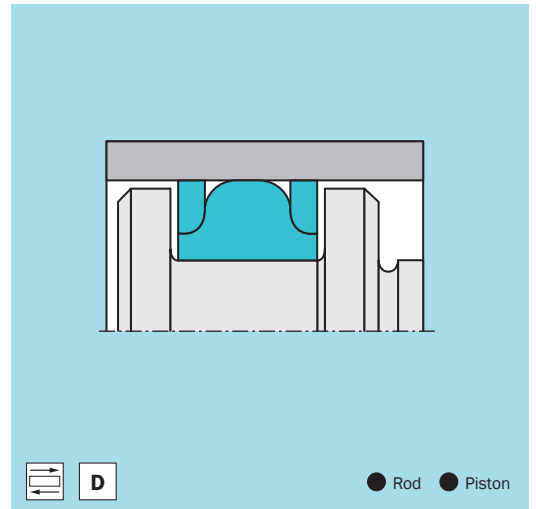
The T-Seal provides a stable base, the semi-circular lip configuration ensuring positive sealing. The side flanges, which form the seal base, offer excellent resistance to rolling and an effective platform to position and energise the anti-extrusion rings.

T-Seals have been used extensively in many static applications, but also as dynamic rod and piston seals, for less demanding applications.

A full range of sizes are offered to suit all MIL-G-5514F and AS4716 grooves.

Custom designs available on request.

Ø Range	Max. Pressure	Temperature Range	Max. Velocity
1.93 - 405.75 mm	35 MPa	-54 °C +200 °C	3 m/s
-	350 bar	-	-
0.076" - 15.974"	5000 psi	-65 °F +392 °F	9.8 ft/s



Turcon® AQ-Seal® 5

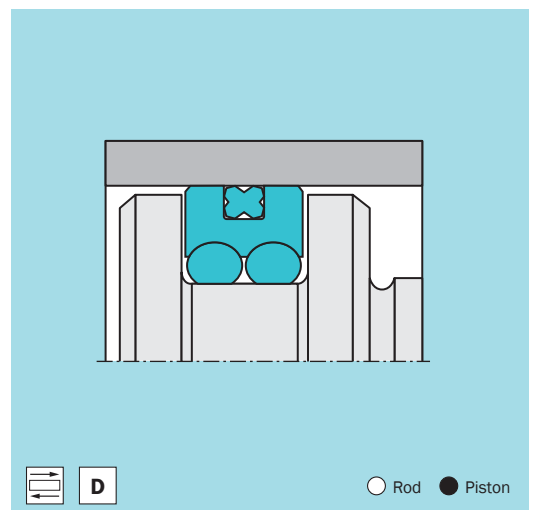
The Turcon® AQ-Seal® 5 is a patented development of the proven standard AQ-Seal®.

The Turcon® AQ-Seal® 5 is a double-acting piston seal designed for reciprocating or helical applications. Comprising a dynamic sealing element in Turcon®, with a limited footprint elastomeric QUAD-RING® seal, inserted centrally into its sealing face. The seal ring is energised by two elastomeric O-Rings. The Turcon® AQ-Seal® 5 is highly recommended in applications requiring media separation.

A range of sizes in the 300 and 400 series are offered to suit MIL-G-5514F and AS4716 bores.

Custom designs available on request.

Ø Range	Max. Pressure	Temperature Range	Max. Velocity
47.42 - 405.75 mm	35 MPa	-54 °C +200 °C	3 m/s
-	350 bar	-	-
1.867" - 15.974"	5000 psi	-65 °F +392 °F	9.8 ft/s



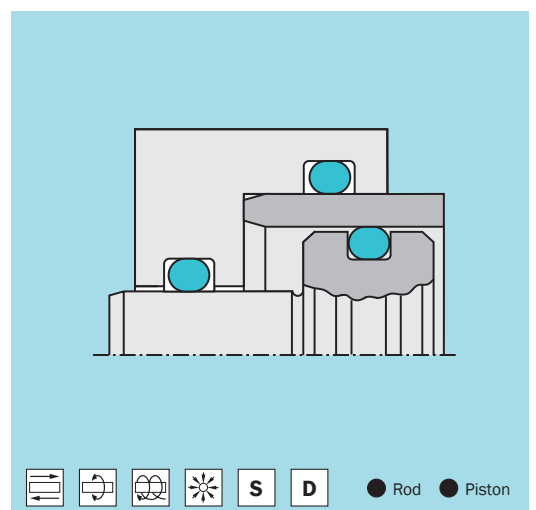
O-Ring

Simple in shape, the O-Ring is most commonly used in static sealing applications where simple, cost-effective leak tight performance is required.

O-Rings can be supplied against all internationally recognised size standards, and can be produced in all aerospace type elastomers. These include Nitriles, EPDMs, Fluorosilicones, Fluorocarbons and Perfluoroelastomers, including the almost universally chemically resistant Isolast®.

Non-standard sized O-Rings are available on request. In addition, special O-Rings can be supplied with their flashline in a specified position on the seal or inspected to stringent criteria, if required.

