

## TR/4

The TR/4 seal is a rotary shaft seal developed based on SKF / TENUTE experience to meet specific needs of aluminium and paper rolling mills as well as iron and steel industry in general, where applications and working conditions can be various.



The main feature of the TR/4 seal is the combination of two springs, providing the lip resilience necessary to withstand high misalignments and high speeds. It is only available with the L-shaped metal insert to provide stiffness of the seal back.

Providing a rubber outside surface the TR/4 seal offers the advantage of minimizing the risk of damaging the housing during assembly and disassembly phases as well as no leakage that sometimes may occur between the outer diameter of metal case seals and the seal housing.

The TR/4 seal has been first patented in Italy in July 2008 and the international patent no. PCT/IB/2009/053141.

Possible size range for TR/4 seals:  $\varnothing d_{\min} = 110 \text{ mm}$ ;  $\varnothing D_{\max} = 1\,350 \text{ mm}$  (please also see the drawing at the next page).

Different models of the TR/4 were developed, according to different specific working conditions. Therefore, parameters like misalignment and run-out have to be discussed with TENUTE Technical Department / SKF Seals Application Engineering during the inquiry phase. The table below has to be considered as a general indication and refers to a TR/4 seal in FKM compound, having a  $\varnothing d$  of 500 mm.

### Models

Design	Circumferential shaft speed v	Pressure p	Shaft to bore misalignment
	max	max	max
	m/s	bar	mm
<b>TR/4/WIDE (1)</b>	10	0,5	± 3,00
<b>TR/4</b>	18	0,5	± 2,00
<b>TR/4/L (2)</b>	25	0,5	± 1,25
<b>TR/4/HS (3)</b>	35	0,5	± 0,75
<b>TR/4/L/PTV (4)</b>	40	0,5	± 0,40

(1) ... WIDE – very high lip interference on shaft

(2) ... L – Light – reduced interference on shaft

(3) ... HS – High Speed

(4) ... L/PTV – Light with PTV layer – reduced interference on shaft and additional exclusive antifriction band on the sealing lip patented with number PCT/EP2006/004962.

## Materials

The TR/4 standard material is NBR (nitril rubber) filled with PTFE, but for particular working conditions seals can be produced also in HNBR (hydrogenated nitril rubber), VMQ (silicone rubber) and FKM (fluorocarbon rubber) materials. Other combinations are available upon request.

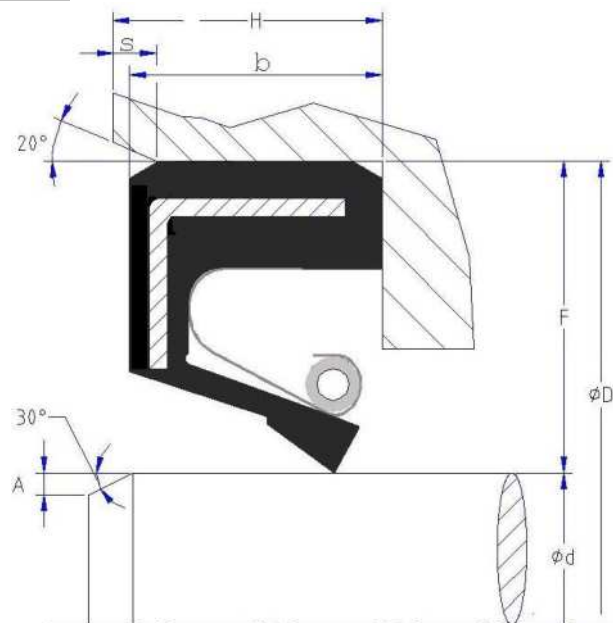
The table below shows working temperature ranges (minimum, maximum, peak (\*)) applicable to each type of compound as well as possible spring configurations. Further spring configurations are available on demand. Please contact the TENUTE Technical Department / SKF Seals Application Engineering.

Material	Temperature		Standard spring
	min	max	
	°C	°C (*)	
<b>NBR</b>	-30	+100 (+120)	AISI 301
<b>HNBR</b>	-40	+150 (+175)	AISI 301
<b>VMQ</b>	-50	+200 (+250)	AISI 301
<b>FKM</b>	-20	+200 (+250)	AISI 301

## Assembly of TR/4 seals

The drawing shows the details of the housing dimensions and the assembly of the TR/4 seal in applications without pressure.

Particular applications or requirements different from those details shall be agreed with the TENUTE Technical Department / SKF Seals Application Engineering.



## Shaft and housing diameter tolerance

Shaft diameter Ød		Tolerance	Housing diameter ØD		Tolerance
Over	Up to		Over	Up to	
mm	mm	mm	mm	mm	
110	1 290	± 0,25	140	250	± 0,05
			250	510	+ 0,05 / -0,10
			510	1 015	+ 0,05 / -0,15
			1015	1 350	+ 0,05 / -0,25

## Housing height tolerance

Housing height H	Tolerance
mm	mm
b + 0,5	+0,2 / 0

## Shaft and housing chamfers

Shaft diameter Ød		Shaft chamfer A	Housing chamfer S
Over	Up to	minimum	
mm	mm	mm	
110	250	4	S = 0,15 x H
250	1 290	7	

## Shaft and housing surface finishing

A roughness of Ra from 0,2 to 0,6 µm is recommended for the shaft in standard applications, while in case of high speeds, a finishing to Ra from 0,2 to 0,4 µm is recommended. Plunge grinding is required. For the housing bore a finish turning is sufficient.

## Shaft hardness

Up to 15 m/s	Over 15 m/s
40 HRC	50 HRC and above

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