Turcon® Stepseal® 2K





Single Acting

Rubber Energized Plastic Faced Seal

Material:
Turcon®, Zurcon® and Elastomer

■ Turcon® Stepseal® 2K*



Description

The Stepseal® 2K is a single-acting seal element consisting of a seal ring of high-grade Turcon® or Zurcon® materials and an O-Ring as energizing element.

The Stepseal® 2K was originally developed and patented by Trelleborg Sealing Solutions as a rod seal. Due to its outstanding properties, however, it is equally well suited as a single-acting piston seal where high demands are made on positional accuracy and free movement.

* Patented and patent pending geometry

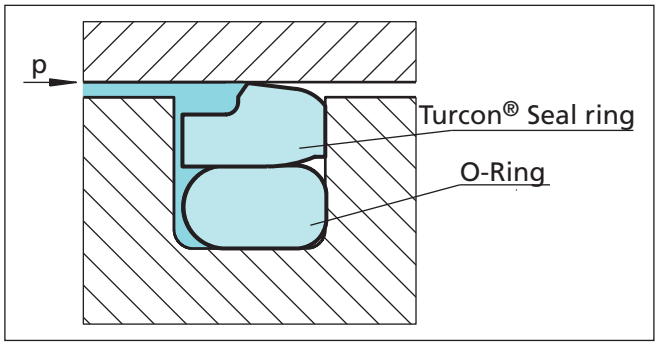


Figure 27 Turcon® Stepseal® 2K

Advantages

- High static and dynamic sealing effect
- Stick-slip free operation for precise control
- High abrasion resistance and high resistance to extrusion
- Long service life
- Simple groove design, one-piece piston possible
- 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 2.700 mm
- Low friction

Application Examples

The Turcon® Stepseal® 2K is the recommended sealing element for single acting pistons in hydraulic components for:

- Injection moulding machines
- Machine tools
- Presses
- Mobile cranes

Technical Data

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 **)
Media:	Mineral oil-based hydraulic fluids, flame retardant hydraulic fluids, environmentally safe hydraulic fluids (bio-oils), phosphate ester, water, air and others,depending on the seal and O-Ring material compatibility (see Table XXVII)
Clearance:	The maximum permissible radial clearance S_{max} is shown in Table XXVIII, 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 medium.

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

Materials

The following material combinations have proven effective for hydraulic applications:

All round material for hydraulic applications with reciprocating, short stroke or helical movements in mineral oils, flame retardant hydraulic fluids HFC, phosphate ester, bio-oils or fluids having less satisfactory lubricating properties:

Turcon® Stepseal® 2K:	Turcon® M12	
O-Ring:	NBR, 70 Shore A	N
	FKM, 70 Shore A	V
Set code:	M12N or M12V	

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

Turcon® Stepseal® 2K:	Turcon® T46	
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 viable material combinations are listed in Table XXVII.

Series

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

Table XXVIII 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 in which no exceptional operating conditions exist.
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 XXVI Available range

Series No.	Bore Diameter D_N H9
PSK00	6.0 - 140.0
PSK10	10.0 - 140.0
PSK20	18.0 - 320.0
PSK30	40.0 - 400.0
PSK40	50.0 - 700.0
PSK80	133.0 - 999.9
PSK50	256.0 - 999.9
PSK5X	1000.0 - 1200.0
PSK60	750.0 - 999.9
PSK6X	1000.0 - 2700.0

For the recommended range see Table XXVIII.

Groove

Stepseal® 2K is also available on request for the groove sizes to ISO 7425/1.

