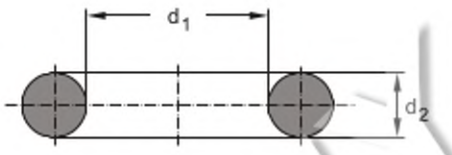
FIELDS OF APPLICATION

O-rings are mainly used to seal stationary machines and system components (static application) against liquid and gaseous media, e.g. flange and cover seals, pipe fittings and the cylinder head and base in hydraulic cylinders. Under certain conditions, O-rings can also be used for reciprocating, rotating and superimposed screw movements (dynamic application). If the installation space is designed properly, they are constructed properly and the correct material is chosen, pressures up to 1,000 bar can be sealed. If necessary, back-up-rings must be used. O-rings are used in many different industries, e.g. hydraulics, vehicle construction, vacuum applications and in plant and mechanical engineering.



d1 inner diameter
d2 cord thickness

SPECIAL APPLICATIONS

- Aseptic pipe fittings to DIN 118641 Form A, standard dimensions available from stock, material FKM 75 perox. with conformity tests FDA (Food and Drug Administration), EU (VO) 1935/2004, EU (VO) 2023/2006, 3A® Sanitary Standards Class I and CIP/SIP (Cleaning In Place/ Sterilization In Place)
- Hydraulic fittings (straight screw-in and pipe connections according to AS 568, metric threads with conical countersink according to ISO 6149, EO series and SAE flanges), standard dimensions in NBR 90 and FKM 90 available from stock
- Ozone and weather-resistant O-rings in NBR 70 and 90
- Low temperature hydraulics (HNBR 75 and 90 with reference tests to John Deere factory standards)
- Gas appliances and systems with DVGW type examination certificates DIN EN 549/DIN EN682
- Food contact with reference tests FDA 21 CFR § 177.2600, EU (VO) 1935/2004
- Drinking water with DVGW type examination certificate WA/WB, ACS, BS 6920

Dichtomatik O-rings are available in EPDM, FKM, NBR, VMQ and with FEP coating (including a FKM or VMQ core). Materials with the necessary certifications are available for special applications (gas appliances and systems, drinking water, food).

Detailed information on our products and the available certifications and conformity tests can be found in our e-Catalog or on our online ordering platform EASY.

Profile	Material	Hardness [Shore A]	Temperature [°C]	Color	Material characteristics
	EPDM, sulfur cross-linked	70	-45 to +130	black	• Very stable in hot water and with steam, washing lyes, caustic soda and caustic potash, silicone oils and greases, many polar solutions, many diluted acids and chemicals • Good resistance to ozone • Incompatible with mineral oil products (lubricants and fuels)
	EPDM, peroxide-cross-linked	70	-50 to +150	black	
	FKM, peroxide-cross-linked	75	-15 to +200	black	• Good chemical resistance to mineral oils and greases, synthetic oils and greases, motor, transmission and ATF oils up to +150°C, fuels, HFD flame-resistant pressure fluids, aliphatic, aromatic and chlorinated hydrocarbons, water up to a maximum of +80°C • Very good weathering, ozone and aging resistance • Very low gas permeability (thus well-suited for vacuum uses)
	FKM	70	-20 to +200	black	
		75	-20 to +200	green	
		80	-20 to +200	black	
		90	-20 to +200	green	
	HNBR	70	-30 to +150	black	• HNBR is formed by the full or partial hydration of NBR • Heat, ozone and aging stability are significantly improved in this manner. Very good mechanical characteristics, such as good wear resistance, are achieved • Media resistance is comparable to that of NB
	NBR	70	-30 to +100	black	• Good chemical resistance to mineral oils and greases, hydraulic oils (H, HL, HLP), the flame-resistant pressure fluids HFA and HFB. HFC up to about +50°C and water up to a maximum of +80°C
		80	-30 to +100		
		90	-30 to +100		
	PTFE		-200 to +260	white	• Good chemical resistance to aggressive acids, bases, alcohols and oils • Resistance to high and extremely low temperatures
	VMQ	70	-55 to +200	red-brown	• Good chemical stability in water (up to +100°C), aliphatic engine and transmission oils, animal- and plant-based oils and greases • Not resistant to fuels, aromatic mineral oils, water vapor (short periods up to a maximum of +120°C are possible), silicone oils and greases, along with acids and alkaline compounds

Profile	Material	Hardness [Shore A]	Temperature [°C]	Color	Material characteristics
	FKM FEP-encapsulate		-20 to +205	transparent/ black	• Including an elastic FKM
	VMQ FEP-encapsulate		-60 to +205	transparent/ red-brown	• Including an elastic VMQ

STANDARD DIMENSIONS

Dichtomatik brand products are stocked in the standard dimensions of DIN ISO 3601-1 and AS568B/BS1806. In addition, different sizes of JIS 2401 (General Industry) and Norm R (NF T 47-501) are also available from stock.

TOLERANCES / SURFACE DEVIATIONS

- Dimensional tolerances in accordance with DIN ISO 3601-1, industry class B
- Surface deviations in accordance with DIN ISO 3601-3, type feature N
- For special applications, the permissible tolerances for special items are limited to industry class A and to the type feature S for shape and surface deviations

An overview of the dimensions and tolerances currently available can be found online in our e-Catalog and on our online ordering platform EASY.

