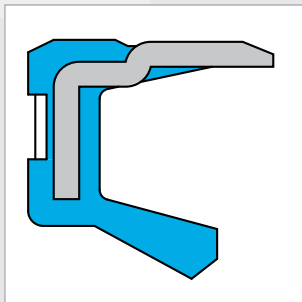




## STANDARD SHAFT SEALS

# VBC

### DESCRIPTION

The VBC profile is a shaft seal composed of a single external metal cage with a rubber coating covering half of the outside of the cage and a primary sealing lip without spring.

### ADVANTAGES

Good radial rigidity, particularly for large diameters

Good stability when assembled, preventing the bounce-back effect

Good static sealing

Good thermal expansion compensation

Good heat transfer

Sealing for high viscosity fluids

Primary sealing lip generating low levels of friction and heat

### APPLICATIONS

All types of rotative applications

Machine tools

Agriculture

Construction

Transmission

Gear boxes

Motors

Pumps

### 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

Stainless steel - AISI 304

Stainless steel - AISI 316

### SEAL DESIGN

#### Tolerance for the outside diameter of the seal (ØD)

| Bore diameter<br>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

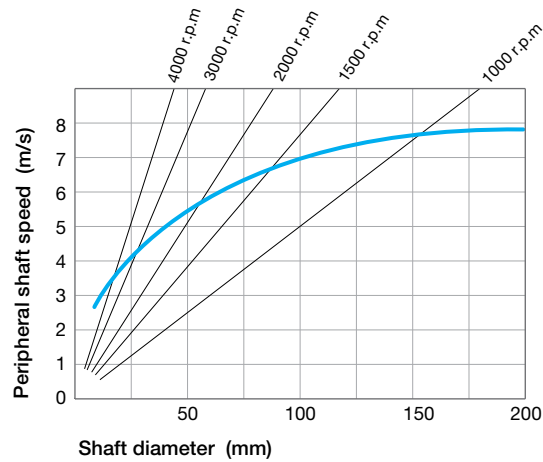
| Bore diameter<br>ØD1 (mm) | Apparent metal cage           | Rubber coating |
|---------------------------|-------------------------------|----------------|
| ØD1 ≤ 50.0                | 0.18                          | 0.25           |
| 50.0 < ØD1 ≤ 80.0         | 0.25                          | 0.35           |
| 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.

## TECHNICAL DATA

### Speed



Linear speed calculation:

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

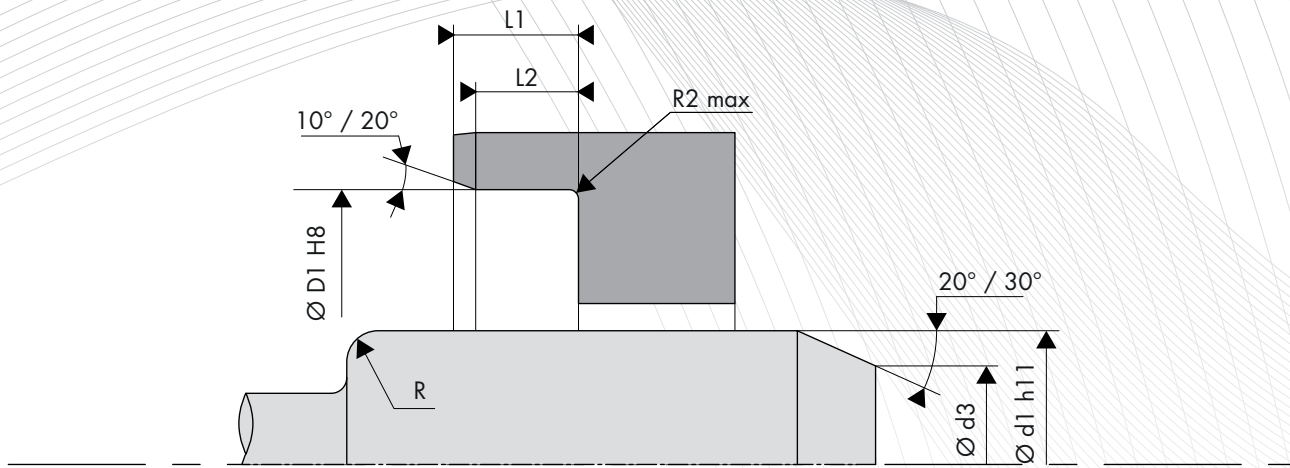
### Pressure

Standard shaft seals with a primary sealing lip and no spring are used only in pressurised environments.

We recommend using shaft seals with springs for use in pressurised environments between 0.02 and 0.05 MPa (max).

### 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

|             |                          |
|-------------|--------------------------|
| <b>Ra</b>   | 0.2 to 0.8 $\mu\text{m}$ |
| <b>Rz</b>   | 1.0 to 4.0 $\mu\text{m}$ |
| <b>Rmax</b> | $\leq 6.3 \mu\text{m}$   |

