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INSTALLATION GUIDE
V-rings

About V-rings

The V-Ring is normally stretched and mounted directly on the shaft, where it is held in position by the inherent tension of the rubber body. It rotates with the shaft and seals axially against a stationary counterface, perpendicular to the shaft. The counterface can be the side wall of a bearing or a washer, stamping, bearing housing, or even the metal case of an oil seal. V-Rings are made entirely of rubber without fabric or sheet metal reinforcement. They are, therefore, particularly easy to install. V-Rings can be stretched and, depending on size, installed over flanges, pulleys and bearing housings without costly dismantling.

Shaft Surface Finish

The surface roughness of the shaft should in general not exceed Ra 6.3 µm. For sealing fluids and fine particles, a maximum of Ra 3.2 µm is recommended. Sharp edges and burrs, which can damage the V-Ring must be avoided.

Material and Material Hardness

Cold rolled steel sheet, stainless steel or zinc plated sheet are excellent materials for the counter-face. However, the choice of material is highly dependent on the medium to be sealed. For normal running conditions, conventional mild steel with a hardness of minimum 125 HB is sufficient. For sealing against grease, oil and dry particles no further surface treatment is required. With an increase in speed and the presence of abrasive particles the hardness of the counterface must also be increased. The following table shows the normally used materials.

Material	Hardness HB	Medium
Mild Steel	125 - 150	Water splash, sand, dust
Grey Cast Iron	190 - 270	Water splash, sand, dust
Sinter Bronze	100 - 160	Water, dust
Stainless Steel (Cr/Ni 18-8, C 0.1%)	150 - 200	Water
Stainless Steel (Cr/Ni 18-8, C 0.15%)	350	Water and abrasive particles
Work-hardened Acid Proof Steel	180 - 200	Chemicals
Tungsten Carbide	350 - 500	Water and scale
Forged Steel	200 - 255	Water and scale
Die-cast Aluminum	90 - 160	Water splash

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Counter-face Design

The condition of the counter-face has a great influence on the sealing function. The medium to be sealed and the peripheral speed of the shaft determine the requirements regarding surface roughness and material of the counterface. It is important that it is smooth and flat without any sharp edges. To achieve the full effect of the flinger action, the V-Ring should always be designed in a relatively open space. Equally important is to keep the gap between the shaft and the counter-face as small as possible, in order to prevent entry of the V-Ring lip during the installation. Recommended application dimensions are given in the dimension tables.

Surface Treatment

When the counter-face is exposed to water or other corrosive media, it must be protected accordingly. Mild steel surfaces should either be zinc-plated and chromated, chromium plated, treated with an anticorrosion spray, or painted. The choice of treatment will depend on the overall running conditions. Where the seal is immersed in water, stainless steel is recommended. However, due to the poor thermal conductivity of stainless steel it should not be used in dry running conditions unless the speed is slow (less than 1 m/s).

Surface Finish

The rate of abrasion of the V-Ring is influenced by a number of factors, one of which is the surface finish of the counterface. The choice of surface finish will depend on the medium to be sealed and the shaft speed as well. It is not only the surface finish value as such that is important, but also the surface character. For turned surfaces, it is recommended to buff the surface with fine emery cloth to remove any sharp peaks arising from the turning operation. Surfaces with too fine finish, e.g. certain cold rolled steel surfaces, may cause a suction effect between the V-Ring lip and the counter-face resulting in noise problems and uneven running (so-called stick-slip effect). The counterface surface must be free from scratch marks and other surface damages within the sealing area. This is important when sealing fluids and fine particles are present.
Guide to recommended surface finish is given in the below table.

Surface finish µm Ra	Speed m/s	Medium
0.4 - 0.8	> 10	Oil, water, scale, fiber
0.8 - 1.6	5 - 10	Oil splash, grease, water splash
1.6 - 2.0	1 - 5	Grease, dust, water splash, scale
2.0 - 2.5	<1	Grease, dust

The surface finish should not be lower than 0.05 µm.

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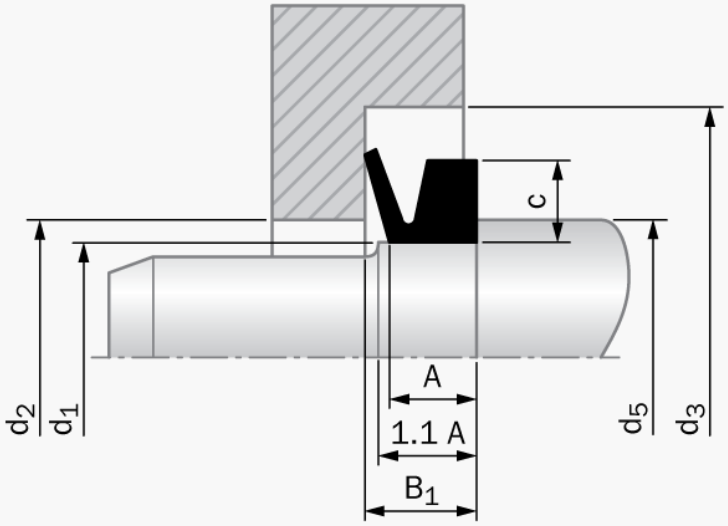
Axial Support

When used to retain oil and grease, an axial support for the V-Ring is always required. For applications with a lower degree of stretch than recommended in the dimension tables (e.g. for ease of assembly) or with a shaft speed exceeding 6-8 m/s (depending on the rubber compound selected) an axial support is also necessary. An axial support can ensure that the correct installation width relative to the counter-face is maintained for blind assemblies.
The V-Ring must always be supported over its entire base. The axial support should be designed in accordance with Figure below. The dimensions A, c, d_1, d_3 and B_1 are shown in the dimension tables. Calculation of the axial support diameter d_5 is as follows;

V-Ring Type	Diameter d_5
A, S	d_1+ 0.5 x c



Radial Retention

When the V-Ring is fitted on the shaft, the body of the V-Ring is subject to a centrifugal force and tends to move or even lift off from the shaft at a certain speed. At shaft speeds over 10-12 m/s, depending on the V-Ring material, the V-Ring in general requires radial retention. The speed when radial retention is required is also dependent on the degree of stretch of the V-Ring. The radial retention can be designed as a recess, in which the V-Ring body fits, or consist of a number of separate clamping segments.

Important Note