M SEALS
- Part of Diploma PLC



O-Rings

Durable, Versatile & Reliable

Small things make **GREAT** things possible

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About M Seals

Expert Sealing Solutions Designed for Industrial Performance.

M Seals is an international company founded in 1963 in Denmark, with offices in Sweden, the UK, Poland, Finland and China. Our many years of experience and knowledge make us a preferred sealing solutions supplier for customers worldwide.

We specialise in the design, manufacture and supply of sealing components and offer a comprehensive range of products tailored to different applications and industries. Our products range from standard seals, with thousands in stock for next day delivery, to customised solutions that meet specific requirements and special environmental conditions.

In 2007, M Seals became a part of Diploma PLC, giving us access to extensive resources and support. This affiliation allows us to offer expert advice, innovative solutions, and high-quality service, benefiting from shared knowledge and best practices within the group. This ensures we stay at the forefront of industry developments and deliver exceptional value to our customers.

Knowledge

We have developed extensive knowledge of seals and their applications, including their composition, lifetime and suitability for a specific job. The right choice of seal minimises the risk of unexpected breakdowns, so our team can advise on the best solution to save you from potential future issues.

We can make recommendations from our wide range of stocked seals or work with your specific requirements to design a bespoke sealing solution. Our team use their technical knowledge and experience to provide the best service to our customers.

Quality Assurance

We ensure high-quality sealing products through careful control and evaluation, and we are proud to have achieved several ISO certifications, including ISO9001:2015, ISO14001:2015, ISO45001:2018 and AS EN 9120:2018.

We also conform to many industry specific regulations, ensuring our sealing products comply to specific requirements and full traceability is maintained throughout the product lifecycle.



History & Introduction

HISTORY OF THE O-RING

The synthetic rubber O-ring seal is generally considered to have been developed into practical use in the USA by the Danish emigrant Niels Christensen. He filed a US patent for the O-ring in 1937 as part of his development work on street car brake systems. However, a Swedish patent was granted in 1896 to J.O. Lundberg – and on Edison's light bulb patent drawing from 1882, a round rubber ring is shown in the neck of the glass bulb!

O-rings were initially adopted by the aircraft industry during WWII as a simple and robust seal for hydraulic systems, but in the 1950s, they became widely adopted by car manufacturers and all general industry.

INTRODUCTION TO O-RINGS

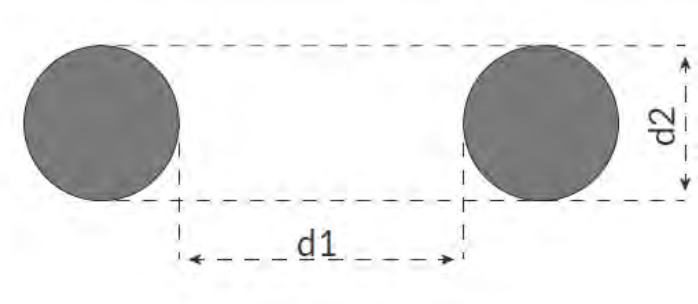
The O-ring seal is among the most ingenious and widely used designs in industrial machinery today. Its ability to effectively seal liquids and gases has been crucial, enabling the development and commercialization of countless everyday products.

The form of an o-ring is simple; it takes little space, it is flexible so it's easy to mount, and the uses are multiple. But behind this lies considerable technology in compounding the synthetic rubbers to the specific purposes and in quality control of production to obtain the necessary precision and a reliable seal.

O-rings sizes are specified by the inside diameter (d1) and the cross section diameter (d2), and are available in various metric and inch sizes. Most commonly used sizes are contained in ISO3601-1, but other standards exists like BS4518, BS1806, AS568A and SMS1586.

Beside the standardised sizes, a vast number of other dimensions are available.

In order to get full benefit from an O-ring, it is necessary to understand some basic characteristics of its behaviour.



BASIC PARAMETERS

- Rubber is essentially incompressible
- Rubber has a high coefficient of expansion – i.e. NBR is 10X the c.e. than for mild steel
- A certain degree of swelling can be expected in most fluids – up 10% is considered acceptable
- Taking the above characteristics into account, the volume of the seal housing shall always be designed so the volume is larger than the O-ring
- Rubber behaves like a high viscous liquid under pressure, and tends to extrude into the gap to be sealed – otherwise the rubber will be mechanically stressed and will rapidly show permanent setting or break
- Rubber gets brittle at very low temperatures, but the characteristic's remain unchanged when returning to normal temperatures.

THE SEALING FUNCTION

A successful O-ring joint requires a specific mechanical design that applies a predictable deformation to the O-ring. This introduces a calculated mechanical stress at the O-ring contacting surfaces. As long as the pressure the fluid being contained does not exceed the contact stress of the O-ring, leaking cannot occur. Because of the incompressible elastomeric nature of the O-ring, an increase of the fluid pressure will result in a reaction force with a proportionate increase of the contact stress. This is the reason why an O-ring can seal very high pressures as long as extrusion through the mating parts is prevented by the correct mechanical design.

For further information, please refer to the pressure and extrusion section.

History & Introduction



The O-ring is designed to have a point contact to the contacting faces. This gives a high local stress, able to contain pressures as high as 1000bars or more, without exceeding the yield stress of the O-ring body.

The flexible nature of O-ring materials conforms to imperfections in the contacting faces, but surface roughness has to be controlled within the recommendations given on page 8-9 in order to minimise friction and abrasion, especially on dynamic applications, where it is important to mention that a too smooth surface will result in an inadequate lubricating fluid film.

The correct selection of material compound is of utmost importance in order to ensure compatibility with the fluid to be sealed and the working temperature of the application. Please see the section about elastomer materials.

Next to the correct choice of basic material, is the design of the groove for which you can find guidelines on pages 8-9, and specification of the correct hardness of the material in order to control pressure, friction and wear.

With the synthetic elastomers on the market today, it is possible to have a reliable O-ring sealing in a broad range of temperatures from -60° to 327° of most fluids and gases at lower pressures. But at higher pressures, it is necessary to consider the design of the parts that are going to be sealed, the choice of elastomer material and the hardness.

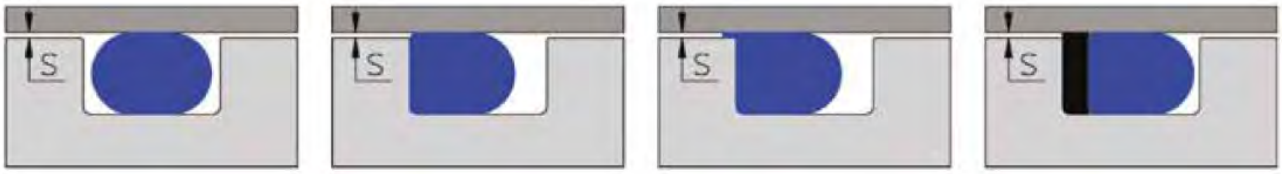
Almost every O-ring seal serves the purpose to fill gaps between two parts which otherwise had to be extremely accurately manufactured to be sealed on their own. But the O-ring material is to be considered like a very high viscous fluid which tends to flow into a gap (s) when under pressure, known as extrusion.

The illustrations below show the effect. This is one of the most common O-ring failures. There is close relation between the pressure, the hardness of the O-ring and the gap(s) to be sealed.

If it is not possible to limit the gap at a given pressure, even with a hard O-ring, a back-up, or anti-extrusion ring can be utilised. The back-up ring is in a material harder than the O-ring, but not so hard that it can damage the surfaces of the metal parts, often PTFE or Polyurethane. It is manufactured so it almost completely closes the gap into where the O-ring would tend to extrude. See the figure at far right below.

It is necessary to design a wider O-ring groove in order to accommodate the back-up ring. The proper function is highly depending on the accurate radial fit of the back-up ring in the given groove, and M Seals recommends that back-up rings are designed and manufactured for the specific application, although some standard ranges are available.

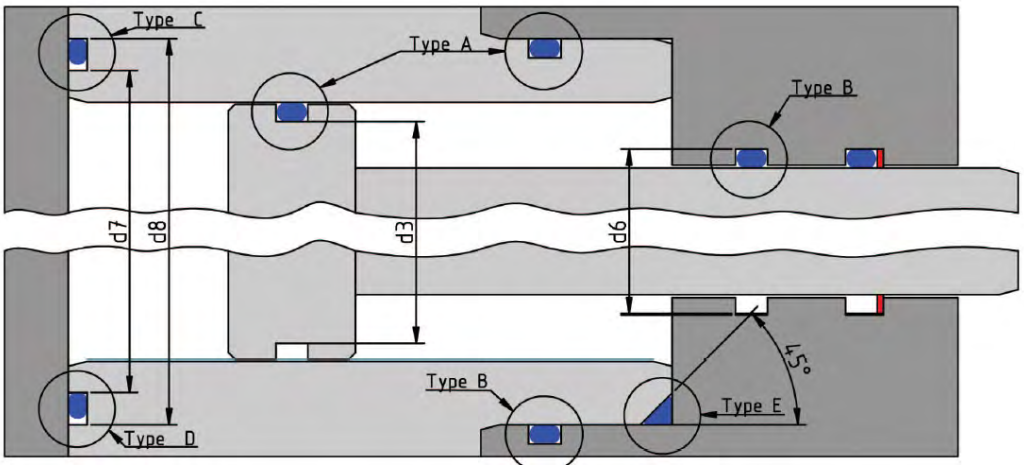
PRESSURE, EXTRUSION AND BACK-UP RINGS



O-ring not pressurised | *O-ring under pressure in normal working condition* | *O-ring extruded into sealing gap* | *Sealing gap limited by a back-up ring*

Application Guidelines

The O-ring has numerous application areas, but can be divided in to the following groups:



Type A: Piston glands (Dynamic/static) * see section on page 7 regarding dynamic sealing
Type B: Rod glands (Dynamic/static) * see section on page 7 regarding dynamic sealing
Type C. Face seal glands (static – internal pressure)
Type D: Face seal glands (static – external pressure)
Type E: Crush installation (triangular groove)

TYPE A , PISTON MOUNTED

- d3 is calculated by finding the proper depth of the groove (squeeze of the O-ring cross section) by using the table on page 8 according to the use – dynamic or static.
- The inside diameter of the O-ring (d1) shall be chosen so a stretch of about 3-6% is obtained. If the O-ring is not stretched, or the d1 is larger than the groove diameter d3, there is a risk of the O-ring being sheared during assembly and roll and movement in the groove can occur at reciprocating movements. The tolerances of both O-ring and groove shall be taken into account.
- The stretch of d1 will result in a slight reduction of the cross section (d2) which shall be taken into account when calculating the groove depth. As a rough thumb rule, the reduction of d2 in % is the half of the stretch of d1 in %.

TYPE B, HOUSING MOUNTED

- d6 is calculated by finding the proper depth of the groove (squeeze of the O-ring cross section) using the table on page 8 according to the use - dynamic or static.
- The inside diameter of the O-ring (d1) is found by taking d6 -2xd2 and choose the nearest larger size d1. It shall be chosen so a diametrical compression of the O-ring of about 0-5% is obtained. If the OD (d1 +2xd2) is smaller than the groove diameter d6, there is a risk of the O-ring being sheared during assembly and roll and movement in the groove can occur at reciprocating movements. If the OD is too large, the O-ring can bulge, and assembly gets difficult.