Ø Range	Max. Pressure	Temperature Range	Max. Velocity
1.93 - 405.75 mm	10 MPa	-54 °C +325 °C	0.5 m/s
-	100 bar	-	-
0.076" - 15.974"	1450 psi	-65 °F +617 °F	1.6 ft/s



1. Seals for MIL-G-5514F and AS 4716 Grooves

Back-up Ring

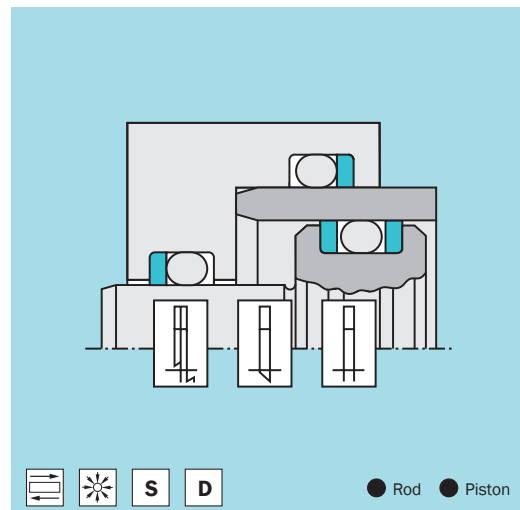
Back-up Rings are commonly used to protect seals from the effects of extrusion when pressurised adjacent to a housing gap.

A wide range is available to suit all seals and grooves.

Usual configurations are Spiral, Scarf cut, Uncut and Concave and materials range from Virgin PTFE, through the range of filled grades, up to the high modulus grades of engineering thermoplastics.

Back-up Rings can be used statically or dynamically, over a broad temperature and pressure range.

Ø Range	Max. Pressure	Temperature Range	Max. Velocity
1.93 - 405.75 mm	41.4 MPa	-54 °C +200 °C	0,5 m/s
-	414 bar	-	-
0.076" - 15.974"	6000 psi	-65 °F +392 °F	1.6 ft/s



2. Seals for MIL-G-5514F and AS 4716 Rod and Bore Sizes

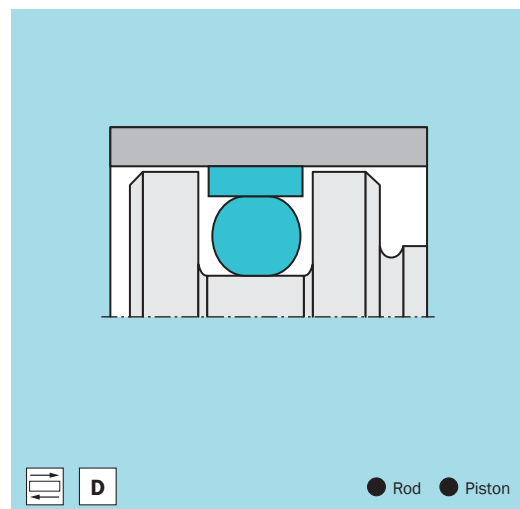
Turcon® Glyd Ring®

The Turcon® Glyd Ring® is a simple and reliable seal consisting of a Turcon® seal cap activated by an O-Ring. A true slipper seal, the Turcon® Glyd Ring® relies on the O-Ring to energise it and provide sealing force, at zero or low pressure. As the pressure increases, the Turcon® Glyd Ring® is energised by hydraulic pressure, forcing it against the sealing surface.

A full range of sizes are offered to suit all MIL-G-5514F and AS4716 rod and bores.

Custom designs available on request.

∅ Range	Max. Pressure	Temperature Range	Max. Velocity
1.93 - 405.75 mm	41.4 MPa	-54 °C +200 °C	15 m/s
-	414 bar	-	-
0.076" - 15.974"	6000 psi	-65 °F +392 °F	50 ft/s

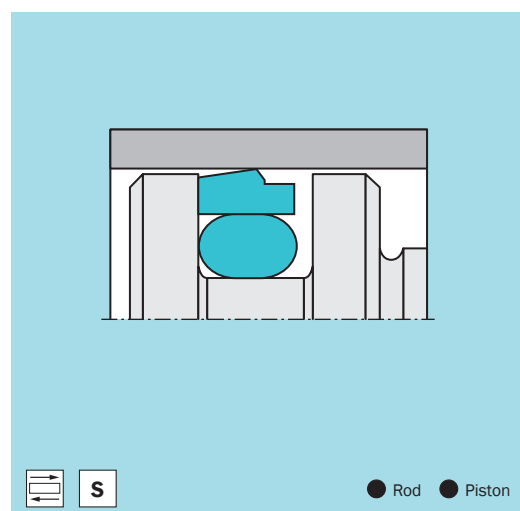


Turcon® Stepseal® K

The Turcon® Stepseal® K, comes closest in satisfying the ideal demands of a dynamic seal. That is, no leakage under all dynamic conditions and completely leaktight when the system is static. In use for several decades, this seal remains a technically outstanding design. The single-acting sealing element is made of high-grade Turcon® materials with superior sliding and wear resistance properties.

A full range of sizes are offered to suit all MIL-G-5514F and AS4716 rod and bores. It is installed in grooves to Trelleborg Sealing Solutions standards using an O-Ring as the energising element.

∅ Range	Max. Pressure	Temperature Range	Max. Velocity
9.47 - 405.75 mm	41.4 MPa	-54 °C +200 °C	15 m/s
-	414 bar	-	-
0.373" - 15.974"	6000 psi	-65 °F +392 °F	50 ft/s



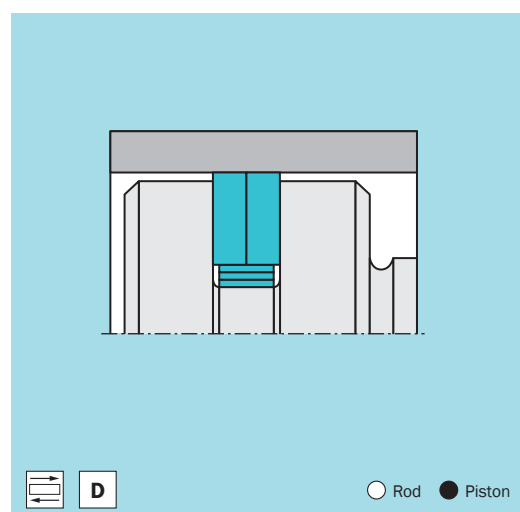
Turcon® Dual Piston Ring

Turcon® Dual Piston Ring is typically energised by a stainless steel wave-shaped spring.

