O-rings



SEALS

- Part of Diploma PLC



M SEALS

The safe choice for seals and moulded parts used in hydraulics, pneumatics, precision engineering and food/medical industries.

History and concept

In M Seals we specialize in seals for industrial use. We cover the whole spectrum from the finest precision seals to the largest heavy duty shaft seals and packings.

Our products address the needs of customers that wish to have a broad range of products and solutions at hand.

The company was founded in 1963 as Mogens Christensen, Ingeniør-& Handelsfirma A/S.

We are undergoing a rapid period of development and we now have 5,000 m^2 of offices, lab, production and warehouses at our disposal.

Our branch in Halmstad, Sweden, has grown significantly and our branch in China, has given us an entry point into this for M Seals already large market.

In 2007 M Seals became a part of the Diploma PLC group. This has opened new possibilities for our company, e.g. the cooperation with the sister companies around the world.

Since 2014, M Seals has been present on the UK market. Our M Seals UK LTD branch in Newcastle has particular expertise in seals for the Aerospace, Defence and the Oil & Gas industries while the M Seals UK LTD branch in Leicester are able to serve the general industry with a broad range of sealing products from their comprehensive stock.

Knowledge

At M Seals, we have developed extensive knowledge of seals and their applications, including their composition, lifetime and suitability for a specific job.

The right choice of seals minimizes the risk of unexpected breakdowns. Our range of seals is wide allowing us to provide multiple solutions.

M Seals range alone covers about 50,000 items, of which a large proportion is stocked. We often cooperate with customers in the design of special solutions.

We have close relationship with many of the world's leading manufacturers of sealing systems and, in cooperation with us, they provide their knowledge and experience to our customers.

Quality assurance

M Seals have been working in accordance with ISO9000 Quality Management systems since 1996, currently ISO9001:2008. Following our growing involvement in the Automotive Industry, we are raising our management system to TS16949 level.

A number of our suppliers are currently working with TS16949.

Our M Seals UK LTD branch in Newcastle, as a distributor to the Aerospace, Defence and Offshore sectors, is working in accordance with BS EN 9120:2010/ ISO 9001:2008.

O-rings

Among all the large variety of seal products that M Seals provide, the O-rings is the most versatile and is found in nearly all kinds of machinery and equipment. Not surprisingly, O-rings are our largest product group, and we stock a wide range of standard dimension for example according to ISO3601, AS568A and SMS in all the common rubber materials like NBR, FPM, EPDM, MVQ as well as special materials like FEP and FFKM.

Many articles can be supplied conforming to common food-contact and medical regulations like EU1935/2004, FDA, 3A and USP.

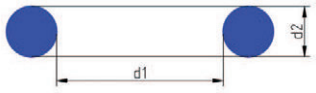
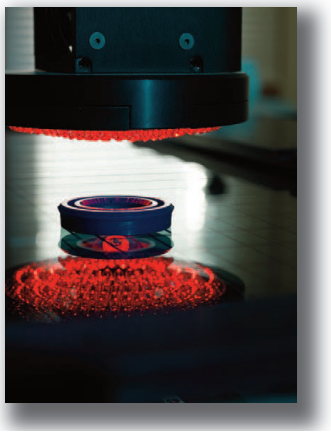


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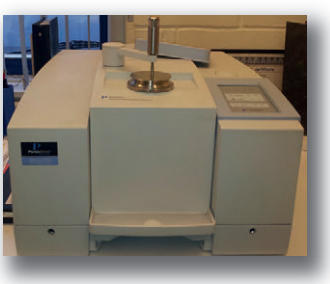


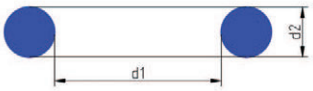




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History and general description

The synthetic rubber O-ring seal is generally considered to be 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 he's development work on street car brake systems, but a Swedish patent exist in 1896 granted 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!

It was initially adopted by the aircraft industry during WWII as a simple and robust seal for hydraulic systems, but in the 1950's, it became widely adopted by car manufacturers – and all general industry.

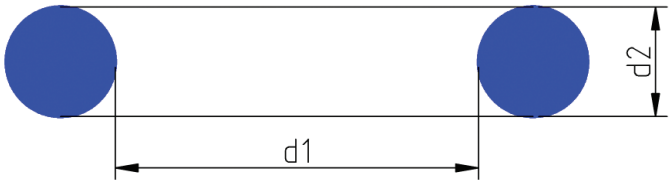
The O-ring seal is one of the most useful designs ever made, and are today a very broadly used and important machine element. Without having this possibility to seal liquids and gasses, many common products could never have been brought on the market. The form is simple, it takes little space, it is flexible so it's easy to mount, and the uses are multiple.

But behind this description lies a considerable technology in compounding the synthetic rubbers to the specific purposes and in quality controlling of the production in order 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 standardized sizes, a vast number of other dimensions are available like straight metric sizes.

In order to get full benefit from the O-ring seal, it is necessary to understand some basic characteristics of its behavior. The following pages give you some basic information on this topic, and advise about designing of seal glands, performance and limitations of the rubber materials and mounting hints.

Should you have any further questions or problems, M Seals' experienced technically department is always at your service ready to help with your specific request!



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

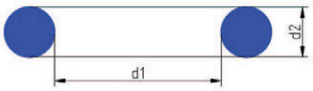
-Taking the above characteristics in to account, the volume of the seal housing shall always be designed so the volume is larger than the O-ring

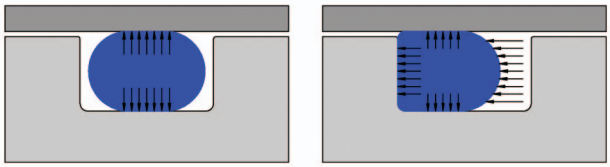
-Rubber behave like a high viscous liquid under pressure, and tend to extrude into the gap to be sealed – otherwise the rubber will be mechanically stressed and will rapidly show permanent setting or break

-Rubber get 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. See the section about pressure and extrusion.

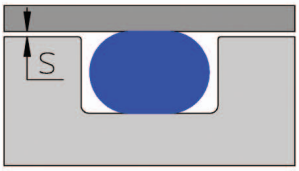




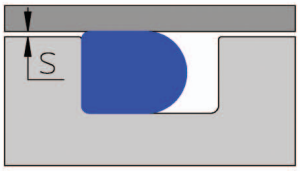
The O-ring is designed to have a point contact to the contacting faces. This gives a high local stress, able to contain pressures as high as 1000bars or more, without exceeding the yield stress of the O-ring body.
The flexible nature of O-ring materials conforms to imperfections in the contacting faces, but surface roughness has to be controlled within the recommendations given on page 8-9 in order to minimize 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 rubber materials – often referred to as "compounds" – 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 at page 10-11. 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.