TYPE C, FACE SEAL, INTERNAL PRESSURE

- This is the most simple and reliable O-ring seal application, but a few things have to be considered
- The squeeze of the O-ring cross section is determined by the groove depth, and shall be within 15-25%
- By internal pressure, the OD (d1 +2xd2) of the ring shall be equal to, or slightly larger than d8
- In certain applications, by constant internal pressure, the inside wall of the groove can be omitted
- It is important to calculate flatness of the parts, material thicknesses, bolt sizes and distances between bolts, so that the parts don't get distorted under max. pressure, and a gap occur which will lead to extrusion of the O-ring.
- If pulsating pressure is foreseen, the surface roughness of the contact faces shall be finer than the sides of the groove because of the sliding movement of the O-ring. See figure on page 8.

Application Guidelines

TYPE D, FACE SEAL, EXTERNAL PRESSURE (OR INTERNAL VACUUM)

- In the case of external pressure, or vacuum, the ID of the O-ring shall be chosen equal to, or slightly smaller than d7.

TYPE C/D, FACE SEAL, TRAPEZOIDAL

- The groove can be designed in trapezoidal shape in order to keep the O-ring firmly in place during assembly. This groove is only practical to machine by O-ring cross sections larger than 3,50mm. See table on page 9. ID (d1) of the O-ring shall be the mean diameter of the groove minus d2.

TYPE E, CRUSH SEAL . TRIANGULAR SEAL

- This way of using an O-ring is sometimes practical and it needs little space, but it can be difficult to machine the groove to the accuracy needed to get a proper seal function, and be sure the groove is not overfilled. The dimensions and tolerances in the table on page 8 must be followed carefully. We recommend the use of rectangular grooves that are more forgiving to the machining.

DYNAMIC O-RING SEALS, RECIPROCATING AND OSCILLATING

- O-ring seals can be used in hydraulic and pneumatic reciprocating and oscillating movement where space is limited, or for simple economical reasons. The squeeze of the O-ring shall be kept as minimum - use table on page 8 or minimum 6%, and good lubrication shall be maintained due to the friction conditions. It is worth noting that beside the running friction, a starting torque, or break-out friction, is to be expected - it can be several times larger than the running friction. The use of a harder O-ring (90ShA) can give better result at higher pressures. An absolute seal is hard to obtain.
- Attention should be given to the surface roughness – see page 8, and hardness shall be 55 HRC.

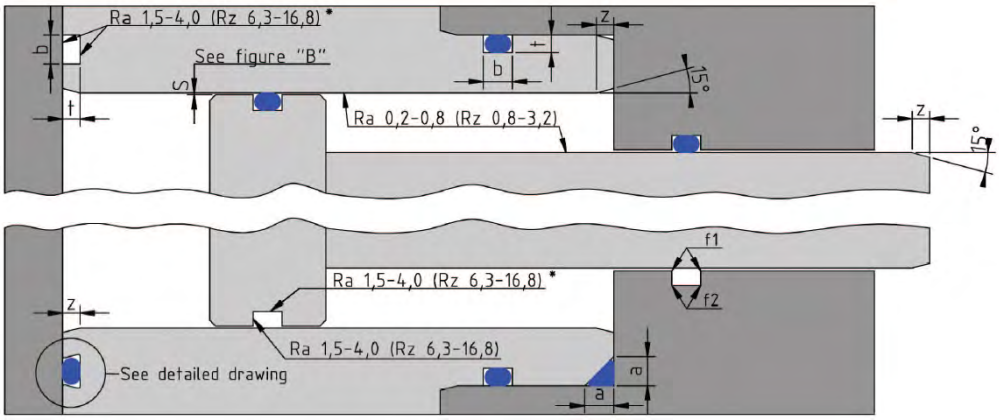
To overcome these disadvantages, M Seals recommends the use of one of the following alternatives in reciprocating action:

- Our M-Glide, M-Step or M Cap PTFE sealing sets which drastically reduced friction, almost eliminate starting torque and secure better sealing.
- The X-ring which has a 4-lobed cross section which has several advantages over O-rings, i.e. better resistant to roll and twist, and lower friction.
- If space allows, it is also recommended to use a more rugged dedicated hydraulic piston or rod seal.
- Further information can be found at www.m-seals.com.

DYNAMIC O-RING SEALS, ROTATING

- The use of simple O-ring seals in rotating applications shall be avoided, except very slow movement such as valve spindles. If no pressure is involved, a speed of 4m/sec can be accepted, if friction or lifetime is of no great concern. The ID (d1) of the O-ring shall be 5% larger than the shaft before installation, and will be compressed when installed. The width of the groove shall be kept smaller than usual – only slightly larger than the cross section (d2) of the O-ring, in order to prevent rotation.
- The use of the M-Turn PTFE antifriction seal will highly improve the performance, or a Radial Oil seal could be considered.

Groove Details

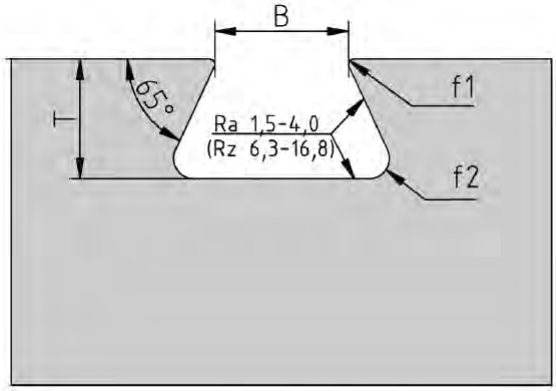


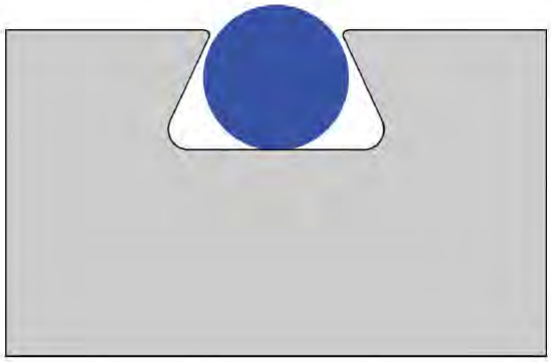
* Pulsating pressure:
Ra 1,5-2,5 (Rz 6,3-10,5)

Cross Section d2	Dynamic Application, hydraulic 1) t		Static Application, t		b 2)	f1	f2	Z	a	
0,50		+0 -0,05	0,35	+0 -0,05	0,80	0,10	0,25	1,0		+0,05 -0
0,75			0,50		1,00					
1,00	0,90		0,80		1,30				1,40	
1,20	1,08		0,96		1,56				1,60	
1,50	1,35		1,20		1,95				2,00	
1,60	1,44		1,28		2,08				2,20	
1,78	1,62		1,44		2,34				2,40	
1,80	1,62		1,44		2,34			1,5	2,40	
2,00	1,80		1,60		2,60				2,70	
2,20	1,98	±0,06	1,76		2,86				3,00	
2,40	2,16		1,92		3,12				3,20	
2,50	2,25		2,00		3,25				3,40	
2,62	2,34		2,08		3,38				3,50	
2,80	2,52		2,24		3,64	0,20	0,63	2,0	3,80	
3,00	2,70		2,40	±0,10	3,90				4,00	
3,50	3,15		2,80		4,55				4,80	
3,53	3,15		2,80		4,55				4,80	
4,00	3,60		3,20		5,20			3,0	5,40	
4,50	4,05		3,60		5,85				6,00	
5,00	4,50	±0,10	4,00	±0,15	6,50				6,70	+0,10 -0
5,33	4,80		4,27		6,95				7,15	
5,50	4,95		4,40		7,15			4,0	7,40	
5,70	5,18		4,60		7,47				7,70	
6,00	5,40		4,80		7,80				8,00	
6,50	5,85		5,20		8,45				8,70	
7,00	6,30		5,60		9,10				9,40	
7,50	6,75		6,00		9,75				10,00	
8,00	7,20		6,40		10,40				10,70	
8,50	7,65		6,80		11,05				11,40	
9,00	8,10		7,20		11,70				12,00	
9,50	8,55		7,60		12,35				12,70	
10,00	9,00		8,00		13,00				13,40	
12,00	11,00		9,60		13,50					

1) For pneumatic lubricated applications, the depth t can be increased by 5%
2) Groove width can be reduced if thermal expansion and volume swell is limited. A groove fill of max. 85% shall never be exceeded.

Trapezoidal Groove

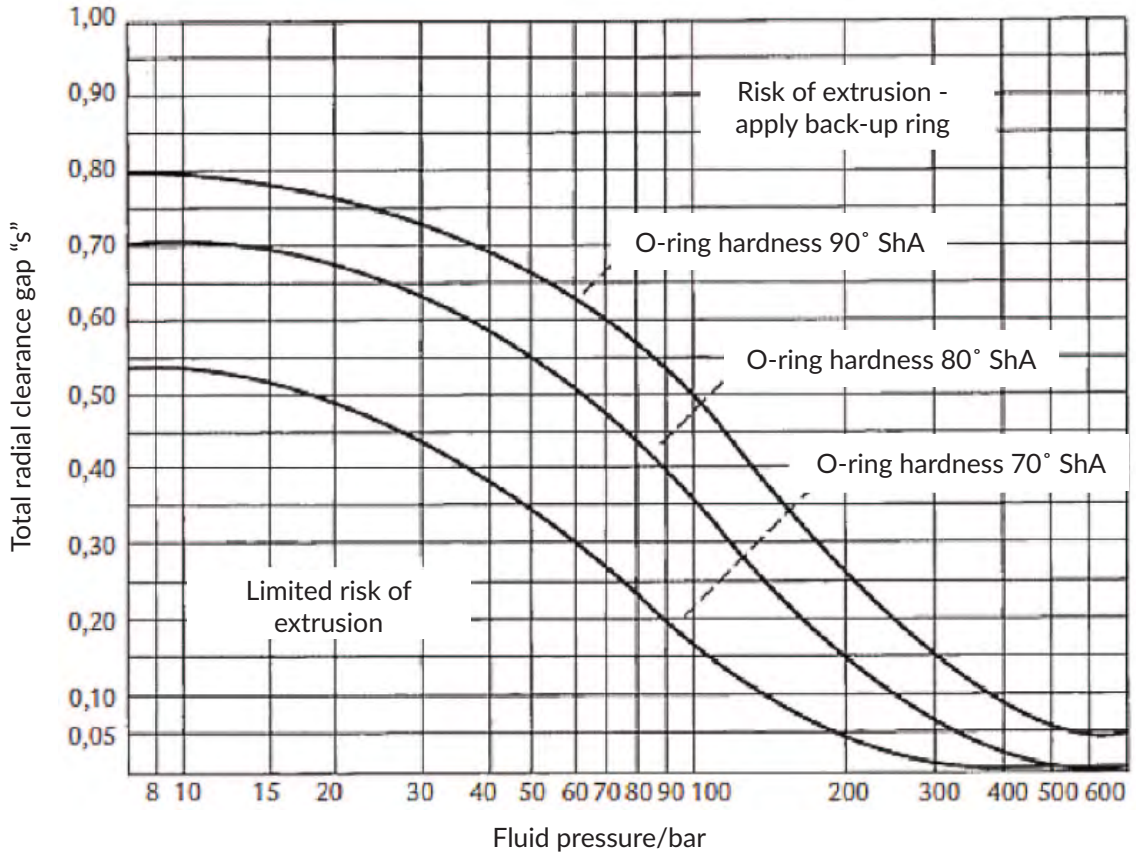




d2	T +/- 0,10	f1	f2	B +/- 0,1
3,53	2,80	0,25	0,80	3,10
4,00	3,20	0,25	0,80	3,50
4,50	3,60	0,25	0,80	4,00
5,00	4,00	0,25	0,80	4,40
5,33	4,27	0,25	0,80	4,70
5,70	4,60	0,25	0,90	5,00
6,00	4,80	0,40	0,90	5,50
6,50	5,20	0,40	0,90	5,90

d2	T +/- 0,10	f1	f2	B +/- 0,1
6,99	5,60	0,50	1,20	6,30
7,50	6,00	0,50	1,20	6,70
8,00	6,40	0,50	1,30	7,30
8,40	6,70	0,50	1,50	7,90
9,00	7,20	0,50	1,50	8,10
9,50	7,60	0,60	1,50	8,60
10,00	8,00	0,60	1,50	9,00

