

## TRIPLE-LIP SHAFT SEALS

# KA2L3

### DESCRIPTION

The KA2L3 profile is a shaft seal composed of a single external metal cage with a metal reinforcement and a triple sealing lip.

### ADVANTAGES

Excellent radial rigidity, particularly for large diameters

Very good stability when assembled, preventing the bounce-back effect

Grease retention

External contaminant retention (mud and water), environments with heavy-duty applications

### APPLICATIONS

All types of rotative applications

Agriculture

Construction

Transmission

### MATERIALS

#### Rubber

FKM 70 - 75 Shore A

HNBR 70 - 75 Shore A

NBR 70 - 75 Shore A

#### Metal cage

Steel - AISI 1010

Stainless steel - AISI 304

Stainless steel - AISI 316

### SEAL DESIGN

#### Tolerance for the outside diameter of the seal ( $\varnothing D$ )

Bore diameter $\varnothing D1$ (mm)	Apparent metal cage	Rubber coating	Coating with grooves
$\varnothing D1 \leq 50.0$	+0.10 / +0.20	+0.15 / +0.30	+0.20 / +0.40
$50.0 < \varnothing D1 \leq 80.0$	+0.13 / +0.23	+0.20 / +0.35	+0.25 / +0.45
$80.0 < \varnothing D1 \leq 120.0$	+0.15 / +0.25	+0.20 / +0.35	+0.25 / +0.45
$120.0 < \varnothing D1 \leq 180.0$	+0.18 / +0.28	+0.25 / +0.45	+0.30 / +0.55
$180.0 < \varnothing D1 \leq 300.0$	+0.20 / +0.30	+0.25 / +0.45	+0.30 / +0.55
$300.0 < \varnothing D1 \leq 500.0$	+0.23 / +0.35	+0.30 / +0.55	+0.35 / +0.65
$500.0 < \varnothing D1 \leq 630.0$	+0.23 / +0.35	+0.35 / +0.65	+0.40 / +0.75

#### Roundness tolerance

Bore diameter $\varnothing D1$ (mm)	Apparent metal cage	Rubber coating
$\varnothing D1 \leq 50.0$	0.18	0.25
$50.0 < \varnothing D1 \leq 80.0$	0.25	0.35
$80.0 < \varnothing D1 \leq 120.0$	0.30	0.50
$120.0 < \varnothing D1 \leq 180.0$	0.40	0.65
$180.0 < \varnothing D1 \leq 300.0$	0.25% of the outside diameter	0.80
$300.0 < \varnothing D1 \leq 500.0$	0.25% of the outside diameter	1.00
$500.0 < \varnothing D1 \leq 630.0$	-	-

#### Tolerance for the inside diameter of the seal ( $\varnothing d$ )

Free and without constraint, the inside diameter of the sealing lips 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 lips is generally considered to be less, between 0.8 and 3.5 mm.

## TECHNICAL DATA

### Speed

The triple-lip shaft seals can support a maximum speed of 2.5 m/s.

Linear speed calculation:

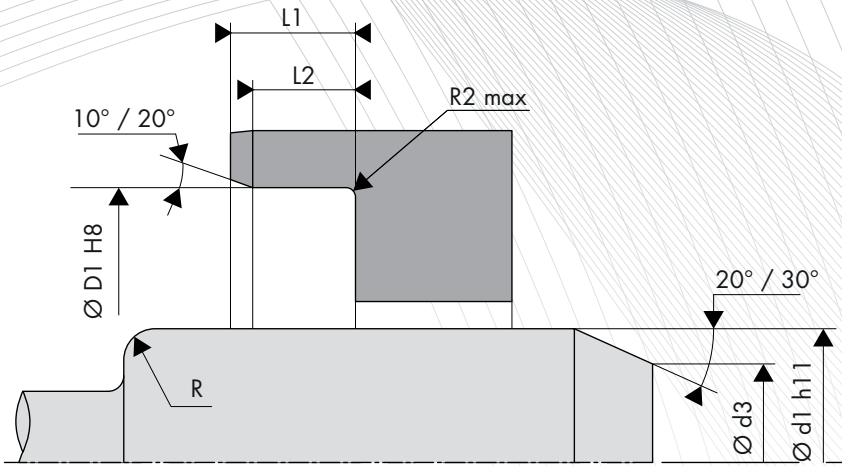
$$s \text{ (m/s)} = \frac{[\text{shaft } \varnothing \text{ (mm)} \times \text{speed (rpm)} \times \pi]}{60,000}$$

