Turcon® Roto VL Seal® F

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Turcon® Roto VL Seal® F

Description

Turcon® Roto VL Seal® F is an O-Ring energized, single-acting seal intended for rotary and swivelling movements. The seal is specially designed for rotary applications with medium to high system pressure. It covers both shaft and bore installations.

It is a further development of the Turcon® Roto VL Seal® design with the extra feature of having a flange which is clammed in the groove preventing the seal from rotating, see page Figure 150.

The single-acting Roto VL Seal® F 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 Turcon® Roto VL Seal® F against the sealing face with increased force.

Turcon® Roto VL Seal® F has very high static sealing ability effect in the groove provided by the O-Ring, which is protected from damage inflicted by pressure cycles by the supporting concave seal back. By clamping the flanged Turcon® Roto VL Seal® F in the groove, it is kept in position at high working pressures.

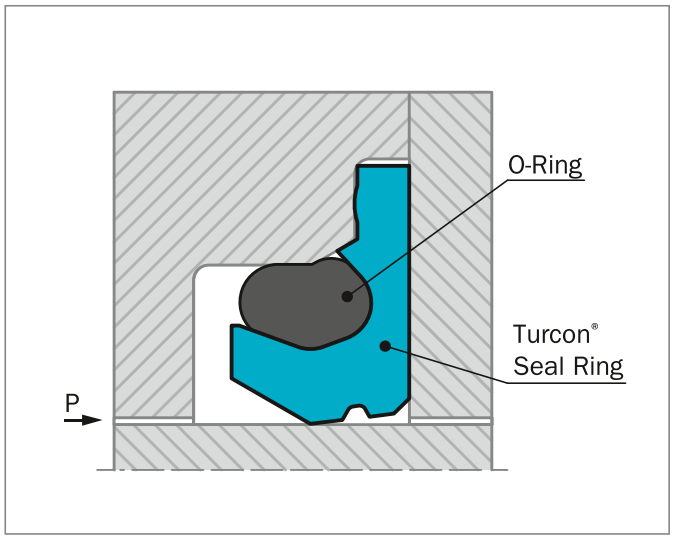


Figure 150: Turcon® Roto VL Seal® F

Roto VL Seal® F offers improved performance in terms of high dynamic seal efficiency, low friction and static sealing by an elastomer component.

ADVANTAGES

- Available for shaft and bore sealing applications
- For rotary, turning and helical movements
- Low friction
- Stick-slip-free starting, no sticking
- High static sealing effect
- High dimensional stability
- Lubricant reservoir
- Available in Turcon® and Zurcon® materials
- Available in most materials in all sizes up to 2,600 mm for shaft seals and to 2,700 mm for bore seals
- The specific O-Ring position eliminates the static seal element normally applied in a split groove assembly
- Fit into standard Turcon® Roto Variseal® grooves.

APPLICATIONS EXAMPLES

The seal is used in hydraulics and general machine construction as an alternative to other single-acting seals according to their individual advantages in:

- Rolling Mills: Bearing Grease Seals
- Tool Machine Industry, mainly Machining Centres
- Hydraulic Swivels
- Injection Moulding Machines: Rotary Injection Unit
- Valve Spindles
- Food Processing: Blender and Mixers
- Hydraulic Steering Units
- Hydraulic Rotator: Forest machines
- Rotator for Handling Devices
- Vane Actuators / Motors
- Hydraulic Motors
- Hydraulic Pumps
- Propeller Thrusters
- ROV (Remotely Operated Vehicles)

OPERATING CONDITIONS

Seal performance is influenced by factors such as lubrication capability of the sealed media and heat dissipation in the hardware. Therefore testing should always be carried out. With good lubrication, the following values can be used:

Movement:	Rotary and oscillating
Pressure:	Up to 30 MPa (40 MPa short term or static) (depending on seal material)
Speed:	Up to 2 m/s and/or 1,000 rpm according to seal material
Temperature:	Turcon® materials: -40 to +120 °C *) (+200 °C static) according to O-Ring material Zurcon® Z54: -40 to +80 °C *) (+100 °C short term or static) according to O-Ring material Zurcon® Z80: -40 to +60 °C *) (+80 °C short term or static) according to O-Ring material
Media:	Mineral oil-based hydraulic fluids, flame-retardant hydraulic fluids, environmentally friendly hydraulic fluids (bio-oils), water and others, depending on seal and elastomer material.
Availability:	Shaft diameters from 6 to 2,600 mm (2,200 for Zurcon® Z54) Bore diameters from 14 to 2,700 mm (2,300 for Zurcon® Z54)
Caution with:	Operating at temperatures above +80 °C, use O-Rings in HNBR or FKM Rotary service on shafts and bores with poor heat dissipation Shaft and bores with hardness below 50 HRC Constant rotation for Zurcon® materials

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 the media.