Table XXVII 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 No wear or abrasion of counter surface Mineral fibre and Additives filled Colour: Dark grey	M12	NBR - 70	N	-30 to +100	Steel Steel hardened Steel chrome plated (rod) Steel plated (rod) Cast iron Stainless steel Titanium	50
		NBR - 70 Low temp.	T	-45 to +80		
		FKM - 70	V	-10 to +200		
Turcon® T05 For lubricating fluids Also for gas service Very low friction Very good sliding and sealing properties Colour: Turquoise	T05	NBR - 70	N	-30 to +100	Steel hardened Steel chrome plated (rod)	20
		NBR - 70 Low temp.	T	-45 to +80		
		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 Colour: 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 lubricating and non-lubricating fluids High extrusion resistance Good chemical resistance Not for electrically conducting fluids BAM tested Carbon, graphite filled Colour: Black	T10	NBR - 70	N	-30 to +100	Steel Steel hardened Steel chrome plated (rod) Stainless steel	40
		NBR - 70 Low temp.	T	-45 to +80		
		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 fibre filled Colour: Grey	T29	NBR - 70	N	-30 to +100	Steel Steel hardened Steel chrome plated (rod) Cast iron Stainless steel	30
		NBR - 70 Low temp.	T	-45 to +80		
		FKM - 70	V	-10 to +200		
		EPDM - 70	E**	-45 to +145		
Turcon® T40 For lubricating and non-lubricating fluids High frequency and short strokes **Water hydraulics** Surface texture is not suitable for gas sealing Carbon fibre filled Colour: Grey	T40	NBR - 70	N	-30 to +100	Steel hardened Steel chrome plated (rod) Cast iron Stainless steel Aluminium	25
		NBR - 70 Low temp.	T	-45 to +80		
		FKM - 70	V	-10 to +200		
		EPDM - 70	E**	-45 to +145		

Material, Applications, Properties	Code	O-Ring Material Shore A	Code	O-Ring Operating Temp.* °C	Mating Surface Material	MPa max. Dyna-mic
Turcon® T46 For lubricated hydraulics in linear motion High compressive strength High extrusion resistance Very good sliding and wear properties BAM tested Bronze filled Colour: Light to dark brown, which may have variations in shading	T46	NBR - 70	N	-30 to +100	Steel hardened Steel chrome plated (rod) Cast iron	50
		NBR - 70 Low temp.	T	-45 to +80		
		FKM - 70	V	-10 to +200		
Zurcon® Z51*** 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 Colour: Yellow to light-brown	Z51	NBR - 70	N	-30 to +100	Steel Steel hardened Steel chrome plated (rod) Cast iron Stainless steel Ceramic coating	60
		NBR - 70 Low temp.	T	-45 to +80		
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) Colour: White to off-white	Z80	NBR - 70	N	-30 to (+100)	Steel Steel hardened Steel chrome plated (rod) Stainless steel Aluminium Ceramic coating	35
		NBR - 70 Low temp.	T	-45 to +80		
		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. Ø 2300 BAM: Tested by "Bundesanstalt Materialprüfung, Germany". Highlighted materials are standard.

