

STANDARD SHAFT SEALS

TCW9



DESCRIPTION

The TCW9 profile is a shaft seal composed of a single metal cage with rubber grooves on the outside of the cage, a primary sealing lip with an integrated spring and three additional radial and axial anti-pollution lips.

ADVANTAGES

Very good static sealing

Very good thermal expansion compensation

Greater roughness is allowed in the housing

Reduced risk of corrosion

Easy to assemble with very limited bounce-back effect

Sealing for low and high viscosity fluids

Modern primary sealing lip with low radial forces

Protection against undesirable air contaminants

APPLICATIONS

All types of rotative applications
 Machine tools Gear boxes
 Agriculture Motors
 Construction Pumps
 Transmission

MATERIALS

Rubber

ACM 70 - 75 Shore A
 EPDM 70 - 75 Shore A
 FKM 70 - 75 Shore A
 HNBR 70 - 75 Shore A
 NBR 70 - 75 Shore A

Metal cage

Steel - AISI 1010

Spring

Steel - AISI 1070 - 1090

Stainless steel - AISI 316

SEAL DESIGN

Tolerance for the outside diameter of the seal (ØD)

Bore diameter ØD1 (mm)	Apparent metal cage	Rubber coating	Coating with grooves
ØD1 ≤ 50.0	+0.10 / +0.20	+0.15 / +0.30	+0.20 / +0.40
50.0 < ØD1 ≤ 80.0	+0.13 / +0.23	+0.20 / +0.35	+0.25 / +0.45
80.0 < ØD1 ≤ 120.0	+0.15 / +0.25	+0.20 / +0.35	+0.25 / +0.45
120.0 < ØD1 ≤ 180.0	+0.18 / +0.28	+0.25 / +0.45	+0.30 / +0.55
180.0 < ØD1 ≤ 300.0	+0.20 / +0.30	+0.25 / +0.45	+0.30 / +0.55
300.0 < ØD1 ≤ 500.0	+0.23 / +0.35	+0.30 / +0.55	+0.35 / +0.65
500.0 < ØD1 ≤ 630.0	+0.23 / +0.35	+0.35 / +0.65	+0.40 / +0.75

Roundness tolerance

Bore diameter ØD1 (mm)	Apparent metal cage	Rubber coating
ØD1 ≤ 50.0	0.18	0.25
50.0 < ØD1 ≤ 80.0	0.25	0.35
80.0 < ØD1 ≤ 120.0	0.30	0.50
120.0 < ØD1 ≤ 180.0	0.40	0.65
180.0 < ØD1 ≤ 300.0	0.25% of the outside diameter	0.80
300.0 < ØD1 ≤ 500.0	0.25% of the outside diameter	1.00
500.0 < ØD1 ≤ 630.0	-	-

Tolerance for the inside diameter of the seal (Ød)

Free and without constraint, the inside diameter of the sealing lip is always smaller than the diameter of the shaft. The pre-tightening or interference denotes the difference between these two values. Depending on the shaft diameter, the diameter of the sealing lip is generally considered to be less, between 0.8 and 3.5 mm.

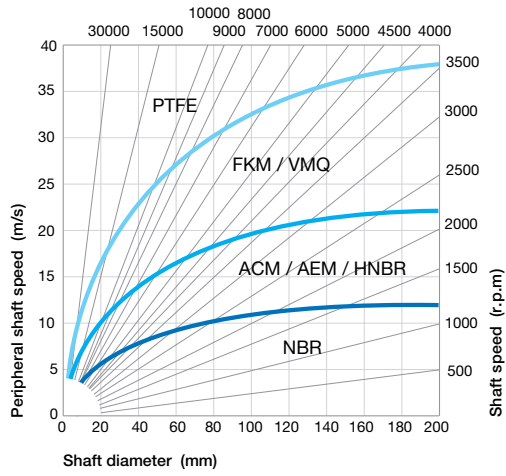
Pumping leads

Clockwise	Anti-clockwise	Bi-directional
R	L	H0

Other types of pumping leads can be created according to your specifications. Please contact our experts.

