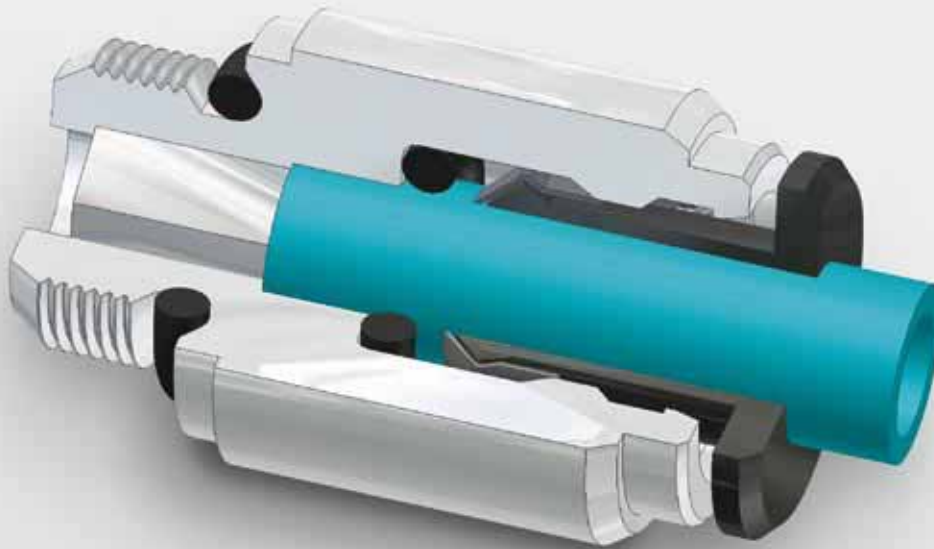


O-Rings



Inch Version



Your Partner for Sealing Technology



Your Partner for Sealing Technology

Trelleborg Sealing Solutions is a major international sealing force, uniquely placed to offer dedicated design and development from our market-leading product and material portfolio: a one-stop-shop providing the best in elastomer, thermoplastic, PTFE and composite technologies for applications in aerospace, industrial and automotive industries.

With 50 years of experience, Trelleborg Sealing Solutions engineers support customers with design, prototyping, production, test and installation using state-of-the-art design tools. An international network of over 70 facilities worldwide includes 30 manufacturing sites, strategically positioned research and development centers, including materials and development laboratories and locations specializing in design and applications.

Developing and formulating materials in-house, we utilize the resource of our material database, including over 2,000 proprietary compounds and a range of unique products.

Trelleborg Sealing Solutions fulfills challenging service requirements, supplying standard parts in volume or a single custom-manufactured component, through our integrated logistical support, which effectively delivers over 40,000 sealing products to customers worldwide.

Facilities are certified to ISO 9001:2000 and ISO/TS 16949:2002. Trelleborg Sealing Solutions is backed by the experiences and resources of one of the world's foremost experts in polymer technology: the Trelleborg Group.

ISO 9001:2000

ISO/TS 16949:2002

The information in this brochure is intended to be for general reference purposes only and is not intended to be a specific recommendation for any individual application. The application limits for pressure, temperature, speed and media given are maximum values determined in laboratory conditions. In application, due to the interaction of operating parameters, maximum values may not be achieved. It is vital therefore, that customers satisfy themselves as to the suitability of product and material for each of their individual applications. Any reliance on information is therefore at the user's own risk. In no event will Trelleborg Sealing Solutions be liable for any loss, damage, claim or expense directly or indirectly arising or resulting from the use of any information contained in this brochure. While every effort is made to ensure the accuracy of information contained herewith, Trelleborg Sealing Solutions cannot warrant the accuracy or completeness of information.

To obtain the best recommendation for a specific application, please contact your local Trelleborg Sealing Solutions marketing company.

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Content

A	General information	3
A.1	Description	3
A.2	Applications	3
A.3	Method of operation	4
B	Technical information	5
B.1	Materials	5
B.1.1	Elastomers	5
B.1.2	Application parameters of elastomers	7
B.1.3	Characteristics and inspection of elastomers	25
B.1.4	Special requirements - authorities and approvals	28
B.1.5	Standard materials	30
B.2	Design recommendations	35
B.2.1	Installation recommendations	35
B.2.2	Initial compression	36
B.2.3	Elongation - compression	37
B.2.4	Methods of installation and design of seal housing	38
C	Dimensions and product range	46
C.1	Dimensions and international standards	46
C.1.1	O-Ring dimensions according to AS 568 B	46
C.1.2	O-Ring range of sizes	56
C.1.3	O-Ring dimensions for straight thread tube fitting sizes, AS 568 B	123
C.1.4	O-Ring dimensions for metric thread with conical recess according to ISO 6149	124
C.2	Tolerances of dimensions	125
C.3	O-Ring quality acceptance criteria	127
C.4	Seal set	129
D	Special O-Rings	130
D.1	Isolast® (FFKM) O-Rings	130
D.2	FEP-encapsulated O-Rings	130
D.3	PTFE O-Rings	135
D.4	Polyurethane O-Rings	137
D.5	Round cord rings (vulcanized)	141
D.6	O-Ring surface treatments	143
D.6.1	O-Rings free of substances affecting the lacquer coating - Labs-free	143
D.6.2	O-Ring friction reducing processes	144
E	General quality criteria and storage guidelines	150
E.1	Quality criteria	150
E.2	Storage and shelf life of polymer sealing material	150
	Index	152



O-Ring



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 vulcanized in molds and are characterized 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 approximately .014 to 1.575 inches (0.35 to 40 mm) and inside diameters up to 200 inches (5,000 mm) and more are available.

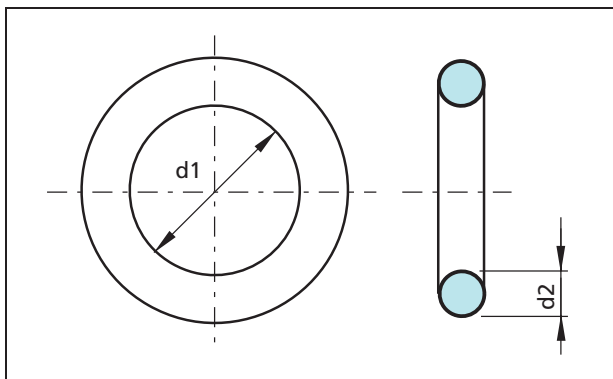


Figure 1 O-Ring dimensioning

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
- Stock availability of many sizes worldwide for easy maintenance and repair

A.2 Applications

O-Rings are used as sealing elements or as energizing 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

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

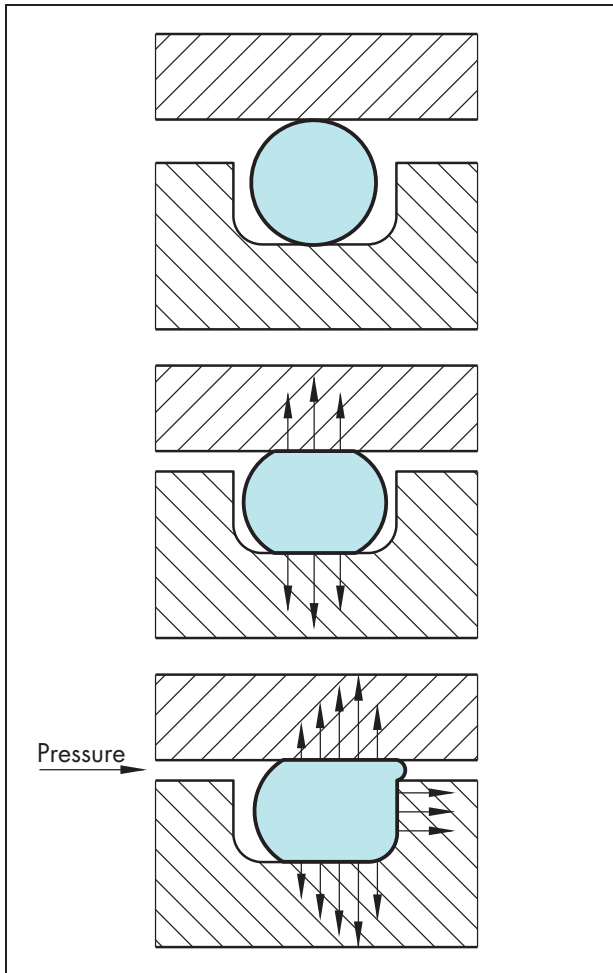


Figure 2 O-Ring sealing forces with and without system pressure



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 seals 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. Trelleborg Sealing Solutions 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 materials").

Table I Elastomers

Designation	Trade Name*	Abbreviation		
		ISO 1629	ASTM 1418	TSS
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®	FEP	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® Kalrez®	FFKM	FFKM	J
Polyester Urethane Polyether Urethane	Zurcon® Adiprene® Pellethan® Vulcollan® Desmopan®	AU EU	AU EU	WU WU

* Selection of registered trade names ASTM = American Society for Testing and Materials



O-Ring

Designation	Trade Name*	Abbreviation		
		ISO 1629	ASTM 1418	TSS
Chlorosulfonated Polyethylene Rubber	Hypalon®	CSM	CSM	WM
Polysulfide Elastomer	Thiokol®	-	TWT	WY
Epichlorohydrin Elastomer	Hydrin®	-	-	WO

* Selection of registered trade names ASTM = American Society for Testing and Materials

Table II The most important types of synthetic rubber, their groupings 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 - Chlorosulfonated Polyethylene Rubber - Ethylene Propylene Diene Rubber - Ethylene Propylene Rubber - Fluorocarbon Rubber - Perfluoro Rubber	ACM AEM CSM EPDM EPM FKM FFKM	ACM CSM EPDM EPM FKM FFKM
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, among 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

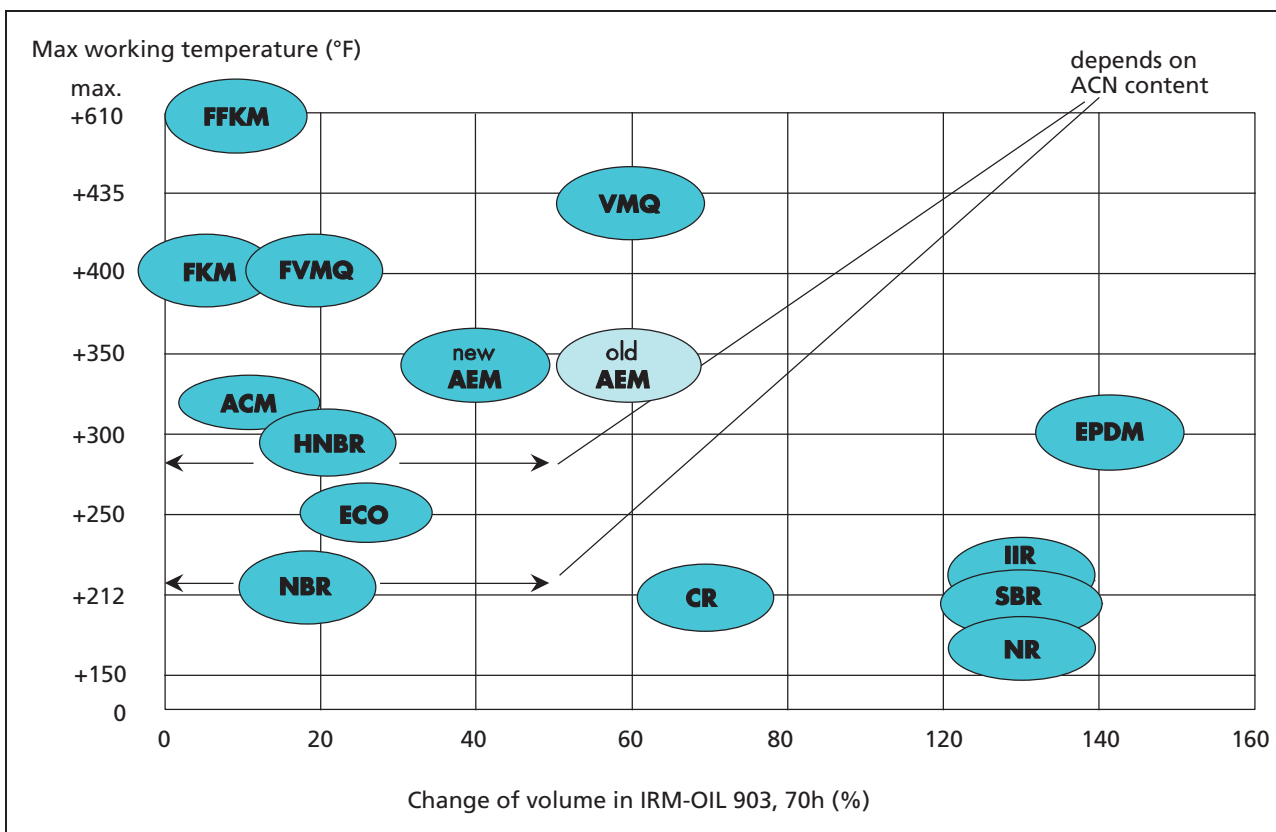


Figure 3 Change of volume in IRM-Oil 903 (old ASTM-Oil No 3)



Temperature range

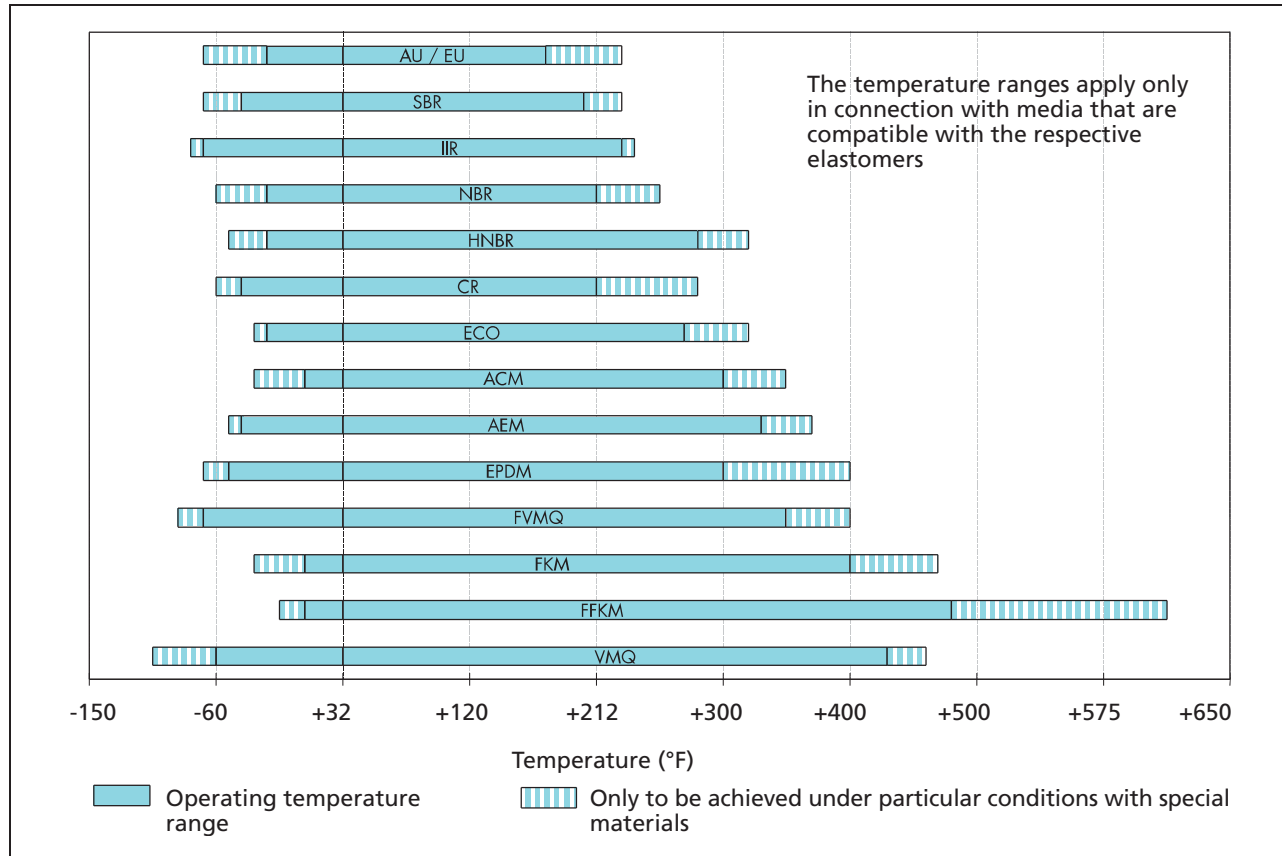


Figure 4 Temperature range of various elastomers

General fields of application

Elastomer materials are used to cover a large number of fields of application. Details regarding resistance in special media are shown in paragraph "Chemical compatibility," page 9.

The various elastomers can be characterized as follows:

NBR (Nitrile Butadiene Rubber)

The properties of 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 -22°F and +212°F (-30°C and +100°C) (for a short period of time up to +250°F (+120°C)). Suitable formulated NBR can be used down to -75°F (-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 Fluorocarbon Rubber range between -5°F and +400°F (-20°C and +200°C) (for a short period of time up to +450°F (+230°C)). Suitable formulated FKM can be used down to -40°F (-40°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, it also exhibits high levels of elasticity, good low temperature behavior and good insulating properties.

The operating temperatures of applications for EPDM range between -50°F and +300°F (-45°C and +150°C) (for a short period of time up to +350°F (+175°C)). With sulfur-cured types the range is reduced to -50°F and +250°F (-45°C and +120°C) (for short period of time up to +300°F (+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 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 -22°F and +285°F (-30°C and +140°C) (for a short period of time up to +320°F (+160°C)) in contact with mineral oils and greases. Special types can be used down to -40°F (-40°C).

VMQ (Silicone Rubber)

VMQ shows excellent heat resistance, cold flexibility, dielectric properties and especially good resistance to weather, ozone and UV rays.

Specific VMQ formulations are resistant to aliphatic engine and gear oils, water up to +212°F (+100°C) and high-molecular chlorinated hydrocarbons. The temperature range is between -75°F and +400°F (-60°C and +200°C) (temporary up to +450°F (+230°C)).

FVMQ (Fluorosilicone Rubber)

FVMQ has good heat resistance, very good low temperature flexibility, good electrical properties and excellent resistance to weather, ozone and UV rays. FVMQ shows significantly better chemical resistance than standard Silicone especially in hydrocarbons, aromatic mineral oils, fuel and low molecular aromatic hydrocarbons, such as Benzene and Toluene. The temperature range is between -70°F (-55°C) and +350°F (+175°C) (temporary up to 400°F (+200°C)).

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°F and +212°F (-40°C and +100°C) (for a short period of time up to +250°F (+120°C)). Special types can be used down to -70°F (-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 -5°F and +300°F (-20°C and +150°C) (for a short period of time up to +350°F (+175°C)). Special types can be used down to -30°F (-35°C). ACM materials are mainly used in automotive applications which require special resistance to lubricants containing many additives (including sulfur) at high temperatures.

FFKM (Perfluoro Rubber- Isolast®)

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 material the operating temperatures range between -13°F and +475°F (-25°C and +240°C). Special types can be used up to +617°F (+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.

Polyurethane (Zurcon® Polyurethane)

Polyurethanes are an exceptionally complex material group. They are individually designed and fit various applications' needs. Therefore it is not possible to unify the materials' properties.

Zurcon® polyurethane materials from Trelleborg Sealing Solutions are customized to appropriate applications and stand out due to their excellent elastic properties and optimum abrasion resistance. Outstanding tensile strength, low compression set and good resistance to O₂ and O₃ are further significant characteristics. Depending on the individual Zurcon® polyurethane type application temperature range from below -58°F and +230°F (-50°C up to +110°C), temporary even higher, is feasible.

For the pre-selection of a suitable material group a comprehensive chemical compatibility guide is available. This can be downloaded from our website www.tss.trelleborg.com or you can contact your local Trelleborg Sealing Solutions sales office for further details.

Chemical compatibility

It is important to recognize that when using this guide, the ratings shown are based on published data and immersion tests. These tests are conducted under laboratory conditions predominantly at room temperature and may not represent adequately the conditions in the field. Relatively 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.



O-Ring

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.

Valid from December 2007

Table III Chemical Compatibility Guide

A

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Acet Aldehyde1	U	U	-	B	U	U	U	U	-
Acet Amide	-	-	A	A	U	A	A	A	B
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
Acetyl Acetone	U	U	U	A	U	U	U	U	U
Acetyl Chloride	U	U	U	U	A	A	U	U	U
Acetylene Gas	A	-	B	A	A	A	A	A	B
Acetylene Tetra-bromide	-	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 Aciddiethyl-ester	-	-	-	A	U	-	U	U	-
Aero Lubriplate	A	A	A	U	A	A	A	A	B

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
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
Aerocene 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 Arylsulfonic Acid	U	U	C	A	U	U	C	C	U
Alkyl Benzene	U	U	U	U	A	A	U	U	U
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 Acetate1	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 Sulfate 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, Al	U	U	U	A	U	U	U	U	C



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Latest information available at www.tss.trelleborg.com

Edition November 2008



CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Aminoacetic Acid	U	U	A	A	A	U	B	B	U
Ammonia	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, anhy-drous	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 Carbo-nate	-	U	B	A	U	-	A	A	-
Ammonium Carbo-nate Solution	-	-	B	A	-	-	U	U	-
Ammonium Chloride	B	U	A	A	A	A	A	A	A
Ammonium Chloride Solution	-	-	A	A	-	-	A	A	-
Ammonium Fluoride	U	U	B	A	B	B	A	A	A
Ammonium Hydro-xide	U	U	A	A	U	-	U	U	-
Ammonium Hydro-xide Solution	U	U	A	A	U	-	U	U	-
Ammonium Nitrate Solution	U	-	A	A	-	-	A	A	-
Ammonium Nitrite	-	-	B	A	-	-	A	A	B
Ammonium Phos-phate, 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 Thio-cyanate	-	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 Naphthalene	U	U	U	U	A	A	U	U	U
Anderol L-774	A	U	U	U	A	A	A	A	U
Aniline Chlorohy-drates	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

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
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 Hydrocar-bons (100% Aromatic)	U	U	U	U	A	A	U	U	U
Arsenic Acid	C	C	A	A	A	A	A	A	A
Arsenic Acid Solu-tion	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
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-Trans-mission Fluid	U	A	B	U	A	A	A	A	B
Automotive Gaso-line	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



O-Ring

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
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
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 Gas1	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 (based on glycol ether)	U	U	B	A	U	U	U	U	U
Brake Fluids (based on mineral oil)	-	A	B	-	A	-	A	A	-
Bromine	U	U	U	U	B	B	U	U	U
Bromine Solution in Water	U	U	U	U	A	B	U	U	U

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Bromine Vapor	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
Butanethiol	U	-	U	U	A	U	U	U	U
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 Acetate1	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
Butyraldehyd1	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



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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 Silicate	-	-	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
Camphor	U	U	B	U	B	U	A	A	U
Camphor 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 Disulfide1	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
Cellulose Acetate	-	A	U	B	U	-	A	A	A
Chile Saltpeter (Sodium Nitrate)	U	B	B	A	A	A	B	B	B
Chinawood Oil	-	C	B	U	A	A	A	A	U

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
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 Amine	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
Chloroform1	U	U	U	U	B	C	U	U	U
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
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



O-Ring

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
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 Oil1	-	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 Hexanone1	U	U	U	U	U	U	U	U	U
Cyclo Hexylamine	U	U	U	C	U	U	U	U	U
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 (Decahydronaphthalene)	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

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
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
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 Methylene Ester	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
Dichloro Propene	-	U	U	U	-	-	U	U	A
Dichloro Propylene Ether	U	B	U	U	U	U	U	U	U
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 Amine	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



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CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
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 Tri-amine	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
Dihydroxybenzene	B	-	U	B	U	B	U	U	U
DihydroxyTartaric Acid (Tartaric Acid)	U	U	A	B	A	A	A	A	A
Diisobutyl Ketone	U	U	U	A	U	U	U	U	U
Diisobutylene	U	U	U	U	A	C	B	B	U
Diisooctyl Sebacate	U	U	U	B	B	U	U	U	U
Diisopropyl Benzene	U	U	U	U	A	A	U	U	U
Diisopropyl 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	-
Dimethylbutane	A	-	B	U	A	A	A	A	U
Dinitro Toluene	U	U	U	U	U	U	U	U	U
Dinitrogen Oxide	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
Diphenyl 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

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
DNCB (Dinitro-chlorobenzene)	U	U	U	U	A	B	U	U	U
Dodecanol1	-	-	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 Acetate1	U	U	U	B	U	U	U	U	U
Ethyl Acrylate1	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



O-Ring

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Ethylene Glycol Ethyl Ether (Cello- solve)	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

F

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Fats (animal/vege- table)	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
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 Solu- tion	-	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

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
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
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 TP35	-	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 (Furfury- laldehyde)	-	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



TRELLEBORG
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CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
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	A	B	B	B	B	B
Glucose Solution	U	U	A	A	A	A	A	A	A
Glucose, aqueous	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 ¹	U	U	B	B	A/B	-	B	B	U
Hexachloro Acetone	U	U	U	A	U	U	U	U	U
Hexachloro Butadiene ¹	U	B	U	U	A	U	U	U	U
Hexachloro Cyclohexane (Lindane)	U	B	U	U	A	U	-	-	U
Hexadecanol	-	-	A	A	-	-	A	A	-
Hexaldehyde	-	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) ¹	U	U	-	B	U	U	-	-	B

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Hexane	A	B	B	U	A	A	A	A	C
Hexanetriol	B	U	B	A	A	A	A	A	A
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
Hydrochloric 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	U	C	U	U	U	U	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 ¹	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 ¹	-	-	-	A	A	-	-	-	-



O-Ring

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Iso-Butane	A	A	U	U	A	A	A	A	U
Iso-Butyl Alcohol	U	U	A	A	B	A	B	B	A
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
Lanolin1	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
Manganese 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
Magnesium Hydroxide (Solution)	U	U	B	A	B	B	B	B	B
Magnesium Silicate (Talcum)	A	A	A	A	A	A	A	A	A



CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Magnesium Sulfate (Epson Salts)	U	U	A	A	A	A	A	A	A
Maleic Acid1	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
Mayonnaise	-	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 Acetate1	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
Methyl Ethyl Ketone1	U	U	U	B	U	U	U	U	U
Methyl Formate1	-	-	U	B	U	-	U	U	-
Methyl Glycol	U	U	U	B	U	U	U	U	U
Methyl Glycol Acetate (Ethylene-glycol)	U	U	U	B	U	-	U	U	B

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
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	-
Methyl Pentane +A2	A	U	-	U	A	U	A	A	U
Methyl Pentane +A3	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
Morpholine1	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



O-Ring

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	-
Naphtalen ZD	U	-	U	U	A	-	B	B	U
Natural Gas	A	B	B	U	A	A	A	A	A
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
Octane	U	U	U	U	A	B	B	B	U
Octanol (Octylalcohol)1	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

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
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 Acid1	-	-	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
Paraffin1	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 Acid1	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
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
Phosphine1	U	U	B	A	B	U	U	U	-
Phosphorus 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



CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Photographic 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 Sulfate	-	-	-	A	-	-	-	-	-
Potassium Bicarbonate	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 Cyanide1	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
Potassium Hypochlorite (Javelle Water)1	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

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
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
Propanol1	U	U	A	A	A	A	B	B	B
Propanone (Acetone)	U	U	U	A	U	U	U	U	U
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 Acid1	-	A	A	A	A	-	B	B	-
Sea Water1	U	U	B	A	B	A	A	A	B
Sewage	-	-	B	A	A	A	A	A	A
Silicone Grease	A	A	A	A	A	A	A	A	U



O-Ring

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
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
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

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Sodium Silicate Solution	-	-	A	A	A	-	A	A	-
Sodium Sulfate (Glaubers Salts)	U	U	B	A	B	B	B	B	B
Sodium Sulfhydrylate Solution	U	-	A	A	A	A	A	A	A
Sodium Sulfide	U	U	B	A	A	A	B	B	B
Sodium Sulfite Solution	U	U	A	A	A	A	A	A	A
Sodium Tetraborate Solution	U	-	B	A	A	A	B	B	B
Sodium Thiosulfate (Antichlor)1	-	-	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
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
Sulfur	U	-	A	A	A	B	U	U	B
Sulfur Chexafluoride (SF6)	B	-	A	A	B	B	B	B	-
Sulfur Chloride	U	U	U	U	A	B	U	U	U
Sulfur Dioxide (SO2)	U	U	U	A	B	B	U	U	B
Sulfur Dioxide Liquid (anhydrous)	U	-	U	A	U	B	U	U	B
Sulfur Dioxide, gaseous	U	-	U	A	U	B	U	U	B
Sulfuric Acid (0 to 50%)	U	U	U	A/B	A/B	U	U	U	U
Sulfuric Acid, diluted	U	U	U	A	A	U	B	B	U
Sulfurous Acid	U	U	-	B	A	-	-	-	U



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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
Tetrachloroethane1	U	U	U	U	B	C	U	U	U
Tetrachloromethane1	-	U	U	U	A	B	U	U	U
Tetrachloroethylene	U	U	U	U	A	B	U	U	U
Tetraethyl Lead1	-	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
Titanium Tetrachloride	U	U	B	B	B	B	B	B	U
Toluene (Toluol)	U	U	U	U	B	B	U	U	U
Town Gas1	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 Marcap-tane	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
Triiso-Propyl Benzene	A	A	U	U	A	-	A	A	U

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
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	-



O-Ring

CHEMICAL	ACM	AU	CR	EPDM	FKM	FVMQ	HNBR	NBR	VMQ
Waste Gas (cont. Sulfuric Acid)	-	-	B	A	A	-	U	U	-
Water 275 °F	U	U	C	A	C	A	C	U	U
Water 175 °F	U	U	B	A	B	A	A	B	B
Water vapor < 285 °F	U	U	U	A	U	B	C	U	B
Water vapor < 300 °F	U	U	U	A	U	B	U	U	B
Water vapor > 285 °F	U	U	U	B	U	B	U	U	B
Water vapor > 300 °F	U	U	U	B	U	U	U	U	U
Wax Alcohols	A	-	B	U	A	-	A	A	A
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 868 / ISO 7619 / DIN 53 505 / ASTM D 2240
Measurement for test samples
2. Durometer IRHD (International Rubber Hardness Degree) according to ISO 48 / 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 $73 \pm 3^\circ\text{F}$ ($23 \pm 2^\circ\text{C}$) - not earlier than 16 hours after the last vulcanization 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. 1.181 inches (30 mm)

Thickness min. .240 inches (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 three layers. All layers must be at minimum .080 inches (2 mm) thick.

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

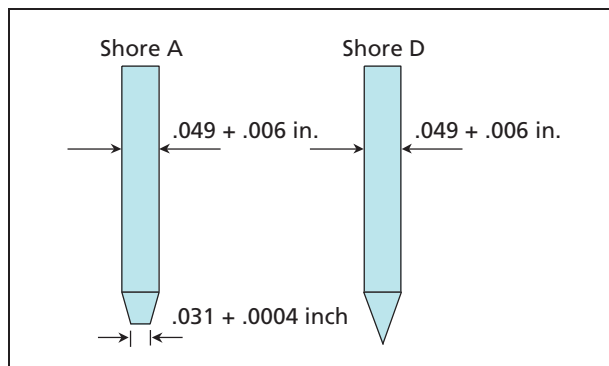


Figure 5 Indenter according to Shore A / D

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 ISO 48 there are two hardness ranges:

- Soft: 10 to 35 IRHD $\Rightarrow$ Sample thickness
.394 to .591 inches
(10 to 15 mm) / procedure "L"
- Normal: over 35 IRHD $\Rightarrow$ Sample thickness
.315 to .394 inches
(8 to 10 mm) / procedure "N"
- Sample thickness
.059 to .098 inches
(1.5 to 2.5 mm) / procedure "M"

The hardness determined with finished parts or samples usually varies from hardness determined from specimen samples, especially those with curved surfaces.

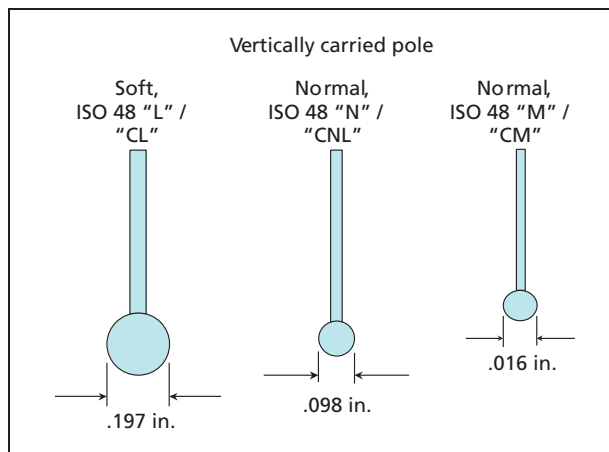


Figure 6 Indenter according to IRHD



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.

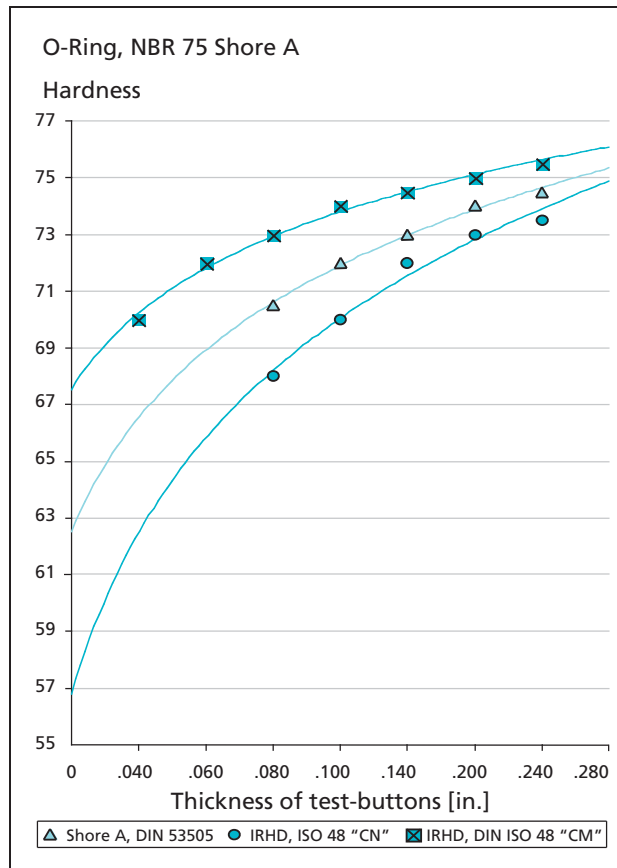


Figure 7 Ranges of hardness depending on sample thickness and test method

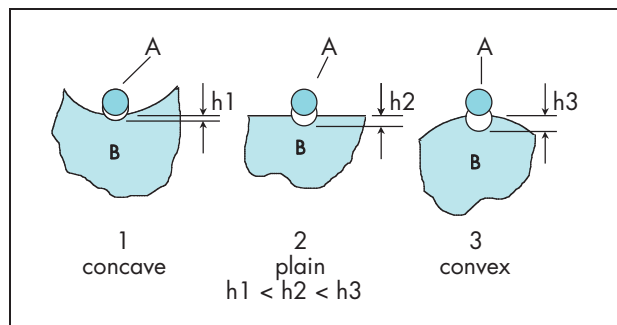


Figure 8 Range of hardness depending on surface geometry for the equivalent material

With equivalent material characteristics of the elastomer sample B, the indenter penetrates the deepest at 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 .079 inches (2.0 mm) should be increased up to +5 / -8 IRHD.