Max Permissible Clearance Gaps “s”



Elastomers for O-Rings

NBR Acrylonitrile (Buna, Perbunan)	NBR has a high resistance to petroleum products, mineral oil, grease, aliphatic hydrocarbons, vegetable oils and water. Not suited for ozone, sunlight and weathering. The polymer has good mechanical properties such as wear, compression set and heat resistance and can be used for a wide range of applications. Temperature range from -40˚C to -100˚C (depending on compound)
FPM/FKM Fluorocarbon	FPM has an excellent resistance to mineral oils, synthetic hydraulic oils, aliphatic hydrocarbons, chlorinated hydrocarbons, gasoline and many organic solvents and chemicals. Good ozone, weather and ageing resistance. Temperature range from -30˚C to +200˚C (depending on compound) FPM is also available in special grades.
HNBR Hydrogenated Nitrile	HNBR has a high oil resistance and an excellent resistance to ozone, ageing and weathering. Resistance to water and steam. High mechanical strength. Temperature range from -40˚C to +150˚C (depending on compound)
EPDM Ethylene Propylene	EPDM has excellent resistance to ozone, ageing and weathering. The polymer has very good low temperature properties and resistance to hot water and steam. Resistance to glycol and silicone based brake fluids, many polar solvents (alcohols, ketones), cleaning agents and lye. Poor resistance to mineral oil products. Temperature range from -50˚C to +150˚C (depending on compound)
VMQ Silicone	VMQ is the rubber with the largest temperature range. Silicone is well known for its high temperature capabilities in dry heat and water up to +130˚C, not suited to steam applications. Ozone, ageing and weather resistant. Moderate resistance to mineral oil products. Due to lower mechanical strength and wear capability it is mainly recommended for static sealing. Many compounds available in food and pharmaceutical qualities. Temperature range from -60˚C to +200˚C (depending on compound)
CR Chloroprene	CR has chemical and mechanical properties similar to NBR, but somewhat lower mineral oil products resistance. Improved ozone, weather and ageing resistance compared to NBR. Special qualities are resistant to some refrigerants (consult M Seals) Temperature range from -40˚C to +200˚C (depending on compound)
FFKM Kalrez®	FFKM is a unique polymer offering the highest chemical resistance in level with PTFE, and highest temperature of all rubbers. Temperature range from -40˚C to +326˚C (depending on compound)
TFE/P Aflas®	TFE/P has a high chemical resistance across a wide range of chemicals. Resistant to all types of engine oils, engine coolants, transmission and power steering fluids, and all types of brake fluids including DOT 3 and mineral oil. Resistant to steam and hot water. Temperature range from -9˚C to +230˚C (depending on compound)
PU Polyurethane	PU is made from a highly extrusion resistant material with excellent oil resistance. PU has a very high abrasion resistance and resists high pressures. Temperature range from -30˚C to +110˚C (depending on compound)

Food, Drinking Water and Pharmaceutical	Many of the above mentioned compounds are available in FDA and EU1935/2004 conforming materials. Several are also approved to USP Class VI. Many can be offered in accordance with 3A, NSF, WRC, KTW, ACS or BGA. Declaration of conformity is available on www.m-seals.com.
Oil & Gas	M Seals can offer many elastomer compounds that are designed to withstand the aggressive gases and chemicals that are present over a wide temperature range in the oil and gas industry, and still maintain their sealing properties. This includes compounds especially designed to withstand Rapid Gas Decompression (RGD). WE can meet requirements for the industry, e.g. NORSOK M-710, ISO23936, NACE TM0297, API6A and TOTAL GS EP PVV 142.

General Properties

Below is an overview of typical properties of elastomer families used for O-rings. This is a guideline only. The values and ratings can vary with the specific compounds. For detailed compatibility information, please contact M Seals.

Suitability	Increase of volume (swell) %	Decrease of hardness - IRHD	Change in physical properties
A - very good	<10 [1]	Max.10 [1]	Non or minor [1]
B - good	10-30 [1]	Max.20 [1]	Moderate [1]
C - limited	30-60 [1]	Max.30 [1]	Noticeable [1]
NR - not recommended	>60 [2]	Max.40 [2]	Considerable [2]

[1] In 30 days to 1 year [2] Immediately to 1 year

General Properties	NBR	EPDM	CR	FKM	VMQ	FEP[3]	FFKM
Hardness range Shore A	40-90	40-90	40-80	50-90	20-80	75-95	65-90
Upper continuous operating temp. ˚C [1]	+100˚C	+150˚C	+100˚C	+200˚C	+200˚C	+205˚C	+326˚C [4]
Lower continuous operating temp. ˚C [1]	-40˚C [4]	-50˚C [4]	-40˚C [4]	-30˚C [4]	-60˚C [4]	-60˚C [4]	-42˚C [4]
Dynamic operation, abrasion resistance	A	A	B	B	NR	C	B
Compression set	B	C	B	B	A	NR	B
Electrical Properties	B	A	B	C	C	B	C
Aldehyde	NR	B	NR	NR	B	B	A
Alkalis	C	A	NR	NR	C	A	A
Alcohols	B	B	B	B	B	A	A
Amines	NR	B	B	NR	C	A	B [4]
Animal oil and fat	A	B	B	A	B	A	A
Bleach solutions	NR	A	NR	A	B	A	A [4]
Diesel fuel	A	NR	C	A	NR	A	A
Esters – alkyl phosphate	NR	A	NR	NR	B	A	A
Esters – aryl phosphate	NR	A	NR	A	B	A	A
Ether	NR	C	NR	NR	NR	A	A
Liquid petroleum gas, LPG	A	NR	B	A	C	A	A
Gas permeability	C	C	C	A	NR	C	A
Ketones	NR	A	NR	NR	NR	A	A
Hydrocarbons - aliphatic	A	NR	C	A	NR	A	A
Hydrocarbons - aromatic	C	NR	NR	A	NR	A	A
Air, compressed	A	A	A	A	A	A	A
Kerosene/paraffin	A	NR	C	A	NR	A	A
Crude oil	B	NR	NR	A	NR	A	A
Silicone oil	A	A	A	A	NR	A	A
Lubricating oil - mineral	A	NR	B	A	C	A	A
Lubricating oil - synthetic (diester)	B	NR	C	A	NR	A	A
Acid - inorganic	C	C	C	A	B	A	A
Acid - organic	C	B	C	C	C	A	A
Toluene	NR	NR	NR	B	NR	A	A
Trichloroethylene	NR	NR	NR	B	NR	A	A
Steam	NR	A	C	NR [4]	NR	A	A [4]
Vegetable oil	A	C	NR	A	B	A	A
Aging in Oxygen	C	B	B	A	B	A	A
Aging in Ozone	NR	A	B	A	B	A	A
Aging in weather	NR	A	B	A	B	B	A

[3] FEP is used for O-rings as encapsulating with a core of either FPM or MVQ. Data is given in accordance with this use. [4] Depending on compound

Kalrez®

Standard and custom Kalrez® parts are able to fill every need for rubber shapes: O-rings in all standard ISO 3601-1 sizes and more than 400 standard metric sizes, as well as custom O-rings and custom shapes such as diaphragms, valve seats, V-rings, T-seals and tubing.

Wherever rubber components are exposed to aggressive chemicals or high temperatures, Kalrez® perfluorelastomer parts last longer. In any harsh environment for rubber components, Kalrez® parts can help you:

- Reduce costly seal failures
- Save on maintenance costs
- Improve productivity
- Increase safety and reduce the risks of environmental hazards.

FIGHTING LEAKS

Kalrez® can help you to avoid the problems and associated high costs of leaky seals by reducing repairs, unscheduled shutdowns, and safety and environmental hazard.

SAVING ON MAINTENANCE

Kalrez®parts stretch your maintenance budget. Their increased durability lets you space-out routine inspections and replacement cycles for critical components without increasing the risk of costly seal failure.

MORE PRODUCTIVITY

With fewer shutdowns for repairs, inspection and routine seal replacement, process and equipment productivity go up. You get more products to sell, deliver more profit to the bottom line.

SAFETY AND ENVIRONMENT

By cutting down on leaky seals, you increase safety in the workplace and improve compliance with today's stringent environmental requirements.



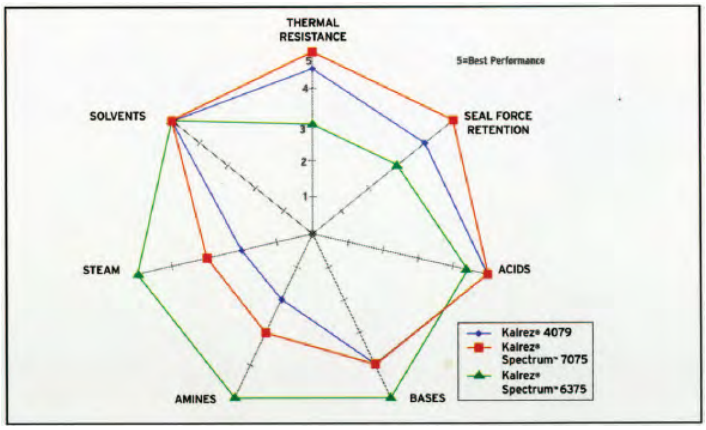
KALREZ® CAN DO THE JOB FOR YOU

Virtually anywhere rubber parts are exposed to chemical attack or high temperature degradation Kalrez®has proven its performance. Look to Kalrez® for cost effective seals or other components for these and other applications:

- Aircraft and aerospace
- Analytical and process instruments
- Chemical process industries
- Agricultural chemicals and fertilizers
- Petroleum refining, petrochemicals
- Pharmaceuticals
- Polymer production
- Inorganic chemicals
- Organic chemicals
- Chemical transport
- Oil and gas recovery
- Paint and coating operations
- Semiconductor manufacturing

M SEALS - A KALREZ® DISTRIBUTOR

As authorized Kalrez® distributor for Denmark and Sweden, M Seals has the expertise to support your needs for demanding sealing tasks. We are in close cooperation with Du Pont technical service and development laboratories for deep support. M Seals stock a large number of standard O-rings in Kalrez® ready for immediate delivery.



KALREZ® COMPOUNDS

Cpd	Max. Temp	Hardness shA	
6375	275	75	Broadest chemical resistance
7075	327	75	Highest thermal resistance
6221	260	70	White, FDA compliant, SIP, WFI, Stage II sterilization
6230	260	75	Black, FDA compliant, SIP, WFI, Stage II sterilization

Kalrez®

DOCUMENTED CHEMICAL RESISTANCE

Kalrez® parts have virtually universal chemical resistance. They are far more resistant to swelling, a key cause of seal failure, and to other forms of chemical attack than other elastomers. In over a decade of field and laboratory experience, Kalrez® parts have proved their long-term resistance to more than 1500 chemicals. A summary of these results is provided in the table below.