TECHNICAL DATA

Speed



The shaft seals with an additional protective lip are limited to a speed of 8 m/sec.

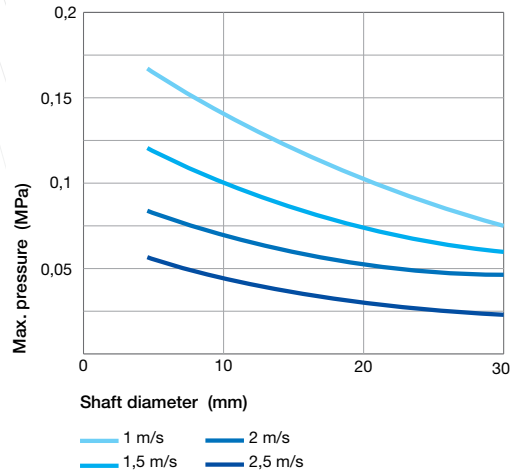
Linear speed calculation:

$$s \text{ (m/s)} = \frac{[\text{shaft } \varnothing \text{ (mm)} \times \text{speed (rpm)} \times \pi]}{60,000}$$

Pressure

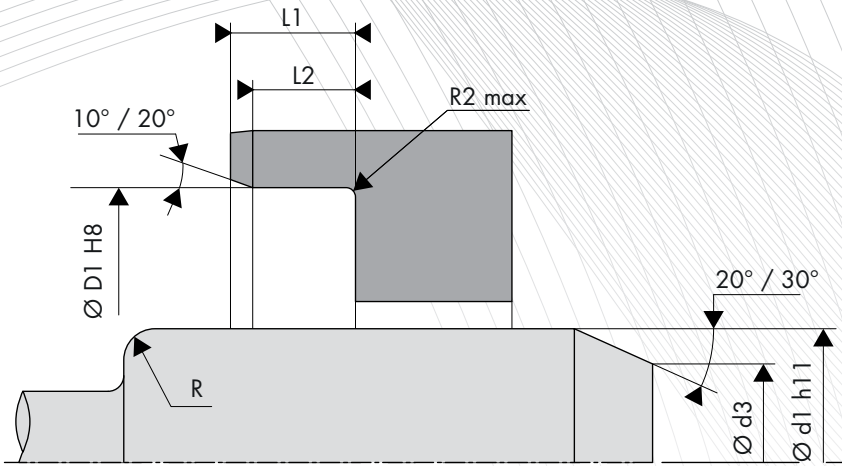
The standard shaft seals are generally used in unpressurised environments, or for pressures between 0.02 and 0.05 MPa maximum.

Higher pressures are acceptable, following testing, for standard NBR or FKM shaft seals used on a shaft of less than 30 mm.



Temperature / Media

Media		Maximum temperature depending on the materials						
		ACM	AEM	EPDM	FKM	HNBR	NBR	VMQ
Mineral oils	Oils for motors	+130°C	+130°C	-	+170°C	+130°C	+100°C	+150°C
	Oils for gearboxes	+120°C	+130°C	-	+150°C	+110°C	+80°C	+130°C
	Oils for hypoid gears	+120°C	+130°C	-	+150°C	+110°C	+80°C	-
	ATF oils	+120°C	+130°C	-	+170°C	+130°C	+100°C	-
	Hydraulic oils	+120°C	+130°C	-	+150°C	+130°C	+90°C	-
	Greases	-	+130°C	-	-	+100°C	+90°C	-
Fire-resistant fluids	HFA group - Emulsion with more than 80% water	-	-	-	-	+70°C	+70°C	+60°C
	HFB group - Opposite solution (water in oil)	-	-	-	-	+70°C	+70°C	+60°C
	HFC group - Polymer aqueous solution	-	-	+60°C	-	+70°C	+70°C	-
	HFD group - Water-free synthetic fluids	-	-	-	+150°C	-	-	-
Other fluids	EL + L heating oil	-	-	-	-	+100°C	+90°C	-
	Air	+150°C	+150°C	+150°C	+200°C	+130°C	+100°C	+200°C
	Water	-	-	+150°C	+100°C	+100°C	+90°C	-
	Water for washing	-	-	+130°C	+100°C	+100°C	+90°C	-
Temperature range	Min.	-25°C	-40°C	-45°C	-20°C	-30°C	-30°C	-60°C
	Max.	+150°C	+150°C	+150°C	+200°C	+150°C	+100°C	+200°C