■ Installation Recommendation

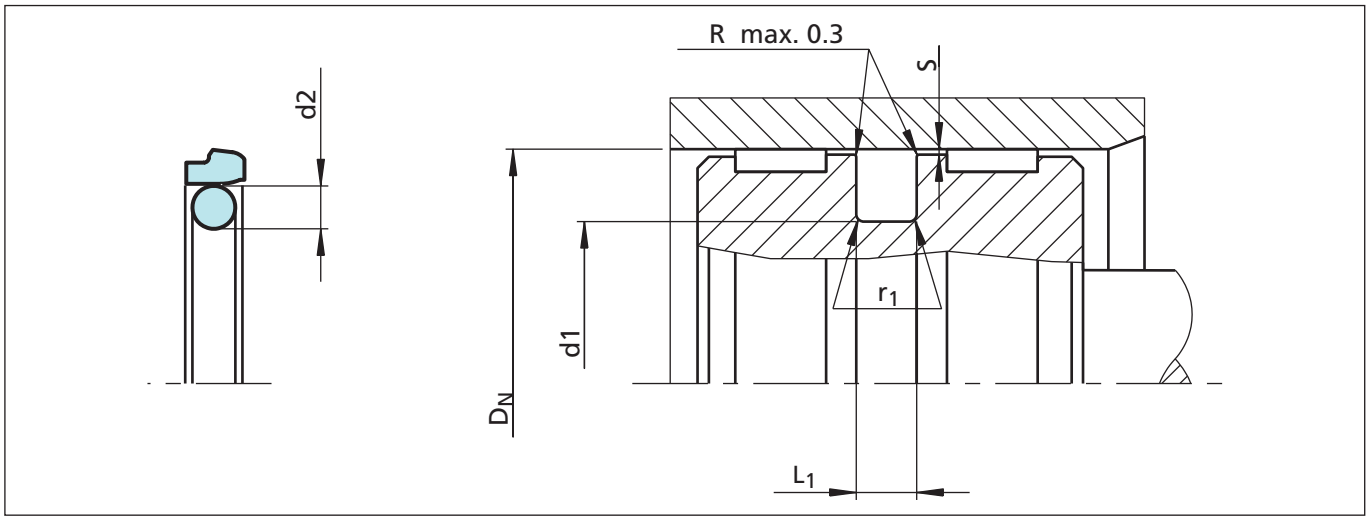


Figure 28 Installation drawing

Table XXVIII Installation Dimensions - Standard recommendations

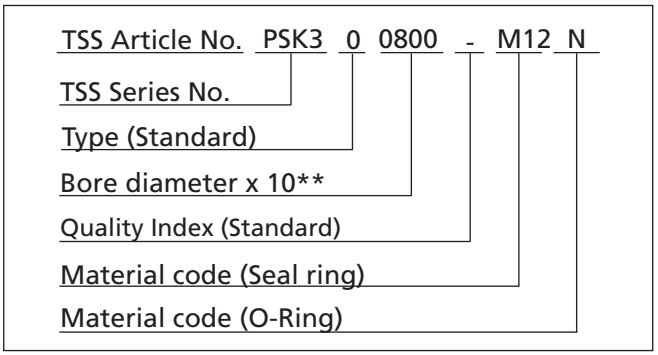
Series No.	Bore Diameter D_N H9			Groove Diameter	Groove Width	Radius	Radial Clearance S max*			O-Ring Cross Sec.
	Standard Application	Light Application	Heavy-Duty Application	d_1 h9	L1 +0.2	r_1	10 MPa	20 MPa	40 MPa	d_2
PSK0	8 - 16.9	17 - 26.9	- -	D_N - 4.9	2.2	0.4	0.30	0.20	0.15	1.78
PSK1	17 - 26.9	27 - 59.9	- -	D_N - 7.3	3.2	0.6	0.40	0.25	0.15	2.62
PSK2	27 - 59.9	60 - 199.9	17 - 26.9	D_N - 10.7	4.2	1.0	0.50	0.30	0.20	3.53
PSK3	60 - 199.9	200 - 255.9	27 - 59.9	D_N - 15.1	6.3	1.3	0.70	0.40	0.25	5.33
PSK4	200 - 255.9	256 - 669.9	60 - 199.9	D_N - 20.5	8.1	1.8	0.80	0.60	0.35	7.00
PSK8	256 - 669.9	670 - 999.9	200 - 255.9	D_N - 24.0	8.1	1.8	0.90	0.70	0.40	7.00
PSK5	670 - 999.9	- -	256 - 669.9	D_N - 28.0	9.5	2.5	1.00	0.80	0.60	8.40
PSK5X	- -	1000 - 1200	- -	D_N - 28.0	9.5	2.5	1.00	0.80	0.60	8.40
PSK6	- -	- -	670 - 999.9	D_N - 38.0	13.8	3.0	1.20	0.90	0.60	12.00
PSK6X	1000 - 2700	- -	- -	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 TSS for alternative material or profiles.
TSS Slydring® / Wear Rings are not applicable at very small radical clearances. Please consult the Slydring® catalog.
O-Rings with 12 mm cross section are delivered as special profilring

Ordering example

Turcon® Stepseal® 2K, complete with O-Ring, standard application, Series PSK3 (from Table XXVIII).
Bore diameter: D_N = 80.0 mm
TSS Part No. PSK300800 (from Table XXIX)

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



** For diameters ≥ 1000.0 mm multiply only by factor 1.
Example: PSK6 for diameter 1200.0 mm.
TSS Article No.: PSK6**X1200** - M12N.

Table XXIX Installation dimensions / TSS Part No.