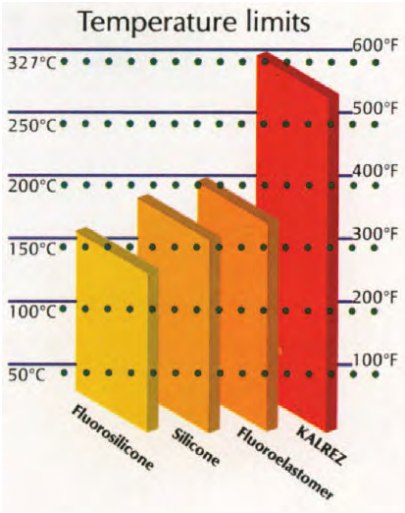
CHEMICAL COMPATIBILITY OF KALREZ® PARTS

Inorganic acids	Sulfuric, nitric, hydrochloric etc
Organic acids	Acetic, adipic, formic etc
Inorganic bases	Sodium, hydroxide, ammonia etc
Organic bases	Ethylene diamine, diethanolamine etc
Alcohol	Ethylene glycol, phenol, methanol etc
Aldehydes	Furfural, formaldehyde, butryaldehyde etc
Ketones	Acetone, methyl ethyl ketone (MEK), methyl isobutyl ketone (MIBK) etc
Solvents	Methylene chloride, dimethyl formamide, 'Cellosolve'*, n-methyl pyrrolidone (NMP) etc
Ethers	Tetrahydrofuran, dimethyl ether, dioxane etc
Esters	Vinyl acetate, butyl acetate etc
Aromatics	Benzene, xylene styrene, toluene etc
Heat transfer fluids	Dowtherm[1] A, Therminol[2] etc
Synthetic oils and lubricants	
Organic intermediates	Dimethyl terephthalate, ethylene, dichloride, adiponitrile etc

*Union Carbide registered trademark for mono and dialkyd esters of ethylene glycol and their derivatives [1] Dow Chemical registered trademark [2] Monsanto registered trademark

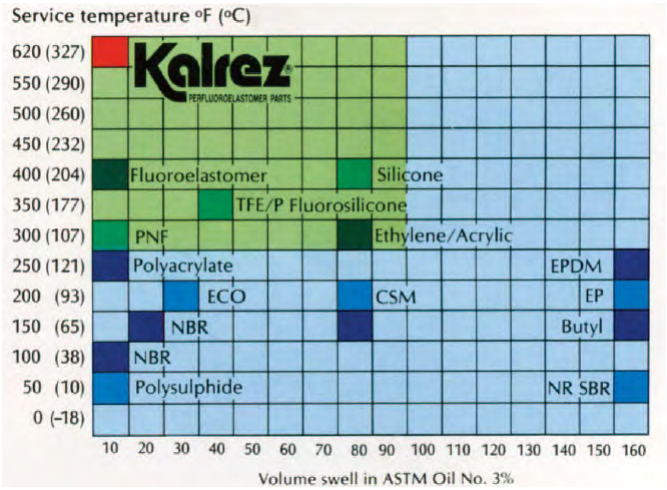
PROVEN THERMAL STABILITY

Kalrez® parts resist hardening and embrittlement, the principal heat-related causes of seal degradation and failure. They retain their elasticity and recovery properties at temperatures up to 327˚C/620˚F in long term service. As shown to the right, these service temperatures are much higher than other high temperature elastomers. The temperature ratings for Kalrez® are supported by thermo gravimetric analyses (TGA), thermal evolution analyses (TEA) and more than a decade of field experience. Additional technical data available upon request.



Kalrez® parts also demonstrate excellent performance in high vacuum environments. They exhibit negligible out-gassing over a wide temperature range, a requirement in semiconductor manufacture, aerospace applications, analytical instruments and other applications where freedom from contamination of process streams in critical.

RELATIVE HEAT & OIL RESISTANCE OF ELASTOMERS



SEALING PERFORMANCE

Kalrez® is a cross-linked rubber which compresses easily and seals effectively on all types of surface. Unlike plastics which creep, Kalrez® maintains tight, effective seals. After exposure to aggressive chemicals and temperatures that cause other rubbers to swell excessively, harden or become brittle, Kalrez® parts continue to perform.

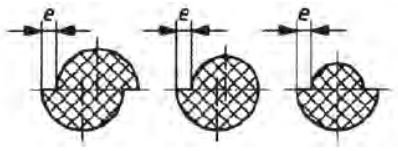
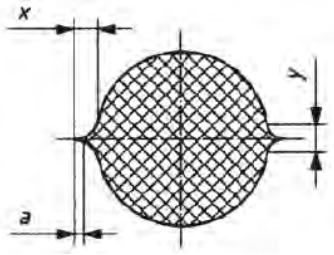
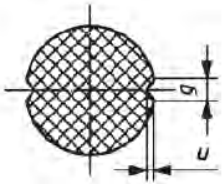
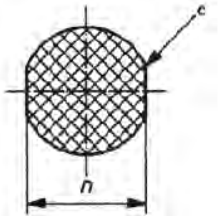
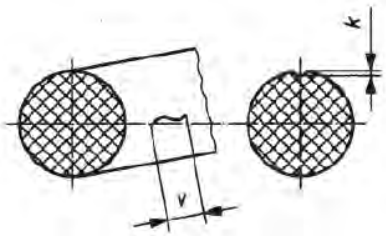
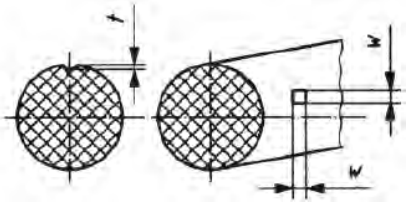
Less swelling - Chemically induced swelling can cause O-rings and sealing components made of other rubbers to expand out of retaining grooves and produce leaks. Kalrez® parts resist swelling in a wider range of chemicals than any other elastomer over a wide range of temperatures.

High temperature resistance - Long-term exposure to elevated temperatures can cause other elastomers to become hard and brittle. Kalrez® parts retain their elasticity and recovery properties even after long-term exposure to temperatures up to 327˚C/620˚F.

More reliable than metal - Because they rely on precision-machined surfaces, perfect metal seals are hard to produce and prone to failure, as true rubbers Kalrez® parts conform to irregular metal surfaces, are easy to install and replace.

Outperforming PTFE - Kalrez® parts are the only elastomer components that match PTFE in chemical resistance. But unlike PTFE, Kalrez® parts have the true rubber properties of elasticity and recovery that are vital to many sealing applications. Also unlike PTFE, Kalrez® parts do not creep or flow and reduce shaft fretting to a minimum in dynamic use.

Surface Imperfections Limits

Surface Imperfection Type	Diagrammatic Representation	Limiting Dimensions	Maximum Limits of Imperfections Grade N O-Rings Cross-section, d_2				
			>0.8[b] ≤2.25	>2.25 ≤3.15	>3.15 ≤4.50	>4.50 ≤6.30	>6.30 ≤8.40[b]
Off-register, mismatch (offset)		*e*	0.08	0.10	0.13	0.15	0.15
Combined flash (combination of offset, flash and parting line projection)		*x*	0.10	0.12	0.14	0.16	0.18
		y	0.10	0.12	0.14	0.16	0.18
		a	When the flash can be differentiated, it shall not exceed 0.07mm				
Backrind		*g*	0.18	0.27	0.36	0.53	0.70
		u	0.08	0.08	0.10	0.10	0.13
Excessive trimming (radial tool marks not allowed)		*n*	Trimming is allowed provided the dimension n is not reduced below the minimum dimension d_2 for the o-ring.				
Flow marks (radial orientation of flow marks is not permissable)		*v*	1.50[a]	1.50[a]	6.50[a]	6.50[a]	6.50[a]
		k	0.08	0.08	0.08	0.08	0.08
Non-fills and indentations (including parting line indentations)		*w*	0.60	0.80	1.00	1.30	1.70
		t	0.08	0.08	0.10	0.10	0.13

[a] Or 0.05 times the o-ring's inside diameter (d_1), whichever is greater
[b] Limits of imperfections for cross sections <0.8mm or >8.40mm shall be agreed upon between manufacturer and customer
[c] Round edges

Standard Dimensions

Standard dimensions according to ISO3601:2008 class B (red) and SMS1586 (blue).

Most of the dimensions shown are stock items in one or more materials as NBR, FPM, EPDM etc.

# No.	Size d1 x d2	Tolerance d1	# No.	Size d1 x d2	Tolerance d1	# No.	Size d1 x d2	Tolerance d1	# No.	Size d1 x d2	Tolerance d1
	3,10 x 1,60	+/-0,15	004	1,78 x 1,78	+/-0,13	028	34,65 x 1,78	+/-0,37		3,30 x 2,40	+/-0,10
	4,10 x 1,60	+/-0,15	005	2,57 x 1,78	+/-0,13	029	37,82 x 1,78	+/-0,39		4,30 x 2,40	+/-0,10
	5,10 x 1,60	+/-0,15	006	2,90 x 1,78	+/-0,13	030	41,00 x 1,78	+/-0,42		5,30 x 2,40	+/-0,10
	6,10 x 1,60	+/-0,15	007	3,68 x 1,78	+/-0,14	031	44,17 x 1,78	+/-0,44		6,30 x 2,40	+/-0,10
	7,10 x 1,60	+/-0,15	008	4,47 x 1,78	+/-0,15	032	47,35 x 1,78	+/-0,46		7,30 x 2,40	+/-0,10
	8,10 x 1,60	+/-0,15	009	5,28 x 1,78	+/-0,15	033	50,52 x 1,78	+/-0,48		8,30 x 2,40	+/-0,10
	9,10 x 1,60	+/-0,15	010	6,07 x 1,78	+/-0,16	034	53,70 x 1,78	+/-0,51		9,30 x 2,40	+/-0,10
	10,10 x 1,60	+/-0,20	011	7,65 x 1,78	+/-0,17	035	56,87 x 1,78	+/-0,53		10,30 x 2,40	+/-0,15
	11,10 x 1,60	+/-0,20	012	9,25 x 1,78	+/-0,18	036	60,05 x 1,78	+/-0,55		11,30 x 2,40	+/-0,15
	12,10 x 1,60	+/-0,20	013	10,82 x 1,78	+/-0,20	037	63,22 x 1,78	+/-0,57		12,30 x 2,40	+/-0,15
	13,10 x 1,60	+/-0,20	014	12,42 x 1,78	+/-0,21	038	66,40 x 1,78	+/-0,59		13,30 x 2,40	+/-0,15
	14,10 x 1,60	+/-0,20	015	14,00 x 1,78	+/-0,22	039	69,57 x 1,78	+/-0,62		14,30 x 2,40	+/-0,15
	15,10 x1,60	+/-0,20	016	15,60 x 1,78	+/-0,23	040	72,75 x 1,78	+/-0,64		15,30 x 2,40	+/-0,15
	16,10 x 1,60	+/-0,20	017	17,17 x 1,78	+/-0,24	041	75,92 x 1,78	+/-0,66		16,30 x 2,40	+/-0,15
	17,10 x 1,60	+/-0,20	018	18,77 x 1,78	+/-0,26	042	82,27 x 1,78	+/-0,70		17,30 x 2,40	+/-0,15
	18,10 x 1,60	+/-0,30	019	20,35 x 1,78	+/-0,27	043	88,62 x 1,78	+/-0,75			
	19,10 x1,60	+/-0,30	020	21,95 x 1,78	+/-0,28	044	94,97 x 1,78	+/-0,79			
	22,10 x 1,60	+/-0,30	021	23,52 x 1,78	+/-0,29	045	101,32 x 1,78	+/-0,83	102	1,24 x 2,62	+/-0,12
	25,10 x 1,60	+/-0,30	022	25,12 x 1,78	+/-0,30	046	107,67 x 1,78	+/-0,88	103	2,06 x 2,62	+/-0,13
	27,10 x 1,60	+/-0,30	023	26,70 x 1,78	+/-0,31	047	107,67 x 1,78	+/-0,88	104	2,84 x 2,62	+/-0,13
	29,10 x 1,60	+/-0,30	024	28,30 x 1,78	+/-0,33	048	120,37 x 1,78	+/-0,96	105	3,63 x 2,62	+/-0,14
	32,10 x 1,60	+/-0,30	025	29,87 x 1,78	+/-0,34	049	126,72 x 1,78	+/-1,01	106	4,42 x 2,62	+/-0,15
	35,10 x 1,60	+/-0,30	026	31,47 x 1,78	+/-0,35	050	133,07 x 1,78	+/-1,05	107	5,23 x 2,62	+/-0,15
	37,10 x 1,60	+/-0,30	027	33,05 x 1,78	+/-0,36				108	6,02 x 2,62	+/-0,16

Tolerances for intermediate sizes - go to the next size in the table.

