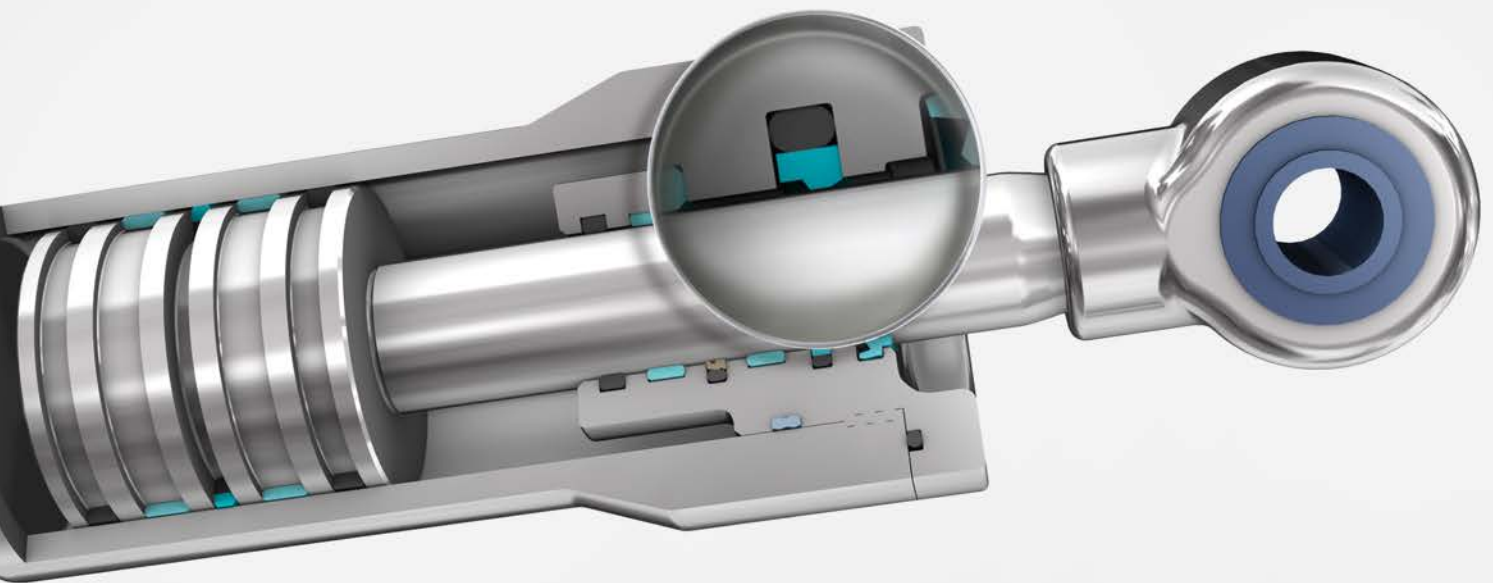


Rod Seals



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145	Turcon® VL Seal®		

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■ Choice of Sealing Element

Sealing elements have a decisive influence on the design, function and service life of hydraulic and pneumatic cylinders and systems.

This applies equally to the piston rod seals where leak tightness, resistance to wear and gap extrusion, resistance to process media, resistance to high and low temperatures, low friction, compact form and simple installation are demanded in order to meet the requirements of industry for a functional sealing solution.

Trelleborg Sealing Solutions has developed a complete range of seals which, due to their optimized geometries, designs and use of high-quality materials such as Turcon® and Zurcon®, satisfy the technical and economic demands of the industry.

In order to select the most appropriate seal type and material, it is necessary to first define all the desired functional parameters. Table 1 can then be used to make an initial selection of seals and materials according to the specific requirements of the application.

The second column of the table contains the number of the page on which further general information, together with specific design and installation instructions on the particular seal type and materials (or material combinations with multi-element seals, e.g. Turcon® Stepseal® 2K), can be found.

Furthermore, on page 38 attention is drawn to the quality of the mating surface. We recommend that the limits specified there be observed, as they have a decisive influence on the functionality and service life of the system.

The final choice of seal type and material must also take account of the detailed information on the seal elements.

Please do not hesitate to contact your local Customer Solution Center for further information on specific applications and special technical questions.

NOTE ON ORDERING

All multi-element standard rod seals, e.g. Turcon® Stepseal® 2K, are generally supplied as complete seal sets. The sets include the seal and matching elastomer energizing elements. The O-Ring does not have to be ordered separately. It is also possible to use other O-Ring materials from our O-Ring catalog. In this case, please order the seal ring and O-Ring separately.






When ordering the seal ring separately, it is then not necessary to mention the "O-Ring material code" in the TSS Article No. shown in the ordering examples.

Older designs of seals no longer contained in this catalog naturally continue to be available (see chapter "Additional Seals"). For all new applications, however, we recommend the use of the seal types and preferred sizes (ISO series, wherever possible) listed in this catalog.

Other combinations of Turcon® materials and special designs can be developed and supplied for special applications in all sizes up to 2,600 mm diameter, provided there is sufficient demand.

The sizes contained in this catalog are mostly available from stock or can be supplied at short notice. We reserve the right to modify our supply program.








Table 1: Selection Criteria for Rod Seals

Seal		Application			Standard	Action		Size Range	Technical Data*			Recommended Seal Material				
Type	Page	Field of Application			ISO	Single	Double	mm	Temp. Range **	Speed	Pressure					
		Light	Medium	Heavy					°C	m/s	MPa max.					
Turcon® Stepseal® 2K 	45	Mobile hydraulics	•	•	•	7425-2	•	3 - 2,600	-45/ +200	15	50	M12				
		Standard cylinders	•	•	•						50	T46				
		Machine tools	•	•	•						20	T05				
		Injection molding machines	•	•	•						3 - 2,200	-45/ +110	2	60	Z53	
		Presses	•	•	•											
		Automotive industry	•	•	•											
		Hydraulic hammers	•	•	•											
Servo hydraulics	•	•	•													
Turcon® Stepseal® V 	59	Mobile hydraulics	•	•	•	7425-2	•	12 - 2,600	-45/ +200	15	50	M12				
		Construction equipment	•	•	•						50	T46				
		Presses	•	•	•											
		Injection molding machines	•	•	•											
Turcon® Stepseal® V LM 	71	Mobile hydraulics	•	•	•	7425-2	•	12 - 2,600	-45/ +200	15	50	M12				
		Wind turbines	•	•	•											
		Injection molding machines	•	•	•						50	T46				
		Presses	•	•	•											
Zurcon® Rimseal 	83	Mobile hydraulics	•	•	•	7425-2	•	8 - 2,200	-45/ +110	In tandem with Turcon® Stepseal® 2K 5m/s	In tandem 60 MPa	Z54				
		Standard cylinders	•	•	•						As single seal 25 MPa					
		Machine tools	•	•	•											
		Injection molding machines	•	•	•											
		Presses	•	•	•											
Zurcon® Rimseal IM 	91	Mobile hydraulics	•	•	•	7425-2	•	50 - 150	-45/ +110	0.5	In tandem 60 MPa	Z13				
		Standard cylinders	•	•	•						As single seal 25 MPa					
		Machine tools	•	•	•											
		Injection molding machines	•	•	•											
		Presses	•	•	•											

* The data below are maximum values and cannot be used at the same time.
The maximum pressure depends on temperature and gap dimensions.

** Temperature range depends on choice of elastomer material and media.

Table continues on next page







Seal		Application			Standard	Action		Size Range	Technical Data*			Recommended Seal Material
Type	Page	Field of Application			ISO	Single	Double	mm	Temp. Range **	Speed	Pressure	
		Light	Medium	Heavy					°C	m/s	MPa max.	
Zurcon® L-Cup® 	99	Hydraulic cylinders	•	•	5597/1	•	6 - 250	-50/ +130	0.5	40	Z20 Z22 Z25	
		Tail lift cylinders	•	•								
		Steering cylinders	•	•								
Zurcon® U-Cup RU2 	107	Hydraulic cylinders	•	•	5597/1	•	6 - 185	-50/ +110	0.5	40	Z20 Z22	
		Telescopic cylinders	•	•								
		Mobile hydraulics	•	•								
Zurcon® U-Cup RU6 	113	Hydraulic cylinders	•	•	7425-2	•	12 - 350	-35/ +110	0.5	25	Z20	
		Industrial hydraulics	•	•								
		Mobile hydraulics	•	•								
Zurcon® U-Cup RU9 	119	Hydraulic cylinders	•	•	5597/1	•	6 - 140	-50/ +130	0.5	40	Z20 Z22 Z25	
		Industrial hydraulics	•	•								
		Mobile hydraulics	•	•								
Zurcon® Buffer Seal LM 	129	Earthmoving Equipment		•	7425-2	•	40 - 140	-35/ +110	1	40 60 (peak)	Z20	
		Mobile hydraulics	•	•								
		Construction Machinery	•	•								
Turcon® Variseal® M2 	135	High and low temperatures	•	•	-	•	3 - 2,600	-253/ +300	15	40	T40	
		Aggressive media	•	•						20	T05	
		Food-contact	•	•								
Turcon® VL Seal® 	145	Automation	•	•	-	•	6 - 2,600	-45/ +200	15	50	M12	
		Telescopic cylinders	•	•						50	T46	
		Valve stems	•	•								
		Down-hole tools	•	•	6 - 2,200	-45/ +110	2	25	Z54			

* The data below are maximum values and cannot be used at the same time.

Table continues on next page

The maximum pressure depends on temperature and gap dimensions.


** Temperature range depends on choice of elastomer material and media.

Seal		Application			Standard	Action		Size Range	Technical Data*			Recommended Seal Material	
Type	Page	Field of Application	Light	Medium		Heavy	ISO		Single	Double	Temp. Range **		Speed
										°C	m/s	MPa max.	
Turcon® Glyd Ring® 	157	Special cylinders	•	•	•	7425-2	•	•	3 - 2,600	-45/+200	15	50	M12
		Pumps and valves	•	•	•							50	T46
		Machine tools	•	•	•							20	T05
		Servo equipment	•	•	•							60	Z53
Turcon® Glyd Ring® T 	167	Special cylinders	•	•	•	7425-2	•	•	3 - 2,600	-45/+200	15	50	M12
		Pumps and valves	•	•	•							50	T46
		Machine tools	•	•	•							60	Z53
		Robotics/manipulators	•	•	•							2	
Presses	•	•	•										
Turcon® Glyd Ring® Hz 	177	Machine tools	•	•		7425-2	•	•	8 - 999	-45/+200	15	30	M12
		Handling machinery	•	•								25	T40
		Servo equipment	•	•								25	Z80
Turcon® AQ-Seal® with Bean Seal 	189	Hydraulics	•	•		7425-2	•	•	18 - 2,200	-45/+110	2	40	M12
		Machine operation	•	•								40	T46
		Fluid/gas separation	•	•									
Holding cylinders	•	•											
Turcon® AQ-Seal® 5 with Bean Seal 	199	Hydraulics		•	•	-	•	•	32 - 2,200	-45/+110	2	50	M12
		Fluid/gas separation		•	•							50	T46
		Mobile hydraulics		•	•								
Holding cylinders		•	•										
Zurcon® Wynseal M 	207	Industrial hydraulics	•	•		7425-2	•	•	3 - 2,600	-45/+200	10	35	M12
		Handling machinery	•	•					3 - 2,200	-45/+110	0.5	25	Z54
		Agricultural equipment	•	•							45	Z53	

* The data below are maximum values and cannot be used at the same time. The maximum pressure depends on temperature and gap dimensions.

** Temperature range depends on choice of elastomer material and media.

Table continues on next page

Seal		Application				Standard	Action		Size Range	Technical Data*			Recommended Seal Material
Type	Page	Field of Application			ISO	Single	Double	mm	Temp. Range **	Speed	Pressure		
		Light	Medium	Heavy					°C	m/s	MPa max.		
Turcon® Double Delta® 	217	Valve stems	•	•	-			2 - 2,600	-45/ +200	15	20	T05	
		Mini hydraulics	•	•							35	M12	
		Hydraulic tools	•	•							35	T46	

* The data below are maximum values and cannot be used at the same time.
The maximum pressure depends on temperature and gap dimensions.

** Temperature range depends on choice of elastomer material and media.

LUBRICATION MANAGEMENT SEALING SYSTEMS

A Lubrication Management system incorporates large-radius, rounded edges on both the seal and Back-up Ring to lower contact pressure, allowing lubrication of the secondary sealing element.

This significantly reduces friction and wear, increasing lifetime and reliability of the seals, as well as reducing ‘run-in’ behavior on counter surfaces. The overall constancy of the tribological system in the sealing contact area is key to improving lifetime and performance.

This technology is available for all Turcon® and Zurcon® Sealing Systems as Turcon® Stepseal® V LM and Zurcon® Buffer Seal LM*. See pages 71 and 129 for more information.

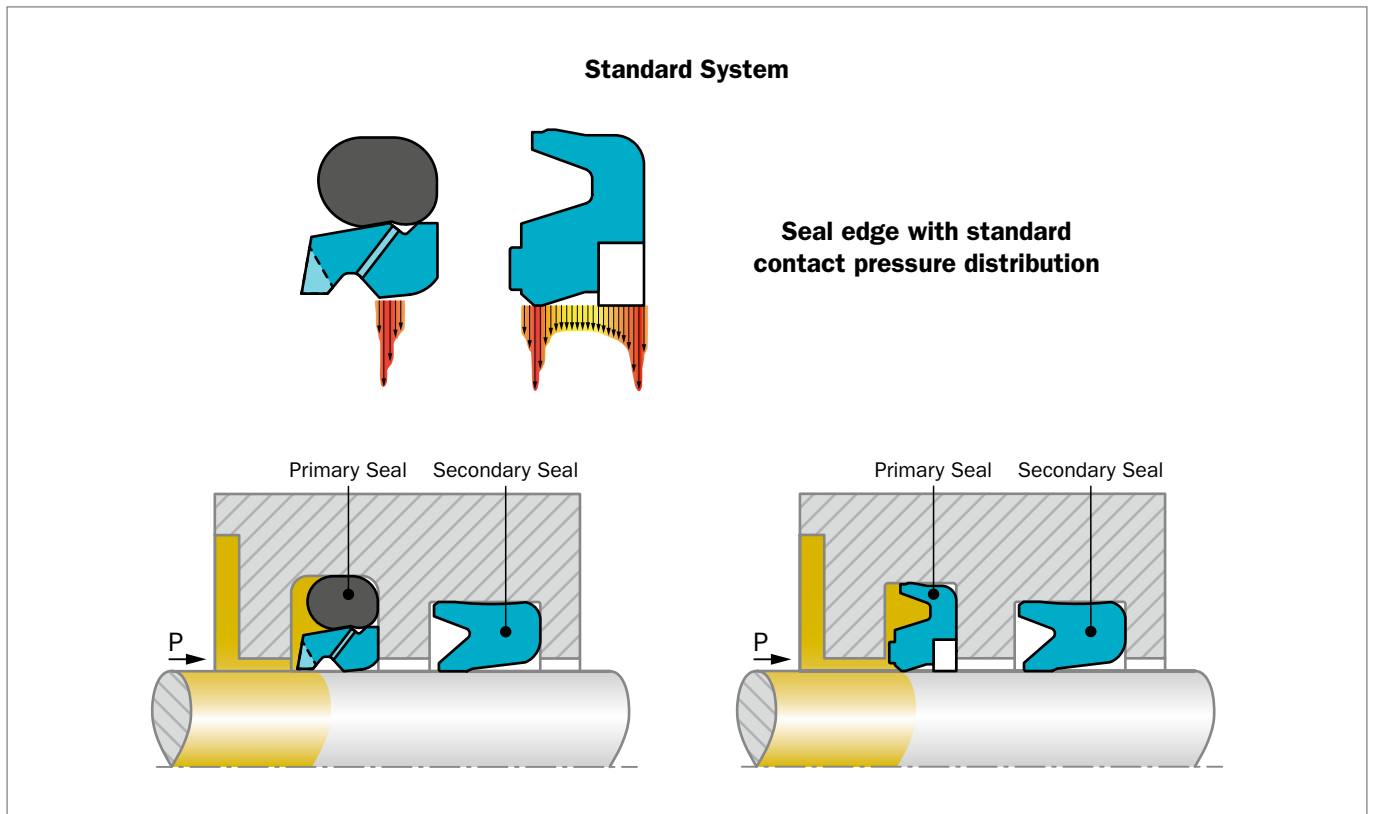


Figure 1: Standard Sealing System

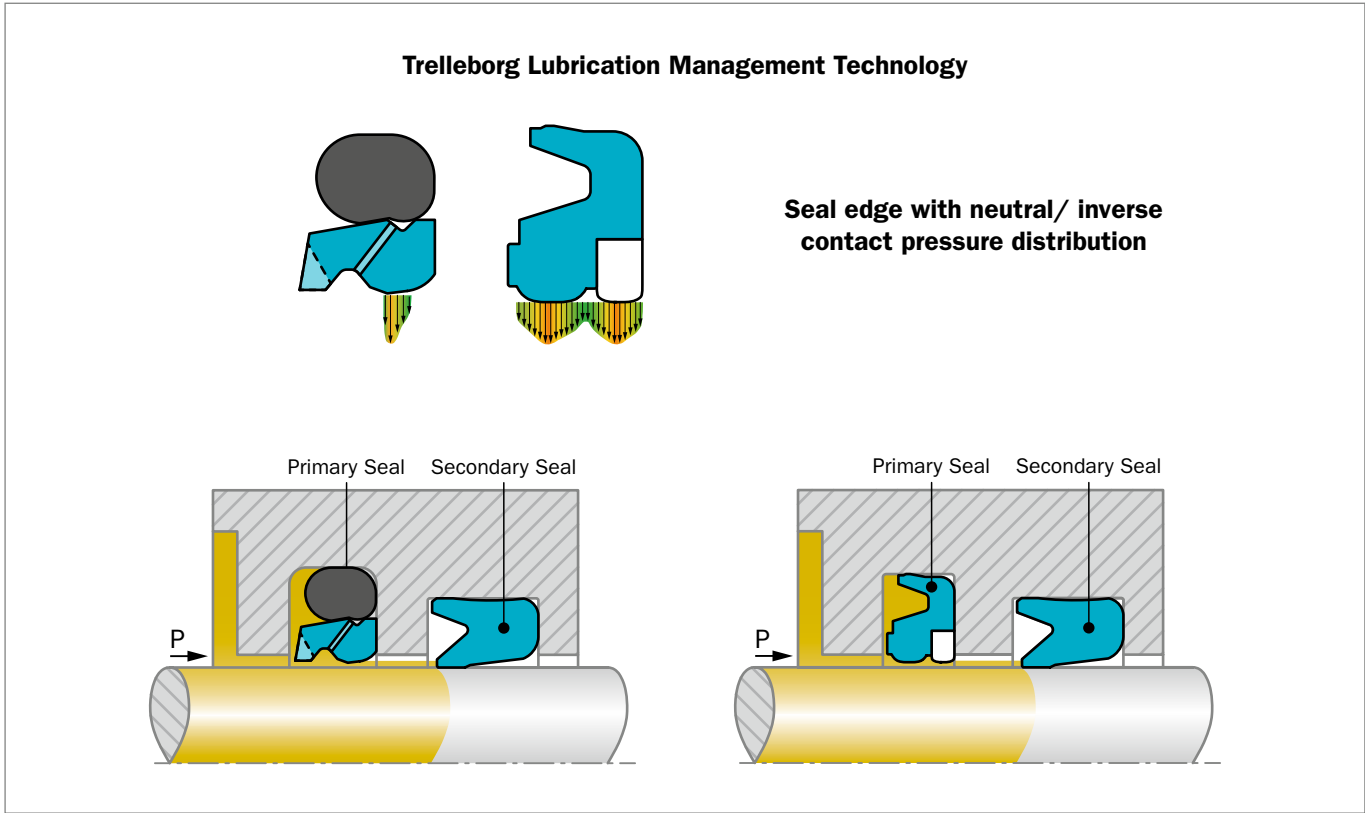


Figure 2: Lubrication Management Sealing System

* Patent application: WO 2016/113414 A1, WO 2007/095915 A1

REDUNDANT SEALING SYSTEM

Sealing of environmentally harmful fluids has led Trelleborg Sealing Solutions to develop innovative sealing systems that meet the demanding industry specifications for leak-free performance and long service life.

In heavy-duty applications, these characteristics cannot be assured by a single sealing element; therefore, specially developed system seals are arranged in series, building a tandem arrangement.

Each sealing element in a system has its specific function and their interaction needs to be secured to get a redundant sealing system.

The primary seal, manufactured from proprietary Turcon® PTFE-based materials, generates low friction and demonstrates excellent wear and extrusion resistance under extreme working conditions. It allows a fine lubrication film to pass this first barrier, ensuring the necessary lubrication of the secondary sealing element, giving long service life.

The tandem arrangement requires the primary seal to have an outstanding backpumping ability. If a double acting scraper is installed, the secondary seal must also possess back-pumping capabilities. A combination of different sealing materials in a system, such as a Turcon® PTFE and a Zurcon® polyurethane, ensures the best sealing performance.

Trelleborg Sealing Solutions has pioneered work in this area and continues development of redundant sealing today.

Trelleborg Sealing Solutions has successfully used the Turcon® Stepseal® 2K in tandem arrangement for heavy-duty applications. A tandem sealing system can also be created by using other seals, such as Zurcon® Rimseal, Zurcon® L-Cup® or Zurcon® U-Cup as secondary sealing elements. Depending on the type of secondary seal, a single or double-acting scraper can be used to complete the system, offering the highest possible operation reliability, ensuring both adequate lubrication of the sealing system and long service life.

Figure 3 shows an example of a redundant sealing system consisting of Turcon® Stepseal® 2K, Zurcon® Rimseal and Rod Scraper DA22 with corresponding wear ring arrangement.

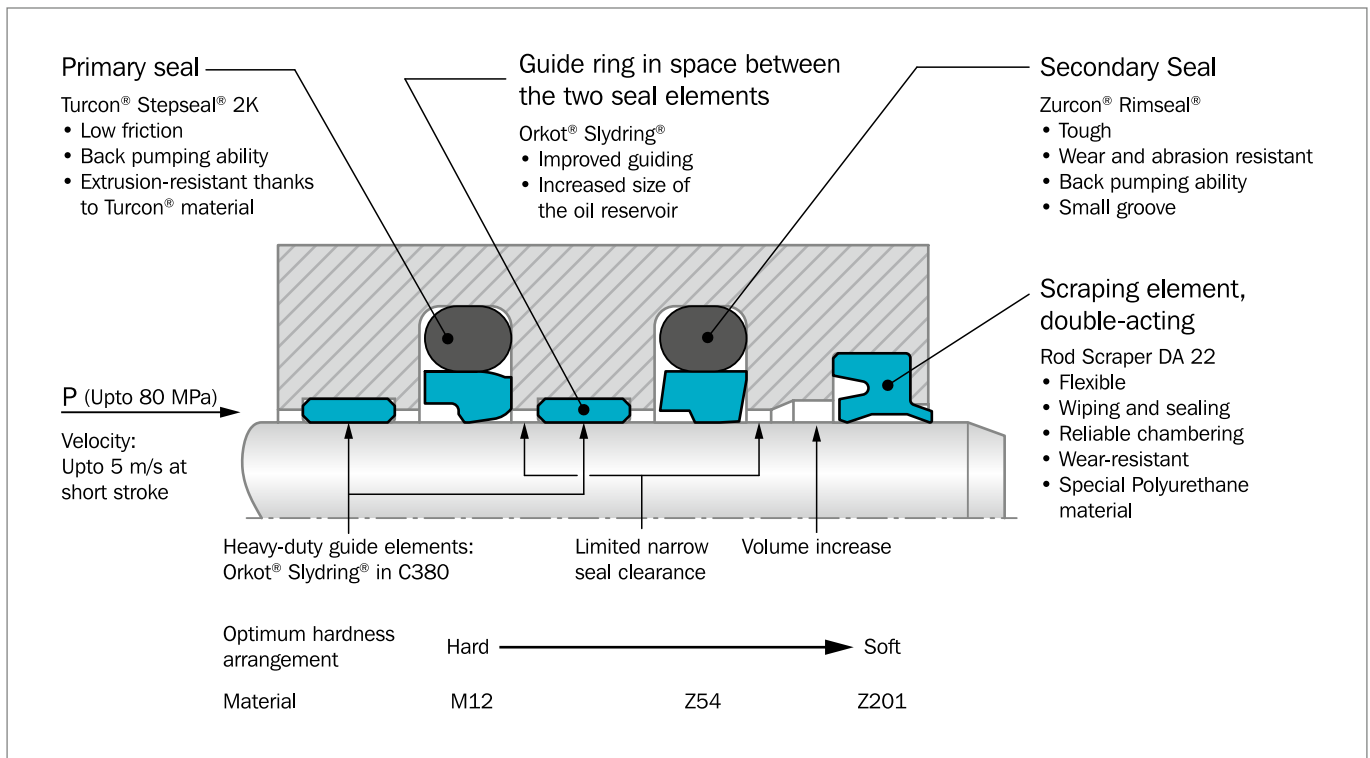


Figure 3: Example of a Redundant Modular Sealing System

■ Design Instructions

LEAD-IN CHAMFERS

In order to avoid damage to the rod seal during installation, lead-in chamfers and rounded edges must be provided on the piston rods, see Figure 4. If this is not possible for design reasons, a separate installation tool must be used.

The minimum length of the lead-in chamfer Z_{\min} depends on the profile size of the seal and can be seen from the following tables.

Generally Z_{\min} from Table 2, Table 3 and Table 4 is recommended but at 15°, Z must also exceed 2.5% of the rod diameter d_N (relevant for large diameter rods). At 20°, Z is calculated correspondingly.

The rod should have a lead-in chamfer of 15° to 20° by Z length minimum to gently guide the seal assembly into the hardware as shown in Figure 4. The chamfer should clear the seal assembly - in a free condition - after the seal has been calibrated.

Table 2: Elastomer Energized Seals

Minimum chamfer for a calibrated seal.

Groove Width L_1^*	Lead-in Chamfer Length Z_{\min}	
	15°	20°
2.2	2.5	2.0
3.2	3.0	2.5
4.2	3.5	3.0
6.3	5.0	4.0
8.1	6.5	5.0
9.5	7.5	5.5
13.8	10.5	8.0

* The groove width can be found in the table Installation Dimensions for Turcon® Glyd Ring®, Glyd Ring® T, Glyd Ring® Hz, AQ-Seal® Stepseal® 2K, Stepseal® V and Zurcon® Wynseal M.

Table 3: Double Delta®

Minimum chamfer for a calibrated seal.

O-Ring Cross Section** d_2	Lead-in Chamfer* Length Z_{\min}	
	15°	20°
1.78	-	2.5
2.40	2.62	3.0
3.00	3.53	3.5
5.33	5.70	5.0
7.00	-	6.5
8.40	-	7.5

* Though not less than 2.5% of rod diameter.

**The O-Ring cross section d_2 can be found in the Installation Dimensions table from the Double Delta® chapter.

Table 4: U-Cup and Variseal®

Minimum chamfer for a calibrated seal (Variseal®)

U-Cup Groove Depth*	Variseal® M2 Series	Lead-in Chamfer Length Z_{\min}	
		15°	20°
3.0 / 3.5 / 4.0		2.5	1.5
5.0		2.5	1.5
6.0 / 6.5		3.0	2.0
7.5 / 8.0	RVA0	4.5	3.0
10.0	RVA1 / RVA2	5.0	4.0
12.5		6.5	6.0
15.0	RVA3	7.5	6.5
20.0		10.0	8.5
	RVA4	12.0	9.0
	RVA5	17.0	13.0

* The groove depth is calculated from: $(d_1-d)/2$. The dimensions for d_1 and d can be found in the Installation Dimensions tables.

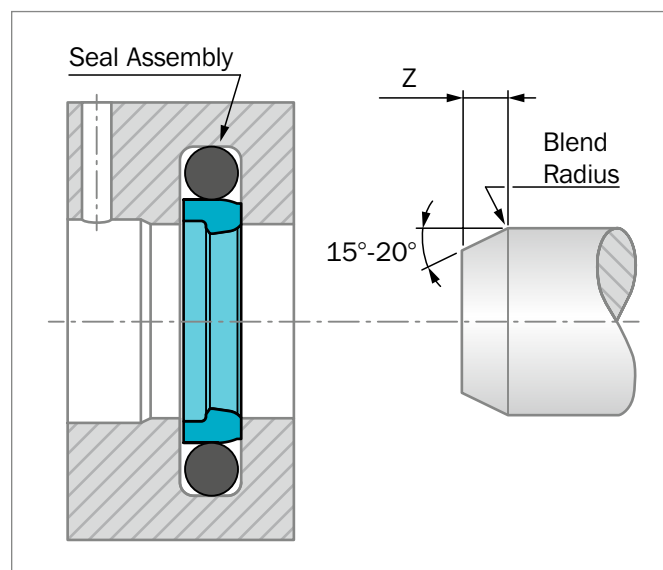


Figure 4: Lead-in chamfers

DISTANCE BETWEEN GROOVES

When installing tandem seal arrangements or double-acting scraper seals in conjunction with rod seals with back-pumping effects such as Turcon® Stepseal® 2K and Zurcon® Rimseal, we recommend the following arrangement:

- Distance between seal grooves and/or scraper seal groove L = at least groove depth X
- Oil reservoir for collecting the returning oil as shown in Figure 5.

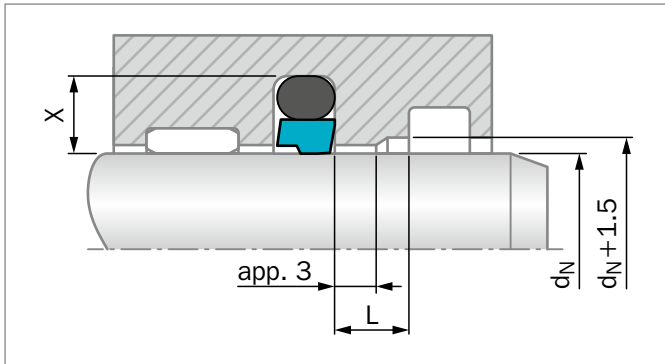


Figure 5: Recommendation for groove spacings between grooves

SURFACE ROUGHNESS DIN EN ISO 4287

The functional reliability and service life of a sealing system is dependent upon the quality and surface finish of the mating surface to be sealed.

Scores, scratches, pores, concentric or spiral machining marks are not permitted. Higher demands must be made on the surface finish of dynamic mating surfaces than on static mating surfaces.

The characteristics most frequently used to describe the surface micro-finish R_a , R_z and R_{max} are defined in DIN 4762 / ISO 4287-1. These characteristics alone, however, are not sufficient for assessing suitability of a surface finish in seal engineering. The material contact area R_{mr} in accordance with ISO 4287-1, must be taken into consideration. The significance of this surface specification is illustrated in Figure 6. It shows that specification of R_a and R_z does not describe the surface roughness profile accurately enough. The material contact area R_{mr} is essential as the specific profile form determines this parameter. This in turn is directly dependent on the machining process employed.

Trelleborg Sealing Solutions recommends that the following surface finishes be observed:

Table 5: Surface Roughness

Parameter	Surface Roughness μm		Groove Surface
	Turcon® Materials	Zurcon® and Rubber	
R_{max}	0.63 - 2.50	1.00 - 4.00	< 16.0
R_z	0.40 - 1.60	0.63 - 2.50	< 10.0
R_a	0.05 - 0.20	0.10 - 0.40	< 1.6

The material contact area R_{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_{ref} . 5%.

Surface profile	R_a	R_z	R_{mr}
closed profile form 	0.1	1.0	70%
open profile form 	0.2	1.0	15%

Figure 6: Profile forms of surfaces

Figure 6 shows two surface profiles, both of which exhibit nearly the same value for R_z in the test procedure. The difference becomes obvious when the material contact areas of the surface roughness profiles are compared. These show that the upper profile with $R_{mr} = 70\%$ has the better seal to mating surface ratio.

HARDWARE

For optimum performance Trelleborg Sealing Solutions recommends a piston rod of chrome-plated steel.

Material:	Preferably 42CrMo4V, purity class K3 to DIN 50602.
Induction hardened	min. HRC 45
Hardening depth	min. 2.5 mm
Ground and hard chrome-plated, coating thickness 20 to 30 μm , polished	
Roughness	R_a 0.1 to 0.3 μm max. corresponding to N4 DIN/ISO 1302
Material contact area	$R_{mr} = 50$ to 70%
Cut depth	$c = 0.25 \times R_z$

For other rod materials, special coatings and treatments please contact your local Customer Solution Center.

■ Installation Instructions

The following points should be observed before installation of the seals:

- Ensure the piston rod has a lead-in chamfer; if not, use a calibration mandrel, see Figure 11.
- Deburr and chamfer, or round sharp edges, cover the tips of screw threads.
- Remove machining residue such as chips, dirt and other foreign particles, and carefully clean all parts.
- The seals can be installed more easily if the rod is greased or oiled. Attention must be paid to the compatibility of the seal materials with these lubricants. Use only grease without solid additives (e.g. molybdenum disulphide or zinc sulphide).
- Do not use tools with sharp edges.

INSTALLATION IN SPLIT GROOVES

Installation in split grooves is problem-free. The sequence of installation corresponds to the configuration of the seal, whereby the individual seal elements must not be allowed to twist. During final installation (insertion of the piston rod into the seal), elastomer or spring-energized seals must be calibrated. The piston rod itself can be used for this purpose, provided that it has a long lead-in chamfer. Alternatively, a calibration mandrel should be used.

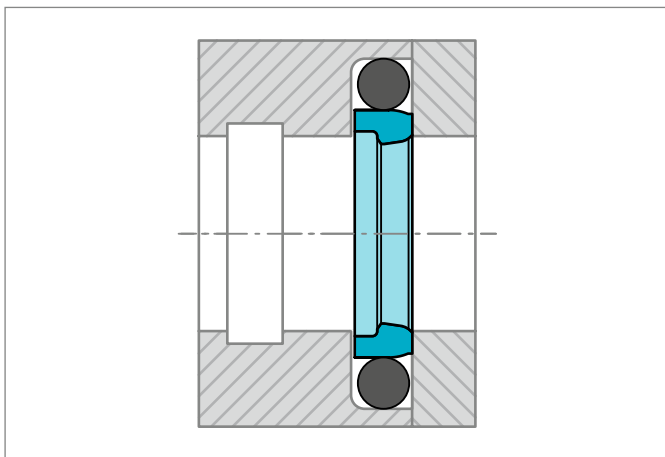


Figure 7: Installation in a split groove

INSTALLATION IN CLOSED GROOVES

By following the instructions in each seal type description (sizes for closed or split grooves) or using the light series for Turcon® seals, installation of our rod seal elements at small diameters will be problem-free.

For Zurcon® and polyurethane seals, the use of installation tools is recommended. If installation has to be performed without installation tools, use the same sequence as for Turcon® elastomer energized seals:

- Place the O-Ring into the groove (not necessary with U-Cup seals).
- Compress the Turcon® or Zurcon® seals into a kidney shape while avoiding sharp bends see Figure 8.

When a rod seal with notches is folded into a kidney shape, take care to avoid bending the seal at the position of the notches as this may cause overstretch or damage to the seal material.

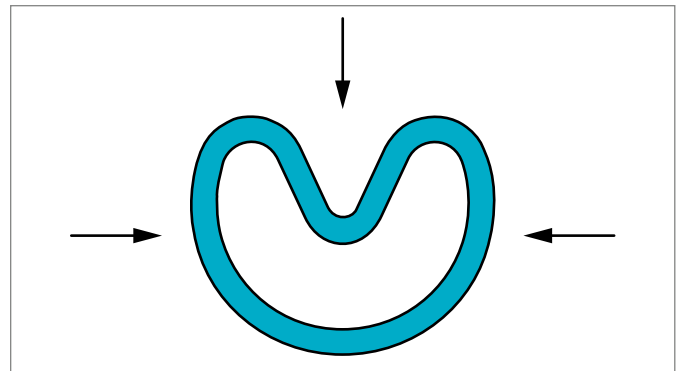


Figure 8: Kidney-shaped deformation of the seal ring

- Place the seal ring in compressed form into the groove and push against the O-Ring in the direction of the arrow and form the seal into a ring see Figure 9.

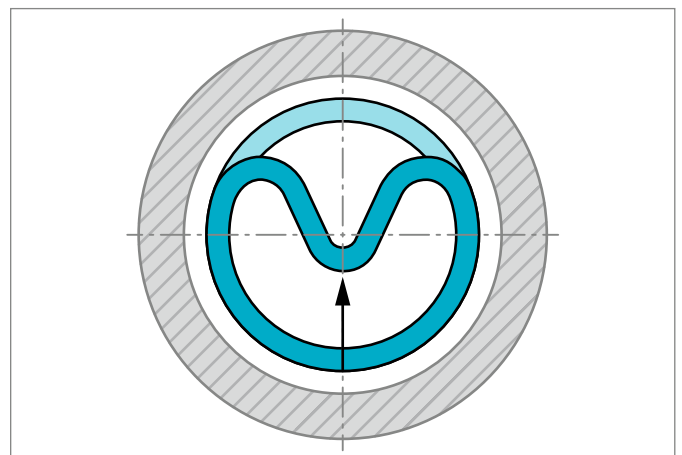


Figure 9: Inserting the seal ring into the closed groove

- Finally size the seal ring using a mandrel which should have a chamfer of 15° to 20° over at least the lead-in chamfer length $Z_{min} \times 2$ see Table 2.

The calibration mandrel should be made from a polymer material (e.g. polyamide) with good sliding characteristics and high surface quality in order to avoid damage to the seals.

The piston rod itself can also be used for calibration, provided it has a sufficiently long lead-in chamfer.

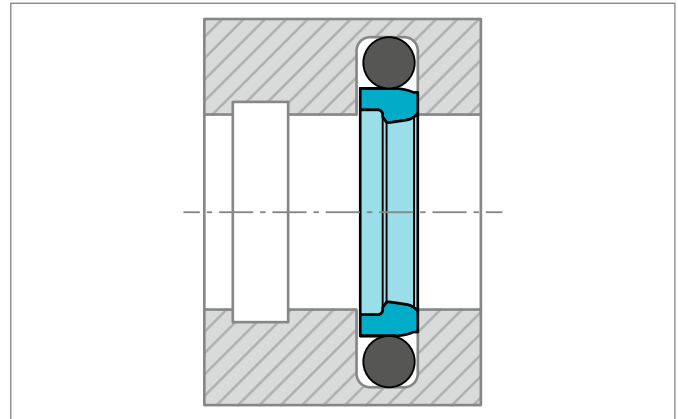


Figure 10: Installation in a closed groove

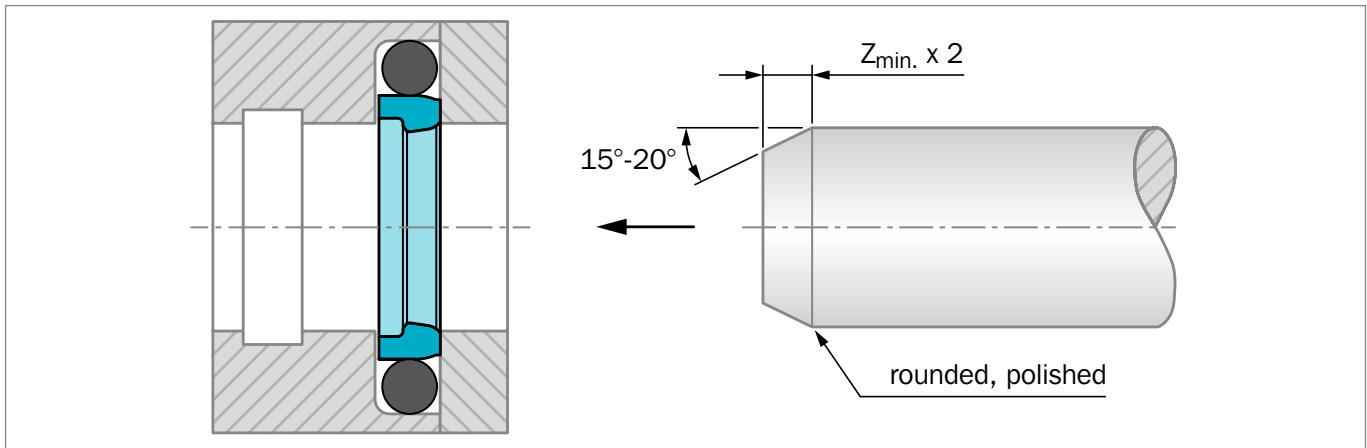


Figure 11: Calibration of the installed seal

Table 6: Closed groove installation for Turcon® rod seals

Stepseal® 2K and seals for similar groove sizes can be installed in closed grooves above the following rod diameters*:

O-Ring Series	Rod Diameter d_N mm	Materials
000	≥ 12	
100	≥ 16	
200	≥ 19	Turcon® M04, M12, T05, T08, T10, T29, T40, T46.
300	≥ 38	
400	≥ 70	
400 H	≥ 200	Zurcon® Z53, Z54, Z80
8.4**	≥ 256	
12.0***	≥ 650	

* For diameter d_N below 30 mm and/or not very accessible grooves it is often essential to use installation tools.

** O-Ring cross section according to SMS 1586

*** The energizer can have a special shape.

INSTALLATION OF AQ-SEAL® AND AQ-SEAL® 5 WITH QUAD-RING® OR BEAN SEAL:

The same installation procedure for rod Stepseal® 2K may be used for AQ-Seal® or AQ-Seal® 5 - see Figure 8 and Figure 9 - except AQ-Seal® 5 uses different groove sizes. However, the Quad-Ring® and Bean Seal should not be fitted until the AQ-Seal® or AQ-Seal® 5 have been calibrated - see Figure 11.

INSTALLATION HINT

AQ-Seal® and AQ-Seal® 5 with Quad-Ring® or Bean Seals are normally supplied without the Quad-Ring® / Bean Seal installed:

To assist mounting of the elastomer element after the AQ-Seal® or AQ-Seal® 5 ring has been calibrated, dental floss could be used to avoid twisting of the Quad-Ring® / Bean Seal - see Figure 12.

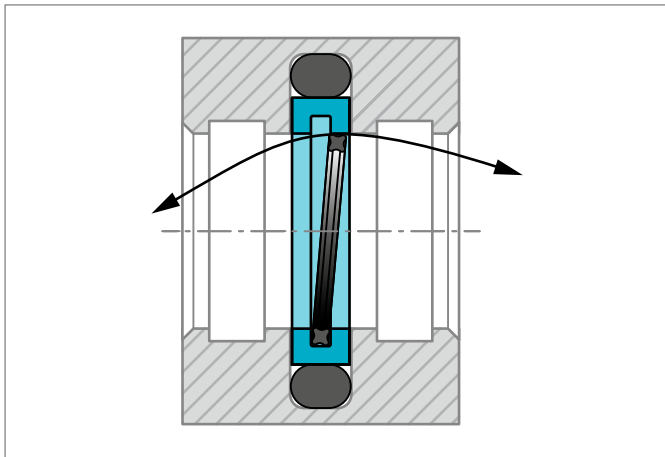


Figure 12: Installation of AQ-Seal® with Bean Seal for Rod

INSTALLATION OF TURCON® VL SEAL®

Installation in closed grooves is possible for diameters according to Table 7.

Table 7: Closed groove installation for VL Seal®

Series No.	Rod Diameter d_N mm
REL1	≥ 30
REL2	≥ 30
REL3	≥ 50
REL4	≥ 80
REL5	≥ 125
REL6	≥ 400

The O-Ring is inserted and positioned in the groove, then the seal is folded and inserted into the groove - see Figure 13.

The seal is folded out in the groove and is thereafter calibrated before the piston rod is inserted.

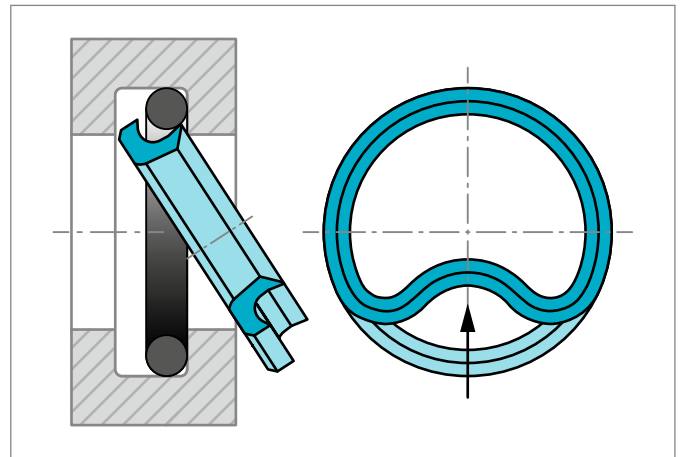


Figure 13: Installation of Rod VL Seal® in closed groove

INSTALLATION OF DOUBLE DELTA®

Installation in closed grooves is possible for diameters from 12 mm using the following procedure:

- Place the O-Ring into the groove.
- Compress the Turcon® seal into a kidney shape, while avoiding sharp bends - see Figure 14. When a rod seal with notches is folded in kidney shape, take care to avoid bending the seal at the position of the notches as this may cause overstretch or damage to the seal material.
- Place the seal ring in compressed form into the groove and push against the O-Ring in the direction of the arrow in the groove by hand - see Figure 15. For diameters smaller than 30 mm an inserter tube is recommended - see Figure 16.
- Finally, size the seal ring using a mandrel, see Figure 17, which should have a chamfer of 10° to 15° over a minimum length of 2 x lead-in chamfer length Z_{min} see Table 3

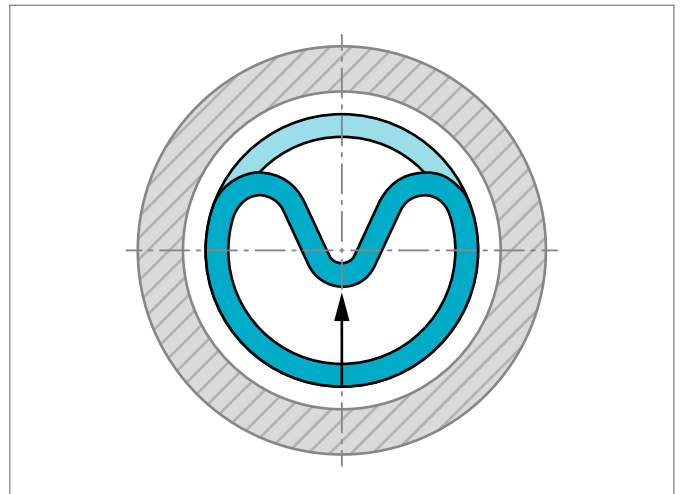


Figure 15: Inserting the seal ring into the closed groove

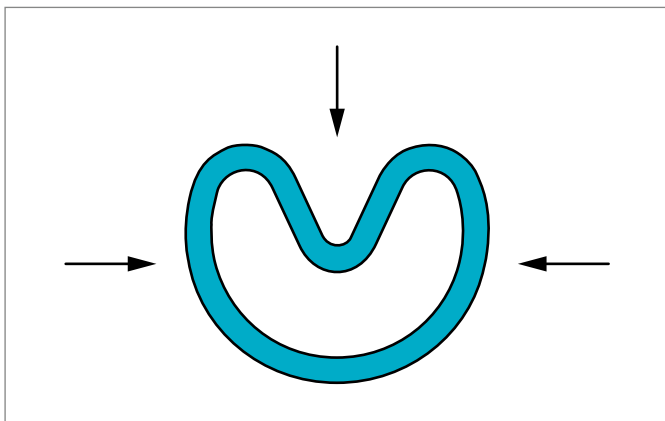


Figure 14: Kidney-shaped deformation

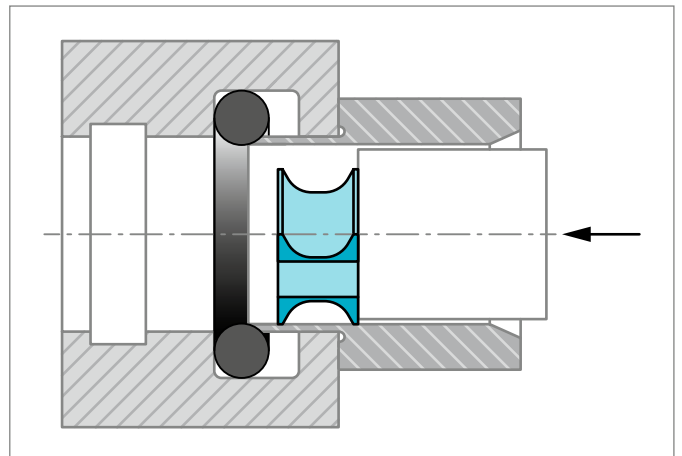


Figure 16: Insertion with an inserter tube

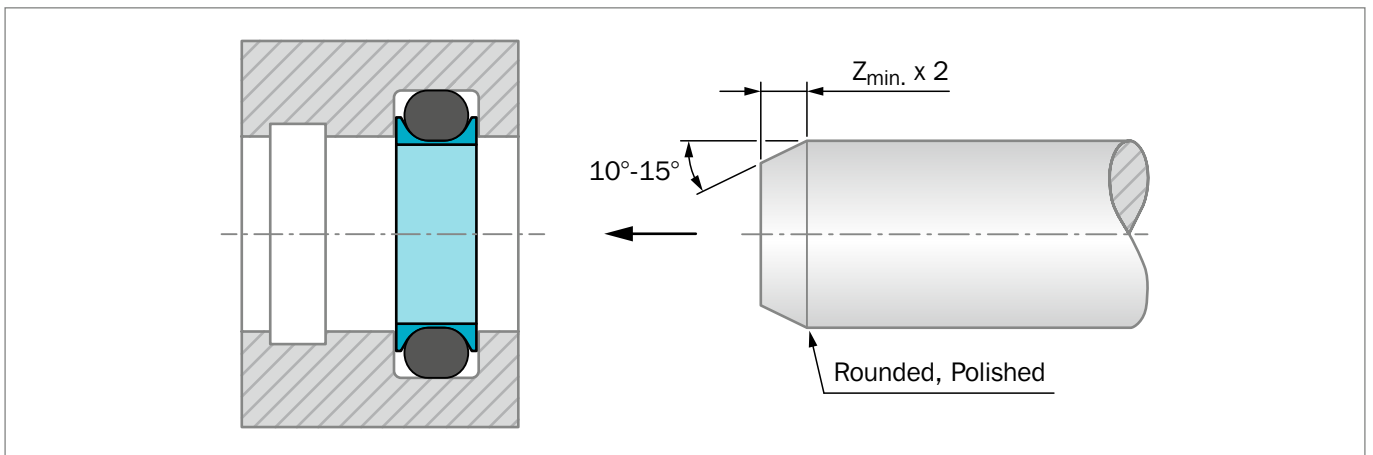


Figure 17: Calibration of the installed seal by means of a calibration mandrel

INSTALLATION OF SPRING ENERGIZED SEALS

Turcon® Variseal® M2 and M2S seals should preferably be installed in split grooves.

Installation in half-open grooves is possible with a snap fitting. Figure 18 shows the design of the groove.

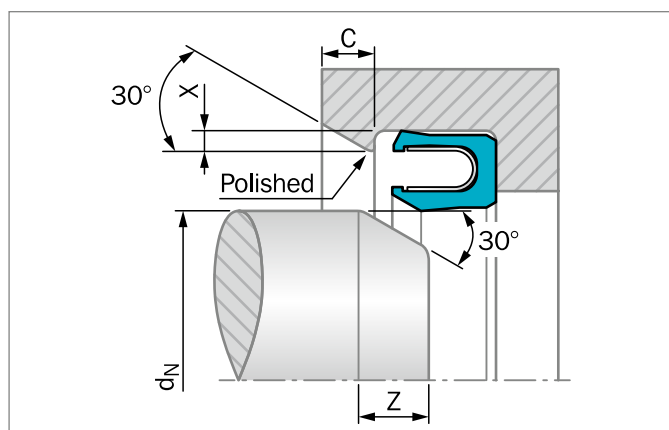


Figure 18: Installation in a half-open groove

Table 8: Installation in Half-Open Grooves

Serial-No.	X min.	d _N min.	Length Z min.	C min.
RVA0 / RVC0	0.4	20.00	1.20	0.70
RVA1 / RVC1	0.6	30.00	1.50	1.10
RVA2 / RVC2	0.7	35.00	2.50	1.25
RVA3 / RVC3	0.8	40.00	4.50	1.40
RVA4 / RVC4	0.9	45.00	6.00	1.60
RVA5 / RVC5	1.5	80.00	11.00	2.60

RVC alongside the RVA references: RVA0 / RVC0

For further information, see Figure 80 and Figure 217 and Figure 60 and Figure 199.

In exceptional cases, or with existing designs, an installation in closed grooves is also possible. The details in Table 9 should be regarded as guide values for installation.

Table 9: Installation in Closed Grooves

Serial-No.	d _N min.
RVA0 / RVC0	30
RVA1 / RVC1	70
RVA2 / RVC2	110
RVA3 / RVC3	300
RVA4 / RVC4	500
RVA5 / RVC5	800

RVC alongside the RVA references: RVA0 / RVC0

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Turcon® Stepseal® 2K



Single-acting

Rubber-energized plastic-faced seal

Material:

Turcon®, Zurcon® and Elastomer



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■ Turcon® Stepseal® 2K*



■ Description

Under all operating conditions, dynamic rod seals must not exhibit any leakage to the atmosphere side and must be completely leak tight when the machine is at a standstill.

Furthermore, they should achieve a high degree of mechanical efficiency through low friction and be easy to install in small grooves. Costs and service life must meet the high expectations of the operator.

The rod seal Turcon® Stepseal® 2K comes closest to satisfying these ideal demands. Since the first Stepseal® was patented, Trelleborg Sealing Solutions has maintained the series as technically outstanding through continuous innovation. Turcon® Stepseal® 2K marks the latest development.

The introduction of Stepseal® made it possible to arrange several seals in sequence, thus allowing statically and dynamically tight double-acting tandem seal configurations to be created, while avoiding build-up of intermediate pressure. The single-acting seal element is made of high-grade Turcon® or Zurcon® materials with outstanding sliding and wear resistance properties. It is installed in Trelleborg Sealing Solutions standard Stepseal® grooves as well as ISO 7425-2 seal housing, using an O-Ring as an energizing element.

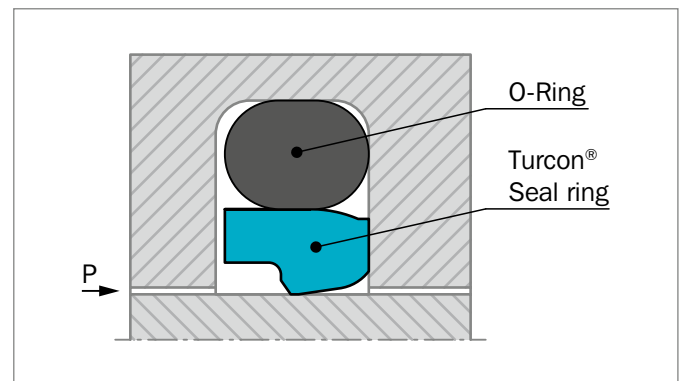


Figure 19: Turcon® Stepseal® 2K

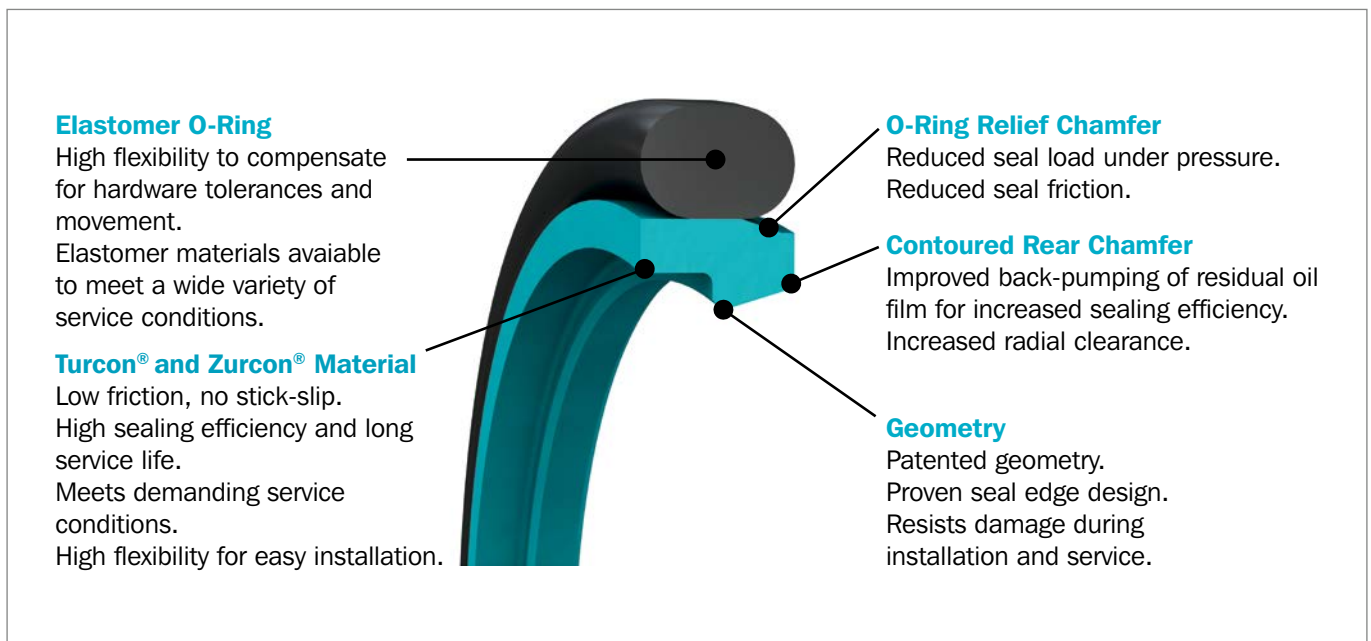


Figure 20: Turcon® Stepseal® 2K design features

* Patent application: WO 00/75539 A1



METHOD OF OPERATION

The sealing performance of Turcon® Stepseal® 2K (Figure 19) results from its hydrodynamic properties. The classic Stepseal® 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 enables residual fluid film on the rod to be returned into the system on the return stroke. This is united with patented design features which further improve the performance of Stepseal® 2K under severe service conditions.

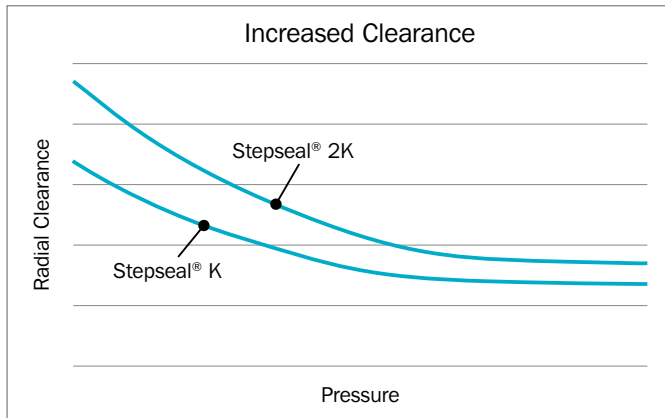


Figure 21: Turcon® Stepseal® 2K possesses superior extrusion resistance and allows increased hardware clearance

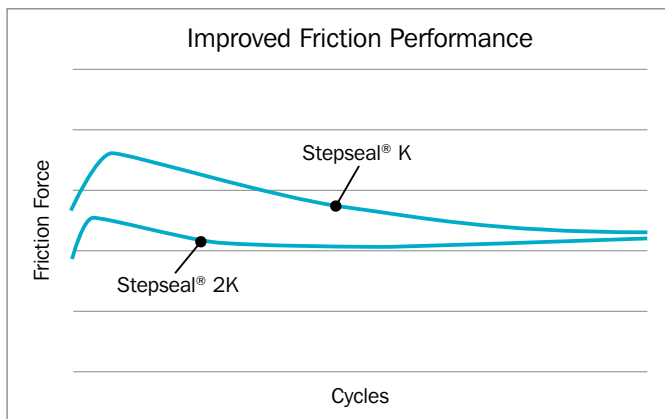


Figure 22: Turcon® Stepseal® 2K offers a uniform, low-friction characteristic

The O-Ring relief chamfer reduces pressure loading on the seal, whereby contact with the rod is optimised and sealing performance is improved at high service pressures. The special high-lift rear chamfer combines a smooth downstream sealing face with the ability to meet large radial clearances and hardware tolerances.

Stepseal® 2K gives high static and dynamic sealing performance, and the build-up of intermediate pressure often found with tandem seal configurations (Figure 23) is efficiently suppressed.

ADVANTAGES

- High static and dynamic sealing effect
- High extrusion resistance, allowing large hardware clearances
- Low friction, high efficiency
- Stick-slip free operation
- High abrasion resistance, high operational reliability
- Wide range of application temperatures and high resistance to chemicals, depending on the choice of O-Ring material
- Simple installation without seal edge deformation
- Available for all diameters up to 2,600 mm rod diameter
- Fits standard Stepseal® 2K groove dimensions as well as ISO 7425 seal housings

APPLICATION EXAMPLES

- Mobile hydraulics
- Construction equipment
- Mining
- Standard cylinders
- Machine tools
- Injection molding machines
- Presses
- Clamp cylinders
- Wind turbines
- Automotive industry
- Shock absorbers
- Hydraulic hammers
- Servo hydraulics



OPERATING CONDITIONS

Pressure:	Up to 60 MPa
Speed:	Up to 15 m/s with reciprocating movements, frequency up to 5 Hz
Temperature:	-45 °C to +200 °C depending on O-Ring material
Media:	Mineral oil-based hydraulic fluids, flame retardant hydraulic fluids, environmentally friendly hydraulic fluids (bio-oils), phosphate ester, water and others, depending on the O-Ring material compatibility (see Table 11)
Clearance:	The maximum permissible radial clearance S_{max} is shown in Table 12, as a function of the operating pressure and functional diameter.

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.

SERIES

Different cross section sizes are recommended as a function of the seal diameters.

Table 12 shows the relationship between the series number according to the seal diameter range and the different application class sizes. These application classes are:

Standard application:	General applications without exceptional operating conditions.
Light application:	Applications with demands for reduced friction or for smaller grooves.
Heavy-duty application:	For exceptional operating loads such as high pressures, pressure peaks, etc.

Table 10: Available Range

Series No.	Rod Diameter d_N f8/h9
RSK00	1.5 - 130.0
RSK10	6.0 - 250.0
RSK20	8.0 - 450.0
RSK30	12.0 - 650.0
RSK40	38.0 - 650.0
RSK80	140.0 - 999.9
RSK50	180.0 - 999.9
RSK5X	1,000.0 - 1,200.0
RSK60	650.0 - 999.9
RSK6X	1,000.0 - 2,600.0

For the Standard Recommendations Application range see Table 12.

ISO GROOVE

Stepseal® 2K is installed in Trelleborg Sealing Solutions standard Stepseal® grooves or according to ISO 7425-2 seal housing.

REDUNDANT SEALING SYSTEM

In many applications, secondary seal systems are required. Figure 23 shows a tandem configuration with the Stepseal® 2K.

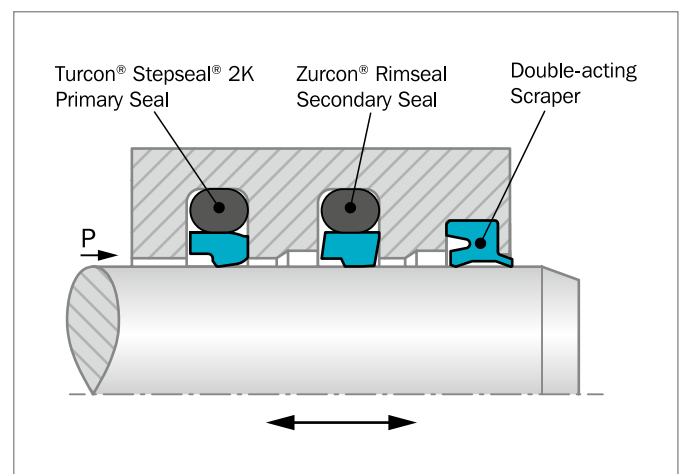


Figure 23: Turcon® Stepseal® 2K and Zurcon® Rimseal in tandem configuration

In this configuration it must be noted that a sufficiently large space is formed between the seals to take the hydraulic fluid, as shown in the figure.



Depending on the application and the operating conditions, the combination of different materials offers a further improvement in the sealing efficiency and the service life of the system, e.g. in hydraulic cylinders subject to high loads and under rough operating conditions, the primary seal should be made of Turcon® and the secondary seal of Zurcon®.

Stepseal® 2K elements should always be used in combination with a double-acting scraper to provide optimum sealing effect.

The scrapers Turcon® Excluder® 2, Turcon® Excluder® 5, Turcon® Excluder® F, Zurcon® Excluder® 500, DA17, DA22 and DA24 are well suited to such applications. For further details, please refer to the Scrapers section in this catalog.

INSTALLATION INSTRUCTIONS

Stepseal® 2K is installed according to information on page 39 and 40.

Closed groove installation according to dimensions in Table 6 page 40.

RECOMMENDED MATERIALS

The following material combinations have proven effective for hydraulic applications:

Turcon® Stepseal® 2K in Turcon® M12

All round material for light to heavy hydraulic applications with linear, short stroke or helical movements in mineral oils, flame retardant hydraulic fluids, phosphate ester, bio-oils or fluids having low lubricating properties:

O-Ring	NBR 70 Shore A	N
	FKM 70 Shore A	V

Set Code: M12N or M12V

Turcon® Stepseal® 2K in Turcon® T46

For medium to heavy applications with linear movements in mineral oils and other media with good lubrication:

O-Ring:	NBR 70 Shore A	N
	FKM 70 Shore A	V

Set Code: T46N or T46V

For specific applications, all Turcon® materials are available. Other material combinations are listed in Table 11.

