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Busak + Shamban

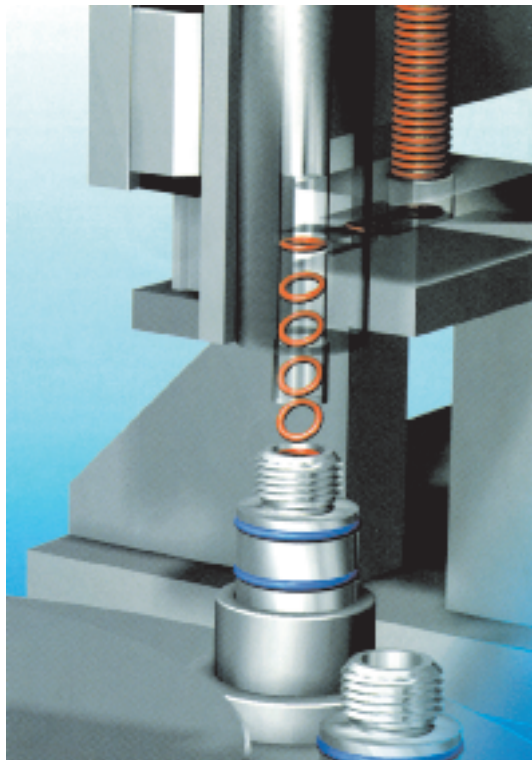
Busak + Luyken was founded in 1954 as a Marketing company to supply O-Rings to the German market. By 1958 Busak + Luyken were distributors of thermoplastic seals for W.S. Shamban, USA. After the take over of W.S. Shamban in 1992, the company changed the name to Busak + Shamban. Since then Busak + Shamban has grown to world wide network of R&D Centres, Manufacturing Facilities, Marketing Companies and Logistic Centres.

In addition Busak + Shamban has strategic alliances with several well-chosen third party suppliers. The sale of products is carried out with 33 Marketing Companies world wide.

This enables B + S to satisfy the customer demands and provide an extensive service, which covers the mass production to the small quantities market.

Since 1994 the quality assurance system has been approved to ISO 9001 an in addition since 2000 to QS 9000.

Most of the group members and partners are also approved to the ISO 9000 and following standards.



Source: Ohrmann Montagetechnik GmbH, Möhnesee, Germany

With the state-of the art laboratories as well as the three R&D centres, B + S is able to develop new materials and proprietary seals.

Busak + Shamban has developed surface treatments for elastomer O-Rings, offering a variety of high-quality methods to reduce friction.

The co-operation with German companies for the production of automatic assembly equipment and for surface technology serves as a basis for this knowledge.

In 1999 Busak + Shamban was acquired by the TI Group.



Skega Seals AB, Sweden

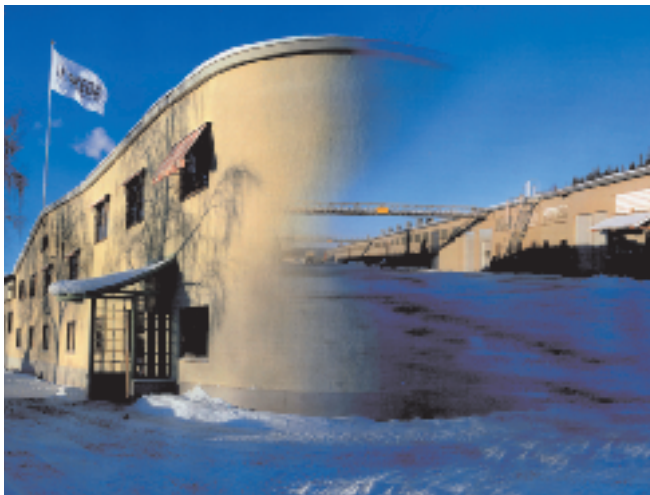
Skega AB was founded in 1932 and at that time it was one product only; heavy duty rubber gloves.

In 1948 the O-Ring was introduced on the Swedish market when Skega started the manufacturing of special O-Rings for the Swedish Air Force, and today 120 million O-Rings are produced each year.

Quality assurance has been a fundamental part of the business for several years. Since 1989 the quality assurance system has been approved to ISO 9001.

In addition to the ISO 9001 requirements, the quality system has since 1999 been third party approved to QS-9000.

The Management System is certified to SS EN ISO 14001 since December 1999.



Most material groups are handled in the laboratory, which includes a variety of test equipment. However, Skega is more and more concentrating on high performance EPDM and FKM materials.

Especially low temperature materials according to airforce standards can be offered.

The production is mainly focused on injection manufacturing and machinery. The company has its own in-house tool design. Since 1999 the designers and tool workshop have been working with 3D Design Software.

The environmental work is considered to be one of the most important issues, which means that the environmental effects of the business are constantly reduced, from the choice of material and all the way through the production line to the end of the product's life.

In 1996 Skega Seals AB was acquired by the TI Group.



Dowty O Rings

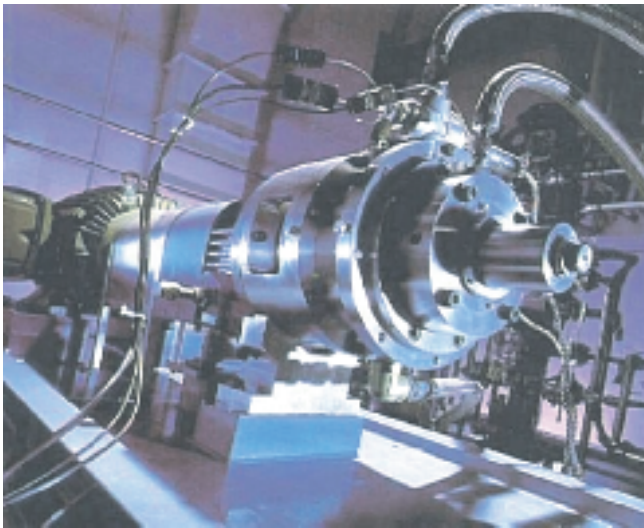
Dowty O Rings was set up in 1961 to produce high volumes of elastomeric O-Rings. With 40 years of experience in producing premium quality elastomeric O-Rings, Dowty O Rings produces and sells over one billion O-Rings each year.

Dowty's expertise lies in providing customised solutions for an extensive range of automotive and industrial applications including:

Automotive

- Fuel Injection Systems
- Fuel Line Connectors
- Antilock Braking Systems
- Air Conditioning Systems
- Diesel systems
- Steering and Transmission Systems

Industrial



- Hydraulics and Pneumatics
- Water and Gas supply systems
- Compressors and Vacuum Systems

With a strong reputation built on performance, reliability & value, together with QS 9000 & ISO 140001 accreditation, Dowty O Rings is committed to continuous improvement, competitive performance and the goal of zero defect culture.



Dowty offers material design and development, in-house material compounding and testing.

The company houses a fully equipped testing laboratory and can provide full support through in-house tool design and manufacture.

The company is committed to lean manufacturing initiatives in its drive for zero defect quality supplies, whilst offering better service reliability at an advantageous price.

In 1990 Dowty O Rings was acquired by the TI Group.



A General information

A.1 Description

O-Rings offer the designer an efficient and economical sealing element for a wide range of static or dynamic applications.

Inexpensive production methods and its ease of use have made the O-Ring the most widely used seal.

A wide choice of elastomer materials for both standard and special applications allow the O-Ring to be used to seal practically all liquid and gaseous media.

O-Rings are vulcanised in moulds and are characterised by their circular form with annular cross section. The dimensions of the O-Ring are defined by the inside diameter d_1 and the cross section d_2 (Figure 1).

Cross sections of approx. 0.35 to 40 mm and inside diameters up to 5,000 mm and more are available.

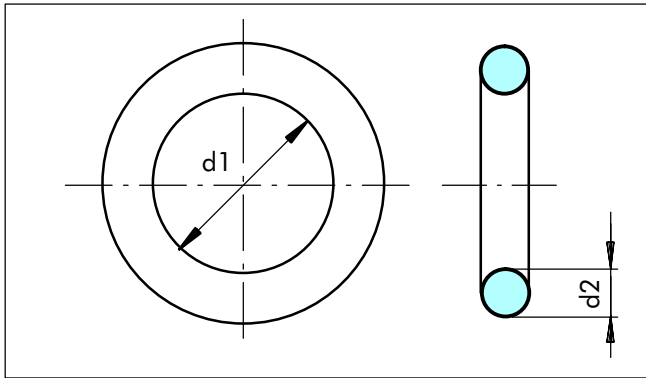


Figure 1 O-Ring dimensioning

A.2 Application

O-Rings are used as sealing elements or as energising elements for hydraulic slipper seals and wipers and thus cover a large number of fields of application. There are no fields of industry where the O-Ring is not used. From an individual seal for repairs or maintenance to a quality assured application in aerospace, automotive or general engineering. The O-Ring is used predominantly for static sealing applications:

- As a radial static seal, e.g. for bushings, covers, pipes, cylinders
- As an axial static seal, e.g. for flanges, plates, caps.

Advantages

Compared with other sealing elements, the O-Ring has a wide range of advantages:

- Simple, one piece groove design reduces hardware and design costs
- Compact design allows smaller hardware
- Easy, foolproof installation reduces risk
- Applicable to a wide range of sealing problems, static, dynamic, single or double acting
- Wide compound choice for compatibility with most fluids
- Ex stock availability of many sizes worldwide for easy maintenance and repair.

O-Rings in dynamic applications are recommended only for moderate service conditions. They are limited by the speed and the pressure against which they are to seal:

- For low duty sealing of reciprocating pistons, rods, plungers, etc.
- For sealing of slowly pivoting, rotating or spiral movements on shafts, spindles, rotary transmission lead-throughs, etc.



A.3 Method of operation

O-Rings are double-acting sealing elements. The initial squeeze, which acts in a radial or axial direction depending on the installation, gives the O-Ring its initial sealing capability. These forces are superimposed by the system pressure to create the total sealing force which increases as the system pressure increases (Figure 2).

Under pressure, the O-Ring behaves in a similar way to a fluid with high surface tension. The pressure is transmitted uniformly to all directions.

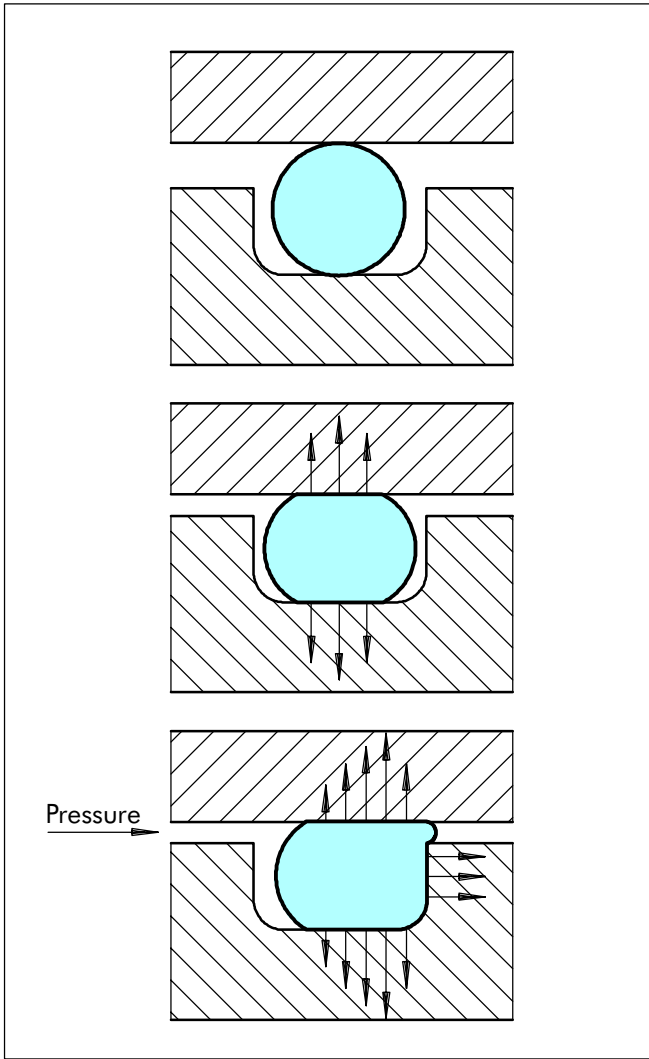


Figure 2 O-Ring sealing forces with and without system pressure



B Technical information

B.1 Materials

B.1.1 Elastomers

Equipment manufacturers and end users expect sealing systems to operate leak free and to maintain long service life. Reliability is crucial to effective low maintenance cost operations. To find the perfect sealing solution in each individual case both material performance and seal design are critically important. One of the main used material groups for sealings are the elastomers. They

show good properties like elasticity or good chemical compatibility.

The following tables provide a summary of the various elastomer material groups. B + S can offer a large number of materials within each group. If no particular specifications are given for the material, standard NBR (Nitrile Rubber) in 70 Shore A will be supplied (see chapter "B.1.5 Standard compounds").

Table I Elastomers

Designation	Trade Name*	Abbreviation		
		ISO 1629	ASTM 1418	B + S
Acrylonitrile–Butadiene Rubber (Nitrile Rubber)	Europrene® Krynac® Nipol N® Perbunan NT Breon®	NBR	NBR	N
Hydrogenated Acrylonitrile–Butadiene Rubber	Therban® Zetpol®	HNBR	HNBR	H
Polyacrylate Rubber	Noxite® Hytemp® Nipol AR®	ACM	ACM	A
Chloroprene Rubber	Baypren® Neoprene®	CR	CR	WC
Ethylene Propylene Diene Rubber	Dutral® Keltan® Vistalon® Buna EP®	EPDM	EPDM	E
Silicone Rubber	Elastoseal® Rhodorsil® Silastic® Silopren®	VMQ	VMQ	S
Fluorosilicone Rubber	Silastic®	FVMQ	FVMQ	F
Tetrafluorethylene–Propylene Copolymer Elastomer	Aflas®	FEPM	TFE / P**	WT
Butyl Rubber	Esso Butyl®	IIR	IIR	WI
Styrene–Butadiene Rubber	Buna S® Europrene® Polysar S®	SBR	SBR	WB
Natural Rubber		NR	WR	WR
Fluorocarbon Rubber	Dai-El® Fluorel® Tecnoflon® Viton®	FKM	FKM	V
Perfluoro Rubber	Isolast®	FFKM	FFKM	J
Polyester Urethane Polyether Urethane	Adiprene® Pellethan® Vulcollan® Desmopan®	AU EU	AU EU	WU WU
Chlorosulphonated Polyethylene Rubber	Hypalon®	CSM	CSM	WM
Polysulphide Elastomer	Thiokol®	-	TWT	WY
Epichlorohydrin Elastomer	Hydrin®	-	-	WO

* Selection of registered trade names
** Abbreviation not yet standardised.

ASTM = American Society for Testing and Materials
ISO = International Organisation for Standardisation



Table II The most important types of synthetic rubber, their grouping and abbreviations

Chemical name	Abbreviation	
	DIN / ISO 1629	ASTM D - 1418
M - Group (saturated carbon molecules in main macro-molecule-chain) – Polyacrylate Rubber – Ethylene Acrylate Rubber – Chlorosulphonated Polyethylene Rubber – Ethylene Propylene Diene Rubber – Ethylene Propylene Rubber – Fluorocarbon Rubber – Perfluoro Rubber	AC M AE M CS M EPD M EP M FK M FFK M	AC M CS M EPD M EP M FK M FFK M
O - Group (with oxygen molecules in the main macro-molecule chain) – Epichlorohydrin Rubber – Epichlorohydrin Copolymer Rubber	CO ECO	CO ECO
R - Group (unsaturated hydrogen carbon chain) – Chloroprene Rubber – Butyl Rubber – Nitrile Butadiene Rubber – Natural Rubber – Styrene Butadiene Rubber – Hydrogenated Nitrile Butadiene Rubber	CR IIR NBR NR SBR HNBR	CR IIR NBR NR SBR HNBR
Q - Group (with Silicone in the main chain) – Fluorosilicone Rubber – Methyl Vinyl Silicone Rubber	FVMQ VMQ	FVMQ VMQ
U - Group (with carbon, oxygen and nitrogen in the main chain) – Polyester Urethane – Polyether Urethane	AU EU	AU EU



B.1.2 Application parameters of elastomers

Elastomers as all other organic chemicals have limited use. External influences such as various media, oxygen or ozone as well as pressure and temperature will affect the material properties and therefore their sealing capability.

Elastomers will amongst others swell, shrink or harden and develop cracks or even tears. The following information illustrates the different application parameters.

Elastomer heat resistance / swelling in oil

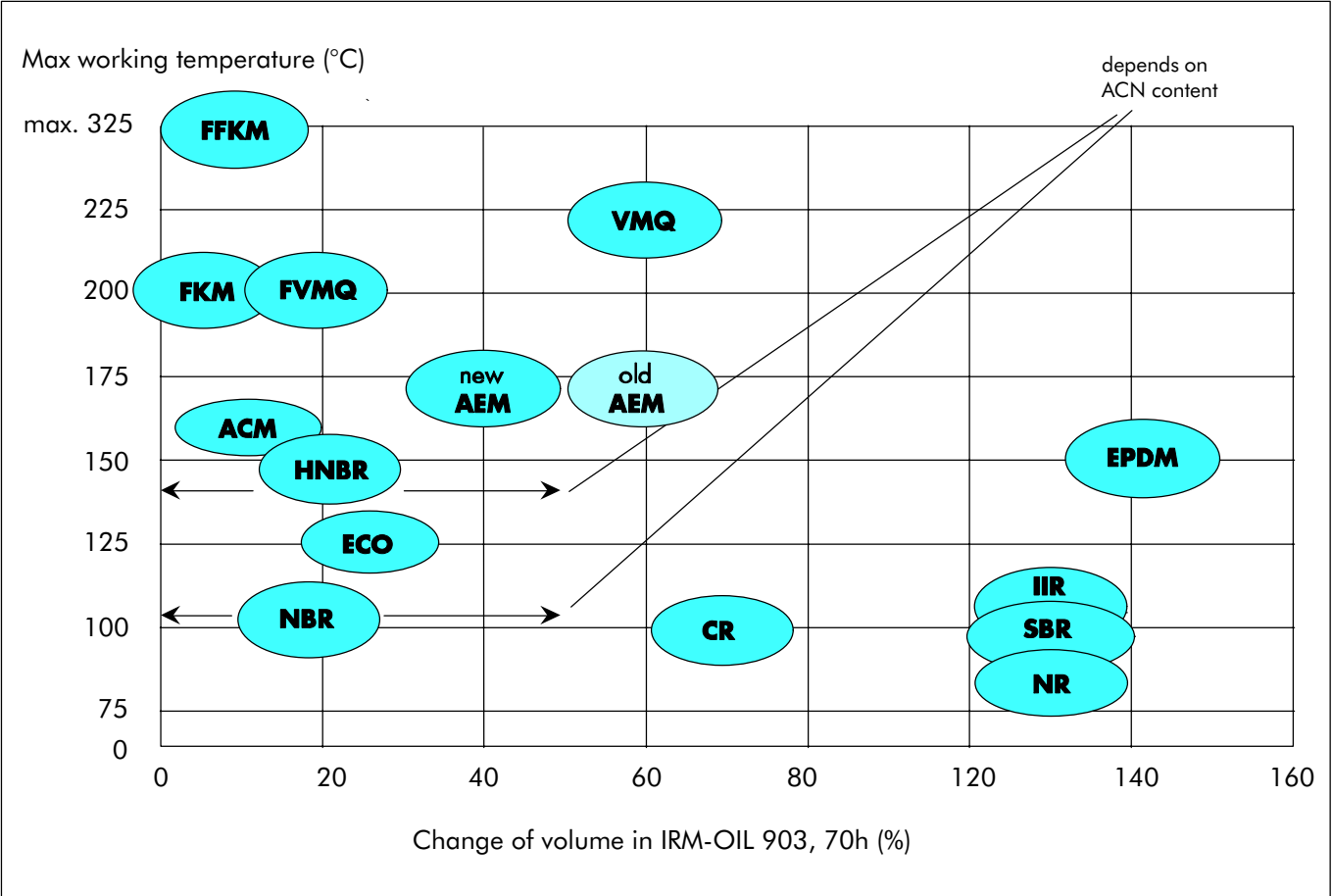


Figure 3 Change of volume in IRM-Oil 903 (old ASTM-Oil No 3)



Temperature range

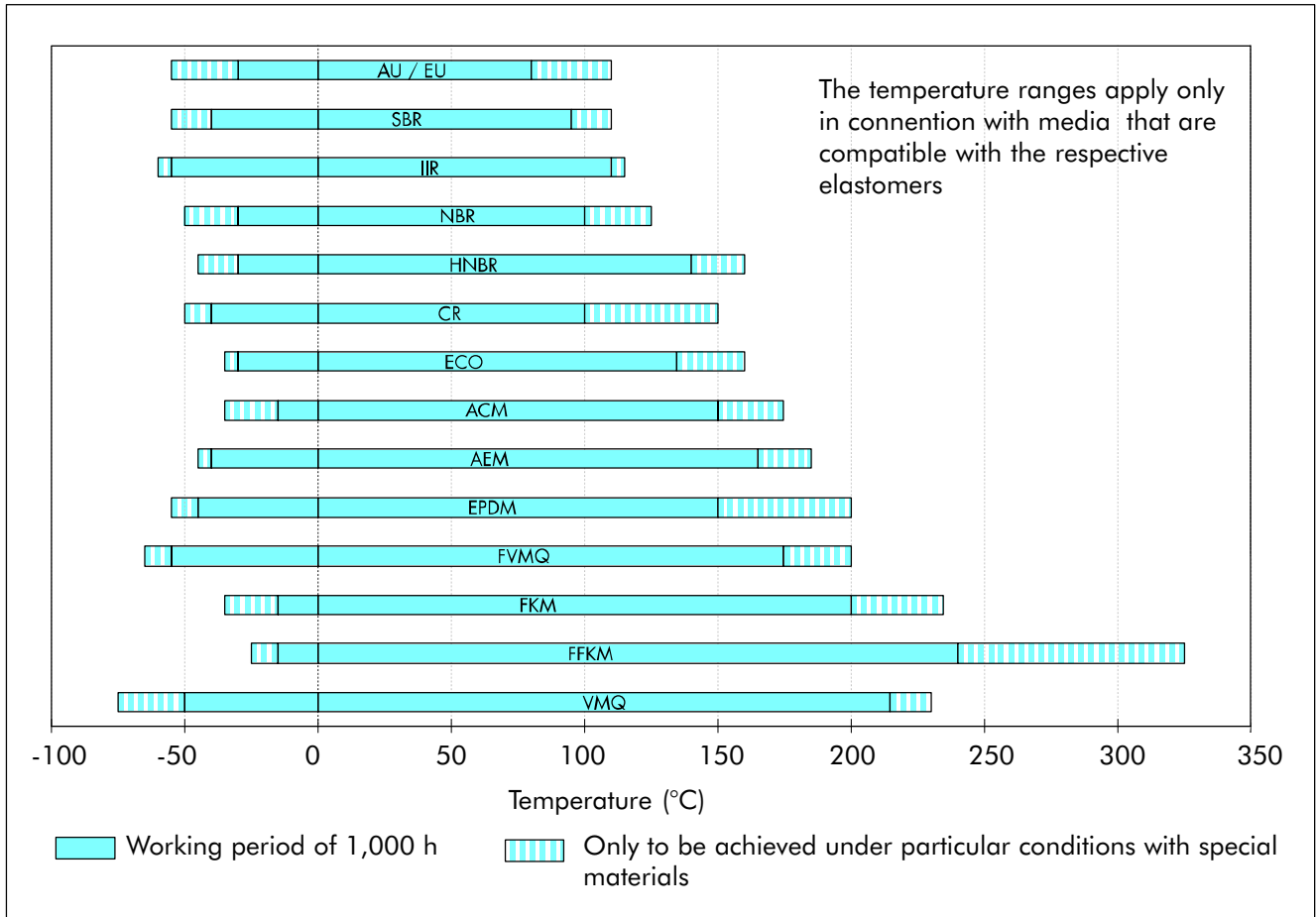


Figure 3 Temperature range of various elastomers

General field of application

Elastomer materials are used to cover a large number of fields of application. Details regarding resistance in special media are shown in chapter "Chemical compatibility", page 13.

The various elastomers can be characterised as follows:

NBR (Nitrile Butadiene Rubber):

The properties of the Nitrile Rubber depend mainly on the ACN content which ranges between 18% and 50%. In general they show good mechanical properties. The operating temperatures range between -30 °C and +100 °C (for a short period of time up to +120 °C). Suitable formulated NBR can be used down to -60 °C. NBR is mostly used with mineral based oils and greases.

FKM (Fluorocarbon Rubber)

Depending on structure and fluorine content FKM materials can differ with regards to their chemical resistance and cold-flexibility.

FKM is known especially for its non-flammability, low gas permeability and excellent resistance to ozone, weathering and aging.

The operating temperatures of the Fluorocarbon Rubber range between -20 °C and +200 °C. (for a short period of time up to +230 °C). Suitable formulated FKM can be used down to -35 °C. FKM is also often used with mineral based oils and greases at high temperatures.

EPDM (Ethylene Propylene Diene Rubber)

EPDM shows good heat, ozone and aging resistance. In addition they also exhibit high levels of elasticity good low temperature behaviour as well as good insulating properties.

The operating temperatures of applications for EPDM range between -45 °C and +150 °C (for a short period of time up to +175 °C). With sulphur cured types the range is reduced to -45 °C and +120 °C (for short period of time up to +150 °C).

EPDM can often be found in applications with brake fluids (based on glycol) and hot water.



HNBR (Hydrogenated Nitrile Butadiene Rubber)

HNBR is made via selective hydrogenation of the NBR butadiene groups. The properties of the HNBR rubber depend on the ACN content which ranges between 18% and 50% as well as on the degree of saturation. HNBR shows good mechanical properties.

The operating temperature of HNBR ranges between -30 °C and +140 °C (for a short period of time up to +160 °C) in contact with mineral oils and greases. Special types can be used down to -40 °C.

Q (Silicone Rubber)

Silicone rubber shows excellent heat resistance, cold flexibility, dielectric properties and especially good resistance against oxygen and ozone.

Depending on the compound the operating temperatures ranges between -60 °C and +200 °C (for a short period of time even up to +230 °C). Special types can be used down to -90 °C. There are also some types with narrow temperature ranges. Silicone is often used in the medical- and food industry.

CR (Chloroprene Rubber)

In general the CR materials show relatively good resistances to ozone, weathering, chemicals and aging. Also they show good non-flammability, good mechanical properties and cold flexibility.

The operating temperatures range between -40 °C and +100 °C (for a short period of time up to +120 °C). Special types can be used down to -55 °C.

CR materials are found in sealing applications such as refrigerants, for outdoor applications and in the glue industry.

ACM (Polyacrylate Rubber)

ACM shows excellent resistance to ozone, weathering and hot air, although it shows only a medium physical strength, low elasticity and a relatively limited low temperature capability.

The operating temperatures range from -20 °C and +150 °C (for a short period of time up to +175 °C). Special types can be used down to -35 °C.

ACM-materials are mainly used in automotive applications which require special resistance to lubricants containing many additives (incl. sulphur) at high temperatures.

FFKM (Perfluoro Rubber)

Perfluoroelastomers show broad chemical resistance similar to PTFE as well as good heat resistance. They show low swelling with almost all media.

Depending on the compound the operating temperatures range between -25 °C and +240 °C. Special types can be used up to +325 °C.

Applications for FFKM can be mostly found in the chemical and process industries and in all applications with either aggressive environments or high temperatures.

Chemical compatibility

It is important to recognise that when using this guide, the ratings shown are based on published data and immersion tests. These tests are conducted under laboratory conditions and may not represent adequately the conditions in the field. Relative short term laboratory tests may not pick up all the additives and impurities which may exist in long term service applications.

Care must be taken to ensure that all aspects of the application are considered carefully before a material is selected. For example at elevated temperatures some aggressive fluids can cause a much more marked effect on an elastomer than at room temperature.

Physical properties as well as fluid compatibility need to be considered. Compression set, hardness, abrasion resistance and thermal expansion can influence the suitability of a material for a particular application.

It is recommended that users conduct their own tests to confirm the suitability of the selected material for each application.

Our experienced technical staff can be consulted for further information on specific applications.

Rating system

- A Very good suitability
Elastomer shows little or no effect from exposure.
Little effect on performance and physical properties. Very good resistance.
- B Good suitability.
Some effects from exposure with some loss of physical properties. Some chemical swelling.
- C Limited suitability.
Significant swell and loss of physical properties after exposure.
Additional tests should be done.
- U The elastomer is unsuitable for application in this media.
- Insufficient information available for service in this media.



Table III Chemical Compatibility Guide

A

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Acet Aldehyde	U	U	-	B	U	U	U	U	-
Acet Amide	-	-	A	A	U	A	A	A	B
Acetyl Acetone	U	U	U	A	U	U	U	U	U
Acetyl Chloride	U	U	U	U	A	A	U	U	U
Acetic Acid	C	U	B	A	C	C	C	C	B
Acetic Acid Chloride	U	U	U	U	A	A	U	U	U
Acetic Acid Vapors	U	U	C	A	U	C	U	U	U
Acetic Acid, 96-99.5% (Glacial)	U	U	U	B	U	U	U	U	B
Acetic Anhydride	U	U	C	B	U	C	U	U	B
Acetone	U	U	U	A	U	U	U	U	U
Acetophenone	U	U	U	A	U	U	U	U	U
Acetylene Gas	A	-	B	A	A	A	A	A	B
Acetylene Tetrabromide	-	U	B	A	A	-	U	U	-
Acrolein	U	U	C	A	U	-	C	C	-
Acrylonitrile	U	U	U	U	U	U	U	U	U
Adipic Acid	U	U	A	A	A	A	A	A	A
Adipic Aciddiethylester	-	-	-	A	U	-	U	U	-
Aero Lubriplate	A	A	A	U	A	A	A	A	B
Aero safe 2300	U	U	U	A	U	U	U	U	U
Aero safe 2300 W	U	U	U	A	U	U	U	U	U
Aero Shell 1 AC Grease	A	A	B	U	A	A	A	A	B
Aero Shell 17 Grease	A	A	B	U	A	A	A	A	B
Aero Shell 7 A Grease	A	A	B	U	A	A	A	A	B
Aero Shell 750	B	U	U	U	A	B	B	B	U
Aero Shell Fluid 4	B	B	U	U	A	A	A	A	U
Aerozene 50 (50% Hydrazine, 50% UDMH)	-	U	U	A	U	U	U	U	U
Air	A	A	A	A	A	A	A	A	A
Alcohol (Methanol)	U	U	A	A	U	A	A	A	A
Alkyl Arylsulphonic Acid	U	U	C	A	U	U	C	C	U
Alkyl Benzene	U	U	U	U	A	A	U	U	U

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Allyl Alcohol (2-Propene-1-ol)	U	U	A	A	B	U	B	B	U
Allyl Chloride (3-Chloro-1-Propene)	-	U	U	U	-	-	U	U	A
Allyl Ketone	U	U	C	A	U	U	U	U	B
Aluminium Acetate	U	U	B	A	U	U	B	B	U
Aluminium Bromide	A	U	A	A	A	A	A	A	A
Aluminium Fluoride	-	U	A	A	A	A	A	A	B
Aluminium Nitrate	U	U	A	A	A	-	A	A	B
Aluminium Phosphate	A	U	A	A	A	A	A	A	A
Aluminium Sulfate	U	U	A	A	A	A	A	A	A
Aluminium-Potassium-sulfate Solution	-	-	-	A	-	-	-	-	-
Aluminum Chloride Solution	A	C	A	A	A	A	A	A	B
Aluminum Hydroxide Solution	U	U	A	A	A	A	A	A	A
Aluminum Sulphate Solution	U	-	A	A	A	A	A	A	A
Ambrex 33 (Mobile)	A	B	B	U	A	U	A	A	U
Ambrex 830 (Mobile)	A	A	B	U	A	A	A	A	B
Amines, Primary (such as Methyl, Ethyl, Propyl, Allyl)	U	U	U	A	U	U	U	U	C
Aminoacetic Acid	U	U	A	A	A	U	B	B	U
Ammonia - Lithium	U	U	U	B	U	U	B	B	U
Ammonia (gas)	U	U	A	A	U	U	A	A	A
Ammonia (gas, hot)	U	U	B	B	U	U	U	U	U
Ammonia (liquid)	U	U	-	A	U	-	B	B	-
Ammonia Solution	U	U	-	A	U	-	B	B	-
Ammonia, anhydrous	U	U	A	A	U	U	A	A	B
Ammonia, aqueous Solution	U	U	A	A	U	U	C	C	C
Ammonium Acetate	-	U	B	A	U	-	A	A	-
Ammonium Carbonate	-	U	B	A	U	-	A	A	-
Ammonium Carbonate Solution	-	-	B	A	-	-	U	U	-
Ammonium Chloride	B	U	A	A	A	A	A	A	A



CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Ammonium Chloride Solution	-	-	A	A	-	-	A	A	-
Ammonium Fluoride	U	U	B	A	B	B	A	A	A
Ammonium Hydroxide	U	U	A	A	U	-	U	U	-
Ammonium Hydroxide Solution	U	U	A	A	U	-	U	U	-
Ammonium Nitrate Solution	U	-	A	A	-	-	A	A	-
Ammonium Nitrite	-	-	B	A	-	-	A	A	B
Ammonium Phosphate, monobasic, etc.	-	-	A	A	-	-	A	A	A
Ammonium Sulfate Solution	U	U	A	A	U	B	A	A	B
Ammonium Sulfide	U	U	B	A	U	B	B	B	B
Ammonium Thiocyanate	-	B	-	A	-	-	A	A	A
Amyl Acetate	U	U	U	A	U	U	U	U	U
Amyl Alcohol	U	U	B	A	B	B	B	B	U
Amyl Borate	-	-	A	U	-	-	A	A	-
Amyl Chloride	U	U	U	U	A	B	U	U	U
Amyl Naphtalene	U	U	U	U	A	A	U	U	U
Anderol L-774	A	U	U	U	A	A	A	A	U
Aniline Chlorohydrate	U	U	B	B	B	B	B	B	U
Aniline Liquid	U	U	U	A	U	U	U	U	U
Animal Fats	A	A	B	B	A	A	A	A	B
Anisole	U	U	U	U	U	U	U	U	U
Antimony Chloride	B	U	B	A	A	A	A	A	B
Antimony Chloride, dry	B	B	A	A	A	A	A	A	A
Aqua Regia (Nitric Acid/Hydrochloric Acid)	U	U	U	U	U	U	U	U	U
Argon Gas	A	A	A	A	A	A	A	A	A
Aromatic Fuels (up to 50% Aromatic)	B	B	U	U	A	A	A	A	U
Aromatic Hydrocarbons (100% Aromatic)	U	U	U	U	A	A	U	U	U
Arsenic Acid	C	C	A	A	A	A	A	A	A
Arsenic Acid Solution	C	C	A	A	A	A	A	A	A
Asphalt, Emulsion	B	B	B	U	A	B	B	B	U
ASTM Test Fuel A	B	A	B	U	A	A	A	A	U

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
ASTM Test Fuel B	U	U	U	U	A	A	A	A	U
ASTM Test Fuel C	U	U	U	U	A	B	B	B	U
ASTM-Oil IRM 902	A	B	B	U	A	A	A	A	B
ASTM-Oil IRM 903	A	B	U	U	A	A	A	A	B
ASTM-Oil No.1	A	B	B	U	A	A	A	A	A
ASTM-Oil No.2	A	B	B	U	A	A	A	A	B
ASTM-Oil No.3	A	B	U	U	A	A	A	A	B
ATM-Brake Fluid (Glycolbased)	U	U	B	A	U	A	U	U	A
Automatic-Transmission Fluid	U	A	B	U	A	A	A	A	B
Automotive Gasoline	C	B	U	U	A	A	A	A	U

B

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Barium Carbonate	-	A	-	A	A	A	A	A	A
Barium Chloride Solution	U	A	A	A	A	A	A	A	A
Barium Hydroxide Solution	U	U	A	A	A	A	A	A	A
Barium Nitrate Solution	U	A	A	A	A	A	A	A	A
Barium Sulfate	A	A	A	A	A	A	A	A	A
Barium Sulfide Solution	U	A	A	A	A	A	A	A	A
Battery Acid (Sulfuric Acid Diluted)	U	U	U	A	A	U	U	U	U
Beef Tallow	C	-	B	U	A	B	A	A	B
Beer	U	C	A	A	A	A	A	A	A
Beet Sugar Sap	U	-	B	A	A	A	A	A	A
Benzaldehyde	U	U	U	B	U	U	U	U	B
Benzenesulfonic Acid	U	U	B	-	A	B	U	U	U
Benzine (Gasoline)	C	B	U	U	A	A	A	A	U
Benzine 50 / Benzene 30 / Ethanol 20	U	U	U	U	B	B	U	U	U



O-Ring

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Benzine 50 / Benzene 50	U	U	U	U	B	B	U	U	U
Benzine 60 / Benzene 40	U	U	U	U	B	B	U	U	U
Benzine 70 / Benzene 30	U	U	U	U	A	A	B	B	U
Benzine 80 / Benzene 20	U	U	U	U	A	A	B	B	U
Benzoic Acid, Solution	B	U	B	B	A	A	B	B	B
Benzol (Benzene)	U	U	U	U	B	B	U	U	U
Benzophenone	U	U	-	B	A	A	-	-	-
Benzyl Alcohol	U	U	B	B	A	B	U	U	B
Benzyl Chloride	U	U	U	U	A	A	U	U	U
Biphenyl	U	-	U	U	A	B	U	U	U
Bitumen	U	B	U	U	A	A	U	U	U
Black Liquor	U	U	B	B	B	-	B	B	-
Blast Furnace Gas	B	U	U	U	A	B	U	U	A
Bleach Solution	U	U	U	A	A	B	U	U	U
Bleaching Powder Solution	U	U	B	A	A	B	C	C	B
Boiler Feed Water	U	U	C	A	B	B	B	B	C
Bone Oil	A	A	U	U	A	A	A	A	U
Borax (Sodiumborate)	A	U	B	A	A	A	B	B	A
Borax Solutions	U	U	U	A	B	B	B	B	B
Boric Acid	U	B	B	A	A	A	A	A	A
Brake Fluids	U	U	B	A	U	U	U	U	U
Bromine	U	U	U	U	B	B	U	U	U
Bromine Solution in Water	U	U	U	U	A	B	U	U	U
Bromine Vapour	U	U	U	U	B	B	U	U	U
Bromobenzene	U	U	U	U	A	B	U	U	U
Bromochloro Trifluoro Ethan	U	U	U	U	A	B	U	U	U
Bunker Oil	A	B	U	U	A	A	B	B	B
Butadiene	U	U	U	U	B	B	U	U	U
Butandiol	-	U	B	A	U	U	A	A	U
Butane	A	B	B	U	A	A	A	A	U
1-Butanethiol	U	-	U	U	A	U	U	U	U

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Butanole	U	U	B	B	A	A	A	A	B
Butantriol	A	B	B	A	A	A	A	A	A
Butene	U	B	U	U	A	B	B	B	U
Buthylphenol	U	U	U	U	B	-	U	U	U
Butter	B	B	B	B	A	A	A	A	B
Buttermilk	U	A	A	A	A	A	A	A	A
Butyl Acetate	U	U	U	b	U	U	U	U	U
Butyl Acrylate	U	-	U	U	U	U	U	U	-
Butyl Alcohol	U	U	B	A	A	A	A	A	B
Butyl Amine	U	U	U	-	U	U	U	U	C
Butyl Benzoate	U	-	U	A	A	A	U	U	-
Butyl Carbitol	U	-	C	A	C	U	U	U	U
Butyl Cellosolve	U	U	C	A	U	U	C	C	-
Butyl Diglycol	-	-	-	A	A	-	A	A	-
Butyl Ether	U	U	U	U	U	U	U	U	U
Butyl Phthalate	U	U	U	A	U	A	U	U	A
Butyl Pyrocatechol	U	-	-	B	A	B	U	U	-
Butyl Stearate	-	A	U	U	A	B	B	B	B
Butylene	b	B	C	U	A	A	A	A	U
Butyraldehyd	U	-	U	B	U	U	U	U	U
Butyric Acid	U	U	C	U	A	B	B	B	U
Butyric Acid Butyl Ester	U	-	U	B	B	B	U	U	-

C

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Calcium Acetate	U	B	B	A	U	U	B	B	U
Calcium Bisulfate	-	A	-	A	A	A	A	A	A
Calcium Bisulfide Solution	C	C	B	A	B	C	B	B	C
Calcium Carbonate	-	A	A	A	A	-	A	A	A



CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Calcium Carbonate Slurry	U	U	A	A	A	A	A	A	A
Calcium Chloride	B	B	A	A	A	A	A	A	A
Calcium Chloride, brine	U	B	A	A	A	A	A	A	A
Calcium Cyanide	-	-	A	A	-	-	A	A	A
Calcium Hydroxide Solution	U	B	A	A	A	A	A	A	A
Calcium Hypochlorite Solution	U	U	B	A	A	A	C	C	B
Calcium Nitrate	B	B	A	A	A	A	A	A	B
Calcium Oxide	U	A	-	A	A	A	A	A	B
Calcium Phosphate Slurry	U	U	B	A	A	A	A	A	A
Calcium Silikate	-	-	A	A	A	-	A	A	-
Calcium Sulfate	-	A	-	A	A	A	A	A	A
Calcium Sulfide	U	A	A	A	A	A	A	A	B
Calcium Sulfite	U	A	A	A	A	A	A	A	A
Calcium Thiosulfate	U	A	A	A	A	A	B	B	A
Caliche Solution (Sodium Nitrate)	U	B	B	A	A	A	B	B	B
Campher	U	U	B	U	B	U	A	A	U
Campher Oil	-	-	U	U	B	-	A	A	-
Cane Sugar Sap	U	-	-	A	A	A	A	A	A
Carbitol	-	U	B	B	B	B	B	B	B
Carbolic Acid (Penole)	U	C	U	B	A	A	U	U	U
Carbolineum	U	U	-	B	A	U	B	B	U
Carbon Dioxide, dry	B	U	B	B	A	B	A	A	B
Carbon Dioxide, wet	U	U	B	B	A	B	A	A	B
Carbon Disulfide	U	U	U	U	A	C	U	U	U
Carbon Monoxide	A	A	B	A	B	B	A	A	A
Carbonic Acid	U	B	B	A	A	B	A	A	B
Carboxylic Acids	-	A	A	A	A	A	A	A	A
Casein	-	-	A	B	A	A	A	A	A
Castor Oil	A	A	A	B	A	A	A	A	A
Cellosolve (2-Ethoxyethanol)	U	U	U	B	U	U	U	U	U
Cellulose	U	B	B	B	U	B	B	B	B