*) IMPORTANT NOTE FOR THE BORE VERSION:

In the case of unpressurized applications in temperatures below °C please contact your local Trelleborg Sealing Solutions marketing company for more information.

FRICTIONAL POWER

Guide values for the frictional power (P) can be determined from the graph in page Figure 151. They are shown as a function of the sliding speed and operating pressure for a shaft diameter of 50 mm with an oil temperature of 60 °C. At higher temperatures, these application limits must be reduced.

Formula for other diameters d:

$$P = \frac{P_{50} \times (d)\ [W]}{(\ 50\ mm\ )}$$

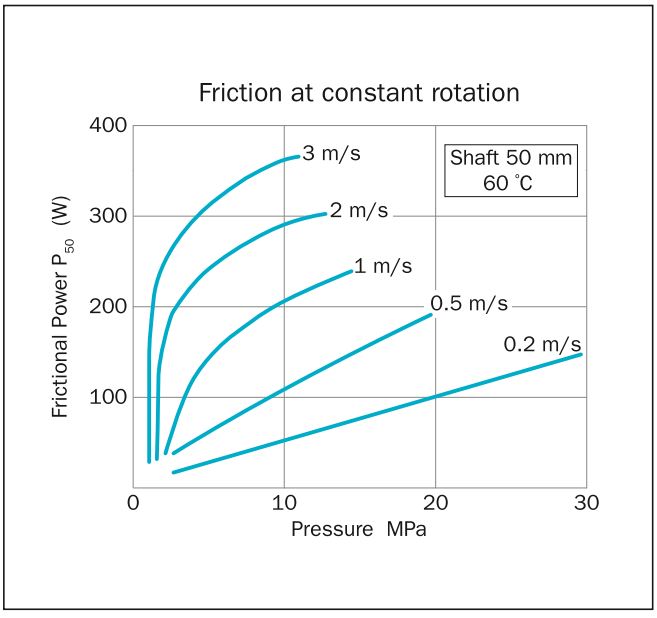


Figure 151: Frictional power for Turcon® VL Seal® F

The guide values apply for constant operating conditions. Pressure fluctuations or alternating directions of shaft rotation can result in considerably higher friction values.

INSTALLATION INSTRUCTIONS

Roto VL Seal® F is installed according to information at page 313.

O-RING SIZE

O-Rings for Roto VL Seal® F are selected to suit the groove diameter:

For shaft seals the O-Ring should have OD equal to or smaller than groove diameter, for bore seals the O-Ring should have ID equal to or smaller than groove diameter.

RECOMMENDED MATERIALS

The following material combinations have proven effective for rotary applications:

Turcon® Roto VL Seal® F in Turcon® T40
All-round material choice in oil hydraulics, water and other fluids with limited lubrication:

O-Ring:	NBR 70 Shore A	N
	FKM 70 Shore A	V
	HNBR 70 Shore A	H
Set code:	T40N, T40V or T40H	

Turcon® Roto VL Seal® F in Turcon® in M15
Material with high sealing effect for light to medium applications in fluids with good lubrication:

O-Ring:	NBR 70 Shore A	N
	FKM 70 Shore A	V
	HNBR 70 Shore A	H
Set code:	M15N, M15V or M15H	

Applications where high resistance to abrasive wear is required Zurcon® Z54 and Z80 are recommended.

Z54 and Z80 are for slow turning motion and not for constant rotation.

For specific applications other Turcon® and Zurcon® materials are available.