**Table 11: Turcon® and Zurcon® Materials for Stepseal® 2K**

Material, Applications, Properties	Code	O-Ring Material Shore A	Code	O-Ring Operating Temp. * °C	Mating Surface Material	MPa max. Dynamic
Turcon® M12 First material choice for seals in linear motion Overall improved properties For new constructions and updating For all commonly applied hydraulic fluids including fluids with low lubrication performance Lowest friction and best sliding properties Lowest wear on seals Improved absorption of abrasive contaminants Low wear or abrasion of counter surface BAM tested Mineral fiber and additives filled Color: Dark gray	M12	NBR 70	N	-30 to +100	Steel	50
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod) Steel plated (rod) Cast iron Stainless steel Titanium	
		FKM 70	V	-10 to +200		
Turcon® T05 For lubricating fluids Also for gas service Very low friction Very good sliding and sealing properties Color: Turquoise	T05	NBR 70	N	-30 to +100	Steel	20
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod)	
		FKM 70	V	-10 to +200		
Turcon® T08 For lubricating fluids and linear motion Very high compressive strength and extrusion resistance Hard counter surfaces is recommended Bronze filled Color: Light to dark brown, which may have variations in shading	T08	NBR 70	N	-30 to +100	Steel hardened	60
		NBR 70 Low temp.	T	-45 to +80	Steel chrome plated (rod) Cast iron	
		FKM 70	V	-10 to +200		
Turcon® T10 For hydraulic and pneumatic For lubricating and non-lubricating fluids High extrusion resistance Good chemical resistance Not for electrically conducting fluids BAM tested Carbon, graphite filled Color: Black	T10	NBR 70	N	-30 to +100	Steel	40
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod) Stainless steel	
		FKM 70	V	-10 to +200		
		EPDM 70	E**	-45 to +145		
Turcon® T29 For lubricating and non-lubricating fluids Good extrusion resistance Surface texture is not suitable for gas sealing Not for electrically conducting fluids Carbon fiber filled Color: Gray	T29	NBR 70	N	-30 to +100	Steel	30
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod) Cast iron Stainless steel	
		FKM 70	V	-10 to +200		
		EPDM 70	E**	-45 to +145		

Table continues on next page



Material, Applications, Properties	Code	O-Ring Material Shore A	Code	O-Ring Operating Temp. * °C	Mating Surface Material	MPa max. Dynamic
Turcon® T40 For lubricating and non-lubricating fluids High frequency and short strokes Water hydraulics Surface texture is not suitable for gas sealing Carbon fiber filled Color: Gray	T40	NBR 70	N	-30 to +100	Steel	25
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod) Cast iron	
		FKM 70	V	-10 to +200	Stainless steel	
		EPDM 70	E**	-45 to +145	Aluminum	
Turcon® T46 For lubricated hydraulics in linear motion High compressive strength High extrusion resistance Very good sliding and wear properties BAM tested Bronze filled Color: Light to dark brown, which may have variations in shading	T46	NBR 70	N	-30 to +100	Steel hardened	50
		NBR 70 Low temp.	T	-45 to +80	Steel chrome plated (rod) Cast iron	
		FKM 70	V	-10 to +200		
Zurcon® Z53*** For mineral oil based fluids Very high abrasion and extrusion resistance For counter surfaces with rougher surface finish Limited chemical resistance Max. working temperature +110 °C Cast polyurethane Color: Yellow to light-brown	Z53	NBR 70	N	-30 to +100	Steel	60
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod) Cast iron Stainless steel Ceramic coating	
Zurcon® Z80 For lubricating and non-lubricating fluids Water based fluids, air and gases Dry air pneumatics High abrasion and extrusion resistance For service in abrasive conditions and media with particles Good chemical resistance Limited temperature capability (-60 to +80 °C) UHMWPE (Ultra High Molecular Weight Polyethylene) Color: White to off-white	Z80	NBR 70	N	-30 to (+100)	Steel	35
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod) Stainless steel Aluminum Ceramic coating	
		EPDM 70	E**	-45 to (+145)		

* The O-Ring operation temperature is only valid in mineral hydraulic oil (except EPDM).

** Material not suitable for mineral oils.

*** Max. diameter 2,200 mm.

BAM: Tested by "Bundesanstalt Materialprüfung, Germany".

 Highlighted materials are recommended.



Installation Recommendation

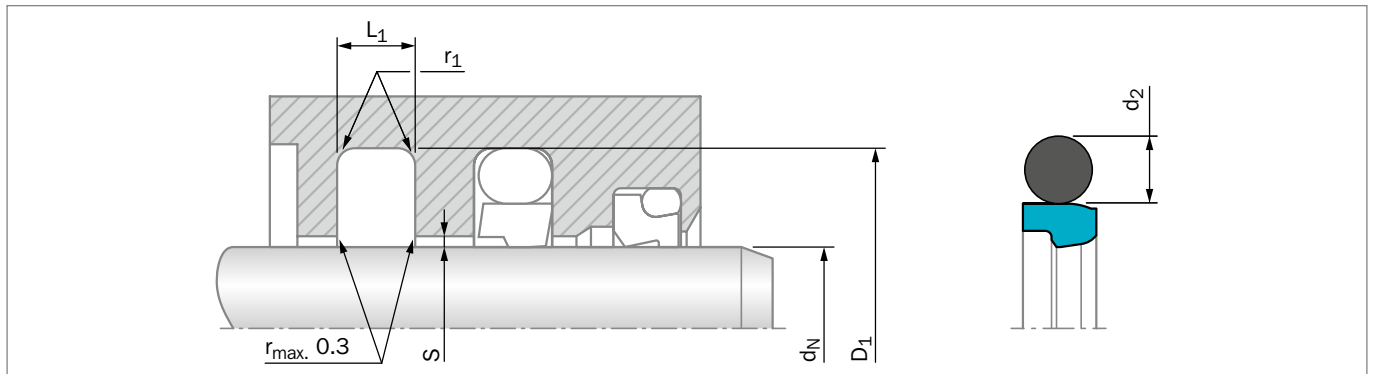


Figure 24: Installation Drawing

Table 12: Installation Dimensions – Standard Recommendations

Series No.	Rod Diameter d_N f8/h9			Groove Diameter D_1 H9	Groove Width L_1 +0.2	Radius r_1 max	Radial Clearance S_{max} *			O-Ring Cross Section d_2
	Standard Application	Light Application**	Heavy Duty Application				10 MPa	20 MPa	40 MPa	
RSK0	3 - 7.9	8 - 18.9	-	$d_N + 4.9$	2.2	0.4	0.30	0.20	0.15	1.78
RSK1	8 - 18.9	19 - 37.9	-	$d_N + 7.3$	3.2	0.6	0.40	0.25	0.15	2.62
RSK2	19 - 37.9	38 - 199.9	8 - 18.9	$d_N + 10.7$	4.2	1.0	0.50	0.30	0.20	3.53
RSK3	38 - 199.9	200 - 255.9	19 - 37.9	$d_N + 15.1$	6.3	1.3	0.70	0.40	0.25	5.33
RSK4	200 - 255.9	256 - 649.9	38 - 199.9	$d_N + 20.5$	8.1	1.8	0.80	0.60	0.35	7.00
RSK8	256 - 649.9	650 - 999.9	200 - 255.9	$d_N + 24.0$	8.1	1.8	0.90	0.70	0.40	7.00
RSK5	650 - 999.9	-	256 - 649.9	$d_N + 27.3$	9.5	2.5	1.00	0.80	0.50	8.40
RSK5X	-	1,000 - 1,200	-	$d_N + 27.3$	9.5	2.5	1.00	0.80	0.50	8.40
RSK6***	-	-	650 - 999.9	$d_N + 38.0$	13.8	3.0	1.20	0.90	0.60	12.00
RSK6X***	1,000 - 2,600	-	-	$d_N + 38.0$	13.8	3.0	1.20	0.90	0.60	12.00

* At pressures > 40 MPa use diameter tolerance H8/f8 (bore/rod) in the area behind seal or consult your local Customer Solution Center for alternative material or profiles.

Slydring® / Wear Rings are not applicable at very small radial clearances, please consult the Slydring® section in this catalog.

** For easier installation in closed grooves with small rod diameters < 40 mm.

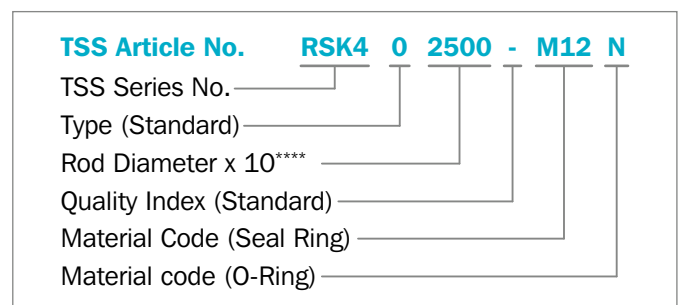
*** All O-Rings with 12 mm cross section are delivered as a special profile ring.

ORDERING EXAMPLE

Turcon® Stepseal® 2K complete with O-Ring, standard application:

Series:	RSK4 from Table 12
Rod diameter:	$d_N = 250.0$ mm
TSS Part No.:	RSK402500 from Table 13

Select the material from Table 11. The corresponding code numbers are appended to the TSS Part No. Together these form the TSS Article Number. The TSS Article Number for all intermediate sizes can be determined by following the example:



**** For diameters d_N 1,000.0 mm multiply only by factor 1.
 Example: RSK6 for diameter $d_N = 1,200.0$ mm.
 TSS Article No.: RSK6X1200-M12N.



Table 13: Installation Dimensions / TSS Part No.

Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size	Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size
d_N f8/h9	D_1 H9	L_1 +0.2			d_N f8/h9	D_1 H9	L_1 +0.2		
3.0	7.9	2.2	RSK000030	4.80 x 1.80	32.0	39.3	3.2	RSK100320	34.59 x 2.62
4.0	8.9	2.2	RSK000040	5.60 x 1.80	32.0	42.7	4.2	RSK200320	36.09 x 3.53
5.0	9.9	2.2	RSK000050	6.70 x 1.80	34.0	44.7	4.2	RSK200340	37.69 x 3.53
6.0	10.9	2.2	RSK000060	7.65 x 1.78	35.0	42.3	3.2	RSK100350	37.77 x 2.62
7.0	11.9	2.2	RSK000070	8.75 x 1.80	35.0	45.7	4.2	RSK200350	37.69 x 3.53
8.0	12.9	2.2	RSK000080	9.50 x 1.80	36.0	43.3	3.2	RSK100360	39.34 x 2.62
8.0	15.3	3.2	RSK100080	10.77 x 2.62	36.0	46.7	4.2	RSK200360	40.87 x 3.53
9.0	13.9	2.2	RSK000090	10.82 x 1.78	37.0	44.3	3.2	RSK100370	39.34 x 2.62
9.0	16.3	3.2	RSK100090	10.77 x 2.62	37.0	47.7	4.2	RSK200370	40.87 x 3.53
10.0	14.9	2.2	RSK000100	11.80 x 1.80	38.0	48.7	4.2	RSK200380	40.87 x 3.53
10.0	17.3	3.2	RSK100100	12.37 x 2.62	38.0	53.1	6.3	RSK300380	43.82 x 5.33
12.0	16.9	2.2	RSK000120	14.00 x 1.78	40.0	50.7	4.2	RSK200400	44.04 x 3.53
12.0	19.3	3.2	RSK100120	14.50 x 2.65	40.0	55.1	6.3	RSK300400	43.82 x 5.33
12.7	17.6	2.2	RSK000127	14.00 x 1.78	42.0	52.7	4.2	RSK200420	47.22 x 3.53
12.7	20.0	3.2	RSK100127	15.54 x 2.62	42.0	57.1	6.3	RSK300420	46.99 x 5.33
14.0	18.9	2.2	RSK000140	15.60 x 1.78	43.0	53.7	4.2	RSK200430	47.22 x 3.53
14.0	21.3	3.2	RSK100140	17.12 x 2.62	44.4	59.5	6.3	RSK300444	50.17 x 5.33
15.0	19.9	2.2	RSK000150	17.17 x 1.78	45.0	55.7	4.2	RSK200450	50.39 x 3.53
15.0	22.3	3.2	RSK100150	18.00 x 2.65	45.0	60.1	6.3	RSK300450	50.17 x 5.33
16.0	20.9	2.2	RSK000160	17.17 x 1.78	48.0	58.7	4.2	RSK200480	53.57 x 3.53
16.0	23.3	3.2	RSK100160	18.72 x 2.62	48.0	63.1	6.3	RSK300480	53.34 x 5.33
17.0	21.9	2.2	RSK000170	18.77 x 1.78	50.0	60.7	4.2	RSK200500	53.57 x 3.53
18.0	22.9	2.2	RSK000180	20.35 x 1.78	50.0	65.1	6.3	RSK300500	56.52 x 5.33
18.0	25.3	3.2	RSK100180	20.29 x 2.62	50.8	61.5	4.2	RSK200508	53.57 x 3.53
19.0	29.7	4.2	RSK200190	23.40 x 3.53	50.8	65.9	6.3	RSK300508	56.52 x 5.33
20.0	27.3	3.2	RSK100200	21.89 x 2.62	52.0	62.7	4.2	RSK200520	56.74 x 3.53
20.0	30.7	4.2	RSK200200	25.00 x 3.53	52.0	67.1	6.3	RSK300520	56.52 x 5.33
22.0	29.3	3.2	RSK100220	25.07 x 2.62	54.0	69.1	6.3	RSK300540	59.69 x 5.33
22.0	32.7	4.2	RSK200220	26.58 x 3.53	55.0	65.7	4.2	RSK200550	59.92 x 3.53
24.0	31.3	3.2	RSK100240	26.64 x 2.62	55.0	70.1	6.3	RSK300550	59.69 x 5.33
25.0	32.3	3.2	RSK100250	28.24 x 2.62	56.0	66.7	4.2	RSK200560	59.92 x 3.53
25.0	35.7	4.2	RSK200250	29.75 x 3.53	56.0	71.1	6.3	RSK300560	62.87 x 5.33
25.4	32.7	3.2	RSK100254	28.24 x 2.62	56.0	76.5	8.1	RSK400560	64 x 7.00
25.4	36.1	4.2	RSK200254	29.75 x 3.53	57.0	72.1	6.3	RSK300570	62.87 x 5.33
26.0	33.3	3.2	RSK100260	28.24 x 2.62	59.0	69.7	4.2	RSK200590	63.09 x 3.53
26.0	36.7	4.2	RSK200260	29.75 x 3.53	60.0	70.7	4.2	RSK200600	63.09 x 3.53
28.0	35.3	3.2	RSK100280	29.82 x 2.62	60.0	75.1	6.3	RSK300600	66.04 x 5.33
28.0	38.7	4.2	RSK200280	32.92 x 3.53	63.0	73.7	4.2	RSK200630	66.27 x 3.53
28.575	35.875	3.2	RSK100286	31.42 x 2.62	63.0	78.1	6.3	RSK300630	69.22 x 5.33
30.0	37.3	3.2	RSK100300	32.99 x 2.62	63.5	78.6	6.3	RSK300635	69.22 x 5.33
30.0	40.7	4.2	RSK200300	34.52 x 3.53	65.0	75.7	4.2	RSK200650	69.44 x 3.53



Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size	Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size
d_N f8/h9	D_1 H9	L_1 +0.2			d_N f8/h9	D_1 H9	L_1 +0.2		
65.0	80.1	6.3	RSK300650	69.22 x 5.33	125.0	140.1	6.3	RSK301250	129.54 x 5.33
67.0	77.7	4.2	RSK200670	72.62 x 3.53	125.0	145.5	8.1	RSK401250	132.72 x 7.00
69.0	84.1	6.3	RSK300690	75.57 x 5.33	125.4	140.5	6.3	RSK301254	132.72 x 5.33
70.0	80.7	4.2	RSK200700	75.79 x 3.53	127.0	142.1	6.3	RSK301270	132.72 x 5.33
70.0	85.1	6.3	RSK300700	75.57 x 5.33	130.0	145.1	6.3	RSK301300	135.89 x 5.33
70.0	90.5	8.1	RSK400700	78 x 7.00	130.0	150.5	8.1	RSK401300	139.07 x 7.00
72.0	82.7	4.2	RSK200720	75.79 x 3.53	132.0	147.1	6.3	RSK301320	139.07 x 5.33
73.0	88.1	6.3	RSK300730	78.74 x 5.33	135.0	145.7	4.2	RSK201350	139.29 x 3.53
75.0	85.7	4.2	RSK200750	78.97 x 3.53	135.0	150.1	6.3	RSK301350	142.24 x 5.33
75.0	90.1	6.3	RSK300750	81.92 x 5.33	137.0	152.1	6.3	RSK301370	142.24 x 5.33
76.2	91.3	6.3	RSK300762	81.92 x 5.33	138.0	153.1	6.3	RSK301380	142.24 x 5.33
78.0	93.1	6.3	RSK300780	85.09 x 5.33	140.0	150.7	4.2	RSK201400	145.64 x 3.53
80.0	90.7	4.2	RSK200800	85.32 x 3.53	140.0	155.1	6.3	RSK301400	145.42 x 5.33
80.0	95.1	6.3	RSK300800	85.09 x 5.33	140.0	160.5	8.1	RSK401400	148.59 x 7.00
80.0	100.5	8.1	RSK400800	88 x 7.00	140.5	155.6	6.3	RSK301405	145.42 x 5.33
82.5	97.6	6.3	RSK300825	88.27 x 5.33	145.0	160.1	6.3	RSK301450	151.77 x 5.33
83.0	93.7	4.2	RSK200830	88.49 x 3.53	145.0	165.5	8.1	RSK401450	151.77 x 7.00
85.0	95.7	4.2	RSK200850	88.49 x 3.53	150.0	165.1	6.3	RSK301500	158.12 x 5.33
85.0	100.1	6.3	RSK300850	91.44 x 5.33	150.0	170.5	8.1	RSK401500	158.12 x 7.00
85.0	105.5	8.1	RSK400850	93 x 7.00	153.0	168.1	6.3	RSK301530	158.12 x 5.33
89.0	104.1	6.3	RSK300890	94.62 x 5.33	155.0	170.1	6.3	RSK301550	158.12 x 5.33
90.0	100.7	4.2	RSK200900	94.84 x 3.53	160.0	175.1	6.3	RSK301600	164.47 x 5.33
90.0	105.1	6.3	RSK300900	94.62 x 5.33	160.0	180.5	8.1	RSK401600	170.82 x 7.00
90.0	110.5	8.1	RSK400900	98 x 7.00	165.0	180.1	6.3	RSK301650	170.82 x 5.33
92.0	102.7	4.2	RSK200920	98.02 x 3.53	170.0	185.1	6.3	RSK301700	177.17 x 5.33
92.0	107.1	6.3	RSK300920	97.79 x 5.33	170.0	190.5	8.1	RSK401700	177.17 x 7.00
95.0	105.7	4.2	RSK200950	101.19 x 3.53	173.0	188.1	6.3	RSK301730	177.17 x 5.33
95.0	110.1	6.3	RSK300950	100.97 x 5.33	175.0	190.1	6.3	RSK301750	183.52 x 5.33
100.0	110.7	4.2	RSK201000	104.37 x 3.53	180.0	195.1	6.3	RSK301800	183.52 x 5.33
100.0	115.1	6.3	RSK301000	107.32 x 5.33	180.0	200.5	8.1	RSK401800	189.87 x 7.00
100.0	120.5	8.1	RSK401000	108 x 7.00	185.0	200.1	6.3	RSK301850	189.87 x 5.33
101.6	116.7	6.3	RSK301016	107.32 x 5.33	185.0	205.5	8.1	RSK401850	196.22 x 7.00
104.7	119.8	6.3	RSK301047	110.49 x 5.33	190.0	205.1	6.3	RSK301900	196.22 x 5.33
105.0	120.1	6.3	RSK301050	110.49 x 5.33	190.0	210.5	8.1	RSK401900	196.22 x 7.00
105.0	125.5	8.1	RSK401050	113.67 x 7.00	195.0	210.1	6.3	RSK301950	202.57 x 5.33
110.0	120.7	4.2	RSK201100	113.89 x 3.53	200.0	215.1	6.3	RSK302000	208.92 x 5.33
110.0	125.1	6.3	RSK301100	116.84 x 5.33	200.0	220.5	8.1	RSK402000	208.90 x 7.00
110.0	130.5	8.1	RSK401100	116.84 x 7.00	205.0	225.5	8.1	RSK402050	215.27 x 7.00
115.0	130.1	6.3	RSK301150	120.02 x 5.33	210.0	230.5	8.1	RSK402100	215.27 x 7.00
120.0	135.1	6.3	RSK301200	126.37 x 5.33	211.0	231.5	8.1	RSK402110	215.27 x 7.00
120.0	140.5	8.1	RSK401200	129.54 x 7.00	212.0	232.5	8.1	RSK402120	227.97 x 7.00



Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size	Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size
d_N f8/h9	D_1 H9	L_1 +0.2			d_N f8/h9	D_1 H9	L_1 +0.2		
215.0	235.5	8.1	RSK402150	227.97 x 7.00	480.0	504.0	8.1	RSK804800	494.16 x 7.00
220.0	240.5	8.1	RSK402200	227.97 x 7.00	485.0	509.0	8.1	RSK804850	494.16 x 7.00
225.0	245.5	8.1	RSK402250	240.67 x 7.00	490.0	514.0	8.1	RSK804900	506.86 x 7.00
230.0	245.1	6.3	RSK302300	234.32 x 5.33	500.0	524.0	8.1	RSK805000	506.86 x 7.00
230.0	250.5	8.1	RSK402300	240.67 x 7.00	510.0	534.0	8.1	RSK805100	532.26 x 7.00
235.0	255.5	8.1	RSK402350	240.67 x 7.00	520.0	544.0	8.1	RSK805200	532.26 x 7.00
240.0	260.5	8.1	RSK402400	253.37 x 7.00	525.0	549.0	8.1	RSK805250	532.26 x 7.00
245.0	265.5	8.1	RSK402450	253.37 x 7.00	530.0	554.0	8.1	RSK805300	557.66 x 7.00
250.0	270.5	8.1	RSK402500	266.07 x 7.00	540.0	564.0	8.1	RSK805400	557.66 x 7.00
260.0	284.0	8.1	RSK802600	266.07 x 7.00	550.0	574.0	8.1	RSK805500	557.66 x 7.00
265.0	289.0	8.1	RSK802650	278.77 x 7.00	560.0	584.0	8.1	RSK805600	582.68 x 7.00
270.0	290.5	8.1	RSK402700	278.77 x 7.00	570.0	594.0	8.1	RSK805700	582.68 x 7.00
270.0	294.0	8.1	RSK802700	278.77 x 7.00	580.0	604.0	8.1	RSK805800	608.08 x 7.00
275.0	299.0	8.1	RSK802750	291.47 x 7.00	585.0	609.0	8.1	RSK805850	608.08 x 7.00
280.0	304.0	8.1	RSK802800	291.47 x 7.00	590.0	614.0	8.1	RSK805900	608.08 x 7.00
285.0	309.0	8.1	RSK802850	291.47 x 7.00	600.0	624.0	8.1	RSK806000	608.08 x 7.00
290.0	314.0	8.1	RSK802900	304.17 x 7.00	610.0	634.0	8.1	RSK806100	633.48 x 7.00
295.0	319.0	8.1	RSK802950	304.17 x 7.00	620.0	644.0	8.1	RSK806200	633.48 x 7.00
300.0	320.5	8.1	RSK403000	304.17 x 7.00	630.0	654.0	8.1	RSK806300	658.88 x 7.00
300.0	324.0	8.1	RSK803000	316.87 x 7.00	640.0	664.0	8.1	RSK806400	658.88 x 7.00
310.0	334.0	8.1	RSK803100	316.87 x 7.00	650.0	677.3	9.5	RSK506500	663.00 x 8.40
320.0	344.0	8.1	RSK803200	329.57 x 7.00	656.0	683.3	9.5	RSK506560	669.00 x 8.40
330.0	354.0	8.1	RSK803300	342.27 x 7.00	660.0	687.3	9.5	RSK506600	673.00 x 8.40
340.0	364.0	8.1	RSK803400	354.97 x 7.00	680.0	707.3	9.5	RSK506800	693.00 x 8.40
350.0	370.5	8.1	RSK403500	354.97 x 7.00	685.0	712.3	9.5	RSK506850	698.00 x 8.40
350.0	374.0	8.1	RSK803500	367.67 x 7.00	700.0	724.0	8.1	RSK807000	712.00 x 7.00
360.0	384.0	8.1	RSK803600	367.67 x 7.00	700.0	727.3	9.5	RSK507000	713.00 x 8.40
365.0	389.0	8.1	RSK803650	380.37 x 7.00	710.0	737.3	9.5	RSK507100	723.00 x 8.40
370.0	394.0	8.1	RSK803700	380.37 x 7.00	730.0	757.3	9.5	RSK507300	743.00 x 8.40
375.0	399.0	8.1	RSK803750	393.07 x 7.00	760.0	787.3	9.5	RSK507600	773.00 x 8.40
380.0	404.0	8.1	RSK803800	393.07 x 7.00	765.0	792.3	9.5	RSK507650	778.00 x 8.40
390.0	414.0	8.1	RSK803900	405.26 x 7.00	780.0	807.3	9.5	RSK507800	793.00 x 8.40
400.0	424.0	8.1	RSK804000	417.96 x 7.00	790.0	817.3	9.5	RSK507900	803.00 x 8.40
410.0	434.0	8.1	RSK804100	417.96 x 7.00	800.0	827.3	9.5	RSK508000	813.00 x 8.40
420.0	444.0	8.1	RSK804200	430.66 x 7.00	810.0	837.3	9.5	RSK508100	823.00 x 8.40
430.0	454.0	8.1	RSK804300	443.36 x 7.00	820.0	847.3	9.5	RSK508200	833.00 x 8.40
435.0	459.0	8.1	RSK804350	443.36 x 7.00	830.0	857.3	9.5	RSK508300	843.00 x 8.40
440.0	464.0	8.1	RSK804400	456.06 x 7.00	850.0	877.3	9.5	RSK508500	863.00 x 8.40
450.0	474.0	8.1	RSK804500	468.76 x 7.00	870.0	897.3	9.5	RSK508700	883.00 x 8.40
460.0	484.0	8.1	RSK804600	468.76 x 7.00	880.0	907.3	9.5	RSK508800	893.00 x 8.40
470.0	494.0	8.1	RSK804700	481.38 x 7.00	885.0	912.3	9.5	RSK508850	898.00 x 8.40



Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size
d_N f8/h9	D₁ H9	L₁ +0.2		
890.0	917.3	9.5	RSK508900	903.00 x 8.40
930.0	957.3	9.5	RSK509300	943.00 x 8.40
955.0	982.3	9.5	RSK509550	968.00 x 8.40
1,000.0	1,038.0	13.8	RSK6X1000	1,016.00 x 12.00
1,035.0	1,073.0	13.8	RSK6X1035	1,051.00 x 12.00
1,040.0	1,067.3	9.5	RSK5X1040	1,052.00 x 8.40
1,040.0	1,078.0	13.8	RSK6X1040	1,056.00 x 12.00
1,050.0	1,077.3	9.5	RSK5X1050	1,062.00 x 8.40
1,050.0	1,088.0	13.8	RSK6X1050	1,066.00 x 12.00
1,100.0	1,138.0	13.8	RSK6X1100	1,116.00 x 12.00
1,120.0	1,147.3	9.5	RSK5X1120	1,132.00 x 8.40
1,120.0	1,158.0	13.8	RSK6X1120	1,136.00 x 12.00
1,200.0	1,227.3	9.5	RSK5X1200	1,212.00 x 8.40
1,200.0	1,238.0	13.8	RSK6X1200	1,216.00 x 12.00
1,330.0	1,368.0	13.8	RSK6X1330	1,346.00 x 12.00
1,500.0	1,538.0	13.8	RSK6X1500	1,516.00 x 12.00
1,600.0	1,638.0	13.8	RSK6X1600	1,616.00 x 12.00
2,000.0	2,038.0	13.8	RSK6X2000	2,016.00 x 12.00
2,600.0	2,638.0	13.8	RSK6X2600	2,616.00 x 12.00

The rod diameters in **bold** type are in accordance with the recommendations of ISO 3320.

Other dimensions and all intermediate sizes up to 2,600 mm diameter including imperial (inch) sizes can be supplied.

All O-Rings with 12 mm cross section are delivered as special profile ring.

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Turcon® Stepseal® V



Single-acting

Rubber-energized plastic-faced seal

Material:

Turcon®, Zurcon® and Elastomer



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■ Turcon® Stepseal® V*



■ Description

Stepseal® V is based on the dynamic, unidirectional Turcon® Stepseal® sealing concept. During the extending stroke of the rod, the contact force on the sealing edge creates high local sealing pressure and limits the formation of fluid film under the seal. When the rod is retracted, the Stepseal® sealing face supports hydrodynamic back-pumping of the fluid film, and ensures leak-free sealing efficiency with low friction and long service life.

In long-stroke cylinders and equipment operating with low speed during retraction, it has been found that hydrodynamic back-pumping may become insufficient to prevent build-up of pressure in the seal system behind the primary seal. Pressure build-up in the seal system leads to leakage, increased friction and wear, and may ultimately require replacement of the seals. The usual precaution in such equipment has been to provide space for a buffer volume behind the primary seal or to install a drain line.

First invented by Trelleborg Sealing Solutions, the built-in check valve function eliminates pressure build-up and so render buffer volumes and drain lines obsolete.

Stepseal® V has the efficient seal performance and outstanding service life of the Turcon® Stepseal® range and the reliable prevention of pressure build-up brought by a refined check valve function. Stepseal® V is available in high-grade Turcon® or Zurcon® materials with outstanding sliding and wear resistance properties.

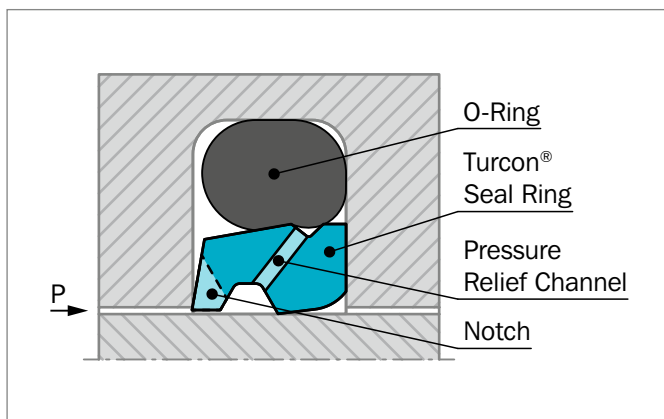


Figure 25: Turcon® Stepseal® V with tight axial groove fit

ADVANTAGES

- Check valve function of O-Ring eliminates risk of fluid bypassing the seal during pressure loading when pressurized
- No pressure build-up on secondary sealing element and Excluder®
- Independent of any speed relation of counter surface
- Independent of stroke length
- High tolerance to hardware non-concentricity and radial play
- Minimum contribution of friction of secondary sealing element and/or Excluder®
- Minimum wear of secondary sealing element and/or Excluder®
- Increased leakage control
- Prolonged seal life
- Increased operational reliability
- Fits standard Stepseal® 2K groove dimensions as well as ISO 7425 seal housings

APPLICATION EXAMPLES

- Mobile hydraulics
- Construction equipment
- Crane boom cylinders
- Presses
- Injection molding machines
- Clamp cylinders
- Wind power cylinders
- Long stroke cylinders
- Waterpower cylinders
- Storm barrier cylinders
- Tensioner cylinders
- Theater hydraulics
- Safety systems

* Patent application: WO 2007/131468 A1



CHARACTERISTICS

- Primary seal with hydrostatic ventilation
- Check valve function
- Hydrodynamic back-pumping
- Stabilized position in the groove
- Prolonged seal life
- Increased leakage control

IMPROVED FRICTION PERFORMANCE

Turcon® Stepseal® V offers a uniform, low friction characteristic to the sealing system throughout its whole life by preventing undefined pressurization of the secondary seal element.

FEATURES

Stepseal® V has been developed to meet continuously increasing demands on sealing systems. In dynamic applications, Stepseal® V brings efficient, reliable sealing performance under even the most demanding service conditions. The high seal efficiency and refined valve function of Stepseal® V eliminates seal system pressure build-up between tandem rod seal configuration and makes buffer volume between the seals a thing of the past.

In rod seal systems, Stepseal® V is preferably used together with a secondary seal from the range of Turcon® and Zurcon® rod seals, or with only a double-acting Turcon® Excluder® or Scraper.

Applied as a piston seal, Stepseal® V is used with a double-acting seal from the Turcon® range of piston seals. Under extreme performance requirements Stepseal® V offers improved leakage control, extended service life and increased reliability.

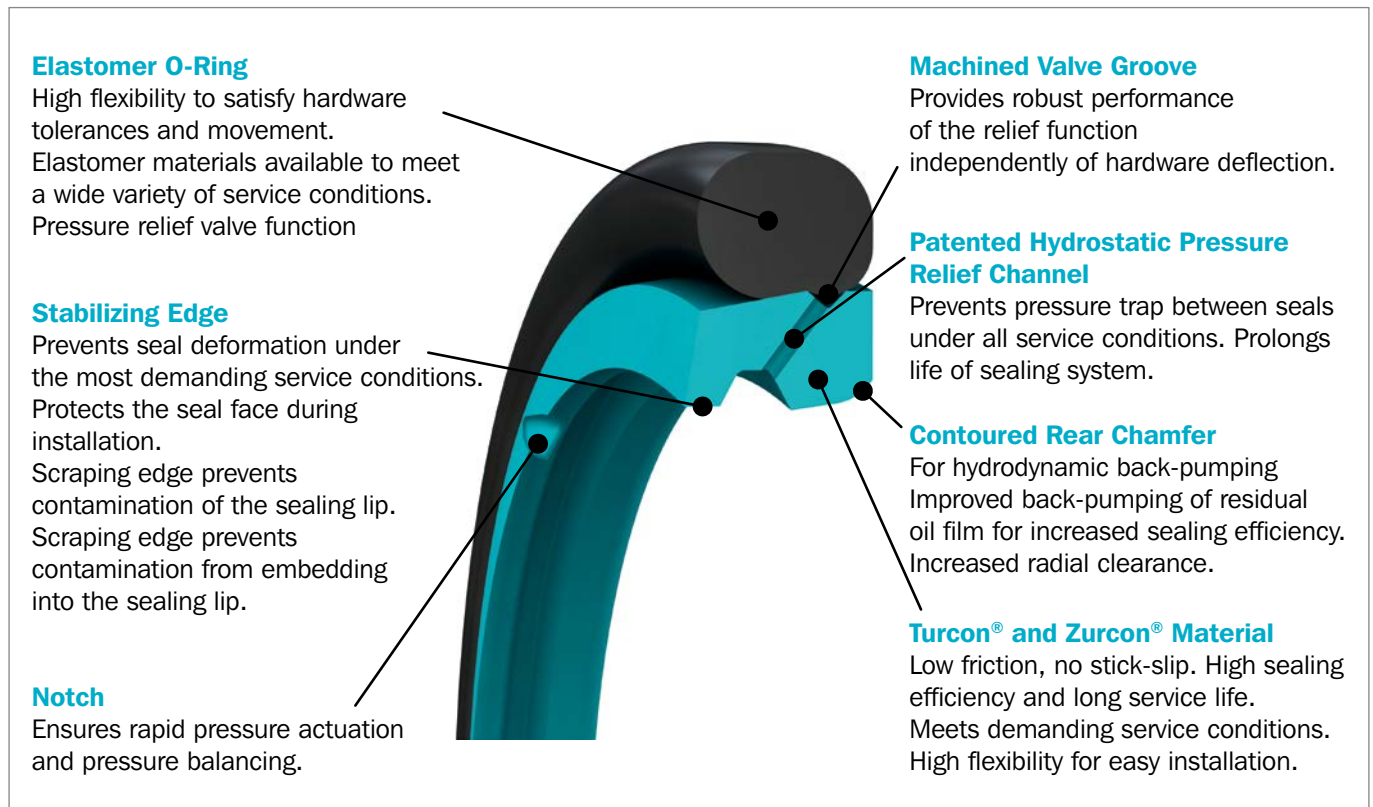


Figure 26: Turcon® Stepseal® V design features



OPERATING CONDITIONS

Pressure:	Up to 50 MPa (Turcon® M12) Up to 60 MPa (Turcon® T08 and Zurcon® Z53)
Speed:	Up to 15 m/s with linear movements, frequency up to 15 Hz
Temperature:	-45 °C to +200 °C depending on seal and O-Ring material
Media:	Mineral oil based hydraulic fluids, flame retardant hydraulic fluids, environmentally friendly hydraulic fluids (bio-oils), phosphate ester, water and others, depending on the seal and O-Ring material - see Table 15.
Clearance:	The maximum permissible radial clearance S_{max} is shown in Table 16, as a function of the operating pressure and functional diameter.

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.

SERIES

Different cross section sizes are recommended as a function of the seal diameters. Table 14 shows the relationship between the series number according to the seal diameter range and the different application class sizes:

Standard application:	General applications without exceptional operating conditions.
Light application:	Applications with demands for reduced friction or for smaller grooves.
Heavy-duty application:	For exceptional operating loads such as high pressures, pressure peaks, etc.

Table 14: Available Range

Series No.	Rod Diameter d_N f8/h9
RSV20	12.0 - 455.0
RSV30	12.0 - 655.0
RSV40	38.0 - 655.0
RSV80	140.0 - 999.9
RSV50	160.0 - 999.9
RSV5X	1,000.0 - 1,200.0
RSV60	650.0 - 999.9
RSV6X	1,000.0 - 2,600.0

For the Standard Recommendations Application range see Table 14.

REDUNDANT SEALING SYSTEM

In many applications, secondary seal systems are needed. Figure 27 shows such a tandem configuration with the Stepseal® V.

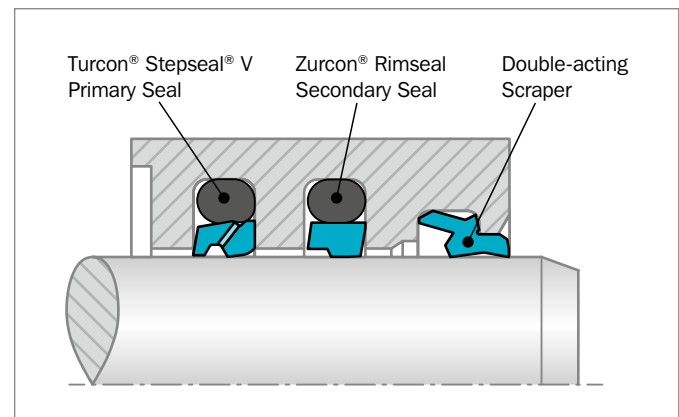


Figure 27: Turcon® Stepseal® V and Zurcon® Rimseal in tandem configuration

The integrated check valve function of Stepseal® V renders pressure trapping between the primary and secondary seal impossible and a dedicated buffer volume between them is unnecessary.

Depending on the application and the operating conditions, the combination of different materials offers a further improvement in the sealing efficiency and the service life of the system. For example in hydraulic cylinders subject to high loads and under rough operating conditions the primary seal should be made of Turcon® and the secondary seal of Zurcon®.



INSTALLATION INSTRUCTIONS

Stepseal® V is installed according to information on page 39 to 40

Closed groove installation applies the same dimensions as for Turcon® Stepseal® 2K in Table 6 page 40.

RECOMMENDED MATERIALS

The following material combinations have proven effective for hydraulic applications:

Turcon® Stepseal® V in Turcon® M12

All-round material for light to heavy hydraulic applications with linear, short stroke or helical movements in mineral oils, flame retardant hydraulic fluids, phosphate ester, bio-oils or fluids with low lubricating properties:

O-Ring:	NBR 70 Shore A	N
	FKM 70 Shore A	V

Set code: M12N or M12V

Turcon® Stepseal® V in Turcon® T46

For medium to heavy applications with linear movements in mineral oils and other media with good lubrication:

O-Ring:	NBR 70 Shore A	N
	FKM 70 Shore A	V

Set code: T46N or T46V

For specific applications, all Turcon® materials are available.

Other material combinations are listed in Table 15.

**Table 15: Turcon® and Zurcon® Materials for Stepseal® V**

Material, Applications, Properties	Code	O-Ring Material Shore A	Code	O-Ring Operating Temp. * °C	Mating Surface Material	MPa max. Dynamic
Turcon® M12 First material choice for seals in linear motion Overall improved properties For new constructions and updating For all commonly applied hydraulic fluids including fluids with low lubrication performance Lowest friction and best sliding properties Lowest wear on seals Improved absorption of abrasive contaminants Low wear or abrasion of counter surface BAM tested Mineral fiber and Additives filled Color: Dark gray	M12	NBR 70	N	-30 to +100	Steel	50
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod)	
		FKM 70	V	-10 to +200	Steel plated (rod) Cast iron Stainless steel Titanium	
Turcon® T05 For lubricating fluids Also for gas service Very low friction Very good sliding and sealing properties Color: Turquoise	T05	NBR 70	N	-30 to +100	Steel	20
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod)	
		FKM 70	V	-10 to +200		
Turcon® T08 For lubricating fluids and linear motion Very high compressive strength and extrusion resistance Hard counter surfaces are recommended Bronze filled Color: Light to dark brown, which may have variations in shading	T08	NBR 70	N	-30 to +100	Steel hardened	60
		NBR 70 Low temp.	T	-45 to +80	Steel chrome plated (rod)	
		FKM 70	V	-10 to +200	Cast iron	
Turcon® T10 For hydraulic and pneumatic For lubricating and non-lubricating fluids High extrusion resistance Good chemical resistance Not for electrically conducting fluids BAM tested Carbon, graphite filled Color: Black	T10	NBR 70	N	-30 to +100	Steel	40
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod)	
		FKM 70	V	-10 to +200	Stainless steel	
		EPDM 70	E**	-45 to +145		
Turcon® T29 For lubricating and non-lubricating fluids Good extrusion resistance Surface texture is not suitable for gas sealing Not for electrically conducting fluids Carbon fiber filled Color: Gray	T29	NBR 70	N	-30 to +100	Steel	30
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod)	
		FKM 70	V	-10 to +200	Cast iron	
		EPDM 70	E**	-45 to +145	Stainless steel	

Table continues on next page



Material, Applications, Properties	Code	O-Ring Material Shore A	Code	O-Ring Operating Temp. * °C	Mating Surface Material	MPa max. Dynamic
Turcon® T40 For lubricating and non-lubricating fluids High frequency and short strokes Water hydraulics Surface texture is not suitable for gas sealing Carbon fiber filled Color: Gray	T40	NBR 70	N	-30 to +100	Steel	25
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod) Cast iron	
		FKM 70	V	-10 to +200	Stainless steel	
		EPDM 70	E**	-45 to +145	Aluminum	
Turcon® T46 For lubricated hydraulics in linear motion High compressive strength High extrusion resistance Very good sliding and wear properties BAM tested Bronze filled Color: Light to dark brown, which may have variations in shading	T46	NBR 70	N	-30 to +100	Steel hardened	50
		NBR 70 Low temp.	T	-45 to +80	Steel chrome plated (rod) Cast iron	
		FKM 70	V	-10 to +200		
Zurcon® Z53*** For mineral oil based fluids Very high abrasion and extrusion resistance For counter surface with rougher surface finish Limited chemical resistance Max. working temperature +110 °C Cast polyurethane Color: Yellow to light-brown	Z53	NBR 70	N	-30 to +100	Steel	60
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod) Cast iron Stainless steel Ceramic coating	
Zurcon® Z80 For lubricating and non-lubricating fluids Water based fluids, air and gases Dry air pneumatics High abrasion and extrusion resistance For service in abrasive conditions and media with particles Good chemical resistance Limited temperature capability (-60 to +80 °C) UHMWPE (Ultra High Molecular Weight Polyethylene) Color: White to off-white	Z80	NBR 70	N	-30 to (+100)	Steel	35
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod) Stainless steel	
		EPDM 70	E**	-45 to (+145)	Aluminum Ceramic coating	

* The O-Ring operation temperature is only valid in mineral hydraulic oil (except EPDM).

** Material not suitable for mineral oils.

*** Max. diameter 2,200 mm.

BAM: Tested by "Bundesanstalt Materialprüfung, Germany".

 Highlighted materials are recommended.



Installation Recommendation

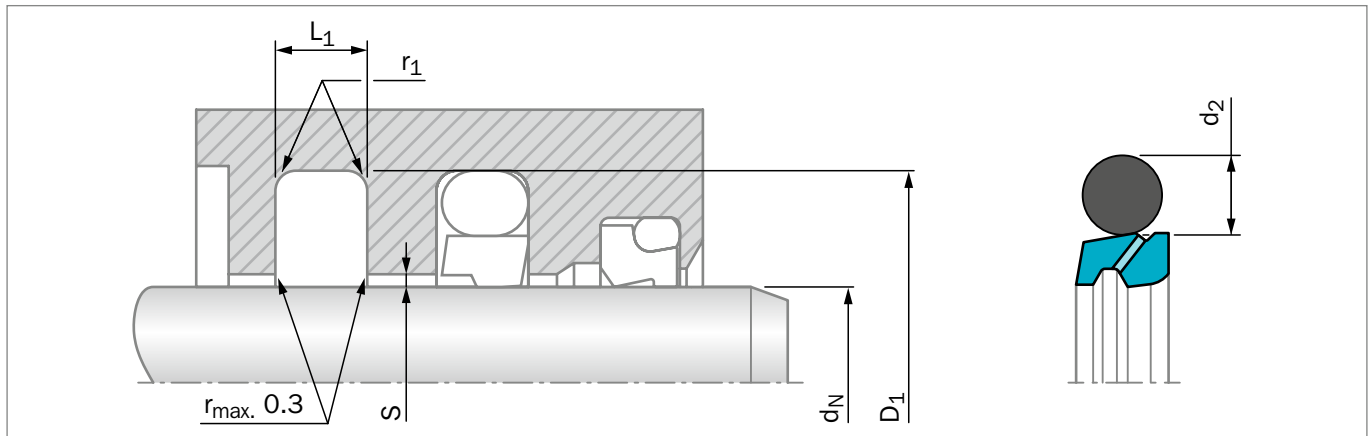


Figure 28: Installation Drawing

Table 16: Installation Dimensions – Standard Recommendations

Series No.	Rod Diameter d_N f8/h9			Groove Diameter D_1 H9	Groove Width L_1 +0.2	Radius r_1 max	Radial Clearance S_{max} *			O-Ring Cross Section d_2
	Standard Application	Light Application	Heavy Duty Application				10 MPa	20 MPa	40 MPa	
RSV2	12 - 37.9	38 - 199.9	-	$d_N + 10.7$	4.2	1.0	0.50	0.30	0.20	3.53
RSV3	38 - 199.9	200 - 255.9	19 - 37.9	$d_N + 15.1$	6.3	1.3	0.70	0.40	0.25	5.33
RSV4	200 - 255.9	256 - 649.9	38 - 199.9	$d_N + 20.5$	8.1	1.8	0.80	0.60	0.35	7.00
RSV8	256 - 649.9	650 - 999.9	200 - 255.9	$d_N + 24.0$	8.1	1.8	0.90	0.70	0.40	7.00
RSV5	650 - 999.9	-	256 - 649.9	$d_N + 27.3$	9.5	2.5	1.00	0.80	0.50	8.40
RSV5X	-	1,000 - 1,200	-	$d_N + 27.3$	9.5	2.5	1.00	0.80	0.50	8.40
RSV6**	-	-	650 - 999.9	$d_N + 38.0$	13.8	3.0	1.20	0.90	0.60	12.00
RSV6X**	1,000 - 2,600	-	-	$d_N + 38.0$	13.8	3.0	1.20	0.90	0.60	12.00

* At pressures > 40 MPa use diameter tolerance H8/f8 (bore/rod) in the area behind seal or consult your local Customer Solution Center for alternative material or profiles.

Slydring® / Wear Rings are not applicable at very small radial clearances please consult the Slydring® section in this catalog.

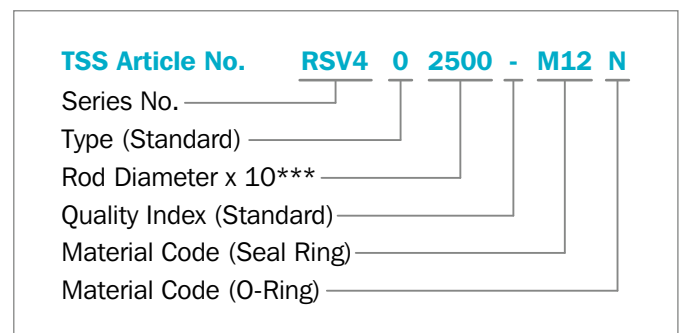
** All O-Rings with 12 mm cross section are delivered as a special profile ring.

ORDERING EXAMPLE

Turcon® Stepseal® V complete with O-Ring, standard application:

Series:	RSV4 from Table 16
Rod diameter:	$d_N = 250.0$ mm
TSS Part No.:	RSV402500 from Table 17

Select the material from Table 15. The corresponding code numbers are appended to the TSS Part No. Together these form the TSS Article Number. The TSS Article Number for all intermediate sizes can be determined by following the example:



*** For diameters d_N 1,000.0 mm multiply only by factor 1.
 Example: RSV6 for diameter $d_N = 1,200.0$ mm.
 TSS Article No.: RSV6**X1200** -M12N



Table 17: Installation Dimensions / TSS Part No.

Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size	Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size
d_N f8/h9	D_1 H9	L_1 +0.2			d_N f8/h9	D_1 H9	L_1 +0.2		
12.0	22.7	4.2	RSV200120	17.04 x 3.53	60.0	70.7	4.2	RSV200600	63.09 x 3.53
15.0	25.7	4.2	RSV200150	18.66 x 3.53	60.0	75.1	6.3	RSV300600	66.04 x 5.33
19.0	29.7	4.2	RSV200190	23.40 x 3.53	63.0	73.7	4.2	RSV200630	66.27 x 3.53
20.0	30.7	4.2	RSV200200	25.00 x 3.53	63.0	78.1	6.3	RSV300630	69.22 x 5.33
22.0	32.7	4.2	RSV200220	26.58 x 3.53	63.5	78.6	6.3	RSV300635	69.22 x 5.33
25.0	35.7	4.2	RSV200250	29.75 x 3.53	65.0	75.7	4.2	RSV200650	69.44 x 3.53
25.4	36.1	4.2	RSV200254	29.75 x 3.53	65.0	80.1	6.3	RSV300650	69.22 x 5.33
26.0	36.7	4.2	RSV200260	29.75 x 3.53	67.0	77.7	4.2	RSV200670	72.62 x 3.53
28.0	38.7	4.2	RSV200280	32.92 x 3.53	69.0	84.1	6.3	RSV300690	75.57 x 5.33
30.0	40.7	4.2	RSV200300	34.52 x 3.53	70.0	80.7	4.2	RSV200700	75.79 x 3.53
32.0	42.7	4.2	RSV200320	36.09 x 3.53	70.0	85.1	6.3	RSV300700	75.57 x 5.33
35.0	45.7	4.2	RSV200350	37.69 x 3.53	70.0	90.5	8.1	RSV400700	78.00 x 7.00
36.0	46.7	4.2	RSV200360	40.87 x 3.53	72.0	82.7	4.2	RSV200720	75.79 x 3.53
37.0	47.7	4.2	RSV200370	40.87 x 3.53	73.0	88.1	6.3	RSV300730	78.74 x 5.33
38.0	48.7	4.2	RSV200380	40.87 x 3.53	75.0	85.7	4.2	RSV200750	78.97 x 3.53
38.0	53.1	6.3	RSV300380	43.82 x 5.33	75.0	90.1	6.3	RSV300750	81.92 x 5.33
40.0	50.7	4.2	RSV200400	44.04 x 3.53	75.0	95.5	8.1	RSV400750	83.00 x 7.00
40.0	55.1	6.3	RSV300400	43.82 x 5.33	76.2	91.3	6.3	RSV300762	81.92 x 5.33
42.0	52.7	4.2	RSV200420	47.22 x 3.53	78.0	93.1	6.3	RSV300780	85.09 x 5.33
42.0	57.1	6.3	RSV300420	46.99 x 5.33	78.0	98.5	8.1	RSV400780	86.00 x 7.00
43.0	53.7	4.2	RSV200430	47.22 x 3.53	80.0	90.7	4.2	RSV200800	85.32 x 3.53
44.45	59.5	6.3	RSV300444	50.17 x 5.33	80.0	95.1	6.3	RSV300800	85.09 x 5.33
45.0	55.7	4.2	RSV200450	50.39 x 3.53	80.0	100.5	8.1	RSV400800	88.00 x 7.00
45.0	60.1	6.3	RSV300450	50.17 x 5.33	82.5	97.6	6.3	RSV300825	88.27 x 5.33
48.0	58.7	4.2	RSV200480	53.57 x 3.53	83.0	93.7	4.2	RSV200830	88.49 x 3.53
48.0	63.1	6.3	RSV300480	53.34 x 5.33	85.0	95.7	4.2	RSV200850	88.49 x 3.53
50.0	60.7	4.2	RSV200500	53.57 x 3.53	85.0	100.1	6.3	RSV300850	91.44 x 5.33
50.0	65.1	6.3	RSV300500	56.52 x 5.33	85.0	105.5	8.1	RSV400850	93.00 x 7.00
50.8	61.5	4.2	RSV200508	53.57 x 3.53	89.0	104.1	6.3	RSV300890	94.62 x 5.33
50.8	65.9	6.3	RSV300508	56.52 x 5.33	90.0	100.7	4.2	RSV200900	94.84 x 3.53
52.0	62.7	4.2	RSV200520	56.74 x 3.53	90.0	105.1	6.3	RSV300900	94.62 x 5.33
52.0	67.1	6.3	RSV300520	56.52 x 5.33	90.0	110.5	8.1	RSV400900	98.00 x 7.00
54.0	69.1	6.3	RSV300540	59.69 x 5.33	92.0	102.7	4.2	RSV200920	98.02 x 3.53
55.0	65.7	4.2	RSV200550	59.92 x 3.53	92.0	107.1	6.3	RSV300920	97.79 x 5.33
55.0	70.1	6.3	RSV300550	59.69 x 5.33	95.0	105.7	4.2	RSV200950	101.19 x 3.53
56.0	66.7	4.2	RSV200560	59.92 x 3.53	95.0	110.1	6.3	RSV300950	100.97 x 5.33
56.0	71.1	6.3	RSV300560	62.87 x 5.33	95.0	115.5	8.1	RSV400950	103.00 x 7.00
57.1	67.8	4.2	RSV200571	59.92 x 3.53	100.0	110.7	4.2	RSV201000	104.37 x 3.53
59.0	69.7	4.2	RSV200590	63.09 x 3.53	100.0	115.1	6.3	RSV301000	107.32 x 5.33



Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size	Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size
d_N f8/h9	D_1 H9	L_1 +0.2			d_N f8/h9	D_1 H9	L_1 +0.2		
100.0	120.5	8.1	RSV401000	108.00 x 7.00	180.0	200.5	8.1	RSV401800	189.87 x 7.00
101.6	116.7	6.3	RSV301016	107.32 x 5.33	185.0	200.1	6.3	RSV301850	189.87 x 5.33
105.0	120.1	6.3	RSV301050	110.49 x 5.33	185.0	205.5	8.1	RSV401850	196.22 x 7.00
105.0	125.5	8.1	RSV401050	113.67 x 7.00	190.0	205.1	6.3	RSV301900	196.22 x 5.33
110.0	120.7	4.2	RSV201100	113.89 x 3.53	190.0	210.5	8.1	RSV401900	196.22 x 7.00
110.0	125.1	6.3	RSV301100	116.84 x 5.33	195.0	210.1	6.3	RSV301950	202.57 x 5.33
110.0	130.5	8.1	RSV401100	116.84 x 7.00	200.0	215.1	6.3	RSV302000	208.92 x 5.33
115.0	130.1	6.3	RSV301150	120.02 x 5.33	200.0	220.5	8.1	RSV402000	208.90 x 7.00
120.0	135.1	6.3	RSV301200	126.37 x 5.33	205.0	225.5	8.1	RSV402050	215.27 x 7.00
120.0	140.5	8.1	RSV401200	129.54 x 7.00	210.0	230.5	8.1	RSV402100	215.27 x 7.00
125.0	140.1	6.3	RSV301250	129.54 x 5.33	211.0	231.5	8.1	RSV402110	215.27 x 7.00
125.0	145.5	8.1	RSV401250	132.72 x 7.00	212.0	232.5	8.1	RSV402120	227.97 x 7.00
125.4	140.5	6.3	RSV301254	132.72 x 5.33	215.0	235.5	8.1	RSV402150	227.97 x 7.00
127.0	142.1	6.3	RSV301270	132.72 x 5.33	220.0	240.5	8.1	RSV402200	227.97 x 7.00
130.0	145.1	6.3	RSV301300	135.89 x 5.33	225.0	245.5	8.1	RSV402250	240.67 x 7.00
130.0	150.5	8.1	RSV401300	139.07 x 7.00	230.0	245.1	6.3	RSV302300	234.32 x 5.33
132.0	147.1	6.3	RSV301320	139.07 x 5.33	230.0	250.5	8.1	RSV402300	240.67 x 7.00
135.0	145.7	4.2	RSV201350	139.29 x 3.53	235.0	255.5	8.1	RSV402350	240.67 x 7.00
135.0	150.1	6.3	RSV301350	142.24 x 5.33	240.0	260.5	8.1	RSV402400	253.37 x 7.00
137.0	152.1	6.3	RSV301370	142.24 x 5.33	245.0	265.5	8.1	RSV402450	253.37 x 7.00
138.0	153.1	6.3	RSV301380	142.24 x 5.33	250.0	270.5	8.1	RSV402500	266.07 x 7.00
140.0	150.7	4.2	RSV201400	145.64 x 3.53	260.0	284.0	8.1	RSV802600	266.07 x 7.00
140.0	155.1	6.3	RSV301400	145.42 x 5.33	265.0	289.0	8.1	RSV802650	278.77 x 7.00
140.0	160.5	8.1	RSV401400	148.59 x 7.00	270.0	290.5	8.1	RSV402700	278.77 x 7.00
140.5	155.6	6.3	RSV301405	145.42 x 5.33	270.0	294.0	8.1	RSV802700	278.77 x 7.00
145.0	160.1	6.3	RSV301450	151.77 x 5.33	275.0	299.0	8.1	RSV802750	291.47 x 7.00
145.0	165.5	8.1	RSV401450	151.77 x 7.00	280.0	304.0	8.1	RSV802800	291.47 x 7.00
150.0	165.1	6.3	RSV301500	158.12 x 5.33	285.0	309.0	8.1	RSV802850	291.47 x 7.00
150.0	170.5	8.1	RSV401500	158.12 x 7.00	290.0	314.0	8.1	RSV802900	304.17 x 7.00
153.0	168.1	6.3	RSV301530	158.12 x 5.33	295.0	319.0	8.1	RSV802950	304.17 x 7.00
155.0	170.1	6.3	RSV301550	158.12 x 5.33	300.0	320.5	8.1	RSV403000	304.17 x 7.00
160.0	175.1	6.3	RSV301600	164.47 x 5.33	300.0	324.0	8.1	RSV803000	316.87 x 7.00
160.0	180.5	8.1	RSV401600	170.82 x 7.00	310.0	334.0	8.1	RSV803100	316.87 x 7.00
165.0	180.1	6.3	RSV301650	170.82 x 5.33	320.0	344.0	8.1	RSV803200	329.57 x 7.00
170.0	185.1	6.3	RSV301700	177.17 x 5.33	330.0	354.0	8.1	RSV803300	342.27 x 7.00
170.0	190.5	8.1	RSV401700	177.17 x 7.00	340.0	364.0	8.1	RSV803400	354.97 x 7.00
173.0	188.1	6.3	RSV301730	177.17 x 5.33	350.0	370.5	8.1	RSV403500	354.97 x 7.00
175.0	190.1	6.3	RSV301750	183.52 x 5.33	350.0	374.0	8.1	RSV803500	367.67 x 7.00
180.0	195.1	6.3	RSV301800	183.52 x 5.33	360.0	384.0	8.1	RSV803600	367.67 x 7.00



Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size
d_N f8/h9	D_1 H9	L_1 +0.2		
365.0	389.0	8.1	RSV803650	380.37 x 7.00
370.0	394.0	8.1	RSV803700	380.37 x 7.00
375.0	399.0	8.1	RSV803750	393.07 x 7.00
380.0	404.0	8.1	RSV803800	393.07 x 7.00
390.0	414.0	8.1	RSV803900	405.26 x 7.00
400.0	424.0	8.1	RSV804000	417.96 x 7.00
410.0	434.0	8.1	RSV804100	417.96 x 7.00
420.0	444.0	8.1	RSV804200	430.66 x 7.00
430.0	454.0	8.1	RSV804300	443.36 x 7.00
435.0	459.0	8.1	RSV804350	443.36 x 7.00
440.0	464.0	8.1	RSV804400	456.06 x 7.00
450.0	474.0	8.1	RSV804500	468.76 x 7.00
460.0	484.0	8.1	RSV804600	468.76 x 7.00
470.0	494.0	8.1	RSV804700	481.38 x 7.00
480.0	504.0	8.1	RSV804800	494.16 x 7.00
485.0	509.0	8.1	RSV804850	494.16 x 7.00
490.0	514.0	8.1	RSV804900	506.86 x 7.00
500.0	524.0	8.1	RSV805000	506.86 x 7.00
510.0	534.0	8.1	RSV805100	532.26 x 7.00
520.0	544.0	8.1	RSV805200	532.26 x 7.00
525.0	549.0	8.1	RSV805250	532.26 x 7.00
530.0	554.0	8.1	RSV805300	557.66 x 7.00
540.0	564.0	8.1	RSV805400	557.66 x 7.00
550.0	574.0	8.1	RSV805500	557.66 x 7.00
560.0	584.0	8.1	RSV805600	582.68 x 7.00
570.0	594.0	8.1	RSV805700	582.68 x 7.00
580.0	604.0	8.1	RSV805800	608.08 x 7.00
585.0	609.0	8.1	RSV805850	608.08 x 7.00
590.0	614.0	8.1	RSV805900	608.08 x 7.00
600.0	624.0	8.1	RSV806000	608.08 x 7.00
610.0	634.0	8.1	RSV806100	633.48 x 7.00
620.0	644.0	8.1	RSV806200	633.48 x 7.00
630.0	654.0	8.1	RSV806300	658.88 x 7.00
640.0	664.0	8.1	RSV806400	658.88 x 7.00
650.0	677.3	9.5	RSV506500	663.00 x 8.40
656.0	683.3	9.5	RSV506560	669.00 x 8.40
660.0	687.3	9.5	RSV506600	673.00 x 8.40
680.0	707.3	9.5	RSV506800	693.00 x 8.40
685.0	712.3	9.5	RSV506850	698.00 x 8.40
700.0	724.0	8.1	RSV807000	713.00 x 7.00
700.0	727.3	9.5	RSV507000	713.00 x 8.40

Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size
d_N f8/h9	D_1 H9	L_1 +0.2		
710.0	737.3	9.5	RSV507100	723.00 x 8.40
730.0	757.3	9.5	RSV507300	743.00 x 8.40
760.0	787.3	9.5	RSV507600	773.00 x 8.40
765.0	792.3	9.5	RSV507650	778.00 x 8.40
780.0	807.3	9.5	RSV507800	793.00 x 8.40
790.0	817.3	9.5	RSV507900	803.00 x 8.40
800.0	827.3	9.5	RSV508000	813.00 x 8.40
810.0	837.3	9.5	RSV508100	823.00 x 8.40
820.0	847.3	9.5	RSV508200	833.00 x 8.40
830.0	857.3	9.5	RSV508300	843.00 x 8.40
850.0	877.3	9.5	RSV508500	863.00 x 8.40
870.0	897.3	9.5	RSV508700	883.00 x 8.40
880.0	907.3	9.5	RSV508800	893.00 x 8.40
885.0	912.3	9.5	RSV508850	898.00 x 8.40
890.0	917.3	9.5	RSV508900	903.00 x 8.40
930.0	957.3	9.5	RSV509300	943.00 x 8.40
955.0	982.3	9.5	RSV509550	968.00 x 8.40
1,000.0	1,038.0	13.8	RSV6X1000	1,017.00 x 12.0
1,035.0	1,073.0	13.8	RSV6X1035	1,052.00 x 12.0
1,040.0	1,067.3	9.5	RSV5X1040	1,053.00 x 8.40
1,040.0	1,078.0	13.8	RSV6X1040	1,057.00 x 12.0
1,050.0	1,077.3	9.5	RSV5X1050	1,063.00 x 8.40
1,050.0	1,088.0	13.8	RSV6X1050	1,067.00 x 12.0
1,100.0	1,138.0	13.8	RSV6X1100	1,117.00 x 12.0
1,120.0	1,147.3	9.5	RSV5X1120	1,133.00 x 8.40
1,120.0	1,158.0	13.8	RSV6X1120	1,137.00 x 12.0
1,200.0	1,227.3	9.5	RSV5X1200	1,213.00 x 8.40
1,200.0	1,238.0	13.8	RSV6X1200	1,217.00 x 12.0
1,330.0	1,368.0	13.8	RSV6X1330	1,347.00 x 12.0
1,500.0	1,538.0	13.8	RSV6X1500	1,517.00 x 12.0
1,600.0	1,638.0	13.8	RSV6X1600	1,617.00 x 12.0
2,000.0	2,038.0	13.8	RSV6X2000	2,017.00 x 12.0
2,600.0	2,638.0	13.8	RSV6X2600	2,617.00 x 12.0

The rod diameters in **bold** type are in accordance with the recommendations of ISO 3320.

Other dimensions and all intermediate sizes up to 2,600 mm diameter including imperial (inch) sizes can be supplied.

All O-Rings with 12 mm cross section are delivered as special profile ring.

Turcon® Stepseal® V LM



Single-acting

Designed for Lubrication Management
Technology

Rubber-energized plastic-faced seal

Material:

Turcon®, Zurcon® and Elastomer



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■ Turcon® Stepseal® V LM*



■ Description

Turcon® Stepseal® V LM is a new type of primary seal, conceived and developed to improve system performance and service life of the whole system, including hardware and other seals.

Stepseal® V LM is the first unidirectional seal element to integrate the Lubrication Management principles developed by Trelleborg Sealing Solutions as a standard feature.

Traditionally unidirectional seals provide sealing by means of sharp, defined sealing edges, which establish high contact pressure with the hardware and suppress fluid film during the forward stroke.

With Lubrication Management, a modified seal edge reduces contact pressure with the hardware and supports the formation of a lubricating fluid film during the forward stroke. This allows fluid to reach secondary seals and scrapers in a controlled way, while back-pumping of fluid ensures lubrication during the return stroke. The efficient, built-in check valve action introduced with Stepseal® V protects secondary seals and scrapers against system pressure, and it ensures that pressure build-up between the seals is eliminated.

Lower contact pressure and improved lubrication reduce the mechanical and thermal load on seals and hardware, resulting in increased service life and system reliability.

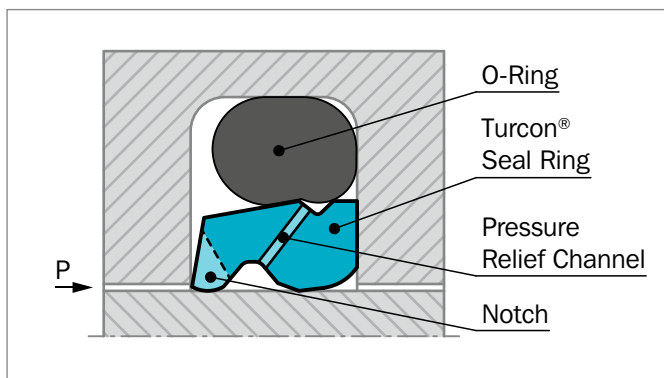


Figure 29: Turcon® Stepseal® V LM

ADVANTAGES

- Built-in check valve performance identical to that of Stepseal® V
- No pressure build-up on secondary sealing element and Scraper
- Independent of in- and outstroke velocity
- Independent of stroke length
- High tolerance to hardware non-concentricity and radial play
- Minimum contribution to friction by secondary sealing element and Scraper
- Minimum wear of secondary sealing element and Scraper
- Robust, optimized seal face
- Increased leakage control
- Extended seal life
- Increased operational reliability
- Fits standard Stepseal® 2K groove dimensions as well as ISO 7425 seal housings

APPLICATION EXAMPLES

- Wind turbine pitch control
- Production presses
- Injection molding clamping cylinders
- Mobile cranes and lifts
- Vehicle suspensions

* Patent application: WO 2007/095915 A1



CHARACTERISTICS

- Primary seal with hydrostatic pressure release
- Check valve function
- Hydrodynamic back-pumping
- Stabilized position in the groove
- Extended seal life
- Improved system reliability

IMPROVED FRICTION PERFORMANCE

Turcon® Stepseal® V LM offers uniform, low friction of the complete sealing system through improved lubrication of all sealing elements and by preventing pressurization of the secondary seal element.