Compression set

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

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

Standard test piece: Cylindrical disc, diameter .512 and height .236 inches (13 mm and height 6 mm)
Deformation: 25%
Tension release time: 30 minutes

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

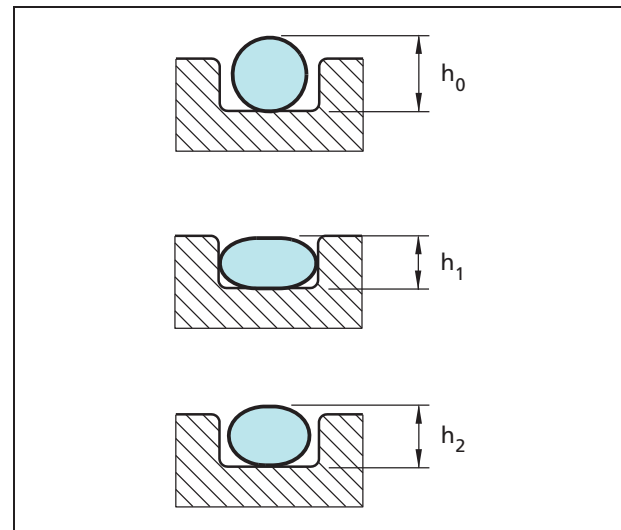


Figure 9 Illustration of the compression set



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 (inches) in respect to the established CS depending on the cross section of the measured O-Rings.

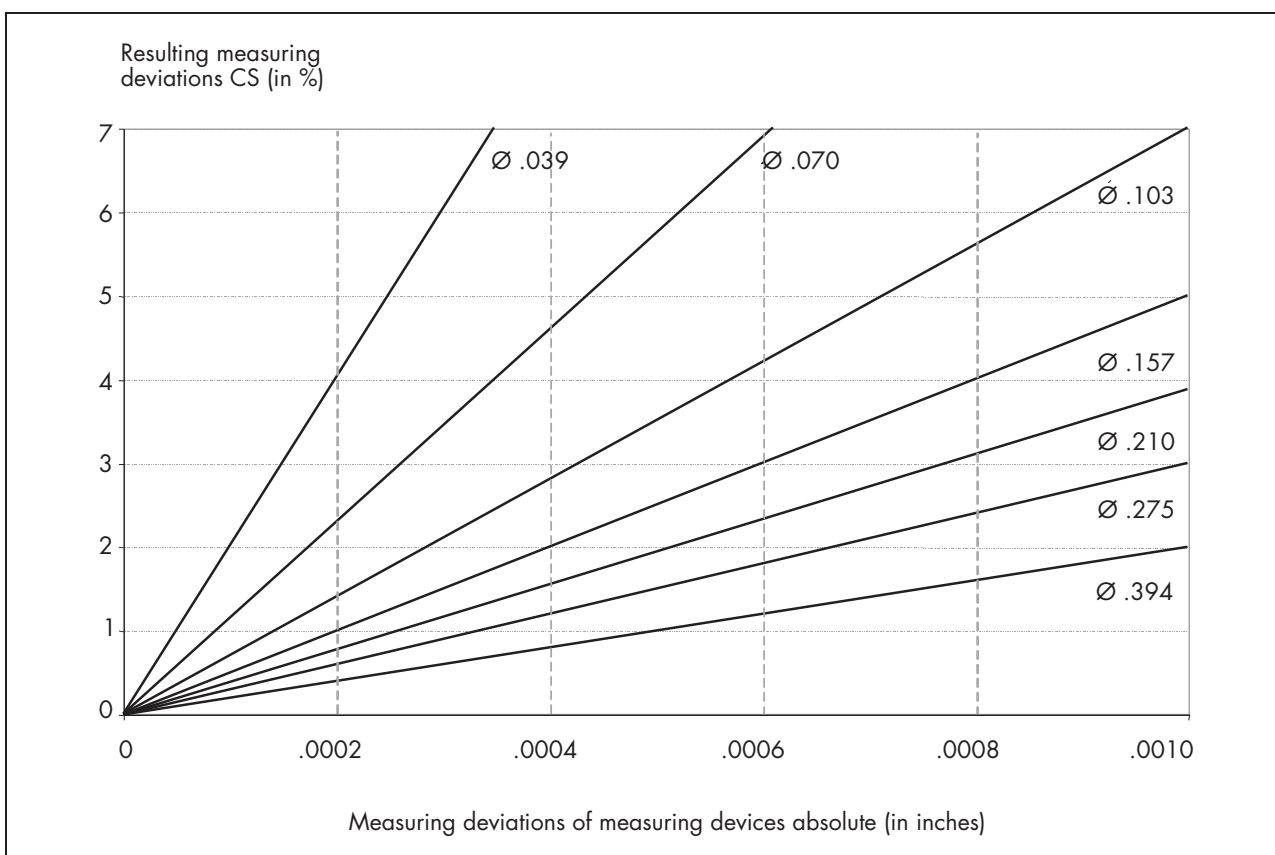


Figure 10 Measuring deviations CS depending on O-Ring cross section and measuring accuracy of the test equipment (schematic illustration of CS)



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 Synoptic Paper 1226	- Analysis of dispensing according to "Synoptic Documents" - Storage test (microbe analysis)	ACS (Accréditation de conformité sanitaire)	3 certified test laboratories in France: Paris / Vandoeuvre / Lille
BAM recommendation	Seals for the use in gas or oxygen fittings	- Reactive behavior with lubricants - Limits for pressure and temperature (DIN 4060) - Seals and components		BAM (Bundesanstalt für Materialforschung und -prüfung)	BAM, Berlin
BfR Recommendation (former: BgVV)	Polymers exposed to food	BfR Guidelines ("Polymers exposed to food") various paragraphs, depending on the application of the seal	- Chemical and physical tests - Biological tests - Sterilization tests - Taste tests	BfR (Bundesanstalt für Risikobewertung)	BAM, Berlin HY (Hygiene-Institut, Gelsenkirchen)
DVGW Release for Gas	Seals for gas services and gas applications	EN 549 EN 682		DVGW, Bonn (Deutscher Verein des Gas- und Wasserfaches e.V.)	Test Laboratory for Gas, Karlsruhe, MPA NRW, Dortmund
DVGW Release for drinking water	Seals for processing storage and distribution of drinking water	BfR 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
DVGW W270 recommendation	Materials exposed to drinking water	DVGW, worksheet W 270	Microbiological testing: reproduction of microorganisms on materials	DVGW, Bonn (Deutscher Verein des Gas- und Wasserfaches e.V.)	TZW, Karlsruhe HY (Hygiene Institution), Gelsenkirchen
FDA guideline	Materials for food and pharmaceutical	"White List" (Register of permitted dispensing components), e.g. 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	BfR Guidelines ("Polymers exposed to food") part 1.3.13	- Extraction test - Odor 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





Approval / Examination Certificate / Guideline	Application	Criteria / Standards	Tests / Examinations / Contents	Authorities / Associations	Institutes / Laboratories
NSF Release	Food and Sanitary	NSF Standard criteria	Depending on application: - Test of components - Test of component group - Physical and chemical material tests - Toxicological and microbiological tests	NSF (National Sanitation Foundation)	NSF, USA UL, USA
UL Listing	Application of seals for electrical equipment and appliances	UL-guidelines	- Chemical comparability test - Additional tests depending on application	UL (Underwriters Laboratory)	Underwriters laboratory in USA/England
USP examination	For medical and pharmaceutical use	Different specifications: USP 26 et seqq., chapter 87, 88, Class I to VI	Depending on specification: - Intracutaneous reactive tests - Systemic Injections - Muscle implantations	USP (United States Pharmacopeia, USA)	Different test laboratories
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
18-03 3-A Sanitary	Food Products	18-03 3-A Sanitary Standards for multiple-use rubber and rubber-like materials used as product contact surfaces in dairy equipment	Chemical and physical properties acc. to Class I to III	Organizations: LAFIS, IAFP, USPHS, EHEDG, DIC	Various laboratories



B.1.5 Standard materials

The following tables show the physical properties of Trelleborg Sealing Solutions standard materials. They concern minimum values. That means that a standard material meets at least the given values. Many of the

Trelleborg Sealing Solutions 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
Tensile strength		DIN 53 504 ASTM D 412	PSI	> 2000	> 1750
Elongation at break		DIN 53 504 ASTM D 412	%	> 200	> 150
Compression set	24h / 212 °F	DIN ISO 815B ASTM D 395B	%	< 25	< 30
Heat aging	72h / 212 °F	DIN 53 508 ASTM D 573			
Change of hardness			Shore A	max +8	max +8
Change of tensile strength			%	max -25	max -25
Change of elongation at break			%	max -25	max -25
Resistance in ASTM-OIL # 1	72h / 212°F	DIN 53 521 ASTM D 471			
Change of hardness			Shore A	max +6	max +6
Change of volume			%	max -8	max -8
Resistance in ASTM-OIL # 3	72h / 212°F	DIN 53 521 ASTM D 471			
Change of hardness			Shore A	max -10	max -10
Change of volume			%	max +15	max +15
Temperature range Maximum and minimum operating temperatures depend on the specific application criteria.				-22°F to +212°F	-15°F to +212°F



Table VI Material specification for standard EPDM

			EPDM 70 Shore A sulfur- 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	PSI	> 1450	> 1450	> 1450
Elongation at break		DIN 53 504 ASTM D 412	%	> 150	> 125	> 125
Compression set	24h / 212°F	DIN ISO 815B ASTM D 395B	%	< 20		
	24h / 302°F		%		< 30	< 30
Heat aging	72h / 212°F	DIN 53 508 ASTM D 573		x		
	72h / 302°F				x	x
Change of hardness			Shore A	max +10	max +10	max +10
Change of tensile strength			%	max -10	max -20	max -20
Change of elongation at break		%	max -20	max -20	max -20	
Resistance in water	72h / 212°F	DIN 53 521 ASTM D 471				
Change of hardness			Shore A	max -10	max -3	max -3
Change of volume			%	max +10	max +3	max +3
Temperature range Maximum and minimum operating temperatures depend on the specific application criteria.				-50°F to +250°F	-50°F to +285°F	-50°F to +285°F

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	PSI	> 725	> 725
Elongation at break		DIN 53 504 ASTM D 412	%	> 100	> 100
Compression set	24h / 350°F	DIN ISO 815B ASTM D 395B	%	< 35	< 35
Heat aging	72h / 435°F	DIN 53 508 ASTM D 573			
Change of hardness			Shore A	max +15	max +15
Change of tensile strength			%	max -40	max -40
Change of elongation at break			%	max -40	max -40
Resistance in ASTM-Oil # 1	72h / 212°F	DIN 53 521 ASTM D 471			
Change of hardness			Shore A	max -10	max -10
Change of volume			%	max +20	max +20
Temperature range				-70°F to +400°F	-70°F to +400°F
Maximum and minimum operating temperatures depend on the specific application criteria.					



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	PSI	> 1450	> 1450	> 1450	> 1450
Elongation at break	DIN 53 504 ASTM D 412	%	> 125	> 125	> 120	> 100
Compression set	24h / 350°F	DIN ISO 815B ASTM D 395B	%	< 20	< 20	< 20
Heat aging	72h / 485°F	DIN 53 508 ASTM D 573				
Change of hardness			Shore A	max +10	max +10	max +10
Change of tensile strength			%	max -25	max -25	max -25
Change of elongation at break			%	max -25	max -25	max -25
Resistance in ASTM-Oil # 3	72h / 300°F	DIN 53 521 ASTM D 471				
Change of hardness			Shore A	max -5	max -5	max -5
Change of volume			%	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
Change of volume			%	max +10	max +10	max +10
Temperature range Maximum and minimum operating temperatures depend on the specific application criteria.			0°F to +400°F	0°F to +400°F	0°F to +400°F	+5°F to +400°F





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	PSI	> 2200	> 2200
Elongation at break		DIN 53 504 ASTM D 412	%	> 250	> 250
Compression set	24h / 260°F	DIN ISO 815B ASTM D 395B	%	< 35	< 35
Heat aging	72h / 300°F	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 / 300°F	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 / 300°F	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.				-22°F to +270°F	-22°F to +270°F

Trelleborg Sealing Solutions offers various materials, which provide additional advantages, in addition to the standard materials previously described. The advantages include a wide range of available molds, special operating temperature range, special media resistance and institutional approvals for the potable water, pharmaceutical and beverage industries.

The following table shows preferred materials, which are characterized by their wide spectrum of use. They can be used for standard applications as well as for special industrial applications.

Table X Preferred materials

Material Type	Hardness Shore A (± 5)	Color	Operating temperature range	Material code	Description
NBR Nitrile Butadiene Rubber	70	black	-22°F to +212°F	N7083	Preferable for sizes acc. to AS 568 B , preferably used for energizing elements, good overall performance
			-60°F to +212°F	N7T40	"Polar", extremely good low temperature properties , preferably used for static applications in mineral oil and for energizing elements, preferable for sizes acc. to AS 568 B
			-22°F to +212°F	N7003	Preferable for metric sizes, good overall performance, wide range of molds available
			-22°F to +212°F	N7024	Good overall performance, preferable for large quantities
			-22°F to +212°F	N7027	Preferable for potable water applications: KTW, ACS, NSF61, NSF51, DIN EN 549: 32 °F/180 °F, W270, FDA , also suitable for use in gas applications
	90	black	-15°F to +212°F	N9002	Good overall performance, wide range of molds available



O-Ring

Material Type	Hardness Shore A (± 5)	Color	Operating temperature range	Material code	Description
HNBR Hydrogenated Nitrile Butadiene Rubber	70	black	-22°F to +285°F	H7671	Good overall performance, wide range of molds available
			-30°F to +285°F	H7503	Wide range of operating temperatures , good resistance to mineral oil, good overall performance
FKM Fluorocarbon Rubber	70	green	-5°F to +400°F	V70GA	Preferable for sizes acc. to AS 568 B , preferably used for energizing elements, good overall performance, DVGW, BAM
			0°F to +400°F	V70G2	Preferable for sizes acc. to AS 568 B , good overall performance
	75	black	-5°F to +400°F	VC009	Preferable for sizes acc. to BS 4518 (metric), standard FKM
	80	green	0°F to +400°F	V80G2	Good overall performance, wide range of molds available
			0°F to +400°F	V8003	Good overall performance, wide range of molds available
			-5°F to +400°F	V8605	For pharmaceutical and food and beverage industries, FDA
	90	green	+5°F to +400°F	V90G1	Good overall performance, wide range of molds available
		black	+5°F to +400°F	V9670	Good overall performance, wide range of molds available
EPDM Ethylene Propylene Diene Rubber	70	black	-50°F to +300°F	E7502	Peroxide-cured, for pharmaceutical and food and beverage industries, KTW, WRAS, FDA, USP Class VI, USP 26 , plasticizer content < 3 %
			-50°F to +260°F	E7002	Sulfur-cured , standard EPDM, wide range of molds available
			-50°F to +285°F	E7515	Peroxide-cured , standard EPDM, wide range of molds available
			-50°F to +300°F	E7T41	Peroxide-cured, extremely low compression set in hot water and steam. Excellent resistance to ozone, can be used in contact with copper and brass
			-50°F to +285°F	E7518	Peroxide-cured, preferable for the use in potable water: KTW, WRAS, FDA, NSF61, NSF51, W270, W534, EN 681, ACS, USP Class VI, USP 26 , plasticizer content < 1 %
VMQ Methyl Vinyl Silicone Rubber	60	red	-60°F to +400°F	S60R1	Good overall performance, wide range of molds available
	70	red	-70°F to +400°F	S70R2	Sulfur-cured , good overall performance, wide range of molds available





B.2 Design recommendations

The following design recommendations cannot be used for the special Isolast® materials. Please use the Isolast® brochure or contact your local Trelleborg Sealing Solutions sales office 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.
Trelleborg Sealing Solutions recommends to use the fluid to be sealed.
- Do not use lubricants with solid additives, e.g. molybdenum disulfide or zinc sulfide.

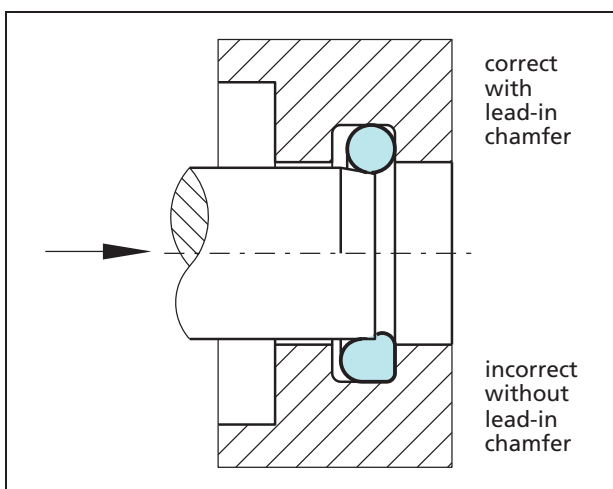


Figure 11 Rod installation with O-Ring

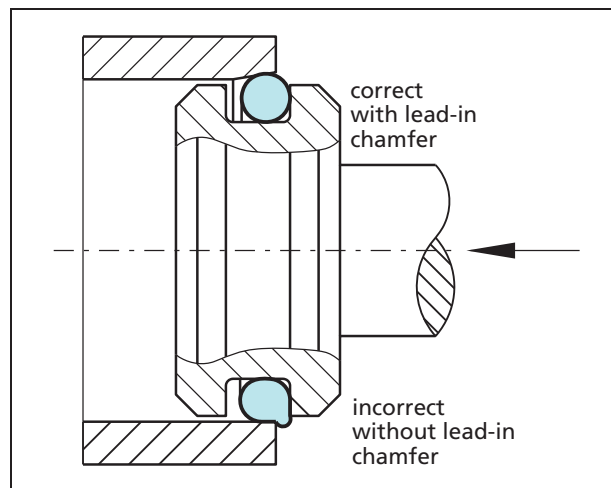


Figure 12 Piston installation with O-Ring

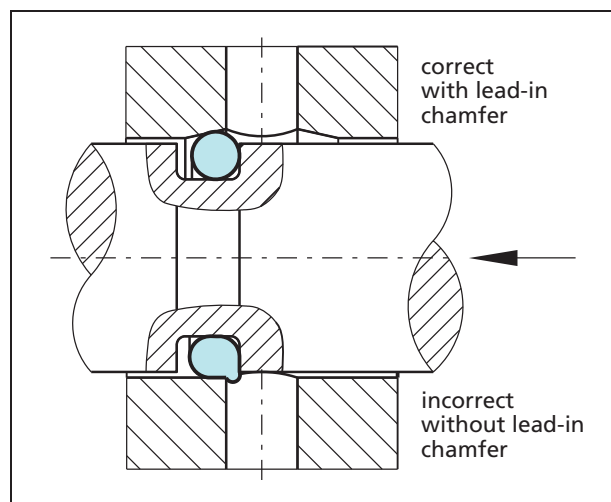


Figure 13 O-Ring installation over transverse bores

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 overstretch O-Rings
- Do not stretch O-Rings made out of cord at the joint



O-Ring

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 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 demands special handling and packing of the O-Rings.

Please ask your local Trelleborg Sealing Solutions sales office 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 15 and 16. These take into account the relationship between loads and cross sections according to ISO 3601-2 (version 1987).

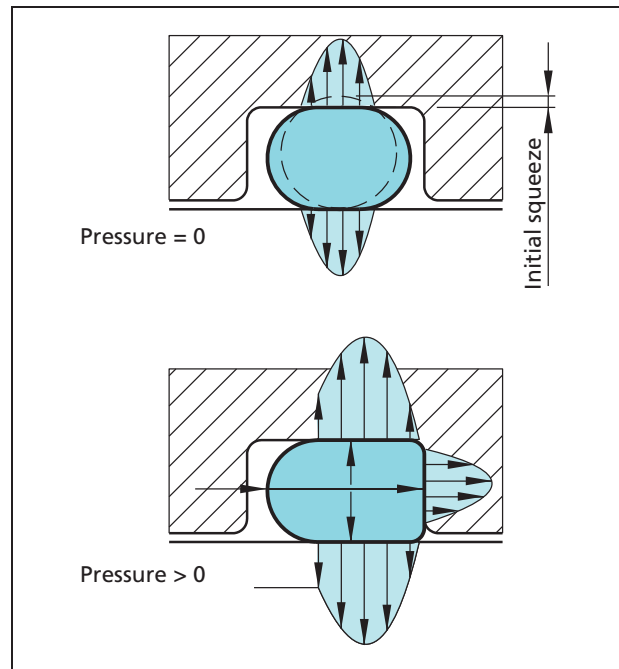


Figure 14 O-Ring contact pressure installed and under service pressure

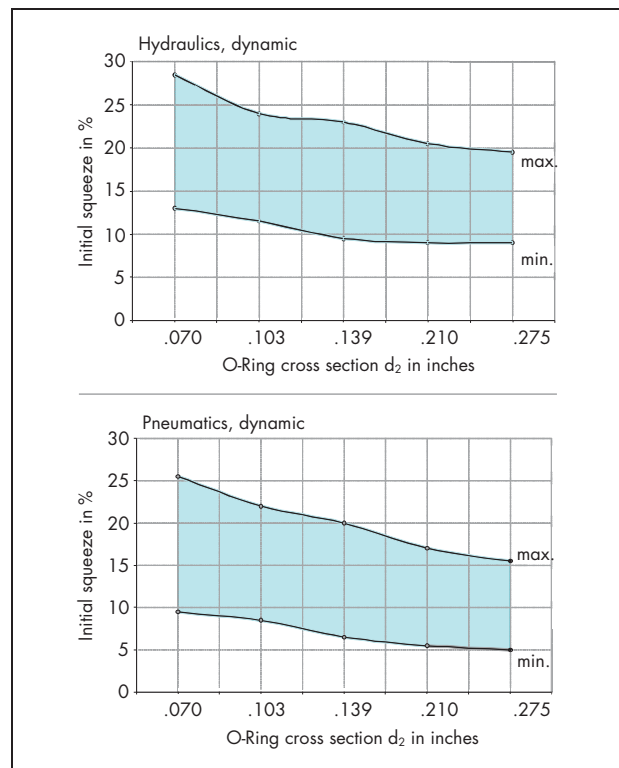


Figure 15 Permissible range of initial squeeze as a function of cross section, radial dynamic

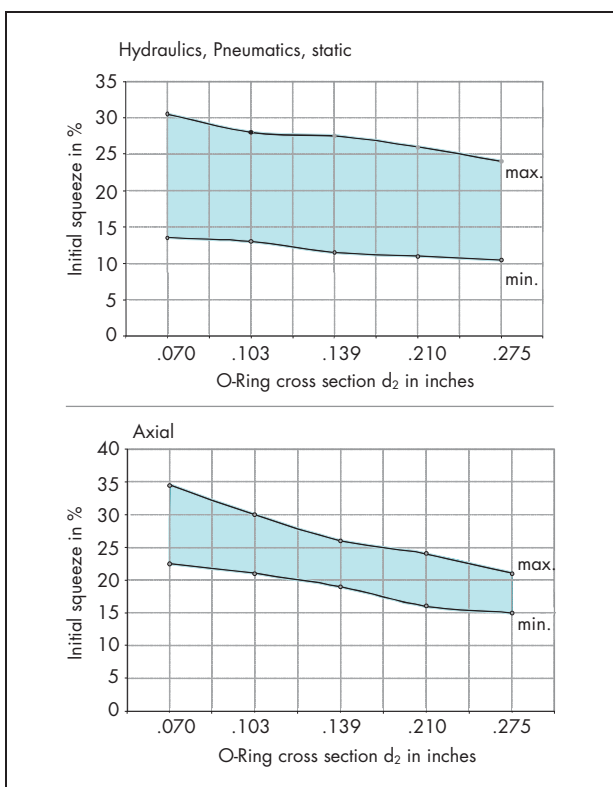


Figure 16 Permissible range of Initial squeeze as a function of cross section, radial static and axial

Compression forces

The deformation forces vary depending on the extent of the initial squeeze and the Shore hardness. Figure 17 shows the specific compression force per inch 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.

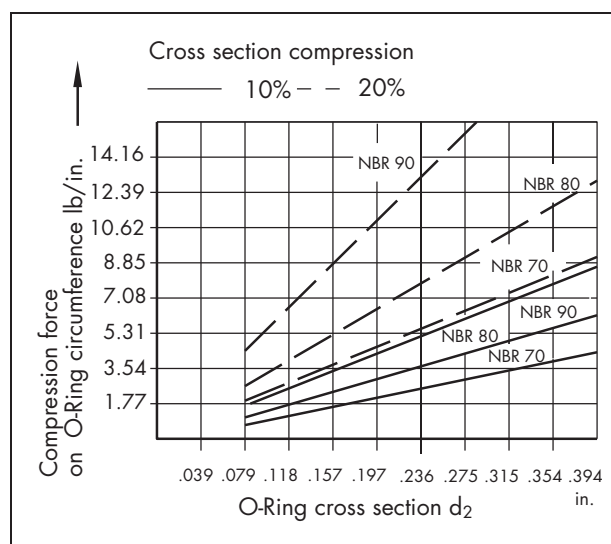


Figure 17 Compression forces on the O-Ring circumference depending on the material

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 > 2.000 inches (>50 mm) and 8% for O-Rings with an inner diameter < 2.000 inches (< 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 of an increase or decrease in the O-Ring cross section. Consequently this can affect 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 approximately 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 18).

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 18).

Axial installation, (static)

During axial-static installation, the direction of the pressure should be taken into consideration when choosing the O-Ring size (Figure 19). With internal pressure the O-Ring should be chosen so that the outside diameter of the O-Ring is approximately 1 to 2% larger than the outer groove diameter d_7 . With external pressure the O-Ring is chosen approximately 1 to 3% smaller than the inner groove diameter d_8 .

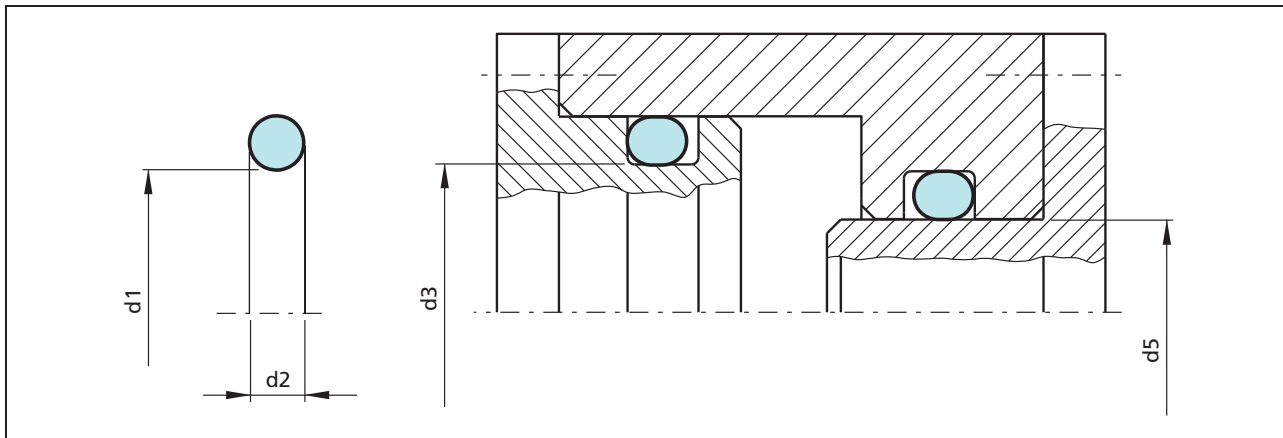


Figure 18 Radial installation, static and dynamic

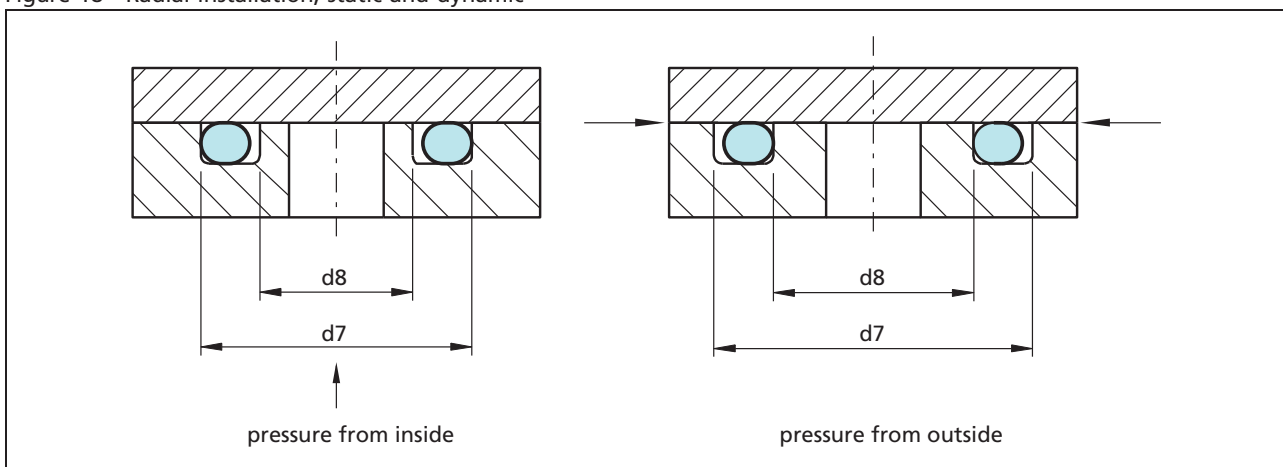


Figure 19 Axial installation, static



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 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 improve the lubrication.

Special materials are available for rotary seal applications. Trelleborg Sealing Solutions does not recommend the use of O-Rings as rotary seals. Please contact your local Trelleborg Sealing Solutions sales office 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 materials. 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

- < 2.000 inches (<50 mm) without back-up ring (depends on the material, the cross section and the clearance)
 - up to 725 PSI (5 MPa) for O-Rings with inside diameter > 2.000 inches (>50 mm) without back-up ring
 - up to 1500 PSI (10 MPa) for O-Rings with inside diameter
 - up to 5800 PSI (40 MPa) with back-up ring
 - up to 36250 PSI (250 MPa) with special back-up ring
- Please note the permissible extrusion gaps.

Dynamic application

- Reciprocating up to 725 PSI (5 MPa) without back-up ring
- Higher pressures with back-up ring

Speed

- Reciprocating up to 1.65 ft/s (0.5 m/s)
 - Rotating up to 1.65 ft/s (0.5 m/s)
- Depending on material and application

Temperature

- From -80°F to +620°F (-60 °C to +325 °C)
- Depending on material and media resistance

When assessing the application criteria, the peak and continuous operating temperatures 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".



O-Ring

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-Rings are squeezed during installation, lead-in chamfers and rounded edges must be provided (Figure 20 and 21).

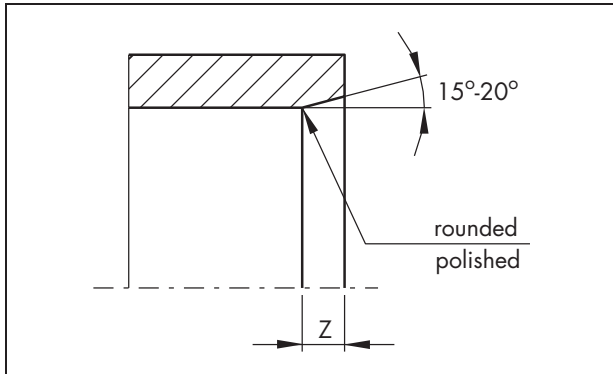


Figure 20 Lead-in chamfers for bores, tubes

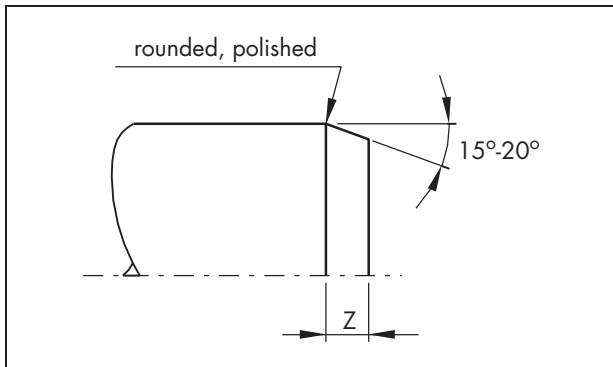


Figure 21 Lead-in chamfers for shafts, rods

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

Table XI Lead-in chamfers

Lead-in chamfers length Z min.		O-Ring cross section d_2
15°	20°	
.100	.060	up to .070
.120	.080	up to .103
.140	.100	up to .139
.180	.140	up to .210
.200	.160	up to .275
.240	.180	above .275

The surface roughness of a lead-in chamfer is:
 $R_z \leq 250 \mu\text{in}$ (6.3 μm) $R_a \leq 30 \mu\text{in}$ (0.8 μm)

Radial clearance

The tolerances given in table XV and the maximum permissible radial clearance S (extrusion gap) given in Table XII 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 22).

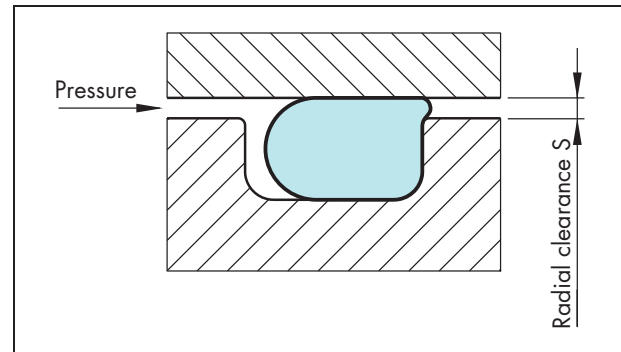


Figure 22 Radial clearance "S"

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 XII 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 725 PSI (5 MPa) for O-Rings with inside diameter > 2.000 inches (>50 mm) and above 1500 PSI (10 MPa) for O-Rings with inside diameter < 2.000 inches (<50 mm) we recommend the use of back-up rings.



Table XII Radial clearance S

O-Ring cross section d ₂	up to .080	.080 - .120	.120 - .200	.200 - .275	above .275
O-Rings with hardness of 70 Shore A					
Pressure PSI	Radial clearance S				
≤ 500	.003	.004	.004	.005	.006
≤ 1000	.002	.003	.003	.004	.004
≤ 1500	.001	.002	.002	.003	.003
O-Rings with hardness of 90 Shore A					
Pressure PSI	Radial clearance S				
≤ 500	.005	.006	.007	.009	.010
≤ 1000	.004	.005	.006	.007	.008
≤ 1500	.003	.004	.004	.005	.006
≤ 2000	.002	.003	.003	.004	.004
≤ 2500	.002	.002	.003	.003	.004
≤ 3000	.001	.002	.002	.003	.003
≤ 5100	.001	.001	.001	.002	.002

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/f7.

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 contain various terms and definitions in accordance with DIN 4768 and DIN EN ISO 4287, among others.

Table XIII Surface finish

Type of Load	Surface	R _t μin	R _z μin	R _a μin
Radial-dynamic	mating surface * (bore, rod, shaft)	40 - 100	24 - 60	4 - 16
	groove flanks, groove diameter	≤ 400	≤ 250	≤ 60
Radial-static Axial-static	mating surface	≤ 400	≤ 250	≤ 60
	groove flanks, groove diameter	≤ 630	≤ 250	≤ 60
	For pulsating pressures mating surface groove flanks, groove diameter	≤ 250 ≤ 400	≤ 250	≤ 30 ≤ 60

* Spiral-free grinding

The above is for guidance only and covers the majority of sealing applications. However, Trelleborg Sealing Solutions should be consulted in areas of particular concern.



O-Ring

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 23). The installation dimensions are summarized in Table XIV. The trapezoidal groove is only recommended for O-Ring cross sections from .139 inches (3.53 mm). The inside diameter of the O-Ring results from the mean groove diameter minus the cross section.