Pressure, extrusion and back-up rings

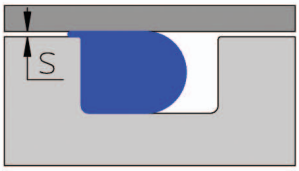
With the synthetic elastomers on the market today, it is possible to have a reliable O-ring sealing in a broad range of temperature from -60° to 327° of most fluids and gasses at lower pressures. But at higher pressures, it is necessary to do some considerations regarding the design of the parts that are going to be sealed, and the choice of elastomer material, and especially the hardness of this.
Almost every O-ring seal serve the purpose to fill gaps between two parts which otherwise had to be extremely accurately manufactured to be sealed on their own. But as we leaned about, 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. We call it 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. Please use the figure on page 9 as a guideline.
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 utilized. The back-up ring is a ring 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 recommend that back-up rings is designed and manufactured for the specific application, although some standard ranges exist on the market. Please contact M Seals sales department for advice.



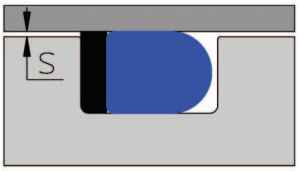
O-ring not pressurized



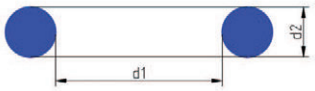
O-ring under pressure in normal working condition



O-ring extruded into sealing gap

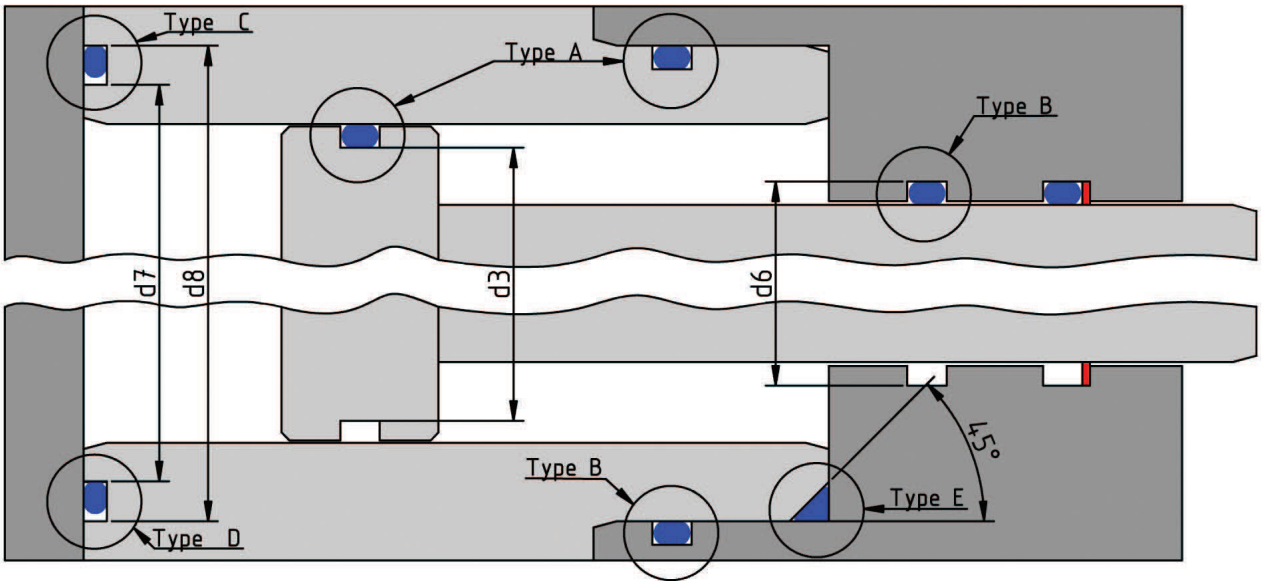


Sealing gap limited by a back up ring



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

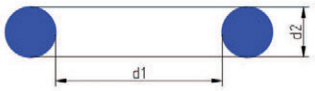
- d3 is calculated by finding the proper depth of the groove (squeeze of the O-ring cross section) by using the table on page 8 according to the use – dynamic or static.
- The inside diameter of the O-ring (d1) shall be chosen so a stretch of about 3-6% is obtained. If the O-ring is not stretched, or 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.

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 need 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

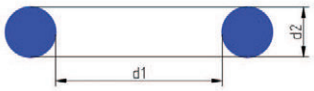
- O-ring seals can be used in hydraulic and pneumatic reciprocating and oscillating movement where space is limited, or for simple economical reasons. The squeeze of the O-ring shall be kept as minimum – use table on page 8 or minimum 6%-, and good lubrication shall be maintained due to the friction 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 oring (90 ShA) can give better result at higher pressures. An absolute sealing is hard to obtain.
- Attention shall be kept on the surface roughness – see page 8, and hardness shall be 55 HRC.

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

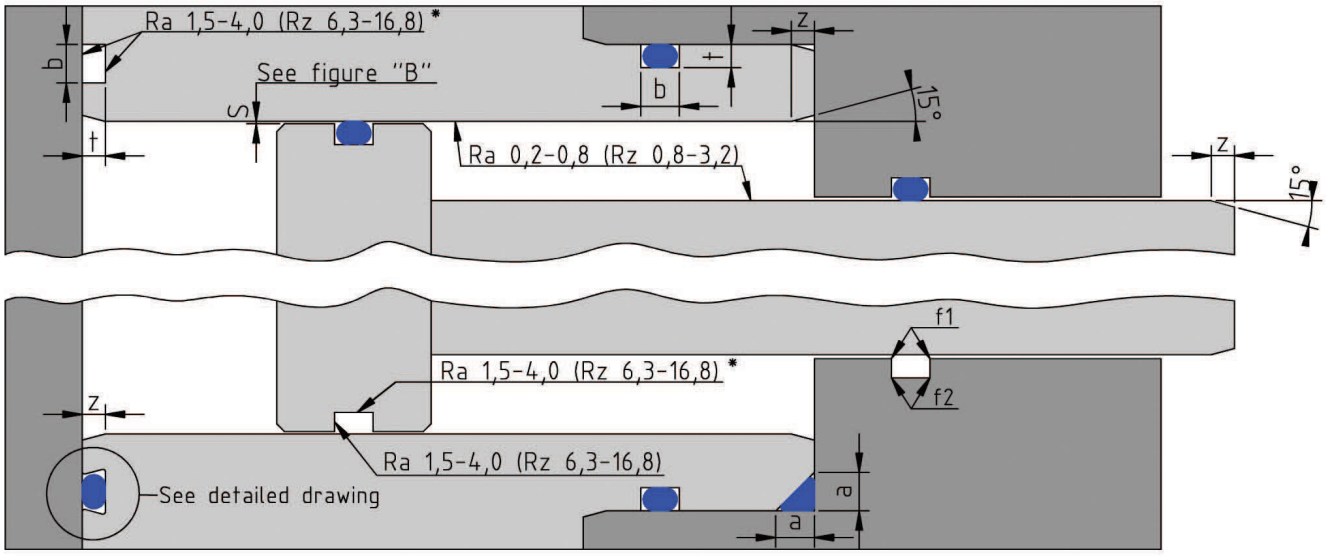
- Our M Glide, M Step or M Cap PTFE sealing sets which drastically reduced friction, almost eliminate starting torque, and secure better sealing. Please see our catalog "PTFE Sealing Systems".
- The X-ring which has a 4-lobed cross section which has several advantages over O-rings, i.e. better resistant to roll and twist, and lower friction. See our catalogue "X-RINGS"
- If space allows, it is also recommended using a more rugged dedicated hydraulic piston or rod seal which can be found in our catalogue "Hydraulic Seals, standard range".
- All catalogues can be found on our website 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 like i.e. valve spindles. If no pressure is involved, a speed of to 4m/sec. can although 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 real Radial Oil seal shall be considered.



