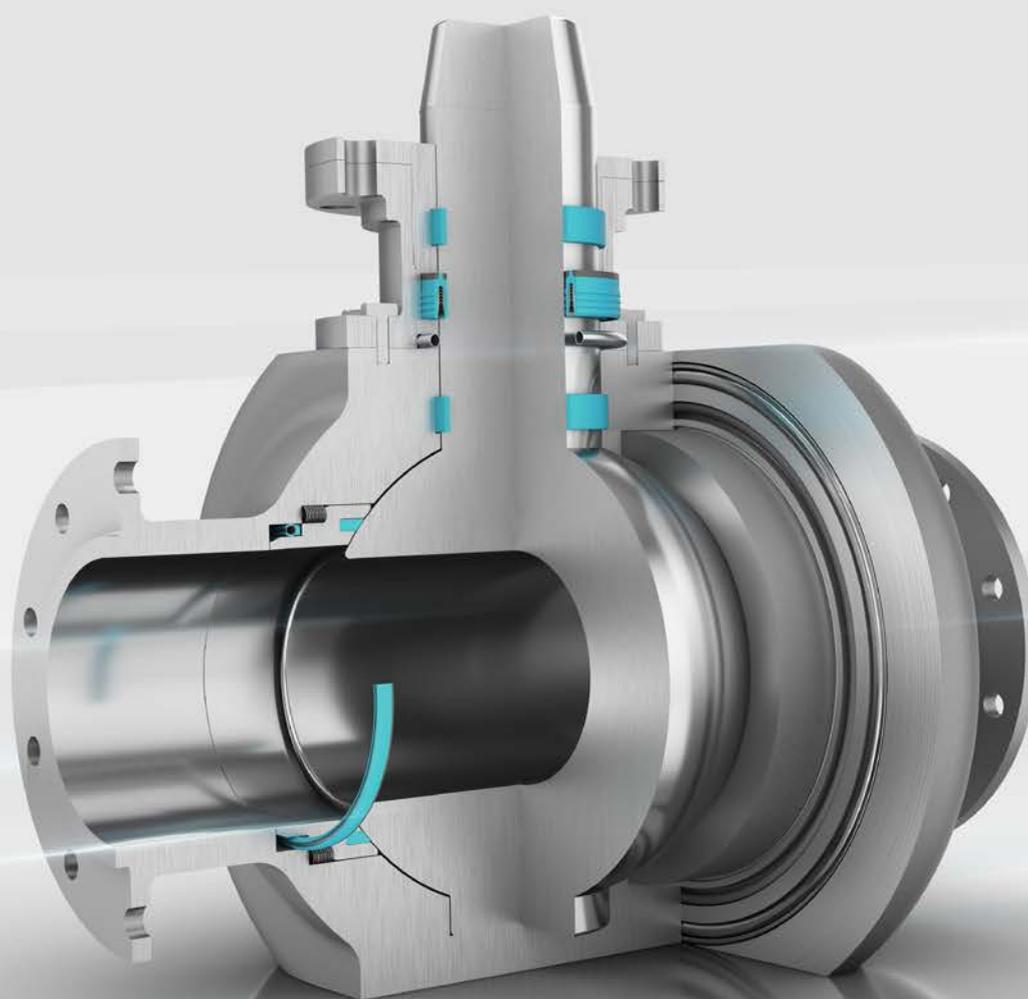


# Valve Stem Sealing Solutions for the Energy Market

**TURCON® VARISEAL® MC & VARISEAL® V-STACK KITS**





## Your Partner for Sealing Technology

Trelleborg Sealing Solutions is a major international developer, manufacturer and supplier of seals, bearings and molded components in polymers. We are 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, silicone, 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 80 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.

Trelleborg Sealing Solutions facilities are certified according to current market-related quality standards. In addition to the established ISO 9001 standard, our facilities are certified to environmental, health and safety standards, as well as specific customer specifications. These certifications are in many cases prerequisites, allowing us to comply to all market segment requirements.



The information in this catalog is intended for general reference only and not for specific applications. Application limits for pressure, temperature, speed and media are maximum values determined in laboratory conditions. In application, due to operating parameters, maximum values may not be achievable. Customers must satisfy themselves of a product and material's suitability for 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 catalog. While every effort is made to ensure the accuracy of information contained herewith, Trelleborg Sealing Solutions cannot warrant the accuracy or completeness of information.

**Contact your local Customer Solution Center to obtain the best recommendation for a specific application from Trelleborg Sealing Solutions.**  
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# Design Support & Engineering Tools

## ONLINE TOOLS MAKE LIFE EASIER

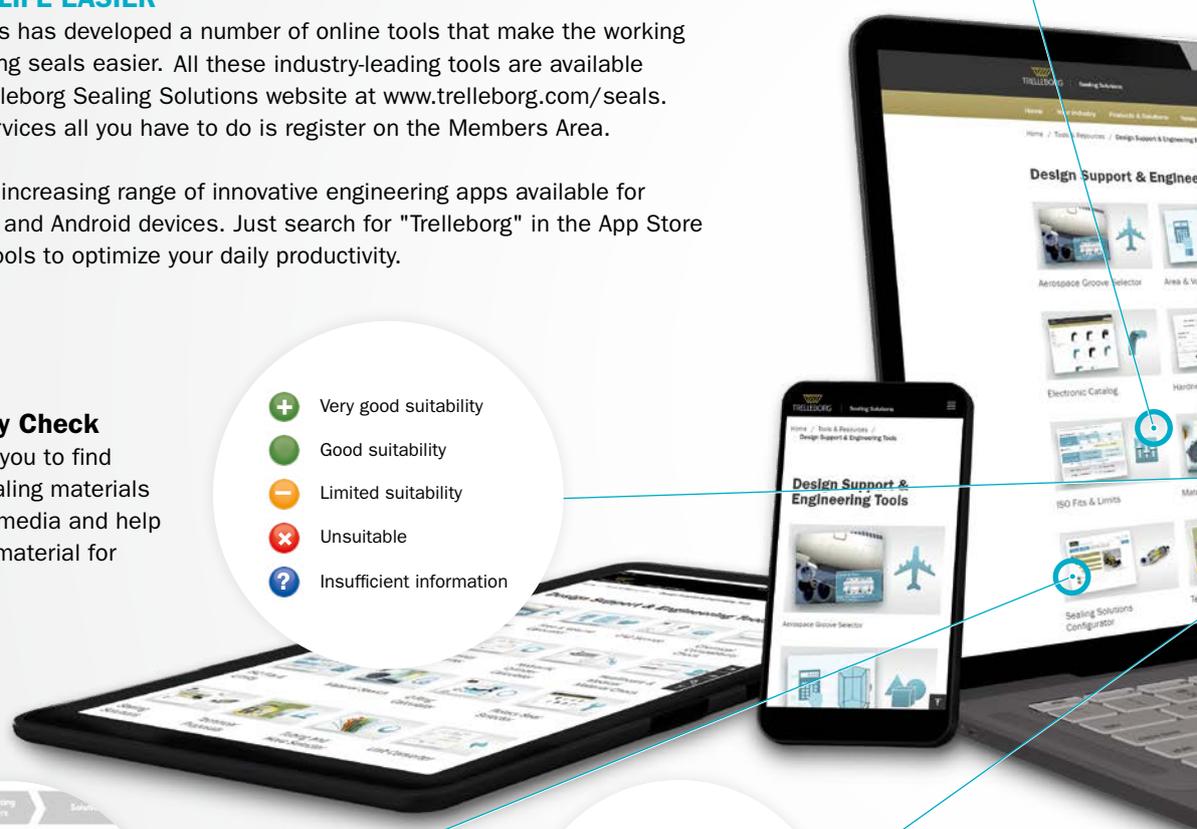
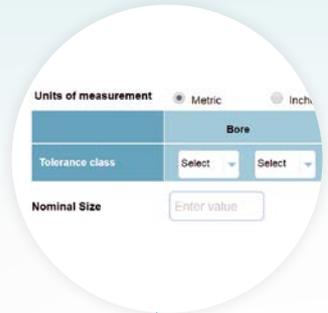
Trelleborg Sealing Solutions has developed a number of online tools that make the working life of an engineer specifying seals easier. All these industry-leading tools are available free-of-charge from the Trelleborg Sealing Solutions website at [www.trelleborg.com/seals](http://www.trelleborg.com/seals). To use these advanced services all you have to do is register on the Members Area.

There is also a continually increasing range of innovative engineering apps available for smartphones, both for iOS and Android devices. Just search for "Trelleborg" in the App Store or GooglePlay to find the tools to optimize your daily productivity.

## Materials Search and Chemical Compatibility Check

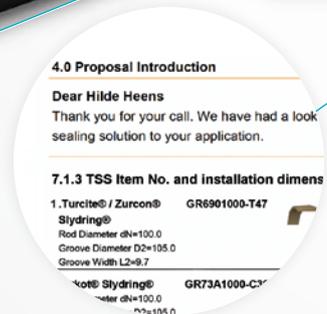
These two programs allow you to find out the compatibility of sealing materials with hundreds of different media and help identify the most suitable material for your application.