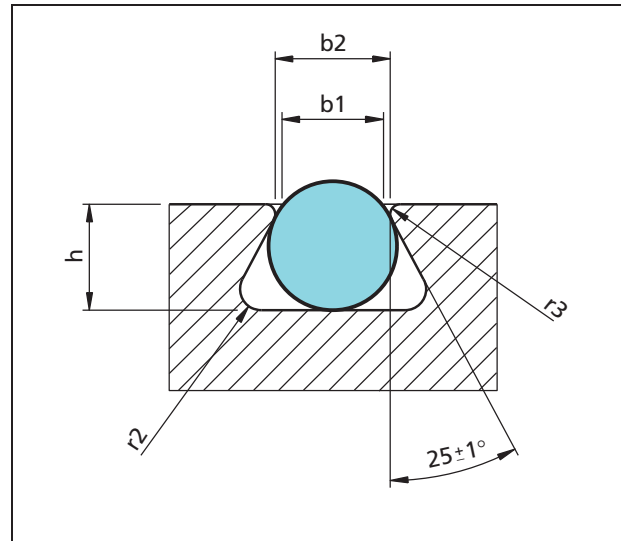


Figure 23 Installation in trapezoidal groove

Table XIV Installation dimensions for trapezoidal groove

O-Ring cross section d2	Groove dimensions				
	Groove width b1 ±.002	Groove width b2 ±.002	Groove depth h ±.002	Radius (max.)	
				r3	r2
.139	.114	.126	.114	.010	.030
.157	.134	.146	.126	.010	.030
.197	.169	.181	.165	.010	.030
.210	.181	.193	.181	.010	.030
.224	.187	.207	.189	.016	.030
.236	.199	.219	.201	.016	.030
.276	.236	.256	.236	.016	.065
.315	.270	.293	.272	.020	.065
.331	.285	.309	.287	.020	.065

Rectangular groove

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

To reduce risk of extrusion the radius r ideally should not exceed the maximum permissible radial clearance S (see Table XII).

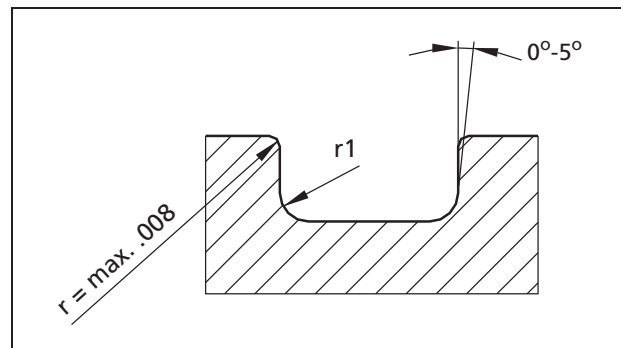


Figure 24 Groove specifications



Installation recommendations

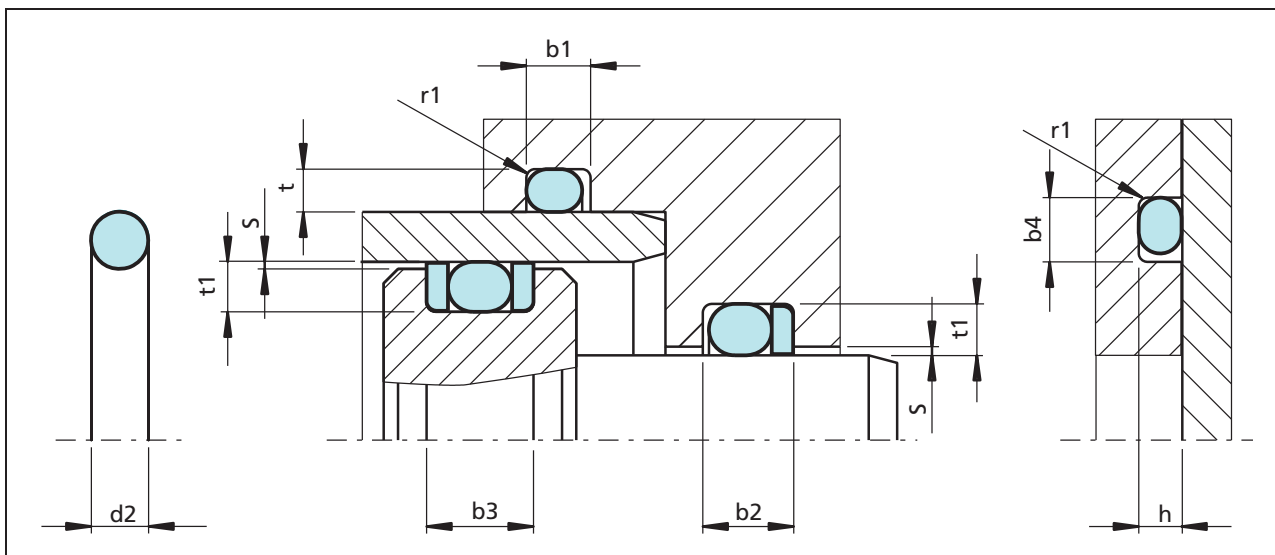


Figure 25 Installation drawing

Radial clearance, see chapter "Design Recommendations," page 7.

Surface specifications, see chapter "Design Recommendations," page 41.

Groove width b2 and b3: When using back-up rings the groove is to be widened by the corresponding back-up ring thickness (b2: one back-up ring, b3: two back-up rings).

Table XV Installation dimensions

Cross section	Radial installation			Axial installation		Radius ¹⁾
	Groove depth		Groove width	Groove depth	Groove width	
	d2 inch	Dynamic t1 ± .002	Static t ± .002	b1 + .008	h + .002	b4 + .008
.020	-	.014	.031	.014	.031	.008
.029	-	.020	.039	.020	.039	.008
.039	-	.028	.055	.028	.055	.008
.040	-	.028	.055	.028	.055	.008
.047	-	.033	.067	.033	.067	.008
.049	-	.035	.067	.035	.071	.008
.050	-	.035	.067	.035	.071	.008
.051	-	.037	.071	.037	.071	.008
.056	-	.041	.075	.041	.079	.012
.059	.049	.043	.079	.043	.083	.012
.060	.049	.043	.079	.043	.083	.012
.063	.051	.047	.083	.047	.087	.012
.064	.051	.047	.083	.047	.087	.012
.070*	.057	.051	.094	.051	.102	.012
.071	.057	.051	.094	.051	.102	.012



O-Ring

Cross section d2 inch	Radial installation			Axial installation		Radius ¹⁾ r1 ± .008
	Groove depth		Groove width b1 + .008	Groove depth h + .002	Groove width b4 + .008	
	Dynamic t1 ± .002	Static t ± .002				
.072	.059	.053	.098	.053	.102	.012
.075	.061	.055	.102	.055	.106	.012
.079	.065	.059	.106	.059	.110	.012
.078	.065	.059	.106	.059	.110	.012
.083	.069	.061	.110	.061	.114	.012
.082	.069	.061	.110	.061	.114	.012
.087	.073	.063	.118	.063	.118	.012
.089	.075	.067	.118	.067	.122	.012
.092	.077	.069	.122	.069	.122	.012
.091	.077	.069	.122	.069	.122	.012
.094	.081	.071	.126	.071	.130	.012
.097	.083	.073	.130	.073	.134	.012
.098	.085	.075	.130	.073	.134	.012
.104	.089	.079	.142	.079	.150	.012
.103*	.089	.079	.142	.079	.150	.012
.106	.091	.081	.142	.081	.150	.012
.110	.094	.083	.146	.083	.154	.024
.116	.098	.087	.154	.087	.157	.024
.115	.098	.087	.154	.087	.157	.024
.118	.102	.091	.157	.091	.157	.024
.122	.106	.094	.161	.094	.161	.024
.138	.120	.104	.181	.104	.185	.024
.140	.122	.106	.189	.106	.197	.024
.139*	.122	.106	.189	.106	.197	.024
.142	.124	.110	.189	.110	.201	.024
.157	.138	.122	.205	.122	.209	.024
.177	.157	.138	.228	.138	.232	.024
.197	.173	.157	.260	.157	.264	.024
.209	.185	.169	.280	.169	.287	.024
.210*	.185	.169	.280	.169	.287	.024
.217	.189	.177	.280	.177	.287	.024
.224	.197	.181	.283	.181	.291	.024
.236	.209	.193	.291	.193	.299	.024
.256	.224	.213	.315	.213	.323	.039
.276	.240	.228	.374	.228	.382	.039
.275*	.240	.228	.374	.228	.382	.039
.295	.260	.248	.382	.248	.390	.039
.315	.280	.264	.386	.264	.394	.039
.331	.295	.280	.394	.280	.406	.039
.354	.319	.303	.417	.303	.429	.059



Cross section d2 inch	Radial installation			Axial installation		Radius ¹⁾ r1 ± .008
	Groove depth		Groove width	Groove depth	Groove width	
	Dynamic t1 ± .002	Static t ± .002	b1 + .008	h + .002	b4 + .008	
.374	.339	.323	.433	.323	.449	.059
.394	.358	.339	.457	.339	.472	.079
.472	.433	.417	.531	.417	.551	.079

 * Preferred sizes

1) If a back-up ring is used the recommended radius r1 should always be $r1 = .010 \pm .008$ in.

The given installation dimensions cannot be used for FFKM materials (Isolast[®]). Please use the Isolast[®] brochure or contact your local Trelleborg Sealing Solutions sales office for further details.



C Dimensions and product range

C.1 Dimensions and international standards

C.1.1 O-Ring dimensions according to AS 568 B

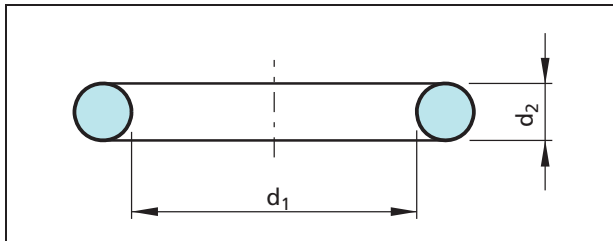


Figure 26 O-Ring dimensions

Table XVI Dimensions / TSS part numbers AS per AS 568 B

TSS Part No.	Dash sizes	Inch dimensions		Metric dimensions (mm)	
		Inside diameter d_1 inch	Cross section d_2 inch	Inside diameter d_1	Cross section d_2
ORAR00001	001	.029	.040	0.74	1.02
ORAR00002	002	.042	.050	1.07	1.27
ORAR00003	003	.056	.060	1.42	1.52
ORAR00004	004	.070	.070	1.78	1.78
ORAR00005	005	.101	.070	2.57	1.78
ORAR00006	006	.114	.070	2.90	1.78
ORAR00007	007	.145	.070	3.68	1.78
ORAR00008	008	.176	.070	4.47	1.78
ORAR00009	009	.208	.070	5.28	1.78
ORAR00010	010	.239	.070	6.07	1.78
ORAR00011	011	.301	.070	7.65	1.78
ORAR00012	012	.364	.070	9.25	1.78
ORAR00013	013	.426	.070	10.82	1.78
ORAR00014	014	.489	.070	12.42	1.78
ORAR00015	015	.551	.070	14.00	1.78
ORAR00016	016	.614	.070	15.60	1.78
ORAR00017	017	.676	.070	17.17	1.78
ORAR00018	018	.739	.070	18.77	1.78
ORAR00019	019	.801	.070	20.35	1.78
ORAR00020	020	.864	.070	21.95	1.78
ORAR00021	021	.926	.070	23.52	1.78
ORAR00022	022	.989	.070	25.12	1.78
ORAR00023	023	1.051	.070	26.70	1.78
ORAR00024	024	1.114	.070	28.30	1.78



TSS Part No.	Dash sizes	Inch dimensions		Metric dimensions (mm)	
		Inside diameter d ₁ inch	Cross section d ₂ inch	Inside diameter d ₁	Cross section d ₂
ORAR00025	025	1.176	.070	29.87	1.78
ORAR00026	026	1.239	.070	31.47	1.78
ORAR00027	027	1.301	.070	33.05	1.78
ORAR00028	028	1.364	.070	34.65	1.78
ORAR00029	029	1.489	.070	37.82	1.78
ORAR00030	030	1.614	.070	41.00	1.78
ORAR00031	031	1.739	.070	44.17	1.78
ORAR00032	032	1.864	.070	47.35	1.78
ORAR00033	033	1.989	.070	50.52	1.78
ORAR00034	034	2.114	.070	53.70	1.78
ORAR00035	035	2.239	.070	56.87	1.78
ORAR00036	036	2.364	.070	60.05	1.78
ORAR00037	037	2.489	.070	63.22	1.78
ORAR00038	038	2.614	.070	66.40	1.78
ORAR00039	039	2.739	.070	69.57	1.78
ORAR00040	040	2.864	.070	72.75	1.78
ORAR00041	041	2.989	.070	75.92	1.78
ORAR00042	042	3.239	.070	82.27	1.78
ORAR00043	043	3.489	.070	88.62	1.78
ORAR00044	044	3.739	.070	94.97	1.78
ORAR00045	045	3.989	.070	101.32	1.78
ORAR00046	046	4.239	.070	107.67	1.78
ORAR00047	047	4.489	.070	114.02	1.78
ORAR00048	048	4.739	.070	120.37	1.78
ORAR00049	049	4.989	.070	126.72	1.78
ORAR00050	050	5.239	.070	133.07	1.78
ORAR00102	102	.049	.103	1.24	2.62
ORAR00103	103	.081	.103	2.06	2.62
ORAR00104	104	.112	.103	2.84	2.62
ORAR00105	105	.143	.103	3.63	2.62
ORAR00106	106	.174	.103	4.42	2.62
ORAR00107	107	.206	.103	5.23	2.62
ORAR00108	108	.237	.103	6.02	2.62
ORAR00109	109	.299	.103	7.59	2.62
ORAR00110	110	.362	.103	9.19	2.62
ORAR00111	111	.424	.103	10.77	2.62



O-Ring

TSS Part No.	Dash sizes	Inch dimensions		Metric dimensions (mm)	
		Inside diameter d ₁ inch	Cross section d ₂ inch	Inside diameter d ₁	Cross section d ₂
ORAR00112	112	.487	.103	12.37	2.62
ORAR00113	113	.549	.103	13.94	2.62
ORAR00114	114	.612	.103	15.54	2.62
ORAR00115	115	.674	.103	17.12	2.62
ORAR00116	116	.737	.103	18.72	2.62
ORAR00117	117	.799	.103	20.29	2.62
ORAR00118	118	.862	.103	21.89	2.62
ORAR00119	119	.924	.103	23.47	2.62
ORAR00120	120	.987	.103	25.07	2.62
ORAR00121	121	1.049	.103	26.64	2.62
ORAR00122	122	1.112	.103	28.24	2.62
ORAR00123	123	1.174	.103	29.82	2.62
ORAR00124	124	1.237	.103	31.42	2.62
ORAR00125	125	1.299	.103	32.99	2.62
ORAR00126	126	1.362	.103	34.59	2.62
ORAR00127	127	1.424	.103	36.17	2.62
ORAR00128	128	1.487	.103	37.77	2.62
ORAR00129	129	1.549	.103	39.34	2.62
ORAR00130	130	1.612	.103	40.94	2.62
ORAR00131	131	1.674	.103	42.52	2.62
ORAR00132	132	1.737	.103	44.12	2.62
ORAR00133	133	1.799	.103	45.69	2.62
ORAR00134	134	1.862	.103	47.29	2.62
ORAR00135	135	1.925	.103	48.90	2.62
ORAR00136	136	1.987	.103	50.47	2.62
ORAR00137	137	2.050	.103	52.07	2.62
ORAR00138	138	2.112	.103	53.64	2.62
ORAR00139	139	2.175	.103	55.25	2.62
ORAR00140	140	2.237	.103	56.82	2.62
ORAR00141	141	2.300	.103	58.42	2.62
ORAR00142	142	2.362	.103	59.99	2.62
ORAR00143	143	2.425	.103	61.60	2.62
ORAR00144	144	2.487	.103	63.17	2.62
ORAR00145	145	2.550	.103	64.77	2.62
ORAR00146	146	2.612	.103	66.34	2.62
ORAR00147	147	2.675	.103	67.95	2.62
ORAR00148	148	2.737	.103	69.52	2.62





TSS Part No.	Dash sizes	Inch dimensions		Metric dimensions (mm)	
		Inside diameter d ₁ inch	Cross section d ₂ inch	Inside diameter d ₁	Cross section d ₂
ORAR00149	149	2.800	.103	71.12	2.62
ORAR00150	150	2.862	.103	72.69	2.62
ORAR00151	151	2.987	.103	75.87	2.62
ORAR00152	152	3.237	.103	82.22	2.62
ORAR00153	153	3.487	.103	88.57	2.62
ORAR00154	154	3.737	.103	94.92	2.62
ORAR00155	155	3.987	.103	101.27	2.62
ORAR00156	156	4.237	.103	107.62	2.62
ORAR00157	157	4.487	.103	113.97	2.62
ORAR00158	158	4.737	.103	120.32	2.62
ORAR00159	159	4.987	.103	126.67	2.62
ORAR00160	160	5.237	.103	133.02	2.62
ORAR00161	161	5.487	.103	139.37	2.62
ORAR00162	162	5.737	.103	145.72	2.62
ORAR00163	163	5.987	.103	152.07	2.62
ORAR00164	164	6.237	.103	158.42	2.62
ORAR00165	165	6.487	.103	164.77	2.62
ORAR00166	166	6.737	.103	171.12	2.62
ORAR00167	167	6.987	.103	177.47	2.62
ORAR00168	168	7.237	.103	183.82	2.62
ORAR00169	169	7.487	.103	190.17	2.62
ORAR00170	170	7.737	.103	196.52	2.62
ORAR00171	171	7.987	.103	202.87	2.62
ORAR00172	172	8.237	.103	209.22	2.62
ORAR00173	173	8.487	.103	215.57	2.62
ORAR00174	174	8.737	.103	221.92	2.62
ORAR00175	175	8.987	.103	228.27	2.62
ORAR00176	176	9.237	.103	234.62	2.62
ORAR00177	177	9.487	.103	240.97	2.62
ORAR00178	178	9.737	.103	247.32	2.62
ORAR00201	201	.171	.139	4.34	3.53
ORAR00202	202	.234	.139	5.94	3.53
ORAR00203	203	.296	.139	7.52	3.53
ORAR00204	204	.359	.139	9.12	3.53
ORAR00205	205	.421	.139	10.69	3.53
ORAR00206	206	.484	.139	12.29	3.53



O-Ring

TSS Part No.	Dash sizes	Inch dimensions		Metric dimensions (mm)	
		Inside diameter d ₁ inch	Cross section d ₂ inch	Inside diameter d ₁	Cross section d ₂
ORAR00207	207	.546	.139	13.87	3.53
ORAR00208	208	.609	.139	15.47	3.53
ORAR00209	209	.671	.139	17.04	3.53
ORAR00210	210	.734	.139	18.64	3.53
ORAR00211	211	.796	.139	20.22	3.53
ORAR00212	212	.859	.139	21.82	3.53
ORAR00213	213	.921	.139	23.39	3.53
ORAR00214	214	.984	.139	24.99	3.53
ORAR00215	215	1.046	.139	26.57	3.53
ORAR00216	216	1.109	.139	28.17	3.53
ORAR00217	217	1.171	.139	29.74	3.53
ORAR00218	218	1.234	.139	31.34	3.53
ORAR00219	219	1.296	.139	32.92	3.53
ORAR00220	220	1.359	.139	34.52	3.53
ORAR00221	221	1.421	.139	36.09	3.53
ORAR00222	222	1.484	.139	37.69	3.53
ORAR00223	223	1.609	.139	40.87	3.53
ORAR00224	224	1.734	.139	44.04	3.53
ORAR00225	225	1.859	.139	47.22	3.53
ORAR00226	226	1.984	.139	50.39	3.53
ORAR00227	227	2.109	.139	53.57	3.53
ORAR00228	228	2.234	.139	56.74	3.53
ORAR00229	229	2.359	.139	59.92	3.53
ORAR00230	230	2.484	.139	63.09	3.53
ORAR00231	231	2.609	.139	66.27	3.53
ORAR00232	232	2.734	.139	69.44	3.53
ORAR00233	233	2.859	.139	72.62	3.53
ORAR00234	234	2.984	.139	75.79	3.53
ORAR00235	235	3.109	.139	78.97	3.53
ORAR00236	236	3.234	.139	82.14	3.53
ORAR00237	237	3.359	.139	85.32	3.53
ORAR00238	238	3.484	.139	88.49	3.53
ORAR00239	239	3.609	.139	91.67	3.53
ORAR00240	240	3.734	.139	94.84	3.53
ORAR00241	241	3.859	.139	98.02	3.53
ORAR00242	242	3.984	.139	101.19	3.53
ORAR00243	243	4.109	.139	104.37	3.53





TSS Part No.	Dash sizes	Inch dimensions		Metric dimensions (mm)	
		Inside diameter d ₁ inch	Cross section d ₂ inch	Inside diameter d ₁	Cross section d ₂
ORAR00244	244	4.234	.139	107.54	3.53
ORAR00245	245	4.359	.139	110.72	3.53
ORAR00246	246	4.484	.139	113.89	3.53
ORAR00247	247	4.609	.139	117.07	3.53
ORAR00248	248	4.734	.139	120.24	3.53
ORAR00249	249	4.859	.139	123.42	3.53
ORAR00250	250	4.984	.139	126.59	3.53
ORAR00251	251	5.109	.139	129.77	3.53
ORAR00252	252	5.234	.139	132.94	3.53
ORAR00253	253	5.359	.139	136.12	3.53
ORAR00254	254	5.484	.139	139.29	3.53
ORAR00255	255	5.609	.139	142.47	3.53
ORAR00256	256	5.734	.139	145.64	3.53
ORAR00257	257	5.859	.139	148.82	3.53
ORAR00258	258	5.984	.139	151.99	3.53
ORAR00259	259	6.234	.139	158.34	3.53
ORAR00260	260	6.484	.139	164.69	3.53
ORAR00261	261	6.734	.139	171.04	3.53
ORAR00262	262	6.984	.139	177.39	3.53
ORAR00263	263	7.234	.139	183.74	3.53
ORAR00264	264	7.484	.139	190.09	3.53
ORAR00265	265	7.734	.139	196.44	3.53
ORAR00266	266	7.984	.139	202.79	3.53
ORAR00267	267	8.234	.139	209.14	3.53
ORAR00268	268	8.484	.139	215.49	3.53
ORAR00269	269	8.734	.139	221.84	3.53
ORAR00270	270	8.984	.139	228.19	3.53
ORAR00271	271	9.234	.139	234.54	3.53
ORAR00272	272	9.484	.139	240.89	3.53
ORAR00273	273	9.734	.139	247.24	3.53
ORAR00274	274	9.984	.139	253.59	3.53
ORAR00275	275	10.484	.139	266.29	3.53
ORAR00276	276	10.984	.139	278.99	3.53
ORAR00277	277	11.484	.139	291.69	3.53
ORAR00278	278	11.984	.139	304.39	3.53
ORAR00279	279	12.984	.139	329.79	3.53
ORAR00280	280	13.984	.139	355.19	3.53



O-Ring

TSS Part No.	Dash sizes	Inch dimensions		Metric dimensions (mm)	
		Inside diameter d ₁ inch	Cross section d ₂ inch	Inside diameter d ₁	Cross section d ₂
ORAR00281	281	14.984	.139	380.59	3.53
ORAR00282	282	15.955	.139	405.26	3.53
ORAR00283	283	16.955	.139	430.66	3.53
ORAR00284	284	17.955	.139	456.06	3.53
ORAR00309	309	.412	.210	10.46	5.33
ORAR00310	310	.475	.210	12.07	5.33
ORAR00311	311	.537	.210	13.64	5.33
ORAR00312	312	.600	.210	15.24	5.33
ORAR00313	313	.662	.210	16.81	5.33
ORAR00314	314	.725	.210	18.42	5.33
ORAR00315	315	.787	.210	19.99	5.33
ORAR00316	316	.850	.210	21.59	5.33
ORAR00317	317	.912	.210	23.16	5.33
ORAR00318	318	.975	.210	24.77	5.33
ORAR00319	319	1.037	.210	26.34	5.33
ORAR00320	320	1.100	.210	27.94	5.33
ORAR00321	321	1.162	.210	29.51	5.33
ORAR00322	322	1.225	.210	31.12	5.33
ORAR00323	323	1.287	.210	32.69	5.33
ORAR00324	324	1.350	.210	34.29	5.33
ORAR00325	325	1.475	.210	37.47	5.33
ORAR00326	326	1.600	.210	40.64	5.33
ORAR00327	327	1.725	.210	43.82	5.33
ORAR00328	328	1.850	.210	46.99	5.33
ORAR00329	329	1.975	.210	50.17	5.33
ORAR00330	330	2.100	.210	53.34	5.33
ORAR00331	331	2.225	.210	56.52	5.33
ORAR00332	332	2.350	.210	59.69	5.33
ORAR00333	333	2.475	.210	62.87	5.33
ORAR00334	334	2.600	.210	66.04	5.33
ORAR00335	335	2.725	.210	69.22	5.33
ORAR00336	336	2.850	.210	72.39	5.33
ORAR00337	337	2.975	.210	75.57	5.33
ORAR00338	338	3.100	.210	78.74	5.33
ORAR00339	339	3.225	.210	81.92	5.33
ORAR00340	340	3.350	.210	85.09	5.33





TSS Part No.	Dash sizes	Inch dimensions		Metric dimensions (mm)	
		Inside diameter d ₁ inch	Cross section d ₂ inch	Inside diameter d ₁	Cross section d ₂
ORAR00341	341	3.475	.210	88.27	5.33
ORAR00342	342	3.600	.210	91.44	5.33
ORAR00343	343	3.725	.210	94.62	5.33
ORAR00344	344	3.850	.210	97.79	5.33
ORAR00345	345	3.975	.210	100.97	5.33
ORAR00346	346	4.100	.210	104.14	5.33
ORAR00347	347	4.225	.210	107.32	5.33
ORAR00348	348	4.350	.210	110.49	5.33
ORAR00349	349	4.475	.210	113.67	5.33
ORAR00350	350	4.600	.210	116.84	5.33
ORAR00351	351	4.725	.210	120.02	5.33
ORAR00352	352	4.850	.210	123.19	5.33
ORAR00353	353	4.975	.210	126.37	5.33
ORAR00354	354	5.100	.210	129.54	5.33
ORAR00355	355	5.225	.210	132.72	5.33
ORAR00356	356	5.350	.210	135.89	5.33
ORAR00357	357	5.475	.210	139.07	5.33
ORAR00358	358	5.600	.210	142.24	5.33
ORAR00359	359	5.725	.210	145.42	5.33
ORAR00360	360	5.850	.210	148.59	5.33
ORAR00361	361	5.975	.210	151.77	5.33
ORAR00362	362	6.225	.210	158.12	5.33
ORAR00363	363	6.475	.210	164.47	5.33
ORAR00364	364	6.725	.210	170.82	5.33
ORAR00365	365	6.975	.210	177.17	5.33
ORAR00366	366	7.225	.210	183.52	5.33
ORAR00367	367	7.475	.210	189.87	5.33
ORAR00368	368	7.725	.210	196.22	5.33
ORAR00369	369	7.975	.210	202.57	5.33
ORAR00370	370	8.225	.210	208.92	5.33
ORAR00371	371	8.475	.210	215.27	5.33
ORAR00372	372	8.725	.210	221.62	5.33
ORAR00373	373	8.975	.210	227.97	5.33
ORAR00374	374	9.225	.210	234.32	5.33
ORAR00375	375	9.475	.210	240.67	5.33
ORAR00376	376	9.725	.210	247.02	5.33
ORAR00377	377	9.975	.210	253.37	5.33



O-Ring

TSS Part No.	Dash sizes	Inch dimensions		Metric dimensions (mm)	
		Inside diameter d ₁ inch	Cross section d ₂ inch	Inside diameter d ₁	Cross section d ₂
ORAR00378	378	10.475	.210	266.07	5.33
ORAR00379	379	10.975	.210	278.77	5.33
ORAR00380	380	11.475	.210	291.47	5.33
ORAR00381	381	11.975	.210	304.17	5.33
ORAR00382	382	12.975	.210	329.57	5.33
ORAR00383	383	13.975	.210	354.97	5.33
ORAR00384	384	14.975	.210	380.37	5.33
ORAR00385	385	15.955	.210	405.26	5.33
ORAR00386	386	16.955	.210	430.66	5.33
ORAR00387	387	17.955	.210	456.06	5.33
ORAR00388	388	18.952	.210	481.38	5.33
ORAR00389	389	19.952	.210	506.78	5.33
ORAR00390	390	20.952	.210	532.18	5.33
ORAR00391	391	21.952	.210	557.58	5.33
ORAR00392	392	22.940	.210	582.68	5.33
ORAR00393	393	23.940	.210	608.08	5.33
ORAR00394	394	24.940	.210	633.48	5.33
ORAR00395	395	25.940	.210	658.88	5.33
ORAR00425	425	4.475	.275	113.67	6.99
ORAR00426	426	4.600	.275	116.84	6.99
ORAR00427	427	4.725	.275	120.02	6.99
ORAR00428	428	4.850	.275	123.19	6.99
ORAR00429	429	4.975	.275	126.37	6.99
ORAR00430	430	5.100	.275	129.54	6.99
ORAR00431	431	5.225	.275	132.72	6.99
ORAR00432	432	5.350	.275	135.89	6.99
ORAR00433	433	5.475	.275	139.07	6.99
ORAR00434	434	5.600	.275	142.24	6.99
ORAR00435	435	5.725	.275	145.42	6.99
ORAR00436	436	5.850	.275	148.59	6.99
ORAR00437	437	5.975	.275	151.77	6.99
ORAR00438	438	6.225	.275	158.12	6.99
ORAR00439	439	6.475	.275	164.47	6.99
ORAR00440	440	6.725	.275	170.82	6.99
ORAR00441	441	6.975	.275	177.17	6.99
ORAR00442	442	7.225	.275	183.52	6.99





TSS Part No.	Dash sizes	Inch dimensions		Metric dimensions (mm)	
		Inside diameter d ₁ inch	Cross section d ₂ inch	Inside diameter d ₁	Cross section d ₂
ORAR00443	443	7.475	.275	189.87	6.99
ORAR00444	444	7.725	.275	196.22	6.99
ORAR00445	445	7.975	.275	202.57	6.99
ORAR00446	446	8.475	.275	215.27	6.99
ORAR00447	447	8.975	.275	227.97	6.99
ORAR00448	448	9.475	.275	240.67	6.99
ORAR00449	449	9.975	.275	253.37	6.99
ORAR00450	450	10.475	.275	266.07	6.99
ORAR00451	451	10.975	.275	278.77	6.99
ORAR00452	452	11.475	.275	291.47	6.99
ORAR00453	453	11.975	.275	304.17	6.99
ORAR00454	454	12.475	.275	316.87	6.99
ORAR00455	455	12.975	.275	329.57	6.99
ORAR00456	456	13.475	.275	342.27	6.99
ORAR00457	457	13.975	.275	354.97	6.99
ORAR00458	458	14.475	.275	367.67	6.99
ORAR00459	459	14.975	.275	380.37	6.99
ORAR00460	460	15.475	.275	393.07	6.99
ORAR00461	461	15.955	.275	405.26	6.99
ORAR00462	462	16.455	.275	417.96	6.99
ORAR00463	463	16.955	.275	430.66	6.99
ORAR00464	464	17.455	.275	443.36	6.99
ORAR00465	465	17.955	.275	456.06	6.99
ORAR00466	466	18.455	.275	468.76	6.99
ORAR00467	467	18.955	.275	481.46	6.99
ORAR00468	468	19.455	.275	494.16	6.99
ORAR00469	469	19.955	.275	506.86	6.99
ORAR00470	470	20.955	.275	532.26	6.99
ORAR00471	471	21.955	.275	557.66	6.99
ORAR00472	472	22.940	.275	582.68	6.99
ORAR00473	473	23.940	.275	608.08	6.99
ORAR00474	474	24.940	.275	633.48	6.99
ORAR00475	475	25.940	.275	658.88	6.99



O-Ring

C.1.2 O-Ring range of sizes

The following table provides a summary of available O-Ring dimensions, Trelleborg Sealing Solutions part numbers and valid standards.

The table represents a guide to common dimensions with or without a valid standard and makes no claim to be complete. The complete range of sizes is more extensive. Special dimensions are also available on request. Please contact your local Trelleborg Sealing Solutions sales office for further details.

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

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

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)

TSS Article No.	OR3004000	-	N7
TSS Art. - Group			
Cross section x 10			
Inside diameter x 100			
Quality Index (Standard)			
Material code (Standard)			

For O-Ring dimensions and Trelleborg Sealing Solutions part numbers see tables XVII to XIX.

For material codes (elastomer type) for standard product orders see table I (last column).

The required shore hardness must be given with the order.

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

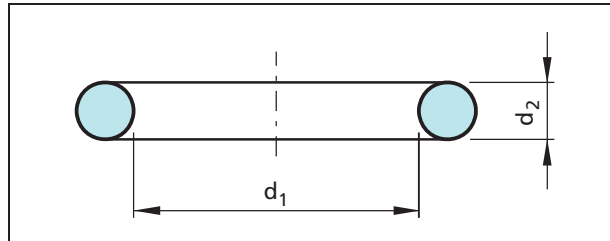


Figure 27 O-Ring dimensions

Ordering example 2

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

Dimensions: Inside diameter = 2.800 inches
Cross section = .103 inches

Material: FKM 80
(Fluorocarbon Rubber
80 Shore A)

TSS Article No.	ORAR00149	-	V8
TSS Art. - Group			
Standard AS 568 B			
Part No. (Dash-No.)			
Quality Index (Standard)			
Material code (Standard)			

When a special material is required the exact five-digit Trelleborg Sealing Solutions material code must be given with the order. In this respect please refer to the information provided in Table X or contact your local Trelleborg Sealing Solutions sales office.



