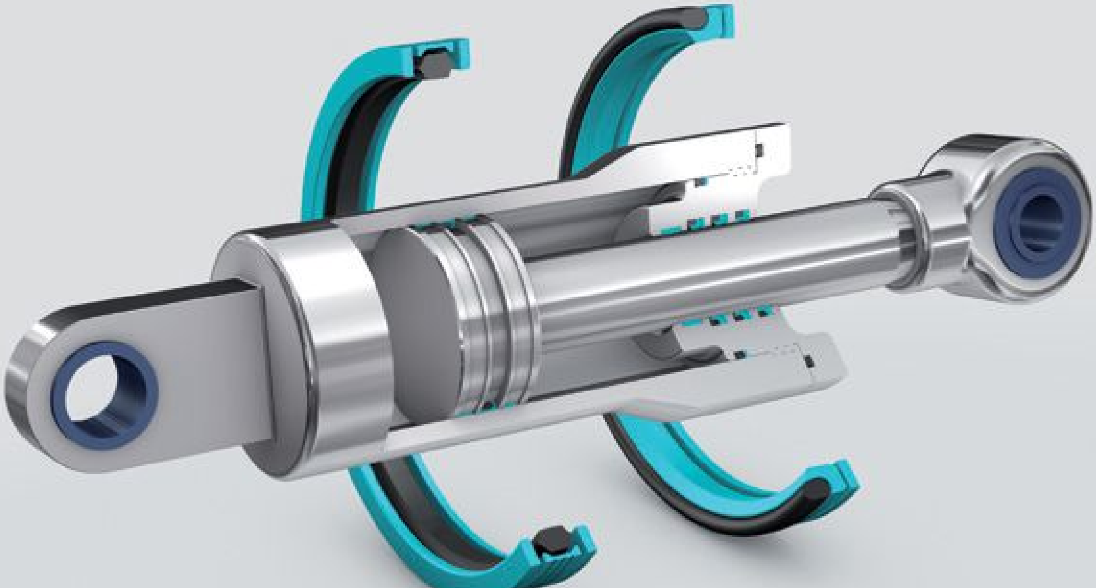
TRELLEBORG SEALING SOLUTIONS

Aerospace Sealing Systems

PRODUCT CATALOG & ENGINEERING GUIDE



YOUR PARTNER FOR SEALING TECHNOLOGY

Your Partner for Sealing Technology

Trelleborg Sealing Solutions is a major international sealing force, uniquely placed to offer dedicated design and development from our market-leading product and material portfolio: a one-stop-shop providing the best in elastomer, thermoplastic, PTFE and composite technologies for applications in aerospace, industrial and automotive industries.

With 50 years of experience, Trelleborg Sealing Solutions engineers support customers with design, prototyping, production, test and installation using state-of-the-art design tools. An international network of over 70 facilities worldwide includes over 20 manufacturing sites, strategically-positioned research and development centers, including materials and development laboratories and locations specializing in design and applications.

Developing and formulating materials in-house, we utilize the resource of our material database, including over 2,000 proprietary compounds and a range of unique products.

Trelleborg Sealing Solutions fulfills challenging service requirements, supplying standard parts in volume or a single custom-manufactured component, through our integrated logistical support, which effectively delivers over 40,000 sealing products to customers worldwide.

Facilities are certified to ISO 9001:2008 and ISO/TS 16949:2009. Trelleborg Sealing Solutions is backed by the experiences and resources of one of the world's foremost experts in polymer technology: the Trelleborg Group.

ISO 9001:2008

ISO/TS 16949:2009

The information in this brochure is intended to be for general reference purposes only and is not intended to be a specific recommendation for any individual application. The application limits for pressure, temperature, speed and media given are maximum values determined in laboratory conditions. In application, due to the interaction of operating parameters, maximum values may not be achieved. It is vital therefore, that customers satisfy themselves as to the suitability of product and material for each of their individual applications. Any reliance on information is therefore at the user's own risk. In no event will Trelleborg Sealing Solutions be liable for any loss, damage, claim or expense directly or indirectly arising or resulting from the use of any information provided in this brochure. While every effort is made to ensure the accuracy of information contained herewith, Trelleborg Sealing Solutions cannot warrant the accuracy or completeness of information.

To obtain the best recommendation for a specific application, please contact your local Trelleborg Sealing Solutions marketing company.

This edition supersedes all previous brochures.
This brochure or any part of it may not be reproduced without permission.

TRELLEBORG
SEALING SOLUTIONS

Aerospace Engineering Guide

■ Sealing Solutions for Demanding Aerospace Applications

As a global market leader in the supply of aerospace sealing solutions, with over 60 years of experience in the industry, Trelleborg Sealing Solutions can provide the optimum seal for the majority of applications. The materials and products included in this catalog can be fitted on anything from two-seater light aircraft to heavy-duty long-range commercial airliners, from military planes to spacecraft and satellites, from ships to submarines and marine applications. Seals from Trelleborg Sealing Solutions provide proven performance in a wide variety of systems including flight controls, actuation, landing gear, wheels, brakes, fuel controls, engines and airframe.

■ Content

Trelleborg Sealing Solutions has the largest sealing product portfolio in the industry. With this and our engineered solutions, we can meet almost any sealing challenge. Included in this catalog are seals specifically recommended for aeropsace and defense applications.

Aerospace Sealing Capabilities

■ Aerospace Sealing Capabilities

Seals from Trelleborg Sealing Solutions provide proven performance in a wide variety of systems including flight controls, actuation, landing gear, wheels, brakes, engines and airframe.

Actuation

High-integrity piston and gland seals are specified to meet the high usage, long-life demands of aircraft actuators. These can be engineered for a variety of configurations up to 8,000 psi/ 55 MPa. With our vast experience in this field, Trelleborg Sealing Solutions can also assist with actuator design by recommending component tolerances, surface finishes, coatings and seal groove geometries.

For rotary shaft seal applications, Trelleborg Sealing Solutions provides anything from conventional radial oil seals to high-performance Turcon® Varilip® PDR lip seals. Subassembly and installation support is also available.

Flight Controls

Flight controls, whether primary or secondary, are the most demanding of all the hydraulic actuation systems on an aircraft. Trelleborg Sealing Solutions has achieved a dominant role as a supplier of dynamic sealing systems for flight controls in both military and civil aircraft, on fixed and rotary wing airframes. Operating conditions and performance requirements have become more stringent when comparing traditional fly-by-wire systems, implemented in military aircraft during the 1980s, to the more complex electro hydraulic actuators used on the latest civil and military aircraft. We have evolved advanced sealing systems to match these.

Trelleborg Sealing Solutions has developed sealing systems that are able to cope with the high system pressure (5,000 psi) demands seen in today's aircraft. They can also handle an almost ten-fold increase in life expectancy as well as high frequency movements resulting from the transition from analog to digital signals to the controls. This has been made possible through extensive developments in seal profiles and materials along with research into the dynamic relationship between individual sealing system elements and performance life.

Landing Gear

As a major supplier of seals and bearings for both large and small landing gear, Trelleborg Sealing Solutions has, with a variety of proprietary seal types, pioneered the use of dual contact seals. These optimized seal designs have contributed to extended operating and service life of landing gear on virtually all aircraft platforms. In addition, new seal designs that are able to work in ultra-high deflection environments on surfaces that are not coated with chrome, such as High-Velocity Oxygen Fuel (HVOF) applied tungsten carbide cobalt-based coatings, are now available.

To further increase service life, adding Orkot® bearings prevents scratches and for existing gear designs, significantly reduces bearing component weight. In addition, service life and seal performance can be improved with retrofit sealing systems in Turcon®, Turel® or Orkot®.

Wheel and Brake

Designed for superior performance in harsh environments, the Trelleborg Sealing Solutions portfolio provides a complete range of static and dynamic sealing systems including steel-reinforced bearing grease retainers, large O-Ring wheel hub seals and high-temperature brake seals. We have test capabilities specific to the rigors of braking applications.

Engine Systems*

A wide range of sealing systems for engine and engine management applications is available including fan blade annulus fillers, fan cowl and thrust reverser doors, heat exchangers, drive shafts, air intakes, fairings and coupling systems. Materials are selected for high-temperature performance including Isolast®, the advanced perfluoroelastomer specially developed by Trelleborg Sealing Solutions, which will operate at up to +608°F/ +320°C. Reinforced engine seals and ducts are available that can provide fire control at tested temperatures of +2,012°F/ +1,100°C.

Airframe*

With a focus on aerodynamic efficiency, Trelleborg Sealing Solutions offers a range of standard and customized designs, developed for reliability in service and efficiency in assembly and maintenance. The Trelleborg Sealing Solutions range includes seals for wing and moving surfaces such as complex aerodynamic shrouds for hydraulic jacks, extrusions and fabricated seals for doors and hatches, interior couplings, inflatable cockpit canopy seals and fabricated swing-wing fuselage fairings.

* For more information on our Engine and Airframe products see our separate brochure *Aero Engine and Airframe Sealing Solutions.*

Brands and Manufacturing Facilities

Trelleborg Sealing Solutions is one of the largest seal producers in the world, with over 25 strategically located manufacturing facilities on four continents. Each site specializes in a single product group or type, whether it is seals in proprietary Turcon® PTFE based materials or Zurcon® polyurethane formulations, exclusive designs in unique elastomers including Turel® or Isolast®, bearings or airframe seals. Listed below are production sites that focus on supply to the aerospace market, many of which are responsible for world-renowned brands respected within the sector.

Trelleborg Sealing Solutions manufacturing sites:

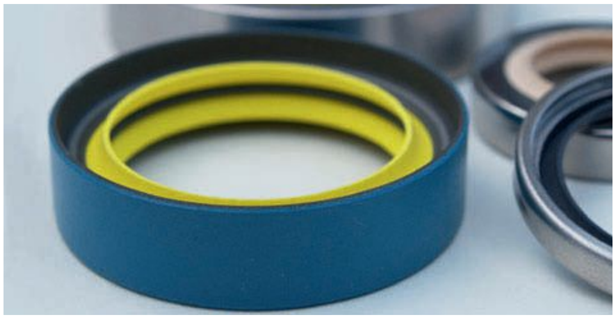
Helsingør, Denmark
Formerly W.S. Shamban Europe A/S

Founded in the 1960s as the European supplier of the Shamban range of products, this facility is a leading manufacturer of hydraulic, fuel systems and engine seals. It is the Trelleborg Sealing Solutions center for the development of the proprietary Turcon® PTFE based materials and Turcon® VL Seal®.

Condé, France
Formerly Impervia

The facility has built its expertise over a 60-year history. It was the first manufacturer of elastomeric and plastic seals in France for the aerospace industry and is still the leading company in this sector within the country. It specializes in elastomer products, O-Rings, special moldings, bonded seals and machined seals.

Bridgwater, UK
Formerly Wills Polymers



The main areas of expertise of this facility are Turcon® Variseal® and Turcon® Varilip® PDR. Wills Rings®, the original metal rings, were developed here in the 1930s.

Cadley Hill, UK
Formerly Woodville Polymers

Experts in homogenous and fabric-reinforced silicone profiles used to seal airframe structures, access panels and engine systems.

Tewkesbury,UK
Formerly Dowty Seals

With roots going back to the 1940s, this facility is the Trelleborg Sealing Solutions center of expertise for elastomer materials, high-performance O-Rings, gaskets and elastomer-based custom-designed sealing solutions.

Brands and Manufacturing Facilities

Broomfield, Colorado, USA
Formerly American Variseal Corporation

The main areas of expertise of the facility are Turcon® Variseal® and Turcon® Varilip® PDR. It is also the design and manufacturing center for engineered bearing products made form high modulus materials.

São Paulo, Brazil

Manufacturer of elastomer seals to support the aerospace & defense industries in Brazil and Latin America.

For full details of our manufacturing facilities worldwide go to www.tss.trelleborg.com. All inquiries should be directed to your local Trelleborg Sealing Solutions marketing company.

Fort Wayne, Indiana, USA
Formerly Busak+Shamban Seals Division

A leading manufacturer of hydraulic, fuel systems and engine seals, the company was established in the 1950s. The facility provides innovative and functional solutions for complex applications by utilizing the best of elastomer and thermoplastic materials technologies. Home of the slipper seal products originally developed by W.S. Shamban: Double Delta®, Footseal, HATSEAL®, Wedgpak® and Plus Seal®.

Northborough, Massachusetts, USA
Formerly Chase-Walton Elastomers

Experts in homogenous and fabric-reinforced silicone profiles used to seal airframe structures, access panels and engine systems. Products manufactured at the facility include ducting for high-temperature applications, aerodynamic wing seals, nacelle seals, engine seals, fire seals and pylon seals.

■ Aerospace Service

Due to the increasingly stringent requirements of the aerospace market, Trelleborg Sealing Solutions places strong emphasis on its ability to globally service, support and supply its aerospace customers through our international network of manufacturing facilities and support teams.

Technical and Engineering Expertise

Trelleborg Sealing Solutions is uniquely placed to offer a dedicated seal design and development service to the aerospace market. As our seals are used in virtually every major commercial and military program, our engineering personnel are able to contribute their knowledge of this specialized technology directly to customers. Dedicated teams are appointed to manage the supply process that starts with the efficient handling of inquiries to complete project management of design, prototyping, production, testing and installation of sealing systems. To facilitate this we employ state-of-the-art design tools, fully customer-compatible CAD systems and leading-edge Finite Element Analysis (FEA).

Quality and Manufacturing Capability

Trelleborg Sealing Solutions manufacturing sites are strategically located to provide global coverage. They succeed in delivering cost-effective sealing solutions, while maintaining the highest standards of international airworthiness, quality control and conformance to the latest environmental legislation. The FAA, EASA and leading aerospace manufacturers are regular visitors to Trelleborg Sealing Solutions facilities worldwide, and Trelleborg Sealing Solutions continues to work with these groups to enhance their reputation for quality and to maintain their key position in the aerospace supply chain.

All Trelleborg Sealing Solutions manufacturing facilities are certified to ISO 9001:2008 and ISO/TS 16949:2009 and those involved in production of aerospace parts have AS/EN 9100 approval.

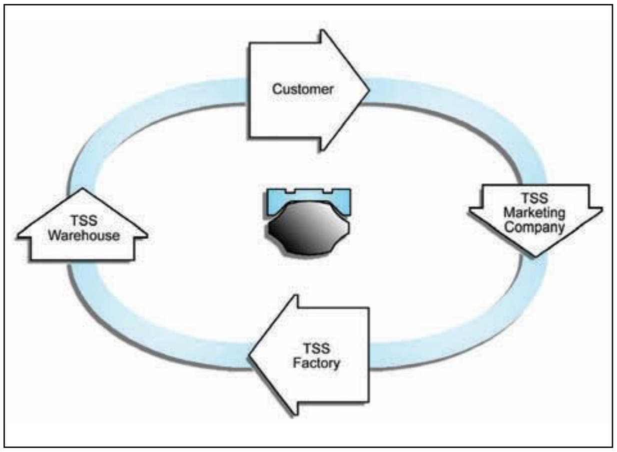
Logistics, Kitting, Direct Line Feed and Subassemblies

An extensive global distribution network, backed by logistic centers in Europe, Asia-Pacific and the Americas, ensures rapid delivery to our customers. Trelleborg Sealing Solutions has proven expertise in kitting to provide complete seal sets to customers presented in the way best suited to their needs. All the seals in the kits are backed up by full technical and quality support.

Trelleborg Sealing Solutions can also produce subassemblies on behalf of our customers. These make assembly at the next stage easier and can minimize installation-related seal failures. Subassemblies, kits or individual seals can be delivered direct to the customers' shop floors using reliable, low paperwork direct line feed (DLF) systems. These minimize customer procurement costs, stock and delivery error rates.

Aftermarket Support

Dedicated customer-focused teams ensure that aftermarket needs are met. Trelleborg Sealing Solutions engineers regularly visit the airframe manufacturers, airlines, Original Equipment Manufacturers (OEMs) and Maintenance Repair Overhaul (MRO) repair stations. Our engineers provide them with technical support and guidance so systems run at peak performance. Our knowledge of seal and bearing system performance in operating conditions has enabled many customers to upgrade to more reliable systems and increase performance, without additional hardware or tooling costs.



■ Aerospace Standards

There are a large number of standards that apply to the aerospace industry. Listed in this section are the key ones.

Standard authorities

All standards prefixed with either AS (Aerospace Standard) or ARP (Aerospace Recommended Practice) are issued by SAE International (Society of Automotive Engineers) in the US. Trelleborg Sealing Solutions is an active contributor to the SAE work. Copies of SAE standards may be obtained from the Society of Automotive Engineers. Go to their website at www.sae.org.

This is a standards development organization for the engineering of powered vehicles of all kinds including aerospace. In addition, MIL standards cover military aircraft and are issued by the US Department of Defense.

ARP1234, Revision B
Gland Design, Elastomeric O-Ring Seals, Static Axial, Without Back-up Rings

Provides standardized dimensional criteria for static axial elastomeric O-Ring seal glands, without Back-up Rings. This standard supplements ARP 1231, "Gland Design, Elastomeric O-Ring Seals, General Considerations." The criteria are similar, but not identical, to those in MIL-G-5514.

ARP5316
Storage of Elastomer Seals and Seal Assemblies Which Include an Elastomer Element Prior to Hardware Assembly

Addresses the general requirements for data recording procedures, packaging and storing of elastomeric seals and seal assemblies which include an elastomeric element prior to the seal being assembled into hardware components.

The requirement for packaging is an integral part of the controlled storage procedure and provides a means of positive product identity from the time of manufacturing to the time of assembly into a component.

AS4088
Aerospace Rod Scraper Gland Design Standard

Defines gland dimensions for rod scrapers. Gives specifications for rod diameters from ¼ to 15 ½ inches/ six to 394 mm, inclusive corresponding to AS568 O-Ring Dash No. sizes -108/-111, -206/-222, -325/-349 and -425/-460. The gland details provide more space than MS33765 and are sufficient to fit more efficient and reliable exclusion devices.

AS4052
Gland Design: Scraper, Landing Gear, Installation

Covers an alternate gland design for the installation of scraper/ wiper rings in the lower end of landing gear shock struts for the purpose of contaminant exclusion.

Piston rod diameters, gland internal diameters, groove sidewall angles and the surface finish are all defined by AS4716, but the gland outer retaining wall diameter is changed. The gland has a reduced atmospheric gland lip and profiled lead in geometry to allow for a PTFE jacket metal spring-energized scraper to be installed.

AS4716
Gland Design, O-Ring and Other Elastomeric Seals

Provides standardized gland design criteria and dimensions for elastomeric seal glands for static and dynamic applications.

The glands have been specifically designed for applications using SAE AS568 size O-Rings, with related class 2 tolerances, at pressures exceeding 1,500psi/ 10.3 MPa utilizing one or two anti-extrusion Back-up Rings and applications at pressures under 1,500psi/ 10.3 MPa without Back-up Rings. While this specification covers the basic design criteria and recommendations for use with standard size O-Rings, these glands are also for use with other elastomeric and PTFE based seals and packings.

AS4832
Gland Design: Nominal 3/8 Inch Cross Section for Custom Compression Type Seals

Offers gland details for a nominal 3/8 inch/ 0.364 mm cross section gland with proposed gland lengths for compression-type seals with two Back-up Rings over a range of eight to 20 inches/ 203 to 508 mm in diameter.

A dash number system is proposed similar to AS568A. Seal configurations and design are not a part of this document. This gland is for use with custom compression-type seals including, but not limited to O-Rings, T-Rings, D-Rings, etc.

AS5857
Gland Design, O-Ring and Other Elastomeric Seals, Static Applications

Provides standardized gland design criteria and dimensions for seal glands for static applications.

The glands have been specifically designed for applications using SAE AS568 size O-Rings, with related class 2 tolerances, at pressures exceeding 1,500psi/ 10.3 MPa utilizing one or two anti-extrusion Back-up Rings and applications at pressures under 1,500psi / 10.3 MPa without Back-up Rings. The glands have been sized to provide increased squeeze as compared to AS4716 for more effective sealing at low temperatures and low seal swell conditions. Primary usage is for static external sealing.

ASME B46.1
Surface Texture (Surface Roughness, Waviness and Lay)

This standard is concerned with the geometric irregularities of surfaces. It defines surface texture and its constituents: roughness, waviness and lay along with parameters for specifying surface texture.

The terms and ratings in this standard relate to surfaces produced by such means as abrading, casting, coating, cutting, etching, plastic deformation, sintering, wear, erosion, etc.

ISO 4287
Geometrical Product Specifications (GPS) -- Surface Texture: Profile Method -- Terms, Definitions and Surface Texture Parameters

This international standard specifies terms, definitions and parameters for the determination of surface texture (roughness, waviness and primary profile) by profiling methods.

MIL-G-5514
Military Specification- General Requirements for Gland Design; Packings, Hydraulic Equipment

Approved for use by all Departments and Agencies of the Department of Defense.

This specification covers basic design criteria recommendations for use and application in packings, gaskets, packing and gasket glands and related features for use in hydraulic equipment utilized in systems designed in accordance with MIL-H-5440.

■ Material technology

As specialists in polymer technology, Trelleborg Sealing Solutions has for decades been a world-leader in the development of new polymeric compounds for use in aerospace applications. Not only does Trelleborg Sealing Solutions develop and formulate its aerospace materials in-house, it has also acquired significant skills in the field of applied materials technology enabling us to recommend coatings and surface finishes. Seals can be individually hand-fabricated, automatically molded, fabric-reinforced or bonded to metallic components.

A full range of aerospace grade Turel® elastomers is available, specifically engineered to withstand the extremes of temperature and aggressive chemicals encountered in today's aircraft. To complement these materials, many proprietary blends of premium-grade Turcon® PTFE based materials along with high-modulus Zurcon® thermoplastics are available to provide a one-stop-shop of engineered solutions for aerospace sealing challenges. In addition for bearings there is Orkot®, a unique thermoplastic composite material.

Turel® and Isolast®

The Turel® range of elastomers is specifically engineered to meet the challenging requirements of the aerospace industry. It includes Nitrile (NBR), Fluorocarbon (FKM), Ethylene Propylene Diene Monomer (EPDM), Hydrogenated Nitrile Butadiene Rubber (HNBR), Fluorosilicone (FVMQ) and Silicone Rubber (Q). In addition, for high-temperature applications, an Isolast® perfluoroelastomer (FFKM) is recommended. These materials are extremely flexible in their use and are suitable for a large number of applications.

The various elastomers can be characterized as follows:

NBR (Nitrile Butadiene Rubber)
Turel® Standard Grades: NE, NG, NB, NZ
NBR is primarily used with mineral-based oils and greases. The properties of NBR depend mainly on their acrylonitrile (ACN) content, which ranges between 18 and 50 percent. In general the materials have good mechanical properties with operating temperatures ranging between -22°F/-30°C and +212°F/+100°C. For short periods of time NBRs can withstand up to +248°F/+120°C and specially formulated NBR can be used down to -76°F/-60°C.

FKM (Fluorocarbon Rubber)
Turel® Standard Grades: FK, FT, FG, FL
FKM is primarily used with mineral-based oils and greases at high temperatures. Depending on structure and fluorine content, FKM materials can differ with regards to their chemical resistance and cold-flexibility. FKM is particularly known for its non-flammability, low gas permeability, and excellent resistance to ozone, weathering, and aging. The operating temperatures of FKM materials range between -4°F/-20°C and +392°F/+200°C. For short periods of time FKMs can withstand up to +446°F/+230°C and specially formulated FKM can be used down to -60°F/-51°C.

EPDM (Ethylene Propylene Diene Monomer)
Turel® Standard Grades: EP, EH
EPDM is often used in applications with brake fluids, based on glycol, and hot water. EPDM materials give good heat, ozone, and aging resistance. In addition they also exhibit high levels of elasticity, good low temperature behavior as well as good insulating properties.

The operating temperatures of EPDM materials range between -49°F/-45°C and +302°F/+150°C. For short periods of time they can withstand up to +347°F/+175°C. Operating temperatures of sulfur cured types are reduced to between -49°F/-45°C and +248°F/+120°C, for short periods of time EPDMs can withstand up to +302°F/+150°C.

HNBR (Hydrogenated Nitrile Butadiene Rubber)
HNBR is often used in high-temperature applications due to excellent abrasion resistance. HNBR materials are produced by selective hydrogenation of the NBR groups. Like these, the properties of the HNBR rubber depend on their acrylonitrile (ACN) content which ranges between 18 and 50 percent as well as on the degree of its saturation. HNBR has good mechanical properties.

The operating temperatures of HNBR materials range between -22°F/-30°C and +284°F/+140°C. For short periods of time HNBRs can withstand up to +320°F/+160°C in contact with mineral oils and greases. Special formulations can be used down to -40°F/-40°C.

FVMQ (Fluorosilicone Rubber)
Turel® Standard Grades: LA, LB, LD, LF
FVMQ is often used in the military applications and fuel systems. FVMQ materials give excellent heat resistance, cold flexibility, dielectric properties and especially good resistance to oxygen and ozone.

Depending on the material, operating temperatures range between -76°F/-60°C and +392°F/+200°C. For short periods of time FVMQs can withstand up to +446°F/+230°C. Special formulations can be used down to -130°F/-90°C.

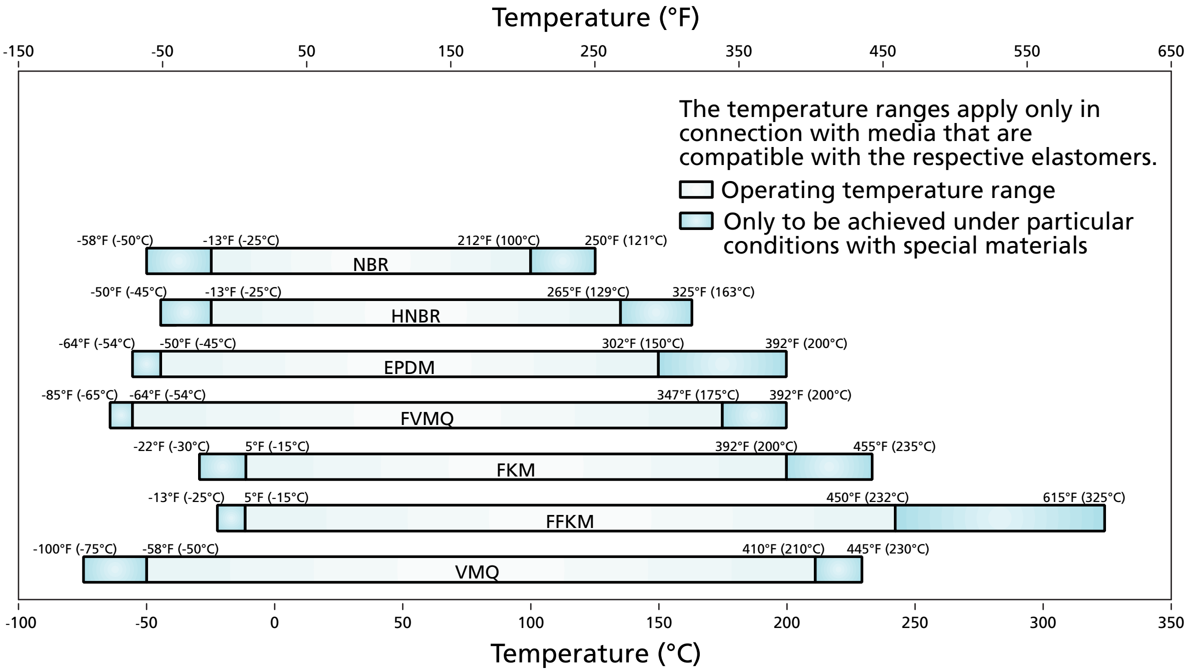
Q (Silicone Rubber)
Turel® Standard Grades: SL
Silicone rubber is often used in gaskets, molded seals, airframe, aerodynamic and engine seals. The material gives excellent heat resistance, cold flexibility, dielectric properties and especially good resistance to oxygen and ozone.

Depending on the material, operating temperatures range between -76°F/-60°C and +392°F/+200°C. For short periods of time Silicone Rubbers can withstand up to +446°F/+230°C. Special types can be used down to -130°F/-90°C.

FFKM (Perfluoroelastomer)
Isolast® Standard Grades: J8325
Applications for FFKM can be mostly found in aircraft engines and in all applications with either aggressive environments or high temperatures.

Perfluoroelastomers are resistant to virtually all media at elevated temperatures and demonstrate low swelling.

Depending on the material, operating temperatures range between -13°F/-25°C and +464°F/+240°C. Special types can be used up to +617°F/+325°C.



The temperature ranges apply only in connection with media that are compatible with the respective elastomers.

Figure 1 General temperature range of various elastomer types

Meeting Specifications and Approvals

For aerospace applications many designs are composite seals, with an elastomer element as an integral part of the seal. It is therefore important that parameters such as elastomer swell, shrinkage during molding, compression set, media compatibility and tolerances are carefully controlled.

Through stable processes and 100 percent batch testing in our laboratories, we make sure that materials are manufactured to Trelleborg Sealing Solutions specifications. A number of materials have also been approved for a Qualified Products List (QPL) as part of US Government and Aerospace Industry support programs.

Chemical Compatibility

Elastomer materials are more sensitive to fluids than other sealing compounds. Chemical reaction can cause damage to the seal, affecting physical properties. Specifically in hydraulic applications, selection of the optimum elastomer material for a given hydraulic fluid is critical. Not only must the oil used be taken into account but also the additives, as these can cause adverse behavior. It may be necessary to conduct a soak test at elevated temperature in order to verify the performance in application. An online chemical compatibility guide can be accessed at www.tss.trelleborg.com.

Temperature Range

Turel® compounds are available to operate in temperatures from -100°F to +500°F/ -73°C to +260°C . Most will therefore meet the temperature requirements of AS4716 type II systems, specified as -65°F to +275°F/ -54°C to +135°C. The use of spring-energized Variseal® can expand the temperature range even further. In addition, for high-temperature applications, Isolast® J8325 has an operating temperature up to +617°F/ +325°C.

Temperature Cycling

The effect of temperature cycling on elastomer seals can result in compression set. This means that the elastomer material loses its elasticity over time. For Turel® materials, this effect is kept to an acceptable minimum if they are specified for applications with operating temperatures within the indicated parameters. The low-temperature dynamic cycling limits vary according to elastomer type.

Cold Temperatures

Elastomer materials from Trelleborg Sealing Solutions are specially engineered to give maximum performance in cold conditions.

Elastomer materials contract approximately ten times more than steel in cold environments. The material becomes stiffer and loses its flexibility at cold temperatures. When passing the lower limit it reaches the glass transition stage, when it becomes extremely brittle. Physical properties will recover when temperatures elevate again. Increased squeeze can improve performance at low temperatures.

Hot Temperatures

Elastomer materials soften and lose their physical properties if the upper temperature limit is exceeded. Physical properties will not recover and the seal will take on a permanent compression set. The compression set also varies with the type of media to which the elastomer is exposed. Continuous exposure to temperatures higher than those recommended can permanently damage the seal.

Surface Speed

In general, the speed of the dynamic surface in contact with an elastomer seal should be kept below 9.8 ft/s / three m/s to avoid damage to the elastomer. Elastomers can be used at speeds greater than listed here. Please contact your local Trelleborg Sealing Solutions marketing company for more information.

Aging

The maximum recommended storage time and shelf-life is shown in Table I, per SAE ARP 5316. This is only valid if the elastomer is stored under controlled conditions in light-proof and airtight packaging, as specified in above standard.

Total Materials Capability

In this section we have given details of those elastomer materials that are recommended and commonly used in aerospace applications. Other materials are available. For further details on these either contact your local marketing company or go to www.tss.trelleborg.com.

Table I Turel® and Isolast® Materials

TSS Material Code	Base Polymer	Temperature Range °F (°C)	Hardness (Shore A)	Material commonly used in listed fluids	Reference Specification	Recommended [2] Shelf Life
Turel®						
NE	Nitrile (NBR)	-65°F to +275°F (-54°C to +135°C)	75	MIL-PRF-83282 MIL-PRF-87257	AMS-P-83461 (on QPL)	15 Years
NG	Nitrile (NBR)	-65°F to +275°F (-54°C to +135°C)	75	MIL-PRF-5606 MIL-PRF-83282	MIL-P-25732	15 Years
EH	Ethylene Propylene (EP)	-65°F to +300°F (-54°C to +149°C)	80	AS1241 Phosphate Ester	NAS 1613 Rev. 2 Equivalent	Unlimited
EP	Ethylene Propylene (EP)	-65°F to +300°F (-54°C to +149°C)	80	AS1241 Phosphate Ester	NAS 1613 Rev. 5 Equivalent	Unlimited
FT	Fluorocarbon (FKM)	-30°F to +500°F (-34°C to +260°C)	75	Jet Fuel	MIL-R-83485 [1]	Unlimited
FG	Fluorocarbon (FKM)	-40°F to +400°F (-40°C to +204°C)	75	Jet Fuel	AMS 7379	Unlimited
LF	Fluorosilicone (FVMQ)	-100°F to +350°F (-73°C to +177°C)	70	MIL-PRF-7808 MIL-PRF-23699 MIL-PRF-5606 MIL-PRF-83282 MIL-PRF-87257	MIL-R-25988 [1]	Unlimited
LA	Fluorosilicone (FVMQ)	-70°F to +350°F (-57°C to +177°C)	80	MIL-PRF-7808 MIL-PRF-23699 MIL-PRF-5606 MIL-PRF-83282 MIL-PRF-87257	MIL-R-25988 [1]	Unlimited
Isolast®						
J8325	Perfluoroelastomer (FFKM)	+5°F to +617°F (-15°C to + 325°C)	75	MIL-PRF-7808 MIL-PRF-23699	AMS 7257C	Unlimited

---

[1] Meets physical property requirements of applicable specification

[2] Shelf life guidelines per SAE Aerospace Recommended Practice ARP 5316 and ISO DIS 27996:2009 (published 2009-02-03)

[3] This table represents common TSS Turel & Isolast elastomer material grades, this table is not comprehensive, for additional materials and for any material questions please contact you local TSS Sales Engineer.

Testing to reference specification on a lot-by-lot basis is available on request.

■ Material recommendations for sealing in Aerospace Hydraulic Fluids

Hydraulic fluid is integral to all hydraulic systems. When specifying seals for these systems it is important to understand the interaction between the polymers the seals are made of and the operating fluid. The elastomer must be compatible with the fluid to ensure long-term performance and durability. It must also be capable of withstanding the operating environment. Listed below are fluids commonly used in today's Aerospace applications along with the most suitable Trelleborg Sealing Solutions elastomer.

A fluid viscosity versus temperature graph is included for referencing the performance characteristics of typical aerospace fluids and lubricants with which Turel® and Isolast® materials are compatible.

Table II Typical Aerospace Hydraulic Fluids with recommended Turel® Material

Specification	Oil Type (base)	Temperature Range	General Information	Most Suitable Turel® Elastomers
MIL-PRF-5606 (NATO code H-515)	Petroleum	-65°F to +275°F (-54°C to +135°C)	Fluid used mostly for landing gear shock strut applications	Turel® NG (NBR) Turel® FT (FKM) Turel® FK (FKM) Turel® FG (FKM)
MIL-PRF-83282 (NATO code H-537)	Synthetic hydrocarbon	-40°F to +401°F (-40°C to +205°C)	Gives improved fire resistance and shear stability. Reduced low temperature capability compared to MIL-PRF-5606 and MIL-PRF-87257.	Turel® NG (NBR) Turel® FT (FKM) Turel® FK (FKM) Turel® FG (FKM)
MIL-PRF-87257 (NATO code H-538)	Synthetic hydrocarbon	-65°F to +350°F (-54°C to +177°C)	Similar to MIL-PRF-83282 with improved low temperature capability	Turel® NE (NBR) Turel® FT (FKM) Turel® FK (FKM) Turel® FG (FKM)
AS1241 Class 1 AS1241 Class 2	Phosphate ester	-65°F to +275°F (-54°C to +135°C)	Primarily used on commercial aircrafts. No fire propagation. Class 1 is low-density and Class 2 is high-density.	Turel® EH (EPR) Turel® EP (EPR)
MIL-PRF-7808	Synthetic oil-ester	-65°F to +300°F (-54°C to +149°C)	Engine lubrication oil	Turel® FT (FKM) Turel® FG (FKM) Turel® FL (FKM) Isolast® J8325 (FFKM)
MIL-PRF-23699	Synthetic lubricant oil	-40°F to +400°F (-40°C to +204°C)	Engine lubrication oil. High Thermal Stability (HTS) versions available for longer operating duration applications. Operating temperatures up to + 450°F/ + 232°C.	Turel® FT (FKM) Turel® FG (FKM) Turel® FL (FKM) Isolast® J8325 (FFKM)
Jet Fuel; JP-4, JP-5 and JP-8, Jet-A and Jet A-1	Wide-cut (gas and kerosene)	-52°F to +100°F (-47°C to +38°C)	Commercial aviation fuel grades. Freezing temperature of Jet A is -40°F/ 40°C and Jet A-1 is -52°F/ -47°C.	Turel® FT (FKM) Turel® FG (FKM) Turel® FL (FKM)

Table III Typical Aerospace Greases with recommended Turel® material

Specifications	Temperature Range	Type	Most Suitable Turel® Elastomers
MIL-G-21164D	-73°C to +121° C (-100° F to +250° F)	Multi-purpose grease; micro gel-thickened synthetic diester oil base with molybodem disulfide	1)
MIL-PRF-23827C	-73°C to +121° C (-100° F to +250° F)	Synthetic aviation grease; lithium complex-thickened synthetic base oil	1)
MIL-PRF-81322F	-54°C to +125° C (-65° F to +250° F)	Multi-purpose grease; micro gel-thickened synthetic hydrocarbon oil base	Turel® NE (NBR) Turel® NG (NBR) Turel® FT (FKM) Turel® FK (FKM) Turel® FG (FKM)
MIL-G-24139A	-73°C to +121° C (-100° F to +250° F)	General purpose airframe grease; Composition: Micro Gel-thickened mineral oil base (Boeing BMS3-33)	Turel® NE (NBR) Turel® NG (NBR)
MIL-G-25537C	-54°C to +93° C (-65° F to +200° F)	Multi-purpose helicopter grease; calcium soap thickened mineral oil base	Turel® NE (NBR) Turel® NG (NBR)
MIL-G-81322E, Grade A	-54°C to +125° C (-65° F to +250° F)	Synthesized hydrocarbon fluid & a non-soap thickener	Turel® NE (NBR) Turel® NG (NBR) Turel® FT (FKM) Turel® FK (FKM) Turel® FG (FKM)
MIL-L-46000	-54°C to +127° C (-65 ° F to +260° F)	Lithium stearate, thickened, synthetic grease for lubricating small gearboxes, automatic weapons, etc.	Turel® NE (NBR) Turel® NG (NBR) Turel® FT (FKM) Turel® FK (FKM) Turel® FG (FKM)
MIL-G-4343C	-65°C to +120° C (-85 ° F to +250° F)	Lithium soap thickened synthetic oil based grease compounded with additives to enhance oxidation resistance, rust and corrosion protection, and lubricity at extreme low temperatures	Turel® NE (NBR Peroxide Cured)
MIL-G-81827A	-55°C to +232° C (-67° F to +450° F)	Synthetic grease with a synthetic hydrocarbon PolyAlphaOlefin- (P.A.O) type base, containing molybdenum disulfide additives thickened by an inorganic gel	Turel® NE (NBR) Turel® NG (NBR)
MIL-PRF-32014	-40°C to +175° C (-40° F to +350° F)	A lithium soap thickened, medium viscosity synthetic hydrocarbon grease designed for high speed and temperature applications	Turel® NG (NBR, Sulfur-Cured)

1) These greases have different base stocks that can meet specification requirements. Due to this, elastomer compatibility needs to be confirmed based on the base stock and manufacturer of the grease. For more information on compatibility with these greases please contact your local Trelleborg Sealing Solutions Marketing Company.

Viscosities of Typical Fluids vs. Temperature

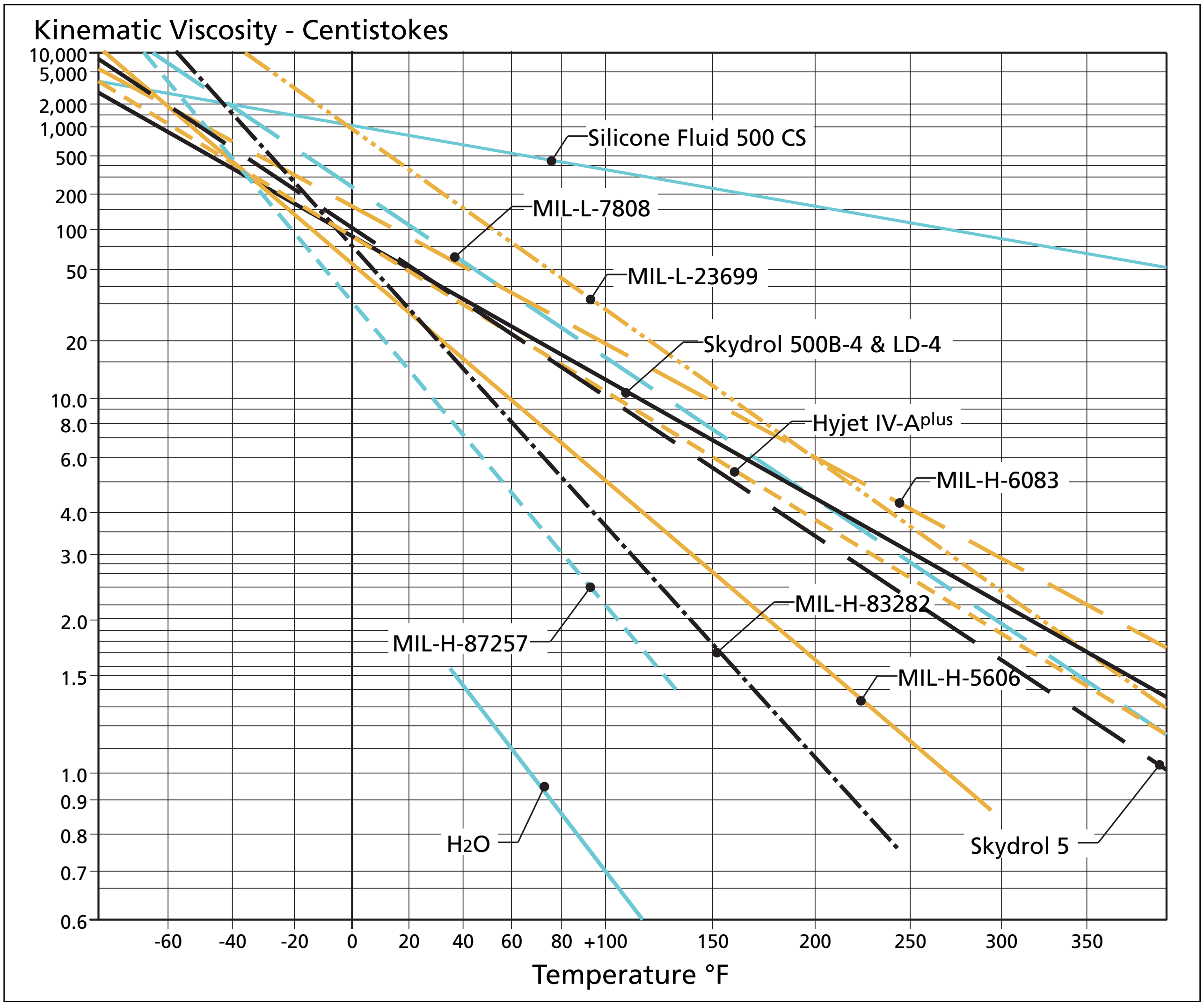


Figure 2 Fluid Viscosity – For reference only. For further information, please contact your fluid supplier.

■ Turcon®

The Turcon® range consists of proprietary materials based on premium-grade Polytetrafluoroethylene (PTFE) fluoropolymer resins. Fillers are added to enhance material properties.

Low Friction

Turcon® materials exhibit the lowest coefficient of friction of any known solid and have a uniquely low static coefficient of friction. This results in an extremely low breakout friction, and as the materials do not adhere to their mating surfaces, stick-slip in dynamic applications is eliminated.

Chemical Compatibility

Turcon® materials are chemically inert in virtually all media, even at elevated temperatures and pressures. They are therefore compatible with an extremely wide range of solvents, acids and other aggressive media.

Temperature Range

Turcon® compounds are available to operate in temperatures from -320°F to +500°F/ -196°C to +260°C and will endure temperature spikes of up to +680°F/ +360°C. Approaching these limits, it is necessary to limit other working conditions.

Temperature Cycling

Turcon® materials are not altered or adversely affected by cycling temperatures.

Degradation

Turcon® does not contain plasticizers or any other ingredients which could degrade at temperatures below +572°F/ +300°C.

Surface Speed

Turcon® materials generate far less heat than other materials. This means that the speed of the dynamic surface in contact with the seal can go up to 49.2 ft/s / 15 m/s, depending on seal design and working conditions. Speeds exceeding 65.6 ft/s / 20 m/s have been achieved under certain conditions.

Aging

The properties of Turcon® materials do not significantly change over time. They will not become brittle or degrade when exposed to severe-weathering conditions such as heat, light, water or salt spray. This is a benefit when seals are left idle for long periods of time, even years, and still need to perform with complete reliability.

Resilience

As they do not have the resilience of elastomers, Turcon® materials may experience cold-flow or creep under continued thermal or mechanical stress. To counter this, Turcon® seals require an elastomer element or spring to provide a radial force. This compensates for seal wear, cold-flow and the normal variations in gland dimensions due to the range of tolerances or eccentricity.

Wear Resistance

The wear resistance of Turcon® materials exceeds the demands of even the most challenging sealing environments. This extends seal life at high speeds, pressures and temperatures.

Radiation

When exposed to radiation, the molecular-chain structure of PTFE can be damaged, lowering tensile strength and potentially leading to seal disintegration. Turcon® is therefore not recommended for an accumulated radiation dose above 7 x 10^4 rad/ 7 x 10^2 Gy. In high-radiation service other fluoropolymers are recommended.

Electrical Properties

Turcon® has excellent electric properties such as a low dielectric constant and a very high dielectric strength, even at elevated temperatures.

Carbon and Graphite filled Turcon® compounds are electrically conductive. Examples are:

Turcon® Material	Filler(s)	Surface Resistivity (Ω)	Volume Resistivity (Ω x cm)
Turcon® T11	Carbon Graphite	2 x 10^5	2 x 10^4
Turcon® T29	Carbon Fiber	6 x 10^4	1 x 10^4
Turcon® T40	Carbon Fiber	5 x 10^{12}	2 x 10^{13}

Fibers making contact throughout the structure help electrical conductivity through the material.

Turcon® materials that do not have fillers, or are low-filled with particles that do not contact have low conductivity. Examples are:

Turcon® Material	**Filler(s)**	**Surface Resistivity (Ω)**	**Volume Resistivity (Ω x cm)**
Turcon® T01	Virgin	5 X 10^{17}	2 X 10^{17}
Turcon® T05	Turcon® (Pigment)	7 X 10^{17}	1 X 10^{17}
Turcon® T99	Turcon® Lubricant	1 X 10^{17}	3 X 10^{17}

Absorption of fluids

The water absorption of PTFE is 0.01 percent and it does not absorb any other fluids to a significant level. One exception is fluorinated-cooling media, for example Freon. These can cause a reversible weight increase of approximately five percent accompanied by dimensional increases of approximately one percent.

Vacuum

PTFE has an extremely low vapor pressure of <10^{-5} mbar at +248°F/ +120°C and can be used safely in vacuum.

Other Characteristics

PTFE will not sustain fire in pure oxygen. Virgin PTFE is physiologically inert. All Trelleborg Sealing Solutions materials are lead and mercury-free.

Total Materials Capability

In this section we have given details of those Turcon® materials that are recommended and commonly used in aerospace applications. Other materials are available. For further details on these either contact your local marketing company or go to www.tss.trelleborg.com.

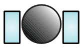
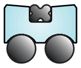
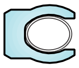
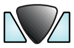
Table IV Turcon® Material Physical Properties

TSS Material Code	Description and Recommended Usage	Color	Tensile Strength		Elongation at Break	Specific Gravity	Hardness
Turcon®			ASTM D 4894 (psi)	ASTM D 4894 (Mpa)	ASTM D 4894 (%)	ASTM D 792 (g/cm^2)	ASTM D 2240 (Shore D)
T01	Virgin PTFE, exceeding AMS-R-8791 Profile: Clean system, low-friction and pressure Surface: Steel and chrome	⬜	6130	42.3	378	2.16	58
T05	Turcon® Profile: All systems, low friction, medium lifetime and pressure Surface: Steel and chrome	🟦	5682	39.2	392	2.17	57
T08	Additive: Bronze (high-filled) Profile: Strong extrusion resistance Surface: Steel and chrome	🟫	2450	17.0	175	3.88	60
T19	Additive: Mineral fibers and molybdenum disulfide (MoS_2) Profile: High-pressure and long wear life Surface: Steel, chrome and HVOF*	⬛	3506	24.2	226	2.30	63
T25	Additive: Glass fibers and Molybdenum disulfide (MoS_2) Profile: Rotary applications Surface: Hardened steel, chrome and HVOF*	⬛	4562	31.5	286	2.23	59
T29	Additive: Carbon fiber (high-filled) Profile: Long wear life and large extrusion gap Surface: Steel, chrome and HVOF*	⬛	3208	22.1	217	2.01	61
T46	Additive: Bronze (medium-filled) Profile: Extrusion-resistant Surface: Hardened steel and chrome	🟩	4000	27.6	250	3.10	63
T99	Additive: Molybdenum disulfide (MoS_2) Profile: Low-friction, medium pressure, long seal life Surface: Steel, chrome anodized aluminum and HVOF*	⬛	5385	37.2	347	2.22	58
M30	Additive: Thermoplastic and lubrication package Profile: Long wear life, high-frequency Surface: Steel, chrome and HVOF*	🟩	3000	21.0	250	1.92	55

Data sheets available upon request.
* HVOF = High Velocity Oxygen Fuel thermal spray coating process

This table represents common Trelleborg Sealing Solutions Turcon® PTFE material grades. This table is not comprehensive; for additional Turcon® PTFE materials and for any Turcon® PTFE material questions please contact you local Trelleborg Sealing Solutions marketing company.

Table V Recommended Turcon® Materials For Seal Designs

Turcon® TSS Material Code	Profile	T01	T05	T08	T19	T25	T29	T46 (T49)	T78	T99	M30
Turcon® Excluder® DC			●		●					●	
Turcon® Slydring® II				●	●			●			
Turcon® Back-up Ring				●			●				
Turcon® AQ-Seal® 5					●					●	
Turcon® Varilip® PDR						●			●		
Turcon® Roto Glyd Ring®					●	●	●				
Turcon® Roto Variseal®					●	●	●				
Turcon® Dual Piston Ring					●		●			●	●
Turcon® Variseal®			●		●		●		●	●	●
Turcon® Stepseal® 2K					●		●	●			●
Turcon® Glyg Ring®					●		●	●			●
Turcon® T-Seal					●		●				●
Turcon® Wedgpak® II					●		●			●	●
Turcon® Double Delta® II					●		●				●
Turcon® Plus Seal® II					●		●			●	●
Turcon® VL Seal®					●						●

The table of general materials and seal recommendations are based on sealing surfaces with hardness of 44 Rockwell C and above that have the recommended Trelleborg Sealing Solutions surface finish.This table is presented as a general guideline for material consideration.

■ Zurcon® Materials

The Zurcon® range of materials is made up of high modulus compounds. They are recommended to support and protect sealing elements from conditions such as high-pressure, large clearance gaps and hardware deflections. These materials have high creep resistance and excellent shear properties giving superior protection from extrusion in Back-up Ring configurations.

Table VI Zurcon® Z60 Physical Properties

TSS Material Code	Description	Color	Tensile Strength		Elongation at Break	Specific Gravity	Hardness
Zurcon®			ASTM D 638 (psi)	ASTM D 638 (MPa)	ASTM D 638 (%)	ASTM D 792 (g/cm^3)	ASTM D 785 (Shore R)
Z60	Composition: Polyamide and Molybdenum Disulfide (MoS_2) Profile: T-Seal and corner reinforcement Surfaces: Steel and chrome Formerly HiMod® 60	⬛	12,000	82.7	50	1.16	120

Table VII Zurcon® Z43 and Z40 Physical Properties

Material Code	Description	Color	Tensile Strength		Elongation at Break	Specific Gravity	Hardness
Zurcon®			ASTM D 1457 (psi)	ASTM D 1457 (MPa)	ASTM D 1457 (%)	ASTM D 621 (Deformation @ 2,000 psi 73°F/ 23°C for 24 hrs)	ASTM D 785 (M Scale)
Z43	Composition: High modulus thermoplastics, PTFE and carbon Profile: Bearing, Stakbak® and corner reinforcement Surfaces: Steel, chrome and ceramic Formerly HiMod® 552	⬛	11,750	81	25	1.4	95
Z40	Composition: Virgin PEEK™ to Mil-R-46183, Poly-Ether-Ether-Ketone thermoplastic Formerly HiMod® 550	⬜	13,000	90	10-25	1.3	99

Note:
The testing of tensile properties is based on the micro-tensile specimen per ASTM D 1457/D 4894, pulled at 2 inches/ 50 mm per minute with an initial jaw separation at 0.875 ± .005 inches/ 0.127 mm. Tensile properties are determined in accordance with the procedures described in ASTM D 638.

The values in the tables above are nominal, intended for engineering reference only. These values are not to be used as a specification requirement. Specified values can only be obtained from each batch.

Table VIII Zurcon® Design Data

Material	Technical Data		Application
	Temperature °F/ °C	Velocity	
Zurcon® Z60	-65 to +250°F -54 to +121°C	16 ft/s 4.9 m/s	Good extrusion and wear resistance, primarily used for piston rings and Wear Rings
Zurcon® Z43	-76 to +500°F -60 to +260°C	16 ft/s 4.9 m/s	Excellent extrusion and wear resistance, high temperature and load capabilities
Zurcon® Z40	-76 to +500°F -60 to +260°C	16 ft/s 4.9 m/s	Excellent extrusion and wear resistance

Total materials capability

In this section we have given details of those Zurcon® materials that are recommended and commonly used in aerospace applications. Other materials are available. For further details on these either contact your local marketing company or go to www.tss.trelleborg.com.

■ Orkot®

Orkot® materials are made of special thermoplastic resin impregnated with a fabric composite of fine weave fibers.

Slydring® Bearings

Where heavy-duty bearing systems are required, Slydring® bearings made from Orkot® material are an established solution worldwide. They offer excellent service life, high compressive strength, heat and chemical resistance along with very low friction characteristics. For rod and piston applications in dynamic hydraulic systems where high side loads are present, Orkot® Slydring® bearings can act as guide rings to maintain correct positioning and concentricity of reciprocating and rotating components. Use of Orkot® Slydring® prevents metal-to-metal hardware contact between moving parts and eliminates scoring and fretting of hardware, resulting in improved system life and reliability.

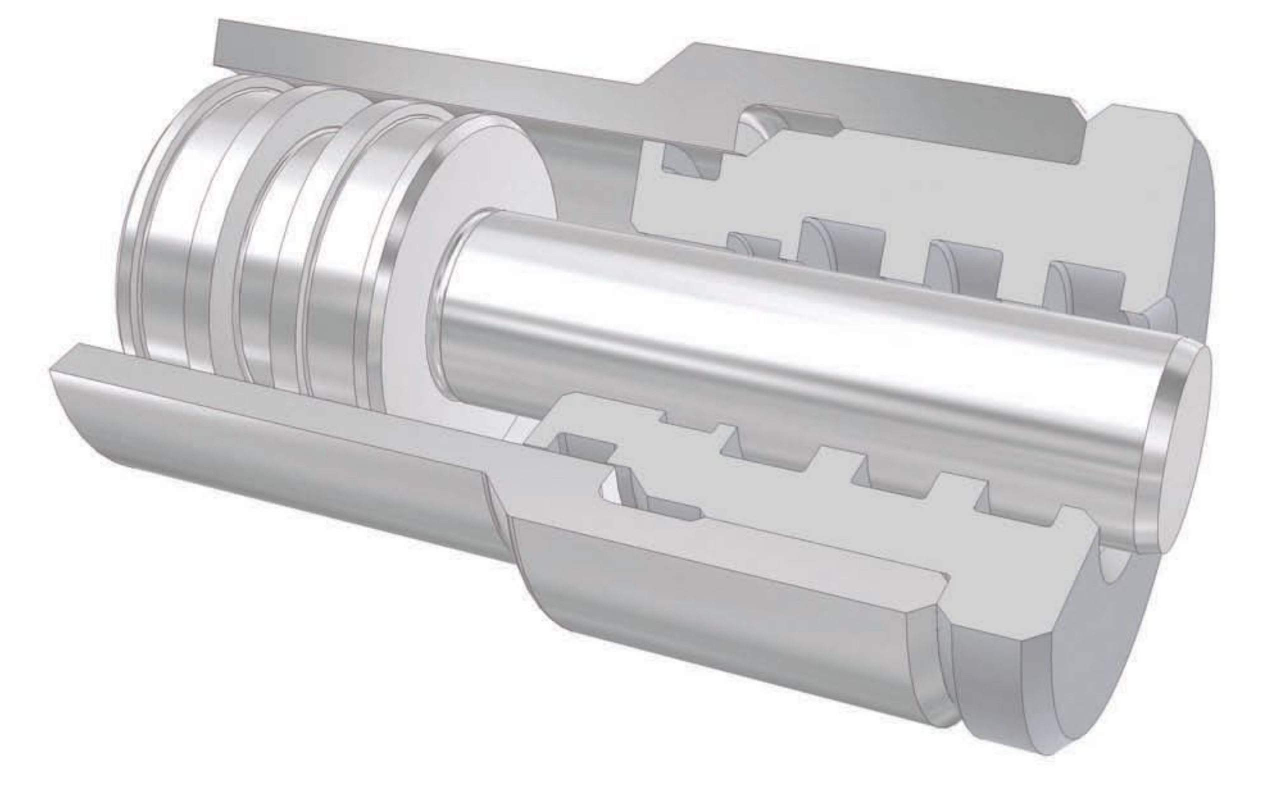
Table IX Orkot® Physical Properties

Material Code	Description	Color	Tensile Strength		Elongation at Break	Specific Gravity	Hardness
Orkot®			**ASTM D 638** (psi)	**ASTM D 638** (MPa)	**ASTM D 638** (%)	**ASTM D 792** (g/cm^3)	**Rockwell M**
C324	Vinylester resin and meta aramid fine mesh	🟫	8,700	60.0	N/A	1.3	105
C380	Polyester resin, polyester fine mesh and PTFE	🟦	8,000	55.2	N/A	1.3	100

Table X Orkot® Design Data

Material	Technical Data		Application
	Temperature	Velocity	
Orkot® C324	-328 to +482°F -200 to +250°C	3.280 ft/s 1 m/s	High temperatures. For use in Phosphate Ester or high-temperature applications. Test Report R1081 available upon request.
Orkot® C380	-328 to +266°F -200 to +130°C	3.280 ft/s 1 m/s	High wear resistance with good sliding properties. For use in mineral, synthetic hydrocarbon-based oils and grease only.

■ Hardware Expertise



The functioning of seals not only depends on the seal itself and its operating conditions, but also on other factors. Over the years Trelleborg Sealing Solutions has developed an in-depth knowledge of applied materials technology. To maximize system performance, we can advise on relevant issues related to the hardware into which seals are fitted and significant properties of mating surfaces.

In this section we give detailed recommendations on surface finishes, outlining shaft materials typically used in contact with polymer seals and the properties of mating part surface coatings and platings. We also provide some basic hardware information.

To find out more contact your local Trelleborg Sealing Solutions marketing company. It is best to involve them at concept stage. This allows them to advise on the design of the component or housing to ensure that it will function as effectively as possible and give maximum seal life and performance.

■ Surface Finishes

Surface finish quality relates directly to dynamic seal performance. Properly defining, measuring and controlling surface finish quality is critical to the functional reliability and service life of a seal.

Developments in surface finish measurement equipment and capabilities, along with finishing methods, have resulted in functional seal testing being performed to determine and verify surface finish recommendations for improved seal performance.

Standard Recommendations

Given below are two sets of standard recommendations that apply to linear hydraulic external seals (rod), dynamic sealing surfaces. The first is for HVOF (High Velocity Oxygen Fuel) applied coatings like Tungsten Carbide Cobalt-Chrome (W_c-C_o-C_r). The second is for bare steel, aluminum or chrome plating. Within the product sections you will find further product specific surface finish recommendations.

Table I Surface Finish Recommendations for HVOF Applied Surfaces

Measurement	Standard Recommendation
R_a	< 5 µin / 0.12 µm
R_p	≤ 8 µin max. / 0.2 µm maximum
R_z (R_{tm})	40 µin / 1.0 µm maximum
T_p (M_r)	70 - 90% @ depth of p = 0.25 R_z (Rtm) relative to a ref. line c = 5% tp
R_{sk}	-0.1 to -3

Table II Surface Finish Recommendations, Chrome Plating, Anodized Surfaces, Bare Metals (Hardened) and Others (Non-HVOF)

Measurement	Standard Recommendation
R_a	< 8 µin / 0.2 µm
R_p	≤ 24 µin / 0.6 µm maximum
R_z	40 µin /1.0 µm maximum
T_p	50 - 75% @ depth of p = 0.25 R_z (Rtm) relative to a ref. line c = 5% tp
R_{sk}	-0.5 to –1.5

For internal seals (piston) the surface finish should be less than 8 µin / 0.2 µm.

For surface finish recommendations on the seal groove sidewalls and groove bottoms as well as static seal interfaces, please follow recommendations in SAE AS4716 and AS5857 seal gland standards. If you have any questions related to surface finish and methods please contact your local Trelleborg Sealing Solutions marketing company.

Pockets and Valleys

Values are given for the high end of the bearing ratio. The seal surface should not be completely closed or void of adequate pockets and valleys. These are needed for seal lubrication retention and build-up of operating fluid film. A bearing ratio of 100 percent is not desirable, but it can be quite high for HVOF-coated surfaces. The values of Valley Roughness (R_v) need to be evaluated during the set-up of the production process.

Optimum Profile

The optimum surface profile for seal counterparts is shown in figure 1. A high concentration and magnitude of peaks on a surface can cause excessive seal wear, promoting unwanted leakage and egression. Surfaces relatively void of peaks but including valleys for lubrication retention are more suitable for sealing applications.

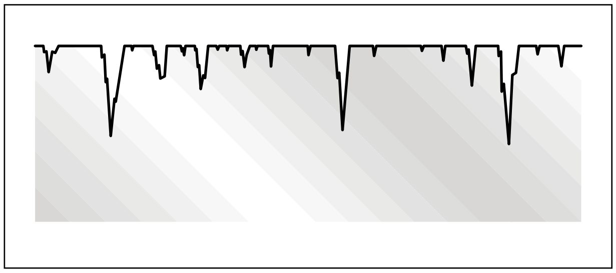


Figure 1 Optimum surface profile for seal counterparts

Direction of Lay

Each method used to obtain a specific surface finish, such as turning, grinding, honing, ball peening, polishing or superfinishing, produces a characteristic direction or lay to the surface. This can have an effect on sealing performance and wear patterns in certain applications.

To obtain the best seal performance, avoid finishing methods which promote the formation of leak paths in your application. For example, avoid a strong axial lay in a reciprocating rod seal application or a definite spiral pattern on the shaft in a rotary application.

Mating Surface Hardness

The hardness of the surface that mates with the seal affects the seal's performance in several ways.

If mating materials are too soft, the seal will burnish or damage the surface. A harder material improves wear life, resisting damage by the seal. Hard surfaces also have a tendency to lower the running friction of a seal.

A seal will polish its mating surface, especially if it is a softer metal. For example, a reciprocating rod made of stainless steel with a hardness of 28 to 30 Rockwell C and a finish of 25 µin/ 0.635 µm R_a will generally be polished by the seal to a finish of 12 µin/ 0.305 µm R_a or better, over a short period of time. Seal friction and wear will then decrease accordingly. Materials that are harder then 44 Rockwell C do not polish as easily.

Longer-lasting tougher Turcon® seal materials such as thermoplastic-filled Turcon® M30 and Carbon fiber-filled T29 should only be specified against harder mating surfaces.

When an application requires the longest possible wear life under moderate to severe conditions, the seal material should be one of the harder, highly-filled Turcon® blends.

Running In

In standard hydraulic systems, the seals and mating surfaces have an initial period of high wear. This phase, know as the run-in, ends once the peaks on the mating surface are broken off and the surface and seal reach an equilibrium state. Provided the seals are sufficiently lubricated, the wear rate drops significantly once the equilibrium state is reached.

By defining the surface finish using multiple surface finish parameters, the overall surface profile can be controlled more precisely. This reduces the sealing system run-in period, and once equilibrium between the seal and sealing surface is reached, gives a more optimal surface finish for leakage control, wear resistance and service life.

The abrasive nature of a rough finish can cause excessive seal wear during the early run-in period. Therefore, the harder the mating surface, the more important it is to start with the correct surface finish.

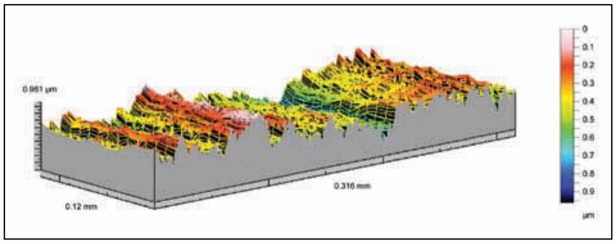
Substrates

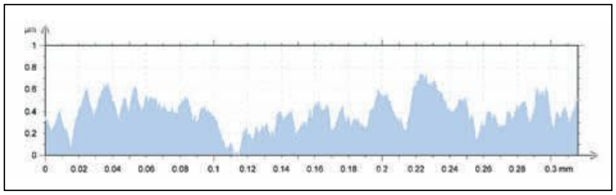
Seals run well against unplated surfaces at moderate speeds and pressures. In high-speed rotary or high-pressure reciprocating applications, harder surfaces are preferable.

Typical mating surface materials are listed below. These materials can also act as substrates for plating or coating to achieve higher hardness values.

Platings and Coatings

It is important to consider the ability of the substrate to support the plating. For example, when a high-pressure load is exerted on a seal running against hard-chrome plating supported by a soft substrate, such as 300 series Stainless Steel, the plating may peel or crack and then abrade the seal. A better substrate would be Stainless Steel Type 440C (hardened to 44 Rockwell C) or an alloy steel such as 4340 in the fully-hardened condition.





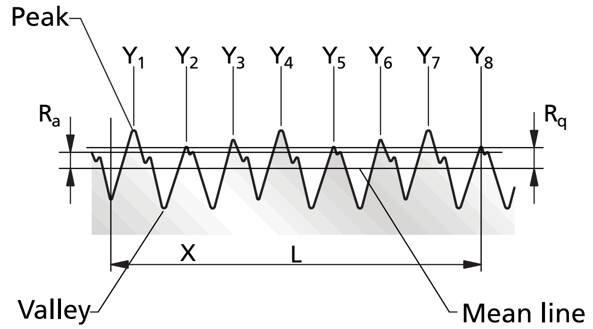
The surface finish measurement illustrations above clearly show the difference between three-dimensional (3D) and two-dimensional (2D) surface finish topography. The correct surface finish profile is critical to proper seal performance.

■ Surface Finish Measurement Methods

R_a – Arithmetic Average Roughness

Roughness averages provide a simple value for accept/reject decisions for surface finishes. Arithmetic average roughness, or R_a, is the arithmetic average height of roughness-component irregularities (peak heights and valleys) from the mean line, measured within the sampling length, L. See Figure 2.

The measurements are taken by the fine point of the stylus on a profilometer, which traverses the sampling length on the surface being measured.



Stylus X Ra and Stylus Y Ra,
the roughness average along X and the roughness average along Y are found from the integral of the profiles along the respective directions:

$$\text{Stylus X Ra} = \frac{1}{Lx}\int_0^{Lx}|Z(X)|dx$$

$$\text{Stylus Y Ra} = \frac{1}{Ly}\int_0^{Ly}|Z(y)|dx$$

Y = individual measured peak height

Figure 2 Surface Finish – R_a versus R_q

R_q – Geometric Average Roughness

R_q is the current term for what was formerly called root-mean-square or RMS. R_q is more sensitive to occasional highs and lows, making it a valuable complement to R_a. R_q. It is the geometric average height of roughness-component irregularities from the mean line measured within the sampling length, L. Compare to R_a in Table III.

The main difference in the two scales is that R_q amplifies occasional high or low readings, while R_a simply averages them. For a given surface, therefore, the R_q value will be higher than the R_a value by approximately 11 percent. A surface finish that measures 2 µin/ 0.051 µm R_q is equivalent to approximately 18 µin/ 0.457 µm R_a.

Table III Surface finish conversion table

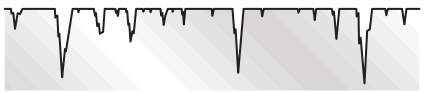
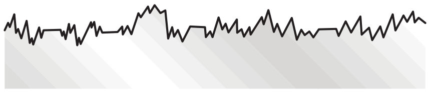
R_a, AA, CLA		Rq or RMS		German-Swiss
Inch (µin)	Metric (µm)	Inch (µin)	Metric (µm)	Norm[1)]
0.9	0.023	**1.0**	0.025	
1.0	0.025	1.1	0.028	N1
1.8	0.046	**2.**0	0.051	
2.0	0.051	2.2	0.056	N2
3.6	0.091	**4.0**	0.102	
4.0	0.102	4.4	0.112	N3
5.4	0.137	**6.0**	0.152	
7.2	0.183	**8.0**	0.203	
8.0	0.203	8.9	0.226	N4
10.8	0.274	**12.0**	0.305	
14.4	0.366	**16.0**	0.406	
16.0	0.406	17.8	0.452	N5
28.8	0.732	**32.0**	0.813	
32.0	0.813	35.5	0.902	N6
56.8	1.443	**63.0**	1.600	
63.0	1.600	69.9	1.775	N7

R_a : Arithmetic average roughness
AA : Arithmetic Average
CLA : Center Line Average
R_q : Geometric average roughness
RMS : Root-mean-square
1) The German-Swiss Norm is a series of roughness-grade numbers used to avoid confusion with numerical values of other types.

Improved Measurement Methods

The R_a measurement does not give a true picture of the real surface profile which is also affected by the finish. An open profile or peak structure can seriously affect seal performance as its jagged structure can cut and nick the seal surface. On the other hand, the closed profile form or valley structure, gives improved seal performance. This is because the valleys retain fluid and lubricate the running seal surface. Please see Table IV.

Table IV R_a Comparison

Surface Profile	R_a
	7.8 µin /0.2 µm
	7.8 µin /0.2 µm

Even with identical R_a values, the resulting seal performance will be very different.

An improved surface measurement method is described in ISO 13565-1/-2/-3, including the peak, valley and material ratios as described below:

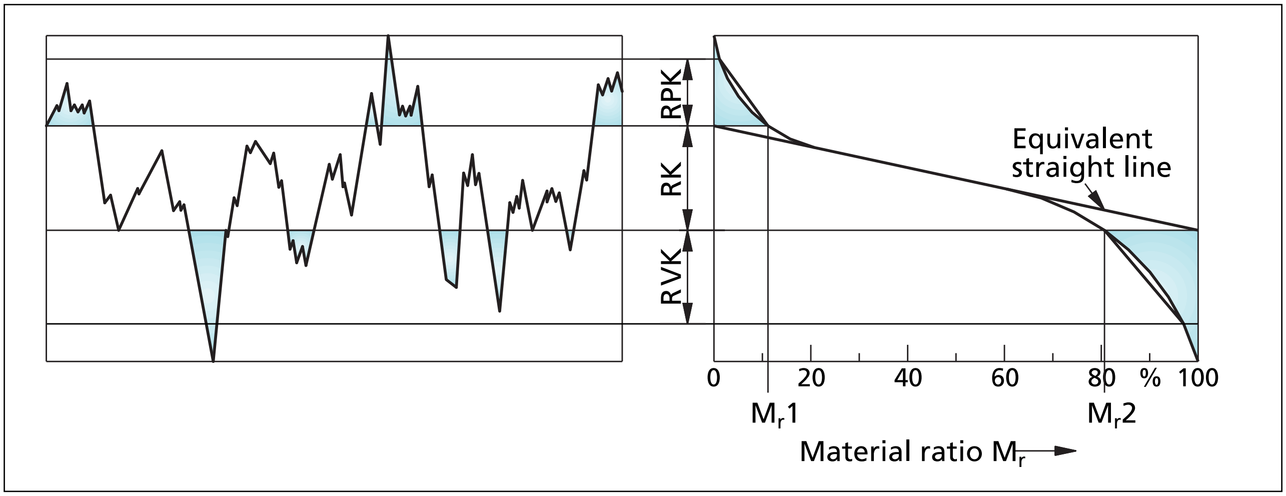


Figure 3 Abbot Curve

R$_k$ Core roughness
The depth of the roughness core profile

M$_r$ Material ratio

M$_{r1}$ in percent
The material portion M$_{r1}$ is determined by the intersecting line that separates the protruding peaks from the roughness core profile.

M$_{r2}$ in percent
The material portion M$_{r2}$ is determined by the intersecting line that separates the valleys from the roughness core profile.

***R*$_{pk}$** Reduced peak height
The average height of the protruding peaks above the roughness core profile

R$_{vk}$ Reduced valley depth
The average depth of the profile valleys projecting through the roughness core profile

The harder the material the more important it is to reduce the peak height R$_{pk}$. If the mating surface is ceramic, the R$_{pk}$ value must be down to 2 μin/ 0.051 μm otherwise the hard peaks will cut into the seal surface.

Other surface parameters are skewness and kurtosis, which give a more detailed picture of the surface.

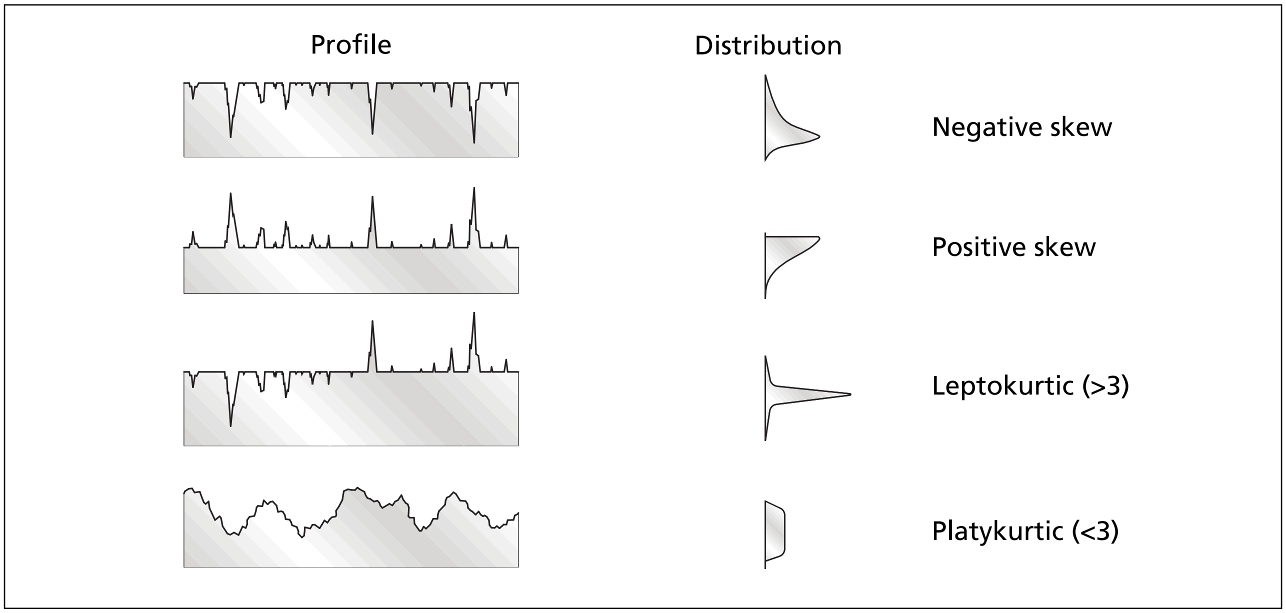


Figure 4 Surface Measurement Visualized

The optimum view of the surface structure is a 3-dimensional computerized picture showing not only peak, core and valley but also direction of ridges and channels in the surface structure. Such pictures can be very valuable in evaluating seal performance. This method of measurement will expose widely varying surface profiles depending on base materials, platings or coatings and the process used to produce the surface.

Table V Properties of Surface Structure

Parameter	Unworn µin / µm	Worn µin /µm
S_a	4.331 0.11	8.268 0.21
S_{pk}	3.543 0.09	4.331 0.11
S_k	9.843 0.25	14.567 0.37
S_{vk}	15.748 0.40	38.583 0.98

S denotes 3-dimensional surface texture characteristics. R denotes 2-dimensional surface texture characteristics. E.g. S_a is the 3-D equivalent to R_a.

To obtain measurements as shown in table V, a sophisticated filter technique and software program is required that can convert the mathematical rounding. This technique is not readily available in industry, but is available at some universities and technical institutes.

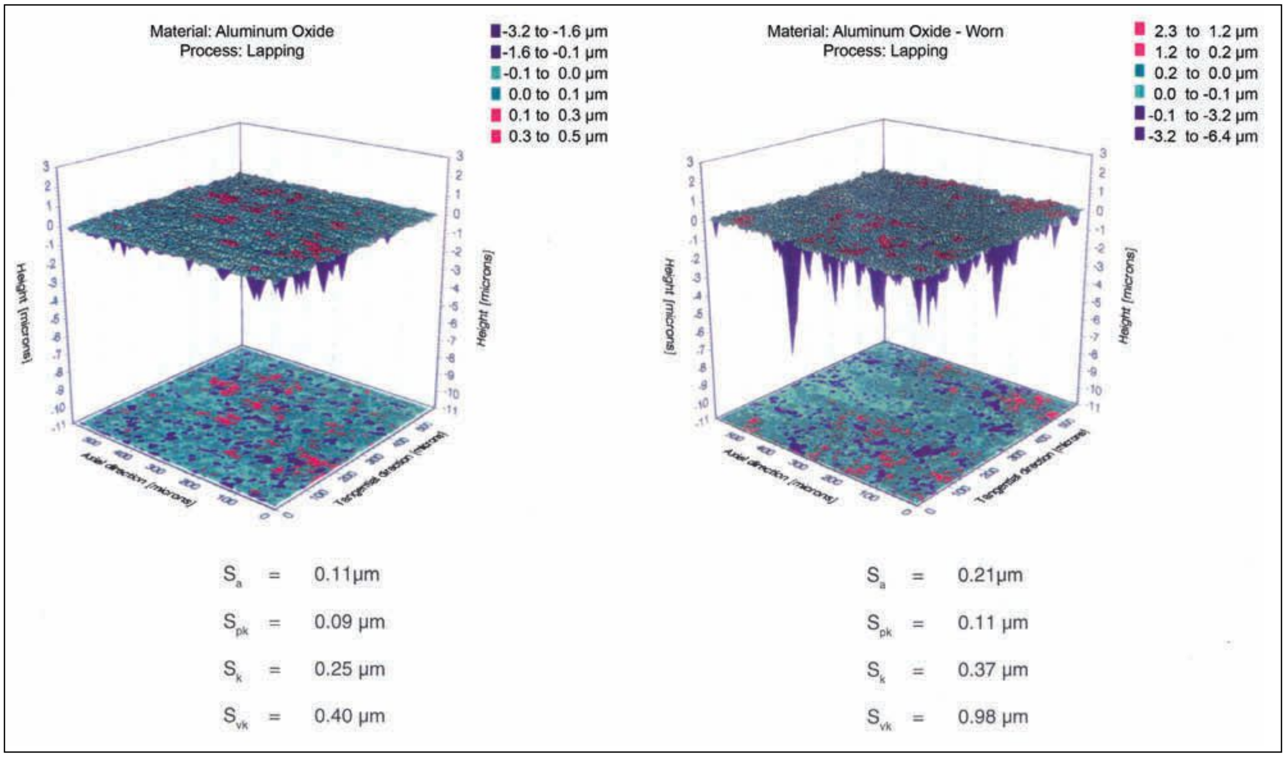


Figure 5 Surface Structure

Shaft Materials

Table VI Typical shaft materials used in contact with polymer seals

Material		Typical Hardness, RC		Applications
		Annealed	Hardened	
Stainless Steel	15-5 PH	35	46	General purpose providing high strength, good corrosion resistance and mechanical properties with moderate hardness. Good for moderate wear applications
	17-4 PH	35	44	General-purpose with moderate corrosion resistance. Material can be hardened for moderate-wear applications.
	Type 303	-	20[1]	Free-machining and very soft with moderate corrosion resistance. For low speeds and pressures
	Type 304	-	28[1]	Soft material with moderate corrosion resistance. For use at low speeds and pressures
	Type 316	-	28[1]	Soft material with excellent corrosion resistance. For use at low speeds and pressure.
	Type 440C	22	44	Heat-treated material is the hardest of all Stainless Steels but has lower corrosion resistance than 300 series Stainless Steel. For higher speeds and pressures
Carbon Steel	SAE 1045	19	58	Good mechanical properties with higher strength than other low-carbon steels. Use in non-corrosive media only.
Alloy Steel	4140	13	50	General-purpose applications in non-corrosive media. For moderate speeds and pressures
	4340	13	50	General service with better mechanical properties than Alloy 4140
Tool Steel	D-2	-	62	High hardness and wear-resistance but limited corrosion resistance. For high speeds at moderate pressures.
Other Metals	Hard-anodized aluminium 6061-T6	-	70+	Hard-anodized aluminium makes an excellent low-friction bore surface for reciprocating piston-seal applications. Not recommended for rotary services.
	Bronze	40 Rockwell B	85 Rockwell B	For light-duty service in slow speeds with low pressures and where friction and corrosion are not concerns
	Mild Steel	150 Brinell	-	Light-duty service in non-corrosive media only
	Titanium	36 Rockwell C		Hard material with high corrosion resistance. Good for high-pressure and speed
Non-Metallic	Ceramic	70		For high wear resistance at high pressures or high speeds and for low friction against Turcon® seals
	Sapphire	9 Mohs[2] Scale		Very hard, chemically-inert material with ability to obtain flame-polished finishes less than 1 µin/ 0.025 µm R_a

The information supplied above is intended only as a guide. We strongly recommend that you test the selected material in the application before production use.

[1] Series 300 Stainless Steel cannot be hardened by heat treatment. Values shown are for 30 percent cold-worked material.

Plating and Coating

Table VII Properties of typical types of plating and coatings used in contact with polymer seals

Coating or plating type		Military specification	Hardness Rockwell C	Suggested thickness	Corrosion resistance	Abrasiveness to seal	Comments
Chrome plating	Hard chrome	QQC 320B Class 2E	65	0.0008/0.0050 in 0.020/0.127 mm	Fair to Good	High	Wear-resistant for light-duty. Not recommended for fast-rotary or corrosive applications.
	Thin dense chrome	AMS 2438	70	0.0002/0.0006 in 0.005/0.015 mm	Excellent	Low	Higher wear resistance and lower friction than conventional chrome in light to moderate speeds.
Electroless nickel plating	Nickel as deposited	MIL-C-26074B	48-52	0.0010 in minimum 0.0254 mm minimum	Excellent	Low	Excellent for corrosive applications in light to moderate speeds and pressures.
	Nickel fully hardened	MIL-C-26074B	58-70	0.0010 in minimum 0.0254 mm minimum	Good	High	Harder but more abrasive than as-deposited nickel. Not recommended for high-speed rotary applications.
Plasma spray coating	Chromium oxide	See note 2.	71	0.0050/0.0300 in 0.127/0.762 mm	Excellent	Low	Recommended when wear life is the primary concern. Not recommended for high-shock loads.
	Aluminium oxide	MIL-P-83348 2) AMS 2448	60-69	0.0050/0.0300 in 0.127/0.762 mm	Excellent	Low	Lower-cost, less wear-resistant but greater ductility than chromium-oxide coatings.
HVOF 1)	Tungsten Carbide	MIL-P-83348 2) AMS 2448	67-74	0.0050/0.0300 in 0.127/0.762 mm	Excellent	Low	High wear-resistance, with higher bonding strength. For high-speed and pressure combinations.

Anodizing	Hard anodized aluminium	MIL-A-8625C Type III	Over 70	0.0005/0.0045 in 0.013/0.114 mm	Excellent	Low	Excellent bore material in piston-seal applications as a low-friction mating surface.
Thermal spray	Triballoy 400 & 800	N/A	55	0.001/0.02 in 0.025/0.508 mm	Excellent	High	Hard to get better than a 14 Ra so not recommended for most dynamic seal applications.
Nitriding	Titanium nitride (TiN)	N/A	Up to 70	0.000039 / 0.000197 in 0.001/0.005mm	Excellent	High	Wear resistant, low friction and resists corrosion. Thickness of coating can be an issue related to useful wear-life.

The information supplied above is intended only as a guide. Testing of the selected material in actual service conditions is recommended to determine the suitability of a plating or coating for a specific application.

1) HVOF = High Velocity Oxygen Fuel. This coating system uses high-pressure, high-temperature, high-velocity spray guns to improve coating density, hardness and bond strength.

2) The military specification is noted for reference only. Plasma spray and HVOF coatings are typically produced using industry standards developed by certain companies whose standards normally meet or exceed the military specifications.

■ Hardware Dimensions per AS4716 BORE

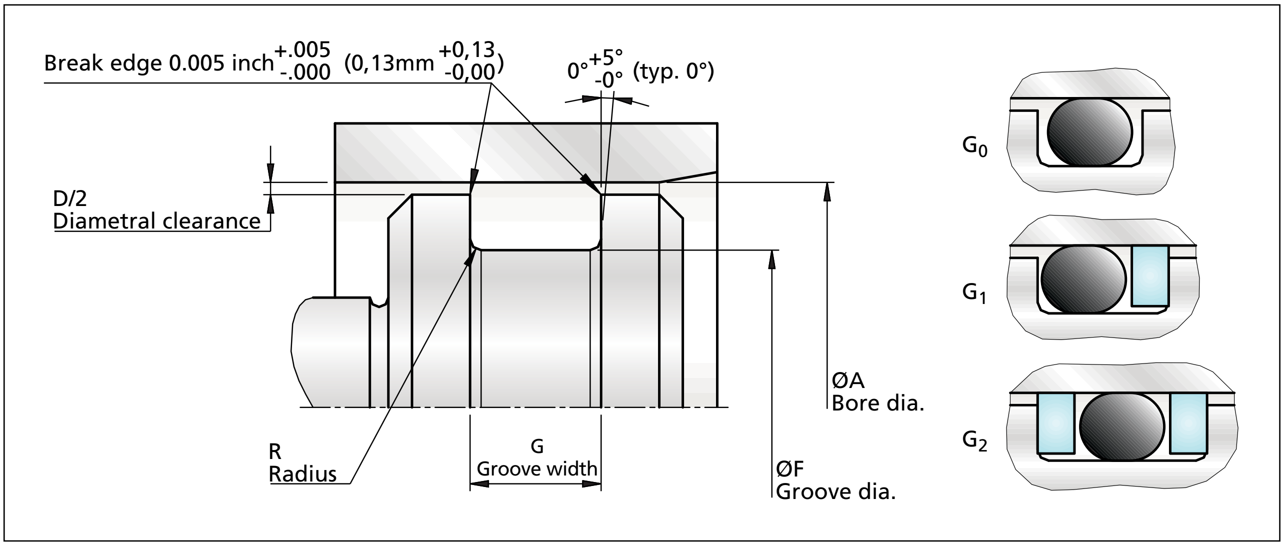


Figure 6 Installation Drawing for BORE

Table VIII Groove Dimensions, BORE per AS4716

	Bore Sizes per AS4716													
	Inch							mm						
Dash No	**øA** Bore Diameter	**øF** Groove Diameter	**D** Diameter Clearance Maximum	**R** Radius	**Groove Width** +0.010/-0.000 G_0	G_1	G_2	**øA** Bore Diameter	**øF** Groove Diameter	**D** Diameter Clearance Maximum	**R** Radius	**Groove Width** +0.25/-0.00 G_0	G_1	G_2
	+0.001 -0.000	+0.000 -0.001	0.004	0.015 I 0.005	0.098 I 0.103	0.154 I 0.164	0.210 I 0.220	+0.025 -0.000	+0.000 -0.025	0.10	0.38 I 0.13	2.49 I 2.62	3.91 I 4.17	5.33 I 5.59
004	0.190	0.076						4.83	1.93					
005	0.221	0.115						5.61	2.92					
006	0.235	0.129						5.97	3.28					
007	0.266	0.158						6.76	4.01					
008	0.297	0.189						7.54	4.80					
009	0.329	0.220						8.36	5.59					
010	0.360	0.250	0.004	0.015 I 0.005	0.094 I 0.099	0.150 I 0.160	0.207 I 0.217	9.14	6.35	0.10	0.38 I 0.13	2.39 I 2.51	3.81 I 4.06	5.26 I 5.51
011	0.422	0.312						10.72	7.93					
012	0.485	0.375						12.32	9.53					
	+0.002 -0.000	+0.000 -0.002	0.005					+0.05 -0.00	+0.00 -0.05	0.13				
013	0.550	0.441						13.97	11.20					
014	0.613	0.504						15.57	12.80					
015	0.675	0.566						17.15	14.38					
016	0.738	0.629						18.75	15.98					
017	0.800	0.691						20.32	17.55					
018	0.863	0.753						21.92	19.13					
019	0.925	0.815						23.50	20.70					
020	0.991	0.881						25.17	22.38					
021	1.053	0.943						26.75	23.95					
022	1.116	1.006						28.35	25.55					
023	1.178	1.068						29.92	27.13					
024	1.241	1.131						31.52	28.73					
025	1.303	1.193						33.10	30.30					
026	1.366	1.256						34.70	31.90					
027	1.428	1.318						36.27	33.48					
028	1.491	1.381						37.87	35.08					

▨ Recommended for static applications only.

🟦 Metric Sizes

Hardware Expertise

	Bore Sizes per AS4716													
	Inch							mm						
Dash No	øA Bore Diameter	øF Groove Diameter	D Diameter Clearance Maximum	R Radius	Groove Width +0.010/-0.000			øA Bore Diameter	øF Groove Diameter	D Diameter Clearance Maximum	R Radius	Groove Width +0.25/-0.00		
					G_0	G_1	G_2					G_0	G_1	G_2
	+0.001 -0.000	+0.000 -0.001	0.004	0.015 I 0.005	0.141	0.183	0.245	+0.025 -0.000	+0.000 -0.025	0.10	0.38 I 0.13	3.58	4.65	6.22
104	0.297	0.128						7.54	3.25					
105	0.329	0.158						8.36	4.01					
106	0.360	0.187						9.14	4.75					
107	0.391	0.215						9.93	5.46					
108	0.422	0.246						10.72	6.25					
109	0.485	0.308						12.32	7.82					
	+0.002 -0.000	+0.000 -0.002	0.005					+0.05 -0.00	+0.00 -0.05	0.13				
110	0.550	0.379						13.97	9.63					
111	0.613	0.441						15.57	11.20					
112	0.675	0.502						17.15	12.75					
113	0.738	0.565						18.75	14.35					
114	0.800	0.627						20.32	15.93					
115	0.863	0.689						21.92	17.50					
116	0.925	0.751						23.50	19.08					
117	0.991	0.817						25.17	20.75					
118	1.053	0.879						26.75	22.33					
119	1.116	0.942						28.35	23.93					
120	1.178	1.003						29.92	25.48					
121	1.241	1.066						31.52	27.08					
122	1.303	1.128						33.10	28.65					
123	1.366	1.191						34.70	30.25					
124	1.428	1.253						36.27	31.83					
125	1.491	1.316						37.87	33.43					
126	1.553	1.378						39.45	35.00					
127	1.616	1.441						41.05	36.60					
128	1.678	1.503						42.62	38.18					
129	1.741	1.566						44.22	39.78					
130	1.805	1.631	0.006					45.85	41.43	0.15				
131	1.867	1.693						47.42	43.00					
132	1.930	1.756						49.02	44.60					
133	1.992	1.818						50.60	46.18					
134	2.055	1.881						52.20	47.78					
135	2.118	1.944						53.80	49.38					
136	2.180	2.006						55.37	50.95					
137	2.243	2.069						56.97	52.55					
138	2.305	2.131						58.55	54.13					
139	2.368	2.194						60.15	55.73					
140	2.430	2.256						61.72	57.30					
141	2.493	2.319	0.007					63.32	58.90	0.18				
142	2.555	2.381						64.90	60.48					
143	2.618	2.444						66.50	62.08					
144	2.680	2.506						68.07	63.65					
145	2.743	2.569						69.67	65.25					
146	2.805	2.631						71.25	66.83					
147	2.868	2.694						72.85	68.43					
148	2.930	2.756						74.42	70.00					
149	2.993	2.819						76.02	71.60					

▨ Recommended for static applications only.

🟦 Metric Sizes

	Bore Sizes per AS4716													
	Inch							mm						
Dash No	øA Bore Diameter	øF Groove Diameter	D Diameter Clearance Maximum	R Radius	Groove Width +0.010/-0.000			øA Bore Diameter	øF Groove Diameter	D Diameter Clearance Maximum	R Radius	Groove Width +0.25/-0.00		
					G_0	G_1	G_2					G_0	G_1	G_2
	+0.002 -0.000	+0.000 -0.002						+0.05 -0.00	+0.00 -0.05					
210	0.991	0.750	0.005	0.025 I 0.010	0.188	0.235	0.304	25.17	19.05	0.13	0.64 I 0.25	4.78	5.97	7.72
211	1.053	0.812						26.75	20.63					
212	1.116	0.874						28.35	22.20					
213	1.178	0.936						29.92	23.77					
214	1.241	0.999						31.52	25.38					
215	1.303	1.061						33.10	26.95					
216	1.366	1.124						34.70	28.55					
217	1.428	1.186						36.27	30.12					
218	1.491	1.249						37.87	31.73					
219	1.553	1.311						39.45	33.30					
220	1.616	1.374						41.05	34.90					
221	1.678	1.436						42.62	36.47					
222	1.741	1.499						44.22	38.08					
223	1.867	1.625	0.006					47.42	41.28	0.15				
224	1.992	1.750						50.60	44.45					
225	2.118	1.876						53.80	47.65					
226	2.243	2.001						56.97	50.83					
227	2.368	2.126						60.15	54.00					
228	2.493	2.251	0.007					63.32	57.18	0.18				
229	2.618	2.376						66.50	60.35					
230	2.743	2.501						69.67	63.53					
231	2.868	2.626						72.85	66.70					
232	2.993	2.751						76.02	69.88					
233	3.118	2.876						79.20	73.05					
234	3.243	3.001						82.37	76.23					
235	3.368	3.126						85.55	79.40					
236	3.493	3.251						88.72	82.58					
237	3.618	3.376						91.90	85.75					
238	3.743	3.501						95.07	88.93					
239	3.868	3.626						98.25	92.10					
240	3.993	3.751						101.42	95.28					
241	4.118	3.876						104.60	98.45					
242	4.243	4.001						107.77	101.63					
243	4.368	4.126						110.95	104.80	0.20				
244	4.493	4.251	0.008					114.12	107.98					
245	4.618	4.376						117.30	111.15					
246	4.743	4.501						120.47	114.33					
247	4.868	4.626						123.65	117.50					
325	1.867	1.495	0.006	0.035 I 0.020	0.281	0.334	0.424	47.42	37.97	0.15	0.89 I 0.51	7.14	8.48	10.77
326	1.992	1.620						50.60	41.15					
327	2.118	1.746						53.80	44.35					
328	2.243	1.871						56.97	47.52					
329	2.368	1.996						60.15	50.70					
330	2.493	2.121	0.007					63.32	53.87	0.18				
331	2.618	2.246						66.50	57.05					
332	2.743	2.371						69.67	60.22					
333	2.868	2.496						72.85	63.40					
334	2.993	2.621						76.02	66.57					
335	3.118	2.746						79.20	69.75					
336	3.243	2.871						82.37	72.92					
337	3.368	2.996						85.55	76.10					
338	3.493	3.121						88.72	79.27					
339	3.618	3.246						91.90	82.45					

▨ Recommended for static applications only.

▨ Metric Sizes

TRELLEBORG
SEALING SOLUTIONS

	Bore Sizes per AS4716													
	Inch							mm						
Dash No	øA Bore Diameter	øF Groove Diameter	D Diameter Clearance Maximum	R Radius	Groove Width +0.010/-0.000			øA Bore Diameter	øF Groove Diameter	D Diameter Clearance Maximum	R Radius	Groove Width +0.25/-0.00		
					G_0	G_1	G_2					G_0	G_1	G_2
	+0.002 -0.000	+0.000 -0.002	0.007	0.035 I 0.020	0.281	0.334	0.424	+0.05 -0.00	+0.00 -0.05	0.18	0.89 I 0.51	7.14	8.48	10.77
340	3.743	3.371						95.07	85.62					
341	3.868	3.496						98.25	88.80					
342	3.993	3.621						101.42	91.97					
343	4.118	3.746						104.60	95.15					
344	4.243	3.871						107.77	98.32					
345	4.368	3.996						110.95	101.50					
346	4.493	4.121	0.008					114.12	104.67	0.20				
347	4.618	4.246						117.30	107.85					
348	4.743	4.371						120.47	111.02					
349	4.868	4.496						123.65	114.20					
	+0.003 -0.000	+0.000 -0.003	0.009	0.035 I 0.020	0.375	0.475	0.579	+0.08 -0.00	+0.00 -0.08	0.23	0.89 I 0.51	9.53	12.07	14.71
425	4.974	4.497						126.34	114.22					
426	5.099	4.622						129.51	117.40					
427	5.224	4.747						132.69	120.57					
428	5.349	4.872						135.86	123.75					
429	5.474	4.997						139.04	126.92					
430	5.599	5.122						142.21	130.10					
431	5.724	5.247						145.39	133.27					
432	5.849	5.372						148.56	136.45					
433	5.974	5.497						151.74	139.62					
434	6.099	5.622						154.91	142.80					
435	6.224	5.747						158.09	145.97					
436	6.349	5.872						161.26	149.15					
437	6.474	5.997						164.44	152.32					
438	6.724	6.247						170.79	158.67					
439	6.974	6.497						177.14	165.02					
440	7.224	6.747						183.49	171.37					
441	7.474	6.997						189.84	177.72					
442	7.724	7.247						196.19	184.07					
443	7.974	7.497						202.54	190.42					
444	8.224	7.747						208.89	196.77					
445	8.474	7.997						215.24	203.12					
446	8.974	8.497	0.010					227.94	215.82	0.25				
	+0.004 -0.000	+0.000 -0.003	0.011					+0.10 -0.00	+0.00 -0.08	0.28				
447	9.474	8.997						240.64	228.52					
448	9.974	9.497						253.34	241.22					
449	10.474	9.997						266.04	253.92					
450	10.974	10.497						278.74	266.62					
451	11.474	10.997						291.44	279.32					
452	11.974	11.497						304.14	292.02					
453	12.474	11.997						316.84	304.72					
454	12.974	12.497						329.54	317.42					
455	13.474	12.997						342.24	330.12					
456	13.974	13.497						354.94	342.82					
457	14.474	13.997						367.64	355.52					
458	14.974	14.497						380.34	368.22					
459	15.474	14.997						393.04	380.92					
460	15.974	15.497						405.74	393.62					

▨ Recommended for static applications only.   🟦 Metric Sizes

The above dimensions are for reference only.

600 Series (3/8“) cross section AS4832 recommended for diameters above -442.
Dash numbers are size codes.

Hardware Dimensions per AS4716 ROD

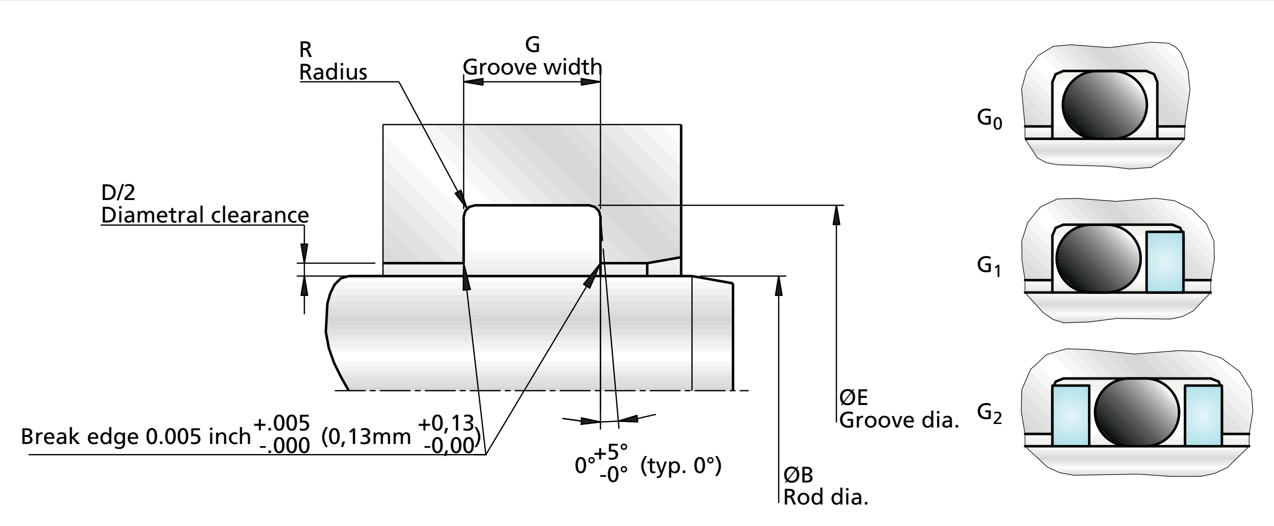


Figure 7 Installation Drawing for ROD

Table IX Groove Dimensions, ROD per AS4716

	Rod Sizes per AS4716													
	Inch							mm						
Dash No	**øB** Rod Diameter	**øE** Groove Diameter	**D** Diameter Clearance Maximum	**R** Radius	**Groove Width** +0.010/-0.000			**øB** Rod Diameter	**øE** Groove Diameter	**D** Diameter Clearance Maximum	**R** Radius	**Groove Width** +0.25/-0.00		
					G_0	G_1	G_2					G_0	G_1	G_2
	+0.000 -0.001	+0.001 -0.000	0.004	0.015 I 0.005	0.098 I 0.103	0.154 I 0.164	0.210 I 0.220	+0.000 -0.025	+0.025 -0.000	0.10	0.38 I 0.13	2.49 I 2.62	3.91 I 4.17	5.33 I 5.59
004	0.076	0.190						1.93	4.83					
005	0.108	0.217						2.74	5.51					
006	0.123	0.232						3.12	5.89					
007	0.154	0.264						3.91	6.71					
008	0.185	0.294						4.70	7.47					
009	0.217	0.327						5.51	8.31					
010	0.248	0.359	0.004	0.015 I 0.005	0.094 I 0.099	0.150 I 0.160	0.207 I 0.217	6.30	9.12	0.10	0.38 I 0.13	2.39 I 2.51	3.81 I 4.06	5.26 I 5.51
011	0.310	0.421						7.87	10.69					
012	0.373	0.484						9.47	12.29					
	+0.000 -0.002	+0.002 -0.000	0.005					+0.00 -0.05	+0.05 -0.00	0.13				
013	0.435	0.545						11.05	13.84					
014	0.498	0.608						12.65	15.44					
015	0.560	0.670						14.22	17.02					
016	0.623	0.733						15.82	18.62					
017	0.685	0.795						17.40	20.19					
018	0.748	0.858						19.00	21.79					
019	0.810	0.920						20.57	23.37					
020	0.873	0.983						22.17	24.97					
021	0.935	1.045						23.75	26.54					
022	0.998	1.108						25.35	28.14					
023	1.060	1.170						26.92	29.72					
024	1.123	1.233						28.52	31.32					
025	1.185	1.295						30.10	32.89					
026	1.248	1.358						31.70	34.49					
027	1.310	1.420						33.27	36.07					
028	1.373	1.483						34.87	37.67					

▨ Recommended for static applications only. 🟦 Metric Sizes

Hardware Expertise

Dash No	Rod Sizes per AS4716													
	Inch							mm						
	øB Rod Diameter	øE Groove Diameter	D Diameter Clearance Maximum	R Radius	Groove Width +0.010/-0.000			øB Rod Diameter	øE Groove Diameter	D Diameter Clearance Maximum	R Radius	Groove Width +0.25/-0.00		
					G_0	G_1	G_2					G_0	G_1	G_2
	+0.000 -0.001	+0.001 -0.000	0.004	0.015 I 0.005	0.141	0.183	0.245	+0.000 -0.025	+0.025 -0.000	0.10	0.38 I 0.13	3.58	4.65	6.22
104	0.123	0.295						3.12	7.49					
105	0.154	0.327						3.91	8.31					
106	0.185	0.359						4.70	9.12					
107	0.217	0.392						5.51	9.96					
108	0.248	0.423						6.30	10.74					
109	0.310	0.486						7.87	12.34					
	+0.000 -0.002	+0.002 -0.000	0.005					+0.00 -0.05	+0.05 0.00	0.13				
110	0.373	0.546						9.47	13.87					
111	0.435	0.609						11.05	15.47					
112	0.498	0.672						12.65	17.07					
113	0.560	0.734						14.22	18.64					
114	0.623	0.797						15.82	20.24					
115	0.685	0.859						17.40	21.82					
116	0.748	0.923						19.00	23.44					
117	0.810	0.985						20.57	25.02					
118	0.873	1.048						22.17	26.62					
119	0.935	1.110						23.75	28.19					
120	0.998	1.173						25.35	29.79					
121	1.060	1.235						26.92	31.37					
122	1.123	1.298						28.52	32.97					
123	1.185	1.360						30.10	34.54					
124	1.248	1.423						31.70	36.14					
125	1.310	1.485						33.27	37.72					
126	1.373	1.548						34.87	39.32					
127	1.435	1.610	0.006					36.45	40.89	0.15				
128	1.498	1.673						38.05	42.49					
129	1.560	1.735						39.62	44.07					
130	1.623	1.798						41.22	45.67					
131	1.685	1.860						42.80	47.24					
132	1.748	1.923						44.40	48.84					
133	1.810	1.984	0.007					45.97	50.39	0.18				
134	1.873	2.047						47.57	51.99					
135	1.936	2.110						49.17	53.59					
136	1.998	2.172						50.75	55.17					
137	2.061	2.235						52.35	56.77					
138	2.123	2.297						53.92	58.34					
139	2.186	2.360						55.52	59.94					
140	2.248	2.422						57.10	61.52					
141	2.311	2.485						58.70	63.12					
142	2.373	2.547						60.27	64.69					
143	2.436	2.610						61.87	66.29					
144	2.498	2.672						63.45	67.87					
145	2.561	2.735						65.05	69.47					
146	2.623	2.797						66.62	71.04					
147	2.686	2.860						68.22	72.64					
148	2.748	2.922						69.80	74.22					
149	2.811	2.985						71.40	75.82					

▨ Recommended for static applications only.

🟦 Metric Sizes

	Rod Sizes per AS4716													
	Inch							mm						
Dash No	øB Rod Diameter	øE Groove Diameter	D Diameter Clearance Maximum	R Radius	Groove Width +0.010/-0.000			øB Rod Diameter	øE Groove Diameter	D Diameter Clearance Maximum	R Radius	Groove Width +0.25/-0.00		
					G_0	G_1	G_2					G_0	G_1	G_2
	+0.000 -0.002	+0.002 -0.000						+0.00 -0.05	+0.05 -0.00					
210	0.748	0.989	0.005	0.025 I 0.010	0.188	0.235	0.304	19.00	25.12	0.13	0.64 I 0.25	4.78	5.97	7.72
211	0.810	1.051						20.57	26.70					
212	0.873	1.115						22.17	28.32					
213	0.935	1.177						23.75	29.90					
214	0.998	1.240						25.35	31.50					
215	1.060	1.302						26.92	33.07					
216	1.123	1.365						28.52	34.67					
217	1.185	1.427						30.10	36.25					
218	1.248	1.490						31.70	37.85					
219	1.310	1.552						33.27	39.42					
220	1.373	1.615						34.87	41.02					
221	1.435	1.677						36.45	42.60					
222	1.498	1.740						38.05	44.20					
223	1.623	1.865	0.006					41.22	47.37	0.15				
224	1.748	1.990						44.40	50.55					
225	1.873	2.115	0.007					47.57	53.72	0.18				
226	1.998	2.240						50.75	56.90					
227	2.123	2.365						53.92	60.07					
228	2.248	2.490						57.10	63.25					
229	2.373	2.615						60.27	66.42					
230	2.498	2.740						63.45	69.60					
231	2.623	2.865						66.62	72.77					
232	2.748	2.990						69.80	75.95					
233	2.873	3.115						72.97	79.12					
234	2.997	3.239						76.12	82.27					
235	3.122	3.364						79.30	85.45					
236	3.247	3.489						82.47	88.62					
237	3.372	3.614						85.65	91.80					
238	3.497	3.739						88.82	94.97					
239	3.622	3.864						92.00	98.15					
240	3.747	3.989						95.17	101.32					
241	3.872	4.114						98.35	104.50					
242	3.997	4.239						101.52	107.67					
243	4.122	4.364						104.70	110.85					
244	4.247	4.489						107.87	114.02					
245	4.372	4.614						111.05	117.20					
246	4.497	4.739	0.008					114.22	120.37	0.20				
247	4.622	4.864						117.40	123.55					
325	1.498	1.870	0.006	0.035 I 0.020	0.281	0.334	0.424	38.05	47.50	0.15	0.89 I 0.51	7.14	8.48	10.77
326	1.623	1.995						41.22	50.67					
327	1.748	2.120						44.40	53.85					
328	1.873	2.245	0.007					47.57	57.02	0.18				
329	1.998	2.370						50.75	60.20					
330	2.123	2.495						53.92	63.37					
331	2.248	2.620						57.10	66.55					
332	2.373	2.745						60.27	69.72					
333	2.498	2.870						63.45	72.90					
334	2.623	2.995						66.62	76.07					
335	2.748	3.120						69.80	79.25					
336	2.873	3.245						72.97	82.42					
337	2.997	3.369						76.12	85.57					

▨ Recommended for static applications only.

🟦 Metric Sizes

	Rod Sizes per AS4716													
	Inch							mm						
Dash No	**øB** Rod Diameter	**øE** Groove Diameter	**D** Diameter Clearance Maximum	**R** Radius	**Groove Width** +0.010/-0.000			**øB** Rod Diameter	**øE** Groove Diameter	**D** Diameter Clearance Maximum	**R** Radius	**Groove Width** +0.25/-0.00		
					G_0	G_1	G_2					G_0	G_1	G_2
	+0.000 -0.002	+0.002 -0.000	0.007	0.035 I 0.020	0.281	0.334	0.424	+0.00 -0.05	+0.05 -0.00	0.18	0.89 I 0.51	7.14	8.48	10.77
338	3.122	3.494						79.30	88.75					
339	3.247	3.619						82.47	91.92					
340	3.372	3.744						85.65	95.10					
341	3.497	3.869						88.82	98.27					
342	3.622	3.994						92.00	101.45					
343	3.747	4.119						95.17	104.62					
344	3.872	4.244						98.35	107.80					
345	3.997	4.369						101.52	110.97					
346	4.122	4.494						104.70	114.15					
347	4.247	4.619						107.87	117.32					
348	4.372	4.744						111.05	120.50					
349	4.497	4.869						114.22	123.67					
	+0.000 -0.003	+0.003 -0.000	0.009	0.035 I 0.020	0.375	0.475	0.579	+0.000 -0.076	+0.076 -0.000	0.23	0.89 I 0.51	9.53	12.07	14.71
425	4.497	4.974						114.22	126.34					
426	4.622	5.099						117.40	129.51					
427	4.747	5.224						120.57	132.69					
428	4.872	5.349						123.75	135.86					
429	4.997	5.474						126.92	139.04					
430	5.122	5.599						130.10	142.21					
431	5.247	5.724						133.27	145.39					
432	5.372	5.849						136.45	148.56					
433	5.497	5.974						139.62	151.74					
434	5.622	6.099						142.80	154.91					
435	5.747	6.224						145.97	158.09					
436	5.872	6.349						149.15	161.26					
437	5.997	6.474						152.32	164.44					
438	6.247	6.724						158.67	170.79					
439	6.497	6.974	0.010					165.02	177.14	0.25				
440	6.747	7.224						171.37	183.49					
441	6.997	7.474						177.72	189.84					
442	7.247	7.724						184.07	196.19					
443	7.497	7.974						190.42	202.54					
444	7.747	8.224						196.77	208.89					
445	7.997	8.474						203.12	215.24					
446	8.497	8.974						215.82	227.94					
	+0.000 -0.003	+0.004 -0.000	0.010					+0.000 -0.076	+0.102 -0.000	0.25				
447	8.997	9.474						228.52	240.64					
448	9.497	9.974						241.22	253.34					
449	9.997	10.474						253.92	266.04					
450	10.497	10.974						266.62	278.74					
451	10.997	11.474						279.32	291.44					
452	11.497	11.974						292.02	304.14					
453	11.997	12.474						304.72	316.84					
454	12.497	12.974						317.42	329.54					
455	12.997	13.474						330.12	342.24					
456	13.497	13.974						342.82	354.94					
457	13.997	14.474						355.52	367.64					
458	14.497	14.974						368.22	380.34					
459	14.997	15.474						380.92	393.04					
460	15.497	15.974						393.62	405.74					

▨ Recommended for static applications only.

🟦 Metric Sizes

The above dimensions are for reference only.

600 Series (3/8") cross section AS4832 recommended for diameters above -442.
Dash Numbers are size codes.

■ Hardware Dimensions per AS5857 BORE

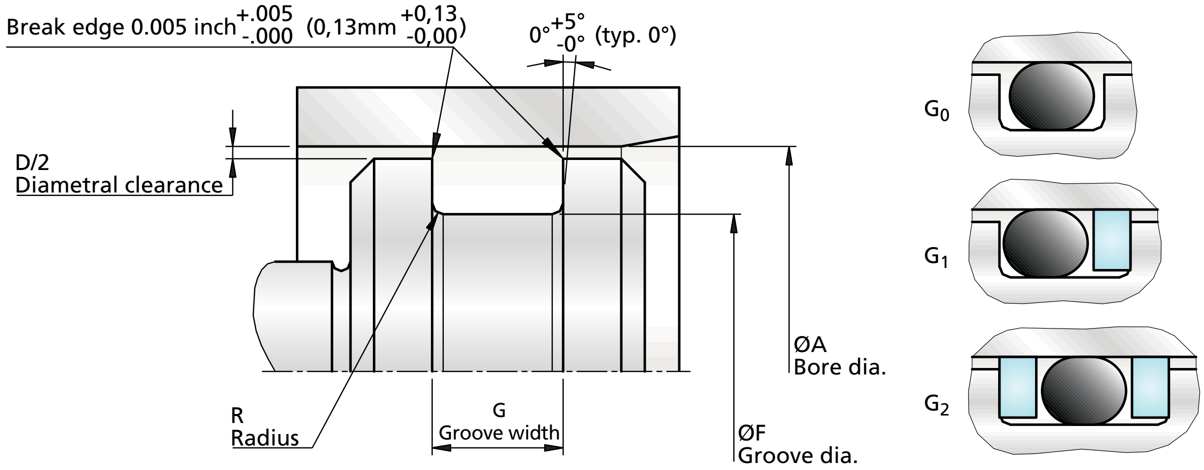


Figure 8 Installation Drawing for BORE

Table X Groove Dimensions, BORE per AS5857

	Bore Sizes per AS5857													
	Inch							**mm**						
Dash No	**øA** Bore Diameter	**øF** Groove Diameter	**D** Diameter Clearance Maximum	R Radius	**Groove Width** +0.010/-0.000			**øA** Bore Diameter	**øF** Groove Diameter	**D** Diameter Clearance Maximum	**R** Radius	**Groove Width** +0.25/-0.00		
					G_0	G_1	G_2					G_0	G_1	G_2
	+0.001 -0.000	+0.000 -0.001			+0.005 -0.000	+0.010 -0.000	+0.010 -0.000	+0.025 -0.000	+0.000 -0.025			+0.13 -0.00	+0.25 -0.00	+0.25 -0.00
001	0.086	0.035	0.004	0.015 I 0.005	0.090	-	-	2.18	0.89	0.10	0.38 I 0.13	2.29	-	-
002	0.118	0.048			0.095	-	-	3.00	1.22			2.41	-	-
003	0.151	0.063			0.105	-	-	3.84	1.60			2.67	-	-
004	0.185	0.078	0.004	0.015 I 0.005	0.115 I 0.120	0.174 I 0.184	0.230 I 0.240	4.70	1.98	0.10	0.38 I 0.13	2.92 I 3.05	4.42 I 4.67	5.84 I 6.09
005	0.217	0.110						5.51	2.79					
006	0.230	0.123						5.84	3.12					
007	0.261	0.154						6.63	3.91					
008	0.293	0.186			0.105 I 0.110	0.164 I 0.174	0.220 I 0.230	7.44	4.72			2.67 I 2.79	4.17 I 4.42	5.59 I 5.84
009	0.326	0.219						8.28	5.56					
010	0.357	0.250						9.07	6.35					
011	0.420	0.313						10.67	7.95					
012	0.485	0.378						12.32	9.60					
	+0.002 -0.000	+0.000 -0.002	0.005					+0.05 -0.00	+0.00 -0.05	0.13				
013	0.550	0.443						13.97	11.25					
014	0.613	0.506						15.57	12.85					
015	0.675	0.568						17.15	14.43					
016	0.738	0.631						18.75	16.03					
017	0.800	0.693						20.32	17.60					
018	0.863	0.756						21.92	19.20					
019	0.925	0.818						23.50	20.78					
020	0.991	0.884						25.17	22.45					
021	1.053	0.946						26.75	24.03					
022	1.116	1.009						28.35	25.63					
023	1.178	1.071						29.92	27.20					
024	1.241	1.134						31.52	28.80					
025	1.303	1.196						33.10	30.38					
026	1.366	1.259						34.70	31.98					
027	1.428	1.321						36.27	33.55					
028	1.491	1.384						37.87	35.15					

	Bore Sizes per AS5857													
	Inch							**mm**						
Dash No	**øA** Bore Diameter	**øF** Groove Diameter	**D** Diameter Clearance Maximum	R Radius	**Groove Width** +0.010/-0.000			**øA** Bore Diameter	**øF** Groove Diameter	**D** Diameter Clearance Maximum	**R** Radius	**Groove Width** +0.25/-0.00		
					G_0	G_1	G_2					G_0	G_1	G_2
	+0.001 -0.000	+0.000 -0.001	0.004	0.015 I 0.005	0.150	0.210	0.275	+0.025 -0.000	+0.000 -0.025	0.10	0.38 I 0.13	3.81	5.33	6.99
104	0.286	0.121						7.26	3.07					
105	0.317	0.152						8.05	3.86					
106	0.349	0.184						8.86	4.67					
107	0.382	0.217						9.70	5.51					
108	0.414	0.249						10.52	6.32					
109	0.477	0.312						12.12	7.92					
	+0.002 -0.000	+0.000 -0.002	0.005		0.140	0.200	0.265	+0.05 -0.00	+0.00 -0.05	0.13		3.56	5.08	6.73
110	0.541	0.377						13.74	9.58					
111	0.604	0.440						15.34	11.18					
112	0.668	0.504						16.97	12.80					
113	0.734	0.570						18.64	14.48					
114	0.800	0.636						20.32	16.15					
115	0.863	0.699						21.92	17.75					
116	0.925	0.761						23.50	19.33					
117	0.991	0.827						25.17	21.01					
118	1.053	0.889						26.75	22.58					
119	1.116	0.952						28.35	24.18					
120	1.178	1.014						29.92	25.76					
121	1.241	1.077						31.52	27.36					
122	1.303	1.139						33.10	28.93					
123	1.366	1.202						34.70	30.53					
124	1.428	1.264						36.27	32.11					
125	1.491	1.327						37.87	33.71					
126	1.553	1.389						39.45	35.28					
127	1.616	1.452						41.05	36.88					
128	1.678	1.514						42.62	38.46					
129	1.741	1.577						44.22	40.06					
130	1.805	1.641	0.006					45.85	41.68	0.15				
131	1.867	1.703						47.42	43.26					
132	1.930	1.766						49.02	44.86					
133	1.992	1.828						50.60	46.43					
134	2.055	1.891						52.20	48.03					
135	2.118	1.954						53.80	49.63					
136	2.180	2.016						55.37	51.21					
137	2.243	2.079						56.97	52.81					
138	2.305	2.141						58.55	54.38					
139	2.368	2.204						60.15	55.98					
140	2.430	2.266						61.72	57.56					
141	2.493	2.329	0.007					63.32	59.16	0.18				
142	2.555	2.391						64.90	60.73					
143	2.618	2.454						66.50	62.33					
144	2.680	2.516						68.07	63.91					
145	2.743	2.579						69.67	65.51					
146	2.805	2.641						71.25	67.08					
147	2.868	2.704						72.85	68.68					
148	2.930	2.766						74.42	70.26					
149	2.993	2.829						76.02	71.86					

▨ Metric Sizes

TRELLEBORG
SEALING SOLUTIONS

	Bore Sizes per AS5857													
	Inch							**mm**						
Dash No	**øA** Bore Diameter	**øF** Groove Diameter	**D** Diameter Clearance Maximum	R Radius	**Groove Width** +0.010/-0.000			**øA** Bore Diameter	**øF** Groove Diameter	**D** Diameter Clearance Maximum	**R** Radius	**Groove Width** +0.25/-0.00		
					G_0	G_1	G_2					G_0	G_1	G_2
	+0.002 -0.000	+0.000 -0.002						+0.05 -0.00	+0.00 -0.05					
210	0.991	0.767	0.006	0.025 I 0.010	0.185	0.250	0.320	25.17	19.48	0.15	0.64 I 0.25	4.70	6.35	8.13
211	1.053	0.829						26.75	21.06					
212	1.116	0.892						28.35	22.66					
213	1.178	0.954						29.92	24.23					
214	1.241	1.017						31.52	25.83					
215	1.303	1.079						33.10	27.41					
216	1.366	1.142						34.70	29.01					
217	1.428	1.204						36.27	30.58					
218	1.491	1.267						37.87	32.18					
219	1.553	1.329						39.45	33.76					
220	1.616	1.392						41.05	35.36					
221	1.678	1.454						42.62	36.93					
222	1.741	1.517						44.22	38.53					
223	1.867	1.643	0.006					47.42	41.73	0.15				
224	1.992	1.768						50.60	44.91					
225	2.118	1.894						53.80	48.11					
226	2.243	2.019						56.97	51.28					
227	2.368	2.144						60.15	54.46					
228	2.493	2.269	0.007					63.32	57.63	0.18				
229	2.618	2.394						66.50	60.81					
230	2.743	2.519						69.67	63.98					
231	2.868	2.644						72.85	67.16					
232	2.993	2.769						76.02	70.33					
233	3.118	2.894						79.20	73.51					
234	3.243	3.019						82.37	76.68					
235	3.368	3.144						85.55	79.86					
236	3.493	3.269						88.72	83.03					
237	3.618	3.394						91.90	86.21					
238	3.743	3.519						95.07	89.38					
239	3.868	3.644						98.25	92.56					
240	3.993	3.769						101.42	95.73					
241	4.118	3.894						104.60	98.91					
242	4.243	4.019						107.77	102.08					
243	4.368	4.144						110.95	105.26					
244	4.493	4.269	0.008					114.12	108.43	0.20				
245	4.618	4.394						117.30	111.61					
246	4.743	4.519						120.47	114.78					
247	4.868	4.644						123.65	117.96					
325	1.867	1.523	0.006	0.035 I 0.020	0.270	0.360	0.455	47.42	38.68	0.15	0.89 I 0.51	6.86	9.14	11.56
326	1.992	1.648						50.60	41.86					
327	2.118	1.774						53.80	45.06					
328	2.243	1.899						56.97	48.23					
329	2.368	2.024						60.15	51.41					
330	2.493	2.149	0.007					63.32	54.58	0.18				
331	2.618	2.274						66.50	57.76					
332	2.743	2.399						69.67	60.93					
333	2.868	2.524						72.85	64.11					
334	2.993	2.649						76.02	67.28					
335	3.118	2.774						79.20	70.46					
336	3.243	2.899						82.37	73.63					
337	3.368	3.024						85.55	76.81					
338	3.493	3.149						88.72	79.98					
339	3.618	3.274						91.90	83.16					

🟦 Metric Sizes

TRELLEBORG
SEALING SOLUTIONS

	Bore Sizes per AS5857													
	Inch							**mm**						
Dash No	**øA** Bore Diameter	**øF** Groove Diameter	**D** Diameter Clearance Maximum	R Radius	**Groove Width** +0.010/-0.000 G$_0$	G$_1$	G$_2$	**øA** Bore Diameter	**øF** Groove Diameter	**D** Diameter Clearance Maximum	**R** Radius	**Groove Width** +0.25/-0.00 G$_0$	G$_1$	G$_2$
	+0.002 -0.000	+0.000 -0.002	0.007	0.035 I 0.020	0.270	0.360	0.455	+0.05 -0.00	+0.00 -0.05	0.18	0.89 I 0.51	6.86	9.14	11.56
340	3.743	3.399						95.07	86.33					
341	3.868	3.524						98.25	89.51					
342	3.993	3.649						101.42	92.68					
343	4.118	3.774						104.60	95.86					
344	4.243	3.899						107.77	99.03					
345	4.368	4.024						110.95	102.21					
346	4.493	4.149	0.008					114.12	105.38	0.20				
347	4.618	4.274						117.30	108.56					
348	4.743	4.399						120.47	111.73					
349	4.868	4.524						123.65	114.91					
	+0.003 -0.000	+0.000 -0.003	0.009	0.035 I 0.020	0.345	0.475	0.610	+0.076 -0.000	+0.000 -0.076	0.23	0.89 I 0.51	8.76	12.07	15.49
425	4.974	4.519						126.34	114.78					
426	5.099	4.644						129.51	117.96					
427	5.224	4.769						132.69	121.13					
428	5.349	4.894						135.86	124.31					
429	5.474	5.019						139.04	127.48					
430	5.599	5.144						142.21	130.66					
431	5.724	5.269						145.39	133.83					
432	5.849	5.394						148.56	137.01					
433	5.974	5.519						151.74	140.18					
434	6.099	5.644						154.91	143.36					
435	6.224	5.769						158.09	146.53					
436	6.349	5.894						161.26	149.71					
437	6.474	6.019						164.44	152.88					
438	6.724	6.269						170.79	159.23					
439	6.974	6.519						177.14	165.58					
440	7.224	6.769						183.49	171.93					
441	7.474	7.019						189.84	178.28					
442	7.724	7.269						196.19	184.63					
443	7.974	7.519						202.54	190.98					
444	8.224	7.769						208.89	197.33					
445	8.474	8.019						215.24	203.68					
446	8.974	8.519	0.010					227.94	216.38	0.25				
	+0.004 -0.000	+0.000 -0.003	0.011					+0.100 -0.000	+0.000 -0.076	0.28				
447	9.474	9.020						240.64	229.11					
448	9.974	9.520						253.34	241.81					
449	10.474	10.020						266.04	254.51					
450	10.974	10.520						278.74	267.21					
451	11.474	11.020						291.44	279.91					
452	11.974	11.520						304.14	292.61					
453	12.474	12.020						316.84	305.31					
454	12.974	12.520						329.54	318.01					
455	13.474	13.020						342.24	330.71					
456	13.974	13.520						354.94	343.41					
457	14.474	14.020						367.64	356.11					
458	14.974	14.520						380.34	368.81					
459	15.474	15.020						393.04	381.51					
460	15.974	15.520						405.74	394.21					

🟦 Metric Sizes

The above dimensions are for reference only.

600 Series (3/8") cross section AS4832 recommended for diameters above -442.
Dash numbers are size codes

■ Hardware Dimensions per AS5857 ROD

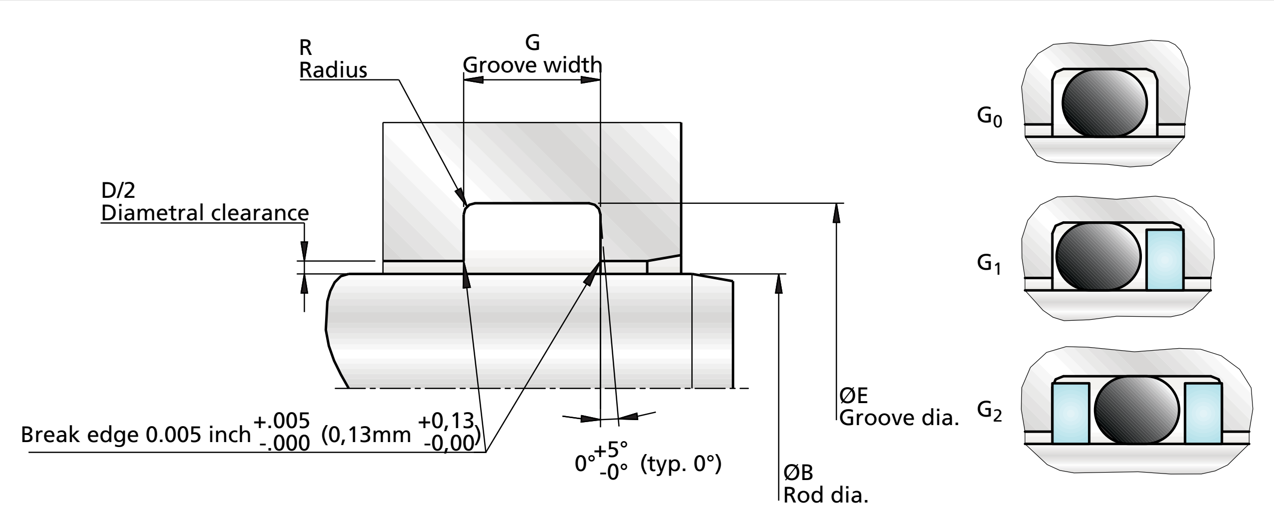


Figure 9 Installation Drawing for ROD

Table XI Groove Dimensions, ROD per AS5857

	Rod Sizes per AS5857													
	Inch							**mm**						
Dash No	**øB** Rod Diameter	**øE** Groove Diameter	**D** Diameter Clearance Maximum	R Radius	**Groove Width** +0.010/-0.000 G_0	G_1	G_2	**øB** Rod Diameter	**øE** Groove Diameter	**D** Diameter Clearance Maximum	**R** Radius	**Groove Width** +0.25/-0.00 G_0	G_1	G_2
	+0.000 -0.001	+0.001 -0.000			+0.005 -0.000			+0.000 -0.025	+0.025 -0.000			+0.13 -0.00	- -	- -
001	0.033	0.086	0.004	0.015 I 0.005	0.090	-	-	0.84	2.18	0.10	0.38 I 0.13	2.29	-	-
002	0.048	0.118			0.095	-	-	1.22	3.00			2.41	-	-
003	0.063	0.151			0.105	-	-	1.60	3.84			2.67	-	-
004	0.076	0.184	0.004	0.015 I 0.005	0.115 I 0.120	0.174 I 0.184	0.230 I 0.240	1.93	4.67	0.10	0.38 I 0.13	2.92 I 3.05	4.42 I 4.67	5.84 I 6.09
005	0.108	0.216						2.74	5.49					
006	0.123	0.231						3.12	5.87					
007	0.154	0.262						3.91	6.65					
008	0.185	0.293			0.105 I 0.110	0.164 I 0.174	0.220 I 0.230	4.70	7.44			2.67 I 2.79	4.17 I 4.42	5.59 I 5.84
009	0.217	0.325						5.51	8.26					
010	0.248	0.356						6.30	9.04					
011	0.310	0.418						7.87	10.62					
012	0.373	0.481						9.47	12.22					
	+0.000 -0.002	+0.002 -0.000	0.005					+0.00 -0.05	+0.05 -0.00	0.13				
013	0.435	0.543						11.05	13.79					
014	0.498	0.606						12.65	15.39					
015	0.560	0.668						14.22	16.97					
016	0.623	0.731						15.82	18.57					
017	0.685	0.793						17.40	20.14					
018	0.748	0.856						19.00	21.74					
019	0.810	0.918						20.57	23.32					
020	0.873	0.981						22.17	24.92					
021	0.935	1.043						23.75	26.49					
022	0.998	1.106						25.35	28.09					
023	1.060	1.168						26.92	29.67					
024	1.123	1.231						28.52	31.27					
025	1.185	1.293						30.10	32.84					
026	1.248	1.356						31.70	34.44					
027	1.310	1.418						33.27	36.02					
028	1.373	1.481						34.87	37.62					

🟦 Metric Sizes

	Rod Sizes per AS5857													
	Inch							**mm**						
Dash No	**øB** Rod Diameter	**øE** Groove Diameter	**D** Diameter Clearance Maximum	R Radius	**Groove Width** +0.010/-0.000			**øB** Rod Diameter	**øE** Groove Diameter	**D** Diameter Clearance Maximum	**R** Radius	**Groove Width** +0.25/-0.00		
					G_0	G_1	G_2					G_0	G_1	G_2
	+0.000 -0.001	+0.001 -0.000	0.004	0.015 I 0.005	0.150	0.210	0.275	+0.000 -0.025	+0.025 -0.000	0.10	0.38 I 0.13	3.81	5.33	6.99
104	0.123	0.288						3.12	7.32					
105	0.154	0.319						3.91	8.10					
106	0.185	0.350						4.70	8.89					
107	0.217	0.382						5.51	9.70					
108	0.248	0.413						6.30	10.49					
109	0.310	0.475						7.87	12.07					
	+0.000 -0.002	+0.002 -0.000	0.005		0.140	0.200	0.265	+0.00 -0.05	+0.05 -0.00	0.13		3.56	5.08	6.73
110	0.373	0.538						9.47	13.67					
111	0.435	0.600						11.05	15.24					
112	0.498	0.663						12.65	16.84					
113	0.560	0.725						14.22	18.42					
114	0.623	0.788						15.82	20.02					
115	0.685	0.850						17.40	21.59					
116	0.748	0.913						19.00	23.19					
117	0.810	0.975						20.57	24.77					
118	0.873	1.038						22.17	26.37					
119	0.935	1.100						23.75	27.94					
120	0.998	1.163						25.35	29.54					
121	1.060	1.225						26.92	31.12					
122	1.123	1.288						28.52	32.72					
123	1.185	1.350						30.10	34.29					
124	1.248	1.413						31.70	35.89					
125	1.310	1.475						33.27	37.47					
126	1.373	1.538						34.87	39.07					
127	1.435	1.600	0.006					36.45	40.64	0.15				
128	1.498	1.663						38.05	42.24					
129	1.560	1.725						39.62	43.82					
130	1.623	1.788						41.22	45.42					
131	1.685	1.850						42.80	46.99					
132	1.748	1.913						44.40	48.59					
133	1.810	1.975	0.007					45.97	50.17	0.18				
134	1.873	2.038						47.57	51.77					
135	1.936	2.101						49.17	53.37					
136	1.998	2.163						50.75	54.94					
137	2.061	2.226						52.35	56.54					
138	2.123	2.288						53.92	58.12					
139	2.186	2.351						55.52	59.72					
140	2.248	2.413						57.10	61.29					
141	2.311	2.476						58.70	62.89					
142	2.373	2.538						60.27	64.47					
143	2.436	2.601						61.87	66.07					
144	2.498	2.663						63.45	67.64					
145	2.561	2.726						65.05	69.24					
146	2.623	2.788						66.62	70.82					
147	2.686	2.851						68.22	72.42					
148	2.748	2.913						69.80	73.99					
149	2.811	2.976						71.40	75.59					

▨ Metric Sizes

Dash No	Rod Sizes per AS5857													
	Inch							mm						
	øB Rod Diameter	øE Groove Diameter	D Diameter Clearance Maximum	R Radius	Groove Width +0.010/-0.000			øB Rod Diameter	øE Groove Diameter	D Diameter Clearance Maximum	R Radius	Groove Width +0.25/-0.00		
					G_0	G_1	G_2					G_0	G_1	G_2
	+0.000 -0.002	+0.002 -0.000						+0.00 -0.05	+0.05 -0.00					
210	0.748	0.974	0.005	0.025 I 0.010	0.185	0.250	0.320	19.00	24.74	0.13	0.64 I 0.25	4.70	6.35	8.13
211	0.810	1.036						20.57	26.31					
212	0.873	1.099						22.17	27.91					
213	0.935	1.161						23.75	29.49					
214	0.998	1.224						25.35	31.09					
215	1.060	1.286						26.92	32.66					
216	1.123	1.349						28.52	34.26					
217	1.185	1.411						30.10	35.84					
218	1.248	1.474						31.70	37.44					
219	1.310	1.536						33.27	39.01					
220	1.373	1.599						34.87	40.61					
221	1.435	1.661						36.45	42.19					
222	1.498	1.724						38.05	43.79					
223	1.623	1.849	0.006					41.22	46.96	0.15				
224	1.748	1.974						44.40	50.14					
225	1.873	2.099	0.007					47.57	53.31	0.18				
226	1.998	2.224						50.75	56.49					
227	2.123	2.349						53.92	59.66					
228	2.248	2.474						57.10	62.84					
229	2.373	2.599						60.27	66.01					
230	2.498	2.724						63.45	69.19					
231	2.623	2.849						66.62	72.36					
232	2.748	2.974						69.80	75.54					
233	2.873	3.099						72.97	78.71					
234	2.997	3.223						76.12	81.86					
235	3.122	3.348						79.30	85.04					
236	3.247	3.473						82.47	88.21					
237	3.372	3.598						85.65	91.39					
238	3.497	3.723						88.82	94.56					
239	3.622	3.848						92.00	97.74					
240	3.747	3.973						95.17	100.91					
241	3.872	4.098						98.35	104.09					
242	3.997	4.223						101.52	107.26					
243	4.122	4.348						104.70	110.44					
244	4.247	4.473						107.87	113.61					
245	4.372	4.598						111.05	116.79					
246	4.497	4.723	0.008					114.22	119.96	0.20				
247	4.622	4.848						117.40	123.14					
325	1.498	1.846	0.006	0.035 I 0.020	0.270	0.360	0.455	38.05	46.89	0.15	0.89 I 0.51	6.86	9.14	11.56
326	1.623	1.971						41.22	50.06					
327	1.748	2.096						44.40	53.24					
328	1.873	2.221	0.007					47.57	56.41	0.18				
329	1.998	2.346						50.75	59.59					
330	2.123	2.471						53.92	62.76					
331	2.248	2.596						57.10	65.94					
332	2.373	2.721						60.27	69.11					
333	2.498	2.846						63.45	72.29					
334	2.623	2.971						66.62	75.46					
335	2.748	3.096						69.80	78.64					
336	2.873	3.221						72.97	81.81					
337	2.997	3.345						76.12	84.96					

🟦 Metric Sizes

	Rod Sizes per AS5857													
	Inch							**mm**						
Dash No	**øB** Rod Diameter	**øE** Groove Diameter	**D** Diameter Clearance Maximum	R Radius	**Groove Width** +0.010/-0.000			**øB** Rod Diameter	**øE** Groove Diameter	**D** Diameter Clearance Maximum	**R** Radius	**Groove Width** +0.25/-0.00		
					G_0	G_1	G_2					G_0	G_1	G_2
	+0.000 -0.002	+0.002 -0.000	0.007	0.035 I 0.020	0.270	0.360	0.455	+0.00 -0.05	+0.05 -0.00	0.18	0.89 I 0.51	6.86	9.14	11.56
338	3.122	3.470						79.30	88.14					
339	3.247	3.595						82.47	91.31					
340	3.372	3.720						85.65	94.49					
341	3.497	3.845						88.82	97.66					
342	3.622	3.970						92.00	100.84					
343	3.747	4.095						95.17	104.01					
344	3.872	4.220						98.35	107.19					
345	3.997	4.345						101.52	110.36					
346	4.122	4.470						104.70	113.54					
347	4.247	4.595						107.87	116.71					
348	4.372	4.720						111.05	119.89					
349	4.497	4.845						114.22	123.06					
	+0.000 -0.003	+0.003 -0.000	0.009	0.035 I 0.020	0.345	0.475	0.610	+0.000 -0.076	+0.076 -0.000	0.23	0.89 I 0.51	8.76	12.07	15.49
425	4.497	4.956						114.22	125.88					
426	4.622	5.081						117.40	129.06					
427	4.747	5.206						120.57	132.23					
428	4.872	5.331						123.75	135.41					
429	4.997	5.456						126.92	138.58					
430	5.122	5.581						130.10	141.76					
431	5.247	5.706						133.27	144.93					
432	5.372	5.831						136.45	148.11					
433	5.497	5.956						139.62	151.28					
434	5.622	6.081						142.80	154.46					
435	5.747	6.206						145.97	157.63					
436	5.872	6.331						149.15	160.81					
437	5.997	6.456						152.32	163.98					
438	6.247	6.706						158.67	170.33					
439	6.497	6.956	0.010					165.02	176.68	0.25				
440	6.747	7.206						171.37	183.03					
441	6.997	7.456						177.72	189.38					
442	7.247	7.706						184.07	195.73					
443	7.497	7.956						190.42	202.08					
444	7.747	8.206						196.77	208.43					
445	7.997	8.456						203.12	214.78					
446	8.497	8.956						215.82	227.48					
	+0.000 -0.003	+0.004 -0.000						+0.000 -0.076	+0.100 -0.000					
447	8.997	9.456						228.52	240.18					
448	9.497	9.956						241.22	252.88					
449	9.997	10.456						253.92	265.58					
450	10.497	10.956						266.62	278.28					
451	10.997	11.456						279.32	290.98					
452	11.497	11.956						292.02	303.68					
453	11.997	12.456						304.72	316.38					
454	12.497	12.956						317.42	329.08					
455	12.997	13.456						330.12	341.78					
456	13.497	13.956						342.82	354.48					
457	13.997	14.456						355.52	367.18					
458	14.497	14.956						368.22	379.88					
459	14.997	15.456						380.92	392.58					
460	15.497	15.956						393.62	405.28					

🟦 Metric Sizes

The above dimensions are for reference only.

600 Series (3/8") cross section AS4832 recommended for diameters above -442.
Dash numbers are size codes

■ Products designed for optimized performance

Trelleborg Sealing Solutions offers one of the widest product portfolios of any seal supplier including many proprietary designs. They range from multi-functional O-Rings to more complex Turcon® geometries, from custom molded designs to bonded products.

Sealing elements have a decisive influence on the function and service life of the aerospace systems into which they are fitted and in particular on cylinders, both hydraulic and pneumatic. It is important to select not only the correct sealing material to meet the performance parameters of an application but also the optimum seal configuration.

The most effective sealing solutions will offer:
- maximized leakage control
- low friction
- resistance to wear
- the ability to withstand the most aggressive chemicals
- broad operating temperatures into the extremes, both hot and cold
- extrusion resistance
- compact form
- ease of installation

For advice on the optimum solution for your application, contact your local Trelleborg Sealing Solutions marketing company.

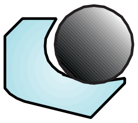
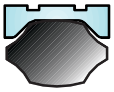
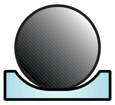
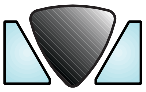
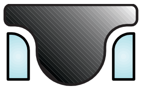
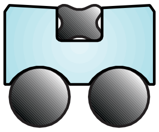
Ordering seals

The multi-element seal assemblies presented in this catalog are supplied as complete sets. The assembly includes the seal and proprietary elastomer energizing element.

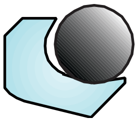
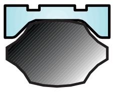
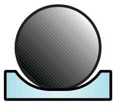
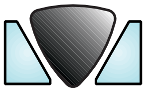
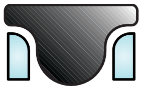
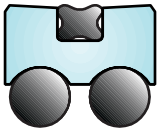
Older seal designs not included in this catalog continue to be available. Information on these parts and part number ordering details can be found in the "Aerospace Part Number Guide" chapter in the back of this catalog or in the stand-alone *Aerospace Part Number Guide.* For all new applications, we recommend you use the seal types and preferred sizes listed here.

Other combinations of Turcon® materials and special designs can be developed and supplied for individual applications. All intermediate sizes up to 10 ft/ 3000 mm diameter are available, provided there is a sufficient volume requirement. Sizes over 10 ft/ 3000 mm can be supplied in some seal designs.

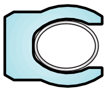
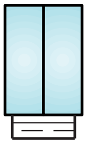
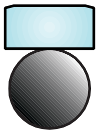
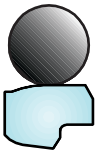
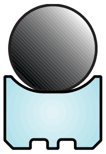
The sizes contained in the catalog are considered standard sizes. For non-standard sizes that include proprietary elastomer designs, a share of the tool cost may be charged if there is only limited demand for that size of seal.

		Application								
Seal	**Features**	**Gland**	**Move-ment**		**Pressure Direction**	**Piston**	**Rod**	**Speed Limit**	**Temperature Range***	**Pressure****
Turcon® VL Seal® 	High performance uni-directional rod seal - Low friction - Leak-tight	MIL-G-5514F AS4716	R T	S	U	No	Yes	49.2 ft/s 15.0 m/s	-65 to +390°F -54 to +200°C	5,000 psi 35 MPa (10,000 psi 69 MPa with Zurcon® Back-up Ring)
Turcon® Plus Seal® II 	High performance slipper seal - Low constant friction - Resistance to wear - Optimized extrusion resistance - Easy installation - Recommended for high frequencies	AS4716	R T O H	S	B	Yes	Yes	49.2 ft/s 15.0 m/s	-65 to +390°F -54 to +200°C	5,000 psi 35 MPa (10,000 psi 69 MPa with Stakbak®)
Turcon® Double Delta® II 	The original slipper seal design - No stick-slip - Cost-effective - Can be made to suit any O-Ring size	AS4716	R	S	B	Yes	Yes	49.2 ft/s 15.0 m/s	-65 to +390°F -54 to +200°C	5,000 psi 35 MPa (10,000 psi 69 MPa with Stakbak®)
Turcon® Wedgpak® 	Symmetrical seal with zero-leakage - Low-friction - Excellent extrusion and wear resistance - Preferred elastomer contact dynamic seal	AS4716	R	S	B	Yes	Yes	9.8 ft/s 3.0 m/s	-65 to +390°F -54 to +200°C	5,000 psi 35 MPa (10,000 psi 69 MPa in Wedgpak® EP configuration)
Turcon® T-Seal 	Excellent static seal - Geometry prevents spiraling or rolling of seal during installation and use	AS4716	R	S	B	Yes	Yes	3.3 ft/s 1.0 m/s	-65 to +390°F -54 to +200°C	5000 psi 35 MPa (10,000 psi 69 MPa in Tandem T-seal configuration)
Turcon® AQ-Seal® 5 	- Excellent sealability between gas and oil - Low-friction and leak-tight	AS4716 (only 300 and 400 series)	R	S	B	Yes	No	9.8 ft/s 3.0 m/s	-65 to +390°F -54 to +200°C	5000 psi 35 MPa

KEY TO MOVEMENT: Reciprocating = R Rotary = T Oscillating = O Helix = H Static = S
KEY TO PRESSURE DIRECTION: Single acting (Unidirectional) = U Double acting (Bidirectional)= B
* Temperature range is dependent upon material selection.
** Pressure is dependent upon material and gap dimension. Avoid combining extreme limits.

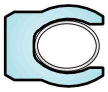
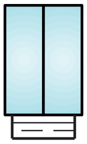
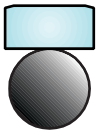
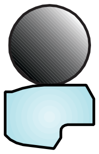
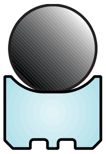
Description	Seal
Developed over the past few years as a new generation unidirectional rod seal. The design has taken the latest empirical and theoretical experience into account in order to optimize performance, friction, leakage and service life. This has been achieved and proven through in-house testing and qualified in customer applications. Its unique back-pumping effect allows the seal to prevent pressure from being trapped between tandem un-vented seals or between seals and double-acting scrapers.	Turcon® VL Seal® 
A superior double acting slipper seal design has a contoured seal cap, formed to match the lemon shaped elastomer ring. The special elastomer allows more room for cap thickness, extending service life and activating the cap equally over the width of the seal. This reduces friction and the cap can be provided with grooves in order to reduce friction even further.	Turcon® Plus Seal® II 
The original slipper seal, it has a delta-shaped cap activated by an Turel® O-Ring. The seal has low friction and good leakage control in dynamic applications.	Turcon® Double Delta® II 
A triangular shaped elastomer part, protected against extrusion, rolling and spiraling by two delta rings. The minimized elastomer footprint on the dynamic surface ensures excellent leakage control with a reduced tendency to adhere to the sealing surface.	Turcon® Wedgpak® 
Primarily recommended for static application, the seal has good leakage control. Its unique shape prevents it from rolling or spiraling in the gland at installation.	Turcon® T-Seal 
This unique seal design was developed from the original Turcon® AQ-Seal®. Its enlarged cap allows it to be centrally positioned in the groove for a X-Ring seal. The seal has the excellent leakage control of an elastomer contact seal, but at the same time, a very low friction and long service life. This is because the X-Ring seal is energized by the squeeze and not by system pressure. Specially designed to separate fluids and gases in dynamic applications.	Turcon® AQ-Seal® 5 

Industry Specific Products

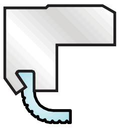
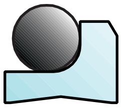
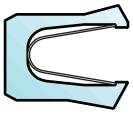
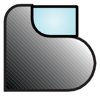
Seal	Features	Application								
		Gland	Move-ment		Pressure Direction	Piston	Rod	Speed Limit	Temperature Range*	Pressure**
Turcon® Variseal® 	- Spring-energized seal - Chemical-resistance optimized - Wide temperature range - Several spring designs available - Unlimited shelf life	AS4716 (Groove may have to be split for installation)	R T O H	S	U	Yes	Yes	49.2 ft/s 15.0 m/s	-460 to +500°F -273 to +260°C	5,000 psi 35 Mpa (10,000 psi 69 MPa with Zurcon® Back-up Ring)
Turcon® Back-up Ring 	- Spiral - Solid - Scarf-cut - Stakbak® design	AS4716	R	S	B	Yes	Yes	-	-94 to +390°F -70 to +200°C	5,000 psi 35 Mpa (10,000 psi 69 MPa with Zurcon® Back-up Ring)
Turcon® Dual Piston Ring 	- Spring-energized seal - Low-friction - Metallic expander - Wide temperature range - Controlled leakage - Saves space by using narrow glands - Low hysteresis - Unlimited shelf life	TSS gland standard which reflect AS4716 bore diameters	R		B	Yes	No	49.2 ft/s 15.0 m/s	-94 to +500°F -70 to +260°C	5,000 psi 35 MPa
Turcon® Glyd Ring® 	- Optimum slipper seal - Low-friction - Long service life - Saves space by using narrow gland	TSS gland standard which reflect AS4716 rod & bore diameters	R T O H	S	B	Yes	Yes	49.2 ft/s 15.0 m/s	-65 to +390°F -54 to +200°C	5,000 psi 35 Mpa (10,000 psi 69 MPa with Zurcon® Back-up Ring, Corner Reinforced Version)
Turcon® Stepseal® 2K 	Excellent primary seal - High-pressure capability - Pressure relieving effect	TSS gland standard which reflect AS4716 rod & bore diameters	R		U	Yes	Yes	49.2 ft/s 15.0 m/s	-65 to +390°F -54 to +200°C	5,000 psi 35 MPa
Turcon® Roto Glyd Ring® 	- Rotary seal - Low speed - High-pressure	TSS gland standard which reflect AS4716 rod & bore diameters	R T O H		B	Yes	Yes	6.5 ft/s 2.0 m/s	-65 to +390°F -54 to +200°C	3,000 psi 21 MPa

KEY TO MOVEMENT: Reciprocating = R Rotary = T Oscillating = O Helix = H Static = S
KEY TO PRESSURE DIRECTION: Single acting (Unidirectional) = U Double acting (Bidirectional)= B
* Temperature range is dependent upon material selection.
** Pressure is dependent upon material and gap dimension. Avoid combining extreme limits.

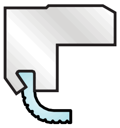
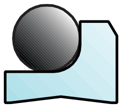
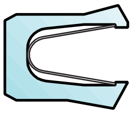
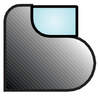
Industry Specific Products

Description	Seal
A single-acting slipper seal activated by a metal spring. The seal is often used in conditions where there are extreme temperatures, aggressive chemical media and a long storage life. It gives low-friction, no stick-slip, good leakage control and long service life. There are four types; M, W, H and SA.	Turcon® Variseal® 
All standards and sizes available in virgin as well as filled PTFE compounds. The patented Stakbak® design allows operation in an extended range of temperatures and pressures.	Turcon® Back-up Ring 
The seal is energized by a Stainless Steel wave-shaped spring. The characteristics of the seal are very low-friction, long service life and controlled leakage. Dual Piston Rings can be supplied with various spring types, depending upon application.	Turcon® Dual Piston Ring 
An all-round seal for hydraulic and pneumatic applications. The seal design combines the experience of years of field test and laboratory research into a highly efficient and reliable low-friction seal for both high and low pressure systems. It has the special advantage that gland width can be reduced, for example, in spool valves.	Turcon® Glyd Ring® 
The seal consists of a patented step cap, activated by an O-Ring. A further development of the slipper seal incorporating an active back-pumping effect when used with a secondary seal. This avoids pressure build-up during long strokes.	Turcon® Stepseal® 2K 
The seal is designed with chamfers, notches, and tangential or circumferential grooves. Energized by an O-Ring, the seal has no interference fit to reduce frictional heat generation. Suitable for high-pressure and low speed applications.	Turcon® Roto Glyd Ring® 

Industry Specific Products

Seal	Features	Application								
		Gland	Movement		Pressure Direction	Piston	Rod	Speed Limit	Temperature Range*	Pressure**
Turcon® Varilip® PDR 	- Rotary seal - Low-friction - Dry running capability - Chemical resistance optimized - Outperforms traditional Oil seals	Gland to suit application	T O H		U	No	Yes	65.6 ft/s 20.0 m/s	-76 to +390°F -60 to +200°C	290 psi 2 MPa
Turcon® Excluder® DC 	- Optimum scraping effect - Dual lip for optimized effect - Vented version available	AS4716, TSS & MS33675 Gland standards	R T O H		U	No	Yes	49.2 ft/s 15.0 m/s	-65 to +390°F -54 to +200°C	-
Turcon® Variseal® Scraper 	- Spring-energized scraper - Wide temperature range - Chemical resistance optimized	AS4716, , AS4052 Rev. B Type II (Groove may have to be split for installation in small diameters)	R T O H		U	Yes	Yes	49.2 ft/s 15.0 m/s	-94 to +500°F -70 to +260°C	-
Turcon® Slydring® Orkot® Wear Ring Zurcon® Wear Ring 	- High load bearing capability - Wear resistant - No rod scoring - Protects seals	TSS Gland Standard which reflect AS4716 Rod and Bore diameters	R T O H	S	B	Yes	Yes	(depending upon material choice)	-76 to +500°F -60 to +260°C	-
Turcon® HST Seal 	- Flange seal - Absorbs pulsing and vibration - Internal and external version - Easy installation	TSS Face Gland Standard		S	U	External	Internal	-	-65 to +390°F -54 to +200°C	10,000 psi 69 MPa

KEY TO MOVEMENT: Reciprocating = R Rotary = T Oscillating = O Helix = H Static = S
KEY TO PRESSURE DIRECTION: Single acting (Unidirectional) = U Double acting (Bidirectional)= B
* Temperature range is dependent upon material selection.
** Pressure is dependent upon material and gap dimension. Avoid combining extreme limits.

Description	Seal
The metal or plastic casing of the seal incorporates one, two or three seal lips in the same or reversed directions, depending upon the chosen design and requirements for the application. Designed for fast rotating shafts the seal gives a long service life and minimal friction combined with very good leakage control.	Turcon® Varilip® PDR 
A solid ring with dual scraper lip contact, activated by an O-Ring, gives the excellent performance. In the Excluder®, 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 going out of the system during the out-stroke.	Turcon® Excluder® DC 
A spring-energized seal with optimized scraping angle, Variseal® Scraper is designed for extreme working temperatures, high speeds and for contact with aggressive media.	Turcon® Variseal® Scraper 
Wear rings made from polymeric materials offer many advantages over metallic bearings. Among these are low friction, long wear life, easy replacement and low cost. They also protect seals by providing a buffer for contamination and pressure peaks.	Turcon® Slydring® Orkot® Wear Ring Zurcon® Wear Ring 
A flange version of the standard T-seal, the optimized shape of the elastomer ring is leak-tight even in application situations where there is pulsing and vibration present. The ring of Turcon® or Zurcon® protects against extrusion.	Turcon® HST Seal 

TRELLEBORG
SEALING SOLUTIONS

Seals and Back-up Rings for AS4716 grooves

Features and benefits

- Tight leakage control
- Unique hydrodynamic back-pumping effect maximizes leakage control
- Avoids the trapping of pressure between tandem seal or between seals and scrapers
- Low friction due to a reduced contact area between seal and mating surface
- Continuously lubricated
- Long service life
- Simple design
- Uses standard size O-Ring as an energizer
- Most AS4716 gland sizes available (compatible with MIL-G-5514F)
- Not available in 000 Series
- US Patent No. 6,497,415

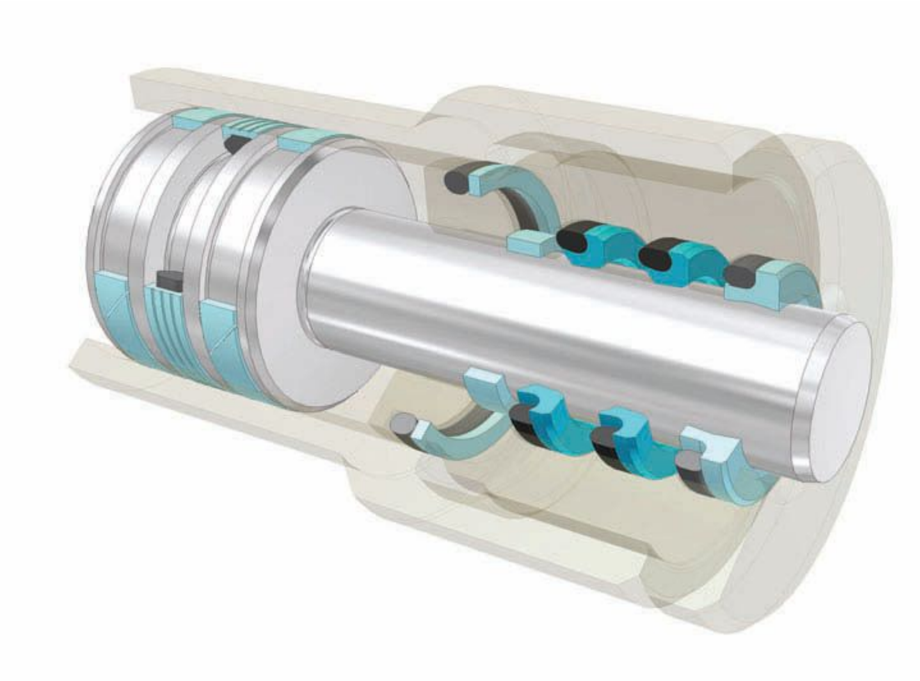


Illustration shows typical hydraulic cylinder with a sealing configuration incorporating Turcon® VL Seal®.

Turcon® VL Seal®

Description

The Turcon® VL Seal® was developed as the next generation unidirectional rod seal. It incorporates leading-edge design and development techniques to optimize frictional behavior, leakage control and service life. Performance parameters are backed up with results from in-house testing and qualified customer applications.

Important to the function of the Turcon® VL Seal® is the Trelleborg Sealing Solutions unique back-pumping effect. This prevents pressure from being trapped between tandem seals or between seals and double-acting scrapers.

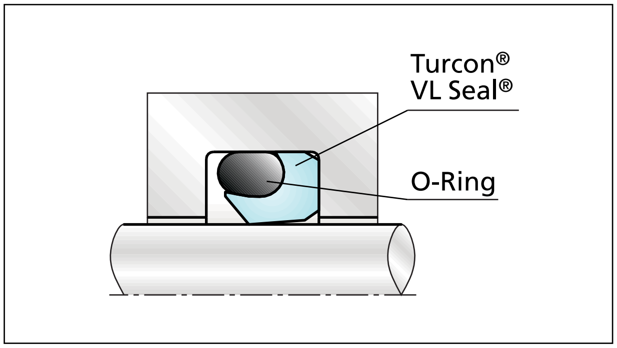


Figure 1 Turcon® VL Seal®

Method of Operation

The sealing mechanism of the Turcon® VL Seal® (Figure 1) is based on the hydrodynamic properties of the seal. The specially formed seal edge has a steep contact pressure gradient on the high-pressure side and a shallow contact pressure gradient on the low-pressure side. This ensures that the fluid film adhering to the piston rod is returned to the high-pressure chamber on the return stroke of the rod. The micro-fluid layer that is carried out of the high-pressure chamber when the piston rod is extended is therefore prevented from causing leaks.

The return delivery property of the Turcon® VL Seal® prevents the build-up of the inter-stage pressure that is normally associated with tandem seal configurations (Figure 2). Inter-stage pressure depends on system pressure speed, stroke length and groove design.

The presence of hydraulic oil around the seal ensures a very long service life, as the seal will always be adequately lubricated.

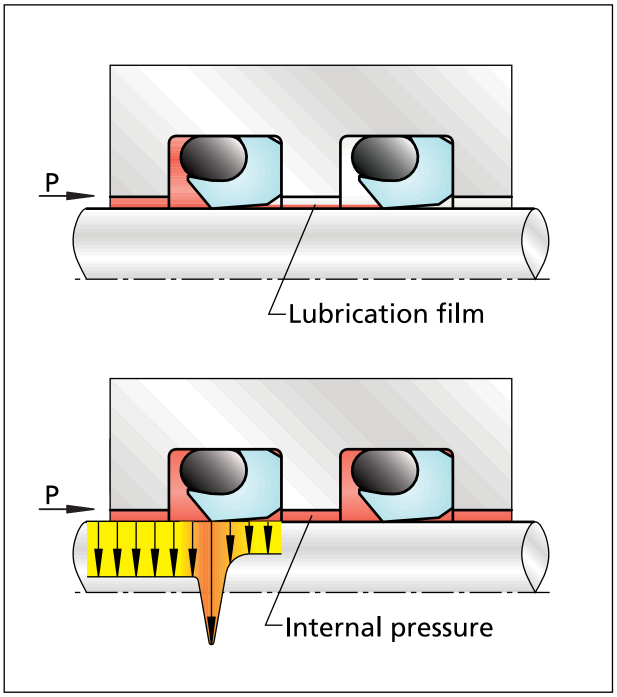


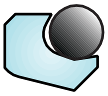
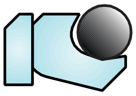
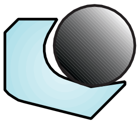
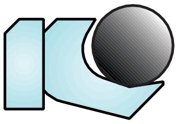
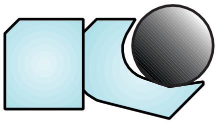
Figure 2 Pressure Distribution in Tandem Installation

Technical Data

Operation pressure:	5000 psi/ 35 MPa
Speed:	Up to 49.2 ft/s/ 15.0 m/s with reciprocating movements
Temperature range:	-65°F to +390°F/ -54°C to +200°C depending on elastomer material
Clearance:	Per AS4716 guidelines, larger clearances are possible.
Media:	Mineral oil-based hydraulic fluids, flame-retardant hydraulic fluids, environmentally-safe hydraulic fluids (bio-oils), phosphate ester, water and others, depending on the elastomer material

Avoid combining extreme limits.