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Cellulose Acetat	-	A	U	B	U	-	A	A	A
Chile Salpetre (Sodium Nitrate)	U	B	B	A	A	A	B	B	B
Chinawood Oil	-	C	B	U	A	A	A	A	U
Chloracetic Acid	U	U	U	A	U	B	U	U	U
Chloracetic Acid Ethyl Ester	U	U	U	U	A	B	U	U	U
Chloric Acid	U	U	U	B	B	U	U	U	U
Chloride of Lime	U	U	U	A	A	A	U	U	B
Chlorine Dioxide	U	-	U	C	A	B	U	U	-
Chlorine gas, anhydrous	-	-	C	A	A	-	C	C	-
Chlorine Water	U	U	U	B	A	U	U	U	U
Chlorine, liquid	U	U	U	B	A	C	U	U	U
Chloro Aamine	U	U	A	A	U	U	A	A	U
Chloro Acetaldehyde	U	U	U	A	U	C	U	U	U
Chloro Acetone	B	U	U	A	U	U	U	U	U
Chloro Benzene	U	U	U	U	B	B	U	U	U
Chloro Bromo Methane	U	U	U	B	B	B	U	U	U
Chloro Butadiene	U	U	U	U	B	B	U	U	U
Chloro Methyl Ether	U	U	U	C	U	U	U	U	U
Chloro Naphthalene	U	U	U	U	A	B	U	U	U
Chloro Sulfonic Acid	U	U	U	C	U	U	U	U	U
Chloroform	U	U	U	U	B	C	U	U	U
o-Chlorophenol	U	U	U	U	A	U	U	U	U
Chlorothene	U	U	U	U	B	B	U	U	U
Chlorotoluene	U	U	U	U	A	B	U	U	U
Chrome Alum	U	-	A	A	A	-	A	A	A
Chromic Acid	U	U	U	C	A	C	U	U	C
Chromo sulfuric Acid	U	U	U	U	A	U	U	U	U
Cider	U	U	B	A	B	A	A	A	B
Citric Acid	U	U	A	A	A	A	A	A	A
Citrous Oils	-	U	B	U	A	-	B	B	B
Coal Tar	-	U	-	U	B	A	B	B	B
Cobalt Chlorite	B	B	A	A	A	A	A	A	B
Coca-Cola	U	B	B	A	B	A	A	A	A



O-Ring

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Cocoa Butter	-	B	B	U	A	B	A	A	C
Coconut grease	A	B	B	U	A	A	A	A	A
Coconut Oil	A	A	B	U	A	A	A	A	A
Coconut, Fatty Acid	A	A	B	U	A	A	A	A	A
Cod-liver Oil	A	A	B	B	A	A	A	A	B
Coffee	U	U	A	A	A	A	A	A	A
Coffee Extract	U	U	A	A	A	A	A	A	A
Coke Oven Gas	U	U	U	U	A	B	U	U	B
Copper Acetate Solution	U	U	C	B	U	U	U	U	U
Copper Ammonium Acetate	U	U	C	B	U	U	U	U	U
Copper Chloride, Solution	U	B	B	A	A	A	A	A	A
Copper Cyanide	A	B	A	A	A	A	A	A	A
Copper Fluoride	U	-	B	A	A	U	B	B	U
Copper Nitrate	U	U	B	A	A	U	B	B	U
Copper Sulfate (Blue Vitriol) Solution	U	U	A	A	A	A	A	A	A
Corn Oil	B	A	B	U	A	A	A	A	B
Cotton Oil	A	A	C	C	A	A	A	A	A
Cottonseed Oil	A	A	B	U	A	A	A	A	B
Cresol	U	U	U	U	A	C	U	U	U
Cronton Aldehyde	U	U	U	A	U	U	U	U	U
Crude Oil	-	U	U	U	A	A	B	B	U
Cumene	U	U	U	U	A	U	U	U	U
Cuprous Ammonia Acetate Solution	U	U	U	A	U	U	U	U	U
Cyanic Acid	U	-	B	A	A	B	B	B	-
Cyanic Acid Solution	U	-	B	A	A	B	B	B	-
Cyclo Hexane	B	A	C	U	A	A	A	A	U
Cyclo Hexanole	-	-	U	U	A	A	B	B	-
Cyclo Hexanone	U	U	U	U	U	U	U	U	U
Cyclo Hexylamine	U	U	U	C	U	U	U	U	U
p-Cymene	U	U	U	U	A	B	U	U	U

D

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
DDT Solutions (Kerosene Solvent)	B	B	C	U	A	A	A	A	U
DDT Solutions (Toluene Solvent)	U	U	U	U	A	A	U	U	U
Decalin (Decahydronaphtalene)	B	U	U	U	A	A	U	U	U
Decane	A	U	U	U	A	A	A	A	B
Dextrin	U	U	A	A	A	A	A	A	A
Dextrose	B	B	-	A	A	A	A	A	A
Diacetone	-	B	-	A	U	U	-	-	-
Diacetone Alcohol	U	U	B	A	U	U	U	U	U
1.2-Diaminoethane	U	U	B	A	U	U	B	B	U
Diamylamine	U	U	U	A	U	U	U	U	U
Diazinone	-	-	U	U	B	B	U	U	U
Dibenzyl Ether	C	B	-	B	C	-	U	U	B
Dibenzyl Sebacate	U	B	U	B	B	U	U	U	U
Dibromo Difluoro Methane	U	U	U	B	-	U	U	U	U
Dibromo Methyl Benzene	U	U	U	U	A	B	U	U	U
Dibutyl Amine	U	U	U	U	U	U	U	U	U
Dibutyl Ether	U	U	U	U	U	U	U	U	U
Dibutyl Phthalate	U	-	U	B	C	B	U	U	C
Dibutyl Sebacate	U	U	U	B	B	B	U	U	B
Dichloro Acetic Acid	U	U	U	U	U	-	U	U	U
Dichloro Acetic Acid Methylester	U	U	U	A	U	U	U	U	U
Dichloro Benzene	U	U	U	U	A	B	U	U	U
Dichloro Butane	U	U	U	U	A	B	B	B	U
Dichloro Butylene	U	U	U	U	B	U	U	U	U
Dichloro Ethane	U	U	U	U	B	U	U	U	U
Dichloro Ethylene	-	U	U	U	B	-	U	U	U
Dichloro Methane	U	U	U	U	B	B	U	U	U
Dichloro Pentane	U	U	U	U	A	C	U	U	U
3,1-Dichloropropene	-	U	U	U	-	-	U	U	A
Dichloro Iso-Propylene Ether	U	B	U	U	U	U	U	U	U



CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Dicyclo Hexyl Amine	U	U	U	U	U	U	U	U	U
Diesel Fuel	U	B	U	U	A	A	A	A	U
Diesel Oil	B	A	U	U	A	A	A	A	U
Diethanol Amine	U	U	U	B	U	U	U	U	U
Diethyl Amin	U	U	U	B	U	U	U	U	B
Diethyl Aniline	U	U	U	A	U	U	U	U	U
Diethyl Benzene	U	U	U	U	A	A	U	U	U
Diethyl Carbonate	U	U	U	U	A	B	U	U	U
Diethyl Ether	U	B	U	U	U	U	U	U	U
Diethyl Formaldehyde	U	U	U	A	U	U	U	U	U
Diethyl Hydrazine	U	U	C	A	U	U	C	C	U
Diethyl Maleate	U	U	C	A	U	U	C	C	U
Diethyl Sebacate	U	U	U	B	B	B	U	U	B
Diethyl Sulfate	-	U	-	-	U	-	U	U	U
Diethylene Glycol	U	U	A	A	A	A	A	A	B
Diethylene Triamine	U	U	U	A	U	U	U	U	U
Diglycolic Acid	U	-	B	A	A	U	U	U	U
Dihexyl Phthalic Acid Ester	U	-	U	-	U	-	U	U	U
1,4-Dihydroxybenzene	B	-	U	B	U	B	U	U	U
Dihydroxy Tartaric Acid (Tartaric Acid)	U	U	A	B	A	A	A	A	A
Di-Isobutyl Ketone	U	U	U	A	U	U	U	U	U
Di-Isobutylene	U	U	U	U	A	C	B	B	U
Di-Isooctyl Sebacate	U	U	U	B	B	U	U	U	U
Di-Isopropyl Benzene	U	U	U	U	A	A	U	U	U
Di-Isopropyl Ketone	U	U	U	A	U	U	U	U	U
Dimethyl Amine	U	U	U	B	U	U	U	U	U
Dimethyl Aniline	U	U	U	B	U	U	U	U	U
Dimethyl Ether	U	B	U	B	U	U	U	U	U
Dimethyl Formamide	U	U	U	B	U	B	B	B	B
Dimethyl Hydrazine	-	-	B	A	U	U	B	B	U
Dimethyl Ketone	U	U	U	A	U	U	U	U	U
Dimethyl Phenol	-	-	U	U	U	U	U	U	U
Dimethyl Phthalate	U	U	U	B	B	B	U	U	-

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Dimethylbutane	A	-	B	U	A	A	A	A	U
Dinitro Toluene	U	U	U	U	U	U	U	U	U
Dinitrogen Oxid	A	A	A	B	A	A	A	A	A
Diocetyl Amine	U	U	U	A	U	U	U	U	U
Diocetyl Phthalate	U	B	U	B	B	B	U	U	B
Diocetyl Sebacate	U	B	U	B	B	U	U	U	U
Dioxane	U	U	U	B	U	U	U	U	U
Dioxolane	-	U	U	B	U	U	U	U	U
Dipentene	U	U	U	U	A	U	B	B	U
Diphenyl	U	U	U	U	A	B	U	U	U
Diphenyl Ether	U	U	U	U	B	B	U	U	U
Diphenyle Oxide	-	U	-	U	A	B	U	U	U
Dipropylene Glycol	B	B	B	B	B	B	B	B	B
Dithionite	-	-	B	A	A	U	B	B	U
Divinyl Benzene	U	U	U	U	A	B	U	U	U
DMT (Dimethyl Terephthalate)	U	U	U	A	A	B	U	U	U
DNCB (Dinitrochlorobenzene)	U	U	U	U	A	B	U	U	U
Dodecanol	-	-	A	B	A	-	B	B	-
Domestic Fuel Oils	A	A	B	U	A	A	A	A	U
Dowtherm A	U	U	U	U	A	B	U	U	U
Dowtherm E	U	U	U	U	A	B	U	U	U

E

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Epichlor Hydrin	U	U	U	B	U	U	U	U	U
Essential Oils	U	B	U	U	B	B	U	U	U
Ethane	A	B	B	U	A	A	A	A	B
Ethanol Amine	U	U	C	B	U	U	C	C	C
Ether	U	U	U	C	U	U	U	U	U
Ethyl Acetate	U	U	U	B	U	U	U	U	U



O-Ring

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Ethyl Acrylate	U	U	U	-	U	U	U	U	U
Ethyl Alcohol, Ethanol	U	U	A	A	U	A	A	A	B
Ethyl Benzene	U	U	U	U	B	B	U	U	U
Ethyl Bromide	U	U	U	U	A	A	B	B	U
Ethyl Cellulose	U	U	B	B	U	U	B	B	U
Ethyl Chloride	U	U	B	B	B	A	U	U	U
Ethyl Chloro Acetate	-	U	B	B	A	U	B	B	U
Ethyl Hexanole	U	U	A	A	A	A	A	A	B
Ethyl Oxalate	U	A	U	B	A	B	U	U	U
Ethyl Pentachloro Benzene	U	U	U	U	A	B	U	U	U
Ethyl Pyridine	U	U	U	A	U	U	U	U	U
Ethyl Sulfate (Diethyl Sulfate)	U	U	A	A	U	C	U	U	A
Ethylene	B	B	C	U	A	A	A	A	U
Ethylene Bromide	U	U	U	C	A	C	U	U	U
Ethylene Chloride	-	-	B	B	B	-	-	-	U
Ethylene Chlorohydrin	U	U	B	B	U	B	U	U	U
Ethylene Diamine	U	U	U	A	U	U	U	U	U
Ethylene Dibromide	U	U	U	U	A	C	U	U	U
Ethylene Dichloride	U	U	U	U	A	C	U	U	U
Ethylene Glycol	C	B	B	A	A	A	A	A	C
Ethylene Glycol Ethyl Ether (Cellosove)	U	U	U	B	U	U	U	U	U
Ethylene Oxide	U	U	U	b	U	U	U	U	U
Ethylene Silicate	-	B	A	A	A	A	A	A	-
Ethylene Trichloride	U	U	U	C	b	B	U	U	U

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Ferric Nitrates	B	B	A	A	A	A	A	A	B
Ferric Sulfate (Ferric Vitrinol)	B	B	A	A	A	A	A	A	B
Ferric Sulfate Solution	-	A	A	A	A	A	A	A	B
Fir Oil	U	B	U	U	A	A	B	B	U
Fish Oil	A	B	B	U	A	A	A	A	U
Fluorine	U	-	-	U	C	U	U	U	U
Fluoro Benzene	U	-	U	U	B	B	U	U	U
Fluorosilicic Acid	-	-	B	A	A	U	B	B	U
Formaldehyde (Formalin-Solution)	U	U	U	A	U	U	C	C	C
Formaldehyde (Methanal)	U	U	U	A	B	U	B	B	B
Formamide	-	U	U	B	B	-	B	B	-
Formic Acid	U	U	B	B	U	U	U	U	U
Freon 11	-	U	U	U	B	B	A	A	U
Freon 112	-	B	B	U	B	B	B	B	U
Freon 113	-	B	A	U	B	U	A	A	U
Freon 114	-	A	A	A	B	B	A	A	U
Freon 114 B2	-	B	B	U	B	B	B	B	U
Freon 115	-	B	A	A	B	B	A	A	U
Freon 12	-	B	A	B	B	U	B	B	U
Freon 13	-	B	A	A	B	U	A	A	U
Freon 13 B1	-	B	A	A	B	U	A	A	U
Freon 134 a	-	-	-	A	-	-	A	-	-
Freon 14	-	A	A	A	B	B	A	A	U
Freon 142 b	-	-	A	A	U	-	A	A	U
Freon 152 a	-	-	A	A	U	-	A	A	-
Freon 21	U	B	B	U	U	B	U	U	U
Freon 218	-	-	A	A	A	-	A	A	-
Freon 22	B	U	A	A	U	U	U	U	U
Freon 31	-	B	A	A	U	B	U	U	U
Freon 32	-	B	A	A	U	B	A	A	U
Freon 502	-	-	A	A	B	-	B	B	A
Freon BF	-	U	B	U	A	-	B	B	U
Freon C316	-	-	A	A	-	-	A	A	U

F

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Fats (animal/vegetable)	A	A	A	U	A	A	A	A	B
Fatty Acids	A	A	B	U	A	A	B	B	B
Ferric Chloride Solution	-	A	B	A	A	A	A	A	B



CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Freon C318	-	-	A	A	B	B	A	A	U
Freon MF	-	B	U	U	B	-	B	B	U
Freon PCA	-	A	A	U	B	-	A	A	U
Freon TA	-	A	A	A	U	-	A	A	A
Freon TC	-	A	A	B	A	-	A	A	U
Freon TF	-	A	A	U	A	U	A	A	U
Freon TMC	-	B	B	B	A	-	B	B	U
Freon T-P35	-	A	A	A	A	-	A	A	A
Freon TWD602	-	A	B	A	A	U	B	B	-
Fruit Juices	U	U	B	A	B	A	B	B	A
Fumaric Acid	U	-	B	-	A	A	A	A	B
Furan	U	U	U	U	U	U	U	U	U
Furfural (Furfurylaldehyde)	-	C	-	-	-	-	C	C	-
Furfurylalcohol	-	C	-	-	-	-	-	-	-

G

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Gallic Acid	U	U	B	B	A	A	A	A	A
Gas Oil	A	A	B	U	A	A	A	A	B
Gasoline / Alcohol Mix	U	U	U	U	B	U	b	B	U
Gasoline, 100 Octane	U	B	U	U	A	A	A	A	U
Gasoline, 130 Octane	U	B	U	U	A	A	A	A	U
Gasoline, Aromatic	U	A	U	U	A	A	A	A	U
Gasoline, Ethyl and Regular	U	B	U	U	A	A	A	A	U
Gasoline, Refined	U	B	U	U	A	A	A	A	U
Gasoline, Sour	U	B	U	U	A	A	A	A	U
Gasoline, with Mercaptan	U	B	U	U	A	A	A	A	U
Gelatin	U	U	A	A	A	A	A	A	A
Generator Gas	B	A	B	U	A	B	A	A	B
Glaubers Salt	U	U	B	B	A	A	U	U	b

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Glucose solution	U	U	A	A	A	A	A	A	A
Glucose, aqueos	C	A	A	A	A	A	A	A	A
Glycerin (Glycerol)	U	U	A	A	A	A	A	A	A
Glycerol	U	U	A	A	A	A	A	A	A
Glycerol Chlorohydrin	-	-	U	B	B	-	U	U	-
Glycerol Triacetate (Triacetin)	U	U	B	A	U	U	B	B	B
Glycerol Trinitrate (Nitroglycerin)	U	U	B	A	A	U	U	U	U
Glycine	U	U	A	A	A	U	B	B	U
Glycol, Diethylene	U	U	A	A	A	A	A	A	A
Glycol, Ethylene	U	B	A	A	A	A	A	A	A
Glycol, Propylene	U	U	A	A	A	A	A	A	A
Glycolic Acid	U	U	B	A	B	A	A	A	A

H

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
HEF-3	U	U	U	U	A	B	B	B	U
Helium Gas	A	A	A	A	A	A	A	A	A
Heptane	A	B	B	U	A	A	A	A	C
Hexa Fluoro Silicic Acid	U	U	B	B	A/B	-	B	B	U
Hexachloro Acetone	U	U	U	A	U	U	U	U	U
Hexachloro Butadiene	U	B	U	U	A	U	U	U	U
Hexachloro Cyclohexane (Lindane)	U	B	U	U	A	U	-	-	U
1-Hexadecanol	-	-	A	A	-	-	A	A	-
Hexaldehyd	-	U	B	A	U	U	U	U	B
Hexalin, Cyclohexanol	-	-	B	U	A	A	A	A	U
Hexamine	U	U	U	A	U	U	U	U	U
Hexanal (Capronaldehyde)	U	U	-	B	U	U	-	-	B
Hexane	A	B	B	U	A	A	A	A	C
Hexanetriol	B	U	B	A	A	A	A	A	A



O-Ring

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Hexene	A	B	B	U	A	A	B	B	U
Hexyl Alcohol	U	U	B	B	A	B	A	A	B
Hydrazine	C	U	B	A	C	B	B	B	U
Hydrazine Hydrate	C	U	B	A	C	B	B	B	U
Hydrobromic Acid	U	U	U	A	A	C	U	U	U
Hydrochlorique Acid (Muriatic Acid) 37%	U	U	U	B	A	U	U	U	U
Hydrocyanic Acid	U	-	B	A	A	B	B	B	-
Hydrofluoric Acid (cold)	U	U	U	B	b	U	U	U	U
Hydrofluoric Acid (hot)	U	U	-	U	U	U	U	U	U
Hydrogen Chloride Gas	-	-	C	A	A	U	U	U	U
Hydrogen Fluoride	U	U	U	B	-	U	U	U	U
Hydrogen Peroxide, concentrated	U	U	U	U	A	B	U	U	B
Hydrogen Sulfide	U	U	B	A	A	U	C	C	U
Hydrogen, Gas	B	A	A	A	A	C	A	A	C
Hydrogene Bromide, anhydrous	U	U	U	U	A	U	U	U	B
Hydrogensulfite Leach	B	U	B	A	A	-	U	U	-
Hydroquinone	B	-	U	B	U	B	U	U	U
Hydroxy Acetic Acid	U	U	U	A	U	U	U	U	B
Hydroxyl Amine	-	-	-	A	A	A	A	A	A
Hydroxyl Amine Sulfate	-	-	B	A	A	A	A	A	A
Hypochlorous Acid	U	-	U	B	A	-	U	U	-

I

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Ink	A	A	A	A	B	A	A	A	A
Iodine	-	-	U	B	A	A	B	B	-
Iodine tincture	U	U	B	B	A	B	B	B	B
Iodoform	-	-	-	A	A	-	-	-	-
Iodoform	-	-	-	A	A	-	-	-	-
Iso-Butane	A	A	U	U	A	A	A	A	U
Iso-Butyl Alcohol	U	U	A	A	B	A	B	B	A

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Iso-Butyl Methyl Ketone	U	U	U	A	U	U	U	U	U
Iso-Butylene	U	U	U	U	A	A	A	A	U
Iso-Butyraldehyde	U	U	U	A	U	U	U	U	U
Iso-Cyanate	-	-	-	A	-	-	-	-	-
Iso-Dodecane	U	U	B	U	A	A	A	A	U
Iso-Octane	A	B	B	U	A	A	A	A	U
Iso-Pentane	A	B	U	U	A	A	A	A	U
Iso-Propyl-Acetate	U	U	U	B	U	U	U	U	U
Iso-Propyl-Alcohol	U	U	B	A	A	A	B	B	A
Iso-Propyl-Benzene	U	U	U	U	A	B	U	U	U
Iso-Propyl-Chloride	U	U	U	U	A	B	U	U	U
Iso-Propyl-Ether	U	U	U	-	U	U	U	U	U

J

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Jet Fuel JP3	B	B	U	U	A	A	A	A	U
Jet Fuel JP4	B	B	U	U	A	B	A	A	U
Jet Fuel JP5	B	B	U	U	A	B	A	A	U
Jet Fuel JP6	B	B	U	U	A	B	A	A	U
JP3 (Fuel)	U	B	U	U	A	A	A	A	U
JP4 (Fuel)	U	B	U	U	A	B	A	A	U
JP5 (Fuel)	U	B	U	U	A	B	A	A	U
JP6 (Fuel)	B	B	U	U	A	B	A	A	U
JPX (Fuel)	-	-	B	U	U	U	A	A	U

K

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Kerosene	C	B	U	U	A	b	A	A	U
Ketchup	U	B	A	A	A	A	A	A	A



L

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Lactams	U	U	C	U	U	U	U	U	U
Lactic Acid	U	B	A	B	A	A	B	B	B
Lanolin	A	A	B	U	A	A	A	A	B
Latex	U	U	A	A	A	A	A	A	A
Laughing Gas (N2O)	A	A	A	B	A	A	A	A	A
Lavender Oil	B	U	U	U	A	B	B	B	U
Lead Acetate Salt Solution	U	U	U	A	U	U	C	C	U
Lead Arsenate	-	A	-	A	-	-	A	A	A
Lead Nitrate	-	U	B	A	A	A	A	A	B
Lead Nitrate Solution	-	-	A	A	-	A	A	A	B
Lead Sulfate	U	A	A	A	A	A	B	B	B
Lemon Juice	U	-	B	A	A	-	A	A	A
Ligroin	-	B	B	U	A	A	A	A	U
Lindol	U	U	U	A	U	C	U	U	C
Linoleic Acid	-	B	-	U	B	-	B	B	B
Linseed Oil	B	B	B	C	A	B	A	A	B
Liqueurs	B	B	A	A	A	A	A	A	A
Lithium Bromide Brine	U	U	A	A	A	A	A	A	A
Lithium Chloride	U	U	A	A	A	A	A	A	A
Lithium Hydroxide	U	U	U	A	C	U	U	U	U

M

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Machinery Oil (mineral)	A	A	B	U	A	A	A	A	B
Maganese Chloride (Solution)	U	U	A	A	A	A	A	A	A
Magnesium Acetate Solution	U	U	U	A	U	U	U	U	U
Magnesium Chloride Solution	-	U	A	A	A	A	A	A	A

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Magnesium Hydroxide (Solution)	U	U	B	A	B	B	B	B	B
Magnesium Silicate (Talcum)	A	A	A	A	A	A	A	A	A
Magnesium Sulfate (Epson Salts)	U	U	A	A	A	A	A	A	A
Maleic Acid	C	C	B	A	A	b	B	B	C
Maleic Anhydride	U	-	U	U	B	-	U	U	-
Malic Acid	U	U	B	B	A	A	A	A	B
Margarine	A	B	B	U	A	A	A	A	B
Mayonaïse	-	U	U	U	U	U	A	A	A
Menthol	U	U	B	B	A	U	B	B	U
Mercaptans	U	U	U	A	U	U	U	U	U
Mercuric Chloride Solution	-	-	A	A	A	A	A	A	A
Mercury	A	A	A	A	A	A	A	A	A
Mercury Nitrate	-	-	A	A	-	-	A	A	A
Mesityl Oxide	U	U	U	A	U	U	U	U	U
Methacrylic Acid	U	U	U	B	U	U	U	U	U
Methanal	U	U	U	A	B	U	B	B	B
Methane	A	U	B	U	A	B	A	A	B
Methanol	U	U	B	A	U	A	B	B	A
Methoxy Benzene	U	U	U	U	U	U	U	U	U
Methoxy Butanol	-	-	B	B	A	-	A	A	-
Methyl Acetate	U	U	B	B	U	U	U	U	U
Methyl Acetoacetate	U	U	C	B	U	U	U	U	U
Methyl Acrylate	U	U	U	B	U	U	U	U	U
Methyl Alcohol	U	U	B	A	U	A	B	B	A
Methyl Amine	U	U	U	A	U	U	U	U	U
Methyl Aniline	U	U	U	B	B	-	U	U	-
Methyl Bromide	U	U	U	U	A	A	U	U	U
Methyl Butyl Ketone	U	U	U	A	U	U	U	U	U
Methyl Carbonate	U	U	U	U	U	B	U	U	U
Methyl Cellosolve	U	U	U	B	U	U	U	U	U
Methyl Cellulose	U	B	B	B	B	U	B	B	B
Methyl Chloride	U	U	U	U	B	B	U	U	U
Methyl Cyclopentane	U	U	U	U	B	B	U	U	U



O-Ring

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Methyl Ethyl Ketone	U	U	U	B	U	U	U	U	U
Methyl Formate	-	-	U	B	U	-	U	U	-
Methyl Glycol	U	U	U	B	U	U	U	U	U
Methyl Glycol Acetate (Ethyleneglycol)	U	U	U	B	U	-	U	U	B
Methyl Iso-Butyl Ketone	U	U	U	B	U	U	U	U	U
Methyl Iso-Propyl Ketone	U	U	U	B	U	U	U	U	U
Methyl Methacrylate	U	U	U	U	U	U	U	U	U
Methyl Methacrylic Acid Ester	U	U	U	U	U	U	U	U	U
Methyl Oleate	-	-	-	B	A	B	U	U	-
2-Methylpentane+A2	A	U	-	U	A	U	A	A	U
3-Methylpentane	A	U	-	U	A	U	A	A	U
Methyl Phenyl Ether (Anisole)	U	U	U	U	U	U	U	U	U
Methyl Pyrrolidone	-	U	-	A	U	-	U	U	B
Methyl Salicylate	-	-	U	B	-	-	U	U	-
Methylene Chloride	U	U	U	U	B	C	U	U	U
Milk	U	B	A	A	A	A	A	A	A
Milk of Lime	U	U	B	A	B	B	U	U	B
Mine Gas (Methane)	A	U	B	B	A	A	A	A	A
Mineral Oil	A	A	B	U	A	A	A/B	A/B	B
Mineral Spirits	c	B	C	U	A	A	A	A	U
Molasses	U	U	B	A	A	A	A	A	A
Monobromo Benzene	U	U	U	U	B	U	U	U	U
Monochloro Benzene	U	U	U	U	B	B	U	U	U
Monochloroacetic Acid	U	U	U	A	U	U	U	U	U
Monochloroacetic Acid Ethyl Ester	U	U	U	B	U	U	U	U	U
Monoethanol Amine	U	U	U	B	U	U	U	U	U
Mononitro Chloro Benzene	U	U	U	U	A	A	U	U	U
Morpholine	U	U	C	B	-	-	U	U	U
Muriatic Acid (HCl) (Hydrochloric Acid)	U	U	-	B	A	-	U	U	U
Muriatic Acid (HCl), diluted	U	U	B	A	A	-	B	B	B

N

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Naphtha	B	B	U	U	A	B	U	U	U
Naphthalene	U	U	U	U	A	B	U	U	U
Naphthenic Acid	-	-	U	U	A	A	B	B	-
Naphtolen ZD	U	-	U	U	A	-	B	B	U
Natural Gas	A	B	B	U	A	A	A	A	U
Neats Foot Oil	A	A	U	B	A	A	A	A	B
Neon Gas	A	A	A	A	A	A	A	A	A
Nickel Acetate	U	U	B	A	U	U	B	B	U
Nickel Chloride	C	C	B	A	A	A	A	A	A
Nickel Nitrate	-	-	A	A	A	-	A	A	A
Nickel Sulfate	U	C	A	A	A	A	A	A	A
Nitrating Acids	U	U	U	A	U	U	U	U	U
Nitric Acid, concentrated	U	U	U	U	B	U	U	U	U
Nitric Acid, fuming	U	U	U	U	B	U	U	U	U
Nitro Benzene	U	U	U	U	U	U	U	U	U
Nitro Glycerin	U	U	C	A	A	U	U	U	U
Nitro Glycol	U	U	B	A	A	U	U	U	U
Nitro Methane	U	U	U	B	U	U	U	U	U
Nitro Propane	U	U	U	B	U	U	U	U	U
Nitro Toluene	U	U	U	U	U	U	U	U	U
Nitrogen Gas	A	A	A	A	A	A	A	A	A
Nitrogen Tetroxide	U	U	U	U	U	U	U	U	U
Nonanol	-	U	-	A	A	-	U	U	B
Nut Oil	A	B	B	U	A	A	A	A	B

O

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Octadecane	B	B	B	U	A	A	A	A	U
Octal	U	B	U	B	B	C	U	U	C



CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Octane	U	U	U	U	A	B	B	B	U
Octanol (Octylalcohol)	U	U	B	A	A	B	B	B	B
Octylcresol	U	U	U	U	B	U	C	C	U
Oil of Turpentine	U	U	U	U	A	B	B	B	U
Olefin, crude	A	A	U	U	A	A	A	A	U
Oleic Acid	-	-	U	U	A	-	A	A	U
Oleic Alcohol	U	U	A	A	A	U	A	A	U
Oleum (Sulfuric Acid, 0 to 50%)	U	U	U	A	A	U	U	U	U
Olive Oil	A	U	B	U	A	B	A	A	B
Ortho Dichloro Benzene	U	U	U	U	A	B	U	U	U
Oxalic Acid	-	-	B	A	A	A	B	B	B
Ozone	B	A	B	A	A	A	B/C	U	A

P

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Palm Kernel Oil	A	-	A	U	A	-	A	A	-
Palm Oil	A	A	U	U	A	A	A	A	U
Palmitic Acid	U	B	B	C	A	A	B	B	U
Para Dichloro Benzene	U	U	-	U	A	B	U	U	U
Paraffin	A	B	A	U	A	A	A	A	B
Paraffin Oil	A	B	A	U	A	A	A	A	B
Peanut Oil	A	A	U	U	A	A	A	A	B
Pectin	A	A	A	A	A	A	A	A	A
Penta Chloro Diphenyl	U	U	U	U	C	U	U	U	U
Penta Chloro Phenol	-	U	-	B	-	-	U	U	U
Pentane	A	U	B	U	A	U	A	A	U
Pentanol	U	U	A	A	B	A	B	B	U
Perchloric Acid	U	U	B	B	A	C	U	U	U
Perchloro Ethylene	U	U	U	U	B	B	U	U	U
Petroleum	B	B	B	U	A	B	A	A	B
Petroleum Ether	A	B	B	U	A	B	A	A	U

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Phenol	C	U	U	U	B	-	U	U	U
Phenyl Benzene	-	U	U	U	B	-	U	U	-
Phenyl Ether	U	U	U	U	U	U	U	U	U
Phenyl Hydrazine	U	U	U	U	B	U	U	U	U
Phosphine	U	U	B	A	B	U	U	U	-
Phosphor Trichloride	U	U	U	A	A	-	U	U	U
Phosphoric Acid	-	U	U	B	A	C	U	U	C
Phosphoric Acid 45%	C	U	B	A	A	A	B	B	B
Photgraphic Developing Bath	-	B	A	B	A	A	A	A	A
Phthalic Acid	-	-	B	A	B	-	B	B	A
Phthalic Anhydride	-	-	-	A	-	-	-	-	-
Picoline, alpha	-	-	-	A	U	-	-	-	-
Picric Acid, Aqueous Solution	-	B	A	B	A	B	B	B	-
Pine Oil	A	A	U	U	A	A	B	B	U
Pineapple Juice	U	U	A	A	A	A	A	A	A
Pinene	U	B	B	U	A	B	B	B	U
Piperidine	U	U	U	U	U	U	U	U	U
Polyvinyl Acetates	-	-	B	A	U	-	-	-	-
Potassium Acetate	U	B	B	A	B	U	B	B	U
Potassium Aluminium Sulfat	-	-	-	A	-	-	-	-	-
Potassium Bicarbonite	U	U	A	A	A	A	A	A	B
Potassium Bisulfate	U	U	B	A	A	B	A	A	B
Potassium Borate	C	U	B	A	A	B	A	A	B
Potassium Bromate	C	U	B	A	A	B	A	A	B
Potassium Bromide	U	U	B	A	A	U	A	A	U
Potassium Carbonate	C	U	B	A	A	A	A	A	A
Potassium Chlorate	U	U	B	A	A	-	U	U	-
Potassium Chloride	C	C	B	A	A	A	A	A	A
Potassium Chromate	U	U	B	A	A	-	B	B	-
Potassium Cyanide	U	U	B	A	A	A	A	A	A
Potassium Dichromate	U	C	B	A	A	U	A	A	B
Potassium Hydroxide (Solution 50%)	U	U	B	A	C	C	B	B	C
Potassium Hydroxide, Potassium Lye	U	U	B	A	U	U	B	B	U



O-Ring

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Potassium Hypochlorite (Javelle Water)	U	U	-	B	A	B	B	B	B
Potassium Iodide	U	U	B	A	A	A	A	A	A
Potassium Nitrate	C	C	B	A	A	A	B	B	A
Potassium Perchlorate	U	U	B	A	A	-	U	U	-
Potassium Perfluoroacetate	-	-	B	A	U	U	B	B	-
Potassium Permanganate	C	B	B	A	A	U	U	U	U
Potassium Persulfate	U	U	B	A	A	U	U	U	U
Potassium Phosphate	-	-	-	A	A	-	A	A	U
Potassium Sulfate	U	C	B	A	A	B	A	A	B
Potassium Sulfite	U	C	A	A	A	A	A	A	A
Propane	B	B	B	U	A	B	A	A	U
Propanol	U	U	A	A	A	A	B	B	B
2-Propanone (Acetone)	U	U	U	A	U	U	U	U	U
2-Propene-1-ol	U	U	A	A	A	U	B	B	U
Propinyl Alcohol	U	-	A	A	A	-	A	A	-
Propion Aldehyde	U	U	U	A	U	U	U	U	U
Propionic Acid	C	U	B	-	A	U	A	A	U
Propyl Acetate	U	U	U	B	U	U	U	U	U
Propyl Acetone	U	U	U	A	U	U	U	U	U
Propyl Amine	U	U	U	U	U	U	U	U	U
Propyl Nitrate	U	U	U	B	U	U	U	U	U
Propylene	U	U	U	U	A	B	U	U	U
Propylene Dichloride	-	-	-	U	-	-	U	U	U
Propylene Glycol	U	U	A	A	A	-	A	A	-
Propylene Oxide	U	U	U	B	U	U	U	U	U
Pyridine	U	U	U	U	U	U	U	U	U
Pyrrole	U	U	U	U	U	B	U	U	B

R

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Rapeseed Oil	B	B	B	U	A	B	B	B	U
Roast Gas (dry)	A	-	B	A	A	A	A	A	A
Rosin (Colophony)	U	U	A	A	A	A	A	A	A

S

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Salicylic Acid	-	A	A	A	A	-	B	B	-
Sea Water	U	U	B	A	B	A	A	A	B
Sewage	-	-	B	A	A	A	A	A	A
Silcone grease	A	A	A	A	A	A	A	A	U
Silicic Acid	U	-	B	A	A	-	A	A	-
Silicon Dioxide	-	A	-	A	A	-	A	A	A
Silicone Oil	A	A	A	A	A	A	A	A	U
Silver Cyanide Solution	U	U	A	U	A	A	U	U	U
Silver Nitrate	B	-	B	A	A	A	B	B	A
Silver Salts	U	U	A	A	A	A	A	A	A
Skydrol 500	U	U	U	A	U	U	U	U	U
Skydrol 7000	U	U	U	A	B	U	U	U	U
Soap Solution	B	B	B	A	A	A	A	A	A
Soda (Natrium Carbonate)	U	U	A	A	A	A	A	A	A
Sodium Acetate	U	U	B	A	U	U	B	B	B
Sodium Benzoate	U	U	B	A	A	A	A	A	A
Sodium Bicarbonate Solution	U	U	A	A	A	A	A	A	A
Sodium Bisulfate Solution	U	U	A	A	A	A	A	A	A
Sodium Bisulfite Solution	U	U	A	A	A	A	A	A	A
Sodium Borate (Borax)	U	U	A	A	A	A	B	B	A
Sodium Carbonate (Soda Ash)	U	U	A	A	A	A	A	A	A



CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Sodium Carbonate Solution	-	-	A	A	A	A	A	A	A
Sodium Chlorate	U	B	B	A	A	U	B	B	U
Sodium Chloride (Common Salt)	U	U	A	A	A	A	A	A	A
Sodium Chloride Solution	-	-	A	A	A	-	A	A	-
Sodium Chlorite	-	-	U	A	A	-	U	U	-
Sodium Cyanide Solution	-	-	A	A	-	-	B	B	A
Sodium Dichromate	U	U	A	A	A	-	B	B	B
Sodium Fluoride	-	B	-	A	A	-	A	A	B
Sodium Hydroxide	C	C	B	A	C	C	B	B	C
Sodium Hydroxide, Caustic Soda	B	B	B	A	B	B	B	B	A
Sodium Hypochlorite Solution	U	U	B	A	A	B	B	B	B
Sodium Nitrate	U	U	B	A	A	A	B	B	B
Sodium Nitrite	U	U	B	A	A	U	U	U	U
Sodium Peroxide Solution	U	U	B	A	A	A	B	B	U
Sodium Phosphate	-	-	B	A	A	-	A	A	U
Sodium Silicate Solution	-	-	A	A	A	-	A	A	-
Sodium Sulfate (Glauber's Salts)	U	U	B	A	A	A	B	B	A
Sodium Sulfhydrate Solution	U	-	A	A	A	A	A	A	A
Sodium Sulphide	U	U	B	A	A	A	B	B	B
Sodium Sulphite Solution	U	U	A	A	A	A	A	A	A
Sodium Tetraborate Solution	U	-	B	A	A	A	B	B	B
Sodium Thiosulfate (Antichlor)	-	-	A	A	A	-	B	B	-
Soy Bean Oil	B	B	B	U	A	A	A	A	B
Sperm Oil	-	-	-	B	A	-	A	A	-
Spermaceti	U	U	B	U	A	U	A	A	U
Spirits	B	B	A	A	A	B	A	A	A
Stannic Chloride Solution	-	-	U	A	A	A	A	A	B

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Starch	B	B	A	A	A	A	A	A	A
Stearic Acid	A	A	B	B	A	A	B	B	B
Stoddard Solvent	A	A	B	U	A	A	A	A	U
Styrene	U	U	U	U	A	C	U	U	U
Succinic Acid	U	U	B	A	A	-	A	A	A
Sucrose Sap	U	U	B	A	A	A	A	A	A
Sugar Solutions	U	U	B	A	A	A	A	A	A
Sulphur	U	-	A	A	A	b	U	U	B
Sulphur Hexafluoride (SF6)	B	-	A	A	B	B	B	B	-
Sulphur Chloride	U	U	U	U	A	B	U	U	U
Sulphur Dioxide (SO2)	U	U	U	A	B	B	U	U	B
Sulphur Dioxide Liquid (anhydrous)	U	-	U	A	U	B	U	U	B
Sulphur Dioxide, gaseous	U	-	U	A	U	B	U	U	B
Sulphuric Acid (0 to 50%)	U	U	U	A	A	U	U	U	U
Sulphuric Acid, diluted	U	U	U	A	A	U	B	B	U
Sulphurous Acid	U	U	-	B	A	-	-	-	U

T

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Talcum	-	A	-	A	A	A	A	A	A
Tallow	U	B	B	B	A	U	A	A	B
Tannins	U	B	B	B	A	A	B	B	B
Tar	U	U	U	U	B	C	U	U	-
Tartaric Acid	U	U	B	B	A	A	A	A	A
Tetrachloroethane	U	U	U	U	B	C	U	U	U
Tetrachloromethane	-	U	U	U	A	B	U	U	U
Tetrachoroethylene	U	U	U	U	A	B	U	U	U
Tetraethyl Lead	-	U	U	U	A	B	B	B	U
Tetrahydrofuran	U	U	U	U	U	U	U	U	U
Thionyl Chloride	U	U	U	B	A	U	U	U	U
Thiophene	U	U	U	U	U	U	U	U	U



O-Ring

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Titanium Tetrachloride	U	U	B	B	B	B	B	B	U
Toluene (Toluol)	U	U	U	U	B	B	U	U	U
Town Gas	U	U	U	U	A	B	B	B	B
Transformer Oil	B	A	U	U	A	A	B	B	B
Triacetin (Glycerine Triacetate)	U	U	B	A	U	U	B	B	B
Triaryl Phosphate	U	U	U	A	A	B	U	U	U
Tributoxy Ethyl Phosphate	B	-	B	B	B	-	U	U	U
Tributyl Marcaptane	U	-	U	U	A	U	U	U	U
Tributyl Phosphate	U	U	U	B	U	U	U	U	U
Trichloro Benzene	U	U	U	-	A	U	-	-	U
Trichloro Ethane	U	U	U	U	A	B	U	U	U
Trichloro Ethyl Phosphate	-	-	U	-	U	-	U	U	-
Trichloro Ethylene	U	U	U	U	B	B	U	U	U
Trichloroacetic Acid	U	U	U	B	U	U	B	B	B
Tricresyl Phosphate	U	U	U	B	B	B	U	U	U
Triethanolamine	U	U	-	A	-	-	-	-	U
Triethyl Borane	-	-	-	-	A	-	-	-	-
Triethyl Glycol	C	-	-	A	A	-	A	A	A
Triethylaluminium	-	-	-	U	B	-	-	-	-
Trifluoro Ethane	U	U	U	U	A	B	U	U	U
Tri-Iso-Propyl Benzene	A	A	U	U	A	-	A	A	U
Trinitrotoluene (TNT)	U	B	B	U	B	B	U	U	-
Trioctyl Phosphate	U	U	U	A	B	B	U	U	U
Trisodium Phosphate Solution	C	B	B	A	A	A	A	A	A
Turpentine	B	C	U	U	A	A	A	A	U

U

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Urea	B	U	B	A	A	A	A	A	A

V

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Vaseline	B	B	B	U	A	A	A	A	B
Vaseline Oil	U	U	B	U	A	B	A	A	B
Vegetable Juices	U	U	B	A	A	A	A	A	A
Vegetable Oils	B	-	B	U	A	A	A	A	B
Vinegar	U	U	B	A	B	B	B	B	A
Vinyl Acetate	-	-	-	-	-	-	-	-	-
Vinyl Chloride, liquid	-	-	-	-	-	-	-	-	-
Vinylidene Chloride	U	U	U	U	B	U	U	U	U

W

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Waste Gas (cont. Carbon Dioxide)	A	-	A	A	A	A	A	A	A
Waste Gas (cont. Carbon Monoxide)	A	A	A	A	A	A	A	A	A
Waste Gas (cont. Hydrogen Chloride)	-	-	A	A	A	-	B	B	-
Waste Gas (cont. Hydrogen Fluoride)	-	-	A	A	A	-	A	A	A
Waste Gas (cont. Nitrous Fumes)	U	-	A	A	A	B	-	-	U
Waste Gas (cont. Sulfur Dioxide)	-	-	A	A	A	-	B	B	-
Waste Gas (cont. Sulfuric Acid)	-	-	B	A	A	-	U	U	-
Water 135 °C	U	U	C	A	C	A	C	U	U
Water 80 °C	U	U	B	A	B	A	A	B	B
Water vapour < 140 °C	U	U	U	A	U	B	C	U	B
Water vapour < 150 °C	U	U	U	A	U	B	U	U	B
Water vapour > 140 °C	U	U	U	B	U	B	U	U	B
Water vapour > 150 °C	U	U	U	B	U	U	U	U	U
Wax Alcohols	A	-	B	U	A	-	A	A	A



CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Wine + Whiskey	U	U	A	A	A	A	A	A	A
Wood Spirit	U	U	U	B	U	U	U	U	-

X

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Xenon	A	A	A	A	A	A	A	A	A
Xylene (Xylol)	U	U	U	U	B	U	U	U	U
Xylidines (aromatic Amines)	U	U	U	B	U	U	U	U	U

Y

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Yeast	B	U	A	A	A	A	A	A	A

Z

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Zeolites	-	-	A	A	A	-	A	A	-
Zinc Acetate	U	U	B	A	U	U	B	B	U
Zinc Chloride Solutions	U	U	A	A	A	A	A	A	-
Zinc Sulfate	U	U	A	A	A	A	A	A	A



B.1.3 Characteristics and inspection of elastomers

Hardness

One of the most often named properties regarding Polymer materials is hardness. Even so the values can be quite misleading.