Table 105: Turcon® Roto VL Seal® F

Material, Applications, Properties	Code	O-Ring Material Shore D	Code	Service Temp.* °C	Mating Surface Material	MPa max. Dynamic
Turcon® M04 For lubricating and non-lubricating fluids and gases Smooth and tight surface texture Good sealing performance Suitable for softer mating surfaces High extrusion resistance For swiveling and low velocity rotary service only Carbon filled Color: Black	M04	NBR 70	N	-30 to +100	Steel Hardend steel	30
		NBR 70 Low temp.	T	-45 to +80		
		FKM 70	V	-10 to +200		
		HNBR 70	H	-30 to +150		
Turcon® M15 Recommended material for rotary motion For lubricating fluids Tight surface texture Good sealing performance Very good wear properties Low friction Good extrusion resistance Suited to softer mating surfaces Polyaramide, mineral fiber, lubricant, graphite and Turcon® filled Color: Dark gray	M15	NBR 70	N	-30 to +100	Hardend steel	30
		NBR 70 Low temp.	T	-45 to +80		
		FKM 70	V	-10 to +200		
		HNBR 70	H	-30 to +150		
Turcon® M30 For lubricating and non-lubricating fluids and gases Good wear and extrusion resistance Suited to high temperature service Tight surface structure Good sealing performance Suited to softer surfaces For swiveling and low velocity rotary service only Aromatic polymer, graphite, Turcon® filled Color: Dark green-gray	M30	NBR 70	N	-30 to +100	Steel Hardend steel Stainless steel Titanium HVOF Tungsten carbide	30
		NBR 70 Low temp.	T	-45 to +80		
		FKM 70	V	-10 to +200		
		HNBR 70	H	-30 to +150		
Turcon® T40 All-round material for rotary and turning movements Good wear resistance and service life with both lubricating and non-lubricating fluids Surface texture less suited to gas sealing Carbon fiber filled; Color: Gray	T40	NBR 70	N	-30 to +100	Hardend steel Hard alloys	30
		NBR 70 Low temp.	T	-45 to +80		
		FKM 70	V	-10 to +200		
		HNBR 70	H	-30 to +150		

Material, Applications, Properties	Code	O-Ring Material Shore D	Code	Service Temp.* °C	Mating Surface Material	MPa max. Dynamic
Zurcon® Z53** For lubricating hydraulic fluids Very high abrasion and extrusion resistance Good sealing performance Well suited to abrasive mating surfaces For swiveling and intermittent low- velocity rotary service only Limited chemical resistance Maximum service temperature: +110 °C Cast polyurethane Color: Yellow to light brown	Z53	NBR 70	N	-30 to +100	Hardend steel Chrome-plated steel (shaft) Ceramic coatings Stainless steel	40
		NBR 70 Low temp.	T	-45 to +80		
Zurcon® Z54** For lubricating hydraulic fluids Very high abrasion resistance Good sealing performance Well suited to abrasive mating surfaces. For swiveling and intermittent low velocity rotary service only Maximum service temperature: +110 °C Cast polyurethane Color: Turquoise	Z54	NBR 70	N	-30 to +100	Steel Hardend steel Chrome-plated steel (shaft) Ceramic coatings Stainless steel	25
		NBR 70 Low temp.	T	-45 to +80		
Zurcon® Z80 For lubricating and non-lubricating fluids and gases High abrasion and extrusion resistance Well suited to abrasive mating surfaces and fluids For swiveling and intermittent low velocity rotary service only Good chemical resistance Ultra-high molecular weight polyethylene Color: White to off-white	Z80	NBR 70	N	-30 to +80	Steel Hardend steel Ceramic coatings HVOF Tungsten carbide	30
		NBR 70 Low temp.	T	-45 to +80		

* Service temperatures are only valid when using hydraulic mineral oil. Note that frictional heat may cause increased temperatures at the seal.

** Maximum diameter 2,200 mm

▭ Recommended material.

Note:
Rotary seals exert high loads on mating surfaces and mild steels are best suited for slow or swivelling service.
As a basic principle, the hardness of the mating surface should increase with the peripheral speed, and a hardness of 60 HRC is recommended for velocities above 1 m/s. Due to the mechanical stresses imposed, a hardness depth of 0.5 mm or more is recommended to limit dimensional changes to the mating