Table I Turcon® VL Seal® Types

Seal	Turcon® VL Seal®		
	Width		
Type	**0 BUR (G_0)**	**1 BUR (G_1)**	**2 BUR (G_2)**
100 Series	 REL10	 REL1_ 1)	 REL1_ 2)
200 Series	 REL20	 REL2_ 1)	 REL2_ 2)
300 Series	 REL30	 REL3_ 1)	 REL3_ 2)
400 Series	 REL40	 REL4_ 1)	 REL4_ 2)

- G denotes groove width; zero, one or two back-up width
- BUR - Back-up Ring
- Not recommended below 0.600 in/ 15 mm in closed grooves
- 1 or 2 B/U groove width recommended below 1.000 in/ 25 mm for installation

1) 5th character - Design characteristics codes for scarf cut Back-up Ring configuration:
A = Cut BUR in Zurcon® Z43
B = Cut BUR in same material as seal
C = Cut BUR in Turcon® T29

2) 5th character - Design characteristics codes for scarf cut Back-up Ring configuration:
D = Cut BUR in Zurcon® Z43
E = Cut BUR in same material as seal
F = Cut BUR in Turcon® T29

Turcon® VL Seal®

DASH NO.	*B* DIA.	*E* DIA.	O-RING NO.
	+.000 −.001	+.001 −.000	
110	.373	.546	013
111	.435	.609	014
112	.498	.672	015
113	.560	.734	016
114	.623	.797	017
115	.685	.859	018
116	.748	.923	019
117	.810	.985	020
118	.873	1.048	021
119	.935	1.110	022
120	.998	1.173	023
121	1.060	1.235	024
122	1.123	1.298	025
123	1.185	1.360	026
124	1.248	1.423	027
125	1.310	1.485	028
126	1.373	1.548	028
127	1.435	1.610	029
128	1.498	1.673	029
129	1.560	1.735	030
130	1.623	1.798	030
131	1.685	1.860	031
132	1.748	1.923	031
133	1.810	1.984	032
134	1.873	2.047	032
135	1.936	2.110	033
136	1.998	2.172	033
137	2.061	2.235	034
138	2.123	2.297	034
139	2.186	2.360	035
140	2.248	2.422	035
141	2.311	2.485	036
142	2.373	2.547	036
143	2.436	2.610	037
144	2.498	2.672	037
145	2.561	2.735	038
146	2.623	2.797	038
147	2.686	2.860	039
148	2.748	2.922	039
149	2.811	2.985	040
	+.000 −.002	+.002 −.000	
210	.748	.989	117
211	.810	1.051	118
212	.873	1.115	119
213	.935	1.177	120
214	.998	1.240	121
215	1.060	1.302	122
216	1.123	1.365	123
217	1.185	1.427	124
218	1.248	1.490	125
219	1.310	1.552	126
220	1.373	1.615	127
221	1.435	1.677	128
222	1.498	1.740	129
223	1.623	1.865	131
224	1.748	1.990	133
225	1.873	2.115	135
226	1.998	2.240	137
227	2.123	2.365	139
228	2.248	2.490	141
229	2.373	2.615	143
230	2.498	2.740	145
231	2.623	2.865	147
232	2.748	2.990	149
233	2.873	3.115	150
234	2.997	3.239	151
235	3.122	3.364	151
236	3.247	3.489	152
237	3.372	3.614	152
238	3.497	3.739	153
239	3.622	3.864	153

DASH NO.	*B* DIA.	*E* DIA.	O-RING NO.
	+.000 −.002	+.002 −.000	
240	3.747	3.989	154
241	3.872	4.114	154
242	3.997	4.239	155
243	4.122	4.364	155
244	4.247	4.489	156
245	4.372	4.614	156
246	4.497	4.739	157
247	4.622	4.864	157
	+.000 −.002	+.002 −.000	
325	1.498	1.870	223
326	1.623	1.995	224
327	1.748	2.120	225
328	1.873	2.245	226
329	1.998	2.370	227
330	2.123	2.495	228
331	2.248	2.620	229
332	2.373	2.745	230
333	2.498	2.870	231
334	2.623	2.995	232
335	2.748	3.120	233
336	2.873	3.245	234
337	2.997	3.369	235
338	3.122	3.494	236
339	3.247	3.619	237
340	3.372	3.744	238
341	3.497	3.869	239
342	3.622	3.994	240
343	3.747	4.119	241
344	3.872	4.244	242
345	3.997	4.369	243
346	4.122	4.494	244
347	4.247	4.619	245
348	4.372	4.744	246
349	4.497	4.869	247
	+.000 −.003	+.003 −.000	
425	4.497	4.974	350
426	4.622	5.099	351
427	4.747	5.224	352
428	4.872	5.349	353
429	4.997	5.474	354
430	5.122	5.599	355
431	5.247	5.724	356
432	5.372	5.849	357
433	5.497	5.974	358
434	5.622	6.099	359
435	5.747	6.224	360
436	5.872	6.349	361
437	5.997	6.474	361
438	6.247	6.724	362
439	6.497	6.974	363
440	6.747	7.224	364
441	6.997	7.474	365
442	7.247	7.724	366
443	7.497	7.974	367
444	7.747	8.224	368
445	7.997	8.474	369
446	8.497	8.974	371
	+.000 −.003	+.004 −.000	
447	8.997	9.474	373
448	9.497	9.974	375
449	9.997	10.474	377
450	10.497	10.974	378
451	10.997	11.474	379
452	11.497	11.974	380
453	11.997	12.474	381
454	12.497	12.974	381
455	12.997	13.474	382
456	13.497	13.974	382
457	13.997	14.474	383
458	14.497	14.974	383
459	14.997	15.474	384
460	15.497	15.974	384

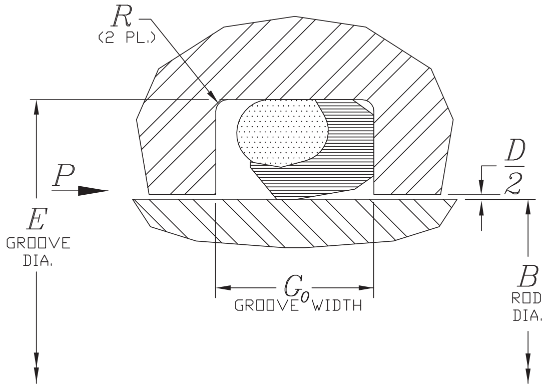
DASH NO.	G_0 ZERO BACKUP WIDTH	*R* RADIUS	*D* DIAMETRAL CLEARANCE MAX.
110-126	.141/.151	.005/.015	.005
127-129			.006
130-132			.006
133-140			.007
141-149			.007
210-222	.188/.198	.010/.025	.005
223-224			.006
225-227			.007
228-243			.007
244-245			.007
246-247			.008
325-327	.281/.291	.020/.035	.006
328-329			.007
330-345			.007
346-349			.007
425-438	.375/.385	.020/.035	.009
439-445			.010
446			.010
447-460			.010

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR VL SEAL® IN AS4716 REV A ROD GLANDS.

2. ORDERING EXAMPLE: REL 2 0 M 214 A T19 NG

VL SEAL®, ROD DESIGNATOR
CROSS SECTION:
1 = 100 SERIES
2 = 200 SERIES
3 = 300 SERIES
4 = 400 SERIES
DESIGN CHARACTERISTICS
0 = STANDARD
GLAND STANDARD
M = AS4716 REVISION A
SIZE DESIGNATION
ACCORDING TO AS4716 REVISION A
QUALITY INDEX:
A = AEROSPACE CERTIFICATE OF CONFORMANCE
TURCON® VL SEAL® MAT'L. CODE
TUREL® O-RING MAT'L CODE
CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.



ROD SEAL INSTALLATION
FOR ZERO BACKUP WIDTH GLAND PER AS4716 REVISION A

INCH
2009_1
TRELLEBORG
SEALING SOLUTIONS
TITLE VL SEAL®
DRAWING NO. REL10M000

WORLD AEROSPACE TITLE BLOCK REV.

Turcon® VL Seal®

DASH NO.	B DIA.	E DIA.	O-RING NO.
	+.000 -.001	+.001 -.000	
110	.373	.546	013
111	.435	.609	014
112	.498	.672	015
113	.560	.734	016
114	.623	.797	017
115	.685	.859	018
116	.748	.923	019
117	.810	.985	020
118	.873	1.048	021
119	.935	1.110	022
120	.998	1.173	023
121	1.060	1.235	024
122	1.123	1.298	025
123	1.185	1.360	026
124	1.248	1.423	027
125	1.310	1.485	028
126	1.373	1.548	028
127	1.435	1.610	029
128	1.498	1.673	029
129	1.560	1.735	030
130	1.623	1.798	030
131	1.685	1.860	031
132	1.748	1.923	031
133	1.810	1.984	032
134	1.873	2.047	032
135	1.936	2.110	033
136	1.998	2.172	033
137	2.061	2.235	034
138	2.123	2.297	034
139	2.186	2.360	035
140	2.248	2.422	035
141	2.311	2.485	036
142	2.373	2.547	036
143	2.436	2.610	037
144	2.498	2.672	037
145	2.561	2.735	038
146	2.623	2.797	038
147	2.686	2.860	039
148	2.748	2.922	039
149	2.811	2.985	040
	+.000 -.002	+.002 -.000	
210	.748	.989	117
211	.810	1.051	118
212	.873	1.115	119
213	.935	1.177	120
214	.998	1.240	121
215	1.060	1.302	122
216	1.123	1.365	123
217	1.185	1.427	124
218	1.248	1.490	125
219	1.310	1.552	126
220	1.373	1.615	127
221	1.435	1.677	128
222	1.498	1.740	129
223	1.623	1.865	131
224	1.748	1.990	133
225	1.873	2.115	135
226	1.998	2.240	137
227	2.123	2.365	139
228	2.248	2.490	141
229	2.373	2.615	143
230	2.498	2.740	145
231	2.623	2.865	147
232	2.748	2.990	149
233	2.873	3.115	150
234	2.997	3.239	151
235	3.122	3.364	151
236	3.247	3.489	152
237	3.372	3.614	152
238	3.497	3.739	153
239	3.622	3.864	153

DASH NO.	B DIA.	E DIA.	O-RING NO.
	+.000 -.002	+.002 -.000	
240	3.747	3.989	154
241	3.872	4.114	154
242	3.997	4.239	155
243	4.122	4.364	155
244	4.247	4.489	156
245	4.372	4.614	156
246	4.497	4.739	157
247	4.622	4.864	157
	+.000 -.002	+.002 -.000	
325	1.498	1.870	223
326	1.623	1.995	224
327	1.748	2.120	225
328	1.873	2.245	226
329	1.998	2.370	227
330	2.123	2.495	228
331	2.248	2.620	229
332	2.373	2.745	230
333	2.498	2.870	231
334	2.623	2.995	232
335	2.748	3.120	233
336	2.873	3.245	234
337	2.997	3.369	235
338	3.122	3.494	236
339	3.247	3.619	237
340	3.372	3.744	238
341	3.497	3.869	239
342	3.622	3.994	240
343	3.747	4.119	241
344	3.872	4.244	242
345	3.997	4.369	243
346	4.122	4.494	244
347	4.247	4.619	245
348	4.372	4.744	246
349	4.497	4.869	247
	+.000 -.003	+.003 -.000	
425	4.497	4.974	350
426	4.622	5.099	351
427	4.747	5.224	352
428	4.872	5.349	353
429	4.997	5.474	354
430	5.122	5.599	355
431	5.247	5.724	356
432	5.372	5.849	357
433	5.497	5.974	358
434	5.622	6.099	359
435	5.747	6.224	360
436	5.872	6.349	361
437	5.997	6.474	361
438	6.247	6.724	362
439	6.497	6.974	363
440	6.747	7.224	364
441	6.997	7.474	365
442	7.247	7.724	366
443	7.497	7.974	367
444	7.747	8.224	368
445	7.997	8.474	369
446	8.497	8.974	371
	+.000 -.003	+.004 -.000	
447	8.997	9.474	373
448	9.497	9.974	375
449	9.997	10.474	377
450	10.497	10.974	378
451	10.997	11.474	379
452	11.497	11.974	380
453	11.997	12.474	381
454	12.497	12.974	381
455	12.997	13.474	382
456	13.497	13.974	382
457	13.997	14.474	383
458	14.497	14.974	383
459	14.997	15.474	384
460	15.497	15.974	384

DASH NO.	G_1 ONE BACKUP WIDTH	R RADIUS	D DIAMETRAL CLEARANCE MAX.
110-126	.183/.193	.005/.015	.005
127-129			.006
130-132			.006
133-140			.007
141-149			.007
210-222	.235/.245	.010/.025	.005
223-224			.006
225-227			.007
228-243			.007
244-245			.007
246-247			.008
325-327	.334/.344	.020/.035	.006
328-329			.007
330-345			.007
346-349			.007
425-438	.475/.485	.020/.035	.009
439-445			.010
446			.010
447-460			.010

NOTES:

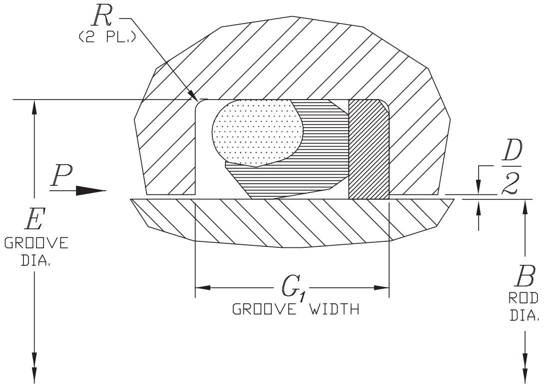
1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR VL SEAL® IN AS4716 REV A ROD GLANDS.

2. ORDERING EXAMPLE: REL 2 B M 214 A T19 NG

VL SEAL® ROD DESIGNATOR
CROSS SECTION:
  1 = 100 SERIES
  2 = 200 SERIES
  3 = 300 SERIES
  4 = 400 SERIES
DESIGN CHARACTERISTICS
△3 SEE BELOW
GLAND STANDARD
  M = AS4716 REVISION A
SIZE DESIGNATION
  ACCORDING TO AS4716 REVISION A
QUALITY INDEX:
  A = AEROSPACE CERTIFICATE OF CONFORMANCE
TURCON® VL SEAL® MAT'L. CODE
TUREL® O-RING MAT'L CODE
CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

△3 DESIGN CODES FOR SCARF CUT BACKUP RING CONFIGURATION.

DESIGN CODE	BACKUP RING TYPE	BACKUP RING MATERIAL		
	CUT BACKUP RING	ZURCON® Z43	MATERIAL SAME AS SEAL RING	TURCON® T29
A	X	X		
B	X		X	
C	X			X



ROD SEAL INSTALLATION
FOR ONE BACKUP WIDTH GLAND PER AS4716 REVISION A

INCH
2009_1
TRELLEBORG
SEALING SOLUTIONS
TITLE
VL SEAL®
DRAWING NO.
REL1BM000

WORLD AEROSPACE TITLE BLOCK REV.

The drawings are also available on the CD supplied with this manual or they can be downloaded from www.tss.trelleborg.com.

Turcon® VL Seal®

DASH NO.	*B* DIA.	*E* DIA.	O-RING NO.
	+.000 -.001	+.001 -.000	
110	.373	.546	013
111	.435	.609	014
112	.498	.672	015
113	.560	.734	016
114	.623	.797	017
115	.685	.859	018
116	.748	.923	019
117	.810	.985	020
118	.873	1.048	021
119	.935	1.110	022
120	.998	1.173	023
121	1.060	1.235	024
122	1.123	1.298	025
123	1.185	1.360	026
124	1.248	1.423	027
125	1.310	1.485	028
126	1.373	1.548	028
127	1.435	1.610	029
128	1.498	1.673	029
129	1.560	1.735	030
130	1.623	1.798	030
131	1.685	1.860	031
132	1.748	1.923	031
133	1.810	1.984	032
134	1.873	2.047	032
135	1.936	2.110	033
136	1.998	2.172	033
137	2.061	2.235	034
138	2.123	2.297	034
139	2.186	2.360	035
140	2.248	2.422	035
141	2.311	2.485	036
142	2.373	2.547	036
143	2.436	2.610	037
144	2.498	2.672	037
145	2.561	2.735	038
146	2.623	2.797	038
147	2.686	2.860	039
148	2.748	2.922	039
149	2.811	2.985	040
	+.000 -.002	+.002 -.000	
210	.748	.989	117
211	.810	1.051	118
212	.873	1.115	119
213	.935	1.177	120
214	.998	1.240	121
215	1.060	1.302	122
216	1.123	1.365	123
217	1.185	1.427	124
218	1.248	1.490	125
219	1.310	1.552	126
220	1.373	1.615	127
221	1.435	1.677	128
222	1.498	1.740	129
223	1.623	1.865	131
224	1.748	1.990	133
225	1.873	2.115	135
226	1.998	2.240	137
227	2.123	2.365	139
228	2.248	2.490	141
229	2.373	2.615	143
230	2.498	2.740	145
231	2.623	2.865	147
232	2.748	2.990	149
233	2.873	3.115	150
234	2.997	3.239	151
235	3.122	3.364	151
236	3.247	3.489	152
237	3.372	3.614	152
238	3.497	3.739	153
239	3.622	3.864	153
	+.000 -.002	+.002 -.000	
240	3.747	3.989	154
241	3.872	4.114	154
242	3.997	4.239	155
243	4.122	4.364	155
244	4.247	4.489	156
245	4.372	4.614	156
246	4.497	4.739	157
247	4.622	4.864	157
	+.000 -.002	+.002 -.000	
325	1.498	1.870	223
326	1.623	1.995	224
327	1.748	2.120	225
328	1.873	2.245	226
329	1.998	2.370	227
330	2.123	2.495	228
331	2.248	2.620	229
332	2.373	2.745	230
333	2.498	2.870	231
334	2.623	2.995	232
335	2.748	3.120	233
336	2.873	3.245	234
337	2.997	3.369	235
338	3.122	3.494	236
339	3.247	3.619	237
340	3.372	3.744	238
341	3.497	3.869	239
342	3.622	3.994	240
343	3.747	4.119	241
344	3.872	4.244	242
345	3.997	4.369	243
346	4.122	4.494	244
347	4.247	4.619	245
348	4.372	4.744	246
349	4.497	4.869	247
	+.000 -.003	+.003 -.000	
425	4.497	4.974	350
426	4.622	5.099	351
427	4.747	5.224	352
428	4.872	5.349	353
429	4.997	5.474	354
430	5.122	5.599	355
431	5.247	5.724	356
432	5.372	5.849	357
433	5.497	5.974	358
434	5.622	6.099	359
435	5.747	6.224	360
436	5.872	6.349	361
437	5.997	6.474	361
438	6.247	6.724	362
439	6.497	6.974	363
440	6.747	7.224	364
441	6.997	7.474	365
442	7.247	7.724	366
443	7.497	7.974	367
444	7.747	8.224	368
445	7.997	8.474	369
446	8.497	8.974	371
	+.000 -.003	+.004 -.000	
447	8.997	9.474	373
448	9.497	9.974	375
449	9.997	10.474	377
450	10.497	10.974	378
451	10.997	11.474	379
452	11.497	11.974	380
453	11.997	12.474	381
454	12.497	12.974	381
455	12.997	13.474	382
456	13.497	13.974	382
457	13.997	14.474	383
458	14.497	14.974	383
459	14.997	15.474	384
460	15.497	15.974	384

DASH NO.	G_2 TWO BACKUP WIDTH	*R* RADIUS	*D* DIAMETRAL CLEARANCE MAX.
110-126	.245/.255	.005/.015	.005
127-129			.006
130-132			.006
133-140			.007
141-149			.007
210-222	.304/.314	.010/.025	.005
223-224			.006
225-227			.007
228-243			.007
244-245			.007
246-247			.008
325-327	.424/.434	.020/.035	.006
328-329			.007
330-345			.007
346-349			.007
425-438	.579/.589	.020/.035	.009
439-445			.010
446			.010
447-460			.010

NOTES:

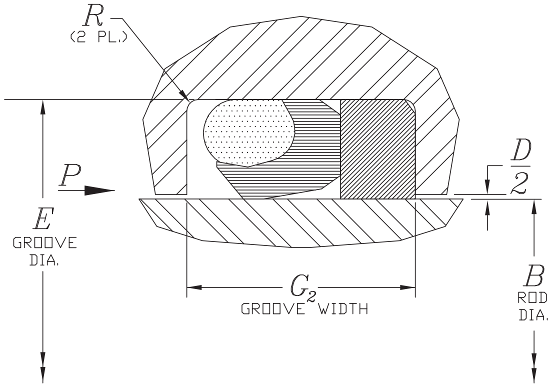
1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR VL SEAL® IN AS4716 REV A ROD GLANDS.

2. ORDERING EXAMPLE: REL 2 E M 214 A T19 NG

VL SEAL® ROD DESIGNATOR — REL
CROSS SECTION: — 2
1 = 100 SERIES
2 = 200 SERIES
3 = 300 SERIES
4 = 400 SERIES
DESIGN CHARACTERISTICS — E
△3 SEE BELOW
GLAND STANDARD — M
M = AS4716 REVISION A
SIZE DESIGNATION — 214
ACCORDING TO AS4716 REVISION A
QUALITY INDEX: — A
A = AEROSPACE CERTIFICATE OF CONFORMANCE
TURCON® VL SEAL® MAT'L. CODE — T19
TUREL® O-RING MAT'L CODE — NG
CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

△3 DESIGN CODES FOR SCARF CUT BACKUP RING CONFIGURATION.

	BACKUP RING			
	TYPE	MATERIAL		
DESIGN CODE	CUT BACKUP RING	ZURCON® Z43	MATERIAL SAME AS SEAL RING	TURCON® T29
D	X	X		
E	X		X	
F	X			X



ROD SEAL INSTALLATION
FOR TWO BACKUP WIDTH GLAND PER AS4716 REVISION A

INCH
2009_1
TRELLEBORG
SEALING SOLUTIONS
TITLE
VL SEAL®
DRAWING NO.
REL1EM000

WORLD AEROSPACE TITLE BLOCK REV.

Features and benefits

- Good dynamic and static sealing
- Very low coefficient of friction
- Very good dry-running properties
- Operating temperature of -423°F to +500°F/ -253°C up to +260°C
- Very good thermal resistance
- Almost universal chemical compatibility
- Permanent elasticity unaffected by contact with chemicals
- Capable of sealing at high speeds up to 49 ft/sec/ 15 m/s
- Capable of withstanding high pressures above 29,000 psi/ 200 MPa when using Back-up Rings
- Excellent leak tightness
- High resistance to wear
- No extrusion into gaps
- Low compression set
- Withstands aggressive and abrasive process media
- Good aging characteristics
- Compact form
- Simple installation
- Can be installed in grooves according to MIL-G-5514F and DIN 3771
- Standard products are available from 0.079 in/ 2 mm up to 8 ft 2 in/ 2,500 mm in diameter along with custom manufactured intermediate sizes, inch sizes or special geometries.

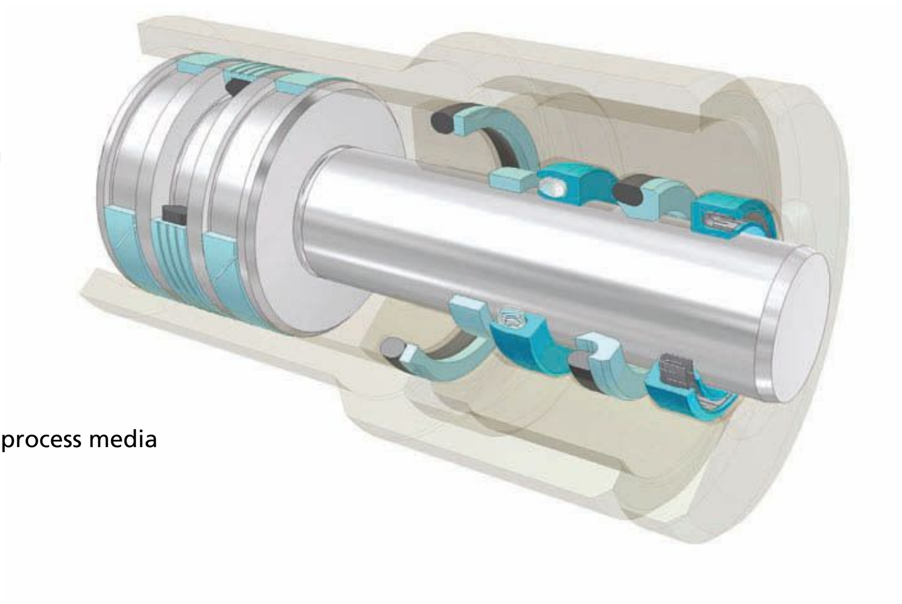


Illustration shows typical hydraulic cylinder with a sealing configuration incorporating Turcon® Variseal® of different types.

Description

The Turcon® Variseal® range is made up of single-acting spring-energized seals that are used in dynamic and static situations. Turcon® Variseal® is available in a range of geometries and designs that allow the optimum profile to be selected for a wide range of applications.

Turcon® Variseal® is chosen when high resistance to chemical media is required, if the seal needs to operate in extremes of temperature and where good extrusion or compression characteristics are needed.

Turcon® Variseal® has three main design characteristics:

1. Application specific U-shaped seal profile
2. Spring geometry suited to the particular application
3. Proven high-performance Turcon® or Zurcon® polymers

Method of Operation

All Turcon® Variseal® included in this catalog have the same operating principle and differ only in their profile form and type of metallic spring used.

The Turcon® Variseal® spring supplies the load required for sealing at low pressures (Figure 1). The U-shaped jacket allows fluid pressure to energize the sealing lips, so total sealing pressure rises with increasing operating pressure (Figure 2).

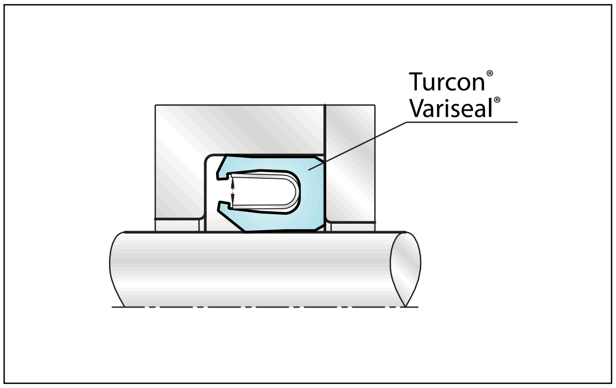


Figure 1 Turcon® Variseal® without system pressure

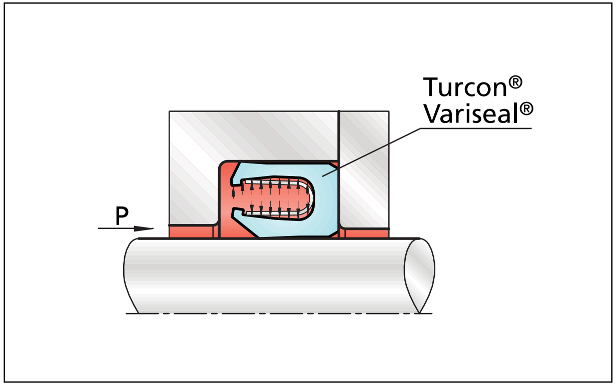


Figure 2 Turcon® Variseal® with system pressure

Spring Types

A metal spring is incorporated into Turcon® Variseal® to provide elasticity to the seal. This makes the seal permanently elastic, despite changes in operating temperature, pressure or chemicals processed. Each of the three spring types used in Turcon® Variseal® has unique properties that give them their performance characteristics. The two most important properties of the spring, besides the corrosion resistance of the metal, are load value and deflection range. The spring load affects sealing ability, friction and the wear rate of the seal. The deflection range determines the ability of Turcon® Variseal® to withstand wear and compensates for variations in gland dimensions.

V Spring

V Spring is the standard spring type for Turcon® Variseal® M2, Turcon® Variseal® M2S and Turcon® Roto Variseal®. It operates as a set of cantilever beams, extending from an arc at the bottom of the spring. The shape of the spring causes the load to be focused on the front edge of the sealing lip, giving the seal a positive wiping action. The V spring has a moderate load and deflection range.

Helical Spring

The Helical spring, used in Turcon® Variseal® H and Turcon® Variseal® HF, is made from a flat strip formed into a helical coil spring. It has a much higher unit load and a shorter deflection range than the other spring types. Therefore, it is best suited to static or slow dynamic applications, where friction and wear are not the key issues. Variseal® H and Variseal® HF are the best choices for vacuum, gas and low-temperature applications.

Slantcoil® Spring

The proprietary Slantcoil® spring used in Turcon® Variseal® W consists of round wire formed into slanted coils and has a relatively constant load over a wide deflection range. This allows accurate control of friction during the working life of the seal. Its unique design makes it almost impossible to damage the spring by excessive deformation of the seal.

Spring Materials

The standard spring material for Turcon® Variseal® is Stainless Steel AISI 301 (spring code S). In addition, Hastelloy® (spring code H) and Elgiloy® (spring code E) are available for specific applications.

Note:

Hastelloy® is a registered trademark of Cabot Corporation.

Elgiloy® is a registered trademark of Elgiloy Company.

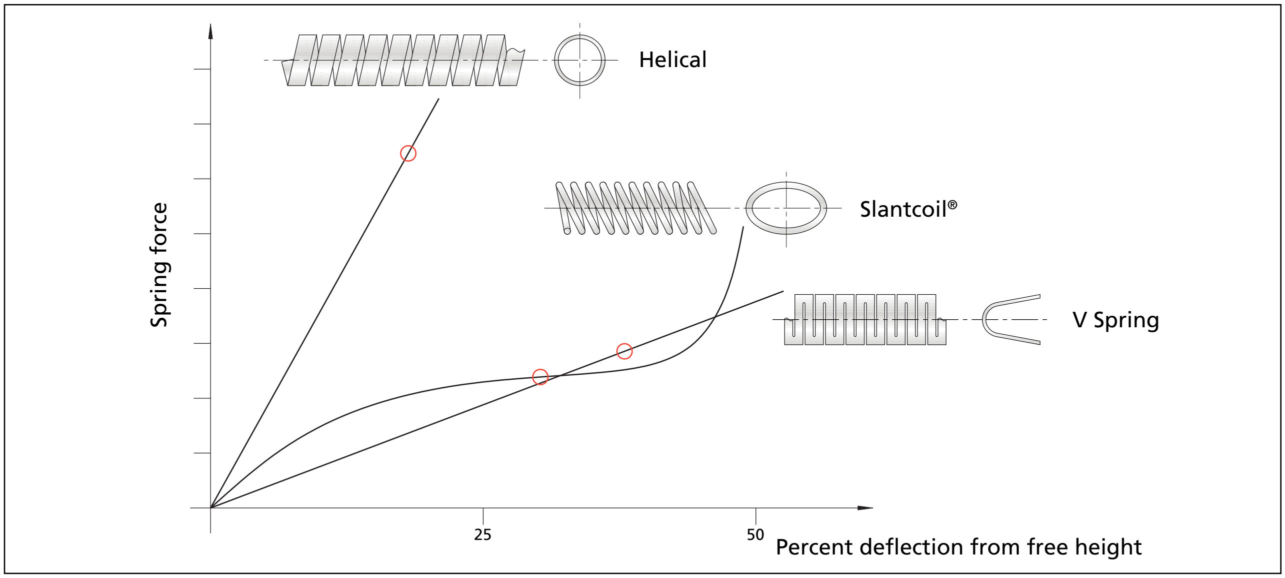


Figure 3 Comparison of load curves for the three spring types. The "o" represents the load point when the seals are installed in the gland.

Table I Turcon® Variseal® Rod Seals

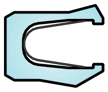
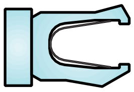
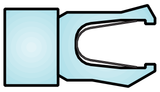
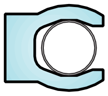
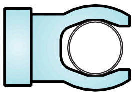
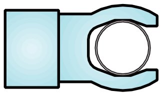
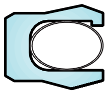
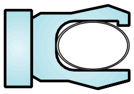
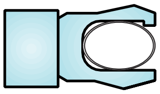
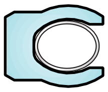
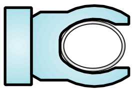
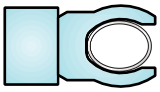
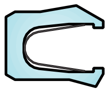
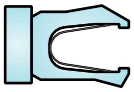
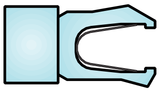
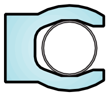
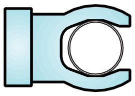
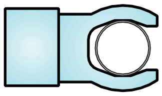
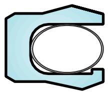
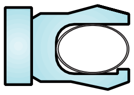
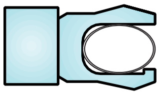
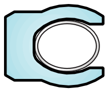
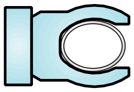
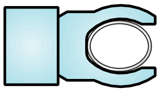
TYPE	0 BUR (G_0)	1 BUR (G_1)	2 BUR (G_2)
M2	 RVA_0	 RVA__ 1)	 RVA__ 2)
Helical	 RVE_0	 RVE__ 1)	 RVE__ 2)
W2	 RVJ_0	 RVJ__ 1)	 RVJ__ 2)
Slantcoil® SA	 RVP_0	 RVP__ 1)	 RVP__ 2)

Table II Turcon® Variseal® Piston Seals

TYPE	0 BUR (G_0)	1 BUR (G_1)	2 BUR (G_2)
M2	 PVA_0	 PVA__ 1)	 PVA__ 2)
Helical	 PVE_0	 PVE__ 1)	 PVE__ 2)
W2	 PVJ_0	 PVJ__ 1)	 PVJ__ 2)
Slantcoil® SA	 PVP_0	 PVP__ 1)	 PVP__ 2)

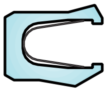
- G denotes groove width; zero, one or two back-up width
- BUR - Back-up Ring

1) 5th character - Design characteristics codes for scarf cut Back-up Ring configuration:
A = Cut BUR in Zurcon® Z43
B = Cut BUR in same material as seal
C = Cut BUR in Turcon® T29

2) 5th character - Design characteristics codes for scarf cut Back-up Ring configuration:
D = Cut BUR in Zurcon® Z43
E = Cut BUR in same material as seal
F = Cut BUR in Turcon® T29

Turcon® Variseal®

■ Turcon® Variseal® M2



Description

Turcon® Variseal® M2 is a single-acting seal consisting of a U-shaped jacket and a V-shaped corrosion-resistant spring.

Turcon® Variseal® M2 has an asymmetric seal profile. The heavy profile of its dynamic lip with an optimized front angle offers good leakage control, reduced friction and long service life.

Areas of Application

- Hydraulic actuators and Cylinders
- Spindles
- Pumps
- Valves

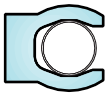
Advantages

- Suitable for reciprocating and rotary applications
- Low coefficient of friction
- Stick-slip-free operating
- High abrasion resistance
- Withstands rapid changes in temperature
- Available in Hi-Clean® (Silicone-filled) version
- Excellent resistance to aging
- Interchangeable with O-Ring and Back-up Ring combinations to AS4716

Technical Data

Operating Pressure:	
Maximum dynamic:	6,527 psi/ 45 MPa
Maximum static:	8,700 psi/ 60 MPa
Speed:	Reciprocating up to 49 ft/s/ 15 m/s Rotating up to 3 ft/s/ 1 m/s
Operating Temperature:	-94°F to +500°F/ -70°C to +260°C
Media:	Virtually all fluids, chemicals and gases
Note:	At high temperatures,operating pressures and speeds are lower.

■ Turcon® Variseal® Helical



Description

Turcon® Variseal® H is a single-acting seal consisting of a U-shaped jacket and a helical wound corrosion resistant spring.

The helical ribbon spring of Turcon® Variseal® H has high spring-loading, which gives excellent sealing integrity at low pressure and even in a vacuum. Variseal® H is suitable for static applications and ideal in low speed situations.

Areas of Application

- Compressors
- Ball valves
- Vacuum or gas-tight sealing
- Very low temperatures

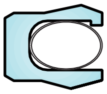
Advantages

- High contact pressure
- Excellent sealing integrity in gas and fluid applications
- Withstands rapid changes in temperature
- Good sealing ability when surfaces are not ideal
- No assembly tools are required for larger diameter seals
- Excellent resistance to aging
- Interchangeable with O-Ring and Back-up Ring combinations to AS4716

Technical Data

Operating Pressure:	
Maximum dynamic:	2,900 psi/ 20 MPa
Maximum static:	11,600 psi/ 80 MPa
Speed:	Reciprocating up to 16 ft/s/ 5 m/s Rotating up to 0.3 ft/s/ 0.1 m/s
Operating Temperature:	-248°F to +500°F/ -120°C to +260°C
Media:	Virtually all fluids, chemicals and gases
Note:	At high temperatures,operating pressures and speeds are lower.

■ Turcon® Variseal® W2



Description

Turcon® Variseal® W2 is a single-acting seal consisting of a U-shaped jacket and a corrosion-resistant Slantcoil® spring. The Slantcoil® spring in the Turcon® Variseal® W2 provides an almost constant load regardless of hardware, tolerances, eccentricity and seal wear.

The Variseal® W2 is designed for reciprocating and rotary applications over a wide range of surface speeds and temperatures. It is virtually resistant to fatigue or compression set since the internal stresses of the Slantcoil® spring geometry are very low.

Areas of Application

- Hydraulic actuators and cylinders
- Servo valves
- Pressure switches
- Electronic equipment

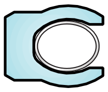
Advantages

- Suitable for reciprocating and rotary applications
- Constant initial squeeze of spring over a large control area
- Almost constant friction for low-pressure applications
- Stick-slip-free operation
- High abrasion resistance
- Withstands rapid changes in temperature
- Interchangeable with O-Ring and Back-up Ring combinations to AS4716

Technical Data

Operating Pressure:	
Maximum dynamic:	2,900 psi/ 20 MPa
Maximum static:	8,700 psi/ 60 MPa
Speed:	Reciprocating up to 49 ft/s/ 15 m/s Rotating up to 3 ft/s/ 1 m/s
Operating Temperature:	-94°F to +446°F/ -70°C to +230°C
Media:	Virtually all fluids, chemicals and gases
Note:	At high temperatures, operating pressures and speeds are lower.

■ Turcon® Variseal® SA



Description

Turcon® Variseal® SA is a single-acting seal with a Slantcoil® spring energizer. The seal was developed for aerospace hydraulic applications, particularly those requiring installation into closed groove gland positions. The special seal jacket profile and Slantcoil® spring enable the seal to more readily withstand the damage and deformation that other spring-energized seals can suffer when fitted into closed grooves.

Turcon® Variseal® SA is designed for reciprocating and rotary applications over a wide range of surface speeds and temperatures. The round sealing lip profile gives a wide contact area, which enhances sealing function when good leakage control is needed.

Areas of Application

- Hydraulic actuators and cylinders
- Spindles
- Pumps
- Valves

Advantages

- Suitable for installation into small diameter closed glands
- Constant initial squeeze of spring over a large control area
- Stick-slip-free operation
- Withstands rapid changes in temperature
- Interchangeable with O-Ring and Back-up Ring combinations to AS4716

Technical Data

Operating Pressure:	
Maximum dynamic:	5,000 psi/ 35 MPa
Maximum static:	11,600 psi/ 80 MPa
Speed:	Reciprocating up to 16 ft/s/ 5 m/s Rotating up to 0.3 ft/s/ 0.1 m/s
Operating Temperature:	-94°F to +446°F/ -70°C to +230°C
Media:	Virtually all fluids, chemicals and gases
Note:	At high temperatures, operating pressures and speeds are lower.

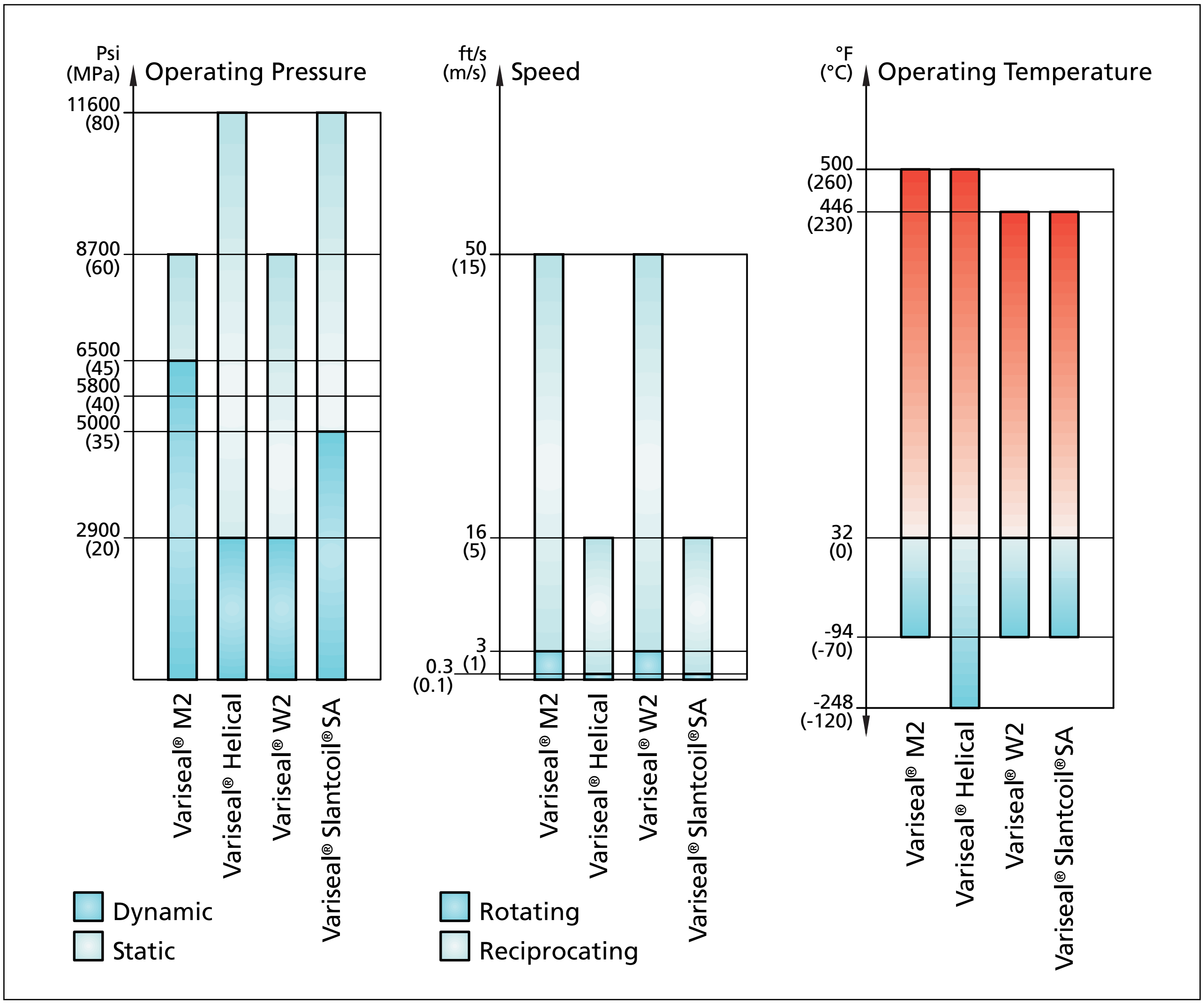


Figure 4 Main performance characteristics

Series

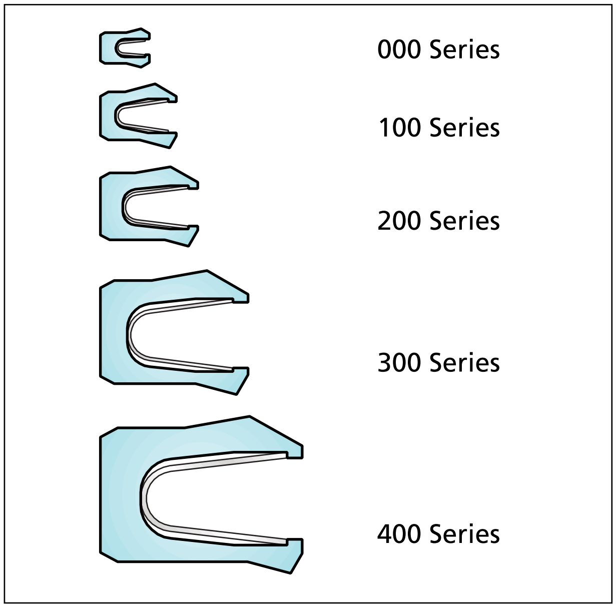


Figure 5 Relative Size of Turcon® Variseal® M2 Cross Section

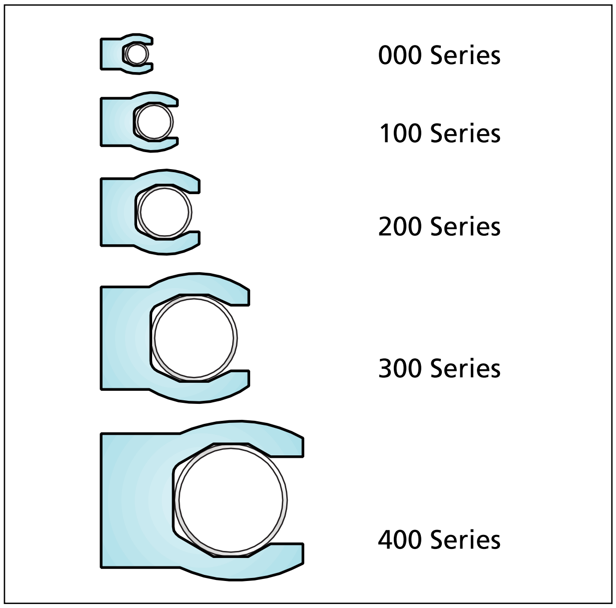


Figure 6 Relative Size of Turcon® Variseal® Helical Cross Section

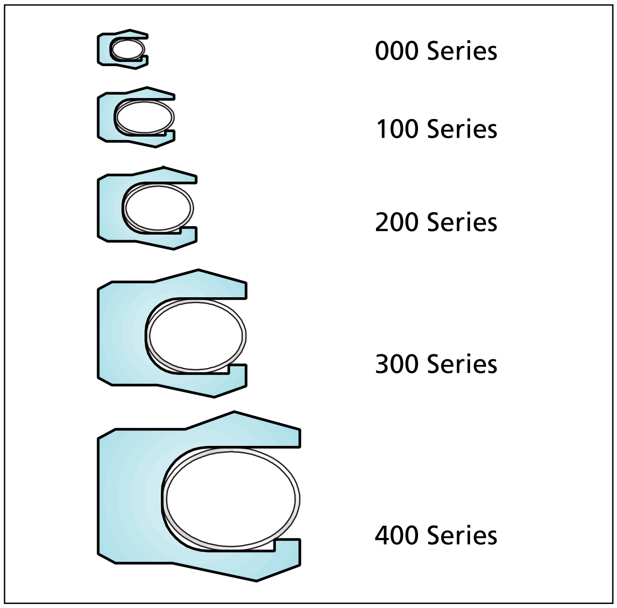


Figure 7 Relative Size of Turcon® Variseal® W2 Cross Section

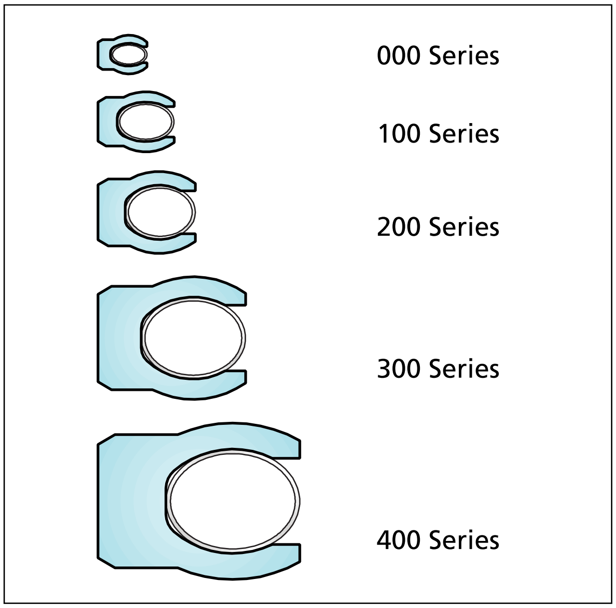


Figure 8 Relative Size of Turcon® Variseal® SA Cross Section

Installation in Closed Grooves

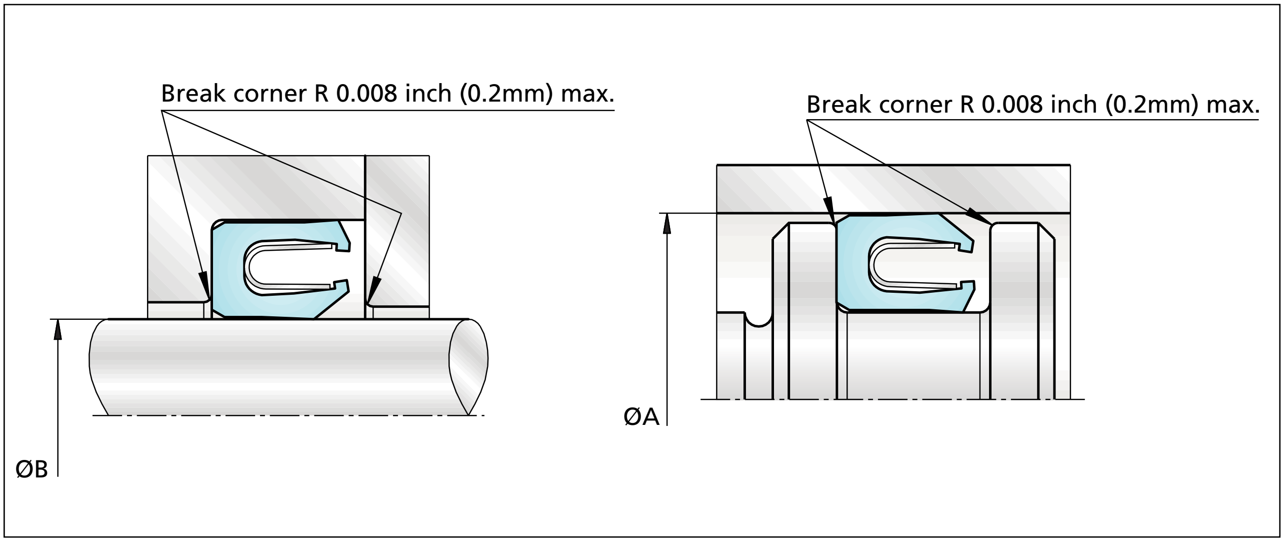


Figure 9 Installation in Closed Grooves

Installation in split or lipped grooves is recommended. Installation in closed grooves is possible for rod and bore diameters according to the following tables.

Rod Seals

Installation of Variseal® M2 Types into Closed Grooves, Rod Seals, Inch sizes

Rod Seals - Table of Minimum Rod dia. B				
Type	M2	Helical	Slantcoil®	SA
Series	**RVA**	**RVE**	**RVJ**	**RVP**
000	1.250	1.000	1.000	0.750
100	2.750	2.500	2.500	0.873
200	4.375	4.250	4.250	1.000
300	11.750	9.000	9.000	1.250
400	19.500	15.750	15.750	3.000
500	27.560	27.560	27.560	5.000

Seals can be fitted into Closed Groove Rod diameter B Gland designs at these sizes and above.

Piston Seals

Installation of Variseal® M2 Types into Closed Grooves, Piston Seals, Inch sizes

Piston Seals - Table of Minimum Bore dia. A				
Type	M2	Helical	Slantcoil®	SA
Series	**PVA**	**PVE**	**PVJ**	**PVP**
000	1.375	0.750	0.750	0.750
100	2.000	1.380	1.380	1.380
200	2.750	1.750	1.750	1.750
300	4.125	2.375	2.375	2.375
400	5.500	3.750	3.750	3.750
500	11.800	11.800	11.800	11.800

Seals can be fitted into Closed Groove Bore diameter A Gland designs at these sizes and above.

Installation in Stepped Grooves

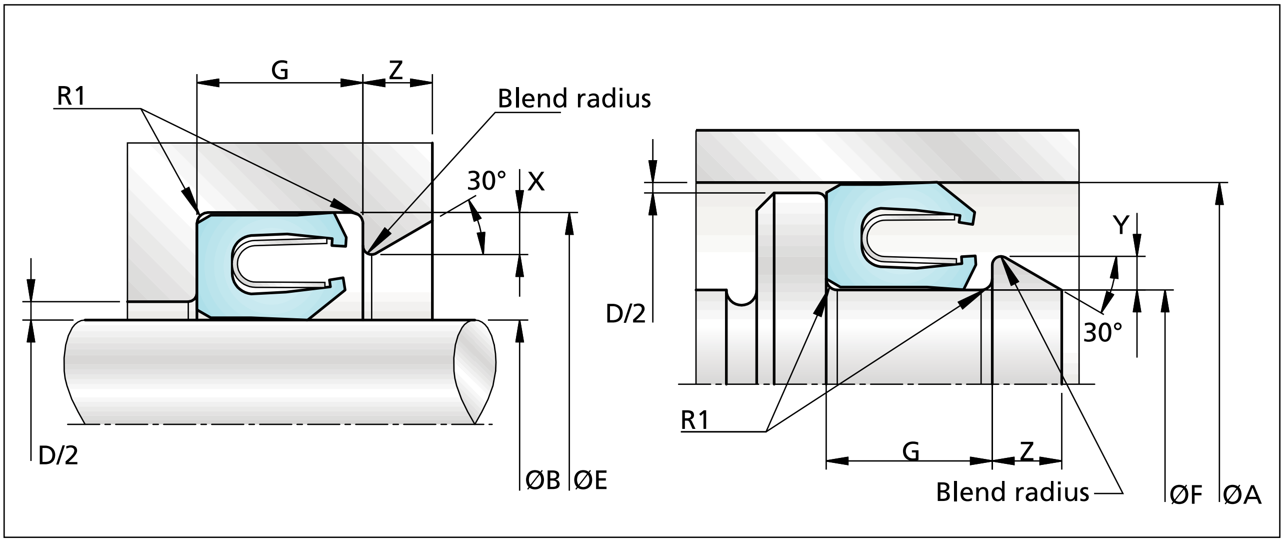


Figure 10 Stepped Grooves, Rod

Rod Seals

Groove Dimensions, Inch Sizes, Rod Seals

Series	M2	W2	H	SA	Lip Height X [1]	Chamfer Length Z min.	Radius Max r1	Rod Dia. B (min.)
000	RVA0	RVJ0	RVE0	RVP0	**.015**	**.098**	**.010**	0.250
100	RVA1	RVJ1	RVE1	RVP1	**.024**	**.138**	**.015**	0.375
200	RVA2	RVJ2	RVE2	RVP2	**.028**	**.138**	**.015**	0.750
300	RVA3	RVJ3	RVE3	RVP3	**.031**	**.177**	**.015**	1.000
400	RVA4	RVJ4	RVE4	RVP4	**.035**	**.295**	**.020**	2.000
500	RVA5	RVJ5	RVE5	RVP5	**.060**	**.295**	**.030**	2.250

[1] X max = 0.02 x ØB

Piston Seals

Groove Dimensions, Inch Sizes, Piston Seals

Series	M2	W2	H	SA	Lip Height Y [1]	Chamfer Length Z min.	Radius Max r1	Bore Dia. A (min.)
000	PVA0	PVJ0	PVE0	PVP0	**.015**	**.098**	**.010**	0.375
100	PVA1	PVJ1	PVE1	PVP1	**.024**	**.138**	**.015**	0.562
200	PVA2	PVJ2	PVE2	PVP2	**.028**	**.138**	**.015**	1.000
300	PVA3	PVJ3	PVE3	PVP3	**.031**	**.177**	**.015**	1.375
400	PVA4	PVJ4	PVE4	PVP4	**.035**	**.295**	**.020**	2.500
500	PVA5	PVJ5	PVE5	PVP5	**.060**	**.295**	**.030**	3.000

[1] Y max = 0.035 x ØF

Note: The recommended dimensions for “Y”, “X” and “Z” cannot always be achieved.

DASH NO.	B DIA.	E DIA.
	+.000 −.001	+.001 −.000
†006	.123	.235
†007	.154	.266
†008	.185	.294
†009	.217	.327
†010	.248	.359
†011	.310	.421
†012	.373	.484
	+.000 −.002	+.002 −.000
†013	.435	.545
†014	.498	.608
†015	.560	.670
†016	.623	.733
†017	.685	.795
†018	.748	.858
019	.810	.920
020	.873	.983
021	.935	1.045
022	.998	1.108
023	1.060	1.170
024	1.123	1.233
025	1.185	1.295
026	1.248	1.358
027	1.310	1.420
028	1.373	1.483
	+.000 −.002	+.002 −.000
†108	.248	.421
†109	.310	.483
†110	.373	.546
†111	.435	.609
†112	.498	.672
†113	.560	.734
†114	.623	.797
†115	.685	.859
†116	.748	.923
117	.810	.985
118	.873	1.048
119	.935	1.110
120	.998	1.173
121	1.060	1.235
122	1.123	1.298
123	1.185	1.360
124	1.248	1.423
125	1.310	1.485
126	1.373	1.548
127	1.435	1.610
128	1.498	1.673
129	1.560	1.735
130	1.623	1.798
131	1.685	1.860
132	1.748	1.923
133	1.810	1.984
134	1.873	2.047
135	1.936	2.110
136	1.998	2.172
137	2.061	2.235
138	2.123	2.297
139	2.186	2.360
140	2.248	2.422
141	2.311	2.485
142	2.373	2.547
143	2.436	2.610
144	2.498	2.672
145	2.561	2.735
146	2.623	2.797
147	2.686	2.860
148	2.748	2.922
149	2.811	2.985

DASH NO.	B DIA.	E DIA.
	+.000 −.002	+.002 −.000
†210	.748	.989
†211	.810	1.051
†212	.873	1.115
†213	.935	1.177
214	.998	1.240
215	1.060	1.302
216	1.123	1.365
217	1.185	1.427
218	1.248	1.490
219	1.310	1.552
220	1.373	1.615
221	1.435	1.677
222	1.498	1.740
223	1.623	1.865
224	1.748	1.990
225	1.873	2.115
226	1.998	2.240
227	2.123	2.365
228	2.248	2.490
229	2.373	2.615
230	2.498	2.740
231	2.623	2.865
232	2.748	2.990
233	2.873	3.115
234	2.997	3.239
235	3.122	3.364
236	3.247	3.489
237	3.372	3.614
238	3.497	3.739
239	3.622	3.864
240	3.747	3.989
241	3.872	4.114
242	3.997	4.239
243	4.122	4.364
244	4.247	4.489
245	4.372	4.614
246	4.497	4.739
247	4.622	4.864
	+.000 −.002	+.002 −.000
325	1.498	1.870
326	1.623	1.995
327	1.748	2.120
328	1.873	2.245
329	1.998	2.370
330	2.123	2.495
331	2.248	2.620
332	2.373	2.745
333	2.498	2.870
334	2.623	2.995
335	2.748	3.120
336	2.873	3.245
337	2.997	3.369
338	3.122	3.494
339	3.247	3.619
340	3.372	3.744
341	3.497	3.869
342	3.622	3.994
343	3.747	4.119
344	3.872	4.244
345	3.997	4.369
346	4.122	4.494
347	4.247	4.619
348	4.372	4.744
349	4.497	4.869

DASH NO.	B DIA.	E DIA.
	+.000 −.003	+.003 −.000
425	4.497	4.974
426	4.622	5.099
427	4.747	5.224
428	4.872	5.349
429	4.997	5.474
430	5.122	5.599
431	5.247	5.724
432	5.372	5.849
433	5.497	5.974
434	5.622	6.099
435	5.747	6.224
436	5.872	6.349
437	5.997	6.474
438	6.247	6.724
439	6.497	6.974
440	6.747	7.224
441	6.997	7.474
442	7.247	7.724
443	7.497	7.974
444	7.747	8.224
445	7.997	8.474
446	8.497	8.974
	+.000 −.004	+.004 −.000
447	8.997	9.474
448	9.497	9.974
449	9.997	10.474
450	10.497	10.974
451	10.997	11.474
452	11.497	11.974
453	11.997	12.474
454	12.497	12.974
455	12.997	13.474
456	13.497	13.974
457	13.997	14.474
458	14.497	14.974
459	14.997	15.474
460	15.497	15.974

DASH NO.	G_0 ZERO BACKUP WIDTH	R RADIUS	D DIAMETRAL CLEARANCE MAX.
006-012	.094/.104	.005/.015	.004
013-028			.005
110-126	.141/.151	.005/.015	.005
127-132			.006
133-149			.007
210-222	.188/.198	.010/.025	.005
223-224			.006
225-245			.007
246-247			.008
325-327	.281/.291	.020/.035	.006
328-349			.007
425-438	.375/.385	.020/.035	.009
439-460			.010

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR VARISEAL®SA IN AS4716 REVISION A ROD GLANDS.

2. ORDERING EXAMPLE: RVP 2 0 G 214 A T05 SM

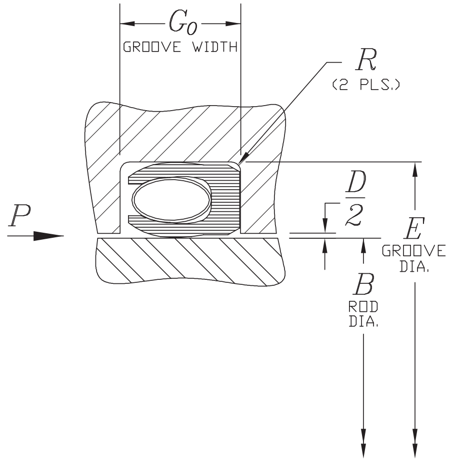
VARISEAL® SA, ROD DESIGNATOR
CROSS SECTION
0 = 000 SERIES
1 = 100 SERIES
2 = 200 SERIES
3 = 300 SERIES
4 = 400 SERIES
DESIGN CHARACTERISTICS
0 = STANDARD DESIGN
GLAND STANDARD
G = AS4716 REVISION A
SIZE DESIGNATION
ACCORDING TO AS4716 REVISION A
QUALITY INDEX:
A = AEROSPACE CERTIFICATE OF CONFORMANCE
△4 TURCON® VARISEAL® SA MAT'L CODE
SPRING MAT'L CODE - MEDIUM SPRING LOAD AS STANDARD

5. †DASH SIZES -004 TO -018, -104 TO -116, AND -210 TO -213 REQUIRE SPLIT OR STEPPED GLAND CONFIGURATION, PLEASE CONSULT YOUR TRELLEBORG SEALING SOLUTIONS SALES ENGINEER FOR DETAILED INFORMATION.

△4 FOR MATERIAL OPTIONS, SEE MATERIALS SECTION OF TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE. SPRING MATERIAL OPTIONS LISTED BELOW.

SPRING MATERIAL CODE
MEDIUM DUTY AS STANDARD

CODE	MATERIAL
S	301 STAINLESS STEEL
H	HASTELLOY
E	ELGILOY



ROD SEAL INSTALLATION
FOR ZERO BACKUP WIDTH GLAND PER AS4716 REVISION A

INCH
2009_1
TRELLEBORG
SEALING SOLUTIONS
TITLE
VARISEAL® SA, ROD
DRAWING NO.
RVP20G000

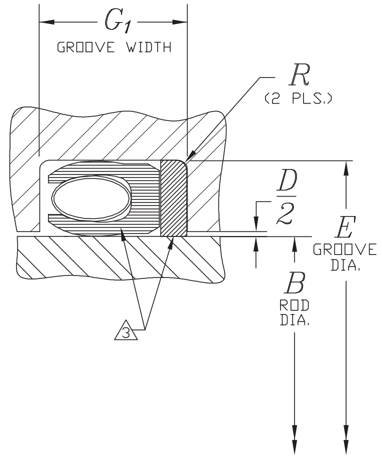
WORLD AEROSPACE TITLE BLOCK REV.

DASH NO.	*B* DIA.	*E* DIA.
	+.000 -.001	+.001 -.000
†006	.123	.235
†007	.154	.266
†008	.185	.294
†009	.217	.327
†010	.248	.359
†011	.310	.421
†012	.373	.484
	+.000 -.002	+.002 -.000
†013	.435	.545
†014	.498	.608
†015	.560	.670
†016	.623	.733
†017	.685	.795
†018	.748	.858
019	.810	.920
020	.873	.983
021	.935	1.045
022	.998	1.108
023	1.060	1.170
024	1.123	1.233
025	1.185	1.295
026	1.248	1.358
027	1.310	1.420
028	1.373	1.483
	+.000 -.002	+.002 -.000
†108	.248	.421
†109	.310	.483
†110	.373	.546
†111	.435	.609
†112	.498	.672
†113	.560	.734
†114	.623	.797
†115	.685	.859
†116	.748	.923
117	.810	.985
118	.873	1.048
119	.935	1.110
120	.998	1.173
121	1.060	1.235
122	1.123	1.298
123	1.185	1.360
124	1.248	1.423
125	1.310	1.485
126	1.373	1.548
127	1.435	1.610
128	1.498	1.673
129	1.560	1.735
130	1.623	1.798
131	1.685	1.860
132	1.748	1.923
133	1.810	1.984
134	1.873	2.047
135	1.936	2.110
136	1.998	2.172
137	2.061	2.235
138	2.123	2.297
139	2.186	2.360
140	2.248	2.422
141	2.311	2.485
142	2.373	2.547
143	2.436	2.610
144	2.498	2.672
145	2.561	2.735
146	2.623	2.797
147	2.686	2.860
148	2.748	2.922
149	2.811	2.985

DASH NO.	*B* DIA.	*E* DIA.
	+.000 -.002	+.002 -.000
†210	.748	.989
†211	.810	1.051
†212	.873	1.115
†213	.935	1.177
214	.998	1.240
215	1.060	1.302
216	1.123	1.365
217	1.185	1.427
218	1.248	1.490
219	1.310	1.552
220	1.373	1.615
221	1.435	1.677
222	1.498	1.740
223	1.623	1.865
224	1.748	1.990
225	1.873	2.115
226	1.998	2.240
227	2.123	2.365
228	2.248	2.490
229	2.373	2.615
230	2.498	2.740
231	2.623	2.865
232	2.748	2.990
233	2.873	3.115
234	2.997	3.239
235	3.122	3.364
236	3.247	3.489
237	3.372	3.614
238	3.497	3.739
239	3.622	3.864
240	3.747	3.989
241	3.872	4.114
242	3.997	4.239
243	4.122	4.364
244	4.247	4.489
245	4.372	4.614
246	4.497	4.739
247	4.622	4.864
	+.000 -.002	+.002 -.000
325	1.498	1.870
326	1.623	1.995
327	1.748	2.120
328	1.873	2.245
329	1.998	2.370
330	2.123	2.495
331	2.248	2.620
332	2.373	2.745
333	2.498	2.870
334	2.623	2.995
335	2.748	3.120
336	2.873	3.245
337	2.997	3.369
338	3.122	3.494
339	3.247	3.619
340	3.372	3.744
341	3.497	3.869
342	3.622	3.994
343	3.747	4.119
344	3.872	4.244
345	3.997	4.369
346	4.122	4.494
347	4.247	4.619
348	4.372	4.744
349	4.497	4.869

DASH NO.	*B* DIA.	*E* DIA.
	+.000 -.003	+.003 -.000
425	4.497	4.974
426	4.622	5.099
427	4.747	5.224
428	4.872	5.349
429	4.997	5.474
430	5.122	5.599
431	5.247	5.724
432	5.372	5.849
433	5.497	5.974
434	5.622	6.099
435	5.747	6.224
436	5.872	6.349
437	5.997	6.474
438	6.247	6.724
439	6.497	6.974
440	6.747	7.224
441	6.997	7.474
442	7.247	7.724
443	7.497	7.974
444	7.747	8.224
445	7.997	8.474
446	8.497	8.974
	+.000 -.004	+.004 -.000
447	8.997	9.474
448	9.497	9.974
449	9.997	10.474
450	10.497	10.974
451	10.997	11.474
452	11.497	11.974
453	11.997	12.474
454	12.497	12.974
455	12.997	13.474
456	13.497	13.974
457	13.997	14.474
458	14.497	14.974
459	14.997	15.474
460	15.497	15.974

DASH NO.	*G₁* ONE BACKUP WIDTH	*R* RADIUS	*D* DIAMETRAL CLEARANCE MAX.
006-012	.150/.160	.005/.015	.004
013-028			.005
110-126	.183/.193	.005/.015	.005
127-132			.006
133-149			.007
210-222	.235/.245	.010/.025	.005
223-224			.006
225-245			.007
246-247			.008
325-327	.334/.344	.020/.035	.006
328-349			.007
425-438	.475/.485	.020/.035	.009
439-460			.010



ROD SEAL INSTALLATION
FOR ONE BACKUP WIDTH GLAND PER AS4716 REVISION A

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR VARISEAL® SA IN AS4716 REVISION A ROD GLANDS.

2. ORDERING EXAMPLE: RVP 2 B G 214 A T05 SM
   - VARISEAL® SA, ROD DESIGNATOR
   - CROSS SECTION
     - 0 = 000 SERIES
     - 1 = 100 SERIES
     - 2 = 200 SERIES
     - 3 = 300 SERIES
     - 4 = 400 SERIES
   - △3 DESIGN CHARACTERISTICS
     - SEE DESIGN CODES BELOW
   - GLAND STANDARD
     - G = AS4716 REVISION A
   - SIZE DESIGNATION
     - ACCORDING TO AS4716 REVISION A
   - QUALITY INDEX:
     - A = AEROSPACE CERTIFICATE OF CONFORMANCE
   - △4 TURCON® VARISEAL® SA MAT'L CODE
   - SPRING MAT'L CODE - MEDIUM SPRING LOAD AS STANDARD

5. †DASH SIZES -004 TO -018, -104 TO -116, AND -210 TO -213 REQUIRE SPLIT OR STEPPED GLAND CONFIGURATION, PLEASE CONSULT YOUR TRELLEBORG SEALING SOLUTIONS SALES ENGINEER FOR DETAILED INFORMATION.

△4 FOR MATERIAL OPTIONS, SEE MATERIALS SECTION OF TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE. SPRING MATERIAL OPTIONS LISTED BELOW.

SPRING MATERIAL CODE
MEDIUM DUTY AS STANDARD

CODE	MATERIAL
S	301 STAINLESS STEEL
H	HASTELLOY
E	ELGILOY

△3 DESIGN CODES FOR CUT BACKUP RING CONFIGURATION
ONE BACKUP WIDTH GLANDS   TWO BACKUP WIDTH GLANDS

	BACKUP RING			
	TYPE	MATERIAL		
DESIGN CODE	SCARF CUT BACKUP RING	ZURCON® Z43	MATERIAL SAME AS SEAL RING	TURCON® T29
A	X	X		
B	X		X	
C	X			X

This uncontrolled document discloses information and data in which the Trelleborg Sealing Solutions has proprietary rights. Neither receipt nor possession thereof confers or transfers any right to reproduce, use or disclose in whole or in part except by written permission from Trelleborg Sealing Solutions. Trelleborg Sealing Solutions cannot be held responsible for printing errors etc.

INCH	2009_1
TRELLEBORG SEALING SOLUTIONS	TITLE VARISEAL® SA, ROD DRAWING NO. RVP2BG000

WORLD AEROSPACE TITLE BLOCK REV.

DASH NO.	B DIA.	E DIA.
	+.000 -.001	+.001 -.000
†006	.123	.235
†007	.154	.266
†008	.185	.294
†009	.217	.327
†010	.248	.359
†011	.310	.421
†012	.373	.484
	+.000 -.002	+.002 -.000
†013	.435	.545
†014	.498	.608
†015	.560	.670
†016	.623	.733
†017	.685	.795
†018	.748	.858
019	.810	.920
020	.873	.983
021	.935	1.045
022	.998	1.108
023	1.060	1.170
024	1.123	1.233
025	1.185	1.295
026	1.248	1.358
027	1.310	1.420
028	1.373	1.483
	+.000 -.002	+.002 -.000
†108	.248	.421
†109	.310	.483
†110	.373	.546
†111	.435	.609
†112	.498	.672
†113	.560	.734
†114	.623	.797
†115	.685	.859
†116	.748	.923
117	.810	.985
118	.873	1.048
119	.935	1.110
120	.998	1.173
121	1.060	1.235
122	1.123	1.298
123	1.185	1.360
124	1.248	1.423
125	1.310	1.485
126	1.373	1.548
127	1.435	1.610
128	1.498	1.673
129	1.560	1.735
130	1.623	1.798
131	1.685	1.860
132	1.748	1.923
133	1.810	1.984
134	1.873	2.047
135	1.936	2.110
136	1.998	2.172
137	2.061	2.235
138	2.123	2.297
139	2.186	2.360
140	2.248	2.422
141	2.311	2.485
142	2.373	2.547
143	2.436	2.610
144	2.498	2.672
145	2.561	2.735
146	2.623	2.797
147	2.686	2.860
148	2.748	2.922
149	2.811	2.985
	+.000 -.002	+.002 -.000
†210	.748	.989
†211	.810	1.051
†212	.873	1.115
†213	.935	1.177
214	.998	1.240
215	1.060	1.302
216	1.123	1.365
217	1.185	1.427
218	1.248	1.490
219	1.310	1.552
220	1.373	1.615
221	1.435	1.677
222	1.498	1.740
223	1.623	1.865
224	1.748	1.990
225	1.873	2.115
226	1.998	2.240
227	2.123	2.365
228	2.248	2.490
229	2.373	2.615
230	2.498	2.740
231	2.623	2.865
232	2.748	2.990
233	2.873	3.115
234	2.997	3.239
235	3.122	3.364
236	3.247	3.489
237	3.372	3.614
238	3.497	3.739
239	3.622	3.864
240	3.747	3.989
241	3.872	4.114
242	3.997	4.239
243	4.122	4.364
244	4.247	4.489
245	4.372	4.614
246	4.497	4.739
247	4.622	4.864
	+.000 -.002	+.002 -.000
325	1.498	1.870
326	1.623	1.995
327	1.748	2.120
328	1.873	2.245
329	1.998	2.370
330	2.123	2.495
331	2.248	2.620
332	2.373	2.745
333	2.498	2.870
334	2.623	2.995
335	2.748	3.120
336	2.873	3.245
337	2.997	3.369
338	3.122	3.494
339	3.247	3.619
340	3.372	3.744
341	3.497	3.869
342	3.622	3.994
343	3.747	4.119
344	3.872	4.244
345	3.997	4.369
346	4.122	4.494
347	4.247	4.619
348	4.372	4.744
349	4.497	4.869
	+.000 -.003	+.003 -.000
425	4.497	4.974
426	4.622	5.099
427	4.747	5.224
428	4.872	5.349
429	4.997	5.474
430	5.122	5.599
431	5.247	5.724
432	5.372	5.849
433	5.497	5.974
434	5.622	6.099
435	5.747	6.224
436	5.872	6.349
437	5.997	6.474
438	6.247	6.724
439	6.497	6.974
440	6.747	7.224
441	6.997	7.474
442	7.247	7.724
443	7.497	7.974
444	7.747	8.224
445	7.997	8.474
446	8.497	8.974
	+.000 -.004	+.004 -.000
447	8.997	9.474
448	9.497	9.974
449	9.997	10.474
450	10.497	10.974
451	10.997	11.474
452	11.497	11.974
453	11.997	12.474
454	12.497	12.974
455	12.997	13.474
456	13.497	13.974
457	13.997	14.474
458	14.497	14.974
459	14.997	15.474
460	15.497	15.974

DASH NO.	G_2 TWO BACKUP WIDTH	R RADIUS	D DIAMETRAL CLEARANCE MAX.
006-012	.207/.217	.005/.015	.004
013-028			.005
110-126	.245/.255	.005/.015	.005
127-132			.006
133-149			.007
210-222	.304/.314	.010/.025	.005
223-224			.006
225-245			.007
246-247			.008
325-327	.424/.434	.020/.035	.006
328-349			.007
425-438	.579/.589	.020/.035	.009
439-460			.010

<u>NOTES:</u>

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR VARISEAL®SA IN AS4716 REVISION A ROD GLANDS.

2. ORDERING EXAMPLE: RVP 2 E G 214 A T05 SM
   - VARISEAL® SA, ROD DESIGNATOR — RVP
   - CROSS SECTION — 2
     - 0 = 000 SERIES
     - 1 = 100 SERIES
     - 2 = 200 SERIES
     - 3 = 300 SERIES
     - 4 = 400 SERIES
   - △3 DESIGN CHARACTERISTICS — E
     - SEE DESIGN CODES BELOW
   - GLAND STANDARD — G
     - G = AS4716 REVISION A
   - SIZE DESIGNATION — 214
     - ACCORDING TO AS4716 REVISION A
   - QUALITY INDEX: — A
     - A = AEROSPACE CERTIFICATE OF CONFORMANCE
   - △4 TURCON®VARISEAL®SA MAT'L CODE — T05
   - SPRING MAT'L CODE - MEDIUM SPRING LOAD AS STANDARD — SM

5.†DASH SIZES -004 TO -018, -104 TO -116, AND -210 TO -213 REQUIRE SPLIT OR STEPPED GLAND CONFIGURATION, PLEASE CONSULT YOUR TRELLEBORG SEALING SOLUTIONS SALES ENGINEER FOR DETAILED INFORMATION.

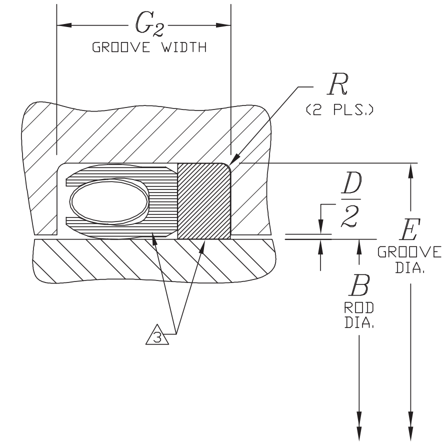
△4 FOR MATERIAL OPTIONS, SEE MATERIALS SECTION OF TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE. SPRING MATERIAL OPTIONS LISTED BELOW.

SPRING MATERIAL CODE MEDIUM DUTY AS STANDARD

CODE	MATERIAL
S	301 STAINLESS STEEL
H	HASTELLOY
E	ELGILOY

△3 DESIGN CODES FOR CUT BACKUP RING CONFIGURATION TWO BACKUP WIDTH GLANDS

	BACKUP RING			
	TYPE	MATERIAL		
DESIGN CODE	SCARF CUT BACKUP RING	ZURCON® Z43	MATERIAL SAME AS SEAL RING	TURCON® T29
D	X	X		
E	X		X	
F	X			X



<u>ROD SEAL INSTALLATION</u>
FOR TWO BACKUP WIDTH GLAND PER AS4716 REVISION A

INCH
2009_1
TRELLEBORG
SEALING SOLUTIONS
TITLE VARISEAL® SA, ROD
DRAWING NO. RVP2EG000

WORLD AEROSPACE TITLE BLOCK REV.

Turcon® Variseal®

DASH NO.	*B* DIA.	*E* DIA.
	+.001 -.000	+.000 -.001
†006	.123	.235
†007	.154	.266
†008	.185	.294
†009	.217	.327
†010	.248	.359
†011	.310	.421
†012	.373	.484
	+.000 -.002	+.002 -.000
†013	.435	.545
†014	.498	.608
†015	.560	.670
†016	.623	.733
†017	.685	.795
†018	.748	.858
†019	.810	.920
†020	.873	.983
†021	.935	1.045
†022	.998	1.108
†023	1.060	1.170
†024	1.123	1.233
†025	1.185	1.295
†026	1.248	1.358
†027	1.310	1.420
†028	1.373	1.483
	+.000 -.002	+.002 -.000
†108	.248	.421
†109	.310	.483
†110	.373	.546
†111	.435	.609
†112	.498	.672
†113	.560	.734
†114	.623	.797
†115	.685	.859
†116	.748	.923
†117	.810	.985
†118	.873	1.048
†119	.935	1.110
†120	.998	1.173
†121	1.060	1.235
†122	1.123	1.298
†123	1.185	1.360
†124	1.248	1.423
†125	1.310	1.485
†126	1.373	1.548
†127	1.435	1.610
†128	1.498	1.673
129	1.560	1.735
130	1.623	1.798
131	1.685	1.860
132	1.748	1.923
133	1.810	1.984
134	1.873	2.047
135	1.936	2.110
136	1.998	2.172
137	2.061	2.235
138	2.123	2.297
139	2.186	2.360
140	2.248	2.422
141	2.311	2.485
142	2.373	2.547
143	2.436	2.610
144	2.498	2.672
145	2.561	2.735
146	2.623	2.797
147	2.686	2.860
148	2.748	2.922
149	2.811	2.985

DASH NO.	*B* DIA.	*E* DIA.
	+.000 -.002	+.002 -.000
†210	.748	.989
†211	.810	1.051
†212	.873	1.115
†213	.935	1.177
†214	.998	1.240
†215	1.060	1.302
†216	1.123	1.365
†217	1.185	1.427
†218	1.248	1.490
†219	1.310	1.552
†220	1.373	1.615
†221	1.435	1.677
222	1.498	1.740
223	1.623	1.865
224	1.748	1.990
225	1.873	2.115
226	1.998	2.240
227	2.123	2.365
228	2.248	2.490
229	2.373	2.615
230	2.498	2.740
231	2.623	2.865
232	2.748	2.990
233	2.873	3.115
234	2.997	3.239
235	3.122	3.364
236	3.247	3.489
237	3.372	3.614
238	3.497	3.739
239	3.622	3.864
240	3.747	3.989
241	3.872	4.114
242	3.997	4.239
243	4.122	4.364
244	4.247	4.489
245	4.372	4.614
246	4.497	4.739
247	4.622	4.864
	+.000 -.002	+.002 -.000
325	1.498	1.870
326	1.623	1.995
327	1.748	2.120
328	1.873	2.245
329	1.998	2.370
330	2.123	2.495
331	2.248	2.620
332	2.373	2.745
333	2.498	2.870
334	2.623	2.995
335	2.748	3.120
336	2.873	3.245
337	2.997	3.369
338	3.122	3.494
339	3.247	3.619
340	3.372	3.744
341	3.497	3.869
342	3.622	3.994
343	3.747	4.119
344	3.872	4.244
345	3.997	4.369
346	4.122	4.494
347	4.247	4.619
348	4.372	4.744
349	4.497	4.869

DASH NO.	*B* DIA.	*E* DIA.
	+.000 -.003	+.003 -.000
425	4.497	4.974
426	4.622	5.099
427	4.747	5.224
428	4.872	5.349
429	4.997	5.474
430	5.122	5.599
431	5.247	5.724
432	5.372	5.849
433	5.497	5.974
434	5.622	6.099
435	5.747	6.224
436	5.872	6.349
437	5.997	6.474
438	6.247	6.724
439	6.497	6.974
440	6.747	7.224
441	6.997	7.474
442	7.247	7.724
443	7.497	7.974
444	7.747	8.224
445	7.997	8.474
446	8.497	8.974
	+.000 -.004	+.004 -.000
447	8.997	9.474
448	9.497	9.974
449	9.997	10.474
450	10.497	10.974
451	10.997	11.474
452	11.497	11.974
453	11.997	12.474
454	12.497	12.974
455	12.997	13.474
456	13.497	13.974
457	13.997	14.474
458	14.497	14.974
459	14.997	15.474
460	15.497	15.974

DASH NO.	G_0 ZERO BACKUP WIDTH	*R* RADIUS	*D* DIAMETRAL CLEARANCE MAX.
006-012	.094/.104	.005/.015	.004
013-028			.005
108-126	.141/.151	.005/.015	.005
127-132			.006
133-149			.007
210-222	.188/.198	.010/.025	.005
223-224			.006
225-245			.007
246-247			.008
325-327	.281/.291	.020/.035	.006
328-349			.007
425-438	.375/.385	.020/.035	.009
439-460			.010

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR VARISEAL® W2 IN AS4716 REVISION A PISTON GLANDS.

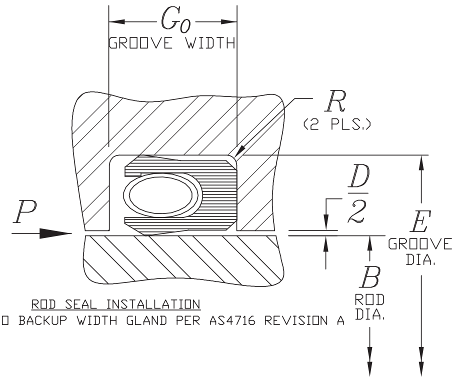
2. ORDERING EXAMPLE: RVJ 2 0 G 214 A T05 SM

VARISEAL® W2, ROD DESIGNATOR
CROSS SECTION
0 = 000 SERIES
1 = 100 SERIES
2 = 200 SERIES
3 = 300 SERIES
4 = 400 SERIES
DESIGN CHARACTERISTICS
SEE DESIGN CODES BELOW
GLAND STANDARD
G = AS4716
SIZE DESIGNATION
ACCORDING TO AS4716 REVISION A
QUALITY INDEX:
A = AEROSPACE CERTIFICATE OF CONFORMANCE
△3 TURCON® VARISEAL® W2 MAT'L CODE
SPRING MAT'L CODE - MEDIUM SPRING LOAD
AS STANDARD

△3 FOR MATERIAL OPTIONS, SEE MATERIALS SECTION OF TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE. SPRING MATERIAL OPTIONS LISTED BELOW.

SPRING MATERIAL CODE MEDIUM DUTY AS STANDARD	
CODE	MATERIAL
S	301 STAINLESS STEEL
H	HASTELLOY
E	ELGILOY

4. †DASH SIZES -006 TO -028, -108 TO -128, AND -210 TO -221 REQUIRE SPLIT OR STEPPED GLAND CONFIGURATION, PLEASE CONSULT YOUR TRELLEBORG SEALING SOLUTIONS SALES ENGINEER FOR DETAILED INFORMATION.



ROD SEAL INSTALLATION
FOR ZERO BACKUP WIDTH GLAND PER AS4716 REVISION A

INCH
2009_1
TRELLEBORG
SEALING SOLUTIONS
TITLE
VARISEAL® W2, ROD
DRAWING NO.
RVJ20G000

WORLD AEROSPACE TITLE BLOCK REV.

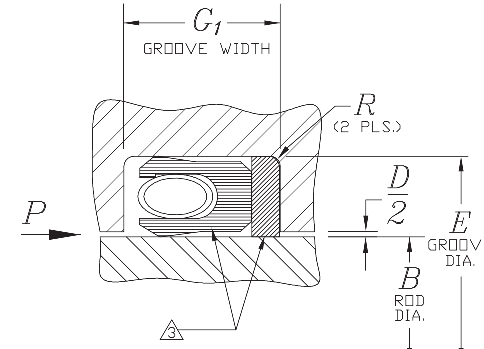
Turcon® Variseal®

DASH NO.	*B* DIA.	*E* DIA.
	+.001 -.000	+.000 -.001
†006	.123	.235
†007	.154	.266
†008	.185	.294
†009	.217	.327
†010	.248	.359
†011	.310	.421
†012	.373	.484
	+.000 -.002	+.002 -.000
†013	.435	.545
†014	.498	.608
†015	.560	.670
†016	.623	.733
†017	.685	.795
†018	.748	.858
†019	.810	.920
†020	.873	.983
†021	.935	1.045
†022	.998	1.108
†023	1.060	1.170
†024	1.123	1.233
†025	1.185	1.295
†026	1.248	1.358
†027	1.310	1.420
†028	1.373	1.483
	+.000 -.002	+.002 -.000
†108	.248	.421
†109	.310	.483
†110	.373	.546
†111	.435	.609
†112	.498	.672
†113	.560	.734
†114	.623	.797
†115	.685	.859
†116	.748	.923
†117	.810	.985
†118	.873	1.048
†119	.935	1.110
†120	.998	1.173
†121	1.060	1.235
†122	1.123	1.298
†123	1.185	1.360
†124	1.248	1.423
†125	1.310	1.485
†126	1.373	1.548
†127	1.435	1.610
†128	1.498	1.673
†129	1.560	1.735
130	1.623	1.798
131	1.685	1.860
132	1.748	1.923
133	1.810	1.984
134	1.873	2.047
135	1.936	2.110
136	1.998	2.172
137	2.061	2.235
138	2.123	2.297
139	2.186	2.360
140	2.248	2.422
141	2.311	2.485
142	2.373	2.547
143	2.436	2.610
144	2.498	2.672
145	2.561	2.735
146	2.623	2.797
147	2.686	2.860
148	2.748	2.922
149	2.811	2.985

DASH NO.	*B* DIA.	*E* DIA.
	+.000 -.002	+.002 -.000
†210	.748	.989
†211	.810	1.051
†212	.873	1.115
†213	.935	1.177
†214	.998	1.240
†215	1.060	1.302
†216	1.123	1.365
†217	1.185	1.427
†218	1.248	1.490
†219	1.310	1.552
†220	1.373	1.615
†221	1.435	1.677
222	1.498	1.740
223	1.623	1.865
224	1.748	1.990
225	1.873	2.115
226	1.998	2.240
227	2.123	2.365
228	2.248	2.490
229	2.373	2.615
230	2.498	2.740
231	2.623	2.865
232	2.748	2.990
233	2.873	3.115
234	2.997	3.239
235	3.122	3.364
236	3.247	3.489
237	3.372	3.614
238	3.497	3.739
239	3.622	3.864
240	3.747	3.989
241	3.872	4.114
242	3.997	4.239
243	4.122	4.364
244	4.247	4.489
245	4.372	4.614
246	4.497	4.739
247	4.622	4.864
	+.000 -.002	+.002 -.000
325	1.498	1.870
326	1.623	1.995
327	1.748	2.120
328	1.873	2.245
329	1.998	2.370
330	2.123	2.495
331	2.248	2.620
332	2.373	2.745
333	2.498	2.870
334	2.623	2.995
335	2.748	3.120
336	2.873	3.245
337	2.997	3.369
338	3.122	3.494
339	3.247	3.619
340	3.372	3.744
341	3.497	3.869
342	3.622	3.994
343	3.747	4.119
344	3.872	4.244
345	3.997	4.369
346	4.122	4.494
347	4.247	4.619
348	4.372	4.744
349	4.497	4.869

DASH NO.	*B* DIA.	*E* DIA.
	+.000 -.003	+.003 -.000
425	4.497	4.974
426	4.622	5.099
427	4.747	5.224
428	4.872	5.349
429	4.997	5.474
430	5.122	5.599
431	5.247	5.724
432	5.372	5.849
433	5.497	5.974
434	5.622	6.099
435	5.747	6.224
436	5.872	6.349
437	5.997	6.474
438	6.247	6.724
439	6.497	6.974
440	6.747	7.224
441	6.997	7.474
442	7.247	7.724
443	7.497	7.974
444	7.747	8.224
445	7.997	8.474
446	8.497	8.974
	+.000 -.004	+.004 -.000
447	8.997	9.474
448	9.497	9.974
449	9.997	10.474
450	10.497	10.974
451	10.997	11.474
452	11.497	11.974
453	11.997	12.474
454	12.497	12.974
455	12.997	13.474
456	13.497	13.974
457	13.997	14.474
458	14.497	14.974
459	14.997	15.474
460	15.497	15.974

DASH NO.	G_1 ONE BACKUP WIDTH	*R* RADIUS	*D* DIAMETRAL CLEARANCE MAX.
006-012	.150/.160	.005/.015	.004
013-028			.005
108-126	.183/.193	.005/.015	.005
127-132			.006
133-149			.007
210-222	.235/.245	.010/.025	.005
223-224			.006
225-245			.007
246-247			.008
325-327	.334/.344	.020/.035	.006
328-349			.007
425-438	.475/.485	.020/.035	.009
439-460			.010



ROD SEAL INSTALLATION
FOR ONE BACKUP WIDTH GLAND PER AS4716 REVISION A

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR VARISEAL® W2 IN AS4716 REVISION A PISTON GLANDS.

2. ORDERING EXAMPLE: RVJ 2 B G 214 A T05 SM

   VARISEAL® W2, ROD DESIGNATOR
   CROSS SECTION
   0 = 000 SERIES
   1 = 100 SERIES
   2 = 200 SERIES
   3 = 300 SERIES
   4 = 400 SERIES
   △3 DESIGN CHARACTERISTICS
   SEE DESIGN CODES BELOW
   GLAND STANDARD
   G = AS4716
   SIZE DESIGNATION
   ACCORDING TO AS4716 REVISION A
   QUALITY INDEX:
   A = AEROSPACE CERTIFICATE OF CONFORMANCE
   △4 TURCON® VARISEAL® W2 MAT'L CODE
   SPRING MAT'L CODE - MEDIUM SPRING LOAD
   AS STANDARD

△4 FOR MATERIAL OPTIONS, SEE MATERIALS SECTION OF TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE. SPRING MATERIAL OPTIONS LISTED BELOW.

SPRING MATERIAL CODE MEDIUM DUTY AS STANDARD	
CODE	MATERIAL
S	301 STAINLESS STEEL
H	HASTELLOY
E	ELGILOY

5. †DASH SIZES -006 TO -028, -108 TO -128, AND -210 TO -221 REQUIRE SPLIT OR STEPPED GLAND CONFIGURATION, PLEASE CONSULT YOUR TRELLEBORG SEALING SOLUTIONS SALES ENGINEER FOR DETAILED INFORMATION.

△3 DESIGN CODES FOR CUT BACKUP RING CONFIGURATION
ONE BACKUP WIDTH GLANDS

	BACKUP RING			
	TYPE	MATERIAL		
DESIGN CODE	SCARF CUT BACKUP RING	ZURCON® Z43	MATERIAL SAME AS SEAL RING	TURCON® T29
A	X	X		
B	X		X	
C	X			X

This uncontrolled document discloses information and data in which the Trelleborg Sealing Solutions has proprietary rights. Neither receipt nor possession thereof confers or transfers any right to reproduce, use or disclose in whole or in part except by written permission from Trelleborg Sealing Solutions. Trelleborg Sealing Solutions cannot be held responsible for printing errors etc.

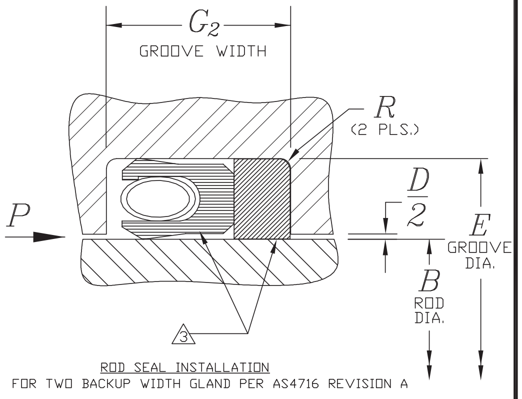
INCH	2009_1
TRELLEBORG SEALING SOLUTIONS	TITLE VARISEAL® W2, ROD
	DRAWING NO. RVJ2BG000

WORLD AEROSPACE TITLE BLOCK REV.

Turcon® Variseal®

DASH NO.	B DIA.	E DIA.
	+.001 -.000	+.000 -.001
†006	.123	.235
†007	.154	.266
†008	.185	.294
†009	.217	.327
†010	.248	.359
†011	.310	.421
†012	.373	.484
	+.000 -.002	+.002 -.000
†013	.435	.545
†014	.498	.608
†015	.560	.670
†016	.623	.733
†017	.685	.795
†018	.748	.858
†019	.810	.920
†020	.873	.983
†021	.935	1.045
†022	.998	1.108
†023	1.060	1.170
†024	1.123	1.233
†025	1.185	1.295
†026	1.248	1.358
†027	1.310	1.420
†028	1.373	1.483
	+.000 -.002	+.002 -.000
†108	.248	.421
†109	.310	.483
†110	.373	.546
†111	.435	.609
†112	.498	.672
†113	.560	.734
†114	.623	.797
†115	.685	.859
†116	.748	.923
†117	.810	.985
†118	.873	1.048
†119	.935	1.110
†120	.998	1.173
†121	1.060	1.235
†122	1.123	1.298
†123	1.185	1.360
†124	1.248	1.423
†125	1.310	1.485
†126	1.373	1.548
†127	1.435	1.610
†128	1.498	1.673
129	1.560	1.735
130	1.623	1.798
131	1.685	1.860
132	1.748	1.923
133	1.810	1.984
134	1.873	2.047
135	1.936	2.110
136	1.998	2.172
137	2.061	2.235
138	2.123	2.297
139	2.186	2.360
140	2.248	2.422
141	2.311	2.485
142	2.373	2.547
143	2.436	2.610
144	2.498	2.672
145	2.561	2.735
146	2.623	2.797
147	2.686	2.860
148	2.748	2.922
149	2.811	2.985
	+.000 -.002	+.002 -.000
†210	.748	.989
†211	.810	1.051
†212	.873	1.115
†213	.935	1.177
†214	.998	1.240
†215	1.060	1.302
†216	1.123	1.365
†217	1.185	1.427
†218	1.248	1.490
†219	1.310	1.552
†220	1.373	1.615
†221	1.435	1.677
222	1.498	1.740
223	1.623	1.865
224	1.748	1.990
225	1.873	2.115
226	1.998	2.240
227	2.123	2.365
228	2.248	2.490
229	2.373	2.615
230	2.498	2.740
231	2.623	2.865
232	2.748	2.990
233	2.873	3.115
234	2.997	3.239
235	3.122	3.364
236	3.247	3.489
237	3.372	3.614
238	3.497	3.739
239	3.622	3.864
240	3.747	3.989
241	3.872	4.114
242	3.997	4.239
243	4.122	4.364
244	4.247	4.489
245	4.372	4.614
246	4.497	4.739
247	4.622	4.864
	+.000 -.002	+.002 -.000
325	1.498	1.870
326	1.623	1.995
327	1.748	2.120
328	1.873	2.245
329	1.998	2.370
330	2.123	2.495
331	2.248	2.620
332	2.373	2.745
333	2.498	2.870
334	2.623	2.995
335	2.748	3.120
336	2.873	3.245
337	2.997	3.369
338	3.122	3.494
339	3.247	3.619
340	3.372	3.744
341	3.497	3.869
342	3.622	3.994
343	3.747	4.119
344	3.872	4.244
345	3.997	4.369
346	4.122	4.494
347	4.247	4.619
348	4.372	4.744
349	4.497	4.869
	+.000 -.003	+.003 -.000
425	4.497	4.974
426	4.622	5.099
427	4.747	5.224
428	4.872	5.349
429	4.997	5.474
430	5.122	5.599
431	5.247	5.724
432	5.372	5.849
433	5.497	5.974
434	5.622	6.099
435	5.747	6.224
436	5.872	6.349
437	5.997	6.474
438	6.247	6.724
439	6.497	6.974
440	6.747	7.224
441	6.997	7.474
442	7.247	7.724
443	7.497	7.974
444	7.747	8.224
445	7.997	8.474
446	8.497	8.974
	+.000 -.004	+.004 -.000
447	8.997	9.474
448	9.497	9.974
449	9.997	10.474
450	10.497	10.974
451	10.997	11.474
452	11.497	11.974
453	11.997	12.474
454	12.497	12.974
455	12.997	13.474
456	13.497	13.974
457	13.997	14.474
458	14.497	14.974
459	14.997	15.474
460	15.497	15.974

DASH NO.	G_2 TWO BACKUP WIDTH	R RADIUS	D DIAMETRAL CLEARANCE MAX.
006-012	.207/.217	.005/.015	.004
013-028			.005
108-126	.245/.255	.005/.015	.005
127-132			.006
133-149			.007
210-222	.304/.314	.010/.025	.005
223-224			.006
225-245			.007
246-247			.008
325-327	.424/.434	.020/.035	.006
328-349			.007
425-438	.579/.589	.020/.035	.009
439-460			.010



ROD SEAL INSTALLATION
FOR TWO BACKUP WIDTH GLAND PER AS4716 REVISION A

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR VARISEAL® W2 IN AS4716 REVISION A PISTON GLANDS.

2. ORDERING EXAMPLE: RVJ 2 E G 214 A T05 SM
   - VARISEAL® W2, ROD DESIGNATOR — RVJ
   - CROSS SECTION — 2
     - 0 = 000 SERIES
     - 1 = 100 SERIES
     - 2 = 200 SERIES
     - 3 = 300 SERIES
     - 4 = 400 SERIES
   - △3 DESIGN CHARACTERISTICS — E
     - SEE DESIGN CODES BELOW
   - GLAND STANDARD — G
     - G = AS4716
   - SIZE DESIGNATION — 214
     - ACCORDING TO AS4716 REVISION A
   - QUALITY INDEX: — A
     - A = AEROSPACE CERTIFICATE OF CONFORMANCE
   - △4 TURCON® VARISEAL® W2 MAT'L CODE — T05
   - SPRING MAT'L CODE - MEDIUM SPRING LOAD AS STANDARD — SM

△4 FOR MATERIAL OPTIONS, SEE MATERIALS SECTION OF TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE. SPRING MATERIAL OPTIONS LISTED BELOW.

SPRING MATERIAL CODE MEDIUM DUTY AS STANDARD	
CODE	MATERIAL
S	301 STAINLESS STEEL
H	HASTELLOY
E	ELGILOY

5. †DASH SIZES -006 TO -028, -108 TO -128, AND -210 TO -221 REQUIRE SPLIT OR STEPPED GLAND CONFIGURATION, PLEASE CONSULT YOUR TRELLEBORG SEALING SOLUTIONS SALES ENGINEER FOR DETAILED INFORMATION.

△3 DESIGN CODES FOR CUT BACKUP RING CONFIGURATION TWO BACKUP WIDTH GLANDS

	BACKUP RING			
	TYPE	MATERIAL		
DESIGN CODE	SCARF CUT BACKUP RING	ZURCON® Z43	MATERIAL SAME AS SEAL RING	TURCON® T29
D	X	X		
E	X		X	
F	X			X

This uncontrolled document discloses information and data in which the Trelleborg Sealing Solutions has proprietary rights. Neither receipt nor possession thereof confers or transfers any right to reproduce, use or disclose in whole or in part except by written permission from Trelleborg Sealing Solutions. Trelleborg Sealing Solutions cannot be held responsible for printing errors etc.

INCH	2009_1
TRELLEBORG SEALING SOLUTIONS	TITLE VARISEAL® W2, ROD
	DRAWING NO. RVJ2EG000

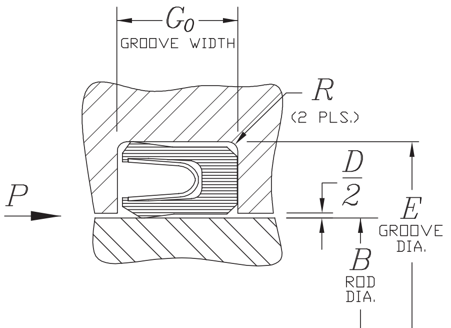
WORLD AEROSPACE TITLE BLOCK REV.

DASH NO.	*B* DIA.	*E* DIA.
	+.001 −.000	+.000 −.001
†006	.123	.235
†007	.154	.266
†008	.185	.294
†009	.217	.327
†010	.248	.359
†011	.310	.421
†012	.373	.484
	+.000 −.002	+.002 −.000
†013	.435	.545
†014	.498	.608
†015	.560	.670
†016	.623	.733
†017	.685	.795
†018	.748	.858
†019	.810	.920
†020	.873	.983
†021	.935	1.045
†022	.998	1.108
†023	1.060	1.170
†024	1.123	1.233
†025	1.185	1.295
†026	1.248	1.358
†027	1.310	1.420
†028	1.373	1.483
	+.000 −.002	+.002 −.000
†108	.248	.421
†109	.310	.483
†110	.373	.546
†111	.435	.609
†112	.498	.672
†113	.560	.734
†114	.623	.797
†115	.685	.859
†116	.748	.923
†117	.810	.985
†118	.873	1.048
†119	.935	1.110
†120	.998	1.173
†121	1.060	1.235
†122	1.123	1.298
†123	1.185	1.360
†124	1.248	1.423
†125	1.310	1.485
†126	1.373	1.548
†127	1.435	1.610
†128	1.498	1.673
129	1.560	1.735
130	1.623	1.798
131	1.685	1.860
132	1.748	1.923
133	1.810	1.984
134	1.873	2.047
135	1.936	2.110
136	1.998	2.172
137	2.061	2.235
138	2.123	2.297
139	2.186	2.360
140	2.248	2.422
141	2.311	2.485
142	2.373	2.547
143	2.436	2.610
144	2.498	2.672
145	2.561	2.735
146	2.623	2.797
147	2.686	2.860
148	2.748	2.922
149	2.811	2.985

DASH NO.	*B* DIA.	*E* DIA.
	+.000 −.002	+.002 −.000
†210	.748	.989
†211	.810	1.051
†212	.873	1.115
†213	.935	1.177
†214	.998	1.240
†215	1.060	1.302
†216	1.123	1.365
†217	1.185	1.427
†218	1.248	1.490
†219	1.310	1.552
†220	1.373	1.615
†221	1.435	1.677
222	1.498	1.740
223	1.623	1.865
224	1.748	1.990
225	1.873	2.115
226	1.998	2.240
227	2.123	2.365
228	2.248	2.490
229	2.373	2.615
230	2.498	2.740
231	2.623	2.865
232	2.748	2.990
233	2.873	3.115
234	2.997	3.239
235	3.122	3.364
236	3.247	3.489
237	3.372	3.614
238	3.497	3.739
239	3.622	3.864
240	3.747	3.989
241	3.872	4.114
242	3.997	4.239
243	4.122	4.364
244	4.247	4.489
245	4.372	4.614
246	4.497	4.739
247	4.622	4.864
	+.000 −.002	+.002 −.000
325	1.498	1.870
326	1.623	1.995
327	1.748	2.120
328	1.873	2.245
329	1.998	2.370
330	2.123	2.495
331	2.248	2.620
332	2.373	2.745
333	2.498	2.870
334	2.623	2.995
335	2.748	3.120
336	2.873	3.245
337	2.997	3.369
338	3.122	3.494
339	3.247	3.619
340	3.372	3.744
341	3.497	3.869
342	3.622	3.994
343	3.747	4.119
344	3.872	4.244
345	3.997	4.369
346	4.122	4.494
347	4.247	4.619
348	4.372	4.744
349	4.497	4.869

DASH NO.	*B* DIA.	*E* DIA.
	+.000 −.003	+.003 −.000
425	4.497	4.974
426	4.622	5.099
427	4.747	5.224
428	4.872	5.349
429	4.997	5.474
430	5.122	5.599
431	5.247	5.724
432	5.372	5.849
433	5.497	5.974
434	5.622	6.099
435	5.747	6.224
436	5.872	6.349
437	5.997	6.474
438	6.247	6.724
439	6.497	6.974
440	6.747	7.224
441	6.997	7.474
442	7.247	7.724
443	7.497	7.974
444	7.747	8.224
445	7.997	8.474
446	8.497	8.974
	+.000 −.004	+.004 −.000
447	8.997	9.474
448	9.497	9.974
449	9.997	10.474
450	10.497	10.974
451	10.997	11.474
452	11.497	11.974
453	11.997	12.474
454	12.497	12.974
455	12.997	13.474
456	13.497	13.974
457	13.997	14.474
458	14.497	14.974
459	14.997	15.474
460	15.497	15.974

DASH NO.	G_0 ZERO BACKUP WIDTH	*R* RADIUS	*D* DIAMETRAL CLEARANCE MAX.
006-012	.094/.104	.005/.015	.004
013-028			.005
108-126	.141/.151	.005/.015	.005
127-132			.006
133-149			.007
210-222	.188/.198	.010/.025	.005
223-224			.006
225-245			.007
246-247			.008
325-327	.281/.291	.020/.035	.006
328-349			.007
425-438	.375/.385	.020/.035	.009
439-460			.010



ROD SEAL INSTALLATION
FOR ZERO BACKUP WIDTH GLAND PER AS4716 REVISION A

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR VARISEAL® M2 IN AS4716 REVISION A ROD GLANDS.

2. ORDERING EXAMPLE: RVA 2 0 G 214 A T05 SM
   - VARISEAL® M2, ROD DESIGNATOR
   - CROSS SECTION
     - 0 = 000 SERIES
     - 1 = 100 SERIES
     - 2 = 200 SERIES
     - 3 = 300 SERIES
     - 4 = 400 SERIES
   - DESIGN CHARACTERISTICS
     - SEE DESIGN CODES BELOW
   - GLAND STANDARD
     - G = AS4716
   - SIZE DESIGNATION
     - ACCORDING TO AS4716 REVISION A
   - QUALITY INDEX:
     - A = AEROSPACE CERTIFICATE OF CONFORMANCE
   - △3 TURCON® VARISEAL® M2 MAT'L CODE
   - SPRING MAT'L CODE - MEDIUM SPRING LOAD AS STANDARD

△3 FOR MATERIAL OPTIONS, SEE MATERIALS SECTION OF TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE. SPRING MATERIAL OPTIONS LISTED BELOW.

SPRING MATERIAL CODE MEDIUM DUTY AS STANDARD	
CODE	MATERIAL
S	301 STAINLESS STEEL
H	HASTELLOY
E	ELGILOY

4. †DASH SIZES -006 TO -028, -108 TO -128, AND -210 TO -221 REQUIRE SPLIT OR STEPPED GLAND CONFIGURATION, PLEASE CONSULT YOUR TRELLEBORG SEALING SOLUTIONS SALES ENGINEER FOR DETAILED INFORMATION.

INCH
2009_1
TRELLEBORG
SEALING SOLUTIONS
TITLE
VARISEAL® M2, ROD
DRAWING NO.
RVA20G000

WORLD AEROSPACE TITLE BLOCK REV.

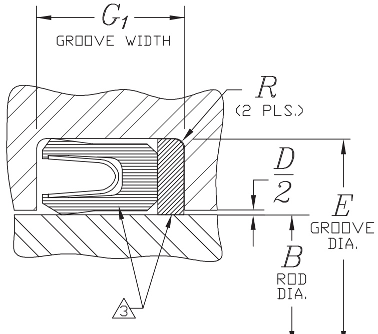
Turcon® Variseal®

DASH NO.	B DIA.	E DIA.
	+.001 -.000	+.000 -.001
†006	.123	.235
†007	.154	.266
†008	.185	.294
†009	.217	.327
†010	.248	.359
†011	.310	.421
†012	.373	.484
	+.000 -.002	+.002 -.000
†013	.435	.545
†014	.498	.608
†015	.560	.670
†016	.623	.733
†017	.685	.795
†018	.748	.858
†019	.810	.920
†020	.873	.983
†021	.935	1.045
†022	.998	1.108
†023	1.060	1.170
†024	1.123	1.233
†025	1.185	1.295
†026	1.248	1.358
†027	1.310	1.420
†028	1.373	1.483
	+.000 -.002	+.002 -.000
†108	.248	.421
†109	.310	.483
†110	.373	.546
†111	.435	.609
†112	.498	.672
†113	.560	.734
†114	.623	.797
†115	.685	.859
†116	.748	.923
†117	.810	.985
†118	.873	1.048
†119	.935	1.110
†120	.998	1.173
†121	1.060	1.235
†122	1.123	1.298
†123	1.185	1.360
†124	1.248	1.423
†125	1.310	1.485
†126	1.373	1.548
†127	1.435	1.610
†128	1.498	1.673
129	1.560	1.735
130	1.623	1.798
131	1.685	1.860
132	1.748	1.923
133	1.810	1.984
134	1.873	2.047
135	1.936	2.110
136	1.998	2.172
137	2.061	2.235
138	2.123	2.297
139	2.186	2.360
140	2.248	2.422
141	2.311	2.485
142	2.373	2.547
143	2.436	2.610
144	2.498	2.672
145	2.561	2.735
146	2.623	2.797
147	2.686	2.860
148	2.748	2.922
149	2.811	2.985

DASH NO.	B DIA.	E DIA.
	+.000 -.002	+.002 -.000
†210	.748	.989
†211	.810	1.051
†212	.873	1.115
†213	.935	1.177
†214	.998	1.240
†215	1.060	1.302
†216	1.123	1.365
†217	1.185	1.427
†218	1.248	1.490
†219	1.310	1.552
†220	1.373	1.615
†221	1.435	1.677
222	1.498	1.740
223	1.623	1.865
224	1.748	1.990
225	1.873	2.115
226	1.998	2.240
227	2.123	2.365
228	2.248	2.490
229	2.373	2.615
230	2.498	2.740
231	2.623	2.865
232	2.748	2.990
233	2.873	3.115
234	2.997	3.239
235	3.122	3.364
236	3.247	3.489
237	3.372	3.614
238	3.497	3.739
239	3.622	3.864
240	3.747	3.989
241	3.872	4.114
242	3.997	4.239
243	4.122	4.364
244	4.247	4.489
245	4.372	4.614
246	4.497	4.739
247	4.622	4.864
	+.000 -.002	+.002 -.000
325	1.498	1.870
326	1.623	1.995
327	1.748	2.120
328	1.873	2.245
329	1.998	2.370
330	2.123	2.495
331	2.248	2.620
332	2.373	2.745
333	2.498	2.870
334	2.623	2.995
335	2.748	3.120
336	2.873	3.245
337	2.997	3.369
338	3.122	3.494
339	3.247	3.619
340	3.372	3.744
341	3.497	3.869
342	3.622	3.994
343	3.747	4.119
344	3.872	4.244
345	3.997	4.369
346	4.122	4.494
347	4.247	4.619
348	4.372	4.744
349	4.497	4.869

DASH NO.	B DIA.	E DIA.
	+.000 -.003	+.003 -.000
425	4.497	4.974
426	4.622	5.099
427	4.747	5.224
428	4.872	5.349
429	4.997	5.474
430	5.122	5.599
431	5.247	5.724
432	5.372	5.849
433	5.497	5.974
434	5.622	6.099
435	5.747	6.224
436	5.872	6.349
437	5.997	6.474
438	6.247	6.724
439	6.497	6.974
440	6.747	7.224
441	6.997	7.474
442	7.247	7.724
443	7.497	7.974
444	7.747	8.224
445	7.997	8.474
446	8.497	8.974
	+.000 -.004	+.004 -.000
447	8.997	9.474
448	9.497	9.974
449	9.997	10.474
450	10.497	10.974
451	10.997	11.474
452	11.497	11.974
453	11.997	12.474
454	12.497	12.974
455	12.997	13.474
456	13.497	13.974
457	13.997	14.474
458	14.497	14.974
459	14.997	15.474
460	15.497	15.974

DASH NO.	G_1 ONE BACKUP WIDTH	R RADIUS	D DIAMETRAL CLEARANCE MAX.
006-012	.150/.160	.005/.015	.004
013-028			.005
108-126	.183/.193	.005/.015	.005
127-132			.006
133-149			.007
210-222	.235/.245	.010/.025	.005
223-224			.006
225-245			.007
246-247			.008
325-327	.334/.344	.020/.035	.006
328-349			.007
425-438	.475/.485	.020/.035	.009
439-460			.010



ROD SEAL INSTALLATION
FOR ONE BACKUP WIDTH GLAND PER AS4716 REVISION A

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR VARISEAL® M2 IN AS4716 REVISION A ROD GLANDS.

2. ORDERING EXAMPLE: RVA 2 B G 214 A T05 SM
   - VARISEAL® M2, ROD DESIGNATOR — RVA
   - CROSS SECTION — 2
     - 0 = 000 SERIES
     - 1 = 100 SERIES
     - 2 = 200 SERIES
     - 3 = 300 SERIES
     - 4 = 400 SERIES
   - △3 DESIGN CHARACTERISTICS — B
     - SEE DESIGN CODES BELOW
   - GLAND STANDARD — G
     - G = AS4716
   - SIZE DESIGNATION — 214
     - ACCORDING TO AS4716 REVISION A
   - QUALITY INDEX: — A
     - A = AEROSPACE CERTIFICATE OF CONFORMANCE
   - △4 TURCON® VARISEAL® M2 MAT'L CODE — T05
   - SPRING MAT'L CODE - MEDIUM SPRING LOAD AS STANDARD — SM

△4 FOR MATERIAL OPTIONS, SEE MATERIALS SECTION OF TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE. SPRING MATERIAL OPTIONS LISTED BELOW.

SPRING MATERIAL CODE MEDIUM DUTY AS STANDARD	
CODE	MATERIAL
S	301 STAINLESS STEEL
H	HASTELLOY
E	ELGILOY

5. †DASH SIZES -006 TO -028, -108 TO -128, AND -210 TO -221 REQUIRE SPLIT OR STEPPED GLAND CONFIGURATION, PLEASE CONSULT YOUR TRELLEBORG SEALING SOLUTIONS SALES ENGINEER FOR DETAILED INFORMATION.

△3 DESIGN CODES FOR CUT BACKUP RING CONFIGURATION ONE BACKUP WIDTH GLANDS

	BACKUP RING			
	TYPE	MATERIAL		
DESIGN CODE	SCARF CUT BACKUP RING	ZURCON® Z43	MATERIAL SAME AS SEAL RING	TURCON® T29
A	X	X		
B	X		X	
C	X			X

This uncontrolled document discloses information and data in which the Trelleborg Sealing Solutions has proprietary rights. Neither receipt nor possession thereof confers or transfers any right to reproduce, use or disclose in whole or in part except by written permission from Trelleborg Sealing Solutions. Trelleborg Sealing Solutions cannot be held responsible for printing errors etc.

INCH	2009_1
TRELLEBORG SEALING SOLUTIONS	TITLE VARISEAL® M2, ROD
	DRAWING NO. RVA2BG000

WORLD AEROSPACE TITLE BLOCK REV.

DASH NO.	B DIA.	E DIA.
	+.001 -.000	+.000 -.001
†006	.123	.235
†007	.154	.266
†008	.185	.294
†009	.217	.327
†010	.248	.359
†011	.310	.421
†012	.373	.484
	+.000 -.002	+.002 -.000
†013	.435	.545
†014	.498	.608
†015	.560	.670
†016	.623	.733
†017	.685	.795
†018	.748	.858
†019	.810	.920
†020	.873	.983
†021	.935	1.045
†022	.998	1.108
†023	1.060	1.170
†024	1.123	1.233
†025	1.185	1.295
†026	1.248	1.358
†027	1.310	1.420
†028	1.373	1.483
	+.000 -.002	+.002 -.000
†108	.248	.421
†109	.310	.483
†110	.373	.546
†111	.435	.609
†112	.498	.672
†113	.560	.734
†114	.623	.797
†115	.685	.859
†116	.748	.923
†117	.810	.985
†118	.873	1.048
†119	.935	1.110
†120	.998	1.173
†121	1.060	1.235
†122	1.123	1.298
†123	1.185	1.360
†124	1.248	1.423
†125	1.310	1.485
†126	1.373	1.548
†127	1.435	1.610
†128	1.498	1.673
129	1.560	1.735
130	1.623	1.798
131	1.685	1.860
132	1.748	1.923
133	1.810	1.984
134	1.873	2.047
135	1.936	2.110
136	1.998	2.172
137	2.061	2.235
138	2.123	2.297
139	2.186	2.360
140	2.248	2.422
141	2.311	2.485
142	2.373	2.547
143	2.436	2.610
144	2.498	2.672
145	2.561	2.735
146	2.623	2.797
147	2.686	2.860
148	2.748	2.922
149	2.811	2.985

DASH NO.	B DIA.	E DIA.
	+.000 -.002	+.002 -.000
†210	.748	.989
†211	.810	1.051
†212	.873	1.115
†213	.935	1.177
†214	.998	1.240
†215	1.060	1.302
†216	1.123	1.365
†217	1.185	1.427
†218	1.248	1.490
†219	1.310	1.552
†220	1.373	1.615
†221	1.435	1.677
222	1.498	1.740
223	1.623	1.865
224	1.748	1.990
225	1.873	2.115
226	1.998	2.240
227	2.123	2.365
228	2.248	2.490
229	2.373	2.615
230	2.498	2.740
231	2.623	2.865
232	2.748	2.990
233	2.873	3.115
234	2.997	3.239
235	3.122	3.364
236	3.247	3.489
237	3.372	3.614
238	3.497	3.739
239	3.622	3.864
240	3.747	3.989
241	3.872	4.114
242	3.997	4.239
243	4.122	4.364
244	4.247	4.489
245	4.372	4.614
246	4.497	4.739
247	4.622	4.864
	+.000 -.002	+.002 -.000
325	1.498	1.870
326	1.623	1.995
327	1.748	2.120
328	1.873	2.245
329	1.998	2.370
330	2.123	2.495
331	2.248	2.620
332	2.373	2.745
333	2.498	2.870
334	2.623	2.995
335	2.748	3.120
336	2.873	3.245
337	2.997	3.369
338	3.122	3.494
339	3.247	3.619
340	3.372	3.744
341	3.497	3.869
342	3.622	3.994
343	3.747	4.119
344	3.872	4.244
345	3.997	4.369
346	4.122	4.494
347	4.247	4.619
348	4.372	4.744
349	4.497	4.869

DASH NO.	B DIA.	E DIA.
	+.000 -.003	+.003 -.000
425	4.497	4.974
426	4.622	5.099
427	4.747	5.224
428	4.872	5.349
429	4.997	5.474
430	5.122	5.599
431	5.247	5.724
432	5.372	5.849
433	5.497	5.974
434	5.622	6.099
435	5.747	6.224
436	5.872	6.349
437	5.997	6.474
438	6.247	6.724
439	6.497	6.974
440	6.747	7.224
441	6.997	7.474
442	7.247	7.724
443	7.497	7.974
444	7.747	8.224
445	7.997	8.474
446	8.497	8.974
	+.000 -.004	+.004 -.000
447	8.997	9.474
448	9.497	9.974
449	9.997	10.474
450	10.497	10.974
451	10.997	11.474
452	11.497	11.974
453	11.997	12.474
454	12.497	12.974
455	12.997	13.474
456	13.497	13.974
457	13.997	14.474
458	14.497	14.974
459	14.997	15.474
460	15.497	15.974

DASH NO.	G_2 TWO BACKUP WIDTH	R RADIUS	D DIAMETRAL CLEARANCE MAX.
006-012	.207/.217	.005/.015	.004
013-028			.005
108-126	.245/.255	.005/.015	.005
127-132			.006
133-149			.007
210-222	.304/.314	.010/.025	.005
223-224			.006
225-245			.007
246-247			.008
325-327	.424/.434	.020/.035	.006
328-349			.007
425-438	.579/.589	.020/.035	.009
439-460			.010

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR VARISEAL® M2 IN AS4716 REVISION A ROD GLANDS.

2. ORDERING EXAMPLE: RVA 2 E G 214 A T05 SM

VARISEAL® M2, ROD DESIGNATOR
CROSS SECTION
  0 = 000 SERIES
  1 = 100 SERIES
  2 = 200 SERIES
  3 = 300 SERIES
  4 = 400 SERIES
△3 DESIGN CHARACTERISTICS
  SEE DESIGN CODES BELOW
GLAND STANDARD
  G = AS4716
SIZE DESIGNATION
  ACCORDING TO AS4716 REVISION A
QUALITY INDEX:
  A = AEROSPACE CERTIFICATE OF CONFORMANCE
△4 TURCON® VARISEAL® M2 MAT'L CODE
SPRING MAT'L CODE - MEDIUM SPRING LOAD
AS STANDARD

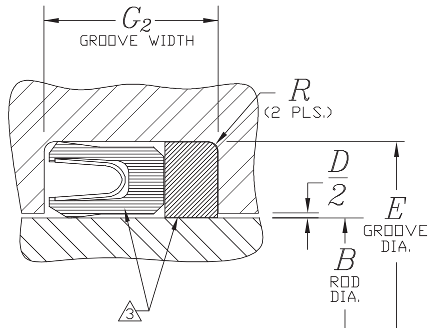
△4 FOR MATERIAL OPTIONS, SEE MATERIALS SECTION OF TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE. SPRING MATERIAL OPTIONS LISTED BELOW.

SPRING MATERIAL CODE MEDIUM DUTY AS STANDARD	
CODE	MATERIAL
S	301 STAINLESS STEEL
H	HASTELLOY
E	ELGILOY

5. †DASH SIZES -006 TO -028, -108 TO -128, AND -210 TO -221 REQUIRE SPLIT OR STEPPED GLAND CONFIGURATION, PLEASE CONSULT YOUR TRELLEBORG SEALING SOLUTIONS SALES ENGINEER FOR DETAILED INFORMATION.

△3 DESIGN CODES FOR CUT BACKUP RING CONFIGURATION TWO BACKUP WIDTH GLANDS

	BACKUP RING			
	TYPE	MATERIAL		
DESIGN CODE	SCARF CUT BACKUP RING	ZURCON® Z43	MATERIAL SAME AS SEAL RING	TURCON® T29
D	X	X		
E	X		X	
F	X			X



ROD SEAL INSTALLATION
FOR TWO BACKUP WIDTH GLAND PER AS4716 REVISION A

INCH
2009_1
TRELLEBORG
SEALING SOLUTIONS
TITLE
VARISEAL® M2, ROD
DRAWING NO.
RVA2EG000

WORLD AEROSPACE TITLE BLOCK REV.

Turcon® Variseal®

DASH NO.	*B* DIA.	*E* DIA.
	+.001 −.000	+.000 −.001
†006	.123	.235
†007	.154	.266
†008	.185	.294
†009	.217	.327
†010	.248	.359
†011	.310	.421
†012	.373	.484
	+.000 −.002	+.002 −.000
†013	.435	.545
†014	.498	.608
†015	.560	.670
†016	.623	.733
†017	.685	.795
†018	.748	.858
†019	.810	.920
†020	.873	.983
†021	.935	1.045
†022	.998	1.108
†023	1.060	1.170
†024	1.123	1.233
†025	1.185	1.295
†026	1.248	1.358
†027	1.310	1.420
†028	1.373	1.483
	+.000 −.002	+.002 −.000
†108	.248	.421
†109	.310	.483
†110	.373	.546
†111	.435	.609
†112	.498	.672
†113	.560	.734
†114	.623	.797
†115	.685	.859
†116	.748	.923
†117	.810	.985
†118	.873	1.048
†119	.935	1.110
†120	.998	1.173
†121	1.060	1.235
†122	1.123	1.298
†123	1.185	1.360
†124	1.248	1.423
†125	1.310	1.485
†126	1.373	1.548
†127	1.435	1.610
†128	1.498	1.673
129	1.560	1.735
130	1.623	1.798
131	1.685	1.860
132	1.748	1.923
133	1.810	1.984
134	1.873	2.047
135	1.936	2.110
136	1.998	2.172
137	2.061	2.235
138	2.123	2.297
139	2.186	2.360
140	2.248	2.422
141	2.311	2.485
142	2.373	2.547
143	2.436	2.610
144	2.498	2.672
145	2.561	2.735
146	2.623	2.797
147	2.686	2.860
148	2.748	2.922
149	2.811	2.985
	+.000 −.002	+.002 −.000
†210	.748	.989
†211	.810	1.051
†212	.873	1.115
†213	.935	1.177
†214	.998	1.240
†215	1.060	1.302
†216	1.123	1.365
†217	1.185	1.427
†218	1.248	1.490
†219	1.310	1.552
†220	1.373	1.615
†221	1.435	1.677
222	1.498	1.740
223	1.623	1.865
224	1.748	1.990
225	1.873	2.115
226	1.998	2.240
227	2.123	2.365
228	2.248	2.490
229	2.373	2.615
230	2.498	2.740
231	2.623	2.865
232	2.748	2.990
233	2.873	3.115
234	2.997	3.239
235	3.122	3.364
236	3.247	3.489
237	3.372	3.614
238	3.497	3.739
239	3.622	3.864
240	3.747	3.989
241	3.872	4.114
242	3.997	4.239
243	4.122	4.364
244	4.247	4.489
245	4.372	4.614
246	4.497	4.739
247	4.622	4.864
	+.000 −.002	+.002 −.000
325	1.498	1.870
326	1.623	1.995
327	1.748	2.120
328	1.873	2.245
329	1.998	2.370
330	2.123	2.495
331	2.248	2.620
332	2.373	2.745
333	2.498	2.870
334	2.623	2.995
335	2.748	3.120
336	2.873	3.245
337	2.997	3.369
338	3.122	3.494
339	3.247	3.619
340	3.372	3.744
341	3.497	3.869
342	3.622	3.994
343	3.747	4.119
344	3.872	4.244
345	3.997	4.369
346	4.122	4.494
347	4.247	4.619
348	4.372	4.744
349	4.497	4.869
	+.000 −.003	+.003 −.000
425	4.497	4.974
426	4.622	5.099
427	4.747	5.224
428	4.872	5.349
429	4.997	5.474
430	5.122	5.599
431	5.247	5.724
432	5.372	5.849
433	5.497	5.974
434	5.622	6.099
435	5.747	6.224
436	5.872	6.349
437	5.997	6.474
438	6.247	6.724
439	6.497	6.974
440	6.747	7.224
441	6.997	7.474
442	7.247	7.724
443	7.497	7.974
444	7.747	8.224
445	7.997	8.474
446	8.497	8.974
	+.000 −.004	+.004 −.000
447	8.997	9.474
448	9.497	9.974
449	9.997	10.474
450	10.497	10.974
451	10.997	11.474
452	11.497	11.974
453	11.997	12.474
454	12.497	12.974
455	12.997	13.474
456	13.497	13.974
457	13.997	14.474
458	14.497	14.974
459	14.997	15.474
460	15.497	15.974

DASH NO.	G_0 ZERO BACKUP WIDTH	*R* RADIUS	*D* DIAMETRAL CLEARANCE MAX.
006-012	.094/.104	.005/.015	.004
013-028			.005
108-126	.141/.151	.005/.015	.005
127-132			.006
133-149			.007
210-222	.188/.198	.010/.025	.005
223-224			.006
225-245			.007
246-247			.008
325-327	.281/.291	.020/.035	.006
328-349			.007
425-438	.375/.385	.020/.035	.009
439-460			.010

NOTES:

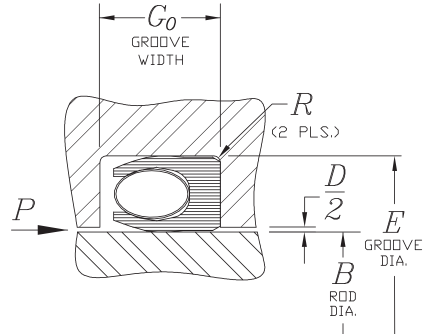
1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR VARISEAL®H IN AS4716 REVISION A ROD GLANDS.

2. ORDERING EXAMPLE: RVE 2 0 G 214 A T05 SM
   - VARISEAL®H, ROD DESIGNATOR
   - CROSS SECTION
     - 0 = 000 SERIES
     - 1 = 100 SERIES
     - 2 = 200 SERIES
     - 3 = 300 SERIES
     - 4 = 400 SERIES
   - DESIGN CHARACTERISTICS
     - SEE DESIGN CODES BELOW
   - GLAND STANDARD
     - G = AS4716
   - SIZE DESIGNATION
     - ACCORDING TO AS4716 REVISION A
   - QUALITY INDEX:
     - A = AEROSPACE CERTIFICATE OF CONFORMANCE
   - △3 TURCON®VARISEAL®H MAT'L CODE
   - SPRING MAT'L CODE - MEDIUM SPRING LOAD AS STANDARD

△3 FOR MATERIAL OPTIONS, SEE MATERIALS SECTION OF TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE. SPRING MATERIAL OPTIONS LISTED BELOW.

SPRING MATERIAL CODE MEDIUM DUTY AS STANDARD	
CODE	MATERIAL
S	301 STAINLESS STEEL
H	HASTELLOY
E	ELGILOY

4. †DASH SIZES -006 TO -028, -108 TO -128, AND -210 TO -221 REQUIRE SPLIT OR STEPPED GLAND CONFIGURATION, PLEASE CONSULT YOUR TRELLEBORG SEALING SOLUTIONS SALES ENGINEER FOR DETAILED INFORMATION.



ROD SEAL INSTALLATION
FOR ZERO BACKUP WIDTH GLAND PER AS4716 REVISION A

INCH
2009_1

TRELLEBORG
SEALING SOLUTIONS

TITLE
VARISEAL®H, ROD

DRAWING NO.
RVE20G000

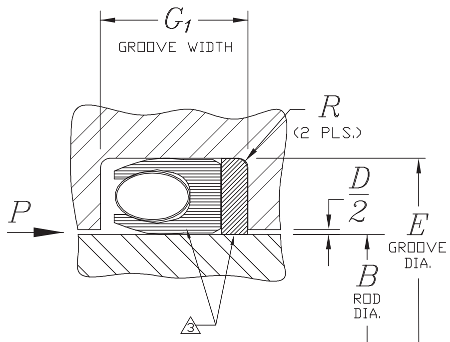
WORLD AEROSPACE TITLE BLOCK REV.

DASH NO.	*B* DIA.	*E* DIA.
	+.001 −.000	+.000 −.001
†006	.123	.235
†007	.154	.266
†008	.185	.294
†009	.217	.327
†010	.248	.359
†011	.310	.421
†012	.373	.484
	+.000 −.002	+.002 −.000
†013	.435	.545
†014	.498	.608
†015	.560	.670
†016	.623	.733
†017	.685	.795
†018	.748	.858
†019	.810	.920
†020	.873	.983
†021	.935	1.045
†022	.998	1.108
†023	1.060	1.170
†024	1.123	1.233
†025	1.185	1.295
†026	1.248	1.358
†027	1.310	1.420
†028	1.373	1.483
	+.000 −.002	+.002 −.000
†108	.248	.421
†109	.310	.483
†110	.373	.546
†111	.435	.609
†112	.498	.672
†113	.560	.734
†114	.623	.797
†115	.685	.859
†116	.748	.923
†117	.810	.985
†118	.873	1.048
†119	.935	1.110
†120	.998	1.173
†121	1.060	1.235
†122	1.123	1.298
†123	1.185	1.360
†124	1.248	1.423
†125	1.310	1.485
†126	1.373	1.548
†127	1.435	1.610
†128	1.498	1.673
129	1.560	1.735
130	1.623	1.798
131	1.685	1.860
132	1.748	1.923
133	1.810	1.984
134	1.873	2.047
135	1.936	2.110
136	1.998	2.172
137	2.061	2.235
138	2.123	2.297
139	2.186	2.360
140	2.248	2.422
141	2.311	2.485
142	2.373	2.547
143	2.436	2.610
144	2.498	2.672
145	2.561	2.735
146	2.623	2.797
147	2.686	2.860
148	2.748	2.922
149	2.811	2.985

DASH NO.	*B* DIA.	*E* DIA.
	+.000 −.002	+.002 −.000
†210	.748	.989
†211	.810	1.051
†212	.873	1.115
†213	.935	1.177
†214	.998	1.240
†215	1.060	1.302
†216	1.123	1.365
†217	1.185	1.427
†218	1.248	1.490
†219	1.310	1.552
†220	1.373	1.615
†221	1.435	1.677
222	1.498	1.740
223	1.623	1.865
224	1.748	1.990
225	1.873	2.115
226	1.998	2.240
227	2.123	2.365
228	2.248	2.490
229	2.373	2.615
230	2.498	2.740
231	2.623	2.865
232	2.748	2.990
233	2.873	3.115
234	2.997	3.239
235	3.122	3.364
236	3.247	3.489
237	3.372	3.614
238	3.497	3.739
239	3.622	3.864
240	3.747	3.989
241	3.872	4.114
242	3.997	4.239
243	4.122	4.364
244	4.247	4.489
245	4.372	4.614
246	4.497	4.739
247	4.622	4.864
	+.000 −.002	+.002 −.000
325	1.498	1.870
326	1.623	1.995
327	1.748	2.120
328	1.873	2.245
329	1.998	2.370
330	2.123	2.495
331	2.248	2.620
332	2.373	2.745
333	2.498	2.870
334	2.623	2.995
335	2.748	3.120
336	2.873	3.245
337	2.997	3.369
338	3.122	3.494
339	3.247	3.619
340	3.372	3.744
341	3.497	3.869
342	3.622	3.994
343	3.747	4.119
344	3.872	4.244
345	3.997	4.369
346	4.122	4.494
347	4.247	4.619
348	4.372	4.744
349	4.497	4.869

DASH NO.	*B* DIA.	*E* DIA.
	+.000 −.003	+.003 −.000
425	4.497	4.974
426	4.622	5.099
427	4.747	5.224
428	4.872	5.349
429	4.997	5.474
430	5.122	5.599
431	5.247	5.724
432	5.372	5.849
433	5.497	5.974
434	5.622	6.099
435	5.747	6.224
436	5.872	6.349
437	5.997	6.474
438	6.247	6.724
439	6.497	6.974
440	6.747	7.224
441	6.997	7.474
442	7.247	7.724
443	7.497	7.974
444	7.747	8.224
445	7.997	8.474
446	8.497	8.974
	+.000 −.004	+.004 −.000
447	8.997	9.474
448	9.497	9.974
449	9.997	10.474
450	10.497	10.974
451	10.997	11.474
452	11.497	11.974
453	11.997	12.474
454	12.497	12.974
455	12.997	13.474
456	13.497	13.974
457	13.997	14.474
458	14.497	14.974
459	14.997	15.474
460	15.497	15.974

DASH NO.	*G₁* ONE BACKUP WIDTH	*R* RADIUS	*D* DIAMETRAL CLEARANCE MAX.
006–012	.150/.160	.005/.015	.004
013–028			.005
108–126	.183/.193	.005/.015	.005
127–132			.006
133–149			.007
210–222	.235/.245	.010/.025	.005
223–224			.006
225–245			.007
246–247			.008
325–327	.334/.344	.020/.035	.006
328–349			.007
425–438	.475/.485	.020/.035	.009
439–460			.010



ROD SEAL INSTALLATION
FOR ONE BACKUP WIDTH GLAND PER AS4716 REVISION A

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR VARISEAL H® IN AS4716 REVISION A ROD GLANDS.

2. ORDERING EXAMPLE: RVE 2 B G 214 A T05 SM
   - VARISEAL® H, ROD DESIGNATOR
   - CROSS SECTION
     - 0 = 000 SERIES
     - 1 = 100 SERIES
     - 2 = 200 SERIES
     - 3 = 300 SERIES
     - 4 = 400 SERIES
   - △3 DESIGN CHARACTERISTICS
     SEE DESIGN CODES BELOW
   - GLAND STANDARD
     G = AS4716
   - SIZE DESIGNATION
     ACCORDING TO AS4716 REVISION A
   - QUALITY INDEX:
     A = AEROSPACE CERTIFICATE OF CONFORMANCE
   - △4 TURCON® VARISEAL® H MAT'L CODE
   - SPRING MAT'L CODE – MEDIUM SPRING LOAD
     AS STANDARD

△4 FOR MATERIAL OPTIONS, SEE MATERIALS SECTION OF TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE. SPRING MATERIAL OPTIONS LISTED BELOW.

SPRING MATERIAL CODE MEDIUM DUTY AS STANDARD	
CODE	MATERIAL
S	301 STAINLESS STEEL
H	HASTELLOY
E	ELGILOY

5. †DASH SIZES -006 TO -028, -108 TO -128, AND -210 TO -221 REQUIRE SPLIT OR STEPPED GLAND CONFIGURATION, PLEASE CONSULT YOUR TRELLEBORG SEALING SOLUTIONS SALES ENGINEER FOR DETAILED INFORMATION.

△3 DESIGN CODES FOR CUT BACKUP RING CONFIGURATION ONE BACKUP WIDTH GLANDS

	BACKUP RING			
	TYPE	MATERIAL		
DESIGN CODE	SCARF CUT BACKUP RING	ZURCON® Z43	MATERIAL SAME AS SEAL RING	TURCON® T29
A	X	X		
B	X		X	
C	X			X

INCH
2009_1

TRELLEBORG
SEALING SOLUTIONS

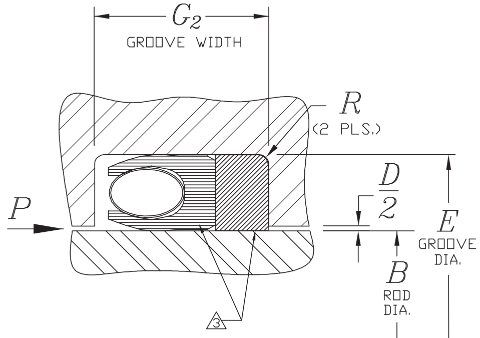
TITLE
VARISEAL®H, ROD

DRAWING NO.
RVE2BG000

WORLD AEROSPACE TITLE BLOCK REV.

DASH NO.	B DIA.	E DIA.
	+.001 -.000	+.000 -.001
†006	.123	.235
†007	.154	.266
†008	.185	.294
†009	.217	.327
†010	.248	.359
†011	.310	.421
†012	.373	.484
	+.000 -.002	+.002 -.000
†013	.435	.545
†014	.498	.608
†015	.560	.670
†016	.623	.733
†017	.685	.795
†018	.748	.858
†019	.810	.920
†020	.873	.983
†021	.935	1.045
†022	.998	1.108
†023	1.060	1.170
†024	1.123	1.233
†025	1.185	1.295
†026	1.248	1.358
†027	1.310	1.420
†028	1.373	1.483
	+.000 -.002	+.002 -.000
†108	.248	.421
†109	.310	.483
†110	.373	.546
†111	.435	.609
†112	.498	.672
†113	.560	.734
†114	.623	.797
†115	.685	.859
†116	.748	.923
†117	.810	.985
†118	.873	1.048
†119	.935	1.110
†120	.998	1.173
†121	1.060	1.235
†122	1.123	1.298
†123	1.185	1.360
†124	1.248	1.423
†125	1.310	1.485
†126	1.373	1.548
†127	1.435	1.610
†128	1.498	1.673
129	1.560	1.735
130	1.623	1.798
131	1.685	1.860
132	1.748	1.923
133	1.810	1.984
134	1.873	2.047
135	1.936	2.110
136	1.998	2.172
137	2.061	2.235
138	2.123	2.297
139	2.186	2.360
140	2.248	2.422
141	2.311	2.485
142	2.373	2.547
143	2.436	2.610
144	2.498	2.672
145	2.561	2.735
146	2.623	2.797
147	2.686	2.860
148	2.748	2.922
149	2.811	2.985
	+.000 -.002	+.002 -.000
†210	.748	.989
†211	.810	1.051
†212	.873	1.115
†213	.935	1.177
†214	.998	1.240
†215	1.060	1.302
†216	1.123	1.365
†217	1.185	1.427
†218	1.248	1.490
†219	1.310	1.552
†220	1.373	1.615
†221	1.435	1.677
222	1.498	1.740
223	1.623	1.865
224	1.748	1.990
225	1.873	2.115
226	1.998	2.240
227	2.123	2.365
228	2.248	2.490
229	2.373	2.615
230	2.498	2.740
231	2.623	2.865
232	2.748	2.990
233	2.873	3.115
234	2.997	3.239
235	3.122	3.364
236	3.247	3.489
237	3.372	3.614
238	3.497	3.739
239	3.622	3.864
240	3.747	3.989
241	3.872	4.114
242	3.997	4.239
243	4.122	4.364
244	4.247	4.489
245	4.372	4.614
246	4.497	4.739
247	4.622	4.864
	+.000 -.002	+.002 -.000
325	1.498	1.870
326	1.623	1.995
327	1.748	2.120
328	1.873	2.245
329	1.998	2.370
330	2.123	2.495
331	2.248	2.620
332	2.373	2.745
333	2.498	2.870
334	2.623	2.995
335	2.748	3.120
336	2.873	3.245
337	2.997	3.369
338	3.122	3.494
339	3.247	3.619
340	3.372	3.744
341	3.497	3.869
342	3.622	3.994
343	3.747	4.119
344	3.872	4.244
345	3.997	4.369
346	4.122	4.494
347	4.247	4.619
348	4.372	4.744
349	4.497	4.869
	+.000 -.003	+.003 -.000
425	4.497	4.974
426	4.622	5.099
427	4.747	5.224
428	4.872	5.349
429	4.997	5.474
430	5.122	5.599
431	5.247	5.724
432	5.372	5.849
433	5.497	5.974
434	5.622	6.099
435	5.747	6.224
436	5.872	6.349
437	5.997	6.474
438	6.247	6.724
439	6.497	6.974
440	6.747	7.224
441	6.997	7.474
442	7.247	7.724
443	7.497	7.974
444	7.747	8.224
445	7.997	8.474
446	8.497	8.974
	+.000 -.004	+.004 -.000
447	8.997	9.474
448	9.497	9.974
449	9.997	10.474
450	10.497	10.974
451	10.997	11.474
452	11.497	11.974
453	11.997	12.474
454	12.497	12.974
455	12.997	13.474
456	13.497	13.974
457	13.997	14.474
458	14.497	14.974
459	14.997	15.474
460	15.497	15.974

DASH NO.	G_2 TWO BACKUP WIDTH	R RADIUS	D DIAMETRAL CLEARANCE MAX.
006-012	.207/.217	.005/.015	.004
013-028			.005
108-126	.245/.255	.005/.015	.005
127-132			.006
133-149			.007
210-222	.304/.314	.010/.025	.005
223-224			.006
225-245			.007
246-247			.008
325-327	.424/.434	.020/.035	.006
328-349			.007
425-438	.579/.589	.020/.035	.009
439-460			.010



ROD SEAL INSTALLATION
FOR TWO BACKUP WIDTH GLAND PER AS4716 REVISION A

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR VARISEAL H® IN AS4716 REVISION A ROD GLANDS.

2. ORDERING EXAMPLE: RVE 2 E G 214 A T05 SM

   VARISEAL® H, ROD DESIGNATOR
   CROSS SECTION
      0 = 000 SERIES
      1 = 100 SERIES
      2 = 200 SERIES
      3 = 300 SERIES
      4 = 400 SERIES
   △3 DESIGN CHARACTERISTICS
      SEE DESIGN CODES BELOW
   GLAND STANDARD
      G = AS4716
   SIZE DESIGNATION
      ACCORDING TO AS4716 REVISION A
   QUALITY INDEX:
      A = AEROSPACE CERTIFICATE OF CONFORMANCE
   △4 TURCON® VARISEAL® H MAT'L CODE
   SPRING MAT'L CODE - MEDIUM SPRING LOAD
   AS STANDARD

△4 FOR MATERIAL OPTIONS, SEE MATERIALS SECTION OF TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE. SPRING MATERIAL OPTIONS LISTED BELOW.

SPRING MATERIAL CODE MEDIUM DUTY AS STANDARD	
CODE	MATERIAL
S	301 STAINLESS STEEL
H	HASTELLOY
E	ELGILOY

5. †DASH SIZES -006 TO -028, -108 TO -128, AND -210 TO -221 REQUIRE SPLIT OR STEPPED GLAND CONFIGURATION, PLEASE CONSULT YOUR TRELLEBORG SEALING SOLUTIONS SALES ENGINEER FOR DETAILED INFORMATION.

△3 DESIGN CODES FOR CUT BACKUP RING CONFIGURATION TWO BACKUP WIDTH GLANDS

	BACKUP RING			
	TYPE	MATERIAL		
DESIGN CODE	SCARF CUT BACKUP RING	ZURCON® Z43	MATERIAL SAME AS SEAL RING	TURCON® T29
D	X	X		
E	X		X	
F	X			X

INCH	2009_1
TRELLEBORG SEALING SOLUTIONS	TITLE VARISEAL® H, ROD
	DRAWING NO. RVE2EG000

WORLD AEROSPACE TITLE BLOCK REV.

DASH NO.	*A* DIA.	*F* DIA.
	+.001 -.000	+.000 -.001
†004	.190	.076
†005	.221	.115
†006	.235	.129
†007	.266	.158
†008	.297	.189
†009	.329	.220
†010	.360	.250
†011	.422	.312
†012	.485	.375
	+.002 -.000	+.000 -.002
†013	.550	.441
†014	.613	.504
†015	.675	.566
†016	.738	.629
†017	.800	.691
†018	.863	.753
019	.925	.815
020	.991	.881
021	1.053	.943
022	1.116	1.006
023	1.178	1.068
024	1.241	1.131
025	1.303	1.193
026	1.366	1.256
027	1.428	1.318
028	1.491	1.381
	+.001 -.000	+.000 -.001
†104	.297	.128
†105	.329	.158
†106	.360	.187
†107	.391	.215
†108	.422	.246
†109	.485	.308
	+.002 -.000	+.000 -.002
†110	.550	.379
†111	.613	.441
†112	.675	.502
†113	.738	.565
†114	.800	.627
†115	.863	.689
†116	.925	.751
117	.991	.817
118	1.053	.879
119	1.116	.942
120	1.178	1.003
121	1.241	1.066
122	1.303	1.128
123	1.366	1.191
124	1.428	1.253
125	1.491	1.316
126	1.553	1.378
127	1.616	1.441
128	1.678	1.503
129	1.741	1.566
130	1.805	1.631
131	1.867	1.693
132	1.930	1.756
133	1.992	1.818
134	2.055	1.881
135	2.118	1.944
136	2.180	2.006
137	2.243	2.069
138	2.305	2.131
139	2.368	2.194
140	2.430	2.256
141	2.493	2.319
142	2.555	2.381
143	2.618	2.444
144	2.680	2.506
145	2.743	2.569
146	2.805	2.631
147	2.868	2.694
148	2.930	2.756
149	2.993	2.819

DASH NO.	*A* DIA.	*F* DIA.
	+.002 -.000	+.000 -.002
†210	.991	.750
†211	1.053	.812
†212	1.116	.874
†213	1.178	.936
214	1.241	.999
215	1.303	1.061
216	1.366	1.124
217	1.428	1.186
218	1.491	1.249
219	1.553	1.311
220	1.616	1.374
221	1.678	1.436
222	1.741	1.499
223	1.867	1.625
224	1.992	1.750
225	2.118	1.876
226	2.243	2.001
227	2.368	2.126
228	2.493	2.251
229	2.618	2.376
230	2.743	2.501
231	2.868	2.626
232	2.993	2.751
233	3.118	2.876
234	3.243	3.001
235	3.368	3.126
236	3.493	3.251
237	3.618	3.376
238	3.743	3.501
239	3.868	3.626
240	3.993	3.751
241	4.118	3.876
242	4.243	4.001
243	4.368	4.126
244	4.493	4.251
245	4.618	4.376
246	4.743	4.501
247	4.868	4.626
	+.002 -.000	+.000 -.002
325	1.867	1.495
326	1.992	1.620
327	2.118	1.746
328	2.243	1.871
329	2.368	1.996
330	2.493	2.121
331	2.618	2.246
332	2.743	2.371
333	2.868	2.496
334	2.993	2.621
335	3.118	2.746
336	3.243	2.871
337	3.368	2.996
338	3.493	3.121
339	3.619	3.246
340	3.743	3.371
341	3.868	3.496
342	3.993	3.621
343	4.118	3.746
344	4.243	3.871
345	4.368	3.996
346	4.493	4.121
347	4.618	4.246
348	4.743	4.371
349	4.868	4.496
	+.003 -.000	+.000 -.003
425	4.974	4.497
426	5.099	4.622
427	5.224	4.747
428	5.349	4.872
429	5.474	4.997
430	4.599	5.122
431	5.724	5.247
432	5.849	5.372
434	5.974	5.497
434	6.099	5.622

DASH NO.	*A* DIA.	*F* DIA.
	+.003 -.000	+.000 -.003
435	6.224	5.747
436	6.349	5.872
437	6.474	5.997
438	6.724	6.247
439	6.974	6.497
440		6.747
441	7.474	6.997
442	7.724	7.247
443	7.974	7.497
444	8.224	7.747
445	8.474	7.997
446	8.974	8.497
	+.004 -.000	+.000 -.004
447	9.474	8.997
448	9.974	9.497
449	10.474	9.997
450	10.974	10.497
451	11.474	10.997
452	11.974	11.497
453	12.474	11.997
454	12.974	12.497
455	13.474	12.997
456	13.974	13.497
457	14.474	13.997
458	14.974	14.497
459	15.474	14.997
460	15.974	15.497

DASH NO.	G_0 ZERO BACKUP WIDTH	*R* RADIUS	*D* DIAMETRAL CLEARANCE MAX.
004-009	.098/.103	.005/.015	.004
010-012	.094/.099		.004
013-028			.005
104-109	.141/.151	.005/.015	.004
110-126			.005
127-129			.005
130-132			.006
133-140			.006
141-149			.007
210-222	.188/.198	.010/.025	.005
223-224			.006
225-227			.006
228-243			.007
244-245			.008
246-247			.008
325-327	.281/.291	.020/.035	.006
328-329			.006
330-345			.007
346-349			.008
425-438	.375/.385	.020/.035	.009
439-445			.009
446			.010
447-460			.011

NOTES:

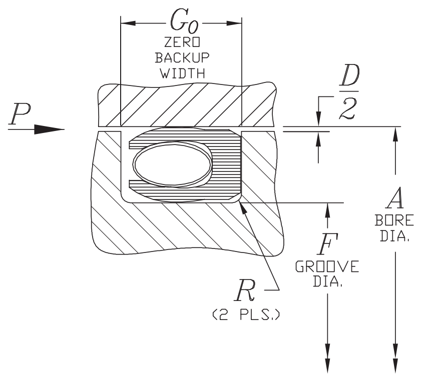
1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR VARISEAL® SA IN AS4716 REVISION A PISTON GLANDS.

2. ORDERING EXAMPLE PVP 2 0 G 214 A T05 SM
   VARISEAL® SA, PISTON DESIGNATOR
   CROSS SECTION
      0 = 000 SERIES
      1 = 100 SERIES
      2 = 200 SERIES
      3 = 300 SERIES
      4 = 400 SERIES
   △3 DESIGN CHARACTERISTICS
      0 = STANDARD
   GLAND STANDARD
      G = AS4716 REVISION A
   SIZE DESIGNATION
      ACCORDING TO AS4716 REVISION A
   QUALITY INDEX:
      A = AEROSPACE CERTIFICATE OF CONFORMANCE
   △4 TURCON® VARISEAL® SA MAT'L CODE
   SPRING MAT'L CODE - MEDIUM SPRING LOAD
   AS STANDARD

5. †DASH SIZES -004 TO -018, -104 TO -116, AND -210 TO -213 REQUIRE SPLIT OR STEPPED GLAND CONFIGURATION, PLEASE CONSULT YOUR TRELLEBORG SEALING SOLUTIONS SALES ENGINEER FOR DETAILED INFORMATION.

△4 FOR MATERIAL OPTIONS, SEE MATERIALS SECTION OF TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE. SPRING MATERIAL OPTIONS LISTED BELOW.

SPRING MATERIAL CODE MEDIUM DUTY AS STANDARD	
CODE	MATERIAL
S	301 STAINLESS STEEL
H	HASTELLOY
E	ELGILOY



PISTON SEAL INSTALLATION
FOR ZERO BACKUP WIDTH GLAND PER AS4716 REVISION A

INCH
2009_1
TRELLEBORG
SEALING SOLUTIONS
TITLE
VARISEAL® SA, PISTON
DRAWING NO.
PVP20G000

WORLD AEROSPACE TITLE BLOCK REV.

DASH NO.	A DIA.	F DIA.
	+.001 -.000	+.000 -.001
†004	.190	.076
†005	.221	.115
†006	.235	.129
†007	.266	.158
†008	.297	.189
†009	.329	.220
†010	.360	.250
†011	.422	.312
†012	.485	.375
	+.002 -.000	+.000 -.002
†013	.550	.441
†014	.613	.504
†015	.675	.566
†016	.738	.629
†017	.800	.691
†018	.863	.753
019	.925	.815
020	.991	.881
021	1.053	.943
022	1.116	1.006
023	1.178	1.068
024	1.241	1.131
025	1.303	1.193
026	1.366	1.256
027	1.428	1.318
028	1.491	1.381
	+.001 -.000	+.000 -.001
†104	.297	.128
†105	.329	.158
†106	.360	.187
†107	.391	.215
†108	.422	.246
†109	.485	.308
	+.002 -.000	+.000 -.002
†110	.550	.379
†111	.613	.441
†112	.675	.502
†113	.738	.565
†114	.800	.627
†115	.863	.689
†116	.925	.751
117	.991	.817
118	1.053	.879
119	1.116	.942
120	1.178	1.003
121	1.241	1.066
122	1.303	1.128
123	1.366	1.191
124	1.428	1.253
125	1.491	1.316
126	1.553	1.378
127	1.616	1.441
128	1.678	1.503
129	1.741	1.566
130	1.805	1.631
131	1.867	1.693
132	1.930	1.756
133	1.992	1.818
134	2.055	1.881
135	2.118	1.944
136	2.180	2.006
137	2.243	2.069
138	2.305	2.131
139	2.368	2.194
140	2.430	2.256
141	2.493	2.319
142	2.555	2.381
143	2.618	2.444
144	2.680	2.506
145	2.743	2.569
146	2.805	2.631
147	2.868	2.694
148	2.930	2.756
149	2.993	2.819

DASH NO.	A DIA.	F DIA.
	+.002 -.000	+.000 -.002
†210	.991	.750
†211	1.053	.812
†212	1.116	.874
†213	1.178	.936
214	1.241	.999
215	1.303	1.061
216	1.366	1.124
217	1.428	1.186
218	1.491	1.249
219	1.553	1.311
220	1.616	1.374
221	1.678	1.436
222	1.741	1.499
223	1.867	1.625
224	1.992	1.750
225	2.118	1.876
226	2.243	2.001
227	2.368	2.126
228	2.493	2.251
229	2.618	2.376
230	2.743	2.501
231	2.868	2.626
232	2.993	2.751
233	3.118	2.876
234	3.243	3.001
235	3.368	3.126
236	3.493	3.251
237	3.618	3.376
238	3.743	3.501
239	3.868	3.626
240	3.993	3.751
241	4.118	3.876
242	4.243	4.001
243	4.368	4.126
244	4.493	4.251
245	4.618	4.376
246	4.743	4.501
247	4.868	4.626
	+.002 -.000	+.000 -.002
325	1.867	1.495
326	1.992	1.620
327	2.118	1.746
328	2.243	1.871
329	2.368	1.996
330	2.493	2.121
331	2.618	2.246
332	2.743	2.371
333	2.868	2.496
334	2.993	2.621
335	3.118	2.746
336	3.243	2.871
337	3.368	2.996
338	3.493	3.121
339	3.619	3.246
340	3.743	3.371
341	3.868	3.496
342	3.993	3.621
343	4.118	3.746
344	4.243	3.871
345	4.368	3.996
346	4.493	4.121
347	4.618	4.246
348	4.743	4.371
349	4.868	4.496
	+.003 -.000	+.000 -.003
425	4.974	4.497
426	5.099	4.622
427	5.224	4.747
428	5.349	4.872
429	5.474	4.997
430	4.599	5.122
431	5.724	5.247
432	5.849	5.372
434	5.974	5.497
434	6.099	5.622

DASH NO.	A DIA.	F DIA.
	+.003 -.000	+.000 -.003
435	6.224	5.747
436	6.349	5.872
437	6.474	5.997
438	6.724	6.247
439	6.974	6.497
440	7.224	6.747
441	7.474	6.997
442	7.724	7.247
443	7.974	7.497
444	8.224	7.747
445	8.474	7.997
446	8.974	8.497
	+.004 -.000	+.000 -.004
447	9.474	8.997
448	9.974	9.497
449	10.474	9.997
450	10.974	10.497
451	11.474	10.997
452	11.974	11.497
453	12.474	11.997
454	12.974	12.497
455	13.474	12.997
456	13.974	13.497
457	14.474	13.997
458	14.974	14.497
459	15.474	14.997
460	15.974	15.497

DASH NO.	G_1 ONE BACKUP WIDTH	R RADIUS	D DIAMETRAL CLEARANCE MAX.
004-009	.154/.164	.005/.015	.004
010-012	.150/.160		.004
013-028			.005
104-109	.183/.193	.005/.015	.004
110-126			.005
127-129			.005
130-132			.006
133-140			.006
141-149			.007
210-222	.235/.245	.010/.025	.005
223-224			.006
225-227			.006
228-243			.007
244-245			.008
246-247			.008
325-327	.334/.344	.020/.035	.006
328-329			.006
330-345			.007
346-349			.008
425-438	.475/.485	.020/.035	.009
439-445			.009
446			.010
447-460			.011

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR VARISEAL®SA IN AS4716 REVISION A PISTON GLANDS.

2. ORDERING EXAMPLE PVP 2 B G 214 A T05 SM
   - VARISEAL®SA, PISTON DESIGNATOR
   - CROSS SECTION
     - 0 = 000 SERIES
     - 1 = 100 SERIES
     - 2 = 200 SERIES
     - 3 = 300 SERIES
     - 4 = 400 SERIES
   - △3 DESIGN CHARACTERISTICS
     - SEE DESIGN CODES BELOW
   - GLAND STANDARD
     - G = AS4716 REVISION A
   - SIZE DESIGNATION
     - ACCORDING TO AS4716 REVISION A
   - QUALITY INDEX:
     - A = AEROSPACE CERTIFICATE OF CONFORMANCE
   - △4 TURCON®VARISEAL®SA MAT'L CODE
   - SPRING MAT'L CODE - MEDIUM SPRING LOAD AS STANDARD

5. †DASH SIZES -004 TO -018, -104 TO -116, AND -210 TO -213 REQUIRE SPLIT OR STEPPED GLAND CONFIGURATION, PLEASE CONSULT YOUR TRELLEBORG SEALING SOLUTIONS SALES ENGINEER FOR DETAILED INFORMATION.

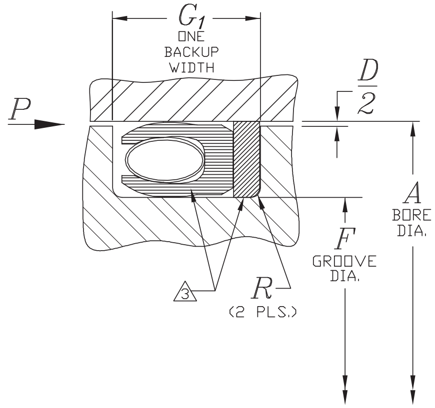
△4 FOR MATERIAL OPTIONS, SEE MATERIALS SECTION OF TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE. SPRING MATERIAL OPTIONS LISTED BELOW.

SPRING MATERIAL CODE MEDIUM DUTY AS STANDARD

CODE	MATERIAL
S	301 STAINLESS STEEL
H	HASTELLOY
E	ELGILOY

△3 DESIGN CODES FOR CUT BACKUP RING CONFIGURATION ONE BACKUP WIDTH GLANDS

	BACKUP RING			
	TYPE	MATERIAL		
DESIGN CODE	SCARF CUT BACKUP RING	ZURCON® Z43	MATERIAL SAME AS SEAL RING	TURCON® T29
A	X	X		
B	X		X	
C	X			X



PISTON SEAL INSTALLATION
FOR ONE BACKUP WIDTH GLAND PER AS4716 REVISION A

INCH	2009_1
TRELLEBORG SEALING SOLUTIONS	TITLE VARISEAL®SA, PISTON
	DRAWING NO. PVP2BG000

WORLD AEROSPACE TITLE BLOCK REV.