Hardness is the resistance of a body against penetration of an even harder body – of a standard shape defined pressure.

There are two procedures for hardness tests regarding test samples and finished parts made out of elastomer material:

1. Shore A/D
according to ISO 48 / DIN 53 505 / ASTM D 2240
Measurement for test samples
2. Durometer IRHD (International Rubber Hardness Degree) according to ISO 48 / DIN 53 519-1 and -2 / ASTM 1414 and 1415
Measurement of test samples and finished parts

The hardness scale has a range of 0 (softest) to 100 (hardest). The measured values depend on the elastic qualities of the elastomers, especially on the tensile strength.

The test should be carried out at temperatures of $23 \pm 2^\circ\text{C}$ – not earlier than 16 hours after the last vulcanisation process (manufacturing stage). If other temperatures are being used this should be mentioned in the test report.

Tests should only be carried out with samples which have not been previously stressed mechanically.

Hardness tests according to Shore A / D

The hardness test device Shore A (indenter with pyramid base) is a sensible application in the hardness range 10 to 90. Samples with a larger hardness should be tested with the device Shore D (indenter with spike).

Test specimen:

Diameter min. 30 mm

Thickness min. 6 mm

Upper and lower sides smooth and flat

When thin material is being tested it can be layered providing minimal sample thickness is achieved by a maximum of 3 layers. All layers must be at minimum 2 mm thick.

The measurement is done at three different places at a defined distance and time.

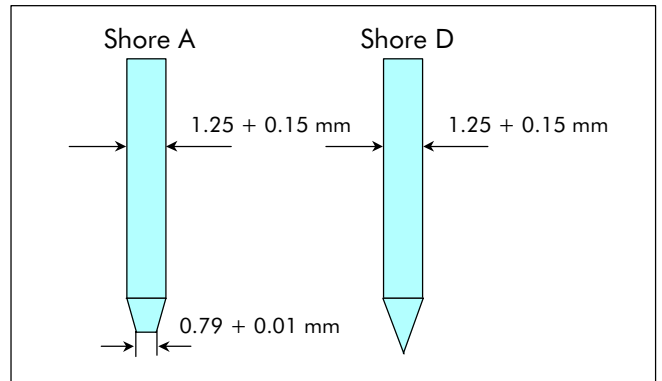


Figure 5 Indentor according to Shore A / D

Hardness test according to IRHD

The test of the Durometer according to IRHD is used with test samples as well as with finished goods.

The thickness of the test material has to be adjusted according to the range of hardness. According to DIN 53 519-1 there are two hardness ranges.

Soft: 10 to 35 IRHD $\Rightarrow$ Sample thickness greater than 10 to 12 mm

Normal: over 35 IRHD $\Rightarrow$ Sample thickness 6 to 10 mm
Sample thickness 1.5 to 2.5 mm / measured according to DIN 53 519-2

The hardness determined with finished parts or samples usually vary in hardness determined from specimen samples, especially those with a curved surface.

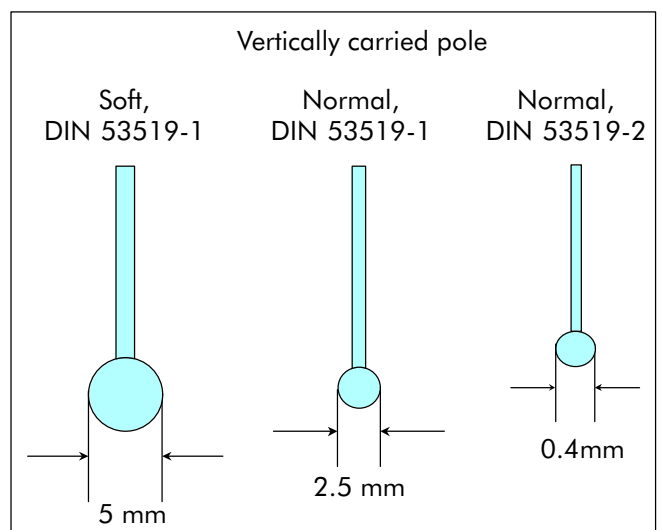


Figure 6 Indentor according to IRHD



Influencing parameters on the hardness test for polymer materials

Various sample thicknesses and geometries as well as various tests can show different hardness values even though the same materials have been used.

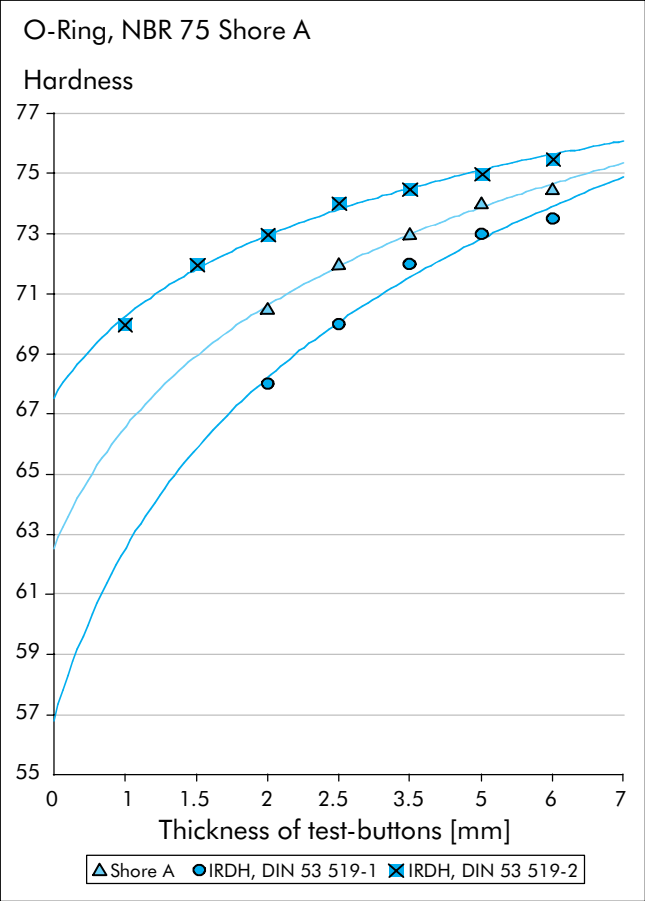


Figure 7 Ranges of hardness depending on sample thickness and test method

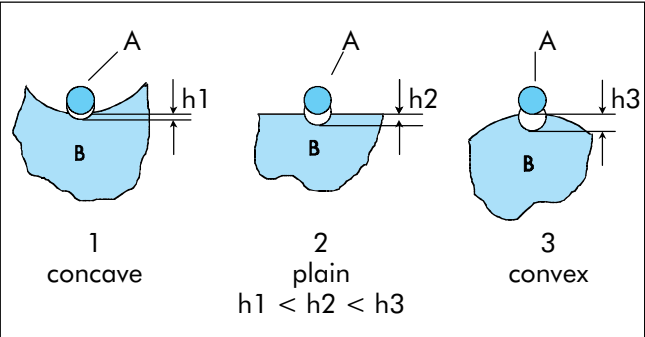


Figure 8 Range of hardness depending on surface geometry for the equivalent material characteristics.

With equivalent material characteristics of the elastomer sample B, the indenter penetrates the deepest at the surface 3 (convex) and therefore establishes the softest area.

As the concave geometry (3) has a stronger effect on smaller width O-Rings, the tolerances on hardness for widths under 2.0 mm should be increased up to +5 / -8 IRHD.

Compression set

An important parameter regarding the sealing capability is the compression set (CS) of the O-Ring material. Elastomers when under compression show aside from an elastic element also a permanent plastic deformation (Figure 9).

The compression set is determined in accordance with ISO 815 as follows:

Standard test piece: Cylindrical disc, diameter 13 mm and height 6 mm
Deformation: 25%
Tension release time: 30 minutes

$$CS = \frac{h_0 - h_2}{h_0 - h_1} \cdot 100(\%)$$

Where h_0 = Original height (cross section d_2)
 h_1 = Height in the compressed state
 h_2 = Height after tension release

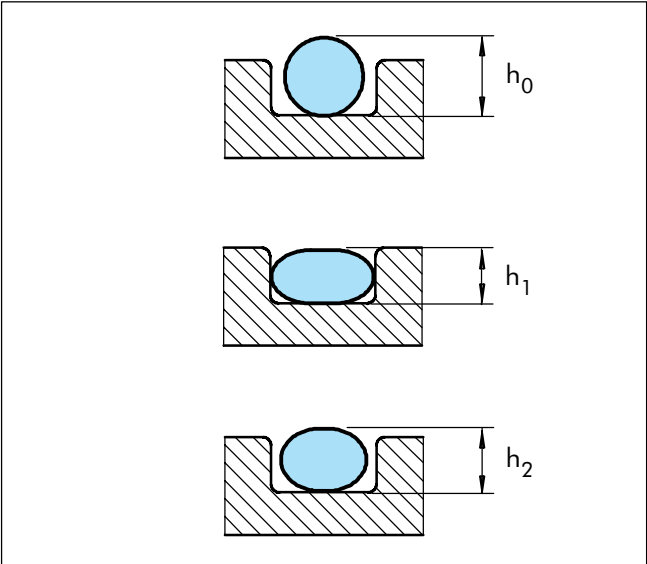


Figure 9 Illustration of the compression set



O-Ring

The accuracy of the measured value depends on:

- Test sample thickness
- Deformation
- Measurement deviations

Therefore the values which have been identified with the test sample cannot be transferred onto the finished part. The result of the measured finished parts are strongly influenced by geometrics and measurements as well as the measuring accuracy of the test equipment.

The following illustration shows the influence of various measuring deviations (in mm) in respect to the established compression set CS depending on the cross section of the measured O-Rings.

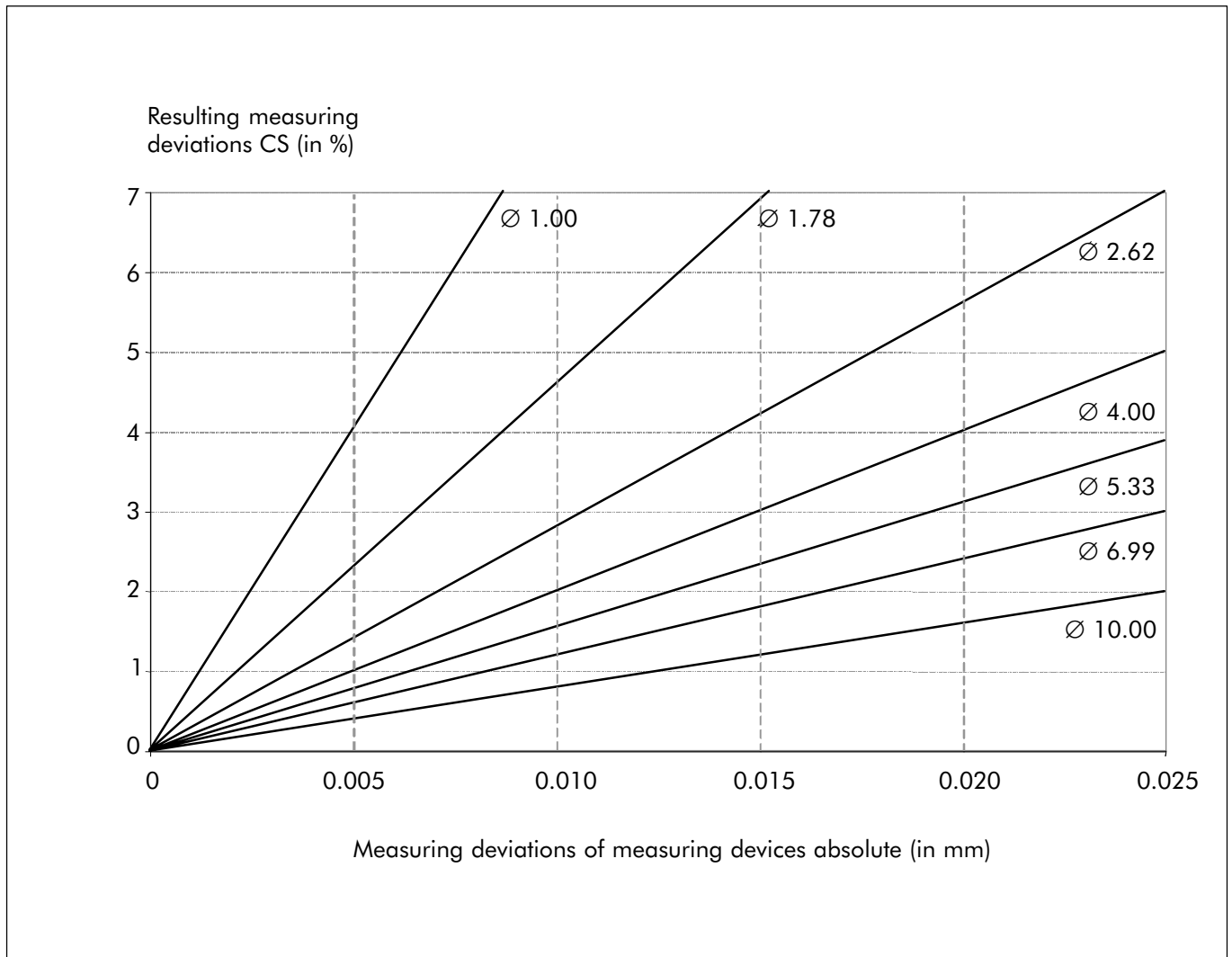


Figure 10 Measuring deviations CS depending on O-Ring cross section and measuring accuracy of the test equipment (schematic illustration)



B.1.4 Special requirements – authorities and approvals

Seals often have to meet the highest performance standards and the most stringent of environment and safety demands.
Also official authorities and associations make great

demands on seals or materials which are to be used in their industries. This is often the case if seals are used for water or gas applications.
The following table shows common authorities and their requirements.

Table IV Authorities and approvals

Approval / Examination Certificate / Guideline	Application	Criteria / Standards	Tests / Examinations / Contents	Authorities / Associations	Institutes / Laboratories
ACS Licensing	Polymers exposed to drinking water	French Standard AFNOR XP P41-250, part 1-3	- Analysis of dispensing according "Synoptic Documents" - Storage test (microbe analysis)	ACS (Accréditation de conformité sanitaire)	3 certified test laboratories in France: Paris / Vandoeuvre / Lille
BgVV Release (former: BGA)	Polymers exposed to food	BgVV Guidelines ("Polymers exposed to food") various paragraphs, depending on the application of the seal	- Chemical and physical tests - Biological tests - Sterilisation tests - Taste tests	BgVV (Bundesinstitut für gesundheitlichen Verbraucherschutz und Veterinärmedizin)	BAM, Berlin
DVGW Release for Gas	Seals for gas services and gas applications	EN 549 DIN 3535 Part 3		DVGW, Bonn (Deutscher Verein des Gas- und Wasserfaches e.V.)	DVGW Research Department Test Laboratory for Gas, Karlsruhe
DVGW Release for drinking water	Seals for processing storage and distribution of drinking water	BgVV Guidelines ("Polymers exposed to food")	Various classifications and tests - depending on the application	DVGW, Bonn (Deutscher Verein des Gas- und Wasserfaches e.V.)	Environmental Hygiene Institute, Gelsenkirchen TZW, Karlsruhe
FDA guideline (Release also possible)	Materials for food and pharmaceutical	"White List" (Register of permitted dispensing components) according to 21. CFR Part 177.2600	- Component test according "White List" - Extended for foods containing water or oil Extraction test for polar / non polar solvents	FDA (Food and Drug Administration)	In house or external laboratories
International Military Releases	Applications for military devices	Various military specifications and standards depending on the application	- Depending on application and specification		Various test laboratories
KTW certificate	Polymers exposed to drinking water, Cold- warm- and hot water	BgVV Guidelines ("Polymers exposed to food") part 1.3.13	- Extraction test - Odour- and taste test - Register of permitted components	DVGW, Bonn (Deutscher Verein des Gas- und Wasserfaches e.V.)	Environmental Hygiene Institute, Gelsenkirchen TZW, Karlsruhe BAM, Berlin
NSF Release	Food and Sanitary	NSF Standard criteria	- Test of components - Test of component group - Physical and chemical Material tests - Toxicological and micro biological tests depending on application	NSF (National Sanitation Foundation)	NSF, USA UL, USA
UL Listing	Application of seals for electrical equipment + appliances	UL-guidelines	- Chemical comparability test - Additional tests depending on application	UL (Under-writers Laboratory)	Underwriters laboratory in USA/England
WRAS Release (former: WRC)	Polymers exposed to drinking water	British Standard BS 6920 BS 2494	- Dispensing test - Microbe test - Extraction test - Hot water test	WRAS (Water Regulations Advisory Scheme)	Various accredited test laboratories in England



B.1.5 Standard materials

The following tables show the physical properties of B + S standard materials. They concern minimum values. That means that a standard material meets at least the given values. Many of the B + S materials (even when defined as standard) have better physical properties.

Table V Material specification for standard NBR

			NBR 70 Shore A	NBR 80 Shore A	NBR 90 Shore A
Hardness	DIN 53 505 ASTM D 2240	Shore A	70 ± 5	80 ± 5	90 ± 5
Tensile strength	DIN 53 504 ASTM D 412	MPa N/mm²	> 14	> 12	> 10
Elongation at break	DIN 53 504 ASTM D 412	%	> 200	> 150	> 100
Compression set 24h / 100 °C	DIN ISO 815B ASTM D 395B	%	< 25	< 30	< 30
Heat aging 72h / 100 °C	DIN 53 508 ASTM D 573				
Change of hardness		Shore A	max +8	max +8	max +8
Change of tensile strength		%	max -25	max -25	max -30
Change of elongation at break		%	max -25	max -25	max -30
Resistance in ASTM-Oil # 1 72h / 100 °C	DIN 53 521 ASTM D 471				
Change of hardness		Shore A	max +6	max +6	max +6
Change of volume		%	max -8	max -8	max -8
Resistance in ASTM-Oil # 3 72h / 100 °C	DIN 53 521 ASTM D 471				
Change of hardness		Shore A	max -10	max -10	max -10
Change of volume		%	max +15	max +15	max +15
Temperature range Maximum and minimum operating temperatures depend on the specific application criteria.			-30 °C to +100 °C	-25 °C to +100 °C	-25 °C to +100 °C



Table VI Material specification for standard EPDM

			EPDM 70 Shore A sulphur cured	EPDM 70 Shore A peroxide cured	EPDM 75 Shore A peroxide cured
Hardness	DIN 53 505 ASTM D 2240	Shore A	70 ± 5	70 ± 5	75 ± 5
Tensile strength	DIN 53 504 ASTM D 412	MPa N/mm ²	> 10	> 10	> 10
Elongation at break	DIN 53 504 ASTM D 412	%	> 150	> 125	> 125
Compression set	24h / 100 °C	DIN ISO 815B ASTM D 395B	%	< 20	
	24h / 150 °C		%	< 30	< 30
Heat aging	72h / 100 °C	DIN 53 508 ASTM D 573		x	
	72h / 150 °C			x	x
Change of hardness			Shore A	max +10	max +10
Change of tensile strength			%	max -10	max -20
Change of elongation at break			%	max -20	max -20
Resistance in water	72h / 100 °C	DIN 53 521 ASTM D 471			
Change of hardness			Shore A	max -10	max -3
Change of volume			%	max +10	max +3
Temperature range Maximum and minimum operating temperatures depend on the specific application criteria.			-45 °C to +120 °C	-45 °C to +140 °C	-45 °C to +140 °C

Table VII Material specification for standard Silicone

			Silicone 60 Shore A	Silicone 70 Shore A
Hardness	DIN 53 505 ASTM D 2240	Shore A	60 ± 5	70 ± 5
Tensile strength	DIN 53 504 ASTM D 412	MPa N/mm ²	> 5	> 5
Elongation at break	DIN 53 504 ASTM D 412	%	> 100	> 100
Compression set	24h / 175 °C	DIN ISO 815B ASTM D 395B	%	< 35
Heat aging	72h / 225 °C	DIN 53 508 ASTM D 573		
Change of hardness			Shore A	max +15
Change of tensile strength			%	max -40
Change of elongation at break			%	max -40
Resistance in ASTM-Oil # 1	72h / 100 °C	DIN 53 521 ASTM D 471		
Change of hardness			Shore A	max -10
Change of volume			%	max +20
Temperature range Maximum and minimum operating temperatures depend on the specific application criteria.			-55 °C to +200 °C	-55 °C to +200 °C



O-Ring

Table VIII Material specification for standard FKM

			FKM 70 Shore A	FKM 75 Shore A	FKM 80 Shore A	FKM 90 Shore A
Hardness	DIN 53 505 ASTM D 2240	Shore A	70 ± 5	75 ± 5	80 ± 5	90 ± 5
Tensile strength	DIN 53 504 ASTM D 412	MPa N/mm²	> 10	> 10	> 10	> 10
Elongation at break	DIN 53 504 ASTM D 412	%	> 125	> 125	> 120	> 100
Compression set 24h / 175 °C	DIN ISO 815B ASTM D 395B	%	< 20	< 20	< 20	< 20
Heat aging 72h / 250 °C	DIN 53 508 ASTM D 573					
Change of hardness		Shore A	max +10	max +10	max +10	max +10
Change of tensile strength		%	max -25	max -25	max -25	max -25
Change of elongation at break		%	max -25	max -25	max -25	max -25
Resistance in 72h / 150 °C ASTM-Oil # 3	DIN 53 521 ASTM D 471					
Change of hardness		Shore A	max -5	max -5	max -5	max -5
Change of volume		%	max +5	max +5	max +5	max +5
Resistance in ASTM-FUEL C 72h / RT	DIN 53 521 ASTM D 471					
Change of hardness		Shore A	max -5	max -5	max -5	max -5
Change of volume		%	max +10	max +10	max +10	max +10
Temperature range Maximum and minimum operating temperatures depend on the specific application criteria.			-18 °C to +200 °C	-18 °C to +200 °C	-18 °C to +200 °C	-15 °C to +200 °C



Table IX Material specification for standard HNBR

			HNBR 70 Shore A partially saturated	HNBR 75 Shore A partially saturated
Hardness	DIN 53 505 ASTM D 2240	Shore A	70 ± 5	75 ± 5
Tensile strength	DIN 53 504 ASTM D 412	MPa N/mm²	> 15	> 15
Elongation at break	DIN 53 504 ASTM D 412	%	> 250	> 250
Compression set 24h / 125 °C	DIN ISO 815B ASTM D 395B	%	< 35	< 35
Heat aging 72h / 150 °C	DIN 53 508 ASTM D 573			
Change of hardness		Shore A	max +10	max +10
Change of tensile strength		%	max -30	max -30
Change of elongation at break		%	max -30	max -30
Resistance in ASTM-Oil # 1 72h / 150 °C	DIN 53 521 ASTM D 471			
Change of hardness		Shore A	max +10	max +10
Change of volume		%	max -10	max -10
Resistance in ASTM-Oil # 3 72h / 150 °C	DIN 53 521 ASTM D 471			
Change of hardness		Shore A	max -15	max -15
Change of volume		%	max +20	max +20
Temperature range Maximum and minimum operating temperatures depend on the specific application criteria.			-30 °C to +130 °C	-30°C to +130 °C



B.2 Design recommendations

The following design recommendations cannot be used for the special Isolast® materials. Please use the Isolast®-brochure or contact our specialists for further details.

B.2.1 Installation recommendations

General recommendations

Before starting installation, check the following points:

- Lead-in chamfers made according to drawing?
- Bores deburred and edges rounded?
- Machining residues, e.g. chips, dirt and foreign particles, removed?
- Screw thread tips covered?
- Seals and components greased or oiled?
Ensure media compatibility with the elastomer material. B+S recommends to use the fluid to be sealed.
- Do not use lubricants with solid additives, e.g. molybdenum disulphide or zinc sulphide.

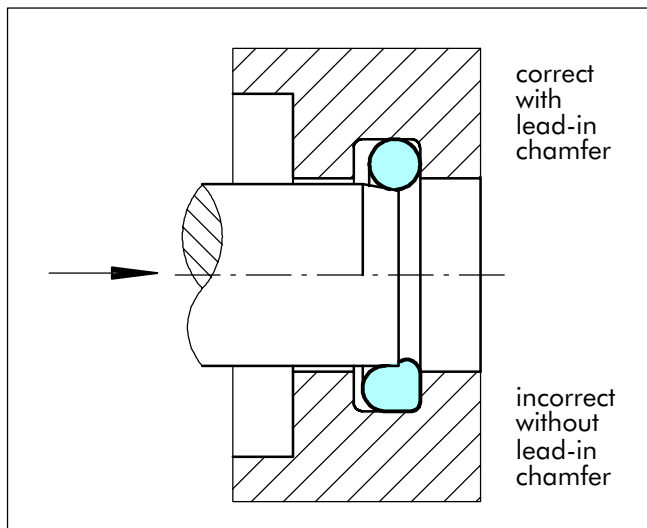


Figure 11 Rod installation with O-Ring

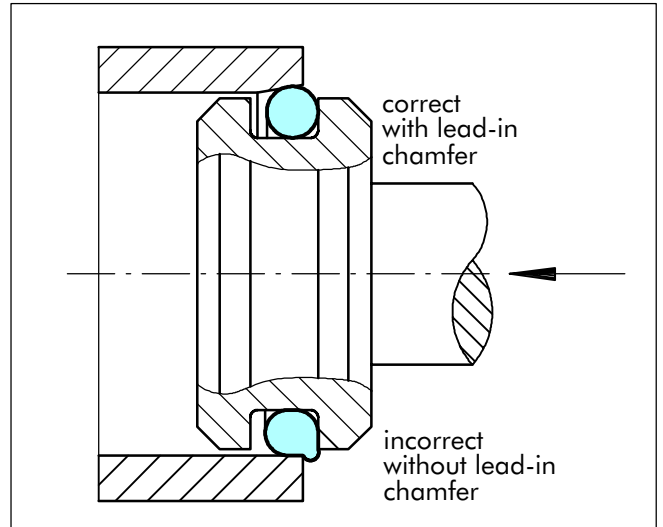


Figure 12 Piston installation with O-Ring

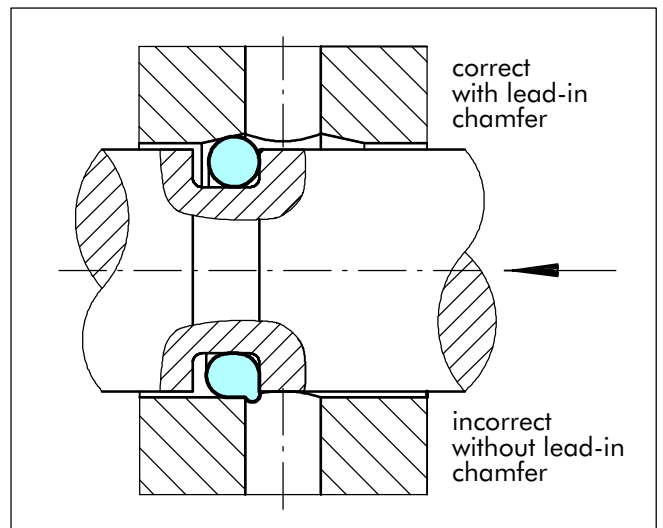


Figure 13 O-Ring installation over transverse bores

Manual installation

- Use tools without sharp edges!
- Ensure that the O-Ring is not twisted, use installation aids to assist correct positioning
- Use installation aids wherever possible
- Do not over stretch O-Rings
- Do not stretch O-Rings made out of cord at the joint.



Installation over threads, splines etc.

Should the O-Ring have to be stretched over threads, splines, keyways etc., then an assembly mandrel is essential. This mandrel can either be manufactured in a soft metal or a plastic material obviously without burrs or sharp edges.

Automatic installation

Automatic O-Ring installation requires good preparation. The surfaces of the O-Rings are frequently treated by several methods (see chapter "O-Ring friction reduced"). This offers a number of benefits during installation by

- Reducing the installation forces
- Non-stick effects, easy removal

The handling and installation of dimensionally unstable components requires a great deal of experience. Reliable automated installation thus demands special handling and packing of the O-Rings.

Please ask our specialists for further details.

B.2.2 Initial compression

An initial compression (squeeze) of the O-Ring in the groove is essential to ensure its function as a primary or secondary sealing element (Figure 14). It serves to:

- Achieve the initial sealing capability
- Bridge production tolerances
- Assure defined frictional forces
- Compensate for the compression set
- Compensate for wear

Depending on the application, the following values apply for the initial squeeze as a proportion of the cross section (d_2):

Dynamic applications:	6 to 20%
Static applications:	15 to 30%

The design of the grooves can be based on the guide values for the initial squeeze shown in the diagrams in Figure 15a/b. These take into account the relationship between loads and cross sections according to ISO 3601-2.

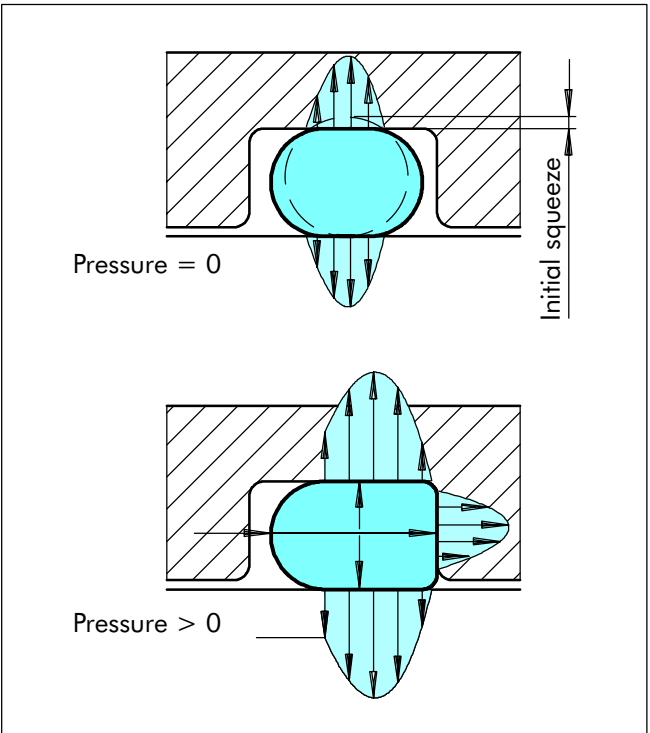


Figure 14 O-Ring contact pressure installed and under service pressure

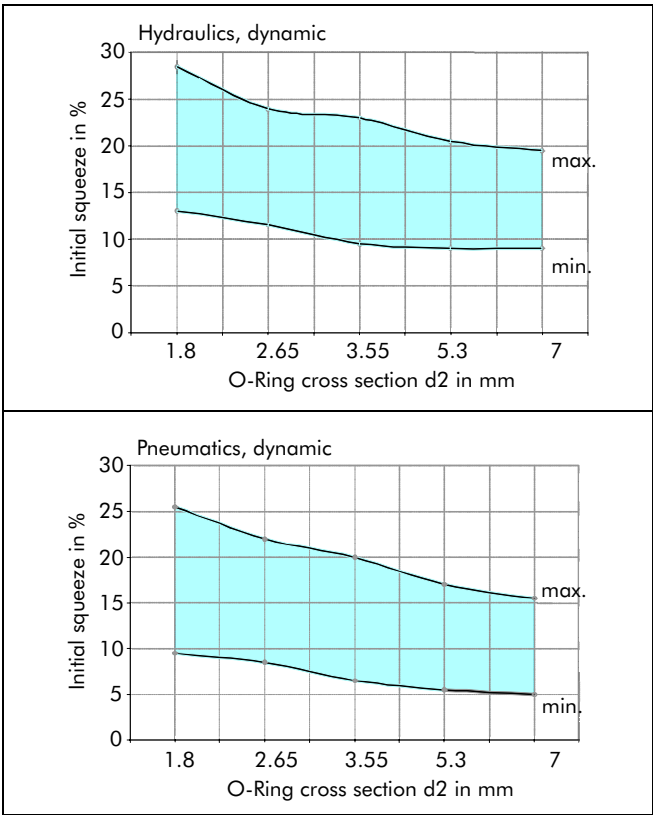


Figure 15a Permissible range of Initial squeeze as a function of cross section

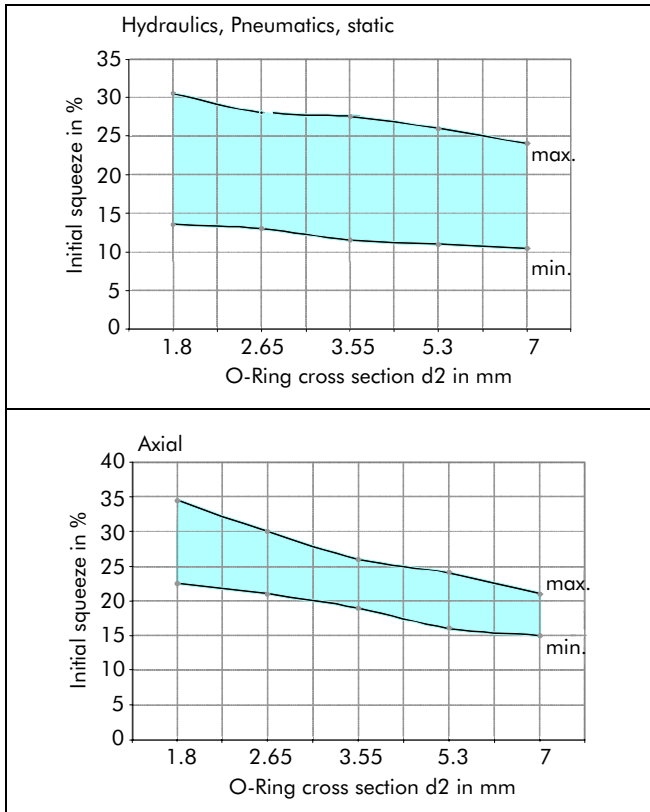


Figure 15b Permissible range of Initial squeeze as a function of cross section

Compression forces

The deformation forces vary depending on the extent of the initial squeeze and the Shore hardness. Figure 16 shows the specific compression force per cm of the seal circumference as a function of the cross section.

The compression forces shown can be used to estimate the total force to be applied for static installation of O-Rings.

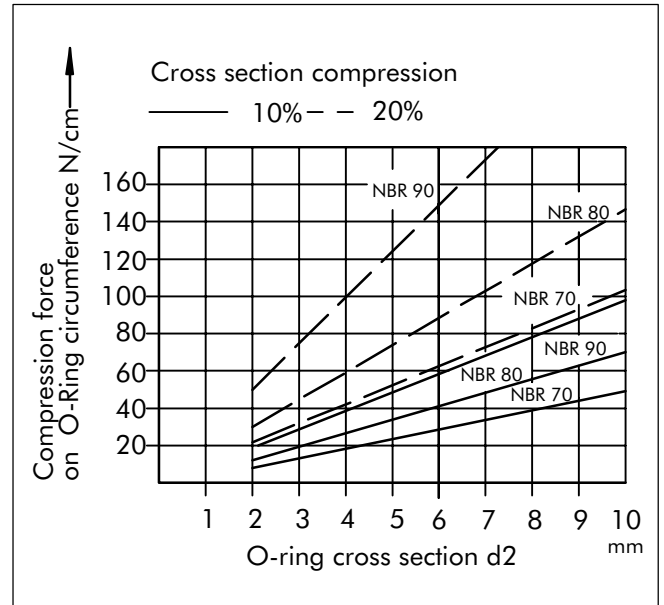


Figure 16 Compression forces on the O-Ring circumference depending on the material

B.2.3 Elongation - compression

With a radial sealing configuration, the O-Ring in an internal groove - "outside sealing" - should be stretched over the diameter of the groove. Maximum elongation in the installed state is 6% for O-Rings with an inner diameter > 50 mm and 8% for O-Rings with an inner diameter < 50 mm.

With external grooves - "inside sealing" - the O-Ring is preferably compressed along its circumference. The maximum circumferential compression in the installed state is 3%.

Exceeding these values will result in too large increase or decrease in the O-Ring cross section. Consequently this can effect the service life of the seal.

The reduction in cross section diameter (d_2) can be calculated as

$$Reduction_{max} = \frac{d_{2min}}{10} \cdot \sqrt{6 \cdot \left(\frac{d_{3max} - d_{1min}}{d_{1min}} \right)}$$

with d_{1min} = minimum inside diameter of the O-Ring
 d_{2min} = minimum cross section of the O-Ring
 d_{3max} = maximum housing diameter

but for approximation it can be assumed, in percentage, to be half the amount of stretch. An elongation of 1% corresponds to a reduction of the cross section (d_2) of approx. 0.5%.



B.2.4 Methods of installation and design of seal housing

Methods of installation

O-Rings can be used in components in a wide variety of ways.

During the design stage installation must be taken into consideration. In order to avoid damage during installation it should not be necessary to pass the O-Ring over edges or bores. When long sliding movements are involved, the seal seat should be recessed, if possible, or the O-Rings arranged so that they only have to travel short distances during installation to reduce risk of twisting.

Radial installation (static and dynamic)

Inner sealing

The O-Ring size should be selected so that the inside diameter d_1 has the smallest possible deviation from the diameter to be sealed d_5 (Figure 17).

Outer sealing.

The O-Ring size should be selected so that the inside diameter d_1 is equal to or smaller than groove diameter d_3 (Figure 17).

Axial installation, (static)

During axial-static installation, the direction of the pressure should be taken into consideration when choosing the O-Ring size (Figure 18). With internal pressure the O-Ring should be chosen so that the outside diameter of the O-Ring is approx. 1 to 2% larger than the outer groove diameter d_7 . With external pressure the O-Ring is chosen approx. 1 to 3% smaller than the inner groove diameter d_8 .

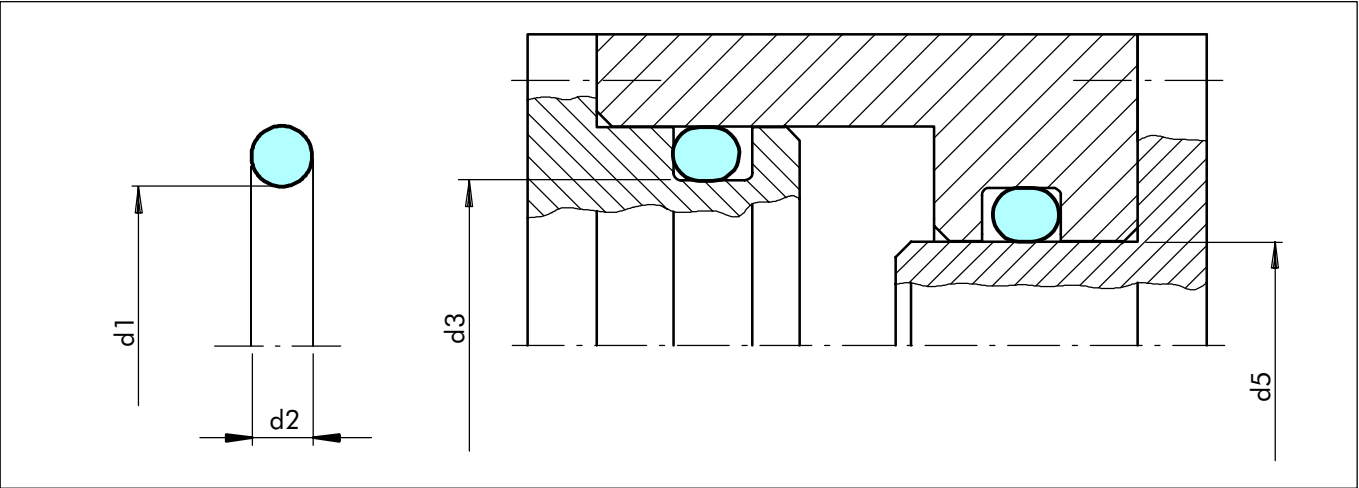


Figure 17 Radial installation, static and dynamic

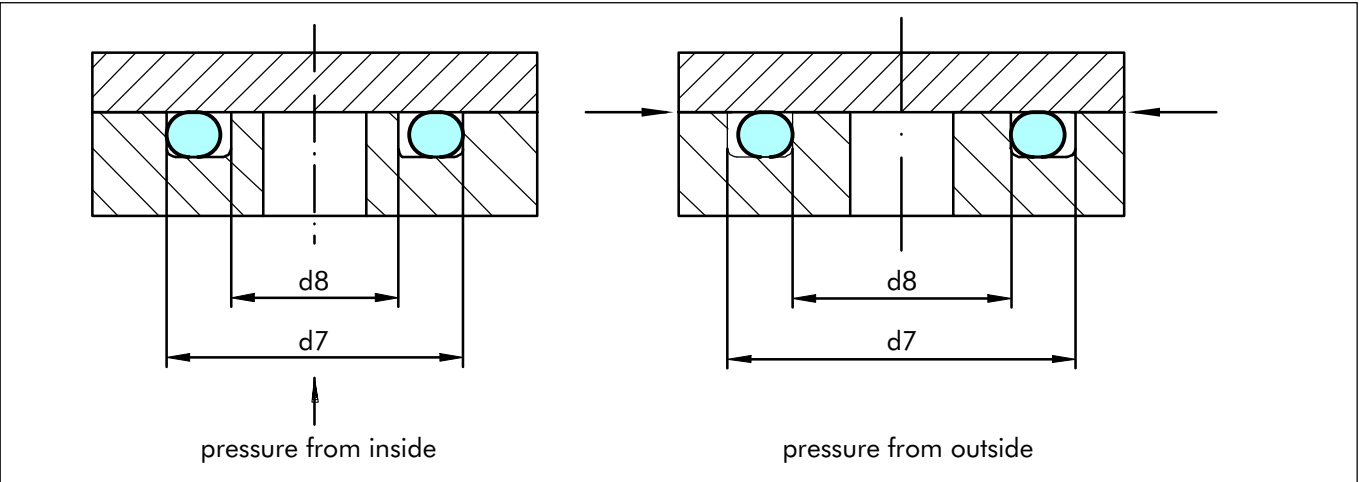


Figure 18 Axial installation, static



O-Ring as a rotary seal

In some applications, e.g. with short running periods, the O-Ring can also be used as a rotary seal for sealing shafts. In this case, the following points should be observed:

In order to be able to function as a rotary seal, O-Rings must be installed in accordance with specific guidelines, the rotary seal principle.