Tolerances for O-rings >Ø660mm is app. +/- d1 x 0,0065

For exact calculation use $\Delta d1 = +/- [(d_1^{0,95}) \times 0,009+0,11]$

The above tolerances are valid for O-rings supplied from M Seals in most materials measured at 21° to 25°C and as per ISO3601:2008 annex B. Excepted are i.e. O-rings in Kalrez® materials, FEP Encapsulated O-rings and M Maxi O-rings made from extruded cord – tolerances for these groups can be informed at request.

For tolerances for d2 see page 19 and for surface imperfections see page 14.

This is only a part of our large selection of o-rings and many other sizes are available from stock or within a short delivery time. Please see www.m-seals.com for further details.

Utilising our manufacturing capabilities, virtually any size can be produced to order.

Standard Dimensions

Standard dimensions according to ISO3601:2008 class B (red) and SMS1586 (blue).

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# No.	Size d1 x d2	Tolerance d1	# No.	Size d1 x d2	Tolerance d1	# No.	Size d1 x d2	Tolerance d1	# No.	Size d1 x d2	Tolerance d1
109	7,59 x 2,62	+/-0,17	133	45,69 x 2,62	+/-0,45	157	113,97 x 2,62	+/-0,92		19,20 x 3,00	+/-0,20
110	9,19 x 2,62	+/-0,18	134	47,29 x 2,62	+/-0,46	158	120,32 x 2,62	+/-0,96		22,20 x 3,00	+/-0,20
111	10,77 x 2,62	+/-0,20	135	48,90 x 2,62	+/-0,47	159	126,67 x 2,62	+/-1,00		24,20 x 3,00	+/-0,20
112	12,37 x 2,62	+/-0,21	136	50,47 x 2,62	+/-0,48	160	133,02 x 2,62	+/-1,05		26,20 x 3,00	+/-0,20
113	13,94 x 2,62	+/-0,22	137	52,07 x 2,62	+/-0,49	161	139,37 x 2,62	+/-1,09		29,20 x 3,00	+/-0,20
114	15,54 x 2,62	+/-0,23	138	53,64 x 2,62	+/-0,51	162	145,72 x 2,62	+/-1,13		32,20 x 3,00	+/-0,30
115	17,12 x 2,62	+/-0,24	139	55,25 x 2,62	+/-0,52	163	152,07 x 2,62	+/-1,17		34,20 x 3,00	+/-0,30
116	18,72 x 2,62	+/-0,26	140	56,82 x 2,62	+/-0,53	164	158,42 x 2,62	+/-1,22		36,20 x 3,00	+/-0,30
117	20,29 x 2,62	+/-0,27	141	58,42 x 2,62	+/-0,54	165	164,77 x 2,62	+/-1,26		39,20 x 3,00	+/-0,30
118	21,89 x 2,62	+/-0,28	142	59,99 x 2,62	+/-0,55	166	171,12 x 2,62	+/-1,30		42,20 x 3,00	+/-0,30
119	23,47 x 2,62	+/-0,29	143	61,60 x 2,62	+/-0,56	167	177,47 x 2,62	+/-1,34		44,20 x 3,00	+/-0,30
120	25,07 x 2,62	+/-0,30	144	63,17 x 2,62	+/-0,57	168	183,82 x 2,62	+/-1,38		49,50 x 3,00	+/-0,40
121	26,64 x 2,62	+/-0,31	145	64,77 x 2,62	+/-0,58	169	190,17 x 2,62	+/-1,43		54,50 x 3,00	+/-0,40
122	28,24 x 2,62	+/-0,33	146	66,34 x 2,62	+/-0,59	170	196,52 x 2,62	+/-1,47		59,50 x 3,00	+/-0,40
123	29,82 x 2,62	+/-0,34	147	67,95 x 2,62	+/-0,61	171	202,87 x 2,62	+/-1,51		64,50 x 3,00	+/-0,40
124	31,42 x 2,62	+/-0,35	148	69,52 x 2,62	+/-0,62	172	209,22 x 2,62	+/-1,55		69,50 x 3,00	+/-0,40
125	32,99 x 2,62	+/-0,36	149	71,12 x 2,62	+/-0,63	173	215,57 x 2,62	+/-1,59		74,50 x 3,00	+/-0,40
126	34,59 x 2,62	+/-0,37	150	72,69 x 2,62	+/-0,64	174	221,92 x 2,62	+/-1,63		79,50 x 3,00	+/-0,40
127	36,17 x 2,62	+/-0,38	151	75,87 x 2,62	+/-0,66	175	228,27 x 2,62	+/-1,68		84,50 x 3,00	+/-0,40
128	37,77 x 2,62	+/-0,39	152	82,22 x 2,62	+/-0,70	176	234,62 x 2,62	+/-1,72		89,50 x 3,00	+/-0,40
129	39,34 x 2,62	+/-0,40	153	88,57 x 2,62	+/-0,75	177	240,97 x 2,62	+/-1,76		94,50 x 3,00	+/-0,40
130	40,94 x 2,62	+/-0,42	154	94,92 x 2,62	+/-0,79	178	247,32 x 2,62	+/-1,80		99,50 x 3,00	+/-0,40
131	42,52 x 2,62	+/-0,43	155	101,27 x 2,62	+/-0,83					104,50 x 3,00	+/-0,40
132	44,12 x 2,62	+/-0,44	156	107,62 x 2,62	+/-0,88					109,50 x 3,00	+/-0,40

Tolerances for intermediate sizes - go to the next size in the table.

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# No.	Size d1 x d2	Tolerance d1	# No.	Size d1 x d2	Tolerance d1	# No.	Size d1 x d2	Tolerance d1	# No.	Size d1 x d2	Tolerance d1
	114,50 x 3,00	+/-0,40	226	50,39 x 3,53	+/-0,48	260	164,69 x 3,53	+/-1,26	316	21,59 x 5,33	+/-0,28
	119,50 x 3,00	+/-0,40	227	53,57 x 3,53	+/-0,51	261	171,04 x 3,53	+/-1,30	317	23,16 x 5,33	+/-0,29
	124,50 x 3,00	+/-0,40	228	56,74 x 3,53	+/-0,53	262	177,39 x 3,53	+/-1,34	318	24,77 x 5,33	+/-0,30
	129,50 x 3,00	+/-0,40	229	59,92 x 3,53	+/-0,55	263	183,74 x 3,53	+/-1,38	319	26,34 x 5,33	+/-0,31
	134,50 x 3,00	+/-0,40	230	63,09 x 3,53	+/-0,57	264	190,09 x 3,53	+/-1,43	320	27,94 x 5,33	+/-0,32
	139,50 x 3,00	+/-0,40	231	66,27 x 3,53	+/-0,59	265	196,44 x 3,53	+/-1,47	321	29,51 x 5,33	+/-0,33
	144,50 x 3,00	+/-0,40	232	69,44 x 3,53	+/-0,62	266	202,79 x 3,53	+/-1,51	322	31,12 x 5,33	+/-0,35
			233	72,62 x 3,53	+/-0,64	267	209,14 x 3,53	+/-1,55	323	32,69 x 5,33	+/-0,36
			234	75,79 x 3,53	+/-0,66	268	215,49 x 3,53	+/-1,59	324	34,29 x 5,33	+/-0,37
201	4,34 x 3,53	+/-0,15	235	78,97 x 3,53	+/-0,68	269	221,84 x 3,53	+/-1,63	325	37,47 x 5,33	+/-0,39
202	5,94 x 3,53	+/-0,16	236	82,14 x 3,53	+/-0,70	270	228,19 x 3,53	+/-1,68	326	40,64 x 5,33	+/-0,41
203	7,52 x 3,53	+/-0,17	237	85,32 x 3,53	+/-0,72	271	234,54 x 3,53	+/-1,72	327	43,82 x 5,33	+/-0,44
204	9,12 x 3,53	+/-0,18	238	88,49 x 3,53	+/-0,75	272	240,89 x 3,53	+/-1,76	328	46,99 x 5,33	+/-0,46
205	10,62 x 3,53	+/-0,20	239	91,67 x 3,53	+/-0,77	273	247,24 x 3,53	+/-1,80	329	50,17 x 5,33	+/-0,48
206	12,29 x 3,53	+/-0,21	240	94,84 x 3,53	+/-0,79	274	253,59 x 3,53	+/-1,84	330	53,34 x 5,33	+/-0,50
207	13,87 x 3,53	+/-0,22	241	98,02 x 3,53	+/-0,81	275	266,29 x 3,53	+/-1,92	331	56,52 x 5,33	+/-0,53
208	15,47 x 3,53	+/-0,23	242	101,19 x 3,53	+/-0,83	276	278,99 x 3,53	+/-2,00	332	59,69 x 5,33	+/-0,55
209	17,04 x 3,53	+/-0,24	243	104,37 x 3,53	+/-0,85	277	291,69 x 3,53	+/-2,09	333	62,87 x 5,33	+/-0,57
210	18,64 x 3,53	+/-0,25	244	107,54 x 3,53	+/-0,88	278	304,39 x 3,53	+/-2,17	334	66,04 x 5,33	+/-0,59
211	20,22 x 3,53	+/-0,27	245	110,72 x 3,53	+/-0,90	279	329,79 x 3,53	+/-2,33	335	69,22 x 5,33	+/-0,61
212	21,82 x 3,53	+/-0,28	246	113,89 x 3,53	+/-0,92	280	355,19 x 3,53	+/-2,49	336	72,39 x 5,33	+/-0,64
213	23,39 x 3,53	+/-0,29	247	117,07 x 3,53	+/-0,94	281	380,59 x 3,53	+/-2,65	337	75,57 x 5,33	+/-0,66
214	24,99 x 3,53	+/-0,30	248	120,24 x 3,53	+/-0,96	282	405,26 x 3,53	+/-2,81	338	78,74 x 5,33	+/-0,68
215	26,57 x 3,53	+/-0,31	249	123,42 x 3,53	+/-0,98	283	430,66 x 3,53	+/-2,97	339	81,92 x 5,33	+/-0,70
216	28,17 x 3,53	+/-0,32	250	126,59 x 3,53	+/-1,00	284	456,06 x 3,53	+/-3,13	340	85,09 x 5,33	+/-0,72
217	29,74 x 3,53	+/-0,34	251	129,77 x 3,53	+/-1,03				341	88,27 x 5,33	+/-0,74
218	31,34 x 3,53	+/-0,35	252	132,94 x 3,53	+/-1,05				342	91,44 x 5,33	+/-0,77
219	32,92 x 3,53	+/-0,36	253	136,12 x 3,53	+/-1,07	309	10,46 x 5,33	+/-0,19	343	94,62 x 5,33	+/-0,79
220	34,52 x 3,53	+/-0,37	254	139,29 x 3,53	+/-1,09	310	12,07 x 5,33	+/-0,21	344	97,79 x 5,33	+/-0,81
221	36,09 x 3,53	+/-0,38	255	142,47 x 3,53	+/-1,11	311	13,64 x 5,33	+/-0,22	345	100,97 x 5,33	+/-0,83
222	37,69 x 3,53	+/-0,39	256	145,64 x 3,53	+/-1,13	312	15,24 x 5,33	+/-0,23	346	104,14 x 5,33	+/-0,85
223	40,87 x 3,53	+/-0,42	257	148,82 x 3,53	+/-1,15	313	16,81 x 5,33	+/-0,24	347	107,32 x 5,33	+/-0,87
224	44,04 x 3,53	+/-0,44	258	151,99 x 3,53	+/-1,17	314	18,42 x 5,33	+/-0,25	348	110,49 x 5,33	+/-0,90
225	47,22 x 3,53	+/-0,46	259	158,34 x 3,53	+/-1,22	315	19,99 x 5,33	+/-0,26	349	113,67 x 5,33	+/-0,92

Standard Dimensions

Standard dimensions according to ISO3601:2008 class B (red) and SMS1586 (blue).