- + Very good suitability
- Good suitability
- Limited suitability
- ✗ Unsuitable
- ? Insufficient information



## Sealing Solutions Configurator

The Sealing Solutions Configurator is the first tool of its kind offered by any seal supplier. It allows engineers to identify a proven sealing solution for their specific application in just four easy steps.



## Technical Proposals Online

Enhance your communication with Trelleborg Sealing Solutions with the Technical Proposals Online tool. Instantly access all your proposed solutions anywhere at any time and benefit from quicker dialog with our sealing specialists.



### ISO Fits & Tolerances

Our Fits & Tolerances Calculator allows you to easily determine type of fits using the tolerances according to DIN ISO 286. In addition, upon entering the nominal diameter the tool calculates lower and upper limit deviations plus the maximum and minimum interferences dependent on the selected tolerance classes for bore and shaft.



### Versatile CAD Service

The CAD download functionality provides thousands of drawings of a wide range of seals. It gives the option of 2- or 3-dimensional files in a range of formats to suit most commonly used CAD systems.



### Hydraulic System Calculator

Hydraulic System Calculator helps you design a solution around the cylinder which may involve motor, pump, orifice and pipe calculations. The application is in compliance with ISO 3320, ISO 3321 & ISO 4393.



### Rotary Seal Selector

The Rotary Seal Selector allows you to search through the wide range of rotary seals and materials available based on application conditions and offers detailed information on installation and seal capabilities.



### O-Ring Calculator

An industry-leading tool, the easy to use O-Ring calculator includes sizing capabilities, compression forces, design parameter recommendations and complete measurements. Results and comments may be printed, shared or filed as PDF.

Discover our design support and engineering tools at [www.trelleborg.com/seals](http://www.trelleborg.com/seals)



# Mobile Tools & Apps

We understand the needs of engineers on the go. Check out our latest mobile tools and apps, ranging from an O-Ring calculator to unit and hardness converters. Just search for "Trelleborg" in the App Store or Google Play to find the tools to optimize your daily productivity.

Discover our wide range of mobile tools and apps at [www.trelleborg.com/seals](http://www.trelleborg.com/seals)

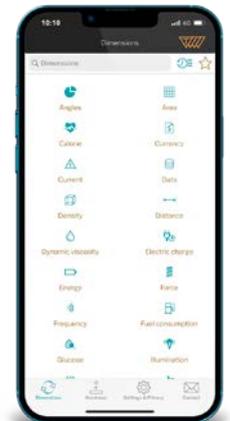
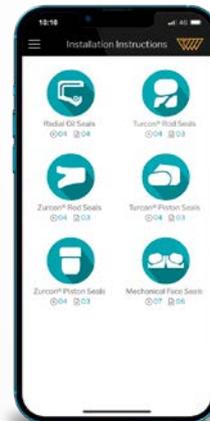
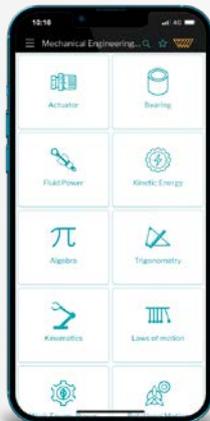


MANY MORE APPS available

Available on the APP STORE



Android App on Google Play



## ISO Fits & Tolerances

Simply enter the nominal diameter and select the tolerance classes for bore and shaft to find the complete ISO fits definition. It contains all relevant values, including type of fit, with handy graphs to illustrate the classes by bore and shaft. The results of this application are based on DIN ISO 286.



## Mechanical Engineering Calculator

A useful app containing over 250 formula calculators in 16 categories, with more being added with every update. Categories include the fields of mathematics, physics and mechanical engineering.



## Aerospace Groove Selector

This app covers five of the most important SAE Aerospace groove standards, making it quick and easy to find the size of grooves and hardware needed. Includes dimensions for AS4716 Rev B, AS5857 Rev A, AS6235 Rev A, AS4088 Rev E and AS4832 Rev A.



## Installation Instructions

Videos demonstrate the best practice methods for installing seals, providing all relevant documentation within the interface. It guides you to successful installation of Radial Oil Seals, Mechanical Face Seals and Turcon® and Zurcon® rod and piston seals.



## Converter – Universal

By simply selecting the dimension and entering a value for conversion, the app offers a wide range of engineering and scientific units for each dimension. It also has other useful features like currency conversion, timezone conversion, percentage calculations, a running pace calculator and more.



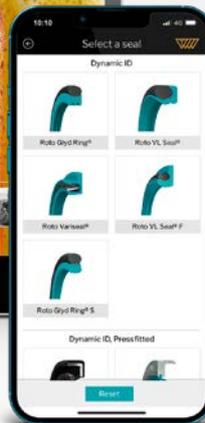
**in the groove**

Our *in the groove* magazine provides news, technical and product information on seals, as well as insights into the markets they are used in. The magazine is also available in print and as an interactive PDF.



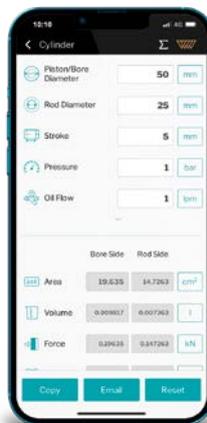
**Rotary Seal Selector**

This app is specifically for the selection of rotary seals based on application information, including size, operating parameters and the lubricant used. It also considers installation type and seal function.



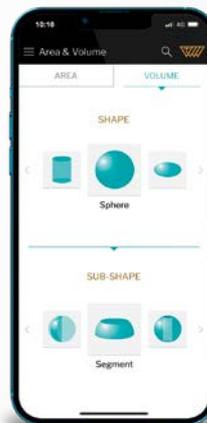
**O-Ring Selector**

When a user enters installation specifications into the O-Ring Selector app, such as the bore or rod/shaft diameter, the app quickly calculates O-Ring and housing dimensions in both metric and inch. Standards covered are ISO 3601-1, NFT 47-502, JIS B 2401 and SMS 1586.



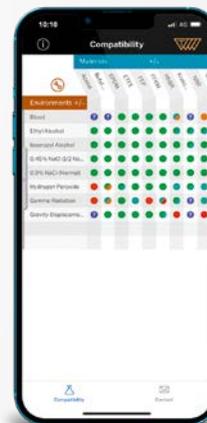
**Hydraulic System Calculator**

The Hydraulic System Calculator helps you design a solution around the cylinder, which may involve motor, pump, orifice and pipe calculations. The application is in compliance with ISO 3320, ISO 3321 and ISO 4393.



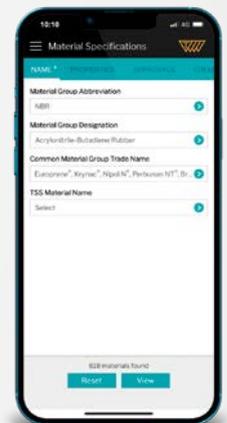
**Area and Volume Calculator**

Speeds up and simplifies calculating the area and volume of more than 170 geometric shapes. The app supports both metric and inch, and conveniently displays the formulas used. Fill your shape with solids or liquids, choosing from 1500 different materials to calculate the weight.



**Healthcare Materials**

A quick and easy overview of the compatibility of 34 materials with 35 chemical environments that are commonly encountered in the healthcare and medical industries. Select up to 20 materials and environments at once to produce a chart that rates each material from 'excellent' to 'not recommended'.



**Sealing Materials Selector**

Enter material specifications and required parameters, such as application temperature or hardness, to receive instant material proposals. The app features filters to limit searches based on chemical compatibility, institute approvals and product type. Data sheets can be requested from within the interface.