FEATURES

Stepseal® V LM combines efficiency with reliability and longevity for the full sealing system and of the hardware. Controlled support of lubrication and lowered contact pressure reduce friction and wear, while the refined valve function eliminates pressure build-up in seal systems, making drain lines and buffer volumes between seals a thing of the past.

In rod seal systems, Stepseal® V LM is used together with a secondary rod seal, preferably from the range of Turcon® and Zurcon® Rod Seals.

OPERATING CONDITIONS

Pressure:	Up to 50 MPa (Turcon® M12) Up to 60 MPa (Turcon® T08 and Zurcon® Z53)
Speed:	Up to 15 m/s with linear movements, frequency up to 15 Hz
Temperature:	-45 °C to +200 °C depending on seal and O-Ring material
Media:	Mineral oil based hydraulic fluids, flame retardant hydraulic fluids, environmentally friendly fluids (bio-oils), phosphate ester, water and others, depending on the seal and O-Ring material - see Table 19.
Clearance:	The maximum permissible radial clearance S_{max} is shown in Table 20, as a function of the operating pressure and functional diameter.

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.

SERIES

Different cross section sizes are recommended as a function of the seal diameters. Table 18 shows the relationship between the series number according to the seal diameter range and the different application class sizes:

Standard application:	General applications without exceptional operating conditions.
Light application:	Applications with demands for reduced friction or for smaller grooves.
Heavy-duty application:	For exceptional operating loads such as high pressures, pressure peaks, large clearances, etc.

**Table 18: Available Range**

Series No.	Rod Diameter d_N f8/h9
RSL20	12.0 - 455.0
RSL30	12.0 - 655.0
RSL40	38.0 - 655.0
RSL80	140.0 - 999.9
RSL50	160.0 - 999.9
RSL5X	1,000.0 - 1,200.0
RSL60	650.0 - 999.9
RSL6X	1,000.0 - 2,600.0

SEALING SYSTEM

Stepseal® V LM is developed for use with a secondary sealing element. Figure 30 shows such a tandem configuration with the Stepseal® V LM.

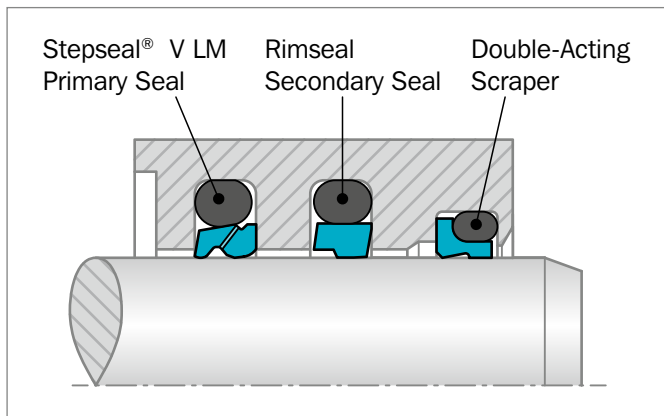


Figure 30: Turcon® Stepseal® V LM and Zurcon® Rimseal in tandem configuration

The integrated check valve function of Stepseal® V LM ensures that pressure cannot be trapped between the primary and secondary seals, and no extra space between them is required to accumulate hydraulic fluid.

Depending on the application and the operating conditions, the combination of different materials offers a further improvement in sealing efficiency and service life of the system.

For example, in hydraulic cylinders subject to high loads and under rough operating conditions, the primary seal should be made of Turcon® and the secondary seal of Zurcon®.

INSTALLATION INSTRUCTIONS

Stepseal® V LM is installed according to information on page 39 to 40

Closed groove installation applies the same dimensions as for Turcon® Stepseal® 2K in Table 6 page 40.

RECOMMENDED MATERIALS

The following material combinations have proven effective for hydraulic applications:

Turcon® Stepseal® V LM in Turcon® M12

All-round material for light to heavy hydraulic applications with linear, short stroke or helical movements in mineral oils, flame retardant hydraulic fluids, phosphate ester, bio-oils or fluids with low lubricating properties:

O-Ring:	NBR 70 Shore A	N
	FKM 70 Shore A	V

Set code: M12N or M12V

Turcon® Stepseal® V LM in Turcon® T46

For medium to heavy applications with linear movements in mineral oils and other media with good lubrication:

O-Ring:	NBR 70 Shore A	N
	FKM 70 Shore A	V

Set code: T46N or T46V

For specific applications, all Turcon® materials are available.

Other material combinations are listed in Table 19.



Table 19: Turcon® and Zurcon® Materials for Stepseal® V LM

Material, Applications, Properties	Code	O-Ring Material Shore A	Code	O-Ring Operating Temp. * °C	Mating Surface Material	MPa max. Dynamic
Turcon® M12 First material choice for seals in linear motion Overall improved properties For new constructions and updating For all commonly applied hydraulic fluids including fluids with low lubrication performance Lowest friction and best sliding properties Lowest wear on seals Improved absorption of abrasive contaminants Low wear or abrasion of counter surface BAM tested Mineral fiber and Additives filled Color: Dark gray	M12	NBR 70	N	-30 to +100	Steel	50
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod)	
		FKM 70	V	-10 to +200	Steel plated (rod) Cast iron Stainless steel Titanium	
Turcon® T05 For lubricating fluids Also for gas service Very low friction Very good sliding and sealing properties Color: Turquoise	T05	NBR 70	N	-30 to +100	Steel	20
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod)	
		FKM 70	V	-10 to +200		
Turcon® T08 For lubricating fluids and linear motion Very high compressive strength and extrusion resistance Hard counter surfaces are recommended Bronze filled Color: Light to dark brown, which may have variations in shading	T08	NBR 70	N	-30 to +100	Steel hardened	60
		NBR 70 Low temp.	T	-45 to +80	Steel chrome plated (rod)	
		FKM 70	V	-10 to +200	Cast iron	
Turcon® T10 For hydraulic and pneumatic For lubricating and non-lubricating fluids High extrusion resistance Good chemical resistance Not for electrically conducting fluids BAM tested Carbon, graphite filled Color: Black	T10	NBR 70	N	-30 to +100	Steel	40
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod)	
		FKM 70	V	-10 to +200	Stainless steel	
		EPDM 70	E**	-45 to +145		
Turcon® T29 For lubricating and non-lubricating fluids Good extrusion resistance Surface texture is not suitable for gas sealing Not for electrically conducting fluids Carbon fiber filled Color: Gray	T29	NBR 70	N	-30 to +100	Steel	30
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod)	
		FKM 70	V	-10 to +200	Cast iron	
		EPDM 70	E**	-45 to +145	Stainless steel	



Material, Applications, Properties	Code	O-Ring Material Shore A	Code	O-Ring Operating Temp.* °C	Mating Surface Material	MPa max. Dynamic
Turcon® T40 For lubricating and non-lubricating fluids High frequency and short strokes Water hydraulics Surface texture is not suitable for gas sealing Carbon fiber filled Color: Gray	T40	NBR 70	N	-30 to +100	Steel	25
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod)	
		FKM 70	V	-10 to +200	Cast iron	
		EPDM 70	E**	-45 to +145	Stainless steel Aluminum	
Turcon® T46 For lubricated hydraulics in linear motion High compressive strength High extrusion resistance Very good sliding and wear properties BAM tested Bronze filled Color: Light to dark brown, which may have variations in shading	T46	NBR 70	N	-30 to +100	Steel hardened	50
		NBR 70 Low temp.	T	-45 to +80	Steel chrome plated (rod) Cast iron	
		FKM 70	V	-10 to +200		
Zurcon® Z53*** For mineral oil based fluids Very high abrasion and extrusion resistance For counter surface with rougher surface finish Limited chemical resistance Max. working temperature +110 °C Cast polyurethane Color: Yellow to light-brown	Z53	NBR 70	N	-30 to +100	Steel	60
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod) Cast iron Stainless steel Ceramic coating	
Zurcon® Z80 For lubricating and non-lubricating fluids Water based fluids, air and gases Dry air pneumatics High abrasion and extrusion resistance For service in abrasive conditions and media with particles Good chemical resistance Limited temperature capability (-60 to +80 °C) UHMWPE (Ultra High Molecular Weight Polyethylene) Color: White to off-white	Z80	NBR 70	N	-30 to (+100)	Steel	35
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod)	
		EPDM 70	E**	-45 to (+145)	Stainless steel Aluminum Ceramic coating	

* The O-Ring operation temperature is only valid in mineral hydraulic oil (except EPDM).

** Material not suitable for mineral oils.

*** Max. diameter 2,200 mm.

BAM: Tested by "Bundesanstalt Materialprüfung, Germany".

Highlighted materials are recommended.



Installation Recommendation

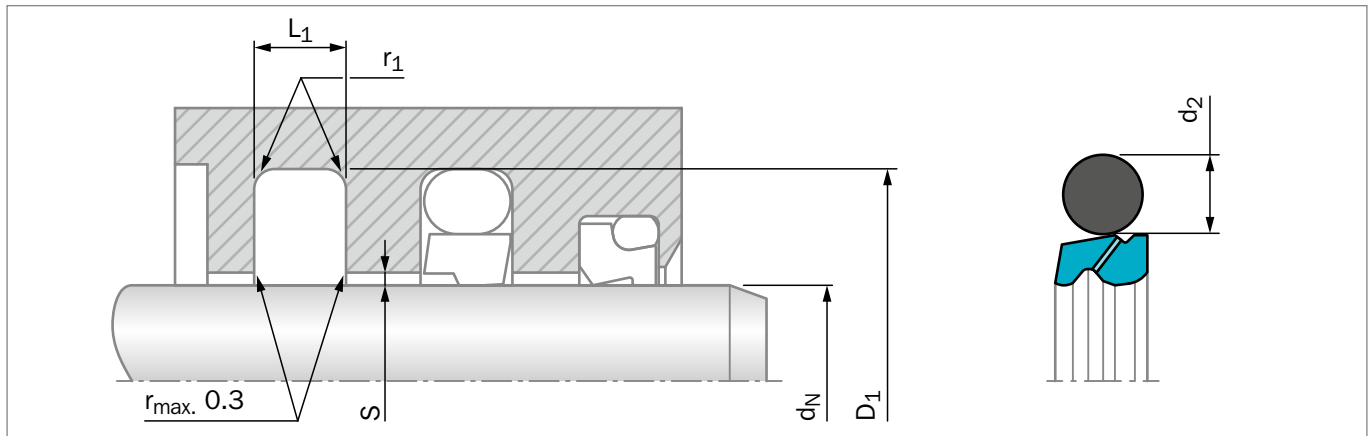


Figure 31: Installation Drawing

Table 20: Installation Dimensions – Standard Recommendations

Series No.	Rod Diameter d_N f8/h9			Groove Diameter D_1 H9	Groove Width L_1 +0.2	Radius r_1 max	Radial Clearance S_{max}^*			O-Ring Cross Section d_2
	Standard Application	Light Application	Heavy Duty Application				10 MPa	20 MPa	40 MPa	
RSL20	19 - 37.9	38 - 199.9	12 - 18.9	$d_N + 10.7$	4.2	1.0	0.50	0.30	0.20	3.53
RSL30	38 - 199.9	200 - 255.9	19 - 37.9	$d_N + 15.1$	6.3	1.3	0.70	0.40	0.25	5.33
RSL40	200 - 255.9	256 - 649.9	38 - 199.9	$d_N + 20.5$	8.1	1.8	0.80	0.60	0.35	7.00
RSL80	256 - 649.9	650 - 999.9	200 - 255.9	$d_N + 24.0$	8.1	1.8	0.90	0.70	0.40	7.00
RSL50	650 - 999.9	-	256 - 649.9	$d_N + 27.3$	9.5	2.5	1.00	0.80	0.50	8.40
RSL5X	-	1,000 - 1,200	-	$d_N + 27.3$	9.5	2.5	1.00	0.80	0.50	8.40
RSL60**	-	-	650 - 999.9	$d_N + 38.0$	13.8	3.0	1.20	0.90	0.60	12.00
RSL6X**	1,000 - 2,600	-	-	$d_N + 38.0$	13.8	3.0	1.20	0.90	0.60	12.00

* At pressures > 40 MPa use diameter tolerance H8/f8 (bore/rod) in the area behind seal or consult your local Customer Solution Center for alternative material or profiles.

Slydring® / Wear Rings are not applicable at very small radial clearances S, consult the Slydring® section in this catalog.

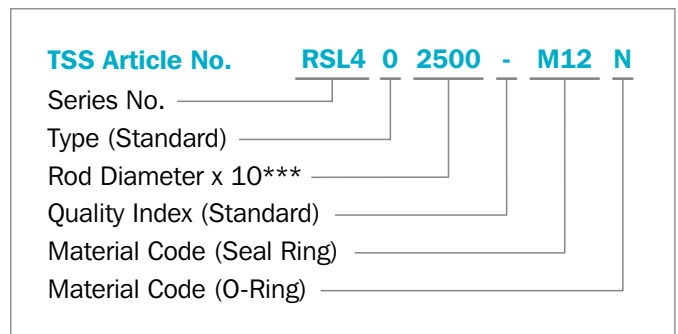
** All O-Rings with 12 mm cross section are delivered as a special profile ring.

ORDERING EXAMPLE

Turcon® Stepseal® V LM complete with O-Ring, standard application:

Series:	RSL4 from Table 20
Rod diameter:	$d_N = 250.0$ mm
TSS Part No.:	RSL402500 from Table 21

Select the material from Table 19. The corresponding code numbers are appended to the TSS Part No. Together these form the TSS Article Number. The TSS Article Number for all intermediate sizes can be determined by following the example:



*** For diameters d_N 1,000.0 mm multiply only by factor 1.
 Example: RSL6 for diameter $d_N = 1,200.0$ mm.
 TSS Article No.: RSL6X1200 -M12



Table 21: Installation Dimensions / TSS Part No.

Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size	Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size
d_N f8/h9	D_1 H9	L_1 +0.2			d_N f8/h9	D_1 H9	L_1 +0.2		
12.0	22.7	4.2	RSL200120	17.04 x 3.53	60.0	75.1	6.3	RSL300600	66.04 x 5.33
15.0	25.7	4.2	RSL200150	18.66 x 3.53	63.0	73.7	4.2	RSL200630	66.27 x 3.53
19.0	29.7	4.2	RSL200190	23.40 x 3.53	63.0	78.1	6.3	RSL300630	69.22 x 5.33
20.0	30.7	4.2	RSL200200	25.00 x 3.53	63.5	78.6	6.3	RSL300635	69.22 x 5.33
22.0	32.7	4.2	RSL200220	26.58 x 3.53	65.0	75.7	4.2	RSL200650	69.44 x 3.53
25.0	35.7	4.2	RSL200250	29.75 x 3.53	65.0	80.1	6.3	RSL300650	69.22 x 5.33
25.4	36.1	4.2	RSL200254	29.75 x 3.53	67.0	77.7	4.2	RSL200670	72.62 x 3.53
26.0	36.7	4.2	RSL200260	29.75 x 3.53	69.0	84.1	6.3	RSL300690	75.57 x 5.33
28.0	38.7	4.2	RSL200280	32.92 x 3.53	70.0	80.7	4.2	RSL200700	75.79 x 3.53
30.0	40.7	4.2	RSL200300	34.52 x 3.53	70.0	85.1	6.3	RSL300700	75.57 x 5.33
32.0	42.7	4.2	RSL200320	36.09 x 3.53	70.0	90.5	8.1	RSL400700	78 x 7.00
35.0	45.7	4.2	RSL200350	37.69 x 3.53	72.0	82.7	4.2	RSL200720	75.79 x 3.53
36.0	46.7	4.2	RSL200360	40.87 x 3.53	73.0	88.1	6.3	RSL300730	78.74 x 5.33
37.0	47.7	4.2	RSL200370	40.87 x 3.53	75.0	85.7	4.2	RSL200750	78.97 x 3.53
38.0	48.7	4.2	RSL200380	40.87 x 3.53	75.0	90.1	6.3	RSL300750	81.92 x 5.33
38.0	53.1	6.3	RSL300380	43.82 x 5.33	75.0	95.5	8.1	RSL400750	83 x 7.00
40.0	50.7	4.2	RSL200400	44.04 x 3.53	76.2	91.3	6.3	RSL300762	81.92 x 5.33
40.0	55.1	6.3	RSL300400	43.82 x 5.33	78.0	93.1	6.3	RSL300780	85.09 x 5.33
42.0	52.7	4.2	RSL200420	47.22 x 3.53	78.0	98.5	8.1	RSL400780	86 x 7.00
42.0	57.1	6.3	RSL300420	46.99 x 5.33	80.0	90.7	4.2	RSL200800	85.32 x 3.53
43.0	53.7	4.2	RSL200430	47.22 x 3.53	80.0	95.1	6.3	RSL300800	85.09 x 5.33
44.45	59.5	6.3	RSL300444	50.17 x 5.33	80.0	100.5	8.1	RSL400800	88 x 7.00
45.0	55.7	4.2	RSL200450	50.39 x 3.53	82.5	97.6	6.3	RSL300825	88.27 x 5.33
45.0	60.1	6.3	RSL300450	50.17 x 5.33	83.0	93.7	4.2	RSL200830	88.49 x 3.53
48.0	58.7	4.2	RSL200480	53.57 x 3.53	85.0	95.7	4.2	RSL200850	88.49 x 3.53
48.0	63.1	6.3	RSL300480	53.34 x 5.33	85.0	100.1	6.3	RSL300850	91.44 x 5.33
50.0	60.7	4.2	RSL200500	53.57 x 3.53	85.0	105.5	8.1	RSL400850	93 x 7.00
50.0	65.1	6.3	RSL300500	56.52 x 5.33	89.0	104.1	6.3	RSL300890	94.62 x 5.33
50.8	61.5	4.2	RSL200508	53.57 x 3.53	90.0	100.7	4.2	RSL200900	94.84 x 3.53
50.8	65.9	6.3	RSL300508	56.52 x 5.33	90.0	105.1	6.3	RSL300900	94.62 x 5.33
52.0	62.7	4.2	RSL200520	56.74 x 3.53	90.0	110.5	8.1	RSL400900	98 x 7.00
52.0	67.1	6.3	RSL300520	56.52 x 5.33	92.0	102.7	4.2	RSL200920	98.02 x 3.53
54.0	69.1	6.3	RSL300540	59.69 x 5.33	92.0	107.1	6.3	RSL300920	97.79 x 5.33
55.0	65.7	4.2	RSL200550	59.92 x 3.53	95.0	105.7	4.2	RSL200950	101.19 x 3.53
55.0	70.1	6.3	RSL300550	59.69 x 5.33	95.0	110.1	6.3	RSL300950	100.97 x 5.33
56.0	66.7	4.2	RSL200560	59.92 x 3.53	95.0	115.5	8.1	RSL400950	103 x 7.00
56.0	71.1	6.3	RSL300560	62.87 x 5.33	100.0	110.7	4.2	RSL201000	104.37 x 3.53
57.1	67.8	4.2	RSL200571	59.92 x 3.53	100.0	115.1	6.3	RSL301000	107.32 x 5.33
59.0	69.7	4.2	RSL200590	63.09 x 3.53	100.0	120.5	8.1	RSL401000	108 x 7.00
60.0	70.7	4.2	RSL200600	63.09 x 3.53	101.6	116.7	6.3	RSL301016	107.32 x 5.33



Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size	Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size
d_N f8/h9	D_1 H9	L_1 +0.2			d_N f8/h9	D_1 H9	L_1 +0.2		
105.0	120.1	6.3	RSL301050	110.49 x 5.33	195.0	210.1	6.3	RSL301950	202.57 x 5.33
105.0	125.5	8.1	RSL401050	113.67 x 7.00	200.0	215.1	6.3	RSL302000	208.92 x 5.33
110.0	120.7	4.2	RSL201100	113.89 x 3.53	200.0	220.5	8.1	RSL402000	208.90 x 7.00
110.0	125.1	6.3	RSL301100	116.84 x 5.33	205.0	225.5	8.1	RSL402050	215.27 x 7.00
110.0	130.5	8.1	RSL401100	116.84 x 7.00	210.0	230.5	8.1	RSL402100	215.27 x 7.00
115.0	130.1	6.3	RSL301150	120.02 x 5.33	211.0	231.5	8.1	RSL402110	215.27 x 7.00
120.0	135.1	6.3	RSL301200	126.37 x 5.33	212.0	232.5	8.1	RSL402120	227.97 x 7.00
120.0	140.5	8.1	RSL401200	129.54 x 7.00	215.0	235.5	8.1	RSL402150	227.97 x 7.00
125.0	140.1	6.3	RSL301250	129.54 x 5.33	220.0	240.5	8.1	RSL402200	227.97 x 7.00
125.0	145.5	8.1	RSL401250	132.72 x 7.00	225.0	245.5	8.1	RSL402250	240.67 x 7.00
125.4	140.5	6.3	RSL301254	132.72 x 5.33	230.0	245.1	6.3	RSL302300	234.32 x 5.33
127.0	142.1	6.3	RSL301270	132.72 x 5.33	230.0	250.5	8.1	RSL402300	240.67 x 7.00
130.0	145.1	6.3	RSL301300	135.89 x 5.33	235.0	255.5	8.1	RSL402350	240.67 x 7.00
130.0	150.5	8.1	RSL401300	139.07 x 7.00	240.0	260.5	8.1	RSL402400	253.37 x 7.00
132.0	147.1	6.3	RSL301320	139.07 x 5.33	245.0	265.5	8.1	RSL402450	253.37 x 7.00
135.0	145.7	4.2	RSL201350	139.29 x 3.53	250.0	270.5	8.1	RSL402500	266.07 x 7.00
135.0	150.1	6.3	RSL301350	142.24 x 5.33	260.0	284.0	8.1	RSL802600	266.07 x 7.00
137.0	152.1	6.3	RSL301370	142.24 x 5.33	265.0	289.0	8.1	RSL802650	278.77 x 7.00
138.0	153.1	6.3	RSL301380	142.24 x 5.33	270.0	290.5	8.1	RSL402700	278.77 x 7.00
140.0	150.7	4.2	RSL201400	145.64 x 3.53	270.0	294.0	8.1	RSL802700	278.77 x 7.00
140.0	155.1	6.3	RSL301400	145.64 x 5.33	275.0	299.0	8.1	RSL802750	291.47 x 7.00
140.0	160.5	8.1	RSL401400	148.59 x 7.00	280.0	304.0	8.1	RSL802800	291.47 x 7.00
140.5	155.6	6.3	RSL301405	145.42 x 5.33	285.0	309.0	8.1	RSL802850	291.47 x 7.00
145.0	160.1	6.3	RSL301450	151.77 x 5.33	290.0	314.0	8.1	RSL802900	304.17 x 7.00
145.0	165.5	8.1	RSL401450	151.77 x 7.00	295.0	319.0	8.1	RSL802950	304.17 x 7.00
150.0	165.1	6.3	RSL301500	158.12 x 5.33	300.0	320.5	8.1	RSL403000	304.17 x 7.00
150.0	170.5	8.1	RSL401500	158.12 x 7.00	300.0	324.0	8.1	RSL803000	316.87 x 7.00
153.0	168.1	6.3	RSL301530	158.12 x 5.33	310.0	334.0	8.1	RSL803100	316.87 x 7.00
155.0	170.1	6.3	RSL301550	158.12 x 5.33	320.0	344.0	8.1	RSL803200	329.57 x 7.00
160.0	175.1	6.3	RSL301600	164.47 x 5.33	330.0	354.0	8.1	RSL803300	342.27 x 7.00
160.0	180.5	8.1	RSL401600	170.82 x 7.00	340.0	364.0	8.1	RSL803400	354.97 x 7.00
165.0	180.1	6.3	RSL301650	170.82 x 5.33	350.0	370.5	8.1	RSL403500	354.97 x 7.00
170.0	185.1	6.3	RSL301700	177.17 x 5.33	350.0	374.0	8.1	RSL803500	367.67 x 7.00
170.0	190.5	8.1	RSL401700	177.17 x 7.00	360.0	384.0	8.1	RSL803600	367.67 x 7.00
173.0	188.1	6.3	RSL301730	177.17 x 5.33	365.0	389.0	8.1	RSL803650	380.37 x 7.00
175.0	190.1	6.3	RSL301750	183.52 x 5.33	370.0	394.0	8.1	RSL803700	380.37 x 7.00
180.0	195.1	6.3	RSL301800	183.52 x 5.33	375.0	399.0	8.1	RSL803750	393.07 x 7.00
180.0	200.5	8.1	RSL401800	189.87 x 7.00	380.0	404.0	8.1	RSL803800	393.07 x 7.00
185.0	200.1	6.3	RSL301850	189.87 x 5.33	390.0	414.0	8.1	RSL803900	405.26 x 7.00
185.0	205.5	8.1	RSL401850	196.22 x 7.00	400.0	424.0	8.1	RSL804000	417.96 x 7.00
190.0	205.1	6.3	RSL301900	196.22 x 5.33	410.0	434.0	8.1	RSL804100	417.96 x 7.00
190.0	210.5	8.1	RSL401900	196.22 x 7.00	420.0	444.0	8.1	RSL804200	430.66 x 7.00



Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size	Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size
d_N f8/h9	D_1 H9	L_1 +0.2			d_N f8/h9	D_1 H9	L_1 +0.2		
430.0	454.0	8.1	RSL804300	443.36 x 7.00	830.0	857.3	9.5	RSL508300	843 x 8.40
435.0	459.0	8.1	RSL804350	443.36 x 7.00	850.0	877.3	9.5	RSL508500	863 x 8.40
440.0	464.0	8.1	RSL804400	456.06 x 7.00	870.0	897.3	9.5	RSL508700	883 x 8.40
450.0	474.0	8.1	RSL804500	468.76 x 7.00	880.0	907.3	9.5	RSL508800	893 x 8.40
460.0	484.0	8.1	RSL804600	468.76 x 7.00	885.0	912.3	9.5	RSL508850	898 x 8.40
470.0	494.0	8.1	RSL804700	481.38 x 7.00	890.0	917.3	9.5	RSL508900	903 x 8.40
480.0	504.0	8.1	RSL804800	494.16 x 7.00	930.0	957.3	9.5	RSL509300	943 x 8.40
485.0	509.0	8.1	RSL804850	494.16 x 7.00	955.0	982.3	9.5	RSL509550	968 x 8.40
490.0	514.0	8.1	RSL804900	506.86 x 7.00	1,000.0	1,038.0	13.8	RSL6X1000	1,017 x 12.0
500.0	524.0	8.1	RSL805000	506.86 x 7.00	1,035.0	1,073.0	13.8	RSL6X1035	1,052 x 12.0
510.0	534.0	8.1	RSL805100	532.26 x 7.00	1,040.0	1,067.3	9.5	RSL5X1040	1,053 x 8.40
520.0	544.0	8.1	RSL805200	532.26 x 7.00	1,040.0	1,078.0	13.8	RSL6X1040	1,057 x 12.0
525.0	549.0	8.1	RSL805250	532.26 x 7.00	1,050.0	1,077.3	9.5	RSL5X1050	1,063 x 8.40
530.0	554.0	8.1	RSL805300	557.66 x 7.00	1,050.0	1,088.0	13.8	RSL6X1050	1,067 x 12.0
540.0	564.0	8.1	RSL805400	557.66 x 7.00	1,100.0	1,138.0	13.8	RSL6X1100	1,117 x 12.0
550.0	574.0	8.1	RSL805500	557.66 x 7.00	1,120.0	1,147.3	9.5	RSL5X1120	1,133 x 8.40
560.0	584.0	8.1	RSL805600	582.68 x 7.00	1,120.0	1,158.0	13.8	RSL6X1120	1,137 x 12.0
570.0	594.0	8.1	RSL805700	582.68 x 7.00	1,200.0	1,227.3	9.5	RSL5X1200	1,213 x 8.40
580.0	604.0	8.1	RSL805800	608.08 x 7.00	1,200.0	1,238.0	13.8	RSL6X1200	1,217 x 12.0
585.0	609.0	8.1	RSL805850	608.08 x 7.00	1,330.0	1,368.0	13.8	RSL6X1330	1,347 x 12.0
590.0	614.0	8.1	RSL805900	608.08 x 7.00	1,500.0	1,538.0	13.8	RSL6X1500	1,517 x 12.0
600.0	624.0	8.1	RSL806000	608.08 x 7.00	1,600.0	1,638.0	13.8	RSL6X1600	1,617 x 12.0
610.0	634.0	8.1	RSL806100	633.48 x 7.00	2,000.0	2,038.0	13.8	RSL6X2000	2,017 x 12.0
620.0	644.0	8.1	RSL806200	633.48 x 7.00	2,600.0	2,638.0	13.8	RSL6X2600	2,617 x 12.0
630.0	654.0	8.1	RSL806300	658.88 x 7.00					
640.0	664.0	8.1	RSL806400	658.88 x 7.00					
650.0	677.3	9.5	RSL506500	663 x 8.40					
656.0	683.3	9.5	RSL506560	669 x 8.40					
660.0	687.3	9.5	RSL506600	673 x 8.40					
680.0	707.3	9.5	RSL506800	693 x 8.40					
685.0	712.3	9.5	RSL506850	698 x 8.40					
700.0	724.0	8.1	RSL807000	713 x 7.00					
700.0	727.3	9.5	RSL507000	713 x 8.40					
710.0	737.3	9.5	RSL507100	723 x 8.40					
730.0	757.3	9.5	RSL507300	743 x 8.40					
760.0	787.3	9.5	RSL507600	773 x 8.40					
765.0	792.3	9.5	RSL507650	778 x 8.40					
780.0	807.3	9.5	RSL507800	793 x 8.40					
790.0	817.3	9.5	RSL507900	803 x 8.40					
800.0	827.3	9.5	RSL508000	813 x 8.40					
810.0	837.3	9.5	RSL508100	823 x 8.40					
820.0	847.3	9.5	RSL508200	833 x 8.40					

The rod diameters in **bold** type are in accordance with the recommendations of ISO 3320.

Other dimensions and all intermediate sizes up to 2,600 mm diameter including imperial (inch) sizes can be supplied.

All O-Rings with 12 mm cross section are delivered as special profile ring.

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Zurcon® Rimseal



Single-acting

Rubber-energized plastic-faced seal

Material:

Zurcon® and Elastomer



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Zurcon® Rimseal*



Description

When the application requirements make high demands on leakage control and reliability, a redundant sealing system is necessary to ensure reliable sealing of hydraulic cylinders at the piston rod.

METHOD OF OPERATION

Zurcon® Rimseal is an elastomer energized seal element. The changes in seal position in the groove, necessary for optimum sealing function, are guaranteed by the combination of the two parts: the O-Ring and seal ring.

In order to achieve a contact force increasing sealing effect with increasing pressure, the seal has a chamfer on the low pressure side which causes the seal to tilt slightly so that the seal ring is forced against the side of the groove. This creates an area of maximum pressure at the edge of the seal.

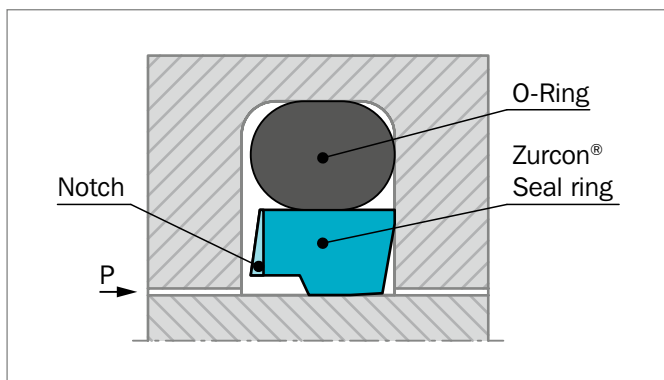


Figure 32: Zurcon® Rimseal

When Zurcon® Rimseal is used in a system with a double-acting scraper DA24 (DA22, DA17, DA27, Excluder® 2 resp. 5 or 500), the sealing function of the system must be assured even if pressure build-up occurs between Rimseal and the double-acting scraper.

The high-pressure side of the seal ring also has a chamfer which, in the event of a build-up of pressure behind Rimseal, comes into contact with the flank of the groove. Rimseal moves in the groove so that a contact pressure distribution is obtained on the rod which enhances the back-pumping effect.

ADVANTAGES

- High static and dynamic sealing effect
- Low friction for reduced power loss
- High wear resistance for long service life
- Small groove
- Easy installation
- ISO 7425-2 grooves optional
- Available for any diameter from 8 to 2,200 mm

APPLICATION EXAMPLES

- Mobile hydraulics
- Standard cylinders
- Machine tools
- Injection molding machines
- Presses

OPERATING CONDITIONS:

Pressure:	In tandem system: Up to 60 MPa As an individual element: 25 MPa
Velocity:	5 m/s with short strokes <1 m in tandem system
Temperature:	-45 °C to +110 °C depending on O-Ring material
Media:	Hydraulic fluids <ul style="list-style-type: none"> - Mineral oil - Synthetic and natural esters - HEES, HETG up to +60 °C - Flame retardant fluids HFA, HFC
Clearance:	The maximum permissible radial clearance S_{max} is shown in Table 22, as a function of the operating pressure and functional diameter.

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.

* Patent application: WO 92/19893 A1



SERIES

Zurcon® Rimseal is a system seal and is preferably used in tandem sealing systems in conjunction with Stepseal® 2K. For this reason the type series are identical with those for Stepseal® 2K.

Table 22 shows the relationship between the series number according to the seal diameter range and the different application class sizes:

Standard application	RR13
Light application	RR15
Heavy-duty application	RR11

REDUNDANT SEALING SYSTEM

Redundant sealing systems are used where the application conditions no longer permit reliable sealing over the demanded service life with a single seal.

The tandem sealing system is particularly important during cold starts when, due to the very high viscosity of the oil, the primary seal allows oil to pass as the piston rod is extended. In the tandem system the oil is heated as a result of the friction at the primary seal and is then reliably wiped off - at a now lower viscosity - by the secondary seal, the Zurcon® Rimseal.

As the piston rod is retracted, the oil is stored in the reservoir between the seals, and is then pumped back against the system pressure by the hydrodynamics in the seal clearance of Stepseal® 2K.

Particularly with strokes of more than 1 meter, measures have to be taken to provide a storage chamber between the seals.

Rimseal is designed to have the back-pumping effect necessary when using a double-acting scraper in the rod sealing system.

Figure 33 shows a redundant rod seal system consisting of Stepseal® 2K, Rimseal and Scraper DA22 with corresponding wear ring arrangement.

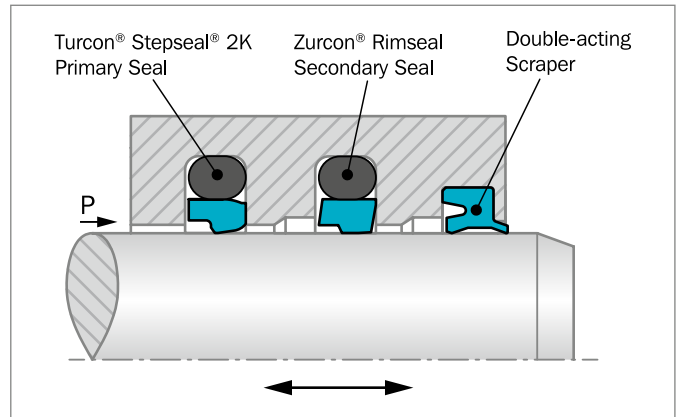


Figure 33: Zurcon® Rimseal in tandem configuration

The optimum rod sealing system for hydraulic cylinders subject to heavy loads should consist of three elements:

- 1) Turcon® Stepseal® 2K used as a primary seal. This seal element offers the back-pumping property necessary for redundant rod seal systems.
- 2) Zurcon® Rimseal as the secondary seal in this system to ensure reliable sealing of thin oil films at low secondary pressures. A Zurcon® material (polyurethane Shore D 58) is used combined with a new seal profile.
- 3) The final outer element of the redundant sealing system is a double-acting scraper seal (e.g. DA24, DA22, DA17, DA27. Turcon® Excluder® 2 resp. 5 or Zurcon® Excluder® 500).

The sealing system thus consists of three independent lip seals installed in line, in which the hardness of the material decreases from the pressure side to the atmospheric side.

INSTALLATION INSTRUCTIONS

Zurcon® Rimseal is installed according to information at Seite 39 and 40.

Closed groove installation applies the same dimensions as Turcon® Stepseal® 2K in Table 6 auf Seite 40.

MATERIAL

Zurcon® Rimseal in Zurcon® Z54

For light to heavy applications with linear movements in mineral oils and other media according to the Technical Data. Rimseal in Zurcon® Z54, special polyurethane 58 Shore D, is available in the following material combinations as standard:

O-Ring: NBR 70 Shore A N
 NBR 70 Shore A Low temp. T

Set code: Z54N or Z54T



Installation Recommendation

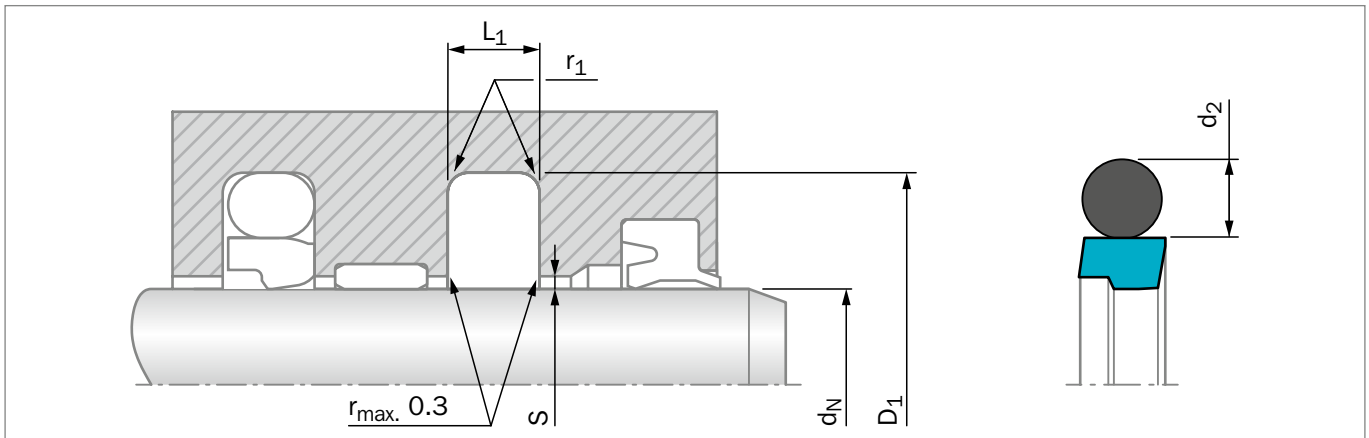


Figure 34: Installation Drawing

Table 22: Installation Dimensions – Standard Recommendations

Rod Diameter d_N f8/h9			Groove Diameter	Groove Width	Radius	Radial Clearance S_{max}^*		O-Ring Cross Section
Series No. RR 13 Standard Application	Series No. RR 15 Light Application	Series No. RR 11 Heavy Duty Application	D_1 H9	$L_1 + 0.2$	r_1 max	10 MPa	20 MPa	d_2
8 - 18.9	19 - 37.9	-	$d_N + 7.3$	3.2	0.6	0.40	0.25	2.62
19 - 37.9	38 - 199.9	8 - 18.9	$d_N + 10.7$	4.2	1.0	0.40	0.25	3.53
38 - 199.9	200 - 255.9	19 - 37.9	$d_N + 15.1$	6.3	1.3	0.50	0.30	5.33
200 - 255.9	256 - 649.9	38 - 199.9	$d_N + 20.5$	8.1	1.8	0.60	0.35	7.00
256 - 649.9	650 - 999.9	200 - 255.9	$d_N + 24.0$	8.1	1.8	0.60	0.35	7.00
650 - 999.9	1,000 - 2,200	256 - 649.9	$d_N + 27.3$	9.5	2.5	0.70	0.50	8.40
1,000 - 2,200	-	650 - 999.9	$d_N + 38.0$	13.8	3.0	1.00	0.70	12.00**

Installation in closed grooves from diameters > 18 mm. Also for installation according to ISO 7425-2.

* Installed as secondary seal utilize S_{max} of the primary seal.

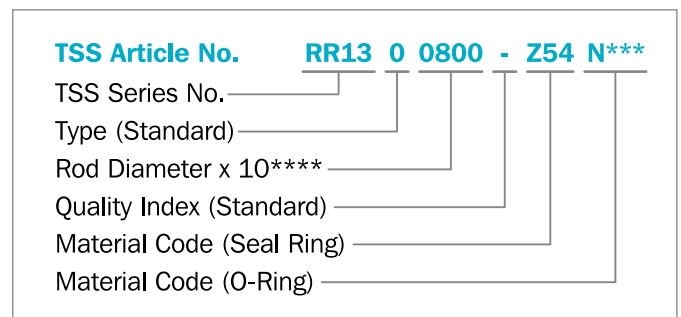
**All O-Rings with 12 mm cross section are delivered as a special profile ring.

ORDERING EXAMPLE

Zurcon® Rimseal complete with O-Ring, standard application:

Series:	RR13 from Table 22
Rod diameter:	$d_N = 80.0$ mm
TSS Part No.:	RR1300800 from Table 23

Select material Z54. The corresponding code numbers are appended to the TSS Part No. Together these form the TSS Article Number. The TSS Article Number for all intermediate sizes can be determined by following the example:



*** Zurcon® Rimseal is always supplied as a set with a Nitrile O-Ring, code N or T. See page 68 O-Ring Code.

**** For diameters d_N 1,000.0 mm multiply only by factor 1.
Example: RR13 for diameter $d_N = 1,200.0$ mm.
TSS Article No.: RR13**X1200** - Z54N.



Table 23: Installation Dimensions / TSS Article No.

Rod	Groove Dia.	Groove Width	TSS Article No. *	O-Ring Size	Rod	Groove Dia.	Groove Width	TSS Article No. *	O-Ring Size
d_N f8/h9	D_1 H9	L_1 +0.2			d_N f8/h9	D_1 H9	L_1 +0.2		
8.0	15.3	3.2	RR1300080-Z54N	10.77 x 2.62	95.0	110.1	6.3	RR1300950-Z54N	100.97 x 5.33
10.0	17.3	3.2	RR1300100-Z54N	12.37 x 2.62	100.0	115.1	6.3	RR1301000-Z54N	107.32 x 5.33
12.0	19.3	3.2	RR1300120-Z54N	13.94 x 2.62	105.0	120.1	6.3	RR1301050-Z54N	110.49 x 5.33
14.0	21.3	3.2	RR1300140-Z54N	17.12 x 2.62	110.0	125.1	6.3	RR1301100-Z54N	116.84 x 5.33
16.0	23.3	3.2	RR1300160-Z54N	18.72 x 2.62	110.0	130.5	8.1	RR1101100-Z54N	116.89 x 7.00
18.0	25.3	3.2	RR1300180-Z54N	20.29 x 2.62	115.0	130.1	6.3	RR1301150-Z54N	120.02 x 5.33
20.0	27.3	3.2	RR1500200-Z54N	21.89 x 2.62	120.0	135.1	6.3	RR1301200-Z54N	126.37 x 5.33
20.0	30.7	4.2	RR1300200-Z54N	23.40 x 3.53	125.0	140.1	6.3	RR1301250-Z54N	129.54 x 5.33
22.0	29.3	3.2	RR1500220-Z54N	25.07 x 2.62	125.0	145.5	8.1	RR1101250-Z54N	132.72 x 7.00
22.0	32.7	4.2	RR1300220-Z54N	26.58 x 3.53	130.0	145.1	6.3	RR1301300-Z54N	135.89 x 5.33
25.0	32.3	3.2	RR1500250-Z54N	26.64 x 2.62	135.0	150.1	6.3	RR1301350-Z54N	142.24 x 5.33
25.0	35.7	4.2	RR1300250-Z54N	29.75 x 3.53	140.0	155.1	6.3	RR1301400-Z54N	145.42 x 5.33
28.0	35.3	3.2	RR1500280-Z54N	29.82 x 2.62	145.0	160.1	6.3	RR1301450-Z54N	151.77 x 7.00
28.0	38.7	4.2	RR1300280-Z54N	32.92 x 3.53	150.0	165.1	6.3	RR1301500-Z54N	158.12 x 5.33
30.0	37.3	3.2	RR1500300-Z54N	32.99 x 2.62	150.0	170.5	8.1	RR1101500-Z54N	158.12 x 7.00
30.0	40.7	4.2	RR1300300-Z54N	34.52 x 3.53	155.0	170.1	6.3	RR1301550-Z54N	158.12 x 5.33
32.0	39.3	3.2	RR1500320-Z54N	34.59 x 2.62	160.0	175.1	6.3	RR1301600-Z54N	164.47 x 5.33
32.0	42.7	4.2	RR1300320-Z54N	36.09 x 3.53	160.0	180.5	8.1	RR1101600-Z54N	170.82 x 7.0
35.0	42.3	3.2	RR1500350-Z54N	37.77 x 2.62	165.0	180.1	6.3	RR1301650-Z54N	170.82 x 5.33
35.0	45.7	4.2	RR1300350-Z54N	37.70 x 3.53	170.0	185.1	6.3	RR1301700-Z54N	177.17 x 5.33
36.0	43.3	3.2	RR1500360-Z54N	39.34 x 2.62	175.0	190.1	6.3	RR1301750-Z54N	183.52 x 5.33
36.0	46.7	4.2	RR1300360-Z54N	40.87 x 3.53	180.0	195.1	6.3	RR1301800-Z54N	183.52 x 5.33
40.0	50.7	4.2	RR1500400-Z54N	44.04 x 3.53	180.0	200.5	8.1	RR1101800-Z54N	189.87 x 7.00
40.0	55.1	6.3	RR1300400-Z54N	43.82 x 5.33	185.0	200.1	6.3	RR1301850-Z54N	189.87 x 5.33
45.0	55.7	4.2	RR1500450-Z54N	50.39 x 3.53	190.0	205.1	6.3	RR1301900-Z54N	196.22 x 5.33
45.0	60.1	6.3	RR1300450-Z54N	50.17 x 5.33	200.0	220.5	8.1	RR1302000-Z54N	208.92 x 7.00
50.0	60.7	4.2	RR1500500-Z54N	53.57 x 3.53	210.0	230.5	8.1	RR1302100-Z54N	215.27 x 7.00
50.0	65.1	6.3	RR1300500-Z54N	56.52 x 5.33	220.0	240.5	8.1	RR1302200-Z54N	227.97 x 7.00
55.0	65.7	4.2	RR1500550-Z54N	59.92 x 3.53	230.0	250.5	8.1	RR1302300-Z54N	240.67 x 7.00
55.0	70.1	6.3	RR1300550-Z54N	59.69 x 5.33	240.0	260.5	8.1	RR1302400-Z54N	253.37 x 7.00
56.0	71.1	6.3	RR1300560-Z54N	62.87 x 5.33	250.0	270.5	8.1	RR1302500-Z54N	266.07 x 7.00
60.0	70.7	4.2	RR1500600-Z54N	63.09 x 3.53	260.0	284.0	8.1	RR1302600-Z54N	266.07 x 7.00
60.0	75.1	6.3	RR1300600-Z54N	66.04 x 5.33	280.0	304.0	8.1	RR1302800-Z54N	291.47 x 7.00
63.0	73.7	4.2	RR1500630-Z54N	66.27 x 3.53	300.0	324.0	8.1	RR1303000-Z54N	316.87 x 7.00
63.0	78.1	6.3	RR1300630-Z54N	69.22 x 5.33	310.0	334.0	8.1	RR1303100-Z54N	316.87 x 7.00
65.0	80.1	6.3	RR1300650-Z54N	69.22 x 5.33	320.0	344.0	8.1	RR1303200-Z54N	329.57 x 7.00
70.0	85.1	6.3	RR1300700-Z54N	75.57 x 5.33	340.0	364.0	8.1	RR1303400-Z54N	354.97 x 7.00
75.0	90.1	6.3	RR1300750-Z54N	81.92 x 5.33	350.0	374.0	8.1	RR1303500-Z54N	367.67 x 7.00
80.0	90.7	4.2	RR1500800-Z54N	85.32 x 3.53	360.0	384.0	8.1	RR1303600-Z54N	367.67 x 7.00
80.0	95.1	6.3	RR1300800-Z54N	85.09 x 5.33	380.0	404.0	8.1	RR1303800-Z54N	393.07 x 7.00
85.0	100.1	6.3	RR1300850-Z54N	91.44 x 5.33	400.0	424.0	8.1	RR1304000-Z54N	417.96 x 7.00
90.0	105.1	6.3	RR1300900-Z54N	94.62 x 5.33	420.0	444.0	8.1	RR1304200-Z54N	430.66 x 7.00



Rod	Groove Dia.	Groove Width	TSS Article No. *	O-Ring Size
d_N f8/h9	D_1 H9	L_1 +0.2		
450.0	474.0	8.1	RR1304500-Z54N	468.76 x 7.00
480.0	504.0	8.1	RR1304800-Z54N	494.16 x 7.00
500.0	524.0	8.1	RR1305000-Z54N	506.86 x 7.00
600.0	624.0	8.1	RR1306000-Z54N	608.08 x 7.00
610.0	634.0	8.1	RR1306100-Z54N	633.48 x 7.00
620.0	644.0	8.1	RR1306200-Z54N	633.48 x 7.00
630.0	654.0	8.1	RR1306300-Z54N	658.88 x 7.00
640.0	664.0	8.1	RR1306400-Z54N	658.88 x 7.00
650.0	677.3	9.5	RR1306500-Z54N	663.00 x 8.40
656.0	683.3	9.5	RR1306560-Z54N	669.00 x 8.40
660.0	687.3	9.5	RR1306600-Z54N	673.00 x 8.40
680.0	707.3	9.5	RR1306800-Z54N	693.00 x 8.40
685.0	712.3	9.5	RR1306850-Z54N	698.00 x 8.40
700.0	724.0	8.1	RR1507000-Z54N	712.00 x 7.00
700.0	727.3	9.5	RR1307000-Z54N	713.00 x 8.40
710.0	737.3	9.5	RR1307100-Z54N	723.00 x 8.40
730.0	757.3	9.5	RR1307300-Z54N	743.00 x 8.40
760.0	787.3	9.5	RR1307600-Z54N	773.00 x 8.40
765.0	792.3	9.5	RR1307650-Z54N	778.00 x 8.40
780.0	807.3	9.5	RR1307800-Z54N	793.00 x 8.40
790.0	817.3	9.5	RR1307900-Z54N	803.00 x 8.40
800.0	827.3	9.5	RR1308000-Z54N	813.00 x 8.40
810.0	837.3	9.5	RR1308100-Z54N	823.00 x 8.40
820.0	847.3	9.5	RR1308200-Z54N	833.00 x 8.40
830.0	857.3	9.5	RR1308300-Z54N	843.00 x 8.40
850.0	877.3	9.5	RR1308500-Z54N	863.00 x 8.40
870.0	897.3	9.5	RR1308700-Z54N	883.00 x 8.40
880.0	907.3	9.5	RR1308800-Z54N	893.00 x 8.40
885.0	912.3	9.5	RR1308850-Z54N	898.00 x 8.40
890.0	917.3	9.5	RR1308900-Z54N	903.00 x 8.40
930.0	957.3	9.5	RR1309300-Z54N	943.00 x 8.40
955.0	982.3	9.5	RR1309550-Z54N	968.00 x 8.40
1,000.0	1,038.0	13.8	RR13X1000-Z54N	1,016.00 x 12.00
1,035.0	1,073.0	13.8	RR13X1035-Z54N	1,051.00 x 12.00
1,040.0	1,067.3	9.5	RR15X1040-Z54N	1,053.00 x 8.40
1,040.0	1,078.0	13.8	RR13X1040-Z54N	1,056.00 x 12.00
1,050.0	1,077.3	9.5	RR15X1050-Z54N	1,063.00 x 8.40
1,050.0	1,088.0	13.8	RR13X1050-Z54N	1,066.00 x 12.00
1,100.0	1,138.0	13.8	RR13X1100-Z54N	1,116.00 x 12.00
1,120.0	1,147.3	9.5	RR15X1120-Z54N	1,133.00 x 8.40
1,120.0	1,158.0	13.8	RR13X1120-Z54N	1,136.00 x 12.00
1,200.0	1,227.3	9.5	RR15X1200-Z54N	1,213.00 x 8.40

Rod	Groove Dia.	Groove Width	TSS Article No. *	O-Ring Size
d_N f8/h9	D_1 H9	L_1 +0.2		
1,200.0	1,238.0	13.8	RR13X1200-Z54N	1,216.00 x 12.00
1,330.0	1,357.3	9.5	RR15X1330-Z54N	1,343.00 x 8.40
1,330.0	1,368.0	13.8	RR13X1330-Z54N	1,346.00 x 12.00
1,500.0	1,527.3	9.5	RR15X1500-Z54N	1,513.00 x 8.40
1,500.0	1,538.0	13.8	RR13X1500-Z54N	1,516.00 x 12.00
1,600.0	1,638.0	13.8	RR13X1600-Z54N	1,616.00 x 12.00
2,000.0	2,038.0	13.8	RR13X2000-Z54N	2,016.00 x 12.00

The rod diameters in **bold** type are in accordance with the recommendations of ISO 3320.

Other dimensions and all intermediate sizes up to 2,200 mm diameter including imperial (inch) sizes can be supplied.

* TSS Article Number incl. of NBR O-Ring.

For application of low-temperature O-Ring, please use Material Set Code Z54T instead of Z54N

All O-Rings with 12 mm cross section are delivered as special profile ring.

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Zurcon® Rimseal IM



Injection Molded (IM)

Single-acting

Rubber-energized plastic-faced seal

Material:

Zurcon® Z13 and Elastomer



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Zurcon® Rimseal IM*



Description

Zurcon® Rimseal IM is an O-Ring energized rod seal designed for high demanding applications, with manufacturing feasible by both injection molding and by lathing from injection molded TPU Zurcon® tubes.

Zurcon® Rimseal IM is an asymmetric rod seal with a slipper ring made of Zurcon® Z13, fitting into both Stepseal® and ISO 7425-2 grooves.

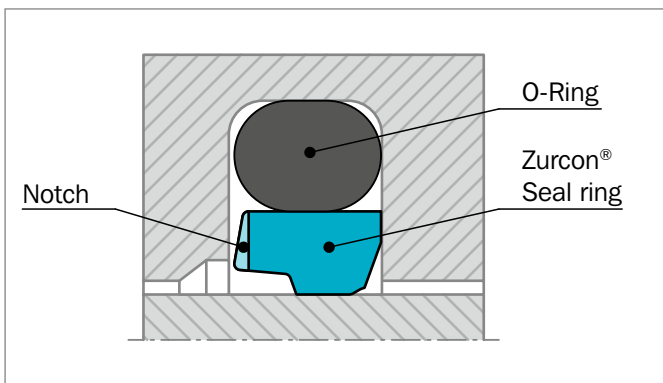


Figure 35: Zurcon® Rimseal IM

Contact length and profile tilting angles are optimized to give the desired contact pressure distribution throughout a wide range of pressures, hardware machining tolerances and different working temperatures within the admissible temperature range.

Especially in tandem with various primary seals, this new design promises to give an effective solution for modern hydraulic applications.

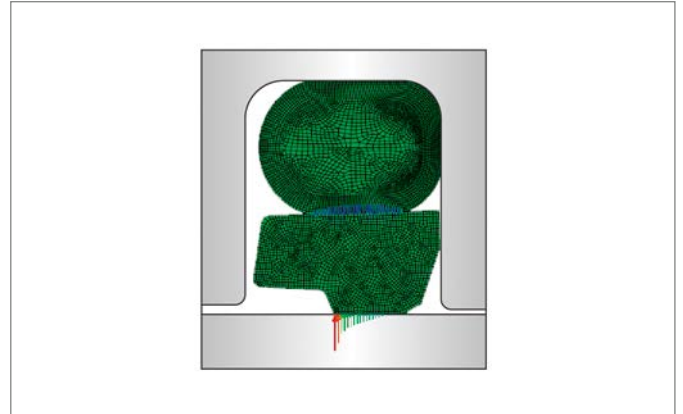


Figure 36: Zurcon® Rimseal IM

This profile is tested and proven to work efficiently within a Lubrication Management (LM) PUR system configuration.

Zurcon® Rimseal IM is able to combine very high abrasion and extrusion resistance together with chemical compatibility.

The wear resistance is improved even more with a LM configuration due to friction reduction within the whole sealing system compared to other traditional TPU solutions.

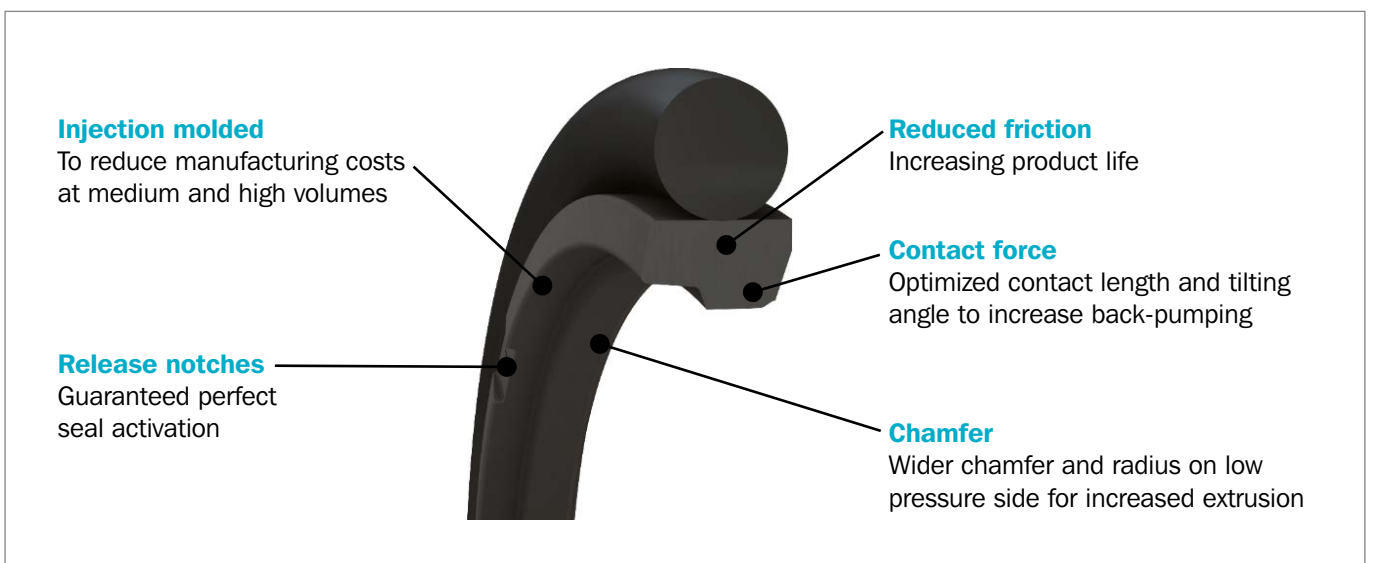


Figure 37: Zurcon® Rimseal IM design features

* Patent application: WO 92/19893 A1



METHOD OF OPERATION

Like all slipper seals, the initial compression is generated by O-Ring squeeze. The contact force distribution at low pressures is optimized for low friction and tight sealing.

Four radial notches at the back of the seal guarantee O-Ring activation, even in the cases of contact with the back side of the groove or for sudden pressure release when the pressure drops. A design shape at the outer corner was studied to increase extrusion resistance (Figure 37).

In Figure 38 shows Von Mises Stress at 3 different pressure levels: after installation, medium range and 25 MPa.

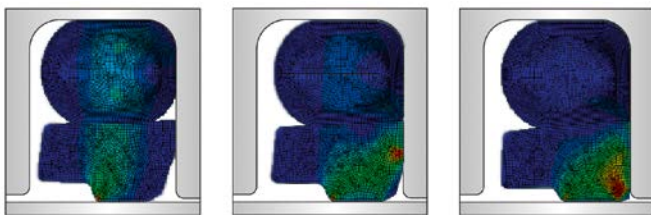


Figure 38: left: 0 MPa; center: 5 MPa; right: 25 MPa

Contact length and tilt angle are also optimized for seal stability at high pressures. The FEA design, shows very good positioning in the groove and relatively small deformation, keeping displacement to a low level with consequent lower material stress, which reduces extrusion risk. Zurcon® Rimseal IM is designed to control fluid film during both outstroke and instroke. The back-pumping function was improved with a special design on the low-pressure side which also provides additional extrusion resistance, unique to Zurcon® Z13 (Figure 38).

ADVANTAGES

- Feasible both by injection moulding and by lathing from injection moulded TPU Zurcon® Z13 tubes.
- Increased extrusion resistance and outstanding abrasion resistance of TPU Zurcon® Z13 positions Zurcon® Rimseal IM as an effective and reliable choice for tandem seal configurations
- Calibrated rod contact pressure and reduced friction from optimized back-pumping behaviour give Zurcon® Rimseal IM the capability to control oil film, making it a very good choice as a secondary seal in Lubrication Management configurations

APPLICATION EXAMPLES

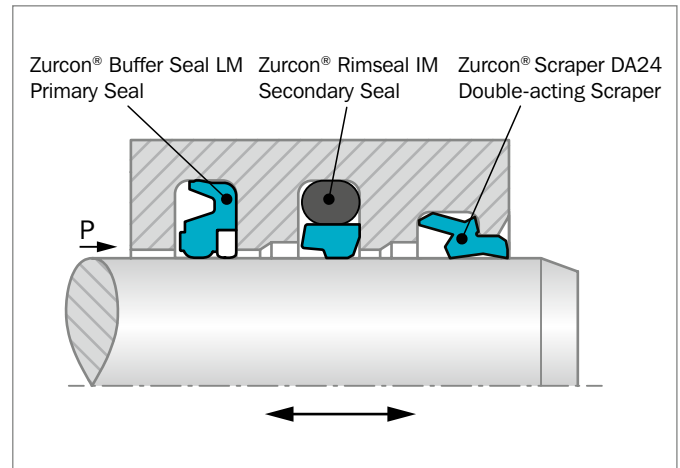


Figure 39: Tandem configuration

- Construction machinery
- Hydraulic cylinders
- Earth moving equipment
- Mobile hydraulics
- Agriculture
- Mobile cranes
- Fork lifts



OPERATING CONDITIONS:

Pressure:	60 MPa in tandem system 25 MPa as individual element
Velocity:	0.5 m/s as primary seal 5 m/s with short strokes (<1 m) in tandem systems
Temperature:	-45 °C to +110 °C depending on O-Ring material
Media:	<ul style="list-style-type: none"> - Mineral oil - Synthetic and natural esters - HEES, HETG up to +60 °C - Flame retardant fluids HF - Special optimized for flame retardant fluids (HFC) up to +60 °C
Installation:	<ul style="list-style-type: none"> - Standard mounting in closed grooves. - For Ø <18 mm request a split groove. - No recalibration needed for installation in closed groove.

IMPORTANT NOTE

The above data are maximum values and cannot be used at the same time, e.g. the maximum operating speed depends on pressure, temperature and gap value. A combination of pressure and speed might cause local heat increases, so care should be taken when evaluating high values for the above parameters simultaneously.

MATERIAL

Zurcon® Z13 is the 60 ShD TPU that combines excellent mechanical and elastic material properties:

- Temperature range from -45 °C to +110 °C (for short periods, up to +120 °C)
- Good combination of elasticity and tensile strength
- Low friction
- Excellent chemical compatibility
- Low compression set at high temperatures

Table 24: Recommended materials

Code	O-Ring Material Shore A	Code	O-Ring Temp. °C*
Z13	NBR 70	N	-30 to +100
	NBR 70 Low temp.	T	-45 to +80
	HNBR 70	H	-30 to +110
	FKM 70	V	-10 to (+200)

* The O-Ring operation temperature is only valid in mineral hydraulic oil.

Table 25: Z13 Chemical compatibility: General guideline (Laboratory compatibility tests 1,008 hours)

FLUIDS TYPE	DIN / ISO Code	Temperatur	Results
Mineral Oils	HLP	+110 °C	Excellent
	HVLP		
	HLPD		
Synthetics fluids	HEES	+80 °C to +100 °C	Excellent
	HEPG (PAG)	+60 °C	Good
	HEPR (PAO)	+100 °C	Excellent
Water based fluids	HFA	+50 °C to +60 °C	Good
	HFC	+60 °C	Excellent
Synthetics water free fluids	HFDU	+100 °C	Excellent

The above results must be considered as general guidelines. We recommend verifying the compound compatibility with the specific fluids and temperature conditions experienced in the application.



Installation Recommendation

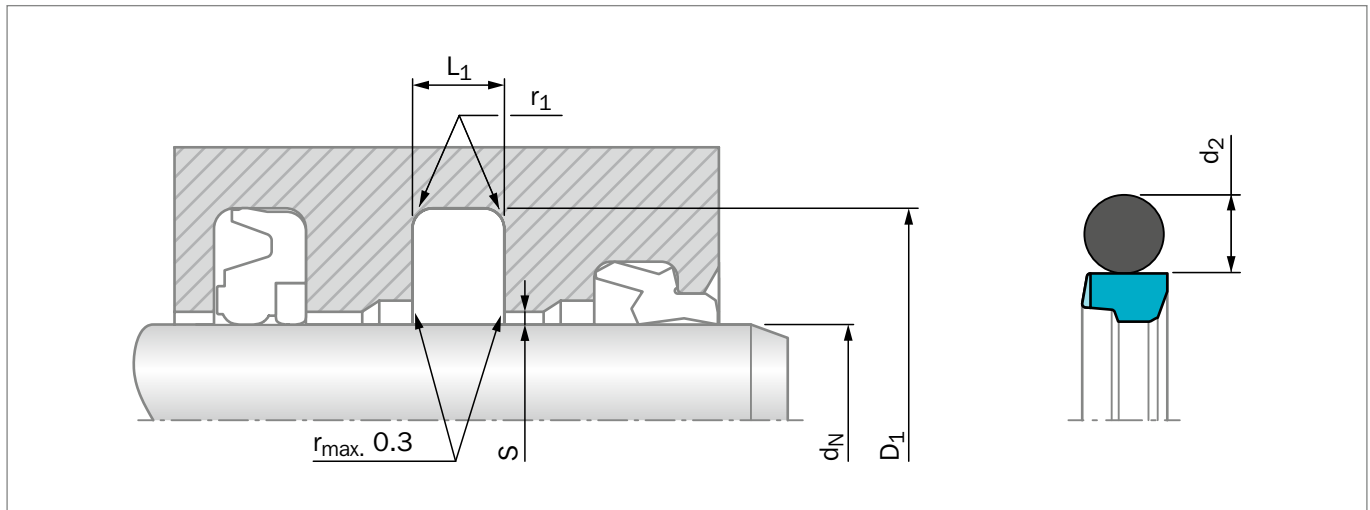


Figure 40: Installation Drawing

Table 26: Installation Dimensions – Standard Recommendations

Seal Series No.	Rod Diameter d_N f8/h9			Groove Diameter D_1 H9	Groove Width $L_1 + 0.2$	Radial Clearance S_{max}^{**} at +110 °C				O-Ring Cross Section d_2
	Light Application	Standard Application	Heavy Duty Application			16 MPa	26 MPa	32 MPa	40 MPa	
RRB1	19 - 37.9	8 - 18.9***	-	$d_N + 7.3$	3.2	0.30	0.20	-	-	2.62
RRB2	38 - 149.9	19 - 37.9	8 - 18.9	$d_N + 10.7$	4.2	0.40	0.30	0.20	-	3.53
RRB3	200 - 255.9	38 - 199.9	19 - 37.9	$d_N + 15.1$	6.3	0.40	0.30	0.20	-	5.33
RRB4	256 - 399.9*	200 - 255.9	38 - 199.9	$d_N + 20.5$	8.1	0.50	0.40	0.30	0.25	7.00
RRB8	-	256 - 399.9*	200 - 255.9	$d_N + 24.0$	8.1	0.50	0.40	0.30	0.25	7.00
RRB5	-	-	256 - 399.9*	$d_N + 27.3$	9.5	0.60	0.50	0.40	0.35	8.40

Installation in closed grooves from diameters > 18 mm. Also for installation according to ISO 7425-2.