Bore Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Dimensions
D_N H9	d_1 h9	L_1 +0.2		
9.0	4.1	2.2	PSK000090	3.68 x 1.78
10.0	5.1	2.2	PSK000100	4.80 x 1.8
12.0	**7.1**	**2.2**	**PSK000120**	**6.70 x 1.8**
14.0	9.1	2.2	PSK000140	8.75 x 1.8
15.0	10.1	2.2	PSK000150	9.25 x 1.78
16.0	**11.1**	**2.2**	**PSK000160**	**10.82 x 1.78**
18.0	10.7	3.2	PSK100180	9.19 x 2.62
20.0	**15.1**	**2.2**	**PSK000200**	**14.00 x 1.78**
20.0	**12.7**	**3.2**	**PSK100200**	**12.37 x 2.62**
22.0	14.7	3.2	PSK100220	13.94 x 2.62
25.0	**17.7**	**3.2**	**PSK100250**	**17.12 x 2.62**
25.0	**14.3**	**4.2**	**PSK200250**	**13.87 x 3.53**
28.0	17.3	4.2	PSK200280	15.47 x 3.53
30.0	22.7	3.2	PSK100300	21.89 x 2.62
30.0	19.3	4.2	PSK200300	18.66 x 3.53
32.0	**24.7**	**3.2**	**PSK100320**	**23.47 x 2.62**
32.0	**21.3**	**4.2**	**PSK200320**	**20.22 x 3.53**
35.0	24.3	4.2	PSK200350	23.40 x 3.53
40.0	**32.7**	**3.2**	**PSK100400**	**31.42 x 2.62**
40.0	**29.3**	**4.2**	**PSK200400**	**28.17 x 3.53**
42.0	31.3	4.2	PSK200420	29.75 x 3.53
45.0	34.3	4.2	PSK200450	32.92 x 3.53
48.0	37.3	4.2	PSK200480	36.09 x 3.53
50.0	**39.3**	**4.2**	**PSK200500**	**37.70 x 3.53**
50.0	**34.9**	**6.3**	**PSK300500**	**32.69 x 5.33**
52.0	41.3	4.2	PSK200520	40.87 x 3.53
55.0	44.3	4.2	PSK200550	44.04 x 3.53
60.0	44.9	6.3	PSK300600	43.82 x 5.33
63.0	**52.3**	**4.2**	**PSK200630**	**50.39 x 3.53**
63.0	**47.9**	**6.3**	**PSK300630**	**46.99 x 5.33**
65.0	49.9	6.3	PSK300650	46.99 x 5.33
70.0	59.3	4.2	PSK200700	56.74 x 3.53
70.0	54.9	6.3	PSK300700	53.34 x 5.33
75.0	59.9	6.3	PSK300750	56.52 x 5.33
80.0	**64.9**	**6.3**	**PSK300800**	**62.87 x 5.33**
80.0	**59.5**	**8.1**	**PSK400800**	**58 x 7.0**

Bore Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Dimensions
D_N H9	d_1 h9	L_1 +0.2		
85.0	69.9	6.3	PSK300850	69.22 x 5.33
85.0	64.5	8.1	PSK400850	63 x 7.0
90.0	74.9	6.3	PSK300900	72.39 x 5.33
90.0	69.5	8.1	PSK400900	68 x 7.0
95.0	79.9	6.3	PSK300950	78.74 x 5.33
95.0	74.5	8.1	PSK400950	73 x 7.0
100.0	**84.9**	**6.3**	**PSK301000**	**81.92 x 5.33**
100.0	**79.5**	**8.1**	**PSK401000**	**78 x 7.0**
105.0	89.9	6.3	PSK301050	88.27 x 5.33
105.0	84.5	8.1	PSK401050	83 x 7.0
106.0	90.9	6.3	PSK301060	88.27 x 5.33
110.0	94.9	6.3	PSK301100	91.44 x 5.33
110.0	89.5	8.1	PSK401100	88 x 7.0
115.0	99.9	6.3	PSK301150	97.79 x 5.33
115.0	94.5	8.1	PSK401150	93 x 7.0
120.0	104.9	6.3	PSK301200	104.14 x 5.33
120.0	99.5	8.1	PSK401200	98 x 7.0
125.0	**109.9**	**6.3**	**PSK301250**	**107.32 x 5.33**
125.0	**104.5**	**8.1**	**PSK401250**	**103 x 7.0**
130.0	114.9	6.3	PSK301300	113.67 x 5.33
130.0	109.5	8.1	PSK401300	108 x 7.0
135.0	114.5	8.1	PSK401350	113.67 x 7.0
140.0	119.5	8.1	PSK401400	116.84 x 7.0
145.0	124.5	8.1	PSK401450	123.19 x 7.0
150.0	129.5	8.1	PSK401500	126.37 x 7.0
155.0	139.9	6.3	PSK301550	135.89 x 5.33
160.0	**144.9**	**6.3**	**PSK301600**	**142.24 x 5.33**
160.0	**139.5**	**8.1**	**PSK401600**	**135.89 x 7.00**
165.0	149.9	6.3	PSK301650	148.49 x 5.33
165.0	144.5	8.1	PSK401650	142.24 x 7.0
170.0	149.5	8.1	PSK401700	145.42 x 7.0
175.0	159.9	6.3	PSK301750	158.12 x 5.33
180.0	164.9	6.3	PSK301800	164.47 x 5.33
180.0	159.5	8.1	PSK401800	158.12 x 7.0
190.0	174.9	6.3	PSK301900	170.82 x 5.33
190.0	169.5	8.1	PSK401900	164.47 x 7.0

