

O-ring selection

The selection of an O-ring is governed by a number of criteria. In addition to the dimensions of the O-ring the material and the hardness must be determined.

Material selection

The best suitable material can only be selected if all media with which the O-ring has contact and the actual temperatures to which the O-ring will be exposed are known. More information in the chapter „Materials“.

Material hardness

The choice of the right O-ring hardness depends on the following criteria:

- Pressure
- Gap size (between the machine parts on the non-pressure side)
- Pressure characteristic (constant or pulsating)
- Surface roughness of the sealed components

The O-ring material is pressed into the gap at the non- pressure side. This so called gap extrusion can damage or destroy the O-ring. The resistance of the O-ring material to the gap extrusion rises with the hardness of the material.

For standard applications, O-rings with a hardness of 70 – 80 Shore A have shown to be practicable. Where high or pulsed pressures must be sealed, materials of 80 or 90 Shore A can be used. More information is available in the chapter „Installation grooves - gap dimensions“.

Inner diameter d1

The inner diameter of the O-ring is chosen for the intended application. For example, a radial O-ring sealing on the outside (groove provided in the inner part) should sit firmly in the groove and therefore be slightly expanded on the inner diameter. The amount of expansion should not be more than 6% of the O-ring inner diameter.

A radial O-ring sealing on the inside (groove provided in the outer part) should make full contact with the outer diameter of the groove and therefore be slightly compressed. The amount of compression should not exceed 1% to 3%.

Cross section d2

The correct selection of the cross section of an O-ring is critical to the sealing action. The correct ratio of cross section and groove depth provides the initial preload of the O-ring cross section during installation. Depending on the application, the compression should be within the following amount ranges:

static sealing

approx. 15% - 30%

dynamic sealing

hydraulic

approx. 10% - 20% (min. 8% after tolerance evaluation)

pneumatic

approx. 6% - 15% (min. 4% after tolerance evaluation)

Groove filling ratio (gland fill)

The design of the installation grooves of O-rings should consider the ratio of the O-ring cross-section and the cross-sectional area of the groove. The so called gland fill is normally about 75%. This means the cross-sectional area of the groove is approximately 25% larger than the cross-sectional area of the O-ring. This ensures that sufficient volume is available if the O-ring swells. The application related data of groove depth and groove width in chapter „Installation grooves, design notes“ already consider this requirement.