The rotary seal principle is based on the fact that an elongated elastomer ring contracts when heated (Joule effect). With the normal design criteria the O-Ring inside diameter d_1 will be slightly smaller than the shaft diameter, and the heat generated by friction would cause the ring to contract even more. This results in a higher pressure on the rotating shaft so that a lubricating film is prevented from forming under the seal and even higher friction occurs. The result would be increased wear and a premature failure of the seal.

Using the rotary seal principle, this is prevented by the seal ring being selected so that its inside diameter is approximately 2 to 5% larger than the shaft diameter to be sealed. The installation in the groove means that the seal ring is compressed radially and is pressed against the shaft by the groove diameter. The seal ring is thus slightly corrugated in the groove, a fact which helps to improve the lubrication.

The rotary seal principle can be neglected at peripheral speeds of less than 0.5 m/s.

Special compounds are available for rotary seal applications. B+S does not recommend the use of O-Rings as rotary seals. Please contact your local B+S company for further details.

Technical data

O-Rings can be used in a wide range of applications. Temperature, pressure and media determine the choice of appropriate compounds. In order to be able to assess the suitability of the O-Ring as a sealing element for a given application, the interaction of all the operating parameters have to be taken into consideration.

Working Pressure

Static application

- up to 5 MPa for O-Rings with Inside diameter > 50 mm without Back-up Ring
up to 10 MPa for O-Rings with Inside diameter < 50 mm without Back-up Ring
(depends on the material, the cross section and the clearance)
 - up to 40 MPa with Back-up Ring
 - up to 250 MPa with special Back-up Ring
- Please note the permissible extrusion gaps.

Dynamic application

- Reciprocating up to 5 MPa without Back-up Ring
- Higher pressures with Back-up Ring

Speed

Reciprocating up to 0.5 m/s

Rotating up to 2.0 m/s

Depending on material and application.

Temperature

From -60 °C to +325 °C

Depending on material and media resistance.

When assessing the application criteria, the peak and continuous operating temperature and the running period must be taken into consideration. For rotating applications the temperature increase due to frictional heat must be taken into account.

Media

With the wide range of the available materials, each with different properties, it is possible to seal against practically all liquids, gases and chemicals. Please note when selecting the most suitable material the information in chapter "B.1 Materials" and in our O-Ring Material Guide.



Groove design / Groove dimensions

Lead-in chamfers

Correct design can help to eliminate possible sources of damage and seal failure from the outset.

Since O-Ring are squeezed during installation, lead-in chamfers and rounded edges must be provided (Figures 19 and 20).

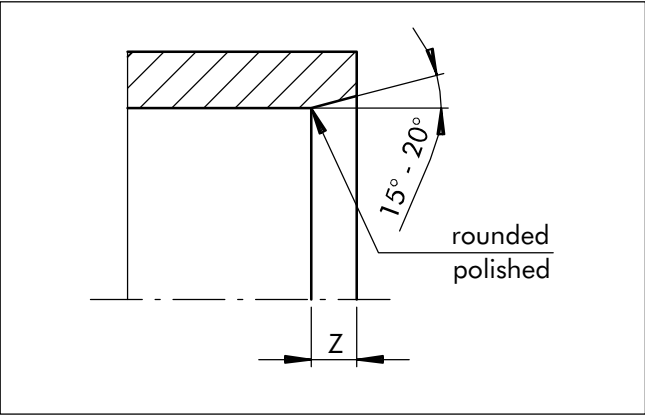


Figure 19 Lead-in chamfers for bores, tubes

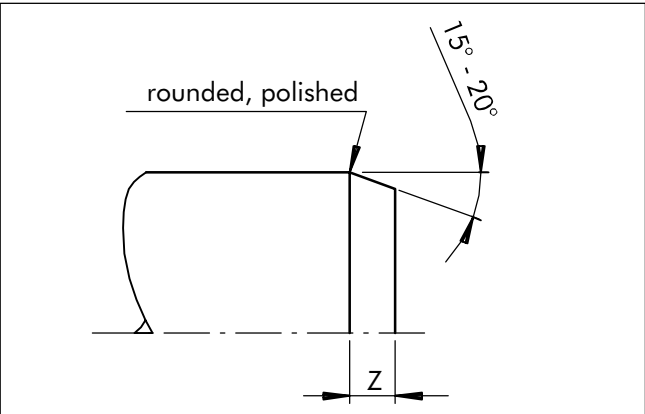


Figure 20 Lead-in chamfers for shafts, rods

The minimum length of the lead-in chamfer is listed in Table X as a function of the cross section d_2 .

Table X Lead-in chamfers

Lead-in chamfers length Z min.		O-Ring cross section d_2
15°	20°	
2.5	1.5	up to 1.78 1.80
3.0	2.0	up to 2.62 2.65
3.5	2.5	up to 3.53 3.55
4.5	3.5	up to 5.33 5.30
5.0	4.0	up to 7.00
6.0	4.5	above 7.00

The surface roughness of a lead-in chamfer is:
 $R_z \leq 4.0 \mu\text{m}$ $R_a \leq 0.8 \mu\text{m}$

Radial clearance

The tolerances given in table XIV and the maximum permissible radial clearance S (extrusion gap) given in the table XI must be maintained.

If the clearance is too large, there is a risk of seal extrusion which can result in the destruction of the O-Ring (Figure 21).

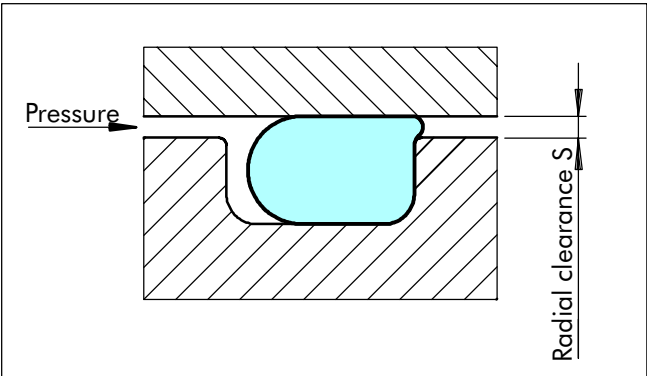


Figure 21 Radial clearance "S"

The permissible radial clearance S between the sealed parts depends on the system pressure, the cross section and the hardness of the O-Ring.

Table XI contains recommendations for the permissible clearance S as a function of O-Ring cross section and shore hardness. The table is valid for elastomeric materials with the exception of polyurethane and FEP encapsulated O-Rings.

For pressure above 5 MPa for O-Rings with Inside diameter > 50 mm and above 10 MPa for O-Rings with Inside diameter < 50 mm we recommend the use of Back-up Rings.



Table XI Radial clearance S

O-Ring cross section d ₂	up to 2	2 - 3	3 - 5	5 - 7	above 7
O-Rings with hardness of 70 Shore A					
Pressure MPa	Radial clearance S				
≤ 3.50	0.08	0.09	0.10	0.13	0.15
≤ 7.00	0.05	0.07	0.08	0.09	0.10
≤ 10.50	0.03	0.04	0.05	0.07	0.08
O-Rings with hardness of 90 Shore A					
Pressure MPa	Radial clearance S				
≤ 3.50	0.13	0.15	0.20	0.23	0.25
≤ 7.00	0.10	0.13	0.15	0.18	0.20
≤ 10.50	0.07	0.09	0.10	0.13	0.15
≤ 14.00	0.05	0.07	0.08	0.09	0.10
≤ 17.50	0.04	0.05	0.07	0.08	0.09
≤ 21.00	0.03	0.04	0.05	0.07	0.08
≤ 35.00	0.02	0.03	0.03	0.04	0.04

These values assume that the parts are fitted concentrically to one another and do not expand under pressure. If this is not the case, the clearance should be kept correspondingly smaller.

For static applications we recommend a fit of H8/g7.

O-Rings made from polyurethane can bridge larger clearances thanks to their high extrusion resistance and greater dimensional stability. See also chapter "Polyurethane O-Rings".

Surfaces

Under pressure, elastomers adapt to irregular surfaces. For gas or liquid tight joints, however, certain minimum demands must be made on the surface quality of the surfaces to be sealed.

Fundamentally grooves, scratches, pit marks, concentric or spiral machining scores, etc. are not permissible. Higher demands must be placed on dynamic mating surfaces than on static surfaces.

At present no uniform definitions exist for describing the mating surfaces. In practice, the specification of the R_a value is not sufficient to permit an assessment of the surface quality. Our recommendations therefore contain various terms and definitions in accordance with DIN 4768/1 and ISO 1302.

Table XII Surface finish

Type of Load	Surface	R _{max} μm	R _z μm	R _a μm
Radial–dynamic	Mating surface * (bore, rod, shaft)	1.0 - 4.0	0.63 - 2.5	0.1 - 0.4
	Groove surface	≤ 16.0	≤ 10.0	≤ 1.6
Radial–static Axial–static	Mating surface Groove surface (groove diameter, groove flanks)	≤ 16.0	≤ 10.0	≤ 1.6
	For pulsating pressures Mating surface Groove surface (groove diameter, groove flanks)	≤ 10.0	≤ 6.3	≤ 0.8

* spiralfree grinding

The above is for guidance only and covers the majority of sealing applications. However B + S should be consulted in areas of particular concern.



Trapezoidal groove

The trapezoidal (dovetail) groove should only be used in special cases, e.g. overhead installation, in order to retain the O-Ring (Figure 22). The installation dimensions are summarised in Table XIII. The trapezoidal groove is only recommended for O-Ring cross section from 3.53 mm. The inside diameter of the O-Ring results from the mean groove diameter minus the cross section.

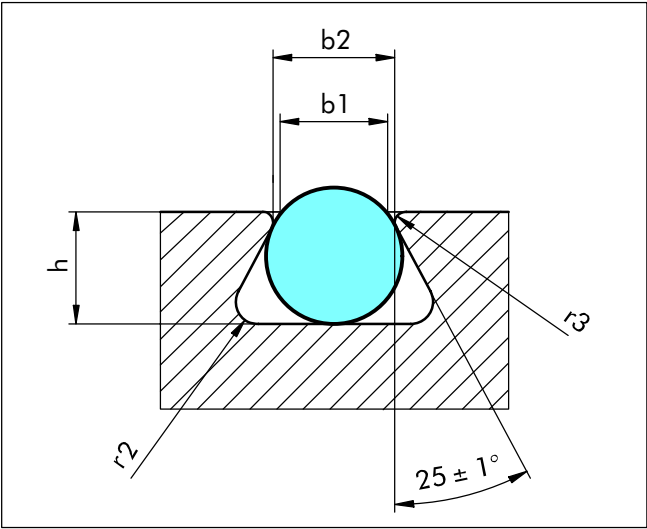


Figure 22 Installation in trapezoidal groove

Table XIII Installation dimensions for trapezoidal groove

O-Ring cross section d2	Groove dimensions				
	Groove width b1 ± 0.05	Groove width b2 ± 0.05	Groove depth h ± 0.05	Radius (max.) r3 r2	
3.53 3.55	2.90	3.20	2.90	0.25	0.80
4.00	3.40	3.70	3.20	0.25	0.80
5.00	4.30	4.60	4.20	0.25	0.80
5.33 5.30	4.60	4.90	4.60	0.25	0.80
5.70	4.75	5.25	4.80	0.40	0.80
6.00	5.05	5.55	5.10	0.40	0.80
7.00	6.00	6.50	6.00	0.40	1.60
8.00	6.85	7.45	6.90	0.50	1.60
8.40	7.25	7.85	7.30	0.50	1.60

Rectangular groove

A rectangular groove is preferred for all new designs. Designs with bevelled groove flanks up to 5° are permissible. If Back-up Rings are used, straight groove flanks are necessary.

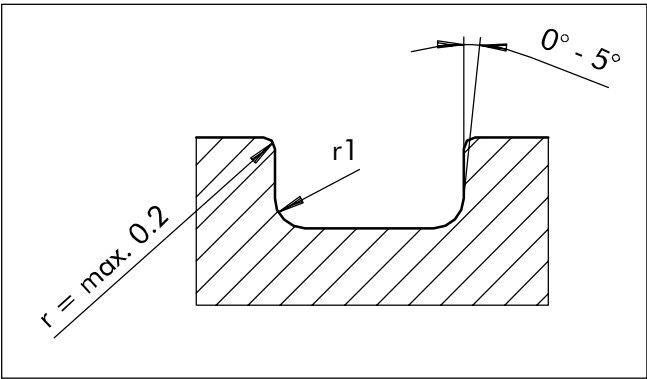


Figure 23 Groove specifications



Installation recommendations

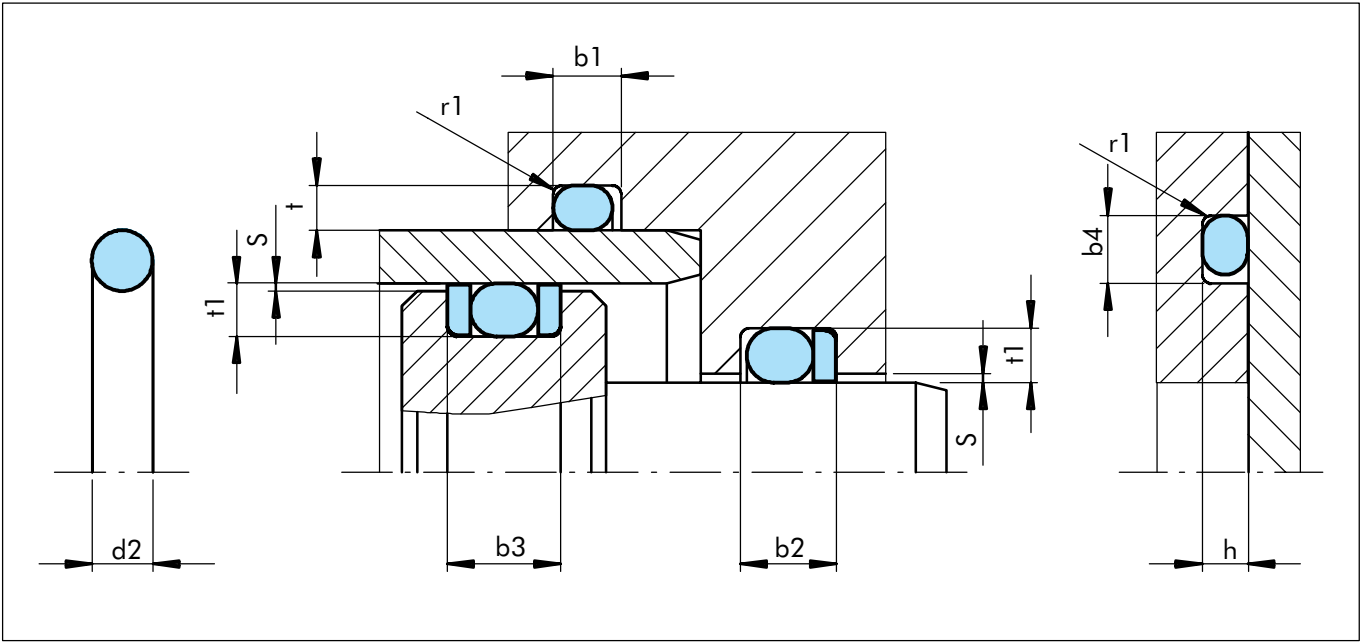


Figure 24 Installation drawing

Gap dimensions, see chapter "Design Recommendations", page 43
Surface specifications, see chapter "Design Recommendations", page 44

Table XIV Installation dimensions

Cross section	Radial installation					Axial installation		Radius
	Groove depth		Groove width			Groove depth	Groove width	
	Dynamic	Static						
d2	t1 + 0.05	t + 0.05	b1 + 0.2	b2 + 0.2	b3 + 0.2	h + 0.05	b4 + 0.2	r1 ± 0.2
0.50	-	0.35	0.80	-	-	0.35	0.80	0.20
0.74	-	0.50	1.00	-	-	0.50	1.00	0.20
1.00 1.02	-	0.70	1.40	-	-	0.70	1.40	0.20
1.20	-	0.85	1.70	-	-	0.85	1.70	0.20
1.25 1.27	-	0.90	1.70	-	-	0.90	1.80	0.20
1.30	-	0.95	1.80	-	-	0.95	1.80	0.20
1.42	-	1.05	1.90	-	-	1.05	2.00	0.30
1.50 1.52	1.25	1.10	2.00	3.00	4.00	1.10	2.10	0.30
1.60 1.63	1.30	1.20	2.10	3.10	4.10	1.20	2.20	0.30
1.78 1.80*	1.45	1.30	2.40	3.80	5.20	1.30	2.60	0.30
1.83	1.50	1.35	2.50	3.90	5.30	1.35	2.60	0.30
1.90	1.55	1.40	2.60	4.00	5.40	1.40	2.70	0.30
1.98 2.00	1.65	1.50	2.70	4.10	5.50	1.50	2.80	0.30
2.08 2.10	1.75	1.55	2.80	4.20	5.60	1.55	2.90	0.30
2.20	1.85	1.60	3.00	4.40	5.80	1.60	3.00	0.30



Cross section	Radial installation					Axial installation		Radius
	Groove depth		Groove width			Groove depth	Groove width	
	Dynamic	Static	b1 + 0.2	b2 + 0.2	b3 + 0.2			
d2	t1 + 0.05	t + 0.05						
2.26	1.90	1.70	3.00	4.40	5.80	1.70	3.10	0.30
2.30 2.34	1.95	1.75	3.10	4.50	5.90	1.75	3.10	0.30
2.40	2.05	1.80	3.20	4.60	6.00	1.80	3.30	0.30
2.46	2.10	1.85	3.30	4.70	6.10	1.85	3.40	0.30
2.50	2.15	1.85	3.30	4.70	6.10	1.85	3.40	0.30
2.62 2.65*	2.25	2.00	3.60	5.00	6.40	2.00	3.80	0.30
2.70	2.30	2.05	3.60	5.00	6.40	2.05	3.80	0.30
2.80	2.40	2.10	3.70	5.10	6.50	2.10	3.90	0.60
2.92 2.95	2.50	2.20	3.90	5.30	6.70	2.20	4.00	0.60
3.00	2.60	2.30	4.00	5.40	6.80	2.30	4.00	0.60
3.10	2.70	2.40	4.10	5.50	6.90	2.40	4.10	0.60
3.50	3.05	2.65	4.60	6.00	7.40	2.65	4.70	0.60
3.53 3.55*	3.10	2.70	4.80	6.20	7.60	2.70	5.00	0.60
3.60	3.15	2.80	4.80	6.20	7.60	2.80	5.10	0.60
4.00	3.50	3.10	5.20	6.90	8.60	3.10	5.30	0.60
4.50	4.00	3.50	5.80	7.50	9.20	3.50	5.90	0.60
5.00	4.40	4.00	6.60	8.30	10.00	4.00	6.70	0.60
5.33 5.30*	4.70	4.30	7.10	9.00	10.90	4.30	7.30	0.60
5.50	4.80	4.50	7.10	9.00	10.90	4.50	7.30	0.60
5.70	5.00	4.60	7.20	9.00	11.00	4.60	7.40	0.60
6.00	5.30	4.90	7.40	9.30	11.20	4.90	7.60	0.60
6.50	5.70	5.40	8.00	9.90	11.90	5.40	8.20	1.00
6.99 7.00*	6.10	5.80	9.50	12.30	15.10	5.80	9.70	1.00
7.50	6.60	6.30	9.70	12.50	15.30	6.30	9.90	1.00
8.00	7.10	6.70	9.80	12.60	15.40	6.70	10.00	1.00
8.40	7.50	7.10	10.00	12.80	15.60	7.10	10.30	1.00
9.00	8.10	7.70	10.60	13.40	16.30	7.70	10.90	1.50
9.50	8.60	8.20	11.00	13.80	16.70	8.20	11.40	1.50
10.00	9.10	8.60	11.60	14.50	17.40	8.60	12.00	2.00
12.00	11.00	10.60	13.50	16.40	19.40	10.60	14.00	2.00

*ISO 3601 recommendation



C Dimensions and product range

C.1 Dimensions and international standards

C.1.1 O-Ring range of sizes

The following table provides a summary of available O-Ring dimensions, part numbers and valid standards. Dowty and Skega reference numbers are also given.

The table represents a guide to common dimensions with or without a valid standard and makes no claim to be exhaustive. The complete range of sizes is more extensive. Special dimensions are also available on request. Please contact our specialists for further details.

For the given dimensions moulds generally exist. Due to different shrinkage factors of various materials, it may not be possible to process certain materials with the existing moulds.

To guarantee a high and constant quality level it might be necessary to produce new or additional moulds with the corresponding costs.

At the time of publication O-Ring moulds for the dimensions according to AS 568 A (ORAR . . .) exist for standard NBR 70 Shore A and standard FKM 70 Shore A. Subject to alterations.

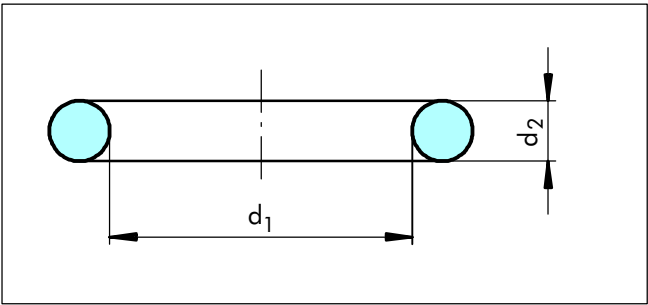


Figure 25 O-Ring dimensions

Table XV Dimensions / Part numbers

Inside diameter d_1	Cross section d_2	Part No.	Standard									Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518		
0.50 0.74 1.00	1.00 1.02 1.50	OR1000050 ORAR00001 OR1500100	001	x								466921	200-001
1.07 1.20 1.24	1.27 1.00 2.62	ORAR00002 OR1000120 ORAR00102	002 102	x x								465755	200-002 200-102
1.42 1.50 1.50	1.52 1.00 1.50	ORAR00003 OR1000150 OR1500150	003	x									200-003
1.78 1.78 1.80	1.02 1.78 1.00	ORAR90212 ORAR00004 OR1000180	004	x x								466048 466657	200-606 200-004
1.80 1.80 2.00	1.20 1.80 1.00	OR1200180 ORIA00180 OR1000200			x			x				466687 463894	208-501
2.00 2.00 2.06	1.50 1.80 2.62	OR1500200 ORIA00200 ORAR00103	103	x	x			x					200-103

O-Ring



Inside diameter d ₁	Cross section d ₂	Part No.	Standard									Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518		
2.20 2.24 2.40	1.00 1.80 1.90	OR1000220 ORIA00224 OR1900240			x			x	R0				201-112
2.50 2.50 2.50	1.00 1.20 1.30	OR1000250 OR1200250 OR1300250											
2.50 2.50 2.50	1.50 1.60 1.80	OR1500250 OR1600250 ORIA00250			x			x				465484	
2.57 2.60 2.60	1.78 1.00 1.20	ORAR00005 OR1000260 OR1200260	005	x								464893	200-005
2.60 2.60 2.70	1.30 1.90 1.60	OR1300260 OR1900260 OR1600270							R1			462476 466011	201-001
2.80 2.80 2.80	1.60 1.80 1.90	OR1600280 ORIA00280 OR1900280			x		P3	x				461418	
2.84 2.90 3.00	2.62 1.78 1.00	ORAR00104 ORAR00006 OR1000300	104 006	x x								464449 463895	200-104 200-006
3.00 3.00 3.00	1.50 2.00 2.40	OR1500300 OR2000300 OR2400300											206-003 204-003
3.00 3.00 3.10	2.70 3.00 1.60	OR2700300 OR3000300 OR1600310				x					x	462914	206-303 202-505
3.15 3.20 3.20	1.80 1.60 1.80	ORIA00315 OR1600320 ORIA00320			x			x				469603	
3.20 3.30 3.30	2.50 1.00 1.50	OR2500320 OR1000330 OR1500330										465380	
3.30 3.40 3.50	2.40 1.90 1.00	OR2400330 OR1900340 OR1000350				x			R2		x	461533 466294 465498	202-605 201-002
3.50 3.50 3.50	1.20 1.50 2.00	OR1200350 OR1500350 OR2000350											



O-Ring

Inside diameter d ₁	Cross section d ₂	Part No.	Standard									Reference No. Skega	Reference No. Dowty	
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518			
3.55 3.60 3.63	1.80 2.40 2.62	ORIA00355 OR2400360 ORAR00105	105	x	x			x			x		202-630 200-105	
3.68 3.70 3.80	1.78 1.90 1.50	ORAR00007 OR1900370 OR1500380			007	x							465326	200-007
3.80 3.90 4.00	1.90 1.80 1.00	OR1900380 ORIA00390 OR1000400								P4				
4.00 4.00 4.00	1.20 1.50 1.80	OR1200400 OR1500400 ORIA00400												206-004
4.00 4.00 4.00	2.00 2.50 3.00	OR2000400 OR2500400 OR3000400										465830	204-004 206-104 206-304	
4.00 4.10 4.20	4.00 1.60 1.90	OR4000400 OR1600410 OR1900420				x			R3		x	461915 466076	204-104 202-506 201-003	
4.30 4.34 4.42	2.40 3.53 2.62	OR2400430 ORAR00201 ORAR00106	201 106	x x							x	464450	202-606 200-201 200-106	
4.47 4.50 4.50	1.78 1.00 1.50	ORAR00008 OR1000450 OR1500450	008	x								465551	200-008	
4.50 4.50 4.60	2.00 2.50 2.00	OR2000450 OR2500450 OR2000460												
4.60 4.70 4.70	2.40 1.00 1.42	OR2400460 OR1000470 ORAR00901			901	x						x		202-631 200-901
4.80 4.80 4.87	1.80 1.90 1.80	ORIA00480 OR1900480 ORIA00487			x		P5	x						
4.90 5.00 5.00	1.90 1.00 1.20	OR1900490 OR1000500 OR1200500							R4			466369 465589	201-004	
5.00 5.00 5.00	1.50 1.80 2.00	OR1500500 ORIA00500 OR2000500			x			x				465715 465822	206-005 204-005	

O-Ring



Inside diameter d ₁	Cross section d ₂	Part No.	Standard									Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518		
5.00 5.00 5.00	2.50 3.00 5.00	OR2500500 OR3000500 OR5000500										465473	206-105 206-305 204-605
5.10 5.15 5.23	1.60 1.80 2.62	OR1600510 ORIA00515 ORAR00107	107	x	x	x		x			x	465441	202-507 200-107
5.28 5.30 5.30	1.78 1.80 2.40	ORAR00009 ORIA00530 OR2400530	009	x		x		x				466021 461547	200-009 202-607
5.50 5.50 5.50	1.00 1.50 1.60	OR1000550 OR1500550 OR1600550										465612	
5.50 5.60 5.60	2.00 1.80 2.40	OR2000550 ORIA00560 OR2400560			x			x			x		202-632
5.70 5.80 5.94	1.90 1.90 3.53	OR1900570 OR1900580 ORAR00202	202	x			P6		R5			466019	201-005 200-202
6.00 6.00 6.00	1.00 1.50 1.80	OR1000600 OR1500600 ORIA00600				x		x				464889 465719	206-006
6.00 6.00 6.00	2.00 2.20 2.50	OR2000600 OR2200600 OR2500600										465785 465472	204-006 201-126 206-106
6.00 6.02 6.07	3.00 2.62 1.63	OR3000600 ORAR00108 ORAR00902	108 902	x x								465628	206-306 200-108 200-902
6.07 6.10 6.30	1.78 1.60 1.80	ORAR00010 OR1600610 ORIA00630	010	x		x		x		x	x	465189 464998	200-010 202-508
6.30 6.40 6.50	2.40 1.90 1.50	OR2400630 OR1900640 OR1500650				x			R5A		x	464186 466022	202-608 201-105
6.50 6.50 6.50	1.60 2.00 3.00	OR1600650 OR2000650 OR3000650										465632	
6.50 6.60 6.60	5.00 1.60 2.40	OR5000650 OR1600660 OR2400660									x	461913	202-633



O-Ring

Inside diameter d ₁	Cross section d ₂	Part No.	Standard									Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518		
6.70 6.80 6.90	1.80 1.90 1.80	ORIA00670 OR1900680 ORIA00690			x x		P7	x x				569004	
7.00 7.00 7.00	1.00 1.20 1.30	OR1000700 OR1200700 OR1300700										465221	
7.00 7.00 7.00	1.50 1.80 2.00	OR1500700 ORIA00700 OR2000700										465556 466413	206-007 204-007
7.00 7.00 7.00	2.50 3.00 4.00	OR2500700 OR3000700 OR4000700										464075	206-107 206-307 204-107
7.10 7.10 7.20	1.60 1.80 1.90	OR1600710 ORIA00710 OR1900720			x	x		x	R6		x	464784 466370	202-509 201-006
7.30 7.50 7.50	2.40 1.50 1.80	OR2400730 OR1500750 ORIA00750				x					x	461492 465741	202-609
7.50 7.50 7.52	2.00 2.50 3.53	OR2000750 OR2500750 ORAR00203	203	x								469723	200-203
7.59 7.60 7.65	2.62 2.40 1.63	ORAR00109 OR2400760 ORAR00903	109 903	x x							x		200-109 202-634 200-903
7.65 7.80 8.00	1.78 1.90 1.00	ORAR00011 OR1900780 OR1000800	011	x			P8					464572 465192	200-011
8.00 8.00 8.00	1.50 1.60 1.80	OR1500800 OR1600800 ORIA00800			x			x				465714	206-008
8.00 8.00 8.00	1.90 2.00 2.20	OR1900800 OR2000800 OR2200800							R6A			466023 465854 465191	201-106 204-008
8.00 8.00 8.00	2.40 2.50 3.00	OR2400800 OR2500800 OR3000800										469895 465258	206-108 206-308
8.00 8.00 8.00	3.50 4.00 4.50	OR3500800 OR4000800 OR4500800										465827	206-558 204-108

O-Ring



Inside diameter d ₁	Cross section d ₂	Part No.	Standard									Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518		
8.00 8.10 8.30	5.00 1.60 2.40	OR5000800 OR1600810 OR2400830				x x				x x	465060 464451	204-608 202-510 202-610	
8.50 8.50 8.50	1.00 1.50 1.80	OR1000850 OR1500850 ORIA00850				x		x			466557		
8.50 8.50 8.50	2.00 2.50 3.00	OR2000850 OR2500850 OR3000850											
8.60 8.75 8.80	2.40 1.80 1.90	OR2400860 ORIA00875 OR1900880			x		P9	x		x		202-635	
8.90 8.90 8.92	1.90 2.70 1.83	OR1900890 OR2700890 ORAR00904	904	x					R7 R8		466024 466063	201-008 200-904	
9.00 9.00 9.00	1.00 1.20 1.50	OR1000900 OR1200900 OR1500900									465240 465855	206-009	
9.00 9.00 9.00	1.80 2.00 2.50	ORIA00900 OR2000900 OR2500900			x			x			465743 466972	204-009 206-109	
9.00 9.00 9.00	3.00 4.00 4.50	OR3000900 OR4000900 OR4500900									465875	206-309 204-109	
9.00 9.10 9.12	6.00 1.60 3.53	OR6000900 OR1600910 ORAR00204	204	x		x				x	462723	202-511 200-204	
9.19 9.25 9.30	2.62 1.78 2.20	ORAR00110 ORAR00012 OR2200930	110 012	x x						x	466190 464511	200-110 200-012	
9.30 9.50 9.50	2.40 1.00 1.50	OR2400930 OR1000950 OR1500950				x				x	461412	202-611	
9.50 9.50 9.50	1.60 1.80 2.00	OR1600950 ORIA00950 OR2000950			x			x			462217		
9.50 9.50 9.60	2.50 3.00 2.40	OR2500950 OR3000950 OR2400960								x	465729	202-636	



O-Ring

Inside diameter d ₁	Cross section d ₂	Part No.	Standard									Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518		
9.80 9.80 10.00	1.90 2.40 1.00	OR1900980 OR2400980 OR1001000					P10 P10A					465488	
10.00 10.00 10.00	1.50 1.80 2.00	OR1501000 ORIA01000 OR2001000			x			x				465553 466393	206-010 204-010
10.00 10.00 10.00	2.40 2.50 3.00	OR2401000 OR2501000 OR3001000										465080 466205	206-110 206-310
10.00 10.00 10.00	3.50 4.00 5.00	OR3501000 OR4001000 OR5001000										465749	206-560 204-110 204-610
10.10 10.30 10.46	1.60 2.40 5.33	OR1601010 OR2401030 ORAR00309	309	x		x x					x x	465636 464452	202-514 202-614 200-309
10.50 10.50 10.52	1.50 2.70 1.83	OR1501050 OR2701050 ORAR00905	905	x					R9			466074 465554	201-009 200-905
10.60 10.60 10.69	1.80 2.40 3.53	ORIA01060 OR2401060 ORAR00205	205	x	x			x			x		202-637 200-205
10.77 10.80 10.82	2.62 2.40 1.78	ORAR00111 OR2401080 ORAR00013	111 013	x x			P11					463751 466427	200-111 200-013
11.00 11.00 11.00	1.00 1.50 2.00	OR1001100 OR1501100 OR2001100											206-011 204-011
11.00 11.00 11.00	2.40 2.50 3.00	OR2401100 OR2501100 OR3001100					P11.2					466977	206-111 206-311
11.00 11.00 11.10	3.50 4.00 1.60	OR3501100 OR4001100 OR1601110				x					x	465061	206-561 204-111 202-513
11.20 11.30 11.30	1.80 2.20 2.40	ORIA01120 OR2201130 OR2401130			x			x		x	x	461332	202-613
11.60 11.80 11.80	2.40 1.80 2.40	OR2401160 ORIA01180 OR2401180			x		P12	x			x		202-638

O-Ring



Inside diameter d ₁	Cross section d ₂	Part No.	Standard								Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518	
11.89	1.98	ORAR00906	906	x							465652	200-906
12.00	1.00	OR1001200									465793	
12.00	1.50	OR1501200									465783	206-012
12.00	2.00	OR2001200									461786	204-012
12.00	2.50	OR2501200									465820	206-112
12.00	3.00	OR3001200									464341	206-312
12.00	4.00	OR4001200									465620	204-112
12.00	4.50	OR4501200									466202	204-612
12.00	5.00	OR5001200										
12.07	5.33	ORAR00310	310	x		x					x	200-310
12.10	1.60	OR1601210										202-514
12.10	2.70	OR2701210							R10			201-010
12.29	3.53	ORAR00206	206	x		x					x	200-206
12.30	2.40	OR2401230										202-614
12.37	2.62	ORAR00112	112	x								200-112
12.42	1.78	ORAR00014	014	x							466231	200-014
12.50	1.50	OR1501250										
12.50	1.80	ORIA01250			x			x				
12.50	2.00	OR2001250									x	465901
12.50	2.50	OR2501250										
12.60	2.40	OR2401260										
13.00	1.00	OR1001300									466647	206-013
13.00	1.50	OR1501300										
13.00	2.00	OR2001300										
13.00	2.50	OR2501300									464742	206-113
13.00	3.00	OR3001300										
13.00	3.50	OR3501300										
13.00	4.00	OR4001300				x					x	465979
13.10	1.60	OR1601310										
13.20	1.80	ORIA01320			x			x				
13.30	2.20	OR2201330	907	x		x				x	x	461351
13.30	2.40	OR2401330										
13.46	2.08	ORAR00907										
13.60	2.40	OR2401360									x	466325
13.60	2.70	OR2701360							R11			
13.64	5.33	ORAR00311	311	x								
13.80	2.40	OR2401380					P14				465374	200-207
13.87	3.53	ORAR00207	207	x								
13.94	2.62	ORAR00113	113	x								



O-Ring

Inside diameter d ₁	Cross section d ₂	Part No.	Standard									Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518		
14.00 14.00 14.00	1.00 1.50 1.60	OR1001400 OR1501400 OR1601400										465675	206-014
14.00 14.00 14.00	1.78 1.80 2.00	ORAR00015 ORIA01400 OR2001400	015	x	x			x				466129 465819	200-015 204-014
14.00 14.00 14.00	2.40 2.50 2.65	OR2401400 OR2501400 ORIB01400			x			x				465066	206-114
14.00 14.00 14.00	2.70 3.00 4.00	OR2701400 OR3001400 OR4001400										461792 466343	206-314 204-114
14.00 14.10 14.30	5.00 1.60 2.40	OR5001400 OR1601410 OR2401430				x x					x x	465515 463744	204-614 202-516 202-616
14.80 15.00 15.00	2.40 1.00 1.50	OR2401480 OR1001500 OR1501500					P15				x		202-641 206-015
15.00 15.00 15.00	1.80 2.00 2.50	ORIA01500 OR2001500 OR2501500			x			x				560021 463754 461562	204-015 206-115
15.00 15.00 15.00	2.65 3.00 3.50	ORIB01500 OR3001500 OR3501500			x			x				465856	206-315 206-565
15.00 15.00 15.00	4.00 5.00 6.00	OR4001500 OR5001500 OR6001500										465230 463592	204-115 204-615
15.00 15.10 15.10	7.00 1.60 2.70	OR7001500 OR1601510 OR2701510				x			R12		x	465062 466303	202-517 201-012
15.24 15.30 15.30	5.33 2.20 2.40	ORAR00312 OR2201530 OR2401530	312	x						x	x		200-312 202-617
15.47 15.54 15.60	3.53 2.62 1.78	ORAR00208 ORAR00114 ORAR00016	208 114 016	x x x								464509 465292	200-208 200-114 200-016
15.60 15.80 16.00	2.40 2.40 1.00	OR2401560 OR2401580 OR1001600					P16				x	469825	202-642

O-Ring



Inside diameter d ₁	Cross section d ₂	Part No.	Standard								Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518	
16.00	1.50	OR1501600									465711	206-016
16.00	1.80	ORIA01600			x			x				204-016
16.00	2.00	OR2001600										
16.00	2.50	OR2501600									465465	206-116
16.00	2.65	ORIB01600			x			x				
16.00	3.00	OR3001600									462911	206-315
16.00	3.50	OR3501600									465540	206-566
16.00	4.00	OR4001600									463241	204-116
16.00	4.50	OR4501600									465565	
16.00	5.00	OR5001600										204-616
16.10	1.60	OR1601610				x					x	465183
16.30	2.40	OR2401630				x					x	464454
16.36	2.20	ORAR00908	908	x								466473
16.81	5.33	ORAR00313	313	x								200-908
16.90	2.70	OR2701690							R13			200-313
												201-013
17.00	1.00	OR1001700									466905	
17.00	1.50	OR1501700									465761	206-017
17.00	1.80	ORIA01700			x			x				
17.00	2.00	OR2001700									466699	204-017
17.00	2.50	OR2501700										206-117
17.00	2.65	ORIB01700			x			x				
17.00	3.00	OR3001700									466015	206-317
17.00	3.50	OR3501700										206-567
17.00	4.00	OR4001700									466766	204-117
17.00	5.00	OR5001700										204-617
17.04	3.53	ORAR00209	209	x								200-209
17.10	1.60	OR1601710				x					x	465288
17.12	2.62	ORAR00115	115	x								200-115
17.17	1.78	ORAR00017	017	x								200-017
17.20	3.00	OR3001720								x		202-705
17.30	2.20	OR2201730								x		
17.30	2.40	OR2401730				x					x	202-619
17.60	2.40	OR2401760									x	202-644
17.80	2.40	OR2401780					P18					
17.93	2.46	ORAR00909	909	x								200-909
18.00	1.00	OR1001800										
18.00	1.50	OR1501800										206-018
18.00	2.00	OR2001800									466419	204-018
18.00	2.50	OR2501800									466410	206-118



O-Ring

Inside diameter d ₁	Cross section d ₂	Part No.	Standard									Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518		
18.00	2.65	ORIB01800			x			x				465440	206-318 206-568
18.00	3.00	OR3001800											
18.00	3.50	OR3501800											
18.00	3.55	ORIC01800			x			x				462597	204-118
18.00	4.00	OR4001800											
18.00	4.50	OR4501800											
18.00	5.00	OR5001800										465019 466012	204-618 202-520 202-706
18.10	1.60	OR1601810				x					x		
18.20	3.00	OR3001820									x		
18.30	2.40	OR2401830									x		202-620 201-015 201-014
18.30	3.60	OR3601830							R15 R14				
18.40	2.70	OR2701840											
18.42	5.33	ORAR00314	314	x								463759	200-314 202-645 200-210
18.60	2.40	OR2401860									x		
18.64	3.53	ORAR00210	210	x									
18.72	2.62	ORAR00116	116	x								464132 466642	200-116 200-018
18.77	1.78	ORAR00018	018	x									
19.00	1.00	OR1001900											
19.00	1.50	OR1501900										463102	206-019 204-019
19.00	1.80	ORIA01900											
19.00	2.00	OR2001900											
19.00	2.50	OR2501900											206-119 206-569
19.00	2.65	ORIB01900			x			x					
19.00	3.50	OR3501900											
19.00	3.55	ORIC01900			x			x				461825	204-119 204-619
19.00	4.00	OR4001900											
19.00	5.00	OR5001900											
19.00	6.00	OR6001900										465344 466696	202-521 200-910
19.10	1.60	OR1601910				x					x		
19.18	2.46	ORAR00910	910	x									
19.20	3.00	OR3001920				x					x	461377 466406	202-707 202-621
19.30	2.20	OR2201930								x			
19.30	2.40	OR2401930									x		
19.50	3.00	OR3001950									x	465904	202-771 202-646
19.60	2.40	OR2401960									x		
19.80	2.40	OR2401980					P20						
19.80	3.60	OR3601980	315	x					R16				201-016 200-315
19.99	5.33	ORAR00315											
20.00	1.00	OR1002000											

O-Ring



Inside diameter d ₁	Cross section d ₂	Part No.	Standard									Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518		
20.00	1.30	OR1302000											
20.00	1.50	OR1502000										465712	206-020
20.00	2.00	OR2002000										466170	204-020
20.00	2.50	OR2502000										466077	206-120
20.00	2.65	ORIB02000			x			x					
20.00	3.00	OR3002000										466990	206-320
20.00	3.50	OR3502000											206-570
20.00	3.55	ORIC02000			x			x					
20.00	4.00	OR4002000										464141	204-120
20.00	4.50	OR4502000											
20.00	5.00	OR5002000										462460	204-620
20.00	6.00	OR6002000											
20.10	1.60	OR1602010									x		202-522
20.20	3.00	OR3002020									x	465800	202-708
20.22	3.53	ORAR00211	211	x								463679	200-211
20.29	2.62	ORAR00117	117	x									200-117
20.30	2.40	OR2402030								x		465588	202-622
20.35	1.78	ORAR00019	019	x								466218	200-019
20.60	2.40	OR2402060					P21				x		202-670
20.80	2.40	OR2402080											
21.00	2.00	OR2002100										465832	204-021
21.00	2.50	OR2502100											206-121
21.00	3.00	OR3002100										465212	206-321
21.00	4.00	OR4002100											204-121
21.00	6.00	OR6002100											
21.10	1.60	OR1602110									x		202-523
21.20	2.65	ORIB02120			x			x					
21.20	3.00	OR3002120									x	461468	202-709
21.20	3.55	ORIC02120			x			x					
21.30	2.40	OR2402130											202-623
21.30	3.60	OR3602130							R17			466373	201-017
21.50	3.00	OR3002150									x	462700	202-772
21.59	5.33	ORAR00316	316	x									200-316
21.60	2.40	OR2402160					P22A				x		202-647
21.70	3.50	OR3502170					P22						
21.80	2.40	OR2402180											
21.82	3.53	ORAR00212	212	x								466184	200-212
21.89	2.62	ORAR00118	118	x								466767	200-118
21.92	2.95	ORAR00911	911	x									200-911