* Max diameter for lathed seal from IM Z13 tube

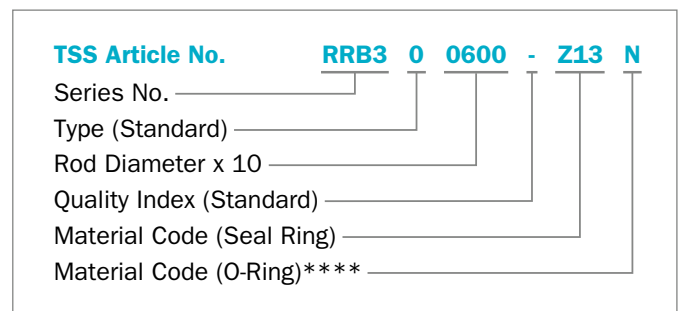
** When installed as secondary seal utilize S_{max} of the primary seal.

*** Special type of mold is necessary

ORDERING EXAMPLE

Zurcon® Rimseal IM complete with O-Ring:

Rod diameter	$d_N = 60.0$ mm
Groove width:	$L_1 = 6.3$ mm
TSS Part No.:	RRB300600 from Table 26 and Table 27



**** From Table 25


Table 27: Installation Dimensions / TSS Article No.

Rod Diameter	Groove Diameter	Groove Width	TSS Article No.	O-Ring Size
d_N f8/h9	D_1 H9	L_1 +0.2		
50.0	65.1	6.3	RRB300500-Z13	56.52 x 5.33
60.0	75.1	6.3	RRB300600-Z13	66.04 x 5.33
65.0	80.1	6.3	RRB300650-Z13	69.22 x 5.33
70.0	85.1	6.3	RRB300700-Z13	75.57 x 5.33
75.0	90.1	6.3	RRB300750-Z13	81.92 x 5.33
80.0	95.1	6.3	RRB300800-Z13	85.09 x 5.33
85.0	100.1	6.3	RRB300850-Z13	91.44 x 5.33
90.0	105.1	6.3	RRB300900-Z13	94.62 x 5.33
95.0	110.1	6.3	RRB300950-Z13	100.97 x 5.33
100.0	115.1	6.3	RRB301000-Z13	107.32 x 5.33
105.0	120.1	6.3	RRB301050-Z13	110.49 x 5.33
110.0	125.1	6.3	RRB301100-Z13	116.84 x 5.33
115.0	130.1	6.3	RRB301150-Z13	120.02 x 5.33
120.0	135.1	6.3	RRB301200-Z13	126.37 x 5.33
125.0	140.1	6.3	RRB301250-Z13	129.54 x 5.33
130.0	145.1	6.3	RRB301300-Z13	135.89 x 5.33
140.0	155.1	6.3	RRB301400-Z13	145.42 x 5.33
150.0	165.1	6.3	RRB301500-Z13	158.12 x 5.33

All dimensions in **bold** type are in accordance with ISO 3320

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Zurcon® L-Cup



Single-acting

Low Friction Properties

Material:

Zurcon®



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■ Zurcon® L-Cup® *



■ Introduction

The rod sealing system is the most critical part of a hydraulic cylinder. Therefore it is expected that a rod sealing system performs under leak-free conditions in the static and dynamic state.

Moreover it has to fulfil a lifetime of several thousand hours.

To meet these requirements, Trelleborg Sealing Solutions has developed the Zurcon® L-Cup® *, a highly effective and innovative rod sealing component.

DESCRIPTION

Zurcon® L-Cup® is a single-acting polyurethane rod seal with a unique design offering a hydrodynamic backpumping ability over the complete working pressure range. The pressure-independent, hydrodynamic sealing ability of this new sealing element requires no lubrication reservoir in the sealing area and ensures a constant and controlled pressure distribution over a wide pressure range.

The advantages of the Zurcon® L-Cup® design lead to the following improved properties:

ADVANTAGES

- Hydrodynamic back-pumping ability over the complete working pressure range
- Low friction and therefore a reduction of heat generated
- Low breakout force even after a long period of non-operation
- Very low stick-slip
- Low increase in friction at increasing pressure
- High extrusion resistance
- Optimum geometry of the static sealing lip for higher sealing ability
- No entrapped oil and grease between seal and groove (due to notches)
- No pressure build-up between seal and groove OD
- Long service life

The Zurcon® L-Cup® was designed in accordance with customers' demands.

- Groove dimensions according to ISO 5597 Part 2
- Interchangeable with existing U-Cup grooves

- Installation into closed grooves
- Wear and extrusion resistant high-performance polyurethane

APPLICATION EXAMPLES

Zurcon® L-Cup® can be used in all applications in which previously a conventional U-Cup was applied, such as:

- Fork lifts
- Agricultural machines
- Light and medium mobile hydraulics
- Industrial hydraulics
- Machine tools
- Injection molding machines
- Hydraulic presses

Another preferred solution for tandem rod sealing systems is the combination with the Turcon® Stepseal® 2K as primary seal and L-Cup® as secondary seal, in conjunction with a double acting scraper.

OPERATING CONDITIONS

Pressure:	Up to 40 MPa
Velocity:	Up to 0.5 m/s
Temperature:	-35 °C to +110 °C (Zurcon® Z20 standard)
Media:	Hydraulic fluids based on mineral oil

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.

* Patent application: WO 95/11395 A1



MATERIALS

Zurcon® Z20 Standard polyurethane 93 Shore A
Temperature: -35 °C to +110 °C
Color: Turquoise

Zurcon® Z22 Premium polyurethane 93 Shore A
Temperature: -50 °C to +110 °C
Color: Dark petrol

Zurcon® Z25 Premium polyurethane 93 Shore A
Temperature: -35 °C to +130 °C
Color: Black

METHOD OF OPERATION

Trelleborg Sealing Solutions experience in the production of hydrodynamic back-pumping seals such as Turcon® Stepseal® 2K, and the use of Finite Element Analysis (FEA) and other laboratory tests have led to the development of Zurcon® L-Cup®. The main objective in the development of this seal was the ability to achieve an optimum pressure distribution over the complete pressure range.

The pressure distribution curve under the sealing lip needs to have a steep gradient on the high-pressure side and a shallow gradient on the rear of the seal.

The operating principles and function of Zurcon® L-Cup® is similar to the well-known Turcon® Stepseal® 2K.

FRICITION

In Figure 41 the friction values of a conventional U-Cup and of Zurcon® L-Cup® are being compared. A high increase in friction of the U-Cup is clearly shown between approximately 5 and 15 MPa. This is due to the U-Cup being totally pressed on the rod surface at increased pressure, causing elimination of the oil reservoir and dry running of the U-Cup.

In comparison, the L-Cup® shows only a low increase in friction which is due to the smaller contact area and better tribological behaviour. The result is a low friction heat generation.

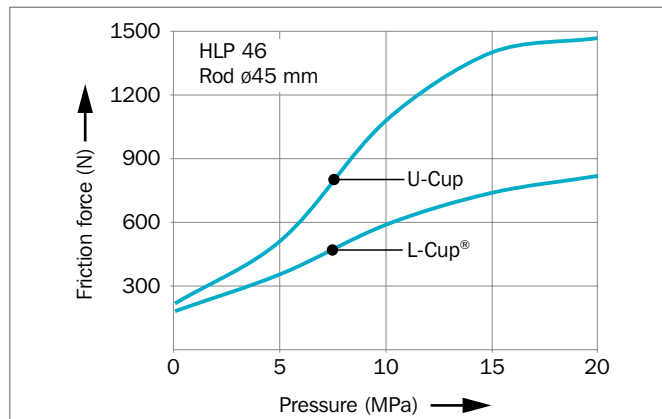


Figure 41: Friction dependent on pressure

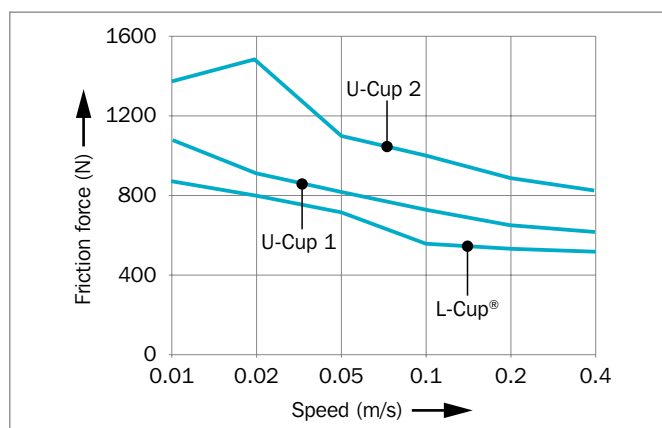


Figure 42: Friction dependent on speed

FRICITION HEAT

The effect described above can be made visible by simply measuring the temperature. Figure 43 shows the increase in temperature on the rod surface caused by friction, measured at a pressure of 40 MPa after 20,000 cycles. This explains the prolonged service life of L-Cup®.

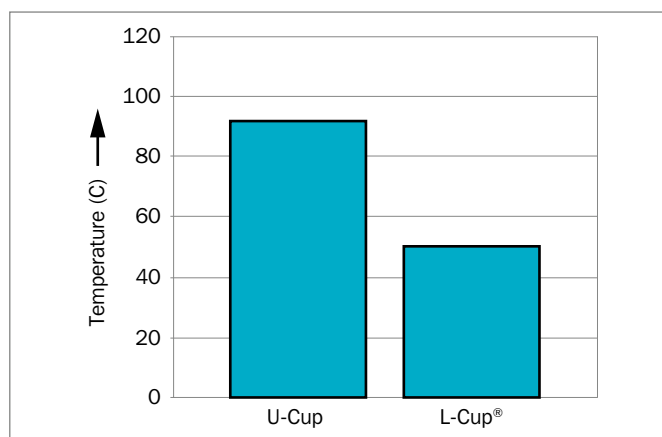


Figure 43: Increase in temperature caused by friction



TEST CONDITIONS (FIGURE 43)

Dimension:	50 x 60 x 11 mm
Pressure:	0/40 MPa
Velocity:	0.1 m/s
Temperature:	ambient

SEALING GAP

The recommended gap dimensions described in Figure 44, depend on pressure and temperature.

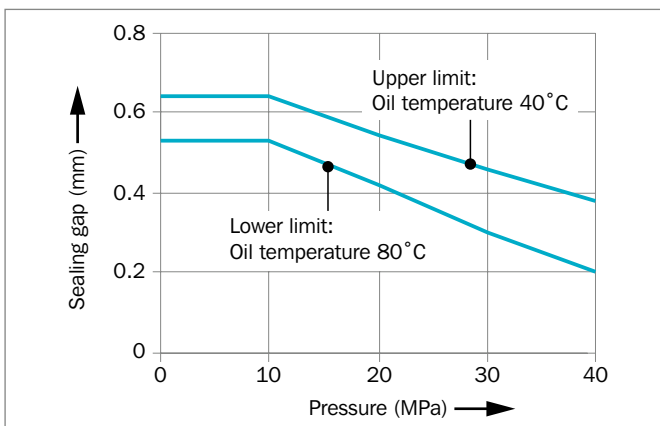


Figure 44: Sealing gap

DESIGN INSTRUCTIONS

Lead in chamfers

In order to avoid damage to the rod seal during installation, lead-in chamfers and rounded edges must be provided on the piston rods (Figure 45). If this is not possible for design reasons, a separate installation tool must be used.

The minimum length of the lead-in chamfer depends on the profile size of the seal and can be seen from the following tables.

Table 29: Material Selection

Material Code	Material Description	Temperature Range	Application
Zurcon® Z20	High performance Polyurethane 93 Shore A; standard grade for hydraulic	-35 °C to +110 °C	Excellent abrasion and extrusion resistance, minimal swelling in mineral oil, acceptable hydrolysis resistance.
Zurcon® Z22	High performance Polyurethane 93 Shore A; Premium grade for low temperature	-50 °C to +110 °C	Wide range of working temperatures with very good compression set performance at very low temperature. Excellent balance between swelling in mineral oil and hydrolysis resistance.
Zurcon® Z25	High performance Polyurethane 95 Shore A; Premium grade for high temperature	-35 °C to +130 °C	Wide range of working temperatures with excellent mechanical properties at high temperature.

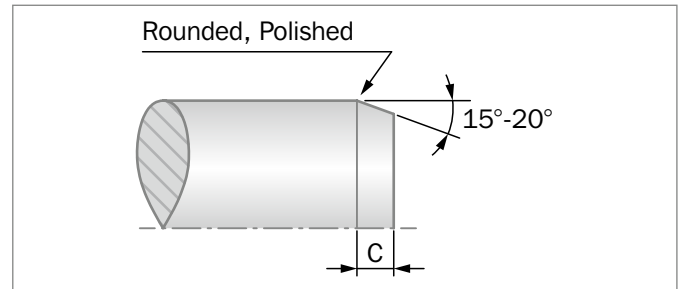


Figure 45: Lead-in chamfer

Table 28: Lead-in chamfers

Lead-in Chamfer Length C min.	Zurcon® L-Cup® Groove Depth*
2.0	3.5
2.0	4.0
2.5	5.0
4.0	7.5
5.0	10.0
6.5	12.5
7.5	15.0

* The groove depth is calculated from: $(D - d_N)/2$.
The dimensions for D and d_N can be found in Table 30.



■ Installation Recommendation

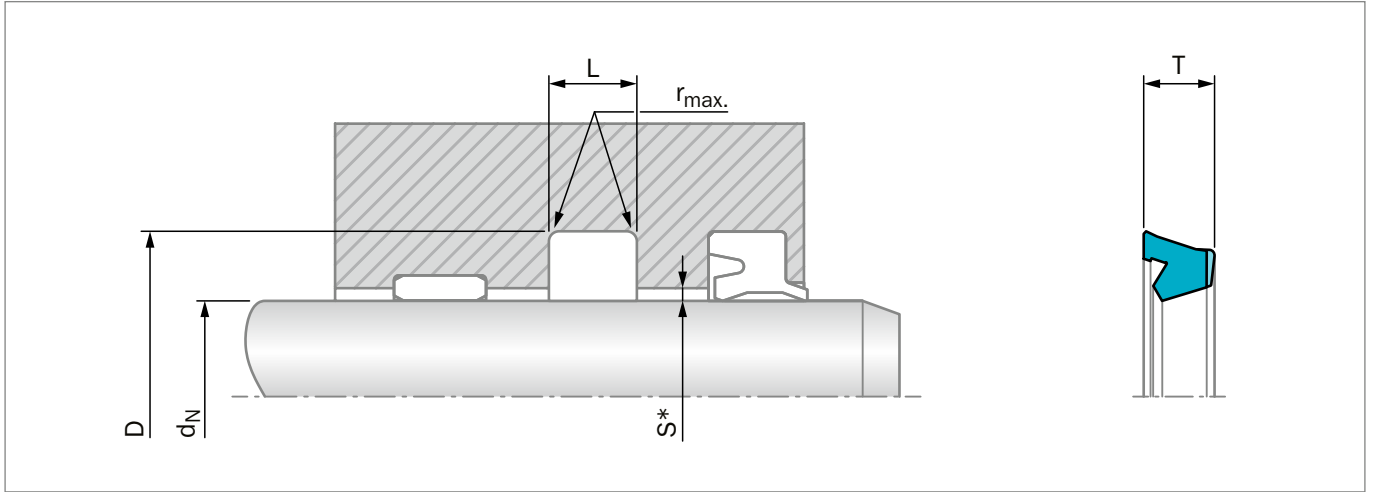


Figure 46: Installation Drawing

* Gap measure "S" see Figure 44

ORDERING EXAMPLE

L-Cup

Rod Diameter:	$d_N = 25.0 \text{ mm}$
Groove Diameter:	$D = 33.0 \text{ mm}$
Groove Width:	$L = 6.3 \text{ mm}$
TSS Part No.:	RL08N0250

TSS Article No. **RL08 N 0250 - Z20**

TSS Series No. _____
 Type (Standard) _____
 Rod Diameter x 10 _____
 Quality Index (Standard) _____
 Material Code _____

MATERIAL

Standard Zurcon®:	Z20
Special Polyurethane:	93 Shore A
Color:	Turquoise



Table 30: Installation Dimensions / TSS Part No.

Rod Diameter	Groove Diameter	Groove Width	Radius	Ring Width	TSS Part No.
d_N f8	D H10	L +0.25	$r_{max.}$	T	
16	22	6.0	0.3	5.4	RL38N0160
20	26	5.5	0.3	5.0	RL04N0200
*20	28	6.3	0.3	5.7	RL08N0200
*22	30	6.3	0.3	5.7	RL08N0220
25	33	8.0	0.3	7.2	RL10N0250
25	33	6.3	0.3	5.7	RL08N0250
28	36	6.3	0.5	5.7	RL08N0280
*28	38	8.0	0.3	7.2	RL14N0280
30	38	6.3	0.3	5.7	RL08N0300
30	40	8.0	0.3	7.2	RL14N0300
30	38	8.0	0.3	7.2	RL10N0300
30	40	11.0	0.3	9.9	RL17N0300
32	42	8.0	0.3	7.2	RL14N0320
35	43	6.3	0.3	5.7	RL08N0350
35	45	11.0	0.3	9.9	RL17N0350
36	44	6.3	0.5	5.7	RL08N0360
36	46	8.0	0.3	7.2	RL14N0360
36	46	10.0	0.3	9.0	RL16N0360
38	48	11.0	0.3	9.9	RL17N0380
40	48	7.0	0.3	6.3	RL09N0400
40	50	8.0	0.3	7.2	RL14N0400
40	50	10.0	0.3	9.0	RL16N0400
42	52	8.0	0.3	7.2	RL14N0420
42	52	10.0	0.3	9.0	RL16N0420
45	53	8.0	0.3	7.2	RL10N0450
45	55	8.0	0.3	7.2	RL14N0450
48	60	11.0	0.3	9.9	RL36N0480
50	58	9.0	0.3	8.1	RL11N0500
50	60	8.0	0.3	7.2	RL14N0500
50	60	10.0	0.3	9.0	RL16N0500
50	65	12.5	0.4	11.3	RL26N0500
55	63	9.0	0.3	8.1	RL11N0550
55	65	10.0	0.3	9.0	RL16N0550
56	71	12.5	0.4	11.3	RL26N0560
60	68	9.0	0.3	8.1	RL11N0600
60	70	8.0	0.3	7.2	RL14N0600
60	70	10.0	0.3	9.0	RL16N0600
63	78	12.5	0.4	11.3	RL26N0630
65	75	10.0	0.3	9.0	RL16N0650
70	80	10.0	0.3	9.0	RL16N0700



Rod Diameter	Groove Diameter	Groove Width	Radius	Ring Width	TSS Part No.
d_N f8	D H10	L +0.25	$r_{max.}$	T	
70	85	12.5	0.4	11.3	RL26N0700
75	90	12.5	0.3	11.3	RL26N0750
80	95	12.5	0.4	11.3	RL26N0800
85	100	13.1	0.4	11.8	RL27N0850
90	105	12.5	0.4	11.3	RL26N0900
100	120	16.0	0.6	14.4	RL30N1000
110	130	16.0	0.6	14.4	RL30N1100
115	135	16.0	0.6	14.4	RL30N1150
119	134	9.4	0.4	8.1	RL22N1190
120	135	12.5	0.4	11.3	RL26N1200
120	140	16.0	0.6	14.4	RL30N1200
125	140	12.0	0.4	10.8	RL25N1250
125	145	16.0	0.6	14.4	RL30N1250
130	150	16.0	0.6	14.4	RL30N1300
135	155	16.0	0.6	14.4	RL30N1350
140	160	16.0	0.6	14.4	RL30N1400
150	170	16.0	0.6	14.4	RL30N1500
155	175	16.0	0.6	14.4	RL30N1550
160	180	16.0	0.6	14.4	RL30N1600
195	220	20.0	0.6	18.0	RL32N1950

Dimensions and TSS Part Numbers in bold according to ISO 5597. * Split groove

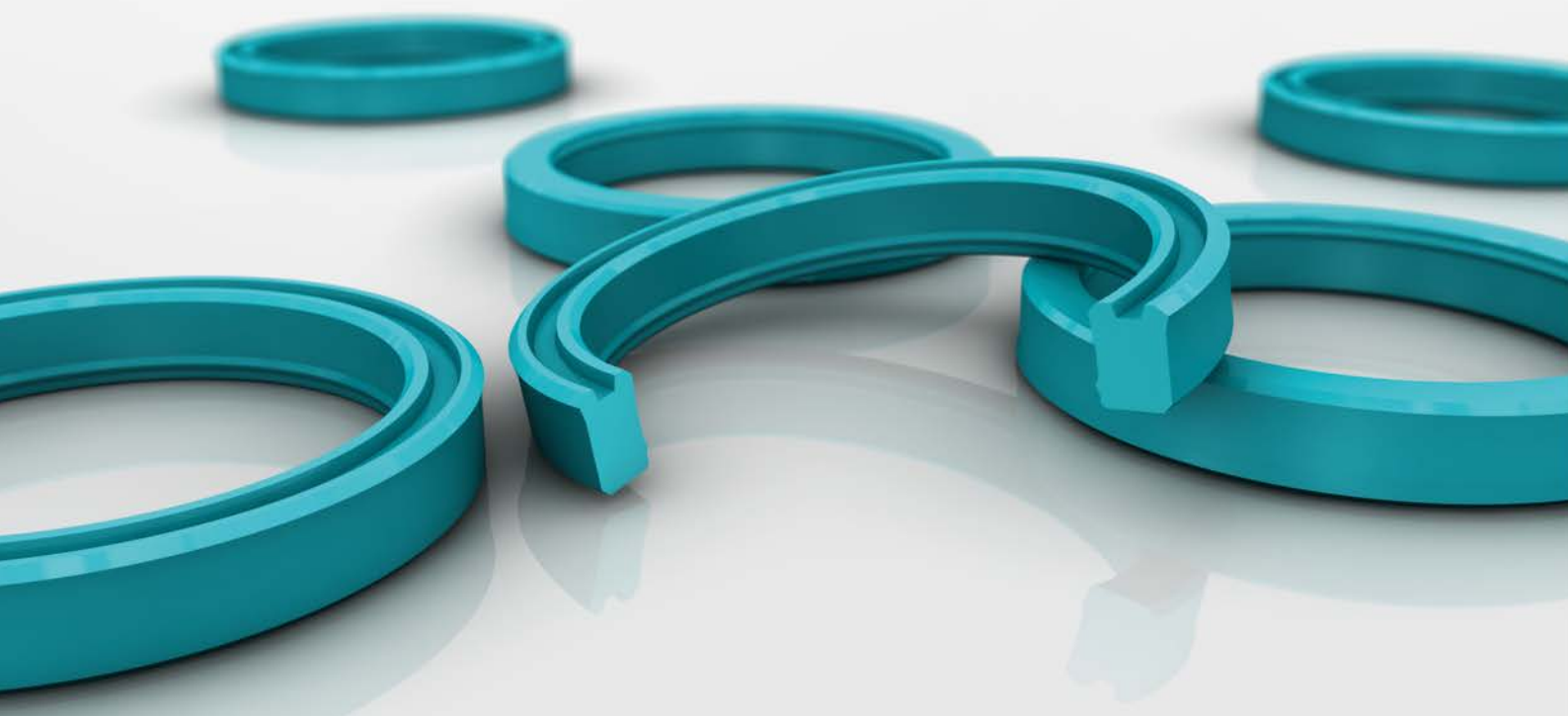
Zurcon® U-Cup RU2



Single-acting U-Cup

Asymmetric, Double Lip,
Compact

Material:
Zurcon®



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Zurcon® U-Cup RU2



Description

Today, U-Cups are used primarily as seals for piston rods in hydraulic cylinders. U-Cups in polyurethane are proven elements, due to their good mechanical properties, for standard cylinder construction, particularly for mobile hydraulics under rough operating conditions. The U-Cup RU2 is a double lip seal in a compact design.

TYPE RU2

The compact U-Cup type RU2 is designed for small grooves. It is thus particularly suitable for use in space-saving designs. The compact form provides a high sealing effect even with low system pressures.

The U-Cup has two sealing lips in the dynamic sealing zone. The compact form with two sealing lips provides an improvement in the leakage behavior at low system pressures. Due to the incorporation of an oil trap between the two sealing lips, friction at pressures above approximately 10 MPa is reduced. Furthermore, the second sealing lip prevents the entry of dirt from the atmosphere side.

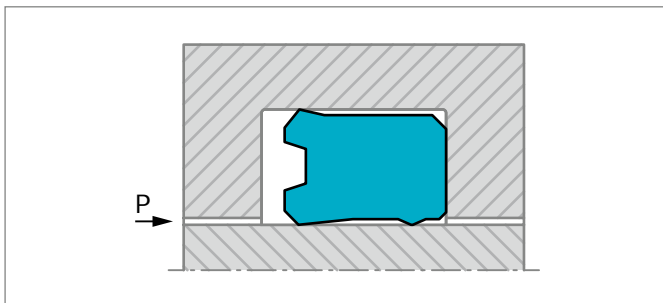


Figure 47: U-Cup, type RU2

METHOD OF OPERATION

The sealing effect of the U-Cup comes from the intrinsic preload of the seal body and from the compression of the seal lips during installation. In operating conditions, the radial mechanical contact forces are superimposed by the system pressure.

At low stroke speeds, U-Cups can tend to have a stick-slip effect due to an inadequate lubrication film formation in the seal clearance and to their material properties. This behavior corresponds to the Stribeck curve described in the relevant literature.

ADVANTAGES

- Good sealing effect at high and low pressures
- Good abrasion resistance, wear-resistant
- Unaffected by sudden loads
- Suitable for small grooves
- Simple installation

OPERATING CONDITIONS

Pressure:	Max. 35 MPa
Speed:	Up to 0.5 m/s
Temperature:	Use in mineral oils: -35 °C to +110 °C
Media:	Mineral oil-based hydraulic fluids.

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.

MATERIAL

Standard Zurcon® :	Z20
Special Polyurethane:	93 Shore A
Temperature:	-35 °C to +110 °C
Color:	Turquoise



SEAL CLEARANCE

Guide values for the radial clearance between rod and gland in relation to the operating pressure and rod diameter can be found in the table below.

Table 31: Radial Clearance

Operating max. Pressure MPa	Radial Clearance S_{\max}	
	$d_N < 60$ mm	$d_N > 60$ mm
5	0.40	0.50
10	0.30	0.40
20	0.20	0.30
30	0.15	0.20
40	0.10	0.15

The values for S_{\max} given in this table apply to all types for the low-pressure side of the U-Cup. They are designed for an operating temperature of 60 °C.

Table 32: Material Selection

Material Code	Material Description	Temperatur Range	Application
Zurcon® Z20	High performance Polyurethane 94 Shore A; standard grade for hydraulic	-35 °C to +110 °C	Excellent abrasion and extrusion resistance, minimal swelling in mineral oil, acceptable hydrolysis resistance.
Zurcon® Z22	High performance Polyurethane 93 Shore A; Premium grade for low temperature	-50 °C to +110 °C	Wide range of working temperatures with very good compression set performance at very low temperature. Excellent balance between swelling in mineral oil and hydrolysis resistance.



■ Installation Recommendation

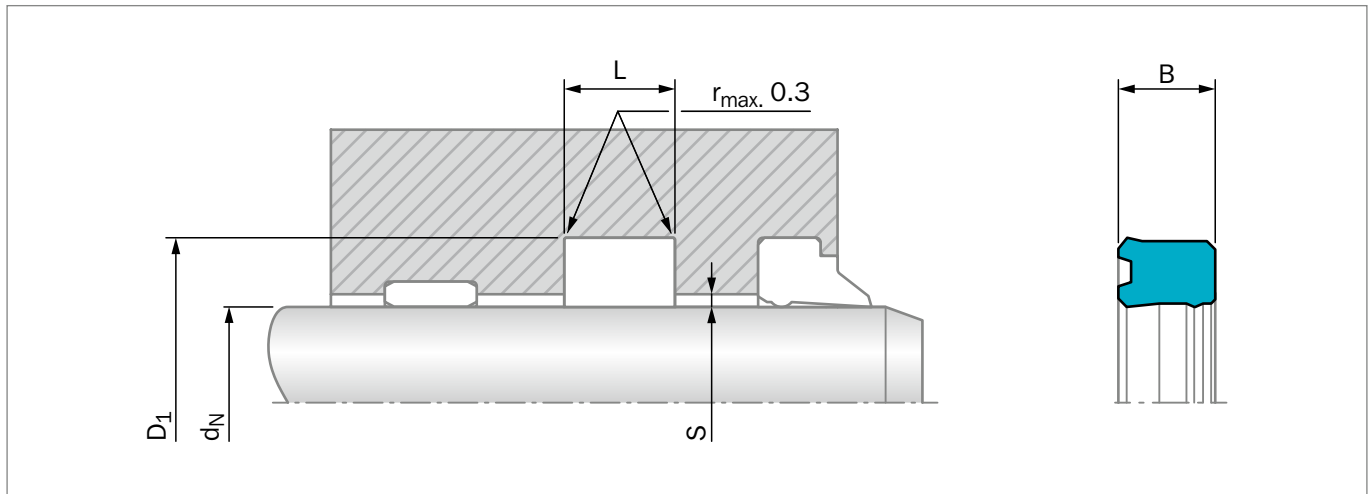


Figure 48: Installation Drawing

Dimensions "S" (see table on previous page)

ORDERING EXAMPLE

U-Cup Type RU2

Rod Diameter:	$d_N = 45.0$ mm
Groove Diameter:	$D_1 = 55.0$ mm
Groove Width:	$L = 6.3$ mm
TSS Part No.:	RU2300450 -

TSS Article No.

RU23 0 0450 - Z20

TSS Series No. _____
 Type (Standard) _____
 Rod Diameter x 10 _____
 Quality Index (Standard) _____
 Material Code _____

MATERIAL

Standard Zurcon® : Z20
 Special Polyurethane: 93 Shore A
 Color: Turquoise

Table 33: Installation Dimensions / TSS Article No.

Rod Diameter	Groove Diameter	Groove Width	Seal Width	TSS Part No.
d_N f8/h9	D_1 H10	L +0.2	B	
*6.0	14.0	6.3	5.8	RU2000060
*8.0	16.0	6.3	5.8	RU2200080
*10.0	18.0	6.3	5.8	RU2000100
*12.0	20.0	6.3	5.8	RU2100120
*14.0	22.0	6.3	5.8	RU2100140
*16.0	24.0	6.3	5.8	RU2000160
*18.0	26.0	6.3	5.8	RU2100180
20.0	28.0	6.3	5.8	RU2100200



Rod Diameter	Groove Diameter	Groove Width	Seal Width	TSS Part No.
d_N f8/h9	D_1 H10	L +0.2	B	
*20.0	30.0	8.0	7.0	RU2300200
22.0	30.0	6.3	5.8	RU2300220
24.0	32.0	6.3	5.7	RU2000240
25.0	33.0	6.3	5.7	RU2000250
*25.0	35.0	8.0	7.0	RU2400250
*25.0	35.0	9.0	8.0	RU2500250
28.0	36.0	6.3	5.8	RU2000280
*28.0	38.0	6.3	5.8	RU2300280
*28.0	38.0	8.0	7.0	RU2400280
32.0	42.0	8.0	7.0	RU2100320
36.0	44.0	6.3	5.8	RU2000360
36.0	46.0	8.0	7.3	RU2300360
40.0	50.0	8.0	7.0	RU2500400
45.0	53.0	6.3	5.8	RU2000450
45.0	55.0	6.3	5.7	RU2300450
45.0	55.0	8.0	7.0	RU2500450
50.0	60.0	8.0	7.0	RU2400500
56.0	66.0	7.5	6.5	RU2100560
56.0	71.0	12.5	11.5	RU2200560
63.0	78.0	12.5	11.5	RU2100630
70.0	80.0	7.5	6.5	RU2200700
80.0	95.0	12.5	11.5	RU2100800
90.0	100.0	7.5	6.5	RU2000900
90.0	105.0	12.5	11.4	RU2400900
110.0	125.0	10.5	9.5	RU2001100
110.0	130.0	16.0	15.0	RU2101100
140.0	160.0	16.0	15.0	RU2201400

Dimensions and TSS Part Numbers in bold according to ISO 5597. * Split groove
Additional dimensions can be delivered on request.

Zurcon® U-Cup RU6

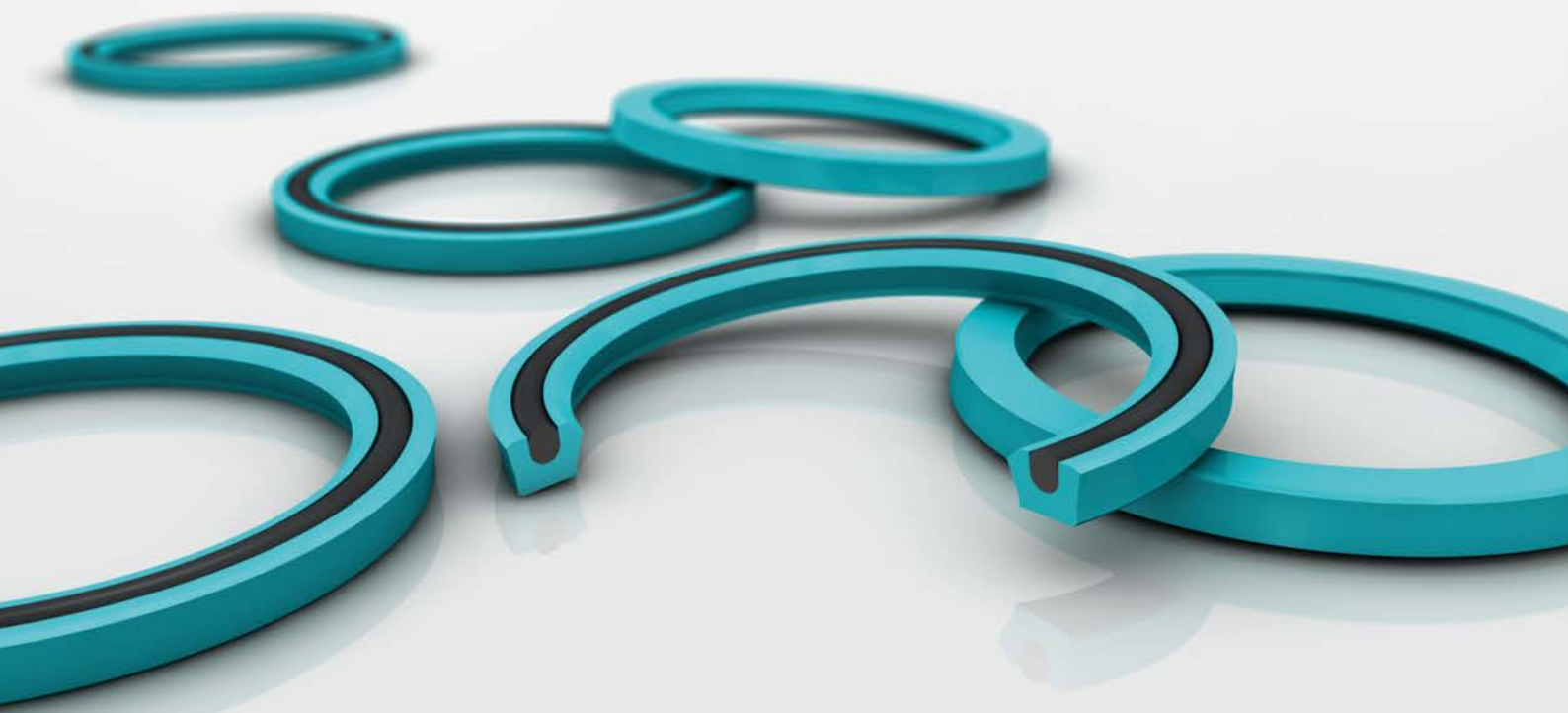


Single-acting U-Cup

Rubber Energized

Material:

Zurcon® + NBR



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■ U-Cup RU6



■ Description

Additional to the machined seals Stepseal® 2K and Rimseal for housings to ISO 7425/2 (rubber energised plastic seals) the U-Cup type RU6 has been developed as an injection molded seal of polyurethane material to fit in the same ISO housings. The integrated NBR O-Ring (only available for series RU62 - RU64) improves the performance at low pressure and low temperature applications. Polyurethane (Zurcon® Z20) is a proven material for U-cups due to their good mechanical properties.

TYPE RU6

The U-Cup type RU6 can be installed as a single seal for low to medium duty applications; for sealing systems, the U-Cup RU6 shall be installed mainly as a secondary seal together with the Turcon® Stepseal® 2K as primary seals.

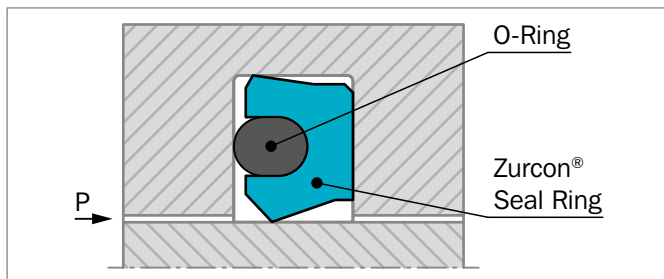


Figure 49: U-Cup, type RU6

METHOD OF OPERATION

The sealing effect of the U-Cup RU6 comes from the intrinsic preload of the seal body and from the compression of the seal lip and the O-Ring during installation. In operation conditions, the radial contact forces are superimposed by the system pressure.

Due to the special design and the integrated O-Ring the RU6 U-Cups have an excellent sealing behavior with and without pressure activation. The short sealing lip gives better friction values compared to common U-Cups.

ADVANTAGES

- Very good low pressure sealability
- Simple installation
- Lower friction compared with common U-Cups
- Installation in ISO 7475/2 grooves
- Very low compression set due to O-Ring

APPLICATION EXAMPLES

- General hydraulic cylinders
- Injection molding machines
- Lift trucks
- Agricultural machines

OPERATING CONDITIONS

Pressure:	Max. 25 MPa (as single element)
Speed:	Up to 0.5 m/s
Temperature:	Use in mineral oils: -35 °C to +110 °C
Media:	Mineral oil-based hydraulic fluids.

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.

CLEARANCE

Table 34: Radial Clearance U-Cup RU6

Operating Pressure MPa max.	Radial Clearance S_{max}
16	0.60
25	0.50

The values for S_{max} given in this table apply to all types for the low-pressure side of the U-Cup. They are designed for an operating temperature of 60 °C. (for harsh conditions and high side loads the gap must be reduced by 50%)

MATERIAL

The thermoplastic polyurethane material Zurcon® Z20 has a high abrasion resistance, a low compression set and exhibits a high resistance to clearance extrusion. The integrated O-Ring is an NBR with 70 shore A and a very low compression set.

U-Cup: polyurethane 93 shore A
material code Z20

O-Ring: NBR 70 Shore A
material code N

Set code: Z20N

**Table 35: Materials**

Material Code	Material Description	Temp. Range	Application
Zurcon® Z20	High performance Polyurethane 94 Shore A; standard grade for hydraulic	-35 °C to +110 °C	Excellent abrasion and extrusion resistance, minimal swelling in mineral oil, acceptable hydrolysis resistance.



■ Installation Recommendation

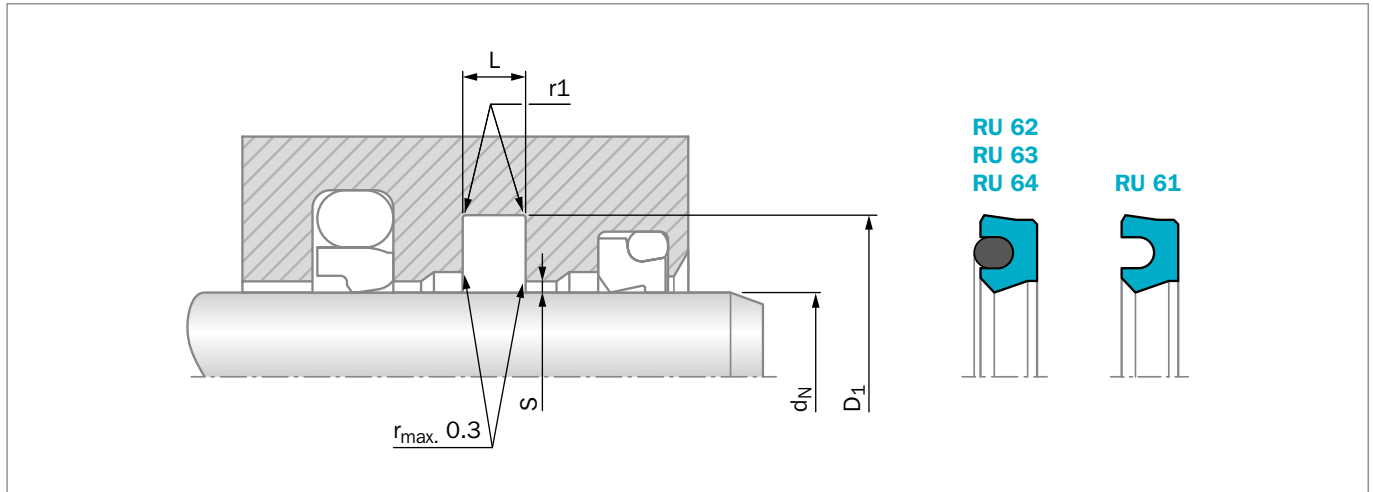


Figure 50: Installation Drawing

ORDERING EXAMPLE

U-Cup Type RU6

Rod Diameter:	$d_N = 70.0 \text{ mm}$
Groove Diameter:	$D_1 = 85.5 \text{ mm}$
Groove Width:	$L = 6.3 \text{ mm}$
TSS Part No.:	RU6300700 -
Compound code seal:	Z20 turquoise
Compound code O-Ring:	N
Material set code:	Z20N

TSS Article No.

RU63 0 0700 - Z20N

TSS Series No. _____

Type (Standard) _____

Rod Diameter x 10 _____

Quality Index (Standard) _____

Material Set Code _____

Table 36: Installation Dimensions / TSS Part No.

Rod Diameter	Groove Diameter	Groove Width	Radius	TSS Part No.	O-Ring Size
d_N f8/h9	D_1 H10	L +0.2	r1		
12.0	19.5	3.2	0.5	RU6100120	-
14.0	21.5	3.2	0.5	RU6100140	-
16.0	23.5	3.2	0.5	RU6100160	-
18.0	25.5	3.2	0.5	RU6100180	-
25.0	32.5	3.2	0.5	RU6100250	-
*28.0	39.0	4.2	0.5	RU6200280	31.42 x 2.62
36.0	47.0	4.2	0.5	RU6200360	39.34 x 2.62
*40.0	51.0	4.2	0.5	RU6200400	44.12 x 2.62
*45.0	56.0	4.2	0.5	RU6200450	48.90 x 2.62
50.0	61.0	4.2	0.5	RU6200500	53.64 x 2.62
55.0	66.0	4.2	0.5	RU6200550	58.42 x 2.62
56.0	71.5	6.3	0.9	RU6300560	59.92 x 3.53



Rod Diameter	Groove Diameter	Groove Width	Radius	TSS Part No.	O-Ring Size
d_N f8/h9	D_1 H10	L +0.2	r1		
63.0	74.0	4.2	0.5	RU6200630	66.34 x 2.62
63.0	78.5	6.3	0.9	RU6300630	66.27 x 3.53
70.0	85.5	6.3	0.9	RU6300700	75.79 x 3.53
80.0	95.5	6.3	0.9	RU6300800	85.32 x 3.53
90.0	105.5	6.3	0.9	RU6300900	94.84 x 3.53
100.0	115.5	6.3	0.9	RU6301000	104.37 x 3.53
110.0	125.5	6.3	0.9	RU6301100	113.89 x 3.53
120.0	135.5	6.3	0.9	RU6301200	126.59 x 3.53
150.0	165.5	6.3	0.9	RU6301500	158.34 x 3.53
160.0	175.5	6.3	0.9	RU6301600	164.69 x 3.53
190.0	205.5	6.3	0.9	RU6301900	196.44 x 3.53
200.0	221.0	8.1	0.9	RU6402000	208.92 x 5.33
210.0	231.0	8.1	0.9	RU6402100	221.62 x 5.33
260.0	281.0	8.1	0.9	RU6402600	266.07 x 5.33
300.0	321.0	8.1	0.9	RU6403000	329.57 x 5.33
350.0	371.0	8.1	0.9	RU6403500	354.97 x 5.33

Dimensions in **bold** according to ISO/DIN 7425/2. Is also suitable for Stepseal® groove.

* Split groove

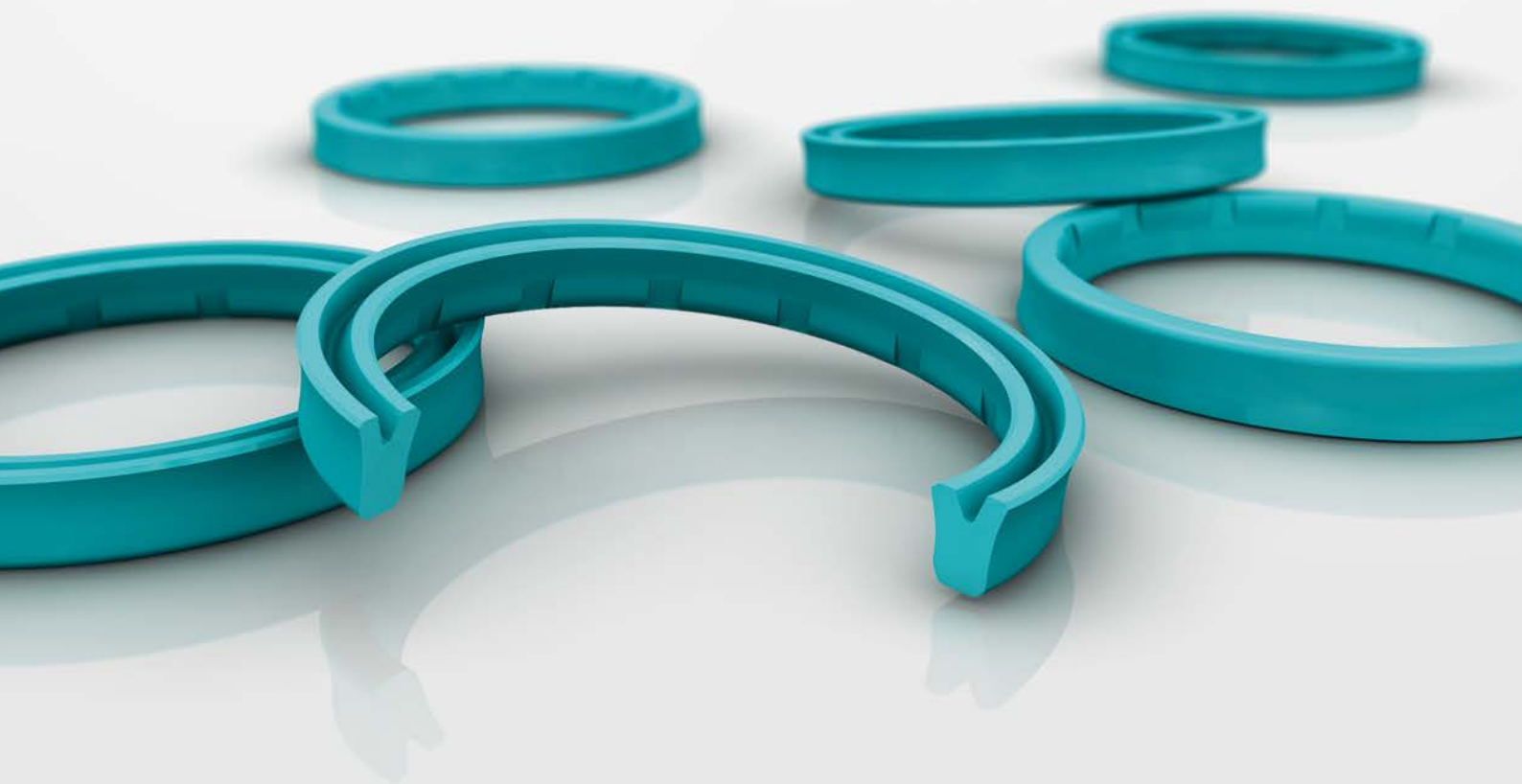
Zurcon® U-Cup RU9



Single-acting U-Cup

New U-Cup Design

Material:
Zurcon®



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Zurcon® U-Cup RU9*



Introduction

Rod seals are particularly exposed to pressure and friction. A long service life is a specific requirement of piston rods. Features such as wear and extrusion resistance, media and temperature compatibility, low friction, compact Installation Dimensions and ease of assembly are also essential and require the introduction of new products and materials. It is against this background that we have developed the Zurcon® U-Cup RU9.

DESCRIPTION

Due to its special design, behind the dynamic seal lip, the Zurcon® U-Cup RU9 with its structure of slide segments interspersed by back-pumping channels features excellent back-pumping ability across the entire pressure range. The dynamic seal slide segments also have a micro-structure with excellent tribological and sealing characteristics. As well as increasing the sealing ability of the U-Cup RU9, this also ensures a constant lubrication film underneath the seal sliding surface, reducing breakaway force even after prolonged periods of rest and reduces dynamic friction force.

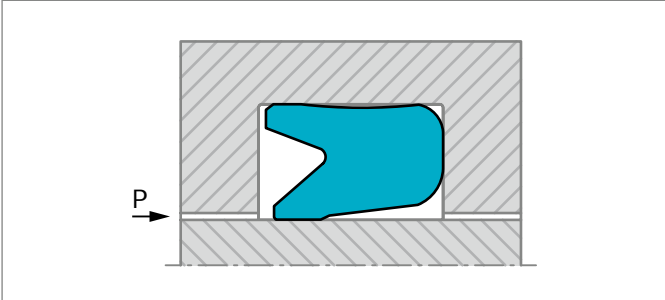


Figure 51: U-Cup, type RU9

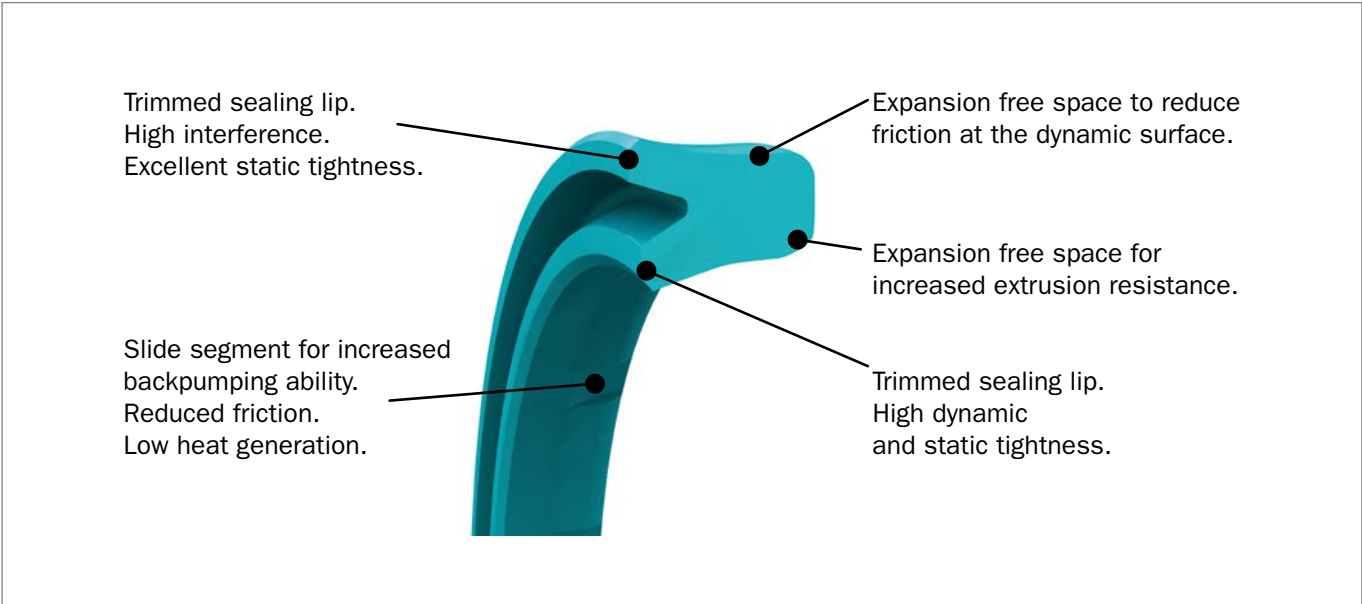


Figure 52: Zurcon® U-Cup RU9 design features

* Patent application: WO 2004/088182 A1



FRICITION

The friction force of U-Cups dramatically increases between 2.5 and 10 MPa. The Zurcon® U-Cup RU9 has a unique feature. As the system pressure increases, the contact surface between the U-Cup and the piston rod increases. Once a specific system pressure is reached, the seal deforms to such an extent that its entire friction-generating inside surface gets in contact with the piston rod. Due to the special design of Zurcon® U-Cup RU9 there is improved pressure distribution on the rod. The resulting tribological benefits restrict the increase in friction. When we compare the friction values of conventional U-Cups with those of the Zurcon® U-Cup RU9 the results are self-evident.

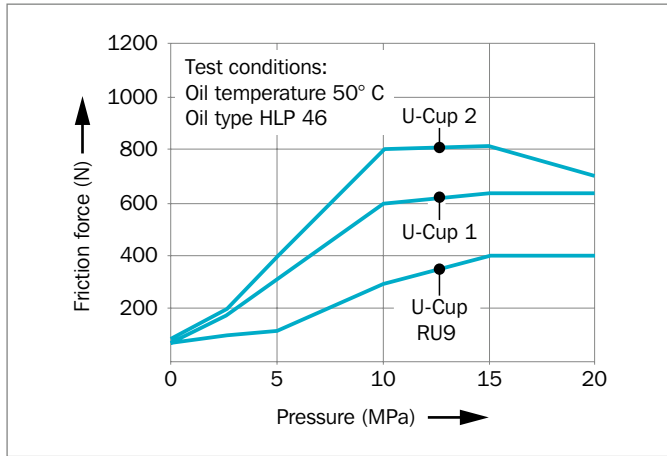


Figure 53: Friction dependent on pressure

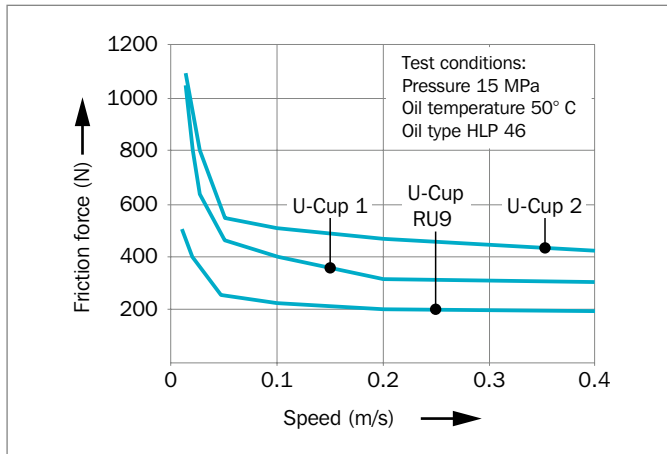


Figure 54: Friction dependent on speed

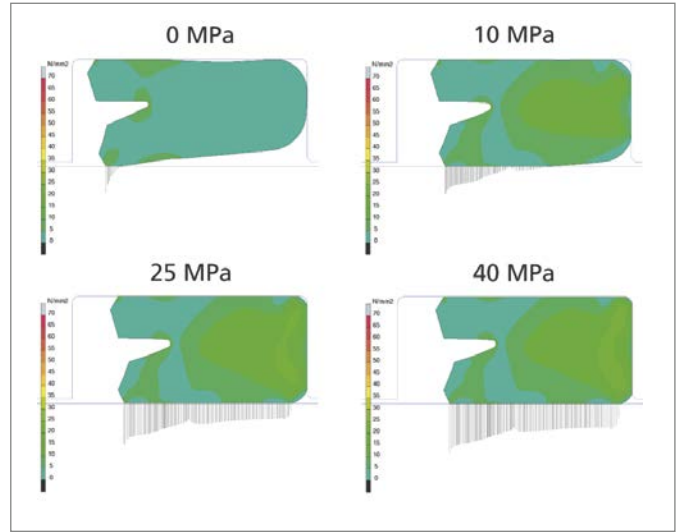


Figure 55: How the Zurcon® U-Cup RU9 performs underpressure

SEALING PERFORMANCE

The high sealing performance is achieved by:

- Interference fit at the external diameter
- Special shape of both trimmed seal lips
- Controlled pressure distribution and hydrodynamic backpumping ability over a wide pressure range

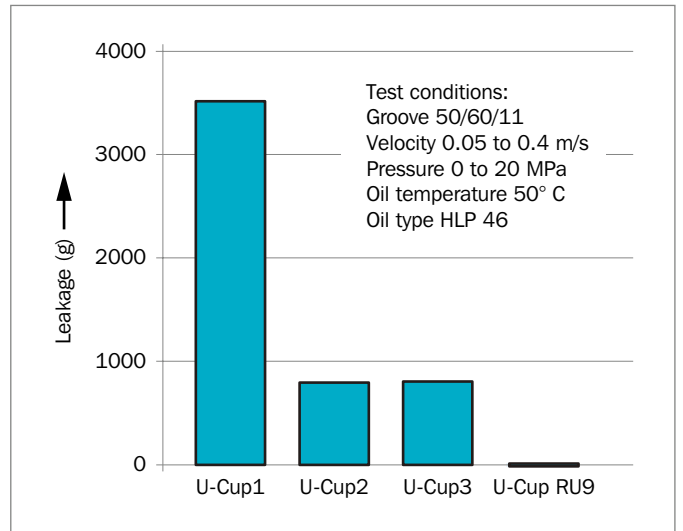


Figure 56: Leakage performance dependent on U-Cup type



RADIAL CLEARANCE

The new Zurcon® RU9 design combined with the special compound properties shows a better extrusion resistance compared to standard U-Cup under all working conditions. The hardware clearance can be increased significantly.

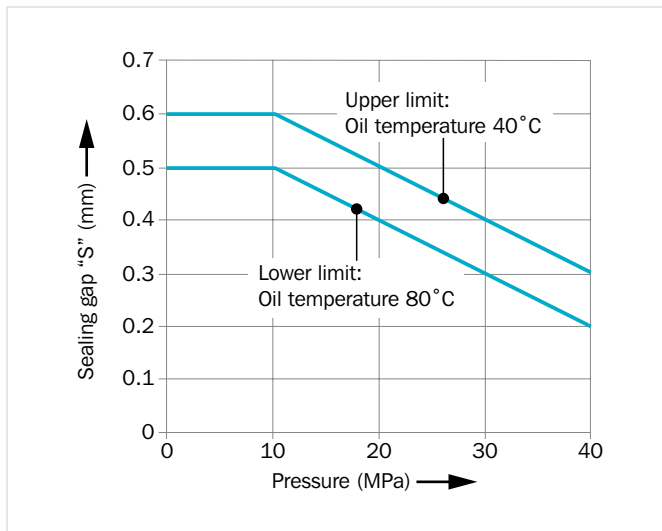


Figure 57: Radial clearance "S" as function of pressure

ADVANTAGES

- Lower friction than standard U-Cups
- Lower heat generation than standard U-Cups
- High extrusion resistance
- Excellent dynamic and static sealing
- Optimum environment protection
- Back pumping ability over the entire pressure range achieved by grooved profile
- Suitable with the Zurcon® Buffer Seal as secondary seal in "tandem design"
- Suitable for sealing systems with double scraper
- Seal stability within the groove

APPLICATION EXAMPLES

Zurcon® U-Cup RU9 can be used in all applications in which previously a conventional U-Cup was applied, such as:

- Hydraulic cylinders
- Construction machinery
- Fork lifts
- Truck cranes
- Telescopic cylinders
- Agricultural machines
- Machine tools
- Injection molding machines
- Hydraulic presses
- Gas spring

In medium/heavy duty applications the preferred solution for tandem rod sealing systems is the combination with the Zurcon® Buffer Seal primary seal and Zurcon® U-Cup RU9 in conjunction with a double acting scraper.

MATERIALS

Zurcon® Z20 Standard polyurethane 93 Shore A
 Temperature: -35 °C to +110 °C
 Color: Turquoise

Zurcon® Z22 Premium polyurethane 93 Shore A
 Temperature: -50 °C to +110 °C
 Color: Dark petrol

Zurcon® Z25 Premium polyurethane 93 Shore A
 Temperature: -35 °C to +130 °C
 Color: Black

The Zurcon® polyurethane has high abrasion resistance, a low compression set, high extrusion resistance and a wide temperature range.

**OPERATING CONDITIONS**

Pressure:	Up to 40 MPa
Velocity:	Up to 0.5 m/s
Temperature:	
Zurcon® Z20 Standard:	-35 °C to +110 °C
Media:	
Hydraulic fluids based on mineral oil:	-35 °C to +110 °C
Synthetic and natural ester HEES, HETG:	Up to +60 °C
Flame-retardant hydraulic fluids HFA/HFB:	Up to +40 °C

IMPORTANT NOTE

The above stated limits for pressure and speed are maximum values individually. Friction heat generated by the combination of pressure and speed may cause local heat built-up. Care should be taken not to apply high values for pressure and speed at the same time.

Table 37: Materials

Material Code	Material Description	Temperature Range	Application
Zurcon® Z20	High performance Polyurethane 94 Shore A; standard grade for hydraulic	-35 °C to +110 °C	Excellent abrasion and extrusion resistance, minimal swelling in mineral oil, acceptable hydrolysis resistance.
Zurcon® Z22	High performance Polyurethane 93 Shore A; Premium grade for low temperature	-50 °C to +110 °C	Wide range of working temperatures with very good compression set performance at very low temperature. Excellent balance between swelling in mineral oil and hydrolysis resistance.
Zurcon® Z25	High performance Polyurethane 95 Shore A; Premium grade for high temperature	-35 °C to +130 °C	Wide range of working temperatures with excellent mechanical properties at high temperature. Products: Ideal for use in heavy duty cylinder and cylinders exposed to high-temperature painting processes.



■ Installation Recommendation

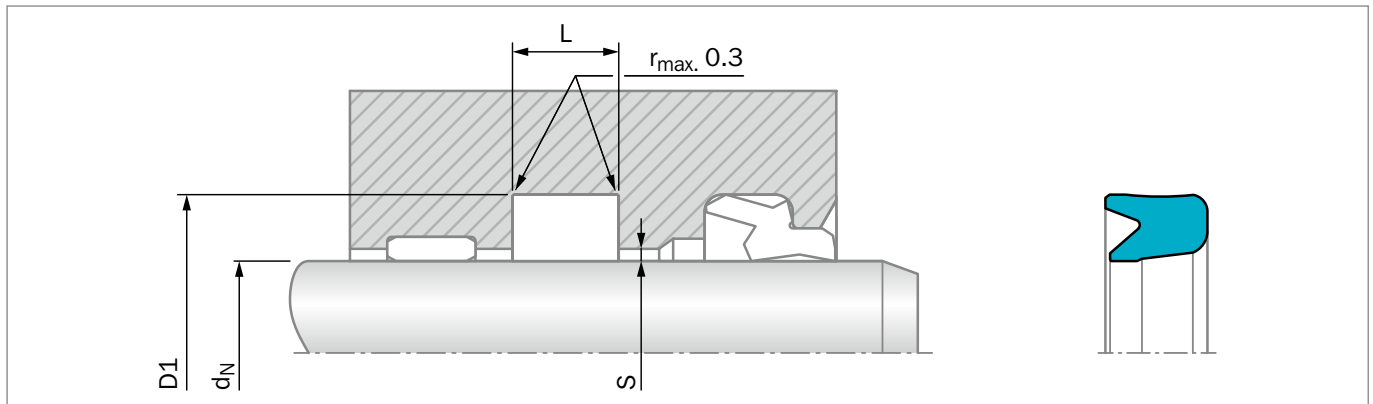


Figure 58: Installation Drawing, Dimension "S" see Figure 57

ORDERING EXAMPLE (METRIC)

Zurcon® U-Cup Type RU9

Rod Diameter:	$d_N = 20.0$ mm
Groove Diameter:	$D1 = 28.0$ mm
Groove Width:	$L = 6.3$ mm
TSS Part No.:	RU9000200 -

TSS Article No.

	RU90	0	0200	- Z20
TSS Series No.	RU90	0	0200	Z20
Type (Standard)				
Rod Diameter x 10				
Quality Index (Standard)				
Material Code				

MATERIAL

Standard Zurcon® :	Z20
Special polyurethane:	93 Shore A
Color:	Turquoise

Table 38: Preferred Series / TSS Article No.

Rod Diameter	Groove Diameter	Groove Width	TSS Part No.
d_N	$D1$	L	
f8/h9	H10	+0.25	
*6.0	14.0	6.3	RU9000060
*8.0	16.0	6.3	RU9000080
12.0	19.0	6.0	RU9000120
15.0	20.0	5.0	RU9000150
*15.0	23.0	6.3	RU9100150
*16.0	22.0	6.0	RU9100160
*16.0	24.0	6.0	RU9200160
*16.0	24.0	6.3	RU9000160
18.0	25.0	5.3	RU9100180
*18.0	26.0	6.3	RU9000180
20.0	26.0	6.0	RU9100200
*22.0	30.0	6.3	RU9100220



Rod Diameter	Groove Diameter	Groove Width	TSS Part No.
d_N f8/h9	D1	L +0.25	
*20.0	28.0	5.0	RU9300200
*20.0	30.0	8.0	RU9200200
*20.0	28.0	6.3	RU9000200
22.0	29.0	5.6	RU9200220
*22.0	30.0	6.3	RU9000220
25.0	31.0	6.3	RU9100250
25.0	33.0	6.3	RU9000250
28.0	36.0	6.3	RU9000280
*28.0	38.0	8.0	RU9100280
30.0	38.0	9.0	RU9100300
30.0	40.0	7.5	RU9200300
30.0	40.0	11.0	RU9000300
32.0	40.0	6.3	RU9200320
32.0	40.0	9.0	RU9100320
32.0	42.0	8.0	RU9000320
35.0	42.0	8.0	RU9100350
35.0	45.0	8.0	RU9000350
36.0	44.0	6.3	RU9100360
36.0	44.0	9.0	RU9000360
36.0	46.0	8.0	RU9200360
40.0	50.0	8.0	RU9000400
*45.0	53.0	8.5	RU9200450
45.0	55.0	6.3	RU9100450
45.0	55.0	8.0	RU9000450
50.0	60.0	8.0	RU9000500
50.0	60.0	11.0	RU9200500
50.0	65.0	12.5	RU9100500
55.0	65.0	8.0	RU9000550
56.0	68.0	11.0	RU9100560
56.0	71.0	12.5	RU9000560
60.0	68.0	7.0	RU9100600
60.0	70.0	8.0	RU9200600
60.0	75.0	12.5	RU9000600
63.0	75.0	13.0	RU9100630
63.0	78.0	12.5	RU9000630
65.0	75.0	8.0	RU9000650
65.0	85.0	12.5	RU9100650
70.0	82.0	9.6	RU9200700
70.0	85.0	12.5	RU9000700
75.0	83.0	7.0	RU9000750
80.0	93.0	12.5	RU9300800
80.0	95.0	10.0	RU9200800



Rod Diameter	Groove Diameter	Groove Width	TSS Part No.
d_N f8/h9	D1 H10	L +0.25	
80.0	95.0	12.5	RU9100800
80.0	100.0	12.5	RU9000800
85.0	100.0	10.0	RU9200850
85.0	100.0	12.5	RU9100850
90.0	100.0	7.5	RU9100900
90.0	102.0	9.6	RU9200900
90.0	105.0	12.5	RU9000900
95.0	110.0	10.0	RU9200950
95.0	110.0	12.5	RU9100950
95.0	115.0	13.0	RU9000950
100.0	108.0	12.0	RU9101000
100.0	115.0	13.0	RU9201000
100.0	120.0	16.0	RU9001000
105.0	120.0	12.5	RU9001050
110.0	120.0	11.0	RU9101100
110.0	125.0	12.0	RU9301100
110.0	125.0	12.5	RU9201100
110.0	130.0	16.0	RU9001100
115.0	125.0	11.0	RU9001150
120.0	135.0	12.5	RU9001200
125.0	145.0	16.0	RU9001250
130.0	140.0	7.5	RU9001300
130.0	145.0	13.0	RU9101300
140.0	160.0	16.0	RU9001400

Dimensions and TSS Part Numbers in bold according to ISO 5597. * splitted groove

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Zurcon® Buffer Seal LM



Single-acting

Designed for Lubrication Management
Technology

Integrated Back-Up Ring

Material:
Zurcon®



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Zurcon® Buffer Seal LM*



Introduction

In heavy-duty applications, leak-free performance and long service life cannot be assured by a single sealing element; therefore, specially developed system seals are arranged in series, building a tandem configuration.