The characteristics of the seal are very low friction, long service life and a controlled leakage over the rings. The Turcon® Dual Piston Rings can be supplied with various spring types, dependent upon the application.

A full range of sizes are available, glands corresponding to MIL-G 5514F and AS4716 Bore sizes.

∅ Range	Max. Pressure	Temperature Range	Max. Velocity
17.15 - 240.64 mm	41.4 MPa	-70 °C +260 °C	15 m/s
-	414 bar	-	-
0.675" - 9.474"	6000 psi	-94 °F +500 °F	50 ft/s



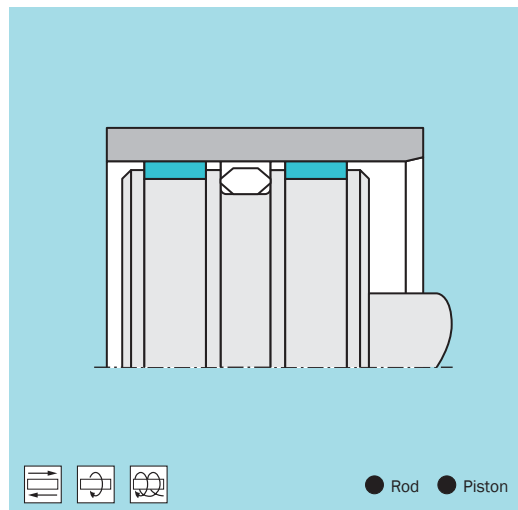
3. Slydring® and Bushings

Slydring® and Wear Ring

The purpose of a Slydring® or Wear Ring is to guide the piston and rod of a working cylinder, absorbing potential transverse forces. Preventing metallic contact between the sliding parts of the cylinder, non-metallic wear rings offer major benefits over traditional metallic bearings, such as better load distribution and less abrasion.

Three different types of materials are available depending upon the application requirements. The highly wear resistant Turcite® Slydring® for low to medium loads, fabric composite Orkot® Wear Ring for high loads and high modulus thermoplastics Zurcon® Wear Ring, for high loads and long service life.

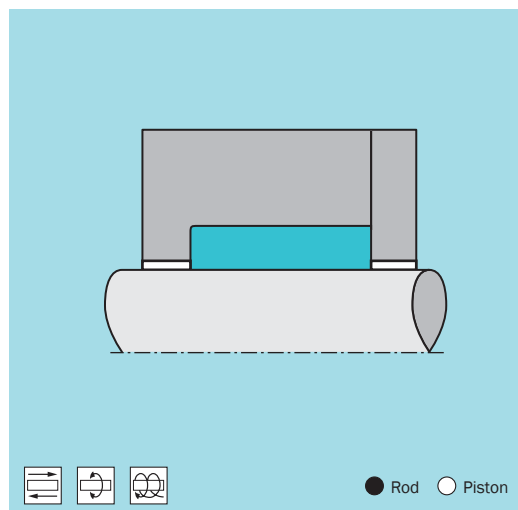
Ø Range	Load	Temperature Range	Max. Velocity
8 - 405.75 mm	15 - 90 N/mm ²	-60°C +200°C	1 - 15 m/s
-	-	-	-
0.315" - 15.974"	2175 - 13050 psi	-76°F +392°F	3 - 50 ft/s



Bushings

High load bushings are available in Turcite® and HiMod® engineered thermoplastics or Orkot® synthetic composites. The bushings are dimensionally stable, wear resistant and provide excellent performance under dry and boundary lubrication conditions.

Ø Range	Load	Temperature Range	max. Velocity
8 - 405.75 mm	9 - 90 N/mm ²	-60°C +200°C	6 m/s
-	-	-	-
0.315" - 15.974"	1300 - 13050 psi	-76°F +392°F	20 ft/s



4. Rotary Seals

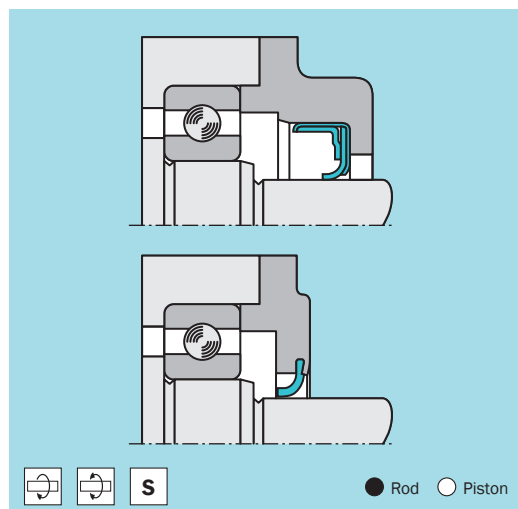
Varilip and PDR

Outstanding, high performance rotary shaft seals, comprising a PTFE sealing lip retained in a crimped or clamped metal case, provides low friction and wear characteristics, even in dry running situations.

They offer almost universal resistance to aircraft fluids and external contaminants, over an extremely wide temperature range.

Varilip seals are available for standard groove geometries (ISO 6144/1 and DIN 3760) or as custom designed PDR seals for other groove geometries. The sealing lip can also be crimped directly into housings, giving designers the added benefit of potential weight saving and reduction in overall component dimensions.