O-Ring

Inside diameter d ₁	Cross section d ₂	Part No.	Standard									Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518		
21.95 22.00 22.00	1.78 1.00 1.30	ORAR00020 OR1002200 OR1302200	020	x								466234 466755	200-020
22.00 22.00 22.00	1.50 2.00 2.50	OR1502200 OR2002200 OR2502200										462741 462913	206-022 204-022 206-122
22.00 22.00 22.00	3.00 3.50 4.00	OR3002200 OR3502200 OR4002200										461752	206-322 206-572 204-122
22.00 22.00 22.00	4.50 5.00 6.00	OR4502200 OR5002200 OR6002200										461856	204-622
22.10 22.10 22.20	1.60 3.50 3.00	OR1602210 OR3502210 OR3002220				x x	P22.4				x x	462301 461378	202-524 202-710
22.30 22.40 22.40	2.40 2.65 3.55	OR2402230 ORIB02240 ORIC02240			x x			x x			x	466690	202-624
22.50 23.00 23.00	3.00 1.00 1.50	OR3002250 OR1002300 OR1502300									x		202-773 206-023
23.00 23.00 23.00	2.00 2.50 3.00	OR2002300 OR2502300 OR3002300										469821 466704	204-023 206-123 206-323
23.00 23.00 23.00	3.60 4.00 5.00	OR3602300 OR4002300 OR5002300							R18			466504 466812	201-018 204-123 204-623
23.00 23.00 23.16	5.50 6.00 5.33	OR5502300 OR6002300 ORAR00317	317	x									200-317
23.30 23.39 23.47	2.40 3.53 2.62	OR2402330 ORAR00213 ORAR00119	213 119	x x							x	462169 464566 466689	202-625 200-213 200-119
23.47 23.52 23.60	2.95 1.78 2.65	ORAR00912 ORAR00021 ORIB02360	912 021	x x								466641 466757	200-912 200-021
23.60 23.60 23.70	2.90 3.55 3.50	OR2902360 ORIC02360 OR3502370			x		P24	x		x			

O-Ring



Inside diameter d ₁	Cross section d ₂	Part No.	Standard									Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518		
24.00	1.00	OR1002400										466765	
24.00	1.50	OR1502400										465619	206-024
24.00	2.00	OR2002400										463414	204-024
24.00	2.50	OR2502400											206-124
24.00	3.00	OR3002400											206-324
24.00	3.50	OR3502400											206-574
24.00	4.00	OR4002400										466326	204-124
24.00	5.00	OR5002400										464965	204-624
24.00	6.00	OR6002400											
24.20	3.00	OR3002420				x	G25				x	461375	202-711
24.40	3.10	OR3102440											
24.50	3.00	OR3002450									x		202-774
24.60	2.40	OR2402460							R19		x		202-648
24.60	3.60	OR3602460					P25						201-019
24.70	3.50	OR3502470											
24.77	5.33	ORAR00318	318	x									200-318
24.99	3.53	ORAR00214	214									466987	
25.00	1.00	OR1002500											
25.00	1.50	OR1502500										465735	206-025
25.00	2.00	OR2002500											204-025
25.00	2.50	OR2502500											206-125
25.00	2.65	ORIB02500			x			x					
25.00	3.00	OR3002500										461781	206-325
25.00	3.53	ORAR00214	214	x									200-214
25.00	3.55	ORIC02500			x			x					
25.00	4.00	OR4002500										466872	204-125
25.00	4.50	OR4502500											
25.00	5.00	OR5002500										463480	204-625
25.00	6.00	OR6002500											
25.04	2.95	ORAR00913	913	x									200-913
25.07	2.62	ORAR00120	120	x								466768	200120
25.10	1.60	OR1602510				x					x	465242	202-525
25.12	1.78	ORAR00022	022	x								466863	200-022
25.20	3.00	OR3002520					P25.5				x		202-712
25.20	3.50	OR3502520											
25.30	2.40	OR2402530									x	465961	202-626
25.50	3.00	OR3002550					P26				x		202-775
25.70	3.50	OR3502570											
25.80	2.65	ORIB02580			x			x					



O-Ring

Inside diameter d ₁	Cross section d ₂	Part No.	Standard									Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518		
25.80	3.55	ORIC02580			x			x				466061	
26.00	1.00	OR1002600										466816	206-026
26.00	1.50	OR1502600											
26.00	2.00	OR2002600										560008	204-026
26.00	2.50	OR2502600										560025	206-125
26.00	3.50	OR3502600											206-576
26.00	4.00	OR4002600										464888	204-126
26.00	5.00	OR5002600										461819	204-626
26.00	6.00	OR6002600											
26.20	3.00	OR3002620				x					x	461491	202-713
26.20	3.60	OR3602620							R20			463154	201-020
26.34	5.33	ORAR00319	319	x									200-319
26.50	3.00	OR3002650									x		202-776
26.57	3.53	ORAR00215	215	x								464620	200-215
26.62	2.95	ORAR00914	914	x									200-914
26.64	2.62	ORAR00121	121	x								466735	200-121
26.70	1.78	ORAR00023	023	x								466559	200-023
27.00	1.50	OR1502700											206-027
27.00	2.00	OR2002700										465869	204-027
27.00	2.50	OR2502700										466956	206-127
27.00	3.00	OR3002700											206-327
27.00	4.00	OR4002700										465303	204-127
27.00	4.50	OR4502700											204-627
27.00	5.00	OR5002700											
27.00	6.00	OR6002700				x					x	463885	202-526
27.10	1.60	OR1602710									x	465091	202-627
27.30	2.40	OR2402730											
27.50	3.00	OR3002750									x		202-777
27.60	2.40	OR2402760									x		202-649
27.70	3.50	OR3502770					P28						
27.80	3.60	OR3602780							R21			466381	201-021
27.94	5.33	ORAR00320	320	x									200-320
28.00	1.00	OR1002800										465665	
28.00	1.50	OR1502800											206-028
28.00	2.00	OR2002800										463323	204-028
28.00	2.50	OR2502800										466438	206-128
28.00	2.65	ORIB02800			x			x				463933	206-328
28.00	3.00	OR3002800											
28.00	3.55	ORIC02800			x			x					

O-Ring



Inside diameter d ₁	Cross section d ₂	Part No.	Standard								Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518	
28.00	4.00	OR4002800									462621	204-128
28.00	5.00	OR5002800									464182	204-628
28.00	6.00	OR6002800										
28.17	3.53	ORAR00216	216	x							466044	200-216
28.24	2.62	ORAR00122	122	x							466682	200-122
28.30	1.78	ORAR00024	024	x							466560	200-024
28.70	3.50	OR3502870					P29					
29.00	1.50	OR1502900										206-029
29.00	2.00	OR2002900										204-029
29.00	2.50	OR2502900									466991	206-129
29.00	3.00	OR3002900										206-329
29.00	3.50	OR3502900										206-579
29.00	5.00	OR5002900										204-629
29.10	1.60	OR1602910				x				x	463886	202-527
29.20	3.00	OR3002920				x				x	461331	202-715
29.20	3.50	OR3502920					P29.5					
29.30	3.60	OR3602930							R22			201-022
29.40	3.10	OR3102940					G30					
29.50	1.50	OR1502950										
29.50	3.00	OR3002950								x		202-778
29.50	4.50	OR4502950										
29.51	5.33	ORAR00321	321	x								200-321
29.60	2.40	OR2402960									x	202-650
29.60	2.90	OR2902960								x		
29.70	3.50	OR3502970					P30					
29.74	2.95	ORAR00916	916	x								200-916
29.74	3.53	ORAR00217	217	x							465034	200-217
29.82	2.62	ORAR00123	123	x								200-123
29.87	1.78	ORAR00025	025	x							466643	200-025
30.00	1.00	OR1003000										
30.00	1.50	OR1503000									462410	206-030
30.00	2.00	OR2003000									466317	204-030
30.00	2.50	OR2503000									463699	206-130
30.00	2.65	ORIB03000			x			x				
30.00	3.00	OR3003000									560010	206-330
30.00	3.50	OR3503000										206-580
30.00	3.55	ORIC03000			x			x				
30.00	4.00	OR4003000									466071	204-130
30.00	4.50	OR4503000										



O-Ring

Inside diameter d ₁	Cross section d ₂	Part No.	Standard									Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518		
30.00 30.00 30.00	5.00 6.00 7.00	OR5003000 OR6003000 ORIE03000										462550 465057	204-630
30.20 30.30 30.70	3.00 2.40 3.50	OR3003020 OR2403030 OR3503070					P31				x x	466106 465437	202-716 202-628
30.80 31.00 31.00	3.60 1.50 2.00	OR3603080 OR1503100 OR2003100							R23			466377 466798	201-023 206-031 204-031
31.00 31.00 31.00	2.50 3.00 3.50	OR2503100 OR3003100 OR3503100										465463	206-131 206-331 206-581
31.00 31.12 31.20	4.00 5.33 3.00	OR4003100 ORAR00322 OR3003120	322				P31.5				x	465433	204-131 200-332 202-717
31.20 31.34 31.42	3.50 3.53 2.62	OR3503120 ORAR00218 ORAR00124	218 124	x x								466037 466160	200-218 200-124
31.47 31.50 31.50	1.78 2.65 3.00	ORAR00026 ORIB03150 OR3003150	026	x	x			x			x	466235	200-026 202-779
31.50 31.60 31.70	3.55 2.40 3.50	ORIC03150 OR2403160 OR3503170			x		P32	x			x	569027	202-651
32.00 32.00 32.00	1.00 1.50 2.00	OR1003200 OR1503200 OR2003200											206-032 204-032
32.00 32.00 32.00	2.50 3.00 3.50	OR2503200 OR3003200 OR3503200										469880	206-132 206-332 206-582
32.00 32.00 32.10	4.00 5.00 1.60	OR4003200 OR5003200 OR1603210				x					x	465302 463579 463887	204-132 204-632 202-528
32.20 32.50 32.50	3.00 2.65 3.00	OR3003220 ORIB03250 OR3003250			x	x		x			x x	461556	202-718 202-780
32.50 32.50 32.69	3.55 3.60 5.33	ORIC03250 OR3603250 ORAR00323	323	x	x			x	R24				201-024 200-323

O-Ring



Inside diameter d ₁	Cross section d ₂	Part No.	Standard									Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518		
32.92	3.53	ORAR00219	219	x								466117	200-219
32.99	2.62	ORAR00125	125	x								466236	200-125
33.00	1.50	OR1503300											206-033
33.00	2.00	OR2003300										462412	204-033
33.00	2.50	OR2503300											206-133
33.00	3.00	OR3003300											206-333
33.00	3.50	OR3503300											206-583
33.00	4.00	OR4003300											204-133
33.05	1.78	ORAR00027	027	x								466582	200-027
33.30	2.40	OR2403330									x	466188	202-629
33.50	2.65	ORIB03350			x			x					
33.50	3.55	ORIC03350			x			x					
33.70	3.50	OR3503370					P34						
34.00	1.00	OR1003400											
34.00	2.00	OR2003400										465669	204-034
34.00	2.30	OR2303400										466173	
34.00	2.50	OR2503400										465294	206-134
34.00	3.00	OR3003400											206-334
34.00	4.00	OR4003400										463702	204-134
34.00	5.00	OR5003400											204-634
34.00	6.00	OR6003400											
34.10	3.60	OR3603410							R25			466009	201-025
34.20	3.00	OR3003420				x					x	461242	202-719
34.29	5.33	ORAR00324	324	x									200-324
34.40	3.10	OR3103440					G35						
34.42	2.95	ORAR00918	918	x									200-918
34.50	2.65	ORIB03450			x			x					
34.50	3.00	OR3003450									x		202-781
34.50	3.55	ORIC03450			x			x					
34.52	3.53	ORAR00220	220	x								464783	200-220
34.59	2.62	ORAR00126	126	x								466718	200-126
34.60	2.40	OR2403460									x		202-652
34.65	1.78	ORAR00028	028	x								466386	200-028
34.70	3.50	OR3503470					P35						
35.00	1.50	OR1503500											206-035
35.00	2.00	OR2003500										466045	204-035
35.00	2.50	OR2503500											206-135
35.00	3.00	OR3003500											206-335
35.00	3.50	OR3503500										462691	206-585



O-Ring

Inside diameter d ₁	Cross section d ₂	Part No.	Standard									Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518		
35.00	4.00	OR4003500										461038	204-135
35.00	5.00	OR5003500											204-635
35.00	6.00	OR6003500											
35.00	7.00	ORIE03500										461801 463888	202-529
35.10	1.60	OR1603510				x					x		202-720
35.20	3.00	OR3003520									x		
35.20	3.50	OR3503520					P35.5					461622	202-805
35.20	5.70	OR5703520									x		
35.50	2.65	ORIB03550			x			x					
35.50	3.00	OR3003550									x		202-782
35.50	3.55	ORIC03550			x			x					202-672
35.60	2.40	OR2403560									x		
35.60	3.60	OR3603560					P36		R26				201-026
35.70	3.50	OR3503570											206-036
36.00	1.50	OR1503600											
36.00	2.00	OR2003600										465194 466409	204-036
36.00	2.50	OR2503600											206-136
36.00	3.00	OR3003600											206-336
36.00	4.00	OR4003600										466933	204-136
36.00	4.50	OR4503600											204-636
36.00	5.00	OR5003600											
36.00	6.00	OR6003600										466118 466724	200-221
36.09	3.53	ORAR00221	221	x									200-127
36.17	2.62	ORAR00127	127	x									
36.20	3.00	OR3003620				x					x	462047	202-721
36.20	5.70	OR5703620									x		202-806
36.50	2.65	ORIB03650			x			x					
36.50	3.55	ORIC03650			x			x				465569	204-037
37.00	2.00	OR2003700											206-137
37.00	2.50	OR2503700											
37.00	3.00	OR3003700										463889	206-337
37.00	3.50	OR3503700											206-587
37.10	1.60	OR1603710				x					x		202-530
37.20	3.00	OR3003720									x	462125 466379	202-722
37.20	5.70	OR5703720									x		202-807
37.30	3.60	OR3603730							R27				201-027
37.47	3.00	ORAR00920	920	x								466979 464728	200-920
37.47	5.33	ORAR00325	325	x					R28				200-325
37.50	2.65	ORIB03750			x			x					

O-Ring



Inside diameter d ₁	Cross section d ₂	Part No.	Standard									Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518		
37.50	3.00	OR3003750								x		202-784	
37.50	3.55	ORIC03750			x			x					
37.60	2.40	OR2403760								x		202-653	
37.69	3.53	ORAR00222	222	x								464560	200-222
37.70	3.50	OR3503770					P38						
37.77	2.62	ORAR00128	128	x								466209	200-128
37.82	1.78	ORAR00029	029	x								466694	200-029
38.00	1.00	OR1003800										464345	
38.00	1.50	OR1503800											206-038
38.00	2.00	OR2003800										465056	204-038
38.00	2.50	OR2503800										465585	206-138
38.00	3.00	OR3003800										464900	206-338
38.00	3.50	OR3503800										466546	206-588
38.00	4.00	OR4003800											204-138
38.00	4.50	OR4503800											
38.00	5.00	OR5003800										463591	204-638
38.00	6.00	OR6003800											
38.00	7.00	ORIE03800											
38.60	2.90	OR2903860								x			
38.70	2.65	ORIB03870			x			x					
38.70	3.50	OR3503870					P39						
38.70	3.55	ORIC03870			x			x					
39.00	1.50	OR1503900											206-039
39.00	2.00	OR2003900											204-039
39.00	2.50	OR2503900											206-139
39.00	3.00	OR3003900											206-339
39.00	4.00	OR4003900											204-139
39.00	5.50	OR5503900				x							
39.20	3.00	OR3003920								x		461414	202-723
39.20	5.70	OR5703920								x		466565	202-808
39.34	2.62	ORAR00129	129	x								466736	200-129
39.40	3.10	OR3103940					G40						
39.50	3.00	OR3003950									x		202-785
39.60	2.40	OR2403960									x		202-654
39.70	3.50	OR3503970					P40						
40.00	1.00	OR1004000											
40.00	1.50	OR1504000										465208	206-040
40.00	2.00	OR2004000										466316	204-040
40.00	2.50	OR2504000										465555	206-140



O-Ring

Inside diameter d ₁	Cross section d ₂	Part No.	Standard									Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518		
40.00	3.00	OR3004000										462485	206-340
40.00	3.50	OR3504000										465467	206-590
40.00	3.55	ORIC04000			x			x					
40.00	4.00	OR4004000										465794	204-140
40.00	4.50	OR4504000											
40.00	5.00	OR5004000										461827	204-640
40.00	5.30	ORID04000			x			x					
40.00	5.50	OR5504000											
40.00	6.00	OR6004000											
40.00	7.00	ORIE04000										461868	
40.00	7.50	OR7504000											
40.20	3.00	OR3004020									x		202-724
40.64	5.33	ORAR00326	326	x			P41		R29			464547	200-326
40.70	3.50	OR3504070											
40.87	3.53	ORAR00223	223	x								466984	200-223
40.94	2.62	ORAR00130	130	x								466237	200-130
41.00	1.78	ORAR00030	030	x								466725	200-030
41.00	2.00	OR2004100											204-041
41.00	3.00	OR3004100										469859	206-341
41.00	4.00	OR4004100											204-141
41.00	7.50	OR7504100											
41.20	3.55	ORIC04120			x			x				569039	
41.20	5.30	ORID04120			x			x					
41.20	5.70	OR5704120									x	466359	202-809
41.50	3.00	OR3004150									x		202-786
41.60	2.40	OR2404160									x		202-655
41.70	3.50	OR3504170					P42						
42.00	1.00	OR1004200											
42.00	1.50	OR1504200											206-042
42.00	2.00	OR2004200										460002	204-042
42.00	2.50	OR2504200										466411	206-142
42.00	3.00	OR3004200											206-342
42.00	3.50	OR3504200											206-592
42.00	4.00	OR4004200											204-142
42.00	4.50	OR4504200											
42.00	5.00	OR5004200											204-642
42.00	6.00	OR6004200										465430	
42.20	3.00	OR3004220				x					x	461723	202-725
42.50	3.55	ORIC04250			x			x			x	569016	202-787

O-Ring



Inside diameter d ₁	Cross section d ₂	Part No.	Standard									Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518		
42.50 42.52 43.00	5.30 2.62 1.60	ORID04250 ORAR00131 OR1604300	131	x	x			x				466232 461718	200-131
43.00 43.00 43.00	2.00 2.50 3.00	OR2004300 OR2504300 OR3004300										462486	204-043 206-143 206-343
43.00 43.00 43.69	3.50 6.00 3.00	OR3504300 OR6004300 ORAR00924	924	x								560007	206-593 200-924
43.70 43.70 43.70	3.50 3.55 5.30	OR3504370 ORIC04370 ORID04370			x x		P44	x x				560104	
43.82 44.00 44.00	5.33 2.00 2.50	ORAR00327 OR2004400 OR2504400	327	x					R30			466119 466927	200-327 204-044 206-144
44.00 44.00 44.00	3.00 4.00 4.50	OR3004400 OR4004400 OR4504400											206-344 204-144
44.00 44.00 44.04	5.00 6.00 3.53	OR5004400 OR6004400 ORAR00224	224	x								466052	204-644 200-224
44.12 44.17 44.20	2.62 1.78 3.00	ORAR00132 ORAR00031 OR3004420	132 031	x x		x					x	466511 465765 461470	200-132 200-031 202-726
44.30 44.40 44.50	5.70 3.10 3.00	OR5704420 OR3104440 OR3004450				x	G45				x x	461330	202-810 202-788
44.60 44.60 44.70	2.40 2.90 3.50	OR2404460 OR2904460 OR3504470					P45			x	x		202-656
45.00 45.00 45.00	1.00 1.50 2.00	OR1004500 OR1504500 OR2004500										463103	206-045 204-045
45.00 45.00 45.00	2.50 3.00 3.50	OR2504500 OR3004500 OR3504500											206-145 206-345 206-595
45.00 45.00 45.00	3.55 4.00 4.50	ORIC04500 OR4004500 OR4504500			x			x					204-145



O-Ring

Inside diameter d ₁	Cross section d ₂	Part No.	Standard									Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518		
45.00	5.00	OR5004500										461010	204-645
45.00	5.30	ORID04500			x			x					
45.00	5.50	OR5504500											
45.00	6.00	OR6004500										463415	
45.00	7.00	ORIE04500											
45.20	3.00	OR3004520									x		202-727
45.30	5.70	OR5704530									x		202-811
45.60	2.40	OR2404560									x		202-673
45.69	2.62	ORAR00133	133	x								466238	200-133
45.70	3.50	OR3504570					P46						
46.00	2.00	OR2004600											204-046
46.00	2.50	OR2504600											206-146
46.00	3.00	OR3004600										461624	206-346
46.00	3.50	OR3504600											206-596
46.00	4.00	OR4004600											204-146
46.00	4.50	OR4504600											
46.00	5.00	OR5004600											204-456
46.00	6.00	OR6004600											
46.20	3.00	OR3004620									x	469838	202-728
46.20	3.55	ORIC04620			x			x					
46.20	5.30	ORID04620			x			x					
46.99	5.33	ORAR00328	328	x					R31			464729	200-328
47.00	2.00	OR2004700											204-047
47.00	2.50	OR2504700											206-147
47.00	3.00	OR3004700											206-347
47.00	4.00	OR4004700											204-147
47.00	5.00	OR5004700											204-647
47.20	5.70	OR5704720											
47.22	3.53	ORAR00225	225	x								464651	200-225
47.29	2.62	ORAR00134	134	x								466711	200-134
47.30	5.70	OR5704730									x		202-812
47.35	1.78	ORAR00032	032	x								466621	200-032
47.50	3.55	ORIC04750			x			x					
47.50	5.30	ORID04750			x			x					
47.60	2.40	OR2404760					P48A				x		202-657
47.60	5.70	OR5704760											
47.70	3.50	OR3504770					P47						
48.00	1.00	OR1004800											
48.00	1.50	OR1504800											206-048

O-Ring



Inside diameter d ₁	Cross section d ₂	Part No.	Standard								Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518	
48.00	2.00	OR2004800									466066	204-048
48.00	2.50	OR2504800									465784	206-148
48.00	3.00	OR3004800									462360	206-348
48.00	4.00	OR4004800									463833	204-148
48.00	4.50	OR4504800										
48.00	5.00	OR5004800										204-648
48.00	6.00	OR6004800										
48.00	7.00	ORIE04800									569110	
48.70	3.50	OR3504870					P49					
48.70	3.55	ORIC04870			x			x				
48.70	5.30	ORID04870			x			x				
48.90	2.62	ORAR00135	135	x							466664	200-135
49.00	1.50	OR1504900										206-049
49.00	2.50	OR2504900										206-149
49.00	3.00	OR3004900										206-349
49.00	3.50	OR3504900									569092	206-599
49.00	4.00	OR4004900									465860	204-149
49.20	5.70	OR5704920				x				x	461392	202-813
49.40	3.10	OR3104940					G50					
49.50	3.00	OR3004950				x					x	463730
49.60	2.40	OR2404960									x	202-729
												202-658
49.60	5.70	OR5704960					P50A					
49.70	3.50	OR3504970					P50					
50.00	1.50	OR1505000										206-050
50.00	2.00	OR2005000									465699	204-050
50.00	2.50	OR2505000										206-150
50.00	3.00	OR3005000									461864	206-350
50.00	3.55	ORIC05000			x			x				
50.00	4.00	OR4005000									466092	204-150
50.00	4.50	OR4505000										
50.00	5.00	OR5005000									463943	204-650
50.00	5.30	ORID05000			x			x				
50.00	5.50	OR5505000										
50.00	6.00	OR6005000									569106	
50.00	6.50	OR6505000										
50.00	7.00	ORIE05000										
50.17	5.33	ORAR00329	329	x					R32		466148	200-329
50.20	3.00	OR3005020										202-730
50.39	3.53	ORAR00226	226	x							x	200-226



O-Ring

Inside diameter d ₁	Cross section d ₂	Part No.	Standard									Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518		
50.47 50.52 51.00	2.62 1.78 2.50	ORAR00136 ORAR00033 OR2505100	136 033	x x								466239 466678 462287	200-136 200-033 206-151
51.00 51.00 51.00	3.00 4.00 4.50	OR3005100 OR4005100 OR4505100											206-351 204-151
51.00 51.20 51.50	5.50 5.70 1.50	OR5505100 OR5705120 OR1505150									x	466358	202-814
51.50 51.50 51.60	3.55 5.30 2.40	ORIC05150 ORID05150 OR2405160			x x			x x			x		202-659
51.60 52.00 52.00	5.70 1.50 2.00	OR5705160 OR1505200 OR2005200				P52						466441	206-052 204-052
52.00 52.00 52.00	2.50 3.00 3.50	OR2505200 OR3005200 OR3505200										465853	206-152 206-352 206-602
52.00 52.00 52.00	4.00 5.00 6.00	OR4005200 OR5005200 OR6005200											204-152 204-652
52.07 52.30 52.60	2.62 5.70 5.70	ORAR00137 OR5705230 OR5705260	137	x			P53				x	466645	200-137 202-815
53.00 53.00 53.00	1.50 2.00 2.50	OR1505300 OR2005300 OR2505300											206-053 206-053 206-153
53.00 53.00 53.00	3.00 3.50 3.55	OR3005300 OR3505300 ORIC05300			x			x					206-353 206-603
53.00 53.00 53.00	5.00 5.30 6.00	OR5005300 ORID05300 OR6005300			x			x				465508 465579	204-653
53.00 53.09 53.34	7.00 3.00 5.33	ORIE05300 ORAR00928 ORAR00330	928 330	x x					R33			569114 466384	200-928 200-330
53.57 53.64 53.70	3.53 2.62 1.78	ORAR00227 ORAR00138 ORAR00034	227 138 034	x x x								466053 466731 465375	200-227 200-138 200-034

O-Ring



Inside diameter d ₁	Cross section d ₂	Part No.	Standard									Reference No. Skega	Reference No. Dowty	
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518			
54.00	1.50	OR1505400										462288	206-054	
54.00	2.50	OR2505400											206-154	
54.00	3.00	OR3005400											206-354	
54.00	4.00	OR4005400											204-154	
54.00	5.00	OR5005400											204-654	
54.00	5.50	OR5505400												
54.00	6.00	OR6005400										461371		
54.20	5.70	OR5705420				x								
54.30	5.70	OR5705430								x			202-816	
54.40	3.10	OR3105440					G55					463731	202-731	
54.50	3.00	OR3005450				x					x			
54.50	3.55	ORIC05450			x			x						
54.50	5.30	ORID05450			x			x				202-660		
54.60	2.40	OR2405460								x				
54.60	5.70	OR5705460					P55							
55.00	1.50	OR1505500										462650	206-055	
55.00	2.00	OR2005500											204-055	
55.00	2.50	OR2505500											206-155	
55.00	3.00	OR3005500										466442	206-355	
55.00	3.50	OR3505500											206-605	
55.00	4.00	OR4005500											204-155	
55.00	5.00	OR5005500										463436	204-655	
55.00	6.00	OR6005500												
55.20	3.00	OR3005520									x		202-732	
55.25	2.62	ORAR00139	139	x								466177	200-139	
55.30	5.70	OR5705530											x	202-879
55.50	3.00	OR3005550											x	202-790
55.60	2.40	OR2405560					P56				x	560011	202-674	
55.60	5.70	OR5705560									x			
56.00	2.00	OR2005600												204-056
56.00	2.50	OR2505600											206-156	
56.00	3.00	OR3005600											206-356	
56.00	3.55	ORIC05600			x			x						
56.00	4.00	OR4005600										461849 469843	204-156	
56.00	4.50	OR4505600												
56.00	5.20	OR5205600												
56.00	5.30	ORID05600	331	x	x			x				464419	202-733 200-331	
56.20	3.00	OR3005620									x			
56.52	5.33	ORAR00331							R34					



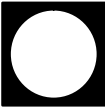
O-Ring

Inside diameter d ₁	Cross section d ₂	Part No.	Standard								Reference No. Skega	Reference No. Dowty		
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2			BS4518	
56.60 56.74 56.82	2.90 3.53 2.62	OR2905660 ORAR00228 ORAR00140	228 140	x x						x		466185	200-228 200-140	
56.87 57.00 57.00	1.78 1.50 2.00	ORAR00035 OR1505700 OR2005700	035	x								465085	200-035 206-057 204-057	
57.00 57.00 57.00	2.50 3.00 4.00	OR2505700 OR3005700 OR4005700											206-157 206-357 204-157	
57.00 57.00 57.20	4.50 8.00 3.00	OR4505700 OR8005700 OR3005720										x	461761	202-734
57.20 57.30 57.50	5.70 5.70 3.00	OR5705720 OR5705730 OR3005750										x x x	463214 466671	202-817 202-791
57.60 57.60 58.00	2.40 5.70 2.00	OR2405760 OR5705760 OR2005800					P58				x		202-661 204-058	
58.00 58.00 58.00	2.50 3.00 3.55	OR2505800 OR3005800 ORIC05800											206-158 206-358	
58.00 58.00 58.00	4.00 5.00 5.30	OR4005800 OR5005800 ORID05800											464177 462930	204-158 204-658
58.00 58.00 58.00	5.50 6.00 7.00	OR5505800 OR6005800 ORIE05800											465426 465874	
58.42 58.60 59.00	2.62 2.40 1.50	ORAR00141 OR2405860 OR1505900	141	x								x	466279	200-141 202-675 206-059
59.00 59.00 59.20	2.50 3.00 5.70	OR2505900 OR3005900 OR5705920											461374	206-159 206-359
59.30 59.36 59.40	5.70 3.00 3.10	OR5705930 ORAR00932 OR3105940	932	x				G60				x		202-818 200-932
59.50 59.60 59.60	3.00 2.40 5.70	OR3005950 OR2405960 OR5705960					x					x x	462411 465481	202-735 202-662

O-Ring



Inside diameter d ₁	Cross section d ₂	Part No.	Standard									Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518		
59.69 59.92 59.99	5.33 3.53 2.62	ORAR00332 ORAR00229 ORAR00142	332 229 142	x x x					R35			461894 466186 465548	200-332 200-229 200-142
60.00 60.00 60.00	1.50 2.00 2.50	OR1506000 OR2006000 OR2506000										466443 466444	206-060 204-060 206-160
60.00 60.00 60.00	3.00 3.50 3.55	OR3006000 OR3506000 ORIC06000			x			x				466957	206-360 206-610
60.00 60.00 60.00	4.00 4.50 5.00	OR4006000 OR4506000 OR5006000										466465 466583 462566	204-160 204-660
60.00 60.00 60.00	5.30 6.00 7.00	ORID06000 OR6006000 ORIE06000			x			x				465239 461812	
60.05 60.50 61.00	1.78 3.00 5.00	ORAR00036 OR3006050 OR5006100	036	x							x	569140 469884	200-036 202-736 204-661
61.20 61.30 61.50	5.70 5.70 3.55	OR5706120 OR5706130 ORIC06150				x		x			x	464924	 202-819
61.50 61.60 61.60	5.30 2.40 2.62	ORID06150 OR2406160 ORAR00143	143	x	x			x			x	466161	202-663 200-143
61.60 62.00 62.00	5.70 1.50 2.00	OR5706160 OR1506200 OR2006200					P62					465500	206-062 204-062
62.00 62.00 62.00	2.50 3.00 4.00	OR2506200 OR3006200 OR4006200											206-162 206-362 204-162
62.00 62.00 62.20	5.00 6.00 3.00	OR5006200 OR6006200 OR3006220									x		204-662 202-737
62.20 62.30 62.60	5.70 5.70 2.40	OR5706220 OR5706230 OR2406260									x x		202-820 202-676
62.60 62.87 63.00	5.70 5.33 1.50	OR5706260 ORAR00333 OR1506300	333	x			P63		R36			466124	200-333 206-063



O-Ring

Inside diameter d ₁	Cross section d ₂	Part No.	Standard									Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518		
63.00	2.00	OR2006300										463694	204-063
63.00	2.50	OR2506300											206-163
63.00	3.00	OR3006300											206-363
63.00	3.55	ORIC06300			x			x				465910	204-163
63.00	4.00	OR4006300											
63.00	4.50	OR4506300											
63.00	5.00	OR5006300										465316	204-663
63.00	5.30	ORID06300			x			x					
63.00	7.00	ORIE06300											
63.09	3.53	ORAR00230	230	x								466495	200-230
63.17	2.62	ORAR00144	144	x								466988	200-144
63.22	1.78	ORAR00037	037	x									200-037
64.00	3.00	OR3006400											206-364
64.00	3.50	OR3506400											206-614
64.00	4.00	OR4006400											204-164
64.00	5.00	OR5006400										462929	204-664
64.00	6.00	OR6006400										465273	
64.20	5.70	OR5706420				x						461328	
64.30	5.70	OR5706430									x		202-821
64.40	3.10	OR3106440					G65						
64.50	3.00	OR3006450				x					x	463574	202-738
64.60	2.40	OR2406460											202-664
64.60	5.70	OR5706460					P65				x		
64.77	2.62	ORAR00145	145	x								466049	200-145
65.00	1.50	OR1506500											206-065
65.00	2.00	OR2006500											204-065
65.00	2.50	OR2506500											206-165
65.00	3.00	OR3006500											206-365
65.00	3.50	OR3506500											206-615
65.00	3.55	ORIC06500			x			x					
65.00	4.00	OR4006500											204-165
65.00	4.50	OR4506500										461828	204-665
65.00	5.00	OR5006500											
65.00	5.30	ORID06500			x			x					
65.00	5.50	OR5506500											
66.00	2.00	OR2006600											204-066
66.00	3.00	OR3006600										569105	206-366
66.00	5.00	OR5006600											204-666
66.04	5.33	ORAR00334	334	x					R37			464140	200-334

O-Ring



Inside diameter d ₁	Cross section d ₂	Part No.	Standard									Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518		
66.27 66.34 66.40	3.53 2.62 1.78	ORAR00231 ORAR00146 ORAR00038	231 146 038	x x x								461652 465815 466727	200-231 200-146 200-038
66.60 67.00 67.00	5.70 1.50 2.00	OR5706660 OR1506700 OR2006700					P67						206-067 204-067
												463073	
67.00 67.00 67.00	2.50 3.00 3.55	OR2506700 OR3006700 ORIC06700										461696 462789	206-167 206-367
					x			x					
67.00 67.00 67.20	4.00 5.30 3.00	OR4006700 ORID06700 OR3006720											204-167
					x			x					
67.20 67.30 67.60	5.70 5.70 2.40	OR5706720 OR5706730 OR2406760											202-822 202-665
											x x		
67.95 68.00 68.00	2.62 2.00 2.50	ORAR00147 OR2006800 OR2506800	147	x								465814	200-147 204-068 206-168
68.00 68.00 68.00	3.00 4.00 5.00	OR3006800 OR4006800 OR5006800										466843 569128	206-368 204-168 204-668
68.00 68.00 68.00	5.50 6.00 7.00	OR5506800 OR6006800 ORIE06800										465507 466717	
69.00 69.00 69.00	1.50 3.00 3.55	OR1506900 OR3006900 ORIC06900										466088	206-069 206-369
					x			x					
69.00 69.00 69.00	4.50 5.30 6.00	OR4506900 ORID06900 OR6006900											
					x			x					
69.20 69.22 69.30	5.70 5.33 5.70	OR5706920 ORAR00335 OR5706930	335	x		x			R38			461329 466322	200-335 202-823
											x		
69.40 69.44 69.50	3.10 3.53 3.00	OR3106940 ORAR00232 OR3006950	232	x			G70					466680 463732	200-232 202-739
						x							
69.52 69.57 69.60	2.62 1.78 2.40	ORAR00148 ORAR00039 OR2406960	148 039	x x								465813	200-148 200-039 202-666
											x		



O-Ring

Inside diameter d ₁	Cross section d ₂	Part No.	Standard									Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518		
69.60 70.00 70.00	5.70 2.00 2.50	OR5706960 OR2007000 OR2507000					P70						204-070 206-170
70.00 70.00 70.00	3.00 4.00 4.50	OR3007000 OR4007000 OR4507000										466461	206-070 204-170
70.00 70.00 70.00	5.00 5.50 6.00	OR5007000 OR5507000 OR6007000										461869	204-670
70.00 70.60 71.00	7.00 5.70 2.00	ORIE07000 OR5707060 OR2007100					P71						204-071
71.00 71.00 71.00	3.00 3.55 5.30	OR3007100 ORIC07100 ORID07100			x x			x x					206-371
71.12 71.20 71.30	2.62 5.70 5.70	ORAR00149 OR5707120 OR5707130	149	x							x	466397 465782	200-149 202-824
71.50 72.00 72.00	1.50 2.00 2.50	OR1507150 OR2007200 OR2507200										465906	206-072 204-072 206-172
72.00 72.00 72.00	3.00 4.00 5.00	OR3007200 OR4007200 OR5007200										461629 463106 464360	206-372 204-172 204-672
72.00 72.00 72.30	5.50 7.00 5.70	OR5507200 ORIE07200 OR5707230									x	569115	202-825
72.39 72.62 72.69	5.33 3.53 2.62	ORAR00336 ORAR00233 ORAR00150	336 233 150	x x x					R39			466267 466277	200-336 200-233 200-150
72.75 73.00 73.00	1.78 2.00 2.50	ORAR00040 OR2007300 OR2507300	040	x								465086	200-040 204-073 206-173
73.00 73.00 73.00	3.00 3.55 5.00	OR3007300 ORIC07300 OR5007300			x			x					206-373 204-673
73.00 74.00 74.00	5.30 1.00 1.50	ORID07300 OR1007400 OR1507400			x			x					206-074

O-Ring



Inside diameter d ₁	Cross section d ₂	Part No.	Standard									Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518		
74.00	2.00	OR2007400											204-074 206-174 206-374
74.00	2.50	ORAR00174									x		
74.00	3.00	OR3007400											
74.00	4.00	OR4007400										465603	204-174
74.00	4.50	OR4507400											
74.00	6.00	OR6007400											
74.20	5.70	OR5707420				x	G75					461327	202-826
74.30	5.70	OR5707430									x		
74.40	3.10	OR3107440											
74.50	3.00	OR3007450				x	P75					463738	202-740 204-075
74.60	5.70	OR5707460									x		
75.00	2.00	OR2007500											
75.00	2.50	OR2507500											206-175 206-375 206-625
75.00	3.00	OR3007500											
75.00	3.50	OR3507500											
75.00	3.55	ORIC07500			x			x				462641	204-175
75.00	4.00	OR4007500											
75.00	4.50	OR4507500											
75.00	5.00	OR5007500										462641	204-675
75.00	5.30	ORID07500			x			x					
75.00	5.50	OR5507500											
75.00	6.00	OR6007500										466125	200-337
75.00	7.00	ORIE07500											
75.57	5.33	ORAR00337	337	x					R40				
75.79	3.53	ORAR00234	234	x								465692 465861	200-234 200-151 200-041
75.87	2.62	ORAR00151	151	x									
75.92	1.78	ORAR00041	041	x									
76.00	1.50	OR1507600											206-076 204-076 206-176
76.00	2.00	OR2007600											
76.00	2.50	OR2507600											
76.00	3.00	OR3007600										461648 469844	206-373 204-176
76.00	4.00	OR4007600											
76.00	4.50	OR4507600											
76.00	5.00	OR5007600											204-676 204-677 202-827
77.00	5.00	OR5007700											
77.30	5.70	OR5707730									x		
77.50	3.55	ORIC07750			x			x					206-078
77.50	5.30	ORID07750			x			x					
78.00	1.50	OR1507800											



O-Ring

Inside diameter d ₁	Cross section d ₂	Part No.	Standard								Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518	
78.00	2.00	OR2007800									462358	204-078
78.00	3.00	OR3007800									466014	206-378
78.00	3.50	OR3507800										206-628
78.00	4.00	OR4007800									463213	204-178
78.00	5.00	OR5007800									560092	204-678
78.00	6.00	OR6007800										
78.74	5.33	ORAR00338	338	x					R41		466337	200-338
78.97	3.53	ORAR00235	235	x							466054	200-235
79.00	2.00	OR2007900										204-079
79.00	3.00	OR3007900				x						206-379
79.20	5.70	OR5707920									461326	
79.30	5.70	OR5707930								x		202-828
79.40	3.10	OR3107940					G80					
79.50	3.00	OR3007950								x	463733	202-741
79.50	7.00	ORIE07950										
79.60	5.70	OR5707960					P80					
80.00	1.50	OR1508000										206-080
80.00	2.00	OR2008000										204-080
80.00	2.50	OR2508000										206-180
80.00	3.00	OR3008000									461235	206-380
80.00	3.55	ORIC08000			x			x				
80.00	4.00	OR4008000									466010	204-180
80.00	4.50	OR4508000										
80.00	5.00	OR5008000										204-680
80.00	5.30	ORID08000			x			x				
80.00	5.50	OR5508000									460588	
80.00	6.00	OR6008000										
80.50	1.50	OR1508050										
81.00	7.00	ORIE08100										
81.30	5.70	OR5708130								x		202-829
81.92	5.33	ORAR00339	339	x					R42		464420	200-339
82.00	3.00	OR3008200										206-382
82.00	4.00	OR4008200									466676	204-182
82.00	5.00	OR5008200										204-682
82.14	3.53	ORAR00236	236	x							465397	200-236
82.20	5.70	OR5708220										
82.22	2.62	ORAR00152	152	x							465649	200-152
82.27	1.78	ORAR00042	042	x							465629	200-042
82.50	3.55	ORIC08250			x			x				

O-Ring



Inside diameter d ₁	Cross section d ₂	Part No.	Standard									Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518		
82.50 83.00 83.00	5.30 2.00 3.00	ORID08250 OR2008300 OR3008300			x			x				464953	204-083 206-383
84.00 84.00 84.00	2.00 3.00 4.00	OR2008400 OR3008400 OR4008400										465764	204-084 206-384 204-184
84.00 84.10 84.20	6.00 5.70 5.70	OR6008400 OR5708410 OR5708420				x						461638	
84.30 84.40 84.50	5.70 3.10 3.00	OR5708430 OR3108440 OR3008450					G85				x	461650	202-831 202-742
84.60 85.00 85.00	5.70 2.00 2.50	OR5708460 OR2008500 OR2508500					P85					465681	204-085 206-185
85.00 85.00 85.00	3.00 3.55 4.00	OR3008500 ORIC08500 OR4008500			x			x					206-385 204-185
85.00 85.00 85.00	4.50 5.00 5.30	OR4508500 OR5008500 ORID08500				x		x				461859	204-685
85.00 85.00 85.00	5.50 6.00 7.00	OR5508500 OR6008500 ORIE08500										461829	
85.09 85.32 85.50	5.33 3.53 2.50	ORAR00340 ORAR00237 OR2508550	340 237	x x					R43			466098 466551	200-340 200-237
86.00 86.00 86.00	2.00 3.00 4.00	OR2008600 OR3008600 OR4008600											204-086 206-386
86.00 87.00 87.00	4.50 4.00 5.00	OR4508600 OR4008700 OR5008700											204-187 204-687
87.20 87.30 87.50	5.70 5.70 3.55	OR5708720 OR5708730 ORIC08750			x			x			x	463666	202-832
87.50 88.00 88.00	5.30 1.50 3.00	ORID08750 OR1508800 OR3008800			x			x					206-088 206-388