DASH NO.	*A* DIA.	*F* DIA.
	+.001 -.000	+.000 -.001
†004	.190	.076
†005	.221	.115
†006	.235	.129
†007	.266	.158
†008	.297	.189
†009	.329	.220
†010	.360	.250
†011	.422	.312
†012	.485	.375
	+.002 -.000	+.000 -.002
†013	.550	.441
†014	.613	.504
†015	.675	.566
†016	.738	.629
†017	.800	.691
†018	.863	.753
019	.925	.815
020	.991	.881
021	1.053	.943
022	1.116	1.006
023	1.178	1.068
024	1.241	1.131
025	1.303	1.193
026	1.366	1.256
027	1.428	1.318
028	1.491	1.381
	+.001 -.000	+.000 -.001
†104	.297	.128
†105	.329	.158
†106	.360	.187
†107	.391	.215
†108	.422	.246
†109	.485	.308
	+.002 -.000	+.000 -.002
†110	.550	.379
†111	.613	.441
†112	.675	.502
†113	.738	.565
†114	.800	.627
†115	.863	.689
†116	.925	.751
117	.991	.817
118	1.053	.879
119	1.116	.942
120	1.178	1.003
121	1.241	1.066
122	1.303	1.128
123	1.366	1.191
124	1.428	1.253
125	1.491	1.316
126	1.553	1.378
127	1.616	1.441
128	1.678	1.503
129	1.741	1.566
130	1.805	1.631
131	1.867	1.693
132	1.930	1.756
133	1.992	1.818
134	2.055	1.881
135	2.118	1.944
136	2.180	2.006
137	2.243	2.069
138	2.305	2.131
139	2.368	2.194
140	2.430	2.256
141	2.493	2.319
142	2.555	2.381
143	2.618	2.444
144	2.680	2.506
145	2.743	2.569
146	2.805	2.631
147	2.868	2.694
148	2.930	2.756
149	2.993	2.819

DASH NO.	*A* DIA.	*F* DIA.
	+.002 -.000	+.000 -.002
†210	.991	.750
†211	1.053	.812
†212	1.116	.874
†213	1.178	.936
214	1.241	.999
215	1.303	1.061
216	1.366	1.124
217	1.428	1.186
218	1.491	1.249
219	1.553	1.311
220	1.616	1.374
221	1.678	1.436
222	1.741	1.499
223	1.867	1.625
224	1.992	1.750
225	2.118	1.876
226	2.243	2.001
227	2.368	2.126
228	2.493	2.251
229	2.618	2.376
230	2.743	2.501
231	2.868	2.626
232	2.993	2.751
233	3.118	2.876
234	3.243	3.001
235	3.368	3.126
236	3.493	3.251
237	3.618	3.376
238	3.743	3.501
239	3.868	3.626
240	3.993	3.751
241	4.118	3.876
242	4.243	4.001
243	4.368	4.126
244	4.493	4.251
245	4.618	4.376
246	4.743	4.501
247	4.868	4.626
	+.002 -.000	+.000 -.002
325	1.867	1.495
326	1.992	1.620
327	2.118	1.746
328	2.243	1.871
329	2.368	1.996
330	2.493	2.121
331	2.618	2.246
332	2.743	2.371
333	2.868	2.496
334	2.993	2.621
335	3.118	2.746
336	3.243	2.871
337	3.368	2.996
338	3.493	3.121
339	3.619	3.246
340	3.743	3.371
341	3.868	3.496
342	3.993	3.621
343	4.118	3.746
344	4.243	3.871
345	4.368	3.996
346	4.493	4.121
347	4.618	4.246
348	4.743	4.371
349	4.868	4.496
	+.003 -.000	+.000 -.003
425	4.974	4.497
426	5.099	4.622
427	5.224	4.747
428	5.349	4.872
429	5.474	4.997
430	4.599	5.122
431	5.724	5.247
432	5.849	5.372
434	5.974	5.497
434	6.099	5.622

DASH NO.	*A* DIA.	*F* DIA.
	+.003 -.000	+.000 -.003
435	6.224	5.747
436	6.349	5.872
437	6.474	5.997
438	6.724	6.247
439	6.974	6.497
440	7.224	6.747
441	7.474	6.997
442	7.724	7.247
443	7.974	7.497
444	8.224	7.747
445	8.474	7.997
446	8.974	8.497
	+.004 -.000	+.000 -.004
447	9.474	8.997
448	9.974	9.497
449	10.474	9.997
450	10.974	10.497
451	11.474	10.997
452	11.974	11.497
453	12.474	11.997
454	12.974	12.497
455	13.474	12.997
456	13.974	13.497
457	14.474	13.997
458	14.974	14.497
459	15.474	14.997
460	15.974	15.497

DASH NO.	G_2 TWO BACKUP WIDTH	*R* RADIUS	*D* DIAMETRAL CLEARANCE MAX.
004-009	.210/.220	.005/.015	.004
010-012	.207/.217		.004
013-028			.005
104-109	.245/.255	.005/.015	.004
110-126			.005
127-129			.005
130-132			.006
133-140			.006
141-149			.007
210-222	.304/.314	.010/.025	.005
223-224			.006
225-227			.006
228-243			.007
244-245			.008
246-247			.008
325-327	.424/.434	.020/.035	.006
328-329			.006
330-345			.007
346-349			.008
425-438	.579/.589	.020/.035	.009
439-445			.009
446			.010
447-460			.011

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR VARISEAL®SA IN AS4716 REVISION A PISTON GLANDS.
2. ORDERING EXAMPLE PVP 2 E G 214 A T05 SM
   VARISEAL® SA, PISTON DESIGNATOR
   CROSS SECTION
      0 = 000 SERIES
      1 = 100 SERIES
      2 = 200 SERIES
      3 = 300 SERIES
      4 = 400 SERIES
   △3 DESIGN CHARACTERISTICS
      SEE DESIGN CODES BELOW
   GLAND STANDARD
      G = AS4716 REVISION A
   SIZE DESIGNATION
      ACCORDING TO AS4716 REVISION A
   QUALITY INDEX:
      A = AEROSPACE CERTIFICATE OF CONFORMANCE
   △4 TURCON® VARISEAL® SA MAT'L CODE
   SPRING MAT'L CODE - MEDIUM SPRING LOAD
   AS STANDARD

5. †DASH SIZES -004 TO -018, -104 TO -116, AND -210 TO -213 REQUIRE SPLIT OR STEPPED GLAND CONFIGURATION, PLEASE CONSULT YOUR TRELLEBORG SEALING SOLUTIONS SALES ENGINEER FOR DETAILED INFORMATION.

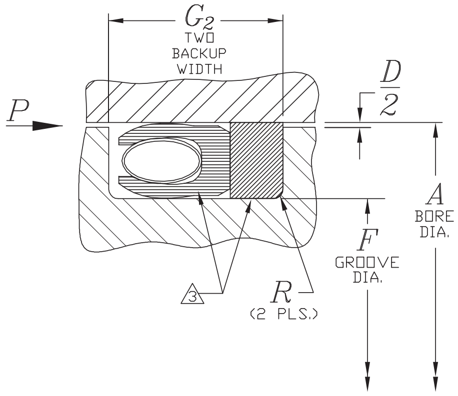
△4 FOR MATERIAL OPTIONS, SEE MATERIALS SECTION OF TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE. SPRING MATERIAL OPTIONS LISTED BELOW.

SPRING MATERIAL CODE
MEDIUM DUTY AS STANDARD

CODE	MATERIAL
S	301 STAINLESS STEEL
H	HASTELLOY
E	ELGILOY

△3 DESIGN CODES FOR CUT BACKUP RING CONFIGURATION
TWO BACKUP WIDTH GLANDS

	BACKUP RING			
	TYPE	MATERIAL		
DESIGN CODE	SCARF CUT BACKUP RING	ZURCON® Z43	MATERIAL SAME AS SEAL RING	TURCON® T29
D	X	X		
E	X		X	
F	X			X



PISTON SEAL INSTALLATION
FOR TWO BACKUP WIDTH GLAND PER AS4716 REVISION A

INCH
2009_1

TRELLEBORG
SEALING SOLUTIONS

TITLE
VARISEAL® SA, PISTON

DRAWING NO.
PVP2EG000

WORLD AEROSPACE TITLE BLOCK REV.

DASH NO.	A DIA.	F DIA.
	+.001 -.000	+.000 -.001
†006	.235	.129
†007	.266	.158
†008	.297	.189
†009	.329	.220
†010	.360	.250
†011	.422	.312
†012	.485	.375
	+.002 -.000	+.000 -.002
†013	.550	.441
†014	.613	.504
†015	.675	.566
†016	.738	.629
†017	.800	.691
†018	.863	.753
†019	.925	.815
†020	.991	.881
†021	1.053	.943
†022	1.116	1.006
†023	1.178	1.068
†024	1.241	1.131
†025	1.303	1.193
†026	1.366	1.256
†027	1.428	1.318
†028	1.491	1.381
	+.001 -.000	+.000 -.001
†106	.360	.187
†107	.391	.215
†108	.422	.246
†109	.485	.308
	+.002 -.000	+.000 -.002
†110	.550	.379
†111	.613	.441
†112	.675	.502
†113	.738	.565
†114	.800	.627
†115	.863	.689
†116	.925	.751
†117	.991	.817
†118	1.053	.879
†119	1.116	.942
†120	1.178	1.003
†121	1.241	1.066
†122	1.303	1.128
†123	1.366	1.191
†124	1.428	1.253
†125	1.491	1.316
†126	1.553	1.378
†127	1.616	1.441
†128	1.678	1.503
129	1.741	1.566
130	1.805	1.631
131	1.867	1.693
132	1.930	1.756
133	1.992	1.818
134	2.055	1.881
135	2.118	1.944
136	2.180	2.006
137	2.243	2.069
138	2.305	2.131
139	2.368	2.194
140	2.430	2.256
141	2.493	2.319
142	2.555	2.381
143	2.618	2.444
144	2.680	2.506
145	2.743	2.569
146	2.805	2.631
147	2.868	2.694
148	2.930	2.756
149	2.993	2.819

DASH NO.	A DIA.	F DIA.
	+.002 -.000	+.000 -.002
†210	.991	.750
†211	1.053	.812
†212	1.116	.874
†213	1.178	.936
†214	1.241	.999
†215	1.303	1.061
†216	1.366	1.124
†217	1.428	1.186
†218	1.491	1.249
†219	1.553	1.311
†220	1.616	1.374
†221	1.678	1.436
222	1.741	1.499
223	1.867	1.625
224	1.992	1.750
225	2.118	1.876
226	2.243	2.001
227	2.368	2.126
228	2.493	2.251
229	2.618	2.376
230	2.743	2.501
231	2.868	2.626
232	2.993	2.751
233	3.118	2.876
234	3.243	3.001
235	3.368	3.126
236	3.493	3.251
237	3.618	3.376
238	3.743	3.501
239	3.868	3.626
240	3.993	3.751
241	4.118	3.876
242	4.243	4.001
243	4.368	4.126
244	4.493	4.251
245	4.618	4.376
246	4.743	4.501
247	4.868	4.626
	+.002 -.000	+.000 -.002
325	1.867	1.495
326	1.992	1.620
327	2.118	1.746
328	2.243	1.871
329	2.368	1.996
330	2.493	2.121
331	2.618	2.246
332	2.743	2.371
333	2.868	2.496
334	2.993	2.621
335	3.118	2.746
336	3.243	2.871
337	3.368	2.996
338	3.493	3.121
339	3.619	3.246
340	3.743	3.371
341	3.868	3.496
342	3.993	3.621
343	4.118	3.746
344	4.243	3.871
345	4.368	3.996
346	4.493	4.121
347	4.618	4.246
348	4.743	4.371
349	4.868	4.496
	+.003 -.000	+.000 -.003
425	4.974	4.497
426	5.099	4.622
427	5.224	4.747
428	5.349	4.872
429	5.474	4.997
430	4.599	5.122
431	5.724	5.247
432	5.849	5.372
434	5.974	5.497
434	6.099	5.622

DASH NO.	A DIA.	F DIA.
	+.003 -.000	+.000 -.003
435	6.224	5.747
436	6.349	5.872
437	6.474	5.997
438	6.724	6.247
439	6.974	6.497
440	7.224	6.747
441	7.474	6.997
442	7.724	7.247
443	7.974	7.497
444	8.224	7.747
445	8.474	7.997
446	8.974	8.497
	+.004 -.000	+.000 -.004
447	9.474	8.997
448	9.974	9.497
449	10.474	9.997
450	10.974	10.497
451	11.474	10.997
452	11.974	11.497
453	12.474	11.997
454	12.974	12.497
455	13.474	12.997
456	13.974	13.497
457	14.474	13.997
458	14.974	14.497
459	15.474	14.997
460	15.974	15.497

DASH NO.	G_0 ZERO BACKUP WIDTH	R RADIUS	D DIAMETRAL CLEARANCE MAX.
004-009	.098/.103	.005/.015	.004
010-012	.094/.099		.004
013-028			.005
104-109	.141/.151	.005/.015	.004
110-126			.005
127-129			.005
130-132			.006
133-140			.006
141-149			.007
210-222	.188/.198	.010/.025	.005
223-224			.006
225-227			.006
228-243			.007
244-245			.008
246-247			.008
325-327	.281/.291	.020/.035	.006
328-329			.006
330-345			.007
346-349			.008
425-438	.375/.385	.020/.035	.009
439-445			.009
446			.010
447-460			.011

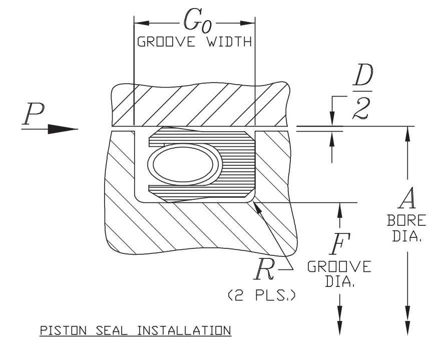
NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR VARISEAL® W2 IN AS4716 REVISION A PISTON GLANDS.
2. ORDERING EXAMPLE: PVJ 2 0 G 214 A T05 SM
   - VARISEAL® W2, PISTON DESIGNATOR
   - CROSS SECTION
     - 0 = 000 SERIES
     - 1 = 100 SERIES
     - 2 = 200 SERIES
     - 3 = 300 SERIES
     - 4 = 400 SERIES
   - DESIGN CHARACTERISTICS
     - SEE DESIGN CODES BELOW
   - GLAND STANDARD
     - G = AS4716
   - SIZE DESIGNATION
     - ACCORDING TO AS4716 REVISION A
   - QUALITY INDEX:
     - A = AEROSPACE CERTIFICATE OF CONFORMANCE
   - △3 TURCON® VARISEAL® W2 MAT'L CODE
   - SPRING MAT'L CODE - MEDIUM SPRING LOAD AS STANDARD

△3 FOR MATERIAL OPTIONS, SEE MATERIALS SECTION OF TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE. SPRING MATERIAL OPTIONS LISTED BELOW.

SPRING MATERIAL CODE MEDIUM DUTY AS STANDARD	
CODE	MATERIAL
S	301 STAINLESS STEEL
H	HASTELLOY
E	ELGILOY

4. †DASH SIZES -006 TO -028, -106 TO -128, AND -210 TO -221 REQUIRE SPLIT OR STEPPED GLAND CONFIGURATION, PLEASE CONSULT YOUR TRELLEBORG SEALING SOLUTIONS SALES ENGINEER FOR DETAILED INFORMATION.



PISTON SEAL INSTALLATION
FOR ZERO BACKUP WIDTH GLAND PER AS4716 REVISION A

INCH
2011_5
TRELLEBORG
SEALING SOLUTIONS
TITLE
VARISEAL® W2, PISTON
DRAWING NO.
PVJ20G000

WORLD AEROSPACE TITLE BLOCK REV.

DASH NO.	*A* DIA.	*F* DIA.
	+.001 -.000	+.000 -.001
†006	.235	.129
†007	.266	.158
†008	.297	.189
†009	.329	.220
†010	.360	.250
†011	.422	.312
†012	.485	.375
	+.002 -.000	+.000 -.002
†013	.550	.441
†014	.613	.504
†015	.675	.566
†016	.738	.629
†017	.800	.691
†018	.863	.753
019	.925	.815
020	.991	.881
021	1.053	.943
022	1.116	1.006
023	1.178	1.068
024	1.241	1.131
025	1.303	1.193
026	1.366	1.256
027	1.428	1.318
028	1.491	1.381
	+.001 -.000	+.000 -.001
†106	.360	.187
†107	.391	.215
†108	.422	.246
†109	.485	.308
	+.002 -.000	+.000 -.002
†110	.550	.379
†111	.613	.441
†112	.675	.502
†113	.738	.565
†114	.800	.627
†115	.863	.689
†116	.925	.751
†117	.991	.817
†118	1.053	.879
†119	1.116	.942
†120	1.178	1.003
†121	1.241	1.066
†122	1.303	1.128
†123	1.366	1.191
†124	1.428	1.253
†125	1.491	1.316
†126	1.553	1.378
†127	1.616	1.441
†128	1.678	1.503
129	1.741	1.566
130	1.805	1.631
131	1.867	1.693
132	1.930	1.756
133	1.992	1.818
134	2.055	1.881
135	2.118	1.944
136	2.180	2.006
137	2.243	2.069
138	2.305	2.131
139	2.368	2.194
140	2.430	2.256
141	2.493	2.319
142	2.555	2.381
143	2.618	2.444
144	2.680	2.506
145	2.743	2.569
146	2.805	2.631
147	2.868	2.694
148	2.930	2.756
149	2.993	2.819

DASH NO.	*A* DIA.	*F* DIA.
	+.002 -.000	+.000 -.002
†210	.991	.750
†211	1.053	.812
†212	1.116	.874
†213	1.178	.936
†214	1.241	.999
†215	1.303	1.061
†216	1.366	1.124
†217	1.428	1.186
†218	1.491	1.249
†219	1.553	1.311
†220	1.616	1.374
†221	1.678	1.436
222	1.741	1.499
223	1.867	1.625
224	1.992	1.750
225	2.118	1.876
226	2.243	2.001
227	2.368	2.126
228	2.493	2.251
229	2.618	2.376
230	2.743	2.501
231	2.868	2.626
232	2.993	2.751
233	3.118	2.876
234	3.243	3.001
235	3.368	3.126
236	3.493	3.251
237	3.618	3.376
238	3.743	3.501
239	3.868	3.626
240	3.993	3.751
241	4.118	3.876
242	4.243	4.001
243	4.368	4.126
244	4.493	4.251
245	4.618	4.376
246	4.743	4.501
247	4.868	4.626
	+.002 -.000	+.000 -.002
325	1.867	1.495
326	1.992	1.620
327	2.118	1.746
328	2.243	1.871
329	2.368	1.996
330	2.493	2.121
331	2.618	2.246
332	2.743	2.371
333	2.868	2.496
334	2.993	2.621
335	3.118	2.746
336	3.243	2.871
337	3.368	2.996
338	3.493	3.121
339	3.619	3.246
340	3.743	3.371
341	3.868	3.496
342	3.993	3.621
343	4.118	3.746
344	4.243	3.871
345	4.368	3.996
346	4.493	4.121
347	4.618	4.246
348	4.743	4.371
349	4.868	4.496
	+.003 -.000	+.000 -.003
425	4.974	4.497
426	5.099	4.622
427	5.224	4.747
428	5.349	4.872
429	5.474	4.997
430	4.599	5.122
431	5.724	5.247
432	5.849	5.372
434	5.974	5.497
434	6.099	5.622

DASH NO.	*A* DIA.	*F* DIA.
	+.003 -.000	+.000 -.003
435	6.224	5.747
436	6.349	5.872
437	6.474	5.997
438	6.724	6.247
439	6.974	6.497
440	7.224	6.747
441	7.474	6.997
442	7.724	7.247
443	7.974	7.497
444	8.224	7.747
445	8.474	7.997
446	8.974	8.497
	+.004 -.000	+.000 -.004
447	9.474	8.997
448	9.974	9.497
449	10.474	9.997
450	10.974	10.497
451	11.474	10.997
452	11.974	11.497
453	12.474	11.997
454	12.974	12.497
455	13.474	12.997
456	13.974	13.497
457	14.474	13.997
458	14.974	14.497
459	15.474	14.997
460	15.974	15.497

DASH NO.	G_1 ONE BACKUP WIDTH	*R* RADIUS	*D* DIAMETRAL CLEARANCE MAX.
004-009	.154/.164	.005/.015	.004
010-012	.150/.160		.004
013-028			.005
104-109	.183/.193	.005/.015	.004
110-126			.005
127-129			.005
130-132			.006
133-140			.006
141-149			.007
210-222	.235/.245	.010/.025	.005
223-224			.006
225-227			.006
228-243			.007
244-245			.008
246-247			.008
325-327	.334/.344	.020/.035	.006
328-329			.006
330-345			.007
346-349			.008
425-438	.475/.485	.020/.035	.009
439-445			.009
446			.010
447-460			.011

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR VARISEAL® W2 IN AS4716 REVISION A PISTON GLANDS.

2. ORDERING EXAMPLE: PVJ 2 B G 214 A T05 SM
   - VARISEAL® W2, PISTON DESIGNATOR — PVJ
   - CROSS SECTION — 2
     - 0 = 000 SERIES
     - 1 = 100 SERIES
     - 2 = 200 SERIES
     - 3 = 300 SERIES
     - 4 = 400 SERIES
   - △3 DESIGN CHARACTERISTICS — B
     - SEE DESIGN CODES BELOW
   - GLAND STANDARD — G
     - G = AS4716
   - SIZE DESIGNATION — 214
     - ACCORDING TO AS4716 REVISION A
   - QUALITY INDEX: — A
     - A = AEROSPACE CERTIFICATE OF CONFORMANCE
   - △4 TURCON® VARISEAL® W2 MAT'L CODE — T05
   - SPRING MAT'L CODE - MEDIUM SPRING LOAD AS STANDARD — SM

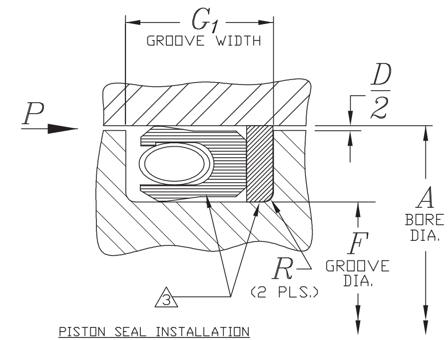
△4 FOR MATERIAL OPTIONS, SEE MATERIALS SECTION OF TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE. SPRING MATERIAL OPTIONS LISTED BELOW.

SPRING MATERIAL CODE MEDIUM DUTY AS STANDARD	
CODE	MATERIAL
S	301 STAINLESS STEEL
H	HASTELLOY
E	ELGILOY

5. †DASH SIZES -006 TO -028, -106 TO -128, AND -210 TO -221 REQUIRE SPLIT OR STEPPED GLAND CONFIGURATION, PLEASE CONSULT YOUR TRELLEBORG SEALING SOLUTIONS SALES ENGINEER FOR DETAILED INFORMATION.

△3 DESIGN CODES FOR CUT BACKUP RING CONFIGURATION ONE BACKUP WIDTH GLANDS

	BACKUP RING			
	TYPE	MATERIAL		
DESIGN CODE	SCARF CUT BACKUP RING	ZURCON® Z43	MATERIAL SAME AS SEAL RING	TURCON® T29
A	X	X		
B	X		X	
C	X			X



PISTON SEAL INSTALLATION

FOR ONE BACKUP WIDTH GLAND PER AS4716 REVISION A

INCH
2011_5
TRELLEBORG
SEALING SOLUTIONS
TITLE
VARISEAL® W2, PISTON
DRAWING NO.
PVJ2BG000

WORLD AEROSPACE TITLE BLOCK REV.

DASH NO.	A DIA.	F DIA.
	+.001 -.000	+.000 -.001
†006	.235	.129
†007	.266	.158
†008	.297	.189
†009	.329	.220
†010	.360	.250
†011	.422	.312
†012	.485	.375
	+.002 -.000	+.000 -.002
†013	.550	.441
†014	.613	.504
†015	.675	.566
†016	.738	.629
†017	.800	.691
†018	.863	.753
†019	.925	.815
†020	.991	.881
†021	1.053	.943
†022	1.116	1.006
†023	1.178	1.068
†024	1.241	1.131
†025	1.303	1.193
†026	1.366	1.256
†027	1.428	1.318
†028	1.491	1.381
	+.001 -.000	+.000 -.001
†106	.360	.187
†107	.391	.215
†108	.422	.246
†109	.485	.308
	+.002 -.000	+.000 -.002
†110	.550	.379
†111	.613	.441
†112	.675	.502
†113	.738	.565
†114	.800	.627
†115	.863	.689
†116	.925	.751
†117	.991	.817
†118	1.053	.879
†119	1.116	.942
†120	1.178	1.003
†121	1.241	1.066
†122	1.303	1.128
†123	1.366	1.191
†124	1.428	1.253
†125	1.491	1.316
†126	1.553	1.378
†127	1.616	1.441
†128	1.678	1.503
129	1.741	1.566
130	1.805	1.631
131	1.867	1.693
132	1.930	1.756
133	1.992	1.818
134	2.055	1.881
135	2.118	1.944
136	2.180	2.006
137	2.243	2.069
138	2.305	2.131
139	2.368	2.194
140	2.430	2.256
141	2.493	2.319
142	2.555	2.381
143	2.618	2.444
144	2.680	2.506
145	2.743	2.569
146	2.805	2.631
147	2.868	2.694
148	2.930	2.756
149	2.993	2.819
	+.002 -.000	+.000 -.002
†210	.991	.750
†211	1.053	.812
†212	1.116	.874
†213	1.178	.936
†214	1.241	.999
†215	1.303	1.061
†216	1.366	1.124
†217	1.428	1.186
†218	1.491	1.249
†219	1.553	1.311
†220	1.616	1.374
†221	1.678	1.436
222	1.741	1.499
223	1.867	1.625
224	1.992	1.750
225	2.118	1.876
226	2.243	2.001
227	2.368	2.126
228	2.493	2.251
229	2.618	2.376
230	2.743	2.501
231	2.868	2.626
232	2.993	2.751
233	3.118	2.876
234	3.243	3.001
235	3.368	3.126
236	3.493	3.251
237	3.618	3.376
238	3.743	3.501
239	3.868	3.626
240	3.993	3.751
241	4.118	3.876
242	4.243	4.001
243	4.368	4.126
244	4.493	4.251
245	4.618	4.376
246	4.743	4.501
247	4.868	4.626
	+.002 -.000	+.000 -.002
325	1.867	1.495
326	1.992	1.620
327	2.118	1.746
328	2.243	1.871
329	2.368	1.996
330	2.493	2.121
331	2.618	2.246
332	2.743	2.371
333	2.868	2.496
334	2.993	2.621
335	3.118	2.746
336	3.243	2.871
337	3.368	2.996
338	3.493	3.121
339	3.619	3.246
340	3.743	3.371
341	3.868	3.496
342	3.993	3.621
343	4.118	3.746
344	4.243	3.871
345	4.368	3.996
346	4.493	4.121
347	4.618	4.246
348	4.743	4.371
349	4.868	4.496
	+.003 -.000	+.000 -.003
425	4.974	4.497
426	5.099	4.622
427	5.224	4.747
428	5.349	4.872
429	5.474	4.997
430	4.599	5.122
431	5.724	5.247
432	5.849	5.372
434	5.974	5.497
434	6.099	5.622
	+.003 -.000	+.000 -.003
435	6.224	5.747
436	6.349	5.872
437	6.474	5.997
438	6.724	6.247
439	6.974	6.497
440	7.224	6.747
441	7.474	6.997
442	7.724	7.247
443	7.974	7.497
444	8.224	7.747
445	8.474	7.997
446	8.974	8.497
	+.004 -.000	+.000 -.004
447	9.474	8.997
448	9.974	9.497
449	10.474	9.997
450	10.974	10.497
451	11.474	10.997
452	11.974	11.497
453	12.474	11.997
454	12.974	12.497
455	13.474	12.997
456	13.974	13.497
457	14.474	13.997
458	14.974	14.497
459	15.474	14.997
460	15.974	15.497

DASH NO.	G_2 TWO BACKUP WIDTH	R RADIUS	D DIAMETRAL CLEARANCE MAX.
004-009	.210/.220	.005/.015	.004
010-012	.207/.217		.004
013-028			.005
104-109	.245/.255	.005/.015	.004
110-126			.005
127-129			.005
130-132			.006
133-140			.006
141-149			.007
210-222	.304/.314	.010/.025	.005
223-224			.006
225-227			.006
228-243			.007
244-245			.008
246-247			.008
325-327	.424/.434	.020/.035	.006
328-329			.006
330-345			.007
346-349			.008
425-438	.579/.589	.020/.035	.009
439-445			.009
446			.010
447-460			.011

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR VARISEAL®W2 IN AS4716 REVISION A PISTON GLANDS.
2. ORDERING EXAMPLE: PVJ 2 E G 214 A T05 SM

VARISEAL® W2, PISTON DESIGNATOR
CROSS SECTION
  0 = 000 SERIES
  1 = 100 SERIES
  2 = 200 SERIES
  3 = 300 SERIES
  4 = 400 SERIES
△3 DESIGN CHARACTERISTICS
  SEE DESIGN CODES BELOW
GLAND STANDARD
  G = AS4716
SIZE DESIGNATION
  ACCORDING TO AS4716 REVISION A
QUALITY INDEX:
  A = AEROSPACE CERTIFICATE OF CONFORMANCE
△4 TURCON®VARISEAL®W2 MAT'L CODE
SPRING MAT'L CODE - MEDIUM SPRING LOAD
AS STANDARD

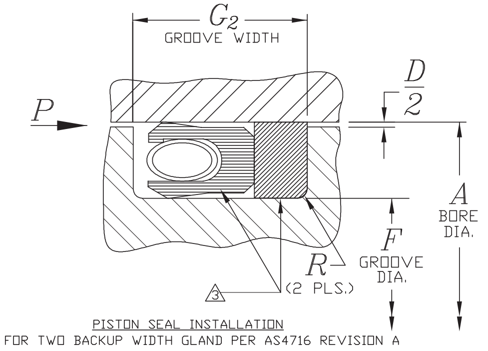
△4 FOR MATERIAL OPTIONS, SEE MATERIALS SECTION OF TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE. SPRING MATERIAL OPTIONS LISTED BELOW.

SPRING MATERIAL CODE MEDIUM DUTY AS STANDARD	
CODE	MATERIAL
S	301 STAINLESS STEEL
H	HASTELLOY
E	ELGILOY

5. †DASH SIZES -006 TO -028, -106 TO -128, AND -210 TO -221 REQUIRE SPLIT OR STEPPED GLAND CONFIGURATION, PLEASE CONSULT YOUR TRELLEBORG SEALING SOLUTIONS SALES ENGINEER FOR DETAILED INFORMATION.

△3 DESIGN CODES FOR CUT BACKUP RING CONFIGURATION TWO BACKUP WIDTH GLANDS

	BACKUP RING			
	TYPE	MATERIAL		
DESIGN CODE	SCARF CUT BACKUP RING	ZURCON® Z43	MATERIAL SAME AS SEAL RING	TURCON® T29
D	X	X		
E	X		X	
F	X			X



PISTON SEAL INSTALLATION
FOR TWO BACKUP WIDTH GLAND PER AS4716 REVISION A

This uncontrolled document discloses information and data in which the Trelleborg Sealing Solutions has proprietary rights. Neither receipt nor possession thereof confers or transfers any right to reproduce, use or disclose in whole or in part except by written permission from Trelleborg Sealing Solutions. Trelleborg Sealing Solutions cannot be held responsible for printing errors etc.

INCH
2011_5
TITLE
VARISEAL®W2, PISTON
TRELLEBORG
SEALING SOLUTIONS
DRAWING NO.
PVJ2EG000

WORLD AEROSPACE TITLE BLOCK REV.

DASH NO.	*A* DIA.	*F* DIA.
	+.001 −.000	+.000 −.001
†006	.235	.129
†007	.266	.158
†008	.297	.189
†009	.329	.220
†010	.360	.250
†011	.422	.312
†012	.485	.375
	+.002 −.000	+.000 −.002
†013	.550	.441
†014	.613	.504
†015	.675	.566
†016	.738	.629
†017	.800	.691
†018	.863	.753
†019	.925	.815
†020	.991	.881
†021	1.053	.943
†022	1.116	1.006
†023	1.178	1.068
†024	1.241	1.131
†025	1.303	1.193
†026	1.366	1.256
†027	1.428	1.318
†028	1.491	1.381
	+.001 −.000	+.000 −.001
†106	.360	.187
†107	.391	.215
†108	.422	.246
†109	.485	.308
	+.002 −.000	+.000 −.002
†110	.550	.379
†111	.613	.441
†112	.675	.502
†113	.738	.565
†114	.800	.627
†115	.863	.689
†116	.925	.751
†117	.991	.817
†118	1.053	.879
†119	1.116	.942
†120	1.178	1.003
†121	1.241	1.066
†122	1.303	1.128
†123	1.366	1.191
†124	1.428	1.253
†125	1.491	1.316
†126	1.553	1.378
†127	1.616	1.441
†128	1.678	1.503
129	1.741	1.566
130	1.805	1.631
131	1.867	1.693
132	1.930	1.756
133	1.992	1.818
134	2.055	1.881
135	2.118	1.944
136	2.180	2.006
137	2.243	2.069
138	2.305	2.131
139	2.368	2.194
140	2.430	2.256
141	2.493	2.319
142	2.555	2.381
143	2.618	2.444
144	2.680	2.506
145	2.743	2.569
146	2.805	2.631
147	2.868	2.694
148	2.930	2.756
149	2.993	2.819

DASH NO.	*A* DIA.	*F* DIA.
	+.002 −.000	+.000 −.002
†210	.991	.750
†211	1.053	.812
†212	1.116	.874
†213	1.178	.936
†214	1.241	.999
†215	1.303	1.061
†216	1.366	1.124
†217	1.428	1.186
†218	1.491	1.249
†219	1.553	1.311
†220	1.616	1.374
†221	1.678	1.436
222	1.741	1.499
223	1.867	1.625
224	1.992	1.750
225	2.118	1.876
226	2.243	2.001
227	2.368	2.126
228	2.493	2.251
229	2.618	2.376
230	2.743	2.501
231	2.868	2.626
232	2.993	2.751
233	3.118	2.876
234	3.243	3.001
235	3.368	3.126
236	3.493	3.251
237	3.618	3.376
238	3.743	3.501
239	3.868	3.626
240	3.993	3.751
241	4.118	3.876
242	4.243	4.001
243	4.368	4.126
244	4.493	4.251
245	4.618	4.376
246	4.743	4.501
247	4.868	4.626
	+.002 −.000	+.000 −.002
325	1.867	1.495
326	1.992	1.620
327	2.118	1.746
328	2.243	1.871
329	2.368	1.996
330	2.493	2.121
331	2.618	2.246
332	2.743	2.371
333	2.868	2.496
334	2.993	2.621
335	3.118	2.746
336	3.243	2.871
337	3.368	2.996
338	3.493	3.121
339	3.619	3.246
340	3.743	3.371
341	3.868	3.496
342	3.993	3.621
343	4.118	3.746
344	4.243	3.871
345	4.368	3.996
346	4.493	4.121
347	4.618	4.246
348	4.743	4.371
349	4.868	4.496
	+.003 −.000	+.000 −.003
425	4.974	4.497
426	5.099	4.622
427	5.224	4.747
428	5.349	4.872
429	5.474	4.997
430	4.599	5.122
431	5.724	5.247
432	5.849	5.372
434	5.974	5.497
434	6.099	5.622

DASH NO.	*A* DIA.	*F* DIA.
	+.003 −.000	+.000 −.003
435	6.224	5.747
436	6.349	5.872
437	6.474	5.997
438	6.724	6.247
439	6.974	6.497
440	7.224	6.747
441	7.474	6.997
442	7.724	7.247
443	7.974	7.497
444	8.224	7.747
445	8.474	7.997
446	8.974	8.497
	+.004 −.000	+.000 −.004
447	9.474	8.997
448	9.974	9.497
449	10.474	9.997
450	10.974	10.497
451	11.474	10.997
452	11.974	11.497
453	12.474	11.997
454	12.974	12.497
455	13.474	12.997
456	13.974	13.497
457	14.474	13.997
458	14.974	14.497
459	15.474	14.997
460	15.974	15.497

DASH NO.	*G₀* ZERO BACKUP WIDTH	*R* RADIUS	*D* DIAMETRAL CLEARANCE MAX.
004-009	.098/.103	.005/.015	.004
010-012	.094/.099		.004
013-028			.005
104-109	.141/.151	.005/.015	.004
110-126			.005
127-129			.005
130-132			.006
133-140			.006
141-149			.007
210-222	.188/.198	.010/.025	.005
223-224			.006
225-227			.006
228-243			.007
244-245			.008
246-247			.008
325-327	.281/.291	.020/.035	.006
328-329			.006
330-345			.007
346-349			.008
425-438	.375/.385	.020/.035	.009
439-445			.009
446			.010
447-460			.011

NOTES:

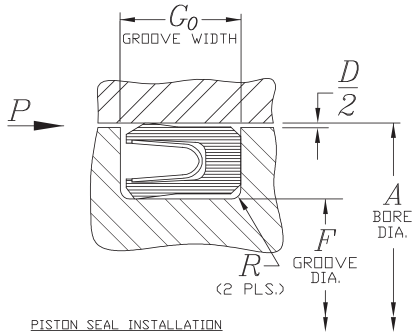
1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR VARISEAL® M2 IN AS4716 REVISION A PISTON GLANDS.

2. ORDERING EXAMPLE: PVA 2 0 G 214 A T05 SM
   - VARISEAL® M2, PISTON DESIGNATOR
   - CROSS SECTION
     - 0 = 000 SERIES
     - 1 = 100 SERIES
     - 2 = 200 SERIES
     - 3 = 300 SERIES
     - 4 = 400 SERIES
   - DESIGN CHARACTERISTICS
     - 0 = STANDARD
   - GLAND STANDARD
     - G = AS4716
   - SIZE DESIGNATION ACCORDING TO AS4716 REVISION A
   - QUALITY INDEX:
     - A = AEROSPACE CERTIFICATE OF CONFORMANCE
   - △3 TURCON® VARISEAL® M2 MAT'L CODE
   - SPRING MAT'L CODE – MEDIUM SPRING LOAD AS STANDARD

△3 FOR MATERIAL OPTIONS, SEE MATERIALS SECTION OF TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE. SPRING MATERIAL OPTIONS LISTED BELOW.

SPRING MATERIAL CODE MEDIUM DUTY AS STANDARD	
CODE	MATERIAL
S	301 STAINLESS STEEL
H	HASTELLOY
E	ELGILOY

4. †DASH SIZES -006 TO -028, -106 TO -128, AND -210 TO -221 REQUIRE SPLIT OR STEPPED GLAND CONFIGURATION, PLEASE CONSULT YOUR TRELLEBORG SEALING SOLUTIONS SALES ENGINEER FOR DETAILED INFORMATION.



PISTON SEAL INSTALLATION
FOR ZERO BACKUP WIDTH GLAND PER AS4716 REVISION A

INCH	2011_6
TRELLEBORG SEALING SOLUTIONS	TITLE VARISEAL® M2, PISTON
	DRAWING NO. PVA20G000

WORLD AEROSPACE TITLE BLOCK REV.

DASH NO.	A DIA.	F DIA.
	+.001 -.000	+.000 -.001
†006	.235	.129
†007	.266	.158
†008	.297	.189
†009	.329	.220
†010	.360	.250
†011	.422	.312
†012	.485	.375
	+.002 -.000	+.000 -.002
†013	.550	.441
†014	.613	.504
†015	.675	.566
†016	.738	.629
†017	.800	.691
†018	.863	.753
†019	.925	.815
†020	.991	.881
†021	1.053	.943
†022	1.116	1.006
†023	1.178	1.068
†024	1.241	1.131
†025	1.303	1.193
†026	1.366	1.256
†027	1.428	1.318
†028	1.491	1.381
	+.001 -.000	+.000 -.001
†106	.360	.187
†107	.391	.215
†108	.422	.246
†109	.485	.308
	+.002 -.000	+.000 -.002
†110	.550	.379
†111	.613	.441
†112	.675	.502
†113	.738	.565
†114	.800	.627
†115	.863	.689
†116	.925	.751
†117	.991	.817
†118	1.053	.879
†119	1.116	.942
†120	1.178	1.003
†121	1.241	1.066
†122	1.303	1.128
†123	1.366	1.191
†124	1.428	1.253
†125	1.491	1.316
†126	1.553	1.378
†127	1.616	1.441
†128	1.678	1.503
129	1.741	1.566
130	1.805	1.631
131	1.867	1.693
132	1.930	1.756
133	1.992	1.818
134	2.055	1.881
135	2.118	1.944
136	2.180	2.006
137	2.243	2.069
138	2.305	2.131
139	2.368	2.194
140	2.430	2.256
141	2.493	2.319
142	2.555	2.381
143	2.618	2.444
144	2.680	2.506
145	2.743	2.569
146	2.805	2.631
147	2.868	2.694
148	2.930	2.756
149	2.993	2.819

DASH NO.	A DIA.	F DIA.
	+.002 -.000	+.000 -.002
†210	.991	.750
†211	1.053	.812
†212	1.116	.874
†213	1.178	.936
†214	1.241	.999
†215	1.303	1.061
†216	1.366	1.124
†217	1.428	1.186
†218	1.491	1.249
†219	1.553	1.311
†220	1.616	1.374
†221	1.678	1.436
222	1.741	1.499
223	1.867	1.625
224	1.992	1.750
225	2.118	1.876
226	2.243	2.001
227	2.368	2.126
228	2.493	2.251
229	2.618	2.376
230	2.743	2.501
231	2.868	2.626
232	2.993	2.751
233	3.118	2.876
234	3.243	3.001
235	3.368	3.126
236	3.493	3.251
237	3.618	3.376
238	3.743	3.501
239	3.868	3.626
240	3.993	3.751
241	4.118	3.876
242	4.243	4.001
243	4.368	4.126
244	4.493	4.251
245	4.618	4.376
246	4.743	4.501
247	4.868	4.626
	+.002 -.000	+.000 -.002
325	1.867	1.495
326	1.992	1.620
327	2.118	1.746
328	2.243	1.871
329	2.368	1.996
330	2.493	2.121
331	2.618	2.246
332	2.743	2.371
333	2.868	2.496
334	2.993	2.621
335	3.118	2.746
336	3.243	2.871
337	3.368	2.996
338	3.493	3.121
339	3.619	3.246
340	3.743	3.371
341	3.868	3.496
342	3.993	3.621
343	4.118	3.746
344	4.243	3.871
345	4.368	3.996
346	4.493	4.121
347	4.618	4.246
348	4.743	4.371
349	4.868	4.496
	+.003 -.000	+.000 -.003
425	4.974	4.497
426	5.099	4.622
427	5.224	4.747
428	5.349	4.872
429	5.474	4.997
430	4.599	5.122
431	5.724	5.247
432	5.849	5.372
434	5.974	5.497
434	6.099	5.622

DASH NO.	A DIA.	F DIA.
	+.003 -.000	+.000 -.003
435	6.224	5.747
436	6.349	5.872
437	6.474	5.997
438	6.724	6.247
439	6.974	6.497
440	7.224	6.747
441	7.474	6.997
442	7.724	7.247
443	7.974	7.497
444	8.224	7.747
445	8.474	7.997
446	8.974	8.497
	+.004 -.000	+.000 -.004
447	9.474	8.997
448	9.974	9.497
449	10.474	9.997
450	10.974	10.497
451	11.474	10.997
452	11.974	11.497
453	12.474	11.997
454	12.974	12.497
455	13.474	12.997
456	13.974	13.497
457	14.474	13.997
458	14.974	14.497
459	15.474	14.997
460	15.974	15.497

DASH NO.	G_1 ONE BACKUP WIDTH	R RADIUS	D DIAMETRAL CLEARANCE MAX.
004-009	.154/.164	.005/.015	.004
010-012	.150/.160		.004
013-028			.005
104-109	.183/.193	.005/.015	.004
110-126			.005
127-129			.005
130-132			.006
133-140			.006
141-149			.007
210-222	.235/.245	.010/.025	.005
223-224			.006
225-227			.006
228-243			.007
244-245			.008
246-247			.008
325-327	.334/.344	.020/.035	.006
328-329			.006
330-345			.007
346-349			.008
425-438	.475/.485	.020/.035	.009
439-445			.009
446			.010
447-460			.011

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR VARISEAL® M2 IN AS4716 REVISION A PISTON GLANDS.

2. ORDERING EXAMPLE: PVA 2 B G 214 A T05 SM
   VARISEAL® M2, PISTON DESIGNATOR
   CROSS SECTION
   0 = 000 SERIES
   1 = 100 SERIES
   2 = 200 SERIES
   3 = 300 SERIES
   4 = 400 SERIES
   △3 DESIGN CHARACTERISTICS
   SEE DESIGN CODES BELOW
   GLAND STANDARD
   G = AS4716
   SIZE DESIGNATION
   ACCORDING TO AS4716 REVISION A
   QUALITY INDEX:
   A = AEROSPACE CERTIFICATE OF CONFORMANCE
   △4 TURCON® VARISEAL® M2 MAT'L CODE
   SPRING MAT'L CODE - MEDIUM SPRING LOAD
   AS STANDARD

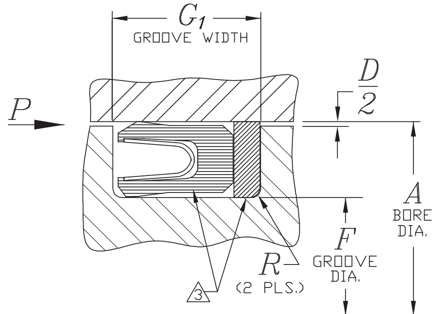
△4 FOR MATERIAL OPTIONS, SEE MATERIALS SECTION OF TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE. SPRING MATERIAL OPTIONS LISTED BELOW.

SPRING MATERIAL CODE MEDIUM DUTY AS STANDARD	
CODE	MATERIAL
S	301 STAINLESS STEEL
H	HASTELLOY
E	ELGILOY

5. †DASH SIZES -006 TO -028, -106 TO -128, AND -210 TO -221 REQUIRE SPLIT OR STEPPED GLAND CONFIGURATION, PLEASE CONSULT YOUR TRELLEBORG SEALING SOLUTIONS SALES ENGINEER FOR DETAILED INFORMATION.

△3 DESIGN CODES FOR CUT BACKUP RING CONFIGURATION ONE BACKUP WIDTH GLANDS

	BACKUP RING			
	TYPE	MATERIAL		
DESIGN CODE	SCARF CUT, BACKUP RING	ZURCON® Z43	MATERIAL SAME AS SEAL RING	TURCON® T29
A	X	X		
B	X		X	
C	X			X



PISTON SEAL INSTALLATION

FOR ONE BACKUP WIDTH GLAND PER AS4716 REVISION A

INCH	2011_6
TRELLEBORG SEALING SOLUTIONS	TITLE VARISEAL® M2, PISTON DRAWING NO. PVA2BG000

WORLD AEROSPACE TITLE BLOCK REV.

Turcon® Variseal®

DASH NO.	*A* DIA.	*F* DIA.
	+.001 -.000	+.000 -.001
†006	.235	.129
†007	.266	.158
†008	.297	.189
†009	.329	.220
†010	.360	.250
†011	.422	.312
†012	.485	.375
	+.002 -.000	+.000 -.002
†013	.550	.441
†014	.613	.504
†015	.675	.566
†016	.738	.629
†017	.800	.691
†018	.863	.753
†019	.925	.815
†020	.991	.881
†021	1.053	.943
†022	1.116	1.006
†023	1.178	1.068
†024	1.241	1.131
†025	1.303	1.193
†026	1.366	1.256
†027	1.428	1.318
†028	1.491	1.381
	+.001 -.000	+.000 -.001
†106	.360	.187
†107	.391	.215
†108	.422	.246
†109	.485	.308
	+.002 -.000	+.000 -.002
†110	.550	.379
†111	.613	.441
†112	.675	.502
†113	.738	.565
†114	.800	.627
†115	.863	.689
†116	.925	.751
†117	.991	.817
†118	1.053	.879
†119	1.116	.942
†120	1.178	1.003
†121	1.241	1.066
†122	1.303	1.128
†123	1.366	1.191
†124	1.428	1.253
†125	1.491	1.316
†126	1.553	1.378
†127	1.616	1.441
†128	1.678	1.503
129	1.741	1.566
130	1.805	1.631
131	1.867	1.693
132	1.930	1.756
133	1.992	1.818
134	2.055	1.881
135	2.118	1.944
136	2.180	2.006
137	2.243	2.069
138	2.305	2.131
139	2.368	2.194
140	2.430	2.256
141	2.493	2.319
142	2.555	2.381
143	2.618	2.444
144	2.680	2.506
145	2.743	2.569
146	2.805	2.631
147	2.868	2.694
148	2.930	2.756
149	2.993	2.819

DASH NO.	*A* DIA.	*F* DIA.
	+.002 -.000	+.000 -.002
†210	.991	.750
†211	1.053	.812
†212	1.116	.874
†213	1.178	.936
†214	1.241	.999
†215	1.303	1.061
†216	1.366	1.124
†217	1.428	1.186
†218	1.491	1.249
†219	1.553	1.311
†220	1.616	1.374
†221	1.678	1.436
222	1.741	1.499
223	1.867	1.625
224	1.992	1.750
225	2.118	1.876
226	2.243	2.001
227	2.368	2.126
228	2.493	2.251
229	2.618	2.376
230	2.743	2.501
231	2.868	2.626
232	2.993	2.751
233	3.118	2.876
234	3.243	3.001
235	3.368	3.126
236	3.493	3.251
237	3.618	3.376
238	3.743	3.501
239	3.868	3.626
240	3.993	3.751
241	4.118	3.876
242	4.243	4.001
243	4.368	4.126
244	4.493	4.251
245	4.618	4.376
246	4.743	4.501
247	4.868	4.626
	+.002 -.000	+.000 -.002
325	1.867	1.495
326	1.992	1.620
327	2.118	1.746
328	2.243	1.871
329	2.368	1.996
330	2.493	2.121
331	2.618	2.246
332	2.743	2.371
333	2.868	2.496
334	2.993	2.621
335	3.118	2.746
336	3.243	2.871
337	3.368	2.996
338	3.493	3.121
339	3.619	3.246
340	3.743	3.371
341	3.868	3.496
342	3.993	3.621
343	4.118	3.746
344	4.243	3.871
345	4.368	3.996
346	4.493	4.121
347	4.618	4.246
348	4.743	4.371
349	4.868	4.496
	+.003 -.000	+.000 -.003
425	4.974	4.497
426	5.099	4.622
427	5.224	4.747
428	5.349	4.872
429	5.474	4.997
430	4.599	5.122
431	5.724	5.247
432	5.849	5.372
434	5.974	5.497
434	6.099	5.622

DASH NO.	*A* DIA.	*F* DIA.
	+.003 -.000	+.000 -.003
435	6.224	5.747
436	6.349	5.872
437	6.474	5.997
438	6.724	6.247
439	6.974	6.497
440	7.224	6.747
441	7.474	6.997
442	7.724	7.247
443	7.974	7.497
444	8.224	7.747
445	8.474	7.997
446	8.974	8.497
	+.004 -.000	+.000 -.004
447	9.474	8.997
448	9.974	9.497
449	10.474	9.997
450	10.974	10.497
451	11.474	10.997
452	11.974	11.497
453	12.474	11.997
454	12.974	12.497
455	13.474	12.997
456	13.974	13.497
457	14.474	13.997
458	14.974	14.497
459	15.474	14.997
460	15.974	15.497

DASH NO.	G_2 TWO BACKUP WIDTH	*R* RADIUS	*D* DIAMETRAL CLEARANCE MAX.
004-009	.210/.220	.005/.015	.004
010-012	.207/.217		.004
013-028			.005
104-109	.245/.255	.005/.015	.004
110-126			.005
127-129			.005
130-132			.006
133-140			.006
141-149			.007
210-222	.304/.314	.010/.025	.005
223-224			.006
225-227			.006
228-243			.007
244-245			.008
246-247			.008
325-327	.424/.434	.020/.035	.006
328-329			.006
330-345			.007
346-349			.008
425-438	.579/.589	.020/.035	.009
439-445			.009
446			.010
447-460			.011

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR VARISEAL® M2 IN AS4716 REVISION A PISTON GLANDS.

2. ORDERING EXAMPLE: PVA 2 E G 214 A T05 SM
   - VARISEAL® M2, PISTON DESIGNATOR
   - CROSS SECTION
     - 0 = 000 SERIES
     - 1 = 100 SERIES
     - 2 = 200 SERIES
     - 3 = 300 SERIES
     - 4 = 400 SERIES
   - △3 DESIGN CHARACTERISTICS
     SEE DESIGN CODES BELOW
   - GLAND STANDARD
     G = AS4716
   - SIZE DESIGNATION
     ACCORDING TO AS4716 REVISION A
   - QUALITY INDEX:
     A = AEROSPACE CERTIFICATE OF CONFORMANCE
   - △4 TURCON® VARISEAL® M2 MAT'L CODE
   - SPRING MAT'L CODE - MEDIUM SPRING LOAD
     AS STANDARD

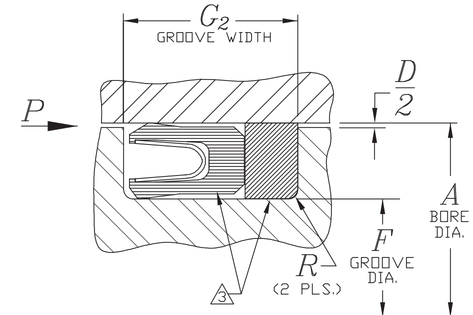
△4 FOR MATERIAL OPTIONS, SEE MATERIALS SECTION OF TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE. SPRING MATERIAL OPTIONS LISTED BELOW.

SPRING MATERIAL CODE MEDIUM DUTY AS STANDARD	
CODE	MATERIAL
S	301 STAINLESS STEEL
H	HASTELLOY
E	ELGILOY

5. †DASH SIZES -006 TO -028, -106 TO -128, AND -210 TO -221 REQUIRE SPLIT OR STEPPED GLAND CONFIGURATION, PLEASE CONSULT YOUR TRELLEBORG SEALING SOLUTIONS SALES ENGINEER FOR DETAILED INFORMATION.

△3 DESIGN CODES FOR CUT BACKUP RING CONFIGURATION TWO BACKUP WIDTH GLANDS

	BACKUP RING			
	TYPE	MATERIAL		
DESIGN CODE	SCARF CUT, BACKUP RING	ZURCON® Z43	MATERIAL SAME AS SEAL RING	TURCON® T29
D	X	X		
E	X		X	
F	X			X



PISTON SEAL INSTALLATION
FOR TWO BACKUP WIDTH GLAND PER AS4716 REVISION A

INCH	2011_6
TRELLEBORG SEALING SOLUTIONS	TITLE VARISEAL® M2, PISTON
	DRAWING NO. PVA2EG000

WORLD AEROSPACE TITLE BLOCK REV.

DASH NO.	*A* DIA.	*F* DIA.
	+.001 -.000	+.000 -.001
†006	.235	.129
†007	.266	.158
†008	.297	.189
†009	.329	.220
†010	.360	.250
†011	.422	.312
†012	.485	.375
	+.002 -.000	+.000 -.002
†013	.550	.441
†014	.613	.504
†015	.675	.566
†016	.738	.629
†017	.800	.691
†018	.863	.753
†019	.925	.815
†020	.991	.881
†021	1.053	.943
†022	1.116	1.006
†023	1.178	1.068
†024	1.241	1.131
†025	1.303	1.193
†026	1.366	1.256
†027	1.428	1.318
†028	1.491	1.381
	+.001 -.000	+.000 -.001
†106	.360	.187
†107	.391	.215
†108	.422	.246
†109	.485	.308
	+.002 -.000	+.000 -.002
†110	.550	.379
†111	.613	.441
†112	.675	.502
†113	.738	.565
†114	.800	.627
†115	.863	.689
†116	.925	.751
†117	.991	.817
†118	1.053	.879
†119	1.116	.942
†120	1.178	1.003
†121	1.241	1.066
†122	1.303	1.128
†123	1.366	1.191
†124	1.428	1.253
†125	1.491	1.316
†126	1.553	1.378
†127	1.616	1.441
†128	1.678	1.503
129	1.741	1.566
130	1.805	1.631
131	1.867	1.693
132	1.930	1.756
133	1.992	1.818
134	2.055	1.881
135	2.118	1.944
136	2.180	2.006
137	2.243	2.069
138	2.305	2.131
139	2.368	2.194
140	2.430	2.256
141	2.493	2.319
142	2.555	2.381
143	2.618	2.444
144	2.680	2.506
145	2.743	2.569
146	2.805	2.631
147	2.868	2.694
148	2.930	2.756
149	2.993	2.819

DASH NO.	*A* DIA.	*F* DIA.
	+.002 -.000	+.000 -.002
†210	.991	.750
†211	1.053	.812
†212	1.116	.874
†213	1.178	.936
†214	1.241	.999
†215	1.303	1.061
†216	1.366	1.124
†217	1.428	1.186
†218	1.491	1.249
†219	1.553	1.311
†220	1.616	1.374
†221	1.678	1.436
222	1.741	1.499
223	1.867	1.625
224	1.992	1.750
225	2.118	1.876
226	2.243	2.001
227	2.368	2.126
228	2.493	2.251
229	2.618	2.376
230	2.743	2.501
231	2.868	2.626
232	2.993	2.751
233	3.118	2.876
234	3.243	3.001
235	3.368	3.126
236	3.493	3.251
237	3.618	3.376
238	3.743	3.501
239	3.868	3.626
240	3.993	3.751
241	4.118	3.876
242	4.243	4.001
243	4.368	4.126
244	4.493	4.251
245	4.618	4.376
246	4.743	4.501
247	4.868	4.626
	+.002 -.000	+.000 -.002
325	1.867	1.495
326	1.992	1.620
327	2.118	1.746
328	2.243	1.871
329	2.368	1.996
330	2.493	2.121
331	2.618	2.246
332	2.743	2.371
333	2.868	2.496
334	2.993	2.621
335	3.118	2.746
336	3.243	2.871
337	3.368	2.996
338	3.493	3.121
339	3.619	3.246
340	3.743	3.371
341	3.868	3.496
342	3.993	3.621
343	4.118	3.746
344	4.243	3.871
345	4.368	3.996
346	4.493	4.121
347	4.618	4.246
348	4.743	4.371
349	4.868	4.496
	+.003 -.000	+.000 -.003
425	4.974	4.497
426	5.099	4.622
427	5.224	4.747
428	5.349	4.872
429	5.474	4.997
430	4.599	5.122
431	5.724	5.247
432	5.849	5.372
434	5.974	5.497
434	6.099	5.622

DASH NO.	*A* DIA.	*F* DIA.
	+.003 -.000	+.000 -.003
435	6.224	5.747
436	6.349	5.872
437	6.474	5.997
438	6.724	6.247
439	6.974	6.497
440	7.224	6.747
441	7.474	6.997
442	7.724	7.247
443	7.974	7.497
444	8.224	7.747
445	8.474	7.997
446	8.974	8.497
	+.004 -.000	+.000 -.004
447	9.474	8.997
448	9.974	9.497
449	10.474	9.997
450	10.974	10.497
451	11.474	10.997
452	11.974	11.497
453	12.474	11.997
454	12.974	12.497
455	13.474	12.997
456	13.974	13.497
457	14.474	13.997
458	14.974	14.497
459	15.474	14.997
460	15.974	15.497

DASH NO.	G_0 ZERO BACKUP WIDTH	*R* RADIUS	*D* DIAMETRAL CLEARANCE MAX.
004-009	.098/.103	.005/.015	.004
010-012	.094/.099		.004
013-028			.005
104-109	.141/.151	.005/.015	.004
110-126			.005
127-129			.005
130-132			.006
133-140			.006
141-149			.007
210-222	.188/.198	.010/.025	.005
223-224			.006
225-227			.006
228-243			.007
244-245			.008
246-247			.008
325-327	.281/.291	.020/.035	.006
328-329			.006
330-345			.007
346-349			.008
425-438	.375/.385	.020/.035	.009
439-445			.009
446			.010
447-460			.011

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR VARISEAL® H IN AS4716 REVISION A PISTON GLANDS.

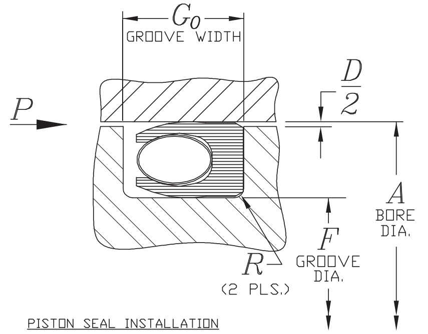
2. ORDERING EXAMPLE PVE 2 0 G 214 A T05 SM
   - VARISEAL® H, PISTON DESIGNATOR
   - CROSS SECTION
     - 0 = 000 SERIES
     - 1 = 100 SERIES
     - 2 = 200 SERIES
     - 3 = 300 SERIES
     - 4 = 400 SERIES
   - DESIGN CHARACTERISTICS
     - 0 = STANDARD
   - GLAND STANDARD
     - G = AS4716
   - SIZE DESIGNATION
     - ACCORDING TO AS4716 REVISION A
   - QUALITY INDEX:
     - A = AEROSPACE CERTIFICATE OF CONFORMANCE
   - △3 TURCON® VARISEAL® H MAT'L CODE
   - SPRING MAT'L CODE - MEDIUM SPRING LOAD AS STANDARD

△3 FOR MATERIAL OPTIONS, SEE MATERIALS SECTION OF TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE. SPRING MATERIAL OPTIONS LISTED BELOW.

SPRING MATERIAL CODE
MEDIUM DUTY AS STANDARD

CODE	MATERIAL
S	301 STAINLESS STEEL
H	HASTELLOY
E	ELGILOY

4. †DASH SIZES -006 TO -028, -106 TO -128, AND -210 TO -221 REQUIRE SPLIT OR STEPPED GLAND CONFIGURATION, PLEASE CONSULT YOUR TRELLEBORG SEALING SOLUTIONS SALES ENGINEER FOR DETAILED INFORMATION.



PISTON SEAL INSTALLATION
FOR ZERO BACKUP WIDTH GLAND PER AS4716 REVISION A

INCH
2011_6
TRELLEBORG
SEALING SOLUTIONS
TITLE
VARISEAL® H, PISTON
DRAWING NO.
PVE20G000

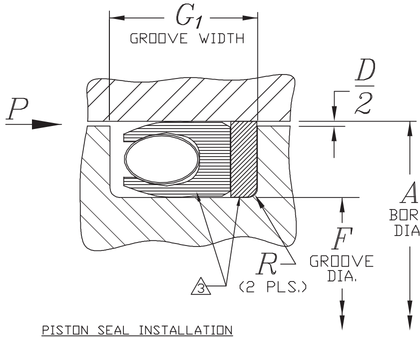
WORLD AEROSPACE TITLE BLOCK REV.

DASH NO.	A DIA.	F DIA.
	+.001 −.000	+.000 −.001
†006	.235	.129
†007	.266	.158
†008	.297	.189
†009	.329	.220
†010	.360	.250
†011	.422	.312
†012	.485	.375
	+.002 −.000	+.000 −.002
†013	.550	.441
†014	.613	.504
†015	.675	.566
†016	.738	.629
†017	.800	.691
†018	.863	.753
†019	.925	.815
†020	.991	.881
†021	1.053	.943
†022	1.116	1.006
†023	1.178	1.068
†024	1.241	1.131
†025	1.303	1.193
†026	1.366	1.256
†027	1.428	1.318
†028	1.491	1.381
	+.001 −.000	+.000 −.001
†106	.360	.187
†107	.391	.215
†108	.422	.246
†109	.485	.308
	+.002 −.000	+.000 −.002
†110	.550	.379
†111	.613	.441
†112	.675	.502
†113	.738	.565
†114	.800	.627
†115	.863	.689
†116	.925	.751
†117	.991	.817
†118	1.053	.879
†119	1.116	.942
†120	1.178	1.003
†121	1.241	1.066
†122	1.303	1.128
†123	1.366	1.191
†124	1.428	1.253
†125	1.491	1.316
†126	1.553	1.378
†127	1.616	1.441
†128	1.678	1.503
129	1.741	1.566
130	1.805	1.631
131	1.867	1.693
132	1.930	1.756
133	1.992	1.818
134	2.055	1.881
135	2.118	1.944
136	2.180	2.006
137	2.243	2.069
138	2.305	2.131
139	2.368	2.194
140	2.430	2.256
141	2.493	2.319
142	2.555	2.381
143	2.618	2.444
144	2.680	2.506
145	2.743	2.569
146	2.805	2.631
147	2.868	2.694
148	2.930	2.756
149	2.993	2.819

DASH NO.	A DIA.	F DIA.
	+.002 −.000	+.000 −.002
†210	.991	.750
†211	1.053	.812
†212	1.116	.874
†213	1.178	.936
†214	1.241	.999
†215	1.303	1.061
†216	1.366	1.124
†217	1.428	1.186
†218	1.491	1.249
†219	1.553	1.311
†220	1.616	1.374
†221	1.678	1.436
222	1.741	1.499
223	1.867	1.625
224	1.992	1.750
225	2.118	1.876
226	2.243	2.001
227	2.368	2.126
228	2.493	2.251
229	2.618	2.376
230	2.743	2.501
231	2.868	2.626
232	2.993	2.751
233	3.118	2.876
234	3.243	3.001
235	3.368	3.126
236	3.493	3.251
237	3.618	3.376
238	3.743	3.501
239	3.868	3.626
240	3.993	3.751
241	4.118	3.876
242	4.243	4.001
243	4.368	4.126
244	4.493	4.251
245	4.618	4.376
246	4.743	4.501
247	4.868	4.626
	+.002 −.000	+.000 −.002
325	1.867	1.495
326	1.992	1.620
327	2.118	1.746
328	2.243	1.871
329	2.368	1.996
330	2.493	2.121
331	2.618	2.246
332	2.743	2.371
333	2.868	2.496
334	2.993	2.621
335	3.118	2.746
336	3.243	2.871
337	3.368	2.996
338	3.493	3.121
339	3.619	3.246
340	3.743	3.371
341	3.868	3.496
342	3.993	3.621
343	4.118	3.746
344	4.243	3.871
345	4.368	3.996
346	4.493	4.121
347	4.618	4.246
348	4.743	4.371
349	4.868	4.496
	+.003 −.000	+.000 −.003
425	4.974	4.497
426	5.099	4.622
427	5.224	4.747
428	5.349	4.872
429	5.474	4.997
430	4.599	5.122
431	5.724	5.247
432	5.849	5.372
434	5.974	5.497
434	6.099	5.622

DASH NO.	A DIA.	F DIA.
	+.003 −.000	+.000 −.003
435	6.224	5.747
436	6.349	5.872
437	6.474	5.997
438	6.724	6.247
439	6.974	6.497
440	7.224	6.747
441	7.474	6.997
442	7.724	7.247
443	7.974	7.497
444	8.224	7.747
445	8.474	7.997
446	8.974	8.497
	+.004 −.000	+.000 −.004
447	9.474	8.997
448	9.974	9.497
449	10.474	9.997
450	10.974	10.497
451	11.474	10.997
452	11.974	11.497
453	12.474	11.997
454	12.974	12.497
455	13.474	12.997
456	13.974	13.497
457	14.474	13.997
458	14.974	14.497
459	15.474	14.997
460	15.974	15.497

DASH NO.	G1 ONE BACKUP WIDTH	R RADIUS	D DIAMETRAL CLEARANCE MAX.
004-009	.154/.164	.005/.015	.004
010-012	.150/.160		.004
013-028			.005
104-109	.183/.193	.005/.015	.004
110-126			.005
127-129			.005
130-132			.006
133-140			.006
141-149			.007
210-222	.235/.245	.010/.025	.005
223-224			.006
225-227			.006
228-243			.007
244-245			.008
246-247			.008
325-327	.334/.344	.020/.035	.006
328-329			.006
330-345			.007
346-349			.008
425-438	.475/.485	.020/.035	.009
439-445			.009
446			.010
447-460			.011



PISTON SEAL INSTALLATION

FOR ONE BACKUP WIDTH GLAND PER AS4716 REVISION A

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR VARISEAL® H IN AS4716 REVISION A PISTON GLANDS.

2. ORDERING EXAMPLE PVE 2 B G 214 A T05 SM
   - VARISEAL® H, PISTON DESIGNATOR — PVE
   - CROSS SECTION — 2
     - 0 = 000 SERIES
     - 1 = 100 SERIES
     - 2 = 200 SERIES
     - 3 = 300 SERIES
     - 4 = 400 SERIES
   - ⚠3 DESIGN CHARACTERISTICS — B
     - SEE DESIGN CODES BELOW
   - GLAND STANDARD — G
     - G = AS4716
   - SIZE DESIGNATION — 214
     - ACCORDING TO AS4716 REVISION A
   - QUALITY INDEX: — A
     - A = AEROSPACE CERTIFICATE OF CONFORMANCE
   - ⚠4 TURCON® VARISEAL® H MAT'L CODE — T05
   - SPRING MAT'L CODE - MEDIUM SPRING LOAD AS STANDARD — SM

⚠4 FOR MATERIAL OPTIONS, SEE MATERIALS SECTION OF TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE. SPRING MATERIAL OPTIONS LISTED BELOW.

SPRING MATERIAL CODE
MEDIUM DUTY AS STANDARD

CODE	MATERIAL
S	301 STAINLESS STEEL
H	HASTELLOY
E	ELGILOY

5. †DASH SIZES -006 TO -028, -106 TO -128, AND -210 TO -221 REQUIRE SPLIT OR STEPPED GLAND CONFIGURATION, PLEASE CONSULT YOUR TRELLEBORG SEALING SOLUTIONS SALES ENGINEER FOR DETAILED INFORMATION.

⚠3 DESIGN CODES FOR CUT BACKUP RING CONFIGURATION ONE BACKUP WIDTH GLANDS

	BACKUP RING			
	TYPE	MATERIAL		
DESIGN CODE	SCARF CUT BACKUP RING	ZURCON® Z43	MATERIAL SAME AS SEAL RING	TURCON® T29
A	X	X		
B	X		X	
C	X			X

INCH	2011_6
TRELLEBORG SEALING SOLUTIONS	TITLE VARISEAL® H, PISTON
	DRAWING NO. PVE2BG000

WORLD AEROSPACE TITLE BLOCK REV.

Turcon® Variseal®

DASH NO.	A DIA.	F DIA.
	+.001 -.000	+.000 -.001
†006	.235	.129
†007	.266	.158
†008	.297	.189
†009	.329	.220
†010	.360	.250
†011	.422	.312
†012	.485	.375
	+.002 -.000	+.000 -.002
†013	.550	.441
†014	.613	.504
†015	.675	.566
†016	.738	.629
†017	.800	.691
†018	.863	.753
†019	.925	.815
†020	.991	.881
†021	1.053	.943
†022	1.116	1.006
†023	1.178	1.068
†024	1.241	1.131
†025	1.303	1.193
†026	1.366	1.256
†027	1.428	1.318
†028	1.491	1.381
	+.001 -.000	+.000 -.001
†106	.360	.187
†107	.391	.215
†108	.422	.246
†109	.485	.308
	+.002 -.000	+.000 -.002
†110	.550	.379
†111	.613	.441
†112	.675	.502
†113	.738	.565
†114	.800	.627
†115	.863	.689
†116	.925	.751
†117	.991	.817
†118	1.053	.879
†119	1.116	.942
†120	1.178	1.003
†121	1.241	1.066
†122	1.303	1.128
†123	1.366	1.191
†124	1.428	1.253
†125	1.491	1.316
†126	1.553	1.378
†127	1.616	1.441
†128	1.678	1.503
129	1.741	1.566
130	1.805	1.631
131	1.867	1.693
132	1.930	1.756
133	1.992	1.818
134	2.055	1.881
135	2.118	1.944
136	2.180	2.006
137	2.243	2.069
138	2.305	2.131
139	2.368	2.194
140	2.430	2.256
141	2.493	2.319
142	2.555	2.381
143	2.618	2.444
144	2.680	2.506
145	2.743	2.569
146	2.805	2.631
147	2.868	2.694
148	2.930	2.756
149	2.993	2.819

DASH NO.	A DIA.	F DIA.
	+.002 -.000	+.000 -.002
†210	.991	.750
†211	1.053	.812
†212	1.116	.874
†213	1.178	.936
†214	1.241	.999
†215	1.303	1.061
†216	1.366	1.124
†217	1.428	1.186
†218	1.491	1.249
†219	1.553	1.311
†220	1.616	1.374
†221	1.678	1.436
222	1.741	1.499
223	1.867	1.625
224	1.992	1.750
225	2.118	1.876
226	2.243	2.001
227	2.368	2.126
228	2.493	2.251
229	2.618	2.376
230	2.743	2.501
231	2.868	2.626
232	2.993	2.751
233	3.118	2.876
234	3.243	3.001
235	3.368	3.126
236	3.493	3.251
237	3.618	3.376
238	3.743	3.501
239	3.868	3.626
240	3.993	3.751
241	4.118	3.876
242	4.243	4.001
243	4.368	4.126
244	4.493	4.251
245	4.618	4.376
246	4.743	4.501
247	4.868	4.626
	+.002 -.000	+.000 -.002
325	1.867	1.495
326	1.992	1.620
327	2.118	1.746
328	2.243	1.871
329	2.368	1.996
330	2.493	2.121
331	2.618	2.246
332	2.743	2.371
333	2.868	2.496
334	2.993	2.621
335	3.118	2.746
336	3.243	2.871
337	3.368	2.996
338	3.493	3.121
339	3.619	3.246
340	3.743	3.371
341	3.868	3.496
342	3.993	3.621
343	4.118	3.746
344	4.243	3.871
345	4.368	3.996
346	4.493	4.121
347	4.618	4.246
348	4.743	4.371
349	4.868	4.496
	+.003 -.000	+.000 -.003
425	4.974	4.497
426	5.099	4.622
427	5.224	4.747
428	5.349	4.872
429	5.474	4.997
430	4.599	5.122
431	5.724	5.247
432	5.849	5.372
434	5.974	5.497
434	6.099	5.622

DASH NO.	A DIA.	F DIA.
	+.003 -.000	+.000 -.003
435	6.224	5.747
436	6.349	5.872
437	6.474	5.997
438	6.724	6.247
439	6.974	6.497
440	7.224	6.747
441	7.474	6.997
442	7.724	7.247
443	7.974	7.497
444	8.224	7.747
445	8.474	7.997
446	8.974	8.497
	+.004 -.000	+.000 -.004
447	9.474	8.997
448	9.974	9.497
449	10.474	9.997
450	10.974	10.497
451	11.474	10.997
452	11.974	11.497
453	12.474	11.997
454	12.974	12.497
455	13.474	12.997
456	13.974	13.497
457	14.474	13.997
458	14.974	14.497
459	15.474	14.997
460	15.974	15.497

DASH NO.	G_2 TWO BACKUP WIDTH	R RADIUS	D DIAMETRAL CLEARANCE MAX.
004-009	.210/.220	.005/.015	.004
010-012	.207/.217		.004
013-028			.005
104-109	.245/.255	.005/.015	.004
110-126			.005
127-129			.005
130-132			.006
133-140			.006
141-149			.007
210-222	.304/.314	.010/.025	.005
223-224			.006
225-227			.006
228-243			.007
244-245			.008
246-247			.008
325-327	.424/.434	.020/.035	.006
328-329			.006
330-345			.007
346-349			.008
425-438	.579/.589	.020/.035	.009
439-445			.009
446			.010
447-460			.011

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR VARISEAL® H IN AS4716 REVISION A PISTON GLANDS.

2. ORDERING EXAMPLE PVE 2 E G 214 A T05 SM
   - VARISEAL® H, PISTON DESIGNATOR
   - CROSS SECTION
     - 0 = 000 SERIES
     - 1 = 100 SERIES
     - 2 = 200 SERIES
     - 3 = 300 SERIES
     - 4 = 400 SERIES
   - △3 DESIGN CHARACTERISTICS
     - SEE DESIGN CODES BELOW
   - GLAND STANDARD
     - G = AS4716
   - SIZE DESIGNATION
     - ACCORDING TO AS4716 REVISION A
   - QUALITY INDEX:
     - A = AEROSPACE CERTIFICATE OF CONFORMANCE
   - △4 TURCON® VARISEAL® H MAT'L CODE
   - SPRING MAT'L CODE - MEDIUM SPRING LOAD AS STANDARD

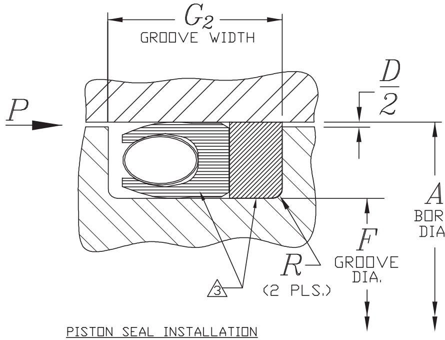
△4 FOR MATERIAL OPTIONS, SEE MATERIALS SECTION OF TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE. SPRING MATERIAL OPTIONS LISTED BELOW.

SPRING MATERIAL CODE MEDIUM DUTY AS STANDARD	
CODE	MATERIAL
S	301 STAINLESS STEEL
H	HASTELLOY
E	ELGILOY

5. †DASH SIZES -004 TO -028, -104 TO -128, AND -210 TO -221 REQUIRE SPLIT OR STEPPED GLAND CONFIGURATION, PLEASE CONSULT YOUR TRELLEBORG SEALING SOLUTIONS SALES ENGINEER FOR DETAILED INFORMATION.

△3 DESIGN CODES FOR CUT BACKUP RING CONFIGURATION TWO BACKUP WIDTH GLANDS

	BACKUP RING			
	TYPE	MATERIAL		
DESIGN CODE	SCARF CUT BACKUP RING	ZURCON® Z43	MATERIAL SAME AS SEAL RING	TURCON® T29
D	X	X		
E	X		X	
F	X			X



PISTON SEAL INSTALLATION

FOR TWO BACKUP WIDTH GLAND PER AS4716 REVISION A

INCH
2011_6

TRELLEBORG
SEALING SOLUTIONS

TITLE
VARISEAL® H, PISTON

DRAWING NO.
PVE2EG000

WORLD AEROSPACE TITLE BLOCK REV.

Features and benefits

- Good static and dynamic sealing effect
- Low friction, high efficiency
- Operating temperatures of -65°F to +390°F/ -54°C to +200°C
- Good chemical compatibility depending on elastomer
- Leak-tight reliable sealing performance
- High abrasion resistance
- Continuously lubricated
- Long service life
- Stick-slip-free starting
- No adhesion even after extended periods of rest
- Simple installation
- Sizes to suit all MIL-G-5514F and AS4716 glands
- If required Turcon® Plus Seal® II is interchangeable with Turcon® Double Delta® II in most applications

Illustration shows typical hydraulic cylinder with a sealing configuration incorporating Turcon® Plus Seal® II with and without Back-up Ring.

Turcon® Plus Seal® II

Description

The double-acting Turcon® Plus Seal® II is a superior slipper seal. Its contoured seal cap is formed to match a lemon-shaped elastomer ring. This allows more room for cap thickness that extends service life. Friction is reduced by activating the cap equally over its width and through the grooves in the cap. A full range of sizes is offered to suit all MIL-G-5514F and AS4716 glands and the seal is fully interchangeable with Turcon® Double Delta® II in most applications.

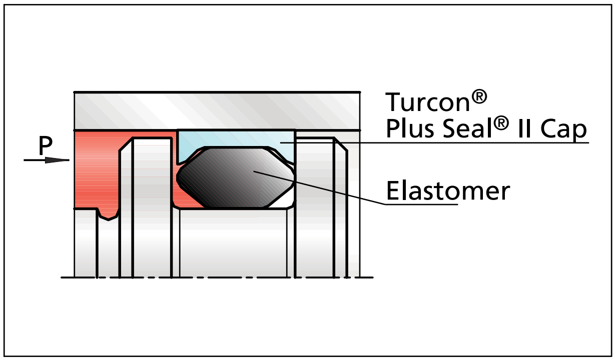


Figure 1 Turcon® Plus Seal® II

Method of Operation

The sealing effect of the Turcon® Plus Seal® II comes from the slight interference of the seal cap with the rod or bore combined with the preload from the compressed elastomer. As the pressure increases, the system pressure joins forces with the elastomer and increases the loading of the seal cap significantly. The resultant load produces a shear effect on the fluid film and provides leak-tight reliable sealing performance.

Instead of a traditional O-Ring, a proprietary lemon-shaped elastomer ring is used under the Turcon® Plus Seal® II cap. This allows the cap to be thicker for increased wear life.

In addition, the elastomer element activates the seal cap over a wider axial area compared to the original slipper seal, providing a lower unit loading. See Figure 2. It also supports the corners to prevent them from sinking away from the sealing surface. This reduces the oil film under the seal to an absolute minimum. See Figure 3.

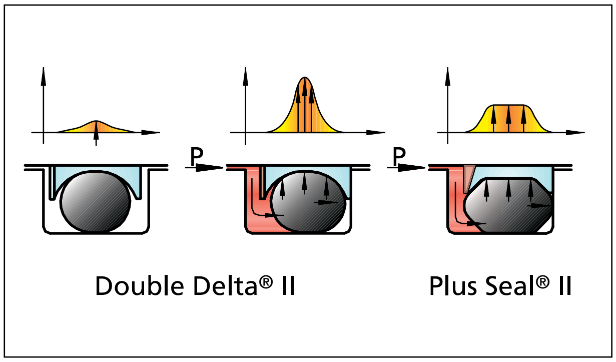


Figure 2 Pressure Distribution

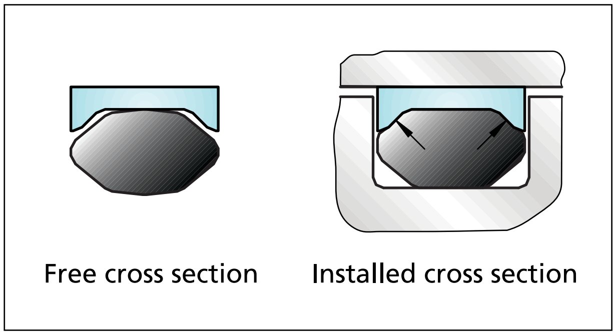


Figure 3 Turcon® Plus Seal® II Cross section

By choosing the grooved version, a further decrease in the film thickness can be achieved. The grooves increase the number of pressure peaks that the oil film must pass under. Another advantage of the grooved seal is that the grooves serve as an oil reservoir when the seal is static. When the seal starts to move dynamically, the oil film is quickly re-established under the sliding surface to lubricate the seal and maintain seal friction at a minimum. This is especially important in applications where the stroke is shorter than the seal width and it provides a general improvement in wear-life. See Figure 4.

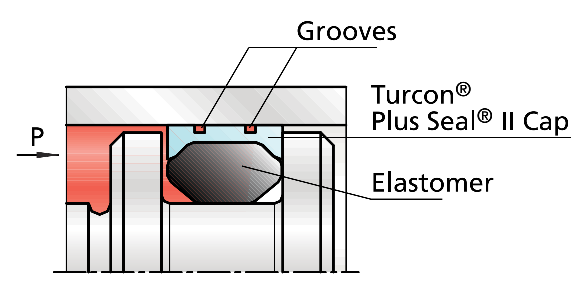


Figure 4 Grooved Turcon® Plus Seal® II

The zero back-up width of the seal is generally preferred, even if a wider groove is available in smaller diameters. The extra space in a wider groove is used more efficiently when filled with Back-up Rings. This increases the seal life without notably affecting the friction.

Where Turcon® Plus Seal® II is subjected bi-directional pressure, pressure from both sides alternately, it should always be equipped with sidewall notches. See Figure 5. These allow the pressure to properly activate the elastomer. See Figure 6. For piston use Turcon® Plus Seal® II is equipped with notches as standard. The rod version must be specified with notches if they are deemed necessary.

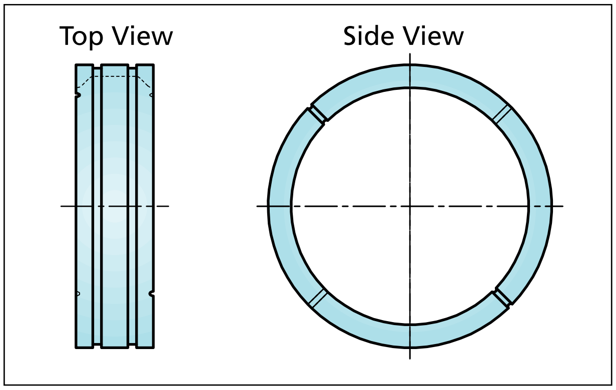


Figure 5 Turcon® Plus Seal® II Notches

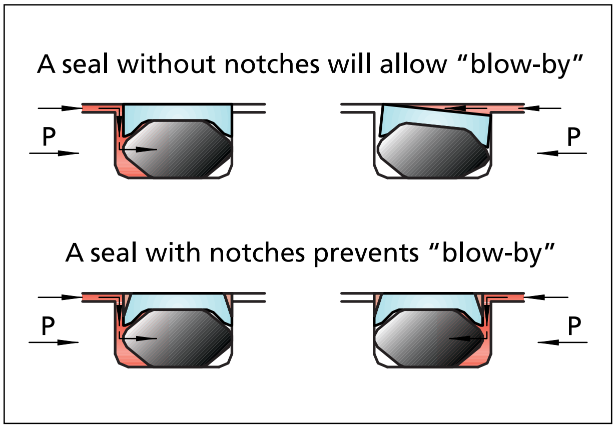


Figure 6 Turcon® Plus Seal® II II with notches, function

Using a seal without notches may allow blow-by, where the pressure shoots over the top of the Turcon® Plus Seal® II cap and forces the seal down into the groove. See SAE International document AIR 1243 for more information on this topic.

Technical Data

Operation pressure:	5,000 psi/ 35 MPa Up to 10,000 psi/ 70 MPa with Stakbak®
Speed:	Up to 49.2 ft/s/ 15.0 m/s
Temperature range:	-65°F to +390°F/ -54°C to +200°C depending on elastomer material
Clearance:	As per AS4716 recommendations Larger clearance possible with Stakbak®
Media:	Mineral oil-based hydraulic fluids, flame-retardant hydraulic fluids, environmentally safe hydraulic fluids (bio-oils), phosphate ester-based hydraulic oils, water and others depending on the elastomer material selected

Avoid combining extreme limits.

Turcon® Plus Seal® II Series

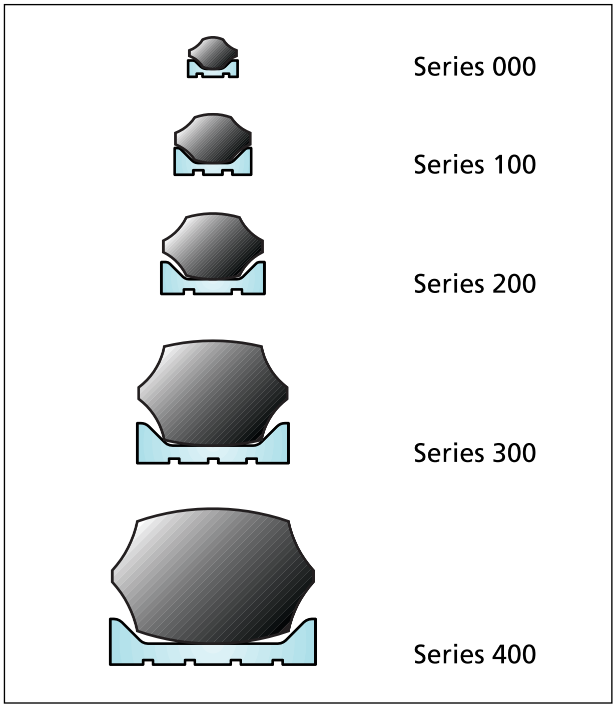
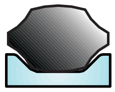
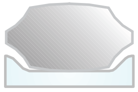
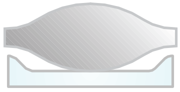
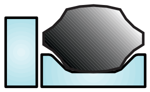
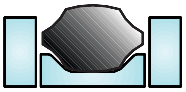
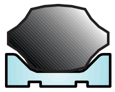
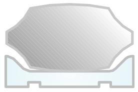
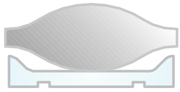
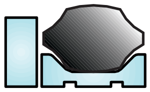
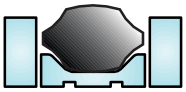
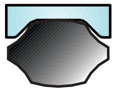
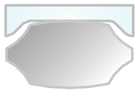
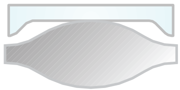
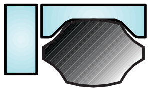
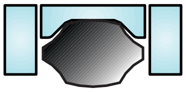
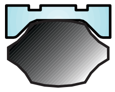
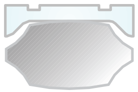
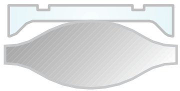
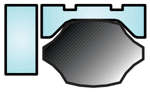
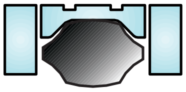


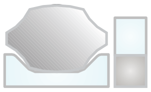
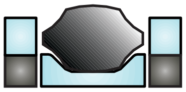
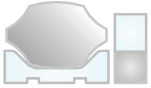
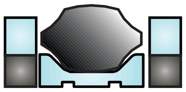
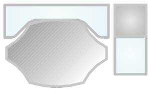
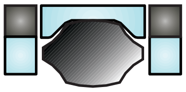
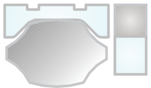
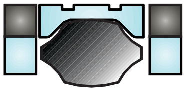
Figure 7 Relationship between Turcon® Plus Seal® II Cross Sections

Table I Turcon® Plus Seal® II Types

Seal	Turcon® Plus Seal® II		
	Width		
Type	0 BUR (G_0)	1 BUR (G_1)	2 BUR (G_2)
Rod	 RPB0_	 RPB1_	 RPB2_
Rod With BUR	N/A	 RPB1A	 RPB2A
Grooved Rod	 RPA0_	 RPA1_	 RPA2_
Grooved Rod With BUR	N/A	 RPA1A	 RPA2A
Piston	 PPB0_	 PPB1_	 PPB2_
Piston With BUR	N/A	 PPB1A	 PPB2A
Grooved Piston	 PPA0_	 PPA1_	 PPA2_
Grooved Piston With BUR	N/A	 PPA1A	 PPA2A

Turcon® Plus Seal® II

Table II Turcon® Plus Seal® II Types with Stakbak®

Seal	Turcon® Plus Seal® II		
	Width		
Type	**0 BUR (G_0)**	**1 BUR (G_1)**	**2 BUR (G_2)**
Rod with Stakbak®	N/A	 RPB18G	 RPB28G
Grooved Rod with Stakbak®	N/A	 RPA18G	 RPA28G
Piston with Stakbak®	N/A	 PPB18G	 PPB28G
Grooved Piston with Stakbak®	N/A	 PPA18G	 PPA28G

- G denotes groove width; zero, one or two back-up width
- BUR - Back-up Ring

Piston seals are always delivered as standard with notch. Rod seals are always delivered without a notch. Turcon® Plus Seal® II are not available with notches in the -000 series, 0 back-up width seals. Piston seal part numbers PPB0 and PPA0 can be ordered without a notch, insert a "**W**" as the 5th digit, example PPB0**W**. Rod seal part number RPB0 and RPA0 can be ordered with a notch, insert a "**N**" as the 5th digit, example RPB0**N**.
Review the individual product drawings in this catalog section for the limits on the individual part number and groove or notching feature availability.

The Plus Seal® II follows the series as laid out in AS4716. We recommend that the guidelines for static and dynamic sizes are followed to ensure a good service life for the seal.

Profiles in full color are recommended configurations.

Turcon® Plus Seal® II

DASH NO.	*B* DIA.	*E* DIA.
	+.000 -.001	+.001 -.000
004	.076	.190
005	.108	.217
006	.123	.232
007	.154	.264
008	.185	.294
009	.217	.327
010	.248	.359
011	.310	.421
012	.373	.484
	+.000 -.002	+.002 -.000
013	.435	.545
014	.498	.608
015	.560	.670
016	.623	.733
017	.685	.795
018	.748	.858
019	.810	.920
020	.873	.983
021	.935	1.045
022	.998	1.108
023	1.060	1.170
024	1.123	1.233
025	1.185	1.295
026	1.248	1.358
027	1.310	1.420
028	1.373	1.483
	+.000 -.001	+.001 -.000
104	.123	.295
105	.154	.327
106	.185	.359
107	.217	.392
108	.248	.423
109	.310	.486
	+.000 -.002	+.002 -.000
110	.373	.546
111	.435	.609
112	.498	.672
113	.560	.734
114	.623	.797
115	.685	.859
116	.748	.923
117	.810	.985
118	.873	1.048
119	.935	1.110
120	.998	1.173
121	1.060	1.235
122	1.123	1.298
123	1.185	1.360
124	1.248	1.423
125	1.310	1.485
126	1.373	1.548
127	1.435	1.610
128	1.498	1.673
129	1.560	1.735
130	1.623	1.798
131	1.685	1.860
132	1.748	1.923
133	1.810	1.984
134	1.873	2.047
135	1.936	2.110
136	1.998	2.172
137	2.061	2.235
138	2.123	2.297
139	2.186	2.360
140	2.248	2.422
141	2.311	2.485
142	2.373	2.547
143	2.436	2.610
144	2.498	2.672
145	2.561	2.735
146	2.623	2.797
147	2.686	2.860
148	2.748	2.922
149	2.811	2.985
	+.000 -.002	+.002 -.000
210	.748	.989
211	.810	1.051
212	.873	1.115
213	.935	1.177
214	.998	1.240
215	1.060	1.302
216	1.123	1.365
217	1.185	1.427
218	1.248	1.490
219	1.310	1.552
220	1.373	1.615
221	1.435	1.677
222	1.498	1.740
223	1.623	1.865
224	1.748	1.990
225	1.873	2.115
226	1.998	2.240
227	2.123	2.365
228	2.248	2.490
229	2.373	2.615
230	2.498	2.740
231	2.623	2.865
232	2.748	2.990
233	2.873	3.115
234	2.997	3.239
235	3.122	3.364
236	3.247	3.489
237	3.372	3.614
238	3.497	3.739
239	3.622	3.864
240	3.747	3.989
241	3.872	4.114
242	3.997	4.239
243	4.122	4.364
244	4.247	4.489
245	4.372	4.614
246	4.497	4.739
247	4.622	4.864
	+.000 -.002	+.002 -.000
325	1.498	1.870
326	1.623	1.995
327	1.748	2.120
328	1.873	2.245
329	1.998	2.370
330	2.123	2.495
331	2.248	2.620
332	2.373	2.745
333	2.498	2.870
334	2.623	2.995
335	2.748	3.120
336	2.873	3.245
337	2.997	3.369
338	3.122	3.494
339	3.247	3.619
340	3.372	3.744
341	3.497	3.869
342	3.622	3.994
343	3.747	4.119
344	3.872	4.244
345	3.997	4.369
346	4.122	4.494
347	4.247	4.619
348	4.372	4.744
349	4.497	4.869
	+.000 -.003	+.003 -.000
425	4.497	4.974
426	4.622	5.099
427	4.747	5.224
428	4.872	5.349
429	4.997	5.474
430	5.122	5.599
431	5.247	5.724
432	5.372	5.849
433	5.497	5.974
434	5.622	6.099
	+.000 -.003	+.003 -.000
435	5.747	6.224
436	5.872	6.349
437	5.997	6.474
438	6.247	6.724
439	6.497	6.974
440	6.747	7.224
441	6.997	7.474
442	7.247	7.724
443	7.497	7.974
444	7.747	8.224
445	7.997	8.474
446	8.497	8.974
	+.000 -.003	+.004 -.000
447	8.997	9.474
448	9.497	9.974
449	9.997	10.474
450	10.497	10.974
451	10.997	11.474
452	11.497	11.974
453	11.997	12.474
454	12.497	12.974
455	12.997	13.474
456	13.497	13.974
457	13.997	14.474
458	14.497	14.974
459	14.997	15.474
460	15.497	15.974

WORLD AEROSPACE TITLE BLOCK REV.

DASH NO.	G_0 ZERO BACKUP WIDTH	G_1 ONE BACKUP WIDTH	G_2 TWO BACKUP WIDTH	*R* RADIUS	*D* DIAMETRAL CLEARANCE MAX.
004-009	.098/.103	.154/.164	.210/.220	.005/.015	.004
010-012	.094/.099	.150/.160	.207/.217		.004
013-028					.005
104-109	.141/.151	.183/.193	.245/.255	.005/.015	.004
110-126					.005
127-129					.006
130-132					.006
133-140					.007
141-149					.007
210-222	.188/.198	.235/.245	.304/.314	.010/.025	.005
223-224					.006
225-227					.007
228-243					.007
244-245					.007
246-247					.008
325-327	.281/.291	.334/.344	.424/.434	.020/.035	.006
328-329					.007
330-345					.007
346-349					.007
425-438	.375/.385	.475/.485	.579/.589	.020/.035	.009
439-445					.010
446					.010
447-460					.010

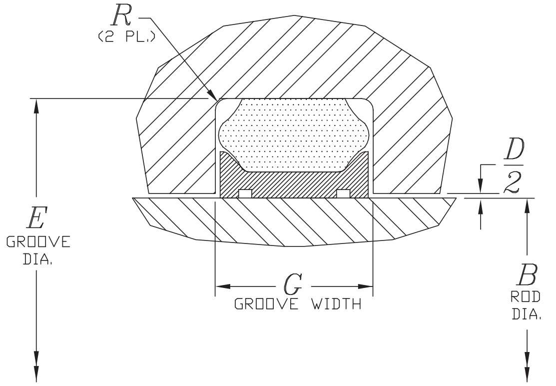
NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR PLUS SEAL® II IN AS4716 REVISION A PISTON GLANDS.

2. ORDERING EXAMPLE: RP A 0 0 G 214 A T19 NG

   PLUS SEAL® II, ROD DESIGNATOR
   STYLE CODE
     A = CIRCUMFRENTIAL GROOVES
       (PREFERRED DESIGN CONFIGURATION)
     B = NO CIRCUMFRENTIAL GROOVES
   BACKUP WIDTH
     0 = ZERO BACKUP WIDTH
       (PREFERRED DESIGN CONFIGURATION)
     1 = ONE BACKUP WIDTH
     2 = TWO BACKUP WIDTH
   DESIGN CHARACTERISTICS
     0 = STANDARD, UNNOTCHED
     N = TO ADD NOTCHES
   GLAND DESIGNATOR
     G = AS4716
   SIZE DESIGNATOR
     ACCORDING TO AS4716 REVISION A
   QUALITY INDEX:
     A = AEROSPACE CERTIFICATE OF CONFORMANCE
   TURCON® SEAL RING MAT'L. CODE
   TUREL® PLUS RING MAT'L CODE
   CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

3. ZERO BACKUP WIDTH PREFERRED, IF GLAND WIDTH IS GREATER THAN ZERO THE USE OF BACKUP RINGS ARE RECOMMENDED.



ROD SEAL INSTALLATION
FOR ZERO, ONE & TWO BACKUP WIDTH GLANDS PER AS4716 REVISION A

PLUS SEAL® II: PATENTED

This uncontrolled document discloses information and data in which the Trelleborg Sealing Solutions has proprietary rights. Neither receipt nor possession thereof confers or transfers any right to reproduce, use or disclose in whole or in part except by written permission from Trelleborg Sealing Solutions. Trelleborg Sealing Solutions cannot be held responsible for printing errors etc.

INCH
2009_1
TRELLEBORG
SEALING SOLUTIONS
TITLE
PLUS SEAL® II
DRAWING NO.
RPA00G000

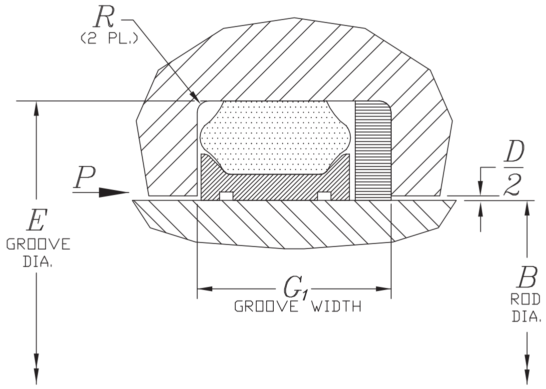
Turcon® Plus Seal® II

DASH NO.	B DIA.	E DIA.
	+.000 -.001	+.001 -.000
004	.076	.190
005	.108	.217
006	.123	.232
007	.154	.264
008	.185	.294
009	.217	.327
010	.248	.359
011	.310	.421
012	.373	.484
	+.000 -.002	+.002 -.000
013	.435	.545
014	.498	.608
015	.560	.670
016	.623	.733
017	.685	.795
018	.748	.858
019	.810	.920
020	.873	.983
021	.935	1.045
022	.998	1.108
023	1.060	1.170
024	1.123	1.233
025	1.185	1.295
026	1.248	1.358
027	1.310	1.420
028	1.373	1.483
	+.000 -.001	+.001 -.000
104	.123	.295
105	.154	.327
106	.185	.359
107	.217	.392
108	.248	.423
109	.310	.486
	+.000 -.002	+.002 -.000
110	.373	.546
111	.435	.609
112	.498	.672
113	.560	.734
114	.623	.797
115	.685	.859
116	.748	.923
117	.810	.985
118	.873	1.048
119	.935	1.110
120	.998	1.173
121	1.060	1.235
122	1.123	1.298
123	1.185	1.360
124	1.248	1.423
125	1.310	1.485
126	1.373	1.548
127	1.435	1.610
128	1.498	1.673
129	1.560	1.735
130	1.623	1.798
131	1.685	1.860
132	1.748	1.923
133	1.810	1.984
134	1.873	2.047
135	1.936	2.110
136	1.998	2.172
137	2.061	2.235
138	2.123	2.297
139	2.186	2.360
140	2.248	2.422
141	2.311	2.485
142	2.373	2.547
143	2.436	2.610
144	2.498	2.672
145	2.561	2.735
146	2.623	2.797
147	2.686	2.860
148	2.748	2.922
149	2.811	2.985

DASH NO.	B DIA.	E DIA.
	+.000 -.002	+.002 -.000
210	.748	.989
211	.810	1.051
212	.873	1.115
213	.935	1.177
214	.998	1.240
215	1.060	1.302
216	1.123	1.365
217	1.185	1.427
218	1.248	1.490
219	1.310	1.552
220	1.373	1.615
221	1.435	1.677
222	1.498	1.740
223	1.623	1.865
224	1.748	1.990
225	1.873	2.115
226	1.998	2.240
227	2.123	2.365
228	2.248	2.490
229	2.373	2.615
230	2.498	2.740
231	2.623	2.865
232	2.748	2.990
233	2.873	3.115
234	2.997	3.239
235	3.122	3.364
236	3.247	3.489
237	3.372	3.614
238	3.497	3.739
239	3.622	3.864
240	3.747	3.989
241	3.872	4.114
242	3.997	4.239
243	4.122	4.364
244	4.247	4.489
245	4.372	4.614
246	4.497	4.739
247	4.622	4.864
	+.000 -.002	+.002 -.000
325	1.498	1.870
326	1.623	1.995
327	1.748	2.120
328	1.873	2.245
329	1.998	2.370
330	2.123	2.495
331	2.248	2.620
332	2.373	2.745
333	2.498	2.870
334	2.623	2.995
335	2.748	3.120
336	2.873	3.245
337	2.997	3.369
338	3.122	3.494
339	3.247	3.619
340	3.372	3.744
341	3.497	3.869
342	3.622	3.994
343	3.747	4.119
344	3.872	4.244
345	3.997	4.369
346	4.122	4.494
347	4.247	4.619
348	4.372	4.744
349	4.497	4.869
	+.000 -.003	+.003 -.000
425	4.497	4.974
426	4.622	5.099
427	4.747	5.224
428	4.872	5.349
429	4.997	5.474
430	5.122	5.599
431	5.247	5.724
432	5.372	5.849
433	5.497	5.974
434	5.622	6.099

DASH NO.	B DIA.	E DIA.
	+.000 -.003	+.003 -.000
435	5.747	6.224
436	5.872	6.349
437	5.997	6.474
438	6.247	6.724
439	6.497	6.974
440	6.747	7.224
441	6.997	7.474
442	7.247	7.724
443	7.497	7.974
444	7.747	8.224
445	7.997	8.474
446	8.497	8.974
	+.000 -.003	+.004 -.000
447	8.997	9.474
448	9.497	9.974
449	9.997	10.474
450	10.497	10.974
451	10.997	11.474
452	11.497	11.974
453	11.997	12.474
454	12.497	12.974
455	12.997	13.474
456	13.497	13.974
457	13.997	14.474
458	14.497	14.974
459	14.997	15.474
460	15.497	15.974

DASH NO.	G_1 ONE BACKUP WIDTH	R RADIUS	D DIAMETRAL CLEARANCE MAX.
004-009	.154/.164	.005/.015	.004
010-012	.150/.160		.004
013-028			.005
104-109	.183/.193	.005/.015	.004
110-126			.005
127-129			.006
130-132			.006
133-140			.007
141-149			.007
210-222	.235/.245	.010/.025	.005
223-224			.006
225-227			.007
228-243			.007
244-245			.007
246-247			.008
325-327	.334/.344	.020/.035	.006
328-329			.007
330-345			.007
346-349			.007
425-438	.475/.485	.020/.035	.009
439-445			.010
446			.010
447-460			.010



ROD SEAL INSTALLATION
FOR ONE BACKUP WIDTH GLANDS PER AS4716 REVISION A

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR PLUS SEAL® II IN AS4716 REVISION A PISTON GLANDS.

2. ORDERING EXAMPLE: RP A 1 A G 214 A T19 NG

   PLUS SEAL® II, ROD DESIGNATOR — RP
   STYLE CODE — A
   A = CIRCUMFRENTIAL GROOVES
   (PREFERRED DESIGN CONFIGURATION)
   B = NO CIRCUMFRENTIAL GROOVES
   BACKUP WIDTH — 1
   1 = ONE BACKUP WIDTH
   DESIGN CHARACTERISTICS — A
   △4 SEE TABLE BELOW
   GLAND DESIGNATOR — G
   G = AS4716
   SIZE DESIGNATOR — 214
   ACCORDING TO AS4716 REVISION A
   QUALITY INDEX: — A
   A = AEROSPACE CERTIFICATE OF CONFORMANCE
   TURCON® SEAL RING MAT'L. CODE — T19
   TUREL® PLUS RING MAT'L CODE — NG
   CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

3. ALL SEAL RING ARE SUPPLIED WITHOUT NOTCHES.

△4 DESIGN CODES FOR BACKUP RING CONFIGURATION.

	BACKUP RING				
	TYPE		MATERIAL		
DESIGN CODE	SOLID BACKUP RING	SCARF CUT △5 BACKUP RING	MATERIAL SAME AS SEAL RING	TURCON® T29	STAKBAK® △6
A	X		X		
D	X			X	
G		X	X		
F		X		X	
8		X			X

△5 SCARF CUT BACKUP RINGS ARE AVIALABLE ONLY IN DASH SIZES, -004 THROUGH -028, -104 THROUGH -135, -210 THROUGH -227, -325 THROUGH -335 & -425 THROUGH -431

△6 STAKBAK® BACKUP RINGS ARE AVAILABLE ONLY IN DASH SIZES, -019 THROUGH -028 -115 THROUGH -149, -211 THROUGH -247, -325 THROUGH -349 & -425 THROUGH -449

PLUS SEAL® II: PATENTED

STAKBAK® PATENTS:

U.S.A.	4,576,386
U.K.	2 169 670
W. GERMANY	3 601 149
FRANCE	2 576 078
SWEDEN	458,469

This uncontrolled document discloses information and data in which the Trelleborg Sealing Solutions has proprietary rights. Neither receipt nor possession thereof confers or transfers any right to reproduce, use or disclose in whole or in part except by written permission from Trelleborg Sealing Solutions. Trelleborg Sealing Solutions cannot be held responsible for printing errors etc.

INCH
2009_1

TRELLEBORG
SEALING SOLUTIONS

TITLE
PLUS SEAL® II

DRAWING NO.
RPA1AG000

WORLD AEROSPACE TITLE BLOCK REV.

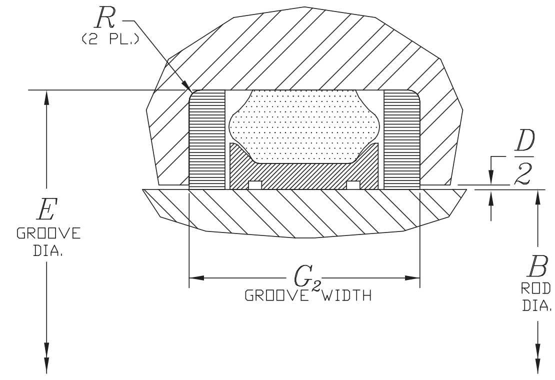
Turcon® Plus Seal® II

DASH NO.	B DIA.	E DIA.
	+.000 -.001	+.001 -.000
004	.076	.190
005	.108	.217
006	.123	.232
007	.154	.264
008	.185	.294
009	.217	.327
010	.248	.359
011	.310	.421
012	.373	.484
	+.000 -.002	+.002 -.000
013	.435	.545
014	.498	.608
015	.560	.670
016	.623	.733
017	.685	.795
018	.748	.858
019	.810	.920
020	.873	.983
021	.935	1.045
022	.998	1.108
023	1.060	1.170
024	1.123	1.233
025	1.185	1.295
026	1.248	1.358
027	1.310	1.420
028	1.373	1.483
	+.000 -.001	+.001 -.000
104	.123	.295
105	.154	.327
106	.185	.359
107	.217	.392
108	.248	.423
109	.310	.486
	+.000 -.002	+.002 -.000
110	.373	.546
111	.435	.609
112	.498	.672
113	.560	.734
114	.623	.797
115	.685	.859
116	.748	.923
117	.810	.985
118	.873	1.048
119	.935	1.110
120	.998	1.173
121	1.060	1.235
122	1.123	1.298
123	1.185	1.360
124	1.248	1.423
125	1.310	1.485
126	1.373	1.548
127	1.435	1.610
128	1.498	1.673
129	1.560	1.735
130	1.623	1.798
131	1.685	1.860
132	1.748	1.923
133	1.810	1.984
134	1.873	2.047
135	1.936	2.110
136	1.998	2.172
137	2.061	2.235
138	2.123	2.297
139	2.186	2.360
140	2.248	2.422
141	2.311	2.485
142	2.373	2.547
143	2.436	2.610
144	2.498	2.672
145	2.561	2.735
146	2.623	2.797
147	2.686	2.860
148	2.748	2.922
149	2.811	2.985

DASH NO.	B DIA.	E DIA.
	+.000 -.002	+.002 -.000
210	.748	.989
211	.810	1.051
212	.873	1.115
213	.935	1.177
214	.998	1.240
215	1.060	1.302
216	1.123	1.365
217	1.185	1.427
218	1.248	1.490
219	1.310	1.552
220	1.373	1.615
221	1.435	1.677
222	1.498	1.740
223	1.623	1.865
224	1.748	1.990
225	1.873	2.115
226	1.998	2.240
227	2.123	2.365
228	2.248	2.490
229	2.373	2.615
230	2.498	2.740
231	2.623	2.865
232	2.748	2.990
233	2.873	3.115
234	2.997	3.239
235	3.122	3.364
236	3.247	3.489
237	3.372	3.614
238	3.497	3.739
239	3.622	3.864
240	3.747	3.989
241	3.872	4.114
242	3.997	4.239
243	4.122	4.364
244	4.247	4.489
245	4.372	4.614
246	4.497	4.739
247	4.622	4.864
	+.000 -.002	+.002 -.000
325	1.498	1.870
326	1.623	1.995
327	1.748	2.120
328	1.873	2.245
329	1.998	2.370
330	2.123	2.495
331	2.248	2.620
332	2.373	2.745
333	2.498	2.870
334	2.623	2.995
335	2.748	3.120
336	2.873	3.245
337	2.997	3.369
338	3.122	3.494
339	3.247	3.619
340	3.372	3.744
341	3.497	3.869
342	3.622	3.994
343	3.747	4.119
344	3.872	4.244
345	3.997	4.369
346	4.122	4.494
347	4.247	4.619
348	4.372	4.744
349	4.497	4.869
	+.000 -.003	+.003 -.000
425	4.497	4.974
426	4.622	5.099
427	4.747	5.224
428	4.872	5.349
429	4.997	5.474
430	5.122	5.599
431	5.247	5.724
432	5.372	5.849
433	5.497	5.974
434	5.622	6.099

DASH NO.	B DIA.	E DIA.
	+.000 -.003	+.003 -.000
435	5.747	6.224
436	5.872	6.349
437	5.997	6.474
438	6.247	6.724
439	6.497	6.974
440	6.747	7.224
441	6.997	7.474
442	7.247	7.724
443	7.497	7.974
444	7.747	8.224
445	7.997	8.474
446	8.497	8.974
	+.000 -.003	+.004 -.000
447	8.997	9.474
448	9.497	9.974
449	9.997	10.474
450	10.497	10.974
451	10.997	11.474
452	11.497	11.974
453	11.997	12.474
454	12.497	12.974
455	12.997	13.474
456	13.497	13.974
457	13.997	14.474
458	14.497	14.974
459	14.997	15.474
460	15.497	15.974

DASH NO.	G_2 TWO BACKUP WIDTH	R RADIUS	D DIAMETRAL CLEARANCE MAX.
004-009	.210/.220	.005/.015	.004
010-012	.207/.217		.004
013-028			.005
104-109	.245/.255	.005/.015	.004
110-126			.005
127-129			.006
130-132			.006
133-140			.007
141-149			.007
210-222	.304/.314	.010/.025	.005
223-224			.006
225-227			.007
228-243			.007
244-245			.007
246-247			.008
325-327	.424/.434	.020/.035	.006
328-329			.007
330-345			.007
346-349			.007
425-438	.579/.589	.020/.035	.009
439-445			.010
446			.010
447-460			.010



ROD SEAL INSTALLATION
FOR TWO BACKUP WIDTH GLANDS PER AS4716 REVISION A

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR PLUS SEAL® II IN AS4716 REVISION A ROD GLANDS.

2. ORDERING EXAMPLE: RP A 2 A G 214 A T19 NG

PLUS SEAL® II, ROD DESIGNATOR
STYLE CODE
A = CIRCUMFRENTIAL GROOVES
(PREFERRED DESIGN CONFIGURATION)
B = NO CIRCUMFRENTIAL GROOVES
BACKUP WIDTH
2 = TWO BACKUP WIDTH
DESIGN CHARACTERISTICS
△4 SEE TABLE BELOW
GLAND DESIGNATOR
G = AS4716
SIZE DESIGNATOR
ACCORDING TO AS4716 REVISION A
QUALITY INDEX:
A = AEROSPACE CERTIFICATE OF CONFORMANCE
TURCON® SEAL RING MAT'L. CODE
TUREL® PLUS RING MAT'L CODE
CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

3. ALL SEAL RING ARE SUPPLIED WITHOUT NOTCHES.

△4 DESIGN CODES FOR BACKUP RING CONFIGURATION.

	BACKUP RING				
	TYPE		MATERIAL		
DESIGN CODE	SOLID BACKUP RING	SCARF CUT △5 BACKUP RING	MATERIAL SAME AS SEAL RING	TURCON® T29	STAKBAK® △6
A	X		X		
D	X			X	
G		X	X		
F		X		X	
8		X			X

△5 SCARF CUT BACKUP RINGS ARE AVIALABLE ONLY IN DASH SIZES, -004 THROUGH -028, -104 THROUGH -135, -210 THROUGH -227, -325 THROUGH -335 & -425 THROUGH -431

△6 STAKBAK® BACKUP RINGS ARE AVAILABLE ONLY IN DASH SIZES, -019 THROUGH -028 -115 THROUGH -149, -211 THROUGH -247, -325 THROUGH -349 & -425 THROUGH -449

PLUS SEAL® II: PATENTED

STAKBAK® PATENTS:

U.S.A.	4,576,386
U.K.	2 169 670
W. GERMANY	3 601 149
FRANCE	2 576 078
SWEDEN	458,469

INCH
2009_1

TRELLEBORG
SEALING SOLUTIONS

TITLE
PLUS SEAL® II

DRAWING NO.
RPA2AG000

WORLD AEROSPACE TITLE BLOCK REV.

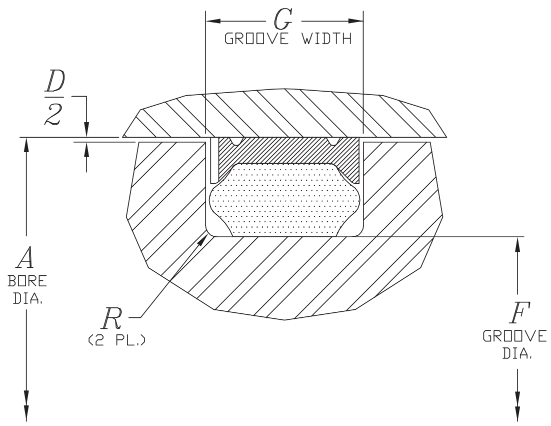
Turcon® Plus Seal® II

DASH NO.	A DIA.	F DIA.
	+.001 -.000	+.000 -.001
004	.190	.076
005	.221	.115
006	.235	.129
007	.266	.158
008	.297	.189
009	.329	.220
010	.360	.250
011	.422	.312
012	.485	.375
	+.002 -.000	+.000 -.002
013	.550	.441
014	.613	.504
015	.675	.566
016	.738	.629
017	.800	.691
018	.863	.753
019	.925	.815
020	.991	.881
021	1.053	.943
022	1.116	1.006
023	1.178	1.068
024	1.241	1.131
025	1.303	1.193
026	1.366	1.256
027	1.428	1.318
028	1.491	1.381
	+.001 -.000	+.000 -.001
104	.297	.128
105	.329	.158
106	.360	.187
107	.391	.215
108	.422	.246
109	.485	.308
	+.002 -.000	+.000 -.002
110	.550	.379
111	.613	.441
112	.675	.502
113	.738	.565
114	.800	.627
115	.863	.689
116	.925	.751
117	.991	.817
118	1.053	.879
119	1.116	.942
120	1.178	1.003
121	1.241	1.066
122	1.303	1.128
123	1.366	1.191
124	1.428	1.253
125	1.491	1.316
126	1.553	1.378
127	1.616	1.441
128	1.678	1.503
129	1.741	1.566
130	1.805	1.631
131	1.867	1.693
132	1.930	1.756
133	1.992	1.818
134	2.055	1.881
135	2.118	1.944
136	2.180	2.006
137	2.243	2.069
138	2.305	2.131
139	2.368	2.194
140	2.430	2.256
141	2.493	2.319
142	2.555	2.381
143	2.618	2.444
144	2.680	2.506
145	2.743	2.569
146	2.805	2.631
147	2.868	2.694
148	2.930	2.756
149	2.993	2.819

DASH NO.	A DIA.	F DIA.
	+.002 -.000	+.000 -.002
210	.991	.750
211	1.053	.812
212	1.116	.874
213	1.178	.936
214	1.241	.999
215	1.303	1.061
216	1.366	1.124
217	1.428	1.186
218	1.491	1.249
219	1.553	1.311
220	1.616	1.374
221	1.678	1.436
222	1.741	1.499
223	1.867	1.625
224	1.992	1.750
225	2.118	1.876
226	2.243	2.001
227	2.368	2.126
228	2.493	2.251
229	2.618	2.376
230	2.743	2.501
231	2.868	2.626
232	2.993	2.751
233	3.118	2.876
234	3.243	3.001
235	3.368	3.126
236	3.493	3.251
237	3.618	3.376
238	3.743	3.501
239	3.868	3.626
240	3.993	3.751
241	4.118	3.876
242	4.243	4.001
243	4.368	4.126
244	4.493	4.251
245	4.618	4.376
246	4.743	4.501
247	4.868	4.626
	+.002 -.000	+.000 -.002
325	1.867	1.495
326	1.992	1.620
327	2.118	1.746
328	2.243	1.871
329	2.368	1.996
330	2.493	2.121
331	2.618	2.246
332	2.743	2.371
333	2.868	2.496
334	2.993	2.621
335	3.118	2.746
336	3.243	2.871
337	3.368	2.996
338	3.493	3.121
339	3.618	3.246
340	3.743	3.371
341	3.868	3.496
342	3.993	3.621
343	4.118	3.746
344	4.243	3.871
345	4.368	3.996
346	4.493	4.121
347	4.618	4.246
348	4.743	4.371
349	4.868	4.496
	+.003 -.000	+.000 -.003
425	4.974	4.497
426	5.099	4.622
427	5.224	4.747
428	5.349	4.872
429	5.474	4.997
430	5.599	5.122
431	5.724	5.247
432	5.849	5.372
433	5.974	5.497
434	6.099	5.622

DASH NO.	A DIA.	F DIA.
	+.003 -.000	+.000 -.003
435	6.224	5.747
436	6.349	5.872
437	6.474	5.997
438	6.724	6.247
439	6.974	6.497
440	7.224	6.747
441	7.474	6.997
442	7.724	7.247
443	7.974	7.497
444	8.224	7.747
445	8.474	7.997
446	8.974	8.497
	+.004 -.000	+.000 -.004
447	9.474	8.997
448	9.974	9.497
449	10.474	9.997
450	10.974	10.497
451	11.474	10.997
452	11.974	11.497
453	12.474	11.997
454	12.974	12.497
455	13.474	12.997
456	13.974	13.497
457	14.474	13.997
458	14.974	14.497
459	15.474	14.997
460	15.974	15.497

DASH NO.	G_0 ZERO BACKUP WIDTH	G_1 ONE BACKUP WIDTH	G_2 TWO BACKUP WIDTH	R RADIUS	D DIAMETRAL CLEARANCE MAX.
004-009	.098/.103	.154/.164	.210/.220	.005/.015	.004
010-012	.094/.099	.150/.160	.207/.217		.004
013-028					.005
104-109	.141/.151	.183/.193	.245/.255	.005/.015	.004
110-126					.005
127-129					.005
130-132					.006
133-140					.006
141-149					.007
210-222	.188/.198	.235/.245	.304/.314	.010/.025	.005
223-224					.006
225-227					.006
228-243					.007
244-245					.008
246-247					.008
325-327	.281/.291	.334/.344	.424/.434	.020/.035	.006
328-329					.006
330-345					.007
346-349					.008
425-438	.375/.385	.475/.485	.579/.589	.020/.035	.009
439-445					.009
446					.010
447-460					.011



PISTON SEAL INSTALLATION

FOR ZERO, ONE & TWO BACKUP WIDTH GLANDS PER AS4716 REVISION A

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR PLUS SEAL® II IN AS4716 REVISION A PISTON GLANDS.

2. ORDERING EXAMPLE: PP A 0 0 G 214 A T19 NG

PLUS SEAL® II, PISTON DESIGNATOR
STYLE CODE
    A = CIRCUMFRENTIAL GROOVES
        (PREFERRED DESIGN CONFIGURATION)
    B = NO CIRCUMFRENTIAL GROOVES
BACKUP WIDTH
    0 = ZERO BACKUP WIDTH
        (PREFERRED DESIGN CONFIGURATION)
    1 = ONE BACKUP WIDTH
    2 = TWO BACKUP WIDTH
DESIGN CHARACTERISTICS
    0 = STANDARD, NOTCHED
        (PREFERRED DESIGN CONFIGURATION)
    W = TO REMOVE NOTCHES
GLAND DESIGNATOR
    G = AS4716
SIZE DESIGNATOR
    ACCORDING TO AS4716 REVISION A
QUALITY INDEX:
    A = AEROSPACE CERTIFICATE OF CONFORMANCE
TURCON® SEAL RING MAT'L. CODE
TUREL® PLUS RING MAT'L CODE
CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

3. ZERO BACKUP WIDTH PREFERRED, IF GLAND WIDTH IS GREATER THAN ZERO THE USE OF BACKUP RINGS ARE RECOMMENDED.

PLUS SEAL® II: PATENTED

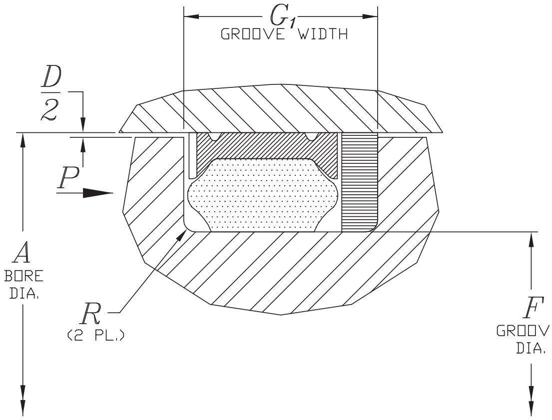
INCH
2009_1
TRELLEBORG
SEALING SOLUTIONS
TITLE
PLUS SEAL® II
DRAWING NO.
PPA00G000

WORLD AEROSPACE TITLE BLOCK REV.

Turcon® Plus Seal® II

DASH NO.	A DIA.	F DIA.
	+.001 -.000	+.000 -.001
004	.190	.076
005	.221	.115
006	.235	.129
007	.266	.158
008	.297	.189
009	.329	.220
010	.360	.250
011	.422	.312
012	.485	.375
	+.002 -.000	+.000 -.002
013	.550	.441
014	.613	.504
015	.675	.566
016	.738	.629
017	.800	.691
018	.863	.753
019	.925	.815
020	.991	.881
021	1.053	.943
022	1.116	1.006
023	1.178	1.068
024	1.241	1.131
025	1.303	1.193
026	1.366	1.256
027	1.428	1.318
028	1.491	1.381
	+.001 -.000	+.000 -.001
104	.297	.128
105	.329	.158
106	.360	.187
107	.391	.215
108	.422	.246
109	.485	.308
	+.002 -.000	+.000 -.002
110	.550	.379
111	.613	.441
112	.675	.502
113	.738	.565
114	.800	.627
115	.863	.689
116	.925	.751
117	.991	.817
118	1.053	.879
119	1.116	.942
120	1.178	1.003
121	1.241	1.066
122	1.303	1.128
123	1.366	1.191
124	1.428	1.253
125	1.491	1.316
126	1.553	1.378
127	1.616	1.441
128	1.678	1.503
129	1.741	1.566
130	1.805	1.631
131	1.867	1.693
132	1.930	1.756
133	1.992	1.818
134	2.055	1.881
135	2.118	1.944
136	2.180	2.006
137	2.243	2.069
138	2.305	2.131
139	2.368	2.194
140	2.430	2.256
141	2.493	2.319
142	2.555	2.381
143	2.618	2.444
144	2.680	2.506
145	2.743	2.569
146	2.805	2.631
147	2.868	2.694
148	2.930	2.756
149	2.993	2.819
	+.002 -.000	+.000 -.002
210	.991	.750
211	1.053	.812
212	1.116	.874
213	1.178	.936
214	1.241	.999
215	1.303	1.061
216	1.366	1.124
217	1.428	1.186
218	1.491	1.249
219	1.553	1.311
220	1.616	1.374
221	1.678	1.436
222	1.741	1.499
223	1.867	1.625
224	1.992	1.750
225	2.118	1.876
226	2.243	2.001
227	2.368	2.126
228	2.493	2.251
229	2.618	2.376
230	2.743	2.501
231	2.868	2.626
232	2.993	2.751
233	3.118	2.876
234	3.243	3.001
235	3.368	3.126
236	3.493	3.251
237	3.618	3.376
238	3.743	3.501
239	3.868	3.626
240	3.993	3.751
241	4.118	3.876
242	4.243	4.001
243	4.368	4.126
244	4.493	4.251
245	4.618	4.376
246	4.743	4.501
247	4.868	4.626
	+.002 -.000	+.000 -.002
325	1.867	1.495
326	1.992	1.620
327	2.118	1.746
328	2.243	1.871
329	2.368	1.996
330	2.493	2.121
331	2.618	2.246
332	2.743	2.371
333	2.868	2.496
334	2.993	2.621
335	3.118	2.746
336	3.243	2.871
337	3.368	2.996
338	3.493	3.121
339	3.618	3.246
340	3.743	3.371
341	3.868	3.496
342	3.993	3.621
343	4.118	3.746
344	4.243	3.871
345	4.368	3.996
346	4.493	4.121
347	4.618	4.246
348	4.743	4.371
349	4.868	4.496
	+.003 -.000	+.000 -.003
425	4.974	4.497
426	5.099	4.622
427	5.224	4.747
428	5.349	4.872
429	5.474	4.997
430	5.599	5.122
431	5.724	5.247
432	5.849	5.372
433	5.974	5.497
434	6.099	5.622
	+.003 -.000	+.000 -.003
435	6.224	5.747
436	6.349	5.872
437	6.474	5.997
438	6.724	6.247
439	6.974	6.497
440	7.224	6.747
441	7.474	6.997
442	7.724	7.247
443	7.974	7.497
444	8.224	7.747
445	8.474	7.997
446	8.974	8.497
	+.004 -.000	+.000 -.004
447	9.474	8.997
448	9.974	9.497
449	10.474	9.997
450	10.974	10.497
451	11.474	10.997
452	11.974	11.497
453	12.474	11.997
454	12.974	12.497
455	13.474	12.997
456	13.974	13.497
457	14.474	13.997
458	14.974	14.497
459	15.474	14.997
460	15.974	15.497

DASH NO.	G_1 ONE BACKUP WIDTH	R RADIUS	D DIAMETRAL CLEARANCE MAX.
004-009	.154/.164	.005/.015	.004
010-012	.150/.160		.004
013-028			.005
104-109	.183/.193	.005/.015	.004
110-126			.005
127-129			.005
130-132			.006
133-140			.006
141-149			.007
210-222	.235/.245	.010/.025	.005
223-224			.006
225-227			.006
228-243			.007
244-245			.008
246-247			.008
325-327	.334/.344	.020/.035	.006
328-329			.006
330-345			.007
346-349			.008
425-438	.475/.485	.020/.035	.009
439-445			.009
446			.010
447-460			.011



PISTON SEAL INSTALLATION
FOR ONE BACKUP WIDTH GLANDS PER AS4716 REVISION A

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR PLUS SEAL® II IN AS4716 REVISION A PISTON GLANDS.

2. ORDERING EXAMPLE: PP A 1 A G 214 A T19 NG

   PLUS SEAL® II, PISTON DESIGNATOR
   STYLE CODE
     A = CIRCUMFRENTIAL GROOVES
       (PREFERRED DESIGN CONFIGURATION)
     B = NO CIRCUMFRENTIAL GROOVES
   BACKUP WIDTH
     1 = ONE BACKUP WIDTH
   DESIGN CHARACTERISTICS
   △4 SEE TABLE BELOW
   GLAND DESIGNATOR
     G = AS4716
   SIZE DESIGNATOR
     ACCORDING TO AS4716 REVISION A
   QUALITY INDEX:
     A = AEROSPACE CERTIFICATE OF CONFORMANCE
   TURCON® SEAL RING MAT'L. CODE
   TUREL® PLUS RING MAT'L CODE
   CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

3. ALL SEAL RING ARE SUPPLIED WITH NOTCHES.

△4 DESIGN CODES FOR BACKUP RING CONFIGURATION.

	BACKUP RING				
	TYPE		MATERIAL		
DESIGN CODE	SOLID BACKUP RING	SCARF CUT △5 BACKUP RING	MATERIAL SAME AS SEAL RING	TURCON® T29	STAKBAK® △6
A	X		X		
D	X			X	
G		X	X		
F		X		X	
8		X			X

△5 SCARF CUT BACKUP RINGS ARE AVIALABLE ONLY IN DASH SIZES, -004 THROUGH -028, -104 THROUGH -135, -210 THROUGH -227, -325 THROUGH -335 & -425 THROUGH -431

△6 STAKBAK® BACKUP RINGS ARE AVAILABLE ONLY IN DASH SIZES, -020 THROUGH -028 -118 THROUGH -149, -211 THROUGH -247, -325 THROUGH -349 & -425 THROUGH -449

PLUS SEAL® II: PATENTED

STAKBAK® PATENTS:

U.S.A.	4,576,386
U.K.	2 169 670
W. GERMANY	3 601 149
FRANCE	2 576 078
SWEDEN	458,469

INCH
2009_1
TRELLEBORG
SEALING SOLUTIONS
TITLE
PLUS SEAL® II
DRAWING NO.
PPA1AG000

WORLD AEROSPACE TITLE BLOCK REV.

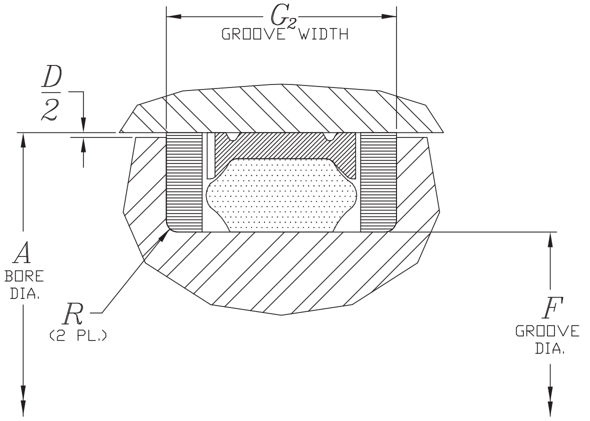
Turcon® Plus Seal® II

DASH NO.	A DIA.	F DIA.
	+.001 −.000	+.000 −.001
004	.190	.076
005	.221	.115
006	.235	.129
007	.266	.158
008	.297	.189
009	.329	.220
010	.360	.250
011	.422	.312
012	.485	.375
	+.002 −.000	+.000 −.002
013	.550	.441
014	.613	.504
015	.675	.566
016	.738	.629
017	.800	.691
018	.863	.753
019	.925	.815
020	.991	.881
021	1.053	.943
022	1.116	1.006
023	1.178	1.068
024	1.241	1.131
025	1.303	1.193
026	1.366	1.256
027	1.428	1.318
028	1.491	1.381
	+.001 −.000	+.000 −.001
104	.297	.128
105	.329	.158
106	.360	.187
107	.391	.215
108	.422	.246
109	.485	.308
	+.002 −.000	+.000 −.002
110	.550	.379
111	.613	.441
112	.675	.502
113	.738	.565
114	.800	.627
115	.863	.689
116	.925	.751
117	.991	.817
118	1.053	.879
119	1.116	.942
120	1.178	1.003
121	1.241	1.066
122	1.303	1.128
123	1.366	1.191
124	1.428	1.253
125	1.491	1.316
126	1.553	1.378
127	1.616	1.441
128	1.678	1.503
129	1.741	1.566
130	1.805	1.631
131	1.867	1.693
132	1.930	1.756
133	1.992	1.818
134	2.055	1.881
135	2.118	1.944
136	2.180	2.006
137	2.243	2.069
138	2.305	2.131
139	2.368	2.194
140	2.430	2.256
141	2.493	2.319
142	2.555	2.381
143	2.618	2.444
144	2.680	2.506
145	2.743	2.569
146	2.805	2.631
147	2.868	2.694
148	2.930	2.756
149	2.993	2.819

DASH NO.	A DIA.	F DIA.
	+.002 −.000	+.000 −.002
210	.991	.750
211	1.053	.812
212	1.116	.874
213	1.178	.936
214	1.241	.999
215	1.303	1.061
216	1.366	1.124
217	1.428	1.186
218	1.491	1.249
219	1.553	1.311
220	1.616	1.374
221	1.678	1.436
222	1.741	1.499
223	1.867	1.625
224	1.992	1.750
225	2.118	1.876
226	2.243	2.001
227	2.368	2.126
228	2.493	2.251
229	2.618	2.376
230	2.743	2.501
231	2.868	2.626
232	2.993	2.751
233	3.118	2.876
234	3.243	3.001
235	3.368	3.126
236	3.493	3.251
237	3.618	3.376
238	3.743	3.501
239	3.868	3.626
240	3.993	3.751
241	4.118	3.876
242	4.243	4.001
243	4.368	4.126
244	4.493	4.251
245	4.618	4.376
246	4.743	4.501
247	4.868	4.626
	+.002 −.000	+.000 −.002
325	1.867	1.495
326	1.992	1.620
327	2.118	1.746
328	2.243	1.871
329	2.368	1.996
330	2.493	2.121
331	2.618	2.246
332	2.743	2.371
333	2.868	2.496
334	2.993	2.621
335	3.118	2.746
336	3.243	2.871
337	3.368	2.996
338	3.493	3.121
339	3.618	3.246
340	3.743	3.371
341	3.868	3.496
342	3.993	3.621
343	4.118	3.746
344	4.243	3.871
345	4.368	3.996
346	4.493	4.121
347	4.618	4.246
348	4.743	4.371
349	4.868	4.496
	+.003 −.000	+.000 −.003
425	4.974	4.497
426	5.099	4.622
427	5.224	4.747
428	5.349	4.872
429	5.474	4.997
430	5.599	5.122
431	5.724	5.247
432	5.849	5.372
433	5.974	5.497
434	6.099	5.622

DASH O-RING NO.	A DIA.	F DIA.
	+.003 −.000	+.000 −.003
435	6.224	5.747
436	6.349	5.872
437	6.474	5.997
438	6.724	6.247
439	6.974	6.497
440	7.224	6.747
441	7.474	6.997
442	7.724	7.247
443	7.974	7.497
444	8.224	7.747
445	8.474	7.997
446	8.974	8.497
	+.004 −.000	+.000 −.004
447	9.474	8.997
448	9.974	9.497
449	10.474	9.997
450	10.974	10.497
451	11.474	10.997
452	11.974	11.497
453	12.474	11.997
454	12.974	12.497
455	13.474	12.997
456	13.974	13.497
457	14.474	13.997
458	14.974	14.497
459	15.474	14.997
460	15.974	15.497

DASH NO.	G_2 TWO BACKUP WIDTH	R RADIUS	D DIAMETRAL CLEARANCE MAX.
004-009	.210/.220	.005/.015	.004
010-012	.207/.217		.004
013-028			.005
104-109	.245/.255	.005/.015	.004
110-126			.005
127-129			.005
130-132			.006
133-140			.006
141-149			.007
210-222	.304/.314	.010/.025	.005
223-224			.006
225-227			.006
228-243			.007
244-245			.008
246-247			.008
325-327	.424/.434	.020/.035	.006
328-329			.006
330-345			.007
346-349			.008
425-438	.579/.589	.020/.035	.009
439-445			.009
446			.010
447-460			.011



PISTON SEAL INSTALLATION
FOR TWO BACKUP WIDTH GLANDS PER AS4716 REVISION A

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR PLUS SEAL® II IN AS4716 REVISION A PISTON GLANDS.

2. ORDERING EXAMPLE: PP A 2 A G 214 A T19 NG

   PLUS SEAL® II, PISTON DESIGNATOR
   STYLE CODE
   A = CIRCUMFRENTIAL GROOVES
   (PREFERRED DESIGN CONFIGURATION)
   B = NO CIRCUMFRENTIAL GROOVES
   BACKUP WIDTH
   2 = TWO BACKUP WIDTH
   DESIGN CHARACTERISTICS
   △4 SEE TABLE BELOW
   GLAND DESIGNATOR
   G = AS4716
   SIZE DESIGNATOR
   ACCORDING TO AS4716 REVISION A
   QUALITY INDEX:
   A = AEROSPACE CERTIFICATE OF CONFORMANCE
   TURCON® SEAL RING MAT'L. CODE
   TUREL® PLUS RING MAT'L CODE
   CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

3. ALL SEAL RING ARE SUPPLIED WITH NOTCHES.

△4 DESIGN CODES FOR BACKUP RING CONFIGURATION.

	BACKUP RING				
	TYPE		MATERIAL		
DESIGN CODE	SOLID BACKUP RING	SCARF CUT △5 BACKUP RING	MATERIAL SAME AS SEAL RING	TURCON® T29	STAKBAK® △6
A	X		X		
D	X			X	
G		X	X		
F		X		X	
8		X			X

△5 SCARF CUT BACKUP RINGS ARE AVIALABLE ONLY IN DASH SIZES, −004 THROUGH −028, −104 THROUGH −135, −210 THROUGH −227, −325 THROUGH −335 & −425 THROUGH −431

△6 STAKBAK® BACKUP RINGS ARE AVAILABLE ONLY IN DASH SIZES, −020 THROUGH −028 −118 THROUGH −149, −211 THROUGH −247, −325 THROUGH −349 & −425 THROUGH −449

PLUS SEAL® II: PATENTED

STAKBAK® PATENTS:

U.S.A.	4,576,386
U.K.	2 169 670
W. GERMANY	3 601 149
FRANCE	2 576 078
SWEDEN	458,469

INCH
2009_1
TRELLEBORG
SEALING SOLUTIONS
TITLE
PLUS SEAL® II
DRAWING NO.
PPA2AG000

WORLD AEROSPACE TITLE BLOCK REV.

Features and benefits

- Good static and dynamic sealing effect
- Low friction, high efficiency
- Operating temperatures of -65°F to +390°F/ -54°C to +200°C
- Good chemical compatibility depending on elastomer
- Leak-tight reliable sealing performance
- No adhesion even after extended periods of rest
- Sizes to suit all O-Ring glands including MIL-G-5514F and AS4716
- High abrasion resistance
- Continuously lubricated
- Long service life
- Stick-slip-free starting
- Simple installation

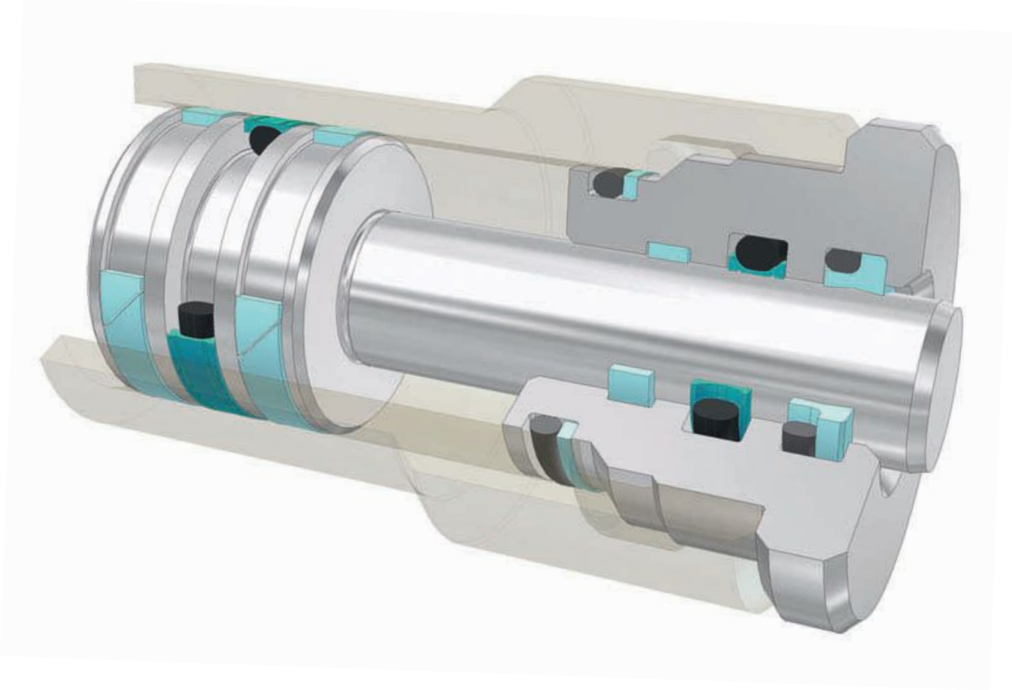


Illustration shows typical hydraulic cylinder with a sealing configuration incorporating Turcon® Double Delta® II.

Description

Turcon® Double Delta® II is the original slipper seal developed to improve the performance of O-Rings and Back-up Rings used in MIL-G-5514F and older versions of the gland standard. It is a double-acting seal energized by an elastomer O-Ring. Demonstrating good friction properties, Turcon® Double Delta® II provides stick-slip-free starting and excellent dry running. A full range of sizes is offered to suit all MIL-G-5514F and AS4716 glands along with custom designs.

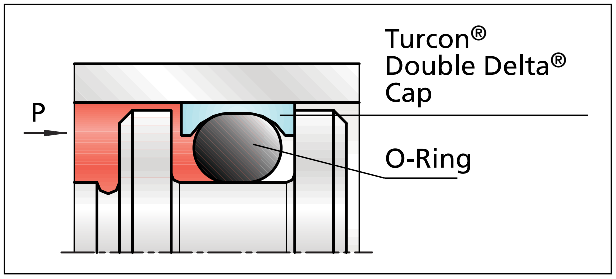


Figure 1 Turcon® Double Delta® II

Method of Operation

The O-Ring in Turcon® Double Delta® II preloads the seal cap in the thin, flexible middle section. This provides good leakage control even at low pressures.

In addition, when there is system pressure, the oil film under the seal is further reduced. Double Delta® II will always allow an oil film to be dragged across the sealing surface. This oil film is necessary to ensure a long service life.

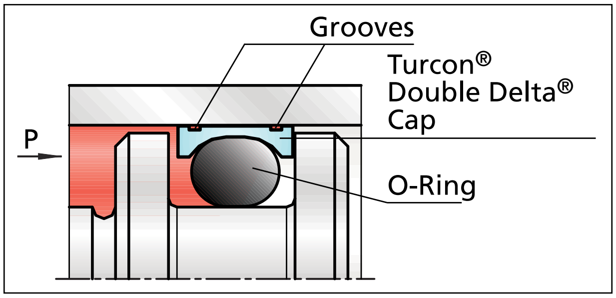


Figure 2 Grooved Turcon® Double Delta® II

By choosing the grooved version, a further decrease in the film thickness can be achieved. The grooves increase the number of pressure peaks that the oil film must pass under. Another advantage of the grooved seal is that the grooves serve as an oil reservoir when the seal is static. When the seal starts to move dynamically, the oil film is quickly re-established under the sliding surface to lubricate the seal and maintain seal friction at a minimum. This is especially important in applications where the stroke is shorter than the seal width and it provides a general improvement in wear-life. See Figure 2.

The zero back-up width of the seal is generally preferred, even if a wider groove is available in smaller diameters. The extra space in a wider groove is used more efficiently when filled with Back-up Rings. This increases the seal life without notably affecting the friction.

Where Turcon® Double Delta® II is subjected bi-directional pressure, pressure from both sides alternately, it should always be equipped with sidewall notches. See Figure 3. These allow the pressure to properly activate the elastomer. See Figure 4. For piston use Turcon® Double Delta® II is equipped with notches as standard. The rod version must be specified with notches if they are deemed necessary.

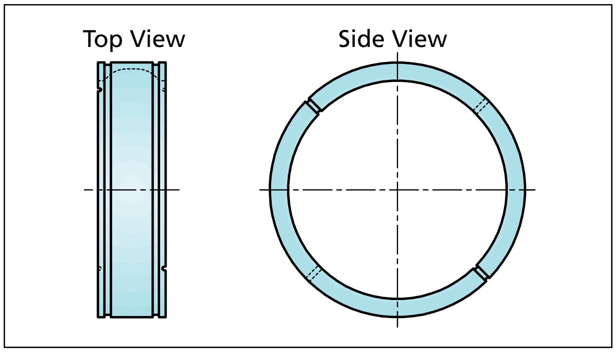


Figure 3 Turcon® Double Delta® II Notches

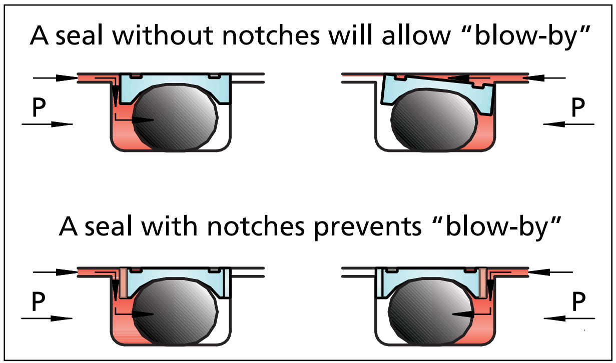


Figure 4 Turcon® Double Delta® II with notches, function

Using a seal without notches may allow blow-by, where the pressure shoots over the top of the Turcon® Double Delta® II cap and forces the seal down into the groove. See SAE International document AIR 1243 for more information on this topic.

Turcon® Double Delta® II

Technical Data

Operation pressure: 5,000 psi/ 35 MPa

Speed: Up to 49.2 ft/s/ 15.0 m/s

Temperature range: -65°F to +390°F/ -54°C to +200°C depending on elastomer material

Clearance: As per AS4716 recommendations Larger clearance possible with Stakbak®

Media: Mineral oil-based hydraulic fluids, flame-retardant hydraulic fluids, environmentally-safe hydraulic fluids (bio-oils), phosphate ester-based hydraulic oils, water and others depending on the elastomer material selected

Avoid combining extreme limits.

Series

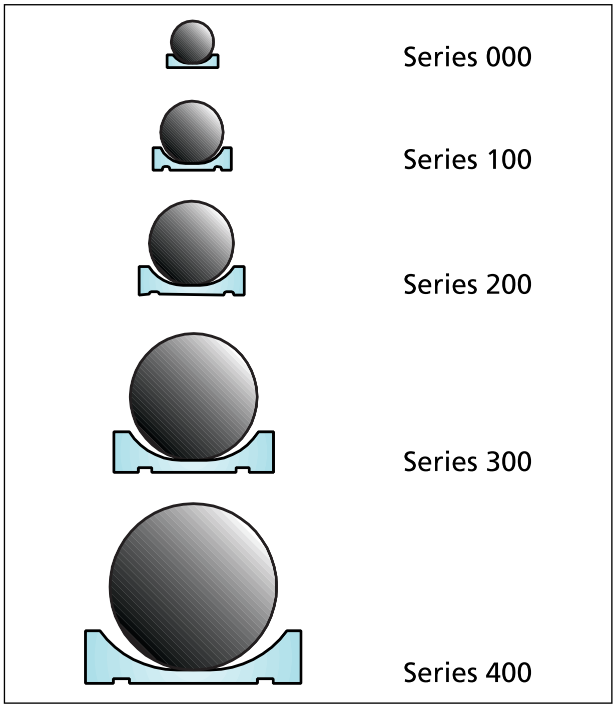


Figure 5 Relationship between Turcon® Double Delta® cross section

Table I Turcon® Double Delta® II Types

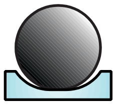
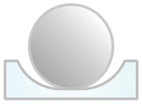
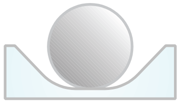
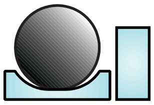
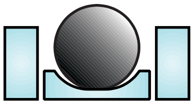
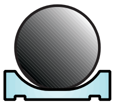
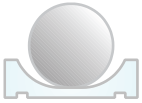
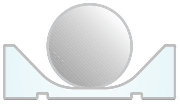
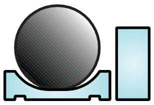
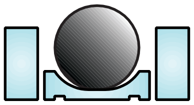
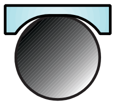
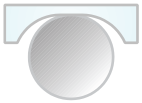
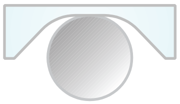
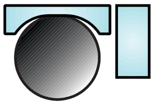
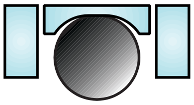
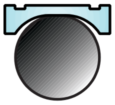
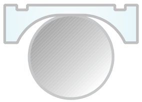
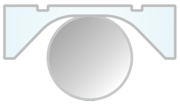
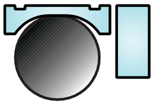
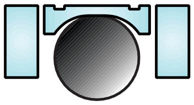
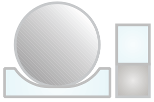
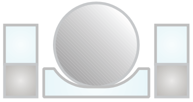
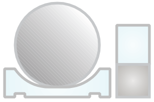
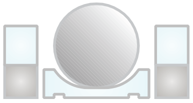
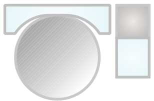
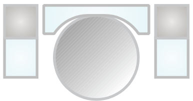
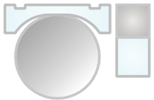
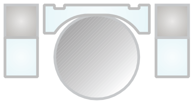
Seal	Turcon® Double Delta® II		
	Width		
Type	0 BUR (G_0)	1 BUR (G_1)	2 BUR (G_2)
Rod	 RDB0_G	 RDB1_G	 RDB2_G
Rod with BUR	N/A	 RDB1AG	 RDB2AG
Grooved Rod	 RDA0_G	 RDA1_G	 RDA2_G
Grooved Rod with BUR	N/A	 RDA1AG	 RDA2AG
Piston	 PDB0_G	 PDB1_G	 PDB2_G
Piston with BUR	N/A	 PDB1AG	 PDB2AG
Grooved Piston	 PDA0_G	 PDA1_G	 PDA2_G
Grooved Piston with BUR	N/A	 PDA1AG	 PDA2AG

Table II Turcon® Double Delta® II Types with Stakbak®

Seal	Turcon® Double Delta® II		
	Width		
Type	**0 BUR (G_0)**	**1 BUR (G_1)**	**2 BUR (G_2)**
Rod with Stakbak®	N/A	 RDB18G	 RDB28G
Grooved Rod with Stakbak®	N/A	 RDA18G	 RDA28G
Piston with Stakbak®	N/A	 PDB18G	 PDB28G
Grooved Piston with Stakbak®	N/A	 PDA18G	 PDA28G

- G denotes groove width; zero, one or two back-up width
- BUR - Back-up Ring

Piston seals are always delivered as standard with notch. Rod seals are always delivered without a notch.

Not every Turcon® Double Delta® is available with circumferential grooves and radial notches as the cross section and available materials limit the possibilities. This is particularly true in -000 and -100 series cross sections. Please refer to the print for groove and notch availability by seal cross section.

Turcon® Double Delta® II follows the series as laid out in AS4716. We recommend that the guidelines for static and dynamic sizes are followed to ensure a good service life for the seal.

Turcon® Double Delta® II is also available for British Standard B.S.4518 and any other O-Ring grooves.

Profiles in color are recommended configurations.

Turcon® Double Delta® II

DASH NO.	*B* DIA.	*E* DIA.	O-RING NO.
	+.000 -.001	+.001 -.000	
004	.076	.190	004
005	.108	.217	005
006	.123	.232	006
007	.154	.264	007
008	.185	.294	008
009	.217	.327	009
010	.248	.359	010
011	.310	.421	011
012	.373	.484	012
	+.000 -.002	+.002 -.000	
013	.435	.545	013
014	.498	.608	014
015	.560	.670	015
016	.623	.733	016
017	.685	.795	017
018	.748	.858	018
019	.810	.920	019
020	.873	.983	020
021	.935	1.045	021
022	.998	1.108	022
023	1.060	1.170	023
024	1.123	1.233	024
025	1.185	1.295	025
026	1.248	1.358	026
027	1.310	1.420	027
028	1.373	1.483	028
	+.000 -.001	+.001 -.000	
104	.123	.295	104
105	.154	.327	105
106	.185	.359	106
107	.217	.392	107
108	.248	.423	108
109	.310	.486	109
	+.000 -.002	+.002 -.000	
110	.373	.546	110
111	.435	.609	111
112	.498	.672	112
113	.560	.734	113
114	.623	.797	114
115	.685	.859	115
116	.748	.923	116
117	.810	.985	117
118	.873	1.048	118
119	.935	1.110	119
120	.998	1.173	120
121	1.060	1.235	121
122	1.123	1.298	122
123	1.185	1.360	123
124	1.248	1.423	124
125	1.310	1.485	125
126	1.373	1.548	126
127	1.435	1.610	127
128	1.498	1.673	128
129	1.560	1.735	129
130	1.623	1.798	130
131	1.685	1.860	131
132	1.748	1.923	132
133	1.810	1.984	133
134	1.873	2.047	134
135	1.936	2.110	135
136	1.998	2.172	136
137	2.061	2.235	137
138	2.123	2.297	138
139	2.186	2.360	139
140	2.248	2.422	140
141	2.311	2.485	141
142	2.373	2.547	142
143	2.436	2.610	143
144	2.498	2.672	144
145	2.561	2.735	145
146	2.623	2.797	146
147	2.686	2.860	147
148	2.748	2.922	148
149	2.811	2.985	149
	+.000 -.002	+.002 -.000	
210	.748	.989	210
211	.810	1.051	211
212	.873	1.115	212
213	.935	1.177	213
214	.998	1.240	214
215	1.060	1.302	215
216	1.123	1.365	216
217	1.185	1.427	217
218	1.248	1.490	218
219	1.310	1.552	219
220	1.373	1.615	220
221	1.435	1.677	221
222	1.498	1.740	222
223	1.623	1.865	223
224	1.748	1.990	224
225	1.873	2.115	225
226	1.998	2.240	226
227	2.123	2.365	227
228	2.248	2.490	228
229	2.373	2.615	229
230	2.498	2.740	230
231	2.623	2.865	231
232	2.748	2.990	232
233	2.873	3.115	233
234	2.997	3.239	234
235	3.122	3.364	235
236	3.247	3.489	236
237	3.372	3.614	237
238	3.497	3.739	238
239	3.622	3.864	239
240	3.747	3.989	240
241	3.872	4.114	241
242	3.997	4.239	242
243	4.122	4.364	243
244	4.247	4.489	244
245	4.372	4.614	245
246	4.497	4.739	246
247	4.622	4.864	247
	+.000 -.002	+.002 -.000	
325	1.498	1.870	325
326	1.623	1.995	326
327	1.748	2.120	327
328	1.873	2.245	328
329	1.998	2.370	329
330	2.123	2.495	330
331	2.248	2.620	331
332	2.373	2.745	332
333	2.498	2.870	333
334	2.623	2.995	334
335	2.748	3.120	335
336	2.873	3.245	336
337	2.997	3.369	337
338	3.122	3.494	338
339	3.247	3.619	339
340	3.372	3.744	340
341	3.497	3.869	341
342	3.622	3.994	342
343	3.747	4.119	343
344	3.872	4.244	344
345	3.997	4.369	345
346	4.122	4.494	346
347	4.247	4.619	347
348	4.372	4.744	348
349	4.497	4.869	349
	+.000 -.003	+.003 -.000	
425	4.497	4.974	425
426	4.622	5.099	426
427	4.747	5.224	427
428	4.872	5.349	428
429	4.997	5.474	429
430	5.122	5.599	430
431	5.247	5.724	431
432	5.372	5.849	432
433	5.497	5.974	433
434	5.622	6.099	434
	+.000 -.003	+.003 -.000	
435	5.747	6.224	435
436	5.872	6.349	436
437	5.997	6.474	437
438	6.247	6.724	438
439	6.497	6.974	439
440	6.747	7.224	440
441	6.997	7.474	441
442	7.247	7.724	442
443	7.497	7.974	443
444	7.747	8.224	444
445	7.997	8.474	445
446	8.497	8.974	446
	+.000 -.003	+.004 -.000	
447	8.997	9.474	447
448	9.497	9.974	448
449	9.997	10.474	449
450	10.497	10.974	450
451	10.997	11.474	451
452	11.497	11.974	452
453	11.997	12.474	453
454	12.497	12.974	454
455	12.997	13.474	455
456	13.497	13.974	456
457	13.997	14.474	457
458	14.497	14.974	458
459	14.997	15.474	459
460	15.497	15.974	460

△3 *CHART A*

DASH NUMBER	INCREASE IN *E*
004-028	.012
104-149	.014
210-247	.020
325-349	.018
425-460	.025

DASH NO.	G_0 ZERO BACKUP WIDTH	G_1 ONE BACKUP WIDTH	G_2 TWO BACKUP WIDTH	*R* RADIUS	*D* DIAMETRAL CLEARANCE MAX.
004-009	.098/.103	.154/.164	.210/.220	.005/.015	.004
010-012	.094/.099	.150/.160	.207/.217		.004
013-028					.005
104-109	.141/.151	.183/.193	.245/.255	.005/.015	.004
110-126					.005
127-129					.006
130-132					.006
133-140					.007
141-149					.007
210-222	.188/.198	.235/.245	.304/.314	.010/.025	.005
223-224					.006
225-227					.007
228-243					.007
244-245					.007
246-247					.008
325-327	.281/.291	.334/.344	.424/.434	.020/.035	.006
328-329					.007
330-345					.007
346-349					.007
425-438	.375/.385	.475/.485	.579/.589	.020/.035	.009
439-445					.010
446					.010
447-460					.010

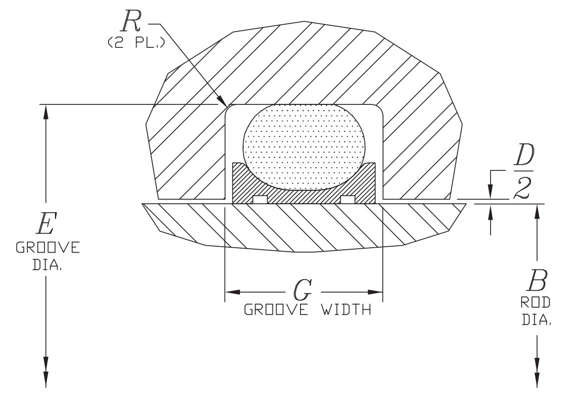
NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR DOUBLE DELTA® II IN AS4716 REVISION A ROD GLANDS.

2. ORDERING EXAMPLE: RD A 0 0 G 214 A T05 NG

DOUBLE DELTA® II, ROD DESIGNATOR
STYLE CODE
  A = CIRCUMFERENTIAL GROOVES
    (PREFERRED DESIGN)
    FOR 0 & 1 BU WIDTH, CIRCUMFERENTIAL
    GROOVES ARE ONLY AVAILABLE IN
    DASH SIZES -104 THROUGH -460)
  B = NO CIRCUMFRENTIAL GROOVES
BACKUP WIDTH
  0 = ZERO BACKUP WIDTH
  1 = ONE BACKUP WIDTH
  2 = TWO BACKUP WIDTH
DESIGN CHARACTERISTICS
  0 = STANDARD, UNNOTCHED
  N = TO ADD NOTCHES
    (COMBINATION OF NOTCHES & CIRCUMFERENTIAL
    GROOVES ARE ONLY AVAILABLE IN
    DASH SIZES -210 THROUGH -460)
GLAND DESIGNATOR
  G = AS4716
SIZE DESIGNATOR
  ACCORDING TO AS4716 REVISION A
QUALITY INDEX:
  A = AEROSPACE CERTIFICATE OF CONFORMANCE
TURCON® DOUBLE DELTA® II MAT'L. CODE
TUREL® O-RING MAT'L CODE
CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

△3 SEAL SQUEEZE, OCCUPANCY AND FRICTION MAY BE REDUCED BY INCREASING GROOVE DIAMETERS, *E*, UP TO THE LIMITS SHOWN IN CHART A. IN ALL CASES, O-RING SQUEEZE WILL REMAIN ABOVE RECOMMENDED MINIMUMS.



ROD SEAL INSTALLATION

FOR ZERO, ONE & TWO BACKUP WIDTH GLANDS PER AS4716 REVISION A

INCH
2009_1
TRELLEBORG
SEALING SOLUTIONS
TITLE
DOUBLE DELTA® II
DRAWING NO.
RDA00G000

WORLD AEROSPACE TITLE BLOCK REV.

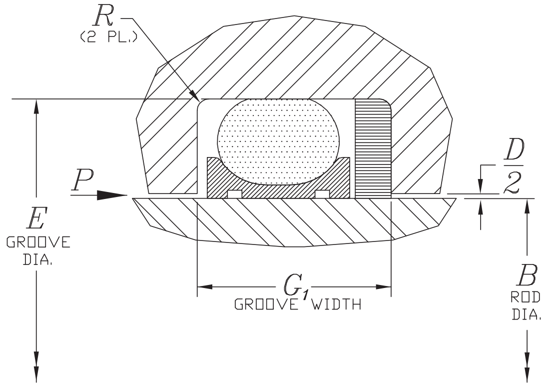
Turcon® Double Delta® II

DASH NO.	*B* DIA.	*E* DIA.	O-RING NO.
	+.000 -.001	+.001 -.000	
004	.076	.190	004
005	.108	.217	005
006	.123	.232	006
007	.154	.264	007
008	.185	.294	008
009	.217	.327	009
010	.248	.359	010
011	.310	.421	011
012	.373	.484	012
	+.000 -.002	+.002 -.000	
013	.435	.545	013
014	.498	.608	014
015	.560	.670	015
016	.623	.733	016
017	.685	.795	017
018	.748	.858	018
019	.810	.920	019
020	.873	.983	020
021	.935	1.045	021
022	.998	1.108	022
023	1.060	1.170	023
024	1.123	1.233	024
025	1.185	1.295	025
026	1.248	1.358	026
027	1.310	1.420	027
028	1.373	1.483	028
	+.000 -.001	+.001 -.000	
104	.123	.295	104
105	.154	.327	105
106	.185	.359	106
107	.217	.392	107
108	.248	.423	108
109	.310	.486	109
	+.000 -.002	+.002 -.000	
110	.373	.546	110
111	.435	.609	111
112	.498	.672	112
113	.560	.734	113
114	.623	.797	114
115	.685	.859	115
116	.748	.923	116
117	.810	.985	117
118	.873	1.048	118
119	.935	1.110	119
120	.998	1.173	120
121	1.060	1.235	121
122	1.123	1.298	122
123	1.185	1.360	123
124	1.248	1.423	124
125	1.310	1.485	125
126	1.373	1.548	126
127	1.435	1.610	127
128	1.498	1.673	128
129	1.560	1.735	129
130	1.623	1.798	130
131	1.685	1.860	131
132	1.748	1.923	132
133	1.810	1.984	133
134	1.873	2.047	134
135	1.936	2.110	135
136	1.998	2.172	136
137	2.061	2.235	137
138	2.123	2.297	138
139	2.186	2.360	139
140	2.248	2.422	140
141	2.311	2.485	141
142	2.373	2.547	142
143	2.436	2.610	143
144	2.498	2.672	144
145	2.561	2.735	145
146	2.623	2.797	146
147	2.686	2.860	147
148	2.748	2.922	148
149	2.811	2.985	149

DASH NO.	*B* DIA.	*E* DIA.	O-RING NO.
	+.000 -.002	+.002 -.000	
210	.748	.989	210
211	.810	1.051	211
212	.873	1.115	212
213	.935	1.177	213
214	.998	1.240	214
215	1.060	1.302	215
216	1.123	1.365	216
217	1.185	1.427	217
218	1.248	1.490	218
219	1.310	1.552	219
220	1.373	1.615	220
221	1.435	1.677	221
222	1.498	1.740	222
223	1.623	1.865	223
224	1.748	1.990	224
225	1.873	2.115	225
226	1.998	2.240	226
227	2.123	2.365	227
228	2.248	2.490	228
229	2.373	2.615	229
230	2.498	2.740	230
231	2.623	2.865	231
232	2.748	2.990	232
233	2.873	3.115	233
234	2.997	3.239	234
235	3.122	3.364	235
236	3.247	3.489	236
237	3.372	3.614	237
238	3.497	3.739	238
239	3.622	3.864	239
240	3.747	3.989	240
241	3.872	4.114	241
242	3.997	4.239	242
243	4.122	4.364	243
244	4.247	4.489	244
245	4.372	4.614	245
246	4.497	4.739	246
247	4.622	4.864	247
	+.000 -.002	+.002 -.000	
325	1.498	1.870	325
326	1.623	1.995	326
327	1.748	2.120	327
328	1.873	2.245	328
329	1.998	2.370	329
330	2.123	2.495	330
331	2.248	2.620	331
332	2.373	2.745	332
333	2.498	2.870	333
334	2.623	2.995	334
335	2.748	3.120	335
336	2.873	3.245	336
337	2.997	3.369	337
338	3.122	3.494	338
339	3.247	3.619	339
340	3.372	3.744	340
341	3.497	3.869	341
342	3.622	3.994	342
343	3.747	4.119	343
344	3.872	4.244	344
345	3.997	4.369	345
346	4.122	4.494	346
347	4.247	4.619	347
348	4.372	4.744	348
349	4.497	4.869	349
	+.000 -.003	+.003 -.000	
425	4.497	4.974	425
426	4.622	5.099	426
427	4.747	5.224	427
428	4.872	5.349	428
429	4.997	5.474	429
430	5.122	5.599	430
431	5.247	5.724	431
432	5.372	5.849	432
433	5.497	5.974	433
434	5.622	6.099	434

DASH NO.	*B* DIA.	*E* DIA.	O-RING NO.
	+.000 -.003	+.003 -.000	
435	5.747	6.224	435
436	5.872	6.349	436
437	5.997	6.474	437
438	6.247	6.724	438
439	6.497	6.974	439
440	6.747	7.224	440
441	6.997	7.474	441
442	7.247	7.724	442
443	7.497	7.974	443
444	7.747	8.224	444
445	7.997	8.474	445
446	8.497	8.974	446
	+.000 -.003	+.004 -.000	
447	8.997	9.474	447
448	9.497	9.974	448
449	9.997	10.474	449
450	10.497	10.974	450
451	10.997	11.474	451
452	11.497	11.974	452
453	11.997	12.474	453
454	12.497	12.974	454
455	12.997	13.474	455
456	13.497	13.974	456
457	13.997	14.474	457
458	14.497	14.974	458
459	14.997	15.474	459
460	15.497	15.974	460

DASH NO.	G_1 ONE BACKUP WIDTH	*R* RADIUS	*D* DIAMETRAL CLEARANCE MAX.
004-009	.154/.164	.005/.015	.004
010-012	.150/.160		.004
013-028			.005
104-109	.183/.193	.005/.015	.004
110-126			.005
127-129			.006
130-132			.006
133-140			.007
141-149			.007
210-222	.235/.245	.010/.025	.005
223-224			.006
225-227			.007
228-243			.007
244-245			.007
246-247			.008
325-327	.334/.344	.020/.035	.006
328-329			.007
330-345			.007
346-349			.007
425-438	.475/.485	.020/.035	.009
439-445			.010
446			.010
447-460			.010



ROD SEAL INSTALLATION
FOR ONE BACKUP WIDTH GLANDS PER AS4716 REVISION A

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR DOUBLE DELTA® II IN AS4716 REVISION A ROD GLANDS.