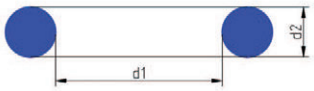
Groove details



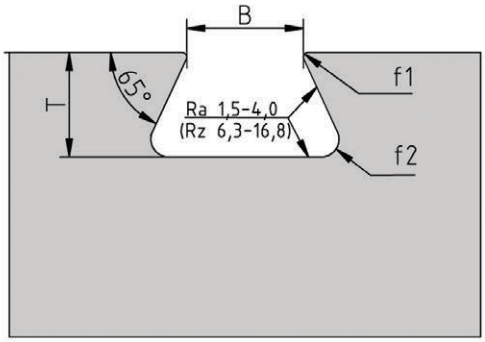
* Pulsating pressure: Ra 1,5-2,5 (Rz 6,3-10,5)

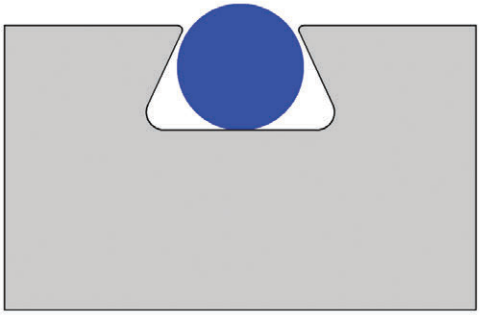
Cross section d2	Dynamic application, hydraulic [1] t		Static application t		b [2]	f1	f2	Z	a	
0,50			0,35		0,80					
0,75			0,50		1,00					
1,00	0,90		0,80		1,30				1,40	
1,20	1,08		0,96		1,56				1,60	
1,50	1,35	+0	1,20		1,95				2,00	
1,60	1,44	-0,05	1,28		2,08			1,0	2,20	
1,78	1,62		1,44		2,34	0,10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

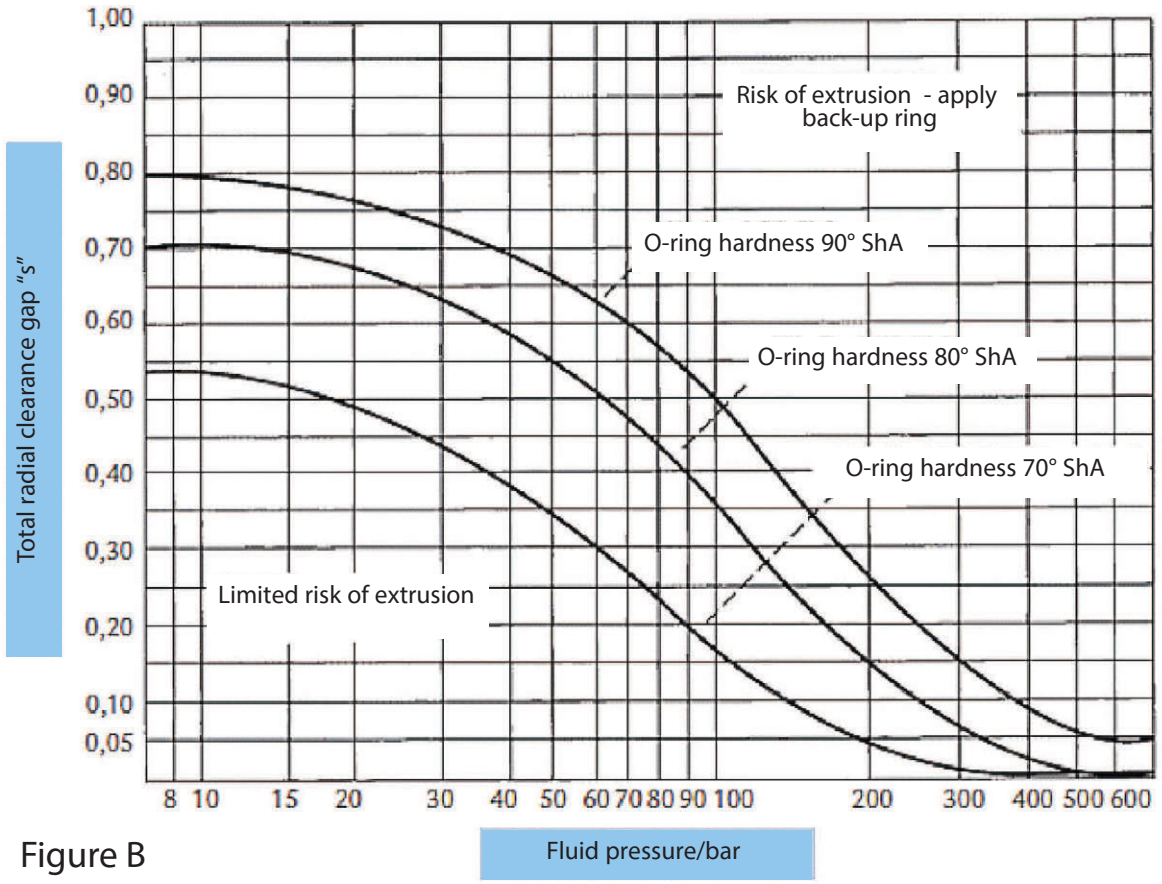
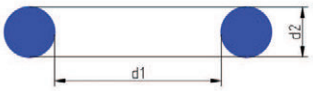


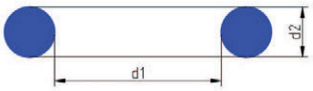
Figure B



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 aging resistance. Temperature range from -30° C to +200° C (depending on compound) FPM is also available in special grades. Ex. better low-temp. properties, resistance to biofuels etc.
HNBR Hydrogenated nitrile	HNBR has a high oil resistance, and in addition to this an excellent resistance to ozon, aging 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 an excellent resistance to ozone,aging 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 resistant to mineral oil products. Temperature range from -50° C to +150° C (depending on compound)
VMQ silicone	VMQ is the rubber with largest temperature range. Silicone is well known for its high temperature capabilities in dry heat and for water up to +100°c, not suited for steam applicatons. Ozone, aging 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 Pharma 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 aging resistance compared to NBR. Special qualities are resistant to some refrigerants. (consult M-seals) Temperature range from -40° C to +100° C
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) See also further details on page 12-13 of this catalog.
TFE/P Aflas®	TFE/P has a high chemical resistance cross 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
PU Polyuhrethane	PU is made from a highly extrution resistant material with excellent oil resistance. Pu has a very high abrasion resistance and resist high pressures. Temperature range from -30° C to +110° C (depending on compound)

