

# O-rings for use in fluid power systems

## Materials and fields of application

**DIN**  
**3771**  
Part 3

Fluidtechnik; O-Ringe; Werkstoffe, Einsatzbereiche

### 1 Scope and field of application

This standard specifies materials along with their hardness and provides information on the application of O-rings as covered in DIN 3771 Part 1.

### 2 Materials

O-rings are made of elastomeric materials based on synthetic rubbers as specified in table 1.

**Table 1**

Symbol used as in ISO 1629	Basic elastomer	Hardness (IRHD) as in DIN 53 519 Part 1 or 2 ( $\pm 5$ )
NBR	Acrylonitrile butadiene rubber	70
NBR	Acrylonitrile butadiene rubber	90
FPM	Fluorocarbon rubber	85
EPDM	Ethylene propylene diene rubber	70
MVQ	Silicone rubber	70
ACM	Polyacrylate rubber	70

### 3 Field of application

Table 2 specifies fields of application of O-rings made of the materials given in table 1 and their compatibility with a range of service fluids. Although these have been grouped, they may vary in their compositions.

More details with regard to application and continuous service temperatures are to be agreed between the user and the manufacturer.

Continued on pages 2 and 3.

Table 2

Material <sup>1)</sup>	Permitted low temperatures <sup>2)</sup>	Service fluids <sup>3)</sup>																
		Fluids based on mineral oil							Fire-resistant hydraulic fluids						Other service fluids			
	°C	Motor lubricants	Hypoid oils	Type ATF oils	Hydraulic oils as in DIN 51 524 and DIN 51 525	Types EL and L fuel oils as in DIN 51 603 Parts 1 and 2 Diesel fuel as in DIN 51 601	Regular grade petrol as in DIN 51 600	Premium grade petrol as in DIN 51 600	Greases	Type HFA-1 as in DIN 24 320	Type HFB as in VDMA 24 317	Type HFC as in VDMA 24 317	Type HFD (phosphoric esters) as in VDMA 24 317	Type HFD (chlorinated hydrocarbons) as in VDMA 24 317	Type HFD (mixtures) as in VDMA 24 317	Water	Air	Brake fluids
	°C	Maximum continuous temperature of service fluid, in °C <sup>2)</sup>																
NBR 70 IRHD NBR 90 IRHD	-30	100	90	100	100	●	●	●	100	60	60	60	-	-	-	100	100	-
FPM 85 IRHD	-15	150	150	150	150	150	150	150	100	60	60	-	150	150	150	100	200	-
EPDM 70 IRHD	-40	-	-	-	-	-	-	-	-	-	-	130	130	-	-	140	130	130
MVQ 70 IRHD	-50	150	130	●	150	-	-	-	100	-	-	-	-	-	-	100	200	130
ACM 70 IRHD	-15	150	130	130	130	130	130	130	100	-	-	-	-	-	-	-	130	-

Where the continuous service temperature has not been specified, ● denotes that the elastomers of this group exhibit a different behaviour towards all or particular service fluids.

- denotes that the elastomer is not suitable for this group of service fluids.

1) The materials specified characterize a particular type of elastomer. From the basic elastomer, a number of mixtures may be prepared which exhibit similar basic characteristics but differ widely in their specific properties (e.g. tensile strength, elongation at break, rebound resilience, compression set and resistance to low and high temperatures).

2) The information on service temperatures has been given for guidance only. It should be noted that if the upper temperature limit is exceeded, a shorter service life may be expected. On the other hand, it may be necessary to lower this limit when using aggressive service fluids.

The fact that elastomeric material, when exposed to low temperatures, usually tends to excessive hardening without embrittlement, does not allow conclusions to be drawn on the service temperature since this is a function of other factors and should be agreed between the user and the manufacturer. There are special materials for use at lower temperatures.

3) Although the behaviour of a mixture towards service fluids is mainly a function of the basic elastomer, the nature and the quantity of the other mixture components, such as plasticizers, fillers, curing agents and antioxidants are of relevance. Large quantities of extractable plasticizers, for example, may change the swelling properties of the elastomer so that it swells substantially less or even shrinks when used in mineral oils or solvents. Therefore, the data given is for general information only and intended to facilitate the selection of seal material for particular applications. In case of doubt, the manufacturer should be contacted.

**Standards and other documents referred to**

DIN 3771 Part 1	O-rings for use in fluid power systems; dimensions to ISO 3601-1
DIN 24 320	Type HFAE fire-resistant hydraulic fluids; requirements
DIN 51 524 Part 1	Type HL hydraulic oils; minimum requirements
DIN 51 525	Type HLP hydraulic oils; minimum requirements
DIN 51 600	Leaded petrol; minimum requirements**)
DIN 51 601	Diesel fuel; minimum requirements***)
DIN 51 603 Part 1	EL type fuel oils; minimum requirements
DIN 51 603 Part 2	Types L, T and M fuel oils; requirements and testing
DIN 53 519 Part 1	Determination of indentation hardness (IRHD) of soft rubber using standard specimens
DIN 53 519 Part 2	Testing of elastomers; determination of indentation hardness (IRHD) of soft rubber; microhardness testing of small specimens
ISO 1629:1994	Rubber and latices; nomenclature*)
VDMA-Einheitsblatt (VDMA Code of practice) 24-317	Fluid power systems; hydraulics; fire-resistant hydraulic fluids, guidelines****)

**Other relevant standards**

DIN 3771 Part 2	O-rings for use in fluid power systems; testing and marking
DIN 3771 Part 4	O-rings for use in fluid power systems; surface imperfections
DIN 50 049	Inspection documents for the delivery of metallic products
DIN 53 479	Determination of density of plastics and elastomers
DIN 53 504	Determination of tensile stress/strain properties of rubber
DIN 53 507	Testing of rubber and elastomers; Determination of tear strength of rubber using trouser test piece
DIN 53 517	Determination of compression set of rubber at constant strain
DIN 53 521	Determination of the behaviour of rubber when exposed to fluid and vapours
DIN 53 538 series	Standard reference elastomers
DIN 53 670 Part 1	Testing of rubber in the form of standard test mixes; apparatus and methods

**Explanatory notes**

In respect of the material characteristics which vary from one manufacturer to the other, only basic properties and fields of application, but no methods of test have been specified.

Data on material characteristics is available from the manufacturer.

The relevant standards for testing elastomers are DIN 50 049, DIN 53 479, DIN 53 504, DIN 53 507, DIN 53 517, DIN 53 521, DIN 53 538 series and DIN 53 670 Part 1.

**International Patent Classification**

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\*) Obtainable from *Beuth Verlag GmbH*, D-10772 Berlin.

\*\*\*) Withdrawn.

\*\*\*\*) Superseded by DIN EN 590.

\*\*\*\*\*) At present at the stage of draft.