SHAFT DESIGN

Shaft hardness

Rotation speed	Hardness in HRC
$s \leq 4.0 \text{ m/sec}$	45 HRC
$4.0 < s \leq 10.0 \text{ m/s}$	55 HRC
$s > 10.0 \text{ m/sec}$	60 HRC

Surface roughness

Ra *	0.2 to 0.8 μm
Rz	1.0 to 4.0 μm
Rmax	$\leq 6.3 \mu\text{m}$

*Ra = 0.1 μm for demanding applications

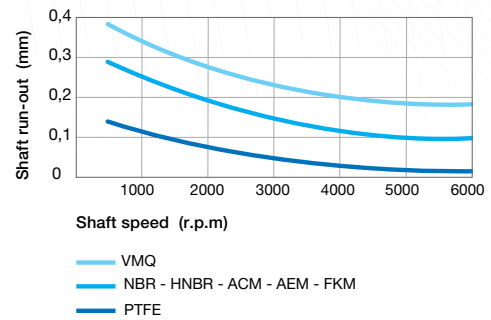
Shaft tolerance

Shaft diameter Ød1 (mm)	Tolerance h11 (mm)
$\text{Ød1} \leq 3.0$	-0.060 / 0
$3.0 < \text{Ød1} \leq 6.0$	-0.075 / 0
$6.0 < \text{Ød1} \leq 10.0$	-0.090 / 0
$10.0 < \text{Ød1} \leq 18.0$	-0.110 / 0
$18.0 < \text{Ød1} \leq 30.0$	-0.130 / 0
$30.0 < \text{Ød1} \leq 50.0$	-0.160 / 0
$50.0 < \text{Ød1} \leq 80.0$	-0.190 / 0
$80.0 < \text{Ød1} \leq 120.0$	-0.220 / 0
$120.0 < \text{Ød1} \leq 180.0$	-0.250 / 0
$180.0 < \text{Ød1} \leq 250.0$	-0.290 / 0
$250.0 < \text{Ød1} \leq 315.0$	-0.320 / 0
$315.0 < \text{Ød1} \leq 400.0$	-0.360 / 0
$400.0 < \text{Ød1} \leq 500.0$	-0.400 / 0