Food, drinking water and Pharma	**Many of above mentioned compounds are available in FDA and EU1935/2004 conforming materials. Several are also approved to USP Class VI. Further to this 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 gasses 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 the Rapid Gas Decompression (RGD) phenomenon that occur due to pressure changes in the oil production processes. We can meet requirements like NORSOK M-710, ISO23936, NACE TM0297, API6A, and TOTAL GS EP PW 142.**



General Properties of Elastomers

The below overview is typical properties of elastomer families used for O-rings. This is a guideline only. The values and rating can vary with the specific compounds. For detailed compatibility information, please contact M Seals.
It is always advisable to test the O-ring in the actual medium.

	Nitrile NBR	Etylen-propylene EPDM	Cloro-prene Neoprene CR	Fluoro-carbon FPM/FKM	Silicone VMQ	Teflon® FEP	Perfluor-carbon Kalrez® FFKM
General Properties						[2]	
Hardness range Shore A	40-90	40-90	40-80	50-90	20-80	75-95	65-90
Upper continuous operation temp. [1] °C	+100°	+150°	+100°	+200°	+200°	+205°	+326°
Lower continuous operation temp. [1]°C	-40°	-50°	-40°	-30°	-60°	-60°	-42°
Dynamic operation, abrasion resistance	••••	••••	•••	•••	•	••	•••
Compression set	•••	••	•••	•••	••••	•	•••
Electrical properties	••	••••	•••	••	••	•••	••
Aldehyde	•	•••	•	•	•••	•••	••••
Alkalis	••	••••	•	•	••	••••	••••
Alcohols	•••	•••	•••	•••	•••	••••	••••
Amines	•	•••	•••	•	••	••••	••• [1]
Animal oil and fat	••••	•••	•••	••••	•••	••••	••••
Bleach solutions	•	••••	•	••••	•••	••••	•••• [1]
Diesel fuel	••••	•	••	••••	•	••••	••••
Esters – alkyl phosphate	•	••••	•	•	•••	••••	••••
Esters – aryl phosphate	•	••••	•	••••	•••	••••	••••
Liquid petroleum gas, LPG	••••	•	•••	••••	••	••••	••••
Gas permeability	••	••	••	••••	•	••	••••
Ketones	•	••••	•	•	•	••••	••••
Hydrocarbons - aliphatic	••••	•	••	••••	•	••••	••••
Hydrocarbons - aromatic	••	•	•	••••	•	••••	••••
Air, compressed	••••	••••	••••	••••	••••	••••	••••
Kerosene/paraffin	••••	•	••	••••	•	••••	••••
Crude oil	•••	•	•	••••	•	••••	••••
Silicone oil	••••	••••	••••	••••	•	••••	••••
Lubricating oil - mineral	••••	•	•••	••••	••	••••	••••
Lubricating oil - synthetic (diester)	•••	•	••	••••	•	••••	••••
Acid - inorganic	••	••	••	••••	•••	••••	••••
Acid - organic	••	•••	••	••	••	••••	••••
Toluene	•	•	•	•••	•	••••	••••
Trichloroethylene	•	•	•	•••	•	••••	••••
Steam	•	••••	••	• [1]	•	••••	•••• [1]
Vegetable oil	••••	••	•	••••	•••	••••	••••
Aging in oxygen	••	•••	•••	••••	•••	••••	••••
Aging in ozone	•	••••	•••	••••	•••	••••	••••
Aging in weather	•	••••	•••	••••	•••	•••	••••
Ether	•	••	•	•	•	••••	••••

[1] Depending on compound

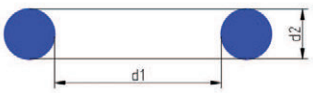
[®] A registered trademark of DuPont Performance Elastomers

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

Suitability	Increase of volume (swell) %	Decrease of hardness - IHRD	Change in physical properties
•••• Exellent	< 10 [3]	Max. 10 [3]	Non or minor [3]
••• Good	10-30 [3]	Max. 20 [3]	Moderate [3]
•• Fair	30-60 [3]	Max. 30 [3]	Noticeable [3]
• Poor	> 60 [4]	Max. 30 [4]	Considerable [4]

[3] In 30 days to 1 year

[4] Immediately to 1 year



Kalrez® perfluorelastomers



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, Karlez® perfluorelastomer parts last longer. In any harsh environment for rubber components, Karlez parts can help you:

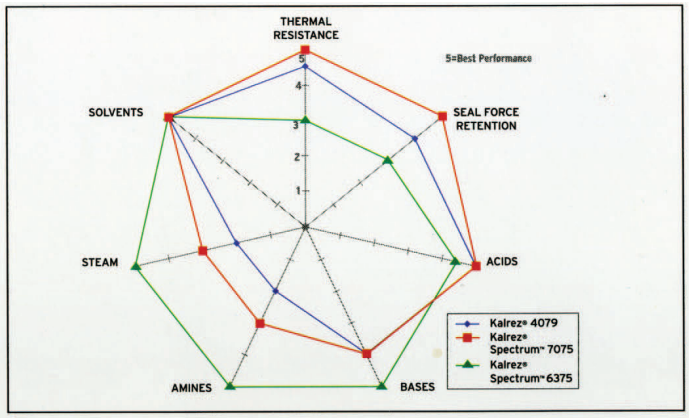
- Reduce costly seal failures
- Save on maintenance costs
- Improve productivity
- Increase safety and reduce the risks of environmental hazards.

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

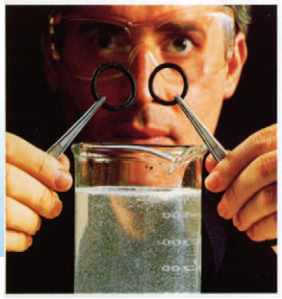
As authorized Kalrez® distributor for Denmark and Sweden, M Seals has the expertise to support your needs for demanding sealing tasks. We are in close cooperation with Du Pont technical service and development laboratories for deep support. M Seals stock a large number of standard O-rings in Kalrez®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

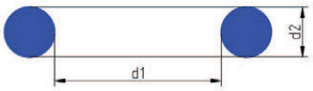


Kalrez compounds

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

® Registered trademark of E.I. du Pont de Nemours and Company





Kalrez® perfluorelastomers

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 1500 chemicals. A summary of these results is provided in the table below. For more specific information, ask M-Seals.