∅ Range	Max. Pressure	Temperature Range	Max. Velocity
3 - 400 mm	2 MPa	-60 °C +200 °C	40 m/s
-	20 bar	-	-
0.118" - 15.748"	290 psi	-76 °F +392 °F	130 ft/s



Radial Oil Seal

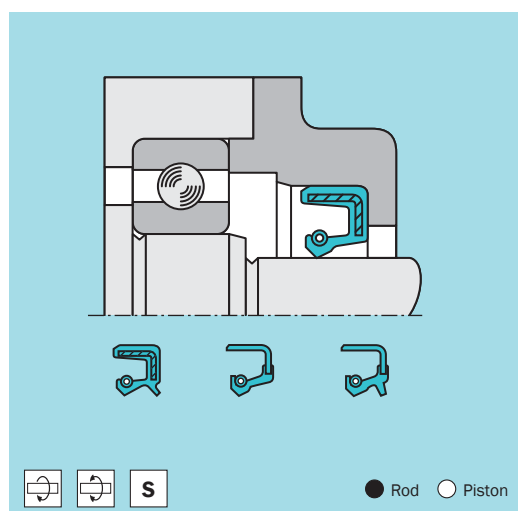
Radial Oil Seals consist of a single lip bonded to a metal support with a garter spring.

There are many different variations of the Radial Oil Seal, both with and without an integral dust excluding lip. These dust lips can be positioned either within the seal width or beyond the seal base.

A successful Radial Oil Seal runs with a thin film of fluid under the sealing lip. The film acts as a lubricant and allows a meniscus to form on the other side of the sealing lip. Radial Oil Seals can also include hydrodynamic aids, which create positive sealing by returning any oil leaking back into the system.

For pressures above the recommended 0.05 MPa (7.3 psi) a metallic support heel can be used.

∅ Range	Max. Pressure	Temperature Range	Max. Velocity
6 - 500 mm	0.05 MPa	-54 °C +170 °C	12 m/s
-	0.5 bar	-	-
0.236" - 19.685"	7.3 psi	-65 °F +338 °F	39 ft/s

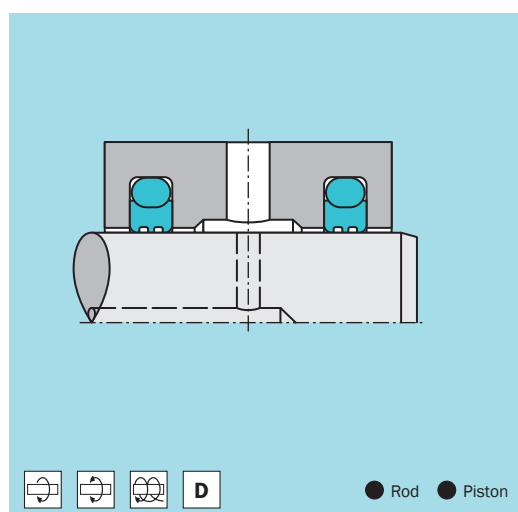


Turcon® Roto Glyd Ring®

The double-acting Turcon® Roto Glyd Ring® is used to seal rods, axles, rotary swivels and steering units with rotary, helical or oscillating movement. The Turcon® Roto Glyd Ring® consists of a seal ring in high grade Turcon® material activated by an O-Ring as an elastic energising element.

A large number of sizes are available for both inch and metric housings.

∅ Range	Max. Pressure	Temperature Range	Max. Velocity
6 - 2500 mm	30 MPa	-54 °C +200 °C	2 m/s
-	300 bar	-	-
0.236" - 98.425"	4350 psi	-65 °F +392 °F	6 ft/s



4. Rotary Seals

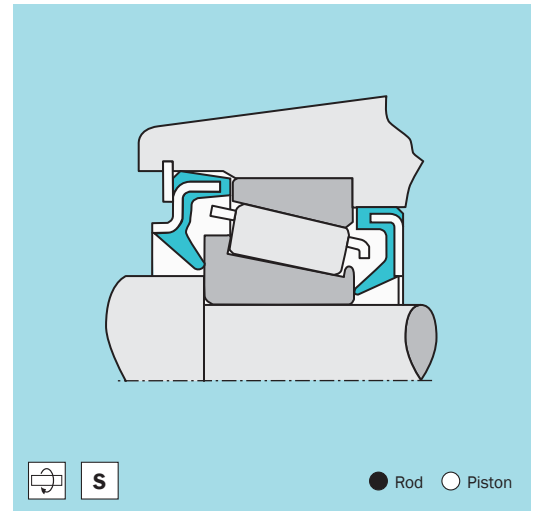
Grease Seal

Grease Seals are bespoke products used to protect and prolong the service life of aircraft wheel bearings. They are usually custom designed rubber rotary lip seals, designed to restrict bearing grease loss and prevent water and dirt ingress, during normal service and cleaning conditions. Snap-fitting PTFE variants are also available.

Grease Seals can be located in a number of ways either designed to: incorporate retention features, press-fit into the wheel hub or axially locate with circlips or sleeves. They have been designed and tested to include 1mm variances in axial bearing face location.

Grease Seal types are offered for both inboard and outboard-of-bearing positions. They can also be designed specifically to aid their assembly as original equipment or in subsequent retrofitting.