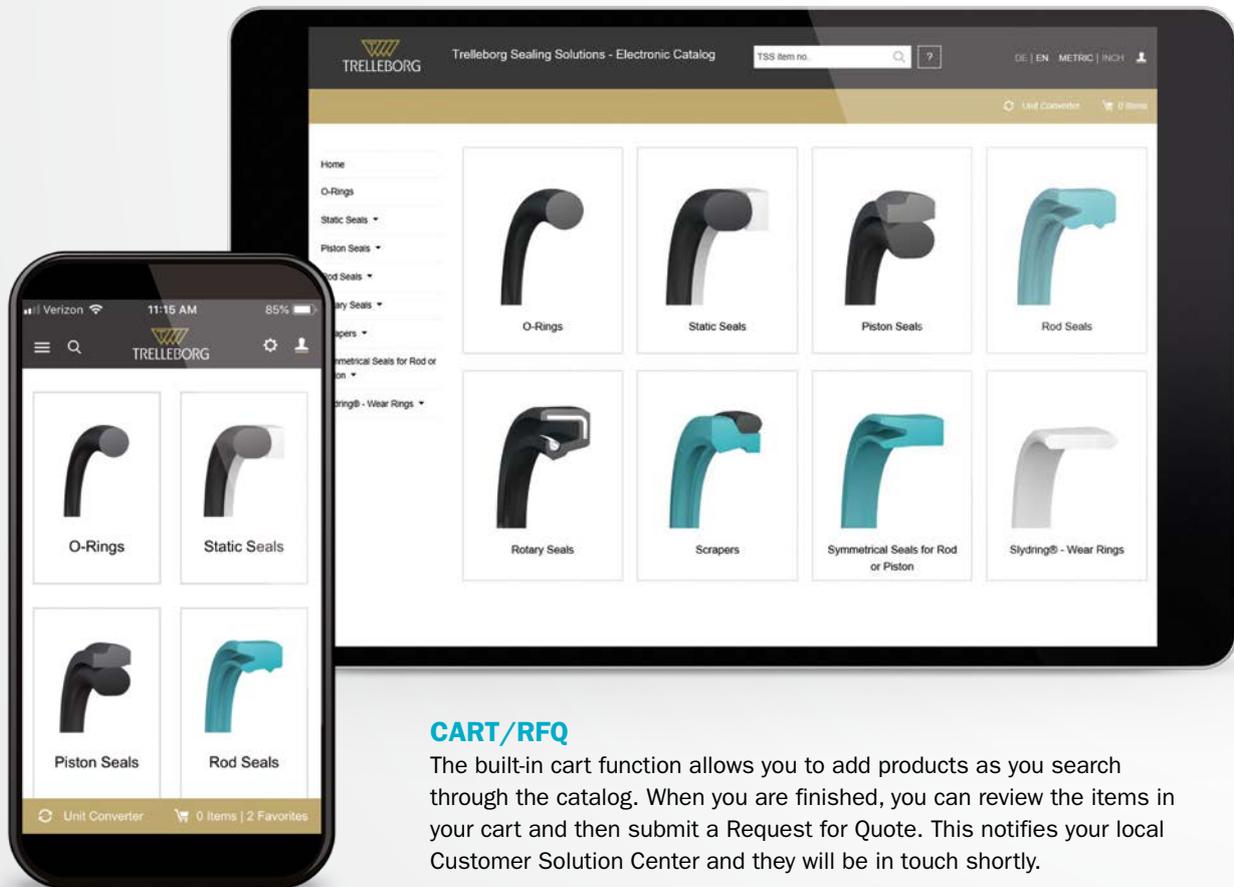
# Electronic Catalog

Discover the Electronic Catalog online as an app or on our website



The Electronic Catalog is a user-friendly service that connects you to the broad range of products Trelleborg Sealing Solutions offers. The products are arranged based on product type and product group, making it easy to find the exact one you need.

Many functions are also included within the Electronic Catalog that allow you to understand product capabilities, compare similar seals, request a quote and much more. The Electronic Catalog is available from the Trelleborg Sealing Solutions website and in the App Store and GooglePlay for mobile use.



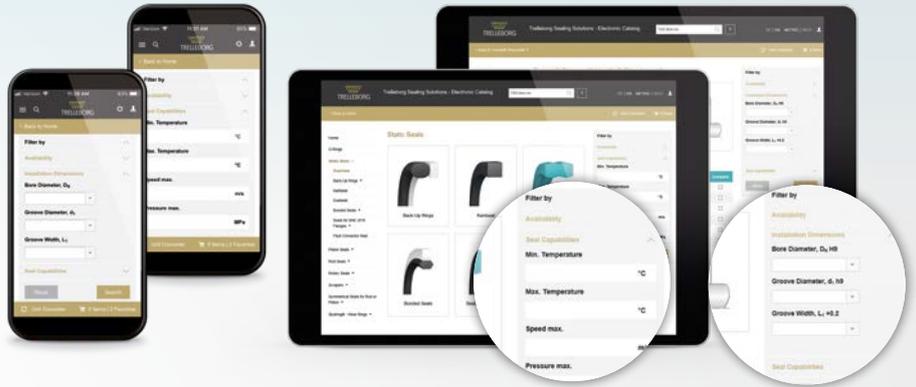
## CART/RFQ

The built-in cart function allows you to add products as you search through the catalog. When you are finished, you can review the items in your cart and then submit a Request for Quote. This notifies your local Customer Solution Center and they will be in touch shortly.



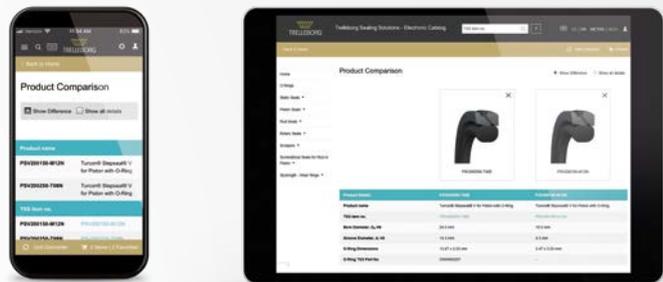
### FILTERING

If you have specific operating conditions that the seal must meet and/or installation dimensions, the Electronic Catalog offers a filtering function within the product groups. Here you can input your temperatures, pressure, speed and various installation dimensions to filter products that can meet your needs.



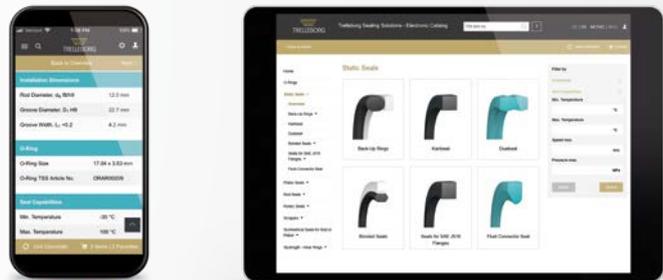
### PRODUCT COMPARISON

When looking through the catalog, you can choose to compare multiple products. The product comparison function allows you to select which products you are interested in, and then puts all relevant information into a table for your review. You can even choose to display all product details side by side or to only show the fields where they differ.



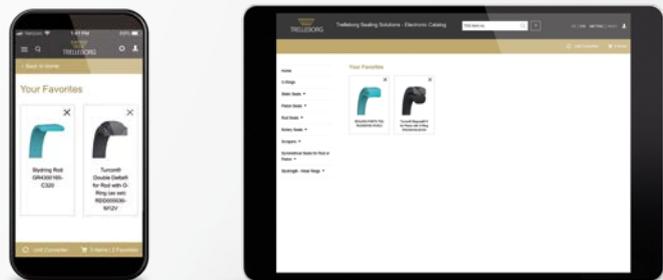
### PRODUCT INFORMATION

Detailed product information is available for each part number. Once you select a specific part number, you will be able to see its installation dimensions, seal capabilities, related catalogs and other information. From this page, registered users can access the material data sheets that are applicable to the part number.



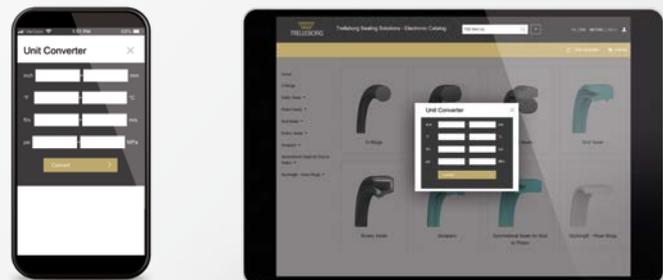
### ADD TO FAVORITES

Do you have a part that you frequently look up or need information on? You can now save any of our part numbers as a favorite that is linked to your account. Anytime you log in to the Electronic Catalog, your favorites will be a click away!



### UNIT CONVERTER

If you are looking at a product and need to know the conversion between metric and imperial, you can use the Unit Converter tool that is available at the top of the screen for web users and at the bottom for mobile.



# Variseal® Oil & Gas Seal Selector

## QUICKLY FIND THE RIGHT SEAL FOR YOUR OIL, GAS & ENERGY APPLICATIONS

Seals are selected for Oil, Gas and Energy applications based on a range of factors that require specialized knowledge, and improper seal selection can result in lost time identifying and correcting the problem. The Variseal® Oil & Gas Seal Selector is a unique online configuration tool that leads you through the selection process to easily create standard or custom proposal documents for our Variseal® range of spring-energized lip seals. Simply select options based on your application parameters and input the required information to instantly see a recommended design, material and type for your application.

You can save the results, send them via email, or download a PDF to share with colleagues outside of the tool. Seal designs or dimensions can be adjusted without the need to repeat the option selection, with instantly revised results.

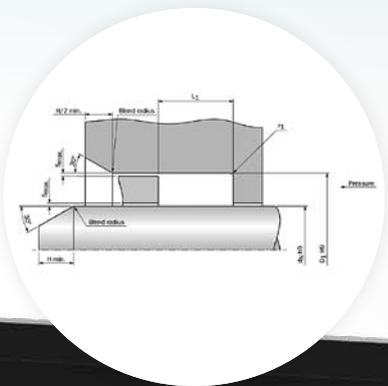


### Covers All Important Parameters

Choose from Radial Rod, Radial Piston, Axial Internal Pressure, and Axial External Pressure sealing options and select values for critical design criteria, including: application, media, temperature, pressure, groove and design type to get an instant recommendation.

