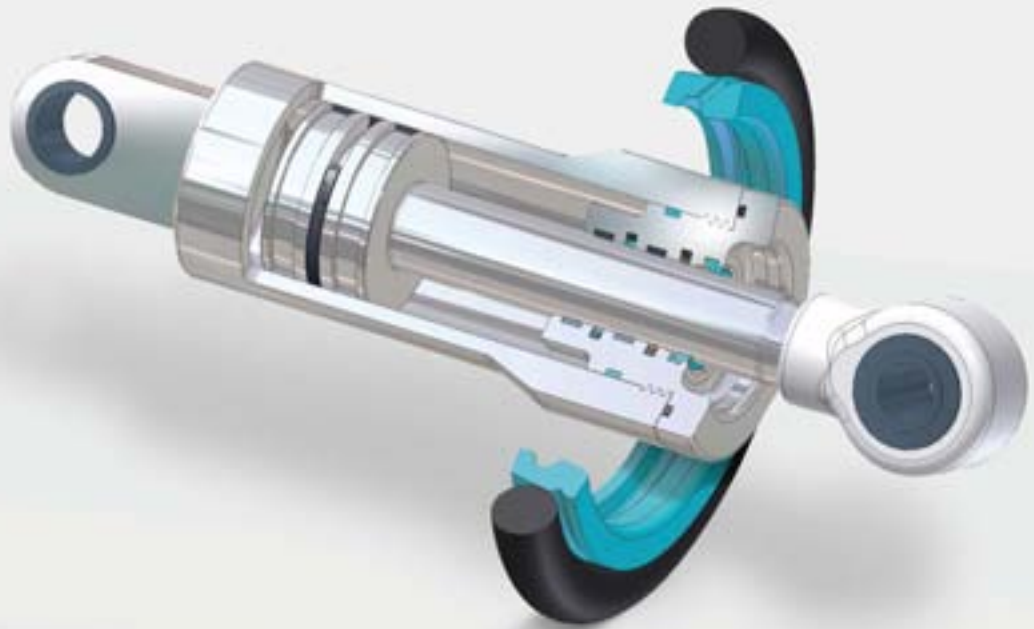


Turcon® Stepseal® V



English



Your Partner for Sealing Technology



Your Partner for Sealing Technology

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

With 50-years experience, Trelleborg Sealing Solutions engineers support customers with design, prototyping, production, test and installation using state-of-the-art design tools. An international network of over 70 facilities worldwide includes 30 manufacturing sites, 8 strategically positioned research and development centers, including materials and development laboratories and locations specializing in design and applications.

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

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

Facilities are certified to ISO 9001:2000 and ISO/TS 16949:2002, with many manufacturing sites also working to QS9000 and VDA 6.1. Trelleborg Sealing Solutions is backed by the experiences and resources of one of the world's foremost experts in polymer technology, Trelleborg AB.

ISO 9001:2000

ISO/TS 16949:2002

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

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

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Contents

Characteristics.....	3
Features	4
Method of operation	5
Test Procedure	6
Materials	7
Installation - Rod	8
Installation dimensions - Rod	9
Installation - Piston	13
Installation dimensions - Piston.....	14



Turcon® Stepseal® V Rod and Piston Seal

■ Characteristics

- Primary seal with hydrostatic ventilation
- Check valve function
- Hydrodynamic back-pumping
- Stabilised position in the groove
- Fits existing Turcon® Stepseal® groove
- Available for ISO 7425/2 groove
- Prolonged seal life
- Increased leakage control

■ Improved Friction Performance:

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

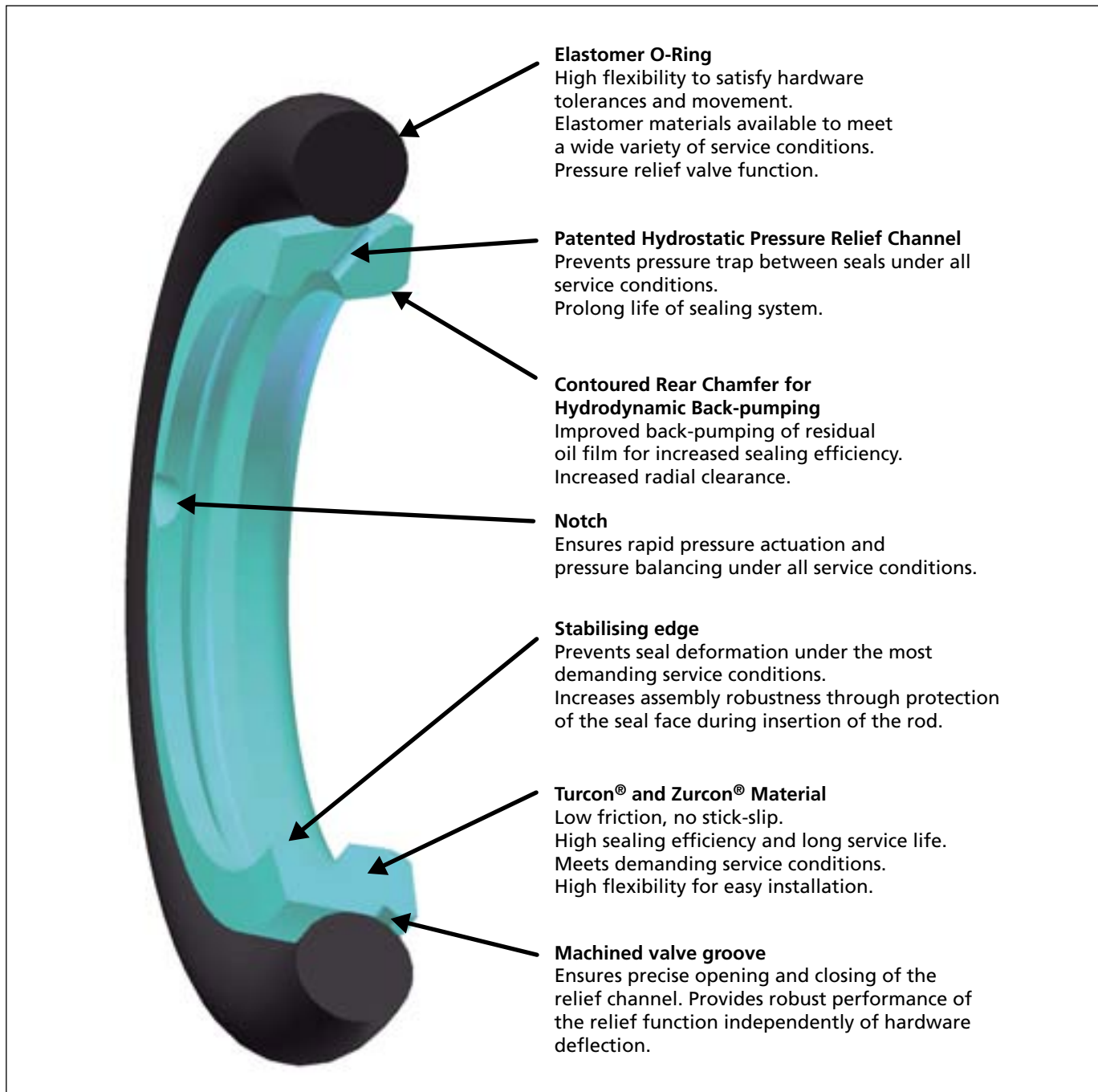


Figure 1



■ Turcon® Stepseal® V*

Features

Stepseal® V has been developed to meet the continuously increasing demands to the 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.