Most of the dimensions shown are stock items in one or more materials as NBR, FPM, EPDM etc.

This is only a part of our large selection of o-rings and many other sizes are available from stock or within a short delivery time. Please see www.m-seals.com for further details.

Utilising our manufacturing capabilities, virtually any size can be produced to order.

# No.	Size d1 x d2	Tolerance d1	# No.	Size d1 x d2	Tolerance d1	# No.	Size d1 x d2	Tolerance d1	# No.	Size d1 x d2	Tolerance d1
350	116,84 x 5,33	+/-0,94	376	247,02 x 5,33	+/-1,80		44,20 x 5,70	+/-0,40		174,30 x 5,70	+/-0,60
351	120,02 x 5,33	+/-0,96	377	253,37 x 5,33	+/-1,84		49,20 x 5,70	+/-0,40		179,30 x 5,70	+/-0,60
352	123,19 x 5,33	+/-0,98	378	266,07 x 5,33	+/-1,92		54,20 x 5,70	+/-0,40		184,30 x 5,70	+/-0,60
353	126,37 x 5,33	+/-1,00	379	278,77 x 5,33	+/-2,00		59,20 x 5,70	+/-0,40		189,30 x 5,70	+/-0,80
354	129,54 x 5,33	+/-1,02	380	291,47 x 5,33	+/-2,09		64,20 x 5,70	+/-0,40		194,30 x 5,70	+/-0,80
355	132,72 x 5,33	+/-1,05	381	304,17 x 5,33	+/-2,17		69,20 x 5,70	+/-0,40		199,30 x 5,70	+/-0,80
356	135,89 x 5,33	+/-1,07	382	329,57 x 5,33	+/-2,33		74,20 x 5,70	+/-0,40		209,30 x 5,70	+/-0,80
357	139,07 x 5,33	+/-1,09	383	354,97 x 5,33	+/-2,49		79,20 x 5,70	+/-0,40		219,30 x 5,70	+/-0,80
358	142,24 x 5,33	+/-1,11	384	380,37 x 5,33	+/-2,65		84,10 x 5,70	+/-0,40		229,30 x 5,70	+/-0,80
359	145,42 x 5,33	+/-1,13	385	405,26 x 5,33	+/-2,81		89,10 x 5,70	+/-0,40		239,30 x 5,70	+/-0,80
360	148,59 x 5,33	+/-1,15	386	430,66 x 5,33	+/-2,97		94,10 x 5,70	+/-0,40		249,30 x 5,70	+/-0,80
361	151,77 x 5,33	+/-1,17	387	456,06 x 5,33	+/-3,13		99,10 x 5,70	+/-0,40		259,30 x 5,70	+/-1,00
362	158,12 x 5,33	+/-1,21	388	481,46 x 5,33	+/-3,29		104,10 x 5,70	+/-0,40		269,30 x 5,70	+/-1,00
363	164,47 x 5,33	+/-1,26	389	506,86 x 5,33	+/-3,45		109,10 x 5,70	+/-0,40		279,30 x 5,70	+/-1,00
364	170,82 x 5,33	+/-1,30	390	532,26 x 5,33	+/-3,61		114,30 x 5,70	+/-0,40		289,30 x 5,70	+/-1,00
365	177,17 x 5,33	+/-1,34	391	557,66 x 5,33	+/-3,77		119,30 x 5,70	+/-0,40		299,30 x 5,70	+/-1,00
366	183,52 x 5,33	+/-1,38	392	582,68 x 5,33	+/-3,92		124,30 x 5,70	+/-0,40		319,30 x 5,70	+/-1,00
367	189,87 x 5,33	+/-1,42	393	608,08 x 5,33	+/-4,08		129,30 x 5,70	+/-0,40		339,30 x 5,70	+/-1,00
368	196,22 x 5,33	+/-1,47	394	633,48 x 5,33	+/-4,24		134,30 x 5,70	+/-0,40		359,30 x 5,70	+/-1,50
369	202,57 x 5,33	+/-1,51	395	658,88 x 5,33	+/-4,40		139,30 x 5,70	+/-0,40		379,30 x 5,70	+/-1,50
370	208,92 x 5,33	+/-1,55					144,30 x 5,70	+/-0,40		399,30 x 5,70	+/-1,50
371	215,27 x 5,33	+/-1,59					149,30 x 5,70	+/-0,60		419,30 x 5,70	+/-2,00
372	221,62 x 5,33	+/-1,63					154,30 x 5,70	+/-0,60		439,30 x 5,70	+/-2,00
373	227,97 x 5,33	+/-1,67					159,30 x 5,70	+/-0,60		459,30 x 5,70	+/-2,00
374	234,32 x 5,33	+/-1,72					164,30 x 5,70	+/-0,60		479,30 x 5,70	+/-2,00
375	240,67 x 5,33	+/-1,76					169,30 x 5,70	+/-0,60		499,30 x 5,70	+/-2,00

Tolerances for intermediate sizes - go to the next size in the table.

Tolerances for O-rings >Ø660mm is app. +/- d1 x 0,0065

For exact calculation use $\Delta d1 = +/- [(d_1^{0,95}) \times 0,009+0,11]$

The above tolerances are valid for O-rings supplied from M Seals in most materials measured at 21° to 25°C and as per ISO3601:2008 annex B. Excepted are i.e. O-rings in Kalrez® materials, FEP Encapsulated O-rings and M Maxi O-rings made from extruded cord – tolerances for these groups can be informed at request.

For tolerances for d2 see page 19 and for surface imperfections see page 14.

Standard Dimensions

# No.	Size d1 x d2	Tolerance d1	# No.	Size d1 x d2	Tolerance d1	# No.	Size d1 x d2	Tolerance d1	# No.	Size d1 x d2	Tolerance d1
425	113,67 x 6,99	+/-0,92	451	278,77 x 6,99	+/-2,00		144,10 x 8,40	+/-0,60		189,10 x 8,40	+/-0,80
426	116,84 x 6,99	+/-0,94	452	291,47 x 6,99	+/-2,09		149,10 x 8,40	+/-0,60		194,10 x 8,40	+/-0,80
427	120,02 x 6,99	+/-0,96	453	304,17 x 6,99	+/-2,17		154,10 x 8,40	+/-0,60		199,10 x 8,40	+/-0,80
428	123,19 x 6,99	+/-0,98	454	316,87 x 6,99	+/-2,25		159,10 x 8,40	+/-0,60		209,10 x 8,40	+/-0,80
429	126,37 x 6,99	+/-1,00	455	329,57 x 6,99	+/-2,33		164,10 x 8,40	+/-0,60		219,10 x 8,40	+/-0,80
430	129,54 x 6,99	+/-1,02	456	342,27 x 6,99	+/-2,41		169,10 x 8,40	+/-0,60		229,10 x 8,40	+/-0,80
431	132,72 x 6,99	+/-1,05	457	354,97 x 6,99	+/-2,49		174,10 x 8,40	+/-0,60		239,10 x 8,40	+/-0,80
432	135,89 x 6,99	+/-1,07	458	367,67 x 6,99	+/-2,57		179,10 x 8,40	+/-0,60		249,10 x 8,40	+/-0,80
433	139,07 x 6,99	+/-1,09	459	380,37 x 6,99	+/-2,65		184,10 x 8,40	+/-0,60			
434	142,24 x 6,99	+/-1,11	460	393,07 x 6,99	+/-2,73						
435	145,42 x 6,99	+/-1,13	461	405,25 x 6,99	+/-2,81						
436	148,59 x 6,99	+/-1,15	462	417,96 x 6,99	+/-2,89						
437	151,77 x 6,99	+/-1,17	463	430,66 x 6,99	+/-2,97						
438	158,12 x 6,99	+/-1,21	464	443,36 x 6,99	+/-3,05						
439	164,47 x 6,99	+/-1,26	465	456,06 x 6,99	+/-3,13						
440	170,82 x 6,99	+/-1,30	466	468,76 x 6,99	+/-3,21						
441	177,17 x 6,99	+/-1,34	467	481,46 x 6,99	+/-3,29						
442	183,52 x 6,99	+/-1,38	468	494,16 x 6,99	+/-3,37						
443	189,87 x 6,99	+/-1,42	469	506,86 x 6,99	+/-3,45						
444	196,22 x 6,99	+/-1,47	470	532,26 x 6,99	+/-3,61						
445	202,57 x 6,99	+/-1,51	471	557,66 x 6,99	+/-3,77						
446	215,27 x 6,99	+/-1,59	472	582,68 x 6,99	+/-3,92						
447	227,97 x 6,99	+/-1,67	473	608,08 x 6,99	+/-4,08						
448	240,67 x 6,99	+/-1,76	474	633,48 x 6,99	+/-4,24						
449	253,37 x 6,99	+/-1,84	475	658,88 x 6,99	+/-4,40						
450	266,07 x 6,99	+/-1,92									

Tolerances, Cross-Section d2
According to ISO3601-1:2008 Class B

Cross Section Ød2mm	Tolerance +/- mm
0,20 - ≤ 0,65	0,05
> 0,65 - ≤ 2,25	0,08
> 2,25 - ≤ 3,15	0,09
> 3,15 - ≤ 4,50	0,10
> 4,50 - ≤ 6,30	0,13
> 6,30 - ≤ 8,40	0,15

For cross-sections from Ø8,5 to Ø25,00mm, the tolerances +/- can be calculated as d2 x 0.018.
The above tolerances apply to o-rings supplied by M Seals in the most common materials. Exceptions are FFKM (Kalrez®) and FEP encapsulated o-rings. Tolerances for these materials can be supplied on request.

Miniature O-Rings Tool List

The below list shows existing tooling for O-rings with d2 below 1,00mm. A part of the sizes are stock items. Please note that this list is not static – sizes can be obsolete and new sizes can be tooled up for.