Installation Recommendation for Shaft

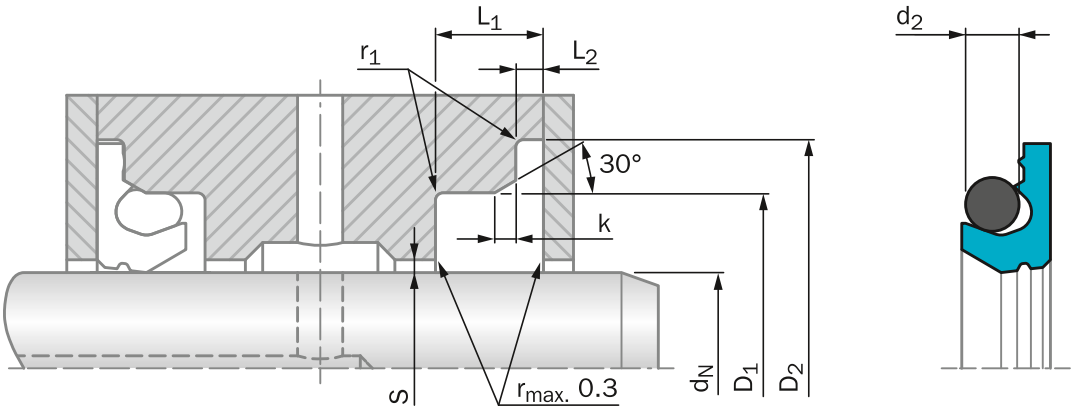


Figure 152: Installation Drawing

Table 106: Installation Dimensions – Standard Recommendations

Series Number	Shaft Diameter d_N f8/h9		Groove Diameter		Groove Width		Lead-in Chamfer	Radius	Radial Clearance S_{max}*			O-Ring Cross-Section-Ø
	Recommended Range	Available Range	D_1 H9	D_2 H10	L_1 min	L_2	k	r_1	10 MPa	20 MPa	30 MPa	d_2
TE310	10 - 19.9	6 - 100.0	d_N + 5.0	d_N + 9.0	3.6	0.85 +0/-0.10	0.8	0.3	0.20	0.15	-	1.78
TE320	20 - 39.9	10 - 200.0	d_N + 7.0	d_N + 12.5	4.8	1.35 +0/-0.15	1.1	0.4	0.25	0.20	0.15	2.62
TE330	40 - 119.9	20 - 400.0	d_N + 10.5	d_N + 17.5	7.1	1.80 +0/-0.20	1.4	0.5	0.30	0.25	0.20	3.53
TE340	120 - 399.9	35 - 650.0	d_N + 14.0	d_N + 22.0	9.5	2.80 +0/-0.20	1.6	0.5	0.35	0.30	0.25	5.33
TE350	400 - 649.9	125 - 999.9	d_N + 18.0	d_N + 28.0	12.2	3.50 +0/-0.20	2.0	0.8	0.40	0.35	0.30	7.00
TE360	650 - 999.9	400 - 999.9	d_N + 22.0	d_N + 34.0	15.0	4.30 +0/-0.20	2.5	1.0	0.45	0.40	0.35	8.40
TE36X	1,000 - 2,600	-	d_N + 22.0	d_N + 34.0	15.0	4.30 +0/-0.20	2.5	1.0	0.45	0.40	0.35	8.40

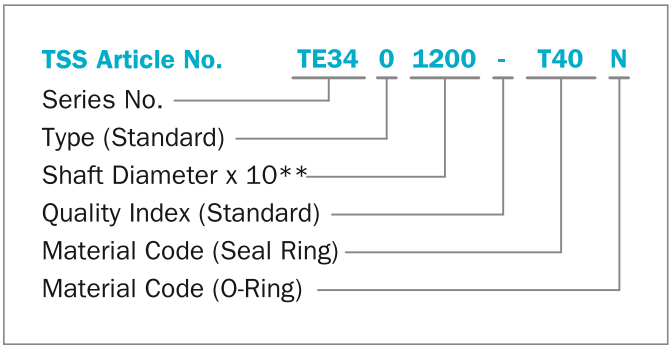
* At pressures **> 30 MPa:** Use diameter tolerance H8/f8 (bore/shaft) in area of seal.

ORDERING EXAMPLE

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

Series:	TE340 (from page Table 106)
Shaft diameter:	d_N = 120 mm
TSS Part No.:	TE3401200 (from page Table 107)

Select the material from page Table 105. The corresponding code numbers are appended to the TSS Part No. Together they form the TSS Article No. The TSS Article No. for all intermediate sizes not shown in page Table 107 can be determined following the example opposite.



** For diameters $d_N \geq$ 1,000.0 mm multiply only by factor 1.
Example: TE36X for diameter d_N = 1,200.0 mm
TSS Article No.: TE36**X1200**-T40N