Stepseal® V is a new generation primary seal designed for use in seal systems. 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 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.

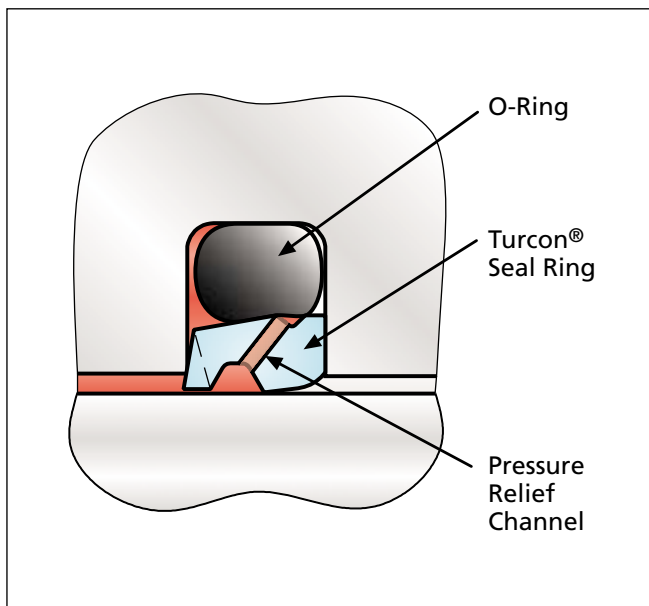


Figure 2 Turcon® Stepseal® V

Description

Stepseal® V is based on the dynamic, unidirectional Stepseal® sealing concept. During the extending stroke of the rod, focusing of contact force on the unique Stepseal® sealing edge creates high local sealing pressure and limits the micro fluid film formation under the seal. When the rod is retracted, the design of the full Stepseal® sealing face supports hydrodynamic back-pumping of the fluid film, and so 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 and patented by Trelleborg Sealing Solutions, the built-in check valve function promised to eliminate pressure build-up and so render buffer volumes and drain lines obsolete. Extensive development has now brought the inherent prevention of pressure build-up together with dependable sealing performance in one element, Stepseal® V. Stepseal® V has the efficient seal performance and outstanding service life of the 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. It is installed in Trelleborg Sealing Solutions standard grooves and according to ISO 7425, using an O-Ring as energising element.

* Patented and patent pending geometry:
DE 19654357; 24.12.1996



Turcon® Stepseal® V Rod and Piston Seal

■ Method of operation

The sealing performance of the patented Stepseal® V design (Figure 2) results from a combination of the hydrodynamic properties of the seal and the O-Ring and the hydrostatic pressure relief check valve function.

The classic Stepseal® operation ensures a controlled pressure gradient that minimizes 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.

The O-Ring check valve function controls the operation of the pressure relief channel: When the seal is pressurised by the system pressure the O-Ring keeps the channel closed to ensure that the hydraulic fluid is not passing through the channel and further between the groove wall and the Turcon® Seal Ring.

If pressure, higher than the actual system pressure, appears between the Stepseal® V and the secondary seal, the O-Ring is opening the relief groove somewhere at the circumference and the inter-seal pressure is immediately relieved. Due to the circumferential groove with integrated relief hole the relief function is independent from side load and deflection of the seal or O-Ring.

These patented design features further improve the performance of the Stepseal® concept at all service conditions. Besides giving high static and dynamic sealing performance, the Stepseal® V secures that build-up of intermediate pressure, which can be found with tandem seal configurations, is non-existent, regardless of the pressure, speed, deflection and rod movements.

■ Advantages:

- Same basic function as Turcon® Stepseal® 2K
- No system pressure on secondary sealing element and/or Excluder®
- Check valve function of O-Ring eliminates risk of fluid bypassing the seal during pressure loading when pressurised
- Independent of any speed relation of counter surface
- Independent of stroke length
- Independent of deflection
- 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 Turcon® Stepseal® 2K groove dimensions as well as ISO 7425 seal housings

■ Technical data

Operating pressure:

- Standard up to 30 MPa with Turcon® T19
- Up to 80 MPa with Turcon® T08 and Zurcon® Z51

Speed:

- Up to 15 m/s with reciprocating 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 safe hydraulic fluids (plant based oils), water and others, depending on the seal and O-Ring material (see Table I, page 5)

Clearance:

- The maximum permissible radial clearance S_{max} is shown in Table II on page 8 and Table IV on page 13, 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.

Important note for the piston version:

In the case of unpressurized applications in temperatures below 0°C please contact our application engineers for assistance!