Size d1 x d2	Tolerance d1	Size d1 x d2	Tolerance d1	Size d1 x d2	Tolerance d1	Size d1 x d2	Tolerance d1	Size d1 x d2	Tolerance d1
0,70 x 0,20	+/-0,08	0,45 x 0,40	+/-0,08	4,75 x 0,48	+/-0,08	2,49 x 0,51	+/-0,08	2,00 x 0,60	+/-0,08
1,00 x 0,20	+/-0,08	0,50 x 0,40	+/-0,08	0,70 x 0,50	+/-0,08	6,99 x 0,51	+/-0,08	2,25 x 0,60	+/-0,08
1,10 x 0,25	+/-0,08	0,55 x 0,40	+/-0,08	1,00 x 0,50	+/-0,08	11,73 x 0,51	+/-0,08	2,50 x 0,60	+/-0,08
1,98 x 0,25	+/-0,08	0,80 x 0,40	+/-0,08	1,30 x 0,50	+/-0,08	14,81 x 0,51	+/-0,08	2,85 x 0,60	+/-0,08
2,72 x 0,25	+/-0,08	1,00 x 0,40	+/-0,08	1,40 x 0,50	+/-0,08	17,40 x 0,51	+/-0,08	3,00 x 0,60	+/-0,08
2,97 x 0,25	+/-0,08	1,10 x 0,40	+/-0,08	1,50 x 0,50	+/-0,08	20,70 x 0,51	+/-0,08	3,30 x 0,60	+/-0,08
3,00 x 0,25	+/-0,08	1,20 x 0,40	+/-0,08	1,60 x 0,50	+/-0,08	0,90 x 0,53	+/-0,08	4,00 x 0,60	+/-0,08
3,23 x 0,25	+/-0,08	1,30 x 0,40	+/-0,08	1,80 x 0,50	+/-0,08	0,65 x 0,55	+/-0,08	4,50 x 0,60	+/-0,08
7,40 x 0,25	+/-0,08	1,40 x 0,40	+/-0,08	2,00 x 0,50	+/-0,08	0,70 x 0,55	+/-0,08	5,20 x 0,60	+/-0,08
7,62 x 0,25	+/-0,08	1,50 x 0,40	+/-0,08	2,20 x 0,50	+/-0,08	0,90 x 0,55	+/-0,08	5,70 x 0,60	+/-0,08
3,937 x 0,254	+/-0,08	1,60 x 0,40	+/-0,08	2,80 x 0,50	+/-0,08	1,15 x 0,55	+/-0,08	7,50 x 0,60	+/-0,08
5,38 x 0,29	+/-0,08	1,80 x 0,40	+/-0,08	3,00 x 0,50	+/-0,08	1,20 x 0,55	+/-0,08	7,80 x 0,60	+/-0,08
0,46 x 0,30	+/-0,08	1,90 x 0,40	+/-0,08	3,80 x 0,50	+/-0,08	1,65 x 0,55	+/-0,08	8,60 x 0,60	+/-0,08
0,50 x 0,30	+/-0,08	2,00 x 0,40	+/-0,08	4,00 x 0,50	+/-0,08	1,75 x 0,55	+/-0,08	9,2 x 0,60	+/-0,08
0,80 x 0,30	+/-0,08	2,20 x 0,40	+/-0,08	4,30 x 0,50	+/-0,08	1,90 x 0,55	+/-0,08	11,50 x 0,60	+/-0,08
1,3 x 0,30	+/-0,08	4,25 x 0,40	+/-0,08	4,45 x 0,50	+/-0,08	2,00 x 0,55	+/-0,08	16,00 x 0,60	+/-0,08
1,7 x 0,30	+/-0,08	5,20 x 0,40	+/-0,08	5,30 x 0,50	+/-0,08	2,30 x 0,55	+/-0,08	17,00 x 0,60	+/-0,08
1,91 x 0,30	+/-0,08	5,30 x 0,40	+/-0,08	6,00 x 0,50	+/-0,08	8,40 x 0,55	+/-0,08	19,00 x 0,60	+/-0,08
9,50 x 0,30	+/-0,08	7,50 x 0,40	+/-0,08	6,10 x 0,50	+/-0,08	8,45 x 0,55	+/-0,08	21,00 x 0,60	+/-0,08
11,30 x 0,30	+/-0,08	10,00 x 0,40	+/-0,08	6,20 x 0,50	+/-0,08	10,00 x 0,55	+/-0,08	22,30 x 0,60	+/-0,08
11,90 x 0,30	+/-0,08	1,194 x 0,406	+/-0,08	6,30 x 0,50	+/-0,08	14,00 x 0,55	+/-0,08	22,80 x 0,60	+/-0,08
14,00 x 0,30	+/-0,08	0,41 x 0,41	+/-0,08	6,80 x 0,50	+/-0,08	0,84 x 0,56	+/-0,08	26,80 x 0,60	+/-0,08
0,50 x 0,31	+/-0,08	0,76 x 0,41	+/-0,08	7,50 x 0,50	+/-0,08	18,39 x 0,56	+/-0,08	29,75 x 0,60	+/-0,08
0,80 x 0,31	+/-0,08	2,90 x 0,41	+/-0,08	7,75 x 0,50	+/-0,08	5,48 x 0,57	+/-0,08	30,00 x 0,60	+/-0,08
0,60 x 0,35	+/-0,08	4,34 x 0,41	+/-0,08	7,90 x 0,50	+/-0,08	2,00 x 0,58	+/-0,08	1,91 x 0,61	+/-0,08
1,40 x 0,35	+/-0,08	14,00 x 0,41	+/-0,08	8,50 x 0,50	+/-0,08	2,44x0,58	+/-0,08	3,81 x 0,61	+/-0,08
1,50 x 0,35	+/-0,08	0,45 x 0,45	+/-0,08	9,05 x 0,50	+/-0,08	0,65 x 0,60	+/-0,08	45,09 x 0,61	+/-0,08
1,60 x 0,35	+/-0,08	0,60 x 0,45	+/-0,08	9,50 x 0,50	+/-0,08	0,80 x 0,60	+/-0,08	4,90 x 0,63	+/-0,08
2,50 x 0,35	+/-0,08	0,70 x 0,45	+/-0,08	11,00 x 0,50	+/-0,08	1,00 x 0,60	+/-0,08	6,50 x 0,63	+/-0,08
3,10 x 0,35	+/-0,08	0,80 x 0,45	+/-0,08	11,50 x 0,50	+/-0,08	1,10 x 0,60	+/-0,08	3,52 x 0,635	+/-0,08
0,55 x 0,37	+/-0,08	1,27 x 0,45	+/-0,08	12,00 x 0,50	+/-0,08	1,20 x 0,60	+/-0,08	4,064 x 0,635	+/-0,08
1,80 x 0,375	+/-0,08	3,50 x 0,45	+/-0,08	18,00 x 0,50	+/-0,08	1,40 x 0,60	+/-0,08	2,97 x 0,64	+/-0,08
0,66 x 0,381	+/-0,08	6,10 x 0,45	+/-0,08	21,60 x 0,50	+/-0,08	1,75 x 0,60	+/-0,08	6,07 x 0,64	+/-0,08
4,953 x 0,381	+/-0,08	26,21 x 0,46	+/-0,08	0,43 x 0,51	+/-0,08	1,80 x 0,60	+/-0,08	7,24 x 0,64	+/-0,08

Miniature O-Rings Tool List

The below list shows existing tooling for O-rings with d2 below 1,00mm. A part of the sizes are stock items. Please note that this list is not static – sizes can be obsolete and new sizes can be tooled up for.

Size d1 x d2	Tolerance d1	Size d1 x d2	Tolerance d1	Size d1 x d2	Tolerance d1	Size d1 x d2	Tolerance d1	Size d1 x d2	Tolerance d1
7,65 x 0,64	+/-0,08	19,80 x 0,70	+/-0,08	26,31 x 0,76	+/-0,08	14,00 x 0,80	+/-0,08	15,88 x 0,86	+/-0,08
35,05 x 0,64	+/-0,08	20,00 x 0,70	+/-0,08	55,30 x 0,76	+/-0,08	16,00 x 0,80	+/-0,08	8,45 x 0,87	+/-0,08
0,56 x 0,648	+/-0,08	21,50 x 0,70	+/-0,08	8,71 x 0,78	+/-0,08	17,50 x 0,80	+/-0,08	10,03 x 0,89	+/-0,08
1,10 x 0,65	+/-0,08	24,70 x 0,70	+/-0,08	10,00 x 0,78	+/-0,08	19,00 x 0,80	+/-0,08	37,03 x 0,89	+/-0,08
1,30 x 0,65	+/-0,08	25,00 x 0,70	+/-0,08	5,28 x 0,79	+/-0,08	20,80 x 0,80	+/-0,08	1,20 x 0,90	+/-0,08
2,20 x 0,65	+/-0,08	26,20 x 0,70	+/-0,08	8,43 x 0,79	+/-0,08	22,80 x 0,80	+/-0,08	1,45 x 0,90	+/-0,08
2,25 x 0,65	+/-0,08	30,00 x 0,70	+/-0,08	11,68 x 0,79	+/-0,08	23,00 x 0,80	+/-0,08	1,60 x 0,90	+/-0,08
2,30 x 0,65	+/-0,08	31,10 x 0,70	+/-0,08	13,36 x 0,79	+/-0,08	25,00 x 0,80	+/-0,08	2,30 x 0,90	+/-0,08
2,50 x 0,65	+/-0,08	1,83 x 0,71	+/-0,08	0,60 x 0,80	+/-0,08	29,80 x 0,80	+/-0,08	2,85 x 0,90	+/-0,08
2,90 x 0,65	+/-0,08	2,79 x 0,71	+/-0,08	1,40 x 0,80	+/-0,08	31,20 x 0,80	+/-0,08	3,50 x 0,90	+/-0,08
3,50 x 0,65	+/-0,08	30,99 x 0,71	+/-0,08	1,50 x 0,80	+/-0,08	31,60 x 0,80	+/-0,08	4,60 x 0,90	+/-0,08
4,90 x 0,65	+/-0,08	8,25 x 0,73	+/-0,08	1,75 x 0,80	+/-0,08	31,70 x 0,80	+/-0,08	5,50 x 0,90	+/-0,08
0,36 x 0,66	+/-0,08	8,45 x 0,73	+/-0,08	1,80 x 0,80	+/-0,08	32,40 x 0,80	+/-0,08	7,20 x 0,90	+/-0,08
1,91 x 0,66	+/-0,08	15,88 x 0,74	+/-0,08	2,15 x 0,80	+/-0,08	32,80 x 0,80	+/-0,08	28,80 x 0,90	+/-0,08
2,80 x 0,66	+/-0,08	82,00 x 0,74	+/-0,08	2,20 x 0,80	+/-0,08	33,10 x 0,80	+/-0,08	29,30 x 0,90	+/-0,08
0,65 x 0,70	+/-0,08	1,50 x 0,75	+/-0,08	2,50 x 0,80	+/-0,08	33,70 x 0,80	+/-0,08	29,60 x 0,90	+/-0,08
0,80 x 0,70	+/-0,08	1,70 x 0,75	+/-0,08	2,80 x 0,80	+/-0,08	34,00 x 0,80	+/-0,08	30,70 x 0,90	+/-0,08
1,00 x 0,70	+/-0,08	2,15 x 0,75	+/-0,08	3,50 x 0,80	+/-0,08	34,90 x 0,80	+/-0,08	7,92 x 0,91	+/-0,08
1,30 x 0,70	+/-0,08	2,30 x 0,75	+/-0,08	3,60 x 0,80	+/-0,08	39,00 x 0,80	+/-0,08	31,19 x 0,91	+/-0,08
1,50 x 0,70	+/-0,08	3,00 x 0,75	+/-0,08	4,00 x 0,80	+/-0,08	49,00 x 0,80	+/-0,08	1,82 x 0,92	+/-0,08
1,55 x 0,70	+/-0,08	3,30 x 0,75	+/-0,08	4,10 x 0,80	+/-0,08	49,90 x 0,80	+/-0,08	25,40 x 0,95	+/-0,08
1,60 x 0,70	+/-0,08	3,80 x 0,75	+/-0,08	4,20 x 0,80	+/-0,08	0,81 x 0,81	+/-0,08	30,50 x 0,95	+/-0,08
1,70 x 0,70	+/-0,08	5,48 x 0,75	+/-0,08	4,40 x 0,80	+/-0,08	2,39 x 0,81	+/-0,08	33,60 x 0,95	+/-0,08
1,80 x 0,70	+/-0,08	6,00 x 0,75	+/-0,08	5,00 x 0,80	+/-0,08	3,38 x 0,81	+/-0,08	16,79 x 0,99	+/-0,08
2,00 x 0,70	+/-0,08	18,60 x 0,75	+/-0,08	5,65 x 0,80	+/-0,08	4,60 x 0,81	+/-0,08	18,59 x 0,99	+/-0,08
2,25 x 0,70	+/-0,08	22,15 x 0,75	+/-0,08	6,70 x 0,80	+/-0,08	4,80 x 0,81	+/-0,08	19,71 x 0,99	+/-0,08
2,30 x 0,70	+/-0,08	26,00 x 0,75	+/-0,08	6,90 x 0,80	+/-0,08	11,91 x 0,81	+/-0,08	32,41 x 0,99	+/-0,08
2,50 x 0,70	+/-0,08	27,90 x 0,75	+/-0,08	7,00 x 0,80	+/-0,08	19,51 x 0,81	+/-0,08		
3,35 x 0,70	+/-0,08	28,10 x 0,75	+/-0,08	7,20 x 0,80	+/-0,08	1,70 x 0,85	+/-0,08		
4,35 x 0,70	+/-0,08	30,05 x 0,75	+/-0,08	7,70 x 0,80	+/-0,08	2,30 x 0,85	+/-0,08		
4,70 x 0,70	+/-0,08	0,58 x 0,76	+/-0,08	10,40 x 0,80	+/-0,08	2,90 x 0,85	+/-0,08		
6,30 x 0,70	+/-0,08	1,91 x 0,76	+/-0,08	10,70 x 0,80	+/-0,08	3,00 x 0,85	+/-0,08		
13,00 x 0,70	+/-0,08	6,07 x 0,76	+/-0,08	12,80 x 0,80	+/-0,08	6,55 x 0,85	+/-0,08		
16,00 x 0,70	+/-0,08	6,10 x 0,76	+/-0,08	13,70 x 0,80	+/-0,08	2,39 x 0,86	+/-0,08		