Table 107: Standard Installation Dimensions / TSS Part Number

Shaft Dia.	Groove Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Dimensions
d_N f8/h9	D_1 H9	D_2 H10	L_1 +0.20		
6.0	**11.0**	**15.0**	**3.6**	**TE3100060**	**7.65 x 1.78**
8.0	**13.0**	**17.0**	**3.6**	**TE3100 080**	**9.50 x 1.80**
10.0	**15.0**	**19.0**	**3.6**	**TE3100100**	**11.80 x 1.80**
12.0	**17.0**	**21.0**	**3.6**	**TE3100120**	**13.20 x 1.80**
14.0	**19.0**	**23.0**	**3.6**	**TE3100140**	**15.60 x 1.78**
15.0	20.0	24.0	3.6	TE3100150	17.17 x 1.78
16.0	**21.0**	**25.0**	**3.6**	**TE3100160**	**17.17 x 1.78**
18.0	**23.0**	**27.0**	**3.6**	**TE3100180**	**19.00 x 1.80**
20.0	**27.0**	**32.5**	**4.8**	**TE3200200**	**21.89 x 2.62**
22.0	**29.0**	**34.5**	**4.8**	**TE3200220**	**23.47 x 2.62**
25.0	**32.0**	**37.5**	**4.8**	**TE3200250**	**26.64 x 2.62**
28.0	**35.0**	**40.5**	**4.8**	**TE3200280**	**29.82 x 2.62**
30.0	37.0	42.5	4.8	TE3200300	31.42 x 2.62
32.0	**39.0**	**44.5**	**4.8**	**TE3200320**	**34.59 x 2.62**
35.0	42.0	47.5	4.8	TE3200350	36.17 x 2.62
36.0	**43.0**	**48.5**	**4.8**	**TE3200360**	**37.77 x 2.62**
40.0	**50.5**	**57.5**	**7.1**	**TE3300400**	**44.04 x 3.53**
42.0	**52.5**	**59.5**	**7.1**	**TE3300420**	**44.04 x 3.53**
45.0	**55.5**	**62.5**	**7.1**	**TE3300450**	**47.22 x 3.53**
48.0	58.5	65.5	7.1	TE3300480	51.50 x 3.55
50.0	**59.4**	**67.5**	**7.1**	**TE3300500**	**53.57 x 3.53**
52.0	62.5	69.5	7.1	TE3300520	56.74 x 3.53
55.0	65.5	72.5	7.1	TE3300550	59.92 x 3.53
56.0	**66.5**	**73.5**	**7.1**	**TE3300560**	**59.92 x 3.53**
60.0	70.5	77.5	7.1	TE3300600	63.09 x 3.53
63.0	**73.5**	**80.5**	**7.1**	**TE3300630**	**66.27 x 3.53**
65.0	75.5	82.5	7.1	TE3300650	69.44 x 3.53
70.0	**80.5**	**87.5**	**7.1**	**TE3300700**	**72.62 x 3.53**
75.0	85.5	92.5	7.1	TE3300750	78.97 x 3.53
80.0	**90.5**	**97.5**	**7.1**	**TE3300800**	**82.14 x 3.53**
85.0	95.5	102.5	7.1	TE3300850	88.49 x 3.53
90.0	**100.5**	**107.5**	**7.1**	**TE3300900**	**94.84 x 3.53**
95.0	105.5	112.5	7.1	TE3300950	98.02 x 3.53
100.0	**110.5**	**117.5**	**7.1**	**TE3301000**	**104.37 x 3.53**
105.0	115.5	122.5	7.1	TE3301050	107.54 x 3.53
110.0	**120.5**	**127.5**	**7.1**	**TE3301100**	**113.89 x 3.53**
115.0	125.5	132.5	7.1	TE3301150	117.07 x 3.53
120.0	134.0	142.0	9.5	TE3401200	123.19 x 5.33
125.0	**139.0**	**147.0**	**9.5**	**TE3401250**	**129.54 x 5.33**
130.0	144.0	152.0	9.5	TE3401300	132.72 x 5.33
135.0	149.0	157.0	9.5	TE3401350	139.07 x 5.33
140.0	**154.0**	**162.0**	**9.5**	**TE3401400**	**145.42 x 5.33**