2. ORDERING EXAMPLE: RD A 1 A G 214 A T05 NG

DOUBLE DELTA® II, ROD DESIGNATOR — RD
STYLE CODE — A
A = CIRCUMFERENTIAL GROOVES (PREFERRED DESIGN, CIRCUMFERENTIAL GROOVES ARE ONLY AVAILABLE IN DASH SIZES -104 THROUGH -460)
B = NO CIRCUMFRENTIAL GROOVES
BACKUP WIDTH — 1
1 = ONE BACKUP WIDTH
DESIGN CHARACTERISTICS — A
⚠4 SEE TABLE BELOW
GLAND DESIGNATOR — G
G = AS4716
SIZE DESIGNATOR — 214
ACCORDING TO AS4716 REVISION A
QUALITY INDEX: — A
A= AEROSPACE CERTIFICATE OF CONFORMANCE
TURCON® DOUBLE DELTA® II MAT'L. CODE — T05
TUREL® O-RING MAT'L CODE — NG
CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

3. ALL SEAL RINGS ARE SUPPLIED WITHOUT NOTCHES, IF NOTCHES ARE REQUIRED, PLEASE CONTACT YOUR TRELLEBORG SEALING SOLUTIONS SALES ENGINEER.

⚠4 DESIGN CODES FOR BACKUP RING CONFIGURATION.

	BACKUP RING				
	TYPE		MATERIAL		
DESIGN CODE	SOLID BACKUP RING	SCARF CUT ⚠5 BACKUP RING	MATERIAL SAME AS SEAL RING	TURCON® T29	STAKBAK® ⚠6
A	X		X		
D	X			X	
G		X	X		
F		X		X	
8		X			X

⚠5 SCARF CUT BACKUP RINGS ARE AVIALABLE ONLY IN DASH SIZES, -004 THROUGH -028, -104 THROUGH -135, -210 THROUGH -227, -325 THROUGH -335 & -425 THROUGH -431

⚠6 STAKBAK® BACKUP RINGS ARE AVAILABLE ONLY IN DASH SIZES, -019 THROUGH -028 -115 THROUGH -149, -211 THROUGH -247, -325 THROUGH -349 & -425 THROUGH -449

STAKBAK® PATENTS:

U.S.A.	4,576,386
U.K.	2 169 670
W. GERMANY	3 601 149
FRANCE	2 576 078
SWEDEN	458,469

INCH
2009_1
TRELLEBORG
SEALING SOLUTIONS
TITLE
DOUBLE DELTA® II
DRAWING NO.
RDA1AG000

WORLD AEROSPACE TITLE BLOCK REV.

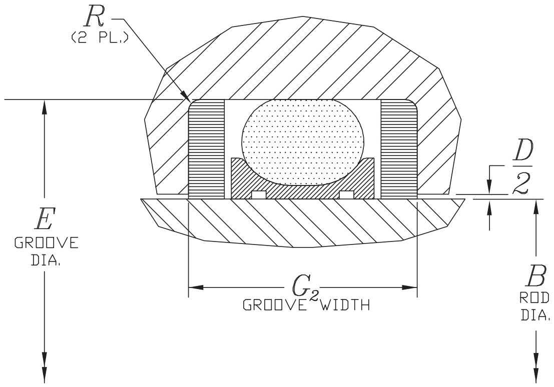
Turcon® Double Delta® II

DASH NO.	B DIA.	E DIA.	O-RING NO.
	+.000 -.001	+.001 -.000	
004	.076	.190	004
005	.108	.217	005
006	.123	.232	006
007	.154	.264	007
008	.185	.294	008
009	.217	.327	009
010	.248	.359	010
011	.310	.421	011
012	.373	.484	012
	+.000 -.002	+.002 -.000	
013	.435	.545	013
014	.498	.608	014
015	.560	.670	015
016	.623	.733	016
017	.685	.795	017
018	.748	.858	018
019	.810	.920	019
020	.873	.983	020
021	.935	1.045	021
022	.998	1.108	022
023	1.060	1.170	023
024	1.123	1.233	024
025	1.185	1.295	025
026	1.248	1.358	026
027	1.310	1.420	027
028	1.373	1.483	028
	+.000 -.001	+.001 -.000	
104	.123	.295	104
105	.154	.327	105
106	.185	.359	106
107	.217	.392	107
108	.248	.423	108
109	.310	.486	109
	+.000 -.002	+.002 -.000	
110	.373	.546	110
111	.435	.609	111
112	.498	.672	112
113	.560	.734	113
114	.623	.797	114
115	.685	.859	115
116	.748	.923	116
117	.810	.985	117
118	.873	1.048	118
119	.935	1.110	119
120	.998	1.173	120
121	1.060	1.235	121
122	1.123	1.298	122
123	1.185	1.360	123
124	1.248	1.423	124
125	1.310	1.485	125
126	1.373	1.548	126
127	1.435	1.610	127
128	1.498	1.673	128
129	1.560	1.735	129
130	1.623	1.798	130
131	1.685	1.860	131
132	1.748	1.923	132
133	1.810	1.984	133
134	1.873	2.047	134
135	1.936	2.110	135
136	1.998	2.172	136
137	2.061	2.235	137
138	2.123	2.297	138
139	2.186	2.360	139
140	2.248	2.422	140
141	2.311	2.485	141
142	2.373	2.547	142
143	2.436	2.610	143
144	2.498	2.672	144
145	2.561	2.735	145
146	2.623	2.797	146
147	2.686	2.860	147
148	2.748	2.922	148
149	2.811	2.985	149

DASH NO.	B DIA.	E DIA.	O-RING NO.
	+.000 -.002	+.002 -.000	
210	.748	.989	210
211	.810	1.051	211
212	.873	1.115	212
213	.935	1.177	213
214	.998	1.240	214
215	1.060	1.302	215
216	1.123	1.365	216
217	1.185	1.427	217
218	1.248	1.490	218
219	1.310	1.552	219
220	1.373	1.615	220
221	1.435	1.677	221
222	1.498	1.740	222
223	1.623	1.865	223
224	1.748	1.990	224
225	1.873	2.115	225
226	1.998	2.240	226
227	2.123	2.365	227
228	2.248	2.490	228
229	2.373	2.615	229
230	2.498	2.740	230
231	2.623	2.865	231
232	2.748	2.990	232
233	2.873	3.115	233
234	2.997	3.239	234
235	3.122	3.364	235
236	3.247	3.489	236
237	3.372	3.614	237
238	3.497	3.739	238
239	3.622	3.864	239
240	3.747	3.989	240
241	3.872	4.114	241
242	3.997	4.239	242
243	4.122	4.364	243
244	4.247	4.489	244
245	4.372	4.614	245
246	4.497	4.739	246
247	4.622	4.864	247
	+.000 -.002	+.002 -.000	
325	1.498	1.870	325
326	1.623	1.995	326
327	1.748	2.120	327
328	1.873	2.245	328
329	1.998	2.370	329
330	2.123	2.495	330
331	2.248	2.620	331
332	2.373	2.745	332
333	2.498	2.870	333
334	2.623	2.995	334
335	2.748	3.120	335
336	2.873	3.245	336
337	2.997	3.369	337
338	3.122	3.494	338
339	3.247	3.619	339
340	3.372	3.744	340
341	3.497	3.869	341
342	3.622	3.994	342
343	3.747	4.119	343
344	3.872	4.244	344
345	3.997	4.369	345
346	4.122	4.494	346
347	4.247	4.619	347
348	4.372	4.744	348
349	4.497	4.869	349
	+.000 -.003	+.003 -.000	
425	4.497	4.974	425
426	4.622	5.099	426
427	4.747	5.224	427
428	4.872	5.349	428
429	4.997	5.474	429
430	5.122	5.599	430
431	5.247	5.724	431
432	5.372	5.849	432
433	5.497	5.974	433
434	5.622	6.099	434

DASH NO.	B DIA.	E DIA.	O-RING NO.
	+.000 -.003	+.003 -.000	
435	5.747	6.224	435
436	5.872	6.349	436
437	5.997	6.474	437
438	6.247	6.724	438
439	6.497	6.974	439
440	6.747	7.224	440
441	6.997	7.474	441
442	7.247	7.724	442
443	7.497	7.974	443
444	7.747	8.224	444
445	7.997	8.474	445
446	8.497	8.974	446
	+.000 -.003	+.004 -.000	
447	8.997	9.474	447
448	9.497	9.974	448
449	9.997	10.474	449
450	10.497	10.974	450
451	10.997	11.474	451
452	11.497	11.974	452
453	11.997	12.474	453
454	12.497	12.974	454
455	12.997	13.474	455
456	13.497	13.974	456
457	13.997	14.474	457
458	14.497	14.974	458
459	14.997	15.474	459
460	15.497	15.974	460

DASH NO.	G_2 TWO BACKUP WIDTH	R RADIUS	D DIAMETRAL CLEARANCE MAX.
004-009	.210/.220	.005/.015	.004
010-012	.207/.217		.004
013-028			.005
104-109	.245/.255	.005/.015	.004
110-126			.005
127-129			.006
130-132			.006
133-140			.007
141-149			.007
210-222	.304/.314	.010/.025	.005
223-224			.006
225-227			.007
228-243			.007
244-245			.007
246-247			.008
325-327	.424/.434	.020/.035	.006
328-329			.007
330-345			.007
346-349			.007
425-438	.579/.589	.020/.035	.009
439-445			.010
446			.010
447-460			.010



ROD SEAL INSTALLATION
FOR TWO BACKUP WIDTH GLANDS PER AS4716 REVISION A

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR DOUBLE DELTA® II IN AS4716 REVISION A ROD GLANDS.

2. ORDERING EXAMPLE: RD A 2 A G 214 A T05 NG

   DOUBLE DELTA® II, ROD DESIGNATOR
   STYLE CODE
     A = CIRCUMFERENTIAL GROOVES
       (PREFERRED DESIGN, CIRCUMFERENTIAL
       GROOVES ARE ONLY AVAILABLE
       IN DASH SIZES -104 THROUGH -460)
     B = NO CIRCUMFERENTIAL GROOVES
   BACKUP WIDTH
     2 = TWO BACKUP WIDTH
   DESIGN CHARACTERISTICS
   △4 SEE TABLE BELOW
   GLAND DESIGNATOR
     G = AS4716
   SIZE DESIGNATOR
     ACCORDING TO AS4716 REVISION A
   QUALITY INDEX:
     A = AEROSPACE CERTIFICATE OF CONFORMANCE
   TURCON® DOUBLE DELTA® II MAT'L. CODE
   TUREL® O-RING MAT'L CODE
   CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE
   DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

3. ALL SEAL RINGS ARE SUPPLIED WITHOUT NOTCHES, IF NOTCHES ARE REQUIRED, PLEASE CONTACT YOUR TRELLEBORG SEALING SOLUTIONS SALES ENGINEER.

△4 DESIGN CODES FOR BACKUP RING CONFIGURATION.

	BACKUP RING				
	TYPE		MATERIAL		
DESIGN CODE	SOLID BACKUP RING	SCARF CUT △5 BACKUP RING	MATERIAL SAME AS SEAL RING	TURCON® T29	STAKBAK® △6
A	X		X		
D	X			X	
G		X	X		
F		X		X	
8		X			X

△5 SCARF CUT BACKUP RINGS ARE AVIALABLE ONLY IN DASH SIZES, -004 THROUGH -028, -104 THROUGH -144, -210 THROUGH -232, -325 THROUGH -342 & -425 THROUGH -431

△6 STAKBAK® BACKUP RINGS ARE AVAILABLE ONLY IN DASH SIZES, -019 THROUGH -028 -115 THROUGH -149, -211 THROUGH -247, -325 THROUGH -349 & -425 THROUGH -449

STAKBAK® PATENTS:

U.S.A.	4,576,386
U.K.	2 169 670
W. GERMANY	3 601 149
FRANCE	2 576 078
SWEDEN	458,469

INCH
2009_1

TRELLEBORG
SEALING SOLUTIONS

TITLE
DOUBLE DELTA® II

DRAWING NO.
RDA2AG000

WORLD AEROSPACE TITLE BLOCK REV.

Turcon® Double Delta® II

DASH NO.	*A* DIA.	*F* DIA.	O-RING NO.
	+.001 -.000	+.000 -.001	
004	.190	.076	004
005	.221	.115	005
006	.235	.129	006
007	.266	.158	007
008	.297	.189	008
009	.329	.220	009
010	.360	.250	010
011	.422	.312	011
012	.485	.375	012
	+.002 -.000	+.000 -.002	
013	.550	.441	013
014	.613	.504	014
015	.675	.566	015
016	.738	.629	016
017	.800	.691	017
018	.863	.753	018
019	.925	.815	019
020	.991	.881	020
021	1.053	.943	021
022	1.116	1.006	022
023	1.178	1.068	023
024	1.241	1.131	024
025	1.303	1.193	025
026	1.366	1.256	026
027	1.428	1.318	027
028	1.491	1.381	028
	+.001 -.000	+.000 -.001	
104	.297	.128	104
105	.329	.158	105
106	.360	.187	106
107	.391	.215	107
108	.422	.246	108
109	.485	.308	109
	+.002 -.000	+.000 -.002	
110	.550	.379	110
111	.613	.441	111
112	.675	.502	112
113	.738	.565	113
114	.800	.627	114
115	.863	.689	115
116	.925	.751	116
117	.991	.817	117
118	1.053	.879	118
119	1.116	.942	119
120	1.178	1.003	120
121	1.241	1.066	121
122	1.303	1.128	122
123	1.366	1.191	123
124	1.428	1.253	124
125	1.491	1.316	125
126	1.553	1.378	126
127	1.616	1.441	127
128	1.678	1.503	128
129	1.741	1.566	129
130	1.805	1.631	130
131	1.867	1.693	131
132	1.930	1.756	132
133	1.992	1.818	133
134	2.055	1.881	134
135	2.118	1.944	135
136	2.180	2.006	136
137	2.243	2.069	137
138	2.305	2.131	138
139	2.368	2.194	139
140	2.430	2.256	140
141	2.493	2.319	141
142	2.555	2.381	142
143	2.618	2.444	143
144	2.680	2.506	144
145	2.743	2.569	145
146	2.805	2.631	146
147	2.868	2.694	147
148	2.930	2.756	148
149	2.993	2.819	149

DASH NO.	*A* DIA.	*F* DIA.	O-RING NO.
	+.002 -.000	+.000 -.002	
210	.991	.750	210
211	1.053	.812	211
212	1.116	.874	212
213	1.178	.936	213
214	1.241	.999	214
215	1.303	1.061	215
216	1.366	1.124	216
217	1.428	1.186	217
218	1.491	1.249	218
219	1.553	1.311	219
220	1.616	1.374	220
221	1.678	1.436	221
222	1.741	1.499	222
223	1.867	1.625	223
224	1.992	1.750	224
225	2.118	1.876	225
226	2.243	2.001	226
227	2.368	2.126	227
228	2.493	2.251	228
229	2.618	2.376	229
230	2.743	2.501	230
231	2.868	2.626	231
232	2.993	2.751	232
233	3.118	2.876	233
234	3.243	3.001	234
235	3.368	3.126	235
236	3.493	3.251	236
237	3.618	3.376	237
238	3.743	3.501	238
239	3.868	3.626	239
240	3.993	3.751	240
241	4.118	3.876	241
242	4.243	4.001	242
243	4.368	4.126	243
244	4.493	4.251	244
245	4.618	4.376	245
246	4.743	4.501	246
247	4.868	4.626	247
	+.002 -.000	+.000 -.002	
325	1.867	1.495	325
326	1.992	1.620	326
327	2.118	1.746	327
328	2.243	1.871	328
329	2.368	1.996	329
330	2.493	2.121	330
331	2.618	2.246	331
332	2.743	2.371	332
333	2.868	2.496	333
334	2.993	2.621	334
335	3.118	2.746	335
336	3.243	2.871	336
337	3.368	2.996	337
338	3.493	3.121	338
339	3.618	3.246	339
340	3.743	3.371	340
341	3.868	3.496	341
342	3.993	3.621	342
343	4.118	3.746	343
344	4.243	3.871	344
345	4.368	3.996	345
346	4.493	4.121	346
347	4.618	4.246	347
348	4.743	4.371	348
349	4.868	4.496	349
	+.003 -.000	+.000 -.003	
425	4.974	4.497	425
426	5.099	4.622	426
427	5.224	4.747	427
428	5.349	4.872	428
429	5.474	4.997	429
430	5.599	5.122	430
431	5.724	5.247	431
432	5.849	5.372	432
433	5.974	5.497	433
434	6.099	5.622	434

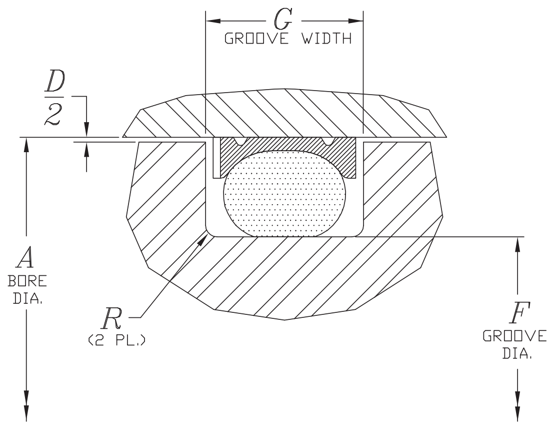
DASH NO.	*A* DIA.	*F* DIA.	O-RING NO.
	+.003 -.000	+.000 -.003	
435	6.224	5.747	435
436	6.349	5.872	436
437	6.474	5.997	437
438	6.724	6.247	438
439	6.974	6.497	439
440	7.224	6.747	440
441	7.474	6.997	441
442	7.724	7.247	442
443	7.974	7.497	443
444	8.224	7.747	444
445	8.474	7.997	445
446	8.974	8.497	446
	+.004 -.000	+.000 -.004	
447	9.474	8.997	447
448	9.974	9.497	448
449	10.474	9.997	449
450	10.974	10.497	450
451	11.474	10.997	451
452	11.974	11.497	452
453	12.474	11.997	453
454	12.974	12.497	454
455	13.474	12.997	455
456	13.974	13.497	456
457	14.474	13.997	457
458	14.974	14.497	458
459	15.474	14.997	459
460	15.974	15.497	460

△3

CHART A

DASH NUMBER	INCREASE IN *F*
004-028	.010
104-149	
210-247	.018
325-349	
425-460	.025

DASH NO.	G_0 ZERO BACKUP WIDTH	G_1 ONE BACKUP WIDTH	G_2 TWO BACKUP WIDTH	*R* RADIUS	*D* DIAMETRAL CLEARANCE MAX.
004-009	.098/.103	.154/.164	.210/.220	.005/.015	.004
010-012	.094/.099	.150/.160	.207/.217		.004
013-028					.005
104-109	.141/.151	.183/.193	.245/.255	.005/.015	.004
110-126					.005
127-129					.005
130-132					.006
133-140					.006
141-149					.007
210-222	.188/.198	.235/.245	.304/.314	.010/.025	.005
223-224					.006
225-227					.006
228-243					.007
244-245					.008
246-247					.008
325-327	.281/.291	.334/.344	.424/.434	.020/.035	.006
328-329					.006
330-345					.007
346-349					.008
425-438	.375/.385	.475/.485	.579/.589	.020/.035	.009
439-445					.009
446					.010
447-460					.011



PISTON SEAL INSTALLATION

FOR ZERO, ONE & TWO BACKUP WIDTH GLANDS PER AS4716 REVISION A

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR DOUBLE DELTA® II IN AS4716 REVISION A PISTON GLANDS.

2. ORDERING EXAMPLE: PD A 0 0 G 214 A T05 NG

DOUBLE DELTA® II, PISTON DESIGNATOR
STYLE CODE
A = CIRCUMFERENTIAL GROOVES
(PREFERRED DESIGN)
FOR 0 & 1 BU WIDTH, CIRCUMFERENTIAL
GROOVES ARE ONLY AVAILABLE IN
DASH SIZES -104 THROUGH -460)
B = NO CIRCUMFERENTIAL GROOVES
BACKUP WIDTH
0 = ZERO BACKUP WIDTH
1 = ONE BACKUP WIDTH
2 = TWO BACKUP WIDTH
DESIGN CHARACTERISTICS
0 = STANDARD, NOTCHED
W = TO REMOVE NOTCHES
(COMBINATION OF NOTCHES & CIRCUMFERENTIAL
GROOVES ARE ONLY AVAILABLE IN
DASH SIZES -210 THROUGH -460)
GLAND DESIGNATOR
G = AS4716
SIZE DESIGNATOR
ACCORDING TO AS4716 REVISION A
QUALITY INDEX:
A = AEROSPACE CERTIFICATE OF CONFORMANCE
TURCON® DOUBLE DELTA® II MAT'L. CODE
TUREL® O-RING MAT'L CODE
CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE
DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

△3 SEAL SQUEEZE, OCCUPANCY AND FRICTION MAY BE REDUCED BY DECREASING GROOVE DIAMETERS, *F*, UP TO THE LIMITS SHOWN IN CHART A. IN ALL CASES, O-RING SQUEEZE WILL REMAIN ABOVE RECOMMENDED MINIMUMS.

INCH
2009_1

TRELLEBORG
SEALING SOLUTIONS

TITLE
DOUBLE DELTA® II

DRAWING NO.
PDA00G000

WORLD AEROSPACE TITLE BLOCK REV.

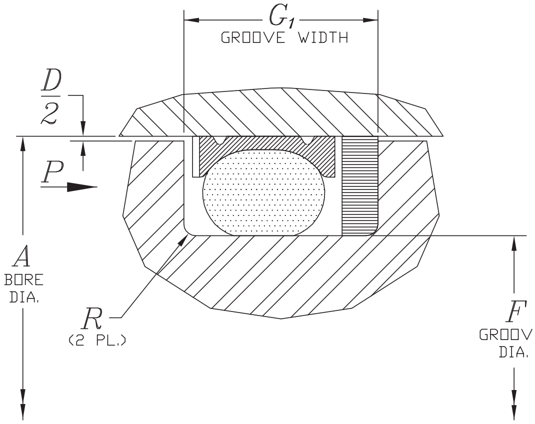
Turcon® Double Delta® II

DASH NO.	A DIA.	F DIA.	O-RING NO.
	+.001 -.000	+.000 -.001	
004	.190	.076	004
005	.221	.115	005
006	.235	.129	006
007	.266	.158	007
008	.297	.189	008
009	.329	.220	009
010	.360	.250	010
011	.422	.312	011
012	.485	.375	012
	+.002 -.000	+.000 -.002	
013	.550	.441	013
014	.613	.504	014
015	.675	.566	015
016	.738	.629	016
017	.800	.691	017
018	.863	.753	018
019	.925	.815	019
020	.991	.881	020
021	1.053	.943	021
022	1.116	1.006	022
023	1.178	1.068	023
024	1.241	1.131	024
025	1.303	1.193	025
026	1.366	1.256	026
027	1.428	1.318	027
028	1.491	1.381	028
	+.001 -.000	+.000 -.001	
104	.297	.128	104
105	.329	.158	105
106	.360	.187	106
107	.391	.215	107
108	.422	.246	108
109	.485	.308	109
	+.002 -.000	+.000 -.002	
110	.550	.379	110
111	.613	.441	111
112	.675	.502	112
113	.738	.565	113
114	.800	.627	114
115	.863	.689	115
116	.925	.751	116
117	.991	.817	117
118	1.053	.879	118
119	1.116	.942	119
120	1.178	1.003	120
121	1.241	1.066	121
122	1.303	1.128	122
123	1.366	1.191	123
124	1.428	1.253	124
125	1.491	1.316	125
126	1.553	1.378	126
127	1.616	1.441	127
128	1.678	1.503	128
129	1.741	1.566	129
130	1.805	1.631	130
131	1.867	1.693	131
132	1.930	1.756	132
133	1.992	1.818	133
134	2.055	1.881	134
135	2.118	1.944	135
136	2.180	2.006	136
137	2.243	2.069	137
138	2.305	2.131	138
139	2.368	2.194	139
140	2.430	2.256	140
141	2.493	2.319	141
142	2.555	2.381	142
143	2.618	2.444	143
144	2.680	2.506	144
145	2.743	2.569	145
146	2.805	2.631	146
147	2.868	2.694	147
148	2.930	2.756	148
149	2.993	2.819	149

DASH NO.	A DIA.	F DIA.	O-RING NO.
	+.002 -.000	+.000 -.002	
210	.991	.750	210
211	1.053	.812	211
212	1.116	.874	212
213	1.178	.936	213
214	1.241	.999	214
215	1.303	1.061	215
216	1.366	1.124	216
217	1.428	1.186	217
218	1.491	1.249	218
219	1.553	1.311	219
220	1.616	1.374	220
221	1.678	1.436	221
222	1.741	1.499	222
223	1.867	1.625	223
224	1.992	1.750	224
225	2.118	1.876	225
226	2.243	2.001	226
227	2.368	2.126	227
228	2.493	2.251	228
229	2.618	2.376	229
230	2.743	2.501	230
231	2.868	2.626	231
232	2.993	2.751	232
233	3.118	2.876	233
234	3.243	3.001	234
235	3.368	3.126	235
236	3.493	3.251	236
237	3.618	3.376	237
238	3.743	3.501	238
239	3.868	3.626	239
240	3.993	3.751	240
241	4.118	3.876	241
242	4.243	4.001	242
243	4.368	4.126	243
244	4.493	4.251	244
245	4.618	4.376	245
246	4.743	4.501	246
247	4.868	4.626	247
	+.002 -.000	+.000 -.002	
325	1.867	1.495	325
326	1.992	1.620	326
327	2.118	1.746	327
328	2.243	1.871	328
329	2.368	1.996	329
330	2.493	2.121	330
331	2.618	2.246	331
332	2.743	2.371	332
333	2.868	2.496	333
334	2.993	2.621	334
335	3.118	2.746	335
336	3.243	2.871	336
337	3.368	2.996	337
338	3.493	3.121	338
339	3.618	3.246	339
340	3.743	3.371	340
341	3.868	3.496	341
342	3.993	3.621	342
343	4.118	3.746	343
344	4.243	3.871	344
345	4.368	3.996	345
346	4.493	4.121	346
347	4.618	4.246	347
348	4.743	4.371	348
349	4.868	4.496	349
	+.003 -.000	+.000 -.003	
425	4.974	4.497	425
426	5.099	4.622	426
427	5.224	4.747	427
428	5.349	4.872	428
429	5.474	4.997	429
430	5.599	5.122	430
431	5.724	5.247	431
432	5.849	5.372	432
433	5.974	5.497	433
434	6.099	5.622	434

DASH NO.	A DIA.	F DIA.	O-RING NO.
	+.003 -.000	+.000 -.003	
435	6.224	5.747	435
436	6.349	5.872	436
437	6.474	5.997	437
438	6.724	6.247	438
439	6.974	6.497	439
440	7.224	6.747	440
441	7.474	6.997	441
442	7.724	7.247	442
443	7.974	7.497	443
444	8.224	7.747	444
445	8.474	7.997	445
446	8.974	8.497	446
	+.004 -.000	+.000 -.004	
447	9.474	8.997	447
448	9.974	9.497	448
449	10.474	9.997	449
450	10.974	10.497	450
451	11.474	10.997	451
452	11.974	11.497	452
453	12.474	11.997	453
454	12.974	12.497	454
455	13.474	12.997	455
456	13.974	13.497	456
457	14.474	13.997	457
458	14.974	14.497	458
459	15.474	14.997	459
460	15.974	15.497	460

DASH NO.	G_1 ONE BACKUP WIDTH	R RADIUS	D DIAMETRAL CLEARANCE MAX.
020-028	.150/.160	.005/.015	.005
110-126	.183/.193	.005/.015	.005
127-129			.005
130-132			.006
133-140			.006
141-149			.007
210-222	.235/.245	.010/.025	.005
223-224			.006
225-227			.006
228-243			.007
244-245			.008
246-247			.008
325-327	.334/.344	.020/.035	.006
328-329			.006
330-345			.007
346-349			.008
425-438	.475/.485	.020/.035	.009
439-445			.009
446			.010
447-449			.011



PISTON SEAL INSTALLATION

FOR ONE BACKUP WIDTH GLANDS PER AS4716 REVISION A

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR DOUBLE DELTA® II IN AS4716 REVISION A PISTON GLANDS.

2. ORDERING EXAMPLE: PD A 1 A G 214 A T05 NG

DOUBLE DELTA® II, PISTON DESIGNATOR
STYLE CODE
  A = CIRCUMFERENTIAL GROOVES
    (PREFERRED DESIGN, CIRCUMFERENTIAL
    GROOVES ARE ONLY AVAILABLE
    IN DASH SIZES -104 THROUGH -460)
  B = NO CIRCUMFERENTIAL GROOVES
BACKUP WIDTH
  1 = ONE BACKUP WIDTH
DESIGN CHARACTERISTICS
△4 SEE TABLE BELOW
GLAND DESIGNATOR
  G = AS4716
SIZE DESIGNATOR
  ACCORDING TO AS4716 REVISION A
QUALITY INDEX:
  A = AEROSPACE CERTIFICATE OF CONFORMANCE
TURCON® DOUBLE DELTA® II MAT'L. CODE
TUREL® O-RING MAT'L CODE
CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE
DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

3. FOR SIZES -004 THROUGH -149, SEAL RINGS WILL BE SUPPLIED WITH NOTCHES ONLY WHEN NO CIRCUMFERENTIAL GROOVES ARE SPECIFIED. FOR ALL OTHER SIZES, SEAL RINGS ARE SUPPLIED WITH NOTCHES.

△4 DESIGN CODES FOR BACKUP RING CONFIGURATION.

	BACKUP RING				
	TYPE		MATERIAL		
DESIGN CODE	SOLID BACKUP RING	SCARF CUT △5 BACKUP RING	MATERIAL SAME AS SEAL RING	TURCON® T29	STAKBAK® △6
A	X		X		
D	X			X	
G		X	X		
F		X		X	
8		X			X

△5 SCARF CUT BACKUP RINGS ARE AVIALABLE ONLY IN DASH SIZES, -004 THROUGH -028, -104 THROUGH -135, -210 THROUGH -227, -325 THROUGH -335 & -425 THROUGH -431

△6 STAKBAK® BACKUP RINGS ARE AVAILABLE ONLY IN DASH SIZES, -020 THROUGH -028 -118 THROUGH -149, -211 THROUGH -247, -325 THROUGH -349 & -425 THROUGH -449

STAKBAK® PATENTS:

U.S.A.	4,576,386
U.K.	2 169 670
W. GERMANY	3 601 149
FRANCE	2 576 078
SWEDEN	458,469

INCH
2009_1
TRELLEBORG
SEALING SOLUTIONS
TITLE
DOUBLE DELTA® II
DRAWING NO.
PDA1AG000

WORLD AEROSPACE TITLE BLOCK REV.

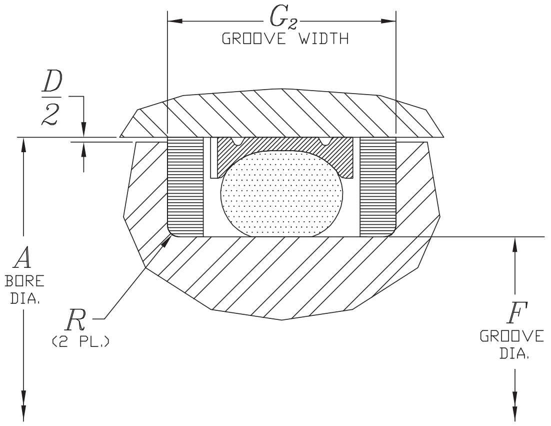
Turcon® Double Delta® II

DASH NO.	A DIA.	F DIA.	O-RING NO.
	+.001 -.000	+.000 -.001	
004	.190	.076	004
005	.221	.115	005
006	.235	.129	006
007	.266	.158	007
008	.297	.189	008
009	.329	.220	009
010	.360	.250	010
011	.422	.312	011
012	.485	.375	012
	+.002 -.000	+.000 -.002	
013	.550	.441	013
014	.613	.504	014
015	.675	.566	015
016	.738	.629	016
017	.800	.691	017
018	.863	.753	018
019	.925	.815	019
020	.991	.881	020
021	1.053	.943	021
022	1.116	1.006	022
023	1.178	1.068	023
024	1.241	1.131	024
025	1.303	1.193	025
026	1.366	1.256	026
027	1.428	1.318	027
028	1.491	1.381	028
	+.001 -.000	+.000 -.001	
104	.297	.128	104
105	.329	.158	105
106	.360	.187	106
107	.391	.215	107
108	.422	.246	108
109	.485	.308	109
	+.002 -.000	+.000 -.002	
110	.550	.379	110
111	.613	.441	111
112	.675	.502	112
113	.738	.565	113
114	.800	.627	114
115	.863	.689	115
116	.925	.751	116
117	.991	.817	117
118	1.053	.879	118
119	1.116	.942	119
120	1.178	1.003	120
121	1.241	1.066	121
122	1.303	1.128	122
123	1.366	1.191	123
124	1.428	1.253	124
125	1.491	1.316	125
126	1.553	1.378	126
127	1.616	1.441	127
128	1.678	1.503	128
129	1.741	1.566	129
130	1.805	1.631	130
131	1.867	1.693	131
132	1.930	1.756	132
133	1.992	1.818	133
134	2.055	1.881	134
135	2.118	1.944	135
136	2.180	2.006	136
137	2.243	2.069	137
138	2.305	2.131	138
139	2.368	2.194	139
140	2.430	2.256	140
141	2.493	2.319	141
142	2.555	2.381	142
143	2.618	2.444	143
144	2.680	2.506	144
145	2.743	2.569	145
146	2.805	2.631	146
147	2.868	2.694	147
148	2.930	2.756	148
149	2.993	2.819	149

DASH NO.	A DIA.	F DIA.	O-RING NO.
	+.002 -.000	+.000 -.002	
210	.991	.750	210
211	1.053	.812	211
212	1.116	.874	212
213	1.178	.936	213
214	1.241	.999	214
215	1.303	1.061	215
216	1.366	1.124	216
217	1.428	1.186	217
218	1.491	1.249	218
219	1.553	1.311	219
220	1.616	1.374	220
221	1.678	1.436	221
222	1.741	1.499	222
223	1.867	1.625	223
224	1.992	1.750	224
225	2.118	1.876	225
226	2.243	2.001	226
227	2.368	2.126	227
228	2.493	2.251	228
229	2.618	2.376	229
230	2.743	2.501	230
231	2.868	2.626	231
232	2.993	2.751	232
233	3.118	2.876	233
234	3.243	3.001	234
235	3.368	3.126	235
236	3.493	3.251	236
237	3.618	3.376	237
238	3.743	3.501	238
239	3.868	3.626	239
240	3.993	3.751	240
241	4.118	3.876	241
242	4.243	4.001	242
243	4.368	4.126	243
244	4.493	4.251	244
245	4.618	4.376	245
246	4.743	4.501	246
247	4.868	4.626	247
	+.002 -.000	+.000 -.002	
325	1.867	1.495	325
326	1.992	1.620	326
327	2.118	1.746	327
328	2.243	1.871	328
329	2.368	1.996	329
330	2.493	2.121	330
331	2.618	2.246	331
332	2.743	2.371	332
333	2.868	2.496	333
334	2.993	2.621	334
335	3.118	2.746	335
336	3.243	2.871	336
337	3.368	2.996	337
338	3.493	3.121	338
339	3.618	3.246	339
340	3.743	3.371	340
341	3.868	3.496	341
342	3.993	3.621	342
343	4.118	3.746	343
344	4.243	3.871	344
345	4.368	3.996	345
346	4.493	4.121	346
347	4.618	4.246	347
348	4.743	4.371	348
349	4.868	4.496	349
	+.003 -.000	+.000 -.003	
425	4.974	4.497	425
426	5.099	4.622	426
427	5.224	4.747	427
428	5.349	4.872	428
429	5.474	4.997	429
430	5.599	5.122	430
431	5.724	5.247	431
432	5.849	5.372	432
433	5.974	5.497	433
434	6.099	5.622	434

DASH NO.	A DIA.	F DIA.	O-RING NO.
	+.003 -.000	+.000 -.003	
435	6.224	5.747	435
436	6.349	5.872	436
437	6.474	5.997	437
438	6.724	6.247	438
439	6.974	6.497	439
440	7.224	6.747	440
441	7.474	6.997	441
442	7.724	7.247	442
443	7.974	7.497	443
444	8.224	7.747	444
445	8.474	7.997	445
446	8.974	8.497	446
	+.004 -.000	+.000 -.004	
447	9.474	8.997	447
448	9.974	9.497	448
449	10.474	9.997	449
450	10.974	10.497	450
451	11.474	10.997	451
452	11.974	11.497	452
453	12.474	11.997	453
454	12.974	12.497	454
455	13.474	12.997	455
456	13.974	13.497	456
457	14.474	13.997	457
458	14.974	14.497	458
459	15.474	14.997	459
460	15.974	15.497	460

DASH NO.	G_2 TWO BACKUP WIDTH	R RADIUS	D DIAMETRAL CLEARANCE MAX.
104-109	.245/.255	.005/.015	.004
110-126			.005
127-129			.005
130-132			.006
133-140			.006
141-149			.007
210-222	.304/.314	.010/.025	.005
223-224			.006
225-227			.006
228-243			.007
244-245			.008
246-247			.008
325-327	.424/.434	.020/.035	.006
328-329			.006
330-345			.007
346-349			.008
425-438	.579/.589	.020/.035	.009
439-445			.009
446			.010
447-460			.011



PISTON SEAL INSTALLATION
FOR TWO BACKUP WIDTH GLANDS PER AS4716 REVISION A

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR DOUBLE DELTA® II IN AS4716 REVISION A PISTON GLANDS.

2. ORDERING EXAMPLE: PD A 2 A G 214 A T05 NG

   DOUBLE DELTA® II, PISTON DESIGNATOR
   STYLE CODE
     A = CIRCUMFERENTIAL GROOVES
       (PREFERRED DESIGN, CIRCUMFERENTIAL
        GROOVES ARE ONLY AVAILABLE
        IN DASH SIZES -104 THROUGH -460)
     B = NO CIRCUMFRENTIAL GROOVES
   BACKUP WIDTH
     2 = TWO BACKUP WIDTH
   DESIGN CHARACTERISTICS
   △4 SEE TABLE BELOW
   GLAND DESIGNATOR
     G = AS4716
   SIZE DESIGNATOR
     ACCORDING TO AS4716 REVISION A
   QUALITY INDEX:
     A = AEROSPACE CERTIFICATE OF CONFORMANCE
   TURCON® DOUBLE DELTA® II MAT'L. CODE
   TUREL® O-RING MAT'L CODE
   CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE
   DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

3. FOR SIZES -004 THROUGH -149, SEAL RINGS WILL BE SUPPLIED WITH NOTCHES ONLY WHEN NO CIRCUMFERENTIAL GROOVES ARE SPECIFIED. FOR ALL OTHER SIZES, SEAL RINGS ARE SUPPLIED WITH NOTCHES.

△4 DESIGN CODES FOR BACKUP RING CONFIGURATION.

DESIGN CODE	BACKUP RING				
	TYPE		MATERIAL		
	SOLID BACKUP RING	SCARF CUT △5 BACKUP RING	MATERIAL SAME AS SEAL RING	TURCON® T29	STAKBAK® △6
A	X		X		
D	X			X	
G		X	X		
F		X		X	
8		X			X

△5 SCARF CUT BACKUP RINGS ARE AVIALABLE ONLY IN DASH SIZES, -004 THROUGH -028, -104 THROUGH -144, -210 THROUGH -232, -325 THROUGH -342 & -425 THROUGH -431

△6 STAKBAK® BACKUP RINGS ARE AVAILABLE ONLY IN DASH SIZES, -020 THROUGH -028 -118 THROUGH -149, -211 THROUGH -247, -325 THROUGH -349 & -425 THROUGH -449

STAKBAK® PATENTS:

U.S.A.	4,576,386
U.K.	2 169 670
W. GERMANY	3 601 149
FRANCE	2 576 078
SWEDEN	458,469

INCH
2009_1

TRELLEBORG
SEALING SOLUTIONS

TITLE
DOUBLE DELTA® II

DRAWING NO.
PDA2AG000

WORLD AEROSPACE TITLE BLOCK REV.

Features and benefits

- Good static and dynamic sealing effect
- Excellent stability of the elastomer element in severe working conditions
- Unidirectional version for applications where there is pressure from one side only
- Low-friction, high efficiency
- Leak-tight reliable sealing performance
- Easy installation
- Extrusion protection version operates in higher pressures and larger clearances
- Unidirectional Wedgpak® II gives effective fluid-film control and gas sealing in low and high-pressure systems
- Available in flash-free version upon request
- Sizes to suit AS4716 glands

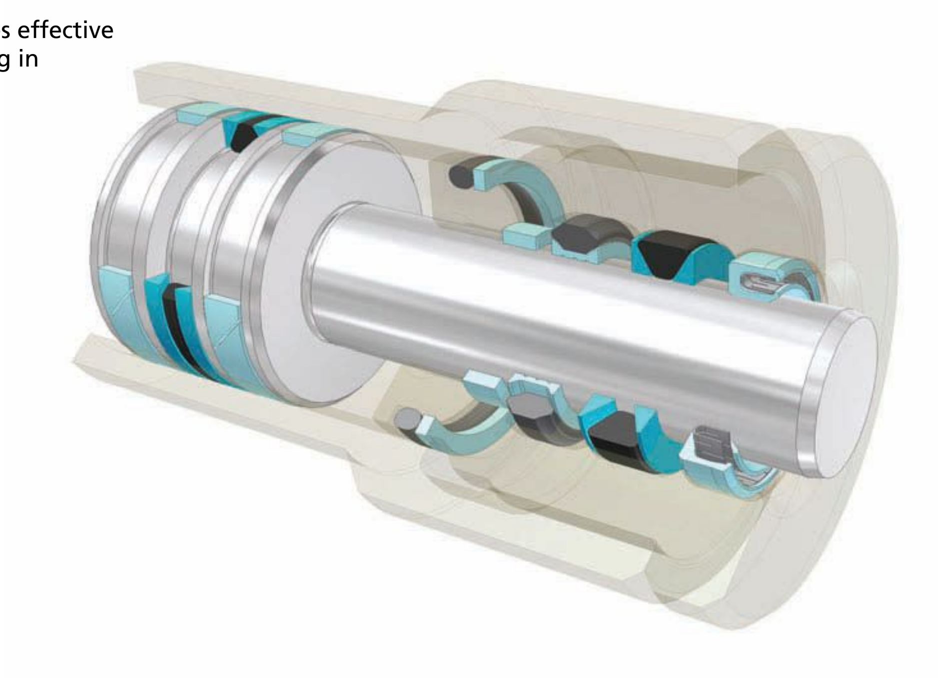


Illustration shows typical hydraulic cylinder with a sealing configuration incorporating Turcon® Wedgpak® II.

Description

Turcon® Wedgpak® II consists of a proprietary triangular elastomer element supported by two delta shaped Back-up Rings. The delta-shaped Back-up Rings of Turcon® Wedgpak® II prevent the elastomer element from spiraling or rolling under severe working conditions.

Turcon® Wedgpak® II EP is a version that provides superior extrusion protection at pressures above 5,000 psi/ 35 MPa and hardware clearances larger than specified in AS4716.

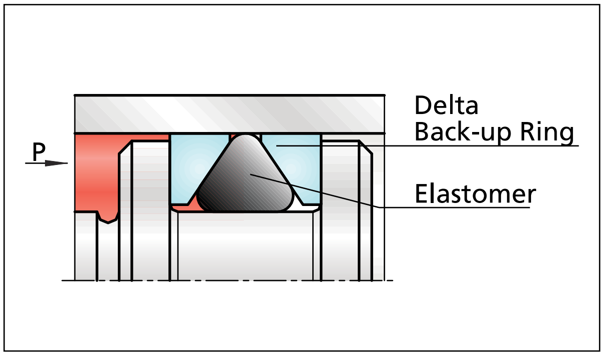


Figure 1 Turcon® Wedgpak® II

Turcon® Unidirectional Wedgpak® II consists of a delta shaped elastomer and a single delta shaped Back-up Ring. This design is used in applications with unidirectional pressure, pressure from one direction only, and provides leak-tight performance in both static and dynamic applications.

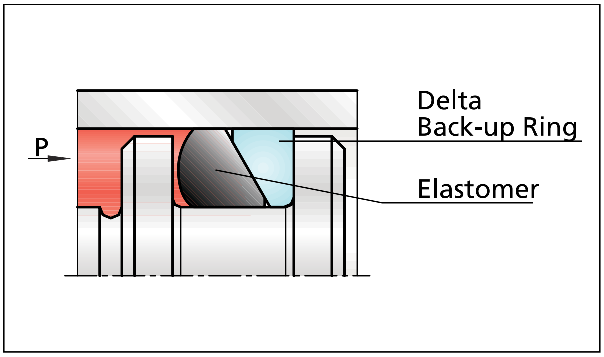


Figure 2 Turcon® Unidirectional Wedgpak® II

Method of Operation

The optimized elastomer contact area of Turcon® Wedgpak® II design results in a slipper seal-like performance with low static and dynamic friction. At the same time, the elastomer wipes the surface efficiently, providing excellent leakage control.

An outstanding load profile is the result of seal squeeze combined with the angles of the elastomer and Back-up Ring in the Unidirectional Wedgpak® II. This gives effective fluid-film control and gas sealing in low and high-pressure systems.

Though originally designed as static seals, Turcon® Wedgpak® II and Turcon® Unidirectional Wedgpak® II are proven in dynamic applications such as aircraft utility actuators and landing gear shock struts. They are also used in gas and oil separators, both at high and low pressures as well as in various hydraulic and fueldraulic applications.

Technical Data

Operation pressure:	5,000 psi/ 35 MPa Turcon® Wedgpak® EP can operate at higher pressures.
Speed:	Up to 9.8 ft/s/ 3.0 m/s Capable of higher speeds in non-continuous or intermittent use
Temperature range:	-65°F to +390°F/ -54°C to +200°C depending on elastomer material
Clearance:	As per AS4716 Larger clearances for Turcon® Wedgpak® EP
Media:	Mineral oil-based hydraulic fluids, flame-retardant hydraulic fluids, environmentally-safe hydraulic fluids (bio-oils), phosphate ester-based hydraulic oils, water and others depending on elastomer material selected

Avoid combining extreme limits.

Series

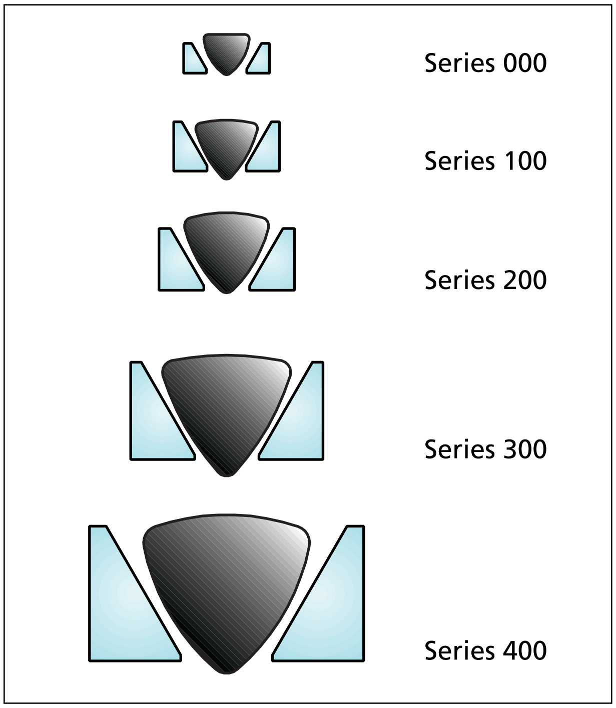
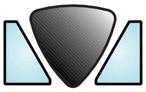
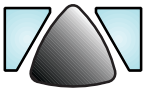
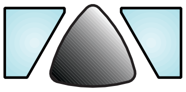
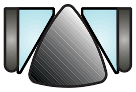
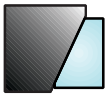
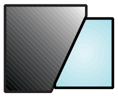
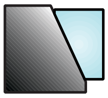
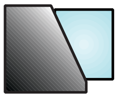


Figure 3 Relationship between Turcon® Wedgpak® II cross sections

Table I Turcon® Wedgpak® II Types

Seal	**Turcon® Wedgpak® II**		
	Width		
Type	**0 BUR (G_0)**	**1 BUR (G_1)**	**2 BUR (G_2)**
Rod	 RAA0_G	 RAA1_G	 RAA2_G
Piston	 PAA0_G	 PAA1_G	 PAA2_G
EP Rod	N/A	 RAB1_G	 RAB2_G
EP Piston	N/A	 PAB1_G	 PAB2_G
Unidirectional Rod	 RAU0_G	 RAU1_G	 RAU2_G
Unidirectional Piston	 PAU0_G	 PAU1_G	 PAU2_G

- G denotes groove width; zero, one or two Back-up width
- BUR - Back-up Ring

The elongation limits of some elastomer materials in combination with the diameter of the seal I.D. prevent the installation of Turcon® Wedgpak® II into closed piston (O.D.) grooves by circumferential stretching. Check the correct installation method with your Trelleborg Sealing Solutions marketing company before using Turcon® Wedgpak® II part numbers beginning with PA in dash sizes -004 to -009 and -104 to -109.

Profiles in color are recommended configurations.

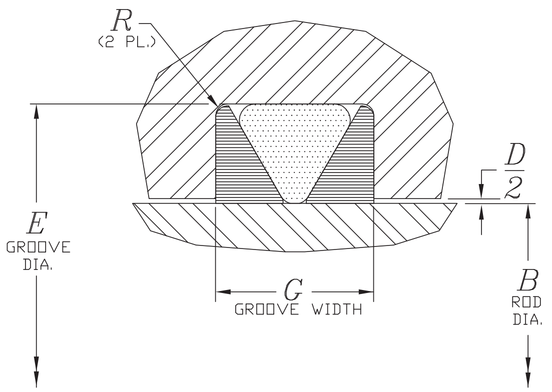
Turcon® Wedgpak® II

DASH NO.	B DIA.	E DIA.
	+.000 −.001	+.001 −.000
004	.076	.190
005	.108	.217
006	.123	.232
007	.154	.264
008	.185	.294
009	.217	.327
010	.248	.359
011	.310	.421
012	.373	.484
	+.000 −.002	+.002 −.000
013	.435	.545
014	.498	.608
015	.560	.670
016	.623	.733
017	.685	.795
018	.748	.858
019	.810	.920
020	.873	.983
021	.935	1.045
022	.998	1.108
023	1.060	1.170
024	1.123	1.233
025	1.185	1.295
026	1.248	1.358
027	1.310	1.420
028	1.373	1.483
	+.000 −.001	+.001 −.000
104	.123	.295
105	.154	.327
106	.185	.359
107	.217	.392
108	.248	.423
109	.310	.486
	+.000 −.002	+.002 −.000
110	.373	.546
111	.435	.609
112	.498	.672
113	.560	.734
114	.623	.797
115	.685	.859
116	.748	.923
117	.810	.985
118	.873	1.048
119	.935	1.110
120	.998	1.173
121	1.060	1.235
122	1.123	1.298
123	1.185	1.360
124	1.248	1.423
125	1.310	1.485
126	1.373	1.548
127	1.435	1.610
128	1.498	1.673
129	1.560	1.735
130	1.623	1.798
131	1.685	1.860
132	1.748	1.923
133	1.810	1.984
134	1.873	2.047
135	1.936	2.110
136	1.998	2.172
137	2.061	2.235
138	2.123	2.297
139	2.186	2.360
140	2.248	2.422
141	2.311	2.485
142	2.373	2.547
143	2.436	2.610
144	2.498	2.672
145	2.561	2.735
146	2.623	2.797
147	2.686	2.860
148	2.748	2.922
149	2.811	2.985

DASH NO.	B DIA.	E DIA.
	+.000 −.002	+.002 −.000
210	.748	.989
211	.810	1.051
212	.873	1.115
213	.935	1.177
214	.998	1.240
215	1.060	1.302
216	1.123	1.365
217	1.185	1.427
218	1.248	1.490
219	1.310	1.552
220	1.373	1.615
221	1.435	1.677
222	1.498	1.740
223	1.623	1.865
224	1.748	1.990
225	1.873	2.115
226	1.998	2.240
227	2.123	2.365
228	2.248	2.490
229	2.373	2.615
230	2.498	2.740
231	2.623	2.865
232	2.748	2.990
233	2.873	3.115
234	2.997	3.239
235	3.122	3.364
236	3.247	3.489
237	3.372	3.614
238	3.497	3.739
239	3.622	3.864
240	3.747	3.989
241	3.872	4.114
242	3.997	4.239
243	4.122	4.364
244	4.247	4.489
245	4.372	4.614
246	4.497	4.739
247	4.622	4.864
	+.000 −.002	+.002 −.000
325	1.498	1.870
326	1.623	1.995
327	1.748	2.120
328	1.873	2.245
329	1.998	2.370
330	2.123	2.495
331	2.248	2.620
332	2.373	2.745
333	2.498	2.870
334	2.623	2.995
335	2.748	3.120
336	2.873	3.245
337	2.997	3.369
338	3.122	3.494
339	3.247	3.619
340	3.372	3.744
341	3.497	3.869
342	3.622	3.994
343	3.747	4.119
344	3.872	4.244
345	3.997	4.369
346	4.122	4.494
347	4.247	4.619
348	4.372	4.744
349	4.497	4.869
	+.000 −.003	+.003 −.000
425	4.497	4.974
426	4.622	5.099
427	4.747	5.224
428	4.872	5.349
429	4.997	5.474
430	5.122	5.599
431	5.247	5.724
432	5.372	5.849
433	5.497	5.974
434	5.622	6.099

DASH NO.	B DIA.	E DIA.
	+.000 −.003	+.003 −.000
435	5.747	6.224
436	5.872	6.349
437	5.997	6.474
438	6.247	6.724
439	6.497	6.974
440	6.747	7.224
441	6.997	7.474
442	7.247	7.724
443	7.497	7.974
444	7.747	8.224
445	7.997	8.474
446	8.497	8.974
	+.000 −.003	+.004 −.000
447	8.997	9.474
448	9.497	9.974
449	9.997	10.474
450	10.497	10.974
451	10.997	11.474
452	11.497	11.974
453	11.997	12.474
454	12.497	12.974
455	12.997	13.474
456	13.497	13.974
457	13.997	14.474
458	14.497	14.974
459	14.997	15.474
460	15.497	15.974

DASH NO.	G_0 ZERO BACKUP WIDTH	G_1 ONE BACKUP WIDTH	G_2 TWO BACKUP WIDTH	R RADIUS	D DIAMETRAL CLEARANCE MAX.
004-009	.098/.103	.154/.164	.210/.220	.005/.015	.004
010-012	.094/.099	.150/.160	.207/.217		.004
013-028					.005
104-109	.141/.151	.183/.193	.245/.255	.005/.015	.004
110-126					.005
127-129					.006
130-132					.006
133-140					.007
141-149					.007
210-222	.188/.198	.235/.245	.304/.314	.010/.025	.005
223-224					.006
225-227					.007
228-243					.007
244-245					.007
246-247					.008
325-327	.281/.291	.334/.344	.424/.434	.020/.035	.006
328-329					.007
330-345					.007
346-349					.007
425-438	.375/.385	.475/.485	.579/.589	.020/.035	.009
439-445					.010
446					.010
447-460					.010



ROD SEAL INSTALLATION

FOR ZERO, ONE & TWO BACKUP WIDTH GLANDS PER AS4716 REVISION A

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR WEDGPAK®II IN AS4716 REVISION A ROD GLANDS.

2. ORDERING EXAMPLE: RAA 0 0 G 214 A T19 NG

WEDGPAK® II, ROD DESIGNATOR
BACKUP WIDTH
0 = ZERO BACKUP WIDTH
△3 {1 = ONE BACKUP WIDTH
{2 = TWO BACKUP WIDTH
DELTA BACKUP RING DESIGN
0 = SOLID DELTA BACKUP RINGS
△4 C = CUT DELTA BACKUP RINGS
GLAND DESIGNATOR
G = AS4716
SIZE DESIGNATOR
ACCORDING TO AS4716 REVISION A
QUALITY INDEX:
A = AEROSPACE CERTIFICATE OF CONFORMANCE
TURCON® DELTA BACKUP RING MAT'L. CODE
TUREL® ELASTOMER MAT'L CODE
CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

△3 PREFERRED SEAL DESIGNS ARE EITHER ONE OR TWO BACKUP WIDTH SEALS.

△4 SCARF-CUT DELTA BACKUP RINGS ARE ONLY AVAILABLE IN
ZERO BACKUP WIDTH SIZES: -004 THROUGH -020, -104 THROUGH -132, -210 THROUGH -230 & -325 THROUGH -342
ONE BACKUP WIDTH SIZES: -004 THROUGH -028, -104 THROUGH -142, -210 THROUGH -236, -325 THROUGH -349 & -425 THROUGH -440
TWO BACKUP WIDTH SIZES: -004 THROUGH -028, -104 THROUGH -149, -210 THROUGH -244, -325 THROUGH -349 & -425 THROUGH -447

5. SOME ELASTOMER MATERIALS ELONGATION LIMITS IN COMBINATION WITH THE DIAMETER OF THE SEAL I.D. PRECLUDE THE INSTALLATION OF THE TURCON WEDGPAK INTO CLOSED GROOVES BY CIRCUMFERENTIAL STRETCHING, BEFORE USING -004 TO -014 AND -104 TO -117 CONSULT YOUR TSS SALES ENGINEER.

INCH
2009_1
TRELLEBORG
SEALING SOLUTIONS
TITLE
WEDGPAK®II, ROD
DRAWING NO.
RAA00G000

WORLD AEROSPACE TITLE BLOCK REV.

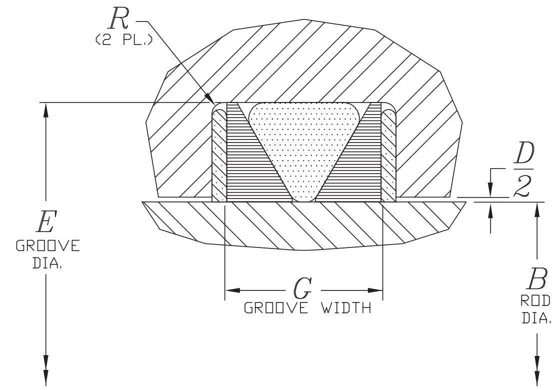
Turcon® Wedgpak® II

DASH NO.	*B* DIA.	*E* DIA.
	+.000 -.001	+.001 -.000
004	.076	.190
005	.108	.217
006	.123	.232
007	.154	.264
008	.185	.294
009	.217	.327
010	.248	.359
011	.310	.421
012	.373	.484
	+.000 -.002	+.002 -.000
013	.435	.545
014	.498	.608
015	.560	.670
016	.623	.733
017	.685	.795
018	.748	.858
019	.810	.920
020	.873	.983
021	.935	1.045
022	.998	1.108
023	1.060	1.170
024	1.123	1.233
025	1.185	1.295
026	1.248	1.358
027	1.310	1.420
028	1.373	1.483
	+.000 -.001	+.001 -.000
104	.123	.295
105	.154	.327
106	.185	.359
107	.217	.392
108	.248	.423
109	.310	.486
	+.000 -.002	+.002 -.000
110	.373	.546
111	.435	.609
112	.498	.672
113	.560	.734
114	.623	.797
115	.685	.859
116	.748	.923
117	.810	.985
118	.873	1.048
119	.935	1.110
120	.998	1.173
121	1.060	1.235
122	1.123	1.298
123	1.185	1.360
124	1.248	1.423
125	1.310	1.485
126	1.373	1.548
127	1.435	1.610
128	1.498	1.673
129	1.560	1.735
130	1.623	1.798
131	1.685	1.860
132	1.748	1.923
133	1.810	1.984
134	1.873	2.047
135	1.936	2.110
136	1.998	2.172
137	2.061	2.235
138	2.123	2.297
139	2.186	2.360
140	2.248	2.422
141	2.311	2.485
142	2.373	2.547
143	2.436	2.610
144	2.498	2.672
145	2.561	2.735
146	2.623	2.797
147	2.686	2.860
148	2.748	2.922
149	2.811	2.985

DASH NO.	*B* DIA.	*E* DIA.
	+.000 -.002	+.002 -.000
210	.748	.989
211	.810	1.051
212	.873	1.115
213	.935	1.177
214	.998	1.240
215	1.060	1.302
216	1.123	1.365
217	1.185	1.427
218	1.248	1.490
219	1.310	1.552
220	1.373	1.615
221	1.435	1.677
222	1.498	1.740
223	1.623	1.865
224	1.748	1.990
225	1.873	2.115
226	1.998	2.240
227	2.123	2.365
228	2.248	2.490
229	2.373	2.615
230	2.498	2.740
231	2.623	2.865
232	2.748	2.990
233	2.873	3.115
234	2.997	3.239
235	3.122	3.364
236	3.247	3.489
237	3.372	3.614
238	3.497	3.739
239	3.622	3.864
240	3.747	3.989
241	3.872	4.114
242	3.997	4.239
243	4.122	4.364
244	4.247	4.489
245	4.372	4.614
246	4.497	4.739
247	4.622	4.864
	+.000 -.002	+.002 -.000
325	1.498	1.870
326	1.623	1.995
327	1.748	2.120
328	1.873	2.245
329	1.998	2.370
330	2.123	2.495
331	2.248	2.620
332	2.373	2.745
333	2.498	2.870
334	2.623	2.995
335	2.748	3.120
336	2.873	3.245
337	2.997	3.369
338	3.122	3.494
339	3.247	3.619
340	3.372	3.744
341	3.497	3.869
342	3.622	3.994
343	3.747	4.119
344	3.872	4.244
345	3.997	4.369
346	4.122	4.494
347	4.247	4.619
348	4.372	4.744
349	4.497	4.869
	+.000 -.003	+.003 -.000
425	4.497	4.974
426	4.622	5.099
427	4.747	5.224
428	4.872	5.349
429	4.997	5.474
430	5.122	5.599
431	5.247	5.724
432	5.372	5.849
433	5.497	5.974
434	5.622	6.099

DASH NO.	*B* DIA.	*E* DIA.
	+.000 -.003	+.003 -.000
435	5.747	6.224
436	5.872	6.349
437	5.997	6.474
438	6.247	6.724
439	6.497	6.974
440	6.747	7.224
441	6.997	7.474
442	7.247	7.724
443	7.497	7.974
444	7.747	8.224
445	7.997	8.474
446	8.497	8.974
	+.000 -.003	+.004 -.000
447	8.997	9.474
448	9.497	9.974
449	9.997	10.474
450	10.497	10.974
451	10.997	11.474
452	11.497	11.974
453	11.997	12.474
454	12.497	12.974
455	12.997	13.474
456	13.497	13.974
457	13.997	14.474
458	14.497	14.974
459	14.997	15.474
460	15.497	15.974

DASH NO.	G_1 ONE BACKUP WIDTH	G_2 TWO BACKUP WIDTH	*R* RADIUS	*D* DIAMETRAL CLEARANCE MAX.
004-009	.154/.164	.210/.220	.005/.015	.004
010-012	.150/.160	.207/.217		.004
013-028				.005
104-109	.183/.193	.245/.255	.005/.015	.004
110-126				.005
127-129				.006
130-132				.006
133-140				.007
141-149				.007
210-222	.235/.245	.304/.314	.010/.025	.005
223-224				.006
225-227				.007
228-243				.007
244-245				.007
246-247				.008
325-327	.334/.344	.424/.434	.020/.035	.006
328-329				.007
330-345				.007
346-349				.007
425-438	.475/.485	.579/.589	.020/.035	.009
439-445				.010
446				.010
447-460				.010



ROD SEAL INSTALLATION

FOR ONE & TWO BACKUP WIDTH GLANDS PER AS4716 REVISION A

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR WEDGPAK® EP IN AS4716 REVISION A ROD GLANDS.

2. ORDERING EXAMPLE: RAB 1 R G 214 A T19 NG

WEDGPAK® EP, ROD DESIGNATOR — RAB
BACKUP WIDTH — 1
  1 = ONE BACKUP WIDTH
  2 = TWO BACKUP WIDTH
△3 DELTA BACKUP RING DESIGN — R
  SEE BELOW
GLAND DESIGNATOR — G
  G = AS4716
SIZE DESIGNATOR — 214
  ACCORDING TO AS4716 REVISION A
QUALITY INDEX: — A
  A = AEROSPACE CERTIFICATE OF CONFORMANCE
TURCON® DELTA BACKUP RING MAT'L. CODE — T19
TUREL® ELASTOMER MAT'L CODE — NG

CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

△3 CUT DELTA BACKUP RINGS ARE ONLY AVAILABLE IN
1 BACKUP WIDTH SIZES: -004 THROUGH -020, -104 THROUGH -132, -210 THROUGH -230 & -325 THROUGH -342
2 BACKUP WIDTH SIZES: -004 THROUGH -020, -104 THROUGH -132, -210 THROUGH -230 & -325 THROUGH -342

	SOLID DELTA RING SCARF-CUT BACKUP RING			
	TYPE	MATERIAL		
DESIGN CODE	SOLID BACKUP RING	ZURCON® Z43	ZURCON® Z60	ZURCON® Z40
1	X	X		
2	X		X	
3	X			X

	SCARF-CUT DELTA RING SCARF-CUT BACKUP RING			
	TYPE	MATERIAL		
DESIGN CODE	SCARF-CUT BACKUP RING	ZURCON® Z43	ZURCON® Z60	ZURCON® Z40
R	X	X		
S	X		X	
T	X			X

4. SOME ELASTOMER MATERIALS ELONGATION LIMITS IN COMBINATION WITH THE DIAMETER OF THE SEAL I.D. PRECLUDE THE INSTALLATION OF THE TURCON WEDGPAK INTO CLOSED GROOVES BY CIRCUMFERENTIAL STRETCHING, BEFORE USING -004 TO -014 AND -104 TO -117 CONSULT YOUR TSS SALES ENGINEER.

INCH
2009_1
TITLE
WEDGPAK® EP
TRELLEBORG
SEALING SOLUTIONS
DRAWING NO.
RAB10G000

WORLD AEROSPACE TITLE BLOCK REV.

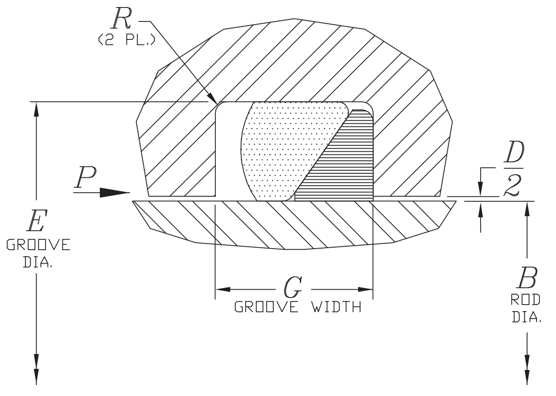
Turcon® Wedgpak® II

DASH NO.	*B* DIA.	*E* DIA.
	+.000 -.001	+.001 -.000
004	.076	.190
005	.108	.217
006	.123	.232
007	.154	.264
008	.185	.294
009	.217	.327
010	.248	.359
011	.310	.421
012	.373	.484
	+.000 -.002	+.002 -.000
013	.435	.545
014	.498	.608
015	.560	.670
016	.623	.733
017	.685	.795
018	.748	.858
019	.810	.920
020	.873	.983
021	.935	1.045
022	.998	1.108
023	1.060	1.170
024	1.123	1.233
025	1.185	1.295
026	1.248	1.358
027	1.310	1.420
028	1.373	1.483
	+.000 -.001	+.001 -.000
104	.123	.295
105	.154	.327
106	.185	.359
107	.217	.392
108	.248	.423
109	.310	.486
	+.000 -.002	+.002 -.000
110	.373	.546
111	.435	.609
112	.498	.672
113	.560	.734
114	.623	.797
115	.685	.859
116	.748	.923
117	.810	.985
118	.873	1.048
119	.935	1.110
120	.998	1.173
121	1.060	1.235
122	1.123	1.298
123	1.185	1.360
124	1.248	1.423
125	1.310	1.485
126	1.373	1.548
127	1.435	1.610
128	1.498	1.673
129	1.560	1.735
130	1.623	1.798
131	1.685	1.860
132	1.748	1.923
133	1.810	1.984
134	1.873	2.047
135	1.936	2.110
136	1.998	2.172
137	2.061	2.235
138	2.123	2.297
139	2.186	2.360
140	2.248	2.422
141	2.311	2.485
142	2.373	2.547
143	2.436	2.610
144	2.498	2.672
145	2.561	2.735
146	2.623	2.797
147	2.686	2.860
148	2.748	2.922
149	2.811	2.985

DASH NO.	*B* DIA.	*E* DIA.
	+.000 -.002	+.002 -.000
210	.748	.989
211	.810	1.051
212	.873	1.115
213	.935	1.177
214	.998	1.240
215	1.060	1.302
216	1.123	1.365
217	1.185	1.427
218	1.248	1.490
219	1.310	1.552
220	1.373	1.615
221	1.435	1.677
222	1.498	1.740
223	1.623	1.865
224	1.748	1.990
225	1.873	2.115
226	1.998	2.240
227	2.123	2.365
228	2.248	2.490
229	2.373	2.615
230	2.498	2.740
231	2.623	2.865
232	2.748	2.990
233	2.873	3.115
234	2.997	3.239
235	3.122	3.364
236	3.247	3.489
237	3.372	3.614
238	3.497	3.739
239	3.622	3.864
240	3.747	3.989
241	3.872	4.114
242	3.997	4.239
243	4.122	4.364
244	4.247	4.489
245	4.372	4.614
246	4.497	4.739
247	4.622	4.864
	+.000 -.002	+.002 -.000
325	1.498	1.870
326	1.623	1.995
327	1.748	2.120
328	1.873	2.245
329	1.998	2.370
330	2.123	2.495
331	2.248	2.620
332	2.373	2.745
333	2.498	2.870
334	2.623	2.995
335	2.748	3.120
336	2.873	3.245
337	2.997	3.369
338	3.122	3.494
339	3.247	3.619
340	3.372	3.744
341	3.497	3.869
342	3.622	3.994
343	3.747	4.119
344	3.872	4.244
345	3.997	4.369
346	4.122	4.494
347	4.247	4.619
348	4.372	4.744
349	4.497	4.869
	+.000 -.003	+.003 -.000
425	4.497	4.974
426	4.622	5.099
427	4.747	5.224
428	4.872	5.349
429	4.997	5.474
430	5.122	5.599
431	5.247	5.724
432	5.372	5.849
433	5.497	5.974
434	5.622	6.099

DASH NO.	*B* DIA.	*E* DIA.
	+.000 -.003	+.003 -.000
435	5.747	6.224
436	5.872	6.349
437	5.997	6.474
438	6.247	6.724
439	6.497	6.974
440	6.747	7.224
441	6.997	7.474
442	7.247	7.724
443	7.497	7.974
444	7.747	8.224
445	7.997	8.474
446	8.497	8.974
	+.000 -.003	+.004 -.000
447	8.997	9.474
448	9.497	9.974
449	9.997	10.474
450	10.497	10.974
451	10.997	11.474
452	11.497	11.974
453	11.997	12.474
454	12.497	12.974
455	12.997	13.474
456	13.497	13.974
457	13.997	14.474
458	14.497	14.974
459	14.997	15.474
460	15.497	15.974

DASH NO.	G_0 ZERO BACKUP WIDTH	G_1 ONE BACKUP WIDTH	G_2 TWO BACKUP WIDTH	*R* RADIUS	*D* DIAMETRAL CLEARANCE MAX.
004-009	.098/.103	.154/.164	.210/.220	.005/.015	.004
010-012	.094/.099	.150/.160	.207/.217		.004
013-028					.005
104-109	.141/.151	.183/.193	.245/.255	.005/.015	.004
110-126					.005
127-129					.006
130-132					.006
133-140					.007
141-149					.007
210-222	.188/.198	.235/.245	.304/.314	.010/.025	.005
223-224					.006
225-227					.007
228-243					.007
244-245					.007
246-247					.008
325-327	.281/.291	.334/.344	.424/.434	.020/.035	.006
328-329					.007
330-345					.007
346-349					.007
425-438	.375/.385	.475/.485	.579/.589	.020/.035	.009
439-445					.010
446					.010
447-460					.010



ROD SEAL INSTALLATION

FOR ZERO, ONE & TWO BACKUP WIDTH GLANDS PER AS4716 REVISION A

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR UNI-DIRECTIONAL WEDGPAK® II IN AS4716 REVISION A PISTON GLANDS.

2. ORDERING EXAMPLE: RAU 0 0 G 214 A T19 NG

UNI-DIRECTIONAL WEDGPAK® II
ROD DESIGNATOR
BACKUP WIDTH
  0 = ZERO BACKUP WIDTH
  1 = ONE BACKUP WIDTH
  2 = TWO BACKUP WIDTH
DELTA BACKUP RING DESIGN
  0 = SOLID DELTA BACKUP RINGS
△3 C = CUT DELTA BACKUP RINGS
GLAND DESIGNATOR
  G = AS4716
SIZE DESIGNATOR
  ACCORDING TO AS4716 REVISION A
QUALITY INDEX:
  A = AEROSPACE CERTIFICATE OF CONFORMANCE
TURCON® DELTA BACKUP RING MAT'L. CODE
TUREL® ELASTOMER MAT'L CODE
CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

△3 SCARF CUT DELTA BACKUP RINGS ARE ONLY AVAILABLE IN
ZERO BACKUP WIDTH SIZES: -004 THROUGH -020, -104 THROUGH -132, -210 -230 & -325 THROUGH -342
ONE BACKUP WIDTH SIZES: -004 THROUGH -028, -104 THROUGH -142, -210 -236, -325 THROUGH -349 & -425 THROUGH -440
TWO BACKUP WIDTH SIZES: -004 THROUGH -028, -104 THROUGH -149, -210 -244, -325 THROUGH -349 & -425 THROUGH -447

4. SOME ELASTOMER MATERIALS ELONGATION LIMITS IN COMBINATION WITH THE DIAMETER OF THE SEAL I.D. PRECLUDE THE INSTALLATION OF THE TURCON WEDGPAK INTO CLOSED GROOVES BY CIRCUMFERENTIAL STRETCHING, BEFORE USING -004 TO -014 AND -104 TO -117 CONSULT YOUR TSS SALES ENGINEER.

INCH
2009_1
TRELLEBORG
SEALING SOLUTIONS
TITLE
UNI-DIRECTIONAL WEDGPAK II,® ROD
DRAWING NO.
RAU00G000

WORLD AEROSPACE TITLE BLOCK REV.

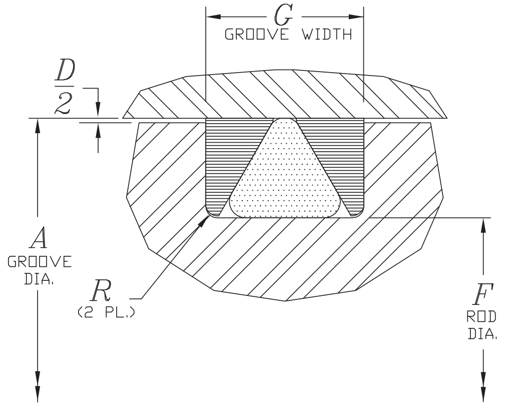
Turcon® Wedgpak® II

DASH NO.	A DIA.	F DIA.
	+.001 -.000	+.000 -.001
004	.190	.076
005	.221	.115
006	.235	.129
007	.266	.158
008	.297	.189
009	.329	.220
010	.360	.250
011	.422	.312
012	.485	.375
	+.002 -.000	+.000 -.002
013	.550	.441
014	.613	.504
015	.675	.566
016	.738	.629
017	.800	.691
018	.863	.753
019	.925	.815
020	.991	.881
021	1.053	.943
022	1.116	1.006
023	1.178	1.068
024	1.241	1.131
025	1.303	1.193
026	1.366	1.256
027	1.428	1.318
028	1.491	1.381
	+.001 -.000	+.000 -.001
104	.297	.128
105	.329	.158
106	.360	.187
107	.391	.215
108	.422	.246
109	.485	.308
	+.002 -.000	+.000 -.002
110	.550	.379
111	.613	.441
112	.675	.502
113	.738	.565
114	.800	.627
115	.863	.689
116	.925	.751
117	.991	.817
118	1.053	.879
119	1.116	.942
120	1.178	1.003
121	1.241	1.066
122	1.303	1.128
123	1.366	1.191
124	1.428	1.253
125	1.491	1.316
126	1.553	1.378
127	1.616	1.441
128	1.678	1.503
129	1.741	1.566
130	1.805	1.631
131	1.867	1.693
132	1.930	1.756
133	1.992	1.818
134	2.055	1.881
135	2.118	1.944
136	2.180	2.006
137	2.243	2.069
138	2.305	2.131
139	2.368	2.194
140	2.430	2.256
141	2.493	2.319
142	2.555	2.381
143	2.618	2.444
144	2.680	2.506
145	2.743	2.569
146	2.805	2.631
147	2.868	2.694
148	2.930	2.756
149	2.993	2.819

DASH NO.	A DIA.	F DIA.
	+.002 -.000	+.000 -.002
210	.991	.750
211	1.053	.812
212	1.116	.874
213	1.178	.936
214	1.241	.999
215	1.303	1.061
216	1.366	1.124
217	1.428	1.186
218	1.491	1.249
219	1.553	1.311
220	1.616	1.374
221	1.678	1.436
222	1.741	1.499
223	1.867	1.625
224	1.992	1.750
225	2.118	1.876
226	2.243	2.001
227	2.368	2.126
228	2.493	2.251
229	2.618	2.376
230	2.743	2.501
231	2.868	2.626
232	2.993	2.751
233	3.118	2.876
234	3.243	3.001
235	3.368	3.126
236	3.493	3.251
237	3.618	3.376
238	3.743	3.501
239	3.868	3.626
240	3.993	3.751
241	4.118	3.876
242	4.243	4.001
243	4.368	4.126
244	4.493	4.251
245	4.618	4.376
246	4.743	4.501
247	4.868	4.626
	+.002 -.000	+.000 -.002
325	1.867	1.495
326	1.992	1.620
327	2.118	1.746
328	2.243	1.871
329	2.368	1.996
330	2.493	2.121
331	2.618	2.246
332	2.743	2.371
333	2.868	2.496
334	2.993	2.621
335	3.118	2.746
336	3.243	2.871
337	3.368	2.996
338	3.493	3.121
339	3.618	3.246
340	3.743	3.371
341	3.868	3.496
342	3.993	3.621
343	4.118	3.746
344	4.243	3.871
345	4.368	3.996
346	4.493	4.121
347	4.618	4.246
348	4.743	4.371
349	4.868	4.496
	+.003 -.000	+.000 -.003
425	4.974	4.497
426	5.099	4.622
427	5.224	4.747
428	5.349	4.872
429	5.474	4.997
430	5.599	5.122
431	5.724	5.247
432	5.849	5.372
433	5.974	5.497
434	6.099	5.622

DASH NO.	A DIA.	F DIA.
	+.003 -.000	+.000 -.003
435	6.224	5.747
436	6.349	5.872
437	6.474	5.997
438	6.724	6.247
439	6.974	6.497
440	7.224	6.747
441	7.474	6.997
442	7.724	7.247
443	7.974	7.497
444	8.224	7.747
445	8.474	7.997
446	8.974	8.497
	+.004 -.000	+.000 -.004
447	9.474	8.997
448	9.974	9.497
449	10.474	9.997
450	10.974	10.497
451	11.474	10.997
452	11.974	11.497
453	12.474	11.997
454	12.974	12.497
455	13.474	12.997
456	13.974	13.497
457	14.474	13.997
458	14.974	14.497
459	15.474	14.997
460	15.974	15.497

DASH NO.	G_0 ZERO BACKUP WIDTH	G_1 ONE BACKUP WIDTH	G_2 TWO BACKUP WIDTH	R RADIUS	D DIAMETRAL CLEARANCE MAX.
004-009	.098/.103	.154/.164	.210/.220	.005/.015	.004
010-012	.094/.099	.150/.160	.207/.217		.004
013-028					.005
104-109	.141/.151	.183/.193	.245/.255	.005/.015	.004
110-126					.005
127-129					.006
130-132					.006
133-140					.007
141-149					.007
210-222	.188/.198	.235/.245	.304/.314	.010/.025	.005
223-224					.006
225-227					.007
228-243					.007
244-245					.007
246-247					.008
325-327	.281/.291	.334/.344	.424/.434	.020/.035	.006
328-329					.007
330-345					.007
346-349					.007
425-438	.375/.385	.475/.485	.579/.589	.020/.035	.009
439-445					.010
446					.010
447-460					.010



PISTON SEAL INSTALLATION

FOR ZERO, ONE & TWO BACKUP WIDTH GLANDS PER AS4716 REVISION A

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR WEDGPAK® II IN AS4716 REVISION A PISTON GLANDS.

2. ORDERING EXAMPLE: PAA 0 0 G 214 A T19 NG

WEDGPAK ®II, PISTON DESIGNATOR
BACKUP WIDTH
  0 = ZERO BACKUP WIDTH
△3 1 = ONE BACKUP WIDTH
  2 = TWO BACKUP WIDTH
DELTA BACKUP RING DESIGN
  0 = SOLID DELTA BACKUP RINGS
△4 C = CUT DELTA BACKUP RINGS
GLAND DESIGNATOR
  G = AS4716
SIZE DESIGNATOR
  ACCORDING TO AS4716 REVISION A
QUALITY INDEX:
  A = AEROSPACE CERTIFICATE OF CONFORMANCE
TURCON® DELTA BACKUP RING MAT'L. CODE
TUREL® ELASTOMER MAT'L CODE
CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

△3 PREFERRED SEAL DESIGNS ARE EITHER ONE OR TWO BACKUP WIDTH SEALS.

△4 SCARF-CUT DELTA BACKUP RINGS ARE ONLY AVAILABLE IN
ZERO BACKUP WIDTH SIZES: -004 THROUGH -020, -104 THROUGH -132, -210 THROUGH -230 & -325 THROUGH -342
ONE BACKUP WIDTH SIZES: -004 THROUGH -028, -104 THROUGH -142, -210 THROUGH -236, -325 THROUGH -349 & -425 THROUGH -440
TWO BACKUP WIDTH SIZES: -004 THROUGH -028, -104 THROUGH -149, -210 THROUGH -244, -325 THROUGH -349 & -425 THROUGH -447

5. SOME ELASTOMER MATERIALS ELONGATION LIMITS IN COMBINATION WITH THE DIAMETER OF THE SEAL I.D. PRECLUDE THE INSTALLATION OF THE TURCON WEDGPAK INTO CLOSED GROOVES BY CIRCUMFERENTIAL STRETCHING, BEFORE USING -004 TO -014 AND -104 TO -117 CONSULT YOUR TSS SALES ENGINEER.

INCH
2009_1
TITLE
WEDGPAK®II, PISTON
TRELLEBORG
SEALING SOLUTIONS
DRAWING NO.
PAA00G000

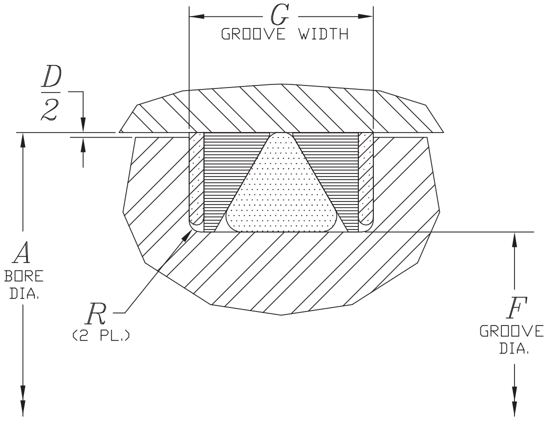
WORLD AEROSPACE TITLE BLOCK REV.

DASH NO.	A DIA.	F DIA.
	+.001 -.000	+.000 -.001
004	.190	.076
005	.221	.115
006	.235	.129
007	.266	.158
008	.297	.189
009	.329	.220
010	.360	.250
011	.422	.312
012	.485	.375
	+.002 -.000	+.000 -.002
013	.550	.441
014	.613	.504
015	.675	.566
016	.738	.629
017	.800	.691
018	.863	.753
019	.925	.815
020	.991	.881
021	1.053	.943
022	1.116	1.006
023	1.178	1.068
024	1.241	1.131
025	1.303	1.193
026	1.366	1.256
027	1.428	1.318
028	1.491	1.381
	+.001 -.000	+.000 -.001
104	.297	.128
105	.329	.158
106	.360	.187
107	.391	.215
108	.422	.246
109	.485	.308
	+.002 -.000	+.000 -.002
110	.550	.379
111	.613	.441
112	.675	.502
113	.738	.565
114	.800	.627
115	.863	.689
116	.925	.751
117	.991	.817
118	1.053	.879
119	1.116	.942
120	1.178	1.003
121	1.241	1.066
122	1.303	1.128
123	1.366	1.191
124	1.428	1.253
125	1.491	1.316
126	1.553	1.378
127	1.616	1.441
128	1.678	1.503
129	1.741	1.566
130	1.805	1.631
131	1.867	1.693
132	1.930	1.756
133	1.992	1.818
134	2.055	1.881
135	2.118	1.944
136	2.180	2.006
137	2.243	2.069
138	2.305	2.131
139	2.368	2.194
140	2.430	2.256
141	2.493	2.319
142	2.555	2.381
143	2.618	2.444
144	2.680	2.506
145	2.743	2.569
146	2.805	2.631
147	2.868	2.694
148	2.930	2.756
149	2.993	2.819

DASH NO.	A DIA.	F DIA.
	+.002 -.000	+.000 -.002
210	.991	.750
211	1.053	.812
212	1.116	.874
213	1.178	.936
214	1.241	.999
215	1.303	1.061
216	1.366	1.124
217	1.428	1.186
218	1.491	1.249
219	1.553	1.311
220	1.616	1.374
221	1.678	1.436
222	1.741	1.499
223	1.867	1.625
224	1.992	1.750
225	2.118	1.876
226	2.243	2.001
227	2.368	2.126
228	2.493	2.251
229	2.618	2.376
230	2.743	2.501
231	2.868	2.626
232	2.993	2.751
233	3.118	2.876
234	3.243	3.001
235	3.368	3.126
236	3.493	3.251
237	3.618	3.376
238	3.743	3.501
239	3.868	3.626
240	3.993	3.751
241	4.118	3.876
242	4.243	4.001
243	4.368	4.126
244	4.493	4.251
245	4.618	4.376
246	4.743	4.501
247	4.868	4.626
	+.002 -.000	+.000 -.002
325	1.867	1.495
326	1.992	1.620
327	2.118	1.746
328	2.243	1.871
329	2.368	1.996
330	2.493	2.121
331	2.618	2.246
332	2.743	2.371
333	2.868	2.496
334	2.993	2.621
335	3.118	2.746
336	3.243	2.871
337	3.368	2.996
338	3.493	3.121
339	3.618	3.246
340	3.743	3.371
341	3.868	3.496
342	3.993	3.621
343	4.118	3.746
344	4.243	3.871
345	4.368	3.996
346	4.493	4.121
347	4.618	4.246
348	4.743	4.371
349	4.868	4.496
	+.003 -.000	+.000 -.003
425	4.974	4.497
426	5.099	4.622
427	5.224	4.747
428	5.349	4.872
429	5.474	4.997
430	5.599	5.122
431	5.724	5.247
432	5.849	5.372
433	5.974	5.497
434	6.099	5.622

DASH NO.	A DIA.	F DIA.
	+.003 -.000	+.000 -.003
435	6.224	5.747
436	6.349	5.872
437	6.474	5.997
438	6.724	6.247
439	6.974	6.497
440	7.224	6.747
441	7.474	6.997
442	7.724	7.247
443	7.974	7.497
444	8.224	7.747
445	8.474	7.997
446	8.974	8.497
	+.004 -.000	+.000 -.004
447	9.474	8.997
448	9.974	9.497
449	10.474	9.997
450	10.974	10.497
451	11.474	10.997
452	11.974	11.497
453	12.474	11.997
454	12.974	12.497
455	13.474	12.997
456	13.974	13.497
457	14.474	13.997
458	14.974	14.497
459	15.474	14.997
460	15.974	15.497

DASH NO.	G_1 ONE BACKUP WIDTH	G_2 TWO BACKUP WIDTH	R RADIUS	D DIAMETRAL CLEARANCE MAX.
004-009	.154/.164	.210/.220	.005/.015	.004
010-012	.150/.160	.207/.217		.004
013-028				.005
104-109	.183/.193	.245/.255	.005/.015	.004
110-126				.005
127-129				.006
130-132				.006
133-140				.006
141-149				.007
210-222	.235/.245	.304/.314	.010/.025	.005
223-224				.006
225-227				.006
228-243				.007
244-245				.008
246-247				.008
325-327	.334/.344	.424/.434	.020/.035	.006
328-329				.006
330-345				.007
346-349				.008
425-438	.475/.485	.579/.589	.020/.035	.009
439-445				.010
446				.010
447-460				.011



PISTON SEAL INSTALLATION

FOR ONE & TWO BACKUP WIDTH GLANDS PER AS4716 REVISION A

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR WEDGPAK® EP IN AS4716 REVISION A PISTON GLANDS.

2. ORDERING EXAMPLE: PAB 1 1 G 214 A T19 NG

WEDGPAK® EP, PISTON DESIGNATOR
BACKUP WIDTH
  1 = ONE BACKUP WIDTH
  2 = TWO BACKUP WIDTH
△3 DELTA BACKUP RING DESIGN
  SEE BELOW
GLAND DESIGNATOR
  G = AS4716
SIZE DESIGNATOR
  ACCORDING TO AS4716 REVISION A
QUALITY INDEX:
  A = AEROSPACE CERTIFICATE OF CONFORMANCE
TURCON® DELTA BACKUP RING MAT'L. CODE
TUREL® ELASTOMER MAT'L CODE
CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

△3 SCARF CUT DELTA BACKUP RINGS ARE ONLY AVAILABLE IN
ONE BACKUP WIDTH SIZES: -004 THROUGH -019, -104 THROUGH -131, -210 THROUGH -230 & -325 THROUGH -341
TWO BACKUP WIDTH SIZES: -004 THROUGH -019, -104 THROUGH -131, -210 THROUGH -230 & -325 THROUGH -341

	SOLID DELTA RING SCARF-CUT BACKUP RING			
	TYPE	MATERIAL		
DESIGN CODE	SOLID BACKUP RING	ZURCON® Z43	ZURCON® Z60	ZURCON® Z40
1	X	X		
2	X		X	
3	X			X

	SCARF-CUT DELTA RING SCARF-CUT BACKUP RING			
	TYPE	MATERIAL		
DESIGN CODE	SCARF CUT BACKUP RING	ZURCON® Z43	ZURCON® Z60	ZURCON® Z40
R	X	X		
S	X		X	
T	X			X

4. SOME ELASTOMER MATERIALS ELONGATION LIMITS IN COMBINATION WITH THE DIAMETER OF THE SEAL I.D. PRECLUDE THE INSTALLATION OF THE TURCON WEDGPAK INTO CLOSED GROOVES BY CIRCUMFERENTIAL STRETCHING, BEFORE USING -004 TO -014 AND -104 TO -117 CONSULT YOUR TSS SALES ENGINEER.

INCH
2009_1

TRELLEBORG
SEALING SOLUTIONS

TITLE
WEDGPAK®EP, PISTON

DRAWING NO.
PAB10G000

WORLD AEROSPACE TITLE BLOCK REV.

Turcon® Wedgpak® II

DASH NO.	*A* DIA.	*F* DIA.
	+.001 -.000	+.000 -.001
004	.190	.076
005	.221	.115
006	.235	.129
007	.266	.158
008	.297	.189
009	.329	.220
010	.360	.250
011	.422	.312
012	.485	.375
	+.002 -.000	+.000 -.002
013	.550	.441
014	.613	.504
015	.675	.566
016	.738	.629
017	.800	.691
018	.863	.753
019	.925	.815
020	.991	.881
021	1.053	.943
022	1.116	1.006
023	1.178	1.068
024	1.241	1.131
025	1.303	1.193
026	1.366	1.256
027	1.428	1.318
028	1.491	1.381
	+.001 -.000	+.000 -.001
104	.297	.128
105	.329	.158
106	.360	.187
107	.391	.215
108	.422	.246
109	.485	.308
	+.002 -.000	+.000 -.002
110	.550	.379
111	.613	.441
112	.675	.502
113	.738	.565
114	.800	.627
115	.863	.689
116	.925	.751
117	.991	.817
118	1.053	.879
119	1.116	.942
120	1.178	1.003
121	1.241	1.066
122	1.303	1.128
123	1.366	1.191
124	1.428	1.253
125	1.491	1.316
126	1.553	1.378
127	1.616	1.441
128	1.678	1.503
129	1.741	1.566
130	1.805	1.631
131	1.867	1.693
132	1.930	1.756
133	1.992	1.818
134	2.055	1.881
135	2.118	1.944
136	2.180	2.006
137	2.243	2.069
138	2.305	2.131
139	2.368	2.194
140	2.430	2.256
141	2.493	2.319
142	2.555	2.381
143	2.618	2.444
144	2.680	2.506
145	2.743	2.569
146	2.805	2.631
147	2.868	2.694
148	2.930	2.756
149	2.993	2.819

DASH NO.	*A* DIA.	*F* DIA.
	+.002 -.000	+.000 -.002
210	.991	.750
211	1.053	.812
212	1.116	.874
213	1.178	.936
214	1.241	.999
215	1.303	1.061
216	1.366	1.124
217	1.428	1.186
218	1.491	1.249
219	1.553	1.311
220	1.616	1.374
221	1.678	1.436
222	1.741	1.499
223	1.867	1.625
224	1.992	1.750
225	2.118	1.876
226	2.243	2.001
227	2.368	2.126
228	2.493	2.251
229	2.618	2.376
230	2.743	2.501
231	2.868	2.626
232	2.993	2.751
233	3.118	2.876
234	3.243	3.001
235	3.368	3.126
236	3.493	3.251
237	3.618	3.376
238	3.743	3.501
239	3.868	3.626
240	3.993	3.751
241	4.118	3.876
242	4.243	4.001
243	4.368	4.126
244	4.493	4.251
245	4.618	4.376
246	4.743	4.501
247	4.868	4.626
	+.002 -.000	+.000 -.002
325	1.867	1.495
326	1.992	1.620
327	2.118	1.746
328	2.243	1.871
329	2.368	1.996
330	2.493	2.121
331	2.618	2.246
332	2.743	2.371
333	2.868	2.496
334	2.993	2.621
335	3.118	2.746
336	3.243	2.871
337	3.368	2.996
338	3.493	3.121
339	3.618	3.246
340	3.743	3.371
341	3.868	3.496
342	3.993	3.621
343	4.118	3.746
344	4.243	3.871
345	4.368	3.996
346	4.493	4.121
347	4.618	4.246
348	4.743	4.371
349	4.868	4.496
	+.003 -.000	+.000 -.003
425	4.974	4.497
426	5.099	4.622
427	5.224	4.747
428	5.349	4.872
429	5.474	4.997
430	5.599	5.122
431	5.724	5.247
432	5.849	5.372
433	5.974	5.497
434	6.099	5.622

DASH NO.	*A* DIA.	*F* DIA.
	+.003 -.000	+.000 -.003
435	6.224	5.747
436	6.349	5.872
437	6.474	5.997
438	6.724	6.247
439	6.974	6.497
440	7.224	6.747
441	7.474	6.997
442	7.724	7.247
443	7.974	7.497
444	8.224	7.747
445	8.474	7.997
446	8.974	8.497
	+.004 -.000	+.000 -.004
447	9.474	8.997
448	9.974	9.497
449	10.474	9.997
450	10.974	10.497
451	11.474	10.997
452	11.974	11.497
453	12.474	11.997
454	12.974	12.497
455	13.474	12.997
456	13.974	13.497
457	14.474	13.997
458	14.974	14.497
459	15.474	14.997
460	15.974	15.497

DASH NO.	G_0 ZERO BACKUP WIDTH	G_1 ONE BACKUP WIDTH	G_2 TWO BACKUP WIDTH	*R* RADIUS	*D* DIAMETRAL CLEARANCE MAX.
004-009	.098/.103	.154/.164	.210/.220	.005/.015	.004
010-012	.094/.099	.150/.160	.207/.217		.004
013-028					.005
104-109	.141/.151	.183/.193	.245/.255	.005/.015	.004
110-126					.005
127-129					.006
130-132					.006
133-140					.006
141-149					.007
210-222	.188/.198	.235/.245	.304/.314	.010/.025	.005
223-224					.006
225-227					.006
228-243					.007
244-245					.008
246-247					.008
325-327	.281/.291	.334/.344	.424/.434	.020/.035	.006
328-329					.006
330-345					.007
346-349					.008
425-438	.375/.385	.475/.485	.579/.589	.020/.035	.009
439-445					.010
446					.010
447-460					.011

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR UNI-DIRECTIONAL WEDGPAK® II IN AS4716 REVISION A PISTON GLANDS.

2. ORDERING EXAMPLE: PAU 0 0 G 214 A T19 NG

   UNI-DIRECTIONAL WEDGPAK® II,
   PISTON DESIGNATOR
   BACKUP WIDTH
   - 0 = ZERO BACKUP WIDTH
   - 1 = ONE BACKUP WIDTH
   - 2 = TWO BACKUP WIDTH

   DELTA BACKUP RING DESIGN
   - 0 = SOLID DELTA BACKUP RINGS
   - △3 C = CUT DELTA BACKUP RINGS

   GLAND DESIGNATOR
   - G = AS4716

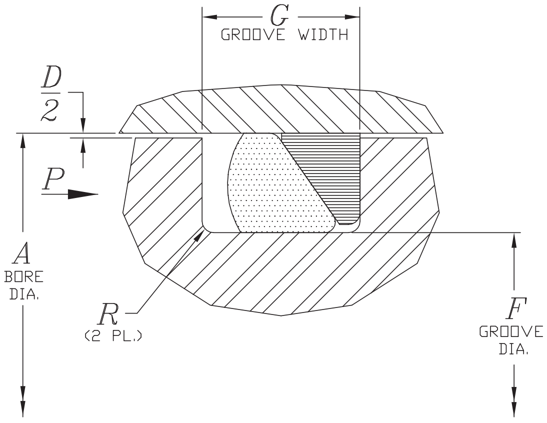
   SIZE DESIGNATOR
   - ACCORDING TO AS4716 REVISION A

   QUALITY INDEX:
   - A = AEROSPACE CERTIFICATE OF CONFORMANCE

   TURCON® DELTA BACKUP RING MAT'L. CODE
   TUREL® ELASTOMER MAT'L CODE
   CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

△3 SCARF CUT DELTA BACKUP RINGS ARE ONLY AVAILABLE IN
ZERO BACKUP WIDTH SIZES: -004 THROUGH -019, -104 THROUGH -131, -210 THROUGH -230 & -325 THROUGH -341
ONE BACKUP WIDTH SIZES: -004 THOUGH -028, -104 THROUGH -142, -210 THROUGH -235, -325 THROUGH -349 & -425 THROUGH -440
TWO BACKUP WIDTH SIZES: -004 THROUGH -028, -104 THROUGH -149, -210 THROUGH -244, -325 THROUGH -349 & -425 THROUGH -447

4. SOME ELASTOMER MATERIALS ELONGATION LIMITS IN COMBINATION WITH THE DIAMETER OF THE SEAL I.D. PRECLUDE THE INSTALLATION OF THE TURCON WEDGPAK INTO CLOSED GROOVES BY CIRCUMFERENTIAL STRETCHING, BEFORE USING -004 TO -014 AND -104 TO -117 CONSULT YOUR TSS SALES ENGINEER.



PISTON SEAL INSTALLATION

FOR ZERO, ONE & TWO BACKUP WIDTH GLANDS PER AS4716 REVISION A

INCH	2009_1
TRELLEBORG SEALING SOLUTIONS	TITLE UNI-DIRECTIONAL WEDGPAK® II, PISTON DRAWING NO. PAU00G000

WORLD AEROSPACE TITLE BLOCK REV.

Features and benefits

- Good static and light-duty dynamic sealing effect
- Excellent resistance to rolling within the gland
- Excellent extrusion resistance
- Provides bidirectional sealing
- Preferred option for media separation, such as fluid/gas or fluid/fluid
- Tandem version maximizes extrusion resistance at system pressures above 5,000 psi/ 35 MPa
- Available in flash-free version
- Sizes to suit all O-Ring glands including MIL-G-5514F and AS4716
- Approved for a large number of National Stock Numbers (NSN)

Illustration shows typical hydraulic cylinder with a sealing configuration incorporating Turcon® T-Seal.

Description

Turcon® T-Seal consists of a T-shaped elastomer sealing element supported by Turcon® Back-up Rings on both sides. This combination results in a stable seal, the semi-circular lip configuration ensuring positive sealing. The side flanges, which form the seal's base offer excellent resistance to rolling and act as an effective platform to position and energize the anti-extrusion rings.

Turcon® T-Seal is ideal for light applications, both as a rod or piston seal, where they provide long-life, maximized leakage control and excellent extrusion protection.

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

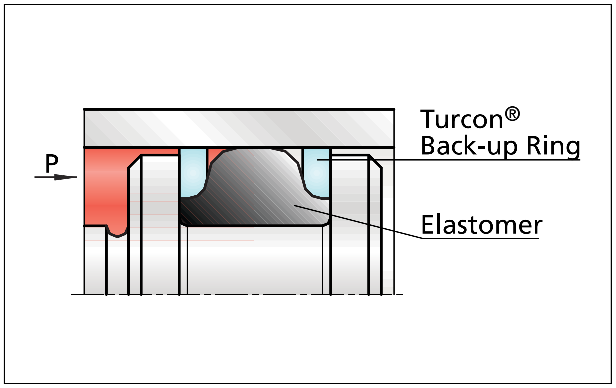


Figure 1 Turcon® T-Seal

Method of Operation

Due to its large elastomer footprint Turcon® T-Seal is a good static seal with high reliability. Providing bidirectional sealing, it is the preferred option for media separation, such as fluid/gas or fluid/fluid.

The one or two Back-up Ring widths offer especially good protection against extrusion. This is due to the additional material volume of the Back-up Rings compared to zero Back-up Ring widths.

An alternative is Tandem Turcon® T-Seal. This utilizes a co-modulus Back-up Ring design to prevent abrasion of the elastomer component. It maximizes extrusion resistance of the sealing assembly at system pressures above 5,000 psi/ 35 MPa. This is even the case in application conditions where optimum seal performance is difficult, such as large hardware clearances. The inner anti-abrasion ring is usually made from softer Turcon® T01 or virgin PTFE, while the outer anti-extrusion ring is made from a high modulus material like polyimide or PEEK™.

Technical Data

Operation pressure:	5,000 psi/ 35 MPa static 3,000 psi/ 21 MPa dynamic
Speed:	9.8 ft/s/ 3.0 m/s or higher for non-continuous or intermittent use
Temperature range:	-65°F to +390°F/ -54°C to +200°C depending on elastomer
Clearance:	As per AS4716 Larger with tandem Back-up Ring configuration
Media:	Mineral oil-based hydraulic fluids, flame-retardant hydraulic fluids, environmentally-safe hydraulic fluids (bio-oils), phosphate ester-based hydraulic oils, water and others depending on the elastomer material selected

Avoid combining extreme limits.

Series

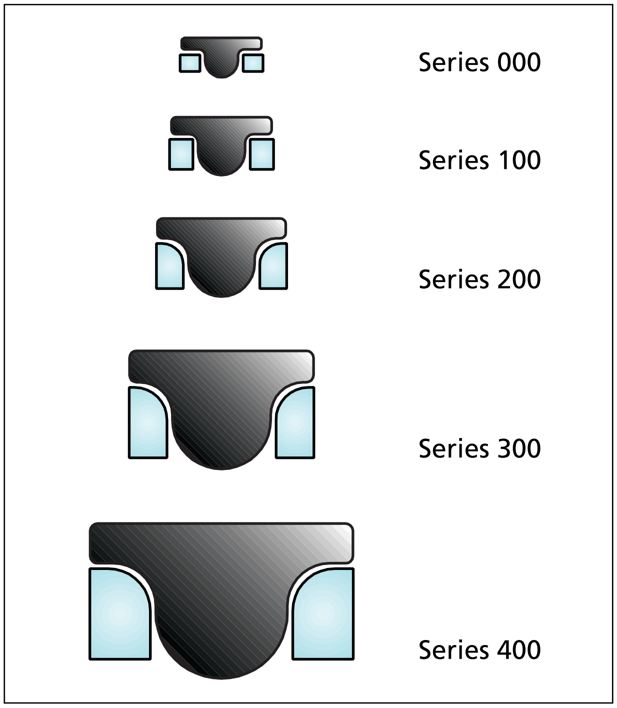
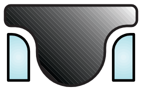
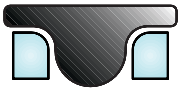
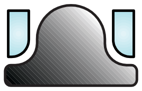
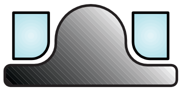
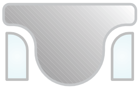
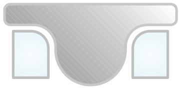
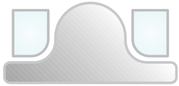
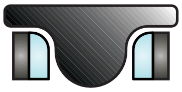
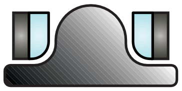


Figure 2 Relative Size of Turcon® T-Seal cross section

Table I Turcon® T-Seal Types

Seal	Turcon® T-Seal		
	Width		
Type	0 BUR (G0)	1 BUR (G1)	2 BUR (G2)
Rod with BUR AS4716 Rev. A	 RBA0_G	 RBA1_G	 RBA2_G
Piston with BUR AS4716 Rev. A	 PBA0_G	 PBA1_G	 PBA2_G
Rod with BUR MIL-G-5514 F	 RB10_M (old p/n S38410)	 RB11_M (old p/n S38411)	 RB12_M (old p/n S38412)
Piston with BUR MIL-G-5514 F	 PB20_M (old p/n S38420)	 PB21_M (old p/n S38421)	 PB22_M (old p/n S38422)
Tandem (Staged) Rod	N/A	N/A	 RBB2_G
Tandem (Staged) Piston	N/A	N/A	 PBB2_G

- G denotes groove width; zero, one or two back-up width
- BUR - Back-up Ring

The elongation limits of some elastomer materials in combination with the diameter of the seal I.D. prevent the installation of Turcon® T-Seal into closed piston (O.D.) grooves by circumferential stretching. Check the correct installation method with your Trelleborg Sealing Solutions marketing company before using Turcon® T-Seal part numbers beginning with PB in dash sizes -004 to -009 and -104 to -109.

Profiles in color are recommended configurations.

DASH NO.	B DIA.	E DIA.
	+.000 -.001	+.001 -.000
004	.076	.190
005	.108	.217
006	.123	.232
007	.154	.264
008	.185	.294
009	.217	.327
010	.248	.359
011	.310	.421
012	.373	.484
	+.000 -.002	+.002 -.000
013	.435	.545
014	.498	.608
015	.560	.670
016	.623	.733
017	.685	.795
018	.748	.858
019	.810	.920
020	.873	.983
021	.935	1.045
022	.998	1.108
023	1.060	1.170
024	1.123	1.233
025	1.185	1.295
026	1.248	1.358
027	1.310	1.420
028	1.373	1.483
	+.000 -.001	+.001 -.000
104	.123	.295
105	.154	.327
106	.185	.359
107	.217	.392
108	.248	.423
109	.310	.486
	+.000 -.002	+.002 -.000
110	.373	.546
111	.435	.609
112	.498	.672
113	.560	.734
114	.623	.797
115	.685	.859
116	.748	.923
117	.810	.985
118	.873	1.048
119	.935	1.110
120	.998	1.173
121	1.060	1.235
122	1.123	1.298
123	1.185	1.360
124	1.248	1.423
125	1.310	1.485
126	1.373	1.548
127	1.435	1.610
128	1.498	1.673
129	1.560	1.735
130	1.623	1.798
131	1.685	1.860
132	1.748	1.923
133	1.810	1.984
134	1.873	2.047
135	1.936	2.110
136	1.998	2.172
137	2.061	2.235
138	2.123	2.297
139	2.186	2.360
140	2.248	2.422
141	2.311	2.485
142	2.373	2.547
143	2.436	2.610
144	2.498	2.672
145	2.561	2.735
146	2.623	2.797
147	2.686	2.860
148	2.748	2.922
149	2.811	2.985

DASH NO.	B DIA.	E DIA.
	+.000 -.002	+.002 -.000
210	.748	.989
211	.810	1.051
212	.873	1.115
213	.935	1.177
214	.998	1.240
215	1.060	1.302
216	1.123	1.365
217	1.185	1.427
218	1.248	1.490
219	1.310	1.552
220	1.373	1.615
221	1.435	1.677
222	1.498	1.740
223	1.623	1.865
224	1.748	1.990
225	1.873	2.115
226	1.998	2.240
227	2.123	2.365
228	2.248	2.490
229	2.373	2.615
230	2.498	2.740
231	2.623	2.865
232	2.748	2.990
233	2.873	3.115
234	2.997	3.239
235	3.122	3.364
236	3.247	3.489
237	3.372	3.614
238	3.497	3.739
239	3.622	3.864
240	3.747	3.989
241	3.872	4.114
242	3.997	4.239
243	4.122	4.364
244	4.247	4.489
245	4.372	4.614
246	4.497	4.739
247	4.622	4.864
	+.000 -.002	+.002 -.000
325	1.498	1.870
326	1.623	1.995
327	1.748	2.120
328	1.873	2.245
329	1.998	2.370
330	2.123	2.495
331	2.248	2.620
332	2.373	2.745
333	2.498	2.870
334	2.623	2.995
335	2.748	3.120
336	2.873	3.245
337	2.997	3.369
338	3.122	3.494
339	3.247	3.619
340	3.372	3.744
341	3.497	3.869
342	3.622	3.994
343	3.747	4.119
344	3.872	4.244
345	3.997	4.369
346	4.122	4.494
347	4.247	4.619
348	4.372	4.744
349	4.497	4.869
	+.000 -.003	+.003 -.000
425	4.497	4.974
426	4.622	5.099
427	4.747	5.224
428	4.872	5.349
429	4.997	5.474
430	5.122	5.599
431	5.247	5.724
432	5.372	5.849
433	5.497	5.974
434	5.622	6.099

DASH NO.	B DIA.	E DIA.
	+.000 -.003	+.003 -.000
435	5.747	6.224
436	5.872	6.349
437	5.997	6.474
438	6.247	6.724
439	6.497	6.974
440	6.747	7.224
441	6.997	7.474
442	7.247	7.724
443	7.497	7.974
444	7.747	8.224
445	7.997	8.474
446	8.497	8.974
	+.000 -.003	+.004 -.000
447	8.997	9.474
448	9.497	9.974
449	9.997	10.474
450	10.497	10.974
451	10.997	11.474
452	11.497	11.974
453	11.997	12.474
454	12.497	12.974
455	12.997	13.474
456	13.497	13.974
457	13.997	14.474
458	14.497	14.974
459	14.997	15.474
460	15.497	15.974

DASH NO.	G_0 ZERO BACKUP WIDTH	G_1 ONE BACKUP WIDTH	G_2 TWO BACKUP WIDTH	R RADIUS	D DIAMETRAL CLEARANCE MAX.
004-009	.098/.103	.154/.164	.210/.220	.005/.015	.004
010-012	.094/.099	.150/.160	.207/.217		.004
013-028					.005
104-109	.141/.151	.183/.193	.245/.255	.005/.015	.004
110-126					.005
127-129					.006
130-132					.006
133-140					.007
141-149					.007
210-222	.188/.198	.235/.245	.304/.314	.010/.025	.005
223-224					.006
225-227					.007
228-243					.007
244-245					.007
246-247					.008
325-327	.281/.291	.334/.344	.424/.434	.020/.035	.006
328-329					.007
330-345					.007
346-349					.007
425-438	.375/.385	.475/.485	.579/.589	.020/.035	.009
439-445					.010
446					.010
447-460					.010

NOTES:

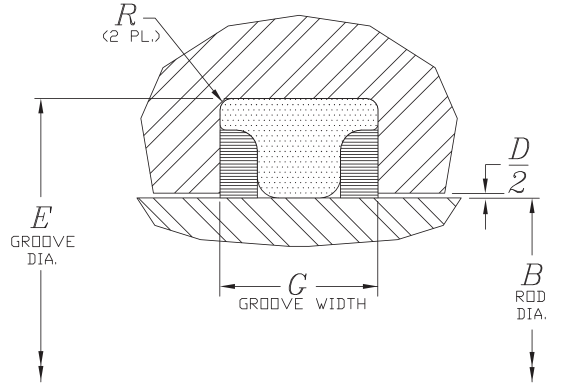
1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR T-SEAL IN AS4716 REVISION A ROD GLANDS.

2. ORDERING EXAMPLE: RBA 0 0 G 214 A T19 NG

   T-SEAL, ROD DESIGNATOR
   BACKUP WIDTH
   0 = ZERO BACKUP WIDTH
   △3 1 = ONE BACKUP WIDTH
   2 = TWO BACKUP WIDTH
   BACKUP RING DESIGN
   0 = SOLID BACKUP RINGS
   C = CUT BACKUP RINGS
   GLAND DESIGNATOR
   G = AS4716
   SIZE DESIGNATOR
   ACCORDING TO AS4716 REVISION A
   QUALITY INDEX:
   A = AEROSPACE CERTIFICATE OF CONFORMANCE
   TURCON® BACKUP RING MAT'L. CODE
   TUREL® ELASTOMER MAT'L CODE
   CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

△3 PREFERRED SEAL DESIGNS ARE EITHER ONE OR TWO BACKUP WIDTH SEALS.

4. SOME ELASTOMER MATERIALS ELONGATION LIMITS IN COMBINATION WITH THE DIAMETER OF THE SEAL I.D. PRECLUDE THE INSTALLATION OF THE TURCON T-SEAL INTO CLOSED GROOVES BY CIRCUMFERENTIAL STRETCHING, BEFORE USING -004 TO -014 AND -104 TO -117 CONSULT YOUR TSS SALES ENGINEER.



ROD SEAL INSTALLATION
FOR ZERO, ONE & TWO BACKUP WIDTH GLANDS PER AS4716 REVISION A

INCH	2009_7
TRELLEBORG SEALING SOLUTIONS	TITLE T-SEAL, ROD
	DRAWING NO. RBA00G000

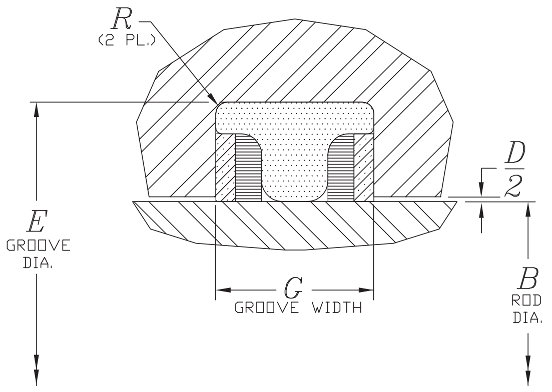
WORLD AEROSPACE TITLE BLOCK REV.

DASH NO.	B DIA.	E DIA.
	+.000 -.001	+.001 -.000
004	.076	.190
005	.108	.217
006	.123	.232
007	.154	.264
008	.185	.294
009	.217	.327
010	.248	.359
011	.310	.421
012	.373	.484
	+.000 -.002	+.002 -.000
013	.435	.545
014	.498	.608
015	.560	.670
016	.623	.733
017	.685	.795
018	.748	.858
019	.810	.920
020	.873	.983
021	.935	1.045
022	.998	1.108
023	1.060	1.170
024	1.123	1.233
025	1.185	1.295
026	1.248	1.358
027	1.310	1.420
028	1.373	1.483
	+.000 -.001	+.001 -.000
104	.123	.295
105	.154	.327
106	.185	.359
107	.217	.392
108	.248	.423
109	.310	.486
	+.000 -.002	+.002 -.000
110	.373	.546
111	.435	.609
112	.498	.672
113	.560	.734
114	.623	.797
115	.685	.859
116	.748	.923
117	.810	.985
118	.873	1.048
119	.935	1.110
120	.998	1.173
121	1.060	1.235
122	1.123	1.298
123	1.185	1.360
124	1.248	1.423
125	1.310	1.485
126	1.373	1.548
127	1.435	1.610
128	1.498	1.673
129	1.560	1.735
130	1.623	1.798
131	1.685	1.860
132	1.748	1.923
133	1.810	1.984
134	1.873	2.047
135	1.936	2.110
136	1.998	2.172
137	2.061	2.235
138	2.123	2.297
139	2.186	2.360
140	2.248	2.422
141	2.311	2.485
142	2.373	2.547
143	2.436	2.610
144	2.498	2.672
145	2.561	2.735
146	2.623	2.797
147	2.686	2.860
148	2.748	2.922
149	2.811	2.985

DASH NO.	B DIA.	E DIA.
	+.000 -.002	+.002 -.000
210	.748	.989
211	.810	1.051
212	.873	1.115
213	.935	1.177
214	.998	1.240
215	1.060	1.302
216	1.123	1.365
217	1.185	1.427
218	1.248	1.490
219	1.310	1.552
220	1.373	1.615
221	1.435	1.677
222	1.498	1.740
223	1.623	1.865
224	1.748	1.990
225	1.873	2.115
226	1.998	2.240
227	2.123	2.365
228	2.248	2.490
229	2.373	2.615
230	2.498	2.740
231	2.623	2.865
232	2.748	2.990
233	2.873	3.115
234	2.997	3.239
235	3.122	3.364
236	3.247	3.489
237	3.372	3.614
238	3.497	3.739
239	3.622	3.864
240	3.747	3.989
241	3.872	4.114
242	3.997	4.239
243	4.122	4.364
244	4.247	4.489
245	4.372	4.614
246	4.497	4.739
247	4.622	4.864
	+.000 -.002	+.002 -.000
325	1.498	1.870
326	1.623	1.995
327	1.748	2.120
328	1.873	2.245
329	1.998	2.370
330	2.123	2.495
331	2.248	2.620
332	2.373	2.745
333	2.498	2.870
334	2.623	2.995
335	2.748	3.120
336	2.873	3.245
337	2.997	3.369
338	3.122	3.494
339	3.247	3.619
340	3.372	3.744
341	3.497	3.869
342	3.622	3.994
343	3.747	4.119
344	3.872	4.244
345	3.997	4.369
346	4.122	4.494
347	4.247	4.619
348	4.372	4.744
349	4.497	4.869
	+.000 -.003	+.003 -.000
425	4.497	4.974
426	4.622	5.099
427	4.747	5.224
428	4.872	5.349
429	4.997	5.474
430	5.122	5.599
431	5.247	5.724
432	5.372	5.849
433	5.497	5.974
434	5.622	6.099

DASH NO.	B DIA.	E DIA.
	+.000 -.003	+.003 -.000
435	5.747	6.224
436	5.872	6.349
437	5.997	6.474
438	6.247	6.724
439	6.497	6.974
440	6.747	7.224
441	6.997	7.474
442	7.247	7.724
443	7.497	7.974
444	7.747	8.224
445	7.997	8.474
446	8.497	8.974
	+.000 -.003	+.004 -.000
447	8.997	9.474
448	9.497	9.974
449	9.997	10.474
450	10.497	10.974
451	10.997	11.474
452	11.497	11.974
453	11.997	12.474
454	12.497	12.974
455	12.997	13.474
456	13.497	13.974
457	13.997	14.474
458	14.497	14.974
459	14.997	15.474
460	15.497	15.974

DASH NO.	G_2 TWO BACKUP WIDTH	R RADIUS	D DIAMETRAL CLEARANCE MAX.
004-009	.210/.220	.005/.015	.004
010-012	.207/.217		.004
013-028			.005
104-109	.245/.255	.005/.015	.004
110-126			.005
127-129			.006
130-132			.006
133-140			.007
141-149			.007
210-222	.304/.314	.010/.025	.005
223-224			.006
225-227			.007
228-243			.007
244-245			.007
246-247			.008
325-327	.424/.434	.020/.035	.006
328-329			.007
330-345			.007
346-349			.007
425-438	.579/.589	.020/.035	.009
439-445			.010
446			.010
447-460			.010



ROD SEAL INSTALLATION

FOR TWO BACKUP WIDTH GLANDS PER AS4716 REVISION A

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR TANDEM T-SEAL IN AS4716 REVISION A ROD GLANDS.

2. ORDERING EXAMPLE: RBB 2 0 G 214 A T19 NG

TANDEM T-SEAL, ROD DESIGNATOR
BACKUP WIDTH
  2 = TWO BACKUP WIDTH
△4 BACKUP RING DESIGN
  SEE BELOW
GLAND DESIGNATOR
  G = AS4716
SIZE DESIGNATOR
  ACCORDING TO AS4716 REVISION A
QUALITY INDEX:
  A = AEROSPACE CERTIFICATE OF CONFORMANCE
TURCON® BACKUP RING MAT'L. CODE
TUREL® ELASTOMER MAT'L CODE
CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

3. ALL TURCON ANTI-ABRASION RINGS ARE SOLID, EXCEPT THE FOLLOWING DASH SIZES:
-004 THROUGH -020, -104 THROUGH -132, -210 THROUGH -230 & -325 THROUGH -342

△4 DESIGN CODES FOR CUT BACKUP RING CONFIGURATION.

DESIGN CODE	BACKUP RING			
	TYPE	MATERIAL		
	CUT BACKUP RING	ZURCON® Z43	ZURCON® Z60	ZURCON® Z40
R	X	X		
S	X		X	
T	X			X

4. SOME ELASTOMER MATERIALS ELONGATION LIMITS IN COMBINATION WITH THE DIAMETER OF THE SEAL I.D. PRECLUDE THE INSTALLATION OF THE TURCON T-SEAL INTO CLOSED GROOVES BY CIRCUMFERENTIAL STRETCHING, BEFORE USING -004 TO -014 AND -104 TO -117 CONSULT YOUR TSS SALES ENGINEER.

INCH
2009_7
TRELLEBORG
SEALING SOLUTIONS
TITLE
TANDEM T-SEAL, ROD
DRAWING NO.
RBB20G000

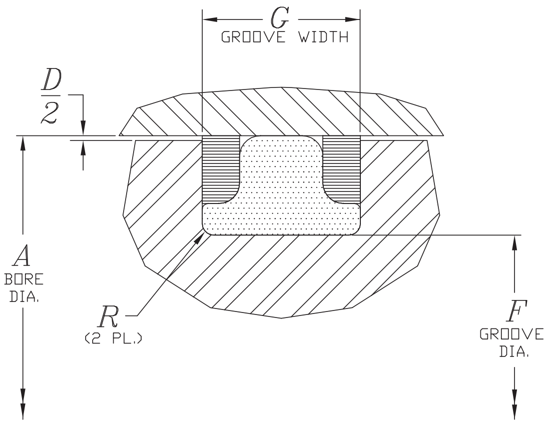
WORLD AEROSPACE TITLE BLOCK REV.

DASH NO.	A DIA.	F DIA.
	+.001 -.000	+.000 -.001
004	.190	.076
005	.221	.115
006	.235	.129
007	.266	.158
008	.297	.189
009	.329	.220
010	.360	.250
011	.422	.312
012	.485	.375
	+.002 -.000	+.000 -.002
013	.550	.441
014	.613	.504
015	.675	.566
016	.738	.629
017	.800	.691
018	.863	.753
019	.925	.815
020	.991	.881
021	1.053	.943
022	1.116	1.006
023	1.178	1.068
024	1.241	1.131
025	1.303	1.193
026	1.366	1.256
027	1.428	1.318
028	1.491	1.381
	+.001 -.000	+.000 -.001
104	.297	.128
105	.329	.158
106	.360	.187
107	.391	.215
108	.422	.246
109	.485	.308
	+.002 -.000	+.000 -.002
110	.550	.379
111	.613	.441
112	.675	.502
113	.738	.565
114	.800	.627
115	.863	.689
116	.925	.751
117	.991	.817
118	1.053	.879
119	1.116	.942
120	1.178	1.003
121	1.241	1.066
122	1.303	1.128
123	1.366	1.191
124	1.428	1.253
125	1.491	1.316
126	1.553	1.378
127	1.616	1.441
128	1.678	1.503
129	1.741	1.566
130	1.805	1.631
131	1.867	1.693
132	1.930	1.756
133	1.992	1.818
134	2.055	1.881
135	2.118	1.944
136	2.180	2.006
137	2.243	2.069
138	2.305	2.131
139	2.368	2.194
140	2.430	2.256
141	2.493	2.319
142	2.555	2.381
143	2.618	2.444
144	2.680	2.506
145	2.743	2.569
146	2.805	2.631
147	2.868	2.694
148	2.930	2.756
149	2.993	2.819

DASH NO.	A DIA.	F DIA.
	+.002 -.000	+.000 -.002
210	.991	.750
211	1.053	.812
212	1.116	.874
213	1.178	.936
214	1.241	.999
215	1.303	1.061
216	1.366	1.124
217	1.428	1.186
218	1.491	1.249
219	1.553	1.311
220	1.616	1.374
221	1.678	1.436
222	1.741	1.499
223	1.867	1.625
224	1.992	1.750
225	2.118	1.876
226	2.243	2.001
227	2.368	2.126
228	2.493	2.251
229	2.618	2.376
230	2.743	2.501
231	2.868	2.626
232	2.993	2.751
233	3.118	2.876
234	3.243	3.001
235	3.368	3.126
236	3.493	3.251
237	3.618	3.376
238	3.743	3.501
239	3.868	3.626
240	3.993	3.751
241	4.118	3.876
242	4.243	4.001
243	4.368	4.126
244	4.493	4.251
245	4.618	4.376
246	4.743	4.501
247	4.868	4.626
	+.002 -.000	+.000 -.002
325	1.867	1.495
326	1.992	1.620
327	2.118	1.746
328	2.243	1.871
329	2.368	1.996
330	2.493	2.121
331	2.618	2.246
332	2.743	2.371
333	2.868	2.496
334	2.993	2.621
335	3.118	2.746
336	3.243	2.871
337	3.368	2.996
338	3.493	3.121
339	3.618	3.246
340	3.743	3.371
341	3.868	3.496
342	3.993	3.621
343	4.118	3.746
344	4.243	3.871
345	4.368	3.996
346	4.493	4.121
347	4.618	4.246
348	4.743	4.371
349	4.868	4.496
	+.003 -.000	+.000 -.003
425	4.974	4.497
426	5.099	4.622
427	5.224	4.747
428	5.349	4.872
429	5.474	4.997
430	5.599	5.122
431	5.724	5.247
432	5.849	5.372
433	5.974	5.497
434	6.099	5.622

DASH NO.	A DIA.	F DIA.
	+.003 -.000	+.000 -.003
435	6.224	5.747
436	6.349	5.872
437	6.474	5.997
438	6.724	6.247
439	6.974	6.497
440	7.224	6.747
441	7.474	6.997
442	7.724	7.247
443	7.974	7.497
444	8.224	7.747
445	8.474	7.997
446	8.974	8.497
	+.004 -.000	+.000 -.004
447	9.474	8.997
448	9.974	9.497
449	10.474	9.997
450	10.974	10.497
451	11.474	10.997
452	11.974	11.497
453	12.474	11.997
454	12.974	12.497
455	13.474	12.997
456	13.974	13.497
457	14.474	13.997
458	14.974	14.497
459	15.474	14.997
460	15.974	15.497

DASH NO.	G_0 ZERO BACKUP WIDTH	G_1 ONE BACKUP WIDTH	G_2 TWO BACKUP WIDTH	R RADIUS	D DIAMETRAL CLEARANCE MAX.
004-009	.098/.103	.154/.164	.210/.220	.005/.015	.004
010-012	.094/.099	.150/.160	.207/.217		.004
013-028					.005
104-109	.141/.151	.183/.193	.245/.255	.005/.015	.004
110-126					.005
127-129					.006
130-132					.006
133-140					.006
141-149					.007
210-222	.188/.198	.235/.245	.304/.314	.010/.025	.005
223-224					.006
225-227					.006
228-243					.007
244-245					.008
246-247					.008
325-327	.281/.291	.334/.344	.424/.434	.020/.035	.006
328-329					.006
330-345					.007
346-349					.008
425-438	.375/.385	.475/.485	.579/.589	.020/.035	.009
439-445					.010
446					.010
447-460					.011



PISTON SEAL INSTALLATION

FOR ZERO, ONE & TWO BACKUP WIDTH GLANDS PER AS4716 REVISION A

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR T-SEAL IN AS4716 REVISION A PISTON GLANDS.

2. ORDERING EXAMPLE: PBA 0 0 G 214 A T19 NG

T-SEAL, PISTON DESIGNATOR
BACKUP WIDTH
  0 = ZERO BACKUP WIDTH
△3 {1 = ONE BACKUP WIDTH
  {2 = TWO BACKUP WIDTH
BACKUP RING DESIGN
  0 = SOLID BACKUP RINGS
  C = CUT BACKUP RINGS
GLAND DESIGNATOR
  G = AS4716
SIZE DESIGNATOR
  ACCORDING TO AS4716 REVISION A
QUALITY INDEX:
  A = AEROSPACE CERTIFICATE OF CONFORMANCE
TURCON® BACKUP RING MAT'L. CODE
TUREL® ELASTOMER MAT'L CODE
CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

△3 PREFERRED SEAL DESIGNS ARE EITHER ONE OR TWO BACKUP WIDTH SEALS.

4. SOME ELASTOMER MATERIALS ELONGATION LIMITS IN COMBINATION WITH THE DIAMETER OF THE SEAL I.D. PRECLUDE THE INSTALLATION OF THE TURCON T-SEAL INTO CLOSED GROOVES BY CIRCUMFERENTIAL STRETCHING, BEFORE USING -004 TO -014 AND -104 TO -117 CONSULT YOUR TSS SALES ENGINEER.

INCH	2009_7
TRELLEBORG SEALING SOLUTIONS	TITLE T-SEAL, PISTON
	DRAWING NO. PBA00G000

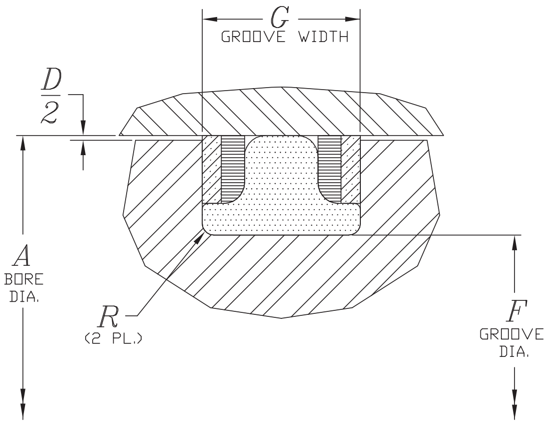
WORLD AEROSPACE TITLE BLOCK REV.

DASH NO.	A DIA.	F DIA.
	+.001 -.000	+.000 -.001
004	.190	.076
005	.221	.115
006	.235	.129
007	.266	.158
008	.297	.189
009	.329	.220
010	.360	.250
011	.422	.312
012	.485	.375
	+.002 -.000	+.000 -.002
013	.550	.441
014	.613	.504
015	.675	.566
016	.738	.629
017	.800	.691
018	.863	.753
019	.925	.815
020	.991	.881
021	1.053	.943
022	1.116	1.006
023	1.178	1.068
024	1.241	1.131
025	1.303	1.193
026	1.366	1.256
027	1.428	1.318
028	1.491	1.381
	+.001 -.000	+.000 -.001
104	.297	.128
105	.329	.158
106	.360	.187
107	.391	.215
108	.422	.246
109	.485	.308
	+.002 -.000	+.000 -.002
110	.550	.379
111	.613	.441
112	.675	.502
113	.738	.565
114	.800	.627
115	.863	.689
116	.925	.751
117	.991	.817
118	1.053	.879
119	1.116	.942
120	1.178	1.003
121	1.241	1.066
122	1.303	1.128
123	1.366	1.191
124	1.428	1.253
125	1.491	1.316
126	1.553	1.378
127	1.616	1.441
128	1.678	1.503
129	1.741	1.566
130	1.805	1.631
131	1.867	1.693
132	1.930	1.756
133	1.992	1.818
134	2.055	1.881
135	2.118	1.944
136	2.180	2.006
137	2.243	2.069
138	2.305	2.131
139	2.368	2.194
140	2.430	2.256
141	2.493	2.319
142	2.555	2.381
143	2.618	2.444
144	2.680	2.506
145	2.743	2.569
146	2.805	2.631
147	2.868	2.694
148	2.930	2.756
149	2.993	2.819

DASH NO.	A DIA.	F DIA.
	+.002 -.000	+.000 -.002
210	.991	.750
211	1.053	.812
212	1.116	.874
213	1.178	.936
214	1.241	.999
215	1.303	1.061
216	1.366	1.124
217	1.428	1.186
218	1.491	1.249
219	1.553	1.311
220	1.616	1.374
221	1.678	1.436
222	1.741	1.499
223	1.867	1.625
224	1.992	1.750
225	2.118	1.876
226	2.243	2.001
227	2.368	2.126
228	2.493	2.251
229	2.618	2.376
230	2.743	2.501
231	2.868	2.626
232	2.993	2.751
233	3.118	2.876
234	3.243	3.001
235	3.368	3.126
236	3.493	3.251
237	3.618	3.376
238	3.743	3.501
239	3.868	3.626
240	3.993	3.751
241	4.118	3.876
242	4.243	4.001
243	4.368	4.126
244	4.493	4.251
245	4.618	4.376
246	4.743	4.501
247	4.868	4.626
	+.002 -.000	+.000 -.002
325	1.867	1.495
326	1.992	1.620
327	2.118	1.746
328	2.243	1.871
329	2.368	1.996
330	2.493	2.121
331	2.618	2.246
332	2.743	2.371
333	2.868	2.496
334	2.993	2.621
335	3.118	2.746
336	3.243	2.871
337	3.368	2.996
338	3.493	3.121
339	3.618	3.246
340	3.743	3.371
341	3.868	3.496
342	3.993	3.621
343	4.118	3.746
344	4.243	3.871
345	4.368	3.996
346	4.493	4.121
347	4.618	4.246
348	4.743	4.371
349	4.868	4.496
	+.003 -.000	+.000 -.003
425	4.974	4.497
426	5.099	4.622
427	5.224	4.747
428	5.349	4.872
429	5.474	4.997
430	5.599	5.122
431	5.724	5.247
432	5.849	5.372
433	5.974	5.497
434	6.099	5.622

DASH NO.	A DIA.	F DIA.
	+.003 -.000	+.000 -.003
435	6.224	5.747
436	6.349	5.872
437	6.474	5.997
438	6.724	6.247
439	6.974	6.497
440	7.224	6.747
441	7.474	6.997
442	7.724	7.247
443	7.974	7.497
444	8.224	7.747
445	8.474	7.997
446	8.974	8.497
	+.004 -.000	+.000 -.004
447	9.474	8.997
448	9.974	9.497
449	10.474	9.997
450	10.974	10.497
451	11.474	10.997
452	11.974	11.497
453	12.474	11.997
454	12.974	12.497
455	13.474	12.997
456	13.974	13.497
457	14.474	13.997
458	14.974	14.497
459	15.474	14.997
460	15.974	15.497

DASH NO.	G_2 TWO BACKUP WIDTH	R RADIUS	D DIAMETRAL CLEARANCE MAX.
004-009	.210/.220	.005/.015	.004
010-012	.207/.217		.004
013-028			.005
104-109	.245/.255	.005/.015	.004
110-126			.005
127-129			.006
130-132			.006
133-140			.006
141-149			.007
210-222	.304/.314	.010/.025	.005
223-224			.006
225-227			.006
228-243			.007
244-245			.008
246-247			.008
325-327	.424/.434	.020/.035	.006
328-329			.006
330-345			.007
346-349			.008
425-438	.579/.589	.020/.035	.009
439-445			.010
446			.010
447-460			.011



PISTON SEAL INSTALLATION
FOR TWO BACKUP WIDTH GLANDS PER AS4716 REVISION A

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR TANDEM T-SEAL IN AS4716 REVISION A PISTON GLANDS.

2. ORDERING EXAMPLE: PBB 2 0 G 214 A T19 NG

TANDEM T-SEAL, PISTON DESIGNATOR — PBB
BACKUP WIDTH — 2
2 = TWO BACKUP WIDTH
△4 BACKUP RING DESIGN — 0
SEE BELOW
GLAND DESIGNATOR — G
G = AS4716
SIZE DESIGNATOR — 214
ACCORDING TO AS4716 REVISION A
QUALITY INDEX: — A
A = AEROSPACE CERTIFICATE OF CONFORMANCE
TURCON® BACKUP RING MAT'L. CODE — T19
TUREL® ELASTOMER MAT'L CODE — NG
CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

3. ALL TURCON ANTI-ABRASION RINGS ARE SOLID, EXCEPT THE FOLLOWING DASH SIZES:
-004 THROUGH -020, -104 THROUGH -132, -210 THROUGH -230 & -325 THROUGH -342

△4 DESIGN CODES FOR BACKUP RING CONFIGURATION.

	BACKUP RING			
	TYPE	MATERIAL		
DESIGN CODE	CUT BACKUP RING	ZURCON® Z43	ZURCON® Z60	ZURCON® Z40
R	X	X		
S	X		X	
T	X			X

5. SOME ELASTOMER MATERIALS ELONGATION LIMITS IN COMBINATION WITH THE DIAMETER OF THE SEAL I.D. PRECLUDE THE INSTALLATION OF THE TURCON T-SEAL INTO CLOSED GROOVES BY CIRCUMFERENTIAL STRETCHING, BEFORE USING -004 TO -014 AND -104 TO -117 CONSULT YOUR TSS SALES ENGINEER.

INCH
2009_7
TRELLEBORG
SEALING SOLUTIONS
TITLE
TANDEM T-SEAL, PISTON
DRAWING NO.
PBB20G000

WORLD AEROSPACE TITLE BLOCK REV.

Features and benefits

- Combines the benefits of a low-friction Turcon® slipper seal with the high sealing characteristics of an elastomer seal
- High sealing effect in applications requiring media separation, fluid/fluid or fluid/gas
- Optimized leakage rate
- Low gas permeation rate
- Capable of operating successfully at higher pressures and sliding speeds than Turcon® T-Seal
- Outstanding sliding properties, no stick-slip effect
- Designed for zero Back-up Ring width groove per AS4716

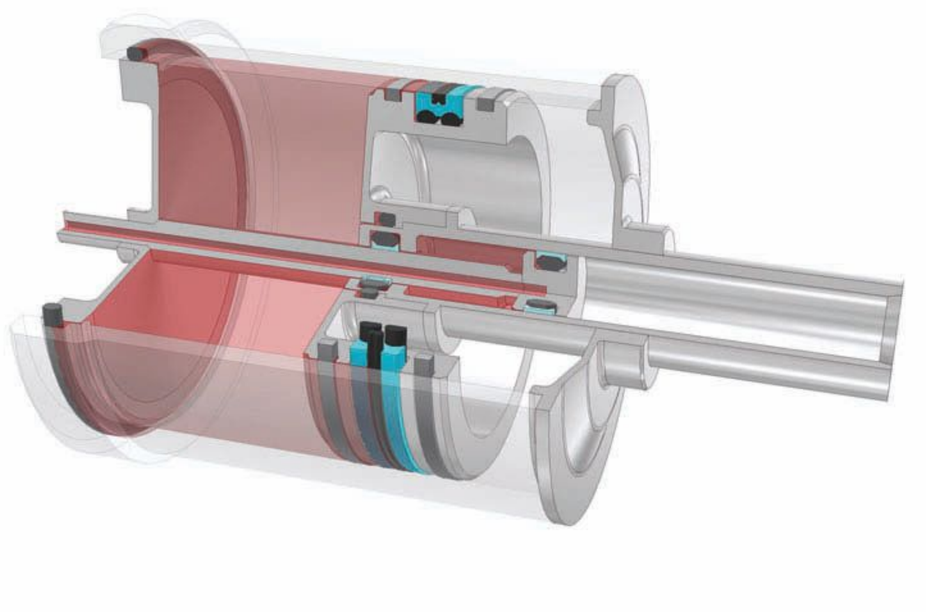


Illustration shows typical hydro-pneumatic accumulator with a sealing configuration incorporating Turcon® AQ-Seal® 5.

Description

Turcon® AQ-Seal® 5 is a double-acting piston seal designed for reciprocating or helical movements. It consists of a dynamic Turcon® sealing element into which an elastomer Turel® X-Ring, with a limited footprint, is inset centrally. The assembly is energized by two elastomer O-Rings. Turcon® AQ Seal® 5 is highly recommended for applications requiring media separation in extremely dynamic situations, such as in shock absorbers.

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

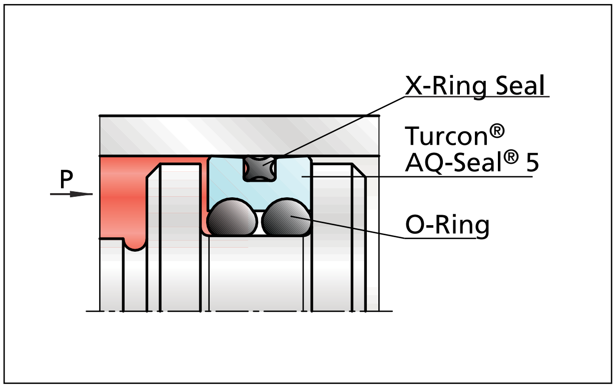


Figure 1 Turcon® AQ-Seal® 5

Method of Operation

Turcon® AQ-Seal® 5 combines the benefits of a low-friction Turcon® slipper seal with the high sealing characteristics of an elastomer seal. It does this by incorporating a limited footprint Turel® X-Ring in the dynamic sealing face, optimizing leakage control, while minimizing friction.

The unique characteristics of Turcon® AQ-Seal® 5 are its special seal profile with a defined seal edge and the use of two elastomer O-Rings as energizing elements to optimize its pressure profile.

Technical Data

Operation pressure:	5,000 psi/ 35 MPa
Speed:	9.8 ft/s/ 3.0 m/s Capable of higher speeds with non-continuous or intermittent use
Temperature range:	-65°F to +390°F/ -54°C to +200°C depending on elastomer
Clearance:	As per AS4716 Larger using custom corner-reinforced configuration
Media:	Mineral oil-based hydraulic fluids, flame-retardant hydraulic fluids, environmentally-safe hydraulic fluids (bio-oils), phosphate ester-based hydraulic oils, water and others depending on the elastomer material selected

Avoid combining extreme limits.

Series

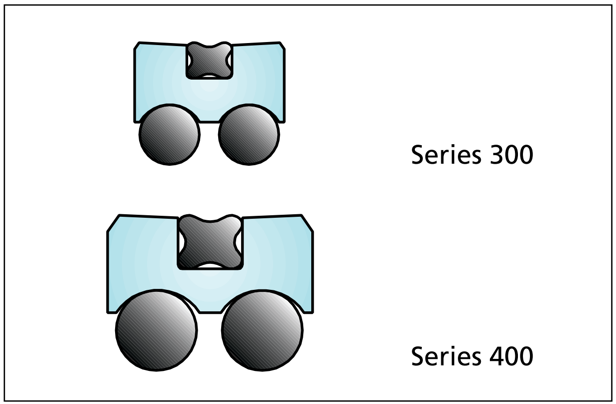
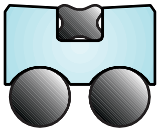
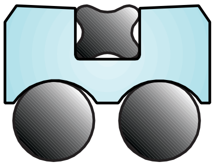


Figure 2 Relative size of Turcon® AQ-Seal® 5 cross section

Table I Turcon® AQ-Seal® 5 Types

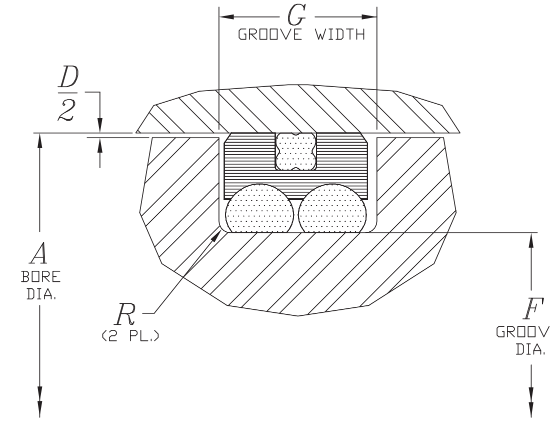
Cross Section	Description	Part Number	Gland Standard
	Turcon® AQ-Seal® 5	PQA00G3__	AS4716 300 Series Glands
	Turcon® AQ-Seal® 5	PQA00G4__	AS4716 400 Series Glands

Profiles in color are recommended configurations.

Turcon® AQ-Seal® 5

DASH NO.	*A* DIA.	*F* DIA.
	+.002 -.000	+.000 -.002
325	1.867	1.495
326	1.992	1.620
327	2.118	1.746
328	2.243	1.871
329	2.368	1.996
330	2.493	2.121
331	2.618	2.246
332	2.743	2.371
333	2.868	2.496
334	2.993	2.621
335	3.118	2.746
336	3.243	2.871
337	3.368	2.996
338	3.493	3.121
339	3.618	3.246
340	3.743	3.371
341	3.868	3.496
342	3.993	3.621
343	4.118	3.746
344	4.243	3.871
345	4.368	3.996
346	4.493	4.121
347	4.618	4.246
348	4.743	4.371
349	4.868	4.496
	+.003 -.000	+.000 -.003
425	4.974	4.497
426	5.099	4.622
427	5.224	4.747
428	5.349	4.872
429	5.474	4.997
430	5.599	5.122
431	5.724	5.247
432	5.849	5.372
433	5.974	5.497
434	6.099	5.622
435	6.224	5.747
436	6.349	5.872
437	6.474	5.997
438	6.724	6.247
439	6.974	6.497
440	7.224	6.747
441	7.474	6.997
442	7.724	7.247
443	7.974	7.497
444	8.224	7.747
445	8.474	7.997
446	8.974	8.497
	+.004 -.000	
447	9.474	8.997
448	9.974	9.497
449	10.474	9.997
450	10.974	10.497
451	11.474	10.997
452	11.974	11.497
453	12.474	11.997
454	12.974	12.497
455	13.474	12.997
456	13.974	13.497
457	14.474	13.997
458	14.974	14.497
459	15.474	14.997
460	15.974	15.497

DASH NO.	*G* GROOVE WIDTH	*R* RADIUS	*D* DIAMETRAL CLEARANCE MAX.
325-329	.281/.291	.020/.035	.006
330-345			.007
346-349			.008
425-445	.375/.385		.009
446			.010
447-460			.011



PISTON SEAL INSTALLATION

FOR ZERO BACK-UP WIDTH AS4716 REVISION A GROOVES

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR AQ SEAL® 5 IN AS4716 REVISION A PISTON GLANDS.

2. ORDERING EXAMPLE: PQA 0 0 G 334 A T05 NP

   AQ SEAL® 5, PISTON DESIGNATOR
   BACKUP WIDTH
   DESIGN CODE
   0 = STANDARD
   GLAND DESIGNATOR
   G = AS4716
   SIZE DESIGNATOR
   ACCORDING TO AS4716 REVISION A
   ZERO BACKUP WIDTH -325 THRU -460 ONLY
   QUALITY INDEX:
   A = AEROSPACE CERTIFICATE OF CONFORMANCE
   TURCON® AQ SEAL MAT'L CODE
   TUREL® X-RING & O-RING MAT'L CODE
   CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

3. GLAND DIMENSIONS PER AS4716 REV A -300 & -400 SERIES ONLY.

AQ SEAL® PATENTS:

U.S.A.	4,179,131
FRANCE	2 371 618
BRAZIL	77.07745
AUSTRIA	358 342
BELGIUM	861.040
U.K.	1 563 972
SWITZERLAND	599.487
CANADA	1.089.890
SPAIN	232.247
HOLLAND	7712219
SWEDEN	771.197.74
W. GERMANY	2 658 428
ITALY	1 088 636
DENMARK	146.050

*JAPAN PATENT PENDING

INCH
2009_1
TRELLEBORG
SEALING SOLUTIONS
TITLE
AQ SEAL® 5
DRAWING NO.
PQA00G000

WORLD AEROSPACE TITLE BLOCK REV.

Features and benefits

- Prevents O-Ring extrusion
- Prolongs O-Ring service life
- Allows O-Rings to be utilized in higher pressure applications, against softer mating surfaces and where there are reciprocating or rotating movements
- Compatible with virtually all media and gases
- Easy Installation
- Wide range of geometries to meet the needs of all applications
- Sizes to meet all standards
- Non-standard sizes also available

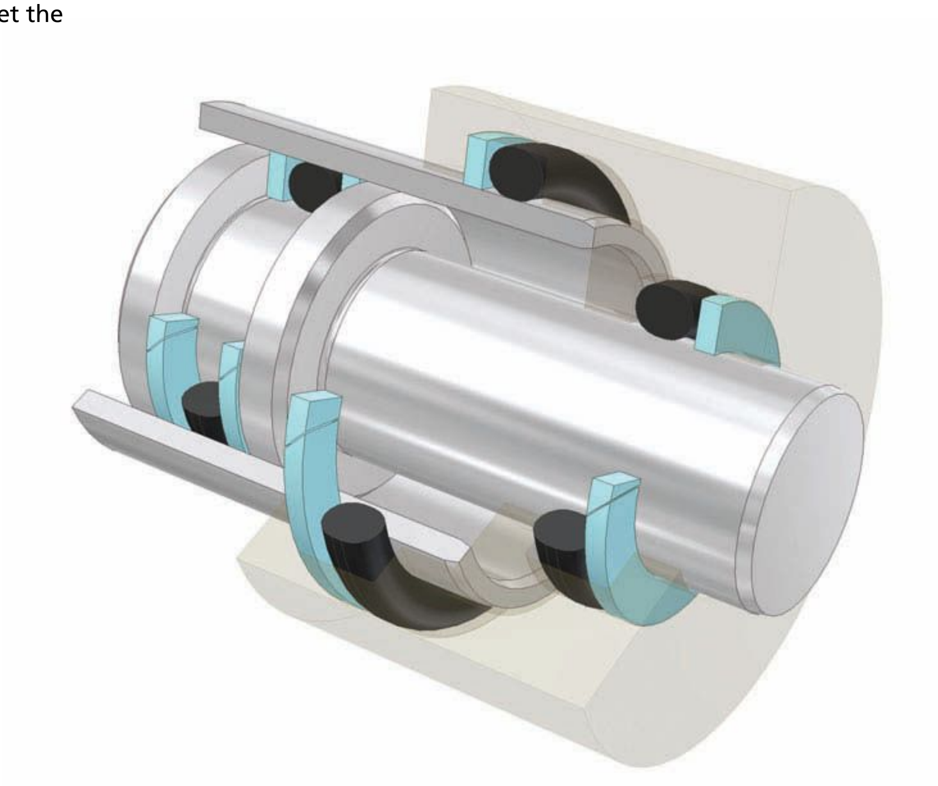


Illustration shows typical hydraulic cylinder with Back-up Rings and O-Rings.

Back-up Ring and Stakbak®

Description

During the 1950s Trelleborg Sealing Solutions developed the Back-up Ring as an improvement on leather packing rings.

Back-up Rings are protective and supporting elements with no sealing function. Made from extrusion-resistant materials such as Turcon®, they usually have a rectangular cross section and are installed in a groove with an elastomer O-Ring. Due to their tight fit in the housing, Back-up Rings prevent extrusion of the pressurized elastomer sealing element into the sealing gap.

Using Back-up Rings allows O-Rings to be utilized in higher pressure applications, against softer mating surfaces and where there are reciprocating or rotating movements. They also compensate for radial sealing gaps and large temperature fluctuations.

The wide range of Back-up Rings offered meets all aerospace industry standards.

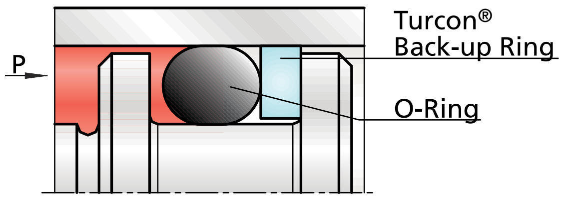


Figure 1 Turcon® Back-up Ring

Stakbak® is a dual modulus bonded stacked Back-up Ring. It consists of one ring made of Turcon®, which protects the O-Ring, and a second ring in HiMod® / Zurcon® to prevent extrusion. Easy to install, the Stakbak® is capable of operating at higher pressures than a standard Back-up Ring.

Method of Operation

The Back-up Ring is installed between the O-Ring and the groove wall, separating the O-Ring from the clearance gap.

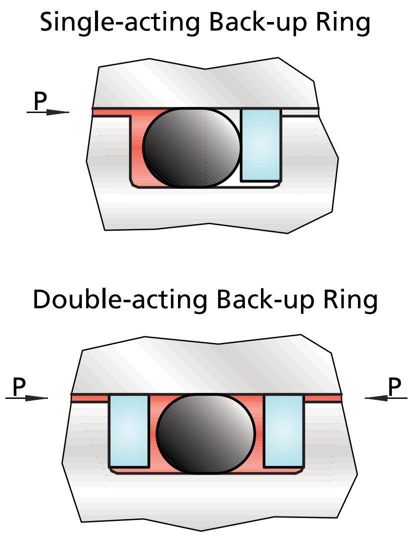


Figure 2 Single-acting and double-acting sealing configurations with Back-up Rings

Technical Data

Operating pressure:

- 3,000 psi/ 21 MPa for standard design in Turcon® T01 or Turcon T28 per AMS8791
- 5,000 psi/ 35 MPa for standard design in Turcon® with fillers, Turcon® T11 carbon and graphite-filled PTFE
- 8,000 psi/ 55 Mpa for special versions such as Stakbak®

Speed:	49.2 ft/s/ 15 m/s
Temperature range:	-94°F to +390°F/ -70°C to +200°C
Clearance:	As per Mil-G-5514, AS4716 or AS5857
Media:	Compatible with virtually all media and gases

Materials

Standard material for Back-up Rings is Turcon® T01, Virgin PTFE. Stronger materials are available for specific applications.

Series

Back-up Rings follow the series according to aerospace seal gland standard AS4716 Revision A and static seal gland standard AS5857. These guidelines should be followed to ensure good service life. Part numbers for Trelleborg Sealing Solutions Back-up Rings correlate to aerospace gland standards as indicated by the sixth digit.

Part No 6th Digit	Description
M	Mil-P-5514 and Mil-G-5514F-Aerospace Hydraulic Packing Gland Standard, Static and Dynamic. Mil-G-5514F Back-up Rings can be used in the AS4716 Rev. A glands in -300 and 400 series glands only.
G	AS4716 Revision A, Aerospace Hydraulic Packing Gland Standard, Static and Dynamic
E	AS5857, Aerospace Static Gland Standard

Back-up Rings can also be supplied in non-standard diameter sizes.

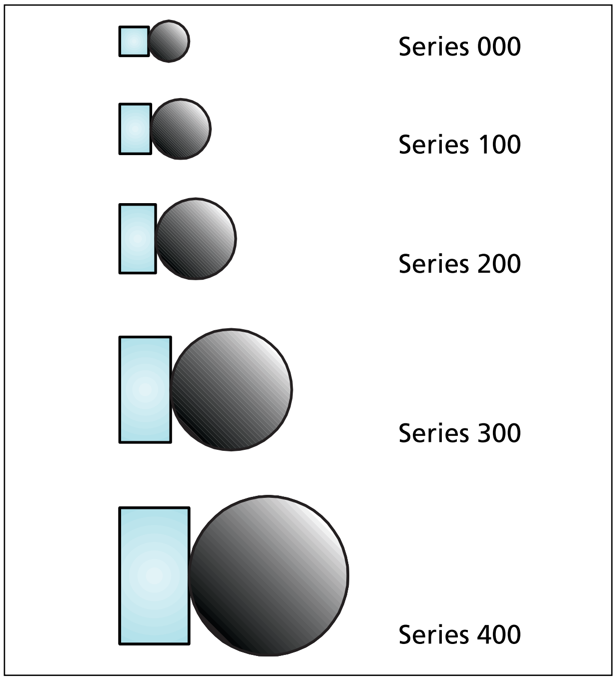


Figure 3 Relative Size of Back-up Ring cross section

Ordering

O-Ring must be ordered separately from Back-up Ring.

Guidelines for Gap, Pressure and Size

Back-up Rings must be used if the pressures given in the tables below are exceeded.

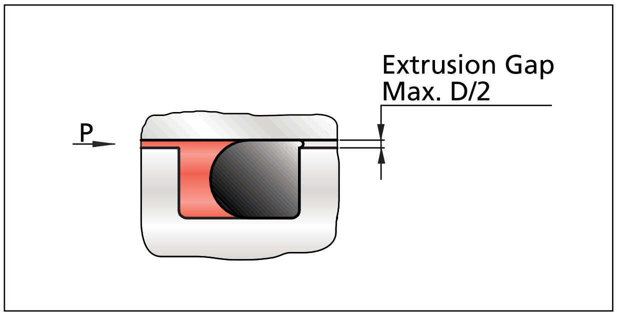


Figure 4 Extrusion Gap

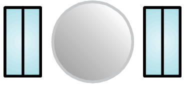
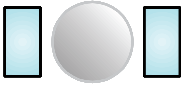
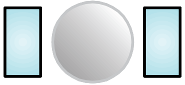
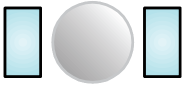
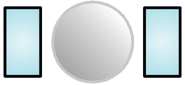
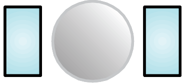
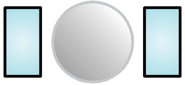
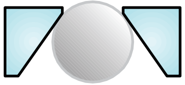
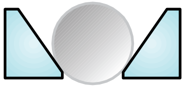
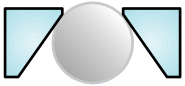
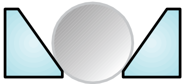
Table I Extrusion Gap Size D for 70 Shore Hardness

Series	O-Ring Cross Section inch mm	Extrusion Gap D inch mm		
		500 psi 3.5 Mpa	1,000 psi 7 Mpa	1,500 psi 10.5 Mpa
000	0.070 1.78	0.006 0.15	0.004 0.10	0.002 0.05
100	0.103 2.62	0.007 0.18	0.005 0.13	0.003 0.08
200	0.139 3.53	0.008 0.20	0.006 0.15	0.004 0.10
300	0.210 5.33	0.010 0.25	0.007 0.18	0.005 0.13
400	0.276 7.00	0.012 0.30	0.008 0.20	0.006 0.15

Table II Extrusion Gap Size D for 80 Shore Hardness

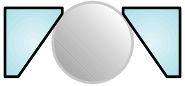
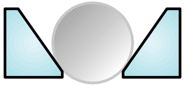
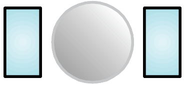
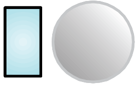
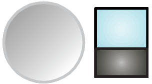
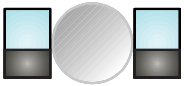
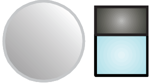
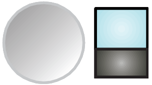
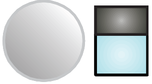
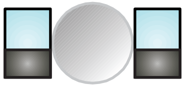
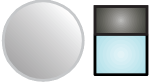
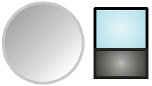
Series	O-Ring Cross Section inch mm	Extrusion Gap D inch mm				
		500 psi 3.5 Mpa	1,000 psi 7 Mpa	1,500 psi 10.5 Mpa	2,000 psi 14 Mpa	2,500 psi 17.5 Mpa
000	0.070 1.78	0.008 0.20	0.006 0.15	0.004 0.10	0.002 0.05	0.001 0.03
100	0.103 2.62	0.010 0.25	0.007 0.18	0.005 0.13	0.003 0.08	0.002 0.04
200	0.139 3.53	0.012 0.30	0.008 0.20	0.006 0.15	0.004 0.10	0.002 0.05
300	0.210 5,33	0.014 0.35	0.010 0.25	0.007 0.18	0.005 0.13	0.002 0.06
400	0.276 7,00	0.016 0.40	0.012 0.30	0.008 0.20	0.006 0.15	0.003 0.07

Table III Back-up Ring Types: Industry Standards Mil-P-5514 and Mil-G-5514

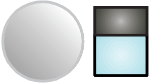
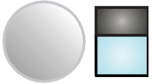
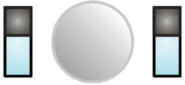
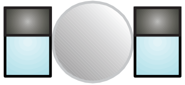
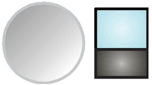
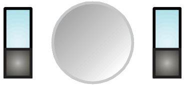
Cross section	Description	Part Number (Old part number)	Aerospace, military or Boeing part number	Gland standard
	Heavy duty Spiral Rod or piston seal (see Note 1)	BM820S (S38030)	MS28782	Mil-P-5514 Revisions A, B, C, D, E one or two BUR widths
	Heavy duty Solid Rod or piston seal	BUS00M* (S13050)		Mil-P-5514 Revisions C, D, E one or two BUR widths
	Heavy duty single turn Rod or piston seal (see Note 1)	BM740M (S38029)	MS28774	Mil-P-5514 thru Mil-G-5514 All revisions one or two BUR widths
	Heavy-duty single turn Scarf-cut Rod or piston seal	BGS20M* (S13122)		Mil-P-5514 thru Mil-G-5514 All revisions one or two BUR widths
	Heavy-duty spiral turn Scarf-cut Rod or piston seal	BP170M* (S12517)		Mil- P-5514 Revisions C, D, E fractional one or two BUR widths
	Heavy-duty single turn Rod or piston seal	BU870M* (S12587)		Mil-P-5514 Revisions A, B, C, D, E one or two BUR widths
	Heavy-duty single turn Scarf-cut Rod or piston seal	BG660M* (S12766)		Mil-P-5514 Revisions D, E one or two BUR widths
	Delta Solid Piston seal	--- (S11243)* (S33824 is recommended)	LS4652	Mil-P-5514 Revisions C, D, E one or two BUR widths
	Delta Solid Rod seal	--- (S11242)* (S33823 is recommended)	LS4652	Mil-P-5514 Revisions C, D, E one or two BUR widths
	Delta Solid Piston seal	--- (S33278)*		Mil-P-5514 Revisions C, D, E one or two BUR widths
	Delta Solid Rod seal	--- (S33277)*		Mil-P-5514 Revisions C, D, E one or two BUR widths

BU*** = Back-up Ring Uncut (Solid); BV*** = Back-up Ring Uncut (Solid); BG*** = Back-up Ring Scarf Cut;
BH*** = Back-up Ring Scarf Cut; BP*** = Back-up Ring Spiral type
BUR – Back-up Ring
* The part number is for one ring only. Two rings should be ordered to form a set.