Each sealing element in a system has its specific function, and their interaction needs to be secured to incorporate redundancy into the sealing system. The primary seal, manufactured from Zurcon® material, has excellent wear and extrusion resistance under extreme working conditions. It allows an optimized lubrication film to pass this first barrier, ensuring the necessary lubrication of the secondary sealing element for long service life.

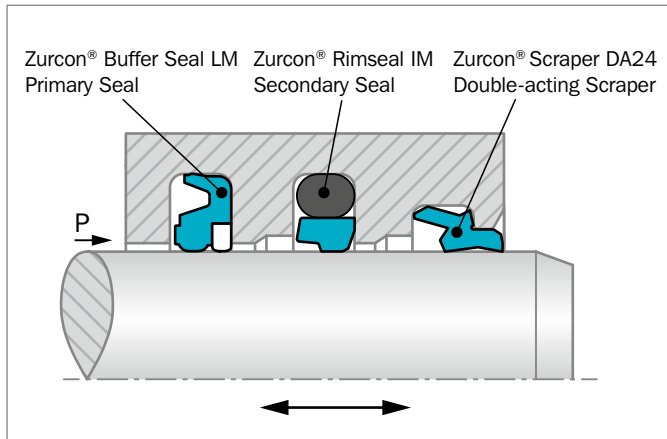


Figure 59: Zurcon® Buffer Seal LM in tandem configuration

In order to further optimize the performance, friction and service life of sealing systems using a tandem sealing configuration, Trelleborg Sealing Solutions developed the already known and appreciated capabilities of Zurcon® Buffer Seal into a new design called Zurcon® Buffer Seal LM.

DESCRIPTION

The single-acting Zurcon® Buffer Seal LM is designed as a heavy-duty primary rod seal. The design of the product incorporates a combination of a Zurcon® sealing ring with a Back-up Ring. By utilizing two materials, the performance of the product is enhanced and life is extended.

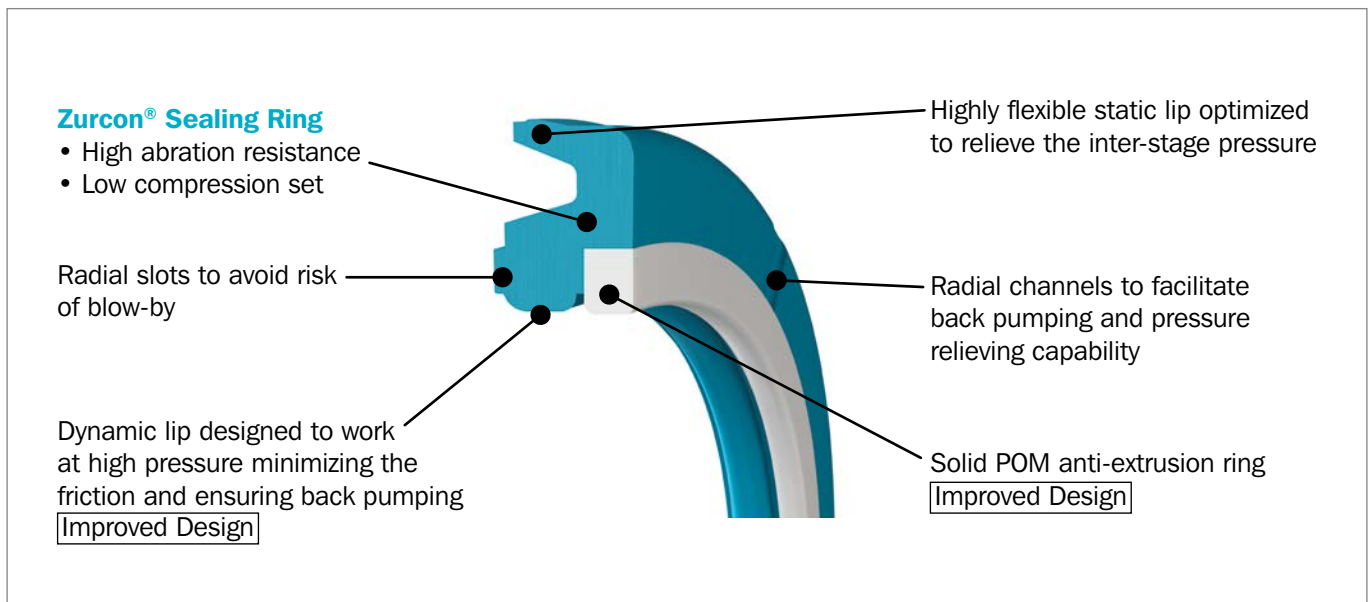


Figure 60: Zurcon® Buffer Seal LM design features

* Patent application: WO 2016/113414 A1



LUBRICATION MANAGEMENT FEATURE

This innovative design incorporates large radius rounded edges on both seal ring and Back-up Ring that lower the contact pressure, allowing a thicker amount of fluid to lubricate and better activate the secondary seal.

By means of this, friction and wear on the lips are reduced significantly, therefore increasing life time and reliability, as well as rod wear.

This engineered wet running creates the right environment to enhance the Zurcon® PU sealing system. New generation secondary seals like RU9, L-Cup and Rimseal IM can manage the larger oil film in the best way, compensating for pressure from oil accumulation, as well as returning oil to the main pressure chamber due to excellent back pumping behavior under all pressure ranges.

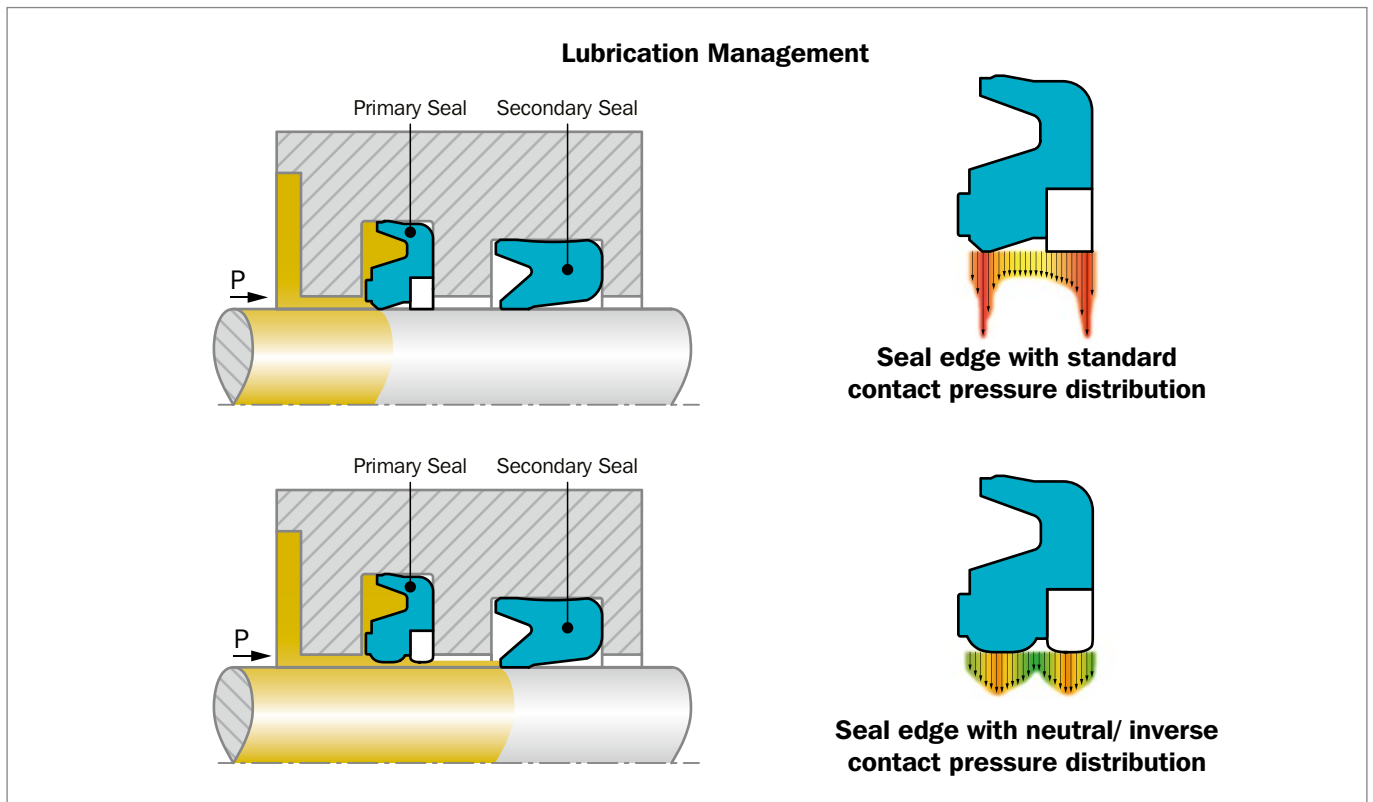


Figure 61: Pressure distribution and function of a standard (top) and a LM (bottom) sealing system



PRESSURE RELIEF

The relief mechanism is activated by the special seal design, through its thin, short and flexible static lip. The radial channels on the back side offer the fluid a direct stream up to both lips. A minimum difference between the pressure trapped and the pressure in the chamber is able to deflect the seal and recover the same pressure level.

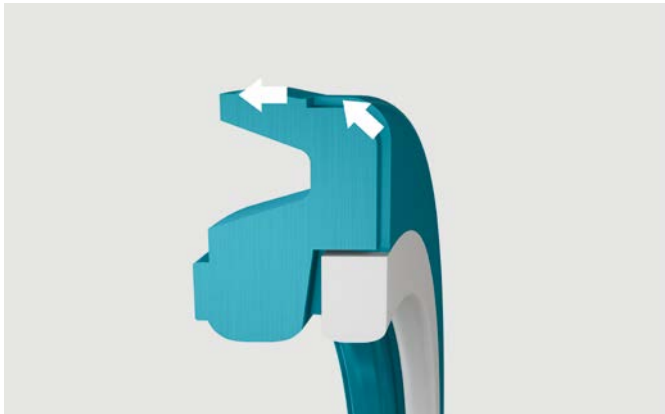


Figure 62: Venting path

Zurcon® Buffer Seal LM is able to guarantee an optimal pressure distribution and sufficient rod lubrication across the entire pressure range.

In unpressurized conditions, head-on slots on the dynamic lip assure correct positioning and avoid any risk of blow-by. When installed, Zurcon® Buffer Seal LM is ready for fast activation, protecting the secondary seal from peaks in pressure.

ADVANTAGES

- Resistance to very high pressure peaks due to an integrated Back-up Ring that closes the radial gap
- Outstanding pressure relief
- Excellent back-pumping guaranteed over the entire pressure range
- Suitable to use both in ISO 7425/2 standard grooves and in Stepseal® grooves
- High performance Zurcon® material with an excellent abrasion resistance and low compression set

APPLICATION EXAMPLES

Medium and heavy-duty applications:

- Construction machinery
- Earth moving equipment
- Mobile hydraulics
- Fork lifts

MATERIALS - STANDARD APPLICATION

For hydraulic components in mineral oils or media with good lubricating performance.

Seal Ring: Zurcon® Z20

Back-up Ring: Polyacetal resin (POM)

Set reference: Z2054

Zurcon® polyurethane has high abrasion resistance, a low compression set, high extrusion resistance and a wide temperature range.

OPERATING CONDITIONS

Pressure:	Up to 40 MPa Up to 60 MPa peak
Velocity:	Up to 1 m/s
Temperature:	-35 °C to +110 °C*
Media:	
Mineral oil:	Up to 110 °C
Synthetic and natural esters HEES, HETG:	Up to +60 °C
Flame retardant fluids HFA/HFB:	Up to +40 °C

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.

* in the case of unpressurized applications in temperatures below 0 °C please contact your local Customer Solution Center for more information!



■ Installation Recommendation

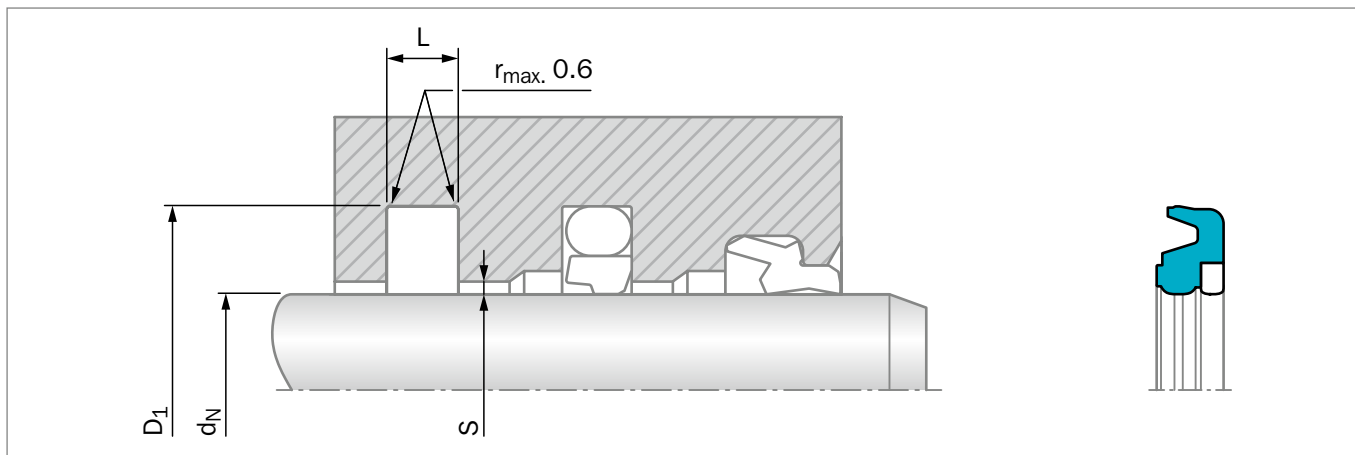


Figure 63: Installation Drawing

ORDERING EXAMPLE

Zurcon® Buffer Seal LM Type RUKC

Rod Diameter:	$d_N = 63.0$ mm
Groove Diameter:	$D_1 = 78.5$ mm
Groove Width:	$L = 6.3$ mm
TSS Part No.:	RUKCB0630 -

TSS Article No.	RUKC	B	0630	-	Z2054
TSS Series No.					
Type (Standard)					
Rod diameter x 10					
Quality Index (Standard)					
Material Code (Seal Ring)					

Table 39: Installation Dimensions / TSS Article No.

Rod Diameter d_N f8/h9	Groove Diameter D_1 H9	Groove Width $L +0.25$	Radial Clearance S_{max}	TSS Article No.
50.0	65.5	6.3	0.4	RUKCB0500-Z2054
60.0	75.5	6.3	0.4	RUKCB0600-Z2054
65.0	80.5	6.3	0.4	RUKCB0650-Z2054
70.0	85.5	6.3	0.4	RUKCB0700-Z2054
75.0	90.5	6.3	0.4	RUKCB0750-Z2054
80.0	95.5	6.3	0.4	RUKCB0800-Z2054
85.0	100.5	6.3	0.4	RUKCB0850-Z2054
90.0	105.5	6.3	0.4	RUKCB0900-Z2054
95.0	110.5	6.3	0.4	RUKCB0950-Z2054
100.0	115.5	6.3	0.4	RUKCB1000-Z2054
105.0	120.5	6.3	0.4	RUKCB1050-Z2054
110.0	125.5	6.3	0.4	RUKCB1100-Z2054
115.0	130.5	6.3	0.4	RUKCB1150-Z2054
120.0	135.5	6.3	0.4	RUKCB1200-Z2054
125.0	140.5	6.3	0.4	RUKCB1250-Z2054
140.0	155.5	6.3	0.4	RUKCB1400-Z2054
150.0	165.5	6.3	0.4	RUKCB1500-Z2054

All dimensions in **bold** type are in accordance with the recommendation of ISO 7425/2. Suitable also in Stepseal groove.

Turcon® Variseal® M2



Single-acting

Spring Energized Plastic U-Cup

Material:

Turcon® and Zurcon®



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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. Variseal® M2 has an asymmetric seal profile. The optimized front angle offers good leakage control, reduced friction and long service life.

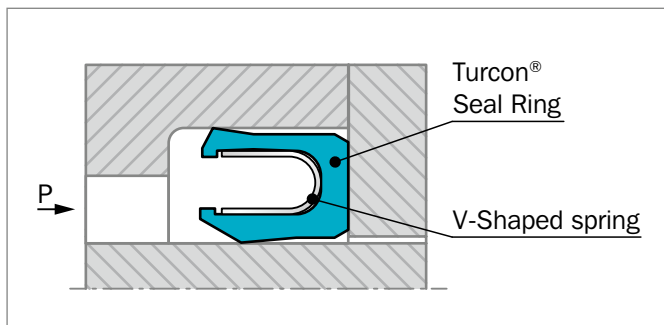


Figure 64: Turcon® Variseal® M2

AREAS OF APPLICATION

- Hydraulic components, e.g. cylinders, valves, pumps, etc.
- Chemical processing equipment
- Pharmaceutical processing
- Food and beverage processing
- Spindle seals for machine tools
- Pneumatics, cylinders and valves

ADVANTAGES

- Suitable for reciprocating and rotary applications
- Low coefficient of friction
- Stick-slip free operating
- High abrasion resistance
- Dimensionally stable
- Resistant to most fluids, chemicals and gases
- Withstands rapid changes in temperature
- No vulcanizing between seal and hardware
- Excellent resistance to aging
- Can be sterilized
- Available in HiClean version
- Interchangeable with O-Ring and Back-up Ring combinations to AS4716 and ISO 6194

OPERATING CONDITIONS

Pressure:	Maximum dynamic load: 20 MPa Maximum static load: 40 MPa (207 MPa with back-up ring)
Speed:	Reciprocating up to 15 m/s Rotating up to 1.27 m/s
Operating temperature:	-70 °C to +300 °C Special Turcon and Zurcon® materials as well as alternative spring materials are available for applications outside this temperature range.
Media compatibility:	Virtually all fluids, chemicals and gases

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 dependent on media.



GENERAL

Turcon® Variseal® are single acting, spring-energized seals which are used for dynamic and static applications.

Variseal® are effective in a wide range of applications. They are chosen when higher resistance to chemical media is required, if the seal is required to operate in extremes of temperature and/or where good extrusion and compression characteristics are needed.

Turcon® Variseal® designs have three main characteristics:

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

Standard or custom geometries available in metric, inch and intermediate sizes ranging from 2 to 3,300 mm.

METHOD OF OPERATION

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

The Variseal® spring supplies the load required for sealing at low pressures (Figure 65). The "U" shaped jacket allows fluid pressure to energize the sealing lips, so total sealing pressure rises with increasing operating pressure (Figure 66).

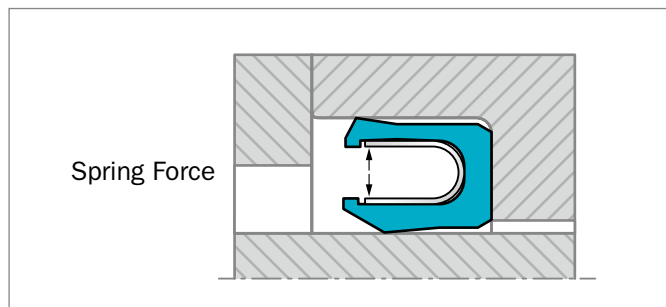


Figure 65: Turcon® Variseal® without system pressure

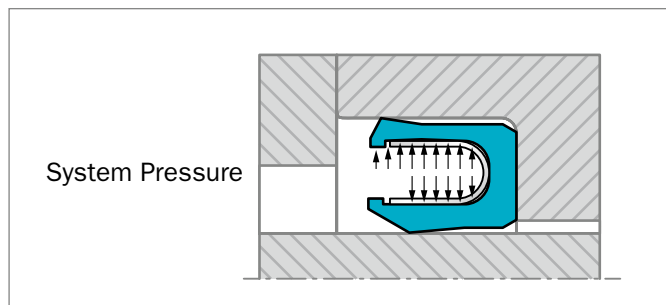


Figure 66: Turcon® Variseal® with system pressure

PERFORMANCE

The different types of Variseal® designs combined with the properties of Turcon® and Zurcon® materials offer design engineers a wide range of solutions to a large number of applications.

The most important characteristics of Variseal® designs are listed below:

- Very low coefficient of friction
- Good dynamic and static sealing
- Capable of sealing at high speeds up to 15 m/s
- Almost universal chemical compatibility
- Operating temperature of -253 °C up to +300 °C
- Very good thermal resistance
- Properties unaffected by contact with chemicals
- Good aging characteristics
- Low compression set
- Capable of withstanding high pressures above 200 MPa (2,000 bar / 29,000 psi) when using Back-up Rings
- Very good dry-running properties
- Can be installed in grooves according to AS4716 (Mil-G-5514 is an old spec) and DIN 3771



MATERIALS

All materials used are physiologically safe. They contain no odor or taste-affecting substances.

The following material combination has proved effective for most fluid applications:

Seal ring: Turcon® T40

Spring: Stainless Steel Material No. AISI 301
Code S

For gas application use:

Seal ring: Turcon® T05/Zurcon® Z80

For use in accordance with the demands of the "Food and Drug Administration", suitable materials are available on request.

Table 40: Turcon® and Zurcon® Materials for Variseal® M2

Material Code	Material Description	Operating Temp. * °C	Mating Surface Material	MPa max.
Turcon® T05	Premium grade modified PTFE. Light duty material with greater wear resistance than Turcon T01. Reciprocating and slow rotary applications. Color: Turquoise	-200 to + 260	Steel Steel, chromeplated Cast iron Stainless steel Aluminum Bronze Alloys	20
Turcon® T40	High-grade formulation of virgin polytetrafluoroethylene (PTFE) based material compounded with carbon fiber additive. Excellent wear and low friction characteristics. Suited to reciprocating and rotary applications. Suitable for use in media with poor lubricating properties and for dry-running situations. Color: Black / gray	-60 to + 300	Steel, hardened Steel, chromeplated	40
Zurcon® Z80	UHMW Polyethylene. Excellent wear and abrasion resistance. Very good lubricity in water based media. Color: Translucent white	-253 to + 80	Steel Steel, chromeplated Stainless steel Aluminum Bronze Ceramic coating	40

* Depending on media.
 Highlighted material is standard.



Spring Materials

The standard spring material for Turcon® Variseal® is stainless steel (spring code S).

Table 41: Spring Material

Media	Spring materials	Spring order code
For General use e.g. Oil Grease Air Water, steam Solvents Food, drugs Gas	Stainless steel DIN Mat No. 1.4310/1.4319 AISI 301/302 UNS 30100	S (Standard spring material)
For use in corrosive media e.g. Acids Caustics Seawater	Hastelloy® C-276 DIN Mat No. 2.4819 UNS N10276	H
For petrochemical use e.g. Crude oil Sour gas	Elgiloy® 1) DIN Mat No. 2.4711 UNSR30003	E

* Hastelloy is a registered trademark of Haynes International, Inc.

* Elgiloy is a registered trademark of the Elgiloy Specialty Metals
 Alternative brand may be used.

1) NACE-approval



Groove Design

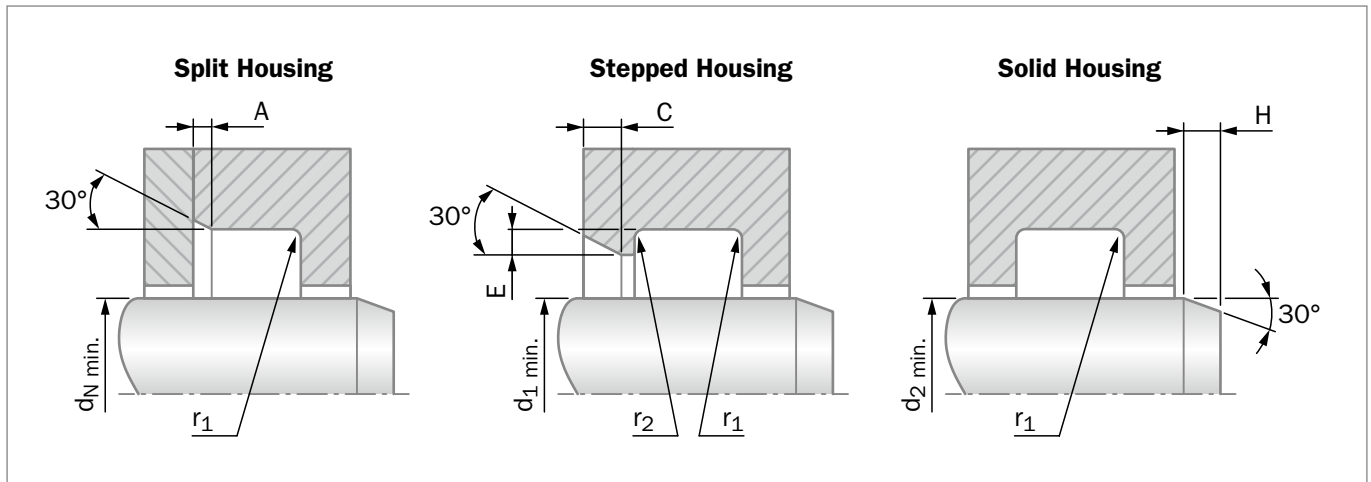


Figure 67: Variseal Groove Configurations

Installation lead-in chamfers and steps to include blend radii and are to be polished.

Table 42: Dimensions for Groove Designs

Series	Rod / Piston Groove Dimensions					
	A Chamfer	r ₁ Maximum Radius	C Minimum Chamfer	r ₂ Maximum Radius	E Minimum Step Height	H Minimum Chamfer
000	0.25 / 0.38	0.25	0.70	0.13	0.40	1.20
100	0.38 / 0.51	0.38	1.10	0.13	0.60	1.50
200	0.38 / 0.51	0.38	1.25	0.18	0.70	2.50
300	0.51 / 0.69	0.38	1.40	0.25	0.80	4.50
400	0.51 / 0.69	0.51	1.60	0.25	0.90	6.00
500	0.76 / 1.02	0.51	2.60	0.38	1.50	11.00

Table 43: Groove Design for Rod

Series	Rod Diameter Recommendations		
	Split Groove Ø d _N Minimum	Stepped Groove Ø d ₁ Minimum	Solid Groove Ø d ₂ Minimum
000	3.00	20.00	31.75
100	6.00	30.00	69.85
200	10.00	35.00	111.13
300	20.00	40.00	298.45
400	35.00	45.00	495.30
500	80.00	80.00	762.00



■ Installation Recommendation

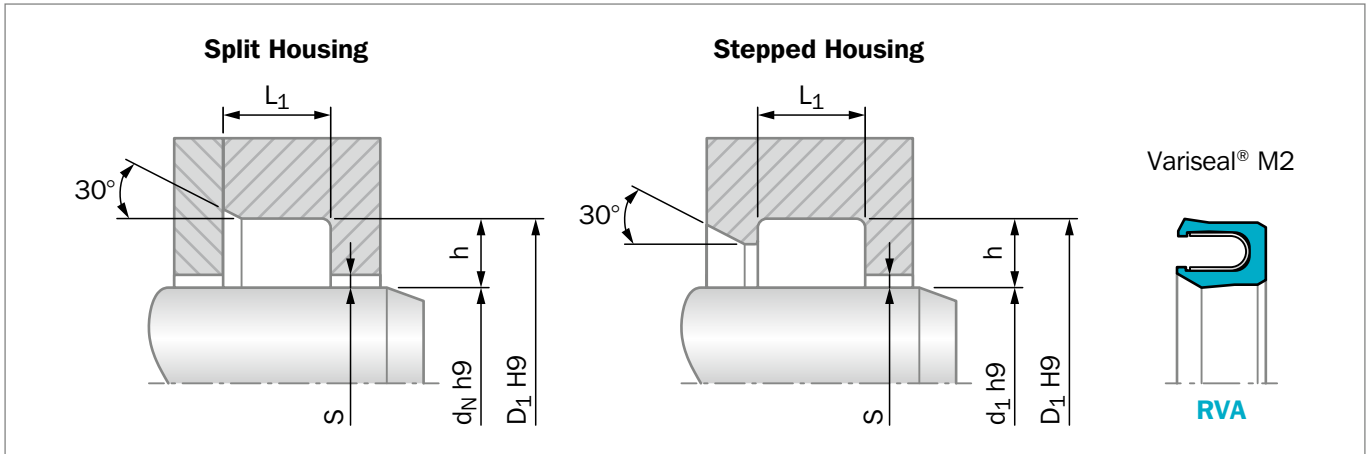


Figure 68: Installation Drawing (see Figure 67 for additional groove details)

Table 44: Installation Dimensions

Series No.	Rod Diameter d_N/d_1 h9		Groove Diameter D_1 H9	Groove Width L_1 +0.2	Radial Clearance S_{max}^*			
	Recommended Range	Extended Range**			<2 MPa	<10 MPa	<20 MPa	<40 MPa
RVA0	3.0 - 9.9	3.0 - 40.0	$d_N/d_1 + 2.9$	2.4	0.20	0.10	0.08	0.05
RVA1	10.0 - 19.9	6.0 - 200.0	$d_N/d_1 + 4.5$	3.6	0.25	0.15	0.10	0.07
RVA2	20.0 - 39.9	10.0 - 400.0	$d_N/d_1 + 6.2$	4.8	0.35	0.20	0.15	0.08
RVA3	40.0 - 119.9	20.0 - 700.0	$d_N/d_1 + 9.4$	7.1	0.50	0.25	0.20	0.10
RVA4	120.0 - 999.0	35.0 - 1,600.0	$d_N/d_1 + 12.2$	9.5	0.60	0.30	0.25	0.12
RVA5	1,000.0 - 2,500.0	80.0 - 2,500.0	$d_N/d_1 + 19.0$	15.0	0.90	0.50	0.40	0.20

* We recommend that the gap dimensions be reduced for temperatures ≥ 80 °C.

At pressures >40MPa a Back-up Ring would be incorporated and the extrusion gap would not be considered.

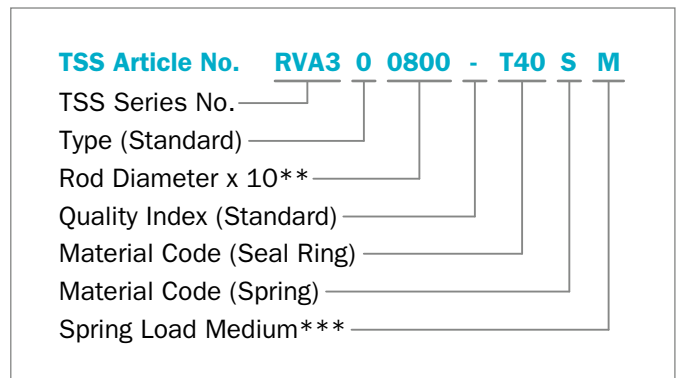
** Available on request.

ORDERING EXAMPLE

Turcon® Variseal® M2, recommended range.

Series:	Series RVA3 (from Table 44)
Rod Diameter:	$d_N = 80.0$ mm
TSS Part No.:	RVA300800 (from Table 45)

For other seal and spring materials please contact the Trelleborg Sealing Solutions representative.



** For diameters $\geq 1,000.0$ mm multiply only by factor 1.

Example: RVA5 for diameter 1,200.0 mm.

TSS Article No.: RVA5X1200 - T40SM according to 15 digit part number system of latest Variseal catalog.

*** M Medium, R HiClean



Table 45: Installation Dimensions / TSS Part No.

d_N	D₁	TSS Part No.	d_N	D₁	TSS Part No.	d_N	D₁	TSS Part No.
3.0	5.9	RVA0_0030	32.0	38.2	RVA2_0320	80.0	89.4	RVA3_0800
4.0	6.9	RVA0_0040	35.0	41.2	RVA2_0350	85.0	94.4	RVA3_0850
5.0	7.9	RVA0_0050	36.0	42.2	RVA2_0360	90.0	99.4	RVA3_0900
6.0	8.9	RVA0_0060	40.0	49.4	RVA3_0400	95.0	104.4	RVA3_0950
8.0	10.9	RVA0_0080	42.0	51.4	RVA3_0420	100.0	109.4	RVA3_1000
10.0	14.5	RVA1_0100	45.0	54.4	RVA3_0450	105.0	114.4	RVA3_1050
12.0	16.5	RVA1_0120	48.0	57.4	RVA3_0480	110.0	119.4	RVA3_1100
14.0	18.5	RVA1_0140	50.0	59.4	RVA3_0500	115.0	124.4	RVA3_1150
15.0	19.5	RVA1_0150	52.0	61.4	RVA3_0520	120.0	132.2	RVA4_1200
16.0	20.5	RVA1_0160	55.0	64.4	RVA3_0550	125.0	137.2	RVA4_1250
18.0	22.5	RVA1_0180	56.0	65.4	RVA3_0560	130.0	142.2	RVA4_1300
20.0	26.2	RVA2_0200	60.0	69.4	RVA3_0600	135.0	147.2	RVA4_1350
22.0	28.2	RVA2_0220	63.0	72.4	RVA3_0630	140.0	152.2	RVA4_1400
25.0	31.2	RVA2_0250	65.0	74.4	RVA3_0650			
28.0	34.2	RVA2_0280	70.0	79.4	RVA3_0700			
30.0	36.2	RVA2_0300	75.0	84.4	RVA3_0750			

The rod diameters in bold type correspond to the recommendations of ISO 3320. Other dimensions and all intermediate sizes up to 2,500 mm diameter including imperial (inch) sizes converted to mm, can be supplied.

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Turcon® VL Seal®



Single-acting

Rubber-energized plastic-faced seal

Material:

Turcon®, Zurcon® and Elastomer



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Turcon® VL Seal® *



Description

Turcon® VL Seal® is a unidirectional Rod seal for the same groove dimensions as standard O-Rings - Figure 69.

The design is optimized with regard to performance, friction, leakage and service life through meticulous simulation, in-house testing and qualification in the most demanding Aerospace applications.

VL Seal® effectively provides static sealing by the O-Ring. The O-Ring is protected from damage under pressure cycles by the contoured O-Ring contact zone which supports the O-Ring and keeps it in position also at high working pressure.

VL Seal® is designed with hydrodynamic back-pumping effect which allows the seal to relieve pressure trapped between tandem seals or between seals and double-acting scrapers.

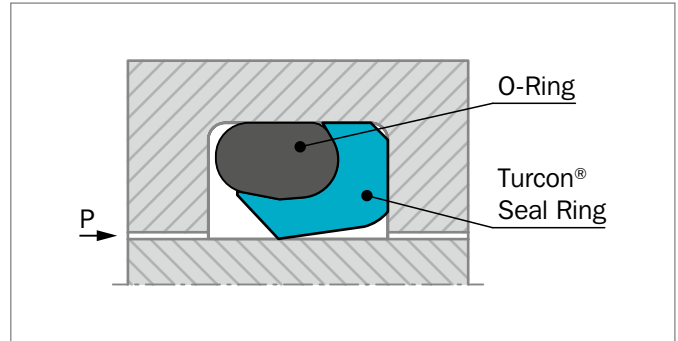


Figure 69: Turcon® VL Seal® mounted in O-Ring groove

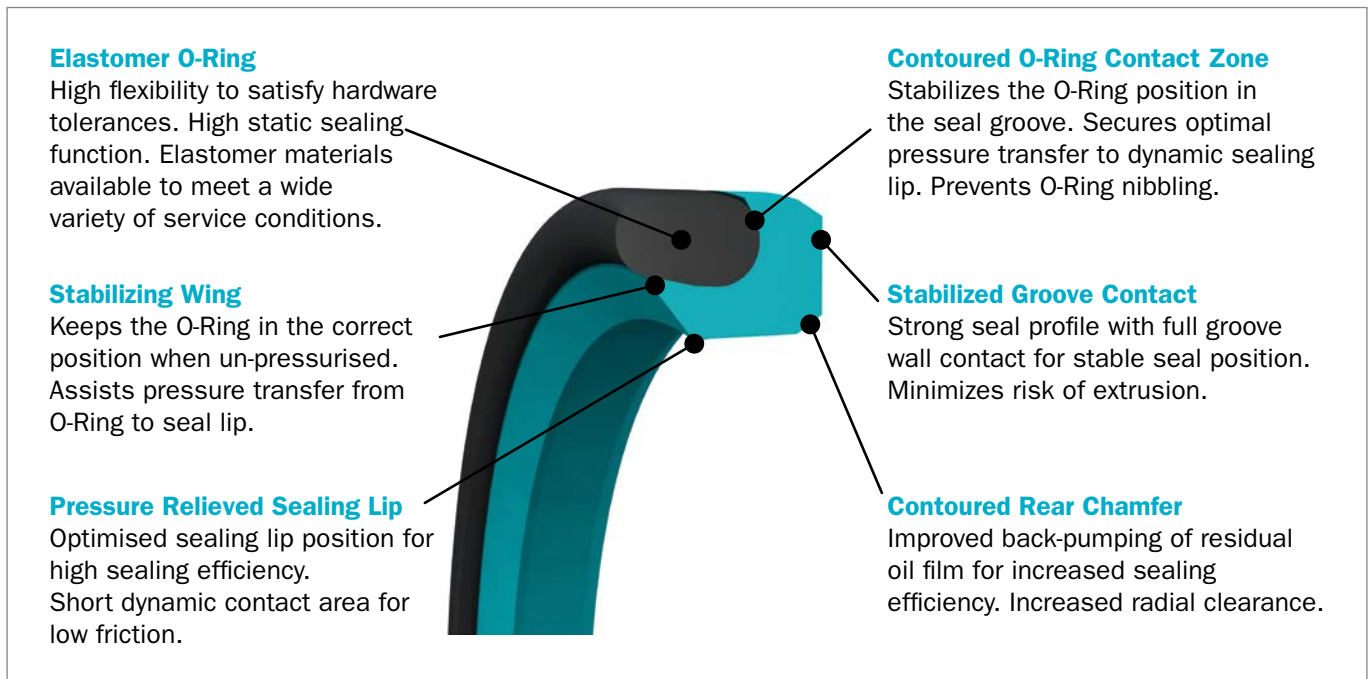


Figure 70: Turcon® VL Seal® design features

* Patent application: US 2019/107203 A1



METHOD OF OPERATION

The sealing mechanism of VL Seal® 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, minimizing the risk of leaks.

This also prevents the build-up of inter-seal pressure normally associated with tandem seal configurations - Figure 71. Inter-seal pressure depends on the system pressure, speed, stroke length and groove design.

ADVANTAGES

- Groove design with shallow radial depth
- Optimized leakage control and service life
- Low friction with small contact area between seal and counter surface
- Featuring the Turcon® Stepseal® 2K back pumping effect
- Utilize standard O-Ring installation groove
- Available in all diameter sizes from 6 to 2,600 mm

APPLICATION EXAMPLES

VL Seal® is recommended for hydraulics and general machine construction as an alternative to Stepseal® 2K and other single-acting seals for example in:

- Aerospace hydraulics
- Machine tools
- Automation
- Handling devises
- Telescopic cylinders
- Automobile industry
- Servo hydraulics
- Valves
- Valve stems
- Down-hole tools
- O-Ring replacement

OPERATING CONDITIONS

Pressure:	Up to 60 MPa
Speed:	Up to 15 m/s with linear movements, frequency up to 5 Hz
Temperature:	-45 °C to +200 °C depending on O-Ring material
Media:	Mineral oil-based hydraulic fluids, flame retardant hydraulic fluids, environmentally friendly hydraulic fluids (bio-oils), phosphate ester, water and others, depending on the seal and O-Ring material compatibility see Table 46
Clearance:	The maximum permissible radial clearance S_{max} is shown in Table 47, as a function of the operating pressure and functional diameter.

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 dependent on media.

RADIAL NOTCH

VL Seal® can be delivered with radial notches at the low pressure side. This is an advantage if the seal is used in rotary applications. Notches can prevent the seal from rotating in the groove by avoiding pressurised fluid being trapped between seal and groove corner.

REDUNDANT SEALING SYSTEM

In many applications, secondary seal systems are required. Figure 69 shows such a tandem configuration with VL Seal®.

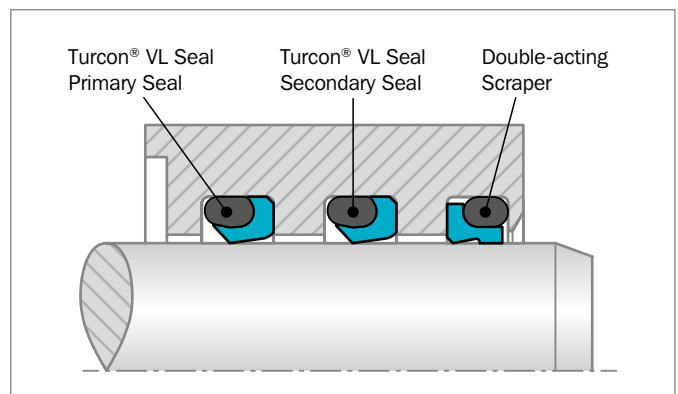


Figure 71: Turcon® VL Seal® in tandem configuration



INSTALLATION INSTRUCTIONS

VL Seal® is dimensionally interchangeable with seals for O-Ring housings, like Turcon® Double Delta® and Turcon® Variseal® M2. Groove dimensions, radial clearances and recommended seal series in relation to diameter are as illustrated in Table 47.

VL Seal® is preferably installed in closed grooves according to Figure 13 page 41. Depending on type and size installation in split grooves is also possible. Recommended minimum diameters for installation in closed grooves see Table 7 page 41.

RECOMMENDED MATERIALS

The following material combinations have proven effective for hydraulic applications:

Turcon® VL Seal® in Turcon® M12

All round material for light to heavy hydraulic applications with linear, short stroke or helical movements in mineral oils, flame retardant hydraulic fluids, phosphate ester, bio-oils or fluids having lubricating properties:

O-Ring:	NBR 70 Shore A	N
	FKM 70 Shore A	V

Set code: M12N or M12V

Turcon® VL Seal® in Turcon® T46

For medium to heavy applications with linear movements in mineral oils and other media with good lubrication.

O-Ring:	NBR 70 Shore A	N
	FKM 70 Shore A	V

Set code: T46N or T46V

Zurcon® Z54 is recommended for VL Seal® as an alternative to polyurethane U-Cups especially outside the size range of these products.

For specific applications, all Turcon® materials are available.

Other material combinations are listed in Table 46.



Table 46: Turcon® and Zurcon® Materials for VL Seal®

Material, Applications, Properties	Code	O-Ring Material Shore A	Code	O-Ring Operating Temp.* °C	Mating Surface Material	MPa max. Dynamic
Turcon® M12 First material choice for seals in linear motion Overall improved properties For new constructions and updating For all commonly applied hydraulic fluids including fluids with low lubrication performance Lowest friction and best sliding properties Lowest wear on seals Improved absorption of abrasive contaminants Low wear or abrasion of counter surface BAM tested Mineral fiber and Additives filled Color: Dark Gray	M12	NBR 70	N	-30 to +100	Steel	50
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod)	
		FKM 70	V	-10 to +200	Steel plated (rod) Cast iron Stainless steel Titanium	
Turcon® T05 For lubricating fluids Also for gas service Very low friction Very good sliding and sealing properties Color: Turquoise	T05	NBR 70	N	-30 to +100	Steel	20
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod)	
		FKM 70	V	-10 to +200		
Turcon® T08 For lubricating fluids and linear motion Very high compressive strength and extrusion resistance Hard counter surfaces is recommended Bronze filled Color: Light to dark brown, which may have variations in shading	T08	NBR 70	N	-30 to +100	Steel hardened	60
		NBR 70 Low temp.	T	-45 to +80	Steel chrome plated (rod)	
		FKM 70	V	-10 to +200	Cast iron	
Turcon® T29 For lubricating and non-lubricating fluids Good extrusion resistance Surface texture is not suitable for gas sealing Not for electrically conducting fluids Carbon fiber filled Color: Gray	T29	NBR 70	N	-30 to +100	Steel	30
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod)	
		FKM 70	V	-10 to +200	Cast iron	
		EPDM 70	E**	-45 to +145	Stainless steel	
Turcon® T40 For lubricating and non-lubricating fluids High frequency and short strokes Water hydraulics Surface texture is not suitable for gas sealing Carbon fiber filled Color: Gray	T40	NBR 70	N	-30 to +100	Steel	25
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod)	
		FKM 70	V	-10 to +200	Cast iron	
		EPDM 70	E**	-45 to +145	Stainless steel Aluminum	

Table continues on next page



Material, Applications, Properties	Code	O-Ring Material Shore A	Code	O-Ring Operating Temp.* °C	Mating Surface Material	MPa max. Dynamic
Turcon® T46 For lubricated hydraulics in linear motion High compressive strength High extrusion resistance Very good sliding and wear properties BAM tested Bronze filled Color: Light to dark brown, which may have variations in shading.	T46	NBR 70	N	-30 to +100	Steel hardened	50
		NBR 70 Low temp.	T	-45 to +80	Steel chrome plated (rod) Cast iron	
		FKM 70	V	-10 to +200		
Zurcon® Z53*** For mineral oil based fluids Very high abrasion and extrusion resistance For counter surface with rougher surface finish Limited chemical resistance Max. working temperature 110 °C Cast polyurethane Color: Yellow to light-brown	Z53	NBR 70	N	-30 to +100	Steel	60
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod) Cast iron Stainless steel Ceramic coating	
Zurcon® Z54*** For mineral oil based fluids Linear and slowly turning movements High abrasion resistance For counter surface with rougher surface finish Good extrusion resistance Limited chemical resistance Max. working temperature 110 °C Cast polyurethane Color: Turquoise	Z54	NBR 70	N	-30 to +100	Steel	25
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod) Cast iron Stainless steel Ceramic coating	
Zurcon® Z80 For lubricating and non-lubricating fluids Water based fluids, air and gases Dry air pneumatics High abrasion and extrusion resistance For service in abrasive conditions and media with particles Good chemical resistance Limited temperature capability (-60 to +80 °C) UHMWPE (Ultra High Molecular Weight Polyethylene) Color: White to off-white	Z80	NBR 70	N	-30 to +100	Steel	35
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod)	
		EPDM 70	E**	-45 to (+145)	Stainless steel Aluminum Ceramic coating	

* The O-Ring Operation Temperature is only valid in mineral hydraulic oil.

** Material not suitable for mineral oils.

*** Max. diameter 2,200 mm.

BAM: Tested by "Bundesanstalt Materialprüfung, Germany".

Highlighted materials are recommended.



■ Installation Recommendation

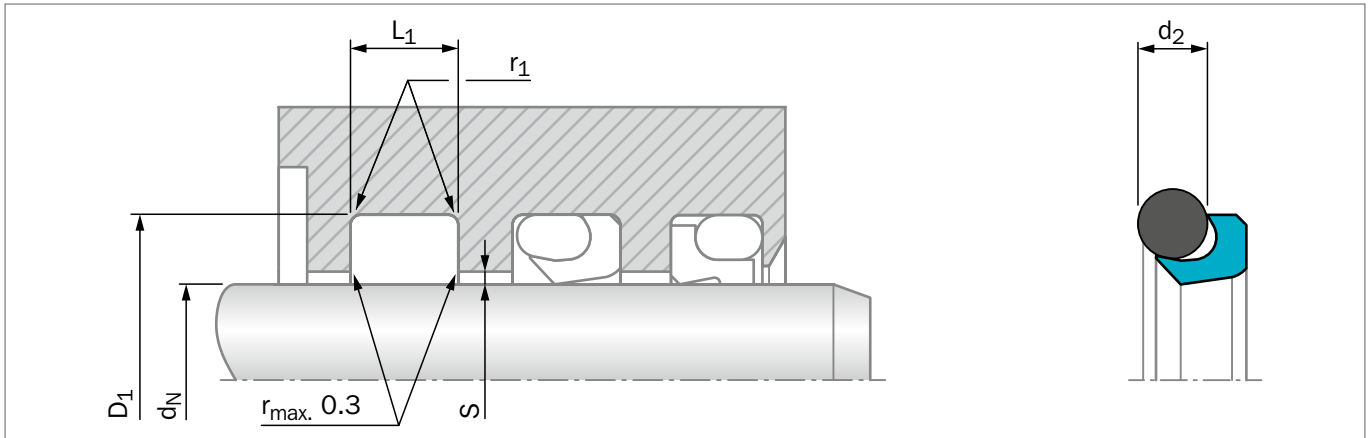


Figure 72: Installation Drawing

Table 47: Installation Dimensions - Standard Recommendations

Series No.	Rod Diameter d_N f8/h9		Groove Diameter D_1 H9	Groove Width L_1 +0.2	Radius r_1 max	Radial Clearance S_{max}^*			O-Ring Cross Section d_2
	Standard Application	Available Range				10 MPa	20 MPa	30 MPa	
REL10	10 - 19.9	6 - 100.0	$d_N + 4.5$	3.6	0.4	0.40	0.25	0.15	1.78
REL20	20 - 39.9	10 - 200.0	$d_N + 6.2$	4.8	0.6	0.40	0.25	0.20	2.62
REL30	40 - 119.9	20 - 400.0	$d_N + 9.4$	7.1	0.8	0.50	0.30	0.20	3.53
REL40	120 - 399.9	35 - 650.0	$d_N + 12.2$	9.5	0.8	0.60	0.35	0.25	5.33
REL50	400 - 649.9	125 - 999.9	$d_N + 15.9$	12.2	0.8	0.70	0.50	0.30	7.00
REL60	650 - 999.9	400 - 999.9	$d_N + 19.0$	15.0	0.8	1.00	0.70	0.60	8.40
REL6X	1,000 - 2,600		$d_N + 19.0$	15.0	0.8	1.00	0.70	0.60	8.40

* At pressures > 40 MPa use diameter tolerance H8/f8 (bore/rod) in the area behind seal or consult your local Customer Solution Center for alternative material or profiles.

Slydring® / Wear Rings are not applicable at very small radial clearances please consult the Slydring® section in this catalog.

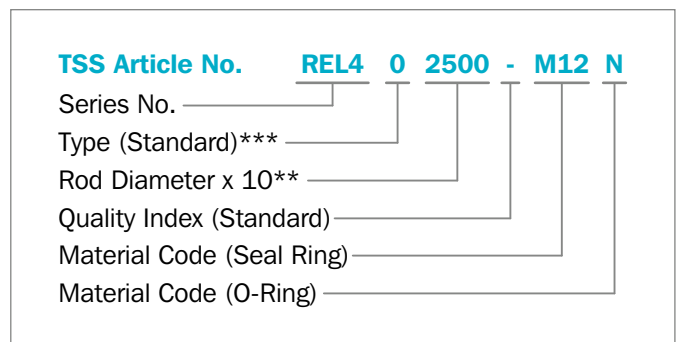
For minimum diameter installation in closed grooves see Table 7 page 41.

ORDERING EXAMPLE

Turcon® VL Seal® complete with O-Ring, standard application:

Series:	REL40 from Table 47
Rod diameter:	$d_N = 250.0$ mm
TSS Part No.:	REL402500 from Table 48

Select the material from Table 46. The corresponding code numbers are appended to the TSS Part No. Together these form the TSS Article Number. The TSS Article Number for all intermediate sizes can be determined by following the example.



** For diameters $d_N \geq 1,000.0$ mm multiply only by factor 1.

Example: REL6X for diameter $d_N = 1,200.0$ mm
TSS Article No.: REL6X1200 - M12N

*** Use suffix "N" for seals with radial notches, for diameter $d_N < 1,000$ mm. (Radial notches for diameter $d_N \geq 1,000$ mm a special part number is required).



Table 48: Installation Dimensions / TSS Part No.

Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size	Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size
d_N f8/h9	D_1 H9	L_1 +0.2			d_N f8/h9	D_1 H9	L_1 +0.2		
6.0	10.5	3.6	REL100060	7.10 x 1.80	43.0	49.2	4.8	REL200430	44.12 x 2.62
8.0	12.5	3.6	REL100080	9.25 x 1.78	45.0	51.2	4.8	REL200450	47.29 x 2.62
9.0	13.5	3.6	REL100090	10.60 x 1.80	45.0	54.4	7.1	REL300450	47.22 x 3.53
10.0	14.5	3.6	REL100100	11.20 x 1.80	48.0	54.2	4.8	REL200480	50.47 x 2.62
12.0	16.5	3.6	REL100120	13.20 x 1.80	48.0	57.4	7.1	REL300480	50.39 x 3.53
12.7	17.2	3.6	REL100127	14.00 x 1.78	50.0	56.2	4.8	REL200500	52.07 x 2.62
14.0	18.5	3.6	REL100140	15.60 x 1.78	50.0	59.4	7.1	REL300500	53.57 x 3.53
15.0	19.5	3.6	REL100150	17.17 x 1.78	50.8	57.0	4.8	REL200508	52.07 x 2.62
16.0	20.5	3.6	REL100160	17.17 x 1.78	50.8	60.2	7.1	REL300508	53.57 x 3.53
18.0	22.5	3.6	REL100180	19.00 x 1.80	52.0	58.2	4.8	REL200520	53.64 x 2.62
19.0	25.2	4.8	REL200190	20.29 x 2.62	52.0	61.4	7.1	REL300520	56.74 x 3.53
20.0	24.5	3.6	REL100200	21.95 x 1.78	54.0	63.4	7.1	REL300540	56.74 x 3.53
20.0	26.2	4.8	REL200200	21.89 x 2.62	55.0	61.2	4.8	REL200550	56.82 x 2.62
22.0	26.5	3.6	REL100220	23.52 x 1.78	55.0	64.4	7.1	REL300550	59.92 x 3.53
22.0	28.2	4.8	REL200220	23.47 x 2.62	56.0	62.2	4.8	REL200560	58.42 x 2.62
24.0	28.5	3.6	REL100240	25.12 x 1.78	56.0	65.4	7.1	REL300560	59.92 x 3.53
25.0	29.5	3.6	REL100250	26.70 x 1.78	56.0	68.2	9.5	REL400560	59.69 x 5.33
25.0	31.2	4.8	REL200250	26.64 x 2.62	60.0	66.2	4.8	REL200600	61.60 x 2.62
25.4	29.9	3.6	REL100254	26.70 x 1.78	60.0	69.4	7.1	REL300600	63.09 x 3.53
25.4	31.6	4.8	REL200254	26.64 x 2.62	63.0	69.2	4.8	REL200630	64.77 x 2.62
26.0	30.5	3.6	REL100260	28.30 x 1.78	63.0	72.4	7.1	REL300630	66.27 x 3.53
26.0	32.2	4.8	REL200260	28.24 x 2.62	65.0	71.2	4.8	REL200650	66.34 x 2.62
28.0	32.5	3.6	REL100280	29.87 x 1.78	65.0	74.4	7.1	REL300650	69.44 x 3.53
28.0	34.2	4.8	REL200280	29.82 x 2.62	70.0	76.2	4.8	REL200700	71.12 x 2.62
30.0	34.5	3.6	REL100300	31.47 x 1.78	70.0	79.4	7.1	REL300700	72.62 x 3.53
30.0	36.2	4.8	REL200300	31.42 x 2.62	70.0	82.2	9.5	REL400700	75.57 x 5.33
32.0	36.5	3.6	REL100320	33.05 x 1.78	72.0	78.2	4.8	REL200720	75.87 x 2.62
32.0	38.2	4.8	REL200320	34.59 x 2.62	75.0	81.2	4.8	REL200750	77.00 x 2.62
35.0	39.5	3.6	REL100350	37.82 x 1.78	75.0	84.4	7.1	REL300750	78.97 x 3.53
35.0	41.2	4.8	REL200350	36.17 x 2.62	76.2	85.6	7.1	REL300762	78.97 x 3.53
36.0	40.5	3.6	REL100360	37.82 x 1.78	80.0	86.2	4.8	REL200800	82.22 x 2.62
36.0	42.2	4.8	REL200360	37.77 x 2.62	80.0	89.4	7.1	REL300800	82.14 x 3.53
37.0	41.5	3.6	REL100370	37.82 x 1.78	80.0	92.2	9.5	REL400800	85.09 x 5.33
37.0	43.2	4.8	REL200370	39.34 x 2.62	85.0	91.2	4.8	REL200850	88.57 x 2.62
38.0	44.2	4.8	REL200380	39.34 x 2.62	85.0	94.4	7.1	REL300850	88.49 x 3.53
38.0	47.4	7.1	REL300380	40.87 x 3.53	85.0	97.2	9.5	REL400850	88.27 x 5.33
40.0	46.2	4.8	REL200400	42.52 x 2.62	90.0	96.2	4.8	REL200900	94.92 x 2.62
40.0	49.4	7.1	REL300400	44.04 x 3.53	90.0	99.4	7.1	REL300900	94.84 x 3.53
42.0	48.2	4.8	REL200420	44.12 x 2.62	90.0	102.2	9.5	REL400900	94.62 x 5.33
42.0	51.4	7.1	REL300420	44.04 x 3.53	95.0	101.2	4.8	REL200950	97.00 x 2.62



Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size	Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size
d_N f8/h9	D_1 H9	L_1 +0.2			d_N f8/h9	D_1 H9	L_1 +0.2		
95.0	104.4	7.1	REL300950	98.02 x 3.53	200.0	209.4	7.1	REL302000	202.79 x 3.53
100.0	106.2	4.8	REL201000	101.27 x 2.62	200.0	212.2	9.5	REL402000	202.57 x 5.33
100.0	109.4	7.1	REL301000	104.37 x 3.53	205.0	217.2	9.5	REL402050	208.92 x 5.33
100.0	112.2	9.5	REL401000	104.14 x 5.33	210.0	222.2	9.5	REL402100	215.27 x 5.33
101.6	111.0	7.1	REL301016	104.37 x 3.53	215.0	227.2	9.5	REL402150	221.62 x 5.33
105.0	114.4	7.1	REL301050	107.54 x 3.53	220.0	232.2	9.5	REL402200	227.97 x 5.33
105.0	117.2	9.5	REL401050	110.49 x 5.33	225.0	237.2	9.5	REL402250	227.97 x 5.33
110.0	116.2	4.8	REL201100	113.97 x 2.62	230.0	239.4	7.1	REL302300	234.54 x 3.53
110.0	119.4	7.1	REL301100	113.89 x 3.53	230.0	242.2	9.5	REL402300	234.32 x 5.33
110.0	122.2	9.5	REL401100	113.67 x 5.33	235.0	247.2	9.5	REL402350	240.67 x 5.33
115.0	124.4	7.1	REL301150	117.07 x 3.53	240.0	252.2	9.5	REL402400	247.02 x 5.33
120.0	129.4	7.1	REL301200	123.42 x 3.53	245.0	257.2	9.5	REL402450	253.37 x 5.33
120.0	132.2	9.5	REL401200	123.19 x 5.33	250.0	262.2	9.5	REL402500	253.37 x 5.33
125.0	134.4	7.1	REL301250	129.77 x 3.53	270.0	282.2	9.5	REL402700	278.77 x 5.33
125.0	137.2	9.5	REL401250	129.54 x 5.33	275.0	287.2	9.5	REL402750	278.77 x 5.33
127.0	136.4	7.1	REL301270	129.77 x 3.53	280.0	292.2	9.5	REL402800	291.47 x 5.33
130.0	139.4	7.1	REL301300	132.94 x 3.53	285.0	297.2	9.5	REL402850	291.47 x 5.33
130.0	142.2	9.5	REL401300	132.72 x 5.33	290.0	302.2	9.5	REL402900	304.17 x 5.33
135.0	141.2	4.8	REL201350	139.37 x 2.62	295.0	307.2	9.5	REL402950	304.17 x 5.33
135.0	144.4	7.1	REL301350	139.29 x 3.53	300.0	312.2	9.5	REL403000	304.17 x 5.33
140.0	146.2	4.8	REL201400	145.72 x 2.62	310.0	322.2	9.5	REL403100	313.00 x 5.33
140.0	149.4	7.1	REL301400	142.47 x 3.53	320.0	332.2	9.5	REL403200	329.57 x 5.33
140.0	152.2	9.5	REL401400	145.42 x 5.33	330.0	342.2	9.5	REL403300	333.00 x 5.33
145.0	154.4	7.1	REL301450	148.82 x 3.53	340.0	352.2	9.5	REL403400	354.97 x 5.33
145.0	157.2	9.5	REL401450	148.49 x 5.33	350.0	362.2	9.5	REL403500	354.97 x 5.33
150.0	159.4	7.1	REL301500	158.34 x 3.53	360.0	372.2	9.5	REL403600	365.00 x 5.30
150.0	162.2	9.5	REL401500	158.12 x 5.33	370.0	382.2	9.5	REL403700	380.37 x 5.33
155.0	164.4	7.1	REL301550	158.34 x 3.53	380.0	392.2	9.5	REL403800	383.00 x 5.33
160.0	169.4	7.1	REL301600	164.69 x 3.53	390.0	402.2	9.5	REL403900	405.26 x 5.33
160.0	172.2	9.5	REL401600	164.47 x 5.33	400.0	412.2	9.5	REL404000	405.26 x 5.33
165.0	174.4	7.1	REL301650	171.04 x 3.53	400.0	415.9	12.2	REL504000	405.26 x 7.00
170.0	179.4	7.1	REL301700	177.39 x 3.53	410.0	422.2	9.5	REL404100	413.00 x 5.33
170.0	182.2	9.5	REL401700	177.17 x 5.33	420.0	432.2	9.5	REL404200	430.66 x 5.33
175.0	184.4	7.1	REL301750	177.39 x 3.53	420.0	435.9	12.2	REL504200	430.66 x 7.00
180.0	189.4	7.1	REL301800	183.74 x 3.53	430.0	442.2	9.5	REL404300	433.00 x 5.33
180.0	192.2	9.5	REL401800	183.52 x 5.33	440.0	452.2	9.5	REL404400	456.06 x 5.33
185.0	194.4	7.1	REL301850	190.09 x 3.53	450.0	462.2	9.5	REL404500	456.06 x 5.33
185.0	197.2	9.5	REL401850	189.87 x 5.33	450.0	465.9	12.2	REL504500	456.06 x 7.00
190.0	199.4	7.1	REL301900	196.44 x 3.53	460.0	472.2	9.5	REL404600	481.38 x 5.33
190.0	202.2	9.5	REL401900	196.22 x 5.33	470.0	482.2	9.5	REL404700	481.38 x 5.33
195.0	204.4	7.1	REL301950	202.79 x 3.53	480.0	492.2	9.5	REL404800	483.00 x 5.33



Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size
d_N f8/h9	D_1 H9	L_1 +0.2		
480.0	495.9	12.2	REL504800	494.16 x 7.00
490.0	502.2	9.5	REL404900	506.78 x 5.33
500.0	512.2	9.5	REL405000	506.78 x 5.33
500.0	515.9	12.2	REL505000	506.86 x 7.00
510.0	522.2	9.5	REL405100	532.18 x 5.33
520.0	532.2	9.5	REL405200	532.18 x 5.33
520.0	535.9	12.2	REL505200	532.26 x 7.00
530.0	542.2	9.5	REL405300	533.00 x 5.33
540.0	552.2	9.5	REL405400	557.58 x 5.33
550.0	562.2	9.5	REL405500	557.58 x 5.33
550.0	565.9	12.2	REL505500	557.66 x 7.00
560.0	572.2	9.5	REL405600	582.68 x 5.33
570.0	582.2	9.5	REL405700	582.68 x 5.33
580.0	592.2	9.5	REL405800	582.68 x 5.33
580.0	595.9	12.2	REL505800	608.08 x 7.00
590.0	602.2	9.5	REL405900	608.08 x 5.33
600.0	612.2	9.5	REL406000	608.08 x 5.33
600.0	615.9	12.2	REL506000	608.08 x 7.00
610.0	622.2	9.5	REL406100	633.48 x 5.33
620.0	632.2	9.5	REL406200	633.48 x 5.33
620.0	635.9	12.2	REL506200	633.48 x 7.00
630.0	642.2	9.5	REL406300	633.48 x 5.33
640.0	652.2	9.5	REL406400	658.88 x 5.33
650.0	665.9	12.2	REL506500	658.88 x 7.00
650.0	669.0	15.0	REL606500	654.00 x 8.40
660.0	675.9	12.2	REL506600	664.00 x 7.00
660.0	679.0	15.0	REL606600	664.00 x 8.40
680.0	695.9	12.2	REL506800	684.00 x 7.00
680.0	699.0	15.0	REL606800	684.00 x 8.40
700.0	715.9	12.2	REL507000	704.00 x 7.00
700.0	719.0	15.0	REL607000	704.00 x 8.40
710.0	725.9	12.2	REL507100	714.00 x 7.00
710.0	729.0	15.0	REL607100	714.00 x 8.40
730.0	745.9	12.2	REL507300	734.00 x 7.00
730.0	749.0	15.0	REL607300	734.00 x 8.40
760.0	775.9	12.2	REL507600	764.00 x 7.00
760.0	779.0	15.0	REL607600	764.00 x 8.40
780.0	795.9	12.2	REL507800	784.00 x 7.00
780.0	799.0	15.0	REL607800	784.00 x 8.40
790.0	805.9	12.2	REL507900	794.00 x 7.00
790.0	809.0	15.0	REL607900	794.00 x 8.40

Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size
d_N f8/h9	D_1 H9	L_1 +0.2		
800.0	815.9	12.2	REL508000	804.00 x 7.00
800.0	819.0	15.0	REL608000	804.00 x 8.40
810.0	825.9	12.2	REL508100	814.00 x 7.00
810.0	829.0	15.0	REL608100	814.00 x 8.40
820.0	835.9	12.2	REL508200	824.00 x 7.00
820.0	839.0	15.0	REL608200	824.00 x 8.40
830.0	845.9	12.2	REL508300	834.00 x 7.00
830.0	849.0	15.0	REL608300	834.00 x 8.40
850.0	865.9	12.2	REL508500	854.00 x 7.00
850.0	869.0	15.0	REL608500	854.00 x 8.40
870.0	885.9	12.2	REL508700	874.00 x 7.00
870.0	889.0	15.0	REL608700	874.00 x 8.40
880.0	895.9	12.2	REL508800	884.00 x 7.00
880.0	899.0	15.0	REL608800	884.00 x 8.40
890.0	905.9	12.2	REL508900	894.00 x 7.00
890.0	909.0	15.0	REL608900	894.00 x 8.40
930.0	945.9	12.2	REL509300	934.00 x 7.00
930.0	949.0	15.0	REL609300	934.00 x 8.40
1,000.0	1,019.0	15.0	REL6X1000	1,004.00 x 8.40
1,050.0	1,069.0	15.0	REL6X1050	1,054.00 x 8.40
1,100.0	1,119.0	15.0	REL6X1100	1,104.00 x 8.40
1,200.0	1,219.0	15.0	REL6X1200	1,204.00 x 8.40
1,500.0	1,519.0	15.0	REL6X1500	1,504.00 x 8.40
1,600.0	1,619.0	15.0	REL6X1600	1,604.00 x 8.40
2,000.0	2,019.0	15.0	REL6X2000	2,004.00 x 8.40
2,600.0	2,619.0	15.0	REL6X2600	2,604.00 x 8.40

The rod diameters in **bold** type are in accordance with the recommendations of ISO 3320.