Test Procedure

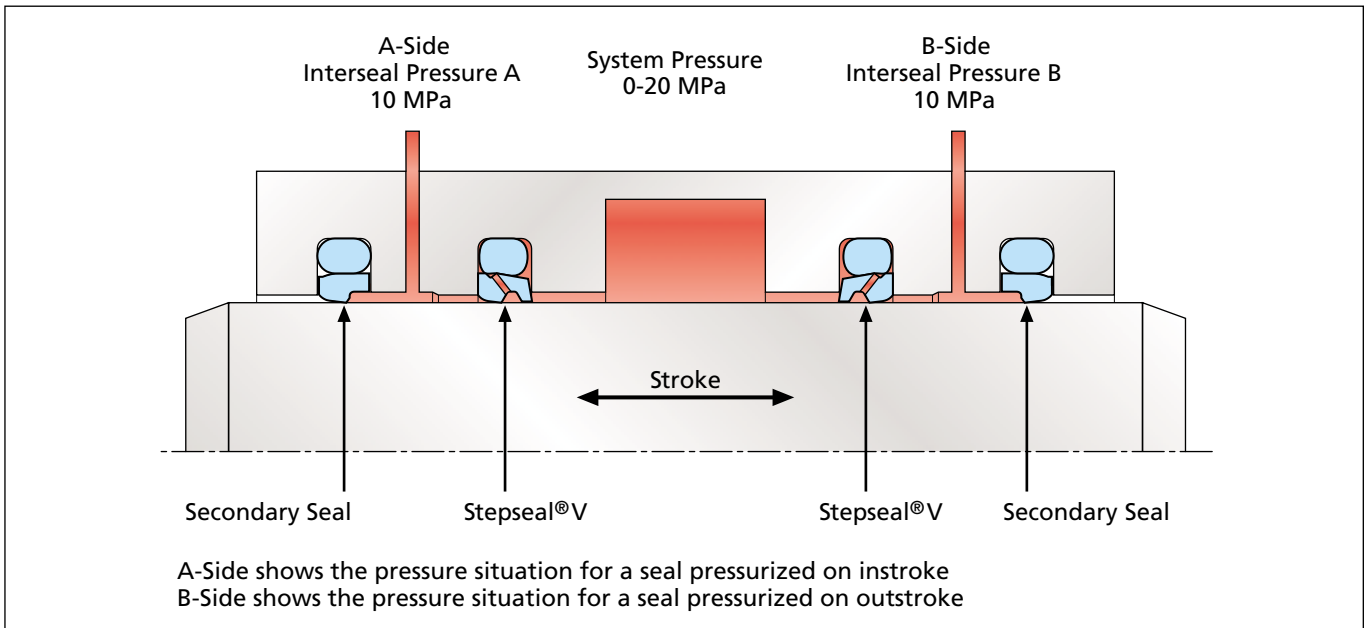
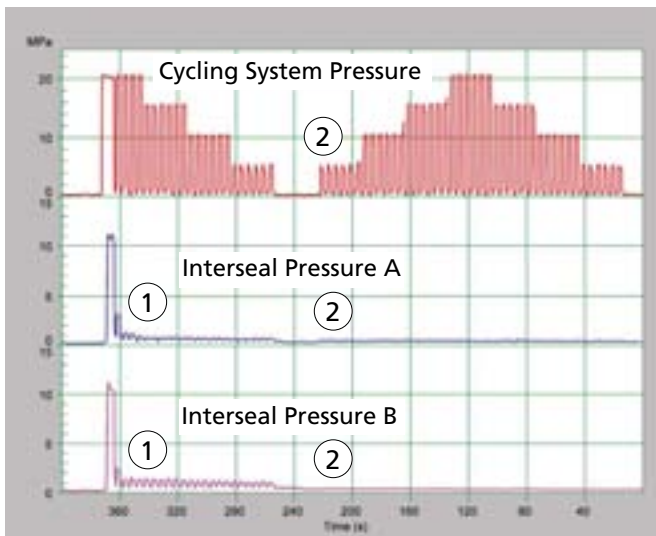


Figure 3 Principle figure of test procedure: A static pressure is applied between two seals, in tandem installation, in order to simulate a hydrodynamic pressure build-up.

The efficiency of the pressure relief channel is shown at Fig. 4.



- ① Relief of the interseal pressure at the first pressure cycle
- ② System pressure changes in 5 MPa steps from 20 MPa down to 0 MPa, then up again to 20 MPa and down to 0 MPa. At the point where pressure increases, the check valve is closed effectively.

Figure 4 Enforced pressurisation between primary seal (Stepseal® V) and secondary seal drops to zero within one stroke of the piston rod.



Turcon® Stepseal® V Rod and Piston Seal

Table I Turcon® and Zurcon® materials for Turcon® Stepseal® V

Material, Applications, Properties	Code	O-Ring Material	Code	O-Ring Operating Temp.* °C	Mating Surface Material	MPa max.
Turcon® T46 Standard material for hydraulics, high compressive strength, good sliding and wear properties, good extrusion resistance, BAM tested. Bronze filled. Colour: Greyish to dark brown	T46	NBR - 70 Shore A	N	-30 to +100	Steel tube (bore) Steel hardened Steel chromeplated (rod) Cast iron	70
		NBR - Low temp. 70 Shore A	T	-45 to +80		
		FKM - 70 Shore A	V	-10 to +200		
Turcon® T08 Very high compressive strength, very good extrusion resistance. High bronze filled Colour: Light to dark brown	T08	NBR - 70 Shore A	N	-30 to +100	Steel tube (bore) Steel hardened Steel chromeplated (rod) Cast iron	80
		NBR - Low temp. 70 Shore A	T	-45 to +80		
		NBR - Low temp. 70 Shore A	V	-10 to +200		
Turcon® T40 For all lubricating and non-lubricating hydraulic fluids, hydraulic oils without zinc additive, water hydraulic, soft mating surfaces. Surface texture not suitable for gases Carbon fibre filled Colour: Grey	T40	NBR - 70 Shore A	N	-30 to +100	Mild steel Steel chromeplated (rod) Cast iron Stainless steel Aluminium Bronze Alloys	30
		NBR - Low temp. 70 Shore A	T	-45 to +80		
		FKM - 70 Shore A	V	-10 to +200		
		EPDM-70 Shore A	E**	-45 to +145		
Turcon® T19 For all lubricating fluids and hydraulic oils without zinc, high sealing efficiency, good sliding and wear properties, mild to counter surface. Mineral fibre filled Colour: Dark green-grey	T19	NBR - 70 Shore A	N	-30 to +80	Steel Steel hardened Steel chromeplated (rod) Cast iron Stainless steel	30
		NBR - Low temp. 70 Shore A	T	-45 to +80		
Zurcon® Z80 For lubricating and non-lubricating hydraulic fluids, high abrasion resistance, very good chemical resistance, limited temperature resistance. Ultra high molecular weight polyethylen Colour: White to off-white	Z80	NBR - Low temp. 70 Shore A	N	-30 to +80	Steel Steel chromeplated (rod) Stainless steel Aluminium, Bronze Ceramic coating	45
		NBR - Low temp. 70 Shore A	T	-45 to +80		

* 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 standard.