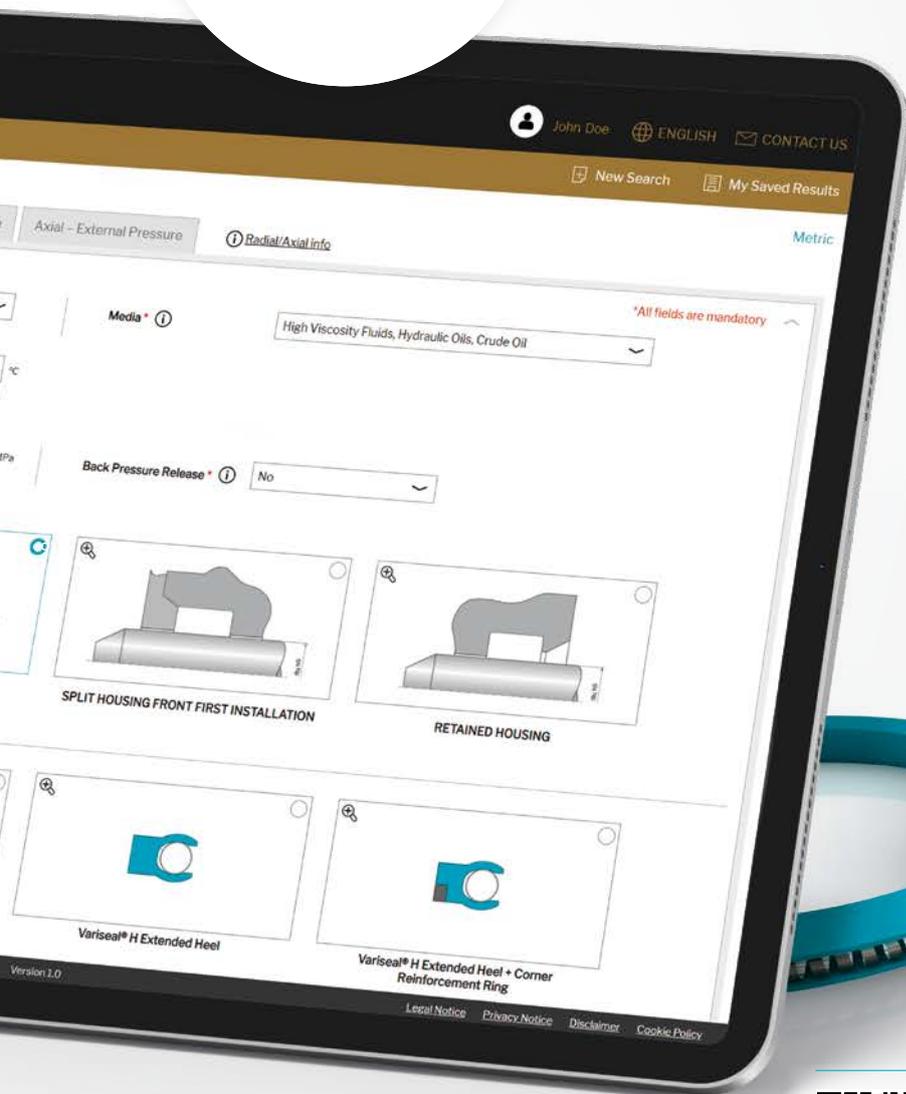
### Designed for Your Application

Use for a wide range of Oil, Gas and Energy applications, including gate, ball and check valves, connectors, and downhole tools.



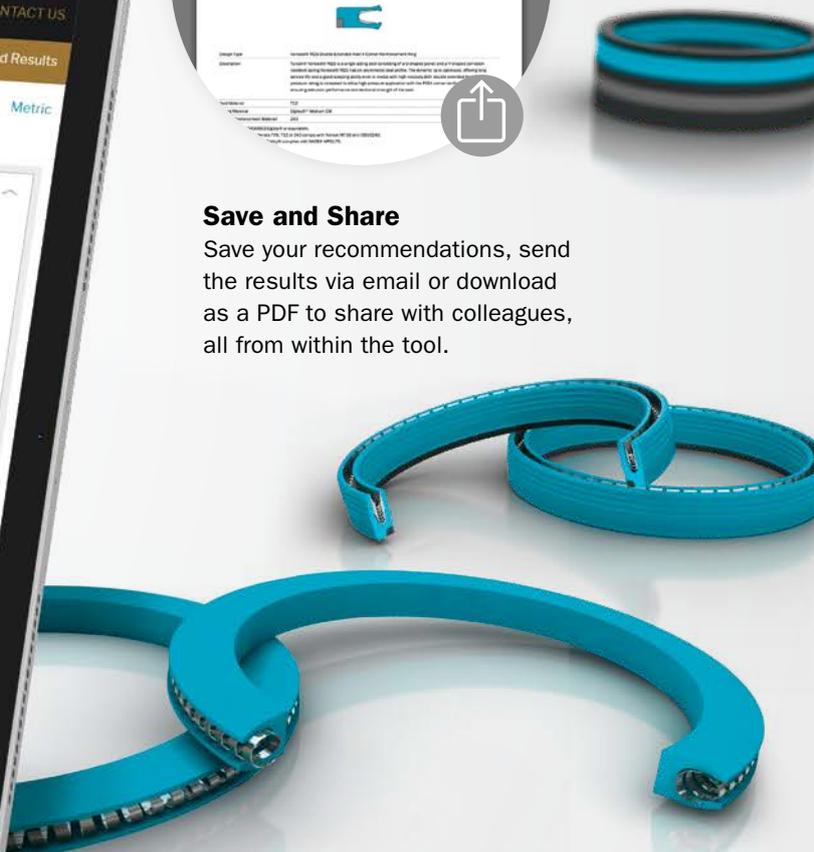
### Everything in One Place

Information is consolidated from multiple resources, including hardware recommendations, design illustrations and other important details to save you time.



### Save and Share

Save your recommendations, send the results via email or download as a PDF to share with colleagues, all from within the tool.



### Free to Use

Sign up for a free members account on the Trelleborg Sealing Solutions website to access the tool and start using it now!

[www.trelleborg.com/seals/tools](http://www.trelleborg.com/seals/tools)



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## ■ Turcon® Variseal® MC

### ■ Introduction

#### DESCRIPTION

Turcon® Variseal® MC is a single-acting, spring-energized primary seal to be used as a single seal within valve stems. Its unique one-piece design is an alternative to conventional technologies, such as V-Stack type products and other valve stem packings. It is characterized by multiple cantilever springs and contact positions on the sealing lips. These provide higher contact force and several sealing positions for increased sealing integrity.

As a self-energizing solution, Turcon® Variseal® MC requires no in-service adjustment and its robust design with improved integrity allows it to withstand extreme pressures and high temperatures. For applications where secondary seals are included behind the primary seal, support rings and pressure release features can be incorporated to prevent back-pressure release or pressure entrapment.

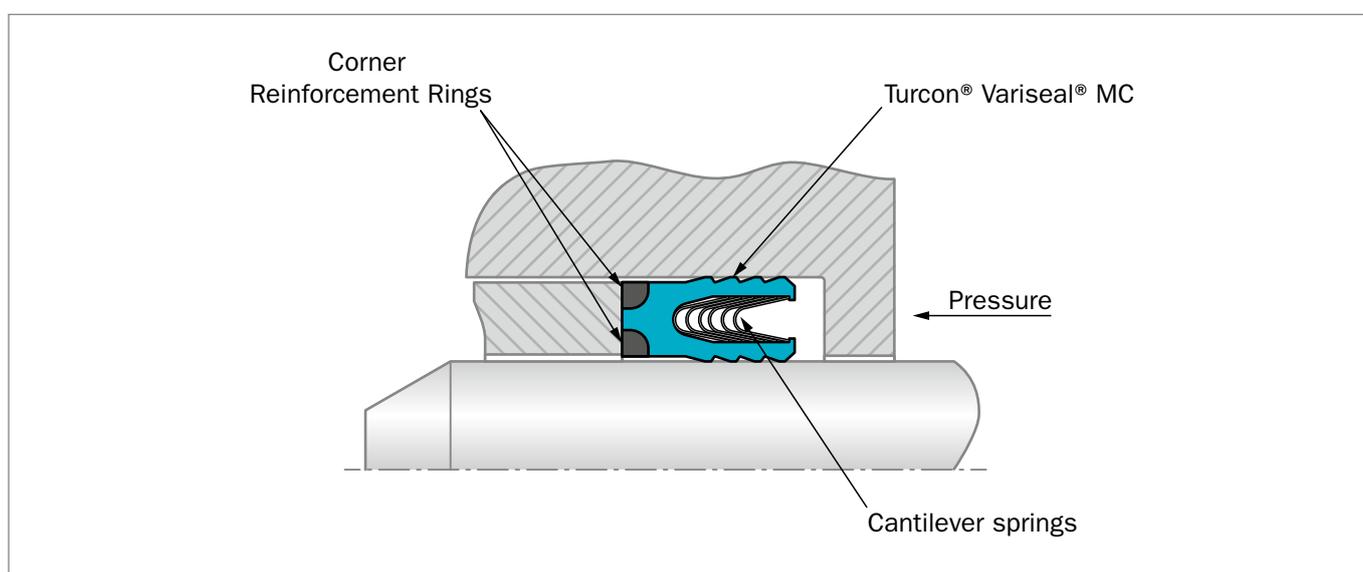


Figure 1: Turcon® Variseal® MC

#### FEATURES AND BENEFITS

- Effective static and slow dynamic sealing
- Reduced friction under high loads compared to packings
- Almost universal chemical compatibility; permanent elasticity unaffected by contact with chemicals
- Withstands aggressive and abrasive process media and resists rapid gas decompression
- Materials compliant with NORSOK M-710 (ISO 23936) and ISO 10423 (API 6A) and UNS R30003; Springs compliant to NACE MR0175
- Available with anti-extrusion Back-up Rings for high pressure service where single or double extrusion gaps are present
- Compact form and single piece installation, ideal for replacing multi-piece packing and sealing systems
- No external preload required. Resistant to compression set and the need for retightening
- Available in standard gland dimensions from 200 to 500 series. Special sizes and geometries are also available.
- Unlimited shelf life



## APPLICATION EXAMPLES

- Valve stems

## OPERATING CONDITIONS

<b>Pressure:</b>	40 MPa (103.4 MPa with Back-up Ring)
<b>Temperature:</b>	-70 °C to +250 °C
<b>Media</b>	Virtually all fluids, chemicals and gases
<b>Compatibility:</b>	

### IMPORTANT NOTE

The above data are maximum values and cannot be used at the same time, e.g, the maximum operating speed depends on material type, pressure, temperature and gap value.