Other dimensions and all intermediate sizes up to 2,600 mm diameter, including imperial (inch) sizes converted to mm, can be supplied.

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Turcon® Glyd Ring®



Double-acting

Rubber-energized plastic-faced seal

Material:

Turcon®, Zurcon® and Elastomer



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Turcon® Glyd Ring®



Description

Turcon® Glyd Ring® is a very effective and reliable low friction seal. It is particularly suitable as a rod seal in both high and low pressure systems.

The double-acting Glyd Ring® is a combination of a Turcon® based slipper seal and an energizing O-Ring. It has an interference fit which together with the squeeze of the O-Ring ensures a good sealing effect even at low pressure. At higher system pressures, the O-Ring is energized by the fluid, pushing Glyd Ring® against the sealing face with increased force.

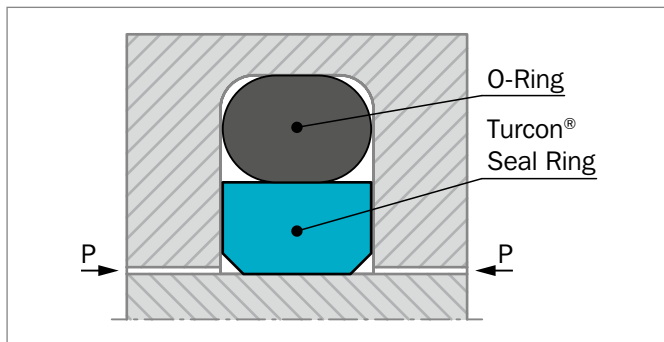


Figure 73: Turcon® Glyd Ring®

The geometry of Glyd Ring® ensures good static sealing and allows the lubricating hydrodynamic fluid film to be built under the seal in linear applications.

ADVANTAGES

- No stick-slip effect when starting for smooth operation
- Minimum static and dynamic friction for a minimum energy loss and operating temperature
- Suitable for non lubricating fluids depending on seal material for optimum design flexibility
- High wear resistance ensures long service life
- Fits standard Stepseal® groove dimensions as well as ISO 7425-2 seal housing
- No adhesive effect to the mating surface during long period of inactivity or storage
- Suitable for most hydraulic fluids in relation with most modern hardware materials and surface finish depending on material selected.
- Suitable for environmentally friendly hydraulic fluids
- Available for all rod diameters up to 2,600 mm

APPLICATIONS EXAMPLES

Over several decades Glyd Ring® has been successfully implemented in a large variety applications as double acting Rod seals in hydraulic components such as:

- Injection molding machines
- Machine tools
- Presses
- Handling machinery
- Valve stems
- Valves for hydraulic & pneumatic circuits.
- Servo equipment
- Hydraulic motors
- Brake booster
- Jacks

OPERATING CONDITIONS

Glyd Ring® is recommended for linear (with a length of stroke at least twice the groove width) and helical movements.

Pressure:	Up to 60 MPa
Speed:	Up to 15 m/s
Frequency:	Up to 5 Hz.
Temperature:	-45 °C to +200 °C depending on O-Ring material
Media:	Mineral oil-based hydraulic fluids, flame retardant hydraulic fluids, environmentally friendly hydraulic fluids (bio-oils), phosphate ester, water, air and others, depending on the seal and O-Ring material compatibility, see Table 49.
Clearance:	The maximum permissible radial clearance S_{max} is shown in Table 50, as a function of the operating pressure and functional diameter.

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.



NOTCHES

To assure that a rapid energizing of the seal takes place at sudden changes of pressure and direction of motion, the seal can be delivered with radial notches on both sides.

Ordering of Glyd Ring® with notches see page 163.

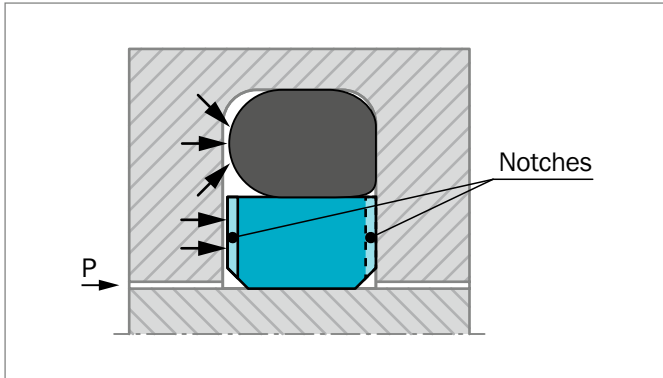


Figure 74: Turcon® Glyd Ring® with notches

INSTALLATION INSTRUCTIONS

Glyd Ring® is installed according to information on page 39 and page 40

Closed groove installation applies same dimensions as for Turcon® Stepseal® 2K in Table 6 page 40.

RECOMMENDED MATERIALS

The following material combinations have proven effective for hydraulic applications:

Turcon® Glyd Ring® in Turcon® M12

All round material for light to heavy hydraulic applications with linear or helical movements in mineral oils, flame retardant hydraulic fluids, phosphate ester, bio-oils or fluids having low lubricating properties:

O-Ring:	NBR 70 Shore A	N
	FKM 70 Shore A	V

Set code: M12N or M12V

Turcon® Glyd Ring® in Turcon® T46

For media to heavy applications with linear movements in mineral oils and other media with good lubrication:

O-Ring:	NBR 70 Shore A	N
	FKM 70 Shore A	V

Set code: T46N or T46V

For specific applications, all Turcon® materials are available. Other material combinations are listed in Table 49.

**Table 49: Turcon® and Zurcon® Materials for Glyd Ring®**

Material, Applications, Properties	Code	O-Ring Material Shore A	Code	O-Ring Operating Temp.* °C	Mating Surface Material	MPa max. Dynamic
Turcon® M12 First material choice for seals in linear motion Overall improved properties For new constructions and updating For all commonly applied hydraulic fluids including fluids with low lubrication performance Lowest friction and best sliding properties Lowest wear on seals Improved absorption of abrasive contaminanants Low wear or abrasion of counter surface BAM tested Mineral fiber and Additives filled Color: Dark gray	M12	NBR 70	N	-30 to +100	Steel	50
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod)	
		FKM 70	V	-10 to +200	Steel plated (rod) Cast iron Stainless steel Titanium	
Turcon® T05 For lubricating fluids Also for gas service Very low friction Very good sliding and sealing properties Color: Turquoise	T05	NBR 70	N	-30 to +100	Steel	20
		NBR 70 Low temp.	T	-45 to +80	Steel, hardened Steel chrome plated (rod)	
		FKM 70	V	-10 to +200		
Turcon® T08 For lubricating fluids and linear motion Very high compressive strength and good extrusion resistance Hard counter surfaces is recommended Bronze filled Color: Light to dark brown which may have variations in shading	T08	NBR 70	N	-30 to +100	Steel, hardened	60
		NBR 70 Low temp.	T	-45 to +80	Steel chrome plated (rod)	
		FKM 70	V	-10 to +200	Cast iron	
Turcon® T10 For hydraulic and pneumatic For lubricating and non-lubricating fluids High extrusion resistance Good chemical resistance Not for electrically conducting fluids BAM tested. Carbon, graphite filled Color: Black	T10	NBR 70	N	-30 to +100	Steel	40
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod)	
		FKM 70	V	-10 to +200	Stainless steel	
		EPDM 70	E**	-45 to +145		
Turcon® T29 For all lubricating and non-lubricating fluids Good extrusion resistance Surface texture is not suitable for gas sealing Not for electrically conducting fluids Carbon fiber filled Color: Gray	T29	NBR 70	N	-30 to +100	Steel	30
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod)	
		FKM 70	V	-10 to +200	Cast iron	
		EPDM 70	E**	-45 to +145	Stainless steel	

Table continues on next page



Material, Applications, Properties	Code	O-Ring Material Shore A	Code	O-Ring Operating Temp.* °C	Mating Surface Material	MPa max. Dynamic
Turcon® T40 For all lubricating and non-lubricating fluids Water hydraulics Surface texture not suitable for gas sealing Carbon fiber filled Color: Gray	T40	NBR 70	N	-30 to +100	Steel	25
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod)	
		FKM 70	V	-10 to +200	Cast iron	
		EPDM 70	E**	-45 to +145	Stainless steel Aluminum	
Turcon® T46 For lubricated hydraulics in linear motion High compressive strength High extrusion resistance Very good sliding and wear properties BAM tested Bronze filled Color: Light to dark brown, which may have variations in shading	T46	NBR 70	N	-30 to +100	Steel hardened	50
		NBR 70 Low temp.	T	-45 to +80	Steel chrome plated (rod)	
		FKM 70	V	-10 to +200	Cast iron	
Zurcon® Z53*** For mineral oil based fluids Very high abrasion and extrusion resistance For counter surface with rougher surface finish Limited chemical resistance. Max. working temperature 110 °C Cast polyurethane Color: Yellow to light-brown	Z53	NBR 70	N	-30 to +100	Steel	60
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod) Cast iron Ceramic coating Stainless steel	
Zurcon® Z80 For lubricating and non-lubricating fluids Water based fluids, air and gases Dry air pneumatics High abrasion and extrusion resistance For service in abrasive conditions and media with particles Good chemical resistance Limited temperature capability (-60 to +80 °C) UHMWPE (Ultra High Molecular Weight Polyethylene) Color: White to off-white	Z80	NBR 70	N	-30 to (+100)	Steel	35
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel, chrome plated (rod)	
		EPDM 70	E**	-45 to (+145)	Stainless steel Aluminum Ceramic coating	

* The O-Ring Operation Temperature is only valid in mineral hydraulic oil (except EPDM).

** Material not suitable for mineral oils.

*** Max. diameter 2,200 mm

BAM: Tested by "Bundesanstalt Materialprüfung, Germany"

Highlighted materials are recommended.



Installation Recommendation

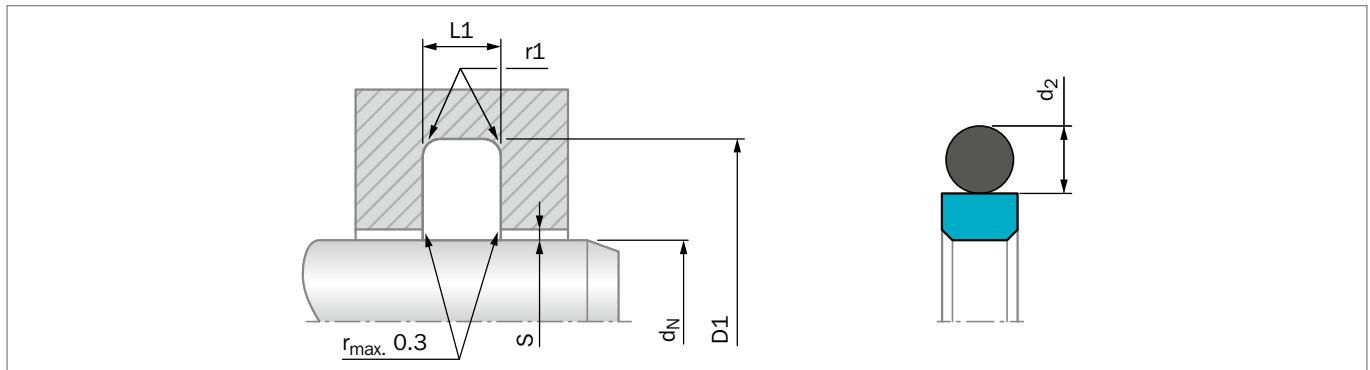


Figure 75: Installation Drawing

Table 50: Installation Dimensions – Standard Recommendations

Rod Diameter d_N f8/h9			Groove Diameter* D1 H9	Groove Width L1 +0.2	Radius r₁ max	Radial Clearance S_{max} **			O-Ring Cross Section d₂
Series No. RG 43 Standard Application	Series No. RG 45 Light Application	Series No. RG 41 Heavy Duty Application				10 MPa	20 MPa	40 MPa	
3 - 7.9	8 - 18.9	-	$d_N + 4.9$	2.2	0.4	0.30	0.20	0.15	1.78
8 - 18.9	19 - 37.9	3 - 7.9	$d_N + 7.3$	3.2	0.6	0.40	0.25	0.15	2.62
19 - 37.9	38 - 199.9	8 - 18.9	$d_N + 10.7$	4.2	1.0	0.40	0.25	0.20	3.53
38 - 199.9	200 - 255.9	19 - 37.9	$d_N + 15.1$	6.3	1.3	0.50	0.30	0.20	5.33
200 - 255.9	256 - 649.9	38 - 199.9	$d_N + 20.5$	8.1	1.8	0.60	0.35	0.25	7.00
256 - 649.9	650 - 999.9	200 - 255.9	$d_N + 24.0$	8.1	1.8	0.60	0.35	0.25	7.00
650 - 999.9	1,000 - 1,200	256 - 649.9	$d_N + 27.3$	9.5	2.5	0.70	0.50	0.30	8.40
1,000 - 2,600***	-	650 - 999.9	$d_N + 38.0$	13.8	3.0	1.00	0.70	0.60	12.00

* Installation with groove dimensions to ISO 7425-2 is also recommendable.

** At pressures > 40 MPa use diameter tolerance H8/f8 (bore/rod) in the area of the seal or consult your local Customer Solution Center for alternative material or profiles.

Slydring® / Wear Rings are not applicable at very small radial clearances please consult the Slydring® section in this catalog.

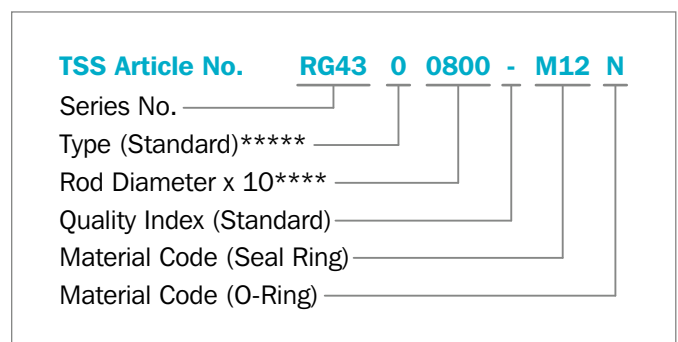
*** O-Rings with 12 mm cross section are delivered as special profile ring.

ORDERING EXAMPLE

Turcon® Glyd Ring® complete with O-Ring, standard application:

Series:	RG43 from Table 50
Rod diameter:	$d_N = 80.0$ mm
TSS Part No.:	RG4300800 from Table 51

Select the material from Table 49. The corresponding code numbers are appended to the TSS Part No. Together these form the TSS Article Number. The TSS Article Number for all intermediate sizes can be determined by following the example.



**** For diameters $d_N \geq 1,000.0$ mm multiply only by factor 1.
Example: RG43 for diameter $d_N = 1,200.0$ mm
TSS Article No.: RG43**X1200** - M12N

***** Ordering Glyd Ring® with radial notches, please use suffix "N" in the fifth character, for diameter $d_N < 1,000.0$ mm (Radial notches for diameter $d_N \geq 1,000.0$ mm a special article number is required).



Table 51: Installation Dimensions / TSS Part No.

Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size	Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size
d_N f8/h9	D_1 H9	L_1 +0.2			d_N f8/h9	D_1 H9	L_1 +0.2		
3.0	7.9	2.2	RG4300030	4.47 x 1.78	35.0	42.3	3.2	RG4500350	37.77 x 2.62
4.0	8.9	2.2	RG4300040	5.60 x 1.80	35.0	45.7	4.2	RG4300350	37.69 x 3.53
5.0	9.9	2.2	RG4300050	6.70 x 1.80	36.0	43.3	3.2	RG4500360	39.34 x 2.62
6.0	10.9	2.2	RG4300060	7.65 x 1.78	36.0	46.7	4.2	RG4300360	40.87 x 3.53
7.0	11.9	2.2	RG4300070	8.75 x 1.80	38.0	48.7	4.2	RG4500380	40.87 x 3.53
8.0	12.9	2.2	RG4500080	9.50 x 1.80	38.0	53.1	6.3	RG4300380	43.82 x 5.33
8.0	15.3	3.2	RG4300080	10.77 x 2.62	39.0	49.7	4.2	RG4500390	44.04 x 3.53
10.0	14.9	2.2	RG4500100	11.80 x 1.80	40.0	50.7	4.2	RG4500400	44.04 x 3.53
10.0	17.3	3.2	RG4300100	12.37 x 2.62	40.0	55.1	6.3	RG4300400	43.82 x 5.33
12.0	16.9	2.2	RG4500120	13.20 x 1.80	42.0	52.7	4.2	RG4500420	47.22 x 3.53
12.0	19.3	3.2	RG4300120	14.50 x 2.65	42.0	57.1	6.3	RG4300420	46.99 x 5.33
14.0	18.9	2.2	RG4500140	15.60 x 1.78	44.0	54.7	4.2	RG4500440	47.22 x 3.53
14.0	21.3	3.2	RG4300140	17.12 x 2.62	44.45	59.5	6.3	RG4300444	50.17 x 5.33
15.0	19.9	2.2	RG4500150	17.17 x 1.78	45.0	55.7	4.2	RG4500450	50.39 x 3.53
15.0	22.3	3.2	RG4300150	18.00 x 2.65	45.0	60.1	6.3	RG4300450	50.17 x 5.33
16.0	20.9	2.2	RG4500160	17.17 x 1.78	48.0	58.7	4.2	RG4500480	51.50 x 3.55
16.0	23.3	3.2	RG4300160	18.72 x 2.62	48.0	63.1	6.3	RG4300480	53.34 x 5.33
18.0	22.9	2.2	RG4500180	19.00 x 1.80	50.0	60.7	4.2	RG4500500	53.57 x 3.53
18.0	25.3	3.2	RG4300180	20.29 x 2.62	50.0	65.1	6.3	RG4300500	56.52 x 5.33
19.0	29.7	4.2	RG4300190	23.40 x 3.53	50.8	61.5	4.2	RG4500508	53.57 x 3.53
20.0	27.3	3.2	RG4500200	21.89 x 2.62	50.8	65.9	6.3	RG4300508	56.52 x 5.33
20.0	30.7	4.2	RG4300200	23.40 x 3.53	52.0	62.7	4.2	RG4500520	56.74 x 3.53
22.0	29.3	3.2	RG4500220	25.07 x 2.62	52.0	67.1	6.3	RG4300520	56.52 x 5.33
22.0	32.7	4.2	RG4300220	26.58 x 3.53	54.0	69.1	6.3	RG4300540	59.69 x 5.33
24.0	31.3	3.2	RG4500240	26.64 x 2.62	55.0	65.7	4.2	RG4500550	59.92 x 3.53
25.0	32.3	3.2	RG4500250	28.24 x 2.62	55.0	70.1	6.3	RG4300550	59.69 x 5.33
25.0	35.7	4.2	RG4300250	29.75 x 3.53	56.0	66.7	4.2	RG4500560	59.92 x 3.53
25.4	32.7	3.2	RG4500254	28.24 x 2.62	56.0	71.1	6.3	RG4300560	62.87 x 5.33
25.4	36.1	4.2	RG4300254	29.75 x 3.53	58.0	73.1	6.3	RG4300580	62.87 x 5.33
26.0	33.3	3.2	RG4500260	28.24 x 2.62	60.0	70.7	4.2	RG4500600	63.09 x 3.53
26.0	36.7	4.2	RG4300260	29.75 x 3.53	60.0	75.1	6.3	RG4300600	66.04 x 5.33
27.0	34.3	3.2	RG4500270	29.82 x 2.62	63.0	73.7	4.2	RG4500630	66.27 x 3.53
28.0	35.3	3.2	RG4500280	29.82 x 2.62	63.0	78.1	6.3	RG4300630	69.22 x 5.33
28.0	38.7	4.2	RG4300280	32.92 x 3.53	65.0	80.1	6.3	RG4300650	69.22 x 5.33
28.575	35.9	3.2	RG4500286	31.42 x 2.62	67.0	77.7	4.2	RG4500670	72.62 x 3.53
29.0	36.3	3.2	RG4500290	31.42 x 2.62	70.0	80.7	4.2	RG4500700	75.79 x 3.53
30.0	37.3	3.2	RG4500300	32.99 x 2.62	70.0	85.1	6.3	RG4300700	75.57 x 5.33
30.0	40.7	4.2	RG4300300	34.52 x 3.53	72.0	82.7	4.2	RG4500720	75.79 x 3.53
32.0	39.3	3.2	RG4500320	34.59 x 2.62	75.0	85.7	4.2	RG4500750	78.97 x 3.53
32.0	42.7	4.2	RG4300320	36.09 x 3.53	75.0	90.1	6.3	RG4300750	81.92 x 5.33



Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size	Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size
d_N f8/h9	D_1 H9	L_1 +0.2			d_N f8/h9	D_1 H9	L_1 +0.2		
80.0	90.7	4.2	RG4500800	85.32 x 3.53	165.0	180.1	6.3	RG4301650	170.82 x 5.33
80.0	95.1	6.3	RG4300800	85.09 x 5.33	170.0	180.7	4.2	RG4501700	177.39 x 3.53
83.0	93.7	4.2	RG4500830	88.49 x 3.53	170.0	185.1	6.3	RG4301700	177.17 x 5.33
85.0	100.1	6.3	RG4300850	91.44 x 5.33	175.0	190.1	6.3	RG4301750	183.52 x 5.33
86.0	96.7	4.2	RG4500860	91.67 x 3.53	180.0	190.7	4.2	RG4501800	183.74 x 3.53
90.0	100.7	4.2	RG4500900	94.84 x 3.53	180.0	195.1	6.3	RG4301800	183.52 x 5.33
90.0	105.1	6.3	RG4300900	94.62 x 5.33	180.0	200.5	8.1	RG4101800	189.87 x 7.00
92.0	102.7	4.2	RG4500920	98.02 x 3.53	190.0	200.7	4.2	RG4501900	196.44 x 3.53
95.0	105.7	4.2	RG4500950	101.19 x 3.53	190.0	205.1	6.3	RG4301900	196.22 x 5.33
95.0	110.1	6.3	RG4300950	100.97 x 5.33	200.0	215.1	6.3	RG4502000	208.92 x 5.33
100.0	110.7	4.2	RG4501000	104.37 x 3.53	200.0	220.5	8.1	RG4302000	208.90 x 7.00
100.0	115.1	6.3	RG4301000	107.32 x 5.33	205.0	220.1	6.3	RG4502050	208.92 x 5.33
101.6	112.3	4.2	RG4501016	107.54 x 3.53	210.0	225.1	6.3	RG4502100	215.27 x 5.33
101.6	116.7	6.3	RG4301016	107.32 x 5.33	220.0	235.1	6.3	RG4502200	227.97 x 5.33
104.7	119.8	6.3	RG4301047	110.49 x 5.33	220.0	240.5	8.1	RG4302200	227.97 x 7.00
105.0	115.7	4.2	RG4501050	110.72 x 3.53	230.0	245.1	6.3	RG4502300	234.32 x 5.33
105.0	120.1	6.3	RG4301050	110.49 x 5.33	230.0	250.5	8.1	RG4302300	240.67 x 7.00
110.0	120.7	4.2	RG4501100	113.89 x 3.53	240.0	255.1	6.3	RG4502400	247.02 x 5.33
110.0	125.1	6.3	RG4301100	116.84 x 5.33	240.0	260.5	8.1	RG4302400	253.37 x 7.00
110.0	130.5	8.1	RG4101100	116.84 x 7.00	250.0	270.5	8.1	RG4302500	266.07 x 7.00
112.0	127.1	6.3	RG4301120	116.84 x 5.33	260.0	284.0	8.1	RG4302600	266.07 x 7.00
115.0	125.7	4.2	RG4501150	120.24 x 3.53	270.0	294.0	8.1	RG4302700	278.77 x 7.00
115.0	130.1	6.3	RG4301150	120.02 x 5.33	270.0	290.5	8.1	RG4502700	278.77 x 7.00
118.0	133.1	6.3	RG4301180	123.19 x 5.33	275.0	299.0	8.1	RG4302750	291.47 x 7.00
120.0	130.7	4.2	RG4501200	123.42 x 3.53	280.0	304.0	8.1	RG4302800	291.47 x 7.00
120.0	135.1	6.3	RG4301200	126.37 x 5.33	280.0	300.5	8.1	RG4502800	291.47 x 7.00
125.0	135.7	4.2	RG4501250	129.77 x 3.53	290.0	314.0	8.1	RG4302900	304.17 x 7.00
125.0	140.1	6.3	RG4301250	129.54 x 5.33	290.0	310.5	8.1	RG4502900	304.17 x 7.00
129.0	139.7	4.2	RG4501290	132.94 x 3.53	300.0	324.0	8.1	RG4303000	316.87 x 7.00
130.0	140.7	4.2	RG4501300	136.12 x 3.53	310.0	334.0	8.1	RG4303100	316.87 x 7.00
130.0	145.1	6.3	RG4301300	135.89 x 5.33	310.0	330.5	8.1	RG4503100	316.87 x 7.00
135.0	145.7	4.2	RG4501350	139.29 x 3.53	320.0	344.0	8.1	RG4303200	329.57 x 7.00
135.0	150.1	6.3	RG4301350	142.24 x 5.33	330.0	354.0	8.1	RG4303300	342.27 x 7.00
140.0	150.7	4.2	RG4501400	145.64 x 3.53	340.0	364.0	8.1	RG4303400	354.97 x 7.00
140.0	155.1	6.3	RG4301400	145.42 x 5.33	350.0	374.0	8.1	RG4303500	367.67 x 7.00
145.0	155.7	4.2	RG4501450	148.82 x 3.53	350.0	370.5	8.1	RG4503500	354.97 x 7.00
145.0	160.1	6.3	RG4301450	151.77 x 5.33	360.0	384.0	8.1	RG4303600	367.67 x 7.00
150.0	165.1	6.3	RG4301500	158.12 x 5.33	370.0	394.0	8.1	RG4303700	380.37 x 7.00
160.0	175.1	6.3	RG4301600	164.47 x 5.33	370.0	390.5	8.1	RG4503700	380.37 x 7.00
160.0	180.5	8.1	RG4101600	170.82 x 7.00	380.0	404.0	8.1	RG4303800	393.07 x 7.00



Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size	Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size
d_N f8/h9	D_1 H9	L_1 +0.2			d_N f8/h9	D_1 H9	L_1 +0.2		
390.0	414.0	8.1	RG4303900	405.26 x 7.00	850.0	877.3	9.5	RG4308500	863.00 x 8.40
400.0	424.0	8.1	RG4304000	417.96 x 7.00	870.0	897.3	9.5	RG4308700	883.00 x 8.40
400.0	420.5	8.1	RG4504000	405.26 x 7.00	900.0	927.3	9.5	RG4309000	913.00 x 8.40
410.0	434.0	8.1	RG4304100	417.96 x 7.00	910.0	937.3	9.5	RG4309100	923.00 x 8.40
420.0	444.0	8.1	RG4304200	430.66 x 7.00	950.0	977.3	9.5	RG4309500	963.00 x 8.40
430.0	454.0	8.1	RG4304300	443.36 x 7.00	960.0	987.3	9.5	RG4309600	973.00 x 8.40
440.0	464.0	8.1	RG4304400	456.06 x 7.00	1,000.0	1,027.3	9.5	RG45X1000	1,013.00 x 8.40
450.0	474.0	8.1	RG4304500	468.76 x 7.00	1,000.0	1,038.0	13.8	RG43X1000	1,016.00 x 12.00
460.0	484.0	8.1	RG4304600	468.76 x 7.00	1,050.0	1,077.3	9.5	RG45X1050	1,063.00 x 8.40
470.0	494.0	8.1	RG4304700	481.38 x 7.00	1,050.0	1,088.0	13.8	RG43X1050	1,066.00 x 12.00
480.0	504.0	8.1	RG4304800	494.16 x 7.00	1,100.0	1,138.0	13.8	RG43X1100	1,116.00 x 12.00
490.0	514.0	8.1	RG4304900	506.86 x 7.00	1,160.0	1,187.3	9.5	RG45X1160	1,173.00 x 8.40
500.0	524.0	8.1	RG4305000	506.86 x 7.00	1,200.0	1,227.3	9.5	RG45X1200	1,213.00 x 8.40
510.0	534.0	8.1	RG4305100	532.26 x 7.00	1,200.0	1,238.0	13.8	RG43X1200	1,216.00 x 12.00
520.0	544.0	8.1	RG4305200	532.26 x 7.00	1,300.0	1,327.3	9.5	RG45X1300	1,313.00 x 8.40
530.0	554.0	8.1	RG4305300	557.66 x 7.00	1,300.0	1,338.0	13.8	RG43X1300	1,316.00 x 12.00
540.0	564.0	8.1	RG4305400	557.66 x 7.00	1,500.0	1,527.3	9.5	RG45X1500	1,513.00 x 8.40
550.0	574.0	8.1	RG4305500	557.66 x 7.00	1,500.0	1,538.0	13.8	RG43X1500	1,516.00 x 12.00
560.0	584.0	8.1	RG4305600	582.68 x 7.00	1,600.0	1,638.0	13.8	RG43X1600	1,616.00 x 12.00
570.0	594.0	8.1	RG4305700	582.68 x 7.00	2,000.0	2,038.0	13.8	RG43X2000	2,016.00 x 12.00
570.0	594.0	8.1	RG4305700	582.68 x 7.00	2,600.0	2,638.0	13.8	RG43X2600	2,616.00 x 12.00
580.0	604.0	8.1	RG4305800	608.08 x 7.00					
590.0	614.0	8.1	RG4305900	608.08 x 7.00					
600.0	624.0	8.1	RG4306000	608.08 x 7.00					
610.0	634.0	8.1	RG4306100	633.48 x 7.00					
620.0	644.0	8.1	RG4306200	633.48 x 7.00					
630.0	654.0	8.1	RG4306300	658.88 x 7.00					
640.0	664.0	8.1	RG4306400	658.88 x 7.00					
650.0	677.3	9.5	RG4306500	663.00 x 8.40					
660.0	687.3	9.5	RG4306600	673.00 x 8.40					
670.0	697.3	9.5	RG4306700	683.00 x 8.40					
680.0	707.3	9.5	RG4306800	693.00 x 8.40					
688.0	715.3	9.5	RG4306880	701.00 x 8.40					
690.0	717.3	9.5	RG4306900	703.00 x 8.40					
700.0	724.0	8.1	RG4507000	712.00 x 7.00					
710.0	737.3	9.5	RG4307100	723.00 x 8.40					
740.0	767.3	9.5	RG4307400	753.00 x 8.40					
760.0	784.0	8.1	RG4507600	772.00 x 7.00					
770.0	797.3	9.5	RG4307700	783.00 x 8.40					
800.0	827.3	9.5	RG4308000	813.00 x 8.40					

The rod diameters in **bold** type are in accordance with the recommendations of ISO 3320.

Other dimensions and all intermediate sizes up to 2,600 mm diameter, including imperial (inch) sizes converted to mm, can be supplied.

All O-Rings with 12 mm cross section are delivered as special profile ring.

Turcon® Glyd Ring® T



Double-acting

Rubber-energized plastic-faced seal

Material:

Turcon®, Zurcon® and Elastomer



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Turcon® Glyd Ring® T*



■ Description

Turcon® Glyd Ring® T is a further technical development of Turcon® Glyd Ring®. It is fully interchangeable with earlier Glyd Ring® seals in all new applications.

The main benefits of the patented seal are provided by the innovative functional principle of the trapezoidal profile cross section. The sides of the seal profile tapers towards the seal surface. The profile can thus retain the robust and compact form typical of piston seals without losing any of the flexibility required to achieve a pressure-related maximum compression - Figure 76.

The edge angle of Glyd Ring® T permits an additional degree of freedom and enables a slight tilting movement of the seal. The maximum compression is thus always shifted towards the area of the seal edge directly exposed to the pressure.

On the low-pressure edge of the seal, Glyd Ring® T exhibits only zones with neutral strains without compressive or shearing loads, thus effectively reducing the danger of gap extrusion. The resulting benefits are as follows below.

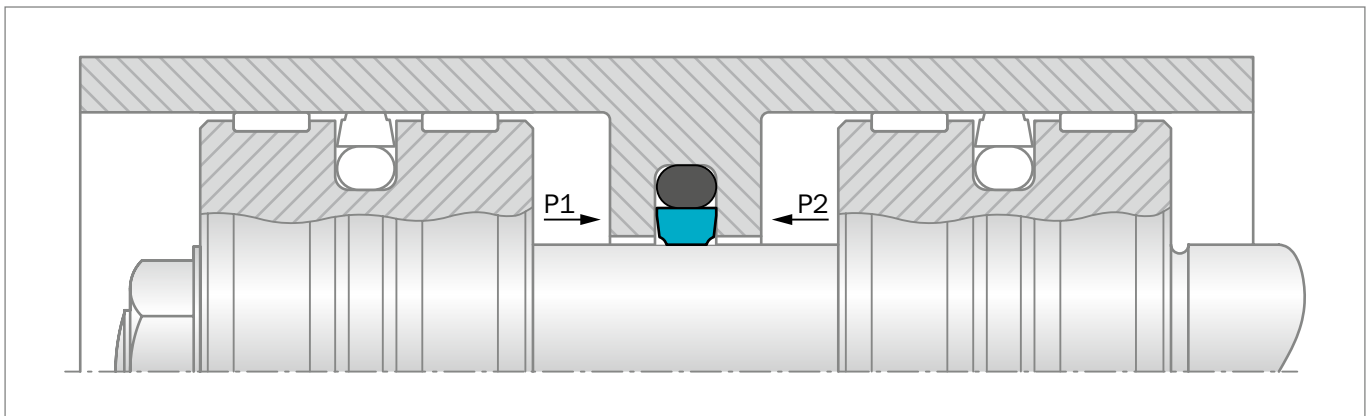


Figure 76: Turcon® Glyd Ring® T

ADVANTAGES

- Very good static sealing performance
- Increased clearance possible (approximately +50%), depending on the operating conditions
- Low friction, no stick-slip effect
- Simple groove design
- Fits standard Stepseal® groove dimensions as well as ISO 7425-2 seal housing
- Adaptable to the operating conditions due to a wide range of materials (Turcon®, Zurcon®)
- Suitable for environmentally friendly hydraulic fluids
- Available for all rod diameters up to 2,600 mm

APPLICATION EXAMPLES

Glyd Ring® T is the recommended sealing element for double acting inside sealing seal for hydraulic components such as:

- Injection molding machines
- Machine tools
- Presses
- Handling machinery
- Servo equipment
- Agriculture
- Valves.

It is particularly recommended for heavy duty and large diameter applications.

* Patent application: WO 92/19893 A1



OPERATING CONDITIONS

Pressure:	Up to 60 MPa
Speed:	Up to 15 m/s
Frequency:	Up to 5 Hz.
Temperature:	-45 °C to +200 °C depending on O-Ring material
Media:	Mineral oil-based hydraulic fluids, flame retardant hydraulic fluids, environmentally friendly hydraulic fluids (bio-oils), phosphate ester, water, air and others, depending on the seal and O-Ring material compatibility see Table 53.
Clearance:	The maximum permissible radial clearance S_{max} is shown in Table 54 as a function of the operating pressure and functional diameter.

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.

SERIES

Different cross section sizes are recommended as a function of the seal diameters.

Table 52 shows the relationship between the series number according to the seal diameter range and the different application class sizes.

Standard application:	General applications without exceptional operating conditions.
Light application:	Applications with demands for reduced friction or for smaller grooves.
Heavy-duty application:	For exceptional operating loads such as high pressures, pressure peaks, etc.

Table 52: Available Range

Series No.	Rod Diameter d_N f8/h9
RT00	2.0 - 130.0
RT01	4.0 - 240.0
RT02	6.0 - 450.0
RT03	12.0 - 650.0
RT04	38.0 - 650.0
RT08	200.0 - 999.9
RT05	256.0 - 999.9
RT05X	1,000.0 - 1,200.0
RT06	650.0 - 999.9
RT06X	1,000.0 - 2,600.0

For the recommended Standard Application range see Table 54.

INSTALLATION INSTRUCTIONS

Glyd Ring® T is installed according to information on page 39 to 40.

Closed groove installation applies same dimensions as for Turcon® Stepseal® 2K in Table 6 page 40.

RECOMMENDED MATERIALS

The following material combinations have proven effective for hydraulic applications:

Turcon® Glyd Ring® T in Turcon® M12

All round material for light to heavy hydraulic applications with linear or helical movements in mineral oils, flame retardant hydraulic fluids, phosphate ester, bio-oils or fluids having low lubricating properties:

O-Ring:	NBR 70 Shore A	N
	FKM 70 Shore A	V

Set code: M12N or M12V

Turcon® Glyd Ring® T in Turcon® T46

For medium to heavy applications with linear movements in mineral oils and other media with good lubrication:

O-Ring:	NBR 70 Shore A	N
	FKM 70 Shore A	V

Set code: T46N or T46V

For specific applications, all Turcon® materials are available. Other material combinations are listed in Table 53.

**Table 53: Turcon® and Zurcon® Materials for Glyd Ring® T**

Material, Applications, Properties	Code	O-Ring Material Shore A	Code	O-Ring Operating Temp.* °C	Mating Surface Material	MPa max. Dynamic
Turcon® M12 First material choice for seals in linear motion Overall improved properties For new constructions and updating For all commonly applied hydraulic fluids including fluids with low lubrication performance Lowest friction and best sliding properties Lowest wear on seals Improved absorption of abrasive contaminants Low wear or abrasion of counter surface BAM tested Mineral fiber and Additives filled Color: Dark gray	M12	NBR 70	N	-30 to +100	Steel	40
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod)	
		FKM 70	V	-10 to +200	Steel plated (rod) Cast iron Stainless steel Titanium	
Turcon® T40 For lubricating and non-lubricating fluids Water hydraulics Surface texture is not suitable for gas sealing Carbon fiber filled Color: Gray	T40	NBR 70	N	-30 to +100	Steel	25
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod)	
		FKM 70	V	-10 to +200	Cast iron	
		EPDM 70	E**	-45 to +145	Stainless steel Aluminum	
Turcon® T46 For lubricated hydraulics in linear motion High compressive strength High extrusion resistance Very good sliding and wear properties BAM tested Bronze filled Color: Light to dark brown, which may have variations in shading.	T46	NBR 70	N	-30 to +100	Steel hardened	50
		NBR 70 Low temp.	T	-45 to +80	Steel chrome plated (rod)	
		FKM 70	V	-10 to +200	Cast iron	
Zurcon® Z53*** For mineral oil based fluids Very high abrasion and extrusion resistance For counter surface with rougher surface finish Hard to install Limited chemical resistance Max. working temperature +110 °C Cast polyurethane Color: Yellow to light-brown	Z53	NBR 70	N	-30 to +100	Steel	60
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod) Cast iron Stainless steel Ceramic coating	

Table continues on next page



Material, Applications, Properties	Code	O-Ring Material Shore A	Code	O-Ring Operating Temp.* °C	Mating Surface Material	MPa max. Dynamic
Zurcon® Z80 For lubricating and non-lubricating fluids Water based fluids, air and gases Dry air pneumatics High abrasion and extrusion resistance For service in abrasive conditions and media with particles Good chemical resistance Limited temperature capability (-60 to +80 °C) UHMWPE (Ultra High Molecular Weight Polyethylene) Color: White to off-white	Z80	NBR 70	N	-30 to (+100)	Steel	35
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod)	
		EPDM 70	E**	-45 to (+145)	Stainless steel Aluminum Ceramic coating	

* The O-Ring Operation Temperature is only valid in mineral hydraulic oil (except EPDM).

** Material not suitable for mineral oils.

*** Max. diameter 2,200 mm

BAM: Tested by "Bundesanstalt Materialprüfung, Germany"

 Highlighted materials are recommended.



Installation Recommendation

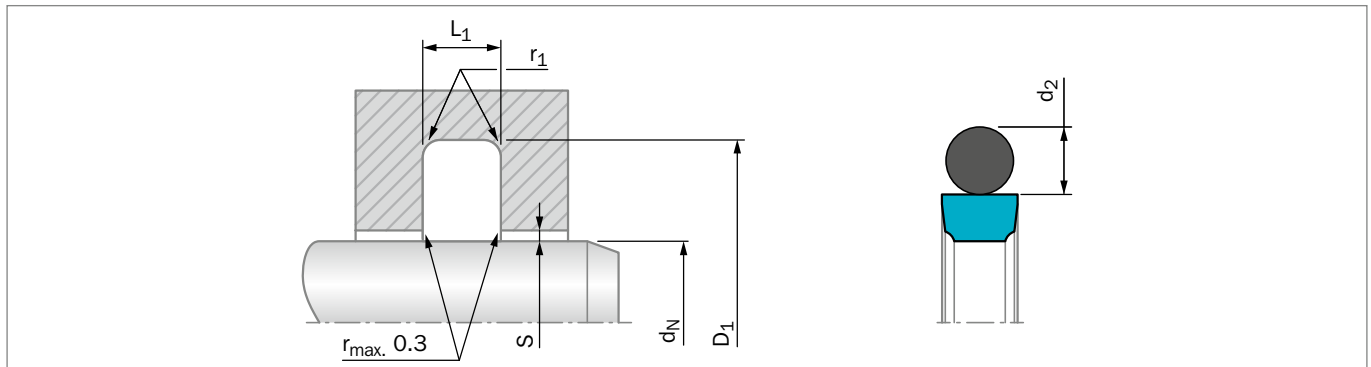


Figure 77: Installation Drawing

Table 54: Installation Dimensions – Standard Recommendations

Series No.	Rod Diameter d_N f8/h9			Groove Diameter* D_1 H9	Groove Width L_1 +0.2	Radius r_1 max	Radial Clearance S_{max} **			O-Ring Cross Section d_2
	Standard Application	Light Application	Heavy Duty Application				10 MPa	20 MPa	40 MPa	
RT00	3 - 7.9	8 - 18.9	-	$d_N + 4.9$	2.2	0.4	0.40	0.30	0.20	1.78
RT01	8 - 18.9	19 - 37.9	-	$d_N + 7.3$	3.2	0.6	0.60	0.50	0.30	2.62
RT02	19 - 37.9	38 - 199.9	8 - 18.9	$d_N + 10.7$	4.2	1.0	0.70	0.50	0.30	3.53
RT03	38 - 199.9	200 - 255.9	19 - 37.9	$d_N + 15.1$	6.3	1.3	0.80	0.60	0.40	5.33
RT04	200 - 255.9	256 - 649.9	38 - 199.9	$d_N + 20.5$	8.1	1.8	0.80	0.60	0.40	7.00
RT08	256 - 649.9	650 - 999.9	200 - 255.9	$d_N + 24.0$	8.1	1.8	0.90	0.70	0.50	7.00
RT05	650 - 999.9	-	256 - 649.9	$d_N + 27.3$	9.5	2.5	1.00	0.80	0.60	8.40
RT05X	-	1,000 - 1,200	-	$d_N + 27.3$	9.5	2.5	1.00	0.80	0.60	8.40
RT06***	-	-	650 - 999.9	$d_N + 38.0$	13.8	3.0	1.20	0.90	0.70	12.00
RT06X***	1,000 - 2,600	-	-	$d_N + 38.0$	13.8	3.0	1.20	0.90	0.70	12.00

* Installation with groove dimensions to ISO 7425-2 is also recommendable.

** At pressures > **40 MPa** use diameter tolerance H8/f8 (bore/rod) in the area of the seal or consult your local Customer Solution Center for alternative material or profiles.

Slydring® / Wear Rings are not applicable at very small radial clearances please consult the Slydring® section in this catalog.

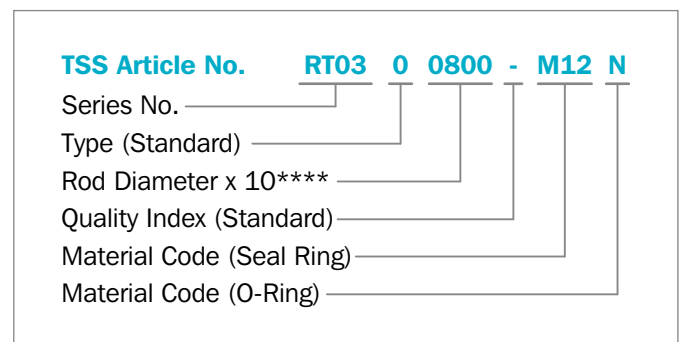
*** O-Rings with 12 mm cross section are delivered as special profile ring.

ORDERING EXAMPLE

Turcon® Glyd Ring® T complete with O-Ring, standard application:

Series:	RT03 from Table 54
Rod diameter:	$d_N = 80.0$ mm
TSS Part No.:	RT0300800 from Table 55

Select the material from Table 53. The corresponding code numbers are appended to the TSS Part No. Together these form the TSS Article Number. The TSS Article Number for all intermediate sizes can be determined by following the example.



**** For diameters $d_N \geq 1,000.0$ mm multiply only by factor 1.
Example: RT06 for diameter $d_N = 1,200.0$ mm
TSS Article No.: RT06**X1200** - M12N



Table 55: Installation Dimensions / TSS Part No.

Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size	Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size
d_N f8/h9	D_1 H9	L_1 +0.2			d_N f8/h9	D_1 H9	L_1 +0.2		
3.0	7.9	2.2	RT0000030	4.80 x 1.80	35.0	42.3	3.2	RT0100350	37.77 x 2.62
4.0	8.9	2.2	RT0000040	5.60 x 1.80	35.0	45.7	4.2	RT0200350	37.69 x 3.53
5.0	9.9	2.2	RT0000050	6.70 x 1.80	36.0	43.3	3.2	RT0100360	39.34 x 2.62
6.0	10.9	2.2	RT0000060	7.65 x 1.78	36.0	46.7	4.2	RT0200360	40.87 x 3.53
7.0	11.9	2.2	RT0000070	8.75 x 1.80	38.0	48.7	4.2	RT0200380	40.87 x 3.53
8.0	12.9	2.2	RT0000080	9.50 x 1.80	38.0	53.1	6.3	RT0300380	43.82 x 5.33
8.0	15.3	3.2	RT0100080	10.77 x 2.62	39.0	49.7	4.2	RT0200390	44.04 x 3.53
10.0	14.9	2.2	RT0000100	11.80 x 1.80	40.0	50.7	4.2	RT0200400	44.04 x 3.53
10.0	17.3	3.2	RT0100100	12.37 x 2.62	40.0	55.1	6.3	RT0300400	43.82 x 5.33
12.0	16.9	2.2	RT0000120	14.00 x 1.78	42.0	52.7	4.2	RT0200420	47.22 x 3.53
12.0	19.3	3.2	RT0100120	14.50 x 2.65	42.0	57.1	6.3	RT0300420	46.99 x 5.33
14.0	18.9	2.2	RT0000140	15.60 x 1.78	44.0	54.7	4.2	RT0200440	47.22 x 3.53
14.0	21.3	3.2	RT0100140	17.12 x 2.62	44.4	59.5	6.3	RT0300444	50.17 x 5.33
15.0	19.9	2.2	RT0000150	17.17 x 1.78	45.0	55.7	4.2	RT0200450	50.39 x 3.53
15.0	22.3	3.2	RT0100150	18.00 x 2.65	45.0	60.1	6.3	RT0300450	50.17 x 5.33
16.0	20.9	2.2	RT0000160	17.17 x 1.78	48.0	58.7	4.2	RT0200480	53.57 x 3.53
16.0	23.3	3.2	RT0100160	18.72 x 2.62	48.0	63.1	6.3	RT0300480	53.34 x 5.33
18.0	22.9	2.2	RT0000180	20.35 x 1.78	50.0	60.7	4.2	RT0200500	53.57 x 3.53
18.0	25.3	3.2	RT0100180	20.29 x 2.62	50.0	65.1	6.3	RT0300500	56.52 x 5.33
19.0	29.7	4.2	RT0200190	23.40 x 3.53	50.8	61.5	4.2	RT0200508	53.57 x 3.53
20.0	27.3	3.2	RT0100200	21.89 x 2.62	50.8	65.9	6.3	RT0300508	56.52 x 5.33
20.0	30.7	4.2	RT0200200	25.00 x 3.53	52.0	62.7	4.2	RT0200520	56.74 x 3.53
22.0	29.3	3.2	RT0100220	25.07 x 2.62	52.0	67.1	6.3	RT0300520	56.52 x 5.33
22.0	32.7	4.2	RT0200220	26.58 x 3.53	54.0	69.1	6.3	RT0300540	59.69 x 5.33
24.0	31.3	3.2	RT0100240	26.64 x 2.62	55.0	65.7	4.2	RT0200550	59.92 x 3.53
25.0	32.3	3.2	RT0100250	28.24 x 2.62	55.0	70.1	6.3	RT0300550	59.69 x 5.33
25.0	35.7	4.2	RT0200250	29.75 x 3.53	56.0	66.7	4.2	RT0200560	59.92 x 3.53
25.4	32.7	3.2	RT0100254	28.24 x 2.62	56.0	71.1	6.3	RT0300560	62.87 x 5.33
25.4	36.1	4.2	RT0200254	29.75 x 3.53	58.0	73.1	6.3	RT0300580	62.87 x 5.33
26.0	33.3	3.2	RT0100260	28.24 x 2.62	60.0	70.7	4.2	RT0200600	63.09 x 3.53
26.0	36.7	4.2	RT0200260	29.75 x 3.53	60.0	75.1	6.3	RT0300600	66.04 x 5.33
27.0	34.3	3.2	RT0100270	29.82 x 2.62	63.0	73.7	4.2	RT0200630	66.27 x 3.53
28.0	35.3	3.2	RT0100280	29.82 x 2.62	63.0	78.1	6.3	RT0300630	69.22 x 5.33
28.0	38.7	4.2	RT0200280	32.92 x 3.53	65.0	80.1	6.3	RT0300650	69.22 x 5.33
28.575	35.875	3.2	RT0100286	31.42 x 2.62	67.0	77.7	4.2	RT0200670	72.62 x 3.53
29.0	36.3	3.2	RT0100290	31.42 x 2.62	70.0	80.7	4.2	RT0200700	75.79 x 3.53
30.0	37.3	3.2	RT0100300	32.99 x 2.62	70.0	85.1	6.3	RT0300700	75.57 x 5.33
30.0	40.7	4.2	RT0200300	34.52 x 3.53	72.0	82.7	4.2	RT0200720	75.79 x 3.53
32.0	39.3	3.2	RT0100320	34.59 x 2.62	75.0	85.7	4.2	RT0200750	78.97 x 3.53
32.0	42.7	4.2	RT0200320	36.09 x 3.53	75.0	90.1	6.3	RT0300750	81.92 x 5.33



Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size	Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size
d_N f8/h9	D_1 H9	L_1 +0.2			d_N f8/h9	D_1 H9	L_1 +0.2		
80.0	90.7	4.2	RT0200800	85.32 x 3.53	165.0	180.1	6.3	RT0301650	170.82 x 5.33
80.0	95.1	6.3	RT0300800	85.09 x 5.33	170.0	180.7	4.2	RT0201700	177.39 x 3.53
83.0	93.7	4.2	RT0200830	88.49 x 3.53	170.0	185.1	6.3	RT0301700	177.17 x 5.33
85.0	100.1	6.3	RT0300850	91.44 x 5.33	175.0	190.1	6.3	RT0301750	183.52 x 5.33
86.0	96.7	4.2	RT0200860	91.67 x 3.53	180.0	190.7	4.2	RT0201800	183.74 x 3.53
90.0	100.7	4.2	RT0200900	94.84 x 3.53	180.0	195.1	6.3	RT0301800	183.52 x 5.33
90.0	105.1	6.3	RT0300900	94.62 x 5.33	180.0	200.5	8.1	RT0401800	189.87 x 7.00
92.0	102.7	4.2	RT0200920	98.02 x 3.53	190.0	200.7	4.2	RT0201900	196.44 x 3.53
95.0	105.7	4.2	RT0200950	101.19 x 3.53	190.0	205.1	6.3	RT0301900	196.22 x 5.33
95.0	110.1	6.3	RT0300950	100.97 x 5.33	200.0	215.1	6.3	RT0302000	208.92 x 5.33
100.0	110.7	4.2	RT0201000	104.37 x 3.53	200.0	220.5	8.1	RT0402000	208.90 x 7.00
100.0	115.1	6.3	RT0301000	107.32 x 5.33	205.0	220.1	6.3	RT0302050	208.92 x 5.33
101.6	112.3	4.2	RT0201016	107.54 x 3.53	210.0	225.1	6.3	RT0302100	215.27 x 5.33
101.6	116.7	6.3	RT0301016	107.32 x 5.33	220.0	235.1	6.3	RT0302200	227.97 x 5.33
104.7	119.8	6.3	RT0301047	110.49 x 5.33	220.0	240.5	8.1	RT0402200	227.97 x 7.00
105.0	115.7	4.2	RT0201050	110.72 x 3.53	230.0	245.1	6.3	RT0302300	234.32 x 5.33
105.0	120.1	6.3	RT0301050	110.49 x 5.33	230.0	250.5	8.1	RT0402300	240.67 x 7.00
110.0	120.7	4.2	RT0201100	113.89 x 3.53	240.0	255.1	6.3	RT0302400	247.02 x 5.33
110.0	125.1	6.3	RT0301100	116.84 x 5.33	240.0	260.5	8.1	RT0402400	253.37 x 7.00
110.0	130.5	8.1	RT0401100	120.02 x 7.00	250.0	270.5	8.1	RT0402500	266.07 x 7.00
112.0	127.1	6.3	RT0301120	116.84 x 5.33	260.0	284.0	8.1	RT0802600	266.07 x 7.00
115.0	125.7	4.2	RT0201150	120.24 x 3.53	270.0	290.5	8.1	RT0402700	278.77 x 7.00
115.0	130.1	6.3	RT0301150	120.02 x 5.33	270.0	294.0	8.1	RT0802700	278.77 x 7.00
118.0	133.1	6.3	RT0301180	123.19 x 5.33	275.0	299.0	8.1	RT0802750	291.47 x 7.00
120.0	130.7	4.2	RT0201200	123.42 x 3.53	280.0	300.5	8.1	RT0402800	291.47 x 7.00
120.0	135.1	6.3	RT0301200	126.37 x 5.33	280.0	304.0	8.1	RT0802800	291.47 x 7.00
125.0	135.7	4.2	RT0201250	129.77 x 3.53	290.0	310.5	8.1	RT0402900	304.17 x 7.00
125.0	140.1	6.3	RT0301250	129.54 x 5.33	290.0	314.0	8.1	RT0802900	304.17 x 7.00
129.0	139.7	4.2	RT0201290	132.94 x 3.53	300.0	324.0	8.1	RT0803000	316.87 x 7.00
130.0	140.7	4.2	RT0201300	136.12 x 3.53	310.0	330.5	8.1	RT0403100	316.87 x 7.00
130.0	145.1	6.3	RT0301300	135.89 x 5.33	310.0	334.0	8.1	RT0803100	316.87 x 7.00
135.0	145.7	4.2	RT0201350	139.29 x 3.53	320.0	344.0	8.1	RT0803200	329.57 x 7.00
135.0	150.1	6.3	RT0301350	142.24 x 5.33	330.0	354.0	8.1	RT0803300	342.27 x 7.00
140.0	150.7	4.2	RT0201400	145.64 x 3.53	340.0	364.0	8.1	RT0803400	354.97 x 7.00
140.0	155.1	6.3	RT0301400	145.42 x 5.33	350.0	370.5	8.1	RT0403500	354.97 x 7.00
145.0	155.7	4.2	RT0201450	148.82 x 3.53	350.0	374.0	8.1	RT0803500	367.67 x 7.00
145.0	160.1	6.3	RT0301450	151.77 x 5.33	360.0	384.0	8.1	RT0803600	367.67 x 7.00
150.0	165.1	6.3	RT0301500	158.12 x 5.33	370.0	390.5	8.1	RT0403700	380.37 x 7.00
160.0	175.1	6.3	RT0301600	164.47 x 5.33	370.0	394.0	8.1	RT0803700	380.37 x 7.00
160.0	180.5	8.1	RT0401600	170.82 x 7.00	380.0	404.0	8.1	RT0803800	393.07 x 7.00



Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size
d_N f8/h9	D_1 H9	L_1 +0.2		
390.0	414.0	8.1	RT0803900	405.26 x 7.00
400.0	420.5	8.1	RT0404000	405.26 x 7.00
400.0	424.0	8.1	RT0804000	417.96 x 7.00
410.0	434.0	8.1	RT0804100	417.96 x 7.00
420.0	444.0	8.1	RT0804200	430.66 x 7.00
430.0	454.0	8.1	RT0804300	443.36 x 7.00
440.0	464.0	8.1	RT0804400	456.06 x 7.00
450.0	474.0	8.1	RT0804500	468.76 x 7.00
460.0	484.0	8.1	RT0804600	468.76 x 7.00
470.0	494.0	8.1	RT0804700	481.38 x 7.00
480.0	504.0	8.1	RT0804800	494.16 x 7.00
490.0	514.0	8.1	RT0804900	506.86 x 7.00
500.0	524.0	8.1	RT0805000	506.86 x 7.00
510.0	534.0	8.1	RT0805100	532.26 x 7.00
520.0	544.0	8.1	RT0805200	532.26 x 7.00
530.0	554.0	8.1	RT0805300	557.66 x 7.00
540.0	564.0	8.1	RT0805400	557.66 x 7.00
550.0	574.0	8.1	RT0805500	557.66 x 7.00
560.0	584.0	8.1	RT0805600	582.68 x 7.00
570.0	594.0	8.1	RT0805700	582.68 x 7.00
580.0	604.0	8.1	RT0805800	608.08 x 7.00
590.0	614.0	8.1	RT0805900	608.08 x 7.00
600.0	624.0	8.1	RT0806000	608.08 x 7.00
610.0	634.0	8.1	RT0806100	633.48 x 7.00
620.0	644.0	8.1	RT0806200	633.48 x 7.00
630.0	654.0	8.1	RT0806300	658.88 x 7.00
640.0	664.0	8.1	RT0806400	658.88 x 7.00
650.0	677.3	9.5	RT0506500	663.00 x 8.40
660.0	687.3	9.5	RT0506600	673.00 x 8.40
670.0	697.3	9.5	RT0506700	683.00 x 8.40
680.0	707.3	9.5	RT0506800	693.00 x 8.40
688.0	715.3	9.5	RT0506880	701.00 x 8.40
690.0	717.3	9.5	RT0506900	703.00 x 8.40
700.0	724.0	8.1	RT0807000	721.00 x 7.00
710.0	737.3	9.5	RT0507100	723.00 x 8.40
740.0	767.3	9.5	RT0507400	753.00 x 8.40
760.0	784.0	8.1	RT0807600	772.00 x 7.00
770.0	797.3	9.5	RT0507700	783.00 x 8.40
800.0	827.3	9.5	RT0508000	813.00 x 8.40
850.0	877.3	9.5	RT0508500	863.00 x 8.40

Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size
d_N f8/h9	D_1 H9	L_1 +0.2		
870.0	897.3	9.5	RT0508700	883.00 x 8.40
900.0	927.3	9.5	RT0509000	913.00 x 8.40
910.0	937.3	9.5	RT0509100	923.00 x 8.40
950.0	977.3	9.5	RT0509500	963.00 x 8.40
960.0	987.3	9.5	RT0509600	973.00 x 8.40
1,000.0	1,027.3	9.5	RT05X1000	1,013.00 x 8.40
1,000.0	1,038.0	13.8	RT06X1000	1,016.00 x 12.00
1,050.0	1,077.3	9.5	RT05X1050	1,063.00 x 8.40
1,050.0	1,088.0	13.8	RT06X1050	1,066.00 x 12.00
1,100.0	1,138.0	13.8	RT06X1100	1,116.00 x 12.00
1,160.0	1,187.3	9.5	RT05X1160	1,173.00 x 8.40
1,200.0	1,227.3	9.5	RT05X1200	1,213.00 x 8.40
1,200.0	1,238.0	13.8	RT06X1200	1,216.00 x 12.00
1,300.0	1,338.0	13.8	RT06X1300	1,316.00 x 12.00
1,500.0	1,538.0	13.8	RT06X1500	1,516.00 x 12.00
1,600.0	1,638.0	13.8	RT06X1600	1,616.00 x 12.00
2,000.0	2,038.0	13.8	RT06X2000	2,016.00 x 12.00
2,600.0	2,638.0	13.8	RT06X2600	2,616.00 x 12.00

The rod diameters in **bold** type are in accordance with the recommendations of ISO 3320.

Other dimensions and all intermediate sizes up to 2,600 mm diameter, including imperial (inch) sizes converted to mm, can be supplied.

All O-Rings with 12 mm cross section are delivered as a special profile ring.

Turcon® Glyd Ring® Hz



Double-acting

Rubber-energized plastic-faced seal

Material:

Turcon®, Zurcon® and Elastomer



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Turcon® Glyd Ring® Hz



Description

Glyd Ring® Hz is a symmetric single- and double-acting rod seal for applications with short-stroke high-frequency linear movements. It is designed to fit into ISO 7425-2 housing grooves.

Glyd Ring® Hz is wider than Turcon® Glyd Ring® giving a tighter fit in the housing groove and limiting its axial movement. It also prevents the seal from being damaged under short-stroke high-frequency movement. Furthermore it eliminates the risk of wear between O-Ring and seal.

Glyd Ring® Hz has notches on both sides to ensure system pressure can instantly activate the O-Ring under the seal despite the tighter fit and the fast alternation of pressure direction.

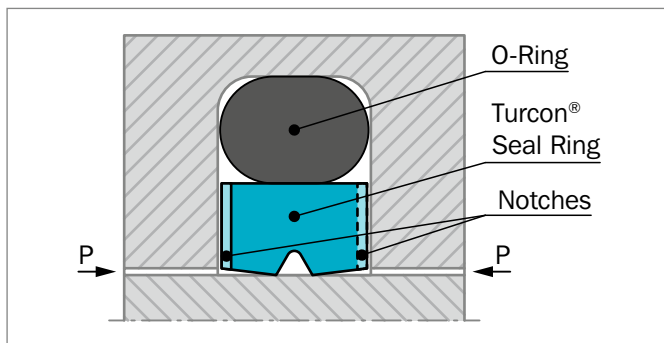


Figure 78: Turcon® Glyd Ring® Hz – short-stroke

The angled contact faces ensure that oil film is not scraped away from the surface but is transported into the groove in the middle of the contact area forming an oil reservoir for lubrication. Wear particles are also likely to be captured in this groove, thus preventing them from embedding in the surface where the highest contact force occurs.

DEFINITION

Short-stroke high-frequency movements are conditions, which in combination can cause problems in hydraulic systems:

Short-Stroke: $\leq 3 \times G$ (Groove width).

Very short reciprocating movements can cause reduced service life due to insufficient lubrication film, giving an increasing temperature on a limited area. These factors increase wear on seal and hardware and wear particles will not be removed from the seal face.

High-Frequency: Reciprocating movement above 5 Hz.

With an increasing frequency the formation of lubrication under the contact face is reduced. High-frequency is most often occurring in connection with short-strokes. These two types of movements together accelerate the wear on hardware and seal.

ADVANTAGES

- Seal face gets lubricated in short-stroke high-frequency linear movements
- Low friction
- No stick-slip effect
- Single and double acting
- High wear resistance
- Installation grooves acc. to ISO 7425-2
- No adhesive effect to the mating surface during long period of inactivity or storage
- Available for all cylinder diameters up to 999.9 mm. (For diameter $\geq 1,000$ mm special part number is required)

APPLICATIONS EXAMPLES

Glyd Ring® Hz has been successfully implemented in a large variety of applications as double acting rod seal for hydraulic components such as:

- Injection molding machines
- Machine tools
- Press brakes
- Handling machinery
- Servo equipment
- Pressure intensifiers
- Shock absorbers
- Wind power pitch cylinders



OPERATING CONDITIONS

Pressure:	Up to 30 MPa with mineral oil depending on seal material
Speed:	Up to 15 m/s with linear movements
Temperature:	-45 °C to +200 °C depending on Seal and O-Ring material
Media:	Mineral oil and other fluids with very high lubricity depending on temperature, seal and O-Ring material compatibility
Clearance:	The maximum permissible radial clearance S_{max} is shown in Table 57 as a function of the operating pressure and functional diameter.

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.

HARDWARE

Short-stroke high-frequency can cause heavy wear on hardware due to poor lubrication under the seal and the fact that wear products cannot be removed from the contact area. The hardest possible hardware material should be recommended, especially when system pressure is above 10 MPa.

INSTALLATION INSTRUCTIONS

Glyd Ring® Hz is installed according to information on page 39 and 40.

Closed groove installation applies the same limits for diameter d_N as for Turcon® Stepseal® 2K in Table 6 page 40.

Tandem seal installation of Glyd Ring® Hz cannot be recommended as the short-strokes create a risk of pressure build-up between the seals.

When used as rod seal we recommend two possibilities, either one Glyd Ring® Hz and one Turcon® Excluder® 2 with drain in between - Figure 79 - or one Glyd Ring® Hz and a single-acting Turcon® Excluder® 1 - Figure 80.

All elements should be in one of the recommended materials.