Back-up Ring Material Notes:
1) Mil-spec and BAC Backup Rings available in only AMS-R-8791 material, TSS Turcon T28 only

Cross section	Description	Part Number (Old part number)	Aerospace, military or Boeing part number	Gland standard
	Delta Solid Piston seal	BU440M* (S33824)		Mil-G-5514 Revision F one or two BUR widths
	Delta Solid Rod seal	BU230M* (S33823)		Mil-G-5514 Revision F one or two BUR widths
	Heavy-duty single turn Solid or scarf-cut Rod or piston seal	BUS70M* Uncut BGS70M* Cut (S33157)		Mil-G-5514 Revision F
	Heavy-duty single turn Solid or scarf-cut Rod or piston seal	BUS10M Uncut BGS10M Cut (S33861)		Mil-G-5514 Revision F One BUR Width
	Stakbak® bonded Scarf-cut Rod Seal	BG990M (S36991)		Mil-G-5514 Revision F One BUR Width
	Stakbak® bonded Scarf-cut Rod Seal	BG920M (S36992)		Mil-G-5514 Revision F Two BUR Width
	Stakbak® bonded Scarf-cut Piston Seal	BG010M (S37001)		Mil-G-5514 Revision F One BUR Width
	Stakbak® bonded Scarf-cut Piston Seal	BG420M (S37242)		Mil-G-5514 Revision F Two BUR Width
	Stakbak® bonded Scarf-cut Rod Seal	BG110M (S37011)		Mil-G-5514 Revision F One BUR Width
	Stakbak® bonded Scarf-cut Piston Seal	BG210M (S37021)		Mil-G-5514 Revision F One BUR Width
	Stakbak® bonded Scarf-cut Rod Seal	BG550M (S37055)		Mil-G-5514 Revision F Two BUR Width
	Stakbak® bonded Scarf-cut Piston Seal	BG660M (S37060)		Mil-G-5514 Revision F One BUR Width
	Stakbak® bonded Scarf-cut Rod Seal	BG760M (S37076)		Mil-G-5514 Revision F One BUR Width

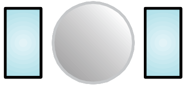
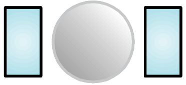
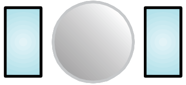
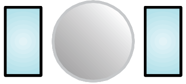
Back-up Ring and Stakbak®

	Stakbak® bonded Scarf-cut Piston Seal	BG830M (S37083)		Mil-G-5514 Revision F One BUR Width
	Stakbak® un-bonded Scarf-cut Piston Seal	BG410M (S37241)		Mil-G-5514 Revision F One BUR Width
	Stakbak® un-bonded Scarf-cut Piston Seal	BG610M (S37261)		Mil-G-5514 Revision F Two BUR Width
	Stakbak® un-bonded Scarf-cut Piston Seal	BG420M (S37242)		Mil-G-5514 Revision F Two BUR Width
	Stakbak® un-bonded Scarf-cut Rod Seal	BG510M (S37251)		Mil-G-5514 Revision F One BUR Width
	Stakbak® un-bonded Scarf-cut Rod Seal	BG710M (S37271)		Mil-G-5514 Revision F One BUR Width
	Stakbak® un-bonded Scarf-cut Rod Seal	BG520M (S37252)		Mil-G-5514 Revision F One BUR Width

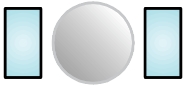
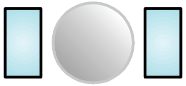
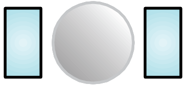
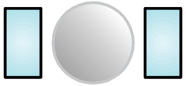
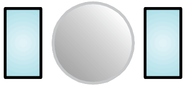
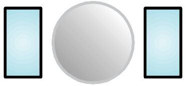
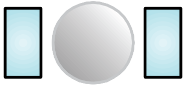
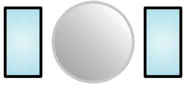
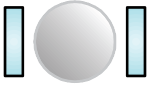
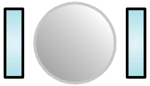
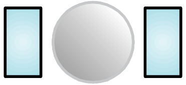
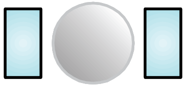
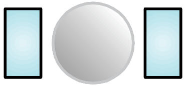
BU*** = Back-up Ring Uncut (Solid); BV*** = Back-up Ring Uncut (Solid); BG*** = Back-up Ring Scarf Cut;
BH*** = Back-up Ring Scarf Cut; BP*** = Back-up Ring Spiral type
BUR – Back-up Ring
* The part number is for one ring only. Two rings should be ordered to form a set.

Back-up Ring Material Notes:
[1] Mil-spec and BAC Backup Rings available in only AMS-R-8791 material, TSS Turcon T28 only

Table IV Back-up Ring Types: Other industry Standards including AS4716 and AS5857

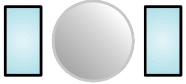
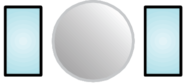
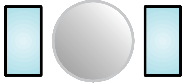
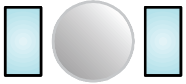
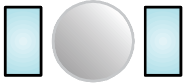
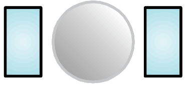
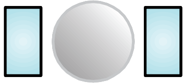
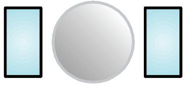
Cross Section	Description	Part Number (Old ref. P/N)	Aerospace, Military or Boeing Part Number	Gland Standard
	Heavy-duty single turn Scarf-cut Rod or piston seal	BG440G* (S38544)		AS4716
	Heavy-duty single turn Scarf-cut Rod or piston seal	BG450G* (S38545)		AS4716
	Heavy-duty single turn Solid Rod or piston seal	BU190G* (S38619)		AS4716
	Heavy-duty single turn Solid Rod or piston seal	BU180G* (S38618)		AS4716

Back-up Ring and Stakbak®

Cross Section	Description	Part Number (Old ref. P/N)	Aerospace, Military or Boeing Part Number	Gland Standard
	Heavy-duty single turn Scarf-cut Rod seal (see Note 2)	BG470G**	AS5781R10-XXX	AS4716 Revision A
	Heavy-duty single turn Scarf-cut Piston seal (see Note 2)	BH470G**	AS5781P10-XXX	AS4716 Revision A
	Heavy-duty single turn Solid Rod seal (see Note 2)	BU470G**	AS5782R10-XXX	AS4716 Revision A
	Heavy-duty single turn Solid Piston seal (see Note 2)	BV470G**	AS5782P10-XXX	AS4716 Revision A
	Heavy-duty single turn Scarf-cut Rod seal	BG47LG*	TSS Standard	AS4716 Revision A
	Heavy-duty single turn Scarf-cut Piston seal	BH47LG*	TSS Standard	AS4716 Revision A
	Heavy-duty single turn Solid Rod seal	BU47LG*	TSS Standard	AS4716 Revision A
	Heavy-duty single turn Solid Piston seal	BV47LG*	TSS Standard	AS4716 Revision A
	Two Back-up Rings in one Back-up Gland Width Cut, Rod seal	BG870G (S38587)		AS4716 Revision A
	Two Back-up Rings in one Back-up Gland Width Cut, Piston seal	BG880G (S38588)		AS4716 Revision A
	Heavy-duty single turn Scarf-cut Rod seal (see Note 3)	BG580E*	AS5861R**10**-XXX	AS5857
	Heavy-duty single turn Scarf-cut Piston seal (see Note 3)	BH580E*	AS5861P**10**-XXX	AS5857
	Heavy-duty single turn Solid Piston seal (see Note 3)	BV580E*	AS5860P**10**-XXX	AS5857

BU*** = Back-up Ring Uncut (Solid); BV*** = Back-up Ring Uncut (Solid); BG*** = Back-up Ring Scarf Cut;
BH*** = Back-up Ring Scarf Cut; BP*** = Back-up Ring Spiral type

Back-up Ring and Stakbak®

	Heavy-duty single turn Solid Rod seal (see Note 3)	BU580E*	AS5860R**10**-XXX	AS5857
	Heavy-duty single turn Scarf-cut Rod seal	BG58LE*	TSS Standard	AS5857
	Heavy-duty single turn Scarf-cut Piston seal	BH58LE*	TSS Standard	AS5857
	Heavy-duty single turn Solid Piston seal	BV58LE*	TSS Standard	AS5857
	Heavy-duty single turn Solid Rod seal	BU58VE*	TSS Standard	AS5857
	Heavy-duty single turn Rod or piston seal	BU890M* (S30989)		AS568 One or Two BUR Width
	Heavy-duty single turn Scarf-cut Rod or piston seal (see Note 1)	BG940M* (S30294)	BACR12BM	Boeing Standard
	Heavy-duty single turn Rod or piston seal (see Note 1)	BG660M* (S30310)	BACR12BP	Boeing Standard

BU*** = Back-up Ring Uncut (Solid); BV*** = Back-up Ring Uncut (Solid); BG*** = Back-up Ring Scarf Cut;
BH*** = Back-up Ring Scarf Cut; BP*** = Back-up Ring Spiral type

BUR – Back-up Ring
* The part number is for one ring only. Two rings should be ordered to form a set.
For gland standard AS4716 note ID and OD differences, AMS3678/X color for rod and AMS3678/X for piston
New gland standard AS5857 for static seals only. Note dimensional differences to other Aerospace gland standards. Standard BUR AS5860 and AS5861 only available in AMS3678/10 material, carbon fiber-filled PTFE (Turcon T29)
BUR labeled TSS Standard are per Trelleborg Sealing Solutions recommended tolerances. These differ from the specification tolerances but parts are designed to same fit, form and function as the standards. TSS Standard BUR designs can be ordered in any Turcon material grade.
** Can be ordered with any AMS 3678 material code

Back-up Ring Material Notes:
[1] Mil-spec and BAC Backup Rings available in only AMS-R-8791 material, TSS Turcon T28 only
[2] AS4716 Backup Rings available in Turcon T01, T09, T13, T44, T05, T04, T10, T40 & T29, PT00 which coincide with AMS3678/ materials (see Table I)
[3] AS5857 Backup Rings available is AMS3678/10 material only, TSS Turcon T29 only

Table V AMS3678 Material to Turcon Cross-reference

AMS3678 Material Code	Filler Types	Turcon Code
AMS3678/1A	Virgin PTFE Grades A and B	T01
AMS3678/1B	Virgin PTFE Grades A and B	T28
AMS3678/2	PTFE filled with graphite	T09
AMS3678/3	PTFE filled with glass fiber and molybdenum disulfide	T13
AMS3678/4	PTFE filled with glass fiber	T44
AMS3678/5	PTFE filled with inorganic pigment	T05
AMS3678/6	PTFE filled with bronze powder	T04
AMS3678/7	PTFE filled with carbon and graphite*	T10
AMS3678/8	PTFE filled with carbon fiber	T40
AMS3678/9	PTFE filled with inorganic pigment (AS4716)	---
AMS3678/10	PTFE filled with carbon fiber	T29

* Turcon T11 does not meet AMS3678/7

Table VI Cross-reference Guide for Back-up Rings

Part Numbers						Description
Boeing standards	**Military standards**	**Aero-space standards**	**Other standards**	**TSS Part Number**		
				Old TSS P/N	**New TSS P/N**	
BACR12AJ	MS28783			---	---	Spiral turn Back-up Ring
BACR12BM			A22549	S30294	BG940M	Single turn Back-up Ring Heavy-duty, scarf-cut
BACR12BM			LS10862	S30294	BG940M	Single turn Back-up Ring Heavy-duty, scarf-cut
BACR12BP			LS11060	S30310	BU100M	Back-up Ring Heavy-duty, solid
	M8791/1	AS8791		S38049	BG910M	Single turn Back-up Ring, scarf-cut
	MS27595			S38027	BU950M	Back-up Ring Solid
	MS28773			S38028	BM730S	Single turn Back-up Ring, Boss connection, scarf-cut
	MS28774			S38029	BM740M	Single turn Back-up Ring, scarf-cut
	MS28782			S38030	BM820S	Spiral turn Back-up Ring
	MS9058			---	---	Single turn Back-up Ring, Boss connection, scarf-cut
		AS5781			BG470G BH470G	Single turn Back-up Ring, AS4716 glands, scarf-cut
		AS5782			BU470G BV470G	Single turn Back-up Ring, AS4716 glands
		AS5860			BG580E BH580E	Single turn Back-up Ring, AS5857 glands*, scarf-cut
		AS5861			BU580E BV580E	Single turn Back-up Ring, AS5857 glands*, solid

BU*** = Back-up Ring Uncut (Solid); BV*** = Back-up Ring Uncut (Solid); BG*** = Back-up Ring Scarf Cut;
BH*** = Back-up Ring Scarf Cut; BP*** = Back-up Ring Spiral type; BM***= Mil-Spec Back-up Ring

* New gland standard AS5857 Back-up Rings for static seals only. Note dimensional gland differences to other Aerospace gland standards; AS4716 and Mil-G-5514. Only available in AMS3678/**10** material, carbon fiber-filled PTFE or Turcon T29, ordering example AS5861P**10**-XXX.

Table VII Conversions from new to old part numbers

New P/N	Old P/N
BP090A	S11109
BG480M	S11248
BP170M	S12517
BU870M	S12587
BG660M	S12766
BUS00M	S13050
BG690M	S13069
BGS20M	S13122
BG940M	S30294
BU100M	S30310
BU890M	S30989
BUS70M	S33157
BU230M	S33823
BU440M	S33824
BGS10M	S33861
BG990M	S36991
BG920M	S36992
BG010M	S37001
BG020M	S37002

New P/N	Old P/N
BG110M	S37011
BG210M	S37021
BG550M	S37055
BG600M	S37060
BG760M	S37076
BG830M	S37083
BG410M	S37241
BG420M	S37242
BG510M	S37251
BG520M	S37252
BG610M	S37261
BG710M	S37271
BG440G	S38544
BG450G	S38545
BG870G	S38587
BG880G	S38588
BU180G	S38618
BU190G	S38619

BU*** = Back-up Ring Uncut (Solid); BV*** = Back-up Ring Uncut (Solid); BG*** = Back-up Ring Scarf Cut;
BH*** = Back-up Ring Scarf Cut; BP*** = Back-up Ring Spiral type

Back-up Ring and Stakbak®

DASH NO.	*B* DIA.	*E* DIA.	O-RING NO.
	+.000 -.001	+.001 -.000	
004	.076	.190	004
005	.108	.217	005
006	.123	.232	006
007	.154	.264	007
008	.185	.294	008
009	.217	.327	009
010	.248	.359	010
011	.310	.421	011
012	.373	.484	012
	+.000 -.002	+.002 -.000	
013	.435	.545	013
014	.498	.608	014
015	.560	.670	015
016	.623	.733	016
017	.685	.795	017
018	.748	.858	018
019	.810	.920	019
020	.873	.983	020
021	.935	1.045	021
022	.998	1.108	022
023	1.060	1.170	023
024	1.123	1.233	024
025	1.185	1.295	025
026	1.248	1.358	026
027	1.310	1.420	027
028	1.373	1.483	028
	+.000 -.001	+.001 -.000	
104	.123	.295	104
105	.154	.327	105
106	.185	.359	106
107	.217	.392	107
108	.248	.423	108
109	.310	.486	109
	+.000 -.002	+.002 -.000	
110	.373	.546	110
111	.435	.609	111
112	.498	.672	112
113	.560	.734	113
114	.623	.797	114
115	.685	.859	115
116	.748	.923	116
117	.810	.985	117
118	.873	1.048	118
119	.935	1.110	119
120	.998	1.173	120
121	1.060	1.235	121
122	1.123	1.298	122
123	1.185	1.360	123
124	1.248	1.423	124
125	1.310	1.485	125
126	1.373	1.548	126
127	1.435	1.610	127
128	1.498	1.673	128
129	1.560	1.735	129
130	1.623	1.798	130
131	1.685	1.860	131
132	1.748	1.923	132
133	1.810	1.984	133
134	1.873	2.047	134
135	1.936	2.110	135
136	1.998	2.172	136
137	2.061	2.235	137
138	2.123	2.297	138
139	2.186	2.360	139

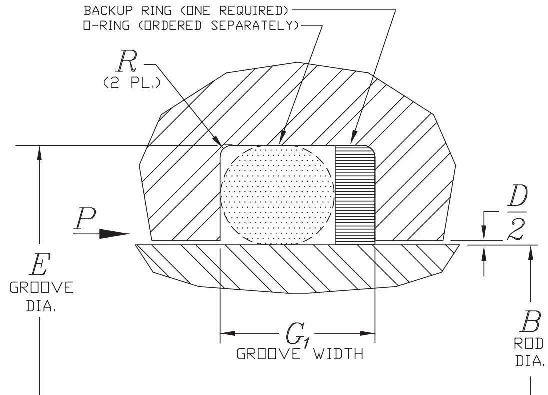
DASH NO.	*B* DIA.	*E* DIA.	O-RING NO.
	+.000 -.002	+.002 -.000	
210	.748	.989	210
211	.810	1.051	211
212	.873	1.115	212
213	.935	1.177	213
214	.998	1.240	214
215	1.060	1.302	215
216	1.123	1.365	216
217	1.185	1.427	217
218	1.248	1.490	218
219	1.310	1.552	219
220	1.373	1.615	220
221	1.435	1.677	221
222	1.498	1.740	222
223	1.623	1.865	223
224	1.748	1.990	224
225	1.873	2.115	225
226	1.998	2.240	226
227	2.123	2.365	227
228	2.248	2.490	228
229	2.373	2.615	229
230	2.498	2.740	230
	+.000 -.002	+.002 -.000	
325	1.498	1.870	325
326	1.623	1.995	326
327	1.748	2.120	327
328	1.873	2.245	328
329	1.998	2.370	329
330	2.123	2.495	330
331	2.248	2.620	331
332	2.373	2.745	332
333	2.498	2.870	333
334	2.623	2.995	334
335	2.748	3.120	335
336	2.873	3.245	336
337	2.997	3.369	337
338	3.122	3.494	338
339	3.247	3.619	339
340	3.372	3.744	340
341	3.497	3.869	341
342	3.622	3.994	342
343	3.747	4.119	343
344	3.872	4.244	344
345	3.997	4.369	345
346	4.122	4.494	346
347	4.247	4.619	347
348	4.372	4.744	348
349	4.497	4.869	349
	+.000 -.003	+.003 -.000	
425	4.497	4.974	425
426	4.622	5.099	426
427	4.747	5.224	427
428	4.872	5.349	428
429	4.997	5.474	429
430	5.122	5.599	430
431	5.247	5.724	431
432	5.372	5.849	432
433	5.497	5.974	433
434	5.622	6.099	434
435	5.747	6.224	435
436	5.872	6.349	436
437	5.997	6.474	437

DASH NO.	G_1 ONE BACKUP WIDTH	G_2 TWO BACKUP WIDTH	*R* RADIUS	*D* DIAMETRAL CLEARANCE MAX.
004-009	.154/.164	.210/.220	.005/.015	.004
010-012	.150/.160	.207/.217		.004
013-028				.005
104-109	.183/.193	.245/.255	.005/.015	.004
110-126				.005
127-129				.006
130-132				.006
133-139				.007
210-222	.235/.245	.304/.314	.010/.025	.005
223-224				.006
225-227				.007
228-230				.007
325-327	.334/.344	.424/.434	.020/.035	.006
328-329				.007
330-345				.007
346-349				.007
425-437	.475/.485	.579/.589	.020/.035	.009

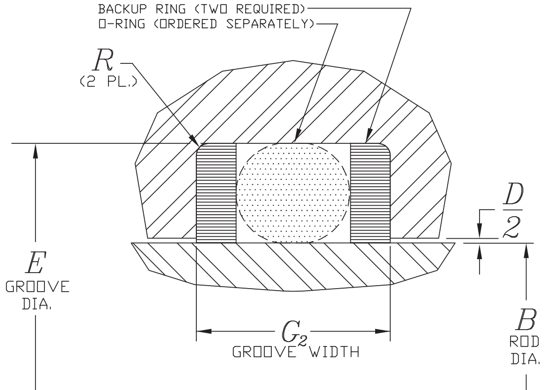
NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR SCARF-CUT, INTERNAL BACKUP RINGS IN AS4716 REVISION A ROD GLANDS.
2. ORDERING EXAMPLE: BG47 0 G 214 A T29

   BACKUP RING, SCARF-CUT, INTERNAL DESIGNATOR
   DESIGN CHARACTERISTICS
   0 = PER SPECIFICATION
   GLAND DESIGNATOR
   G = AS4716
   SIZE DESIGNATOR
   ACCORDING TO AS4716 REVISION A
   QUALITY INDEX:
   A = AEROSPACE CERTIFICATE OF CONFORMANCE
   TURCON® BACKUP RING MAT'L. CODE
   CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.
3. FOR SOLID, INTERNAL BACKUP RINGS, PLEASE REFERENCE TRELLEBORG SEALING SOLUTIONS PART NUMBER BU470G000.
4. ONLY AVAILABLE IN AMS3678/10 MATERIAL, CARBON FIBER-FILLED PTFE



ROD SEAL INSTALLATION
FOR ONE BACKUP WIDTH GLANDS PER AS4716 REVISION A



ROD SEAL INSTALLATION
FOR TWO BACKUP WIDTH GLANDS PER AS4716 REVISION A

INCH
2011_8
TRELLEBORG
SEALING SOLUTIONS
TITLE
BACKUP RING, SCARF-CUT, INTERNAL
DRAWING NO.
BG470G000

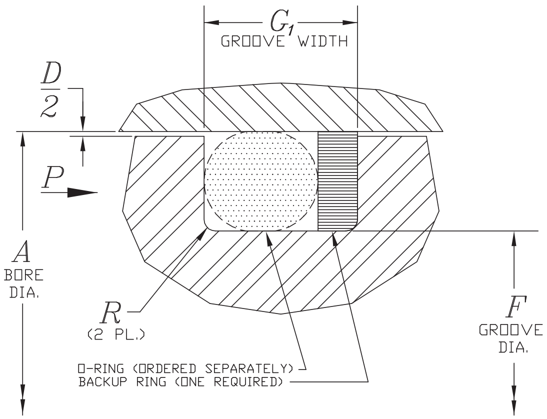
WORLD AEROSPACE TITLE BLOCK REV.

Back-up Ring and Stakbak®

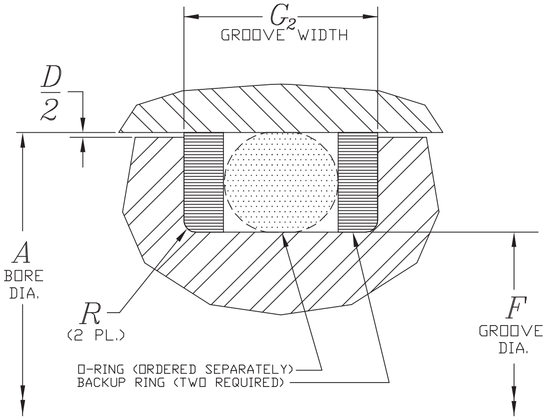
DASH NO.	*A* DIA.	*F* DIA.	O-RING NO.
	+.001 -.000	+.000 -.001	
004	.190	.076	004
005	.221	.115	005
006	.235	.129	006
007	.266	.158	007
008	.297	.189	008
009	.329	.220	009
010	.360	.250	010
011	.422	.312	011
012	.485	.375	012
	+.002 -.000	+.000 -.002	
013	.550	.441	013
014	.613	.504	014
015	.675	.566	015
016	.738	.629	016
017	.800	.691	017
018	.863	.753	018
019	.925	.815	019
020	.991	.881	020
021	1.053	.943	021
022	1.116	1.006	022
023	1.178	1.068	023
024	1.241	1.131	024
025	1.303	1.193	025
026	1.366	1.256	026
027	1.428	1.318	027
028	1.491	1.381	028
	+.001 -.000	+.000 -.001	
104	.297	.128	104
105	.329	.158	105
106	.360	.187	106
107	.391	.215	107
108	.422	.246	108
109	.485	.308	109
	+.002 -.000	+.000 -.002	
110	.550	.379	110
111	.613	.441	111
112	.675	.502	112
113	.738	.565	113
114	.800	.627	114
115	.863	.689	115
116	.925	.751	116
117	.991	.817	117
118	1.053	.879	118
119	1.116	.942	119
120	1.178	1.003	120
121	1.241	1.066	121
122	1.303	1.128	122
123	1.366	1.191	123
124	1.428	1.253	124
125	1.491	1.316	125
126	1.553	1.378	126
127	1.616	1.441	127
128	1.678	1.503	128
129	1.741	1.566	129
130	1.805	1.631	130
131	1.867	1.693	131
132	1.930	1.756	132
133	1.992	1.818	133
134	2.055	1.881	134
135	2.118	1.944	135
136	2.180	2.006	136
137	2.243	2.069	137
138	2.305	2.131	138
139	2.368	2.194	139

DASH NO.	*A* DIA.	*F* DIA.	O-RING NO.
	+.002 -.000	+.000 -.002	
210	.991	.750	210
211	1.053	.812	211
212	1.116	.874	212
213	1.178	.936	213
214	1.241	.999	214
215	1.303	1.061	215
216	1.366	1.124	216
217	1.428	1.186	217
218	1.491	1.249	218
219	1.553	1.311	219
220	1.616	1.374	220
221	1.678	1.436	221
222	1.741	1.499	222
223	1.867	1.625	223
224	1.992	1.750	224
225	2.118	1.876	225
226	2.243	2.001	226
227	2.368	2.126	227
228	2.493	2.251	228
229	2.618	2.376	229
230	2.743	2.501	230
	+.002 -.000	+.000 -.002	
325	1.867	1.495	325
326	1.992	1.620	326
327	2.118	1.746	327
328	2.243	1.871	328
329	2.368	1.996	329
330	2.493	2.121	330
331	2.618	2.246	331
332	2.743	2.371	332
333	2.868	2.496	333
334	2.993	2.621	334
335	3.118	2.746	335
336	3.243	2.871	336
337	3.368	2.996	337
338	3.493	3.121	338
339	3.618	3.246	339
340	3.743	3.371	340
341	3.868	3.496	341
342	3.993	3.621	342
343	4.118	3.746	343
344	4.243	3.871	344
345	4.368	3.996	345
346	4.493	4.121	346
347	4.618	4.246	347
348	4.743	4.371	348
349	4.868	4.496	349
	+.003 -.000	+.000 -.003	
425	4.974	4.497	425
426	5.099	4.622	426
427	5.224	4.747	427
428	5.349	4.872	428
429	5.474	4.997	429
430	5.599	5.122	430
431	5.724	5.247	431
432	5.849	5.372	432
433	5.974	5.497	433
434	6.099	5.622	434
435	6.224	5.747	435
436	6.349	5.872	436
437	6.474	5.997	437

DASH NO.	G_1 ONE BACKUP WIDTH	G_2 TWO BACKUP WIDTH	*R* RADIUS	*D* DIAMETRAL CLEARANCE MAX.
004-009	.154/.164	.210/.220	.005/.015	.004
010-012	.150/.160	.207/.217		.004
013-028				.005
104-109	.183/.193	.245/.255	.005/.015	.004
110-126				.005
127-129				.005
130-132				.006
133-139				.006
210-222	.235/.245	.304/.314	.010/.025	.005
223-224				.006
225-227				.006
228-230				.007
325-327	.334/.344	.424/.434	.020/.035	.006
328-329				.006
330-345				.007
346-349				.008
425-437	.475/.485	.579/.589	.020/.035	.009



BACKUP RING INSTALLATION
FOR ONE BACKUP WIDTH GLANDS PER AS4716 REVISION A



BACKUP RING INSTALLATION
FOR TWO BACKUP WIDTH GLANDS PER AS4716 REVISION A

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR SCARF-CUT, EXTERNAL BACKUP RINGS IN AS4716 REVISION A PISTON GLANDS.
2. ORDERING EXAMPLE: BH47 L 0 214 A T29

   BACKUP RING, SCARF-CUT, EXTERNAL DESIGNATOR
   DESIGN CHARACTERISTICS
   0 = PER SPECIFICATION
   GLAND DESIGNATOR
   G = AS4716
   SIZE DESIGNATOR
   ACCORDING TO AS4716 REVISION A
   QUALITY INDEX:
   A = AEROSPACE CERTIFICATE OF CONFORMANCE
   TURCON® BACKUP RING MAT'L. CODE
   CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.
3. FOR SOLID, EXTERNAL BACKUP RINGS, PLEASE REFERENCE TRELLEBORG SEALING SOLUTIONS PART NUMBER BV470G000.
4. ONLY AVAILABLE IN AMS3678/10 MATERIAL, CARBON FIBER-FILLED PTFE.

INCH
2011_9
TRELLEBORG
SEALING SOLUTIONS
TITLE
BACKUP RING, SCARF-CUT, EXTERNAL
DRAWING NO.
BH470G000

WORLD AEROSPACE TITLE BLOCK REV.

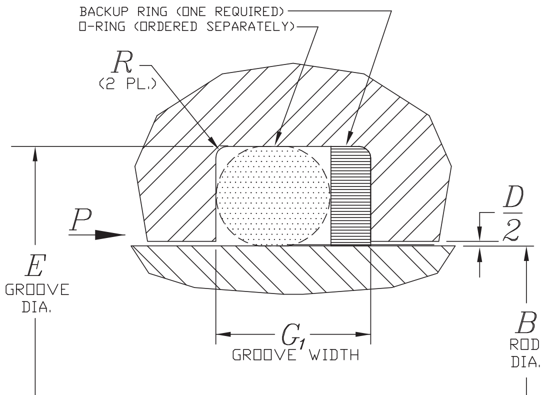
Back-up Ring and Stakbak®

DASH NO.	*B* DIA.	*E* DIA.	O-RING NO.
	+.000 −.001	+.001 −.000	
004	.076	.190	004
005	.108	.217	005
006	.123	.232	006
007	.154	.264	007
008	.185	.294	008
009	.217	.327	009
010	.248	.359	010
011	.310	.421	011
012	.373	.484	012
	+.000 −.002	+.002 −.000	
013	.435	.545	013
014	.498	.608	014
015	.560	.670	015
016	.623	.733	016
017	.685	.795	017
018	.748	.858	018
019	.810	.920	019
020	.873	.983	020
021	.935	1.045	021
022	.998	1.108	022
023	1.060	1.170	023
024	1.123	1.233	024
025	1.185	1.295	025
026	1.248	1.358	026
027	1.310	1.420	027
028	1.373	1.483	028
	+.000 −.001	+.001 −.000	
104	.123	.295	104
105	.154	.327	105
106	.185	.359	106
107	.217	.392	107
108	.248	.423	108
109	.310	.486	109
	+.000 −.002	+.002 −.000	
110	.373	.546	110
111	.435	.609	111
112	.498	.672	112
113	.560	.734	113
114	.623	.797	114
115	.685	.859	115
116	.748	.923	116
117	.810	.985	117
118	.873	1.048	118
119	.935	1.110	119
120	.998	1.173	120
121	1.060	1.235	121
122	1.123	1.298	122
123	1.185	1.360	123
124	1.248	1.423	124
125	1.310	1.485	125
126	1.373	1.548	126
127	1.435	1.610	127
128	1.498	1.673	128
129	1.560	1.735	129
130	1.623	1.798	130
131	1.685	1.860	131
132	1.748	1.923	132
133	1.810	1.984	133
134	1.873	2.047	134
135	1.936	2.110	135
136	1.998	2.172	136
137	2.061	2.235	137
138	2.123	2.297	138
139	2.186	2.360	139
140	2.248	2.422	140
141	2.311	2.485	141
142	2.373	2.547	142
143	2.436	2.610	143
144	2.498	2.672	144
145	2.561	2.737	145
146	2.623	2.797	146
147	2.686	2.860	147
148	2.748	2.922	148
149	2.811	2.985	149

DASH NO.	*B* DIA.	*E* DIA.	O-RING NO.
	+.000 −.002	+.002 −.000	
210	.748	.989	210
211	.810	1.051	211
212	.873	1.115	212
213	.935	1.177	213
214	.998	1.240	214
215	1.060	1.302	215
216	1.123	1.365	216
217	1.185	1.427	217
218	1.248	1.490	218
219	1.310	1.552	219
220	1.373	1.615	220
221	1.435	1.677	221
222	1.498	1.740	222
223	1.623	1.865	223
224	1.748	1.990	224
225	1.873	2.115	225
226	1.998	2.240	226
227	2.123	2.365	227
228	2.248	2.490	228
229	2.373	2.615	229
230	2.498	2.740	230
231	2.623	2.865	231
232	2.748	2.990	232
233	2.873	3.115	233
234	2.997	3.239	234
235	3.122	3.364	235
236	3.247	3.489	236
237	3.372	3.614	237
238	3.497	3.739	238
239	3.622	3.864	239
240	3.747	3.989	240
241	3.872	4.114	241
242	3.997	4.239	242
243	4.122	4.364	243
244	4.247	4.489	244
245	4.372	4.614	245
246	4.497	4.739	246
247	4.622	4.864	247
	+.000 −.002	+.002 −.000	
325	1.498	1.870	325
326	1.623	1.995	326
327	1.748	2.120	327
328	1.873	2.245	328
329	1.998	2.370	329
330	2.123	2.495	330
331	2.248	2.620	331
332	2.373	2.745	332
333	2.498	2.870	333
334	2.623	2.995	334
335	2.748	3.120	335
336	2.873	3.245	336
337	2.997	3.369	337
338	3.122	3.494	338
339	3.247	3.619	339
340	3.372	3.744	340
341	3.497	3.869	341
342	3.622	3.994	342
343	3.747	4.119	343
344	3.872	4.244	344
345	3.997	4.369	345
346	4.122	4.494	346
347	4.247	4.619	347
348	4.372	4.744	348
349	4.497	4.869	349
	+.000 −.003	+.003 −.000	
425	4.497	4.974	425
426	4.622	5.099	426
427	4.747	5.224	427
428	4.872	5.349	428
429	4.997	5.474	429
430	5.122	5.599	430
431	5.247	5.724	431
432	5.372	5.849	432
433	5.497	5.974	433
434	5.622	6.099	434

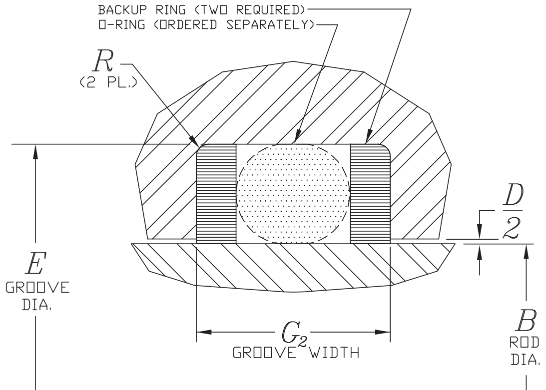
DASH NO.	*B* DIA.	*E* DIA.	O-RING NO.
	+.000 −.003	+.003 −.000	
435	5.747	6.224	435
436	5.872	6.349	436
437	5.997	6.474	437
438	6.247	6.724	438
439	6.497	6.974	439
440	6.747	7.224	440
441	6.997	7.474	441
442	7.247	7.724	442
443	7.497	7.974	443
444	7.747	8.224	444
445	7.997	8.474	445
446	8.497	8.974	446
	+.000 −.003	+.004 −.000	
447	8.997	9.474	447
448	9.497	9.974	448
449	9.997	10.474	449
450	10.497	10.974	450
451	10.997	11.474	451
452	11.497	11.974	452
453	11.997	12.474	453
454	12.497	12.974	454
455	12.997	13.474	455
456	13.497	13.974	456
457	13.997	14.474	457
458	14.497	14.974	458
459	14.997	15.474	459
460	15.497	15.974	460

DASH NO.	G_1 ONE BACKUP WIDTH	G_2 TWO BACKUP WIDTH	*R* RADIUS	*D* DIAMETRAL CLEARANCE MAX.
004-009	.154/.164	.210/.220	.005/.015	.004
010-012	.150/.160	.207/.217		.004
013-028				.005
104-109	.183/.193	.245/.255	.005/.015	.004
110-126				.005
127-129				.006
130-132				.006
133-140				.007
141-149				.007
210-222	.235/.245	.304/.314	.010/.025	.005
223-224				.006
225-227				.007
228-243				.007
244-245				.007
246-247				.008
325-327	.334/.344	.424/.434	.020/.035	.006
328-329				.007
330-345				.007
346-349				.007
425-438	.475/.485	.579/.589	.020/.035	.009
439-445				.010
446				.010
447-460				.010



ROD SEAL INSTALLATION

FOR ONE BACKUP WIDTH GLANDS PER AS4716 REVISION A



ROD SEAL INSTALLATION

FOR TWO BACKUP WIDTH GLANDS PER AS4716 REVISION A

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR SOLID, INTERNAL BACKUP RINGS IN AS4716 REVISION A ROD GLANDS.
2. ORDERING EXAMPLE: BU47 L G 214 A T29

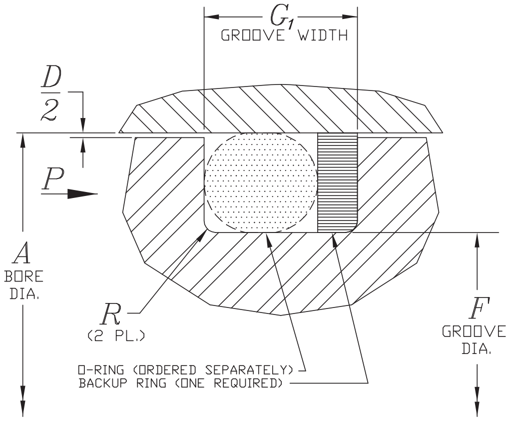
   BACKUP RING, SOLID, INTERNAL DESIGNATOR
   DESIGN CHARACTERISTICS
   0 = PER SPECIFICATION
   GLAND DESIGNATOR
   G = AS4716
   SIZE DESIGNATOR
   ACCORDING TO AS4716 REVISION A
   QUALITY INDEX:
   A = AEROSPACE CERTIFICATE OF CONFORMANCE
   TURCON® BACKUP RING MAT'L. CODE
   CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.
3. FOR SCARF-CUT, INTERNAL BACKUP RINGS, PLEASE REFERENCE TRELLEBORG SEALING SOLUTIONS PART NUMBER BG470G000.
4. ONLY AVAILABLE IN AMS3678/10 MATERIAL, CARBON FIBER-FILLED PTFE.

INCH
2009_1
TRELLEBORG
SEALING SOLUTIONS
TITLE
BACKUP RING, SOLID, INTERNAL
DRAWING NO.
BU470G000

WORLD AEROSPACE TITLE BLOCK REV.

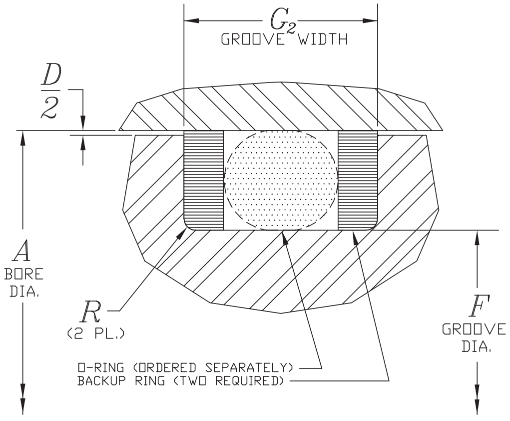
DASH NO.	*A* DIA.	*F* DIA.	O-RING NO.
	+.001 -.000	+.000 -.001	
004	.190	.076	004
005	.221	.115	005
006	.235	.129	006
007	.266	.158	007
008	.297	.189	008
009	.329	.220	009
010	.360	.250	010
011	.422	.312	011
012	.485	.375	012
	+.002 -.000	+.000 -.002	
013	.550	.441	013
014	.613	.504	014
015	.675	.566	015
016	.738	.629	016
017	.800	.691	017
018	.863	.753	018
019	.925	.815	019
020	.991	.881	020
021	1.053	.943	021
022	1.116	1.006	022
023	1.178	1.068	023
024	1.241	1.131	024
025	1.303	1.193	025
026	1.366	1.256	026
027	1.428	1.318	027
028	1.491	1.381	028
	+.001 -.000	+.000 -.001	
104	.297	.128	104
105	.329	.158	105
106	.360	.187	106
107	.391	.215	107
108	.422	.246	108
109	.485	.308	109
	+.002 -.000	+.000 -.002	
110	.550	.379	110
111	.613	.441	111
112	.675	.502	112
113	.738	.565	113
114	.800	.627	114
115	.863	.689	115
116	.925	.751	116
117	.991	.817	117
118	1.053	.879	118
119	1.116	.942	119
120	1.178	1.003	120
121	1.241	1.066	121
122	1.303	1.128	122
123	1.366	1.191	123
124	1.428	1.253	124
125	1.491	1.316	125
126	1.553	1.378	126
127	1.616	1.441	127
128	1.678	1.503	128
129	1.741	1.566	129
130	1.805	1.631	130
131	1.867	1.693	131
132	1.930	1.756	132
133	1.992	1.818	133
134	2.055	1.881	134
135	2.118	1.944	135
136	2.180	2.006	136
137	2.243	2.069	137
138	2.305	2.131	138
139	2.368	2.194	139
140	2.430	2.256	140
141	2.493	2.319	141
142	2.555	2.381	142
143	2.618	2.444	143
144	2.680	2.506	144
145	2.743	2.569	145
146	2.805	2.631	146
147	2.868	2.694	147
148	2.930	2.756	148
149	2.993	2.819	149
	+.002 -.000	+.000 -.002	
210	.991	.750	210
211	1.053	.812	211
212	1.116	.874	212
213	1.178	.936	213
214	1.241	.999	214
215	1.303	1.061	215
216	1.366	1.124	216
217	1.428	1.186	217
218	1.491	1.249	218
219	1.553	1.311	219
220	1.616	1.374	220
221	1.678	1.436	221
222	1.741	1.499	222
223	1.867	1.625	223
224	1.992	1.750	224
225	2.118	1.876	225
226	2.243	2.001	226
227	2.368	2.126	227
228	2.493	2.251	228
229	2.618	2.376	229
230	2.743	2.501	230
231	2.868	2.626	231
232	2.993	2.751	232
233	3.118	2.876	233
234	3.243	3.001	234
235	3.368	3.126	235
236	3.493	3.251	236
237	3.618	3.376	237
238	3.743	3.501	238
239	3.868	3.626	239
240	3.993	3.751	240
241	4.118	3.876	241
242	4.243	4.001	242
243	4.368	4.126	243
244	4.493	4.251	244
245	4.618	4.376	245
246	4.743	4.501	246
247	4.868	4.626	247
	+.002 -.000	+.000 -.002	
325	1.867	1.495	325
326	1.992	1.620	326
327	2.118	1.746	327
328	2.243	1.871	328
329	2.368	1.996	329
330	2.493	2.121	330
331	2.618	2.246	331
332	2.743	2.371	332
333	2.868	2.496	333
334	2.993	2.621	334
335	3.118	2.746	335
336	3.243	2.871	336
337	3.368	2.996	337
338	3.493	3.121	338
339	3.618	3.246	339
340	3.743	3.371	340
341	3.868	3.496	341
342	3.993	3.621	342
343	4.118	3.746	343
344	4.243	3.871	344
345	4.368	3.996	345
346	4.493	4.121	346
347	4.618	4.246	347
348	4.743	4.371	348
349	4.868	4.496	349
	+.003 -.000	+.000 -.003	
425	4.974	4.497	425
426	5.099	4.622	426
427	5.224	4.747	427
428	5.349	4.872	428
429	5.474	4.997	429
430	5.599	5.122	430
431	5.724	5.247	431
432	5.849	5.372	432
433	5.974	5.497	433
434	6.099	5.622	434
	+.003 -.000	+.000 -.003	
435	6.224	5.747	435
436	6.349	5.872	436
437	6.474	5.997	437
438	6.724	6.247	438
439	6.974	6.497	439
440	7.224	6.747	440
441	7.474	6.997	441
442	7.724	7.247	442
443	7.974	7.497	443
444	8.224	7.747	444
445	8.474	7.997	445
446	8.974	8.497	446
	+.004 -.000	+.000 -.004	
447	9.474	8.997	447
448	9.974	9.497	448
449	10.474	9.997	449
450	10.974	10.497	450
451	11.474	10.997	451
452	11.974	11.497	452
453	12.474	11.997	453
454	12.974	12.497	454
455	13.474	12.997	455
456	13.974	13.497	456
457	14.474	13.997	457
458	14.974	14.497	458
459	15.474	14.997	459
460	15.974	15.497	460

DASH NO.	G_1 ONE BACKUP WIDTH	G_2 TWO BACKUP WIDTH	*R* RADIUS	*D* DIAMETRAL CLEARANCE MAX.
004-009	.154/.164	.210/.220	.005/.015	.004
010-012	.150/.160	.207/.217		.004
013-028				.005
104-109	.183/.193	.245/.255	.005/.015	.004
110-126				.005
127-129				.005
130-132				.006
133-140				.006
141-149				.007
210-222	.235/.245	.304/.314	.010/.025	.005
223-224				.006
225-227				.006
228-243				.007
244-245				.008
246-247				.008
325-327	.334/.344	.424/.434	.020/.035	.006
328-329				.006
330-345				.007
346-349				.008
425-438	.475/.485	.579/.589	.020/.035	.009
439-445				.009
446				.010
447-460				.011



BACKUP RING INSTALLATION

FOR ONE BACKUP WIDTH GLANDS PER AS4716 REVISION A



BACKUP RING INSTALLATION

FOR TWO BACKUP WIDTH GLANDS PER AS4716 REVISION A

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR SOLID, EXTERNAL BACKUP RINGS IN AS4716 REVISION A PISTON GLANDS.
2. ORDERING EXAMPLE: BV4 7 0 G 214 A T29

   BACKUP RING, SOLID, EXTERNAL DESIGNATOR
   DESIGN CHARACTERISTICS
     0 = PER SPECIFICATION
   GLAND DESIGNATOR
     G = AS4716
   SIZE DESIGNATOR
     ACCORDING TO AS4716 REVISION A
   QUALITY INDEX:
     A= AEROSPACE CERTIFICATE OF CONFORMANCE
   TURCON® BACKUP RING MAT'L. CODE
   CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.
3. FOR SCARF-CUT, EXTERNAL BACKUP RINGS, PLEASE REFERENCE TRELLEBORG SEALING SOLUTIONS PART NUMBER BH470G000.
4. ONLY AVAILABLE IN AMS3678/10 MATERIAL, CARBON FIBER-FILLED PTFE.

INCH
2009_1

TRELLEBORG
SEALING SOLUTIONS

TITLE
BACKUP RING, SOLID, EXTERNAL

DRAWING NO.
BV470G000

WORLD AEROSPACE TITLE BLOCK REV.

DASH NO.	B DIA.	E DIA.	O-RING NO.
	+.000 -.001	+.001 -.000	
004	.076	.190	004
005	.108	.217	005
006	.123	.232	006
007	.154	.264	007
008	.185	.294	008
009	.217	.327	009
010	.248	.359	010
011	.310	.421	011
012	.373	.484	012
	+.000 -.002	+.002 -.000	
013	.435	.545	013
014	.498	.608	014
015	.560	.670	015
016	.623	.733	016
017	.685	.795	017
018	.748	.858	018
019	.810	.920	019
020	.873	.983	020
021	.935	1.045	021
022	.998	1.108	022
023	1.060	1.170	023
024	1.123	1.233	024
025	1.185	1.295	025
026	1.248	1.358	026
027	1.310	1.420	027
028	1.373	1.483	028
	+.000 -.001	+.001 -.000	
104	.123	.295	104
105	.154	.327	105
106	.185	.359	106
107	.217	.392	107
108	.248	.423	108
109	.310	.486	109
	+.000 -.002	+.002 -.000	
110	.373	.546	110
111	.435	.609	111
112	.498	.672	112
113	.560	.734	113
114	.623	.797	114
115	.685	.859	115
116	.748	.923	116
117	.810	.985	117
118	.873	1.048	118
119	.935	1.110	119
120	.998	1.173	120
121	1.060	1.235	121
122	1.123	1.298	122
123	1.185	1.360	123
124	1.248	1.423	124
125	1.310	1.485	125
126	1.373	1.548	126
127	1.435	1.610	127
128	1.498	1.673	128
129	1.560	1.735	129
130	1.623	1.798	130
131	1.685	1.860	131
132	1.748	1.923	132
133	1.810	1.984	133
134	1.873	2.047	134
135	1.936	2.110	135
136	1.998	2.172	136
137	2.061	2.235	137
138	2.123	2.297	138
139	2.186	2.360	139
	+.000 -.002	+.002 -.000	
210	.748	.989	210
211	.810	1.051	211
212	.873	1.115	212
213	.935	1.177	213
214	.998	1.240	214
215	1.060	1.302	215
216	1.123	1.365	216
217	1.185	1.427	217
218	1.248	1.490	218
219	1.310	1.552	219
220	1.373	1.615	220
221	1.435	1.677	221
222	1.498	1.740	222
223	1.623	1.865	223
224	1.748	1.990	224
225	1.873	2.115	225
226	1.998	2.240	226
227	2.123	2.365	227
228	2.248	2.490	228
229	2.373	2.615	229
230	2.498	2.740	230
	+.000 -.002	+.002 -.000	
325	1.498	1.870	325
326	1.623	1.995	326
327	1.748	2.120	327
328	1.873	2.245	328
329	1.998	2.370	329
330	2.123	2.495	330
331	2.248	2.620	331
332	2.373	2.745	332
333	2.498	2.870	333
334	2.623	2.995	334
335	2.748	3.120	335
336	2.873	3.245	336
337	2.997	3.369	337
338	3.122	3.494	338
339	3.247	3.619	339
340	3.372	3.744	340
341	3.497	3.869	341
342	3.622	3.994	342
343	3.747	4.119	343
344	3.872	4.244	344
345	3.997	4.369	345
346	4.122	4.494	346
347	4.247	4.619	347
348	4.372	4.744	348
349	4.497	4.869	349
	+.000 -.003	+.003 -.000	
425	4.497	4.974	425
426	4.622	5.099	426
427	4.747	5.224	427
428	4.872	5.349	428
429	4.997	5.474	429
430	5.122	5.599	430
431	5.247	5.724	431
432	5.372	5.849	432
433	5.497	5.974	433
434	5.622	6.099	434
435	5.747	6.224	435
436	5.872	6.349	436
437	5.997	6.474	437

DASH NO.	G_1 ONE BACKUP WIDTH	G_2 TWO BACKUP WIDTH	R RADIUS	D DIAMETRAL CLEARANCE MAX.
004-009	.154/.164	.210/.220	.005/.015	.004
010-012	.150/.160	.207/.217		.004
013-028				.005
104-109	.183/.193	.245/.255	.005/.015	.004
110-126				.005
127-129				.006
130-132				.006
133-139				.007
210-222	.235/.245	.304/.314	.010/.025	.005
223-224				.006
225-227				.007
228-230				.007
325-327	.334/.344	.424/.434	.020/.035	.006
328-329				.007
330-345				.007
346-349				.007
425-437	.475/.485	.579/.589	.020/.035	.009

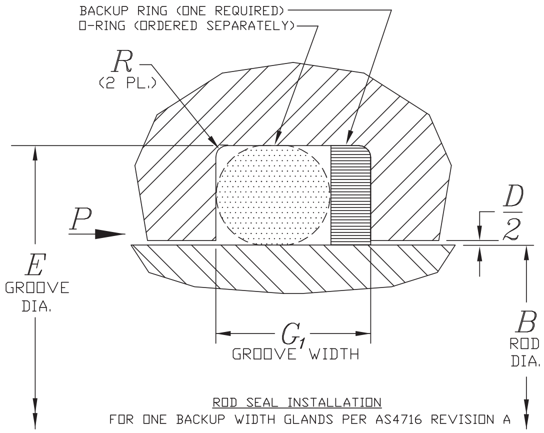
NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR SCARF-CUT, INTERNAL BACKUP RINGS IN AS4716 REVISION A ROD GLANDS.

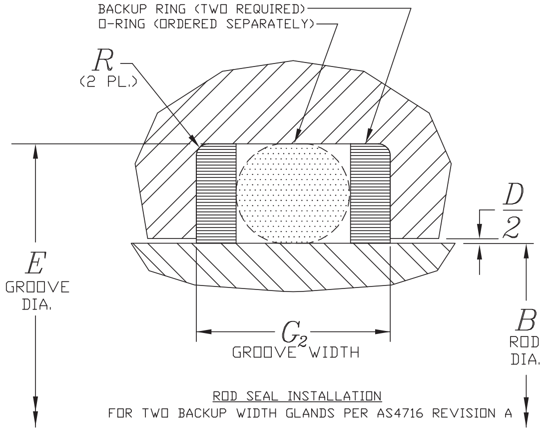
2. ORDERING EXAMPLE: BG47 L G 214 A T05

   BACKUP RING, SCARF-CUT, INTERNAL DESIGNATOR
   DESIGN CHARACTERISTICS
   L = TRELLEBORG SEALING SOLUTIONS DESIGN
   GLAND DESIGNATOR
   G = AS4716
   SIZE DESIGNATOR
   ACCORDING TO AS4716 REVISION A
   QUALITY INDEX:
   A = AEROSPACE CERTIFICATE OF CONFORMANCE
   TURCON® BACKUP RING MAT'L. CODE
   CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE
   DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

3. FOR SOLID, INTERNAL BACKUP RINGS, PLEASE REFERENCE TRELLEBORG SEALING SOLUTIONS PART NUMBER BU47LG000.



ROD SEAL INSTALLATION
FOR ONE BACKUP WIDTH GLANDS PER AS4716 REVISION A



ROD SEAL INSTALLATION
FOR TWO BACKUP WIDTH GLANDS PER AS4716 REVISION A

INCH
2011_8
TRELLEBORG
SEALING SOLUTIONS
TITLE
BACKUP RING, SCARF-CUT, INTERNAL
DRAWING NO.
BG47LG000

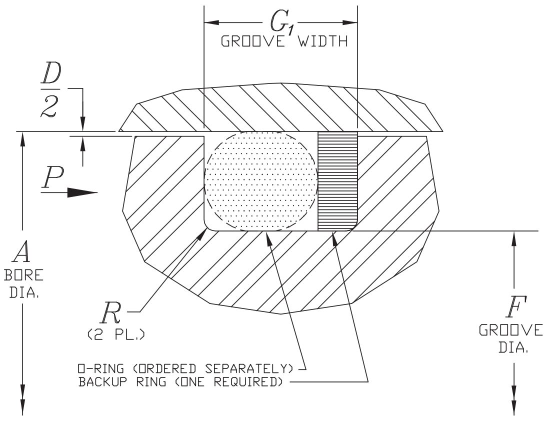
WORLD AEROSPACE TITLE BLOCK REV.

Back-up Ring and Stakbak®

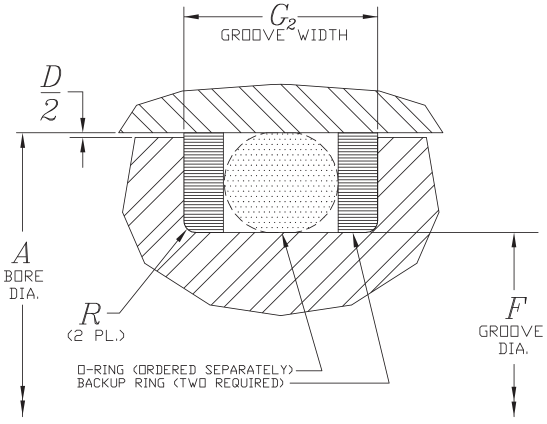
DASH NO.	A DIA.	F DIA.	O-RING NO.
	+.001 -.000	+.000 -.001	
004	.190	.076	004
005	.221	.115	005
006	.235	.129	006
007	.266	.158	007
008	.297	.189	008
009	.329	.220	009
010	.360	.250	010
011	.422	.312	011
012	.485	.375	012
	+.002 -.000	+.000 -.002	
013	.550	.441	013
014	.613	.504	014
015	.675	.566	015
016	.738	.629	016
017	.800	.691	017
018	.863	.753	018
019	.925	.815	019
020	.991	.881	020
021	1.053	.943	021
022	1.116	1.006	022
023	1.178	1.068	023
024	1.241	1.131	024
025	1.303	1.193	025
026	1.366	1.256	026
027	1.428	1.318	027
028	1.491	1.381	028
	+.001 -.000	+.000 -.001	
104	.297	.128	104
105	.329	.158	105
106	.360	.187	106
107	.391	.215	107
108	.422	.246	108
109	.485	.308	109
	+.002 -.000	+.000 -.002	
110	.550	.379	110
111	.613	.441	111
112	.675	.502	112
113	.738	.565	113
114	.800	.627	114
115	.863	.689	115
116	.925	.751	116
117	.991	.817	117
118	1.053	.879	118
119	1.116	.942	119
120	1.178	1.003	120
121	1.241	1.066	121
122	1.303	1.128	122
123	1.366	1.191	123
124	1.428	1.253	124
125	1.491	1.316	125
126	1.553	1.378	126
127	1.616	1.441	127
128	1.678	1.503	128
129	1.741	1.566	129
130	1.805	1.631	130
131	1.867	1.693	131
132	1.930	1.756	132
133	1.992	1.818	133
134	2.055	1.881	134
135	2.118	1.944	135
136	2.180	2.006	136
137	2.243	2.069	137
138	2.305	2.131	138
139	2.368	2.194	139

DASH NO.	A DIA.	F DIA.	O-RING NO.
	+.002 -.000	+.000 -.002	
210	.991	.750	210
211	1.053	.812	211
212	1.116	.874	212
213	1.178	.936	213
214	1.241	.999	214
215	1.303	1.061	215
216	1.366	1.124	216
217	1.428	1.186	217
218	1.491	1.249	218
219	1.553	1.311	219
220	1.616	1.374	220
221	1.678	1.436	221
222	1.741	1.499	222
223	1.867	1.625	223
224	1.992	1.750	224
225	2.118	1.876	225
226	2.243	2.001	226
227	2.368	2.126	227
228	2.493	2.251	228
229	2.618	2.376	229
230	2.743	2.501	230
	+.002 -.000	+.000 -.002	
325	1.867	1.495	325
326	1.992	1.620	326
327	2.118	1.746	327
328	2.243	1.871	328
329	2.368	1.996	329
330	2.493	2.121	330
331	2.618	2.246	331
332	2.743	2.371	332
333	2.868	2.496	333
334	2.993	2.621	334
335	3.118	2.746	335
336	3.243	2.871	336
337	3.368	2.996	337
338	3.493	3.121	338
339	3.618	3.246	339
340	3.743	3.371	340
341	3.868	3.496	341
342	3.993	3.621	342
343	4.118	3.746	343
344	4.243	3.871	344
345	4.368	3.996	345
346	4.493	4.121	346
347	4.618	4.246	347
348	4.743	4.371	348
349	4.868	4.496	349
	+.003 -.000	+.000 -.003	
425	4.974	4.497	425
426	5.099	4.622	426
427	5.224	4.747	427
428	5.349	4.872	428
429	5.474	4.997	429
430	5.599	5.122	430
431	5.724	5.247	431
432	5.849	5.372	432
433	5.974	5.497	433
434	6.099	5.622	434
435	6.224	5.747	435
436	6.349	5.872	436
437	6.474	5.997	437

DASH NO.	G_1 ONE BACKUP WIDTH	G_2 TWO BACKUP WIDTH	R RADIUS	D DIAMETRAL CLEARANCE MAX.
004-009	.154/.164	.210/.220	.005/.015	.004
010-012	.150/.160	.207/.217		.004
013-028				.005
104-109	.183/.193	.245/.255	.005/.015	.004
110-126				.005
127-129				.005
130-132				.006
133-139				.006
210-222	.235/.245	.304/.314	.010/.025	.005
223-224				.006
225-227				.006
228-230				.007
325-327	.334/.344	.424/.434	.020/.035	.006
328-329				.006
330-345				.007
346-349				.008
425-437	.475/.485	.579/.589	.020/.035	.009



BACKUP RING INSTALLATION
FOR ONE BACKUP WIDTH GLANDS PER AS4716 REVISION A



BACKUP RING INSTALLATION
FOR TWO BACKUP WIDTH GLANDS PER AS4716 REVISION A

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR SCARF-CUT, EXTERNAL BACKUP RINGS IN AS4716 REVISION A PISTON GLANDS.

2. ORDERING EXAMPLE: BH4 7 L G 214 A T05

   BACKUP RING, SCARF-CUT, EXTERNAL DESIGNATOR
   DESIGN CHARACTERISTICS
   L = TRELLEBORG SEALING SOLUTIONS DESIGN
   GLAND DESIGNATOR
   G = AS4716
   SIZE DESIGNATOR
   ACCORDING TO AS4716 REVISION A
   QUALITY INDEX:
   A = AEROSPACE CERTIFICATE OF CONFORMANCE
   TURCON® BACKUP RING MAT'L. CODE
   CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

3. FOR SOLID, EXTERNAL BACKUP RINGS, PLEASE REFERENCE TRELLEBORG SEALING SOLUTIONS PART NUMBER BV47LG000.

INCH
2011_8
TITLE
BACKUP RING, SCARF-CUT, EXTERNAL
TRELLEBORG
SEALING SOLUTIONS
DRAWING NO.
BH47LG000

WORLD AEROSPACE TITLE BLOCK REV.

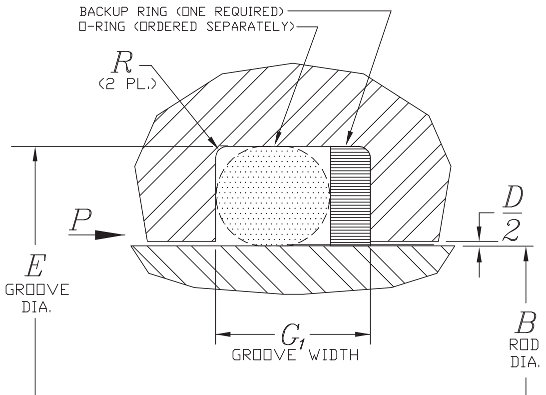
Back-up Ring and Stakbak®

DASH NO.	*B* DIA.	*E* DIA.	O-RING NO.
	+.000 −.001	+.001 −.000	
004	.076	.190	004
005	.108	.217	005
006	.123	.232	006
007	.154	.264	007
008	.185	.294	008
009	.217	.327	009
010	.248	.359	010
011	.310	.421	011
012	.373	.484	012
	+.000 −.002	+.002 −.000	
013	.435	.545	013
014	.498	.608	014
015	.560	.670	015
016	.623	.733	016
017	.685	.795	017
018	.748	.858	018
019	.810	.920	019
020	.873	.983	020
021	.935	1.045	021
022	.998	1.108	022
023	1.060	1.170	023
024	1.123	1.233	024
025	1.185	1.295	025
026	1.248	1.358	026
027	1.310	1.420	027
028	1.373	1.483	028
	+.000 −.001	+.001 −.000	
104	.123	.295	104
105	.154	.327	105
106	.185	.359	106
107	.217	.392	107
108	.248	.423	108
109	.310	.486	109
	+.000 −.002	+.002 −.000	
110	.373	.546	110
111	.435	.609	111
112	.498	.672	112
113	.560	.734	113
114	.623	.797	114
115	.685	.859	115
116	.748	.923	116
117	.810	.985	117
118	.873	1.048	118
119	.935	1.110	119
120	.998	1.173	120
121	1.060	1.235	121
122	1.123	1.298	122
123	1.185	1.360	123
124	1.248	1.423	124
125	1.310	1.485	125
126	1.373	1.548	126
127	1.435	1.610	127
128	1.498	1.673	128
129	1.560	1.735	129
130	1.623	1.798	130
131	1.685	1.860	131
132	1.748	1.923	132
133	1.810	1.984	133
134	1.873	2.047	134
135	1.936	2.110	135
136	1.998	2.172	136
137	2.061	2.235	137
138	2.123	2.297	138
139	2.186	2.360	139
140	2.248	2.422	140
141	2.311	2.485	141
142	2.373	2.547	142
143	2.436	2.610	143
144	2.498	2.672	144
145	2.561	2.737	145
146	2.623	2.797	146
147	2.686	2.860	147
148	2.748	2.922	148
149	2.811	2.985	149

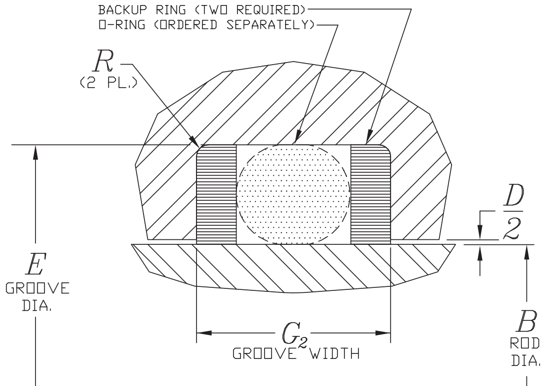
DASH NO.	*B* DIA.	*E* DIA.	O-RING NO.
	+.000 −.002	+.002 −.000	
210	.748	.989	210
211	.810	1.051	211
212	.873	1.115	212
213	.935	1.177	213
214	.998	1.240	214
215	1.060	1.302	215
216	1.123	1.365	216
217	1.185	1.427	217
218	1.248	1.490	218
219	1.310	1.552	219
220	1.373	1.615	220
221	1.435	1.677	221
222	1.498	1.740	222
223	1.623	1.865	223
224	1.748	1.990	224
225	1.873	2.115	225
226	1.998	2.240	226
227	2.123	2.365	227
228	2.248	2.490	228
229	2.373	2.615	229
230	2.498	2.740	230
231	2.623	2.865	231
232	2.748	2.990	232
233	2.873	3.115	233
234	2.997	3.239	234
235	3.122	3.364	235
236	3.247	3.489	236
237	3.372	3.614	237
238	3.497	3.739	238
239	3.622	3.864	239
240	3.747	3.989	240
241	3.872	4.114	241
242	3.997	4.239	242
243	4.122	4.364	243
244	4.247	4.489	244
245	4.372	4.614	245
246	4.497	4.739	246
247	4.622	4.864	247
	+.000 −.002	+.002 −.000	
325	1.498	1.870	325
326	1.623	1.995	326
327	1.748	2.120	327
328	1.873	2.245	328
329	1.998	2.370	329
330	2.123	2.495	330
331	2.248	2.620	331
332	2.373	2.745	332
333	2.498	2.870	333
334	2.623	2.995	334
335	2.748	3.120	335
336	2.873	3.245	336
337	2.997	3.369	337
338	3.122	3.494	338
339	3.247	3.619	339
340	3.372	3.744	340
341	3.497	3.869	341
342	3.622	3.994	342
343	3.747	4.119	343
344	3.872	4.244	344
345	3.997	4.369	345
346	4.122	4.494	346
347	4.247	4.619	347
348	4.372	4.744	348
349	4.497	4.869	349
	+.000 −.003	+.003 −.000	
425	4.497	4.974	425
426	4.622	5.099	426
427	4.747	5.224	427
428	4.872	5.349	428
429	4.997	5.474	429
430	5.122	5.599	430
431	5.247	5.724	431
432	5.372	5.849	432
433	5.497	5.974	433
434	5.622	6.099	434

DASH NO.	*B* DIA.	*E* DIA.	O-RING NO.
	+.000 −.003	+.003 −.000	
435	5.747	6.224	435
436	5.872	6.349	436
437	5.997	6.474	437
438	6.247	6.724	438
439	6.497	6.974	439
440	6.747	7.224	440
441	6.997	7.474	441
442	7.247	7.724	442
443	7.497	7.974	443
444	7.747	8.224	444
445	7.997	8.474	445
446	8.497	8.974	446
	+.000 −.003	+.004 −.000	
447	8.997	9.474	447
448	9.497	9.974	448
449	9.997	10.474	449
450	10.497	10.974	450
451	10.997	11.474	451
452	11.497	11.974	452
453	11.997	12.474	453
454	12.497	12.974	454
455	12.997	13.474	455
456	13.497	13.974	456
457	13.997	14.474	457
458	14.497	14.974	458
459	14.997	15.474	459
460	15.497	15.974	460

DASH NO.	G_1 ONE BACKUP WIDTH	G_2 TWO BACKUP WIDTH	*R* RADIUS	*D* DIAMETRAL CLEARANCE MAX.
004-009	.154/.164	.210/.220	.005/.015	.004
010-012	.150/.160	.207/.217		.004
013-028				.005
104-109	.183/.193	.245/.255	.005/.015	.004
110-126				.005
127-129				.006
130-132				.006
133-140				.007
141-149				.007
210-222	.235/.245	.304/.314	.010/.025	.005
223-224				.006
225-227				.007
228-243				.007
244-245				.007
246-247				.008
325-327	.334/.344	.424/.434	.020/.035	.006
328-329				.007
330-345				.007
346-349				.007
425-438	.475/.485	.579/.589	.020/.035	.009
439-445				.010
446				.010
447-460				.010



ROD SEAL INSTALLATION
FOR ONE BACKUP WIDTH GLANDS PER AS4716 REVISION A



ROD SEAL INSTALLATION
FOR TWO BACKUP WIDTH GLANDS PER AS4716 REVISION A

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR SOLID, INTERNAL BACKUP RINGS IN AS4716 REVISION A ROD GLANDS.
2. ORDERING EXAMPLE: BU47 L G 214 A T05

   BACKUP RING, SOLID, INTERNAL DESIGNATOR
   DESIGN CHARACTERISTICS
   L = TRELLEBORG SEALING SOLUTIONS DESIGN
   GLAND DESIGNATOR
   G = AS4716
   SIZE DESIGNATOR
   ACCORDING TO AS4716 REVISION A
   QUALITY INDEX:
   A = AEROSPACE CERTIFICATE OF CONFORMANCE
   TURCON® BACKUP RING MAT'L. CODE
   CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.
3. FOR SCARF-CUT, INTERNAL BACKUP RINGS, PLEASE REFERENCE TRELLEBORG SEALING SOLUTIONS PART NUMBER BG47LG000.

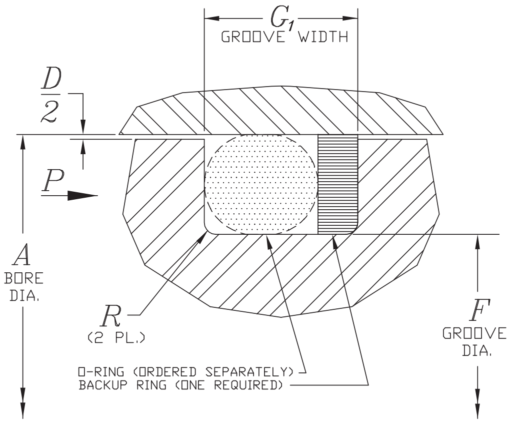
INCH
2009_1
TRELLEBORG
SEALING SOLUTIONS
TITLE
BACKUP RING, SOLID, INTERNAL
DRAWING NO.
BU47LG000

WORLD AEROSPACE TITLE BLOCK REV.

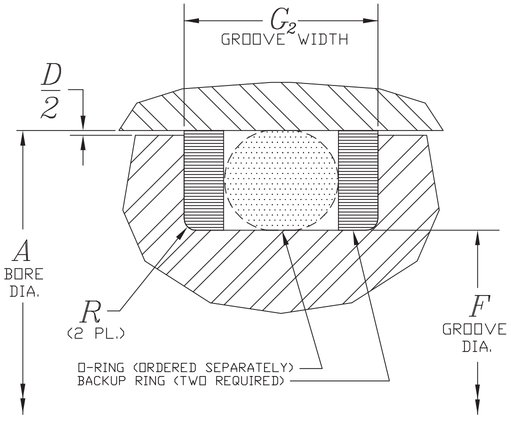
Back-up Ring and Stakbak®

DASH NO.	A DIA.	F DIA.	O-RING NO.
	+.001 -.000	+.000 -.001	
004	.190	.076	004
005	.221	.115	005
006	.235	.129	006
007	.266	.158	007
008	.297	.189	008
009	.329	.220	009
010	.360	.250	010
011	.422	.312	011
012	.485	.375	012
	+.002 -.000	+.000 -.002	
013	.550	.441	013
014	.613	.504	014
015	.675	.566	015
016	.738	.629	016
017	.800	.691	017
018	.863	.753	018
019	.925	.815	019
020	.991	.881	020
021	1.053	.943	021
022	1.116	1.006	022
023	1.178	1.068	023
024	1.241	1.131	024
025	1.303	1.193	025
026	1.366	1.256	026
027	1.428	1.318	027
028	1.491	1.381	028
	+.001 -.000	+.000 -.001	
104	.297	.128	104
105	.329	.158	105
106	.360	.187	106
107	.391	.215	107
108	.422	.246	108
109	.485	.308	109
	+.002 -.000	+.000 -.002	
110	.550	.379	110
111	.613	.441	111
112	.675	.502	112
113	.738	.565	113
114	.800	.627	114
115	.863	.689	115
116	.925	.751	116
117	.991	.817	117
118	1.053	.879	118
119	1.116	.942	119
120	1.178	1.003	120
121	1.241	1.066	121
122	1.303	1.128	122
123	1.366	1.191	123
124	1.428	1.253	124
125	1.491	1.316	125
126	1.553	1.378	126
127	1.616	1.441	127
128	1.678	1.503	128
129	1.741	1.566	129
130	1.805	1.631	130
131	1.867	1.693	131
132	1.930	1.756	132
133	1.992	1.818	133
134	2.055	1.881	134
135	2.118	1.944	135
136	2.180	2.006	136
137	2.243	2.069	137
138	2.305	2.131	138
139	2.368	2.194	139
140	2.430	2.256	140
141	2.493	2.319	141
142	2.555	2.381	142
143	2.618	2.444	143
144	2.680	2.506	144
145	2.743	2.569	145
146	2.805	2.631	146
147	2.868	2.694	147
148	2.930	2.756	148
149	2.993	2.819	149
	+.002 -.000	+.000 -.002	
210	.991	.750	210
211	1.053	.812	211
212	1.116	.874	212
213	1.178	.936	213
214	1.241	.999	214
215	1.303	1.061	215
216	1.366	1.124	216
217	1.428	1.186	217
218	1.491	1.249	218
219	1.553	1.311	219
220	1.616	1.374	220
221	1.678	1.436	221
222	1.741	1.499	222
223	1.867	1.625	223
224	1.992	1.750	224
225	2.118	1.876	225
226	2.243	2.001	226
227	2.368	2.126	227
228	2.493	2.251	228
229	2.618	2.376	229
230	2.743	2.501	230
231	2.868	2.626	231
232	2.993	2.751	232
233	3.118	2.876	233
234	3.243	3.001	234
235	3.368	3.126	235
236	3.493	3.251	236
237	3.618	3.376	237
238	3.743	3.501	238
239	3.868	3.626	239
240	3.993	3.751	240
241	4.118	3.876	241
242	4.243	4.001	242
243	4.368	4.126	243
244	4.493	4.251	244
245	4.618	4.376	245
246	4.743	4.501	246
247	4.868	4.626	247
	+.002 -.000	+.000 -.002	
325	1.867	1.495	325
326	1.992	1.620	326
327	2.118	1.746	327
328	2.243	1.871	328
329	2.368	1.996	329
330	2.493	2.121	330
331	2.618	2.246	331
332	2.743	2.371	332
333	2.868	2.496	333
334	2.993	2.621	334
335	3.118	2.746	335
336	3.243	2.871	336
337	3.368	2.996	337
338	3.493	3.121	338
339	3.618	3.246	339
340	3.743	3.371	340
341	3.868	3.496	341
342	3.993	3.621	342
343	4.118	3.746	343
344	4.243	3.871	344
345	4.368	3.996	345
346	4.493	4.121	346
347	4.618	4.246	347
348	4.743	4.371	348
349	4.868	4.496	349
	+.003 -.000	+.000 -.003	
425	4.974	4.497	425
426	5.099	4.622	426
427	5.224	4.747	427
428	5.349	4.872	428
429	5.474	4.997	429
430	5.599	5.122	430
431	5.724	5.247	431
432	5.849	5.372	432
433	5.974	5.497	433
434	6.099	5.622	434
	+.003 -.000	+.000 -.003	
435	6.224	5.747	435
436	6.349	5.872	436
437	6.474	5.997	437
438	6.724	6.247	438
439	6.974	6.497	439
440	7.224	6.747	440
441	7.474	6.997	441
442	7.724	7.247	442
443	7.974	7.497	443
444	8.224	7.747	444
445	8.474	7.997	445
446	8.974	8.497	446
	+.004 -.000	+.000 -.004	
447	9.474	8.997	447
448	9.974	9.497	448
449	10.474	9.997	449
450	10.974	10.497	450
451	11.474	10.997	451
452	11.974	11.497	452
453	12.474	11.997	453
454	12.974	12.497	454
455	13.474	12.997	455
456	13.974	13.497	456
457	14.474	13.997	457
458	14.974	14.497	458
459	15.474	14.997	459
460	15.974	15.497	460

DASH NO.	G_1 ONE BACKUP WIDTH	G_2 TWO BACKUP WIDTH	R RADIUS	D DIAMETRAL CLEARANCE MAX.
004-009	.154/.164	.210/.220	.005/.015	.004
010-012	.150/.160	.207/.217		.004
013-028				.005
104-109	.183/.193	.245/.255	.005/.015	.004
110-126				.005
127-129				.005
130-132				.006
133-140				.006
141-149				.007
210-222	.235/.245	.304/.314	.010/.025	.005
223-224				.006
225-227				.006
228-243				.007
244-245				.008
246-247				.008
325-327	.334/.344	.424/.434	.020/.035	.006
328-329				.006
330-345				.007
346-349				.008
425-438	.475/.485	.579/.589	.020/.035	.009
439-445				.009
446				.010
447-460				.011



BACKUP RING INSTALLATION
FOR ONE BACKUP WIDTH GLANDS PER AS4716 REVISION A



BACKUP RING INSTALLATION
FOR TWO BACKUP WIDTH GLANDS PER AS4716 REVISION A

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR SOLID, EXTERNAL BACKUP RINGS IN AS4716 REVISION A PISTON GLANDS.

2. ORDERING EXAMPLE: BV4 7 L G 214 A T05

BACKUP RING, SOLID, EXTERNAL DESIGNATOR
DESIGN CHARACTERISTICS
  L = TRELLEBORG SEALING SOLUTIONS DESIGN
GLAND DESIGNATOR
  G = AS4716
SIZE DESIGNATOR
  ACCORDING TO AS4716 REVISION A
QUALITY INDEX:
  A= AEROSPACE CERTIFICATE OF CONFORMANCE
TURCON® BACKUP RING MAT'L. CODE
CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

3. FOR SCARF-CUT, EXTERNAL BACKUP RINGS, PLEASE REFERENCE TRELLEBORG SEALING SOLUTIONS PART NUMBER BH47LG000.

INCH
2009_1
TRELLEBORG
SEALING SOLUTIONS
TITLE
BACKUP RING, SOLID, EXTERNAL
DRAWING NO.
BV47LG000

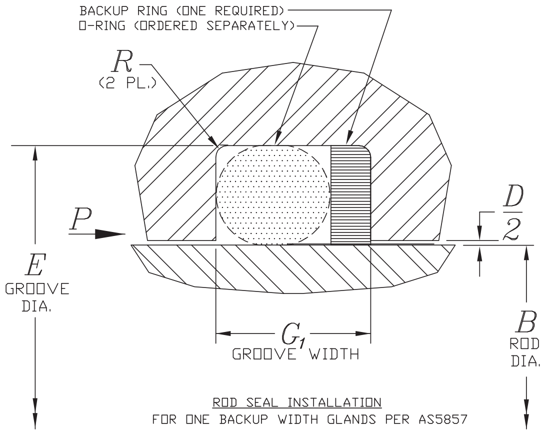
WORLD AEROSPACE TITLE BLOCK REV.

Back-up Ring and Stakbak®

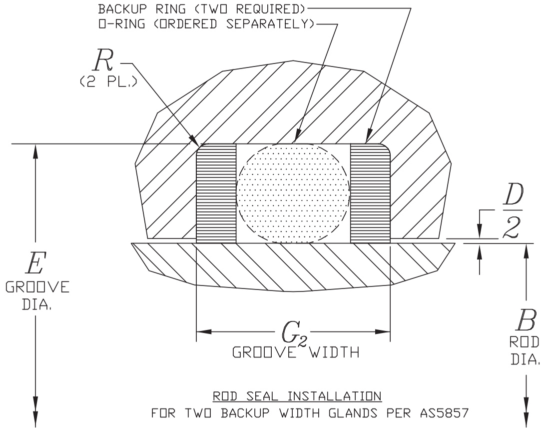
DASH NO.	*B* DIA.	*E* DIA.	O-RING NO.
	+.000 -.001	+.001 -.000	
004	.076	.184	004
005	.108	.216	005
006	.123	.231	006
007	.154	.262	007
008	.185	.293	008
009	.217	.325	009
010	.248	.356	010
011	.310	.418	011
012	.373	.481	012
	+.000 -.002	+.002 -.000	
013	.435	.543	013
014	.498	.606	014
015	.560	.668	015
016	.623	.731	016
017	.685	.793	017
018	.748	.856	018
019	.810	.918	019
020	.873	.981	020
021	.935	1.043	021
022	.998	1.106	022
023	1.060	1.168	023
024	1.123	1.231	024
025	1.185	1.293	025
026	1.248	1.356	026
027	1.310	1.418	027
028	1.373	1.481	028
	+.000 -.001	+.001 -.000	
104	.123	.288	104
105	.154	.319	105
106	.185	.350	106
107	.217	.382	107
108	.248	.413	108
109	.310	.475	109
	+.000 -.002	+.002 -.000	
110	.373	.538	110
111	.435	.600	111
112	.498	.663	112
113	.560	.725	113
114	.623	.788	114
115	.685	.850	115
116	.748	.913	116
117	.810	.975	117
118	.873	1.038	118
119	.935	1.100	119
120	.998	1.163	120
121	1.060	1.225	121
122	1.123	1.288	122
123	1.185	1.350	123
124	1.248	1.413	124
125	1.310	1.475	125
126	1.373	1.538	126
127	1.435	1.600	127
128	1.498	1.663	128
129	1.560	1.725	129
130	1.623	1.788	130
131	1.685	1.850	131
132	1.748	1.913	132
133	1.810	1.975	133
134	1.873	2.038	134
135	1.936	2.101	135
136	1.998	2.163	136
137	2.061	2.226	137
138	2.123	2.288	138
139	2.186	2.351	139

DASH NO.	*B* DIA.	*E* DIA.	O-RING NO.
	+.000 -.002	+.002 -.000	
210	.748	.974	210
211	.810	1.036	211
212	.873	1.099	212
213	.935	1.161	213
214	.998	1.224	214
215	1.060	1.286	215
216	1.123	1.349	216
217	1.185	1.411	217
218	1.248	1.474	218
219	1.310	1.536	219
220	1.373	1.599	220
221	1.435	1.661	221
222	1.498	1.724	222
223	1.623	1.849	223
224	1.748	1.974	224
225	1.873	2.099	225
226	1.998	2.224	226
227	2.123	2.349	227
228	2.248	2.474	228
229	2.373	2.599	229
230	2.498	2.724	230
	+.000 -.002	+.002 -.000	
325	1.498	1.846	325
326	1.623	1.971	326
327	1.748	2.096	327
328	1.873	2.221	328
329	1.998	2.346	329
330	2.123	2.471	330
331	2.248	2.596	331
332	2.373	2.721	332
333	2.498	2.846	333
334	2.623	2.971	334
335	2.748	3.096	335
336	2.873	3.221	336
337	2.997	3.345	337
338	3.122	3.470	338
339	3.247	3.595	339
340	3.372	3.720	340
341	3.497	3.845	341
342	3.622	3.970	342
343	3.747	4.095	343
344	3.872	4.220	344
345	3.997	4.345	345
346	4.122	4.470	346
347	4.247	4.595	347
348	4.372	4.720	348
349	4.497	4.845	349
	+.000 -.003	+.003 -.000	
425	4.497	4.956	425
426	4.622	5.081	426
427	4.747	5.206	427
428	4.872	5.331	428
429	4.997	5.456	429
430	5.122	5.581	430
431	5.247	5.706	431
432	5.372	5.831	432
433	5.497	5.956	433
434	5.622	6.081	434
435	5.747	6.206	435
436	5.872	6.331	436
437	5.997	6.456	437

DASH NO.	G_1 ONE BACKUP WIDTH	G_2 TWO BACKUP WIDTH	*R* RADIUS	*D* DIAMETRAL CLEARANCE MAX.
004-007	.174/.184	.230/.240	.005/.015	.004
008-012	.164/.174	.220/.230		.004
013-028				.005
104-109	.210/.220	.275/.285	.005/.015	.004
110-126	.200/.210	.265/.275		.005
127-129				.006
130-132				.006
133-139				.007
210-222	.250/.260	.320/.330	.010/.025	.005
223-224				.006
225-227				.007
228-230				.007
325-327	.360/.370	.455/.465	.020/.035	.006
328-329				.007
330-345				.007
346-349				.007
425-437	.475/.485	.610/.620	.020/.035	.009



ROD SEAL INSTALLATION
FOR ONE BACKUP WIDTH GLANDS PER AS5857



ROD SEAL INSTALLATION
FOR TWO BACKUP WIDTH GLANDS PER AS5857

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR SCARF-CUT, INTERNAL BACKUP RINGS IN AS5857 ROD GLANDS.

2. ORDERING EXAMPLE: BG58 0 E 214 A T29

   BACKUP RING, SCARF-CUT, INTERNAL DESIGNATOR
   DESIGN CHARACTERISTICS
   0 = PER SPECIFICATION
   GLAND DESIGNATOR
   E = AS5857 GLAND STANDARD
   SIZE DESIGNATOR
   ACCORDING TO AS5857
   QUALITY INDEX:
   A= AEROSPACE CERTIFICATE OF CONFORMANCE
   TURCON® BACKUP RING MAT'L. CODE
   CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

3. FOR SOLID, INTERNAL BACKUP RINGS, PLEASE REFERENCE TRELLEBORG SEALING SOLUTIONS PART NUMBER BU580E000.

4. ONLY AVAILABLE IN AMS3678/10 MATERIAL, CARBON FIBER-FILLED PTFE.

INCH
2011_8
TRELLEBORG
SEALING SOLUTIONS
TITLE
BACKUP RING, SCARF-CUT, INTERNAL
DRAWING NO.
BG580E000

WORLD AEROSPACE TITLE BLOCK REV.

Back-up Ring and Stakbak®

DASH NO.	*A* DIA.	*F* DIA.	O-RING NO.
	+.001 -.000	+.000 -.001	
004	.185	.078	004
005	.217	.110	005
006	.230	.123	006
007	.261	.154	007
008	.293	.186	008
009	.326	.219	009
010	.357	.250	010
011	.420	.313	011
012	.485	.378	012
	+.002 -.000	+.000 -.002	
013	.550	.443	013
014	.613	.506	014
015	.675	.568	015
016	.738	.631	016
017	.800	.693	017
018	.863	.756	018
019	.925	.818	019
020	.991	.884	020
021	1.053	.946	021
022	1.116	1.009	022
023	1.178	1.071	023
024	1.241	1.134	024
025	1.303	1.196	025
026	1.366	1.259	026
027	1.428	1.321	027
028	1.491	1.384	028
	+.001 -.000	+.000 -.001	
104	.286	.121	104
105	.317	.152	105
106	.349	.184	106
107	.382	.217	107
108	.414	.249	108
109	.477	.312	109
	+.002 -.000	+.000 -.002	
110	.541	.377	110
111	.604	.440	111
112	.668	.504	112
113	.734	.570	113
114	.800	.636	114
115	.863	.699	115
116	.925	.761	116
117	.991	.827	117
118	1.053	.889	118
119	1.116	.952	119
120	1.178	1.014	120
121	1.241	1.077	121
122	1.303	1.139	122
123	1.366	1.202	123
124	1.428	1.264	124
125	1.491	1.327	125
126	1.553	1.389	126
127	1.616	1.452	127
128	1.678	1.514	128
129	1.741	1.577	129
130	1.805	1.641	130
131	1.867	1.703	131
132	1.930	1.766	132
133	1.992	1.828	133
134	2.055	1.891	134
135	2.118	1.954	135
136	2.180	2.016	136
137	2.243	2.079	137
138	2.305	2.141	138
139	2.368	2.204	139

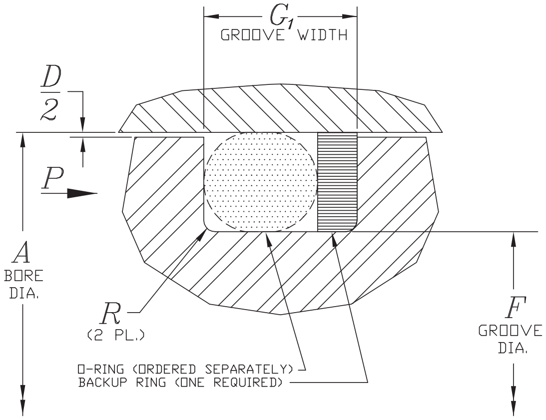
DASH NO.	*A* DIA.	*F* DIA.	O-RING NO.
	+.002 -.000	+.000 -.002	
210	.991	.767	210
211	1.053	.829	211
212	1.116	.892	212
213	1.178	.954	213
214	1.241	1.017	214
215	1.303	1.079	215
216	1.366	1.142	216
217	1.428	1.204	217
218	1.491	1.267	218
219	1.553	1.329	219
220	1.616	1.392	220
221	1.678	1.454	221
222	1.741	1.517	222
223	1.867	1.643	223
224	1.992	1.768	224
225	2.118	1.894	225
226	2.243	2.019	226
227	2.368	2.144	227
228	2.493	2.269	228
229	2.618	2.394	229
230	2.743	2.519	230
	+.002 -.000	+.000 -.002	
325	1.867	1.523	325
326	1.992	1.648	326
327	2.118	1.774	327
328	2.243	1.899	328
329	2.368	2.024	329
330	2.493	2.149	330
331	2.618	2.274	331
332	2.743	2.399	332
333	2.868	2.524	333
334	2.993	2.649	334
335	3.118	2.774	335
336	3.243	2.899	336
337	3.368	3.024	337
338	3.493	3.149	338
339	3.618	3.274	339
340	3.743	3.399	340
341	3.868	3.524	341
342	3.993	3.649	342
343	4.118	3.774	343
344	4.243	3.899	344
345	4.368	4.024	345
346	4.493	4.149	346
347	4.618	4.274	347
348	4.743	4.399	348
349	4.868	4.524	349
	+.003 -.000	+.000 -.003	
425	4.974	4.519	425
426	5.099	4.644	426
427	5.224	4.769	427
428	5.349	4.894	428
429	5.474	5.019	429
430	5.599	5.144	430
431	5.724	5.269	431
432	5.849	5.394	432
433	5.974	5.519	433
434	6.099	5.644	434
435	6.224	5.769	435
436	6.349	5.894	436
437	6.474	6.019	437

DASH NO.	G_1 ONE BACKUP WIDTH	G_2 TWO BACKUP WIDTH	*R* RADIUS	*D* DIAMETRAL CLEARANCE MAX.
004-007	.174/.184	.230/.240	.005/.015	.004
008-012	.164/.174	.220/.230		.004
013-028				.005
104-109	.210/.220	.275/.285	.005/.015	.004
110-129	.200/.210	.265/.275		.005
130-140				.006
210-222	.250/.260	.320/.330	.010/.025	.005
223-227				.006
228-230				.007
325-329	.360/.370	.455/.465	.020/.035	.006
330-345				.007
346-349				.008
425-437	.475/.485	.610/.620	.020/.035	.009

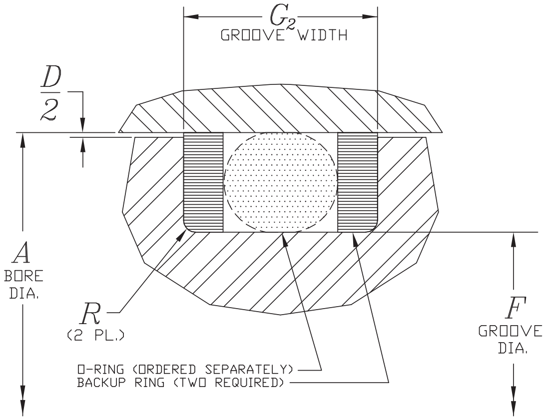
NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR SCARF-CUT, EXTERNAL BACKUP RINGS IN AS5857 PISTON GLANDS.
2. ORDERING EXAMPLE: BH58 0 E 214 A T29

   BACKUP RING, SCARF-CUT, EXTERNAL DESIGNATOR
   DESIGN CHARACTERISTICS
   0 = PER SPECIFICATION
   GLAND DESIGNATOR
   E = AS5857 GLAND STANDARD
   SIZE DESIGNATOR
   ACCORDING TO AS5857
   QUALITY INDEX:
   A = AEROSPACE CERTIFICATE OF CONFORMANCE
   TURCON® BACKUP RING MAT'L. CODE
   CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.
3. FOR SOLID, EXTERNAL BACKUP RINGS, PLEASE REFERENCE TRELLEBORG SEALING SOLUTIONS PART NUMBER BV580E000.
4. ONLY AVAILABLE IN AMS3678/10 MATERIAL, CARBON FIBER-FILLED PTFE.



BACKUP RING INSTALLATION
FOR ONE BACKUP WIDTH GLANDS PER AS5857



BACKUP RING INSTALLATION
FOR TWO BACKUP WIDTH GLANDS PER AS5857

INCH
2011_8
TRELLEBORG
SEALING SOLUTIONS
TITLE
BACKUP RING, SCARF-CUT, EXTERNAL
DRAWING NO.
BH580E000

WORLD AEROSPACE TITLE BLOCK REV.

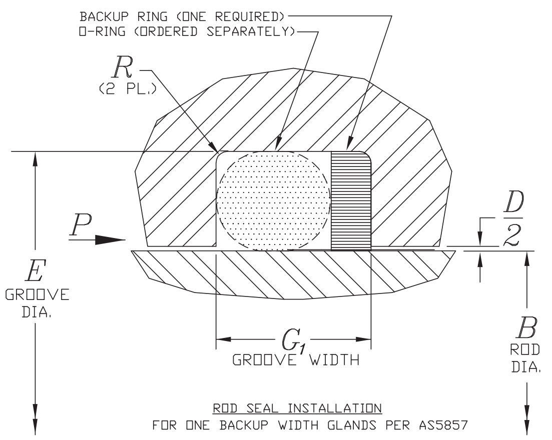
Back-up Ring and Stakbak®

DASH NO.	*B* DIA.	*E* DIA.	O-RING NO.
	+.000 -.001	+.001 -.000	
004	.076	.184	004
005	.108	.216	005
006	.123	.231	006
007	.154	.262	007
008	.185	.293	008
009	.217	.325	009
010	.248	.356	010
011	.310	.418	011
012	.373	.481	012
	+.000 -.002	+.002 -.000	
013	.435	.543	013
014	.498	.606	014
015	.560	.668	015
016	.623	.731	016
017	.685	.793	017
018	.748	.856	018
019	.810	.918	019
020	.873	.981	020
021	.935	1.043	021
022	.998	1.106	022
023	1.060	1.168	023
024	1.123	1.231	024
025	1.185	1.293	025
026	1.248	1.356	026
027	1.310	1.418	027
028	1.373	1.481	028
	+.000 -.001	+.001 -.000	
104	.123	.288	104
105	.154	.319	105
106	.185	.350	106
107	.217	.382	107
108	.248	.413	108
109	.310	.475	109
	+.000 -.002	+.002 -.000	
110	.373	.538	110
111	.435	.600	111
112	.498	.663	112
113	.560	.725	113
114	.623	.788	114
115	.685	.850	115
116	.748	.913	116
117	.810	.975	117
118	.873	1.038	118
119	.935	1.100	119
120	.998	1.163	120
121	1.060	1.225	121
122	1.123	1.228	122
123	1.185	1.350	123
124	1.248	1.413	124
125	1.310	1.475	125
126	1.373	1.538	126
127	1.435	1.600	127
128	1.498	1.663	128
129	1.560	1.725	129
130	1.623	1.788	130
131	1.685	1.850	131
132	1.748	1.913	132
133	1.810	1.975	133
134	1.873	2.038	134
135	1.936	2.101	135
136	1.998	2.163	136
137	2.061	2.226	137
138	2.123	2.288	138
139	2.186	2.351	139
140	2.248	2.413	140
141	2.311	2.476	141
142	2.373	2.538	142
143	2.436	2.601	143
144	2.498	2.663	144
145	2.561	2.726	145
146	2.623	2.788	146
147	2.686	2.851	147
148	2.748	2.913	148
149	2.811	2.976	149

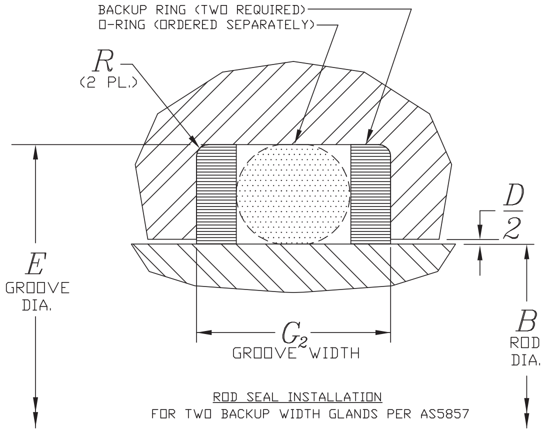
DASH NO.	*B* DIA.	*E* DIA.	O-RING NO.
	+.000 -.002	+.002 -.000	
210	.748	.974	210
211	.810	1.036	211
212	.873	1.099	212
213	.935	1.161	213
214	.998	1.224	214
215	1.060	1.286	215
216	1.123	1.349	216
217	1.185	1.411	217
218	1.248	1.474	218
219	1.310	1.536	219
220	1.373	1.599	220
221	1.435	1.661	221
222	1.498	1.724	222
223	1.623	1.849	223
224	1.748	1.974	224
225	1.873	2.099	225
226	1.998	2.224	226
227	2.123	2.349	227
228	2.248	2.474	228
229	2.373	2.599	229
230	2.498	2.724	230
231	2.623	2.849	231
232	2.748	2.974	232
233	2.873	3.099	233
234	2.997	3.223	234
235	3.122	3.348	235
236	3.247	3.473	236
237	3.372	3.598	237
238	3.497	3.723	238
239	3.622	3.848	239
240	3.747	3.973	240
241	3.872	4.098	241
242	3.997	4.223	242
243	4.122	4.348	243
244	4.247	4.473	244
245	4.372	4.598	245
246	4.497	4.723	246
247	4.622	4.848	247
	+.000 -.002	+.002 -.000	
325	1.498	1.846	325
326	1.623	1.971	326
327	1.748	2.096	327
328	1.873	2.221	328
329	1.998	2.346	329
330	2.123	2.471	330
331	2.248	2.596	331
332	2.373	2.721	332
333	2.498	2.846	333
334	2.623	2.971	334
335	2.748	3.096	335
336	2.873	3.221	336
337	2.997	3.345	337
338	3.122	3.470	338
339	3.247	3.595	339
340	3.372	3.720	340
341	3.497	3.845	341
342	3.622	3.970	342
343	3.747	4.095	343
344	3.872	4.220	344
345	3.997	4.345	345
346	4.122	4.470	346
347	4.247	4.595	347
348	4.372	4.720	348
349	4.497	4.845	349
	+.000 -.003	+.003 -.000	
425	4.497	4.956	425
426	4.622	5.081	426
427	4.747	5.206	427
428	4.872	5.331	428
429	4.997	5.456	429
430	5.122	5.581	430
431	5.247	5.706	431
432	5.372	5.831	432
433	5.497	5.956	433
434	5.622	6.081	434

DASH NO.	*B* DIA.	*E* DIA.	O-RING NO.
	+.000 -.003	+.003 -.000	
435	5.747	6.206	435
436	5.872	6.331	436
437	5.997	6.456	437
438	6.247	6.706	438
439	6.497	6.956	439
440	6.747	7.206	440
441	6.997	7.456	441
442	7.247	7.706	442
443	7.497	7.956	443
444	7.747	8.206	444
445	7.997	8.456	445
446	8.497	8.956	446
	+.000 -.003	+.004 -.000	
447	8.997	9.456	447
448	9.497	9.956	448
449	9.997	10.456	449
450	10.497	10.956	450
451	10.997	11.456	451
452	11.497	11.956	452
453	11.997	12.456	453
454	12.497	12.956	454
455	12.997	13.456	455
456	13.497	13.956	456
457	13.997	14.456	457
458	14.497	14.956	458
459	14.997	15.456	459
460	15.497	15.956	460

DASH NO.	G_1 ONE BACKUP WIDTH	G_2 TWO BACKUP WIDTH	*R* RADIUS	*D* DIAMETRAL CLEARANCE MAX.
004-007	.174/.184	.230/.240	.005/.015	.004
008-012	.164/.174	.220/.230		.004
013-028				.005
104-109	.210/.220	.275/.285	.005/.015	.004
110-126	.200/.210	.265/.275		.005
127-129				.006
130-132				.006
133-140				.007
141-149				.007
210-222	.250/.260	.320/.330	.010/.025	.005
223-224				.006
225-227				.007
228-243				.007
244-245				.007
246-247				.008
325-327	.360/.370	.455/.465	.020/.035	.006
328-329				.007
330-345				.007
346-349				.007
425-438	.475/.485	.610/.620	.020/.035	.009
439-445				.010
446				.010
447-460				.010



ROD SEAL INSTALLATION
FOR ONE BACKUP WIDTH GLANDS PER AS5857



ROD SEAL INSTALLATION
FOR TWO BACKUP WIDTH GLANDS PER AS5857

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR SOLID, INTERNAL BACKUP RINGS IN AS5857 ROD GLANDS.

2. ORDERING EXAMPLE: BU58 0 E 214 A T29

   BACKUP RING, SOLID, INTERNAL DESIGNATOR (BU58)
   DESIGN CHARACTERISTICS (0)
     0 = PER SPECIFICATION
   GLAND DESIGNATOR (E)
     E = AS5857 GLAND STANDARD
   SIZE DESIGNATOR (214)
     ACCORDING TO AS5857
   QUALITY INDEX: (A)
     A = AEROSPACE CERTIFICATE OF CONFORMANCE
   TURCON® BACKUP RING MAT'L. CODE (T29)
   CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

3. FOR SCARF-CUT INTERNAL BACKUP RINGS, PLEASE REFERENCE TRELLEBORG SEALING SOLUTIONS PART NUMBER BG580E000.

4. ONLY AVAILABLE IN AMS3678/10 MATERIAL, CARBON FIBER-FILLED PTFE.

INCH
2009_1
TRELLEBORG
SEALING SOLUTIONS
TITLE
BACKUP RING, SOLID, INTERNAL
DRAWING NO.
BU580E000

WORLD AEROSPACE TITLE BLOCK REV.

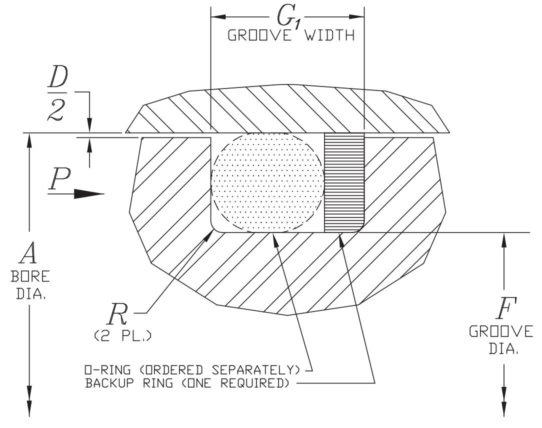
Back-up Ring and Stakbak®

DASH NO.	A DIA.	F DIA.	O-RING NO.
	+.001 -.000	+.000 -.001	
004	.185	.078	004
005	.217	.110	005
006	.230	.123	006
007	.261	.154	007
008	.293	.186	008
009	.326	.219	009
010	.357	.250	010
011	.420	.313	011
012	.485	.378	012
	+.002 -.000	+.000 -.002	
013	.550	.443	013
014	.613	.506	014
015	.675	.568	015
016	.738	.631	016
017	.800	.693	017
018	.863	.756	018
019	.925	.818	019
020	.991	.884	020
021	1.053	.946	021
022	1.116	1.009	022
023	1.178	1.071	023
024	1.241	1.134	024
025	1.303	1.196	025
026	1.366	1.259	026
027	1.428	1.321	027
028	1.491	1.384	028
	+.001 -.000	+.000 -.001	
104	.286	.121	104
105	.317	.152	105
106	.349	.184	106
107	.382	.217	107
108	.414	.249	108
109	.477	.312	109
	+.002 -.000	+.000 -.002	
110	.541	.377	110
111	.604	.440	111
112	.668	.504	112
113	.734	.570	113
114	.800	.636	114
115	.863	.699	115
116	.925	.761	116
117	.991	.827	117
118	1.053	.889	118
119	1.116	.952	119
120	1.178	1.014	120
121	1.241	1.077	121
122	1.303	1.139	122
123	1.366	1.202	123
124	1.428	1.264	124
125	1.491	1.327	125
126	1.553	1.389	126
127	1.616	1.452	127
128	1.678	1.514	128
129	1.741	1.577	129
130	1.805	1.641	130
131	1.867	1.703	131
132	1.930	1.766	132
133	1.992	1.828	133
134	2.055	1.891	134
135	2.118	1.954	135
136	2.180	2.016	136
137	2.243	2.079	137
138	2.305	2.141	138
139	2.368	2.204	139
140	2.430	2.266	140
141	2.493	2.329	141
142	2.555	2.391	142
143	2.618	2.454	143
144	2.680	2.516	144
145	2.743	2.579	145
146	2.805	2.641	146
147	2.868	2.704	147
148	2.930	2.766	148
149	2.993	2.829	149

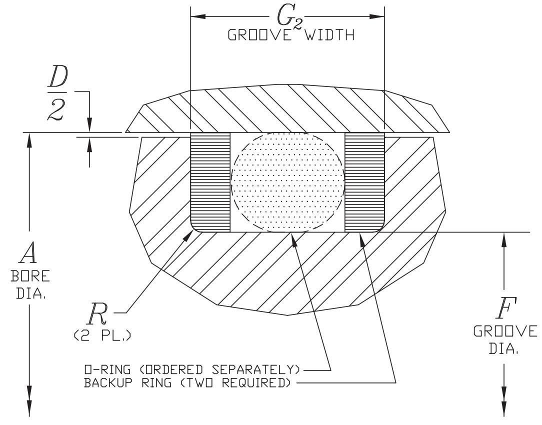
DASH NO.	A DIA.	F DIA.	O-RING NO.
	+.002 -.000	+.000 -.002	
210	.991	.767	210
211	1.053	.829	211
212	1.116	.892	212
213	1.178	.954	213
214	1.241	1.017	214
215	1.303	1.079	215
216	1.366	1.142	216
217	1.428	1.204	217
218	1.491	1.267	218
219	1.553	1.329	219
220	1.616	1.392	220
221	1.678	1.454	221
222	1.741	1.517	222
223	1.867	1.643	223
224	1.992	1.768	224
225	2.118	1.894	225
226	2.243	2.019	226
227	2.368	2.144	227
228	2.493	2.269	228
229	2.618	2.394	229
230	2.743	2.519	230
231	2.868	2.644	231
232	2.993	2.769	232
233	3.118	2.894	233
234	3.243	3.019	234
235	3.368	3.144	235
236	3.493	3.269	236
237	3.618	3.394	237
238	3.743	3.519	238
239	3.868	3.644	239
240	3.993	3.769	240
241	4.118	3.894	241
242	4.243	4.019	242
243	4.368	4.144	243
244	4.493	4.269	244
245	4.618	4.394	245
246	4.743	4.519	246
247	4.868	4.644	247
	+.002 -.000	+.000 -.002	
325	1.867	1.523	325
326	1.992	1.648	326
327	2.118	1.774	327
328	2.243	1.899	328
329	2.368	2.024	329
330	2.493	2.149	330
331	2.618	2.274	331
332	2.743	2.399	332
333	2.868	2.524	333
334	2.993	2.649	334
335	3.118	2.774	335
336	3.243	2.899	336
337	3.368	3.024	337
338	3.493	3.149	338
339	3.618	3.274	339
340	3.743	3.399	340
341	3.868	3.524	341
342	3.993	3.649	342
343	4.118	3.774	343
344	4.243	3.899	344
345	4.368	4.024	345
346	4.493	4.149	346
347	4.618	4.274	347
348	4.743	4.399	348
349	4.868	4.524	349
	+.003 -.000	+.000 -.003	
425	4.974	4.519	425
426	5.099	4.644	426
427	5.224	4.769	427
428	5.349	4.894	428
429	5.474	5.019	429
430	5.599	5.144	430
431	5.724	5.269	431
432	5.849	5.394	432
433	5.974	5.519	433
434	6.099	5.644	434

DASH NO.	A DIA.	F DIA.	O-RING NO.
	+.003 -.000	+.000 -.003	
435	6.224	5.769	435
436	6.349	5.894	436
437	6.474	6.019	437
438	6.724	6.269	438
439	6.974	6.519	439
440	7.224	6.769	440
441	7.474	7.019	441
442	7.724	7.269	442
443	7.974	7.519	443
444	8.224	7.769	444
445	8.474	8.019	445
446	8.974	8.519	446
	+.004 -.000	+.000 -.003	
447	9.474	9.020	447
448	9.974	9.520	448
449	10.474	10.020	449
450	10.974	10.520	450
451	11.474	11.020	451
452	11.974	11.520	452
453	12.474	12.020	453
454	12.974	12.520	454
455	13.474	13.020	455
456	13.974	13.520	456
457	14.474	14.020	457
458	14.974	14.520	458
459	15.474	15.020	459
460	15.974	15.520	460

DASH NO.	G_1 ONE BACKUP WIDTH	G_2 TWO BACKUP WIDTH	R RADIUS	D DIAMETRAL CLEARANCE MAX.
004-007	.174/.184	.230/.240	.005/.015	.004
008-012	.164/.174	.220/.230		.004
013-028				.005
104-109	.210/.220	.275/.285	.005/.015	.004
110-129	.200/.210	.265/.275		.005
130-140				.006
141-149				.007
210-222	.250/.260	.320/.330	.010/.025	.005
223-227				.006
228-243				.007
244-247				.008
325-329	.360/.370	.455/.465	.020/.035	.006
330-345				.007
346-349				.008
425-445	.475/.485	.610/.620	.020/.035	.009
446				.010
447-460				.011



BACKUP RING INSTALLATION
FOR ONE BACKUP WIDTH GLANDS PER AS5857



BACKUP RING INSTALLATION
FOR TWO BACKUP WIDTH GLANDS PER AS5857

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR SOLID, EXTERNAL BACKUP RINGS IN AS5857 PISTON GLANDS.
2. ORDERING EXAMPLE: BV58 0 E 214 A T29

   BACKUP RING, SOLID, EXTERNAL DESIGNATOR
   DESIGN CHARACTERISTICS
   0 = PER SPECIFICATION
   GLAND DESIGNATOR
   E = AS5857 GLAND STANDARD
   SIZE DESIGNATOR
   ACCORDING TO AS5857
   QUALITY INDEX:
   A = AEROSPACE CERTIFICATE OF CONFORMANCE
   TURCON® BACKUP RING MAT'L. CODE
   CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.
3. FOR SCARF-CUT, EXTERNAL BACKUP RINGS , PLEASE REFERENCE TRELLEBORG SEALING SOLUTIONS PART NUMBER BH580E000.
4. ONLY AVAILABLE IN AMS3678/10 MATERIAL, CARBON FIBER-FILLED PTFE.

INCH
2009_1
TITLE
BACKUP RING, SOLID, EXTERNAL
TRELLEBORG
SEALING SOLUTIONS
DRAWING NO.
BV580E000

WORLD AEROSPACE TITLE BLOCK REV.

Back-up Ring and Stakbak®

DASH NO.	B DIA.	E DIA.	O-RING NO.
	+.000 -.001	+.001 -.000	
004	.076	.184	004
005	.108	.216	005
006	.123	.231	006
007	.154	.262	007
008	.185	.293	008
009	.217	.325	009
010	.248	.356	010
011	.310	.418	011
012	.373	.481	012
	+.000 -.002	+.002 -.000	
013	.435	.543	013
014	.498	.606	014
015	.560	.668	015
016	.623	.731	016
017	.685	.793	017
018	.748	.856	018
019	.810	.918	019
020	.873	.981	020
021	.935	1.043	021
022	.998	1.106	022
023	1.060	1.168	023
024	1.123	1.231	024
025	1.185	1.293	025
026	1.248	1.356	026
027	1.310	1.418	027
028	1.373	1.481	028
	+.000 -.001	+.001 -.000	
104	.123	.288	104
105	.154	.319	105
106	.185	.350	106
107	.217	.382	107
108	.248	.413	108
109	.310	.475	109
	+.000 -.002	+.002 -.000	
110	.373	.538	110
111	.435	.600	111
112	.498	.663	112
113	.560	.725	113
114	.623	.788	114
115	.685	.850	115
116	.748	.913	116
117	.810	.975	117
118	.873	1.038	118
119	.935	1.100	119
120	.998	1.163	120
121	1.060	1.225	121
122	1.123	1.288	122
123	1.185	1.350	123
124	1.248	1.413	124
125	1.310	1.475	125
126	1.373	1.538	126
127	1.435	1.600	127
128	1.498	1.663	128
129	1.560	1.725	129
130	1.623	1.788	130
131	1.685	1.850	131
132	1.748	1.913	132
133	1.810	1.975	133
134	1.873	2.038	134
135	1.936	2.101	135
136	1.998	2.163	136
137	2.061	2.226	137
138	2.123	2.288	138
139	2.186	2.351	139

DASH NO.	B DIA.	E DIA.	O-RING NO.
	+.000 -.002	+.002 -.000	
210	.748	.974	210
211	.810	1.036	211
212	.873	1.099	212
213	.935	1.161	213
214	.998	1.224	214
215	1.060	1.286	215
216	1.123	1.349	216
217	1.185	1.411	217
218	1.248	1.474	218
219	1.310	1.536	219
220	1.373	1.599	220
221	1.435	1.661	221
222	1.498	1.724	222
223	1.623	1.849	223
224	1.748	1.974	224
225	1.873	2.099	225
226	1.998	2.224	226
227	2.123	2.349	227
228	2.248	2.474	228
229	2.373	2.599	229
230	2.498	2.724	230
	+.000 -.002	+.002 -.000	
325	1.498	1.846	325
326	1.623	1.971	326
327	1.748	2.096	327
328	1.873	2.221	328
329	1.998	2.346	329
330	2.123	2.471	330
331	2.248	2.596	331
332	2.373	2.721	332
333	2.498	2.846	333
334	2.623	2.971	334
335	2.748	3.096	335
336	2.873	3.221	336
337	2.997	3.345	337
338	3.122	3.470	338
339	3.247	3.595	339
340	3.372	3.720	340
341	3.497	3.845	341
342	3.622	3.970	342
343	3.747	4.095	343
344	3.872	4.220	344
345	3.997	4.345	345
346	4.122	4.470	346
347	4.247	4.595	347
348	4.372	4.720	348
349	4.497	4.845	349
	+.000 -.003	+.003 -.000	
425	4.497	4.956	425
426	4.622	5.081	426
427	4.747	5.206	427
428	4.872	5.331	428
429	4.997	5.456	429
430	5.122	5.581	430
431	5.247	5.706	431
432	5.372	5.831	432
433	5.497	5.956	433
434	5.622	6.081	434
435	5.747	6.206	435
436	5.872	6.331	436
437	5.997	6.456	437

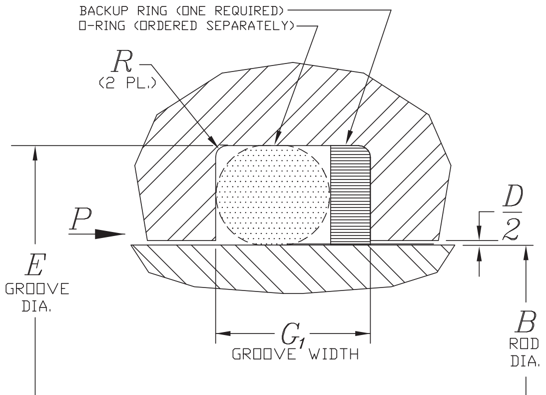
DASH NO.	G_1 ONE BACKUP WIDTH	G_2 TWO BACKUP WIDTH	R RADIUS	D DIAMETRAL CLEARANCE MAX.
004-007	.174/.184	.230/.240	.005/.015	.004
008-012	.164/.174	.220/.230		.004
013-028				.005
104-109	.210/.220	.275/.285	.005/.015	.004
110-126	.200/.210	.265/.275		.005
127-129				.006
130-132				.006
133-139				.007
210-222	.250/.260	.320/.330	.010/.025	.005
223-224				.006
225-227				.007
228-230				.007
325-327	.360/.370	.455/.465	.020/.035	.006
328-329				.007
330-345				.007
346-349				.007
425-437	.475/.485	.610/.620	.020/.035	.009

NOTES:

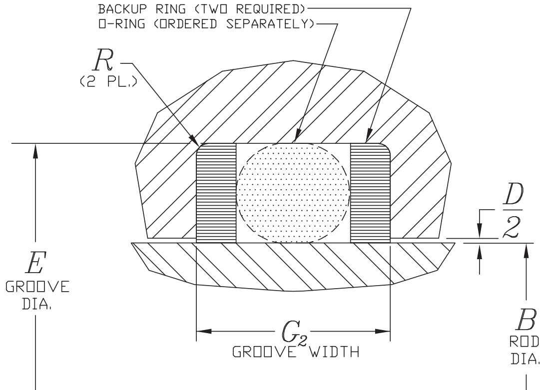
1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR SCARF-CUT, INTERNAL BACKUP RINGS IN AS5857 ROD GLANDS.
2. ORDERING EXAMPLE: BG58 L E 214 A T05

BACKUP RING, SCARF-CUT, INTERNAL DESIGNATOR
DESIGN CHARACTERISTICS
L = TRELLEBORG SEALING SOLUTIONS DESIGN
GLAND DESIGNATOR
E = AS5857 GLAND STANDARD
SIZE DESIGNATOR
ACCORDING TO AS5857
QUALITY INDEX:
A= AEROSPACE CERTIFICATE OF CONFORMANCE
TURCON® BACKUP RING MAT'L. CODE
CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE
DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

3. FOR SOLID, INTERNAL BACKUP RINGS, PLEASE REFERENCE TRELLEBORG SEALING SOLUTIONS PART NUMBER BU58LE000.



ROD SEAL INSTALLATION
FOR ONE BACKUP WIDTH GLANDS PER AS5857



ROD SEAL INSTALLATION
FOR TWO BACKUP WIDTH GLANDS PER AS5857

INCH
2011_8
TRELLEBORG
SEALING SOLUTIONS
TITLE
BACKUP RING, SCARF-CUT, INTERNAL
DRAWING NO.
BG58LE000

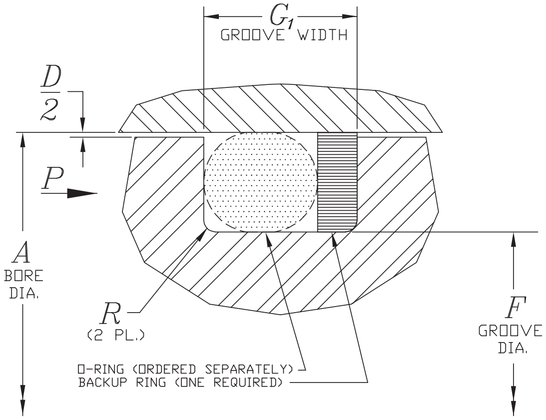
WORLD AEROSPACE TITLE BLOCK REV.

Back-up Ring and Stakbak®

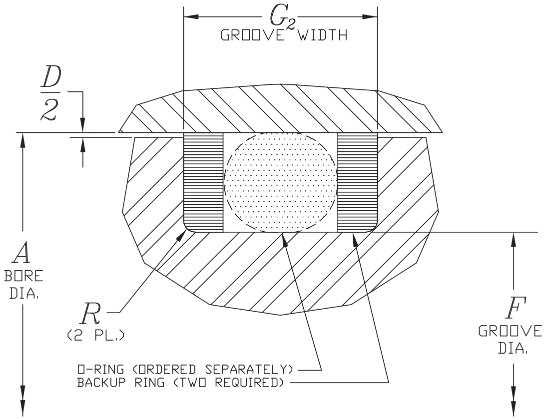
DASH NO.	A DIA.	F DIA.	O-RING NO.
	+.001 -.000	+.000 -.001	
004	.185	.078	004
005	.217	.110	005
006	.230	.123	006
007	.261	.154	007
008	.293	.186	008
009	.326	.219	009
010	.357	.250	010
011	.420	.313	011
012	.485	.378	012
	+.002 -.000	+.000 -.002	
013	.550	.443	013
014	.613	.506	014
015	.675	.568	015
016	.738	.631	016
017	.800	.693	017
018	.863	.756	018
019	.925	.818	019
020	.991	.884	020
021	1.053	.946	021
022	1.116	1.009	022
023	1.178	1.071	023
024	1.241	1.134	024
025	1.303	1.196	025
026	1.366	1.259	026
027	1.428	1.321	027
028	1.491	1.384	028
	+.001 -.000	+.000 -.001	
104	.286	.121	104
105	.317	.152	105
106	.349	.184	106
107	.382	.217	107
108	.414	.249	108
109	.477	.312	109
	+.002 -.000	+.000 -.002	
110	.541	.377	110
111	.604	.440	111
112	.668	.504	112
113	.734	.570	113
114	.800	.636	114
115	.863	.699	115
116	.925	.761	116
117	.991	.827	117
118	1.053	.889	118
119	1.116	.952	119
120	1.178	1.014	120
121	1.241	1.077	121
122	1.303	1.139	122
123	1.366	1.202	123
124	1.428	1.264	124
125	1.491	1.327	125
126	1.553	1.389	126
127	1.616	1.452	127
128	1.678	1.514	128
129	1.741	1.577	129
130	1.805	1.641	130
131	1.867	1.703	131
132	1.930	1.766	132
133	1.992	1.828	133
134	2.055	1.891	134
135	2.118	1.954	135
136	2.180	2.016	136
137	2.243	2.079	137
138	2.305	2.141	138
139	2.368	2.204	139

DASH NO.	A DIA.	F DIA.	O-RING NO.
	+.002 -.000	+.000 -.002	
210	.991	.767	210
211	1.053	.829	211
212	1.116	.892	212
213	1.178	.954	213
214	1.241	1.017	214
215	1.303	1.079	215
216	1.366	1.142	216
217	1.428	1.204	217
218	1.491	1.267	218
219	1.553	1.329	219
220	1.616	1.392	220
221	1.678	1.454	221
222	1.741	1.517	222
223	1.867	1.643	223
224	1.992	1.768	224
225	2.118	1.894	225
226	2.243	2.019	226
227	2.368	2.144	227
228	2.493	2.269	228
229	2.618	2.394	229
230	2.743	2.519	230
	+.002 -.000	+.000 -.002	
325	1.867	1.523	325
326	1.992	1.648	326
327	2.118	1.774	327
328	2.243	1.899	328
329	2.368	2.024	329
330	2.493	2.149	330
331	2.618	2.274	331
332	2.743	2.399	332
333	2.868	2.524	333
334	2.993	2.649	334
335	3.118	2.774	335
336	3.243	2.899	336
337	3.368	3.024	337
338	3.493	3.149	338
339	3.618	3.274	339
340	3.743	3.399	340
341	3.868	3.524	341
342	3.993	3.649	342
343	4.118	3.774	343
344	4.243	3.899	344
345	4.368	4.024	345
346	4.493	4.149	346
347	4.618	4.274	347
348	4.743	4.399	348
349	4.868	4.524	349
	+.003 -.000	+.000 -.003	
425	4.974	4.519	425
426	5.099	4.644	426
427	5.224	4.769	427
428	5.349	4.894	428
429	5.474	5.019	429
430	5.599	5.144	430
431	5.724	5.269	431
432	5.849	5.394	432
433	5.974	5.519	433
434	6.099	5.644	434
435	6.224	5.769	435
436	6.349	5.894	436
437	6.474	6.019	437

DASH NO.	G_1 ONE BACKUP WIDTH	G_2 TWO BACKUP WIDTH	R RADIUS	D DIAMETRAL CLEARANCE MAX.
004-007	.174/.184	.230/.240	.005/.015	.004
008-012	.164/.174	.220/.230		.004
013-028				.005
104-109	.210/.220	.275/.285	.005/.015	.004
110-129	.200/.210	.265/.275		.005
130-140				.006
210-222	.250/.260	.320/.330	.010/.025	.005
223-227				.006
228-230				.007
325-329	.360/.370	.455/.465	.020/.035	.006
330-345				.007
346-349				.008
425-437	.475/.485	.610/.620	.020/.035	.009



BACKUP RING INSTALLATION
FOR ONE BACKUP WIDTH GLANDS PER AS5857



BACKUP RING INSTALLATION
FOR TWO BACKUP WIDTH GLANDS PER AS5857

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR SCARF-CUT, EXTERNAL BACKUP RINGS IN AS5857 PISTON GLANDS.

2. ORDERING EXAMPLE: BH58 L E 214 A T05

BACKUP RING, SCARF-CUT, EXTERNAL DESIGNATOR
DESIGN CHARACTERISTICS
L = TRELLEBORG SEALING SOLUTIONS DESIGN
GLAND DESIGNATOR
E = AS5857 GLAND STANDARD
SIZE DESIGNATOR
ACCORDING TO AS5857
QUALITY INDEX:
A = AEROSPACE CERTIFICATE OF CONFORMANCE
TURCON® BACKUP RING MAT'L. CODE
CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

3. FOR SOLID, EXTERNAL BACKUP RINGS, PLEASE REFERENCE TRELLEBORG SEALING SOLUTIONS PART NUMBER BV58LE000.

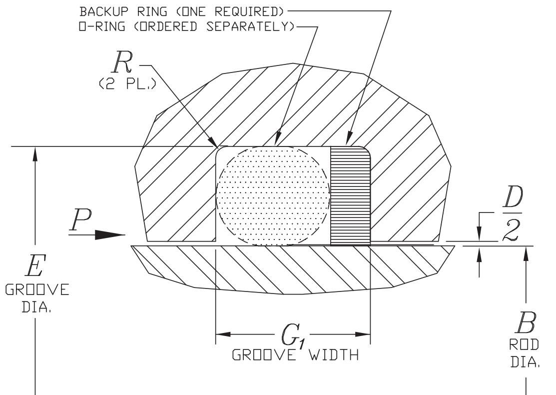
INCH	2011_8
TRELLEBORG SEALING SOLUTIONS	TITLE BACKUP RING, SCARF-CUT, EXTERNAL
	DRAWING NO. BH58LE000

WORLD AEROSPACE TITLE BLOCK REV.

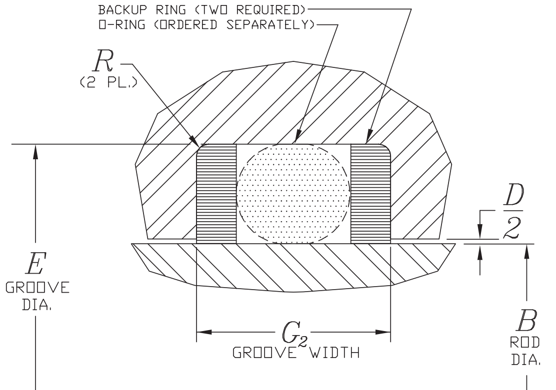
Back-up Ring and Stakbak®

DASH NO.	*B* DIA.	*E* DIA.	O-RING NO.
	+.000 -.001	+.001 -.000	
004	.076	.184	004
005	.108	.216	005
006	.123	.231	006
007	.154	.262	007
008	.185	.293	008
009	.217	.325	009
010	.248	.356	010
011	.310	.418	011
012	.373	.481	012
	+.000 -.002	+.002 -.000	
013	.435	.543	013
014	.498	.606	014
015	.560	.668	015
016	.623	.731	016
017	.685	.793	017
018	.748	.856	018
019	.810	.918	019
020	.873	.981	020
021	.935	1.043	021
022	.998	1.106	022
023	1.060	1.168	023
024	1.123	1.231	024
025	1.185	1.293	025
026	1.248	1.356	026
027	1.310	1.418	027
028	1.373	1.481	028
	+.000 -.001	+.001 -.000	
104	.123	.288	104
105	.154	.319	105
106	.185	.350	106
107	.217	.382	107
108	.248	.413	108
109	.310	.475	109
	+.000 -.002	+.002 -.000	
110	.373	.538	110
111	.435	.600	111
112	.498	.663	112
113	.560	.725	113
114	.623	.788	114
115	.685	.850	115
116	.748	.913	116
117	.810	.975	117
118	.873	1.038	118
119	.935	1.100	119
120	.998	1.163	120
121	1.060	1.225	121
122	1.123	1.228	122
123	1.185	1.350	123
124	1.248	1.413	124
125	1.310	1.475	125
126	1.373	1.538	126
127	1.435	1.600	127
128	1.498	1.663	128
129	1.560	1.725	129
130	1.623	1.788	130
131	1.685	1.850	131
132	1.748	1.913	132
133	1.810	1.975	133
134	1.873	2.038	134
135	1.936	2.101	135
136	1.998	2.163	136
137	2.061	2.226	137
138	2.123	2.288	138
139	2.186	2.351	139
140	2.248	2.413	140
141	2.311	2.476	141
142	2.373	2.538	142
143	2.436	2.601	143
144	2.498	2.663	144
145	2.561	2.726	145
146	2.623	2.788	146
147	2.686	2.851	147
148	2.748	2.913	148
149	2.811	2.976	149
	+.000 -.002	+.002 -.000	
210	.748	.974	210
211	.810	1.036	211
212	.873	1.099	212
213	.935	1.161	213
214	.998	1.224	214
215	1.060	1.286	215
216	1.123	1.349	216
217	1.185	1.411	217
218	1.248	1.474	218
219	1.310	1.536	219
220	1.373	1.599	220
221	1.435	1.661	221
222	1.498	1.724	222
223	1.623	1.849	223
224	1.748	1.974	224
225	1.873	2.099	225
226	1.998	2.224	226
227	2.123	2.349	227
228	2.248	2.474	228
229	2.373	2.599	229
230	2.498	2.724	230
231	2.623	2.849	231
232	2.748	2.974	232
233	2.873	3.099	233
234	2.997	3.223	234
235	3.122	3.348	235
236	3.247	3.473	236
237	3.372	3.598	237
238	3.497	3.723	238
239	3.622	3.848	239
240	3.747	3.973	240
241	3.872	4.098	241
242	3.997	4.223	242
243	4.122	4.348	243
244	4.247	4.473	244
245	4.372	4.598	245
246	4.497	4.723	246
247	4.622	4.848	247
	+.000 -.002	+.002 -.000	
325	1.498	1.846	325
326	1.623	1.971	326
327	1.748	2.096	327
328	1.873	2.221	328
329	1.998	2.346	329
330	2.123	2.471	330
331	2.248	2.596	331
332	2.373	2.721	332
333	2.498	2.846	333
334	2.623	2.971	334
335	2.748	3.096	335
336	2.873	3.221	336
337	2.997	3.345	337
338	3.122	3.470	338
339	3.247	3.595	339
340	3.372	3.720	340
341	3.497	3.845	341
342	3.622	3.970	342
343	3.747	4.095	343
344	3.872	4.220	344
345	3.997	4.345	345
346	4.122	4.470	346
347	4.247	4.595	347
348	4.372	4.720	348
349	4.497	4.845	349
	+.000 -.003	+.003 -.000	
425	4.497	4.956	425
426	4.622	5.081	426
427	4.747	5.206	427
428	4.872	5.331	428
429	4.997	5.456	429
430	5.122	5.581	430
431	5.247	5.706	431
432	5.372	5.831	432
433	5.497	5.956	433
434	5.622	6.081	434
	+.000 -.003	+.003 -.000	
435	5.747	6.206	435
436	5.872	6.331	436
437	5.997	6.456	437
438	6.247	6.706	438
439	6.497	6.956	439
440	6.747	7.206	440
441	6.997	7.456	441
442	7.247	7.706	442
443	7.497	7.956	443
444	7.747	8.206	444
445	7.997	8.456	445
446	8.497	8.956	446
	+.000 -.003	+.004 -.000	
447	8.997	9.456	447
448	9.497	9.956	448
449	9.997	10.456	449
450	10.497	10.956	450
451	10.997	11.456	451
452	11.497	11.956	452
453	11.997	12.456	453
454	12.497	12.956	454
455	12.997	13.456	455
456	13.497	13.956	456
457	13.997	14.456	457
458	14.497	14.956	458
459	14.997	15.456	459
460	15.497	15.956	460

DASH NO.	G_1 ONE BACKUP WIDTH	G_2 TWO BACKUP WIDTH	*R* RADIUS	*D* DIAMETRAL CLEARANCE MAX.
004-007	.174/.184	.230/.240	.005/.015	.004
008-012	.164/.174	.220/.230		.004
013-028				.005
104-109	.210/.220	.275/.285	.005/.015	.004
110-126	.200/.210	.265/.275		.005
127-129				.006
130-132				.006
133-140				.007
141-149				.007
210-222	.250/.260	.320/.330	.010/.025	.005
223-224				.006
225-227				.007
228-243				.007
244-245				.007
246-247				.008
325-327	.360/.370	.455/.465	.020/.035	.006
328-329				.007
330-345				.007
346-349				.007
425-438	.475/.485	.610/.620	.020/.035	.009
439-445				.010
446				.010
447-460				.010



ROD SEAL INSTALLATION
FOR ONE BACKUP WIDTH GLANDS PER AS5857



ROD SEAL INSTALLATION
FOR TWO BACKUP WIDTH GLANDS PER AS5857

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR SOLID, INTERNAL BACKUP RINGS IN AS5857 ROD GLANDS.
2. ORDERING EXAMPLE: BU58 L E 214 A T05

   BACKUP RING, SOLID, INTERNAL DESIGNATOR
   DESIGN CHARACTERISTICS
     L = TRELLEBORG SEALING SOLUTIONS DESIGN
   GLAND DESIGNATOR
     E = AS5857 GLAND STANDARD
   SIZE DESIGNATOR
     ACCORDING TO AS5857
   QUALITY INDEX:
     A = AEROSPACE CERTIFICATE OF CONFORMANCE
   TURCON® BACKUP RING MAT'L. CODE
   CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE
   FOR A WIDE RANGE OF MATERIALS.
3. FOR SCARF-CUT INTERNAL BACKUP RINGS, PLEASE REFERENCE TRELLEBORG SEALING SOLUTIONS PART NUMBER BG58LE000.

INCH
2009_1
TITLE
BACKUP RING, SOLID, INTERNAL
TRELLEBORG
SEALING SOLUTIONS
DRAWING NO.
BU58LE000

WORLD AEROSPACE TITLE BLOCK REV.

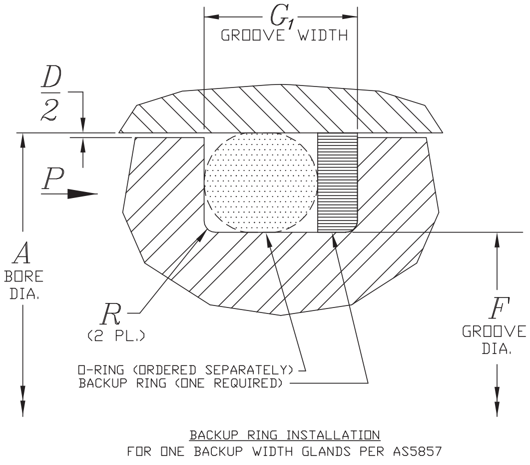
Back-up Ring and Stakbak®

DASH NO.	A DIA.	F DIA.	O-RING NO.
	+.001 -.000	+.000 -.001	
004	.185	.078	004
005	.217	.110	005
006	.230	.123	006
007	.261	.154	007
008	.293	.186	008
009	.326	.219	009
010	.357	.250	010
011	.420	.313	011
012	.485	.378	012
	+.002 -.000	+.000 -.002	
013	.550	.443	013
014	.613	.506	014
015	.675	.568	015
016	.738	.631	016
017	.800	.693	017
018	.863	.756	018
019	.925	.818	019
020	.991	.884	020
021	1.053	.946	021
022	1.116	1.009	022
023	1.178	1.071	023
024	1.241	1.134	024
025	1.303	1.196	025
026	1.366	1.259	026
027	1.428	1.321	027
028	1.491	1.384	028
	+.001 -.000	+.000 -.001	
104	.286	.121	104
105	.317	.152	105
106	.349	.184	106
107	.382	.217	107
108	.414	.249	108
109	.477	.312	109
	+.002 -.000	+.000 -.002	
110	.541	.377	110
111	.604	.440	111
112	.668	.504	112
113	.734	.570	113
114	.800	.636	114
115	.863	.699	115
116	.925	.761	116
117	.991	.827	117
118	1.053	.889	118
119	1.116	.952	119
120	1.178	1.014	120
121	1.241	1.077	121
122	1.303	1.139	122
123	1.366	1.202	123
124	1.428	1.264	124
125	1.491	1.327	125
126	1.553	1.389	126
127	1.616	1.452	127
128	1.678	1.514	128
129	1.741	1.577	129
130	1.805	1.641	130
131	1.867	1.703	131
132	1.930	1.766	132
133	1.992	1.828	133
134	2.055	1.891	134
135	2.118	1.954	135
136	2.180	2.016	136
137	2.243	2.079	137
138	2.305	2.141	138
139	2.368	2.204	139
140	2.430	2.266	140
141	2.493	2.329	141
142	2.555	2.391	142
143	2.618	2.454	143
144	2.680	2.516	144
145	2.743	2.579	145
146	2.805	2.641	146
147	2.868	2.704	147
148	2.930	2.766	148
149	2.993	2.829	149

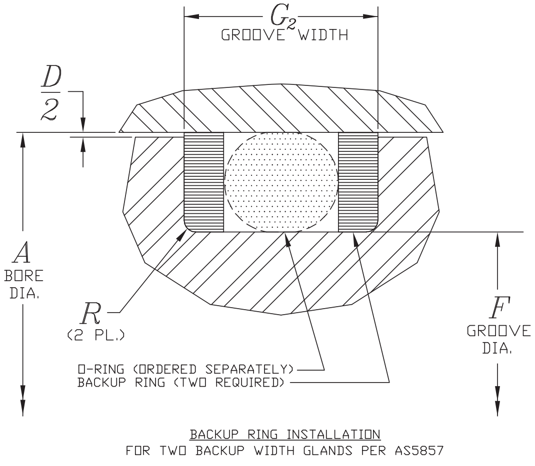
DASH NO.	A DIA.	F DIA.	O-RING NO.
	+.002 -.000	+.000 -.002	
210	.991	.767	210
211	1.053	.829	211
212	1.116	.892	212
213	1.178	.954	213
214	1.241	1.017	214
215	1.303	1.079	215
216	1.366	1.142	216
217	1.428	1.204	217
218	1.491	1.267	218
219	1.553	1.329	219
220	1.616	1.392	220
221	1.678	1.454	221
222	1.741	1.517	222
223	1.867	1.643	223
224	1.992	1.768	224
225	2.118	1.894	225
226	2.243	2.019	226
227	2.368	2.144	227
228	2.493	2.269	228
229	2.618	2.394	229
230	2.743	2.519	230
231	2.868	2.644	231
232	2.993	2.769	232
233	3.118	2.894	233
234	3.243	3.019	234
235	3.368	3.144	235
236	3.493	3.269	236
237	3.618	3.394	237
238	3.743	3.519	238
239	3.868	3.644	239
240	3.993	3.769	240
241	4.118	3.894	241
242	4.243	4.019	242
243	4.368	4.144	243
244	4.493	4.269	244
245	4.618	4.394	245
246	4.743	4.519	246
247	4.868	4.644	247
	+.002 -.000	+.000 -.002	
325	1.867	1.523	325
326	1.992	1.648	326
327	2.118	1.774	327
328	2.243	1.899	328
329	2.368	2.024	329
330	2.493	2.149	330
331	2.618	2.274	331
332	2.743	2.399	332
333	2.868	2.524	333
334	2.993	2.649	334
335	3.118	2.774	335
336	3.243	2.899	336
337	3.368	3.024	337
338	3.493	3.149	338
339	3.618	3.274	339
340	3.743	3.399	340
341	3.868	3.524	341
342	3.993	3.649	342
343	4.118	3.774	343
344	4.243	3.899	344
345	4.368	4.024	345
346	4.493	4.149	346
347	4.618	4.274	347
348	4.743	4.399	348
349	4.868	4.524	349
	+.003 -.000	+.000 -.003	
425	4.974	4.519	425
426	5.099	4.644	426
427	5.224	4.769	427
428	5.349	4.894	428
429	5.474	5.019	429
430	5.599	5.144	430
431	5.724	5.269	431
432	5.849	5.394	432
433	5.974	5.519	433
434	6.099	5.644	434

DASH NO.	A DIA.	F DIA.	O-RING NO.
	+.003 -.000	+.000 -.003	
435	6.224	5.769	435
436	6.349	5.894	436
437	6.474	6.019	437
438	6.724	6.269	438
439	6.974	6.519	439
440	7.224	6.769	440
441	7.474	7.019	441
442	7.724	7.269	442
443	7.974	7.519	443
444	8.224	7.769	444
445	8.474	8.019	445
446	8.974	8.519	446
	+.004 -.000	+.000 -.003	
447	9.474	9.020	447
448	9.974	9.520	448
449	10.474	10.020	449
450	10.974	10.520	450
451	11.474	11.020	451
452	11.974	11.520	452
453	12.474	12.020	453
454	12.974	12.520	454
455	13.474	13.020	455
456	13.974	13.520	456
457	14.474	14.020	457
458	14.974	14.520	458
459	15.474	15.020	459
460	15.974	15.520	460

DASH NO.	G_1 ONE BACKUP WIDTH	G_2 TWO BACKUP WIDTH	R RADIUS	D DIAMETRAL CLEARANCE MAX.
004-007	.174/.184	.230/.240	.005/.015	.004
008-012	.164/.174	.220/.230		.004
013-028				.005
104-109	.210/.220	.275/.285	.005/.015	.004
110-129	.200/.210	.265/.275		.005
130-140				.006
141-149				.007
210-222	.250/.260	.320/.330	.010/.025	.005
223-227				.006
228-243				.007
244-247				.008
325-329	.360/.370	.455/.465	.020/.035	.006
330-345				.007
346-349				.008
425-445	.475/.485	.610/.620	.020/.035	.009
446				.010
447-460				.011



BACKUP RING INSTALLATION
FOR ONE BACKUP WIDTH GLANDS PER AS5857



BACKUP RING INSTALLATION
FOR TWO BACKUP WIDTH GLANDS PER AS5857

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR SOLID, EXTERNAL BACKUP RINGS IN AS5857 PISTON GLANDS.
2. ORDERING EXAMPLE: BV58 L E 214 A T05

   BACKUP RING, SOLID, EXTERNAL DESIGNATOR
   DESIGN CHARACTERISTICS
   L = TRELLEBORG SEALING SOLUTIONS DESIGN
   GLAND DESIGNATOR
   E = AS5857 GLAND STANDARD
   SIZE DESIGNATOR
   ACCORDING TO AS5857
   QUALITY INDEX:
   A = AEROSPACE CERTIFICATE OF CONFORMANCE
   TURCON® BACKUP RING MAT'L. CODE
   CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.
3. FOR SCARF-CUT, EXTERNAL BACKUP RINGS , PLEASE REFERENCE TRELLEBORG SEALING SOLUTIONS PART NUMBER BH58LE000.

INCH
2009_1
TRELLEBORG
SEALING SOLUTIONS
TITLE
BACKUP RING, SOLID, EXTERNAL
DRAWING NO.
BV58LE000

WORLD AEROSPACE TITLE BLOCK REV.

Seals for AS4716
Rod and bore sizes only

Features and benefits

- Suitable for demanding dynamic applications
- Very low friction
- Wide operating temperature range
- Fits into narrow grooves
- Excellent chemical resistance
- React to pressure changes very quickly
- Low hysteresis
- Sealing characteristics remain constant over time
- Easy installation
- Available for AS4716 bore diameters from -112 to -447
- Bidirectional seal

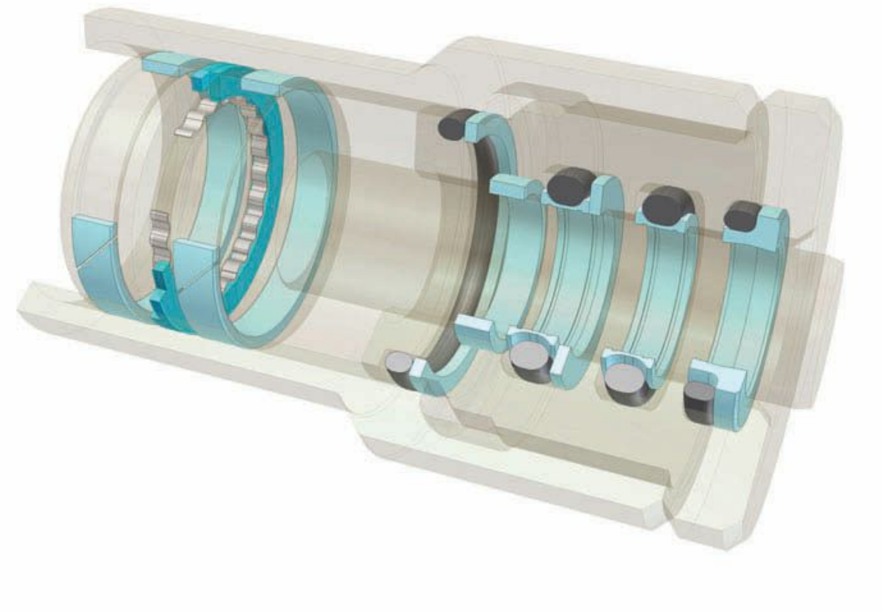


Illustration shows typical hydraulic cylinder with a sealing configuration incorporating Turcon® Dual Piston Ring.

Description

Turcon® Dual Piston Ring consists of two Turcon® rings, each with a step-cut. These rings are activated by a wave-shaped Stainless Steel expander. On the inside of the Turcon® rings there is a small notch into which a tab on the springs fits. This prevents the rings from rotating relative to each other. When installed correctly the step-cuts of the two rings will be separated by 180 degrees.

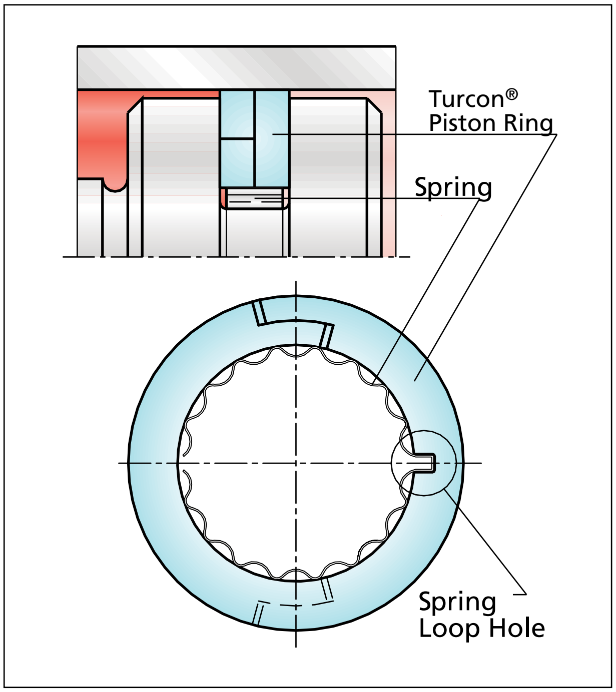


Figure 1 Turcon® Dual Piston Ring

Method of Operation

With zero or low system pressure, the two Turcon® rings of the Turcon® Dual Piston Ring are kept in contact with the bore by spring force. As the system pressure increases it acts on the side and inner diameter of the rings, forcing them against the bore.

Groove and ring width tolerances are very tight. This means that the Turcon® Dual Piston Ring can be made to fit the sealing groove closely. The seal will therefore react to pressure changes very quickly. Fly-by-wire flight controls, where minimum hysteresis is important, use this feature to its full extent.

The narrow seal design provides low friction in comparison to other seals for groove widths per AS4716. The use of metal expanders allows for a broader operating temperature range and improves the chemical resistance of the assembly. With no elastomer element, it also means that sealing characteristics remain constant over time.

The surface finish of the groove sidewalls is an integral part of sealing performance. It should be controlled within an average roughness range of 12 – 24 µin/ 0.4 to 0.8 µm to achieve optimum performance from the interface.

Technical Data

Operation pressure:	Up to 5,000 psi / 35 MPa for standard design Special versions are available for higher pressures
Speed:	Up to 49 ft/s/ 15 m/s
Temperature range:	-94°F to +500°F/ -70°C to +260°C Special versions are available that can operate in higher temperatures
Clearance:	As per AS4716
Media:	Compatible with virtually all media and gases At high temperatures and pressures the seal can operate at the upper speed level

Avoid combining extreme limits.

To provide greater strength in demanding dynamic applications, an insert can be added to the anti-rotation tab (a.r.t.). This option can be ordered by inserting a K in the fifth character of the part number.

Spring materials

The standard spring material is 17-7 PH Stainless Steel condition CH900, spring code PH. This will be supplied if the spring code is omitted.

Other spring materials are 17-7 PH Stainless Steel condition C, spring code CC and Stainless Steel 301 per AMS 5519, fully hard, spring code SS.

Series

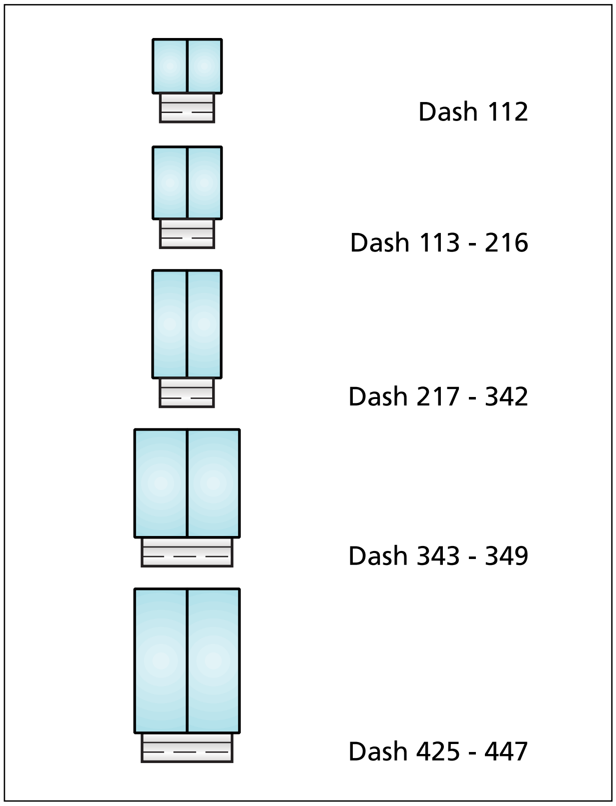
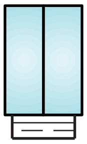


Figure 2 Relative size of Turcon® Dual Piston Ring cross section

Table I Turcon® Dual Piston Ring

Cross Section	Description	Part Number	Gland Standard
	**Dual Piston Ring Set**	PF52_	**TSS Gland** Bore per AS4716

Turcon® Dual Piston Ring

DASH NO.	*A* DIA.	*F* DIA.
	+.002 −.000	+.004 −.004
112	.675	.429
113	.738	.428
114	.800	.490
115	.863	.553
116	.925	.615
210	.991	.681
211	1.053	.743
212	1.116	.806
213	1.178	.868
214	1.241	.931
215	1.303	.993
216	1.366	1.056
217	1.428	.994
218	1.491	1.057
219	1.553	1.119
220	1.616	1.182
221	1.678	1.244
222	1.741	1.307
325	1.867	1.433
326	1.992	1.558
327	2.118	1.684
328	2.243	1.809
329	2.368	1.934
330	2.493	2.059
331	2.618	2.184
332	2.743	2.309
333	2.868	2.434
334	2.993	2.559
335	3.118	2.684
336	3.243	2.809
337	3.368	2.934
338	3.493	3.059
339	3.618	3.184
340	3.743	3.309
341	3.868	3.434
342	3.993	3.559
343	4.118	3.558
344	4.243	3.683
345	4.368	3.808
346	4.493	3.933
347	4.618	4.058
348	4.743	4.183
349	4.868	4.308
	+.003 −.000	+.004 −.004
425	4.974	4.414
426	5.099	4.539
427	5.224	4.664
428	5.349	4.789
429	5.474	4.914
430	5.599	5.039
431	5.724	5.164
432	5.849	5.289
433	5.974	5.414
434	6.099	5.539
435	6.224	5.664
436	6.349	5.789
437	6.474	5.914
438	6.724	6.164
439	6.974	6.414
440	7.224	6.664
441	7.474	6.914
442	7.724	7.164
443	7.974	7.414
444	8.224	7.664
445	8.474	7.914
446	8.974	8.414
447	9.474	8.914

DASH NO.	G_0 ZERO BACKUP WIDTH	*R* RADIUS	*D* DIAMETRAL CLEARANCE MAX.
112-334	.125/.127	.010/.020	.005
335-342			.006
343-349			.007
425-447	.188/.190		.008

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR DUAL PISTON RING IN PISTON RING SET GLANDS.

2. ORDERING EXAMPLE: PF52 K B 214 A T05 S

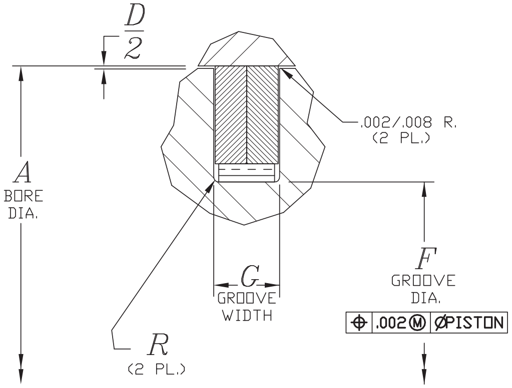
DUAL PISTON RING SET DESIGNATOR
DESIGN OPTIONS
  0 = STANDARD
△3 K = ANTI-ROTATION TAB
GROOVE STANDARD
  B = TRELLEBORG SEALING SOLUTIONS
    GROOVE STANDARD
DASH SIZE
  ACCORDING TO TRELLEBORG SEALING SOLUTIONS
  GLAND STANDARD
QUALITY INDEX:
  A = AEROSPACE CERTIFICATE OF CONFORMANCE
TURCON® PISTON RING MAT'L CODE
STANDARD EXPANDER MAT'L

CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

△3 FOR DEMANDING APPLICATIONS A PTFE INSERT CAN BE ADDED TO THE ANTI-ROTATION TAB (A.R.T.) TO PROVIDE GREATER STRENGTH. THIS OPTION IS RECOMMENDED AND CAN BE ORDERED BY INSERTING A "K" IN THE DESIGN OPTION LOCATION (5TH CHARACTER) OF THE PART NUMBER.

4. BORE DIAMETERS PER AS4716 REVISION A.

5. DASH NUMBERS OF THIS DRAWING CORRESPOND TO DASH NUMBERS OF AS568 UNIFORM DASH NUMBERING SYSTEMS FOR O-RINGS.



PISTON SEAL INSTALLATION
FOR TRELLEBORG SEALING SOLUTIONS PISTON RING SET GLANDS

INCH
2010_7
TITLE
DUAL PISTON RING
TRELLEBORG
SEALING SOLUTIONS
DRAWING NO.
PF520B000

WORLD AEROSPACE TITLE BLOCK REV.

Features and benefits

- High sealing efficiency
- Low wear
- Long service life
- High operational reliability
- Low friction
- Stick-slip-free operation
- Suitable for narrow grooves
- Design flexibility – adaptable for almost all grooves sizes
- Easy installation
- Available for all MIL-G-5514F and AS4716 Rod and Bore diameters
- Custom designs available
- Bidirectional seal

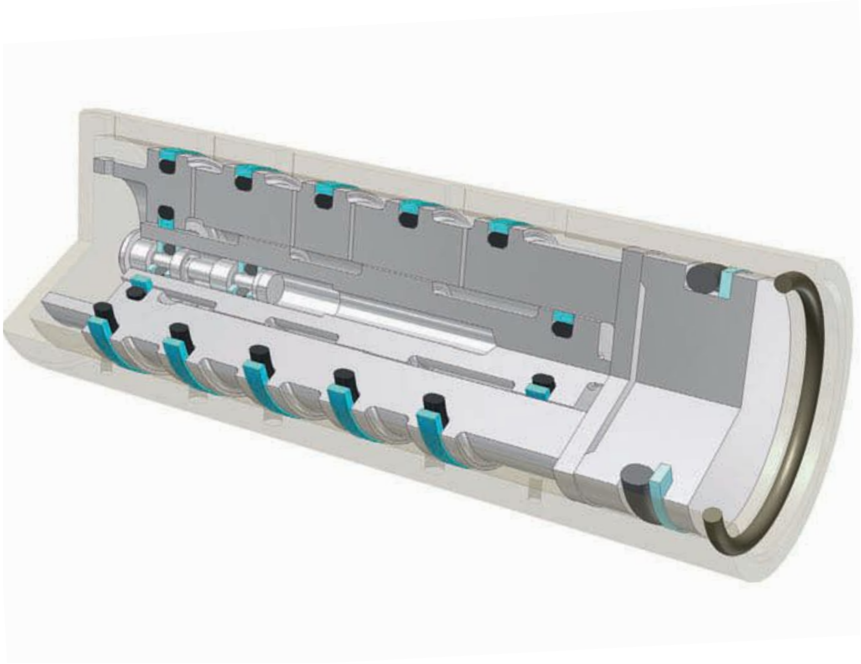


Illustration shows typical hydraulic valve fitted with Turcon® Glyd Ring®.

Turcon® Glyd Ring®

Description

Turcon® Glyd Ring® is a simple and reliable seal consisting of a Turcon® seal cap activated by an elastomer O-Ring.

A full range of sizes is offered to suit all MIL-G-5514F and AS4716 rods and bores. Custom designs are available on request.

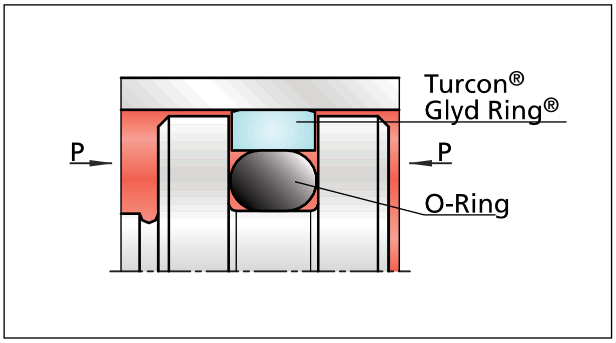


Figure 1 Turcon® Glyd Ring®

Method of Operation

The slight interference fit of Turcon® Glyd Ring® ensures initial contact with the mating surface. A true slipper seal, Turcon® Glyd Ring® is energized by an elastomer O-Ring at zero or low pressure. As the pressure increases, the Turcon® Glyd Ring® is energized by hydraulic pressure, forcing it against the sealing surface. The seal's geometry allows the formation of a lubricating hydro-dynamic oil film under the seal in reciprocating applications. This results in low wear and long service life with high sealing efficiency.

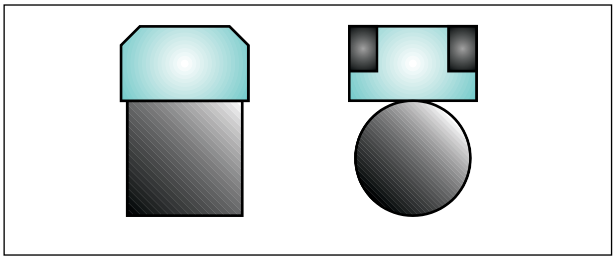


Figure 2 Square-ring energized Glyd Ring®, Turcon® Glyd Ring® CR

Optional Configurations

As mentioned above, the Turcon® Glyd Ring® is versatile and capable of being designed to meet specific application requirements. Some common custom configurations include the Turcon® Glyd Ring® CR and the square-ring energized Glyd Ring®

Notches

Where Turcon® Glyd Ring® is subjected to bidirectional pressure, pressure from both sides alternately, it should always be equipped with sidewall notches. See figure 2. This allows the pressure to properly activate the elastomer. See Figure 3.

Turcon® Glyd Ring® for piston use is equipped as standard with notches. For rod versions notches must be specified if required.

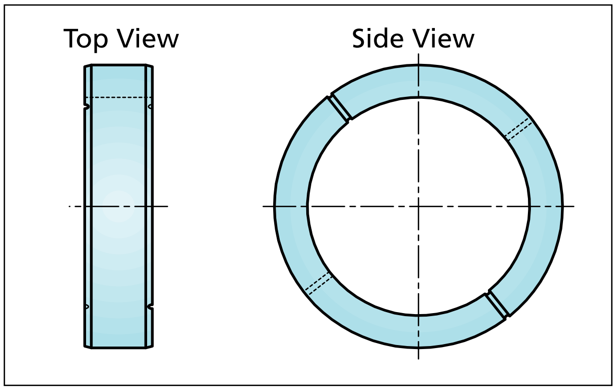


Figure 3 Turcon® Glyd Ring® notches

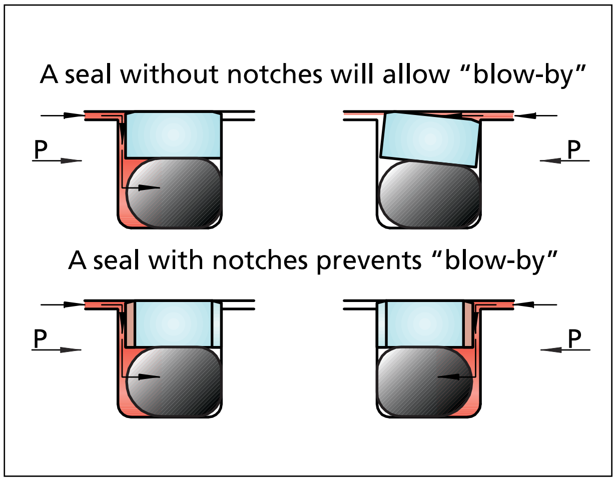


Figure 4 Functioning of Turcon® Glyd Ring® with notches

Using a seal without notches may allow blow-by, where the pressure shoots over the top of the Turcon® Glyd Ring® cap and forces the seal down into the groove. See SAE document AIR 1243 for more information on this topic.

Technical Data

Operation pressure:	5,000 psi/ 35 MPa static 3,000 psi/ 21 MPa dynamic
Speed:	Up to 49.2 ft/s/ 15 m/s for reciprocating movements
Temperature range:	-65°F to +390°F/ -54°C to +200°C depending on elastomer
Clearance:	Per the AS4716 rod and bore clearances
Media:	Mineral oil-based hydraulic fluids, flame-retardant hydraulic fluids, environmentally-safe hydraulic fluids (bio-oils), phosphate ester-based hydraulic oils, water and others depending on the elastomer material selected

Avoid combining extreme limits.