Table XVII Dimensions / TSS part numbers

Inside diameter d ₁	Cross section d ₂	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
.020	.039	OR1000050	001	x							
.029	.040	ORAR00001									
.039	.059	OR1500100									
.042	.050	ORAR00002	002	x							
.047	.039	OR1000120	102	x							
.049	.103	ORAR00102									
.056	.060	ORAR00003	003	x							
.059	.039	OR1000150	004	x							
.059	.059	OR1500150									
.070	.040	ORAR90212		x							
.070	.070	ORAR00004	x								
.071	.039	OR1000180									
.071	.047	OR1200180			x			x			
.071	.071	ORIA00180			x						
.079	.039	OR1000200									
.079	.059	OR1500200	103		x			x			
.079	.071	ORIA00200									
.081	.103	ORAR00103		x							
.087	.039	OR1000220									
.088	.071	ORIA00224			x			x			
.094	.075	OR1900240							R0		
.098	.039	OR1000250									
.098	.047	OR1200250									
.098	.051	OR1300250									
.098	.059	OR1500250	005								
.098	.063	OR1600250									
.098	.071	ORIA00250		x				x			
.101	.070	ORAR00005	005	x							
.102	.039	OR1000260									
.102	.047	OR1200260									
.102	.051	OR1300260									
.102	.075	OR1900260							R1		
.106	.063	OR1600270									
.110	.063	OR1600280			x						
.110	.071	ORIA00280			x			x			
.110	.075	OR1900280					P3				



O-Ring

Inside diameter d ₁	Cross section d ₂	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
.112	.103	ORAR00104	104	x							
.114	.070	ORAR00006	006	x							
.118	.039	OR1000300									
.118	.059	OR1500300									
.118	.079	OR2000300									
.118	.094	OR2400300									
.118	.106	OR2700300									
.118	.118	OR3000300									
.122	.063	OR1600310				x					x
.124	.071	ORIA00315			x			x			
.126	.063	OR1600320									
.126	.071	ORIA00320									
.126	.098	OR2500320									
.130	.039	OR1000330									
.130	.059	OR1500330									
.130	.094	OR2400330				x					x
.134	.075	OR1900340							R2		
.138	.039	OR1000350									
.138	.047	OR1200350									
.138	.059	OR1500350									
.138	.079	OR2000350									
.140	.071	ORIA00355			x			x			
.142	.094	OR2400360									x
.143	.103	ORAR00105	105	x							
.145	.070	ORAR00007	007	x							
.146	.075	OR1900370									
.150	.059	OR1500380									
.150	.075	OR1900380					P4				
.154	.071	ORIA00390									
.157	.039	OR1000400									
.157	.047	OR1200400									
.157	.059	OR1500400									
.157	.071	ORIA00400			x			x			
.157	.079	OR2000400									
.157	.098	OR2500400									
.157	.118	OR3000400									



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Inside diameter d ₁	Cross section d ₂	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
.157	.157	OR4000400									
.161	.063	OR1600410				x					x
.165	.075	OR1900420							R3		
.169	.094	OR2400430									x
.171	.139	ORAR00201	201	x							
.174	.103	ORAR00106	106	x							
.176	.070	ORAR00008	008	x							
.177	.039	OR1000450									
.177	.059	OR1500450									
.177	.079	OR2000450									
.177	.098	OR2500450									
.181	.079	OR2000460									
.181	.094	OR2400460									x
.185	.039	OR1000470									
.185	.056	ORAR00901	901	x							
.189	.071	ORIA00480									
.189	.075	OR1900480					P5				
.192	.071	ORIA00487			x			x			
.193	.075	OR1900490							R4		
.197	.039	OR1000500									
.197	.047	OR1200500									
.197	.059	OR1500500									
.197	.071	ORIA00500			x			x			
.197	.079	OR2000500									
.197	.098	OR2500500									
.197	.118	OR3000500									
.197	.197	OR5000500									
.201	.063	OR1600510				x					x
.203	.071	ORIA00515			x			x			
.206	.103	ORAR00107	107	x							
.208	.070	ORAR00009	009	x							
.209	.071	ORIA00530			x			x			
.209	.094	OR2400530				x					x
.217	.039	OR1000550									
.217	.059	OR1500550									
.217	.063	OR1600550									



O-Ring

Inside diameter d ₁	Cross section d ₂	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
.217	.079	OR2000550									
.220	.071	ORIA00560			x			x			
.220	.094	OR2400560									x
.224	.075	OR1900570							R5		
.228	.075	OR1900580					P6				
.234	.139	ORAR00202	202	x							
.236	.039	OR1000600									
.236	.059	OR1500600									
.236	.071	ORIA00600			x			x			
.236	.079	OR2000600									
.236	.087	OR2200600									
.236	.098	OR2500600									
.236	.118	OR3000600									
.237	.103	ORAR00108	108	x							
.239	.064	ORAR00902	902	x							
.239	.070	ORAR00010	010	x							
.240	.063	OR1600610				x				x	x
.248	.071	ORIA00630			x			x			
.248	.094	OR2400630				x					x
.252	.075	OR1900640							R5A		
.256	.059	OR1500650									
.256	.063	OR1600650									
.256	.079	OR2000650									
.256	.118	OR3000650									
.256	.197	OR5000650									
.260	.063	OR1600660									
.260	.094	OR2400660									x
.264	.071	ORIA00670			x			x			
.268	.075	OR1900680					P7				
.272	.071	ORIA00690			x			x			
.276	.039	OR1000700									
.276	.047	OR1200700									
.276	.051	OR1300700									
.276	.059	OR1500700									
.276	.071	ORIA00700									
.276	.079	OR2000700									



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Inside diameter d ₁	Cross section d ₂	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
.276	.098	OR2500700									
.276	.118	OR3000700									
.276	.157	OR4000700									
.280	.063	OR1600710				x				x	
.280	.071	ORIA00710			x			x			
.283	.075	OR1900720						R6			
.287	.094	OR2400730				x				x	
.295	.059	OR1500750									
.295	.071	ORIA00750			x			x			
.295	.079	OR2000750									
.295	.098	OR2500750									
.296	.139	ORAR00203	203	x							
.299	.094	OR2400760								x	
.299	.103	ORAR00109	109	x							
.301	.064	ORAR00903	903	x							
.301	.070	ORAR00011	011	x							
.307	.075	OR1900780					P8				
.315	.039	OR1000800									
.315	.059	OR1500800									
.315	.063	OR1600800									
.315	.071	ORIA00800			x			x			
.315	.075	OR1900800							R6A		
.315	.079	OR2000800									
.315	.087	OR2200800									
.315	.094	OR2400800									
.315	.098	OR2500800									
.315	.118	OR3000800									
.315	.138	OR3500800									
.315	.157	OR4000800									
.315	.177	OR4500800									
.315	.197	OR5000800									
.319	.063	OR1600810				x			x	x	
.327	.094	OR2400830				x				x	
.335	.039	OR1000850									
.335	.059	OR1500850									
.335	.071	ORIA00850			x			x			



O-Ring

Inside diameter d_1	Cross section d_2	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
.335	.079	OR2000850									
.335	.098	OR2500850									
.335	.118	OR3000850									
.339	.094	OR2400860									x
.344	.071	ORIA00875			x			x			
.346	.075	OR1900880					P9				
.350	.075	OR1900890							R7		
.350	.106	OR2700890							R8		
.351	.072	ORAR00904	904	x							
.354	.039	OR1000900									
.354	.047	OR1200900									
.354	.059	OR1500900									
.354	.071	ORIA00900			x			x			
.354	.079	OR2000900									
.354	.098	OR2500900									
.354	.118	OR3000900									
.354	.157	OR4000900									
.354	.177	OR4500900									
.354	.236	OR6000900									
.358	.063	OR1600910				x					x
.359	.139	ORAR00204	204	x							
.362	.103	ORAR00110	110	x							
.364	.070	ORAR00012	012	x							
.366	.087	OR2200930								x	
.366	.094	OR2400930				x					x
.374	.039	OR1000950									
.374	.059	OR1500950									
.374	.063	OR1600950									
.374	.071	ORIA00950			x			x			
.374	.079	OR2000950									
.374	.098	OR2500950									
.374	.118	OR3000950									
.378	.094	OR2400960									x
.386	.075	OR1900980					P10				
.386	.094	OR2400980					P10A				
.394	.039	OR1001000									





Inside diameter d ₁	Cross section d ₂	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
.394	.059	OR1501000									
.394	.071	ORIA01000			x			x			
.394	.079	OR2001000									
.394	.094	OR2401000									
.394	.098	OR2501000									
.394	.118	OR3001000									
.394	.138	OR3501000									
.394	.157	OR4001000									
.394	.197	OR5001000									
.398	.063	OR1601010				x				x	
.406	.094	OR2401030				x				x	
.412	.210	ORAR00309	309	x							
.413	.059	OR1501050									
.413	.106	OR2701050						R9			
.414	.072	ORAR00905	905	x							
.417	.071	ORIA01060			x			x			
.417	.094	OR2401060								x	
.421	.139	ORAR00205	205	x							
.424	.103	ORAR00111	111	x			P11				
.425	.094	OR2401080									
.426	.070	ORAR00013	013	x							
.433	.039	OR1001100									
.433	.059	OR1501100									
.433	.079	OR2001100									
.433	.094	OR2401100					P11.2				
.433	.098	OR2501100									
.433	.118	OR3001100									
.433	.138	OR3501100									
.433	.157	OR4001100									
.437	.063	OR1601110				x				x	
.441	.071	ORIA01120			x			x			
.445	.087	OR2201130							x		
.445	.094	OR2401130				x				x	
.457	.094	OR2401160									
.465	.071	ORIA01180			x			x		x	
.465	.094	OR2401180					P12				



O-Ring

Inside diameter d ₁	Cross section d ₂	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
.468	.078	ORAR00906	906	x							
.472	.039	OR1001200									
.472	.059	OR1501200									
.472	.079	OR2001200									
.472	.098	OR2501200									
.472	.118	OR3001200									
.472	.157	OR4001200									
.472	.177	OR4501200									
.472	.197	OR5001200									
.475	.210	ORAR00310	310	x							
.476	.063	OR1601210				x					x
.476	.106	OR2701210						R10			
.484	.094	OR2401230				x				x	
.484	.139	ORAR00206	206	x							
.487	.103	ORAR00112	112	x							
.489	.070	ORAR00014	014	x							
.492	.059	OR1501250									
.492	.071	ORIA01250				x		x			
.492	.079	OR2001250									
.492	.098	OR2501250									
.496	.094	OR2401260								x	
.512	.039	OR1001300									
.512	.059	OR1501300									
.512	.079	OR2001300									
.512	.098	OR2501300									
.512	.118	OR3001300									
.512	.138	OR3501300									
.512	.157	OR4001300									
.516	.063	OR1601310				x				x	
.520	.071	ORIA01320			x			x			
.524	.087	OR2201330									
.524	.094	OR2401330				x					
.530	.082	ORAR00907	907	x						x	
.535	.094	OR2401360									
.535	.106	OR2701360						R11			
.537	.210	ORAR00311	311	x						x	





Inside diameter d ₁	Cross section d ₂	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
.543	.094	OR2401380					P14				
.546	.139	ORAR00207	207	x							
.549	.103	ORAR00113	113	x							
.551	.039	OR1001400									
.551	.059	OR1501400									
.551	.063	OR1601400									
.551	.070	ORAR00015	015	x							
.551	.071	ORIA01400			x			x			
.551	.079	OR2001400									
.551	.094	OR2401400									
.551	.098	OR2501400									
.551	.104	ORIB01400			x			x			
.551	.106	OR2701400									
.551	.118	OR3001400									
.551	.157	OR4001400									
.551	.197	OR5001400									
.555	.063	OR1601410				x					x
.563	.094	OR2401430				x					x
.583	.094	OR2401480					P15				x
.591	.039	OR1001500									
.591	.059	OR1501500									
.591	.071	ORIA01500			x			x			
.591	.079	OR2001500									
.591	.098	OR2501500									
.591	.104	ORIB01500			x			x			
.591	.118	OR3001500									
.591	.138	OR3501500									
.591	.157	OR4001500									
.591	.197	OR5001500									
.591	.236	OR6001500									
.591	.276	OR7001500									
.594	.063	OR1601510				x					x
.594	.106	OR2701510							R12		
.600	.210	ORAR00312	312	x							
.602	.087	OR2201530								x	
.602	.094	OR2401530				x					x



O-Ring

Inside diameter d ₁	Cross section d ₂	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
.609	.139	ORAR00208	208	x							
.612	.103	ORAR00114	114	x							
.614	.070	ORAR00016	016	x							
.614	.094	OR2401560					P16				x
.622	.094	OR2401580									
.630	.039	OR1001600									
.630	.059	OR1501600									
.630	.071	ORIA01600			x			x			
.630	.079	OR2001600									
.630	.098	OR2501600									
.630	.104	ORIB01600			x			x			
.630	.118	OR3001600									
.630	.138	OR3501600									
.630	.157	OR4001600									
.630	.177	OR4501600									
.630	.197	OR5001600									
.634	.063	OR1601610				x					x
.642	.094	OR2401630				x					x
.644	.087	ORAR00908	908	x							
.662	.210	ORAR00313	313	x							
.665	.106	OR2701690							R13		
.669	.039	OR1001700									
.669	.059	OR1501700									
.669	.071	ORIA01700			x			x			
.669	.079	OR2001700									
.669	.098	OR2501700									
.669	.104	ORIB01700			x			x			
.669	.118	OR3001700									
.669	.138	OR3501700									
.669	.157	OR4001700									
.669	.197	OR5001700									
.671	.139	ORAR00209	209	x							
.673	.063	OR1601710				x					x
.674	.103	ORAR00115	115	x							
.676	.070	ORAR00017	017	x							
.677	.118	OR3001720								x	





Inside diameter d ₁	Cross section d ₂	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
.681	.087	OR2201730								x	
.681	.094	OR2401730				x					x
.693	.094	OR2401760									x
.701	.094	OR2401780					P18				
.706	.097	ORAR00909	909	x							
.709	.039	OR1001800									
.709	.059	OR1501800									
.709	.079	OR2001800									
.709	.098	OR2501800									
.709	.104	ORIB01800			x			x			
.709	.118	OR3001800									
.709	.138	OR3501800									
.709	.140	ORIC01800			x			x			
.709	.157	OR4001800									
.709	.177	OR4501800									
.709	.197	OR5001800									
.713	.063	OR1601810				x					x
.717	.118	OR3001820									x
.720	.094	OR2401830									x
.720	.142	OR3601830							R15		
.724	.106	OR2701840							R14		
.725	.210	ORAR00314	314	x							
.732	.094	OR2401860									x
.734	.139	ORAR00210	210	x							
.737	.103	ORAR00116	116	x							
.739	.070	ORAR00018	018	x							
.748	.039	OR1001900									
.748	.059	OR1501900									
.748	.071	ORIA01900									
.748	.079	OR2001900									
.748	.098	OR2501900									
.748	.104	ORIB01900			x			x			
.748	.138	OR3501900									
.748	.140	ORIC01900			x			x			
.748	.157	OR4001900									
.748	.197	OR5001900									



O-Ring

Inside diameter d ₁	Cross section d ₂	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
.748	.236	OR6001900	910	x		x					x
.752	.063	OR1601910									
.755	.097	ORAR00910									
.756	.118	OR3001920				x				x	x
.760	.087	OR2201930									
.760	.094	OR2401930									
.768	.118	OR3001950									x
.772	.094	OR2401960									
.780	.094	OR2401980									
.780	.142	OR3601980							R16		
.787	.039	OR1002000									
.787	.051	OR1302000									
.787	.059	OR1502000									
.787	.079	OR2002000									
.787	.098	OR2502000									
.787	.104	ORIB02000			x			x			
.787	.118	OR3002000									
.787	.138	OR3502000									
.787	.140	ORIC02000			x			x			
.787	.157	OR4002000									
.787	.177	OR4502000									
.787	.197	OR5002000	315	x							
.787	.210	ORAR00315									
.787	.236	OR6002000									
.791	.063	OR1602010	211	x							x
.795	.118	OR3002020									
.796	.139	ORAR00211									
.799	.094	OR2402030	117 019	x x							x
.799	.103	ORAR00117									
.801	.070	ORAR00019									
.811	.094	OR2402060					P21				x
.819	.094	OR2402080									
.827	.079	OR2002100									
.827	.098	OR2502100									
.827	.118	OR3002100									
.827	.157	OR4002100									





Inside diameter d ₁	Cross section d ₂	TSS Part No.	Standard							
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2
.827	.236	OR6002100								
.831	.063	OR1602110								x
.835	.104	ORIB02120			x			x		
.835	.118	OR3002120								x
.835	.140	ORIC02120			x			x		
.839	.094	OR2402130								
.839	.142	OR3602130						R17		
.846	.118	OR3002150								x
.850	.094	OR2402160								x
.850	.210	ORAR00316	316	x			P22A P22			
.854	.138	OR3502170								
.858	.094	OR2402180								
.859	.139	ORAR00212	212	x						
.862	.103	ORAR00118	118	x						
.863	.116	ORAR00911	911	x						
.864	.070	ORAR00020	020	x						
.866	.039	OR1002200								
.866	.051	OR1302200								
.866	.059	OR1502200								
.866	.079	OR2002200								
.866	.098	OR2502200								
.866	.118	OR3002200								
.866	.138	OR3502200								
.866	.157	OR4002200								
.866	.177	OR4502200								
.866	.197	OR5002200								
.866	.236	OR6002200								
.870	.063	OR1602210				x	P22.4			x
.870	.138	OR3502210								
.874	.118	OR3002220				x				x
.878	.094	OR2402230								x
.882	.104	ORIB02240			x			x		
.882	.140	ORIC02240			x			x		
.886	.118	OR3002250								x
.906	.039	OR1002300								
.906	.059	OR1502300								



O-Ring

Inside diameter d ₁	Cross section d ₂	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
.906	.079	OR2002300									
.906	.098	OR2502300									
.906	.118	OR3002300									
.906	.142	OR3602300							R18		
.906	.157	OR4002300									
.906	.197	OR5002300									
.906	.217	OR5502300									
.906	.236	OR6002300									
.912	.210	ORAR00317	317	x							
.917	.094	OR2402330									x
.921	.139	ORAR00213	213	x							
.924	.103	ORAR00119	119	x							
.924	.116	ORAR00912	912	x							
.926	.070	ORAR00021	021	x							
.929	.104	ORIB02360			x			x			
.929	.114	OR2902360								x	
.929	.140	ORIC02360			x			x			
.933	.138	OR3502370					P24				
.945	.039	OR1002400									
.945	.059	OR1502400									
.945	.079	OR2002400									
.945	.098	OR2502400									
.945	.118	OR3002400									
.945	.138	OR3502400									
.945	.157	OR4002400									
.945	.197	OR5002400									
.945	.236	OR6002400									
.953	.118	OR3002420				x					x
.961	.122	OR3102440					G25				
.965	.118	OR3002450									x
.969	.094	OR2402460									x
.969	.142	OR3602460							R19		
.972	.138	OR3502470					P25				
.975	.210	ORAR00318	318	x							
.984	.039	OR1002500									
.984	.059	OR1502500									



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Inside diameter d ₁	Cross section d ₂	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
.984	.079	OR2002500									
.984	.098	OR2502500									
.984	.104	ORIB02500			x			x			
.984	.118	OR3002500									
.984	.139	ORAR00214	214	x							
.984	.140	ORIC02500			x			x			
.984	.157	OR4002500									
.984	.177	OR4502500									
.984	.197	OR5002500									
.984	.236	OR6002500									
.986	.116	ORAR00913	913	x							
.987	.103	ORAR00120	120	x							
.988	.063	OR1602510				x				x	
.989	.070	ORAR00022	022	x							
.992	.118	OR3002520								x	
.992	.138	OR3502520					P25.5				
.996	.094	OR2402530								x	
1.004	.118	OR3002550								x	
1.012	.138	OR3502570					P26				
1.016	.104	ORIB02580			x			x			
1.016	.140	ORIC02580			x			x			
1.024	.039	OR1002600									
1.024	.059	OR1502600									
1.024	.079	OR2002600									
1.024	.098	OR2502600									
1.024	.138	OR3502600									
1.024	.157	OR4002600									
1.024	.197	OR5002600									
1.024	.236	OR6002600									
1.031	.118	OR3002620				x				x	
1.031	.142	OR3602620							R20		
1.037	.210	ORAR00319	319	x							
1.043	.118	OR3002650								x	
1.046	.139	ORAR00215	215	x							
1.048	.116	ORAR00914	914	x							
1.049	.103	ORAR00121	121	x							



O-Ring

Inside diameter d ₁	Cross section d ₂	TSS Part No.	Standard									
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518	
1.051	.070	ORAR00023	023	x								
1.063	.059	OR1502700										
1.063	.079	OR2002700										
1.063	.098	OR2502700										
1.063	.118	OR3002700										
1.063	.157	OR4002700										
1.063	.177	OR4502700										
1.063	.197	OR5002700										
1.063	.236	OR6002700										
1.067	.063	OR1602710				x					x	
1.075	.094	OR2402730									x	
1.083	.118	OR3002750									x	
1.087	.094	OR2402760					P28				x	
1.091	.138	OR3502770										
1.094	.142	OR3602780						R21				
1.100	.210	ORAR00320	320	x								
1.102	.039	OR1002800										
1.102	.059	OR1502800										
1.102	.079	OR2002800										
1.102	.098	OR2502800										
1.102	.104	ORIB02800			x			x				
1.102	.118	OR3002800										
1.102	.140	ORIC02800			x			x				
1.102	.157	OR4002800										
1.102	.197	OR5002800										
1.102	.236	OR6002800										
1.109	.139	ORAR00216	216	x								
1.112	.103	ORAR00122	122	x								
1.114	.070	ORAR00024	024	x								
1.130	.138	OR3502870					P29					
1.142	.059	OR1502900										
1.142	.079	OR2002900										
1.142	.098	OR2502900										
1.142	.118	OR3002900										
1.142	.138	OR3502900										
1.142	.197	OR5002900										



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Inside diameter d ₁	Cross section d ₂	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
1.146	.063	OR1602910				x					x
1.150	.118	OR3002920				x					x
1.150	.138	OR3502920					P29.5				
1.154	.142	OR3602930							R22		
1.157	.122	OR3102940					G30				
1.161	.059	OR1502950									
1.161	.118	OR3002950									x
1.161	.177	OR4502950									
1.162	.210	ORAR00321	321	x							
1.165	.094	OR2402960									x
1.165	.114	OR2902960								x	
1.169	.138	OR3502970					P30				
1.171	.116	ORAR00916	916	x							
1.171	.139	ORAR00217	217	x							
1.174	.103	ORAR00123	123	x							
1.176	.070	ORAR00025	025	x							
1.181	.039	OR1003000									
1.181	.059	OR1503000									
1.181	.079	OR2003000									
1.181	.098	OR2503000									
1.181	.104	ORIB03000			x			x			
1.181	.118	OR3003000									
1.181	.138	OR3503000									
1.181	.140	ORIC03000			x			x			
1.181	.157	OR4003000									
1.181	.177	OR4503000									
1.181	.197	OR5003000									
1.181	.236	OR6003000									
1.181	.276	ORIE03000									
1.189	.118	OR3003020									x
1.193	.094	OR2403030									x
1.209	.138	OR3503070					P31				
1.213	.142	OR3603080							R23		
1.220	.059	OR1503100									
1.220	.079	OR2003100									
1.220	.098	OR2503100									



O-Ring

Inside diameter d_1	Cross section d_2	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
1.220	.118	OR3003100									
1.220	.138	OR3503100									
1.220	.157	OR4003100									
1.225	.210	ORAR00322	322				P31.5				
1.228	.118	OR3003120									x
1.228	.138	OR3503120									
1.234	.139	ORAR00218	218	x							
1.237	.103	ORAR00124	124	x							
1.239	.070	ORAR00026	026	x							
1.240	.104	ORIB03150			x			x			
1.240	.118	OR3003150									x
1.240	.140	ORIC03150			x			x			
1.244	.094	OR2403160					P32				x
1.248	.138	OR3503170									
1.260	.039	OR1003200									
1.260	.059	OR1503200									
1.260	.079	OR2003200									
1.260	.098	OR2503200									
1.260	.118	OR3003200									
1.260	.138	OR3503200									
1.260	.157	OR4003200									
1.260	.197	OR5003200									
1.264	.063	OR1603210				x					x
1.268	.118	OR3003220				x					x
1.280	.104	ORIB03250			x			x			
1.280	.118	OR3003250									x
1.280	.140	ORIC03250			x			x			
1.280	.142	OR3603250							R24		
1.287	.210	ORAR00323	323	x							
1.296	.139	ORAR00219	219	x							
1.299	.059	OR1503300									
1.299	.079	OR2003300									
1.299	.098	OR2503300									
1.299	.103	ORAR00125	125	x							
1.299	.118	OR3003300									
1.299	.138	OR3503300									





Inside diameter d ₁	Cross section d ₂	TSS Part No.	Standard											
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518			
1.299	.157	OR4003300	027	x										
1.301	.070	ORAR00027												
1.311	.094	OR2403330									x			
1.319	.104	ORIB03350			x		P34	x						
1.319	.140	ORIC03350			x			x						
1.327	.138	OR3503370												
1.339	.039	OR1003400												
1.339	.079	OR2003400												
1.339	.091	OR2303400												
1.339	.098	OR2503400												
1.339	.118	OR3003400												
1.339	.157	OR4003400												
1.339	.197	OR5003400							R25					
1.339	.236	OR6003400												
1.343	.142	OR3603410												
1.346	.118	OR3003420	324	x		x					x			
1.350	.210	ORAR00324												
1.354	.122	OR3103440												
1.355	.116	ORAR00918	918	x										
1.358	.104	ORIB03450										x		x
1.358	.118	OR3003450												
1.358	.140	ORIC03450	220	x	x			x						
1.359	.139	ORAR00220												
1.362	.094	OR2403460												
1.362	.103	ORAR00126	126	x			P35							
1.364	.070	ORAR00028	028	x										
1.366	.138	OR3503470												
1.378	.059	OR1503500												
1.378	.079	OR2003500												
1.378	.098	OR2503500												
1.378	.118	OR3003500												
1.378	.138	OR3503500												
1.378	.157	OR4003500												
1.378	.197	OR5003500												
1.378	.236	OR6003500												
1.378	.276	ORIE03500												



O-Ring

Inside diameter d ₁	Cross section d ₂	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
1.382	.063	OR1603510				x					x
1.386	.118	OR3003520									x
1.386	.138	OR3503520					P35.5				
1.386	.224	OR5703520									x
1.398	.104	ORIB03550			x			x			
1.398	.118	OR3003550									x
1.398	.140	ORIC03550			x			x			
1.402	.094	OR2403560									x
1.402	.142	OR3603560							R26		
1.406	.138	OR3503570					P36				
1.417	.059	OR1503600									
1.417	.079	OR2003600									
1.417	.098	OR2503600									
1.417	.118	OR3003600									
1.417	.157	OR4003600									
1.417	.177	OR4503600									
1.417	.197	OR5003600									
1.417	.236	OR6003600									
1.421	.139	ORAR00221	221	x							
1.424	.103	ORAR00127	127	x							
1.425	.118	OR3003620				x					x
1.425	.224	OR5703620									x
1.437	.104	ORIB03650			x			x			
1.437	.140	ORIC03650			x			x			
1.457	.079	OR2003700									
1.457	.098	OR2503700									
1.457	.118	OR3003700									
1.457	.138	OR3503700									
1.461	.063	OR1603710				x					x
1.465	.118	OR3003720									x
1.465	.224	OR5703720									x
1.469	.142	OR3603730							R27		
1.475	.118	ORAR00920	920	x							
1.475	.210	ORAR00325	325	x					R28		
1.476	.104	ORIB03750			x			x			
1.476	.118	OR3003750									x



Inside diameter d ₁	Cross section d ₂	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
1.476	.140	ORIC03750			x			x			
1.480	.094	OR2403760									x
1.484	.138	OR3503770					P38				
1.484	.139	ORAR00222	222	x							
1.487	.103	ORAR00128	128	x							
1.489	.070	ORAR00029	029	x							
1.496	.039	OR1003800									
1.496	.059	OR1503800									
1.496	.079	OR2003800									
1.496	.098	OR2503800									
1.496	.118	OR3003800									
1.496	.138	OR3503800									
1.496	.157	OR4003800									
1.496	.177	OR4503800									
1.496	.197	OR5003800									
1.496	.236	OR6003800									
1.496	.276	ORIE03800									
1.520	.114	OR2903860								x	
1.524	.104	ORIB03870			x			x			
1.524	.138	OR3503870					P39				
1.524	.140	ORIC03870			x			x			
1.535	.059	OR1503900									
1.535	.079	OR2003900									
1.535	.098	OR2503900									
1.535	.118	OR3003900									
1.535	.157	OR4003900									
1.535	.217	OR5503900									
1.543	.118	OR3003920				x					x
1.543	.224	OR5703920									x
1.549	.103	ORAR00129	129	x							
1.551	.122	OR3103940					G40				
1.555	.118	OR3003950									x
1.559	.094	OR2403960									x
1.563	.138	OR3503970					P40				
1.575	.039	OR1004000									
1.575	.059	OR1504000									



O-Ring

Inside diameter d_1	Cross section d_2	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
1.575	.079	OR2004000									
1.575	.098	OR2504000									
1.575	.118	OR3004000									
1.575	.138	OR3504000									
1.575	.140	ORIC04000			x			x			
1.575	.157	OR4004000									
1.575	.177	OR4504000									
1.575	.197	OR5004000									
1.575	.209	ORID04000			x			x			
1.575	.217	OR5504000									
1.575	.236	OR6004000									
1.575	.276	ORIE04000									
1.575	.295	OR7504000									
1.583	.118	OR3004020									x
1.600	.210	ORAR00326	326	x					R29		
1.602	.138	OR3504070					P41				
1.609	.139	ORAR00223	223	x							
1.612	.103	ORAR00130	130	x							
1.614	.070	ORAR00030	030	x							
1.614	.079	OR2004100									
1.614	.118	OR3004100									
1.614	.157	OR4004100									
1.614	.295	OR7504100									
1.622	.140	ORIC04120			x			x			
1.622	.209	ORID04120			x			x			
1.622	.224	OR5704120									x
1.634	.118	OR3004150									x
1.638	.094	OR2404160									x
1.642	.138	OR3504170					P42				
1.654	.039	OR1004200									
1.654	.059	OR1504200									
1.654	.079	OR2004200									
1.654	.098	OR2504200									
1.654	.118	OR3004200									
1.654	.138	OR3504200									
1.654	.157	OR4004200									





Inside diameter d ₁	Cross section d ₂	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
1.654	.177	OR4504200									
1.654	.197	OR5004200									
1.654	.236	OR6004200									
1.661	.118	OR3004220				x				x	
1.673	.140	ORIC04250			x			x		x	
1.673	.209	ORID04250			x			x			
1.674	.103	ORAR00131	131	x							
1.693	.063	OR1604300									
1.693	.079	OR2004300									
1.693	.098	OR2504300									
1.693	.118	OR3004300									
1.693	.138	OR3504300									
1.693	.236	OR6004300									
1.720	.118	ORAR00924	924	x							
1.720	.138	OR3504370					P44				
1.720	.140	ORIC04370			x			x			
1.720	.209	ORID04370			x			x			
1.725	.210	ORAR00327	327	x					R30		
1.732	.079	OR2004400									
1.732	.098	OR2504400									
1.732	.118	OR3004400									
1.732	.157	OR4004400									
1.732	.177	OR4504400									
1.732	.197	OR5004400									
1.732	.236	OR6004400									
1.734	.139	ORAR00224	224	x							
1.737	.103	ORAR00132	132	x							
1.739	.070	ORAR00031	031	x							
1.740	.118	OR3004420				x				x	
1.744	.224	OR5704420				x				x	
1.748	.122	OR3104440					G45				
1.752	.118	OR3004450								x	
1.756	.094	OR2404460								x	
1.756	.114	OR2904460							x		
1.760	.138	OR3504470					P45				
1.772	.039	OR1004500									



O-Ring

Inside diameter d_1	Cross section d_2	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
1.772	.059	OR1504500									
1.772	.079	OR2004500									
1.772	.098	OR2504500									
1.772	.118	OR3004500									
1.772	.138	OR3504500									
1.772	.140	ORIC04500			x			x			
1.772	.157	OR4004500									
1.772	.177	OR4504500									
1.772	.197	OR5004500									
1.772	.209	ORID04500			x			x			
1.772	.217	OR5504500									
1.772	.236	OR6004500									
1.772	.276	ORIE04500									
1.780	.118	OR3004520									x
1.783	.224	OR5704530									x
1.795	.094	OR2404560									x
1.799	.103	ORAR00133	133	x							
1.799	.138	OR3504570					P46				
1.811	.079	OR2004600									
1.811	.098	OR2504600									
1.811	.118	OR3004600									
1.811	.138	OR3504600									
1.811	.157	OR4004600									
1.811	.177	OR4504600									
1.811	.197	OR5004600									
1.811	.236	OR6004600									
1.819	.118	OR3004620									x
1.819	.140	ORIC04620			x			x			
1.819	.209	ORID04620			x			x			
1.850	.079	OR2004700									
1.850	.098	OR2504700									
1.850	.118	OR3004700									
1.850	.157	OR4004700									
1.850	.197	OR5004700									
1.850	.210	ORAR00328	328	x					R31		
1.858	.224	OR5704720									



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Inside diameter d ₁	Cross section d ₂	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
1.859	.139	ORAR00225	225	x							
1.862	.103	ORAR00134	134	x							
1.862	.224	OR5704730									x
1.864	.070	ORAR00032	032	x							
1.870	.140	ORIC04750			x			x			
1.870	.209	ORID04750			x			x			
1.874	.094	OR2404760									x
1.874	.224	OR5704760					P48A				
1.878	.138	OR3504770					P47				
1.890	.039	OR1004800									
1.890	.059	OR1504800									
1.890	.079	OR2004800									
1.890	.098	OR2504800									
1.890	.118	OR3004800									
1.890	.157	OR4004800									
1.890	.177	OR4504800									
1.890	.197	OR5004800									
1.890	.236	OR6004800									
1.890	.276	ORIE04800									
1.917	.138	OR3504870					P49				
1.917	.140	ORIC04870			x			x			
1.917	.209	ORID04870			x			x			
1.925	.103	ORAR00135	135	x							
1.929	.059	OR1504900									
1.929	.098	OR2504900									
1.929	.118	OR3004900									
1.929	.138	OR3504900									
1.929	.157	OR4004900									
1.937	.224	OR5704920				x					x
1.945	.122	OR3104940					G50				
1.949	.118	OR3004950				x					x
1.953	.094	OR2404960									x
1.953	.224	OR5704960					P50A				
1.957	.138	OR3504970					P50				
1.969	.059	OR1505000									
1.969	.079	OR2005000									



O-Ring

Inside diameter d_1	Cross section d_2	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
1.969	.098	OR2505000									
1.969	.118	OR3005000									
1.969	.140	ORIC05000			x			x			
1.969	.157	OR4005000									
1.969	.177	OR4505000									
1.969	.197	OR5005000									
1.969	.209	ORID05000			x			x			
1.969	.217	OR5505000									
1.969	.236	OR6005000									
1.969	.256	OR6505000									
1.969	.276	ORIE05000									
1.975	.210	ORAR00329	329	x					R32		
1.976	.118	OR3005020									x
1.984	.139	ORAR00226	226	x							
1.987	.103	ORAR00136	136	x							
1.989	.070	ORAR00033	033	x							
2.008	.098	OR2505100									
2.008	.118	OR3005100									
2.008	.157	OR4005100									
2.008	.177	OR4505100									
2.008	.217	OR5505100									
2.016	.224	OR5705120									x
2.028	.059	OR1505150									
2.028	.140	ORIC05150			x			x			
2.028	.209	ORID05150			x			x			
2.031	.094	OR2405160									x
2.031	.224	OR5705160					P52				
2.047	.059	OR1505200									
2.047	.079	OR2005200									
2.047	.098	OR2505200									
2.047	.118	OR3005200									
2.047	.138	OR3505200									
2.047	.157	OR4005200									
2.047	.197	OR5005200									
2.047	.236	OR6005200									
2.050	.103	ORAR00137	137	x							





Inside diameter d ₁	Cross section d ₂	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
2.059	.224	OR5705230					P53				x
2.071	.224	OR5705260									
2.087	.059	OR1505300									
2.087	.079	OR2005300									
2.087	.098	OR2505300									
2.087	.118	OR3005300									
2.087	.138	OR3505300									
2.087	.140	ORIC05300			x			x			
2.087	.197	OR5005300									
2.087	.209	ORID05300			x			x			
2.087	.236	OR6005300									
2.087	.276	ORIE05300									
2.090	.118	ORAR00928	928	x					R33		
2.100	.210	ORAR00330	330	x							
2.109	.139	ORAR00227	227	x							
2.112	.103	ORAR00138	138	x							
2.114	.070	ORAR00034	034	x							
2.126	.059	OR1505400									
2.126	.098	OR2505400									
2.126	.118	OR3005400									
2.126	.157	OR4005400									
2.126	.197	OR5005400									
2.126	.217	OR5505400									
2.126	.236	OR6005400									
2.134	.224	OR5705420				x					x
2.138	.224	OR5705430									
2.142	.122	OR3105440					G55				
2.146	.118	OR3005450				x					x
2.146	.140	ORIC05450			x			x			
2.146	.209	ORID05450			x			x			
2.150	.094	OR2405460									x
2.150	.224	OR5705460					P55				
2.165	.059	OR1505500									
2.165	.079	OR2005500									
2.165	.098	OR2505500									
2.165	.118	OR3005500									



O-Ring

Inside diameter d_1	Cross section d_2	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
2.165	.138	OR3505500									
2.165	.157	OR4005500									
2.165	.197	OR5005500									
2.165	.236	OR6005500									
2.173	.118	OR3005520									x
2.175	.103	ORAR00139	139	x							
2.177	.224	OR5705530									x
2.185	.118	OR3005550									x
2.189	.094	OR2405560									x
2.189	.224	OR5705560					P56				x
2.205	.079	OR2005600									
2.205	.098	OR2505600									
2.205	.118	OR3005600			x			x			
2.205	.140	ORIC05600									
2.205	.157	OR4005600									
2.205	.177	OR4505600									
2.205	.205	OR5205600			x			x			
2.205	.209	ORID05600									
2.213	.118	OR3005620									x
2.225	.210	ORAR00331	331	x					R34		
2.228	.114	OR2905660								x	
2.234	.139	ORAR00228	228	x							
2.237	.103	ORAR00140	140	x							
2.239	.070	ORAR00035	035	x							
2.244	.059	OR1505700									
2.244	.079	OR2005700									
2.244	.098	OR2505700									
2.244	.118	OR3005700									
2.244	.157	OR4005700									
2.244	.177	OR4505700									
2.244	.315	OR8005700									
2.252	.118	OR3005720									x
2.252	.224	OR5705720									
2.256	.224	OR5705730									x
2.264	.118	OR3005750									x
2.268	.094	OR2405760									x