Ø Range	Max. Pressure	Temperature Range	Max. Velocity
25 - 300 mm	Atmospheric	-54 °C +135 °C	40 m/s
-	-	-	-
0.984" - 11.811"	-	-65 °F +275 °F	130 ft/s

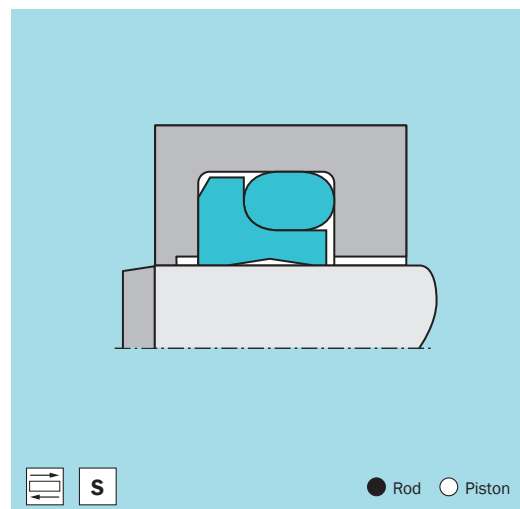


5. Scraper and Exclusion Devices

Turcon® Excluder® DC

The Turcon® Excluder® DC is a solid ring with dual scraper lip contact, activated by an O-Ring, providing excellent scraping performance. The primary lip prevents dust and ice from penetrating the system during the in-stroke of the rod, while the secondary lip stops the oil film from leaving the system during the out-stroke.

Ø Range	Max. Pressure	Temperature Range	Max. Velocity
9.47 - 405.75 mm	-	-54 °C +200 °C	15 m/s
-	-	-	-
0.372" - 15.974"	-	-65 °F +392 °F	50 ft/s



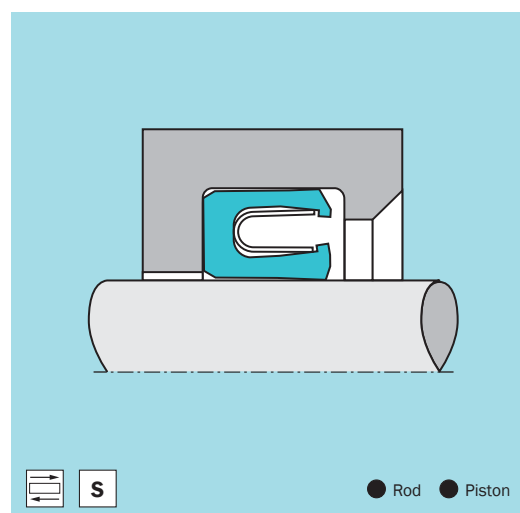
Turcon® Variseal® M2S

The Turcon® Variseal® M2S is a single acting seal/scraper consisting of a U-shaped seal jacket and a corrosion resistant V-spring. The most unique feature of the Turcon® Variseal® M2S is the asymmetric seal profile that gives the dynamic scraping lip a heavy wear resistant profile.

The lip will provide good scraping effect even in highly viscous or particle filled media. It is available both in piston and rod configurations in both metric and AS4716 sizes.

The chemical resistance of the Turcon® material and V-spring gives almost universal compatibility with fluids or chemicals and its wide temperature range allows it to be used under extreme conditions. In addition, the Turcon® Variseal® M2S has unlimited shelf life.

Ø Range	Max. Pressure	Temperature Range	Max. Velocity
6 - 2500 mm	-	-70 °C +260 °C	15 m/s
-	-	-	-
0.236" - 98.425"	-	-94 °F +500 °F	50 ft/s

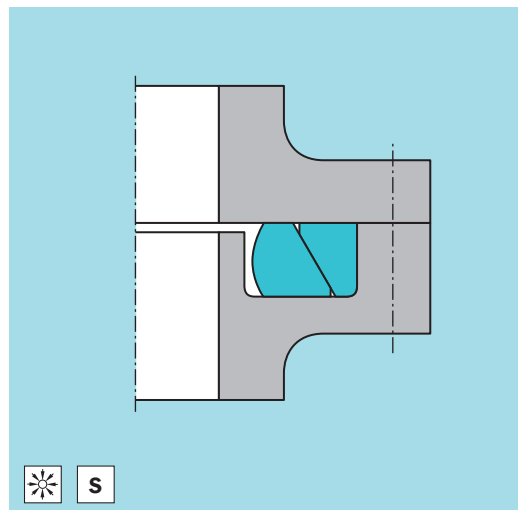


6. Static Seals

Turcon® Wedgpak® Face Seal

The Turcon® Wedgpak® Face Seal is an adaptation of the traditional Wedgpak®, designed to maximise performance in face seal applications. It utilises a triangular shaped Turcon® delta ring, energised by a uniquely shaped elastomer sealing element, to maximise extrusion protection under abnormal clearance gap conditions. The elastomer provides a preload under low-pressure conditions. This forces the delta ring up against the clearance gap to prevent extrusion of the elastomer, when pressure increases.

Ø Range	Max. Pressure	Temperature Range	Max. Velocity
8.03 - 124.33 mm	80 MPa	-54 °C +200 °C	-
-	800 bar	-	-
0.316" - 4.895"	11600 psi	-65 °F +392 °F	-



Turcon® Variseal® HF

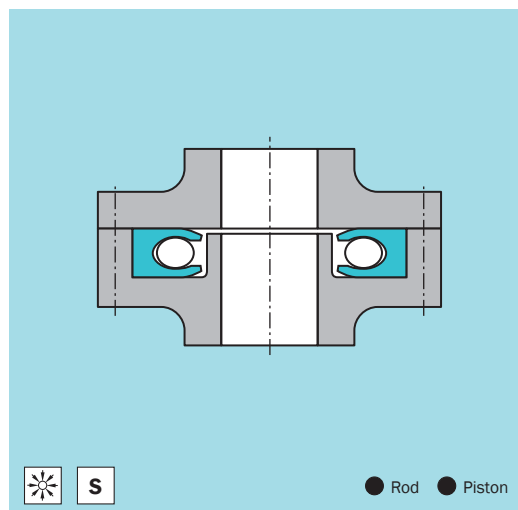
The Turcon® Variseal® HF is a single acting sealing element optimised for sealing high-pressure fluid and gas. The high spring load of the helical spring ensures effective sealing even in extremely low temperature applications.