Series

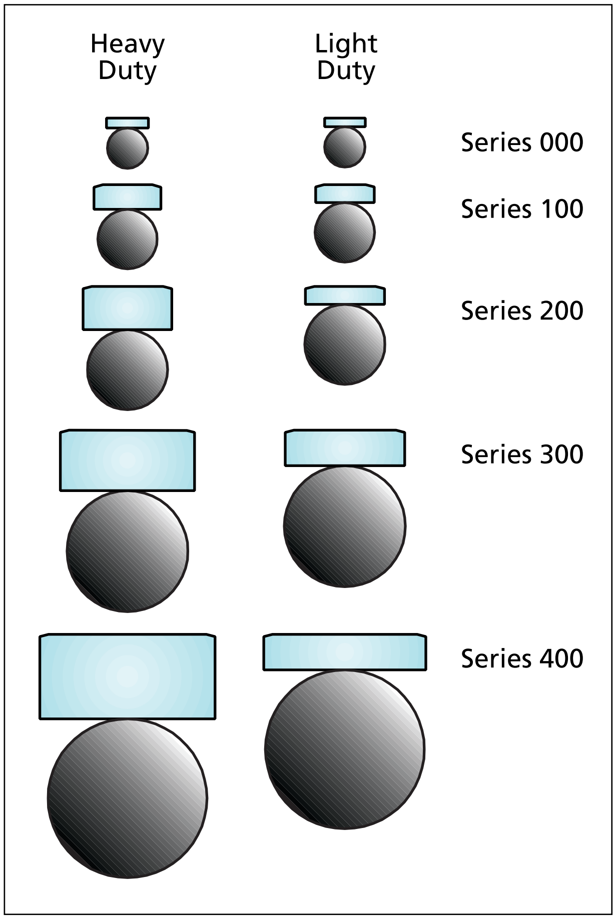
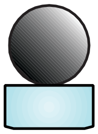
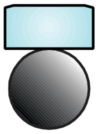
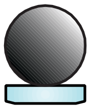
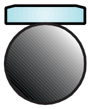


Figure 5 Relative Size of Turcon® Glyd Ring® cross section

Table I Turcon® Glyd Ring® Types

Cross Section	Description	Part Number	Gland Standard
	Series J Rod	RG27_B	TSS Gland Rod per AS4716
	Series J Piston	PG28_B	TSS Gland Piston per AS4716
	Series B Rod	RG66_B	TSS Gland Rod per AS4716
	Series B Piston	PG68_B	TSS Gland Piston per AS4716

Turcon® Glyd Ring®

DASH NO.	*B* DIA.	*E* DIA.	O-RING NO.
	+.000 -.001	+.001 -.000	
006	.123	.259	007
007	.154	.290	008
008	.185	.321	
			009
009	.217	.353	010
010	.248	.422	011
011	.310	.484	012
012	.373	.547	013
	+.000 -.002	+.002 -.000	
013	.435	.609	014
014	.498	.672	015
015	.560	.734	016
016	.623	.797	017
017	.685	.859	018
018	.748	.922	019
019	.810	.984	020
020	.873	1.047	021
021	.935	1.109	022
022	.998	1.172	023
023	1.060	1.234	024
024	1.123	1.297	025
025	1.185	1.359	026
026	1.248	1.422	027
027	1.310	1.484	028
028	1.373	1.547	028
	+.000 -.001	+.001 -.000	
104	.123	.373	105
105	.154	.403	106
106	.185	.435	107
107	.217	.467	108
108	.248	.498	109
109	.310	.560	110
	+.000 -.002	+.002 -.000	
110	.373	.623	111
111	.435	.685	112
112	.498	.748	113
113	.560	.810	114
114	.623	.873	115
115	.685	.935	116
116	.748	.998	117
117	.810	1.060	118
118	.873	1.123	119
119	.935	1.185	120
120	.998	1.248	121
121	1.060	1.310	122
122	1.123	1.373	123
123	1.185	1.435	124
124	1.248	1.498	125
125	1.310	1.560	126
126	1.373	1.623	127
127	1.435	1.685	128
128	1.498	1.748	129
129	1.560	1.810	130
130	1.623	1.873	131
131	1.685	1.935	132
132	1.748	1.998	133
133	1.810	2.060	134
134	1.873	2.123	135
135	1.936	2.186	136
136	1.998	2.248	137
137	2.061	2.311	138
138	2.123	2.373	139
139	2.186	2.436	140
140	2.248	2.498	141
141	2.311	2.561	142
142	2.373	2.623	143
143	2.436	2.686	144
144	2.498	2.748	145
145	2.561	2.811	146
146	2.623	2.873	147
147	2.686	2.936	148
148	2.748	2.998	149
149	2.811	3.061	150

DASH NO.	*B* DIA.	*E* DIA.	O-RING NO.
	+.000 -.002	+.002 -.000	
210	.748	1.122	212
211	.810	1.184	213
212	.873	1.247	214
213	.935	1.309	215
214	.998	1.372	216
215	1.060	1.434	217
216	1.123	1.497	218
217	1.185	1.559	219
218	1.248	1.622	220
219	1.310	1.684	221
220	1.373	1.747	222
221	1.435	1.809	222
222	1.498	1.872	223
223	1.623	1.997	224
224	1.748	2.122	225
225	1.873	2.247	226
226	1.998	2.372	227
227	2.123	2.497	228
228	2.248	2.622	229
229	2.373	2.747	230
230	2.498	2.872	231
231	2.623	2.997	232
232	2.748	3.122	233
233	2.873	3.247	234
234	2.997	3.371	235
235	3.122	3.496	236
236	3.247	3.621	237
237	3.372	3.746	238
238	3.497	3.871	239
239	3.622	3.996	240
240	3.747	4.121	241
241	3.872	4.246	242
242	3.997	4.371	243
243	4.122	4.496	244
244	4.247	4.621	245
245	4.372	4.746	246
246	4.497	4.871	247
247	4.622	4.996	248
	+.000 -.002	+.002 -.000	
325	1.498	2.052	326
326	1.623	2.177	327
327	1.748	2.302	328
328	1.873	2.427	329
329	1.998	2.552	330
330	2.123	2.677	331
331	2.248	2.802	332
332	2.373	2.927	333
333	2.498	3.052	334
334	2.623	3.177	335
335	2.748	3.302	336
336	2.873	3.427	337
337	2.997	3.551	338
338	3.122	3.676	339
339	3.247	3.801	340
340	3.372	3.926	341
341	3.497	4.051	342
342	3.622	4.176	343
343	3.747	4.301	344
344	3.872	4.426	345
345	3.997	4.551	346
346	4.122	4.676	347
347	4.247	4.801	348
348	4.372	4.926	349
349	4.497	5.051	350
	+.000 -.003	+.003 -.000	
425	4.497	5.247	427
426	4.622	5.372	428
427	4.747	5.497	429
428	4.872	5.622	430
429	4.997	5.747	431
430	5.122	5.872	432
431	5.247	5.997	433
432	5.372	6.122	434
433	5.497	6.247	435
434	5.622	6.372	436

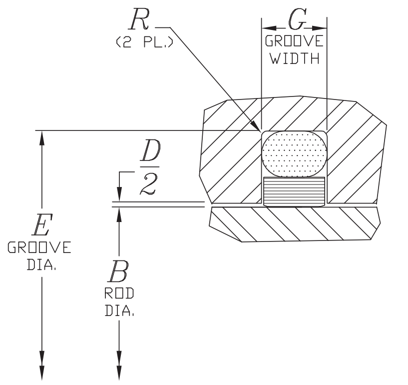
DASH NO.	*B* DIA.	*E* DIA.	O-RING NO.
	+.000 -.003	+.003 -.000	
435	5.747	6.497	437
436	5.872	6.622	437
437	5.997	6.747	438
438	6.247	6.997	439
439	6.497	7.247	440
440	6.747	7.497	441
441	6.997	7.747	442
442	7.247	7.997	443
443	7.497	8.247	444
444	7.747	8.497	445
445	7.997	8.747	445
446	8.497	9.247	446
	+.000 -.003	+.004 -.000	
447	8.997	9.747	447
448	9.497	10.247	448
449	9.997	10.747	449
450	10.497	11.247	450
451	10.997	11.747	451
452	11.497	12.247	452
453	11.997	12.747	453
454	12.497	13.247	454
455	12.997	13.747	455
456	13.497	14.247	456
457	13.997	14.747	457
458	14.497	15.247	458
459	14.997	15.747	459
460	15.497	16.247	460

DASH NO.	*G* GROOVE WIDTH	*R* RADIUS	*D* DIAMETRAL CLEARANCE MAX.
006-009	.081/.086	.005/.015	.004
010-012			.004
013-028			.005
110-126	.126/.131	.005/.015	.005
127-129			.006
130-132			.006
133-140			.007
141-149			.007
210-222	.166/.171	.010/.025	.005
223-224			.006
225-227			.007
228-243			.007
244-245			.007
246-247			.008
325-327	.247/.252	.020/.035	.006
328-329			.007
330-345			.007
346-349			.007
425-438	.320/.325	.020/.035	.009
439-445			.010
446			.010
447-460			.010

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR GLYD RING® IN TRELLEBORG SEALING SOLUTIONS GLYD RING® SERIES J ROD GLANDS.
2. ORDERING EXAMPLE: RG27 0 B 214 A T05 NG

GLYD RING® ROD SERIES NUMBER
DESIGN CODE
0 = STANDARD, WITHOUT NOTCHES
N = TO ADD NOTCHES
GLAND STANDARD
B = TRELLEBORG SEALING SOLUTIONS GLAND STANDARD
SIZE DESIGNATOR
ACCORDING TO TRELLEBORG SEALING SOLUTIONS GLAND STANDARD
QUALITY INDEX:
A = AEROSPACE CERTIFICATE OF CONFORMANCE
TURCON® GLYD RING® MAT'L. CODE
TUREL® O-RING MAT'L. CODE
CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.



ROD SEAL INSTALLATION
FOR TRELLEBORG SEALING SOLUTIONS GLYD RING® SERIES J GLANDS

This uncontrolled document discloses information and data in which the Trelleborg Sealing Solutions has proprietary rights. Neither receipt nor possession thereof confers or transfers any right to reproduce, use or disclose in whole or in part except by written permission from Trelleborg Sealing Solutions. Trelleborg Sealing Solutions cannot be held responsible for printing errors etc.

INCH
2009_1
TRELLEBORG
SEALING SOLUTIONS
TITLE
GLYD RING®
DRAWING NO.
RG270B000

WORLD AEROSPACE TITLE BLOCK REV.

Turcon® Glyd Ring®

DASH NO.	*A* DIA.	*F* DIA.	O-RING NO.
	+.001 −.000	+.000 −.001	
007	.266	.124	006
008	.297	.155	007
009	.329	.187	008
010	.360	.218	009
011	.422	.248	010
012	.485	.311	011
	+.002 −.000	+.000 −.002	
013	.550	.376	012
014	.613	.439	013
015	.675	.501	014
016	.738	.564	015
017	.800	.626	016
018	.863	.689	017
019	.925	.751	018
020	.991	.817	019
021	1.053	.879	020
022	1.116	.942	021
023	1.178	1.004	022
024	1.241	1.067	023
025	1.303	1.129	024
026	1.366	1.192	025
027	1.428	1.254	026
028	1.491	1.317	027
	+.002 −.000	+.000 −.002	
110	.550	.300	109
111	.613	.363	110
112	.675	.425	111
113	.738	.488	112
114	.800	.550	113
115	.863	.613	114
116	.925	.675	115
117	.991	.741	116
118	1.053	.803	117
119	1.116	.866	118
120	1.178	.928	119
121	1.241	.991	120
122	1.303	1.053	121
123	1.366	1.116	122
124	1.428	1.178	123
125	1.491	1.241	124
126	1.553	1.303	125
127	1.616	1.366	126
128	1.678	1.428	127
129	1.741	1.491	128
130	1.805	1.555	129
131	1.867	1.617	130
132	1.930	1.680	131
133	1.992	1.742	132
134	2.055	1.805	133
135	2.118	1.868	134
136	2.180	1.930	135
137	2.243	1.993	136
138	2.305	2.055	137
139	2.368	2.118	138
140	2.430	2.180	139
141	2.493	2.243	140
142	2.555	2.305	141
143	2.618	2.368	142
144	2.680	2.430	143
145	2.743	2.493	144
146	2.805	2.555	145
147	2.868	2.618	146
148	2.930	2.680	147
149	2.993	2.743	148

DASH NO.	*A* DIA.	*F* DIA.	O-RING NO.
	+.002 −.000	+.000 −.002	
210	.991	.617	208
211	1.053	.679	209
212	1.116	.742	210
213	1.178	.804	211
214	1.241	8.67	212
215	1.303	.929	213
216	1.366	.992	214
217	1.428	1.054	215
218	1.491	1.117	216
219	1.553	1.179	217
220	1.616	1.242	218
221	1.678	1.304	219
222	1.741	1.367	220
223	1.867	1.493	222
224	1.992	1.618	223
225	2.118	1.744	224
226	2.243	1.869	225
227	2.368	1.994	226
228	2.493	2.119	227
229	2.618	2.244	228
230	2.743	2.369	229
231	2.868	2.494	230
232	2.993	2.619	231
233	3.118	2.744	232
234	3.243	2.869	233
235	3.368	2.994	234
236	3.493	3.119	235
237	3.618	3.244	236
238	3.743	3.369	237
239	3.868	3.494	238
240	3.993	3.619	239
241	4.118	3.744	240
242	4.243	3.869	241
243	4.368	3.994	242
244	4.493	4.119	243
245	4.618	4.244	244
246	4.743	4.369	245
247	4.868	4.494	246
	+.002 −.000	+.000 −.002	
325	1.867	1.313	323
326	1.992	1.438	324
327	2.118	1.564	325
328	2.243	1.689	326
329	2.368	1.814	327
330	2.493	1.939	328
331	2.618	2.064	329
332	2.743	2.189	330
333	2.868	2.314	331
334	2.993	2.439	332
335	3.118	2.564	333
336	3.243	2.689	334
337	3.368	2.814	335
338	3.493	2.939	336
339	3.618	3.064	337
340	3.743	3.189	338
341	3.868	3.314	339
342	3.993	3.439	340
343	4.118	3.564	341
344	4.243	3.689	342
345	4.368	3.814	343
346	4.493	3.939	344
347	4.618	4.064	345
348	4.743	4.189	346
349	4.868	4.314	347
	+.003 −.000	+.000 −.003	
428	5.349	4.599	425
429	5.474	4.724	426
430	5.599	4.849	427
431	5.724	4.974	428
432	5.849	5.099	429
434	5.974	5.224	430
435	6.099	5.349	431

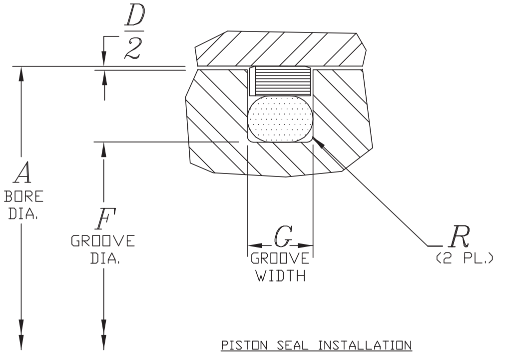
DASH NO.	*A* DIA.	*F* DIA.	O-RING NO.
	+.003 −.000	+.000 −.003	
435	6.224	5.474	432
436	6.349	5.599	433
437	6.474	5.724	434
438	6.724	5.974	436
439	6.974	6.224	437
440	7.224	6.474	438
441	7.474	6.724	439
442	7.724	6.974	440
443	7.974	7.224	441
444	8.224	7.474	443
445	8.474	7.724	443
446	8.974	8.224	445
	+.004 −.000	+.000 −.004	
447	9.474	8.997	447
448	9.974	9.497	448
449	10.474	9.997	449
450	10.974	10.497	450
451	11.474	10.997	451
452	11.974	11.497	452
453	12.474	11.997	453
454	12.974	12.497	454
455	13.474	12.997	455
456	13.974	13.497	456
457	14.474	13.997	457
458	14.974	14.497	458
459	15.474	14.997	459
460	15.974	15.497	460

DASH NO.	*G* GROOVE WIDTH	*R* RADIUS	*D* DIAMETRAL CLEARANCE MAX.
007-009	.081/.086	.005/.015	.004
010-012			.004
013-028			.005
110-126	.126/.131	.005/.015	.005
127-129			.005
130-132			.006
133-140			.006
141-149			.007
210-222	.166/.171	.010/.025	.005
223-224			.006
225-227			.006
228-243			.007
244-245			.008
246-247			.008
325-327	.247/.252	.020/.035	.006
328-329			.006
330-345			.007
346-352			.008
428-438	.320/.330	.020/.035	.009
439-445			.009
446			.010
447-460			.011

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR GLYD RING® IN TRELLEBORG SEALING SOLUTIONS GLYD RING,® SERIES J PISTON GLANDS.
2. ORDERING EXAMPLE: PG28 0 B 214 A T05 NG

GLYD RING® PISTON SERIES NUMBER
DESGIN CODE
  0 = STANDARD, NOTCHED
  W = WITHOUT NOTCHES
GLAND STANDARD
  B = TRELLEBORG SEALING SOLUTIONS
    GLAND STANDARD
SIZE DESIGNATOR
  ACCORDING TO TRELLEBORG SEALING SOLUTIONS
  GLAND STANDARD
QUALITY INDEX:
  A = AEROSPACE CERTIFICATE OF CONFORMANCE
TURCON® GLYD RING® MAT'L. CODE
TUREL® O-RING MAT'L. CODE
CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE
DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.



PISTON SEAL INSTALLATION
FOR TRELLEBORG SEALING SOLUTIONS GLYD RING,® SERIES J GLANDS

INCH
2009_1
TRELLEBORG
SEALING SOLUTIONS
TITLE
GLYD RING®
DRAWING NO.
PG280B000

WORLD AEROSPACE TITLE BLOCK REV.

Turcon® Glyd Ring®

DASH NO.	B DIA.	E DIA.	O-RING NO.
	+.000 −.001	+.001 −.000	
006	.123	.266	007
007	.154	.297	008
008	.185	.329	009
009	.217	.360	010
010	.248	.422	011
011	.310	.485	012
012	.373	.547	013
	+.000 −.002	+.002 −.000	
013	.435	.610	014
014	.498	.672	015
015	.560	.735	016
016	.623	.797	017
017	.685	.860	018
018	.748	.922	019
019	.810	.985	020
020	.873	1.047	021
021	.935	1.110	022
022	.998	1.172	023
023	1.060	1.235	024
024	1.123	1.297	025
025	1.185	1.360	026
026	1.248	1.422	027
027	1.310	1.485	028
028	1.373	1.547	029
	+.000 −.001	+.001 −.000	
104	.123	.363	105
105	.154	.395	106
106	.185	.425	107
107	.217	.458	108
108	.248	.488	109
109	.310	.551	110
	+.000 −.002	+.002 −.000	
110	.373	.613	111
111	.435	.676	112
112	.498	.738	113
113	.560	.801	114
114	.623	.863	115
115	.685	.926	116
116	.748	.988	117
117	.810	1.051	118
118	.873	1.113	119
119	.935	1.176	120
120	.998	1.238	121
121	1.060	1.301	122
122	1.123	1.363	123
123	1.185	1.426	124
124	1.248	1.488	125
125	1.310	1.551	126
126	1.373	1.613	127
127	1.435	1.676	128
128	1.498	1.738	129
129	1.560	1.801	130
130	1.623	1.863	131
131	1.685	1.926	132
132	1.748	1.988	133
133	1.810	2.051	134
134	1.873	2.114	135
135	1.936	2.176	136
136	1.998	2.239	137
137	2.061	2.301	138
138	2.123	2.364	139
139	2.186	2.426	140
140	2.248	2.489	141
141	2.311	2.551	142
142	2.373	2.614	143
143	2.436	2.676	144
144	2.498	2.739	145
145	2.561	2.801	146
146	2.623	2.864	147
147	2.686	2.926	148
148	2.748	2.989	149
149	2.811	3.051	150

DASH NO.	B DIA.	E DIA.	O-RING NO.
	+.000 −.002	+.002 −.000	
210	.748	1.053	211
211	.810	1.116	212
212	.873	1.178	213
213	.935	1.241	214
214	.998	1.303	215
215	1.060	1.366	216
216	1.123	1.428	217
217	1.185	1.491	218
218	1.248	1.553	219
219	1.310	1.616	220
220	1.373	1.678	221
221	1.435	1.741	222
222	1.498	1.866	223
223	1.623	1.991	224
224	1.748	2.116	225
225	1.873	2.241	226
226	1.998	2.366	227
227	2.123	2.491	228
228	2.248	2.616	229
229	2.373	2.741	230
230	2.498	2.866	231
231	2.623	2.991	232
232	2.748	3.116	233
233	2.873	3.241	234
234	2.997	3.365	235
235	3.122	3.490	236
236	3.247	3.621	237
237	3.372	3.740	238
238	3.497	3.865	239
239	3.622	3.990	240
240	3.747	4.115	241
241	3.872	4.240	242
242	3.997	4.365	243
243	4.122	4.490	244
244	4.247	4.615	245
245	4.372	4.740	246
246	4.497	4.865	247
247	4.622	4.990	248
	+.000 −.002	+.002 −.000	
325	1.498	1.995	326
326	1.623	2.120	327
327	1.748	2.245	328
328	1.873	2.370	329
329	1.998	2.495	330
330	2.123	2.620	331
331	2.248	2.745	332
332	2.373	2.870	333
333	2.498	2.995	334
334	2.623	3.120	335
335	2.748	3.245	336
336	2.873	3.369	337
337	2.997	3.494	338
338	3.122	3.619	339
339	3.247	3.744	340
340	3.372	3.869	341
341	3.497	3.994	342
342	3.622	4.119	343
343	3.747	4.244	344
344	3.872	4.369	345
345	3.997	4.494	346
346	4.122	4.619	347
347	4.247	4.744	348
348	4.372	4.869	349
349	4.497	4.994	350

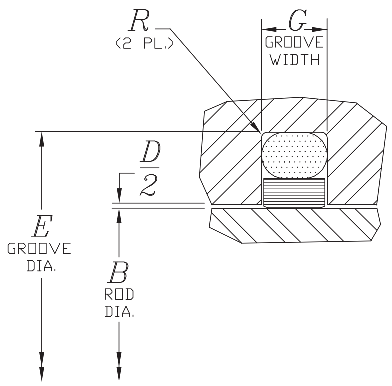
DASH NO.	B DIA.	E DIA.	O-RING NO.
	+.000 −.003	+.003 −.000	
425	4.497	5.099	426
426	4.622	5.224	427
427	4.747	5.349	428
428	4.872	5.474	429
429	4.997	5.599	430
430	5.122	5.724	431
431	5.247	5.849	432
432	5.372	5.974	433
433	5.497	6.099	434
434	5.622	6.224	435
435	5.747	6.349	436
436	5.872	6.474	437

DASH NO.	G GROOVE WIDTH	R RADIUS	D DIAMETRAL CLEARANCE MAX.
006-012	.079/.084	.005/.015	.004
013-028			.005
104-126	.112/.117	.005/.015	.005
127-132			.006
133-149			.007
210-222	.149/.154	.010/.025	.005
223-224			.006
225-245			.007
246-247			.008
325-327	.221/.226	.020/.035	.006
328-349			.007
425-436	.297/.302	.020/.035	.009

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR GLYD RING® IN TRELLEBORG SEALING SOLUTIONS GLYD RING,® SERIES B ROD GLANDS.
2. ORDERING EXAMPLE: RG66 0 B 214 A T05 NG

GLYD RING® ROD SERIES NUMBER
DESGIN CODE
  0 = STANDARD, WITHOUT NOTCHES
  N = TO ADD NOTCHES
GLAND STANDARD
  B = TRELLEBORG SEALING SOLUTIONS
      GLAND STANDARD
SIZE DESIGNATOR
  ACCORDING TO TRELLEBORG SEALING SOLUTIONS
  GLAND STANDARD
QUALITY INDEX:
  A = AEROSPACE CERTIFICATE OF CONFORMANCE
TURCON® GLYD RING® MAT'L. CODE
TUREL® O-RING MAT'L. CODE
CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE
DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.



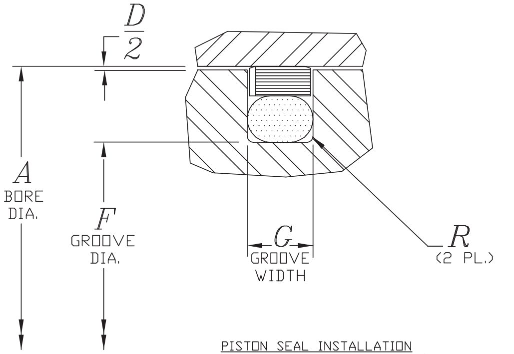
ROD SEAL INSTALLATION
FOR TRELLEBORG SEALING SOLUTIONS GLYD RING,® SERIES B GLANDS

INCH
2009_1
TRELLEBORG
SEALING SOLUTIONS
TITLE
GLYD RING®
DRAWING NO.
RG660B000

WORLD AEROSPACE TITLE BLOCK REV.

DASH NO.	*A* DIA.	*F* DIA.	O-RING NO.
	+.001 -.000	+.000 -.001	
007	.266	.123	006
008	.297	.154	007
009	.329	.185	008
010	.360	.217	009
011	.422	.248	010
012	.485	.310	011
	+.002 -.000	+.000 -.002	
013	.550	.376	012
014	.613	.438	013
015	.675	.501	014
016	.738	.563	015
017	.800	.626	016
018	.863	.688	017
019	.925	.751	018
020	.991	.816	019
021	1.053	.879	020
022	1.116	.941	021
023	1.178	1.004	022
024	1.241	1.066	023
025	1.303	1.129	024
026	1.366	1.191	025
027	1.428	1.254	026
028	1.491	1.316	027
	+.002 -.000	+.000 -.002	
110	.550	.310	109
111	.613	.373	110
112	.675	.434	111
113	.738	.498	112
114	.800	.559	113
115	.863	.623	114
116	.925	.684	115
117	.991	.751	116
118	1.053	.812	117
119	1.116	.876	118
120	1.178	.937	119
121	1.241	1.001	120
122	1.303	1.062	121
123	1.366	1.126	122
124	1.428	1.187	123
125	1.491	1.251	124
126	1.553	1.312	125
127	1.616	1.376	126
128	1.678	1.437	127
129	1.741	1.501	128
130	1.805	1.564	129
131	1.867	1.627	130
132	1.930	1.689	131
133	1.992	1.752	132
134	2.055	1.814	133
135	2.118	1.877	134
136	2.180	1.940	135
137	2.243	2.002	136
138	2.305	2.065	137
139	2.368	2.127	138
140	2.430	2.190	139
141	2.493	2.252	140
142	2.555	2.315	141
143	2.618	2.377	142
144	2.680	2.440	143
145	2.743	2.502	144
146	2.805	2.565	145
147	2.868	2.627	146
148	2.930	2.690	147
149	2.993	2.752	148
	+.002 -.000	+.000 -.002	
210	.991	.686	209
211	1.053	.748	210
212	1.116	.810	211
213	1.178	.873	212
214	1.241	.935	213
215	1.303	.998	214
216	1.366	1.060	215
217	1.428	1.123	216
218	1.491	1.185	217
219	1.553	1.248	218
220	1.616	1.310	219
221	1.678	1.373	220
222	1.741	1.435	221
223	1.867	1.499	222
224	1.992	1.624	223
225	2.118	1.750	224
226	2.243	1.875	225
227	2.368	2.000	226
228	2.493	2.125	227
229	2.618	2.250	228
230	2.743	2.375	229
231	2.868	2.500	230
232	2.993	2.625	231
233	3.118	2.750	232
234	3.243	2.875	233
235	3.368	3.000	234
236	3.493	3.125	235
237	3.618	3.250	236
238	3.743	3.375	237
239	3.868	3.500	238
240	3.993	3.625	239
241	4.118	3.750	240
242	4.243	3.875	241
243	4.368	4.000	242
244	4.493	4.125	243
245	4.618	4.250	244
246	4.743	4.375	245
247	4.868	4.500	246
248	4.993	4.625	247
	+.002 -.000	+.000 -.002	
325	1.867	1.370	324
326	1.992	1.495	325
327	2.118	1.621	326
328	2.243	1.746	327
329	2.368	1.871	328
330	2.493	1.996	329
331	2.618	2.121	330
332	2.743	2.246	331
333	2.868	2.371	332
334	2.993	2.496	333
335	3.118	2.621	334
336	3.243	2.746	335
337	3.368	2.871	336
338	3.493	2.996	337
339	3.618	3.121	338
340	3.743	3.246	339
341	3.868	3.371	340
342	3.993	3.496	341
343	4.118	3.621	342
344	4.243	3.746	343
345	4.368	3.871	344
346	4.493	3.996	345
347	4.618	4.121	346
348	4.743	4.246	347
349	4.868	4.371	348
	+.003 -.000	+.000 -.003	
425	4.974	4.372	424
426	5.099	4.497	425
427	5.224	4.622	426
428	5.349	4.747	427
429	5.474	4.872	428
430	5.599	4.997	429
	+.003 -.000	+.000 -.003	
431	5.724	5.122	430
432	5.849	5.247	431
433	5.974	5.372	432
434	6.099	5.497	433
435	6.222	5.622	434
436	6.349	5.747	435
437	6.474	5.872	436

DASH NO.	*G* GROOVE WIDTH	*R* RADIUS	*D* DIAMETRAL CLEARANCE MAX.
007-012	.079/.084	.005/.015	.004
013-028			.005
110-129	.112/.117	.005/.015	.005
130-140			.006
141-149			.007
210-222	.149/.154	.010/.025	.005
223-227			.006
228-243			.007
244-248			.008
325-329	.221/.226	.020/.035	.006
330-345			.007
346-352			.008
425-437	.297/.302	.020/.035	.009



PISTON SEAL INSTALLATION

FOR TRELLEBORG SEALING SOLUTIONS GLYD RING,® SERIES B GLANDS

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR GLYD RING® IN TRELLEBORG SEALING SOLUTIONS GLYD RING,® SERIES B PISTON GLANDS.

2. ORDERING EXAMPLE: PG68 0 B 214 A T05 NG

GLYD RING® PISTON SERIES NUMBER
DESGIN CODE
  0 = STANDARD, NOTCHED
  W = WITHOUT NOTCHES
GLAND STANDARD
  B = TRELLEBORG SEALING SOLUTIONS GLAND STANDARD
SIZE DESIGNATOR
  ACCORDING TO TRELLEBORG SEALING SOLUTIONS GLAND STANDARD
QUALITY INDEX:
  A = AEROSPACE CERTIFICATE OF CONFORMANCE
TURCON® GLYD RING® MAT'L. CODE
TUREL® O-RING MAT'L. CODE
CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

INCH	2009_1
TRELLEBORG SEALING SOLUTIONS	TITLE GLYD RING®
	DRAWING NO. PG680B000

WORLD AEROSPACE TITLE BLOCK REV.

Turcon® Stepseal® 2K

Features and benefits

- High static and dynamic sealing effect
- Eliminates the build-up of disruptive intermediate pressures between seals
- High extrusion resistance, to suit wide hardware clearances
- Operational at pressures up to 11,600 psi/ 80 MPa
- Operational at speeds up to 49 ft/sec/ 15 m/s with reciprocating movements
- High-frequency operation
- Operating temperatures of -65°F to +500°F/ -55°C to +260°C depending on the elastomer
- Low friction, increasing performance and working life
- Stick-slip-free starting, no sticking even after extended periods of rest
- High abrasion resistance, maximum operational reliability
- Compatible with virtually all media
- Suited to mineral oil-based hydraulic fluids, flame-retardant hydraulic fluids, environmentally-safe hydraulic fluids (bio-oils), water and other media
- Simple installation without seal edge deformation
- Unidirectional seal

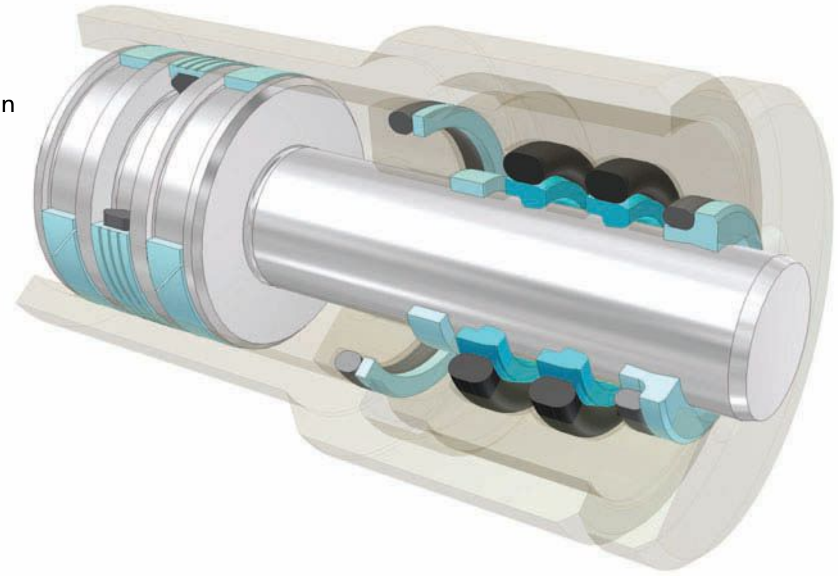


Illustration shows typical hydraulic cylinder with a sealing configuration incorporating Turcon® Stepseal® 2K.

Turcon® Stepseal® 2K

Description

Developing a hydraulic cylinder sealing arrangement with certainty of performance over a wide range of applications has provided a long- term engineering challenge for Trelleborg Sealing Solutions. The first breakthrough was in the 1970s, when Turcon® Stepseal® revolutionized fluid sealing in cylinder applications. Through ongoing research and development Stepseal® has been further refined and improved, with the latest version, Turcon® Stepseal® 2K, achieving new levels in cylinder sealing performance.

With Turcon® Stepseal® 2K it is possible to arrange several seals, one behind the other, to create a static and dynamic sealing arrangement. This double-acting tandem seal eliminates the build-up of disruptive intermediate pressures between seals that can cause a loss of operating efficiency, seal destruction and leakage.

Turcon® Stepseal® 2K enhances sealing efficiency. Better extrusion resistance gives superior leakage control and allows larger hardware tolerances, making cylinder production more economic. It is also more uniform, showing low-friction characteristics throughout an extended life and even during the run-in period when friction forces can have the greatest effect on hydraulic seals.

Offering unsurpassed sealing security, Turcon® Stepseal® 2K can be used with all lubricating and non-lubricating hydraulic fluids, including zinc-free oils and water-based hydraulic fluids. They can also be matched to specific mating surfaces and media. Seals can be specified to meet the precise degree of extrusion and abrasion tolerance required for an application.

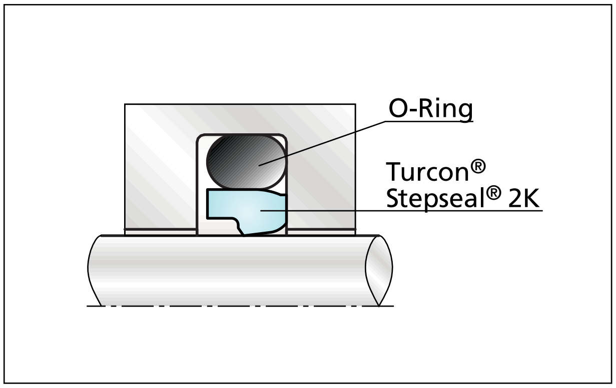


Figure 1 Turcon® Stepseal® 2K

Method of Operation

The sealing performance of Turcon® Stepseal® 2K is a result of its hydrodynamic properties. The seal edge creates a steep contact pressure gradient on the high-pressure side and a shallow contact pressure gradient on the low-pressure side. The controlled pressure gradients minimize fluid adherence to the piston rod during the extending stroke and enable residual fluid film on the rod to be returned into the system on the return stroke.

The O-Ring relief chamber reduces pressure loading on the seal. This optimizes contact with the rod, improving sealing performance at high service pressures. A special high-lift rear chamfer combines a smooth downstream sealing face with the ability to meet large radial clearances and hardware tolerances.

Technical Data

Operation pressure:	Up to 11,600 psi/ 80 MPa
Speed:	Up to 49.2 ft/s/ 15.0 m/s
Temperature range:	-65°F to +500°F/ -55°C to +260°C depending on elastomer
Clearance:	As per AS4716 Clearance can be larger when combined with a Slydring® bearing.
Media:	Mineral oil-based hydraulic fluids, flame-retardant hydraulic fluids, environmentally-safe hydraulic fluids (bio-oils), phosphate ester-based hydraulic oils, water and others depending on the elastomer material selected

Series

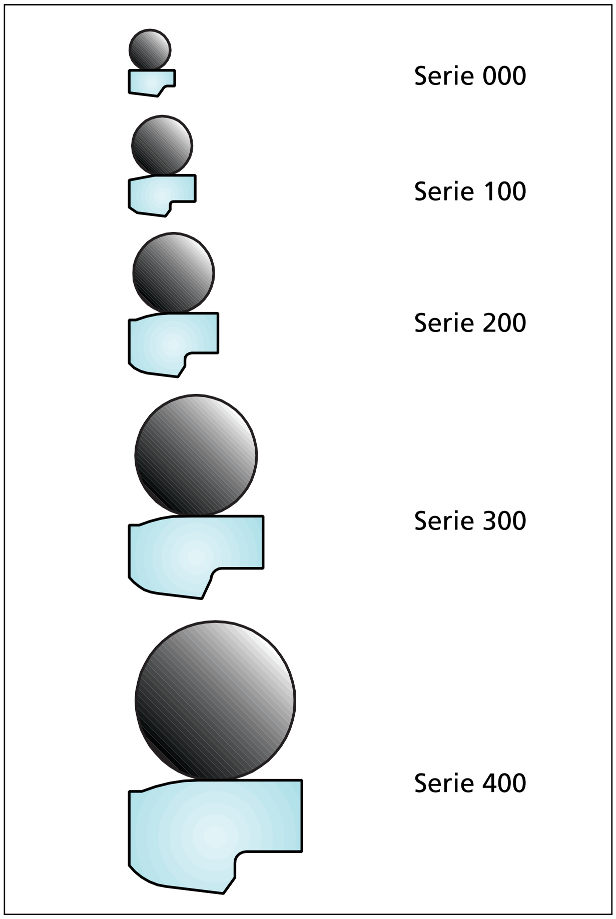
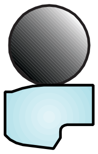
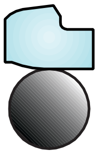


Figure 2 Relative size of Turcon® Stepseal® 2K cross section

Table I Turcon® Stepseal® 2K Types

Cross Section	Description	Part Number	Gland Standard
	Rod	RSF00B	TSS Gland Rod per AS4716
	Piston	PSF00B	TSS Gland Piston per AS4716

Turcon® Stepseal® 2K

DASH NO.	*B* DIA.	*E* DIA.	O-RING NO.
	+.000 -.001	+.001 -.000	
010	.248	.441	011
011	.310	.503	012
012	.373	.566	013
	+.000 -.002	+.002 -.000	
013	.435	.628	014
014	.498	.691	015
015	.560	.753	016
016	.623	.816	017
017	.685	.878	018
018	.748	.941	019
019	.810	1.003	020
020	.873	1.066	021
021	.935	1.128	022
022	.998	1.191	023
023	1.060	1.253	024
024	1.123	1.316	025
025	1.185	1.378	026
026	1.248	1.441	027
027	1.310	1.503	028
028	1.373	1.566	028
	+.000 -.001	+.001 -.000	
108	.248	.535	110
109	.310	.597	111
	+.000 -.002	+.002 -.000	
110	.373	.660	112
111	.435	.722	113
112	.498	.785	114
113	.560	.847	115
114	.623	.910	116
115	.685	.972	117
116	.748	1.035	118
117	.810	1.097	119
118	.873	1.160	120
119	.935	1.222	121
120	.998	1.285	122
121	1.060	1.347	123
122	1.123	1.410	124
123	1.185	1.472	125
124	1.248	1.535	126
125	1.310	1.597	127
126	1.373	1.660	128
127	1.435	1.722	128
128	1.498	1.785	129
129	1.560	1.847	130
130	1.623	1.910	131
131	1.685	1.972	132
132	1.748	2.035	133
133	1.810	2.097	134
134	1.873	2.160	135
135	1.936	2.233	136
136	1.998	2.285	137
137	2.061	2.348	138
138	2.123	2.410	139
139	2.186	2.473	140
140	2.248	2.535	141
141	2.311	2.598	142
142	2.373	2.660	143
143	2.436	2.723	144
144	2.498	2.785	145
145	2.561	2.848	146
146	2.623	2.910	147
147	2.686	2.973	148
148	2.748	3.035	149
149	2.811	3.098	150

DASH NO.	*B* DIA.	*E* DIA.	O-RING NO.
	+.000 -.002	+.002 -.000	
210	.748	1.169	213
211	.810	1.231	214
212	.873	1.294	215
213	.935	1.356	216
214	.998	1.419	217
215	1.060	1.481	218
216	1.123	1.544	219
217	1.185	1.606	220
218	1.248	1.669	221
219	1.310	1.731	222
220	1.373	1.794	222
221	1.435	1.856	223
222	1.498	1.919	223
223	1.623	2.044	224
224	1.748	2.169	225
225	1.873	2.294	226
226	1.998	2.419	227
227	2.123	2.544	228
228	2.248	2.669	229
229	2.373	2.794	230
230	2.498	2.919	231
231	2.623	3.044	232
232	2.748	3.169	233
233	2.873	3.294	234
234	2.997	3.418	235
235	3.122	3.543	236
236	3.247	3.668	237
237	3.372	3.793	238
238	3.497	3.918	239
239	3.622	4.043	240
240	3.747	4.168	241
241	3.872	4.293	242
242	3.997	4.418	243
243	4.122	4.543	244
244	4.247	4.668	245
245	4.372	4.793	245
246	4.497	4.918	246
247	4.622	5.043	247
	+.000 -.002	+.002 -.000	
325	1.498	2.092	327
326	1.623	2.217	328
327	1.748	2.342	329
328	1.873	2.467	330
329	1.998	2.592	331
330	2.123	2.717	332
331	2.248	2.842	333
332	2.373	2.967	334
333	2.498	3.092	335
334	2.623	3.217	336
335	2.748	3.342	337
336	2.873	3.467	338
337	2.997	3.591	339
338	3.122	3.716	340
339	3.247	3.841	340
340	3.372	3.966	341
341	3.497	4.091	342
342	3.622	4.216	343
343	3.747	4.341	344
344	3.872	4.466	345
345	3.997	4.591	346
346	4.122	4.716	347
347	4.247	4.841	348
348	4.372	4.966	349
349	4.497	5.091	350
	+.000 -.003	+.003 -.000	
425	4.497	5.304	427
426	4.622	5.429	428
427	4.747	5.554	429
428	4.872	5.679	430
429	4.997	5.804	431
430	5.122	5.929	432
431	5.247	6.054	433
432	5.372	6.179	434
433	5.497	6.304	435
434	5.622	6.429	436

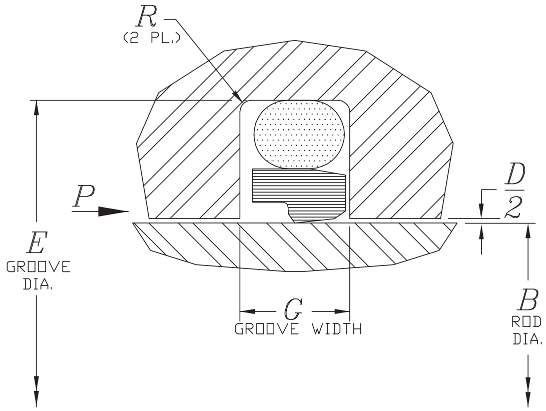
DASH NO.	*B* DIA.	*E* DIA.	O-RING NO.
	+.000 -.003	+.003 -.000	
435	5.747	6.554	437
436	5.872	6.679	437
437	5.997	6.804	438
438	6.247	7.054	439
439	6.497	7.304	440
440	6.747	7.554	441
441	6.997	7.804	442
442	7.247	8.054	443
443	7.497	8.304	443
444	7.747	8.554	444
445	7.997	8.804	445
446	8.497	9.304	446
	+.000 -.004	+.004 -.000	
447	8.997	9.804	447
448	9.497	10.304	448
449	9.997	10.804	449
450	10.497	11.304	450
451	10.997	11.804	451
452	11.497	12.304	452
453	11.997	12.804	453
454	12.497	13.304	454
455	12.997	13.804	455
456	13.497	14.304	456
457	13.997	14.804	457
458	14.497	15.304	458
459	14.997	15.804	459
460	15.497	16.304	460

DASH NO.	*G* GROOVE WIDTH	*R* RADIUS	*D* DIAMETRAL CLEARANCE MAX.
010-012	.087/.094	.005/.020	.004
013-028			.005
108-109	.126/.134	.005/.020	.004
110-126			.005
127-129			.006
130-132			.006
133-140			.007
141-149			.007
210-222	.165/.173	.010/.025	.005
223-224			.006
225-227			.007
228-243			.007
244-245			.007
246-247			.008
325-327	.248/.256	.015/.030	.006
328-329			.007
330-345			.007
346-349			.007
425-438	.319/.327	.020/.035	.009
439-445			.010
446			.010
447-460			.010

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR STEPSEAL ®2K IN TRELLEBORG SEALING SOLUTIONS STEPSEAL ®2K ROD GLANDS.
2. ORDERING EXAMPLE: RSF 2 0 B 214 A T19 NG

STEPSEAL®2K, ROD DESIGNATOR
SEAL CROSS SECTION
  0 = -0XX SERIES
  1 = -1XX SERIES
  2 = -2XX SERIES
  3 = -3XX SERIES
  4 = -4XX SERIES
DESIGN CHARACTERISTICS
  0 = STANDARD
GLAND STANDARD
  B = TRELLEBORG SEALING SOLUTIONS
    GLAND STANDARD
DASH SIZE
  ACCORDING TO TRELLEBORG SEALING SOLUTIONS
  GLAND STANDARD
QUALITY INDEX:
  A = AEROSPACE CERTIFICATE OF CONFORMANCE
TURCON® STEPSEAL®2K MAT'L. CODE
TUREL® O-RING MAT'L CODE
CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.



ROD SEAL INSTALLATION
FOR TRELLEBORG SEALING SOLUTIONS GLAND SPECIFICATION

INCH
2009_1
TRELLEBORG
SEALING SOLUTIONS
TITLE
STEPSEAL® 2K
DRAWING NO.
RSF00B000

WORLD AEROSPACE TITLE BLOCK REV.

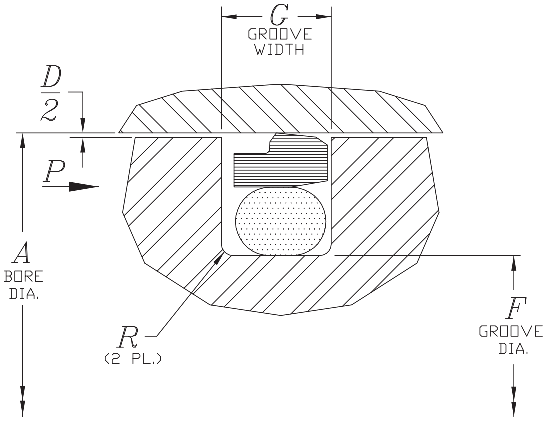
Turcon® Stepseal® 2K

DASH NO.	A DIA.	F DIA.	O-RING NO.
	+.001 -.000	+.000 -.001	
011	.422	.229	009
012	.485	.292	010
	+.002 -.000	+.000 -.002	
013	.550	.357	011
014	.613	.420	012
015	.675	.482	013
016	.738	.545	014
017	.800	.607	015
018	.863	.670	016
019	.925	.732	017
020	.991	.798	018
021	1.053	.860	019
022	1.116	.923	020
023	1.178	.985	021
024	1.241	1.048	022
025	1.303	1.110	023
026	1.366	1.173	024
027	1.428	1.235	025
028	1.491	1.298	026
	+.001 -.000	+.000 -.001	
108	.422	.135	104
109	.485	.198	106
	+.002 -.000	+.000 -.002	
110	.550	.263	108
111	.613	.326	109
112	.675	.388	110
113	.738	.451	111
114	.800	.513	112
115	.863	.576	113
116	.925	.638	114
117	.991	.704	115
118	1.053	.766	116
119	1.116	.829	117
120	1.178	.891	118
121	1.241	.954	119
122	1.303	1.016	120
123	1.366	1.079	121
124	1.428	1.141	122
125	1.491	1.204	123
126	1.553	1.266	124
127	1.616	1.329	125
128	1.678	1.391	126
129	1.741	1.454	127
130	1.805	1.518	128
131	1.867	1.580	128
132	1.930	1.643	129
133	1.992	1.705	130
134	2.055	1.768	131
135	2.118	1.831	132
136	2.180	1.893	133
137	2.243	1.956	134
138	2.305	2.018	135
139	2.368	2.081	136
140	2.430	2.143	137
141	2.493	2.206	138
142	2.555	2.268	139
143	2.618	2.331	140
144	2.680	2.393	141
145	2.743	2.456	142
146	2.805	2.518	143
147	2.868	2.581	144
148	2.930	2.643	145
149	2.993	2.706	146

DASH NO.	A DIA.	F DIA.	O-RING NO.
	+.002 -.000	+.000 -.002	
210	.991	.570	207
211	1.053	.632	208
212	1.116	.695	209
213	1.178	.757	210
214	1.241	.820	211
215	1.303	.882	212
216	1.366	.945	213
217	1.428	1.007	214
218	1.491	1.070	215
219	1.553	1.132	216
220	1.616	1.195	217
221	1.678	1.257	218
222	1.741	1.320	219
223	1.867	1.446	221
224	1.992	1.571	222
225	2.118	1.697	223
226	2.243	1.822	224
227	2.368	1.947	225
228	2.493	2.072	226
229	2.618	2.197	227
230	2.743	2.322	228
231	2.868	2.447	229
232	2.993	2.572	230
233	3.118	2.697	231
234	3.243	2.822	232
235	3.368	2.947	233
236	3.493	3.072	234
237	3.618	3.197	235
238	3.743	3.322	236
239	3.868	3.447	237
240	3.993	3.572	238
241	4.118	3.697	239
242	4.243	3.822	240
243	4.368	3.947	241
244	4.493	4.072	242
245	4.618	4.197	243
246	4.743	4.322	244
247	4.868	4.447	245
	+.002 -.000	+.000 -.002	
325	1.867	1.273	322
326	1.992	1.398	324
327	2.118	1.524	325
328	2.243	1.649	326
329	2.368	1.774	327
330	2.493	1.899	328
331	2.618	2.024	329
332	2.743	2.149	330
333	2.868	2.274	331
334	2.993	2.399	332
335	3.118	2.524	333
336	3.243	2.649	334
337	3.368	2.774	335
338	3.493	2.899	336
339	3.619	3.025	337
340	3.743	3.149	338
341	3.868	3.274	339
342	3.993	3.399	340
343	4.118	3.524	340
344	4.243	3.649	341
345	4.368	3.775	342
346	4.493	3.899	343
347	4.618	4.024	344
348	4.743	4.149	345
349	4.868	4.274	346
	+.003 -.000	+.000 -.003	
425	4.974	4.167	425
426	5.099	4.292	425
427	5.224	4.417	425
428	5.349	4.542	425
429	5.474	4.667	425
430	4.599	4.792	426
431	5.724	4.917	427
432	5.849	5.042	428
433	5.974	5.167	429
434	6.099	5.292	430

DASH NO.	A DIA.	F DIA.	O-RING NO.
	+.003 -.000	+.000 -.003	
435	6.224	5.417	431
436	6.349	5.542	432
437	6.474	5.667	433
438	6.724	5.917	435
439	6.974	6.167	437
440	7.224	6.417	438
441	7.474	6.667	439
442	7.724	6.917	440
443	7.974	7.167	441
444	8.224	7.417	442
445	8.474	7.667	443
446	8.974	8.167	445
	+.004 -.000	+.000 -.004	
447	9.474	8.667	446
448	9.974	9.190	447
449	10.474	9.667	448
450	10.974	10.167	449
451	11.474	10.667	450
452	11.974	11.167	451
453	12.474	11.667	452
454	12.974	12.167	453
455	13.474	12.667	454
456	13.974	13.167	455
457	14.474	13.667	455
458	14.974	14.167	456
459	15.474	14.667	457
460	15.974	15.167	458

DASH NO.	G GROOVE WIDTH	R RADIUS	D DIAMETRAL CLEARANCE MAX.
011-012	.087/.094	.005/.020	.004
013-028			.005
108-109	.126/.134	.005/.020	.004
110-126			.005
127-129			.006
130-132			.006
133-140			.007
141-149			.007
210-222	.165/.173	.010/.025	.005
223-224			.006
225-227			.007
228-243			.007
244-245			.007
246-247			.008
325-327	.248/.256	.015/.030	.006
328-329			.007
330-345			.007
346-349			.007
425-438	.319/.327	.020/.035	.009
439-445			.010
446			.010
447-460			.010



PISTON SEAL INSTALLATION
FOR TRELLEBORG SEALING SOLUTIONS GLAND SPECIFICATION

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR STEPSEAL® 2K IN TRELLEBORG SEALING SOLUTIONS STEPSEAL® 2K PISTON GLANDS.

2. ORDERING EXAMPLE: PSF 2 0 B 214 A T19 NG

STEPSEAL® 2K, PISTON DESIGNATOR
SEAL CROSS SECTION
  0 = -0XX SERIES
  1 = -1XX SERIES
  2 = -2XX SERIES
  3 = -3XX SERIES
  4 = -4XX SERIES
DESIGN CHARACTERISTICS
  0 = STANDARD
GLAND STANDARD
  B = TRELLEBORG SEALING SOLUTIONS GLAND STANDARD
DASH SIZE
  ACCORDING TO TRELLEBORG SEALING SOLUTIONS GLAND STANDARD
QUALITY INDEX:
  A = AEROSPACE CERTIFICATE OF CONFORMANCE
TURCON® STEPSEAL® 2K MAT'L. CODE
TUREL® O-RING MAT'L CODE
CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

INCH
2009_1
TRELLEBORG
SEALING SOLUTIONS
TITLE
STEPSEAL® 2K
DRAWING NO.
PSF00B000

WORLD AEROSPACE TITLE BLOCK REV.

Rotary seals for AS4716 –
Rod and bore sizes only

Specialized High-Performance Rotary Sealing Products

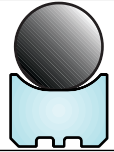
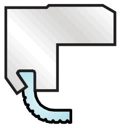
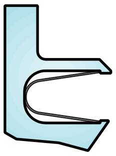
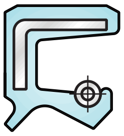
Rotary seals are installed in rotating or pivoting components to keep in the lubrication fluid that is needed for long-term operation of these devices. Sealing configurations need to be leak-free while preventing ingress of mud and water.

When it comes to successfully sealing in rotary applications, specialized products are required. Trelleborg Sealing Solutions offers a range of unique options, both standard and custom, that give exceptional performance characteristics in demanding rotary situations.

Within aerospace application the most commonly used types are Turcon® Roto Glyd Ring®, Turcon® Varilip® PDR, Turcon® Roto Variseal® and Turel® Radial Oil Seals. One of these options can provide the optimum solution for your rotary sealing requirements.

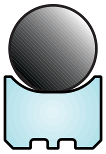
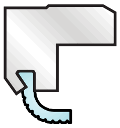
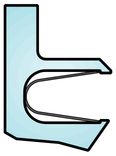
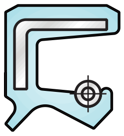
Illustration shows a typical application for rotary seals. Turcon® Varilip® PDR keeps grease round a ball bearing while excluding dirt and water spray from the outside.

Table I Rotary seal types

Cross Section	Description	Gland Standard	Pressure	Velocity
	Turcon® Roto Glyd Ring®	Trelleborg Standard Gland	< 2,100 psi < 15 MPa	< 3.3 ft/s < 1 m/s
	Turcon® Varilip® PDR	ISO 16859	< 300 psi < 2 MPa	< 164 ft/s < 100 m/s
	Turcon® Roto Variseal®	Trelleborg Standard Gland	< 4,200 psi < 30 MPa	< 6.6 ft/s < 2 m/s
	Turel® Radial Oil Seal	DIN 3760 and ISO 6194/1	< 15 psi < 0.1 MPa	< 115 ft/s < 35 m/s

Service life depends on PV factor (pressure x velocity)
Avoid combining extreme limits

Table II Typical features of rotary seal types

Main features	 **Turcon® Roto Glyd Ring®**	 **Turcon® Varilip® PDR**	 **Turcon® Roto Variseal®**	 **Turel® Radial Oil Seal**
Static sealing	Good	Good	Good	Excellent
Dynamic sealing	Good	Very good	Good	Very good
Hardware surface requirements	Low	High	Medium	Low
Installation	Closed gland	Open or split housing	Split housing	Open or split housing
Chemical resistance	Good with correctly selected seal material	Excellent	Excellent	Good with correctly selected seal material
Start friction/Stick-slip	Medium	Very low	Low	Medium
Running friction	Medium to high	Very low	Low	Medium
Shelf life	As for selected elastomer	Unlimited*	Unlimited*	As for selected elastomer
Application	Rod and piston	Rod	Rod and piston	Rod
Pressure capability	High	Low to Medium	Medium	Low
Speed capability	Medium to low	High	Medium to high	Medium to high

*Certain versions may contain elastomer. Shelf life then as specified for selected elastomer.

■ Critical Factors in Seal Selection

To ensure long seal life several factors must be considered in selection of the optimal material for the elastomer element.

Chemical Compatibility

Seal materials must be compatible with system media, in particular with lubricants.

The various oils used in rotary applications as lubricants have differing effects on elastomers. In aerospace these are primarily mineral based and synthetic hydrocarbon based oils and greases. Trelleborg Sealing Solutions offers materials that will give optimized performance in contact with this media. Turcon® PTFE based compounds are compatible with virtually all media.

Temperature Resistance

The aging of elastomers has a significant effect on their useful life and higher temperatures accelerate the aging of these materials. Elastomers can become hard and brittle, elongation may decrease and compression set increase. Axial cracks at the sealing edge are a typical indication that the seal has been exposed to excessively high temperature.

Turcon® PTFE based compounds are capable of operating at more elevated temperatures than elastomers.

For guidance on temperature limits for different materials, see materials section.

Peripheral Speed and Number of Revolutions

Different designs of sealing elements affect the magnitude of friction, resulting in varying temperature rises. As a result the various designs of the sealing element allow different maximum peripheral speeds. Below are the approximate maximum values for the permissible peripheral speeds for sealing elements without a dust lip in NBR, EP, FKM, FVMQ and PTFE when there is no differential pressure and where adequate lubrication or cooling of the sealing edge by the sealing medium exists. The curve shows that higher peripheral speeds are permissible for larger shaft diameters. This is due to the fact that the cross-sectional area increases in proportion to the square of the diameter, thus increasing the heat dissipation capacity of the shaft.

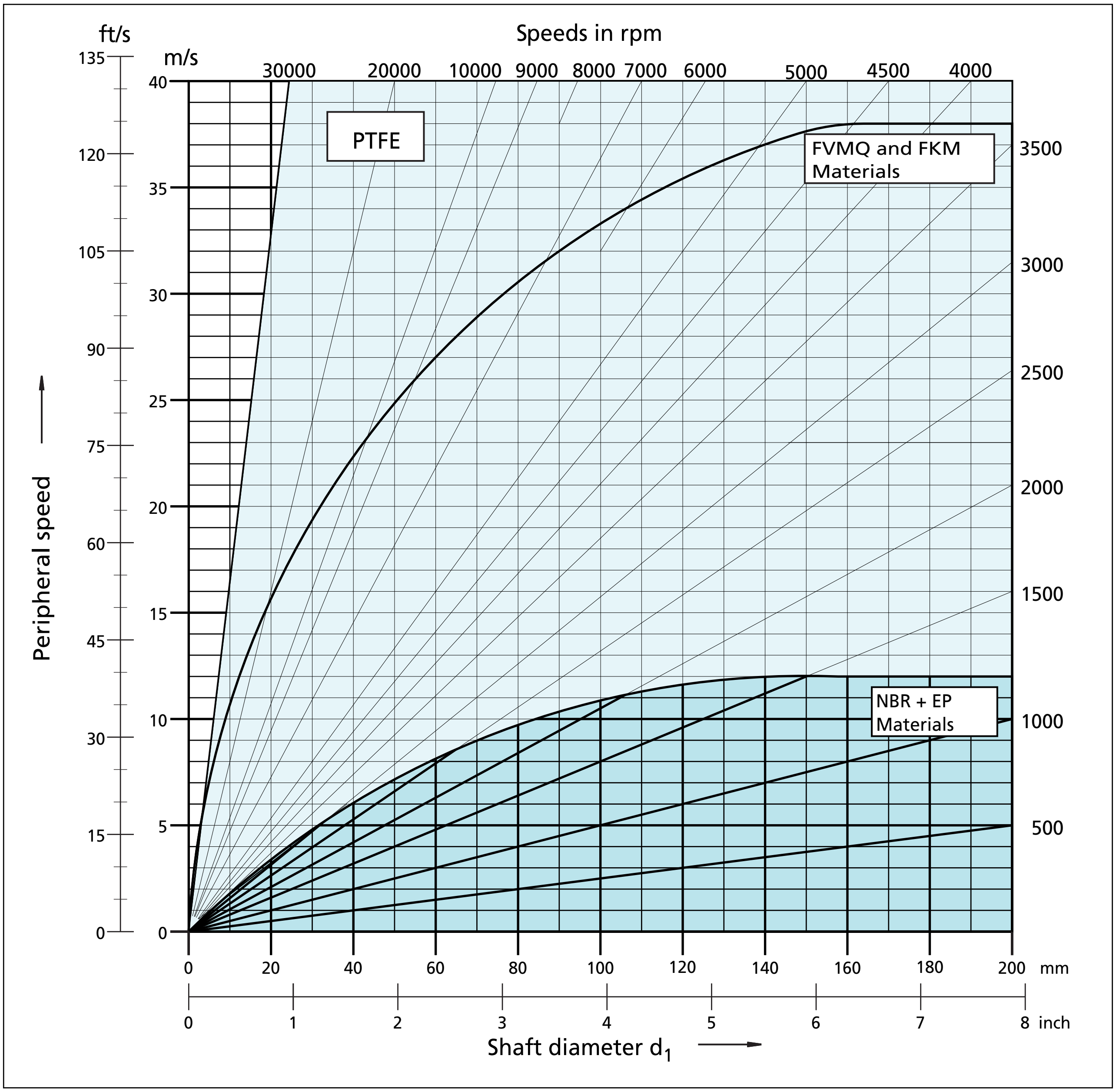


Figure 1 Peripheral speed capability of rotary seal materials

Eccentricity

The graph in Figure 3 shows the maximum recommended operating envelope for various elastomer sealing materials and for Turcon® Varilip® PDR. The levels of eccentricity should be kept within the limits shown. In order to achieve a uniform radial load of the sealing lip on the shaft, the best possible coaxiality, or static offset, should be maintained between the housing bore and the shaft, as shown in Figure 4.

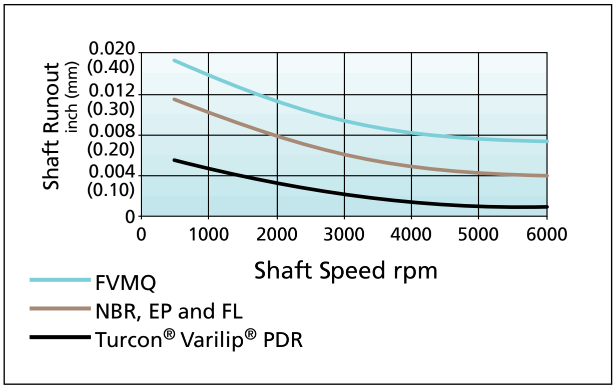


Figure 2 Dynamic Eccentricity Capability

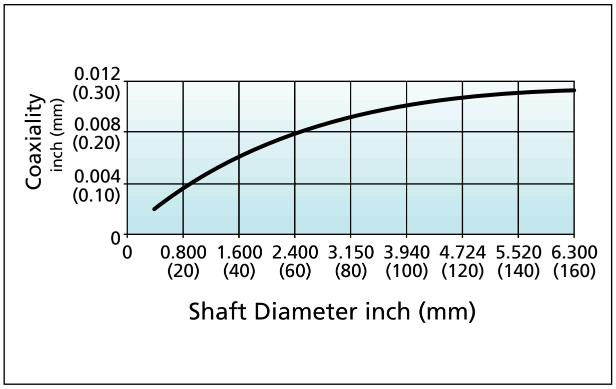


Figure 3 Coaxial Tolerance Capabilities

Surface Finish Recommendations – Radial Oil Seals and PTFE Lip Seals

It is important to control the shaft preparation for rotary applications and to ensure the desired non-orientation of the shaft surface finish as it relates to sealing. The recommended shaft condition is to have no machining leads and be free from scratches, nicks or defects as well as any contamination.

Plunge grinding is recommended for the finishing process. This gives short to medium grind marks which are good for lip lubrication. It also produces a lay that is perpendicular to the shaft axis with no lead angle. Additionally, there should be traversing during the plunge grinding process to eliminate any smear or detrimental patterns on the shaft.

Surface hardness is recommended to be 55 HRc, hardness depth minimum .012 in/ 0.3 mm. In certain circumstances such as low circumferential velocity, good lubrication and no contamination, surfaces with hardness levels below 55 HRc are suitable.

Surface Finish Recommendations

Measurement	Standard Recommendation
Ra	< 8 µin/ < 0.2 µm
Rz (Rtm)	39 -157 µin max. 1.0 - 4.0 µm max.
Tp (Mr)	50 - 90% @ depth of p = 0.25 Rz (Rtm) relative to reference line = 5 %
Rsk	-0.1 to –3

Features and benefits

- Good static sealing
- Compensates for different levels of thermal expansion
- No risk of corrosion due to fretting
- Can have a rougher bore surface
- Lip design gives low radial forces
- Can be installed in split housings
- Unidirectional seal

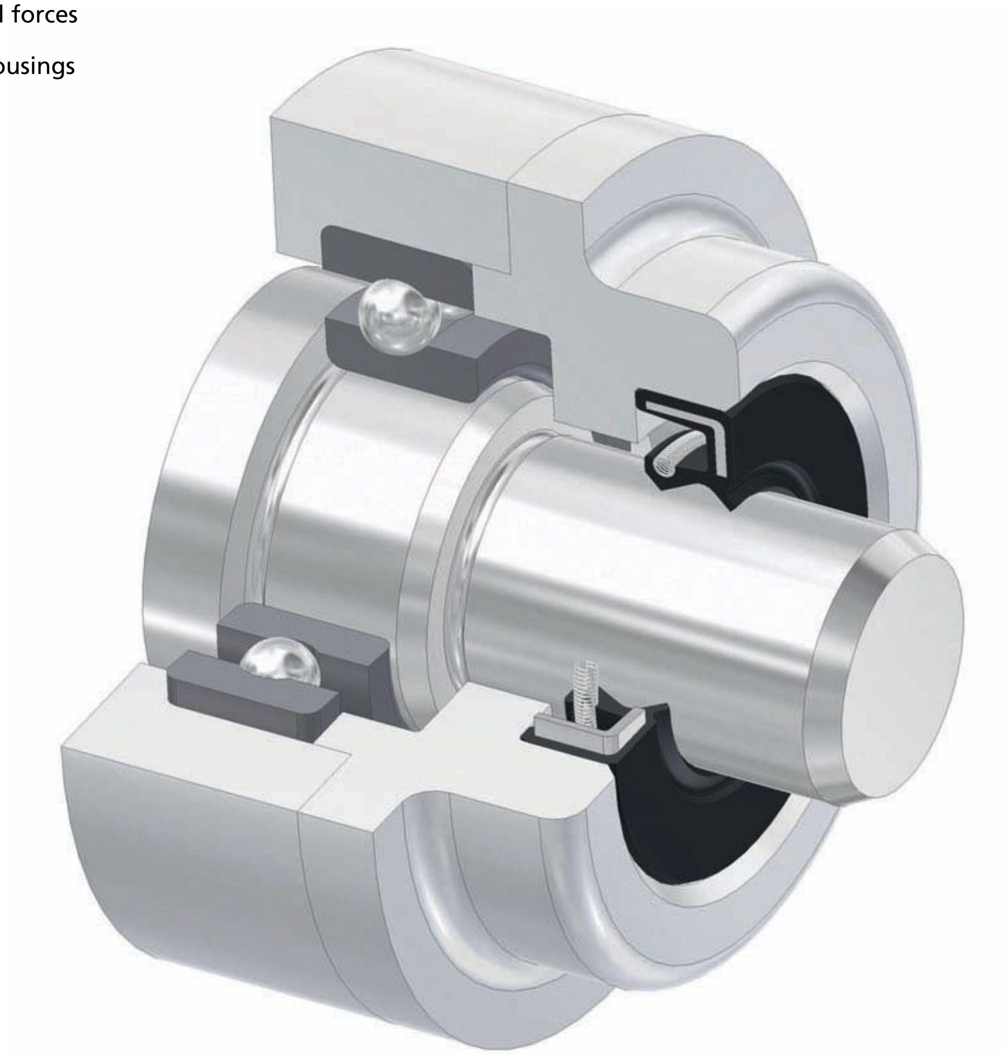


Illustration shows typical Turel® Radial Oil Seal application.

Description

Turel® Radial Oil Seal consists of a single elastomer lip bonded to a metal support with a garter spring. There are many different variations of the Turel® 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 Turel® 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. Turel® Radial Oil Seals can also include hydrodynamic aids, which create positive sealing by returning any oil leaking back into the system.

Turel® Radial Oil Seal type A and E are recommended for aerospace applications. A wide range of other types are available if required.

Method of Operation

The total radial force of the sealing lip is given by elastomer pre-tension together with tensile spring force. The former depends on the deformation and elasticity of the elastomer, geometry of the sealing lip and interference between shaft and seal.

Further information

More detailed design recommendations for Turel® Radial Oil Seals can be found in the Rotary Seals catalog. This can be downloaded from the Trelleborg Sealing Solutions website at www.tss.trelleborg.com or a copy obtained from your local marketing company.

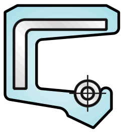
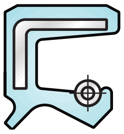
Technical Data

Operation pressure:	Up to 7.2 psi/ 0.05 MPa
Speed:	Up to 98 ft/s/ 30 m/s depending on elastomer material
Temperature range:	Up to -40°F to +390°F/ -40°C to +200°C depending on elastomer material
Media:	Mineral oil-based hydraulic fluids, flame-retardant hydraulic fluids, environmentally-safe hydraulic fluids (bio-oils), phosphate ester-based hydraulic oils, water and others depending on the elastomer material selected

Avoid combining extreme limits.

Turel® Radial Oil Seal

Table I Radial Oil Seals to DIN 3760 type A and AS

Cross Section	Description	Part Number	Gland Standard
	DIN 3760 Type AS	TRA	TSS Gland Rod per AS4716
	DIN 3760 Type A	TRE	

Design Instructions

See the specific national and international standards that contain instructions for design and assembly (e.g. DIN 3760/3761 and ISO 6194/1).

Installation in the Gland

The static seal in the mounting bore is provided by the corresponding force fit allowance at the outer sheath of the seal.

Turel® Radial Oil Seals are referred to according to the design of their outer cover – rubber-coated (smooth or corrugated) or metallic. The bore is dimensioned to fit ISO H8.

Values for the surface roughness in the gland are specified in ISO 6194/1.

Installation on the Shaft, Depth and Lead-In Chamfer

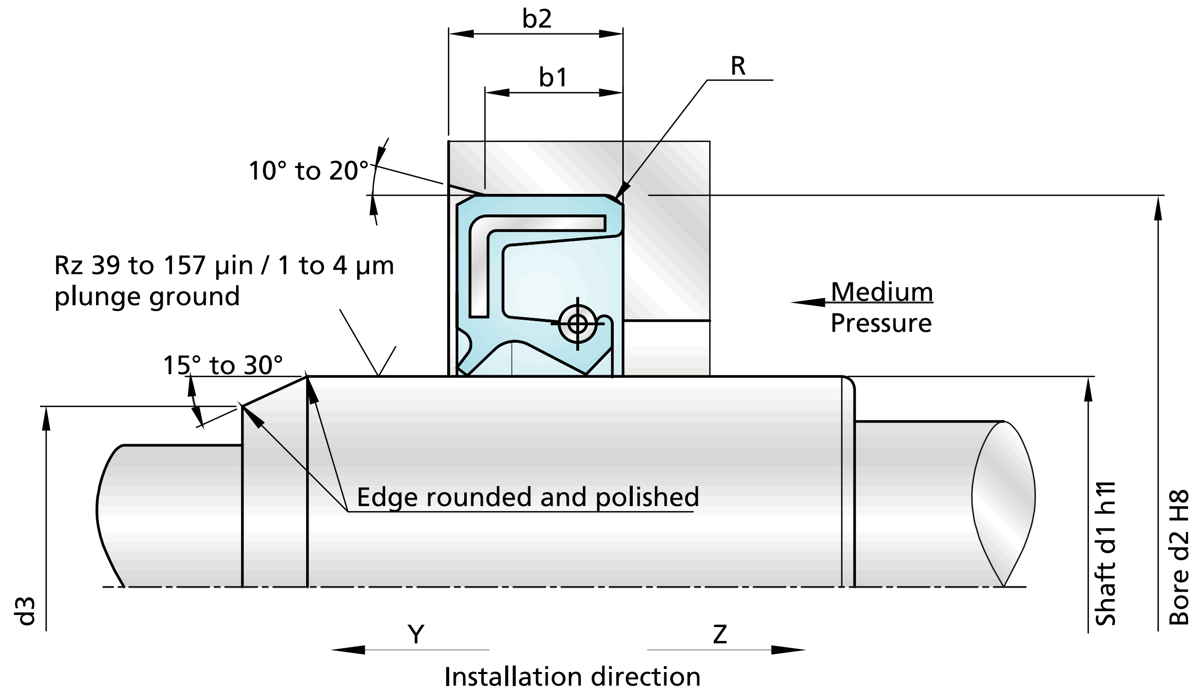


Figure 1 Installation of the Radial Oil Seal
Depending on the installation direction (Y or Z), a chamfer or radius on the shaft is recommended.

Table II Housing Dimensions

Ring Width b in b mm	b1 .033 x b in (0.85 x b mm)	b2 b + .012 in (b + 0.3 mm)	r2 max. in (mm)
.276 **7**	.234 5.95	.287 7.3	.020 0.5
.315 **8**	.268 6.80	.327 8.3	
.394 **10**	.335 8.5	.406 10.3	
.472 **12**	.406 10.30	.484 12.3	.028 0.7
.591 **15**	.502 12.75	.602 15.3	
.787 **20**	.669 17.00	.799 20.3	

Table III Shaft Chamfer and Radius Dimensions

d1 inch (mm)	D2 inch mm	R Inch mm
< .393 **(< 10)**	d1 – .059 d1 – 1.50	.079 2.0
.393 – .787 **(10 – 20)**	d1 – .079 d1 – 2.01	.079 2.0
.787 – 1.181 **(20 – 30)**	d1 – .098 d1 – 2.49	.118 3.0
1.181 – 1.575 **(30 – 40)**	d1 – .118 d1 – 3.00	.118 3.0
1.181 – 1.575 **(30 – 40)**	d1 – .118 d1 – 3.00	.118 3.0
1. 575 – 1.969 **(40 – 50)**	d1 – .138 d1 – 3.50	.157 4.0
1. 969 – 2.756 **(50 – 60)**	d1 – .157 d1 – 4.00	.157 4.0
2.756 – 3.740 **(70 – 95)**	d1 – .177 d1 – 4.50	.197 5.0
3.740 – 5.118 **(95 – 130)**	d1 – .217 d1 – 5.50	.236 6.0
5.118 – 9.449 **(130 – 240)**	d1 – .276 d1 – 7.00	.315 8.0
9.449 – 19.685 **(240 – 500)**	d1 – .433 d1 – 11.00	.472 12.0

Features and benefits

- Suitable for rotary, reciprocating and static service
- Remains tight in gland even when subject to oscillating or helical movements
- Low coefficient of friction
- Good scraping effect
- Stick-slip-free operating for precise control
- High abrasion resistance and dimensional stability
- Withstands rapid changes in temperature
- Protects against mechanical torsion
- No contamination in contact with fuel, oxygen or air
- Excellent resistance to aging
- Unlimited shelf life
- Unidirectional seal

Illustration shows typical Turcon® Roto Variseal® application.

Description

Turcon® Roto Variseal® is excellent in rotary, reciprocating and static applications when there is a need to lock the seal in the groove. It is a single-acting seal consisting of a U-shaped seal jacket and a V-shaped corrosion-resistant metal spring.

The flanged heel of Turcon® Roto Variseal® prevents the seal from rotating by clamping it in the gland. The seal's short and heavy dynamic lip offers reduced friction, long service life and a good scraping effect, even in highly viscous media.

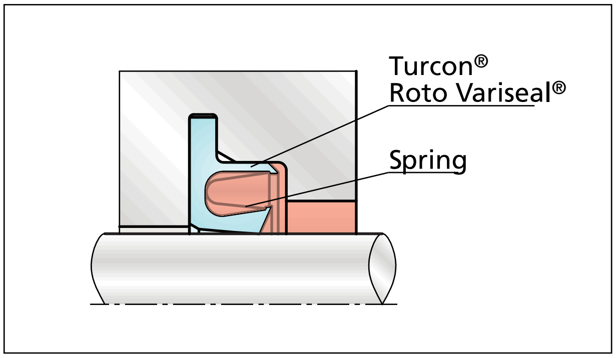


Figure 1 Turcon® Roto Variseal®

The Turcon® jacket material and that of the spring can be matched to specific requirements. This allows Turcon® Roto Variseal® to be used in a wide range of applications. These are not confined to hydraulics but also in fuel and environmental control systems, as well as oxygen and space applications.

Turcon® Roto Variseal® is available in a special Hi-Clean version where the spring cavity is filled with a Silicone elastomer. Preventing contaminants from being trapped in the seal, this design works well in applications involving mud or slurries. It keeps grit or ice from packing into the seal cavity, which can inhibit the spring action.

Method of operation

At low and zero pressure, the metal spring provides the primary sealing force. As the system pressure increases, the main sealing force is achieved by the system pressure. This ensures a tight seal from zero to high pressure.

Technical data

Operation pressure:	Up to 2,000 psi/ 15 MPa for dynamc loads Up to 3,500 psi/ 25 MPa for static loads
Speed:	Up to 6.5 ft/s/ 2.0 m/s rotating
Temperature range:	-148°F to +500°F/ -100°C to +260°C For specific applications at lower temperatures, contact your local Trelleborg Sealing Solutions marketing company.
Media:	Virtually all fluids, chemicals and gases

Avoid combining extreme limits.

Mating surface materials

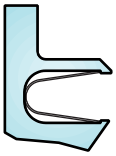
Sealing of applications with rotating movements requires very good mating surfaces. A minimum hardness of 55 HRC is recommended to a hardening depth of at least .012 in/ 0.3 mm.

Coated surfaces must be finished with particular care:

- Chrome-plating must not peel off in service
- Good heat dissipation must be assured by the coating

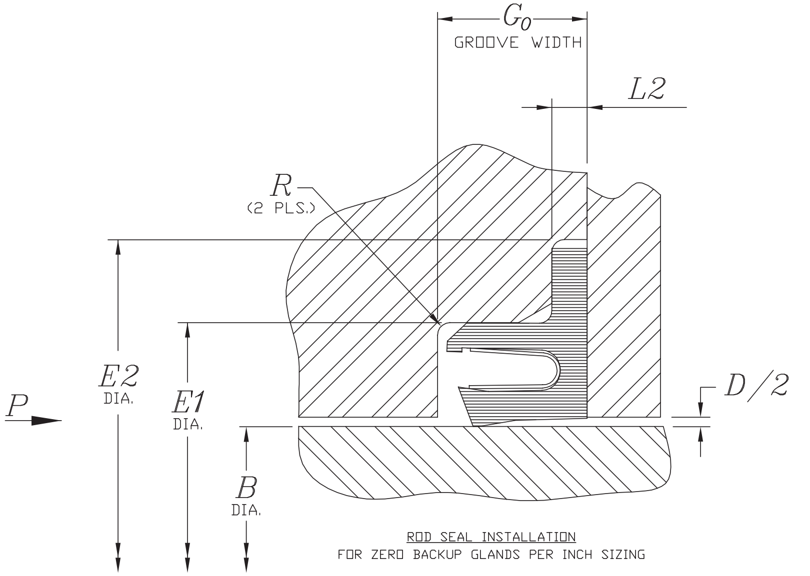
Unhardened mating surfaces should have a Brinell hardness of at least 1,700 N/mm^2.

Table I Turcon® Roto Variseal®

Cross Section	Description	Part Number	Gland Standard
	Turcon® Roto Variseal®	TVM_S0000 (inch) TVM_00000 (metric)	TSS Gland Rod per AS4716

Turcon® Roto Variseal®

SERIES NO.	B DIA.	G_0 ZERO BACKUP WIDTH	L2 FLANGE WIDTH	R RADIUS	D/2 MAX.		
					290 PSI MAX	1450 PSI MAX	2900 PSI MAX
TVM1	0.200 - 8.000	.141/.151	.033/.029	.012	.010	.006	.004
TVM2	0.400 - 16.000	.188/.198	.053/.047	.016	.014	.008	.006
TVM3	0.800 - 28.000	.281/.291	.071/.063	.020	.020	.010	.008
TVM4	1.500 - 40.000	.375/.385	.110/.090	.020	.024	.012	.010



ROD SEAL INSTALLATION
FOR ZERO BACKUP GLANDS PER INCH SIZING

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR VARISEAL®FM

2. ORDERING EXAMPLE TVM 3 S 2000 A T25 S
   VARISEAL®FM, ROD DESIGNATOR
   CROSS SECTION
      1 = 100 SERIES
      2 = 200 SERIES
      3 = 300 SERIES
      4 = 400 SERIES
   S DESIGNATOR, LESS THAN 10.000"
   ØB × 1000
   QUALITY INDEX:
      A = AEROSPACE CERTIFICATE OF CONFORMANCE
   3 TURCON®VARISEAL®FM MAT'L CODE
   SPRING MAT'L CODE - HEAVY SPRING LOAD
   AS STANDARD

3 FOR MATERIAL OPTIONS, SEE MATERIALS SECTION OF TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE. SPRING MATERIAL OPTIONS LISTED BELOW

SPRING MATERIAL CODE HEAVY DUTY AS STANDARD	
CODE	MATERIAL
S	301 STAINLESS STEEL
H	HASTELLOY
E	ELGILOY

4. DIMENSIONS PER ISO 286-2 SPECIFICATION

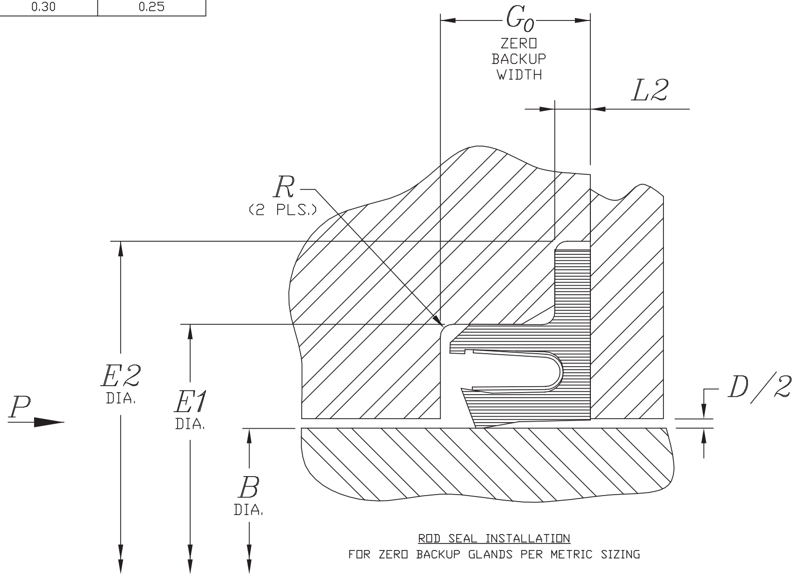
INCH
2009_1
TRELLEBORG
SEALING SOLUTIONS
TITLE
ROTO STANDARD (TVM)
DRAWING NO.
TVM2S0000

WORLD AEROSPACE TITLE BLOCK REV.

Turcon® Roto Variseal®

B DIA.	E1 DIA.	E2 DIA.	Part No.
f8/h9	H9	H10	
5.0	10.0	14.0	TVM100050
6.0	11.0	15.0	TVM100060
8.0	13.0	17.0	TVM100080
10.0	15.0	19.0	TVM100100
12.0	17.0	21.0	TVM100120
14.0	19.0	23.0	TVM100140
15.0	20.0	24.0	TVM100150
16.0	21.0	25.0	TVM100160
18.0	23.0	27.0	TVM100180
20.0	27.0	32.5	TVM200200
22.0	29.0	34.5	TVM200220
25.0	32.0	37.5	TVM200250
28.0	35.0	40.5	TVM200280
30.0	37.0	42.5	TVM200300
32.0	39.0	44.5	TVM200320
35.0	42.0	47.5	TVM200350
36.0	43.0	48.5	TVM200360
40.0	50.5	57.5	TVM300400
42.0	52.5	59.5	TVM300420
45.0	55.5	62.5	TVM300450
48.0	58.5	65.5	TVM300480
42.0	52.5	59.5	TVM300420
45.0	55.5	62.5	TVM300450
48.0	58.5	65.5	TVM300480
50.0	60.5	67.5	TVM300500
52.0	62.5	69.5	TVM300520
55.0	65.5	72.5	TVM300550
56.0	66.5	73.5	TVM300560
60.0	70.5	77.5	TVM300600
63.0	73.5	80.5	TVM300630
65.0	75.5	82.5	TVM300650
70.0	80.5	87.5	TVM300700
75.0	85.5	92.5	TVM300750
80.0	90.5	97.5	TVM300800
85.0	95.5	102.5	TVM300850
90.0	100.5	107.5	TVM300900
95.0	105.5	112.5	TVM300950
100.0	110.5	117.5	TVM301000
105.0	115.5	122.5	TVM301050
110.0	120.5	127.5	TVM301100
115.0	125.5	132.5	TVM301150
120.0	130.5	137.5	TVM301200
125.0	135.5	142.5	TVM301250
130.0	140.5	147.5	TVM301300
135.0	145.5	152.5	TVM301350
140.0	150.5	157.5	TVM301400
150.0	160.5	167.5	TVM301500
160.0	170.5	177.5	TVM301600
170.0	180.5	187.5	TVM301700
180.0	190.5	197.5	TVM301800
190.0	200.5	207.5	TVM301900
200.0	210.5	217.5	TVM302000
210.0	220.5	227.5	TVM302100
220.0	230.5	237.5	TVM302200
230.0	240.5	247.5	TVM302300
240.0	250.5	257.5	TVM302400
250.0	260.5	267.5	TVM302500
280.0	290.5	297.5	TVM302800
300.0	310.5	317.5	TVM303000
320.0	330.5	337.5	TVM303200
350.0	360.5	367.5	TVM303500
360.0	370.5	377.5	TVM303600
400.0	414.0	422.0	TVM404000
420.0	434.0	442.0	TVM404200
450.0	464.0	472.0	TVM404500
480.0	494.0	502.0	TVM404800
500.0	514.0	522.0	TVM405000
600.0	614.0	622.0	TVM406000
700.0	714.0	722.0	TVM407000

SERIES NO.	B DIA.	G_0 ZERO BACKUP WIDTH	L2 FLANGE WIDTH	R RADIUS	D/2 MAX.		
					290 PSI MAX	1450 PSI MAX	2900 PSI MAX
TVM1	5.0-200.0	3.60/3.85	0.85/0.95	0.3	0.25	0.15	0.10
TVM2	10.0-400.0	4.80/5.05	1.35/1.20	0.4	0.35	0.20	0.15
TVM3	20.0-700.0	7.10/7.35	1.80/1.60	0.5	0.50	0.25	0.20
TVM4	35.0-999.9	9.50/9.75	2.80/2.60	0.5	0.60	0.30	0.25



ROD SEAL INSTALLATION
FOR ZERO BACKUP GLANDS PER METRIC SIZING

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR VARISEAL®FM

2. ORDERING EXAMPLE: TVM 3 0 0508 A T25 S
   VARISEAL®FM, ROD DESIGNATOR
   CROSS SECTION
      1 = 100 SERIES
      2 = 200 SERIES
      3 = 300 SERIES
      4 = 000 SERIES
   0 DESIGNATOR, LESS THAN 1000 MM
   ØB x 10
   QUALITY INDEX:
      A = AEROSPACE CERTIFICATE OF CONFORMANCE
   △3 TURCON®VARISEAL®FM MAT'L CODE
   SPRING MAT'L CODE - HEAVY SPRING LOAD
   AS STANDARD

△3 FOR MATERIAL OPTIONS, SEE MATERIALS SECTION OF TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE. SPRING MATERIAL OPTIONS LISTED BELOW

SPRING MATERIAL CODE HEAVY DUTY AS STANDARD	
CODE	MATERIAL
S	301 STAINLESS STEEL
H	HASTELLOY
E	ELGILOY

4. DIMENSIONS PER ISO 286-2 SPECIFICATION

METRIC
2009_1
TRELLEBORG
SEALING SOLUTIONS
TITLE
ROTO STANDARD (TVM)
DRAWING NO.
TVM200000

WORLD AEROSPACE TITLE BLOCK REV.

Features and benefits

Benefits of Turcon® Varilip® PDR include:

Turcon® PTFE based sealing lip

- Low-friction to facilitate reduced power loss and friction-induced heat
- Unique self-lubricating hydrodynamic feature further reduces friction
- Advanced geometries engineered to give excellent performance in almost every high-speed rotary situation
- Multiple lip configurations to address most sealing needs
- Material compatible with virtually all media
- Available in FDA-compliant grades

Metal body

- Durability in harsh environments
- Effective sealing on static outer diameter
- Resistance to thermal cycling
- Choice of high-quality metals including Stainless Steel, aluminum and other specialized metals such as Hastelloy® or Titanium
- High corrosion resistance
- Superior precision-machined finish forimproved sealing on the static interface

Overall Turcon® Varilip® PDR seal

- Contributes to a reduction in power consumption of equipment
- High speed capability up to 328 ft/s / 100 m/s
- Wide operating temperature range from -76° to +392°F/ -60° to +200°C
- Options available for dry-running applications and for soft shafts
- Retrofits in radial oil seal grooves
- Unlimited shelf life with no special storage requirements

Turcon® Varilip® PDR has several lip combinations that retain oil or grease while giving excellent protection from dust and sand.

Turcon® Varilip® PDR

Description

Turcon® Varilip® PDR rotary shaft seal is a metal bodied seal with a mechanically retained Turcon® sealing element. It extends the boundaries imposed by elastomer radial shaft seals, utilizing advanced materials and design techniques to provide optimum sealing performance for each application. The outcome is a superior sealing solution, which retains a compact seal envelope.

Standard elastomer rotary shaft seals have a limited application range with respect to temperature, surface speed, media compatibility, pressure or a combination of these. This is due to the inherent limitations of different elastomer grades. They also have limited suitability for applications with inadequate lubrication.

Turcon® Varilip® PDR rotary shaft seals are characterized in particular by low friction and their stick-slip-free running, reducing temperature generation and permitting higher peripheral speeds.

Method of operation

Turcon® Varilip® PDR seals are constructed from two parts – a precision manufactured metal body and a mechanically retained Turcon® sealing element. Unlike seals with pressed metal cases, Turcon® Varilip® PDR does not require a gasket to provide mechanical retention of the lip. This improves both the chemical resistance and temperature range of the sealing system.

Turcon® has inherent memory. A distorted Turcon® component will attempt to recover to the profile it had during the sintering cycle of its manufacturing process. This feature is used to provide the necessary radial loading of the sealing lip onto the shaft.

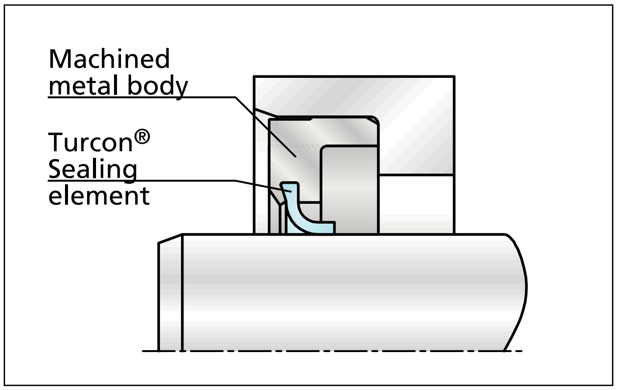
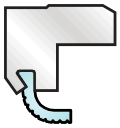
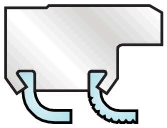
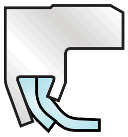
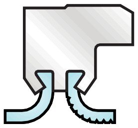
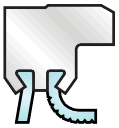


Figure 1 Turcon® Varilip® PDR seal

When required, Turcon® Varilip® PDR is available with a hydrodynamic feature on the Turcon® sealing lip. This provides a positive displacement of fluid as a result of shaft rotation, giving improved sealing in applications where the shaft only rotates in a single direction. The feature also increases the flexibility of the lip, allowing a wider contact band between the Turcon® lip and the shaft. This helps to reduce shaft load and associated wear.

Table I Turcon® Varilip® PDR Types

Turcon® Varilip® PDR seals are produced in one of five basic design styles, detailed in table below.

Cross Section	Part Number	Description
 Turcon® Varilip® PDR Type A / Type1	TJ1 _ B (Inch) TJA _ B (Metric)	Type A is a single lip seal suitable for applications up to a pressure of 73 psi/ 0.5 MPa. It is used when an elastomer radial shaft seal is unable to withstand the temperature or friction, in medium or poor lubrication. It operates at sealing surface speeds up to 328 ft/s / 100 m/s with sufficient cooling and lubrication of the sealing lip.
 Turcon® Varilip® PDR Type B / Type 3	TJ3 _ B (Inch) TJB _ B (Metric)	Type B is the preferred choice for applications in which high seal integrity is demanded or where contaminated media are to be sealed. This type offers a back-up sealing lip to provide secondary sealing. Pressure limit is 73 psi/ 0.5 MPa.
 Turcon® Varilip® PDR Type C / Type 4	TJ4 _ B (Inch) TJC _ B (Metric)	Type C can be used for applications with higher pressures when an elastomer radial shaft seal can no longer be considered. Due to reinforcement of the sealing lip, pressures up to 145 psi/ 1 MPa are possible as pump, shaft or rotor seals.
 Turcon® Varilip® PDR Type D / Type 5	TJ5 _ B (Inch) TJD _ B (Metric)	Type D can operate with pressure from both sides. Pressure differential of up to 73 psi/ 0.5 MPa is permissible. It is also possible to separate two different media with this single seal.
 Turcon® Varilip® PDR Type G / Type 6	TJ6 _ B (Inch) TJG _ B (Metric)	Type G is similar to Type D but has a non-contacting environmental sealing element rather than a full lay-down lip. This prevents ingress of dust and dirt into the system while also ensuring torque and resulting power consumption are kept to a minimum.

All designs are to Trelleborg Sealing Solutions gland standard and rod per AS4716.
Lip style B is selected as default for bi-directional shaft rotation. For anti-clockwise shaft rotation select A and for clock-wise shaft rotation select C.

Materials

Sealing lip

The proper function of Turcon® Varilip® PDR depends on the material used for the sealing lip. The compounds used for these are manufactured specially modified for Turcon® Varilip® PDR. Particular importance is attached to the optimization of friction and wear properties, while providing excellent sealing performance, even at high peripheral speeds.

The table below shows the Turcon® materials available as Turcon® Varilip® PDR seals. Additional compounds have been developed for specific applications and these are available on request.

Table II Turcon® sealing element materials

Material, Applications, Properties, Fillers	Code	Operating temp.		Mating surface hardness	psi/ MPa Maximum
		F°	C°		
Turcon® T25 Standard material with exceptional wear and friction characteristics. For lubricated running, e.g. oil, grease-filled gearboxes Glass fiber, lubricant	T25 ■	-76 to +392	-60 to +200	Min. 55 HRC At low pressure Min. 45 HRC up to 13 ft/s 4 m/s	290 psi 2 MPa
Turcon® T40 For all lubricating and non-lubricating fluids, especially water. Used with medium hard shafts in applications where there is risk of shaft wear. Carbon fiber	T40 ■	-76 to +392	-60 to +200	Min. 30 HRC	290 psi 2 MPa
Turcon® T78 Particularly good running behavior allows use in dry running situations or when lubrication is poor. Can be used with soft shaft surfaces, e.g. Stainless Steel shafts in fuel systems and electronic devices. Aromatic polymer	T78 □	-76 to +392	-60 to +200	Min. 170 HB	290 psi 2 MPa
Turcon® M83 Specially designed for dry-running situations. Gives particularly good results in electrical and electronic applications. Can also be used lubricated. Glass fiber, pigment	M83 🟨	-76 to +392	-60 to +200	Min. 55 HRC	290 psi 2 MPa

Other Turcon® materials are available by using the relevant material code when ordering.
FDA compliant materials, for use in environmental control systems and oxygen supply, are available on request.

Metal Body

The preferred material for the metal body of Turcon® Varilip® PDR is Stainless Steel 304L. Other materials such as Stainless Steel 316L and Zinc-Plated Mild Steel are available within the standard range. The table below shows the codes for these materials. Other specialized materials are available on request. Ordering Turcon® Varilip® PDR in any material other than Stainless Steel 304L may result in extended lead-time.

Metal Body Materials

Code	Material
1	Stainless Steel 304
2	Stainless Steel 316
4	Mild Steel (Zinc-Plated)
5	Aluminum

Turcon® Varilip® PDR

Technical Data

Speed

The graph below shows the superior surface speed capability of Turcon® PDR compared to elastomer shaft seals.

The operating speed directly impacts the temperature generated by the seal and is an important factor when considering the requirements for the sealing system.

The actual limiting speed will depend on temperature, pressure, media, lubrication, heat dissipation and shaft condition within a specific application.

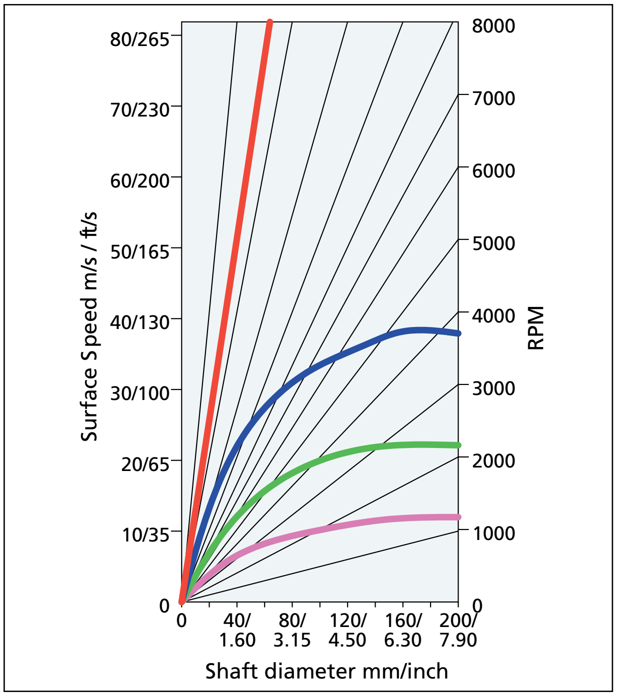


Figure 2 Surface speed as a function of shaft diameter and RPM

Table III Surface Speed

General recommended maximum surface speed			
Turcon® Varilip® PDR	🟥	19,680 ft/min	100 m/s
Fluoroelastomer	🟦	7,500 ft/min	38 m/s
Silicone	🟦	7,500 ft/min	38 m/s
Polyacrylic	🟩	4,320 ft/min	22 m/s
Nitrile	🟪	2,340 ft/min	12 m/s

Speed capability depends on application conditions

Temperature

All Turcon® PDR seals are capable of outstanding high and low temperature performance compared to those including elastomer materials. So, unlike other PTFE lip seals, the Turcon® PDR seal is not limited in its temperature performance by the presence of an elastomer gasket. This gives it excellent temperature range capability.

The temperatures in the figure below are general working limits for the seal material. In all cases the effective limit for a rotary shaft seal application would be lower.

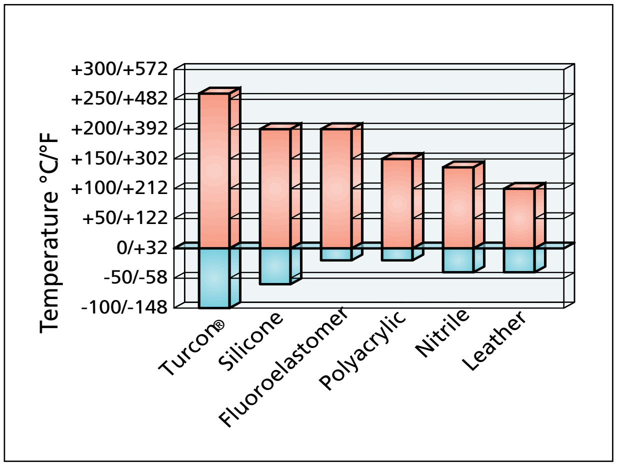


Figure 3 Maximum and minimum temperatures for different materials

Table IV Temperature

General recommended minimum / maximum temperature		
Filled PTFE	-148 to +500°F	-100 to +260° C
Fluoroelastomer	-4 to +392° F	-20 to +200° C
Silicone	-76 to +392°F	-60 to +200° C
Polyacrylic	-4 to +300°F	-20 to +150° C
Nitrile	-40 to +275°F	-40 to +135° C
Leather	-40 to +212°F	-40 to +100° C

Pressure

Turcon® Varilip® PDR Types A, B, D and G are suitable for pressures up to 73 psi/ 0.5 MPa. Turcon® Varilip® PDR Type C provides a double sealing lip design for pressures up to 145 psi/ 1 MPa.

Pressures heavily influence the contact force between the Turcon® lip and the shaft, which in turn determines heat generation. This must be taken into consideration when selecting the appropriate seal type.

Turcon® Varilip® PDR seals can remain leak-tight when exposed to pressurization during static shaft conditions.

Fluid resistance

Turcon® consists of fully substituted carbon-carbon chains. The outstanding physical and chemical properties of Turcon® can be attributed to the resulting carbon-fluorine bonds, which are among the strongest known in organic chemistry.

Turcon® Varilip® PDR seals are resistant to mineral acids, bases, common organic fluids and solvents.

A particular benefit of Turcon® Varilip® PDR is a resistance to oil additives and biofuels, which have an adverse effect on many elastomers. Specification of Turcon® Varilip® PDR allows increased use of additives within applications, leading to a longer oil service life.

Environmental exposure

Turcon® Varilip® PDR is unaffected by oxidation, ultraviolet radiation or ozone. This makes the seal ideal for use in applications exposed to the atmosphere or in outer space.

Lubrication starvation

Turcon® Varilip® PDR is capable of running without lubrication for long periods of time without adversely affecting their ultimate life. This not only allows the seal to be used in applications where the lubrication may be intermittent but it is also effective in dirt, dust and powder.

Custom designs

Higher speeds and pressure capabilities can be achieved with the use of custom designs.

Further information

Additional more detailed information on Turcon® Varilip® PDR can be found in the Trelleborg Sealing Solutions Turcon® Varilip® PDR catalog. This can be downloaded from the services section of the website at www.tss.trelleborg.com or a printed copy ordered from your local Trelleborg Sealing Solutions marketing company.

Design Guidelines

Housing

Turcon® Varilip® PDR is designed to meet global standards, including ISO 6194/1 and ISO 16589.

Turcon® Varilip® PDR requires an interference fit with the housing bore to provide adequate sealing of this interface. It also ensures that the seal remains in place when subjected to pressure, axial movement and induced torsion produced by the relative rotary motion of shaft to housing bore. The bore should be machined with an H8 diametric tolerance as detailed in the table below.

Turcon® Varilip® PDR seals should not be pushed into bores that were previously scored by the assembly of another component, such as a bearing. In these circumstances a larger seal outer diameter should be selected.

Surface finish of the bore is required to be 32 µin/ 0.8 µm Ra maximum. A sealant or adhesive should be used if the housing bore is split and an axial joint crosses the seal outer diameter or if surface finish requirements cannot be met. Alternatively a custom solution can be supplied with a rubber covering or O-Ring for OD sealing.

Table V Housing Installation Data

Bore Diameter				Tolerance	
Over		To		H8 (in)	H8 (mm)
inch	mm	inch	mm		
0.394	10	0.787	18	0.0011 -0.000	+0.027 -0
0.787	18	1.181	30	0.0013 -0.0000	+0.033 -0
1.181	30	1.969	50	0.0015 -0.000	+0.039 -0
1.969	50	3.150	80	0.0018 -0.000	+0.046 -0
3.150	80	4.724	120	0.0021 -0.000	+0.054 -0
4.724	120	7.087	180	0.0025 -0.000	+0.063 -0
7.087	180	9.843	250	0.0028 -0.000	+0.072 -0
9.843	250	12.402	315	0.0032 -0.000	+0.081 -0
12.402	315	15.748	400	0.0035 -0.000	+0.089 -0

Table VI Housing Design Data

Seal Width	< 0.394 inch 10 mm	> 0.394 inch 10 mm
Min. bore depth (b)	b + 0.0197 b + 0.5 mm	b + 0.0394 b+ 1.0
Chamfer length (c)	0.028 to 0.04 0.70 to 1.00	0.047 to 0.06 1.20 to 1.50
Max. corner radius (r)	0.0157 0.40	0.0157 0.40

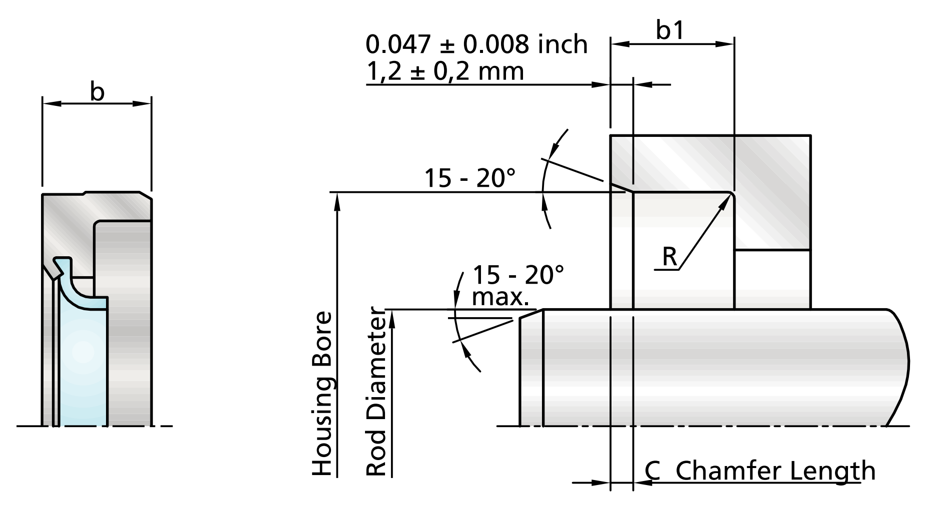


Figure 4 Housing Design Schematic

Shaft

For Turcon® Varilip® PDR the shaft should be machined to an h11 tolerance or greater, as detailed in the table below. The surface finish should be prepared by plunge grinding to avoid any machining lead that may act with the shaft rotation, potentially causing leakage.

The recommended surface finish for the shaft is 8-16 µinch/ 0.2 to 0.4 µm Ra.

Table VII Shaft Installation Data

Shaft Diameter				Tolerance	
Over		To		h11 (in)	h11 (mm)
inch	mm	inch	mm		
0.236	6	0.394	10	+0 -0.0035	+0 -0.090
0.394	10	0.787	18	+0 -0.0043	+0 -0.110
0.787	18	1.181	30	+0 -0.0051	+0 -0.130
1.181	30	1.969	50	+0 -0.0063	+0 -0.160
1.969	50	3.150	80	+0 -0.0075	+0 -0.190
3.150	80	4.724	120	+0 -0.0087	+0 -0.220
4.724	120	7.087	180	+0 -0.0098	+0 -0.250
7.087	180	9.843	250	+0 -0.0114	+0 -0.290
9.843	250	12.402	315	+0 -0.0126	+0 -0.320
12.402	315	15.748	400	+0 -0.0142	+0 -0.360

Shaft hardness in excess of 55 HRC is generally recommended for Turcon® Varilip® PDR, although softer shafts are permissible depending on pressure, speed and sealing lip material.

Titanium shafts should be avoided unless nitrided. Shafts with good chrome, nickel or zinc plating, properly finished, are acceptable depending on application. Certain ceramic coatings can also be used, although some grades can result in wear of the sealing lip due to their open structure.

In certain applications it may not be possible to provide a shaft with the necessary hardness, surface finish and corrosion resistance. Fitting a wear sleeve onto the shaft can solve this problem. If wear should occur, only the sleeve needs replacing. The surface finish of the sleeve should be as outlined above. Consideration should be given to adequate heat dissipation and effective sealing of the interface between the wear sleeve and the shaft.

Installation Requirements

Careful handling is important when installing Turcon® Varilip® PDR to avoid damaging the sealing lip.

Radii or lead-in chamfers must be machined on the end of the shaft if the seal is installed from the back. The end of the shaft must also be free from burrs, sharp corners or rough machining marks.

When installing the seal with the lip against the shaft end, a lead-in chamfer is required. Its smallest diameter must be smaller than the unstressed diameter of the sealing lip.

It is recommended that the angle of the shaft's lead-in chamfer is as shallow as practical within the range given in the table below.

Table VIII Shaft Lead-in Chamfer

d1 (inch)	d1 (mm)	d1-d2 (inch)	d1-d2 (mm)
< 0.4	< 10	0.06	1.5
0.4 – 0.8	10 – 20	0.08	2.0
0.8 – 1.2	20 – 30	0.10	2.5
1.2 – 1.6	30 – 40	0.12	3.0
1.6 – 2.0	40 – 50	0.14	3.5
2.0 – 2.8	50 – 70	0.16	4.0
2.8 – 3.7	70 – 95	0.18	4.5
3.7 – 5.1	95 – 130	0.22	5.5
5.1 – 9.4	130 – 240	0.28	7.0
9.4 –11.8	240 – 300	0.43	11.0

To ensure correct orientation of the sealing lip, fitting of the seal on an installation cone before fitting is preferred.

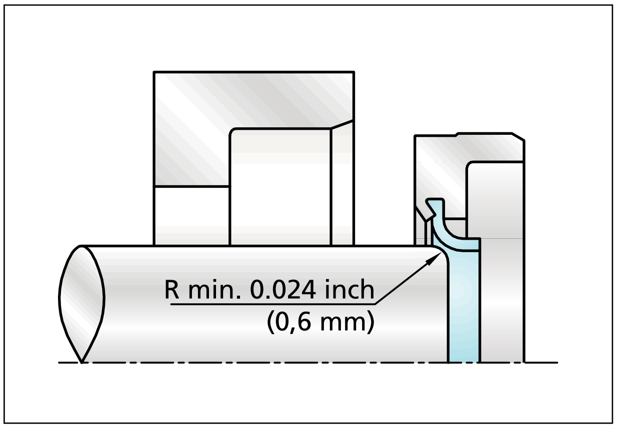


Figure 5 Installation of the sealing lip with the back to the shaft for pressurized application

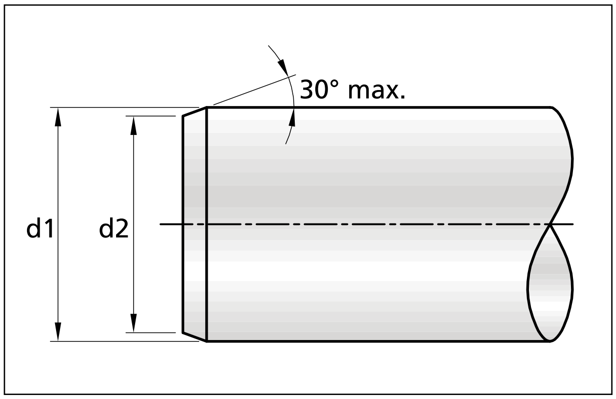


Figure 6 Shaft lead-in chamfer

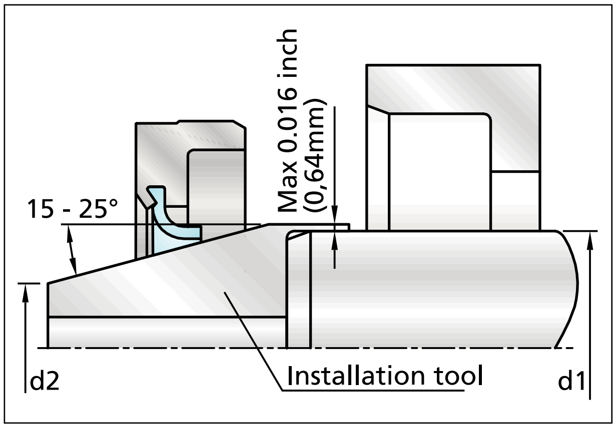


Figure 7 Fitting the sealing lip using an installation tool

Fitting should be performed in a swift movement to limit the time that the lip is formed above shaft size, reducing the amount of lip recovery needed.

Packaging

Single and small quantities of Turcon® Varilip® PDR seals will be supplied in blister packs with individual transport mandrels. These mandrels will pre-form the element to above its free diameter but below the intended shaft diameter. This assists in ease of installation while ensuring the element is not overstretched or damaged in transit.

Larger quantities of Turcon® Varilip® PDR seals will be supplied in a tube-and-end cap configuration.

Storage

Turcon® Varilip® PDR seals require no special storage conditions and do not have a limited shelf life.

Fitting Instructions

Investigations into premature failures have shown that significant numbers result from inappropriate installation techniques. By observing the following guidelines, such failures can be avoided.

- Assembly sleeves and fitting tools should be regularly checked for signs of damage.
- When supplied on mandrels the seals should not be removed from the mandrel until immediately prior to fitting. Seals supplied on cardboard mandrels should be removed in the direction so that the spiral paper overlay of the mandrel is not lifted.
- Turcon® Varilip® PDR seals should be assembled on the shaft in a non-lubricated (dry) condition to avoid contamination of the hydrodynamic feature if present.
- Care should be taken not to damage the outer diameter surface of the seal.
- Seals should be pressed squarely into the housing with the pressing-in force applied as close as possible to the outside diameter of the seal.
- If the seal contains a hydrodynamic feature on the sealing lip, ensure that it is correctly oriented in relation to the shaft's direction of rotation.
- Normal practice is to install the seal with the lip facing the medium to be sealed. The seal is reversed only when it becomes more important to exclude a medium than to retain it.
- Suitable sealants or adhesives may be used for improved sealing of the outer diameter in critical applications or for seal retention purposes.

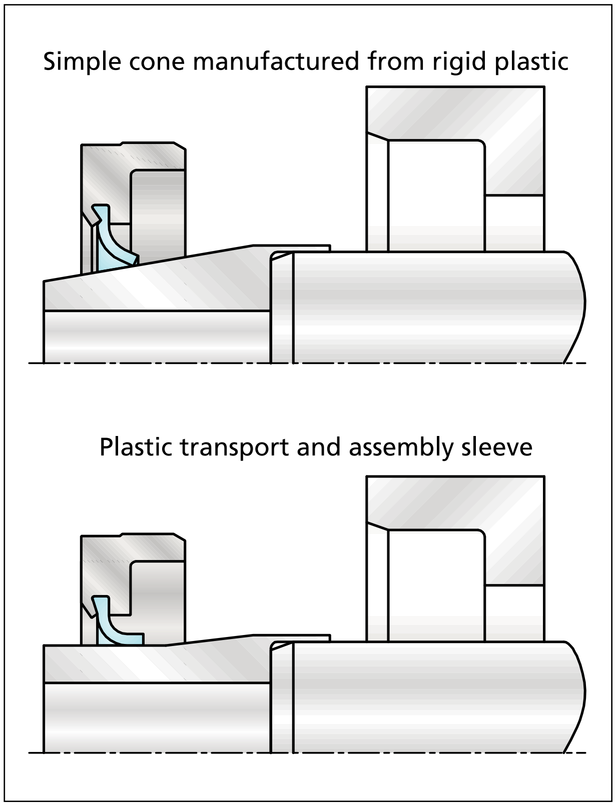


Figure 8 Assembly Techniques

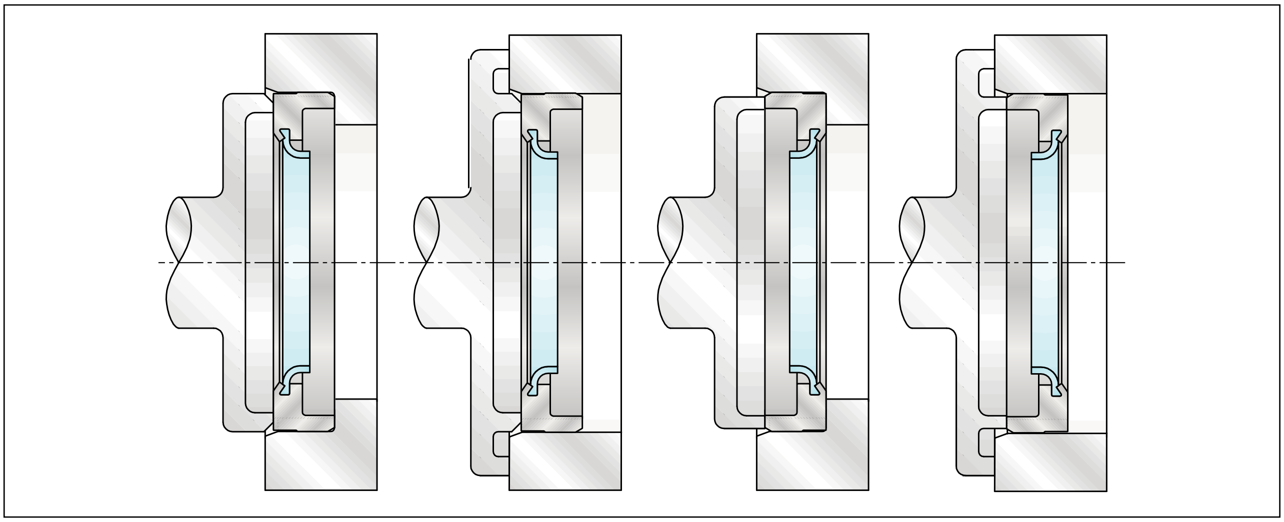


Figure 9 Assembly Techniques

Installation Recommendations

The following diagrams show installation recommendations for seal retention under conditions where there is pressure.

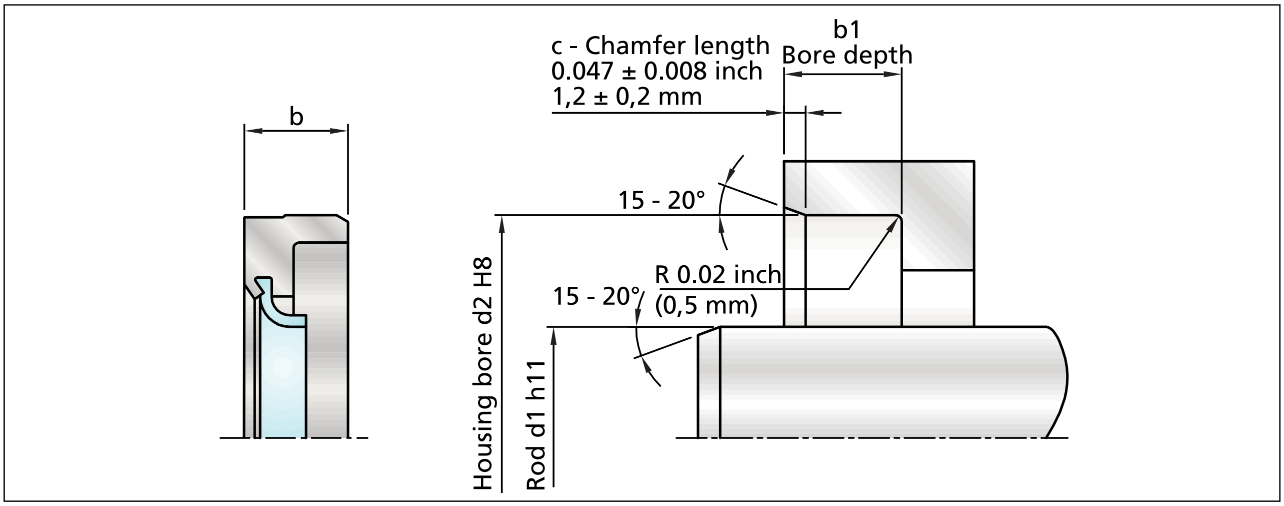


Figure 10 Installation drawing for pressure up to 73 psi/ 0.5 MPa

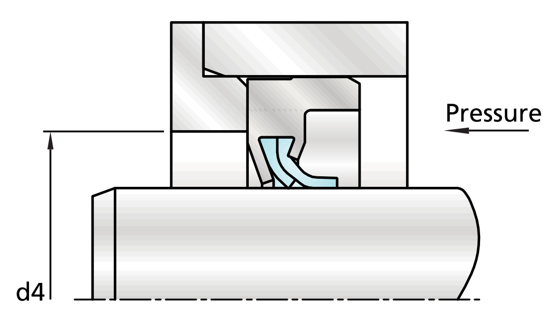


Figure 11 Installation for pressure from 73 psi/ 0.5 MPa up to 145 psi/ 1 MPa

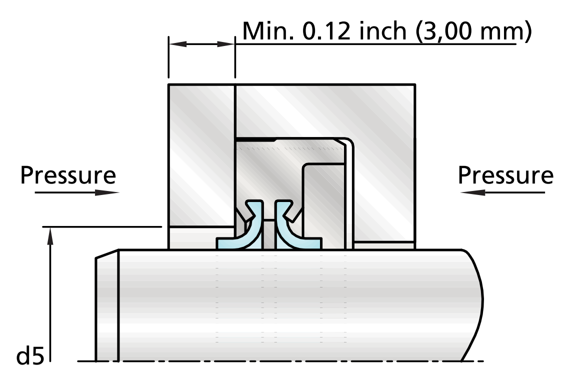


Figure 12 Installation type for fluid separation at pressures up to 73 psi/ 0.5 MPa

Post installation recommendations:

If painting the application, be sure to mask the seal. Avoid getting paint on the lip or the shaft where the lip rides. Also, mask any vents or drain holes, so they will not become clogged. Be sure to remove masks before operating unit.

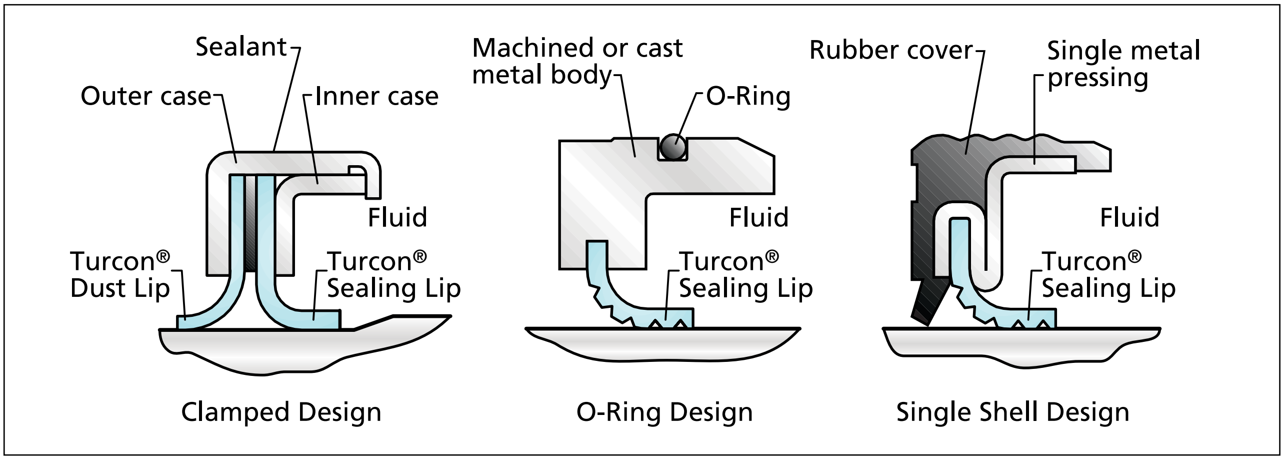
If paint is to be baked or the mechanism is subjected to heat, seals should not be heated to temperatures higher than their materials can tolerate.

In cleaning or testing, do not subject seals to any fluids or pressures other than those for which the seals have been specified.

Extraction features such as tapped holes, internal threads or simple grooves can be included in custom Turcon® Varilip® PDR designs.

Turcon® Varilip® PDR – Special Designs

Apart from the standard range, Turcon® Varilip® PDR seals are available as special designs to satisfy the demands of specific applications. These can accommodate non-standard housing and shaft sizes. The figures below show some of the special designs available.

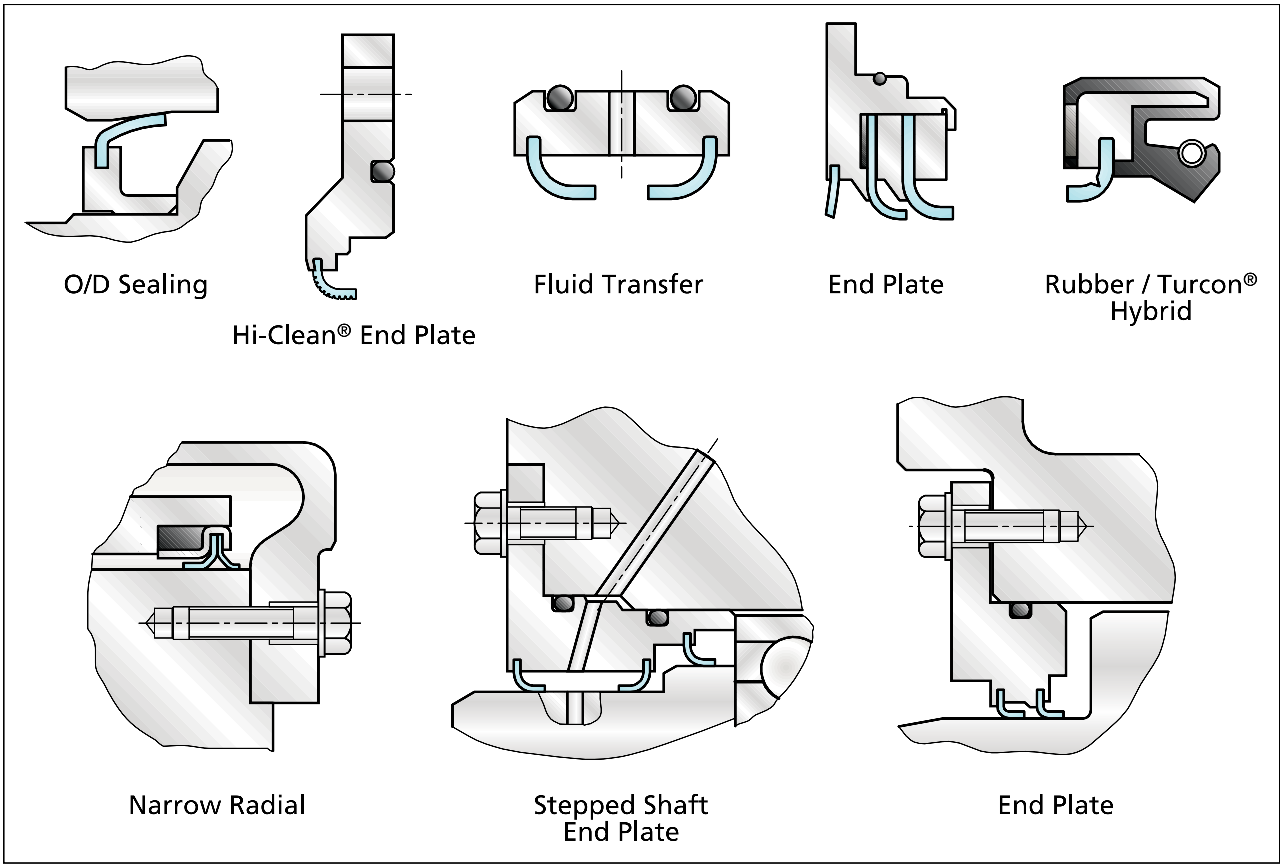


Clamped Design

O-Ring Design

Single Shell Design

Figure 13 Turcon® Varilip® PDR – Special Designs


O/D Sealing

Hi-Clean® End Plate

Fluid Transfer

End Plate

Rubber / Turcon® Hybrid

Narrow Radial

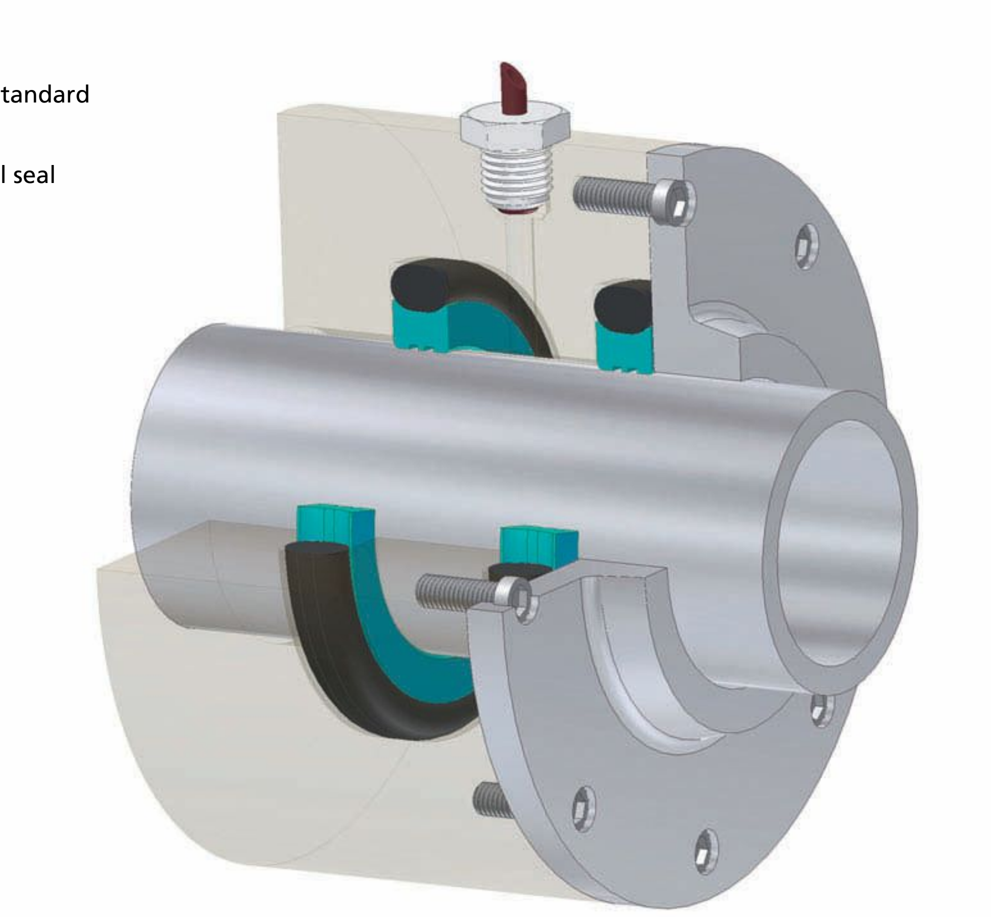
Stepped Shaft End Plate

End Plate

Figure 14 Turcon® Varilip® PDR – Special Designs

Features and benefits

- Available for internal and external sealing applications
- For use at high-pressure and low sliding speeds
- Low friction
- Stick-slip-free starting
- High abrasion resistance and dimensional stability
- Simple groove design, narrow space-saving groove dimensions
- Lubricant reservoir
- Available in a wide range of standard and custom sizes
- Unidirectional or bidirectional seal



Turcon® Roto Glyd Ring® is well suited for sealing swivel joints for movable actuators.

Turcon® Roto Glyd Ring®

Description

The double-acting Turcon® Roto Glyd Ring® is used to seal rods, shafts, axles, bores, rotary transmission leadthroughs, journals and swivels with rotary, helical or oscillating movement. It consists of a seal ring in high-grade Turcon® material activated by an elastomer O-Ring.

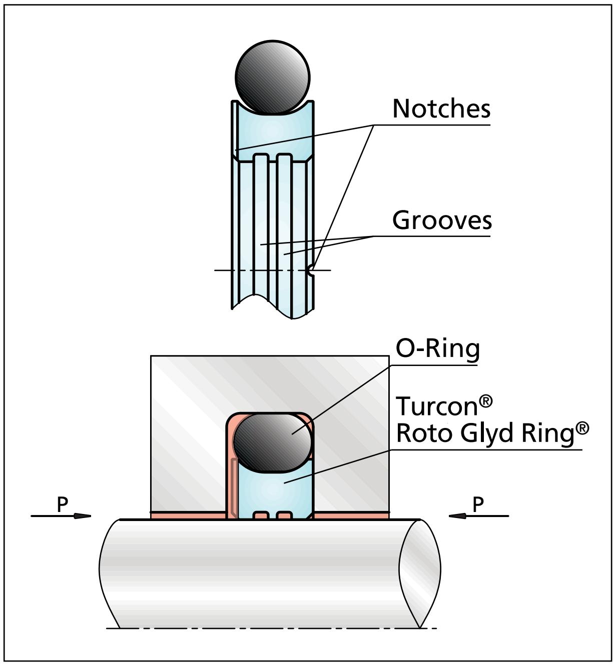


Figure 1 Turcon® Roto Glyd Ring®

The contact surface profile of the seal ring is specially designed for use at high-pressure and low sliding speeds.

Method of Operation

Depending on the cross section profile of the seal, the contact surface has one or two continuous machined grooves. These improve seal efficiency by increasing the specific surface load pressure against the sealed surface. They also form a lubricant reservoir and reduce friction.

In order to improve the pressure activation of the O-Ring, the Roto Glyd Ring® has notched end faces as standard.

The rear face which holds the O-Ring has a concave form. This increases the surface and prevents the seal from turning with the rotating surface.

Technical Data

Operation pressure:	Up to 4,000 psi/ 30 MPa
Speed:	Up to 6.5 ft/s/ 2.0 m/s
Temperature range:	-49°F to +428°F/ -45°C to +220°C depending on elastomer For applications at temperatures below -22°F/ -30°C contact your local Trelleborg Sealing Solutions marketing company.
Media:	Mineral oil-based hydraulic fluids, flame-retardant hydraulic fluids, environmentally-safe hydraulic fluids (bio-oils), phosphate ester, water and others, depending on the elastomer material For continuous operation at temperatures over +140°F/ +60°C, pressure and speed must be limited

Avoid combining extreme limits.

Mating Surface Materials

Sealing of applications with rotating movements requires very good mating surfaces. A minimum hardness of 55 HRC is recommended to a hardening depth of at least .012 in/ 0.3 mm.

Coated surfaces must be finished with particular care:

- Chrome-plating must not peel off in service.
- Good heat dissipation must be assured by the coating.

Unhardened mating surfaces should have a Brinell hardness of at least 1,700 N/mm^2.

Frictional Power

Guide values for frictional power can be determined from the graph below. They are shown as a function of the sliding speed and operating pressure for a shaft diameter of 1.968 in/ 50 mm with an oil temperature of +140°F/ +60°C. At higher temperatures, these application limits must be reduced.

Formula for other diameters: $p \simeq p50 \times (\frac{d}{50\ mm})$ [W]

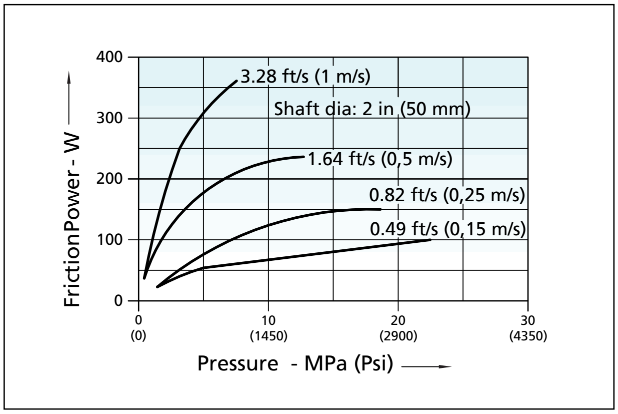
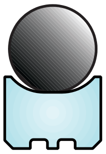
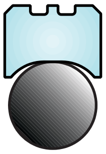


Figure 2 Friction for Turcon® Roto Glyd Ring®

Table I Turcon® Roto Glyd Ring®

Cross Section	Description	Part Number	Gland Standard
	Turcon® Roto Glyd Ring® Rod	TGR_0B	TSS Gland Rod per AS4716
	Turcon® Roto Glyd Ring® Bore	TGP_0B	TSS Gland Bore per AS4716

Turcon® Roto Glyd Ring®

DASH NO.	B DIA.	E DIA.	O-RING NO.
	+.000 −.001	+.001 −.000	
010	.248	.441	011
011	.310	.503	012
012	.373	.566	013
	+.000 −.002	+.002 −.000	
013	.435	.628	014
014	.498	.691	015
015	.560	.753	016
016	.623	.816	017
017	.685	.878	018
018	.748	.941	019
019	.810	1.003	020
020	.873	1.066	021
021	.935	1.128	022
022	.998	1.191	022
023	1.060	1.253	024
024	1.123	1.316	025
025	1.185	1.378	026
026	1.248	1.441	028
027	1.310	1.503	028
028	1.373	1.566	029
	+.000 −.001	+.001 −.000	
108	.248	.543	109
109	.310	.605	110
	+.000 −.002	+.002 −.000	
110	.373	.668	111
111	.435	.730	112
112	.498	.793	113
113	.560	.855	114
114	.623	.918	115
115	.685	.980	116
116	.748	1.043	117
117	.810	1.105	118
118	.873	1.168	119
119	.935	1.230	120
120	.998	1.293	121
121	1.060	1.355	122
122	1.123	1.418	123
123	1.185	1.480	124
124	1.248	1.543	125
125	1.310	1.605	126
126	1.373	1.668	127
127	1.435	1.730	128
128	1.498	1.793	129
129	1.560	1.855	130
130	1.623	1.918	131
131	1.685	1.980	132
132	1.748	2.043	133
133	1.810	2.105	134
134	1.873	2.168	135
135	1.936	2.231	136
136	1.998	2.293	137
137	2.061	2.356	138
138	2.123	2.418	139
139	2.186	2.481	140
140	2.248	2.543	141
141	2.311	2.606	142
142	2.373	2.668	143
143	2.436	2.731	144
144	2.498	2.793	145
145	2.561	2.856	146
146	2.623	2.918	147
147	2.686	2.981	148
148	2.748	3.043	149
149	2.811	3.106	150

DASH NO.	B DIA.	E DIA.	O-RING NO.
	+.000 −.002	+.002 −.000	
210	.748	1.181	212
211	.810	1.243	213
212	.873	1.306	214
213	.935	1.368	215
214	.998	1.431	216
215	1.060	1.493	217
216	1.123	1.556	218
217	1.185	1.618	219
218	1.248	1.681	220
219	1.310	1.743	221
220	1.373	1.806	222
221	1.435	1.868	222
222	1.498	1.931	223
223	1.623	2.056	224
224	1.748	2.181	225
225	1.873	2.306	226
226	1.998	2.431	227
227	2.123	2.556	228
228	2.248	2.681	229
229	2.373	2.806	230
230	2.498	2.931	231
231	2.623	3.056	232
232	2.748	3.181	233
233	2.873	3.306	234
234	2.997	3.430	235
235	3.122	3.555	236
236	3.247	3.680	237
237	3.372	3.805	238
238	3.497	3.930	239
239	3.622	4.055	240
240	3.747	4.180	241
241	3.872	4.305	242
242	3.997	4.430	243
243	4.122	4.555	244
244	4.247	4.680	245
245	4.372	4.805	246
246	4.497	4.930	247
247	4.622	5.055	248
	+.000 −.002	+.002 −.000	
325	1.498	2.108	326
326	1.623	2.233	327
327	1.748	2.358	328
328	1.873	2.483	329
329	1.998	2.608	330
330	2.123	2.733	331
331	2.248	2.858	332
332	2.373	2.983	333
333	2.498	3.092	334
334	2.623	3.217	335
335	2.748	3.342	336
336	2.873	3.467	337
337	2.997	3.591	338
338	3.122	3.716	339
339	3.247	3.841	340
340	3.372	3.966	341
341	3.497	4.091	342
342	3.622	4.216	343
343	3.747	4.341	344
344	3.872	4.466	345
345	3.997	4.591	346
346	4.122	4.716	347
347	4.247	4.841	348
348	4.372	4.966	349
349	4.497	5.091	351
	+.000 −.003	+.003 −.000	
425	4.497	5.234	427
426	4.622	5.449	428
427	4.747	5.574	429
428	4.872	5.699	430
429	4.997	5.824	431
430	5.122	5.949	432
431	5.247	6.074	433
432	5.372	6.199	434
433	5.497	6.324	435
434	5.622	6.449	436

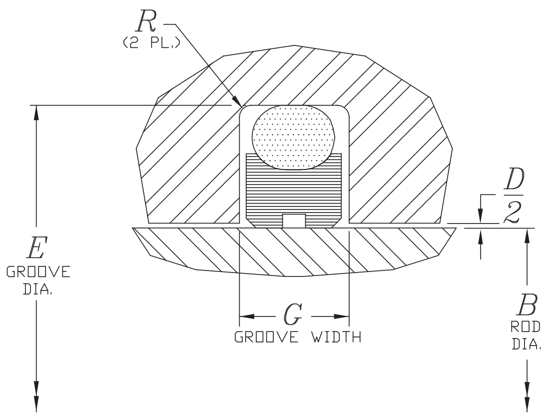
DASH NO.	B DIA.	E DIA.	O-RING NO.
	+.000 −.003	+.003 −.000	
435	5.747	6.574	437
436	5.872	6.699	437
437	5.997	6.824	438
438	6.247	7.074	439
439	6.497	7.324	440
440	6.747	7.574	441
441	6.997	7.824	442
442	7.247	8.074	443
443	7.497	8.324	444
444	7.747	8.574	445
445	7.997	8.824	445
446	8.497	9.324	446
	+.000 −.003	+.004 −.000	
447	8.997	9.824	447
448	9.497	10.324	448
449	9.997	10.824	449
450	10.497	11.324	450
451	10.997	11.824	451
452	11.497	12.324	452
453	11.997	12.824	453
454	12.497	13.324	454
455	12.997	13.824	455
456	13.497	14.324	456
457	13.997	14.824	457
458	14.497	15.324	458
459	14.997	15.824	459
460	15.497	16.324	460

DASH NO.	G GROOVE WIDTH	R RADIUS	D DIAMETRAL CLEARANCE MAX.
010-012	.087/.095	.005/.020	.004
013-028			.005
108-109	.126/.134	.005/.020	.004
110-126			.005
127-129			.006
130-132			.006
133-140			.007
141-149			.007
210-222	.165/.173	.010/.025	.005
223-224			.006
225-227			.007
228-243			.007
244-245			.007
246-247			.008
325-327	.248/.256	.015/.030	.006
328-329			.007
330-345			.007
346-349			.007
425-438	.319/.327	.020/.035	.009
439-445			.010
446			.010
447-460			.010

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR ROTO GLYD RING® IN TRELLEBORG SEALING SOLUTIONS ROTO GLYD RING,® ROD GLANDS.
2. ORDERING EXAMPLE: TGR 2 0 B 214 A T19 NG

ROTO GLYD RING,® ROD DESIGNATOR — TGR
SEAL CROSS SECTION — 2
  0 = -0XX SERIES
  1 = -1XX SERIES
  2 = -2XX SERIES
  3 = -3XX SERIES
  4 = -4XX SERIES
DESIGN CHARACTERISTICS — 0
  0 = WITHOUT NOTCHES & WITH ROTOLOK
GLAND STANDARD — B
  B = TRELLEBORG SEALING SOLUTIONS
      GLAND STANDARD
DASH SIZE — 214
  ACCORDING TO TRELLEBORG SEALING SOLUTIONS
  GLAND STANDARD
QUALITY INDEX: — A
  A = AEROSPACE CERTIFICATE OF CONFORMANCE
TURCON® ROTO GLYDRING® MAT'L. CODE — T19
TUREL® O-RING MAT'L CODE — NG
CONSULT THE TRELLEBROG SEALING SOLUTIONS AEROSPACE
DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.



ROD SEAL INSTALLATION
FOR TRELLEBORG SEALING SOLUTIONS GLAND SPECIFICATION

INCH
2009_1
TRELLEBORG
SEALING SOLUTIONS
TITLE
ROTO GLYD RING ®
DRAWING NO.
TGR00B000

WORLD AEROSPACE TITLE BLOCK REV.

Turcon® Roto Glyd Ring®

DASH NO.	*A* DIA.	*F* DIA.	O-RING NO.
	+.001 −.000	+.000 −.001	
011	.422	.229	009
012	.485	.292	010
	+.002 −.000	+.000 −.002	
013	.550	.357	011
014	.613	.420	012
015	.675	.482	013
016	.738	.545	014
017	.800	.607	015
018	.863	.670	016
019	.925	.732	017
020	.991	.798	018
021	1.053	.860	019
022	1.116	.923	020
023	1.178	.985	021
024	1.241	1.048	022
025	1.303	1.110	023
026	1.366	1.173	024
027	1.428	1.235	025
028	1.491	1.298	026
	+.002 −.000	+.000 −.002	
110	.550	.255	107
111	.613	.318	109
112	.675	.380	110
113	.738	.443	111
114	.800	.505	112
115	.863	.568	113
116	.925	.630	114
117	.991	.696	115
118	1.053	.758	116
119	1.116	.821	117
120	1.178	.883	118
121	1.241	.946	119
122	1.303	1.008	120
123	1.366	1.071	121
124	1.428	1.133	122
125	1.491	1.196	123
126	1.553	1.258	124
127	1.616	1.321	125
128	1.678	1.383	126
129	1.741	1.446	127
130	1.805	1.510	128
131	1.867	1.572	128
132	1.930	1.635	129
133	1.992	1.697	130
134	2.055	1.760	131
135	2.118	1.823	132
136	2.180	1.885	133
137	2.243	1.948	134
138	2.305	2.010	135
139	2.368	2.073	136
140	2.430	2.135	137
141	2.493	2.198	138
142	2.555	2.260	139
143	2.618	2.323	140
144	2.680	2.385	141
145	2.743	2.448	142
146	2.805	2.510	143
147	2.868	2.573	144
148	2.930	2.635	145
149	2.993	2.698	146
	+.002 −.000	+.000 −.002	
210	.991	.558	206
211	1.053	.620	207
212	1.116	.683	208
213	1.178	.745	209
214	1.241	.808	210
215	1.303	.870	211
216	1.366	.933	212
217	1.428	.985	213
218	1.491	1.058	214
219	1.553	1.120	215
220	1.616	1.183	216
221	1.678	1.245	217
222	1.741	1.308	218
223	1.867	1.434	220
224	1.992	1.559	222
225	2.118	1.685	223
226	2.243	1.810	224
227	2.368	1.935	225
228	2.493	2.060	226
229	2.618	2.185	227
230	2.743	2.310	228
231	2.868	2.435	229
232	2.993	2.560	230
233	3.118	2.685	231
234	3.243	2.810	232
235	3.368	2.935	233
236	3.493	3.060	234
237	3.618	3.185	235
238	3.743	3.310	236
239	3.868	3.435	237
240	3.993	3.560	238
241	4.118	3.685	239
242	4.243	3.810	240
243	4.368	3.935	241
244	4.493	4.060	242
245	4.618	4.185	243
246	4.743	4.310	244
247	4.868	4.435	245
	+.002 −.000	+.000 −.002	
325	1.867	1.257	321
326	1.992	1.382	323
327	2.118	1.508	325
328	2.243	1.633	326
329	2.368	1.758	327
330	2.493	1.883	328
331	2.618	2.008	329
332	2.743	2.133	330
333	2.868	2.258	331
334	2.993	2.383	332
335	3.118	2.508	333
336	3.243	2.633	334
337	3.368	2.758	334
338	3.493	2.833	335
339	3.618	3.009	336
340	3.743	3.133	337
341	3.868	3.258	338
342	3.993	3.383	339
343	4.118	3.508	340
344	4.243	3.633	341
345	4.368	3.759	342
346	4.493	3.883	343
347	4.618	4.008	344
348	4.743	4.133	345
349	4.868	4.258	346
	+.003 −.000	+.000 −.003	
425	4.974	4.147	425
426	5.099	4.272	425
427	5.224	4.397	425
428	5.349	4.552	425
429	5.474	4.647	425
430	5.559	4.772	426
431	5.724	4.897	427
432	5.849	5.022	428
433	5.974	5.147	429
434	6.099	5.272	430
	+.003 −.000	+.000 −.003	
435	6.224	5.397	431
436	6.349	5.552	432
437	6.474	5.920	433
438	6.724	5.897	435
439	6.974	6.147	437
440	7.224	6.397	438
441	7.474	6.647	439
442	7.724	6.897	440
443	7.974	7.147	441
444	8.224	7.397	442
445	8.474	7.647	443
446	8.974	8.147	445
	+.004 −.000	+.000 −.004	
447	9.474	8.647	446
448	9.974	9.170	447
449	10.474	9.647	448
450	10.974	10.147	449
451	11.474	10.647	450
452	11.974	11.147	451
453	12.474	11.647	452
454	12.974	12.147	453
455	13.474	12.647	454
456	13.974	13.147	455
457	14.474	13.647	456
458	14.974	14.147	457
459	15.474	14.647	458
460	15.974	15.147	459

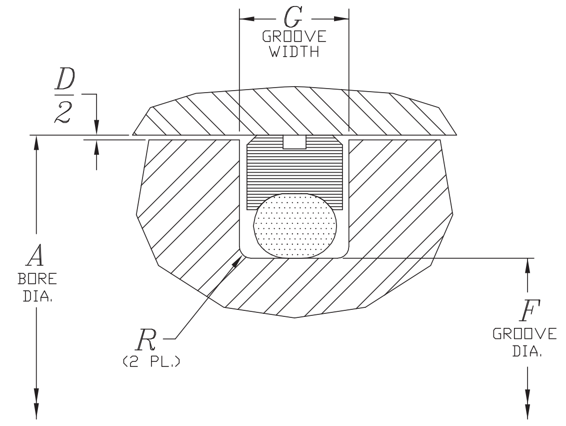
DASH NO.	*G* GROOVE WIDTH	*R* RADIUS	*D* DIAMETRAL CLEARANCE MAX.
011-012	.087/.095	.005/.020	.004
013-028			.005
107-109	.126/.134	.005/.020	.004
110-126			.005
127-129			.006
130-132			.006
133-140			.007
141-149			.007
210-222	.165/.173	.010/.025	.005
223-224			.006
225-227			.007
228-243			.007
244-245			.007
246-247			.008
325-327	.248/.256	.015/.030	.006
328-329			.007
330-345			.007
346-349			.007
425-438	.319/.327	.020/.035	.009
439-445			.010
446			.010
447-460			.010

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR ROTO GLYD RING® IN TRELLEBORG SEALING SOLUTIONS ROTO GLYD RING,® PISTON GLANDS.

2. ORDERING EXAMPLE: TGP 2 0 B 214 A T19 NG

ROTO GLYD RING,® PISTON DESIGNATOR
SEAL CROSS SECTION
0 = -0XX SERIES
1 = -1XX SERIES
2 = -2XX SERIES
3 = -3XX SERIES
4 = -4XX SERIES
DESIGN CHARACTERISTICS
0 = WITHOUT NOTCHES & WITH ROTOLOK
GLAND STANDARD
B = TRELLEBORG SEALING SOLUTIONS GLAND STANDARD
DASH SIZE
ACCORDING TO TRELLEBORG SEALING SOLUTIONS GLAND STANDARD
QUALITY INDEX:
A = AEROSPACE CERTIFICATE OF CONFORMANCE
TURCON® ROTO GLYDRING® MAT'L. CODE
TUREL® O-RING MAT'L CODE
CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.



PISTON SEAL INSTALLATION
FOR TRELLEBORG SEALING SOLUTIONS GLAND SPECIFICATION

INCH
2009_1
TRELLEBORG
SEALING SOLUTIONS
TITLE
ROTO GLYD RING®
DRAWING NO.
TGP00B000

WORLD AEROSPACE TITLE BLOCK REV.

Other elements used in sealing configurations

Polymer Bearings

Features and benefits

- Prevent metal-to-metal contact
- Low friction
- Resist side loading
- Weight savings potential of 4:1 compared to metal bearings, depending on material and configuration selection
- Cost-effective
- High load bearing capacity, both static and dynamic operation
- Eliminate local stress concentrations
- Eliminate hydrodynamic problems in the guide system
- Very wear-resistant, providing long service life
- Eliminate galling between components
- Good friction characteristics
- Damp mechanical vibrations
- Protect against diesel effect
- Low maintenance costs
- Easy installation

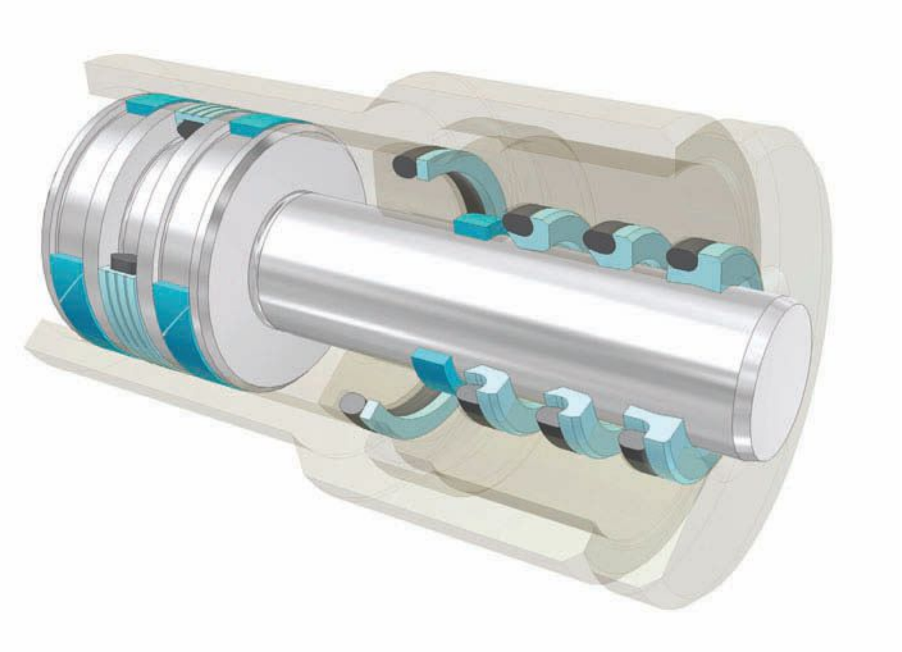


Illustration shows hydraulic cylinder fitted with Turcon® Slydring® and Wear Rings.

Description

The purpose of polymer bearings is to guide the piston and rod of a working cylinder, absorbing any transverse forces which may occur. They prevent metal-to-metal contact, optimizing the performance of the sealing system.

In the past the use of bearings was limited in aerospace applications. This was due to limitations imposed by gland standard AS4716 and the minimum required clearance gaps necessary to minimize seal extrusion. To fit polymer bearings, hardware clearance gaps need to be larger than specified in the standard.

However, due to the trend towards higher hydraulic pressures in aerospace systems and the resulting increased side loads, the use of bearings has become necessary in an increasing number of applications. They are needed to protect primary seal components and hardware so optimum sealing performance and service life can be achieved.

Polymer bearings offer major benefits over traditional metal bearings, in particular to help meet the weight reduction goals of today's aerospace designers. On average, depending on material and configuration, a polymer bearing is a quarter of the weight of a metal one.

Cost-effective, polymer bearings are very wear-resistant, providing long service life. They offer high load bearing capacity in static and dynamic operation, have good friction characteristics and damp mechanical vibrations. They also eliminate local stress concentrations, galling between components and hydrodynamic problems in the guide system. In addition, they protect against the diesel effect where combustion of pockets of oil vapor caused by rapid changes of pressure can damage seals.

Designs

Four different types of bearing materials are available depending on application demands:

- Highly wear-resistant, low-friction, specially modified **Turcon®** PTFE based materials. For low to medium loads. Supplied as the Trelleborg Sealing Solutions proprietary **Slydring®**.
- **Orkot®** fabric composite materials for high loads and transverse forces. Supplied as Wear Ring.
- **Zurcon®** high-modulus thermoplastic provides long service life in high loads and temperatures. Supplied as Wear Ring.
- **HiMod®** high-modulus thermoplastic for use in extreme working conditions. Supplied as **Slydring®**.

Bearing Features

Though bearings appear to be simple in design, their function of preventing metal-to-metal contact within a sealing system is complex. Selection of the correct material and configuration is critical to ensure optimized performance and service life.

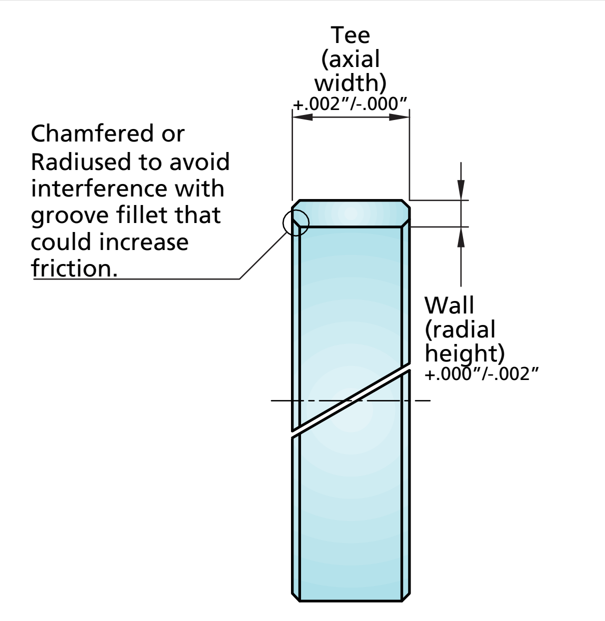


Figure 1 Bearing Features. Tolerance is for reference only.

Table I Turcon® Slydring®

Piston and Rod Bearing				
Cross Section		**Description**	**Part Number**	**Available AS4716 Dash Sizes (1)**
	**Piston**	Turcon® Slydring® 1/32 Thick, Maximum .032" / 0.79 mm Wall	GP0_X (S34545)	006-012, 110-116, 137, 210-219, 222, 328, 339, 347
		Turcon® Slydring® 1/16 Thick, Maximum .063" / 1.59 mm Wall	GP0_W (S34546)	110-116, 210-222, 325-349
		Turcon® Slydring® 3/32 Thick, Maximum .094" / 2.38 mm Wall	GP0_Y (S34547)	328, 334-339, 425-449, 455
	**Rod**	Turcon® Slydring® 1/32 Thick, Maximum .032" / 0.79 mm Wall	GR0_X (S34548)	006-011, 110-115, 210-222
		Turcon® Slydring® 1/16 Thick, Maximum .063" / 1.59 mm Wall	GR0_W (S34549)	110-115, 210-221, 325-349
		Turcon® Slydring® 3/32 Thick, Maximum .094" / 2.38 mm Wall	GR0_Y (S34550)	337-348, 425-449

Notes:
1) Available dash numbers are limited by Turcon® Slydring® nominal wall thickness and AS4716 bore or rod diameter - where common rod or bore sizes are covered by different cross sections numbers but are the same dimensionally, i.e. AS4716-223 and AS4716-325 are both for a bore diameter of 1.867 inches / 47.42 mm.

Wear Ring in bearing material Orkot® and Zurcon® and Slydring® in bearing material HiMod® use special part numbers due to tolerance and temperature variations. For other sizes, bearing widths and depths not in the catalog consult your local Trelleborg Sealing Solutions marketing company.

Table II Selection Criteria for bearings

Material	Filler	Technical Data		Application
		Temperature	Velocity	
Turcon® T10 ■	Carbon and graphite-filled PTFE	-320 to +500°F -196 to +260°C	49 ft/s 15 m/s	Good wear resistance and low friction. A bearing material used in poorly lubricated applications. In the Americas use Turcon® T11 in the part number.
Turcon® T19 ■	Mineral fibers and Molydenum Disulfide (MoS_2)	-320 to +500°F -196 to +260°C	49 ft/s 15 m/s	Good deformation resistance and low friction. Well suited for use in flight controls and utility actuators.
Turcon® T46 ■	Bronze-filled medium PTFE	-320 to +500°F -196 to +260°C	49 ft/s 15 m/s	Excellent deformation resistance and stability. Used for applications above 5,800 psi/ 40 MPa. Not recommended for non-lubricated applications.
Orkot® C380* ■	Polyester resin, polyester fine mesh and PTFE	-328 to +266°F -200 to +130°C	3.3 ft/s 1 m/s	High wear resistance with good sliding properties. For use in red oil only.
Orkot® C324* ■	Vinylester resin and Nomex® fine mesh	-328 to +482°F -200 to +250°C	3.3 ft/s 1 m/s	Developed for high-temperature applications. For use in phosphate ester. Test Report R1081 available on request.
Zurcon® Z43* ■	PEEK™, PTFE and carbon	-65 to +500°F -54 to +260°C	16 ft/s 5 m/s	For high-temperature and pressure service. Good chemical compatibility. Can be used for structural parts, such as piston heads.
HiMod® 914* ■	PEEK™, thermoplastic, carbon and PTFE	-65 to +500°F -54 to +250°C	16 ft/s 5 m/s	Self-lubricating, chemical-resistant bearing developed for the most severe and critical applications.
HiMod® 924* ■	PEEK and carbon fiber	-65 to +500°F -54 to +250°C	8 ft/s 2.4 m/s	High-temperature, high-modulus material with low thermal expansion, high strength and high compressive properties.

* Require a special part number

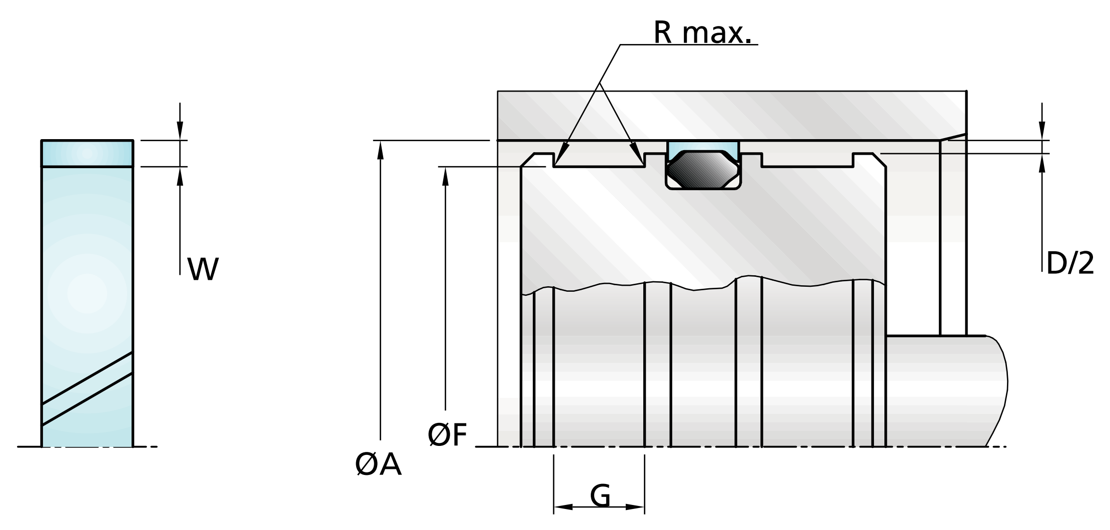


Figure 2 Sealing system with bearings - piston

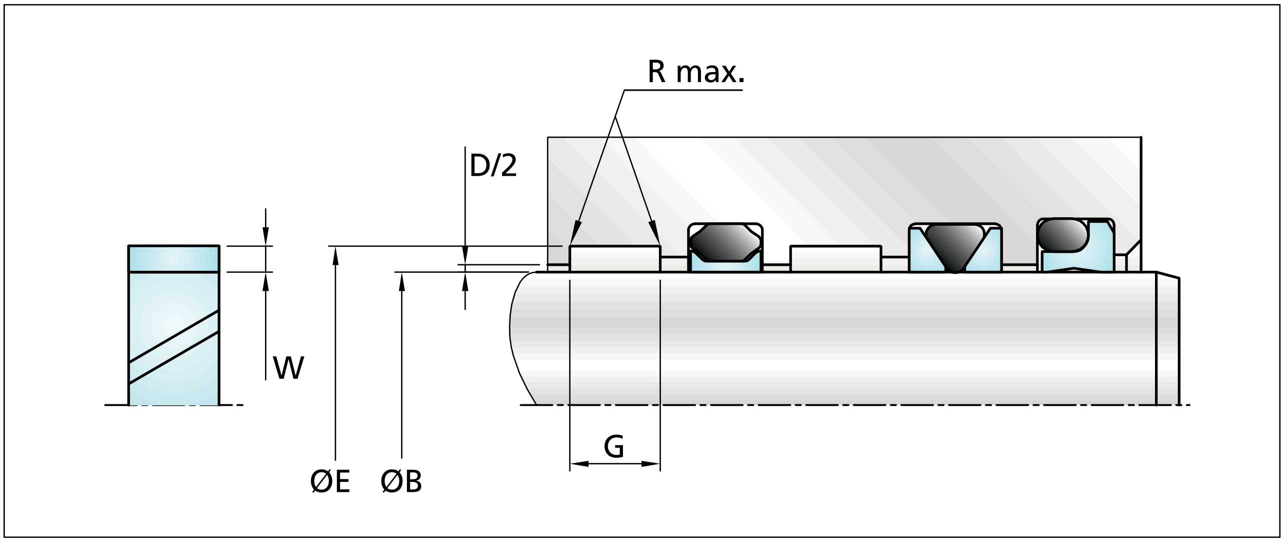


Figure 3 Sealing system with bearings - rod

Note: Wear Ring in Orkot® and Zurcon® require special part numbers due to tolerance and temperature variations.