Temperature range also depends on media.

## ORDERING

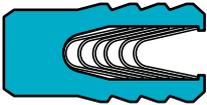
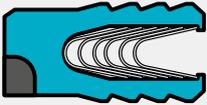
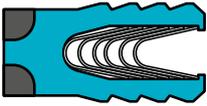
For more information on this product, or for orders and enquiries, contact your local Trelleborg Sealing Solutions Customer Solution Center.



## ■ Design Selection

Turcon® Variseal® MC designs are selected according to the pressure level and series. The standard selections are as follows:

**Table 1: Selection Criteria**

Profile	Typical Materials	Maximum Pressure	Temperature Range	Series
Turcon® Variseal® MC 	Turcon® T99 or T78  V-Springs in UNS R30003 (Elgiloy or equivalent)	40 MPa	-70 to +250 °C	200 300 400 500
Turcon® Variseal® MC with Corner Reinforcement Ring 	Turcon® T99 or T78  V-Springs in UNS R30003 (Elgiloy or equivalent)  Corner Reinforcement Ring in Zurcon® Z43  Selected for when hardware has a single $S_{max}$ gap	103.4 MPa	-70 to +250 °C	200 300 400 500
Turcon® Variseal® MC with Two Corner Reinforcement Rings 	Turcon® T99 or T78  V-Springs in UNS R30003 (Elgiloy or equivalent)  Corner Reinforcement Rings in Zurcon® Z43  Selected for when hardware has two $S_{max}$ gaps	103.4 MPa	-70 to +250 °C	200 300 400 500



## ■ Assembly Instructions

The following method provides the easiest assembly for Turcon® Variseal® MC. It ensures optimal alignment of the springs and positioning of the lips during installation.

The multiple springs and long lip profile of Turcon® Variseal® MC require that care must be taken during installation. Employing installation chamfers with a 15 to 20 degree angle enables smooth transition into the groove space.

Figure 2 provides a suggested hardware arrangement using a screw thread to insert the Turcon® Variseal® MC, but alternate methods include using a press or bolts to push the seal into position.

**Table 2: Installation Chamfer Recommendations by Seal Series**

Series	H Minimum Chamfer mm
200	5.00
300	7.50
400	8.00
500	8.50

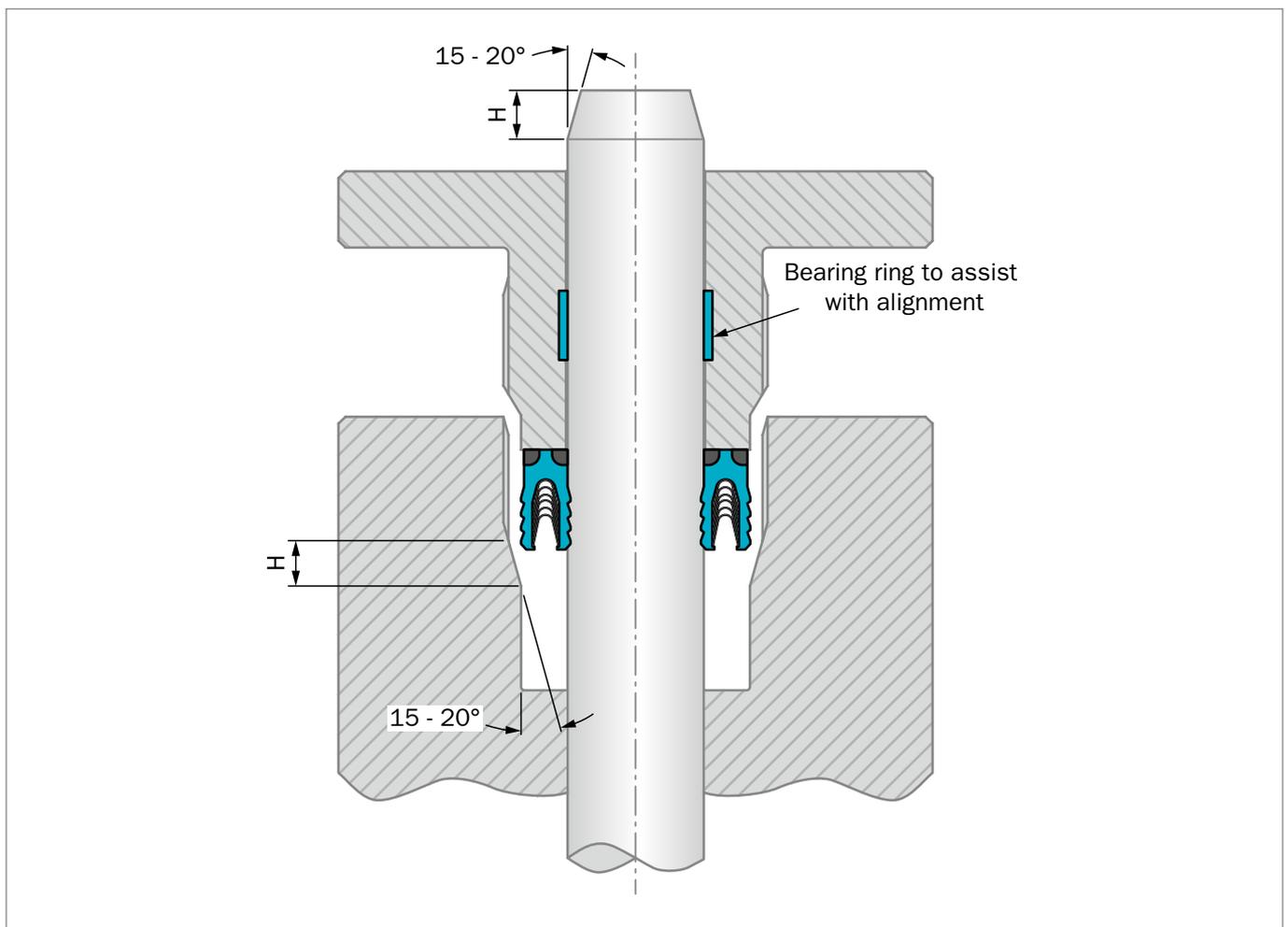


Figure 2: Turcon® Variseal® MC installation arrangement, detailed as valve stem.



## ■ Installation Recommendation

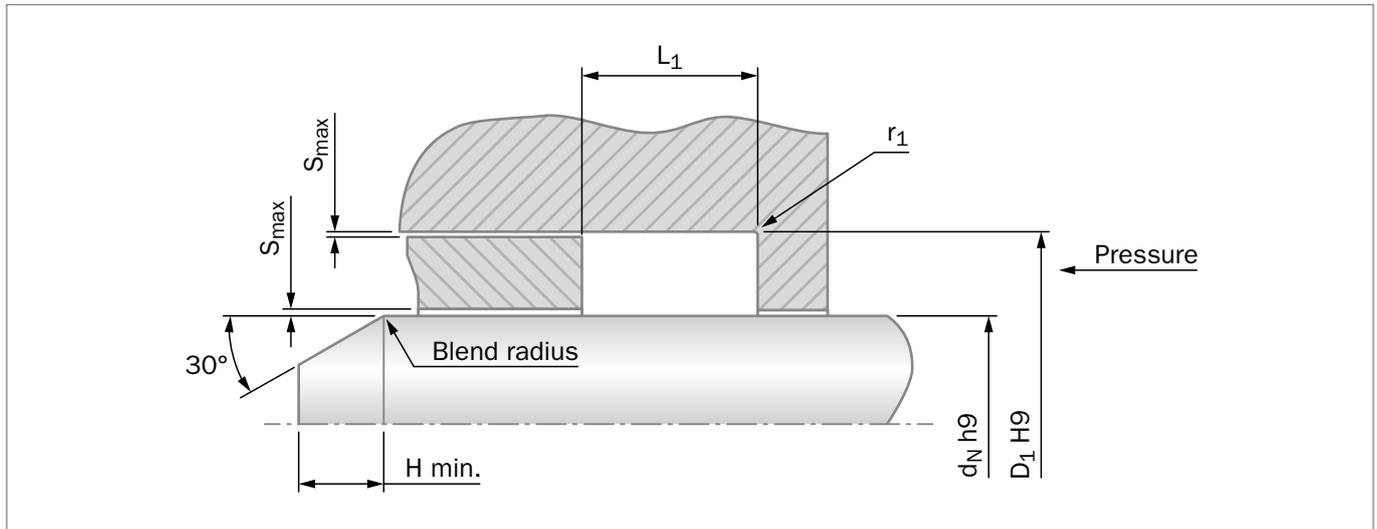


Figure 3: Installation drawing

**Table 3: Installation Dimensions – Standard Recommendations - Metric**

Series	Diameter	Groove Depth	Housing Diameter	Installation Chamfer	Radius	Groove Width
	$d_N h9$		$D_1 H9$	H min.	$r_1$ max.	$L_1$
200	10.0 - 40.0	3.10	$d_N +6.10$	2.50	0.38	12.00
300	16.0 - 50.0	4.70	$d_N +9.40$	4.50	0.38	17.50
400	18.0 - 75.0	6.10	$d_N +12.20$	6.00	0.51	20.00
500	25.0 - 150.0	9.50	$d_N +19.00$	11.00	0.51	25.00