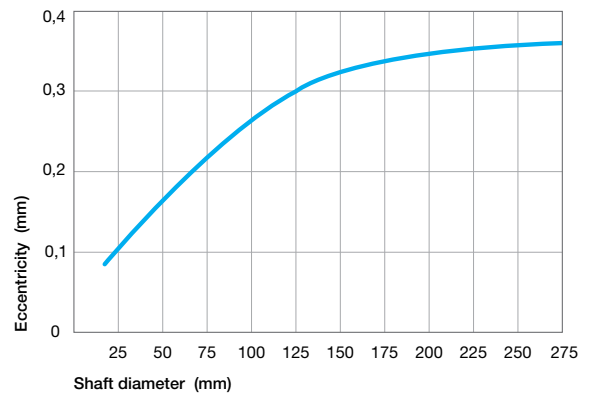
Chamfer and radius

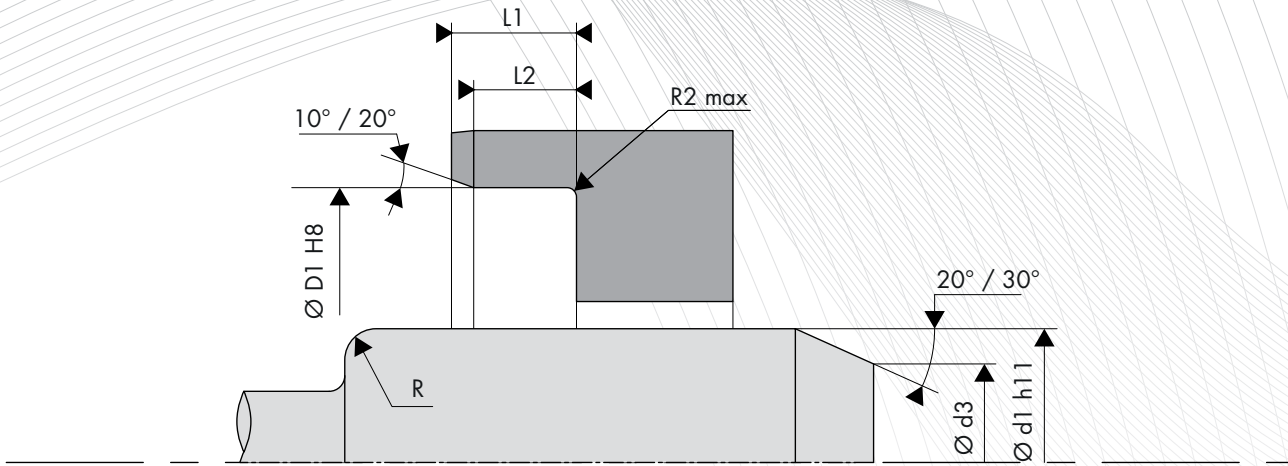
Shaft diameter Ød1 (mm)	Chamfer diameter Ød3 (mm)	Radius R (mm)
$\text{Ød1} \leq 10.0$	$\text{Ød1} - 1.50$	2.00
$10.0 < \text{Ød1} \leq 20.0$	$\text{Ød1} - 2.00$	2.00
$20.0 < \text{Ød1} \leq 30.0$	$\text{Ød1} - 2.50$	3.00
$30.0 < \text{Ød1} \leq 40.0$	$\text{Ød1} - 3.00$	3.00
$40.0 < \text{Ød1} \leq 50.0$	$\text{Ød1} - 3.50$	4.00
$50.0 < \text{Ød1} \leq 70.0$	$\text{Ød1} - 4.00$	4.00
$70.0 < \text{Ød1} \leq 95.0$	$\text{Ød1} - 4.50$	5.00
$95.0 < \text{Ød1} \leq 130.0$	$\text{Ød1} - 5.50$	6.00
$130.0 < \text{Ød1} \leq 240.0$	$\text{Ød1} - 7.00$	8.00
$240.0 < \text{Ød1} \leq 500.0$	$\text{Ød1} - 11.00$	12.00

Shaft run out



Eccentricity





HOUSING DESIGN

Surface roughness

Ra	1.6 to 6.3 μm
Rz	10.0 to 25.0 μm
Rmax	$\leq 25.0 \mu\text{m}$

Housing tolerance

Bore diameter ØD1 (mm)	Tolerance H8 (mm)
$3.0 < \text{ØD1} \leq 6.0$	0 / +0.018
$6.0 < \text{ØD1} \leq 10.0$	0 / +0.022
$10.0 < \text{ØD1} \leq 18.0$	0 / +0.027
$18.0 < \text{ØD1} \leq 30.0$	0 / +0.033
$30.0 < \text{ØD1} \leq 50.0$	0 / +0.039
$50.0 < \text{ØD1} \leq 80.0$	0 / +0.046
$80.0 < \text{ØD1} \leq 120.0$	0 / +0.054
$120.0 < \text{ØD1} \leq 180.0$	0 / +0.063
$180.0 < \text{ØD1} \leq 250.0$	0 / +0.072
$250.0 < \text{ØD1} \leq 315.0$	0 / +0.081
$315.0 < \text{ØD1} \leq 400.0$	0 / +0.089
$400.0 < \text{ØD1} \leq 500.0$	0 / +0.097
$500.0 < \text{ØD1} \leq 630.0$	0 / +0.110

Housing radius and width

Height H1 (mm)	Width		Radius R2 max (mm)
	L2min (H1 x 0.85)	L1min (H1 x +0.3)	
7.00	5.95	7.30	0.50
8.00	6.80	8.30	
10.00	8.50	10.30	
12.00	10.30	12.30	0.70
15.00	12.75	15.30	
20.00	17.00	20.30	