O-Ring

Inside diameter d ₁	Cross section d ₂	Part No.	Standard									Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518		
88.00	4.00	OR4008800											204-188
88.00	5.00	OR5008800											204-688
88.00	6.00	OR6008800											
88.27	5.33	ORAR00341	341	x					R44			466156	200-341
88.49	3.53	ORAR00238	238	x								466004	200-238
88.57	2.62	ORAR00153	153	x									200-153
88.62	1.78	ORAR00043	043	x								465740	200-043
89.00	3.00	OR3008900											206-389
89.00	4.50	OR4508900											
89.00	7.00	ORIE08900				x						466108	
89.10	5.70	OR5708910									x	461325	
89.30	5.70	OR5708930											202-833
89.40	3.10	OR3108940				x	G90						
89.50	3.00	OR3008950					P90				x	461821	202-743
89.60	5.70	OR5708960											
90.00	1.00	OR1009000											
90.00	2.00	OR2009000										465630	204-090
90.00	2.50	OR2509000											206-190
90.00	3.00	OR3009000											206-390
90.00	3.55	ORIC09000			x			x					
90.00	4.00	OR4009000										466610	204-190
90.00	4.50	OR4509000											
90.00	5.00	OR5009000										463589	204-690
90.00	5.30	ORID09000			x			x					
90.00	5.50	OR5509000											
90.00	6.00	OR6009000											
90.00	7.00	ORIE09000											
91.44	5.33	ORAR00342	342	x					R45			464457	200-342
91.67	3.53	ORAR00239	239	x								466846	200-239
92.00	1.50	OR1509200											206-092
92.00	3.00	OR3009200										466291	206-392
92.00	4.00	OR4009200											204-192
92.00	4.50	OR4509200											
92.00	5.00	OR5009200											204-692
92.00	5.50	OR5509200											
92.00	7.00	ORIE09200										464778	
92.30	5.70	OR5709230									x		202-834
92.50	3.55	ORIC09250			x			x					
92.50	5.30	ORID09250			x			x					

O-Ring



Inside diameter d ₁	Cross section d ₂	Part No.	Standard								Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518	
93.00	2.00	OR2009300										204-093
93.00	3.00	OR3009300										206-393
93.00	4.00	OR4009300										204-193
93.50	4.50	OR4509350										206-194
94.00	2.50	OR2509400										206-394
94.00	3.00	OR3009400										
94.00	4.00	OR4009400										204-194
94.00	5.00	OR5009400									462584	204-694
94.00	7.00	ORIE09400										
94.10	5.70	OR5709410				x					461486	202-835
94.30	5.70	OR5709430									x	
94.40	3.10	OR3109440					G95					
94.50	3.00	OR3009450				x					x	462744
94.60	5.70	OR5709460					P95					202-744
94.62	5.33	ORAR00343	343	x					R46			466243
												200-343
94.84	3.53	ORAR00240	240	x								466777
94.92	2.62	ORAR00154	154	x								200-240
94.97	1.78	ORAR00044	044	x								200-154
												200-044
95.00	2.00	OR2009500										204-095
95.00	2.50	OR2509500										206-195
95.00	3.55	ORIC09500			x			x				
95.00	4.00	OR4009500										204-195
95.00	4.50	OR4509500										
95.00	5.00	OR5009500									464630	204-695
95.00	5.30	ORID09500			x			x				
95.00	5.50	OR5509500										
95.00	6.00	OR6009500									465873	
95.00	7.00	ORIE09500										
96.00	2.50	OR2509600										206-196
96.00	3.00	OR3009600									465865	206-396
96.00	4.00	OR4009600										
96.00	5.00	OR5009600									469727	204-196
96.00	6.00	OR6009600										204-696
96.50	6.50	OR6509650										
97.00	3.50	OR3509700										206-647
97.00	5.00	OR5009700										204-697
97.30	5.70	OR5709730									x	202-836
97.50	3.55	ORIC09750			x			x				
97.50	5.30	ORID09750			x			x				



O-Ring

Inside diameter d ₁	Cross section d ₂	Part No.	Standard									Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518		
97.79 98.00 98.00	5.33 2.50 3.00	ORAR00344 OR2509800 OR3009800	344	x					R47			466244	200-344 206-198 206-398
98.00 98.02 99.00	4.00 3.53 3.00	OR4009800 ORAR00241 OR3009900	241	x								466644	204-198 200-241 206-399
99.00 99.10 99.30	7.00 5.70 5.70	ORIE09900 OR5709910 OR5709930				x					x	465955 461373	202-837
99.40 99.50 99.60	3.10 3.00 5.70	OR3109940 OR3009950 OR5709960				x	G100 P100				x	464167	202-745
100.00 100.00 100.00	1.00 1.50 2.00	OR1010000 OR1510000 OR2010000											206-100 204-100
100.00 100.00 100.00	2.50 3.00 3.55	OR2510000 OR3010000 ORIC10000											206-200 206-400
100.00 100.00 100.00	4.00 5.00 5.30	OR4010000 OR5010000 ORID10000										466875 464005	204-200 204-700
100.00 100.00 100.00	5.50 6.00 7.00	OR5510000 OR6010000 ORIE10000											
100.00 100.97 101.19	8.00 5.33 3.53	OR8010000 ORAR00345 ORAR00242	345 242	x x					R48			463700 466515	200-345 200-242
101.27 101.32 101.60	2.62 1.78 5.70	ORAR00155 ORAR00045 OR5710160	155 045	x x			P102						200-155 200-045
102.00 102.00 103.00	3.00 4.00 2.00	OR3010200 OR4010200 OR2010300											206-402 204-202 204-702
103.00 103.00 103.00	3.55 5.30 6.00	ORIC10300 ORID10300 OR6010300			x x			x x				560018	
104.00 104.00 104.00	2.50 3.00 4.00	OR2510400 OR3010400 OR4010400											206-204 206-404 204-204

O-Ring



Inside diameter d ₁	Cross section d ₂	Part No.	Standard									Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518		
104.00 104.00 104.10	5.00 6.00 5.70	OR5010400 OR6010400 OR5710410				x						462029	204-704
104.14 104.30 104.37	5.33 5.70 3.53	ORAR00346 OR5710430 ORAR00243	346 243	x x					R49		x	466245 466005	200-346 202-838 200-243
104.40 104.50 104.60	3.10 3.00 5.70	OR3110440 OR3010450 OR5710460				x	G105 P105				x	464236	202-746
105.00 105.00 105.00	2.00 2.50 3.00	OR2010500 OR2510500 OR3010500											206-205 206-405
105.00 105.00 105.00	3.50 4.00 4.50	OR3510500 OR4010500 OR4510500											206-655 204-205
105.00 105.00 106.00	5.00 6.00 2.00	OR5010500 OR6010500 OR2010600											204-705
106.00 106.00 106.00	3.00 3.55 4.50	OR3010600 ORIC10600 OR4510600			x			x					206-406
106.00 106.00 106.00	5.30 6.00 7.00	ORID10600 OR6010600 ORIE10600			x			x					
107.00 107.00 107.32	2.50 5.00 5.33	OR2510700 OR5010700 ORAR00347	347	x					R50			466246	206-207 204-707 200-347
107.54 107.62 107.67	3.53 2.62 1.78	ORAR00244 ORAR00156 ORAR00046	244 156 046	x x x								466247	200-244 200-156 200-046
108.00 108.00 108.00	3.00 4.00 6.00	OR3010800 OR4010800 OR6010800										465878	206-408 204-208
108.00 108.80 109.00	7.00 8.40 3.55	ORIE10800 OR8410880 ORIC10900			x							466968 462027	
109.00 109.10 109.20	5.30 5.70 5.70	ORID10900 OR5710910 OR5710920			x	x						461324	



O-Ring

Inside diameter d ₁	Cross section d ₂	Part No.	Standard									Reference No. Skega	Reference No. Dowty	
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518			
109.30	5.70	OR5710930					G110				x	462034	202-839	
109.40	3.10	OR3110940											x	202-747
109.50	3.00	OR3010950				x								
109.60	5.70	OR5710960					P110						206-410	
110.00	2.00	OR2011000												
110.00	3.00	OR3011000												
110.00	3.50	OR3511000											206-660 204-210	
110.00	4.00	OR4011000												
110.00	4.50	OR4511000												
110.00	5.00	OR5011000										465656	204-710	
110.00	5.50	OR5511000												
110.00	6.00	OR6011000												
110.00	8.00	OR8011000										466233 466574	200-348 200-245	
110.49	5.33	ORAR00348	348	x				R51						
110.72	3.53	ORAR00245	245	x										
111.60	5.70	OR5711160					P112						206-212	
112.00	1.50	OR1511200												
112.00	2.50	OR2511200												
112.00	3.00	OR3011200											206-412 204-212	
112.00	3.55	ORIC11200			x			x						
112.00	4.00	OR4011200												
112.00	5.00	OR5011200											204-712	
112.00	5.30	ORID11200			x			x						
112.00	6.00	OR6011200												
112.00	8.00	OR8011200											206-663 204-213	
113.00	3.50	OR3511300												
113.00	4.00	OR4011300												
113.67	5.33	ORAR00349	349	x					R52			466157 466519 466006	200-349 200-425 200-246	
113.67	7.00	ORAR00425	425	x					R53					
113.89	3.53	ORAR00246	246	x										
113.97	2.62	ORAR00157	157	x									200-157 206-414 204-214	
114.00	3.00	OR3011400												
114.00	4.00	OR4011400												
114.00	6.00	OR6011400											200-047	
114.00	8.00	OR8011400												
114.02	1.78	ORAR00047	047	x										
114.30	5.70	OR5711430				x	G115				x	462808	202-840	
114.40	3.10	OR3111440										x	463734	202-748
114.50	3.00	OR3011450				x								

O-Ring



Inside diameter d ₁	Cross section d ₂	Part No.	Standard									Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518		
114.60 115.00 115.00	5.70 2.00 2.50	OR5711460 OR2011500 OR2511500					P115					465789	206-215
115.00 115.00 115.00	3.00 3.55 4.00	OR3011500 ORIC11500 OR4011500			x			x					206-415 204-215
115.00 115.00 115.00	4.50 5.00 5.30	OR4511500 OR5011500 ORID11500			x			x					204-715
115.00 115.00 116.00	6.00 7.00 3.00	OR6011500 ORIE11500 OR3011600			x			x					206-416
116.00 116.84 116.84	4.00 5.33 7.00	OR4011600 ORAR00350 ORAR00426	350 426	x x					R54			463629 466592	204-216 200-350 200-426
117.00 117.00 117.00	2.50 4.00 8.00	OR2511700 OR4011700 OR8011700										463216 466171	206-217 204-217
117.07 118.00 118.00	3.53 2.00 3.00	ORAR00247 OR2011800 OR3011800	247	x								466249 464986	200-247 206-418
118.00 118.00 118.00	3.55 4.00 4.50	ORIC11800 OR4011800 OR4511800			x			x					204-218
118.00 118.00 118.00	5.00 5.30 6.00	OR5011800 ORID11800 OR6011800			x			x					204-718
119.00 119.30 119.40	3.00 5.70 3.10	OR3011900 OR5711930 OR3111940				x	G120				x	462400	206-419 202-841
119.50 119.60 120.00	3.00 5.70 2.00	OR3011950 OR5711960 OR2012000				x	P120				x	462986	202-749
120.00 120.00 120.00	2.50 3.00 3.50	OR2512000 OR3012000 OR3512000											206-220 206-420 206-670
120.00 120.00 120.00	4.00 4.50 5.00	OR4012000 OR4512000 OR5012000											204-220 204-720



O-Ring

Inside diameter d ₁	Cross section d ₂	Part No.	Standard									Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518		
120.00 120.02 120.02	6.00 5.33 7.00	OR6012000 ORAR00351 ORAR00427	351 427	x x					R55				200-351 200-427
120.24 120.32 120.37	3.53 2.62 1.78	ORAR00248 ORAR00158 ORAR00048	248 158 048	x x x								466250	200-248 200-158 200-048
122.00 122.00 122.00	2.00 3.00 3.55	OR2012200 OR3012200 ORIC12200			x			x					206-422
122.00 122.00 123.00	4.00 5.30 6.00	OR4012200 ORID12200 OR6012300			x			x					204-222 204-722
123.19 123.19 123.42	5.33 7.00 3.53	ORAR00352 ORAR00428 ORAR00249	352 428 249	x x x					R56			465048 466719	200-352 200-428 200-249
124.00 124.00 124.30	4.00 4.50 5.70	OR4012400 OR4512400 OR5712430				x					x	462471	204-224 202-842
124.40 124.50 124.60	3.10 3.00 5.70	OR3112440 OR3012450 OR5712460				x	G125 P125				x	463735	202-750
125.00 125.00 125.00	2.00 2.50 3.00	OR2012500 OR2512500 OR3012500											206-225 206-425
125.00 125.00 125.00	3.50 3.55 4.00	OR3512500 ORIC12500 OR4012500			x			x					206-675 204-225
125.00 125.00 125.00	5.00 5.30 6.00	OR5012500 ORID12500 OR6012500			x			x					204-725
125.00 126.00 126.00	8.00 4.00 4.50	OR8012500 OR4012600 OR4512600											204-226 204-726
126.37 126.37 126.59	5.33 7.00 3.53	ORAR00353 ORAR00429 ORAR00250	353 429 250	x x x					R57			466596 465802	200-353 200-429 200-250
126.67 126.72 127.00	2.62 1.78 4.00	ORAR00159 ORAR00049 OR4012700	159 049	x x									200-159 200-049 204-227

O-Ring



Inside diameter d ₁	Cross section d ₂	Part No.	Standard								Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518	
127.00	5.00	OR5012700										204-727
128.00	2.00	OR2012800										206-228
128.00	2.50	OR2512800										
128.00	3.00	OR3012800									461621	206-428
128.00	3.55	ORIC12800			x			x				
128.00	5.30	ORID12800			x			x				
128.00	6.00	OR6012800										204-229
129.00	4.00	OR4012900										202-843
129.30	5.70	OR5712930				x					x	
129.40	3.10	OR3112940					G130					
129.50	3.00	OR3012950				x					x	463736
129.54	5.33	ORAR00354	354	x								202-751
129.54	7.00	ORAR00430	430	x					R58			200-430
129.60	5.70	OR5712960					P130					569120
129.77	3.53	ORAR00251	251	x								200-251
130.00	2.00	OR2013000										206-230
130.00	2.50	OR2513000										206-430
130.00	3.00	OR3013000										
130.00	4.00	OR4013000										204-230
130.00	4.50	OR4513000										
130.00	5.00	OR5013000									464546	204-730
130.00	5.50	OR5513000										
130.00	6.00	OR6013000									466892	
130.00	7.50	OR7513000										
131.50	4.50	OR4513150					P132					
131.60	5.70	OR5713160										
132.00	2.00	OR2013200										
132.00	3.00	OR3013200										206-432
132.00	3.55	ORIC13200			x			x				204-232
132.00	4.00	OR4013200										
132.00	5.00	OR5013200										204-732
132.00	5.30	ORID13200			x			x				
132.00	8.00	OR8013200										
132.72	5.33	ORAR00355	355	x								200-355
132.72	7.00	ORAR00431	431	x					R59		466254	200-431
132.94	3.53	ORAR00252	252	x							466720	200-252
133.00	2.62	ORAR00160	160	x							465742	200-160
133.00	4.00	OR4013300		x								204-233
133.02	2.62	ORAR00160	160	x								



O-Ring

Inside diameter d ₁	Cross section d ₂	Part No.	Standard									Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518		
133.07 134.00 134.00	1.78 3.00 4.00	ORAR00050 OR3013400 OR4013400	050	x									200-050 206-434 204-234
134.00 134.30 134.40	5.00 5.70 3.10	OR5013400 OR5713430 OR3113440				x	G135				x	461895	204-734 202-844
134.50 135.00 135.00	3.00 2.00 2.50	OR3013450 OR2013500 OR2513500				x					x	462985	202-752 206-235
135.00 135.00 135.00	3.00 4.00 5.00	OR3013500 OR4013500 OR5013500										460630	206-435 204-235 204-735
135.00 135.60 135.89	6.00 5.70 5.33	OR6013500 OR5713560 ORAR00356	356	x			P135						200-356
135.89 136.00 136.00	7.00 3.55 5.30	ORAR00432 ORIC13600 ORID13600	432	x	x x			x x	R60			466255	200-432
136.00 136.12 138.00	8.00 3.53 3.00	OR8013600 ORAR00253 OR3013800	253	x								466822	200-253 206-438
138.00 138.00 139.07	5.00 6.00 5.33	OR5013800 OR6013800 ORAR00357	357	x									200-357
139.07 139.29 139.30	7.00 3.53 5.70	ORAR00433 ORAR00254 OR5713930	433 254	x x		x			R61			466598 466564 462788	200-433 200-254 202-845
139.37 139.40 139.50	2.62 3.10 3.00	ORAR00161 OR3113940 OR3013950	161	x		x	G140				x	463664	200-161 202-753
139.60 140.00 140.00	5.70 2.00 2.50	OR5713960 OR2014000 OR2514000					P140						206-240
140.00 140.00 140.00	3.00 3.55 4.00	OR3014000 ORIC14000 OR4014000			x			x					206-440 204-240
140.00 140.00 140.00	4.50 5.00 5.30	OR4514000 OR5014000 ORID14000			x			x					204-740

O-Ring



Inside diameter d ₁	Cross section d ₂	Part No.	Standard								Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518	
142.00	4.00	OR4014200	358	x								204-242
142.00	6.00	OR6014200										
142.24	5.33	ORAR00358										
142.24	7.00	ORAR00434	434	x					R62			200-434
142.47	3.53	ORAR00255	255	x								
143.00	2.00	OR2014300										
144.00	4.00	OR4014400										204-244
144.00	5.00	OR5014400										
144.00	8.00	OR8014400										
144.10	8.40	OR8414410				x	G145				x	202-905
144.30	5.70	OR5714430				x					x	
144.40	3.10	OR3114440										
144.50	3.00	OR3014450				x	P145				x	202-754
144.60	5.70	OR5714460										
145.00	2.50	OR2514500										
145.00	3.55	ORIC14500			x			x				204-245
145.00	4.00	OR4014500										
145.00	4.50	OR4514500										
145.00	5.30	ORID14500			x			x				200-359
145.00	6.00	OR6014500										
145.42	5.33	ORAR00359	359	x								
145.42	7.00	ORAR00435	435	x					R63			200-435
145.64	3.53	ORAR00256	256	x								
145.72	2.62	ORAR00162	162	x								
146.00	2.00	OR2014600										206-446
146.00	3.00	OR3014600										
146.00	4.00	OR4014600										
148.00	4.00	OR4014800										204-248
148.00	6.00	OR6014800										
148.59	5.33	ORAR00360	360	x								
148.59	7.00	ORAR00436	436	x					R64			200-436
148.82	3.53	ORAR00257	257	x								
149.00	3.00	OR3014900										
149.00	5.00	OR5014900				x					x	204-749
149.10	8.40	OR8414910										
149.20	5.70	OR5714920										
149.30	5.70	OR5714930					G150				x	202-847
149.50	3.00	OR3014950					P150A				x	
149.50	8.40	OR8414950										



O-Ring

Inside diameter d ₁	Cross section d ₂	Part No.	Standard									Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518		
149.60 150.00 150.00	5.70 2.00 2.50	OR5714960 OR2015000 OR2515000					P150						206-250
150.00 150.00 150.00	3.00 3.55 4.00	OR3015000 ORIC15000 OR4015000			x			x				462430	206-450 204-250
150.00 150.00 150.00	4.50 5.00 5.30	OR4515000 OR5015000 ORID15000			x			x					204-750
150.00 150.00 151.77	6.00 8.00 5.33	OR6015000 OR8015000 ORAR00361	361	x								465185	200-361
151.77 151.99 152.00	7.00 3.53 7.50	ORAR00437 ORAR00258 OR7515200	437 258	x x					R65			466599 466278	200-437 200-258
152.07 153.00 153.00	2.62 4.50 6.00	ORAR00163 OR4515300 OR6015300	163	x									200-163
153.50 154.00 154.10	1.60 3.00 8.40	OR1615350 OR3015400 OR8415410				x					x	463079	206-454 202-907
154.30 154.50 154.50	5.70 3.00 8.40	OR5715430 OR3015450 OR8415450					G155 P155				x x	463740 461958	202-848 202-756
155.00 155.00 155.00	2.50 3.00 3.55	OR2515500 OR3015500 ORIC15500			x			x					206-455
155.00 155.00 155.00	4.00 4.50 5.00	OR4015500 OR4515500 OR5015500										466715	204-255 204-755
155.00 155.00 155.60	5.30 8.00 6.99	ORID15500 OR8015500 ORA415560			x			x			x	466352	202-872
156.00 156.00 156.00	2.00 2.50 3.00	OR2015600 OR2515600 OR3015600										465880	206-456
156.00 157.00 158.00	4.00 3.00 5.00	OR4015600 OR3015700 OR5015800											204-256 206-457 204-758

O-Ring



Inside diameter d ₁	Cross section d ₂	Part No.	Standard									Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518		
158.00 158.12 158.12	6.00 5.33 7.00	OR6015800 ORAR00362 ORAR00438	362 438	x x						R66		466520	200-362 200-438
158.34 158.42 159.10	3.53 2.62 8.40	ORAR00259 ORAR00164 OR8415910	259 164	x x							x	466055 462904	200-259 200-164 202-908
159.30 159.50 159.50	5.70 3.00 8.40	OR5715930 OR3015950 OR8415950				x	G160 P160				x x	462502	202-849 202-757
160.00 160.00 160.00	2.00 2.50 3.00	OR2016000 OR2516000 OR3016000											206-460
160.00 160.00 160.00	3.55 4.00 4.50	ORIC16000 OR4016000 OR4516000			x			x				461986	204-260
160.00 160.00 160.00	5.00 5.30 6.00	OR5016000 ORID16000 OR6016000			x			x				461816	204-760
160.00 162.00 164.00	8.00 3.00 3.00	OR8016000 OR3016200 OR3016400										463100	206-462 206-464
164.00 164.00 164.10	4.00 5.00 8.40	OR4016400 OR5016400 OR8416410									x		204-264 204-764 202-909
164.30 164.47 164.47	5.70 5.33 7.00	OR5716430 ORAR00363 ORAR00439	363 439	x x		x	G165			R67	x	461646 465184 466480	202-850 200-363 200-439
164.50 164.50 164.69	3.00 8.40 3.53	OR3016450 OR8416450 ORAR00260	260	x			P165				x	465328	202-758 200-260
164.77 165.00 165.00	2.62 2.00 2.50	ORAR00165 OR2016500 OR2516500	165	x									200-165
165.00 165.00 165.00	3.00 3.55 4.00	OR3016500 ORIC16500 OR4016500			x			x				466779	206-465 204-265
165.00 165.00 165.00	4.50 5.00 5.30	OR4516500 OR5016500 ORID16500			x			x					204-765



O-Ring

Inside diameter d ₁	Cross section d ₂	Part No.	Standard									Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518		
165.00	6.00	OR6016500											
165.00	8.00	OR8016500											
166.00	6.00	OR6016600											
166.00	8.00	OR8016600										465756	
167.00	2.50	OR2516700											204-268
168.00	4.00	OR4016800											
168.00	5.00	OR5016800											204-768
169.10	8.40	OR8416910				x					x	463051	202-910
169.30	5.70	OR5716930				x	G170				x	463741	202-851
169.50	3.00	OR3016950									x		202-759
169.50	8.40	OR8416950					P170						
170.00	2.00	OR2017000											
170.00	2.50	OR2517000										461972	206-470
170.00	3.00	OR3017000											206-720
170.00	3.50	OR3517000											
170.00	3.55	ORIC17000			x			x					
170.00	4.00	OR4017000											204-270
170.00	5.00	OR5017000										466854	204-770
170.00	5.30	ORID17000			x			x					
170.00	6.00	OR6017000											
170.00	8.00	OR8017000											
170.82	5.33	ORAR00364	364	x								465113	200-364
170.82	7.00	ORAR00440	440	x					R68			466601	200-440
171.04	3.53	ORAR00261	261	x								466721	200-261
171.12	2.62	ORAR00166	166	x									200-166
172.00	4.00	OR4017200											204-272
172.00	6.00	OR6017200											
174.00	3.00	OR3017400											206-474
174.10	8.40	OR8417410				x					x	462959	202-911
174.30	5.70	OR5717430				x	G175				x	462737	202-852
174.50	3.00	OR3017450									x		202-760
174.50	8.40	OR8417450					P175						
175.00	2.00	OR2017500											
175.00	3.55	ORIC17500			x			x				465205	204-275
175.00	4.00	OR4017500											204-775
175.00	5.00	OR5017500											
175.00	5.30	ORID17500			x			x					
175.00	6.00	OR6017500											
175.00	7.00	ORIE17500											

O-Ring



Inside diameter d ₁	Cross section d ₂	Part No.	Standard									Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518		
175.00 177.17 177.17	8.00 5.33 7.00	OR8017500 ORAR00365 ORAR00441	365 441	x x								465181 466603	200-365 200-441
177.39 177.47 179.10	3.53 2.62 8.40	ORAR00262 ORAR00167 OR8417910	262 167	x x							x	466712 463075	200-262 200-167 202-912
179.30 179.50 183.52	5.70 3.00 5.33	OR5717930 OR3017950 ORAR00366	366	x		x					x x	462907 465967	202-853 202-761 200-366
183.52 183.74 183.82	7.00 3.53 2.62	ORAR00442 ORAR00263 ORAR00168	442 263 168	x x x								466509 466733	200-442 200-263 200-168
184.10 184.30 184.50	8.40 5.70 3.00	OR8418410 OR5718430 OR3018450				x x					x x x	463078 465161	202-913 202-854 202-762
189.10 189.30 189.50	8.40 5.70 3.00	OR8418910 OR5718930 OR3018950				x x					x x x	463262 464690 461779	202-914 202-855 202-763
189.87 189.87 190.09	5.33 7.00 3.53	ORAR00367 ORAR00443 ORAR00264	367 443 264	x x x								466271 466722	200-367 200-443 200-264
190.17 194.10 194.30	2.62 8.40 5.70	ORAR00169 OR8419410 OR5719430	169	x							x x	463076 462738	200-169 202-915 202-856
194.50 196.22 196.22	3.00 5.33 7.00	OR3019450 ORAR00368 ORAR00444	368 444	x x							x	461787 465173 466607	202-764 200-368 200-444
196.44 196.52 199.10	3.53 2.62 8.40	ORAR00265 ORAR00170 OR8419910	265 170	x x		x					x	466723 462776	200-265 200-170 202-916
199.30 199.50 202.57	5.70 3.00 5.33	OR5719930 OR3019950 ORAR00369	369	x		x					x x	462775	202-857 202-765 200-369
202.57 202.79 202.87	7.00 3.53 2.62	ORAR00445 ORAR00266 ORAR00171	445 266 171	x x x								466259 466414	200-445 200-266 200-171
204.30 208.92 209.10	5.70 5.33 8.40	OR5720430 ORAR00370 OR8420910	370	x		x x					x	465519	202-858 200-370 202-917



O-Ring

Inside diameter d ₁	Cross section d ₂	Part No.	Standard									Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518		
209.14	3.53	ORAR00267	267	x								466691	200-267
209.22	2.62	ORAR00172	172	x									200-172
209.30	5.70	OR5720930				x					x	463008	202-859
209.50	3.00	OR3020950									x	461615	202-789
210.00	4.00	OR4021000										465111	204-310
210.00	5.00	OR5021000										463545	204-810
210.00	6.50	OR6521000											
210.00	7.00	ORIE21000											
210.00	8.00	OR8021000											
212.00	2.50	OR2521200											
212.00	5.30	ORID21200			x			x					
212.00	6.00	OR6021200											
212.00	7.00	ORIE21200			x			x					206-513
213.00	3.00	OR3021300											
213.00	7.00	ORIE21300											
214.00	5.00	OR5021400					P215						204-814
214.50	8.40	OR8421450											206-515
215.00	3.00	OR3021500											
215.00	5.00	OR5021500											204-815
215.00	8.00	OR8021500											
215.27	5.33	ORAR00371	371	x								465999	200-371
215.27	7.00	ORAR00446	446	x					R74			466260	200-446
215.49	3.53	ORAR00268	268	x									200-268
215.57	2.62	ORAR00173	173	x									200-173
216.00	2.00	OR2021600											
216.00	4.00	OR4021600											204-316
217.00	5.00	OR5021700											204-817
218.00	5.30	ORID21800			x			x					
218.00	6.00	OR6021800											
218.00	7.00	ORIE21800			x			x					
218.50	4.50	OR4521850											
219.10	8.40	OR8421910				x					x	462903	202-918
219.30	5.70	OR5721930				x	G220					463948	202-860
219.50	3.00	OR3021950									x		202-767
219.50	8.40	OR8421950					P220						
220.00	2.00	OR2022000											
220.00	3.00	OR3022000											206-520
220.00	4.00	OR4022000										465204	204-320
220.00	5.00	OR5022000										462979	204-820

O-Ring



Inside diameter d ₁	Cross section d ₂	Part No.	Standard									Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518		
220.00 220.00 221.62	7.00 8.00 5.33	ORIE22000 OR8022000 ORAR00372	372	x									200-372
221.84 221.92 222.00	3.53 2.62 4.00	ORAR00269 ORAR00174 OR4022200	269 174	x x								466261	200-269 200-174 204-322
224.00 224.00 224.50	5.30 7.00 8.40	ORID22400 ORIE22400 OR8422450			x x		P225	x x					
225.00 225.00 225.00	3.00 4.00 5.00	OR3022500 OR4022500 OR5022500										461845	206-525 204-325 204-825
225.00 225.00 225.00	6.00 7.00 8.00	OR6022500 ORIE22500 OR8022500											
226.00 227.97 227.97	6.00 5.33 7.00	OR6022600 ORAR00373 ORAR00447	373 447	x x					R75			466363	200-373 200-447
228.00 228.00 228.19	4.00 7.00 3.53	OR4022800 ORIE22800 ORAR00270	270	x								466692 466830	204-328 200-270
228.27 229.00 229.10	2.62 6.00 8.40	ORAR00175 OR6022900 OR8422910	175	x		x					x	463806	200-175 202-919
229.30 229.50 230.00	5.70 8.40 2.00	OR5722930 OR8422950 OR2023000				x	G230 P230				x	462906	202-861
230.00 230.00 230.00	3.00 4.00 5.00	OR3023000 OR4023000 OR5023000										464361	206-530 204-330 204-830
230.00 230.00 230.00	5.30 7.00 8.00	ORID23000 ORIE23000 OR8023000			x x			x x				466418	
233.00 234.10 234.32	3.00 8.40 5.33	OR3023300 OR8423410 ORAR00374	374	x							x		206-533 202-923 200-374
234.50 234.54 234.62	8.40 3.53 2.62	OR8423450 ORAR00271 ORAR00176	271 176	x x			P235					466980	200-271 200-176



O-Ring

Inside diameter d ₁	Cross section d ₂	Part No.	Standard									Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518		
235.00 235.00 235.00	4.00 5.00 6.00	OR4023500 OR5023500 OR6023500											204-335 204-835
235.00 235.00 236.00	7.00 8.00 5.30	ORIE23500 OR8023500 ORID23600			x			x					
236.00 238.00 238.00	7.00 2.00 4.00	ORIE23600 OR2023800 OR4023800			x			x					204-338
238.00 238.00 239.10	5.00 8.00 8.40	OR5023800 OR8023800 OR8423910				x					x	462957	204-838 202-920
239.30 239.50 239.50	5.70 3.00 8.40	OR5723930 OR3023950 OR8423950				x	G240 P240				x x	463949	202-862 202-769
240.00 240.00 240.00	3.00 4.00 5.00	OR3024000 OR4024000 OR5024000										466474 465658	206-540 204-340 204-840
240.00 240.67 240.67	6.00 5.33 7.00	OR6024000 ORAR00375 ORAR00448	375 448	x x							R76	466183	200-375 200-448
240.89 240.97 242.00	3.53 2.62 5.00	ORAR00272 ORAR00177 OR5024200	272 177	x x								466477	200-272 200-177 204-842
242.00 242.00 243.00	6.00 8.00 5.30	OR6024200 OR8024200 ORID24300			x			x					
243.00 244.00 244.00	7.00 2.00 7.00	ORIE24300 OR2024400 ORIE24400			x			x					
244.50 244.50 245.00	3.00 8.40 3.00	OR3024450 OR8424450 OR3024500					P245				x	466862	202-793 206-545
245.00 246.00 247.00	5.00 4.00 6.00	OR5024500 OR4024600 OR6024700										466298	204-845 204-346
247.00 247.02 247.24	7.00 5.33 3.53	ORIE24700 ORAR00376 ORAR00273	376 273	x x								466272	200-680 200-376 200-273

O-Ring



Inside diameter d ₁	Cross section d ₂	Part No.	Standard									Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518		
247.32 248.00 249.10	2.62 5.00 8.40	ORAR00178 OR5024800 OR8424910	178	x		x					x	463050	200-178 204-848 202-921
249.30 249.50 249.50	5.70 3.00 8.40	OR5724930 OR3024950 OR8424950			x		G250 P250				x x	461925	202-863 202-770
250.00 250.00 250.00	3.00 3.55 4.00	OR3025000 ORIC25000 OR4025000											206-550 204-350
250.00 250.00 250.00	5.00 6.00 7.00	OR5025000 OR6025000 ORIE25000			x			x					204-850
250.00 253.37 253.37	8.00 5.33 7.00	OR8025000 ORAR00377 ORAR00449	377 449	x x					R77				200-377 200-449
253.59 254.00 254.50	3.53 3.00 8.40	ORAR00274 OR3025400 OR8425450	274	x			P255					466770 465243	200-274
255.00 255.00 255.00	2.00 3.00 4.00	OR2025500 OR3025500 OR4025500											204-355
255.00 258.00 258.00	5.00 5.30 6.00	OR5025500 ORID25800 OR6025800			x			x					204-855
258.00 259.10 259.30	7.00 8.40 5.70	ORIE25800 OR8425910 OR5725930			x			x				466895 464006	202-864
259.50 260.00 260.00	8.40 2.50 3.00	OR8425950 OR2526000 OR3026000					P260						
260.00 260.00 260.00	4.00 5.00 6.00	OR4026000 OR5026000 OR6026000											204-360 204-860
260.00 260.00 262.00	7.00 8.00 2.00	ORIE26000 OR8026000 OR2026200											
262.00 264.50 265.00	4.00 8.40 3.00	OR4026200 OR8426450 OR3026500					P265						204-362



O-Ring

Inside diameter d ₁	Cross section d ₂	Part No.	Standard									Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518		
265.00	4.00	OR4026500											204-365 204-865
265.00	5.00	OR5026500											
265.00	5.30	ORID26500			x			x					
265.00	6.50	OR6526500											
265.00	7.00	ORIE26500			x			x					
265.00	8.00	OR8026500											
266.00	6.00	OR6026600											200-378 200-450
266.07	5.33	ORAR00378	378	x									
266.07	7.00	ORAR00450	450	x					R78			466262	
266.29	3.53	ORAR00275	275	x								465808	200-275
267.00	4.50	OR4526700											
268.80	8.40	OR8426880										462248	
269.00	2.50	OR2526900											202-865
269.30	5.70	OR5726930				x	G270					464411	
269.50	8.40	OR8426950					P270						
270.00	2.50	OR2527000											204-370
270.00	3.00	OR3027000											
270.00	4.00	OR4027000											
270.00	5.00	OR5027000											204-870
270.00	6.00	OR6027000											
270.00	8.00	OR8027000											
272.00	4.00	OR4027200											204-372
272.00	5.30	ORID27200			x			x					
272.00	7.00	ORIE27200			x			x					
274.00	2.00	OR2027400											
274.00	3.00	OR3027400											
274.00	6.50	OR6527400											
274.50	8.40	OR8427450					P275						204-375 204-875
275.00	4.00	OR4027500											
275.00	5.00	OR5027500											
276.00	2.00	OR2027600											200-379 200-451
278.77	5.33	ORAR00379	379	x									
278.77	7.00	ORAR00451	451	x					R79			461836	
278.99	3.53	ORAR00276	276	x								465611	200-276
279.10	8.40	OR8427910										466000	
279.30	5.70	OR5727930				x	G280			x		462905	
279.50	8.40	OR8427950					P280						461791
280.00	2.50	OR2528000											
280.00	3.00	OR3028000											

O-Ring



Inside diameter d ₁	Cross section d ₂	Part No.	Standard									Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518		
280.00 280.00 280.00	4.00 5.00 5.30	OR4028000 OR5028000 ORID28000			x			x			461831	204-380 204-880	
280.00 280.00 280.00	6.00 7.00 8.00	OR6028000 ORIE28000 OR8028000			x			x					
282.00 284.50 285.00	4.00 8.40 3.00	OR4028200 OR8428450 OR3028500					P285				465591 465182	204-382	
285.00 285.00 285.10	4.00 5.00 7.00	OR4028500 OR5028500 ORIE28510										204-385 204-885 200-686	
288.00 289.10 289.30	6.00 8.40 5.70	OR6028800 OR8428910 OR5728930				x	G290			x	465247 464183 464934	202-867	
289.50 290.00 290.00	8.40 2.00 3.00	OR8428950 OR2029000 OR3029000					P290						
290.00 290.00 290.00	5.00 5.30 6.00	OR5029000 ORID29000 OR6029000			x			x				204-890	
290.00 290.00 291.47	7.00 8.00 5.33	ORIE29000 OR8029000 ORAR00380	380	x	x			x			465403	200-380	
291.47 291.69 292.00	7.00 3.53 4.00	ORAR00452 ORAR00277 OR4029200	452 277	x x					R80		466263	200-452 200-277 204-392	
292.60 294.00 294.00	8.40 4.00 6.00	OR8429260 OR4029400 OR6029400									464708	204-394	
294.50 295.00 296.00	8.40 6.00 2.50	OR8429450 OR6029500 OR2529600					P295				462285		
297.00 299.30 299.50	4.00 5.70 8.40	OR4029700 OR5729930 OR8429950				x	G300 P300			x	462484	204-397 202-868	
300.00 300.00 300.00	3.00 5.00 5.30	OR3030000 OR5030000 ORID30000			x			x			464978	204-900	



O-Ring

Inside diameter d ₁	Cross section d ₂	Part No.	Standard									Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518		
300.00 300.00 300.00	6.00 7.00 8.00	OR6030000 ORIE30000 OR8030000			x			x					
304.00 304.17 304.17	8.00 5.33 7.00	OR8030400 ORAR00381 ORAR00453	381 453	x x					R81				200-381 200-453
304.39 305.00 305.00	3.53 4.00 5.00	ORAR00278 OR4030500 OR5030500	278	x								465698 465590	200-278 204-405 204-905
307.00 307.00 309.30	5.30 7.00 5.70	ORID30700 ORIE30700 OR5730930			x x			x x			x		202-890
310.00 310.00 310.00	3.00 4.00 5.00	OR3031000 OR4031000 OR5031000											204-410 204-910
310.00 310.00 314.00	7.00 8.00 8.00	ORIE31000 OR8031000 OR8031400										463622	
314.50 315.00 315.00	8.40 2.50 4.00	OR8431450 OR2531500 OR4031500					P315						204-415
315.00 315.00 315.00	5.00 5.30 6.00	OR5031500 ORID31500 OR6031500			x			x					204-915
315.00 316.87 319.30	7.00 7.00 5.70	ORIE31500 ORAR00454 OR5731930	454	x	x			x	R82		x	462734	200-454 202-869
319.50 320.00 320.00	8.40 3.00 4.00	OR8431950 OR3032000 OR4032000					P320						204-420
320.00 320.00 320.00	5.00 6.00 7.00	OR5032000 OR6032000 ORIE32000										463687	204-920
320.00 324.00 325.00	8.00 4.00 5.00	OR8032000 OR4032400 OR5032500											204-424 204-925
325.00 325.00 325.00	5.30 6.00 7.00	ORID32500 OR6032500 ORIE32500			x x			x x					

O-Ring



Inside diameter d ₁	Cross section d ₂	Part No.	Standard									Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518		
329.57	5.33	ORAR00382	382	x					R83			465809	200-382
329.57	7.00	ORAR00455	455	x									200-455
329.79	3.53	ORAR00279	279	x									200-279
330.00	4.00	OR4033000											204-430
330.00	5.00	OR5033000											204-930
330.00	6.00	OR6033000											
330.00	7.00	ORIE33000											
330.00	8.00	OR8033000											
331.00	3.00	OR3033100											
333.00	4.00	OR4033300					P335						204-433
334.50	8.40	OR8433450											204-935
335.00	5.30	ORID33500			x			x					
335.00	6.00	OR6033500						x					
335.00	7.00	ORIE33500			x								
338.00	6.00	OR6033800											
339.30	5.70	OR5733930				x					x	465244	202-870
339.50	8.40	OR8433950					P340						
340.00	3.50	OR3534000											206-890
340.00	4.00	OR4034000											204-440
340.00	5.00	OR5034000											204-940
340.00	6.00	OR6034000											
340.00	8.00	OR8034000											
342.00	8.00	OR8034200											
342.27	7.00	ORAR00456	456	x					R84			466429	200-456
345.00	5.00	OR5034500											204-945
345.00	5.30	ORID34500			x			x					
345.00	7.00	ORIE34500			x			x					
348.00	4.00	OR4034800											204-448
348.00	6.00	OR6034800											
349.10	8.40	OR8434910											
350.00	2.50	OR2535000										466920	
350.00	5.00	OR5035000											204-950
350.00	6.00	OR6035000											
350.00	8.00	OR8035000					P355						
354.50	8.40	OR8435450											
354.97	5.33	ORAR00383	383	x									200-383
354.97	7.00	ORAR00457	457	x					R85			466615	200-457
355.00	4.00	OR4035500											204-455



O-Ring

Inside diameter d ₁	Cross section d ₂	Part No.	Standard									Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518		
355.00 355.00 355.00	5.00 5.30 7.00	OR5035500 ORID35500 ORIE35500			x x			x x					204-955
355.19 358.00 359.10	3.53 6.00 8.40	ORAR00280 OR6035800 OR8435910	280	x								466918	200-280
359.30 359.50 360.00	5.70 8.40 4.00	OR5735930 OR8435950 OR4036000				x	P360				x	464535 465196	202-871 204-460
360.00 360.00 365.00	5.00 8.00 5.00	OR5036000 OR8036000 OR5036500										463604	204-960 204-965
365.00 365.00 367.00	5.30 7.00 3.50	ORID36500 ORIE36500 OR3536700			x x			x x					206-917
367.00 367.67 368.00	5.00 7.00 2.50	OR5036700 ORAR00458 OR2536800	458	x					R86				204-967 200-458
368.00 370.00 370.00	6.00 4.00 5.00	OR6036800 OR4037000 OR5037000											204-470 204-970
372.00 374.00 374.50	8.40 8.00 8.40	OR8437200 OR8037400 OR8437450					P375					466203	
375.00 375.00 375.00	5.00 5.30 7.00	OR5037500 ORID37500 ORIE37500			x x			x x					204-975
376.00 379.10 379.20	6.00 8.40 5.70	OR6037600 OR8437910 OR5737920										466467	
379.30 380.00 380.00	5.70 3.00 4.00	OR5737930 OR3038000 OR4038000				x					x	464952 465149 466456	202-872 204-480
380.00 380.00 380.00	5.00 6.00 8.00	OR5038000 OR6038000 OR8038000											204-980
380.37 380.37 380.59	5.33 7.00 3.53	ORAR00384 ORAR00459 ORAR00281	384 459 281	x x x					R87			466468	200-384 200-459 200-281