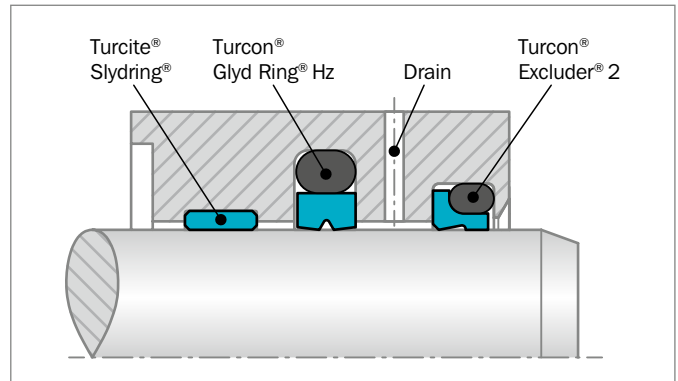


Figure 79: Glyd Ring® Hz with Turcon® Excluder® 2 and Turcite® Slydring®

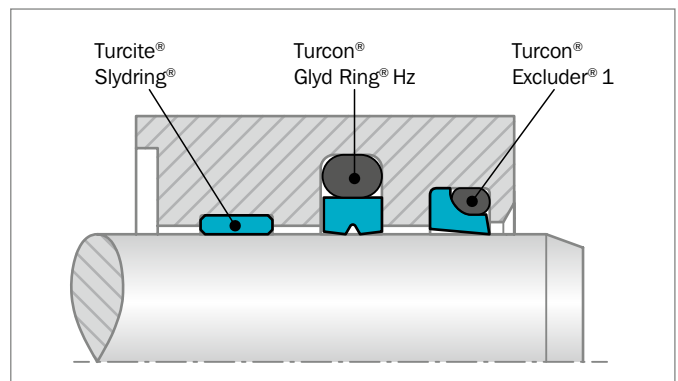


Figure 80: Glyd Ring® Hz with Turcon® Excluder® 1 and Turcite® Slydring®

RECOMMENDED MATERIALS

The following material combinations have proven effective for short-stroke and/or high-frequency applications:

Turcon® Glyd Ring® Hz in Turcon® M12

All round material for hydraulic applications with linear, short-stroke and /or high-frequency movements in mineral oils and fluids having high lubricating properties:

O-Ring:	NBR 70 Shore A	N
	FKM 70 Shore A	V
	depending on medium and temperature	

Set code: M12N or M12V

**Turcon® Glyd Ring® Hz in Turcon® T49**

For medium to heavy applications with linear, short-stroke and/or high-frequency movements in mineral oils:

O-Ring: NBR 70 Shore A N
 FKM 70 Shore A V
 depending on media and temperature

Set code: T49N or T49V

Turcon® Glyd Ring® Hz in Turcon® T40

For light to medium applications with linear, short-stroke and/or high-frequency movements in fluids with lower lubricating properties:

O-Ring: NBR 70 Shore A N
 FKM 70 Shore A V
 EPDM 70 Shore A E
 depending on media and temperature

Set code: T40N, T40V or T40E

Zurcon® Glyd Ring® Hz in Zurcon® Z80

For light applications with linear, short-stroke and/or high-frequency movements in water based fluids, air and gases at reduced pressure and frequencies due to the temperature limitation of the material:

O-Ring: NBR 70 Shore A N
 EPDM 70 Shore A E
 depending on media and temperature

Set code: Z80N or Z80E



Table 56: Turcon® and Zurcon® Materials for Glyd Ring® Hz

Material, Applications, Properties	Code	O-Ring Material Shore A	Code	O-Ring Operating Temp. * °C	Mating Surface Material	MPa max. Dynamic
Turcon® M12 First material choice for seals in linear motion with high-frequency and short-strokes For new constructions and updating For commonly applied hydraulic fluids Lowest friction and best sliding properties Lowest wear on seals Improved absorption of abrasive contaminants Low wear or abrasion of counter surface BAM tested Mineral fiber and Additives filled Color: Dark gray	M12	NBR 70	N	-30 to +100	Steel	30
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod)	
		FKM 70	V	-10 to +200	Steel plated (rod) Cast iron Stainless steel Titanium	
Turcon® T40 For lubricating fluids and fluids with lower lubrication performance Water hydraulics at reduced pressure and frequency Surface texture is only suitable for gas sealing when lubricated with fluid Carbon fiber filled Color: Gray	T40	NBR 70	N	-30 to +100	Steel	25
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod)	
		FKM 70	V	-10 to +200	Cast iron	
		EPDM-70	E**	-45 to +145	Stainless steel Aluminum	
Turcon® T49 For lubricated hydraulics in linear motion High compressive strength High extrusion resistance Very good sliding and wear properties Surface treated for very quick run-in BAM tested Bronze filled Color: Light to dark brown, which may have variations in shading.	T49	NBR 70	N	-30 to +100	Steel (tubes)	30
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod)	
		FKM 70	V	-10 to +200	Cast iron	

Table continues on next page



Material, Applications, Properties	Code	O-Ring Material Shore A	Code	O-Ring Operating Temp. * °C	Mating Surface Material	MPa max. Dynamic
Zurcon® Z80 For low frequencies due to the temperature limitation of the material For lubricating fluids and fluids with lower lubrication performance Water based fluids, air and gases at reduced pressure Dry air pneumatics High abrasion and extrusion resistance For service in abrasive conditions and media with particles Good chemical resistance Limited temperature capability (-60 to +80 °C) UHMWPE (Ultra High Molecular Weight Polyethylene) Color: White to off-white	Z80	NBR 70	N	-30 to (+100)	Steel	25
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod)	
		EPDM 70	E**	-45 to (+145)	Stainless steel Aluminum Ceramic coating	

* The O-Ring Operation Temperature is only valid in mineral hydraulic oil (except EPDM).

** Material not suitable for mineral oils.

BAM: Tested by "Bundes-anstalt Materialprüfung, Germany"

Highlighted materials are recommended.



■ Installation Recommendation

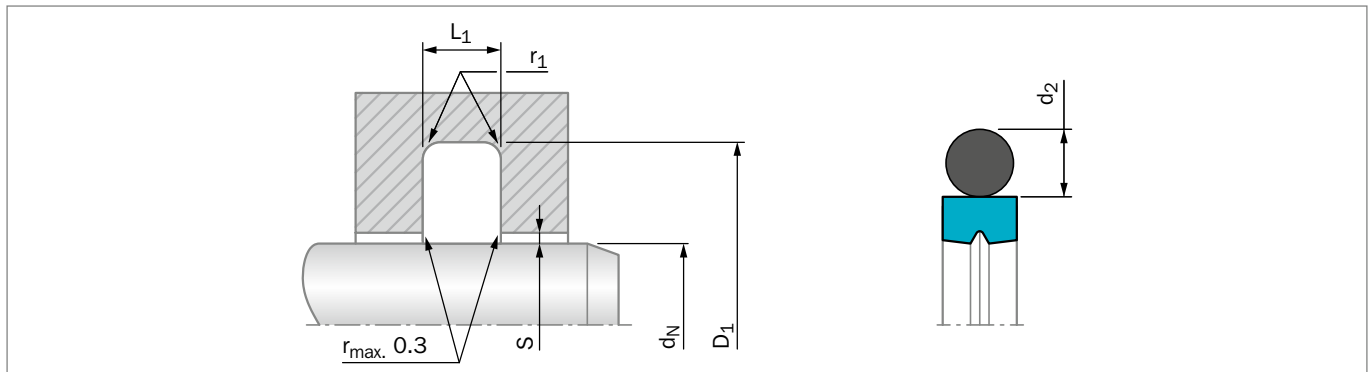


Figure 81: Installation Drawing

Table 57: Installation Dimensions – Standard Recommendations

Series No.	Rod Diameter d_N f8/h9		Groove Diameter D_1 H9	Groove Width L_1 +0.2	Radius $r_{1 \max}$	Radial Clearance S_{\max}^*			O-Ring Cross Section d_2
	Standard Range	Available Range				10 MPa	20 MPa	30 MPa	
RGS0	5 - 7.9	5 - 150.0	$d_N + 5.0^{**}$	2.2	0.4	0.25	0.20	0.15	1.78
RGS1	8 - 18.9	8 - 260.0	$d_N + 7.5$	3.2	0.6	0.40	0.25	0.15	2.62
RGS2	19 - 37.9	19 - 480.0	$d_N + 11.0$	4.2	1.0	0.45	0.25	0.20	3.53
RGS3	38 - 199.9	19 - 750.0	$d_N + 15.5$	6.3	1.3	0.55	0.30	0.20	5.33
RGS4	200 - 255.9	38 - 750.0	$d_N + 21.0$	8.1	1.8	0.60	0.35	0.25	7.00
RGS8***	256 - 649.9	120 - 999.9	$d_N + 24.5$	8.1	1.8	0.60	0.35	0.25	7.00
RGS5***	650 - 999.9	256 - 999.9	$d_N + 28.0$	9.5	2.5	0.65	0.50	0.30	8.40

* At pressures > 30 MPa use diameter tolerance H8/f8 (bore/rod) in the area of the seal or consult your local Customer Solution Center for alternative material or profiles.

Slydring® / Wear Rings are not applicable at very small radial clearances please consult the Slydring® section in this catalog.

** Can also be used in Turcon® Glyd Ring® T groove $d_N + 4.9$ mm.

*** Grooves are not according to ISO 7425-2.

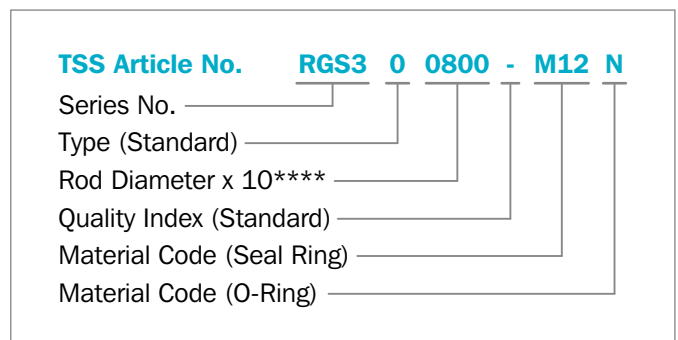
ORDERING EXAMPLE

Glyd Ring® Hz complete with O-Ring, Standard application:

Series:	RGS30 from Table 57
Rod diameter:	$d_N = 80.0$ mm
TSS Part No.:	RGS300800 from Table 58

Select the material from Table 56. The corresponding code numbers are appended to the TSS Part No. Together they form the TSS Article Number.

The TSS Article Number for all intermediate sizes can be determined by following the example:



**** For diameters $d_N \geq 1,000$ mm only with TSS Special Article Number.

IMPORTANT NOTE

Installation Dimensions: For rod sealing the groove diameters are **not** identical to diameters for Stepseal® 2K, Glyd Ring® T and Glyd Ring® PG43.



Table 58: Installation Dimensions / TSS Part No.

Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size	Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size
d_N f8/h9	D_1 H9	L_1 +0.2			d_N f8/h9	D_1 H9	L_1 +0.2		
8.0	13.0	2.2	RGS000080	9.50 x 1.80	40.0	55.5	6.3	RGS300400	46.99 x 5.33
8.0	15.5	3.2	RGS100080	10.77 x 2.62	42.0	53.0	4.2	RGS200420	47.22 x 3.53
10.0	15.0	2.2	RGS000100	11.80 x 1.80	42.0	57.5	6.3	RGS300420	46.99 x 5.33
10.0	17.5	3.2	RGS100100	12.37 x 2.62	44.0	55.0	4.2	RGS200440	47.22 x 3.53
12.0	17.0	2.2	RGS000120	14.00 x 1.78	44.4	59.9	6.3	RGS300444	50.17 x 5.33
12.0	19.5	3.2	RGS100120	14.50 x 2.65	45.0	56.0	4.2	RGS200450	50.39 x 3.53
14.0	19.0	2.2	RGS000140	15.60 x 1.78	45.0	60.5	6.3	RGS300450	50.17 x 5.33
14.0	21.5	3.2	RGS100140	17.12 x 2.62	48.0	59.0	4.2	RGS200480	53.57 x 3.53
15.0	20.0	2.2	RGS000150	17.17 x 1.78	48.0	63.5	6.3	RGS300480	53.34 x 5.33
15.0	22.5	3.2	RGS100150	18.00 x 2.65	50.0	61.0	4.2	RGS200500	53.57 x 3.53
16.0	21.0	2.2	RGS000160	17.17 x 1.78	50.0	65.5	6.3	RGS300500	56.52 x 5.33
16.0	23.5	3.2	RGS100160	18.72 x 2.62	50.8	61.8	4.2	RGS200508	53.57 x 3.53
18.0	23.0	2.2	RGS000180	20.35 x 1.78	50.8	66.3	6.3	RGS300508	56.52 x 5.33
18.0	25.5	3.2	RGS100180	20.29 x 2.62	52.0	63.0	4.2	RGS200520	56.74 x 3.53
19.0	30.0	4.2	RGS200190	23.40 x 3.53	52.0	67.5	6.3	RGS300520	56.52 x 5.33
20.0	27.5	3.2	RGS100200	21.89 x 2.62	54.0	69.5	6.3	RGS300540	59.69 x 5.33
20.0	31.0	4.2	RGS200200	25.00 x 3.53	55.0	66.0	4.2	RGS200550	59.92 x 3.53
22.0	29.5	3.2	RGS100220	25.07 x 2.62	55.0	70.5	6.3	RGS300550	59.69 x 5.33
22.0	33.0	4.2	RGS200220	26.58 x 3.53	56.0	67.0	4.2	RGS200560	59.92 x 3.53
24.0	31.5	3.2	RGS100240	26.64 x 2.62	56.0	71.5	6.3	RGS300560	62.87 x 5.33
25.0	32.5	3.2	RGS100250	28.24 x 2.62	58.0	73.5	6.3	RGS300580	62.87 x 5.33
25.0	36.0	4.2	RGS200250	29.75 x 3.53	60.0	71.0	4.2	RGS200600	63.09 x 3.53
25.4	32.9	3.2	RGS100254	28.24 x 2.62	60.0	75.5	6.3	RGS300600	66.04 x 5.33
25.4	36.4	4.2	RGS200254	29.75 x 3.53	63.0	74.0	4.2	RGS200630	66.27 x 3.53
26.0	33.5	3.2	RGS100260	28.24 x 2.62	63.0	78.5	6.3	RGS300630	69.22 x 5.33
26.0	37.0	4.2	RGS200260	31.35 x 3.53	65.0	80.5	6.3	RGS300650	72.39 x 5.33
27.0	34.5	3.2	RGS100270	29.82 x 2.62	67.0	78.0	4.2	RGS200670	72.62 x 3.53
28.0	35.5	3.2	RGS100280	31.42 x 2.62	70.0	81.0	4.2	RGS200700	75.79 x 3.53
28.0	39.0	4.2	RGS200280	32.92 x 3.53	70.0	85.5	6.3	RGS300700	75.57 x 5.33
28.6	36.1	3.2	RGS100286	31.42 x 2.62	72.0	83.0	4.2	RGS200720	75.79 x 3.53
29.0	36.5	3.2	RGS100290	31.42 x 2.62	75.0	86.0	4.2	RGS200750	78.97 x 3.53
30.0	37.5	3.2	RGS100300	32.99 x 2.62	75.0	90.5	6.3	RGS300750	81.92 x 5.33
30.0	41.0	4.2	RGS200300	34.52 x 3.53	80.0	91.0	4.2	RGS200800	85.32 x 3.53
32.0	43.0	4.2	RGS200320	36.09 x 3.53	80.0	95.5	6.3	RGS300800	85.09 x 5.33
35.0	46.0	4.2	RGS200350	40.87 x 3.53	83.0	94.0	4.2	RGS200830	88.49 x 3.53
36.0	43.5	3.2	RGS100360	39.34 x 2.62	85.0	100.5	6.3	RGS300850	91.44 x 5.33
36.0	47.0	4.2	RGS200360	40.87 x 3.53	86.0	97.0	4.2	RGS200860	91.67 x 3.53
38.0	49.0	4.2	RGS200380	44.04 x 3.53	90.0	101.0	4.2	RGS200900	94.84 x 3.53
38.0	53.5	6.3	RGS300380	43.82 x 5.33	90.0	105.5	6.3	RGS300900	97.79 x 5.33
39.0	50.0	4.2	RGS200390	44.04 x 3.53	92.0	103.0	4.2	RGS200920	98.02 x 3.53
40.0	51.0	4.2	RGS200400	44.04 x 3.53	95.0	106.0	4.2	RGS200950	101.19 x 3.53



Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size	Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size
d_N f8/h9	D_1 H9	L_1 +0.2			d_N f8/h9	D_1 H9	L_1 +0.2		
95.0	110.5	6.3	RGS300950	100.97 x 5.33	205.0	220.5	6.3	RGS302050	208.92 x 5.33
100.0	111.0	4.2	RGS201000	104.37 x 3.53	210.0	225.5	6.3	RGS302100	215.27 x 5.33
100.0	115.5	6.3	RGS301000	107.32 x 5.33	220.0	235.5	6.3	RGS302200	227.97 x 5.33
101.6	112.6	4.2	RGS201016	107.54 x 3.53	220.0	241.0	8.1	RGS402200	227.97 x 7.00
101.6	117.1	6.3	RGS301016	107.32 x 5.33	230.0	245.5	6.3	RGS302300	234.32 x 5.33
104.7	120.2	6.3	RGS301047	110.49 x 5.33	230.0	251.0	8.1	RGS402300	240.67 x 7.00
105.0	116.0	4.2	RGS201050	110.72 x 3.53	240.0	255.5	6.3	RGS302400	247.02 x 5.33
105.0	120.5	6.3	RGS301050	110.49 x 5.33	240.0	261.0	8.1	RGS402400	253.37 x 7.00
110.0	121.0	4.2	RGS201100	113.89 x 3.53	250.0	271.0	8.1	RGS402500	266.07 x 7.00
110.0	125.5	6.3	RGS301100	116.84 x 5.33	260.0	284.5	8.1	RGS802600	266.07 x 7.00
110.0	131.0	8.1	RGS401100	120.02 x 7.00	270.0	291.0	8.1	RGS402700	278.77 x 7.00
112.0	127.5	6.3	RGS301120	116.84 x 5.33	270.0	294.5	8.1	RGS802700	278.77 x 7.00
115.0	126.0	4.2	RGS201150	120.24 x 3.53	275.0	299.5	8.1	RGS802750	291.47 x 7.00
115.0	130.5	6.3	RGS301150	120.02 x 5.33	280.0	301.0	8.1	RGS402800	291.47 x 7.00
118.0	133.5	6.3	RGS301180	123.19 x 5.33	280.0	304.5	8.1	RGS802800	291.47 x 7.00
120.0	131.0	4.2	RGS201200	126.59 x 3.53	290.0	311.0	8.1	RGS402900	304.17 x 7.00
120.0	135.5	6.3	RGS301200	126.37 x 5.33	290.0	314.5	8.1	RGS802900	304.17 x 7.00
125.0	136.0	4.2	RGS201250	129.77 x 3.53	300.0	324.5	8.1	RGS803000	316.87 x 7.00
125.0	140.5	6.3	RGS301250	132.72 x 5.33	310.0	331.0	8.1	RGS403100	316.87 x 7.00
129.0	140.0	4.2	RGS201290	132.94 x 3.53	310.0	334.5	8.1	RGS803100	316.87 x 7.00
130.0	141.0	4.2	RGS201300	136.12 x 3.53	320.0	344.5	8.1	RGS803200	329.57 x 7.00
130.0	145.5	6.3	RGS301300	135.89 x 5.33	330.0	354.5	8.1	RGS803300	342.27 x 7.00
135.0	146.0	4.2	RGS201350	139.29 x 3.53	340.0	364.5	8.1	RGS803400	354.97 x 7.00
135.0	150.5	6.3	RGS301350	142.24 x 5.33	350.0	371.0	8.1	RGS403500	354.97 x 7.00
140.0	151.0	4.2	RGS201400	145.64 x 3.53	350.0	374.5	8.1	RGS803500	367.67 x 7.00
140.0	155.5	6.3	RGS301400	145.42 x 5.33	360.0	384.5	8.1	RGS803600	367.67 x 7.00
145.0	156.0	4.2	RGS201450	148.82 x 3.53	370.0	391.0	8.1	RGS403700	380.37 x 7.00
145.0	160.5	6.3	RGS301450	151.77 x 5.33	370.0	394.5	8.1	RGS803700	380.37 x 7.00
150.0	165.5	6.3	RGS301500	158.12 x 5.33	380.0	404.5	8.1	RGS803800	393.07 x 7.00
160.0	175.5	6.3	RGS301600	164.47 x 5.33	390.0	414.5	8.1	RGS803900	405.26 x 7.00
160.0	181.0	8.1	RGS401600	170.82 x 7.00	400.0	421.0	8.1	RGS404000	405.26 x 7.00
165.0	180.5	6.3	RGS301650	170.82 x 5.33	400.0	424.5	8.1	RGS804000	417.96 x 7.00
170.0	181.0	4.2	RGS201700	177.39 x 3.53	410.0	434.5	8.1	RGS804100	417.96 x 7.00
170.0	185.5	6.3	RGS301700	177.17 x 5.33	420.0	444.5	8.1	RGS804200	430.66 x 7.00
175.0	190.5	6.3	RGS301750	183.52 x 5.33	430.0	454.5	8.1	RGS804300	443.36 x 7.00
180.0	191.0	4.2	RGS201800	183.74 x 3.53	440.0	464.5	8.1	RGS804400	456.06 x 7.00
180.0	195.5	6.3	RGS301800	189.87 x 5.33	450.0	474.5	8.1	RGS804500	468.76 x 7.00
180.0	201.0	8.1	RGS401800	189.87 x 7.00	460.0	484.5	8.1	RGS804600	468.76 x 7.00
190.0	201.0	4.2	RGS201900	196.44 x 3.53	470.0	494.5	8.1	RGS804700	481.38 x 7.00
190.0	205.5	6.3	RGS301900	196.22 x 5.33	500.0	524.5	8.1	RGS805000	506.86 x 7.00
200.0	215.5	6.3	RGS302000	208.92 x 5.33	550.0	574.5	8.1	RGS805500	557.66 x 7.00
200.0	221.0	8.1	RGS402000	208.90 x 7.00	560.0	584.5	8.1	RGS805600	582.68 x 7.00



Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size
d_N f8/h9	D_1 H9	L_1 +0.2		
570.0	594.5	8.1	RGS805700	582.68 x 7.00
580.0	604.5	8.1	RGS805800	608.08 x 7.00
590.0	614.5	8.1	RGS805900	608.08 x 7.00
600.0	624.5	8.1	RGS806000	608.08 x 7.00
630.0	654.5	8.1	RGS806300	658.88 x 7.00
650.0	678.0	9.5	RGS506500	662.90 x 8.40
660.0	688.0	9.5	RGS506600	672.90 x 8.40
670.0	698.0	9.5	RGS506700	682.90 x 8.40
680.0	708.0	9.5	RGS506800	692.90 x 8.40
700.0	724.5	8.1	RGS807000	712.90 x 8.40
800.0	828.0	9.5	RGS508000	812.90 x 8.40
850.0	878.0	9.5	RGS508500	862.90 x 8.40
900.0	928.0	9.5	RGS509000	912.90 x 8.40
950.0	978.0	9.5	RGS509500	962.90 x 8.40
960.0	988.0	9.5	RGS509600	972.90 x 8.40

The rod diameters in **bold** type correspond to the recommendations of ISO 3320.

Part No. for other dimensions and **all** intermediate sizes up to 999.9 mm diameter including imperial (inch) sizes can be supplied.

Larger sizes up to 2,600 mm are available upon request.

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Turcon® AQ-Seal® with Bean Seal



Double-acting

Rubber-energized plastic-faced seal

Material:

Turcon®, and Zurcon® and Elastomer



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Turcon® AQ-Seal® with Bean Seal*



Description

Turcon® AQ-Seal® with Bean Seal is a double-acting seal consisting of a seal ring of Turcon® material, a Bean Seal in Zurcon® Z54 and an O-Ring as energizing element.

The Turcon® seal ring and the Bean Seal together create the dynamic sealing function while the O-Ring performs the static sealing function.

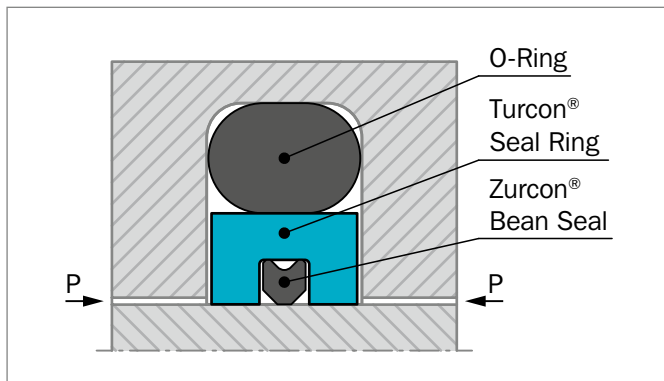


Figure 82: Turcon® AQ-Seal® with Bean Seal

AQ-Seal® with Bean Seal combines the benefits of a low-friction Turcon® slipper seal with the high sealing characteristics of an elastomeric seal by incorporating a limited foot print Bean Seal in the dynamic sealing face. This optimizes leakage control while minimizing friction.

ADVANTAGES

- High sealing effect in applications requiring media separation, e.g. fluid/fluid or fluid/gas
- Double security through the combination of low friction special materials with elastomer seals
- Higher pressure application, higher sliding speed compared to AQ-Seal® with Quad-Ring®
- Outstanding sliding properties, no stick-slip effect.
- Simple groove design, small installation space. Interchangeable with Turcon® Glyd Ring®, Turcon® Glyd Ring® T and Turcon® Stepseal® 2K groove. Installation according to ISO 7425-2 possible.
- Available for any rod diameters from 18 and up to 2,200 mm.

* Patent application: WO 90/00693 A1

APPLICATION EXAMPLES

AQ-Seal® with Bean Seal is the recommended sealing element for double acting positioning and holding cylinders for:

- Mobile hydraulics
- Machine tools
- Presses
- Stabilizers
- Heavy duty suspension cylinders
- Medium separation of fluid /fluid or fluid/gas; please note that one of the media must be lubricating
- Hydro-pneumatic suspensions for heavy vehicles
- Cylinders with retaining function over longer periods such as jacks and support cylinders.

OPERATING CONDITIONS

Pressure:	Up to 50 MPa with mineral oil Up to 30 MPa for media with reduced lubricating properties
Speed:	Up to 2 m/s with linear movements
Temperature:	-45 °C to +110 °C depending on seal and O-Ring material
Media:	Mineral oil-based hydraulic fluids, flame retardant hydraulic fluids, phosphate ester and others, depending on temperature, seal, O-Ring and Bean Seal material compatibility see Table 59 and Table 60
Clearance:	The maximum permissible radial clearance S_{max} is shown in Table 61 as a function of the operating pressure and functional diameter.

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.



INSTALLATION INSTRUCTIONS

AQ-Seal® V is installed according to information on page 39 and 40.

Closed groove installation applies same dimensions as for Turcon® Stepseal® 2K in Table 6 page 40.

RECOMMENDED MATERIALS

The following material combinations have proven effective for hydraulic applications:

Turcon® AQ-Seal® in Turcon® M12

All round material for light to heavy hydraulic applications with linear, movements in mineral oils, flame retardant hydraulic fluids and phosphate ester:

Bean Seal: Zurcon® Z54

O-Ring: NBR 70 Shore A N
FKM 70 Shore A V

Set code: M12N or M12V

Turcon® AQ-Seal® in Turcon® T46

For medium to heavy applications with linear movements in mineral oils and other media with good lubrication:

Bean Seal: Zurcon® Z54

O-Ring: NBR 70 Shore A N
FKM 70 Shore A V

Set code: T46N or T46V

For specific applications, all Turcon® materials are available.

Other material combinations are listed in Table 59.

Table 59: Recommended Turcon® Materials for Turcon® AQ-Seal®

Material, Applications, Properties	Code	O-Ring Material Shore A	Code	O-Ring Operating Temp. * °C	Mating Surface Material	MPa max. Dynamic
Turcon® M12 First material choice for seals in linear motion Overall improved properties For new constructions and updating For all commonly applied hydraulic fluids including fluids with low lubrication performance Lowest friction and best sliding properties Lowest wear on seals Improved absorption of abrasion of counter surface BAM tested Mineral fiber and Additives filled Color: Dark gray	M12	NBR 70	N	-30 to +100	Steel	40
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod)	
		FKM 70	V	-10 to (+200)	Steel plated (rod) Cast iron Stainless steel Titanium	



Material, Applications, Properties	Code	O-Ring Material Shore A	Code	O-Ring Operating Temp.* °C	Mating Surface Material	MPa max. Dynamic
Turcon® T08 For lubricating fluids and linear motion Very high compressive strength and extrusion resistance Hard counter surfaces is recommended Bronze filled Color: Light to dark brown, which may have variations in shading	T08	NBR 70	N	-30 to +100	Steel hardened	50
		NBR 70 Low temp.	T	-45 to +80	Steel chrome plated (rod)	
		FKM 70	V	-10 to (+200)	Cast iron	
Turcon® T10 For hydraulic and pneumatic For linear motion in lubricating and non-lubricating fluids High extrusion resistance Good chemical resistance Not for electrically conducting fluids BAM tested Carbon, graphite filled Color: Black	T10	NBR 70	N	-30 to +100	Steel	30
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod)	
		FKM 70	V	-10 to (+200)	Stainless steel	
Turcon® T29 For lubricating and non-lubricating fluids Good extrusion resistance Surface texture is not suitable for gas sealin Not for electrically conducting fluids Carbon fiber filled Color: Gray	T29	NBR 70	N	-30 to +100	Steel	30
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod)	
		FKM 70	V	-10 to (+200)	Cast iron Stainless steel	
Turcon® T40 For lubricating and non-lubricating fluids High frequency and short strokes Water hydraulics Surface texture is not suitable for gas sealing Carbon fiber filled Color: Gray	T40	NBR 70	N	-30 to +100	Steel chrome plated (rod)	25
		NBR 70 Low temp.	T	-45 to +80	Cast iron Stainless steel	
		FKM 70	V	-10 to (+200)	Aluminum	
Turcon® T46 For lubricated hydraulics in linear motion High compressive strength High extrusion resistance Very good sliding and wear properties Bronze filled BAM tested Color: Light to dark brown, which may have variations in shading	T46	NBR 70	N	-30 to +100	Steel	40
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod)	
		FKM 70	V	-10 to (+200)	Cast iron	

Table continues on next page



Material, Applications, Properties	Code	O-Ring Material Shore A	Code	O-Ring Operating Temp. * °C	Mating Surface Material	MPa max. Dynamic
Zurcon® Z80 For lubricating and non-lubricating fluids Water based fluids, air and gases Dry air pneumatics High abrasion and extrusion resistance For service in abrasive conditions and media with particles Good chemical resistance Limited temperature capability (-60 to +80 °C) UHMWPE (Ultra High Molecular Weight Polyethylene) Color: White to off-white	Z80	NBR 70	N	-30 to (+100)	Steel	30
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod) Stainless steel Aluminum Ceramic coating	

* The O-Ring Operation Temperature is only valid in mineral hydraulic oil (except EPDM).

** Material not suitable for mineral oils.

BAM: Tested by "Bundesanstalt Materialprüfung, Germany"

Highlighted materials are recommended.

Table 60: Zurcon® Z54 for Bean Seal

Material, Applications, Properties	Code	O-Ring Material Shore A	Code	O-Ring Operating Temp. * °C	Mating Surface Material	MPa max. Dynamic
Turcon® Z54 For mineral oil based fluids Linear and slowly turning movements High sealing effect High abrasion resistance Good extrusion resistance Limited chemical resistance Max. working temperature +110°C Cast Polyurethane Color: Turquoise	Z54	-	-	-	Steel Steel hardened Steel chrome plated (rod) Cast iron Stainless steel Ceramic coating	-



Installation Recommendation

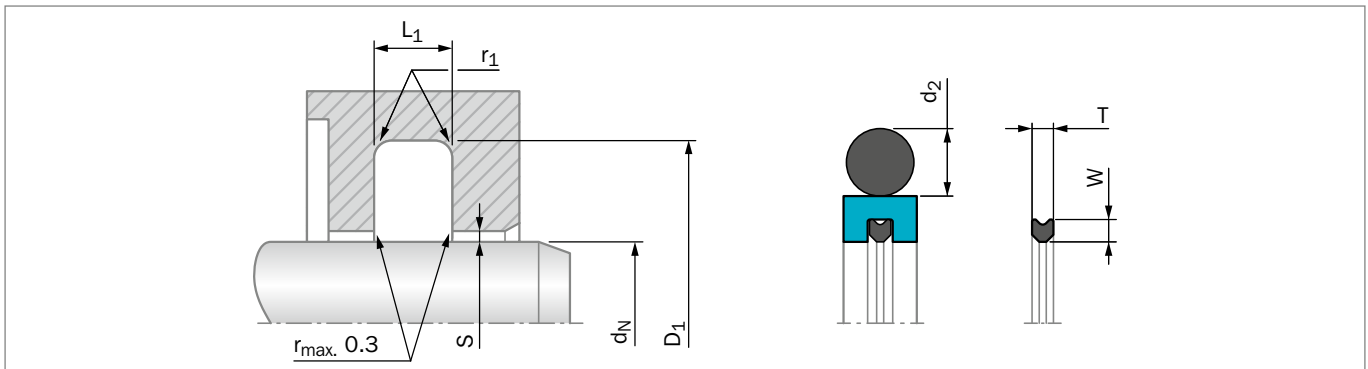


Figure 83: Installation Drawing

Table 61: Installation Dimensions – Standard Installation

Series No.	Rod Diameter d_N f8/h9		Groove Diameter D_1 H9	Groove Width $L_1 +0.2$	Radius r_1 max	Radial Clearance S_{max}^*			O-Ring Cross Section d_2	Bean Seal Cross Section	
	Standard Application	Available Range				10 MPa	20 MPa	40 MPa		W	T
RQB20	19 - 37.9	18 - 450.0	$d_N + 10.7$	4.2	1.0	0.25	0.15	0.10	3.53	1.70	1.70
RQB30	38 - 199.9	30 - 650.0	$d_N + 15.1$	6.3	1.3	0.30	0.20	0.15	5.33	1.70	1.70
RQB40	200 - 255.9	105 - 999.9	$d_N + 20.5$	8.1	1.8	0.30	0.20	0.15	7.00	2.45	2.45
RQB80	256 - 649.9	120 - 999.9	$d_N + 24.0$	8.1	1.8	0.30	0.20	0.15	7.00	2.45	2.45
RQB50	650 - 999.9	285 - 999.9	$d_N + 27.3$	9.5	2.5	0.45	0.30	0.25	8.40	3.50	3.65
RQB5X	-	1,000 - 1,200.0	$d_N + 27.3$	9.5	2.5	0.45	0.40	0.35	8.40	3.50	3.65
RQB60**	-	650 - 999.9	$d_N + 38.0$	13.8	3.0	0.70	0.60	0.45	12.00	5.20	5.05
RQB6X**	1,000 - 2,200		$d_N + 38.0$	13.8	3.0	0.70	0.60	0.45	12.00	5.20	5.05

* At pressures > 40 MPa use diameter tolerance H8/f8 (bore/rod) in the area of the seal use Turcon® AQ-Seal® 5 CR or consult your local Customer Solution Center for alternative material or profiles.

Slydring® / Wear Rings are not applicable at very small radial clearances please consult the Slydring® section in this catalog.

All AQ-Seal® supplied without Bean Seals must have "W" in the 5th character of the TSS Article Number.

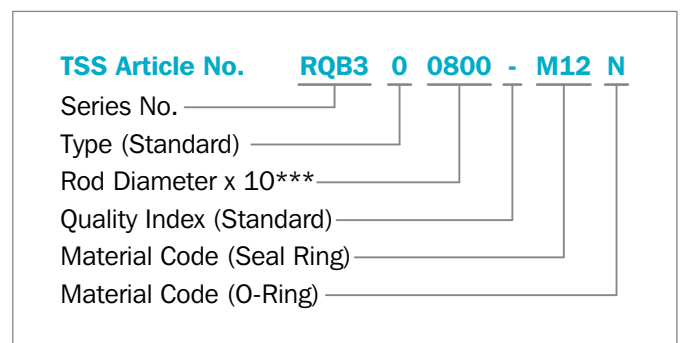
** All O-Rings with 12 mm cross section are delivered as a special profile ring.

ORDERING EXAMPLE

Turcon® AQ-Seal® complete with Bean Seal and O-Ring, standard application:

Series:	RQB30 from Table 61
Rod diameter:	$d_N = 80.0$ mm
TSS Part No.:	RQB300800 from Table 62

Select the material from Table 59. The corresponding code numbers are appended to the TSS Part No. Together these form the TSS Article Number. The TSS Article Number for all intermediate sizes can be determined by following the example:



*** For diameters $d_N \geq 1,000.0$ mm multiply only by factor 1.
 Example: RQB5X for diameter $d_N = 1,200.0$ mm
 TSS Article No.: RQB5X1200-M12N



Table 62: Installation Dimensions / TSS Part No

Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size	Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size
d _N f8/h9	D ₁ H9	L ₁ +0.2			d _N f8/h9	D ₁ H9	L ₁ +0.2		
18.0	28.7	4.2	RQB200180	21.82 x 3.53	95.0	110.1	6.3	RQB300950	100.97 x 5.33
20.0	30.7	4.2	RQB200200	25.00 x 3.53	100.0	110.7	4.2	RQB201000	104.37 x 3.53
22.0	32.7	4.2	RQB200220	26.58 x 3.53	100.0	115.1	6.3	RQB301000	107.32 x 5.33
25.0	35.7	4.2	RQB200250	29.75 x 3.53	105.0	115.7	4.2	RQB201050	110.72 x 3.53
28.0	38.7	4.2	RQB200280	32.92 x 3.53	105.0	120.1	6.3	RQB301050	110.49 x 5.33
30.0	40.7	4.2	RQB200300	34.52 x 3.53	110.0	120.7	4.2	RQB201100	113.89 x 3.53
32.0	42.7	4.2	RQB200320	36.09 x 3.53	110.0	125.1	6.3	RQB301100	116.84 x 5.33
35.0	45.7	4.2	RQB200350	40.87 x 3.53	110.0	131.0	8.1	RQB401100	120.02 x 7.00
36.0	46.7	4.2	RQB200360	40.87 x 3.53	115.0	125.7	4.2	RQB201150	120.24 x 3.53
40.0	50.7	4.2	RQB200400	44.04 x 3.53	115.0	130.1	6.3	RQB301150	120.02 x 5.33
40.0	55.1	6.3	RQB300400	46.99 x 5.33	120.0	130.7	4.2	RQB201200	126.59 x 3.53
42.0	52.7	4.2	RQB200420	47.22 x 3.53	120.0	135.1	6.3	RQB301200	126.37 x 5.33
42.0	57.1	6.3	RQB300420	46.99 x 5.33	125.0	135.7	4.2	RQB201250	129.77 x 3.53
45.0	55.7	4.2	RQB200450	50.39 x 3.53	125.0	140.1	6.3	RQB301250	132.72 x 5.33
45.0	60.1	6.3	RQB300450	50.17 x 5.33	130.0	140.7	4.2	RQB201300	136.12 x 3.53
48.0	58.70	4.2	RQB200480	53.57 x 3.55	130.0	145.1	6.3	RQB301300	135.89 x 5.33
48.0	63.1	6.3	RQB300480	53.34 x 5.33	135.0	145.7	4.2	RQB201350	139.29 x 3.53
50.0	60.70	4.2	RQB200500	53.57 x 3.53	135.0	150.1	6.3	RQB301350	142.24 x 5.33
50.0	65.1	6.3	RQB300500	56.52 x 5.33	140.0	150.7	4.2	RQB201400	145.64 x 3.53
52.0	62.7	4.2	RQB200520	56.74 x 3.53	140.0	155.1	6.3	RQB301400	145.42 x 5.33
52.0	67.1	6.3	RQB300520	56.52 x 5.33	145.0	155.7	4.2	RQB201450	148.82 x 3.53
55.0	65.7	4.2	RQB200550	59.92 x 3.53	145.0	160.1	6.3	RQB301450	151.77 x 5.33
55.0	70.1	6.3	RQB300550	59.69 x 5.33	150.0	165.1	6.3	RQB301500	158.12 x 5.33
56.0	66.7	4.2	RQB200560	59.92 x 3.53	160.0	175.1	6.3	RQB301600	164.47 x 5.33
56.0	71.1	6.3	RQB300560	62.87 x 5.33	160.0	180.5	8.1	RQB401600	170.82 x 7.00
60.0	70.7	4.2	RQB200600	63.09 x 3.53	165.0	180.1	6.3	RQB301650	170.82 x 5.33
60.0	75.1	6.3	RQB300600	66.04 x 5.33	170.0	180.7	4.2	RQB201700	177.39 x 3.53
63.0	73.7	4.2	RQB200630	66.27 x 3.53	170.0	185.1	6.3	RQB301700	177.17 x 5.33
63.0	78.1	6.3	RQB300630	69.22 x 5.33	175.0	190.1	6.3	RQB301750	183.52 x 5.33
65.0	80.1	6.3	RQB300650	72.39 x 5.33	180.0	190.7	4.2	RQB201800	183.74 x 3.53
70.0	80.7	4.2	RQB200700	75.79 x 3.53	180.0	195.1	6.3	RQB301800	189.87 x 5.33
70.0	85.1	6.3	RQB300700	75.57 x 5.33	180.0	200.5	8.1	RQB401800	189.87 x 7.00
75.0	85.7	4.2	RQB200750	78.97 x 3.53	190.0	201.0	4.2	RQB201900	196.44 x 3.53
75.0	90.1	6.3	RQB300750	81.92 x 5.33	190.0	205.1	6.3	RQB301900	196.22 x 5.33
80.0	90.7	4.2	RQB200800	85.32 x 3.53	200.0	215.1	6.3	RQB302000	208.92 x 5.33
80.0	95.1	6.3	RQB300800	85.09 x 5.33	200.0	220.5	8.1	RQB402000	208.92 x 7.00
85.0	100.1	6.3	RQB300850	91.44 x 5.33	210.0	225.1	6.3	RQB302100	215.27 x 5.33
90.0	100.7	4.2	RQB200900	94.84 x 3.53	220.0	235.1	6.3	RQB302200	227.97 x 5.33
90.0	105.1	6.3	RQB300900	97.79 x 5.33	220.0	240.5	8.1	RQB402200	227.97 x 7.00
95.0	105.7	4.2	RQB200950	101.19 x 3.53	230.0	245.1	6.3	RQB302300	234.32 x 5.33



Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size
d_N f8/h9	D_1 H9	L_1 +0.2		
230.0	250.5	8.1	RQB402300	240.67 x 7.00
240.0	255.1	6.3	RQB302400	247.02 x 5.33
240.0	260.5	8.1	RQB402400	253.37 x 7.00
250.0	270.5	8.1	RQB402500	266.07 x 7.00
260.0	284.0	8.1	RQB802600	266.07 x 7.00
270.0	290.5	8.1	RQB402700	278.77 x 7.00
270.0	294.0	8.1	RQB802700	278.77 x 7.00
280.0	300.5	8.1	RQB402800	291.47 x 7.00
280.0	304.0	8.1	RQB802800	291.47 x 7.00
300.0	324.0	8.1	RQB803000	316.87 x 7.00
320.0	344.0	8.1	RQB803200	329.57 x 7.00
350.0	370.5	8.1	RQB403500	354.97 x 7.00
350.0	374.0	8.1	RQB803500	367.67 x 7.00
360.0	384.0	8.1	RQB803600	367.67 x 7.00
400.0	420.5	8.1	RQB404000	405.26 x 7.00
400.0	424.0	8.1	RQB804000	417.96 x 7.00
450.0	474.0	8.1	RQB804500	468.76 x 7.00
500.0	524.0	8.1	RQB805000	506.86 x 7.00
550.0	574.0	8.1	RQB805500	557.66 x 7.00
600.0	624.0	8.1	RQB806000	608.08 x 7.00
650.0	677.3	9.5	RQB506500	663.00 x 8.40
700.0	724.0	8.1	RQB807000	712.00 x 7.00
800.0	827.3	9.5	RQB508000	813.00 x 8.40
900.0	927.3	9.5	RQB509000	913.00 x 8.40
1,000.0	1,027.3	9.5	RQB5X1000	1,013.00 x 8.40
1,000.0	1,038.0	13.8	RQB6X1000	1,016.00 x 12.00
1,100.0	1,138.0	13.8	RQB6X1100	1,116.00 x 12.00
1,200.0	1,227.3	9.5	RQB5X1200	1,213.00 x 8.40
1,200.0	1,238.0	13.8	RQB6X1200	1,216.00 x 12.00
1,300.0	1,338.0	13.8	RQB6X1300	1,316.00 x 12.00
1,500.0	1,538.0	13.8	RQB6X1500	1,516.00 x 12.00
2,000.0	2,038.0	13.8	RQB6X2000	2,016.00 x 12.00
2,200.0	2,238.0	13.8	RQB6X2200	2,216.00 x 12.00

The rod diameters in **bold** type are in accordance with the recommendations of ISO 3320.

Other dimensions and all intermediate sizes up to 2,200 mm diameter, including imperial (inch) sizes converted to mm, can be supplied.

All O-Rings with 12 mm cross section are delivered as special profiling.

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Turcon® AQ-Seal® 5 with Bean Seal



Double-acting

Rubber-energized plastic-faced seal

Material:

Turcon®, Zurcon® and Elastomer



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Turcon® AQ-Seal® 5 with Bean Seal*



Description

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

The particular characteristics of AQ-Seal® 5 with Bean Seal are the seal profile with a defined seal edge and the use of two O-Rings as energizing elements to optimize the pressure profile and to reduce the gas permeability.

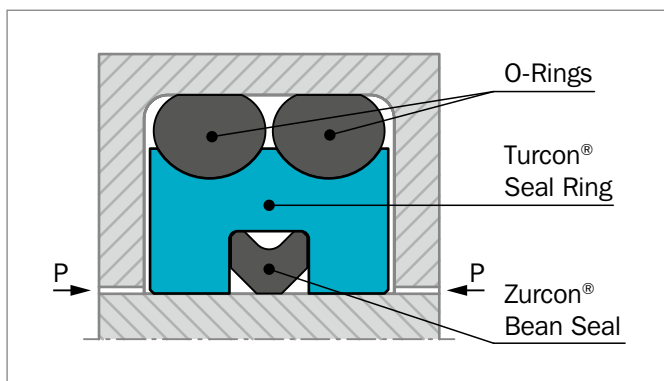


Figure 84: Turcon® AQ-Seal® 5 with Bean Seal

AQ-Seal® 5 with Bean Seal combines the benefits of a low-friction Turcon® slipper seal with the high sealing characteristics of an elastomeric seal by incorporating a limited foot print Bean Seal in the dynamic sealing face. This optimizes leakage control while minimizing friction.

ADVANTAGES

- High sealing effect in applications requiring media separation, e.g. fluid/fluid or fluid/gas
- Double security through the combination of low-friction special materials with elastomer seals
- Higher pressure application, higher sliding speed compared to AQ-Seal® 5 with Quad-Ring®
- Outstanding sliding properties, no stick-slip effect.
- Available for any rod diameters from 32 mm and up to 2,200 mm

APPLICATION EXAMPLES

TurconAQ-Seal® 5 is mainly designed for heavy duty and large diameter applications and is recommended as double acting piston seal for hydraulic equipment such as:

- Mobile hydraulics
- Presses
- Stabilizers
- Heavy duty suspension cylinders
- Media separation of fluid /fluid or fluid/gas; please note that one of the media must be lubricating
- Hydro-pneumatic suspensions for heavy vehicles
- Cylinders with retaining function over longer periods such as jacks and support cylinders

OPERATING CONDITIONS

Pressure:	Up to 60 MPa with mineral oil Up to 40 MPa for media with low lubricating properties
Speed:	Up to 3 m/s with linear movements
Temperature:	-45 °C to +110 °C depending on seal, O-Ring and Bean Seal material
Media:	Mineral oil-based hydraulic fluids, flame retardant hydraulic fluids, phosphate ester and others, depending on temperature, seal, O-Ring and Bean Seal material compatibility see Table 63.
Clearance:	The maximum permissible radial clearance S_{max} is shown in Table 65 as a function of the operating pressure and functional diameter.

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.

* Patent application: WO 90/00693 A1



INSTALLATION INSTRUCTIONS

AQ-Seal® 5 is installed according to information on page 39 and 40.

RECOMMENDED MATERIALS

The following material combinations have proven effective for hydraulic applications:

Turcon® AQ-Seal® 5 in Turcon® M12

All round material for light to heavy hydraulic applications with linear movements in mineral oils, flame retardant hydraulic fluids and phosphate ester.

Bean Seal: Zurcon® Z54

O-Ring: NBR 70 Shore A N
FKM 70 Shore A V

Set code: M12N or M12V

Turcon® AQ-Seal® 5 in Turcon® T46

For medium to heavy applications with linear movements in mineral oils and other media with good lubrication:

Bean Seal: Zurcon® Z54

O-Ring: NBR 70 Shore A N
FKM 70 Shore A V

Set code: T46N or T46V

For specific applications, all Turcon® materials are available. Other material combinations are listed in Table 63.

**Table 63: Recommended Turcon® Materials for Turcon® AQ-Seal® 5**

Material, Applications, Properties	Code	O-Ring Material Shore A	Code	O-Ring Operating Temp. * °C	Mating Surface Material	MPa max. Dynamic
Turcon® M12 First material choice for seals in linear motion Overall improved properties For new constructions and updating For all commonly applied hydraulic fluids including fluids with low lubrication performance Lowest friction and best sliding properties Lowest wear on seals Improved absorption of abrasive contaminants Low wear or abrasion of counter surface BAM tested Mineral fiber and Additives filled Color: Dark gray	M12	NBR 70	N	-30 to +100	Steel	50
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod)	
		FKM 70	V	-10 to (+200)	Steel plated (rod) Cast iron Stainless steel Titanium	
Turcon® T08 For lubricating fluids and linear motion Very high compressive strength and extrusion resistance Hard counter surfaces is recommended Bronze filled Color: Light to dark brown, which may have variations in shading	T08	NBR 70	N	-30 to +100	Steel hardened Steel chrome plated (rod) Cast iron	60
		NBR 70 Low temp.	T	-45 to +80		
		FKM 70	V	-10 to (+200)		
Turcon® T10 For hydraulic and pneumatic For linear motion in lubricating and non-lubricating fluids High extrusion resistance Good chemical resistance Not for electrically conducting fluids Carbon, graphite filled BAM tested Color: Black	T10	NBR 70	N	-30 to +100	Steel	40
		NBR 70 Low temp.	T	-45 to +80	Steel chrome plated (rod)	
		FKM 70	V	-10 to (+200)	Stainless steel	
Turcon® T29 For lubricating and non-lubricating fluids Good extrusion resistance Surface texture is not suitable for gas sealing Not for electrically conducting fluids Carbon fiber filled Color: Gray	T29	NBR 70	N	-30 to +100	Steel	30
		NBR 70 Low temp.	T	-45 to +80	Steel chrome plated (rod)	
		FKM 70	V	-10 to (+200)	Cast iron Stainless steel	

Table continues on next page



Material, Applications, Properties	Code	O-Ring Material Shore A	Code	O-Ring Operating Temp.* °C	Mating Surface Material	MPa max. Dynamic
Turcon® T40 For lubricating and non-lubricating fluids High frequency and short strokes Water hydraulics Surface texture is not suitable for gas sealing Carbon fiber filled Color: Gray	T40	NBR 70	N	-30 to +100	Steel	25
		NBR 70 Low temp.	T	-45 to +80	Steel chrome plated (rod)	
		FKM 70	V	-10 to (+200)	Cast iron Stainless steel Aluminum	
Turcon® T46 For lubricated hydraulics in linear motion High compressive strength High extrusion resistance Very good sliding and wear properties Bronze filled BAM tested Color: Light to dark brown, which may have variations in shading.	T46	NBR 70	N	-30 to +100	Steel hardened	50
		NBR 70 Low temp.	T	-45 to +80	Steel chrome plated (rod)	
		FKM 70	V	-10 to (+200)	Cast iron	
Zurcon® Z80 For lubrication and non-lubrication fluids Water based fluids, air and gases Dry air pneumatics High abrasion and extrusion resistance For service in abrasive conditions and media with particles Good chemical resistance Limited temperature capability (-60 to +80 °C) UHMWPE (Ultra High Molecular Weight Polyethylene) Color: White to off-white	Z80	NBR 70	N	-30 to (+100)	Steel	35
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod) Stainless steel Aluminum Ceramic coating	

* The O-Ring Operation Temperature is only valid in mineral hydraulic oil.

BAM: Tested by "Bundesanstalt Materialprüfung, Germany"

Highlighted materials are recommended.

Table 64: Zurcon® Z54 for Bean Seal

Material, Applications, Properties	Code	O-Ring Material Shore A	Code	O-Ring Operating Temp.* °C	Mating Surface Material
Zurcon® Z54 For mineral oil based fluids Linear and slowly turning movements High sealing effect High abrasion resistance Good extrusion resistance Limited chemical resistance Max. working temperature +110 °C Cast Polyurethane Color: Turquoise	Z54	-	-	-	Steel Steel hardened Steel chrome plated (rod) Cast iron Stainless steel Ceramic coating



■ Installation Recommendation

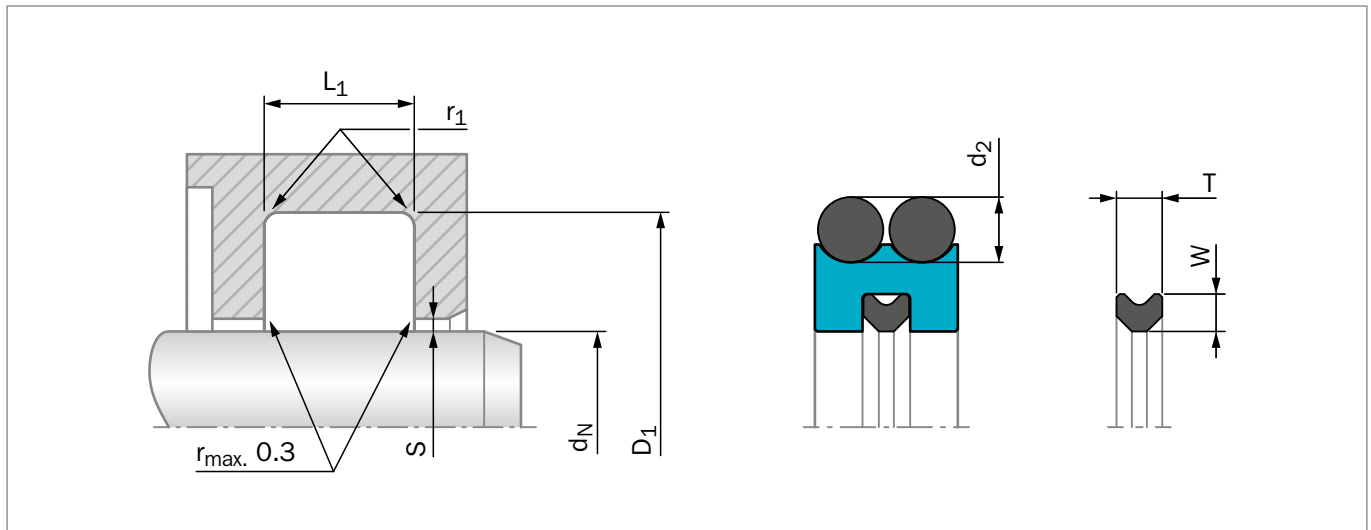


Figure 85: Installation Drawing

Table 65: Installation Dimensions – Standard installation

Series No.	Rod Diameter d_N f8/h9		Groove Diameter D_1 H9	Groove Width L_1 +0.2	Radius r_{1max}	Radial Clearance S_{max}^*			O-Ring Cross Section d_2	Bean Seal Cross Section W T	
	Standard Application	Available Range				10 MPa	20 MPa	40 MPa		W	T
RQC10	40 - 79.9	32 - 250.0	$d_N + 10.0$	6.3	0.6	0.30	0.20	0.15	2.62	1.70	1.70
RQC20	80 - 132.9	50 - 450.0	$d_N + 13.0$	8.3	1.0	0.40	0.30	0.15	3.53	2.52	2.65
RQC30	133 - 462.9	80 - 650.0	$d_N + 18.0$	12.3	1.3	0.40	0.30	0.20	5.33	3.50	3.65
RQC40	463 - 999.9	180 - 999.9	$d_N + 31.0$	16.3	1.8	0.50	0.40	0.30	7.00	5.20	5.05
RQC4X	1,000 - 2,200.0	1,000 - 2,200.0	$d_N + 31.0$	16.3	1.8	0.50	0.40	0.30	7.00	5.20	5.05

*At pressures > 40 MPa use diameter tolerance H8/f8 (bore/rod) in the area of the seal use Turcon® AQ-Seal® 5 CR or consult your local Customer Solution Center for alternative material or profiles.

Slydring® / Wear Rings are not applicable at very small radial clearances please consult the Slydring® section in this catalog.

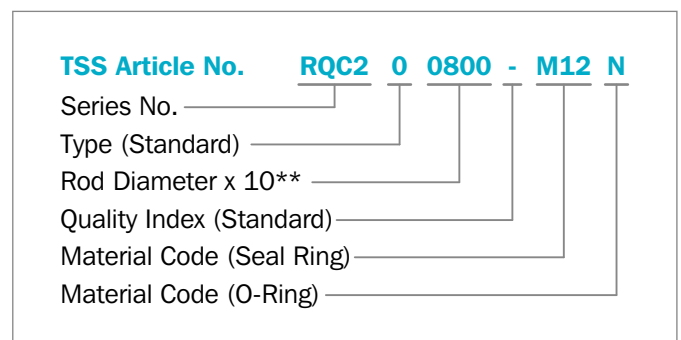
All AQ-Seal® supplied without Bean Seals must have "W" in the 5th character of the TSS Article Number.

ORDERING EXAMPLE

AQ-Seal® 5 complete with Bean Seal and O-Rings, standard application:

Series:	RQC20 from Table 65
Rod diameter:	$d_N = 80.0$ mm
TSS Part No.:	RQC200800 from Table 66

Select the material from Table 63. The corresponding code numbers are appended to the TSS Part No. Together these form the TSS Article Number. The TSS Article Number for all intermediate sizes can be determined by following the example:



** For diameters $d_N \geq 1,000.0$ mm multiply only by factor 1.

Example: RQC4X for diameter $d_N = 1,200.0$ mm

TSS Article No.: RQC4X1200-M12N



Table 66: Installation Dimensions / TSS Part No.

Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size	Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size
d_N f8/h9	D_1 H9	L_1 +0.2			d_N f8/h9	D_1 H9	L_1 +0.2		
40.0	50.0	6.3	RQC100400	44.12 x 2.62	160.0	178.0	12.3	RQC301600	164.47 x 5.33
42.0	52.0	6.3	RQC100420	47.29 x 2,62	170.0	188.0	12.3	RQC301700	177.17 x 5.33
45.0	55.0	6.3	RQC100450	50.47 x 2.62	180.0	198.0	12.3	RQC301800	183.52 x 5.33
48.0	58.0	6.3	RQC100480	52.07 x 2.62	190.0	208.0	12.3	RQC301900	196.22 x 5.33
50.0	60.0	6.3	RQC100500	55.25 x 2.62	200.0	218.0	12.3	RQC302000	208.92 x 5.33
50.0	63.0	8.3	RQC200500	56.74 x 3.53	220.0	238.0	12.3	RQC302200	227.97 x 5.33
52.0	62.0	6.3	RQC100520	56.82 x 2.62	230.0	248.0	12.3	RQC302300	234.32 x 5.33
55.0	65.0	6.3	RQC100550	59.99 x 2.62	240.0	258.0	12.3	RQC302400	247.02 x 5.33
56.0	66.0	6.3	RQC100560	61.60 x 2.62	250.0	258.0	12.3	RQC302500	253.37 x 5.33
56.0	69.0	8.3	RGC200560	63.09 x 3.53	280.0	298.0	12.3	RQC302800	291.47 x 5.33
60.0	70.0	6.3	RQC100600	64.77 x 2.62	300.0	318.0	12.3	RQC303000	304.17 x 5.33
60.0	73.0	8.3	RQC200600	66.27 x 3.53	320.0	338.0	12.3	RQC303200	329.57 x 5.33
63.0	73.0	6.3	RQC100630	67.95 x 2.62	350.0	368.0	12.3	RQC303500	354.97 x 5.33
63.0	76.0	8.3	RQC200630	69.44 x 3.53	400.0	418.0	12.3	RQC304000	405.26 x 5.33
65.0	75.0	6.3	RQC100650	69.52 X 2.62	420.0	438.0	12.3	RQC304200	430.66 x 5.33
70.0	80.0	6.3	RQC100700	75.87 X 2.62	450.0	468.0	12.3	RQC304500	456.06 x 5.33
70.0	83.0	8.3	RQC200700	75.79 X 3.53	465.0	496.0	16.3	RQC404650	481.38 x 7.00
75.0	85.0	6.3	RQC100750	82.22 X 2.62	480.0	511.0	16.3	RQC404800	494.16 x 7.00
75.0	88.0	8.3	RQC200750	82.14 X 3.53	500.0	531.0	16.3	RQC405000	506.86 x 7.00
80.0	90.0	6.3	RQC100800	82.22 x 2.62	550.0	581.0	16.3	RQC405500	557.66 x 7.00
80.0	93.0	8.3	RQC200800	85.32 x 3.53	600.0	631.0	16.3	RQC406000	608.08 x 7.00
85.0	98.0	8.3	RQC200850	91.67 x 3,53	650.0	681.0	16.3	RQC406500	668.00 x 7.00
90.0	100.0	6.3	RQC100900	94.92 x 2.62	700.0	731.0	16.3	RQC407000	718.00 x 7.00
90.0	103.0	8.3	RQC200900	94.84 x 3.53	750.0	781.0	16.3	RQC407500	768.00 x 7.00
95.0	108.0	8.3	RQC200950	101.19 x 3.53	800.0	831.0	16.3	RQC408000	818.00 x 7.00
100.0	110.0	6.3	RQC101000	101.27 x 2.62	850.0	881.0	16.3	RQC408500	868.00 x 7.00
100.0	113.0	8.3	RQC201000	104.37 x 3.53	900.0	931.0	16.3	RQC409000	918.00 x 7.00
105.0	118.0	8.3	RQC201050	110.72 x 3.53	950.0	981.0	16.3	RQC409500	968.00 x 7.00
110.0	120.0	6.3	RQC101100	113.97 x 2.62	1,000.0	1,031.0	16.3	RQC4X1000	1,018.00 x 7.00
110.0	123.0	8.3	RQC201100	117.07 x 3.53	1,050.0	1,081.0	16.3	RQC4X1050	1,068.00 x 7.00
115.0	128.0	8.3	RQC201150	120,24 x 3,53	1,200.0	1,231.0	16.3	RQC4X1200	1,218.00 x 7.00
120.0	133.0	8.3	RQC201200	126.59 x 3.53	1,300.0	1,331.0	16.3	RQC4X1300	1,318.00 x 7.00
120.0	138.0	12.3	RQC301200	126.37 x 5.33	1,400.0	1,431.0	16.3	RQC4X1400	1,418.00 x 7.00
125.0	138.0	8.3	RQC201250	129.77 x 3.53	1,500.0	1,531.0	16.3	RQC4X1500	1,518.00 x 7.00
125.0	143.0	12.3	RQC301250	132.72 x 5.33	2,000.0	2,031.0	16.3	RQC4X2000	2,018.00 x 7.00
130.0	143.0	8.3	RQC201300	136.12 x 3.53	2,200.0	2,231.0	16.3	RQC4X2200	2,218.00 x 7.00
130.0	148.0	12.3	RQC301300	135.89 x 5.33	<p>The rod diameters in bold type are in accordance with the recommendations of ISO 3320.</p> <p>Other dimensions and all intermediate sizes up to 2,200 mm diameter, including imperial (inch) sizes converted to mm, can be supplied.</p>				
135.0	148.0	8.3	RQC201350	139.29 x 3.53					
135.0	153.0	12.3	RQC301350	142.24 x 5.33					
140.0	158.0	12.3	RQC301400	145.42 x 5.33					
150.0	168.0	12.3	RQC301500	158.12 x 5.33					
160.0	173.0	8.3	RQC201600	164.69 x 3.53					

Zurcon® Wynseal M



Double-acting

Rubber-energized plastic-faced seal

Material:

Turcon®, Zurcon® and Elastomer



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■ Zurcon® Wynseal M



■ Description

Zurcon® Wynseal M for rod sealing is a modified machined version of the Zurcon® Wynseal design.

Zurcon® Wynseal M is a double-acting seal consisting of a Zurcon® or Turcon® seal ring and an O-Ring as energizing element - Figure 86.

The seal is designed with a seal edge profile. Two seal edges act as primary seal for pressures from both sides and prevent build-up of hydrodynamic pressure over the seal profile and the risk of blow-by effect. The central sealing and supporting rib increases the sealing effect*.

Radial notches are provided on both sides to provide activation of the energizing O-Ring. These ensure direct pressure loading of the seal under all operating conditions.

Installation groove is identical to that of Turcon® Glyd Ring®.

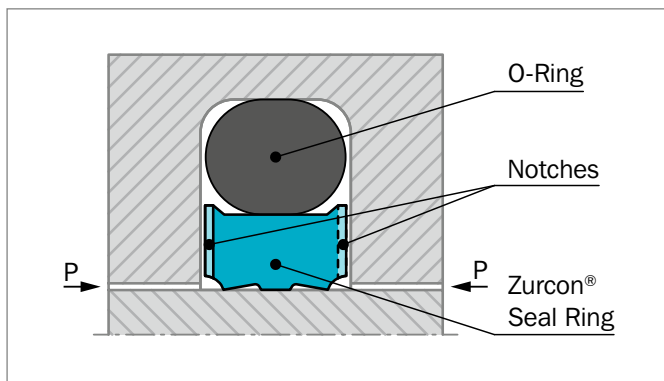


Figure 86: Zurcon® Wynseal M

* Only from RW52 and the following Series No.; RW50 is without seal edge profile and RW51 is without supporting rib.

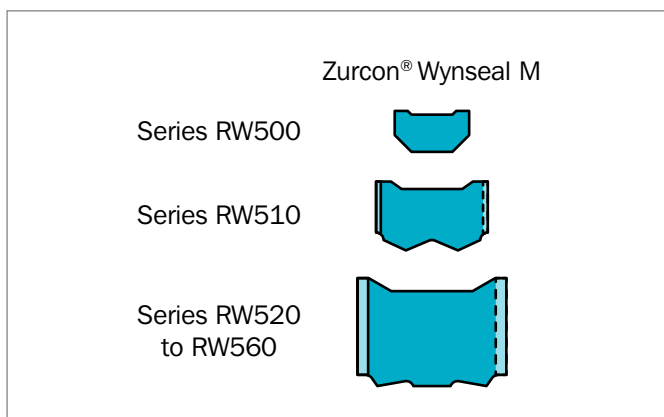


Figure 87: Zurcon® Wynseal M series profile

ADVANTAGES

- High static and dynamic sealing effect
- High abrasion resistance (Zurcon® materials)
- Simple groove design, one-piece piston possible
- Diameter range - from 3 to 2,600 mm
- Fits Stepseal® 2K groove as well as ISO 7425-2 seal housing
- Low friction
- Higher temperature (Turcon® materials)
- Higher pressure
- High chemical resistance

APPLICATION EXAMPLES

Zurcon® Wynseal M is used as double acting rod seal for hydraulic components in applications such as:

- Machine tools
- Forklifts & handling machinery
- Agriculture
- Industrial hydraulics light to medium duty



OPERATING CONDITIONS

Pressure:	Up to 50 MPa
Speed:	Up to 10 m/s
Temperature:	-45 °C to +200 °C depending on seal and O-Ring material
Media:	Mineral oil-based hydraulic fluids, flame retardant hydraulic fluids, environmentally friendly hydraulic fluids (bio-oils), phosphate ester, water and others, depending on temperature, seal and O-Ring material compatibility - see Table 67.
Clearance:	The maximum permissible radial clearance S_{max} is shown in Table 68, as a function of the operating pressure and functional diameter.

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.

INSTALLATION INSTRUCTIONS

Wynseal® M is installed according to information on page 39 to page 40.

Closed groove installation applies same dimensions as for Turcon® Stepseal® 2K in Table 6 page 40.