Inside diameter d ₁	Cross section d ₂	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
2.268	.224	OR5705760					P58				
2.283	.079	OR2005800									
2.283	.098	OR2505800									
2.283	.118	OR3005800									
2.283	.140	ORIC05800			x			x			
2.283	.157	OR4005800									
2.283	.197	OR5005800									
2.283	.209	ORID05800			x			x			
2.283	.217	OR5505800									
2.283	.236	OR6005800									
2.283	.276	ORIE05800									
2.300	.103	ORAR00141	141	x							
2.307	.094	OR2405860								x	
2.323	.059	OR1505900									
2.323	.098	OR2505900									
2.323	.118	OR3005900									
2.331	.224	OR5705920				x					
2.335	.224	OR5705930								x	
2.337	.118	ORAR00932	932	x							
2.339	.122	OR3105940					G60				
2.343	.118	OR3005950				x				x	
2.346	.094	OR2405960								x	
2.346	.224	OR5705960					P60				
2.350	.210	ORAR00332	332	x					R35		
2.359	.139	ORAR00229	229	x							
2.362	.059	OR1506000									
2.362	.079	OR2006000									
2.362	.098	OR2506000									
2.362	.103	ORAR00142	142	x							
2.362	.118	OR3006000									
2.362	.138	OR3506000									
2.362	.140	ORIC06000			x			x			
2.362	.157	OR4006000									
2.362	.177	OR4506000									
2.362	.197	OR5006000									
2.362	.209	ORID06000			x			x			



O-Ring

Inside diameter d_1	Cross section d_2	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
2.362	.236	OR6006000	036	x							
2.362	.276	ORIE06000									
2.364	.070	ORAR00036									
2.382	.118	OR3006050									x
2.402	.197	OR5006100									
2.409	.224	OR5706120									
2.413	.224	OR5706130									x
2.421	.140	ORIC06150			x			x			
2.421	.209	ORID06150			x			x			
2.425	.094	OR2406160	143	x			P62				x
2.425	.103	ORAR00143									
2.425	.224	OR5706160									
2.441	.059	OR1506200									
2.441	.079	OR2006200									
2.441	.098	OR2506200									
2.441	.118	OR3006200									
2.441	.157	OR4006200									
2.441	.197	OR5006200									
2.441	.236	OR6006200									x
2.449	.118	OR3006220									
2.449	.224	OR5706220									
2.453	.224	OR5706230					P63				x
2.465	.094	OR2406260									x
2.465	.224	OR5706260									
2.475	.210	ORAR00333	333	x					R36		
2.480	.059	OR1506300									
2.480	.079	OR2006300									
2.480	.098	OR2506300									
2.480	.118	OR3006300									
2.480	.140	ORIC06300			x			x			
2.480	.157	OR4006300									
2.480	.177	OR4506300									
2.480	.197	OR5006300									
2.480	.209	ORID06300	230	x	x			x			
2.480	.276	ORIE06300									
2.484	.139	ORAR00230									





Inside diameter d ₁	Cross section d ₂	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
2.487	.103	ORAR00144	144	x							
2.489	.070	ORAR00037	037	x							
2.520	.118	OR3006400									
2.520	.138	OR3506400									
2.520	.157	OR4006400									
2.520	.197	OR5006400									
2.520	.236	OR6006400									
2.528	.224	OR5706420				x					
2.531	.224	OR5706430									x
2.535	.122	OR3106440					G65				
2.539	.118	OR3006450				x					x
2.543	.094	OR2406460									x
2.543	.224	OR5706460					P65				
2.550	.103	ORAR00145	145	x							
2.559	.059	OR1506500									
2.559	.079	OR2006500									
2.559	.098	OR2506500									
2.559	.118	OR3006500									
2.559	.138	OR3506500									
2.559	.140	ORIC06500			x			x			
2.559	.157	OR4006500									
2.559	.177	OR4506500									
2.559	.197	OR5006500									
2.559	.209	ORID06500			x			x			
2.559	.217	OR5506500									
2.598	.079	OR2006600									
2.598	.118	OR3006600									
2.598	.197	OR5006600									
2.600	.210	ORAR00334	334	x					R37		
2.609	.139	ORAR00231	231	x							
2.612	.103	ORAR00146	146	x							
2.614	.070	ORAR00038	038	x							
2.622	.224	OR5706660					P67				
2.638	.059	OR1506700									
2.638	.079	OR2006700									
2.638	.098	OR2506700									



O-Ring

Inside diameter d ₁	Cross section d ₂	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
2.638	.118	OR3006700									
2.638	.140	ORIC06700			x			x			
2.638	.157	OR4006700									
2.638	.209	ORID06700			x			x			
2.646	.118	OR3006720									
2.646	.224	OR5706720									
2.650	.224	OR5706730									x
2.661	.094	OR2406760									x
2.675	.103	ORAR00147	147	x							
2.677	.079	OR2006800									
2.677	.098	OR2506800									
2.677	.118	OR3006800									
2.677	.157	OR4006800									
2.677	.197	OR5006800									
2.677	.217	OR5506800									
2.677	.236	OR6006800									
2.677	.276	ORIE06800									
2.717	.059	OR1506900									
2.717	.118	OR3006900									
2.717	.140	ORIC06900			x			x			
2.717	.177	OR4506900									
2.717	.209	ORID06900			x			x			
2.717	.236	OR6006900									
2.724	.224	OR5706920				x					
2.725	.210	ORAR00335	335	x					R38		
2.728	.224	OR5706930									x
2.732	.122	OR3106940					G70				
2.734	.139	ORAR00232	232	x							
2.736	.118	OR3006950				x					x
2.737	.103	ORAR00148	148	x							
2.739	.070	ORAR00039	039	x							
2.740	.094	OR2406960									x
2.740	.224	OR5706960					P70				
2.756	.079	OR2007000									
2.756	.098	OR2507000									
2.756	.118	OR3007000									





Inside diameter d ₁	Cross section d ₂	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
2.756	.157	OR4007000									
2.756	.177	OR4507000									
2.756	.197	OR5007000									
2.756	.217	OR5507000									
2.756	.236	OR6007000									
2.756	.276	ORIE07000									
2.780	.224	OR5707060					P71				
2.795	.079	OR2007100									
2.795	.118	OR3007100									
2.795	.140	ORIC07100			x			x			
2.795	.209	ORID07100			x			x			
2.800	.103	ORAR00149	149	x							
2.803	.224	OR5707120									
2.807	.224	OR5707130									x
2.815	.059	OR1507150									
2.835	.079	OR2007200									
2.835	.098	OR2507200									
2.835	.118	OR3007200									
2.835	.157	OR4007200									
2.835	.197	OR5007200									
2.835	.217	OR5507200									
2.835	.276	ORIE07200									
2.846	.224	OR5707230									x
2.850	.210	ORAR00336	336	x					R39		
2.859	.139	ORAR00233	233	x							
2.862	.103	ORAR00150	150	x							
2.864	.070	ORAR00040	040	x							
2.874	.079	OR2007300									
2.874	.098	OR2507300									
2.874	.118	OR3007300									
2.874	.140	ORIC07300			x			x			
2.874	.197	OR5007300									
2.874	.209	ORID07300			x			x			
2.913	.039	OR1007400									
2.913	.059	OR1507400									
2.913	.079	OR2007400									



O-Ring

Inside diameter d ₁	Cross section d ₂	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
2.913	.098	OR2507400									x
2.913	.118	OR3007400									
2.913	.157	OR4007400									
2.913	.177	OR4507400									
2.913	.236	OR6007400									
2.921	.224	OR5707420				x					
2.925	.224	OR5707430									x
2.929	.122	OR3107440					G75				
2.933	.118	OR3007450				x					x
2.937	.224	OR5707460					P75				
2.953	.079	OR2007500									
2.953	.098	OR2507500									
2.953	.118	OR3007500									
2.953	.138	OR3507500									
2.953	.140	ORIC07500			x			x			
2.953	.157	OR4007500									
2.953	.177	OR4507500									
2.953	.197	OR5007500									
2.953	.209	ORID07500			x			x			
2.953	.217	OR5507500									
2.953	.236	OR6007500									
2.953	.276	ORIE07500									
2.975	.210	ORAR00337	337	x					R40		
2.984	.139	ORAR00234	234	x							
2.987	.103	ORAR00151	151	x							
2.989	.070	ORAR00041	041	x							
2.992	.059	OR1507600									
2.992	.079	OR2007600									
2.992	.098	OR2507600									
2.992	.118	OR3007600									
2.992	.157	OR4007600									
2.992	.177	OR4507600									
2.992	.197	OR5007600									
3.031	.197	OR5007700									
3.043	.224	OR5707730									x
3.051	.140	ORIC07750			x			x			





Inside diameter d ₁	Cross section d ₂	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
3.051	.209	ORID07750			x			x			
3.071	.059	OR1507800									
3.071	.079	OR2007800									
3.071	.118	OR3007800									
3.071	.138	OR3507800									
3.071	.157	OR4007800									
3.071	.197	OR5007800									
3.071	.236	OR6007800									
3.100	.210	ORAR00338	338	x					R41		
3.109	.139	ORAR00235	235	x							
3.110	.079	OR2007900									
3.110	.118	OR3007900									
3.118	.224	OR5707920				x					
3.122	.224	OR5707930									x
3.126	.122	OR3107940					G80				
3.130	.118	OR3007950									x
3.130	.276	ORIE07950									
3.134	.224	OR5707960					P80				
3.150	.059	OR1508000									
3.150	.079	OR2008000									
3.150	.098	OR2508000									
3.150	.118	OR3008000									
3.150	.140	ORIC08000			x			x			
3.150	.157	OR4008000									
3.150	.177	OR4508000									
3.150	.197	OR5008000									
3.150	.209	ORID08000			x			x			
3.150	.217	OR5508000									
3.150	.236	OR6008000									
3.169	.059	OR1508050									
3.189	.276	ORIE08100									
3.201	.224	OR5708130									x
3.225	.210	ORAR00339	339	x					R42		
3.228	.118	OR3008200									
3.228	.157	OR4008200									
3.228	.197	OR5008200									



O-Ring

Inside diameter d ₁	Cross section d ₂	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
3.234	.139	ORAR00236	236	x							
3.236	.224	OR5708220									
3.237	.103	ORAR00152	152	x							
3.239	.070	ORAR00042	042	x							
3.248	.140	ORIC08250			x			x			
3.248	.209	ORID08250			x			x			
3.268	.079	OR2008300									
3.268	.118	OR3008300									
3.307	.079	OR2008400									
3.307	.118	OR3008400									
3.307	.157	OR4008400									
3.307	.236	OR6008400									
3.311	.224	OR5708410				x					
3.315	.224	OR5708420									
3.319	.224	OR5708430								x	
3.323	.122	OR3108440					G85				
3.327	.118	OR3008450				x				x	
3.331	.224	OR5708460					P85				
3.346	.079	OR2008500									
3.346	.098	OR2508500									
3.346	.118	OR3008500									
3.346	.140	ORIC08500			x			x			
3.346	.157	OR4008500									
3.346	.177	OR4508500									
3.346	.197	OR5008500									
3.346	.209	ORID08500			x			x			
3.346	.217	OR5508500									
3.346	.236	OR6008500									
3.346	.276	ORIE08500									
3.350	.210	ORAR00340	340	x					R43		
3.359	.139	ORAR00237	237	x							
3.366	.098	OR2508550									
3.386	.079	OR2008600									
3.386	.118	OR3008600									
3.386	.157	OR4008600									
3.386	.177	OR4508600									



Inside diameter d ₁	Cross section d ₂	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
3.425	.157	OR4008700									
3.425	.197	OR5008700									
3.433	.224	OR5708720									
3.437	.224	OR5708730								x	
3.445	.140	ORIC08750			x			x			
3.445	.209	ORID08750			x			x			
3.465	.059	OR1508800									
3.465	.118	OR3008800									
3.465	.157	OR4008800									
3.465	.197	OR5008800									
3.465	.236	OR6008800									
3.475	.210	ORAR00341	341	x					R44		
3.484	.139	ORAR00238	238	x							
3.487	.103	ORAR00153	153	x							
3.489	.070	ORAR00043	043	x							
3.504	.118	OR3008900									
3.504	.177	OR4508900									
3.504	.276	ORIE08900									
3.508	.224	OR5708910				x					
3.516	.224	OR5708930								x	
3.520	.122	OR3108940					G90				
3.524	.118	OR3008950				x				x	
3.528	.224	OR5708960					P90				
3.543	.039	OR1009000									
3.543	.079	OR2009000									
3.543	.098	OR2509000									
3.543	.118	OR3009000									
3.543	.140	ORIC09000			x			x			
3.543	.157	OR4009000									
3.543	.177	OR4509000									
3.543	.197	OR5009000									
3.543	.209	ORID09000			x			x			
3.543	.217	OR5509000									
3.543	.236	OR6009000									
3.543	.276	ORIE09000									
3.600	.210	ORAR00342	342	x					R45		



O-Ring

Inside diameter d ₁	Cross section d ₂	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
3.609	.139	ORAR00239	239	x							
3.622	.059	OR1509200									
3.622	.118	OR3009200									
3.622	.157	OR4009200									
3.622	.177	OR4509200									
3.622	.197	OR5009200									
3.622	.217	OR5509200									
3.622	.276	ORIE09200									
3.634	.224	OR5709230									x
3.642	.140	ORIC09250			x			x			
3.642	.209	ORID09250			x			x			
3.661	.079	OR2009300									
3.661	.118	OR3009300									
3.661	.157	OR4009300									
3.681	.177	OR4509350									
3.701	.098	OR2509400									
3.701	.118	OR3009400									
3.701	.157	OR4009400									
3.701	.197	OR5009400									
3.701	.276	ORIE09400									
3.705	.224	OR5709410				x					
3.713	.224	OR5709430									x
3.717	.122	OR3109440					G95				
3.720	.118	OR3009450				x					x
3.724	.224	OR5709460					P95				
3.725	.210	ORAR00343	343	x					R46		
3.734	.139	ORAR00240	240	x							
3.737	.103	ORAR00154	154	x							
3.739	.070	ORAR00044	044	x							
3.740	.079	OR2009500									
3.740	.098	OR2509500									
3.740	.140	ORIC09500			x			x			
3.740	.157	OR4009500									
3.740	.177	OR4509500									
3.740	.197	OR5009500									
3.740	.209	ORID09500			x			x			





Inside diameter d_1	Cross section d_2	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
3.740	.217	OR5509500									
3.740	.236	OR6009500									
3.740	.276	ORIE09500									
3.780	.098	OR2509600									
3.780	.118	OR3009600									
3.780	.157	OR4009600									
3.780	.197	OR5009600									
3.780	.236	OR6009600									
3.799	.256	OR6509650									
3.819	.138	OR3509700									
3.819	.197	OR5009700									
3.831	.224	OR5709730									x
3.839	.140	ORIC09750			x			x			
3.839	.209	ORID09750			x			x			
3.850	.210	ORAR00344	344	x					R47		
3.858	.098	OR2509800									
3.858	.118	OR3009800									
3.858	.157	OR4009800									
3.859	.139	ORAR00241	241	x							
3.898	.118	OR3009900									
3.898	.276	ORIE09900									
3.902	.224	OR5709910				x					
3.909	.224	OR5709930									x
3.913	.122	OR3109940					G100				
3.917	.118	OR3009950				x					x
3.921	.224	OR5709960					P100				
3.937	.039	OR1010000									
3.937	.059	OR1510000									
3.937	.079	OR2010000									
3.937	.098	OR2510000									
3.937	.118	OR3010000									
3.937	.140	ORIC10000			x			x			
3.937	.157	OR4010000									
3.937	.197	OR5010000									
3.937	.209	ORID10000			x			x			
3.937	.217	OR5510000									



O-Ring

Inside diameter d ₁	Cross section d ₂	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
3.937	.236	OR6010000									
3.937	.276	ORIE10000									
3.937	.315	OR8010000									
3.975	.210	ORAR00345	345	x					R48		
3.984	.139	ORAR00242	242	x							
3.987	.103	ORAR00155	155	x							
3.989	.070	ORAR00045	045	x			P102				
4.000	.224	OR5710160									
4.016	.118	OR3010200									
4.016	.157	OR4010200									
4.055	.079	OR2010300									
4.055	.140	ORIC10300			x			x			
4.055	.209	ORID10300			x			x			
4.055	.236	OR6010300									
4.094	.098	OR2510400									
4.094	.118	OR3010400									
4.094	.157	OR4010400									
4.094	.197	OR5010400									
4.094	.236	OR6010400									
4.098	.224	OR5710410				x					
4.100	.210	ORAR00346	346	x					R49		
4.106	.224	OR5710430									x
4.109	.139	ORAR00243	243	x							
4.110	.122	OR3110440					G105				
4.114	.118	OR3010450				x					x
4.118	.224	OR5710460					P105				
4.134	.079	OR2010500									
4.134	.098	OR2510500									
4.134	.118	OR3010500									
4.134	.138	OR3510500									
4.134	.157	OR4010500									
4.134	.177	OR4510500									
4.134	.197	OR5010500									
4.134	.236	OR6010500									
4.173	.079	OR2010600									
4.173	.118	OR3010600									





Inside diameter d ₁	Cross section d ₂	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
4.173	.140	ORIC10600			x			x			
4.173	.177	OR4510600									
4.173	.209	ORID10600			x			x			
4.173	.236	OR6010600									
4.173	.276	ORIE10600									
4.213	.098	OR2510700									
4.213	.197	OR5010700									
4.225	.210	ORAR00347	347	x					R50		
4.234	.139	ORAR00244	244	x							
4.237	.103	ORAR00156	156	x							
4.239	.070	ORAR00046	046	x							
4.252	.118	OR3010800									
4.252	.157	OR4010800									
4.252	.236	OR6010800									
4.252	.276	ORIE10800									
4.283	.331	OR8410880									
4.291	.140	ORIC10900			x						
4.291	.209	ORID10900			x						
4.295	.224	OR5710910				x					
4.299	.224	OR5710920									
4.303	.224	OR5710930									x
4.307	.122	OR3110940					G110				
4.311	.118	OR3010950				x					x
4.315	.224	OR5710960					P110				
4.331	.079	OR2011000									
4.331	.118	OR3011000									
4.331	.138	OR3511000									
4.331	.157	OR4011000									
4.331	.177	OR4511000									
4.331	.197	OR5011000									
4.331	.217	OR5511000									
4.331	.236	OR6011000									
4.331	.315	OR8011000									
4.350	.210	ORAR00348	348	x					R51		
4.359	.139	ORAR00245	245	x							
4.394	.224	OR5711160					P112				



O-Ring

Inside diameter d_1	Cross section d_2	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
4.409	.059	OR1511200									
4.409	.098	OR2511200									
4.409	.118	OR3011200									
4.409	.140	ORIC11200			x			x			
4.409	.157	OR4011200									
4.409	.197	OR5011200									
4.409	.209	ORID11200			x			x			
4.409	.236	OR6011200									
4.409	.315	OR8011200									
4.449	.138	OR3511300									
4.449	.157	OR4011300									
4.475	.210	ORAR00349	349	x					R52		
4.475	.275	ORAR00425	425	x					R53		
4.484	.139	ORAR00246	246	x							
4.487	.103	ORAR00157	157	x							
4.488	.118	OR3011400									
4.488	.157	OR4011400									
4.488	.236	OR6011400									
4.488	.315	OR8011400									
4.489	.070	ORAR00047	047	x							
4.500	.224	OR5711430				x					x
4.504	.122	OR3111440					G115				
4.508	.118	OR3011450				x					x
4.512	.224	OR5711460					P115				
4.528	.079	OR2011500									
4.528	.098	OR2511500									
4.528	.118	OR3011500									
4.528	.140	ORIC11500			x			x			
4.528	.157	OR4011500									
4.528	.177	OR4511500									
4.528	.197	OR5011500									
4.528	.209	ORID11500			x			x			
4.528	.236	OR6011500									
4.528	.276	ORIE11500			x			x			
4.567	.118	OR3011600									
4.567	.157	OR4011600									





Inside diameter d ₁	Cross section d ₂	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
4.600	.210	ORAR00350	350	x							
4.600	.275	ORAR00426	426	x					R54		
4.606	.098	OR2511700									
4.606	.157	OR4011700									
4.606	.315	OR8011700									
4.609	.139	ORAR00247	247	x							
4.646	.079	OR2011800									
4.646	.118	OR3011800									
4.646	.140	ORIC11800			x			x			
4.646	.157	OR4011800									
4.646	.177	OR4511800									
4.646	.197	OR5011800									
4.646	.209	ORID11800			x			x			
4.646	.236	OR6011800									
4.685	.118	OR3011900									
4.697	.224	OR5711930				x					x
4.701	.122	OR3111940					G120				
4.705	.118	OR3011950				x					x
4.709	.224	OR5711960					P120				
4.724	.079	OR2012000									
4.724	.098	OR2512000									
4.724	.118	OR3012000									
4.724	.138	OR3512000									
4.724	.157	OR4012000									
4.724	.177	OR4512000									
4.724	.197	OR5012000									
4.724	.236	OR6012000									
4.725	.210	ORAR00351	351	x					R55		
4.725	.275	ORAR00427	427	x							
4.734	.139	ORAR00248	248	x							
4.737	.103	ORAR00158	158	x							
4.739	.070	ORAR00048	048	x							
4.803	.079	OR2012200									
4.803	.118	OR3012200									
4.803	.140	ORIC12200			x			x			
4.803	.157	OR4012200									



O-Ring

Inside diameter d ₁	Cross section d ₂	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
4.803	.209	ORID12200	352	x	x			x			
4.843	.236	OR6012300									
4.850	.210	ORAR00352									
4.850	.275	ORAR00428	428	x					R56		
4.859	.139	ORAR00249	249	x							
4.882	.157	OR4012400									
4.882	.177	OR4512400									
4.894	.224	OR5712430				x					x
4.898	.122	OR3112440					G125				
4.902	.118	OR3012450				x					x
4.906	.224	OR5712460					P125				
4.921	.079	OR2012500									
4.921	.098	OR2512500									
4.921	.118	OR3012500									
4.921	.138	OR3512500									
4.921	.140	ORIC12500			x			x			
4.921	.157	OR4012500									
4.921	.197	OR5012500									
4.921	.209	ORID12500			x			x			
4.921	.236	OR6012500									
4.921	.315	OR8012500									
4.961	.157	OR4012600	353	x							
4.961	.177	OR4512600									
4.975	.210	ORAR00353									
4.975	.275	ORAR00429	429	x					R57		
4.984	.139	ORAR00250	250	x							
4.987	.103	ORAR00159	159	x							
4.989	.070	ORAR00049	049	x							
5.000	.157	OR4012700									
5.000	.197	OR5012700									
5.039	.079	OR2012800									
5.039	.098	OR2512800									
5.039	.118	OR3012800									
5.039	.140	ORIC12800			x			x			
5.039	.209	ORID12800			x			x			
5.039	.236	OR6012800									



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Inside diameter d ₁	Cross section d ₂	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
5.079	.157	OR4012900									
5.091	.224	OR5712930				x					x
5.094	.122	OR3112940					G130				
5.098	.118	OR3012950				x					x
5.100	.210	ORAR00354	354	x							
5.100	.275	ORAR00430	430	x					R58		
5.102	.224	OR5712960					P130				
5.109	.139	ORAR00251	251	x							
5.118	.079	OR2013000									
5.118	.098	OR2513000									
5.118	.118	OR3013000									
5.118	.157	OR4013000									
5.118	.177	OR4513000									
5.118	.197	OR5013000									
5.118	.217	OR5513000									
5.118	.236	OR6013000									
5.118	.295	OR7513000									
5.177	.177	OR4513150									
5.181	.224	OR5713160					P132				
5.197	.079	OR2013200									
5.197	.118	OR3013200									
5.197	.140	ORIC13200			x			x			
5.197	.157	OR4013200									
5.197	.197	OR5013200									
5.197	.209	ORID13200			x			x			
5.197	.315	OR8013200									
5.225	.210	ORAR00355	355	x							
5.225	.275	ORAR00431	431	x					R59		
5.234	.139	ORAR00252	252	x							
5.236	.157	OR4013300		x							
5.237	.103	ORAR00160	160	x							
5.239	.070	ORAR00050	050	x							
5.276	.118	OR3013400									
5.276	.157	OR4013400									
5.276	.197	OR5013400									
5.287	.224	OR5713430				x					x



O-Ring

Inside diameter d ₁	Cross section d ₂	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
5.291	.122	OR3113440					G135				
5.295	.118	OR3013450				x					x
5.315	.079	OR2013500									
5.315	.098	OR2513500									
5.315	.118	OR3013500									
5.315	.157	OR4013500									
5.315	.197	OR5013500									
5.315	.236	OR6013500									
5.339	.224	OR5713560					P135				
5.350	.210	ORAR00356	356	x							
5.350	.275	ORAR00432	432	x					R60		
5.354	.140	ORIC13600			x			x			
5.354	.209	ORID13600			x			x			
5.354	.315	OR8013600									
5.359	.139	ORAR00253	253	x							
5.433	.118	OR3013800									
5.433	.197	OR5013800									
5.433	.236	OR6013800									
5.475	.210	ORAR00357	357	x							
5.475	.275	ORAR00433	433	x					R61		
5.484	.139	ORAR00254	254	x							
5.484	.224	OR5713930				x					x
5.487	.103	ORAR00161	161	x							
5.488	.122	OR3113940					G140				
5.492	.118	OR3013950				x					x
5.496	.224	OR5713960					P140				
5.512	.079	OR2014000									
5.512	.098	OR2514000									
5.512	.118	OR3014000									
5.512	.140	ORIC14000			x			x			
5.512	.157	OR4014000									
5.512	.177	OR4514000									
5.512	.197	OR5014000									
5.512	.209	ORID14000			x			x			
5.591	.157	OR4014200									
5.591	.236	OR6014200									





Inside diameter d ₁	Cross section d ₂	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
5.600	.210	ORAR00358	358	x							
5.600	.275	ORAR00434	434	x					R62		
5.609	.139	ORAR00255	255	x							
5.630	.079	OR2014300									
5.669	.157	OR4014400									
5.669	.197	OR5014400									
5.669	.315	OR8014400									
5.673	.331	OR8414410				x					x
5.681	.224	OR5714430				x					x
5.685	.122	OR3114440					G145				
5.689	.118	OR3014450				x					x
5.693	.224	OR5714460					P145				
5.709	.098	OR2514500									
5.709	.140	ORIC14500			x			x			
5.709	.157	OR4014500									
5.709	.177	OR4514500									
5.709	.209	ORID14500			x			x			
5.709	.236	OR6014500									
5.725	.210	ORAR00359	359	x							
5.725	.275	ORAR00435	435	x					R63		
5.734	.139	ORAR00256	256	x							
5.737	.103	ORAR00162	162	x							
5.748	.079	OR2014600									
5.748	.118	OR3014600									
5.748	.157	OR4014600									
5.827	.157	OR4014800									
5.827	.236	OR6014800									
5.850	.210	ORAR00360	360	x							
5.850	.275	ORAR00436	436	x					R64		
5.859	.139	ORAR00257	257	x							
5.866	.118	OR3014900									
5.866	.197	OR5014900									
5.870	.331	OR8414910				x					x
5.874	.224	OR5714920									
5.878	.224	OR5714930					G150				x
5.886	.118	OR3014950									x



O-Ring

Inside diameter d ₁	Cross section d ₂	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
5.886	.331	OR8414950					P150A				
5.890	.224	OR5714960					P150				
5.906	.079	OR2015000									
5.906	.098	OR2515000									
5.906	.118	OR3015000									
5.906	.140	ORIC15000			x			x			
5.906	.157	OR4015000									
5.906	.177	OR4515000									
5.906	.197	OR5015000									
5.906	.209	ORID15000			x			x			
5.906	.236	OR6015000									
5.906	.315	OR8015000									
5.975	.210	ORAR00361	361	x							
5.975	.275	ORAR00437	437	x					R65		
5.984	.139	ORAR00258	258	x							
5.984	.295	OR7515200									
5.987	.103	ORAR00163	163	x							
6.024	.177	OR4515300									
6.024	.236	OR6015300									
6.043	.063	OR1615350									
6.063	.118	OR3015400									
6.067	.331	OR8415410				x					x
6.075	.224	OR5715430					G155				x
6.083	.118	OR3015450									x
6.083	.331	OR8415450					P155				
6.102	.098	OR2515500									
6.102	.118	OR3015500									
6.102	.140	ORIC15500			x			x			
6.102	.157	OR4015500									
6.102	.177	OR4515500									
6.102	.197	OR5015500									
6.102	.209	ORID15500			x			x			
6.102	.315	OR8015500									
6.126	.275	ORA415560									x
6.142	.079	OR2015600									
6.142	.098	OR2515600									



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Inside diameter d_1	Cross section d_2	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
6.142	.118	OR3015600									
6.142	.157	OR4015600									
6.181	.118	OR3015700									
6.220	.197	OR5015800									
6.220	.236	OR6015800									
6.225	.210	ORAR00362	362	x							
6.225	.275	ORAR00438	438	x					R66		
6.234	.139	ORAR00259	259	x							
6.237	.103	ORAR00164	164	x							
6.264	.331	OR8415910				x					x
6.272	.224	OR5715930				x	G160				x
6.280	.118	OR3015950									x
6.280	.331	OR8415950					P160				
6.299	.079	OR2016000									
6.299	.098	OR2516000									
6.299	.118	OR3016000									
6.299	.140	ORIC16000			x			x			
6.299	.157	OR4016000									
6.299	.177	OR4516000									
6.299	.197	OR5016000									
6.299	.209	ORID16000			x			x			
6.299	.236	OR6016000									
6.299	.315	OR8016000									
6.378	.118	OR3016200									
6.457	.118	OR3016400									
6.457	.157	OR4016400									
6.457	.197	OR5016400									
6.461	.331	OR8416410				x					x
6.469	.224	OR5716430				x	G165				x
6.475	.210	ORAR00363	363	x							
6.475	.275	ORAR00439	439	x					R67		
6.476	.118	OR3016450									
6.476	.331	OR8416450					P165				x
6.484	.139	ORAR00260	260	x							
6.487	.103	ORAR00165	165	x							
6.496	.079	OR2016500									



O-Ring

Inside diameter d_1	Cross section d_2	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
6.496	.098	OR2516500									
6.496	.118	OR3016500									
6.496	.140	ORIC16500			x			x			
6.496	.157	OR4016500									
6.496	.177	OR4516500									
6.496	.197	OR5016500									
6.496	.209	ORID16500			x			x			
6.496	.236	OR6016500									
6.496	.315	OR8016500									
6.535	.236	OR6016600									
6.535	.315	OR8016600									
6.575	.098	OR2516700									
6.614	.157	OR4016800									
6.614	.197	OR5016800									
6.657	.331	OR8416910				x					x
6.665	.224	OR5716930				x	G170				x
6.673	.118	OR3016950									x
6.673	.331	OR8416950					P170				
6.693	.079	OR2017000									
6.693	.098	OR2517000									
6.693	.118	OR3017000									
6.693	.138	OR3517000									
6.693	.140	ORIC17000			x			x			
6.693	.157	OR4017000									
6.693	.197	OR5017000									
6.693	.209	ORID17000			x			x			
6.693	.236	OR6017000									
6.693	.315	OR8017000									
6.725	.210	ORAR00364	364	x							
6.725	.275	ORAR00440	440	x					R68		
6.734	.139	ORAR00261	261	x							
6.737	.103	ORAR00166	166	x							
6.772	.157	OR4017200									
6.772	.236	OR6017200									
6.850	.118	OR3017400									
6.854	.331	OR8417410				x					x



Inside diameter d ₁	Cross section d ₂	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
6.862	.224	OR5717430				x	G175				x
6.870	.118	OR3017450									x
6.870	.331	OR8417450					P175				
6.890	.079	OR2017500									
6.890	.140	ORIC17500			x			x			
6.890	.157	OR4017500									
6.890	.197	OR5017500									
6.890	.209	ORID17500			x			x			
6.890	.236	OR6017500									
6.890	.276	ORIE17500			x						
6.890	.315	OR8017500									
6.975	.210	ORAR00365	365	x							
6.975	.275	ORAR00441	441	x							
6.984	.139	ORAR00262	262	x							
6.987	.103	ORAR00167	167	x							
7.051	.331	OR8417910									x
7.059	.224	OR5717930				x					x
7.067	.118	OR3017950									x
7.225	.210	ORAR00366	366	x							
7.225	.275	ORAR00442	442	x							
7.234	.139	ORAR00263	263	x							
7.237	.103	ORAR00168	168	x							
7.248	.331	OR8418410				x					x
7.256	.224	OR5718430				x					x
7.264	.118	OR3018450									x
7.445	.331	OR8418910				x					x
7.453	.224	OR5718930				x					x
7.461	.118	OR3018950									x
7.475	.210	ORAR00367	367	x							
7.475	.275	ORAR00443	443	x							
7.484	.139	ORAR00264	264	x							
7.487	.103	ORAR00169	169	x							
7.642	.331	OR8419410									x
7.650	.224	OR5719430				x					x
7.657	.118	OR3019450									x
7.725	.210	ORAR00368	368	x							



O-Ring

Inside diameter d ₁	Cross section d ₂	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
7.725	.275	ORAR00444	444	x							
7.734	.139	ORAR00265	265	x							
7.737	.103	ORAR00170	170	x							
7.839	.331	OR8419910				x					x
7.846	.224	OR5719930				x					x
7.854	.118	OR3019950									x
7.975	.210	ORAR00369	369	x							
7.975	.275	ORAR00445	445	x							
7.984	.139	ORAR00266	266	x							
7.987	.103	ORAR00171	171	x							
8.043	.224	OR5720430				x					
8.225	.210	ORAR00370	370	x							
8.232	.331	OR8420910				x					x
8.234	.139	ORAR00267	267	x							
8.237	.103	ORAR00172	172	x							
8.240	.224	OR5720930				x					x
8.248	.118	OR3020950									x
8.268	.157	OR4021000									
8.268	.197	OR5021000									
8.268	.256	OR6521000									
8.268	.276	ORIE21000									
8.268	.315	OR8021000									
8.346	.098	OR2521200									
8.346	.209	ORID21200			x			x			
8.346	.236	OR6021200									
8.346	.276	ORIE21200			x			x			
8.386	.118	OR3021300									
8.386	.276	ORIE21300									
8.425	.197	OR5021400									
8.445	.331	OR8421450					P215				
8.465	.118	OR3021500									
8.465	.197	OR5021500									
8.465	.315	OR8021500									
8.475	.210	ORAR00371	371	x							
8.475	.275	ORAR00446	446	x					R74		
8.484	.139	ORAR00268	268	x							



Inside diameter d ₁	Cross section d ₂	TSS Part No.	Standard									
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518	
8.487	.103	ORAR00173	173	x								
8.504	.079	OR2021600										
8.504	.157	OR4021600										
8.543	.197	OR5021700										
8.583	.209	ORID21800			x			x				
8.583	.236	OR6021800										
8.583	.276	ORIE21800			x			x				
8.602	.177	OR4521850										
8.626	.331	OR8421910				x					x	
8.634	.224	OR5721930				x	G220					
8.642	.118	OR3021950									x	
8.642	.331	OR8421950					P220					
8.661	.079	OR2022000										
8.661	.118	OR3022000										
8.661	.157	OR4022000										
8.661	.197	OR5022000										
8.661	.276	ORIE22000										
8.661	.315	OR8022000										
8.725	.210	ORAR00372	372	x								
8.734	.139	ORAR00269	269	x								
8.737	.103	ORAR00174	174	x								
8.740	.157	OR4022200										
8.819	.209	ORID22400			x			x				
8.819	.276	ORIE22400			x			x				
8.839	.331	OR8422450					P225					
8.858	.118	OR3022500										
8.858	.157	OR4022500										
8.858	.197	OR5022500										
8.858	.236	OR6022500										
8.858	.276	ORIE22500										
8.858	.315	OR8022500										
8.898	.236	OR6022600										
8.975	.210	ORAR00373	373	x								
8.975	.275	ORAR00447	447	x					R75			
8.976	.157	OR4022800										
8.976	.276	ORIE22800										



