

## TR/3/ML/CS

The TR/3/ML/CS seal is a rotary shaft seal with a rigid metal case rather than a flexible metal band inside the seal back as well as a circumferential groove and radial ports for lubrication. As the TR/3/M/CS, it can be installed without a retainer plate and offers remarkable advantages over normal rotary shaft seals with stiff metal insert, avoiding any shrinkage over time. Dimensions and tolerances are according to German Standard DIN 3760.



This type of seal is used in sealing arrangements requiring two opposed seals due to aggressive environment, such as roll necks in hot and cold rolling mills.

Lip flexibility and elasticity are identical to the other TR/3 styles.

Maximum pressure capability is 0,5 bar.

Exclusive features of TR/3/ML/CS seals are:

- Possibility of lubrication through the seal
- Possibility of assembly without retainer plate
- Improved resistance to possible shaft misalignments
- Decreased radial force exerted on shaft
- Reduced friction and consequent temperature decrease
- Protected spring to avoid slipping/popping out from groove
- Reduced spring preload
- Absence of external metallic parts and consequent prevention of damages to housing bore

Possible size range for TR/3/ML/CS seals:  $\varnothing d_{\min} = 25 \text{ mm}$ ;  $\varnothing D_{\max} = 1\,350 \text{ mm}$  (please also see the drawing at the next page)

## Materials

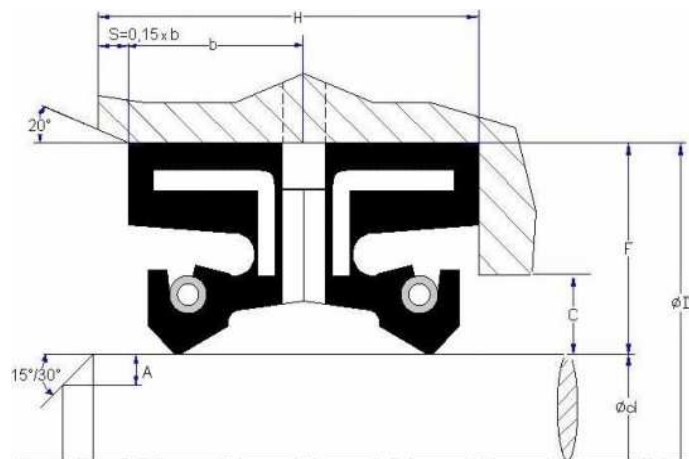
The standard production is in Nitril elastomer NBR added with PTFE, but for particular working conditions, TR/3/ML seals can be produced in HNBR (hydrogenated nitril elastomer), VMQ (silicon elastomer) or FKM (fluorocarbon elastomer). Other combinations are available upon request. The table below shows working temperature ranges (minimum, maximum, peak (\*)) applicable to each kind of compound as well as possible spring configurations. The standard metal case is made in carbon steel.

Material	Temperature		Standard spring	Special spring	Recommended circumferential shaft speed	Misalignment
	min	max				
	°C	°C (*)			m/s	
<b>NBR</b>	-30	+100 (+120)	Carbon steel	AISI 302	15	According to cross section
<b>HNBR</b>	-40	+150 (+175)	Carbon steel	AISI 302	20	
<b>MVQ</b>	-50	+200 (+250)	Carbon steel	AISI 302	25	
<b>FKM</b>	-20	+200 (+250)	AISI 302	AISI 316	25	

## Assembly of TR/3/ML/CS seals

The drawing shows the details of the housing dimensions and the assembly of the TR/3/ML/CS 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.



$$C_{\text{maximum}} = 0,5 \times F$$

## Shaft and housing diameter tolerance

Shaft diameter Ød		Tolerance	Housing diameter ØD		Tolerance
Over	Up to		Over	Up to	
mm	mm		mm	mm	
25	1 000	h11	45	1 350	H8
1 000	1 290	h10			

## Housing height tolerance and chamfers

Housing height			Shaft chamfer			Housing chamfer
b	H	Tolerance	Ød		A minimum	S
mm	mm	mm	Over mm	Up to mm	mm	
Up to 10	$2 \times b + 0,3$	+0,2 / 0	25	50	1,5	S = 0,15 x b
Over 10	$2 \times b + 0,4$	+0,3 / 0	50	250	3	
			250	800	4,5	
			800	1 350	6	

## 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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