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.
Alcohols	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.

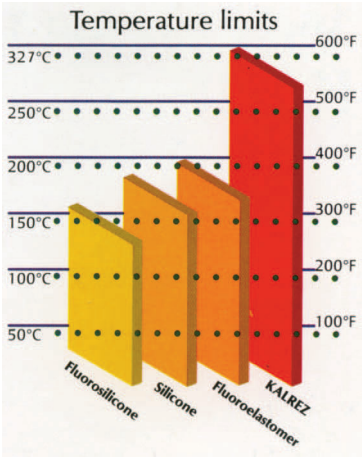
*Union Carbide registered trademark for mono-and dialkyd esters of ethylene glycol and their derivatives.

(1)Dow Chemical registered trademark

(2)Monsanto registered trademark

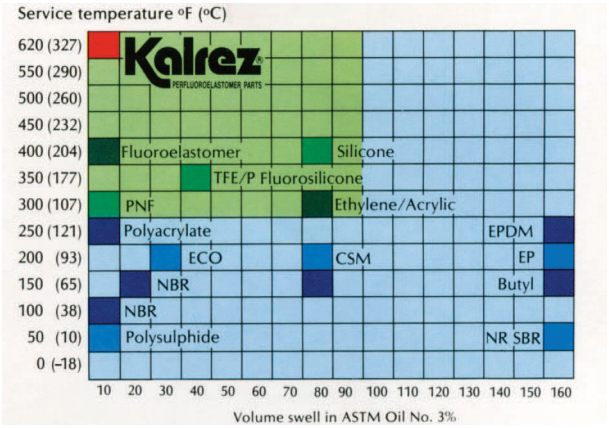
Proven thermal stability

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 in the figure at right, these service temperatures are 127 °C/220 °F or 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 are 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 is critical.

Relative heat and 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.

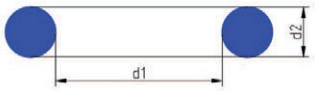
After exposure to aggressive chemicals and temperatures that cause other rubbers to swell excessively, harden or become brittle, Kalrez parts continue to perform

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.

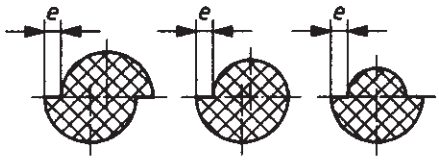
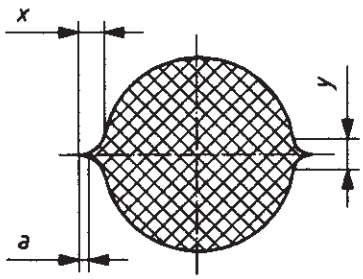
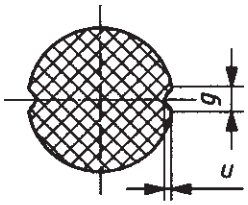
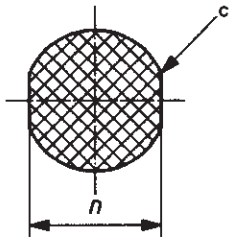
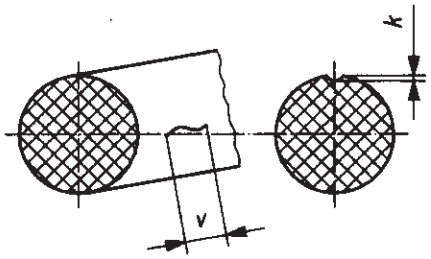
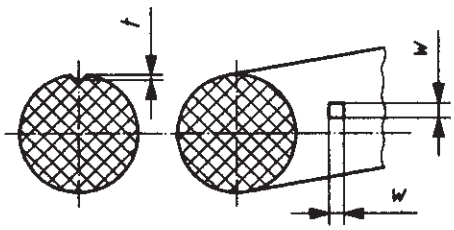
High temperature resistance. Long-term exposure to elevated temperatures can cause other elastomers to become hard and brittle. Kalrez parts retain their elasticity and recovery properties even after long-term exposure to temperatures up to 327°C/620 °F.

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.



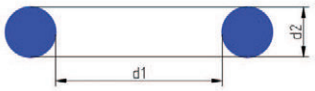
Surface imperfections limits, acc. to ISO 3601-3

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 0,07 mm.				
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 diameter d_2 for the O-ring.				
Flow marks (radial orientation of flow marks is not permissible)		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 < 0,8 mm or > 8,40 mm shall be agreed upon between manufacturer and customer.

[c] Round edges.



Standard Dimensions

Standard dimensions acc. 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, and EPDM etc.
This is only a part of our large selection of O-rings, and many other sizes i.e. in even millimetre cross sections, are available from stock, or with a short delivery time. Please see our website www.m-seals.com / Products & E-shop, where you can easily search any size and material. Furthermore, in reasonable quantities, virtually any sizes can be produced to order.

# No.	Size d1xd2	Tolerance d1	# No.	Size d1xd2	Tolerance d1	# No.	Size d1xd2	Tolerance d1	# No.	Size d1xd2	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	114,02 x 1,78	+/-0,92	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

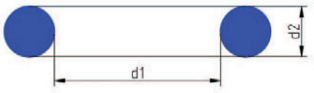
Tolerances for intermediate sizes - go to the next size in the table.

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



Standard Dimensions

Standard dimensions acc. 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, and EPDM etc.
This is only a part of our large selection of O-rings, and many other sizes i.e. in even millimetre cross sections, are available from stock, or with a short delivery time. Please see our website www.m-seals.com / Products & E-shop, where you can easily search any size and material. Furthermore, in reasonable quantities, virtually any sizes can be produced to order.

# No.	Size d1xd2	Tolerance d1	# No.	Size d1xd2	Tolerance d1	# No.	Size d1xd2	Tolerance d1	# No.	Size d1xd2	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	140	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

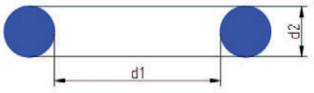
Tolerances for intermediate sizes - go to the next size in the table.