These helical spring seals are ideal for slow moving and static applications or in a vacuum sealing applications.

The chemical resistance of the Turcon® material and metallic helical spring gives almost universal compatibility with fluids or chemicals and its wide temperature range allows it to be used under extreme conditions. In addition, the Turcon® Variseal® HF has unlimited shelf life.

Illustrated as a face seal, it is also available both in piston and rod configurations in metric and AS4716 sizes.

Ø Range	Max. Pressure	Temperature Range	Max. Velocity
3 - 2500 mm	80 MPa	-200 °C +260 °C	-
-	800 bar	-	-
0.118" - 98.425"	11600 psi	-328 °F +500 °F	-

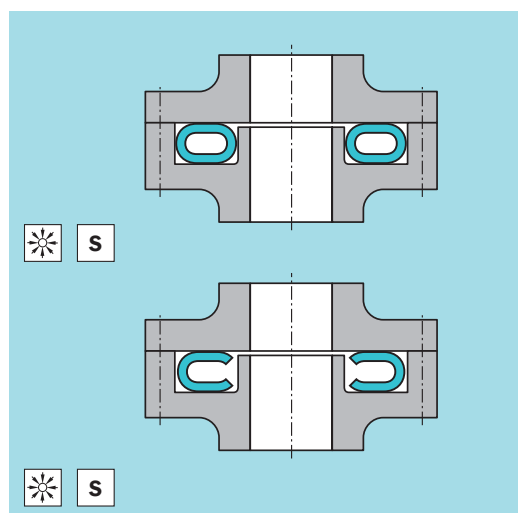


Wills Rings®

Wills Rings® are metal seals, supplied in two forms, either O or C cross-sections.

Controlled-compression type face seals, for static use only, they are designed for use in extreme conditions where the capabilities of polymeric seals are exceeded. Wills Rings® can be supplied in a wide range of metals, which can then be coated or gas-filled to suit their specific application.

Ø Range	Max. Pressure	Temperature Range	Max. Velocity
8 - 3000 mm	1000 MPa	-272 °C +850 °C	-
-	10000 bar	-	-
0.315" - 118.1"	145000 psi	-458 °F +1562 °F	-



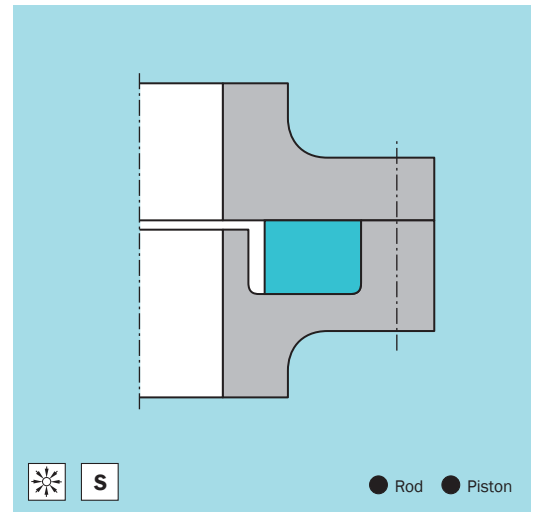
Kantseal

Kantseals are square or rectangular sectioned elastomer rings, typically used in static locations or lower pressure dynamic positions, where high sealing efficiency and shape stability are important.

Kantseals can be compression moulded or machined and additional corner chamfers or radii can be used to alter the seal's frictional behaviour.

Available in a full range of elastomer materials compatible with almost any fluid commonly found in aircraft applications.

Ø Range	Max. Pressure	Temperature Range	Max. Velocity
9.47 - 405.75 mm	80 MPa	-54 °C +200 °C	-
-	800 bar	-	-
0.373" - 15.974"	11600 psi	-65 °F +392 °F	-



7. Miscellaneous

Airframe Seals

This is a broad family of products, individually developed and manufactured for unique applications. In general, these seals are static and offer low friction and good abrasion resistance characteristics.

They are typically used for the aerodynamic sealing of doors, windows, ailerons, spoilers, canopies, hatches and panels.

Airframe seals are typically bonded into place and can be made conductive. They can also be strategically reinforced, to offer the load and deformation properties required for variable working conditions. An FEA (Finite Element Analysis) service is available to assist in design of this seal type.

∅ Range	Max. Pressure	Temperature Range
-	0.1 MPa	-60 °C +250 °C
-	1 bar	-
-	14.5 psi	-76 °F +482 °F

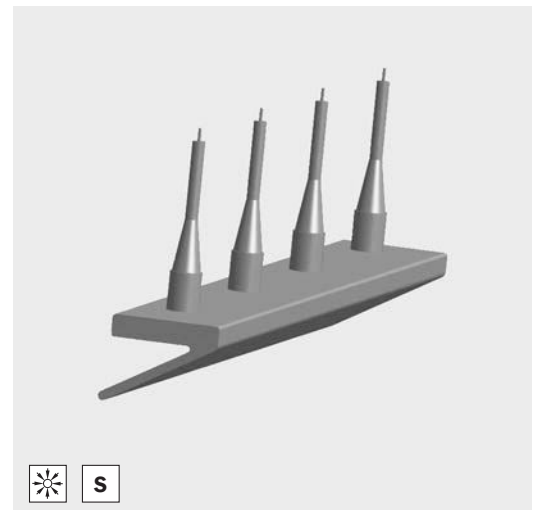


Environmental Seals

Environmental seals encompass a broad range of products developed to satisfy various customer requirements and include hatch seals. These can be fabric reinforced to meet load and deformation requirements, attached to the assembly by the use of moulded lugs, located into pre-drilled holes.