O-Ring

Inside diameter d ₁	Cross section d ₂	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
8.984	.139	ORAR00270	270	x							
8.987	.103	ORAR00175	175	x							
9.016	.236	OR6022900									
9.020	.331	OR8422910				x					x
9.028	.224	OR5722930				x	G230				x
9.035	.331	OR8422950					P230				
9.055	.079	OR2023000									
9.055	.118	OR3023000									
9.055	.157	OR4023000									
9.055	.197	OR5023000									
9.055	.209	ORID23000			x			x			
9.055	.276	ORIE23000			x			x			
9.055	.315	OR8023000									
9.173	.118	OR3023300									
9.217	.331	OR8423410									x
9.225	.210	ORAR00374	374	x							
9.232	.331	OR8423450					P235				
9.234	.139	ORAR00271	271	x							
9.237	.103	ORAR00176	176	x							
9.252	.157	OR4023500									
9.252	.197	OR5023500									
9.252	.236	OR6023500									
9.252	.276	ORIE23500									
9.252	.315	OR8023500									
9.291	.209	ORID23600			x			x			
9.291	.276	ORIE23600			x			x			
9.370	.079	OR2023800									
9.370	.157	OR4023800									
9.370	.197	OR5023800									
9.370	.315	OR8023800									
9.413	.331	OR8423910				x					x
9.421	.224	OR5723930				x	G240				x
9.429	.118	OR3023950									x
9.429	.331	OR8423950					P240				
9.449	.118	OR3024000									
9.449	.157	OR4024000									



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Edition November 2008



Inside diameter d_1	Cross section d_2	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
9.449	.197	OR5024000									
9.449	.236	OR6024000									
9.475	.210	ORAR00375	375	x							
9.475	.275	ORAR00448	448	x					R76		
9.484	.139	ORAR00272	272	x							
9.487	.103	ORAR00177	177	x							
9.528	.197	OR5024200									
9.528	.236	OR6024200									
9.528	.315	OR8024200									
9.567	.209	ORID24300			x			x			
9.567	.276	ORIE24300			x			x			
9.606	.079	OR2024400									
9.606	.276	ORIE24400									
9.626	.118	OR3024450									x
9.626	.331	OR8424450					P245				
9.646	.118	OR3024500									
9.646	.197	OR5024500									
9.685	.157	OR4024600									
9.724	.236	OR6024700									
9.724	.276	ORIE24700									
9.725	.210	ORAR00376	376	x							
9.734	.139	ORAR00273	273	x							
9.737	.103	ORAR00178	178	x							
9.764	.197	OR5024800									
9.807	.331	OR8424910				x					x
9.815	.224	OR5724930				x	G250				x
9.823	.118	OR3024950									x
9.823	.331	OR8424950					P250				
9.843	.118	OR3025000									
9.843	.140	ORIC25000									
9.843	.157	OR4025000									
9.843	.197	OR5025000									
9.843	.236	OR6025000									
9.843	.276	ORIE25000			x			x			
9.843	.315	OR8025000									
9.975	.210	ORAR00377	377	x							



O-Ring

Inside diameter d ₁	Cross section d ₂	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
9.975	.275	ORAR00449	449	x					R77		
9.984	.139	ORAR00274	274	x							
10.000	.118	OR3025400									
10.020	.331	OR8425450					P255				
10.039	.079	OR2025500									
10.039	.118	OR3025500									
10.039	.157	OR4025500									
10.039	.197	OR5025500									
10.157	.209	ORID25800			x			x			
10.157	.236	OR6025800									
10.157	.276	ORIE25800			x			x			
10.201	.331	OR8425910									
10.209	.224	OR5725930				x	G260				x
10.217	.331	OR8425950					P260				
10.236	.098	OR2526000									
10.236	.118	OR3026000									
10.236	.157	OR4026000									
10.236	.197	OR5026000									
10.236	.236	OR6026000									
10.236	.276	ORIE26000									
10.236	.315	OR8026000									
10.315	.079	OR2026200									
10.315	.157	OR4026200									
10.413	.331	OR8426450					P265				
10.433	.118	OR3026500									
10.433	.157	OR4026500									
10.433	.197	OR5026500									
10.433	.209	ORID26500			x			x			
10.433	.256	OR6526500									
10.433	.276	ORIE26500			x			x			
10.433	.315	OR8026500									
10.472	.236	OR6026600									
10.475	.210	ORAR00378	378	x							
10.475	.275	ORAR00450	450	x					R78		
10.484	.139	ORAR00275	275	x							
10.512	.177	OR4526700									



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Edition November 2008



Inside diameter d ₁	Cross section d ₂	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
10.583	.331	OR8426880									
10.591	.098	OR2526900									
10.602	.224	OR5726930				x	G270				
10.610	.331	OR8426950					P270				
10.630	.098	OR2527000									
10.630	.118	OR3027000									
10.630	.157	OR4027000									
10.630	.197	OR5027000									
10.630	.236	OR6027000									
10.630	.315	OR8027000									
10.709	.157	OR4027200									
10.709	.209	ORID27200			x			x			
10.709	.276	ORIE27200			x			x			
10.787	.079	OR2027400									
10.787	.118	OR3027400									
10.787	.256	OR6527400									
10.807	.331	OR8427450					P275				
10.827	.157	OR4027500									
10.827	.197	OR5027500									
10.866	.079	OR2027600									
10.975	.210	ORAR00379	379	x							
10.975	.275	ORAR00451	451	x					R79		
10.984	.139	ORAR00276	276	x							
10.988	.331	OR8427910									
10.996	.224	OR5727930				x	G280				x
11.004	.331	OR8427950					P280				
11.024	.098	OR2528000									
11.024	.118	OR3028000									
11.024	.157	OR4028000									
11.024	.197	OR5028000									
11.024	.209	ORID28000			x			x			
11.024	.236	OR6028000									
11.024	.276	ORIE28000			x			x			
11.024	.315	OR8028000									
11.102	.157	OR4028200									
11.201	.331	OR8428450					P285				



O-Ring

Inside diameter d_1	Cross section d_2	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
11.220	.118	OR3028500									
11.220	.157	OR4028500									
11.220	.197	OR5028500									
11.224	.276	ORIE28510									
11.339	.236	OR6028800									
11.382	.331	OR8428910									
11.390	.224	OR5728930				x	G290 P290				x
11.398	.331	OR8428950									
11.417	.079	OR2029000									
11.417	.118	OR3029000									
11.417	.197	OR5029000									
11.417	.209	ORID29000			x			x			
11.417	.236	OR6029000									
11.417	.276	ORIE29000			x			x			
11.417	.315	OR8029000									
11.475	.210	ORAR00380	380	x							
11.475	.275	ORAR00452	452	x					R80		
11.484	.139	ORAR00277	277	x							
11.496	.157	OR4029200									
11.520	.331	OR8429260									
11.575	.157	OR4029400									
11.575	.236	OR6029400									
11.594	.331	OR8429450					P295				
11.614	.236	OR6029500									
11.654	.098	OR2529600									
11.693	.157	OR4029700									
11.783	.224	OR5729930				x	G300				x
11.791	.331	OR8429950					P300				
11.811	.118	OR3030000									
11.811	.197	OR5030000									
11.811	.209	ORID30000			x			x			
11.811	.236	OR6030000									
11.811	.276	ORIE30000			x			x			
11.811	.315	OR8030000									
11.969	.315	OR8030400									
11.975	.210	ORAR00381	381	x							



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			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
11.975	.275	ORAR00453	453	x					R81		
11.984	.139	ORAR00278	278	x							
12.008	.157	OR4030500									
12.008	.197	OR5030500									
12.087	.209	ORID30700			x			x			
12.087	.276	ORIE30700			x			x			
12.177	.224	OR5730930									x
12.205	.118	OR3031000									
12.205	.157	OR4031000									
12.205	.197	OR5031000									
12.205	.276	ORIE31000									
12.205	.315	OR8031000									
12.362	.315	OR8031400					P315				
12.382	.331	OR8431450									
12.402	.098	OR2531500									
12.402	.157	OR4031500									
12.402	.197	OR5031500									
12.402	.209	ORID31500			x			x			
12.402	.236	OR6031500									
12.402	.276	ORIE31500			x			x			
12.475	.275	ORAR00454	454	x					R82		
12.571	.224	OR5731930				x					x
12.579	.331	OR8431950					P320				
12.598	.118	OR3032000									
12.598	.157	OR4032000									
12.598	.197	OR5032000									
12.598	.236	OR6032000									
12.598	.276	ORIE32000			x						
12.598	.315	OR8032000									
12.756	.157	OR4032400									
12.795	.197	OR5032500									
12.795	.209	ORID32500			x			x			
12.795	.236	OR6032500									
12.795	.276	ORIE32500			x			x			
12.975	.210	ORAR00382	382	x							
12.975	.275	ORAR00455	455	x					R83		



O-Ring

Inside diameter d ₁	Cross section d ₂	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
12.984	.139	ORAR00279	279	x							
12.992	.157	OR4033000									
12.992	.197	OR5033000									
12.992	.236	OR6033000									
12.992	.276	ORIE33000			x						
12.992	.315	OR8033000									
13.031	.118	OR3033100									
13.110	.157	OR4033300									
13.169	.331	OR8433450					P335				
13.189	.197	OR5033500									
13.189	.209	ORID33500			x			x			
13.189	.236	OR6033500									
13.189	.276	ORIE33500			x			x			
13.307	.236	OR6033800									
13.358	.224	OR5733930				x					x
13.366	.331	OR8433950					P340				
13.386	.138	OR3534000									
13.386	.157	OR4034000									
13.386	.197	OR5034000									
13.386	.236	OR6034000									
13.386	.315	OR8034000									
13.465	.315	OR8034200									
13.475	.275	ORAR00456	456	x					R84		
13.583	.197	OR5034500									
13.583	.209	ORID34500					x			x	
13.583	.276	ORIE34500			x			x			
13.701	.157	OR4034800									
13.701	.236	OR6034800									
13.744	.331	OR8434910									
13.780	.098	OR2535000									
13.780	.197	OR5035000									
13.780	.236	OR6035000									
13.780	.315	OR8035000									
13.957	.331	OR8435450					P355				
13.975	.210	ORAR00383	383	x							
13.975	.275	ORAR00457	457	x					R85		



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			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
13.976	.157	OR4035500									
13.976	.197	OR5035500									
13.976	.209	ORID35500			x			x			
13.976	.276	ORIE35500			x			x			
13.984	.139	ORAR00280	280	x							
14.094	.236	OR6035800									
14.138	.331	OR8435910									
14.146	.224	OR5735930				x				x	
14.154	.331	OR8435950					P360				
14.173	.157	OR4036000									
14.173	.197	OR5036000									
14.173	.315	OR8036000									
14.370	.197	OR5036500									
14.370	.209	ORID36500			x			x			
14.370	.276	ORIE36500			x			x			
14.449	.138	OR3536700									
14.449	.197	OR5036700									
14.475	.275	ORAR00458	458	x					R86		
14.488	.098	OR2536800									
14.488	.236	OR6036800									
14.567	.157	OR4037000									
14.567	.197	OR5037000									
14.646	.331	OR8437200									
14.724	.315	OR8037400									
14.744	.331	OR8437450					P375				
14.764	.197	OR5037500									
14.764	.209	ORID37500			x			x			
14.764	.276	ORIE37500			x			x			
14.803	.236	OR6037600									
14.925	.331	OR8437910									
14.929	.224	OR5737920									
14.933	.224	OR5737930				x				x	
14.961	.118	OR3038000									
14.961	.157	OR4038000									
14.961	.197	OR5038000									
14.961	.236	OR6038000									



O-Ring

Inside diameter d ₁	Cross section d ₂	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
14.961	.315	OR8038000									
14.975	.210	ORAR00384	384	x							
14.975	.275	ORAR00459	459	x					R87		
14.984	.139	ORAR00281	281	x							
15.039	.315	OR8038200									
15.138	.331	OR8438450					P385				
15.157	.197	OR5038500									
15.197	.236	OR6038600									
15.236	.209	ORID38700			x			x			
15.236	.276	ORIE38700			x			x			
15.276	.236	OR6038800									
15.276	.276	ORIE38800									
15.315	.315	OR8038900									
15.327	.224	OR5738930								x	
15.354	.118	OR3039000									
15.354	.157	OR4039000									
15.475	.275	ORAR00460	460	x					R88		
15.512	.236	OR6039400									
15.512	.315	OR8039400									
15.551	.197	OR5039500									
15.713	.331	OR8439910									
15.720	.224	OR5739930				x				x	
15.728	.331	OR8439950					P400				
15.748	.079	OR2040000									
15.748	.118	OR3040000									
15.748	.157	OR4040000									
15.748	.197	OR5040000									
15.748	.209	ORID40000			x			x			
15.748	.276	ORIE40000			x			x			
15.748	.315	OR8040000									
15.955	.139	ORAR00282	282	x							
15.955	.210	ORAR00385	385	x							
15.955	.275	ORAR00461	461	x							
16.142	.157	OR4041000									
16.142	.197	OR5041000									
16.142	.256	OR6541000									



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			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
16.220	.276	ORIE41200			x			x			
16.220	.315	OR8041200									
16.339	.197	OR5041500									
16.455	.275	ORAR00462	462	x							
16.508	.224	OR5741930									x
16.535	.157	OR4042000									
16.535	.197	OR5042000									
16.614	.236	OR6042200									
16.693	.197	OR5042400									
16.732	.157	OR4042500									
16.732	.276	ORIE42500			x			x			
16.732	.315	OR8042500									
16.811	.197	OR5042700									
16.890	.236	OR6042900									
16.929	.157	OR4043000									
16.955	.139	ORAR00283	283	x							
16.955	.210	ORAR00386	386	x							
16.955	.275	ORAR00463	463	x							
17.047	.157	OR4043300									
17.205	.276	ORIE43700			x			x			
17.244	.157	OR4043800									
17.295	.224	OR5743930				x					x
17.323	.118	OR3044000									
17.323	.157	OR4044000									
17.455	.275	ORAR00464	464	x							
17.480	.315	OR8044400									
17.520	.197	OR5044500									
17.638	.236	OR6044800									
17.717	.197	OR5045000									
17.717	.276	ORIE45000			x			x			
17.717	.315	OR8045000									
17.756	.276	ORIE45100									
17.955	.139	ORAR00284	284	x							
17.955	.210	ORAR00387	387	x							
17.955	.275	ORAR00465	465	x							
18.083	.224	OR5745930				x					x



O-Ring

Inside diameter d ₁	Cross section d ₂	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
18.110	.157	OR4046000									
18.110	.197	OR5046000									
18.110	.315	OR8046000									
18.189	.276	ORIE46200			x			x			
18.307	.197	OR5046500									
18.307	.354	OR9046500									
18.455	.275	ORAR00466	466	x							
18.504	.157	OR4047000									
18.504	.197	OR5047000									
18.504	.236	OR6047000									
18.504	.315	OR8047000									
18.583	.315	OR8047200									
18.701	.157	OR4047500									
18.701	.276	ORIE47500			x			x			
18.870	.224	OR5747930				x				x	
18.898	.157	OR4048000									
18.898	.197	OR5048000									
18.898	.236	OR6048000									
18.898	.315	OR8048000									
18.952	.210	ORAR00388	388	x							
18.955	.275	ORAR00467	467	x							
19.173	.276	ORIE48700			x			x			
19.173	.315	OR8048700									
19.260	.224	OR5748910									
19.264	.224	OR5748930								x	
19.291	.197	OR5049000									
19.291	.315	OR8049000									
19.370	.157	OR4049200									
19.455	.275	ORAR00468	468	x							
19.657	.224	OR5749930								x	
19.685	.197	OR5050000									
19.685	.236	OR6050000									
19.685	.276	ORIE50000			x			x			
19.685	.315	OR8050000									
19.843	.236	OR6050400									
19.952	.210	ORAR00389	389	x							



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Inside diameter d ₁	Cross section d ₂	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
19.955	.275	ORAR00469	469	x							
20.000	.236	OR6050800									
20.079	.197	OR5051000									
20.276	.276	ORIE51500			x			x			
20.472	.197	OR5052000									
20.669	.315	OR8052500									
20.866	.157	OR4053000									
20.866	.197	OR5053000									
20.866	.276	ORIE53000									
20.952	.210	ORAR00390	390	x							
20.955	.275	ORAR00470	470	x							
21.260	.118	OR3054000									
21.260	.157	OR4054000									
21.260	.197	OR5054000									
21.260	.315	OR8054000									
21.339	.276	ORIE54200									
21.457	.118	OR3054500									
21.457	.276	ORIE54500									
21.614	.236	OR6054900	391	x							
21.654	.197	OR5055000									
21.952	.210	ORAR00391									
21.955	.275	ORAR00471	471	x							
22.047	.157	OR4056000									
22.047	.197	OR5056000									
22.047	.236	OR6056000			x			x			
22.047	.276	ORIE56000									
22.402	.236	OR6056900									
22.795	.236	OR6057900			x			x			
22.835	.276	ORIE58000									
22.835	.315	OR8058000									
22.940	.210	ORAR00392	392	x							
22.940	.275	ORAR00472	472	x							
23.031	.157	OR4058500									
23.031	.197	OR5058500									
23.228	.197	OR5059000									
23.307	.315	OR8059200									



O-Ring

Inside diameter d ₁	Cross section d ₂	TSS Part No.	Standard								
			Reference No. / AS 568 B	AS 568 B / BS 1806	ISO 3601	SMS 1586	JIS B2401	NFT47 – 501	French recommendation	ISO 6149 – 2	BS4518
23.622	.157	OR4060000									
23.622	.197	OR5060000									
23.622	.276	ORIE60000			x			x			
23.622	.315	OR8060000									
23.940	.210	ORAR00393	393	x							
23.940	.275	ORAR00473	473	x							
24.213	.276	ORIE61500			x			x			
24.803	.276	ORIE63000			x			x			
24.940	.210	ORAR00394	394	x							
24.940	.275	ORAR00474	474	x							
25.551	.331	OR8464900									
25.591	.276	ORIE65000			x			x			
25.940	.210	ORAR00395	395	x							
25.940	.275	ORAR00475	475	x							
26.378	.276	ORIE67000			x			x			
26.772	.331	OR8468000									
28.150	.331	OR8471500									
29.134	.331	OR8474000									
30.476	.331	OR8477410									
31.890	.331	OR8481000									
33.268	.331	OR8484500									
34.055	.331	OR8486500									
34.961	.331	OR8488800									
36.776	.331	OR8493410									
37.760	.331	OR8495910									

Further sizes on request! The given standards are valid for nominal sizes only. Tolerances, see the following pages.{Part Number}



C.1.3 O-Ring dimensions for straight thread tube fitting sizes, AS 568 B

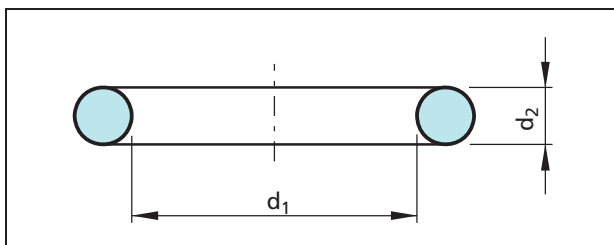


Figure 28 O-Ring dimensions

Ordering example

O-Ring according to AS 568 B

Dimensions: Inside diameter $d_1 = .924$ inches
 Cross section $d_2 = .116$ inches
 Compound: NBR 70
 Nitrile-Butadiene Rubber 70 Shore A)

For O-Ring dimensions and Trelleborg Sealing Solutions part numbers see Table XVIII. For material codes (elastomer type) for standard product orders, 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 Trelleborg Sealing Solutions material code must be given with the order. Please refer to the information provided in Table X or contact your local Trelleborg Sealing Solutions sales office.

TSS Article No.	ORAR00912	-	N7
TSS Art. - Group			
AS 568 B			
Dash No.			
Quality Index (Standard)			
Material Code (Standard)			

Table XVIII Dimensions / TSS part numbers

TSS Part No.	Inch dimensions (inch)		Metric dimensions (mm)		Tube size (inch)
	Inside diameter d_1	Cross section d_2	Inside diameter d_1	Cross section d_2	Outside diameter OD
ORAR00901	.185	.056	4.70	1.42	3/32
ORAR00902	.239	.064	6.07	1.63	1/8
ORAR00903	.301	.064	7.65	1.63	3/16
ORAR00904	.351	.072	8.92	1.83	1/4
ORAR00905	.414	.072	10.52	1.83	5/16
ORAR00906	.468	.078	11.89	1.98	3/8
ORAR00907	.530	.082	13.46	2.08	7/16
ORAR00908	.644	.087	16.36	2.20	1/2
ORAR00909	.706	.097	17.93	2.46	9/16
ORAR00910	.755	.097	19.18	2.46	5/8
ORAR00911	.863	.116	21.92	2.95	11/16
ORAR00912	.924	.116	23.47	2.95	3/4



O-Ring

TSS Part No.	Inch dimensions (inch)		Metric dimensions (mm)		Tube size (inch)
	Inside diameter d_1	Cross section d_2	Inside diameter d_1	Cross section d_2	Outside diameter OD
ORAR00913	.986	.116	25.04	2.95	13/16
ORAR00914	1.048	.116	26.62	2.95	7/8
ORAR00916	1.171	.116	29.74	2.95	1
ORAR00918	1.355	.116	34.42	2.95	1 1/8
ORAR00920	1.475	.118	37.47	3.00	1 1/4
ORAR00924	1.720	.118	43.69	3.00	1 1/2
ORAR00928	2.090	.118	53.09	3.00	1 3/4
ORAR00932	2.337	.118	59.36	3.00	2

C.1.4 O-Ring dimensions for metric thread with conical recess according to ISO 6149

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

TSS Part No.	Inch dimensions (inch)		Metric dimensions (mm)		Thread (metric)
	Inside diameter d_1	Cross section d_2	Inside diameter d_1	Cross section d_2	
OR1600610	.240	.063	6.10	1.60	M8 x 1
OR1600810	.319	.063	8.10	1.60	M10 x 1
OR2200930	.366	.087	9.30	2.20	M12 x 1.5
OR2201130	.445	.087	11.30	2.20	M14 x 1.5
OR2201330	.524	.087	13.30	2.20	M16 x 1.5
OR2201530	.602	.087	15.30	2.20	M18 x 1.5
OR2201730	.681	.087	17.30	2.20	M20 x 1.5
OR2201930	.760	.087	19.30	2.20	M22 x 1.5
OR2902360	.929	.114	23.60	2.90	M27 x 2
OR2902960	1.165	.114	29.60	2.90	M33 x 2
OR2903860	1.520	.114	38.60	2.90	M42 x 2
OR2904460	1.756	.114	44.60	2.90	M48 x 2
OR2905660	2.228	.114	56.60	2.90	M60 x 2



C.2 Tolerances of dimensions

During vulcanization, elastomers are subject to dimensional changes due to shrinkage. The degree of shrinkage depends on material, mold geometry and the vulcanization process employed.

The following tables XX and XXI 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 molds designed for NBR 70 materials. To guarantee a high and constant quality level it might be necessary to produce new or additional molds with the corresponding costs.

Precision O-Rings with reduced tolerances are available if required - please contact your local Trelleborg Sealing Solutions sales office. O-Ring dimensions not included in the tables are manufactured with tolerances according to the Trelleborg Sealing Solutions standard TBS-00024, based on ISO 3601-1.

Table XX Cross section tolerances according to Trelleborg Sealing Solutions TBS-00024, based on ISO 3601-1

Cross section d2	
≤ .070	
.070 < d2 ≤ .103	
.103 < d2 ≤ .139	
.139 < d2 ≤ .210	
.210 < d2 ≤ .270	
.270 < d2 ≤ .335	
.335 < d2 ≤ .394	
.394 < d2 ≤ .441	
.441 < d2 ≤ .551	
.551 < d2 ≤ .630	
.630 < d2 ≤ .709	
.709 < d2 ≤ .787	
.787 < d2 ≤ .835	
.835 < d2 ≤ .929	
.929 < d2 ≤ .984	
.984 < d2 ≤ 1.043	
1.043 < d2 ≤ 1.102	
1.102 < d2 ≤ 1.172	
1.172 < d2 ≤ 1.246	
1.246 < d2 ≤ 1.315	
1.315 < d2 ≤ 1.394	
1.394 < d2 ≤ 1.466	
1.466 < d2 ≤ 1.541	
1.541 < d2 ≤ 1.619	
1.619 < d2 ≤ 1.700	
1.700 < d2 ≤ 1.783	
1.783 < d2 ≤ 1.869	
1.869 < d2 ≤ 1.957	
1.957 < d2 ≤ 2.048	
2.048 < d2 ≤ 2.146	
2.146 < d2 ≤ 2.250	
2.250 < d2 ≤ 2.362	
2.362 < d2 ≤ 2.480	
2.480 < d2 ≤ 2.603	
2.603 < d2 ≤ 2.731	
2.731 < d2 ≤ 2.864	
2.864 < d2 ≤ 3.001	
3.001 < d2 ≤ 3.143	
3.143 < d2 ≤ 3.290	
3.290 < d2 ≤ 3.441	
3.441 < d2 ≤ 3.596	
3.596 < d2 ≤ 3.755	
3.755 < d2 ≤ 3.918	
3.918 < d2 ≤ 4.085	
4.085 < d2 ≤ 4.256	
4.256 < d2 ≤ 4.431	
4.431 < d2 ≤ 4.610	
4.610 < d2 ≤ 4.793	
4.793 < d2 ≤ 4.980	
4.980 < d2 ≤ 5.171	
5.171 < d2 ≤ 5.366	
5.366 < d2 ≤ 5.565	
5.565 < d2 ≤ 5.768	
5.768 < d2 ≤ 5.975	
5.975 < d2 ≤ 6.186	
6.186 < d2 ≤ 6.400	
6.400 < d2 ≤ 6.618	
6.618 < d2 ≤ 6.840	
6.840 < d2 ≤ 7.065	
7.065 < d2 ≤ 7.294	
7.294 < d2 ≤ 7.527	
7.527 < d2 ≤ 7.763	
7.763 < d2 ≤ 8.003	
8.003 < d2 ≤ 8.246	
8.246 < d2 ≤ 8.493	
8.493 < d2 ≤ 8.743	
8.743 < d2 ≤ 9.000	
9.000 < d2 ≤ 9.260	
9.260 < d2 ≤ 9.523	
9.523 < d2 ≤ 9.790	
9.790 < d2 ≤ 10.060	
10.060 < d2 ≤ 10.333	
10.333 < d2 ≤ 10.609	
10.609 < d2 ≤ 10.888	
10.888 < d2 ≤ 11.170	
11.170 < d2 ≤ 11.455	
11.455 < d2 ≤ 11.743	
11.743 < d2 ≤ 12.034	
12.034 < d2 ≤ 12.328	
12.328 < d2 ≤ 12.625	
12.625 < d2 ≤ 12.925	
12.925 < d2 ≤ 13.228	
13.228 < d2 ≤ 13.534	
13.534 < d2 ≤ 13.843	
13.843 < d2 ≤ 14.154	
14.154 < d2 ≤ 14.468	
14.468 < d2 ≤ 14.784	
14.784 < d2 ≤ 15.103	
15.103 < d2 ≤ 15.425	
15.425 < d2 ≤ 15.749	
15.749 < d2 ≤ 16.076	
16.076 < d2 ≤ 16.405	
16.405 < d2 ≤ 16.737	
16.737 < d2 ≤ 17.071	
17.071 < d2 ≤ 17.408	
17.408 < d2 ≤ 17.748	
17.748 < d2 ≤ 18.090	
18.090 < d2 ≤ 18.435	
18.435 < d2 ≤ 18.782	
18.782 < d2 ≤ 19.132	
19.132 < d2 ≤ 19.484	
19.484 < d2 ≤ 19.838	
19.838 < d2 ≤ 20.195	
20.195 < d2 ≤ 20.554	
20.554 < d2 ≤ 20.916	
20.916 < d2 ≤ 21.280	
21.280 < d2 ≤ 21.647	
21.647 < d2 ≤ 22.016	
22.016 < d2 ≤ 22.388	
22.388 < d2 ≤ 22.762	
22.762 < d2 ≤ 23.139	
23.139 < d2 ≤ 23.518	
23.518 < d2 ≤ 23.899	
23.899 < d2 ≤ 24.282	
24.282 < d2 ≤ 24.667	
24.667 < d2 ≤ 25.054	
25.054 < d2 ≤ 25.443	
25.443 < d2 ≤ 25.834	
25.834 < d2 ≤ 26.227	
26.227 < d2 ≤ 26.622	
26.622 < d2 ≤ 27.019	
27.019 < d2 ≤ 27.418	
27.418 < d2 ≤ 27.819	
27.819 < d2 ≤ 28.222	
28.222 < d2 ≤ 28.627	
28.627 < d2 ≤ 29.034	
29.034 < d2 ≤ 29.443	
29.443 < d2 ≤ 29.854	
29.854 < d2 ≤ 30.267	
30.267 < d2 ≤ 30.682	
30.682 < d2 ≤ 31.099	
31.099 < d2 ≤ 31.518	
31.518 < d2 ≤ 31.939	
31.939 < d2 ≤ 32.362	
32.362 < d2 ≤ 32.787	
32.787 < d2 ≤ 33.214	
33.214 < d2 ≤ 33.643	
33.643 < d2 ≤ 34.074	
34.074 < d2 ≤ 34.507	
34.507 < d2 ≤ 34.942	
34.942 < d2 ≤ 35.379	
35.379 < d2 ≤ 35.818	
35.818 < d2 ≤ 36.259	
36.259 < d2 ≤ 36.702	
36.702 < d2 ≤ 37.147	
37.147 < d2 ≤ 37.594	
37.594 < d2 ≤ 38.043	
38.043 < d2 ≤ 38.494	
38.494 < d2 ≤ 38.947	
38.947 < d2 ≤ 39.402	
39.402 < d2 ≤ 39.859	
39.859 < d2 ≤ 40.318	
40.318 < d2 ≤ 40.779	
40.779 < d2 ≤ 41.242	
41.242 < d2 ≤ 41.707	
41.707 < d2 ≤ 42.174	
42.174 < d2 ≤ 42.643	
42.643 < d2 ≤ 43.114	
43.114 < d2 ≤ 43.587	
43.587 < d2 ≤ 44.062	
44.062 < d2 ≤ 44.539	
44.539 < d2 ≤ 45.018	
45.018 < d2 ≤ 45.499	
45.499 < d2 ≤ 45.982	
45.982 < d2 ≤ 46.467	
46.467 < d2 ≤ 46.954	
46.954 < d2 ≤ 47.443	
47.443 < d2 ≤ 47.934	
47.934 < d2 ≤ 48.427	
48.427 < d2 ≤ 48.922	
48.922 < d2 ≤ 49.419	
49.419 < d2 ≤ 49.918	
49.918 < d2 ≤ 50.419	
50.419 < d2 ≤ 50.922	
50.922 < d2 ≤ 51.427	
51.427 < d2 ≤ 51.934	
51.934 < d2 ≤ 52.443	
52.443 < d2 ≤ 52.954	
52.954 < d2 ≤ 53.467	
53.467 < d2 ≤ 53.982	
53.982 < d2 ≤ 54.499	
54.499 < d2 ≤ 55.018	
55.018 < d2 ≤ 55.539	
55.539 < d2 ≤ 56.062	
56.062 < d2 ≤ 56.587	
56.587 < d2 ≤ 57.114	
57.114 < d2 ≤ 57.643	
57.643 < d2 ≤ 58.174	
58.174 < d2 ≤ 58.707	
58.707 < d2 ≤ 59.242	
59.242 < d2 ≤ 59.779	
59.779 < d2 ≤ 60.318	
60.318 < d2 ≤ 60.859	
60.859 < d2 ≤ 61.402	
61.402 < d2 ≤ 61.947	
61.947 < d2 ≤ 62.494	
62.494 < d2 ≤ 63.043	
63.043 < d2 ≤ 63.594	
63.594 < d2 ≤ 64.147	
64.147 < d2 ≤ 64.702	
64.702 < d2 ≤ 65.259	
65.259 < d2 ≤ 65.818	
65.818 < d2 ≤ 66.379	
66.379 < d2 ≤ 66.942	
66.942 < d2 ≤ 67.507	
67.507 < d2 ≤ 68.074	
68.074 < d2 ≤ 68.643	
68.643 < d2 ≤ 69.214	
69.214 < d2 ≤ 69.787	
69.787 < d2 ≤ 70.362	
70.362 < d2 ≤ 70.939	
70.939 < d2 ≤ 71.518	
71.518 < d2 ≤ 72.099	
72.099 < d2 ≤ 72.682	
72.682 < d2 ≤ 73.267	
73.267 < d2 ≤ 73.854	
73.854 < d2 ≤ 74.443	
74.443 < d2 ≤ 75.034	
75.034 < d2 ≤ 75.627	
75.627 < d2 ≤ 76.222	
76.222 < d2 ≤ 76.819	
76.819 < d2 ≤ 77.418	
77.418 < d2 ≤ 78.019	
78.019 < d2 ≤ 78.622	
78.622 < d2 ≤ 79.227	
79.227 < d2 ≤ 79.834	
79.834 < d2 ≤ 80.443	
80.443 < d2 ≤ 81.054	
81.054 < d2 ≤ 81.667	
81.667 < d2 ≤ 82.282	
82.282 < d2 ≤ 82.899	
82.899 < d2 ≤ 83.518	
83.518 < d2 ≤ 84.139	
84.139 < d2 ≤ 84.762	
84.762 < d2 ≤ 85.387	
85.387 < d2 ≤ 86.014	
86.014 < d2 ≤ 86.643	
86.643 < d2 ≤ 87.274	
87.274 < d2 ≤ 87.907	
87.907 < d2 ≤ 88.542	
88.542 < d2 ≤ 89.179	
89.179 < d2 ≤ 89.818	
89.818 < d2 ≤ 90.459	
90.459 < d2 ≤ 91.102	
91.102 < d2 ≤ 91.747	
91.747 < d2 ≤ 92.394	
92.394 < d2 ≤ 93.043	
93.043 < d2 ≤ 93.694	
93.694 < d2 ≤ 94.347	
94.347 < d2 ≤ 94.999	
94.999 < d2 ≤ 95.654	
95.654 < d2 ≤ 96.311	
96.311 < d2 ≤ 96.967	
96.967 < d2 ≤ 97.626	
97.626 < d2 ≤ 98.287	
98.287 < d2 ≤ 98.950	
98.950 < d2 ≤ 99.614	
99.614 < d2 ≤ 100.281	
100.281 < d2 ≤ 100.950	
100.950 < d2 ≤ 101.621	
101.621 < d2 ≤ 102.294	
102.294 < d2 ≤ 102.969	
102.969 < d2 ≤ 103.646	
103.646 < d2 ≤ 104.325	
104.325 < d2 ≤ 105.006	
105.006 < d2 ≤ 105.689	
105.689 < d2 ≤ 106.374	
106.374 < d2 ≤ 107.061	
107.061 < d2 ≤ 107.750	
107.750 < d2 ≤ 108.441	
108.441 < d2 ≤ 109.134	
109.134 < d2 ≤ 109.829	
109.829 < d2 ≤ 110.526	
110.526 < d2 ≤ 111.225	
111.225 < d2 ≤ 111.926	
111.926 < d2 ≤ 112.629	
112.629 < d2 ≤ 113.334	
113.334 < d2 ≤ 114.041	
114.041 < d2 ≤ 114.750	
114.750 < d2 ≤ 115.461	
115.461 < d2 ≤ 116.174	
116.174 < d2 ≤ 116.889	
116.889 < d2 ≤ 117.606	
117.606 < d2 ≤ 118.325	
118.325 < d2 ≤ 119.046	
119.046 < d2 ≤ 119.769	
119.769 < d2 ≤ 120.494	
120.494 < d2 ≤ 121.221	
121.221 < d2 ≤ 121.950	
121.950 < d2 ≤ 122.681	
122.681 < d2 ≤ 123.414	
123.414 < d2 ≤ 124.149	
124.149 < d2 ≤ 124.886	
124.886 < d2 ≤ 125.625	
125.625 < d2 ≤ 126.366	
126.366 < d2 ≤ 127.109	
127.109 < d2 ≤ 127.854	
127.854 < d2 ≤ 128.601	
128.601 < d2 ≤ 129.350	
129.350 < d2 ≤ 130.101	
130.101 < d2 ≤ 130.854	
130.854 < d2 ≤ 131.609	
131.609 < d2 ≤ 132.366	
132.366 < d2 ≤ 133.125	
133.125 < d2 ≤ 133.886	
133.886 < d2 ≤ 134.649	
134.649 < d2 ≤ 135.414	
135.414 < d2 ≤ 136.181	
136.181 < d2 ≤ 136.950	
136.950 < d2 ≤ 137.721	
137.721 < d2 ≤ 138.494	
138.494 < d2 ≤ 139.269	
139.269 < d2 ≤ 140.046	
140.046 < d2 ≤ 140.825	
140.825 < d2 ≤ 141.606	
141.606 < d2 ≤ 142.389	
142.389 < d2 ≤ 143.174	
143.174 < d2 ≤ 143.961	
143.961 < d2 ≤ 144.750	
144.750 < d2 ≤ 145.541	
145.541 < d2 ≤ 146.334	
146.334 < d2 ≤ 147.129	
147.129 < d2 ≤ 147.926	
147.926 < d2 ≤ 148.725	
148.725 < d2 ≤ 149.526	
149.526 < d2 ≤ 150.329	
150.329 < d2 ≤ 151.134	
151.134 < d2 ≤ 151.941	
151.941 < d2 ≤ 152.750	
152.750 < d2 ≤ 153.561	
153.561 < d2 ≤ 154.374	
154.374 < d2 ≤ 155.189	
155.189 < d2 ≤ 156.006	
156.006 < d2 ≤ 156.825	
156.825 < d2 ≤ 157.646	
157.646 < d2 ≤ 158.469	
158.469 < d2 ≤ 159.294	
159.294 < d2 ≤ 160.121	
160.121 < d2 ≤ 160.950	
160.950 < d2 ≤ 161.781	
161.781 < d2 ≤ 162.614	
162.614 < d2 ≤ 163.449	
163.449 < d2 ≤ 164.286	
164.286 < d2 ≤ 165.125	
165.125 < d2 ≤ 165.966	
165.966 < d2 ≤ 166.809	
166.809 < d2 ≤ 167.654	
167.654 < d2 ≤ 168.501	
168.501 < d2 ≤ 169.350	
169.350 < d2 ≤ 170.199	
170.199 < d2 ≤ 171.050	
171.050 < d2 ≤ 171.903	
171.903 < d2 ≤ 172.758	
172.758 < d2 ≤ 173.615	
173.615 < d2 ≤ 174.474	
174.474 < d2 ≤ 175.335	
175.335 < d2 ≤ 176.198	
176.198 < d2 ≤ 177.063	
177.063 < d2 ≤ 177.930	
177.930 < d2 ≤ 178.799	
178.799 < d2 ≤ 179.670	
179.670 < d2 ≤ 180.543	
180.543 < d2 ≤ 181.418	
181.418 < d2 ≤ 182.295	
182.295 < d2 ≤ 183.174	
183.174 < d2 ≤ 184.055	
184.055 < d2 ≤ 184.938	
184.938 < d2 ≤ 185.823	
185.823 < d2 ≤ 186.710	
186.710 < d2 ≤ 187.599	
187.599 < d2 ≤ 188.490	
188.490 < d2 ≤ 189.383	
189.383 < d2 ≤ 190.278	
190.278 < d2 ≤ 191.175	
191.175 < d2 ≤ 192.074	
192.074 < d2 ≤ 19 ≤	