## ■ Turcon® Variseal® V-Stack Kits

### ■ Introduction

#### DESCRIPTION

Turcon® Variseal® V-Stack Kits are commonly used in Oil & Gas valve stem applications, where they provide a single-acting, high integrity sealing solution for higher pressures and temperatures over a long service life. Unlike packing and axial compressed V-Stack sets, the use of a Turcon® Variseal® M2S on the front makes the seal self-energized. The pressure loading acting on the seal provides axial loading to the V-Stack set, which is transferred by use of interacting angles to the radial faces of the V-Stack elements. This means that the seal requires no adjustment over its lifetime for maintenance-free service.

The multiple contacts provided by Turcon® Variseal® M2S, and V-Stack elements provide redundancy, making the seal less sensitive to hardware defects and/or damage that may occur during installation, similar to packing.

Turcon® Variseal® V-Stack Kits use a Back-up Ring as pressure support, made from high-filled PTFE or PEEK. In front of the seal is a T-Support Ring (Hat-ring) which provides support from back-pressure and pressure entrapment pushing the seal forwards within the groove-space.

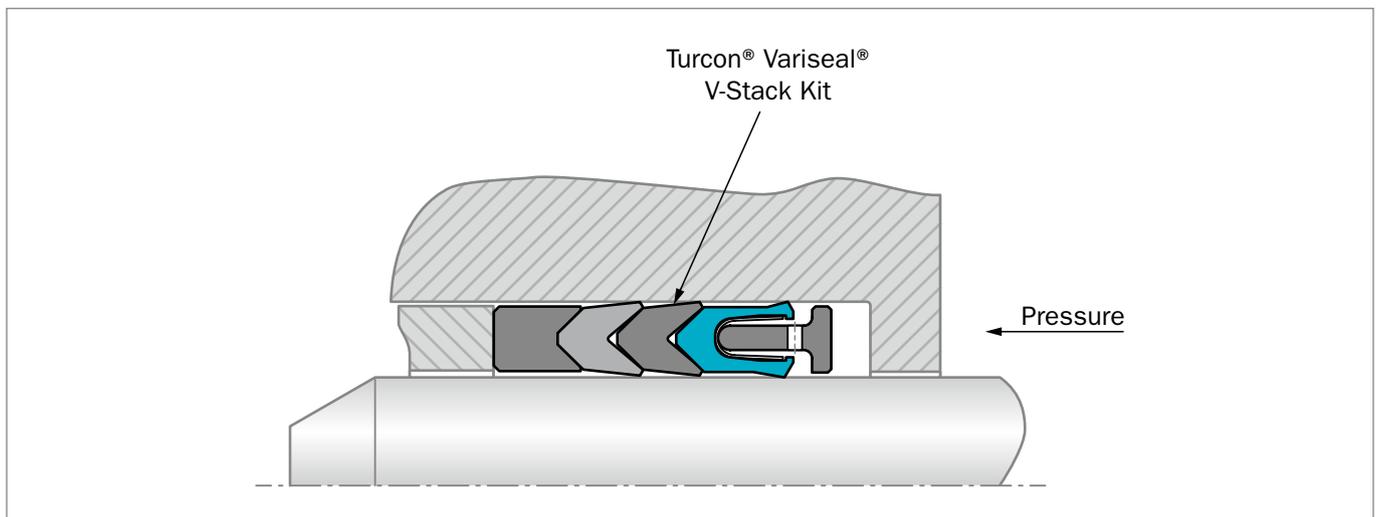


Figure 4: Turcon® Variseal® V-Stack Kit

#### TURCON® VARISEAL® M2S

Turcon® Variseal® M2S is a single-acting seal consisting of a U-shaped jacket and a V-shaped corrosion resistant spring. Variseal® M2S has an asymmetric seal profile. The dynamic lip is optimized to offer long service life and effective scraping, even with high viscosity or particle-filled media.

Used in combination with V-Stack elements, the kit adds a secondary sealing component for redundancy, providing a multi-stage high integrity sealing solution. The number of V-Stack elements can be adjusted according to available groove space and/or the pressure level being sealed. Back-up Ring and T-Support Rings are used at either end of the assembly to provide pressure resistance.

#### FEATURES AND BENEFITS

- Effective static and slow dynamic sealing
- Reduced friction under high loads compared to packings
- Excellent scraping ability and high abrasion resistance
- Almost universal chemical compatibility; permanent elasticity unaffected by contact with chemicals
- Withstands aggressive and abrasive process media and resists rapid gas decompression
- Materials compliant with NORSOK M-710 (ISO 23936) and ISO 10423 (API 6A) and UNS R30003; Springs compliant to NACE MR0175
- No external pre-load required - resistant to compression set and the need for retightening
- Available in standard gland dimensions from 100 to 500 series. Special sizes and geometries are also available
- Unlimited shelf life



## APPLICATION EXAMPLES

- Valve stems

## OPERATING CONDITIONS

<b>Pressure:</b>	40 MPa (103.4 MPa with Back-up Ring)
<b>Temperature:</b>	-70 °C to +250 °C
<b>Media</b>	Virtually all fluids, chemicals and gases
<b>Compatibility:</b>	

### IMPORTANT NOTE

The above data are maximum values and cannot be used at the same time, e.g, the maximum operating speed depends on material type, pressure, temperature and gap value.

Temperature range also depends on media.

## ORDERING

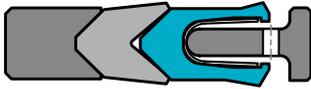
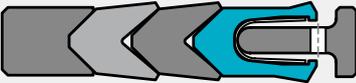
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## ■ Design Selection

Turcon® Variseal® V-Stack Kit designs are selected according to the pressure level, available groove space and/or the number of V-Stack elements preferred. The standard selections are as follows:

**Table 4: Selection Criteria**

Profile	Typical Materials	Maximum Pressure	Temperature Range	Series
<p>Turcon® Variseal® M2S Extended Heel, 1 x V-Stack Element, Back-up Ring and T-Support Ring</p> 	<p>Turcon® Variseal® M2S in Turcon® T12 V-Spring in UNS R30003 (Elgiloy or equivalent) 1 x V-Stack in T99 Back-up Ring in Turcon® T12 T-Support Ring in Zurcon® Z43</p>	40 MPa	-50 to +200 °C	100 200 300 400 500
<p>Turcon® Variseal® M2S Extended Heel, 2 x V-Stack Element, Back-up Ring and T-Support Ring</p> 	<p>Turcon® Variseal® M2S in Turcon® T99 V-Spring in UNS R30003 (Elgiloy or equivalent) 2 x V-Stacks in Turcon® T12 and T99, Back-up Ring and T-Support Ring in Zurcon® Z43</p>	69 MPa	-50 to +200 °C	100 200 300 400 500
<p>Turcon® Variseal® M2S Extended Heel, 3 x V-Stack Element, Back-up Ring and T-Support Ring</p> 	<p>Turcon® Variseal® M2S in Turcon® T12 V-Spring in UNS R30003 (Elgiloy or equivalent) 3 x V-Stacks in Turcon® T99, T12 and T99 Back-up Ring and T-Support Ring in Zurcon® Z43</p>	103.4 MPa	-50 to +200 °C	100 200 300 400 500