An extensive range of polymers is available for manufacture of environmental seals, allowing them to satisfy most operational conditions. An FEA (Finite Element Analysis) service is available to assist in design of this seal type.

∅ Range	Max. Pressure	Temperature Range
20 - 2000 mm	0.1 MPa	-60 °C +250 °C
-	1 bar	-
0.787" - 78.74"	14.5 psi	-76 °F +482 °F



Fire Seals

These are dual-purpose components, acting as pressure seals, as well as being barriers for fire containment.

Fire seals are elastomeric, with glass or ceramic reinforcement. They are commonly tested to ISO 2685, which dictates that the seals withstand an applied flame of 1100 °C for 15 minutes, without failure. Fire seals can also be made in conductive variants for RFI screening.

∅ Range	Max. Pressure	Temperature Range
50 - 2000 mm	0.1 MPa	-60 °C +1100 °C
-	1 bar	-
1.968" - 78.74"	14.5 psi	-76 °F +2012 °F



Custom Mouldings and Extrusions

A wide range of custom moulded and extruded products can be made in a variety of elastomeric and thermoplastic materials.

Components for all areas of Aerospace applications can be offered with the assistance of the Trelleborg Sealing Solutions design department. Alternatively, products can be manufactured to customer drawings.

Typical components include environmental bellows, facemasks, protective covers, bonded plates, inflatable seals, extrusions and assemblies combining rubber, metal and plastic parts.

∅ Range	Max. Pressure	Temperature Range	Max. Velocity
-	-	-60 °C +325 °C	-
-	-	-	-
-	-	-76 °F +617 °F	-



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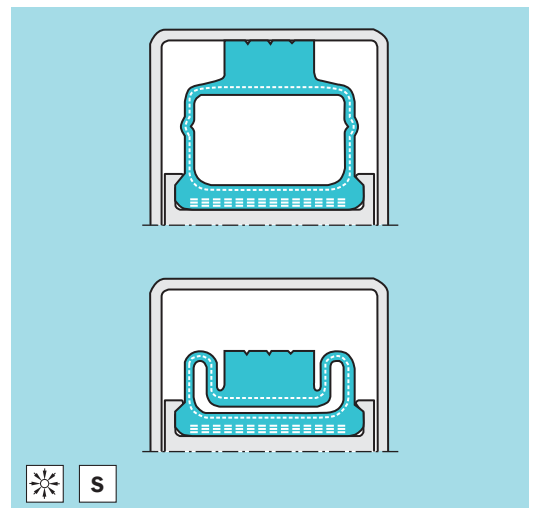
Inflatable Seals

Inflatable seals are individually designed and manufactured to satisfy exacting customer specifications, with applications including canopy seals for military aircraft.

The seals are either bonded in position or designed to be mechanically restrained by the use of retaining plates.

Inflatable seals normally include fabric reinforcement and can also be made conductive. An FEA (Finite Element Analysis) service is available to assist in design of this seal type.

∅ Range	Max. Pressure	Temperature Range
-	0.69 MPa	-60 °C +250 °C
-	6.9 bar	-
-	100 psi	-76 °F +482 °F

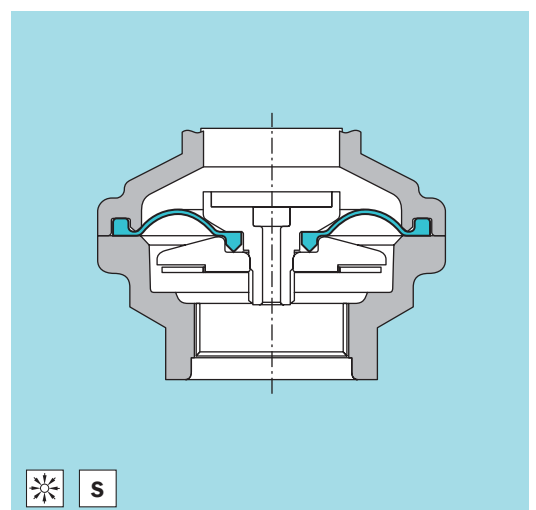


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Diaphragms

All diaphragms are custom designed to suit the requirements of an application and can either be manufactured from fabric-reinforced or thin membrane rubber-only material. Higher pressures can be accommodated, by increasing the burst resistance, with synthetic fabric reinforcement. This also gives the advantages of extended product life, reduced deformation and allows the use of thinner sections to improve sensitivity of control. Diaphragms are commonly used in aircraft fuel systems, for example in control and metering valves.