Shaft Dia.	Groove Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Dimensions
d_N f8/h9	D_1 H9	D_2 H10	L_1 +0.20		
150.0	164.0	172.0	9.5	TE3401500	158.12 x 5.33
160.0	**174.0**	**182.0**	**9.5**	**TE3401600**	**164.47 x 5.33**
170.0	180.0	192.0	9.5	TE3401700	177.17 x 5.33
180.0	**194.0**	**202.0**	**9.5**	**TE3401800**	**183.52 x 5.33**
190.0	204.0	212.0	9.5	TE3401900	196.22 x 5.33
200.0	**214.0**	**222.0**	**9.5**	**TE3402000**	**202.57 x 5.33**
210.0	224.0	232.0	9.5	TE3402100	215.27 x 5.33
220.0	**234.0**	**242.0**	**9.5**	**TE3402200**	**227.97 x 5.33**
230.0	240.0	252.0	9.5	TE3402300	234.32 x 5.33
240.0	254.0	262.0	9.5	TE3402400	247.02 x 5.33
250.0	**264.0**	**272.0**	**9.5**	**TE3402500**	**253.37 x 5.33**
280.0	**294.0**	**302.0**	**9.5**	**TE3402800**	**291.47 x 5.33**
300.0	314.0	322.0	9.5	TE3403000	304.17 x 5.33
320.0	**334.0**	**342.0**	**9.5**	**TE3403200**	**329.57 x 5.33**
350.0	364.0	372.0	9.5	TE3403500	354.97 x 5.33
360.0	**374.0**	**382.0**	**9.5**	**TE3403600**	**365.00 x 5.30**
400.0	418.0	428.0	12.2	TE3504000	405.26 x 7.00
500.0	518.0	528.0	12.2	TE3505000	506.86 x 7.00
600.0	618.0	628.0	12.2	TE3506000	608.08 x 7.00
700.0	722.0	734.0	15.0	TE3607000	703.90 x 8.40*
800.0	822.0	834.0	15.0	TE3608000	803.90 x 8.40*
900.0	922.0	934.0	15.0	TE3609000	903.90 x 8.40*
1,000	1,022.0	1,034.0	15.0	TE36X1000	1,003.90 x 8.40*
1,500	1,522.0	1,534.0	15.0	TE36X1500	1,503.90 x 8.40*
2,000	2,022.0	2,034.0	15.0	TE36X2000	2,003.90 x 8.40*
2,200	2,222.0	2,234.0	15.0	TE36X2200	2,206.90 x 8.40*
2,600	2,622.0	2,634.0	15.0	TE36X2600	2,606.90 x 8.40*

The Shaft diameters in **bold** type correspond to the recommendations of ISO 3320.
Other dimensions and all intermediate sizes up to 2,600 mm diameter including imperial (inch) sizes can be supplied.
* Theoretical ideal O-Ring size