O-Ring

Inside diameter d_1	Tolerances $\pm$
3.150 < d_1 ≤ 3.248	.028
3.248 < d_1 ≤ 3.346	.029
3.346 < d_1 ≤ 3.445	.030
3.445 < d_1 ≤ 3.543	.030
3.543 < d_1 ≤ 3.642	.031
3.642 < d_1 ≤ 3.740	.032
3.740 < d_1 ≤ 3.839	.033
3.839 < d_1 ≤ 3.937	.033
3.937 < d_1 ≤ 4.055	.034
4.055 < d_1 ≤ 4.173	.035
4.173 < d_1 ≤ 4.291	.036
4.291 < d_1 ≤ 4.409	.037
4.409 < d_1 ≤ 4.528	.037
4.528 < d_1 ≤ 4.646	.038
4.646 < d_1 ≤ 4.803	.039
4.803 < d_1 ≤ 4.921	.041
4.921 < d_1 ≤ 5.039	.041
5.039 < d_1 ≤ 5.197	.043
5.197 < d_1 ≤ 5.354	
5.354 < d_1 ≤ 5.512	
5.512 < d_1 ≤ 5.709	
5.709 < d_1 ≤ 5.906	
5.906 < d_1 ≤ 6.102	
6.102 < d_1 ≤ 6.299	
6.299 < d_1 ≤ 6.496	
6.496 < d_1 ≤ 6.685	
6.685 < d_1 ≤ 6.875	
6.875 < d_1 ≤ 7.065	
7.065 < d_1 ≤ 7.255	
7.255 < d_1 ≤ 7.445	
7.445 < d_1 ≤ 7.635	
7.635 < d_1 ≤ 7.825	
7.825 < d_1 ≤ 8.015	
8.015 < d_1 ≤ 8.205	
8.205 < d_1 ≤ 8.395	
8.395 < d_1 ≤ 8.583	
8.583 < d_1 ≤ 8.771	
8.771 < d_1 ≤ 8.959	
8.959 < d_1 ≤ 9.147	
9.147 < d_1 ≤ 9.335	
9.335 < d_1 ≤ 9.523	
9.523 < d_1 ≤ 9.711	
9.711 < d_1 ≤ 9.899	
9.899 < d_1 ≤ 10.087	
10.087 < d_1 ≤ 10.275	
10.275 < d_1 ≤ 10.463	
10.463 < d_1 ≤ 10.651	
10.651 < d_1 ≤ 10.839	
10.839 < d_1 ≤ 11.027	
11.027 < d_1 ≤ 11.215	
11.215 < d_1 ≤ 11.403	
11.403 < d_1 ≤ 11.591	
11.591 < d_1 ≤ 11.779	
11.779 < d_1 ≤ 11.967	
11.967 < d_1 ≤ 12.155	
12.155 < d_1 ≤ 12.343	
12.343 < d_1 ≤ 12.531	
12.531 < d_1 ≤ 12.719	
12.719 < d_1 ≤ 12.907	
12.907 < d_1 ≤ 13.095	
13.095 < d_1 ≤ 13.283	
13.283 < d_1 ≤ 13.471	
13.471 < d_1 ≤ 13.659	
13.659 < d_1 ≤ 13.847	
13.847 < d_1 ≤ 14.035	
14.035 < d_1 ≤ 14.223	
14.223 < d_1 ≤ 14.411	
14.411 < d_1 ≤ 14.599	
14.599 < d_1 ≤ 14.787	
14.787 < d_1 ≤ 14.975	
14.975 < d_1 ≤ 15.163	
15.163 < d_1 ≤ 15.351	
15.351 < d_1 ≤ 15.539	
15.539 < d_1 ≤ 15.727	
15.727 < d_1 ≤ 15.915	
15.915 < d_1 ≤ 16.103	
16.103 < d_1 ≤ 16.291	
16.291 < d_1 ≤ 16.479	
16.479 < d_1 ≤ 16.667	
16.667 < d_1 ≤ 16.855	
16.855 < d_1 ≤ 17.043	
17.043 < d_1 ≤ 17.231	
17.231 < d_1 ≤ 17.419	
17.419 < d_1 ≤ 17.607	
17.607 < d_1 ≤ 17.795	
17.795 < d_1 ≤ 17.983	
17.983 < d_1 ≤ 18.171	
18.171 < d_1 ≤ 18.359	
18.359 < d_1 ≤ 18.547	
18.547 < d_1 ≤ 18.735	
18.735 < d_1 ≤ 18.923	
18.923 < d_1 ≤ 19.111	
19.111 < d_1 ≤ 19.299	
19.299 < d_1 ≤ 19.487	
19.487 < d_1 ≤ 19.675	
19.675 < d_1 ≤ 19.863	
19.863 < d_1 ≤ 20.051	
20.051 < d_1 ≤ 20.239	
20.239 < d_1 ≤ 20.427	
20.427 < d_1 ≤ 20.615	
20.615 < d_1 ≤ 20.803	
20.803 < d_1 ≤ 20.991	
20.991 < d_1 ≤ 21.179	
21.179 < d_1 ≤ 21.367	
21.367 < d_1 ≤ 21.555	
21.555 < d_1 ≤ 21.743	
21.743 < d_1 ≤ 21.931	
21.931 < d_1 ≤ 22.119	
22.119 < d_1 ≤ 22.307	
22.307 < d_1 ≤ 22.495	
22.495 < d_1 ≤ 22.683	
22.683 < d_1 ≤ 22.871	
22.871 < d_1 ≤ 23.059	
23.059 < d_1 ≤ 23.247	
23.247 < d_1 ≤ 23.435	
23.435 < d_1 ≤ 23.623	
23.623 < d_1 ≤ 23.811	
23.811 < d_1 ≤ 24.0	
24.0 < d_1 ≤ 24.188	
24.188 < d_1 ≤ 24.376	
24.376 < d_1 ≤ 24.564	
24.564 < d_1 ≤ 24.752	
24.752 < d_1 ≤ 24.94	
24.94 < d_1 ≤ 25.128	
25.128 < d_1 ≤ 25.316	
25.316 < d_1 ≤ 25.504	
25.504 < d_1 ≤ 25.692	
25.692 < d_1 ≤ 25.88	
25.88 < d_1 ≤ 26.068	
26.068 < d_1 ≤ 26.256	
26.256 < d_1 ≤ 26.444	
26.444 < d_1 ≤ 26.632	
26.632 < d_1 ≤ 26.82	
26.82 < d_1 ≤ 27.008	
27.008 < d_1 ≤ 27.196	
27.196 < d_1 ≤ 27.384	
27.384 < d_1 ≤ 27.572	
27.572 < d_1 ≤ 27.76	
27.76 < d_1 ≤ 27.948	
27.948 < d_1 ≤ 28.136	
28.136 < d_1 ≤ 28.324	
28.324 < d_1 ≤ 28.512	
28.512 < d_1 ≤ 28.7	
28.7 < d_1 ≤ 28.888	
28.888 < d_1 ≤ 29.076	
29.076 < d_1 ≤ 29.264	
29.264 < d_1 ≤ 29.452	
29.452 < d_1 ≤ 29.64	
29.64 < d_1 ≤ 29.828	
29.828 < d_1 ≤ 30.016	
30.016 < d_1 ≤ 30.204	
30.204 < d_1 ≤ 30.392	
30.392 < d_1 ≤ 30.58	
30.58 < d_1 ≤ 30.768	
30.768 < d_1 ≤ 30.956	
30.956 < d_1 ≤ 31.144	
31.144 < d_1 ≤ 31.332	
31.332 < d_1 ≤ 31.52	
31.52 < d_1 ≤ 31.708	
31.708 < d_1 ≤ 31.896	
31.896 < d_1 ≤ 32.084	
32.084 < d_1 ≤ 32.272	
32.272 < d_1 ≤ 32.46	
32.46 < d_1 ≤ 32.648	
32.648 < d_1 ≤ 32.836	
32.836 < d_1 ≤ 33.024	
33.024 < d_1 ≤ 33.212	
33.212 < d_1 ≤ 33.4	
33.4 < d_1 ≤ 33.588	
33.588 < d_1 ≤ 33.776	
33.776 < d_1 ≤ 33.964	
33.964 < d_1 ≤ 34.152	
34.152 < d_1 ≤ 34.34	
34.34 < d_1 ≤ 34.528	
34.528 < d_1 ≤ 34.716	
34.716 < d_1 ≤ 34.904	
34.904 < d_1 ≤ 35.092	
35.092 < d_1 ≤ 35.28	
35.28 < d_1 ≤ 35.468	
35.468 < d_1 ≤ 35.656	
35.656 < d_1 ≤ 35.844	
35.844 < d_1 ≤ 36.032	
36.032 < d_1 ≤ 36.22	
36.22 < d_1 ≤ 36.408	
36.408 < d_1 ≤ 36.596	
36.596 < d_1 ≤ 36.784	
36.784 < d_1 ≤ 36.972	
36.972 < d_1 ≤ 37.16	
37.16 < d_1 ≤ 37.348	
37.348 < d_1 ≤ 37.536	
37.536 < d_1 ≤ 37.724	
37.724 < d_1 ≤ 37.912	
37.912 < d_1 ≤ 38.1	
38.1 < d_1 ≤ 38.288	
38.288 < d_1 ≤ 38.476	
38.476 < d_1 ≤ 38.664	
38.664 < d_1 ≤ 38.852	
38.852 < d_1 ≤ 39.04	
39.04 < d_1 ≤ 39.228	
39.228 < d_1 ≤ 39.416	
39.416 < d_1 ≤ 39.604	
39.604 < d_1 ≤ 39.792	
39.792 < d_1 ≤ 39.98	
39.98 < d_1 ≤ 40.168	
40.168 < d_1 ≤ 40.356	
40.356 < d_1 ≤ 40.544	
40.544 < d_1 ≤ 40.732	
40.732 < d_1 ≤ 40.92	
40.92 < d_1 ≤ 41.108	
41.108 < d_1 ≤ 41.296	
41.296 < d_1 ≤ 41.484	
41.484 < d_1 ≤ 41.672	
41.672 < d_1 ≤ 41.86	
41.86 < d_1 ≤ 42.048	
42.048 < d_1 ≤ 42.236	
42.236 < d_1 ≤ 42.424	
42.424 < d_1 ≤ 42.612	
42.612 < d_1 ≤ 42.8	
42.8 < d_1 ≤ 42.988	
42.988 < d_1 ≤ 43.176	
43.176 < d_1 ≤ 43.364	
43.364 < d_1 ≤ 43.552	
43.552 < d_1 ≤ 43.74	
43.74 < d_1 ≤ 43.928	
43.928 < d_1 ≤ 44.116	
44.116 < d_1 ≤ 44.304	
44.304 < d_1 ≤ 44.492	
44.492 < d_1 ≤ 44.68	
44.68 < d_1 ≤ 44.868	
44.868 < d_1 ≤ 45.056	
45.056 < d_1 ≤ 45.244	
45.244 < d_1 ≤ 45.432	
45.432 < d_1 ≤ 45.62	
45.62 < d_1 ≤ 45.808	
45.808 < d_1 ≤ 46.0	
46.0 < d_1 ≤ 46.188	
46.188 < d_1 ≤ 46.376	
46.376 < d_1 ≤ 46.564	
46.564 < d_1 ≤ 46.752	
46.752 < d_1 ≤ 46.94	
46.94 < d_1 ≤ 47.128	
47.128 < d_1 ≤ 47.316	
47.316 < d_1 ≤ 47.504	
47.504 < d_1 ≤ 47.692	
47.692 < d_1 ≤ 47.88	
47.88 < d_1 ≤ 48.068	
48.068 < d_1 ≤ 48.256	
48.256 < d_1 ≤ 48.444	
48.444 < d_1 ≤ 48.632	
48.632 < d_1 ≤ 48.82	
48.82 < d_1 ≤ 49.008	
49.008 < d_1 ≤ 49.196	
49.196 < d_1 ≤ 49.384	
49.384 < d_1 ≤ 49.572	
49.572 < d_1 ≤ 49.76	
49.76 < d_1 ≤ 49.948	
49.948 < d_1 ≤ 50.136	
50.136 < d_1 ≤ 50.324	
50.324 < d_1 ≤ 50.512	
50.512 < d_1 ≤ 50.7	
50.7 < d_1 ≤ 50.888	
50.888 < d_1 ≤ 51.076	
51.076 < d_1 ≤ 51.264	
51.264 < d_1 ≤ 51.452	
51.452 < d_1 ≤ 51.64	
51.64 < d_1 ≤ 51.828	
51.828 < d_1 ≤ 52.016	
52.016 < d_1 ≤ 52.204	
52.204 < d_1 ≤ 52.392	
52.392 < d_1 ≤ 52.58	
52.58 < d_1 ≤ 52.768	
52.768 < d_1 ≤ 52.956	
52.956 < d_1 ≤ 53.144	
53.144 < d_1 ≤ 53.332	
53.332 < d_1 ≤ 53.52	
53.52 < d_1 ≤ 53.708	
53.708 < d_1 ≤ 53.896	
53.896 < d_1 ≤ 54.084	
54.084 < d_1 ≤ 54.272	
54.272 < d_1 ≤ 54.46	
54.46 < d_1 ≤ 54.648	
54.648 < d_1 ≤ 54.836	
54.836 < d_1 ≤ 55.024	
55.024 < d_1 ≤ 55.212	
55.212 < d_1 ≤ 55.4	
55.4 < d_1 ≤ 55.588	
55.588 < d_1 ≤ 55.776	
55.776 < d_1 ≤ 55.964	
55.964 < d_1 ≤ 56.152	
56.152 < d_1 ≤ 56.34	
56.34 < d_1 ≤ 56.528	
56.528 < d_1 ≤ 56.716	
56.716 < d_1 ≤ 56.904	
56.904 < d_1 ≤ 57.092	
57.092 < d_1 ≤ 57.28	
57.28 < d_1 ≤ 57.468	
57.468 < d_1 ≤ 57.656	
57.656 < d_1 ≤ 57.844	
57.844 < d_1 ≤ 58.032	
58.032 < d_1 ≤ 58.22	
58.22 < d_1 ≤ 58.408	
58.408 < d_1 ≤ 58.596	
58.596 < d_1 ≤ 58.784	
58.784 < d_1 ≤ 58.972	
58.972 < d_1 ≤ 59.16	
59.16 < d_1 ≤ 59.348	
59.348 < d_1 ≤ 59.536	
59.536 < d_1 ≤ 59.724	
59.724 < d_1 ≤ 59.912	
59.912 < d_1 ≤ 60.1	
60.1 < d_1 ≤ 60.288	
60.288 < d_1 ≤ 60.476	
60.476 < d_1 ≤ 60.664	
60.664 < d_1 ≤ 60.852	
60.852 < d_1 ≤ 61.04	
61.04 < d_1 ≤ 61.228	
61.228 < d_1 ≤ 61.416	
61.416 < d_1 ≤ 61.604	
61.604 < d_1 ≤ 61.792	
61.792 < d_1 ≤ 61.98	
61.98 < d_1 ≤ 62.168	
62.168 < d_1 ≤ 62.356	
62.356 < d_1 ≤ 62.544	
62.544 < d_1 ≤ 62.732	
62.732 < d_1 ≤ 62.92	
62.92 < <	



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 Trelleborg Sealing Solutions elastomer O-Rings for standard quality as well as for reduced tolerances. The given values are according to the Trelleborg Sealing Solutions standard TBS-00005, based on ISO 3601-3:2005, grade N and respectively S.

If no quality requirements are specified with the order, O-Rings are supplied with standard quality according to Table XXII (according to Trelleborg Sealing Solutions standard TBS-00005, based on ISO 3601-3:2005, grade N). For surface deviations ISO 2859-1:2004-01 AQL 1,0 general inspection level II is supplied as standard. Higher quality levels are available on request.

Table XXII Surface specification for O-Rings - standard

Standard										
Type of defects according to Trelleborg Sealing Solutions standard TBS-00005***		Schematic illustration		Maximum acceptable limits according to Trelleborg Sealing Solutions standard TBS-00005***, Grade N						
				Cross section d_2						
				$\leq .031$	$\leq .089$	$\leq .124$	$\leq .177$	$\leq .248$	$\leq .331$	$\leq .394$
				$\leq .591$	$> .591$					
1.	Offset		e	by agreement	.003	.004	.005	.006	.006	.008
2.	Flash		f a		.004	.005	.006	.006	.007	.008
3.	Backrind		g h		When the flash can be differentiated, it should not exceed .003 inches					
4.	Non-fills and indentations		l m		.007	.011	.014	.021	.028	.035
5.	Flow marks (radial orientation is not permitted)		j** k		.003	.003	.004	.004	.005	.005
6.	Area of excessive trimming (radial tool marks not allowed)		n		.003	.003	.004	.004	.005	.005
7.	Foreign material		-		.024	.031	.039	.051	.067	.079
8.	Straightness tolerance		-		.003	.003	.004	.004	.005	.005
9.	Roundness		-		.059	.059	.026	.026	.026	.026
10.	The O-Ring surface shall be free from cracks, ruptures, blisters and other imperfections that are greater than the limits given in the table when inspected at 2-times-magnification with adequate illumination. The unstretched O-Ring is viewed.		-		or $0.05 \times d_1^*$					
11.	Flow marks, non-fills and indentations within the limits given in the table shall not be allowed if a) there are more than three in any 1 inch (25 mm) length of circumference b) they interconnect c) there are more than three that are separated from each other by a distance that is less than the maximum length of such imperfection		-		.003	.003	.003	.003	.003	.004
12.	Trimming is allowed provided the dimension n is not reduced below the minimum diameter d_2 for the O-Ring		-		.003	.003	.003	.003	.003	.004
13.	not permitted when viewed two-times-magnified		-							
14.			-							
15.			-							

All dimensions in in. * d_1 = Inside Diameter ** Whichever is the greater *** Based on ISO 3601-3:2005



O-Ring

Table XXIII Surface specification for O-Rings - reduced

Reduced														
Type of defects according to Trelleborg Sealing Solutions standard TBS-00005***		Schematic illustration		Maximum acceptable limits according to Trelleborg Sealing Solutions standard TBS-00005***, Grade S										
				Cross section d ₂										
				≤.031	≤.089	≤.124	≤.177	≤.248	≤.331	≤.394	≤.591	>.591		
1.	Offset			e	by agreement	.003	.003	.004	.005	.005	.006	.008	by agreement	
2.	Flash			f a		.004	.004	.005	.006	.006	.007	.008		
3.	Backrind			g h		When the flash can be differentiated, it should not exceed .002 inches								
4.	Non-fills and indentations			l m		.004	.006	.008	.008	.012	.020	.030		
5.	Flow marks (radial orientation is not permitted)			j** k		.002	.003	.004	.004	.005	.005	.006		
6.	Area of excessive trimming (radial tool marks not allowed)			n		.006	.010	.016	.025	.039	.059	.079		
7.	Foreign material			-		.003	.003	.004	.004	.005	.005	.006		
8.	Straightness tolerance			-		.059	.059	.197	.197	.197	.197	.276		
9.	Roundness			-		or 0.05 x d ₁ *								
10.	The O-Ring surface shall be free from cracks, ruptures, blisters and other imperfections that are greater than the limits given in the table when inspected at two-times-magnification with adequate illumination. The unstretched O-Ring is viewed.			-		.002	.002	.002	.002	.002	.003	.003		
11.	Flow marks, non-fills and indentations within the limits given in the table shall not be allowed if a) there are more than three in any 1 inch (25 mm) length of circumference b) they interconnect c) there are more than three that are separated from each other by a distance that is less than the maximum length of such imperfection			-		Trimming is allowed provided the dimension n is not reduced below the minimum diameter d ₂ for the O-Ring								

All dimensions in mm * d₁ = Inside Diameter ** Whichever is the greater *** Based on ISO 3601-3:2005



C.4 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 B and British Standard BS 1806			
TSS Article No. ORSETAASS-N7 (NBR 70)			
Quantity	Dimensions (inch)	Quantity	Dimensions (inch)
30	.114 x .070	10	.739 x .070
30	.145 x .070	15	.362 x .103
30	.176 x .070	15	.424 x .103
30	.208 x .070	15	.487 x .103
30	.239 x .070	10	.674 x .103
30	.301 x .070	10	.737 x .103
30	.364 x .070	10	.799 x .103
20	.426 x .070	5	.734 x .139
20	.489 x .070	5	.796 x .139
10	.551 x .070	5	.859 x .139
10	.614 x .070	5	.920 x .139
10	.676 x .070	5	.984 x .139

O-Ring Set, Type B

295 O-Rings in 24 different sizes to American Standard AS 568 B and British Standard BS 1806			
TSS Article No. ORSETBASS-N7 (NBR 70)			
Quantity	Dimensions (inch)	Quantity	Dimensions (inch)
15	.801 x .070	15	1.359 x .139
15	.864 x .070	10	1.421 x .139
15	.987 x .103	10	1.484 x .139
15	1.049 x .103	10	1.609 x .139
15	1.112 x .103	10	1.734 x .139
15	1.174 x .103	10	1.859 x .139
15	1.237 x .103	10	1.984 x .139
15	1.299 x .103	10	1.475 x .210
15	1.362 x .103	10	1.600 x .210
15	1.171 x .139	10	1.725 x .210
15	1.234 x .139	5	1.850 x .210
15	1.296 x .139	5	1.975 x .210

O-Ring Set, Type C

380 O-Rings in 24 different sizes, common Metric sizes			
TSS Article No. ORSETCMET-N7 (NBR 70)			
Quantity	Dimensions (inch)	Quantity	Dimensions (inch)
20	.157 x .079	15	.406 x .094
20	.236 x .079	15	.441 x .094
20	.315 x .079	15	.484 x .094
20	.394 x .079	15	.524 x .094
20	.472 x .079	15	.563 x .094
20	.130 x .094	10	.394 x .118
20	.169 x .094	10	.472 x .118
20	.209 x .094	10	.551 x .118
20	.248 x .094	10	.630 x .118
20	.287 x .094	10	.709 x .118
20	.327 x .094	10	.756 x .118
20	.362 x .094	5	.787 x .118

O-Ring Set, Type D

295 O-Rings in 24 different sizes, common Metric sizes			
TSS Article No. ORSETDMET-N7 (NBR 70)			
Quantity	Dimensions (inch)	Quantity	Dimensions (inch)
15	.709 x .079	15	1.378 x .157
15	.787 x .079	15	1.496 x .157
15	.984 x .118	15	1.575 x .157
15	1.031 x .118	10	1.654 x .157
15	1.102 x .118	10	1.772 x .157
15	1.150 x .118	10	1.811 x .157
15	1.268 x .118	10	1.890 x .157
15	1.346 x .118	10	1.378 x .197
15	1.425 x .118	10	1.575 x .197
15	1.181 x .157	10	1.772 x .197
15	1.260 x .157	5	1.890 x .197
15	1.339 x .157	5	1.969 x .197



D Special O-Rings

D.1 Isolast® (FFKM) O-Rings

Information about our Isolast® (FFKM) O-Rings is available either in our special Isolast® brochure or through your local Trelleborg Sealing Solutions sales office.

D.2 FEP-encapsulated O-Rings

FEP-encapsulated O-Rings consist of an elastomer inner ring and a seamless FEP sheath 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 is 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. -75°F to +400°F (-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 sterilized
- Low friction, no adhesion or stick-slip effect
- Adequate elastic behavior for improved sealability

Versions

- | | |
|--------------------|---------------------------------------|
| Standard versions: | Elastomer O-Ring with FEP sheath |
| Special versions: | Hollow elastomer ring with FEP sheath |

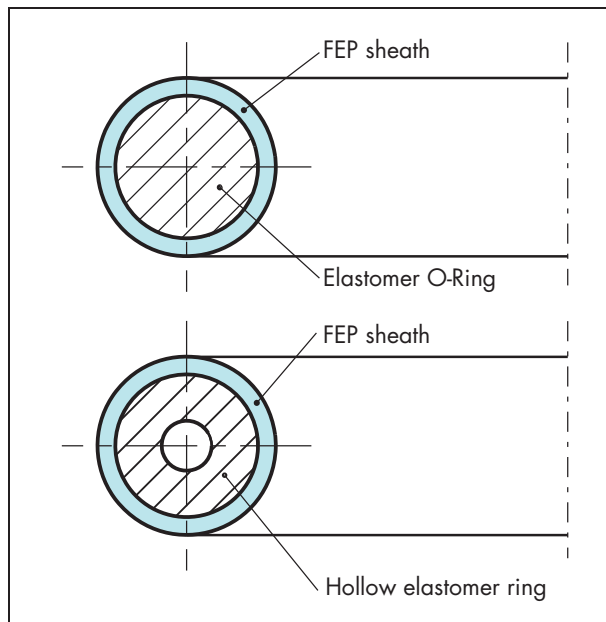


Figure 29 Different versions of FEP O-Ring

Applications

Fields of application

FEP-encapsulated O-Rings are ideally suited for use in the chemical, petrochemicals, medical technology, foodstuffs, water, sewage and similar industries. A typical application for FEP-encapsulated 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 30).

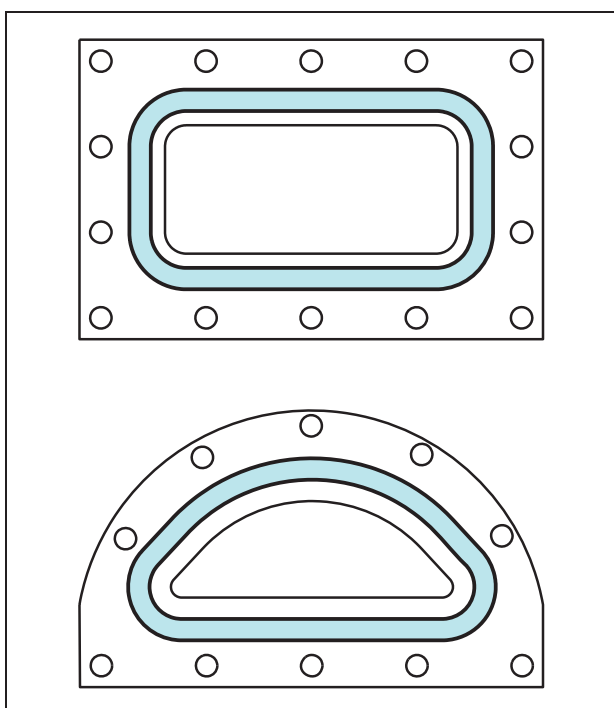


Figure 30 Seals for special flange cross sections

Technical data

Working pressure: Up to 3625 PSI (25 MPa)

Temperature: -75°F to +400°F (-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 moldable. This allows the material to be processed to form flexible semi-finished 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: -5°F up to +400°F (-20°C up to +200 °C)
- Silicone elastomer (VMQ), material code SZ00R
temperature range: -75°F up to +400°F (-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 catalog 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.

Applications 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 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 XXIV.



Table XXIV Thickness of the FEP sheath

O-Ring		Thickness of the FEP Sheath
Cross section d_2	Tolerance $\pm$	
.070	.004	.008
.103	.004	.012
.139	.005	.015
.210	.010	.020
.275	.015	.020

The diagram (Figure 31) gives guide values for the permeation of different gases.

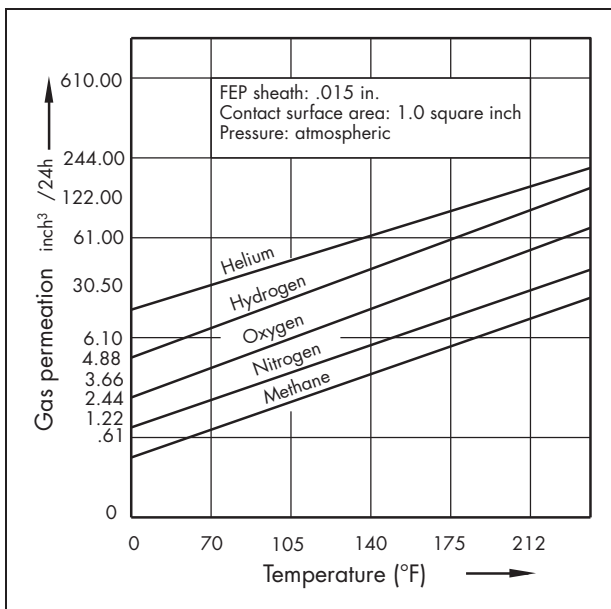


Figure 31 Gas permeation rates for FEP O-Rings

The diagram (Figure 32) gives guide values for the permeation of water vapor.

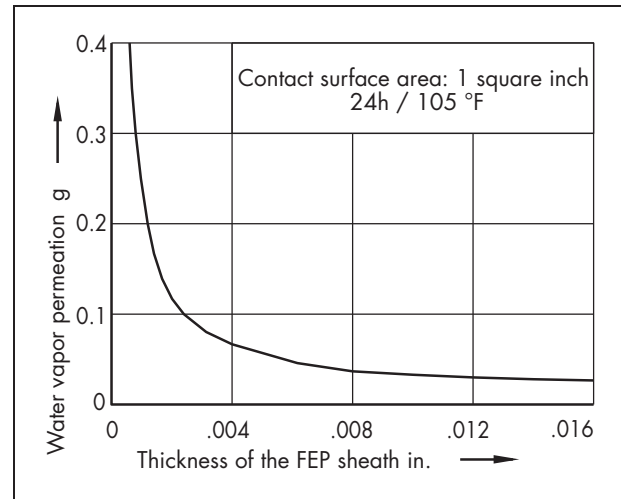


Figure 32 Water vapor permeation for FEP O-Rings

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 XXVI shows the smallest available inside diameters for the different cord diameters.

Table XXV Tolerances inside diameter

Inside diameter (inches)	Tolerance ID (± inches)
$d1 < .300$	not available
$.300 \leq d1 \leq 1.180$	.010
$1.180 < d1 \leq 5.120$	.015
$5.120 < d1 \leq 6.700$	.020
$6.700 < d1 \leq 15.000$	.025
$15.000 < d1 \leq 25.600$	.030
$25.600 < d1 \leq 39.400$	.060
$d1 > 39.400$	on request

Table XXVI Smallest available sizes and cross section tolerances

O-Ring		Minimum inside diameter (inches)
Cross section (inches)	Tolerance CS (± inches)	
.063	.004	.299
.070		.301
.079		.315
.094		.366
.098		.394
.103		.362
.110		.413
.118	.005	.394
.122		.394
.126		.472
.139		.472
.148		.472
.157	.010	.472
.165		.591
.177		.591
.185		.709
.197		.709
.210		.725
.217		1.181
.224		1.181

O-Ring		Minimum inside diameter (inches)
Cross section (inches)	Tolerance CS (± inches)	
.236	.015	1.181
.248		1.614
.256		1.614
.276		1.614
.295		4.000
.315		2.756
.331		4.016
.354	.020	4.016
.374		4.016
.394		4.251
.413		5.000
.433		5.000
.472		6.000
.500		7.000
.512		10.000
.551		10.000
.591		10.000
.630		12.008
.709		16.614
.748		16.614
.787		20.000



O-Ring

Ordering example

O-Ring 30 x 3, FEP-encapsulated

Dimensions: Inside diameter $d_1 = 30.0$ mm
Cross section $d_2 = 3.0$ mm

Material of the inner ring: Silicone Rubber (VMQ)

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

For further information, see page 56

Ordering example

O-Ring, FEP-encapsulated

American Standard AS 568 B, ref. 356

Dimensions: Inside diameter $d_1 = 5.350$ inches
Cross section $d_2 = .210$ inches

Material of the inner ring: Fluorocarbon Rubber (FKM)

TSS Article No.	O FAR00356	-	VZ00R
TSS Part No.			
Quality Index (Standard)			
Material Code (Standard)			

For further information, see page 56

For O-Ring dimensions and TSS Part No. see Table XVII, page 57-122.

For installation dimensions, see Table XV, page 41.

Orders 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 sections. The dimensions are, as with elastomer O-Rings, characterized by the inside diameter d_1 and the cord diameter d_2 (Figure 33). PTFE O-Rings are not molded but produced by machining. The rings can be manufactured in all sizes.