Installation recommendation - Rod

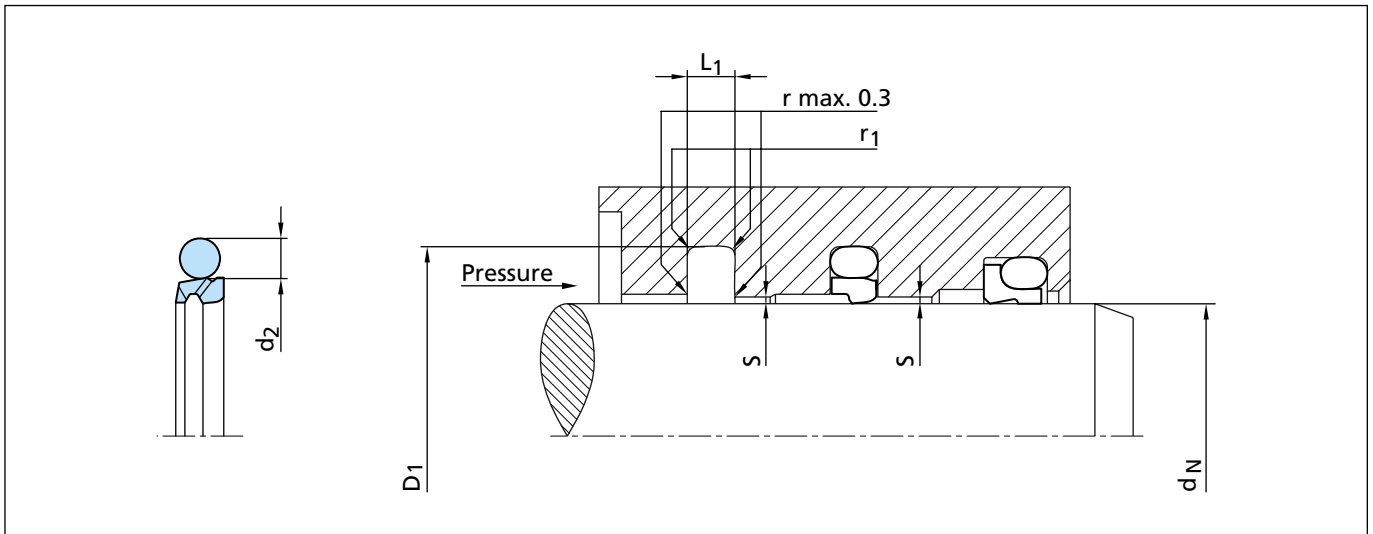


Figure 5 Installation drawing

Table II 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	Radial Clearance S_{max}^*			O-Ring Cross-Section d_2
	Standard Application	Light ¹⁾ Application	Heavy Duty Application				10 MPa	20 MPa	40 MPa	
RSV2	19.0 – 37.9	38.0 – 199.9	-	$d_N + 10.7$	4.2	1.0	0.50	0.30	0.20	3.53
RSV3	38.0 – 199.9	200.0 – 255.9	19.0 – 37.9	$d_N + 15.1$	6.3	1.3	0.70	0.40	0.25	5.33
RSV4	200.0 – 255.9	256.0 – 649.9	38.0 – 199.9	$d_N + 20.5$	8.1	1.8	0.80	0.60	0.35	7.00
RSV8	256.0 – 649.9	650.0 – 999.9	200.0 – 255.9	$d_N + 24.0$	8.1	1.8	0.90	0.70	0.40	7.00
RSV5	650.0 – 999.9	≥ 1000	256.0 – 649.9	$d_N + 27.3$	9.5	2.5	1.00	0.80	0.50	8.40
RSV6	$\geq 1000^{**}$	-	650.0 – 999.9	$d_N + 38.0$	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 the seal or consult Trelleborg Sealing Solutions for alternative material or profiles.

¹⁾ For easier installation in closed grooves with small rod diameters (< 40 mm).

** Energizer has a special shape.



Turcon® Stepseal® V Rod and Piston Seal

Table III Installation dimensions / TSS Part No. - Rod

Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-ring Sizes	Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-ring Sizes
d_N f8/h9	D_1 H9	$L_1 +0.2$			d_N f8/h9	D_1 H9	$L_1 +0.2$		
19.0	29.7	4.2	RSV200190	23.40 x 3.53	56.0	66.7	4.2	RSV200560	59.92 x 3.53
20.0	30.7	4.2	RSV200200	23.40 x 3.53	56.0	71.1	6.3	RSV300560	62.87 x 5.33
22.0	32.7	4.2	RSV200220	26.58 x 3.53	56.0	76.5	8.1	RSV400560	63 x 7.0
25.0	35.7	4.2	RSV200250	29.75 x 3.53	57.0	72.1	6.3	RSV300570	62.87 x 5.33
25.4	36.1	4.2	RSV200254	29.75 x 3.53	59.0	69.7	4.2	RSV200590	63.09 x 3.53
26.0	36.7	4.2	RSV200260	29.75 x 3.53	60.0	70.7	4.2	RSV200600	63.09 x 3.53
28.0	38.7	4.2	RSV200280	32.92 x 3.53	60.0	75.1	6.3	RSV300600	66.04 x 5.33
30.0	40.7	4.2	RSV200300	34.52 x 3.53	63.0	73.7	4.2	RSV200630	66.27 x 3.53
32.0	42.7	4.2	RSV200320	36.09 x 3.53	63.0	78.1	6.3	RSV300630	69.22 x 5.33
35.0	45.7	4.2	RSV200350	37.69 x 3.53	63.5	78.6	6.3	RSV300635	69.22 x 5.33
36.0	46.7	4.2	RSV200360	40.87 x 3.53	65.0	75.7	4.2	RSV200650	69.44 x 3.53
37.0	47.7	4.2	RSV200370	40.87 x 3.53	65.0	80.1	6.3	RSV300650	69.22 x 5.33
38.0	48.7	4.2	RSV200380	40.87 x 3.53	67.0	77.7	4.2	RSV200670	72.62 x 3.53
38.0	53.1	6.3	RSV300380	43.82 x 5.33	69.0	84.1	6.3	RSV300690	75.57 x 5.33
40.0	50.7	4.2	RSV200400	44.04 x 3.53	70.0	80.7	4.2	RSV200700	75.79 x 3.53
40.0	55.1	6.3	RSV300400	43.82 x 5.33	70.0	85.1	6.3	RSV300700	75.57 x 5.33
42.0	52.7	4.2	RSV200420	47.22 x 3.53	70.0	90.5	8.1	RSV400700	78 x 7.0
42.0	57.1	6.3	RSV300420	46.99 x 5.33	72.0	82.7	4.2	RSV200720	75.79 x 3.53
43.0	53.7	4.2	RSV200430	47.22 x 3.53	73.0	88.1	6.3	RSV300730	78.74 x 5.33
44.45	59.55	6.3	RSV300444	50.17 x 5.33	75.0	85.7	4.2	RSV200750	78.97 x 3.53
45.0	55.7	4.2	RSV200450	50.39 x 3.53	75.0	90.1	6.3	RSV300750	81.92 x 5.33
45.0	60.1	6.3	RSV300450	50.17 x 5.33	76.2	91.3	6.3	RSV300762	81.92 x 5.33
48.0	58.7	4.2	RSV200480	51.5 x 3.55	78.0	93.1	6.3	RSV300780	85.09 x 5.33
48.0	63.1	6.3	RSV300480	53.34 x 5.33	80.0	90.7	4.2	RSV200800	85.32 x 3.53
50.0	60.7	4.2	RSV200500	53.57 x 3.53	80.0	95.1	6.3	RSV300800	85.09 x 5.33
50.0	65.1	6.3	RSV300500	56.52 x 5.33	80.0	100.5	8.1	RSV400800	88 x 7.0
50.8	61.5	4.2	RSV200508	53.57 x 3.53	82.5	97.6	6.3	RSV300825	88.27 x 5.33
50.8	65.9	6.3	RSV300508	56.52 x 5.33	83.0	93.7	4.2	RSV200830	88.49 x 3.53
52.0	62.7	4.2	RSV200520	56.74 x 3.53	85.0	95.7	4.2	RSV200850	88.49 x 3.53
52.0	67.1	6.3	RSV300520	56.52 x 5.33	85.0	100.1	6.3	RSV300850	91.44 x 5.33
54.0	69.1	6.3	RSV300540	59.69 x 5.33	85.0	105.5	8.1	RSV400850	93 x 7.0
55.0	65.7	4.2	RSV200550	59.92 x 3.53	89.0	104.1	6.3	RSV300890	94.62 x 5.33
55.0	70.1	6.3	RSV300550	59.69 x 5.33	90.0	100.7	4.2	RSV200900	94.84 x 3.53