O-Ring



Inside diameter d ₁	Cross section d ₂	Part No.	Standard									Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518		
382.00 384.50 385.00	8.00 8.40 5.00	OR8038200 OR8438450 OR5038500					P385					463616	204-985
386.00 387.00 387.00	6.00 5.30 7.00	OR6038600 ORID38700 ORIE38700			x x			x x					
388.00 388.00 389.00	6.00 7.00 8.00	OR6038800 ORIE38800 OR8038900										466420	
389.30 390.00 390.00	5.70 3.00 4.00	OR5738930 OR3039000 OR4039000									x		202-891 204-490
393.07 394.00 394.00	7.00 6.00 8.00	ORAR00460 OR6039400 OR8039400	460	x					R88				200-460
395.00 399.10 399.30	5.00 8.40 5.70	OR5039500 OR8439910 OR5739930				x					x	465778 465287	204-995 202-873
399.50 400.00 400.00	8.40 2.00 3.00	OR8439950 OR2040000 OR3040000					P400						
400.00 400.00 400.00	4.00 5.00 5.30	OR4040000 OR5040000 ORID40000			x			x				465252	204-500
400.00 400.00 405.26	7.00 8.00 3.53	ORIE40000 OR8040000 ORAR00282			x			x					200-282
405.26 405.26 410.00	5.33 7.00 4.00	ORAR00385 ORAR00461 OR4041000	385 461	x x								465174	200-385 200-461 204-510
410.00 410.00 412.00	5.00 6.50 7.00	OR5041000 OR6541000 ORIE41200			x			x				465576	
412.00 415.00 417.96	8.00 5.00 7.00	OR8041200 OR5041500 ORAR00462										463497 465175	200-462
419.30 420.00 420.00	5.70 4.00 5.00	OR5741930 OR4042000 OR5042000									x	466038	202-874 204-520



O-Ring

Inside diameter d ₁	Cross section d ₂	Part No.	Standard									Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518		
422.00 424.00 425.00	6.00 5.00 4.00	OR6042200 OR5042400 OR4042500											204-525
425.00 425.00 427.00	7.00 8.00 5.00	ORIE42500 OR8042500 OR5042700			x			x					
429.00 430.00 430.66	6.00 4.00 3.53	OR6042900 OR4043000 ORAR00283	283	x								466227	204-530 200-283
430.66 430.66 433.00	5.33 7.00 4.00	ORAR00386 ORAR00463 OR4043300	386 463	x x									200-386 200-463 204-533
437.00 438.00 439.30	7.00 4.00 5.70	ORIE43700 OR4043800 OR5743930			x			x				463984	204-538 202-875
440.00 440.00 443.36	3.00 4.00 7.00	OR3044000 OR4044000 ORAR00464											204-540 200-464
444.00 445.00 448.00	8.00 5.00 6.00	OR8044400 OR5044500 OR6044800											
450.00 450.00 450.00	5.00 7.00 8.00	OR5045000 ORIE45000 OR8045000			x			x				465233	
451.00 456.06 456.06	7.00 3.53 5.33	ORIE45100 ORAR00284 ORAR00387	284 387	x x									200-284 200-387
456.06 459.30 460.00	7.00 5.70 4.00	ORAR00465 OR5745930 OR4046000	465	x		x					x	465176 464705	200-465 202-876 204-560
460.00 460.00 462.00	5.00 8.00 7.00	OR5046000 OR8046000 ORIE46200			x			x					
465.00 465.00 468.76	5.00 9.00 7.00	OR5046500 OR9046500 ORAR00466	466	x								465177	200-466
470.00 470.00 470.00	4.00 5.00 6.00	OR4047000 OR5047000 OR6047000										465232	204-570

O-Ring



Inside diameter d ₁	Cross section d ₂	Part No.	Standard									Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518		
470.00 472.00 475.00	8.00 8.00 4.00	OR8047000 OR8047200 OR4047500											204-575
475.00 479.30 480.00	7.00 5.70 4.00	ORIE47500 OR5747930 OR4048000			x	x		x			x	462488	202-877 204-580
480.00 480.00 480.00	5.00 6.00 8.00	OR5048000 OR6048000 OR8048000											
481.38 481.38 487.00	5.33 7.00 7.00	ORAR00388 ORAR00467 ORIE48700	388 467	x x									200-388 200-467
487.00 489.20 489.30	8.00 5.70 5.70	OR8048700 OR5748910 OR5748930									x		202-892
490.00 490.00 492.00	5.00 8.00 4.00	OR5049000 OR8049000 OR4049200											204-592
494.16 499.30 500.00	7.00 5.70 5.00	ORAR00468 OR5749930 OR5050000	468	x							x	464337	200-468 202-878
500.00 500.00 500.00	6.00 7.00 8.00	OR6050000 ORIE50000 OR8050000			x			x					
504.00 506.78 506.86	6.00 5.33 7.00	OR6050400 ORAR00389 ORAR00469	389 469	x x									200-389 200-469
508.00 510.00 515.00	6.00 5.00 7.00	OR6050800 OR5051000 ORIE51500			x			x					
520.00 525.00 530.00	5.00 8.00 4.00	OR5052000 OR8052500 OR4053000											
530.00 530.00 532.18	5.00 7.00 5.33	OR5053000 ORIE53000 ORAR00390	390	x	x			x				465662	200-390
532.26 540.00 540.00	7.00 3.00 4.00	ORAR00470 OR3054000 OR4054000	470	x								465043	200-470



O-Ring

Inside diameter d ₁	Cross section d ₂	Part No.	Standard									Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518		
540.00 540.00 542.00	5.00 8.00 7.00	OR5054000 OR8054000 ORIE54200										463581	
545.00 545.00 549.00	3.00 7.00 6.00	OR3054500 ORIE54500 OR6054900			x			x					
550.00 557.58 557.66	5.00 5.33 7.00	OR5055000 ORAR00391 ORAR00471	391 471	x x									200-391 200-471
560.00 560.00 560.00	4.00 5.00 6.00	OR4056000 OR5056000 OR6056000											
560.00 569.00 579.00	7.00 6.00 6.00	ORIE56000 OR6056900 OR6057900			x			x				461880	
580.00 580.00 582.68	7.00 8.00 5.33	ORIE58000 OR8058000 ORAR00392	392	x	x			x				466885 466426	200-392
582.68 585.00 585.00	7.00 4.00 5.00	ORAR00472 OR4058500 OR5058500	472	x									200-472
590.00 592.00 600.00	5.00 8.00 4.00	OR5059000 OR8059200 OR4060000											
600.00 600.00 600.00	5.00 7.00 8.00	OR5060000 ORIE60000 OR8060000			x			x					
608.08 608.08 615.00	5.33 7.00 7.00	ORAR00393 ORAR00473 ORIE61500	393 473	x x								465179	200-393 200-473
630.00 633.48 633.48	7.00 5.33 7	ORIE63000 ORAR00394 ORAR00474	394 474	x x	x			x					200-394
649.00 650.00 658.88	8.40 7.00 5.33	OR8464900 ORIE65000 ORAR00395	395	x	x			x				465938	200-395
658.88 670.00 680.00	7.00 7.00 8.40	ORAR00475 ORIE67000 OR8468000	475	x	x			x				466457	200-475



Inside diameter d ₁	Cross section d ₂	Part No.	Standard								Reference No. Skega	Reference No. Dowty
			Reference No. AS 568 A	AS 568 A / BS 1806	ISO 3601	SMS 1586	JIS B 2401	NFT47-501	French recommendation	ISO 6149-2	BS4518	
715.00	8.40	OR8471500									465862	
740.00	8.40	OR8474000									466146	
774.10	8.40	OR8477410									466791	
810.00	8.40	OR8481000									466109	
845.00	8.40	OR8484500									465789	
865.00	8.40	OR8486500									466745	
888.00	8.40	OR8488800									466096	
934.10	8.40	OR8493410									466943	
959.10	8.40	OR8495910									466944	

Further sizes on request!

Ordering example 1

O-Ring, metric 40 x 3

Dimensions: Inside diameter = 40.0 mm
 Cross section = 3.0 mm

Material: NBR 70
 (Nitrile-Butadiene Rubber
 70 Shore A)

Order No.

OR3004000 - N7

Art. - Group

Cross section x 10

Inside diameter x 100

Quality Index (Standard)

Material code (Standard)

Ordering example 2

O-Ring, American Standard AS 568 A, ref. 149

Dimensions: Inside diameter = 71.12 mm
 Cross section = 2.62 mm

Material: FKM 80
 (Fluorocarbon
 Rubber 70 Shore A)

Order No.

ORAR00149 - V8

Art. - Group

Standard AS 568 A

Part No. (Dash No.)

Quality Index (Standard)

Material code (Standard)

O-Ring dimensions and part numbers see tables XV, XVI, XVII.
Material codes (elastomer type) for standard product order see table I (last column).
The required Shore hardness must be given with the order.

When a special material is required the exact five-digit B+S material code must be given with the order. In this respect please refer to the information provided in our O-Ring Material Guide or contact your local Busak + Shamban company.



C.1.2 O-Ring dimensions for straight thread tube fitting sizes, AS 568 A

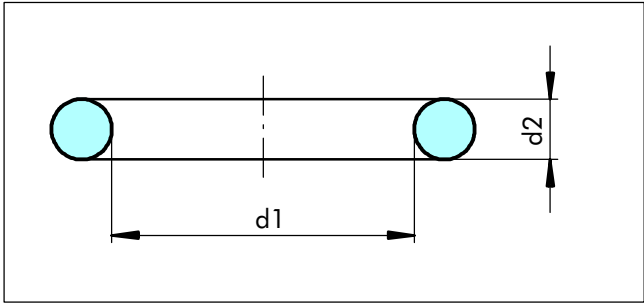


Figure 26 O-Ring dimensions

Table XVI Dimensions / Part numbers

Part No.	Metric dimensions (mm)		Imperial dimensions (inch)		Tube size (inch)
	Inside diameter d ₁	Cross section d ₂	Inside diameter d ₁	Cross section d ₂	Outside diameter OD
ORAR00901	4.70	1.42	.185	.056	3/32
ORAR00902	6.07	1.63	.239	.064	1/8
ORAR00903	7.65	1.63	.301	.064	3/16
ORAR00904	8.92	1.83	.351	.072	1/4
ORAR00905	10.52	1.83	.414	.072	5/16
ORAR00906	11.89	1.98	.468	.078	3/8
ORAR00907	13.46	2.08	.530	.082	7/16
ORAR00908	16.36	2.20	.644	.087	1/2
ORAR00909	17.93	2.46	.706	.097	9/16
ORAR00910	19.18	2.46	.755	.097	5/8
ORAR00911	21.92	2.95	.863	.116	11/16
ORAR00912	23.47	2.95	.924	.116	3/4
ORAR00913	25.04	2.95	.986	.116	13/16
ORAR00914	26.62	2.95	1.048	.116	7/8
ORAR00916	29.74	2.95	1.171	.116	1
ORAR00918	34.42	2.95	1.355	.116	1 1/8
ORAR00920	37.47	3.00	1.475	.118	1 1/4
ORAR00924	43.69	3.00	1.720	.118	1 1/2
ORAR00928	53.09	3.00	2.090	.118	1 3/4
ORAR00932	59.36	3.00	2.337	.118	1 3/4



Ordering example

O-Ring according to AS 568 A
Dimensions: Inside diameter $d_1 = 23.47\text{ mm}$
Cross section $d_2 = 2.95\text{ mm}$
Compound: NBR 70
(Nitrile-Butadiene Rubber 70 Shore A)

Order No.	ORAR00912	-	N7
Art. - Group			
AS 568 A			
Dash No.			
Quality Index (Standard)			
Material Code (Standard)			

O-Ring dimensions and part numbers see table XVI.
Material codes (elastomer type) for standard product order see table I (last column).
The required Shore hardness must be given with the order.

When a special material is required the exact five-digit B+S material code must be given with the order. In this respect please refer to the information provided in our O-Ring Material Guide or contact your local Busak + Shamban company.

C.1.3 O-Ring dimensions for metric thread with conical recess according to ISO 6149

Table XVII O-Ring dimensions for metric thread with conical recess according to ISO 6149

Part No.	Metric dimensions (mm)		Thread (metric)
	Inside diameter d_1	Cross section d_2	
OR1600610	6.10	1.60	M8 x 1
OR1600810	8.10	1.60	M10 x 1
OR2200930	9.30	2.20	M12 x 1.5
OR2201130	11.30	2.20	M14 x 1.5
OR2201330	13.30	2.20	M16 x 1.5
OR2201530	15.30	2.20	M18 x 1.5
OR2201730	17.30	2.20	M20 x 1.5
OR2201930	19.30	2.20	M22 x 1.5
OR2902360	23.60	2.90	M27 x 2
OR2902960	29.60	2.90	M33 x 2
OR2903860	38.60	2.90	M42 x 2
OR2904460	44.60	2.90	M48 x 2
OR2905660	56.60	2.90	M60 x 2



C.2 Tolerances of dimensions

During vulcanisation, elastomers are subject to dimensional changes due to shrinkage. The degree of shrinkage depends on compound, mould geometry and on the vulcanisation process employed.

The following tables XVIII and XIX show the tolerances for the inside diameter (d_1) and cross section (d_2). The tables are valid for all 70 Shore A Nitrile (NBR) elastomer materials; other materials may exhibit different dimensional tolerances if they are produced from moulds designed for NBR 70 materials. To guarantee a high and constant quality level it might be necessary to produce new or additional moulds with the corresponding costs.

Precision O-Rings with reduced tolerances are available if required - please contact your local B+S company.

O-Ring dimensions not included in the tables are manufactured acc. to tolerances based on ISO 3601.

Table XVIII Cross section tolerances based on ISO 3601-1

Cross section d_2				Tolerances $\pm$
≤ 1.80				0.08
1.80	<	d_2	≤ 2.65	0.09
2.65	<	d_2	≤ 3.55	0.10
3.55	<	d_2	≤ 5.30	0.13
5.30	<	d_2	≤ 7.00	0.15
7.00	<	d_2	≤ 8.00	0.18
8.00	<	d_2	≤ 10.00	0.21
10.00	<	d_2	≤ 12.00	0.25
$d_2 > 12.00$				on request

Table XIX Tolerances for O-Ring inside diameters d_1 based on ISO 3601-1

Inside diameter d_1				Tolerances $\pm$
$d_1 \leq 2.50$				0.13
2.50	<	d_1	≤ 4.50	0.14
4.50	<	d_1	≤ 6.30	0.15
6.30	<	d_1	≤ 8.50	0.16
8.50	<	d_1	≤ 10.00	0.17
10.00	<	d_1	≤ 11.20	0.18
11.20	<	d_1	≤ 14.00	0.19
14.00	<	d_1	≤ 16.00	0.20
16.00	<	d_1	≤ 18.00	0.21
18.00	<	d_1	≤ 20.00	0.22
20.00	<	d_1	≤ 21.20	0.23
21.20	<	d_1	≤ 23.60	0.24
23.60	<	d_1	≤ 25.00	0.25
25.00	<	d_1	≤ 26.50	0.26
26.50	<	d_1	≤ 28.00	0.28
28.00	<	d_1	≤ 30.00	0.29
30.00	<	d_1	≤ 31.50	0.31
31.50	<	d_1	≤ 33.50	0.32
33.50	<	d_1	≤ 34.50	0.33

Inside diameter d_1				Tolerances $\pm$
34.50	<	d_1	≤ 35.50	0.34
35.50	<	d_1	≤ 36.50	0.35
36.50	<	d_1	≤ 37.50	0.36
37.50	<	d_1	≤ 38.70	0.37
38.70	<	d_1	≤ 40.00	0.38
40.00	<	d_1	≤ 41.20	0.39
41.20	<	d_1	≤ 42.50	0.40
42.50	<	d_1	≤ 43.70	0.41
43.70	<	d_1	≤ 45.00	0.42
45.00	<	d_1	≤ 46.20	0.43
46.20	<	d_1	≤ 47.50	0.44
47.50	<	d_1	≤ 48.70	0.45
48.70	<	d_1	≤ 50.00	0.46
50.00	<	d_1	≤ 51.50	0.47
51.50	<	d_1	≤ 53.00	0.48
53.00	<	d_1	≤ 54.50	0.50
54.50	<	d_1	≤ 56.00	0.51
56.00	<	d_1	≤ 58.00	0.52
58.00	<	d_1	≤ 60.00	0.54



Inside diameter d ₁	Tolerances ±
60.00 < d ₁ ≤ 61.50	0.55
61.50 < d ₁ ≤ 63.00	0.56
63.00 < d ₁ ≤ 65.00	0.58
65.00 < d ₁ ≤ 67.00	0.59
67.00 < d ₁ ≤ 69.00	0.61
69.00 < d ₁ ≤ 71.00	0.63
71.00 < d ₁ ≤ 73.00	0.64
73.00 < d ₁ ≤ 75.00	0.66
75.00 < d ₁ ≤ 77.50	0.67
77.50 < d ₁ ≤ 80.00	0.69
80.00 < d ₁ ≤ 82.50	0.71
82.50 < d ₁ ≤ 85.00	0.73
85.00 < d ₁ ≤ 87.50	0.75
87.50 < d ₁ ≤ 90.00	0.77
90.00 < d ₁ ≤ 92.50	0.79
92.50 < d ₁ ≤ 95.00	0.81
95.00 < d ₁ ≤ 97.50	0.83
97.50 < d ₁ ≤ 100.00	0.84
100.00 < d ₁ ≤ 103.00	0.87
103.00 < d ₁ ≤ 106.00	0.89
106.00 < d ₁ ≤ 109.00	0.91
109.00 < d ₁ ≤ 112.00	0.93
112.00 < d ₁ ≤ 115.00	0.95
115.00 < d ₁ ≤ 118.00	0.97
118.00 < d ₁ ≤ 122.00	1.00
122.00 < d ₁ ≤ 125.00	1.03
125.00 < d ₁ ≤ 128.00	1.05
128.00 < d ₁ ≤ 132.00	1.08
132.00 < d ₁ ≤ 136.00	1.10
136.00 < d ₁ ≤ 140.00	1.13
140.00 < d ₁ ≤ 145.00	1.17
145.00 < d ₁ ≤ 150.00	1.20
150.00 < d ₁ ≤ 155.00	1.24
155.00 < d ₁ ≤ 160.00	1.27
160.00 < d ₁ ≤ 165.00	1.31
165.00 < d ₁ ≤ 170.00	1.34
170.00 < d ₁ ≤ 175.00	1.38

Inside diameter d ₁	Tolerances ±
175.00 < d ₁ ≤ 180.00	1.41
180.00 < d ₁ ≤ 185.00	1.44
185.00 < d ₁ ≤ 190.00	1.48
190.00 < d ₁ ≤ 195.00	1.51
195.00 < d ₁ ≤ 200.00	1.55
200.00 < d ₁ ≤ 206.00	1.59
206.00 < d ₁ ≤ 212.00	1.63
212.00 < d ₁ ≤ 218.00	1.67
218.00 < d ₁ ≤ 224.00	1.71
224.00 < d ₁ ≤ 230.00	1.75
230.00 < d ₁ ≤ 236.00	1.79
236.00 < d ₁ ≤ 243.00	1.83
243.00 < d ₁ ≤ 250.00	1.88
250.00 < d ₁ ≤ 258.00	1.93
258.00 < d ₁ ≤ 265.00	1.98
265.00 < d ₁ ≤ 272.00	2.02
272.00 < d ₁ ≤ 280.00	2.08
280.00 < d ₁ ≤ 290.00	2.14
290.00 < d ₁ ≤ 300.00	2.21
300.00 < d ₁ ≤ 307.00	2.25
307.00 < d ₁ ≤ 315.00	2.30
315.00 < d ₁ ≤ 325.00	2.37
325.00 < d ₁ ≤ 335.00	2.43
335.00 < d ₁ ≤ 345.00	2.49
345.00 < d ₁ ≤ 355.00	2.56
355.00 < d ₁ ≤ 365.00	2.62
365.00 < d ₁ ≤ 375.00	2.68
375.00 < d ₁ ≤ 387.00	2.76
387.00 < d ₁ ≤ 400.00	2.84
400.00 < d ₁ ≤ 412.00	2.91
412.00 < d ₁ ≤ 425.00	2.99
425.00 < d ₁ ≤ 437.00	3.07
437.00 < d ₁ ≤ 450.00	3.15
450.00 < d ₁ ≤ 462.00	3.22
462.00 < d ₁ ≤ 475.00	3.30
475.00 < d ₁ ≤ 487.00	3.37
487.00 < d ₁ ≤ 500.00	3.45



Inside diameter d ₁				Tolerances ±
500.00	<	d ₁	≤ 515.00	3.54
515.00	<	d ₁	≤ 530.00	3.63
530.00	<	d ₁	≤ 545.00	3.72
545.00	<	d ₁	≤ 560.00	2.81
560.00	<	d ₁	≤ 580.00	3.93
580.00	<	d ₁	≤ 600.00	4.05
600.00	<	d ₁	≤ 615.00	4.13
615.00	<	d ₁	≤ 630.00	4.22
630.00	<	d ₁	≤ 650.00	4.34
650.00	<	d ₁	≤ 670.00	4.46
		d ₁	> 670.00	approximately ± 0,7%

C.3 O-Ring quality acceptance criteria

ISO 3601-3 defines permissible form and surface deviations of Elastomeric O-Rings.

Distinctions are made in the table between permissible flaw sizes according to type characteristics.

Type characteristic N

O-Rings falling under this characteristic meet the requirements made on a standard quality. They satisfy the demands made on static and dynamic seals.

Type characteristic S

O-Rings falling under type characteristic S are subject to exceptional demands, e.g. for safety relevant components in automobile engineering. The permissible flaw sizes are very limited. This demands a greater process technology and stricter quality control procedures.

The following tables define the form and surface deviations of B+S Elastomer O-Rings for standard quality as well as for reduced tolerances. The given values are based on ISO 3601-3, grade N and S.

If no quality requirements are specified with the order, O-Rings are supplied with standard quality according to Table XX (based on ISO 3601-3, grade N).



Table XX Surface specification for O-Rings - standard

Standard											
Type of defects based on ISO 3601-3		Schematic illustration		Maximum acceptable limits based on ISO 3601-3, Grade N							
				Cross section d ₂							
				≤1.00	≤1.80	≤2.65	≤3.55	≤5.30	≤7.00	≤10.00 ≤15.00	
1.	Offset		e	on request	0.08	0.10	0.13	0.15	0.15	0.20 0.25	
2.	Flash		f		0.10	0.12	0.14	0.16	0.18	0.20 0.25	
3.	Backrind		g		0.18	0.27	0.36	0.53	0.70	0.90 1.20	
			h		0.08	0.08	0.10	0.10	0.13	0.13 0.15	
4.	Non-fills and indentations		l		0.60	0.80	1.00	1.30	1.70	2.00 2.50	
			m		0.08	0.08	0.10	0.10	0.13	0.13 0.15	
5.	Flow marks (radial orientation is not permitted)		i**	on request	1.50	1.50	6.50	6.50	6.50	6.50 8.00	
			k		or 0.05 × d ₁ *					0.10 0.10	
6.	Area of excessive trimming		-	Deviations from a circular cross-section due to trimming is allowed, provided that the resultant surface is smoothly blended and is within the size tolerance limits for d ₂ .							
7.	Foreign material		-	not permitted							
8.	Straightness tolerance		-	-							
9.	Roundness		-	-							
10.	The O-Ring surface has to be free from cracks, ruptures, blisters and other imperfections except as allowed by the table when inspected at 2-times-magnification with adequate illumination. Deviations are only permissible, a) if not more than three deviations exist within a circumference length of 25 mm, b) they do not blend and c) the distance between three deviations is at least the same as the maximum width of a single deviation										

all dimensions in mm

* d₁ = Inside diameter

** the value which is the greater



O-Ring

Table XXI Surface specification for O-Rings - reduced

Reduced											
Type of defects based on ISO 3601-3		Schematic illustration		Maximum acceptable limits based on ISO 3601-3, Grade S							
				Cross section d ₂							
				≤1.00	≤1.80	≤2.65	≤3.55	≤5.30	≤7.00	≤10.00	≤15.00
1.	Offset		e	on request	0.08	0.08	0.10	0.12	0.13	0.15	0.20
2.	Flash		f		0.10	0.10	0.13	0.15	0.15	0.18	0.20
3.	Backrind		g		0.10	0.15	0.20	0.20	0.30	0.50	0.75
			h		0.05	0.08	0.10	0.10	0.13	0.13	0.15
4.	Non-fills and indentations		l		0.15	0.25	0.40	0.63	1.00	1.50	2.00
			m		0.08	0.08	0.10	0.10	0.13	0.13	0.15
5.	Flow marks (radial orientation is not permitted)		i**		1.50	1.50	5.00	5.00	5.00	5.00	7.00
			k		or 0.03 × d ₁ *					5.00	7.00
					0.05	0.05	0.05	0.05	0.05	0.08	0.08
6.	Area of excessive trimming		-	Deviations from a circular cross-section due to trimming is allowed, provided that the resultant surface is smoothly blended and is within the size tolerance limits for d ₂ .							
7.	Foreign material		-	not permitted							
8.	Straightness tolerance		-	-							
9.	Roundness		-	-							
10.	The O-Ring surface has to be free from cracks, ruptures, blisters and other imperfections except as allowed by the table when inspected at 2-times-magnification with adequate illumination. Deviations are only permissible, a) if not more than three deviations exist within a circumference length of 25 mm, b) they do not blend and c) the distance between three deviations is at least the same as the maximum width of a single deviation										

all dimensions in mm

* d₁ = Inside diameter

** the value which is the greater



C.5 Seal Set

The rapid availability of spare parts is very important during the servicing maintenance and repair of machines and equipment.

We offer a variety of standard ranges which are supplied in sturdy cases as a set with foam inlays.

O-Ring Set, Type A

390 O-Rings in 24 different Sizes to American Standard AS 568 A and British Standard BS 1806			
Order No. ORSETAASS-N7 (NBR 70)			
Quantity	Dimensions (mm)	Quantity	Dimensions (mm)
30	2.90 x 1.78	10	18.77 x 1.78
30	3.69 x 1.78	15	9.20 x 2.62
30	4.47 x 1.78	15	10.78 x 2.62
30	5.28 x 1.78	15	12.37 x 2.62
30	6.07 x 1.78	10	17.12 x 2.62
30	7.65 x 1.78	10	18.72 x 2.62
30	9.25 x 1.78	10	20.30 x 2.62
20	10.82 x 1.78	5	18.64 x 3.53
20	12.42 x 1.78	5	20.22 x 3.53
10	14.00 x 1.78	5	21.82 x 3.53
10	15.60 x 1.78	5	23.38 x 3.53
10	17.17 x 1.78	5	24.99 x 3.53

O-Ring Set, Type B

295 O-Rings in 24 different Sizes to American Standard AS 568 A and British Standard BS 1806			
Order No. ORSETBASS-N7 (NBR 70)			
Quantity	Dimensions (mm)	Quantity	Dimensions (mm)
15	20.35 x 1.78	15	34.52 x 3.53
15	21.95 x 1.78	10	36.09 x 3.53
15	25.07 x 2.62	10	37.69 x 3.53
15	26.64 x 2.62	10	40.87 x 3.53
15	28.24 x 2.62	10	44.04 x 3.53
15	29.82 x 2.62	10	47.22 x 3.53
15	31.42 x 2.62	10	50.39 x 3.53
15	32.99 x 2.62	10	37.47 x 5.33
15	34.59 x 2.62	10	40.64 x 5.33
15	29.74 x 3.53	10	43.82 x 5.33
15	31.34 x 3.53	5	46.99 x 5.33
15	32.92 x 3.53	5	50.17 x 5.33

O-Ring Set, Type C

380 O-Rings in 24 different Sizes, common Metric Sizes			
Order No. ORSETCMET-N7 (NBR 70)			
Quantity	Dimensions (mm)	Quantity	Dimensions (mm)
20	4.00 x 2.00	15	10.30 x 2.40
20	6.00 x 2.00	15	11.20 x 2.40
20	8.00 x 2.00	15	12.30 x 2.40
20	10.00 x 2.00	15	13.30 x 2.40
20	12.00 x 2.00	15	14.30 x 2.40
20	3.30 x 2.40	10	10.00 x 3.00
20	4.30 x 2.40	10	12.00 x 3.00
20	5.30 x 2.40	10	14.00 x 3.00
20	6.30 x 2.40	10	16.00 x 3.00
20	7.30 x 2.40	10	18.00 x 3.00
20	8.30 x 2.40	10	19.20 x 3.00
20	9.20 x 2.40	5	20.00 x 3.00

O-Ring Set, Type D

295 O-Rings in 24 different Sizes, common Metric Sizes			
Order No. ORSETDMET-N7 (NBR 70)			
Quantity	Dimensions (mm)	Quantity	Dimensions (mm)
15	18.00 x 2.00	15	35.00 x 4.00
15	20.00 x 2.00	15	38.00 x 4.00
15	25.00 x 3.00	15	40.00 x 4.00
15	26.20 x 3.00	10	42.00 x 4.00
15	28.00 x 3.00	10	45.00 x 4.00
15	29.20 x 3.00	10	46.00 x 4.00
15	32.20 x 3.00	10	48.00 x 4.00
15	34.20 x 3.00	10	35.00 x 5.00
15	36.20 x 3.00	10	40.00 x 5.00
15	30.00 x 4.00	10	45.00 x 5.00
15	32.00 x 4.00	5	48.00 x 5.00
15	34.00 x 4.00	5	50.00 x 5.00



D Special O-Rings

D.1 Isolast® (FFKM) O-Rings

Information about our Isolast® (FFKM) O-Rings are available either in our special Isolast® brochure or through your local Busak + Shamban company.

D.2 FEP encapsulated O-Rings

FEP O-Rings consist of an elastomer inner ring and a seamless FEP encapsulated which surrounds the elastomer ring.

Similar to PTFE O-Rings FEP encapsulated O-Rings are used wherever the chemical resistance of normal elastomer O-Rings are not sufficient.

The required elasticity is provided by the elastomer ring, the chemical resistance by the seamless FEP sheath.

Advantages

- Very good chemical resistance to most liquids and chemicals, with the exception of liquid alkaline metals and some fluorine compounds
- Temperature application range from approx. -60 °C to +200 °C (depending on the material for the inner ring)
- Can be used with foodstuffs, pharmaceutical and medicinal products
- Physiologically safe and can be sterilised
- Low friction, no adhesion or stick-slip effect
- Adequate elastic behaviour for improved sealability.

Versions

Standard versions: Elastomer O-Ring with FEP sheath

Special versions: Hollow elastomer ring with FEP sheath

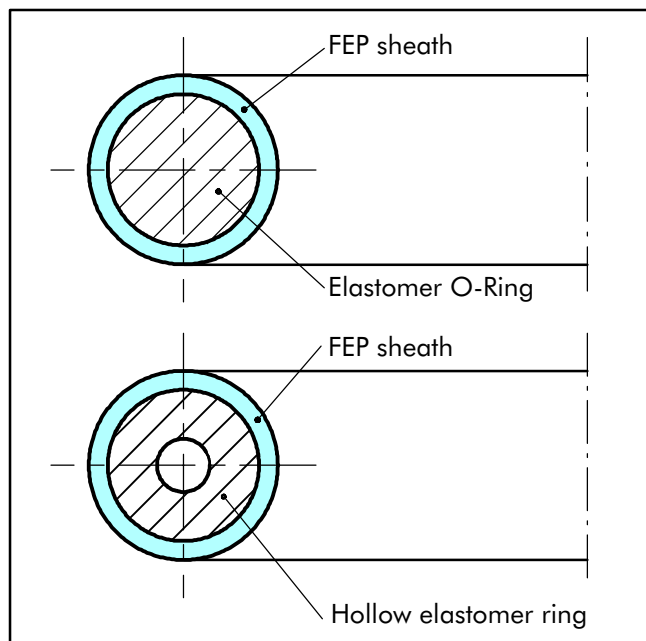


Figure 27 Different versions of FEP O-Ring

Applications

Fields of application

FEP encapsulated O-Rings are ideally suited for use in the chemical, petrochemicals, medical technology, foodstuffs, water, sewage and similar sectors of industry. A typical application for FEP O-Rings is the sealing of valve spindles and as secondary sealing elements for mechanical seals.

FEP encapsulated O-Rings are used primarily as static seals. They are also suitable for use as sealing elements for slow switching and rotary movements.

In the chemical process industry, seals with special sealing profiles are frequently required. For such applications, we manufacture special seals for various flange cross sections either from drawings or from templates (Figure 28).

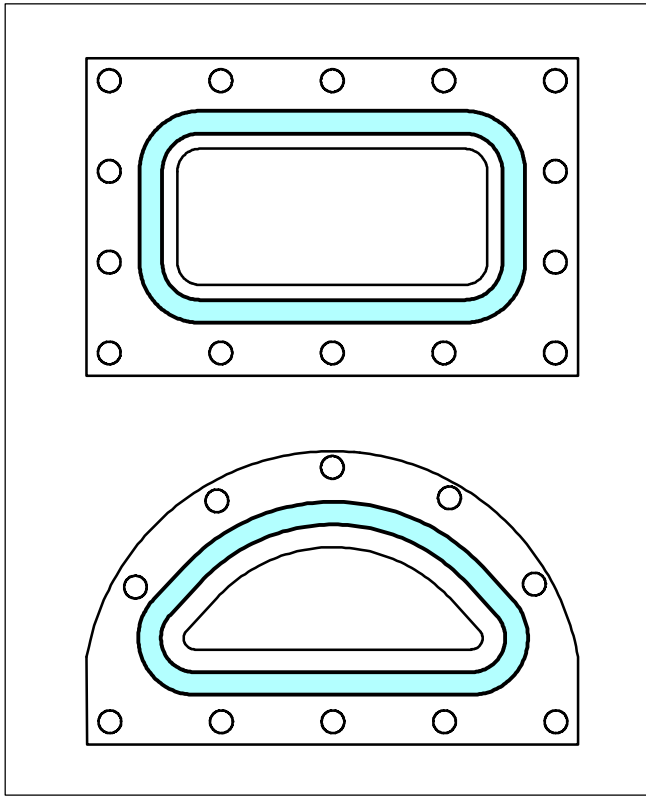


Figure 28 Seals for special flange cross sections

Technical data

Working pressure: Up to 25 MPa

Temperature: - 60 °C to + 200 °C - depending on the elastomer material

Media: Practically all liquids, gases and chemicals

Materials

FEP sheath

FEP is the abbreviated designation for tetrafluoroethylene-hexafluoropropylene. This material has similar properties to those of polytetrafluoroethylene (PTFE). It also has a very high chemical resistance and exhibits a good resistance to abrasion.

In contrast to PTFE, however, FEP is thermoplastically mouldable. This allows the material to be processed to form flexible semifinished products, such as thin-walled hoses.

Inner ring

A choice of two materials is available for the elastomer inner rings. The choice of the material also determines the service temperature range.

- Fluoroelastomer (FKM), material code VZ00R
temperature range: - 20 °C up to + 200 °C
- Silicone elastomer (VMQ), material code SZ00R
temperature range: - 60 °C up to + 200 °C

The specified temperature ranges are limits which must always be considered in conjunction with the medium to be sealed and the working pressure. The permissible continuous operating temperatures are always lower than the upper limits.

Design recommendations

FEP encapsulated O-Rings are fully interchangeable with standard O-Ring seals. There is no need to modify the groove dimensions. The FEP sheath is relatively thin-walled.

All the specifications given in this catalogue therefore refer to the installation dimensions of elastomer O-Rings.

As a result of the FEP sheath, the O-Rings are less flexible than elastomer O-Rings. They have limited stretch and higher permanent deformation.

Split grooves are recommended, especially for outside sealing FEP encapsulated O-Rings, in order to avoid overstretching during installation.

The general information on the construction, design and surfaces given for the elastomer O-Rings applies also to FEP encapsulated O-Rings.

At higher pressures, additional concave Back-up Rings should be used.

Application in gases

Where the O-Ring is used to seal gases, the permeation rate must be taken into consideration. In this case the material of the inner ring must also have a good resistance to the medium to be sealed. The permeation rate depends on the exposed surface area, the temperature, the working pressure and the thickness of the FEP sheath.

The thickness of the FEP sheath can be found in Table XXII.



Table XXII Thickness of the FEP sheath

O-Ring		Thickness of the FEP Sheath
Cross section d ₂	Tolerance ±	
1.78 1.80	0.10	0.20
2.62 2.65	0.10	0.30
3.53 3.55	0.12	0.38
5.33 5.30	0.25	0.50
7.00	0.38	0.50

The diagram (Figure 29) gives guide values for the permeation of different gases.

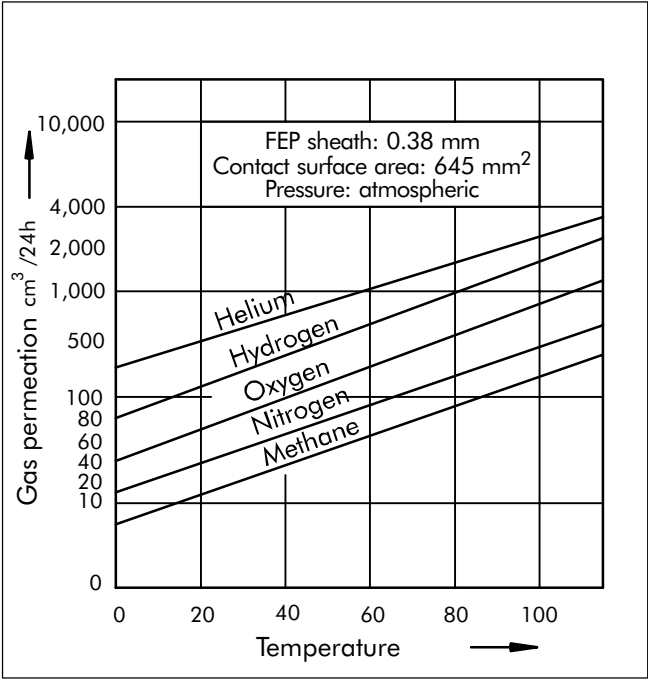


Figure 29 Gas permeation rates for FEP O-Rings

The diagram (Figure 30) gives guide values for the permeation of water vapour.

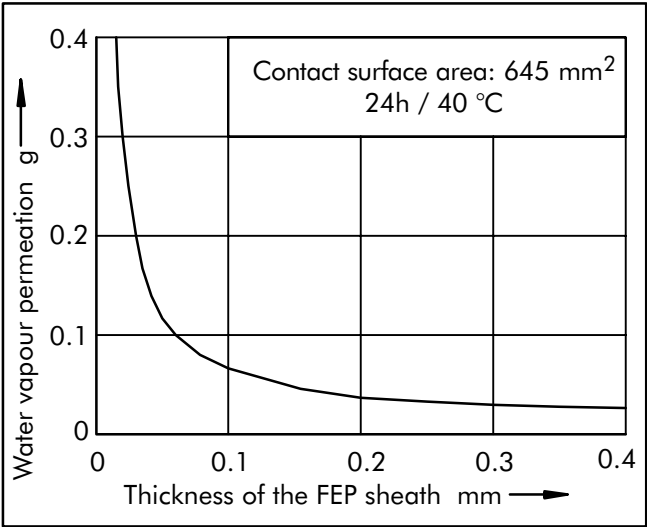


Figure 30 Water vapour permeation for FEP O-Rings

Methods of installation

The same recommendations apply to the installation of FEP encapsulated O-Rings as for standard elastomer O-Rings. It should be noted, however, that the O-Rings have only limited stretch due to the FEP sheath.

If, for design reasons, a split groove is not possible, auxiliary tools must be used for installation.

For inside sealing applications (e.g. rod), FEP encapsulated O-Rings can be installed with larger diameters without tools. On no account should the seal ring be forced into the groove (e. g. by bending), otherwise the sealing function cannot be assured.



Dimensions

FEP encapsulated O-Rings are available in the same sizes as the elastomer O-Rings. Table XXIII shows the smallest available inside diameters for the different cord diameters.

Table XXIII Smallest available sizes

O-Ring		Tolerance ±	Inside diameter d ₁
Cross section d ₂ (mm)			
1.60		0.10	≥ 7.64
1.78	1.80	0.10	≥ 7.64
2.00		0.10	≥ 7.64
2.40		0.10	≥ 9.19
2.50		0.10	≥ 9.19
2.62	2.65	0.10	≥ 9.19
3.00		0.12	≥ 12.00
3.53	3.55	0.12	≥ 13.10
4.00		0.25	≥ 18.00
5.00		0.25	≥ 23.10
5.33	5.30	0.25	≥ 23.10
5.70		0.38	≥ 50.00
6.00		0.38	≥ 50.00
7.00		0.38	≥ 50.00
8.00		0.38	≥ 50.00

Table XXIV Tolerances inside diameter

Inside diameter d ₁ [mm]	Tolerances ±
≤ 50	0.25
≤ 100	0.38
≤ 250	0.63
≤ 500	0.76
≤ 1000	1.58

Ordering example

O-Ring 30 x 3, FEP sheathed

Dimensions: Inside diameter d₁ = 30.0 mm
 Cross section d₂ = 3.0 mm

Material of the inner ring: Silicone Rubber (VMQ)

Order No.	OF3003000	-	SZ00R
Part No.			
Quality Index (Standard)			
Material Code (Standard)			

Further information see page 109

Ordering example

O-Ring, FEP sheathed
American Standard AS 568 A, ref. 356

Dimensions: Inside diameter d₁ = 135.89 mm
 Cross section d₂ = 5.33 mm

Material of the inner ring: Fluorocarbon Rubber (FKM)

Order No.	OFAR00356	-	VZ00R
Part No.			
Quality Index (Standard)			
Material Code (Standard)			

Further information see page 109

O-Ring dimensions and Part No. see Table XV, page 48-109.
Installation dimensions, see Table XIV, page 46.

Ordering can also be made according to O-Ring dimensions and material.



D.3 PTFE O-Rings

O-Rings in polytetrafluoroethylene (PTFE) are closed, circular rings with annular cross section. The dimensions are - as with the elastomer O-Ring - characterised by the inside diameter d_1 and the cord diameter d_2 (Figure 31). PTFE O-Rings are not moulded but produced by machining. The rings can therefore be manufactured in all sizes.

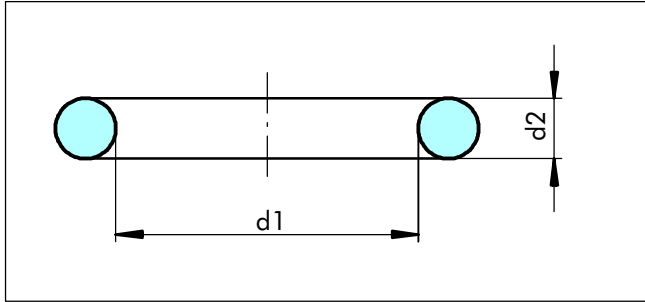


Figure 31 O-Ring dimensions

Advantages

- Very good chemical resistance, compatible with most liquids and chemicals, with the exception of liquid alkaline metals and some fluorine compounds.
- Wide temperature range from approx. - 200 °C to + 260 °C
- Suitable for contact with foodstuffs, pharmaceutical and medicinal products
- Physiologically safe, can be sterilised
- Low friction, no adhesion
- Available for all diameters up to approx. 1,000 mm.