SURFACE COATING

Dichtomatik O-rings are available on request with various surface coatings that are specially adapted to the application or the required properties. A surface coating can be used to make assembly easier, provide optimized abrasion resistance or be used for color differentiation. If you have any questions regarding the application or the selection of a suitable coating, we will be happy to advise you.

STANDARD MATERIALS

The wide range of O-ring dimensions is available from stock in four standard materials:

Base elastomer	Abbreviation	Hardness [Shore A]	Color	Temperature [°C]	
	DIN ISO 1629			depth	height
Nitrile butadiene rubber	NBR	70 80+90	black	-30 -30	+100 to 120* +100 to 120*
Fluorinated rubber	FKM	80	black	-20	+200
Ethylene propylene diene rubber	EPDM	70	black	-45	+130
Silicone rubbe (Vinyl methyl polysiloxane)	VMQ	70	red-brown	-55	+200
Fluorinated rubber perox.	FKM perox.	75	black	-15	+200
Ethylene propylene diene rubber perox.	EPDM perox.	70	black	-50	+150

*temporarily

The operating temperature range and media resistance are primary criteria in the selection of materials. Nevertheless, the mechanical and technological values of an elastomer compound must be taken into account in an appropriate manner, since they are decisive for the service life of the seal.

NBR (NITRILE BUTADIENE RUBBER)

NBR is the most commonly used material for O-rings because of its good mechanical properties and resistance to lubricating oils and greases based on mineral oil. These properties are mainly determined by the acrylonitrile content (ACN between 18% and 50%). A low ACN content results in good low-temperature flexibility but limited resistance to oils and fuels; as the ACN content increases, low-temperature flexibility decreases and oil and fuel resistance increases.

The standard NBR material for Dichtomatik O-rings has a medium ACN content to cover a wide range of applications with balanced properties. It exhibits good mechanical and technological values, e.g. high abrasion resistance, low gas permeability and good resistance to mineral oil-based lubricating oils and greases, hydraulic oils H, HL, HLP, flame-retardant hydraulic fluids HFA, HFB, HFC, aliphatic hydrocarbons, silicone oils and greases, water up to approx. +80 °C.

NBR, on the other hand, is generally not resistant to aromatic and chlorinated hydrocarbons, fuels with a high aromatic content, polar solvents, glycol-based brake fluids and flame-retardant hydraulic fluids HFD. The resistance to ozone, weathering and aging is low. However, this does not have a negative effect in the majority of applications.

FKM (FLUORINATED RUBBER)

FKM materials are characterized by their very high temperature and chemical resistance. In addition, the very good resistance to aging and ozone as well as the very low gas permeability (good suitability for vacuum applications) and the self-extinguishing fire behavior are also worth mentioning.

The FKM standard material for O-rings shows very good resistance properties in mineral oils and fatty, aliphatic, aromatic and chlorinated hydrocarbons, fuels, hardly inflammable pressure fluids HFD and many organic solvents and chemicals.

In addition to the standard FKM materials, various special compounds are available, which are tailored to special applications through different compositions of the polymer chains and varying fluorine contents (65% to 71%).

FKM is generally not resistant to hot water, steam, polar solvents, glycol-based brake fluids and low-molecular organic acids.

COMPARATIVE PRESENTATION OF SOME ELASTOMER PROPERTIES

Properties	Materials									
	NBR	FKM	EPDM Sulfur	EPDM peroxid	VMQ	HNBR	FFKM	FVMQ	CR	AU/EU
Compression set	1	1	3	1	2	1	3	2	2	3
Tearability	2	2	3	2	4	1	2	3	2	1
Abrasion resistance	2	2 – 3	2	2	4	2	3	3	2	1
Resistance to aging	4	1	2	2	1	2	1	1	2	1
Ozone resistance	4	1	2	2	1	2	1	1	2	1
Oil and grease resistance	2	1	5	5	3	2	1	2	3	2
Gasoline resistance	4**	2**	5	5	4	3	1	2	3	3
Hot water resistance	80**	80**	130	150	100	100**	***	100	80	50
Steam resistance	–	–	130	175	120*	–	***	120*	–	–
Heat resistance standard materials [°C]	100	200	130	150	200	150	260	175	100	100
Heat resistance special materials [°C]	120	–	–	–	250	–	330	–	–	–
Cold resistance standard materials [°C]	-30	-15	-45	-50	-55	-30	-15	-55	-40	-40
Cold resistance special materials [°C]	-50	-35	–	–	–	-40	-35	–	-50	–

1 = very good / 2 = good / 3 = moderate / 4 = low / 5 = weak / * = short term / ** = better only with a special mixture / *** = mixture dependent

Surface treatment/gliding intensification

The typical properties of elastomer materials also include "non-gliding" and "adhesive" surfaces. In certain applications and during the assembly of O-rings (especially with automatic feed), the friction that arises can have a negative effect. A reduction in friction to facilitate assembly and even extend service life can be achieved by using various methods of gliding intensification. A distinction is made between:n:

- short-term gliding intensification, e.g. to facilitate assembly through
  - siliconizing
  - graphitizing
  - molykotizing
  - talcumizing
- longer-term gliding intensification through
  - halogenation (fluorination)
  - PTFE coating
  - Introduction of dry lubricants into the surface
- long-term friction reduction through gliding intensifying additives in the elastomer compound, such as molybdenum disulfide (MoS2) or polytetrafluorethylene (PTFE)