Turcon® Stepseal® V Rod and Piston Seal



Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-ring Sizes
d_N f8/h9	D_1 H9	L_1 +0.2		
90.0	105.1	6.3	RSV300900	94.62 x 5.33
90.0	110.5	8.1	RSV400900	98 x 7.0
92.0	102.7	4.2	RSV200920	98.02 x 3.53
92.0	107.1	6.3	RSV300920	97.79 x 5.33
95.0	105.7	4.2	RSV200950	101.19 x 3.53
95.0	110.1	6.3	RSV300950	100.97 x 5.33
100.0	110.7	4.2	RSV201000	104.37 x 3.53
100.0	115.1	6.3	RSV301000	107.32 x 5.33
100.0	120.5	8.1	RSV401000	108 x 7.0
101.6	116.7	6.3	RSV301016	107.32 x 5.33
104.7	119.8	6.3	RSV301047	110.49 x 5.33
105.0	120.1	6.3	RSV301050	110.49 x 5.33
105.0	125.5	8.1	RSV401050	113.67 x 7.0
110.0	120.7	4.2	RSV201100	113.89 x 3.53
110.0	125.1	6.3	RSV301100	116.84 x 5.33
110.0	130.5	8.1	RSV401100	116.84 x 7.0
115.0	130.1	6.3	RSV301150	120.02 x 5.33
120.0	135.1	6.3	RSV301200	126.37 x 5.33
120.0	145.5	8.1	RSV401200	129.54 x 7.0
125.0	140.1	6.3	RSV301250	129.54 x 5.33
125.0	145.5	8.1	RSV401250	132.72 x 7.0
125.4	140.5	6.3	RSV301254	132.72 x 5.33
127.0	142.1	6.3	RSV301270	132.72 x 5.33
130.0	145.1	6.3	RSV301300	135.89 x 5.33
130.0	150.5	8.1	RSV401300	139.07 x 7.0
132.0	147.1	6.3	RSV301320	139.07 x 5.33
135.0	145.7	4.2	RSV201350	139.29 x 3.53
135.0	150.1	6.3	RSV301350	142.24 x 5.33
137.0	152.1	6.3	RSV301370	142.24 x 5.33
138.0	153.1	6.3	RSV301380	142.24 x 5.33
140.0	150.7	4.2	RSV201400	145.64 x 3.53
140.0	155.1	6.3	RSV301400	145.42 x 5.33
140.0	160.5	8.1	RSV401400	148.59 x 7.0

Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-ring Sizes
d_N f8/h9	D_1 H9	L_1 +0.2		
140.5	155.6	6.3	RSV301405	145.42 x 5.33
145.0	160.1	6.3	RSV301450	151.77 x 5.33
145.0	165.5	8.1	RSV401450	151.77 x 7.0
150.0	165.1	6.3	RSV301500	158.12 x 5.33
150.0	170.5	8.1	RSV401500	158.12 x 7.0
153.0	168.1	6.3	RSV301530	158.12 x 5.33
155.0	170.1	6.3	RSV301550	158.12 x 5.33
160.0	175.1	6.3	RSV301600	164.47 x 5.33
160.0	180.5	8.1	RSV401600	170.82 x 7.0
165.0	180.1	6.3	RSV301650	170.82 x 5.33
170.0	185.1	6.3	RSV301700	177.17 x 5.33
170.0	190.5	8.1	RSV401700	177.17 x 7.0
173.0	188.1	6.3	RSV301730	177.17 x 5.33
175.0	190.1	6.3	RSV301750	183.52 x 5.33
180.0	195.1	6.3	RSV301800	183.52 x 5.33
180.0	200.5	8.1	RSV401800	189.87 x 7.0
185.0	200.1	6.3	RSV301850	189.87 x 5.33
185.0	205.5	8.1	RSV401850	196.22 x 7.0
190.0	205.1	6.3	RSV301900	196.22 x 5.33
190.0	210.5	8.1	RSV401900	196.22 x 7.0
195.0	210.1	6.3	RSV301950	202.57 x 5.33
200.0	215.1	6.3	RSV302000	208.92 x 5.33
200.0	220.5	8.1	RSV402000	215.27 x 7.0
205.0	225.5	8.1	RSV402050	215.27 x 7.0
210.0	230.5	8.1	RSV402100	215.27 x 7.0
211.0	231.5	8.1	RSV402110	215.27 x 7.0
212.0	232.5	8.1	RSV402120	227.97 x 7.0
215.0	235.5	8.1	RSV402150	227.97 x 7.0
220.0	240.5	8.1	RSV402200	227.97 x 7.0
225.0	245.5	8.1	RSV402250	240.67 x 7.0
230.0	245.1	6.3	RSV302300	234.32 x 5.33
230.0	250.5	8.1	RSV402300	240.67 x 7.0
235.0	255.5	8.1	RSV402350	240.67 x 7.0



Turcon® Stepseal® V Rod and Piston Seal

Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-ring Sizes
d_N f8/h9	D_1 H9	$L_1 +0.2$		
240.0	260.5	8.1	RSV402400	253.37 x 7.0
245.0	265.5	8.1	RSV402450	253.37 x 7.0
250.0	270.5	8.1	RSV402500	266.07 x 7.0
260.0	284.0	8.1	RSV802600	266.07 x 7.0
265.0	289.0	8.1	RSV802650	278.77 x 7.0
270.0	290.5	8.1	RSV402700	278.77 x 7.0
270.0	294.0	8.1	RSV802700	278.77 x 7.0
275.0	299.0	8.1	RSV802750	291.47 x 7.0
280.0	304.0	8.1	RSV802800	291.47 x 7.0
285.0	309.0	8.1	RSV802850	291.47 x 7.0
290.0	314.0	8.1	RSV802900	304.17 x 7.0
295.0	319.0	8.1	RSV802950	304.17 x 7.0
300.0	320.5	8.1	RSV403000	304.17 x 7.0
300.0	324.0	8.1	RSV803000	316.87 x 7.0
310.0	334.0	8.1	RSV803100	316.87 x 7.0
320.0	344.0	8.1	RSV803200	329.57 x 7.0
330.0	354.0	8.1	RSV803300	342.27 x 7.0
340.0	364.0	8.1	RSV803400	354.97 x 7.0
350.0	370.5	8.1	RSV403500	354.97 x 7.0
350.0	374.0	8.1	RSV803500	367.67 x 7.0
360.0	384.0	8.1	RSV803600	367.67 x 7.0
365.0	389.0	8.1	RSV803650	380.37 x 7.0
370.0	394.0	8.1	RSV803700	380.37 x 7.0
375.0	399.0	8.1	RSV803750	393.07 x 7.0
380.0	404.0	8.1	RSV803800	393.07 x 7.0
390.0	414.0	8.1	RSV803900	405.26 x 7.0
400.0	424.0	8.1	RSV804000	417.96 x 7.0
410.0	434.0	8.1	RSV804100	417.96 x 7.0
420.0	444.0	8.1	RSV804200	430.66 x 7.0
430.0	454.0	8.1	RSV804300	443.36 x 7.0
435.0	459.0	8.1	RSV804350	443.36 x 7.0
440.0	464.0	8.1	RSV804400	456.06 x 7.0
450.0	474.0	8.1	RSV804500	468.76 x 7.0

Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-ring Sizes
d_N f8/h9	D_1 H9	$L_1 +0.2$		
460.0	484.0	8.1	RSV804600	468.76 x 7.0
470.0	494.0	8.1	RSV804700	481.46 x 7.0
480.0	504.0	8.1	RSV804800	494.16 x 7.0
485.0	509.0	8.1	RSV804850	494.16 x 7.0
490.0	514.0	8.1	RSV804900	506.86 x 7.0
500.0	524.0	8.1	RSV805000	506.86 x 7.0
510.0	534.0	8.1	RSV805100	532.26 x 7.0
520.0	544.0	8.1	RSV805200	532.26 x 7.0
525.0	549.0	8.1	RSV805250	532.26 x 7.0
530.0	554.0	8.1	RSV805300	557.66 x 7.0
540.0	564.0	8.1	RSV805400	557.66 x 7.0
550.0	574.0	8.1	RSV805500	557.66 x 7.0
560.0	584.0	8.1	RSV805600	582.68 x 7.0
570.0	594.0	8.1	RSV805700	582.68 x 7.0
580.0	604.0	8.1	RSV805800	608.08 x 7.0
585.0	609.0	8.1	RSV805850	608.08 x 7.0
590.0	614.0	8.1	RSV805900	608.08 x 7.0
600.0	624.0	8.1	RSV806000	608.08 x 7.0
610.0	634.0	8.1	RSV806100	633.48 x 7.0
620.0	644.0	8.1	RSV806200	633.48 x 7.0
630.0	654.0	8.1	RSV806300	658.88 x 7.0
640.0	664.0	8.1	RSV806400	658.88 x 7.0
650.0	677.3	9.5	RSV506500	663 x 8.4
656.0	683.3	9.5	RSV506560	669 x 8.4
660.0	687.3	9.5	RSV506600	673 x 8.4
680.0	707.3	9.5	RSV506800	693 x 8.4
685.0	712.3	9.5	RSV506850	698 x 8.4
700.0	724.0	8.1	RSV807000	712 x 7.0
700.0	727.3	9.5	RSV507000	713 x 8.4
710.0	737.3	9.5	RSV507100	723 x 8.4
730.0	757.3	9.5	RSV507300	743 x 8.4
760.0	787.3	9.5	RSV507600	773 x 8.4
765.0	792.3	9.5	RSV507650	778 x 8.4



Turcon® Stepseal® V Rod and Piston Seal

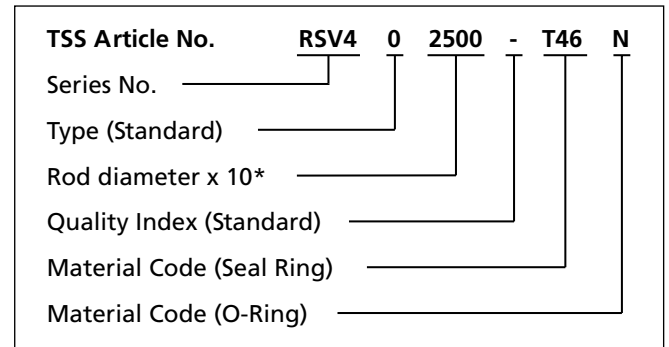


Rod Dia.	Groove Dia.	Groove Width	TSS Part No.	O-ring Sizes
d_N f8/h9	D_1 H9	$L_1 +0.2$		
780.0	807.3	9.5	RSV507800	793 x 8.4
790.0	817.3	9.5	RSV507900	803 x 8.4
800.0	827.3	9.5	RSV508000	813 x 8.4
810.0	837.3	9.5	RSV508100	823 x 8.4
820.0	847.3	9.5	RSV508200	833 x 8.4
830.0	857.3	9.5	RSV508300	843 x 8.4
850.0	877.3	9.5	RSV508500	863 x 8.4
870.0	897.3	9.5	RSV508700	883 x 8.4
880.0	907.3	9.5	RSV508800	893 x 8.4
885.0	912.3	9.5	RSV508850	898 x 8.4
890.0	917.3	9.5	RSV508900	903 x 8.4
930.0	957.3	9.5	RSV509300	943 x 8.4
955.0	982.3	9.5	RSV509550	968 x 8.4
1000.0	1038.0	13.8	RSV6X1000	1016 x 12
1035.0	1073.0	13.8	RSV6X1035	1051 x 12
1040.0	1067.3	9.5	RSV5X1040	1053 x 8.4
1040.0	1078.0	13.8	RSV6X1040	1056 x 12
1050.0	1077.3	9.5	RSV5X1050	1063 x 8.4
1050.0	1088.0	13.8	RSV6X1050	1066 x 12
1100.0	1138.0	13.8	RSV6X1100	1116 x 12
1120.0	1147.3	9.5	RSV5X1120	1133 x 8.4
1120.0	1158.0	13.8	RSV6X1120	1136 x 12
1200.0	1227.3	9.5	RSV5X1200	1213 x 8.4
1200.0	1238.0	13.8	RSV6X1200	1216 x 12
1330.0	1357.3	9.5	RSV5X1330	1343 x 8.4
1330.0	1368.0	13.8	RSV6X1330	1346 x 12
1500.0	1527.3	9.5	RSV5X1500	1513 x 8.4
1500.0	1538.0	13.8	RSV6X1500	1516 x 12
1600.0	1638.0	13.8	RSV6X1600	1616 x 12
2000.0	2038.0	13.8	RSV6X2000	2016 x 12
2600.0	2638.0	13.8	RSV6X2600	2616 x 12

■ Ordering example

Turcon® Stepseal® V complete with O-Ring, standard application, Series RSV4 (from Table II).
Rod diameter: $d_N = 250.0$ mm
TSS Part No.: RSV402500 (from Table III)

Select the material from Table I, page 6. The corresponding code numbers are appended to the TSS Part No. (from Table III). Together these form the TSS Article number. The TSS Article number for all intermediate sizes not shown in Table III can be determined following the example beneath.