RECOMMENDED MATERIALS

The following material combinations have proven effective for hydraulic applications:

Turcon® Wynseal M in Zurcon® Z54

For light to medium hydraulic applications with linear movements in mineral oils and other media with good lubrication:

O-Ring: NBR 70 Shore A N

Set code: Z54N

Turcon® Wynseal M in Turcon® M12

All round material for light to heavy hydraulic applications with linear, short stroke or helical movements in mineral oils, flame retardant hydraulic fluids, phosphate ester, bio-oils or fluids having low lubricating properties:

O-Ring: NBR 70 Shore A N
FKM 70 Shore A V

Set code: M12N or M12V

For specific applications, all Turcon® materials are available.

Other material combinations are listed in Table 67.

**Table 67: Turcon® and Zurcon® Materials for Zurcon® Wynseal M**

Material, Applications, Properties	Code	O-Ring Material Shore A	Code	O-Ring Operating Temp.* °C	Mating Surface Material	MPa max. Dynamic
Turcon® M12 First material choice for seals in linear motion Overall improved properties For new constructions and updating For all commonly applied hydraulic fluids including fluids with low lubrication performance Lowest friction and best sliding properties Lowest wear on seals Improved absorption of abrasive contaminants Low wear or abrasion of counter surface BAM tested Mineral fiber and Additives filled Color: Dark gray	M12	NBR 70	N	-30 to +100	Steel	35
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod)	
		FKM 70	V	-10 to +200	Steel plated (rod) Cast iron Stainless steel Titanium	
Turcon® T08 For lubricating fluids and linear motion Very high compressive strength and extrusion resistance Hard counter surfaces is recommended Bronze filled Color: Light to dark brown, which may have variations in shading	T08	NBR 70	N	-30 to +100	Steel hardened	50
		NBR 70 Low temp.	T	-45 to +80	Steel chrome plated (rod)	
		FKM 70	V	-10 to +200	Cast iron	
Turcon® T40 For lubricating and non-lubricating fluids High frequency and short strokes Water hydraulics Surface texture is not suitable for gas sealing Carbon fiber filled Color: Gray	T40	NBR 70	N	-30 to +100	Steel	25
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod)	
		FKM 70	V	-10 to +200	Cast iron	
		EPDM 70	E**	-45 to +145	Stainless steel Aluminum	
Turcon® T46 For lubricated hydraulics in linear motion High compressive strength High extrusion resistance Very good sliding and wear properties BAM tested Bronze filled Color: Light to dark brown, which may have variations in shading.	T46	NBR 70	N	-30 to +100	Steel hardened	35
		NBR 70 Low temp.	T	-45 to +80	Steel chrome plated (rod)	
		FKM 70	V	-10 to +200	Cast iron	

Table continues on next page



Material, Applications, Properties	Code	O-Ring Material Shore A	Code	O-Ring Operating Temp.* °C	Mating Surface Material	MPa max. Dynamic
Zurcon® Z53*** For mineral oil based fluids Very high abrasion and extrusion resistance For counter surface with rougher surface finish Limited chemical resistance Max. working temperature +110 °C Cast polyurethane Color: Yellow to light-brown	Z53	NBR 70	N	-30 to +100	Steel	45
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod) Cast iron Stainless steel Ceramic coating	
Zurcon® Z54*** For mineral oil based fluids Linear and slowly turning movements High abrasion resistance For counter surface with rougher surface finish Good extrusion resistance Limited chemical resistance Max. working temperature +110 °C Cast polyurethane Color: Turquoise	Z54	NBR 70	N	-30 to +100	Steel	25
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod) Cast iron Stainless steel Ceramic coating	
Zurcon® Z80 For lubricating and non-lubricating fluids Water based fluids, air and gases Dry air pneumatics High abrasion and extrusion resistance For service in abrasive conditions and media with particles Good chemical resistance Limited temperature capability (-60 to +80 °C) UHMWPE (Ultra High Molecular Weight Polyethylene) Color: White to off-white	Z80	NBR 70	N	-30 to (+100)	Steel	30
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod)	
		EPDM 70	E**	-45 to (+145)	Stainless steel Aluminum Bronze Ceramic coating	

* The O-Ring Operation Temperature is only valid in mineral hydraulic oil - except EPDM.

** Material not suitable for mineral oils.

*** Max. diameter 2,200 mm

BAM Tested by "Bundesanstalt Materialprüfung, Germany"

 Highlighted materials are recommended.



Installation Recommendation

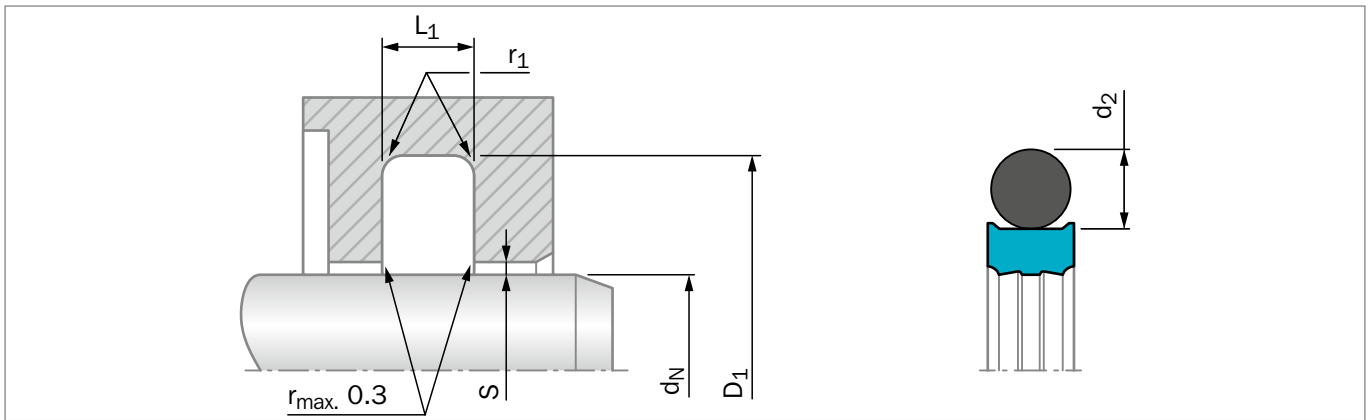


Figure 88: Installation Drawing

Table 68: Installation Dimensions - Standard Recommendations

Series No.	Rod Diameter d_N f8/h9		Groove Diameter*	Groove width	Radius	Radial Clearance S_{max}^{**}			O-Ring Cross Section
	Standard Application	Available Range	D_1 H9	$L_1 +0.2/-0$	r_1 max	10 MPa	20 MPa	40 MPa	d_2
RW500	3 - 7.9	3 - 130.0	$d_N + 4.9$	2.20	0.4	0.40	0.30	0.20	1.78
RW510	8 - 18.9	8 - 250.0	$d_N + 7.3$	3.20	0.6	0.60	0.50	0.30	2.62
RW520	19 - 37.9	8 - 450.0	$d_N + 10.7$	4.20	1.0	0.70	0.50	0.30	3.53
RW530	38 - 199.9	19 - 650.0	$d_N + 15.1$	6.30	1.3	0.80	0.60	0.40	5.33
RW540	200 - 255.9	38 - 650.0	$d_N + 20.5$	8.10	1.8	0.80	0.60	0.40	7.00
RW580	256 - 649.9	200 - 999.9	$d_N + 24.0$	8.10	1.8	0.90	0.70	0.50	7.00
RW550	650 - 999.9	256 - 999.9	$d_N + 27.3$	9.50	2.5	1.00	0.80	0.60	8.40
RW55X	1,000 - 1,200	-	$d_N + 27.3$	9.50	2.5	1.00	0.80	0.60	8.40
RW560***	-	650 - 999.9	$d_N + 38.0$	13.80	3.0	1.20	0.90	0.70	12.00
RW56X***	1,000 - 2,600****	-	$d_N + 38.0$	13.80	3.0	1.20	0.90	0.70	12.00

* Installation with groove dimensions to ISO 7425-2 is also recommended.

** At pressures > **40 MPa** use diameter tolerance H8/f8 (bore/rod) in the area of the seal or consult your local Customer Solution Center for alternative material or profiles. Slydring® / Wear Rings are not applicable at very small radial clearances please consult the Slydring® section in this catalog.

*** O-Rings with 12 mm cross section are delivered as special profile ring.

**** Z53 and Z54 max diameter 2,200 mm

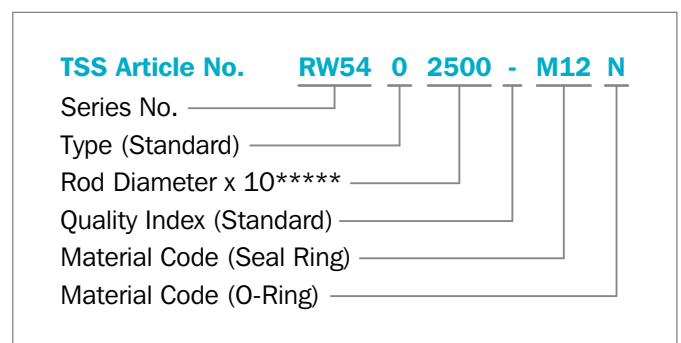
ORDERING EXAMPLE

Zurcon® Wynseal M complete with O-Ring, standard application:

Series:	RW540 from Table 68
Rod Diameter:	$d_N = 250.0$ mm
TSS Part No.:	RW5402500 from Table 69

Select the material from Table 67. The corresponding code numbers are appended to the TSS Part No. Together these form the TSS Article Number.

The TSS Article Number for all intermediate sizes can be determined by following the example:



***** For diameters $d_N \geq 1,000.0$ mm multiply only by factor 1.
 Example: RW56X for diameter $d_N = 1,200.0$ mm
 TSS Article No.: RW56X1200 - M12N



Table 69: Installation Dimensions / TSS Part No.

Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size	Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size
d_N f8/h9	D_1 H9	L_1 +0.2			d_N f8/h9	D_1 H9	L_1 +0.2		
3.0	7.9	2.2	RW5000030	4.47 x 1.78	48.0	58.7	4.2	RW5200480	51.50 x 3.55
4.0	8.9	2.2	RW5000040	5.60 x 1.80	48.0	63.1	6.3	RW5300480	53.34 x 5.33
5.0	9.9	2.2	RW5000050	6.70 x 1.80	50.0	60.7	4.2	RW5200500	53.57 x 3.53
6.0	10.9	2.2	RW5000060	7.65 x 1.78	50.0	65.1	6.3	RW5300500	56.52 x 5.33
8.0	12.9	2.2	RW5000080	9.50 x 1.80	52.0	62.7	4.2	RW5200520	56.74 x 3.53
8.0	15.3	3.2	RW5100080	10.77 x 2.62	52.0	67.1	6.3	RW5300520	56.52 x 5.33
10.0	14.9	2.2	RW5000100	11.80 x 1.80	55.0	65.7	4.2	RW5200550	59.92 x 3.53
10.0	17.3	3.2	RW5100100	12.37 x 2.62	55.0	70.1	6.3	RW5300550	59.69 x 5.33
12.0	16.9	2.2	RW5000120	13.20 x 1.80	56.0	66.7	4.2	RW5200560	59.92 x 3.53
12.0	19.3	3.2	RW5100120	14.50 x 2.65	56.0	71.1	6.3	RW5300560	59.69 x 5.33
14.0	18.9	2.2	RW5000140	15.60 x 1.78	60.0	70.7	4.2	RW5200600	63.09 x 3.53
14.0	21.3	3.2	RW5100140	17.12 x 2.62	60.0	75.1	6.3	RW5300600	66.04 x 5.33
15.0	19.9	2.2	RW5000150	17.17 x 1.78	63.0	73.7	4.2	RW5200630	66.27 x 3.53
15.0	22.3	3.2	RW5100150	17.12 x 2.62	63.0	78.1	6.3	RW5300630	69.22 x 5.33
16.0	20.9	2.2	RW5000160	17.17 x 1.78	65.0	80.1	6.3	RW5300650	69.22 x 5.33
16.0	23.3	3.2	RW5100160	18.72 x 2.62	70.0	80.7	4.2	RW5200700	75.79 x 3.53
18.0	22.9	2.2	RW5000180	19.00 x 1.80	70.0	85.1	6.3	RW5300700	75.57 x 5.33
18.0	25.3	3.2	RW5100180	20.29 x 2.62	75.0	85.7	4.2	RW5200750	78.97 x 3.53
20.0	27.3	3.2	RW5100200	21.89 x 2.62	75.0	90.1	6.3	RW5300750	81.92 x 5.33
20.0	30.7	4.2	RW5200200	23.40 x 3.53	80.0	90.7	4.2	RW5200800	85.32 x 3.53
22.0	29.3	3.2	RW5100220	25.07 x 2.62	80.0	95.1	6.3	RW5300800	85.09 x 5.33
22.0	32.7	4.2	RW5200220	26.58 x 3.53	85.0	100.1	6.3	RW5300850	91.44 x 5.33
25.0	32.3	3.2	RW5100250	26.64 x 2.62	90.0	100.7	4.2	RW5200900	94.84 x 3.53
25.0	35.7	4.2	RW5200250	29.75 x 3.53	90.0	105.1	6.3	RW5300900	94.62 x 5.33
28.0	35.3	3.2	RW5100280	29.82 x 2.62	95.0	105.7	4.2	RW5200950	101.19 x 3.53
28.0	38.7	4.2	RW5200280	32.92 x 3.53	95.0	110.1	6.3	RW5300950	100.97 x 5.33
30.0	37.3	3.2	RW5100300	32.99 x 2.62	100.0	110.7	4.2	RW5201000	104.37 x 3.53
30.0	40.7	4.2	RW5200300	34.52 x 3.53	100.0	115.1	6.3	RW5301000	107.32 x 5.33
32.0	39.3	3.2	RW5100320	34.59 x 2.62	105.0	115.7	4.2	RW5201050	110.72 x 3.53
32.0	42.7	4.2	RW5200320	36.09 x 3.53	105.0	120.1	6.3	RW5301050	110.49 x 5.33
35.0	42.3	3.2	RW5100350	37.77 x 2.62	110.0	120.7	4.2	RW5201100	113.89 x 3.53
35.0	45.7	4.2	RW5200350	37.69 x 3.53	110.0	125.1	6.3	RW5301100	116.84 x 5.33
36.0	43.3	3.2	RW5100360	39.34 x 2.62	110.0	130.5	8.1	RW5401100	116.84 x 7.00
36.0	46.7	4.2	RW5200360	40.87 x 3.53	115.0	125.7	4.2	RW5201150	120.24 x 3.53
40.0	50.7	4.2	RW5200400	44.04 x 3.53	115.0	130.1	6.3	RW5301150	120.02 x 5.33
40.0	55.1	6.3	RW5300400	43.82 x 5.33	120.0	130.7	4.2	RW5201200	123.42 x 3.53
42.0	52.7	4.2	RW5200420	47.22 x 3.53	120.0	135.1	6.3	RW5301200	126.37 x 5.33
42.0	57.1	6.3	RW5300420	46.99 x 5.33	125.0	135.7	4.2	RW5201250	129.77 x 3.53
45.0	55.7	4.2	RW5200450	50.39 x 3.53	125.0	140.1	6.3	RW5301250	129.54 x 5.33
45.0	60.1	6.3	RW5300450	50.17 x 5.33	130.0	140.7	4.2	RW5201300	136.12 x 3.53



Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size
d_N f8/h9	D_1 H9	L_1 +0.2		
130.0	145.1	6.3	RW5301300	135.89 x 5.33
135.0	145.7	4.2	RW5201350	139.29 x 3.53
135.0	150.1	6.3	RW5301350	139.07 x 5.33
140.0	150.7	4.2	RW5201400	145.64 x 3.53
140.0	155.1	6.3	RW5301400	145.42 x 5.33
145.0	155.7	4.2	RW5201450	148.82 x 3.53
145.0	160.1	6.3	RW5301450	151.77 x 5.33
150.0	165.1	6.3	RW5301500	158.12 x 5.33
160.0	175.1	6.3	RW5301600	164.47 x 5.33
160.0	180.5	8.1	RW5401600	170.82 x 7.00
165.0	180.1	6.3	RW5301650	170.82 x 5.33
170.0	180.7	4.2	RW5201700	177.39 x 3.53
170.0	185.1	6.3	RW5301700	177.17 x 5.33
175.0	190.1	6.3	RW5301750	183.52 x 5.33
180.0	190.7	4.2	RW5201800	183.74 x 3.53
180.0	195.1	6.3	RW5301800	183.52 x 5.33
180.0	200.5	8.1	RW5401800	189.87 x 7.00
190.0	200.7	4.2	RW5201900	196.44 x 3.53
190.0	205.1	6.3	RW5301900	196.22 x 5.33
200.0	215.1	6.3	RW5302000	208.92 x 5.33
200.0	220.5	8.1	RW5402000	208.90 x 7.00
210.0	225.1	6.3	RW5302100	215.27 x 5.33
220.0	235.1	6.3	RW5302200	227.97 x 5.33
220.0	240.5	8.1	RW5402200	227.97 x 7.00
230.0	245.1	6.3	RW5302300	234.32 x 5.33
230.0	250.5	8.1	RW5402300	240.67 x 7.00
240.0	255.1	6.3	RW5302400	247.02 x 5.33
240.0	260.5	8.1	RW5402400	253.37 x 7.00
250.0	270.5	8.1	RW5402500	266.07 x 7.00
260.0	284.0	8.1	RW5802600	266.07 x 7.00
270.0	290.5	8.1	RW5402700	278.77 x 7.00
270.0	294.0	8.1	RW5802700	278.77 x 7.00
280.0	300.5	8.1	RW5402800	291.47 x 7.00
280.0	304.0	8.1	RW5802800	291.47 x 7.00
300.0	324.0	8.1	RW5803000	316.87 x 7.00
320.0	344.0	8.1	RW5803200	329.57 x 7.00
350.0	370.5	8.1	RW5403500	354.97 x 7.00
350.0	374.0	8.1	RW5803500	367.67 x 7.00
360.0	384.0	8.1	RW5803600	367.67 x 7.00
400.0	420.5	8.1	RW5404000	405.26 x 7.00

Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size
d_N f8/h9	D_1 H9	L_1 +0.2		
400.0	424.0	8.1	RW5804000	417.96 x 7.00
450.0	474.0	8.1	RW5804500	468.76 x 7.00
500.0	524.0	8.1	RW5805000	506.86 x 7.00
550.0	574.0	8.1	RW5805500	557.66 x 7.00
600.0	624.0	8.1	RW5806000	608.08 x 7.00
650.0	677.3	9.5	RW5506500	663.00 x 8.40
700.0	724.0	8.1	RW5807000	712.00 x 8.40
800.0	827.3	9.5	RW5508000	813.00 x 8.40
900.0	927.3	9.5	RW5509000	913.00 x 8.40
1,000.0	1,027.3	9.5	RW55X1000	1,013.00 x 8.40
1,000.0	1,038.0	13.8	RW56X1000	1,016.00 x 12.00
1,100.0	1,138.0	13.8	RW56X1100	1,116.00 x 12.00
1,200.0	1,227.3	9.5	RW55X1200	1,213.00 x 8.40
1,200.0	1,238.0	13.8	RW56X1200	1,216.00 x 12.00
1,300.0	1,338.0	13.8	RW56X1300	1,316.00 x 12.00
1,500.0	1,538.0	13.8	RW56X1500	1,516.00 x 12.00
2,000.0	2,038.0	13.8	RW56X2000	2,016.00 x 12.00
2,600.0	2,638.0	13.8	RW56X2600	2,616.00 x 12.00

The rod diameters in **bold** type are in accordance with the recommendations of ISO 3320.

Other dimensions and all intermediate sizes up to 2,600 mm diameter including imperial (inch) sizes can be supplied.

All O-Rings with 12 mm cross section are delivered as special profile ring.

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Turcon® Double Delta®



Double-acting

Rubber-energized plastic-faced seal

For O-Ring Grooves

Material:

Turcon®, Zurcon® and Elastomer



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Turcon® Double Delta®



Description

Turcon® Double Delta® is a rubber energized plastic faced seal, designed to expand and significantly improve the service parameters of O-Rings. Double Delta® can be installed in existing O-Ring grooves.

Double Delta® combines the flexibility and responsiveness of O-Rings with the wear and friction characteristics of the Turcon® materials in dynamic applications.

The double-acting performance of the seal follows from the symmetrical cross section which allows the seal to respond to pressure in both directions - Figure 89.

Initial contact pressure is provided by radial compression of the O-Ring. When the system pressure is increased the O-Ring transforms this into additional contact pressure, the contact pressure of the seal is thereby automatically adjusted so sealing is ensured under all service conditions.

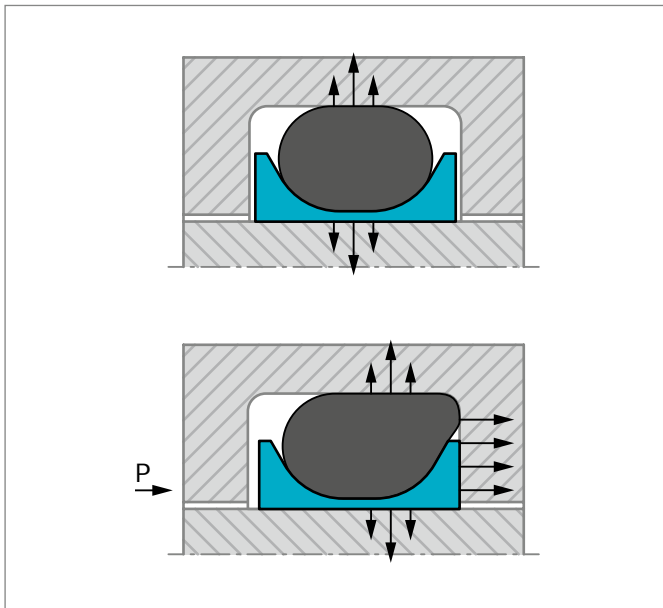


Figure 89: Turcon® Double Delta® without and with pressure

ADVANTAGES

- Compact groove dimensions and simple installation
- Low friction without stick-slip
- Resistance against wear and extrusion
- Rod seals available for all diameters from 2 to 999.9 mm
- Standard cross sections cover AS 568A and important metric O-Rings, other cross sections available on request.
- Fits also groove dimensions per ISO 6194 and AS 4716

APPLICATION EXAMPLES

Turcon® Double Delta® is used as double-acting seal for hydraulic and pneumatic components in applications such as:

- Machine tools
- Handling devices
- Valves
- Chemical processing equipment

It is particular recommended for light duty and small diameter applications.

OPERATING CONDITIONS

Pressure:	Up to 35 MPa
Speed:	Up to 15 m/s
Temperature:	-45 °C to +200 °C according to O-Ring material
Media:	Mineral oil-based hydraulic fluids, flame retardant hydraulic fluids, environmentally friendly hydraulic fluids (bio-oils), phosphate ester, water and others, depending on temperature, seal and O-Ring material compatibility - see Table 71
Clearance:	The maximum permissible radial clearance S_{max} is shown in Table 72, as a function of the operating pressure and functional diameter.

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.



NOTCH

Double Delta® is as standard supplied without radial notches, as the thin radial section of the seal gives good response to pressure variations.

For diameters from 2 mm, notches on both sides are optional. These ensure direct pressurizing of the seal under all operating conditions.

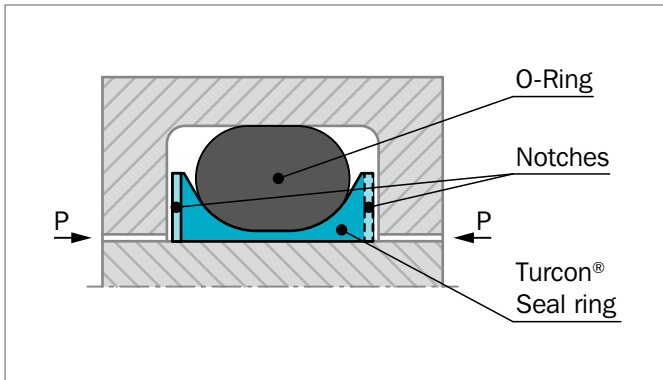


Figure 90: Turcon® Double Delta® with notches

INSTALLATION INSTRUCTIONS

Double Delta® is installed according to information on page 42.

RECOMMENDED MATERIALS

The following material combinations have proven effective for hydraulic applications:

Turcon® Double Delta® in Turcon® M12

All round material for light to medium hydraulic applications with linear or helical movements in mineral oils, flame retardant hydraulic fluids, phosphate ester, bio-oils or fluids having low lubricating properties:

O-Ring:	NBR 70 Shore A	N
	FKM 70 Shore A	V
	EPDM 70 Shore A	E

Set code: M12N, M12V or M12E

Turcon® Double Delta® in Turcon® T46

For light to medium applications with linear movements in mineral oils and other media with good lubrication:

O-Ring:	NBR 70 Shore A	N
	FKM 70 Shore A	V

Set code: T46N or T46V

For specific applications, all Turcon® materials are available.

Other material combinations are listed in Table 70.

**Table 70: Turcon® and Zurcon® Materials for Turcon® Double Delta®**

Material, Applications, Properties	Code	O-Ring Material Shore A	Code	O-Ring Operating Temp.* °C	Mating Surface Material	MPa max. Dynamic
Turcon® M12 First material choice for seals in linear motion Overall improved properties For new constructions and updating For all commonly applied hydraulic fluids including fluids with low lubrication performance Lowest friction and best sliding properties Lowest wear on seals Improved absorption of abrasive contaminants Low wear or abrasion of counter surface BAM tested Mineral fiber and Additives filled Color: Dark gray	M12	NBR 70	N	-30 to +100	Steel	35
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod)	
		FKM 70	V	-10 to +200	Steel plated (rod) Cast iron Stainless Steel Titanium	
Turcon® T05 For lubricating fluids Also for gas service Very low friction Very good sliding and sealing properties Color: Turquoise	T05	NBR 70	N	-30 to +100	Steel	20
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod)	
		FKM 70	V	-10 to +200		
Turcon® T24 For lubricating and non-lubricating hydraulic fluids Good sealing function Moderate extrusion resistance Carbon filled Color: Black	T24	NBR 70	N	-30 to +100	Steel	25
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod)	
		FKM 70	V	-10 to +200	Cast iron	
		EPDM 70	E**	-45 to +145	Stainless steel Aluminum	
Turcon® T46 For lubricated hydraulics in linear motion High compressive strength High extrusion resistance Very good sliding and wear properties BAM tested Bronze filled Color: Light to dark brown, which may have variations in shading	T46	NBR 70	N	-30 to +100	Steel hardened	35
		NBR-70 Low temp.	T	-45 to +80	Steel chrome plated (rod)	
		FKM 70	V	-10 to +200	Cast iron	

Table continues on next page




Material, Applications, Properties	Code	O-Ring Material Shore A	Code	O-Ring Operating Temp.* °C	Mating Surface Material	MPa max. Dynamic
Zurcon® Z80 For lubricating and non-lubricating fluids Water based fluids, air and gases Dry air pneumatics High abrasion and extrusion resistance For service in abrasive conditions and media with particles Good chemical resistance Limited temperature capability (-60 to +80 °C) UHMWPE (Ultra High Molecular Weight PE) Color: White to off-white	Z80	NBR 70	N	-30 to (+100)	Steel	30
		NBR 70 Low temp.	T	-45 to +80	Steel hardened Steel chrome plated (rod)	
		EPDM 70	E**	-45 to(+145)	Stainless steel Aluminum Ceramic coating	

* The O-Ring Operation Temperature is only valid in mineral hydraulic oil (except EPDM).

** Material not suitable for mineral oils.

BAM: Tested by "Bundesanstalt Materialprüfung, Germany"

 Highlighted materials are recommended.



Installation Recommendation

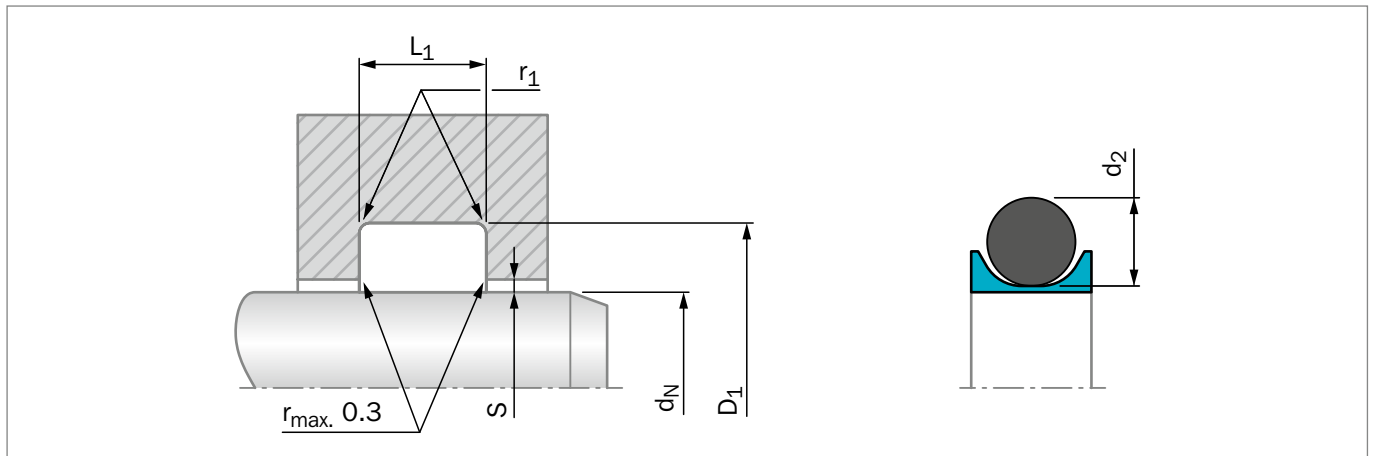


Figure 91: Installation Drawing

Table 71: Installation Dimensions

Series No.	Rod Diameter d_N f8/h9		Groove Diameter D_1 H9	Groove Width L_1 +0.2	Radius $r_{1 \text{ max}}$	Radial Clearance S_{max}^*				O-Ring Cross Section d_2
	Standard Application	Available Range				2 MPa	10 MPa	20 MPa	35 MPa	
RDD0	4 - 9.9	2 - 129.9	$d_N + 2.9$	2.4	0.4	0.10	0.10	0.08	0.05	1.78
RDD1	10 - 19.9	5 - 249.9	$d_N + 4.5$	3.6	0.4	0.15	0.15	0.10	0.07	2.62
RDD2	20 - 39.9	5 - 449.9	$d_N + 6.2$	4.8	0.6	0.25	0.20	0.15	0.08	3.53
RDD3	40 - 119.9	12 - 649.9	$d_N + 9.4$	7.1	0.8	0.35	0.25	0.20	0.10	5.33
RDD4	120 - 649.9	60 - 999.9	$d_N + 12.2$	9.5	0.8	0.50	0.30	0.25	0.15	7.00
RDD5	650 - 999.9	110 - 999.9	$d_N + 15.0$	10.0	1.0	0.60	0.40	0.30	0.20	8.40

*Slydring® / Wear Rings are not applicable at very small radial clearances please consult the Slydring® section in this catalog.

ORDERING EXAMPLE

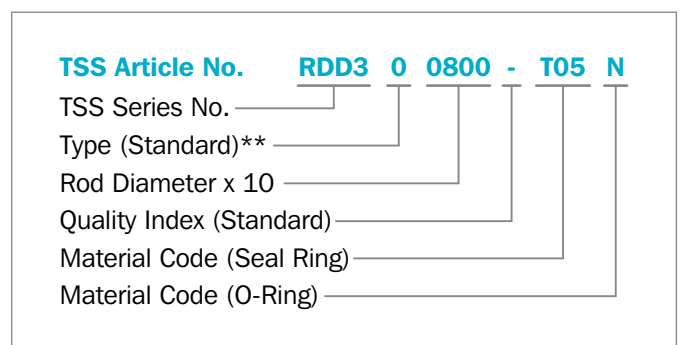
Double Delta® complete with O-Ring, standard application:

Series:	RDD3 from Table 71
Rod diameter:	$d_N = 80.0$ mm
TSS Part No.:	RDD300800 from Table 72

Select the material from Table 70. The corresponding code numbers are appended to the Part No. Together these form the TSS Article Number.

For seals for other groove widths/dimensions please refer to Table 78.

The TSS Article Number for all intermediate sizes can be determined by following the example:



** "N" for seals with notches. Available at diameters from 2.0 mm.



Table 72: Installation Dimensions / TSS Part No.

Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size	Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Size
d_N f8/h9	D_1 H9	L_1 +0.2			d_N f8/h9	D_1 H9	L_1 +0.2		
3.0	5.9	2.4	RDD000030	2.90 x 1.78	120.0	132.2	9.5	RDD401200	120.02 x 7.00
4.0	6.9	2.4	RDD000040	3.68 x 1.78	125.0	137.2	9.5	RDD401250	126.37 x 7.00
5.0	7.9	2.4	RDD000050	4.80 x 1.80	130.0	142.2	9.5	RDD401300	129.54 x 7.00
6.0	8.9	2.4	RDD000060	5.60 x 1.80	135.0	147.2	9.5	RDD401350	135.89 x 7.00
8.0	10.9	2.4	RDD000080	7.65 x 1.78	140.0	152.2	9.5	RDD401400	139.07 x 7.00
9.9	12.8	2.4	RDD000099	9.50 x 1.80	150.0	162.2	9.5	RDD401500	148.59 x 7.00
10.0	14.5	3.6	RDD100100	10.77 x 2.62	160.0	172.2	9.5	RDD401600	164.47 x 7.00
12.0	16.5	3.6	RDD100120	12.37 x 2.62	170.0	182.2	9.5	RDD401700	170.82 x 7.00
14.0	18.5	3.6	RDD100140	13.94 x 2.62	180.0	192.2	9.5	RDD401800	183.52 x 7.00
15.0	19.5	3.6	RDD100150	14.50 x 2.65	190.0	202.2	9.5	RDD401900	189.87 x 7.00
16.0	20.5	3.6	RDD100160	15.54 x 2.62	200.0	212.2	9.5	RDD402000	202.57 x 7.00
18.0	22.5	3.6	RDD100180	18.00 x 2.65	210.0	222.2	9.5	RDD402100	208.90 x 7.00
20.0	26.2	4.8	RDD200200	20.22 x 3.53	220.0	232.2	9.5	RDD402200	227.97 x 7.00
22.0	28.2	4.8	RDD200220	21.82 x 3.53	230.0	242.2	9.5	RDD402300	240.67 x 7.00
25.0	31.2	4.8	RDD200250	25.00 x 3.53	240.0	252.2	9.5	RDD402400	240.67 x 7.00
28.0	34.2	4.8	RDD200280	28.17 x 3.53	250.0	262.2	9.5	RDD402500	253.37 x 7.00
30.0	36.2	4.8	RDD200300	29.75 x 3.53	280.0	292.2	9.5	RDD402800	278.77 x 7.00
32.0	38.2	4.8	RDD200320	31.35 x 3.53	300.0	312.2	9.5	RDD403000	304.17 x 7.00
35.0	41.2	4.8	RDD200350	34.52 x 3.53	320.0	332.2	9.5	RDD403200	329.57 x 7.00
36.0	42.2	4.8	RDD200360	36.09 x 3.53	350.0	362.2	9.5	RDD403500	354.97 x 7.00
40.0	49.4	7.1	RDD300400	40.64 x 5.33	360.0	372.2	9.5	RDD403600	367.67 x 7.00
42.0	51.4	7.1	RDD300420	43.82 x 5.33	400.0	412.2	9.5	RDD404000	405.26 x 7.00
45.0	54.4	7.1	RDD300450	43.82 x 5.33	500.0	512.2	9.5	RDD405000	506.86 x 7.00
48.0	57.4	7.1	RDD300480	46.99 x 5.33	600.0	612.2	9.5	RDD406000	608.08 x 7.00
50.0	59.4	7.1	RDD300500	50.17 x 5.33	650.0	665.0	10.0	RDD506500	650.00 x 8.40
52.0	61.4	7.1	RDD300520	53.34 x 5.33	700.0	715.0	10.0	RDD507000	700.00 x 8.40
55.0	64.4	7.1	RDD300550	56.52 x 5.33	800.0	815.0	10.0	RDD508000	800.00 x 8.40
56.0	65.4	7.1	RDD300560	56.52 x 5.33	900.0	915.0	10.0	RDD509000	900.00 x 8.40
60.0	69.4	7.1	RDD300600	59.69 x 5.33	950.0	965.0	10.0	RDD509500	950.00 x 8.40
63.0	72.4	7.1	RDD300630	62.87 x 5.33	<p>The rod diameters in bold type correspond to the recommendations of ISO 3320. TSS Part No. for other dimensions and all intermediate sizes up to 999.9 mm diameter including imperial (inch) sizes can be supplied. Larger sizes up to 2,600 mm available upon request.</p>				
65.0	74.4	7.1	RDD300650	66.04 x 5.33					
70.0	79.4	7.1	RDD300700	69.22 x 5.33					
80.0	89.4	7.1	RDD300800	78.74 x 5.33					
85.0	94.4	7.1	RDD300850	85.09 x 5.33					
90.0	99.4	7.1	RDD300900	91.44 x 5.33					
95.0	104.4	7.1	RDD300950	94.62 x 5.33					
100.0	109.4	7.1	RDD301000	100.97 x 5.33					
105.0	114.4	7.1	RDD301050	104.14 x 5.33					
110.0	119.4	7.1	RDD301100	110.49 x 5.33					
115.0	124.4	7.1	RDD301150	116.84 x 5.33					



Turcon® Double Delta® for one Back-up Ring groove

Double Delta® is available for designs where grooves for O-Ring with one Back-up Ring are used according to Table 73.

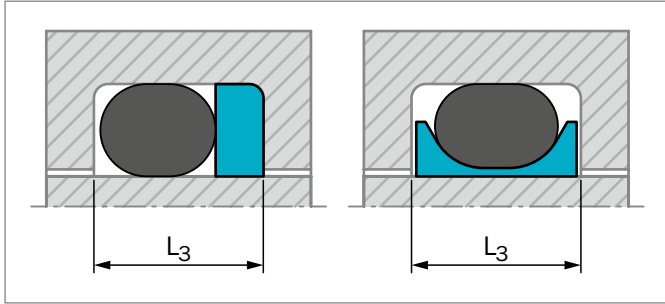


Figure 92: Groove width

Table 73: Seals for one Back-up Ring groove

Series No.	Groove Width L_3	Execution Mark 5th digit		O-Ring Cross Section d_2
		Without Notch	With Notch*	
RDA0	3.80	0	N	1.78
RDA1	4.65	0	N	2.62
RDA2	5.70	0	N	3.53
RDA3	8.50	0	N	5.33
RDA4	11.20	0	N	7.00
RDA5	12.50	0	N	8.40

* Available for diameters from 8 mm

ORDERING EXAMPLE

Double Delta® complete with O-Ring, standard application:

Rod diameter:	$d_N = 80.0$ mm
Groove diameter:	89.4 mm
Groove width:	8.5 mm
TSS Article No.:	RDA300800-M12N

TSS Article No.	RDA3	0	0800	-	M12	N
TSS Series No.**	_____	_____	_____	_____	_____	_____
Type (Standard)***	_____	_____	_____	_____	_____	_____
Rod Diameter x 10	_____	_____	_____	_____	_____	_____
Quality Index (Standard)	_____	_____	_____	_____	_____	_____
Material Code (Seal Ring)****	_____	_____	_____	_____	_____	_____
Material Code (O-Ring)*****	_____	_____	_____	_____	_____	_____

** From Table 73 or Table 74

*** N for seals with notches, available from dia. 8 mm

**** From Table 70

***** From Table 70



■ Turcon® Double Delta® for Metric O-Rings

Double Delta® is available for installation in grooves for metric O-Rings as listed in Table 74.

Table 74: Rod Seals for Metric O-Ring Grooves

O-Ring Cross Section	Groove Diameter	Groove Width	Series No.	Execution Mark 5th digit		Available Range
				Standard	Notch*	
d_2	D_1 H9	L_1 +0.2				
2.00	$d_N + 3.3$	2.7	RD2A	0	N	3.0 - 100.0
2.40	$d_N + 4.1$	3.2	RD2E	0	N	5.0 - 160.0
2.50	$d_N + 4.3$	3.3	RD2F	0	N	5.0 - 160.0
3.00	$d_N + 5.2$	4.0	RD3A	0	N	6.0 - 200.0
4.00	$d_N + 7.0$	5.2	RD4A	0	N	8.0 - 300.0
5.00	$d_N + 8.8$	6.6	RD5A	0	N	12.0 - 400.0
5.70	$d_N + 10.0$	7.2	RD5H	0	N	12.0 - 649.9

* Available for diameters from 8 mm

Additional Seals



Available upon Request

Old Series

Special Series



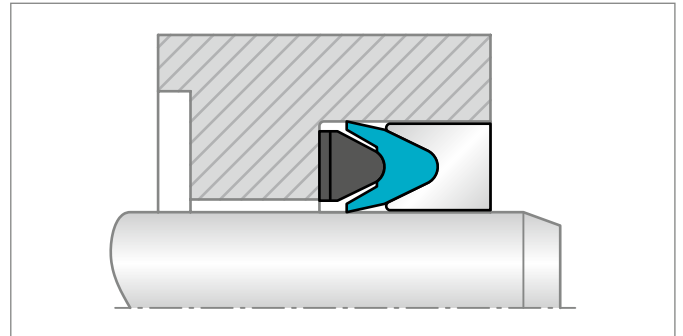
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POLYPAC® VA

Seal for high pressure volumetric water pump. It's made with a special grade NBR+FABRIC. High sealing efficiency and wear resistance.

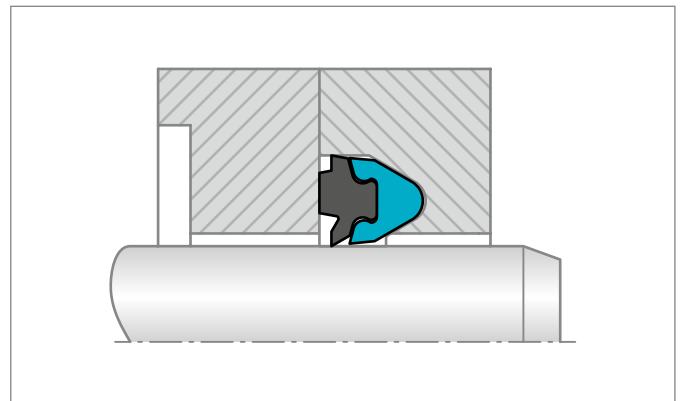
Diameter Range mm	Pressure Range MPa	Temperature Range °C	Velocity m/s
15 - 70	Up to 40	Up to +80	Up to 2



POLYPAC® VB

Seal for low pressure volumetric water pumps. It's made with a NBR rubber gasket clamped on a softer NBR+FABRIC V-ring shape. These seals in combination with VA seals for high pressure improve the performance of the sealing system in high pressure water pump applications.

Diameter Range mm	Pressure Range MPa	Temperature Range °C	Velocity m/s
13 - 60	-	Up to +80	Up to 2

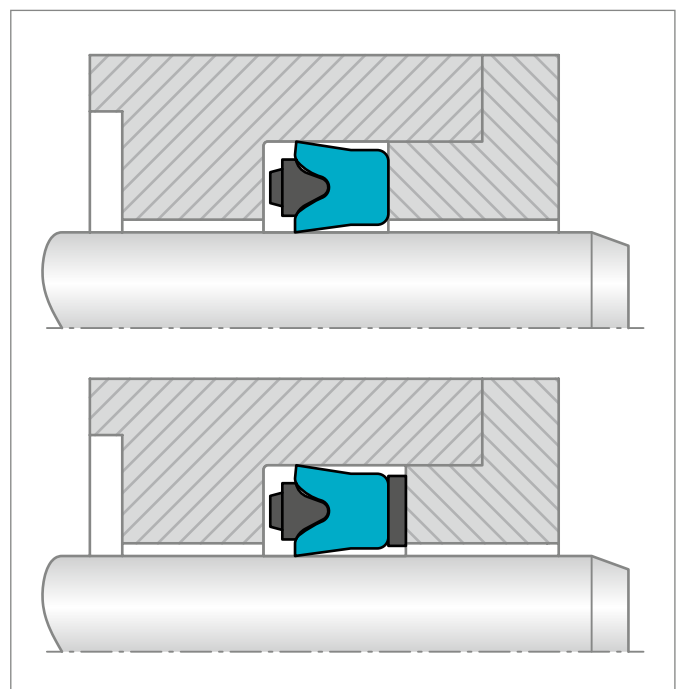


POLYPAC® DS - CX95 AND DS/TE - CX95

The seals DS and DS/TE are designed to improve the water cleaning equipment's performance.

The special profile can withstand the frequent pressure variations, high temperatures and critical lubrication. The U shaped sealing element is made out of cotton fabric reinforced NBR and provide with a NBR energizer ring a good sealing performance at high as low pressure working conditions. The version DS/TE with bronze filled PTFE Back-up Ring permits working at high pressures.

Diameter Range mm	Pressure Range MPa	Temperature Range °C	Velocity m/s
15 - 40	Up to 40 for DS/TE	Up to +80	Up to 2
	Up to 10 for DS		





TURCON® STEPSEAL® 2A

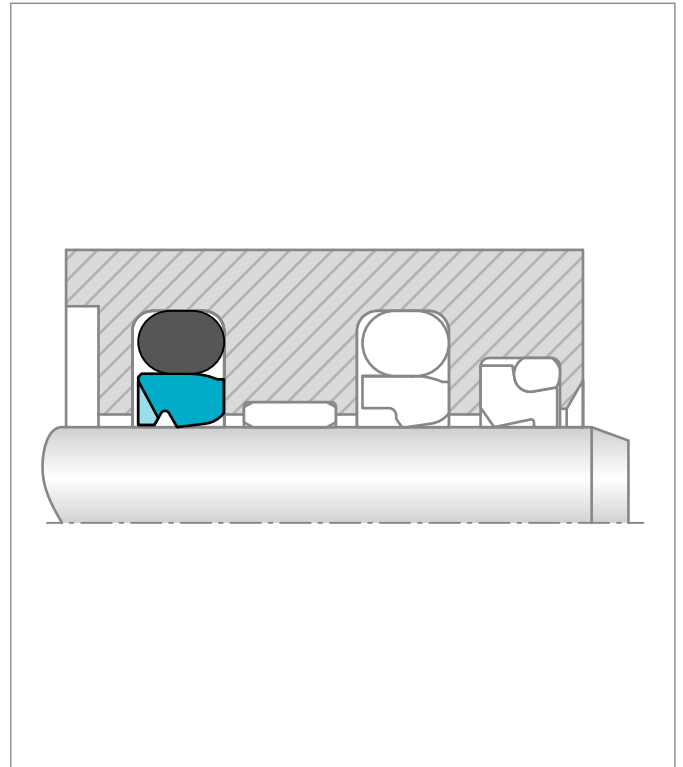
Single-acting primary seal for applications requiring stabilized seal position in the groove. A further development of Turcon® Stepseal® 2K by adding a stabilizing edge, which prevents the seal from “tilting”, caused by seal-system pressure build-up between seals, in tandem configuration. It also increases assembly robustness through protection of the seal face during insertion of the rod.

Same high sealing properties as Stepseal® 2K.

Stepseal® 2A is used as primary seal in rod sealing systems preferably together with a secondary seal from the range of Turcon® and Zurcon® seals, a double-acting Excluder® or Scraper.

Installation in the same grooves as Turcon® Stepseal® 2K and grooves according to ISO 7425-2.

Diameter Range mm	Pressure Range MPa	Temperature Range °C	Velocity m/s
12 - 2,600	60	-45 to +200	Up to 15



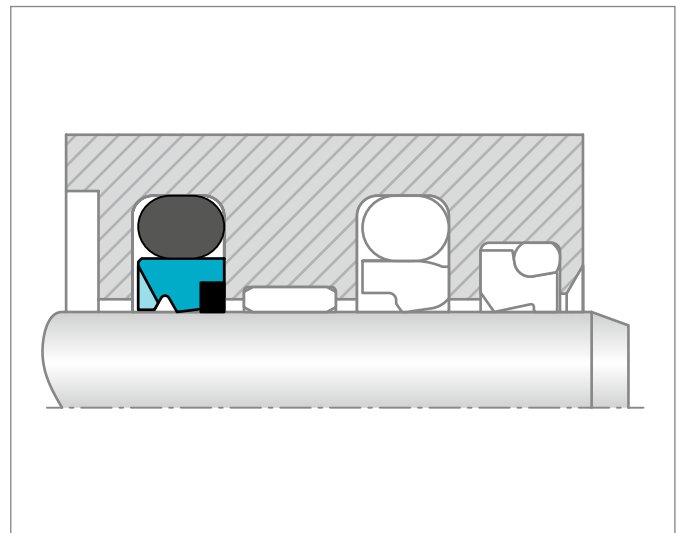
TURCON® STEPSEAL® 2A CR

Single-acting rubber energized rod seal with integrated Back-up Ring for higher pressure or bigger gaps for dynamic applications. High sealing efficiency, low friction with no stick-slip, minimal break out force and high wear resistance.

Installation in the same grooves as Turcon® Stepseal® 2K and grooves according to ISO 7425-2.

Standard TSS Part Numbers are available (RSB)

Diameter Range mm	Pressure Range MPa	Temperature Range °C	Velocity m/s
30 - 2,600	100	-45 to +200	Up to 5



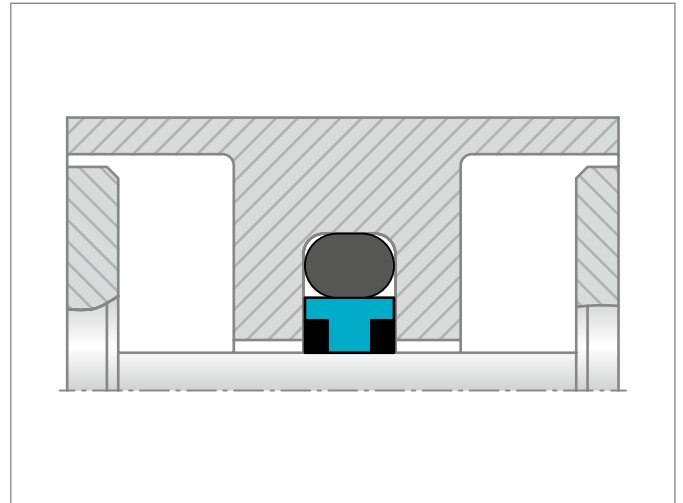


TURCON® GLYD RING® CR

Double-acting rubber energized rod seal for dynamic applications. Low friction with no stick-slip, minimal break out force and high wear resistance with integrated Back-up Rings for higher pressures or larger gaps. Installation in grooves with dimensions according to ISO 7425-2 (the same as for Turcon® Glyd Ring® for piston).

Standard TSS Part Numbers are available (RGR)

Diameter Range mm	Pressure Range MPa	Temperature Range °C	Velocity m/s
30 - 2,600	100	-45 to +200	5

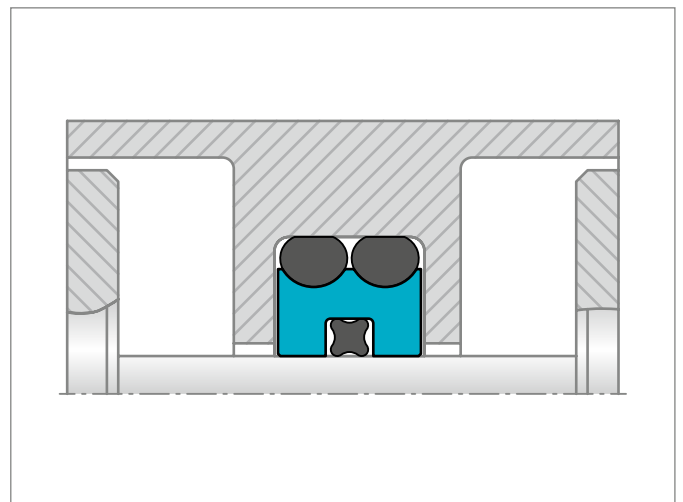


TURCON® AQ-SEAL® 5

A further development of the standard Turcon® AQ-Seal® double-acting seal for sealing between two media, e.g. fluid/gas separation by incorporating a limited footprint elastomer Quad-Ring® seal in the dynamic sealing face. Energized by two O-rings to improve sealing behaviour. Same groove dimensions as Turcon® AQ-Seal® 5 Bean Seal.

Standard TSS Part Numbers are available (RQ2)

Diameter Range mm	Pressure Range MPa	Temperature Range °C	Velocity m/s
40 - 700	60	-45 to +200	3

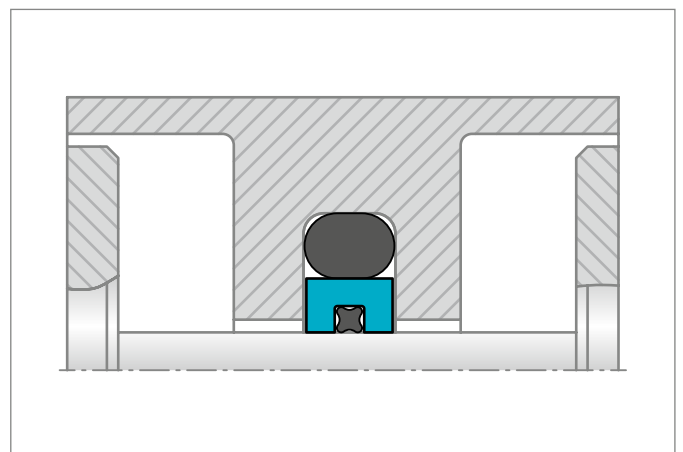


TURCON® AQ-SEAL®

A double-acting rubber energized seal for sealing between two media, e.g. fluid/gas separation by incorporating a limited footprint elastomer Quad-Ring® seal inset into the dynamic sealing face. Installation in the same groove as Turcon® AQ-Seal® Bean Seal.

Standard TSS Part Numbers are available (RQ1)

Diameter Range mm	Pressure Range MPa	Temperature Range °C	Velocity m/s
16 - 2,600	50	-45 to +200	2

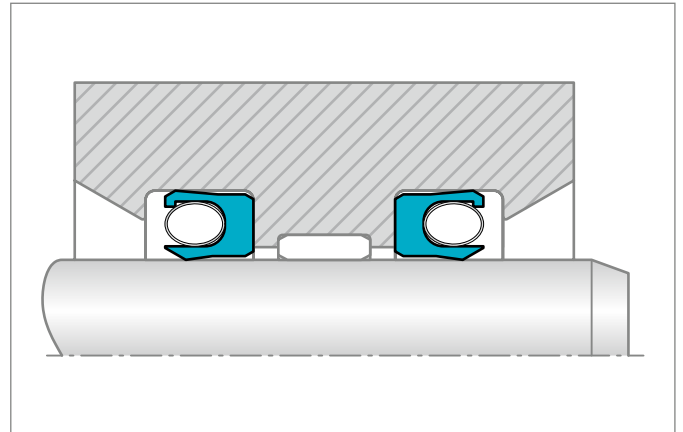




TURCON® VARISEAL® W

The Turcon® Variseal® W is a single acting rod seal energized by a special helical spring. The advantage of the Turcon® Variseal® W lies in its low friction and constant preloading force over a relatively large deformation range. The Turcon® Variseal® W is used wherever friction has to be kept within a narrow tolerance zone.

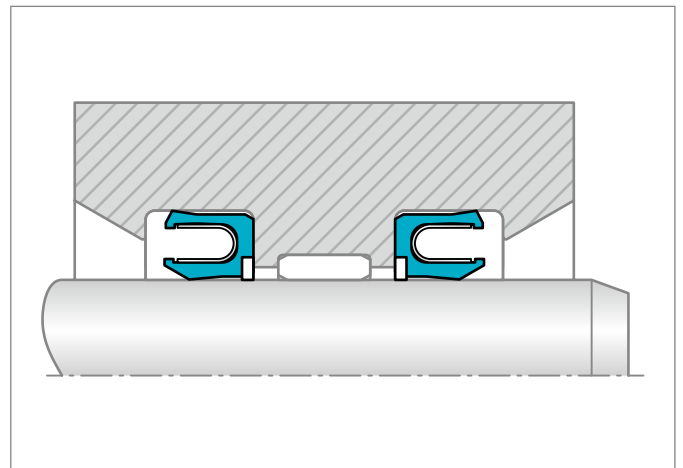
Diameter Range mm	Pressure Range MPa	Temperature Range °C	Velocity m/s
6 - 2,600	45	-70 to +200	15



TURCON® VARISEAL® M2 CR

Single-acting sealing element comprising a U-shaped Turcon® ring and stainless energising finger spring. Low friction with no stick-slip, minimal break out force and high wear resistance. Resistant to most liquids and chemical. Unlimited shelf life. For higher pressure applications or larger extrusion gaps the Variseal® M2 CR has an integrated Back-up Ring in material Zurcon® Z43.

Diameter Range mm	Pressure Range MPa	Temperature Range °C	Velocity m/s
8 - 300	100	-30 to +260	15

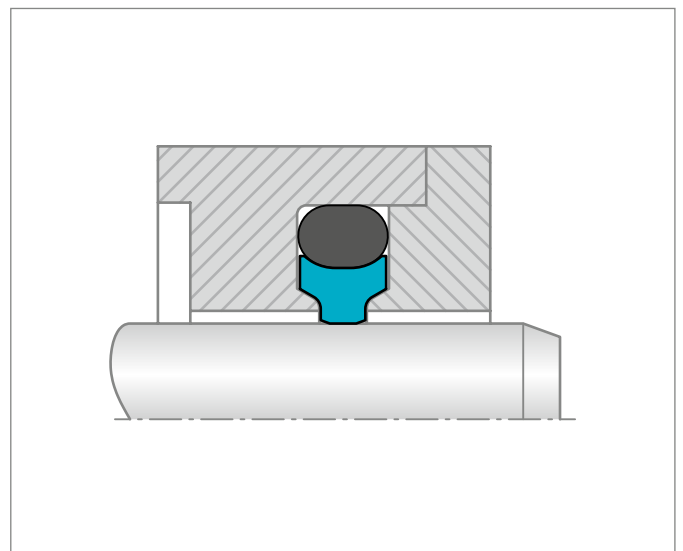


TURCON® CAPTIVE GLYD RING®

A double-acting seal recommended for linear applications. It is designed to pass over holes/ports in the counter surface or to slide across mating surfaces that have dimensional changes from a small diameter with sealing function over the seal to a large diameter with no sealing function or vice versa. Split hardware is required and prevents the seal from pulling out the groove while passing over ports or variable diameter counter parts.

Standard TSS Part Numbers are available (RGC)

Diameter Range mm	Pressure Range MPa	Temperature Range °C	Velocity m/s
6 - 2,600	Up to 60	-45 to +200	Up to 15





TURCON® BUFFER RING

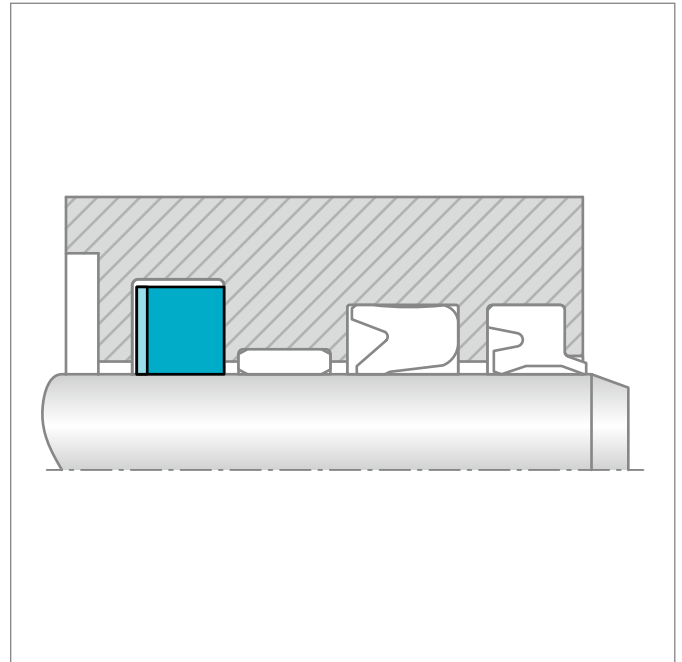
Turcon® Buffer Ring is an uncut “Piston Ring”, with notches on one side, the Ring is a single-acting seal often used as protector of a common rod sealing system against peak pressures where the notch prevents risk of pressure trap.

If double-acting sealing is required it is necessary to install two Buffer Rings, back to back, to take the pressure from both sides.

For linear, helical and rotary movements.

Standard TSS Part Numbers are available (RFB)

Diameter Range mm	Pressure Range MPa	Temperature Range °C	Velocity m/s
4 - 2,500	60	+30 to +160	Up to 15 (10 rotary)



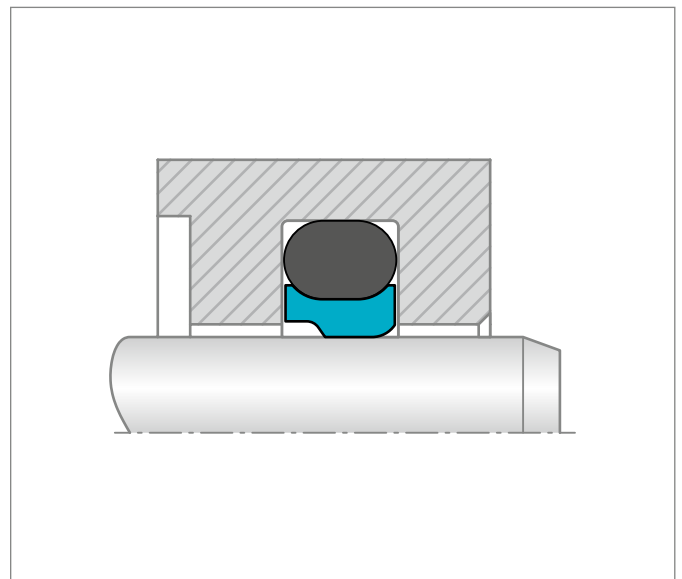
TURCON® STEPSEAL® SG

Single-acting O-Ring energized rod seal for dynamic applications. Generally applied as spare part or for heavy applications requiring seals in oversize cross section. Installation identical to ISO 7425-1 “Square Groove housings for pistons seals” (ISO for “Square Groove Housing” for rods does not exist) .

Turcon® materials provide low friction with no stick-slip, minimal break out force and high wear and pressure resistance.

Standard TSS Part Numbers are available (RSM)

Diameter Range mm	Pressure Range MPa	Temperature Range °C	Velocity m/s
20 - 2,600	Up to 60	-45 to +200	Up to 5





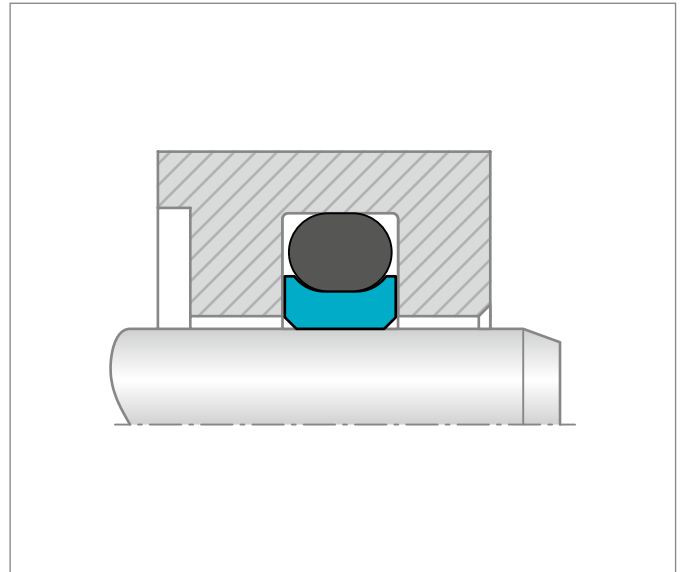
TURCON® GLYD RING® SG

Double-acting O-Ring energized rod seal for dynamic applications. Generally applied as spare part or for heavy applications requiring seals in oversize cross section. Installation identical to ISO 7425-1 “Square Groove housings for pistons seals”.

Turcon® materials provide low friction with no stick-slip, minimal break out force and high wear and pressure resistance.

Standard TSS Part Numbers are available (RSM)

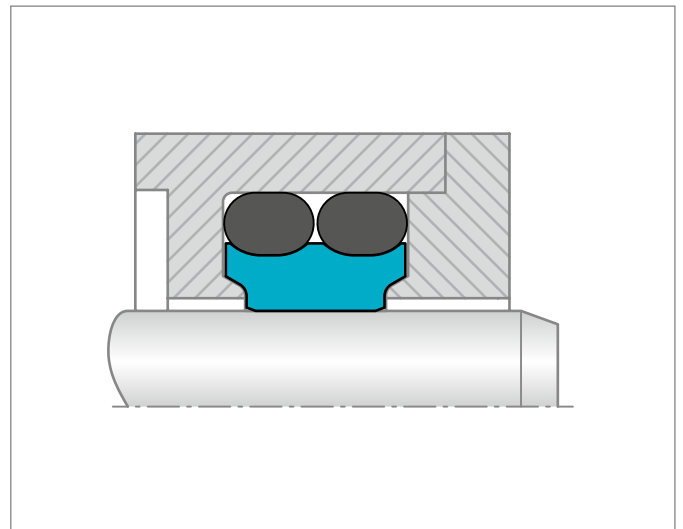
Diameter Range mm	Pressure Range MPa	Temperature Range °C	Velocity m/s
20 - 2,600	Up to 60	-45 to +200	Up to 5



TURCON® CAPTIVE GLYD RING® WITH DOUBLE O-RING

A double-acting seal for linear applications recommended for passing over larger holes/ports in the counter surface or to slide across mating surfaces that have dimensional changes from a small diameter with sealing function over the seal to a large diameter with no sealing function or vice versa. Split hardware is required and prevents the seal from pulling out the groove while passing over ports or variable diameter counter parts.

Diameter Range mm	Pressure Range MPa	Temperature Range °C	Velocity m/s
6 - 2,600	Up to 60	-45 to +200	Up to 15

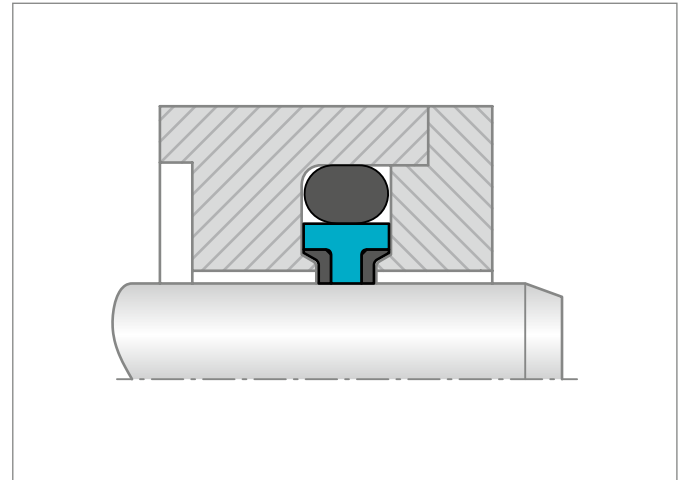




TURCON® CAPTIVE GLYD RING® CR

A double-acting corner reinforced seal for higher pressure linear applications recommended for passing over larger holes/ports in the counter surface or to slide across mating surfaces that have dimensional changes from a small diameter with sealing function over the seal to a large diameter with no sealing function or vice versa. Split hardware is required and prevents the seal from pulling out the groove while passing over ports or variable diameter counter parts.

Diameter Range mm	Pressure Range MPa	Temperature Range °C	Velocity m/s
6 - 2,600	Up to 100	-45 to +200	Up to 15



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