Calculating the Proper Bearing Exposure

The bearing running clearance, or bearing exposure, is the least understood and the most frequently encountered problem in the design of polymer bearings. Due to the difference in thermal behavior during operation of polymer materials, they require larger running clearances than those recommended for metal bearings. Insufficient running clearances are often the cause of polymer bearing failures, so care should be taken in specifying these.

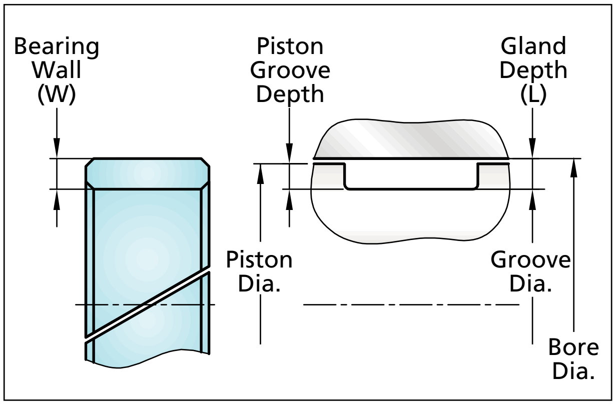


Figure 4 Bearing Exposure Variables

It is recommended that unless side load is extremely low, start with a bearing exposure of .005 inch/ 0.127 mm minimum.

As a guide:

Piston groove depth maximum equals piston diameter maximum minus groove diameter minimum.

Piston groove depth minimum equals piston diameter minimum minus groove diameter maximum.

Bearing exposure minimum equals bearing wall minimum minus piston groove depth maximum.

Bearing exposure maximum equals bearing wall maximum minus piston groove depth minimum.

To ensure that bearing exposure is correctly specified consult your local Trelleborg Sealing Solutions marketing company.

Calculate Bearing Length

A rough estimate of the number and width of the bearings required within an application can be calculated from the formula in the figure below.

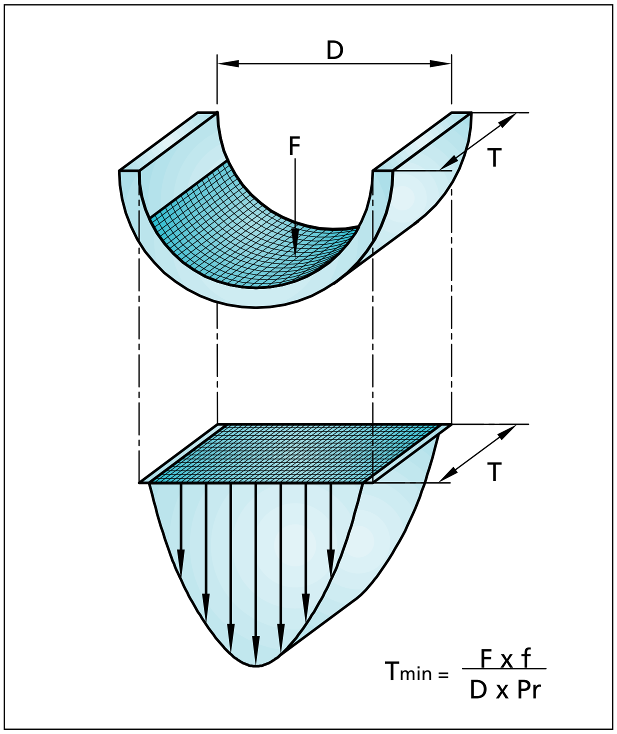


Figure 5 Bearing T

Where:
F = Maximum radial load
f = Safety factor
D = Rod/Bore diameter
Pr = Permissible dynamic load

Running Velocity

Bearing surface speed is calculated as follows:

For rotary applications:
- V = (D x π x RPM)/12

For reciprocating applications:
- V = (LS x C x 2)/12

Where:
V = Velocity
D = Dynamic diameter
LS = Length of stroke
C = Cycles per minute

Multiply V by the system pressure to get PV.

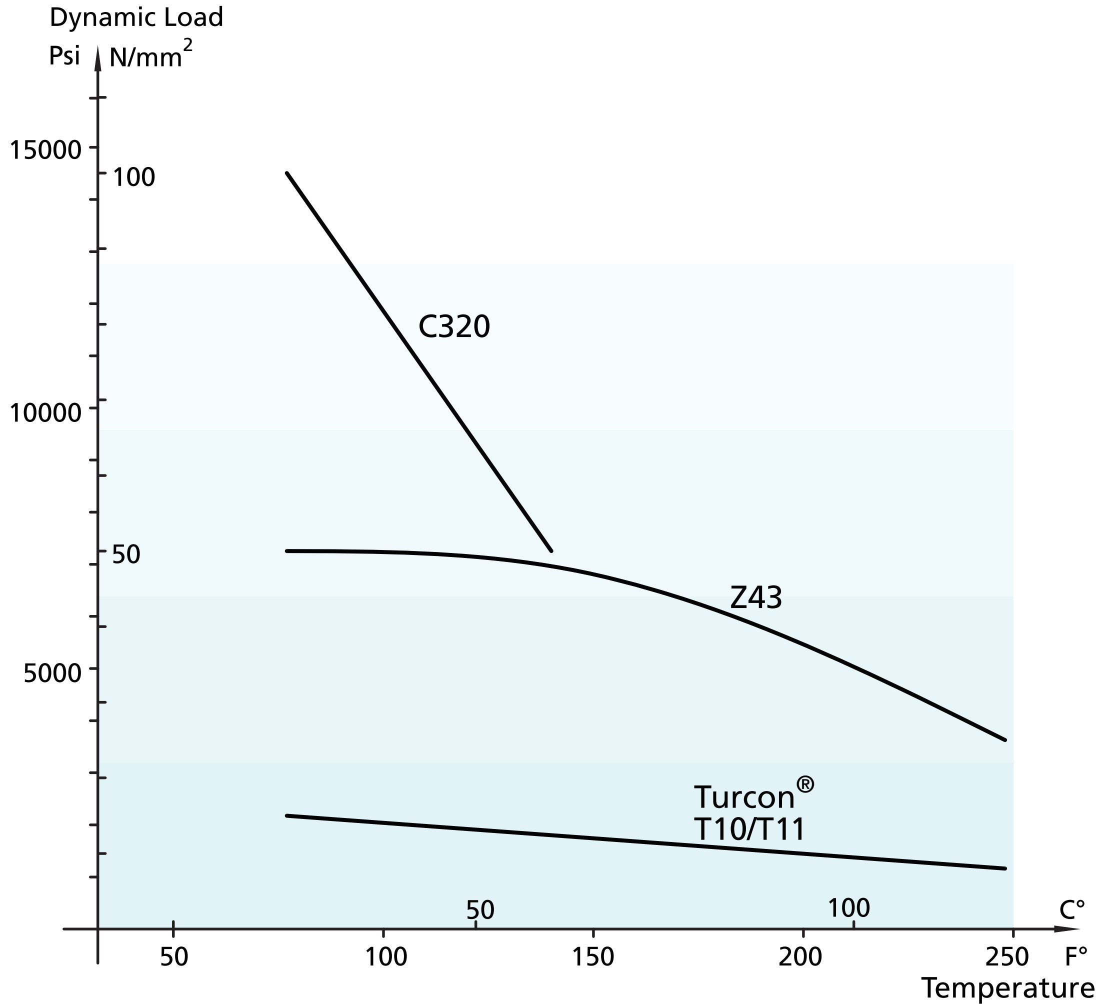
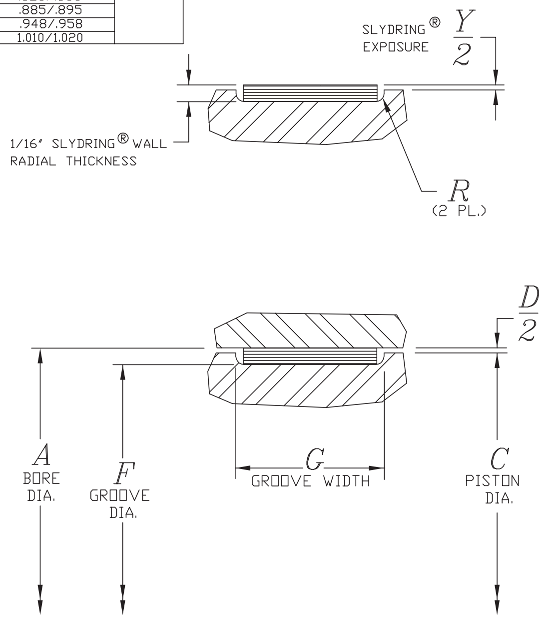


Figure 6 Permissible dynamic load bearing materials

DASH NO.	*A* DIA.	*F* DIA.	*C* DIA.	*D* DIA. CLEARANCE MAX.	*Y* SLYDRING EXPOSURE
	+.002 −.000	+.000 −.001	+.000 −.001	MAX.	
110	.550	.424	.536	.016	.010/.016
111	.613	.487	.599		
112	.675	.549	.661		
113	.738	.612	.724		
114	.800	.674	.786		
115	.863	.737	.849		
116	.925	.799	.911	.016	.010/.016
	+.002 −.000	+.000 −.001	+.000 −.001		
130	1.805	1.679	1.791	.016	.010/.016
132	1.930	1.804	1.916		
134	2.055	1.929	2.041		
136	2.180	2.054	2.166		
138	2.305	2.179	2.291		
140	2.430	2.304	2.416		
142	2.555	2.429	2.541		
144	2.680	2.554	2.666		
146	2.805	2.679	2.791		
148	2.930	2.804	2.916	.016	.010/.016
	+.002 −.000	+.000 −.001	+.000 −.001		
210	.991	.865	.977	.016	.010/.016
211	1.053	.927	1.039		
212	1.116	.990	1.102		
213	1.178	1.052	1.164		
214	1.241	1.115	1.227		
215	1.303	1.177	1.289		
216	1.366	1.240	1.352		
217	1.428	1.302	1.414		
218	1.491	1.365	1.477		
219	1.553	1.427	1.539		
220	1.616	1.490	1.602		
221	1.678	1.552	1.664		
222	1.741	1.615	1.727	.016	.010/.016
	+.002 −.000	+.000 −.001	+.000 −.001		
325	1.867	1.741	1.853	.016	.010/.016
326	1.992	1.866	1.978		
327	2.118	1.992	2.104		
328	2.243	2.117	2.229	.016	.010/.016
	+.002 −.000	+.000 −.002	+.000 −.002		
329	2.368	2.242	2.354	.018	.010/.018
330	2.493	2.367	2.479		
331	2.618	2.492	2.604		
332	2.743	2.617	2.729		
333	2.868	2.742	2.854		
334	2.993	2.867	2.979		
335	3.118	2.992	3.104		
336	3.243	3.117	3.229		
337	3.368	3.242	3.354		
338	3.493	3.367	3.479		
339	3.618	3.492	3.604		
340	3.743	3.617	3.729		
341	3.868	3.742	3.854		
342	3.993	3.867	3.979		
343	4.118	3.992	4.104		
344	4.243	4.117	4.229		
345	4.368	4.242	4.354		
346	4.493	4.367	4.479		
347	4.618	4.492	4.604		
348	4.743	4.617	4.729		
349	4.868	4.742	4.854	.018	.010/.018

△3 GROOVE WIDTH DESIGNATOR	*G* GROOVE WIDTH	*R* RADIUS
01	.073/.083	.010/.020
02	.135/.145	
03	.198/.208	
04	.260/.270	
05	.323/.333	
06	.385/.395	
07	.448/.458	
08	.510/.520	
09	.573/.583	
10	.635/.645	
11	.698/.708	
12	.760/.770	
13	.823/.833	
14	.885/.895	
15	.948/.958	
16	1.010/1.020	



PISTON BEARING INSTALLATION
FOR TRELLEBORG SEALING SOLUTIONS 1/16″ SLYDRING® GLANDS

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR SLYDRING® IN PISTON GLANDS.

2. ORDERING EXAMPLE:

GP 04 W B 214 A T46

PISTON SLYDRING® DEISGNATOR — GP
GROOVE WIDTH DESIGNATOR — 04
△3 SEE GROOVE WIDTH TABLE
GROOVE DEPTH DESIGNATOR — W
  W = 1/16″ WALL (.063″)
GLAND DESIGNATOR — B
  B = TRELLEBORG SEALING SOLUTIONS
      GLAND STANDARD
SIZE DESIGNATOR — 214
△4 ACCORDING TO TRELLEBORG SEALING SOLUTIONS
  GLAND STANDARD
QUALITY INDEX — A
  A = AEROSPACE CERTIFICATE OF COMFORMANCE
TURCITE® SLYDRING® MAT'L CODE — T46
CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

△3 GROOVE WIDTH DESINGATOR LISTED IN ABOVE TABLE. MINIMUM GROOVE WIDTH INCREASE IN 1/16″ INCREMENTS WITH MAXIMUM OF 1.000 INCHES.

△4 DASH SIZES CORRESPOND TO TRELLEBORG SEALING SOLUTIONS GLAND STANDARD WHICH REPRESENT BORE DIAMETERS 0.550″ THROUGH 4.868″ OF AS4716.

5. THE USE OF A SLYDRING® RESULTS IN DIAMETRAL CLEARANCES; *D*, WHICH EXCEED THOSE SPECIFIED IN AS4716.

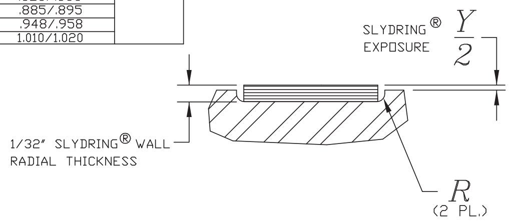
6. THIS PART NUMBER REPRESENTS TURCON® SLYDRING® BEARINGS ONLY. FOR BEARINGS IN ZURCON® AND ORKOT® MATERIALS, PLEASE CONTACT TRELLEBORG SEALING SOLUTIONS.

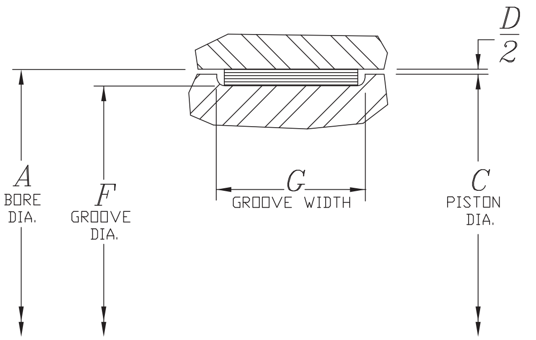
INCH
2009_1
TRELLEBORG
SEALING SOLUTIONS
TITLE
SLYDRING®, PISTON
DRAWING NO.
GPOOWBOOO

WORLD AEROSPACE TITLE BLOCK REV.

DASH NO.	*A* DIA.	*F* DIA.	*C* DIA.	*D* DIA. CLEARANCE MAX.	*Y* SLYDRING EXPOSURE
	+.001 -.000	+.000 -.001	+.000 -.001	MAX.	
006	.235	.171	.221	.016	.010/.016
007	.266	.202	.252		
008	.297	.233	.283		
009	.329	.265	.315		
010	.360	.296	.346		
011	.422	.358	.408		
012	.485	.421	.471	.016	.010/.016
	+.002 -.000	+.000 -.001	+.000 -.001		
110	.550	.486	.536	.017	.010/.016
111	.613	.549	.599		
112	.675	.611	.661		
113	.738	.674	.724		
114	.800	.736	.786		
115	.863	.799	.849		
116	.925	.861	.911	.017	.010/.016
	+.002 -.000	+.000 -.001	+.000 -.001		
137	2.243	2.179	2.229	.017	.010/.016
	+.002 -.000	+.000 -.001	+.000 -.001		
210	.991	.927	.977	.017	.010/.016
211	1.053	.989	1.039		
212	1.116	1.052	1.102		
213	1.178	1.114	1.164		
214	1.241	1.177	1.227		
215	1.303	1.239	1.289		
216	1.366	1.302	1.352		
217	1.428	1.364	1.414		
218	1.491	1.427	1.477		
219	1.553	1.489	1.539		
220	1.616	1.552	1.602		
221	1.678	1.614	1.664		
222	1.741	1.677	1.727	.017	.010/.016
	+.002 -.000	+.000 -.001	+.000 -.001		
325	1.867	1.803	1.853	.017	.010/.016
326	1.992	1.928	1.978		
327	2.118	2.054	2.104		
328	2.243	2.179	2.229		
329	2.368	2.304	2.354		
330	2.493	2.429	2.479		
331	2.618	2.554	2.604		
332	2.743	2.679	2.729		
333	2.868	2.804	2.854		
334	2.993	2.929	2.979		
335	3.118	3.054	3.104		
336	3.243	3.179	3.229		
337	3.368	3.304	3.354		
338	3.493	3.429	3.479		
339	3.618	3.554	3.604		
340	3.743	3.679	3.729		
341	3.868	3.804	3.854		
342	3.993	3.929	3.979		
343	4.118	4.054	4.104		
344	4.243	4.179	4.229		
345	4.368	4.304	4.354		
346	4.493	4.429	4.479		
347	4.618	4.554	4.604		
348	4.743	4.679	4.729		
349	4.868	4.804	4.854	.017	.010/.016

△3 GROOVE WIDTH DESIGNATOR	*G* GROOVE WIDTH	*R* RADIUS
01	.073/.083	.010/.020
02	.135/.145	
03	.198/.208	
04	.260/.270	
05	.323/.333	
06	.385/.395	
07	.448/.458	
08	.510/.520	
09	.573/.583	
10	.635/.645	
11	.698/.708	
12	.760/.770	
13	.823/.833	
14	.885/.895	
15	.948/.958	
16	1.010/1.020	





PISTON BEARING INSTALLATION
FOR TRELLEBORG SEALING SOLUTIONS 1/32″ SLYDRING® GLANDS

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR SLYDRING® IN PISTON GLANDS.

2. ORDERING EXAMPLE:

GP 04 X B 214 A T46

PISTON SLYDRING® DEISGNATOR
GROOVE WIDTH DESIGNATOR
△3 SEE GROOVE WIDTH TABLE
GROOVE DEPTH DESIGNATOR
X = 1/32″ WALL (.032″)
GLAND DESIGNATOR
B = TRELLEBORG SEALING SOLUTION GLAND STANDARD
SIZE DESIGNATOR
△4 ACCORDING TO TRELLEBORG SEALING SOLUTIONS GLAND STANDARD
QUALITY INDEX
A = AEROSPACE CERTIFICATE OF COMFORMANCE
TURCITE® SLYDRING ®MAT'L CODE
CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

△3 GROOVE WIDTH DESINGATOR LISTED IN ABOVE TABLE. MINIMUM GROOVE WIDTH INCREASE IN 1/16″ INCREMENTS WITH MAXIMUM OF 1.000 INCHES.

△4 DASH SIZES CORRESPOND TO TRELLEBORG SEALING SOLUTIONS GLAND STANDARD WHICH REPRESENT BORE DIAMETERS 0.235″ THROUGH 4.868″ OF AS4716.

5. THE USE OF A SLYDRING® RESULTS IN DIAMETRAL CLEARANCES; *D*, WHICH EXCEED THOSE SPECIFIED IN AS4716.

6. THIS PART NUMBER REPRESENTS TURCON® SLYDRING® BEARINGS ONLY. FOR BEARINGS IN ZURCON® AND ORKOT® MATERIALS, PLEASE CONTACT TRELLEBORG SEALING SOLUTIONS.

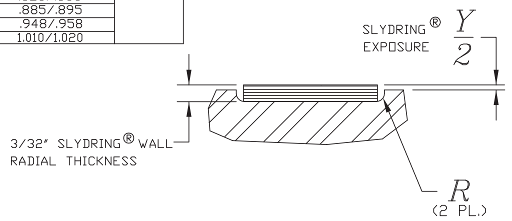
This uncontrolled document discloses information and data in which the Trelleborg Sealing Solutions has proprietary rights. Neither receipt nor possession thereof confers or transfers any right to reproduce, use or disclose in whole or in part except by written permission from Trelleborg Sealing Solutions. Trelleborg Sealing Solutions cannot be held responsible for printing errors etc.

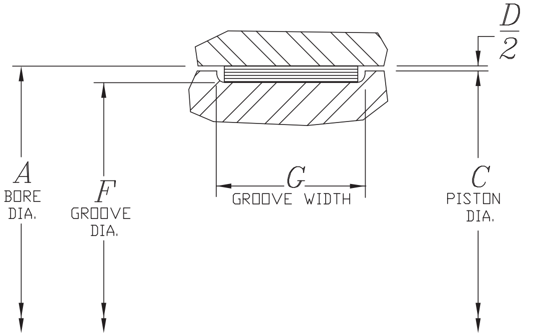
INCH
2009_1
TRELLEBORG
SEALING SOLUTIONS
TITLE
SLYDRING®, PISTON
DRAWING NO.
GP00XB000

WORLD AEROSPACE TITLE BLOCK REV.

DASH NO.	*A* DIA.	*F* DIA.	*C* DIA.	*D* DIA. CLEARANCE MAX.	*Y* SLYDRING EXPOSURE
	+.002 -.000	+.000 -.002	+.000 -.002	MAX.	
325	1.867	1.679	1.853	.018	.010/.018
326	1.992	1.804	1.978	.018	.010/.018
	+.002 -.000	+.000 -.002	+.000 -.002		
327	2.118	1.930	2.104	.018	.010/.018
328	2.243	2.055	2.229		
329	2.368	2.180	2.354		
330	2.493	2.305	2.479		
331	2.618	2.430	2.604		
332	2.743	2.555	2.729		
333	2.868	2.680	2.854		
334	2.993	2.805	2.979		
335	3.118	2.930	3.104		
336	3.243	3.055	3.229		
337	3.368	3.180	3.354		
338	3.493	3.305	3.479		
339	3.618	3.430	2.604		
340	3.743	3.555	3.729		
341	3.868	3.680	3.854		
342	3.993	3.805	3.979		
343	4.118	3.930	4.104	.018	.010/.018
	+.002 -.000	+.000 -.002	+.000 -.002		
344	4.243	4.055	4.229	.018	.010/.018
345	4.368	4.180	4.354		
346	4.493	4.305	4.479		
347	4.618	4.430	4.604		
348	4.743	4.555	4.729		
349	4.868	4.680	4.854	.018	.010/.018
	+.003 -.000	+.000 -.002	+.000 -.002		
425	4.974	4.786	4.960	.019	.010/.018
426	5.099	4.911	5.085		
427	5.224	5.036	5.210		
428	5.349	5.161	5.335		
429	5.474	5.286	5.460		
430	5.599	5.411	5.585		
431	5.724	5.536	5.710		
432	5.849	5.661	5.835		
433	5.974	5.786	5.960		
434	6.099	5.911	6.085		
435	6.224	6.036	6.210		
436	6.349	6.161	6.335		
437	6.474	6.286	6.460		
438	6.724	6.536	6.710		
439	6.974	6.786	6.960		
440	7.224	7.036	7.210		
441	7.474	7.286	7.460		
442	7.724	7.536	7.710		
443	7.974	7.786	7.960		
444	8.224	8.036	8.210		
445	8.474	8.286	8.460		
446	8.974	8.786	8.960	.019	.010/.018
	+.004 -.000	+.000 -.002	+.000 -.002		
447	9.474	9.286	9.460	.020	.010/.018
448	9.974	9.786	9.960		
449	10.474	10.286	10.460		
450	10.974	10.786	10.960		
451	11.474	11.286	11.460		
452	11.974	11.786	11.960		
453	12.474	12.286	12.460		
454	12.974	12.786	12.960		
455	13.474	13.286	13.460	.020	.010/.018

△3 GROOVE WIDTH DESIGNATOR	*G* GROOVE WIDTH	*R* RADIUS
01	.073/.083	.010/.020
02	.135/.145	
03	.198/.208	
04	.260/.270	
05	.323/.333	
06	.385/.395	
07	.448/.458	
08	.510/.520	
09	.573/.583	
10	.635/.645	
11	.698/.708	
12	.760/.770	
13	.823/.833	
14	.885/.895	
15	.948/.958	
16	1.010/1.020	





PISTON BEARING INSTALLATION

FOR TRELLEBORG SEALING SOLUTIONS 3/32" SLYDRING® GLANDS

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR SLYDRING® IN PISTON GLANDS.

2. ORDERING EXAMPLE:

GP 04 Y B 214 A T46

PISTON SLYDRING® DEISGNATOR
GROOVE WIDTH DESIGNATOR
△3 SEE GROOVE WIDTH TABLE
GROOVE DEPTH DESIGNATOR
  Y = 3/32" WALL (.094")
GLAND DESIGNATOR
  B = TRELLEBORG SEALING SOLUTIONS
      GLAND STANDARD
SIZE DESIGNATOR
△4 ACCORDING TO TRELLEBORG SEALING SOLUTIONS
  GLAND STANDARD
QULITY INDEX
  A = AEROSPACE CERTIFICATE OF COMFORMANCE
TURCITE® SLYDRING® MAT'L CODE
CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

△3 GROOVE WIDTH DESINGATOR LISTED IN ABOVE TABLE. MINIMUM GROOVE WIDTH INCREASE IN 1/16" INCREMENTS WITH MAXIMUM OF 1.000 INCHES

△4 DASH SIZES CORRESPOND TO TRELEBORG SEALING SOLUTIONS GLAND STANDARD WHICH REPRESENTS BORE DIAMETERS 1.867" THROUGH 13.474" OF AS4716.

5. THE USE OF A SLYDRING® RESULTS IN DIAMETRAL CLEARANCES; *D*, WHICH EXCEED THOSE SPECIFIED IN AS4716.

6. THIS PART NUMBER REPRESENTS TURCON® SLYDRING® BEARINGS ONLY. FOR BEARINGS IN ZURCON® AND ORKOT® MATERIALS, PLEASE CONTACT TRELLEBORG SEALING SOLUTIONS.

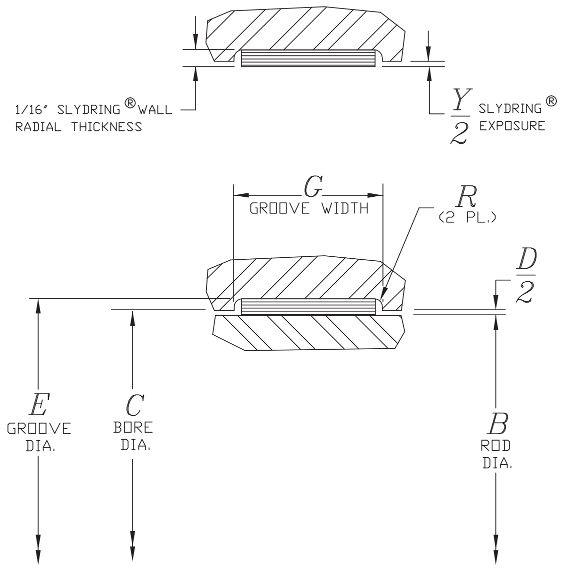
INCH
2009_1
TRELLEBORG
SEALING SOLUTIONS
TITLE
SLYDRING®, PISTON
DRAWING NO.
GP00YB000

WORLD AEROSPACE TITLE BLOCK REV.

Polymer Bearings

DASH NO.	*B* DIA.	*E* DIA.	*C* DIA.	*D* DIA. CLEARANCE MAX.	*Y* SLYDRING EXPOSURE
	+.000 -.002	+.001 -.000	+.001 -.000	MAX.	
110	.373	.499	.387	.017	.010/.016
111	.435	.561	.499		
112	.498	.624	.512		
113	.560	.686	.574		
114	.623	.749	.637		
115	.685	.811	.699	.017	.010/.016
	+.000 -.002	+.001 -.000	+.001 -.000		
129	1.560	1.685	1.573	.016	.010/.016
131	1.685	1.810	1.698		
133	1.810	1.935	1.823		
135	1.936	2.061	1.949		
137	2.061	2.186	2.074		
139	2.186	2.311	2.199		
141	2.311	2.436	2.324		
143	2.436	2.561	2.449		
145	2.561	2.686	2.574		
147	2.686	2.811	2.699		
149	2.811	2.936	2.824	.016	.010/.016
	+.000 -.002	+.001 -.000	+.001 -.000		
210	.748	.874	.762	.017	.010/.016
211	.810	.936	.824		
212	.873	.999	.887		
213	.935	1.061	.949		
214	.998	1.124	1.012		
215	1.060	1.186	1.074		
216	1.123	1.249	1.137		
217	1.185	1.311	1.199		
218	1.248	1.374	1.262		
219	1.310	1.436	1.324		
220	1.373	1.499	1.387		
221	1.435	1.561	1.449	.017	.010/.016
	+.000 -.002	+.001 -.000	+.001 -.000		
325	1.498	1.624	1.512	.017	.010/.016
326	1.623	1.749	1.637		
327	1.748	1.874	1.762		
328	1.873	1.999	1.887		
329	1.998	2.124	2.012		
330	2.123	2.249	2.137	.017	.010/.016
	+.000 -.002	+.002 -.000	+.002 -.000		
331	2.248	2.374	2.262	.018	.010/.018
332	2.373	2.499	2.387		
333	2.498	2.624	2.512		
334	2.623	2.749	2.637		
335	2.748	2.874	2.762		
336	2.873	2.999	2.887		
337	2.997	3.123	3.011		
338	3.122	3.248	3.136		
339	3.247	3.373	3.261		
340	3.372	3.498	3.386		
341	3.497	3.623	3.511		
342	3.622	3.748	3.636		
343	3.747	3.873	3.761		
344	3.872	3.998	3.886		
345	3.997	4.123	4.011		
346	4.122	4.248	4.136		
347	4.247	4.373	4.261		
348	4.372	4.498	4.386		
349	4.497	4.623	4.511	.018	.010/.018

△3 GROOVE WIDTH DESIGNATOR	*G* GROOVE WIDTH	*R* RADIUS
01	.073/.083	.010/.020
02	.135/.145	
03	.198/.208	
04	.260/.270	
05	.323/.333	
06	.385/.395	
07	.448/.458	
08	.510/.520	
09	.573/.583	
10	.635/.645	
11	.698/.708	
12	.760/.770	
13	.823/.833	
14	.885/.895	
15	.948/.958	
16	1.010/1.020	



ROD BEARING INSTALLATION

FOR TRELLEBORG SEALING SOLUTIONS 1/16" SLYDRING® GLANDS

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR SLYDRING® IN ROD GLANDS.
2. ORDERING EXAMPLE: GR 04 W B 214 A T46
   - ROD SLYDRING® DEISGNATOR
   - GROOVE WIDTH DESIGNATOR
     △3 SEE GROOVE WIDTH TABLE
   - GROOVE DEPTH DESIGNATOR
     W = 1/16" WALL (.063")
   - GLAND DESIGNATOR
     B = TRELLEBORG SEALING SOLUTIONS GLAND STANDARD
   - SIZE DESIGNATOR
     △4 ACCORDING TO TRELLEBORG SEALING SOLUTIONS GLAND STANDARD
   - QUALITY INDEX
     A = AEROSPACE CERTIFICATE OF CONFORMANCE
   - TURCITE® SLYDRING ®MAT'L CODE
     CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

△3 GROOVE WIDTH DESINGATOR LISTED IN ABOVE TABLE. MINIMUM GROOVE WIDTH INCREASE IN 1/16" INCREMENTS WITH MAXIMUM OF 1.000 INCHES.

△4 DASH SIZES CORRESPOND TO TRELLEBORG SEALING SOLUTIONS GLAND STANDARD WHICH REPRESENT ROD DIAMETERS 0.373" THROUGH 4.497" OF AS4716.

5. THE USE OF A SLYDRING® RESULTS IN DIAMETRAL CLEARANCES; *D*, WHICH EXCEED THOSE SPECIFIED IN AS4716.
6. THIS PART NUMBER REPRESENTS TURCON® SLYDRING® BEARINGS ONLY. FOR BEARINGS IN ZURCON® AND ORKOT® MATERIALS, PLEASE CONTACT TRELLEBORG SEALING SOLUTIONS.

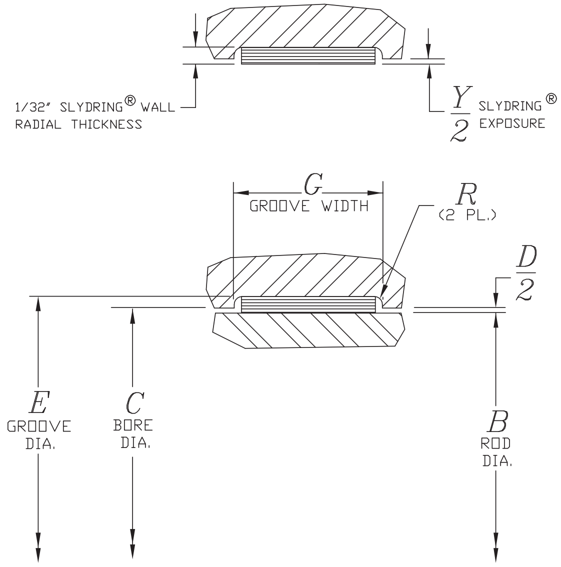
INCH
2009_1
TRELLEBORG
SEALING SOLUTIONS
TITLE SLYDRING®, ROD
DRAWING NO. GROOWBOOO

WORLD AEROSPACE TITLE BLOCK REV.

Polymer Bearings

DASH NO.	*B* DIA.	*E* DIA.	*C* DIA.	*D* DIA. CLEARANCE MAX.	*Y* SLYDRING EXPOSURE
	+.000 -.001	+.001 -.000	+.001 -.000	MAX.	
006	.123	.187	.137	.016	.010/.016
007	.154	.218	.168		
008	.185	.249	.199		
009	.217	.281	.231		
010	.248	.312	.262		
011	.310	.374	.324	.016	.010/.016
	+.000 -.002	+.001 -.000	+.001 -.000		
110	.373	.437	.387	.017	.010/.016
111	.435	.499	.449		
112	.498	.562	.512		
113	.560	.624	.574		
114	.623	.687	.637		
115	.685	.749	.699	.017	.010/.016
	+.000 -.002	+.001 -.000	+.001 -.000		
210	.748	.812	.762	.017	.010/.016
211	.810	.874	.824		
212	.873	.937	.887		
213	.935	.999	.949		
214	.998	1.062	1.012		
215	1.060	1.124	1.074		
216	1.123	1.187	1.137		
217	1.185	1.249	1.199		
218	1.248	1.312	1.262		
219	1.310	1.374	1.324		
220	1.373	1.437	1.387		
221	1.435	1.499	1.449		
222	1.498	1.562	1.512	.017	.010/.016

⚠3 GROOVE WIDTH DESIGNATOR	*G* GROOVE WIDTH	*R* RADIUS
01	.073/.083	.010/.020
02	.135/.145	
03	.198/.208	
04	.260/.270	
05	.323/.333	
06	.385/.395	
07	.448/.458	
08	.510/.520	
09	.573/.583	
10	.635/.645	
11	.698/.708	
12	.760/.770	
13	.823/.833	
14	.885/.895	
15	.948/.958	
16	1.010/1.020	



ROD BEARING INSTALLATION
FOR TRELLEBORG SEALING SOLUTIONS 1/32" SLYDRING® GLANDS

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR SLYDRING® IN ROD GLANDS.
2. ORDERING EXAMPLE: GR 04 X B 214 A T46
   - ROD SLYDRING® DEISGNATOR — GR
   - GROOVE WIDTH DESIGNATOR — 04
     ⚠3 SEE GROOVE WIDTH TABLE
   - GROOVE DEPTH DESIGNATOR — X
     X = 1/32" WALL (.032")
   - GLAND DESIGNATOR — B
     B = TRELLEBORG SEALING SOLUTIONS GLAND STANDARD
   - SIZE DESIGNATOR — 214
     ⚠4 ACCORDING TO TRELLEBORG SEALING SOLUTIONS GLAND STANDARD
   - QUALITY INDEX — A
     A = AEROSPACE CERTIFICATE OF COMFORMANCE
   - TURCITE® SLYDRING ®MAT'L CODE — T46
     CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

⚠3 GROOVE WIDTH DESINGATOR LISTED IN ABOVE TABLE. MINIMUM GROOVE WIDTH INCREASE IN 1/16" INCREMENTS WITH MAXIMUM OF 1.000 INCHES.

⚠4 DASH SIZES CORRESPOND TO TRELLEBORG SEALING SOLUTIONS GLAND STANDARD WHICH REPRESENTS ROD DIAMETERS 0.123" THROUGH 1.498" OF AS4716.

5. THE USE OF A SLYDRING® RESULTS IN DIAMETRAL CLEARANCES; *D*, WHICH EXCEED THOSE SPECIFIED IN AS4716.

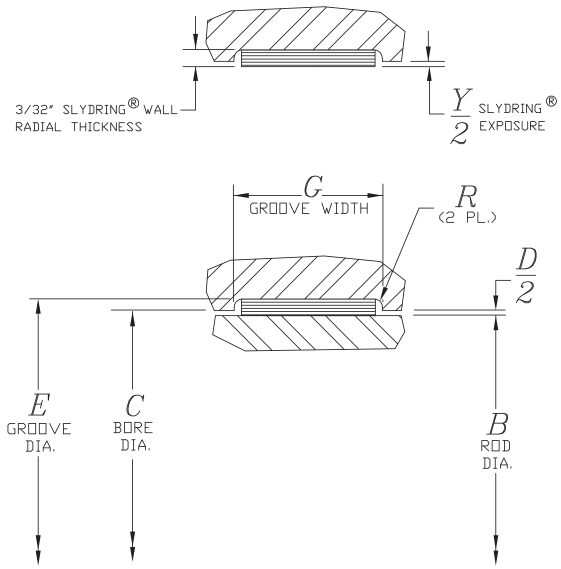
6. THIS PART NUMBER REPRESENTS TURCON® SLYDRING® BEARINGS ONLY. FOR BEARINGS IN ZURCON® AND ORKOT® MATERIALS, PLEASE CONTACT TRELLEBORG SEALING SOLUTIONS.

INCH	2009_1
TRELLEBORG SEALING SOLUTIONS	TITLE SLYDRING®, ROD
	DRAWING NO. GR00XB000

WORLD AEROSPACE TITLE BLOCK REV.

DASH NO.	B DIA.	E DIA.	C DIA.	D DIA. CLEARANCE MAX.	Y SLYDRING EXPOSURE
	+.000 -.002	+.002 -.000	+.002 -.000	MAX.	
337	2.997	3.185	3.011	.018	.010/.018
338	3.122	3.310	3.136		
339	3.247	3.435	3.261		
340	3.372	3.560	3.386		
341	3.497	3.685	3.511		
342	3.622	3.810	3.636		
343	3.747	3.935	3.761		
344	3.872	4.060	3.886		
345	3.997	4.185	4.011		
346	4.122	4.310	4.136		
347	4.247	4.435	4.261		
348	4.372	4.560	4.386	.018	.010/.018
	+.000 -.003	+.002 -.000	+.002 -.000		
425	4.497	4.685	4.511	.018	.010/.018
426	4.622	4.810	4.636		
427	4.747	4.935	4.761		
428	4.872	5.060	4.886		
429	4.997	5.185	5.011		
430	5.122	5.310	5.136		
431	5.247	5.435	5.261		
432	5.372	5.560	5.386		
433	5.497	5.685	5.511		
434	5.622	5.810	5.636		
435	5.747	5.935	5.761		
436	5.872	6.060	5.886		
437	5.997	6.185	6.011		
438	6.247	6.435	6.261		
439	6.497	6.685	6.511		
440	6.747	6.935	6.761		
441	6.997	7.185	7.011		
442	7.247	7.435	7.261		
443	7.497	7.685	7.511		
444	7.747	7.935	7.761		
445	7.997	8.185	8.011		
446	8.497	8.685	8.511		
447	8.997	9.185	9.011		
448	9.497	9.685	9.511		
449	9.997	10.185	10.011	.018	.010/.018

⚠3 GROOVE WIDTH DESIGNATOR	G GROOVE WIDTH	R RADIUS
01	.073/.083	.010/.020
02	.135/.145	
03	.198/.208	
04	.260/.270	
05	.323/.333	
06	.385/.395	
07	.448/.458	
08	.510/.520	
09	.573/.583	
10	.635/.645	
11	.698/.708	
12	.760/.770	
13	.823/.833	
14	.885/.895	
15	.948/.958	
16	1.010/1.020	



ROD BEARING INSTALLATION

FOR TRELLEBORG SEALING SOLUTIONS 3/32" SLYDRING® GLANDS

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR SLYDRING® IN ROD GLANDS.

2. ORDERING EXAMPLE: GR 04 Y B 214 A T46
   - ROD SLYDRING® DEISGNATOR
   - GROOVE WIDTH DESIGNATOR
     - ⚠3 SEE GROOVE WIDTH TABLE
   - GROOVE DEPTH DESIGNATOR
     - Y = 3/32" WALL (.094")
   - GLAND DESIGNATOR
     - B = TRELLEBORG SEALING SOLUTIONS GLAND STANDARD
   - SIZE DESIGNATOR
     - ⚠4 ACCORDING TO TRELLEBORG SEALING SOLUTIONS GLAND STANDARD
   - QUALITY INDEX
     - A = AEROSPACE CERTIFICATE OF COMFORMANCE
   - TURCITE® SLYDRING® MAT'L CODE

   CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

⚠3 GROOVE WIDTH DESINGATOR LISTED IN ABOVE TABLE. MINIMUM GROOVE WIDTH INCREASE IN 1/16" INCREMENTS WITH MAXIMUM OF 1.000 INCHES

⚠4 DASH SIZES CORRESPOND TO TRELLEBORG SEALING SOLUTIONS GLAND STANDARD WHICH REPRESENT ROD DIAMETERS 2.997 THROUGH 9.997 OF AS4716.

5. THE USE OF A SLYDRING® RESULTS IN DIAMETRAL CLEARANCES, *D*, WHICH EXCEED THOSE SPECIFIED IN AS4716.

6. THIS PART NUMBER REPRESENTS TURCON® SLYDRING® BEARINGS ONLY. FOR BEARINGS IN ZURCON® AND ORKOT® MATERIALS, PLEASE CONTACT TRELLEBORG SEALING SOLUTIONS.

INCH
2009_1
TRELLEBORG
SEALING SOLUTIONS
TITLE SLYDRING®, ROD
DRAWING NO. GROOYBOOO

WORLD AEROSPACE TITLE BLOCK REV.

Features and benefits

- Prevent ingress of contaminants into sealing systems
- Protect sealing systems from damage by contaminants
- Can act as secondary sealing elements
- Can be designed to vent interstage pressure
- Scrapers can be matched to specific applications and gland sizes
- Eliminate rod scoring
- Low-friction
- Long service life
- Replace metallic scrapers

The Turcon® Excluder® DC shown here is a well proven scraping device that protects the sealing system from ingress of dirt and sand.

Turcon® Excluder® and Scrapers

Description

Scrapers are elements used in sealing configurations, usually consisting of a Turcon® PTFE based ring and elastomer O-Ring. Installed in hydraulic cylinders, they are designed to scrape dirt, foreign particles, chips or moisture from the piston rods as they retract into the system. This prevents contamination of the hydraulic medium that could damage wear rings, seals and other components.

Single-acting scrapers keep contamination from the outside. Double-acting scrapers also scrape off residual fluid film. They minimize the ingression of small particles into the system and act as a secondary seal, avoiding external leakage.

Trelleborg Sealing Solutions offers a wide range of scrapers. Specifically recommended for aerospace applications is Turcon® Excluder®, the Trelleborg Sealing Solutions proprietary design of double-acting scraper.

In addition, for systems with extreme working conditions, spring-energized scraper Turcon® Variseal® M2S can be specified. As its operating performance is not limited by an elastomer element, it offers a wide temperature range and optimal chemical resistance.

Method of Operation

The Turcon® PTFE based element within the scraper or Turcon® Excluder® configuration performs the scraping function. The elastomer O-Ring (or spring in Turcon® Variseal® M2S) maintains the pressure of the scraper lips against the sliding surface and can compensate any deflections of the piston rod.

The scraper should be considered an integral part of a sealing system within hydraulic systems. Incorrect selection can result in the migration of contamination into a system, potentially causing damage to wear rings, seals and hardware components.

An axial notch can be added to the inner scraping lip of a double-acting scraper. This provides a path to vent any interstage pressure to the outside while still retaining the double-acting scraper effect. See Turcon® Excluder® DC section.

Note on Ordering

Any standard scraper configuration in this catalog containing an elastomer O-Ring part can be supplied as a complete seal set.

Older designs no longer contained in this catalog continue to be available. For all new applications we recommend use of the types shown in this catalog.

Other combinations of Turcon® materials and special designs can be developed and supplied for specific applications in sizes up to 10 feet/ three meter diameter, provided there is sufficient volume demand. Sizes above this are available for specific scraper types.

Design Recommendations

When installing scrapers in applications where interstage pressure may occur the distance between seal groove and scraper groove L should exceed groove depth x. See figure below. There should also be provision for an oil reservoir to collect the oil returned to the hydraulic system by the seal.

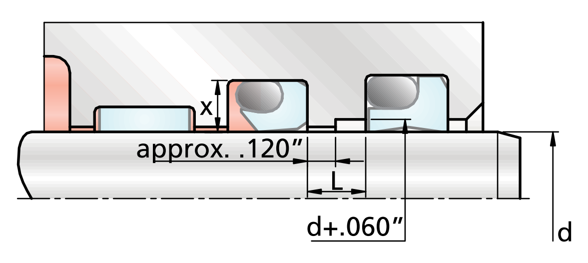
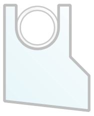
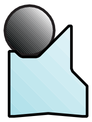
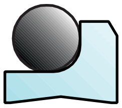
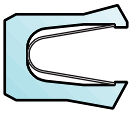
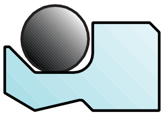
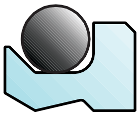
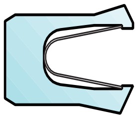


Figure 1 Recommendation for hardware design in applications when there may be interstage pressure

Table I Turcon® Scrapers and Excluders® with Aerospace Gland Specification

Gland Standard	Standard Type	TSS Trade name	Profile	Configuration	Part Number	Primary Application Area
MS33675	-	DC Scraper Ring		Scarf-cut, garter-spring-energized	WM65	Not recommended for new designs
		Turcon® Excluder® DC Series E		Continuous, energized with an elastomer O-Ring	WE65	Light duty, space saving design
TSS Groove	-	Turcon® Excluder® DC		Continuous, energized with an elastomer O-Ring	WE25_B	Flight controls and utility actuators
AS4716	0 BU width Glands[1]				WE25_G	
		Turcon® Variseal® M2S		Spring-energized	RVC_NM	Applications with a wide temperature range, large hardware deflection or aggressive chemicals
AS4088	-	Turcon® Excluder® AS		Continuous, energized with an elastomer O-Ring	WE670B	Heavy duty general applications
AS4052 **Rev. B**	I	Turcon® Excluder® AS		Continuous, energized with an elastomer O-Ring	WE710B	Landing gear applications
	II	Turcon® Variseal® M2S		Spring-energized	RVD_0B	Landing gear applications. Use where there is a large hardware deflection or aggressive chemicals

Profiles in color are recommended configurations

[1] Scrapers are designed to fit in AS4716 zero back-up width grooves. Certain dimensions such as the downstream sidewall are modified to allow optimum operating performance for scrapers.

■ Turcon® Excluder® DC

Description

In Turcon® Excluder® DC the gland has been altered to accommodate a larger cross section O-Ring for better activation of the scraping lips. It optimizes the configuration's ability to exclude contamination without the restrictions and limitations of the MS 33675 gland dimensions.

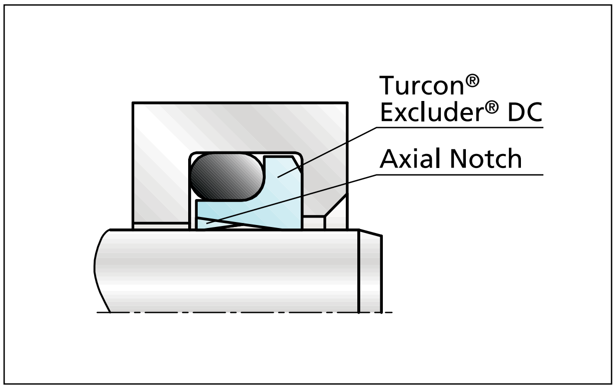


Figure 2 Turcon® Excluder® DC with axial notch

Due to the heavy cross section of the Turcon® element on the downstream side, Turcon® Excluder® DC will accept a significant back-pressure without being extruded out of the groove.

If high back-pressure is expected, we recommend use of Turcon® Excluder® DC with an axial notch.

Groove specification

AS4716 zero backup width gland. Open/split grooves are recommended for diameters smaller than 1.4 inch/ 35 mm (see page 257, 258).

Technical Data

Speed: 49.2 ft/s/ 15 m/s

Temperature range: -65°F to +500°F/ -54°C to +260°C depending on elastomer material

Media: All commonly used aerospace fluids depending on elastomer

■ Turcon® Excluder® DC Series E

Description

Turcon® Excluder® DC Series E is optimized for MS 33675 gland dimensions. The configuration is for relatively light duty and it is not recommended for new designs. The original virgin PTFE split Ring spring-energized scraper is not recommended.

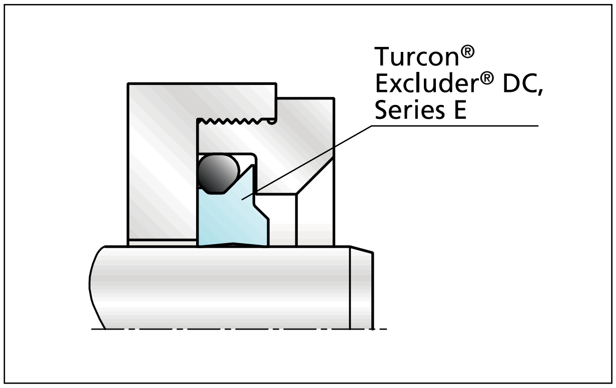


Figure 3 Turcon® Excluder® DC Series E

If back-pressure is expected, we recommend use of Turcon® Excluder® DC with an axial notch.

Groove specification

MS 33675. Open/split grooves are recommended for diameters smaller than 1.4 inch/ 35 mm (see page 263).

Technical Data

Speed: 49.2 ft/s/ 15 m/s

Temperature range: -65°F to +500°F/ -54°C to +260°C depending on elastomer material

Media: All commonly used aerospace fluids depending on elastomer

■ Turcon® Excluder® AS

Description

The three versions of Turcon® Excluder® AS are designed for AS4088 and AS4052 Type I glands. The O-Ring is located over the inside sealing lip, providing an excellent secondary sealing function. The outside wall of Turcon® Excluder® AS is the full depth of the groove, meaning it can effectively scrape dust, sand and ice.

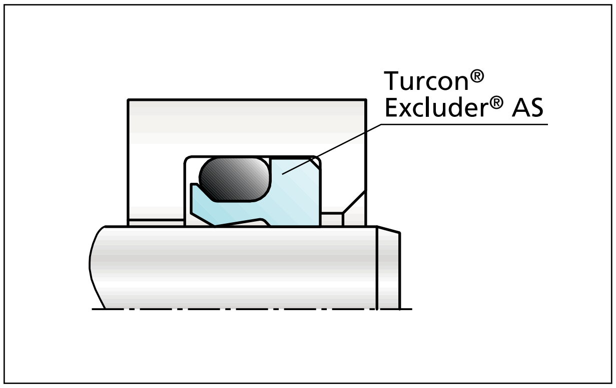


Figure 4 Turcon® Excluder® AS

Turcon® Excluder® AS per AS4088 standard, is a heavy duty scraper for general use (see page 259). A design for AS4052 Rev. B Type I for use in landing gear applications is shown on page 260 and page 262.

Groove specification

AS4716 zero backup width gland. Open/split grooves are recommended for diameters smaller than 1.4 inch/ 35 mm.

Technical Data

Speed:	49.2 ft/s/ 15 m/s
Temperature range:	-65°F to +500°F/ -54°C to +260°C depending on elastomer material
Media:	All commonly used aerospace fluids depending on elastomer

■ Turcon® Variseal® M2S Scraper

Description

Turcon® Variseal® M2S is a single-acting seal/scraper with an asymmetric seal profile. The dynamic lip has an optimized heavy profile. This offers long service life and a good scraping effect, even in highly viscous media. The U-shaped corrosion resistant spring provides consistent loading of the scraping lip.

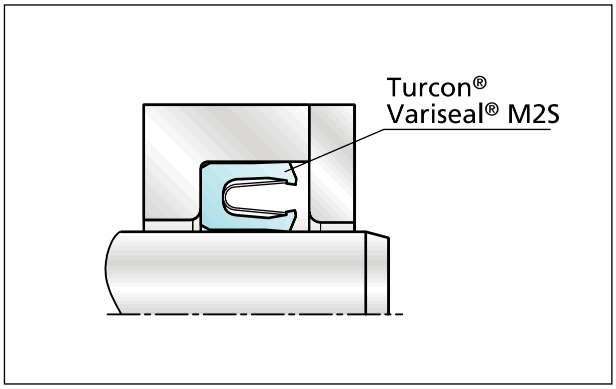


Figure 5 Turcon® Variseal® M2S

Turcon® Variseal® M2S has unlimited shelf-life and a very wide temperature range

A Hi-Clean version is available where the spring cavity is filled with silicone. This prevents contaminant lodging in the spring cavity.

Groove specification

MIL-G-5514F/AS4716 and ISO 3771 (see page 255, 256). The seal can only be installed to a limited extent in closed grooves. Refer to the Installation & Hardware Guidelines (page 293).
A version for AS4052 Rev. B Type II is shown on page 261.

Technical Data

Speed:	Reciprocating up to 49.2 ft/s/ 15 m/s Turning up to 1.65 ft/s/ 0.5 m/s
Temperature:	-94°F to +500°F/ -70°C to +260°C
Media:	Typically all fluids with medium to high viscosity and media containing hard particles

Relative Sizes of Cross Sections

Turcon® Excluder® DC

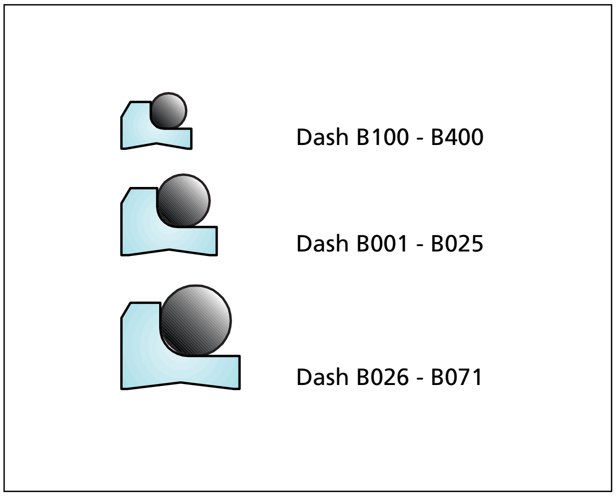


Figure 6 Turcon® Excluder® DC

Turcon® Excluder® DC, Series E

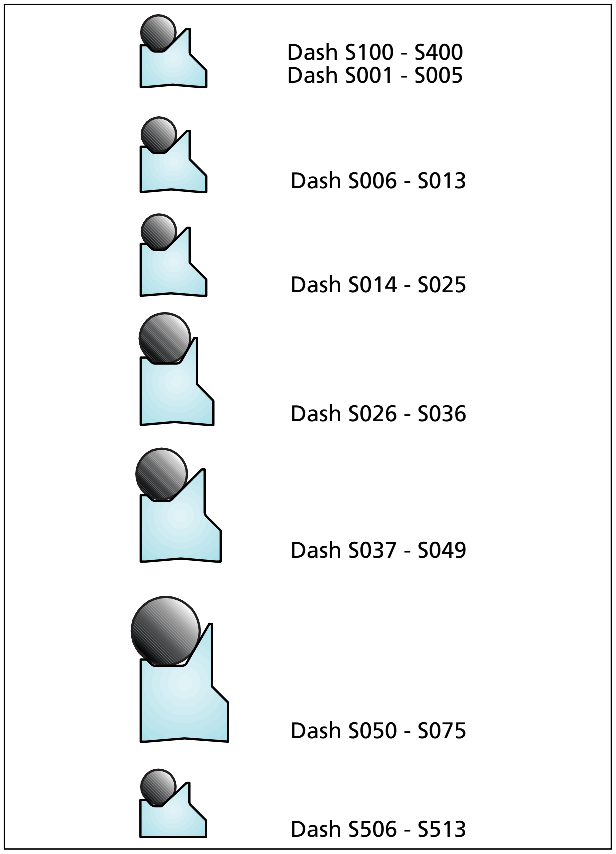


Figure 7 Turcon® Excluder® DC, Series E

Turcon® Excluder® AS

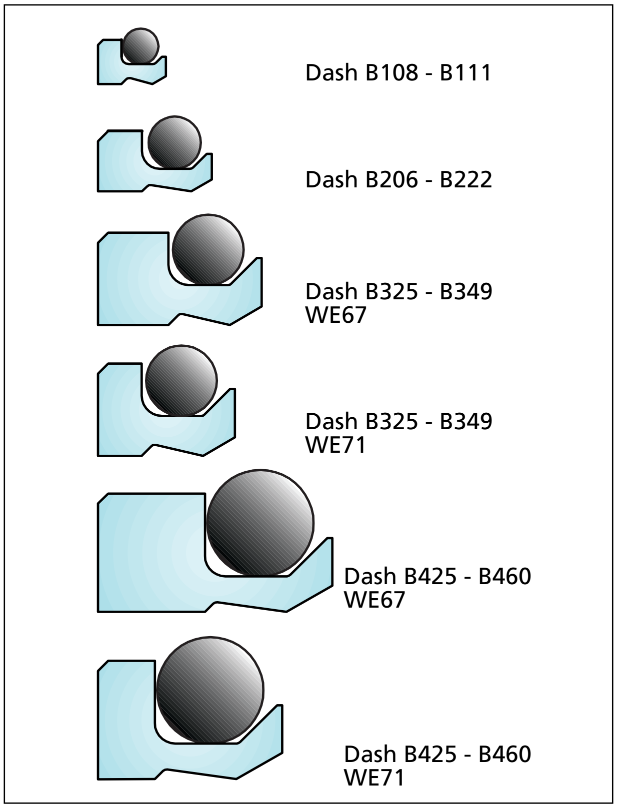


Figure 8 Turcon® Excluder® AS

Turcon® Variseal® M2S Scraper

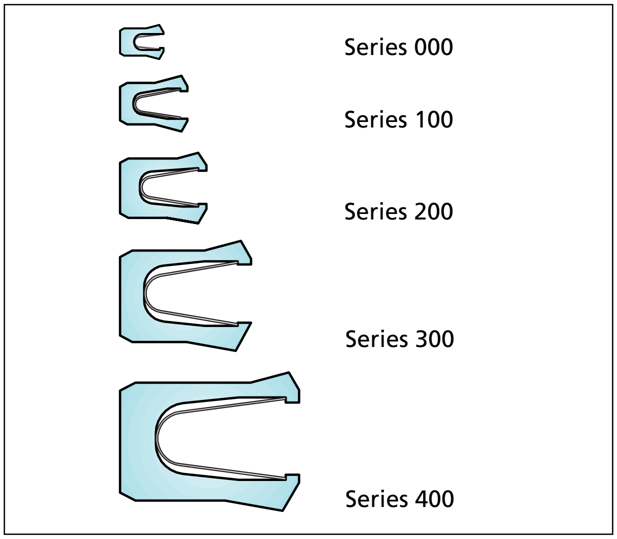


Figure 9 Turcon® Variseal® M2S Scraper

Turcon® Excluder® and Scrapers

DASH NO.	B DIA.	E DIA.
	+.000 -.001	+.001 -.000
†006	.123	.232
†007	.154	.264
†008	.185	.294
†009	.217	.327
†010	.248	.359
†011	.310	.421
†012	.373	.484
	+.000 -.002	+.002 -.000
†013	.435	.545
†014	.498	.608
†015	.560	.670
†016	.623	.733
†017	.685	.795
†018	.748	.858
†019	.810	.920
†020	.873	.983
†021	.935	1.045
†022	.998	1.108
†023	1.060	1.170
†024	1.123	1.233
†025	1.185	1.295
†026	1.248	1.358
†027	1.310	1.420
†028	1.373	1.483
	+.000 -.002	+.002 -.000
†108	.248	.421
†109	.310	.483
†110	.373	.546
†111	.435	.609
†112	.498	.672
†113	.560	.734
†114	.623	.797
†115	.685	.859
†116	.748	.923
†117	.810	.985
†118	.873	1.048
†119	.935	1.110
†120	.998	1.173
†121	1.060	1.235
†122	1.123	1.298
†123	1.185	1.360
†124	1.248	1.423
†125	1.310	1.485
†126	1.373	1.548
†127	1.435	1.610
†128	1.498	1.673
129	1.560	1.735
130	1.623	1.798
131	1.685	1.860
132	1.748	1.923
133	1.810	1.984
134	1.873	2.047
135	1.936	2.110
136	1.998	2.172
137	2.061	2.235
138	2.123	2.297
139	2.186	2.360
140	2.248	2.422
141	2.311	2.485
142	2.373	2.547
143	2.436	2.610
144	2.498	2.672
145	2.561	2.735
146	2.623	2.797
147	2.686	2.860
148	2.748	2.922
149	2.811	2.985

DASH NO.	B DIA.	E DIA.
	+.000 -.002	+.002 -.000
†210	.748	.989
†211	.810	1.051
†212	.873	1.115
†213	.935	1.177
†214	.998	1.240
†215	1.060	1.302
†216	1.123	1.365
†217	1.185	1.427
†218	1.248	1.490
†219	1.310	1.552
†220	1.373	1.615
†221	1.435	1.677
222	1.498	1.740
223	1.623	1.865
224	1.748	1.990
225	1.873	2.115
226	1.998	2.240
227	2.123	2.365
228	2.248	2.490
229	2.373	2.615
230	2.498	2.740
231	2.623	2.865
232	2.748	2.990
233	2.873	3.115
234	2.997	3.239
235	3.122	3.364
236	3.247	3.489
237	3.372	3.614
238	3.497	3.739
239	3.622	3.864
240	3.747	3.989
241	3.872	4.114
242	3.997	4.239
243	4.122	4.364
244	4.247	4.489
245	4.372	4.614
246	4.497	4.739
247	4.622	4.864
	+.000 -.002	+.002 -.000
325	1.498	1.870
326	1.623	1.995
327	1.748	2.120
328	1.873	2.245
329	1.998	2.370
330	2.123	2.495
331	2.248	2.620
332	2.373	2.745
333	2.498	2.870
334	2.623	2.995
335	2.748	3.120
336	2.873	3.245
337	2.997	3.369
338	3.122	3.494
339	3.247	3.619
340	3.372	3.744
341	3.497	3.869
342	3.622	3.994
343	3.747	4.119
344	3.872	4.244
345	3.997	4.369
346	4.122	4.494
347	4.247	4.619
348	4.372	4.744
349	4.497	4.869

DASH NO.	B DIA.	E DIA.
	+.000 -.003	+.003 -.000
425	4.497	4.974
426	4.622	5.099
427	4.747	5.224
428	4.872	5.349
429	4.997	5.474
430	5.122	5.599
431	5.247	5.724
432	5.372	5.849
433	5.497	5.974
434	5.622	6.099
435	5.747	6.224
436	5.872	6.349
437	5.997	6.474
438	6.247	6.724
439	6.497	6.974
440	6.747	7.224
441	6.997	7.474
442	7.247	7.724
443	7.497	7.974
444	7.747	8.224
445	7.997	8.474
446	8.497	8.974
	+.000 -.003	+.004 -.000
447	8.997	9.474
448	9.497	9.974
449	9.997	10.474
450	10.497	10.974
451	10.997	11.474
452	11.497	11.974
453	11.997	12.474
454	12.497	12.974
455	12.997	13.474
456	13.497	13.974
457	13.997	14.474
458	14.497	14.974
459	14.997	15.474
460	15.497	15.974

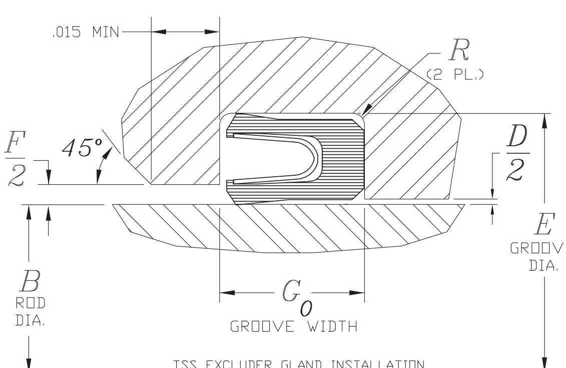
TSS EXCLUDER GLAND DIMENSIONS - TABLE 1

DASH NO.	G_0 GROOVE WIDTH	R RADIUS	F DIAMETRAL CLEARANCE MAX.
† 006-017	.094/.104	.005/.015	.042
† 018-028			
† 108-115	.141/.151	.005/.015	.042
116-149			
210-247	.188/.191	.010/.025	.042
325-349	.281/.291	.020/.035	.042
425-460	.375/.385	.020/.035	.042

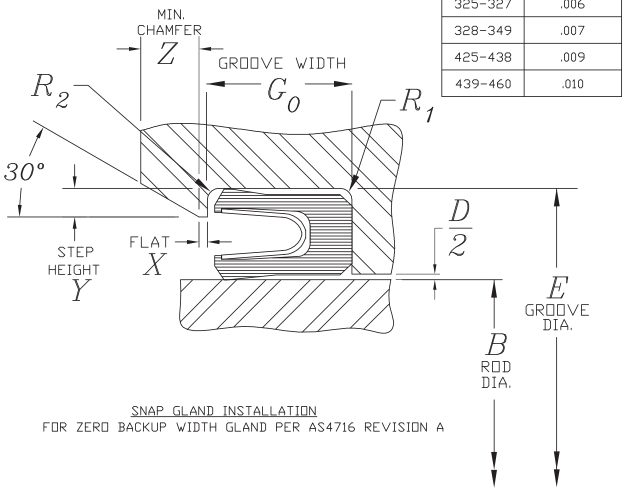
SNAP GLAND DIMENSIONS - TABLE 2

DASH NO.	G_0 GROOVE WIDTH	Y STEP HEIGHT	Z CHAMFER MIN.	R_1 RADIUS MAX.	R_2 RADIUS MAX.	X FLAT MIN.	SEAL ID MIN.
† 006-017	.094/.104	.008/.012	.025	.010	.005	.015	.375
† 018-028		.015/.020					
† 108-115	.141/.151	.010/.015	.030	.015	.005	.015	.562
116-149		.020/.025					
210-247	.188/.191	.030/.035	.040	.015	.007	.015	1.000
325-349	.281/.291	.032/.037	.045	.015	.010	.100	1.375
425-460	.375/.385	.042/.047	.055	.020	.010	.100	2.500

DASH NO.	D DIAMETRAL CLEARANCE MAX.
006-012	.004
013-028	.005
108-126	.005
127-132	.006
133-149	.007
210-222	.005
223-224	.006
225-245	.007
246-247	.008
325-327	.006
328-349	.007
425-438	.009
439-460	.010



TSS EXCLUDER GLAND INSTALLATION
TRELLEBORG SEALING SOLUTIONS GLAND STANDARD



SNAP GLAND INSTALLATION
FOR ZERO BACKUP WIDTH GLAND PER AS4716 REVISION A

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR VARISEAL® M2S IN AS4716 REVISION A ROD GLANDS WITH THE EXCEPTION OF THE TSS RECOMMENDED RELIEF DIAMETERS (F).

2. ORDERING EXAMPLE RVC 2 0 G 214 A T05 SM
   VARISEAL® M2S, ROD DESIGNATOR
   CROSS SECTION
      0 = 000 SERIES
      1 = 100 SERIES
      2 = 200 SERIES
      3 = 300 SERIES
      4 = 400 SERIES
   DESIGN CHARACTERISTICS
   GLAND STANDARD
      G = AS4716
   SIZE DESIGNATION
      ACCORDING TO AS4716 REVISION A
   QUALITY INDEX:
      A = AEROSPACE CERTIFICATE OF CONFORMANCE
   △3 TURCON® VARISEAL® M2S MAT'L CODE
   SPRING MAT'L CODE - MEDIUM SPRING LOAD AS STANDARD

△3 FOR MATERIAL OPTIONS, SEE MATERIALS SECTION OF TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE. SPRING MATERIAL OPTIONS LISTED BELOW.

SPRING MATERIAL CODE MEDIUM DUTY AS STANDARD

CODE	MATERIAL
S	301 STAINLESS STEEL
H	HASTELLOY
E	ELGILOY

4. †DASH SIZES -006 TO -028, -108 TO -128, AND -210 TO -221 REQUIRE SPLIT OR SNAP FITTING GLAND CONFIGURATION, PLEASE CONSULT YOUR TRELLEBORG SEALING SOLUTIONS SALES ENGINEER FOR DETAILED INFORMATION (REFER TO TABLE 1).

INCH
2011_5

TRELLEBORG
SEALING SOLUTIONS

TITLE
VARISEAL® M2S, ROD, SCRAPER

DRAWING NO.
RVC20G000

WORLD AEROSPACE TITLE BLOCK REV.

DASH NO.	*A* DIA.	*F* DIA.
	+.001 -.000	+.000 -.001
† 006	.235	.129
† 007	.266	.158
† 008	.297	.189
† 009	.329	.220
† 010	.360	.250
† 011	.422	.312
† 012	.485	.375
	+.002 -.000	+.000 -.002
† 013	.550	.441
† 014	.613	.504
† 015	.675	.566
† 016	.738	.629
† 017	.800	.691
† 018	.863	.753
† 019	.925	.815
† 020	.991	.881
† 021	1.053	.943
† 022	1.116	1.006
† 023	1.178	1.068
† 024	1.241	1.131
† 025	1.303	1.193
† 026	1.366	1.256
† 027	1.428	1.318
† 028	1.491	1.381
	+.001 -.000	+.000 -.001
† 106	.360	.187
† 107	.391	.215
† 108	.422	.246
† 109	.485	.308
	+.002 -.000	+.000 -.002
† 110	.550	.379
† 111	.613	.441
† 112	.675	.502
† 113	.738	.565
† 114	.800	.627
† 115	.863	.689
† 116	.925	.751
† 117	.991	.817
† 118	1.053	.879
† 119	1.116	.942
† 120	1.178	1.003
† 121	1.241	1.066
† 122	1.303	1.128
† 123	1.366	1.191
† 124	1.428	1.253
† 125	1.491	1.316
† 126	1.553	1.378
† 127	1.616	1.441
† 128	1.678	1.503
129	1.741	1.566
130	1.805	1.631
131	1.867	1.693
132	1.930	1.756
133	1.992	1.818
134	2.055	1.881
135	2.118	1.944
136	2.180	2.006
137	2.243	2.069
138	2.305	2.131
139	2.368	2.194
140	2.430	2.256
141	2.493	2.319
142	2.555	2.381
143	2.618	2.444
144	2.680	2.506
145	2.743	2.569
146	2.805	2.631
147	2.868	2.694
148	2.930	2.756
149	2.993	2.819

DASH NO.	*A* DIA.	*F* DIA.
	+.002 -.000	+.000 -.002
†210	.991	.750
†211	1.053	.812
†212	1.116	.874
†213	1.178	.936
†214	1.241	.999
†215	1.303	1.061
†216	1.366	1.124
†217	1.428	1.186
†218	1.491	1.249
†219	1.553	1.311
†220	1.616	1.374
†221	1.678	1.436
222	1.741	1.499
223	1.867	1.625
224	1.992	1.750
225	2.118	1.876
226	2.243	2.001
227	2.368	2.126
228	2.493	2.251
229	2.618	2.376
230	2.743	2.501
231	2.868	2.626
232	2.993	2.751
233	3.118	2.876
234	3.243	3.001
235	3.368	3.126
236	3.493	3.251
237	3.618	3.376
238	3.743	3.501
239	3.868	3.626
240	3.993	3.751
241	4.118	3.876
242	4.243	4.001
243	4.368	4.126
244	4.493	4.251
245	4.618	4.376
246	4.743	4.501
247	4.868	4.626
	+.002 -.000	+.000 -.002
325	1.867	1.495
326	1.992	1.620
327	2.118	1.746
328	2.243	1.871
329	2.368	1.996
330	2.493	2.121
331	2.618	2.246
332	2.743	2.371
333	2.868	2.496
334	2.993	2.621
335	3.118	2.746
336	3.243	2.871
337	3.368	2.996
338	3.493	3.121
339	3.618	3.246
340	3.743	3.371
341	3.868	3.496
342	3.993	3.621
343	4.118	3.746
344	4.243	3.871
345	4.368	3.996
346	4.493	4.121
347	4.618	4.246
348	4.743	4.371
349	4.868	4.496
	+.003 -.000	+.000 -.003
425	4.974	4.497
426	5.099	4.622
427	5.224	4.747
428	5.349	4.872
429	5.474	4.997
430	4.599	5.122
431	5.724	5.247
432	5.849	5.372
434	5.974	5.497
434	6.099	5.622

DASH NO.	*A* DIA.	*F* DIA.
	+.003 -.000	+.000 -.003
435	6.224	5.747
436	6.349	5.872
437	6.474	5.997
438	6.724	6.247
439	6.974	6.497
440	7.224	6.747
441	7.474	6.997
442	7.724	7.247
443	7.974	7.497
444	8.224	7.747
445	8.474	7.997
446	8.974	8.497
	+.004 -.000	+.000 -.003
447	9.474	8.997
448	9.974	9.497
449	10.474	9.997
450	10.974	10.497
451	11.474	10.997
452	11.974	11.497
453	12.474	11.997
454	12.974	12.497
455	13.474	12.997
456	13.974	13.497
457	14.474	13.997
458	14.974	14.497
459	15.474	14.997
460	15.974	15.497

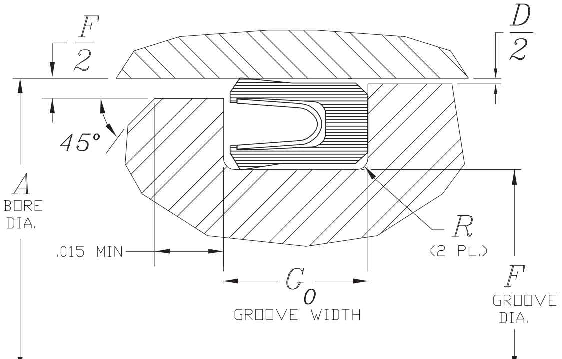
TSS EXCLUDER GLAND DIMENSIONS - TABLE 1

DASH NO.	G_0 GROOVE WIDTH	*R* RADIUS	*F* DIAMETRAL CLEARANCE MAX.
† 004-009	.098/.103	.005/.015	.042
† 010-028	.094/.099		
† 104-109	.141/.151	.005/.015	.042
110-149			
210-247	.188/.191	.010/.025	.042
325-349	.281/.291	.020/.035	.042
425-460	.375/.385	.020/.035	.042

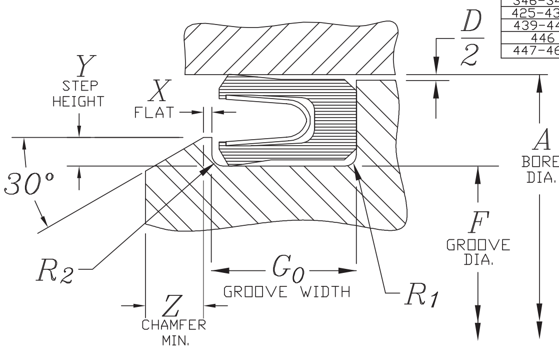
SNAP GLAND DIMENSIONS - TABLE 2

DASH NO.	G_0 GROOVE WIDTH	*Y* STEP HEIGHT	*Z* CHAMFER MIN.	R_1 RADIUS MAX.	R_2 RADIUS MAX.	*X* FLAT MIN.	SEAL ID MIN.
† 004-009	.098/.103	.008/.012	.025	.010	.005	.015	.375
† 010-028	.094/.099	.015/.020					
† 104-109	.141/.151	.010/.015	.030	.015	.005	.015	.562
110-149		.020/.025					
210-247	.188/.191	.030/.035	.040	.015	.007	.015	1.000
325-349	.281/.291	.032/.037	.045	.015	.010	.100	1.375
425-460	.375/.385	.042/.047	.055	.020	.010	.100	2.500

DASH NO.	*D* DIAMETRAL CLEARANCE MAX.
004-009	.004
010-012	.004
013-028	.005
104-109	.004
110-126	.005
127-129	.005
130-132	.006
133-140	.006
141-149	.007
210-222	.005
223-224	.006
225-227	.006
228-243	.007
244-245	.008
246-247	.008
325-327	.006
328-329	.006
330-345	.007
346-349	.008
425-438	.009
439-445	.009
446	.010
447-460	.011



TSS EXCLUDER GLAND INSTALLATION
TRELLEBORG SEALING SOLUTIONS GLAND STANDARD



SNAP GLAND INSTALLATION
FOR ZERO BACKUP WIDTH GLAND PER AS4716 REVISION A

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR VARISEAL®M2S SCRAPER IN AS4716 REVISION A PISTON GLANDS WITH THE EXCEPTION OF THE TSS RECOMMENDED STEP HEIGTH (Y).

2. ORDERING EXAMPLE: PVC 2 0 G 214 A T05 SM
   VARISEAL®M2S, PISTON DESIGNATOR
   CROSS SECTION
      0 = 000 SERIES
      1 = 100 SERIES
      2 = 200 SERIES
      3 = 300 SERIES
      4 = 400 SERIES
   DESIGN CHARACTERISTICS
   GLAND STANDARD
      G = AS4716
   SIZE DESIGNATION
      ACCORDING TO AS4716 REVISION A
   QUALITY INDEX:
      A = AEROSPACE CERTIFICATE OF CONFORMANCE
   △3 TURCON®VARISEAL®M2S MAT'L CODE
   SPRING MAT'L CODE - MEDIUM SPRING LOAD AS STANDARD

△3 FOR MATERIAL OPTIONS, SEE MATERIALS SECTION OF TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE. SPRING MATERIAL OPTIONS LISTED BELOW.

SPRING MATERIAL CODE
MEDIUM DUTY AS STANDARD

CODE	MATERIAL
S	301 STAINLESS STEEL
H	HASTELLOY
E	ELGILOY

4. †DASH SIZES -006 TO -028, -106 TO -128, AND -210 TO -221 REQUIRE SPLIT OR SNAP FITTING GLAND CONFIGURATION, PLEASE CONSULT YOUR TRELLEBORG SEALING SOLUTIONS SALES ENGINEER FOR DETAILED INFORMATION.

INCH
2011_5

TRELLEBORG
SEALING SOLUTIONS

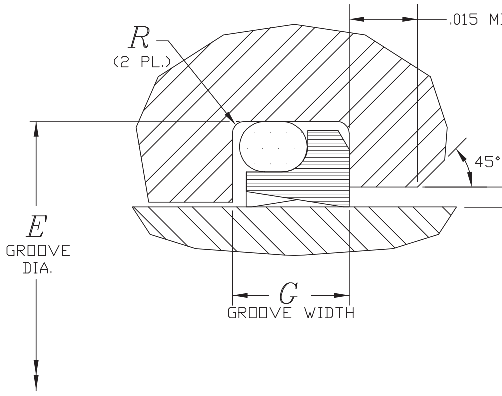
TITLE
VARISEAL®M2S, PISTON, SCRAPER

DRAWING NO.
PVC20G000

WORLD AEROSPACE TITLE BLOCK REV.

DASH NO.	*B* DIA.	*E* DIA.	O-RING NO.
	+.000 -.002	+.002 -.000	
† 110	.373	.546	013
† 111	.435	.609	014
† 112	.498	.672	015
† 113	.560	.734	016
† 114	.623	.797	017
† 115	.685	.859	018
† 116	.748	.923	019
117	.810	.985	020
118	.873	1.048	021
119	.935	1.110	022
120	.998	1.173	023
121	1.060	1.235	024
122	1.123	1.298	025
123	1.185	1.360	026
124	1.248	1.423	027
125	1.310	1.485	028
126	1.373	1.548	028
127	1.435	1.610	029
128	1.498	1.673	029
129	1.560	1.735	030
130	1.623	1.798	030
131	1.685	1.860	031
132	1.748	1.923	031
133	1.810	1.984	032
134	1.873	2.047	032
135	1.936	2.110	033
136	1.998	2.172	033
137	2.061	2.235	034
138	2.123	2.297	034
139	2.186	2.360	035
140	2.248	2.422	035
141	2.311	2.485	036
142	2.373	2.547	036
143	2.436	2.610	037
144	2.498	2.672	037
145	2.561	2.735	038
146	2.623	2.797	038
147	2.686	2.860	039
148	2.748	2.922	039
149	2.811	2.985	040
	+.000 -.002	+.002 -.000	
† 210	.748	.989	117
211	.810	1.051	118
212	.873	1.115	119
213	.935	1.177	120
214	.998	1.240	121
215	1.060	1.302	122
216	1.123	1.365	123
217	1.185	1.427	124
218	1.248	1.490	125
219	1.310	1.552	126
220	1.373	1.615	127
221	1.435	1.677	128
222	1.498	1.740	129
223	1.623	1.865	131
224	1.748	1.990	133
225	1.873	2.115	135
226	1.998	2.240	137
227	2.123	2.365	139
228	2.248	2.490	141
229	2.373	2.615	143
230	2.498	2.740	145
231	2.623	2.865	147
232	2.748	2.990	149
233	2.873	3.115	150
234	2.997	3.239	151
235	3.122	3.364	151
236	3.247	3.489	152
237	3.372	3.614	152
238	3.497	3.739	153
239	3.622	3.864	154
	+.000 -.002	+.002 -.000	
240	3.747	3.989	154
241	3.872	4.114	155
242	3.997	4.239	155
243	4.122	4.364	156
244	4.247	4.489	156
245	4.372	4.614	157
246	4.497	4.739	157
247	4.622	4.864	158
	+.000 -.002	+.002 -.000	
325	1.498	1.870	223
326	1.623	1.995	224
327	1.748	2.120	225
328	1.873	2.245	226
329	1.998	2.370	227
330	2.123	2.495	228
331	2.248	2.620	229
332	2.373	2.745	230
333	2.498	2.870	231
334	2.623	2.995	232
335	2.748	3.120	233
336	2.873	3.245	234
337	2.997	3.369	235
338	3.122	3.494	236
339	3.247	3.619	237
340	3.372	3.744	238
341	3.497	3.869	239
342	3.622	3.994	240
343	3.747	4.119	241
344	3.872	4.244	242
345	3.997	4.369	243
346	4.122	4.494	244
347	4.247	4.619	245
348	4.372	4.744	246
349	4.497	4.869	247
	+.000 -.003	+.003 -.000	
425	4.497	4.974	350
426	4.622	5.099	351
427	4.747	5.224	352
428	4.872	5.349	353
429	4.997	5.474	354
430	5.122	5.599	355
431	5.247	5.724	356
432	5.372	5.849	357
433	5.497	5.974	358
434	5.622	6.099	359
435	5.747	6.224	360
436	5.872	6.349	361
437	5.997	6.474	361
438	6.247	6.724	362
439	6.497	6.974	363
440	6.747	7.224	364
441	6.997	7.474	365
442	7.247	7.724	366
443	7.497	7.974	367
444	7.747	8.224	368
445	7.997	8.474	369
446	8.497	8.974	371
	+.000 -.003	+.004 -.000	
447	8.997	9.474	373
448	9.497	9.974	375
449	9.997	10.474	377
450	10.497	10.974	378
451	10.997	11.474	379
452	11.497	11.974	380
453	11.997	12.474	381
454	12.497	12.974	381
455	12.997	13.474	382
456	13.497	13.974	382
457	13.997	14.474	383
458	14.497	14.974	383
459	14.997	15.474	384
460	15.497	15.974	384

DASH NO.	*G* GROOVE WIDTH	*R* RADIUS	*F* DIAMETRAL CLEARANCE MAX.
110-149	.141/.151	.005/.015	.042
210-247	.188/.198	.010/.025	.042
325-349	.281/.291	.020/.035	.042
425-460	.375/.385	.020/.035	.042



EXCLUDER® DC INSTALLATION
FOR ZERO BACKUP WIDTH AS4716 REVISION B GLANDS
SIZES -110 THROUGH -460 ONLY

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR EXCLUDER® DC IN AS4716 REVISION B ROD GLANDS WITH THE EXCEPTION OF THE TSS RECOMMENDED RELIEF DIAMETERS (F).

2. ORDERING EXAMPLE: WE 25 0 G 214 A T99 NG

EXCLUDER® DESIGNATOR
SERIES NUMBER
DESIGN CHARACTERISTICS
0 = STANDARD
N = NOTCHED (SHOWN)
GLAND STANDARD
G = AS4716
DASH SIZE
ACCORDING TO AS4716 REVISION B
QUALITY INDEX:
A = AEROSPACE CERTIFICATE OF CONFORMANCE
TURCON® EXCLUDER® MAT'L. CODE
TUREL® O-RING MAT'L CODE
CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

3. †REQUIRES SPLIT GLAND

This uncontrolled document discloses information and data in which the Trelleborg Sealing Solutions has proprietary rights. Neither receipt nor possession thereof confers or transfers any right to reproduce, use or disclose in whole or in part except by written permission from Trelleborg Sealing Solutions. Trelleborg Sealing Solutions cannot be held responsible for printing errors etc.

INCH
2011_5

TRELLEBORG
SEALING SOLUTIONS

TITLE
EXCLUDER® DC

DRAWING NO.
WE25_G000

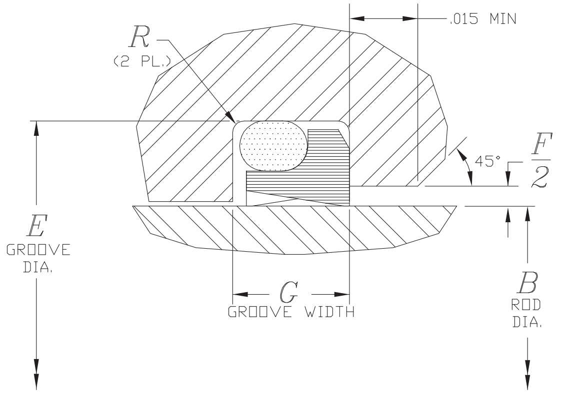
WORLD AEROSPACE TITLE BLOCK REV.

DASH NO.	*B* DIA.	*E* DIA.	O-RING NO.
	+.000 -.001	+.002 -.000	
†1/4 △3	.248	.436	011
†5/16 △3	.310	.498	012
†3/8 △3	.373	.561	013
†7/16 △3	.435	.623	014
	+.000 -.002	+.002 -.000	
† 001	.498	.766	113
† 002	.560	.828	114
† 003	.623	.891	115
† 004	.685	.953	116
† 005	.748	1.016	117
006	.810	1.078	118
007	.873	1.141	119
008	.935	1.203	120
009	.998	1.266	121
010	1.060	1.328	122
011	1.123	1.391	123
012	1.185	1.453	124
013	1.248	1.516	125
014	1.310	1.578	126
015	1.373	1.641	127
016	1.435	1.703	128
017	1.498	1.766	129
018	1.623	1.891	131
019	1.748	2.016	133
020	1.873	2.141	135
021	1.998	2.266	137
022	2.123	2.391	139
023	2.248	2.516	141
024	2.373	2.641	143
025	2.498	2.766	145
026	2.623	2.971	232
027	2.748	3.096	233
028	2.873	3.221	234
029	2.997	3.345	235
030	3.122	3.470	236
031	3.247	3.595	237
032	3.372	3.720	238
033	3.497	3.845	239
034	3.622	3.970	240
035	3.747	4.095	241
036	3.872	4.220	242
037	3.997	4.345	243
038	4.122	4.470	244
039	4.247	4.595	245
040	4.372	4.720	246
	+.000 -.003	+.003 -.000	
041	4.497	4.845	247
042	4.622	4.970	248
043	4.747	5.095	249
044	4.872	5.220	250
045	4.997	5.345	251
046	5.122	5.470	252
047	5.247	5.595	253
048	5.372	5.720	254
049	5.497	5.845	255
050	5.622	5.970	256
051	5.747	6.095	257
052	5.872	6.220	258
053	5.997	6.345	258
054	6.247	6.595	259
055	6.497	6.845	260
056	6.747	7.095	261
057	6.997	7.345	262
058	7.247	7.595	263
059	7.497	7.845	264
060	7.747	8.095	265
	+.000 -.003	+.005 -.000	
061	7.997	8.345	266
062	8.497	8.845	268
063	8.997	9.345	270
064	9.497	9.845	272
065	9.997	10.345	274
066	10.497	10.845	275
067	10.997	11.345	276
068	11.497	11.845	277
069	11.997	12.345	278
070	12.497	12.845	278
071	12.997	13.345	279

DASH NO.	*B* DIA.	*E* DIA.	O-RING NO.
	+.000 -.002	+.002 -.000	
501	.498	.686	015
† 502	.560	.748	016
† 503	.623	.811	017
† 504	.685	.873	018
† 505	.748	.936	019
506	.810	.998	020
507	.873	1.061	021
508	.935	1.123	022
509	.998	1.186	023
510	1.060	1.248	024
511	1.123	1.311	025
512	1.185	1.373	026
513	1.248	1.436	027
514	1.310	1.498	028
515	1.373	1.561	028
516	1.435	1.623	029
517	1.498	1.686	029
518	1.623	1.811	030
519	1.748	1.936	031
520	1.873	2.061	032
521	1.998	2.186	033
522	2.123	2.311	034
523	2.248	2.436	035
524	2.373	2.561	036
525	2.498	2.686	037
	+.000 -.002	+.002 -.000	
626	2.623	2.891	147
627	2.748	3.016	149
628	2.873	3.141	150
629	2.997	3.265	151
630	3.122	3.390	151
631	3.247	3.515	152
632	3.372	3.640	152
633	3.497	3.765	153
634	3.622	3.890	153
635	3.747	4.015	154
636	3.872	4.140	154
637	3.997	4.265	155
638	4.122	4.390	155
639	4.247	4.515	156
640	4.372	4.640	156
	+.000 -.003	+.003 -.000	
641	4.497	4.765	157
642	4.622	4.890	157
643	4.747	5.015	158
644	4.872	5.140	158
645	4.997	5.265	159
646	5.122	5.390	159
647	5.247	5.515	160
648	5.372	5.640	160
649	5.497	5.765	161
650	5.622	5.890	161
651	5.747	6.015	162
652	5.872	6.140	162
653	5.997	6.265	163
654	6.247	6.515	164
655	6.497	6.765	165
656	6.747	7.015	166
657	6.997	7.265	167
658	7.247	7.515	168
659	7.497	7.765	169
660	7.747	8.015	170
	+.000 -.003	+.005 -.000	
661	7.997	8.265	171
662	8.497	8.765	173
663	8.997	9.265	175
664	9.497	9.765	177
665	9.997	10.265	178

DASH NO.	*B* DIA.	*E* DIA.	O-RING NO.
	+.000 -.002	+.002 -.000	
†705	.748	1.096	212
706	.810	1.158	213
707	.873	1.221	214
708	.935	1.283	215
709	.998	1.346	216
710	1.060	1.408	217
711	1.123	1.471	218
712	1.185	1.533	219
713	1.248	1.596	220
714	1.310	1.658	221
715	1.373	1.721	222
716	1.435	1.783	222
717	1.498	1.846	223
718	1.623	1.971	224
719	1.748	2.096	225
720	1.873	2.221	226
721	1.998	2.346	227
722	2.123	2.471	228
723	2.248	2.596	229
724	2.373	2.721	230
725	2.498	2.846	231

DASH NO.	*G* GLAND WIDTH	*R* RADIUS	*F* DIAMETRAL CLEARANCE
	+.005 -.000		MAX.
1/4-7/16 501-525	.144	.005/.015	.042
1-25 626-665	.195	.005/.015	.042
26-71 705-725	.240	.005/.015	.042



EXCLUDER® DC INSTALLATION
TRELLEBORG SEALING SOLUTIONS GLAND STANDARD

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR EXCLUDER® DC IN TRELLEBORG SEALING SOLUTIONS GLAND STANDARD.

2. ORDERING EXAMPLE: WE 25 0 B 014 A T99 NE

EXCLUDER® DESIGNATOR
SERIES NUMBER
DESIGN CHARACTERISTICS
 0 = STANDARD
 N = NOTCHED (SHOWN)
GLAND STANDARD
 B = TRELLEBORG SEALING SOLUTIONS STANDARD
DASH SIZE
△3 ACCORDING TO MIL-G-5514 ROD DIA.
QUALITY INDEX:
 A = AEROSPACE CERTIFICATE OF CONFORMANCE
TURCON® EXCLUDER® MAT'L. CODE
TUREL® O-RING MAT'L. CODE

CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

△3 THE FOLLOWING TABLE APPLIES TO THOSE FRACTIONAL INCHES SIZES PER MS33675. ALL ROD DIAMETERS ARE PER MIL-G-5514.

MS33675 DASH SIZE	TSS P/N SIZE
1/4	100
5/16	200
3/8	300
7/16	400

4. †REQUIRES SPLIT GLAND

5. 500 AND 600 DASH NUMBERS ARE LIGHT DUTY VERSION. 700 DASH NUMBERS ARE HEAVY DUTY.

INCH
2011_4
TRELLEBORG
SEALING SOLUTIONS
TITLE
EXCLUDER® DC
DRAWING NO.
WE250B000

WORLD AEROSPACE TITLE BLOCK REV.

Turcon® Excluder® and Scrapers

DASH NO.	*B* DIA.	*E* DIA.	*D* DIA.	O-RING SIZE
	+.000 -.002	+.002 -.000	+.010 -.000	
†108	.248	.426	.278	011
†109	.310	.488	.340	012
†110	.373	.551	.403	013
†111	.435	.613	.465	014
	+.000 -.002	+.002 -.000	+.010 -.000	
†206	.498	.741	.528	
†207	.560	.803	.590	114
†208	.623	.866	.653	115
†209	.685	.928	.715	116
†210	.748	.991	.778	117
211	.810	1.053	.852	118
212	.873	1.116	.915	119
213	.935	1.178	.977	120
214	.998	1.241	1.040	121
215	1.060	1.303	1.102	122
216	1.123	1.366	1.165	123
217	1.185	1.428	1.227	124
218	1.248	1.491	1.290	125
219	1.310	1.553	1.352	126
220	1.373	1.616	1.415	127
221	1.435	1.678	1.477	128
222	1.498	1.741	1.540	129
	+.000 -.002	+.002 -.000	+.010 -.000	
325	1.498	1.870	1.540	223
326	1.623	1.995	1.665	224
327	1.748	2.120	1.790	225
328	1.873	2.245	1.915	226
329	1.998	2.370	2.040	227
330	2.123	2.495	2.165	228
331	2.248	2.620	2.290	229
332	2.373	2.745	2.415	230
333	2.498	2.870	2.540	231
334	2.623	2.995	2.665	232
335	2.748	3.120	2.790	233
336	2.873	3.245	2.915	234
337	2.997	3.369	3.039	235
338	3.122	3.494	3.164	236
339	3.247	3.619	3.289	237
340	3.372	3.744	3.414	238
341	3.497	3.869	3.539	239
342	3.622	3.994	3.664	240
343	3.747	4.119	3.789	241
344	3.872	4.244	3.914	242
345	3.997	4.369	4.039	243
346	4.122	4.494	4.164	244
347	4.247	4.619	4.289	245
348	4.372	4.744	4.414	246
349	4.497	4.869	4.539	247
	+.000 -.003	+.003 -.000	+.010 -.000	
425	4.497	4.974	4.539	350
426	4.622	5.099	4.664	351
427	4.747	5.224	4.789	352
428	4.872	5.349	4.914	353
429	4.997	5.474	5.039	354
430	5.122	5.599	5.164	355
431	5.247	5.724	5.289	356
432	5.372	5.849	5.414	357
433	5.497	5.974	5.539	358
434	5.622	6.099	5.664	359
435	5.747	6.224	5.789	360
436	5.872	6.349	5.914	361
437	5.997	6.474	6.039	361
438	6.247	6.724	6.289	362
439	6.497	6.974	6.539	363
440	6.747	7.224	6.789	364
441	6.997	7.474	7.039	365
442	7.247	7.724	7.289	366
443	7.497	7.974	7.539	367
444	7.747	8.224	7.789	368
445	7.997	8.474	8.039	369
446	8.497	8.974	8.539	371

DASH NO.	*B* DIA.	*E* DIA.	*D* DIA.	O-RING SIZE
	+.000 -.003	+.003 -.000	+.010 -.000	
447	8.997	9.474	9.039	373
448	9.497	9.974	9.539	375
449	9.997	10.474	10.039	377
450	10.497	10.974	10.539	378
451	10.997	11.474	11.039	379
452	11.497	11.974	11.539	380
453	11.997	12.474	12.039	381
454	12.497	12.974	12.539	381
455	12.997	13.474	13.039	382
456	13.497	13.974	13.539	382
457	13.997	14.474	14.039	383
458	14.497	14.974	14.539	383
459	14.997	15.474	15.039	384
460	15.497	15.974	15.539	384

DASH NO.	*G* GLAND WIDTH	*R* RADIUS
108-111	.183/.193	.005/.015
206-222	.235/.245	.010/.025
325-327	.334/.344	.020/.035
328-349		
425-438	.475/.485	.020/.035
439-460		

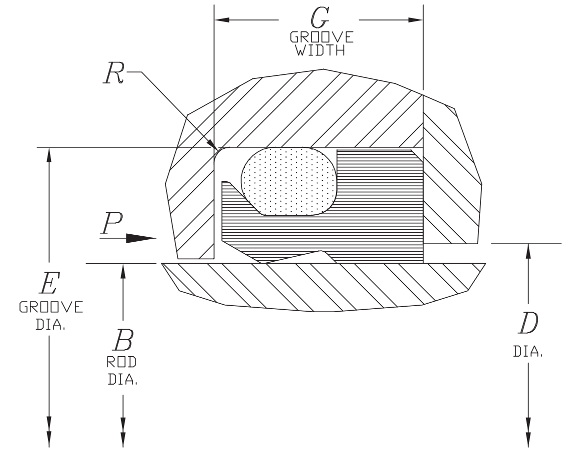
NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR EXCLUDER® AS IN AS4088 SCRAPER GLANDS.
2. ORDERING EXAMPLE: WE 67 0 B 214 A T99 NE

EXCLUDER® DESIGNATOR
SERIES NUMBER
DESIGN CHARACTERISTICS
△3 0 = STANDARD
GLAND STANDARD DESIGNATOR
B = TRELLEBORG SEALING SOLUTIONS GLAND STANDARD
SIZE DESIGNATOR ACCORDING TO AS4088
QUALITY INDEX:
A = AEROSPACE CERTIFICATE OF CONFORMANCE
TURCON® EXCLUDER® MAT'L CODE
TUREL® O-RING MAT'L CODE
CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

△3 NOTCHES NOT AVAILABLE

4. †REQUIRES SPLIT GLAND



EXCLUDER®AS INSTALLATION
FOR AS4088 SCRAPER GLAND STANDARD

INCH
2011_4
TRELLEBORG
SEALING SOLUTIONS
TITLE
EXCLUDER® AS
DRAWING NO.
WE670B000

WORLD AEROSPACE TITLE BLOCK REV.

DASH NO.	B DIA.	E DIA.	D DIA.	O-RING SIZE
	+.000 -.002	+.002 -.000	+.000 -.010	
325	1.498	1.870	1.646	223
326	1.623	1.995	1.771	224
327	1.748	2.120	1.896	225
328	1.873	2.245	2.021	226
329	1.998	2.370	2.146	227
330	2.123	2.495	2.271	228
331	2.248	2.620	2.396	229
332	2.373	2.745	2.521	230
333	2.498	2.870	2.646	231
334	2.623	2.995	2.771	232
335	2.748	3.120	2.896	233
336	2.873	3.245	3.021	234
337	2.997	3.369	3.145	235
338	3.122	3.494	3.270	236
339	3.247	3.619	3.395	237
340	3.372	3.744	3.520	238
341	3.497	3.869	3.645	239
342	3.622	3.994	3.770	240
343	3.747	4.119	3.895	241
344	3.872	4.244	4.020	242
345	3.997	4.369	4.145	243
346	4.122	4.494	4.270	244
347	4.247	4.619	4.395	245
348	4.372	4.744	4.520	246
349	4.497	4.869	4.645	247
	+.000 -.003	+.003 -.000	+.000 -.010	
425	4.497	4.974	4.686	350
426	4.622	5.099	4.811	351
427	4.747	5.224	4.936	352
428	4.872	5.349	5.061	353
429	4.997	5.474	5.186	354
430	5.122	5.599	5.311	355
431	5.247	5.724	5.436	356
432	5.372	5.849	5.561	357
433	5.497	5.974	5.686	358
434	5.622	6.099	5.811	359
435	5.747	6.224	5.936	360
436	5.872	6.349	6.061	361
437	5.997	6.474	6.186	361
438	6.247	6.724	6.436	362
439	6.497	6.974	6.686	363
440	6.747	7.224	6.936	364
441	6.997	7.474	7.186	365
442	7.247	7.724	7.436	366
443	7.497	7.974	7.686	367
444	7.747	8.224	7.936	368
445	7.997	8.474	8.186	369
446	8.497	8.974	8.686	371
447	8.997	9.474	9.186	373
448	9.497	9.974	9.686	375
449	9.997	10.474	10.186	377
450	10.497	10.974	10.686	378
451	10.997	11.474	11.186	379
452	11.497	11.974	11.686	380
453	11.997	12.474	12.186	381
454	12.497	12.974	12.686	381
455	12.997	13.474	13.186	382
456	13.497	13.974	13.686	382
457	13.997	14.474	14.186	383
458	14.497	14.974	14.686	383
459	14.997	15.474	15.186	384
460	15.497	15.974	15.686	384

DASH NO.	G GLAND WIDTH	R RADIUS
325-349	.334/.344	.020/.035
425-460	.475/.485	.020/.035

NOTES:

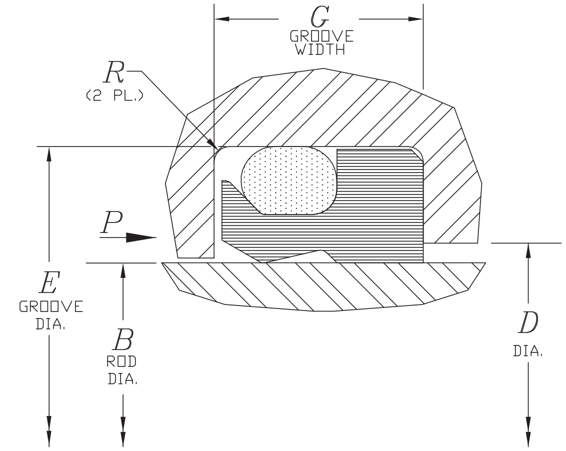
1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR EXCLUDER® AS IN AS4052 REV B TYPE I SCRAPER GLANDS.

2. ORDERING EXAMPLE: WE 71 0 B 214 A T99 NE

EXCLUDER® DESIGNATOR
SERIES NUMBER
DESIGN CHARACTERISTICS
3 0 = STANDARD
GLAND STANDARD DESIGNATOR
B = TRELLEBORG SEALING SOLUTIONS GLAND STANDARD
SIZE DESIGNATOR
ACCORDING TO AS4052 REV B TYPE I
QUALITY INDEX:
A = AEROSPACE CERTIFICATE OF CONFORMANCE
TURCON® EXCLUDER® MAT'L CODE
TUREL® O-RING MAT'L CODE
CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

3 NOTCHES NOT AVAILABLE

4. FOR SCRAPERS TO OLD REVISION OF AS4052 SEE TSS PART NUMBER WE720B000.



EXCLUDER® AS INSTALLATION
FOR AS4052 REV B TYPE I SCRAPER GLAND STANDARD

INCH
2011_4
TRELLEBORG
SEALING SOLUTIONS
TITLE
EXCLUDER® AS
DRAWING NO.
WE710B000

WORLD AEROSPACE TITLE BLOCK REV.

DASH NO.	*B* DIA.	*E* DIA.	*D* DIA.
	+.000 -.002	+.002 -.000	MINIMUM LEAD-IN Ø
325	1.498	1.870	1.888
326	1.623	1.995	2.013
327	1.748	2.120	2.138
328	1.873	2.245	2.263
329	1.998	2.370	2.388
330	2.123	2.495	2.513
331	2.248	2.620	2.638
332	2.373	2.745	2.763
333	2.498	2.870	2.888
334	2.623	2.995	3.013
335	2.748	3.120	3.138
336	2.873	3.245	3.263
337	2.997	3.369	3.387
338	3.122	3.494	3.512
339	3.247	3.619	3.637
340	3.372	3.744	3.762
341	3.497	3.869	3.887
342	3.622	3.994	4.012
343	3.747	4.119	4.137
344	3.872	4.244	4.262
345	3.997	4.369	4.387
346	4.122	4.494	4.512
347	4.247	4.619	4.637
348	4.372	4.744	4.762
349	4.497	4.869	4.887
	+.000 -.003	+.003 -.000	MINIMUM
425	4.497	4.974	5.017
426	4.622	5.099	5.042
427	4.747	5.224	5.267
428	4.872	5.349	5.392
429	4.997	5.474	5.517
430	5.122	5.599	5.642
431	5.247	5.724	5.767
432	5.372	5.849	5.892
433	5.497	5.974	6.017
434	5.622	6.099	6.042
435	5.747	6.224	6.267
436	5.872	6.349	6.392
437	5.997	6.474	6.517
438	6.247	6.724	6.767
439	6.497	6.974	7.017
440	6.747	7.224	7.267
441	6.997	7.474	7.517
442	7.247	7.724	7.767
443	7.497	7.974	8.017
444	7.747	8.224	8.267
445	7.997	8.474	8.517
446	8.497	8.974	9.017
447	8.997	9.474	9.517
448	9.497	9.974	10.017
449	9.997	10.474	10.517
450	10.497	10.974	11.017
451	10.997	11.474	11.517
452	11.497	11.974	12.017
453	11.997	12.474	12.517
454	12.497	12.974	13.017
455	12.997	13.474	13.517
456	13.497	13.974	14.017
457	13.997	14.474	14.517
458	14.497	14.974	15.017
459	14.997	15.474	15.517
460	15.497	15.974	16.017

DASH NO.	*G* GLAND WIDTH	*X* DIMENSION	*R1* RADIUS	*R2* RADIUS
325-349	.334/.344	.032/.037	.020/.035	.009 MAX.
425-460	.475/.485	.042/.043	.020/.035	.012 MAX.

NOTES:

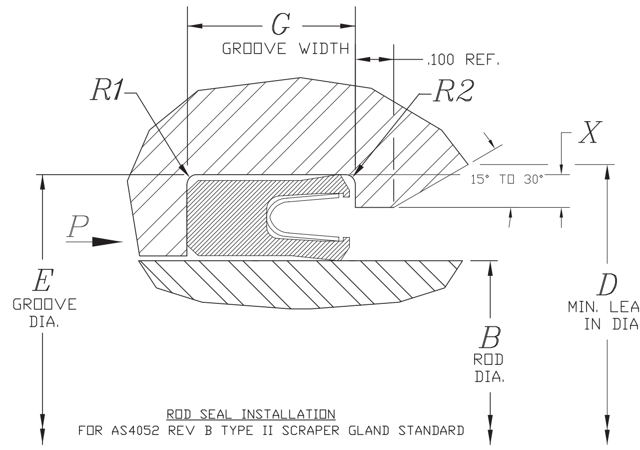
1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR VARISEAL® M2S IN AS4052 REV B TYPE II SCRAPER GLANDS.

2. ORDERING EXAMPLE RVD 3 N B 325 A T99 SM
   - VARISEAL® M2S, ROD DESIGNATOR — RVD
   - CROSS SECTION — 3
     - 3 = 300 SERIES
     - 4 = 400 SERIES
   - DESIGN CHARACTERISTICS — N
     - 0 = NOTCH, HEEL (NOT RECOMMENDED)
     - N = NO NOTCH, HEEL (RECOMMENDED)
   - TSS GLAND STANDARD — B
   - SIZE DESIGNATION ACCORDING TO AS4052 REV B TYPE II — 325
   - QUALITY INDEX: — A
     - A = AEROSPACE CERTIFICATE OF CONFORMANCE
   - △3 TURCON® VARISEAL® M2S MAT'L CODE — T99
   - SPRING MAT'L CODE - MEDIUM SPRING LOAD AS STANDARD — SM

△3 FOR MATERIAL OPTIONS, SEE MATERIALS SECTION OF TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE. SPRING MATERIAL OPTIONS LISTED BELOW.

SPRING MATERIAL CODE MEDIUM DUTY AS STANDARD	
CODE	MATERIAL
S	301 STAINLESS STEEL
H	HASTELLOY
E	ELGILOY

4. FOR SCRAPERS TO OLD REVISION OF AS4052 SEE TSS PART NUMBER WE720B000.



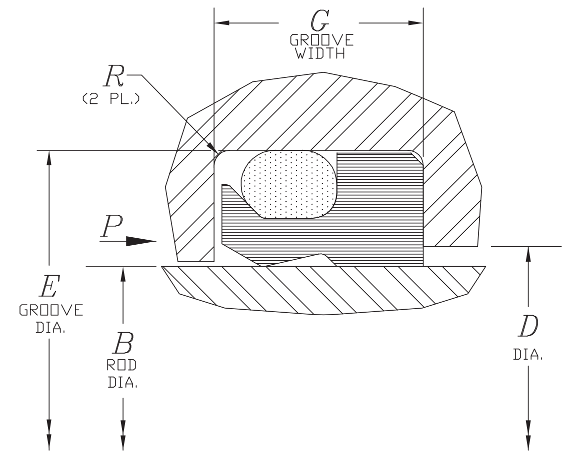
ROD SEAL INSTALLATION
FOR AS4052 REV B TYPE II SCRAPER GLAND STANDARD

INCH
2011_5
TRELLEBORG
SEALING SOLUTIONS
TITLE
VARISEAL® M2S
DRAWING NO.
RVD30B000

WORLD AEROSPACE TITLE BLOCK REV.

DASH NO.	*B* DIA.	*E* DIA.	*D* DIA.	O-RING SIZE
	+.000 -.002	+.002 -.000	+.010 -.000	
325	1.498	1.870	1.674	223
326	1.623	1.995	1.779	224
327	1.748	2.120	1.924	225
328	1.873	2.245	2.049	226
329	1.998	2.370	2.174	227
330	2.123	2.495	2.299	228
331	2.248	2.620	2.424	229
332	2.373	2.745	2.549	230
333	2.498	2.870	2.674	231
334	2.623	2.995	2.799	232
335	2.748	3.120	2.924	233
336	2.873	3.245	3.049	234
337	2.997	3.369	3.173	235
338	3.122	3.494	3.299	236
339	3.247	3.619	3.423	237
340	3.372	3.744	3.548	238
341	3.497	3.869	3.673	239
342	3.622	3.994	3.799	240
343	3.747	4.119	3.923	241
344	3.872	4.244	4.048	242
345	3.997	4.369	4.173	243
346	4.122	4.494	4.299	244
347	4.247	4.619	4.423	245
348	4.372	4.744	4.548	246
349	4.497	4.869	4.673	247
	+.000 -.003	+.003 -.000	+.010 -.000	
425	4.497	4.974	4.726	350
426	4.622	5.099	4.851	351
427	4.747	5.224	4.976	352
428	4.872	5.349	5.101	353
429	4.997	5.474	5.226	354
430	5.122	5.599	5.351	355
431	5.247	5.724	5.476	356
432	5.372	5.849	5.601	357
433	5.497	5.974	5.726	358
434	5.622	6.099	5.851	359
435	5.747	6.224	5.976	360
436	5.872	6.349	6.101	361
437	5.997	6.474	6.226	361
438	6.247	6.724	6.476	362
439	6.497	6.974	6.726	363
440	6.747	7.224	6.976	364
441	6.997	7.474	7.226	365
442	7.247	7.724	7.476	366
443	7.497	7.974	7.726	367
444	7.747	8.224	7.976	368
445	7.997	8.474	8.226	369
446	8.497	8.974	8.726	371
447	8.997	9.474	9.226	373
448	9.497	9.974	9.726	375
449	9.997	10.474	10.226	377
450	10.497	10.974	10.726	378
451	10.997	11.474	11.226	379
452	11.497	11.974	11.726	380
453	11.997	12.474	12.226	381
454	12.497	12.974	12.726	381
455	12.997	13.474	13.226	382
456	13.497	13.974	13.726	382
457	13.997	14.474	14.226	383
458	14.497	14.974	14.726	383
459	14.997	15.474	15.226	384
460	15.497	15.974	15.726	384

DASH NO.	*G* GLAND WIDTH	*R* RADIUS
325-349	.281/.291	.020/.035
425-460	.375/.385	.020/.035



EXCLUDER® AS INSTALLATION
FOR AS4052 TYPE I SCRAPER GLAND STANDARD

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR EXCLUDER® AS IN AS4052 TYPE I SCRAPER GLANDS.

2. ORDERING EXAMPLE: WE 72 0 B 214 A T99 NE

   EXCLUDER® DESIGNATOR
   SERIES NUMBER
   DESIGN CHARACTERISTICS
   △3 0 = STANDARD
   GLAND STANDARD DESIGNATOR
   B = TRELLEBORG SEALING SOLUTIONS GLAND STANDARD
   SIZE DESIGNATOR
   ACCORDING TO AS4052 TYPE I
   QUALITY INDEX:
   A = AEROSPACE CERTIFICATE OF CONFORMANCE
   TURCON® EXCLUDER® MAT'L CODE
   TUREL® O-RING MAT'L CODE
   CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

△3 NOTCHES NOT AVAILABLE

4. WE720B000 IS DESIGNED TO FIT AS4052 REVISIONS BEFORE REVISION LEVEL B. FOR AS4052 REVISION B OR LATER SCRAPERS DESIGNS SEE WE710B000 AND RVD3NM000.

INCH
2011_4
TRELLEBORG
SEALING SOLUTIONS
TITLE
EXCLUDER® AS
DRAWING NO.
WE720B000

WORLD AEROSPACE TITLE BLOCK REV.

Turcon® Excluder® and Scrapers

DASH NO.	*B* DIA.	*E* DIA.	*D* DIA.	*G* WIDTH	O-RING SIZE
	+.000 -.002	+.004 -.000	+.005 -.000	+.005 -.000	
†1/4 △3	.248	.510	.398	.104	012
†5/16 △3	.310	.572	.327		013
†3/8 △3	.373	.636	.460		014
†7/16 △3	.435	.697	.585		015
†001	.498	.760	.647		016
†002	.560	.823	.710		017
†003	.623	.885	.772		018
†004	.685	.948	.834		019
†005	.748	1.010	.897		020
006	.810	1.086	.949		021
007	.873	1.148	1.012		022
008	.935	1.210	1.074		023
009	.998	1.273	1.136		024
010	1.060	1.335	1.199		025
011	1.123	1.398	1.262		026
012	1.185	1.460	1.324		027
013	1.248	1.523	1.386		028
014	1.310	1.614	1.480		029
015	1.373	1.677	1.542		029
016	1.435	1.739	1.605		030
017	1.498	1.802	1.668		030
018	1.623	1.927	1.793		031
019	1.748	2.052	1.918		032
020	1.873	2.177	2.043		033
021	1.998	2.302	2.178		034
022	2.123	2.427	2.303		035
023	2.248	2.552	2.248		036
024	2.373	2.677	2.553		037
025	2.498	2.802	2.678	.104	038
026	2.623	2.989	2.834	.119	039
027	2.748	3.114	2.959		040
028	2.873	3.239	3.084		041
029	2.997	3.364	3.209		041
030	3.122	3.489	3.334		042
031	3.247	3.614	3.459		042
032	3.372	3.729	3.584		043
033	3.497	3.864	3.709		043
034	3.622	3.989	3.834		044
035	3.747	4.114	3.959		044
036	3.872	4.239	4.084	.119	045
037	3.997	4.427	4.240	.135	156
038	4.122	4.552	4.365	.135	156
039	4.247	4.677	4.490	.135	157
040	4.372	4.802	4.615	.135	157
	+.000 -.003	+.005 -.000	+.005 -.000	+.005 -.000	
041	4.497	4.927	4.740	.135	158
042	4.622	5.052	4.865		158
043	4.747	5.177	4.990		159
044	4.872	5.302	5.115		159
045	4.997	5.427	5.240		160
046	5.122	5.552	5.365		160
047	5.247	5.677	5.490		161
048	5.372	5.802	5.615		161
049	5.497	5.927	5.740	.135	162
050	5.622	6.114	5.896	.151	162
051	5.747	6.239	6.022		163
052	5.872	6.364	6.146		163
053	5.997	6.489	6.272		164
054	6.247	6.739	6.522		165
055	6.497	6.989	6.772		166
056	6.747	7.239	7.022		167
057	6.997	7.489	7.272		168
058	7.247	7.739	7.522		169
059	7.497	7.989	7.772		170
060	7.747	8.239	8.022		171
061	7.997	8.489	8.272		172
062	8.497	8.989	8.772		174
063	8.997	9.489	9.272		176
064	9.497	9.989	9.772		178
065	9.997	10.489	10.272	.151	065 △5

DASH NO.	*B* DIA.	*E* DIA.	*D* DIA.	*G* WIDTH	O-RING SIZE
	+.000 -.003	+.005 -.000	+.005 -.000	+.005 -.000	
066	10.497	10.989	10.772	.151	066 △5
067	10.997	11.489	11.272	.151	067
068	11.497	11.989	11.772	.166	277
069	11.997	12.489	12.272		278
070	12.497	12.989	12.772		278
071	12.997	13.489	13.272		279
072	13.497	13.989	13.772		279
073	13.997	14.489	14.272		280
074	14.497	14.989	14.772		280
075	14.997	15.489	15.272		281
076	15.497	15.989	15.772	.166	281
	+.000 -.002	+.010 -.000	+.010 -.000	+.010 -.000	
506	.810	1.052	.954	.104	021
507	.873	1.114	1.017		022
508	.935	1.177	1.079		023
509	.998	1.239	1.141		024
510	1.060	1.302	1.204		025
511	1.123	1.364	1.267		026
512	1.185	1.427	1.329		027
513	1.248	1.489	1.391	.104	028

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR EXCLUDER® DC SERIES E IN MS33675 GLANDS.

2. ORDERING EXAMPLE: WE 65 0 S 025 A T99 NE

EXCLUDER® DESIGNATOR
SERIES NUMBER
DESIGN CHARACTERISTICS
  0 = STANDARD
  N = NOTCHED (SHOWN)
GLAND STANDARD DESIGNATOR
  S = MS33675 SCRAPER GLAND STANDARD
SIZE DESIGNATOR
△3 ACCORDING TO MS33675
QUALITY INDEX:
  A = AEROSPACE CERTIFICATE OF CONFORMANCE
TURCON® EXCLUDER® MAT'L CODE
TUREL® O-RING MAT'L CODE
CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

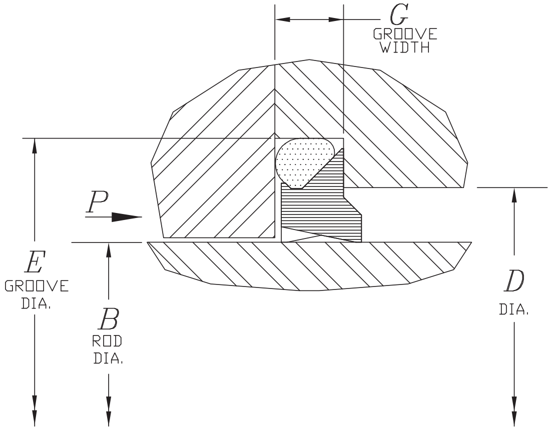
△3 THE FOLLOWING TABLE APPLIES TO THOSE FRACTIONAL INCHES SIZES PER MS33675

MS33675 DASH SIZE	TSS P/N SIZE
1/4	100
5/16	200
3/8	300
7/16	400

4. †REQUIRES SPLIT GLAND

△5 STANDARD O-RINGS NOT AVAILABLE - SPECIAL O-RINGS FROM TRELLEBORG SEALING SOLUTIONS ARE REQUIRED.

6. EXCLUDER D.C. SERIES E SIZES -506 THRU -513 ARE DIMENSIONALLY INTERCHANGEABLE WITH MS28776 SIZEZ -6 THRU -13 GLANDS.



EXCLUDER® DC SERIES E INSTALLATION
FOR MS33675 GLAND STANDARD

INCH
2011_4
TRELLEBORG
SEALING SOLUTIONS
TITLE
EXCLUDER® D.C. SERIES E
DRAWING NO.
WE650S000

WORLD AEROSPACE TITLE BLOCK REV.

Other elements

DASH NO.	B DIA.	E DIA.	D DIA.	G WIDTH
	+.000 −.002	+.004 −.000	+.005 −.000	+.005 −.000
† 1/4 △3	.248	.510	.398	.104
†5/16 △3	.310	.572	.327	
† 3/8 △3	.373	.636	.460	
†7/16 △3	.435	.697	.585	
1	.498	.760	.647	
2	.560	.823	.710	
3	.623	.885	.772	
4	.685	.948	.834	
5	.748	1.010	.897	
6	.810	1.086	.949	
7	.873	1.148	1.012	
8	.935	1.210	1.074	
9	.998	1.273	1.136	
10	1.060	1.335	1.199	
11	1.123	1.398	1.262	
12	1.185	1.460	1.324	
13	1.248	1.523	1.386	
14	1.310	1.614	1.480	
15	1.373	1.677	1.542	
16	1.435	1.739	1.605	
17	1.498	1.802	1.668	
18	1.623	1.927	1.793	
19	1.748	2.052	1.918	
20	1.873	2.177	2.043	
21	1.998	2.302	2.178	
22	2.123	2.427	2.303	
23	2.248	2.552	2.248	
24	2.373	2.677	2.553	
25	2.498	2.802	2.678	.104
26	2.623	2.989	2.834	.119
27	2.748	3.114	2.959	
28	2.873	3.239	3.084	
29	2.997	3.364	3.209	
30	3.122	3.489	3.334	
31	3.247	3.614	3.459	
32	3.372	3.729	3.584	
33	3.497	3.864	3.709	
34	3.622	3.989	3.834	
35	3.747	4.114	3.959	
36	3.872	4.239	4.084	.119
37	3.997	4.427	4.240	.135
38	4.122	4.552	4.365	.135
39	4.247	4.677	4.490	.135
40	4.372	4.802	4.615	.135
	+.000 −.003	+.005 −.000	+.005 −.000	+.005 −.000
41	4.497	4.927	4.740	.135
42	4.622	5.052	4.865	
43	4.747	5.177	4.990	
44	4.872	5.302	5.115	
45	4.997	5.427	5.240	
46	5.122	5.552	5.365	
47	5.247	5.677	5.490	
48	5.372	5.802	5.615	
49	5.497	5.927	5.740	.135
50	5.622	6.114	5.896	.151
51	5.747	6.239	6.022	
52	5.872	6.364	6.146	
53	5.997	6.489	6.272	
54	6.247	6.739	6.522	
55	6.497	6.989	6.772	
56	6.747	7.239	7.022	
57	6.997	7.489	7.272	
58	7.247	7.739	7.522	
59	7.497	7.989	7.772	
60	7.747	8.239	8.022	
61	7.997	8.489	8.272	
62	8.497	8.989	8.772	
63	8.997	9.489	9.272	
64	9.497	9.989	9.772	
65	9.997	10.489	10.272	.151
	+.000 −.003	+.005 −.000	+.005 −.000	+.005 −.000
66	10.497	10.989	10.772	.151
67	10.997	11.489	11.272	.151
68	11.497	11.989	11.772	.166
69	11.997	12.489	12.272	
70	12.497	12.989	12.772	
71	12.997	13.489	13.272	
72	13.497	13.989	13.772	
73	13.997	14.489	14.272	
74	14.497	14.989	14.772	
75	14.997	15.489	15.272	
76	15.497	15.989	15.772	.166

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR SCRAPER RING IN MS33675 SCRAPER GLANDS.

2. ORDERING EXAMPLE: WM 65 0 S 025 A T05 S

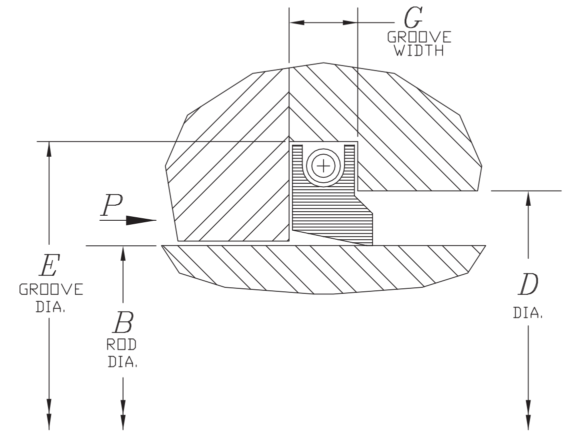
SCRAPER DESIGNATOR
SERIES NUMBER
DESIGN CHARACTERISTICS
  0 = STANDARD
GLAND STANDARD DESIGNATOR
  S = MS33675 SCRAPER GLAND STANDARD
SIZE DESIGNATOR
△3 ACCORDING TO MS33675
QUALITY INDEX:
  A = AEROSPACE CERTIFICATE OF CONFORMANCE
TURCON® SCRAPER MAT'L CODE
STANDARD EXPANDER MAT'L
CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

△3 THE FOLLOWING TABLE APPLIES TO FRACTIONAL INCH SIZES PER MS33675.

MS33675 DASH SIZE	TSS P/N SIZE
1/4	100
5/16	200
3/8	300
7/16	400

4. †REQUIRES SPLIT GLAND

5. EXCLUDER D.C. SERIES E SIZES -506 THRU -513 ARE DIMENSIONALLY INTERCHANGEABLE WITH MS28776 SIZEZ -6 THRU -13 GLANDS.



SCRAPER RING INSTALLATION
FOR MS33675 GLAND STANDARD

INCH
2011_4
TITLE
SCRAPER RING ASSEMBLY
TRELLEBORG
SEALING SOLUTIONS
DRAWING NO.
WM650S000

WORLD AEROSPACE TITLE BLOCK REV.

The drawings are also available on the CD supplied with this manual or they can be downloaded from www.tss.trelleborg.com.

DASH NO.	*B* DIA.	*E* DIA.	*D* DIA.	*G* WIDTH
	+.000 −.002	+.004 −.000	+.005 −.000	+.005 −.000
† 1/4 △3	.248	.510	.398	.104
†5/16 △3	.310	.572	.327	
† 3/8 △3	.373	.636	.460	
†7/16 △3	.435	.697	.585	
†001	.498	.760	.647	
002	.560	.823	.710	
003	.623	.885	.772	
004	.685	.948	.834	
005	.748	1.010	.897	
006	.810	1.086	.949	
007	.873	1.148	1.012	
008	.935	1.210	1.074	
009	.998	1.273	1.136	
010	1.060	1.335	1.199	
011	1.123	1.398	1.262	
012	1.185	1.460	1.324	
013	1.248	1.523	1.386	
014	1.310	1.614	1.480	
015	1.373	1.677	1.542	
016	1.435	1.739	1.605	
017	1.498	1.802	1.668	
018	1.623	1.927	1.793	
019	1.748	2.052	1.918	
020	1.873	2.177	2.043	
021	1.998	2.302	2.178	
022	2.123	2.427	2.303	
023	2.248	2.552	2.428	
024	2.373	2.677	2.553	
025	2.498	2.802	2.678	.104
026	2.623	2.989	2.834	.119
027	2.748	3.114	2.959	
028	2.873	3.239	3.084	
029	2.997	3.364	3.209	
030	3.122	3.489	3.334	
031	3.247	3.614	3.459	
032	3.372	3.729	3.584	
033	3.497	3.864	3.709	
034	3.622	3.989	3.834	
035	3.747	4.114	3.959	
036	3.872	4.239	4.084	.119
037	3.997	4.427	4.240	.135
038	4.122	4.552	4.365	.135
039	4.247	4.677	4.490	.135
040	4.372	4.802	4.615	.135
	+.000 −.003	+.005 −.000	+.005 −.000	+.005 −.000
041	4.497	4.927	4.740	.135
042	4.622	5.052	4.865	
043	4.747	5.177	4.990	
044	4.872	5.302	5.115	
045	4.997	5.427	5.240	
046	5.122	5.552	5.365	
047	5.247	5.677	5.490	
048	5.372	5.802	5.615	
049	5.497	5.927	5.740	.135
050	5.622	6.114	5.896	.151
051	5.747	6.239	6.022	
052	5.872	6.364	6.146	
053	5.997	6.489	6.272	
054	6.247	6.739	6.522	
055	6.497	6.989	6.772	
056	6.747	7.239	7.022	
057	6.997	7.489	7.272	
058	7.247	7.739	7.522	
059	7.497	7.989	7.772	
060	7.747	8.239	8.022	
061	7.997	8.489	8.272	
062	8.497	8.989	8.772	
063	8.997	9.489	9.272	
064	9.497	9.989	9.772	
065	9.997	10.489	10.272	.151

DASH NO.	*B* DIA.	*E* DIA.	*D* DIA.	*G* WIDTH
	+.000 −.003	+.005 −.000	+.005 −.000	+.005 −.000
066	10.497	10.989	10.772	.151
067	10.997	11.489	11.272	.151
068	11.497	11.989	11.772	.166
069	11.997	12.489	12.272	
070	12.497	12.989	12.772	
071	12.997	13.489	13.272	
072	13.497	13.989	13.772	
073	13.997	14.489	14.272	
074	14.497	14.989	14.772	
075	14.997	15.489	15.272	
076	15.497	15.989	15.772	.166
	+.000 −.002	+.010 −.000	+.010 −.000	+.010 −.000
506	.810	1.052	.954	.104
507	.873	1.114	1.017	
508	.935	1.177	1.079	
509	.998	1.239	1.141	
510	1.060	1.302	1.204	
511	1.123	1.364	1.267	
512	1.185	1.427	1.329	
513	1.248	1.489	1.391	.104

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR DC SCRAPER RING IN MS33675 GLANDS.
2. ORDERING EXAMPLE: WE 82 0 S 025 A T05

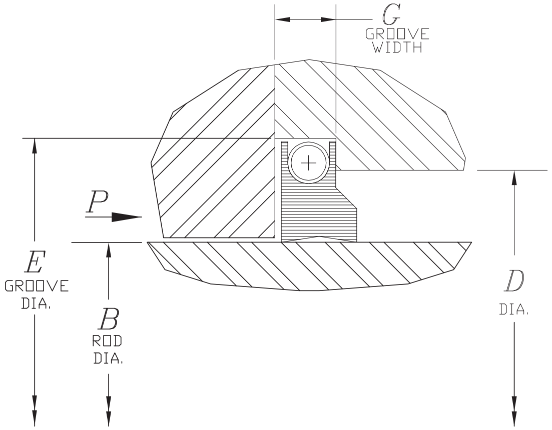
DC SCRAPER RING DESIGNATOR — WE
SERIES NUMBER — 82
DESIGN CHARACTERISTICS — 0
  0 = NO NOTCH (STANDARD)
GLAND STANDARD DESIGNATOR — S
  S = MS33675 SCRAPER GLAND STANDARD
SIZE DESIGNATOR — 025
△3 ACCORDING TO MS33675
QUALITY INDEX: — A
  A = AEROSPACE CERTIFICATE OF CONFORMANCE
TURCON® DC SCRAPER RING MAT'L CODE — T05

CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

△3 THE FOLLOWING TABLE APPLIES TO THOSE FRACTIONAL INCHES SIZES PER MS33675

MS33675 DASH SIZE	TSS P/N SIZE
1/4	100
5/16	200
3/8	300
7/16	400

4. †REQUIRES SPLIT GLAND
5. EXCLUDER D.C. SERIES E SIZES -506 THRU -513 ARE DIMENSIONALLY INTERCHANGEABLE WITH MS28776 SIZEZ -6 THRU -13 GLANDS.



DC SCRAPER RING INSTALLATION
FOR MS33675 GLAND STANDARD

INCH
2011_4
TRELLEBORG
SEALING SOLUTIONS
TITLE
DC SCRAPER RING
DRAWING NO.
WM820S000

WORLD AEROSPACE TITLE BLOCK REV.

Other elements

Features and benefits

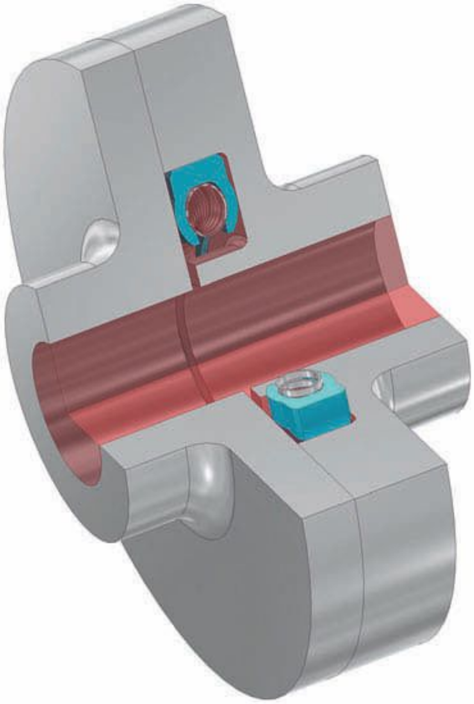
- For demanding applications
- Internal and external designs
- High performance materials
- Superior low friction
- Very wide temperature range
- Available for AS4716 and non-standard sizes

Turcon® Variseal® Face Seal

- Pressure actuated
- Large hardware deflection capable
- Corrosion resistant metal spring energizer
- Unidirectional seal

Turcon® HST Face Seal and Turcon® Wedgpak® Face Seal

- Back-up Ring extrusion resistant for zero-leakage
- Elastomer profile gives optimum performance and loading profile
- Provides unidirectional sealing



Turcon® Variseal® Face Seal HF has unparalleled temperature and chemical resistance and can be used to seal hot or aggressive fluids effectively.

■ Turcon® Variseal® Face Seal

Description

Turcon® Variseal® Face Seal is an adaptation of the traditional Turcon® Variseal® design that maximizes performance in face seal applications. Turcon® Variseal® M Face Seal utilizes the cantilever or v-spring and Turcon® Variseal® H Face Seal utilizes a helical spring.

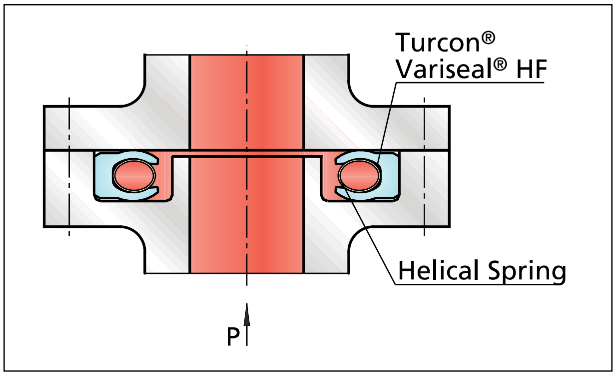


Figure 1 Turcon® Variseal® H Face Seal, Internal

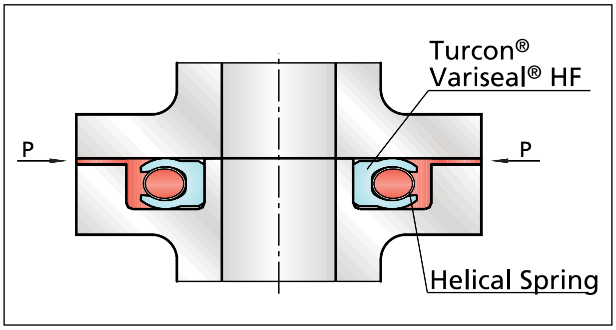


Figure 2 Turcon® Variseal® H Face Seal, External

Turcon® Variseal® Face Seal uses the full depth of the seal groove to optimize the amount of sealing material available, maximizing extrusion protection under worst case operating conditions.

Method of Operation

The spring-energizer in Turcon® Variseal® Face Seal provides tight sealing in system conditions without pressure or when pressure is very low. As the system pressure increases, this activates the seal.

Typically in face seal applications there are impulse pressures. This causes high breathing conditions between the seal and mating hardware. The large heel of Turcon® Variseal® Face Seal acts as a Back-up Ring in these situations, preventing extrusion of the seal.

The Turcon® Variseal® H is especially suitable for sealing gas and for cryogenic applications. The Turcon® Variseal® M is a good all-round seal with low friction characteristics for rotary joints and swivels. Additionally, due to the large flexibility of the sealing lips, it allows a relatively high deflection of the flanges. However it is important to note that large flange deflections must only occur at low pressure.

Spring Types

For details on v-spring and helical spring types see the main section on Turcon® Variseal®.

Technical Data

Operating pressure:	5,000 psi/ 35 MPa (greater in non-standard configurations)
Temperature range:	-65°F to +390°F/ -54°C to +200°C depending on elastomer material
Clearance:	Can exceed recommendations of AS4716 depending on the combination of pressures and clearance gaps
Media:	Virtually all media and gases

Series

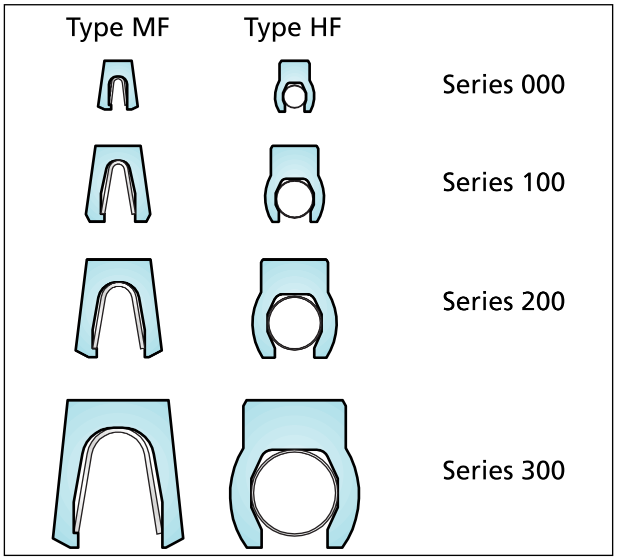


Figure 3 Relative size of Turcon® Variseal® MF and Turcon® Variseal® HF seal cross sections

■ Turcon® HST Face Seal

Description

Turcon® HST Face Seal is designed to retrofit O-Rings in AS4716 glands in face seal applications. It consists of an L-shaped elastomer sealing element supported by a solid Turcon® Back-up Ring.

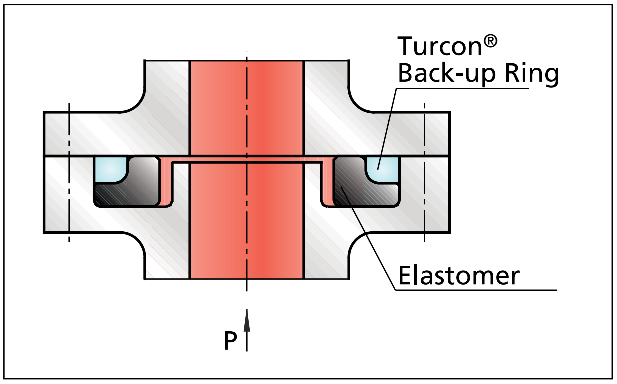


Figure 4 Turcon® HST Face Seal (internal pressure)

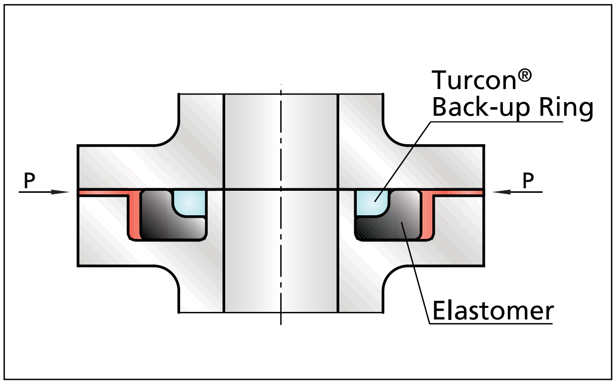


Figure 5 Turcon® HST Face Seal (external pressure)

Typically in face seal applications there are impulse pressures. This causes high breathing conditions between the seal and mating hardware. Turcon® HST Face Seal gives optimized sealing in these situations.

Method of Operation

At zero or low pressure operation, the L-shaped elastomer element functions as a positive sealing element. As the system pressure increases, the L-shaped elastomer is deflected against the Turcon® Back-up Ring. This provides excellent extrusion protection while allowing the L-shaped elastomer to provide outstanding leakage control.

Technical Data

Operation pressure:	5,000 psi/ 35 MPa (greater in non-standard configurations)
Temperature range:	Up to -65°F to +390°F/ -54°C to +200°C depending on elastomer material
Clearance:	Zero clearance is recommended. Clearance can exceed the recommended clearances of AS4716 depending on the combination of pressures and clearance gaps
Media:	Mineral oil-based hydraulic fluids, flame-retardant hydraulic fluids, environmentally-safe hydraulic fluids (bio-oils), phosphate ester-based hydraulic oils, water and others depending on the elastomer material selected

Avoid combining extreme limits.

Series

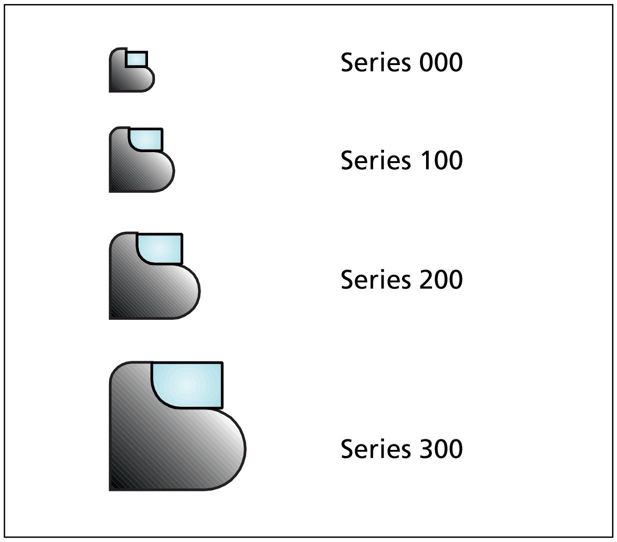


Figure 6 Relative Size of Turcon® HST Face Seal cross section

■ Turcon® Wedgpak® Face Seal

Description

Turcon® Wedgpak® Face Seal is an adaptation of the Wedgpak® design. It utilizes a triangular shaped Turcon® delta ring energized by a uniquely shaped elastomer. This maximizes extrusion protection under abnormal clearance gap conditions.

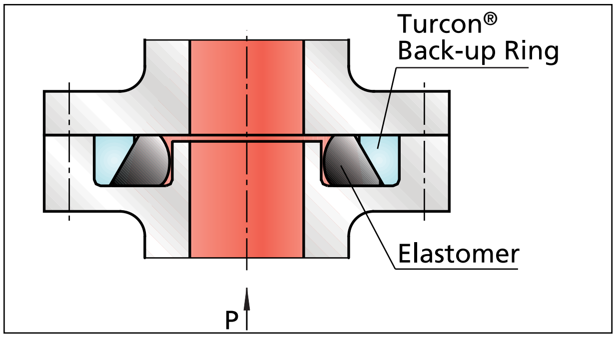


Figure 7 Turcon® Wedgpak® Face Seal (Internal pressure)

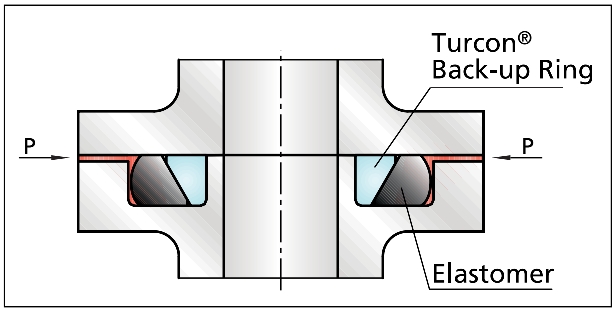


Figure 8 Turcon® Wedgpak® Face Seal (External pressure)

Typically in face seal applications there are impulse pressures. This causes high breathing conditions between the seal and mating hardware. Turcon® Wedgpak® Face Seal gives optimized sealing in these situations.

Method of Operation

The Turcon® delta ring in Turcon® Wedgpak® Face Seal uses the full depth of the seal groove to optimize the amount of sealing material available, maximizing extrusion protection under worst case operating conditions.

The special shaped geometry of the elastomer provides a preload under low pressure conditions, and constantly forces the Turcon® delta ring up against the clearance gap to prevent extrusion of the elastomer.

Technical Data

Operating pressure:	5,000 psi/ 35 MPa (greater in non-standard configurations)
Temperature range:	-65°F to +390°F/ -54°C to +200°C depending on elastomer material
Clearance:	Can exceed recommendations of MIL-G-5514F/AS4716 dependent upon the combination of pressures and clearance gaps
Media:	Mineral oil-based hydraulic fluids, flame-retardant hydraulic fluids, environmentally-safe hydraulic fluids (bio-oils), phosphate ester-based hydraulic oils, water and others depending on the elastomer material selected

Series

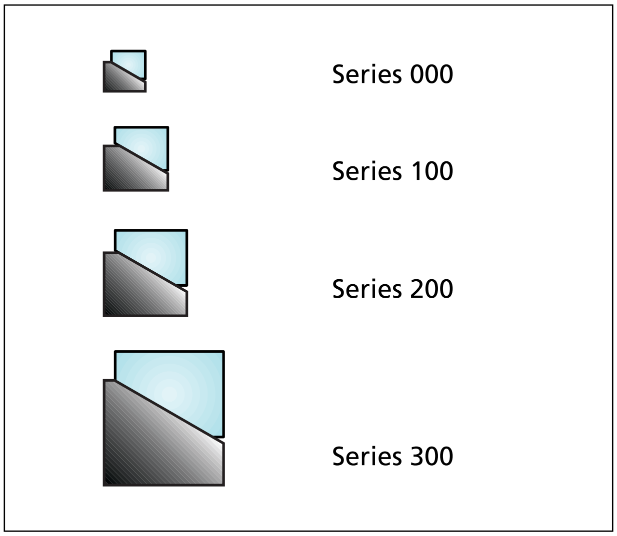
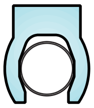
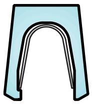
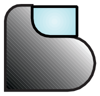
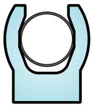
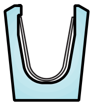
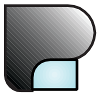


Figure 9 Relative Size of Turcon® Wedgpak® Face Seal cross section

Turcon® Face Seals

Table I Turcon® Face Seal Selection

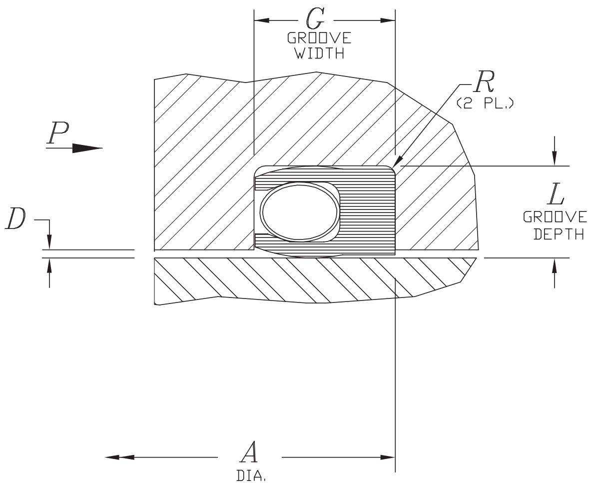
Cross Section	Description	Available Configuration	Part Number	Gland Standard
	**Turcon® Variseal® HF Face Seal**	**Internal Pressure**	DVE	Gland design based on AS4716 dimensions
	**Turcon® Variseal® MF Face Seal**		DVA	
	**Turcon® HST Face Seal**		DYHA	
	**Turcon® Wedgpak® Face Seal**		DW00	
	**Turcon® Variseal® HF Face Seal**	**External Pressure**	DVL	Gland design based on AS4716 dimensions
	**Turcon® Variseal® MF Face Seal**		DVC	
	**Turcon® HST Face Seal**		DYHB	
	**Turcon® Wedgpak® Face Seal**		DW01	

DASH NO.	A DIA.
	+.000 -.005
010	.379
011	.441
012	.504
013	.566
014	.629
015	.691
016	.754
017	.816
018	.879
019	.941
020	1.004
021	1.066
022	1.129
023	1.191
024	1.254
025	1.316
026	1.379
027	1.441
028	1.504
110	.568
111	.630
112	.693
113	.755
114	.818
115	.880
116	.943
117	1.005
118	1.068
119	1.130
120	1.193
121	1.255
122	1.318
123	1.380
124	1.443
125	1.505
126	1.568
127	1.630
128	1.693
129	1.755
130	1.818
131	1.880
132	1.943
133	2.005
134	2.068
135	2.131

DASH NO.	A DIA.
	+.000 -.005
210	1.012
211	1.074
212	1.137
213	1.199
214	1.262
215	1.324
216	1.387
217	1.449
218	1.512
219	1.574
220	1.637
221	1.699
222	1.762
223	1.887
224	2.012
225	2.137
226	2.262
227	2.387
228	2.512
229	2.637
230	2.762
231	2.887
232	3.012
233	3.137
234	3.262
235	3.387
236	3.512
237	3.637
238	3.762
239	3.887
240	4.012
241	4.137
242	4.262
243	4.387
244	4.512
245	4.637
246	4.762
247	4.887

DASH NO.	A DIA.
	+.000 -.005
325	1.895
326	2.020
327	2.145
328	2.270
329	2.395
330	2.520
331	2.645
332	2.770
333	2.895
334	3.020
335	3.145
336	3.270
337	3.395
338	3.520
339	3.645
340	3.770
341	3.895
342	4.020
343	4.145
344	4.270
345	4.395
346	4.520
347	4.645
348	4.770
349	4.895

DASH NO.	L GROOVE DEPTH	G GROOVE WIDTH	R RADIUS	D HARDWARE CLEARANCE MAX.
008-028	.058/.056	.094/.104	.005/.015	.005
110-135	.091/.089	.141/.151	.005/.015	.007
210-247	.123/.121	.188/.198	.010/.025	.008
325-349	.188/.186	.281/.291	.020/.035	.007



VARISEAL®HF INSTALLATION
FOR INTERNAL PRESSURE FACE SEAL GLANDS

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER IN VARISEAL®HF, FACE SEAL, INTERNAL PRESSURE GLANDS.

2. ORDERING EXAMPLE: DVE 2 0 M 214 A T05 SH
   VARISEAL®HF, INTERNAL DESIGNATOR
   CROSS SECTION
      0 = 000 SERIES
      1 = 100 SERIES
      2 = 200 SERIES
      3 = 300 SERIES
   DESIGN CHARACTERISTICS
   GLAND STANDARD
    M = AS4716
   SIZE DESIGNATION
    ACCORDING TO AS4716 REVISION A
   QUALITY INDEX:
    A = AEROSPACE CERTIFICATE OF CONFORMANCE
   △3 TURCON®VARISEAL®HF MAT'L CODE
   SPRING MAT'L CODE - HEAVY SPRING LOAD
   AS STANDARD

△3 FOR MATERIAL OPTIONS, SEE MATERIALS SECTION OF TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE. SPRING MATERIAL OPTIONS LISTED BELOW.

SPRING MATERIAL CODE HEAVY DUTY AS STANDARD	
CODE	MATERIAL
S	301 STAINLESS STEEL
H	HASTELLOY
E	ELGILOY

INCH
2009_1
TRELLEBORG
SEALING SOLUTIONS
TITLE
VARISEAL®HF, FACE SEAL, INTERNAL
DRAWING NO.
DVE00B000

WORLD AEROSPACE TITLE BLOCK REV.

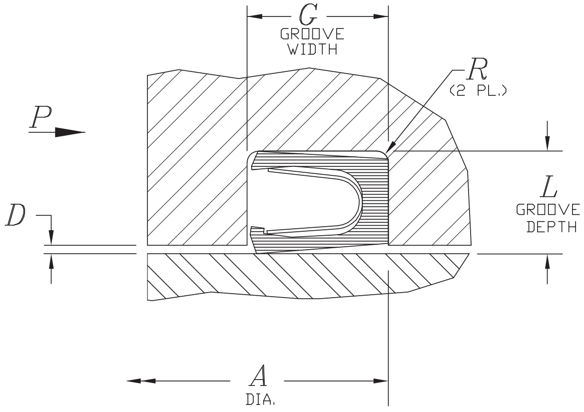
Turcon® Face Seals

DASH NO.	*A* DIA.
	+.000 -.005
010	.379
011	.441
012	.504
013	.566
014	.629
015	.691
016	.754
017	.816
018	.879
019	.941
020	1.004
021	1.066
022	1.129
023	1.191
024	1.254
025	1.316
026	1.379
027	1.441
028	1.504
110	.568
111	.630
112	.693
113	.755
114	.818
115	.880
116	.943
117	1.005
118	1.068
119	1.130
120	1.193
121	1.255
122	1.318
123	1.380
124	1.443
125	1.505
126	1.568
127	1.630
128	1.693
129	1.755
130	1.818
131	1.880
132	1.943
133	2.005
134	2.068
135	2.131

DASH NO.	*A* DIA.
	+.000 -.005
210	1.012
211	1.074
212	1.137
213	1.199
214	1.262
215	1.324
216	1.387
217	1.449
218	1.512
219	1.574
220	1.637
221	1.699
222	1.762
223	1.887
224	2.012
225	2.137
226	2.262
227	2.387
228	2.512
229	2.637
230	2.762
231	2.887
232	3.012
233	3.137
234	3.262
235	3.387
236	3.512
237	3.637
238	3.762
239	3.887
240	4.012
241	4.137
242	4.262
243	4.387
244	4.512
245	4.637
246	4.762
247	4.887

DASH NO.	*A* DIA.
	+.000 -.005
325	1.895
326	2.020
327	2.145
328	2.270
329	2.395
330	2.520
331	2.645
332	2.770
333	2.895
334	3.020
335	3.145
336	3.270
337	3.395
338	3.520
339	3.645
340	3.770
341	3.895
342	4.020
343	4.145
344	4.270
345	4.395
346	4.520
347	4.645
348	4.770
349	4.895

DASH NO.	*L* GROOVE DEPTH	*G* GROOVE WIDTH	*R* RADIUS	*D* HARDWARE CLEARANCE MAX.
008-028	.058/.056	.094/.104	.005/.015	.005
110-135	.091/.089	.141/.151	.005/.015	.007
210-247	.123/.121	.188/.198	.010/.025	.008
325-349	.188/.186	.281/.291	.020/.035	.007



VARISEAL® MF INSTALLATION
FOR INTERNAL PRESSURE FACE SEAL GLANDS

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER IN VARISEAL® MF, FACE SEAL, INTERNAL PRESSURE GLANDS.

2. ORDERING EXAMPLE: DVA 2 0 M 214 A T05 SH
   - VARISEAL® MF, INTERNAL DESIGNATOR
   - CROSS SECTION
     - 0 = 000 SERIES
     - 1 = 100 SERIES
     - 2 = 200 SERIES
     - 3 = 300 SERIES
   - DESIGN CHARACTERISTICS
   - GLAND STANDARD
     - M = AS4716
   - SIZE DESIGNATION
     - ACCORDING TO AS4716 REVISION A
   - QUALITY INDEX:
     - A = AEROSPACE CERTIFICATE OF CONFORMANCE
   - ⚠3 TURCON® VARISEAL® MF MAT'L CODE
   - SPRING MAT'L CODE - HEAVY SPRING LOAD AS STANDARD

⚠3 FOR MATERIAL OPTIONS, SEE MATERIALS SECTION OF TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE. SPRING MATERIAL OPTIONS LISTED BELOW.

SPRING MATERIAL CODE HEAVY DUTY AS STANDARD	
CODE	MATERIAL
S	301 STAINLESS STEEL
H	HASTELLOY
E	ELGILOY

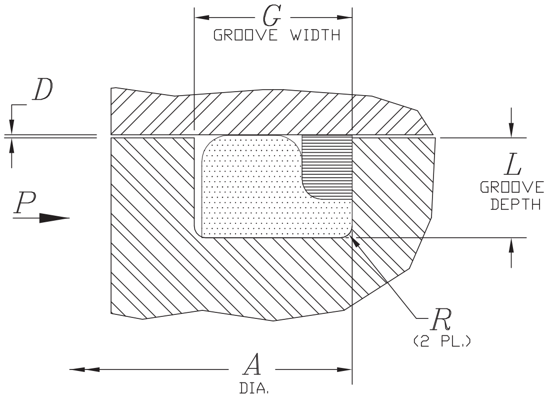
INCH
2009_1
TRELLEBORG
SEALING SOLUTIONS
TITLE
VARISEAL® MF, FACE SEAL, INTERNAL
DRAWING NO.
DVA00B000

WORLD AEROSPACE TITLE BLOCK REV.

DASH NO.	*A* DIA.
	+.000 -.005
008	.316
009	.348
010	.379
011	.441
012	.504
013	.566
014	.629
015	.691
016	.754
017	.816
018	.879
019	.941
020	1.004
021	1.066
022	1.129
023	1.191
024	1.254
025	1.316
026	1.379
027	1.441
028	1.504
110	.568
111	.630
112	.693
113	.755
114	.818
115	.880
116	.943
117	1.005
118	1.068
119	1.130
120	1.193
121	1.255
122	1.318
123	1.380
124	1.443
125	1.505
126	1.568
127	1.630
128	1.693
129	1.755
130	1.818
131	1.880
132	1.943
133	2.005
134	2.068
135	2.131

DASH NO.	*A* DIA.
	+.000 -.005
210	1.012
211	1.074
212	1.137
213	1.199
214	1.262
215	1.324
216	1.387
217	1.449
218	1.512
219	1.574
220	1.637
221	1.699
222	1.762
223	1.887
224	2.012
225	2.137
226	2.262
227	2.387
228	2.512
229	2.637
230	2.762
231	2.887
232	3.012
233	3.137
234	3.262
235	3.512
236	3.637
237	3.762
238	3.743
239	3.887
240	4.012
241	4.137
242	4.262
243	4.387
244	4.512
245	4.637
246	4.762
247	4.887
325	1.895
326	2.020
327	2.145
328	2.270
329	2.395
330	2.520
331	2.645
332	2.770
333	2.895
334	3.020
335	3.145
336	3.270
337	3.395
338	3.520
339	3.645
340	3.770
341	3.895
342	4.020
343	4.145
344	4.270
345	4.395
346	4.520
347	4.645
348	4.770
349	4.895

DASH NO.	*L* GROOVE DEPTH	*G* GROOVE WIDTH	*R* RADIUS	*D* HARDWARE CLEARANCE MAX.
008-028	.058/.056	.094/.104	.005/.015	.005
110-135	.091/.089	.141/.151	.005/.015	.007
210-247	.123/.121	.188/.198	.010/.025	.008
325-349	.188/.186	.281/.291	.020/.035	.007



HST SEAL™ INSTALLATION
FOR INTERNAL PRESSUE, ZERO BACKUP WIDTH GLANDS

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER IN HST SEAL™, FACE SEAL, INTERNAL PRESSURE GLANDS.

2. ORDERING EXAMPLE: DYHA0 B 224 A T19 NE

HST SEAL™ INTERNAL DESIGNATOR
BACKUP WIDTH
GROOVE STANDARD
B = TRELLEBORG SEALING SOLUTIONS GLAND STANDARD
SIZE DESIGNATOR
ACCORDING TO TRELLEBORG SEALING SOLUTIONS GLAND STANDARD
QUALITY INDEX:
A = AEROSPACE CERTIFICATE OF CONFORMANCE
△3 TURCON® OR ZURCON® BACKUP RING MAT'L. CODE
TUREL® ELASTOMER MAT'L CODE
CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

△3 AVAILABLE ZURCON® MATERIALS, ORDERING CODES

ZURCON® DESCRIPTION	PART NUMBER CODE
ZURCON® Z60	Z60
ZURCON® Z40	Z40
ZURCON® Z43	Z43

INCH
2011_4
TRELLEBORG
SEALING SOLUTIONS
TITLE HST SEAL™
DRAWING NO. DYHA0B000

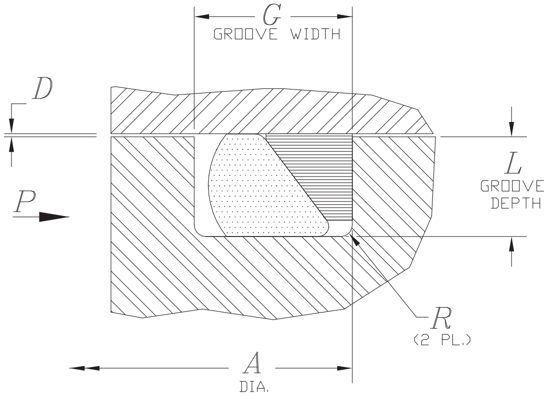
WORLD AEROSPACE TITLE BLOCK REV.

Turcon® Face Seals

DASH NO.	*A* DIA.
	+.000 -.005
008	.316
009	.348
010	.379
011	.441
012	.504
013	.566
014	.629
015	.691
016	.754
017	.816
018	.879
019	.941
020	1.004
021	1.066
022	1.129
023	1.191
024	1.254
025	1.316
026	1.379
027	1.441
028	1.504
110	.568
111	.630
112	.693
113	.755
114	.818
115	.880
116	.943
117	1.005
118	1.068
119	1.130
120	1.193
121	1.255
122	1.318
123	1.380
124	1.443
125	1.505
126	1.568
127	1.630
128	1.693
129	1.755
130	1.818
131	1.880
132	1.943
133	2.005
134	2.068
135	2.131

DASH NO.	*A* DIA.
	+.000 -.005
210	1.012
211	1.074
212	1.137
213	1.199
214	1.262
215	1.324
216	1.387
217	1.449
218	1.512
219	1.574
220	1.637
221	1.699
222	1.762
223	1.887
224	2.012
225	2.137
226	2.262
227	2.387
228	2.512
229	2.637
230	2.762
231	2.887
232	3.012
233	3.137
234	3.262
235	3.512
236	3.637
237	3.762
238	3.743
239	3.887
240	4.012
241	4.137
242	4.262
243	4.387
244	4.512
245	4.637
246	4.762
247	4.887
325	1.895
326	2.020
327	2.145
328	2.270
329	2.395
330	2.520
331	2.645
332	2.770
333	2.895
334	3.020
335	3.145
336	3.270
337	3.395
338	3.520
339	3.645
340	3.770
341	3.895
342	4.020
343	4.145
344	4.270
345	4.395
346	4.520
347	4.645
348	4.770
349	4.895

DASH NO.	*L* GROOVE DEPTH	*G* GROOVE WIDTH	*R* RADIUS	*D* HARDWARE CLEARANCE MAX.
008-028	.058/.056	.094/.104	.005/.015	.005
110-135	.091/.089	.141/.151	.005/.015	.007
210-247	.123/.121	.188/.198	.010/.025	.008
325-349	.188/.186	.281/.291	.020/.035	.007



WEDGPAK® FACE SEAL INSTALLATION
FOR INTERNAL PRESSURE, ZERO BACKUP WIDTH GLANDS

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR WEDGPAK® FACE SEAL IN INTERNAL PRESSURE GLANDS.