## ■ Installation Recommendation

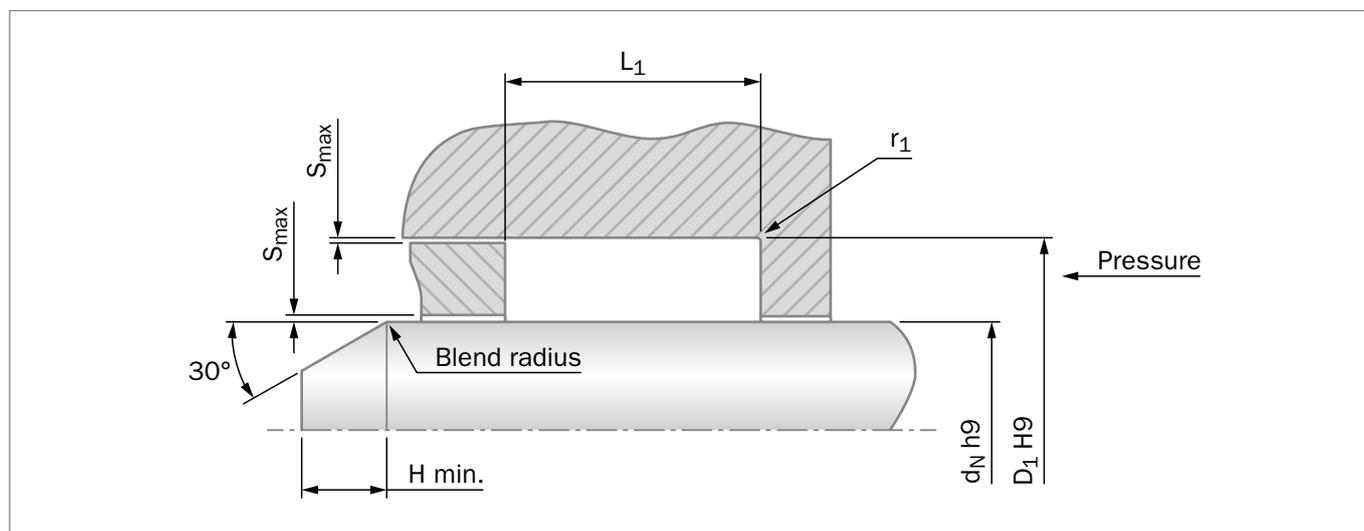


Figure 5: Installation drawing

Turcon® Variseal® V-Stack Kits are available in standard series sections, each with a recommended diameter range. They are designed to not be compressed axially, instead using the Turcon® Variseal® M2S element on the front to self-energize.

The table below provides recommended diameter ranges for each series and minimum recommended groove widths.

**Table 5: Installation Dimensions – Standard Recommendations - Metric**

Series	Diameter	Groove Depth	Chamfer length	Radius	Single V-Stack Groove Width	Double V-Stack Groove Width	Groove Width
			H min.	r <sub>1</sub>	L <sub>1</sub>	L <sub>1</sub>	L <sub>1</sub>
100	6.0 - 20.0	2.25	1.50	0.38	11.50	13.50	16.00
200	20.0 - 50.0	3.10	2.50	0.38	14.80	17.50	21.00
300	30.0 - 120.0	4.70	4.50	0.38	22.00	26.00	31.00
400	50.0 - 200.0	6.10	6.00	0.51	29.00	34.00	39.00
500	75.0 - 300.0	9.50	11.00	0.51	41.70	50.00	59.00



## ■ Turcon® Variseal® MC and Turcon® Variseal® V-Stack Kits

### ■ Material Selection

Seal jacket and V-Stack element materials are selected for their temperature and pressure stability, suitability for the media type and wear performance. When selecting materials for V-Stack elements, different compounds are generally used together. A V-Stack element made from a high-filled grade is often followed by one from a low-filled grade as this helps with the stability and energizing of the elements.

The springs are generally in Elgiloy® material, but Stainless Steel and Hastelloy® grades can also be selected according to media type.

Back-up Rings can be selected from a high-filled PTFE grade for low pressure application, or a PEEK material such as Zurcon® Z43 for higher pressures.

**Table 6: Material Options**

Material	Description
<b>Turcon® T99</b> PTFE + Turcon® + Lubricant	Grayish to black, preferred sealing material for gas applications, low friction, limited form stability at high temperatures. Approved to NORSOK M-710 (ISO 23936) and ISO 10423 (API 6A).
<b>Turcon® T12</b> PTFE + Carbon	Black, preferred seal material for high temperature applications, high filled with good form stability, recommended for both static and dynamic gas and fluid applications. Approved to NORSOK M-710 (ISO 23936) and ISO 10423 (API 6A).
<b>Turcon® T78</b> PTFE + Aromatic Polymer	Tan, good gas tightness and wide temperature suitability as well as low abrasion to hardware. Approved to ISO 10423 (API 6A)
<b>Elgiloy®, W. Nr. 2.4711</b> UNSR30003	Meets the requirements of NACE MR0175 and is therefore the preferred spring material in the petrochemical industry.
<b>Zurcon® Z43</b> PEEK + Lubricant	Black, very high form stability at high temperatures. Used for high temperature and/or high-pressure Corner Reinforcement Rings and Back-Up Rings, as well as T-Support Rings. Approved to NORSOK M-710 (ISO 23936) and ISO 10423 (API 6A).



## ■ Groove Types

The following groove types are suitable for both Turcon® Variseal® MC and Turcon® Variseal® V-Stack Kits.

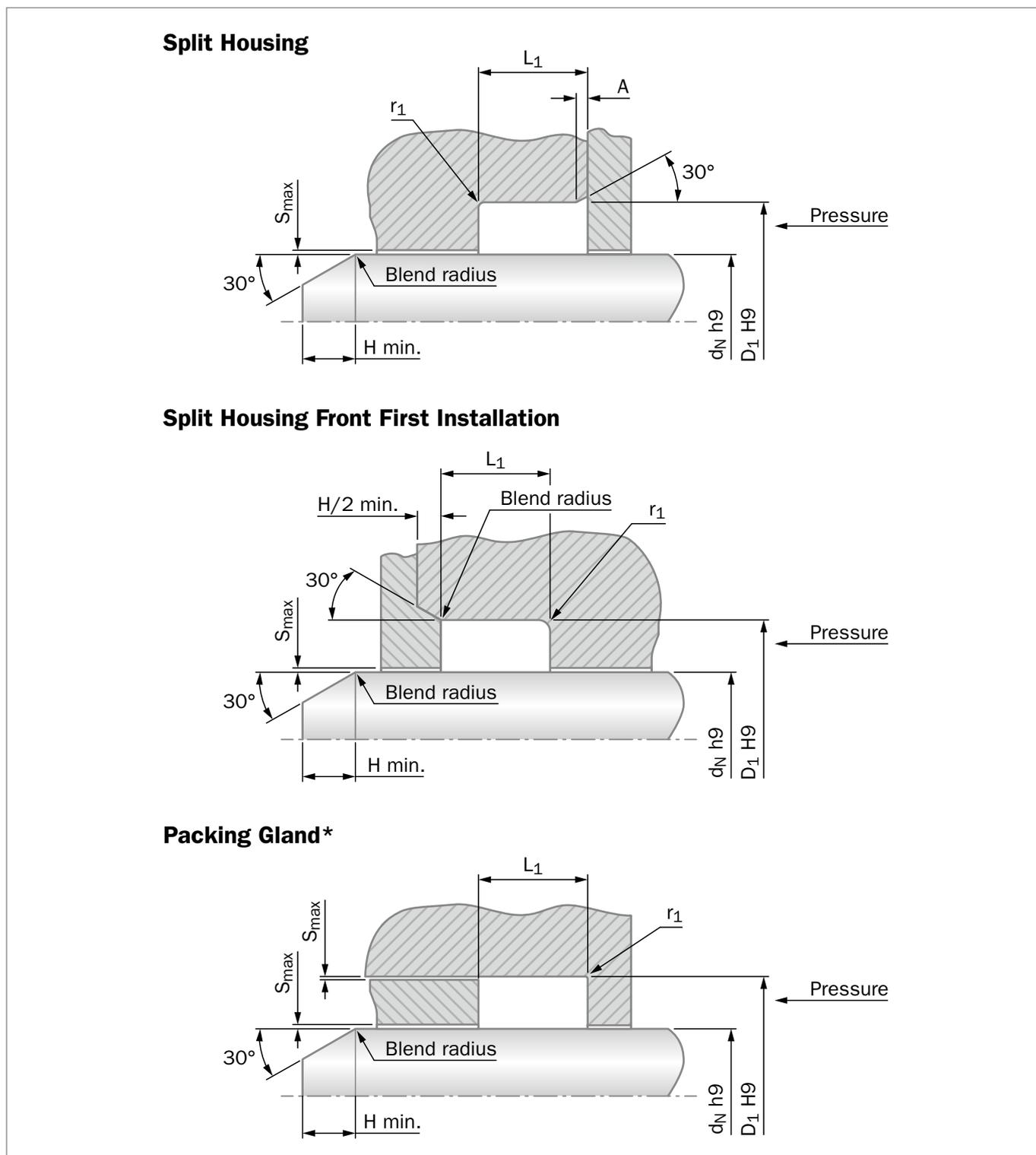


Figure 6: Groove Types

\* If using a Packing Gland type groove, then a Turcon® Variseal® MC design including two Corner Reinforcement Rings will be required.



## Hardware Extrusion Gap Recommendations

The following recommendations are suitable for both the Turcon® Variseal® MC and Turcon® Variseal® V-Stack Kits. Hardware extrusion gap clearances, known as  $S_{max}$ , are an

important consideration to ensure the stability of the sealing solution and avoid extrusion damage. The values given below are maximum sizes.