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

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

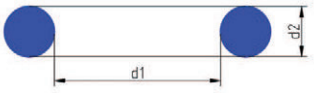
The above tolerances are valid for O-rings supplied from M Seals in most materials measured at 21° to 25°C and as per ISO3601:2008 annex B. Excepted are i.e. O-rings in Kalrez materials, FEP Encapsulated O-rings and M Maxi O-rings made from extruded cord – tolerances for these groups can be informed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

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



Standard Dimensions

# No.	Size d1xd2	Tolerance d1	# No.	Size d1xd2	Tolerance d1	# No.	Size d1xd2	Tolerance d1	# No.	Size d1xd2	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 acc. 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, and EPDM etc.
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# No.	Size d1xd2	Tolerance d1	# No.	Size d1xd2	Tolerance d1	# No.	Size d1xd2	Tolerance d1	# No.	Size d1xd2	Tolerance d1
350	116,84 x 5,33	+/-0,94	374	234,32 x 5,33	+/-1,72		44,20 x 5,70	+/-0,40		164,30 x 5,70	+/-0,60
351	120,02 x 5,33	+/-0,96	375	240,67 x 5,33	+/-1,76		49,20 x 5,70	+/-0,40		169,30 x 5,70	+/-0,60
352	123,19 x 5,33	+/-0,98	376	247,02 x 5,33	+/-1,80		54,20 x 5,70	+/-0,40		174,30 x 5,70	+/-0,60
353	126,37 x 5,33	+/-1,00	377	253,37 x 5,33	+/-1,84		59,20 x 5,70	+/-0,40		179,30 x 5,70	+/-0,60
354	129,54 x 5,33	+/-1,02	378	266,07 x 5,33	+/-1,92		64,20 x 5,70	+/-0,40		184,30 x 5,70	+/-0,60
355	132,72 x 5,33	+/-1,05	379	278,77 x 5,33	+/-2,00		69,20 x 5,70	+/-0,40		189,30 x 5,70	+/-0,80
356	135,89 x 5,33	+/-1,07	380	291,47 x 5,33	+/-2,09		74,20 x 5,70	+/-0,40		194,30 x 5,70	+/-0,80
357	139,07 x 5,33	+/-1,09	381	304,17 x 5,33	+/-2,17		79,20 x 5,70	+/-0,40		199,30 x 5,70	+/-0,80
358	142,24 x 5,33	+/-1,11	382	329,57 x 5,33	+/-2,33		84,10 x 5,70	+/-0,40		209,30 x 5,70	+/-0,80
359	145,42 x 5,33	+/-1,13	383	354,97 x 5,33	+/-2,49		89,10 x 5,70	+/-0,40		219,30 x 5,70	+/-0,80
360	148,59 x 5,33	+/-1,15	384	380,37 x 5,33	+/-2,65		94,10 x 5,70	+/-0,40		229,30 x 5,70	+/-0,80
361	151,77 x 5,33	+/-1,17	385	405,26 x 5,33	+/-2,81		99,10 x 5,70	+/-0,40		239,30 x 5,70	+/-0,80
362	158,12 x 5,33	+/-1,21	386	430,66 x 5,3	+/-2,97		104,10 x 5,70	+/-0,40		249,30 x 5,70	+/-0,80
363	164,47 x 5,33	+/-1,26	387	456,06 x 5,33	+/-3,13		109,10 x 5,70	+/-0,40		259,30 x 5,70	+/-1,00
364	170,82 x 5,33	+/-1,30	388	481,46 x 5,33	+/-3,29		114,30 x 5,70	+/-0,40		269,30 x 5,70	+/-1,00
365	177,17 x 5,33	+/-1,34	389	506,86 x 5,33	+/-3,45		119,30 x 5,70	+/-0,40		279,30 x 5,70	+/-1,00
366	183,52 x 5,33	+/-1,38	390	532,26 x 5,33	+/-3,61		124,30 x 5,70	+/-0,40		289,30 x 5,70	+/-1,00
367	189,87 x 5,33	+/-1,42	391	557,66 x 5,33	+/-3,77		129,30 x 5,70	+/-0,40		299,30 x 5,70	+/-1,00
368	196,22 x 5,33	+/-1,47	392	582,68 x 5,33	+/-3,92		134,30 x 5,70	+/-0,40		319,30 x 5,70	+/-1,00
369	202,57 x 5,33	+/-1,51	393	608,08 x 5,33	+/-4,08		139,30 x 5,70	+/-0,40		339,30 x 5,70	+/-1,00
370	208,92 x 5,33	+/-1,55	394	633,48 x 5,33	+/-4,24		144,30 x 5,70	+/-0,40		359,30 x 5,70	+/-1,50
371	215,27 x 5,33	+/-1,59	395	658,88 x 5,33	+/-4,40		149,30 x 5,70	+/-0,60		379,30 x 5,70	+/-1,50
372	221,62 x 5,33	+/-1,63					154,30 x 5,70	+/-0,60		399,30 x 5,70	+/-1,50
373	227,97 x 5,33	+/-1,67					159,30 x 5,70	+/-0,60		419,30 x 5,70	+/-2,00

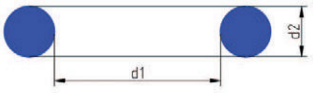
Tolerances for intermediate sizes - go to the next size in the table.

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

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



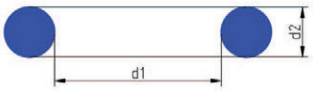
Standard Dimensions

# No.	Size d1xd2	Tolerance d1	# No.	Size d1xd2	Tolerance d1	# No.	Size d1xd2	Tolerance d1	# No.	Size d1xd2	Tolerance d1
	439,30 x 5,70	+/-2,00	452	291,47 x 6,99	+/-2,09		144,10 x 8,40	+/-0,60		189,10 x 8,40	+/-0,80
	459,30 x 5,70	+/-2,00	453	304,17 x 6,99	+/-2,17		149,10 x 8,40	+/-0,60		194,10 x 8,40	+/-0,80
	479,30 x 5,70	+/-2,00	454	316,87 x 6,99	+/-2,25		154,10 x 8,40	+/-0,60		199,10 x 8,40	+/-0,80
	499,30 x 5,70	+/-2,00	455	329,57 x 6,99	+/-2,33		159,10 x 8,40	+/-0,60		209,10 x 8,40	+/-0,80
			456	342,27 x 6,99	+/-2,41		164,10 x 8,40	+/-0,60		219,10 x 8,40	+/-0,80
			457	354,97 x 6,99	+/-2,49		169,10 x 8,40	+/-0,60		229,10 x 8,40	+/-0,80
425	113,67 x 6,99	+/-0,92	458	367,67 x 6,99	+/-2,57		174,10 x 8,40	+/-0,60		239,10 x 8,40	+/-0,80
426	116,84 x 6,99	+/-0,94	459	380,37 x 6,99	+/-2,65		179,10 x 8,40	+/-0,60		249,10 x 8,40	+/-0,80
427	120,02 x 6,99	+/-0,96	460	393,07 x 6,99	+/-2,73		184,10 x 8,40	+/-0,60			
428	123,19 x 6,99	+/-0,98	461	405,26 x 6,99	+/-2,81						
429	126,37 x 6,99	+/-1,00	462	417,96 x 6,99	+/-2,89						
430	129,54 x 6,99	+/-1,02	463	430,66 x 6,99	+/-2,97						
431	132,72 x 6,99	+/-1,05	464	443,36 x 6,99	+/-3,05						
432	135,89 x 6,99	+/-1,07	465	456,06 x 6,99	+/-3,13						
433	139,07 x 6,99	+/-1,09	466	468,76 x 6,99	+/-3,21						
434	142,24 x 6,99	+/-1,11	467	481,46 x 6,99	+/-3,29						
435	145,42 x 6,99	+/-1,13	468	494,16 x 6,99	+/-3,37						
436	148,59 x 6,99	+/-1,15	469	506,86 x 6,99	+/-3,45						
437	151,77 x 6,99	+/-1,17	470	532,26 x 6,99	+/-3,61						
438	158,12 x 6,99	+/-1,21	471	557,66 x 6,99	+/-3,77						
439	164,47 x 6,99	+/-1,26	472	582,68 x 6,99	+/-3,92						
440	170,82 x 6,99	+/-1,30	473	608,08 x 6,99	+/-4,08						
441	177,17 x 6,99	+/-1,34	474	633,48 x 6,99	+/-4,24						
442	183,52 x 6,99	+/-1,38	475	658,88 x 6,99	+/-4,40						
443	189,87 x 6,99	+/-1,42									
444	196,22 x 6,99	+/-1,47									
445	202,57 x 6,99	+/-1,51									
446	215,27 x 6,99	+/-1,59									
447	227,97 x 6,99	+/-1,67									
448	240,67 x 6,99	+/-1,76									
449	253,37 x 6,99	+/-1,84									
450	266,07 x 6,99	+/-1,92									
451	278,77 x 6,99	+/-2,00									