2. ORDERING EXAMPLE: DW000 B 224 A T19 NE

WEDGPAK® FACE SEAL,
INTERNAL DESIGNATOR
GROOVE STANDARD
B = TRELLEBORG SEALING SOLUTIONS GLAND STANDARD
SIZE DESIGNATOR
ACCORDING TO TRELLEBORG SEALING SOLUTIONS GLAND STANDARD
QUALITY INDEX:
A = AEROSPACE CERTIFICATE OF CONFORMANCE
△3 TURCON® OR ZURCON® BACKUP RING MAT'L. CODE
TUREL® ELASTOMER MAT'L CODE
CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

△3 AVAILABLE ZURCON® MATERIALS, ORDERING CODES

ZURCON® DESCRIPTION	PART NUMBER CODE
ZURCON® Z60	Z60
ZURCON® Z40	Z40
ZURCON® Z43	Z43

INCH	2009_1
TRELLEBORG SEALING SOLUTIONS	TITLE WEDGPAK,® FACE SEAL DRAWING NO. DW000B000

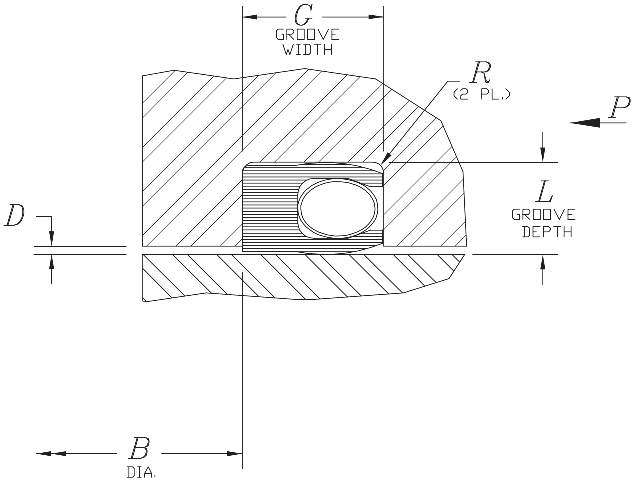
WORLD AEROSPACE TITLE BLOCK REV.

DASH NO.	B DIA.
	+.000 −.005
008	.176
009	.208
010	.239
011	.301
012	.364
013	.426
014	.489
015	.551
016	.614
017	.676
018	.739
019	.801
020	.864
021	.926
022	.989
023	1.051
024	1.114
025	1.176
026	1.239
027	1.301
028	1.364
110	.362
111	.424
112	.487
113	.549
114	.612
115	.674
116	.737
117	.799
118	.862
119	.924
120	.987
121	1.049
122	1.112
123	1.174
124	1.237
125	1.299
126	1.362
127	1.424
128	1.487
129	1.549
130	1.612
131	1.674
132	1.737
133	1.799
134	1.862
135	1.925

DASH NO.	B DIA.
	+.000 −.005
210	.734
211	.796
212	.859
213	.921
214	.984
215	1.046
216	1.109
217	1.171
218	1.234
219	1.296
220	1.359
221	1.421
222	1.484
223	1.609
224	1.734
225	1.859
226	1.984
227	2.109
228	2.234
229	2.359
230	2.484
231	2.609
232	2.734
233	2.859
234	2.984
235	3.109
236	3.234
237	3.359
238	3.484
239	3.609
240	3.734
241	3.859
242	3.984
243	4.109
244	4.234
245	4.359
246	4.484
247	4.609

DASH NO.	B DIA.
	+.000 −.005
325	1.475
326	1.600
327	1.725
328	1.850
329	1.975
330	2.100
331	2.225
332	2.350
333	2.475
334	2.600
335	2.725
336	2.850
337	2.975
338	3.100
339	3.225
340	3.350
341	3.475
342	3.600
343	3.725
344	3.850
345	3.975
346	4.100
347	4.225
348	4.350
349	4.475

DASH NO.	L GROOVE DEPTH	G GROOVE WIDTH	R RADIUS	D HARDWARE CLEARANCE MAX.
008-028	.058/.056	.094/.104	.005/.015	.005
110-135	.091/.089	.141/.151	.005/.015	.007
210-247	.123/.121	.188/.198	.010/.025	.008
325-349	.188/.186	.281/.291	.020/.035	.007



VARISEAL® HF INSTALLATION
FOR EXTERNAL PRESSURE FACE SEAL GLANDS

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER IN VARISEAL®HF, FACE SEAL, EXTERNAL PRESSURE GLANDS.

2. ORDERING EXAMPLE: DVL 2 0 M 214 A T05 SH
   - VARISEAL®HF, EXTERNAL DESIGNATOR
   - CROSS SECTION
     - 0 = 000 SERIES
     - 1 = 100 SERIES
     - 2 = 200 SERIES
     - 3 = 300 SERIES
   - DESIGN CHARACTERISTICS
   - GLAND STANDARD
     - M = AS4716
   - SIZE DESIGNATION
     - ACCORDING TO AS4716 REVISION A
   - QUALITY INDEX:
     - A = AEROSPACE CERTIFICATE OF CONFORMANCE
   - 3 TURCON®VARISEAL®HF MAT'L CODE
   - SPRING MAT'L CODE - HEAVY SPRING LOAD AS STANDARD

3 FOR MATERIAL OPTIONS, SEE MATERIALS SECTION OF TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE. SPRING MATERIAL OPTIONS LISTED BELOW.

SPRING MATERIAL CODE HEAVY DUTY AS STANDARD	
CODE	MATERIAL
S	301 STAINLESS STEEL
H	HASTELLOY
E	ELGILOY

INCH
2009_1
TRELLEBORG
SEALING SOLUTIONS
TITLE
VARISEAL®HF, FACE SEAL, EXTERNAL
DRAWING NO.
DVL00B000

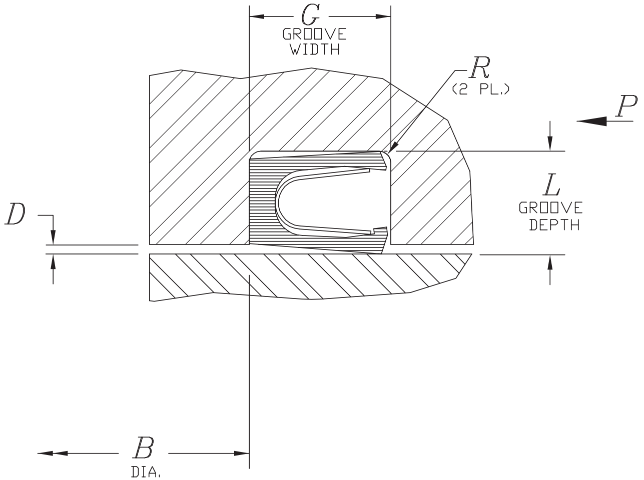
WORLD AEROSPACE TITLE BLOCK REV.

DASH NO.	B DIA.
	+.000 -.005
008	.176
009	.208
010	.239
011	.301
012	.364
013	.426
014	.489
015	.551
016	.614
017	.676
018	.739
019	.801
020	.864
021	.926
022	.989
023	1.051
024	1.114
025	1.176
026	1.239
027	1.301
028	1.364
110	.362
111	.424
112	.487
113	.549
114	.612
115	.674
116	.737
117	.799
118	.862
119	.924
120	.987
121	1.049
122	1.112
123	1.174
124	1.237
125	1.299
126	1.362
127	1.424
128	1.487
129	1.549
130	1.612
131	1.674
132	1.737
133	1.799
134	1.862
135	1.925

DASH NO.	B DIA.
	+.000 -.005
210	.734
211	.796
212	.859
213	.921
214	.984
215	1.046
216	1.109
217	1.171
218	1.234
219	1.296
220	1.359
221	1.421
222	1.484
223	1.609
224	1.734
225	1.859
226	1.984
227	2.109
228	2.234
229	2.359
230	2.484
231	2.609
232	2.734
233	2.859
234	2.984
235	3.109
236	3.234
237	3.359
238	3.484
239	3.609
240	3.734
241	3.859
242	3.984
243	4.109
244	4.234
245	4.359
246	4.484
247	4.609

DASH NO.	B DIA.
	+.000 -.005
325	1.475
326	1.600
327	1.725
328	1.850
329	1.975
330	2.100
331	2.225
332	2.350
333	2.475
334	2.600
335	2.725
336	2.850
337	2.975
338	3.100
339	3.225
340	3.350
341	3.475
342	3.600
343	3.725
344	3.850
345	3.975
346	4.100
347	4.225
348	4.350
349	4.475

DASH NO.	L GROOVE DEPTH	G GROOVE WIDTH	R RADIUS	D HARDWARE CLEARANCE MAX.
008-028	.058/.056	.094/.104	.005/.015	.005
110-135	.091/.089	.141/.151	.005/.015	.007
210-247	.123/.121	.188/.198	.010/.025	.008
325-349	.188/.186	.281/.291	.020/.035	.007



VARISEAL®MF INSTALLATION
FOR EXTERNAL PRESSURE FACE SEAL GLANDS

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER IN VARISEAL®MF, FACE SEAL, EXTERNAL PRESSURE GLANDS.

2. ORDERING EXAMPLE: DVC 2 0 M 214 A T05 SH
   VARISEAL®MF, EXTERNAL DESIGNATOR
   CROSS SECTION
      0 = 000 SERIES
      1 = 100 SERIES
      2 = 200 SERIES
      3 = 300 SERIES
   DESIGN CHARACTERISTICS
   GLAND STANDARD
      M = AS4716
   SIZE DESIGNATION
      ACCORDING TO AS4716 REVISION A
   QUALITY INDEX:
      A = AEROSPACE CERTIFICATE OF CONFORMANCE
   △3 TURCON®VARISEAL®MF MAT'L CODE
   SPRING MAT'L CODE - HEAVY SPRING LOAD
   AS STANDARD

△3 FOR MATERIAL OPTIONS, SEE MATERIALS SECTION OF TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE. SPRING MATERIAL OPTIONS LISTED BELOW.

SPRING MATERIAL CODE
HEAVY DUTY AS STANDARD

CODE	MATERIAL
S	301 STAINLESS STEEL
H	HASTELLOY
E	ELGILOY

INCH
2009_1

TRELLEBORG
SEALING SOLUTIONS

TITLE
VARISEAL®MF, FACE SEAL, EXTERNAL

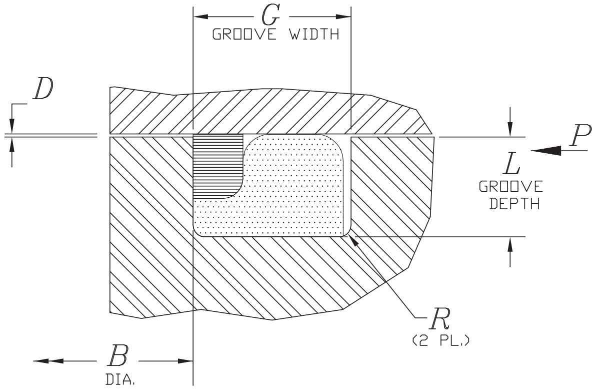
DRAWING NO.
DVC00B000

WORLD AEROSPACE TITLE BLOCK REV.

DASH NO.	*B* DIA.
	+.005 −.000
008	.176
009	.208
010	.239
011	.301
012	.364
013	.426
014	.489
015	.551
016	.614
017	.676
018	.739
019	.801
020	.864
021	.926
022	.989
023	1.051
024	1.114
025	1.176
026	1.239
027	1.301
028	1.364
110	.362
111	.424
112	.487
113	.549
114	.612
115	.674
116	.737
117	.799
118	.862
119	.924
120	.987
121	1.049
122	1.112
123	1.174
124	1.237
125	1.299
126	1.362
127	1.424
128	1.487
129	1.549
130	1.612
131	1.674
132	1.737
133	1.799
134	1.862
135	1.925

DASH NO.	*B* DIA.
	+.005 −.000
210	.734
211	.796
212	.859
213	.921
214	.984
215	1.046
216	1.109
217	1.171
218	1.234
219	1.296
220	1.359
221	1.421
222	1.484
223	1.609
224	1.734
225	1.859
226	1.984
227	2.109
228	2.234
229	2.359
230	2.484
231	2.609
232	2.734
233	2.859
234	2.984
235	3.109
236	3.234
237	3.359
238	3.484
239	3.609
240	3.734
241	3.859
242	3.984
243	4.109
244	4.234
245	4.359
246	4.484
247	4.609
325	1.475
326	1.600
327	1.725
328	1.850
329	1.975
330	2.100
331	2.225
332	2.350
333	2.475
334	2.600
335	2.725
336	2.850
337	2.975
338	3.100
339	3.225
340	3.350
341	3.475
342	3.600
343	3.725
344	3.850
345	3.975
346	4.100
347	4.225
348	4.350
349	4.475

DASH NO.	*L* GROOVE DEPTH	*G* GROOVE WIDTH	*R* RADIUS	*D* HARDWARE CLEARANCE MAX.
008-028	.058/.056	.094/.104	.005/.015	.005
110-135	.091/.089	.141/.151	.005/.015	.007
210-247	.123/.121	.188/.198	.010/.025	.008
325-349	.188/.186	.281/.291	.020/.035	.007



HST SEAL™ INSTALLATION
FOR EXTERNAL PRESSUE FACE SEAL GLANDS

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER IN HST SEAL™, FACE SEAL, EXTERNAL PRESSURE GLANDS.

2. ORDERING EXAMPLE: DYHB0 B 224 A T19 NE

HST SEAL™, EXTERNAL DESIGNATOR
BACKUP WIDTH
GROOVE STANDARD
B = TRELLEBORG SEALING SOLUTIONS GLAND STANDARD
SIZE DESIGNATOR
ACCORDING TO TRELLEBORG SEALING SOLUTIONS GLAND STANDARD
QUALITY INDEX:
A = AEROSPACE CERTIFICATE OF CONFORMANCE
△3 TURCON® OR ZURCON® BACKUP RING MAT'L. CODE
TUREL® ELASTOMER MAT'L CODE
CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

△3 AVAILABLE ZURCON® MATERIALS, ORDERING CODES

ZURCON® DESCRIPTION	PART NUMBER CODE
ZURCON® Z60	Z60
ZURCON® Z40	Z40
ZURCON® Z43	Z43

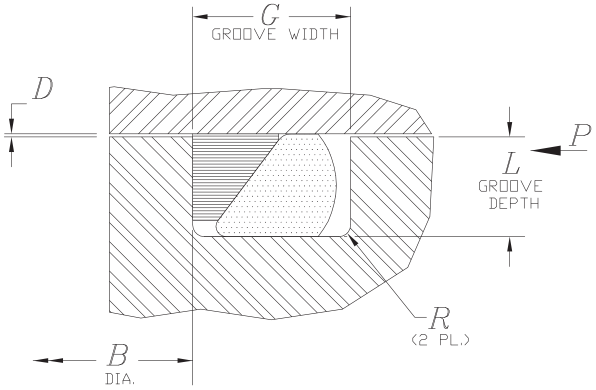
INCH
2011_4
TITLE
HST SEAL™
TRELLEBORG
SEALING SOLUTIONS
DRAWING NO.
DYHB0B000

WORLD AEROSPACE TITLE BLOCK REV.

DASH NO.	B DIA.
	+.005 -.000
008	.176
009	.208
010	.239
011	.301
012	.364
013	.426
014	.489
015	.551
016	.614
017	.676
018	.739
019	.801
020	.864
021	.926
022	.989
023	1.051
024	1.114
025	1.176
026	1.239
027	1.301
028	1.364
110	.362
111	.424
112	.487
113	.549
114	.612
115	.674
116	.737
117	.799
118	.862
119	.924
120	.987
121	1.049
122	1.112
123	1.174
124	1.237
125	1.299
126	1.362
127	1.424
128	1.487
129	1.549
130	1.612
131	1.674
132	1.737
133	1.799
134	1.862
135	1.925

DASH NO.	B DIA.
	+.005 -.000
210	.734
211	.796
212	.859
213	.921
214	.984
215	1.046
216	1.109
217	1.171
218	1.234
219	1.296
220	1.359
221	1.421
222	1.484
223	1.609
224	1.734
225	1.859
226	1.984
227	2.109
228	2.234
229	2.359
230	2.484
231	2.609
232	2.734
233	2.859
234	2.984
235	3.109
236	3.234
237	3.359
238	3.484
239	3.609
240	3.734
241	3.859
242	3.984
243	4.109
244	4.234
245	4.359
246	4.484
247	4.609
325	1.475
326	1.600
327	1.725
328	1.850
329	1.975
330	2.100
331	2.225
332	2.350
333	2.475
334	2.600
335	2.725
336	2.850
337	2.975
338	3.100
339	3.225
340	3.350
341	3.475
342	3.600
343	3.725
344	3.850
345	3.975
346	4.100
347	4.225
348	4.350
349	4.475

DASH NO.	L GROOVE DEPTH	G GROOVE WIDTH	R RADIUS	D HARDWARE CLEARANCE MAX.
008-028	.058/.056	.094/.104	.005/.015	.005
110-135	.091/.089	.141/.151	.005/.015	.007
210-247	.123/.121	.188/.198	.010/.025	.008
325-349	.188/.186	.281/.291	.020/.035	.007



WEDGPAK® FACE SEAL INSTALLATION
FOR EXTERNAL PRESSURE FACE SEAL GLANDS

NOTES:

1. TRELLEBORG SEALING SOLUTIONS PART NUMBER FOR WEDGPAK® FACE SEAL IN EXTERNAL PRESSURE GLANDS.

2. ORDERING EXAMPLE: DW010 B 224 A T19 NE

   WEDGPAK® FACE SEAL, EXTERNAL DESIGNATOR
   BACKUP WIDTH
   GROOVE STANDARD
   B = TRELLEBORG SEALING SOLUTIONS GLAND STANDARD
   SIZE DESIGNATOR
   ACCORDING TO TRELLEBORG SEALING SOLUTIONS GLAND STANDARD
   QUALITY INDEX:
   A = AEROSPACE CERTIFICATE OF CONFORMANCE
   △3 TURCON® OR ZURCON® BACKUP RING MAT'L. CODE
   TUREL® ELASTOMER MAT'L CODE
   CONSULT THE TRELLEBORG SEALING SOLUTIONS AEROSPACE DESIGN GUIDE FOR A WIDE RANGE OF MATERIALS.

△3 AVAILABLE ZURCON® MATERIALS, ORDERING CODES

ZURCON® DESCRIPTION	PART NUMBER CODE
ZURCON® Z60	Z60
ZURCON® Z40	Z40
ZURCON® Z43	Z43

INCH
2009_1
TITLE
WEDGPAK® FACE SEAL
TRELLEBORG
SEALING SOLUTIONS
DRAWING NO.
DW010B000

WORLD AEROSPACE TITLE BLOCK REV.

O-Rings

Features and benefits

- Versatile sealing element
- Cost-effective in a wide range of primarily static applications
- Simple one-piece gland design minimizes hardware and design costs
- Compact design allows smaller hardware
- Easy installation
- Compounds specifically engineered for aerospace applications provide broad chemical compatibility
- Many sizes available from stock worldwide

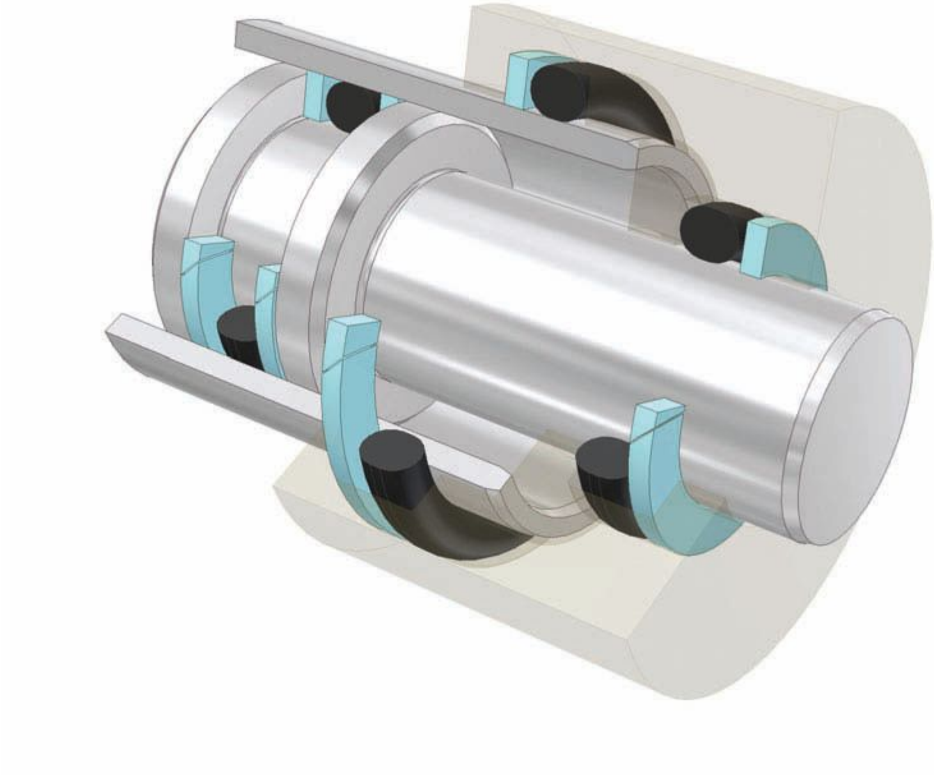


Illustration shows O-Rings in a hydraulic application.

O-Rings

Description

O-Rings are vulcanized in molds and characterized by their circular or torus form. The dimensions of O-Rings are defined by their inside diameter and cross section.

Efficient production methods and ease of use have made O-Rings the most widely used seals. They offer the designer an efficient, versatile and economical sealing element for a wide range of static and very light-duty dynamic applications.

O-Rings can be produced in a wide choice of Turel® or Isolast® elastomer materials specifically engineered for the aerospace industry. Compounds are available that are compatible with virtually all media commonly used in aircraft or spacecraft applications.

Cross sections of .013 in/ 0.35 mm up to 1.6 in/ 40 mm and inside diameters of up to 196 ft /50 m and more are available. Giant O-Rings can be produced by Trelleborg Sealing Solutions FlexiMold™ process without the need for a dedicated tool, minimizing lead times and costs.

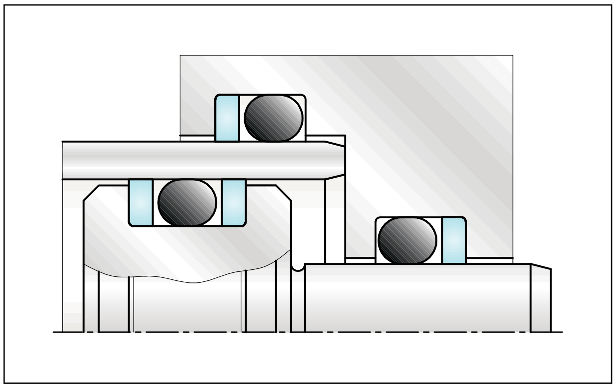


Figure 1 Typical Turel® O-Ring Application

In addition, O-Rings can be manufactured in Zurcon® polyurethane in hardness 70 to 90 Shore A. These demonstrate high wear and extrusion resistance with low friction.

O-Rings are available to meet ISO 3601, AS568 A, BS1806, BS4518 and other recognized standards.

Applications

Turel® or Isolast ® O-Rings are used as sealing elements on their own or as energizing elements for hydraulic slipper seals and wipers. This means that they cover a large number of fields of application.

Typical aerospace applications include:

- Radial static seal for bushings, covers, pipes and cylinders
- Axial static seal for flanges, manifolds, plates and caps

O-Rings are not generally recommended in dynamic applications as they are limited by speed and the system pressure they are trying to seal against.

Method of Operation

O-Rings are double-acting sealing elements. The initial squeeze or compression acts in a radial or axial direction, depending on the application. This gives the O-Ring its initial sealing capability. These forces are increased by the system pressure to create the total sealing force. This increases as the system pressure increases.

Under pressure the O-Ring behaves in a similar fashion to a fluid with high surface tension. The pressure is transmitted uniformly in all directions. The net result is efficient reliable sealing performance.

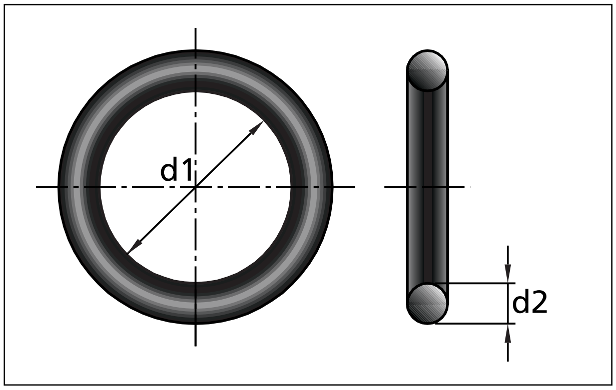


Figure 2 O-Ring Dimensioning

Trelleborg Sealing Solutions recommends O-Rings be used with Turcon® Back-up Rings at higher pressures.

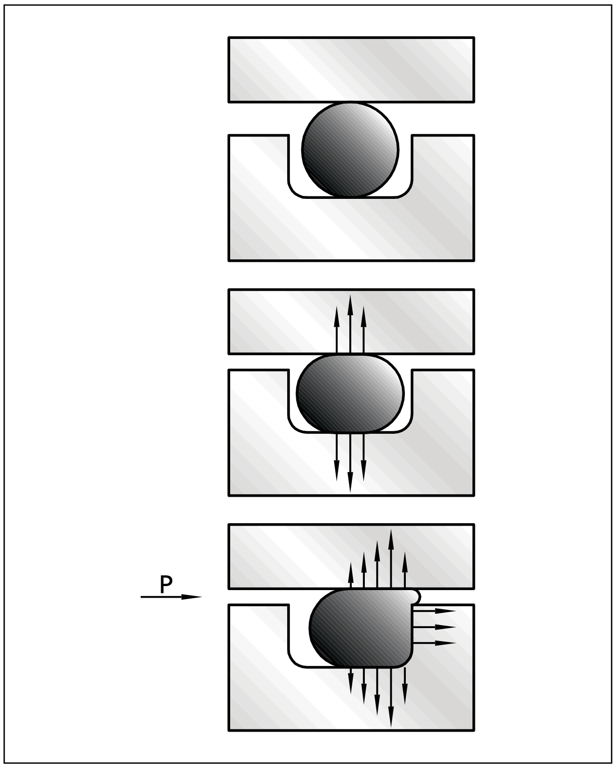


Figure 3 Turel® O-Ring Sealing Forces with and without System Pressure

Technical data

O-Rings can be used in a wide range of applications. Temperature, pressure and media determine the choice of appropriate materials. In order to assess the suitability of an O-Ring as a sealing element for a given application, the interaction of all the operating parameters have to be taken into consideration.

Working Pressure

Static applications

Up to 725 psi/ 5 MPa for O-Rings with inside diameter > 1.968 in/ 50 mm without Back-up Ring

Up to 1,500 psi/ 10 MPa for O-Rings with inside diameter > 1.968 in/ 50 mm without Back-up Ring depending on the material, the cross section and clearance

Up to 5,800 psi/ 40 MPa with Back-up Ring

Up to 36,260 psi/ 250 MPa with special Back-up Ring

Dynamic applications

Reciprocating up to 725 psi/ 5 MPa without Back-up Ring

Higher pressures with Back-up Ring

Speed:	Reciprocating up to 1.64 ft/s/ 0.5 m/s Rotating up to 1.64 ft/s/ 0.5 m/s Depending on material and application
Temperature:	From -76 to +617°F/ -60 to +325 °C Depending on material and media resistance Peak and continuous operating temperatures and running period should be taken into consideration when specifying material. For rotating applications the temperature increase due to frictional heat must be taken into account.
Media:	Elastomer materials are available that are compatible with virtually all media and gases. To identify suitable elastomer types for a particular media use the Trelleborg Sealing Solutions online chemical compatibility check on www.tss.trelleborg.com

Materials

O-Rings are primarily manufactured from Turel® elastomers including Nitrile (NBR), Fluorocarbon (FKM), Ethylene Propylene Diene Monomer (EPDM), Fluorosilicone (FVMQ) and Silicone Rubber (Q). In addition, for high-temperature applications, an Isolast® perfluoroelastomer (FFKM) is recommended. These materials are extremely flexible in their use and are suitable for a large number of applications. For further details on these go to the Material Technology section.

Characteristics and Inspection of Elastomers for use in O-Rings

Hardness

Hardness is an important characteristic of an O-Ring. It is defined as the resistance of a body against penetration of an even harder body of a standard shape and defined pressure.

There are two procedures for hardness testing:

1. Shore A/D according to ISO 868 /ISO 7619 / DIN 53 505 / ASTM D 2240
   Measurement of test samples
2. Durometer IRHD (International Rubber Hardness Degree) according to ISO 48 / ASTM 1414 and 1415
   Measurement of test samples and finished parts

The hardness scale has a range from zero (softest) to 100 (hardest). The measured values depend on the elastic qualities of the elastomers, especially the tensile strength.

The test should be carried out at temperatures of 73 ± 2°F / 23 ± 2°C - not earlier than 16 hours after the last vulcanization process. If the test is carried out at other temperatures, this should be mentioned in the test report.

Tests should only be carried out with samples which have not previously been stressed mechanically.

Hardness tests according to Shore A / D

The hardness test device for Shore A is an indenter with a pyramid base. It is suitable for use in the hardness range of shore 10 up to 90. Samples with a greater hardness than this should be tested with a Shore D device, an indenter with spike.

Test specimen:
Diameter minimum 1.181 in/ 30 mm
Thickness minimum 0.236 in /6 mm
Upper and lower sides smooth and flat
When thin material is being tested it can be layered, providing minimal sample thickness is achieved by a maximum of three layers. All layers must be a minimum 0.079 in / 2 mm thick.

The measurement is done at three different places at a defined distance and time.

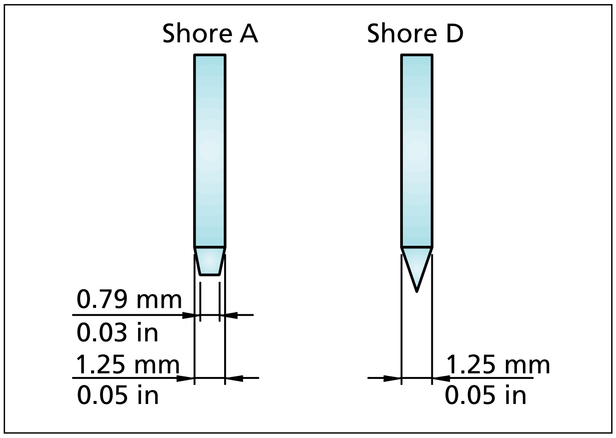


Figure 4 Indenter according to Shore A/D

Hardness test according to IRHD

The durometer test according to IRHD is used with test samples and with finished goods.

The thickness of the test material has to be adjusted according to the range of hardness. According to ISO 48, there are two hardness ranges.

Soft:	10 to 35 IRHD →	Sample thicknesses 0.394 to 0.591 in/ 10 to 15 mm - procedure L
Normal:	over 35 IRHD →	Sample thicknesses 0.315 to 0.394 in/8 to 10 mm - procedure N
		Sample thicknesses 0.059 to 0.098 in/ 1.5 to 2.5 mm - procedure M

The hardness of finished parts or product samples usually varies from that of specimen samples, especially those with a curved surface.

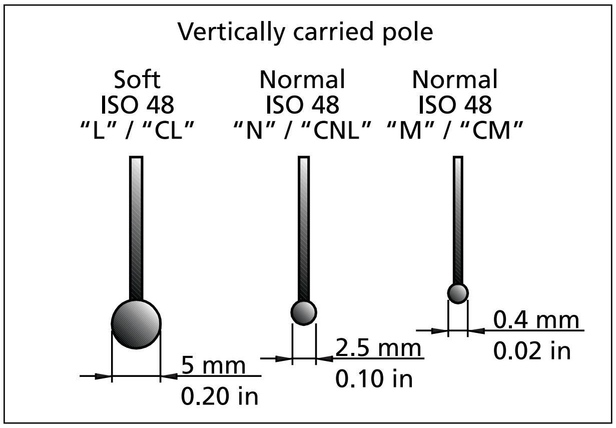


Figure 5 Indenter according to IRHD

Compression Set

An important parameter affecting the sealing capability of an O-Ring is the compression set (CS) of its material. Elastomers, when under compression, demonstrate elasticity and also permanent plastic deformation.

The compression set is determined in accordance with ISO 815 as follows:
Standard test piece: Cylindrical disc, diameter 0.512 in /13 mm and height 0.236 in /6 mm
Deformation: 25%
Tension release time: 30 minutes

$$CS = \frac{H_0 - h_2}{H_0 - h_1} \text{ x } 100$$

Where h_0 = Original height (cross section d_2)
h_1 = Height in the compressed state
h_2 = Height after tension release

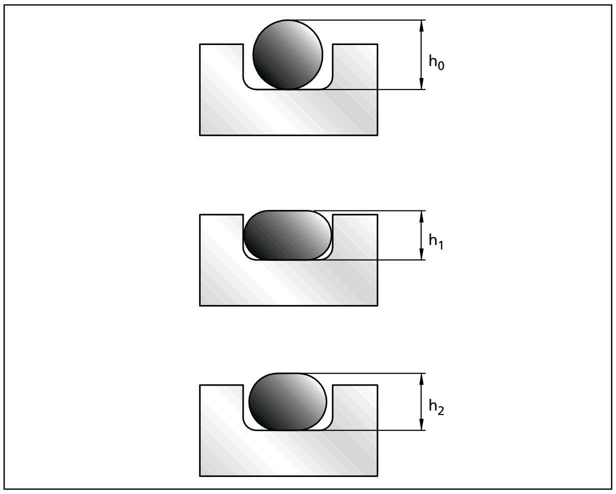


Figure 6 Illustration of compression set

Design Recommendations

The following design recommendations do not apply to Isolast® perfluoroelastomer materials. For these refer to our Isolast® brochure or contact your local Trelleborg Sealing Solutions marketing company for further details.

Installation Recommendations

General recommendations

Before starting installation, check that:
- Lead-in chamfers are made according to drawing
- Bores are deburred and edges rounded
- Machining residues such as chips, dirt and foreign particles are removed
- Screw thread tips are covered
- Seals and components are greased or oiled
- The elastomer is compatible application media
- Lubricants with solid additives, such as molybdenum disulfide or zinc sulfide, are not used in the application.

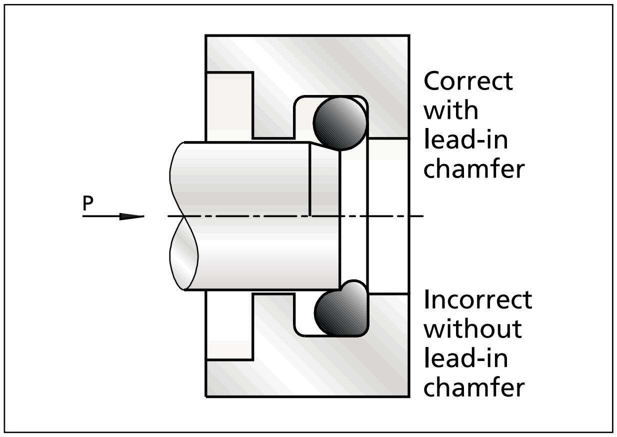


Figure 7 Rod installation with O-Ring

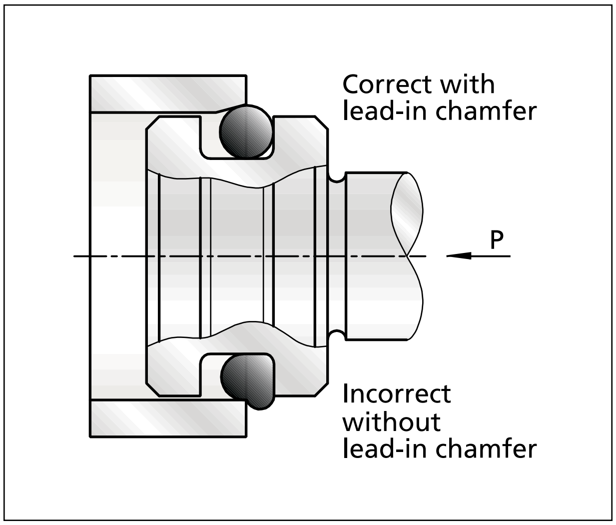


Figure 8 Piston installation with O-Ring

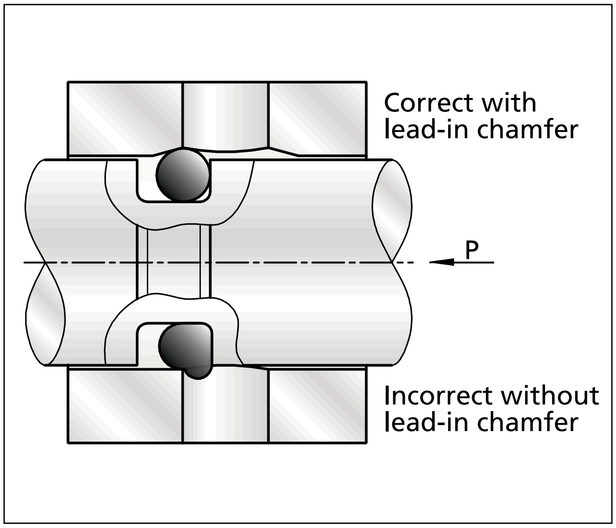


Figure 9 O-Ring installation over transverse bores

Installation over threads, splines etc.

Should an O-Ring have to be stretched over threads, splines, keyways etc., then an assembly mandrel is essential. This mandrel can either be manufactured in a soft metal or a plastic material, without burrs or sharp edges.

Automated installation

Before automated O-Ring installation, good preparation is required. The surfaces of O-Rings can be treated in several ways to reduce installation forces and prevent O-Rings sticking together.

For further details contact your local Trelleborg Sealing Solutions marketing company.

Initial Compression

An initial compression or squeeze of the O-Ring in the groove is essential to ensure its function as a primary or secondary sealing element. This is required to:
- achieve the initial sealing capability
- bridge production tolerances
- assure defined frictional forces
- compensate for compression set and wear

Depending on the application, the following values apply for the initial squeeze as a proportion of the cross section (d_2):

Dynamic applications:	6 to 20 percent
Static applications:	15 to 30 percent

The design of the grooves can be based on the guide values for the initial squeeze shown in the diagrams in Figures 11 and 12. These take into account the relationship between loads and cross sections according to ISO 3601-2 (version 1987).

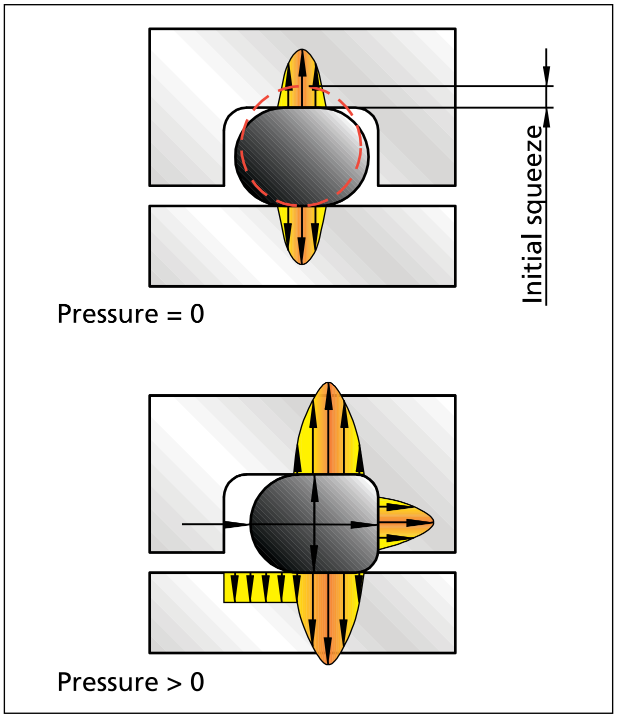


Figure 10 O-Ring contact pressure installed and under service pressure

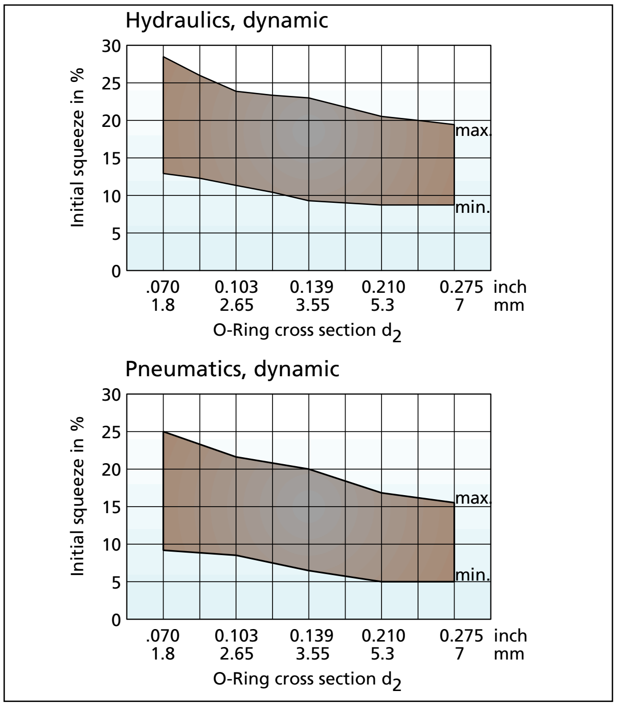


Figure 11 Permissible range of initial squeeze as a function of cross section, radial dynamic

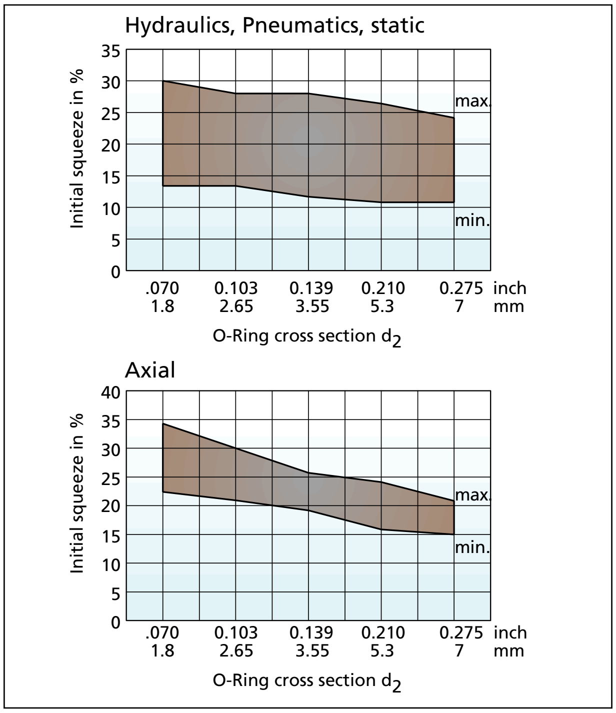


Figure 12 Permissible range of initial squeeze as a function of cross section, radial static and axial

Compression forces

Deformation forces vary depending on the extent of the initial squeeze on the O-Ring and the Shore hardness of its material. Figure 13 shows the specific compression force of the seal circumference as a function of the cross section.

The compression forces shown can be used to estimate the total force to be applied for static installation of O-Rings.

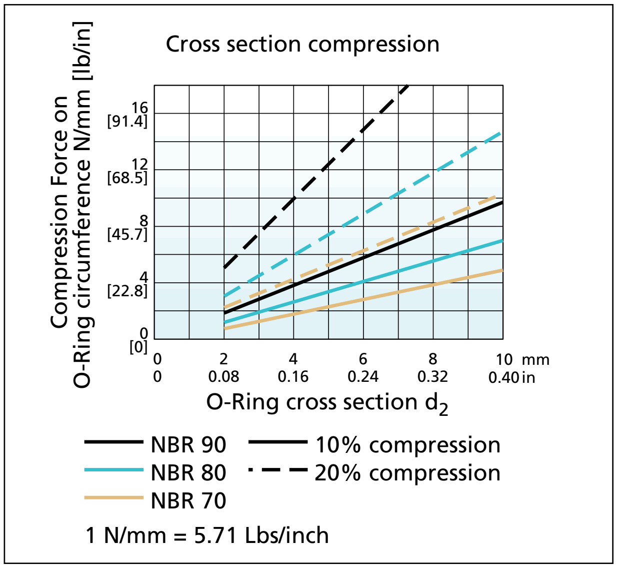


Figure 13 Compression forces on the O-Ring circumference depending on material

Elongation - Compression

With a radial sealing configuration, the O-Ring in an internal gland - “outside sealing” - should be stretched over the diameter of the gland. Maximum elongation in the installed state is six percent for O-Rings with an inner diameter of more than 1.968 in/ 50 mm and eight percent for O-Rings with an inner diameter of less than 1.968 in/ 50 mm.

With external grooves - “inside sealing” - the O-Ring is preferably compressed along its circumference. The maximum circumferential compression in the installed state is three percent.

Exceeding these values will result in an increase or decrease that is too large in the O-Ring cross section, potentially affecting the service life of the seal.

The reduction in cross section diameter (d_2) can be calculated as:

$$\text{Reduction}_{\max} = \frac{d_{2\min}}{10} \times \sqrt{6 \times \left(\frac{d_{3\max} - d_{1\min}}{d_{1\min}}\right)}$$

With d_{1min} = minimum inside diameter of the O-Ring
d_{2min} = minimum cross section of the O-Ring
d_{3max} = maximum housing diameter

This figure is approximately half the amount of stretch in percentage terms. An elongation of one percent therefore corresponds to a reduction in the cross section (d_2) of approximately half a percent.

Methods of Installation and Design of Seal Housing

Methods of installation

O-Rings can be used in components in a wide variety of ways. During the design stage, in order to avoid damage during installation, how the O-Ring is to be installed into the component must be taken into consideration. For instance, there should be no edges or bores for the O-Ring to pass over. When long sliding movements are involved, the seal seat should be recessed, if possible, or the O-Rings arranged so that they only have to travel short distances during installation to reduce risk of twisting.

Radial installation (static and dynamic)

Outer sealing
The O-Ring size should be selected so that the inside diameter d_1 is equal to or smaller than groove diameter d_3.

Axial installation (static)

Inner sealing
The O-Ring size should be selected so that the inside diameter d_1 has the smallest possible deviation from the diameter to be sealed d_4.

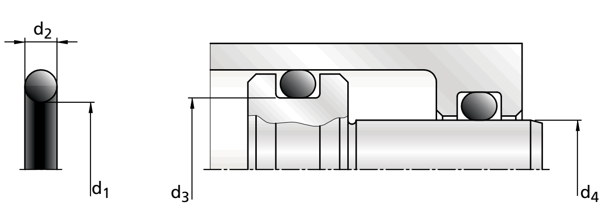


Figure 14 Radial Installation, Static and Dynamic

During axial-static installation, the direction of pressure should be taken into consideration when choosing the O-Ring size. With internal pressure the O-Ring should be chosen so that the outside diameter of the O-Ring is approximately one o two percent larger than the outer groove diameter d5. With external pressure the O-Ring is chosen approximately one to three percent smaller than the inner groove diameter d_6.

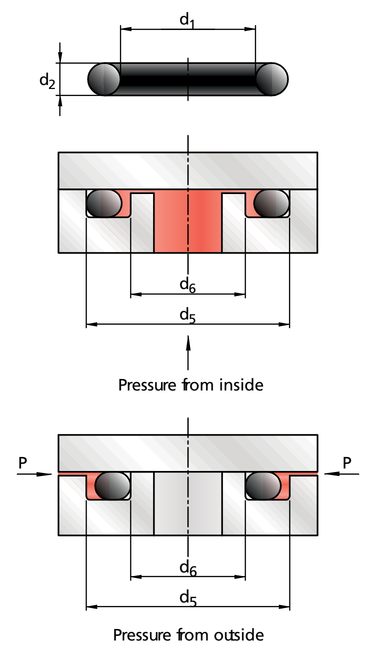


Figure 15 Axial Installation, Static

The O-Ring as a rotary seal

In some applications, for example with short running periods, O-Ring can be used as a rotary seal on shafts.

In order for an O-Ring to be able to function as a rotary seal it must be installed in accordance with specific guidelines, the rotary seal principle. This is based on the fact that an elongated elastomer ring contracts when heated - the Gough-Joule effect.

Using normal design criteria, the inside diameter d1 of the O-Ring will be slightly smaller than the shaft diameter. The heat generated by friction causes the ring to contract even more. This results in a higher pressure on the rotating shaft, so that a lubricating film is prevented from forming under the seal and even higher friction occurs. The result is increased wear and premature failure of the seal.

Using the rotary seal principle, this is prevented by the O-Ring having an inside diameter approximately two to five percent larger than the shaft diameter to be sealed. The O-Ring is installed so that it is compressed radially and pressed against the shaft by the groove diameter. The O-Ring is therefore slightly corrugated in the groove, helping to improve the lubrication.

Special materials are available for rotary seal applications. Trelleborg Sealing Solutions does not recommend the use of O-Rings as rotary seals. Please contact your local Trelleborg Sealing Solutions marketing company for further details.

Technical data

O-Rings can be used in a wide range of applications. The operating temperature, pressure and contact media of the application determine the choice of appropriate materials. In order to be able to assess the suitability of an O-Ring as a sealing element for a given application, the interaction of all the operating parameters have to be taken into consideration.

Working Pressure

Static applications

- Up to 725 psi/ 5 MPa for O-Rings with inside diameter greater than 1.968 in/ 50 mm without Back-up Ring
- Up to 1,500 psi /10 MPa for O-Rings with inside diameter less than 1.968 in/ 50 mm without Back-up Ring

Depending on material, cross section and clearance

- Up to 5,800 psi /40 MPa with Back-up Ring
- Up to 36,260 psi /250 MPa with a special Back-up Ring

Please note the permissible extrusion gaps.

Dynamic applications

- Reciprocating up to 5 MPa without a Back-up Ring
- Higher pressures with a Back-up Ring

Speed

- Reciprocating up to 1,640 ft/s/ 0.5 m/s
- Rotating up to 1,640 ft/s /0.5 m/s

Depending on material and application

Temperature

- From -76°F /-60 °C to +617°F /+325 °C

Depending on material and media resistance

When assessing the application criteria, the peak and continuous operating temperature and the running period must be taken into consideration. For rotating applications the temperature increase due to frictional heat must be taken into account.

Media

From the wide range of materials offered by Trelleborg Sealing Solutions it is possible to seal against practically all liquids, gases and chemicals. To select the optimum material type use our online chemical compatibility guide and consult your local Trelleborg Sealing Solutions marketing company.

Groove design / Groove dimensions

Lead-in chamfers

Correct design can help to eliminate possible sources of damage and seal failure from the outset.

Since O-Rings are squeezed during installation, lead-in chamfers and rounded edges must be provided.

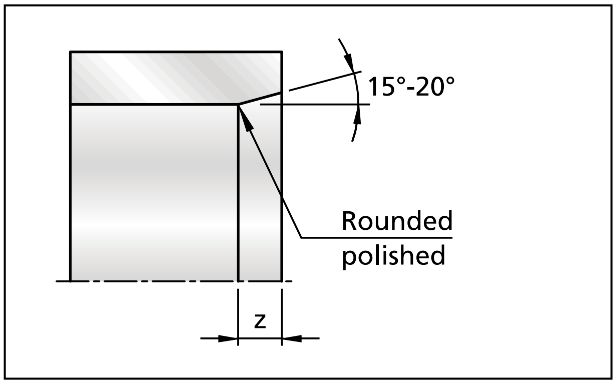


Figure 16 Lead-in Chamfers for Bores, Tubes

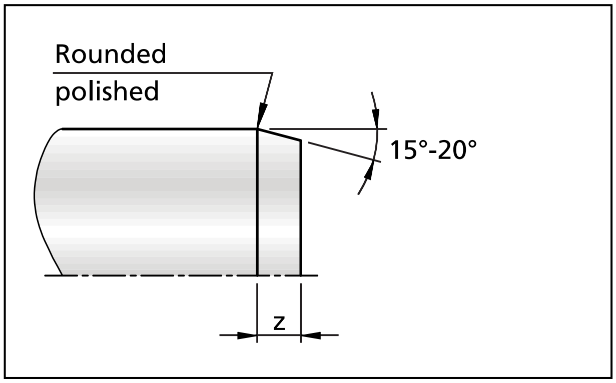


Figure 17 Lead-in Chamfers for Shafts, Rods

The minimum length of the lead-in chamfer is listed in Table I as a function of the cross section d_2.

Table I Lead-in Chamfers

Lead-in chamfers length Z min.		O-Ring cross section d_2
15°	20°	
2.5	1.5	up to 1.78 1.80
3.0	2.0	up to 2.62 2.65
3.5	2.5	up to 3.53 3.55
4.5	3.5	up to 5.33 5.30
5.0	4.0	up to 7.00
6.0	4.5	above 7.00

The surface roughness of a lead-in chamfer is:
$R_a \leq$ 32 µin/ 0.8 µm $R_z \leq$ 248 µin/ 6.3 µm

Table II Lead-in Chamfers

Lead-in chamfers length Z min.		O-Ring cross section d_2
15°	**20°**	
.100	.060	up to .070
.120	.080	up to .103
.140	.100	up to .139
.180	.140	up to .210
.200	.160	up to .275
.240	.180	above .275

The surface roughness of a lead-in chamfer is:
$R_z \leq$ 250 µin/ 6.3 µm $R_a \leq$ 30 µin/ 0.8 µm

Radial clearance

The tolerances given in AS4716 and AS5857 and the maximum permissible radial clearance, or extrusion gap, must be maintained.

If the clearance is too large, there is a risk of seal extrusion which can result in the destruction of the O-Ring.

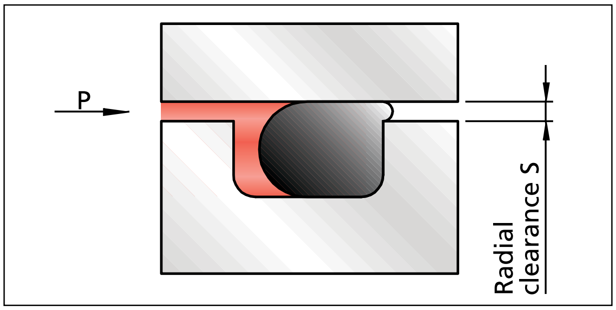


Figure 18   Radial Clearance

The permissible radial clearance between the sealed parts depends on the system pressure, the cross section, and the hardness of the O-Ring and Back-up Ring materials.

Table III contains recommendations for the permissible clearance S as a function of O-Ring cross section and shore hardness. The table is valid for elastomeric materials with the exception of polyurethane and FEP-encapsulated O-Rings.

For pressure above 725 PSI (5 MPa) for O-Rings with inside diameter > 2.000 inches (>50 mm) and above 1500 PSI (10 MPa) for O-Rings with inside diameter < 2.000 inches (<50 mm) we recommend the use of Back-up Rings.

Table III Radial clearance S

O-Ring cross section d_2	up to .080	.080 - .120	.120 - .200	.200 - .275	above .275
O-Rings with hardness of 70 Shore A					
Pressure PSI	Radial clearance S				
≤ 500	.003	.004	.004	.005	.006
≤ 1000	.002	.003	.003	.004	.004
≤ 1500	.001	.002	.002	.003	.003
O-Rings with hardness of 90 Shore A					
Pressure PSI	Radial clearance S				
≤ 500	.005	.006	.007	.009	.010
≤ 1000	.004	.005	.006	.007	.008
≤ 1500	.003	.004	.004	.005	.006
≤ 2000	.002	.003	.003	.004	.004
≤ 2500	.002	.002	.003	.003	.004
≤ 3000	.001	.002	.002	.003	.003
≤ 5100	.001	.001	.001	.002	.002

These values assume that the parts are fitted concentrically to one another and do not expand under pressure. If this is not the case, the clearance should be kept correspondingly smaller.

For static applications we recommend a fit of H8/f7.

Table IV Turel® O-Ring Types

TSS Part Number	Purchasing Callout	Industry Specification	International Turel® Code
ORMS2AXXXA000NB	MS29512-9YY	MIL-P-5315 (AMS-P-5315)	NB
ORMS2BXXXA000NB	MS29513-XXX	MIL-P-5315 (AMS-P-5315)	NB
ORMS2DXXXA000NG	MS28775-XXX	MIL-P-25732	NG
ORMS2EXXXA000NG	AS28775-XXX	AMS-P-25732	NG
ORMS2FXXXA000NZ	AS3578-XXX	AMS7271	NZ
ORMS2GXXXA000NZ	AS3578-9YY	AMS7271	NZ
ORMS2HXXXA000SL	MS9385-XXX	AMS7267	SL
ORMS2JXXXA000NZ	MS9020-XXX	AMS7271	NZ
ORMS2KXXXA000SL	MS9068-XXX	AMS3304	SL
ORMS2LXXXA000NZ	MS9021-XXX	AMS7271	NZ
ORMS2MXXXA000SL	MS9386-XXX	AMS7267	SL
ORMI2EXXXA000LF	M25988/1-XXX	AMS-R-25988 T1C1G70	LF
ORMI2GXXXA000LB	M25988/2-XXX	AMS-R-25988 CL3 GR75	LB
ORMI2HXXXA000LD	M25988/3-XXX	AMS-R-25988 CL1 GR60	LD
ORMI2FXXXA000LA	M25988/4-XXX	AMS-R-25988 T1C1G80	LA
ORMI5DXXXA000NE	AS83461/1-XXX	AMS-P-83461	NE
ORMI5EXXXA000NE	AS83461/2-9YY	AMS-P-83461	NE
ORMI8FXXXA000FT	M83485/1-XXX	AMS-R-83485	FT
ORMI8GXXXA000FE	M83248/2-XXX	AMS-R-83248	FE
ORMI8HXXXA000FE	M83248/1-XXX	AMS-R-83248	FE
ORMI8KXXXA000FG	AS5729-XXX	AMS7379 -40F tg FKM	FG
ORMI8MXXXA000FK	AS3208-9YY	AMS7276	FK
ORMI8NXXXA000FL	AS3581-XXX	AMS7276	FL
ORMI8PXXXA000FK	AS3209-XXX	AMS7276	FL
ORMI8QXXXA000FK	AS3085-9YY	AMS7276	FK
ORMI8RXXXA000FK	AS3084-9YY	AMS7276	FK
ORNA4AXXXA000EP	NAS1611-XXXA	NAS1613 Rev. 5	EP
ORNA4BXXXA000EH	NAS1611-XXX	NAS1613 Rev. 2	EH
ORNA4CXXXA000EP	NAS1612-YYA	NAS1613 Rev. 5	EP
ORNA4DXXXA000EH	NAS1612-YY	NAS1613 Rev. 2	EH

O-Rings are always supplied to the most current revision level.

Installation & Hardware Guidelines

■ Hardware Design Tips

The following recommendation for hydraulic hardware will simplify the installation of seals. AS4716 specification gives recommendations. They should be considered at an early hardware design stage in order to ensure damage-free installation of seals. These are general guidelines. Further information can be found in catalogs specific to each product types.

Piston and Rod

A lead-in chamfer on the end of the rod or bore helps installation. Recommended chamfer dimensions are given below. A lead-in chamfer is especially important where lip seals are to be installed face-first into the gland.

Lead-in Chamfer

AS4716 Dash No. Series	Z Length Minimum Inches/ mm
-0XX	.043/ 1.092
-1XX	.059/ 1.499
-2XX	.071/ 1.803
-3XX	.106/ 2.692
-4XX	.142/ 3.607

The cylinder bore or rod should have a lead-in chamfer of 20 to 25 degrees by Z length minimum to gently guide the seal assembly into the hardware as shown in Figure 1 and Figure 2. The chamfer should clear the seal assembly, in a free condition, after it has been sized.

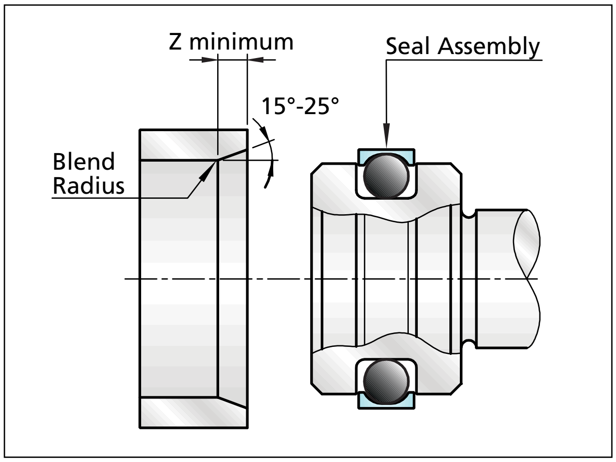


Figure 1 Piston Installation

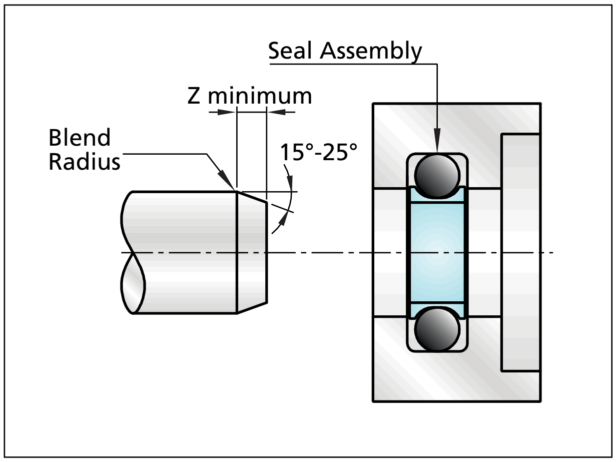


Figure 2 Rod Installation

Ports – Non-operational (Installation Only)

When installing a seal assembly across a port, in a non-operational capacity, a relief should be provided with 20 to 25 degrees by Z minimum, as shown in Figure 3.

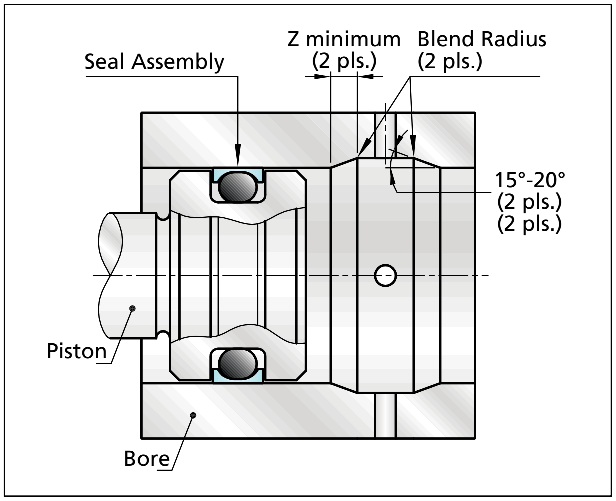


Figure 3 Relief Across Port, Non-operational, Installation Only

For dynamic seals that will cross ports during pressurized operation please contact your local Trelleborg Sealing Solutions marketing company for recommendations

Threads

When passing over threads, the seal assembly must clear the threads or other uneven surfaces. A lead-in chamfer of 20 to 25 degrees by Z minimum will gently guide the seal assembly into the bore as shown in Figure 4.

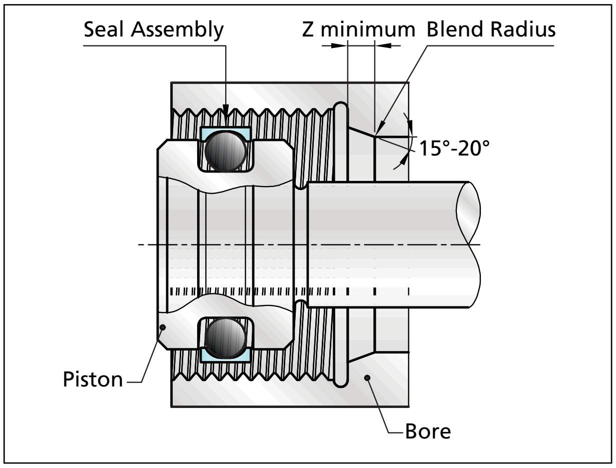


Figure 4 Threads

Material and Finish Recommendations

Recommended aerospace hardware:
Steel surface – bare for cylinders
Aluminum surface – hard anodized (type III)
Steel surface – HVOF coated (e.g. Tungsten Carbide-Cobalt-Chrome)

Recommended material hardness:
44-48 Rockwell "C" - Low to moderate pressure application
55-60 Rockwell "C" - High-pressure applications

Surface finishes:
Dynamic surfaces:
- Bare metal, hard chrome, hard anodized: Ra = 4-8 Ra µin/0,1-0.2 µm

Dynamic surfaces:
- HVOF: Ra = >4 µin/ 0.1 µm

Static surface in seal groove:
- Slipper Seal (Elastomer contact):
- Ra ≤ 32 µin/ 0.8 µm
- Variseal® (PTFE contact):
- Ra ≤ 12 µin/ 0.3 µm
- Groove sodewall:
- Ra ≤ 63 µin/ 1.6 µm

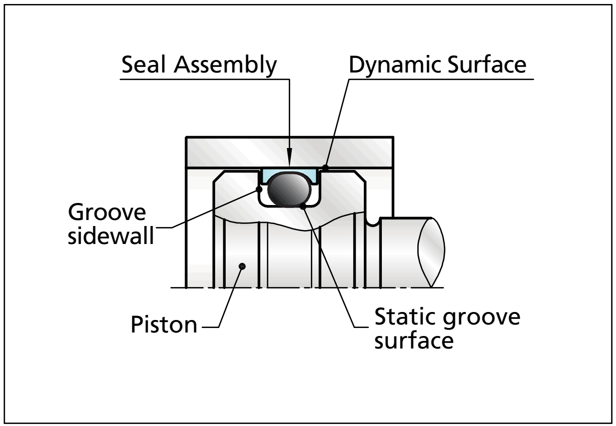


Figure 5 Surface Finishes µ In

Note:

All dynamic surfaces must be either burnished, post-ground,honed or super-finished (HVOF applied coatings). All dynamic and static surfaces must be free of nicks, scratches and burrs.

General Guidelines

The following installation guidelines should be considered at an early hardware design stage in order to ensure damage-free installation of seals. These are general guidelines. Further information can be found in catalogs specific to each product type.

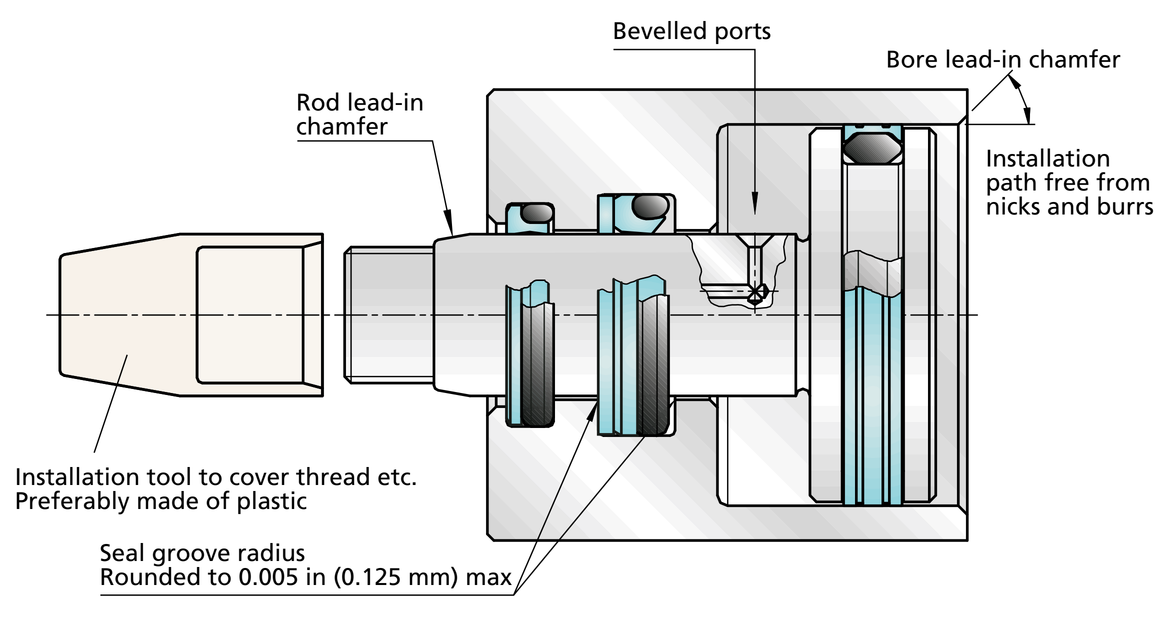


Figure 1 Methods of hardware design to prevent seal damage

- The seal installation path should be kept free of nicks, burrs, scratches or any sharp edges that could damage the seal.
- Any tool used to install a seal should be free of sharp edges. Screwdrivers often damage sealing lips and should not be used to handle seals.
- Tools should preferably be made of hard plastics such as Delrin®.
- In situations where heat is required to soften and expand Turcon® PTFE based seal components, submerse them for a few minutes in hot oil or water at +200°F/ +93°C. Heat should not be required to install elastomer components.
- Application of a lubricant to surfaces of the seal and hardware reduces the force required to push the seal into a difficult gland, such as a solid O-Ring groove.
- When using lubricant during installation, ensure that the material of Turel® elastomer components is compatible with the lubricant.

Delrin® is a registered trademark of Dupont™.

- Piston seals may be sized by freezing them prior to installing the piston in the bore. This is an advantage on spool valve pistons with multiple seals within the hardware.
- When seals are installed across ports, the edge of the ports should be smooth and rounded.
- Design splines or keyways to be of a smaller diameter than the sealing surface or use a protective sleeve to cover them during installation as illustrated in Figure 1.
- Avoid glands that require bending of the seal during installation. When seals must be stretched or compressed into a difficult gland, resize the seals using recommended tools as shown in Figure 2-4.
- Do not side-load the seals any more than is necessary. Avoid situations in the gland where a heavy rod or piston bears against one side of the seal.

Procedure for installation of piston seals

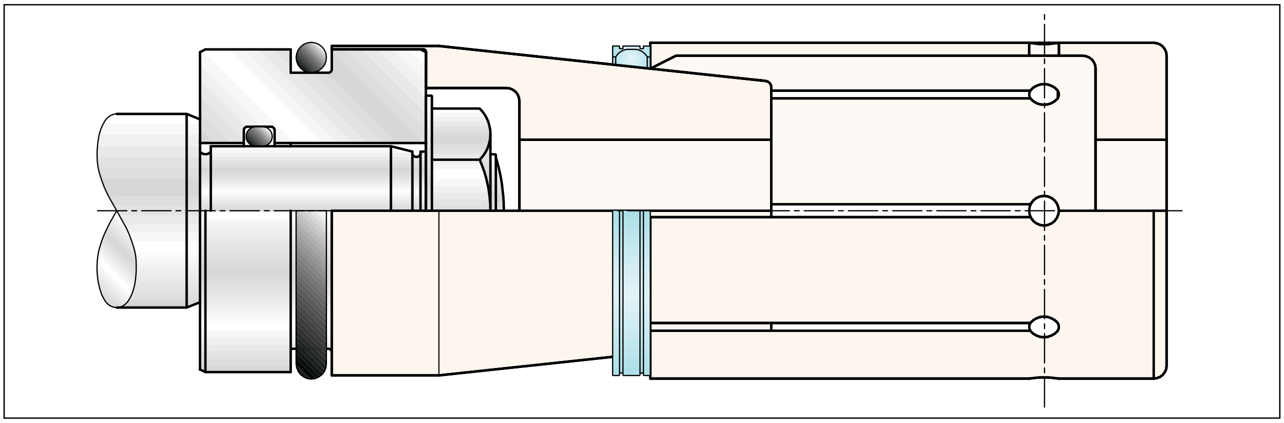


Figure 2 Expanding the Turcon® sealing element using an expanding sleeve over the installation sleeve

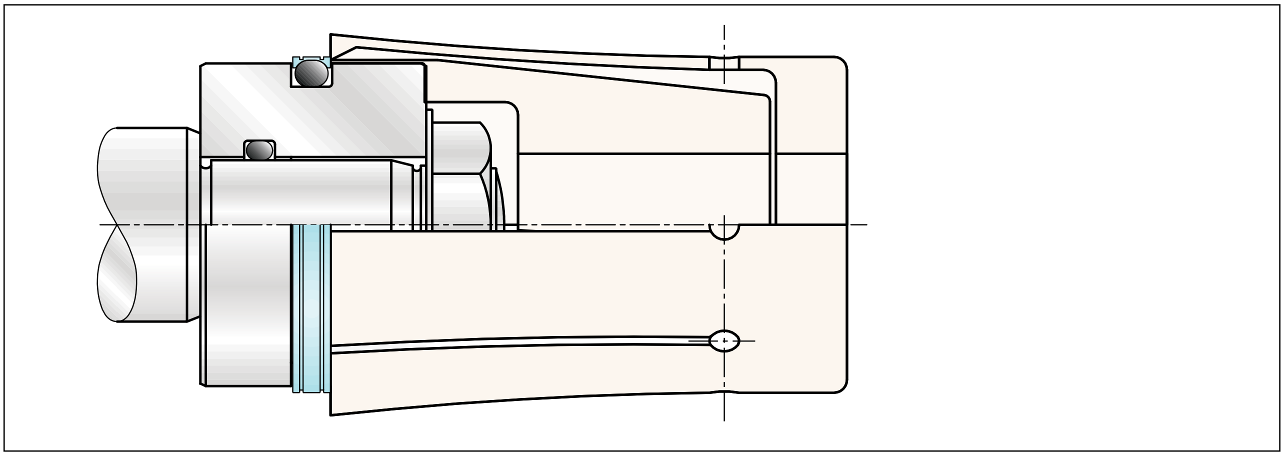


Figure 3 Sealing element after snapping into the groove

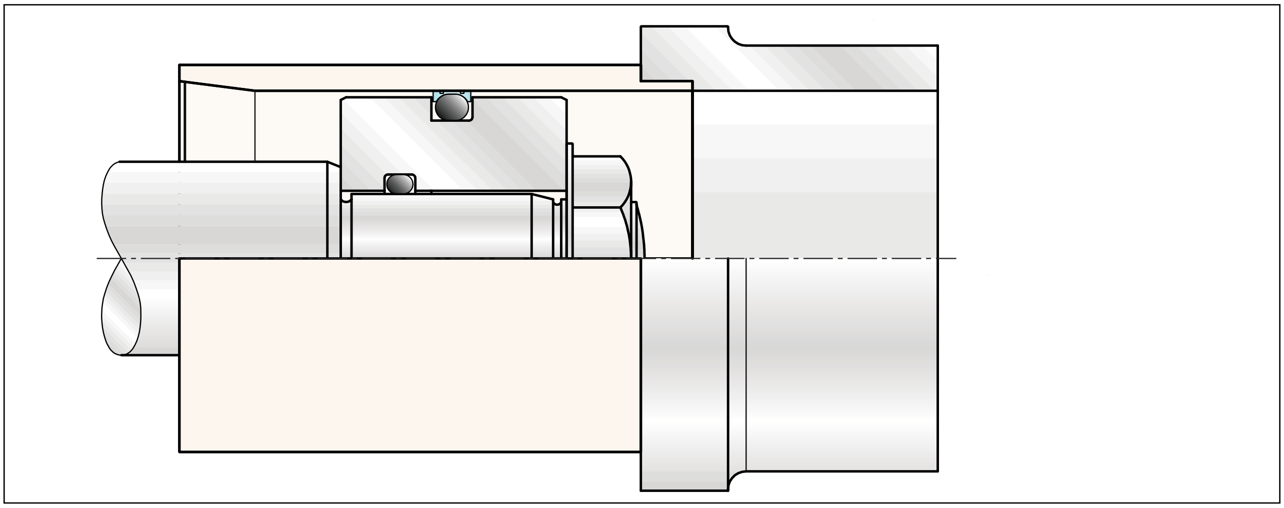


Figure 4 Sizing the sealing element with a sizing sleeve

If the Turcon® seal is expanded more than 15 percent (10 percent for the high-filled materials Turcon® T11 and Turcon® T29), a split groove is necessary.

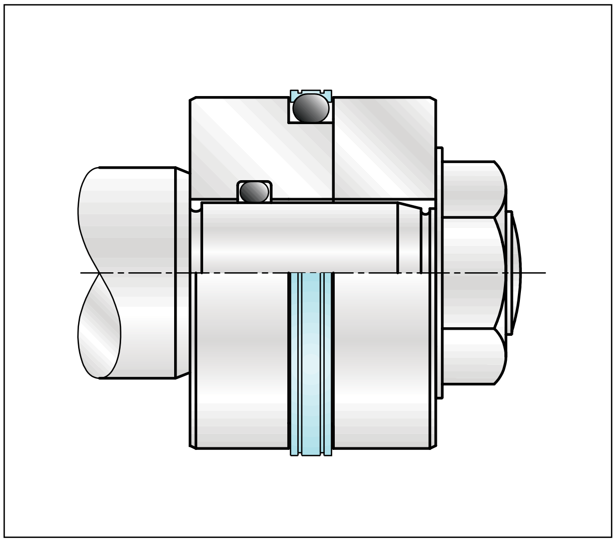


Figure 5 Installation in a split groove

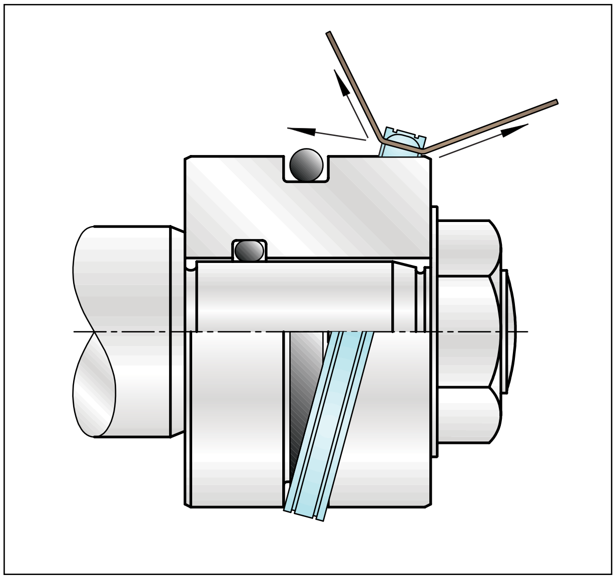


Figure 6 Fitting the seal ring onto the O-Ring in the groove, using a thin plastic strip

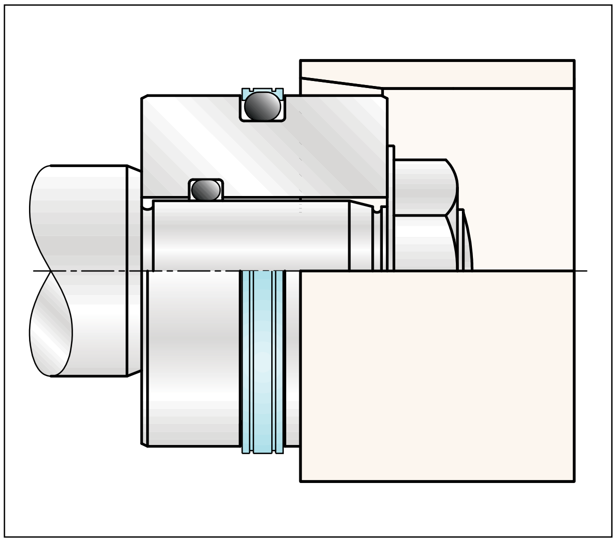


Figure 7 Sizing of the installation

Procedure for installation of rod seals

- Place the elastomer part into the groove.
- Compress the Turcon® part into a kidney shape. The seal must have no sharp bends, see figure below. Use a rounded object to compress the Turcon® part without pinching or creating sharp bends.

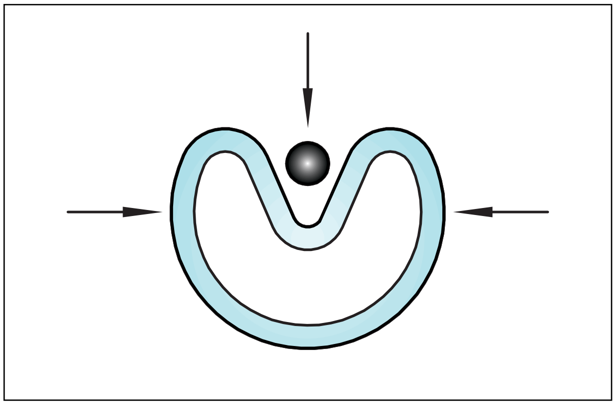


Figure 8 Kidney-shaped deformation of the seal ring

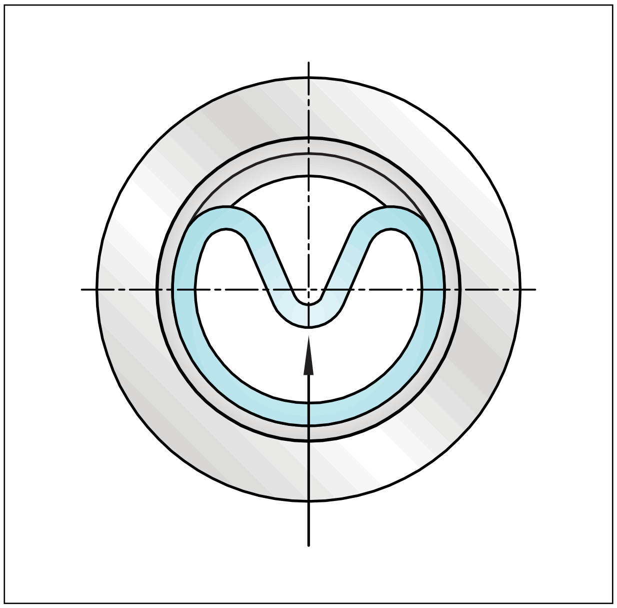


Figure 9 Inserting the seal ring into a closed groove

- After placing the seal into the groove, form it into a ring again by smoothing the ID by hand.
- Finally, size the seal ring using a mandrel which should have a chamfer of 10 to 15 degrees over a length of approximately 1.18 in/ 30 mm. See Figure 10.

In order to avoid damage to the seals the sizing mandrel should be made from a polymer material with good sliding characteristics and high surface quality such as Delrin®.

The piston rod itself can also be used for calibration, provided it has a sufficiently long lead-in chamfer

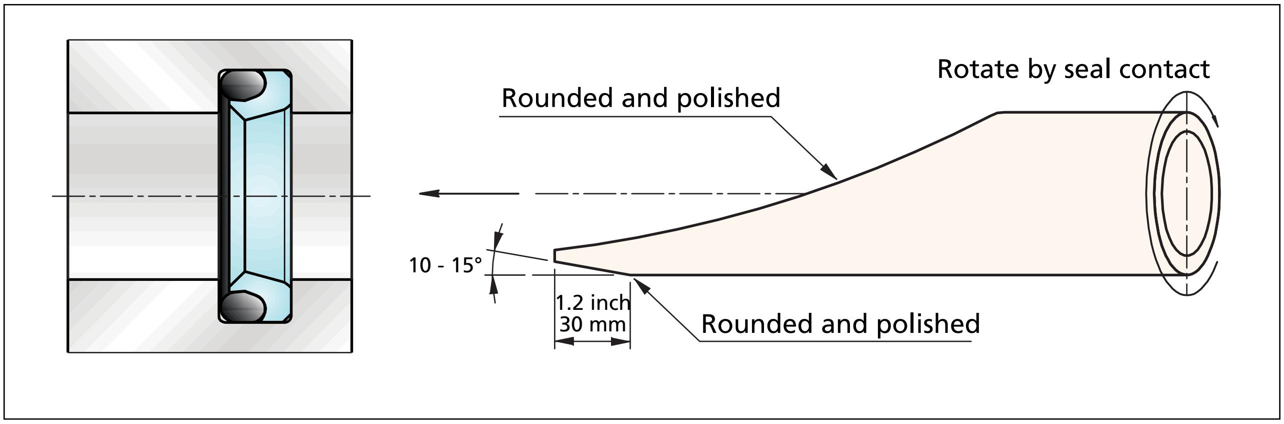


Figure 10 Sizing of the installed seal

Delrin® is a registered trademark of Dupont™

■ Shelf Life and Correct Storage

Seals and bearings are often stored for prolonged periods of time.

Turcon® PTFE based sealing materials have an unlimited shelf life as the material is inert to all commonly occurring gases and chemicals. It is therefore not adversely affected by exposure to air, light ozone or oxygen.Temperature variations do not harm Turcon® materials.

Elastomer seals have a limited shelf life and various external factors such as heat, moisture, light, oxygen, ozone and contact with liquid media can alter their properties. Resulting deformation, aging and weathering can cause deterioration of mechanical and physical properties.

The shelf life of seals can be preserved by correct storage in their original packaging.

General Advice on Storage of All Seal Types

Physical damage

All seals and bearings should be stored so that they are safe from physical damage. In particular, deformation should be avoided. Do not store heavy goods or packages on top of seals as this may permanently damage them.

Heat

The ideal temperature for storage is between +41°F and +77°F/ +5°C and +25°C. Direct contact with heaters should be avoided.

Moisture

Parts must be stored dry under normal atmospheric conditions: 65 percent relative moisture ±10.

Packaging

Seals and bearings should be kept in their original sealed packaging, as supplied from Trelleborg Sealing Solutions.

Advice on Storage of Elastomer Seals

Instructions on storage, cleaning and maintenance of elastomer seal elements are described in international standards, such as:

Storage of rubber products:
DIN 7716/BS 3F68: 1977

Maximum age limitation:
ARP5316
ISO/CD 27996

The individual guidelines give several recommendations to preserve the shelf life of elastomers, depending on their material type.

Light

Elastomer seals should not be exposed to ultraviolet or neon light.

Oxygen

To protect elastomer seals from oxygen, they should be kept in their original packaging or in airtight containers.

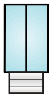
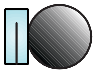
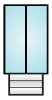
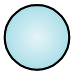
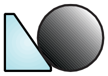
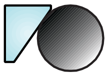
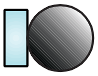
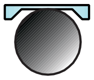
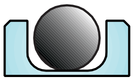
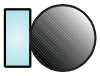
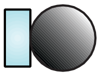
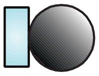
Ozone

Elastomer seals should be stored away from the following equipment. These appliances can cause deterioration of the elastomers due to ozone discharge.

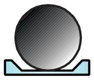
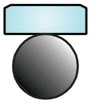
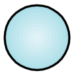
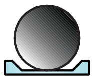
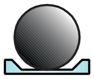
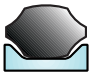
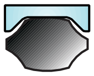
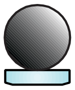
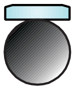
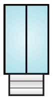
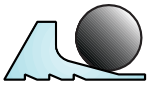
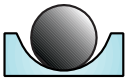
- Mercury discharge lamps
- High voltage equipment
- Electric motors
- Electric spark sources or discharges

Part Number Guide

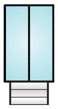
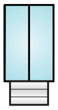
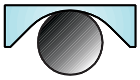
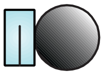
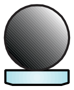
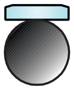
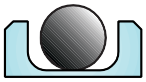
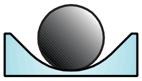
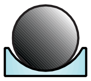
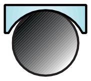
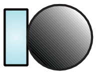
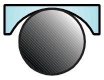
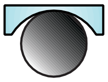
Part Number Guide

Cross Section	Old Part No.	New Part No.	Description	Seal Type	Gland Standard
	S11052	PF00_B	Turcon® Dual Piston Ring (S13126 is preferred design)	Piston	Trelleborg Standard Fractional
	S11065	WM650S	Turcon® Scraper Ring (S34382 is preferred design)	Rod	MS33675 MIL-P-5514 thru MIL-G-5514; All Revisions
	S11109	BP090A	Turcon® Back-up Ring Spiral	Rod/Piston	MIL-P-5514; Revisions A, B, C, D, E One or Two Back-up Rings
	S11114	PF01_B	Turcon® Dual Piston Ring (S13126 is preferred design)	Piston	Trelleborg Standard Fractional
	S11214	OC140M	PTFE O-Ring (S13126 is preferred design)	Piston	Trelleborg Standard Fractional
	S11242	N/A	Turcon® Delta Back-up Ring Single Turn (S33823 is preferred design)	Rod	LS4652 MIL-P-5514: Revisions C, D, E One or Two Back-up Rings
	S11243	N/A	Turcon® Delta Back-up Ring Single Turn (S33823 is preferred design)	Piston	LS4653 MIL-P-5514: Revisions C, D, E One or Two Back-up Rings
	S11248	BG480M	Turcon® Back-up Ring Single Turn	Rod/Piston	MIL-P-5514 thru MIL-G-5514; All Revisions One or Two Back-up Rings
	S11338	PD130M	Turcon® Cap Seal	Piston	MIL-P-5514: Revisions A, B, C, D, E Zero Back-up Rings
	S11370	N/A	Turcon® Channel Seal	Rod	MIL-P-5514: Revisions A, B Two Back-up Rings
	S11395	N/A	Turcon® Back-up Ring	Rod/Piston	Trelleborg Standard
	S11399	N/A	Turcon® Back-up Ring	Rod/Piston	Trelleborg Standard
	S11413	N/A	Turcon® Back-up Ring	Rod/Piston	Trelleborg Standard

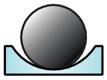
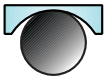
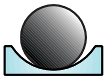
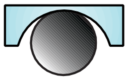
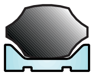
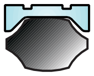
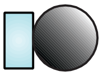
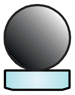
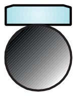
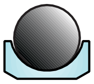
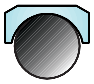
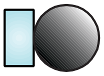
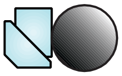
Part Number Guide

Cross Section	Old Part No.	New Part No.	Description	Seal Type	Gland Standard
	S11589	RD890M	Turcon® Cap Seal	Rod	MIL-P-5514: Revisions A, B, C, D, E Zero Back-up Rings
	S11717	RG00_B	Turcon® Glyd Ring®	Rod	Trelleborg Standard Fractional Rod
	S11718	PG00_B	Turcon® Glyd Ring®	Piston	Trelleborg Standard Fractional Bore
	S11732	OC320M	PTFE O-Ring (general purpose application)	Rod/Piston	AS568A
	S11859	RD240B	Turcon® Cap Seal	Rod	Trelleborg Standard
	S11860	N/A	Turcon® Cap Seal	Rod	Trelleborg Standard
	S11940	RP40_M	Turcon® Plus Seal® (S30775 is preferred design)	Rod	MIL-P-5514; Revisions C, D, E Zero Back-up Rings
	S11943	N/A	Turcon® Plus Seal® (S34750 is preferred design)	Piston	MIL-P-5514; Revisions C, D, E Zero Back-up Rings
	S12066	RG66_B	Turcon® Glyd Ring® Series B	Rod	Trelleborg Standard MIL-P-5514; Revisions A, B, C, D, E
	S12068	PG68_B	Turcon® Glyd Ring® Series B	Piston	Trelleborg Standard MIL-P-5514; Revisions A, B, C, D, E
	S12083	PF02_B	Turcon® Dual Piston Ring (S30071 is preferred design)	Piston	Trelleborg Standard MIL-P-5514; Revisions A, B, C, D, E
	S12095	RF95_B	Turcon® Footseal (S33121 is preferred design)	Rod	Boeing Standard BAS: BACS11AA
	S12223	RD03_M	Turcon® Double Delta®	Rod	MIL-P-5514; Revisions A, B Two Back-up Rings

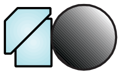
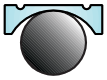
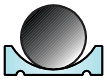
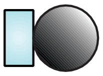
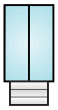
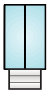
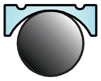
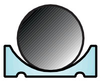
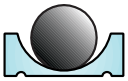
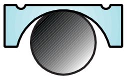
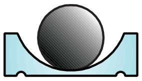
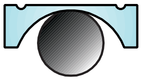
Part Number Guide

Cross Section	Old Part No.	New Part No.	Description	Seal Type	Gland Standard
	S12230	PF03_B	Turcon® Dual Piston Ring (S30071 is preferred design)	Piston	Trelleborg Standard MIL-P-5514; Revisions A, B, C, D, E
	S12257	N/A	Turcon® Dual Piston Ring (S13126 is preferred design)	Piston	Trelleborg Standard Fractional
	S12508	PD03_M	Turcon® Double Delta® (S30642 is preferred design)	Piston	MIL-P-5514; Revisions C, D, E Two Back-up Rings
	S12517	BP170M	Turcon® Back-up Ring Spiral, Heavy Duty	Rod/Piston	MIL-P-5514; Revisions C, D, E Fractional One or Two Back-up Rings
	S12546	RG46_B	Turcon® Glyd Ring® Series C	Rod	Trelleborg Standard Fractional Rod
	S12547	PG47_B	Turcon® Glyd Ring® Series C	Piston	Trelleborg Standard Fractional Bore
	S12560	RD040M	Turcon® Channel Seal	Rod	MIL-P-5514; Revisions C, D, E Two Back-up Rings
	S12561	RD05_M	Turcon® Double Delta® (S30632 is preferred design)	Rod	MIL-P-5514; Revisions C, D, E Two Back-up Rings
	S12562	RD06_M	Turcon® Double Delta® (S30630 is preferred design)	Rod	MIL-P-5514; Revisions A, B, C, D, E Zero Back-up Rings
	S12563	PD04_M	Turcon® Double Delta® (S30640 is preferred design)	Piston	MIL-P-5514; Revisions A, B, C, D, E Zero Back-up Rings
	S12587	BU870M	Turcon® Back-up Ring Solid	Rod/Piston	MIL-P-5514; Revisions A, B, C, D, E One or Two Back-up Rings
	S12599	PG990B	Turcon® Channel Seal	Piston	Trelleborg Standard
	S12603	PD05_M	Turcon® Double Delta® (S30641 is preferred design)	Piston	MIL-P-5514; Revisions C, D, E One Back-up Ring

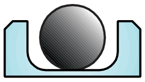
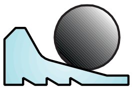
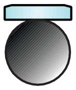
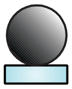
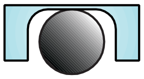
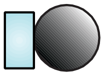
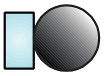
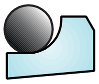
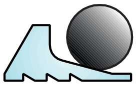
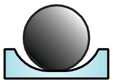
Part Number Guide

Cross Section	Old Part No.	New Part No.	Description	Seal Type	Gland Standard
	S12604	RD07_M	Turcon® Double Delta® (S30631 is preferred design)	Rod	MIL-P-5514; Revisions C, D, E One Back-up Ring
	S12714	PD00_M	Turcon® Double Delta®	Piston	MIL-P-5514; Revisions A, B One Back-up Ring
	S12715	RD08_M	Turcon® Double Delta® (S30611 is preferred design)	Rod	MIL-P-5514; Revisions A, B One Back-up Ring
	S12716	PD06_M	Turcon® Double Delta® (S30622 is preferred design)	Piston	MIL-P-5514; Revisions A, B Two Back-up Rings
	S12735	RP35_M	Turcon® Grooved Plus Seal® (S30855 is preferred design)	Rod	MIL-P-5514; Revisions A, B, C, D, E Zero Back-up Rings
	S12737	PP37_M	Turcon® Grooved Plus Seal® (S34760 is preferred design)	Piston	MIL-P-5514; Revisions A, B, C, D, E Zero Back-up Rings
	S12766	BG660M	Turcon® Back-up Ring	Rod/Piston	MIL-P-5514; Revisions D, E One or Two Back-up Rings
	S12794	RG94_B	Turcon® Glyd Ring®	Rod	Trelleborg Standard MIL-P-5514; Revisions A, B
	S12795	PG95_B	Turcon® Glyd Ring®	Piston	Trelleborg Standard Metric
	S12956	RD090M	Turcon® Cap Seal	Rod	MIL-P-5514; Revisions A, B, C, D, E Zero Back-up Rings
	S12957	PD070M	Turcon® Cap Seal	Piston	MIL-P-5514; Revisions A, B, C, D, E Zero Back-up Rings
	S13050	BUS00M	Turcon® Back-up Ring, Heavy Duty	Rod/Piston	MIL-P-5514; Revisions C, D, E One or Two Back-up Rings
	S13068	RD100M	Turcon® Camseal®	Rod	MIL-P-5514; Revisions C, D, E Two Back-up Rings

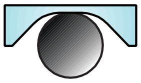
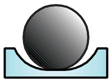
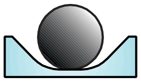
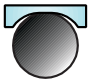
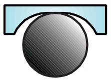
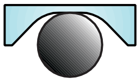
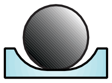
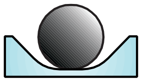
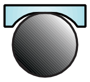
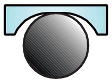
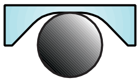
Part Number Guide

Cross Section	Old Part No.	New Part No.	Description	Seal Type	Gland Standard
	S13069	BG690M	Turcon® Camseal®	Piston	MIL-P-5514; Revisions C, D, E Two Back-up Rings
	S13076	N/A	Grooved Turcon® Double Delta®	Piston	MIL-P-5514; Revisions C, D, E One Back-up Ring
	S13077	N/A	Grooved Turcon® Double Delta®	Rod	MIL-P-5514; Revisions C, D, E One Back-up Ring
	S13095	PF04_B	Turcon® Piston Ring	Piston	Trelleborg Standard Fractional
	S13122	BGS20M	Turcon® Back-up Ring Single Turn, Heavy Duty, Scarf-cut	Rod/Piston	MIL-P-5514 thru MIL-G-5514 All Revisions One or Two Back-up Rings
	S13126	PF05_B	Turcon® Dual Piston Ring	Piston	Trelleborg Standard Fractional
	S13135	PF06_B	Turcon® Dual Piston Ring	Piston	Trelleborg Standard MIL-G-5514
	S13180	N/A	Grooved Turcon® Double Delta®	Piston	MIL-P-5514; Revisions A, B One Back-up Ring
	S13181	N/A	Grooved Turcon® Double Delta®	Rod	MIL-P-5514; Revisions A, B One Back-up Ring
	S13200	RD12_M	Grooved Turcon® Double Delta®	Rod	MIL-P-5514; Revisions A, B Two Back-up Rings
	S13201	N/A	Grooved Turcon® Double Delta®	Piston	MIL-P-5514; Revisions A, B Two Back-up Rings
	S13206	N/A	Grooved Turcon® Double Delta®	Rod	MIL-P-5514; Revisions C, D, E Two Back-up Rings
	S13207	N/A	Grooved Turcon® Double Delta®	Piston	MIL-P-5514; Revisions C, D, E Two Back-up Rings

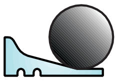
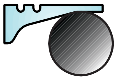
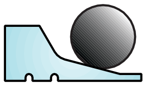
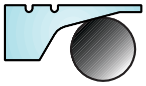
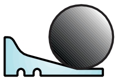
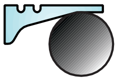
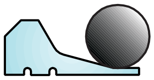
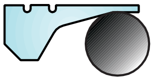
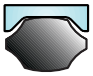
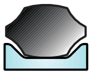
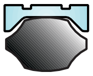
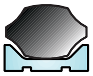
Part Number Guide

Cross Section	Old Part No.	New Part No.	Description	Seal Type	Gland Standard
	S30010	RD140M	Turcon® Channel Seal	Rod	MIL-P-5514; Revisions C, D, E Two Back-up Rings
	S30050	RD160M	Turcon® Delta Seal®	Rod	MIL-P-5514; Revisions C, D, E Two Back-up Rings
	S30058	RG58N	Turcon® Glyd Ring®	Rod	Trelleborg Standard Metric
	S30059	PG59N	Turcon® Glyd Ring®	Piston	Trelleborg Standard Metric
	S30071	PF07_B	Turcon® Dual Piston Ring	Piston	Trelleborg Standard MIL-P-5514; Revisions C, D, E
	S30213	N/A	Turcon® Cap Seal	Rod	Trelleborg Standard MIL-P-5514; Revisions C, D, E
	S30289	PD080M	Turcon® Channel Seal	Piston	MIL-P-5514; Revisions C, D, E Two Back-up Rings
	S30294	BG940M	Turcon® Back-up Ring Cut	Rod/Piston	Boeing Standard BACR12BM
	S30310	BU100M	Turcon® Back-up Ring Solid	Rod/Piston	Boeing Standard BACR12BP
	S30388	WM880S	Turcon® Scraper Ring (S34382 is preferred design)	Rod	Boeing Standard BACS34A
	S30395	WE95_B	Turcon® Excluder® (S32925 is preferred design)	Rod	Trelleborg Standard MIL-P-5514 thru MIL-G-5514 All Revisions
	S30471	N/A	Turcon® Footseal (S33121 is preferred design)	Rod	Boeing Standard BACS11AA
	S30611	N/A	Turcon® Double Delta®II	Rod	MIL-P-5514; Revisions A, B One Back-up Ring

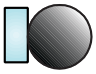
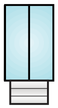
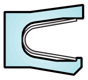
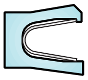
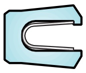
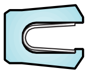
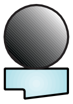
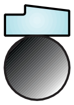
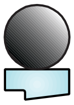
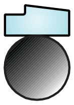
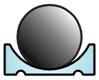
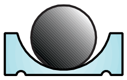
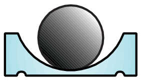
Part Number Guide

Cross Section	Old Part No.	New Part No.	Description	Seal Type	Gland Standard
	S30622	N/A	Turcon® Double Delta®II	Piston	MIL-P-5514; Revisions A, B Two Back-up Rings
	S30630	RD17_M	Turcon® Double Delta®II	Rod	MIL-P-5514; Revisions C, D, E Zero Back-up Rings
	S30631	RD18_M	Turcon® Double Delta®II	Rod	MIL-P-5514; Revisions C, D, E One Back-up Ring
	S30632	RD19_M	Turcon® Double Delta®II	Rod	MIL-P-5514; Revisions C, D, E Two Back-up Rings
	S30640	PD09_M	Turcon® Double Delta®II	Piston	MIL-P-5514; Revisions C, D, E Zero Back-up Rings
	S30641	PD10_M	Turcon® Double Delta®II	Piston	MIL-P-5514; Revisions C, D, E One Back-up Ring
	S30642	PD11_M	Turcon® Double Delta®II	Piston	MIL-P-5514; Revisions C, D, E Two Back-up Rings
	S30650	RD50_M	Turcon® Double Delta®II	Rod	MIL-G-5514; Revision F Zero Back-up Rings
	S30651	RD51_M	Turcon® Double Delta®II	Rod	MIL-G-5514; Revision F One Back-up Ring
	S30652	RD52_M	Turcon® Double Delta®II	Rod	MIL-G-5514; Revision F Two Back-up Rings
	S30660	PD60_M	Turcon® Double Delta®II	Piston	MIL-G-5514; Revision F Zero Back-up Rings
	S30661	PD61_M	Turcon® Double Delta®II	Piston	MIL-G-5514; Revision F One Back-up Ring
	S30662	PD62_M	Turcon® Double Delta®II	Piston	MIL-G-5514; Revision F Two Back-up Rings

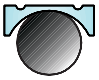
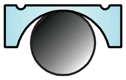
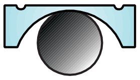
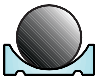
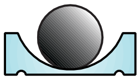
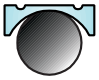
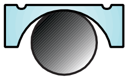
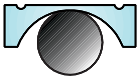
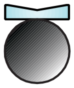
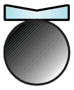
Part Number Guide

Cross Section	Old Part No.	New Part No.	Description	Seal Type	Gland Standard
	S30669	WE69_S	Turcon® Scraper, Series E (S33865 is preferred design)	Rod	MS33675 MIL-P-5514 thru MIL-G-5514 All Revisions
	S30675	RD200M	Turcon® Delta Seal®	Rod	MIL-P-5514; Revisions C, D, E One Back-up Ring
	S30676	N/A	Turcon® Delta Seal®	Piston	MIL-P-5514; Revisions C, D, E One Back-up Ring
	S30677	RD210M	Turcon® Delta Seal®	Rod	MIL-P-5514; Revisions C, D, E Two Back-up Rings
	S30678	PD780M	Turcon® Delta Seal®	Piston	MIL-P-5514; Revisions C, D, E Two Back-up Rings
	S30681	N/A	Turcon® Delta Seal®	Rod	MIL-G-5514; Revision F One Back-up Ring
	S30682	N/A	Turcon® Delta Seal®	Piston	MIL-G-5514; Revision F One Back-up Ring
	S30683	N/A	Turcon® Delta Seal®	Rod	MIL-G-5514; Revision F Two Back-up Rings
	S30684	N/A	Turcon® Delta Seal®	Piston	MIL-G-5514; Revision F Two Back-up Rings
	S30772	PP72_M	Turcon® Plus Seal® II (S34750 is preferred design)	Piston	MIL-G-5514; Revision F Zero Back-up Rings
	S30775	RP75_M	Turcon® Plus Seal® II	Rod	MIL-G-5514; Revision F Zero Back-up Rings
	S30852	PP52_M	Grooved Turcon® Plus Seal® II (S34760 is preferred design)	Piston	MIL-G-5514; Revision F Zero Back-up Rings
	S30855	RP55_M	Grooved Turcon® Plus Seal® II	Rod	MIL-G-5514; Revision F Zero Back-up Rings

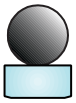
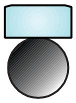
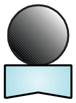
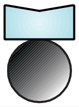
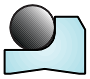
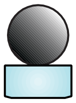
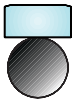
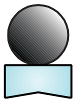
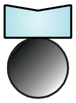
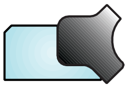
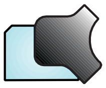
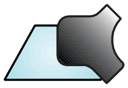
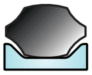
Part Number Guide

Cross Section	Old Part No.	New Part No.	Description	Seal Type	Gland Standard
	S30989	BU890M	Turcon® Back-up Ring, Solid	Rod/Piston	AS568 One or Two Back-up Rings
	S32152	PF52_B	Turcon® Dual Piston Ring	Piston	Trelleborg Standard MIL-G-5514; Revision F
	S32240	PV920M	Turcon® Variseal® M	Piston	MIL-P-5514; Revisions C, D, E Zero Back-up Rings
	S32240	RV920M	Turcon® Variseal® M	Rod	MIL-P-5514; Revisions C, D, E Zero Back-up Rings
	S32265	PV930M	Turcon® Variseal® M	Piston	MIL-P-5514; Revisions C, D, E Zero Back-up Rings
	S32265	RV930M	Turcon® Variseal® M	Rod	MIL-P-5514; Revisions C, D, E Zero Back-up Rings
	S32571	RS570B	Turcon® Stepseal®	Rod	Trelleborg Standard MIL-P-5514; Revision E
	S32572	PS720B	Turcon® Stepseal®	Piston	Trelleborg Standard MIL-P-5514; Revision E
	S32573	RS730B	Turcon® Stepseal®	Rod	Trelleborg Standard MIL-P-5514; Revision E
	S32574	PS740B	Turcon® Stepseal®	Piston	Trelleborg Standard MIL-P-5514; Revision E
	S32830	RD22_M	Turcon® Grooved Double Delta®II	Rod	MIL-P-5514; Revisions C, D, E Zero Back-up Rings
	S32831	N/A	Turcon® Grooved Double Delta®II	Rod	MIL-P-5514; Revisions C, D, E One Back-up Ring
	S32832	N/A	Turcon® Grooved Double Delta®II	Rod	MIL-P-5514; Revisions C, D, E Two Back-up Rings

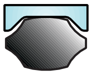
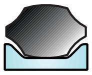
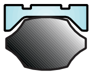
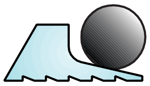
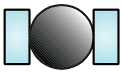
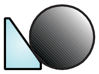
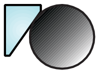
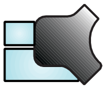
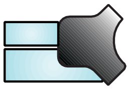
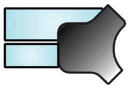
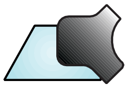
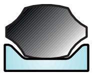
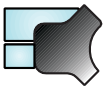
Part Number Guide

Cross Section	Old Part No.	New Part No.	Description	Seal Type	Gland Standard
	S32840	N/A	Turcon® Grooved Double Delta®II	Piston	MIL-P-5514; Revisions C, D, E Zero Back-up Rings
	S32841	N/A	Turcon® Grooved Double Delta®II	Piston	MIL-P-5514; Revisions C, D, E One Back-up Ring
	S32842	N/A	Turcon® Grooved Double Delta®II	Piston	MIL-P-5514; Revisions C, D, E Two Back-up Rings
	S32850	RD80_M	Turcon® Grooved Double Delta®II	Rod	MIL-G-5514; Revision F Zero Back-up Rings
	S32851	RD81_M	Turcon® Grooved Double Delta®II	Rod	MIL-G-5514; Revision F One Back-up Ring
	S32852	RD82_M	Turcon® Grooved Double Delta®II	Rod	MIL-G-5514; Revision F Two Back-up Rings
	S32860	PD80_M	Turcon® Grooved Double Delta®II	Piston	MIL-G-5514; Revision F Zero Back-up Rings
	S32861	PD81_M	Grooved Turcon® Double Delta®II	Piston	MIL-G-5514; Revision F One Back-up Ring
	S32862	PD82_M	Grooved Turcon® Double Delta®II	Piston	MIL-G-5514; Revision F Two Back-up Rings
	S32891	N/A	Turcon® Glyd Ring® DC Series C	Rod	Trelleborg Standard Fractional Rod
	S32892	N/A	Turcon® Glyd Ring® DC Series C	Piston	Trelleborg Standard Fractional Bore
	S32893	N/A	Turcon® Glyd Ring® DC Series B	Rod	Trelleborg Standard MIL-P-5514; Revisions C, D, E
	S32894	N/A	Turcon® Glyd Ring® DC Series B	Piston	Trelleborg Standard MIL-P-5514; Revisions C, D, E

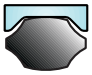
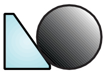
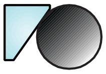
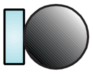
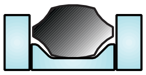
Part Number Guide

Cross Section	Old Part No.	New Part No.	Description	Seal Type	Gland Standard
	S32909	N/A	Turcon® Glyd Ring® Series J	Rod	Trelleborg Standard Fractional Rod
	S32910	PG02_B	Turcon® Glyd Ring® Series J	Piston	Trelleborg Standard Fractional Bore
	S32913	RG13_B	Turcon® Glyd Ring® DC Series J	Rod	Trelleborg Standard Fractional Rod
	S32914	PG14_B	Turcon® Glyd Ring® DC Series J	Piston	Trelleborg Standard Fractional Bore
	S32925	WE25_B	Turcon® Excluder® DC	Rod	Trelleborg Standard MIL-P-5514 thru MIL-G-5514 All Revisions
	S32927	RG27_B	Turcon® Glyd Ring® Series J	Rod	Trelleborg Standard MIL-P-5514 Revision F
	S32928	PG28_B	Turcon® Glyd Ring® Series J	Piston	Trelleborg Standard MIL-P-5514 Revision F
	S32933	RGE3_B	Turcon® Glyd Ring® DC Series J	Rod	Trelleborg Standard Rod MIL-P-5514; Revision F
	S32934	PGE4_B	Turcon® Glyd Ring® DC Series J	Piston	Trelleborg Standard MIL-P-5514; Revision F
	S32979	RH790M	Turcon® Hatseal® II Two-Piece (S34852 is preferred design)	Rod	MIL-G-5514; Revision F Two Back-up Rings
	S32985	N/A	Turcon® Hatseal® II Two-Piece (S34851 is preferred design)	Rod	MIL-G-5514; Revision F One Back-up Ring
	S32991	RH910M	Turcon® Hatseal® II Two-Piece (S34853 is preferred design)	Rod	Boeing Standard
	S33081	N/A	Turcon® Plus Seal® II (S34571 is preferred design)	Rod	MIL-G-5514; Revision F One Back-up Ring

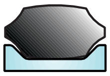
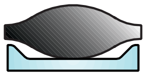
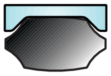
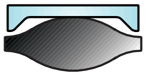
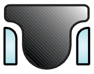
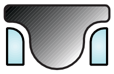
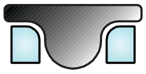
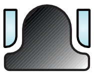
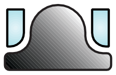
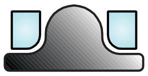
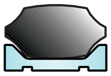
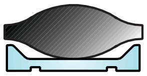
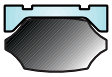
Part Number Guide

Cross Section	Old Part No.	New Part No.	Description	Seal Type	Gland Standard
	S33084	N/A	Turcon® Plus Seal® II (S34581 is preferred design)	Piston	MIL-G-5514; Revision F One Back-up Ring
	S33087	N/A	Turcon® Plus Seal® II (S34711 is preferred design)	Rod	MIL-G-5514; Revision F One Back-up Ring
	S33090	N/A	Grooved Turcon® Plus Seal® II (S34721 is preferred design)	Piston	MIL-G-5514; Revision F One Back-up Ring
	S33121	RF210B	Turcon® Foot Seal II	Rod	Boeing Standard
	S33157	BUS70M (Solid) BGS70M (Scarf-cut)	Turcon® Back-up Ring Solid or Scarf-cut, two required	Rod/Piston	MIL-G-5514; Revisions C, D, E Two Back-up Rings
	S33277	N/A	Turcon® Delta Back-up Ring, Solid	Rod	MIL-P-5514; Revisions C, D, E One or Two Back-up Rings
	S33278	N/A	Turcon® Delta Back-up Ring, Solid	Piston	MIL-P-5514; Revisions C, D, E One or Two Back-up Rings
	S33317	RH170M	Turcon® Hatseal® II Three-Piece (S34831 is preferred design)	Rod	MIL-G-5514; Revision F One Back-up Ring
	S33353	N/A	Turcon® Hatseal® II Three-Piece (S34832 is preferred design)	Rod	MIL-G-5514; Revision F Two Back-up Rings
	S33528	N/A	Turcon® Hatseal® II Three-Piece (S34842 is preferred design)	Piston	MIL-G-5514; Revision F Two Back-up Rings
	S33555	RD550M	Turcon® Hatseal® II Two-Piece (S34842 is preferred design)	Rod	Boeing Standard
	S33557	N/A	Turcon® Plus Seal® II (S34572 is preferred design)	Rod	MIL-G-5514; Revision F Two Back-up Rings
	S33565	N/A	Turcon® Hatseal® II Three-Piece (S34841 is preferred design)	Piston	MIL-G-5514; Revision F One Back-up Ring

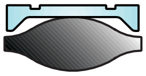
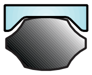
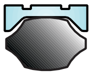
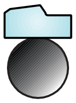
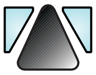
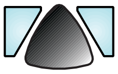
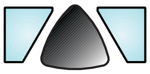
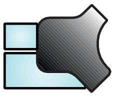
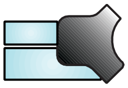
Part Number Guide

Cross Section	Old Part No.	New Part No.	Description	Seal Type	Gland Standard
	S33709	PP09_M	Turcon® Plus Seal® II	Piston	MIL-G-5514; Revision F Two Back-up Rings
	S33823	BU230M	Turcon® Delta Back-up Ring, Solid	Rod	MIL-G-5514; Revision F One or Two Back-up Rings
	S33824	BU440M	Turcon® Delta Back-up Ring, Solid	Piston	MIL-G-5514; Revision F One or Two Back-up Rings
	S33861	BGS10M (solid) BUS10M (Scarf-cut)	Turcon® Back-up Ring Solid or Scarf-cut, one required	Rod/Piston	MIL-G-5514; Revision F One Back-up Ring
	S33865	WE65_S	Turcon® Excluder® DC, Series E	Rod	MS33675 MIL-P-5514 thru MIL-G-5514F All Revisions
	S34382	WM820S	Turcon® DC Scraper Ring	Rod	MS33675 MIL-P-5514 thru MIL-G-5514F All Revisions
	S34435	RP01_M	Turcon® Plus Seal® II Set	Rod	MIL-G-5514; Revision F Two Back-up Rings
	S34545	GP__XB	Turcon® Slydring® (1/32 thick)	Piston	Trelleborg Standard MIL-G-5514F
	S34546	GP__WB	Turcon® Slydring® (1/16 thick)	Piston	Trelleborg Standard MIL-G-5514F
	S34547	GP__YB	Turcon® Slydring® (3/32 thick)	Piston	Trelleborg Standard MIL-G-5514F
	S34548	GR__XB	Turcon® Slydring® (1/32 thick)	Rod	Trelleborg Standard MIL-G-5514F
	S34549	GR__WB	Turcon® Slydring® (1/16 thick)	Rod	Trelleborg Standard MIL-G-5514F
	S34550	GR__YB	Turcon® Slydring® (3/32 thick)	Rod	Trelleborg Standard MIL-G-5514F

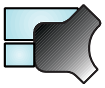
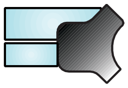
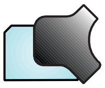
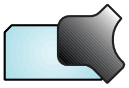
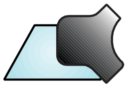
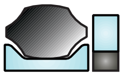
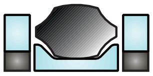
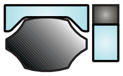
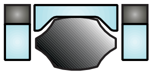
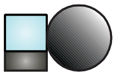
Part Number Guide

Cross Section	Old Part No.	New Part No.	Description	Seal Type	Gland Standard
	S34571	RP71_M	Turcon® Plus Seal® II	Rod	MIL-G-5514; Revision F One Back-up Ring
	S34572	RP72_M	Turcon® Plus Seal® II	Rod	MIL-G-5514; Revision F Two Back-up Rings
	S34581	PP81_M	Turcon® Plus Seal® II	Piston	MIL-G-5514; Revision F One Back-up Ring
	S34582	PP82_M	Turcon® Plus Seal® II	Piston	MIL-G-5514; Revision F Two Back-up Rings
	S34690	RB90_M	Turcon® T-Seal	Rod	MIL-G-5514; Revision F Zero Back-up Rings
	S34691	RB91_M	Turcon® T-Seal	Rod	MIL-G-5514; Revision F One Back-up Ring
	S34692	RB92_M	Turcon® T-Seal	Rod	MIL-G-5514; Revision F Two Back-up Rings
	S34700	PB00_M	Turcon® T-Seal	Piston	MIL-G-5514; Revision F Zero Back-up Rings
	S34701	PB01_M	Turcon® T-Seal	Piston	MIL-G-5514; Revision F One Back-up Ring
	S34702	PB02_M	Turcon® T-Seal	Piston	MIL-G-5514; Revision F Two Back-up Rings
	S34711	RP11_M	Grooved Turcon® Plus Seal® II	Rod	MIL-G-5514; Revision F One Back-up Ring
	S34712	RP12_M	Grooved Turcon® Plus Seal® II	Rod	MIL-G-5514; Revision F Two Back-up Rings
	S34721	PP21_M	Grooved Turcon® Plus Seal® II	Piston	MIL-G-5514; Revision F One Back-up Ring

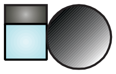
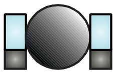
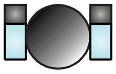
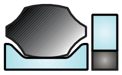
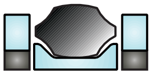
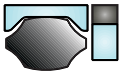
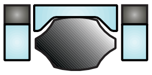
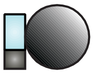
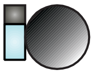
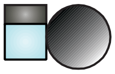
Part Number Guide

Cross Section	Old Part No.	New Part No.	Description	Seal Type	Gland Standard
	S34722	PP22_M	Grooved Turcon® Plus Seal® II	Piston	MIL-G-5514; Revision F Two Back-up Rings
	S34750	PP50_M	Turcon® Plus Seal® II	Piston	MIL-G-5514; Revision F Zero Back-up Rings
	S34760	PP60_M	Grooved Turcon® Plus Seal® II	Piston	MIL-G-5514; Revision F Zero Back-up Rings
	S34767	RSA70B	Turcon® Stepseal®	Rod	Trelleborg Standard MIL-G-5514; Revision F
	S34768	PSA80B	Turcon® Stepseal®	Piston	Trelleborg Standard MIL-G-5514; Revision F
	S34770	RA70_M	Turcon® Wedgpak®	Rod	MIL-G-5514; Revision F Zero Back-up Rings
	S34771	RA71_M	Turcon® Wedgpak®	Rod	MIL-G-5514; Revision F One Back-up Ring
	S34772	RA72_M	Turcon® Wedgpak®	Rod	MIL-G-5514; Revision F Two Back-up Rings
	S34780	PA80_M	Turcon® Wedgpak®	Piston	MIL-G-5514; Revision F Zero Back-up Rings
	S34781	PA81_M	Turcon® Wedgpak®	Piston	MIL-G-5514; Revision F One Back-up Ring
	S34782	PA82_M	Turcon® Wedgpak®	Piston	MIL-G-5514; Revision F Two Back-up Rings
	S34831	RH310M	Turcon® Hatseal® II Three-Piece	Rod	MIL-G-5514; Revision F One Back-up Ring
	S34832	RH320M	Turcon® Hatseal® II Three-Piece	Rod	MIL-G-5514; Revision F Two Back-up Rings

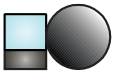
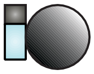
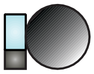
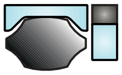
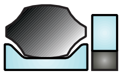
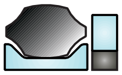
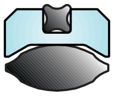
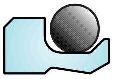
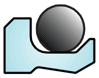
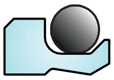
Part Number Guide

Cross Section	Old Part No.	New Part No.	Description	Seal Type	Gland Standard
	S34841	N/A	Turcon® Hatseal® II Three-Piece	Piston	MIL-G-5514; Revision F One Back-up Ring
	S34842	N/A	Turcon® Hatseal® II Three-Piece	Piston	MIL-G-5514; Revision F Two Back-up Rings
	S34851	RH510M	Turcon® Hatseal® II Two-Piece	Rod	MIL-G-5514; Revision F One Back-up Ring
	S34852	RH520M	Turcon® Hatseal® II Two-Piece	Rod	MIL-G-5514; Revision F Two Back-up Rings
	S34853	RH530M	Turcon® Hatseal® II Two-Piece	Rod	Boeing Standard BACS11AA
	S35961	RA610M	Turcon® Wedgpak®	Rod Static	MIL-G-5514; Revision F Zero Back-up Rings
	S35964	PA640M	Turcon® Wedgpak®	Piston Static	MIL-G-5514; Revision F Zero Back-up Rings
	S36611	RP00_M	Turcon® Plus Seal® II Set	Rod	MIL-G-5514; Revision F One Back-up Ring, Unbonded
	S36612	RP99_M	Turcon® Plus Seal® II Set	Rod	MIL-G-5514; Revision F Two Back-up Rings, Unbonded
	S36621	PP01_M	Turcon® Plus Seal® II Set	Piston	MIL-G-5514; Revision F One Back-up Ring, Unbonded
	S36622	PP03_M	Turcon® Plus Seal® II Set	Piston	MIL-G-5514; Revision F Two Back-up Rings, Unbonded
	S36991	BG990M	Turcon® Stakbak®, Scarf-cut	Rod	MIL-G-5514; Revision F One Back-up Ring
	S36992	BG920M	Turcon® Stakbak®, Scarf-cut	Rod	MIL-G-5514; Revision F Two Back-up Rings

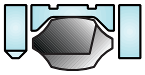
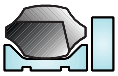
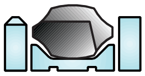
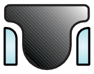
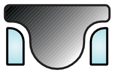
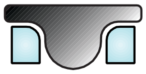
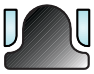
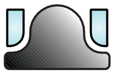
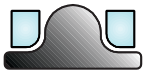
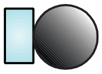
Part Number Guide

Cross Section	Old Part No.	New Part No.	Description	Seal Type	Gland Standard
	S37001	BG010M	Turcon® Stakbak®, Scarf-cut	Piston	MIL-G-5514; Revision F One Back-up Ring
	S37002	BG020M	Turcon® Stakbak®, Scarf-cut	Piston	MIL-G-5514; Revision F Two Back-up Rings
	S37011	BG110M	Turcon® Stakbak®, Scarf-cut	Rod	MIL-G-5514; Revision F One Back-up Ring
	S37021	BG210M	Turcon® Stakbak®, Scarf-cut	Piston	MIL-G-5514; Revision F One Back-up Ring
	S37051	RP51_M	Turcon® Plus Seal® II Set	Rod	MIL-G-5514; Revision F One Back-up Ring
	S37052	RP52_M	Turcon® Plus Seal® II Set	Rod	MIL-G-5514; Revision F Two Back-up Rings
	S37055	BG550M	Turcon® Stakbak®, Scarf-cut	Rod	MIL-G-5514; Revision F Two Back-up Rings
	S37060	BG600M	Turcon® Stakbak®, Scarf-cut	Piston	MIL-G-5514; Revision F One Back-up Ring
	S37061	PP61_M	Turcon® Plus Seal® II Set	Piston	MIL-G-5514; Revision F One Back-up Ring
	S37062	PP62_M	Turcon® Plus Seal® II Set	Piston	MIL-G-5514; Revision F Two Back-up Rings
	S37076	BG760M	Turcon® Stakbak®, Scarf-cut	Rod	MIL-G-5514; Revision F One Back-up Ring
	S37083	BG830M	Turcon® Stakbak®, Scarf-cut	Piston	MIL-G-5514; Revision F One Back-up Ring
	S37241	BG410M	Turcon® Stakbak®, Scarf-cut, Static Seal Set	Piston	MIL-G-5514; Revision F One Back-up Ring

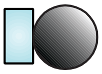
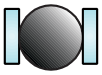
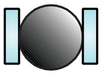
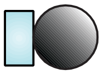
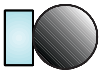
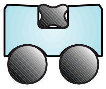
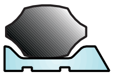
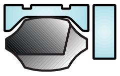
Part Number Guide

Cross Section	Old Part No.	New Part No.	Description	Seal Type	Gland Standard
	S37242	BG420M	Turcon® Stakbak®, Scarf-cut, Static Seal Set	Piston	MIL-G-5514; Revision F Two Back-up Rings
	S37251	BG510M	Turcon® Stakbak®, Scarf-cut, Static Seal Set	Rod	MIL-G-5514; Revision F One Back-up Ring
	S37252	BG520M	Turcon® Stakbak®, Scarf-cut, Static Seal Set	Rod	MIL-G-5514; Revision F Two Back-up Rings
	S37261	BG610M	Turcon® Stakbak®, Scarf-cut, Static Seal Set	Piston	MIL-G-5514; Revision F One Back-up Ring
	S37271	BG710M	Turcon® Stakbak®, Scarf-cut, Static Seal Set	Rod	MIL-G-5514; Revision F One Back-up Ring
	S37401	PP02_M	Turcon® Plus Seal® II Set	Piston	MIL-G-5514; Revision F One Back-up Ring
	S37411	RP02_M	Turcon® Plus Seal® II Set	Rod	MIL-G-5514; Revision F One Back-up Ring
	S37431	RP03_M	Turcon® Plus Seal® II Set	Rod	MIL-G-5514; Revision F One Back-up Ring
	S37804	PP040M	Turcon® Plus Seal® AQ	Piston	MIL-G-5514; Revision F Zero Back-up Rings
	S37967	WE670B	Turcon® Excluder® AS	Rod	AS4088
	S37971	WE710B	Turcon® Excluder® AS	Rod	AS4052 Rev. B Type I
	S37972	WE720B	Turcon® Excluder® AS	Rod	AS4052 Rev. A Type II
	S38000	DW000B	Turcon® Wedgpak®	Face (External Pressure)	Trelleborg Face Seal Gland Standard

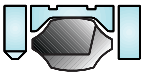
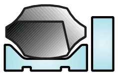
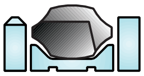
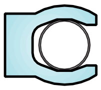
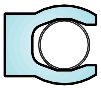
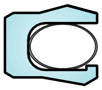
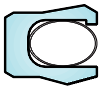
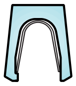
Part Number Guide

Cross Section	Old Part No.	New Part No.	Description	Seal Type	Gland Standard
	S38001	DW010B	Turcon® Wedgpak®	Face (Internal Pressure)	Trelleborg Face Seal Gland Standard
	S38002	PF09_B	Turcon® Single Piston Ring	Piston	Trelleborg Standard MIL-G-5514; Revision F
	S38003	PF08_B	Turcon® Single Piston Ring	Piston	Trelleborg Standard MIL-G-5514; Revision F
	S38362	PP00_M	Turcon® Plus Seal® PR	Piston	Two Back-up Rings MIL-G-5514; Revision F
	S38371	RP31_M	Turcon® Plus Seal® PR	Rod	One Back-up Ring MIL-G-5514; Revision F
	S38372	RP32_M	Turcon® Plus Seal® PR	Rod	Two Back-up Rings MIL-G-5514; Revision F
	S38410	RB10_M	Turcon® T-Seal	Rod	MIL-G-5514; Revision F Zero Back-up Rings
	S38411	RB11_M	Turcon® T-Seal	Rod	MIL-G-5514; Revision F One Back-up Ring
	S38412	RB12_M	Turcon® T-Seal	Rod	MIL-G-5514; Revision F Two Back-up Rings
	S38420	PB20_M	Turcon® T-Seal	Piston	MIL-G-5514; Revision F Zero Back-up Rings
	S38421	PB21_M	Turcon® T-Seal	Piston	MIL-G-5514; Revision F One Back-up Ring
	S38422	PB22_M	Turcon® T-Seal	Piston	MIL-G-5514; Revision F Two Back-up Rings
	S38544	BG440G	Turcon® Back-up Ring Scarf-cut	Rod	AS4716 One or Two Back-up Rings

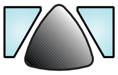
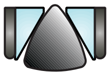
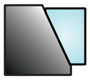
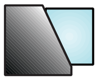
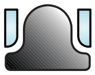
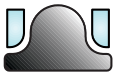
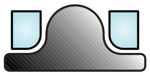
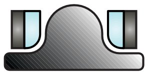
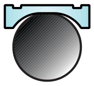
Part Number Guide

Cross Section	Old Part No.	New Part No.	Description	Seal Type	Gland Standard
	S38545	BG450G	Turcon® Back-up Ring Scarf-cut	Piston	AS4716 One or Two Back-up Rings
	S38587	BG870G	Turcon® Back-up Ring, Scarf-cut (1/2 Width)	Rod	AS4716 Two Back-up Rings in One Back-up Ring Width Gland
	S38588	BG880G	Turcon® Back-up Ring, Scarf-cut (1/2 Width)	Piston	AS4716 Two Back-up Rings in One Back-up Ring Width Gland
	S38611	RA1__0M	Turcon® Wedgpak® EP	Rod	MIL-G-5514; Revision F One Back-up Ring
	S38612	RA2__0M	Turcon® Wedgpak® EP	Rod	MIL-G-5514; Revision F Two Back-up Rings
	S38618	BU180G	Turcon® Back-up Ring Solid	Piston	AS4716 One or Two Back-up Rings
	S38619	BU190G	Turcon® Back-up Ring Solid	Rod	AS4716 One or Two Back-up Rings
	S38620	PQ200M	Turcon® AQ-Seal® 5	Piston	Trelleborg Standard MIL-G-5514; Revision F
	S38621	PA1__0M	Turcon® Wedgpak® EP	Piston	MIL-G-5514; Revision F One Back-up Ring
	S38622	PA2__0M	Turcon® Wedgpak® EP	Piston	MIL-G-5514; Revision F Two Back-up Rings
	S38647	RP470B	Grooved Turcon® Plus Seal® PR	Rod	Boeing Standard BACS11AA
	S38649	RA490B	Turcon® Wedgpak®	Rod	Boeing Standard BACS11AA
	S38661	PP68_M	Grooved Turcon® Plus Seal® PR	Piston	One Back-up Ring MIL-G-5514; Revision F

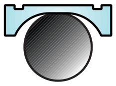
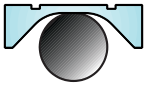
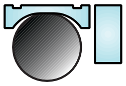
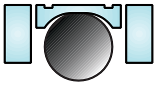
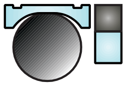
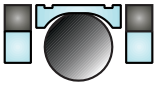
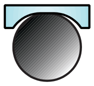
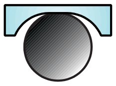
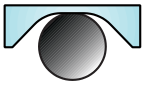
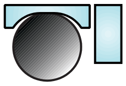
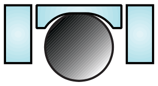
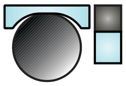
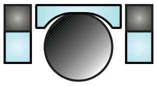
Part Number Guide

Cross Section	Old Part No.	New Part No.	Description	Seal Type	Gland Standard
	S38662	PP66_M	Grooved Turcon® Plus Seal® PR	Piston	MIL-G-5514; Revision F Two Back-up Rings
	S38671	RP81_M	Turcon® Plus Seal® PR Set	Rod	MIL-G-5514; Revision F One Back-up Ring
	S38672	RP82_M	Turcon® Plus Seal® PR Set	Rod	MIL-G-5514; Revision F Two Back-up Rings
	S62600	PV910M	Turcon® Variseal® H	Piston	MIL-P-5514; Revisions C, D, E Zero Back-up Rings, MIL-G-5514F and AS4716
	S62600	RV910M	Turcon® Variseal® H	Rod	MIL-P-5514; Revisions C, D, E Zero Back-up Rings, MIL-G-5514F and AS4716
	S910	PV950M	Turcon® Variseal® W	Piston	MIL-P-5514; Revisions C, D, E Zero Back-up Rings, MIL-G-5514F and AS4716
	S910	RV950M	Turcon® Variseal® W	Rod	MIL-P-5514; Revisions C, D, E Zero Back-up Rings, MIL-G-5514F and AS4716
	N/A	DVA	Turcon® Variseal® M	Face, (Internal Pressure)	Trelleborg Face Seal Gland Standard
	N/A	DVC	Turcon® Variseal® M	Face, (External Pressure)	Trelleborg Face Seal Gland Standard
	N/A	DVE	Turcon® Variseal® H	Face, (Internal Pressure)	Trelleborg Face Seal Gland Standard
	N/A	DVL	Turcon® Variseal® H	Face, (External Pressure)	Trelleborg Face Seal Gland Standard
	S38686	DYHA	Turcon® HST Seal	Face, (Internal Pressure)	Trelleborg Face Seal Gland Standard
	N/A	DYHB	Turcon® HST Seal	Face, (External Pressure)	Trelleborg Face Seal Gland Standard

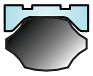
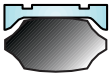
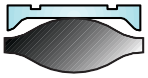
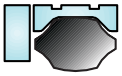
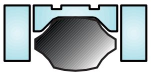
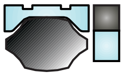
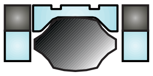
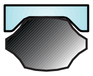
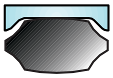
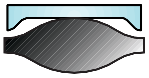
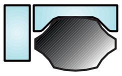
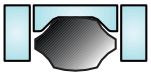
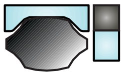
Part Number Guide

Cross Section	Old Part No.	New Part No.	Description	Seal Type	Gland Standard
	N/A	PA00_G	Turcon® Wedgpak®II	Piston	AS4716 Rev. A Zero Back-up Rings
	N/A	PAA1_G	Turcon® Wedgpak®II	Piston	AS4716 Rev. A One Back-up Ring
	N/A	PAA2_G	Turcon® Wedgpak®II	Piston	AS4716 Rev. A Two Back-up Rings
	N/A	PAB1_G	Turcon® Wedgpak®EP	Piston	AS4716 Rev. A One Back-up Ring
	N/A	PAB2_G	Turcon® Wedgpak®EP	Piston	AS4716 Rev. A Two Back-up Rings
	N/A	PAU0_G	Turcon® Unidirectional Wedgpak®II	Piston	AS4716 Rev. A Zero Back-up Rings
	N/A	PAU1_G	Turcon® Unidirectional Wedgpak®II	Piston	AS4716 Rev. A One Back-up Ring
	N/A	PAU2_G	Turcon® Unidirectional Wedgpak®II	Piston	AS4716 Rev. A Two Back-up Rings
	N/A	PBA0_G	Turcon® T-Seal	Piston	AS4716 Rev. A Zero Back-up Rings
	N/A	PBA1_G	Turcon® T-Seal	Piston	AS4716 Rev. A One Back-up Ring
	N/A	PBA2_G	Turcon® T-Seal	Piston	AS4716 Rev. A Two Back-up Rings
	N/A	PBB2_G	Turcon® T-Seal Staged	Piston	AS4716 Rev. A Two Back-up Rings
	N/A	PDA0_G	Grooved Turcon® Double Delta® II	Piston	AS4716 Rev. A Zero Back-up Rings

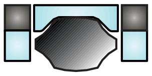
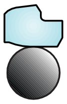
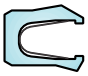
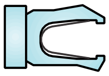
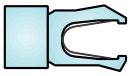
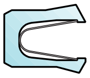
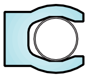
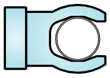
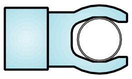
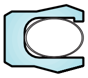
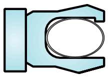
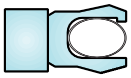
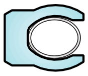
Part Number Guide

Cross Section	Old Part No.	New Part No.	Description	Seal Type	Gland Standard
	N/A	PDA1_G	Grooved Turcon® Double Delta® II	Piston	AS4716 Rev. A One Back-up Ring
	N/A	PDA2_G	Grooved Turcon® Double Delta® II	Piston	AS4716 Rev. A Two Back-up Rings
	N/A	PDA1AG	Grooved Turcon® Double Delta® II w/ one Back-up Ring	Piston	AS4716 Rev. A One Back-up Ring
	N/A	PDA2AG	Grooved Turcon® Double Delta® II w/ two Back-up Rings	Piston	AS4716 Rev. A Two Back-up Rings
	N/A	PDA18G	Grooved Turcon® Double Delta® II w/ one Stakbak® Back-up Ring	Piston	AS4716 Rev. A One Back-up Ring
	N/A	PDA28G	Grooved Turcon® Double Delta® II w/ two Stakbak® Back-up Rings	Piston	AS4716 Rev. A Two Back-up Rings
	N/A	PDB0_G	Turcon® Double Delta® II	Piston	AS4716 Rev. A Zero Back-up Rings
	N/A	PDB1_G	Turcon® Double Delta® II	Piston	AS4716 Rev. A One Back-up Ring
	N/A	PDB2_G	Turcon® Double Delta® II	Piston	AS4716 Rev. A Two Back-up Rings
	N/A	PDB1AG	Turcon® Double Delta® II w/ one Back-up Ring	Piston	AS4716 Rev. A One Back-up Ring
	N/A	PDB2AG	Turcon® Double Delta® II w/ two Back-up Rings	Piston	AS4716 Rev. A Two Back-up Rings
	N/A	PDB18G	Turcon® Double Delta® II w/ one Stakbak® Back-up Ring	Piston	AS4716 Rev. A One Back-up Ring
	N/A	PDB28G	Turcon® Double Delta® II w/ two Stakbak® Back-up Rings	Piston	AS4716 Rev. A Two Back-up Rings

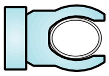
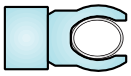
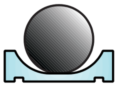
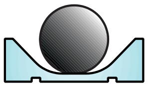
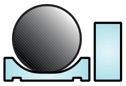
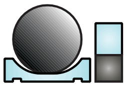
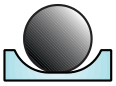
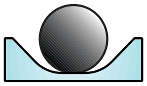
Part Number Guide

Cross Section	Old Part No.	New Part No.	Description	Seal Type	Gland Standard
	N/A	PPA0	Grooved Turcon® Plus Seal® II	Piston	AS4716 Rev. A Zero Back-up Rings
	N/A	PPA1	Grooved Turcon® Plus Seal® II	Piston	AS4716 Rev. A One Back-up Ring
	N/A	PPA2	Grooved Turcon® Plus Seal® II	Piston	AS4716 Rev. A Two Back-up Rings
	N/A	PPA1A	Grooved Turcon® Plus Seal® II w/ one Back-up Ring	Piston	AS4716 Rev. A One Back-up Ring
	N/A	PPA2A	Grooved Turcon® Plus Seal® II w/ two Back-up Rings	Piston	AS4716 Rev. A Two Back-up Rings
	N/A	PPA18G	Grooved Turcon® Plus Seal® II w/ one Stakbak® Back-up Ring	Piston	AS4716 Rev. A One Back-up Ring
	N/A	PPA28G	Grooved Turcon® Plus Seal® w/ two Stakbak® Back-up Rings	Piston	AS4716 Rev. A Two Back-up Rings
	N/A	PPB0	Turcon® Plus Seal® II	Piston	AS4716 Rev. A Zero Back-up Rings
	N/A	PPB1	Turcon® Plus Seal® II	Piston	AS4716 Rev. A One Back-up Ring
	N/A	PPB2	Turcon® Plus Seal® II	Piston	AS4716 Rev. A Two Back-up Rings
	N/A	PPB1A	Turcon® Plus Seal® II w/ one Back-up Ring	Piston	AS4716 Rev. A One Back-up Ring
	N/A	PPB2A	Turcon® Plus Seal® II w/ two Back-up Rings	Piston	AS4716 Rev. A Two Back-up Rings
	N/A	PPB18G	Turcon® Plus Seal® II w/ one Stakbak® Back-up Ring	Piston	AS4716 Rev. A One Back-up Ring

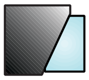
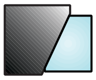
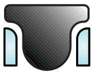
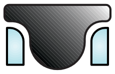
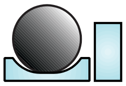
Part Number Guide

Cross Section	Old Part No.	New Part No.	Description	Seal Type	Gland Standard
	N/A	PPB28G	Turcon® Plus Seal® II w/ two Stakbak® Back-up Rings	Piston	AS4716 Rev. A Two Back-up Rings
	N/A	PSF00B	Turcon® Stepseal®	Piston	AS4716 Rev. A Zero Back-up Rings
	N/A	PVA_0	Turcon® Variseal® M2	Piston	AS4716 Rev. A Zero Back-up Rings
	N/A	PVA_B	Turcon® Variseal® M2	Piston	AS4716 Rev. A One Back-up Ring
	N/A	PVA_E	Turcon® Variseal® M2	Piston	AS4716 Rev. A Two Back-up Rings
	N/A	PVC	Turcon® Variseal® M2S	Piston	AS4716 Rev. A Zero Back-up Rings
	N/A	PVE_0	Turcon® Variseal® H	Piston	AS4716 Rev. A Zero Back-up Rings
	N/A	PVE_B	Turcon® Variseal® H	Piston	AS4716 Rev. A One Back-up Ring
	N/A	PVE_E	Turcon® Variseal® H	Piston	AS4716 Rev. A Two Back-up Rings
	N/A	PVJ_0	Turcon® Variseal® W2	Piston	AS4716 Rev. A Zero Back-up Rings
	N/A	PVJ_B	Turcon® Variseal® W2	Piston	AS4716 Rev. A One Back-up Ring
	N/A	PVJ_E	Turcon® Variseal® W2	Piston	AS4716 Rev. A Two Back-up Rings
	N/A	PVP_0	Turcon® Variseal® SA	Piston	AS4716 Rev. A Zero Back-up Rings

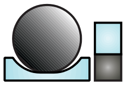
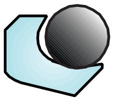
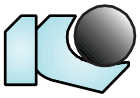
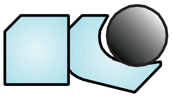
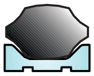
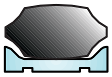
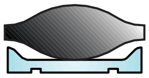
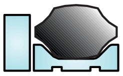
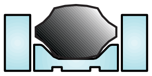
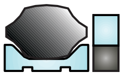
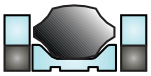
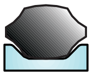
Part Number Guide

Cross Section	Old Part No.	New Part No.	Description	Seal Type	Gland Standard
	N/A	PVP_B	Turcon® Variseal® SA	Piston	AS4716 Rev. A One Back-up Ring
	N/A	PVP_E	Turcon® Variseal® SA	Piston	AS4716 Rev. A Two Back-up Rings
	N/A	RBB2_G	Turcon® T-Seal Staged	Rod	AS4716 Rev. A Two Back-up Rings
	N/A	RDA0_G	Grooved Turcon® Double Delta® II	Rod	AS4716 Rev. A Zero Back-up Rings
	N/A	RDA1_G	Grooved Turcon® Double Delta® II w/ one Back-up Ring	Rod	AS4716 Rev. A One Back-up Ring
	N/A	RDA2_G	Grooved Turcon® Double Delta® II w/ two Back-up Rings	Rod	AS4716 Rev. A Two Back-up Rings
	N/A	RDA1AG	Grooved Turcon® Double Delta® II w/ one Back-up Ring	Rod	AS4716 Rev. A One Back-up Ring
	N/A	RDA2AG	Grooved Turcon® Double Delta® II w/ two Back-up Rings	Rod	AS4716 Rev. A Two Back-up Rings
	N/A	RDA18G	Grooved Turcon® Double Delta® II w/ one Stakbak® Back-up Ring	Rod	AS4716 Rev. A One Back-up Ring
	N/A	RDA28G	Grooved Turcon® Double Delta® II w/ two Stakbak® Back-up Rings	Rod	AS4716 Rev. A Two Back-up Rings
	N/A	RDB0_G	Turcon® Double Delta® II	Rod	AS4716 Rev. A Zero Back-up Rings
	N/A	RDB1_G	Turcon® Double Delta® II	Rod	AS4716 Rev. A One Back-up Ring
	N/A	RDB2_G	Turcon® Double Delta® II	Rod	AS4716 Rev. A Two Back-up Rings

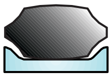
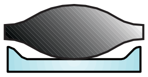
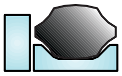
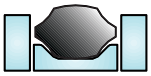
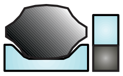
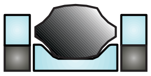
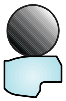
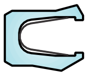
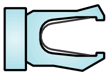
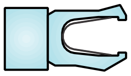
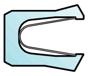
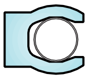
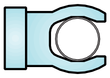
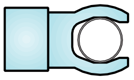
Part Number Guide

Cross Section	Old Part No.	New Part No.	Description	Seal Type	Gland Standard
	N/A	RAA0_G	Turcon® Unidirectional Wedgpak® II	Rod	AS4716 Rev. A Zero Back-up Rings
	N/A	RAA1_G	Turcon® Wedgpak® II	Rod	AS4716 Rev. A One Back-up Ring
	N/A	RAA2_G	Turcon® Wedgpak® II	Rod	AS4716 Rev. A Two Back-up Rings
	N/A	RAB1_G	Turcon® Wedgpak® EP	Rod	AS4716 Rev. A One Back-up Ring
	N/A	RAB2_G	Turcon® Wedgpak® EP	Rod	AS4716 Rev. A Two Back-up Rings
	N/A	RAU0_G	Turcon® Unidirectional Wedgpak® II	Rod	AS4716 Rev. A Zero Back-up Rings
	N/A	RAU1_G	Turcon® Unidirectional Wedgpak® II	Rod	AS4716 Rev. A One Back-up Ring
	N/A	RAU2_G	Turcon® Unidirectional Wedgpak® II	Rod	AS4716 Rev. A Two Back-up Rings
	N/A	RBA0_G	Turcon® T-Seal	Rod	AS4716 Rev. A Zero Back-up Rings
	N/A	RBA1_G	Turcon® T-Seal	Rod	AS4716 Rev. A One Back-up Ring
	N/A	RBA2_G	Turcon® T-Seal	Rod	AS4716 Rev. A Two Back-up Rings
	N/A	RDB1AG	Turcon® Double Delta® II w/ one Back-up Ring	Rod	AS4716 Rev. A One Back-up Ring
	N/A	RDB2AG	Turcon® Double Delta® II w/ two Back-up Rings	Rod	AS4716 Rev. A Two Back-up Rings

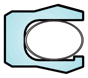
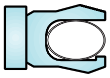
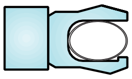
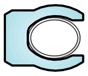
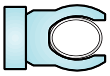
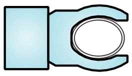
Part Number Guide

Cross Section	Old Part No.	New Part No.	Description	Seal Type	Gland Standard
	N/A	RDB18G	Turcon® Double Delta® II w/ one Stakbak® Back-up Ring	Rod	AS4716 Rev. A One Back-up Ring
	N/A	RDB28G	Turcon® Double Delta® II w/ two Stakbak® Back-up Rings	Rod	AS4716 Rev. A Two Back-up Rings
	N/A	REL2	Turcon® VL seal	Rod	AS4716 Rev. A Zero Back-up Rings
	N/A	REL2B	Turcon® VL seal w/ one Back-up Ring	Rod	AS4716 Rev. A One Back-up Ring
	N/A	REL2E	Turcon® VL seal w/ one Back-up Ring	Rod	AS4716 Rev. A Two Back-up Rings
	N/A	RPA0	Grooved Turcon® Plus Seal® II	Rod	AS4716 Rev. A Zero Back-up Rings
	N/A	RPA1	Grooved Turcon® Plus Seal® II	Rod	AS4716 Rev. A One Back-up Ring
	N/A	RPA2	Grooved Turcon® Plus Seal® II	Rod	AS4716 Rev. A Two Back-up Rings
	N/A	RPA1A	Grooved Turcon® Plus Seal® II w/ one Back-up Ring	Rod	AS4716 Rev. A One Back-up Ring
	N/A	RPA2A	Grooved Turcon® Plus Seal® II w/ two Back-up Rings	Rod	AS4716 Rev. A Two Back-up Rings
	N/A	RPA18G	Grooved Turcon® Plus Seal® II w/ one Stakbak® Back-up Ring	Rod	AS4716 Rev. A One Back-up Ring
	N/A	RPA28G	Grooved Turcon® Plus Seal® II w/ two Stakbak® Back-up Rings	Rod	AS4716 Rev. A Two Back-up Rings
	N/A	RPB0	Turcon® Plus Seal® II	Rod	AS4716 Rev. A Zero Back-up Rings

Part Number Guide

Cross Section	Old Part No.	New Part No.	Description	Seal Type	Gland Standard
	N/A	RPB1	Turcon® Plus Seal® II	Rod	AS4716 Rev. A One Back-up Ring
	N/A	RPB2	Turcon® Plus Seal® II	Rod	AS4716 Rev. A Two Back-up Rings
	N/A	RPB1A	Turcon® Plus Seal® II w/ one Back-up Ring	Rod	AS4716 Rev. A One Back-up Ring
	N/A	RPB2A	Turcon® Plus Seal® II w/ two Back-up Rings	Rod	AS4716 Rev. A Two Back-up Rings
	N/A	RPB18G	Turcon® Plus Seal® II w/ one Stakbak® Back-up Ring	Rod	AS4716 Rev. A One Back-up Ring
	N/A	RPB28G	Turcon® Plus Seal® II w/ two Stakbak® Back-up Rings	Rod	AS4716 Rev. A Two Back-up Rings
	N/A	RSF00B	Turcon® Stepseal® 2K	Rod	AS4716 Rev. A Zero Back-up Rings
	N/A	RVA_0	Turcon® Variseal® M2	Rod	AS4716 Rev. A Zero Back-up Rings
	N/A	RVA_B	Turcon® Variseal® M2 w/ one Back-up Ring	Rod	AS4716 Rev. A One Back-up Ring
	N/A	RVA_E	Turcon® Variseal® M2 w/ two Back-up Rings	Rod	AS4716 Rev. A Two Back-up Rings
	N/A	RVC	Turcon® Variseal® M2S	Rod	AS4716 Rev. A Zero Back-up Rings
	N/A	RVE_0	Turcon® Variseal® H	Rod	AS4716 Rev. A Zero Back-up Rings
	N/A	RVE_B	Turcon® Variseal® H w/ one Back-up Ring	Rod	AS4716 Rev. A One Back-up Ring
	N/A	RVE_E	Turcon® Variseal® H w/ two Back-up Rings	Rod	AS4716 Rev. A Two Back-up Rings

Part Number Guide

Cross Section	Old Part No.	New Part No.	Description	Seal Type	Gland Standard
	N/A	RVJ_0	Turcon® Variseal® W2	Rod	AS4716 Rev. A Zero Back-up Rings
	N/A	RVJ_B	Turcon® Variseal® W2 w/ one Back-up Ring	Rod	AS4716 Rev. A One Back-up Ring
	N/A	RVJ_E	Turcon® Variseal® W2 w/ two Back-up Rings	Rod	AS4716 Rev. A Two Back-up Rings
	N/A	RVP_0	Turcon® Variseal® SA	Rod	AS4716 Rev. A Zero Back-up Rings
	N/A	RVP_B	Turcon® Variseal® SA w/ one Back-up Ring	Rod	AS4716 Rev. A One Back-up Ring
	N/A	RVP_E	Turcon® Variseal® SA w/ two Back-up Rings	Rod	AS4716 Rev. A Two Back-up Rings

Part Number Guide

Aerospace Part Number Reference Guide - (By New Part Number)

New P/N	Old P/N
BG010M	S37001
BG020M	S37002
BG110M	S37011
BG210M	S37021
BG410M	S37241
BG420M	S37242
BG440G	S38544
BG450G	S38545
BG480M	S11248
BG510M	S37251
BG520M	S37252
BG550M	S37055
BG600M	S37060
BG610M	S37261
BG660M	S12766
BG690M	S13069
BG710M	S37271
BG760M	S37076
BG830M	S37083
BG870G	S38587
BG880G	S38588
BG920M	S36992
BG940M	S30294
BG990M	S36991
BGS10M	S33861
BGS20M	S13122
BP090A	S11109
BP170M	S12517
BU100M	S30310
BU180G	S38618
BU190G	S38619
BU230M	S33823

New P/N	Old P/N
BU440M	S33824
BU870M	S12587
BU890M	S30989
BUS00M	S13050
BUS70M	S33157
DW000B	S38000
DW010B	S38001
GP__WB	S34546
GP__XB	S34545
GP__YB	S34547
GR__WB	S34549
GR__XB	S34548
GR__YB	S34550
N/A	S11242
N/A	S11243
N/A	S11370
N/A	S11943
N/A	S12257
N/A	S13076
N/A	S13077
N/A	S13180
N/A	S13181
N/A	S13201
N/A	S13206
N/A	S13207
N/A	S30471
N/A	S30611
N/A	S30622
N/A	S30676
N/A	S30681
N/A	S30682
N/A	S30683

Part Number Guide

Aerospace Part Number Reference Guide - (By New Part Number)

New P/N	Old P/N
N/A	S30684
N/A	S32831
N/A	S32832
N/A	S32840
N/A	S32841
N/A	S32842
N/A	S32891
N/A	S32892
N/A	S32893
N/A	S32894
N/A	S32909
RG13_B	S32913
PG14_B	S32914
N/A	S32985
N/A	S33081
N/A	S33084
N/A	S33087
N/A	S33090
N/A	S33277
N/A	S33278
N/A	S33353
N/A	S33528
N/A	S33557
N/A	S33565
N/A	S34841
N/A	S34842
OC140M	S11214
OC320M	S11732
PA1__M	S38621
PA2__M	S38622
PA640M	S35964
PA80_M	S34780
PA81_M	S34781
PA82_M	S34782
PB00_M	S34700
PB01_M	S34701
PB02_M	S34702
PB20_M	S38420
PB21_M	S38421
PB22_M	S38422
PD00_M	S12714
PD03_M	S12508
PD04_M	S12563
PD05_M	S12603
PD06_M	S12716
PD070M	S12957
PD080M	S30289
PD10_M	S30641
PD11_M	S30642
PD130M	S11338
PD19_M	S30640
PD60_M	S30660
PD61_M	S30661
PD62_M	S30662
PD780M	S30678
PD80_M	S32860
PD81_M	S32861
PD82_M	S32862
PF00_B	S11052
PF01_B	S11114
PF02_B	S12083
PF03_B	S12230
PF04_B	S13095
PF05_B	S13126

Aerospace Part Number Reference Guide - (By New Part Number)

New P/N	Old P/N
PF06_B	S13135
PF07_B	S30071
PF08_B	S38003
PF09_B	S38002
PF52_B	S32152
PG00_B	S11718
PG02_B	S32910
PG28_B	S32928
PG47_B	S12547
PG59N	S30059
PG68_B	S12068
PG95_B	S12795
PG990B	S12599
PGE4_B	S32934
PP00_M	S38362
PP01_M	S36621
PP02_M	S37401
PP03_M	S36622
PP040M	S37804
PP09_M	S33709
PP21_M	S34721
PP22_M	S34722
PP37_M	S12737
PP50_M	S34750
PP52_M	S30852
PP60_M	S34760
PP61_M	S37061
PP62_M	S37062
PP66_M	S38662
PP68_M	S38661
PP72_M	S30772
PP81_M	S34581

New P/N	Old P/N
PP82_M	S34582
PQ200M	S38620
PS720B	S32572
PS740B	S32574
PSA80B	S34768
PV920M	S32240
PV930M	S32265
RA1_M	S38611
RA2_M	S38612
RA490G	S38649
RA610M	S35961
RA70_M	S34770
RA71_M	S34771
RA72_M	S34772
RB10_M	S38410
RB11_M	S38411
RB12_M	S38412
RB90_M	S34690
RB91_M	S34691
RB92_M	S34692
RD03_M	S12223
RD040M	S12560
RD05_M	S12561
RD06_M	S12562
RD07_M	S12604
RD08_M	S12715
RD090M	S12956
RD100M	S13068
RD12_M	S13200
RD140M	S30010
RD160M	S30050
RD17_M	S30630

Part Number Guide

Aerospace Part Number Reference Guide - (By New Part Number)

New P/N	Old P/N
RD18_M	S30631
RD19_M	S30632
RD200M	S30675
RD210M	S30677
RD22_M	S32830
RD240B	S11859
RD50_M	S30650
RD51_M	S30651
RD52_M	S30652
RD550M	S33555
RD80_M	S32850
RD81_M	S32851
RD82_M	S32852
RD890M	S11589
RF210B	S33121
RF95_B	S12095
RG00_B	S11717
RG27_B	S32927
RG46_B	S12546
RG58N	S30058
RG66_B	S12066
RG94_B	S12794
RGE3_B	S32933
RH170M	S33317
RH310M	S34831
RH320M	S34832
RH510M	S34851
RH520M	S34852
RH530B	S34853
RH790M	S32979
RH910M	S32991
RP00_M	S36611

New P/N	Old P/N
RP01_M	S34435
RP02_M	S37411
RP03_M	S37431
RP11_M	S34711
RP12_M	S34712
RP31_M	S38371
RP32_M	S38372
RP35_M	S12735
RP40_M	S11940
RP470G	S38647
RP51_M	S37051
RP52_M	S37052
RP55_M	S30855
RP71_M	S34571
RP72_M	S34572
RP75_M	S30775
RP81_M	S38671
RP82_M	S38672
RP99_M	S36612
RS570B	S32571
RS730B	S32573
RSA70B	S34767
WE25_B	S32925
WE65_S	S33865
WE670B	S37967
WE69_S	S30669
WE710B	S37971
WE720B	S37972
WE95_B	S30395
WM650S	S11065
WM820S	S34382
WM880S	S30388

Notes

Notes

LOCAL CONTACTS

EUROPE

Austria – Vienna (Slovenia)
+43 (0) 1 406 47 33
Belgium - Dion-Valmont (Luxembourg)
+32 (0) 10 22 57 50
Bulgaria – Sofia (Azerbaijan, Belarus, Greece, Romania, Ukraine)
+359 (0) 2 969 95 99
Croatia – Zagreb (Albania, Bosnia and Herzegovina, Macedonia, Serbia, Montenegro)
+385 (0) 1 24 56 387
Czech Republic - Rakovnik (Slovakia)
+420 313 529 111
Denmark – Copenhagen
+45 48 22 80 80
Finland – Vantaa (Estonia, Latvia)
+358 (0) 207 12 13 50
France - Maisons-Laffitte
+33 (0) 1 30 86 56 00

Germany - Stuttgart
+49 (0) 711 7864 0
Hungary – Budaörs
+36 (06) 23 50 21 21
Italy – Livorno
+39 0586 22 6111
The Netherlands - Rotterdam
+31 (0) 10 29 22 111
Norway – Oslo
+47 22 64 60 80
Poland – Warsaw (Lithuania)
+48 (0) 22 863 30 11
Russia – Moscow
+7 495 627 57 22
Spain – Madrid (Portugal)
+34 (0) 91 71057 30
Sweden – Jönköping
+46 (0) 36 34 15 00

Switzerland – Crissier
+41 (0) 21 631 41 11
Turkey – Istanbul
+90 216 569 73 00
United Kingdom - Solihull (Eire, South Africa)
+44 (0) 121 744 1221

Aerospace Hub Europe, North (UK and Nordic Countries)
+44 (0) 121 744 1221
Aerospace Hub Europe, South & West (Continental Europe and Middle East)
+33 (0) 1 30 86 56 00
Automotive Hub Europe
+49 (0) 711 7864 0

AMERICAS

Americas Regional
+1 260 749 9631
Brazil – São José dos Campos
+55 12 3932 7600
Canada Central – Etobicoke, ON
+1 416 213 9444
Canada East – Montreal, QC
+1 514 284 1114
Canada West – Langley, BC
+1 604 539 0098
Mexico - Mexico City
+52 55 57 19 50 05

USA, Great Lakes - Fort Wayne, IN
+1 260 482 4050
USA, East - Mt. Juliet, TN
+1 615 800 8340
USA, Midwest - Schaumburg, IL
+1 630 539 5500
USA, Northern California - Fresno, CA
+1 559 449 6070
USA, Northwest - Portland, OR
+1 503 595 6565
USA, Southwest - Houston, TX
+1 713 461 3495

Aerospace Hub Airframe
+1 303 469 1357
Aerospace Hub Distribution & Engineering
+1 260 749 9631
Aerospace Hub East
+1 610 828 3209
Aerospace Hub West
+1 310 371 1025
Automotive Hub North America
+1 734 354 1250
Automotive Hub South America
+55 12 3932 7600

ASIA PACIFIC

Asia Pacific Regional
+65 6 577 1778
China – Hong Kong
+852 2366 9165
China – Shanghai
+86 (0) 21 6145 1830
India – Bangalore
+91 (0) 80 3372 9000
Japan – Tokyo
+81 (0) 3 5633 8008
Korea – Seoul
+82 (0) 2 761 3471

Malaysia - Kuala Lumpur
+60 (0) 3 90549266
Taiwan – Taichung
+886 4 2382 8886
Vietnam – Ho Chi Minh City
+84 8 6288 6407
Singapore and all other countries in South and East Asia, Australasia
+65 6 577 1778

Aerospace Hub China
+86 (0) 21 6145 1830
Aerospace Hub Singapore
+65 6 577 1778
Automotive Hub China
+86 (0) 21 6145 1830
Automotive Hub India
+91 (0) 80 3372 9200

AFRICA, CENTRAL ASIA AND MIDDLE EAST

Africa & Iran (excluding South Africa (see UK))
+41 (0) 21 631 41 11

Central Asia (Armenia, Georgia, Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan)
+7 495 627 57 22

Middle East and Gulf Region
+359 (0) 2 969 95 99

TRELLEBORG

Trelleborg is a world leader in engineered polymer solutions that seal, damp and protect critical applications in demanding environments. Its innovative engineered solutions accelerate performance for customers in a sustainable way. The Trelleborg Group has local presence in over 40 countries around the world.

facebook.com/TrelleborgSealingSolutions
twitter.com/TrelleborgSeals
youtube.com/TrelleborgSeals
flickr.com/TrelleborgSealingSolutions

99GBAOCATAE0811

WWW.TSS.TRELLEBORG.COM