* For diameters ≥ 1000.0 mm multiply only by factor 1.
Example: RSV6 for diameter 1200.0 mm.
TSS Article no.: RSV6X1200 - T46N.



Installation recommendation - Piston

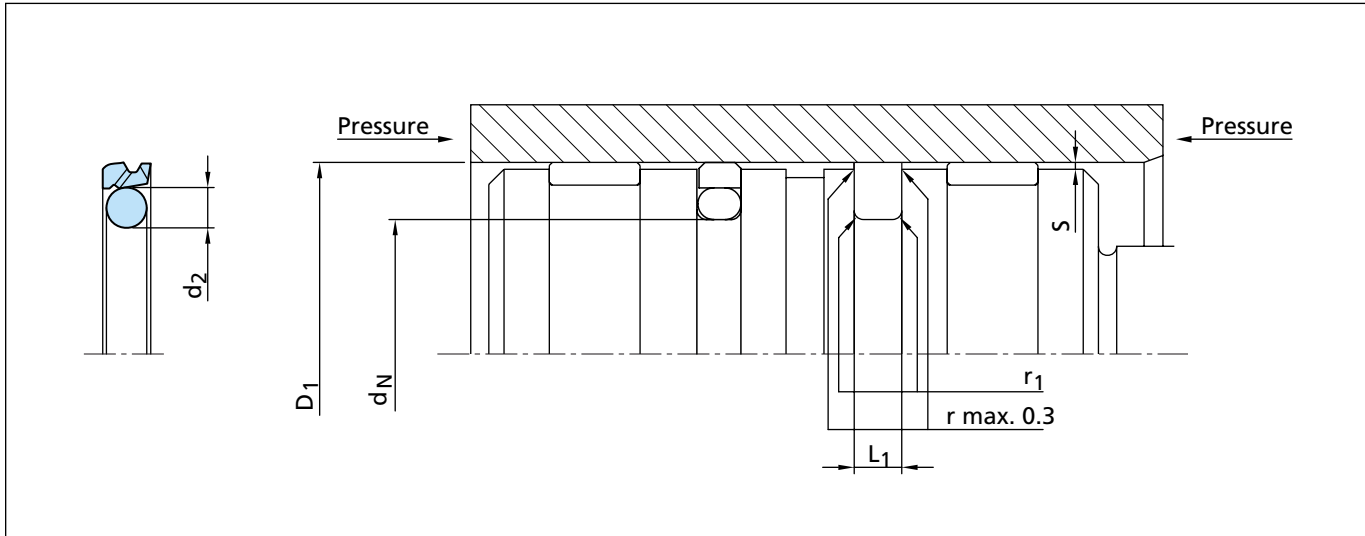


Figure 6 Installation drawing

Table IV Installation dimensions – Standard recommendations

Series No.	Rod Diameter D_N H9			Groove Diameter D_1 H9	Groove Width $L_1 +0.2$	Radius r_1	Radial Clearance S_{max}^*			O-Ring Cross-Section d_2
	Standard Application	Light Application	Heavy Duty Application				10 MPa	20 MPa	40 MPa	
PSV2	25.0 – 59.9	38.0 – 199.9	-	$D_N - 10.7$	4.2	1.0	0.50	0.30	0.20	3.53
PSV3	60.0 – 199.9	200.0 – 255.9	27.0 – 59.9	$D_N - 15.1$	6.3	1.3	0.70	0.40	0.25	5.33
PSV4	200.0 – 255.9	256.0 – 669.9	60.0 – 199.9	$D_N - 20.5$	8.1	1.8	0.80	0.60	0.35	7.00
PSV8	256.0 – 669.9	670.0 – 999.9	200.0 – 255.9	$D_N - 24.0$	8.1	1.8	0.90	0.70	0.40	7.00
PSV5	670.0 – 999.9	≥ 1000	256.0 – 669.9	$D_N - 27.3$	9.5	2.5	1.00	0.80	0.50	8.40
PSV6	$\geq 1000^{**}$	-	670.0 – 999.9	$D_N - 38.0$	13.8	3.0	1.20	0.90	0.60	12.00

* At pressures > 40 MPa use diameter tolerance H8/f8 (bore/piston) in area of seal or consult Trelleborg Sealing Solutions for alternative material or profiles.