∅ Range	Max. Pressure	Temperature Range	Max. Velocity
-	1.5 MPa	-54 °C +200 °C	-
-	15 bar	-	-
-	218 psi	-65 °F +392 °F	-



S

7. Miscellaneous

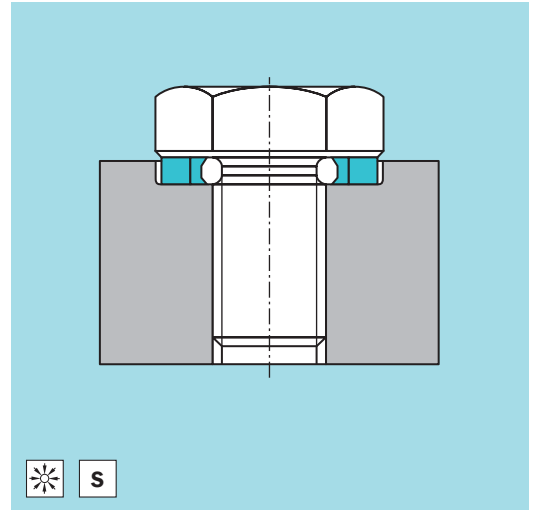
Bonded Seals

The Bonded Seal comprises a metal annulus, square or rectangular in section, to which an elastomeric ring of trapezoidal section is bonded. Developed to replace copper type washers in high-pressure hydraulic and pneumatic threaded connections, the metal ring resists the pressure bursting forces and limits the deformation of the elastomeric element. This prevents over-compression and extrusion.

The standard type Bonded Seal is supplemented by a range of self-centering Bonded Seals that eliminate the possibility of leakage, by ensuring it is properly centred during assembly. Available in a wide range of aerospace and defence released materials.

Custom designs are also available.

Thread Size	Max. Pressure	Temperature Range	Max. Velocity
M3 - M75	250 MPa	-65 °C +200 °C	-
-	2500 bar	-	-
1/8" - 3"	36250 psi	-85 °F +392 °F	-



Conversion Tables

SI - Basic Units

Measures	Units	Symbol
Length	Metre	m
Mass	Kilogram	kg
Time	Second	s
Electric current	Ampere	A
Temperature	Kelvin	K
Luminous intensity	Candela	cd
Amount of substance	Mol	mol

Length

	inch	foot	yard	mm	metre
1 inch	=	0.0833	0.0278	25.4	0.0254
1 foot	=	12	0.333	304.8	0.3048
1 yard	=	36	3	914.4	0.9144
1 mm	=	0.03937	0.0033	0.00109	0.001
1 metre	=	39.37	3.2808	1.0936	1,000

Torque

	inch-ounce	inch-pound	foot-pound	kg-metre	Newton metre
1 inch-ounce	=	0.0625	0.0052	7.2×10^{-4}	7.06×10^{-3}
1 inch-pound	=	16	0.0833	1.152×10^{-2}	0.113
1 foot-pound	=	192	12	0.1383	1.356
1 kg-metre	=	1,388.7	86.796	7.233	9.80665
1 Newton-metre	=	141.6	8.850	0.7376	0.102

Area

	inch ²	foot ²	yard ²	mm ²	metre ²
1 inch ²	=	0.0069	0.00077	645.16	6.45×10^{-4}
1 foot ²	=	144	0.111	92,903	0.0929
1 yard ²	=	1,296	9	836,127	0.8361
1 mm ²	=	0.0016	1.0764×10^{-5}	1.196×10^{-6}	10^{-6}
1 m ²	=	1,550	10.764	1.196	10^6

Volume

	inch ³	US quart	imp. gallon	foot ³	US gallon	litre
1 inch ³	=	0.0173	0.0036	0.00058	0.0043	0.0164
1 US quart	=	57.75	0.2082	0.0334	0.25	0.9464
1 imp. gallon	=	277.42	4.8	0.1605	1.2	4.546
1 foot ³	=	1,728	29.922	6.23	7.48	28.317
1 US gallon	=	231	4	0.8327	0.1337	3.785
1 litre	=	61.024	1.0567	0.220	0.0353	0.264

Pressure

	inch Hg	psi	atmosphere	torr	mm Hg	bar	MPa	kg/cm ²
1 inch Hg	=	0.491	0.0334	25.4	25.4	0.0339	0.00339	0.0345
1 psi	=	2.036	0.0680	51.715	51.715	0.0689	0.00689	0.0703
1 atmosphere	=	29.921	14.696	760	760	1.0133	0.10133	1.0332
1 torr	=	0.0394	0.0193	0.0013	1	0.0013	0.00013	0.00136
1 mm Hg	=	0.0394	0.0193	0.0013	1	0.0013	0.00013	0.00136
1 bar	=	29.53	14.504	0.987	750.06	750.06	0.1	1.020
1 MPa	=	295.3	145.04	9.869	7500.61	7500.61	10	10.2
1 kg/cm ²	=	28.96	14.22	0.968	735.55	735.55	0.098	1

Temperature

	°K (Kelvin)	°C	°F
°K	=	°C + 273.15	(°F - 459.67) 5/9
°C	=	°K - 273.15	(°F - 32) 5/9
°F	=	°K 9/5 - 459.67	°C 9/5 + 32

Density

	ounce/inch ³	pound/foot ³	g/cm ³
1 ounce/inch ³	=	108	1.73
1 pound/foot ³	=	0.0093	0.016
1 g/cm ³	=	0.578	62.43

Force

	Newton (N)	kilogram force (kgf)	pound force
1 Newton (N)	=	0.10197	0.22481
1 kilogramforce	=	9.80665	2.20462
1 pound force	=	4.4482	0.45359

Velocity (Speed)

	foot/s	foot/min	mile/hour	metre/s	km/hour
1 foot/s	=	60	0.6818	0.3048	1.097
1 foot/min	=	0.017	0.0114	0.00508	0.01829
1 mile/hour	=	1.4667	88	0.447	1.609
1 metre/s	=	3.280	196.85	2.237	3.6
1 km/hour	=	0.9113	54.68	0.6214	0.278

Mass

	ounce	pound	kg
1 ounce	=	0.0625	0.0283
1 pound	=	16	0.4536
1 kg	=	35.274	2.2046

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