### Pressure

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

### 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
$s \leq 4.0$ m/sec	45 HRC
$4.0 < s \leq 10.0$ m/s	55 HRC
$s > 10.0$ m/sec	60 HRC

### Surface roughness

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

\*Ra = 0.1  $\mu\text{m}$  for demanding applications

### Chamfer and radius

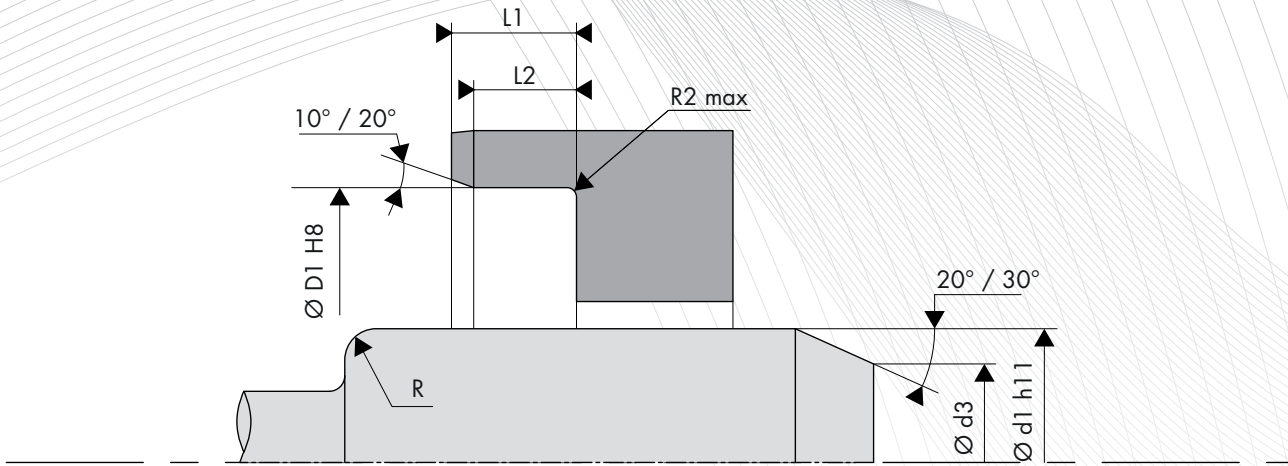
Shaft diameter $\text{Ød1}$ (mm)	Chamfer diameter $\text{Ød3}$ (mm)	Radius R (mm)
$\text{Ød1} \leq 10.0$	$\text{Ød1} - 1.50$	2.00
$10.0 < \text{Ød1} \leq 20.0$	$\text{Ød1} - 2.00$	2.00
$20.0 < \text{Ød1} \leq 30.0$	$\text{Ød1} - 2.50$	3.00
$30.0 < \text{Ød1} \leq 40.0$	$\text{Ød1} - 3.00$	3.00
$40.0 < \text{Ød1} \leq 50.0$	$\text{Ød1} - 3.50$	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 tolerance

Shaft diameter $\text{Ød1}$ (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

### Overall eccentricity

Shaft diameter $\text{Ød1}$ (mm)	Overall eccentricity (mm)
$\text{Ød1} \leq 40.00$	0.15
$40.00 < \text{Ød1} \leq 80.00$	0.20
$80.00 < \text{Ød1} \leq 120.00$	0.30



## HOUSING DESIGN

### Surface roughness

Ra	0.8 to 3.2 $\mu\text{m}$
Rz	6.3 to 16.0 $\mu\text{m}$
Rmax	$\leq 16.0 \mu\text{m}$

### Housing tolerance

Bore diameter $\varnothing D1$ (mm)	Tolerance H8 (mm)
$3.0 < \varnothing D1 \leq 6.0$	0 / +0.018
$6.0 < \varnothing D1 \leq 10.0$	0 / +0.022
$10.0 < \varnothing D1 \leq 18.0$	0 / +0.027
$18.0 < \varnothing D1 \leq 30.0$	0 / +0.033
$30.0 < \varnothing D1 \leq 50.0$	0 / +0.039
$50.0 < \varnothing D1 \leq 80.0$	0 / +0.046
$80.0 < \varnothing D1 \leq 120.0$	0 / +0.054
$120.0 < \varnothing D1 \leq 180.0$	0 / +0.063
$180.0 < \varnothing D1 \leq 250.0$	0 / +0.072
$250.0 < \varnothing D1 \leq 315.0$	0 / +0.081
$315.0 < \varnothing D1 \leq 400.0$	0 / +0.089
$400.0 < \varnothing D1 \leq 500.0$	0 / +0.097
$500.0 < \varnothing D1 \leq 630.0$	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	