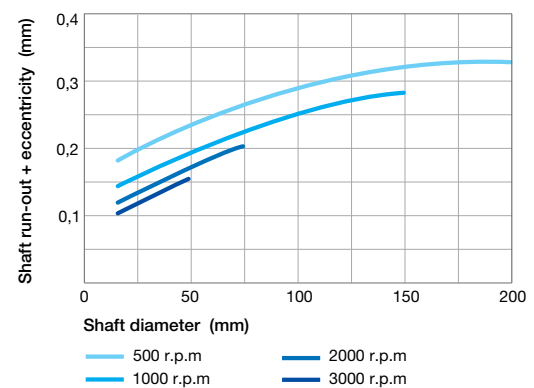
### Chamfer and radius

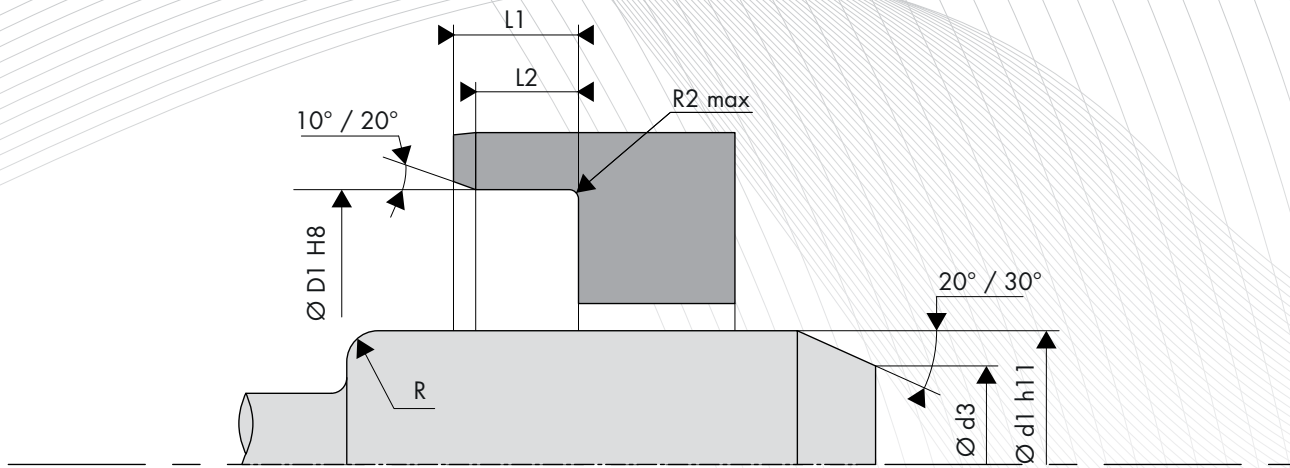
| Shaft diameter $\varnothing d1$ (mm) | Chamfer diameter $\varnothing d3$ (mm) | Radius R (mm) |
|--------------------------------------|----------------------------------------|---------------|
| $\varnothing d1 \leq 10.0$           | $\varnothing d1 - 1.50$                | 2.00          |
| $10.0 < \varnothing d1 \leq 20.0$    | $\varnothing d1 - 2.00$                | 2.00          |
| $20.0 < \varnothing d1 \leq 30.0$    | $\varnothing d1 - 2.50$                | 3.00          |
| $30.0 < \varnothing d1 \leq 40.0$    | $\varnothing d1 - 3.00$                | 3.00          |
| $40.0 < \varnothing d1 \leq 50.0$    | $\varnothing d1 - 3.50$                | 4.00          |
| $50.0 < \varnothing d1 \leq 70.0$    | $\varnothing d1 - 4.00$                | 4.00          |
| $70.0 < \varnothing d1 \leq 95.0$    | $\varnothing d1 - 4.50$                | 5.00          |
| $95.0 < \varnothing d1 \leq 130.0$   | $\varnothing d1 - 5.50$                | 6.00          |
| $130.0 < \varnothing d1 \leq 240.0$  | $\varnothing d1 - 7.00$                | 8.00          |
| $240.0 < \varnothing d1 \leq 500.0$  | $\varnothing d1 - 11.00$               | 12.00         |

### Shaft tolerance

| Shaft diameter $\varnothing d1$ (mm) | Tolerance h11 (mm) |
|--------------------------------------|--------------------|
| $\varnothing d1 \leq 3.0$            | -0.060 / 0         |
| $3.0 < \varnothing d1 \leq 6.0$      | -0.075 / 0         |
| $6.0 < \varnothing d1 \leq 10.0$     | -0.090 / 0         |
| $10.0 < \varnothing d1 \leq 18.0$    | -0.110 / 0         |
| $18.0 < \varnothing d1 \leq 30.0$    | -0.130 / 0         |
| $30.0 < \varnothing d1 \leq 50.0$    | -0.160 / 0         |
| $50.0 < \varnothing d1 \leq 80.0$    | -0.190 / 0         |
| $80.0 < \varnothing d1 \leq 120.0$   | -0.220 / 0         |
| $120.0 < \varnothing d1 \leq 180.0$  | -0.250 / 0         |
| $180.0 < \varnothing d1 \leq 250.0$  | -0.290 / 0         |
| $250.0 < \varnothing d1 \leq 315.0$  | -0.320 / 0         |
| $315.0 < \varnothing d1 \leq 400.0$  | -0.360 / 0         |
| $400.0 < \varnothing d1 \leq 500.0$  | -0.400 / 0         |

### Shaft run out and eccentricity





## HOUSING DESIGN

### Surface roughness

|             |                           |
|-------------|---------------------------|
| <b>Ra</b>   | 0.8 to 3.2 $\mu\text{m}$  |
| <b>Rz</b>   | 6.3 to 16.0 $\mu\text{m}$ |
| <b>Rmax</b> | $\leq 16.0 \mu\text{m}$   |

### Housing tolerance

| Bore diameter<br>$\varnothing D1$ (mm) | Tolerance<br>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<br>H1 (mm) | Width                |                      | Radius<br>R2 max (mm) |
|-------------------|----------------------|----------------------|-----------------------|
|                   | L2min<br>(H1 x 0.85) | L1min<br>(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                |                       |