Tolerances, cross-section d2
According to ISO3601-1:2008 class B

Cross section Ø d2 mm	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 x0.018.
Above tolerances apply to O-rings supplied from M Seals in the most common materials. Excepted is FFKM (Kalrez) and FEP encapsulated o-rings. Tolerances for FFKM and encapsulated orings can be informed on request.

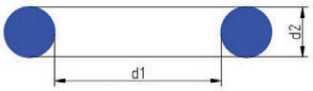


M Mini miniature O-rings, tool list

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.

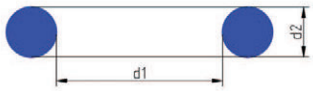
Size d1xd2	Tolerance d1	Size d1xd2	Tolerance d1	Size d1xd2	Tolerance d1	Size d1xd2	Tolerance d1	Size d1xd2	Tolerance d1
0,70 x 0,20	+/-0,08	0,45 x 0,40	+/-0,08	4,75 x 0,48	+/-0,08	2,49 x 0,51	+/-0,08	2,00 x 0,60	+/-0,08
1,00 x 0,20	+/-0,08	0,50 x 0,40	+/-0,08	0,70 x 0,50	+/-0,08	6,99 x 0,51	+/-0,08	2,25 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

Tolerance for d2, see page 19



M Mini miniature O-rings, tool list

Size d1xd2	Tolerance d1	Size d1xd2	Tolerance d1	Size d1xd2	Tolerance d1	Size d1xd2	Tolerance d1	Size d1xd2	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
1,5 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

M Seals assortments are stocked in NBR 70 material, but all are available in FPM75 material.

Special composed assortments are made up on request



Numbers in brackets is quantity per size

MC1/NBR 70

- 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 ø1,78 mm (1 m)
6,07 - 1,78 (25)	18,64 - 3,53 (15)	Cord ø2,62 mm (1 m)
7,65 - 1,78 (25)	20,22 - 3,53 (10)	Cord ø3,53 mm (1 m)
9,25 - 1,78 (25)	21,82 - 3,53 (10)	Glue (1)
9,19 - 2,62 (25)	23,39 - 3,53 (10)	Knife (1)

MC 2A/NBR 70

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

12,42 - 1,78 (30)	44,12 - 2,62 (20)	
15,60 - 1,78 (30)	47,29 - 2,62 (20)	
18,77 - 1,78 (30)	50,47 - 2,62 (20)	
21,95 - 1,78 (30)	40,87 - 3,53 (10)	
25,12 - 1,78 (30)	44,04 - 3,53 (10)	Cord ø1,78 mm (1 m)
28,30 - 1,78 (30)	47,22 - 3,53 (10)	Cord ø2,62 mm (1 m)
31,47 - 1,78 (30)	50,39 - 3,53 (10)	Cord ø3,53 mm (1 m)
34,65 - 1,78 (30)	56,74 - 3,53 (10)	Cord ø5,34 mm (1 m)
37,77 - 2,62 (20)	63,09 - 3,53 (10)	Glue (1)
40,94 - 2,62 (20)		Knife (1)

MC 2B/NBR 70

- 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)	

MC 3/NBR 70

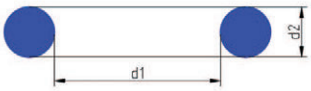
- 432 O-rings in NBR (nitrile)
- Hardness 70 +/-5 Sh. A
- In accordance with BS 4518 and SMS 1586

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)	Cord ø1,60 mm (1 m)
9,10 - 1,60 (25)	10,60 - 2,40 (15)	Cord ø2,40 mm (1 m)
10,10 - 1,60 (25)	11,60 - 2,40 (10)	Cord ø3,00 mm (1 m)
11,10 - 1,60 (25)	13,60 - 2,40 (10)	Glue (1)
12,10 - 1,60 (25)	15,60 - 2,40 (10)	Knife (1)
14,10 - 1,60 (25)	17,60 - 2,40 (10)	