Installation Recommendation for Bore

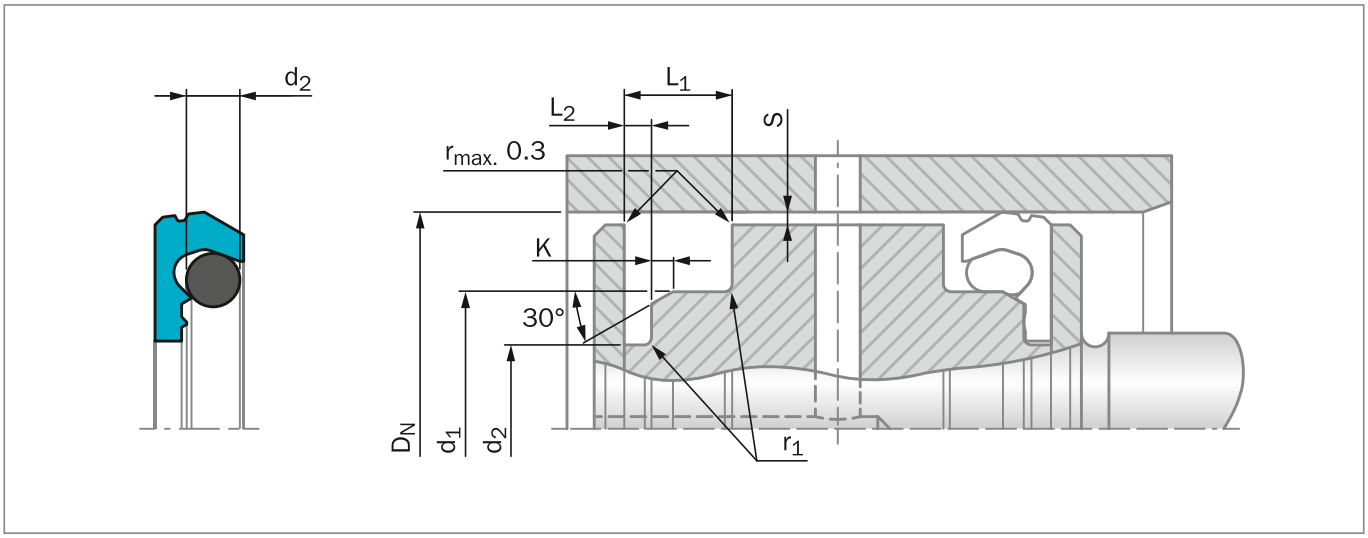


Figure 153: Installation Drawing

Table 108: Installation Dimensions – Standard Recommendations

Series Number	Bore Diameter D_N H9		Groove Diameter		Groove Width		Lead-in Chamfer	Radius	Radial Clearance S_{max}*			O-Ring Cross-Section-Ø
	Recommended Range	Available Range	d_1 h9	d_2 H10	L_1 min	L_2	k	r_1	10 MPa	20 MPa	30 MPa	d_2
TE410	18 - 24.9	14 - 100.0	D_N - 5.0	D_N - 9.0	3.6	0.85 +0/-0.10	0.80	0.3	0.20	0.15	-	1.78
TE420	25 - 45.9	16 - 200.0	D_N - 7.0	D_N - 12.5	4.8	1.35 +0/-0.15	1.10	0.4	0.25	0.20	0.15	2.62
TE430	46 - 124.9	28 - 400.0	D_N - 10.5	D_N - 17.5	7.1	1.80 +0/-0.20	1.40	0.5	0.30	0.25	0.20	3.53
TE440	125 - 399.9	45 - 650.0	D_N - 14.0	D_N - 22.0	9.5	2.80 +0/-0.20	1.60	0.5	0.35	0.30	0.25	5.33
TE450	400 - 649.9	125 - 999.9	D_N - 18.0	D_N - 22.0	12.2	3.50 +0/-0.20	2.0	0.8	0.40	0.35	0.30	7.00
TE460	650 - 999.9	400 - 999.9	D_N - 22.0	D_N - 34.0	15.0	4.30 +0/-0.20	2.50	1.0	0.45	0.40	0.35	8.40
TE46X	1,000 - 2,700	-	D_N - 22.0	D_N - 34.0	15.0	4.30 +0/-0.20	2.50	1.0	0.45	0.40	0.35	8.40

* At pressures **> 30 MPa**: Use diameter tolerance H8/f8 (bore / shaft) in area of seal.

ORDERING EXAMPLE

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

Series:	TE440 (from page Table 108)
Bore diameter:	D_N = 250.0 mm
TSS Part No.:	TE4402500 (from page Table 109)

Select the material from page Table 105. The corresponding code numbers are appended to the TSS Part No. Together they form the TSS Article No. The TSS Article No. for all intermediate sizes not shown in page Table 109 can be determined following the example opposite.

TSS Article No. **TE44 0 2500 - T40 N**

- Series No.
- Type (Standard)
- Bore Diameter x 10**
- Quality Index (Standard)
- Material Code (Seal Ring)
- Material Code (O-Ring)

** For diameters $D_N \geq$ 1,000.0 mm multiply only by factor 1.
Example: TE46X for diameter D_N = 1,200.0 mm
TSS Article No.: TE46**X1200**-T40N