Applications

Fields of application

PTFE O-Rings are used wherever the chemical and thermal resistance of the normal elastomer O-Rings is no longer sufficient. These are primarily applications in the chemical industry, foodstuffs industry, pharmaceuticals and medical technology. PTFE O-Rings are used only as static seals, e.g. on flange connections, on covers, etc.

Technical data

Working pressure: Up to 40 MPa

Temperature: - 200 °C to + 260 °C

Media: Practically all liquids, gases and chemicals

Materials

Standard material: Virgin, unfilled PTFE (polytetrafluoroethylene), Material Code PT00

PTFE is a partially crystalline thermoplastic characterised by a very high chemical and thermal resistance. PTFE has the highest resistance to chemicals of all plastics and can be used for almost any application. It has a slightly limited resistance to molten alkaline metals, to elementary fluorine and to certain halogen materials.

The material undergoes no changes on exposure to ageing, light and ozone. The water absorption rate is less than 0.01 %.

Design recommendations

PTFE O-Rings have low elasticity. The O-Ring size should therefore be chosen to suit the nominal diameter (rod or bore) to be sealed. Installation in axial easily accessible and radial split grooves is to be preferred.

The general information on the construction, design and surfaces given for the elastomer O-Rings applies also to PTFE O-Rings.

Methods of installation

PTFE O-Ring can only be stretched or compressed to a very limited extent during installation.

During installation, e.g. on flanges, the cold flow tendency of the thermoplastic PTFE should be taken into consideration. Under pressure, PTFE deforms plastically also in the cold state, i.e. a permanent deformation takes place. If flange seals are not tightened sufficiently to give metal/metal contact, the elastic deformation and thus the elastic tension can deteriorate.



Installation recommendations

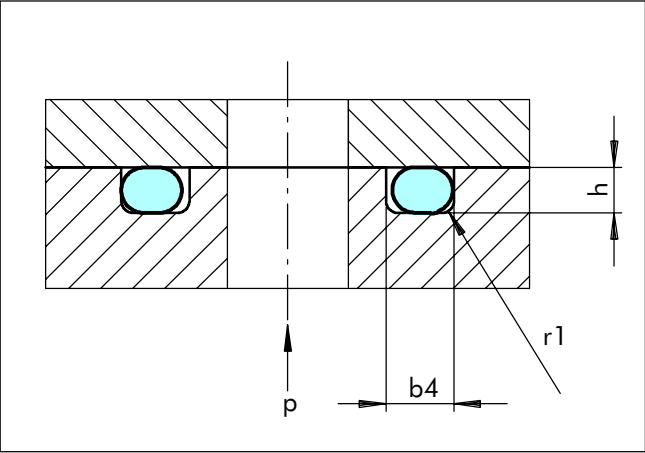


Figure 32 Axial installation, static, inside pressure

Table XXV Installation dimensions

Cross section d ₂	Groove dimensions		Radius r ₁
	Groove depth h +0.05	Groove width b ₄ +0.1	
1.50	1.30	1.7	0.2
1.60	1.40	1.8	0.3
1.78 1.80	1.60	2.0	0.4
2.00	1.80	2.2	0.5
2.40	2.15	2.6	0.5
2.50	2.25	2.8	0.5
2.62 2.65	2.35	2.9	0.6
3.00	2.70	3.3	0.8
3.53 3.55	3.15	3.9	1.0
4.00	3.60	4.4	1.0
5.00	4.50	5.5	1.0
5.33 5.30	4.80	5.9	1.2
5.70	5.10	6.3	1.2
6.00	5.60	6.6	1.2
7.00	6.30	7.7	1.5
8.00	7.20	8.8	1.5
8.40	7.55	9.2	2.0

Available dimensions

PTFE O-Rings are available in the same dimensions as the elastomer O-Rings. See O-Ring dimensions, page 48-109.

Ordering example

O-Ring, 40 x 3

Dimensions: Inside diameter d₁ = 40.0 mm
Cross section d₂ = 3.0 mm

Order No.	OR3004000	-	PT00
Part No.			
Quality Index (Standard)			
Material Code (Standard)			

O-Ring dimensions and Part No. see Table XV, page 48-109.
Installation dimensions, see Table XIV, page 46,
Ordering can also be made according to O-Ring dimensions and material.



D.4 Polyurethane O-Rings

Polyurethane is becoming more and more widely used as a sealing material due to its exceptionally high abrasion resistance and high extrusion resistance.

The polyurethane materials from Busak + Shamban have a number of improved properties.

Polyurethane is therefore an ideal material for O-Rings and sealing elements.

The outstanding properties of the materials play a major role particularly in the WU7TI, a 70 Shore A hardness material with low compression set, good hydrolysis behaviour, high flexibility, etc. see Table XXVI.

Polyurethane O-Rings are available in dimensions to American Standard AS 568 A (see dimension list, Table XXVII, page 126-127).

The dimensions are given with the inside diameter "d₁" and the cord diameter "d₂" (Figure 35, page 126).

Advantages

The main advantages of a polyurethane material for O-Rings compared with other elastomer are the outstanding mechanical properties:

- High abrasion and wear resistance tolerates aggressive operating conditions
- High extrusion resistance allows increased pressures or extrusion gaps
- Good mechanical properties improve service life
- Low friction reduces breakout forces on start up

Applications

Fields of application

Polyurethane O-Rings are especially suited wherever O-Rings are subject to dynamic loads.

This includes for example, applications in hydraulics, pneumatics and in a wide range of other critical areas. In many cases, polyurethane O-Rings are used instead of NBR in view of their high mechanical strengths.

Due to their particularly high abrasion resistance, polyurethane O-Rings are more suitable than other materials in applications where bores have to be crossed or where frequent opening and closing is demanded, e.g. plug connectors and couplings.

Polyurethane O-Rings in 70 Shore A hardness material WU7TI can, with advance, be used in applications such as pneumatics where low compression set and low friction are essential.

Technical data

Working pressure: Static up to approx. 100 MPa
without Back-up Ring
(depending on the extrusion gap)
Dynamic up to 25 MPa

Speed: Reciprocating up to
≤ 0.2 m/s

Temperature: -30 °C up to +100 °C

Media: Hydraulic fluids and mineral
oil-based greases and air.

Materials

The most important characteristics of these polyurethanes are:

- High tensile strength
- Low compression set
- Very good cold flexibility
- Constant shear modulus even at high temperatures
- Resistant to weathering and ageing
- High damping properties
- Low gas permeability
- Good hydrolysis resistance
- High tear propagation resistance
- Free from substances which hinder paint coverage



Polyurethane materials are resistant in:
Mineral oils and greases, oxygen, ozone.

Polyurethane compounds are not resistant in:
Esters, aromatic and chlorinated hydrocarbons, concentrated acids and lyes.

Polyurethane O-Rings are available in the grades:
Standard: Polyurethane, 70 Shore A
Material code WU7T1
On request: Polyurethane, 92 Shore A
Material code WU9T2

Table XXVI Material data sheet

Mechanical properties	Standard	Material WU7T1	Material WU9T2
Specific gravity (g/cm³)	DIN 53479	1.15 ±0.02	1.17 ±0.02
Hardness in Shore A	DIN 53505	70 ±5	92 ±3
Tensile strength (N/mm²), min.	DIN 54504	40	55
Elongation at fracture (%), min.	DIN 53504	480	400
Compression set (%) 22h / 70 °C 22h / 100 °C 70h / 70 °C	DIN 53517 Test specimen A	8 29 15	13 29 16
Low temperature characteristics TR (°C)	DIN 53545	-22	-20
Low temperature behaviour after 4h at -60 °C Folding test: Mandrel diameter = 3 mm, no breakage of the specimens	ASTM D 2137	no breakage	no breakage
Hot air ageing at 70h / 100 °C Change in hardness (Shore A) Change in tensile strength (%) Change in elongation at fracture (%)	DIN 53508	+1 +2 -1	0 +2 -4
Chemical resistance			
Resistance in ASTM-Oil-No. 3 70h / 100 °C Change in hardness (Shore A) Volumetric change (%)	DIN 53521	-11 +13	-2 +8
Resistance in water 70h / 80 °C Change in hardness (Shore A) Volumetric change (%)	DIN 53521	-1 +2	-1 +2

The measured results quoted were determined on standardised **test specimens**. These are mean values which cannot be used as specification values. **The measured results are not comparable with results which may be obtained on the finished product.**

Design instructions

The same design rules apply to polyurethane O-Rings as to other elastomer O-Rings, i.e. the same installation dimensions (groove depth, groove width), see Table XIV, page 46.

Radial clearance

In view of the high extrusion resistance of polyurethane, larger clearances can be bridged with polyurethane

O-Rings than with other elastomers, without the additional installation of Back-up Rings.

The diagrams in Figure 33 and Figure 34 show a comparison of the permissible clearances, depending on the Shore hardness and the system pressure. Compare these also with the extrusion gap sizes for standard elastomers in Table XI on page 44.

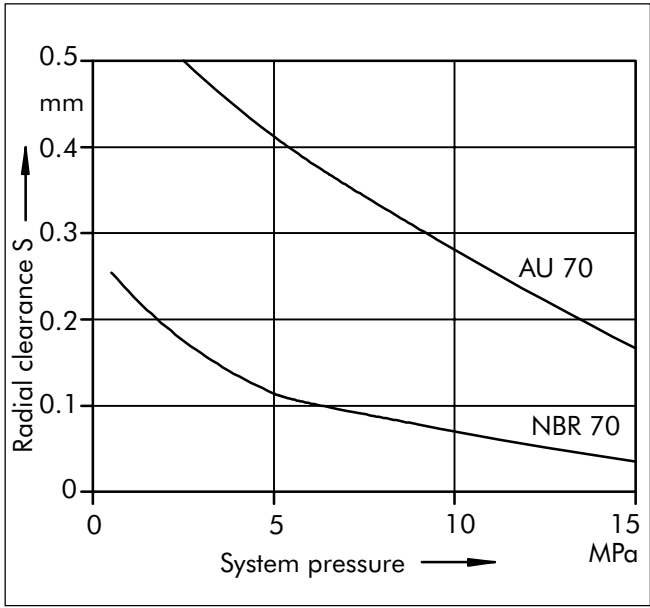


Figure 33

Permissible radial clearance as a function of system pressure for O-Rings in NBR 70 and AU 70 Shore A for **reciprocating service**.

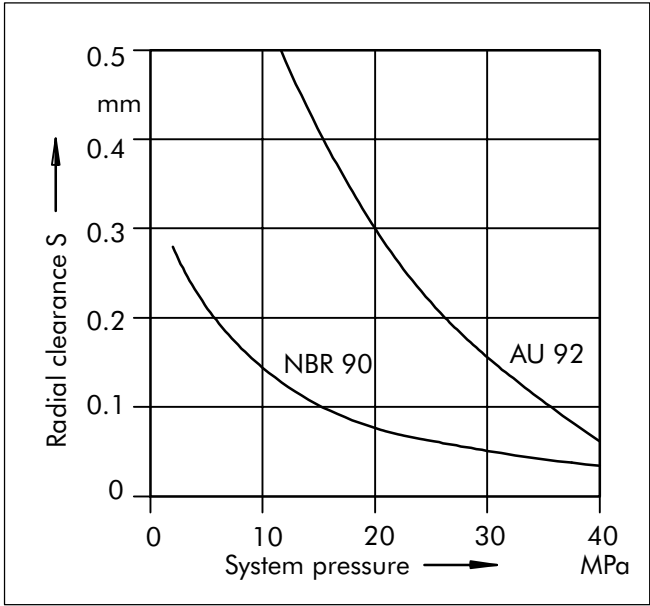


Figure 34

Permissible radial clearance as a function of system pressure for O-Rings in NBR 90 and AU 92 Shore A for **static service**.

O-Ring dimensions

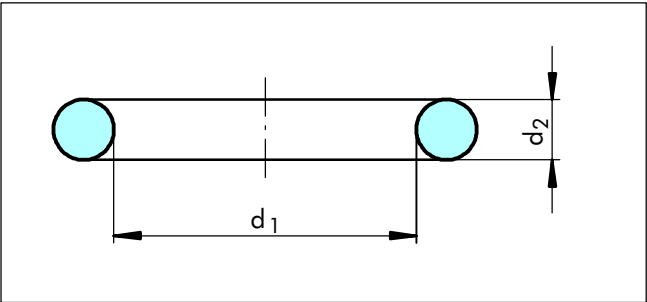


Figure 35 O-Ring dimensions

Table XXVII Dimensions according to AS 568 A
(Further sizes on request!)

Part No.	Inside-Ø d ₁	Cross Section d ₂
ORAR00005	2.57	1.78
ORAR00006	2.90	1.78
ORAR00008	4.47	1.78
ORAR00009	5.28	1.78
ORAR00010	6.07	1.78
ORAR00011	7.65	1.78
ORAR00012	9.25	1.78
ORAR00013	10.82	1.78
ORAR00014	12.42	1.78
ORAR00015	14.00	1.78
ORAR00017	17.17	1.78
ORAR00018	18.77	1.78
ORAR00019	20.35	1.78
ORAR00020	21.95	1.78
ORAR00022	25.12	1.78
ORAR00023	26.70	1.78
ORAR00025	29.87	1.78
ORAR00027	33.05	1.78
ORAR00029	37.82	1.78
ORAR00034	53.70	1.78
ORAR00036	60.05	1.78
ORAR00039	69.57	1.78
ORAR00040	72.75	1.78
ORAR00041	75.92	1.78



Part No.	Inside- $\varnothing$ d ₁	Cross Section d ₂
ORAR00045	101.32	1.78
ORAR00046	107.67	1.78
ORAR00047	114.02	1.78
ORAR00050	133.07	1.78
ORAR00110	9.19	2.62
ORAR00111	10.77	2.62
ORAR00112	12.37	2.62
ORAR00113	13.94	2.62
ORAR00114	15.54	2.62
ORAR00115	17.12	2.62
ORAR00116	18.72	2.62
ORAR00117	20.29	2.62
ORAR00118	21.89	2.62
ORAR00119	23.47	2.62
ORAR00120	25.07	2.62
ORAR00122	28.24	2.62
ORAR00124	31.42	2.62
ORAR00125	32.99	2.62
ORAR00126	34.59	2.62
ORAR00127	36.17	2.62
ORAR00128	37.77	2.62
ORAR00129	39.34	2.62
ORAR00132	44.12	2.62
ORAR00133	45.69	2.62
ORAR00134	47.29	2.62
ORAR00135	48.90	2.62
ORAR00136	50.47	2.62
ORAR00137	52.07	2.62
ORAR00138	53.64	2.62
ORAR00141	58.42	2.62
ORAR00142	59.99	2.62
ORAR00145	64.77	2.62
ORAR00146	66.34	2.62
ORAR00147	67.95	2.62
ORAR00210	18.64	3.53
ORAR00211	20.22	3.53
ORAR00213	23.39	3.53
ORAR00214	24.99	3.53

Part No.	Inside- $\varnothing$ d ₁	Cross Section d ₂
ORAR00215	26.57	3.53
ORAR00216	28.17	3.53
ORAR00217	29.74	3.53
ORAR00218	31.34	3.53
ORAR00220	34.52	3.53
ORAR00222	37.69	3.53
ORAR00224	44.04	3.53
ORAR00225	47.22	3.53
ORAR00226	50.39	3.53
ORAR00227	53.57	3.53
ORAR00228	56.74	3.53
ORAR00229	59.92	3.53
ORAR00230	63.09	3.53
ORAR00231	66.27	3.53
ORAR00232	69.44	3.53
ORAR00234	75.79	3.53
ORAR00235	78.97	3.53
ORAR00236	82.14	3.53
ORAR00237	85.32	3.53
ORAR00238	88.49	3.53
ORAR00239	91.67	3.53
ORAR00240	94.84	3.53
ORAR00325	37.47	5.33
ORAR00326	40.64	5.33
ORAR00327	43.82	5.33
ORAR00328	46.99	5.33
ORAR00329	50.17	5.33
ORAR00330	53.34	5.33
ORAR00331	56.52	5.33
ORAR00332	59.69	5.33
ORAR00334	66.04	5.33
ORAR00336	72.39	5.33
ORAR00337	75.57	5.33
ORAR00338	78.74	5.33
ORAR00339	81.92	5.33
ORAR00340	85.09	5.33

Tolerances based on ISO 3601. See tables XVIII and XIX.



Ordering Example

O-Ring, American Standard AS 568A, ref. 214

Dimensions: Inside diameter d_1 = 24.99 mm
 Cross section d_2 = 3.53 mm

Material: Polyurethane (AU 70 Shore A)

O-Ring dimensions and Part No. see Table XXVII.
Compounds, see page 125.
Installation dimensions, see Table XIV, page 46.

Ordering can also be made according to O-Ring dimensions and material.

Order No,	ORAR00214	-	WU7T1
Part No.			
Quality Index (Standard)			
Material code (Standard)			

D.5 Round cord rings (butt vulcanised)

Round cords are produced by extrusion, They are supplied as cut lengths. The most common materials are NBR 70 Shore A, EPDM 65 Shore A and FKM 75 Shore A. Other materials are available on request.

In contrast to mould-vulcanised O-Rings, round cord rings made from continuously extruded cord can be made up to any desired diameter. The connection point

always has poorer mechanical properties than the basic material.

For this reason, round cord rings should not be used for dynamic seals, gaseous media or vacuum.

The O-Ring tolerances according to ISO 3601-1 for cross section d_2 are not applicable.

Table XXVIII Available cross sections and valid tolerances for FKM 75 Shore A

Cross section (mm)	Tolerance
1.78	+ 0.3 / - 0.1
2.00	
2.50	+ 0.3 / - 0.2
2.60	
3.00	
3.50	
4.00	
4.50	+ 0.4 / - 0.2
5.00	
5.30	
5.70	
6.00	

Cross section (mm)	Tolerance
6.50	+ 0.5 / - 0.3
7.00	
8.00	
8.40	
9.00	
10.00	+ 0.6 / - 0.4
11.00	
12.00	
14.00	
15.00	
18.00	+ 0.8 / - 0.6
20.00	



Table XXIX Available cross sections and valid tolerances for NBR 70 Shore A

Cross section (mm)	Tolerance
1.00	± 0.20
1.50	
1.78	
2.00	
2.50	
3.00	± 0.25
3.20	
3.53	
4.00	
4.75	
5.00	± 0.35
5.33	
5.70	
6.00	
6.40	
7.00	± 0.40
7.50	
8.00	
8.40	
9.00	
9.50	
10.00	
11.00	
12.00	± 0.50
12.70	
13.00	
14.00	
15.00	
16.00	
18.00	
20.00	± 0.70
22.00	
25.00	
30.00	± 0.80

Table XXX Available cross sections and valid tolerances for EPDM 65 Shore A

Cross section (mm)	Tolerance
2.00	± 0.20
2.50	
3.00	± 0.25
3.50	
4.00	
5.00	± 0.35
5.33	
5.70	
6.00	
7.00	± 0.40
8.00	
9.00	
9.50	
10.00	
11.00	± 0.50
12.00	
13.00	
14.00	
15.00	
20.00	± 0.70

On demand moulded O-rings can be cut and butt-vulcanised to create special sizes. Please ask our specialists for further details.



D.6 O-Ring surface treatments

In many cases standard elastomeric O-Rings cannot be used without a modified surface. Friction can be one of the reasons. Also the possible contamination of the systems through extraction of material components is often not acceptable.

Therefore O-Rings can be surface-treated by special ways

of cleaning, dipping, spraying or coating in order to reduce friction and adhesion, achieve permanent lubrication or facilitate installation.

Depending on the desired effect several high-quality surface treatments or coatings can be used. These are described in the following sections.

D.6.1 O-Rings free of substances causing problems with paint wetting "Labs-free"

In compressed-air processing, these Labs-free O-Rings are particularly suited to highly-automated paint technology, primarily in the automobile industry. The sealing property of being "silicon-free" is frequently no longer adequate here.

Plant must be free from all substances posing paint wetting problems.

A high-technology cleaning process fulfils VW Test specification no. 3.10.7., along with other regulations. Every batch is checked and documented accordingly. No

subsequent exuding of the mixture components takes place, making medicine another possible area of application. The special packing in "labs-free" bags and appropriate labeling also make storage problem-free.

This absolutely environment-friendly process does not change the physical properties of the O-Ring. In addition, these cleaned components, being dry, are very suitable for automatic assembly. O-Rings made of FKM are especially suitable for this treatment.

Article group OC.

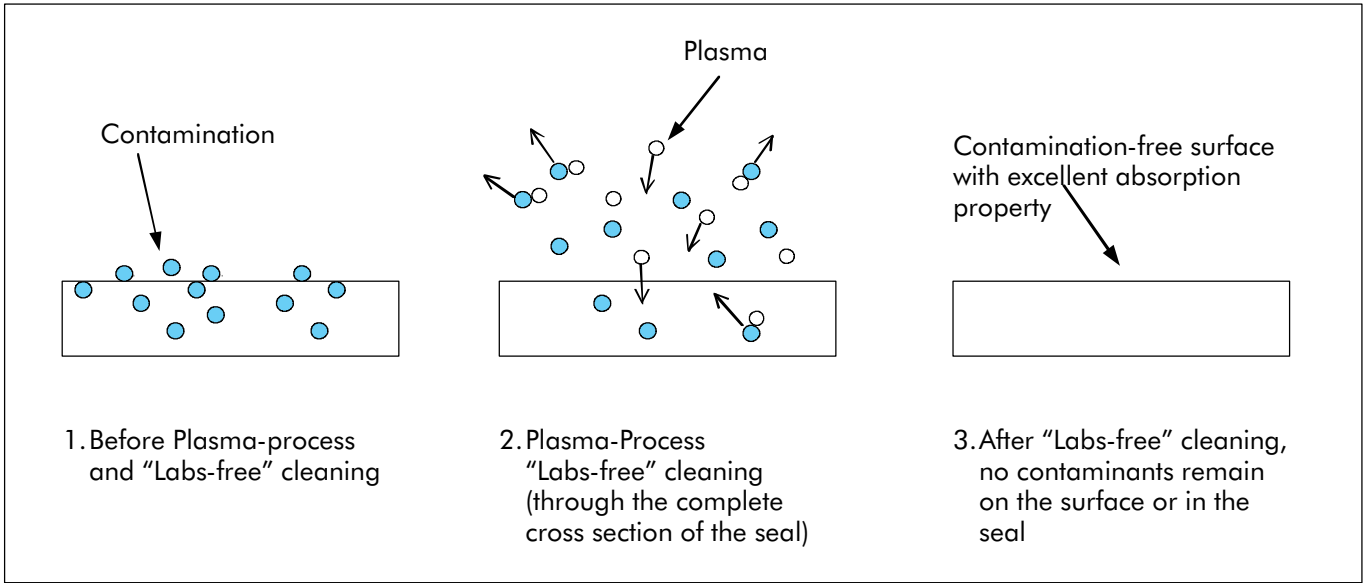


Figure 36 Schematic course of the labs-free treatment



Ordering example

(Further information see page 109)

O-Ring metric 40 x 3 - FKM 70

Dimensions: Inside diameter = 40.0 mm

 Cross section = 3.0 mm

Material: FKM 70
 (Fluorocarbon Rubber 70 Shore A)

Order No.	OC	30	04000	-	V7
Article Group					
Cross section x 10					
Inside Diameter x 100					
Quality Index (Standard)					
Material Code (Standard)					

D.6.2 O-Ring friction reducing processes

The strong trend towards automatic assembly in all areas of production places completely new requirements on O-Rings. The elements must be treated in such a way that they can be separated without problems. Depending on the application area, stick-slip phenomena and high breakaway forces need to be prevented. Particularly in the transmission of dynamic functions, as in the case of

short strokes and infrequent switch operation, or in the reduction of assembly forces, e. g. plug connections, a reduction of friction is demanded.

The table XXXI provides a summary of different surface treatments and the selection criteria. The treatments are described in the following sections.

Table XXXI Selection criteria for friction reducing processes

Procedure	Article group	Elastomers	Adhesion prevention (packing)	Reduction of assembly force (plug-in systems)	Automatic assembly (separation)	Dynamic application (valves)
HF coating	OD	NBR, FKM, EPDM, (black types)	A	A	A	B
DF treatment	OI	NBR	A	A	A	A
Plastic coating (X-Sel)	OB	NBR	A	A	A	A
Molycote treatment	OM	All	A	A	B	C
Elastolub 013 coating	OE	All except VMQ	C	A	C	C
PTFE powder coating	OH	FKM	A	A	B	C
PTFE hard coating	OL	NBR, FKM, EPDM	A	A	A	A
Talcum coating	OT	All	A	C	B	C
MaxWax®	OW	All	A	A	A	C

A = Very good
B = Good
C = Satisfactory

This table represents a selection of the most important variants. Further proposals are available on request.



HF coating

This is a special coating which is applied to the elastomer surface after the additional "Plasma Treatment" which cleans the total cross section to ensure permanent surface bonding.

- Flexible coating with surface bond
- Coating thickness 5 – 10 µm
- Temperature range of the coating material -40 °C to +150 °C
- No negative influence on elastomer features
- Constant process assured quality
- No additional oil/grease coating necessary
- Parts remain separated in the packaging
- Dry surface
- Low mounting force
- Suitable for dynamic applications
- Excellent usage with automatic installation
- No corrosion with metal
- For NBR, FKM, EPDM, only black types
- **Article group OD**

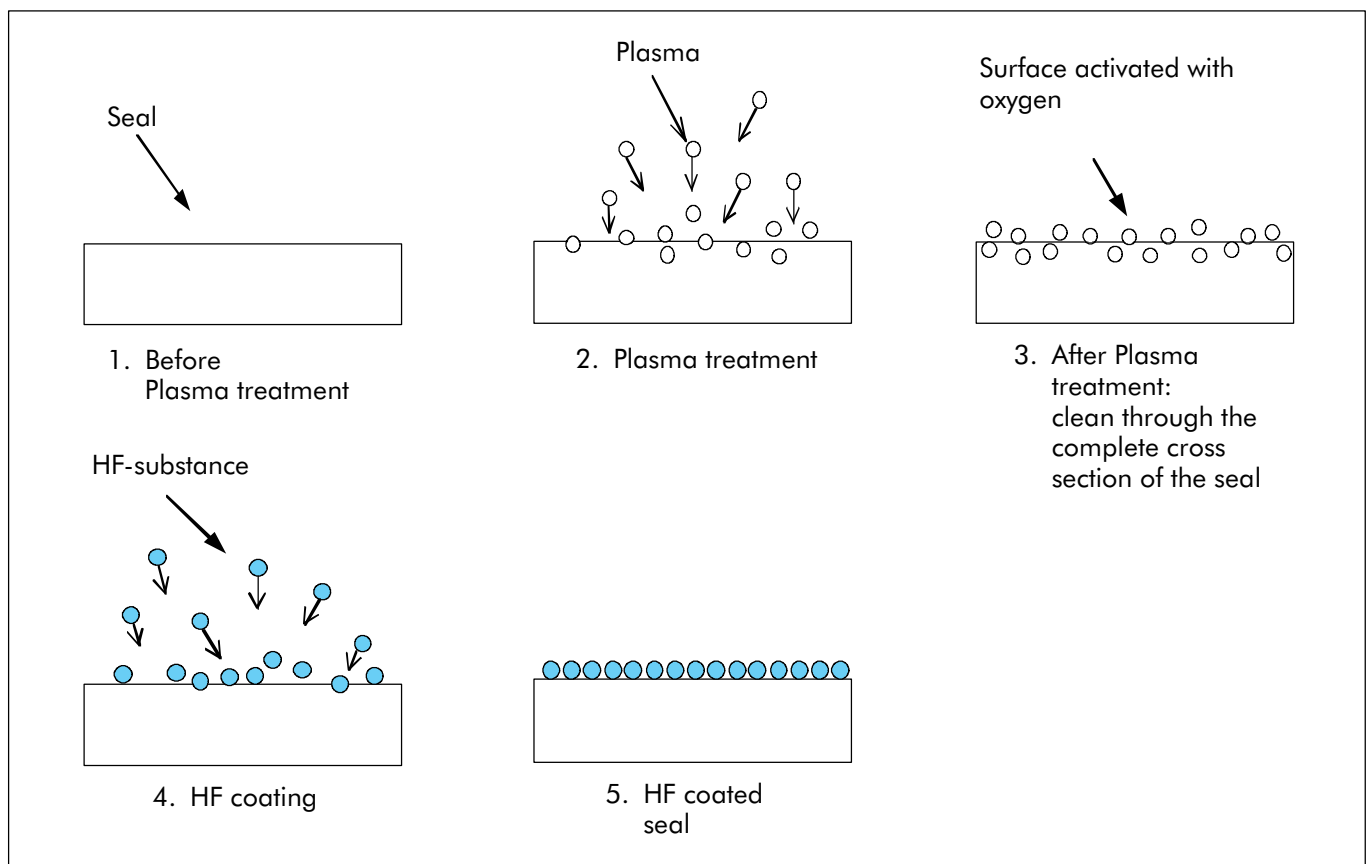


Figure 37 Schematic course of the HF coating

Ordering example

(Further information see page 109)

O-Ring metric 40 x 3 - NBR 70

Dimensions: Inside diameter = 40.0 mm
Cross section = 3.0 mm

Material: NBR 70
(Nitrile Butadiene Rubber 70 Shore A)

Order No.	OD30	04000-	N7
Article Group			
Cross section x 10			
Inside diameter x 100			
Quality Index (Standard)			
Material Code (Standard)			



DF treatment

In this computer-controlled process, specially developed for NBR, the surface of the O-Ring is modified in the μm range. The physical properties of the elastomer change only slightly as a result. One important aspect of this process is its particular environmentally-friendly nature and the dirt-free handling of the seals without odour nuisance.

- Surface modification
- No coating $\Rightarrow$ no negative effect on the initial squeeze of the O-Ring
- Change of hardness up to +4 IRHD after treatment
- Temperature range equivalent to NBR material
- Constant process ensured quality
- No additional oil/grease coating necessary
- KTW approval possible in combination with special materials
- Parts remain separated in the packaging
- Dry surface
- Low mounting force
- Suitable to dynamic applications if squeeze of the O-Ring cross section is $< 10\%$
- Excellent usage with automatic installation
- "Labs-free" quality available on request
- Only for NBR (sulphur cured types)
- **Article group OI**

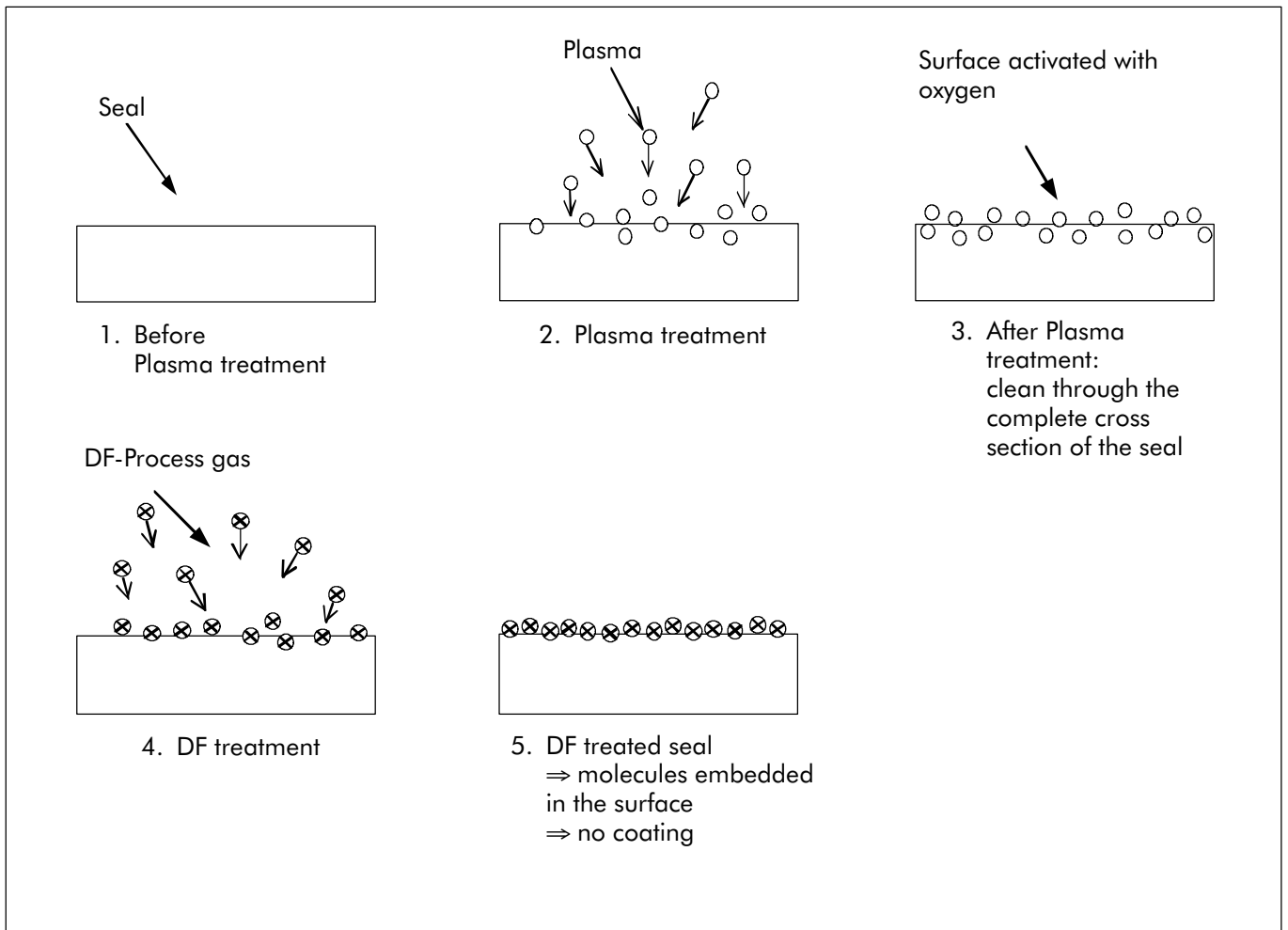


Figure 38 Schematic course of the DF treatment



Ordering example

(If the product is also to be free from substances causing problems with paint wetting, state "labs-free" in the Order. Further information see page 109)

O-Ring, metric 40 x 3 - NBR 70

Dimensions: Inside diameter = 40.0 mm

Cross section = 3.0 mm

Material: NBR 70

(Nitrile-Butadiene Rubber 70 Shore A)

Order No.	OI	30	04000	-	N7
Article Group					
Cross section x 10					
Inside Diameter x 100					
Quality Index (Standard)					
Material Code (Standard)					

Other variants of friction reducing processes

Plastic coating (X-Sel)

This is a thin, but wear-resistant blue plastic layer. Although it appears smooth in practice, caverns are created, forming a lubricant reservoir. Under pressure, these caverns seal the edges so that the lubricant is enclosed and retained over a long operating period.

- Thin, wear-resistant plastic layer (blue)
- Suitable for all hydraulic fluids and mineral-oil based lubricating oils
- Not suitable for biodegradable hydraulic fluids
- Maximum temperature in conjunction with water +50 °C
maximum operating temperature in conjunction with synthetic fluids +80 °C
- In dry running applications reduction in friction force is at least 20%
In the lubricated state reduction in friction force by up to 50%
- Only for NBR
- **Article group OB**

Elastolub 013 coating

Elastolub 013 is a silicon fluid-based lubricant. The substance is applied to the rings in a drum, and combines very well with the elastomere surface. Elastolub 013 forms a thin lubricating film.

- A thin lubricating film by tumbling
- Reduction of assembly forces
- Tendency for such O-Rings to stick together slightly
- For all types of elastomers
- **Article group OE**

Molycote treatment

In Molycote treatment, high-purity, micro-fine molybdenum disulphide (MoS_2) is applied to the surface of the elastomere. The MoS_2 is incorporated as a dry lubricating film by tumbling onto the sealing surface. This gives rise to mechanical interlocking, which over a long period, brings about a reduction in friction and wear under dynamic stresses.

- Dry lubricating film by tumbling into the sealing surface (silvery colour)
- Friction force reduction in conjunction with low dynamic stresses
- Long-term friction reduction can be achieved by deposition of the slide-promoting substances in hollows in the opposing surface
- Improved separation in automatic assembly
- Low abrasion resistance of MoS_2 layer
- Rubbing of the surface layer can lead to dirt build up on the automatic assembly machine peripherals
- For all types of elastomers
- **Article group OM**



PTFE powder coating

As with Molycote coating, the finest PTFE powder is applied by tumbling to the surface of the seals. In addition, a very good connection between the powder and the elastomer is achieved owing to the prior cleaning and the elevation of surface energy in the seals.

- Powder-coating by tumbling
- Insoluble in water
- No environmentally polluting effects
- PTFE is chemically inert
- We are unaware of any negative reactions in conjunction with metallic components
- Primarily used to facilitate assembly
- Dirt build up on the assembly machine is largely prevented
- Only for FKM
- **Article group OH**

PTFE hard coating

The PTFE is sprayed onto the seal and joins with the elastomere in a firm bond.

- Coating with surface bond
- Low static friction after long down times and dry running
- Especially suited to dynamic applications
- Not intended to improve chemical resistance
- For NBR, FKM, EPDM
- **Article group OL**

Talcum coating

The talcum is applied to the seal in a drum as a loose powder coating. No interlocking with the surface of the elastomere takes place.

- Loose powder coating
- Prevent components from sticking together after packing
- Better separation in automatic assembly
- Not suitable for dynamic applications
- For all types of elastomers
- **Article group OT**

MaxWax® coating

Ready made parts are covered with a quick-drying synthetic hard wax of polythene in a diffusion process. No changes are made in the material composition.

- Coating free from silicone
- Dry surface
- No changes in material composition
- Replaces lubrication at installation
- Reduces friction
- Gives good results in dynamic applications specifically with short- or medium-length strokes
- For all types of materials
- Only available for Skega materials
- **Article group OW**



E General quality criteria and storage guidelines

E.1 Quality criteria

The cost-effective use of seals and bearings is highly influenced by the quality criteria applied in production. Seals and bearings from Busak+Shamban are continuously monitored according to strict quality standards from material acquisition through to delivery.

Certification of our production plants in accordance with international standards QS 9000 / ISO 9000 meets the specific requirements for quality control and management of purchasing, production and marketing functions.

Our quality policy is consistently controlled by strict procedures and guidelines which are implemented within all strategic areas of the company.

All testing of materials and products is performed in accordance with accepted test standards and specifications, e.g. random sample testing in accordance with DIN ISO 2859, part 1.

Inspection specifications correspond to standards applicable to individual product groups (e.g. for O-Rings: ISO 3601).

Our sealing materials are produced free of chlorofluorinated hydrocarbons and carcinogenic elements.

The tenth digit of our part number defines the quality characteristics of the part. A hyphen indicates compliance with standard quality criteria outlined in this catalogue. Customer-specific requirements are indicated by a different symbol in this position. Customers who require special quality criteria should contact their local Busak+Shamban sales office for assistance. We have experience in meeting all Customer quality requirements.

E.2 Storage and shelf life

Seals and bearings are often stored as spare parts for prolonged periods. Most rubbers change in physical properties during storage and ultimately become unserviceable due, e.g., to excessive hardening, softening, cracking, crazing or other surface degradation. These changes may be the result of particular factors or combination of factors, such as the action of deformation, oxygen, ozone, light, heat, humidity or oils and solvents.

With a few simple precautions, the shelf life of these products can be considerably lengthened.

Fundamental instructions on storage, cleaning and maintenance of elastomeric seal elements are described in international standards, such as:

DIN 7716 / BS 3F68:1977,
ISO 2230 or
DIN 9088

The standards give several recommendations for the storage and the shelf life of elastomers, depending on the material classes.

The following recommendations are based on the several standards and are intended to provide the most suitable conditions for storage of rubbers. They should be observed to maintain the optimum physical and chemical values of the parts:

Heat

The storage temperature should preferably be between +5 °C and +25 °C. Direct contact with sources of heat such as boilers, radiators and direct sunlight should be avoided.

If articles are taken from low temperature storage, care should be taken to avoid distorting them during handling at that temperature as they may have stiffened. In this case the temperature of the articles should be raised to approximately +20 °C before they are put into service.

Humidity

The relative humidity in the store room should be below 70 %. Very moist or very dry conditions should be avoided. Condensation should not occur.

Light

Elastomeric seals should be protected from light sources, in particular direct sunlight or strong artificial light with an ultraviolet content. The individual storage bags offer the best protection as long as they are UV resistant. It is advisable to cover any windows of storage rooms with a red or orange coating or screen.

Radiation

Precaution should be taken to protect stored articles from all sources of ionising radiation likely to cause damage to stored articles.



Oxygen and ozone

Where possible, elastomeric materials should be protected from circulating air by wrapping, storage in airtight containers or by other suitable means. As ozone is particular deleterious to some elastomeric seals, storage rooms should not contain any equipment that is capable of generating ozone, such as mercury vapour lamps, high voltage electrical equipment, electric motors or other equipment which may give rise to electric sparks or silent electrical discharges. Combustion gases and organic vapour should be excluded from storage rooms as they may give rise to ozone via photochemical processes.

Deformation

Elastomeric materials should, wherever possible, be stored in a relaxed condition free from tension, compression or other deformation. Where articles are packed in a strain-free condition they should be stored in their original packaging.

Contact with liquid and semi-solid materials

Elastomeric seals should not be allowed to come into contact with solvents, oils, greases or any other semi-solid materials at any time during storage, unless so packed by the manufacturer.

Contact with metal and non-metals

Direct contact with certain metals, e.g. manganese, iron and particularly copper and its alloys, e.g. brass and compounds of these materials are known to have deleterious effects on some rubbers. Elastomeric seals should not be stored in contact with such metals. Because of possible transfer of plasticisers or other ingredients, rubbers must not be stored in contact with PVC. Different rubbers should preferably be separated from each other.

Cleaning

Where necessary, cleaning should be carried out with the aid of soap and water or methylated spirits. Water should not, however, be permitted to come into contact with fabric reinforced components, bonded seals (because of corrosion) or polyurethane rubbers. Disinfectants or other organic solvents as well as sharp-edged objects must not be used. The articles should be dried at room temperature and not placed near a source of heat.

Shelf life and shelf life control

The useful life of a elastomeric seals will depend to a large extend on the type of rubber. When stored under the recommended conditions (above sections) the below given shelf life of several materials should be considered.

AU, thermoplastics	4 years
NBR, HNBR, CR	6 years
EPDM	8 years
FKM, VMQ, FVMQ	10 years
FFKM, Isolast®	18 years
PTFE	unlimited

Elastomeric seals should be inspected after the given period. After this giving an extension period is possible.

Rubber details and components less than 1.5 mm thick are liable to be more seriously affected by oxidation degradation even when stored in satisfactory conditions as recommended. Therefore they may be inspected and tested more frequently than it is mentioned above.

Rubber details / seals in assembled components

It is recommended that the units should be exercised at least every six months and that the maximum period a rubber detail be allowed to remain assembled within a stored unit, without inspection, be a total of the initial period stated above and the extension period. Naturally this will depend on the design of the unit concerned.



O-Ring

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