MC4/ NBR 70

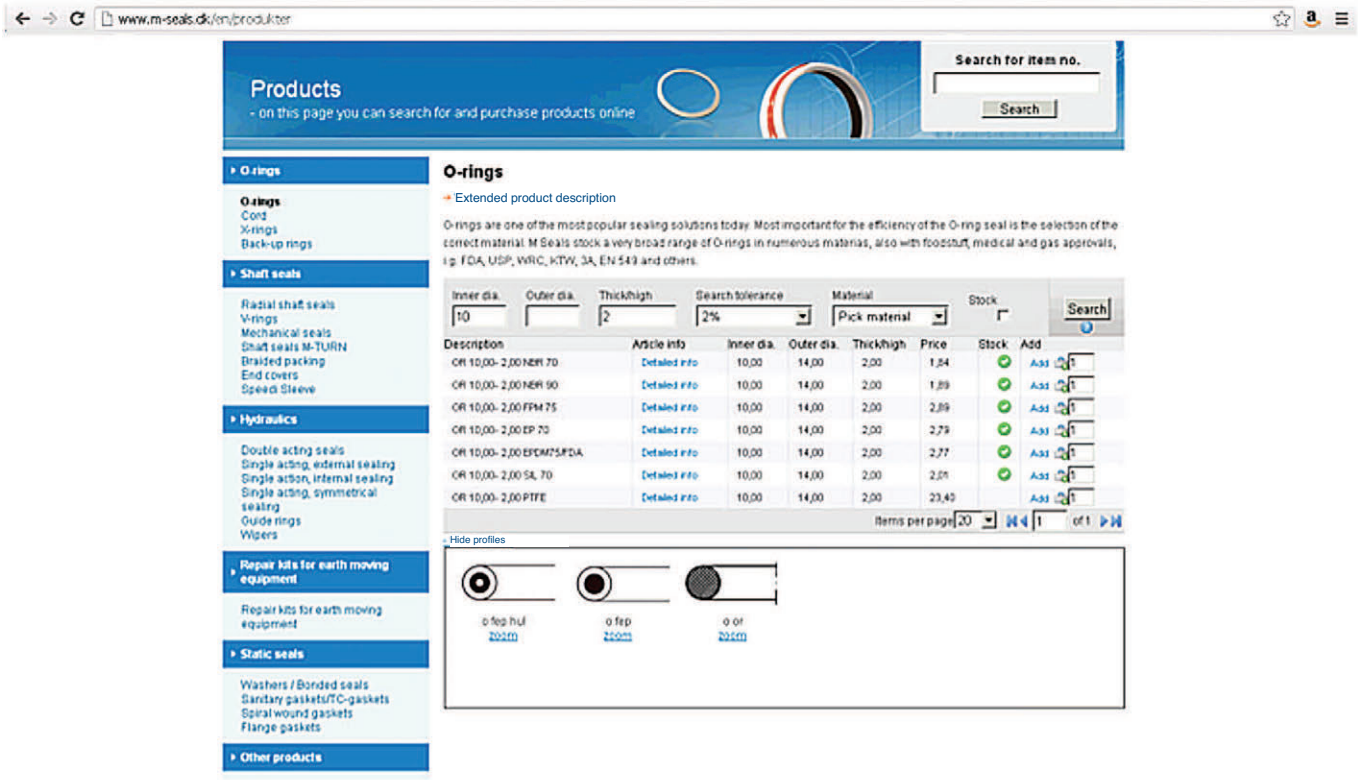
- 385 O-rings in NBR (nitrile)
- Hardness 70 +/-5 Sh. A
- In accordance with BS 4518 and SMS 1586

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)	Cord ø1,60 mm (1 m)
22,10 - 1,60 (25)	27,50 - 3,00 (10)	Cord ø2,40 mm (1 m)
25,10 - 1,60 (25)	31,50 - 3,00 (10)	Cord ø3,00 mm (1 m)
27,10 - 1,60 (25)	35,50 - 3,00 (5)	Glue (1)
37.60 – 2,40 (15)	37,50 - 3,00 (5)	Knife (1)
39,60 - 2,40 (15)	41,50 - 3,00 (5)	

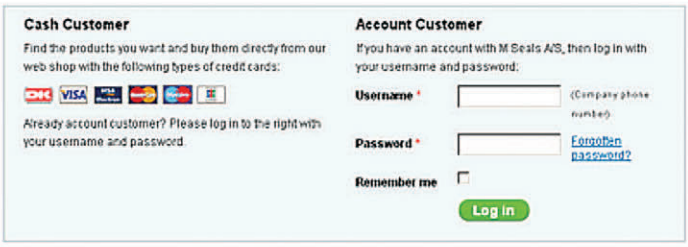


M Seals Website – www.m-seals.com

We can highly recommend you to make use of our comprehensive website and e-shop.
You will have simple direct access to our complete product range and stock. Just choose "Products and e-shop" and select the desired product group in the left column. You will then get a search picture, as shown here, and then enter the dimension and material. There may be certain items not shown in the product search – if you don't find what you are looking for, please call our sales department on +45 49130205, or email us on sales@m-seals.com
After you have found the relevant items, you can click on "Detailed info" and see additional specifications of the item.
Also on the website, all our catalogues and a lot of technical data – including various Certificates of Compliance, is ready available for download.

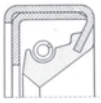


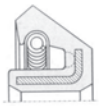
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Type A+AI

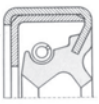

Type B+BI

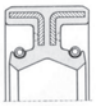

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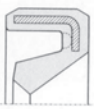

Type AE


Type AS+ASI


Type BS+BSI


Type CS+CSI


Type ADUO


Type AUF


Type BUF


Type ATS


Type BP

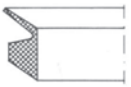

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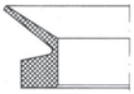

BD

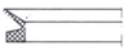

OR

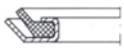

X

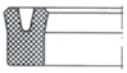

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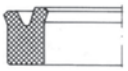

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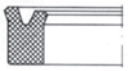

VE


VL


VRB

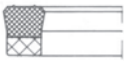

S01-02

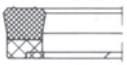

E01-02


I01-02

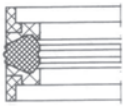

E41

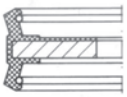

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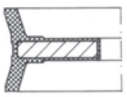

S50

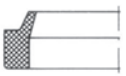

I52

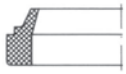

S64-66

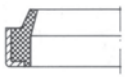

D16

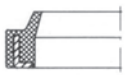

D91

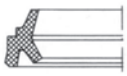

D90


W01

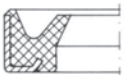

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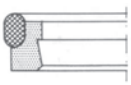

W30


W35


W20


W10


W34


M Wipe™
W50

M Step™
I70

M Glide™
D80

M Turn™
D74

M Flex™
I99

M Flex™
E90

M Guide™

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M SEALS
- Part of Diploma PLC

Denmark
M Seals A/S
Bybjergvej 13
DK-3060 Espergærde
Tel.: +45 49 13 02 05
Fax: +45 49 13 01 41
sales@m-seals.dk
www.m-seals.dk

Poland
M Seals
ul. Przyjazna 10
62-030 Luboń (Poznań)
Kom.: +48 72 482 84 01
Tel.: +48 61 646 07 47
p.potocki@m-seals.com
www.m-seals.com

Sweden
M Seals AB
Industrivägen 17
SE-302 41 Halmstad
Tel.: +46 (0)35 15 89 40
sales@m-seals.se
www.m-seals.se

China
M Seals China
Room 411, No. 9 Building
No. 9 Yuan, Yuxi road,
Houshayu, Shunyi District
Beijing 100102, China
Tel.: +86 10 8478 3090
sales@m-seals.cn
www.m-seals.com

United Kingdom
M Seals UK Ltd.
Unit E, Aquarius
Kingsway North, Team Valley
Gateshead NE11 OJH
Tel.: +44 (0)191 422 4200
Fax: +44 (0)191 422 4222
salesuk@m-seals.com
www.m-seals.com

M Seals UK Ltd.
Quartz Close
Enderby
Leicester, LE19 4SG
Tel.: +44 (0)116 275 4720
Fax: +44 (0)116 275 4721
sales@m-seals.co.uk
www.m-seals.co.uk

Finland
M Seals OY
Nuolikuja 8
01740 Vantaa
Tel.: +358 40 7011978
sales@m-seals.fi
www.m-seals.fi