

Turcon® Double Delta®



Double-acting

Rubber-energized plastic-faced seal

For O-Ring Grooves

Material:

Turcon®, Zurcon® and Elastomer





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 87.

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.

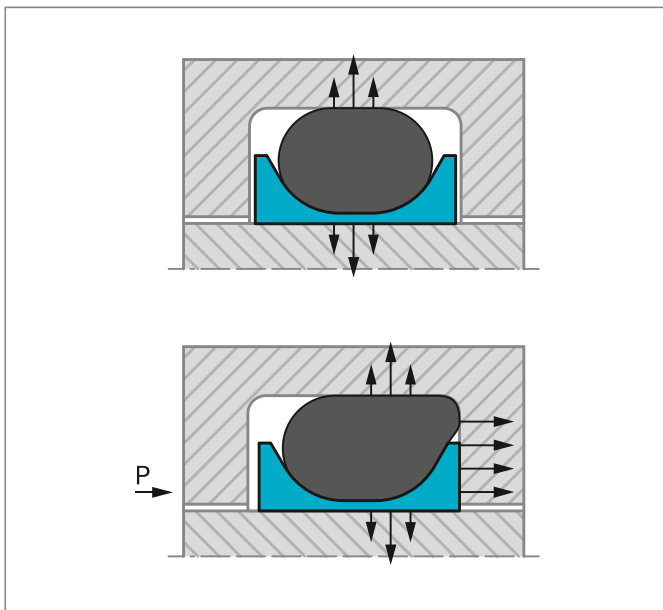


Figure 87: Turcon® Double Delta® without and with pressure

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 72
Clearance:	The maximum permissible radial clearance S_{max} is shown in Table 73, 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.

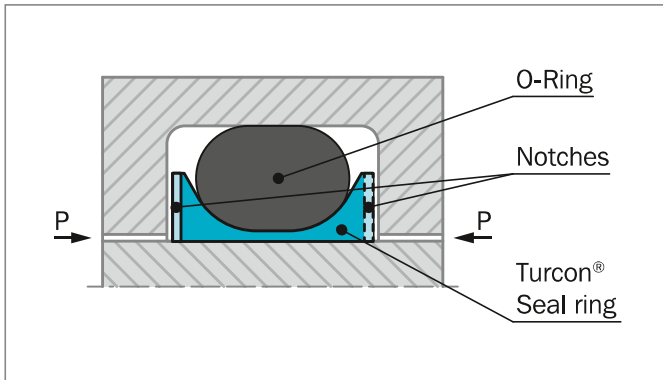


Figure 88: Turcon® Double Delta® with notches

INSTALLATION INSTRUCTIONS

Double Delta® is installed according to information on page 40.

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 71.

**Table 71: 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

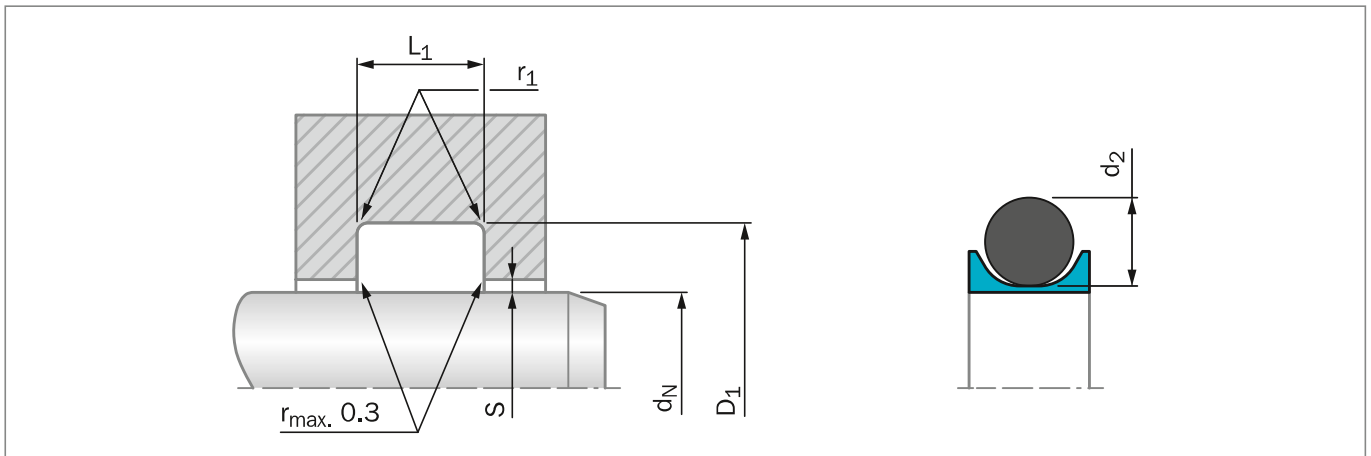


Figure 89: Installation Drawing

Table 72: 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

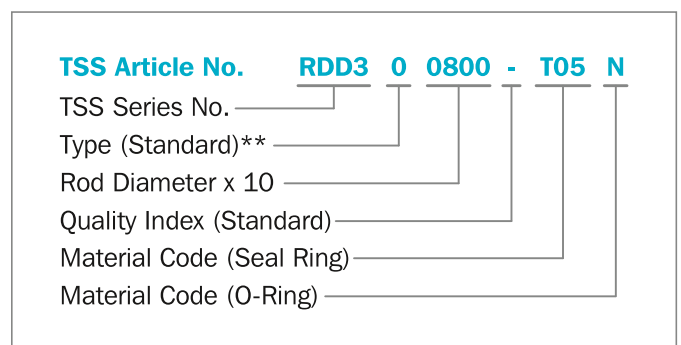
Double Delta® complete with O-Ring, standard application:

Series:	RDD3 from Table 72
Rod diameter:	$d_N = 80.0$ mm
TSS Part No.:	RDD300800 from Table 73

Select the material from Table 71. 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 73: 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.</p> <p>TSS Part No. for other dimensions and all intermediate sizes up to 999.9 mm diameter including imperial (inch) sizes can be supplied.</p> <p>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 74.

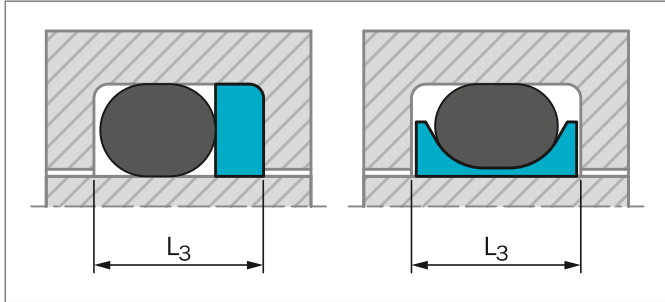


Figure 90: Groove width

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

Table 74: 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

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 74 or Table 75

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

**** From Table 71

***** From Table 71



■ Turcon® Double Delta® for Metric O-Rings

Double Delta® is available for installation in grooves for metric O-Rings as listed in Table 75.

Table 75: 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