O-Ring Assortments

Our o-ring assortments are stocked in NBR70, but are also available in FPM75.

Special composed assortments are made up on request.



MC1/NBR70

419 O-rings in NBR (Nitrile)
Hardness 70+/-5 Sh.A
In accordance with ISO3601

1,78 - 1,78 (25)	10,77 - 2,62 (25)	24,99 - 3,53 (4)
2,57 - 1,78 (25)	12,37 - 2,62 (25)	26,57 - 3,53 (4)
2,90 - 1,78 (25)	13,94 - 2,62 (15)	28,17 - 3,53 (4)
3,68 - 1,78 (25)	15,54 - 2,62 (15)	29,74 - 3,53 (2)
4,47 - 1,78 (25)	17,12 - 2,62 (15)	
5,28 - 1,78 (25)	18,72 - 2,62 (15)	Cord Ø1,78m (1mm)
6,07 - 1,78 (25)	18,64 - 3,53 (15)	Cord Ø2,62m (1mm)
7,65 - 1,78 (25)	20,22 - 3,53 (10)	Cord Ø3,53m (1mm)
9,25 - 1,78 (25)	21,82 - 3,53 (10)	Glue (1)
9,19 - 2,62 (25)	23,39 - 3,53 (10)	Knife (1)

MC2A/NBR70

348 O-rings in NBR (Nitrile)
Hardness 70+/-5 Sh.A
In accordance with ISO3601

12,42 - 1,78 (30)	40,94 - 2,62 (20)	56,74 - 3,53 (10)
15,60 - 1,78 (30)	44,12 - 2,62 (20)	63,09 - 3,53 (10)
18,77 - 1,78 (30)	47,29 - 2,62 (20)	
21,95 - 1,78 (30)	50,47 - 2,62 (20)	Cord Ø1,78m (1mm)
25,12 - 1,78 (30)	40,87 - 3,53 (10)	Cord Ø2,62m (1mm)
28,30 - 1,78 (30)	44,04 - 3,53 (10)	Cord Ø3,53m (1mm)
31,47 - 1,78 (30)	47,22 - 3,53 (10)	Glue (1)
34,65 - 1,78 (30)	50,39 - 3,53 (10)	Knife (1)
37,77 - 2,62 (20)		

MC2B/NBR70

133 O-rings in NBR (Nitrile)
Hardness 70+/-5 Sh.A
In accordance with ISO3601

53,64 - 2,62 (10)	69,44 - 3,53 (10)	37,47 - 5,33 (8)
58,82 - 2,62 (10)	78,97 - 3,53 (8)	46,99 - 5,33 (8)
59,99 - 2,62 (10)	88,49 - 3,53 (8)	53,52 - 5,33 (8)
63,17 - 2,62 (10)	98,02 - 3,53 (8)	66,04 - 5,33 (5)
66,34 - 2,62 (10)	107,54 - 3,53 (5)	
69,52 - 2,62 (10)	117,07 - 3,53 (5)	

MC3/NBR70

432 O-rings in NBR (Nitrile)
Hardness 70+/-5 Sh.A
In accordance with BS 4518 and SMS 1586

3,10 - 1,60 (25)	3,60 - 2,40 (15)	19,50 - 3,00 (10)
4,10 - 1,60 (25)	4,60 - 2,40 (15)	22,50 - 3,00 (2)
5,10 - 1,60 (25)	5,60 - 2,40 (15)	
6,10 - 1,60 (25)	7,60 - 2,40 (15)	
7,10 - 1,60 (25)	8,60 - 2,40 (15)	
8,10 - 1,60 (25)	9,60 - 2,40 (15)	
9,10 - 1,60 (25)	10,60 - 2,40 (15)	Cord Ø1,60m (1mm)
10,10 - 1,60 (25)	11,60 - 2,40 (10)	Cord Ø2,40m (1mm)
11,10 - 1,60 (25)	13,60 - 2,40 (10)	Cord Ø3,00m (1mm)
12,10 - 1,60 (25)	15,60 - 2,40 (10)	Glue (1)
14,10 - 1,60 (25)	17,60 - 2,40 (10)	Knife (1)

MC4/NBR70

385 O-rings in NBR (Nitrile)
Hardness 70+/-5 Sh.A
In accordance with BS 4518 and SMS 1586

13,10 - 1,60 (25)	41,60 - 2,40 (15)	49,50 - 3,00 (5)
15,10 - 1,60 (25)	44,60 - 2,40 (15)	54,50 - 3,00 (5)
16,10 - 1,60 (25)	47,60 - 2,40 (15)	
17,10 - 1,60 (25)	49,60 - 2,40 (15)	
18,10 - 1,60 (25)	51,60 - 2,40 (15)	
19,10 - 1,60 (25)	25,50 - 3,00 (10)	
22,10 - 1,60 (25)	27,50 - 3,00 (10)	Cord Ø1,60m (1mm)
25,10 - 1,60 (25)	31,50 - 3,00 (10)	Cord Ø2,40m (1mm)
27,10 - 1,60 (25)	35,50 - 3,00 (5)	Cord Ø3,00m (1mm)
37,60 - 2,40 (15)	37,50 - 3,00 (5)	Glue (1)
39,60 - 2,40 (15)	41,50 - 3,00 (5)	Knife (1)

M-Quick™ - Vulcanized O-Rings



Available materials: **FPM**/FDA - **EPDM**/FDA/USP Cl.VI/3A - **NBR**/FDA - **VMQ**/FDA

Minimum inner diameter of the o-ring (d_1): Cross section (d_2) <8=Ø100mm / d_2 <12=d_1 Ø150mm / d_2 <Ø20 = d_1Ø200mm

All above materials comply with FDA cfr21: 177.2600 / EU1935/2004 / EU2023/2006

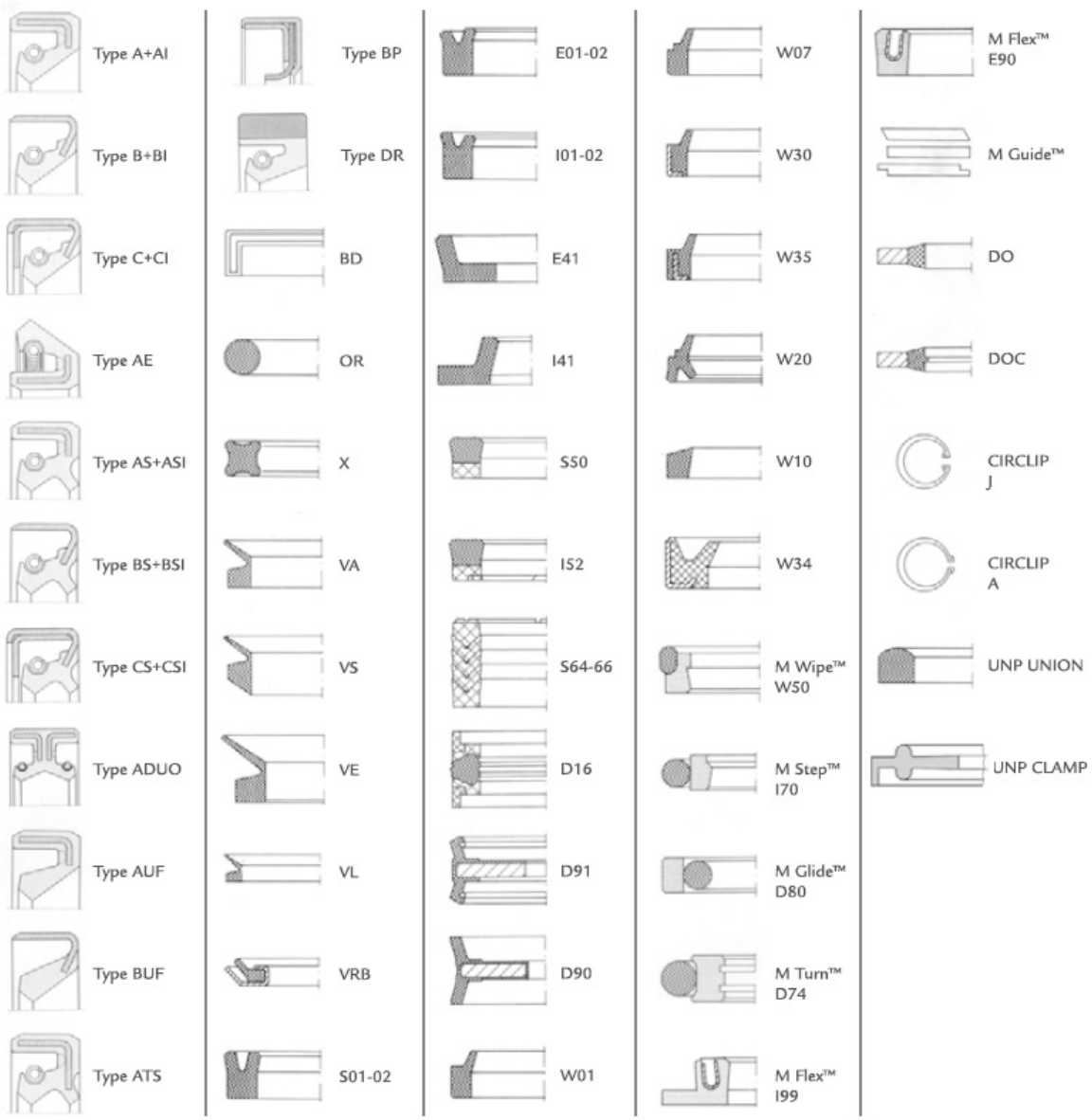
Available cross-sections:

	2,62	3	3,53	4	4,5	5	5,33	5,7	6	6,35	6,5	7	7,5	8	8,4	9	10	11	12	13	14	15	18	20
EPDM70	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*	*
FPM70	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*	*		
NBR70	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*		*	*
VMQ70						*	*	*	*	*		*		*	*	*	*	*	*					

For sizes or materials not shown, please contact sales@m-seals.com.

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