** Energizer has a special shape.



Table V Installation dimensions / TSS Part No. - Piston

Bore Dia.	Groove Dia.	Groove Width	TSS Part No.	O-ring Sizes	Bore Dia.	Groove Dia.	Groove Width	TSS Part No.	O-ring Sizes
D _N f8/h9	d ₁ H9	L ₁ +0.2			D _N f8/h9	d ₁ H9	L ₁ +0.2		
25.0	14.3	4.2	PSV200250	13.87 x 3.53	110.0	94.9	6.3	PSV301100	91.44 x 5.33
28.0	17.3	4.2	PSV200280	15.47 x 3.53	110.0	89.5	8.1	PSV401100	88 x 7.0
30.0	19.3	4.2	PSV200300	18.66 x 3.53	115.0	99.9	6.3	PSV301150	97.79 x 5.33
32.0	21.3	4.2	PSV200320	20.22 x 3.53	115.0	94.5	8.1	PSV401150	93 x 7.0
35.0	24.3	4.2	PSV200350	23.40 x 3.53	120.0	104.9	6.3	PSV301200	104.14 x 5.33
40.0	29.3	4.2	PSV200400	28.17 x 3.53	120.0	99.5	8.1	PSV401200	98 x 7.0
42.0	31.3	4.2	PSV200420	29.75 x 3.53	125.0	109.9	6.3	PSV301250	107.32 x 5.33
45.0	34.3	4.2	PSV200450	32.92 x 3.53	125.0	104.5	8.1	PSV401250	103 x 7.0
48.0	37.3	4.2	PSV200480	36.09 x 3.53	130.0	114.9	6.3	PSV301300	113.67 x 5.33
50.0	39.3	4.2	PSV200500	37.70 x 3.53	130.0	109.5	8.1	PSV401300	108 x 7.0
50.0	34.9	6.3	PSV300500	32.69 x 5.33	135.0	114.5	8.1	PSV401350	113.67 x 7.0
52.0	41.3	4.2	PSV200520	40.87 x 3.53	140.0	119.5	8.1	PSV401400	116.84 x 7.0
55.0	44.3	4.2	PSV200550	44.04 x 3.53	145.0	124.5	8.1	PSV401450	123.19 x 7.0
60.0	44.9	6.3	PSV300600	43.82 x 5.33	150.0	129.5	8.1	PSV401500	126.37 x 7.0
63.0	52.3	4.2	PSV200630	50.39 x 3.53	155.0	139.9	6.3	PSV301550	135.89 x 5.33
63.0	47.9	6.3	PSV300630	46.99 x 5.33	160.0	144.9	6.3	PSV301600	142.24 x 5.33
65.0	49.9	6.3	PSV300650	46.99 x 5.33	160.0	139.5	8.1	PSV401600	135.89 x 7.00
70.0	59.3	4.2	PSV200700	56.74 x 3.53	165.0	149.9	6.3	PSV301650	148.49 x 5.33
70.0	54.9	6.3	PSV300700	53.34 x 5.33	165.0	144.5	8.1	PSV401650	142.24 x 7.0
75.0	59.9	6.3	PSV300750	56.52 x 5.33	170.0	149.5	8.1	PSV401700	145.42 x 7.0
80.0	64.9	6.3	PSV300800	62.87 x 5.33	175.0	159.9	6.3	PSV301750	158.12 x 5.33
80.0	59.5	8.1	PSV400800	58 x 7.0	180.0	164.9	6.3	PSV301800	164.47 x 5.33
85.0	69.9	6.3	PSV300850	69.22 x 5.33	180.0	159.5	8.1	PSV401800	158.12 x 7.0
85.0	64.5	8.1	PSV400850	63 x 7.0	190.0	174.9	6.3	PSV301900	170.82 x 5.33
90.0	74.9	6.3	PSV300900	72.39 x 5.33	190.0	169.5	8.1	PSV401900	164.47 x 7.0
90.0	69.5	8.1	PSV400900	68 x 7.0	200.0	184.9	6.3	PSV302000	183.52 x 5.33
95.0	79.9	6.3	PSV300950	78.74 x 5.33	200.0	179.5	8.1	PSV402000	177.17 x 7.0
95.0	74.5	8.1	PSV400950	72 x 7.0	205.0	184.5	8.1	PSV402050	183.52 x 7.0
100.0	84.9	6.3	PSV301000	81.92 x 5.33	210.0	189.5	8.1	PSV402100	183.52 x 7.0
100.0	79.5	8.1	PSV401000	78 x 7.0	220.0	204.9	6.3	PSV302200	202.57 x 5.33
105.0	89.9	6.3	PSV301050	88.27 x 5.33	220.0	199.5	8.1	PSV402200	196.22 x 7.0
105.0	84.5	8.1	PSV401050	83 x 7.0	230.0	209.5	8.1	PSV402300	202.57 x 7.0
106.0	90.9	6.3	PSV301060	88.27 x 5.33	240.0	219.5	8.1	PSV402400	215.27 x 7.0



Turcon® Stepseal® V Rod and Piston Seal

Bore Dia.	Groove Dia.	Groove Width	TSS Part No.	O-ring Sizes
D_N f8/h9	d_1 H9	$L_1 +0.2$		
250.0	229.5	8.1	PSV402500	227.97 x 7.0
250.0	226.0	8.1	PSV802500	227.97 x 7.0
260.0	236.0	8.1	PSV802600	227.97 x 7.0
270.0	246.0	8.1	PSV802700	240.67 x 7.0
280.0	256.0	8.1	PSV802800	253.37 x 7.0
300.0	276.0	8.1	PSV803000	266.07 x 7.0
306.0	285.5	8.1	PSV403060	278.77 x 7.0
310.0	286.0	8.1	PSV803100	278.77 x 7.0
320.0	299.5	8.1	PSV403200	291.47 x 7.0
320.0	296.0	8.1	PSV803200	291.47 x 7.0
330.0	306.0	8.1	PSV803300	304.17 x 7.0
340.0	316.0	8.1	PSV803400	316.87 x 7.0
345.0	324.5	8.1	PSV403450	316.87 x 7.0
350.0	326.0	8.1	PSV803500	316.87 x 7.0
360.0	336.0	8.1	PSV803600	329.57 x 7.0
370.0	346.0	8.1	PSV803700	342.27 x 7.0
380.0	356.0	8.1	PSV803800	354.97 x 7.0
400.0	376.0	8.1	PSV804000	367.67 x 7.0
420.0	396.0	8.1	PSV804200	393.07 x 7.0
430.0	406.0	8.1	PSV804300	405.26 x 7.0
440.0	416.0	8.1	PSV804400	405.26 x 7.0
450.0	426.0	8.1	PSV804500	417.96 x 7.0
480.0	456.0	8.1	PSV804800	456.06 x 7.0
500.0	476.0	8.1	PSV805000	468.76 x 7.0
520.0	499.5	8.1	PSV405200	494.16 x 7.0
540.0	516.0	8.1	PSV805400	506.86 x 7.0
600.0	576.0	8.1	PSV806000	557.66 x 7.0
650.0	626.0	8.1	PSV806500	608.08 x 7.0
700.0	672.7	9.5	PSV507000	670 x 8.4
800.0	772.7	9.5	PSV508000	770 x 8.4
860.0	832.7	9.5	PSV508600	830 x 8.4
900.0	872.7	9.5	PSV509000	870 x 8.4
920.0	892.7	9.5	PSV509200	890 x 8.4

Bore Dia.	Groove Dia.	Groove Width	TSS Part No.	O-ring Sizes
D_N f8/h9	d_1 H9	$L_1 +0.2$		
1000.0	972.7	9.5	PSV5X1000	970 x 8.4
1000.0	962.0	13.8	PSV6X1000	960 x 12.0
1200.0	1172.7	9.5	PSV5X1200	1170 x 8.4
1200.0	1162.0	13.8	PSV6X1200	1160 x 12.0
1500.0	1462.0	13.8	PSV6X1500	1460 x 12.0
2000.0	1962.0	13.8	PSV6X2000	1960 x 12.0
2700.0	2662.0	13.8	PSV6X2700	2660 x 12.0

Ordering example

Turcon® Stepseal® V complete with O-Ring, standard application, Series PSV3 (from Table IV).

Bore diameter: $D_N = 80.0$ mm

TSS Part No. PSV300800 (from Table V)

Select the material from Table I, page 6. The corresponding code numbers are appended to the TSS Part No. (from Table V, page 13). Together they form the TSS Article No. For all intermediate sizes not shown in Table V, the TSS Article No. can be determined from the example opposite.

TSS Article No.	PSV3	0	0800	-	T46	N
Series No.	_____	_____	_____	_____	_____	_____
Type (Standard)	_____	_____	_____	_____	_____	_____
Bore diameter x 10*	_____	_____	_____	_____	_____	_____
Quality Index (Standard)	_____	_____	_____	_____	_____	_____
Material Code (Seal Ring)	_____	_____	_____	_____	_____	_____
Material Code (O-Ring)	_____	_____	_____	_____	_____	_____

* For diameters ≥ 1000.0 mm multiply only by factor 1.

Example: PSVK6 for diameter 1200.0 mm.

TSS Article no.: PSV6X1200 - T46N.

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