Bore Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Dimensions
D_N H9	d_1 h9	L_1 +0.2		
200.0	**184.9**	**6.3**	**PSK302000**	**183.52 x 5.33**
200.0	**179.5**	**8.1**	**PSK402000**	**177.17 x 7.0**
205.0	184.5	8.1	PSK402050	183.52 x 7.0
210.0	189.5	8.1	PSK402100	183.52 x 7.0
220.0	204.9	6.3	PSK302200	202.57 x 5.33
220.0	199.5	8.1	PSK402200	196.22 x 7.0
230.0	209.5	8.1	PSK402300	208.92 x 7.0
240.0	219.5	8.1	PSK402400	215.27 x 7.0
250.0	**229.5**	**8.1**	**PSK402500**	**227.97 x 7.0**
250.0	**226.0**	**8.1**	**PSK802500**	**227.97 x 7.0**
260.0	236.0	8.1	PSK802600	227.97 x 7.0
270.0	246.0	8.1	PSK802700	240.67 x 7.0
280.0	256.0	8.1	PSK802800	253.37 x 7.0
300.0	276.0	8.1	PSK803000	266.07 x 7.0
306.0	285.5	8.1	PSK403060	278.77 x 7.0
310.0	286.0	8.1	PSK803100	278.77 x 7.0
320.0	**299.5**	**8.1**	**PSK403200**	**291.47 x 7.0**
320.0	**296.0**	**8.1**	**PSK803200**	**291.47 x 7.0**
330.0	306.0	8.1	PSK803300	304.17 x 7.0
340.0	316.0	8.1	PSK803400	316.87 x 7.0
345.0	324.5	8.1	PSK403450	316.87 x 7.0
350.0	326.0	8.1	PSK803500	316.87 x 7.0
360.0	336.0	8.1	PSK803600	329.57 x 7.0
370.0	346.0	8.1	PSK803700	342.27 x 7.0
380.0	356.0	8.1	PSK803800	354.97 x 7.0
400.0	**376.0**	**8.1**	**PSK804000**	**367.67 x 7.0**
420.0	396.0	8.1	PSK804200	393.07 x 7.0
430.0	406.0	8.1	PSK804300	405.26 x 7.0
440.0	416.0	8.1	PSK804400	405.26 x 7.0
450.0	426.0	8.1	PSK804500	417.96 x 7.0
480.0	456.0	8.1	PSK804800	456.06 x 7.0
500.0	**476.0**	**8.1**	**PSK805000**	**468.76 x 7.0**
520.0	499.5	8.1	PSK405200	494.16 x 7.0
540.0	516.0	8.1	PSK805400	506.86 x 7.0
600.0	576.0	8.1	PSK806000	557.66 x 7.0
650.0	626.0	8.1	PSK806500	608.08 x 7.0

Bore Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Dimensions
D_N H9	d_1 h9	L_1 +0.2		
700.0	672.7	9.5	PSK507000	670 x 8.4
800.0	772.7	9.5	PSK508000	770 x 8.4
860.0	832.7	9.5	PSK508600	830 x 8.4
900.0	872.7	9.5	PSK509000	870 x 8.4
920.0	892.7	9.5	PSK509200	890 x 8.4
1000.0	972.7	9.5	PSK5X1000	970 x 8.4
1000.0	962.0	13.8	PSK6X1000	960 x 12.0
1200.0	1172.7	9.5	PSK5X1200	1170 x 8.4
1200.0	1162.0	13.8	PSK6X1200	1160 x 12.0
1500.0	1462.0	13.8	PSK6X1500	1460 x 12.0
2000.0	1962.0	13.8	PSK6X2000	1960 x 12.0
2700.0	2662.0	13.8	PSK6X2700	2660 x 12.0

The bore diameters in **bold** type comply with the recommendations of ISO 3320.
Other dimensions and all intermediate sizes up to 2700 mm diameter including imperial (inch) sizes can be supplied.

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