Table 109: Standard Installation Dimensions / TSS Part Number

Bore Dia.	Groove Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Dimensions
D_N H9	d_1 h9	d_2 h10	L_1 +0.20		
14.0	9.0	5.0	3.6	TE4100140	9.25 x 1.78
15.0	10.0	6.0	3.6	**TE4100150**	9.50 x 1.80
16.0	**11.0**	**7.0**	**3.6**	**TE4100160**	**11.20 x 1.80**
18.0	13.0	9.0	3.6	**TE4100180**	13.20 x 1.80
20.0	**15.0**	**11.0**	**3.6**	**TE4100200**	**15.60 x 1.78**
22.0	17.0	13.0	3.6	**TE4100220**	17.17 x 1.78
25.0	**18.8**	12.5	**4.8**	**TE4200250**	**18.00 x 2.65**
28.0	21.0	15.5	4.8	TE4200280	21.89 x 2.62
30.0	23.0	17.5	4.8	TE4200300	23.47 x 2.62
32.0	**25.0**	**19.5**	**4.8**	**TE4200320**	**25.07 x 2.62**
35.0	28.0	22.5	4.8	TE4200350	28.24 x 2.62
40.0	**33.0**	**27.5**	**4.8**	**TE4200400**	**32.99 x 2.62**
42.0	35.0	29.5	4.8	TE4200420	34.59 x 2.62
45.0	38.0	32.5	4.8	**TE4200450**	37.77 x 2.62
48.0	37.5	30.5	7.1	TE4300480	37.69 x 3.53
50.0	**39.5**	**32.5**	**7.1**	**TE4300500**	**40.87 x 3.53**
52.0	41.5	34.5	7.1	TE4300520	40.87 x 3.53
55.0	44.5	37.5	7.1	TE4300550	44.04 x 3.53
56.0	45.5	38.5	7.1	TE4300560	44.04 x 3.53
60.0	49.5	42.5	7.1	**TE4300600**	50.39 x 3.53
63.0	**52.5**	**45.5**	**7.1**	**TE4300630**	**53.57 x 3.53**
65.0	54.5	47.5	7.1	**TE4300650**	53.57 x 3.53
70.0	59.5	52.5	7.1	TE4300700	59.92 x 3.53
75.0	64.5	57.5	7.1	**TE4300750**	66.27 x 3.53
80.0	**69.5**	**62.5**	**7.1**	**TE4300800**	**69.44 x 3.53**
85.0	74.5	67.5	7.1	**TE4300850**	75.79 x 3.53
90.0	79.5	72.5	7.1	TE4300900	78.97 x 3.53
95.0	84.5	77.5	7.1	**TE4300950**	85.32 x 3.53
100.0	**89.5**	**82.5**	**7.1**	**TE4301000**	**91.67 x 3.53**
110.0	99.5	92.5	7.1	**TE4301100**	101.19 x 3.53
115.0	104.5	97.5	7.1	TE4301150	104.37 x 3.53
120.0	109.5	102.5	7.1	**TE4301200**	110.72 x 3.53
125.0	111.0	**103.0**	9.5	TE4401250	113.67 x 5.33
130.0	116.0	108.0	9.5	**TE4401300**	116.84 x 5.33
135.0	121.0	113.0	9.5	TE440135	123.19 x 5.33
140.0	126.0	118.0	9.5	**TE440140**	126.37 x 5.33
150.0	136.0	128.0	9.5	TE440150	135.89 x 5.33
160.0	**146.0**	**138.0**	**9.5**	**TE440160**	**145.42 x 5.33**
170.0	156.0	148.0	9.5	TE440170	158.12 x 5.33
180.0	166.0	158.0	9.5	**TE440180**	164.47 x 5.33
190.0	176.0	168.0	9.5	TE440190	177.17 x 5.33
200.0	**186.0**	**178.0**	**9.5**	**TE440200**	**189.87 x 5.33**

Bore Dia.	Groove Dia.	Groove Dia.	Groove Width	TSS Part No.	O-Ring Dimensions
D_N H9	d_1 h9	d_2 h10	L_1 +0.20		
210.0	196.0	188.0	9.5	TE440210	196.22 x 5.33
220.0	206.0	198.0	9.5	**TE440220**	208.92 x 5.33
230.0	216.0	208.0	9.5	TE440230	215.27 x 5.33
240.0	226.0	218.0	9.5	**TE440240**	227.97 x 5.33
250.0	**236.0**	**228.0**	**9.5**	**TE440250**	**234.32 x 5.33**
280.0	266.0	258.0	9.5	**TE440280**	266.07 x 5.33
300.0	286.0	278.0	9.5	TE440300	291.47 x 5.33
320.0	**306.0**	**298.0**	**9.5**	**TE440320**	**304.17 x 5.33**
350.0	336.0	328.0	9.5	TE440350	329.57 x 5.33
400.0	**382.0**	**378.0**	**12.2**	**TE450400**	**380.37 x 7.00**
420.0	402.0	398.0	12.2	TE450420	405.26 x 7.00
450.0	432.0	428.0	12.2	**TE450450**	430.66 x 7.00
480.0	462.0	458.0	12.2	TE450480	468.76 x 7.00
500.0	**482.0**	**478.0**	**12.2**	**TE450500**	**481.38 x 7.00**
550.0	532.0	522.0	12.2	TE4505500	532.26 x 7.00
600.0	582.0	578.0	12.2	**TE450600**	582.68 x 7.00
700.0	678.0	666.0	15.0	TE460700	679.30 x 8.40*
800.0	778.0	766.0	15.0	**TE460800**	779.30 x 8.40*
900.0	878.0	866.0	15.0	TE460900	879.30 x 8.40*
1,000.0	978.0	966.0	15.0	**TE46X1000**	979.30 x 8.40*
1,500.0	1,478.0	1,466.0	15.0	TE46X1500	1,479.30 x 8.40*
2,000.0	1,978.0	1,966.0	15.0	**TE46X2000**	1,979.30 x 8.40*
2,200.0	2,178.0	2,166.0	15.0	TE46X2200	2,173.30 x 8.40*
2,700.0	2,678.0	2,666.0	15.0	**TE46X2700**	2,676.30 x 8.40*

The Shaft diameters in **bold** type correspond to the recommendations of ISO 3320.
Other dimensions and all intermediate sizes up to 2,700 mm diameter including imperial (inch) sizes can be supplied.
* Theoretical ideal O-Ring size