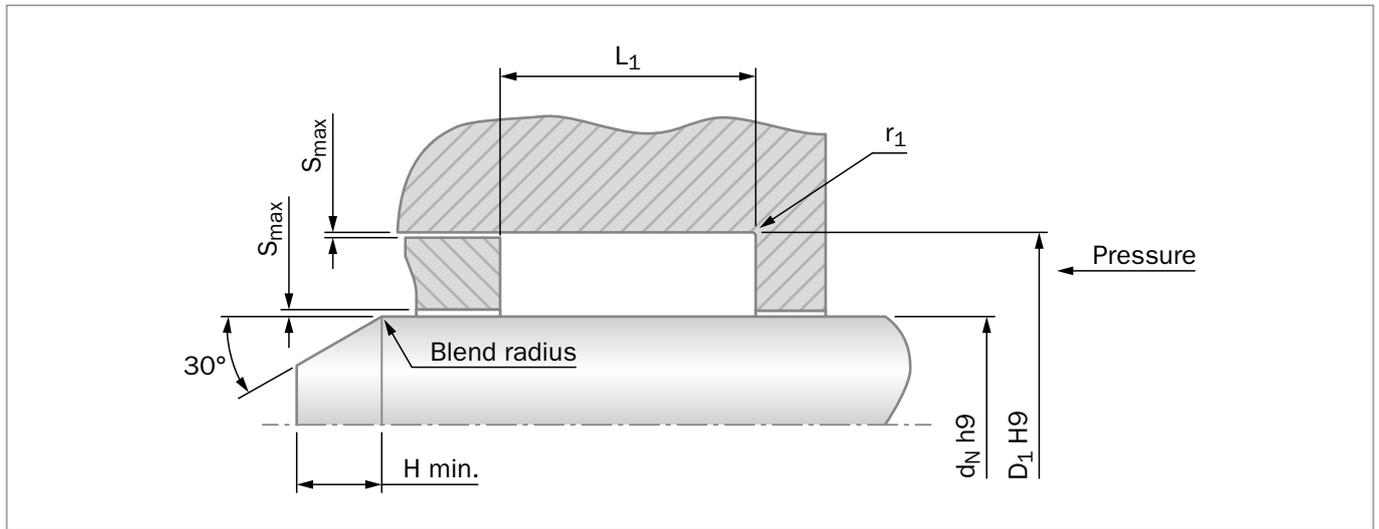


Figure 7: Installation drawing

Table 7:  $S_{max}$  for temperatures up to +120 °C

Series	Turcon® Material				Corner Reinforcement or Back-up Ring in PEEK			
	$S_{max}$ Hardware Clearance				$S_{max}$ Hardware Clearance			
	up to 2 MPa	up to 10 MPa	up to 20 MPa	up to 40 MPa	up to 20 MPa	up to 40 MPa	up to 70 MPa	above 700 MPa
100*	0.25	0.15	0.10	0.07	0.20	0.20	0.10	0.10
200	0.35	0.20	0.15	0.08	0.30	0.20	0.10	0.10
300	0.50	0.25	0.20	0.10	0.25	0.25	0.15	0.12
400	0.60	0.30	0.25	0.12	0.50	0.30	0.15	0.15
500	0.90	0.50	0.40	0.20	0.75	0.40	0.25	0.20

\*100 series with Turcon® Variseal® V-Stack Kits only

Table 8:  $S_{max}$  for temperatures from +121 °C to +200 °C

Series	Turcon® Material				Corner Reinforcement or Back-up Ring in PEEK			
	$S_{max}$ Hardware Clearance				$S_{max}$ Hardware Clearance			
	up to 2 MPa	up to 10 MPa	up to 20 MPa	up to 40 MPa	up to 20 MPa	up to 40 MPa	up to 70 MPa	above 700 MPa
100*	0.18	0.11	0.08	0.05	0.15	0.15	0.08	0.08
200	0.26	0.15	0.11	0.06	0.22	0.15	0.08	0.08
300	0.38	0.19	0.15	0.08	0.18	0.18	0.12	0.09
400	0.45	0.22	0.19	0.09	0.38	0.22	0.12	0.12
500	0.68	0.38	0.30	0.15	0.55	0.30	0.18	0.15

\*100 series with Turcon® Variseal® V-Stack Kits only



**Table 9:  $S_{max}$  for temperatures above +200 °C**

Series	Corner Reinforcement or Back-up Ring in PEEK			
	$S_{max}$ Hardware Clearance			
	up to 20 MPa	up to 40 MPa	up to 70 MPa	above 700 MPa
200	0.15	0.10	0.05	0.05
300	0.12	0.12	0.08	0.06
400	0.25	0.15	0.10	0.07
500	0.38	0.20	0.12	0.10

Turcon® Variseal® MC only for temperatures above +200°C



## ■ Surface Finish Recommendations

The following recommendations are suitable for both the Turcon® Variseal® MC and Turcon® Variseal® V-Stack Kits.

**Table 10: Recommended Maximum Surface Roughness**

Recommended Maximum Surface Roughness $\mu\text{m}$ and $\mu\text{in}$						
Media	Rotary Surface*		Reciprocating Surface		Static Groove Surface	
Cryogenic and low molecular gases, hydrogen, helium, freon, oxygen, nitrogen	$R_{\text{max}} = 1.0 \mu\text{m}$ $R_z = 0.63 \mu\text{m}$ $R_a = 0.1 \mu\text{m}$	$R_{\text{max}} = 39 \mu\text{in}$ $R_z = 25 \mu\text{in}$ $R_a = 4 \mu\text{in}$	$R_{\text{max}} = 2.5 \mu\text{m}$ $R_z = 1.6 \mu\text{m}$ $R_a = 0.2 \mu\text{m}$	$R_{\text{max}} = 98 \mu\text{in}$ $R_z = 63 \mu\text{in}$ $R_a = 8 \mu\text{in}$	$R_{\text{max}} = 3.5 \mu\text{m}$ $R_z = 2.2 \mu\text{m}$ $R_a = 0.3 \mu\text{m}$	$R_{\text{max}} = 138 \mu\text{in}$ $R_z = 87 \mu\text{in}$ $R_a = 12 \mu\text{in}$
Low viscosity fluids water, alcohols, hydrazine, gaseous nitrogen, natural gas, skydrol, air	$R_{\text{max}} = 2.5 \mu\text{m}$ $R_z = 1.6 \mu\text{m}$ $R_a = 0.2 \mu\text{m}$	$R_{\text{max}} = 98 \mu\text{in}$ $R_z = 63 \mu\text{in}$ $R_a = 8 \mu\text{in}$	$R_{\text{max}} = 3.5 \mu\text{m}$ $R_z = 2.2 \mu\text{m}$ $R_a = 0.3 \mu\text{m}$	$R_{\text{max}} = 138 \mu\text{in}$ $R_z = 87 \mu\text{in}$ $R_a = 12 \mu\text{in}$	$R_{\text{max}} = 3.5 \mu\text{m}$ $R_z = 2.2 \mu\text{m}$ $R_a = 0.3 \mu\text{m}$	$R_{\text{max}} = 138 \mu\text{in}$ $R_z = 87 \mu\text{in}$ $R_a = 12 \mu\text{in}$
High viscosity fluids hydraulic oils, crude oil, gear oil, sealants, glue, milk products	$R_{\text{max}} = 2.5 \mu\text{m}$ $R_z = 1.6 \mu\text{m}$ $R_a = 0.2 \mu\text{m}$	$R_{\text{max}} = 98 \mu\text{in}$ $R_z = 63 \mu\text{in}$ $R_a = 8 \mu\text{in}$	$R_{\text{max}} = 4.0 \mu\text{m}$ $R_z = 2.5 \mu\text{m}$ $R_a = 0.4 \mu\text{m}$	$R_{\text{max}} = 157 \mu\text{in}$ $R_z = 98 \mu\text{in}$ $R_a = 16 \mu\text{in}$	$R_{\text{max}} = 6.5 \mu\text{m}$ $R_z = 5.0 \mu\text{m}$ $R_a = 0.8 \mu\text{m}$	$R_{\text{max}} = 256 \mu\text{in}$ $R_z = 197 \mu\text{in}$ $R_a = 32 \mu\text{in}$

\* The sealing surface must be free from spiral grooves.

The material contact area  $R_{\text{mr}}$  should be approximately 50% to 70%, determined at a cut depth  $C = 0.25 \times R_z$ , relative to a reference line of  $C_{\text{ref}}$  5%.

Figure 8 shows two surface profiles, both of which give the same values for  $R_z$  in the test procedure. The difference shows up when the material contact areas are compared. These show that the upper profile with  $R_{\text{mr}} = 70\%$  has the better seal to mating surface ratio.

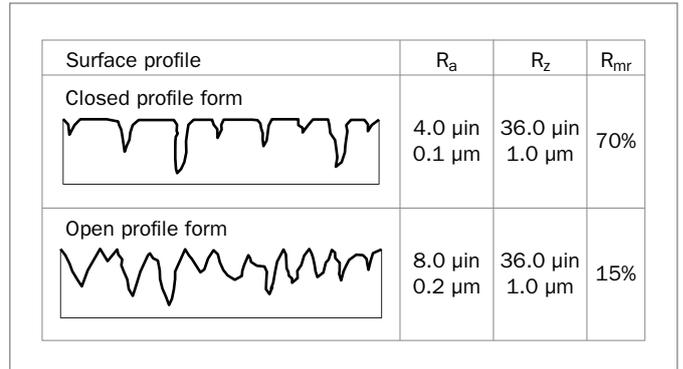


Figure 8: Profile forms of surfaces

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