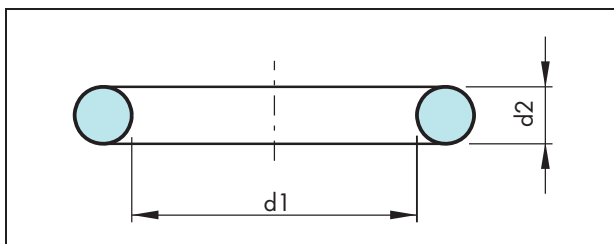


Figure 33 O-Ring dimensions

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 approximately -325°F to +500°F (-200°C to +260°C)
- Suitable for contact with foodstuffs, pharmaceutical and medicinal products
- Physiologically safe, can be sterilized
- Low friction, no adhesion
- Available for all diameters up to approximately 40 inches (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 5800 PSI (40 MPa)
 Temperature: -325°F to +500°F (-200 °C to +260 °C)
 Media: Almost all liquids, gases and chemicals

Materials

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

PTFE is a partially crystalline thermoplastic characterized 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 aging, light and ozone. The water absorption rate is less than 0.01%.

Design recommendations

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.

Methods of installation

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 preferred.

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



O-Ring

Installation recommendations

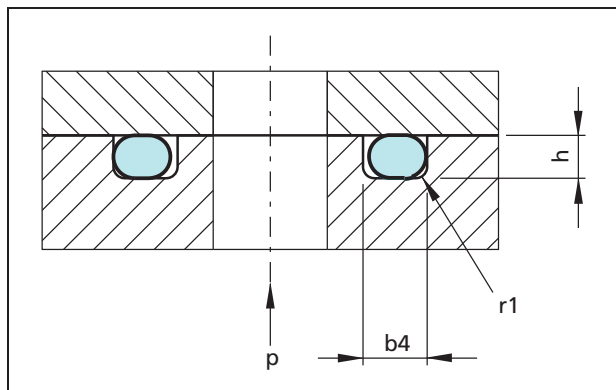


Figure 34 Axial installation, static, inside pressure

Cross section d_2	Groove dimensions		Radius
	Groove depth $h +.002$	Groove width $b_4 +.004$	r_1
.059	.051	.067	.008
.063	.055	.071	.012
.070	.063	.079	.016
.079	.071	.087	.020
.094	.085	.102	.020
.098	.089	.110	.020
.103	.093	.114	.024
.118	.106	.130	.031
.139	.124	.154	.039
.157	.142	.173	.039
.197	.177	.217	.039
.210	.189	.232	.047
.224	.201	.248	.047
.236	.220	.260	.047
.276	.248	.303	.059
.315	.283	.346	.059
.331	.297	.362	.079

Available dimensions

PTFE O-Rings are available in the same dimensions as the elastomer O-Rings. See O-Ring dimensions, pages 57-122.

Ordering example

O-Ring, 40 x 3

Dimensions: Inside diameter $d_1 = 40.0$ mm
Cross section $d_2 = 3.0$ mm

For O-Ring dimensions and TSS Part No. see Table XVII, page 57-122.

Orders can also be made according to O-Ring dimensions and materials.

TSS Article No. OR3004000 - PT00

TSS Part No. _____

Quality Index (Standard) _____

Material Code (Standard) _____



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 Trelleborg Sealing Solutions 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 our Zurcon® materials.

Polyurethane O-Rings are available in dimensions to American Standard AS 568 B (see dimension list, Table XXVIII, page 139).

The dimensions are given with the inside diameter d_1 and the cord diameter d_2 (Figure 35, page 138).

Advantages

The main advantages of a polyurethane material for O-Rings compared with other elastomers 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 be used in applications such as pneumatics where low compression set and low friction are essential.

Technical data

Working pressure:	Static up to approx. 8700 PSI (60 MPa) without back-up ring (depending on the extrusion gap) Dynamic up to 3625 PSI (25 MPa)
Speed:	Reciprocating up to ≤ 0.65 ft/s (0.2 m/s)
Temperature:	-50°F up to +212°F (-45°C up to +100°C) depending on the material
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 aging
- High damping properties
- Low gas permeability
- Good hydrolysis resistance
- High tear propagation resistance
- Free from substances which hinder paint coverage



O-Ring

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

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

Polyurethane O-Rings are available on request in the following grades:

- Polyurethane, 70 Shore A
Material code WU7T1
- Polyurethane, 92 Shore A
Material code WU9T2
- Polyurethane, 93 Shore A, Zurcon®:
Material code Z22 and Z24
- Polyurethane, 94 Shore A, Zurcon®:
Material code Z20

Depending on the production method Zurcon® O-Rings can have an injection point on the inside diameter. This marking is placed at a 45° angle from the flash.

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 XV, page 41.

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 permissible radial clearance depends on the used material, on the O-Ring cross section and on the application properties, e. g. the temperature.

O-Ring dimensions

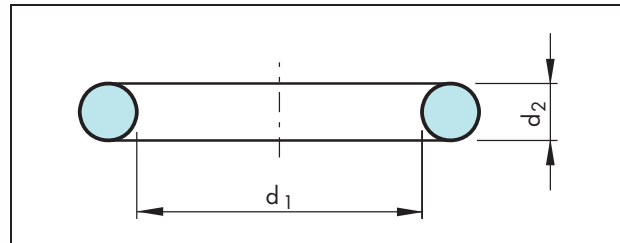


Figure 35 O-Ring dimensions

Ordering Example

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

Dimensions: Inside diameter $d_1 = .984$ inches
Cross section $d_2 = .139$ inches

Material: Polyurethane (AU 70 Shore A)

For O-Ring dimensions and TSS Part No. see Table XXVIII.

For installation dimensions, see Table XV, page 41.

Orders can also be made according to O-Ring dimensions and materials.

TSS Article No.	ORAR00214	-	WU7T1
TSS Part No.			
Quality Index (Standard)			
Material code (Standard)			



Table XXVIII Dimensions according to AS 568 B (Further sizes on request)

TSS Part No.	Inside-Ø d ₁	Cross Section d ₂	TSS Part No.	Inside-Ø d ₁	Cross Section d ₂
ORAR00005	.101	.070	ORAR00118	.862	.103
ORAR00006	.114	.070	ORAR00119	.924	.103
ORAR00008	.176	.070	ORAR00120	.987	.103
ORAR00009	.208	.070	ORAR00122	1.112	.103
ORAR00010	.239	.070	ORAR00124	1.237	.103
ORAR00011	.301	.070	ORAR00125	1.299	.103
ORAR00012	.364	.070	ORAR00126	1.362	.103
ORAR00013	.426	.070	ORAR00127	1.424	.103
ORAR00014	.489	.070	ORAR00128	1.487	.103
ORAR00015	.551	.070	ORAR00129	1.549	.103
ORAR00017	.676	.070	ORAR00132	1.737	.103
ORAR00018	.739	.070	ORAR00133	1.799	.103
ORAR00019	.801	.070	ORAR00134	1.862	.103
ORAR00020	.864	.070	ORAR00135	1.925	.103
ORAR00022	.989	.070	ORAR00136	1.987	.103
ORAR00023	1.051	.070	ORAR00137	2.050	.103
ORAR00025	1.176	.070	ORAR00138	2.112	.103
ORAR00027	1.301	.070	ORAR00141	2.300	.103
ORAR00029	1.489	.070	ORAR00142	2.362	.103
ORAR00034	2.114	.070	ORAR00145	2.550	.103
ORAR00036	2.364	.070	ORAR00146	2.612	.103
ORAR00039	2.739	.070	ORAR00147	2.675	.103
ORAR00040	2.864	.070	ORAR00210	.734	.139
ORAR00041	2.989	.070	ORAR00211	.796	.139
ORAR00045	3.989	.070	ORAR00213	.921	.139
ORAR00046	4.239	.070	ORAR00214	.984	.139
ORAR00047	4.489	.070	ORAR00215	1.046	.139
ORAR00050	5.239	.070	ORAR00216	1.109	.139
ORAR00110	.362	.103	ORAR00217	1.171	.139
ORAR00111	.424	.103	ORAR00218	1.234	.139
ORAR00112	.487	.103	ORAR00220	1.359	.139
ORAR00113	.549	.103	ORAR00222	1.484	.139
ORAR00114	.612	.103	ORAR00224	1.734	.139
ORAR00115	.674	.103	ORAR00225	1.859	.139
ORAR00116	.737	.103	ORAR00226	1.984	.139
ORAR00117	.799	.103	ORAR00227	2.109	.139



O-Ring

TSS Part No.	Inside-Ø d ₁	Cross Section d ₂
ORAR00228	2.234	.139
ORAR00229	2.359	.139
ORAR00230	2.484	.139
ORAR00231	2.609	.139
ORAR00232	2.734	.139
ORAR00234	2.984	.139
ORAR00235	3.109	.139
ORAR00236	3.234	.139
ORAR00237	3.359	.139
ORAR00238	3.484	.139
ORAR00239	3.609	.139
ORAR00240	3.734	.139
ORAR00325	1.475	.210
ORAR00326	1.600	.210
ORAR00327	1.725	.210
ORAR00328	1.850	.210
ORAR00329	1.975	.210
ORAR00330	2.100	.210
ORAR00331	2.225	.210
ORAR00332	2.350	.210
ORAR00334	2.600	.210
ORAR00336	2.850	.210
ORAR00337	2.975	.210
ORAR00338	3.100	.210
ORAR00339	3.225	.210
ORAR00340	3.350	.210

Tolerances based on ISO 3601. See tables XX and XXI.



D.5 Round cord rings (vulcanized)

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 mold-vulcanized O-Rings, round cord rings made from continuously extruded cord can be made up to any desired diameter.

The junction point always has poorer mechanical properties than the basic material. For this reason, round cord rings should be used with caution for dynamic applications, gaseous media or vacuum applications.

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

For the use of round cord rings in high-vacuum applications it is recommended to use FKM. In that case the joint has to be manufactured in a special high-vacuum quality and has to be ordered accordingly. Please contact your local Trelleborg Sealing Solutions sales office for further details.

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

Cross section (mm)	Tolerance
.070	+ .012 / - .004
.079	
.102	+ .012 / - .008
.118	
.138	
.157	+ .016 / - .008
.177	
.197	
.209	
.224	
.236	
.256	+ .020 / - .012
.276	
.315	
.331	
.354	
.394	+ .024 / - .016
.433	
.472	
.551	
.591	
.709	
.787	+ .031 / - .024

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

Cross section (inches)	Tolerance
.039	± .008
.059	
.070	
.079	
.098	
.118	± .010
.126	
.139	
.157	
.187	± .014
.197	
.210	
.224	
.236	± .016
.252	
.276	
.295	
.315	
.331	
.354	
.374	± .020
.394	
.433	
.472	
.500	
.512	
.551	
.591	± .028
.630	
.709	
.787	
.866	± .031
.984	
1.181	



Table XXXI Available cross sections and valid tolerances for EPDM 70 Shore A

Cross section (inches)	Tolerance
.079	± .012
.098	
.118	± .014
.138	
.157	
.197	± .016
.209	
.224	
.236	± .018
.276	
.315	± .020
.354	
.374	
.394	
.433	± .028
.472	
.512	
.551	
.591	
.709	± .035
.787	

The tolerances stated are valid for round cord rings (vulcanized) only and refer to the cross section. Due to the applied pressure during the vulcanization process, the junction point can be thinner than the cord. In general this has no negative effect on the sealing function.



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.

For further details regarding surface treatments, coatings and cleaning of seals please refer to the separate brochure *Friction-Free Running* or contact your local Trelleborg Sealing Solutions sales office.

D.6.1 O-Rings free of substances affecting the lacquer coating - Labs-free

In the automotive supply industry, it is important to assure that components are clean, principally for processes involving varnishing technology. No substances, which could affect the lacquer coating or cause so called dimples on the lacquer surface, are allowed in the system.

Due to the production system, elastomeric seals in particular may introduce such dimple creators. They may possibly contain processing aids, softeners or similar ingredients not necessarily based on silicone, which might affect the lacquer coating. The results are similar to the effects from well-known silicone oils.

The seals must be cleaned through a special process before using them in varnishing fields.

In a high-tech cleaning process the seals are rid of contaminating substances in or upon the surface. The result of the cleaning process is evaluated by a test following the test specification, "Colors and Lacquers" P-VW 3.10.7 for each batch. Subsequent exudation of mixture components is prevented. The seals cleaned through this process are labeled as Labs-free.

A special packaging and the respective labeling provide for easy storage.

Labs-free seals are also applied in the field of medical technology.

Article group OC.

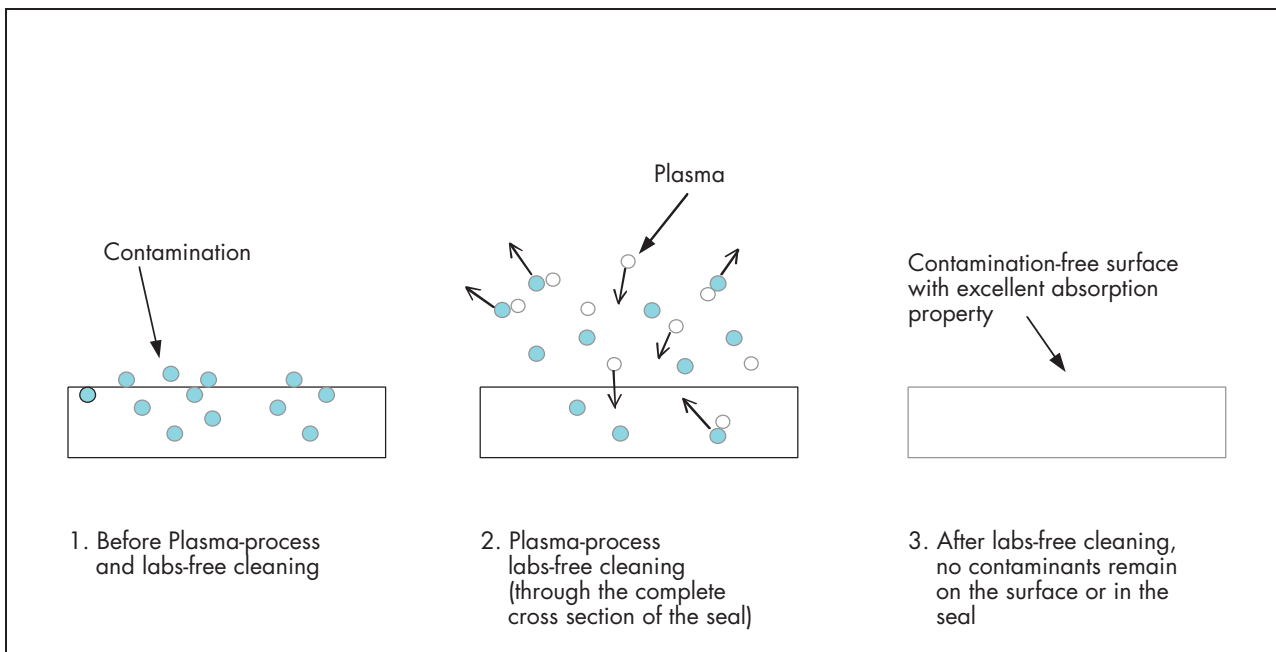


Figure 36 Schematic course of the labs-free treatment



O-Ring

Ordering example

(Further information see page 56)

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)

TSS Article No.	OC	30	04000	-	V7
TSS 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.

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

Table XXXII 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)
Talcum coating	OT	All	A	C	B	C
Elastolub 013 coating	OE	All except Silicones	C	A	C	C
Molycote treatment	OM	All	A	A	B	C
MaxWax®	-	All	A	A	A	C
DF treatment	OI	NBR	A	A	A	A
LF coating	OJ	All except Silicones	A	A	A	A
MF coating	OQ	All except Silicones	A	B	A	C
FF coating	OY	All except Silicones	A	A	A	B
SF coating	OS	All except Silicones	A	A	A	A

A = Very Good
B = Good
C = Satisfactory

This table is for guidance only. It represents a selection of the most important variants. Further proposals are available on request. Please contact your local Trelleborg Sealing Solutions sales office.



LF coating

The LF coating is a transparent, dry coating based on PTFE which is applied to the elastomer surface in a computerized process. The seal surface remains elastic.

To ensure permanent surface bonding the parts are pre-treated with plasma.

LF is primarily used to reduce surface friction among other things for dynamic applications and beyond that for the strong reduction up to the prevention of the gluing inclination of elastomeric seals.

- Flexible coating with surface bond
 - Transparent with a slight milkiness
 - UV-indicator allows 100 percent inspection
 - Water-based, solvent-free
 - Coating thickness about 80-240 µinch (2 - 6 µm) (deviations depending on part geometry are possible)
 - Operating temperature range of the coating material -40°F to +300°F (-40°C to +150°C)
 - Contains no substances with duty of declaration according to VDA 232-101
 - Constant process-secure quality
 - Reduced mounting forces through friction reduction
 - Pieces remain separate in packing
 - Reduction of the gluing inclination of elastomeric seals
 - Excellent usage for automated assembly
 - Suitable for dynamic applications, preferred at low rate or for short strokes
 - Suitable for various types of elastomers except silicones
- **Article group OJ**

MF coating

The MF coating is a dry coating which is applied to the elastomer surface in a computerized process. Similar to the LF coating, MF is transparent and based on PTFE.

The good surface bond is achieved through prior elevation of surface energy in the seal through a plasma treatment.

MF is primarily used to facilitate assembly of elastomeric seals and provides a better separating of parts. Due to its composition it is suited for one-time assembly only.

- Elastic, dry coating
 - Transparent with a slight milkiness
 - UV-indicator allows 100 percent inspection
 - Water-based, solvent-free
 - Coating thickness about 80-240 µinch (2 - 6 µm) (deviations depending on part geometry are possible)
 - Contains no substances with duty of declaration according to VDA 232-101
 - Constant process-secure quality
 - Prevents contamination of the assembly facilities
 - Pieces remain separate in packing
 - Excellent usage for automated assembly
 - Suitable for various types of elastomers except silicones
- **Article group OQ**



SF coating

SF coating is a black, dry coating based on PTFE particularly intended for use in dynamic applications.

To ensure permanent surface bonding the parts are pre-treated with plasma.

Signs of wear at the seal's surface are effectively reduced. Gluing phenomenon and stick-slip effects are nearly eliminated.

- Flexible coating with surface bond
- Black with UV indicator (allows 100 percent inspection)
- Water-based, solvent-free
- Coating thickness about 80-240 µinch (2 - 6 µm) (deviations depending on part geometry are possible)
- Contains no substances with duty of declaration according to VDA 232-101
- Constant, process-secure quality
- Operating temperature range of the coating material -40°F to +300°F (-40°C to +150°C)
- Pieces remain separate in packing
- Reduces mounting forces
- Reduction of the gluing inclination of elastomeric seals
- Excellent usage for automated assembly
- Friction reduction in dynamic use
- Reduces the seal surface's signs of wear in dynamic use
- Suitable for various types of elastomers except silicones
- **Article group OS**

FF coating

The transparent FF coating for elastomeric seals is especially suitable for the reduction of forces and to ease assembly.

Through FDA compliance FF can be used in corresponding applications of the food or the potable water industry.

As with SF coating the permanent surface bonding is assured through a pre-treatment with plasma.

- Flexible coating with surface bond based on PTFE
- Transparent: milky or dull
- Water-based, solvent free
- FDA compliant ("White list")
- Approved according to the Foodstuffs and Commodities Act (LMBG, § 5, paragraph 1)
- Complies with the standards of the German Federal Environmental Agency (FEA), valid for area D2 (seals)
- Coating thickness about 80-400 µinch (2-10 µm) (deviations depending on part geometry are possible)
- Contains no substances with duty of declaration according to VDA 232-101
- Constant process-secure quality
- Operating temperature range of the coating material -40°F to +300°F (-40°C to +150°C)
- Pieces remain separate in packing
- Reduces considerably mounting resp. plugging forces
- Reduces the risk of the seal shearing off during assembly
- Friction reduction for gentle dynamic use, e.g. infrequent switching operations with short strokes and at low rate
- Suitable for various types of elastomers except silicones
- **Article group OY**

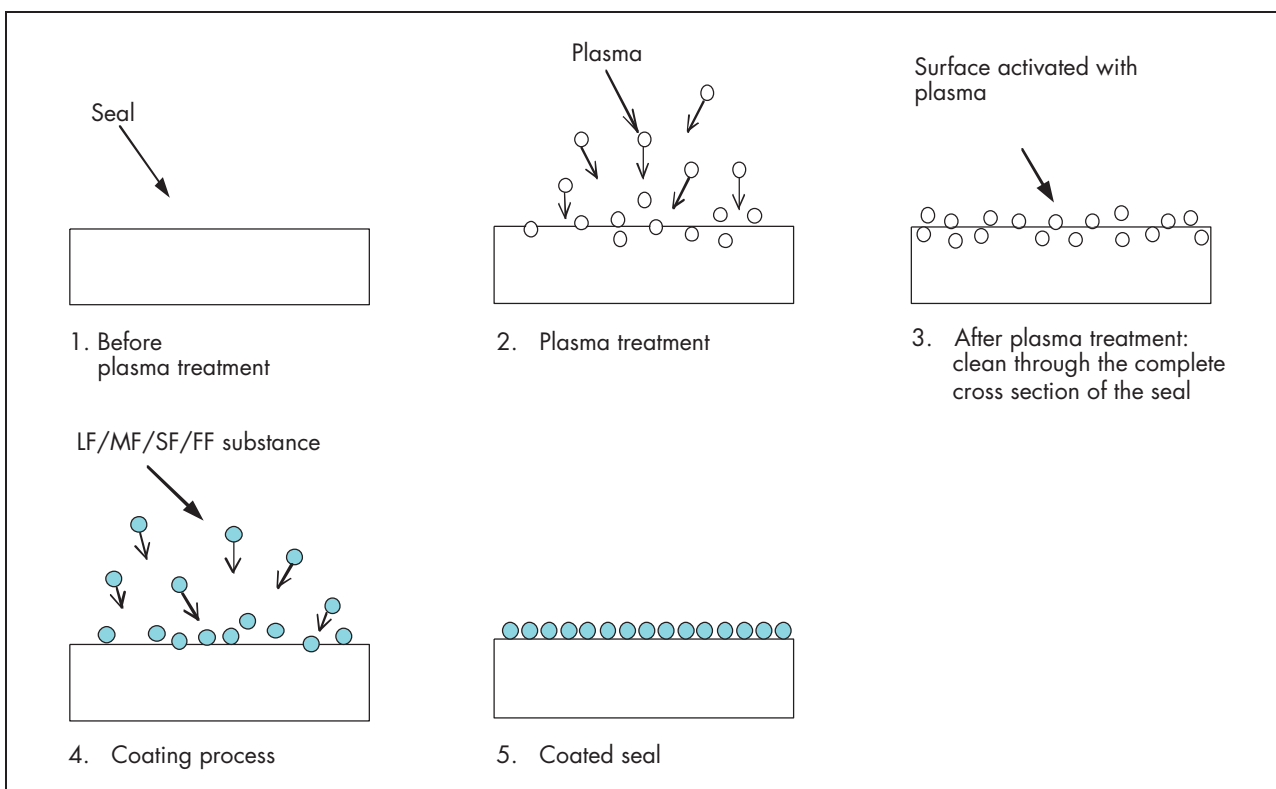


Figure 37 Schematic course of the LF, MF, SF and FF coating

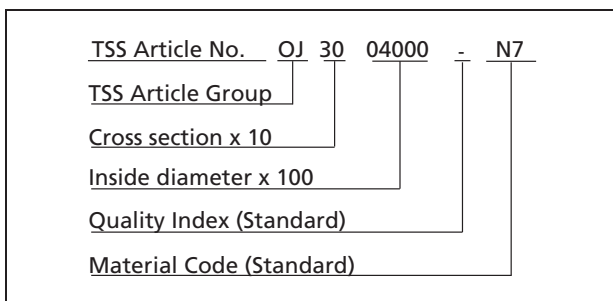
Ordering example LF coating

(Further information see page 56)

O-Ring, metric 40 x 3 - NBR 70, LF coated

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

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



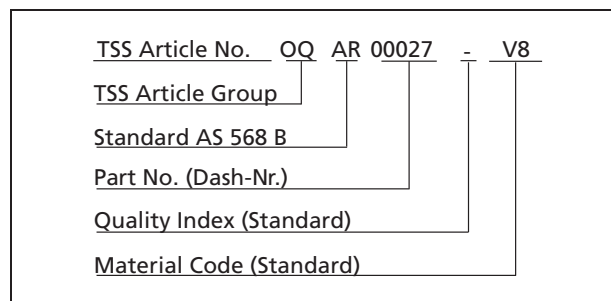
Ordering example MF coating

(Further information see page 56)

O-Ring, American Standard AS 568 B, ref. 27, MF coated

Dimensions: Inside diameter = 1.301 inches
Cross section = .070 inches

Material: FKM 80
(Fluorocarbon Rubber 80 Shore A)





DF treatment

In this computer-controlled process, especially 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 particularly environmentally-friendly nature and the dirt-free handling of the seals without odor 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 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 (sulfur-cured types)
- **Article group OI**

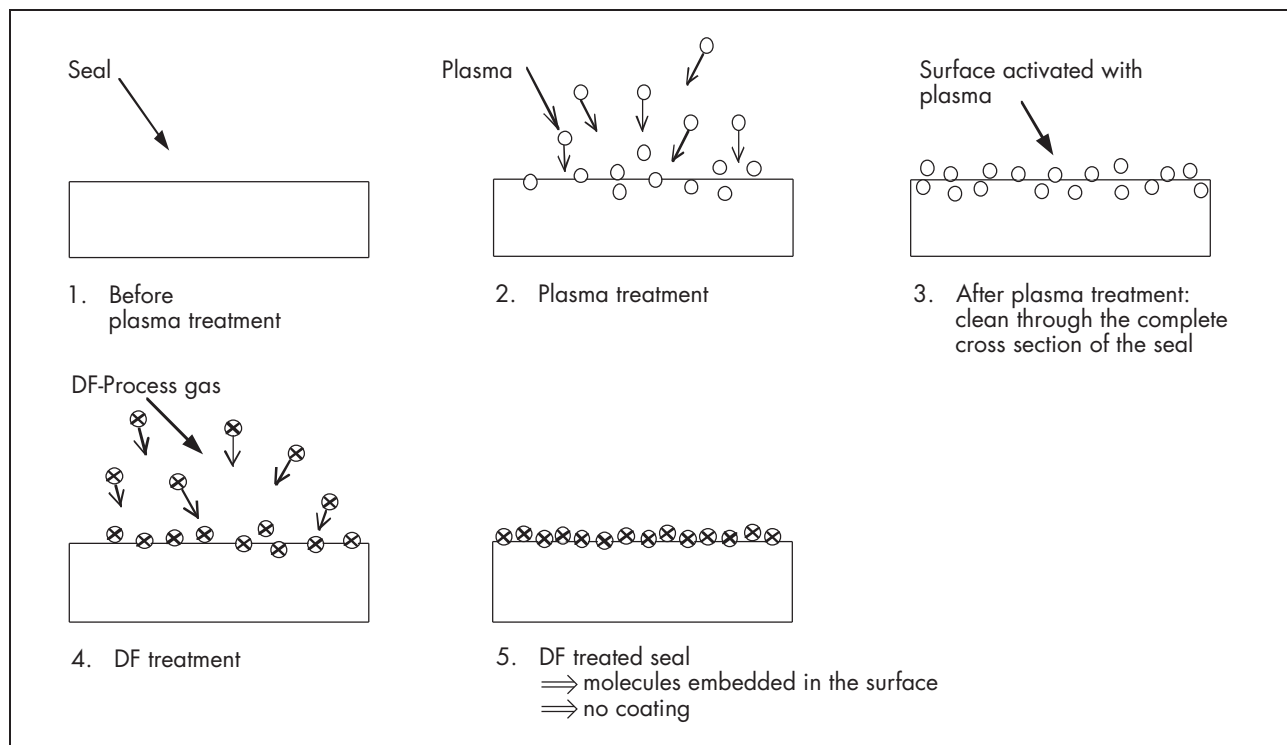


Figure 38 Schematic course of the DF treatment

Ordering example

If the product is also to be free from substances causing problems with paint wetting, state labs-free in the order. For further information, see page 56.

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)

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



Other variants of friction reducing processes

Molycote treatment

In Molycote treatment, high-purity, micro-fine molybdenum disulfide (MoS_2) is applied to the surface of the elastomer. 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 onto the sealing surface (silvery color)
- 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 buildup on the automatic assembly machine peripherals
- For all types of elastomers
- **Article group OM**

Elastolub 013 coating

Elastolub 013 is a silicone fluid-based lubricant. The substance is applied to the rings in a drum and combines very well with the elastomer 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, except silicone rubber
- **Article group OE**

Talcum coating

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

- Loose powder coating
- Prevent components from sticking together after packing
- 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 polyethylene in a diffusion process. No changes are made in the material composition.

- 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
- Available from Trelleborg Sealing Solutions Skellefteå

Further coating variants are available on request.



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 Trelleborg Sealing Solutions are continuously monitored according to strict quality standards from material acquisition 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 ISO 2859-1:2004-01 AQL 1,0 general inspection level II.

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 catalog. Customer-specific requirements are indicated by a different symbol in this position. Customers who require special quality criteria should contact their local Trelleborg Sealing Solutions sales office for assistance. We have experience in meeting all customer quality requirements.

E.2 Storage and shelf life of polymer sealing material

Seals and bearings are often stored for longer time periods. Due to wrong storage conditions the physical properties of elastomers may change during storage. Because of hardening, softening, crack initiation, breakage or other degradation they can become unusable. These types of material deterioration are the result of particular factors or a combination of factors such as deformation, high temperatures, contact with oxygen, ozone, light, humidity or other media.

A few simple precautions can help to extend shelf life of seals considerably. Basic instructions for the storage, cleaning and maintenance of elastomer sealing elements are described in international standards, such as: DIN 7716 / BS 3F68:1977, ISO 2230 or DIN 9088.

These standards provide several recommendations for the storage and the shelf life of elastomers, depending on the type of material.

The following requirements for storage of elastomers and other polymers, based on the recommendations of these standards, need to be followed to preserve the physical and chemical properties of such seals.

Heat

The storage temperature should preferably be between +40°F and +75°F (+5°C and +25°C). Direct contact with heat sources such as boilers, radiators or direct sunlight are to be avoided. During storage at low temperatures, elastomers can stiffen. Therefore the handling of seals at low temperatures must be done very carefully in order to avoid deformation or damage.

Humidity

The relative humidity in the storage area should be below 70%. Extreme humid or extreme dry conditions should be avoided. Condensation must not develop.

Light

Elastomer seals must be protected from light sources during storage. In particular direct sunlight and strong artificial light with an ultraviolet content should be avoided. The original storage bags, especially plastic bags, are favored if they provide UV protection.

In case of strong external light exposure it is recommended to mask the windows of the storage rooms with red or orange covers or screens.

Radiation

Elastomer seals should be stored protected from all sources of ionizing radiation likely to cause damage to the stored parts.

Oxygen and ozone

If possible elastomers should be stored in the original packaging or in airtight containers in order to protect them from circulating air.

Ozone is harmful to many sealing materials. Therefore no equipment producing ozone (i.e. mercury vapor lamps, high voltage electrical equipment, electric motors or other producers of electric sparks or electric discharges) should be kept in the storage areas. Also combustion emissions and organic vapors should be avoided as they may produce ozone via photochemical processes.



Deformation

If possible elastomer materials should be stored free from tension, compression or other deformation. Parts delivered in a tension-free condition should remain in their original packaging.

Contact with liquids and lubricants

Elastomer seals shall not come in contact with solvents, oils, greases or any other media at any time during storage, unless so packed by the manufacturer.

Contact with metal and non-metals

Direct contact with certain metals such as manganese, iron and particularly copper and its alloys, e.g. brass, are known to have damaging effects on some rubbers. Elastomer seals should not be stored in contact with such metals.

Because of possible transfer of plasticizers or other ingredients, rubbers should not be stored in contact with PVC. To avoid a mix-up different rubbers should preferably be stored separately from each other.

Cleaning

If necessary, cleaning should be carried out using soap and water (demineralized water to avoid lime stains) or denatured alcohol. However, water should not come into contact with fabric-reinforced components, polyurethane rubbers or metal components without anti-corrosive protection. Disinfectants or other organic solvents as well as sharp-edged objects should not be used. The cleaned parts should be dried at room temperature and should not be placed near heat sources.

Shelf life and shelf life control

The shelf life of seals depends to a large extent on the polymer type. When stored under the above recommended conditions the below listed shelf life for the different materials can be considered.

NR, SBR	2 years
AU, TFE/P, Thermoplastics	4 years
CR, CSM, ECO, HNBR, IIR, NBR	6 years
ACM, AEM, EPDM	8 years
FKM, FMQ, FVMQ, VMQ	10 years
FFKM, Isolast®	18 years
PTFE	unlimited

Elastomer seals need to be checked after the above periods. If the seals are okay an extension of the shelf life is possible.

Elastomer parts and components with less than .060 inches (1.5 mm) thickness are more strongly affected by oxidation degradation even if stored under ideal conditions according to the above described. Therefore they need to be checked and tested more frequently than mentioned above.

Pre-assembled elastomer parts and seals

Generally it is not recommended to store elastomer seals in assembled condition. If it is necessary to do so it is recommended that the units should be checked at least every six months. The maximum shelf life period a rubber component is allowed to remain assembled within a stored unit is a total of the initial period stated above and the extension period. The inspection interval will depend on the design and geometry of the unit.



O-Ring

Index

A

ACS 28
Adhesion 130, 135, 143-144
American Standards 56
Approval 28-29
Authorities 28-29
Axial installation 38

B

Back-up rings 7, 42, 131, 138
BAM 28
BfR 28
British standard 56

C

Chemical compatibility 5, 8-9
Chemicals 7, 9, 39, 130-131, 135
Chloroprene Rubber 5-6, 9
Clearance 40-41
Compression 37
Compression set 7, 9, 30-33
Contact pressure 36

D

Design recommendations 35
DF treatment 144
DVGW 28
Dynamic service 39, 41, 137

E

Elastolub 013 coating 144, 149
Elastomers 5, 7-9, 25, 41, 125, 138, 144, 149-150
Ethylene-Propylene-Diene 5
Extrusion 7, 41-42, 137-138, 141
Extrusion gap 7, 39, 137

F

FDA 28
FEP O-Ring 130
FF coating 144, 146
Fluorocarbon Rubber FKM 5
Fluorosilicone Rubber FVMQ 5
Foodstuff contact 130
Form deviations 127
Friction 36, 39, 130, 135, 137, 143-144, 149

G

Groove design 3, 40

H

Hardness 25, 30-33
Hydrogenated Nitrile Butadiene 6, 9

I

Initial compression 36
Installation 36, 134-135, 138
Installation recommendations 35
IRHD Hardness 25
Isolast® O-Rings 35, 130

J

Japanese standard 56
Joule effect 39

K

KTW 28, 148

L

Labs-free 148
Lead-in chamfers 7, 35, 40
LF coating 144-145

M

Materials 28
MaxWax® coating 149
MF coating 144-145
Military standard 56
Molycote treatment 144, 149

N

Nitrile Butadiene Rubber 6, 8
NSF 29

O

O-Ring sets 129
Ordering example 56, 134, 136, 144, 147-148
Oxygen 6-7, 138, 150

P

Part Number 56
Perfluoro Rubber 5-6, 9
Permeation 131
Polyacrylate Rubber ACM 5-6, 9
Polyurethane AU 5, 137
Polyurethane O-Rings 137-138
PTFE O-Rings, 130, 135-136

Q

Quality Acceptance Criteria 127
Quality criteria 150

R

Radial installation 38
Recommendations 43
Rectangular groove 42
Rotary service 39
Roto principle 39
Round cord rings 141



S

Seal Set	129
SF coating	144, 146
Shelf life	150
Shore hardness	7, 56, 123
Shrinkage	56, 125
Silicone rubber	149
Squeeze	4, 36-37, 40, 148
Standard materials	5, 30
Stick-slip effect	130
Storage	28, 150-151
Stretching	131
Surface finish	41
Surface treatment	143
Swedish treatment	56
Swelling	9-10

T

Talcum coating	144, 149
Temperature range	30-33, 131, 135, 148
Tetrafluoroethylene Propylene	5
Tolerance ID	133
Tolerances	7, 36, 125-127, 141
Trade names	5
Trapezoidal groove	42

U

UL	29
----	----

V

VMQ	9
Volume Change	7

W

WRAS	29
WRC	29



Notes

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